







VePAL TX130M+ DSn/PDH, Ethernet Analyzer

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1.0 Introduction

Every effort was made to ensure that the information contained in this user manual is accurate. Information is subject to change without notice and we accept no responsibility for any errors or omissions. In case of discrepancy, the web version takes precedence over any printed literature.

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2.0 About This Guide

This user manual is suitable for novice, intermediate, and experienced users and is intended to help you successfully use the features and capabilities of the TX130M+. It is assumed the user has basic computer experience and skills, and is generally familiar with Cable TV and telecommunication concepts, terminology, and safety.

For more technical resources, visit VeEX Inc web site at <u>www.veexinc.com</u>.

If you need assistance or have questions related to the use of this product, call or e-mail our customer care department for customer support. Before contacting our customer care department, you must have your product serial number ready. Please go to <u>Basic Operations</u> section for details on locating your unit serial number in the menus or locate the serial number on the back of the chassis.

Customer Care:

Phone: + 1 510 651 0500 E-mail: <u>customercare@veexinc.com</u> Website: <u>www.veexinc.com</u>

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3.0 Safety Information



Safety precautions should be observed during all phases of operation of this instrument. The instrument has been designed to ensure safe operation however please observe all safety markings and instructions. Do not operate the instrument in the presence of flammable gases or fumes or any other combustible environment. VeEX Inc. assumes no liability for the customer's failure to comply with safety precautions and requirements.

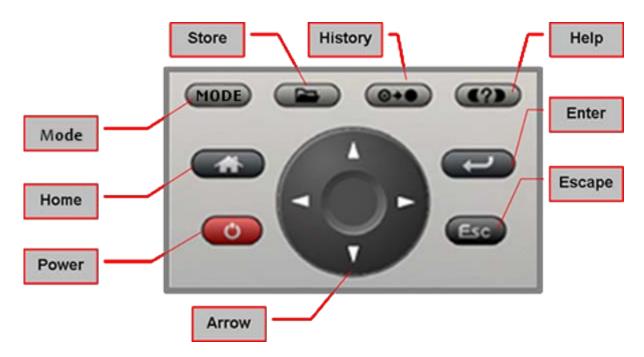
4.0 Basic Operations

The unit is powered on and off from the red key on the keyboard area. In order to turn off the unit, press the power key for at least 2 seconds. If the unit is not responding, holding the power key down by more than 10 seconds will force the unit to power down.

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4.1 Keypad

The keyboard includes the following keys:



- Home key. Brings the unit to its home menu regardless of its location on the user interface.
- Mode key. Press the MODE key to toggle between Menu A and Menu B. Menu A features Ethernet, SyncE, 1588v2, and Common Functions. Menu B features PDH and DSn.
- Store key. Performs storage of current results in the memory of the test set. If the result is running, it will provide a snapshot at the moment the key is pressed. The Store function provides automatic storage with automatic naming and timestamping function. To manipulate a stored file, please go to 7.0 Files in the Common Functions manual.
- History key. Resets any blinking LED due to a history condition. For more details on the LED, please go to LEDs.
- Help key. Brings the user to the online help, regardless of the current user interface location of the unit.
- Arrow key. Moves the cursor in any of the four supported directions (left, right, up, down). The Arrow key works in conjunction with the Enter and Escape keys.
- Enter key. Provides an enter sequence to the user interface. It is used in non touch-screen operation mode to enter menus and functions.
- **Escape** key. Provides an escape sequence to the user interface. It is used in non touch-screen operation mode to escape menus and functions.

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4.2 Touch-Screen Display

The LCD supports touch-screen operations. In order to use the unit in touch-screen mode, open the transparent door covering the screen. Then take out the stylus available on the top door i.e. door protecting the connector panel. Keep the LCD cover closed when using the unit on non touch-screen mode, and use the arrow, enter, and escape keys. The location of the cursor on the screen is indicated by a focus state. The focus state varies depending on the function or section of the test set.





4.3 Battery

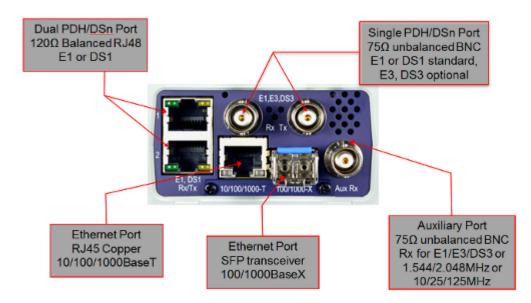
The VePAL is equipped with an intelligent Li-ion rechargeable battery pack which is located in the rear of the unit. The battery will be partially charged upon delivery so it is recommended to charge the battery fully before use. It is recommended to charge the battery at room temperature to preserve its life and to obtain maximum charge. The battery can be removed during operation, provided the unit is connected to the AC Main using the supplied AC adapter. Removing the battery when not connected to the AC Main will cause the unit to shutdown. Remove the rubber cover on the left side to connect the AC Main adapter to the unit.



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4.5 Connectors and Panels

The TX130M+ is equipped with the following physical test interfaces:



4.5.1 BNC Interface

75 ohm unbalanced BNC for E1, DS1, E3, DS3.

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4.5.2 Ethernet Port

RJ45 Copper 10/100/1000BaseT and SFP 100/1000BaseX.

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4.5.3 Dual PDH/DSn Port

120 ohm Balanced RJ48 E1 and DS1.

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4.5.4 Utility Ports

The Ethernet and USB ports are located on the left and right side of the unit.

• RJ45, 10/100/1000Base-T port:

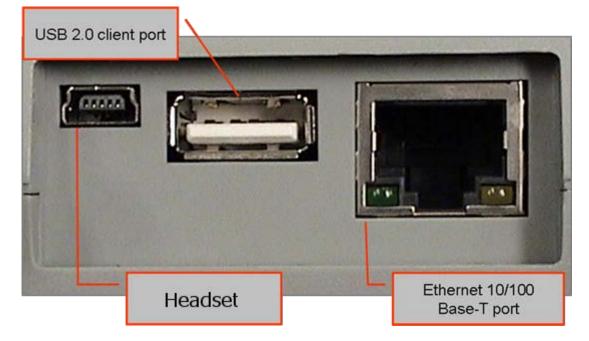
- 10/100/1000Base-T Ports, RJ45 connector, IEEE 802.3 compliant
- A green LED on the RJ45 connector flashes when there is activity on the network.
- The green LED is On when there is a valid Ethernet link with the network and off when there is no link.

To access the Ethernet management port, remove the protective rubber cover on the right hand side of the unit to expose the connector. Ethernet applications include:

- IP connectivity testing
- WiFi Wiz testing
- Voice over IP (VoIP) testing
- IPTV testing
- Transfer measurement results and test profiles between the instrument and a computer using ReVeal MTX software
- Upload/download channel tables between the instrument and a computer using ReVeal MTX software
- $\circ~$ Upgrade the instrument software using ReVeal MTX software
- Remote control of the instrument using ReVeal MTX software (optional)
- USB Port:

To access the USB port, remove the protective rubber cover on the right hand side of the unit to expose the connector. The USB port supports:

- Memory drives
- WiFi adaptor for WiFi testing application



4.6 LEDs

The TX130M+ is equipped with the following LEDs:

- Power LED: A single LED indicates the power state of the unit.
 - The LED is off when the unit is powered off.
 - The LED is green when the unit is powered on.
 - The LED is orange when the unit is connected to the AC Main and powered off.
- Signal LED Indicates presence of a valid input signal.
- Alarm / Error LED Indicates the presence of alarms or errors.
 - Green LED Indicates that no alarm/error has occurred
 - Red LED Indicates that at least one alarm/error has occurred during the test
 - Red flashing LED Indicates any alarms/errors that have occurred
 - Grey LED Indicates that no condition or a test that has not begun yet

Note: The Signal and Alarm/Error lights are separated according to whether the Signal or Error/Alarm refers to Ethernet (**ETH**) or **PDH** testing.

Ved	VePAL	. TX130	M+ 🛛 🖒
0-E	гн — 🌑	— PI	DH-
SIGNAL	ALM/ERR	SIGNAL	ALM/ERR

Note: Each LED is equipped with a History function.

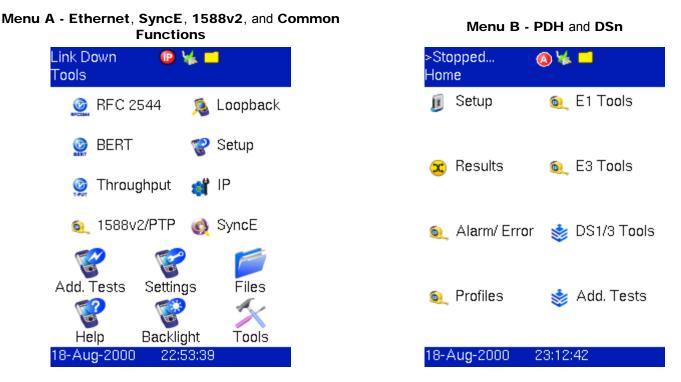
Note: The History key on the rubber keyboard (O -> O) resets the soft LEDs on the GUI.

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5.0 Home Menus

5.1 Ethernet and PDH/DSn Home Menus

The TX130M+ is able to record Ethernet and PDH/DSn measurements. The two modes are featured on separate home menus. To toggle between Ethernet and PDH/DSn modes, press the **MODE** key. Either Home Menu can be accessed at anytime during operation by pressing the **Home** key on the rubber keypad.



Menu A features Ethernet, SyncE, 1588v2, and Common Functions.

The upper part of Menu A contains items specific to the test application of the handheld test set, while the lower part of the menu contains items common to all VeEX VePAL handheld test sets.

Menu B features PDH and DSn test functions.

Some items are optional, and require the purchase of a software option in order to be activated. Some items have not been released, and will become available in future software releases.

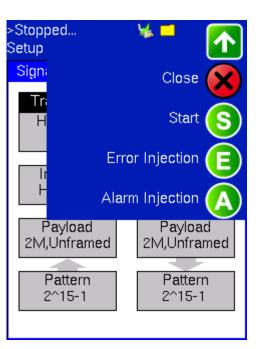
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5.2 Action Menu (Menu B only)

In Menu B, tapping the green arrow access the Action Menu, which displays the following menu selections:

- Close Closes the Actions menu
- Start Starts measurements and brings up the Results screen.
- **Stop** Stops measurements
- Error/Alarm Injection

Action Menu





6.0 Menu A - Ethernet/SyncE/1588v2/Common Features Setup

Test ports and network settings are required prior to performing any measurements or applications.

6.1 Port Setup

Port setup of the test interface configurations are accessed via the Setup menu located on the Home page. The user selects the operation mode and the interfaces that will be used to carry out tests. The available selections are as follows:

- Port Selection 10/100/1000T or 100/1000Base-X
- Auto Neg On or Off. Matches the test set's negotiation settings to those of the link partner.
 - Off Enables access Speed and Duplex.
 - **On** Enables Advertisement
 - **Advertisement** Default-All or User Defined. Choosing User Defined brings up the Auto Neg. Advertisements screen
- **Speed** Only available when auto-negotiation is off. Select from 10Mbps or 100Mbps on the 10/100/1000/T port and 100Mbps or 1000Mbps when the 100/1000Base-X port is selected.
- **Duplex** Only available when auto-negotiation is off for the 10/100/1000T port. Select from half or full duplex modes. Full is chosen as default when 100/1000Base-X is selected.
- Flow control On or Off. Once the operating mode and interfaces are selected, the user can independently configure the auto-negotiation, speed, duplex, and flow control settings for each port (where applicable).
 - When flow control is enabled, the test set will respond to pause frames received by the link partner by adjusting the transmit rate.
 - When flow control is disabled, the test set ignores all incoming pause frames from the link partner and continues transmitting at the configured transmit rate

Port Setup - 10/100/1000T - Auto-Neg ON

Port Setup - 10/100/1000T - Auto-Neg OFF

Port	Profile	es	Measuren	nent
Set	up		Status	
Port Sele	ction	10/1	00/1000T	V
Auto-Neg	1	On		V
Advertisement		Default-ALL 🛛 🔻		
Flow Control		Both On 🛛 🔻 🔻		
MDIX		Off		▼

Link Down Setup	(D 🎺	` <mark>-</mark> (X	
Port	Profil	es	nent		
Set	up	Status			
Port Selection		10/100/1000T 🔻			
Auto-Neg		Off 🛛 🔻			
Speed		100Mbps 🛛 🔻			
Duplex		Full 🔻			
Flow Control		Both	i On	▼	
MDIX		Auto)	▼	

Advertisement - User Defined



Port Setup - 100/1000BaseX

Link Down Setup	8	D 🚧	- 🗸		
Port	Profile	es	Measurement		
Set	up		Status		
Port Selec	ction	100/	'1000Base- 🔻		
Auto-Neg		Öff	▼		
Speed		1001	Vbps 🛛 🔻		
Duplex		Full			
Flow Con	trol	Both	i On 🛛 🔻 🔻		

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6.2 Port Status (10/100/1000T only)

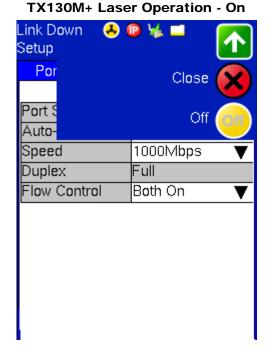
Copper Port Status (Page 1) Copper Port Status (Page 2) Copper Port Status (Page 3)

Up-1000T F 🛛 😰 Setup	😣	Up-1000T Setup	F 🖸	😣	Up-1000 [°] Setup	TF 🕕	😣
Port Profiles	Measurement	Port	Profiles	s Measurement	Port	Profile	s Measurement
Setup	Status	Set	up	Status	Se	etup	Status
MX100 Port		Link Adve	ertisemen	ts Av ailable	MX100.	Advertiser	m en ts
Link Advertisement	Done	10Mbps/	Half	YES	10Mbps	/Half	YES
Link Config. ACK	YES	10Mbps/	Full	YES	10Mbps	/Full	YES
Link Up Speed	1000Mbps	100Mbps	/Half	YES	100Mbp	s/Half	YES
Link Up Duplex	Full	100Mbps	/Full	YES	100Mbp	s/Full	YES
Link Partner Port		1000Mbp	s/Half	NO	1000Mb	ps/Half	NO
Link Up Speed	1000Mbps	1000Mbp	s/Full	YES	1000Mb	ps/Full	YES
Link Up Duplex	Full						
		Remote F	ault	NO			
Page 1	of 3 💿	۲	Page	2 of 3 💿	٩	Page	3of3 💿
Auto-Neg.	Re-Start		Auto-Neg	. Re-Start		Auto-Neo	. Re-Start

6.3 Laser Activation

- LASER On/Off Operation When the 100/1000Base-X ports is/are selected, the top pull down menu appears in the Setup/Port screen. From this pull down menu the user is able turn the LASER on or off.
 - The LASER may also be turned on/off from any of the following application menus;
 - BERT, RFC 2544, Throughput, Loopback, and IP.

• 🔶 🚺
Close 🔀
On 💿
100Mbps 🛛 🔻
Full
Both On 🛛 🔻 🔻



TX130M+ Laser Operation - Off

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6.4 Profiles

Profiles Tab:

Previously stored profiles can be viewed, deleted and loaded from this screen. When the user loads a profile, the screen will change automatically to the application that the profile corresponds to.

Link Down Setup	(D 😽			8
Port	Profil	es	Meas	surem	ient
Name:	Τ	ype:	C)ate:	
🗂 alt prof	ïle be	ert	1	0/20/	11
🗂 TsLat.t	xt 19	588v2	2 1	0/19/	11
🗂 UcMst	Tbl.tx19	588v2	2 1	0/19/	11
ClockR	cvr.t 19	588v2	2 1	0/19/	11
🗂 Config.	txt 19	588v2	2 1	0/19/	11
💼 FilterCi	fg.txt 19	588v2	2 1	0/19/	11
View Loa	ad Del	Ren	ame	Un/L	ock



GENERAL

Test: Layer 3 VLAN: 0 Tag MPLS: 0 Tag

HEADER

MAC Source: 00-18-63-00-00-6F MAC Dest: 00-18-63-CC-BB-AA Ethernet Type:0800-IP

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6.5 Measurement Settings

Measurement Tab:

The measurement and event log settings are configured in this screen.

- **Mode:** Manual, timed, or auto mode are available.
 - Manual User starts and stops the measurements manually.
 - **Timed** User defines the duration of the test; after the test is started, the test will run for the configured duration and stop automatically.
 - Auto User configures the start and end time of the test, selects the type of test to run, and a profile if one has been previously stored.

The test set must be powered on to carry out and automatic test.

• TestType (Auto Test only) - BERT, Throughput, or RFC 2544.

Measurement Settings -Auto Test - BERT & Throughput

	51
Link Down 🛛 Setup	• • * • 🛃
Port Pro	ofiles Measurement
Mode	Auto Test 🛛 🔻 🔻
Start time	08: 00
Month	January 🛛 🔻
Date:	01
End Time	09: 00
Month	January 🛛 🔻
Date:	01
TestType	BERT 🛛 🔻
Profile	Current 🛛 🔻
Event Log	Circular 🛛 🔻
Tx Start	Coupled
OAM Enable	On 🗸
	_

Measurement Settings - Auto Test - RFC 2544

Port	Pro	files		uremen
Mode		Auto 1	Test	
		08: 00		
Month		January 🛛 🔻		
Date:		01		
TestType		RFC 2544 🔹 📢		
Profile		Current		•
Event Log		Circular		•
Tx Start		Coupl	ed	
OAM Ena	ıble	On		
				•

Measurement Settings - Manual

Link Down Setup	8	0 😰 🤘		✓
Port	Pro	fil e s	Measu	rement
Mode		Manu	al	▼
Event Log]	Circul	ar	•
Tx Start		Coupl	ed	•
OAM Ena	ıble	Off		•

Measure	emen	t Sett	ings - Ti	med
Link Down Setup	8	0		✔
Port	Pro	files	Measur	ement
Mode		Timed		V
Duration(r	nin)	60		
Event Log		Circula	ar	▼
Tx Start		Coupl	ed	▼
OAM Ena	ıble	On		V

- Event Log: Circular or Blocked. Up to 1000 event logs can be stored.
 - **Circular** only the latest events will be stored if there are over 1000 event logs. The oldest event will be deleted so that the new event can be added.
 - **Blocked** only the maximum number of events will be stored; any event that occurs after the 1000th event will not be stored. Event logs consist of a log of the start of test, end of test, errors, alarms, frame loss, etc. The log will have a timestamp, type of event, and count (number of errors occurring in that instant).
- Tx Start: Coupled or Separate. Configure how the measurements are started when in BERT and Multiple Streams test modes
 - **Coupled** Transmitter and receiver are turned on at the same time, and the Tx and Rx measurements start at the same time at the start of the test.
 - **Separate** independent control (Start/Stop) of the transmitter is enabled. At the start of the test only the receiver is turned on the user must start the transmitter manually.
- OAM Enable: On / Off.
 - When OAM is enabled, the TX130M+ supports the IEEE 802.3ah EFM standard for discovery and loopback control of OAM-enabled devices.

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7.0 BERT

Overview:

BER testing at layer 1, 2, 3, and 4 is supported. The test can be configured to use either regular PRBS patterns, stress patterns or user defined test patterns to simulate various conditions. All patterns are encapsulated into an Ethernet frame to verify bit-perbit performance of the circuit under test.

• Layer 1: Framed mode - Test pattern is encapsulated into a valid Ethernet frame with SOF, Preamble and CRC field.

BERT Setup - Header (Layer 1 Framed)

Data Patterns

Page 18 of 121	Page	18	of	121
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Link Down 🐵 🦗 💻 🚺 BERT	Link Down BERT	0	¥ =	
Setup Results		D <mark>ata P</mark> a	atterns	
Header Traffic Error Inj Control	IP		R	X Filter
Profile Default 🔻	Summary	MA	\C	Data
TEST Layer 1 Framed V	MAC Source MAC Dest. Ethernet Ty IP TOS:Pre Values=000 IP TTL:128 Fragment C	:00-18-6 /pe:0800 cedenc 00-Norr	63-CC 0-IP :e=000 mal Se)	-BB-AA D-Routine, ervice, etc.
	OK	AR	P	ARP GW

- Layer 2: Framed BERT (same as Layer 1 Framed)
 - **MAC Address:** A default or user configured Media Access Control (MAC) address is added to the frame. This MAC address is used as the source MAC address for all streams (Throughput Testing mode).

BERT Setup	- H	eader (La	ayer 2)
Link Down 🛛 🔮 RFC2544) () 🤘 💻	✓
Setup		Resu	ults
Thrpt Latend	cy F	Frm Loss	Burst
Header Frame	es T	hreshold	Control
Profile	Def	ault	▼
TEST	Lay	er 2	▼
Frame Type	802	3 R a w	▼
VLAN	Off		V
MAC		Data	CRC
			٩

BERT Setup - MAC address editing

Link Down BERT	(]	≰ 🗖	\otimes
MAC Source			
00-18-63-00-0	0-6F		
A	В	C	
D	Е	F	
1	2	3	
4	5	6	
7	8	9]
	0		
Del DelAL	.L –	Apply	<-

- Layer 3: Framed BERT (same as Layer 1 & 2 Framed)
 - **MAC Address:** A default or user configured Media Access Control (MAC) address is added to the frame. This MAC address is used as the source MAC address for all streams.
 - **IP Address:** A default or user configured IP address is added to the frame. This IP address is used as the source IP address for all streams.

BERT Setup - Header (Layer 3)

Link Down BERT	• • • •
Setup	Results
Header Traffi	ic Error Inj Control
Profile	Default 🛛 🔻
TEST	Layer 3 🛛 🔻 🔻
Frame Type	Ethernet II (DIX) 🛛 🔻
VLAN	Off 🛛 🔻
MPLS	Off 🛛 🔻
MAC IP	Data C R C
	2

- Layer 4: Framed BERT (same as Layer 1, 2 & 3 Framed)
 - **MAC Address:** A default or user configured Media Access Control (MAC) address is added to the frame. This MAC address is used as the source MAC address for all streams.
 - **IP Address:** A default or user configured IP address is added to the frame. This IP address is used as the source IP address for all streams.
 - **UDP/TCP:** A user defined source and destination port address is added to the frame.

BERT Setup - Header (Layer 4)

Link Down BERT	· • ¥ - 📃	•
Setup	Results	
Header Traffi	ic Error Inj Conti	rol
Profile	Default 🛛	7
TEST	Layer 4 🛛 🖪	7
VLAN	Off 🛛	7
MPLS	Off 🔹	7
PROTOCOL	UDP T	
MAC IP	U Data C D R P C	
	٩	

BERT Setup - Header (Layer 4) UDP Settings

Link Down BERT	0 😼	•				
Data Patterns						
Summary	MAC	Data				
IP	UDP	RX Filter				
Source Port	8001					
Dest Port	8000					
ОК	ARP	ARP GW				

Go back to top

7.1 BERT Setup

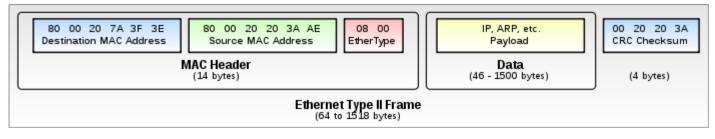
The test layer, frame header, traffic profile, error injection, and control settings of the far end device (if applicable) must be configured prior to testing.

7.1.1 Header Settings

• **BERT Profile:** Load a previously configured test profile or create a new profile from existing settings. See <u>Profiles</u> for more details on how to create new profiles.

- Test: Select the test layer to perform the BERT.
 - Options are Layer 1 Framed, Layer 2, Layer 3, and Layer 4.
- Frame Type: Select the Ethernet frame type for Layer 2 or Layer 3.
 - 802.3 Raw (IEEE 802.3 frame without LLC) Not available when Layer 3 is selected
 - Ethernet II (DIX) (named after DEC, Intel, and Xerox, this is the most common frame type today)
- MAC/IP: Tap the MAC and IP blocks on the Frame image to access the setup menus
 - Set the Source and Destination MAC address for Layer 2
 - Set the Source and Destination MAC and IP addresses for Layer 3
- VLAN: Off, 1 tag, 2 tags, 3 tags.
 - The user is able to configure up to 3 VLAN tags (VLAN stacking, for Q-in-Q applications)
 Note: VLAN stacking is an option.
- MPLS: Off, 1 tag, 2 tags, 3 tags.
 - The user is able to configure up to 3 MPLS tags.
 - Note: MPLS tag configuration is only available when the MPLS option is purchased.

The most common Ethernet Frame format, Type II



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MAC, VLAN, MPLS, IP, and Test Pattern Configurations:

To configure the MAC addresses, IP addresses, VLAN tags, MPLS tags, and test pattern, tap on the frame image displayed on the screen. This brings you to the configuration screens for all the header fields. Alternately, tap on the magnifying glass at the bottom right corner to access the configuration screens.

- MAC Header Tab:
 - MAC Source Use the default source address of the test set or configure a new or different address.
 - MAC Destination Configure the destination MAC address of the far end partner test set.
 - Ethernet Type For Layer 3 testing, the user can also configure the Ethernet type;
 - 0800-IP (Internet Protocol Version 4, IPv4)
 - 0600-Xerox
 - 0801-X.75 (X.75 Internet)
 - 0805-X.25 (X.25 Level 3)
 - 0806-ARP (Address Resolution Protocol (ARP))
 - 8035-RARP (Reverse Address Resolution Protocol (RARP))
 - 8137-IPX (Novell IPX)
 - 814C-SNMP
 - 8847-MPLS unicast
 - 8848-MPLS multicast
 - 86DD (Internet Protocol, Version 6 (IPv6)) Future Release

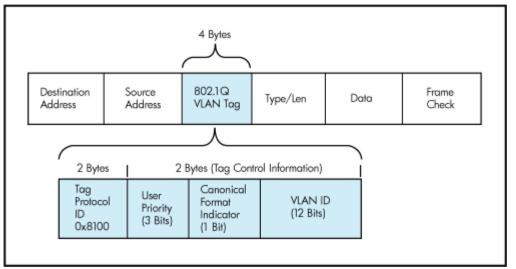
BERT Setup - MAC Address Settings (Layer 3)

BERT Setup - Ethertype Settings (Layer 3)

Down	• • •
Dat	a Patterns
IP	RX Filter
Summary	MAC Data
AC Source	00-18-63-00-00-6F
AC Dest.	00-18-63-CC-BB-A
	0800-IP
Ethernet Type	
Defa	ault MAC Src
ОК	ARP ARP GW

- VLAN Tab: In the VLAN tab the following parameters are configured;
 - VLAN ID: Can be configured in the range 1 to 4094
 - VLAN ID is the identification of the VLAN, which is basically used by the standard 802.1Q.
 - It has 12 bits which allows the identification of 4096 (2¹²) VLANs.
 - Of the 4096 possible VIDs, a VID of 0 is used to identify priority frames and value 4095 (FFF) is reserved
 - Maximum possible VLAN configurations are therefore set to 4094
 - VLAN Priority: Can be configured in the range 0 to 7
 - Set by the Priority Code Point (PCP), a 3-bit field which refers to the IEEE 802.1p priority.
 - It indicates the frame priority level from 0 (lowest) to 7 (highest), which can be used to prioritize different classes of traffic (voice, video, data, etc)
 - Type: The following selections are possible;
 - 8100 (IEEE 802.1Q tagged frame)
 - 88a8 (IEEE 802.1ad Provider Bridging)

IEEE 802.1Q VLAN Tag in an Ethernet Frame



BERT Setup - VLAN Tag Configuration

BERT Setup - VLAN Tag Summary

Page 22 of 121

Link Down BERT		0 🤸		✓
Setup			Resi	ults
Header Tra	affic	Error	Inj	Control
Profile	De	efault		▼
TEST	La	iyer 2		▼
Frame Type	e Et	hernet	II (D	IX) 🔻
VLAN	21	tags		▼
MAC V L A N	L A N	D	ata	C R C
				٩

Link D <mark>o</mark> w BERT	n	0	¥ <mark>-</mark>		\mathbf{V}
	Data	Pa	atterns		
Summa	ry 👘	MA	\C	Dat	ta
VL	AN .		R	X Filter	-
VLAN #1	1				
ID 1	Priorit	7	Туре	8100	V
VLAN #2	2 Priorit	7	Туре	88 a 8	•
Drop 8	Eliaible				-
- 0.00					
		Oł			

- MPLS Tab: In the MPLS tab the following parameters are configured;
 - **MPLS label:** Can be configured in the range 16 through 1,048,575 (labels 0 to 15 are reserved) Note: Composed of 20 bits which allows for the creation of over one million labels.
 - CoS: Can be configured in the range 0 to 7 Note: This field is three bits in length and maps directly to IP Precedence TOS bits to provide Class of Service (COS).
 - S-bit: Can be configured 0 or 1
 Note; The S field is one bit in length and is used for stacking labels. This is important as it is used to indicate the last label in the label stack.
 - **TTL:** Can be configured in the range 0 to 255. The default setting is 128 hops Note: Used to decrement the time-to-live counter.

Link Down BERT	• • •
Setup	Results
Header Traff	ic Error Inj Control
Profile	Default 🛛 🔻
TEST	Layer 3 🛛 🔻 🔻
Frame Type	Ethernet II (DIX) 🔻
VLAN	2 tags 🛛 💙
MPLS	1 tag 🛛 🔍 🗸
MAC V V M L L P A A L N N S	IP Data C R C
	٩

BERT Setup - Header with MPLS Label

BERT Setup - MPLS Label Summary

Link Dowr BERT	۱	(6		↓
	Da	ata P	attern	s	
Summar	У	M	AC		Data
VLAN	MF	ĽS	IF)	RX Filte
MPLS #	Lab	el=	0	2	S= 1
1	CoS	i=	0	TTĹ	.= 128
OK		A	RP	AR	PGW

Go back to top

- **IP Tab:** In the IP tab the user must configure the destination IP address and source address. The user may also configure the following IP header fields:
 - IP TOS (for Quality of Service testing):

- Legacy TOS (Precedence) The first three bits of the IP TOS field can be edited;
 - 000 Routine
 - 001 Priority
 - 010 Immediate
 - 011 Flash
 - 100 Flash Override
 - 101 Critical
 - 110 Internetwork Control
 - 111 Network Control
- DSCP (Differentiated Services Code Point) The first six bits of the IP TOS can be edited to provide more granular service classification.
 - For more information on the definition of DSCP field in IPv4 and IPv6 headers, refer to RFC2474
- Time To Live (TTL): Can be configured in the range 0 to 255
- Fragment offset byte: Can be configured in the range 0 to 65.528 Note: The fragment offset field, measured in units of eight-byte blocks, is 13 bits long and specifies the offset of a particular fragment relative to the beginning of the original unfragmented IP datagram.
- Protocol: UDP (0x11), TCP (0x06), or User defined

BERT Setup - IP Settings (DSCP)

	Data	Pat	tte	erns		<u> </u>	-
Summary		MA	С		Data		
VLAN N	/IPL:	S -		IP	R	X Fil	te
ІР Туре		IΡv	4			٦	7
IP Src Addr		192.	1	68.0	10		
IP Dest Add	۶r	192.168.2.200					
IP TOS		DSCP 🔻					
DSCP 000	000	ECT	-	ΟV	CE	0	7
TTL		128				_	
Frag. Offset	:	0					
Protocol		UDP - 0x11 🛛 🔻					

BERT Setup - IP Settings (Legacy TOS)

Link Down BERT	(9 🤸 🛯		✓		
C	ata P	atterns	3			
Summary	M	AC		Data		
VLAN M	PLS	IP		RX Filter		
ІР Туре	IF	' v4		▼		
IP Src Addr	19	2.168.0	0.10) [
IP Dest Add	r 19	192.168.2.200				
IP TOS	Le	Legacy TOS 🛛 🔻				
Precedence	00	000-Routine 🛛 🔻				
TOS Values	00	0000-Normal 🛛 🔻				
TTL	12	:8				
Frag. Offset	0					
Protocol	U	DP - Ox	11	V		
OK						

Go back to top

• **Data Tab:** User selects a test pattern that will be encapsulated in the Ethernet frame payload (for framed mode). Depending on the test layer, different test pattern options are available;

• Layer 1 test patterns

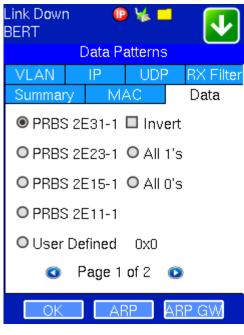
- **CRPAT** Compliant Random Pattern provides broad spectral content and minimal peaking for the measurement of jitter at component or system level.
- CJTPAT Compliant Jitter Test Pattern is a Jitter Tolerance Pattern that stresses a receiver by exposing it to extreme phase jumps thereby stressing the Clock Data Recovery (CDR) circuitry. The pattern alternates between repeating low transition density patterns and repeating high transition density patterns.
 CSPAT
- CSPAT

BERT Setup - Test Pattern (Layer 1 Framed)

Link Down BERT	🕑 🧏 🗖	✓
Head	ler Configuration	
CRPAT		
○ CJPAT		
○ CSPAT		
	OK	

- Layer 2 & 3 test patterns
 - PRBS:
 - 2³¹ -1 (147 483 647-bit pattern used for special measurement tasks, e.g. delay measurements at higher bit rates)
 - 2²3 -1 (8 388 607-bit pattern primarily intended for error and jitter measurements at bit rates of 34 368 and 139 264kbit/s)
 - 2¹⁵ -1 (32 767-bit pattern primarily intended for error and jitter measurements at bit rates of 1544, 2048, 6312, 8448, 32 064 and 44 736kbit/s
 - 2¹¹ -1 (2047-bit pattern primarily intended for error and jitter measurements on circuits operating at bit rates of 64kbit/s and N 64kbit/s)
 - Fixed: All 0s or All 1s
 - User Defined pattern: Length depends on size of frame
 - Inversion: Normal or inverted

BERT Setup - PRBS Patterns



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• RX Filter Tab: Allows the user to filter incoming streams by:

- MAC Destination address
- MAC Source address
- VLAN ID
- IP Destination address
- IP Source address

BERT Setup - RX Filter Selection

Link Dowr BERT		• • • • • • • • • • • • • • • • • • •					
Data Patterns							
Summar	У	MAC			Data		
VLAN	IP		UDF	2	RX Filter		
□ MAC [)est		IP	Des	st		
□ MAC S	Source	e 🗆	IP	Sou	irce		
VLAN	ID		De	st F	ort		
VLAN	Priorit	y 🗖	So	urc	e Port		
🗖 VLAN	Eligibl	е					
🗖 Frame	Туре						
🗖 Туре о	f Serv	ice					
Protoc	Protocol Type						
🗖 Remote	e Loop	o Filte	r				
ОК		ARP		AR	P GW		

BERT Setup - UDP/TCP				
Link Down BERT		•		.↓
[Data	Patte	erns	
Summary		MAC		Data
VLAN	IP	l	JDP	RX Filte
Source Port		8001		
Dest Port		8000		
Dubber off		0000		
ОК				RP GW

• UDP/TCP: Input Source Port and Destination Port.

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7.1.2 Traffic Settings

Traffic tab:

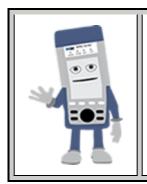
The user configures the traffic profile for the stream, including traffic flow, frame size, frame type, and transmit rate.

- Traffic Flow: Select from the following traffic flows:
 - Constant the selected frame is transmitted continuously according to the selected bandwidth %.
 - Ramp the selected frame is transmitted at maximum bandwidth according to the selected duty cycle and burst period.
 - Burst the selected frame is transmitted in a stair case profile according to user selectable step time, number of steps, and maximum bandwidth
 - Single Burst
- Frame Size: Enter the frame size when a Layer 2 or Layer 3 BERT is selected.
 - Frame size configuration is not available for Layer 1 BERT.
 - Frame sizes can be from 64 bytes to 1518 bytes, in addition to jumbo frames up to 9000 bytes.
- BW (Transmit Bandwidth): Configure the transmit rate for the test.
 - When traffic flow is equal to Burst, two burst bandwidths are configured with burst time.
 - When traffic flow is equal to Ramp, starting and an ending bandwidth are configured along with the bandwidth step size and duration.

BERT Setup - Layer 1 Constant Traffic

BERT Setup - Layer 2 & 3 Burst Traffic

Link Down BERT	🔍 🖗 🐂 🚺	✓	Link Down BERT	🕑 🧏 🗖
Setup	Results		Setup	Result
Header Traf	<mark>fic</mark> Error Inj Co	ontrol	Header Traf	<mark>fic</mark> Error Inj C
Traffic Flow	Constant	▼	Traffic Flow	Burst
Frame Size	Fixed	V	Frame Size	1518
Frame Size	1518		Burst 1 BW	75.00 %
Const BW	100.00 %	V	Burst 1 Time	5 ms
			Burst 2 BW	100.00 %
			Burst 2 Time	5 ms
B <u>W%</u>	100.00%		BW% 75% ms	100% ms
	t	time		



Frame Size Limitations

Layer 1 framed mode - Frame size configuration is not available. Layer 1 unframed mode - Traffic profile is constant at 100% bandwidth.

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7.1.3 Error Injection

Error injection can only be performed during testing. The error type and injection rate are configured in the Error Injection tab.

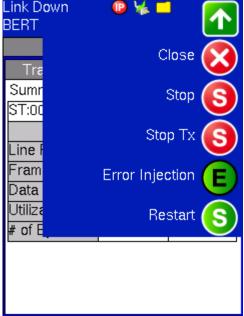
- Error type: Select from Bit, CRC, Bit and CRC, IP Checksum (layer 3 only), TCP/UDP Checksum (layer 4 only), or Pause.
- Injection Flow: Determines how the selected errors will be injected.
 - Select a single error injection, specific count, or error rate.
- Rate and Count: Configures the error rate and error count via the numeric pop-up keypad

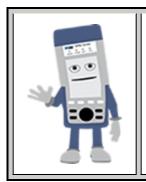
Once the test is running, error injection is enabled by selecting the "Error Injection" icon from the action pull down menu at the top of the screen. Press the "error inject" button to injecting error at the predetermined settings.

BERT - Error Injection Setup

BERT - Error Injection Action Menu

Header Traffic Error Type	Error Inj	Control	
Error Type		Control	
	CRC	▼	
Injection Flow	Count	▼	
Count	1000		





Error Injection

Once a test is running, error injection can be enabled by selecting the "Error Injection" icon from the action pull-down menu at the top of the screen. Press the "Error Injection" button to start injecting errors.

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7.1.4 Control Settings

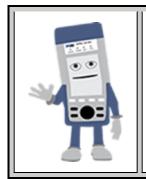
In the Control settings tab, the user configures the loop-up and loop-down commands necessary to control a far end unit. Looping back test traffic is possible as follows:

- Layer 1: All incoming traffic is looped back unchanged.
- Layer 2: All incoming unicast traffic is looped back with the MAC source and destination addresses swapped.
- Layer 3: All incoming unicast traffic is looped back with MAC and IP source and destination addresses swapped.
- Mode Manual or Asymmetric
 - Manual: User must input the destination MAC/IP address of the far end device along with the type of command.
 - IP Destination: Enter the IP address of the far end test set that is to be looped up/down.
 - Prior to starting the test, manually send the loop up command by pressing the Loop Up button
 - A "Loop-up successful" message will appear
 - After completing the test, manually send a loop down command by pressing the Loop Down button

BERT - Control Setup (Manual)

BERT - Device Discovery





MX Discover Feature

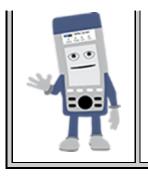
- If the local and remote test sets are on the same IP subnet, the MX Discover feature can be used
- Automatically discover the far end test unit by pressing the Discover button
- Once discovered, select the remote unit and send a loop up command
- No manual configuration of the IP address is needed, since these are populated automatically

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• Asymmetric Mode: No configuration is necessary.

BERT - Control Setup (Asymmetric)

Up-1000X BERT	F 🐣	🖌 🗖 🖗	<u> </u>	
Seti	lb	Res	ults	
Header 7	Fraffic	Error Inj	Control	
MX Dis	cover	OAM D	iscover	
Mode	Peer-to-	-Peer	▼	
IP Dest	192.168	.1.10		
No devices detected Press "Discover" to try to disc over devices.				
	e Setup scover	Remote F	esults	



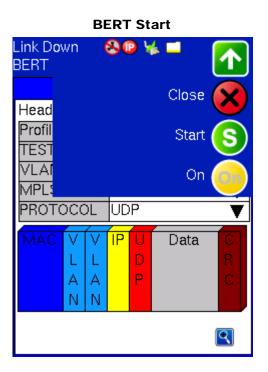
OAM Devices

If OAM is enabled, any link partner that supports the IEEE 802.3ah protocol, will be discovered automatically and be displayed under the "OAM Discover" tab.

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7.1.5 Starting/Stopping a BERT

Once all the necessary configurations have been completed, the user can start the test by selecting Start from the top right corner action pull-down menu (green arrow pointing down). Once selected, the test will start immediately and the icon will change to a Stop indication. To stop the test, simply tap the Stop icon. If testing on any of the fiber ports, ensure the LASER is switched ON before starting the test.



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7.2 BERT Results

7.2.1 Summary

Summary tab: The following results including the Start (ST) and Elapsed (ET) times are displayed:

- Line rate
- Framed rate
- Data rate
- Utilization
- Number of bytes
- Optical power Optical level measured by the SFP or XFP transceiver

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7.2.2 Errors

Errors tab: The following Errors (Current and Total) are displayed:

- Bits Indicates errors related to test pattern (Bit Error or LSS (Pattern Loss)).
- BER Bit Error Ratio
- Symbol Declared when an invalid code-group in the transmission code is detected
- FCS/CRC Number of received frames with an invalid FCS
- IP Checksum (Layer 3 only)
- Jabber frames Number of received frames larger than 1518 bytes containing an invalid FCS.
- Runt frames Number of received frames smaller than 64 bytes containing an invalid FCS.
- Giant frames Number of received frames larger than 1522 bytes containing an invalid FCS.

BERT Results-Running				
Setup	Results-Running			
Traffic	De	lay		Rates
Summary E	Irrors	Alarm	าร	Events
ST:17:17:59		ET:00:	00:	23
	Тх		Rx	
Line Rate	100	0.00M	10	00.00M
Framed Rate	9 87	.00M	98	6.70M
Data Rate	944	.08M	94	3.57M
Utilization	100	.00%	10	0.00%
# of Bytes	1.07	'E+09	1.0)7E+09

BERT Results - Summary

BERT Results - Errors				
Up-1000T F BERT	e) 💳 🗖		✓
Setup		Result	ts-l	Running
Traffic	De	lay		Rates
Summary Err	ors	Alarm	IS	Events
	Curi	rent	Πo	ital
Bits	0		0	
BER	0.00)E+00	0.0	00E+00
Symbol	0		0	
FCS/CRC	0		0	
FCS/CRC(%)	0.00)E+00	0.0	00E+00
IP Checksum	0		0	
IP chks(%)	0.00)E+00	0.0	00E+00
top/udp chks	0		1	
P	age	1 of 2		۲

BERT Results - Errors

Go back to top

7.2.3 Events

Events tab: A time stamped record or log of anomalies, alarms, test status (start/stop) and test application are displayed.

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7.2.4 Alarms

Alarms tab: The following Alarms (Current and Total) are displayed:

- LOS Loss of Signal
- LOS Sync
- · Pattern Loss Indicates errors related to test pattern
- Service Disruption:
 - Current
 - Total
 - Min/Max
 - Times

BERT Results - Events

BERT Results - Alarms

Up-1000T F BERT	<u>(</u>) 💳 🗖		✓	
Setup)	Result	ts-l	Stopped	
Traffic	De	lay		Rates	
Summary	Errors	Alarm	IS	Events	
tim e	Even	ts	η	FEST	
17:19:47	Test	Stoppe	dE	BERT	
17:18:01	UDP	Chk Er	r 1		
17:17:59	Test	Started	E	BERT	
			Τ		
			Τ		
Page 1 of 1 O					

Up-1000T F BERT	œ			✓
Setup		Resul	ts-l	Running
Traffic	De	lay		Rates
Summary E	Errors	Alarn	าร	Events
	Cur	rent	Πc	otal
LOS(ms)	0		0.00E+00	
LOSync	N/A		N/A	
Pattern Los:	s 0)		
Service Dis	sruptio	n (tim <mark>e</mark>)	
Current	Oms	3		
Total	Oms	6		
Last	Oms	6		
Min/Max	Oms	6	Om	s
Times	0			

7.2.5 Traffic

Traffic tab: The following Traffic statistics are displayed:

- Frame Type Test and non-test frames
- Traffic type Layer 2 and Layer 3 Unicast, Broadcast and Multicast frame percentage
- Frame size distribution
- Pause frames

Frames tab: The following Frame distribution statistics are displayed in count (#) and percentage (%):

• Received (RX) frames:

- Total frames
- Test frames
- VLAN tagged frames
- VLAN stacked frames
- MPLS labeled frames
- MPLS stacked frames
- Non-test frame
- Transmitted (TX) frames:
 - Total frame
- Paused frames: Transmitted and Received

BERT Results - Traffic Graph

BERT Results - Traffic / Frames

Up-1000T BERT	F	æ) 🚥 🗖		✓	
Set	Setup			Results-Running		
Summary	У	Errors	Alarm	າຣ	Events	
Traffic		De	lay		Rates	
R Frame Type		Tes	t Fram	es		
Traffic Type		Ur	ni ca st			
Frame Size		1280-1518B				
0%	6		50%		100%	

Jp-1000T F BERT Traffi	- 🕞 🖛 🖬	- 🔽
Frames	Traffic Type	Frame Size
Rx Frames	; #	%
Total	5352724	100
Test	5352724	100
VLAN	0	0
Q-in-Q	0	0
Non-Test	0	0
Tx Frames	; #	
Total	5240240	
Pause Fra	me Tx	Rx
Total	0	1200
	OK	

Traffic Type tab: The following Traffic distribution statistics are displayed in Count (#) and Percentage (%):

- Layer 2 Unicast frames Number of Unicast frames received without FCS errors.
- Layer 2 Broadcast frames Number of Broadcast frames received without FCS errors. Broadcast frames have a MAC address equal to FF-FF-FF-FF-FF.
- Layer 2 Multicast frames Number of Multicast frames received without FCS errors.
- Pause frames Number of valid flow-control frames received. Frames having a type/length field equal to 8808h are counted as pause frames.
- Layer 3 Unicast frames Number of Unicast frames received without FCS errors.
- Layer 3 Broadcast frames Number of Broadcast frames received without FCS errors. Broadcast frames have a MAC address equal to FF-FF-FF-FF-FF.
- Layer 3 Multicast frames Number of Multicast frames received without FCS errors.

Frame Size tab: The following Frame distribution statistics are displayed in count (#) and percentage (%):

- < 64 byte frames</p>
- 64-127 byte frames
- 128-255 byte frames
- 256-511 byte frames
- 512-1023 byte frames
- 1024-1279 byte frames
- 1280-1518 byte frames
- > 1518 byte frames Jumbo frames

BERT Results - Traffic Type

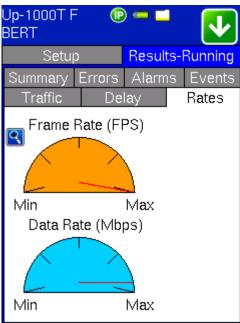
BERT Results - Traffic Frame Size

p-1000T F ERT	(P) 🚥 🗖	•
Traffic	Distribution D	etails
Frames	Traffic Type 🚺	Frame Size
Distribution	#	%
Uni ca st	7018426	98
Broadcast	0	0
Multicast	162001	2
Pause	162001	2
	ОК	

7.2.6 Rates

Rates tab: Rate statistics are displayed graphically and in tabular format:

- Frame rate in Frames per second (FPS) Number of received frames (including bad frames, Broadcast frames and Multicast frames)
- Data rate in Mbps Received data rate expressed in Mbps.



Up-1000T F BERT	(P) 🚥 🗖	- 🗸				
Rate Details						
Frames/sec	Tx	Rx				
Current	81274	83077				
Minimum	59977	60619				
Maximum	81275	83079				
Average	81075	82856				
Data Rate (Mb/s Tx Rx						
Current	944.08	943.57				
Minimum	696.69	696.50				
Maximum	944.08	943.85				
Average	941.77	941.21				
OK						

BERT Results - Rates Details

BERT Results - Rates Graph

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7.2.7 Delay

Delay tab: Frame arrival statistics are displayed in tabular format:

- Current
- Minimum

MaximumVariation (Current)

BERT Results - Delay

Up-1000T F BERT	•) 💳 🗖	✓		
Setup)	Results-Running			
Summary	Errors	Alarms	Events		
Traffic	De	lay	Rates		
Frm Arriva	ıl Delay	(
Current	0.16 ı	0.16 us			
Minimum	0.16 ı	0.16 us			
Maximum	12.19	12.19 ms			
Average	0.16 ı	0.16 us			
	∀aria	Variation			
Current	0.00 ι	JS			

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7.2.8 Saving BERT Results

Once the test is completed, results can be saved by pressing the save function key on the keypad. The results will be saved and named automatically. Once saved, the user can view or rename the files by going to the results folder of the files menu.

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8.0 RFC 2544 Conformance Testing

Overview:

Service providers often need to test the end to end performance of the link when deploying Ethernet services to customers. The Internet Engineering Task Force (IETF) RFC 2544 "Benchmarking Methodology for Network Interconnect Devices" defines tests that describe the performance characteristics of a network interconnecting device.

RFC 2544 recommendations are well accepted in the test and measurement industry for network performance testing. The RFC 2544 test suite consists of and performs a set of four automated tests (throughput, latency, frame loss, and burst or back-to-back) to qualify the performance of a network link under test. The tests are especially popular for the verification of network links with certain service level agreements (SLA).

The following settings must be configured prior to RFC 2544 testing;

- Test layer (Layer 1/2/3/4)
- Frame header (MAC, VLAN, MPLS, IP, UDP, and Data)
- Test frames selection
- Pass/fail thresholds (optional)
- Far end unit loop control
- Throughput
- Latency
- Frame loss
- Burst (back-to-back)

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Unless otherwise noted, the Header and related setups are identical to the setups described in the BERT Test Application above. A summary of the RFC 2544 setup options are outlined below.

8.1.1 Header Settings

- **BERT Profile:** Load a previously configured test profile or create a new profile from existing settings. See <u>Profiles</u> for more details on how to create new profiles.
- Test: Select the test layer to perform the BERT.
 - Options are Layer 1 Unframed, Layer 1 Framed, Layer 2, and Layer 3.
- Frame Type: Select the Ethernet frame type for Layer 2 or Layer 3.
 - 802.3 Raw (IEEE 802.3 frame without LLC) Not available when Layer 3 is selected
 - 802.3 LLC (IEEE 802.3 frame with LLC header)
 - 802.3 SNAP (IEEE 802.3 frame with SNAP header)
 - Ethernet II (DIX) (named after DEC, Intel, and Xerox, this is the most common frame type today)
- MAC/IP: Tap the MAC and IP blocks on the Frame image to access the setup menus
 - Set the Source and Destination MAC address for Layer 2
 - Set the Source and Destination MAC and IP addresses for Layer 3
- VLAN: Off, 1 tag, 2 tags, 3 tags.
 - The user is able to configure up to 3 VLAN tags (VLAN stacking, for Q-in-Q applications)
 - Note: VLAN stacking is an option.
- MPLS: Off, 1 tag, 2 tags, 3 tags.
 - The user is able to configure up to 3 MPLS tags.

Note: MPLS tag configuration is only available when the MPLS option is purchased.

MAC, VLAN, MPLS, IP, and Test Pattern Configurations:

Tap on the Frame image displayed on the screen to configure the MAC addresses, IP addresses, VLAN tags, MPLS tags, and test pattern. This brings you to the configuration screens for all the header fields.

RFC Setup Overview						
Up-1000T RFC2544	F	(P 🚧 🗖	✓		
Set	up 🛛		Res	Results		
Thrpt L	Thrpt Latency			Burst		
Header	Fram	es	Threshold	Control		
Profile		Sa	ive	▼		
TEST		La	Layer 4 🛛 🔻			
VLAN		Of	Off 🛛 🔻			
MPLS		Of	Off 🛛 🔻			
PROTOCOL ()P	▼		
MAC	IP	U D P	Data	C R C		
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Head	Header Configuration					
UDP		F	RX Filter			
Summary	- MA	AC 👘	IP			
MAC Sourc MAC Dest.: Ethernet Ty Traffic Clas Flow Label:(Next Heade Hop Limit:0	00-18- p e :86D s:0)	63-C(C-BB-AA			
O P	age 1	of 2	٥			
ОК	AF	₹P	ARP GW			



RFC 2544 Parameter Summary

Once setup parameters are completed, tapping the zoom function at the bottom right hand side of the screen displays a summary of all settings

RFC Setup Summary

- Go back to top
 - MAC Header Tab:
 - **MAC Source -** Use the default source address of the test set or configure a new or different address. See MAC address editing screen shot below.
 - **MAC Destination** Configure the destination MAC address of the far end partner test set. See MAC address editing screen shot below.
 - Ethernet Type For Layer 3 testing, the user can also configure the Ethertype:
 - 0800-IP (Internet Protocol Version 4, IPv4)
 - 0600-Xerox
 - 0801-X.75 (X.75 Internet)
 - 0805-X.25 (X.25 Level 3)
 - 0806-ARP (Address Resolution Protocol (ARP))
 - 8035-RARP (Reverse Address Resolution Protocol (RARP))
 - 8137-IPX (Novell IPX)
 - 814C-SNMP
 - 8847-MPLS unicast
 - 8848-MPLS multicast
 - 86DD (Internet Protocol, Version 6 (IPv6)) Future Release
 - Data Tab: No payload selection is possible.
 - The payload area is populated with a VeEX signature field and other proprietary data.
 - RX Filter Tab: Depending on test layer, allows the user to filter streams by;
 - MAC Destination address
 - MAC Source address
 - VLAN ID
 - IP Destination address
 - IP Source address
 - VLAN Tab: VLAN ID, priority, and Tag Type (Ethernet Type) can be configured. Please refer to the BERT application for more details.
 - **MPLS Tab:** MPLS label, CoS priority settings, TTL, and S-bit fields are configured for available MPLS tags. Please refer to the BERT application for more details.
 - IP Tab: User configures the source and destination IP addresses The user can also configure the following IP header fields; IP TOS (for quality of service testing), TTL, fragment offset byte, and the protocol field. Please refer to the BERT application for more details.



RFC 2544 Header Setups

The MAC, VLAN, MPLS, and IP configuration procedures are the same as in BERT mode Please refer to the BERT Application section for details.

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8.1.2 Frame Settings

Frames tab: User Configures;

- Preset Frames: User selects from a list of recommended test frame sizes defined in RFC 2544:
 - Test frames are 64, 128, 256, 512, 1024, 1280, and 1518 bytes.
 - The default selected frames are 64 and 1518 bytes.
 - To select/deselect any of the recommended test frames, check the box to the right of the desired frame.
- Add frame: The user can add two additional user configurable test frames of any size ranging from 64 bytes to 9000 bytes.
 - To add additional test frames, tap the 'Add Frame' button.

- $\circ\;$ Enter the frame size using the numeric keypad and click apply.
- Press the back button to return to the frames screen.
- The new custom frame size is displayed it can be enabled or disabled as needed.

RFC 2544 Setup - Frame Settings

Up-1000T F RFC2544	• • •
Setup	Results-Running
Thrpt Latency	Frm Loss Burst
Header Frames	Threshold Control
64bytes	
128bytes	\checkmark
256bytes	
512bytes	\checkmark
1024bytes	
1280bytes	\checkmark
1518bytes	Add Frame

Up-1000T F RFC2544	• 🚺
Setup	Results-Stopped
Thrpt Latency	Frm Loss Burst
Header Frames	Threshold Control
64bytes	
128bytes	
256bytes	
512bytes	\checkmark
1024bytes	
1280bytes	
1518bytes	Add Frame
9000bytes	Delete

RFC 2544 Setup - Jumbo Frame

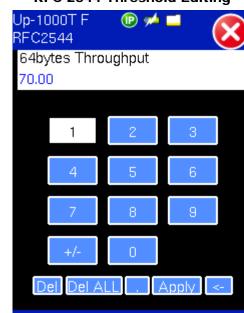
Go back to top

8.1.3 Threshold Settings

Threshold tab:

- User enables or disables threshold settings for the throughput and latency tests.
 - When enabled, threshold settings can be configured for all of the test frames selected in the frame settings tab.
- A Pass/Fail criteria will be applied when the threshold settings are enabled.
 - For example If the throughput threshold value for a 64 byte frame is configured for 80%, then a Pass criteria is assigned if the throughput rate is 80% or better
 - The threshold values for Throughput and Latency can be customized per user requirements. Tap on the selected value to edit.

RFC 2544 Setup - Thresholds Up-1000T F 🕞 🚧 🗖 RFC2544 Results Setup Thrpt Latency Frm Loss Burst Header Frames Threshold Control 🗹 Enable Thrpt(%) Ltncy(ms) 64bytes 70.00 1.000 2.000 128bytes 75.00 256bytes 80.00 3.000 512bytes 85.00 4.000 1024bytes 90.00 5.000 1280bytes 95.00 6.000 7.000 1518bytes 100.00



RFC 2544 Threshold Editing

8.1.4 Throughput, Latency, Frame Loss, and Burst Settings

The RFC 2544 test suite allows the user to run all of the four tests, one of the four tests, or a combination of any of the four tests. The user simply has to enable/disable which tests to perform by checking/unchecking a selection box in the respective tab for each test. By default all of the four tests are enabled.

The following parameters must be configured before running the RFC 2544 conformance test suite.

Throughput tab:

- Max Rate: Up to 100% of the negotiated line rate. The default value is 100%.
 - This is the maximum transmit rate to perform the throughput test for each test frame size.
 - The user may configure this rate as a % of the total line rate or in Mbps. For example if the user configures the Max Rate to be 90% and the negotiated line rate of the link is 100Mbps, then the maximum transmit rate will be 90Mbps or 90% of the line rat
- Resolution: 1% to 0.001%. The default value is 1%.
- Duration: 5 to 999 seconds. The default value is 20 seconds.
 - The duration is the amount of time the throughput test is run for, for each frame size at a given rate.

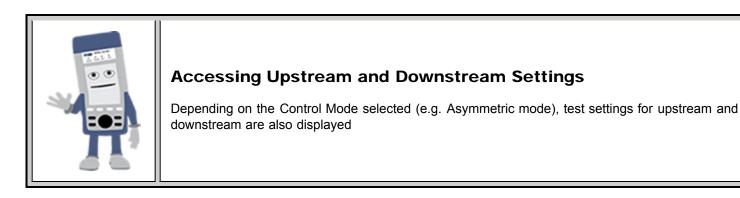
<mark>Setup</mark> Header Frar	nes 1		Resi Ald		
Thrpt Later				Burst	
Asymmetric	Up S	tream		T	
MAX Rate	100.00 % 🔻				
Resolution	1.00%				
Duration	20 seconds				
Enable Tes	t 🛽	Z			

RFC 2544 Setup - Throughput Upstream

RFC 2544 Setup - Throughput Downstream

Up-1000T F RFC2544	(D 🧏 🛛		✓
Setup		ł	Resi	ults
Header Fra	mes	Thresh	old	Control
Thrpt Late	ncy	Frm Lo	ISS	Burst
Asymmetric	Dow	'n Strea	ım	▼
MAX R ate	100.	000	%	▼
Resolution	1.00	%		
Duration	20 s	econds	3	

Enable Test 🛛 🗹



Go back to top

Latency tab: User configures:

• Test: Throughput Rate or Custom Rate. The default value is throughput.

- Throughput rate Latency test will be performed at the throughput rate found for each of the tested frame sizes.
- Custom rate User configures a custom rate in % or Mbps
- Rate: Only available if Custom Rate is selected'. Enter up to 100% of the negotiated line rate or enter the rate in Mbps.
- **Duration:** 5 to 999 seconds. The default value is 20 seconds. This is the amount of time that the latency test will be performed for each test frame size.
- **Repetitions:** 1 to 100. The default value is 1. This is the amount of times that the latency test will be repeated for each test frame size

Setup Results Header Frames Threshold Control Thrpt Latency Frm Loss Burst TEST Throughput Rate ▼ Duration 20 seconds ■ Repetitions 1 ■	Jp-1000 RFC2544		(P 🤸 🗖	✓	
ThrptLatencyFrm LossBurstTESTThroughput Rate▼Duration20 secondsRepetitions1	Se	Setup Results				
TEST Throughput Rate Duration 20 seconds Repetitions 1	Header	Frai	nes	Threshold	Control	
Duration 20 seconds Repetitions 1	Thrpt	Late	ncy	Frm Loss	Burst	
Repetitions 1	TEST		Thro	oughput Rat	te 🔻	
	Duratior	۱	20 s	econds		
Enable Test 🔽	Repetitions 1					
	Enable	e Tes	st			

Up-1000T F P RFC2544 Results Setup Header Frames Threshold Control Latency Frm Loss Thrpt Burst TEST Custom Rate Ŧ Rate 100.000 1% Duration 20 seconds Repetitions Enable Test \checkmark

RFC 2544 Setup - Latency Custom Rate

Go back to top

Frame Loss tab:

- Max Rate: Up to 100% of the negotiated line rate. The default value is 100%. This is the maximum transmit rate to perform the frame loss test for each test frame size. The user may configure this rate as a % of the total line rate or in Mbps. For example if the user configures the Max Rate to be 90% and the negotiated line rate of the link is 100Mbps, then the maximum transmit rate will be 90Mbps or 90% of the line rate.
- Step Size: 1 to 10%. The default value is 10%. The step size is the rate % that the frame loss test will be reduced by in the event of any frame loss. For example if the Max Rate is 100Mbps (or 100%) and frames are lost at this rate, then the transmit rate will be reduced to 90Mbps (or 90%). The frame loss test will now be performed at the new rate until there is zero frame loss at two consecutive rate settings. This means that the test will have to be performed at 80% (assuming that there was zero frame loss at 90%).
- **Duration:** Selectable in the range 5 to 999 seconds. The default value is 20 seconds. The duration is the amount of time the throughput test is run for, for each frame size at a given rate

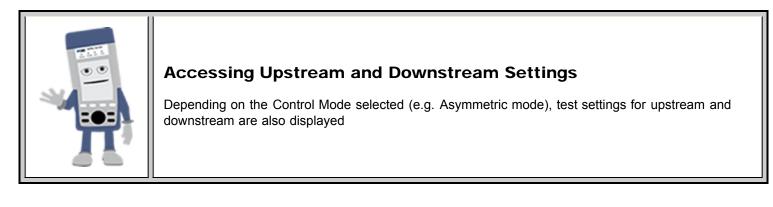
RFC 2544 Setup - Frame Loss Upstream

RFC 2544 Setup - Frame Loss Upstream

Setup		F	Resi	ults
Header Fra	mes ⁻	Thresh	old	Control
Thrpt Late	ncy	Frm Lo	SS	Burst
Asymmetric	Up S	Stream		▼
MAX Rate	100.0	100.00 % 🔻		
Resolution	1.00%			
Duration	econds	;		
Enable Tes	st 🛙	Z		

Up-1000T F RFC2544	(D 🧏 🗖		✓
Setup		F	?esi	ults
Header Fran	nes	Thresh	old	Control
Thrpt Late	Frm Lo	ss	Burst	
Asymmetric			m	▼
MAX Rate	100.	.000	%	▼
Resolution	1.00%			
Duration	20 s	econds	i	

Enable Test 🛛 🗹



Go back to top

Burst (Back-to-Back) tab:

- Max Rate: The default value is 100%. In the burst test, frames are always transmitted at the maximum rate for a given minimum and maximum burst duration.
- **Minimum Duration:** Selectable in the range 2 to 999 seconds. Default value is 2 seconds. This is the duration of the first burst
- **Maximum Duration:** Selectable up to 999 seconds. The default value is 20 seconds. This is the duration of the second burst, which must be greater than the minimum burst.
- **Repetitions:** Selectable in the range 1 to 100. The default value is 1. This is the amount of times that the latency test will be repeated for each test frame size

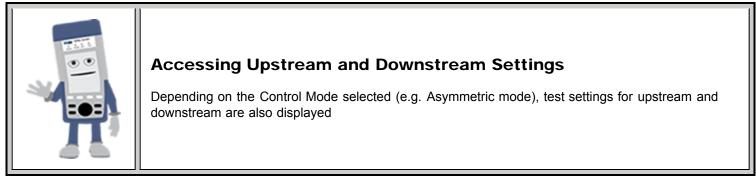
RFC 2544 Setup - Burst Upstream

RFC 2544 Setup - Burst Downstream

Setup			Resi	
Header Fram	ies	Thresh	old	Control
Thrpt Laten	су	Frm Lo	ss	Burst
Asymmetric	Up	Strean	n	▼
MAX R ate	100	0.000	%	▼
Min Duration	2 s	econds	3	
Max Duration	second	ds		
Repetitions	1			
Enable Test		V		

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Se	etup		R	lesi	ults
Header	Frame	es "	Thresh	bld	Control
Thrpt	Latenc	:y	Frm Lo:	5S	Burst
	D٥	wn Stre	am	▼	
	MAX Rate 100			%	▼
		econds			
Max Du	20	second	s		
Repetiti	ons	1			
	-		_		

Enable Test 🛛 🗹



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8.1.5 Control Settings

Overview:

Asymmetrical links like ADSL and VDSL2 provide different line rates in the two directions - normally the downlink line rate is significantly higher than the uplink line rate. To verify the information for both the low and the high rates of the link, the user needs to send a test signal from one instrument located at one end of the link to an instrument at the other end of the link and vice versa to test traffic capacity. The two test instruments have to be synchronized, because the tests defined in RFC 2544 require the receiver to know the contents of the test signal to be transmitted in detail.

The MX120+ offers an automated RFC 2544 test application to perform throughput, frame loss and burstability tests in a localremote unit setup. The user first configures the test setup in the local MX120+ - once initiated, the local MX120+ transfers the setup information to the remote MX120+ via the line under test. Upon completion, the remote MX120+ transfers the test results back to the local MX120+, enabling the user to read the results for both directions of the link on the local unit. The dual-port capability of the MX120+ allows the user to test two links simultaneously.

RFC 2544 End-to-End Testing



Control button:

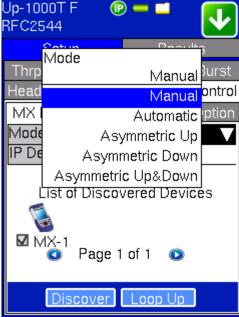
Configures the loop-up and loop-down commands necessary to control the remote unit or the test profile in the case of Asymmetric testing. The user is allowed to configure the commands manually or automatically.

- Manual selection: user must input the destination IP address of the far end device
- Automatic selection:
 - No configuration is necessary user only has to select the "discovered" far end device to control.
 - Select from a list of discovered devices to loop-up/down.
- Asymmetric Up
- Asymmetric Down
- Asymmetric Up/Down

RFC 2544 Setup - Control Manual



RFC 2544 Setup - Control Modes



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8.1.6 Starting/Stopping a RFC 2544 Test

Once all configurations have been made, the user can start the RFC 2544 test. The following are three scenarios of how to prepare and start the unit for RFC 2544 testing.

Note: If the testing on the fiber ports, make sure the LASER is turned On before starting the test.

Far End Unit in Manual Loopback Mode:

- If the far end unit (another MX) is already in a manual loopback mode, the user must make sure that the control settings mode are set to manual. Do not send a loop up command, since it is not necessary.
- $\circ\;$ Once the correct control settings are configured, the user can start the test

The selected tests will run automatically. When all the tests are complete the test will stop automatically. If the RFC 2544 test

suite needs to be stopped before they are done, then simply press the Stop button, located in the actions pull down menu. The status of each selected test can be seen in the Results tab.

Far End Unit Controlled with Manual Mode Loop Up/Down Commands

- If the far end unit is not manually looped back, then it must first receive a loop up command from the control unit before the RFC 2544 test suite can be started.
- To loop up the far end unit with the manual mode loop up/down commands, configure the control settings mode to manual.
- Enter the MAC and/or IP address of the far end unit.
- Send the loop up command by pressing 'Loop Up'

Once the far end unit has been looped back, start the test by pressing the Start button. When the all of the selected test are completed, the RFC 2544 test suite will stop automatically. Once all tests have been completed and there is no need to test again, go back to the Control tab, and press the 'Loop Down' button. This will send a loop down command to the far end unit to remove the loopback that is in place.

Far End Unit Controlled with Automatic Mode Loop Up/Down Commands

- If the far end unit is not manually looped back, then it must first receive a loop up command from the control unit before the RFC 2544 test suite is started.
- To loop up the far end unit with the automatic mode loop up/down commands, configure the control settings mode to automatic.
- Enter the MAC and/or IP address of the far end unit.
- Press Start to automatically loop up the far end unit

Start the RFC 2544 test, and loop down the far end unit when all tests have been completed.

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8.2 RFC 2544 Results

The progress and current result of the RFC 2544 can be viewed as the test is in progress.

Results tab:

Navigate the respective sub-tabs (throughput, latency, frame loss, or burst) to view the results for each test. For the burst test the results can be viewed in summary table format or test log format.

8.2.1 Status and Events

The status of each test is displayed including a time stamped log of each test.

RFC 2544 Results - Status

Up-1000T F 🛛 👊 RFC2544	•*• 👽		
Setup	Results-Running		
Thrpt Latency R	Frm Loss Burst		
Status	Events		
ST:22:25:23	ET:00:06:43		
Throughput Test	Done		
Latency Test	Done		
Frame Loss Test	In Progress		
Burstability Test	Pending		

RFC 2544 Results - Events					
Up-1000T RFC2544	F 🤇	• 🤘		✓	
Setu	ıp	Resu	ts-	Running	
Thrpt La	atency	Frm Lo	SS	Burst	
Stat	us		Eve	ents	
time	Events		ΤE	ST	
22:25:23	Test St	arted	RFC 2544		
22:25:23	Test St	arted	Thruput		
22:29:14	Test St	opped	Th	ruput	
22:29:14	Test St	arted	La	tency	
22:30:28	Test St	opped	La	tency	
22:30:28	Test Started F			n Loss	
٥	Page 1	of 1	٥		

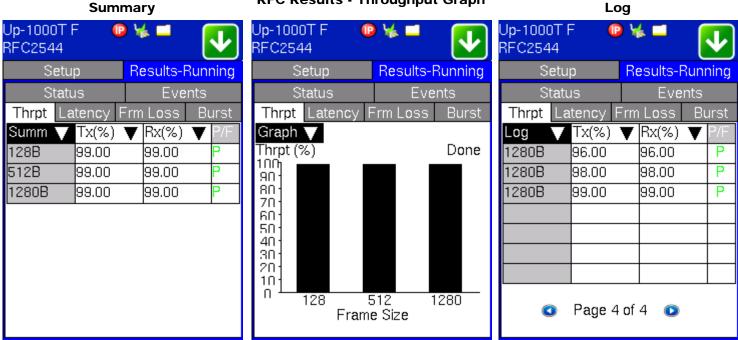
DEC 2544 Deculte Evente

8.2.2 Throughput

Throughput results are displayed in the following formats:

- Graphical
- Summary table
- · Test log table

RFC Results - Throughput Summary



RFC Results - Throughput Graph

Go back to top

8.2.3 Latency

Latency results are displayed in the following formats;

- Graphical
- Summary table
- Test log Byte Size, Latency (ms), Rate (%) and Status (Pass or Fail)
- Jitter Graph
- Jitter Summary
- Jitter Log

RFC Results - Latency Summary RFC Results - Latency Graph

RFC Results - Latency Test Log

RFC Results - Throughput Test

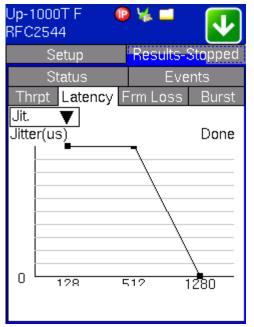
Set	up		Re	esults-	Ŝt	opped	
Sta	tus	6		Eve	ent	ts	
Thrpt L	at	ency	Frm	Loss		Burst	
Summa	Z	Ltncy	(us)	Rate	%	statu	
128 byte:	5	6.96		99.00	0	Pass	
512 byte:	5	12.98		99.00	0	Pass	
1280 byte	es	25.26	i	99.00	0	Pass	

	000T F 🛛 🍳 2544	9 🧏 🗖	✓
	Setup	Results	-Stopped
	Status	Ev	/ents
Th	rpt Latency	Frm Loss	s Burst
Gra	phi 🔻		
Late	ency(us)		Done
			<u>/</u>
		/	
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	_		
0	128	512	1280
			1200

RFC2544						
Setup	Re	sults-S	ito	pped		
Status	3		Eve	nts	3	
Thrpt Lat	ency F	rm	Loss	E	Burst	
Test 🔻	Ltncy()	us)	Rate%		statu	
· · ·	6.96		99.000) F	ass	
512 bytes	12.98		99.000) F	ass	
1280 bytes	25.26		99.000) F	ass	
Page 1 of 1						

1000T D

RFC Results - Latency Jitter Graph



RFC Results - Latency Jitter Summary

Up-1000T F RFC2544	œ) 🤘			≁
Setup		Re	sults-	St	opped
Status	3		Eve	nt	is
Thrpt Lat	ency F	rm	Loss		Burst
Jit. 🔻	Jit.(us)		Rate%	6	statu
128 bytes	0.005		99.00	0	Pass
512 bytes	0.005		99.00	0	Pass
1280 bytes	0.000		99.00	0	Pass

RFC Results - Latency Jitter Log

Up-1000T F 🔮 🦌 🗖 🚺						
Setup		ке	suits-a	Stopped		
Status	3		Eve	nts		
Thrpt Lat	ency F	rm	Loss	Burst		
Jit. Log 🔻	Jit.(us))	Rate%	statu		
128 bytes	0.005		99.000) Pass		
512 bytes	0.005		99.000) Pass		
1280 bytes	0.000		99.000) Pass		
	💿 Page 1 of 1 💿					

Go back to top

8.2.4 Frame Loss

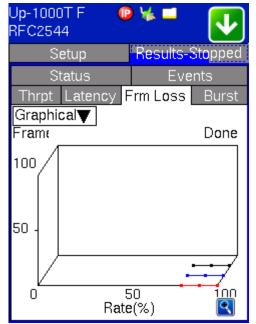
Frame loss results are displayed in the following formats;

- Summary table
- Test log table
- Graphical

RFC Results - Frame Loss Summary

Up-1000T F RFC2544	0) 🦗 🗖		✓	
Setup		Resul	ts-3	Stopped	
Status		E	Eve	nts	
Thrpt Later	ncy F	rm L o s	3S	Burst	
Summary 🔻	FrLos	3S%	Ra	te%	
128 bytes	0.125	j	10	0.000	
128 bytes	0.000		90.000		
512 bytes	0.125		100.000		
512 bytes	0.000		90.000		
1280 bytes	0.125		100.000		
1280 bytes	0.000		90.000		
Page 1 of 1					

RFC Results - Frame Loss Test Graph



Go back to top

8.2.5 Burst

Burstability (back-back) results are displayed in the following formats;

- Summary table
- Test log table

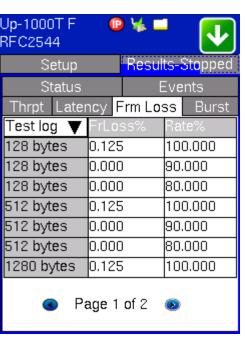
RFC Results - Burstability Summary

1280 bytes 0.125 100.000 Page 1 of 2 ۲

RFC Results - Frame Loss Graph (Zoomed)

Up-1000T F 🛛 🕼 RFC2544	* = 👽
Setup	Results
Status	Events
Thrpt Latency F	Frm Loss Burst
Graphical	
128 k	oyte frames
512 k	oyte frames
_ 1280	byte frames
	_
	🛛 🕄

RFC Results - Burstability Test Log

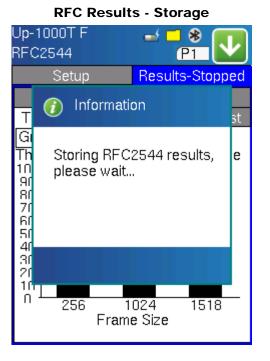


Jp-1000T F RFC2544	•) 🧏 💻	✓
Setup		Results-S	Stopped
Status		Eve	nts
Thrpt Later	ncy F	rm Loss	Burst
Summary 🔻	Avgl	Frame Co	unt
128 bytes	1182	4323	
512 bytes	3289	473	
1280 bytes	1346	153	

Up-1000T F RFC2544	G) 🤘 🖬	<		
Setup		Results-Stopped			
Status		E٧	ents/		
Thrpt Later	ndy F	^E rm Loss	s Burst		
Test log 🔻	Avg.	Frame	Duration		
128 bytes	1182	432	2		
128 bytes	1182	4323	20		
512 bytes	3289	46	2		
512 bytes	3289	473	20		
1280 bytes	1346	14	2		
1280 bytes	1346	153	20		
Page 1 of 1					

8.2.6 Saving RFC 2544 Results

Once the test has been stopped the results can be saved by pressing the save key on the keypad. The results will be saved and named automatically. Once the results are saved, the user may view or rename the results file by going to the Explorer folder located in the Files menu.



Up-1000T F Files	(₽ 🤘 🗖	8
Capacity	Exp	lorer	Transfer
Name:	Size:	Туре:	Date:
<u>=</u> 221048	4k	rfc254	08/21/00
<u>=</u> 224102	4k	rfc254	08/21/00
View Del	Rer	name	U/L Job
21-Aug-2000	D 2	2:41:48	

RFC Results - File Explorer

Go back to top

9.0 Throughput Testing (Multiple Streams)

Overview:

The throughput application (or the multiple streams application) performs the following measurements: throughput performance, frame loss analysis, delay analysis, frame/packet arrival analysis, received traffic type analysis, and received traffic frame size analysis. On the transmit side, the throughput application allows for the configuration of up to 8 traffic streams with their own MAC and IP addresses, VLAN tags (up to 3 per stream), bandwidth/rate, frame size, and L2 and/or L3 quality of service (QoS)

parameters. On the receiver end the traffic is analyzed on a per stream (up to 8 streams) basis as well as a global or aggregate measurement.

This application is very useful in verifying the transport of traffic with different prioritization settings across a network link. The test helps verify that the network can handle high priority traffic and low priority traffic accordingly.

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9.1 Setup

Unless otherwise noted, the Frame Header and related setups are identical to the <u>BERT</u> and <u>RFC 2544</u> Applications described above. The following parameters must be configured prior to performing a Throughput test;

- Number of streams (See General settings below)
- Bandwidth per stream (See General settings below)
- Test layer
- Frame Type
- VLAN tags
- MPLS tags
- Frame header per stream (if applicable)
- Traffic profile per stream (if applicable)
- Error injection per stream (if applicable)
- Control settings of the far end devices (if applicable).

Throughput Setup - General

Go back to top

9.1.1 General Settings

- **Profile:** Load a previously configured test profile or create a new profile from the existing settings.
- **# of Streams:** From 1 to 8 streams. Pressing the zoom function, displays the Bandwidth allocated per Stream: **Note**: The total bandwidth for all streams cannot exceed 100%.

Up-1000T F Throughput	0	-		•	
Setup		Re	sul	ts-Running	
Header	Tra	affic		Error Inj	
Genera	ıl		(Control	
Profile			De	efault 🛛 🔻	
RTD Measu	iremer	nt	Er	nable 🔻 🔻	
# of Stream:	5		4 🔻		
Total TX Ra	.te(Mb	ps)	10	00.00	
				٩	

Up-1000T F P - C Throughput Of Total Bandwidth per Stream Stream #1 40.000 Stream #2 25.000 Stream #3 22.500 Stream #4 12.500 Total 100.000

Go back to top

9.1.2 Control

Control button:

Overview: Configures the loop-up and loop-down commands necessary to control the far end unit. The user is allowed to configure the commands manually or automatically.

Throughput Setup - Stream BW Overview

- Manual selection: user must input the destination MAC/IP address of the far end device including the command type
 Automatic selection: User must select from a list of discovered devices to loop-up/down.
 - In automatic mode no configuration is necessary user only has to select the "discovered" far end device to control.

9.1.3 Per Stream Configurations

Please note that for any of the per stream configurations (Header, Traffic, and Error Injection), a stream number will be displayed. The user must select each stream number separately to configure the respective parameters. Select the stream # by tapping the stream number box at the top right hand side of the screen.

Header Settings (Per Stream Configurations)

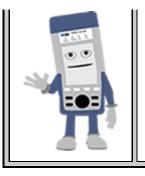
- Profile: Load a previously configured test profile or create a new profile from the existing settings.
- Test: Select the test layer. Options Layer 2 and Layer 3.
- Frame Type: Select the Ethernet frame type. The options are 802.3 Raw (IEEE 802.3 frame without LLC), 802.3 LLC (IEEE 802.3 frame with LLC header), 802.3 SNAP (IEEE 802.3 frame with SNAP header), and Ethernet II (Dix). Note: The 802.3 Raw frame type is not available when Layer 3 is selected.
- VLAN: Off, 1 tag, 2 tags, or 3 tags. The user will be able to configured up to 3 VLAN tags (VLAN stacking, for Q-in-Q applications).
- MPLS: Off, 1 tag, 2 tags, or 3 tags. MPLS tag configuration is only available when the MPLS option is purchased.
- MAC, VLAN, MPLS, and IP: To configure the MAC addresses, VLAN ID/priority, MPLS label/CoS/etc, IP addresses and header, tap on the 3-D image of the frame on the screen. This will bring you to the configuration screens for all the header fields.
- MAC Header Tab: In the MAC tab the user must configure the destination MAC address of the far end partner test set. For the source address use the default source address of the test set or configure a different one. Depending on the type of frame the user may also configure an Ethernet Type filed (Ethernet II frame), LLC header fields (802.3 LLC frame), or SNAP header fields (802.3 SNAP frame).
- VLAN Tab: In the VLAN tab the, the VLAN ID, priority, and Tag Type (or Ethernet Type) can be configured for all available VLANs.
- **MPLS Tab:** In the MPLS tab the MPLS label, CoS priority settings, TTL, and S-bit fields are configured for all available MPLS tags.
- IP Tab: In the IP tab the user must configure the destination IP address and source address. The user may also configure the following IP header fields; IP TOS (for quality of service testing), TTL, fragment offset byte, and the protocol field.
- RX Filter: Filter traffic by MAC or IP source and destination addresses or VLAN tag.

Throughput Setup - Stream List

Up-1000T Throughp		(i 1	↓
Stream # Description Stream # S1 Hea S1 Profil S2 TEST S3 VLAI S4					
MPLS PROTOC	COL	UD	Р		▼ ▼
MAC	IP	U D P	Data	a	C R C
					٩

Throughput Setup - Header / Stream #1

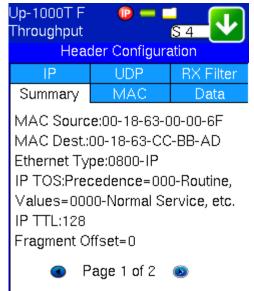
Up-1000 Through		œ	, 🚧 (S 1 (≁		
Se	tup		Results				
Ge	neral		(Control			
Heade	er	Tra	ıffic	Error	· Inj		
Profile		Defa	ault		V		
TEST		· ·	Layer 3 🛛 🔻 🔻				
	Frame Type			Ethernet II (DIX) 🛛 🔻			
VLAN		Off			▼		
MPLS		Off			V		
MAC	IP		Dat	a	C R C		
				(ঀ		



Multiple Streams

All streams are configured for the same test layer - if layer 2 is selected, then all streams will be layer 2 traffic.

Throughput - Header Summary Stream #1



Throughput - MAC Setup Stream #1

	D 3-63-00-0		
00-18	3-63-00-0	0-6F	
00-18	8-63-CC-F		
_	3-63-CC-BB-A		
	0800-IP 🔻		
	Disable 🔻		
	Disable 🔻		
	0		
Defa	ult MAC	Src	
	Defa	Disable Disable 0 Default MAC	



Multiple Streams - MAC/IP address setups

If all streams are going to the same far end unit, then the MAC/IP destination addresses must be the same on all of the streams.

If any of the traffic streams are going to more than one far end unit, please ensure that the correct MAC/IP destination addresses are configured for the respective streams.

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9.1.4 Traffic Settings (Individual Stream Configuration)

In the Traffic tab the user is be able to configure the traffic profile per stream, including frame size selection, traffic type, and transmit rate. If the same traffic type applies to all streams, apply this profile to all streams using the Apply to ALL button

- Frame Size: Enter the frame size when a Layer 2 or Layer 3 BERT is selected. Frame size configuration is not available for Layer 1 BERT. Frame sizes can be from 64 bytes to 1518 bytes, in addition to jumbo frames up to 9k bytes.
- Traffic Flow: Select from Constant, Ramp, Burst or Single Burst traffic flow.
- BW (Transmit Bandwidth): Configure the transmit rate for the stream.
- **Note:** the bandwidth allocation per stream is already configured in the General Settings tab, but can be modified in this screen as well.

Up-1000T F Throughput	œ) 🚧	6		
Setup			R	esults	
General	Control				
Header	Tra	iffic		Error Inj	
Traffic Flow	Cons	tant		▼	
Frame Size	Fixed	1		▼	
Frame Size	1518				
Const BW	12.50)	%	of total 🔻	

Up-1000T F Throughput	C) — (SZ 🗸
Setup		Resu	Ilts-Running
General			Control
Header	Tra	íffic	Error Inj
Traffic Flow	Ram	о С	V
Frame Size	1518		
Start BW	6.25		%of 🛛 🔻
Stop BW	25.00)	%of 🛛 🔻
Step BW(%)	6.25		
Ramp Time	5		ms 🔻

Throughput - Traffic Setup - Single Burst

Up-1000T F Throughput	e) 🚧		S1		
Setup			F	Results		
Genera			(Control		
Header	Tra	ffic		Error Inj		
Traffic Flow	Singl	e Bur	S	t 🔻		
Frame Size	1518					
Frame Num	1000	00				
Burst BW	12.50		%	of total 🔻		

Go back to top

9.1.5 Error Injection Settings (Individual Stream Configuration)

Error injection can be performed during test. The type of errors and error injection are configured in the Error Injection tab. Once the test is running, error injection can be performed by pressing the Error Inject button on the right side of the screen.

- Error type: Select from Bit, CRC, Bit and CRC, OOS/IPR, TCP/UDP Checksum (Layer 4 only), or Pause.
- Injection Flow: The error injection flow determines how the selected errors will be injected. The user can select a single error or a specific count.
- **Count:** The user will be able to configure the error count via numeric keypad.

Throughput - Error Inject Setup - CRC

Throughput - Error Inject Setup - Pause

Throughput - Traffic Setup - Burst

Up-1000T F	e) 🐋		ſ	
Throughput			S 1		
Setup			Resu	ilts	
General			Cont	rol	
Header	Tra	ffic	Er	ror	Inj
Traffic Flow	Burst				▼
Frame Size	1518				
Burst 1 BW	9.38		%of t	otal	▼
Burst 1 Time	5		ms		▼
Burst 2 BW	12.50		%of t	otal	V
Burst 2 Tim <mark>e</mark>	5		ms		▼

Jp-1000T F) 🚧 🗖					
Throughput		S1 💙					
Setup		F	esults				
Genera	.	(Control				
Header	Tra	affic	Error Inj				
Error Type		CRC	V				
Injection Flo	W	Count	V				
Count		1000					
	Annly	to All					
Apply to All							

Up-1000T F 🛛 🕧 Throughput	° 🗕 🔽					
Setup	Results					
General	Control					
Header Tra	affic Error Inj					
Error Type	Pause 🔻 🔻					
Injection Flow	Single 🛛 🔻					
Pause Time	1000					
Apply	/ to All					

9.1.6 Starting/Stopping a Throughput (Multiple Streams) Test

Once all the necessary configurations have been made, the user can now start the Throughput test. The following are three scenarios of how to prepare and start the unit for Throughput testing.

Note: If the testing on the fiber ports, make sure the LASER is turned On before starting the test.

• Far End Unit in Manual Loopback Mode:

- If the far end unit (another MX) is already in a manual loopback mode, the user must make sure that the control settings mode is set to manual. Do not send a loop up command, since it is not necessary.
- Once the correct control settings are configured, the user can start the test

The selected tests will run automatically. When all the tests are complete the test will stop automatically. If the Throughput test needs to be stopped before they are done, then simply press the Stop button, located in the actions pull down menu. The status of each selected test can be seen in the Results tab.

• Far End Unit Controlled with Manual Mode Loop Up/Down Commands

- If the far end unit is not manually looped back, then it must first receive a loop up command from the control unit before the Throughput test can be started.
- To loop up the far end unit with the manual mode loop up/down commands, configure the control settings mode to manual.
- Enter the MAC and/or IP address of the far end unit.
- Send the loop up command by pressing 'Loop Up'

Once the far end unit has been looped back, start the test by pressing the Start button. Once Throughput tests have been completed and there is no need to test again, go back to the Control tab, and press the 'Loop Down' button. This will send a loop down command to the far end unit to remove the loopback that is in place.

Far End Unit Controlled with Automatic Mode Loop Up/Down Commands

- If the far end unit is not manually looped back, then it must first receive a loop up command from the control unit before the Throughput test is started.
- To loop up the far end unit with the automatic mode loop up/down commands, configure the control settings mode to automatic.
- Enter the MAC and/or IP address of the far end unit.
- Press Start to automatically loop up the far end unit

Start the Throughput test, and loop down the far end unit when all tests have been completed.

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9.2 Throughput Results

9.2.1 Viewing Test Results (Individual and Multiple Streams)

When the test is first started, the screen automatically changes to the Global/Aggregate results screen.

Go back to top

9.2.2 Global Results

The Aggregate screen displays;

- Line rate
- Framed rate
- Total data rate
- Total utilization
- Total # of frames
- Total number of bad frames
- Optical power measurement (if applicable).

The Global 'Stream Summary' screen displays;

- Stream number (#)
- Total received bandwidth per stream
- Errors/alarms associated with the stream
- Quality of Service (QOS) associated with each stream

Throughput Results - Global Aggregate

Jp-1000T F 🛛 📴 💳 🔤 🔽						
Setup		Result	:s-F	Running		
Global		Per	Str	ream		
Traffic Alarr	ns	Delay	1	Errors		
Aggregate Stro	eam	Summa	ary	Events		
ST:23:00:08		ET:00:	14:	19		
	Тх		Rx			
Line Rate	100	M00.00	10	00.00M		
Framed Rate	742	42.76M		3.37M		
Data Rate	720	20.26M C		юK		
Utilization 75.		5.25% 1:		.50%		
Total Frames 514		198043	85	47280		
Bad Frames 0			17	094446		

Go back to top

The Global 'Errors' screen displays the Current and Total error count of all streams:

- Bits
- BER
- Symbol
- FCS/CRC
- IP Checksum
- Jabber Frames
- Runt Frames

The Global 'Alarms' screen displays the Current and Total alarm count of all streams:

Throughput Results - Stream Summary

Up-1000T Throughp		C		✓
Set	up		Results-P	lunning
Glo	bal		Per Str	eam
Traffic	Alarms	3	Delay	Errors
Aggrega	te Strea	ım	Summary	Events
Stream#	%BW	E	rrors	QoS
1	12.50	Т	CP/UDP C	5
2	0.00	Ν	one	5
3	0.00	Ν	one	5
4	0.00	Ν	one	5

- LOS synchronization in ms
- Service Disruption statistics in ms

Throughput Results - Global Errors (Page 1)

Up-1000T F 🛛 🕑 🗕 🗖 🚺						
Set	:up		Result	ts-F	Running	
Glo	bal		Per	Str	eam	
Aggrega	te Stre	eam	i Summ	ary	Events	
Traffic Alarms			Delay	/	Errors	
	C		rrent T		tal	
Bits		N/A		N/A		
BER		N/A		N/A		
Symbol I	Error	0		0		
FCS/CR	С	0		0		
FCS/CRC(%)		0.00E+00		0.00E+00		
IP Checksum		0		0		
IP chks(%)		0.0	0E+00	0.0	IOE+00	
٩	Ρ	age	1 of 2		٥	

Throughput Results - Global Alarms

Jp-1000T F 🛛 😰 🗕 🗖 🚺					
Set	tup		Resul	ts-F	Running
Glo	bal		Per	· Str	ream
Aggrega	te Stri	eam	Summ	ary	Events
Traffic	Alarr	ns	Delay	/	Errors
Cui			rrent	Τo	tal
LOS(ms	LOS(ms) 0		0.00E+)0E+00
LOSync	(ms)	N/A			A
Service	Disru	iptic	on (time	e)	
Current		Om	S		
Total		Om	ms		
Last		Om	S		
Min/Ma:	x	Om	S	Om:	5
Times		0			

Go back to top

The Global 'Traffic' screen displays:

- Frame Type of all streams
- Traffic Type/s of all streams
- Frame size of all streams

Throughput Results - Global Traffic Summary

Throughput Results - Global Errors (Page 2)

Up-1000T Throughp		C			✓	
Set	up		Result	s-F	Running	
Glo	bal		Per	Str	ream	
Aggrega	te Stre	eam	Summa	ary	Events	
Traffic	Alarr	ns	Delay		Errors	
		Cur	rrent	Τo	tal	
Jabber F		0		0		
Runt Fra	ımes	0		0		
٥	Р	age	2 of 2		•	

Throughput Results - Global Stream Delay

Jp-10007) — 🖬	
Throughp Set		Results-F	
Glo		Per Str	
	te Stream Alarms	Summary Delay	Events Errors
Frame Type		Doidy	
Traffic Type	l	Jni ca st	
Frame Size	128	30-1518B	
	2		1000

Up-1000T F Throughput			✓			
Setu	0	Results-F	Running			
Globa	al	Per Str	ream			
Aggregate	Stream	Summary	Events			
Traffic A	larms	Delay	Errors			
Frm Arriva	al Dela	У				
Current	86.29	86.29 us				
Minimum	86.29	86.29 us				
Maximum	86.30	86.30 us				
Average	86.29	36.29 us				
	Varia	ation				
Current	0.00	us				

9.2.3 Individual Stream Results

In the 'Per Stream' tab the following measurements are available:

- Summary Framed rate, data rate, # of bytes, total # of frames associated with each stream
- Errors Errors associated with each stream
- Events Events associated with each stream
- Traffic Traffic statistics associated with each stream
- Delay Delay associated with each stream
- Rates Rates information associated with each stream

Throughput Results - Summary Stream #1

Jp-1000T F Throughput			<u>S1</u>
Setup		Rest	ults-Running
Global		Pe	er Str <mark>ea</mark> m
Traffic	Ever	nts	Delay
Summary	En	rors	Rates
ST:23:00:08		ET:0	0:20:31
	Тx		Rx
Framed Rate	: 394	1.80M	123.37M
Data Rate	382	.84M	0.00K
Utilization	40.0	0%	12.50%
Total Frames	s <mark>394</mark>	1294	2 12326526
Bad Frames	0		24652879

Throughput Results - Summary Stream #2

Up-1000T F Throughput		ſ	₩		S 2 🗸
Setup			Res	uli	ts-Running
Global			P	er	Stream
Traffic	E	Ever	nts		Delay
Summary		En	rors		Rates
ST:23:00:08			ET:0	0:	21:00
		Тх			Rx
Framed Rate	5	153	.66M		0.00K
Data Rate		149.00M			0.00K
Utilization		15.57%			0.00%
Total Frame	s	157	0732	0	0
Bad Frames		0			0

Go back to top

The Per Stream 'Errors' screen displays the Current and Total error count of each stream:

- Bits
- BER

- Frame Loss
- Frame Loss %
- FCS/CRC
- Out of Sequence (OOS) frames
- IP Checksum
- Jabber Frames
- Runt Frames
- Giant Frames

Throughput Results - Errors (Page Throughput Results - Errors (Page Throughput Results - Errors (Page

	1)				2)				3)	
Up-1000T F Throughput	🕒 🤘 🕐	S 1 - V		Jp-1000T F Throughput	•••			Jp-1000T F Throughput	0) 🧏 🗖	S 1
Setup	Result	s-Running		Setup	Re	sults	s-Running	Setup		Resul	ts-Running
Global	Per	Stream		Global		Per	Stream	Global		Per	Stream
Traffic E	Events	Delay	Γ	Traffic E	Events		Delay	Traffic	Ever	nts	Delay
Summary	Errors	Rates		Summary	Errors		Rates	Summary	Eri	rors	Rates
	Current	Total			Current	:	Total		Cur	rrent	Total
Bits	N/A	N/A		OOS/IPR(%)	0.00E+I	00	0.00E+00	Jabber Fram	0		0
BER	N/A	N/A		IP Checksum	10159		13108604	Runt Frames	0		0
Frame Loss	0	0		IP chks(%)	1.00E+	02	1.00E+02				
Frameloss(%	0.00E+00	0.00E+00		top/udp_chks_	10159		13108789				
FCS/CRC	0	0									
FCS/CRC(%)	0.00E+00	0.00E+00									
OOS/IPR	0	0									
₽	age 1 of 3	۲		o P:	age 2 of	fЗ	٠	<u> </u>	age	3 of 3	۲

Go back to top

The Per Stream 'Events' screen displays a Date and Time stamped record of bit errors, alarms and other anomalies pertaining to each stream.

The Per Stream 'Delay' screen displays the frame delay information pertaining to each stream.

Throughput Results - Events per Stream

Up-1000T F Throughput	(•		\$ 1	✓		
Setup		Res	ult	s-Ru	nning		
Global		P	er	Strea	am		
Summary	Eri	rors		Ra	ates		
Traffic	Ever	nts		De	lay		
time	Even	its		TE	ST		
23:22:41	UDP	Chk	En	· 10	159		
23:22:41	IP Cł	nk Eri	r	10	158		
23:22:40	UDP	Chk	En	· 10	159		
23:22:40	IP Cł	nk Eri	r	10	159		
23:22:39	UDP	Chk	En	· 10	159		
23:22:39	IP Cł	IP Chk Err 10			158		
23:22:38	UDP	UDP Chk Err 10160					
💿 Pa	age 1	of 143	O Page 1 of 147 O				

Throughput Results - Delay per Stream

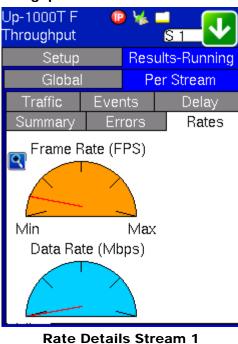
51				•	
Up-1000T F Throughput	0) 🦗	- S	1	↓
Setup		Res	ults	-Rur	ning
Global		P	er S	Strea	m
Summary	Eri	rors		Ra	tes
Traffic	Ever	nts		Del	ay
Frm Arrival	Delay	y –			
Current	86.29	9 us			
Minimum	86.29	9 us			
Maximum	86.30)us			
Average	86.29	9 us			
	∀aria	ation			
Current	0.00				
Round trip	Delay	y 🗌			
Current	13.10	3 us			

The Per Stream 'Traffic' screen displays the frame type summary (graphical), frame type (tabular) and frame size distribution pertaining to each stream.

Throughput Results Traffic Overview per Stream		ughput Results Types per Stre		Throughput Results Frame size per Stream			
Up-1000T F 🛛 😰 🤘 🗖 🔤 🚺	Up-1000T F Throughput	🕞 🧏 🖬 ST		Up-1000T F 🧧 🧕	S - V		
Setup Results-Running	Traffic I	Distribution Deta	ails	Traffic Distrit	oution Details		
Global Per Stream	Frames	Frame	Size	Frames	Frame Size		
Summary Errors Rates	Rx Frames	#	%	Distribution #	%		
Traffic Events Delay	Total	14216150	100	<64B 0	0		
٩	Test	0	0	64-127B O	0		
	VLAN	0	0	128-255B O	0		
Frame Non-Test	Tx Frames	#		256-511B 0	0		
Туре	Total	45459756		512-1023B O	0		
				1024-1279B0	0		
Frame 1280-1518B				1280-1518B 1445	9972 100		
Size				>1518B 0	0		
0% 50% 100 [°] .		OK			K		

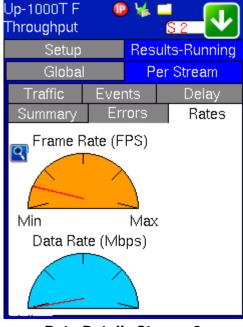
Go back to top

The Per Stream 'Rate' screen displays the frame rate and data rate pertaining to each stream. Tapping the zoom icon displays the rate details applicable to that stream



Throughput Results - Rates Stream 1

Throughput Results - Rates Stream 2



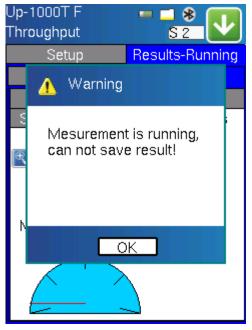
Rate Details Stream 2

Up-1000T F	🛛 🕑 🧏 🛛						
Throughput	ate Details	<u>S1</u>					
Frames/sec	Тх	Rx					
Current	32510	10159					
Minimum	0	0					
Maximum	32510	10160					
Average	32146	10052					
Data Rate (Mb	o∕s Tx	Rx					
Current	382.84	0.00					
Minimum	0.00	0.00					
Maximum	382.84	0.00					
Average	378.55	0.00					
	OK						

Up-1000T F Throughput	0 🤘	S2 🔽			
Ra	ate Details				
Frames/sec	Τx	Rx			
Current	12654	0			
Minimum	0	0			
Maximum	12654	0			
Average	12508	0			
Data Rate (Mb	√s Tx	Rx			
Current	149.01	0.00			
Minimum	0.00	0.00			
Maximum	149.01	0.00			
Average	147.29	0.00			
OK					

9.2.4 Saving Throughput (Multiple Streams) Results

- Only once the test has been stopped, can the results be saved by pressing the save function key on the VePAL keypad
- If the measurement is not stopped, a pop-up message will appear warning the user.
- The test results are saved and named automatically. Once saved, the user may view or rename the results file by going to the Explorer tab located in the Files menu.



Throughput Results - Storage Warning

Stored Throughput Results - File Explorer

Up-1000T F Files	(•	8			
Capacity	Exp	lorer	Transfer			
Name:	Size:	Туре:	Date:			
<u>=</u> 221048	4k	rf c 254	08/21/00			
<u>=</u> 224102	4k	rf c 254	08/21/00			
<u>=</u> 230414	27k	thrpt	08/21/00			
<u>=</u> 230421	27k	thrpt	08/21/00			
<u>-</u> 232738	38k	thrpt	08/21/00			
View Del	Rer	name	U/L Job			
21-Aug-2000 23:43:07						



10.0 Loopback

The Loopback application in the main menu allows the user to establish a manual loopback on the test set. The loopback function is used when an end-to-end test needs to be performed with one of the test partners in software loopback mode. The Loopback function will loopback the incoming traffic to the test set back into the network under test.

The type of traffic that the loopback function loops back will depend on the type of test layer configured; Layer 1, Layer 2, or

Layer 3. Layer 1:

- In Layer 1 loopback, all incoming traffic to the Rx loopback interface will be sent out unaltered to the Tx loopback interface.
- Layer 2 or 3: In a Layer 2 or 3 loopback all incoming test traffic will be looped back.
 - The loopback function will swap the MAC destination and MAC Source addresses (for Layer 2) or MAC and IP destination and source addresses (for Layer 3).
 - All incoming frames with CRC errors will be dropped; similar to what an Ethernet switch does.
 - All broadcast and multicast frames will be dropped including any incoming unicast frames that have the MAC Source address equal to the MAC Destination address

Go back to top

11.0 SyncE

11.1 SyncE Setup



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11.1.1 Port (Test Port selection)

Prior to starting the SyncE operation, the selected test port must be connected to a network that supports SyncE timing synchronization. Port selections include 10/100/1000T and 100/1000BaseX. After setting up the port, establish an IP connection by tapping on the IP tab and going through the IP setup. Please see section <u>6.1 Port Setup</u> for port configuration instructions.

Port Setup

IP Menu

SetupStatusPort Selection10/100/1000T▼Auto-NegOff▼Speed100Mbps▼DuplexFull▼Flow ControlBoth On▼MDIXOn▼	Mode	Port		IP	Sta	tus
Auto-Neg Off ▼ Speed 100Mbps ▼ Duplex Full ▼ Flow Control Both On ▼	Set	tup		S	tatus	
Speed 100Mbps ▼ Duplex Full ▼ Flow Control Both On ▼	Port Sele	ction	1	0/100/1	000T	V
Duplex Full V Flow Control Both On V	Auto-Neg	g	C	Dff		V
Flow Control Both On 🔻	Speed		1	00Mbp	S	V
Ť	Duplex		F	ull		V
MDIX On 🔻	Flow Cor	ntrol	E	Both On		V
•••••	MDIX		C)n		V

Link Down (IP DOWN	D 🧏 💻	\bigotimes
Mode Port	IP	Status
ІР Туре	IPv6	V
IP Address	Static	▼
Local IP	2001::1002	
Gateway	2001::1001	
CIDR	64	
DNS Off 🛛 🔻		
Page 1 of 2		
Cc	onnect	

11.1.2 IP (IP Setup)

IP configuration settings are as follows:

(Page 1)

- IP Type IPv4 or IPv6
- IP Address Static, DHCP (IPv4 only) or AUTO (IPv6 only)
- Static The user is required to enter a Local IP, Gateway address, and Subnet. All Static fields can be filled by tapping on the section to access an alphanumeric keyboard
 - Local IP IPv4/IPv6 address of the test set
 - Gateway IPv4/IPv6 address of the network gateway
 - CIDR (IPv6 only) The user can enter a Classless Inter-domain Routing Network
 - Subnet (IPv4 only) The user can enter a subnet mask
- **DNS** Off, Manual, or Auto. If Manual is selected, a DNS IP is required in order to use the URL as a destination. Enter the IP address of the Domain Name System (DNS) Server providing domain name translation to IP addresses.

	VLAN	(Pag	je 2	2)	
Link Down IP DOWN		IP 🤘	-		\otimes
Mode	Port		IP		Status
VLAN		On			
		ID	0	Pri	0
		Туре	e Ox	8100)
DHCP Opt	ions	All			
Vendor Type					
User Class					
Host Nam	е				
Vendor In	fo				
Page 2 of 2					
	E Co	onne	ct		

IP Status			
Up-100T 192.168.1		0 🦗 🗖	\otimes
Mode	Port	IP	Status
Local IP		192.168.1	.100
Subnet N	1 a sk	255.255.2	:55.0
Gateway		192.168.1	.1
Lease Tii	ne	00:05:00	
Lease Time 00:05:00 DHCP: PASS IP: PASS Gateway: PASS			
	Disc	onnect	

(Page 2)

- VLAN Off/On. For each VLAN tag, enter the following:
 - ID VLAN ID. Enter value 0 to 4095.
 - Pri VLAN priority 0 to 7.
 - Type Set to 8100. Indicates 802.1q tag type.
- DHCP Options DHCP options can be edited. Off, All, Vendor Type, User Class, Host Name, and Vendor Info. Note: DHCP Options are only available under AUTO or DHCP.

Go back to top

11.1.3 Mode (SyncE test mode)

SyncE Master-Emulation Mode

Link Dowi Setup	n 😣 🕼) 🧏 🗖	✓
Mode	Port	IP	Status
	Mode	Master-E	imulat 🔻
	k Source		•
Clock I	nput Port	RX2-Unb	al 🔻
Re	ference C		but
	Port	TX1-Bal	•
		2Mbps	•
	ine Code		•
	Framing		•
PRB:	S Pattern	2^23-1	•
	Invert		
	St	art 🛛	

Link Dowi Setup	י 😣 🕼) 🦗 💻	. ↓
Mode	Port	IP	Status
Mode Slave-Emulatio 🔻			nulatio 🔻
Re	f <mark>erence</mark> C	lock Outp	but
Port TX1-Bal			▼
	Rate	1.5Mbps	•
L	ine Code	AMI	▼
DS1 Framing		ESF	▼
PRBS Pattern		2^23-1	•
	Invert		
	St	tart	

SyncE Slave-Emulation Mode

The Mode setup parameters are as follows:

- **Mode**: There are four test modes available: Master Emulation, Slave Emulation, Master Sync, and Slave Sync.
 - Master Emulation emulates a SyncE Master clock device. Reference clock used on the SyncE link can be made available for other network elements out of the PDH TX port at a different frequency but synchronized to the reference clock The clock can be regenerated out of the PDH TX port with a different clock format and is synchronized. The clock can be formatted to: 2Mbps (E1 signal), 2.048MHz, 1.544Mbps (T1 signal), 1.544MHz, 10MHz, 25MHz, and 125MHz.
 - **Slave Emulation** emulates a SyncE Slave clock device. Recovered clock can be regenerated out of the PDH TX port with a different clock format and is synchronized. The clock can be formatted to: 2Mbps (E1 signal), 2.048MHz, 1.544Mbps (T1 signal), 1.544MHz, 10MHz, 25MHz, and 125MHz.

Master Sync Mode

Slave Sync Mode

nk Down 😢 😼 🗖 🚺	Link Down Setup	8 🕫 🤘
Mode Port IP Status	Mode	Port IP Sta
Mode Master-Sync 🔻		Mode Slave-Sync
Clock Source GPS 🛛 🔍 🔻		
Clock Input Port RX2-Unbal		
Start		Start

- **Master Sync** Reference clock to be used on the SyncE link can be used for Ethernet and PDH testing simultaneously while the clocks are synchronized.
- **Slave Sync** Clock recovered from the SyncE link can be used for Ethernet and PDH testing simultaneously while the clocks are synchronized.
- **Note:** In Sync mode, the PDH TX port is used for BERT testing, therefore, reference clock output is not available. The main application of the Sync mode is test whether the PDH network and Ethernet network are properly synchronized.
- Clock Source Select between an internal or external clock source. Possible external clock sources can be: 2 MHz, 2 Mbps (E1 signal), 10MHz, 25MHz, 125MHz or GPS (1 pps).
- Clock Input Port If a non-internal clock source is chosen, the external reference clock is connected through the Aux Rx port
- Reference Clock Output
 - Port Tx1 Unbalanced or Tx1 Balanced
 - Rate Signal rate to transmit to slave clock. Options include: 2 Mbps, 10 MHz, 25 MHz, 125 MHz, or None
 - Line Code HDB3 or AMI
 - E1 Framing Unframed, PCM31, PCM31C, PCM30, or PCM30C
 - PRBS Pattern
 - Invert

Press Start to start the connection.

Indicator Symbols - M and SyncE

Up-100T) 🖌 🗖	
192.168.1	.101 🔣	SyncE	
Mode	Port	IP	Status
	Mode	Master-	Sync 🔻
	k Source		V
– Clock I	nput Port	RX2-Un	bal 🔻
	0	top	
		top	

Indicator Symbols

An M or S indicates that the test set is in Master or Slave Mode. A green SyncE icon indicates that the SyncE test is running and a green 1588 icon indicates that the 1588 test is running. If the icon is flashing or solid red, there may be an issue with setup and the test will not work.

Go back to top

11.2 Clock Measurement

Clock Me	asur	ement Re	sults
Up-100T F Clock Meas	(F) 🤸 🗖 SyncE	\otimes
	Set	tup	
	Src	2Mbps	V

Resul	ts
Offset (ppm)	-19.1
Min (ppm)	-19.4
Max (ppm)	-18.6

Stop	Stop
------	------

Note: Clock and Wander measurements are only available in slave mode.

Src - Select the source of the reference clock used for the wander measurement. Possible external clock sources can be: 2 MHz, 2 Mbps (E1 signal), 10MHz, 25MHz, 125MHz or GPS.

Press Start to start the test. Offset, Min, and Max clock measurement offset results are displayed in ppm.

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11.3 Wander Measurements Setup

- **Reference Clock** Select between an internal or external clock source. Possible external clock sources can be: 2 MHz, 2 Mbps (E1 signal), 10MHz, 25MHz, 125MHz or GPS (1 pps).
- Save TIE to USB OFF/ON. Insert a USB and select ON to save test results to USB for further analysis of MTIE/TDEV
 with wander analysis PC software provided by VeEX. The USB memory stick must be inserted to the USB port before
 turning on this option.

Press Start to initiate the test. Current, Max, Min and MTIE results are displayed in nanoseconds.

Wander Measurement Setup and Results

Up-100T F Wander Mea	15 🔄 Synce 🛛 🐼
	Results
ET:	00/00:01:52
Current TIE	2025440 ns
Max +TIE	2025440 ns
Min -TIE	0 ns
MTIE	2025440 ns
	Catura

Setup				
Reference Clock	2Mbps	◄		
Save TIE to USB	OFF	◄		

Go back to top

12.0 1588v2/PTP

12.1 Setup



Setup - Master-sync					
Up-100T	F (ſ) 🤘 🗖	6	
Setup				<u> </u>	>
Mode	Port		IP	Stati	JS
Setu	o 🛛		Ref. Clo	ock	
Clock Mi	ode	ł	vlaster-sy	/nc 🍸	▼
Protocol	Mode	I	Pv4 UDP		▼
Master (Clock ID	C	001863fffe007fc0		
Slave Clock ID		C	001863fffe00006f		
Sync Rat	te	3	32 pkts/se	ec - 1	▼
Announce Int.		ľ	1.0 sec 🛛 🔻 🔻		
Domain I	Vumber	C)		▼
Start					
		3	lart		

Setup - Slave-emulation				
Up-100T F 👘 🤇 🌔	P 🤸 🗖			
Setup		- 📀		
Mode Port	IP	Status		
Setup	Ref. Clo	ock		
Clock Mode	Slave-emu	ulatio 🔻		
Protocol Mode	IPv4 UDP	▼		
Transfer Mode	IPv4 Unicast 🛛 🔻			
Master Address	192.168.0.10			
Master Clock ID	001863fffe007fc0			
Slave Clock ID	001863fff e 00006f			
Sync Rate	32 pkts/sec 🛛 🔻			
Announce Int.	1.0 sec 🛛 🔻 🔻			
Lease Duration	300 sec			
Domain Number 0				
Start				

Before proceeding with any tests, please configure the Port and IP connection. Refer to 11.0 SyncE <u>Port</u> and <u>IP</u> sections for further configuration instructions, then continue to Mode Setup. **Reference Clock** configuration instructions can be found in the 11.1.3 SyncE <u>Mode</u> Setup section. Prior to starting the 1588v2 operation, the selected test port must be connected to the network.

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12.1.1 Mode (Test Mode)

- Clock Mode Master-emulation, Master-sync, Slave-emulation and Slave-sync. Please refer to <u>SyncE Mode Setup</u> in 11.0 SyncE for further information on these clock mode types.
- Protocol Mode IPv4 UDP, IPv6 UDP or Layer 2
- Master clock ID this is the MAC address of the TX130M+ in Master sync/emulation mode. The format of the ID is MAC's first 3 byte -- FF -- FE -- last 3 byte. The MAC address can be manually changed in Tool > IP menu.
- Slave clock ID same as above. Note, the clock IDs will be populated once the 1588v2 is synchronized. The TX130M+ in master clock mode supports ONE slave clock only.
- Sync Rate (master or unicast only) The sync packet sending rate for the Master clock.
- Announce Int Interval of the announcement message to be sent by the master clock. Options are 1, 2, 4, 8, and 16 seconds.
- **Domain Number** Enable/Disable. Enabling this feature allows the user to assign a domain number to a slave-master network. The domain number limit is 255.

Slave-emulation and Slave-sync only options

- **Transfer Mode** Select between Unicast or Multicast mode of the Master Clock. If Unicast is selected, Master Clock's IP address needs to be entered. Master Clock ID and Slave Clock ID are automatically populated once 1588v2 is synchronized between the master and slave clock devices.
- Master Address (unicast only) Tap on the field and use the soft-keyboard to enter the master address.
- Lease duration Set to 300 sec by default

Test Results - Summary

Test Results - Summary - Details

Up-100T F 🛛 🔞 Test Results 🛛 💽		X
Summary Mess	sages Resu	lts
Total messages	4379	
Event message	2174	
General message	2205	
CRC error		
Lost		
Duplicated		
Out Of Ordered		
Un-identified		

Up-100T F 💿 🤸 🗖 Test Results 🕞 🛯 5887	3
Summer Massages Desult	3
To 🕜 Lost	
EV Sync:0 GeDelay_Req:0	Н
CHPDelay_Req:0	Η
Lo Pdelay_Resp:0 Du Follow_UP:0	
Delay Respill	
OuPdelay_Resp_FollowUP:0 Un Announce:0	•••
Signaling:0 Management:0	
ОК	
	-

Note: Tap on the "..." next to the Lost, Duplicated, or Out of Ordered to view detailed error counters.

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12.2 Test Results

The **Summary** screen displays message statistics including the number of **Total messages**, **Event messages**, and **General messages** along with information on **Lost**, **Duplicated** and **Out of Ordered** messages. Tap on the "..." tab to see more detailed message error information. Additional message information is displayed on the **Messages** screen.

Tap on the **Results** tab to access histogram and **PDV**, **RTD** and **IPG** statistics. Tap on the **NEXT** tab to view additional Data statistics. Pressing the "-t" or"+t" respectively decreases or increases the time frame on the histogram, as shown in the PDV Test Result screens below.

PDV - Delay Request, Asymmetry, and Sync PDV min and max information.

RTD - RTD and Delay Response RTD min and max information.

IPG - Sync and Delay Response IPG min and max information.

Test Results - Summary

PDV Test Results (0-3:20)

PDV Test Results (3:21-6:41)

		Up-100T F Test Results	P 🖌 🗉		Up-100T F Test Results	P 🖌 🗖 5 S 1588	
Summary Mess	s <mark>ages</mark> Results	Summary	Messages	Results	Summary	Messages	Results
Announce	97	PDV	RTD	IPG	PDV	RTD	IPG
Sync	97	Sync PDV	99	ns	Sync PDV	42	ns
FollowUp	97	Sync PDV r	nin O I	าร	Sync PDV (min 0 r	าร
Delay_Resp	92	Sync PDV r	n a x 21	.542 us	Sync PDV (max 21	.542 us
Pdelay_Req		1000 ns			1000 ns		
Signalling							
Delay_Req	92						
Pdelay_Resp		U V.I	n.h				
Pdelay_Resp_Foll		1 \\	Mante .	A			
Management			T With Al t				
			· · · · · · · · · · · · · · · · · · ·	WVTWWI	MMA		
		00:00:00		00:03:20	00:03:21		00:06:41
		-t	+t	NEXT	-t	+t	NEXT

RTD Test Results

Up-100T F	🕞 🕑 🤘		
Test Results	S 158	8	
Summary	Message	s	Results
PDV	RTD		IPG
Delay_Resp	RTD	9.3	334 ms
Delay_Resp			
Delay_Resp	RTD max	61	.904 ms
100 ms			
What	}		
100	Ŷ		
00:03:21			00:06:41
-t	+t		NEXT

Go back to top

12.3 Protocol Monitor

The Tracer shows the 1588v2 messages from both Master and Slave clock devices. The TX130M+ stores up to 2000 messages. There are 4 function keys:

- Pause/Continue to pause or continue the tracer.
- -> & <- in Pause mode, use the key to page up or page down.
- End in Pause mode, use End key to jump to the end of the trace.

To view decoded messages, press **Pause** to pause the protocol tracer and tap on the desired message to view decoded message details.

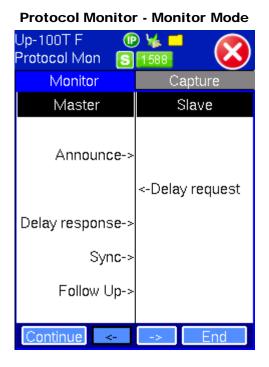
Tap on the Capture tab then hit **Start** to capture packets. The Capture function can store up to 20,000 messages. The messages are saved in pcap format and can be viewed on wire shark for future analysis.

For Clock and Wander Measurement Results, please refer to <u>11.2 Clock Measurements (SyncE</u>) and <u>11.3 Wander</u>

IPG Test Results

Up-100T F Test Results	(P) 🖌 S 158		8
Summary	Message	s	Results
PDV	RTD		IPG
Sync IPG		36	6.726 ms
Sync IPG m		84	13.008 us
Sync IPG m	ax	20	10.964 ms
100 ms			00:06:41
-t	+t		NEXT

Measurements Setup.



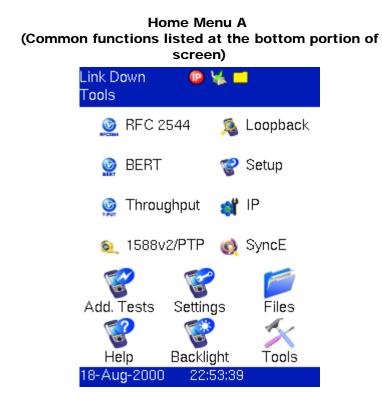
Protocol Monitor - Message Details

Up-100T F	- (D 🤸 💶 🛛 🧑		
Protocol N	/lon 🛛 💽] 1588 🛛 🌄		
message]	Гуре	Delay response		
transportS	Specific	0x0		
versionPT	P	0x2		
messagel	ength	54		
domainNumber		0		
flags		0x0		
C Field 0x00000		000000000000		
SRC PID	0x00188	63fff e 00006f0001		
sequenceID		716		
controlField		0x3		
logMsg1nt	erval	0		

Page 1 of 2 Solution

Go back to top

13.0 Common Functions



The following functions, (Chapters 13.1-13.6) are functions common to all V100+ test sets. Please refer to the V100+ Common Functions Manual for these sections. The sections are renumbered in the V100+ Common Functions Manual as follows:

- 13.1 Additional Tests: (5.2) Net Wiz
- 13.2 (6.0) Settings

- 13.3 (7.0) Files
- 13.4 (8.0) Help
- 13.5 (9.0) Backlight
- 13.6 (5.0) Tools

14.0 V-SAM

V-SAM (found under Additional Tests) Link Down Tools

16-Jan-2012 1<u>5:14:35</u>

Note: To access V-SAM, go to Home > Add. Tests > V-SAM.

V-SAM (VeEX Service Activation Methodology) is an automated Ethernet service activation test feature conforming to the ITU-T Y.1564 standard, created to address and solve the deficiencies of RFC 2544:

- RFC2544 was limited to test at the maximum throughput line rate for a single service. SAM is able to run multiple services on a single 10/100/1000 or 10G Ethernet line at a bandwidth ranging from 0 to the line rate, allowing for more realistic stream testing.
- The Frame Delay Variation, also known as (packet) jitter was not included in RFC2544. Jitter is a critical parameter for real time voice and video services. It is now part of the SAM test suite.
- RFC2544 validates the service parameters like frame loss, throughput and latency, one after the other, while SAM allows testing all the service critical parameters simultaneously. This results in significant time saving compared to RFC2544.

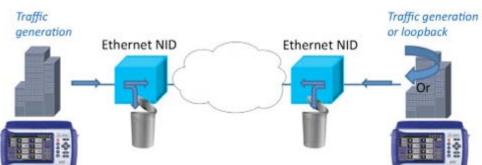
Comparison of RFC2544 and Y.1564

	RFC2544	Y.1564
Key Test Objective	Device performance	Network Service verification/activation
Service validation	One service at a time	Multiple services simultaneously
Throughput	Yes	Yes
Latency	Yes	Yes
Frame Loss	Yes	Yes
Burstability	Yes	Yes
Packet Jitter	No	Yes
Multiple Streams	No	Yes
Test Duration	Long (serialized test procedure)	Short (simultaneous test/service)
Test Result	Link performance limit	Related to SLA, fast, simple, Pass/Fail

Test Methodology

The purpose of the SAM test suite is to verify that the service is compliant to its Bandwidth Profile and Service Acceptance Criteria. The test is broken down into two phases:

- Phase 1: Service Configuration test: The services running on the same line are tested one by one to verify the correct service profile provisioning.
- **Phase 2: Service Performance test**: The services running on the same line are tested simultaneously over an extended period of time, to verify network robustness.



Test Application

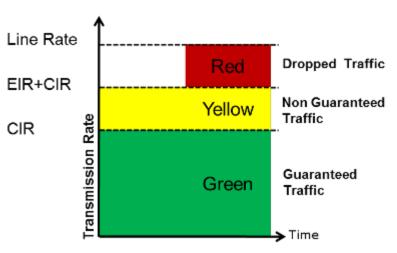
Phase 1: Service Configuration Test

The service configuration test is broken down into three steps. The steps are tested individually for all the services delivered on the same line.

- Step 1: Committed Information Rate (CIR) Test: Traffic is transmitted at the CIR for a short period of time and the received traffic is evaluated against the Service Acceptance Criteria (FLR, FTD, FDV) measured simultaneously. The CIR test passes if the measurements on the received traffic stay below the performance objectives.
- Step 2: Excess Information Rate (EIR) Test: Traffic is transmitted at the CIR+EIR rate for a short period of time; the EIR test passes if the received traffic rate is between the CIR (minus the margin allowed by the FLR) and CIR+EIR.
- Step 3: Traffic Policing (Overshoot Test): The purpose of the Traffic Policing Test is to ensure that when transmitting at a rate higher than the allowed CIR+EIR, the excess traffic will be appropriately blocked to avoid interference with other services. For this test, traffic is transmitted at 25% higher than the CIR+EIR for a short period of time. The test passes if the received traffic rate is at least at the CIR (minus the margin allowed by the FLR) but does not exceed the allowed CIR+EIR.

V-SAM Sorvicos Summary

• At this time the **Committed Burst Size (CBS)** and **Excess Burst Size (EBS)** tests are considered experimental and not an integral part of the standard.



Service Bandwidth Profile

Phase 2: Service Performance Test

V-SAM Sotup (Dago 1)

Services running on the same line are tested simultaneously over an extended period of time, to verify network robustness. Service Acceptance Criteria (SAC) including Frame Transfer Delay (FTD), Frame Delay Variation (FDV), Frame Loss Ratio (FLR) and Availability (AVAIL) are verified for each service.

V-SAM Setup (Page 1)		Step Load Test		V-SAM Services Summary			
Link Down 🛛 😰 🗕 V-SAM	- 🗸	Link Down 🛛 🕼 V-SAM	🕹	Link Dowr V-SAM			✓
Setup Results		Setup Results		Summary Bandwidth per Service			
General Service	es Control	General Serv	vices Control	Service#		EIR	Traffic
Profile	Save 🔻	CIR Test Config.	Simple and 🛛 💙		(Mbps)	(Mbps)	Policing
# of Services	8 🔻	Step 1 (% of CIR)	25	☑ 1	1.000	0.000	Yes
Configuration Test	Enable 🔻	Step 2 (% of CIR)	50	2 2	1.000	0.000	Yes
Config. Test Step	10 seconds	Step 3 (% of CIR)	75	⊠ 3	1.000	0.000	Yes
Performance Test	Enable V		100	☑ 4	1.000	0.000	Yes
Perf. Test Duration	· · ·			☑ 5	1.000	0.000	Yes
Fen. Test Duration	15-min 🔻			☑ 6	1.000	0.000	Yes
				☑ 7	1.000	0.000	Yes
		Step Load Test is only performed if		☑ 8	1.000	0.000	Yes
		the Simple Validation test fails.		Total IR(CIR+EIR):8.00Mbps(8.11M bps ULR)			
O Page 1 c	of 2 💿	 Page 	2 of 2 💿		C	К	

V-SAM Setup (Page 2) - Simple and Step Load Test

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14.1 V-SAM Setup

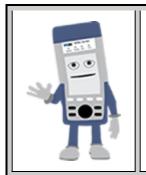
General (Page 1)

- Profile Default, Save, Save as New
- # of Services Select the number of services to run. Up to 8 services can be chosen for a 1 GE interface and up to 10 services can be chosen for a 10 GE interface.
- Configuration Test Enable or Disable the configuration test.
- Configuration Test Step Specify min and max duration for the configuration test step.
- Performance Test Enable or Disable the performance test.

Perf. Test Duration - Selections are 15 min, 30 min, 1 hour 2 hours, 24 hours, and user defined. User defined enables the user to specify min and max duration for the performance test.

General (Page 2)

- CIR Test Config. Select Simple Test, Step Load Test, or Simple and Step.
 - Simple Test Starts the tests at the CIR.
 - Step Load Test Starts the test below the CIR and continues in steps until it reaches the CIR.
 - Simple and Step Load Test Step Load Test performs only if the Simple Validation test fails.
- Step # Tap on the corresponding box to enter the percentage of CIR that the test will reach for each step.



V-SAM Services Summary

Once setup parameters are completed, tapping the zoom function at the bottom right hand side of the screen displays a summary of all service settings. A check next to the Service number indicates that the test for the corresponding service is set to run. Tap on the box to remove the check and cancel the test for that service.

V-SAM Services - Header - Selecting a Stream

Up-1000T F V-SAM	🕑 🦌 🗖	
Stream	#	oulto otrol
Ger He:		S 1 ^{htrol} S 1 sholds
Serv		S 2
TES Frame Type	Ethernet II	S3 ▼ (Xוס)
VLAN	Off	V
MAC	Data	C.D.C.L
MAC	Data	CRC
	Сору	٩

Go back to top

14.1.1 Header Settings

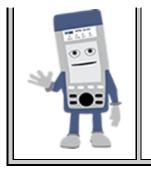
Please see <u>8.1 RFC 2544 Setup</u> and follow the setup procedure to configure the Header Settings for V-SAM. Tapping the zoom function on the bottom right hand side of the screen displays the Summary, MAC and RX Filter tabs which are also explained in the RFC 2544 Setup section. The user can assign a name to each stream by tapping on the **Service Name** box and entering a name.

Selecting a Stream

On the Services tab, tap on the stream number (S #) next to the Action Menu icon to select a service to configure.

V-SAM Header Configuration

Up-1000T F) 🤸 🛛					
V-SAM			S 2				
Header Configuration							
UDP	RX Filter						
Summary	- M/	AC 👘		P			
MAC Source:00-18-63-43-01-02 MAC Dest.:00-18-63-00-8F-1A Ethernet Type:0800-IP IP TOS:Precedence=000-Routine, Values=0000-Normal Service, etc. IP TTL:128 Fragment Offset=0 Q Page 1 of 2 Q							
	0	K					



V-SAM Services - Bandwidth

Up-1000T F V-SAM	. @	0 🦌 🛛	S2	
Setup			Results	
General	Serv	/ices	Control	
Header	Band	dwidth	Thresholds	
Frame Size	Fixe	ed	▼	
Frame Size	151	8		
CIR	1.00)	IR Mbps 🔻	
EIR	0.00)	IR Mbps▼	
Traf. Policing	Ena	able	▼	
CBS	20K	В	Disable 🔻	
EBS	20K	В	Disable 🔻	
Color Mode	Dis	able	▼	
	C	ору		

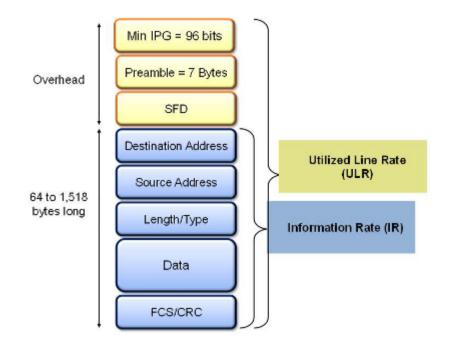
Go back to top

14.1.2 Bandwidth Profile

The Bandwidth Profile specifies how much traffic the customer is authorized to transmit and how the frames are prioritized within the network. Under the Bandwidth tab, the user specifies the following bandwidth criteria:

- Frame Size Input a fixed frame size within the range of 64-10000 bytes.
- **CIR** Committed Information Rate. This is the guaranteed maximum rate at which the customer can send frames that are assured to be forwarded through the network without being dropped. Tap on the box to enter a rate and choose between **IR Mbps** or **ULR Mbps**. Allowed values range from 0.01Mbps to the line bandwidth.
 - Information Rate (IR) Measures the average Ethernet frame rate starting at the MAC address field and ending at the CRC.
 - Utilized Line Rate (ULR) Measures the average Ethernet frame rate starting with the overhead and ending at the CRC.

V-SAM Services - Header



- Excess Information Rate (EIR) Maximum rate above the CIR at which the customer can send frames that will be forwarded on a best effort basis, but may be dropped in the event of congestion within the network. The combined CIR and EIR must not exceed the line bandwidth. Traffic beyond CIR + EIR will be dropped when it enters the carrier's network. Tap on the box to enter a rate. EIR is expressed in terms IR Mbps or ULR Mbps. Select a term to express EIR or select Disable to disable the test.
- **Traf. Policing** Enable or Disable the traffic policing test. For this test, traffic is transmitted at 25% higher than the CIR+EIR. The Policing test fails if the higher traffic rate is allowed through the network.
- CBS, EBS, and color mode are currently not supported with this release.

Up-1000T F V-SAM	. 🕑 🤸 🗖	S 2
Setup	F	Results
General	Services	Control
Header	Bandwidth	Thresholds
FLR	0.1	% 🔻
FTD	10.000	ms 🔻
IFDV	1.000	ms 🔻
AVAIL	99.900	% 🔻
	Сору	

Between Services

Copying Frame Configurations

V-SAM Services - Thresholds

Go back to top

14.1.3 Thresholds

The user establishes Pass/Fail test criteria for the following Service Acceptance Criteria. Values define the minimum requirements to ensure that the service meets the Service Level Agreement (SLA):

• FLR - Ratio of lost frames to the total transmitted frames.

FTD - Measures the transfer time that the frames can take to travel from source to destination. Values are measured in us, ms, or sec. Input a value within the digital range of .001-999 and 1 us-999sec. The user can also choose to Disable the FTD threshold evaluation. FTD will be measured regardless, but the value will not contribute toward passing or failing the service.

- IFDV Measures the frame jitter.
- AVAIL Minimum percentage of service availability allowed to still be compliant with the SLA. The service becomes unavailable if more than 50% of the frames are errored or missing in a one second interval. Availability is only guaranteed for traffic conforming to the CIR. Enter a percentage from 0-100. The user can also choose to **Disable** the AVAIL threshold evaluation. AVAIL will be measured regardless, but the value will not contribute toward passing or failing the service.



Copying Services

Tap on the **Copy** button on the bottom of any of the **Services** tabs (Header, Bandwidth, Threshold) to copy frame parameters specific to that tab to other services. For example, pressing Copy on the Header tab will only transfer header parameters to other services.

Control Settings

Please see 7.1.4 Control Settings for information on setting up a remote connection with another unit. Note that Asymmetric Mode, mentioned in that section, is unavailable for V-SAM Control settings.

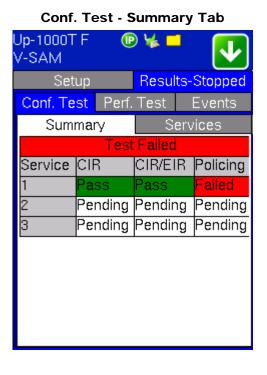
Go back to top

14.2 Results

Configuration Test

Note: To run the test, make sure that traffic is being looped back at the far end of the network under test.

The **Summary** tab displays the status of each service and test as **Pass**, **Failed**, **Pending**, or **Disabled**. Tapping on Services displays live values for FLR, FTD, and FDV as the test is running. If any measured values do not meet the service test parameters set in the Bandwidth and Threshold tabs, the test fails. The zoom function on the bottom right side of the screen displays detailed results for each stream.

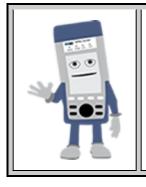


Conf. Test - Services Tab						
Up-1000T V-SAM	F 🕕) 🤸 <mark></mark> S				
Setu	ιp	Results-Stopped				
Conf. Tes	st Perf.	Test	Events			
Sumn	nary	Serv	vices			
Se	rvice#1	Failed				
	CIR	CIR/EIR	Policing			
Status	Pass	Pass	Failed			
Duration	40s ec	10sec	10s ec			
IR Mbps	99.996	129.998	137.494			
FLR(%)	0.0	0.0	0.0			
FTD(ms)	0.006	0.006	0.006			
FDV(ms)	0.000	0.000	0.000			
			٩			

S1 Detailed Results - CIR Test S1 Detailed Results - CIR/EIR Test

S1 Detailed Results - Policing Test

Up-1000T F P S C C C C C C C C C C C C C C C C C C	Up-1000T F P S C C C C C C C C C C C C C C C C C C	Up-1000T F P V-SAM S1
CIR Test CIR/EIR Test Policing Step 1 Step 2 Step 3 Step 4	CIR Test CIR/EIR Test Policing Total	CIR Test CIR/EIR Test Policing Total
Step1 CIR Test: Pass ET:00:00:40	CIR/EIR Test: Pass ET:00:00:10	Policing Test: Failed ET:00:00:10
Min Mean Max IR Mbps 24.992 24.993 24.993 FTD(ms) 0.006 0.006 0.006 FDV ms 0.000 0.001 0.001 FL Count 0 FLR(%) 0.0	Min Mean Max IR Mbps 129.995 129.998 130.004 FTD(ms) 0.006 0.006 0.006 FDV ms 0.000 0.001 FL Count 0 FLR(%) 0.0	Min Mean Max IR Mbps 137.490 137.494 137.502 FTD(ms) 0.006 0.006 0.006 FDV ms 0.000 0.001 0.001 FL Count 0 0.00 FLR(%) 0.00 TX Rate(Mbps) 137.494 137.494 0.00
OK	OK	OK



Viewing Test Results on Different Streams

On the Services tab of **Conf. Test** and **Perf. Test**, tap on the service number (S #) next to the Action Menu icon to view the test results for a specific stream.

CIR test: The test passes if all measured values are below the thresholds configured. If a threshold is disabled, it will not be evaluated towards pass/fail criteria.

CIR/EIR test: The test passes if the received IR value is between the CIR (minus the margin allowed by the FLR) and CIR+EIR.

Policing test: The test passes if the received traffic rate is at least at the CIR (minus the margin allowed by the FLR) but does not exceed the allowed CIR+EIR.

CIR, CIR/EIR Test, and Policing tabs display min, mean, and max values for IR Mbps, FTD, FDV, FL Count, and FLR (%). If Step Load was selected for the CIR Test, these values will be displayed for each step.

Performance Test

The **Summary** tab displays the status of each service and test as Pass, Failed, or Pending. Tapping on **Services** displays live values for the following parameters as the test is running:

Page 1

- **IR Mbps** Information Rate. Measures the average Ethernet frame rate starting at the MAC address field and ending at the CRC.
- FTD Measures the transfer time that the frames can take to travel from source to destination.
- FDV Measures the frame jitter.
- FL Count Counts the number of lost frames.

FLR - Ratio of lost frames to the total transmitted frames.

• AVAIL - Minimum percentage of service availability allowed to still be compliant with the SLA. The service becomes unavailable if more than 50% of the frames are errored or missing in a one second interval. Availability is only guaranteed for traffic conforming to the CIR.

Page 2

- Severely Errored Sec (SES) Occurs for a block of frames over a one-second interval, when more than 50% of the frames are errored or missing.
- **Unavailable Sec** An interval of time that begins at the start of 10 consecutive SES occurrences. The ethernet network is in unavailable state during this time span.
- Total RX Frames Total number of frames received
- number of Out of Sequence Counts
- Errored Frame Count Number of frames with CRC or IP Checksum errors

Measured values that do not meet the service test parameters set in the Bandwidth and Threshold tabs cause the test to fail.

Perf. Test	- Summa	ary	Perf. Te	st - Sei	rvices (I	Page 1)	Perf. To	est - Ser	vices	(Page 2)
Up-1000T F (V-SAM	D 🧏 🗖	✓	Up-1000T F V-SAM	- () 🤸 <mark>-</mark> S		Link Down V-SAM) 🤸 드 (S 1 🕹
Setup	Results	-Stopped	Setu	p	Results	-Stopped	Seti	up	R	esults
Conf. Test Per	f. Test 👘	Events	Conf. Test	t Perf.	Test	Events	Conf. Tes	st Perf.	Test	Events
Summary	Ser	vices	Summ	ary	Ser	vices	Sumr	nary	Se	ervices
ET:00:00:00 Service Status	Pendin IR Mbps	i g s AVAIL		iance T T:00:00	est: Peni :00	ding		m <mark>ance</mark> Te ET:00:00:		nding
1 Pending	0.000	100.000		√lin	Mean	Max	Severely		Sec	
2 Pending	J 0.000	100.000	IR Mbps				Unavaila			
3 Pending	0.000	100.000	FTD(ms) FDV ms FL Count				Total RX Out of Se Errored F	eq Count	unt	
			FLR(%) AVAILAE	· · ·	6) 1 of 2	0	0	Page		۲

Events

A time stamped record or log of test types and test statuses (start/stop).

Events

Up-1000T F V-SAM	œ) 🤘 🗖	•
Setup		Resul	ts-Stopped
Conf. Test	Perf.	Test	Events
time	Event	S.	TEST
16:59:00	Test	Started	V-SAM
17:00:16	Test	Stoppe	d V-SAM
O P	age 1	of 1	٥

15.0 Menu B - PDH/Dsn Setup

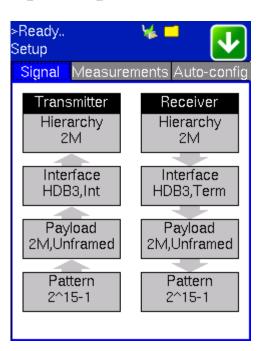
PDH/DSn Home Menu						
>Sto Hon) 1				
I	Setup	0	E1 Tools			
×	Results	0	E3 Tools			
0	Alarm/ Error	\$	DS1/3 Tools			
0	Profiles	*	Add. Tests			
18-7	Aug-2000 2	3:12:	42			

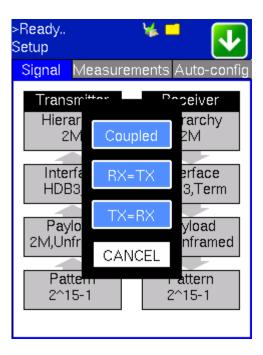
To access the Setup application, tap on the Setup icon. This application allows the user to set up the Transmitter and Receiver interfaces and associated test parameters prior to running a test.

The Setup page has three tabs for setting the PDH, DSn (T-Carrier) parameters. The Signal, Measurements and Auto-Config tabs are described below.

PDH/DSn Signal Setup Menu

Coupling TX and RX





15.1 Signal Overview

The Transmitter and Receiver configurations are grouped into a simple yet intuitive block diagram. The Tx and Rx signal parameters can be modified by tapping the applicable block which brings up a new dialog window displaying additional input and specific selection settings. The transmitter transmits as soon as a valid configuration is entered. The receiver will check for a valid signal on its input so the measurement function is synchronized. When a test is not running, the LEDs will still indicate errors and alarms, but any other results displayed will be the results of a previous test.

When the Tx and Rx signal structures are required to be identical or symmetrical, coupling the Transmitter and Receiver is possible. The signal structure can be copied from Tx to the Rx, or vice versa.

Changes to Setup are applied immediately unless an invalid parameter has been selected.

When the Tx and Rx signal structures need to be independent or asymmetrical, uncoupling the transmitter and receiver is possible.

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15.1.1 Hierarchy

Tapping the Hierarchy box opens the Hierarchy Setup screen. The screen examples shown in this part of the manual depict and describe the settings for 2M or E1 signals. The options for other bit rates and modes are described in text format.

High Rate - In PDH mode, 2Mbit/s, Options are 34Mbit/s and 1.5Mb/s, 45Mbit/s. **Dual** (Rx only) - Dual DS1or E1 Receiver Option ON/OFF; the Receiver 2 set exact same configuration as Receiver 1.

Coupled Hierarchy

≻Ready Setup	¥ <mark>-</mark>	.↓
H	Hierarchy	
	R ate 2M	V
[Dual OFF	V



15.1.2 Interface

Tap the Interface box to access this feature. Interface allows the user to select clock source. Offset options are also configured in this screen.

Coupled Interface - External >Ready.. Setup Interface Line Code HDB3 ▼ Clock Src External ▼ Clock Port Unbal RX2 ▼ Clock External 2Mbit/s ▼ Aux Line Code HDB3 ▼ Termination Bridge ▼ Balanced



Line Code:

- In E1 mode, the line code options default to HDB3 or AMI. Normal E1 systems use HDB3 line coding while AMI is
 reserved for special applications.
- In E3 mode, the line code defaults to HDB3 only
- In DS1 mode, the line code options default to B3ZS or AMI
- In DS3 mode, the line code is B3ZS, AMI

Clock Source (Tx only): Can be configured as follows:

• Internal - The clock for the transmitter is derived from the internal clock. The internal clock has an accuracy of +/- 3.5ppm conforming to G.812 recommendations.

- External
 - **Clock Port** Unbalanced RX2 selected as default.
 - Clock External
 - Aux Line Code HDB3, B8ZS, or AMI
- **Rx** The clock for the transmitter is derived from the received signal and the jitter of the incoming signal is suppressed.
- Offset
 - Clock Offset With the Clock Offset box checked, a custom deviation value of +/- 50ppm can be entered

Termination (Rx only): The sensitivity of the receiver can be set for ITU-T/ANSI, Protected Monitoring Points (PMP) or High Impedance connections. The options under the Termination menu are

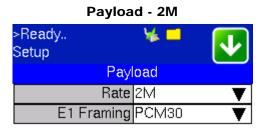
- **Terminated** The received signal is terminated with a 100ohm impedance enabling the unit to decode the signal over a wide range of cable losses.
- **Monitor** To be used when the measurement is made at a Protected Monitoring Point (PMP) of network equipment. The PMP level can range between -20 and -26dB. The TX130M+ is fully compliant with ITU-T G.772 and relevant sections defining PMP.
- **Bridge** Select this mode for a high impedance monitor test or when the receiver is connected directly in parallel to a DS1 line carrying live traffic. The isolation circuit of the unit protects the DS1 signal from any possible disruption.

Balanced (Tx only): Check when using the RJ-45 connectors. The transmitter output impedance will be set to 120 ohms. The Primary test port is "1" on top panel. If unchecked, the unit will assume that testing is taking place on the 75ohm unbalanced BNC TX connector for E1 mode.

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15.1.3 Payload

Tap the payload box to access this feature. Payload allows the user to configure a low rate signal (if applicable) and associated framing.





Rate:

In 2M mode, the options are 2M or Fractional E1 (N x64) where:

- 2M: Configures the transmitter for full rate testing at 2,048Mbit/s
- Fractional E1 (N x64): Configures the transmitter for fractional testing using N or M 64kbit/s timeslots. (Contiguous or noncontiguous timeslots)

In E3 (34Mbit/s) mode, the options are 34M or 2M Mux (E3/E1 Mux) or Fractional E1 (Nx64) Mux where:

• 34 M: Configures the transmitter for full rate testing at 34Mbit/s

- 2 M (E3/E1 Mux): Configures the transmitter for full rate testing at 34Mbit/s signal with E1 payloads (1 to 16 channels)
- Fractional E1 (E3/E1Mux w/Nx64): Configures the transmitter for full rate testing at 34Mbit/s signal with E1 payloads (1 to 16 channels) for fractional testing using N or M 64kbit/s timeslots. (Contiguous or noncontiguous timeslots)

In DS1 (1.544 Mbit/s) mode, the options are 1.544M or Fractional DS1(Nx64 or Nx56) where;

- 1.544 M: Configures the transmitter for full rate testing at 1.544Mbit/s
- Fractional DS1 (Nx64 or Nx56): Configures the transmitter for fractional testing using N or M 64kbit/s timeslots. (Contiguous or noncontiguous timeslots)

In DS3 (45Mbit/s) mode, the option are 45M or 1.544M (DS3/DS1 Mux) or Nx64 (DS3/DS1 w/Nx64 Mux) where:

- 45 M: Configures the transmitter for full rate testing at 45Mbit/s
- 1.544 M (DS3/DS1 Mux): Configures the transmitter for full rate testing at 45Mbit/s signal with DS1 payloads (1 to 28 channels)
- Fractional DS1 Mux: Configures the transmitter for full rate testing at 45Mbit/s signal with DS1 payloads (1 to 28 channels) for fractional testing using N or M 64kbit/s timeslots. (Contiguous or noncontiguous timeslots)

Framing:

In E1 mode, the options are unframed, PCM31, PCM31C, PCM30, and PCM30C. Framing conforms to G.704 and G.706 recommendations and are briefly described below:

- Unframed: No Frame Alignment Signal (FAS) or Multi Frame Alignment Signal (MFAS) is transmitted
- PCM31: Unit transmits a Frame Alignment Signal (FAS)
- PCM31C: Unit transmits a Frame Alignment Signal (FAS) with CRC-4 bits for error checking
- PCM30: Unit transmits a Frame Alignment Signal (FAS) and a Multi Frame Alignment Signal (MFAS)
- PCM30C: Unit transmits a Frame Alignment Signal (FAS) and a Multi Frame Alignment Signal (MFAS) with CRC-4 bits for error checking

In E3 mode, the options are unframed and G.751 (PCM 480)

In DS1 mode, the options are unframed, D4 (SF) and ANSI T1.107 (ESF)

In DS3 mode, the options are unframed, M13 and C-Parity

When the Nx64 fractional rate is selected, the following screen is displayed:

		Pay	load	1 - N	x64		
>Rea Setu				1			↓
			Pay	load			
			Rate	Nx6	4		▼
	E1	Fra	ming	PCN	/130		▼
Unused AIS 🛛 🔻						V	
		Time	eslot	Sele	ctior	1	
00	01	02	03	04	05	06	07
08	09	10	11	12	13	14	15
16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31
Clear All Select All							

Framing: Options are PCM31, PCM31C, PCM30, and PCM30C per G.704 and G.706 recommendations same as E1 described above.

Note: Unframed signal types are not supported in the Nx64 fractional mode because framing is required to determine the location of timeslots.

Unused: AIS, Broadcast, Unequipped used to fill up the unused (idle) timeslots

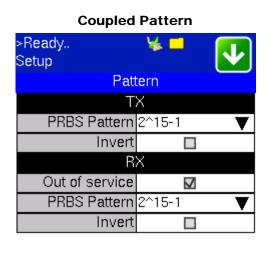
Timeslot Selection: Select the timeslot by tapping the applicable box. Deselect the timeslot by tapping the box again.

Note: Timeslots 1-31 correspond to channels 1-31 when using PCM-31 framing. When using PCM-30 framing, timeslots 1-15 correspond to channels 1-15, while timeslots 17-31 correspond to channels 16-30. Timeslot 16 is used for the Multi Frame Alignment Signal.

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15.1.4 Pattern

Tap on the pattern box to access this feature. The test patterns can be applied to all PDH/DSn rates; however, ITU-T recommends certain sequences dependent on the bit rate under test.



Close

Pattern: Use the pattern drop down box to select the test pattern which will be inserted into the transmitted signal. Pseudo Random Bit Sequences (PRBS) defined by ITU-T 0.150 and 0.151 standards, fixed words and 24-bit or 32 bit user defined patterns are available. Note, if the 32 bit user pattern entered is incorrect, the default pattern will be 0xFFFFFFF.

Invert: Inversion of polarity is available.

Out of Service (Rx only): Should be selected if the incoming signal is expected to contain a known test pattern. Deselect this option if signal is expected to contain live network traffic, this will disable the pattern detection process and will enable the reporting of LSS.

Note: ITU-T specification 0.150 recommends the following test patterns:

Test Sequences for PDH/DSn signals according to ITU-T 0.150 recommendation						
PRBS	Zeros	Application				
2^9-1	8	Error measurements for bit rates ≤ 14,400 kbits/s				
2^11-1	10	Error & jitter measurements for bit rates of n x 64 kbit/s & 64 kbits/s				
2^15-1	15	Error & jitter measurements for T1, E1 and DS3 bit rates				
2^20-1	14	Error & jitter measurements for T1, E1 and DS3 bit rates				
2^23-1	23	Error & jitter measurements for DS3 bit rates				
2^31-1	31	Delay measurements for DS3 bit rates				

Warning Message

While a test is running, it is possible to view the signal configuration, but it is not possible to change the setup or modify other measurements settings on the fly. This warning screen is only shown during initial setup to alert the user.

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15.2 Measurement Configuration

Tapping the Measurements box opens the setup screen for the Timer, Performance Analysis and General configurations.

weasurement - Timed would			
>Ready Setup		¥ -	
Signal	Measure	ments	Auto-config
Timer	Analy	sis	General
	Mode	Timed	V
	Dura	ation	
	Duration		10
	Units	Secor	nds 🔻
			•

Measurement - Timed Mode

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15.2.1 Timer Setup

Configure a test to run for a fixed duration or a delayed start.

Mode: Manual, Timed and Auto selections are available

- Manual: This is linked to the Start/Stop function on the pull-down menu
- **Timed:** The test duration can be set by the user. The test duration can be set in seconds, minutes, hours or days. The test is activated by the Start/Stop function on the pull-down menu
- Auto: A predetermined start time can be set by the user. The test duration can be set in seconds, minutes, hours or days. After programming the start time and duration, press the Start button on the pull-down menu and the test will be activated automatically when the programmed start time is reached.

Note: The timed mode will be required when running a M.2100 performance

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15.2.2 Performance Analysis

The Analysis setup page selects the ITU-T performance test that will be performed by the unit. The selections include None, G.821, G.826 and M.2100. The recommendations are briefly defined as follows:

Measurements - Analysis				
>Ready Setup		¥ -		
Signal	Measure	m <mark>en</mark> ts	Auto-config	
Timer	Analy		General	
Perfo	ormance	M.210	0 🔻	
	lierarchy	oos	▼	
	llocation		100.00	
BISO	Multiplier		1.00	

G.821: Error performance of an international digital connection operating at a bit rate below the primary rate and forming part of an Integrated Service Digital Network (ISDN)

- Long term error performance Conducted Out of Service (OOS)
- Based on measuring bit errors
- Evaluation period of 30 days
- Since there is no overhead structure at these bit rates, in-service measurements are extremely difficult
- **G.826**: End-to-end error performance parameters and objectives for international, constant bit rate digital paths and connections.
 - Long term error performance for Out of Service (OOS) and In-Service Measurement (ISM)
 - Based on measuring bit errors for connections and block errors for paths
 - Evaluation period of 30 days
- M.2100: Performance limits for bringing into service and maintenance of international multi-operator PDH paths and connections
 - Deals exclusively with PDH paths, sections and systems
 - Based on measuring bit errors and block errors
 - BIS limits for OOS/ISM
 - Evaluation periods of 15 minutes, 2 hours and 24 hours
 - First step is a continuity test for 15 minutes
 - PDH paths are composed of sub-elements of different lengths each with its own set Reference Performance Objectives (RPO)

Note: Only one performance analysis can be performed at a time. To view or enable the M.2100 analyses, the measurement timer has to be set to a determined

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15.2.3 General

The General setup page configures the Audible Alarm and Auto Save settings.

Measurements - General

>Ready Setup		¥ -	•
Signal	Measure	m <mark>en</mark> ts	Auto-config
Timer	Analy	'sis	General
Audik	ole Alarm	OFF	V
	s on start		V
A	uto Save		V
	Events	Blocke	ed 🔻

- Audible Alarm: On or Off. Provides an audible indication when alarm or error condition is recorded.
- Results on start: On or Off. Provides an automatic move to results screen when it starts
- Auto Save: The Automatic Save results file. Tapping the Auto Save set to "ON" will automatically save the results file.
- Measurement Clock Source: Internal Clock or Tx Clock Source; the measurement synchronized to the Tx clock.

15.3 Auto-Config

The Auto-Configuration function is described below.

-Stoppec Setup	I	₩ =	✓
Signal	Measure	ments <mark>Au</mark>	ito-config
	Auto	Config	
PDł	HE1 Unba E1 PCM3 PRBS		
	Start	Fast	

Setup - Auto Config

The **"Auto-Config"** function automatically sets the receiver of the TX130M+. A search of PDH signals at both the electrical inputs is performed to determine the signal structure. For electrical signals, both Terminated and PMP voltage ranges are searched and supported.

Procedure

Tap the "Start" button to begin the search. The received signal is checked for network type, hierarchy and bit rate, payload structure, payload framing, test pattern and signal level. If the search is successful, a "PASS" result is displayed.

Search Parameters and Criteria

- Interface: Checks physical parameters (bit rate line code)
- **Payload:** Only test patterns defined in ITU-T or ANSI standards will be recognized. If no test pattern is detected, the unit assumes live traffic.

PDH Signals: Unframed or framed payloads at all hierarchies. For 2M signals containing 64kbit/s timeslots, the TX130+ will assume live traffic and will not search for a test pattern.

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16.0 Results

Measurements are accessed by tapping the Results icon in the main menu. The results comprise a range of tabbed pages, similar to the setup pages.

16.1 PDH Results

16.1.1 Summary

The Summary tab displays an overview of the major test parameters. At a glance, the user is able to see if there are any alarms, errors or signal failure. The selected performance analysis test and its current verdict (Pass or Fail) is also displayed..

PDH Su	mmary			
>Running 📵 🥝	* - 😼			
Signal Analysis	Histogram Graph			
Summary Errors/#	Alarms Event Log			
ET:	00/00:01:10			
LOS Al a rm	OK			
PDH Alarms	Alarm			
PDH Errors	Errors detected			
LSS Al a rms	OK			
Bit Errors	*			
Error(s)				
Page 1 of 1_ O				

Go back to top

16.1.2 PDH Errors/Alarms

The Errors/Alarms tab brings up several pages showing the errors and alarm status. Page 1 of 4 (Dual E1 mode, Page 1 of 6) provides an overview of all the errors and alarms applicable to the signal or network under test. The color of the page tab is normally blue; however, it will turn red when an alarm error condition has been detected or recorded.

The soft LEDs on-screen are arranged logically and will depend on signal hierarchy, structure, payload and framing selected. The soft LEDs have a tricolor function:

- Green: No error or alarm is present
- Red: An error or alarm condition is detected and is currently present
- Yellow: Indicates a history condition. An error or alarm was detected during the measurement interval, but it is no longer present or active

Errors/Alarms Tab	Errors/Alarms Tab - Dual E1 Mode
>Running 📵 🔕 🚧 📮 🛛 🚺 Results	>Running 📵 🔕 🚧 💻 🚺
Signal Analysis Histogram Graph	Signal Analysis Histogram Graph
Summary Errors/Alarms Event Log	Summary Errors/Alarms Event Log
E1 Pat	E1 Pat E1 Pat
Los	Los Los Los
Ais Bit	Ais Bit Ais Bit
Cod	Cod Cod
💿 Page 1 of 4 💿	💽 Page 1 of 6 💽

Note: Tapping the individual soft LED will automatically link you to the applicable result screen which provides detailed information.

Go back to top

Errors/Alarms (Page 2)

Page 2 of 4 lists the alarms in logical order that are associated with the signal under test. All alarms are evaluated and stored. The time resolution of alarms is 100ms.

≻Runnin Results	ıg	()	ا 🚧 🔕		✔
Signal	Ana	lysis	Histo	gram	Graph
Summa	ıry E	irrors/	'Al <mark>a</mark> rm	s Eve	ent Log
		PDH	: [2M]		
ET:				00/0	0:01:27
LOS					Оs
AIS					84 s
		Page	2 of 4	1 🕞	

Errors/Alarms Tab (Page 2)

>Running Results	🖲 🔕 🚧 🗖	•
Signal Ana	ılysis Histogr	am Graph
Summary E	rrors/Alarms	Event Log
PDH	Secondary : [[2M]
ET:	(00/00:00:49
LOS		49 s
AIS		0 s
٩	Page 4 of 6	

Errors/Alarms Tab (Page 4) - Dual E1 Mode

Go back to top

Errors/Alarms (Page 3)

Page 3 of 4 lists the errors in logical order that are associated with the signal under test. All errors are counted simultaneously and stored.



>Running Results	(B) 🔕 🚧 드	✓
Signal Ana	lysis Histogram	n Graph
Summary E	rrors/Alarms Ev	vent Log
PDH	Secondary : [2N	4]
ET:	00/	00:02:01
CODE	0	*
	Page 5 of 6 💽	

Errors/Alarms (Page 4)

Page 4 of 4 lists the Bit Error Performance (BERT) associated with the signal under test.

EITUISIAIAIIIIS TAD (Paye 4)					
>Runnin Results	ıg	(3 🚧		✓
Signal	Ana	lysis	Histo	gram	Graph
Summa	iry <mark>E</mark>	rrors/	Alarm	is Eve	ent Log
		BE	ERT		
ET:				00/0	0:01:35
LSS					Оs
BIT				0	*
		Page	4 of -	4 🕟	

Frrors/Alarms Tab (Page 4)

Errors/Alarms Tab (Page 6) - Dual E1 Mode

>Running Results	🖲 🔕 🚧 🗖	· 🗸
Signal Ana	lysis Histogr	am Graph
Summary E	rrors/Alarms	Event Log
	BERT	
ET:	۱ C)0/00:02:22
LSS		0 s
BIT		0 0.0E+00
BE	RT Secondar	У
LSS		0 s
BIT		0 *
٩	Page 6 of 6	\bullet

Go back to top

16.1.3 Event Log

The Event log tab brings up the screen listing the error and alarm events recorded during a test. The events are presented in chronological sequence:

- Number (#): Event number, events are numbered sequentially
- Type: Indicates alarm or error type
- Start: Indicates when the alarm or error was detected
- Dur/Count: Indicates for how long the alarm or error was detected and provides count (alarms) and ratio (errors). The duration format is day:hour:minute:second
- Pages: Scroll through the pages depending on the number of events recorded.

Event Log				
>Runn Result) 🔕 🚧 🛛	-	
Signa	l Analys	is Histog	jram Graph	
Summ	nary Erro	irs/Al <mark>a</mark> rms	Event Log	
#	Туре	Start	Dur/Count	
1	Start	21:31:46.	0	
2	CODE	21:31:48.	0 1	
3	CODE	21:31:49.	0 10	
4	2M:AIS	21:31:49.	6	
5	CODE	21:31:50.	0 6	
6				
7				
8				
9				
Page 1 of 1 (2)				

16.1.4 Signal

The Signal tab brings up the Frequency and Level result screen.

Signal					
>Stopped (2) Results	* - 👽				
Summary Errors/Ala	arms Event Log				
<mark>Signal</mark> Analysis Hi	stogram Graph				
Freque	ncy				
2M current (bps)	2048000				
Offset (ppm):	0.0				
Min (ppm):	-0.5				
Max (ppm):	0.5				
Leve	:I				
V(p-p)	4.8 V				
Page 1	of 1 💿				

Frequency: The received signal frequency and offset is measured and displayed. For E1 signals, the measurement is performed on both balanced 120ohm and unbalanced 75ohm interfaces.

- Current: Indicates the frequency of the input signal
- Offset: Indicates the difference between the standard rate and the rate of the input signal
- Min (ppm): Indicates the difference between the standard rate and the minimum deviation detected in the input signal
- Max (ppm): Indicates the difference between the standard rate and the maximum deviation detected in the input signal

A Min (ppm) and Max (ppm) function can be used to ensure that the received signal is within a certain clock tolerance and that the network element is transmitting correctly. The frequency limits for the various signal types according to ITU-T recommendations are presented in the table below.

Frequency Tolerances for PDH and T-Carrier Systems		
Signal Frequency Specification		
E1 PDH	2.048 Mbps ± 50 ppm	
E3 PDH	34.368 Mbps ± 20 ppm	
DS1T-Carrier	1.544 Mbps ± 30 ppm	
DS3 T-Carrier	44.736 Mbps ± 20 ppm	

Level: Measures the Peak and Peak-Peak voltage values of the incoming signal. The levels for the various signal types according to ITU-T recommendations are presented in the table below.

PDH Signal Levels per ITU-T G.703 Recommendations					
Cinnal	Dit Data	Line and	Input		
Signal	Bit Rate	Line code	Termination	Level	
E1	2 Mbit/s	HDB3	75 ohm unbalanced BNC 120 ohm balanced RJ45	Terminate: 2.37 Volt peak Monitor: 2.37 Volt peak with 20 or 26dB gain Terminate: 3.0 Volt peak Monitor: 3.0 Volt peak with 20 or 26dB gain	
E3	34 Mbit/s	HDB3	75 ohm unbalanced BNC	Terminate: 1.0 Volt peak Monitor: 1.0 Volt peak with 20 or 26dB gain	

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16.1.5 Analysis

ITU-T recommendations are available to analyze results.

ITU-T G-series: Telecommunications design, checking of performance limits, expected behaviors and design structures

ITU-T M-series: Applies to the installation and maintenance of the network and defines "Bringing Into Service" (BIS) procedures and test limits for fault detection and localization.

The ITU-T recommendations are described in greater detail in the Measurements section.

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16.1.6 Histograms

The Histogram tab brings up the screen displaying a historical record of the Alarms and Errors recorded during the measurement interval. A dedicated page is available for errors, alarms including BER. Scroll through the various pages to display the anomalies of interest.

Histogram (E1 Alarms)

>Runnir Results	ıg	(<mark>0</mark> 7	<u> -</u>		√
Summa	ary Ei	rrors/	'Ala	rms	Eve	ent Log
Signal		ysis	_			Graph
0		+		-		
		E1 A	larr	ns		
LOS						
AIS						
sec	0		60		120)
		Page	e 1 c	of 3_	۲	

The alarms and errors presented will depend on the signal type and structure selected. A graphical timeline on the horizontal axis indicates when the event occurred since the test was started. The upper left and right arrows allow the user to scroll through the measurement period while the + and - keys allow zooming of the time axis. The events presented above are shown in the table below.

E1 signal	Alarm description
LOS	Loss of signal
AIS	Alarm Indication Signal
LOF	Loss of Frame
LOMF	Loss of Multi Frame
RDI	Remote Defect Indication

The screen below depicts E1 Errors.

Histogram (E1 Errors)

		•	÷			·
>Runnin Results	ıg	()	0 🚧			✓
Summa	iry E	Errors/	'Alarr	ns	Eνε	ent Log
Signal	Ana	alysis	Histo	ogr	am	Graph
		+	-			
		E1 E	Errors	;		
CODE						
sec	0		60		120)
		Page	e 2 of	3	D	

E1 signal	Error description
Code	Code error (HDB3, AMI)
FAS	Frame Alignment Signal
CRC	Cyclic Redundancy Check error
REI	Remote Error Indication

The screen below depicts BER and bit errors.

Histogram (BERT Alarms/Errors)				
>Runnir Results		() 🚧		✓
Summa	ary Er	rors/Alarn	ns Even	t Log
Signal	Anal	ysis <mark>Histo</mark>	o <mark>gra</mark> m G	iraph
		+ -		0
	BER	F Al <mark>a</mark> rms/B	Errors	
LSS				
BIT				
sec	0	60	120	
		Page 3 of	3 💿	

BERT	Description
LSS	Loss of Sequence Synchronization
Bit	Bit error

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16.1.7 Graph

The Bar tab brings up the screen displaying a log of the Errors recorded during the measurement interval. A dedicated page is available for each error type. Scroll through the various pages to display the anomaly of interest.

Graph

>Running Results	🧿) 🔕 🚧 🗖		✓
Summary	/ Error	s/Al <mark>ar</mark> ms	s Eve	ent Log
Signal A	\nalysi:	s Histog	ram	Graph
Code			0	+ 0
1E8				
1E7				
1E6				
1E5				
1E4				
1E3				
1E2				
1E1				
1E0				
hr	0	2	4	
(Pa	ge 1 of 2	۲	

A graphical timeline on the horizontal axis indicates when the event occurred while, the vertical axis indicates the error ratio. The upper left and right arrows allow the user to scroll through the measurement period while the + and – keys allow zooming of the time axis.

A View status screen can be accessed by tapping on the result area. A start and finish time, including count of the event type will be displayed. The View status screen is shown below.

Graph - View Status				
Results	•••	V		
30	ew Status	og ph		
1E Start	17/10/11 21:43:25.0 17/10/11 22:13:25.0			
1E 1E Type	Code	-		
1E Count	10			
1E 1E	OK			
1E2				
1E1 1E0				
hr 0	2 4			
٩	Page 1 of 2 💿			

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17.0 Alarms/Errors

The Alarm and Error generation functionality can be found on the main menu.

Tap the Alarm/Error icon to display the Alarm and Error Generation screen. The Alarm and Error functions are used in conjunction with the pull-down menu, which has dedicated buttons for Error Injection and Alarm Generation. The alarm and error selections will depend on PDH signal types.

>Ready DS1	A 🗖	≁
Alarm Type		▼
Alarm Flow		▼
Alarm Duration	0.1s	•
Error Type		V
Error Flow		V
Error Rate	1E-3	▼

17.1 Alarm Generation

The following PDH/DSn (T-Carrier) alarms can be generated:

Alarm Type:

- E1 signals: LOS, LOF, AIS, RDI
- E3 signals: LOS, LOF, AIS, RDI
- DS1 signals: AIS, Yellow, idle, LOS, LOF
- DS3 signals: LOS, LOF, OOF, AIS, Parity

Alarm Flow - Continuous, Count

Alarm Duration - 0.1s, 1s, 10s, 100s

Error Type:

- E1 signals: Code, FAS, CRC, REI, E-bit, Bit
- E3 signals: Code, FAS, Bit
- DS1 signals: Code, FAS, Bit
- DS3 signals: Code, FAS, Bit

Error Flow - Injects a range of different anomalies into the transmit signal. Error insertion modes include:

- Single: Inserts a single error every time the insertion button is tapped
- Count: Specific count or number of errors when the insertion button is tapped
- Rate: Specific rate between 1^10⁻³ and 5^10⁻⁶

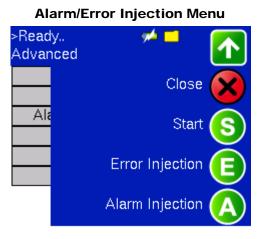
The list of available error types depends on the type of framing being used, and the PDH/DSn hierarchies and line interfaces that have been selected.

PDH/DSn

>Ready DS1	A 🗖	≁
Alarm Type		▼
Alarm Flow		▼
Alarm Duration		•
Error Type		▼
Error Flow		▼
Error Rate	1E-3	▼

Alarm Generation Error Insertion (pull-down menu)

At any time during the test process, you can inject errors or generate alarms by tapping the Error Injection and Alarm Generation buttons in the pull-down menu.



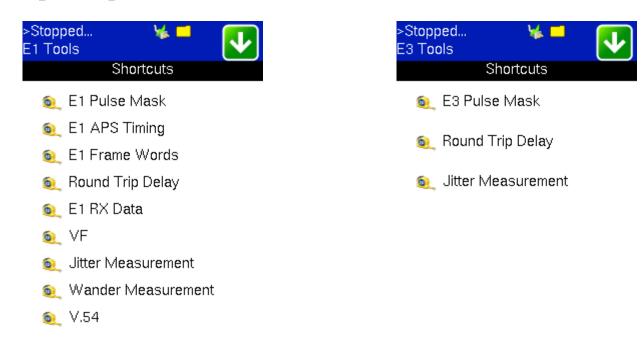
Go back to top

18.0 E1/E3 Tools

The E1 and E3 Tools can be found on the main menu. Tap the E1 and E3 Tools icon to display the shortcut screen shown below.

E1 Tools Menu

E3 Tools Menu



18.1 E1/E3 Pulse Mask

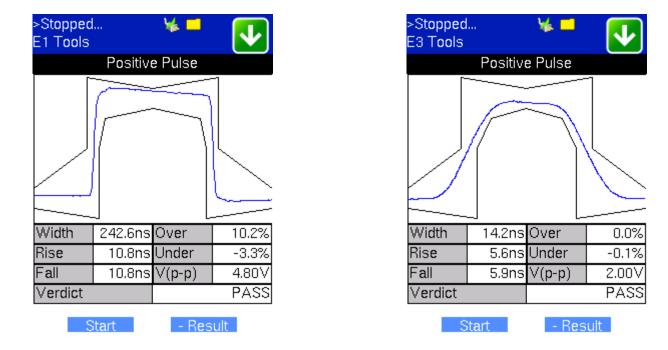
This function captures and analyzes E1 (2,048Mbits/s) or E3 (34,368Mbits/s) pulse shape. The purpose of maintaining the correct pulse shape is to reduce inter-symbol interference – if the logic 1s and 0s cannot be detected by the receiver correctly, bit and code errors will result.

The pulse amplitude and overall shape are superimposed and compared with the ITU-T G.703 pulse conformance template. Telecommunications signals require specific load impedance for pulse mask compliance testing to be accurate. When high frequency pulses are transmitted down a transmission line, a portion of the pulse will be reflected when and wherever it encounters an impedance mismatch. The reflection is proportional to the impedance mismatch i.e. the greater the mismatch, the greater the reflection of the pulse. To avoid reflections impacting the E1 measurement, the TX130M+ will terminate twisted pair cables with 120 ohms and coax cable with 75 ohms impedance. Note that 75ohm and 120ohm twisted pair cables each have different nominal amplitudes associated with them - For the 75ohm coax cable, the pulse amplitude must be $2.37V \pm 10\%$ while for 120ohm twisted pair cables, the pulse amplitude must be $3.0V \pm 10\%$.

According to the G.703 recommendation, E1 pulses need only be measured at the transmitter output, and are *not* required to meet the pulse template over a variety of cable lengths – this of course will not provide information on distortions caused by misalignment and other impairments of the line. The TX130M+ on the other hand allows you to connect to a live system at the Tx output port via a Protected Monitoring Point (PMP) or at the far end of a transmission line. In either case, the signal will be attenuated or amplified as necessary to compensate for test point or cable attenuation characteristics.

E1 Pulse Mask

E3 Pulse Mask

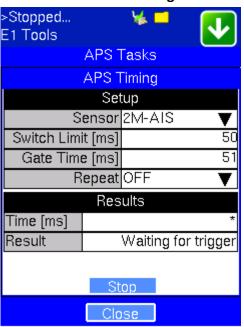


18.2 E1 APS Testing

This function measures the Automatic Protection Switching (APS) limits of the network. APS applies the Multiple E1 Links and enables network elements to reroute traffic to a backup circuit in the event of network failure or problems.

Test Procedure:

- 1. The TX130M+ should be connected to transmission system to ensure that the switching time is measured for the service transported by the E1 links.
- 2. Ensure that no errors or alarms are present on the transmission system because this will impact the measurement.
- 3. The measurement will be triggered by an Alarm Indication Signal (AIS) or a Test Sequence Error (TSE) event of >1 x 10-4
- 4. The TX130M+ measures how long the AIS or TSE event remains present after the event is first recognized and will continue to measure the total disruption time in the event of multiple disruptions



E1 APS Testing

18.3 E1 Frame Words

This function requires the E1 signal to be framed. The NFAS word is used to carry information about the status of the link and to

provide control signals for primary rate multiplexers.

Not Frame Alignment Signal (NFAS)								
Bit	1	2	3	4	5	6	7	8
Value	Si (M)	1	А	Sa4	Sa5	Sa6	Sa7	Sa8

• Bit 1: Reserved for International use (M is used to transmit the CRC multiframe signal in PCM30C and PCM31C)

- Bit 2: Set to "1" to prevent simulation of FAS
- Bit 3: A shows the remote alarm indication
- Bits 4 to 8: Sa4 to Sa8 are spare bits.

Tx: Bits Sa4 to Sa8 are used to send optional network messages. The Sa bits should be set to "1" when they are not used or when links cross International borders.

Rx: Bit Sa4 can be used as a message based data link for operations, maintenance and performance monitoring.

E1 Frame Words - Rx		
>Stopped E1 Tools	- *- 🛃	
	E1 Framed	
RX	TX	
SA4	11111111	
SA5	11111111	
SA6	11111111	
SA7	11111111	
SA8	11111111	
	Close	

E1 Frame Words - Tx		
>Stopped E1 Tools	* 🗸 😼	
E1 F	ramed	
RX	TX	
SA		
SAS		
SA		
SA:		
SA	3 11111111	
C	ose	

Go back to top

18.4 Round Trip Delay

>Stopped E3 Tools	¥.	
Ro	und Trip De	lay
	Timing	
	Results	
Time [ms]		0.000 ms
Result		Complete
	Start	
	Close	

The Round Trip Delay (Propagation Delay) measurement works by sending a test pattern. A errors is transmitted in the pattern. The time it takes for the error to reach the receiver is the propagation time through the network.

- View the Round Trip Delay of a looped back signal.
- Set check box on Setup Rx pattern to Out-of-Service

Go back to top

18.5 E1 Rx Data

Tapping the E1 Rx Data the E1 Tools screen displays the PDH E1 Rx Data showing received data and captures the current timeslots.

	L		
	opped Tools	¥ =	
	E	1 Rx Data	
0	FAS	01110010	00101110
3	11011101	01101011	11000110
6	10110000	01101100	01101011
9	11100110	01100110	00011110
12	01101001	10101010	10101101
15	11011010	01001001	11111111
18	10000110	00010000	00001100
21	00000111	01101101	00100000
24	11011000	01111000	00001000
27	01001100	00110111	01110000
30	10010100	01011011	
	(Pause	

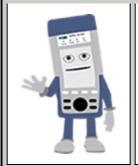
E1 Rx Data

Go back to top

18.6 E1 VF

Tapping the VF the E1 Tools screen displays the VF Tasks showing The VF menu performs a variety of talk/listen functions.

E1 VF Tasks	E1 Warning
>Stopped 🦌 💻 🚫	>Stopped 🦌 🗖 🚺
VF Tasks	Shortcuts
Setup Tx T/S 1 Rx T/S 1	🕢 Error
Mode Talk V Code A-Law V	Only available with Framed E1
Results	
Data 11010100	
Freq 0 Hz Level -62.6	
	ОК
	😥 Wander Measurement
Close	Q V.54



Note

Do not attempt to enter VF Tasks if the Frame LED is not green. Green LEDs indicate that the framing found on the received signal matches the framing selected in the Setup screen. It is impossible to talk, listen, or perform other channelized functions in the absence of frame synchronization, since channels can be identified only within a framed signal.

The VF Tasks screen lets you choose:

Setup:

- Timeslot Channel to test for both transmitting and receiving: Options: 1 31
- Mode Talk, send a Tone on the transmit signal. Transmit audio data from the external headset into selected timeslot.
- Code: Options: u-Law or A-Law
- Programmable ABCD: Manual edit ABCD (User) or IDLE, SEIZE
- Transmitted Frequency: Options: 50 to 3950Hz
- Transmitted Level: Options: -60 to 3dBm

Results:

- Measure signal frequency and level in selected timeslot.
- Listen to the voice channel in selected timeslot via external headset.
- ABCD bits monitor and View data in selected T/S channel.

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18.7 Jitter Measurement

By tapping the Jitter Measurement, the E1/E3 Tools screen displays the jitter measurements showing measurements and analysis of jitter in received signal.

E1 Jitter Measurement

E3 Jitter Measurement

>Stopped 🤸 🗖 🚫	>Stopped 🦌 💻 🚫
Jitter Measurement	Jitter Measurement
10.0	10.0
8.0	8.0
6.0	6.0
4.0	4.0
2.0	2.0
0.0	0.0
Results	Results
Current 0.008UI Max 0.009UI	Current 0.026UI Max 0.037UI
Setup	Setup
Filter HP1+LP	Filter HP2+LP
Stop	Stop

The Jitter Measurement submenu allows the user to measure and analyze received signal jitter. The measurements example is shown above (the vertical grid spacing is 2.0Ulpp). Red Bar is Max. peaked jitter during testing and Yellow is the current peaked jitter.

Press "Start" to start measurement

Select the HP1+LP (20Hz to 100kHz) or HP2+LP (18kHz to 100kHz) filter for E1, and HP1+LP (10Hz to 400kHz) or HP2+LP (30kHz to 400kHz) filter for E3

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18.8 Wander Measurement

Setup

- Clock Port Unb RX2 selected as default. The external reference clock is connected through the Aux Rx port.
- Clock External 2Mbit/s chosen as default

Press Start to run the test. The Wander Measurement Menu displays Current, Max, Min, and MTIE results in nanoseconds.

Wander Measurement Menu

>Stopped E1 Tools	¥ <mark>=</mark>	\otimes
	Results	
Current TIE	-23	52787 ns
Max +TIE		0 ns
Min -TIE	-23	52787 ns
MTIE	23	52787 ns

Setup		
Clock Port	Unb RX2	¥
Clock External	2Mbit/s	V



18.9 V.54

The V.54 menu features the Loop Up and Loop Down functions for Loopback testing. Tap on **Loop Up** or **Loop Down** to create or cancel a loopback.





19.0 DS1/3 Tools

The DS1/3 Tools can be found on the main menu. Tap the DS1/3 Tools icon to display the shortcut screen shown below.

E1 Jitter Measurement

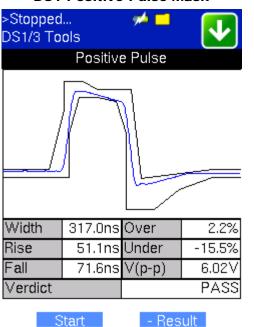
E3 Jitter Measurement

>Stopped 🤸 🗖 🚫	>Stopped 🦌 📁 🐼 E3 Tools
Jitter Measurement	Jitter Measurement
10.0	10.0
8.0	8.0
6.0	6.0
4.0	4.0
2.0	2.0
0.0	0.0
Results	Results
Current 0.008UI Max 0.009UI	Current 0.026UI Max 0.037U
Setup	Setup
Filter HP1+LP	Filter HP2+LP
Stop	Stop

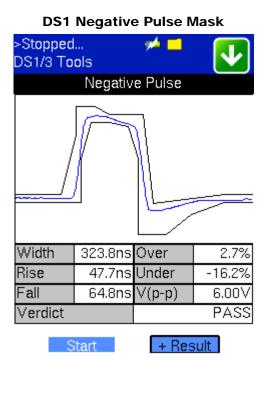
19.1 DS1 Pulse Mask

This function captures and analyzes DS1 (1.544Mbits/s) pulse shape. The purpose of maintaining the correct pulse shape is to reduce inter-symbol interference – if the logic 1s and 0s cannot be detected by the receiver correctly, bit and code errors will result.

The pulse amplitude and overall shape are superimposed and compared with the Telcordia TR-TSY-000499 and ITU-T G.703 pulse conformance template. Telecommunications signals require specific load impedance for pulse mask compliance testing to be accurate. When high frequency pulses are transmitted down a transmission line, a portion of the pulse will be reflected when and wherever it encounters an impedance mismatch. The reflection is proportional to the impedance mismatch i.e. the greater the mismatch, the greater the reflection of the pulse.



DS1 Positive Pulse Mask



Go back to top

19.2 DS1 Loop

Tap the DS1 Loop icon to display the shortcut screen shown below.

DS1 Loop	DS1 Loop Menu
>Stopped 📌 🗖 👽 DS1/3 Tools	>Stopped 📌 🗖 🏠
DS1 Loop	Close 🙀
TX	
Direction Up 🛛 🔻	Start 🕟
Loop Type Inband 🛛 🔻 🔻	
Mode CSU V	Error Injection
	Alarm Injection 🛕
	Loop 🕜
Close	Close

Loopback Control: Tap the Loop Icon located at the top of the screen to select Up (Loop Up) or Down (Loop Down).

Loop Up:

- 1. Send a known test pattern and check if the pattern is received. If received, declare "pre-exist loop" and stop.
- 2. Send the loop up code for 5 seconds. If in-band, check if the loop up code is returned. If out of band (ESF FDL), send a known pattern in the payload and check if the known pattern is returned. If not returned in 10 seconds, declare loop up failed.

Loop Down:

- 1. Send a known test pattern and check if the pattern is received. If not received, declare "loop down" and stop.
- 2. Send the loop down code for 5 seconds. Same as loop up but check for the return code disappeared.

Transmits in-band and out-of-band DS1 loop

In-band:CSU, NIU FAC1, NIU FAC2. Transmit: Select code transmitted for 5 seconds (nominal).

ESF DFL (Out-of-band): Line, Payload, Network.

Transmit: Selected code transmitted either continuously or a burst of n-messages (where n is selectable in the range 1 to 15).

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19.3 Round Trip Delay

The Round Trip Delay (Propagation Delay) measurement works by sending a test pattern. Errors are transmitted in the pattern. The time it takes for the error to reach the receiver is the propagation time through the network.

- View the Round Trip Delay of a looped back signal.
- Set check box on Setup Rx pattern to Out-of-Service

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19.4 DS1 Rx Data

Tapping the DS1 Rx Data the DS1 Tools screen shows the DS1 Rx Data, which shows received data and captures the current timeslots.

DS1 Rx Data

>Stopped 📌 🗖 🚺 DS1/3 Tools DS1 RX Data				
0	F	11011110	11001001	
3	11000010	10001000	01111101	
6	01101100	10111001	01100000	
9	10010111	00100110	01000010	
12	11100001	01000101	01011110	
15	10110110	11111010	10110000	
18	00010010	11110011	00001000	
21	01010110	10110100	10101110	
24	00110001			

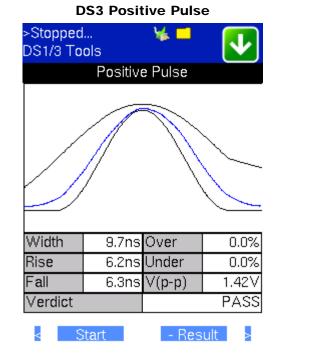
Pause

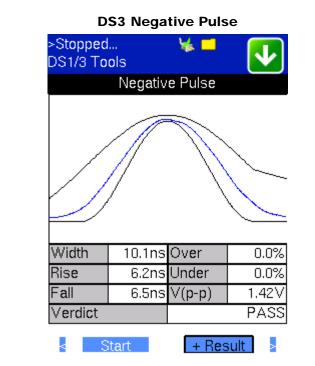
Go	back	to	top	

19.5 DS3 Pulse Mask

This function captures and analyzes DS3 (44.736Mbits/s) pulse shape. The purpose of maintaining the correct pulse shape is to reduce inter-symbol interference – if the logic 1s and 0s cannot be detected by the receiver correctly, bit and code errors will result.

The pulse amplitude and overall shape are superimposed and compared with the Telcordia TR-TSY-000499 and ITU-T G.703 pulse conformance template. Telecommunications signals require specific load impedance for pulse mask compliance testing to be accurate. When high frequency pulses are transmitted down a transmission line, a portion of the pulse will be reflected when and wherever it encounters an impedance mismatch. The reflection is proportional to the impedance mismatch i.e. the greater the mismatch, the greater the reflection of the pulse.





- Left/Right button: To move the pulse mask to left or right direction, press the left or right button first and re-run the test.

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19.6 DS3 FEAC

DS3 FEAC responses (Far End Alarm and Control Channel Responses):

Enabling this option allows loop-back to be configured from any "far-end" equipment connected on the other end of the line. These can be used to send and receive loop up codes and information from the far end T3 device. You can enable and disable through a drop down menu in this field.

- LoopUP Activate: 00010010 11111111 sent >10 repetitions
- LoopDown Deactivate: 00100100 11111111 sent >10 repetitions

FEAC alarms are sent from the remote end device towards the local device by means of the C bit in the sub-frame. When a failure is declared on the remote end unit, this is how it notifies the near end unit. Some FEAC Codes are shown below

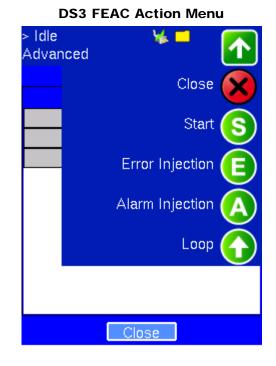
DS3 FEAC Menu			
>Stopped DS1/3 Tools	9 *		✓
FEAC	Tasks		
ΤX		RΧ	
FEAC	None		▼
Direction	Down		▼
Loop Туре	NIU		▼
Clo	se		

FEAC Alarm TYPE

DS3 Equip. Failure(Service Affecting) DS3 LOS DS3 OOF DS3 AIS RCV DS3 IDLE RCV DS3 EQUIQ FAIL(NON-SERVICE AFFECT) COMMON EQUIP. FAIL (NSA) MULTIPLE DS1 LOS DS1 EQUIP FAIL SINGLE DS1 LOS DS1 EQUIP FAIL(NON-SERVICE AFFECT)

LOOP TYPE: Options: NIU, LINE

DS3 FEAC Tasks (Page 1)

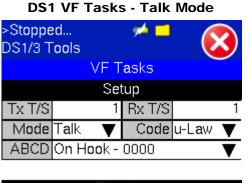


DS3 FEAC Tasks (Page 2)

>Stopped 🔞 🐼 🚧 💻 🛛 🚺	>Stopped 📵 🙆 DS1/3 Tools) **
FEAC Tasks	FEAC	Fasks
TX RX	TX	RX
FEAC	LOS	*
LOS OOF	OOF	*
AIS > Idle	AIS	*
EQ FAIL SA EQ FAIL NSA	> Idle	*
	EQ FAIL SA	*
	EQ FAIL NSA	*
💿 Page 1 of 2 💿	💿 Page	2 of 2_ 💿
Close	Clo	se

19.7 DS1 VF

Tapping the VF the DS1 Tools screen displays the VF Tasks showing The VF menu performs a variety of talk/listen functions.



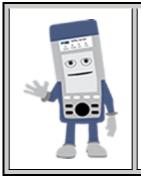
Results			
ABCD	* Data	*	
Freq	* Level	*	

DS1 VF Tasks - Tone Mode

>Stoppe DS1/3 T			*	\otimes	
	VF Tasks				
	Setup				
Tx T/S		1	Rx T/S	1	
Mode	Tone	◄	Code	A-Law 🔻	
Freq		50	Level	3.00	
ABCD	ABCD On Hook - 0000				
Results					
ABCD		*	Data	*	
Freq		*	Level	*	

Close





Note

Do not attempt to enter VF Tasks if the Frame LED is not green. Green LEDs indicate that the framing found on the received signal matches the framing selected in the Setup screen. It is impossible to talk, listen, or perform other channelized functions in the absence of frame synchronization, since channels can be identified only within a framed signal.

The VF Tasks screen lets you choose:

Setup:

- Timeslot Channel to test for both transmitting and receiving: Options: 1 24
- Mode Talk, send a Tone on the transmit signal. Transmit audio data from the external headset into selected timeslot.
- Code: Options: u-Law or A-Law
- Programmable ABCD state for On-Hook, Off-Hook, Wink, User
- Transmitted Frequency: Options: 50 to 3950Hz
- Transmitted Level: Options: -60 to 3dBm

Results:

- Measure signal frequency and level in selected timeslot
- Listen to the voice channel in selected timeslot via external headset.
- ABCD bits monitor in selected channel

Go back to top

19.8 Jitter Measurement

By tapping the Jitter Measurement, the DS1/3 Tools screen displays the jitter measurements showing measurements and analysis of jitter in received signal.

05	Do no Sitter Medsarement							
>Stoppe			🦟 🗖					
DS1/3 T	oois							
	Jitter	Mea	surem	ent				
10.0								
8.0								
6.0								
4.0								
2.0								
0.0								
		Res	ults					
Current	0.0	65UI	Max		0.071UI			
		Set						
	- RX I	Filter	HP1+L	P.	V			
		Sto	qq					

DS1/3 Jitter Measurement

The Jitter Measurement submenu allows the user to measure and analyze received signal jitter. The measurements example is shown above (the vertical grid spacing is 2.0UIpp). Red Bar is Max. peaked jitter during testing and Yellow is the current peaked jitter.

Press "Start" to start measurement

Select the HP1+LP (10Hz to 40kHz) or HP2+LP (8kHz to 40kHz) filter for DS1, and HP1+LP (10Hz to 400kHz) or HP2+LP (30kHz to 400kHz) filter for DS3

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20.0 Profiles

Profiles can be created in any application that has a 'Profiles' pull-down menu available. The PDH & DS1/3 applications all have the ability to save profiles. Profiles can be viewed and loaded in the Profiles folder located in the Files folder structure.



To save a new profile from the PDH & DS1/3 applications mentioned above, select the 'Save as New' pull-down menu option. This will bring up an alpha-numeric keypad to name the profile. When the profile is saved, all of the test configurations that apply to the particular application (PDH & DS1/3) are saved. This allows for fast access to pre-configured test configurations.

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21.0 Additional Tests

21.1 ISDN PRI Call

21.1.1 Setup (PRI Call Setup)

Configuration parameters for ISDN PRI Call are as follows:

(Page 1)

- Mode: TE or NT
 - **TE:** Terminating Equipment used when the TX130M+ is emulating customer equipment. TE usually uses the received signal to clock the transmitter.
 - **NT:** Network Terminal is used when the TX130M+ is emulating an ISDN switch, such as DMS-100, 5ESS. NT usually uses the internal clock
 - Monitor: Trace message details:
 - D Channel decodes help to verify that a call is successfully established, or determine why a call was not completed by examining the protocol cause values.
- Call Control: The Q.931 specification indicates which type of ISDN switch is to be tested.
 - **AT&T** relates to the 5ESS switch
 - NTI relates to the Northern Telecom DMS-100 switch
 - ETSI is the ETSI standard
- Channel Config: 23B+D, 46B+2D, 47B+D, or 23Bx2 in T1; Single/Dual PRI in E1.
- **D** Channel Designates the time slot to transmit D Channel messages. The D Channel decoder helps to verify that a call is successfully established, or determine why a call was not completed by examining the protocol cause values.
- My num type: Unknown, International, National, or Local
- My num plan: Unknown, Telephony, or Private
- My phone#: Tap on the box and enter the phone number using the alphanumeric keyboard

PRI Call Setup (Page 1)

PRI Call Setup (Page 2)

DTMF Setup Sig	Sca inal		31	lulti Ca	_	-	ckup sult
octop olg		ode		00	ui	110	T
Call	Con	trol	ETS	SI			Ť
Channel Config			23B+D 🔻				
D Channel							24
My nu	um ty	/pe	Loc	al			T
My ni	um p	lan	Tele	epho	ny		T
My	phor	ne#	58 52			22	:997
0	Pa	age	1 of	2 (0		

DTMF	Sca	in	\mathbb{N}	lulti	D	Backup
Setup Si	gnal	Tra	ice	Ca	ll	Result
	Caller	' ID	Blo	cked	-	T
Call	answ	/er	Car	ncel		T
Sub Addr Type			NSAP 🛛 🔻			
	My si	ub#				
Coc	lec T	уре	U la	ŧw		V
	L2 Fi	ilter	Off			T
h	dle Co	ode	19 23	- 3	01	111111
Line	1 Int	fld				0
Line	2 Int	fld	37 			1

(Page 2)

- Caller ID Blocked/Allow.
- Call Answer Prompt, Accept or Cancel.
 - **Prompt** Prompts the user to answer or reject incoming calls. Selecting Prompt displays an answer and reject button on the Call tab.
 - Accept Automatically answers incoming calls
 - Cancel Automatically rejects incoming calls
- Sub Addr Type NSAP or User
- My sub# Tap on the box and enter the sub address number using the alphanumeric keyboard
- Codec Type A law or U law
- L2 Filter Turn ON or OFF layer 2 filter. Turning on the filter prevents layer 2 messages from displaying in the captured trace
- Idle Code Code to be transferred on unused channels. Tap on the box and use the alphanumeric keyboard to enter the code.
- Line Intf Id Line interference ID. Tap on the box and enter the line interference ID using the alphanumeric keyboard

Note: In Service (**IS**) indicates a proper port connection, while Out of Service (**OOS**) indicates a faulty port connection in which the user will be unable to run any tests. If OOS is displayed, please check that the physical cable is correctly connected to the port.

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21.1.2 Signal

- Line Code B8ZS or AMI
- Clock Source Internal, External, Rx, or Offset. If the test set is in TE mode, select Rx to receive timing signals from the master clock.
- Termination Terminated, Monitor, or Bridge
- DS1 Framing SF or ESF
- Unused AIS or Idle

PRI Call Signal

IS PRI CALL		* =	✓		
DTMF	Scan	Multi	DBackup		
Setup Si	<mark>gnal</mark> Tra	ace Cal	l Result		
Li	ne Code	B8ZS	V		
С	lock Src	Internal	Y		
Ter	mination	Terminat	ed 🔻		
DS1	Framing	ESF 🔻			
	Unused	AIS	V		

Main Setup

- Connect to the CPE or Network.
- Connect headsets to the mini USB port
- Select Call Control protocol type
- Select the emulation type (Should be TE on the other NT)

Go back to top

21.1.3 Call - Voice Setup

Press Call to bring up the Call Setup menu. Fill out the following parameters:

- Call Type Select Voice
- Channel
- Line If the Channel Config is set to 46B+2D or 47B+D in T1 mode or Dual PRI in E1, the user can choose which line to use.
- Numbering Type Unknown, International, National, or Local
- Numbering Plan Unknown, Telephony, or Private
- Dial To Tap on the corresponding box and use the alphanumeric keypad to enter the number of the receiving line.
- Sub Addr Type NSAP or User
- Sub Addr Tap on the corresponding box and use the alphanumeric keypad to enter a subaddress

Press **Call** to initiate a call to the receiving number. If Prompt was selected for Call Answer in the Setup tab, the unit receiving the call will ring and the user can press **Answer** or **Reject** to accept or reject the call.

Call

Call - Voice Setup

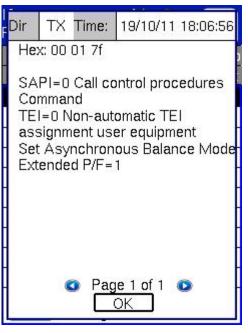
IS PRI CALL			¥		ţ.	✓
DTMF	Sca			lulti		Backup
Setup S RX: RR My num		Tra 22	ΓX:	Ca IFra 7		Result
Call 1:OFF HOOK TS: 1 L1 V <- 25819 Received Name:						
Call 2:ON HOOK						
Answer	Reje	ect			Са	

Trace: ISDN Protocol Decode

Trace								
IS PRI CALL								
DTN	4F 5	Scan	Mu	ulti	DBackup			
Setu	p Sign	ial <mark>Tra</mark>	ace	Call	Result			
#	Dir	Tim	e:	Me	essage			
1	TX1	18:06	:56	S.	ABME			
2	RX1	18:06	:56	UA				
3	TX1	18:07	:03	SABME				
4	RX1	18:07	:03	UA				
5	TX1	18:07	:04	SABME				
6	RX1	18:07	:04	UA				
7	RX1	18:07	:14	RR				
8	RX1	18:07	:15	RR				
9	RX1	18:07	:16		RR			
Ch	0	Page	1 of	2 💽				

T
T
V
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1
T
Y
997
T

Trace Details



D Channel Decodes help to verify that a call is successfully established, or determine why a call was not completed by examining the protocol messages. The user can monitor layer 2 (Q.921) and layer 3 (Q.931) messages on the D Channel in both terminate and monitor modes. Layer 2 results give technicians the ability to check link and D Channel status, verify LAPD frames and check utilization rates. Following link establishment, layer 3 decodes allow technicians to verify such factors as call state, who made or dropped the call, why the call was dropped, where the call is being carried (Interface ID/B channel) and call types.

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21.1.4 Call - Data Setup

Press Call to bring up the Call Setup menu. Fill out the call setup parameters as mentioned in <u>21.1.3 Voice Setup</u>, but select Data as the Call Type. Select a **Bearer Rate** in the call setup options. Press the **Pattern** tab and select a test pattern to be transmitted on the B channel during data calls.

Note: Test pattern is only applied when call button is pressed.

3	a a second a	Call - Data Setup					
RECALL	* [↓					
Call	Pattern						
Ca	ıll						
Call Type I	Data	V					
Bearer Rate	64K	Y					
Channel		1					
Numbering Type	Local	V					
Numbering Plan	Telephony	V					
Dial To	2	5819					
Sub Addr Type	NSAP	V					
Sub Addr							

Pattern tab						
IS PRI CALL	* 🗸 🗸					
Call	Pattern					
T	X					
PRBS Pattern	2^15-1 🛛 💙					
Invert						
R	×					
PRBS Pattern	2^15-1 🛛 🔻					
Invert						

Press Call and the other unit should ring.

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21.1.5 Data Call BERT Results (Result)

After successfully placing a data call, the BER is available. Pressing the Result screen presents the measurement parameters specified in G.821. Only DATA-64/56 and Nx64 Data Call Type in the CALL mode can give BER measurements. When viewing BER measurements, verify that both the PAT SYNC LED and the appropriate framing LED are green. These two LEDs signify that the patterns and framing match for the transmitting and receiving patterns.

Data Cal	I - BERT - Errors/Alarms	Data Call - BEI	Data Call - BERT - Analysis			
IS PRI CALL	* 🗸 😼	IS Y PRI CALL	*- 🗸	IS PRI CALL	¥ •	•
DTMF	Scan Multi DBackup	DTMF Scan	DTMF Scan Multi DBackup			
Setup Sig	gnal Trace Call <mark>Result</mark>	Setup Signal Trace	e Call <mark>Result</mark>	Setup Signal Trace Call Result		
Errors/Ala	arms Signal Analysis	Errors/Alarms Sig	i <mark>nal</mark> Analysis	Errors/Alarms Signal Analysis		
	DSn : [DS1]	Freque	G.821			
ET:	00/00:00:09	1.5M current (bps)	1544000	ES	0%	100.00
LOS	0 s	Offset (ppm):	0.0	SES	0%	100.00
AIS	0 s	Min (ppm):	-0.6	AS	0%	0.00
LOF	0 s	Max (ppm):	0.6	UAS	24%	100.00
Yellow	0 s	Leve		EFS	0%	0.00
		V(p-p)	6.4 V	Result	Y	PASS
		Level(p-p)	0.6dB/18.3dBm		35	
	5 86 86 50	1 B	88 S.			
(Page 1 of 3 💽	O Page 1	of 1 💽	0	Page 1 of 1	0

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21.1.6 Supplementary Service Scan (Scan)

In ETSI protocol, a Supplementary Service Scan scans a line to determine which of a variety of supplementary services are available on it.

Call - Data Setup

	¥	. 🗖		✓			
jnal Tr	ace	Ca	1	Result			
Scan	\mathbb{N}	lulti	DE	Backup			
Setup			Supp. Scan				
	Construction of the						
	St	AP		T			
ub Addi							
	tart						
	Scan up MSN # dr Type ub Addr	<mark>Scan</mark> M µp MSN #	gnal Trace Ca Scan Multi up Supp MSN # dr Type NSAP ub Addr	gnal Trace Call Scan Multi DE up Supp. Sup			

IS PRI CALL			¥		✓		
Setup S	ignal	Tra	ice	Call	Result		
DTMF	Sca	ın	N	lulti	DBackup		
Setup			Supp. Scan				
CLIP	-	*	CLI	R	*		
CFU	<u>.</u>	*	COLP		*		
COLR	2	*	CFB		*		
SUB	<u>.</u>	*	MSN		*		
CFNR	2	*	DDI		*		
HOLD	<u>.</u>	*	UUS		Unavail		
TP	2	*	AO	CD	*		
MCID) * AO		AOCE		*		
AOCS	2	*	CU	G	Verified		
	[St	art				

Pattern tab

SubAddress Type:

- NSAP to select the Network Service Access Point subaddress.
- User to use a subaddress defined by a user (no standard applied)

When the test is finished, Here is a list of the services:

- CLIP: Calling Line Identification Presentation presents the Calling Party Number to the called user.
- CLIR: Calling Line Identification Restriction prevents the Calling Party Number from showing to the called user.
- CFU: Call Forwarding Unconditional€" diverts a received call to a specified different number.
- COLP: Connected Line Identification Presentation€"the answering party's number is conveyed to the calling party.
- COLR: Connected Line Identification Restriction€"allows the connected subscriber to stop COLP from operating.
- **CFB**: Call Forwarding Busy Calls are forwarded to a specified number only when the subscriber (called party) 's number is busy.
- **SUB**: Sub Address digit is added to an incoming call to specify an extension.
- MSN: Multiple Subscriber Number. Multiple full numbers are assigned to one BRI line.
- **CFNR**: Call Forwarding No Reply calls are forwarded to a specified number only when the subscriber (called party) does not pick up the line in a specified amount of time.
- **DDI**: Direct Dialing In adds a number of telephone number to a circuit which can be used to dial that BRI (common use is a company number with individual 4 or 4 digit extension numbers that can be dialed)
- HOLD: Call Hold the user may interrupt a call, then reestablish it later. Interruption frees the associated B channel.
- **UUS**: User to User Signaling allows a user to send an Information message in the Setup, Alerting, or Connect message on the D Channel, without connecting the call; the message shows on the ISDN phone display.
- **TP**: Terminal Portability; the ability to suspend and reconnect a call; for example, to move a phone from one plug to another.
- AOC-D/E/S: Advice of Charge determines when charging information is available to the served user; during the call, when the call is terminated, when the call is established.
- MCID: Malicious Call Identification. The called party, on a per call basis, requests the network to register the called party phone number, the calling party number, and the date and time of the calls.
- CW: Call Waiting informs a user of an incoming call which has no B-ch available; user may accept, reject, or ignore.
- CUG: Closed User Group; a private network which restricts communication between members and nonmembers.

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21.1.7 Multi Call

- Type Single Number or Number Script
- Mode Parallel or Sequential.

IS PRI CALL		¥ =	✓		
Setup S	ignal Tra	ace Call	Result		
DTMF	Scan	Multi I	DBackup		
Setup	Map L1	Map L2	Result		
	Туре	Single Nu	mber		
	Mode	Parallel	T		
	Call Type	Voice 🛛 🔻			
Number	ring Type	Local 🛛 🔻			
Numbe	ring Plan	Telephony	/ 🔻		
Dia	I Number	n on on S	22997		
Page 1 of 2 Stop					

Multi Call by Single Call Number

Multi Call Map L1						
IS PRI CALL		¥ =	✓			
Setup S	ignal Tra	ace Call	Result			
DTMF	Scan	Multi	DBackup			
Setup	Map L1	Map L2	Result			
1-8	9-16	17-24				
Idle	Voice	Idle				
Idle	Voice	Idle				
Idle	Voice	Idle				
Voice	Idle	Idle				
Voice	Idle	Idle				
Listening	Idle	Idle				
Voice	Idle	Idle				
Voice	Idle	DChan				
Stop						

ISDN Phone Number List Using Reveal MTX

ace Call Result						
Multi DBackup						
Map L2 Result						
15						
3						
1						
23						
1						
23						
Page 2 of 2 Stop						

Multi Call Result

IS PRI C	ALL			*		₩
Setu DTN	_	gnal Sca		ice Mu	Call	Result DBackup
Set	_			Мар		Result
Ln	Dir	Ν	lum	ber	Ts#	* Result
153	Out		229	97	1	FAIL
1	Out	8	22997		2	OK
1	Out		22997		3	OK
1	Out	228		:997		OK
	8	8			8	-2
	į	2				
	(O P	age	1 of	1 0	

ofiles	-ISDN Phone N	lumber Lis	st					
-	Call Type		Number Type		Number Plan		B Channel Number	Phone Number
	VOICE		Local	•	Private	-	1	22997

Alternately, the user can prepare a Multi Call list using ReVeal MTX software and upload the list to the test set.

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21.1.8 DTMF

During the call DTMF tones can be transmitted.

To transmit DTMF tones, access the DTMF tab. An alphanumeric keypad will be displayed. DTMF tones are transmitted as soon as they are typed.

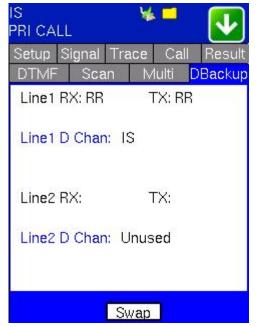
	DT	MF	
S PRI CALL		¥ =	•
Setup Si DTMF	ignal Tra Scan	ace Ca Multi	II Result DBackup
1	2	3	4
5	6	7	8
9	*	<u> </u>	#
A	В	С	D

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21.1.9 DBackup

To setup a backup D Channel, go to the Dbackup tab and press **Swap**. This operation is only applicable for 46B+2D Channel Config. Any other Channel Config will yield an error message when pressing Swap.

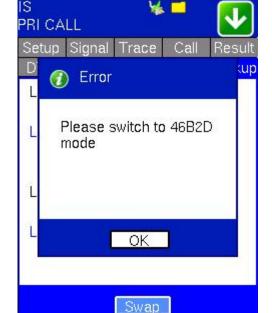
DBackup



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21.2 ISDN PRI Monitor

ISDN PRI Monitor ¥k 🗖 J PRI CALL BMap Line1 BMap Line2 Result Signal Setup Trace Mode Monitor ▼ Call Control National ISDN ▼ Ln1 D Channel 16 Ln2 D Channel 16 Codec Type A law V L2 Filter Off Idle Code 01111111



PRI Monitor Action Menu

PRI CALL		
Set BMap	Close	×
Error	Start	S
ET: LOS	Error Injection	Ē
AIS		*
LOF		*
LOMF		*
RDI		*
¢	Page 1 of 4 💿	

The ISDN PRI Monitor's setup and results resemble those found in ISDN PRI Call. Please refer to <u>21.1 ISDN PRI Call</u> for more information on these respective sections:

- Setup: 21.1.1 Setup (PRI Call Setup)
- Signal: 21.1.2 Signal
- **BMap Line**: Detects active traffic on the timeslots. The user can listen to the conversation by pressing on active call cells. Please see <u>21.1.7 Multi Call</u> for more information.
- Trace: 21.1.3 Call Voice Setup
- **Result**: Press the green arrow to access the action menu and press Start to initiate BERT Testing. Please refer to <u>21.1.5</u> <u>Data Call BERT Results</u> for more details.

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21.3 WAN IP Test

Please consult the factory.

22.0 Warranty and Software

Warranty Period:

The warranty period for hardware, software and firmware is three (3) years from the date of shipment to the customer. The warranty period for battery pack, LCD touch panel, LCD protective cover, and accessories (including but not limited to patch cords, AC adaptor, SFP, USB adaptors, carrying case, carrying pouch) is limited to one (1) year only.

Hardware Coverage: VeEX Inc warrants hardware products against defects in materials and workmanship.

- Repair the products
- Replace hardware which proves to be defective

provided that the products that the customer elects to replace is returned to VeEX Inc by the customer along with proof of purchase within thirty (30) days of the request by the customer, freight prepaid.

Software Coverage: VeEX Inc warrants software and firmware materials against defects in materials and workmanship. During the warranty period, VeEX will, at its sole discretion,

- Repair the products
- · Replace software and/or firmware which proves to be defective

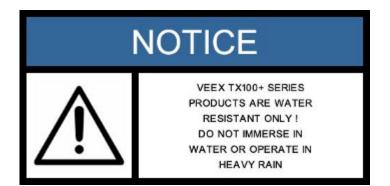
provided that the products that the customer elects to replace is returned to VeEX Inc by the customer along with proof of purchase within thirty (30) days of the request by the customer, freight prepaid.

Additionally, during the warranty period, VeEX Inc will provide, without charge to the customer, all fixes, patches and enhancements to the purchased software, firmware and software options. VeEX Inc does not warrant that all software or firmware defects will be corrected. New enhancements attached to a software option require the option to be purchased (at the time of order or the time of upgrade) in order to benefit from such enhancements.

Limitations: The warranty is only for the benefit of the customer and not for the benefit of any subsequent purchaser or licensee of any merchandise (hardware, software, firmware and/or accessories).

Revoking the warranty: VeEX Inc does not guarantee or warrant that the operation of the hardware, software or firmware will be uninterrupted or error-free. The warranty will not apply in any of the following cases:

- · Improper or inadequate maintenance by the customer
- Damage due to software installed by the customer on the unit without prior authorization (written) from VeEX Inc.
- Unauthorized alteration or misuse
- Damage occurred from operating the unit from outside of the environmental specifications for the product
- Improper installation by the customer



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23.0 Product Specifications

The TX130M+ product specifications are available in pdf format by clicking the link or specification sheet below. Please note you

will need Adobe Reader version 9.0 or higher to open and view the file.

To get the latest free version of Adobe Reader, click here

TX130M+ Product Family - Click here



Transport Expert

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24.0 Certification and Declarations



What is CE?

The CE marking is a mandatory European marking for certain product groups to indicate conformity with the essential health and safety requirements set out in European Directives. To permit the use of a CE mark on a product, proof that the item meets the relevant requirements must be documented.

For a copy of the CE Declaration of Conformity relating to VeEX products, please contact VeEX customer service.

What is RoHS?

RoHS is the acronym for Restriction of Hazardous Substances. Also known as Directive 2002/95/EC, it originated in the European Union and restricts the use of specific hazardous materials found in electrical and electronic products. All applicable products imported into the EU market after July 1, 2006 must pass



RoHS compliance.

Click here for ROHS Statement relating to VeEX products

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25.0 About VeEX

VeEX (Verification EXperts), is an innovative designer and manufacturer of test and measurement solutions addressing numerous technologies. Global presence through a worldwide distribution channel provides uncompromised product and technical support.

Visit us online at <u>www.veexinc.com</u> for latest updates and additional documentation.

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End of User Manual