User's Manual

DataScout 10G

Version 14

52071568

Copyright

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Safety Information

Overview

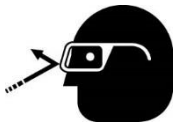
Hazards exist in every workplace in many different forms: sharp edges, falling objects, flying sparks, chemicals, noise and a myriad of other potentially dangerous situations. Controlling hazards at their source is the best way to protect you from accidents. While the test set is designed to be a safe and reliable tool, the environment in which you perform work in may expose you to hazards.

Shock Hazard

While this test device does not produce, or emit harmful sources of electrical voltage or current, network elements and circuitry you are testing may. Always follow your established safety practices and the instructions in this user manual regarding proper connection to the circuit under test.

Please note that this test device is not designed to warn you if connection to input voltage or current exceeds the maximum allowed by the test interfaces installed in this unit. Exceeding maximum values may result in damage and not be covered under warranty.

Eye Protection



⚠CAUTION

Wear eye protection when using this device.
Failure to observe this precaution may result in injury.

Laser Safety

⚠CAUTION

Never look into laser transceivers (SFP/SFP+).
Failure to observe this precaution may result in eye damage.

Optical small form-factor pluggable (SFP/SFP+) transceivers use laser radiation to generate communication signals. Always keep the optical transmit and receive ports covered whenever the optical patch cord is not plugged in and turn the laser off prior to connecting or disconnecting fiber optic patch cords.

Battery Safety

⚠CAUTION

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

Do not allow anything to contact the battery terminals.

- Do not immerse 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.
- 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
- Use this product only in the manner described in this manual. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

FCC/IC Notifications

The following notifications apply for models DataScout 10G and DataScout 10Gx when 802.11 and/or Bluetooth radio interfaces are installed:

This device complies with part 15 of the FCC Rules and Industry Canada RSS standards. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Cet appareil est conforme à la partie 15 des normes FCC RSS Règles et Industrie Canada. Son fonctionnement est soumis aux deux conditions suivantes: (1) Ce dispositif ne peut causer des interférences nuisibles, et (2) cet appareil doit accepter toute interférence reçue, y compris les interférences qui peuvent provoquer un fonctionnement indésirable.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Les changements ou modifications non expressément approuvés par la partie responsable de la conformité pourraient annuler l'autorité de l'utilisateur à utiliser l'équipement.

Getting Started

Upon receipt of your test set perform a visual inspection, accessories and power supply. If any item is missing appears damaged, please contact your local Greenlee Communications representative or our customer support team using one of these methods:

Phone:

Americas: 800-642-2155
EMEA: +44 1633 627710

Email:

communicationtechsupport@greenlee.textron.com

Mail:

Greenlee Communications
1390 Aspen Way
Vista, CA 92081

Battery Information

The test set can be powered from its internal rechargeable battery pack or from the provided universal 100-240VAC wall mount charger. Battery life will depend on the active test interface selection but on average a single test interface supports approximately 6-8 hours of continuous operation. Multiple test interface selections will decrease the battery life by approximately 30% per interface. The Ethernet 10G interface consume the most power and thus you should expect typically around 2-3 hours of testing on batteries when using this interface.

Before using the test set for the first time you will need to charge the battery for approximately 8 hours to achieve a full charge. A yellow graphic battery charge icon located to the left of the display indicates the batteries are charging. This indicator is independent of the power state (On/Off) of the test set. The ON/OFF power indicator is located on the upper left panel next to the display.

Warranty

The test set is warranted for a period of at least one year from the date of shipment against defects in material and workmanship. This warranty applies to the original equipment purchaser and is non-transferable without express written authorization.

Warranty is void if:

1. The warranty sticker has been tampered with or
2. The equipment has been altered
3. The equipment has not been serviced by a Greenlee Communications authorized service and repair center
4. The equipment is installed or operated in any manner other than those specifically described in the instructions and operating literature.

No other warranty is expressed or implied.

Calibration

This test set is of modern design incorporating components which do not require a periodic calibration schedule. If desired or required by your internal quality processes, the device may be returned to the factory, for a charge, to confirm conformance to factory settings.

Training Videos

Portions of this user manual are preloaded onto your test set and available online in video format. To access videos preloaded on your test set:

1. Plug headphones into the headphone jack on the right side of the test unit
2. Press the Office Suite application icon
3. Tap on the folder named “Training Videos”
4. Tap on the video you wish to watch

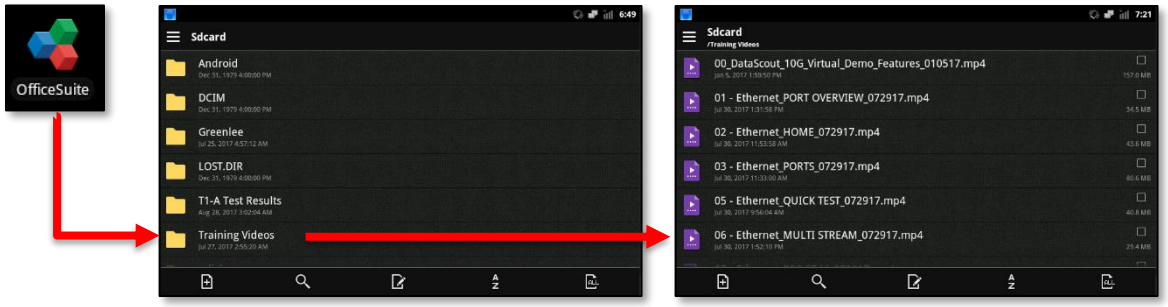


Figure 1 - Accessing Training Videos

Alternately, you can copy these files to a USB drive and install on a device of your choice. These videos are also available online at: https://www.youtube.com.

Buttons & Icons

Figure 2 - DataScout 10G Front View

User Interface

Power on/off

To power **ON** the test set, press and hold the power button for two seconds or until the green power indicator lights. Once powered on, the unit takes approximately 35 seconds to display the home screen.

To Power **OFF** press and hold the power button for four seconds or until the green power indicator turns off. Note that the yellow charge Icon may or may not be lit depending on the state of the battery and if the AC charger is plugged into the unit.

Touch screen

Unlike your smart phone which may utilize capacitive touch screen technology, this device utilizes an industrial grades resistive touch technology. Resistive touch screens require pressing or sliding your finger in a deliberate medium force action when interacting with the touch screen. If you slide or press lightly like you would a smart phone the unit may not respond and is a design feature, not a limitation. Additionally, advanced touch screen features such as pinch, flick and zoom are not supported by resistive touch screens.

Utilization of a stylus or your finger nail is usually the best way to interact with the touch screen. Never use metal objects (knives, snips, screwdrivers, picks, etc.) as a stylus. Doing so may damage the touch screen and void your warranty.

Unlocking the screen

Slide the unlock button from bottom to top to unlock the unit. You are now at the home screen. Press a test Icon for the tests you would like to perform or use your finger and slide from left to right or right to left to view additional screens.

User Settings

To adjust various user settings such as LCD brightness or data and time press the all applications menu icon located middle right of LCD followed by the settings icon. Alternately from the home screen you can also press the menu icon followed by settings.

Using your finger or a stylus scroll down to the setting you wish to change then press the setting. The only settings recommend for changing is the Display and Date & Time located at the bottom of the menu.

Important: Do not use the reset or default option available in the settings menu. All user settings and test applications will be deleted which will require a return to the factory for reload.

Navigation Buttons

From left to right the navigations buttons are **BACK**, **HOME**, **MENU**, and **POWER**.

BACK will take you to the previous screen. Press and hold to view recently accessed apps.

HOME quickly returns you to the home screen from whatever application or screen you are in. This is the screen with the test applications. Press and hold to view recent accessed apps

MENU when on the home screen displays a menu for changing wallpaper, search, and other settings. Within a test application pressing the menu button enables and disables test options. Additionally, pressing and holding the menu button in a test application displays the keyboard. Press and hold the menu button to close the keyboard.

POWER turns on/off the test set. Press and hold two seconds to turn on or press and hold for four seconds to turn off.

Indicator Lights

Power Indicator

The green powered-on indicator is located above the upper left corner of the display and is only lighted when the unit is powered on. When this indicator is off it indicates that unit is powered off.

Low Battery

A red battery indicator to the left side of the screen will flash rapidly, indicating the battery charge status is critically low. If this occurs the test set should be immediately plugged into power to continue testing.

Battery Charging

An orange battery indicator with a lightning bolt will appear to the left side of the screen when the battery is charging. A full charge cycle will take approximately eight hours to complete when the battery is fully discharged.

Interfaces

Test Interfaces

The test set uses a plug & stay architecture which eliminates removing, damaging or losing modules like you would with other test sets. Plug & stay also enables testing multiple services at the same time without powering off the device to change modules. You can't do that with many modular test systems.

All test interfaces are located on the right side of the unit as shown in the graphic below. Please note that depending on your configuration you may not have all ports installed on your unit.

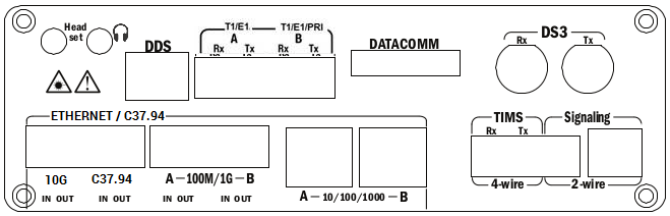


Figure 3 - Test Interface Ports

- Ethernet (10/100) Copper
- Fast Ethernet (100) Fiber SFP
- Dual Gigabit Ethernet (1000) Copper
- Dual Gigabit Ethernet (1000) Fiber
- Dual 10 Gigabit Ethernet Fiber
- T3 Test Interface
- First T1/E1 Test Interface
- Second fully independent T1/E1/PRI-ISDN Test Interface
- PRI-ISDN NT/TE Voice & Data Testing
- Datacomm Testing SYNC/ASYNC DTE/DCE RS232, V.35, RS449, RS530
- 2-Wire Signaling TIMS–CO, PBX, DID, E&M type I-V, Selective, Wink, Loop/Ground Start Test Interface
- 4-Wire Voice-band and Wideband TIMS Test Interface
- 4-Wire DDS & Frame Relay DLCI Decode Test Interface

Charger, Wi-Fi & Remote Management Interfaces

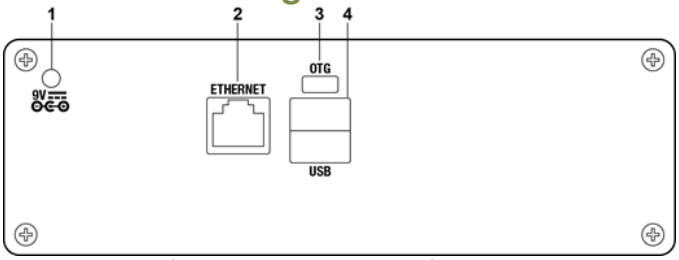


Figure 4 - Management Interface Ports

1. Charger input is in the upper left corner and is labeled 9V. Only use the approved Greenlee Communications supplied charger as other models may damage the internal power supply and will void the warranty.
2. RJ45 Ethernet port enables full remote control of the test set when the DS10-SW-RC option is enabled.
3. OTG (On-the-Go) Micro-AB USB port is to connect to your PC in order to perform application updates or copy/delete documents and save test results.
4. Two USB type-A ports are used to connect a variety of USB accessories such as flash drives, monitor or keyboards/mice. Do not use the USB for charging external products or accessories.

LCD Display

The test set is equipped with a bright 7” color tablet LCD enabling test results, web pages, documents and office applications to be easily viewed, even in bright sunlight.

Proper Care

Always use clean fingers or a touch screen stylus when interacting with the touch screen. Never use hard objects such as screw drivers, knives, or pen tips as they may damage the LCD screen. To clean the LCD, use a cloth lightly dampened with clean water only.

Failure to follow any of the above could result in permanent damage to the LCD and void the warranty.

LCD settings

To change the LCD display settings, press the icon, then settings, select **Display** and then select **Brightness**. Slide the bar left or right to increase or decrease brightness.

To change how long the screen should remain lit before dimming to save power select **Screen Timeout**.

Results (Test/Capture) Retrieval

The test set has 4GB of internal storage (up to 16GB optional) and can store thousands of phone numbers (TIMS) and contacts (via the built-in contacts app in) along with thousands of test results and set up information – by test type. To Log

(Capture errors) you must be in the DS1 or DS3 app; the unit can store thousands of events in internal memory. Tap the menu button and then "**Log Results**". Select the Alarm, Event, Slips or BERT error then hit OK. Note the log will capture any alarm or event and place in a DS1 or DS3 folder with a date and time stamp. Note to prevent streaming errors from creating many files the unit will stop logging at greater than 45% error rate.

To copy time-stamped test results from internal memory to your PC simply power-on the test set and connect a USB OTG (On-the-Go) cable to your PC USB port. Press the **Menu** button on the test set and select **Notifications** followed by USB connected. Tap on the "**Turn on USB storage**". Your PC will now treat the test set as a removable storage device (like a USB stick) and you can copy, paste, add and delete test results (files) to/from the unit. From here you can easily add to your database, print or backup your test results.

User Interface Overview

Upon launching the Ethernet application, the home screen will be displayed. The home screen provides a convenient place to view current port status and begin test configuration. For all DataScout test applications it is recommended to interact with the unit much like you would do when reading a book, start at the top left side of the screen and work your way to the bottom right. All work flows follow this concept as much as possible, ensuring an intuitive user experience.

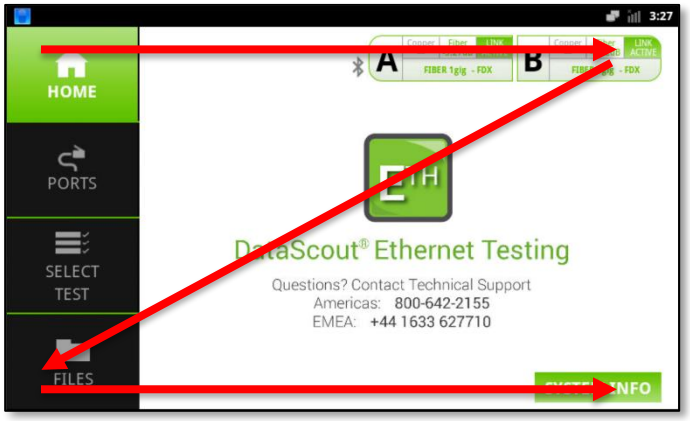


Figure 5 - User Interface Flow

Ethernet Testing

Overview

Service providers rely on enterprise and carrier Ethernet technology as the need for more bandwidth and quality of service is desired. The need for bandwidth and quality services has never been more important, making comprehensive Ethernet testing immediately at service turn-up vital to ensuring service quality and increasing customer satisfaction.

Customer Service-Level Agreements (SLAs) dictate certain performance criteria that must be met, with the majority documenting network availability and mean-time-to-repair values which are easily verified. Today, Ethernet performance criteria are more difficult to prove. Demonstrating performance availability, transmission loss, bursts, latency and delay, link and service integrity cannot be accomplished accurately by a PING or a volt meter.

With the DS10G-HW-ETH Ethernet test interface option installed field technicians, installers and contractors can perform traditional BERT or RFC-2544 tests as well as modern Multi Stream or ITU-T Y.1564 service level testing to demonstrate Ethernet services meet the customer SLA.

Test Interfaces

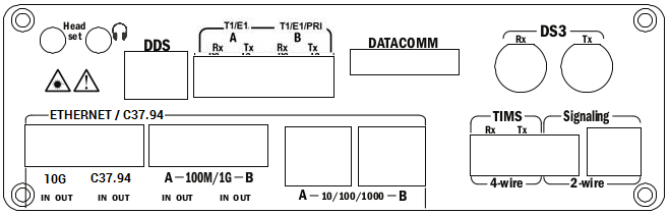


Figure 6 - Ethernet Test Ports

The test set supports testing:

1. Single port 10000Base-X
2. Single port IEEE C37.94
3. Dual port 100FX or 1000Base-X SFP (1GbE)
4. Dual port 10/100/1000Base-T

Test Interface Connections

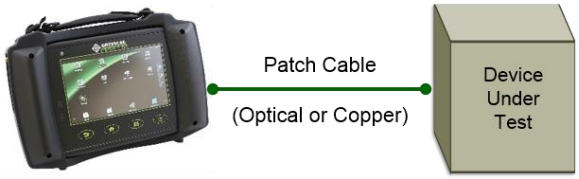


Figure 7 - Ethernet Interface Connection

To connect the test interface to the device under test you must select the proper patch cable depending on which interface you are testing and the termination type if using the optical ports. There is no specific order of connection required. You can connect the patch cord to the test device or network device first.

Home

There are three sections of note on the home view:

1. Menu bar
2. Link status indication bar
3. System Info button

Figure 8 - Home View Sections

Menu Bar

The menu bar provides access to port configuration, selecting which test to run and view or retrieving test profiles as well as results. Menu bar buttons, when selected and active, will be green. When not select or active they will be black. In the figure above, the HOME button on the menu bar is active.

Link Status Indication Bar

The link status indication bar is present in the port configuration and test application views. It provides real time feedback regarding current link status of both Ports A and

B as well as optical and copper link speed status. When link is established the LINK ACTIVE indicator will be green.

Figure 9 - Link Status Indication Bar

Along with link status, the status bar also displays fiber optic receive power in dB relative to 1 milliwatt (mW) if an optical transceiver is plugged in and receiving optical signals.

System Info Button

Figure 10 - System Info, Settings Tab

Pressing the system info button activates a popover view with two tabs labeled settings and install.

Settings

The Settings tab displays system information such as test Platform software and firmware versions, port default MAC addresses and FPGA code version. This information is helpful to have on hand before calling customer service or technical support as the agent may ask you to provide it.

Install

The install tab enables viewing of installed test options and activation of new options by entering a key into the License Key field.

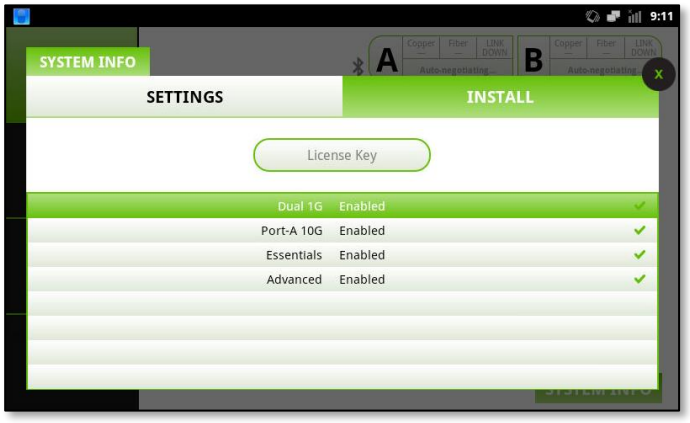


Figure 11 - System Info, Install Tab

Port Configuration

To configure physical port attributes, press the PORTS button. The Ports view has three sections of note on the home view:

1. Port A/B selection icons
2. Physical interface configuration
3. System Info and Laser On/Off buttons

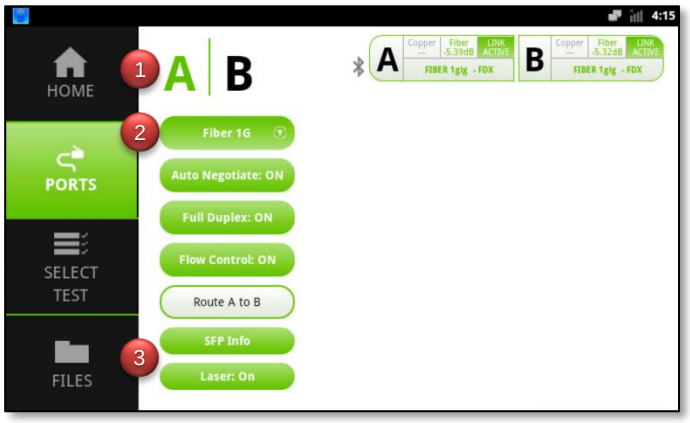


Figure 12 - Ports View

Port A & B Selection

Pressing the A | B port icons enables configuring the physical interface settings for port A and B respectively. The currently selected port will be green in color, in the example above port A is currently the currently selected port.

Port A can operate as either a traffic generation port (BERT, RFC-2544, Y.1564, etc.) or as a loopback port. Port B is a dedicated loopback port. The test set can generate traffic or reflect traffic on port A and loopback traffic on port B simultaneously.

Port B is only active if option DS10G-SW-201 is enabled. If this option is not enabled port B will be inactive and the link status indication bar for port be will display "Option Disabled". Pressing the port B icon will also display an error message confirming the feature is not enabled as shown below.

Figure 13 - DS10G-SW-201 Not Enabled

Physical Interface Configuration

Interface Speed

To configure the physical interface speed, press the Copper 100M button [default] to select a different interface type or speed as shown below.

Figure 14 - Interface Speed Selection

If option DS10G-SW-110 is not enabled the **Fiber 10G** menu option will be disabled.

Auto Negotiate, Duplex and Flow Control

Auto negotiation is an Ethernet procedure by which two connected devices choose common transmission parameters, such as speed, duplex mode, and flow control. In this process, the connected devices first share their capabilities regarding these parameters and then choose the highest performance transmission mode they both support. 1000BASE-T, 1000BASE-TX and 10GBASE-T require auto negotiation to be always present and enabled.

A duplex mismatch occurs when two connected devices are configured in different duplex modes. This may happen for example if one is configured for auto negotiation while the other one has a fixed mode of operation that is full duplex (no auto negotiation). In such conditions, the auto negotiation device correctly detects the speed of operation, but is unable to correctly detect the duplex mode. Thus, it sets the correct speed but uses half-duplex mode. In the table below, various configuration results are shown, combinations marked "Duplex Conflict" or blank indicates no link is possible.

Test Set Configuration								
	Speed	Auto	10	10	100	100	1000	1000
	Duplex	Full	Half	Full	Half	Full	Half	Full
DUT Configuration		↓	↓	↓	↓	↓	↓	↓
Speed	Duplex							
Auto		1000 FDX	10 HDX	Duplex Conflict	100 HDX	Duplex Conflict	1000 HDX	Duplex Conflict
10	Half	10 HDX	10 HDX					
10	Full	Duplex Conflict		10 FDX				
100	Half	100 HDX			100 HDX			
100	Full	Duplex Conflict				100 FDX		
1000	Half	1000 HDX					1000 HDX	
1000	Full	Duplex Conflict						1000 FDX

Table 1 - Speed / Duplex Interoperability

Flow control manages the rate of data transmission between two nodes to prevent a fast sender from overwhelming a slow receiver. It allows the receiver to control the transmission speed so it is not overwhelmed with data from transmitting node.

Route A to B

When the Route A to B button is active the test set passes all traffic from Port A to Port B, providing several innovative functions:

- **Type Conversion:** Pass traffic from Port A to Port B at different physical types but same rates
  - Set Fiber 1G on Port A and Copper 1G on Port B
- **Speed Conversion:** Drop traffic from Port A to Port B at same physical type but different rates
  - Set Copper 1G on Port A and Copper 100M on Port B
- **Speed and Type Conversion:** Drop traffic from high rate on Port A to lower rate on Port B
  - Set Fiber 10G on Port A and Copper 1G on Port B

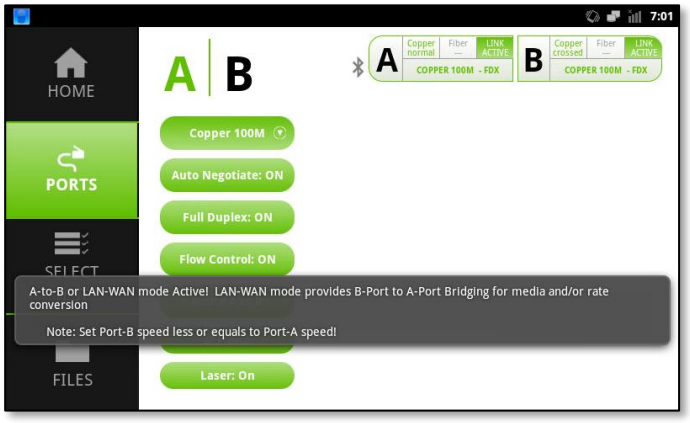


Figure 15 - A to B Mode

When A to B mode is enabled, Port B will automatically be set from Loopback mode to Through mode and cannot be used to loop back traffic.

SFP Info and Laser On/Off

SFP Info

Pressing the SFP Info button will display diagnostic information provided by SFP transceivers which support reporting this information. If details are not populated in the information popover, pressing the refresh button will query the SFP again and attempt to refresh the information.

Not all SFPs provide diagnostic information. In these situations, the SFP info table may not display full, or any, information.

Pressing the tabs at the top of the table will allow viewing SFP information for different ports. The test set will always select the currently selected port and interface speed automatically. In the example below Port A 100M/1G SFP information is being displayed.

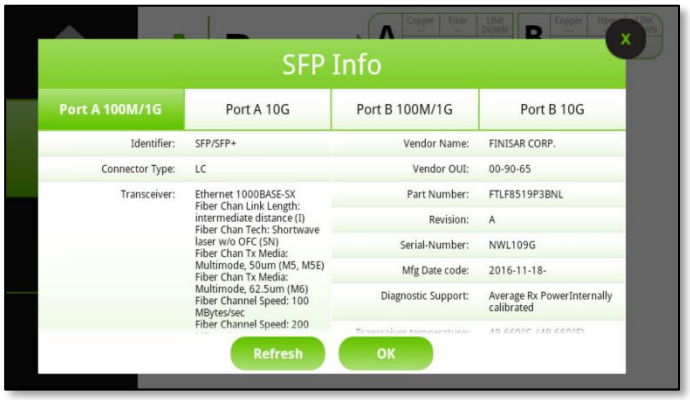


Figure 16 - SFP Information

Laser On/Off

When an optical SFP is plugged into the test set it is on by default. To turn off the laser, press the **Laser: On** button and it will toggle to **Laser: Off**.

Port B Configuration

The Port B configuration view has three sections of note:

1. Physical interface configuration
2. Loopback mode configuration
3. Statistics view

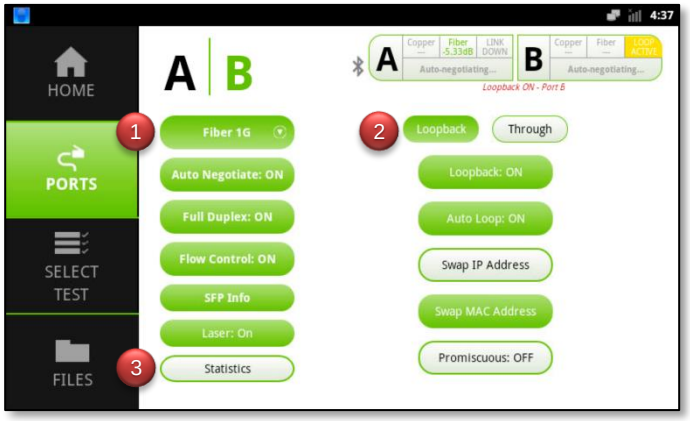


Figure 17 - Port B Configuration

Physical Interface Configuration

Port B configuration is similar to Port A with regards to interface speed, auto negotiate, duplex, and flow control. Because it is a dedicated loopback port there are additional configuration buttons to configure though.

Loopback Mode Configuration

Loopback and Through – These buttons determine if port B is in active loopback mode or is in through mode. By default, port B is always in loopback mode unless A to B is active on port A.

Loopback On/Off – This button manually turns loopback mode on or off. When on, the test set will reflect traffic coming into Port B. When off, the port will not loopback traffic.

Auto Loop On/Off – This button determines whether Port B will respond to loopback queries received from remote devices. When auto loop is on, Port B will respond to queries and loop up/down commands received from compatible devices. When auto loop is off, Port B will not respond to queries or loop up/down commands.

Swap IP Address – This button, when enabled, instructs Port B to swap the source and destination IP addresses of received traffic.

Swap MAC Address – This button, when enabled, instructs Port B to swap the source and destination MAC addresses of received traffic.

Promiscuous Mode On/Off – This button, when enabled, instructs Port B to reflect all traffic received, even if the traffic is not addressed to Port B specifically. This includes unicast, multicast and broadcast traffic.

Statistics View

Pressing the statistics button will activate a popover view displaying the current loop-back statistics. Pressing the left ◀ or right arrow ▶ buttons will display the previous or next page of statistics. Pressing the ↺ reset button will reset counts back to zero. The speedometer reflects the current percentage, from 0 to 100%, of received traffic.

When Port B is selected the **Select Test** and **Files** buttons are not active.

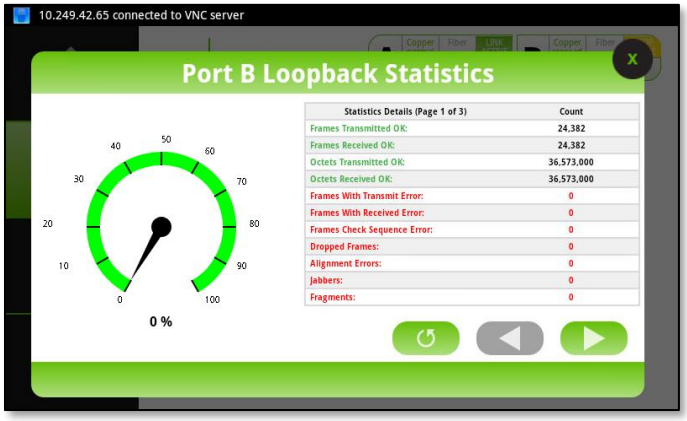


Figure 18 - Port B Statistics View

Test Selection

Once port configuration is completed, tap on the **SELECT TEST** button to select which test to run.

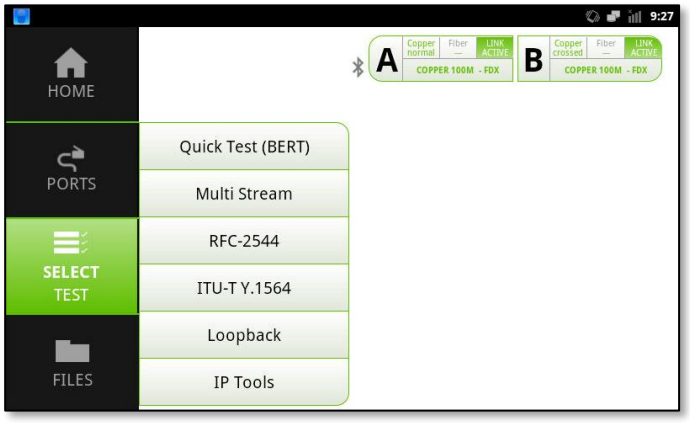


Figure 19 - Select Test Menu

If your unit is configured only to support loopback, this is the only menu item which will be active.

Test feature option DS10-SW-ADV must be active to enable the Multi-stream and ITU-T Y.1564 menu items.

General Test Configuration

Individual sections below will detail how to perform Quick Test (BERT), Multi-Stream, RFC-2544 and ITU-T Y.1564 tests. Each test though requires the same general test configuration such as framing, traffic rate and test duration. As such, this section will describe test configuration pertaining to all tests. Where differences exist, they will be detailed in their respective test section.

Frame Configuration

Regardless of test type, pressing the frame configuration button will activate the frame configuration view.

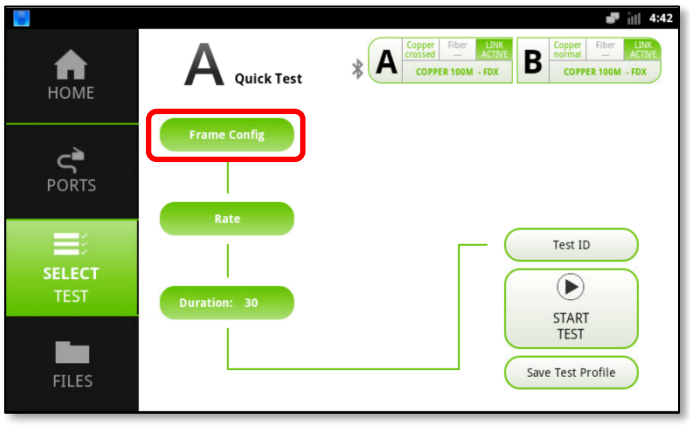


Figure 20 - Frame Configuration Button

Select Frame Size

Pressing the "Select Frame Size" button will display a list of common Ethernet frame sizes and options for EMIX and User Defined frame sizes. Select the desired frame size by tapping it.

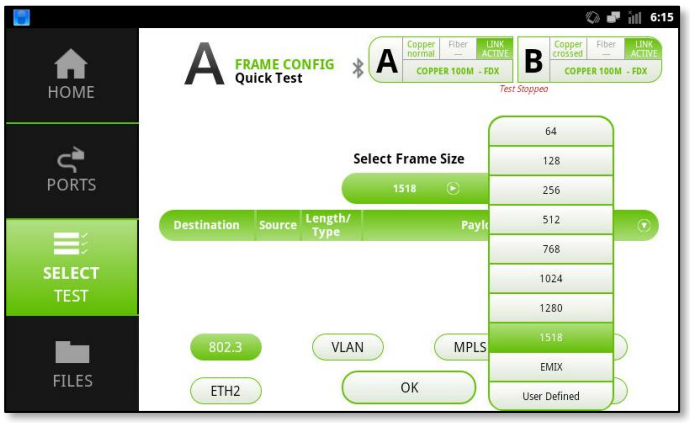


Figure 21 - Select Frame Size Menu

EMIX

Ethernet MIX, also known as EMIX is designed to mimic realistic data flows on a network by mixing different size Ethernet frames and sending as a consolidated test flow. When EMIX a new button labeled **EMIX Config** is displayed to the right of the Select Frame Size button. Press to enter the EMIX configuration view.

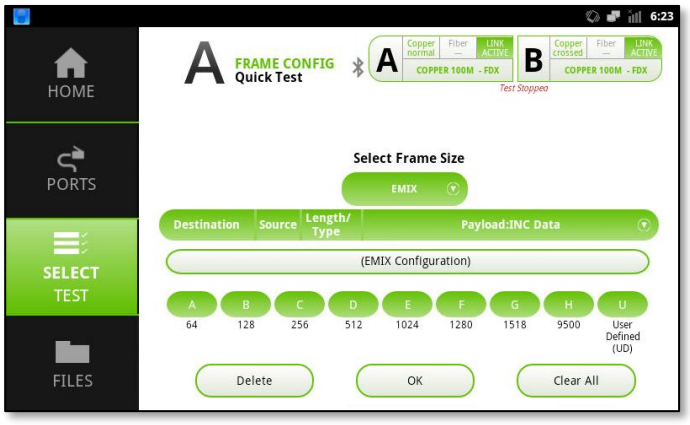


Figure 22 - EMIX Configuration View

Each letter conforms to a specific frame size as shown below the EMIX Configuration bar. To move a frame size onto the bar, press the letter of choice. Up to 32 letters, in any combination, can be entered into the configuration bar. When a test is started, the test set will generate the first frame size in the sequence and then move onto the next. Each frame size in the mix is generated until the last one is transmitted at which point the tester begins the sequence generation again. This repeats until the test is completed.

Letters A to G – Standard frame sizes

Letter H – Maximum transmission unit (MTU) frame size. Depending on the interface speed selected and if IPv4 or IPv6 is enabled, the MTU size may range from 2024 to 9500 bytes.

Letter U – User defined frame size. The first time you press letter U, a dialogue will be displayed prompting you to enter a user defined frame size.

Delete – Clears out the last entry on the configuration bar.

Clear All – Clears out all entries from the configuration bar.

OK – Closes the EMIX configuration view

User Defined Frame Size

Selecting User Defined in the Select Frame Size menu button allows entering a custom frame size to be generated. Any valid frame size may be entered.

Destination MAC Address

Pressing the **Destination** button on the frame configuration bar will enable entering the destination MAC address to which test traffic will be sent.

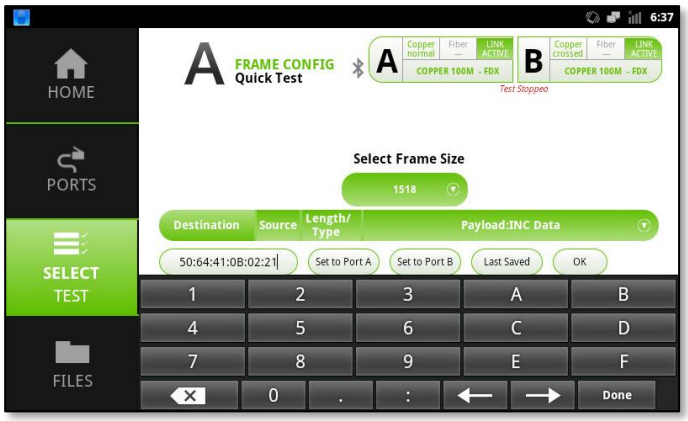


Figure 23 - Destination MAC Address Entry

Destination MAC – Enter a custom MAC address by tapping on the MAC address field. Acceptable values are 0-9 and A-F. Press the **Done** button to close the keypad.

Set to Port A / B – automatically enters the default MAC address for each respective port.

Last Saved – Automatically populates the last entered MAC address, even if the unit has been powered cycled.

OK – Closes the Destination MAC address view.

Source MAC Address

Pressing the **Source** button on the frame configuration bar will enable entering the source MAC address from which test traffic will be sent. Enter a custom MAC address by tapping on the MAC address field.

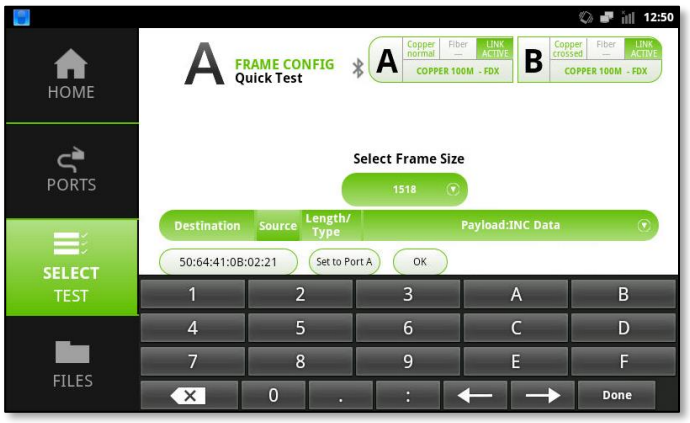


Figure 24 - Source MAC Address Entry

Set to Port A – automatically enters the default MAC address.

OK – Closes the Destination MAC address view.

VLAN

Pressing the **VLAN** button on the frame configuration view will enable configuration of up to eight stacked VLANs. Each VLAN in the stack may have unique properties depending on the setting required by the network under test.

TPID – The Tag Protocol ID (TPID) menu button by default is set to 8100 but three different ID's are available: 8100, 88A8 and 9100.

When stacking two or more VLANs, the inner tag is the tag which is closest to the payload portion of the frame; it is officially called the C-TAG (Customer Tag) and uses TPID 8100. The outer tag is the one closer/closest to the Ethernet header and is called the S-TAG (Service Tag) and uses TPID 88a8. Some vendors also utilize TPID 9100 instead of 8100 when VLAN-tagged (IEEE 802.1Q) frame with double tagging is utilized.

When in doubt, it is recommended to use TPID 8100 for the first VLAN tag and TPID 88A8 for all subsequent tags.

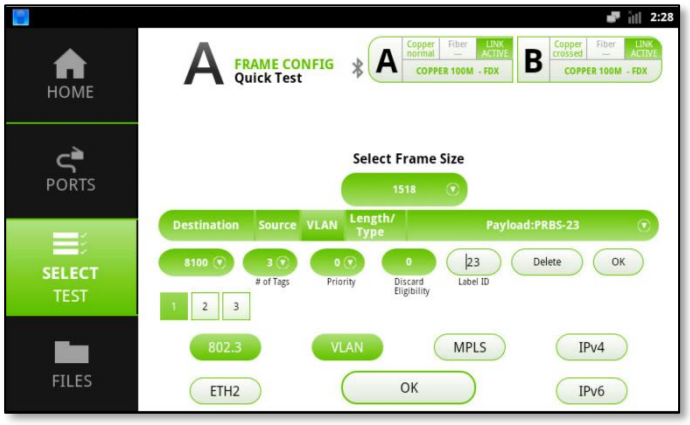


Figure 25 - VLAN Configuration

# of Tags – Enables selecting up to eight stacked VLAN tags. If more than one tag is selected a series of number boxes will be displayed below the VLAN configuration menu. Tap on the desired VLAN to configure specific VLAN values for that VLAN.

Priority – Enables configuring the priority value to be assigned for the selected VLAN. Values range from 0 (low priority) to 7 (high priority).

Discard Eligibility – Drop eligible indicator (DEI), formally used as a Canonical Flag Indicator (CFI) is by default set to 0 (not drop eligible). Setting this field to 1 indicates to the network the frames are eligible to be dropped in the presence of congestion.

Unless you are specifically testing a networks ability to perform DEI functions it is recommended to always leave this field set to 0.

Label ID – This field enables configuration or the VLAN identifier (VID). Acceptable values are 0 to 4,095.

Label ID 0 indicates the frame does not carry a VLAN ID, in this case, the tag specifies only a priority and is referred to as a priority tag. On bridges, label ID 1 is often reserved for a management VLAN but this is vendor-specific. A label ID value 4095 is reserved for implementation use only and should not be used. However, the DataScout allows this label ID to be configured for experimental purposes.

Delete – Deletes all VLAN configuration. Use this only when you want to remove all VLAN information and start in a default state.

OK – Closes the VLAN configuration view.

Once you have configured the desired VLAN(s) and press the OK button, a new VLAN button will be present on the frame configuration bar. To return to the VLAN configuration view, tap this button.

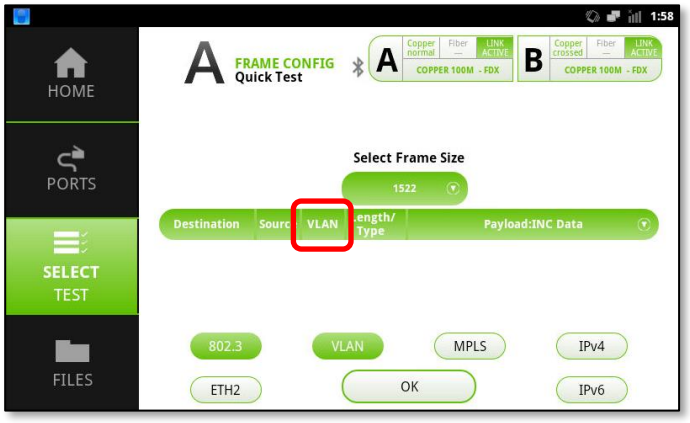


Figure 26 - VLAN button on Frame Configuration Bar

MPLS

Pressing the **MPLS** button on the frame configuration view will enable configuration of up to eight stacked MPLS tags. Each MPLS in the stack may have unique properties depending on the setting required by the network under test.

MPLS is a layer two routing protocol. As such, IPv4 and IPv6 are disabled when MPLS is enabled.

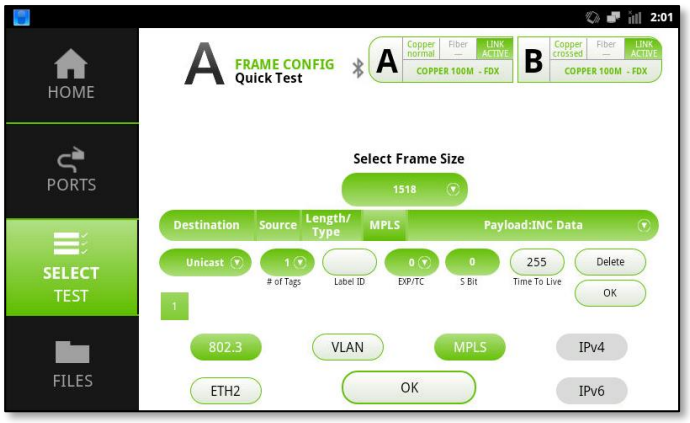


Figure 27 - MPLS Configuration

Unicast/Multicast – The unicast/multicast menu button by default is set to unicast tagged traffic but can be set to multicast when desired.

# of Tags – Enables selecting up to eight stacked MPLS tags. If more than one tag is selected a series of number boxes will be displayed below the MPLS configuration menu. Tap on the desired MPLS tag to configure specific MPLS values for that tag.

Label ID – This field enables configuration or the MPLS label ID. Acceptable values are 0 to 1,048,575.

MPLS label ID values 0-15 are reserved values and should not be used for live traffic flows.

EXP/TC – Enables configuring the priority value to be assigned for the selected MPLS. Values range from 0 (low priority) to 7 (high priority).

S Bit – When set to one this field Indicates the MPLS tag is the last tag in the stack.

Time to Live – Sets the TTL value for the MPLS tag. Acceptable values are 0-255 hops, with the default set to 255.

Delete – Deletes all MPLS configuration. Use this only when you want to remove all MPLS information and start in a default state.

OK – Closes the MPLS configuration view.

Once you have configured the desired MPLS tags and press the OK button, a new MPLS button will be present on the frame configuration bar. To return to the MPLS configuration view, tap this button.

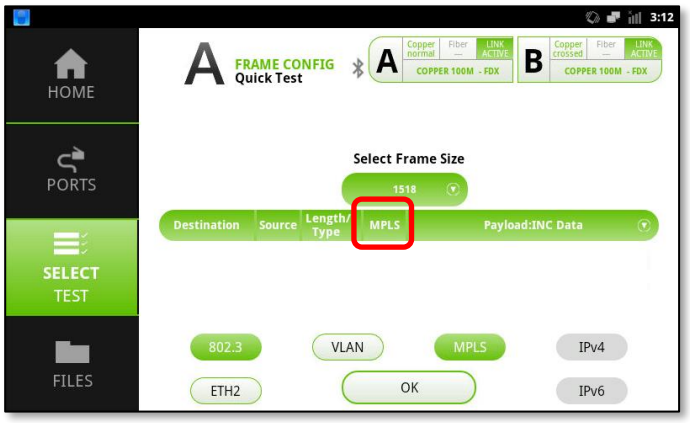


Figure 28 – MPLS button on Frame Configuration Bar

IPv4

Pressing the **IPv4** button on the frame configuration view will enable configuration of static IPv4 test traffic.

MPLS is a layer two routing protocol. As such, MPLS is disabled when IPv4 is enabled.

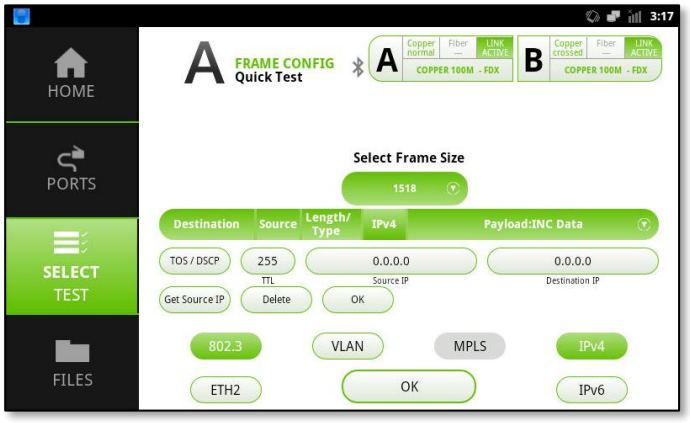


Figure 29 - IPv4 Configuration

TOS/DSCP – The type of service (TOS), differentiated services code point (DSCP) button activates a popover view, enabling you to select the desired TOS or DSCP value. The currently selected TOS/DSCP value will be highlighted in green. Alternately, you can enter your own binary user defined value in the **User Defined (UD)** field. To close the popover, press the "X" button in the upper right-hand corner.

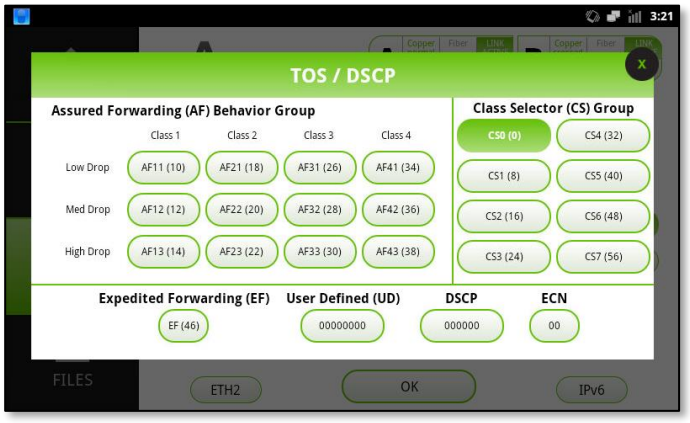


Figure 30 - TOS/DSCP Popover View

Time to Live – Sets the TTL value for the IP packet. Acceptable values are 0-255 hops, with the default set to 255.

Source IP – Sets the IP address from which packets are being transmitted. Acceptable values are 0-9. Press the **Done** button to close the keypad.

Destination IP – Sets the IP address from which packets should be received. Acceptable values are 0-9. Press the **Done** button to close the keypad.

Get Source IP – Utilizes the test sets management port and Route A to B mode to pass DHCP request from the controller to test port A. If A to B mode is not activated the test set will display a warning message.

Delete – Deletes all IP configuration. Use this only when you want to remove all IP information and start in a default state.

OK – Closes the IP configuration view.

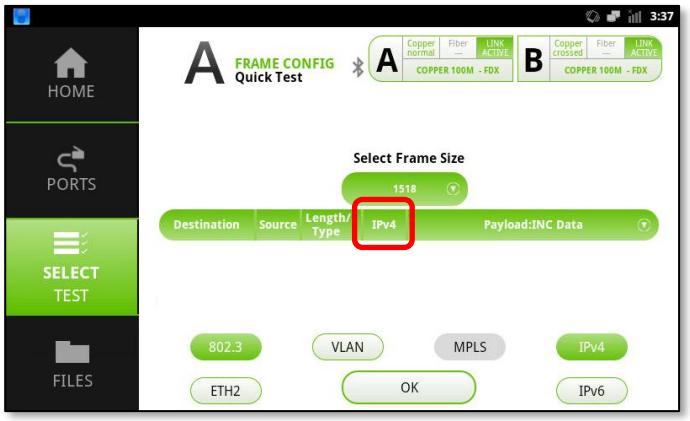


Figure 31 - IPv4 button on Frame Configuration Bar

Once you have configured the desired IP information press the OK button, a new IPv4 button will be present on the frame configuration bar. To return to the IPv4 configuration view, tap this button.

IPv6

Pressing the **IPv6** button on the frame configuration view will enable configuration of static IPv4 test traffic.

MPLS is a layer two routing protocol. As such, MPLS is disabled when IPv6 is enabled.

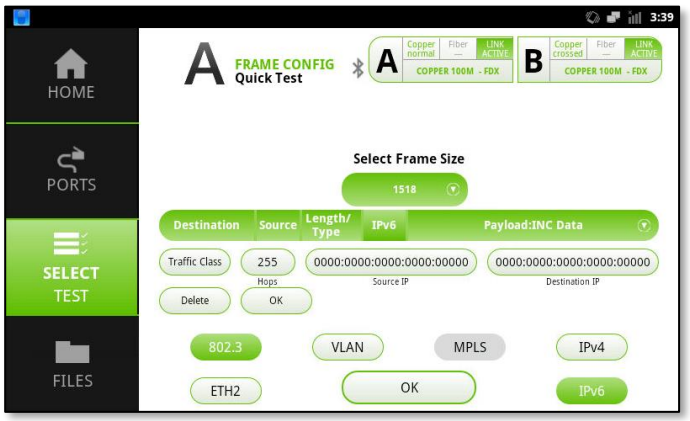


Figure 32 – IPv6 Configuration

Traffic Class – The traffic class button activates a popover view, enabling you to select the desired traffic class value. The currently selected value will be highlighted in

green. Alternately, you can enter your own binary user defined value in the **User Defined (UD)** field. To close the popover, press the "X" button in the upper right-hand corner.

Figure 33 – Traffic Class Popover View

Hops – Sets the hop value for the IP packet. Acceptable values are 0-255 hops, with the default set to 255.

Source IP – Sets the IP address from which packets are being transmitted. Acceptable values are 0-9 and A-F in any format complying to RFC-4291. Press the **Done** button to close the keypad.

Destination IP – Sets the IP address from which packets should be received. Acceptable values are 0-9 and A-F in any format complying to RFC-4291. Press the **Done** button to close the keypad.

Rule #1
The preferred form is x:x:x:x:x:x:x:x, where the 'x's are one to four hexadecimal digits of the eight 16-bit pieces of the address. EXAMPLE: **ABCD:EF01:2345:6789:ABCD:EF01:2345:6789**
Rule #2
It is not necessary to write the leading zeros in an individual field, but there must be at least one numeral in every field. EXAMPLE: **2001:DB8:0:0:8:800:200C:417A**
Rule #3
The use of "::" indicates one or more groups of 16 bits of zeros. The "::" can only appear once in an address and can also be used to compress leading or trailing zeros in an address. EXAMPLE: **2001:DB8::8:800:200C:417A**
Rule #4
An alternative form that is sometimes more convenient when dealing with a mixed environment of IPv4 and IPv6 nodes is x:x:x:x:x:x:d.d.d.d, where the 'x's are the hexadecimal values of the six high-order 16-bit pieces of the address, and the 'd's are the decimal values of the four low-order 8-bit pieces of the address (standard IPv4 representation). EXAMPLES: **0:0:0:0:0:0:13.1.68.3** and **0:0:0:0:0:FFFF:129.144.52.38**
Rule #5
Alternative forms can also be displayed in compressed form. Examples: **::13.1.68.3** and **::FFFF:129.144.52.38**

Table 2 - Valid IP Address Notation per RFC-4291

Delete – Deletes all IP configuration. Use this only when you want to remove all IP information and start in a default state.

OK – Closes the IP configuration view.

Once you have configured the desired IP information press the OK button, a new IPv6 button will be present on the frame configuration bar. To return to the IPv6 configuration view, tap this button.

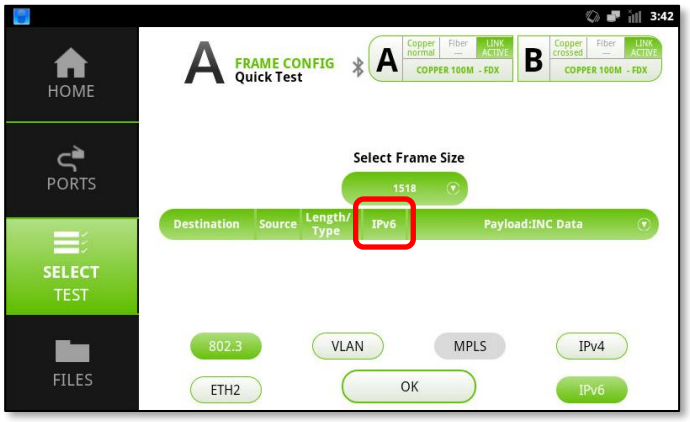


Figure 34 – IPv6 Button on Frame Configuration Bar

Payload

Pressing the **Payload: INC Data** button on the frame configuration bar enables selection of two different test patterns.

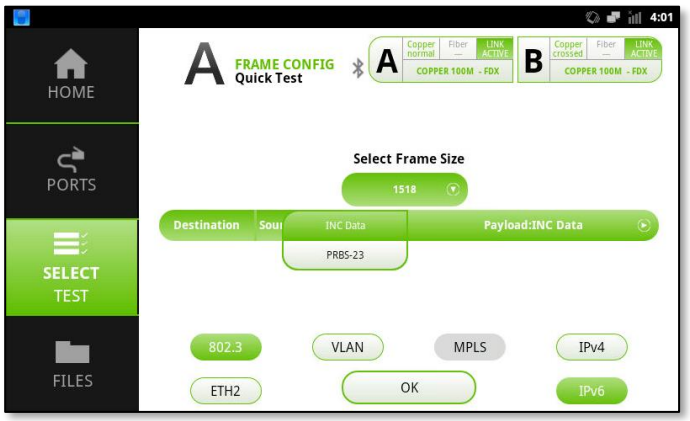


Figure 35 - Payload Button on Frame Configuration Bar

INC Data – Creates traffic which increments from lowest to highest numerical value supported by the frame size.

PRBS-23 – Creates pseudo-random bit stream data.

802.3

Pressing the **802.3** button on the frame configuration view configures the test unit to transmit Ethernet frames conforming to IEEE 802.3 format.

ETH2

Pressing the **ETH2** button on the frame configuration view configures the test unit to transmit Ethernet frames in Ethernet 2 (DIX) format.

Rate

Regardless of test type, pressing the rate configuration button will activate the frame configuration view.

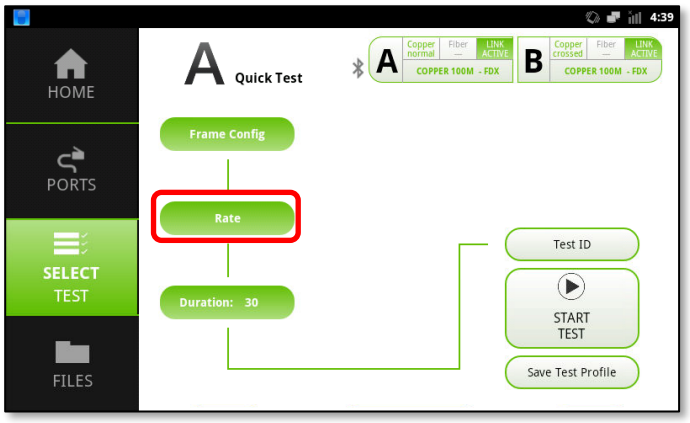


Figure 36 - Rate Selection Button

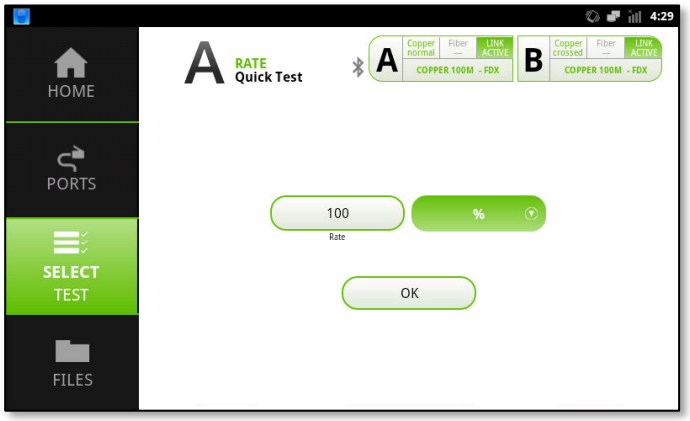


Figure 37 - Rate Configuration View

Rate – Enter the desired rate value. Depending on interface speed selected valid entries will be limited but typically range in value from 0.01 to 100 maximum line rate in % or speed selected.

Rate Value – Press the rate value (default is %) to select entering traffic rate in Kbps, Mbps or Gbps. Some values may not be active depending on which physical port speed it selected.

OK – Closes the rate configuration view.

Duration

Regardless of test type, pressing the duration button will prompt you to enter how long the test should run in seconds. The default test length for most tests is 30 seconds.

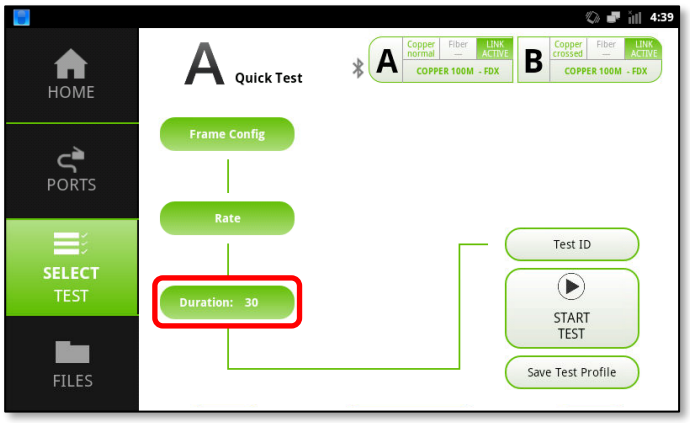


Figure 38 - Test Duration Field

Maximum Duration

Maximum test duration is dependent on the frame size(s) selected during frame configuration. The test unit calculates prior to starting a test the maximum number of test frames to generate which will fit within the duration window and line rate selected. Smaller frame sizes exhaust the total available pool of sequence numbers faster than larger frames which limits the total duration a test can run. In the tables below, estimated maximum test durations are detailed.

10 Gbps							
Frame Size	**Years**	**Months**	**Weeks**	**Days**	**Hours**	**Minutes**	**Seconds**
64				1	21	1,231	73,887
128				2	36	2,169	130,182
256				3	67	4,046	242,772
512			1	5	130	7,798	467,952
768			1	8	193	11,551	693,132
1024			2	11	255	15,303	918,312
1280			2	13	318	19,056	1,143,492
1518		1	2	16	376	22,544	1,352,839
9500		3	14	97	2,326	139,547	8,373,881
EMIX (A-G)			1	7	174	10,451	627,161

Table 3 - Maximum Approximate Duration at 10 Gbps

1 Gbps							
Frame Size	Years	Months	Weeks	Days	Hours	Minutes	Seconds
64			1	9	205	12,313	738,872
128			2	15	362	21,694	1,301,822
256		1	4	28	674	40,457	2,427,722
512		2	8	54	1,300	77,982	4,679,521
768		3	11	80	1,925	115,507	6,931,321
1024		3	15	106	2,551	153,033	9,183,121
1280		4	19	132	3,176	190,558	11,434,921
1518		5	22	157	3,757	225,445	13,528,391
9500	3	32	138	969	23,258	1,395,470	83,738,806
EMIX (A-G)		2	10	73	1,742	104,514	6,271,614

Table 4 - Maximum Approximate Duration at 1 Gbps

100 Mbps							
Frame Size	Years	Months	Weeks	Days	Hours	Minutes	Seconds
64		3	12	86	2,052	123,130	7,388,718
128		5	22	151	3,616	216,943	13,018,218
256	1	9	40	281	6,743	404,569	24,277,217
512	1	18	77	542	12,997	779,821	46,795,215
768	2	26	115	802	19,251	1,155,074	69,313,213
1024	3	35	152	1,063	25,505	1,530,326	91,831,211
1280	4	44	189	1,323	31,760	1,905,578	114,349,209
1518	4	51	224	1,566	37,574	2,254,446	135,283,911
9500	27	319	1,384	9,691	232,578	13,954,698	837,388,056
EMIX (A-G)	2	24	104	726	17,419	1,045,136	62,716,143

Table 5 - Maximum Approximate Duration at 100 Mbps

10 Mbps							
Frame Size	Years	Months	Weeks	Days	Hours	Minutes	Seconds
64	2	28	122	855	20,522	1,231,297	73,887,181
128	4	50	215	1,507	36,157	2,169,428	130,182,177
256	8	92	401	2,810	67,428	4,045,690	242,772,167
512	15	178	774	5,415	129,970	7,798,213	467,952,149
768	22	264	1,146	8,021	192,512	11,550,737	693,132,130
1024	29	349	1,518	10,627	255,054	15,303,261	918,312,112
1280	36	435	1,890	13,233	317,596	19,055,785	1,143,492,093
1518	43	515	2,237	15,656	375,741	22,544,459	1,352,839,107
9500	266	3,186	13,844	96,908	2,325,783	139,546,976	8,373,880,557
EMIX (A-G)	20	239	1,037	7,258	174,189	10,451,365	627,161,432

Table 6 - Maximum Approximate Duration at 10 Mbps

Test Mode

Looped Test Mode

Tests can be performed in both Looped Test Mode where the test expects a reflector of some type (NID, port in administrative loopback or another test set) as well as End to

End mode where the test set will synchronize itself with another DataScout unit and send bidirectional test data. By default, the test set operates in looped test mode.

End-to-End Test Mode

To activate end-to-end mode, press the menu button and tap the End-to-End Test mode button. To return to Looped test mode, press the menu button again and tap the Looped Test mode button.

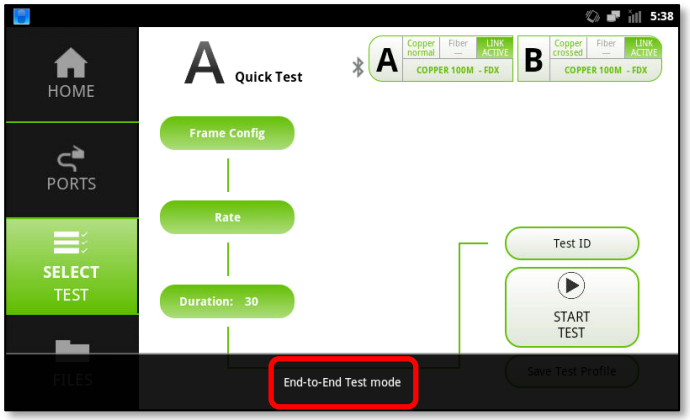


Figure 39 - End-to-End Test Mode

Test ID

Most test results automatically save when the **START TEST** button is pressed. If a test ID is not entered in the **Test ID** field the unit will generate a file name for you. This test file name can always be changed by navigating to the **Files**, then **Results** menu.

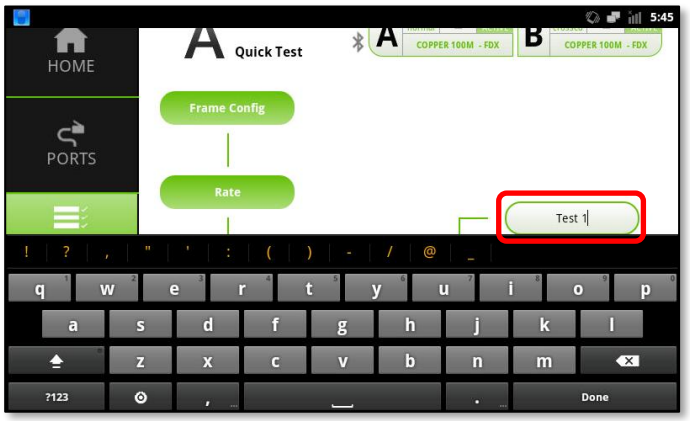


Figure 40 - Test ID Field

Test Profile

After configuring the test unit, especially when the test configuration is complicated, it may be desired to save the configuration as a profile so you can recall it later for rapid

test setup. To save a test profile, press the **Save Test Profile** button. The test file can be retrieved by navigating to the **Files,** then **Profiles** menu.

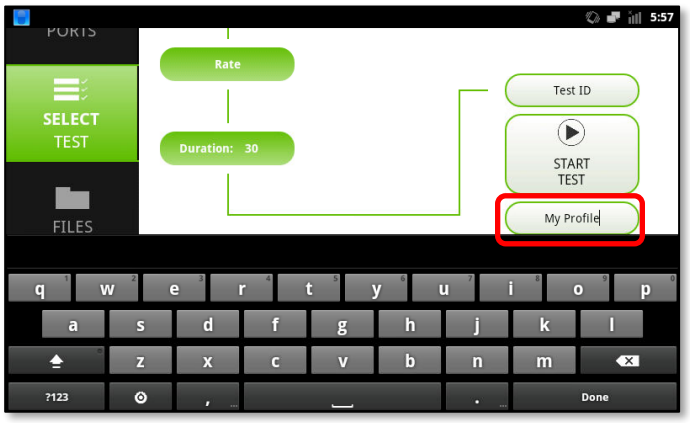


Figure 41 - Test Profile Field

If a test profile name is not saved in the Test Profile field, the test configuration will not be saved. The current test configuration will persist until you change the test type or power cycle the test unit. If you neglect to save a test profile and desire to do so, return to the test view you are on prior to initiating another test or changing the configuration, then press the Test Profile button and save the profile.

Quick Test (BERT)

This test is designed to accomplish two tasks:

- Quickly establish if test settings or a network is correctly configured
- Perform longer duration single stream BER tests

Frame Configuration

Frame configuration is detailed in the General Test Configuration, Frame Configuration section above.

Rate Configuration

Rate configuration is detailed in the General Test Configuration, Rate Configuration section above.

Test Duration

Test duration configuration is detailed in the General Test Configuration, Test Duration section above.

Test Mode

Test mode configuration is detailed in the General Test Configuration, Test Mode section above.

Test ID

Test ID configuration is detailed in the General Test Configuration, Test ID section above.

Test Profile

Test Profile configuration is detailed in the General Test Configuration, Test Profile section above.

Running the Quick Test

Press the **START TEST** button to initiate your test. The following gauges and indicators are provided:

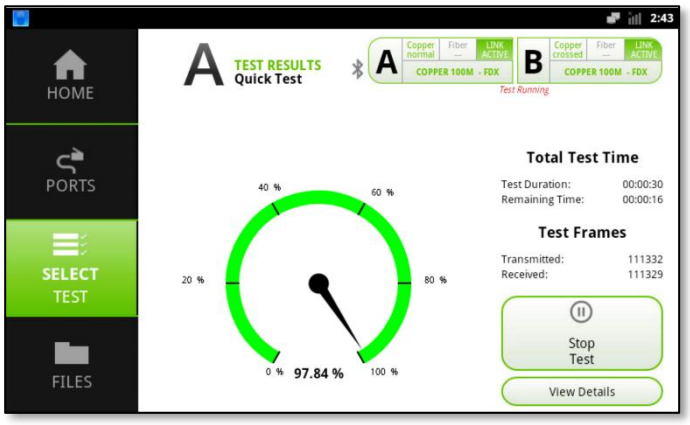


Figure 42 - Quick Test in Progress

Rx Traffic Gauge – The received rate indicator gauge provides an indication test traffic is being looped back and at what rate.

Total Test Time – Provides an active count of the total test duration and time remaining until the test is completed.

Test Frames – Provides an active count of the number of transmitted and received frames. Counts update once per second so a minor discrepancy may be displayed while the test is actively running.

Stop Test – Pressing this button will abort the current test in progress.

View Details – Pressing the button activates the test result popover view. If the test is currently running not all statistics will be populated in real time so it is recommended to wait until the test completes, which will automatically display test results.

You may need to run quick test once when first connected to a HUB or SWITCH so the device can learn the MAC address of the test device.

Quick Test Results

The quick test popover view provides detailed test results and statistics. Passing test results are displayed in black or green type, failing results are displayed in red. Press the right arrow button to access additional test details.

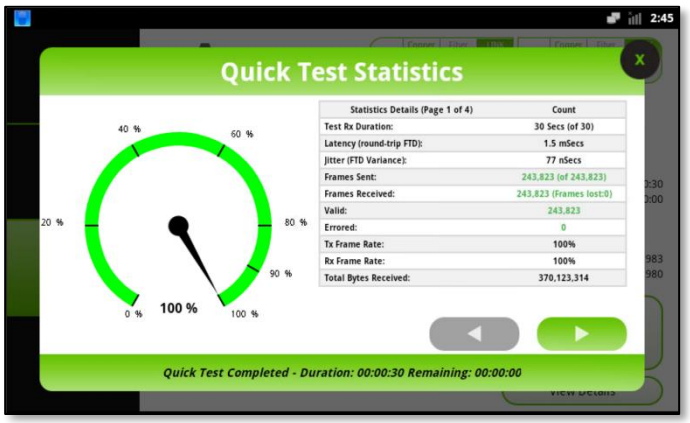


Figure 43 - View Details Popover View

Multi Stream Test

This test is only activated when feature option DS10G-SW-ADV is purchased. This option can be activated in the field by entering a valid license key as detailed in the Settings section above. The multi stream test enables generation of up to 16 unique streams of test traffic. Each stream can have a different:

- Frame configuration (frame type, size, VLAN, MPLS or IP type)
- Traffic rate

Frame Configuration

Frame configuration is similar as detailed in the General Test Configuration, Frame Configuration section above with the following differences:

# of Streams – This menu button enables selecting how many streams of traffic the test unit will generate. Valid options are 1-16 streams.

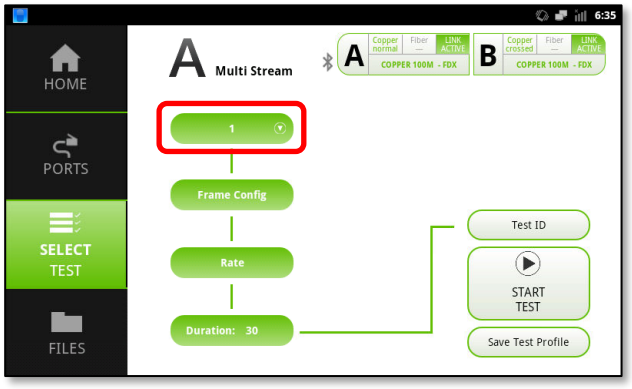


Figure 44 - Multi Stream Main View

When the frame configuration view is activated, a series of stream selection buttons will be displayed above the frame configuration bar. Press the desired stream to configure settings for the selected stream.

Each stream must be configured to be unique from all other streams using any one or combination of the following:

- Different 802.3 or ETH2 framing
- Different destination or source MAC
- Different VLAN configuration
- Different MPLS configuration
- Different IPv4 or IPv6 destination or source

Stream buttons that do not contain a unique setting will be colored red. Changing the configuration and then selecting another stream will validate the configuration again. Continue adjusting settings until all streams are displayed outlined in Green.

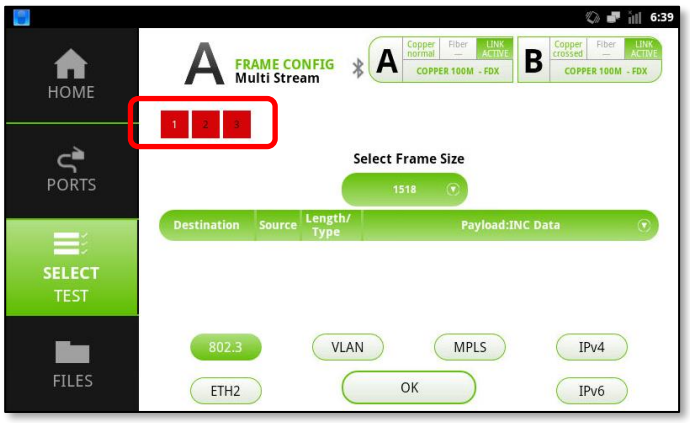


Figure 45 - Invalid Multi Stream Configuration

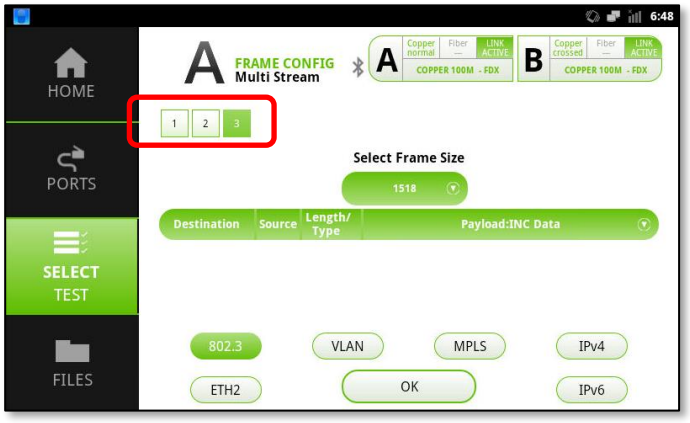


Figure 46 - Valid Multi Stream Configuration

Rate Configuration

Rate configuration is similar to as detailed in the General Test Configuration, Rate Configuration section above with the following differences:

When the rate configuration view is activated, a series of stream selection buttons will be displayed above the rate selection button. Press the desired stream to configure rate settings for the selected stream.

Figure 47 - Multi Stream Rate Configuration

Copy To All – When pressed, this button will copy the rate entered in the **Rate** field to all streams

Clear All – When pressed, this button will clear out all custom values and reset to the default values

Distribute Evenly – When pressed, this button will distribute the total line rate across all streams evenly

OK – Closes the Traffic Rate view

Test Duration

Test duration configuration is detailed in the General Test Configuration, Test Duration section above.

Test Mode

Test mode configuration is detailed in the General Test Configuration, Test Mode section above.

Test ID

Test ID configuration is similar to detailed in the General Test Configuration, Test ID section above with the following differences:

- Tests are not automatically saved. Instead, the SAVE RESULTS button must be press on the test result popover view as shown below.

Test Profile

Test Profile configuration is detailed in the General Test Configuration, Test Profile section above.

Running the Multi Stream Test

Press the **START TEST** button to initiate your test. The following gauges and indicators are provided:

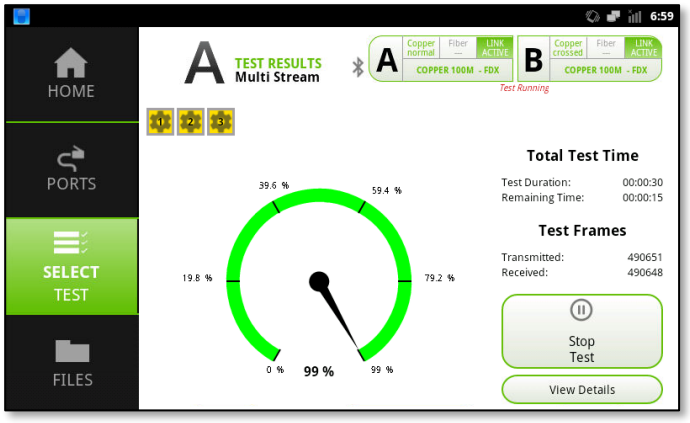


Figure 48 - Multi Stream Test in Progress

Stream Icons – Stream icons provide a visual reminder of the number of streams the tester is currently generating.

Rx Traffic Gauge – The received rate indicator gauge provides an indication test traffic is being looped back and at what rate.

Total Test Time – Provides an active count of the total test duration and time remaining until the test is completed.

Test Frames – Provides an active count of the number of transmitted and received frames. Counts update once per second so a minor discrepancy may be displayed while the test is actively running.

Stop Test – Pressing this button will abort the current test in progress.

View Details – Pressing the button activates the test result popover view. If the test is currently running not all statistics will be populated in real time so it is recommended to wait until the test completes, which will automatically display test results.

You may need to run quick test once when first connected to a HUB or SWITCH so the device can learn the MAC address of the test device.

Multi Stream Test Results

The multi stream test popover view provides detailed test results and statistics. Passing test results are displayed in black or green type, failing results are displayed in red. Press the right arrow button to access additional test details.

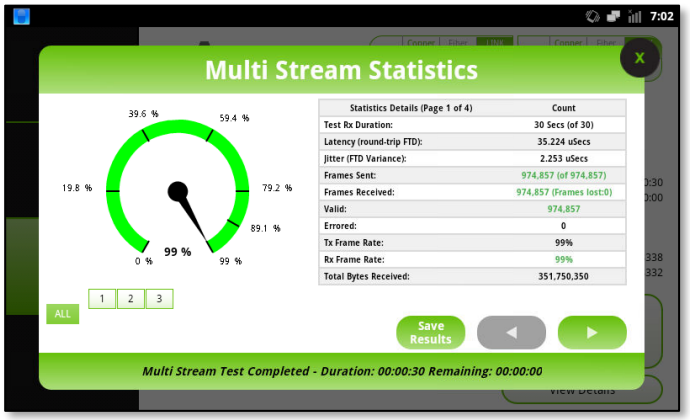


Figure 49 - Multi Stream Test Results

ALL – Pressing this button displays aggregate results for all streams

Stream Buttons – Pressing a stream button displays statistics for the selected stream

Save Results – When pressed this button saves test results for all streams

Multi Stream test results accumulate a large amount of statistics and can take up to a minute to store results for 16 streams. Once the save test button is pressed the process cannot be aborted.

RFC-2544

RFC-2544 is a benchmark test allowing both service providers and end users to validate performance of a circuit or network device. The RFC-2544 methodology published by the Internet Engineering Task Force (IETF) outlines the tests required to measure and prove performance criteria. This standard provides an out-of-service

benchmarking evaluation of the performance of network devices using throughput, frame loss, latency, jitter and burst tests. Each test validates a specific aspect of the circuit or network.

Frame Configuration

Frame configuration is similar as detailed in the General Test Configuration, Frame Configuration section above with the following differences:

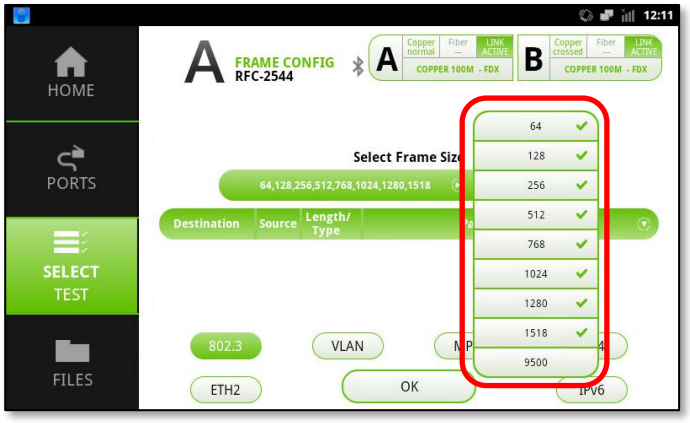


Figure 50 - RFC-2544 Frame Size Selection

Select Frame Size – Pressing the frame size menu button displays all RFC-2544 standard frames sizes as well as an optional jumbo frame size. Tap each frame you want to add to include in the test trials.

To fully comply with the RFC-2544 recommendation selecting the following frame sizes is required: 64, 128, 256, 512, 1024, 1280, 1518

Rate Configuration

Rate configuration is different from what is detailed in the General Test Configuration, Rate Configuration section above. Refer to the Thresholds section below for details.

Test Duration

Test duration configuration is different from what is detailed in the General Test Configuration, Test Duration section above. Refer to the Test Configuration section below.

Test Mode

Test mode configuration is detailed in the General Test Configuration, Test Mode section above.

Test ID

Test ID configuration is detailed in the General Test Configuration, Test ID section above.

Test Profile

Test Profile configuration is detailed in the General Test Configuration, Test Profile section above.

Test Configuration

Performing a test which conforms to the complete RFC-2544 recommendation requires running the following standard tests:

- Throughput
- Frame Loss
- Latency
- Back to Back (Burst)

In addition to the standard tests many providers have opted to include testing for Jitter as well even thought this is not part of the recommendation. The DataScout supports testing all standard tests and jitter.

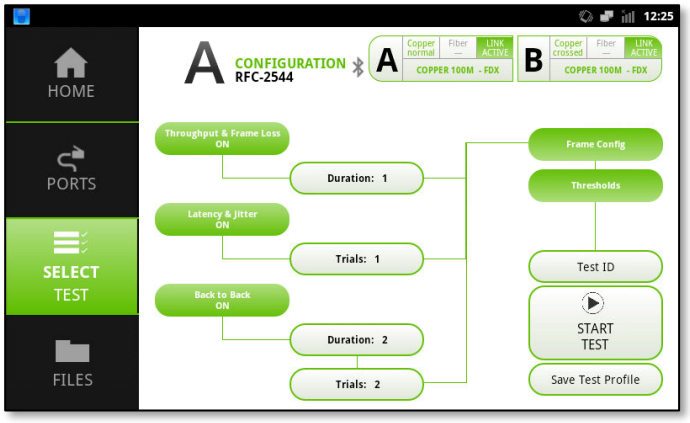


Figure 51 - RFC-2544 Configuration View

Some customers or service providers opt to not run a complete RFC-2544 test per the recommendation because it can take up to 7.5 hours to finish. To accommodate deviating from performing a complete RFC-2544 test the configuration menu allows turning each test on or off to shorten the test time.

Latency and Jitter measurements are performed simultaneously with the Throughput and Frame Loss test. Turning on Latency and Jitter will automatically activate the Throughput and Frame Loss Test.

Duration – Sets the test duration, in seconds, the test will be performed

To fully comply with the RFC-2544 recommendation selecting the duration of each trial should be at least 60 seconds.

To fully comply with the RFC-2544 recommendation selecting the duration of each latency trial should be at least 120 seconds. This requires setting the Throughput and Frame Loss duration on the test set to be 120 seconds

To fully comply with the RFC-2544 recommendation selecting the duration of each back to back trial should be at least 2 seconds

Trials – Sets the number of test iterations that will be performed

To fully comply with the RFC-2544 recommendation a minimum of 20 latency trials is required

To fully comply with the RFC-2544 recommendation selecting a minimum of 50 back to back trials is required

Thresholds

Pressing the **Thresholds** button activates the thresholds view. This enables setting pass/fail criteria for each test and whether to test against that criteria.

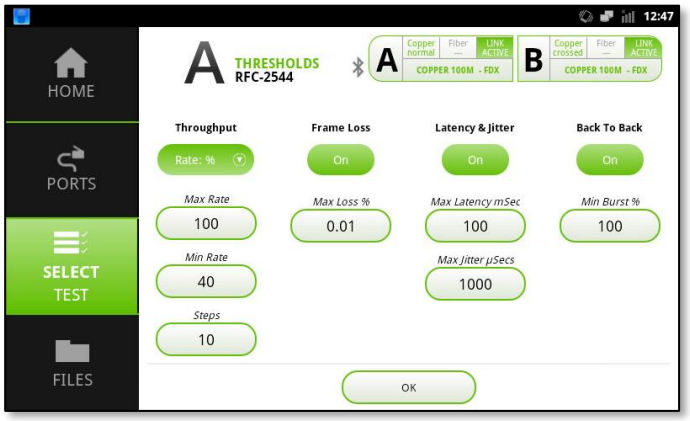


Figure 52 - RFC-2544 Thresholds View

Throughput Rate – Is set to % and cannot be changed

On/Off – Thresholds with these buttons at the top can be selectively enabled or disabled. When the button is on, the test set will measure against the threshold and present a pass/fail result in the test details as well as reports. When off, the threshold is ignored and “N/A” is displayed in test details and reports.

Max Rate – Sets the maximum rate to transmit test traffic during throughput and frame loss test. By default, this is set to 100% but it may be desirable to set this to a lower rate if it is clearly understood the network under test cannot support maximum frame rates.

Min Rate – Sets the minimum rate at which test traffic must pass without frame loss or errors. If the minimum rate cannot be achieved error free, the test set aborts testing for the current frame size under test and displays “Fail” in test details and reports. Minimum rate must be set to less than maximum rate.

Steps – Sets the percent resolution, or delta, of each test sequence if the previous trial failed.

Setting smaller steps results in more granular detail regarding precise maximum throughput of a given frame size but may greatly extend total test time

Max Loss % – Sets the maximum acceptable frame loss before displaying "Fail" in test details and reports.

Max Latency mSec – Displays the maximum acceptable latency, in milliseconds, before displaying "Fail" in test details and reports.

Max Latency µSec – Displays the maximum acceptable jitter, in microseconds, before displaying "Fail" in test details and reports.

Min Burst % – Sets the minimum acceptable 2 second burst deviation from theoretical maximum burst, before displaying "Fail" in test details and reports.

Minimum burst % is set to 100% by default. This means no deviation is permitted and any frame loss during the back-to-back test will cause the test to fail due to the total number of frames received in a two second burst is not equal to the theoretical total possible.

OK – Closes the Thresholds view

Running the RFC-2544 Test

Press the **START TEST** button to initiate your test. The following gauges and indicators are provided:

Rx Traffic Gauge – The received rate indicator gauge provides an indication test traffic is being looped back and at what rate. The yellow inner portion of the gauge indicates the Maximum and Minimum rate selected in the thresholds view

Current Test Status Table – Provides a visual indication of the current test, frame size and iteration in progress. At the completion of each iteration a Pass/Fail indication will also be briefly displayed

Total Test Time – Provides an active count of the total test duration and time remaining until the test is completed.

Test Progress – Provides a visual indication of the total progress of each test step

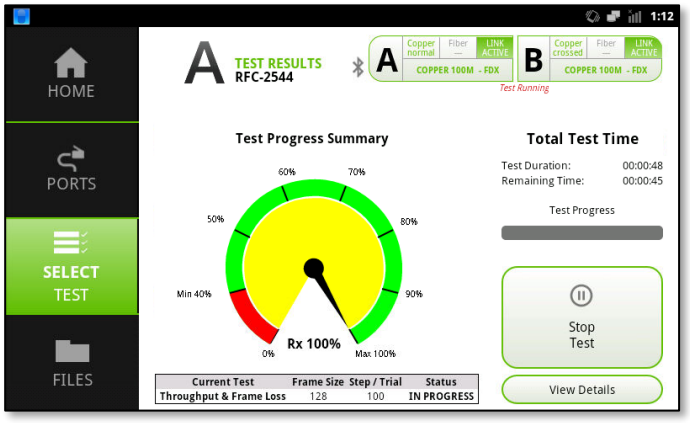


Figure 53 – RFC-2544 Test in Progress

Stop Test – Pressing this button will abort the current test in progress.

View Details – Pressing the button activates the test result popover view. If the test is currently running not all statistics will be populated in real time so it is recommended to wait until the test completes, which will automatically display test results.

You may need to run quick test once when first connected to a HUB or SWITCH so the device can learn the MAC address of the test device.

RFC-2544 Test Results

The RFC-2544 test popover view provides several pages of detailed test result tables and graphics. Press the right arrow button to access additional test details.

Table/Graphic – Pressing this button alternates between displaying test results in tabular form or graphical form. Multiple graphics may be available depending on the test selected.

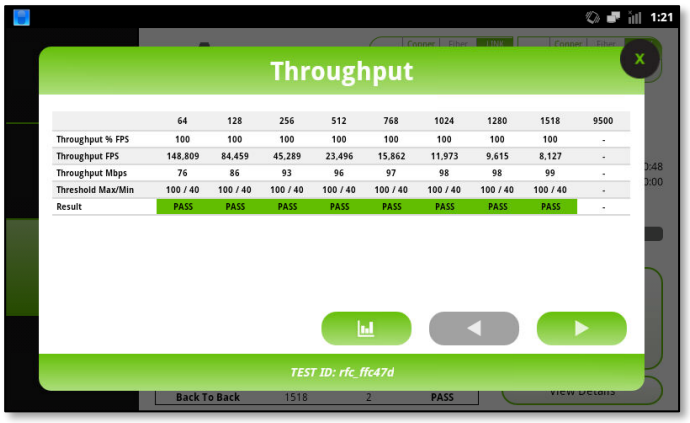


Figure 54 - RFC-2544 Results Table View

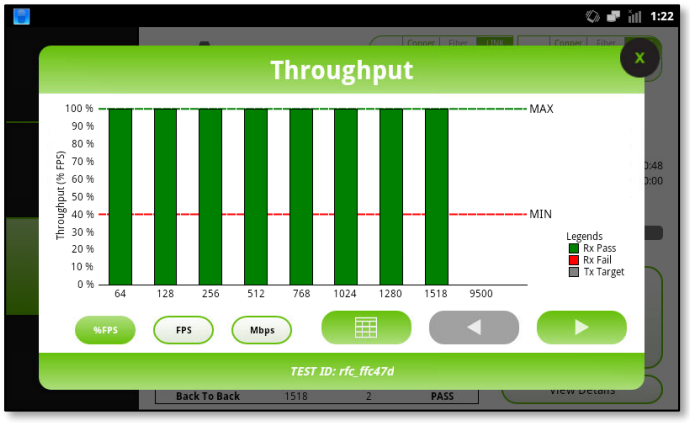


Figure 55 - RFC-2544 Results Graphic View

ITU-T Y.1564

This test is only activated when feature option DS10G-SW-ADV is purchased. This option can be activated in the field by entering a valid license key as detailed in the Settings section above. The ITU-T Y.1564 test enables generation of up to 16 unique services, verifying conformance to the subscriber Service Level Agreement (SLA). Each service can have a different:

- Frame configuration (frame type, size, VLAN, MPLS or IP type)
- Traffic rate

Frame Configuration

Frame configuration is similar as detailed in the General Test Configuration, Frame Configuration section above with the following differences:

# of Services – This menu button enables selecting how many services the test unit will generate. Valid options are 1-16 services.

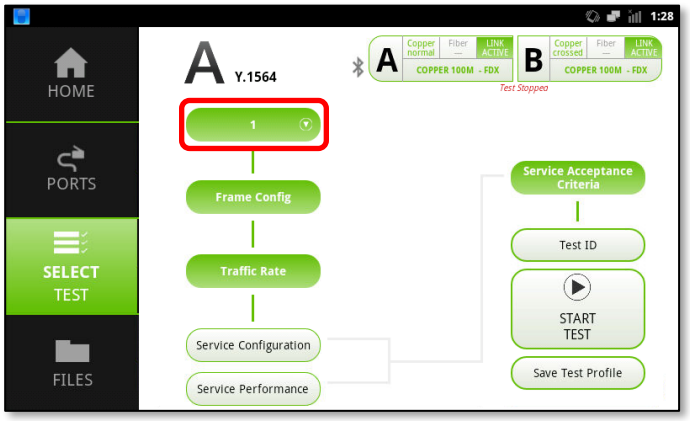


Figure 56 – ITU-T Y.1564 Main View

When the frame configuration view is activated, a series of service selection buttons will be displayed above the frame configuration bar. Press the desired service to configure settings for the selected stream.

Each stream must be configured to be unique from all other streams using any one or combination of the following:

- Different 802.3 or ETH2 framing
- Different destination or source MAC
- Different VLAN configuration
- Different MPLS configuration
- Different IPv4 or IPv6 destination or source

Stream buttons that do not contain a unique setting will be colored red. Changing the configuration and then selecting another stream will validate the configuration again. Continue adjusting settings until all streams are displayed outlined in Green.

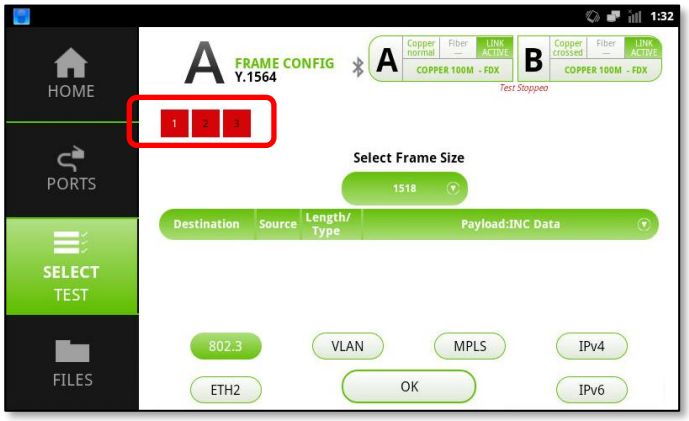


Figure 57 - Invalid ITU-T Y.1564 Configuration

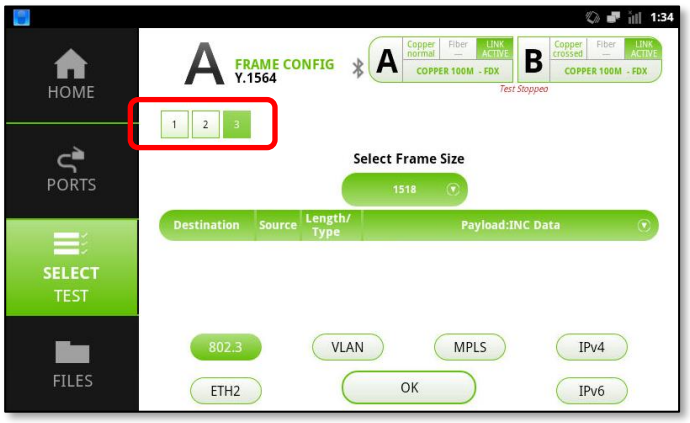


Figure 58 - Valid ITU-T Y.1564 Configuration

Traffic Rate Configuration

Rate configuration is similar to as detailed in the General Test Configuration, Rate Configuration section above with the following differences:

When the rate configuration view is activated, a series of stream selection buttons will be displayed above the rate selection button. Press the desired stream to configure rate settings for the selected stream.

Figure 59 – ITU-T Y.1564 Traffic Rate Configuration

CIR Rate – When pressed, sets the Committed Information Rate (CIR) of the service

EIR Rate – When pressed, sets the Excess Information Rate (EIR) of the service. Setting EIR to 0 disables EIR measurement

% – When pressed for either CIR or EIR rate, sets whether the rate is displayed in %, Kbps, Mbps or Gbps. Depending on the line rate selected, not all selections may be active

Steps – When pressed, this button enables configuring the number of steps the test set should take when ramping up to CIR rate

Step Duration – This field sets the duration for each test step iteration. It also sets the duration for EIR and Traffic Policing test iterations

Traffic Policing – When pressed, this button toggles between on and off. When on, the test set assumes a traffic policer exists on the network under test and attempts to transmit above CIR or CIR+EIR depending on configuration. When off, the test set assumes a traffic policer does not exist on the network under test and will not transmit above CIR or CIR+EIR

To comply with ITU-T Y.1564, if EIR < 20%*CIR, the traffic policing rate generated will be 125%*CIR + EIR. When EIR > 125% of CIR, traffic policing rate generated will be equal to CIR + 125% EIR.

Activating the traffic policing test when a traffic policer is not present on the network under test will always result in failing test results. The test set is actively testing for the policer to prevent overshoot traffic more than CIR+EIR. Because the network will accept the overshoot traffic the test set will detect this and declare the test a failure.

Copy To All – When pressed for CIR, EIR, or Traffic Policing, this button will copy the value entered in the respective field to all services

Clear All – When pressed, this button will clear out all custom values and reset to the default values

Distribute Evenly – When pressed, this button will distribute the total line rate across all streams evenly

OK – Closes the Traffic Rate view

Service Configuration Test

Pressing the **Service Configuration** button will toggle on or off the service configuration test. When on, the test set will test each service individually to confirm it is configured properly and meeting the SLA for the service under test.

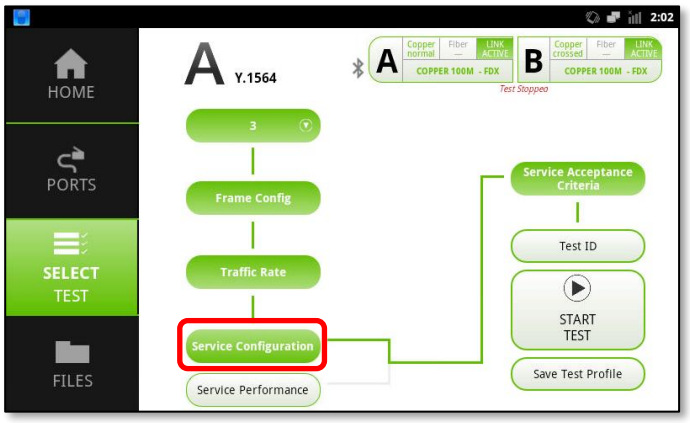


Figure 60 - Service Configuration On/Off Button

Service Performance Test

Pressing the **Service Performance** button will toggle on or off the service performance test. When on, the test set will test all services simultaneously to confirm the services meet the SLA for all services under test.

To comply with ITU-T Y.1564, if the Service Configuration Test fails for any service, the performance test will not be performed.

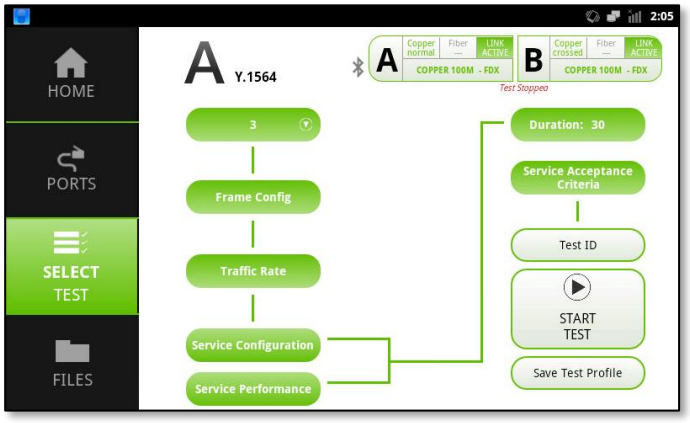


Figure 61 - Service Performance On/Off Button

Step Duration – This field sets the duration for the service performance test

To comply with ITU-T Y.1564, the Service Performance test should be performed for at least 15 minutes (900 seconds).

Service Acceptance Criteria

Pressing the **Service Acceptance Criteria** button activates the service acceptance criteria view. This enables setting pass/fail criteria for each service and whether to test against that criteria.

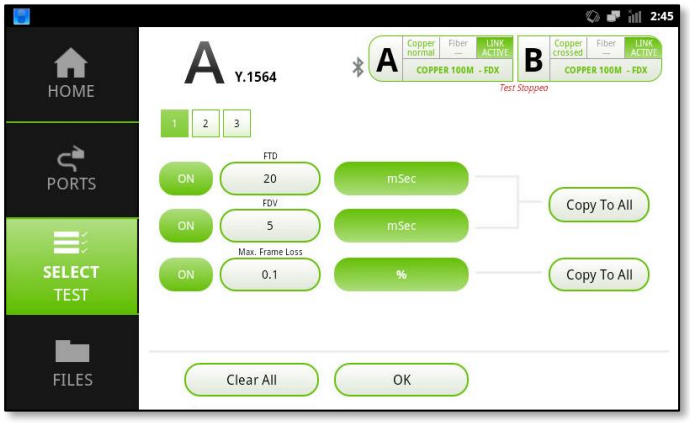


Figure 62 - Service Acceptance Criteria View

On/Off – When the button is on, the test set will measure against the criteria and present a pass/fail result in the test details as well as reports. When off, the criteria is ignored and "N/A" is displayed in test details and reports

FTD – Displays the maximum acceptable frame transfer delay (latency), in milliseconds, before displaying "Fail" in test details and reports

FDV – Displays the maximum acceptable frame delay variation (jitter), in milliseconds, before displaying "Fail" in test details and reports

Max Frame Loss – Sets the maximum acceptable frame loss before displaying “Fail” in test details and reports

Copy To All – When pressed for any criteria, this button will copy the value entered in the respective field to all services

Clear All – When pressed, this button will clear out all criteria values and reset to the default values

OK – Closes the Service Acceptance Criteria view

Test Mode

Test mode configuration is detailed in the General Test Configuration, Test Mode section above.

Test ID

Test ID configuration is similar to detailed in the General Test Configuration, Test ID section above with the following differences:

- Tests are not automatically saved. Instead, the SAVE RESULTS button must be press on the test result popover view as shown below.

Test Profile

Test Profile configuration is detailed in the General Test Configuration, Test Profile section above.

Running the ITU-T Y.1564 Test

Press the **START TEST** button to initiate your test. The following gauges and indicators are provided:

Service Icons – Service icons provide a visual reminder of the number of streams the tester is currently generating. The following indicators are provided for each service:

- Pending services will be displayed outlined in yellow
- Services currently under test will display a yellow cog
- Services with passing test results will be highlighted green
- Services with failing test results will be highlighted red

Rx Traffic Gauge – The received rate indicator gauge provides an indication test traffic is being looped back and at what rate. CIR traffic segments are colored green, EIR is colored yellow and Traffic Policing segments are colored red

Step Progress – Provides a visual indicator of the total percent complete for the current step under test

Test Duration – Provides total test duration

Remaining Time – Provides time remaining until the test is completed

Test Frames – Provides an active count of the number of transmitted and received frames. Counts update once per second so a minor discrepancy may be displayed while the test is actively running.

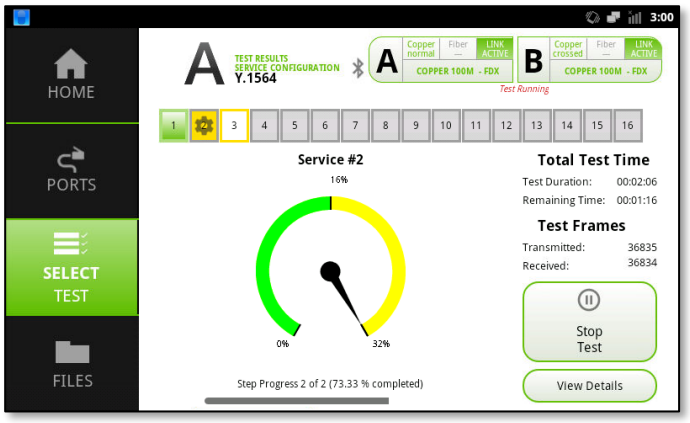


Figure 63 - ITU-T Service Configuration Test in Progress

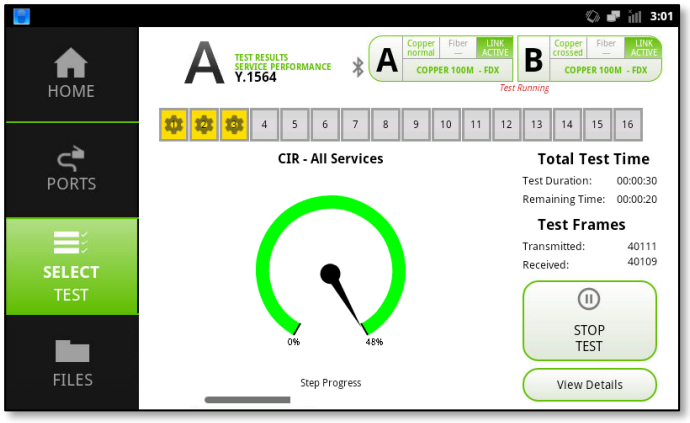


Figure 64 - ITU-T Service Performance Test in Progress

Stop Test – Pressing this button will abort the current test in progress.

View Details – Pressing the button activates the test result popover view. If the test is currently running not all statistics will be populated in real time so it is recommended to wait until the test completes, which will automatically display test results.

You may need to run quick test once when first connected to a HUB or SWITCH so the device can learn the MAC address of the test device.

ITU-T Y.1564 Test Results

The ITU-T Y.1564 test popover view provides both summary and detailed test results and statistics for configuration and performance tests. Several report views are available:

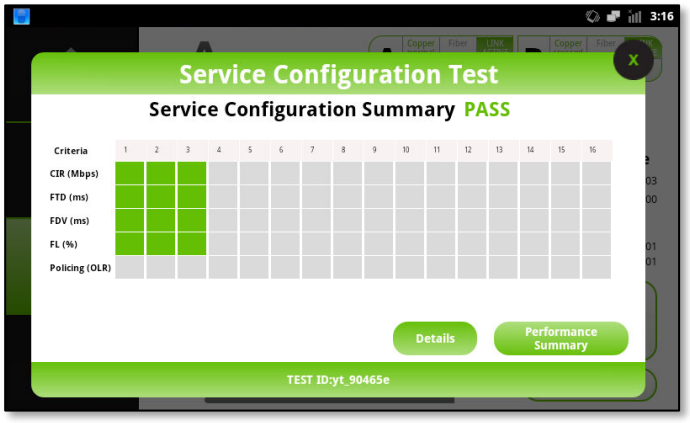


Figure 65 - ITU-T Y.1564 Service Configuration Summary Results

Service Configuration Summary Results – Display a visual scorecard of key performance metrics for each service in a consolidated view. Passing result cells in the table are shaded green, failing result cells are shaded red and inactive services or tests are shaded gray.

Details – Press the details button to view service configuration detailed test results for each service

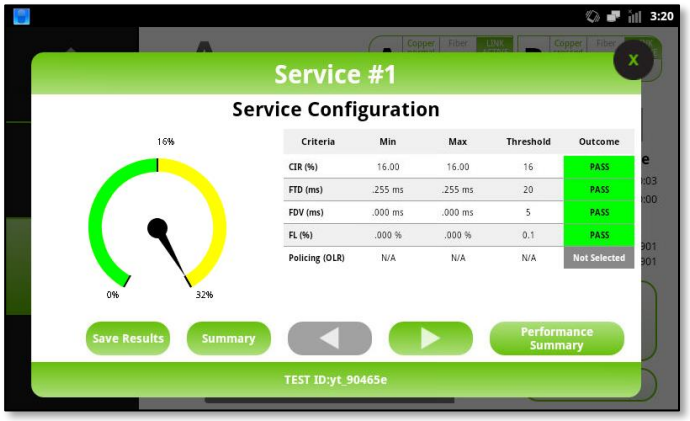


Figure 66 - ITU-T Y.1564 Service Configuration Detail Results

Service Configuration Detail Results – Display a detailed results of service acceptance criteria for each service.

Save Results – When pressed this button saves test results for all services and tests

⚠ ITU-T Y.1564 test results accumulate a large amount of statistics and can take up to a minute to store results for 16 services. Once the save test button is pressed the process cannot be aborted

Summary – Press the summary button to return to the service configuration summary view

Arrow Buttons – Moves to the next or previous service detailed test results

Performance Summary – Displays a visual scorecard of key performance metrics for each service in a consolidated view. Passing result cells in the table are shaded green, failing result cells are shaded red and inactive services or tests are shaded gray

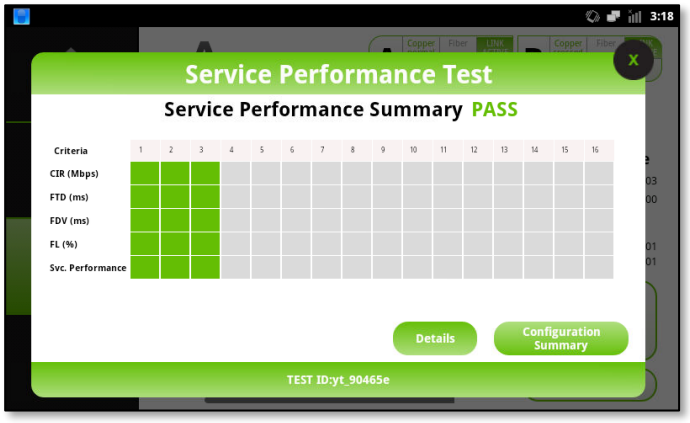


Figure 67 - ITU-T Y.1564 Service Performance Summary Results

Details – Press the details button to view service performance detailed test results for each service

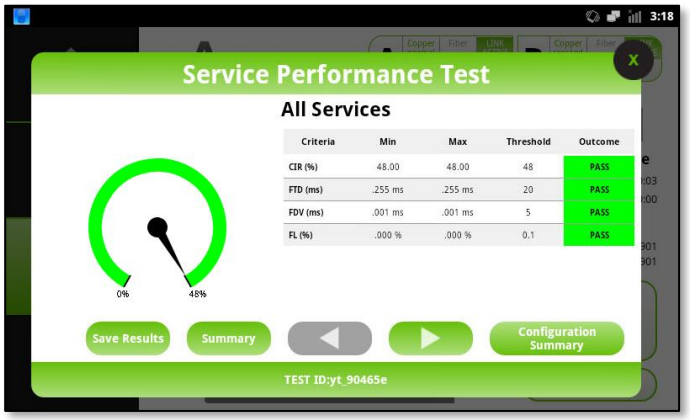


Figure 68 - ITU-T Y.1564 Service Performance Detail Results

Stream Buttons – Pressing a stream button displays statistics for the selected stream

Save Results – When pressed this button saves test results for all streams

⚠ Multi Stream test results accumulate a large amount of statistics and can take up to a minute to store results for 16 streams. Once the save test button is pressed the process cannot be aborted

Advanced Loopback

Port A loopback operates similarly to Port B loopback but provides advanced loopback control capability:

- Support for 10Gbps loopback
- Query and discover up to six different remote devices
- Send loop up and down commands to individual devices

The advanced loopback feature is compatible with both Greenlee DataScout test units and JDSU/Viavi™ test units

Configuration

The Port A advanced loopback view has three sections of note:

1. This Device configuration
2. This Device Statistics view
3. Remote Device query and control

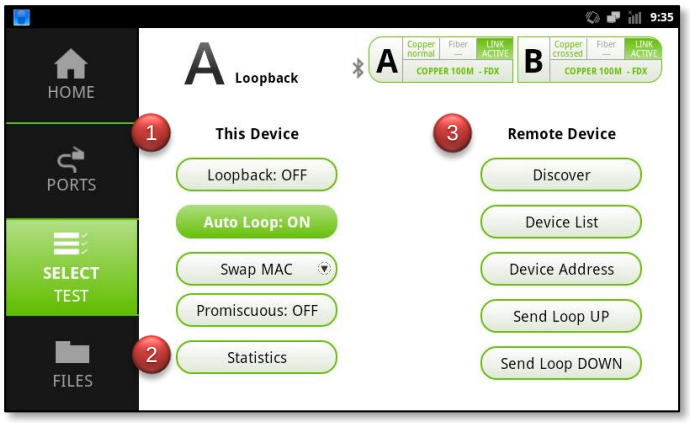


Figure 69 – Advanced Loopback View

This Device Configuration

Loopback On/Off – This button manually turns loopback mode on or off. When on, the test set will reflect traffic coming into Port B. When off, the port will not loopback traffic.

Auto Loop On/Off – This button determines whether Port B will respond to loopback queries received from remote devices. When auto loop is on, Port B will respond to queries and loop up/down commands received from compatible devices. When auto loop is off, Port B will not respond to queries or loop up/down commands

Swap IP Address – This button, when enabled, instructs Port B to swap the source and destination IP addresses of received traffic

Swap MAC/IP Address – This menu button, when set to MAC, instructs Port A to swap the source and destination MAC addresses of received traffic. When set to IP, it instructs Port A to swap both source and destination MAC and IP addresses of received traffic

Promiscuous Mode On/Off – This button, when enabled, instructs Port A to reflect all traffic received, even if the traffic is not addressed to Port A specifically. This includes unicast, multicast and broadcast traffic

This Device Statistics View

Pressing the statistics button will activate a popover view displaying the current loop-back statistics. Pressing the left ◀ or right arrow ▶ buttons will display the previous or next page of statistics. Pressing the ↺ reset button will reset counts back to zero. The speedometer reflects the current percentage, from 0 to 100%, of received traffic.

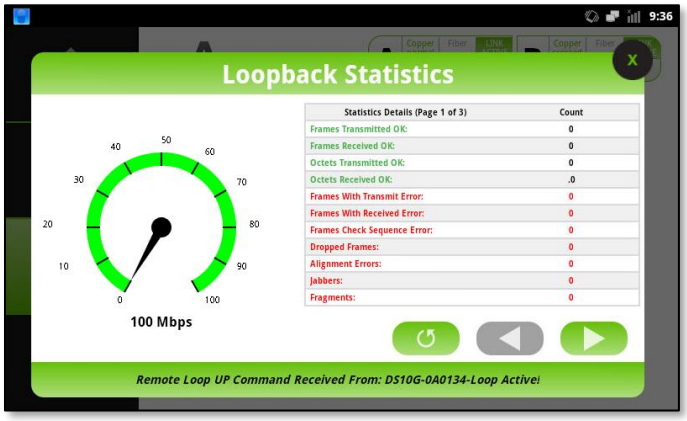


Figure 70 - Port A Statistics View

Remote Device Query and Control

Several options are available in the Remote Device column of advanced loopback:

Discover – This button, when pressed, instructs the test set to send out a query to all loopback devices requesting their address information and current loopback status. Up to six remote devices may respond. If more than six remote devices are available the first six devices to respond will be displayed.

It takes up to thirty seconds for network link and routing to be established on a network device. Pressing Discover before waiting at least thirty seconds for the link to "settle" may result in time out error messages. If this occurs, wait at least thirty seconds before pressing the Discover button again.

Figure 71 - Remote Device List

Loop Up – This button, when pressed, instructs the test unit to send a loop up command to the selected remote device. If successful, the remote device will respond with "Looped Up" in the status column.

Loop Down – This button, when pressed, instructs the test unit to send a loop down command to the selected remote device. If successful, the remote device will respond with "Looped Down" in the status column.

If the remote device responds with "Status Unavailable" it does not indicate the remote device is unavailable, only that a status message was not sent back to the test unit.

If the remote device responds with "Busy" this indicates the test set is currently looping back traffic to another device and cannot be looped up/down by the test unit.

History – This button, when pressed, displays a running history of all devices discovered, looped up and looped down. Pressing the left ◄ or right arrow ► buttons will display the previous or next page of history information. Pressing the ↺ reset button will reset history.

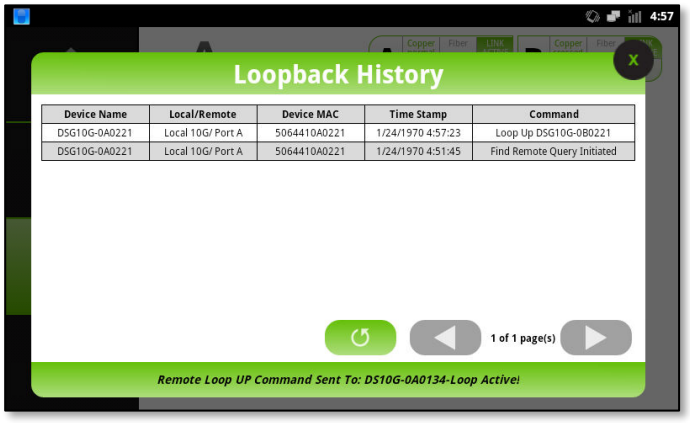


Figure 72 - Loopback History Popover

Device List – This button, when pressed, will activate the device list popover view as described in the Discover section above.

Device Address – This button, when pressed, enables manually setting the destination MAC/IP address of a device in the event it does not respond to a query or is not compatible with the advanced loopback function.

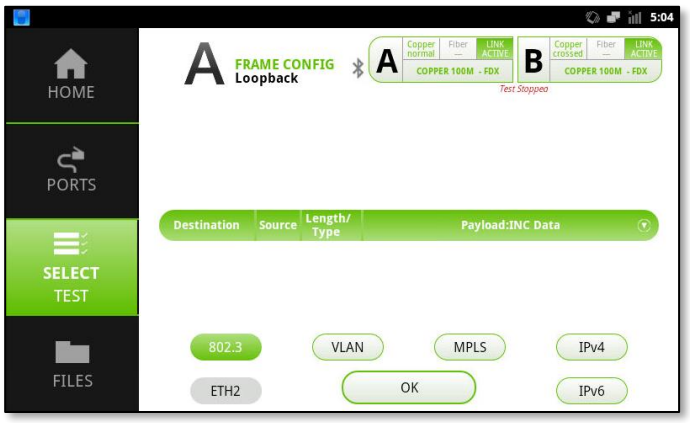


Figure 73 - Device Address View

The current frame configuration entered on any other test menu (Quick Test, Multi Stream, RFC-2544 or ITU-T Y.1564 will be overwritten when this view is active. Use caution if you have a complex frame configuration entered.

Send Loop UP – This button, when pressed, instructs the test unit to send a loop up command to the selected remote device.

Send Loop DOWN – This button, when pressed, instructs the test unit to send a loop down command to the selected remote device.

IP Tools

IP Tools provide the ability to perform PING, Traceroute and Web Browser capability.

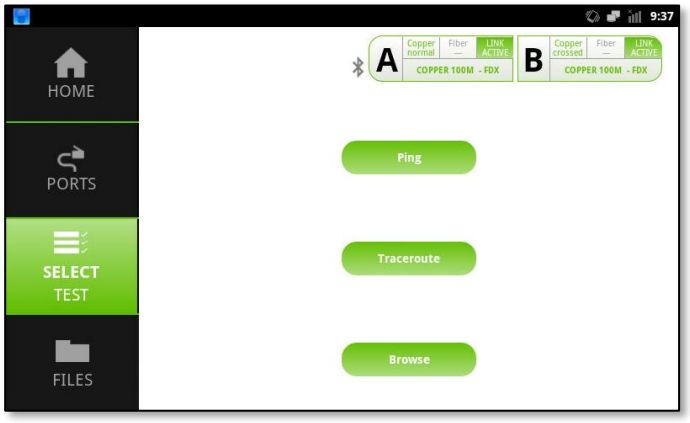


Figure 74 - IP Tools View

Ping

Ping is a computer network administration software utility used to test the reachability of a host on an Internet Protocol (IP) network. It measures the round-trip time for messages sent from the test set to a destination URL or IP address. If the destination responds the pings are echoed back to the test set.

The name Ping comes from active sonar terminology that sends a pulse of sound and listens for an echo to detect objects under water. It is also sometimes interpreted as an acronym to Packet INternet Groper (PING).

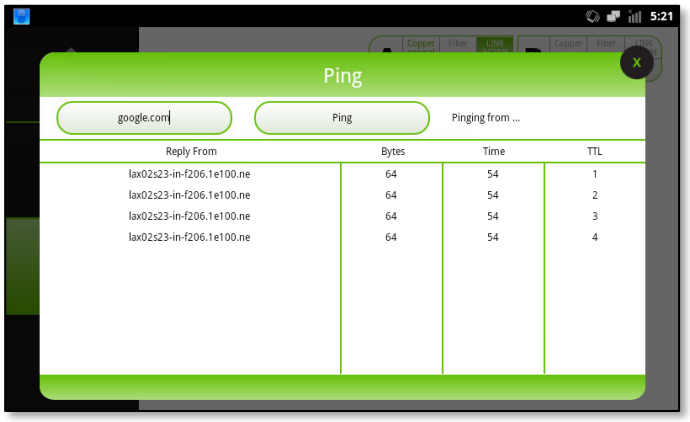


Figure 75 - Ping Function

Traceroute

Traceroute is a computer network diagnostic tool for displaying the route (path) and measuring transit delays of packets across an IP network. The history of the route is recorded as the round-trip times of the packets received from each successive host (remote node) in the route (path); the sum of the mean times in each hop is a measure of the total time spent to establish the connection.

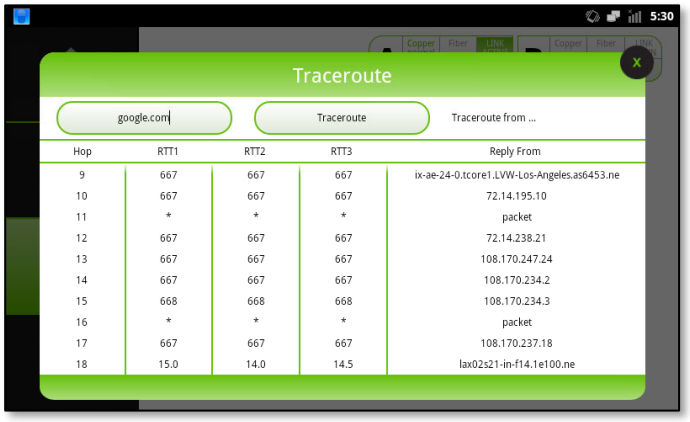


Figure 76 - Traceroute Function

Browse

The browse function activates the internal browser. This provides the ability to verify websites can be reached or to read online documentation.

Figure 77 - Browse Function

Files

When the files button is pressed four different options are available:

- Company Logo – Add a custom logo to test reports
- Technician Profiles – Technician information used for test reports
- Test Profiles – Manage saved test profiles
- Test Results – Export results in PDF and/or CSV format

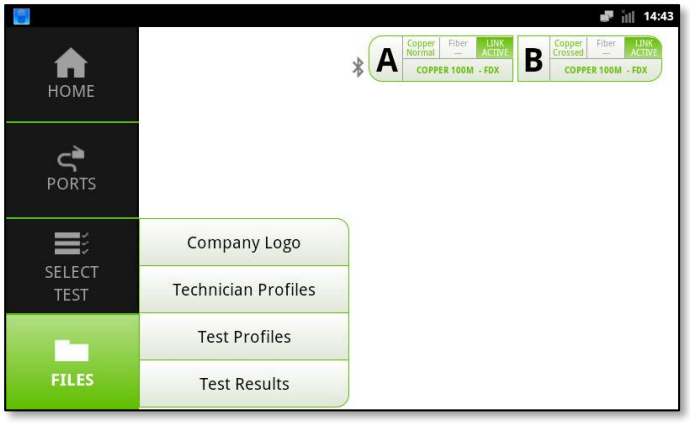


Figure 78 - Files Menu

Company Logo

Adding a company logo to test reports allows personalizing reports you send to customers. Any custom logo in PNG or JPG format can be used and should not exceed 100x240 pixels in size. Larger pictures should be resized to be as close as possible to minimize distortion. To add a custom logo into the header of test reports, tap the Company Logo menu button.

The company logo view has three sections of note:

1. Import
2. Current
3. Save Logo

Figure 79 - Company Logo View

Import

Internal Storage – This button opens a dialogue which enables selecting a logo image already stored on the system. Previously imported logos initiated by pressing the USB Flash Drive button will be stored in the Logos folder. If you imported a logo into a different folder, either scroll up/down the folder list or press the back button on the screen to access the folder where you saved your logo.

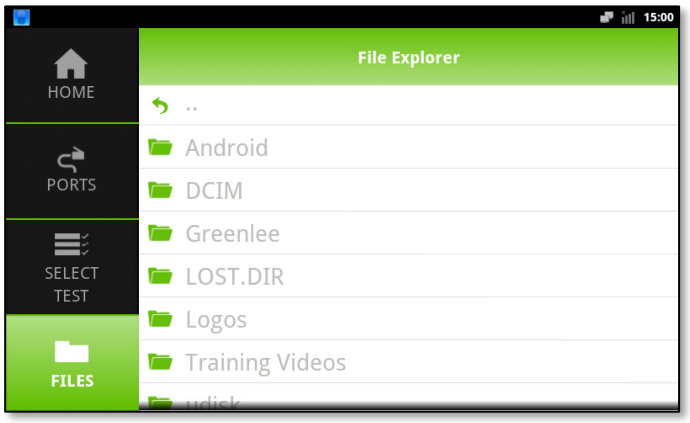


Figure 80 – Internal Storage Explorer View

USB Flash Drive – This button opens a dialogue which enables selecting a logo image stored on a USB flash drive. Insert the flash drive containing your logo and wait for the device to mounted by the operating system. This typically takes about five seconds. Once the device is mounted, press the USB Flash Drive and select the logo file desired.

Use Default – Pressing the Use Default button will revert the system back to using the factory default Greenlee Communications logo image.

Current

The current section provides an example of the current company logo selected. If the logo appears distorted or of low visual quality in this section it will likely not display well on reports.

Figure 81 – Current Section Displaying Custom Logo

Save Logo

The Save Logo button commits the currently selected logo to the internal memory in the Logo folder and makes it active for all reports generated in the future.

Technician Profiles

When generating reports, you may be required to include information about the technician who performed the test. This menu option enables storing multiple technician profiles which can then be selected to include in the test report, saving time entering the same information after every job.

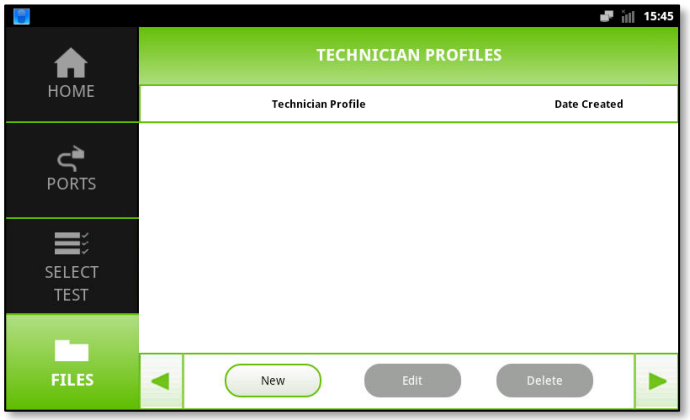


Figure 82 - Technician Profile View

New – To create a new technician, press the New button and enter your information into the desired fields on the popover entry form. Once you are done entering information enter the desired technician profile name and then press the Save button.

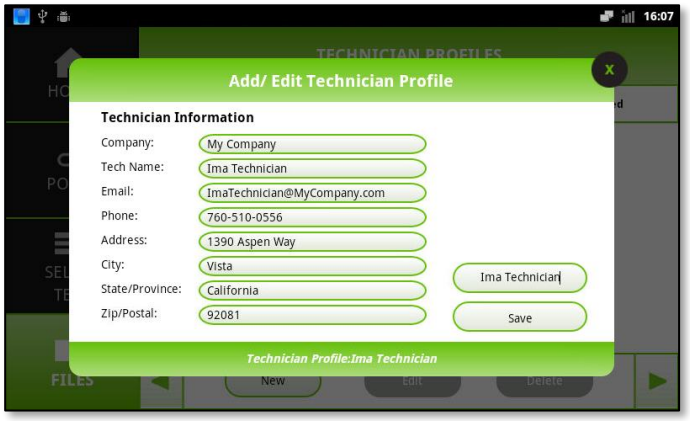


Figure 83 - New Technician Profile Popover Form

Edit – To edit an existing technician profile, select the desired profile and press the edit button. Once you are done editing information press the Save button.

Delete – To delete an existing technician profile, select the desired profile and press the delete button. Press OK on the warning message to permanently delete the profile.

Test Profiles

When performing complex tests, it is often easier to save the test configuration for rapid recall later. This menu option enables storing multiple test profiles which can then be loaded later or used as a template for creating new test profiles, saving time entering the same information. Thousands of test profiles can be created and stored on the test set.

Test profiles, results and technician profiles are stored in a database on the test set. If a consistent master list of test profiles is desired to be loaded on all devices in your fleet the database can be copied to multiple devices. Contact Greenlee Communications technical support for more information on how this is performed.

The test profile view has four sections of note:

1. Test Type Selector Tabs
2. Saved Profile List
3. View Profile Function
4. Profile Load/Edit/Delete Bar

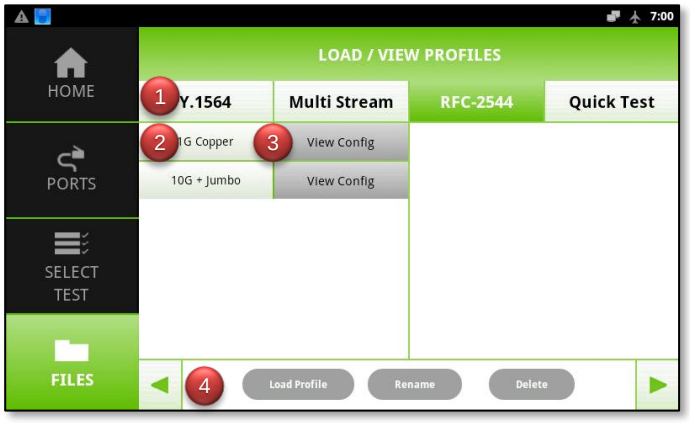


Figure 84 – Test Profile Main View

Test Type Selector Tabs

The test type selector tab sub-divides all test profiles by the type of test it performs. This enables quickly finding the desired profile.

Saved Profile List

Profiles for the selected test type are displayed in the saved profile list. Tap the desired test profile to select it.

View Profile Function

Pressing the View Profile button will display the configuration settings for the test so you can confirm this is the correct profile you desire. Press the “X” to close the View Config popover view once you are finished.

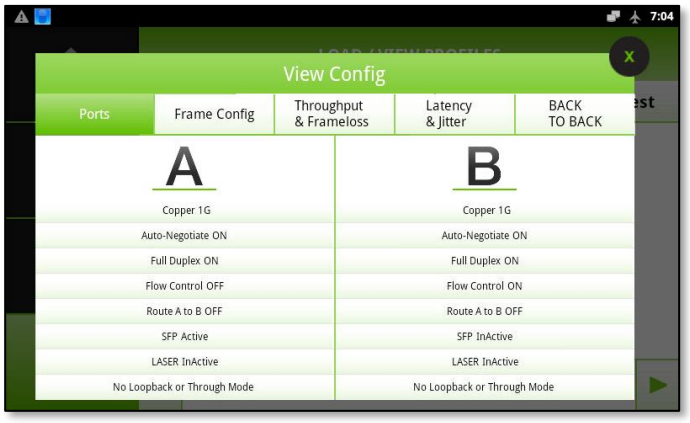


Figure 85 - View Config Popover View

Profile Load/Edit/Delete Bar

Load Profile – Once you have selected the desired profile from the saved profile list, press the Load Profile button and wait for the configuration to be loaded. You will be automatically taken to the correct test view once profile loading is completed.

Rename – To rename a profile select it from the saved profile list and tap the Rename button.

Delete – To delete an existing test profile, select the desired profile and press the delete button. Press OK on the warning message to permanently delete the profile.

Arrow Buttons – Each test profile type may have multiple pages of stored test profiles. Profiles are listed in last saved first order from top to bottom in the first table column, then the second. Once the second table column is filled a new page is created. To move between pages, use the left and right arrow buttons.

Test Results

This menu option enables viewing and exported storing test results. Each time a test completes it is automatically stored to the results database. If no test ID is entered when the test is started the system will generate a random test ID name which can be edited if desired. Thousands of test results can be stored on the test set.

The test profile view has four sections of note:

1. Test Type Selector Tabs
2. Saved Result List
3. Test Result Control Bar
4. Test Result Export Function

Figure 86 – Test Results Main View

Test Type Selector Tabs

The test type selector tab sub-divides all test results by the type of test it performs. This enables quickly finding the desired result.

Saved Result List

Results for the selected test type are displayed in the saved result list. Tap the desired test result to select it.

Test Result Control Bar

View – Once you have selected the desired result from the saved result list, press this button to recall test results and display it on the screen again.

Export – Used to export test results in PDF or CSV format. See the Test Profile Export Function section below for more information.

Rename – To rename an existing test result, select the desired result and press the rename button.

Delete – To delete an existing test result, select the desired result and press the delete button. Press OK on the warning message to permanently delete the result.

Arrow Buttons – Each test result type may have multiple pages of stored test results. Results are listed in last saved first order from top to bottom. Once ten results are stored a new page is created. To move between pages, use the left and right arrow buttons.

Test Result Export Function

This function enables exporting customized test results in both PDF and/or CSV format. By selecting which sections are desired to include reports they can be as simple as a one-page summary to in-depth reports that include detailed results, test configuration and even technician/job information sections. If a custom logo was imported, this logo is also added to the report header.

The test result export view has three sections of note:

1. Report Details
2. Report Format
3. Export To

Figure 87 - Export Test Results Popover View

Report Details

This section defines what details should be included in the test report. Each section option button toggles on/off, enabling which sections should be included in the report. Any or all sections may be included in reports, enabling creation of simple summary reports to in-depth comprehensive ones.

Enabling all report sections may result in a very long report being generated for RFC-2544, Multi Stream or ITU-T Y.1564 reports with many streams.

Technician Profile – When a technician profile is created as described in the Technician Profile section above, this information is included in the header of the report, enabling identification of which technician performed the test.

Job Information – Enabling this section activates the job information popover view, allowing you to enter pertinent job information which is then added to the report header. Job information entered is stored in the database so it does not have to be entered again if the report is generated in the future.

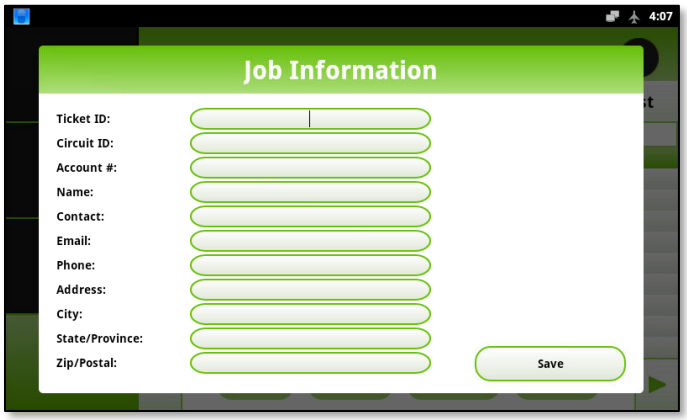


Figure 88 - Job Information Popover View

Score Card Results – Enabling this section activates population of the score card report section. The score card provides a visual and simple to understand tabular summary of test pass/fail status and is appropriate for customers who desire only a high-level report of test results.

Detailed Results – Enabling this section activates population of test result details, including frame transmitted/received counts, errors and performance information. The detailed results section provides a traditional tabular summary of all test results and is appropriate for customers who require in depth metrics for analysis or validation.

Test Configuration – Enabling this section activates population of port, frame and rate configuration used to perform the test. If optical ports are used, the SFP information is also provided showing SFP vendor, wavelength, transmitted and receive power as well as other diagnostic information.

Report Format

This section defines what format(s) the test report should be exported to. The report file name will be taken from the test result ID name.

PDF – Report is generated as a PDF (Portable Document Format). When printed, the report will support both letter 8.5” x11” and A4 210 x 297 mm paper sizes.

CSV – Report is generated in CSV (Comma Separated Value) format. This format can be opened using most spreadsheet or text editors.

PDF & CSV – Reports are generated in both formats simultaneously.

Export To

This section defines where to export the report files to. All reports are saved to the folder path /Greenlee/Results/[Test Type] where [Test Type] is a separate folder matching the test run.

Internal Storage – The results are stored to the internal SD memory card

USB Flash Drive – The results are stored to an external USB drive. The USB drive must be plugged in prior to exporting test results to this location.

Export Results – Once you have selected the desired report detail, format and location parameters, press the Export Results button to start the export process.

Test results are saved in the local language configured and cannot be exported in a different language. For example, you cannot save a test result while in English language mode, switch to Spanish language mode, then export the test result.

IEEE C37.94 Testing

Overview

IEEE C37.94 defines an optical transmission interface used by utilities to monitor and control mission critical supervisory control and data acquisition (SCADA) links. C37.94 typically utilizes an 850 nm MMF interface with ST connectors but 1310 nm SMF variants with other connector types are also used. The protocol can transmit a single data stream utilizing between 1 and 12 separate 64kbps channels for a maximum of 768kbps maximum throughput using a basic framing structure with a line rate of 2048kbps.

Test Interface

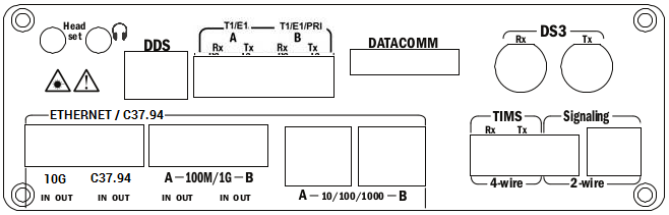


Figure 89 - Ethernet Test Ports

C37.94 testing is incorporated into the Ethernet test interface and as such can support the following:

1. Single port 10000Base-X
2. Single port IEEE C37.94
3. Dual port 100FX or 1000Base-X SFP (1GbE)
4. Dual port 10/100/1000Base-T

This chapter will focus only on the C37.94 test option. For more information regarding Ethernet test options refer to the Ethernet Testing chapter.

Test Interface Connections

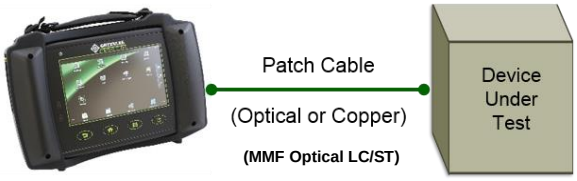


Figure 90 – C37.94 Interface Connection

To connect the test interface to the device under test you must select the proper patch cable depending on the termination on the network element you are testing. In all cases the only termination supported on the test set is LC. It is also required to use the SFP provided with the test set at time of purchase for C37.94 testing, other models

may operate but are not guaranteed to work to specification. There is no specific order of connection required. You can connect the patch cord to the test device or network device first.

Home

There are three sections of note on the home view:

1. Menu bar
2. Link status indication bar
3. System Info button

Figure 91 - Home View Sections

Menu Bar

The menu bar provides access to channel configuration, selecting which test to run and view or retrieving test profiles as well as results. Menu bar buttons, when selected and active, will be green. When not select or active they will be black. In the figure above, the HOME button on the menu bar is active.

Link Status Indication Bar

The link status indication bar is present on all setup and test application views. It provides real time feedback regarding current optical link receive power, alarms, errors and loopback mode status.

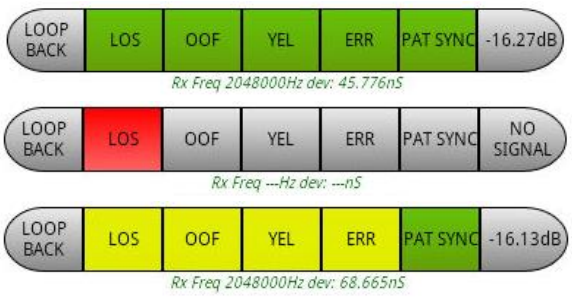


Figure 92 - Link Status Indication Bar

The status of the signal or alarm or error is displayed in one of four colors:

- Gray – Mode is off or providing advisory status
- Red – Alarm or Error state currently occurring
- Yellow – Alarm or Error state has occurred but is no longer active
- Green – Normal state, operating properly

To reset the status bar and clear yellow history indication status, press anywhere on the status bar and tap the OK button on the pop over warning message.

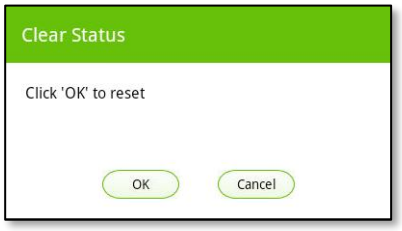


Figure 93 – Link Status Bar Reset History

System Info Button

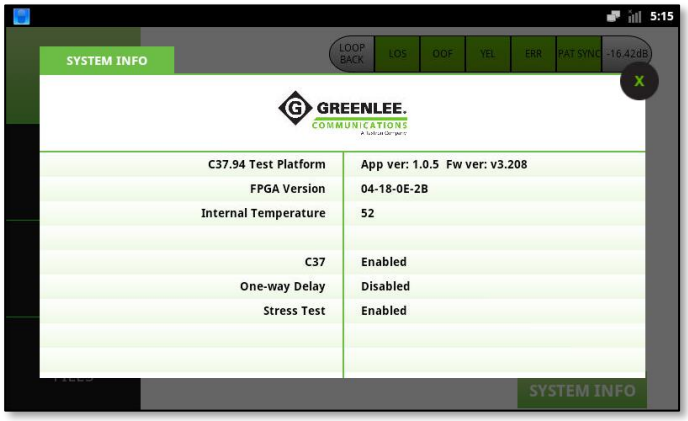


Figure 94 - System Info

Pressing the system info button activates a popover view which displays system information such as test platform software and firm-ware version, internal temperature and options installed. This information is helpful to have on hand before calling customer service or technical support as the agent may ask you to provide it.

Channel Setup

To configure physical channel attributes, press the SETUP button. The Setup view has three sections of note on the home view:

1. Tx/Rx rate selection
2. Clock selection
3. Optical SFP and Laser On/Off buttons
4. Save Port Profile

Figure 95 - Setup View

Tx/Rx Rate Selection

IEEE C37.94 supports up to 12 separate 64kbps data channels. The Nx64 rate selection menus determine the total number of channels to generate test traffic on. If the total number of channels selected is less than 12, the unused channels will carry idle indication information.

Nx64 TX Rate – Select desired number of channels to transmit on (1-12)

Nx64 RX Rate – Select desired number of channels to receive on (1-12). Selecting "From Tx" instructs the test set to use the same number of channels as TX rate. Selecting "Auto" allows the test set to detect the incoming number of channels and automatically match that rate.

Clock Selection

The test set supports internal, recovered and external transmit clock sources.

Internal – The internal precision clock as the transmit time source.

Recovered – Transmit timing is derived from the receive clock source.

External – When external timing is selected, an external clock source must be connected to the EXT CLK input located on the left side of the unit. The test set supports input sources ranging from 2MHz to 254MHz.

If an external clock source is not connected the system will display "No Signal" in the status table located to the right of the clock source button. Once a supported clock source is connected and detected the system will display "Connected". If a connected clock source is not within the acceptable range of 2-254MHz the system will display "Out of Range".

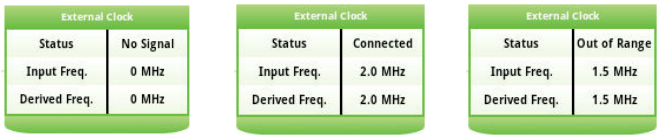


Figure 96 - External Clock Status Messages

The external clock setup on this screen does not accept a 1PPS input. 1PPS is only applicable on the one-way delay test setup screen.

Optical SFP and Laser On/Off buttons

SFP Info

Pressing the SFP Info button will display a popover view of the SFP diagnostic information. Use your finger to scroll down the screen to see more information. To refresh the SFP diagnostic information press the "Refresh" button. Press OK to close the SFP popover view.

Figure 97 - SFP Info Popover View

Laser On/Off

Pressing the "Laser: On" button will toggle the button to "Laser: Off" and turn off the transmit portion of the laser. Press the button again to toggle the laser back on again.

Save Port Profile

Pressing the "Save Profile" button will allow saving the entire port configuration for rapid recall after powering down your test set.

Figure 98 - Save Port Profile Entry

Test Selection

Once channel setup is completed, tap on the **SELECT TEST** button to select which test to run.

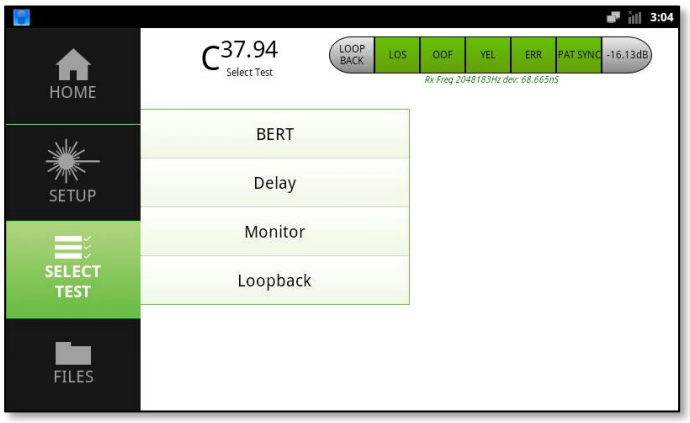


Figure 99 - Select Test Menu

BERT

This test is designed to accomplish several tasks simultaneously or concurrently:

- Generate a user selectable test pattern on the active Nx64 channels and compare received data to what was transmitted for errors
- Remotely loop up/down Greenlee test devices at the remote side of the circuit
- Display and count received errors and alarms
- Display G.821 performance metrics
- Display received data
- Inject alarms and errors

BERT Setup

There are six areas of note in the BERT setup view:

1. Duration Selection
2. Test Pattern Selection
3. Remote Loop Control

4. Test ID
5. Save Test Profile
6. Start Test

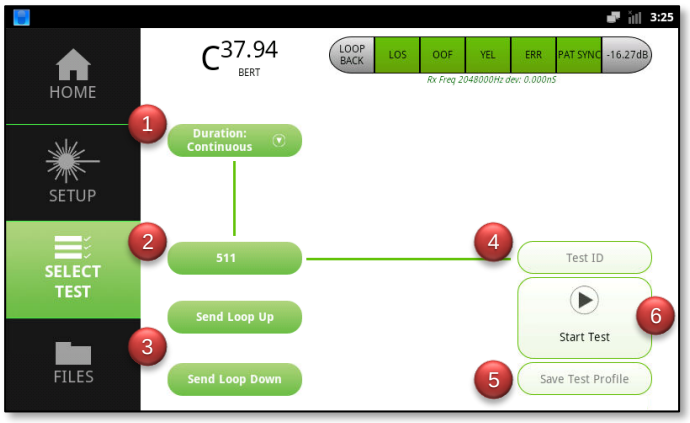


Figure 100 - C37.94 BERT Configuration View

Duration Selection

By default, the test set performs BERT in continuous mode. Pressing the "Duration: Continuous" button will display a menu enabling configuration of timed tests. Enter the total duration desired by typing the quantity into numeric field and then selecting the desired range of seconds, minutes or hours.

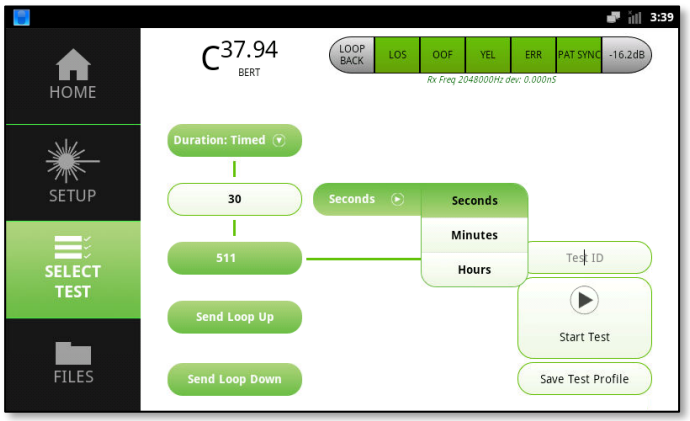


Figure 101 – Timed Duration Configuration

Test Pattern Selection

Pressing the pattern selection button enables selecting the desired test pattern to generate when the test is started. Note that you may change the test pattern once the test begins on the test results view as well. Press the "Invert BERT Pattern" button to invert the test pattern. Press the OK button to close the popover view.

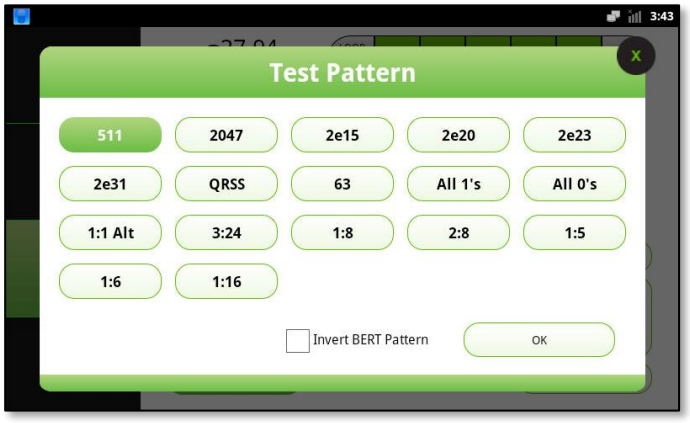


Figure 102 - BERT Test Pattern Popover View

Remote Loop Control

If there is another Greenlee DataScout unit connected to the far side of the circuit it is possible to send remote loop up and down commands to remote test set by pressing the loop up and loop down buttons respectively. The test set will provide status information regarding feedback received from the far end device.

Test ID

Test results are automatically saved when the **START TEST** button is pressed. If a test ID is not entered in the **Test ID** field the unit will generate a file name for you. This test file name can always be changed by navigating to the **Files**, then **Results** menu.

Figure 103 - Test ID Field

Save Test Profile

After configuring the test setup, it may be desired to save the configuration as a profile so you can recall it later for rapid test setup. To save a test profile, press the **Save Test Profile** button. The test file can be retrieved by navigating to the **Files,** then **Profiles** menu.

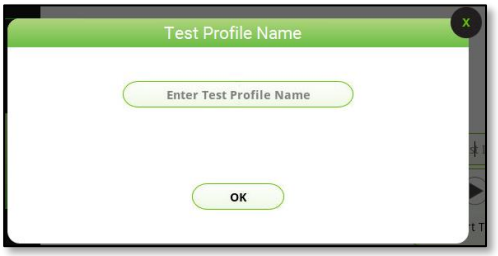


Figure 104 - Test Profile Field

If a test profile name is not saved in the Test Profile field, the test configuration will not be saved. The current test configuration will persist until you change the test type or power cycle the test unit. If you neglect to save a test profile and desire to do so, return to the test view you are on prior to initiating another test or changing the configuration, then press the Test Profile button and save the profile.

Start Test

To start a test, press the START TEST button. The test set will begin transmitting the initial test pattern selected in the previous view and display live test results.

BERT Results

There are four areas of note in the BERT results view:

1. Elapsed Time & Nx64 Details
2. Test Pattern Selection, Error & Alarm Injection
3. Stop & Reset Test
4. Live View Test Results

Figure 105 - BERT Test Result View

Elapsed Time & Nx64 Details

When the test set is in continuous mode the elapsed time counter will increment to show the total elapsed time the test has been running. When in timed mode both elapsed and remaining time is displayed.

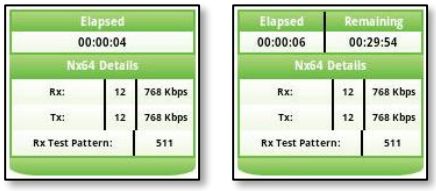


Figure 106 - Elapsed Time Display

Below the elapsed time entry is the Nx64 Details which displays the total number of Nx64 channels being transmitted and received as well as the total throughput of the channels.

Lastly, below the Nx64 details entry is the Rx Test Pattern display. The test set automatically determines the test pattern received and displays this information to the user. If the test pattern received does not match what is being sent the PAT SYNC indicator will be red. This indicates the test set at the far side of the circuit is transmitting a different test pattern from the local test set.

Test Pattern Selection, Error and Alarm Injection

Test Pattern Selection

To change the test pattern currently being transmitted, press the test pattern button (default 511) and select the desired test pattern just as you did on the initial setup screen. It is common to receive a few errors during the transition of test patterns.

Error & Alarm Injection

During a test it is possible to inject frame, code or logic errors into the test stream to verify proper circuit response to these events. To inject errors, press the “Inject Errors” button. A popover selector view will appear.

Figure 107 - Error & Alarm Injection Popover View

Pressing the Frame and Code buttons will inject a single frame or code error each time either button is pressed. The Logic button can be used to inject a single logic error (default) or at a desired rate by pressing the “Single” button and then selecting the desired rate to transmit logic errors at.

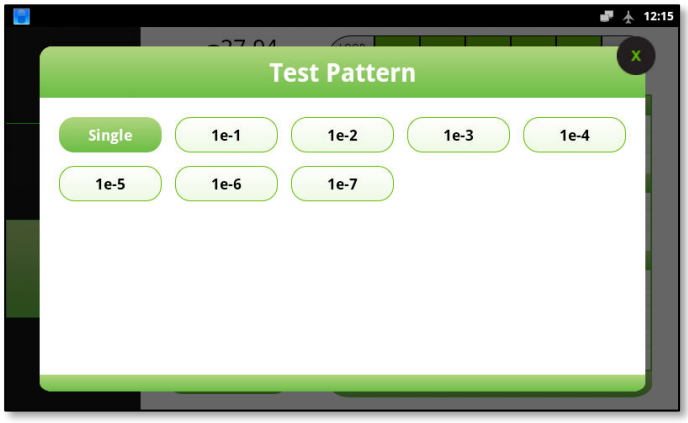


Figure 108 - Logic Error Insertion Rate Selection

Once an injection rate is selected the device will begin injecting errors and the Logic button will change to display **Injecting**. To stop injecting logic errors, press the **Injecting** button and it will return to displaying **Logic** again.

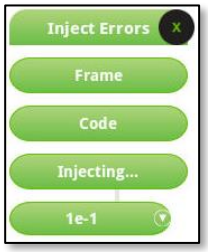


Figure 109 - Logic Error Injecting

To send alarms, press the **Send Alarms** button. A popover selector view will appear.

Figure 110 - Send Alarms Popover View

Pressing either the **Send LOS** or **Send Yellow** buttons will toggle sending either or both LOS and Yellow alarms to the far end unit. When alarms are active the buttons will display **On**. To stop send either alarm, tap the button again. To close the popover view, press the X in the upper right corner of the popover view.

Stop & Reset Test

While at test is running you may stop it immediately at any time by pressing the **Stop Test** button. Test results will automatically be saved once this button is pressed. To reset the live test results and restart the test, press the **Reset Test** button. Elapsed time counters and alarm status indicators will be reset and test will start over again.

Live View Test Results

While a test is running live results are displayed. Total counts of Alarms, Error and G.821 metrics will be displayed on the first page of test results.

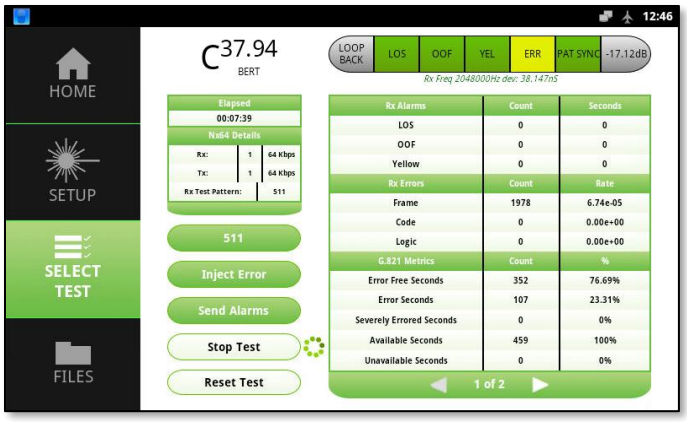


Figure 111 – Live View Test Results, Page 1

Pressing the right arrow at the bottom of the live view test results table will display live received data for each channel.

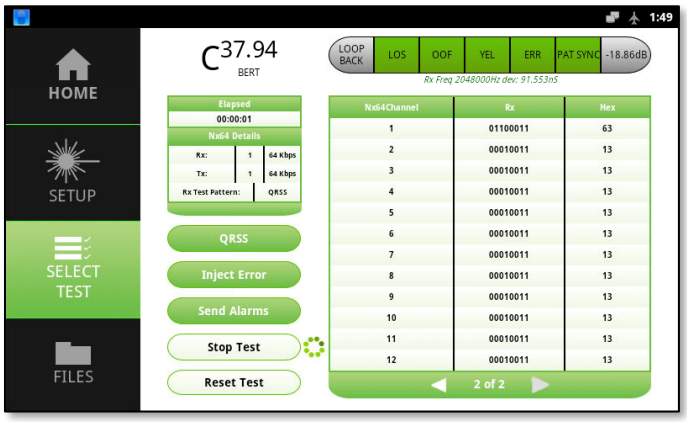


Figure 112 - Live View Test Results, Page 2

Delay (Propagation)

The delay test enables measuring round trip or one-way propagation delay across the circuit under test. One-way measurements require activation of the one-way delay software option.

Delay Test Setup

There are five areas of note in the BERT setup view:

1. Duration Selection
2. Delay Mode Selection
3. Test ID

4. Save Test Profile
5. Start Test

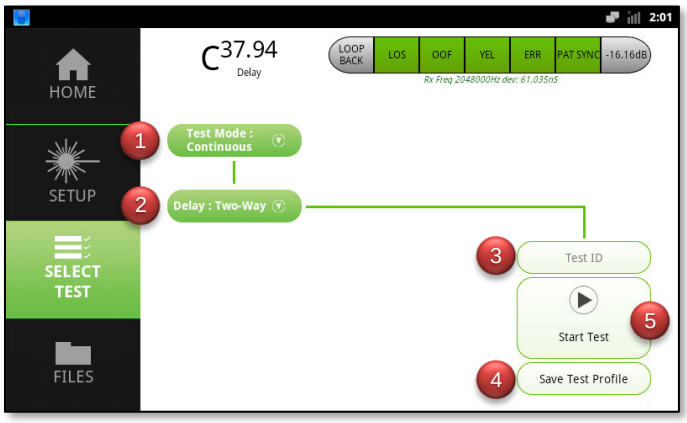


Figure 113 - Delay Test Configuration View

Duration Selection

By default, the test set performs delay measurements in continuous mode, meaning measurements are performed once per second and results are cumulative. Pressing the **Test Mode: Continuous** button will display a menu enabling configuration of a single shot "ping" test. In this mode the unit will perform a single delay measurement and display the result.

Delay Mode Selection

By default, the test set performs two-way (round trip) delay measurements. Pressing the **Delay: Two-Way** button will enable choosing one-way (asymmetric) delay measurements.

One-Way External Clock Source

When in one-way test mode the test set required a one pulse per second input (1PPS) from a stable time source such as a GPS receiver or building interface timing source (BITS) clock. Connect the 1PPS source to the **EXT CLK** input located on the left side of the test set.

When connected to a valid 1PPS source, the test set will synchronize its internal clock and display **1PPS Connected**. If a valid 1PPS source is not connected or the source cannot be synchronized for any reason the test set will display **Connect to 1PPS**.

Figure 114 - External 1PPS Clock Status

For one-way measurements to work properly both test sets on either end of the circuit must be DataScout models and each requires a 1PPS input to be connected.

If a 1PPS source is not available on site it is possible to use a standalone GPS receiver such as the Time Machines TM 1000A to provide a stable 1PPS signal. Construction of a custom RS-232 to female SMA test lead is required to interface the 1PPS signal to the test device. Contact Greenlee communications technical support for more information.

Test ID

The Test ID button works the same as described in BERT Setup. Refer to this section for more information.

Save Test Profile

The Save Test Profile button works the same as described in BERT Setup. Refer to this section for more information.

Start Test

To start a test, press the START TEST button. The test set will begin performing delay measurements as configured.

Two-Way Delay Results

Whether in continuous or ping test modes, Minimum, Maximum and Average delay test results are displayed in the results table. When in Ping mode all values will be the same as only one test measurement occurred. When in Continuous mode the Elapsed time box will display the total elapsed time since the test was started.

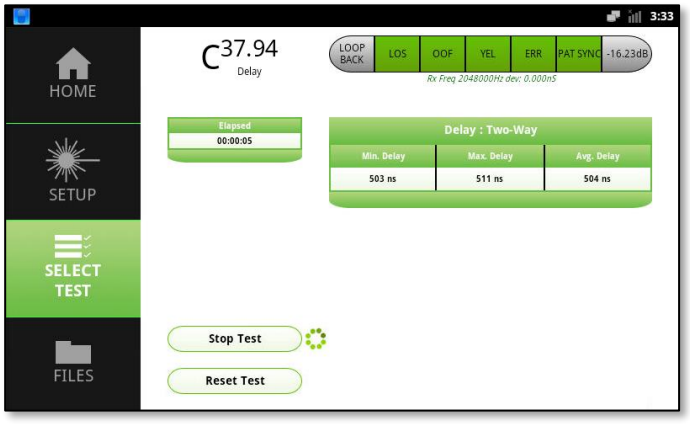


Figure 115 - Two-Way Delay Test Results View

One-Way Delay Results

One-way delay results display the Near-End and Far-End delay results on the circuit. Minimum, maximum and average delay is displayed.

Figure 116 - One-Way Delay Test Results View

Monitor Mode

This test enables monitoring an active circuit without disrupting the data being transmitted. When in monitor mode the transmitter is disabled and only the receive side of the transceiver is active. The following features are supported in monitor mode:

- Monitor the receive side of a terminated circuit (out of service)
- Monitor the active side of an in-service circuit (requires optical splitter)
- Display and count received errors and alarms
- Display G.821 performance metrics
- Display received data

Test Results

Elapsed Time & Nx64 Details

When monitor mode is selected the total elapsed time since start of monitoring will increment.

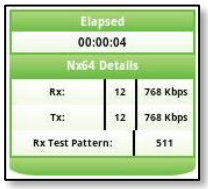


Figure 117 - Elapsed Time Display

Below the elapsed time entry is the Nx64 Details which displays the total number of Nx64 channels being transmitted and received as well as the total throughput of the channels.

When in monitor mode no data is being transmitted. This is simply a reminder of what is being transmitted by the circuit under test.

Lastly, below the Nx64 details entry is the Rx Test Pattern display. The test set automatically determines the test pattern received and displays this information to the user. If the test pattern received does not match what is being sent the PAT SYNC indicator will be red. This indicates the test set at the far side of the circuit is transmitting a different test pattern from the local test set.

Reset Test

To reset the live test results and restart the test, press the **Reset Test** button. Elapsed time counters and alarm status indicators will be reset and test will start over again.

Live View Test Results

While a test is running live results are displayed. Total counts of Alarms, Error and G.821 metrics will be displayed on the first page of test results.

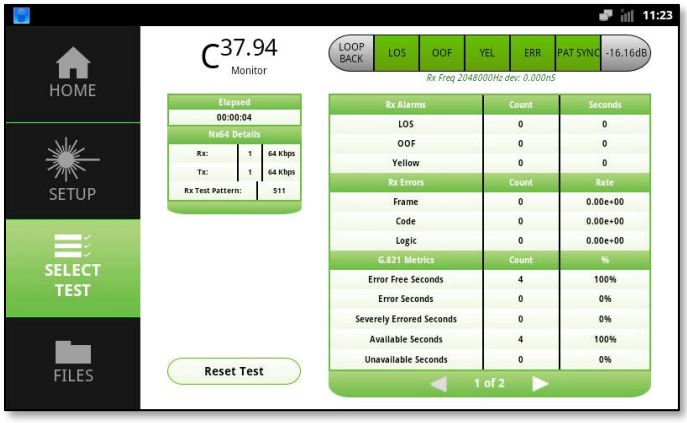


Figure 118 – Live View Test Results, Page 1

Pressing the right arrow at the bottom of the live view test results table will display live received data for each channel.

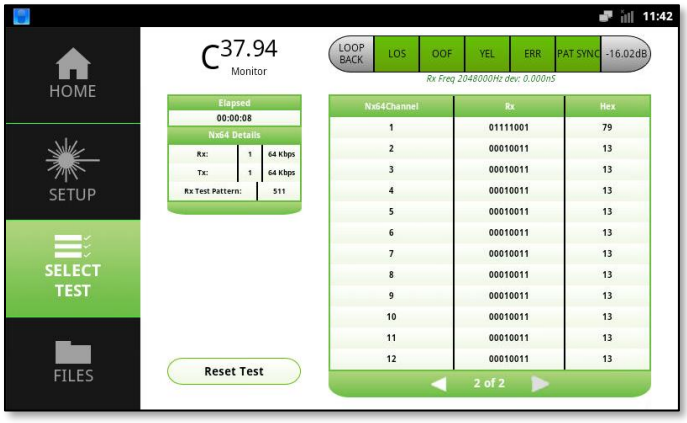


Figure 119 - Live View Test Results, Page 2

Loopback Mode

This mode enables control of the loopback status of the test unit and viewing of received data while in loopback mode. The following features are supported in loopback mode:

- Manually activate loopback mode
- Enable/Disable automatic response to loopback queries
- Display and count received errors and alarms
- Display G.821 performance metrics
- Display received data

Elapsed Time & Nx64 Details

When loopback mode is selected the total elapsed time since entering the mode will increment.

Figure 120 - Elapsed Time Display

Below the elapsed time entry is the Nx64 Details which displays the total number of Nx64 channels being transmitted and received as well as the total throughput of the channels.

Lastly, below the Nx64 details entry is the Rx Test Pattern display. The test set automatically determines the test pattern received and displays this information to the user. If the test pattern received does not match what is being sent the PAT SYNC indicator will be red. This indicates the test set at the far side of the circuit is transmitting a different test pattern from the local test set.

Manual Loopback

Pressing the **NW Loopback: OFF** button will manually activate the loopback mode on the test device. In this mode the unit will automatically reflect back all test traffic received to the sending device. The status bar **LOOP BACK** indicator will change color from gray to yellow to indicate loopback is currently active. Pressing the button again will toggle loopback mode back to off.

Figure 121 - Loopback Status Bar Indicator

Automatic Loopback Response

By default, the **Auto Loop: Enabled** button will be set to enabled. This indicates if a remote device sends a loopback request the test unit will respond and enter loopback mode automatically. When a loopback request is received and accepted, the status bar **LOOP BACK** indicator will change color from gray to yellow to indicate loopback is currently active.

Pressing the **Auto Loop: Enabled** button will toggle it to **Auto Loop: Disabled**. In this mode the test device will not respond to loopback queries. This may be desirable when monitoring a circuit.

Reset Test

To reset the live test results and restart the test, press the **Reset Test** button. Elapsed time counters and alarm status indicators will be reset and test will start over again.

Pressing the reset test button will not interrupt an active loopback. It only resets the local live results display.

Live View Test Results

While a test is running live results are displayed. Total counts of Alarms, Error and G.821 metrics will be displayed on the first page of test results.

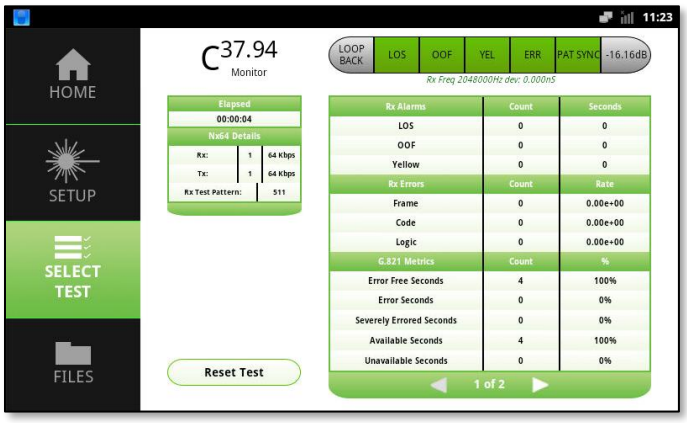


Figure 122 – Live View Test Results, Page 1

Pressing the right arrow at the bottom of the live view test results table will display live received data for each channel.

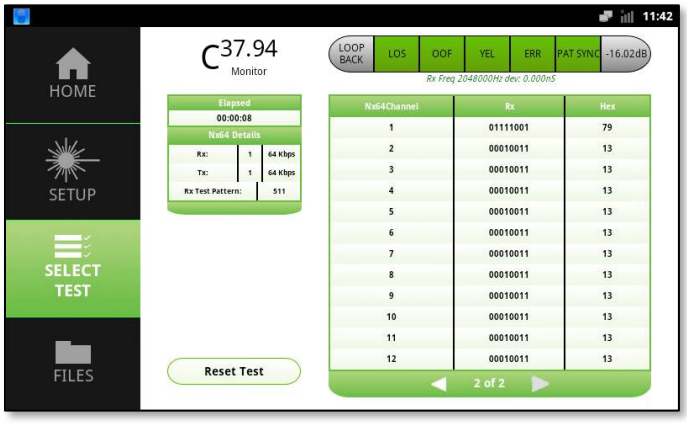


Figure 123 - Live View Test Results, Page 2

Files

When the files button is pressed four different options are available:

- Company Logo – Add a custom logo to test reports
- Technician Profiles – Technician information used for test reports
- Test Profiles – Manage saved test profiles
- Test Results – Export results in PDF and/or CSV format

Figure 124 - Files Menu

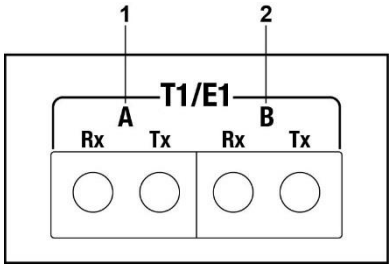
The files menu options are described in detail in the Ethernet Application Files section. Please refer to this section for more information.

DS1 Testing

Overview

DS1 testing is activated by pressing the DS3-DS1 icon. Note the elapsed time display, "ET: xxx" – ET appears when the self-test has completed. DS1-A default configuration is monitor mode, NW (Network Clock), ESF Framing, and B8ZS Coding, BERT–OFF.

The test set supports Single/ Dual T1 test port DS1-A (1) & DS1-B (2) (bantams). Settings, test functions and results are identical regardless of port selections.



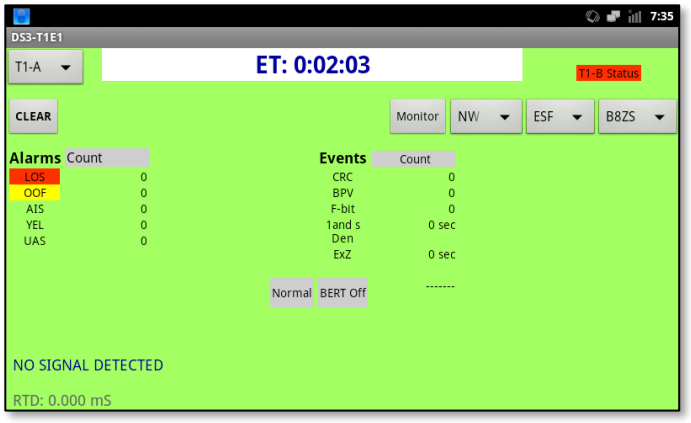
Test Interface Connections

Single DS1 Interface Connection

To connect the test interface to the device under test you must select the proper patch cable depending on which interface you are testing and the termination type if using the optical ports. There is no specific order of connection required. You can connect the patch cord to the test device or network device first.

DS1 Configuration

Except for the Clear button, the grey buttons are pull-down menus for changing the selected parameter. Select the test mode (Monitor, TERM, Bridged, etc.) by tapping on the Monitor button and selecting the desired test. In the example below the test set is configured as TERM, NW Clock, ESF Framing, B8ZS Coding, and BERT-Off.



DS1 Auto Configuration

The test set can determine the proper signal and framing detected on a live circuit then self-configure itself to achieve signal lock and pattern synch. This makes configuration fast and easy. To enable select **Auto** from the framing drop-down menu. The test set will auto-detect and configure the framing, coding and BERT pattern detected on the received signal.

Note: if an all-1's pattern or a fixed pattern with a high 1's density is received, the test set will not be able to auto-detect B8ZS coding. A BERT pattern such as QRSS or 3in24, etc. must be received in order to properly detect B8ZS coding.

DS1 Mode Selection

In the mode selection drop down are the following options:

Monitor – Select this mode if monitoring at a DSX (–20dB) point or at a monitor port on smart jacks (NIU). The transmitter is off when in MONITOR mode.

TERM DSX – Select this mode to perform intrusive testing, e.g. send loopbacks, straight away BERT tests, etc. tap on DS1 TERM DSX and select a clock mode: looped NW (recovered) or internal INT (master).

Bridged – Select this mode for monitoring at a high impedance point. The receiver is placed in a >1KΩ high impedance state for monitoring RX or TX lines. The transmitter is off when in BRIDGED mode.

CSU/NIU Emulation – Tap on CSU/NIU Emulate to configure the test set to respond to CSU, NIU-4, and NIU-5 (Smart Jack) loopbacks. Upon reception of a loopback the system will beep and display (at the bottom) "**loopback activated**" and the type of loopback detected (e.g. NIU-5 loopback activated!). In a loopback mode the DataScout 10G recovers the RCV data and loops it to the TX. You must first configure the DataScout 10G for DS1 TERM and then CSU/NIU Emulate. The clocking should be **NW** (looped-timed) for this mode.

Signaling Bits – Tap Signaling Bits to select the Signaling Bits to display all 24 DS0 channels in of DS1-A and DS1-B on one screen. This first bit is A then B, C, D.

PCM Voice – When the DST-SW-V option is enabled the test set can emulate Loop-Start (LS), Ground-Start (GS), DID and E&M circuit (IMM and Wink) from in both CO and PBX (Station) modes.

DS0 Frequency & Level – Select PCM Voice (under TERM/Monitor button) followed by the DS0 channel (1-24) that you would like to measure frequency and loss. Note the frequency is displayed in Hz +/- 2Hz and the level in dBm0 +/- .5dB. The digital data content (Bit 1 through 8) is also displayed under F&L. along with the hexadecimal equivalent to the binary bit 1-8 value. To exit DS0 Freq/Level (PCM Voice) tap on DS0 channel # and select OFF.

DS0 Data – This option is used for DS0 BERTS and TX/RX DDS control code. To activate select the DS0 channel pull-down (left of DS0 Data). The DataScout 10G displays the TX and RX data content along with the hexadecimal equivalent to the binary bit 1-8 value.

Fractional T1 – Select this mode to test contiguous and noncontiguous DS0's (Nx56/64K). Select FT1 select under the Monitor/TERM pull down menu (use finger to scroll down) then tap on a desired channel or all desired channel numbers. You can BERT on the selected channels and perform a BER as well.

Drop & Insert – Requires the DST-SW-DT1 dual port DS1 option. Tap on the DROP & INSERT to drop the DS1-A test side and insert from the DS1-B bypass side. When you select DROP & INSERT mode a sequence of screens prompt you how to the properly setup and configure the system. One of these setup screens provide a block diagram of which side is the test-side and which is the bypass and how to correctly patch into the circuit.

DS1 TERM (-7.5, -15, -22.5dB) – Selecting any of these options will activate terminate mode with the transmit level set to the selected value +/- 2db.

Clock Settings

NW Network Timed – When this mode is selected the test set recovers the clock timing from the received signal. NW is the default initial setting.

INT Internal Timed – When this mode is selected the test set uses its internal clock to generate the timing signal with a resolution accuracy of <10ppm at 1.544MHz. Sync and Async data transfer on 24 DS0 is supported.

DS1 Framing Selection

The test set default is ESF framing. To change the TX frame format simply tap on the ESF drop down and select SF(D4), SLC or unframed.

Framing Status Indicators

Under the ALARMS you will find two acronyms and status indicators that are very important for determining whether framing lock has been established or not:

- LOS (Loss of Signal)

- OOF (Out of Frame)

When either of these indicators is highlighted in red it means the alarm currently exists. If the alarm has occurred in the past and is no longer occurring (alarm history) they will be highlighted in yellow. Pressing the **CLEAR** button will clear all alarm and event indicators and counters. A large green **NO ERRORS** banner indicates the signal is currently framed and working properly.

Line Code Selection

Default zero coding is B8ZS. To change to AMI tap on B8ZS and select AMI coding.

Reception of Valid B8ZS Code Words

The test set displays an inverse video B8ZS detected under the Alarms section. When no B8ZS word is detected the inverse video “B8ZS” is extinguished.

Excessive Jitter monitor

The test set displays an inverse video Excessive Jitter detected under the Alarms screen. When Jitter is within the specified 128-bit attenuator tolerance the inverse video “Excessive Jitter” is extinguished.

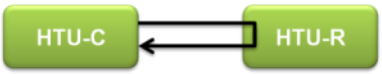
Loopback

Five types of loopback are supported:

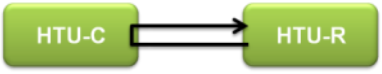
- PairGain HDSL
- Adtran HDSL
- Smart Repeater
- In-Band
- Manual (self and local)

PairGain HDSL

NREM - Loops the remote HTUR towards the network
NLOC - Loops the HTUC toward the network
NDU1 - Loops 1st Doublers towards the network
NDU2 - Loops 2nd Doublers towards the network
CREM - From CPE loops the HTUC towards CPE
CLOC - Loops local HTUR towards CPE
CDU1 - Loops 1st Doublers towards the CPE
CDU2 - Loops 2nd Doublers towards the CPE



NETWORK to CUSTOMER loopback



CUSTOMER to NETWORK loopback

Adtran HDSL

ARM – Places HDSL / T1 elements into diagnostic mode for detection of loopbacks. You must send ARM before sending Adtran loopbacks!
HTUR – Loops HTUR towards the Network

HTUC – Local HTUC towards Network
HRE1 – Loops 1st Extender towards Network
HRE2 – Loops 2nd Extender towards Network

Smart Repeaters

ARM – Places HDSL / T1 elements into diagnostic mode for detection of loopbacks.
IOR – Intelligent Office Repeater loops the office repeater
LineRptr 01 – Loops the addressable line repeaters #1 – 20. Use the pull down menu to select the desired repeater #.

In-band & FDL

CSU (10000,100) – Loops the T1 CSU towards the network
NIU4 (1100, 1110) – Older vintage NIU loopback, Loops the CSU towards the network
NIU5 (11000, 11100) – SMART JACK loops the NIU towards the Network
Payload – Loops only the payload towards the network, uses the FDL link (ESF only)
Line – Loops entire DS1 at the CSU towards the Network, using the FDL link (ESF)
Network – Loops the NIU towards the Network, uses the FDL link (ESF)

User & Self-loop

User – using the set button a user can configure the loop-up and loop down byte
Local-NW – Loops the RX to the TX, manual DS1 loopback towards the network
Self-loop – Loops the TX to the RX port internally (used for training and factory tests)

Loopback Commands

LOOP-Up - sends the selected loop up command
LOOP-Down - sends the selected loop down command

NIU5 Smart Jack

Loop Up

NIU5 (Smart Jack) is the default loopback simply Tap on LOOP-UP. Completion of loop up will take approximately 5 seconds the unit will display active, after which a QRSS pattern is automatically started. NUI5 loopback commands require the test set to be in TERM Mode.

Loop Down

Tap the Loop Down button. Note sending will be displayed until the element is looped down.

BERT (Bit Error Rate Test)

Test Pattern Selection

To select and send a test pattern tap on the BERT button. The test set supports the following BERT patterns:

- **QRSS** – Industry standard Quasi-Random Signal is formed from 20 Bits with max of 14 consecutive zeros
- **3in24** – Three ones in 24 bits used to stress AMI lines, (0100 0100 0000 0000 0000 0100)
- **1:7,1in8** – Used for stress testing AMI & B8ZS lines, (0100 000)
- **All-1's** – All data content is 1's 1111. In unframed mode this will be interpreted as AIS
- **All-0's** – All data content is 0's 0000
- **1:1 Alt** – Alternates 1 and 0, …1010
- **DALY** – Obeys pulse density and consecutive zeros in both AMI and B8ZS coding
- **Bridge Tap** – Sequence of patterns that emulates specific frequencies
- **2^23-1** – 23 stage shift register, emulates random data
- **2^20-1** – 20 stage shift register, emulates random data
- **2^15-1** – Quasi-random sequence of 32,767 bits containing up to 14 consecutive zeros
- **2047** – 2,047 Bit sequence commonly used for 64K DS0 channel testing (DDS)
- **511- 2^9** – 1-bit pattern used for DDS and DTE/DCE testing
- **2in8** – Two 1's in 8 bits, Used for stress testing AMI & B8ZS lines
- **1in16** – Violates 1's density but stresses clock recovery circuitry
- **D5D5** – Intelligent (Smart) Line Repeater address query, sent to determine which repeater is looped

Stopping a BERT

To turn a BERT pattern off tap on the selected BERT pattern (e.g. QRSS) and select "**BERT Off**" at the top.

BERT results

If the BERT pattern is green this tells the user that the selected pattern matches the receive pattern. The number to the right of the pattern is the bit error count. You can change the error count display by tapping on the **Counts** pull down menu and selecting one of the following:

Bits – (default), view the number of bits in error.
BER – View the bit error rate (bits in error/total bits) since the start of the test.
ES – Errored Seconds displays the number of seconds in which one or more errors occurred.
EFS – Error Free Seconds displays the number of total seconds that a test has run error free.
%EFS - Percent Error Free Seconds displays the current ratio of EFS to total test seconds.

SES – Severely Errored Seconds displays the total number of seconds with an error rate >= 1.0e-3.
%SES – Percent Severely Errored Seconds displays the current ratio of SES to total test seconds.

Send Errors

This button selects what type of error will be inserted when a user taps the insert key. Available errors include:

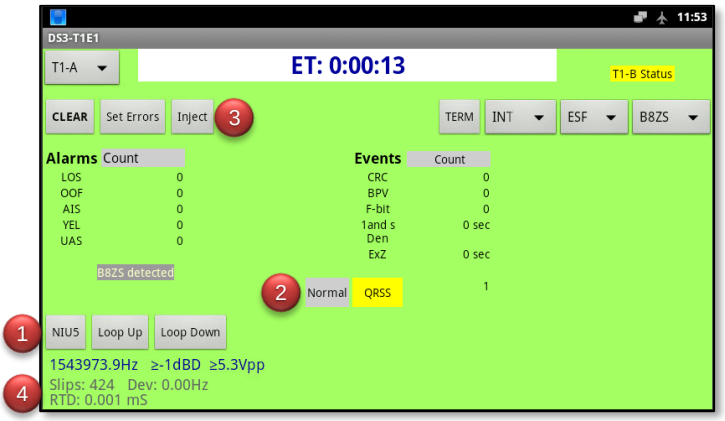
- Logic
- Frame bit (single frame error)
- BPV
- Frame Loss
- CRC

Check the box or boxes of the error you would like to insert then press **OK**. NOTE: by pressing OK you have not inserted an error into the transmit stream. You MUST tap the "Inject" button to insert an error or error's (rate) into the transmit data stream.

Round Trip Delay

To perform Round Trip Delay (RTD) measurements:

1. Establish a Loop Back at the far end of the circuit using a loop back plug or successfully sending a loop-up command to the CSU/NIU
2. Start a BERT using any test pattern
3. Inject a logic Error into the test stream
4. Round Trip Delay measurement will be displayed in the lower left corner of the screen.



Clear Errors & Elapsed-Time

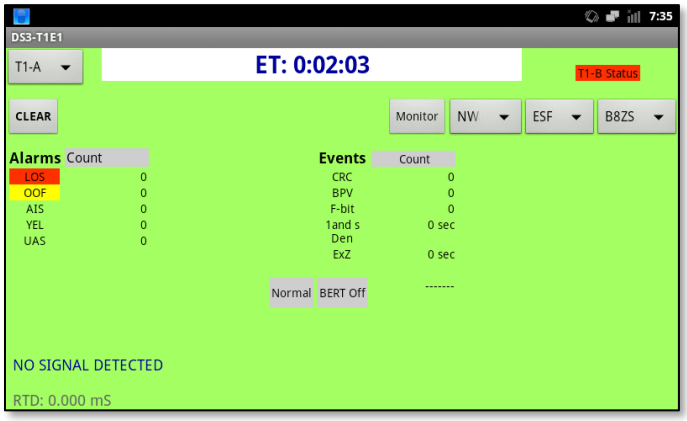
To clear Errors and History simply tap on the **CLEAR** button. Note that the elapsed time gets reset and all accumulated errors, alarms and events also get cleared.

If there are no Alarms or Events you will see **NO ERRORS** on the screen.

Alarms & Events

The test set continuously monitors for alarms & events. The **NO ERRORS** display is the sum of no alarms, events or bit errors received. If an alarm or event is received the test set removes the **NO ERRORS** screen as shown above.

Alarms status is located on the left-hand side of the screen and the events are on the right. Next to the alarm is the count, which represents the number of times the test set has detected this condition. Tap on the Count pull down menu to change to SEC, which is the duration in seconds the alarm existed. Select the **Count** pull down menu above the event log to change the count to BER, EFS, SES, %EFS or %SES.



In the example above the unit is currently in Loss of Signal, the LOS is RED and No Signal detected is displayed at the bottom left.

Reported Alarms:

LOS – Loss Of Signal
OOF – Out Of Frame
AIS - unframed all 1's
Yellow - RAI sent by far end device
UAS – Unavailable seconds, seconds of SES after 10 consecutive seconds of SES.

Reported Events:

CRC – Error is received in the payload
BPV – Bipolar violation has occurred
F-Bit – Framing Bit error
1's Den – 1's density has been violated
ExZ – Excessive Zero's has been received, 15 zero's for AMI and 7 for B8ZS.

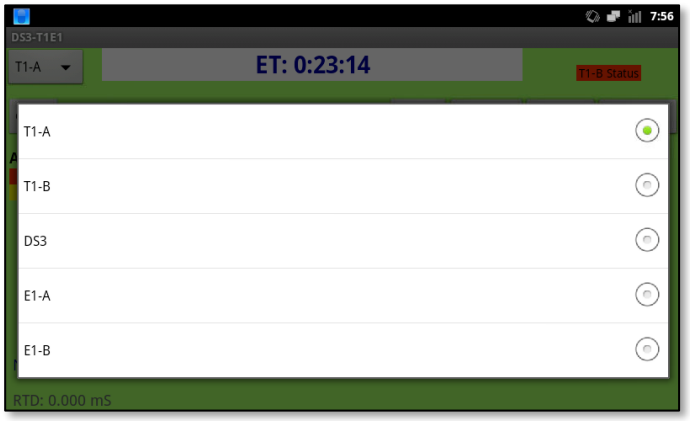
Active alarms and events cannot be cleared until the condition itself goes away. For the example above, LOS will not be cleared until valid DS1 pulses are received. To clear the user must press the **CLEAR** button.

Frequency, Level and Slips

Signal frequency and level measurement is at the bottom of the LCD. The frequency is displayed in Hz and the level is displayed in dB-DSX and Vp-p. If no signal is received the Freq & level will display "**No Signal detected**". Slips are displayed under the frequency and level. Note: a reference clock must be plugged into the DS1-B RCV (Ref) jack. Slip compares the DS1-A clock to the reference (DS1-B RCV) clock and displays the difference in frequency deviation (Hz) and slips (count).

DS1-B Test Interface

The test set can be optioned for a second independent DS1 test interface. To select the second test interface, tap on the **DS1-A** button and select DS1-B. Any tests or configuration changes on DS1-B does **not** affect the DS1-A side, they are two completely independent test interfaces (e.g. DS1-A can be framed to ESF and DS1-B can be to D4).

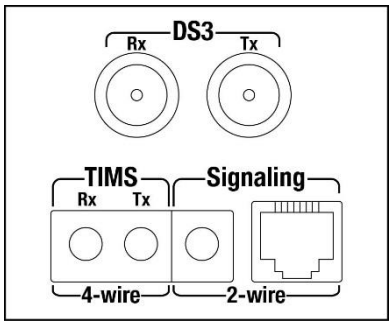


DS1-B test features are identical to DS1-A except for DS0 drop.

DS3 Testing

Test Interface

The DS3 test interface uses BNC connectors as the input (Rx) and output (Tx) to/from the test set. Note: The test set has more than enough processing power to test Dual T1 and DS3 at the same time. You can select DS1-A or B and cycle through DS3 GUI without affecting your tests.



Test Interface Connections

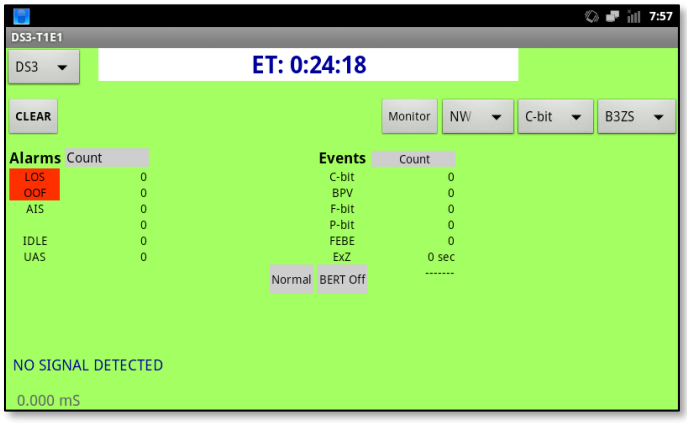
DS3 Interface Connection

To connect the test interface to the device under test you must select the proper patch cable depending on which interface you are testing and the termination type if using the optical ports. There is no specific order of connection required. You can connect the patch cord to the test device or network device first.

DS3 Main Menu

From power-up select the DS3-DS1 icon, tap on DS1-A then select DS3. The DS3 test interface is powered-up and a quick self-test is performed. The elapsed time ET:xxx appears when the self-test is complete.

The DS3 default configuration is DS3 Monitor C-Bit Frame, B3ZS, BERT Off. Alarms highlighted such as LOS indicates a current condition.



Configuration

Mode Selection

Select the desired test mode (Monitor, TERM, DS1 Drop, etc.), by tapping on the DS3 Monitor and selecting the desired mode

DS3 Monitor – Select this mode if monitoring at a DSX –20db point or monitor port of a DS3 NIU. Note: the DataScout 10G transmit is off in MONITOR mode.

DS3 TERM DSX – Select this mode to perform intrusive DS3 tests e.g. straight-away BERTS, loopbacks, NIU emulation, etc. Note in TERM mode clock selection is important; NW is looped timed and INT is internal timed (the test set sources timing for the circuit).

DS3 TERM HI – Changes the transmit signal to a rectangular pulse 0.90V base-to-peak.

CSU/NIU Emulation This mode places the test set in a CSU/NIU configuration and the test set will respond to CSU or NIU loopback and loop the recovered receive data to the transmit back towards the network.

DS2 STATUS – Select this mode to monitor and test one of the seven DS2's. The top screen is the receive DS2 1-7 and the bottom screen is the transmit DS2 1-7. The test set monitors and transmits RAI, AIS and LOF from all seven DS2's.

DS1 Drop – Select this mode to monitor or Drop any 1 of the 28 DS1's within the DS3. DS3-DS1-DS0 systems can drop a DS1 to the DS1-B port. From the main DS3 screen you can select T1 by pressing on DS3 button and select DS1-A or B to go straight to the DS1 test interface.

DS3 Thru Mode – Select this mode for intrusive through-mode testing. Through-mode gives you the ability to place the test set in series with a RCV or XMT pair for monitoring errors and alarms. The test set receive recovers the DS3 signal and passes it to the transmit circuitry; framing and signal format is regenerated.

DS3 Thru Mode No GEN – Select this mode for intrusive through-mode testing with framing and signal format passing directly through to the transmit circuitry without re-generating framing errors, BPV, alarms, etc. Any error detected on the RCV pair will be passed through to the XMT pair. The test set still captures and display all received errors.

Clocking

The test set default clocking is NW-Network (recovered) clock. In TERM mode only **Int-Internal** clock may be selected by pressing NW Network button and select **Int-Internal** clock. The test set will now be the master clock.

Framing Selection

The test set default framing is 'C-Bit'. To change the framing press C-Bit and select M13, Unframed or Auto. In Auto framing, the occurrence of an LOS greater than two (2) seconds will trigger an Auto-frame upon next valid signal (pulse) detection.

DS3 Receive Framing

FRAMED! – The DataScout 10G displays a RED "**OOF"** to the right of the TX frame mode (above).

DS3 Line Code

B3ZS coding is ALWAYS selected for DS3 - users cannot change this setting.

Loopback

Loopbacks are only used in TERM modes (intrusive testing). Tap the Loopback DS3 NIU pull down menu to select a loopback. Note that Monitor mode removes the Loop-back menu.

Local Loopbacks

Self-Loopback – loops the test set transmit port internally to the receive port; this setting should only be used for training or confirming the test set circuitry.

Line-Loop – loops the receive signal to the transmit port (toward the network)

Stuff-Bit M23 – Optional loopback for looping M13 Mux's

FEAC Loopback – To loopback a DS3 NIU or MUX select the element to loop i.e. NIU and tap Loop-Up. The test set will check for pre-existing loop then send the selected loopback code, verify loopback and display "ACTIVE" in place of "Loop-UP". A 2^23-1 BERT pattern is automatically started upon loop-up.

To loop-down a DS3 device simply press the **Loop-Down** button. Note the Loopback button is removed in Monitor modes.

Transmit FEAC Codes

The FEAC code screen displays any received FEAC codes. To transmit a FEAC code, select the **Transmit** pull-down menu and select the desired FEAC code.

BERT (Bit Error Rate Test)

To select / send a test pattern tap on the BERT pull down menu. The test set currently supports the following BERT patterns:

- **2^23-1** – is a 23 stage shift register, emulates random data
- **2^20-1** – is a 20 stage shift register, emulates random data
- **2^15-1** – is a 15 stage shift register, emulates random data
- **QRSS** – Industry standard Quasi-Random Signal is formed from 20 Bits with max of 14 consecutive zeros
- **1:1** Alt – alternates 1 and 0 (1010)
- **1000** – test B3ZS
- **1010, 1100, 1111** – Simulates RAI, AIS and IDLE (respectively) in non-ANSI elements
- **Tx Idle, Tx RAI, Tx AIS** – transmits per ANSI spec RAI, AIS and IDLE (proper C and X bit)
- **3in24** – Three ones in 24 bits used to stress AMI lines and clock recovery, (0100 0100 0000 0000 0000 0100).

BERT Default

The test set default is BERT OFF sending all-1's. To start a BERT select a pattern from the BERT pull down menu. To turn a BERT OFF simply tap on the BERT menu pull down and select BERT OFF at the top.

BERT Results

If the BERT pattern is green this indicates the receive pattern matches the selected pattern and the number to the right of the BERT pattern indicates the bit error count. A user can change the Bit count display by tapping on the Count pull down menu and selecting one of the following:

- **Bits (default)** – view the number of bits in error.
- **BER** – view the bit error rate (bits in error/total bits) since the start of the test.
- **ES (Errored Seconds)** – displays the number of seconds in which one or more errors occurred
- **EFS Error Free Seconds** – displays the number of total seconds that a test has run error free.
- **%EFS Percent Error Free Seconds** – displays the current ratio of EFS to total test seconds.
- **SES Severely Errored Seconds** – displays the total number of seconds with an error rate >= 1.0e-3.
- **%SES Percent Severely Errored Seconds** – displays the current ratio of SES to total test seconds.

Error Injection

The Set Error button selects what type of error will be inserted when a user taps the insert key. Pressing the **Set Error** button displays six available types of errors:

- Logic (default)
- F-Bit
- BPV
- C-Bit
- P-Bit
- ExZero's

Check the box or boxes of the error you would like to insert then press **OK**. To inject the error tap the **INJECT** button.

Clear Errors & Elapsed-Time

To clear the error and history simply tap on the **CLEAR** button. Elapsed time will reset and all errors, alarms and events also be cleared.

Alarms & Events

The test set is continuously monitoring for alarms & events. The **NO ERRORS** indicate no alarms, no events or bit errors have been detected during the current test period.

The alarms are on the left-hand side and the events are on the right. Next to the alarm is the count, which represents the number of times the test set has detected this alarm or event. Select the **COUNT** pull down menu above Alarms to change to **SEC**, which is the duration in seconds the alarm was present. Select the Count pull down menu above the event log to change the count to BER, EFS, SES, %EFS or %SES.

To clear history tap the **CLEAR** button.

Alarms & Events Current

- **C-Bit** – C-Bit Error is received
- **BPV** – Bipolar violation has occurred
- **F-Bit** – Framing Bit error
- **P-Bit** – Used for performance Monitoring
- **FEBE** – Far End Block Error, FE RCV error

Alarms & Events History

- **LOS** – Loss Of Signal
- **OOF** – Out Of Frame
- **AIS** – Unframed all 1's
- **X-Bit** – Remote Alarm Indication (RAI) sent by far end device
- **Idle** – 110 with C-Bit =0 X-Bit=1

- **UAS** – Unavailable seconds, seconds of SES after 10 consecutive seconds of SES.
- **ExZ** – An Excessive Zero's event has occurred, three (3) or more consecutive Zero's.

A current condition cannot be cleared until the condition goes away. For the example on page 23, LOS alarms will not be cleared until valid DS3 SIGNAL is received. To clear history press the CLEAR button.

DS3 Signal: Frequency & Level

Signal frequency and level measurement is displayed at the bottom of the screen. The frequency is displayed in Hz and the level is displayed in Vpk. The test set validates the incoming DS3 signal & pulses and displays **Possible STS-1 Signal** if the user has accidentally plugged into an STS-1 circuit. If no valid DS3 signal pulses are detected LOS is and **No Signal is** displayed.

Signaling TIMS Testing

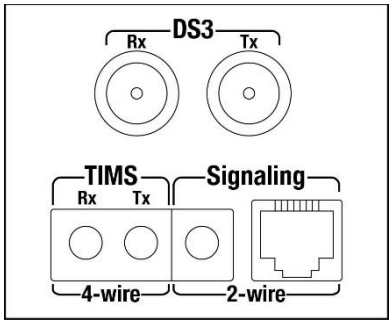
The Signaling-TIMS test interface provides emulation of a Station (PBX) and Central Office (CO) with LS-Loop-Start, GS-Ground-Start, DID Immediate or DID Wink signaling. The Signaling-TIMS generates -48V line-battery, ringing, dial tone, DTMF, DP, MF and voice tones.

To select 2-Wire TIMS from power-up press the Sig-TIMS button; the test set will perform a self-test after which the TIMS main menu will be displayed. To access 4-wire TIMS press the 2-Wire pull-down button and select 4-Wire.

Signaling-TIMS Interfaces

2-Wire Signaling – uses the RJ11 & single bantam jack

4-Wire Signaling – uses the 4-wire bantam jacks and/or the E&M and SB/SG jacks (also T1-B).



Test Interface Connections

TIMS / 4-wire Interface Connection

Signaling / 2-wire Interface Connection

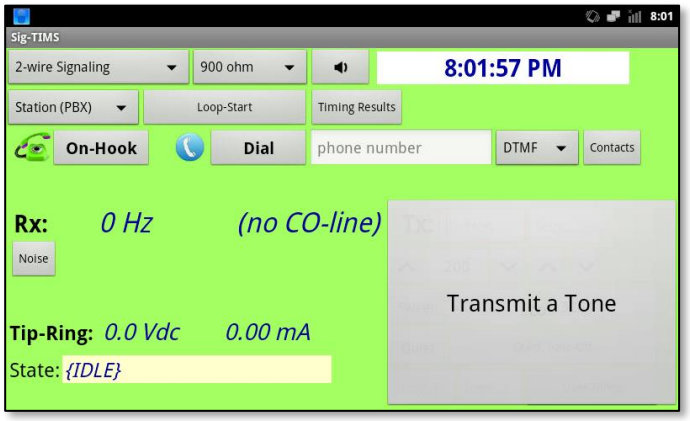
To connect the test interface to the device under test you must select the proper patch cable depending on which interface you are testing and the termination type if using the optical ports. There is no specific order of connection required. You can connect the patch cord to the test device or network device first.

Impedance Selection

2-wire signaling supports voice-band 600, 900 and 1200Ω impedances. 4-Wire signaling also supports the impedances plus 100 (T1) and 135Ω (DDS). To change receive and transmit impedances, tap on the impedance pull-down menu and select the desired impedance. The RCV and XMT are always the same impedance.

Some features are enabled or disabled based on impedance and 2/4 Wire selection i.e. 600, 900, 1200 are voice-band impedances and will enable voice-band test features. 100 & 135 Ohm are wideband impedances and will enable wideband features.

Signaling Mode Selection



Upon selection of 2-wire Signaling defaults to LS-Loop-Start Station signaling mode. To change signaling modes simply tap on Station (PBX). Tap the desired Emulation (CO/PBX) and Signaling type (LS, GS, E&M I-V, DID and DID-wink, Selective Signaling). 4-wire Signaling defaults to E&M type I.

Station LS

This mode emulates a telephone or butt-set in a **Loop-Start** station circuit and uses a 20mA holding circuit for off-hook conditions.

Station GS

This mode emulates a telephone or butt-set in a **Ground-Start** station circuit and generates DTMF, DP and MF signaling. The test set grounds the RING and monitors for TIP-ground. It acknowledges by closing the loop (drawing loop current).

Station DID

This mode emulates a DID-IMMEDIATE station (PBX) circuit and generates -48V_{dc} battery across TIP and RING. The test set monitors for Seizure (far-end CO loop-closure) and displays incoming digits

Station DID WINK

This mode emulates a DID-WINK station (PBX) circuit and generates -48V_{dc} battery across TIP and RING. The DataScout™ 10G detects Seizure (far-end off-hook), WINK's (reverses the TIP/RING polarity) and then waits for incoming digits. Tap on the Timing button to view Wink timing measurements.

CO LS

This mode emulates a CO Loop-Start circuit and generates -48V_{dc} battery across TIP and RING. To go Off-Hook and RING the far-end, tap the **ON-Hook** button. Also in this mode the test set will detect far-end off-hook and provide dial tone to the circuit. Once a digit is received dial tone is removed. Warning: RING voltage will be applied to the TIP/RING.

CO GS

This mode emulates a CO Ground-Start circuit and monitors for line seizure (TIP-ground) then acknowledges by generating -48V_{dc} battery across TIP and RING. To go Off-hook and SEIZE the circuit, tap On-hook.

In all modes above the DataScout 10G measures Tip-Ring voltage, current, digit decode, frequency & level, noise, noise with tone and displays the state of the far-end.

CO (Signaling) E&M I-V

E&M signaling defines PBX trunk and CO signaling using 2 leads E (Ear or Earth), M (Mouth or Magnet) for Type I and type V and an additional 2 leads (4 total) SG (Signal Ground), SB (Signal Battery) for type II, III, IV. The Signaling (CO) grounds the E lead to go Off-Hook and monitors the Trunk M lead for battery Off-Hook. See table below for On-Hook and Off-Hook states for the various E&M types.

Type	Lead	On-Hook	Off-Hook
I-V	E	Open	Ground
I, III	M	Ground	Battery
II, IV, V	M	OPEN	Battery

CO DID IMMEDIATE

This mode emulates a CO DID-IMMEDIATE circuit. The test set generates DTMF, DP and MF signaling. It also measures Tip-Ring voltage, current, digit decode, frequency & level, noise, noise with tone and displays the state of the far-end. In CO DID-Immediate mode the test set uses a 20mA holding circuit for off-hook conditions. Tap DIAL

to enter the desired dial digit string. To go Off-Hook (Seize the circuit) tap Dial from the DIAL screen or tap On-hook, the test set draws loop current and outputs the digits.

CO DID WINK

This mode emulates a CO DID-Wink circuit. The test set generates DTMF, DP and MF signaling. It also measures Tip-Ring voltage, current, digit decode, frequency & level, noise, noise with tone and displays the state of the far-end. In CO DID-Wink mode the test set uses a 20ma holding circuit for off-hook conditions.

In CO DID-Wink, tap **DIAL** to enter the desired dial digit string. To go Off-Hook (Seize the circuit) tap dial from the DIAL screen or tap Off-hook to initiate drawing loop current and monitor for WINK (Tip/Ring polarity reversal). Once detected dialing digits are then transmitted to the station (PBX). Tap on the **STATE** button to view associated wink timing measurements.

SELECTIVE SIGNALING (SS1/SS4) 2&3 Digit

Selective Signaling is typically used on aviation point-to-point or multipoint circuits that allow a caller to dial a two or three digit dial code for destination party. SS uses Frequency Shift Key (FSK) 2400 (make) & 2600Hz (break) at a -8dBm0 level when dialing.

The number of digits in dial code is 2 or 3 with codes of 81 or 729 respectively. 1 can be used for backspace or digit – for trouble-shooting it is always displayed when received.

Transmitting SS digits:

1. Configure the test set for Selective Signaling (SS) by selecting 4-Wire Signaling under the 2/4 Wire mode pull down menu (upper left).
2. Use the Loop Start/DID pull down to select SS.
3. Ensure SS Dial mode is from the pull-down menu to the right of the phone# box.
4. Enter 2 or 3 digits in the phone # box using the pop up keyboard. For testing purposes, the test set allows any number of digits to be dialed.
5. Press the Dial button to transmit the digits out the Tx of the 4-Wire port.

Receiving SS digits:

1. Configure the test set for Selective Signaling (SS) by selecting 4-Wire Signaling under the 2/4 Wire pull down menu (upper left).
2. Use the Loop Start/DID pull down to select SS.

The test set is now ready to receive SS digits on the 4-Wire RX port and will be displayed in the receive digit window. Up to 20 digits can be received then you must exit and re-enter SS mode to capture additional digits.

Return Loss (RL) – Tx Complex Tones

Return Loss is a ratio difference in a transmitted power and the power reflected from a discontinuity and is displayed in dB. Return Loss is typically used to measure the impedance match between the circuit under test and a selected termination of 600Ω, 900Ω or 1200 Ω.

Return loss uses three bands:

- ERL (Echo Return Loss) transmits frequencies from 560Hz to 1965Hz
- SRL-Hi (Singing Return Loss High) transmit from 2200Hz to 3400Hz
- SRL-LO (Singing Return Loss Low) transmit from 260Hz to 500Hz with a transmit output level between -6dBm and -10dBm

Poor return loss is typically in the single digit range. The higher the number the better the return loss and impedance match.

To test Return Loss press the **Tx Complex** button and select the desired band. The return loss ratio will be displayed in dB next to the RX.

To turn off Return Loss (RL) press the Tx Complex button and select Off.

Measurements

Voltage & Current

Voltage measured across TIP & Ring along with current draw is displayed in the upper right of the LCD. If no voltage is detected (less than 1V) **No CO line** is displayed. Current is measured in an Off-Hook condition and is displayed in mill-amperes (mA).

RX Frequency & Level

The test set defaults to RX (receive) frequency & level measurements. The voice-band frequency is displayed to the right of the RX button along with level in dBm.

TX Frequency & Level

To toggle to transmit (TX) voice-band frequencies tap the big Transmit Tone button. The default TX frequency is 0Hz (Quiet). To change the TX frequency, use the key board to enter the desired frequency then press **DONE**. Change the step size by highlighting the step frequency text box; enter the desired step frequency and press **DONE**.

To change the TX level, tap the up/down arrow or tap the level box and enter the level, use the (-) to enter lower levels than 0db then press **DONE**.

Noise

The test set in 2-Wire mode measures C-MSG noise, C-Notched, S/N C-MSG in Station-LS, GS and CO-DID modes. Tap the noise pull-down menu to select the desired noise measurement. 4-Wire mode offers more noise filters for voice & wide band modes.

Capturing DTMF/DP & MF Digits and Timing

Upon detection of valid digits the test set displays them (real-time) under the voltage display. If the test set detects an invalid digit it will display "**?**". To configure the test set for MF detection tap on the DTMF/DP to toggle to MF detection mode.

In DID-Wink modes, tap the Timing button to view associated wink timing information.

Ringing & Dial Tone

To go Off-hook and Ring the far-end station in LS-CO modes, tap the On-hook button, the test set will apply ring voltage to Tip/Ring and ring-trip on detection of loop current. The test set will apply dial tone when configured for LS-CO when it detects a far-end off-hook and remove dial tone upon detection of an incoming digit.

Dialing

If the selected signaling mode supports Dialing a dial button will be appear. Tap on the type of digits to send (MF, DTMF or DP) next to the phone # box, press on the box to enter a phone number, press **DONE** and then **DIAL**. It will then go Off-Hook and send the selected digits.

The test set can store and retrieve thousands of phone numbers, contacts and emails, simply tap on **Contacts**, retrieve the desired contact number to dial or edit. To edit tap on the number and use the back key and enter the new 10 digit number. To dial select the stored number and press **DONE**.

Quick Tones

Under Transmit Tone a Quick tones pull-down enables selecting common frequencies to TX, simply select the desired frequency to transmit the selected tone. Tone off is the default and you can select this mode to turn off the tone or press the Quiet button.

Quiet Termination

The **Quiet** button turns off the transmit (Tx) frequency generator and presents a quiet TERM.

Sweep

Users selectable start, stop and step frequencies is supported. To start a sweep test press the **Sweep** button. The frequency will increment every 2 seconds. To stop the sweep function, press the **Stop** button.

Tone 1-4 Buttons

These buttons are user defined frequencies. Press the Tone 1 button and enter the desired frequency then press **DONE**. Note that the text on Tone 1 changes to your entered frequency, repeat for Tone 2, 3 and 4 buttons. To recall a stored tone press the desired tone 1-4 button, then **DONE** to quickly send your defined tone.

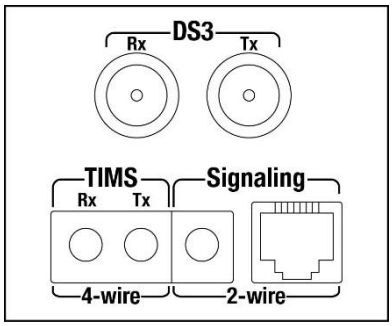
The Tone 1-4 buttons are volatile and will be lost upon power down or pressing the home or back key.

Speaker Adjust

The  speaker button adjusts the volume. Four levels including mute are available.

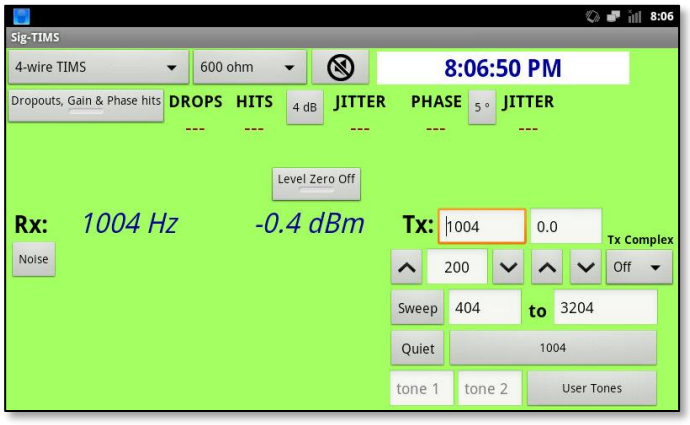
4-Wire TIMS

The 4-Wire (dry-loop) TIMS interface uses the bantam jacks marked 4-Wire Rx and Tx on the front-panel. The Rx is the test set input and the Tx is the output. For all wet-loop -48V Signaling testing please select 2-Wire Signaling and use the RJ11 jack or single bantam jack. Some feature are enabled or disabled based on impedance and 2/4 Wire selection i.e. 600, 900, 1200Ω are voiceband impedances and will enable voiceband test features. 100 & 135Ω are wideband impedances and will enable wide-band features.



Terminations

Use the 600 Ohm pull-down menu and select 900 or 1200 Ohm termination or Bridge high impedance. Note voiceband 600, 900, 1200 frequency range is 50Hz to 16KHz and Wideband is 16KHz to 2MHz.



4-Wire TIMS Wideband

Use the 600 Ohm pull-down menu and select 100 or 135 Ohm termination. Wideband mode is typically used for DDS, ISDN, HDSL, T1 and XDSL copper qualifications.

Measurements

Transmit & Receive

Receive frequency and level is displayed next to RX and is displayed in Hz and dBm.

To change the TX frequency, tap the up or down arrows. The frequency will step up/down by 200Hz in voice-band modes and 20kHz in wide-band modes. Change the step size by highlighting the step frequency (200/20k) and enter the desired step frequency and press **DONE**. To transmit a specific frequency tap on the frequency box (right of TX), use the keyboard to enter the desired frequency then press Done To change the TX level use the up/down arrow or enter the desired level by highlighting the (0) and entering a level (number) followed by pressing Done.

Sweep Button

The user can select a start and stop frequency along with a step frequency. To start a sweep test press the Sweep button. The frequency will increment by the step frequency that is entered (200Hz) every 2 seconds. To stop the sweep function, press the **STOP** button.

Quick Tones

The Quick tones pull-down includes the most common frequencies to test. In voice-band (600, 900, 1200Ω) these are 404, 1004, 2804, 2713, 1804, 3204, 1913, and 2413Hz. In Wideband (100 and 135Ω) these are DDS, HDSL, and XDSL frequencies 28KHz, 40KHz, 48KHz, 82KHz, 96KHz, 196KHz, 392KHz, and 1024KHz. Select the desired frequency to transmit the selected tone.

Quiet Termination

The **Quiet** button turns off the transmit (Tx) frequency generator and presents a quiet TERM.

Level Zero Button

This button when green zero's the receive level for easy frequency response measurements. I.e. if Rx level is -2.3dB, press Level zero and the display will zero the Rx.

Tone 1-4 Buttons

These buttons are user defined frequencies. Press the Tone 1 button and enter the desired frequency then press **DONE**. Note that the text on Tone 1 changes to your entered frequency, repeat for Tone 2, 3 and 4 buttons. To recall a stored tone press the desired tone 1-4 button, then **DONE** to quickly send your defined tone.

The Tone 1-4 buttons are volatile and will be lost upon power down or pressing the home or back key.

Speaker Adjust

The  speaker button adjusts the volume. Four levels including mute are available.

4-Wire Noise Measurements

The test set measures noise with and without tone and support the following filters

Voiceband:

- C-MSG noise
- C-Notched
- D
- D-Notched
- Prog weighted (15KHz Filter)
- Noise to ground
- Impulse and S/N

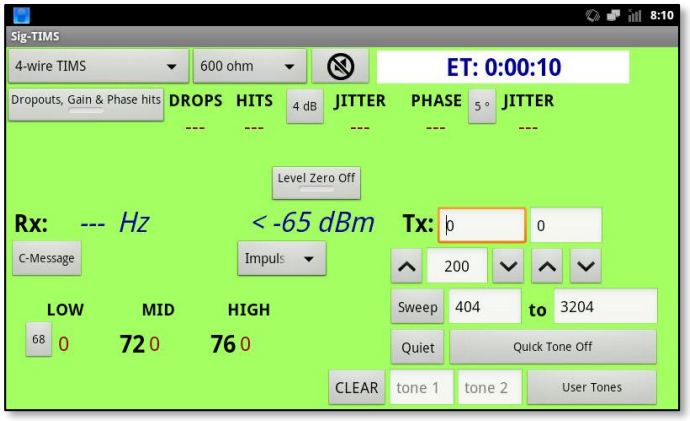
Wideband:

- E (DSL)
- F (HDSL)
- G (ADSL)

Tap the noise pull-down menu to select the desired noise measurement filter. When in voiceband mode only the voiceband filters will be displayed and in wideband only wideband filters.

Noise-to-Ground does not require an external cable and shorts Tip/Ring and measures across T/R to ground, typically through a C-Message filter and displays results in dBrnC.

Impulse Noise



For Impulse noise use the threshold pull down to set the Low (29 to 84) threshold. The Mid, and High levels are set based on the Low threshold setting. The test set counts to 9999 and displays OLF if the counter is greater than 9999 counts. Under the counts you will find the Clear Impulse counter button. The elapsed time will restart when the **Clear** button is pressed.

Dropouts, Gain & Phase Hits Amplitude Jitter & Phase Jitter

A dropout (Figure 5-1) is counted when the level of the holding tone decreases by at least 12dB+/-1dB whereas gain hits (Figure 5-2) are counted when a change in amplitude of the holding tone exceeds a preset threshold which may indicate an increase or decrease in amplitude. Phase hits (Figure 5-3) are sudden signal phase changes (out & back) lasting longer than 4ms.

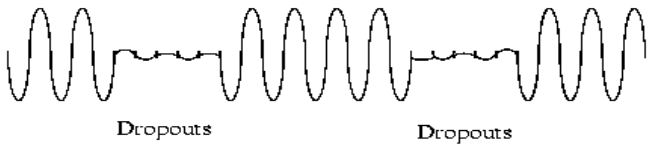


Figure 5-1

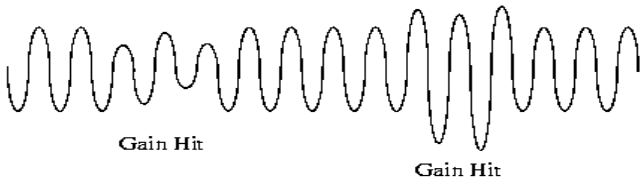


Figure 5-2

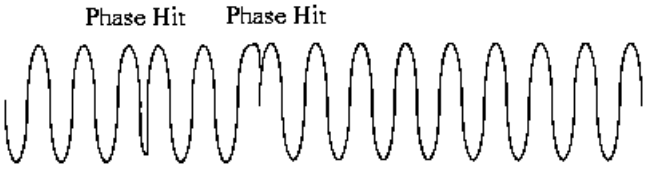


Figure 5-3

To start a Dropout, Gain & Phase test:

1. Check for valid Receive (RX) holding tone frequency and Level

2. Adjust the Gain Hits threshold using the pull down menu located by Hits count 2, 3, 4(default), 6, 8, or 10. This threshold is only used for Gain hits not Drop-outs. Adjust the Phase hits threshold (use pull down menu) from 5-45 degrees in 5-degree steps.

3. Tap on the Dropouts, Gain & Phase hits button located under the 4-wire button, the green indicator tells the user that the Dropout & Hits reference amplitude has been taken and the D&G counters have been cleared along with Elapsed Time.

If the amplitude decreases by 12dB (greater than 4ms) from the reference level a Drop-out will be counted (maximum of 1 per second). If an increase or decrease in level exceeds the Gain hits threshold pull down (4dB default) then a Gain hit will be counted (max 8 per second). If a phase hits exceeds the threshold then the phase counter will increment.

Note: The holding tone must be greater than -40dB. To reset a reference level toggle the D&G button, when green a new reference level is taken and counters/ET is cleared. Dropout counts supersede any Gain hit or Impulse count. To stop counting D&G simply toggle the D&G button and note the green indicator is extinguished.

When the test is started References are taken – you may be required to press **Clear Counters** several times once the Holding tone has settled.

Amplitude & Phase Jitter

Phase and amplitude jitter (Figure 5-4) test indicates the cumulative effect of incidental phase /amplitude modulation and additive tones. Comparison between these two measurements can be an effective tool in diagnosing channel impairments. If the circuit is a digital PCM you do not want the amplitude to be greater than +3dBm as the digital PCM will clip the sign wave.

Amplitude Jitter is displayed is % peak 0.1-100% and Phase Jitter is displayed in degree 0.1-350 º

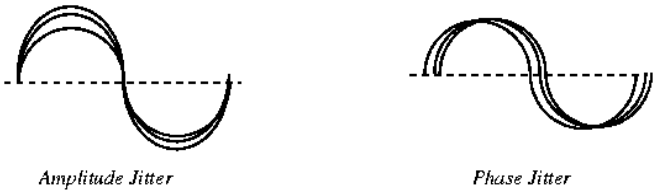


Figure 5-4

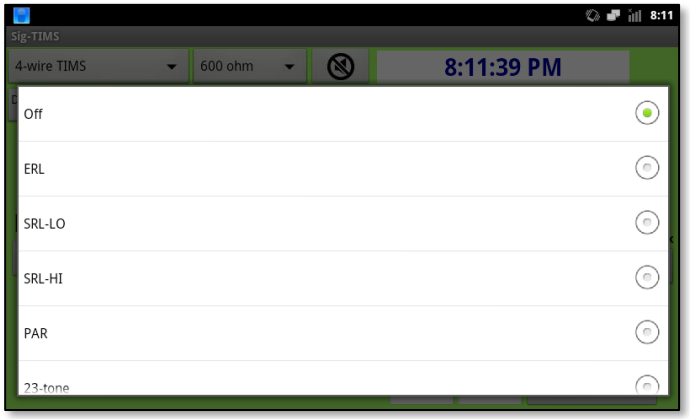
Return Loss (RL) – Tx Complex Tones

Return Loss is a ratio difference in a transmitted power and the power reflected from a discontinuity and is displayed in dB. Return Loss is typically used to measure the impedance match between the circuit under test and a selected termination (600, 900, 1200Ω).

Return Loss uses three bands:

- **ERL (Echo Return Loss)** – transmits frequencies from 560Hz to 1965Hz.
- **SRL-Hi (Singing Return Loss High)** – transmits from 2200Hz to 3400Hz
- **SRL-LO (Singing Return Loss Low)** – transmits from 260Hz to 500Hz with a transmit output level between -6dBm and -10dBm.

To test Return Loss press the **TxComplex** button and select the desired band. Return Loss ratio will be displayed in dB next to the RX.
Poor return loss is indicated by a single digit reading, the higher the number the better the return loss and impedance match.



To turn off Return Loss tap the **TxComplex** button and select **OFF**.

23-Tone Test

The recommended transmit level of 23-tone sequence is -8dBm which prevents tone clipping on PCM facilities.

Press the TxComplex button and select 23-tone to activate transmission. The DataScout 10G will transmit a complex 23-tone waveform at -10dBm on the 4-Wire TX

(output) port of the test set. To turn off the 23-tone generator simply the TxComplex button and then Off.

23-Tone Results Display

To view 23-tone results tap on the View 23-tone button. Use the Dialog buttons to view the desired results. Receive level is displayed in dBm from 0dB to -50dBm.

The following results are displayed:

- **Envelope Delay Distortion (EDD)** – is the difference in the transit delay transmitted over a transmission facility) is displayed in microseconds (uS) 0 to 12,000uS.
- **Inter-modulation Distortion (IMD)** – is the result of two signals interacting in a non linear device to produce unwanted signals and displays 2^{nd} and 3^{rd} IMD in dB.
- **Signal to Total Distortion (S/TD)** – is the ratio of power of multiple tone signal to spurious signals and is displayed in dB.
- **Signal to Noise Ratio (SNR)** – is the ratio of power of multi-tone to background noise and is displayed in dB.

4-Wire Signaling Mode Selection

4-wire signaling mode selection is similarly to the 2-Wire Signaling mode where you have signaling selection and dial functions. Some signaling modes such as Loop Start and Ground Start are not supported in 4-wire modes. To change signaling modes tap on Station (PBX) and then select the desired Emulation (CO/PBX) and Signaling type.

Station DID

This mode emulates a DID-IMMEDIATE station (PBX) circuit and generates -48V_{dc} battery across TIP and RING and measures Tip-Ring voltage, current, digit decodes, frequency & level and displays the state of the far-end. The test set monitors for Seizure (far-end CO loop-closure) and displays incoming digits. Default is DTMF/DP digit decode mode. To decode MF digits tap the receive DTMF/DP text to toggle to MF digit detection.

Station DID-wink

The test set emulates a DID-WINK station (PBX) circuit. The DataScout 10G generates -48V_{dc} battery across TIP and RING and measures Tip-Ring voltage, current, digit decodes, frequency & level and displays the state of the far-end. The default mode is DTMF/DP digit decode. To decode MF digits tap the receive DTMF/DP text to toggle to MF digit detection.

In Station DID-Wink emulation, the test set detects Seizure (far-end off-hook), WINK's (reverses the TIP/RING polarity) and then waits for incoming digits. Tap on the Timing button to view Wink timing measurements.

CO (Signaling)

E&M I-V – E&M signaling defines a PBX (TRUNK) and a CO (Signaling) using 2 leads E (Ear or Earth), M (Mouth or Magnet) for Type I and type V, an additional 2 leads (4

total) SG (Signal Ground), SB (Signal Battery) for type II, III, IV. The Signaling (CO) grounds the E lead to go Off-Hook and monitors the Trunk M lead for battery Off-Hook. See table below for On-Hook and Off-Hook states for the various E&M types. E&M Testing provides direct user control of On-hook/Off-hook states and monitoring of Far-end Hook state in all modes!

Type	Lead	On-Hook	Off-Hook
I-V	E	Open	Ground
I, III	M	Ground	Battery
II, IV, V	M	Open	Battery

Type II, III, IV connect SG and SB pairs to the SG/SB jacks of the unit

Note in Type I and V you CANNOT connect to SG/SB bantam jacks.

PBX (TRUNK) E&M I-V

E&M signaling defines a PBX (TRUNK) and a CO (Signaling) using 2 leads E (Ear or Earth), M (Mouth or Magnet) for Type I and V, an additional 2 leads (4 total) SG (Signal Ground), SB (Signal Battery) for type II, III, IV. The Trunk (PBX) applies battery to its M lead for Off-Hook and monitors its E lead for Signaling side Off-Hook. See table below for On-Hook and Off-Hook Trunk states for the various E&M types. E&M Testing provides direct user control of On-hook/Off-hook states and monitoring of Far-end Hook state in all modes!

Type II, III, IV connect SG and SB pairs to the SG/SB jacks of the test set.

Note in Type I and V you CANNOT connect to SG/SB bantam jacks.

CO DID

Emulates a CO DID-IMMEDIATE circuit. The test set generates DTMF, DP and MF. The test set also measures Tip-Ring voltage, current, digit decode, frequency & level, noise, noise with tone and displays the state of the far-end. In CO DID-Immediate mode the test set uses a 20ma holding circuit for off-hook conditions. Tap DIAL to enter the desired dial digit string. To go Off-Hook (Seize the circuit) tap Dial from the DIAL screen or tap On-hook, the test set draws loop current and outputs the digits.

CO DID-Wink

Emulates a CO DID-Wink circuit. The test set generates DTMF, DP and MF. The DataScout 10G also measures Tip-Ring voltage, current, digit decode, frequency & level, noise, noise with tone and displays the state of the far-end. In CO DID-Wink mode the test set uses a 20ma holding circuit for off-hook conditions.

In CO DID-Wink, Tap DIAL to enter the desired dial digit string. To go Off-Hook (Seize the circuit) tap Dial from the DIAL screen or tap On-hook, the test set draws loop current and monitors for WINK (Tip/Ring polarity reversal) then transmits digits to the station (PBX). Tap on the STATE button to view associated wink timing measurements.

SELECTIVE SIGNALING (SS1, SS4) 2&3 Digit

Selective Signaling is typically used on F.A.A. point to point or multipoint circuits that allow a caller to dial a two or three digit dial code for destination party. SS uses Frequency Shift Key (FSK) 2400 (make) & 2600Hz (break) at a -8dBm0 level when dialing. The number of digits in dial code is 2 or 3 with codes of 81 or 729 respectively. 1 can be used for backspace or digit – for troubleshooting it is always displayed when received.

Transmit SS digits:

Configure the test set for Selective Signaling (SS) by selecting 4-Wire Signaling under the 2/4 Wire mode pull down menu (upper left). Use the LoopStart/DID pull down to select SS. Ensure SS Dial mode is from the pull-down menu to the right of the phone# box. Enter 2 or 3 digits in the phone# box using the pop up keyboard. Press the Dial button to transmit the digits out the Tx of the 4-Wire port. For testing purposes, the test set allows any number of digits to be dialed!

Receive SS digits:

Configure the test set for Selective Signaling (SS) by selecting 4-Wire Signaling under the 2/4 Wire pull down menu (upper left). Use the LoopStart/DID pull down to select SS. The test set is now ready to receive SS digits on the 4-Wire RX port and will be displayed in the receive digit window. Up to 20 digits can be received then you must exit and re-enter SS mode to capture additional digits.

Menu Functions

Under the Menu button (left of power button) you will find Sys-Info, E&M mode and Save Results. The Sys-info displays the unit software/firmware revision along with the installed options. The set jack to EM configures the E&M SB/SG signals to the T1-B port.

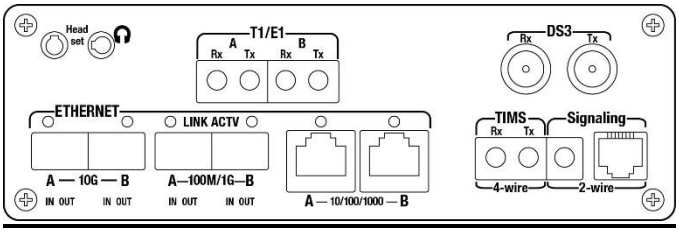
Save Results takes a screen shot and saves to the internal memory. Use a mini USB cable to retrieve the stored results or Office7 on test set to view results saved.

PRI-ISDN Testing

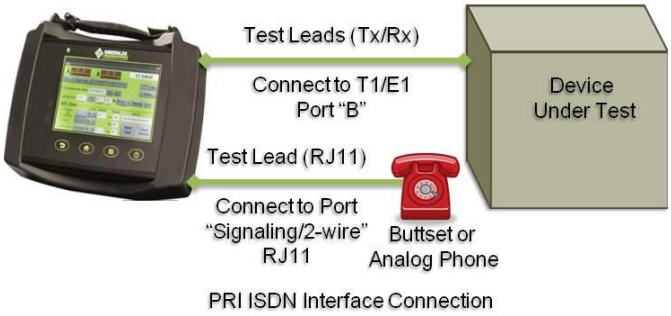
North American PRI-ISDN uses DS1 (T1) as the Layer-1 transport while the rest of the world (except Japan-J1) uses E1 as the transport Layer-1. North American PRI-ISDN format is 23B+D, the B channels are bearer data\voice channels and the D is the signaling channel that uses Q.931 codes. 23B+D occupy 24 DS0 channels of a DS1.

The test set PRI ISDN interface uses the DS1-B bantam jacks on the front panel. The RX is the input and TX is the output of the DataScout 10G test system. Power on and configure the test set first before connecting the PRI circuit under test.

To test a PRI circuit, connect bantam leads to the T1/E1 "B" port bantam and a butt-set or analog phone to the 2-wire signaling RJ-11 port.



Test Interface Connections



PRI ISDN Interface Connection

To connect the test interface to the device under test you must select the proper patch cable depending on which interface you are testing and the termination type if using the optical ports. There is no specific order of connection required. You can connect the patch cord to the test device or network device first.

Initial Layer-1 Test

Select the DS1 application and configure settings as follows depending on the type of PRI-ISDN you will be testing.

T1

- T1-B
- TERM
- ESF (default)

- B8ZS (default)

E1

- E1-B
- TERM (75 or 120Ω)
- PCM31+CRC (default)
- HDB3 (default)

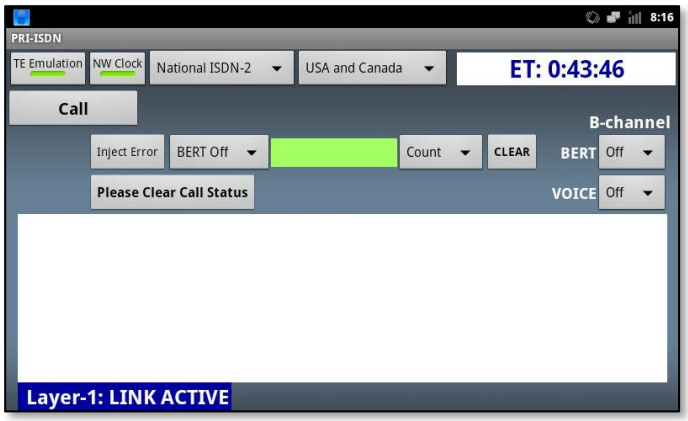
Press the **CLEAR** button and verify **No Errors** or **YEL Alarm** (will clear after 30 sec) is shown and proper line coding is detected.

Note: An incoming all ones will not detect B8ZS as there needs to be 8 zero's in a row to detect B8ZS. Also look at the frequency and level and make sure they are within specification. Please refer to DS1 testing section for more information.

PRI Configuration

Once Layer-1 has been checked and verified, from the DS1 application screen press the Home button followed by the PRI application. An initial self test occurs which takes about 2 seconds to complete so do not press any buttons until you see the elapsed time is increasing.

Your screen should look similar to below when the test set is configured and ready for testing:



When the PRI circuit is connected this window is CURRENT Layer-1 STATUS and should say Layer-1 LINK ACTIVE. If LOSS of Signal is displayed please check cable connections.

Emulation Mode

- **TE** (CPE/PBX) operation towards switch
- **NT** (Switch) operation toward station

Tap on the TE button to toggle to NT in upper left of LCD. NT mode is useful for testing the PBX (CPE) side to isolate any network problems.

Note: When connecting to the Network Select TE. When connecting to CPE select NT mode.

Select Clocking, NW Clock is Network (Looped) typically used in TE mode. Press NW Clock to toggle to INT Clock for Internal Clock typically used in NT mode where the test set is the source of the clocking.

To select the switch type tap National ISDN-2 (default) pull-down menu and select the switch type of your circuit-under-test. National ISDN-2 is the most common but we also support *DMS100, 5ESS, 4ESS, Euro-ISDN, VN6, 1TR6, QSIG, NTT, KDD*

PRI-ISDN country codes supported include:

- USA and Canada
- Euro-ISDN
- France
- Germany
- Japan
- Hong Kong
- Korea
- UK
- Australia

PRI "Link Active" Layer's 1 & 2

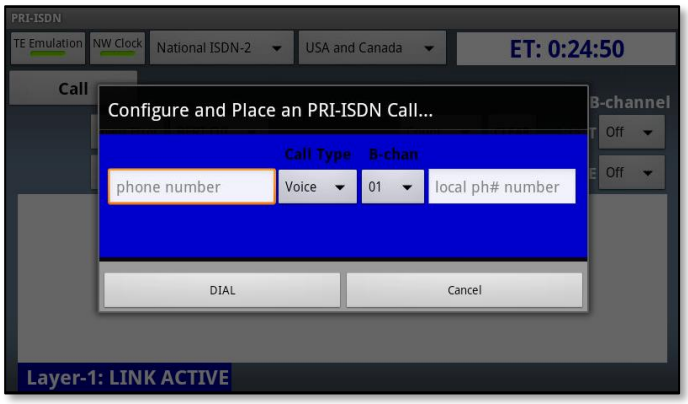
If not already done, connect the test set to the PRI circuit using the DS1-B bantam jacks. The current layer 1 status should display "Link Active" in the bottom left of the screen. If no Link is displayed check your cables and Layer-1 DS1 connection. It may take up to 30 seconds to complete layer-1 and layer-2 link setup (switch or NT to TE). Once layer-1 and Layer-2 "LINK ACTIVE" is displayed the test set is ready to make or take calls.

Placing a VOICE or Audio Call

When placing a voice call, connect a butt-set or any analog phone to the RJ11 port (2-Wire) on the front panel. From the main menu (press Home) select Sig-TIMS application, WAIT for the TIMS to power up (time will be displayed) tap the 4-wire mode (upper left) followed by ISDN B Channel. Tap the Home key followed by the PRI application, the voice circuitry is now connected to the RJ11 jack. Note you need only do this once for any voice call

Make sure "LINK Active" is displayed in the current state window on the bottom of the LCD. Tap the Call button and enter the phone number followed by **Done**. Select the type of call Voice (most common selection) or Audio (rarely used due to lower quality) along with the B-Channel (01-23) to place the call on. To set a Local number for Caller-ID tap on local ph# number and enter local# followed by Done.

Note: You do not need to enter a Local# unless you want the far end to see your number. Once configured tap on the **Dial** button and note the progress messages. Once you see the **Connected** message the call is connected



Hang Up

The Hang Up and Answer button will only be visible when there is a call pending or established. To hang up, tap the “Hang up” button. If there are more than one calls simply select the call (by ID#) to disconnect. The call ID# is 2-99 for VOICE calls, 122-180 for DATA calls and 181-250 for Audio calls. Use the status screen to determine the ID# and B-Channel of the call you wish to disconnect. If only one call is established the test set will not prompt you for which call to disconnect.

Placing a Data Call

To place a **DATA** call to another PRI-Test Set (straight away test) or a Loopback device make sure “LINK Active” is displayed in the current state window on the bottom left of the screen. Tap the **Call** button and enter the phone number followed by **Done**. Select the type of call (DATA) along with the B-Channel (01-23) to place the call on.

To set a Local number for Caller-ID tap on local ph# number and enter local# followed by done and then press Set Local#. Note you do not need to enter a Local# unless you want the far end to see your number. Once configured tap on the **Dial** button and note the progress messages

Once the test set has successfully connected the data call you can select a BERT pattern (2047, 511, ALT, 1’s) from the BERT pull-down menu (2047 most common). The test set will display SYNC in green if it receives the BERT pattern it is sending along with **0** Bit Errors.

To insert a Bit Error, Tap the Inject Error button. Tap Clear (button to right of Count) to restart the BERT and Clear any Bit Errors.

BERT

If the **BERT** pattern is green this tells the user that the selected pattern matches the receive pattern. The number to the right of the pattern (0) is the bit error count. You can

change the error count display by tapping on the count pull down menu and selecting one of the following:

- **Bits** – (default), view the number of bits in error
- **BER** – View the bit error rate (bits in error/total bits) since the start of the test
- **ES** – Errored Seconds displays the number of seconds in which one or more errors occurred
- **EFS** – Error Free Seconds displays the number of total seconds that a test has run error free
- **%EFS** – Percent Error Free Seconds displays the current ratio of EFS to total test seconds
- **SES** – Severely Errored Seconds displays the total number of seconds with an error rate >= 1.0e-3
- **%SES** - Percent Severely Errored Seconds displays the current ratio of SES to total test seconds

To turn a BERT pattern off tap on the selected BERT pattern (e.g. 2047) and select "BERT Off" at the top

Receiving a Call

Before receiving an incoming call make sure "LINK Active" is displayed in the current state window on the bottom left of the LCD If NO LINK then check DS1 Layer-1 using the DS1-B test application and check for OOF and signal/level.

When the test set receives an incoming call in the call progress window it displays **RING:** the type# and call (Voice, Data, Audio), the B-Channel and Caller ID information. To answer the incoming calls, tap the **Answer** button (only visible when call is pending) on the top of the screen.

You should see Connected on the status window. If the incoming call is a VOICE call, connect a butt-set or any analog phone to the RJ11 port on the front panel and from the main menu (press Home key for main menu) select Sig-TIMS app, tap the 4-wire TIMS mode followed by ISDN B Channel. Tap the Home key followed by the PRI mode, the voice circuitry is now connected to the RJ11 jack. Note you need only do this once for any voice call.

If the incoming call is a DATA call press the **Answer** button (note Connected) and select a BERT pattern (2047, 511, ALT, 1's) from the BERT pull-down menu (2047 most common). The test set will display SYNC if it receives the BERT pattern it is sending along with **0** Bit Errors.

To insert a Bit Error, Tap the Inject Error button. Tap the Clear (button to right of Count) to restart the BERT and Clear any Bit Errors. Tap the COUNT button to change the display from Bit Errors (default) to the display desired.

Terminate Call

The Hang Up and Answer button will only be visible when there is a call pending or established To hang up, tap the "Hang up" button and select the call (by ID#) to discon-

nect. The call ID# is 2-99 for VOICE calls, 122-180 for DATA calls and 181-250 for audio calls use the status screen to determine the ID# and B-Channel of the call you wish to disconnect.

Multiple B-Channel Calls

Your test set test system can terminate up to 23 calls (both voice and data) on all B-Channels. If you have more than one call connected use the "**B-Chan Voice**" selector to change the B-Channel to talk over for voice calls and the **B-Chan BERT** to select the B-Channel you would like to BERT for data calls. You can only talk on one voice call and BERT on one data call at-a-time.

While multiple CALLs (up to 23) can be established only ONE call at a time can be running BERT and only ONE call, at a time, can be routed to the Butt-set interface.

Use the "B-chan" button to step through and select any/all CONNECTED calls through the BERT screen or through the Butt-set interface.

Q.931 Decodes & Status Window

The middle screen (Call Progress Message) logs all link status, call progress and Q.931 decode messages. If you want more information on the cause code tap on the cause code to decode and display the Q.931 cause codes in simple readable text.

Protocol Decode Messages

- **Layer 2 failure** – "D-channel Not Established"
- **Q.931 cause codes** – Protocol Decode & translation

Hot-button access to ASCII description is achieved by tapping on the cause code to display a simple text description of Q.931 cause codes.

Clear CALL Status & BERT

Tap Clear Call Status to clear the Call Progress Message window (Call History). To clear Bit errors, tap the CLEAR button. Note the current status is always displayed on the bottom of the screen.

List of Common Problems

- **Cabling open/shorted** – can be verified by checking Layer-1 with DS1
- **Layer-1 DS1 Timing (clocking)** – Framing (must be ESF) and Coding (must be B8ZS). Use DS1 to verify OOF/Freq/Level /B8ZS
- **Misconfigured Switch Type** – National ISDN-2 is the most common
- **Incorrect B-Channel Mapping**

DDS Testing

The DDS 4-Wire interface uses an RJ48 jack with a pin-out of pins 1&2 transmit (output) and pins 7&8 receive (input). The test set emulates a CSU/DSU and responds to the following loopback commands:

- Latching CSU, CCITT
- Latching V.54
- Alternating CSU
- Alternating DSU

The DDS interface is 135 Ohm and supports TERM and THRU modes for both primary and secondary channels. Primary channel are unframed and use bipolar violations to transmit control codes such as:

- CMI (Control Mode Idle)
- DMI (Data Mode Idle)
- Loopbacks.

The test set encodes and decodes all DDS control codes in Primary and Secondary channels. 64K Clear channel has a line rate of 72K but a data rate of 64K due to the frame format of 64Kbps.

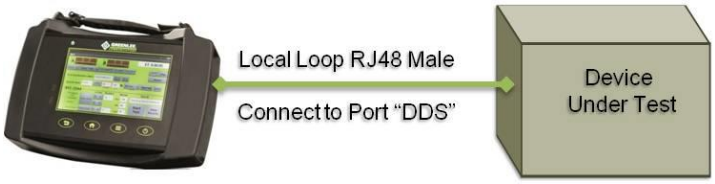
For monitor testing please use monitor adaptor. With this adaptor your local loop cannot be greater than -10dB as the adaptor adds loss to the monitor circuit. This is adapter provides features most DDS test sets do not have and allows you to monitor DDS circuits as you would a T1 circuit.

DDS 4-Wire Connections

Connect the 4-Wire local loop RJ48 male with a pin-out of pins 1&2 transmit (output) and pins 7&8 (receive) to the test set. If the test set immediately detects a CSU loopback the pairs are reversed (1&2 and 7&8 are swapped). After connection, LOS alarm will disappear and the "**misc. status messages**" line will display the received signal level and sealing current (voltage across RX & TX pairs).

You may want to perform a cable loss measurement of the receive and transmit pair at the Nyquist frequency (1/2 the line rate), for example at 56K the Nyquist is 28K Hz (greater than -48dB line loss or greater than -40 dB at subrate Nyquist). To transmit and receive frequency use the TIMS application and follow the procedure in the TIMS section of this user manual or simply configure TIMS for frequency and level measurements at 135 Ohm impedance.

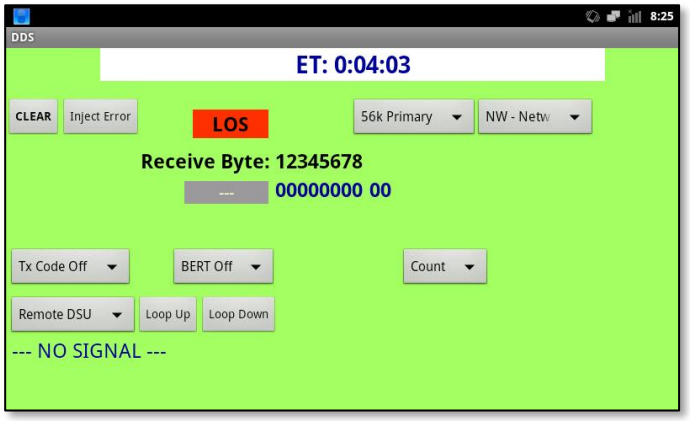
Test Interface Connections



DDS 4-Wire Interface Connection

To connect the test interface to the device under test you must select the proper patch cable depending on which interface you are testing and the termination type if using the optical ports. There is no specific order of connection required. You can connect the patch cord to the test device or network device first.

DDS 4-Wire Configuration



Select the desired data rate by tapping on the 56K Primary Mode (default and most command data rate) and select 64k, 56K, or sub-rates 2.4K, 4.8K, 9.6K,1 9.2K, and 38.4K speed. Select timing clock source mode desired. If connecting to an OCU select NW clock. Connect the 4-wire local loop to the RJ48 port marked DDS.

Receive Loopbacks

The test set will respond to Latching or Alternating CSU, Alternating DSU and Latching CCITT V.54 loopback.

CSU Loopback

The test set detects reversal of sealing current and loops the receive circuit to the transmit circuit. The CSU loopback code is detected by the OCU and the OCU reverses sealing current to the CSU/DSU. This loopback is used for checking wiring, OCU's, DS0 and helps separate where the problem is at the demarc or Customer

Premise (CPE). Removal of sealing current or return to normal polarity terminates the CSU loopback.

DSU Loopback

The test set detects the Alternating DSU loopback sequence and loops it's receive back to transmit. The 'Misc. Status Message' line will display "DSU LOOPBACK". After reception of four consecutive non-DSU loopback codes the DSU loopback is removed.

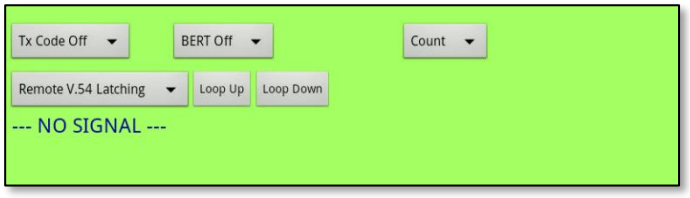
V.54 Loopback

The test set detects the latching V.54 loopback pattern and loops it's receive back to transmit. The 'Misc. Status Message' line will display V.54 LOOPBACK. The test set will loop down when a V.54 loop down sequence is received.

Local Loopbacks

Local loopbacks are helpful if the CO cannot loop the test set. To select local loop-back, tap the loopback button and select CSU or DSU local loopback and then tap loop-up. The test set will loop the receive signal to the transmit path. To loop down tap the loopback button and then tap loop-down.

To loop a far-end CSU/DSU use the "**All data V.54**" loopback. This loopback does not have any control codes and will not be remapped by the DDS elements. V.54 loop-backs are great for end-to-end tests if the far-end CSU/DSU supports a V.54 loop-back).



TX Control Codes

To transmit a control code, tap the TX code pull down menu and select the control code you want to send.

- **DMI** – Data Mode Idle (all 1's)
- **CMI** – Control Mode Idle (1111xov where xov is a BPV)
- **OOS** – Out of Service (network out of service)
- **OOF** – Out of Frame
- **UMC**- Unassigned Mux Code
- **ASC** – Abnormal Station Code (sent when the far-end CSU/DSU is unplugged).
- **MOS** – Mux Out of Sync

To stop sending a control code tap the selected control code then tap "TX code" (off).

RX Level and Sealing Current Detection

The test set will display receive (input) level at the bottom of the screen along with sealing current detected on No Loop Current. In a 4-Wire DDS circuit there must be sealing current.

BERT - Bit Error Rate Test and Display

To send a straight-away BERT or BERT to a unit in loopback tap the BERT pull down menu and select the desired BERT.

- **2047** – 2^11-1 (2047 bit) pseudo-random data sequence
- **511** – 2^9-1 (511 bit) pseudo-random data sequence
- **SP1** – DDS Special Pattern 1 100 Bytes of 0xFF and 100 Bytes of 0x00
- **SP2** – DDS Special Pattern 2 100 Bytes of 0x7E and 100 Bytes of 0x00
- **SP3 –** DDS Special Pattern 3 Continuously send 0x32
- **SP4** – DDS Special Pattern 4 Continuously send 0x40
- **SP5** – DDS Special Pattern 5 Combination of SP1-4
- **Packet** – Embeds CMI (Control Mode Idle) into a 2047 or 511 used in Switch 56 Modes
- **All-1's** – DMI (used for optimum level measurements)
- **All- 0's** – used to verify zero coding and stress signal and clock recovery circuits
- **Alt, 1:1** – 101010 a fixed pattern with no BPV's

The test set will display the industry standard DDS/DataCom errors (AS, %AS, UAS, DGRM, Blk Size, BLK's, BLK Error and BLK rate) along with BERT pattern in Green if in Sync and Bit errors "**0"** next to the BERT pattern. A user can change the Bit count display by tapping on the **Count** pull-down menu and selecting one of the following:

- **BER** – View the bit error rate (bits in error/total bits) since the start of the test
- **ES (Errored Seconds)** – displays the number of seconds in which one or more errors occurred
- **EFS** (**Error Free Seconds)** – displays the number of total seconds that a test has run error free
- **%EFS (Percent Error Free Seconds)** – displays the current ratio of EFS to total test seconds
- **SES (Severely Errored Seconds)** – the total number of seconds with an error rate >= 1.0e-3
- **%SES (Percent Severely Errored Seconds)** – the current ratio of SES to total test seconds

Bit Error Insertion

To insert a Bit Error into the transmit data stream, tap the Insert Error button. The test set will insert one error with each press of the Insert Error button and can also inject errors at a predefined rate.

CLEAR Errors

To clear Errors, tap the CLEAR button. The Bit errors will be cleared to zero and the "ET: xxx" will be cleared and restarted.

Receive Byte and Control Code Decode

Real-time Received data is displayed (below the bit #'s) in binary and hex formats along with a real-time decode of all defined data and control codes. The test set will also display an Invalid Bipolar Violation Code (BPV) if detected. These typically occur when one side of Tip or Ring is not connected.

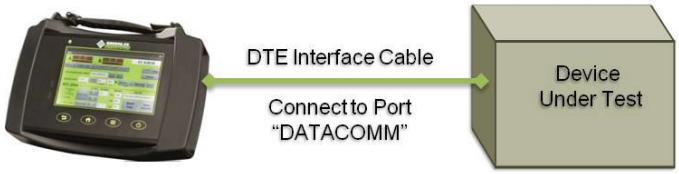
Datacomm Testing

Datacomm Test Option

If optioned the test set supports Data Terminal Equipment (DTE) emulation and Data Customer Equipment (DCE) emulation and supports the following interfaces:

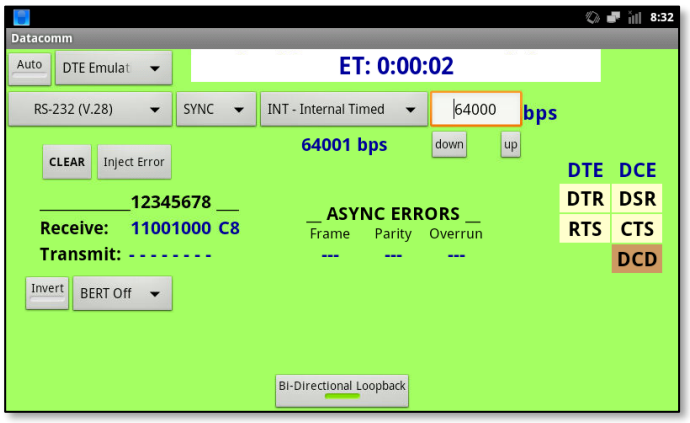
Interface	Type	DTE	DCE
RS232	Unbalanced	Male DB25	Female DB25
V.35	Balanced	Male V.35	Female V.35
X.21	Balanced	Male DB15	Female DB15
RS449	Balanced	Male DB37	Female DB37
RS530	Balanced	Male DB25	Female DB25

Test Interface Connections



DATACOMM Interface Connection

To connect the test interface to the device under test you must select the proper patch cable depending on which interface you are testing and the termination type if using the optical ports. There is no specific order of connection required. You can connect the patch cord to the test device or network device first.



DTE BERT Testing

Select the appropriate DTE interface cable and connect the opposite end (looks like a large USB connector) connection to the test set and the **Male** DB25 or V.35 to the DCE

CSU/DSU. Make sure you screw the connector into the DCE as to make a good connection. The test set reads the RTS (Ready to Send) signal when the connection is active.

Select **Sync** or **Async** mode, clocking mode and note the frequency displayed under the clock tab, and finally select the cable type (RS232/V.35). Note the handshake line is highlighted Yellow if active. Press the BERT pull-down to select the desired BERT pattern:

- **QRSS** – Industry standard Quasi-Random Signal is formed from 20 Bits with max of 14 consecutive zeros.
- **3in24** – Three ones in 24 bits used to stress AMI lines
- **1:7,1in8** – Used for stress testing AMI & B8ZS lines
- **All-1's** – All data content is 1's 1111. In unframed mode this will be interpreted as AIS
- **All-0's** – All data content is 0's
- **1:1 Alt** – Alternates 1 and 0
- **2^23-1** – 23 stage shift register, emulates random data
- **2^20-1** – 20 stage shift register, emulates random data
- **2^15-1** – Quasi-random sequence of 32767 bits which contains up to 14 consecutive zero's.
- **2047** – 2,047 Bit sequence commonly used for 64K DS0 channel testing (DDS)
- **511 (2^9-1)** – bit pattern used for DDS and DTE/DCE Testing
- **2in8** – Two 1's in 8 bits, Used for stress testing AMI & B8ZS lines

BERT SYNC

If the BERT pattern is in Sync the pattern will be highlighted in Green with Bit Errors (0) next to the pattern. If no pattern is detected than the pattern will be highlighted in Red, Yellow is pattern was lost (History).

DCE BERT

Select the appropriate DCE interface cable and connect the Versa connection to the test set and the Female DB25 or V.35 to the DTE Male. Make sure you screw the connector into the DCE as to make a good connection.

Select Sync or Async mode, clocking source and note the frequency displayed under the clock tab, and finally select the cable type (RS232/V.35). Note the handshake line are highlighted Yellow if active. In DCE mode the test set activates DSR,CTS, DCD. The DTR & RTS lines are activated by the DTE.

Press the BERT pull-down to select the desired BERT pattern. Note patterns are listed on previous page.

Byte Encoder Display

Above the BERT Tab is the Receive and Transmit bits labeled 1-8 bits, the Receive is the test set input and is useful in seeing what type of data is being received. To the right of RX/TX bit display is Async Errors only displayed and updated in Async mode.

Auto Mode

If this option was purchased press the Auto button (upper left of the screen) to Auto detect the cable is plugged into the test set. The test set will configure for what cable is detected.

Other Features

Up/Down buttons

These buttons increase or decrease the internal frequency by 100Hz steps.

Invert button

This button inverts the BERT pattern that is selected.

Bi-Directional loopback button

This button is useful for checking cable connections, press the Bi-Directional Loopback to loop toward the test set and towards the DTE (DCE mode) or DCE (DTE mode).

Remote Control

Remote Control Option

Remote control requires purchase of the DS10G-SW-RC option. Once activated, this option enables anytime, anywhere remote control of the test unit using the wired management port or wireless interface if the DS10G-HW-WIFI option is installed.

The remote-control option enables the DataScout to act as a web server, thus no proprietary software is required to be installed on your computer, tablet or mobile device. Any HTML 5 compliant web browser may be used, including but not limited to:

- Chrome
- Firefox
- Safari
- Internet Explorer
- Edge

Management Port Configuration

Before the remote-control feature can be used the desired management port interface must be configured. To do so, press the Settings icon then tap **Wireless & networks**:

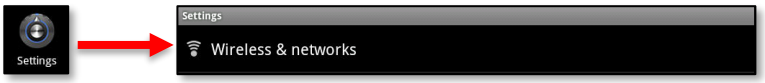


Figure 125 - Management Port Settings

Wired Connection

If using the wired Ethernet management port, select **Ethernet settings**.

Figure 126 - Ethernet Settings

Tap on Ethernet to activate the Ethernet management port. If authentication is successful, "Connected" will be displayed:

Figure 127 - Ethernet Connected

Currently only DHCP Ethernet connections are supported. Static addresses are not supported

Wireless Connection

If using the wired Ethernet management port, tap on **Wi-Fi** to enable the wireless radio.

Figure 128 - Ethernet Settings

Tap on **Wi-Fi Settings** and select the desired wireless access point. If a password is required, enter it when prompted. If authentication is successful, “Connected” will be displayed:

Figure 129 – Wi-Fi Connected

VMLite VNC Server Application

Press the home button to return to the home screen and then tap on the VMLite VNC Server icon:

Figure 130 - VMLite Application Icon

Press the green START button when the application launches. The button will change to a red STOP button and display the IP address of server. Note this IP address and the port number. In the example below the browser address is 192.168.0.105:5801.

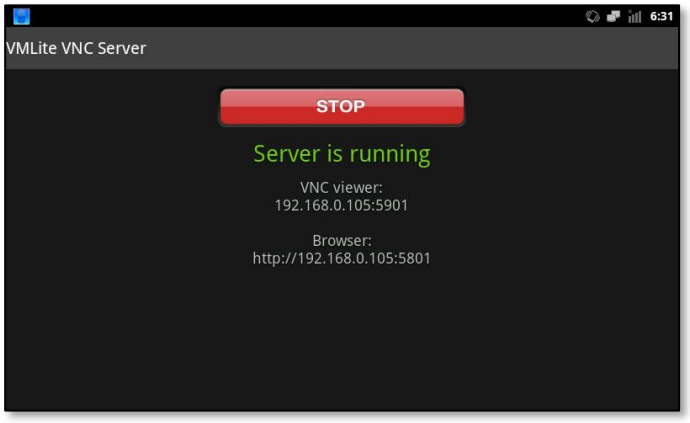


Figure 131 - VMLite VNC Server Running

Open a browser window and enter the IP address and port number of the server in the browsers address bar. If connection is successful the web page below will be displayed:

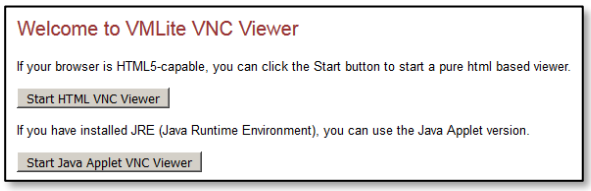


Figure 132 - VMLite Launch Page

Tap on the Start HTML VNC Viewer button to launch the web application in your browser window:

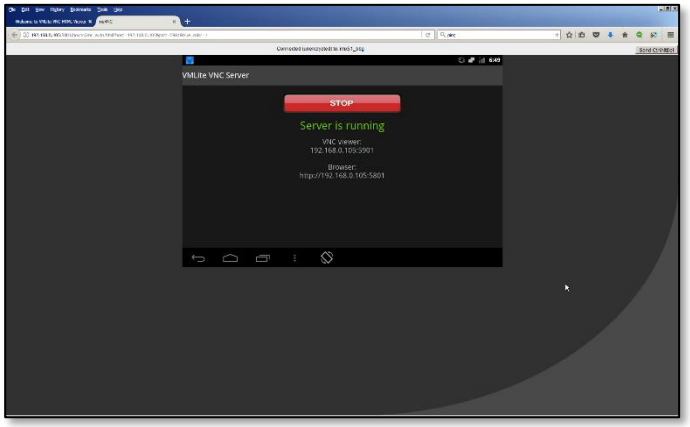


Figure 133 - Remote Control Web View

At this point you can command and control the DataScout unit just as you would from the touch screen.

Specifications

Specification Download

Detailed specifications can be download from www.greenleecommunications.com.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