JDSU HST-3000 RFC-2544 Ethernet Testing Guide

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Technical Support   tac@jdsu.com   855-275-5378

Table of Contents

Scope

This document covers Ethernet testing procedures used for Business Services customer activation, fault isolation, and troubleshooting using the JDSU HST-3000 portable business services tester. This document provides procedures for Metro Ethernet service up to 1 Gbps, including:

- Layer 2 and Layer 3 IPv4 RFC-2544 tests between two HST-3000s
- Layer 2 and Layer 3 IPv4 RFC-2544 tests between the HST-3000 and T-BERD 5800
- Layer 2 and Layer 3 IPv4 RFC-2544 tests between the HST-3000 and T-BERD 6000A
- Layer 2 and Layer 3 IPv4 RFC-2544 tests between the HST-3000 and SmartClass Ethernet

RFC-2544 is a recommended test suite for verifying key performance indicators for Metro Ethernet service with a single class of service

This document mandates proper care, cleaning, inspection, and handling of fiber optic connectors. All fibers and connectors must be cleaned and inspected when service is turned up on these fibers and whenever a fiber is disconnected and reconnected.

Revision History

Revision	Description	Name
1.0	Initial Draft	Dave Baker, JDSU
1.1	Updated process for HST-3000 Firmware Revision 7.41.03. Added check for Autonegotiation mismatch.	Dave Baker, JDSU
1.2	Added instructions for SmartClass Ethernet loopback device. Added instructions to save and load configuration. Added User Interface Description	Dave Baker, JDSU

1. Overview

This document covers Ethernet testing procedures used for Business Services customer activation, fault isolation and troubleshooting. At customer activation, this test equipment is used to validate the performance of an Ethernet circuit and to verify conformance to the agreed upon Service Level Agreement (SLA).

1.1   Hardware Description

The HST-3000 is a portable test tools for Ethernet testing. The product supports a variety of subscriber interface modules (SIMs) to support Ethernet, T1/T3, Copper/DSL and other access technologies. An Ethernet SIM is required for this test. The HST-3000 works in conjunction with a fiber cleaning and inspection kit to help turn-up and maintain Ethernet links. Menu selections are made from the HST-3000 front panel by using the keypad to select the option number or by using the arrow keys to scroll to the desired selection and pressing the OK key.

HST-3000 Front Panel:

User Interface:
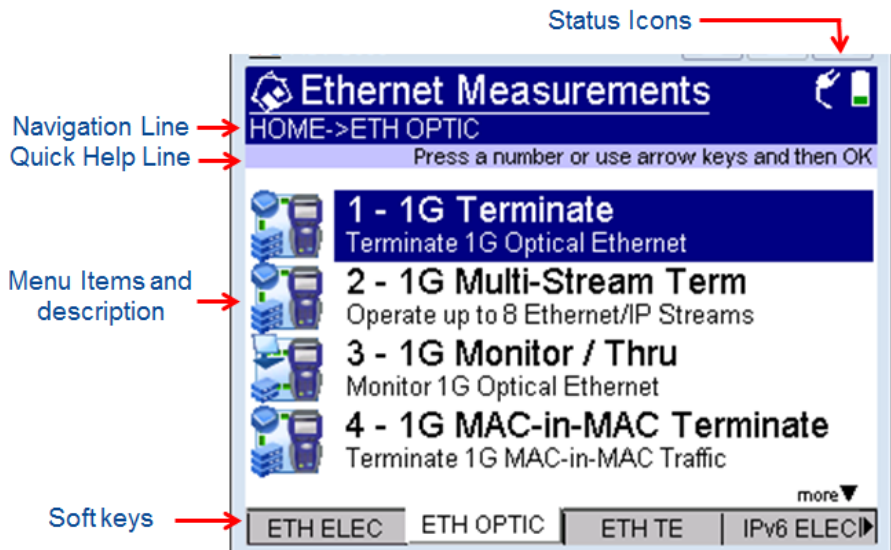
2.   RFC-2544 Test Procedures

The following procedures describe how to measure throughput, frame loss, round trip delay, and jitter (delay variation) with the HST-3000 in accordance with the RFC-2544 Metro Ethernet benchmarking methodology.

Test procedures are described for:
- Electrical (Copper/RJ-45) and Optical (Single Mode and Multimode Fiber) handoffs
- 10Mbps, 100Mbps, and 1Gbps links
- Layer 2 and Layer 3 IPv4 testing
- JDSU HST-3000, T-BERD 5800, T-BERD 6000A, and SmartClass Ethernet loopback devices

Procedures are described for RFC-2544 Tests to verify throughput, round trip delay, jitter, and frame loss SLA metrics. Technicians should follow procedure in one of the following sections, depending on his location (A-side or Z-side) and whether he is using a T-BERD 5800, T-BERD 6000A, SmartClass Ethernet, or HST-3000 test equipment. The RFC-2544 test is run from the A-Side. The Z-side is placed in loopback.

Meter	A-Side	Z-Side
HST-3000	Section 2.1	Section 2.2
T-BERD 5800	Not applicable	Section 2.3
T-BERD 6000A	Not applicable	Section 2.4
SmartClass Ethernet	Not applicable	Section 2.5

2.1   HST-3000 RFC-2544 Test

Use this procedure to set up an HST-3000 to test a 10Mbps, 100Mbps, or 1000Mbps link.

Step	Action	Details
1.	Install SIM	Install Ethernet Module on the HST-3000.
2.	Power On	Press the green Power Key to turn on the HST-3000. Wait approximately 1 minute for the Base Unit software to load.
3.	Insert SFP	For optical testing, insert desired SFP (1000BASE-SX, 1000BASE-LX) into the optical SFP connector labeled **R/T 1**.

Electrical RJ-45 Connectors   Optical SFP connectors

4.	Clean & Inspect	Before connecting to an optical link, make sure all fiber optic cables and connectors are clean using a Fiber Inspection microscope.

5.	Connect	Connect the Ethernet test port to the Ethernet switch port under test.

- Use Orange Multimode jumper cables for 850 nm 1000BASE-SX.

- Use Yellow Single Mode Fiber jumper cables for 1310 nm 1000BASE-LX and 1550 nm1000BASE-ZX.
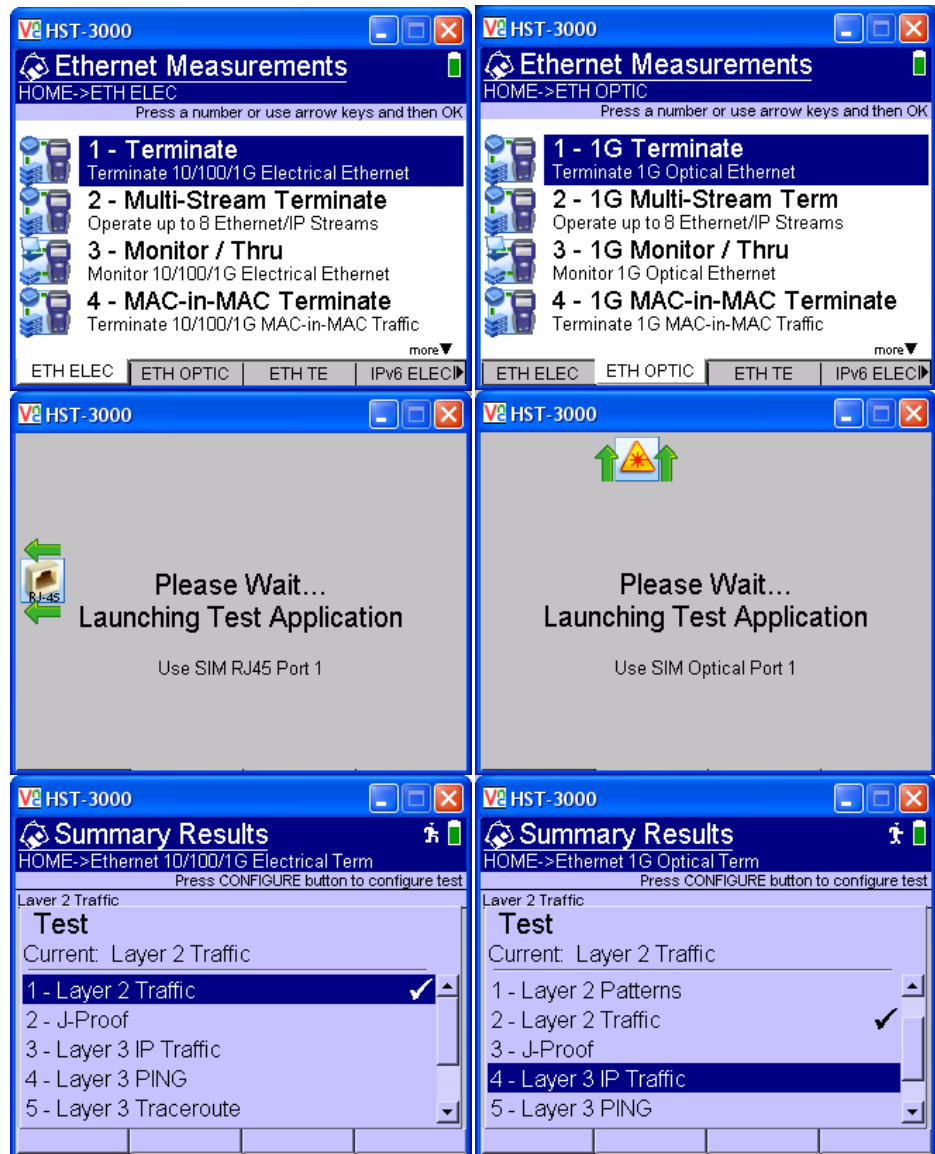

- Use CAT 5E or better cable for copper 10/100/1000BASE-T connections

6.   Launch Test App   Launch test application as follows:
- For Layer 2 Electrical (Copper/RJ-45) Testing, press the **ETH ELEC** Soft key, select **Terminate**, and press the **OK** key. Select **Layer 2 Traffic** at the **Test** prompt
- For Layer 2 Optical Testing, press the **ETH OPTIC** Soft key, select **1G Terminate**, and press the **OK** key. Select **Layer 2 Traffic** at the **Test** prompt
- For Layer 3 IPv4 Electrical (Copper/RJ-45) Testing, press the **ETH ELEC** Soft key, select **Terminate**, and press the **OK** key. Select **Layer 3 IP Traffic** at the **Test** prompt
- For Layer 3 IPv4 Optical Testing, press the **ETH OPTIC** Soft key, select **1G Terminate**, and press the **OK** key. Select **Layer 3 IP Traffic** at the **Test** prompt.

7.   Configure Test   Press the **Configure** Navigation key to configure test setting. If you have previously saved configuration files, press the **Save** soft key, then **Load Config** and **Load RFC 2544 Config**. Follow prompts to load desired files. Using the **Right Arrow** key or **Settings** soft key, scroll through Settings menus and configure/update your test as follows. Leave all other values at factory default settings, unless specified in the Work Order.

For Layer 2 Testing:

Menu	Option	Value	Comment
Test Mode	Test	Layer 2 Traffic	
	RFC 2544 Mode	Symmetric	
	SAM Complete	Disable	
Link Init	Auto Negotiation	See Work Order	Set to same values as Ethernet switch port.
	Speed	Set to 100 if Committed Information Rate (CIR) is less than 10 Mbps or Auto Negotiation is Off; Otherwise set to 1000.	
	Duplex	Full	
Ethernet	Encapsulation	See Work Order	None or VLAN
	VLAN ID	See Work Order	

For Layer 3 IP Testing:

Menu	Option	Value	Comment
Test Mode	Test	Layer 3 IP Traffic	.
	RFC 2544 Mode	Symmetric	
Link Init	Auto Negotiation	See Work Order	Set to same values as Ethernet switch port.
	Speed	See Work Order	
	Duplex	Full	
IP Init	ARP Mode	Enable	
	Source Type	Static IP	
	Source IP	See Work Order	
	Subnet Mask	See Work Order	
	Default Gateway	See Work Order	

RFC 2544 Settings:

Menu	Option	Value	Comment
RFC 2544 Settings	Load Format	Bit Rate	
	Length Type	Frame Length	Option only displayed if Test = Layer 3 IPv4
	Customer	Enter Customer name	
	Technician	Enter Technician name	
	Location	Enter Location	
	Comments	Enter Comments	
Test Selections	Throughput	Enable	
	Latency (RTD)	Enable	
	Packet Jitter	Enable	
	System Recovery	Disable	
	Frame Loss	Enable	
	Back to Back	Disable	
	Maximum Bandwidth	See Work Order for Committed Information Rate (CIR)	

Menu	Option	Value	Comment
Frame Length	Frame 1	64 if no VLAN; 68 if VLAN	
	Frame 2	Disable	
	Frame 3	Disable	
	Frame 4	Disable	
	Frame 5	Disable	
	Frame 6	Disable	
	Frame 7	1518 if no VLAN; 1522 if VLAN	
	Frame 8	Disable	If the Maximum Transmission Unit (MTU) is greater than 1518 or 1522 w/ VLAN, enter MTU as User Defined Length
Throughput	Accuracy	To within 1.0 (Mbps)	
	Trial Dur	60 sec	
	Frame Loss Tol.	0 Mbps	
	Show Pass/Fail	Yes	
	Threshold	See Work Order for CIR	
	Zero in Method	JDSU Enhanced	
Latency	Number of Trials	1	
	Trial Dur	60	
	Show Pass/Fail	**Yes** for VoIP, IPTV, Circuit Emulation, or Cell Backhaul service; **No** for other services	
	Latency Threshold (μsec)	See Work Order	If not specified: •250,000 for VoIP •250,000 for IPTV •50,000 for Circuit Emulation •20,000 for Mobile Backhaul
Jitter	Number of Trials	1	
	Trial Dur	60	
	Show Pass/Fail Status	**Yes** for VoIP, IPTV, Circuit Emulation, or Cell Backhaul service; **No** for other services	
	Packet Jitter Threshold (μs)	See Work Order	If not specified: •40,000 for VoIP •250,000 for IPTV •20,000 for Circuit Emulation •3,000 for Mobile Backhaul
Setup, Frame Loss	Test Procedure	RFC 2544	
	Trial Durations (seconds)	60	
	Bandwidth Granularity (%)	1Mbps	

8.   Save Config   If your configuration file has not been previously saved, press the **Save** soft key, select **Save Config**, enter a configuration file name, and press **OK**. Press the **Save** soft key again, select **Save RFC 2544 Config**, enter an RFC 2544 configuration file name, and press **OK**.

9.   View Results   Press the **Home** key to display Summary Results.

10.   Turn Laser On   For optical testing, press the **Action** soft key and select **Laser On**.

| 11. | Check AutoNeg Stats | For Electric connections, if Auto Negotiation was enabled in the Link **Init** Setup, press the **Right Arrow** key until **Auto-Neg Results** are displayed. Verify that **Link Config ACK** = **Yes** and **Duplex** = **Full.** |

| 12. | Check LED Results | Press the **Right Arrow** key until **LED Results** are displayed. A **Green** Signal Present LED indicates that the HST-3000 is receiving an optical signal from the near end Ethernet Switch. **Green Sync Acquired** and **Link Active** LEDs indicate that the HST-3000 has successfully connected to the near end Ethernet switch and the Ethernet link is active. |

| 13. | Check ARP Status | If you are running a **Layer 3 IPv4 Test**, verify that the final message in the Message bar is "**ARP Done**" |
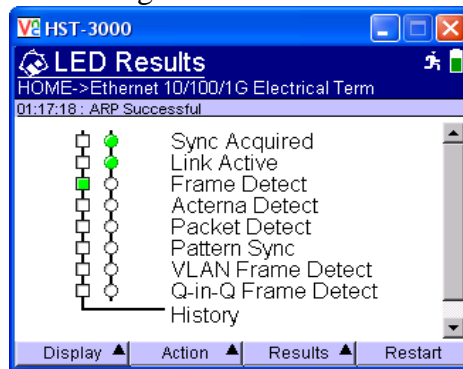
If "**ARP Done**" is not displayed, verify that the HST-3000's IP menu is configured correctly, as outlined above.

| 14. | Run Test | Press the **Action** soft key and select **Start RFC 2544**. The HST-3000 will loop up the far end unit, and test Throughput, Delay, Jitter, and Frame Loss. The test will take about 7 minutes to complete. At the conclusion of the test, the HST-3000 will automatically loop down the far end JDSU loopback device and create a test report in PDF format. |

The filename, including a time and date stamp, will be displayed in the RFC 2544 log. The report is saved to the /results/rfc2544 folder. It can be viewed or copied to USB from the **File Manager** in the **System** menu.

15.   View Summary   Press the **Right Arrow** key and **Next Frame** soft key view status of all tests. Verify that all tests **PASS** and the displayed values meet the performance objectives of the line under test.

HST-3000 — Throughput
HOME->Ethernet 10/100/1G Electrical Term
Test Complete

Pass or Fail	Frame Length (Bytes)	Cfg Rate (Mbps)	Measured Rate (Mbps)	Measured Rate (frms/sec)	Pause Det
PASS	64	200.00	200.00	297621	No
PASS	1518	200.00	200.00	16255	No
PASS	1592	200.00	200.00	15509	No

Display ▲   Action ▲   Results ▲

HST-3000 — Latency
HOME->Ethernet 10/100/1G Electrical Term
Test Complete

Pass or Fail	Frame Length (Bytes)	Latency (us)	Measured Rate (Mbps)	Measured Rate (frms/sec)	Pause Det
PASS	64	5	200.00	297621	No
PASS	1518	16	200.00	16255	No
PASS	1592	17	200.00	15509	No

Display ▲   Action ▲   Results ▲

HST-3000 — Packet Jitter
HOME->Ethernet 10/100/1G Electrical Term
Test Complete

Pass or Fail	Frame Length (Bytes)	Avg. PktJitter (us)	Max PktJitter (us)	Measured Rate (Mbps)	Pause Det
PASS	64	0	0	200.00	No
PASS	1518	0	0	200.00	No
PASS	1592	0	0	200.00	No

Display ▲   Action ▲   Results ▲

HST-3000 — Frame Loss (64)
HOME->Ethernet 10/100/1G Electrical Term
Test Complete

Cfg Rate (Mbps)	Throughput Rate (Mbps)	Frame Loss Rate (%)	Frames Lost	Pause Det
200.000	200.001	0.00	0	No
190.000	190.001	0.00	0	No

Display ▲   Action ▲   Results ▲   Next Frame

HST-3000 — Frame Loss (1518)
HOME->Ethernet 10/100/1G Electrical Term
Test Complete

Cfg Rate (Mbps)	Throughput Rate (Mbps)	Frame Loss Rate (%)	Frames Lost	Pause Det
200.000	200.002	0.00	0	No
190.000	190.011	0.00	0	No

Display ▲   Action ▲   Results ▲   Next Frame

HST-3000 — Frame Loss (1592)
HOME->Ethernet 10/100/1G Electrical Term
Test Complete

Cfg Rate (Mbps)	Throughput Rate (Mbps)	Frame Loss Rate (%)	Frames Lost	Pause Det
200.000	200.004	0.00	0	No
190.000	190.010	0.00	0	No

Display ▲   Action ▲   Results ▲   Next Frame

2.2 HST-3000 Loopback

Use this procedure to set up an HST-3000 as a far-end Z-side loopback device.

Step	*Action*	*Details*
1.	Install SIM	Install Ethernet Module on the HST-3000.
2.	Power On	Press the green Power Key to turn on the HST-3000. Wait approximately 1 minute for the Base Unit software to load.
3.	Insert SFP	For optical testing, insert desired SFP (1000BASE-SX, 1000BASE-LX, or 1000BASE-ZX) into the optical SFP connector labeled R/T 1.
4.	Clean & Inspect	Before connecting to an optical link, make sure the fiber and connector are clean using a Fiber Inspection probe.
5.	Connect	Connect the Ethernet test port to the Ethernet switch port under test. - Use Orange Multimode jumper cables for 850 nm 1000BASE-SX. - Use Yellow Single Mode Fiber jumper cables for 1310 nm 1000BASE-LX and 1550 nm1000BASE-ZX. - Use CAT 5E or better cable for copper 10/100/1000BASE-T connections

6.   Launch Test App   Launch test application as follows:

- For Layer 2 Electrical (Copper/RJ-45) Testing, press the **ETH ELEC** Soft key, select **Terminate**, and press the **OK** key. Select **Layer 2 Traffic** at the **Test** prompt
- For Layer 2 Optical Testing, press the **ETH OPTIC** Soft key, select **1G Terminate**, and press the **OK** key. Select **Layer 2 Traffic** at the **Test** prompt
- For Layer 3 IPv4 Electrical (Copper) Testing, press the **ETH ELEC** Soft key, select **Terminate**, and press the **OK** key. Select Layer 3 IP Traffic at the **Test** prompt
- For Layer 3 IPv4 Optical Testing, press the **ETH OPTIC** Soft key, select **1G Terminate**, and press the **OK** key. Select Layer 3 IP Traffic at the **Test** prompt.

7. Configure Test

Press the **Configure** Navigation key to configure test setting. Using the **Right Arrow** key or **Settings** soft key, scroll through Settings menus and configure your test as follows. Leave all other values at default, unless specified in the Work Order.
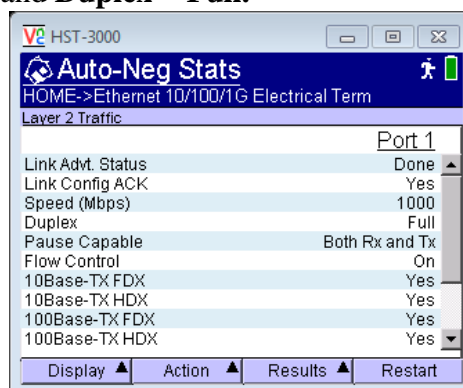
For Layer 2 Testing:

Menu	Option	Value	Comment
Test Mode	Test	Layer 2 Traffic	.
	RFC 2544 Mode	Disable	
	SAM Complete	Disable	
Link Init	Auto Negotiation	See Work Order	Set to same values as Ethernet switch port.
	Speed	See Work Order	
	Duplex	Full	

For Layer 3 IP Testing:

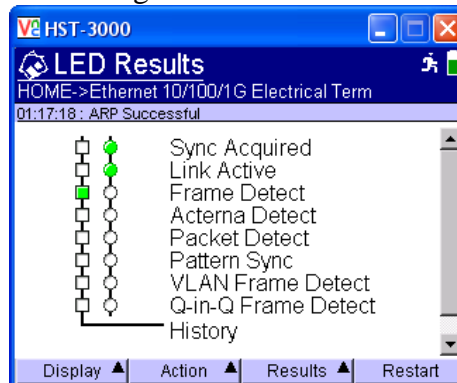| Menu	Option	Value	Comment
Test Mode	Test	Layer 3 IP Traffic	.
	RFC 2544 Mode	Disable	
Link Init	Auto Negotiation	See Work Order	Set to same values as Ethernet switch port.
	Speed	See Work Order	
	Duplex	Full	
IP Init	ARP Mode	Enable	
	Destination IP	See Work Order	If unknown, set to IP address of Default Gateway
	Source Type	Static IP	
	Source IP	See Work Order	
	Subnet Mask	See Work Order	
	Default Gateway	See Work Order	

8. View Results

Press the **Home** key to display Summary Results.

9. Turn Laser On

For optical testing, press the **Action** soft key and select **Laser On**.

10. Restart

Press the **Restart** soft key to reset test results.

11. Check AutoNeg Stats

For Electric (Copper/RJ-45) connections, if Auto Negotiation was enabled in the Link Initiation Setup, press the **Right Arrow** key until **Auto-Neg Results** are displayed. Verify that **Link Config ACK** = **Yes** and **Duplex** = **Full.**

12. Check LED Results

Press the **Right Arrow** key until **LED Results** are displayed. A **Green** Signal Present LED indicates that the HST-3000 is receiving an optical signal from the near end Ethernet Switch. **Green** **Sync Acquired** and **Link Active** LEDs indicate that the HST-3000 has successfully connected to the near end Ethernet switch and the Ethernet link is active.

13. Check ARP Status

If you are running a **Layer 3 IPv4 Test**, verify that the final message in the Message bar is "ARP Successful"

If "**ARP Successful"** is not displayed, verify that the HST-3000's IP menu is configured correctly, as outlined above.

14. Test

Inform the A-side technician that you are ready for test.

2.3 T-BERD 5800 Loopback

Use this procedure to set up a T-BERD 5800 as a far-end (Z-side) loopback device.

| Step	Action	Details
1.	Power On	Press the ON/OFF button to turn on the T-BERD 5800. Wait approximately 2 minutes for the Base Unit software to load.
2.	Insert SFP	For optical testing, insert desired SFP (1000BASE-SX, 1000BASE-LX, or 1000BASE-ZX) in the desired T-BERD 5800's SFP port.
3.	Clean & Inspect	Before connecting to an optical link, make sure the fiber and connector are clean using a Fiber Inspection probe.
4.	Connect	Connect the Ethernet test port on the top of T-BERD 5800 to the Ethernet switch port under test. • Use Orange Multimode jumper cables for 850 nm 1000BASE-SX. • Use Yellow Single Mode Fiber jumper cables for 1310 nm 1000BASE-LX and 1550 nm1000BASE-ZX. • Use CAT 5E or better cable for copper 1000BASE-T connections
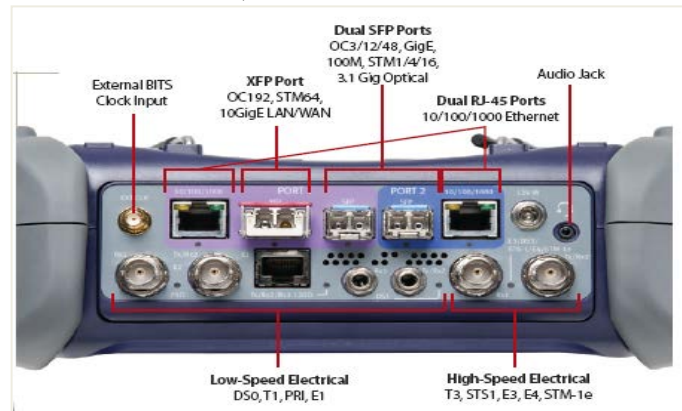
5.　　Select Test　　In the Test menu, select one of the following:
- For Layer 2 Electrical (Copper/RF-45) Testing:
  Ethernet>10/100/1000>Layer 2 Traffic> Terminate.
- For Layer 2 Optical Testing:
  Ethernet>1GigE Optical>Layer 2 Traffic> Terminate.
- For Layer 3 IPv4 Electrical Testing:
  Ethernet>10/100/1000>Layer 3 Traffic> IPv4>Terminate.
- For Layer 3 IPv4 Optical Testing:
  Ethernet>1GigE Optical>Layer 3 Traffic> IPv4>Terminate.
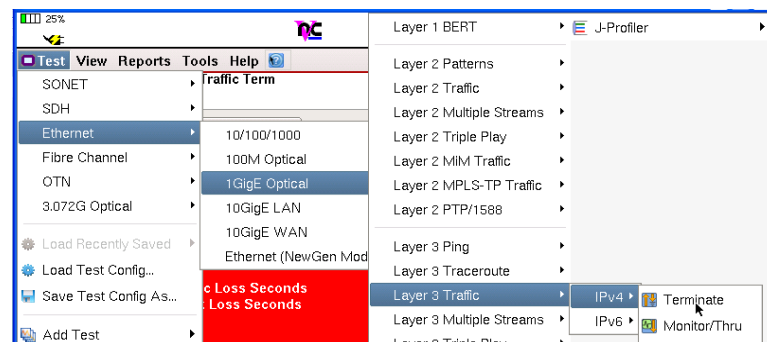
6.　　Reset to Defaults　　In the **Tools** menu, select **Reset Test to Defaults**. Press **OK** to continue.

7.　　Setup　　Press the **SETUP** soft key on the top right side of screen. Select the indicated folders and configure your test as follows. Leave all other values at default, unless specified in the Work Order.

Folder	Option	Value(s)	Comment
Interface, Physical Layer	Auto Negotiation	See Work Order	Set to same value as Ethernet switch port.
	Duplex	See Work Order	Options only displayed if Auto Negotiate = Off
	Speed		

For Layer 3 IPv4 testing, configure the following additional settings:

| Folder	Option	Value(s)	Comment
IP	Source IP Type	Static	Options displayed after tapping **Source/Destination Addresses** field.
	Source IP	See Work Order	
	Default Gateway	See Work Order	
	Subnet Mask	See Work Order	
	Destination IP	See Work Order	If unknown, enter IP Address of Default Gateway

8.　　View Results　　Press the **RESULTS** soft key, to display the Results screen.

9.　　Turn Laser On　　If testing an Optical link, select the Laser tab in the lower part of the screen and press **Laser Off**. The button will turn Yellow and be relabeled to indicate the **Laser** is **On**.

10.   Check LEDs   Press the **Restart** soft key on the Right side of the display to reset test results. A **Green** Signal Present LED indicates that the T-BERD is receiving an optical signal from the near end Ethernet Switch. **Green Sync Acquired** and **Link Active** LEDs indicate that the T-BERD has successfully connected to the near end Ethernet switch and the Ethernet link is active.

11.   Check AutoNeg Stats For Copper (RJ-45) connections, if Auto Negotiation was enabled in the Interface Setup, Set the right Results **Group/Category** to Ethernet/**Autoneg Status**. Verify that **Link Config ACK** = **Yes** and **Duplex** = **Full.**

12.   Check ARP Status   If you are running a **Layer 3 IPv4 Test**, verify that the final message in the Message bar is "ARP Successful. Destination MAC obtained." If the message bar displays: "Messages logged," tap the down arrow next to "Messages logged" and verify that the final message is "ARP Successful. Destination MAC obtained." Click **OK** to exit the log.
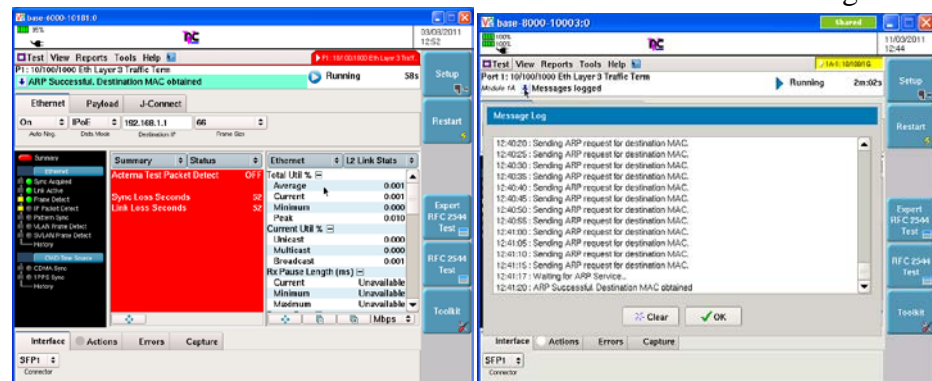

If "**ARP Successful"** is not displayed, verify that the T-BERD's IP menu is configured correctly, as outlined above.

13.   Test   Inform the A-side technician that you are ready for test.

2.4   T-BERD 6000A Loopback

Use this procedure to set up a T-BERD 6000A as a far-end (Z-side) loopback device.

Step	Action	Details
1.	Install PIM	Install the SFP or SFP+ Physical Interface Module (PIM) in the T-BERD 6000A.
2.	Insert SFP	Insert desired SFP (1000BASE-T, 1000BASE-SX, 1000BASE-LX, or 1000BASE-ZX) in PIM.
3.	Power On	Press the ON/OFF button to turn on the T-BERD 6000A. Wait approximately 1 minute for the Base Unit software to load.
4.	Launch MSAM	Press the **SYSTEM** button. The MSAM is represented by a BERT icon. If the BERT icon is yellow, tap the icon to start the application. The icon will turn yellow and the fan will start.
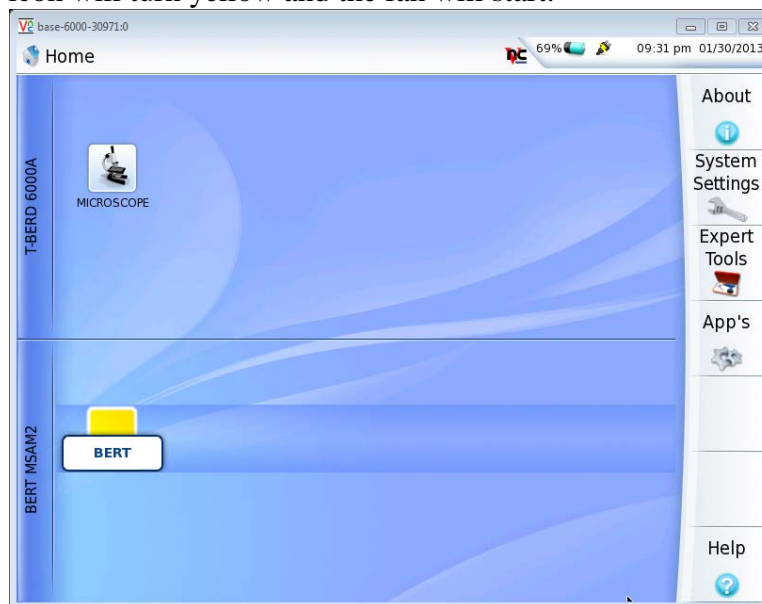
Step	Action	Details
5.	View Results	Press the **RESULTS** button to watch the progress of the MSAM/BERT Module startup.
6.	Clean & Inspect	While the BERT module is starting up, and before connecting to an optical link, make sure the fiber and connector are clean using a Fiber Inspection probe.

| 7. | Connect | Connect the SFP on the T-BERD 6000A to the Ethernet switch port. |

- Use Orange Multimode jumper cables for 850 nm 1000BASE-SX.

- Use Yellow Single Mode Fiber jumper cables for 1310 nm 1000BASE-LX and 1550 nm1000BASE-ZX.

- Use CAT 5E or better cable for copper 1000BASE-T connections

| 8. | Select Test | In the Test menu, select one of the following: |

- For Layer 2 Electrical (Copper/RJ-45) Testing:
  Ethernet>10/100/1000>Layer 2 Traffic> Terminate.
- For Layer 2 Optical Testing:
  Ethernet>1GigE Optical>Layer 2 Traffic> Terminate.
- For Layer 3 IPv4 Electrical Testing:
  Ethernet>10/100/1000>Layer 3 Traffic> IPv4>Terminate.
- For Layer 3 IPv4 Optical Testing:
  Ethernet>1GigE Optical>Layer 3 Traffic> IPv4>Terminate.
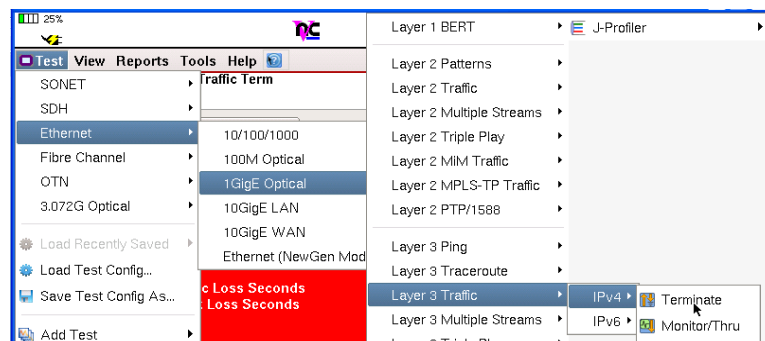
| 9. | Reset to Defaults | In the **Tools** menu, select **Reset Test to Defaults**. Press **OK** to continue. |

10. Setup   Press the **SETUP** soft key on the top right side of screen. Select the indicated folders and configure your test as follows. Leave all other values at default, unless specified in the Work Order.

Folder	Option	Value(s)	Comment
Interface, Connector	Electrical Connector	SFP1 or SFP2	For Electrical tests, select ETHERNET 1000BASE-T SFP
Interface, Connector	Optical Connector	SFP1 or SFP2	For Optical tests, select desired optical SFP (1000BASE-SX, 1000BASE-LX, etc.)
Interface, Physical Layer	Auto Negotiation	See Work Order	Set to same value as Ethernet switch port.
	Duplex	See Work Order	Options only displayed if Auto Negotiate = Off
	Speed		

For Layer 3 IPv4 testing, configure the following additional settings:

Folder	Option	Value(s)	Comment
IP	Source IP Type	Static	Options displayed after tapping **Source/Destination Addresses** field.
	Source IP	See Work Order	
	Default Gateway	See Work Order	
	Subnet Mask	See Work Order	
	Destination IP	See Work Order	If unknown, enter IP Address of Default Gateway

11. View Results   Press the **RESULTS** button, to display the Results screen.

12. Turn Laser On   If testing an Optical link, select the Laser tab in the lower part of the screen and press **Laser Off**. The button will turn Yellow and be relabeled to indicate the **Laser** is **On**.

13. Check LEDs   Press the **Restart** soft key on the Right side of the display to reset test results. A **Green** Signal Present LED indicates that the T-BERD is receiving an optical signal from the near end Ethernet Switch. **Green Sync Acquired** and **Link Active** LEDs indicate that the T-BERD has successfully connected to the near end Ethernet switch and the Ethernet link is active.

14. Check AutoNeg Stats   For Copper (RJ-45) connections, if Auto Negotiation was enabled in the Interface Setup, Set the right Results **Group/Category** to Ethernet/**Autoneg Status**. Verify that **Link Config ACK** = **Yes** and **Duplex** = **Full.**

15.   Check ARP Status   If you are running a **Layer 3 IPv4 Test**, verify that the final message in the Message bar is "ARP Successful. Destination MAC obtained." If the message bar displays: "Messages logged," tap the down arrow next to "Messages logged" and verify that the final message is "ARP Successful. Destination MAC obtained." Click **OK** to exit the log.
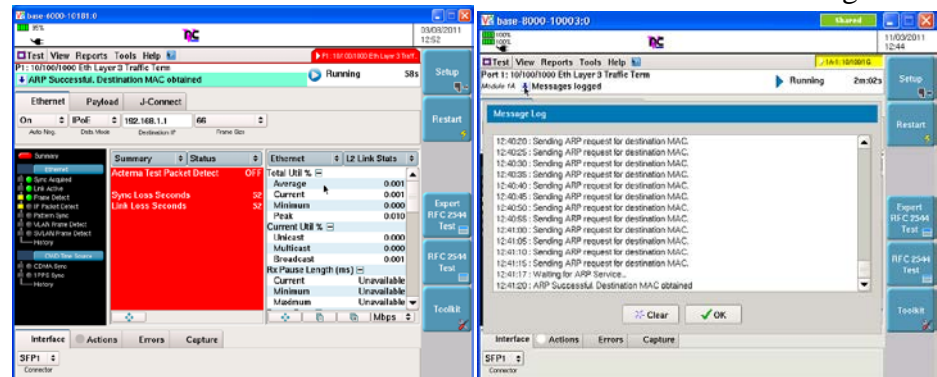
If "**ARP Successful"** is not displayed, verify that the T-BERD's IP menu is configured correctly, as outlined above.

16.   Test   Inform the A-side technician that you are ready for test.

2.5   SmartClass Ethernet

Use this procedure to set up a SmartClass Ethernet as a far-end Z-side loopback device.

Step	Action	Details
1.	Power On	Press the green Power Key to turn on the SmartClass Ethernet. Wait approximately 25 seconds for the Base Unit software to load.
2.	Clean & Inspect	Before connecting to an optical link, make sure the fiber and connector are clean using a Fiber Inspection probe.
3.	Connect	Connect the Ethernet test port to the Ethernet switch port under test. • Use Orange Multimode jumper cables for 850 nm 1000BASE-SX. • Use Yellow Single Mode Fiber jumper cables for 1310 nm 1000BASE-LX and 1550 nm1000BASE-ZX. • Use CAT 5E or better cable for copper 10/100/1000BASE-T connections
4.	Launch Test App	Launch test application as follows: • For Layer 2 Electrical (Copper/RJ-45) Testing, select the **Electrical Ethernet** option, and select **L2 Loopback Mode** • For Layer 2 Optical Testing, select the Optical Ethernet option and select **L2 Loopback Mode** • For Layer 3 IPv4 Electrical (Copper) Testing, select the **Electrical IP** option, and select **L3 Loopback Mode** • For Layer 3 IPv4 Optical Testing, select the **Optical IP** option, and select **L3 Loopback Mode**

5. Configure Test Select **Configuration** to configure test setting. Configure your test as follows. Leave all other values at default, unless specified in the Work Order.

For Layer 2 Testing:

Menu	Option	Value	Comment
Link Settings	Auto Neg	See Work Order	Set to same values as Ethernet switch port.
	Speed	See Work Order	
	Duplex	Full	
	RJ-45 Port Setting	Auto Sensing	Electrical option
	Laser Enable	Yes	Optical option

For Layer 3 IP Testing:

Menu	Option	Value	Comment
Link Settings	Auto Neg	See Work Order	Set to same values as Ethernet switch port.
	Speed	See Work Order	
	Duplex	Full	
	RJ-45 Port Setting	Auto Sensing	Electrical option
	Laser Enable	Yes	Optical option
IP Settings	ARP Mode	Disable	
	Dest Adress	See Work Order	IP Address of A side HST-3000
	Source Type	Static	
	Source Addr	See Work Order	
	Subnet Mask	See Work Order	
	Default Gateway	See Work Order	

6. View Results Press the **Cancel** Key twice, then select **Results**.

7. Check AutoNeg Stats For Copper (RJ-45) connections, if Auto Negotiation was enabled in the Link Initiation Setup, press the **Right Arrow** key until **Link Status** is displayed. Verify that **Link Config ACK** = **Yes** and **Duplex** = **Full.**

8. Test   Inform the A-side technician that you are ready for test.

Technical Support   tac@jdsu.com   855-275-5378