Fibre Channel Consortium

FC-FS Clause 7
FC_Port State Machine Test Suite
Version 1.4.1

Technical Document

Last Updated: June 6, 2008

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Modification Record

- June 14, 2007 – Version 1.0 Draft for internal review
  Daniel Reynolds: Original Document based on FC-FS Clause 7. Based off of the UNH-IOL FC-PH v1.01 Test Suite.
- October 25, 2007 - Version 1.1 Draft for internal review
  Michael Davidson: Rearranged test into a logical fashion.
- December 28, 2007 – Version 1.2 Draft for internal review
  Michael Davidson: Expanded procedure for Test 7.1.7, deleted Tests 7.1.8 and 7.2.8, clarified procedures for Group 2, added a test to each group for E_D_TOV, added a Loss-of-Synchronization test to each group (where applicable), added a Loss of Signal test to each group.
- January 2, 2008 – Version 1.3 Draft for internal review
  Michael Davidson: Clarified Procedures for Receive Primitives tests and added to each group, Cleaned up and expanded procedures for all tests.
- January 8, 2008 – Version 1.4 Final Release
  Michael Davidson and Daniel Reynolds: Minor Changes and revisions to Purposes, procedures, discussions, observable results and possible problems for all tests.
- June 6, 2008 – Version 1.4.1 Final Release
  Michael Davidson: Corrected the observable results for Group 3. Removed Acknowledgments of people not involved with the development of this test suite (dsr).

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Michael Davidson	University of New Hampshire
Daniel Reynolds	University of New Hampshire

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Introduction

Overview
The University of New Hampshire's InterOperability Laboratory (UNH-IOL) is an institution designed to improve the interoperability of standards based products by providing an environment where a product can be tested against other implementations of a standard. This particular suite of tests has been developed to help implementers evaluate the functionality of their Fibre Channel based products.

These tests are designed to determine if a product conforms to specifications defined in **ANSI X3T11/Project 1331-D/Rev 1.9, Fibre Channel Framing and Signaling (FC-FS) hereafter referred to as "FC-FS".** Successful completion of all tests contained in this suite does not guarantee that the tested device will operate with other devices. However, combined with satisfactory operation in the IOL's interoperability test bed, these tests provide a reasonable level of confidence that the device under test (DUT) will function in most multivendor Fibre Channel environments.

Organization of Tests
The tests contained in this document are organized to simplify the identification of information related to a test and to facilitate in the actual testing process. Each test contains an identification section that describes the test and provides cross-reference information. The discussion section covers background information and specifies why the test is to be performed. Tests are grouped in order to reduce setup time in the lab environment. Each test contains the following information:

Test Number
The Test Number associated with each test follows a simple grouping structure. Listed first is the Clause followed by the Test Group Number followed by the test's number within the group. This allows for the addition of future tests to the appropriate groups of the test suite without requiring the renumbering of the subsequent tests.

Purpose
The purpose is a brief statement outlining what the test attempts to achieve. The test is written at the functional level.

References
This section specifies all reference material *external* to the test suite, including the specific subclauses references for the test in question, and any other references that might be helpful in understanding the test methodology and/or test results. External sources are always referenced by a bracketed number (e.g., [1]) when mentioned in the test description. Any other references in the test description that are not indicated in this manner refer to elements within the test suite document itself (e.g., "Appendix 6.A", or "Table 6.1.1-1")

Resource Requirements
The requirements section specifies the test hardware and/or software needed to perform the test. This is generally expressed in terms of minimum requirements, however in some cases specific equipment manufacturer/model information may be provided.

Last Modification
This specifies the date of the last modification to this test.

Discussion
The discussion covers the assumptions made in the design or implementation of the test, as well as known limitations. Other items specific to the test are covered here.

Test Setup
The setup section describes the initial configuration of the test environment. Small changes in the configuration should be included in the test procedure.

Procedure
The procedure section of the test description contains the systematic instructions for carrying out the test. It provides a cookbook approach to testing, and may be interspersed with observable results.

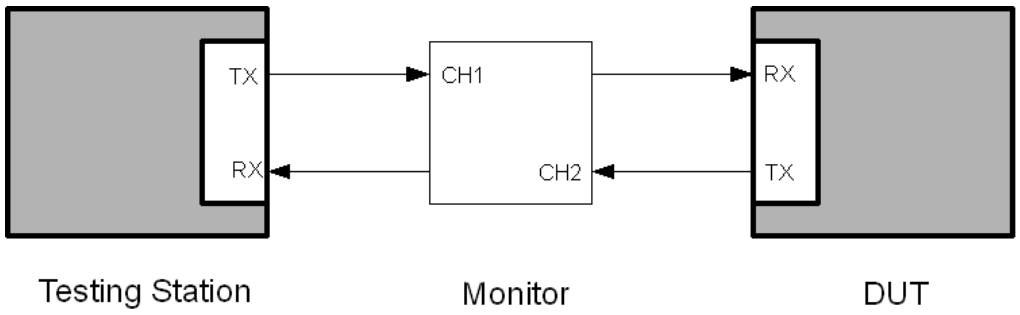
Observable Results
This section lists the specific observables that can be examined by the tester in order to verify that the DUT is operating properly. When multiple values for an observable are possible, this section provides a short discussion on how to interpret them. The determination of a pass or fail outcome for a particular test is often based on the successful (or unsuccessful) detection of a certain observable.

Possible Problems
This section contains a description of known issues with the test procedure, which may affect test results in certain situations. It may also refer the reader to test suite appendices and/or whitepapers that may provide more detail regarding these issues.

Test Setups

The following test setups are used in this test suite:

Test Setup 1:



Group 1: Active (AC)

Overview:
A Port shall enter the Active state when it completes the Link Initialization Protocol or the Link Reset Protocol. These tests are designed to verify the various transitions and actions required in the Active state.

Test #7.1.1: Receive LR

Purpose: To verify that the DUT transitions to the LR Receive State if LR is received while in the Active State.

References:
[1] FC-FS Clause 7.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If LR is received and recognized by a Port while in the Active State, the Port shall transition to the LR Receive State. While in the LR Receive State, the Port shall transmit the LRR Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits LR.

Observable Results:
The DUT should:
a. transmit LRR.

Possible Problems: None.

Test #7.1.2: Receive LRR

Purpose: To verify that the DUT transitions to the LRR Receive State if LRR is received while in the Active State.

References:
[1] FC-FS Clause 7.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If LRR is received and recognized by a Port while in the Active State, the Port shall transition to the LRR Receive State. While in the LRR Receive State, the Port shall transmit Idles.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) LRR.
2. The Testing Station transmits a frame.

Observable Results:
The DUT should:
a. transmit Idle. Verify that the DUT does not transmit a response to the received frame.

Possible Problems: Because the DUT is expected to transmit Idle when it is in both the Active State as well as when it is in the LR3 State, a frame or some other method must be used to ensure that the DUT has made the transition to the LR3 State.

Test #7.1.3: Receive Idle

Purpose: To verify that the DUT remains in the Active State if Idle is received.

References:
[1] FC-FS Clause 7.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If Idle is received and recognized by a Port while in the Active State, the Port shall remain in the Active State. While in the Active State, the Port shall transmit Idle.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits Idle.

Observable Results:
The DUT should:
a. continue to transmit Idle.

Possible Problems: None.

Test #7.1.4: Receive OLS

Purpose: To verify that the DUT transitions to OLS Receive State if OLS is received while in the Active State.

References:
[1] FC-FS Clause 7.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If OLS is received and recognized by a Port while in the Active State, the Port shall transition to the OLS Receive State. While in the OLS Receive State, the Port shall transmit the LR Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits OLS.

Observable Results:
The DUT should:
a. transmit Idle followed by LR.

Possible Problems: None.

Test #7.1.5: Receive NOS

Purpose: To verify that the DUT transitions to NOS Receive State if NOS is received while in the Active State.

References:
[1] FC-FS Clause 7.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If NOS is received and recognized by a Port while in the Active State, the Port shall transition to the NOS Receive State. While in the NOS Receive State, the Port shall transmit the OLS Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits NOS.

Observable Results:
The DUT should:
a. transmit Idle followed by OLS.

Possible Problems: None.

Test #7.1.6: Loss of Signal

Purpose: To verify that the DUT transitions to the NOS Transmit State if it detects Loss of Signal while in the Active State.

References:
[1] FC-FS Clause 7.3.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 2. 2008

Discussion:
The Link Reset Primitive Sequence shall be transmitted by a Port to initiate the Link Reset Protocol or to recover from a Link Timeout. A Port shall enter the LR Transmit State to initiate the Link Reset Protocol. While in the LR Transmit State, the Port shall transmit the LR Primitive Sequence. If a Loss of Signal is detected, the Port shall enter the NOS Transmit State. While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station disables its transmitter.

Observable Results:
The DUT should:
a. transmit Idle followed by NOS.

Possible Problems: It may require user intervention to cause the DUT to initiate the Link Reset Protocol (i.e., unplug the RX fiber of the DUT). Also, upon the Loss of Signal, devices using short wave lasers may transition to the Open-Fibre State in the FC-0 OFC. When this happens, the laser will be deactivated and the monitor will not pick up any signal.

Test #7.1.7: LOS (Loss of Synchronization) Signal

Purpose: To verify that the DUT transitions to the NOS Transmit State if Loss of Synchronization for greater than R_T_TOV is detected while in the Active State.

References:
[1] FC-FS Clause 7.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If Loss of Synchronization for greater than R_T_TOV is detected by a Port while in the AC state, the Port shall transition to the Transmit NOS State. While in the Transmit NOS State, the Port shall transmit the NOS Primitive Sequence

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits invalid Transmission Words for > R_T_TOV.

Observable Results:
The DUT should:
a. transmit Idle followed by NOS.

Possible Problems: None.

Test #7.1.8: E_D_TOV Link Time-out

Purpose: To verify that the DUT properly implements the Link-Reset protocol.

References:
[1] FC-FS Clause 7.2
[2] FC-FS Clause 7.6
[3] FC-FS Clause 21.2.3

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
The Link Reset protocol begins when the FC_Port enters the LR1 State after one of the following events has been detected:
a) Connection Recover
b) Link timeout
c) buffer-to-buffer overrun
A short timeout value is known as the Error_Detect_Timeout Value (E_D_TOV). The E_D_TOV is used as the timeout value for detecting an error condition. The default value is 2 seconds. A Link timeout error shall be detected if one or more R_RDY Primitive Signals are not received within E_D_TOV after the buffer-to-buffer Credit_CNT has reached zero.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits a PLOGI to the DUT without any accompanying R_RDY primitives.
2. The Testing Station waits for a time greater than E_D_TOV.

Observable Results:
The DUT should:
a. transmit LR after one E_D_TOV.

Possible Problems: None.

Test #7.1.9: Receive Primitives

Purpose: To verify that the DUT remains in the Active State if a valid primitive sequence or signal is received.

References:
[1] FC-FS Clause 7.1
[2] FC-FS Table 9, 10, 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If a valid primitive signal is received and recognized by a Port while in the Active State or a valid primitive sequence is received by a Port while in the active state, the Port shall remain in the Active State. While in the Active State, the Port shall transmit Idle.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a: Receive Primitive Signals
1. The Testing Station transmits the following primitive signals to the DUT:
   a) 10 Idle, R_RDY, 10 Idle, ARByx, 10 Idle, CLS, 10 Idle, DHD, 10 Idle, MRKtx, 10 Idle, OPNyx, 10 Idle, OPNyy, 10 Idle, OPNyr, 10 Idle, and OPNfr. (Where y = 0x51, x = 0x52, t = 0x01.)

Part b: Receive Primitive Sequences
1. The Testing Station transmits the following primitive sequences to the DUT:
   a) (3) LIP(F7,F7), 10 Idle, (3) LIP(F8,F7), 10 Idle, (3) LIP(F7,x), 10 Idle, (3) LIP(F8,x), 10 Idle, (3) LIP(y,x), 10 Idle, (3) LIP(f,x), 10 Idle, (3) LPB(y,x), 10 Idle, (3) LPB(f,x), 10 Idle, (3) LPE(y,x), 10 Idle, and (3) LPE(f,x). (Where y = 0x51, x = 0x52, t = 0x01.)

Observable Results:
The DUT should:
a. continue to transmit Idle.
b. continue to transmit Idle.

Possible Problems: Part b. is not applicable if the DUT supports loop initialization.

Group 2: LR Transmit (LR1)

Overview:
A Port shall enter the LR Transmit State to initiate the Link Reset Protocol. An N_Port supporting Class 1 may also enter the LR transmit state when it is unable to determine its connection status. These tests are designed to verify the various transitions and actions required in the LR1 state.

Test #7.2.1: Receive LR

Purpose: To verify that the DUT transitions to the LR Receive State if LR is received while in the LR Transmit State.

References:
[1] FC-FS Clause 7.3.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
The Link Reset Primitive Sequence shall be transmitted by a Port to initiate the Link Reset Protocol or to recover from a Link Timeout. A Port shall enter the LR Transmit State to initiate the Link Reset Protocol. While in the LR Transmit State, the Port shall transmit the LR Primitive Sequence. If LR is received and recognized by a Port while in the LR Transmit State, the Port shall transition to the LR Receive State. While in the LR Receive State, the Port shall transmit the LRR Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits a PLOGI to the DUT without any accompanying R_RDY primitives.
2. The Testing Station waits for a time greater than E_D_TOV.
3. Once the DUT begins transmitting LR, the Testing Station transmits LR.

Observable Results:
The DUT should:
a. transmit LR followed by LRR.

Possible Problems: It may require user intervention to cause the DUT to initiate the Link Reset Protocol (i.e., unplug the RX fiber of the DUT).

Test #7.2.2: Receive LRR

Purpose: To verify that the DUT transitions to the LRR Receive State if LRR is received while in the LR Transmit State.

References:
[1] FC-FS Clause 7.3.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
The Link Reset Primitive Sequence shall be transmitted by a Port to initiate the Link Reset Protocol or to recover from a Link Timeout. A Port shall enter the LR Transmit State to initiate the Link Reset Protocol. While in the LR Transmit State, the Port shall transmit the LR Primitive Sequence. If LRR is received and recognized by a Port while in the LR Transmit State, the Port shall transition to the LRR Receive State. While in the LRR Receive State, the Port shall transmit Idle.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits a PLOGI to the DUT without any accompanying R_RDY primitives.
2. The Testing Station waits for a time greater than E_D_TOV.
3. Once the DUT begins transmitting LR, the Testing Station transmits LRR.

Observable Results:
The DUT should:
a. transmit Idle.

Possible Problems: It may require user intervention to cause the DUT to initiate the Link Reset Protocol (i.e., unplug the RX fiber of the DUT).

Test #7.2.3: Receive Idle

Purpose: To verify that the DUT remains in the LR Transmit State if Idle is received.

References:
[1] FC-FS Clause 7.3.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
The Link Reset Primitive Sequence shall be transmitted by a Port to initiate the Link Reset Protocol or to recover from a Link Timeout. A Port shall enter the LR Transmit State to initiate the Link Reset Protocol. While in the LR Transmit State, the Port shall transmit the LR Primitive Sequence. If Idle is received and recognized by a Port while in the LR Transmit State, the Port shall remain in the LR Transmit State.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits a PLOGI to the DUT without any accompanying R_RDY primitives.
2. The Testing Station waits for a time greater than E_D_TOV.
3. Once the DUT begins transmitting LR, the Testing Station transmits Idle.

Observable Results:
The DUT should:
a. continue to transmit LR.

Possible Problems: It may require user intervention to cause the DUT to initiate the Link Reset Protocol (i.e., unplug the RX fiber of the DUT).

Test #7.2.4: Receive OLS

Purpose: To verify that the DUT transitions to the OLS Receive State if OLS is received while in the LR Transmit State.

References:
[1] FC-FS Clause 7.3.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
The Link Reset Primitive Sequence shall be transmitted by a Port to initiate the Link Reset Protocol or to recover from a Link Timeout. A Port shall enter the LR Transmit State to initiate the Link Reset Protocol. While in the LR Transmit State, the Port shall transmit the LR Primitive Sequence. If OLS is received and recognized by a Port while in the LR Transmit State, the Port shall transition to the OLS Receive State. While in the OLS Receive State, the Port shall transmit LR.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits a PLOGI to the DUT without any accompanying R_RDY primitives.
2. The Testing Station waits for a time greater than E_D_TOV.
3. Once the DUT begins transmitting LR, the Testing Station transmits OLS.

Observable Results:
The DUT should:
a. transmit LR.

Possible Problems: It may require user intervention to cause the DUT to initiate the Link Reset Protocol (i.e., unplug the RX fiber of the DUT). Also, because the DUT will transmit LR in both the LR Transmit and OLS Receive States, it may require some other way to determine that the DUT actually made the transition.

Test #7.2.5: Receive NOS

Purpose: To verify that the DUT transitions to the NOS Receive State if NOS is received while in the LR Transmit State.

References:
[1] FC-FS Clause 7.3.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
The Link Reset Primitive Sequence shall be transmitted by a Port to initiate the Link Reset Protocol or to recover from a Link Timeout. A Port shall enter the LR Transmit State to initiate the Link Reset Protocol. While in the LR Transmit State, the Port shall transmit the LR Primitive Sequence. If NOS is received and recognized by a Port while in the LR Transmit State, the Port shall transition to the NOS Receive State. While in the NOS Receive State, the Port shall transmit OLS.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits a PLOGI to the DUT without any accompanying R_RDY primitives.
2. The Testing Station waits for a time greater than E_D_TOV.
3. Once the DUT begins transmitting LR, the Testing Station transmits NOS.

Observable Results:
The DUT should:
a. transmit OLS.

Possible Problems: It may require user intervention to cause the DUT to initiate the Link Reset Protocol (i.e., unplug the RX fiber of the DUT).

Test #7.2.6: Loss of Signal

Purpose: To verify that the DUT transitions to the NOS Transmit State if it detects Loss of Signal while in the LR Transmit State.

References:
[1] FC-FS Clause 7.3.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
The Link Reset Primitive Sequence shall be transmitted by a Port to initiate the Link Reset Protocol or to recover from a Link Timeout. A Port shall enter the LR Transmit State to initiate the Link Reset Protocol. While in the LR Transmit State, the Port shall transmit the LR Primitive Sequence. If a Loss of Signal is detected, the Port shall enter the NOS Transmit State. While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits a PLOGI to the DUT without any accompanying R_RDY primitives.
2. The Testing Station waits for a time greater than E_D_TOV.
3. Once the DUT begins transmitting LR, the Testing Station disables its transmitter.

Observable Results:
The DUT should:
a. transmit NOS.

Possible Problems: It may require user intervention to cause the DUT to initiate the Link Reset Protocol (i.e., unplug the RX fiber of the DUT). Also, upon the Loss of Signal, devices using short wave lasers may transition to the Open-Fibre State in the FC-0 OFC. When this happens, the laser will be deactivated and the monitor will not pick up any signal.

Test #7.2.7: LOS (Loss of Synchronization) Signal

Purpose: To verify that the DUT transitions to the NOS Transmit State if Loss of Synchronization for greater than R_T_TOV or Loss of Signal is detected while in the Active State.

References:
[1] FC-FS Clause 7.3
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If Loss of Synchronization for greater than R_T_TOV or Loss of Signal is detected by a Port while in the AC state, the Port shall transition to the Transmit NOS State. While in the Transmit NOS State, the Port shall transmit the NOS Primitive Sequence

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits a PLOGI to the DUT without any accompanying R_RDY primitives.
2. The Testing Station waits for a time greater than E_D_TOV.
3. The Testing Station transmits invalid Transmission Words for > R_T_TOV.

Observable Results:
The DUT should:
a. transmit NOS.

Possible Problems: None.

Test #7.2.8: R_T_TOV Abort

Purpose: To verify that the DUT transitions to the NOS Transmit State if it remains in the LR Transmit State for greater than R_T_TOV.

References:

[1] FC-FS Clause 7.3.2
[2] FC-FS Clause 7.6.3
[3] FC-FS Table 11

Resource Requirements:

- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:

The Link Reset Protocol shall be performed when any of the following conditions are detected:

- Connection Recovery
- Link timeout
- buffer-to-buffer overrun

The Link Reset protocol begins when the FC_Port enters the LR1 State after one of the above events has been detected and is complete when the FC_Port enters the Active State.

If an FC_Port, performing the Link Reset Protocol, enters the LR3 State, without receiving an appropriate response within R_T_TOV, a Link Failure shall be detected and the Link Failure Protocol shall be performed.

Test Setup:

Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:

Part a:

1. The Testing Station transmits a PLOGI to the DUT without any accompanying R_RDY primitives.
2. The Testing Station waits for a time greater than E_D_TOV.
3. Once the DUT begins transmitting LR, the Testing Station transmits Idle.

Observable Results:

The DUT should:

a. transmit NOS after one R_T_TOV.

Possible Problems: It may require user intervention to cause the DUT to initiate the Link Reset Protocol (i.e., unplug the RX fiber of the DUT).

Test #7.2.9: E_D_TOV Link Time-out

Purpose: To verify that the DUT properly implements the Link-Reset protocol.

References:
[1] FC-FS Clause 7.2
[2] FC-FS Clause 7.6
[3] FC-FS Clause 21.2.3

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
The Link Reset protocol begins when the FC_Port enters the LR1 State after one of the following events has been detected:
a) Connection Recover
b) Link timeout
c) buffer-to-buffer overrun
A short timeout value is known as the Error_Detect_Timeout Value (E_D_TOV). The E_D_TOV is used as the timeout value for detecting an error condition. The default value is 2 seconds. A Link timeout error shall be detected if one or more R_RDY Primitive Signals are not received within E_D_TOV after the buffer-to-buffer Credit_CNT has reached zero.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits a PLOGI to the DUT without any accompanying R_RDY primitives.
2. The Testing Station waits for a time greater than E_D_TOV.
3. The Testing Station transmits a PLOGI to the DUT without any accompanying R_RDY primitives.
4. The Testing Station waits for a time greater than E_D_TOV.

Observable Results:
The DUT should:
a. Transmit continuous LR.

Possible Problems: If the E_D_TOV of the DUT is greater than the R_T_TOV of the DUT, the DUT may possibly take the R_T_TOV transition first. In this case the Testing Station should perform PLOGI with the DUT in order to set the E_D_TOV to a value less than that of the R_T_TOV.

Test #7.2.10: Receive Primitives

Purpose: To verify that the DUT remains in the LR1 State if a valid primitive sequence or signal is received.

References:
[1] FC-FS Clause 7.1
[2] FC-FS Table 9, 10, 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If a valid primitive signal is received and recognized by a Port while in the LR1 State or a valid primitive sequence is received by a Port while in the active state, the Port shall remain in the LR1 State. While in the Active State, the Port shall transmit Idle.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a: Receive Primitive Signals
1. The Testing Station transmits a PLOGI to the DUT without any accompanying R_RDY primitives.
2. The Testing Station waits for a time greater than E_D_TOV.
3. The Testing Station transmits the following primitive signals to the DUT:
   a) 10 Idle, R_RDY, 10 Idle, ARByx, 10 Idle, CLS, 10 Idle, DHD, 10 Idle, MRKtx, 10 Idle, OPNyx, 10 Idle, OPNyy, 10 Idle, OPNyr, 10 Idle, and OPNfr. (Where y = 0x51, x = 0x52, t = 0x01.)

Part b: Receive Primitive Sequences
1. The Testing Station transmits a PLOGI to the DUT without any accompanying R_RDY primitives.
2. The Testing Station waits for a time greater than E_D_TOV.
3. The Testing Station transmits the following primitive sequences to the DUT:
   a) (3) LIP(F7,F7), 10 Idle, (3) LIP(F8,F7), 10 Idle, (3) LIP(F7,x), 10 Idle, (3) LIP(F8,x), 10 Idle, (3) LIP(y,x), 10 Idle, (3) LIP(f,x), 10 Idle, (3) LPB(y,x), 10 Idle, (3) LPB(f,x), 10 Idle, (3) LPE(y,x), 10 Idle, and (3) LPE(f,x). (Where y = 0x51, x = 0x52, t = 0x01.)

Observable Results:
The DUT should:
a. continue to transmit LR.
b. continue to transmit LR.

Possible Problems: Part b. is not applicable if the DUT supports loop initialization.

Group 3: LR Receive (LR2)

Overview:
A Port shall enter the LR Receive State when it receives and recognizes the LR Primitive Sequence while it is not in the Wait for OLS or NOS Transmit State. These tests are designed to verify the various transitions and actions required in the LR2 state.

Test #7.3.1: Receive LR

Purpose: To verify that the DUT remains in the LR Receive State if LR is received.

References:
[1] FC-FS Clause 7.3.3
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: June 6, 2008

Discussion:
If LR is received and recognized by a Port while in the Active State, the Port shall transition to the LR Receive State. While in the LR Receive State, the Port shall transmit the LRR Primitive Sequence. If LR is received and recognized by a Port while in the LR Receive State, the Port shall remain in the LR Receive State.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits LR continuously.

Observable Results:
The DUT should:
a. transmit LRR continuously.

Possible Problems: None.

Test #7.3.2: Receive LRR

Purpose: To verify that the DUT transitions to the LRR Receive State if LRR is received while in the LR Receive State.

References:
[1] FC-FS Clause 7.3.3
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: June 6, 2008

Discussion:
If LR is received and recognized by a Port while in the Active State, the Port shall transition to the LR Receive State. While in the LR Receive State, the Port shall transmit the LRR Primitive Sequence. If LRR is received and recognized by a Port while in the LR Receive State, the Port shall transition to the LRR Receive State. While in the LRR Receive State, the Port shall transmit Idle.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) LR.
2. The Testing Station transmits LRR continuously.

Observable Results:
The DUT should:
a. transmit LRR followed by continuous Idle.

Possible Problems: None.

Test #7.3.3: Receive Idle

Purpose: To verify that the DUT transitions to the Active State if Idle is received while in the LR Receive State.

References:
[1] FC-FS Clause 7.3.3
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: June 6, 2008

Discussion:
If LR is received and recognized by a Port while in the Active State, the Port shall transition to the LR Receive State. While in the LR Receive State, the Port shall transmit the LRR Primitive Sequence. If Idle is received and recognized by a Port while in the LR Receive State, the Port shall transition to the Active State. While in the Active State, the Port shall transmit Idle.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) LR.
2. The Testing Station transmits Idle continuously.

Observable Results:
The DUT should:
a. transmit LRR followed by continuous Idle.

Possible Problems: None.

Test #7.3.4: Receive OLS

Purpose: To verify that the DUT transitions to the OLS Receive State if OLS is received while in the LR Receive State.

References:
[1] FC-FS Clause 7.3.3
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: June 6, 2008

Discussion:
If LR is received and recognized by a Port while in the Active State, the Port shall transition to the LR Receive State. While in the LR Receive State, the Port shall transmit the LRR Primitive Sequence. If OLS is received and recognized by a Port while in the LR Receive State, the Port shall transition to the OLS Receive State. While in the OLS Receive State, the Port shall transmit the LR Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) LR.
2. The Testing Station transmits OLS continuously.

Observable Results:
The DUT should:
a. transmit LRR followed by continuous LR.

Possible Problems: None.

Test #7.3.5: Receive NOS

Purpose: To verify that the DUT transitions to the NOS Receive State if NOS is received while in the LR Receive State.

References:
[1] FC-FS Clause 7.3.3
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: June 6, 2008

Discussion:
If LR is received and recognized by a Port while in the Active State, the Port shall transition to the LR Receive State. While in the LR Receive State, the Port shall transmit the LRR Primitive Sequence. If NOS is received and recognized by a Port while in the LR Receive State, the Port shall transition to the NOS Receive State. While in the NOS Receive State, the Port shall transmit the OLS Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) LR.
2. The Testing Station transmits NOS continuously.

Observable Results:
The DUT should:
a. transmit LRR followed by continuous OLS.

Possible Problems: None.

Test #7.3.6: Loss of Signal

Purpose: To verify that the DUT transitions to the NOS Transmit State if it detects Loss of Signal while in the LR Receive State.

References:
[1] FC-FS Clause 7.3.3
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: June 6, 2008

Discussion:
If LR is received and recognized by a Port while in the Active State, the Port shall transition to the LR Receive State. While in the LR Receive State, the Port shall transmit the LRR Primitive Sequence. If Loss of Signal is detected by a Port while in the LR Receive State, the Port shall transition to the NOS Transmit State. While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) LR.
2. The Testing Station disables its transmitter.

Observable Results:
The DUT should:
a. transmit LRR followed by continuous NOS.

Possible Problems: It may require user intervention to cause the DUT to initiate the Link Reset Protocol (i.e., unplug the RX fiber of the DUT). Upon the Loss of Signal, devices using short wave lasers may transition to the Open-Fibre State in the FC-0 OFC. When this happens, the laser will be deactivated and the monitor will not pick up any signal.

Test #7.3.7: LOS (Loss of Synchronization) Signal

Purpose: To verify that the DUT transitions to the NOS Transmit State if Loss of Synchronization for greater than R_T_TOV is detected while in the Active State.

References:

[1] FC-FS Clause 7
[2] FC-FS Table 11

Resource Requirements:

- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: June 6, 2008

Discussion:

If LR is received and recognized by a Port while in the Active State, the Port shall transition to the LR Receive State. While in the LR Receive State, the Port shall transmit the LRR Primitive Sequence. If loss of synchronization is detected by a port while in the LR Receive state, the port shall transition to the NOS Transmit State.

Test Setup:

Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:

Part a:

1. The Testing Station transmits three (3) LR.
2. The Testing Station transmits invalid Transmission Words for > R_T_TOV.

Observable Results:

The DUT should:

a. transmit continuous NOS.

Possible Problems: Upon the Loss of Signal, devices using short wave lasers may transition to the Open-Fibre State in the FC-0 OFC. When this happens, the laser will be deactivated and the monitor will not pick up any signal.

Test #7.3.8: R_T_TOV Abort

Purpose: To verify that the DUT transitions to the NOS Transmit State if it remains in the LR Receive State for greater than R_T_TOV.

References:
[1] FC-FS Clause 7.3.3
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: June 6, 2008

Discussion:
If LR is received and recognized by a Port while in the Active State, the Port shall transition to the LR Receive State. While in the LR Receive State, the Port shall transmit the LRR Primitive Sequence. If a Port remains in the LR Receive State for a period of time greater than a timeout period (R_T_TOV), a Link Reset Protocol Timeout shall be detected which results in a Link Failure condition (enter the NOS Transmit State). While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits LR for > R_T_TOV.

Observable Results:
The DUT should:
a. transmit LRR followed by continuous NOS.

Possible Problems: None.

Test #7.3.9: E_D_TOV Link Time-out

Purpose: To verify that the DUT properly implements the Link-Reset protocol.

References:
[1] FC-FS Clause 7.2
[2] FC-FS Clause 7.6
[3] FC-FS Clause 21.2.3

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: June 6, 2008

Discussion:
The Link Reset protocol begins when the FC_Port enters the LR1 State after one of the following events has been detected:
a) Connection Recover
b) Link timeout
c) buffer-to-buffer overrun
A short timeout value is known as the Error_Detect_Timeout Value (E_D_TOV). The E_D_TOV is used as the timeout value for detecting an error condition. The default value is 2 seconds. A Link timeout error shall be detected if one or more R_RDY Primitive Signals are not received within E_D_TOV after the buffer-to-buffer Credit_CNT has reached zero.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) LR.
2. The Testing Station transmits a PLOGI to the DUT without any accompanying R_RDY primitives.
3. The Testing Station waits for a time greater than E_D_TOV.

Observable Results:
The DUT should:
a. Transmit LRR and wait one E_D_TOV then transmit continuous LR.

Possible Problems: If the E_D_TOV of the DUT is greater than the R_T_TOV of the DUT, the DUT may possibly take the R_T_TOV transition first. In this case the Testing Station should perform PLOGI with the DUT in order to set the E_D_TOV to a value less than that of the R_T_TOV.

Test #7.3.10: Receive Primitives

Purpose: To verify that the DUT remains in the LR2 State if a valid primitive sequence or signal is received.

References:
[1] FC-FS Clause 7.1
[2] FC-FS Table 9, 10, 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: June 6, 2008

Discussion:
If a valid primitive signal is received and recognized by a Port while in the LR2 State or a valid primitive sequence is received by a Port while in the active state, the Port shall remain in the LR2 State. While in the Active State, the Port shall transmit Idle.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a: Receive Primitive Signals
1. The Testing Station transmits three (3) LR.
2. The Testing Station transmits the following primitive signals to the DUT:
   a) 10 Idle, R_RDY, 10 Idle, ARByx, 10 Idle, CLS, 10 Idle, DHD, 10 Idle, MRKtx, 10 Idle, OPNyx, 10 Idle, OPNyy, 10 Idle, OPNyr, 10 Idle, and OPNfr. (Where y = 0x51, x = 0x52, t = 0x01.)

Part b: Receive Primitive Sequences
1. The Testing Station transmits three (3) LR.
2. The Testing Station transmits the following primitive sequences to the DUT:
   a) (3) LIP(F7,F7), 10 Idle, (3) LIP(F8,F7), 10 Idle, (3) LIP(F7,x), 10 Idle, (3) LIP(F8,x), 10 Idle, (3) LIP(y,x), 10 Idle, (3) LIP(f,x), 10 Idle, (3) LPB(y,x), 10 Idle, (3) LPB(f,x), 10 Idle, (3) LPE(y,x), 10 Idle, and (3) LPE(f,x). (Where y = 0x51, x = 0x52, t = 0x01.)

Observable Results:
The DUT should:
a. continue to transmit continuous LRR.
b. continue to transmit continuous LRR.

Possible Problems: Part b. is not applicable if the DUT supports loop initialization.

Group 4: LRR Receive (LR3)

Overview:
A Port shall enter the LRR Receive State when it receives and recognizes the LRR Primitive Sequence while it is in the Active, LR Transmit, LR Receive, or OLS Receive State. These tests are designed to verify the various transitions and actions required in the LR3 state.

Test #7.4.1: Receive LR

Purpose: To verify that the DUT transitions to the LR Receive State if LR is received while in the LRR Receive State.

References:
[1] FC-FS Clause 7.3.4
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If LRR is received and recognized by a Port while in the Active State, the Port shall transition to the LRR Receive State. While in the LRR Receive State, the Port shall transmit Idles. If LR is received and recognized by a Port while in the LRR Receive State, the Port shall transition to the LR Receive State. While in the LR Receive State, the Port shall transmit the LRR Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) LRR.
2. The Testing Station transmits LR.

Observable Results:
The DUT should:
a. transmit Idle followed by LRR.

Possible Problems: After Transmitting LRR to the DUT, it may be necessary to transmit a frame to the DUT to ensure that it has made the transition to the LR3 state.

Test #7.4.2: Receive LRR

Purpose: To verify that the DUT remains in the LRR Receive State if LRR is received.

References:
[1] FC-FS Clause 7.3.4
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If LRR is received and recognized by a Port while in the Active State, the Port shall transition to the LRR Receive State. While in the LRR Receive State, the Port shall transmit Idles. If LRR is received and recognized by a Port while in the LRR Receive State, the Port shall remain in the LRR Receive State.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits continuous LRR.

Observable Results:
The DUT should:
a. continue to transmit Idle.

Possible Problems: After Transmitting LRR to the DUT, it may be necessary to transmit a frame to the DUT to ensure that it has made the transition to the LR3 state.

Test #7.4.3: Receive Idle

Purpose: To verify that the DUT transitions to the Active State if Idle is received while in the LRR Receive State.

References:
[1] FC-FS Clause 7.3.4
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If LRR is received and recognized by a Port while in the Active State, the Port shall transition to the LRR Receive State. While in the LRR Receive State, the Port shall transmit Idles. If Idle is received and recognized by a Port while in the LRR Receive State, the Port shall transition to the Active State. While in the Active State, the Port shall transmit Idle.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) LRR.
2. The Testing Station transmits a PLOGI.
3. The Testing Station transmits continuous idle.
4. The Testing Station transmits a second PLOGI.

Observable Results:
The DUT should:
a. continue to transmit Idle after receiving the LRR primitive sequences. Verify that the DUT responds to the second received PLOGI frame and not the first.

Possible Problems: None.

Test #7.4.4: Receive OLS

Purpose: To verify that the DUT transitions to the OLS Receive State if OLS is received while in the LRR Receive State.

References:
[1] FC-FS Clause 7.3.4
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If LRR is received and recognized by a Port while in the Active State, the Port shall transition to the LRR Receive State. While in the LRR Receive State, the Port shall transmit Idles. If OLS is received and recognized by a Port while in the LRR Receive State, the Port shall transition to the OLS Receive State. While in the OLS Receive State, the Port shall transmit LR.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) LRR.
2. The Testing Station transmits continuous OLS.

Observable Results:
The DUT should:
a. transmit Idle followed by LR.

Possible Problems: After Transmitting LRR to the DUT, it may be necessary to transmit a frame to the DUT to ensure that it has made the transition to the LR3 state.

Test #7.4.5: Receive NOS

Purpose: To verify that the DUT transitions to the NOS Receive State if NOS is received while in the LRR Receive State.

References:

[1] FC-FS Clause 7.3.4
[2] FC-FS Table 11

Resource Requirements:

- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:

If LRR is received and recognized by a Port while in the Active State, the Port shall transition to the LRR Receive State. While in the LRR Receive State, the Port shall transmit Idles. If NOS is received and recognized by a Port while in the LRR Receive State, the Port shall transition to the NOS Receive State. While in the NOS Receive State, the Port shall transmit OLS.

Test Setup:

Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:

Part a:

1. The Testing Station transmits three (3) LRR.
2. The Testing Station transmits NOS.

Observable Results:

The DUT should:

a. transmit Idle followed by OLS.

Possible Problems: After Transmitting LRR to the DUT, it may be necessary to transmit a frame to the DUT to ensure that it has made the transition to the LR3 state.

Test #7.4.6: Loss of Signal

Purpose: To verify that the DUT transitions to the NOS Transmit State if it detects Loss of Signal while in the LRR Receive State.

References:

[1] FC-FS Clause 7.3.4
[2] FC-FS Table 11

Resource Requirements:

- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:

If LRR is received and recognized by a Port while in the Active State, the Port shall transition to the LRR Receive State. While in the LRR Receive State, the Port shall transmit Idles. If Loss of Signal is detected by a Port while in the LRR Receive State, the Port shall transition to the NOS Transmit State. While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence.

Test Setup:

Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:

Part a:

1. The Testing Station transmits three (3) LRR.
2. The Testing Station disables its transmitter.

Observable Results:

The DUT should:

a. transmit Idle followed by NOS.

Possible Problems: It may require user intervention to cause the DUT to initiate the Link Reset Protocol (i.e., unplug the RX fiber of the DUT). Upon the Loss of Signal, devices using short wave lasers may transition to the Open-Fibre State in the FC-0 OFC. When this happens, the laser will be deactivated and the monitor will not pick up any signal. After Transmitting LRR to the DUT, it may be necessary to transmit a frame to the DUT to ensure that it has made the transition to the LR3 state.

Test #7.4.7: LOS (Loss of Synchronization) Signal

Purpose: To verify that the DUT transitions to the NOS Transmit State if Loss of Synchronization for greater than R_T_TOV is detected while in the Active State.

References:

[1] FC-FS Clause 7
[2] FC-FS Table 11

Resource Requirements:

- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:

If Loss of Synchronization for greater than R_T_TOV is detected by a Port while in the AC state, the Port shall transition to the NOS Transmit State. While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence

Test Setup:

Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:

Part a:

1. The Testing Station transmits three (3) LRR.
2. The Testing Station transmits invalid Transmission Words for > R_T_TOV.

Observable Results:

The DUT should:

a. transmit Idle followed by NOS.

Possible Problems: After Transmitting LRR to the DUT, it may be necessary to transmit a frame to the DUT to ensure that it has made the transition to the LR3 state.

Test #7.4.8: R_T_TOV Abort

Purpose: To verify that the DUT transitions to the NOS Transmit State if it remains in the LRR Receive State for greater than R_T_TOV.

References:
[1] FC-FS Clause 7.3.4
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If LRR is received and recognized by a Port while in the Active State, the Port shall transition to the LRR Receive State. While in the LRR Receive State, the Port shall transmit Idles. If a Port remains in the LRR Receive State for a period of time greater than a timeout period (R_T_TOV), a Link Reset Protocol Timeout shall be detected which results in a Link Failure condition (enter the NOS Transmit State). While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits LRR for > R_T_TOV.

Observable Results:
The DUT should:
a. transmit Idle followed by NOS.

Possible Problems: After Transmitting LRR to the DUT, it may be necessary to transmit a frame to the DUT to ensure that it has made the transition to the LR3 state.

Test #7.4.9: E_D_TOV Link Time-out

Purpose: To verify that the DUT properly implements the Link-Reset protocol.

References:
[1] FC-FS Clause 7.2
[2] FC-FS Clause 7.6
[3] FC-FS Clause 21.2.3

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
The Link Reset protocol begins when the FC_Port enters the LR1 State after one of the following events has been detected:
a) Connection Recover
b) Link timeout
c) buffer-to-buffer overrun
A short timeout value is known as the Error_Detect_Timeout Value (E_D_TOV). The E_D_TOV is used as the timeout value for detecting an error condition. The default value is 2 seconds. A Link timeout error shall be detected if one or more R_RDY Primitive Signals are not received within E_D_TOV after the buffer-to-buffer Credit_CNT has reached zero.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) LRR.
2. The Testing Station transmits a PLOGI to the DUT without any accompanying R_RDY primitives.
3. The Testing Station waits for a time greater than E_D_TOV.

Observable Results:
The DUT should:
a. Transmit Idle and wait one E_D_TOV then transmit LR.

Possible Problems: After Transmitting LRR to the DUT, it may be necessary to transmit a frame to the DUT to ensure that it has made the transition to the LR3 state. If the E_D_TOV of the DUT is greater than the R_T_TOV of the DUT, the DUT may possibly take the R_T_TOV transition first. In this case the Testing Station should perform PLOGI with the DUT in order to set the E_D_TOV to a value less than that of the R_T_TOV.

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Test #7.4.10: Receive Primitives

Purpose: To verify that the DUT remains in the LR3 State if a valid primitive sequence or signal is received.

References:
[1] FC-FS Clause 7.1
[2] FC-FS Table 9, 10, 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If a valid primitive signal is received and recognized by a Port while in the LR3 State or a valid primitive sequence is received by a Port while in the LR3 state, the Port shall remain in the LR3 State. While in the LR3 State, the Port shall transmit Idle.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the LR3 State.

Procedure:
Part a: Receive Primitive Signals
1. The Testing Station transmits three (3) LRR.
2. The Testing Station transmits the following primitive signals:
   a) 10 Idle, R_RDY, 10 Idle, ARByx, 10 Idle, CLS, 10 Idle, DHD, 10 Idle, MRKtx, 10 Idle, OPNyx, 10 Idle, OPNyy, 10 Idle, OPNyr, 10 Idle, and OPNfr. (Where y = 0x51, x = 0x52, t = 0x01.)

Part b: Receive Primitive Sequences
1. The Testing Station transmits three (3) LRR.
2. The Testing Station transmits the following primitive sequences:
   a) (3) LIP(F7,F7), 10 Idle, (3) LIP(F8,F7), 10 Idle, (3) LIP(F7,x), 10 Idle, (3) LIP(F8,x), 10 Idle, (3) LIP(y,x), 10 Idle, (3) LIP(f,x), 10 Idle, (3) LPB(y,x), 10 Idle, (3) LPB(f,x), 10 Idle, (3) LPE(y,x), 10 Idle, and (3) LPE(f,x). (Where y = 0x51, x = 0x52, t = 0x01.)

Observable Results:
The DUT should:
a. continue to transmit Idle.
b. continue to transmit Idle.

Possible Problems: Part b. is not applicable if the DUT supports loop initialization. After Transmitting LRR to the DUT, it may be necessary to transmit a frame to the DUT to ensure that it has made the transition to the LR3 state.

Group 5: NOS Receive (LF1)

Overview:
A Port shall enter the NOS Receive State when it receives and recognizes the NOS Primitive Sequence. These tests are designed to verify the various transitions and actions required in the LF1 state.

Test #7.5.1: Receive LR

Purpose: To verify that the DUT transitions to the LR Receive State if LR is received while in the NOS Receive State.

References:
[1] FC-FS Clause 7.4.1
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If NOS is received and recognized by a Port while in the Active State, the Port shall transition to the NOS Receive State. While in the NOS Receive State, the Port shall transmit the OLS Primitive Sequence. If LR is received and recognized by a Port while in the NOS Receive State, the Port shall transition to the LR Receive State. While in the LR Receive State, the Port shall transmit the LRR Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) NOS.
2. The Testing Station transmits continuous LR.

Observable Results:
The DUT should:
a. transmit OLS followed by LRR.

Possible Problems: None.

Test #7.5.2: Receive LRR

Purpose: To verify that the DUT remains in the NOS Receive State if LRR is received.

References:
[1] FC-FS Clause 7.4.1
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If NOS is received and recognized by a Port while in the Active State, the Port shall transition to the NOS Receive State. While in the NOS Receive State, the Port shall transmit the OLS Primitive Sequence. If LRR is received and recognized by a Port while in the NOS Receive State, the Port shall remain in the NOS Receive State.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) NOS.
2. The Testing Station transmits continuous LRR.

Observable Results:
The DUT should:
a. transmit OLS. Verify that once the DUT began transmitting OLS, it continued transmitting OLS.

Possible Problems: None.

Test #7.5.3: Receive Idle

Purpose: To verify that the DUT remains in the NOS Receive State if Idle is received.

References:
[1] FC-FS Clause 7.4.1
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If NOS is received and recognized by a Port while in the Active State, the Port shall transition to the NOS Receive State. While in the NOS Receive State, the Port shall transmit the OLS Primitive Sequence. If Idle is received and recognized by a Port while in the NOS Receive State, the Port shall remain in the NOS Receive State.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) NOS.
2. The Testing Station transmits continuous Idle.

Observable Results:
The DUT should:
a. transmit OLS. Verify that once the DUT began transmitting OLS, it continued transmitting OLS.

Possible Problems: None.

Test #7.5.4: Receive OLS

Purpose: To verify that the DUT transitions to the OLS Receive State if OLS is received while in the NOS Receive State.

References:
[1] FC-FS Clause 7.4.1
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If NOS is received and recognized by a Port while in the Active State, the Port shall transition to the NOS Receive State. While in the NOS Receive State, the Port shall transmit the OLS Primitive Sequence. If OLS is received and recognized by a Port while in the NOS Receive State, the Port shall transition to the OLS Receive State. While in the OLS Receive State, the Port shall transmit the LR Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) NOS.
2. The Testing Station transmits continuous OLS.

Observable Results:
The DUT should:
a. transmit OLS followed by LR.

Possible Problems: None.

Test #7.5.5: Receive NOS

Purpose: To verify that the DUT remains in the NOS Receive State if NOS is received.

References:
[1] FC-FS Clause 7.4.1
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If NOS is received and recognized by a Port while in the Active State, the Port shall transition to the NOS Receive State. While in the NOS Receive State, the Port shall transmit the OLS Primitive Sequence. If NOS is received and recognized by a Port while in the NOS Receive State, the Port shall remain in the NOS Receive State.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits continuous NOS.

Observable Results:
The DUT should:
a. transmit OLS. Verify that once the DUT began transmitting OLS, it continued transmitting OLS.

Possible Problems: None.

Test #7.5.6: Loss of Signal

Purpose: To verify that the DUT transitions to the NOS Transmit State if it detects Loss of Signal while in the NOS Receive State.

References:
[1] FC-FS Clause 7.3.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 2, 2007

Discussion:
The Link Reset Primitive Sequence shall be transmitted by a Port to initiate the Link Reset Protocol or to recover from a Link Timeout. A Port shall enter the LR Transmit State to initiate the Link Reset Protocol. While in the LR Transmit State, the Port shall transmit the LR Primitive Sequence. If a Loss of Signal is detected, the Port shall enter the NOS Transmit State. While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) NOS.
2. The Testing Station disables its transmitter.

Observable Results:
The DUT should:
a. transmit OLS followed by NOS.

Possible Problems: It may require user intervention to cause the DUT to initiate the Link Reset Protocol (i.e., unplug the RX fiber of the DUT). Also, upon the Loss of Signal, devices using short wave lasers may transition to the Open-Fibre State in the FC-0 OFC. When this happens, the laser will be deactivated and the monitor will not pick up any signal.

Test #7.5.7: LOS (Loss of Synchronization) Signal

Purpose: To verify that the DUT transitions to the NOS Transmit State if Loss of Synchronization for greater than R_T_TOV is detected while in the NOS Receive State.

References:
[1] FC-FS Clause 7.4.1
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 2, 2007

Discussion:
If NOS is received and recognized by a Port while in the Active State, the Port shall transition to the NOS Receive State. While in the NOS Receive State, the Port shall transmit the OLS Primitive Sequence. If Loss of Synchronization for greater than R_T_TOV is detected by a Port while in the NOS Receive State, the Port shall transition to the NOS Transmit State. While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) NOS.
2. The Testing Station transmits invalid Transmission Words for > R_T_TOV.

Observable Results:
The DUT should:
a. transmit OLS followed by NOS.

Possible Problems: None.

Test #7.5.8: R_T_TOV Abort

Purpose: To verify that the DUT transitions to the NOS Transmit State if it remains in the NOS Receive State without receiving NOS for greater than R_T_TOV.

References:
[1] FC-FS Clause 7.4.1
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If NOS is received and recognized by a Port while in the Active State, the Port shall transition to the NOS Receive State. While in the NOS Receive State, the Port shall transmit the OLS Primitive Sequence. If a Port remains in the NOS Receive State for a period of time greater than a timeout period (R_T_TOV), it shall enter the NOS Transmit State. While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) NOS.
2. The Testing Station transmits Idle for > R_T_TOV.

Observable Results:
The DUT should:
a. transmit OLS followed by NOS.

Possible Problems: None.

Test #7.5.9: E_D_TOV Link Time-out

Purpose: To verify that the DUT properly implements the Link-Reset protocol.

References:
[1] FC-FS Clause 7.2
[2] FC-FS Clause 7.6
[3] FC-FS Clause 21.2.3

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
The Link Reset protocol begins when the FC_Port enters the LR1 State after one of the following events has been detected:
a) Connection Recover
b) Link timeout
c) buffer-to-buffer overrun
A short timeout value is known as the Error_Detect_Timeout Value (E_D_TOV). The E_D_TOV is used as the timeout value for detecting an error condition. The default value is 2 seconds. A Link timeout error shall be detected if one or more R_RDY Primitive Signals are not received within E_D_TOV after the buffer-to-buffer Credit_CNT has reached zero.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) NOS.
2. The Testing Station transmits a PLOGI to the DUT without any accompanying R_RDY primitives.
3. The Testing Station waits for a time greater than E_D_TOV.

Observable Results:
The DUT should:
a. transmit OLS and wait one E_D_TOV then transmit LR.

Possible Problems: If the E_D_TOV of the DUT is greater than the R_T_TOV of the DUT, the DUT may possibly take the R_T_TOV transition first. In this case the Testing Station should perform PLOGI with the DUT in order to set the E_D_TOV to a value less than that of the R_T_TOV.

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Test #7.5.10: Receive Primitives

Purpose: To verify that the DUT remains in the NOS Receive State if a valid primitive sequence or signal is received.

References:
[1] FC-FS Clause 7.1
[2] FC-FS Table 9, 10, 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 2, 2007

Discussion:
If a valid primitive signal is received and recognized by a Port while in the LF1 State or a valid primitive sequence is received by a Port while in the active state, the Port shall remain in the LF1 State. While in the Active State, the Port shall transmit Idle.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a: Receive Primitive Signals
1. The Testing Station transmits three (3) NOS.
2. The Testing Station transmits the following primitive signals to the DUT:
   a) 10 Idle, R_RDY, 10 Idle, ARByx, 10 Idle, CLS, 10 Idle, DHD, 10 Idle, MRKtx, 10 Idle, OPNyx, 10 Idle, OPNyy, 10 Idle, OPNyr, 10 Idle, and OPNfr. (Where y = 0x51, x = 0x52, t = 0x01.)

Part b: Receive Primitive Sequences
1. The Testing Station transmits three (3) NOS.
2. The Testing Station transmits the following primitive sequences to the DUT:
   a) (3) LIP(F7,F7), 10 Idle, (3) LIP(F8,F7), 10 Idle, (3) LIP(F7,x), 10 Idle, (3) LIP(F8,x), 10 Idle, (3) LIP(y,x), 10 Idle, (3) LIP(f,x), 10 Idle, (3) LPB(y,x), 10 Idle, (3) LPB(f,x), 10 Idle, (3) LPE(y,x), 10 Idle, and (3) LPE(f,x). (Where y = 0x51, x = 0x52, t = 0x01.)

Observable Results:
The DUT should:
a. continue to transmit OLS.
b. continue to transmit OLS.

Possible Problems: Part b. is not applicable if the DUT supports loop initialization.

Group 6: NOS Transmit (LF2)

Overview:
A Port shall enter the NOS Transmit State when a Link Failure condition is detected. These tests are designed to verify the various transitions and actions required in the LF2 state.

Test #7.6.1: Receive LR

Purpose: To verify that the DUT remains in the NOS Transmit State if LR is received.

References:
[1] FC-FS Clause 7.4.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 2, 2007

Discussion:
If a Port receives Loss of Synchronization while in the Active State for greater than R_T_TOV, it shall enter the NOS Transmit State. While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence. If LR is received and recognized by a Port while in the NOS Transmit State, the Port shall remain in the NOS Transmit State.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits Invalid Transmission words for > R_T_TOV.
2. The Testing Station transmits continuous LR.

Observable Results:
The DUT should:
a. transmit Idle followed by NOS. The DUT should continue transmitting NOS once it begins transmitting NOS.

Possible Problems: None.

Test #7.6.2: Receive LRR

Purpose: To verify that the DUT remains in the NOS Transmit State if LRR is received.

References:
[1] FC-FS Clause 7.4.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 2, 2007

Discussion:
If a Port receives Loss of Synchronization while in the Active State for greater than R_T_TOV, it shall enter the NOS Transmit State. While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence. If LRR is received and recognized by a Port while in the NOS Transmit State, the Port shall remain in the NOS Transmit State.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits Invalid Transmission words for > R_T_TOV.
2. The Testing Station transmits continuous LRR.

Observable Results:
The DUT should:
a. transmit Idle followed by NOS. Verify that once the DUT began transmitting NOS, it continued transmitting NOS.

Possible Problems: None.

Test #7.6.3: Receive Idle

Purpose: To verify that the DUT remains in the NOS Transmit State if Idle is received.

References:
[1] FC-FS Clause 7.4.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If a Port receives Loss of Synchronization while in the Active State for greater than R_T_TOV, it shall enter the NOS Transmit State. While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence. If Idle is received and recognized by a Port while in the NOS Transmit State, the Port shall remain in the NOS Transmit State.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits Invalid Transmission words for > R_T_TOV.
2. The Testing Station transmits continuous Idle.

Observable Results:
The DUT should:
a. transmit Idle followed by NOS. Verify that once the DUT began transmitting NOS, it continued transmitting NOS.

Possible Problems: None.

Test #7.6.4: Receive OLS

Purpose: To verify that the DUT transitions to the OLS Receive State if OLS is received while in the NOS Transmit State.

References:
[1] FC-FS Clause 7.4.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If a Port receives Loss of Synchronization while in the Active State for greater than R_T_TOV, it shall enter the NOS Transmit State. While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence. If OLS is received and recognized by a Port while in the NOS Transmit State, the Port shall transition to the OLS Receive State. While in the OLS Receive State, the Port shall transmit LR.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits Invalid Transmission words for > R_T_TOV.
2. The Testing Station transmits continuous OLS.

Observable Results:
The DUT should:
a. transmit Idle, followed by NOS, followed by LR.

Possible Problems: None.

Test #7.6.5: Receive NOS

Purpose: To verify that the DUT transitions to the NOS Receive State if NOS is received while in the NOS Transmit State.

References:
[1] FC-FS Clause 7.4.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If a Port receives Loss of Synchronization while in the Active State for greater than R_T_TOV, it shall enter the NOS Transmit State. While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence. If NOS is received and recognized by a Port while in the NOS Transmit State, the Port shall transition to the NOS Receive State.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits Invalid Transmission words for > R_T_TOV.
2. The Testing Station transmits continuous NOS.

Observable Results:
The DUT should:
a. transmit Idle, followed by NOS, followed by OLS.

Possible Problems: None.

Test #7.6.6: Loss of Signal

Purpose: To verify that the DUT transitions to the NOS Transmit State if it detects Loss of Signal while in the LR Transmit State.

References:

[1] FC-FS Clause 7.3.2
[2] FC-FS Table 11

Resource Requirements:

- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:

The Link Reset Primitive Sequence shall be transmitted by a Port to initiate the Link Reset Protocol or to recover from a Link Timeout. A Port shall enter the LR Transmit State to initiate the Link Reset Protocol. While in the LR Transmit State, the Port shall transmit the LR Primitive Sequence. If a Port receives Loss of Synchronization while in the Active State for greater than R_T_TOV, it shall enter the NOS Transmit State. While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence.

Test Setup:

Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:

Part a:

1. The Testing Station transmits Invalid Transmission words for > R_T_TOV.
2. The Testing Station disables its transmitter.

Observable Results:

The DUT should:

a. transmit Idle, followed by NOS.

Possible Problems: It may require user intervention to cause the DUT to initiate the Link Reset Protocol (i.e., unplug the RX fiber of the DUT). Also, upon the Loss of Signal, devices using short wave lasers may transition to the Open-Fibre State in the FC-0 OFC. When this happens, the laser will be deactivated and the monitor will not pick up any signal.

Test #7.6.7: LOS (Loss of Synchronization) Signal

Purpose: To verify that the DUT transitions to the NOS Transmit State if Loss of Synchronization for greater than R_T_TOV is detected while in the NOS Transmit State.

References:
[1] FC-FS Clause 7.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If a Port receives Loss of Synchronization while in the Active State for greater than R_T_TOV, it shall enter the NOS Transmit State. While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence. If Loss of Synchronization for greater than R_T_TOV is detected by a Port while in the NOS Transmit state, the Port shall transition to the NOS Transmit State.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits Invalid Transmission words continuously.

Observable Results:
The DUT should:
a. transmit Idle followed by continuous NOS.

Possible Problems: None.

Test #7.6.8: E_D_TOV Link Time-out

Purpose: To verify that the DUT properly implements the Link-Reset protocol.

References:
[1] FC-FS Clause 7
[2] FC-FS Clause 7.6
[3] FC-FS Clause 21.2.3

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
The Link Reset protocol begins when the FC_Port enters the LR1 State after one of the following events has been detected:
a) Connection Recover
b) Link timeout
c) buffer-to-buffer overrun
A short timeout value is known as the Error_Detect_Timeout Value (E_D_TOV). The E_D_TOV is used as the timeout value for detecting an error condition. The default value is 2 seconds. A Link timeout error shall be detected if one or more R_RDY Primitive Signals are not received within E_D_TOV after the buffer-to-buffer Credit_CNT has reached zero.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits Invalid Transmission words for > R_T_TOV.
2. The Testing Station transmits a PLOGI to the DUT without any accompanying R_RDY primitives.
3. The Testing Station waits for a time greater than E_D_TOV.

Observable Results:
The DUT should:
a. transmit Idle and wait one E_D_TOV then transmit LR.

Possible Problems: None.

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Test #7.6.9: Receive Primitives

Purpose: To verify that the DUT remains in the NOS Transmit State if a valid primitive sequence or signal is received.

References:
[1] FC-FS Clause 7.1
[2] FC-FS Table 9, 10, 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If a Port receives Loss of Synchronization while in the Active State for greater than R_T_TOV, it shall enter the NOS Transmit State. If a valid primitive signal is received and recognized by a Port while in the NOS Transmit State or a valid primitive sequence is received by a Port while in the NOS Transmit state, the Port shall remain in the NOS Transmit State. While in the NOS Transmit State, the Port shall transmit NOS.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a: Receive Primitive Signals
1. The Testing Station transmits Invalid Transmission words for > R_T_TOV.
2. The Testing Station transmits the following primitive signals to the DUT:
   a) 10 Idle, R_RDY, 10 Idle, ARByx, 10 Idle, CLS, 10 Idle, DHD, 10 Idle, MRKtx, 10 Idle, OPNyx, 10 Idle, OPNyy, 10 Idle, OPNyr, 10 Idle, and OPNfr. (Where y = 0x51, x = 0x52, t = 0x01.)

Part b: Receive Primitive Sequences
1. The Testing Station transmits Invalid Transmission words for > R_T_TOV.
2. The Testing Station transmits the following primitive sequences to the DUT:
   a) (3) LIP(F7,F7), 10 Idle, (3) LIP(F8,F7), 10 Idle, (3) LIP(F7,x), 10 Idle, (3) LIP(F8,x), 10 Idle, (3) LIP(y,x), 10 Idle, (3) LIP(f,x), 10 Idle, (3) LPB(y,x), 10 Idle, (3) LPB(f,x), 10 Idle, (3) LPE(y,x), 10 Idle, and (3) LPE(f,x). (Where y = 0x51, x = 0x52, t = 0x01.)

Observable Results:
The DUT should:
a. transmit Idle followed by continuous NOS.
b. transmit Idle followed by continuous NOS.

Possible Problems: Part b. is not applicable if the DUT supports loop initialization.

Group 7: OLS Transmit (OL1)

Overview:
A Port shall enter the OLS Transmit State in order to :

- perform Link Initialization using the Link Initialization Protocol in order to exit the Offline State.
- transition from the Online to Offline using the Online to Offline Protocol.

These tests are designed to verify the various transitions and actions required in the OL1 state.

Test #7.7.1: Initialization

Purpose: To verify that the DUT transmits OLS for at least 5 ms upon entering the OLS Transmit State.

References:
[1] FC-PH Clauses 16.4, 16.5, and 16.6
[2] FC-FS Clause 7.5.2
[3] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
The transition to the OLS Transmit State shall be made after power on or during the Online to Offline protocol. When the Port enters the OLS Transmit State, it shall transmit OLS for a minimum of 5 ms.

Test Setup:
Test Setup 1. The Testing Station disables it's transmitters. The DUT is powered off.

Procedure:
Part a:
1. Power on the DUT.

Observable Results:
The DUT should:
a. transmit OLS for a minimum of 5 ms before transmitting NOS.

Possible Problems: None.

Test #7.7.2: Receive LR

Purpose: To verify that the DUT transitions to the LR Receive State if LR is received while in the OLS Transmit State.

References:

[1] FC-FS Clause 7.5.2
[2] FC-FS Table 11

Resource Requirements:

- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:

The transition to the OLS Transmit State shall be made after power-up of during the Online to Offline protocol. The Port shall remain in the OLS Transmit State for a minimum of 5 ms. While in the OLS Transmit State, the Port shall transmit the OLS Primitive Sequence. If LR is received and recognized by a Port while in the OLS Transmit State, the Port shall transition to the LR Receive State. While in the LR Receive State, the Port shall transmit the LRR Primitive Sequence.

Test Setup:

Test Setup 1. The Testing Station is transmitting LR. The DUT is powered off.

Procedure:

Part a:

1. Power on the DUT.

Observable Results:

The DUT should:

a. transmit LRR after transmitting OLS for a minimum of 5 ms.

Possible Problems: None.

Test #7.7.3: Receive LRR

Purpose: To verify that the DUT remains in the OLS Transmit State if LRR is received.

References:
[1] FC-FS Clause 7.5.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
The transition to the OLS Transmit State shall be made after power-up of during the Online to Offline protocol. The Port shall remain in the OLS Transmit State for a minimum of 5 ms. While in the OLS Transmit State, the Port shall transmit the OLS Primitive Sequence. If LRR is received and recognized by a Port while in the OLS Transmit State, the Port shall remain in the OLS Transmit State.

Test Setup:
Test Setup 1. The Testing Station is transmitting LRR. The DUT is powered off.

Procedure:
Part a:
1. Power on the DUT.

Observable Results:
The DUT should:
a. continue to transmit OLS.

Possible Problems: None.

Test #7.7.4: Receive Idle

Purpose: To verify that the DUT remains in the OLS Transmit State if Idle is received.

References:
[1] FC-FS Clause 7.5.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
The transition to the OLS Transmit State shall be made after power-up of during the Online to Offline protocol. The Port shall remain in the OLS Transmit State for a minimum of 5 ms. While in the OLS Transmit State, the Port shall transmit the OLS Primitive Sequence. If Idle is received and recognized by a Port while in the OLS Transmit State, the Port shall remain in the OLS Transmit State.

Test Setup:
Test Setup 1. The Testing Station is transmitting Idle. The DUT is powered off.

Procedure:
Part a:
1. Power on the DUT.

Observable Results:
The DUT should:
a. continue to transmit OLS.

Possible Problems: None.

Test #7.7.5: Receive OLS

Purpose: To verify that the DUT transitions to the OLS Receive State if OLS is received while in the OLS Transmit State.

References:
[1] FC-FS Clause 7.5.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
The transition to the OLS Transmit State shall be made after power-up of during the Online to Offline protocol. The Port shall remain in the OLS Transmit State for a minimum of 5 ms. While in the OLS Transmit State, the Port shall transmit the OLS Primitive Sequence. If OLS is received and recognized by a Port while in the OLS Transmit State, the Port shall transition to the OLS Receive State. While in the OLS Receive State, the Port shall transmit the LR Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station is transmitting OLS. The DUT is powered off.

Procedure:
Part a:
1. Power on the DUT.

Observable Results:
The DUT should:
a. transmit LR after transmitting OLS for a minimum of 5 ms.

Possible Problems: None.

Test #7.7.6: Receive NOS

Purpose: To verify that the DUT transitions to the NOS Receive State if NOS is received while in the OLS Transmit State.

References:

[1] FC-FS Clause 7.5.2
[2] FC-FS Table 11

Resource Requirements:

- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:

The transition to the OLS Transmit State shall be made after power-up of during the Online to Offline protocol. The Port shall remain in the OLS Transmit State for a minimum of 5 ms. While in the OLS Transmit State, the Port shall transmit the OLS Primitive Sequence. If NOS is received and recognized by a Port while in the OLS Transmit State, the Port shall transition to the NOS Receive State. While in the NOS Receive State, the Port shall transmit the OLS Primitive Sequence.

Test Setup:

Test Setup 1. The Testing Station is transmitting NOS. The DUT is powered off.

Procedure:

Part a:

1. Power on the DUT.

Observable Results:

The DUT should:

a. continue to transmit OLS.

Possible Problems: Because the DUT will transmit OLS in both the OLS Transmit and NOS Receive States, it may require some other way to determine that the DUT actually made the transition.

Test #7.7.7: Loss of Signal

Purpose: To verify that the DUT transitions to the NOS Transmit State if it detects Loss of Signal while in the LR Transmit State.

References:
[1] FC-FS Clause 7.3.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
The Link Reset Primitive Sequence shall be transmitted by a Port to initiate the Link Reset Protocol or to recover from a Link Timeout. A Port shall enter the LR Transmit State to initiate the Link Reset Protocol. While in the LR Transmit State, the Port shall transmit the LR Primitive Sequence. If a Loss of Signal is detected, the Port shall enter the NOS Transmit State. While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station's transmitter is disabled. The DUT is powered off.

Procedure:
Part a:
1. Power on the DUT.

Observable Results:
The DUT should:
a. transmit OLS for a minimum of 5 ms before transmitting NOS.

Possible Problems: It may require user intervention to cause the DUT to initiate the Link Reset Protocol (i.e., unplug the RX fiber of the DUT). Also, upon the Loss of Signal, devices using short wave lasers may transition to the Open-Fibre State in the FC-0 OFC. When this happens, the laser will be deactivated and the monitor will not pick up any signal.

Test #7.7.8: LOS (Loss of Synchronization) Signal

Purpose: To verify that the DUT transitions to the Wait for OLS State if Loss of Synchronization for greater than R_T_TOV is detected while in the OLS Transmit State.

References:
[1] FC-FS Clause 7.5.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
The transition to the OLS Transmit State shall be made after power-up of during the Online to Offline protocol. The Port shall remain in the OLS Transmit State for a minimum of 5 ms. While in the OLS Transmit State, the Port shall transmit the OLS Primitive Sequence. If Loss of Synchronization is detected for more than R_T_TOV is detected, the Port shall transition to the Wait for OLS State. While in the Wait for OLS State, the Port shall transmit the NOS Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station is transmitting Invalid Transmission Words. The DUT is powered off.

Procedure:
Part a:
1. Power on the DUT.

Observable Results:
The DUT should:
a. transmit NOS after transmitting OLS for a minimum of (5 ms + R_T_TOV).

Possible Problems: None.

Test #7.7.9: R_T_TOV Abort

Purpose: To verify that the DUT transitions to the Wait for OLS State if it remains in the OLS Transmit State for greater than R_T_TOV.

References:
[1] FC-FS Clause 7.5.2
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
The transition to the OLS Transmit State shall be made after power-up of during the Online to Offline protocol. The Port shall remain in the OLS Transmit State for a minimum of 5 ms. While in the OLS Transmit State, the Port shall transmit the OLS Primitive Sequence. If no Primitive Sequence is received or event detected which causes the Port to exit the OLS Transmit State after a timeout period (R_T_TOV), the Port shall transition to the Wait for OLS State. While in the Wait for OLS State, the Port shall transmit the NOS Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station is transmitting Idle. The DUT is powered off.

Procedure:
Part a:
1. Power on the DUT.

Observable Results:
The DUT should:
a. transmit NOS after transmitting OLS for a minimum of 5 ms.

Possible Problems: None.

Test #7.7.10: E_D_TOV Link Time-out

Purpose: To verify that the DUT properly implements the Link-Reset protocol.

References:
[1] FC-FS Clause 7.2
[2] FC-FS Clause 7.6
[3] FC-FS Clause 21.2.3

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
The Link Reset protocol begins when the FC_Port enters the LR1 State after one of the following events has been detected:
a) Connection Recover
b) Link timeout
c) buffer-to-buffer overrun
A short timeout value is known as the Error_Detect_Timeout Value (E_D_TOV). The E_D_TOV is used as the timeout value for detecting an error condition. The default value is 2 seconds. A Link timeout error shall be detected if one or more R_RDY Primitive Signals are not received within E_D_TOV after the buffer-to-buffer Credit_CNT has reached zero.

Test Setup:
Test Setup 1. The Testing Station is transmitting Invalid Transmission words. The DUT is powered off.

Procedure:
Part a:
1. The Testing Station transmits Invalid Transmission words for > R_T_TOV.
2. The Testing Station transmits a PLOGI to the DUT without any accompanying R_RDY primitives.
3. The Testing Station waits for a time greater than E_D_TOV.

Observable Results:
The DUT should:
a. transmit LR after transmitting OLS for a minimum of 5ms + E_D_TOV.

Possible Problems: If the E_D_TOV of the DUT is greater than the R_T_TOV of the DUT, the DUT may possibly take the R_T_TOV transition first.

Test #7.7.11: Receive Primitives

Purpose: To verify that the DUT remains in the OLS Transmit State if a valid primitive sequence or signal is received.

References:
[1] FC-FS Clause 7.1
[2] FC-FS Table 9, 10, 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If a valid primitive signal is received and recognized by a Port while in the OLS Transmit State or a valid primitive sequence is received by a Port while in the OLS Transmit State, the Port shall remain in the OLS Transmit State. While in the OLS Transmit State, the Port shall transmit OLS.

Test Setup:
Test Setup 1. The DUT is powered off.

Procedure:
Part a: Receive Primitive Signals
1. Power on the DUT.
2. The Testing Station transmits the following primitive signals to the DUT after 5 ms:
   a) 10 Idle, R_RDY, 10 Idle, ARByx, 10 Idle, CLS, 10 Idle, DHD, 10 Idle, MRKtx, 10 Idle, OPNyx, 10 Idle, OPNyy, 10 Idle, OPNyr, 10 Idle, and OPNfr. (Where y = 0x51, x = 0x52, t = 0x01.)

Part b: Receive Primitive Sequences
1. Power on the DUT.
2. The Testing Station transmits the following primitive sequences to the DUT after 5 ms:
   a) (3) LIP(F7,F7), 10 Idle, (3) LIP(F8,F7), 10 Idle, (3) LIP(F7,x), 10 Idle, (3) LIP(F8,x), 10 Idle, (3) LIP(y,x), 10 Idle, (3) LIP(f,x), 10 Idle, (3) LPB(y,x), 10 Idle, (3) LPB(f,x), 10 Idle, (3) LPE(y,x), 10 Idle, and (3) LPE(f,x). (Where y = 0x51, x = 0x52, t = 0x01.)

Observable Results:
The DUT should:
a. transmit OLS for a minimum of 5 ms and not respond to any of the received primitive signals.
b. transmit OLS for a minimum of 5 ms and not respond to any of the received primitive sequences.

Possible Problems: Part b. is not applicable if the DUT supports loop initialization. The DUT is expected to transmit OLS for 5 ms upon power on, however the DUT is allowed to transmit OLS for longer and does not have to respond to any events until the Port determines it is time to leave the OLS Transmit State.

Group 8: OLS Receive (OL2)

Overview:
A Port shall enter the OLS Receive State when it receives and recognizes the OLS Primitive Sequence. These tests are designed to verify the various transitions and actions required in the OL2 state.

Test #7.8.1: Receive LR

Purpose: To verify that the DUT transitions to the LR Receive State if LR is received while in the OLS Receive State.

References:
[1] FC-FS Clause 7.5.3
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If OLS is received and recognized by a Port while in the Active State, the Port shall transition to the OLS Receive State. While in the OLS Receive State, the Port shall transmit the LR Primitive Sequence. If LR is received and recognized by a Port while in the OLS Receive State, the Port shall transition to the LR Receive State. While in the LR Receive State, the Port shall transmit the LRR Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) OLS.
2. The Testing Station transmits continuous LR.

Observable Results:
The DUT should:
a. transmit LR followed by LRR.

Possible Problems: None.

Test #7.8.2: Receive LRR

Purpose: To verify that the DUT transitions to the LRR Receive State if LRR is received while in the OLS Receive State.

References:
[1] FC-FS Clause 7.5.3
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If OLS is received and recognized by a Port while in the Active State, the Port shall transition to the OLS Receive State. While in the OLS Receive State, the Port shall transmit the LR Primitive Sequence. If LRR is received and recognized by a Port while in the OLS Receive State, the Port shall transition to the LRR Receive State. While in the LRR Receive State, the Port shall transmit Idle.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) OLS.
2. The Testing Station transmits continuous LRR.

Observable Results:
The DUT should:
a. transmit LR followed by Idle.

Possible Problems: None.

Test #7.8.3: Receive Idle

Purpose: To verify that the DUT remains in the OLS Receive State if Idle is received.

References:
[1] FC-FS Clause 7.5.3
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If OLS is received and recognized by a Port while in the Active State, the Port shall transition to the OLS Receive State. While in the OLS Receive State, the Port shall transmit the LR Primitive Sequence. If Idle is received and recognized by a Port while in the OLS Receive State, the Port shall remain in the OLS Receive State.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) OLS.
2. The Testing Station transmits continuous Idle.

Observable Results:
The DUT should:
a. continue to transmit LR.

Possible Problems: None.

Test #7.8.4: Receive OLS

Purpose: To verify that the DUT remains in the OLS Receive State if OLS is received.

References:
[1] FC-FS Clause 7.5.3
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If OLS is received and recognized by a Port while in the Active State, the Port shall transition to the OLS Receive State. While in the OLS Receive State, the Port shall transmit the LR Primitive Sequence. If OLS is received and recognized by a Port while in the OLS Receive State, the Port shall remain in the OLS Receive State.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits continuous OLS.

Observable Results:
The DUT should:
a. continue to transmit LR.

Possible Problems: None.

Test #7.8.5: Receive NOS

Purpose: To verify that the DUT transitions to the NOS Receive State if NOS is received while in the OLS Receive State.

References:
[1] FC-FS Clause 7.5.3
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If OLS is received and recognized by a Port while in the Active State, the Port shall transition to the OLS Receive State. While in the OLS Receive State, the Port shall transmit the LR Primitive Sequence. If NOS is received and recognized by a Port while in the OLS Receive State, the Port shall transition to the NOS Receive State. While in the NOS Receive State, the Port shall transmit the OLS Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) OLS.
2. The Testing Station transmits continuous NOS.

Observable Results:
The DUT should:
a. transmit LR followed by OLS.

Possible Problems: None.

Test #7.8.6: Loss of Signal

Purpose: To verify that the DUT transitions to the NOS Transmit State if it detects Loss of Signal while in the OLS Receive State.

References:

[1] FC-FS Clause 7.3.2
[2] FC-FS Table 11

Resource Requirements:

- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:

The Link Reset Primitive Sequence shall be transmitted by a Port to initiate the Link Reset Protocol or to recover from a Link Timeout. A Port shall enter the LR Transmit State to initiate the Link Reset Protocol. While in the OLS Receive State, the Port shall transmit the LR Primitive Sequence. If a Loss of Signal is detected, the Port shall enter the NOS Transmit State. While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence.

Test Setup:

Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:

Part a:

1. The Testing Station transmits three (3) OLS.
2. The Testing Station disables its transmitter.

Observable Results:

The DUT should:

a. transmit LR followed by NOS.

Possible Problems: It may require user intervention to cause the DUT to initiate the Link Reset Protocol (i.e., unplug the RX fiber of the DUT). Also, upon the Loss of Signal, devices using short wave lasers may transition to the Open-Fibre State in the FC-0 OFC. When this happens, the laser will be deactivated and the monitor will not pick up any signal.

Test #7.8.7: LOS (Loss of Synchronization) Signal

Purpose: To verify that the DUT transitions to the Wait for OLS State if Loss of Synchronization for greater than R_T_TOV is detected while in the OLS Receive State.

References:

[1] FC-FS Clause 7.5.3
[2] FC-FS Table 11

Resource Requirements:

- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:

If OLS is recognized and received by a Port while in the Active State, the Port shall transition to the OLS Receive State. While in the OLS Receive State, the Port shall transmit the LR Primitive Sequence. If Loss of Synchronization is detected for more than R_T_TOV, the Port shall enter the Wait for OLS State. While in the Wait for OLS State, the Port shall transmit the NOS Primitive Sequence.

Test Setup:

Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:

Part a:

1. The Testing Station transmits three (3) OLS.
2. The Testing Station transmits Transmission Words for > R_T_TOV.

Observable Results:

The DUT should:

a. transmit LR followed by NOS.

Possible Problems: None.

Test #7.8.8: E_D_TOV Link Time-out

Purpose: To verify that the DUT properly implements the Link-Reset protocol.

References:
[1] FC-FS Clause 7.2
[2] FC-FS Clause 7.6
[3] FC-FS Clause 21.2.3

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
The Link Reset protocol begins when the FC_Port enters the LR1 State after one of the following events has been detected:
a) Connection Recover
b) Link timeout
c) buffer-to-buffer overrun
A short timeout value is known as the Error_Detect_Timeout Value (E_D_TOV). The E_D_TOV is used as the timeout value for detecting an error condition. The default value is 2 seconds. A Link timeout error shall be detected if one or more R_RDY Primitive Signals are not received within E_D_TOV after the buffer-to-buffer Credit_CNT has reached zero.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) OLS.
2. The Testing Station transmits a PLOGI to the DUT without any accompanying R_RDY primitives.
3. The Testing Station waits for a time greater than E_D_TOV.

Observable Results:
The DUT should:
a. transmit Idle followed by continuous LR.

Possible Problems: If the E_D_TOV of the DUT is greater than the R_T_TOV of the DUT, the DUT may possibly take the R_T_TOV transition first. In this case the Testing Station should perform PLOGI with the DUT in order to set the E_D_TOV to a value less than that of the R_T_TOV.

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Test #7.8.9: Receive Primitives

Purpose: To verify that the DUT remains in the OLS Receive State if a valid primitive sequence or signal is received.

References:
[1] FC-FS Clause 7.1
[2] FC-FS Table 9, 10, 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If a valid primitive signal is received and recognized by a Port while in the OLS Receive State or a valid primitive sequence is received by a Port while in the OLS Receive State, the Port shall remain in the OLS Receive State. While in the OLS Receive State, the Port shall transmit LR.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a: Receive Primitive Signals
1. The Testing Station transmits three (3) OLS.
2. The Testing Station transmits the following primitive signals to the DUT:
   a) 10 Idle, R_RDY, 10 Idle, ARByx, 10 Idle, CLS, 10 Idle, DHD, 10 Idle, MRKtx, 10 Idle, OPNyx, 10 Idle, OPNyy, 10 Idle, OPNyr, 10 Idle, and OPNfr. (Where y = 0x51, x = 0x52, t = 0x01.)

Part b: Receive Primitive Sequences
1. The Testing Station transmits three (3) OLS.
2. The Testing Station transmits the following primitive sequences to the DUT:
   a) (3) LIP(F7,F7), 10 Idle, (3) LIP(F8,F7), 10 Idle, (3) LIP(F7,x), 10 Idle, (3) LIP(F8,x), 10 Idle, (3) LIP(y,x), 10 Idle, (3) LIP(f,x), 10 Idle, (3) LPB(y,x), 10 Idle, (3) LPB(f,x), 10 Idle, (3) LPE(y,x), 10 Idle, and (3) LPE(f,x). (Where y = 0x51, x = 0x52, t = 0x01.)

Observable Results:
The DUT should:
a. continue to transmit LR.
b. continue to transmit LR.

Possible Problems: Part b. is not applicable if the DUT supports loop initialization.

Group 9: Wait for OLS (OL3)

Overview:
A Port shall enter the Wait for OLS State when it detects Loss of Signal or Loss of Synchronization for more than R_T_TOV while it is in the OLS Receive State, or while it is in the OLS Transmit State at an appropriate time in the Link Initialization Protocol. These tests are designed to verify the various transitions and actions required in the OL3 state.

Test #7.9.1: Receive LR

Purpose: To verify that the DUT transitions to the NOS Transmit State if LR is received while in the Wait for OLS State.

References:
[1] FC-FS Clause 7.5.4
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If OLS is received and recognized by a Port while in the Active State, the Port shall transition to the OLS Receive State. While in the OLS Receive State, the Port shall transmit the LR Primitive Sequence. If Loss of Synchronization is detected for more than R_T_TOV, the Port shall enter the Wait for OLS State. While in the Wait for OLS State, the Port shall transmit the NOS Primitive Sequence. If LR is received and recognized by a Port while in the Wait for OLS State, the Port shall transition to the NOS Transmit State. While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) OLS.
2. The Testing Station transmits invalid Transmission Words for > R_T_TOV.
3. The Testing Station transmits continuous LR.

Observable Results:
The DUT should:
a. transmit LR followed by continuous NOS.

Possible Problems: Because the DUT will transmit NOS in both the Wait for OLS and NOS Transmit States, it may require some other way to determine that the DUT actually made the transition.

Test #7.9.2: Receive LRR

Purpose: To verify that the DUT transitions to the NOS Transmit State if LRR is received while in the Wait for OLS State.

References:
[1] FC-FS Clause 7.5.4
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If OLS is received and recognized by a Port while in the Active State, the Port shall transition to the OLS Receive State. While in the OLS Receive State, the Port shall transmit the LR Primitive Sequence. If Loss of Synchronization is detected for more than R_T_TOV, the Port shall enter the Wait for OLS State. While in the Wait for OLS State, the Port shall transmit the NOS Primitive Sequence. If LRR is received and recognized by a Port while in the Wait for OLS State, the Port shall transition to the NOS Transmit State. While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) OLS.
2. The Testing Station transmits invalid Transmission Words for > R_T_TOV.
3. The Testing Station transmits continuous LRR.

Observable Results:
The DUT should:
a. transmit LR followed by continuous NOS.

Possible Problems: Because the DUT will transmit NOS in both the Wait for OLS and NOS Transmit States, it may require some other way to determine that the DUT actually made the transition.

Test #7.9.3: Receive Idle

Purpose: To verify that the DUT remains in the Wait for OLS State if Idle is received while in the Wait for OLS State.

References:
[1] FC-FS Clause 7.5.4
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If OLS is received and recognized by a Port while in the Active State, the Port shall transition to the OLS Receive State. While in the OLS Receive State, the Port shall transmit the LR Primitive Sequence. If Loss of Synchronization is detected for more than a R_T_TOV, the Port shall enter the Wait for OLS State. While in the Wait for OLS State, the Port shall transmit the NOS Primitive Sequence. If Idle is received and recognized by a Port while in the Wait for OLS State, the Port shall remain in the Wait for OLS State.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) OLS.
2. The Testing Station transmits invalid Transmission Words for > R_T_TOV.
3. The Testing Station transmits continuous Idle.

Observable Results:
The DUT should:
a. transmit LR followed by continuous NOS.

Possible Problems: None.

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Test #7.9.4: Receive OLS

Purpose: To verify that the DUT transitions to the OLS Receive State if OLS is received while in the Wait for OLS State.

References:
[1] FC-FS Clause 7.5.4
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If OLS is received and recognized by a Port while in the Active State, the Port shall transition to the OLS Receive State. While in the OLS Receive State, the Port shall transmit the LR Primitive Sequence. If Loss of Synchronization is detected for more than a R_T_TOV, the Port shall enter the Wait for OLS State. While in the Wait for OLS State, the Port shall transmit the NOS Primitive Sequence. If OLS is received and recognized by a Port while in the Wait for OLS State, the Port shall transition to the OLS Receive State. While in the OLS Receive State, the Port shall transmit LR.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) OLS.
2. The Testing Station transmits invalid Transmission Words for > R_T_TOV.
3. The Testing Station transmits continuous OLS.

Observable Results:
The DUT should:
a. transmit LR followed by NOS followed by LR.

Possible Problems: None.

Test #7.9.5: Receive NOS

Purpose: To verify that the DUT transitions to the NOS Receive State if NOS is received while in the Wait for OLS State.

References:
[1] FC-FS Clause 7.5.4
[2] FC-FS Table 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If OLS is received and recognized by a Port while in the Active State, the Port shall transition to the OLS Receive State. While in the OLS Receive State, the Port shall transmit the LR Primitive Sequence. If Loss of Synchronization is detected for more than a R_T_TOV, the Port shall enter the Wait for OLS State. While in the Wait for OLS State, the Port shall transmit the NOS Primitive Sequence. If NOS is received and recognized by a Port while in the Wait for OLS State, the Port shall transition to the NOS Receive State. While in the NOS Receive State, the Port shall transmit the OLS Primitive Sequence.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) OLS.
2. The Testing Station transmits invalid Transmission Words for > R_T_TOV.
3. The Testing Station transmits continuous NOS.

Observable Results:
The DUT should:
a. transmit LR followed by NOS followed by OLS.

Possible Problems: None.

Test #7.9.6: Loss of Signal

Purpose: To verify that the DUT transitions to the NOS Transmit State if it detects Loss of Signal while in the Wait for OLS State.

References:

[1] FC-FS Clause 7.3.2
[2] FC-FS Table 11

Resource Requirements:

- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:

The Link Reset Primitive Sequence shall be transmitted by a Port to initiate the Link Reset Protocol or to recover from a Link Timeout. A Port shall enter the OLS Receive State to initiate the Link Reset Protocol. While in the OLS Receive State, the Port shall transmit the LR Primitive Sequence. If a Loss of Signal is detected, the Port shall enter the NOS Transmit State. While in the NOS Transmit State, the Port shall transmit the NOS Primitive Sequence.

Test Setup:

Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:

Part a:

1. The Testing Station transmits three (3) OLS.
2. The Testing Station transmits invalid Transmission Words for > R_T_TOV.
3. The Testing Station disables it's transmitter.

Observable Results:

The DUT should:

a. transmit LR followed by NOS.

Possible Problems: It may require user intervention to cause the DUT to initiate the Link Reset Protocol (i.e., unplug the RX fiber of the DUT). Also, upon the Loss of Signal, devices using short wave lasers may transition to the Open-Fibre State in the FC-0 OFC. When this happens, the laser will be deactivated and the monitor will not pick up any signal.

Test #7.9.7: E_D_TOV Link Time-out

Purpose: To verify that the DUT properly implements the Link-Reset protocol.

References:
[1] FC-FS Clause 7.2
[2] FC-FS Clause 7.6
[3] FC-FS Clause 21.2.3

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
The Link Reset protocol begins when the FC_Port enters the LR1 State after one of the following events has been detected:
a) Connection Recover
b) Link timeout
c) buffer-to-buffer overrun
A short timeout value is known as the Error_Detect_Timeout Value (E_D_TOV). The E_D_TOV is used as the timeout value for detecting an error condition. The default value is 2 seconds. A Link timeout error shall be detected if one or more R_RDY Primitive Signals are not received within E_D_TOV after the buffer-to-buffer Credit_CNT has reached zero.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a:
1. The Testing Station transmits three (3) OLS.
2. The Testing Station transmits invalid Transmission Words for > R_T_TOV.
3. The Testing Station waits for a time greater than E_D_TOV.

Observable Results:
The DUT should:
b. transmit Idle followed by LR followed by NOS followed by LR.

Possible Problems: None.

Test #7.9.8: Receive Primitives

Purpose: To verify that the DUT remains in the Wait for OLS State if a valid primitive sequence or signal is received.

References:
[1] FC-FS Clause 7.1
[2] FC-FS Table 9, 10, 11

Resource Requirements:
- Testing Station capable to transmitting valid FC Primitives and Frames.
- Monitor to capture Primitive Signals, Primitive Sequences, FC-2 layer frames, and errors.

Last Updated: January 8, 2008

Discussion:
If a valid primitive signal is received and recognized by a Port while in the Wait for OLS State or a valid primitive sequence is received by a Port while in the Wait for OLS state, the Port shall remain in the Wait for OLS State. While in the Wait for OLS State, the Port shall transmit Idle.

Test Setup:
Test Setup 1. The Testing Station and the DUT have transitioned to the Active State.

Procedure:
Part a: Receive Primitive Signals
1. The Testing Station transmits three (3) OLS.
2. The Testing Station transmits invalid Transmission Words for > R_T_TOV.
3. The Testing Station transmits the following primitive signals to the DUT:
   a) 10 Idle, R_RDY, 10 Idle, ARByx, 10 Idle, CLS, 10 Idle, DHD, 10 Idle, MRKtx, 10 Idle, OPNyx, 10 Idle, OPNyy, 10 Idle, OPNyr, 10 Idle, and OPNfr. (Where y = 0x51, x = 0x52, t = 0x01.)

Part b: Receive Primitive Sequences
1. The Testing Station transmits three (3) OLS.
2. The Testing Station transmits invalid Transmission Words for > R_T_TOV.
3. The Testing Station transmits the following primitive sequences to the DUT:
   a) (3) LIP(F7,F7), 10 Idle, (3) LIP(F8,F7), 10 Idle, (3) LIP(F7,x), 10 Idle, (3) LIP(F8,x), 10 Idle, (3) LIP(y,x), 10 Idle, (3) LIP(f,x), 10 Idle, (3) LPB(y,x), 10 Idle, (3) LPB(f,x), 10 Idle, (3) LPE(y,x), 10 Idle, and (3) LPE(f,x). (Where y = 0x51, x = 0x52, t = 0x01.)

Observable Results:
The DUT should:
a. continue to transmit NOS.
b. continue to transmit NOS.

Possible Problems: Part b. is not applicable if the DUT supports loop initialization.