



ATT-TP76440-001

Ethernet Testing using the Sunrise Test Set

Abstract

Presented in this document are the methods and procedures to test Ethernet Services using the Sunrise Test Set.

Audience: The primary audience for this document are AT&T LOCAL EXCHANGE company personnel in the following disciplines, Local Field Organization (LFO-IN), Special Services (LFO-OUT), Information Technology Operations, Switch Capacity Planner/Engineer, Transport Equipment Engineer (TEE), Facility Equipment Engineer (FEE), Digital Transport Engineer (DTE), Maintenance Engineer, Space Planner, Frame Planner, Long Range Technical Planners, Outside Plant Engineering, Fundamental Network Planning and Special Services I/M. This document is to be used internally within AT&T LOCAL EXCHANGE companies and their Authorized AT&T Approved Vendors and has a limited distribution subject to the header/footer information.

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Business Unit: Network

Documents Coordinator: Wing Eng, Area Manager-Network Planning & Engineering, AT&T Services Inc. (925) 823-4616, E-Mail: we2583@camail.att.com

Authors:

Wing Eng, Area Manager-Network Planning & Engineering, AT&T Services Inc.
(925) 823-4616, E-Mail: we2583@camail.att.com

Bruce E. Jones – (817) 338-6266, E-Mail: bj3246@txmail.att.com

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2. Reasons for Reissue

This section will highlight all future revisions.

3. Turn-Up Testing Procedures and Expected Results

This Section contains procedures for initial verification of equipment related for the installation of AT&T LOCAL EXCHANGE companies Ethernet services. Use of these procedures will help ensure a successful service hand-off and reduce repeat troubles. This document also covers testing procedures that are features of a variety of test sets. Test and Turn-up procedures covered in this document are those utilizing two Acterna (Test Set) FST-2802 Test Pads. The test device must have the capability of operating as an Ethernet switch port on a circuit. Ethernet switches are capable of interpreting Ethernet frames (data); therefore, you can use the test set to ensure physical and data layer integrity by transmitting and analyzing Ethernet frames. The Acterna FST-2802 Test Pad is already being used by AT&T LOCAL EXCHANGE companies personnel in connection with the Installation and Maintenance of Central Office Ethernet switches and the deployment of AT&T's current Gig-E offering GigaMAN.

The following test will determine the physical characteristics of the Ethernet element. Testing the Ethernet Element from end to end will give a true test of all segments of the circuit. The same procedure can be of use; testing the different segments when needing to isolate a defect for repair purposes. The three tests performed are essential for the successful deployment of Ethernet services. These tests are to determine:

- Connectivity
- Throughput
- QoS

Ethernet Elements

The Ethernet elements that the 10/100BaseT signals passed through to complete the end-to-testing are the following:

- ADC FMT (Fiber Management Tray)
- ADC RJ-45 to RJ-45 (EIA/TIA T568-B specification)
- ADC Media Converter Module 10/100BaseT-100Base-LX, RJ-45, 1310nm, FP Laser, SC
- 10ft Cat 5e/5t patch cords
- 10ft Fiber Optic SC-UPC patch cords

3A. Ethernet Link Connectivity Test Procedure

1. Connectivity – Signal (Light)
2. Synchronization (Bit Stream from far end)
3. Link Establishment with far end test set (Both ends communicating)

Before you transmit and receive traffic (Ethernet frames) over a circuit, you must initialize an Ethernet link. At a minimum, initializing a link involves connecting compatible test sets that emulates Ethernet switch ports to a circuit, and allows the test sets to transmit idle traffic.

Connectivity Link Establishment

To specify link initialization parameters

- 1 Using the application buttons, select a TERM 10/100 (Unit A)
- 2 Select SETUP. A group of quick configuration buttons appears.
- 3 Select Link Init. The Link Init tab appears.
- 4 Set the parameters to Auto Neg On, Flow Control On.
- 5 Click OK to get back to the main user interface
- 6 Repeat the same process at the far end test (Unit B).
- 7 Connect each test set each end of circuit (See Figure 1 and 2)
- 8 Turn Signal ON for Unit A
- 9 Now look for Signal (from previous step), Sync LEDs on the test set of Unit B. If link is not established check the settings on both devices and try again.
- 10 Turn Signal ON for Unit B
- 11 Now look for Signal (from previous step), Sync LEDs on the test set of Unit A. If link is not established check the settings on both devices and try again.
- 12 You now have an Ethernet connection between the two ends of the circuit. This will be indicated by a Sync LED on both test sets at either end of the circuit.

3B. Frame Generation

1. Monitor the LED's for Signal, Sync, Link Active, and Frame Detect.
2. All are lit indicating the Test Pad detects a signal, obtains synchronization, link is active, and frames are detected.
3. On the left results pane, select the Result Category button.
4. Select Link Stats and record stats:
 - Average Bandwidth Received- 100%
 - Current Bandwidth- 100%
 - Shows a continual growing number of frames received and frames transmitted.
5. On the right results pane, select the Result Category Button.
6. Select the Error Stats and record stats:
 - Symbol Errors-0
 - FCS Errored Frames- 0
 - Runts-0
 - Undersized Frames-0
 - Oversized Frames-0
 - Errored Frames- 0

3C. Signal Throughput

The test set supports three traffic load types. They are Constant Rate, Burst, or Ramp. For this application we will use a Constant Load type at 10/100. The First step is to prepare the test Ethernet frames for transmission.

3C.1. Constant Load Test

To choose a frame profile

1. Select Setup.
2. A menu appears listing the Quick Configuration buttons.
3. Select Tx Profiles. The Tx Profiles tab appears.
4. Under Selections/Tx Profile, select the Profile P1.
5. There is no need to change anything in the Settings fields.
6. Repeat for the far end test set (Unit B) .

To set-up for a Constant Load Test

- 1 Select Setup (if not already in set-up).
- 2 Select the Traffic Tab.
- 3 Select Const.
- 4 Select %BW and 100%.
- 5 Select OK and return to the main user interface.
- 6 Repeat steps 1 through 5 for the far end test set (Unit B).
- 7 Select restart to clear any errors, and press button to Start Traffic.
- 8 You are now transmitting traffic at 100 percent of the circuit capability. Note if errors occur. See the Test Results section for details on results categories and values. Perform the 100% transmission test for 8 minutes or more.
- 9 Repeat process for far end unit.

3C.2. Constant Load Test Expectations

On the left results pane, select the Result Category button.

Select Link Stats and record stats:

Average Bandwidth Received- 100%

Current Bandwidth- 100%

Shows a continual growing number of frames received and frames transmitted.

On the right results pane, select the Result Category Button.

Select the Error Stats and record stats:

Symbol Errors-0

FCS Errored Frames- 0

Runts-0

Undersized Frames-0

Oversized Frames-0

Errored Frames- 0

3C.3. Link Stats Expectations

The Link Stats category lists link statistics such as the average frame rate, peak frame rate, and the number of frames transmitted, etc. To view Link Stats results, set the result category to Link Stats. The following is a list and a general explanation of all the Link Stats results. Bold type indicates elaboration as to the relevance to this specific test procedure.

Link Statistics (Stats) Test Expectations

Benchmark Test Result Expectations	Description
Total Util %, Average	The average bandwidth received, expressed as a percentage of the entire 1 Gbps of available bandwidth. The average is calculated over the time period elapsed since the last test restart.
Total Util %, Cur	The current bandwidth received expressed as a percentage of the entire 1 Gbps of available bandwidth. This result indicates what rate of traffic is making it across the link from the far end.
Total Util %, Peak	The peak bandwidth utilized by the received traffic expressed as a percentage of the entire 1 Gbps of available bandwidth since the last test restart.
Frame Rate, Average	The average rate of received frames, expressed in frames per second. The average is calculated over the time period elapsed since the last test restart.
Frame Rate, Cur	The current rate of received frames, expressed in frames per second. This measurement is an average taken over the prior second of test time.
Frame Rate, Min	The minimum rate of received frames over a one second period, expressed in frames per second.
Frame Rate, Peak	The maximum rate of received frames over a one second period, expressed in frames per second.
Frame Size, Min	The size in bytes of the smallest frame seen since last test restart.
Frame Size, Max	The size in bytes of the largest frame seen since last test restart.
Received Frames	The number of frames received since the last test restart.
Transmitted Frames	The number of frames transmitted since the last test restart. In a loop back test Received and Transmitted frames should be equal. If they are not, an error may have occurred. Check error counters.
Rx Bits/Sec, Cur	The current bandwidth utilized by the received traffic expressed in bits per second. This measurement is an average taken over the prior second of test time. In a loopback test, the Rx and TX Bits/Sec Cur values should track together. This is also true for an end to end test, if the same profile settings are used.
Tx Bits/Sec, Cur	The current bandwidth utilized by the transmitted traffic expressed in bits per second. This measurement is an average taken over the prior second of test time. This will tell us how fast we are transmitting. In the Ramp Test, once a pause frame is received, we want to check this result to see that it settles in near the rate in the customer contract.
Delay, Max	The maximum Round Trip Delay measurement since the last test restart. You must transmit an Acterna payload to measure round trip

	delay. RTD measurements are only performed when using a Constant traffic type. Check the service contract or SLA for a max RTD parameter. If there is none, a benchmark for the particular network is still recommended. In general, the Max RTD should not be vastly greater than the average. A significant differential would indicate packet jitter is being imposed on the circuit by a switching or buffering device.
Delay, Min	The minimum round trip delay calculated in microseconds. You must transmit an Acterna payload to measure round trip delay. RTD measurements are only performed when using a Constant traffic type. Check the service contract or SLA for an average. RTD parameter. If there is none, a benchmark for the particular network is still recommended. In general, this value should be under 100 ms. Average delays in excess of 100 ms might impair the performance of delay sensitive applications.
Delay, Avg.	The average round trip delay calculated in microseconds. You must transmit an Acterna payload to measure round trip delay. RTD measurements are only performed when using a Constant traffic type
Svc Disruption	The service disruption time (maximum inter-frame gap) when service switches to a protect line calculated in milli-seconds.

3C.4. Link Counts Expectations

Test Result	Description
Received Frames	A count of frames received since the last test restart, including errored frames.
Transmitted Frames	A count of frames transmitted since the last test restart.
RX Acterna Frames	A count of received frames with Acterna test packets.
PAUSE Frames	A count of PAUSE frames received from a remote Ethernet device. This should be 0 until using the Ramp Test. When the bandwidth approaches the provisioned limit, this counter should increment by at least 1.
Out of Seq Frames	A count of out of sequence frames. Only valid while receiving frames with the Acterna payload. If this result is non zero, it indicates that frames are being lost on the circuit under test.
VLAN Frames	A count of VLAN frames as defined in IEEE 802.p/q. This result only appears for Test Pads with the VLAN Tagging option.
Unicast Frames	The number of unicast frames received since the last test restart.
Multicast Frames	The number of multicast frames received since the last test restart.
Broadcast Frames	The number of broadcast frames received since the last test restart.
64 Byte Frames	A count of frames with a length of 64 bytes.
65-127 Byte Frames	A count of frames with lengths between 65 and 127 bytes, inclusive.
128-255 Byte Frames	A count of frames with lengths between 128 and 255 bytes, inclusive.
256-511 Byte Frames	A count of frames with lengths between 256 and 511 bytes, inclusive. Since we chose a frame size of 256, all the frames should be counted here. If you chose a different frame size, the counts will

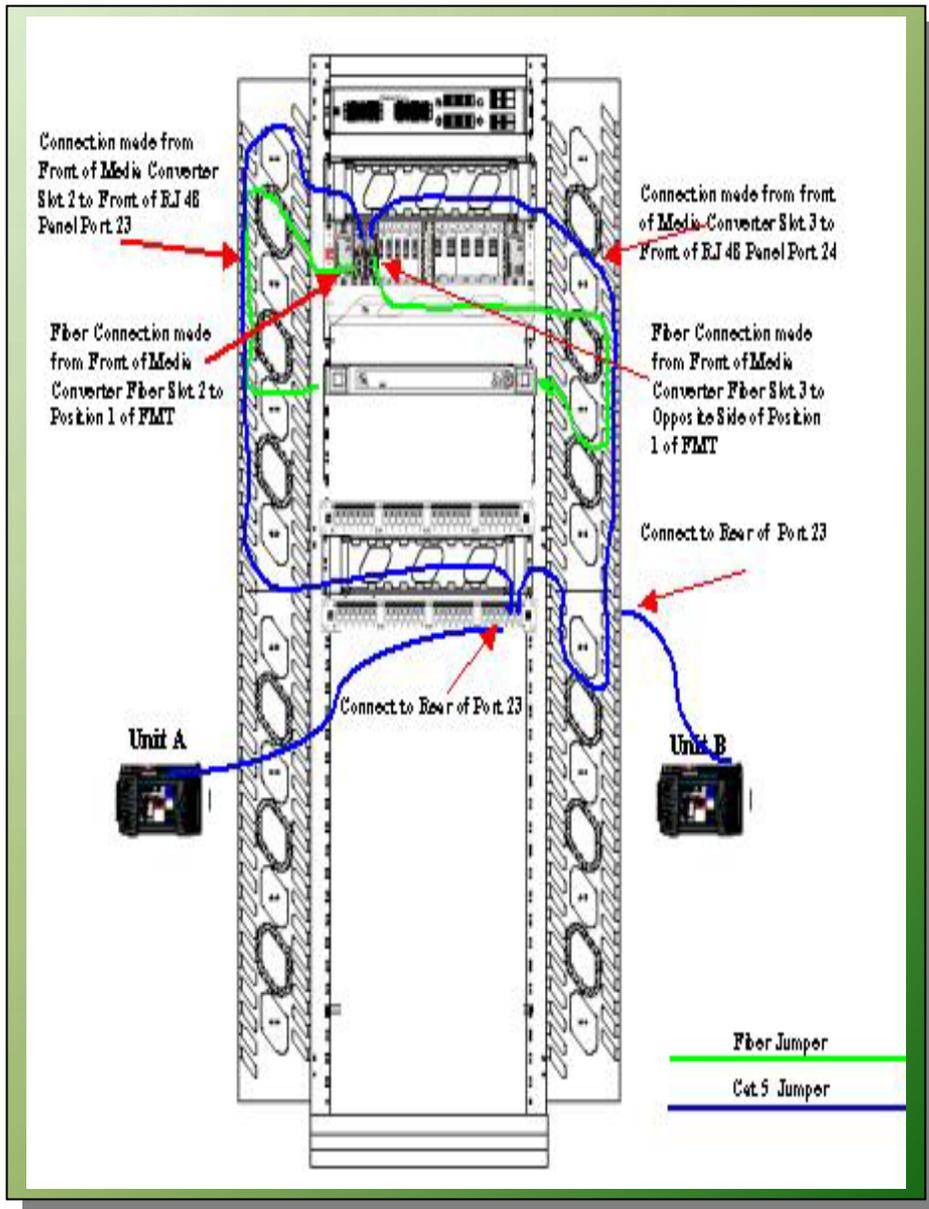
	fall into the appropriate bins.
512-1023 Byte Frames	A count of frames with lengths between 512 and 1023 bytes, inclusive.
1024-1518 Byte Frames	A count of frames with lengths between 1024 and 1518 bytes, inclusive.

3C.5. Error Stats Expectations

The Error Stats category lists error statistics such as the number of symbol errors, FCS errored frames, and runts. In this test procedure, any non-zero value for these Error Stats, constitutes a test failure.

Test Result	Description
Symbol Errors	A count of invalid 10-bit code words received on the physical layer. This result will not increment more than one time per frame.
FCS Errored Frames	A count of frames containing Frame Check Sequence (CRC) errors.
Runts	A count of frames under the required 64 byte frame length containing Frame Check Sequence (CRC) errors.
Undersized Frames	A count of frames under the minimum 64 byte frame length.
Oversized Frames	A count of frames over the maximum 1518 byte frame length.
Errored Frames	A summed count of FCS Errored Frames, Runts, Undersized Frames, and Oversized Frames.

3D. End-to-End Testing Illustration



3E. Note on Sending Deliberate Errors

In the transport test world it is common to send a bit error across a circuit once BERT pattern synchronization has been achieved. This assures the technician(s) that the proper end locations are the ones that are synchronized. The parallel for Ethernet testing is to send a FCS error. However, one of the inherent traits of Ethernet is that error frames are discarded by Ethernet aware interfaces. In the case of the 10/100 and Gigabit services over SONET, the Network Element interfaces are Ethernet aware. Frames with deliberate FCS errors sent by the test set will be dropped by the locally connected Ethernet port. Instead of seeing an FCS, what the far end test set will see is that a frame was lost. In contrast, the DWDM application would behave differently. The ports on the DWDM device handle traffic with complete transparency. Error frames are passed through along with valid frames. The far end test set would count an FCS error. However, since the test set is behaving as an Ethernet element, if it were in loop back, it would discard an error frame just as a switch would. In this way, the technique so often used in the TDM world can still be used for most Ethernet Transport applications.

Caution. Testing of cables, jumpers and frame facilities need to be performed from end-to-end without the attachment of active Ethernet devices. Perform testing from test set to test set to validate Category 5t facilities.

3F. Test Set Interoperability

3F.1 Same Type Test Sets

With the deployment of Ethernet type services, it has been well known that there are idiosyncrasies and standards differences between products and manufacturers. As a result, it is most advantageous that when end-to-end testing is performed, that the same type of test set and model from the same manufacturer is used for this testing. The two test set manufacturers standardized within AT&T (Sunrise and Acterna) work extremely effectively when the same test set is used on each end of the circuit.

The general availability of the Sunrise Telecom MTT-28/SSMTT-29 and Acterna 2802 Test Sets will be December 2003.

3F.2 Different Type Test Sets

Ethernet testing using different manufacturers products dictates special handling due to the soft standards found within the Ethernet architecture. While AT&T has selected two outstanding test sets from two different manufacturers (Sunrise Telecom & Acterna), both which will test to each other in an end-to-end test. The following information was ascertained through multiple interoperable tests. When the following stipulations are met, both test sets will function with one another. If any other manufacturer test sets are used, it will be necessary for interoperable lab tests be performed to insure their interoperability compliance as well.

3F.2.A End-to-End testing

The Acterna 2802 must be configured to run an All 1s or All 0s test pattern and the MAC address of the Sunrise Telecom module needs to be entered as the Destination MAC address for the 2802. Auto negotiation should be set for Disabled.

The Sunrise Telecom MTT-28 (10/100Base-T) module or the SSMTT-29 (Gigabit Ethernet) module must be configured for Layer 2, with an All 1s or All 0s test pattern, and the MAC address of the 2802 needs to be entered as the Destination MAC Address of the Sunrise Telecom module. Auto negotiation should be set for Disabled.

3F.2.B Loopback testing

If the Sunrise Telecom Ethernet module is set in a manual loop back mode, the Acterna 2802 module can run clean to itself.

The Sunrise Telecom Ethernet modules cannot run clean through a manual loop on the Acterna 2802. The Acterna 2802 must not be able to retransmit the Sunrise payload.

3F.3 Cable Test Devices

The Westek Cable Test Device has been approved by the AT&T LOCAL EXCHANGE companies for use in the end-to-end testing of electrical 8-wire cable used for Ethernet and other electrical circuits. This device can be used to test for electrical faults (open, short, grounds) from one RJ45 end point to the other RJ45 end point. The master device attaches to one end with the remote attaching to the other. This device will tell the technician at either end the correct test and wiring configuration end-to-end. This device is suitable for all Ethernet pre-wiring before circuit placements are made. (Circuit testing will be made with the Acterna and Sunrise Telecom test sets.)

The Westek device also provides talk battery in order for a hand set to be placed at each Cable Test Device which permits the remote technicians to converse with one another.

The general availability of this product will be December 2003.

4. Testing Job Aids using the Sunrise Test Set



Job Aid – Burst Pattern Test

When Required: Whenever the service rate is less than the line interface rate. If the service rate exceeds the interface rate, then conduct a Frame Transport Test at constant bandwidth instead of the Burst Pattern Test. For Gigabit Ethernet, required for all service rates except STS-24 or STS3c-8v. For Fast Ethernet (100BaseT) interface, required for the STS-1 service rate.

Purpose: Verification that the circuit properly handles bursts of traffic.

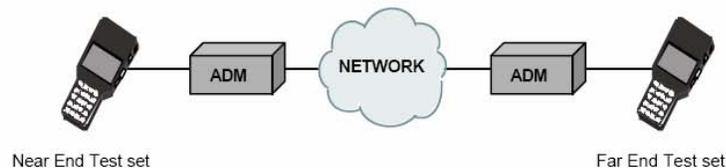
Goal: Zero errors and zero frames lost.



Job Aid – Burst Pattern Test

Note: The procedure described below applies to the Gigabit Ethernet (SSMTT-29) and Ethernet (SSMTT-28) modules.

This test requires two test sets, a near end and a far end test set



On the Far End Test Set:

1. Connect the test set to the circuit under test and power on the unit
2. Press the MODULE key and configure the test set as required (refer to the applicable Module Configuration job aid)
3. Make sure that the Ethernet link is established between the test set and the circuit under test
4. Go to Main Menu, Loopback and select:
MODE: MANUAL (F1 key)
FORMAT: LAYER 1 (F1 key)
and Press START (F4 key)

```
LASER 08:14:33
> P1: LINK-UP
  LOOPBACK
MODE: MANUAL
FORMAT : LAYER 1
```



Job Aid – Burst Pattern Test

5. The unit will display “Loopback Test in progress do not disturb”

On the Near End Test Set:

1. Connect the test set to the circuit under test and power on the unit
2. Press the MODULE key and configure the test set as required (refer to the applicable Module Configuration job aid)
3. Make sure that the Ethernet link is established between the test set and the circuit under test
4. Go to Main Menu, BERT/Throughput and select BERT Configuration

```
SHFT LASER 19:57:15
> P1: LINK-UP
>
  BERT/THROUGHPUT
  BERT CONFIGURATION
  MEASUREMENTS
  QUICK TEST
```

```
LASER 08:49:31
> P1: LINK-UP
>
  BERT CONFIGURATION
TEST : LAYER 1
TEST PATTERN : 2e31
FRAME LENGTH : 64
TRAFFIC SHAPING : BURST
SEQUENCE # : ENABL
```

Select the pattern. Press F1
SELECT and a pattern
selection screen will be
shown

Select the frame length 64
to 1518

Select the type of traffic
BURST. Press EDIT to
adjust the traffic parameters



Job Aid – Burst Pattern Test

5. Enter the following parameters:

TEST: LAYER1 (F1 key)

TEST PATTERN: Press SELECT (F1 key) and select the test pattern

FRAME LENGTH: press the shift key and enter the frame length (between 64 and 1518) using the keypad

TRAFFIC SHAPING: select BURST (F3 key) and press EDIT (F4 key)

```
LASER 08:48:19
> P1: LINK-UP
TRAFFIC SHAPING
TRAFFIC SHAPING: BURST
BANDWIDTH #1 : 100 %
DURATION #1 : 010.00 ms
BANDWIDTH #2 : 0 %
DURATION #2 : 010.00 ms
```

Enter BURST time value
Press ms (F2 key) to
select ms duration

Enter INTER-BURST
time value Press ms (F2
key) to select ms
duration

SEQUENCE #: ENABLE (F1 key) enables sequence number in the Ethernet frame in order to determine the number of lost frames

6. Press ENTER or press ESC and select MEASUREMENTS to start the test

7. Use the UP and DOWN arrow keys to navigate between the results screen and go to FRAME STATISTICS screens

```
LASER 08:33:23
> P1: LINK-UP
ET:000:00:18
ST: 08:32:36 RT:000:04:42
FRAME STATISTICS
#FRAMES: 16917759 16917759
FPS : 898073 897806
Min: 194063 189802
Max: 944478 944588
Avg: 860918 860662
#ERR FR: 0 %ERR FR: 0%
#RUNTS : 0 #OVERSIZED: 0
#MULTICAST: N/A #BROADCAST: N/A
#FLOW CONTROL: 0
```

TX Frames counter

RX Frames counter

Pause Frames counter



Job Aid – Burst Pattern Test

Verify that TX Frames counter = RX Frames counter - Pause Frames counter

Or alternatively make sure that the #LOST FRAMES counter is zero

```
LASER 08:38:31
> P1: LINK-UP
<
ST: 08:32:36 ET:000:00:18
RT:000:04:42
FRAME STATISTICS
#FRAMES RX : 16917759
#UNICAST RX : N/A
#LOST FRAMES: 0
LOST FPS : 0
%LOST FRAMES: 0%
#OUT OF SEQ FRAMES: 0
OUT OF SEQ FPS : 0
%OUT OF SEQ FRAMES: 0%
```

Lost Frames counter

Note: The # LOST FRAMES count is based on the sequence number of the Ethernet frames. To read this counter make sure to enable the Sequence # in the BERT configuration screen

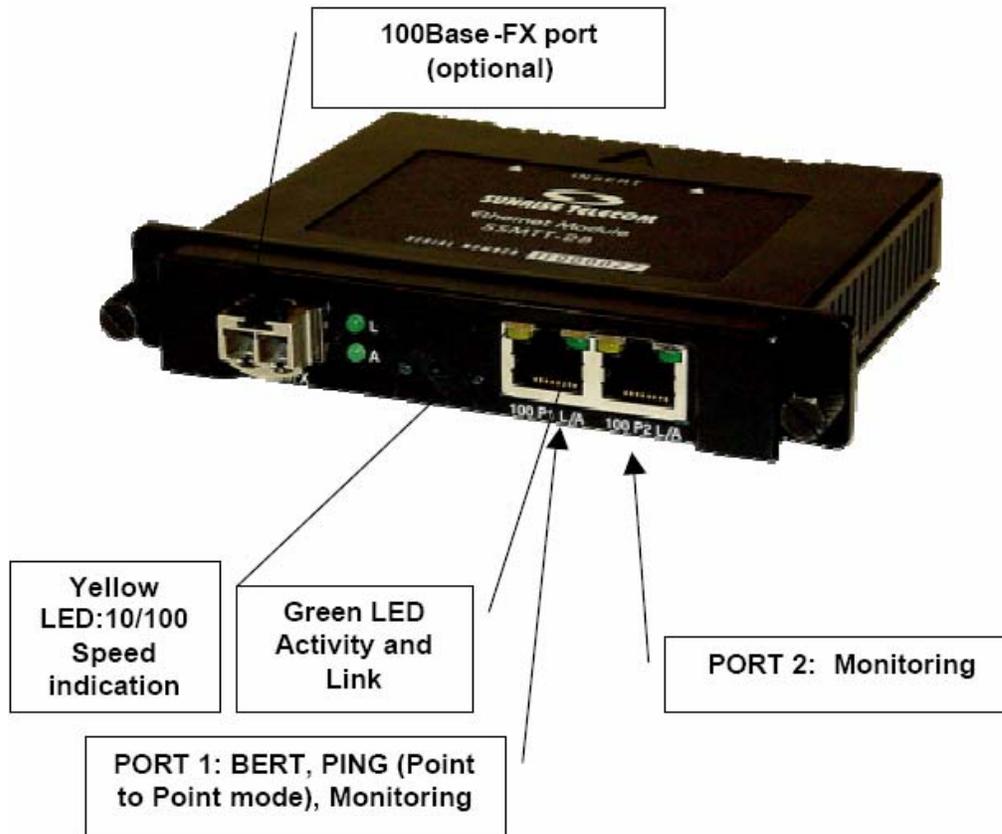
8. At the end of the test, reverse the role of the Near End and Far End Test sets and repeat the procedure





Job Aid – Ethernet Module Configuration

ETHERNET – SSMTT-28 10/100 Base T – 100 Base FX (optional)



Modules are not hot swappable. In order to exchange the module, power down the test set, change the module and power up again.



Job Aid – Ethernet Module Configuration

1. Power on the test set. The module by default will always boot up in the Quick Test screen, unless you change this setting in the Module configuration screen. Press the MODULE key to access the Module main menu.
2. Go to CONFIGURATION using the Up and Down arrow keys and press the ENTER key

```
05:14:19
>P1:100BT/F-DPLX
ETHERNET MAIN MENU

CONFIGURATION
LOOPBACK
BERT/THROUGHPUT
ADVANCED FEATURES
MEASUREMENTS SETUP
VIEW/PRINT RESULTS
```

10/100T for RJ45
10/100BaseT interface or
100FX for 100BaseFX
interface

```
05:16:48
>P1:100BT/F-DPLX
CONFIGURATION

PORT          : 10/100T
OPERATION     : P-TO-P
START-UP      : QUICK TEST
AUTO-NEGO.    : ENABLE
PAUSE         : ENABLE
ASYM PAUSE    : ENABLE
```

POINT TO POINT for BERT,
THROUGHPUT, PING
MONITOR for IN SERVICE
ANALYSIS

START-UP Screen at Power
UP, Quick Test,
Configuration or Module
Main Menu

3. Select PORT: 10/100T (F2 key) to use the 10/100BaseT interface or PORT: 100FX (F1 key) to use the 100Base-FX interface. Note that the PORT setting is not available if the module doesn't have the optional 100Base-FX interface
4. Select OPERATION: P-TO-P (F1 key)



Job Aid – Ethernet Module Configuration

5. Select AUTO-NEGO. : ENABLE (F1 key) to enable auto-negotiation. Or select AUTO-NEGO. : DISABLE (F2 key) to disable auto-negotiation

Note: If auto-negotiation is enabled, the test set will negotiate the speed, duplex, and pause settings with the network interface.

6. Select PAUSE: ENABLE (F1 key) to enable Pause flow control. For this case the module will stop transmitting upon receiving Pause flow control frames. Or select PAUSE: DISABLE (F2 key) to disable Pause flow control. For this case the module will not stop transmitting when receiving Pause flow control frames.

Note: If auto-negotiation is disabled the test set will attempt to link up with the speed, duplex, and pause set by the user as shown on the picture below:

```
>P1:100BT/F-DPLX 05:28:33
>
  CONFIGURATION
PORT      : 10/100T
OPERATION : P-T0-P
START-UP  : QUICK TEST
AUTO-NEGO: DISABLE
INTERFACE : 100BT
MODE      : F-DPLX
PAUSE     : ENABLE
```

The screenshot shows a configuration menu with the following settings: PORT: 10/100T, OPERATION: P-T0-P, START-UP: QUICK TEST, AUTO-NEGO: DISABLE, INTERFACE: 100BT, MODE: F-DPLX, and PAUSE: ENABLE. Two callout boxes are present: one pointing to '100BT' with the text 'Link Speed Base-T or 100Base-TX', and another pointing to 'F-DPLX' with the text 'Duplex mode: Half or Full Duplex'.

1. INTERFACE: 10BT (F1 key) or 100BT (F2 key) to select the link speed Ethernet (10Base-T) or Fast Ethernet (100Base-T)

2. MODE: H-DPLX (F1key) or F-DPLX (F2 key) to select either duplex mode Half duplex or Full duplex modes



Job Aid – Frame Transport Test

When Required: Always

Purpose: Verification of end-to-end frame transport.

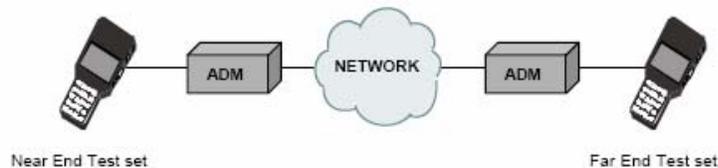
Goal: Zero errors and zero frames lost during tests.



Job Aid – Frame Transport Test

Note: The procedure described below applies to the Gigabit Ethernet (SSMTT-29) and Ethernet (SSMTT-28) modules.

This test requires two test sets, a near end and a far end test set



On the Far End Test Set:

1. Connect the test set to the circuit under test and power on the unit
2. Press the MODULE key and configure the test set as required (refer to the applicable Module Configuration job aid)
3. Make sure that the Ethernet link is established between the test set and the circuit under test
4. Go to Main Menu, Loopback and select:
MODE: MANUAL (F1 key)
FORMAT: LAYER 1 (F1 key)
and Press START (F4 key)

```
LASER 08:14:33
> P1: LINK-UP
> LOOPBACK
MODE: MANUAL
FORMAT : LAYER 1
```



Job Aid – Frame Transport Test

5. The unit will display “Loopback Test in progress do not disturb”

On the Near End Test Set:

1. Connect the test set to the circuit under test and power on the unit
2. Press the MODULE key and configure the test set as required (refer to the applicable Module Configuration job aid)
3. Make sure that the Ethernet link is established between the test set and the circuit under test
4. Go to Main Menu, BERT/Throughput and select BERT Configuration

```
SHFT LASER 19:57:15
> P1: LINK-UP
  BERT/THROUGHPUT
  BERT CONFIGURATION
  MEASUREMENTS
  QUICK TEST
```

```
LASER 07:24:08
> P1: LINK-UP
  BERT CONFIGURATION
TEST : LAYER 1
TEST PATTERN : Ze31
FRAME LENGTH : 64
TRAFFIC SHAPING : CONST
SEQUENCE # : ENBL
```

Select the pattern. Press F1 SELECT and a pattern selection screen will be shown

Select the frame length 64 to 1518 or Jumbo

Select the type of traffic CONSTANT, BURST, or RAMP. Press EDIT to adjust the traffic parameters



Job Aid – Frame Transport Test

5. Enter the following parameters:

TEST: LAYER1 (F1 key)

TEST PATTERN: Press SELECT (F1 key) and select the test pattern

FRAME LENGTH: press the shift key and enter the frame length (between 64 and 1518) using the keypad

TRAFFIC SHAPING: select CONSTANT (F1 key) and press EDIT (F4 key) and enter the desired bandwidth

```
LASER 08:31:14
> P1: LINK-UP
TRAFFIC SHAPING
TRAFFIC SHAPING: CONST
IPG : 536 ns
BANDWIDTH : 0 %
```

Enter BANDWIDTH

SEQUENCE #: ENABLE (F1 key) enables sequence number in the Ethernet frame in order to determine the number of lost frames

6. Press ENTER or press ESC and select MEASUREMENTS to start the test

7. Use the UP and DOWN arrow keys to navigate between the results screen and go to FRAME STATISTICS screens

```
LASER 08:33:23
> P1: LINK-UP
ST: 08:32:36 ET:000:00:18 RT:000:04:42
FRAME STATISTICS
#FRAMES: 16917759 16917759
FPS : 898073 897806
Min: 194063 189802
Max: 944478 944588
Avg: 860918 860662
#ERR FR: 0 %ERR FR: 0%
#RUNTS : 0 #OVERSIZED: 0
#MULTICAST: N/A #BROADCAST: N/A
#FLOW CONTROL: 0
```

TX Frames counter

RX Frames counter

Pause Frames counter

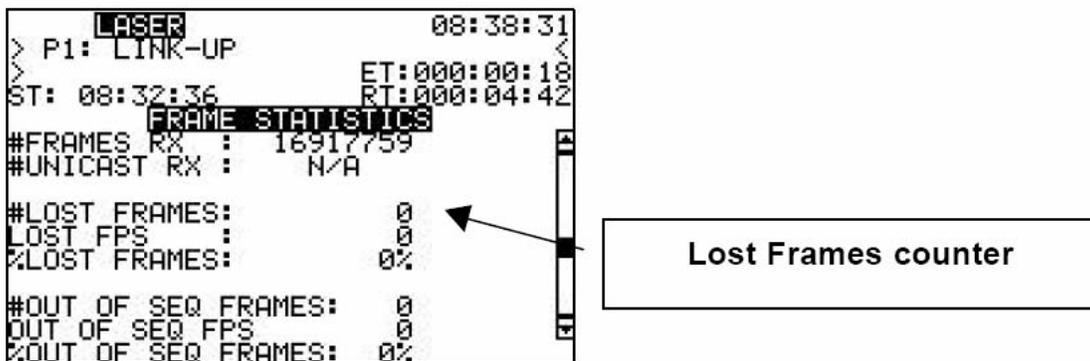


Job Aid – Frame Transport Test

Verify that TX Frames counter = RX Frames counter - Pause Frames counter

Or alternatively make sure that the #LOST FRAMES counter is zero

```
LASER 08:38:31
> P1: LINK-UP ET:000:00:18
ST: 08:32:36 RT:000:04:42
FRAME STATISTICS
#FRAMES RX : 16917759
#UNICAST RX : N/A
#LOST FRAMES: 0
LOST FPS : 0
%LOST FRAMES: 0%
#OUT OF SEQ FRAMES: 0
OUT OF SEQ FPS : 0
%OUT OF SEQ FRAMES: 0%
```

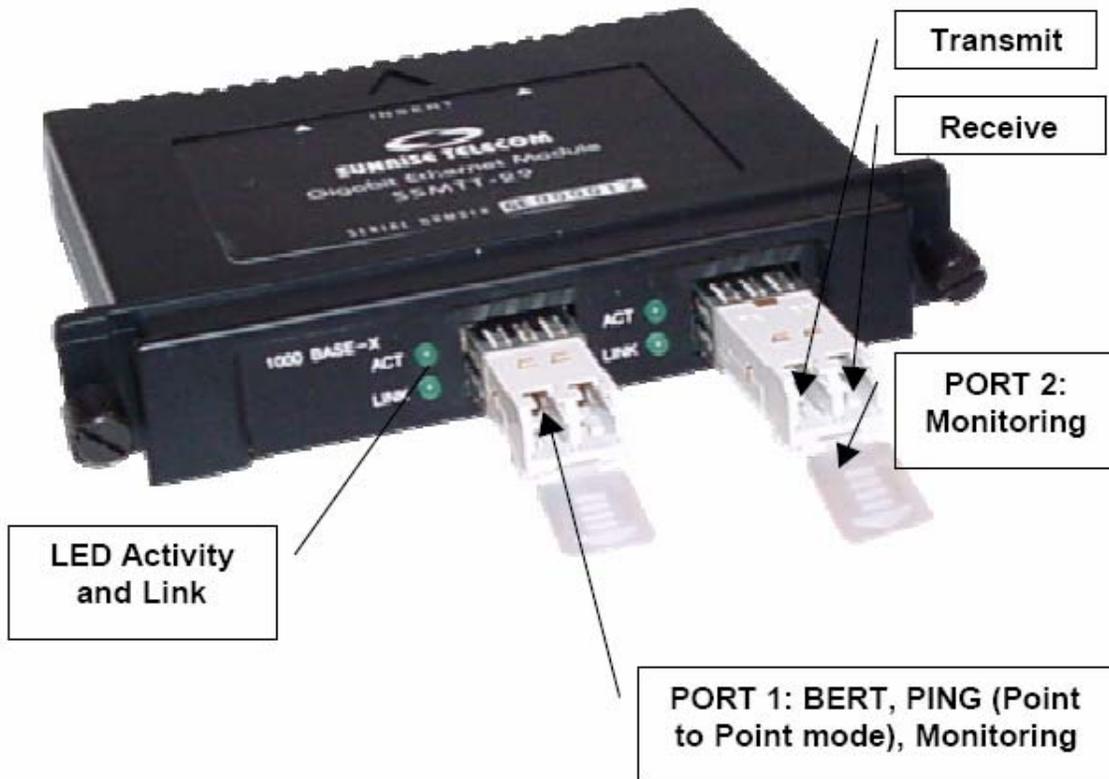


Note: The # LOST FRAMES count is based on the sequence number of the Ethernet frames. To read this counter make sure the Sequence # in the BERT configuration screen 8. At the end of the test, reverse the role of the Near End and Far End Test sets and repeat the procedure



Job Aid – GigE Module Configuration

GIGABIT ETHERNET – SSMTT-29 1000 Base-X

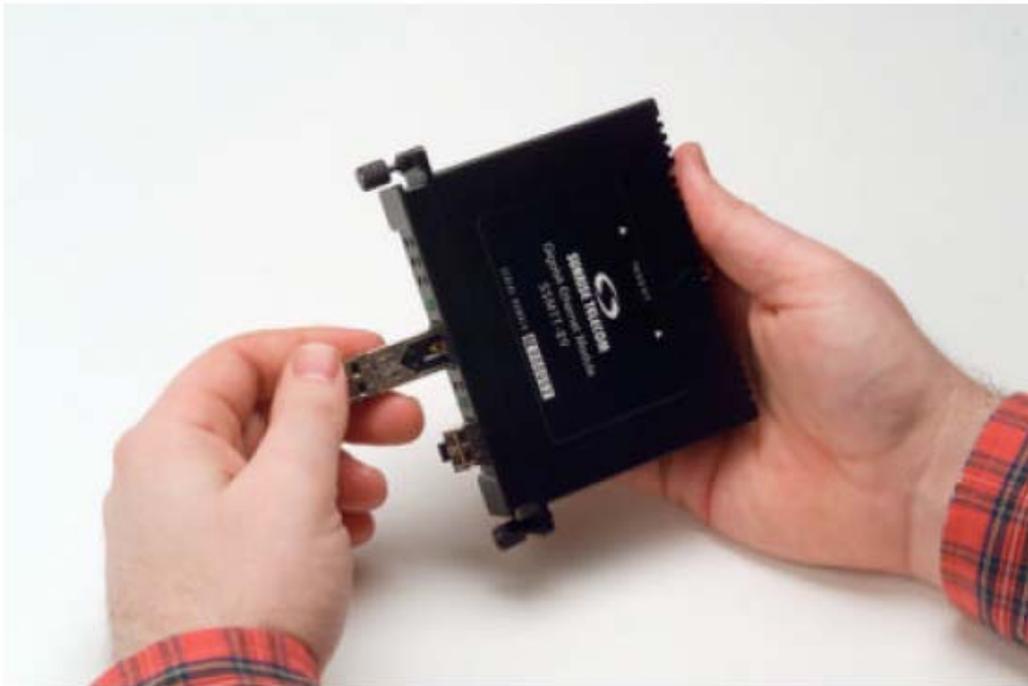


Modules are not hot swappable. In order to exchange the module, power down the test set, change the module and power up again.



Job Aid – GigE Module Configuration

Optical Transceiver



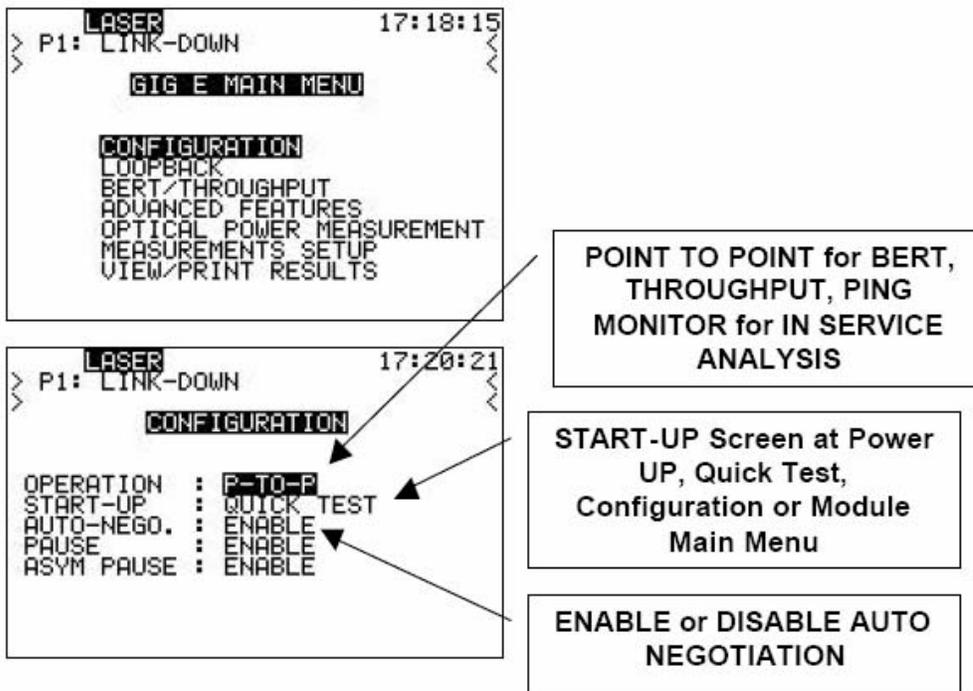
Insert the SFP optical transceiver as shown on the picture. The transceivers are hot swappable.

- For 1000Base-SX use SSMTT-29-850 transceiver (850nm)
- For 1000Base-LX use SSMTT-29-1310 transceiver (1310nm)
- For 1000Base-ZX use SSMTT-29-1550 transceiver (1550nm)



Job Aid – GigE Module Configuration

1. Power on the test set. The module by default will always boot up in the Quick Test screen, unless you change this setting in the Module configuration screen. Press the MODULE key to access the Module main menu.
2. Go to CONFIGURATION using the Up and Down arrow keys and press the ENTER key



3. Select OPERATION: P-TO-P (F1 key)
4. Select AUTO-NEGO. : ENABLE (F1 key) to enable auto-negotiation. Or select AUTO-NEGO. : DISABLE (F2 key) to disable auto-negotiation

Note: If auto-negotiation is enabled, the test set will negotiate pause settings with the network interface. If auto-negotiation is disabled, the test set will attempt to link up without negotiating with the network interface.



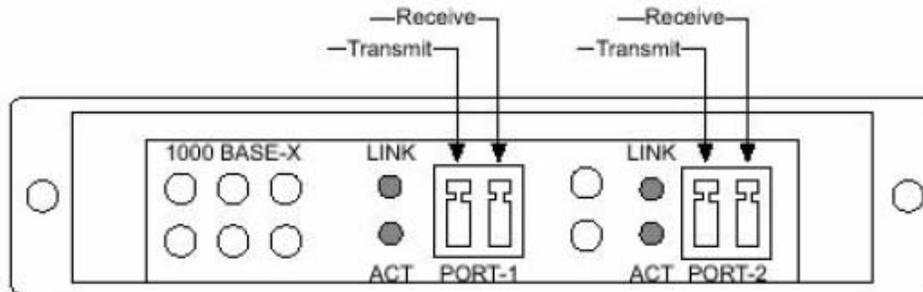
Job Aid – GigE Module Configuration

5. Select PAUSE: ENABLE (F1 key) to enable Pause flow control. For this case the module will stop transmitting upon receiving Pause flow control frames. Or select PAUSE: DISABLE (F2 key) to disable to Pause flow control, for this case the module will not stop transmitting when receiving Pause flow control frames.

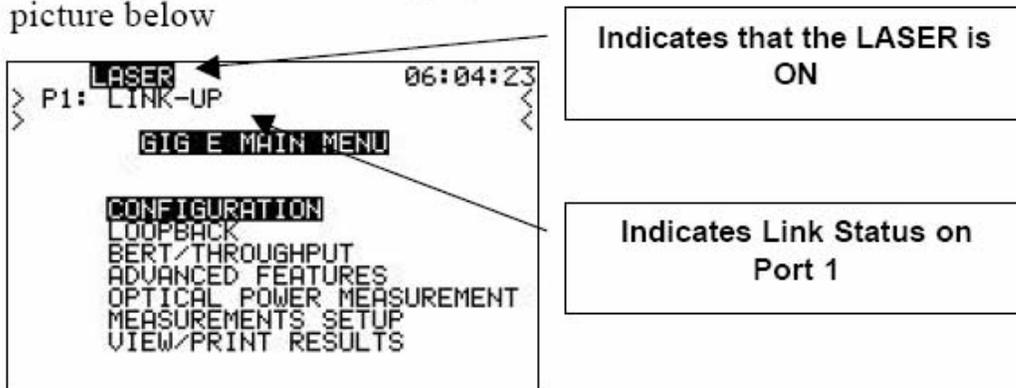


Job Aid – Link Connectivity Test

GIGABIT ETHERNET – SSMTT-29 1000 Base-X



1. For 1000Base-X test, connect SSMTT-29 Gigabit Ethernet module Port 1 to the circuit under test
2. Power on the test set and press the MODULE key
3. Go to Configuration and verify AUTO-NEGO. : DISABLE (refer to the Gigabit Ethernet module configuration job aid)
4. Verify that the screen displays >P1: LINK-UP as shown on the picture below



If the screen displays >P1: LINK-DOWN this indicates that the test set could not open the Ethernet link with the circuit under test.



Job Aid – Link Connectivity Test

TIPS: If the link is down make sure that:

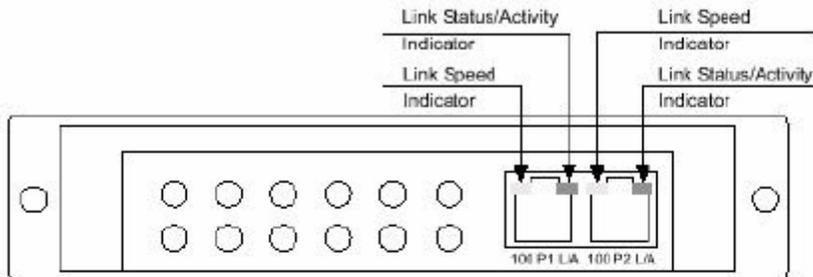
- The LASER is ON (laser ON is indicated on the first row of the screen)*
- The TX and RX of the fiber are properly connected*
- Verify the Optical power (Go to main menu, optical power measurement) and make sure that the signal is not LOS (Loss of Signal) or SATURAT (saturation)*
- Verify that you are using the proper transceiver 850nm or 1310nm or 1550nm by looking at the label*

5. Verify that the front panel LEDs for SIGNAL and FRAME are solid GREEN, which indicates that the Link is up.
If the LEDs are blinking RED/GREEN, press the HISTORY key and verify that they become solid green. Blinking LEDs mean that the link was previously down, but is now up.
If the LEDs are solid RED, this indicates that the link is down.

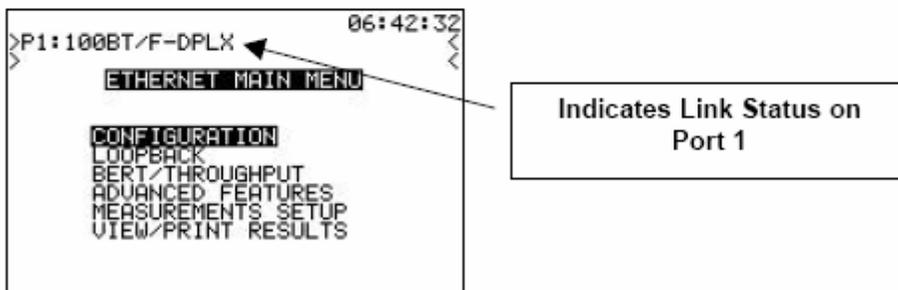


Job Aid – Link Connectivity Test

ETHERNET – SSMTT-28 10/100BaseT



1. For 10/100BaseT test, connect SSMTT-28 Ethernet module Port 1 to the circuit under test
2. Power on the test set and press the MODULE key
3. Go to Configuration and verify AUTO-NEGO. : DISABLE (refer to Ethernet module configuration job aid)
4. Verify that the screen displays >P1:100BT/F-DPLX as shown on the picture below



If the screen displays >P1: LINK-DOWN, this indicates that the test set could not open the Ethernet link with the circuit under test.

TIP: If the link is down make sure that the RJ45 cable is not short or open (go to Main menu, Advanced features, Cable test)



Job Aid – Link Connectivity Test

5. Verify that the front panel LEDs for SIGNAL and FRAME are solid GREEN, which indicates that the Link is up.
If the LEDs are blinking RED/GREEN, press the HISTORY key and verify that they become solid green. Blinking LEDs mean that the link was previously down, but is now up.
If the LEDs are solid RED, this indicates that the link is down.



Job Aid – Pause Test

When Required: Whenever the service rate is less than the line interface rate. For Gigabit Ethernet, required for all service rates except STS-24 or STS3c-8v. For Fast Ethernet (100BaseT) interface, required for the STS-1 service rate.

Purpose: Verification that the network sends Pause frames when congested.

Goal: Pause frames detection

Note: The procedure described below applies to the Gigabit Ethernet (SSMTT-29) and Ethernet (SSMTT-28) modules.

1. Connect the test set to the circuit under test and power on the unit
2. Press the MODULE key and configure the test set as required (refer to module configuration job aid)
3. Make sure that the Ethernet link is established between the test set and the circuit under test
4. In the Main menu go to BERT/THROUGHPUT and select BERT CONFIGURATION

```
SHFT | LASER 19:57:15
> P1: LINK-UP
>
  BERT/THROUGHPUT
  BERT CONFIGURATION
  MEASUREMENTS
  QUICK TEST
```

```
LASER 07:24:08
> P1: LINK-UP
>
  BERT CONFIGURATION
TEST          : LAYER 1
TEST PATTERN  : 2e31
FRAME LENGTH  : 64
TRAFFIC SHAPING : CONST
SEQUENCE #    : ENABL
```

Select the pattern. Press F1 SELECT and a pattern selection screen will be shown

Select the frame length 64 to 1518

Select the type of traffic CONSTANT, BURST, or RAMP. Press EDIT to adjust the traffic parameters



Job Aid – Pause Test

5. Enter the following parameters:

TEST: LAYER1 (F1 key)

TEST PATTERN: Press SELECT (F1 key) and select the test pattern

FRAME LENGTH: press the shift key and enter the frame length (between 64 and 1518) using the keypad

TRAFFIC SHAPING: select CONSTant (F1 key) and press EDIT (F4 key) and enter BANDWIDTH: 100 %

```
LASER 07:25:50
> P1: LINK-UP
>
  TRAFFIC SHAPING
TRAFFIC SHAPING: CONST
IPG              : 96   ns
BANDWIDTH        : 100 %
```

Enter BANDWIDTH: 100%

SEQUENCE #: ENABLE (F1 key) enables a sequence number in the Ethernet frame in order to determine the number of lost frames

6. Press ENTER or press ESC and select MEASUREMENTS to start the test

7. Use the UP and DOWN arrow keys to navigate between the results screen and go to the FRAME STATISTICS screen

```
LASER 07:32:04
> P1: LINK-UP
>
ST: 07:31:47 ET:000:00:16
RT:000:04:44
  FRAME STATISTICS
#FRAMES: 20660859 20650060
FPS      : 1554749 1551412
  Min:    324764 317671
  Max:    1554749 1551412
  Avg:    1105312 1104821
#ERR FR: 0 %ERR FR: 0%
#RUNTS  : 0 #OVERSIZED: 0
#MULTICAST: N/A #BROADCAST: N/A
#FLOW CONTROL: 127
```

Pause flow control counter



Job Aid – Pause Test

Verify that the #FLOW CONTROL frames counter is incrementing within a few seconds.

If #FLOW CONTROL remains 0, the PAUSE may not have been properly provisioned on the network interface.

5. Non-Supported Features and Expectations

5A. Auto-Negotiation

Auto Negotiation allows two devices at either end of the circuit to advertise and negotiate the link operation mode, such as the speed of the link and the duplex configuration of half or full duplex, to the highest common denominator

AT&T does not support this feature; all network elements with the feature shall be turned "off", due to the following reasons:

1. Standards are not ubiquitous in the industry, nor is their technical support for this parameter setting.
2. Manufacturers meet the "lowest common denominator" on interoperability between one another.
3. The flow through provisioning systems do not have the capability to provision auto-negotiation settings in an automated or remote manner.
4. Some manufacturers' cards on SONET ADMs do not have the capability to flexibly provision auto-negotiation of a port to "on" from "off".

5B. Flow Control

The Flow Control feature allows the provider to throttle back the customer traffic by sending "Pause Frames" when the customer tries to send Ethernet frames that would overflow the buffer capacity on the Ethernet card.

AT&T does not support this feature due to the following issues:

- 1 Some Ethernet Cards do not have the capability to perform this feature.
- 2 Some manufacturers products have the Flow-Control feature tied to Auto-Negotiation. Turning "on" Flow-Control also turns "on" Auto-Negotiation, which is not desired.
- 3 Some manufacturers products require a complicated procedure and the aid of an external device to turn "on" Flow-Control.
- 4 Standards have not fully matured on this feature.

5C. Fault Propagation

Fault Propagation allows traffic sources and destinations to be notified if a fault occurs anywhere in the network. AT&T will not support this feature due to the following reasons:

1. Some manufacturers Ethernet cards do not have Fault Propagation supported or available.
2. If a customer has alternate paths set up for traffic reroutes in case of network failures, the customer equipment may not be notified about the fault to perform a traffic reroute in a timely fashion.

5D. Throughput

Customers should not expect to get the maximum throughput capacity and speeds. While AT&T supports the 99.999% reliability on circuit level traffic, bursty Ethernet traffic are not guaranteed speeds or performance reliability factors. Just a few of the many reasons are listed:

1. Some Ethernet cards do not deliver the ideal throughput due to Ethernet processing issues or clock synchronization components.
2. Customers could sometimes see effective throughput even more than the expected maximum speeds. This could happen because while Ethernet is mapped over SONET, the inter-frame gap in Ethernet is removed and re-inserted only when Ethernet is de-encapsulated from SONET.

5E. Performance Metrics

Almost all Ethernet cards have issues with performance metrics. Some of the PM counts are incorrectly calculated on these cards. Some important PM counts are missing on these cards. Standards for Performance Metrics are considered as optional in many manufacturers products. As a result, AT&T will not offer or support Performance Metrics for Ethernet.

1. Customers may see packet losses or degraded performance due to certain traffic patterns.
2. AT&T will not be able to easily verify customer complaints on this issue.
3. Customers should not expect AT&T to respond to throughput or packet loss problems.

5F. Jumbo Framing

Jumbo Frames are non-standard Ethernet Frames that are longer than 1518 bytes (for untagged frames) and 1522 bytes for tagged frames. Not all ADM manufacturers support the transport of jumbo frames today. AT&T will not support this feature in the initial Ethernet over SONET offerings.

1. Not all Ethernet switches are capable of generating Jumbo Frames.
2. AT&T will not be able to guarantee transport of Jumbo Frames. Customers will need to turn "off" this feature.

5G. Layer 2 Protection Aggregation

Spanning tree protocol and link aggregation protocol are protocols that can be run on the Layer 2 Network to prevent the formation of transmission loops. On Layer 1, it can be used to view several independent circuits between two customer sites as a single logical circuit. Transport of spanning tree protocol or link aggregation control protocol frames through the EoS network is not guaranteed or supported. Customers may not be able to run spanning tree protocol or link aggregation protocol through AT&T's network.

6.References

For further information or electronic copies of this document and related information, visit the internal AT&T LOCAL EXCHANGE companies web site: <http://ebiz.sbc.com/commonsystems> or <http://apex.sbc.com>. Drawings may be viewed on the AT&T LOCAL EXCHANGE companies Internal web site: <http://woodduck/standarddrawings/sbc/cbc-index.htm>

Document	Description	Issue & Date
ATT-TP76200	Network Equipment – Building Systems (NEBS)	Current
ATT-TP76300	Installation Guide within the Central Office	Current
AT-TP76400	Detail Engineer Requirements for the C.O.	Current
ATT-TP76412	AT&T-Customer Interface Standards for 100 Mbps and Higher Excluding SONET Interfaces	April 2005
ATT-TP76440	Ethernet Copper Cable & Ethernet Copper Assembly Specification	May 2005
ATT-TP76440-001	AT&T-Ethernet Testing using the Sunrise Test Set	June 2005
ATT-TP76440-002	AT&T-Ethernet testing using the Acterna Test Set	June 2005
ATT-TP76412-003	AT&T-Cable Test Device	Dec 2003
ATT-TP76450	Common Systems Standards for the AT&T Communications Network	May 2003
ATT-TP76450-001	Common Systems Checklist	May 2003
ATT-TP76450-002	Common Systems Product Exception and Evaluation Request	May 2003

7. Contacts

7A. AT&T Contacts

Mike Yeilding, Area Manager-Network Centralized Support (Drawings & Ethernet Standards)
(925) 823-4747, E-Mail: my1515@camail.att.com

Bruce E. Jones, Associate Director-Network Planning & Engineering (Common Systems)
(817) 338-6266, E-Mail: bj3246@txmail.att.com

Dave Smith, Area Manager-Network Planning & Engineering, AT&T Services Inc.
(818) 713-7308, E-Mail: ds2375@camail.att.com

Wing Eng, Area Manager-Network Planning & Engineering, AT&T Services Inc.
(925) 823-4616, E-Mail: we2583@camail.att.com

7B. Strategic Supplier Contacts

ADC Telecommunications Inc.

Carter Gaddis, Field Sales Engineer, ADC Telecommunications Inc.
(972) 878-2066, E-Mail: Carter.Gaddis@adc.com

Dennis Powell, Field Sales Engineer, ADC Telecommunications Inc.
(847) 452-3468, E-Mail: dennis.powell@adc.com

Sunrise Telecom

Jeff Harmon, Regional Sales Engineer
(972) 529-6073, E-Mail: jharmon@sunrisetelecom.com

Acterna

Todd Watkins, AT&T Account Team
(972) 692-3781, todd.watkins@acterna.com

Westek

800-526-2673