

FCLC January 1998 Group Testing Period

- Overview of the Testing
- General Results
- Issues
- Proposed Directions

Overview of Testing

- Focus was on Arbitrated Loop Stability
 - Test all possible pairs of devices (2 days)
 - Test SCSI coexistence of multiple initiators
 - Test public loop operation
 - Study problems and issues in “large” loops

All L_Port Pair Testing

- Power on L_1 and wait until it is fully powered up.
Power on L_2 .
- Power on L_2 and wait until it is fully powered up.
Power on L_1 .
- Disconnect L_1 from the Loop and then reconnect it.
- Disconnect L_2 from the Loop and then reconnect it.
- Disconnect the receiver of L_1 . Power cycle L_1 .
Reconnect the receiver after L_1 is fully powered up.
- Disconnect the receiver of L_2 . Power cycle L_2 .
Reconnect the receiver after L_2 is fully powered up.

Pair Test Results

•	L_1	L_2	Hub	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
•	R	N	H	Pass	Pass	Pass	Pass	Pass	Pass
•	S	D		FAIL1	FAIL1	N/T	N/T	N/T	N/T
•	N	A		Pass	Pass	Pass	FAIL2	Pass	Pass
•	N	F	U	Pass	Pass	Pass	FAIL3	Pass	FAIL 3
•	J	R	H	Pass	FAIL4	Pass	Pass	Pass	Pass
•	P	K	H	Pass	Pass	Pass	Pass	Pass	FAIL 5
•	S	D	H	Pass	Pass	Pass	Pass	Pass	FAIL 6

Pair Test Results

- Test1 - 11/62 Pairs Failed (18%)
- Test2 - 16/62 Pairs Failed (26%)
- Test3 - 12/62 Pairs Failed (19%)
- Test4 - 12/62 Pairs Failed (19%)
- Test5 - 30/62 Pairs Failed (48%)
- Test6 - 27/62 Pairs Failed (44%)
- All tests passed by 19/62 Pairs (31%)

SCSI Coexistence Tests - 1

- Power on the targets and wait until they are fully powered up. Power on I_1 and wait for it to fully power up. Power on I_2 . Verify SCSI connectivity.
- Disconnect I_1 and reconnect it after fifteen seconds. Verify SCSI connectivity.
- Disconnect I_2 and reconnect it after fifteen seconds. Verify SCSI connectivity.
- Disconnect T_1 and reconnect it after fifteen seconds. Verify SCSI connectivity.
- Disconnect T_2 and reconnect it after fifteen seconds. Verify SCSI connectivity.

SCSI Coexistence Test - 2

- Power on the targets and wait until they are fully powered up. Power on I_2 and wait for it to fully power up. Power on I_1 . Verify SCSI connectivity.
- Disconnect I_1 and reconnect it after fifteen seconds. Verify SCSI connectivity.
- Disconnect I_2 and reconnect it after fifteen seconds. Verify SCSI connectivity.
- Disconnect T_1 and reconnect it after fifteen seconds. Verify SCSI connectivity.
- Disconnect T_2 and reconnect it after fifteen seconds. Verify SCSI connectivity.

SCSI Coexistence Results - 1

- Test1 - 10/14 Initiator Pairs Failed
- Test2 - 12/14 Initiator Pairs Failed
- Test3 - 11/14 Initiator Pairs Failed
- Test4 - 10/14 Initiator Pairs Failed
- Test5 - 11/14 Initiator Pairs Failed
- One Initiator pair passed all five tests

SCSI Coexistence Results - 2

- Test6 - 9/14 Initiator Pairs Failed
- Test7 - 10/14 Initiator Pairs Failed
- Test8 - 10/14 Initiator Pairs Failed
- Test9 - 9/14 Initiator Pairs Failed
- Test10 - 10/14 Initiator Pairs Failed
- Three Initiator pairs passed all five tests

Public Loop Testing Procedure

- Power on the target and wait until it is fully powered up. Power on the initiator. Verify SCSI connectivity.
- Move the initiator to a different F_Port on the switch. Verify SCSI connectivity.
- Move the target to a different FL_Port on the switch. Verify SCSI connectivity.
- Power on the initiator and wait until it is fully powered up. Power on the target. Verify SCSI connectivity.

Public Loop Test Results

- Test1 - 5/10 Pairs Failed
- Test2 - 6/10 Pairs Failed
- Test3 - 8/10 Pairs Failed
- Test4 - 8/10 Pairs Failed
- No pair passed all tests

Large Loop Test Procedure

- Mission - To examine the behavior of larger loops to see if additional failure modes can be isolated
- Isolated problems
 - A station would not respond to LIP while sending LISM frames
 - A station, if it hit a timing window during loop insertion, would send LIP every 2 to 3 seconds
 - A station would reinitialize the loop 10 milliseconds after an error burst.

Large Loop Test Procedure

- Unresolved observations
 - Steady state of OLS being transmitted, LSIM being received
 - CLS observed while LIM sending loop initialization frames
 - ARB F0 received while the LIM is waiting for a LISA frame
 - orphan sequences (ARB 01, CLS)
 - morphed LIP to LIPr
 - bad idles (typically B5)

Major Issues - The FC-AL 4.5 standard

- Is imprecise relative to loop initialization and recovery
 - fundamental reason for loop instability
- The INITIALIZATION and OPEN-INIT states are not robust
 - OPEN-INIT needs to have a time out mechanism
 - entry into OLD-PORT is poorly controlled
- Insertion process into loop uncontrolled
 - endless source of inconsistent behavior

The road to recovery - key #1

- Define simple precise behavior of an L_Port during loop initialization and recovery
 - use normative state machine and pseudo code
 - simplify - ignore LPB, LPE until MONITORING state has been reached
 - simplify - ignore LIPr until MONITORING has been reached
 - simplify - get rid of Annex I.2.2
 - enter OLD-PORT only on reception of OLS
 - do timers in OPEN-INIT (in FC-AL-2)

The road to recovery - key #2

- Define the behavior of hubs so that they may “gracefully” insert broken nodes
 - initialize L_Ports (bring to MONITORING state) and then reinitialize before insertion
 - standard needs to address market needs that impact interoperability
 - can resolve problems with current 4.5 equipment

Make conformance a requirement

- interoperability assumes conformance
- Can not base conformance on “working” in a particular application environment
- loop community should establish a “self-policing” metric for conformance and interoperability
- Group test periods are helpful but not sufficient

Fibre Channel Consortium On the Loop Program

- detailed conformance tests
- demonstrated loop stability in heterogeneous loop
- interoperability tested for conformant devices only
- public posting of products that pass testing (web only)
- see <http://www.iol.unh.edu>