

**Draft Meeting Minutes**  
**Prepared 18 December 1997**  
**Fibre Channel Working (FCW) Group:**  
**National Committee for Information Technology Standardization (NCITS)**  
**(Formerly: Accredited Standards Committee X3 - Information Technology)**  
**8 - 12 December 1997; Radisson Orlando Airport, Orlando, FL.**

The Fibre Channel Working (FCW) group includes the following work areas:

- a) Fibre Channel Physical and Signaling Interface Enhancements 3 (FC-PH-3);
- b) Fibre Channel Arbitrated Loop Enhancements 2 (FC-AL-2);
- c) Fibre Channel Private Loop Direct Attach (FC-PLDA);
- d) Fibre Channel Fabric Loop Attach (FC-FLA);
- e) Fibre Channel Arbitrated Loop Enhancements 3 (FC-AL-3) Working Document;
- f) Fibre Channel Slotted Loop (FC-SL);

**FCW Document Number: 97w112r9(a)**

Points of Contact:

Dal Allan (Working Group Chairman)  
ENDL  
14426 Black Walnut Court  
Saratoga, CA. 95070  
(408) 867-6630  
Dal.allan@mcimail.com

John Scheible (FCL Editor)  
IBM  
Bldg 902 M/S 9263  
11400 Burnet Road  
Austin, TX 78758  
(512) 823-8208 Fx: 512-838-3822  
[scheible@vnet.ibm.com](mailto:scheible@vnet.ibm.com)

Michael Hoard (FCW Co-Secretary)  
Boeing Defense and Space  
Mail Code 270-4235  
PO Box 516  
St. Louis, MO. 63166-0516  
(314) 232-6209  
[michael.a.hoard@boeing.com](mailto:michael.a.hoard@boeing.com)

Bill Martin (FCW Co-Secretary)  
Gadzoox Networks  
1209 Crescendo Drive  
Roseville, CA 95678  
(916)-772-3658  
[bmartin@gadzoox.com](mailto:bmartin@gadzoox.com)

**Electronic Document Availability:**

Draft documents, proposals, and presentations for the FCW working group may be obtained at the SCSI BBS (719)-533-7950 (area 37).

An alternate source for electronic documents is at the following FTP site:

<ftp://ftp.symbios.com/pub/standards/io/t11/pub/fc/futures/>

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Note: some Internet programs may have to use x3t11 rather than t11.

The FCW web page can be found at the following URL:

<http://www.symbios.com/fcw/>

Additional information regarding Fibre Channel standards development efforts, meeting schedules, and NCITS T11 administrative materials may be obtained at the following ftp site: <ftp.dpt.com/t11/pub/fc/>

**Meeting Summary:**

On 8 - 12 December 1997, the Fibre Channel Working (FCW) group held a working group meeting focused on the following areas: a) Fibre Channel Arbitrated Loop Enhancements 2 (FC-AL-2), b) Fibre Channel Private Loop Direct Attach (FC-PLDA), and c) Fibre Channel Arbitrated Loop Enhancements 3 (FC-AL-3) Working Document. The FCW meeting did not address the following work areas: a) the Fibre Channel Physical and Signaling Interface Enhancements 3 (FC-PH-3), b) Fibre Channel Fabric Loop Attach (FC-FLA), and c) Fibre Channel Slotted Loop (FC-SL). The FCW meeting was hosted by Distributed Processing Technology (DPT), during the NCITS T11 Plenary week at the Radisson Orlando Airport, Orlando, FL. Topics covered in the 8 - 12 December FCW meeting included:

Please note: the FCW Co-Secretary was not present in the room, during the entire set of FCW meetings; therefore, the following minutes reflect the available information as of 16 December 1997. Thank you for your patience.

<u>- FC-AL-3 Proposals</u>	Dal Allan
<u>- FCW Working Group Priorities</u>	Dal Allan
<u>- Application of ARB(FF) for Reducing EMI in FC-AL Systems</u>	Bill Martin
<u>- Clock Skew Management</u>	Jim Coomes
<u>- PLDA-2 Proposal Revision 1.2</u>	Dave Peterson
<u>- Tape Recovery</u>	Brian Smith
<u>- FC-AL-3 Use of MRK Primitive</u>	Horst Truestedt
<u>- Discussion on FC-AL-3</u>	Dal Allan
<u>- FC-AL-2 Reserved Ordered Set Handling</u>	Ed Gardner
<u>- January Agenda</u>	Dal Allan
<u>- Power-On</u>	Horst Truestedt
<u>- FC-0 / FCW Joint Report</u>	Schelto Van Doorn

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**Meeting Details:**

- FC-AL-3 Proposals

Dal Allan

Dal Allan, ENDL Associates, began the meeting with introductions, and asked for any proposals to be considered for inclusion into the FC-AL-3 working document. Please note that at the last FCW meeting, held in Tucson AZ., the FCL proposal had been effectively withdrawn from the FCW working group. The FCW group had selected their new document to be called FC-AL-3, with the baseline structure being FC-AL-2. This was done to ensure strict backwards compatibility with existing FC-AL products. At this meeting, the first item on the agenda was the call to receive any new proposals to be included with the FC-AL-2 baseline functionality.

No FC-AL-3 proposals were submitted during the Monday, 8 December FCW meeting. It was noted that Bent Stoevhase, Independent, submitted a FC-AL-3 proposal later in the T11 meeting week. Bent's proposal will be considered at a future FCW meeting, probably in January '98. Bent's presentation is available at the following sites:

[ftp://ftp.dpt.com/t11/member/incoming/bents\\_al-3\\_prop.pdf](ftp://ftp.dpt.com/t11/member/incoming/bents_al-3_prop.pdf)

[ftp://ftp.dpt.com/t11/pub/fc/futures/bents\\_al-3\\_prop.pdf](ftp://ftp.dpt.com/t11/pub/fc/futures/bents_al-3_prop.pdf)

- FCW Working Group Priorities

Dal Allan

Dal Allan, ENDL Associates, lead the group in a discussion regarding FCW working group priorities. Dal listed the priorities of the group as of November 1996. He then generated a new list, based on open discussion within the group. The two lists are captured below.

Priorities November 1996

- 1) Backwards Compatibility
- 2) Bandwidth (High Throughput)
- 3) Fault Isolation
- 4) Cost / Performance
- 5) Scalability

Priorities December 1997

- 1) Reduce Performance Loss On Long Links
- 2) Avoid Roll Off When Adding Devices
- 3) Negotiate Speed On Mixed Rate Parts
- 4) Use Anti-Starvation Mechanism / Bound Delays (Deterministic)
- 5) Lower Latency (More Suitable For Network - Storage Applications)

- Application of ARB(FF) for Reducing EMI in FC-AL Systems

Bill Martin

Bill Martin, Gadzoox Networks, presented his recommendation to use the ARB(FF) ordered set as a substitute for the IDLE ordered set as a means to reduce EMI effects associated with the frequently transmitted IDLE pattern. Bill stated that the use of ARB(FF) as an "IDLE-2" would be optional. Bill stated that a minimum number of IDLES must still be present before ARB(FF) is substituted. Bill listed a number of substitution rules.

Bill stated the issue has impact on hub architectures, which have a large concentration of coherent IDLES in a confined space. Designers run into a strong antenna effect. He stated that the IDLE ordered set has a very high EMI peak at 531 MHz for 1 Gbit/s signaling rate systems, and the use of ARB(FF) would significantly reduce this impact. Question was asked, "If you have to meet regulatory provisions, don't you need to satisfy EMI using the IDLE anyway?" Response, it only takes one device on the loop to get the loop into this mode of operation. A suggestion was made to not call the new ordered set an ARB, since this would be confusing. A recommendation was made to call it an "IDLE-2." Comments were made asking whether there is a better ordered set to use, as compared to ARB(FF). Response, the intent was to not break FC-AL-1 devices. Question was asked by Jeff Stai,

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Brocade Communications, could we make this proposal suitable for use in point-to-point links, and switches too.

Questions were asked regarding whether a product that was designed to handle existing IDLEs would find any benefit in this proposal, since the EMI criteria would have to be satisfied using the worst case IDLE mode of operation. Response, the proposal would be optional; those products which are targeted to use the existing IDLE would need to pass their tests using the appropriate test criteria; those products which are targeted to only operate using the new "IDLE-2" would need to pass their tests using the appropriate test criteria. It was noted in the group that the regulatory agencies do not dictate what the IDLE ordered set is, only that the device must be tested using the IDLE ordered set appropriate for normal operation. Bill Martin stated this would allow people to build devices and enclosures that could benefit from this approach.

Comments were made in the group that the device which triggers this behavior could be an intelligent node within the hub. Discussion explored the possibility of the intelligent node getting by-passed. Comments were made that the hub issues were not addressed in the FC-AL standard. Comments were made that any changes proposed should not break existing devices. Question was asked, "what happens on a point to point, would the return path transfer the IDLE or IDLE-2?" Response, no; however, the link would benefit from half of the amount of EMI reduction. Suggestion was made to put the new device on the more "idle" of the two end nodes. Bob Snively, Sun Microsystems, stated that he would strongly support this proposal.

The group changed topics briefly, and addressed issues involving the mixing of FC-AL-1 and FC-AL-2 devices. Bill Martin stated that when you mix FC-AL-1 and FC-AL-2 devices you greatly increase the potential of missing a fairness window. Comments were made that we should increase the number of IDLEs sent out from 6 to 12 IDLEs before sending out ARBs. Comments were made that this is only an issue when you are operating a totally utilized loop, and the IDLEs have a decreased probability of making their way fully around the loop. Comments were made that if the loop is so heavily utilized, then fairness is not worth talking about; the loop is already full. Bob Snively, Sun Microsystems, stated that this is a pathological case, and is not worth taking additional precautions. Comments were made that 6 IDLEs probably work fine; however, it is the use of 2 IDLEs that is the problem. Comments were made that we are dealing with probability here.

Comments were made that the issue is when an FC-AL-1 device sees an IDLE and wants to arbitrate, it will take in the IDLE, reset its fairness window, send out a small number of IDLEs, then immediately send out ARBs. The issue arises when the next down-stream FC-AL-1 device(s) take out IDLEs for clock skew management. The small number of IDLEs then become absorbed by FC-AL-1 devices before making their way around the loop; therefore, the fairness window is not reset for all devices around the loop. Jim Coomes, Seagate, stated that this does not happen in real applications; this is just theory.

Suggestions were made to put Bill Martin's proposal into FC-AL-2, and change the name of the "IDLE-2." Other suggestions were made to place the text in the monitoring state, and not make this mandatory. Comments were made that people are already implementing FC-AL-2.

Discussion then explored the removal of ARB(F7). Comments were made to remove the functional definition of ARB(F7), and add the ordered set to the reserved list for future use. Further suggestions were made to add the definition of ARB(FF) (according to the Gadzoos proposal), and remove it from the reserved list. This impacted changes to FC-AL-2, 7.1.2, 7.1.3, 5.1.2. A vote was taken regarding these suggestions: 29 for, 0 against.

- Clock Skew Management

Jim Coomes

Jim Coomes, Seagate, provided a presentation which was previously posted on the reflector. Jim recommended that the "Synchronous L\_Port" design be termed "NOT RECOMMENDED." Jim stated that the standard should strongly recommend the "Fully Asynchronous L\_Port" design. Jim's presentation changes 8.3.3 and replaces Annex G. A vote was taken: 28 for, 0 against.

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- PLDA-2 Proposal Revision 1.2

Dave Peterson

Dave Peterson, Network Systems, presented a proposal for tape systems using Class 3 on private loops. Dave recommended the use of Class 2 for public loops. (NOTE: could people who attended this session send more information to include into the minutes, send email to michael.a.hoard@boeing.com, thank you)

- Tape Recovery

Brian Smith

Brian Smith, Crossroads Systems, presented a proposal on Tape Recovery using a Class 3 recovery protocol. It was noted that the recovery protocol could be used in Class 2, but the protocol would not be optimized for Class 2. (NOTE: could people who attended this session send more information to include into the minutes, send email to michael.a.hoard@boeing.com, thank you)

- FC-AL-3 Use of MRK Primitive

Horst Truestedt

Horst Truestedt, ENDL Associates, presented new recommendations on additional functionality for the MRK Primitive. Horst stated that the purpose of his proposal was to quinsies the loop before transmitting a LIP which could potentially destroy frames in flight. A suggestion was made to use the MRK primitive as an low latency interrupt signal distribution mechanism. Comments on the suggestion stated that the MRK primitive is not a protected ordered set; therefore, if the interrupt were truly "time or mission critical," then the user would want to protect the interrupt information within a frame (which has protection in the form of R\_RDYs, ACKs, frame count, sequence count, etc.). Comments were made that if the MRK primitive comes back to you, you know that no body else took it.

Discussion explored how this compares to ARB(F7), others stated that this is not like ARB(F7). Horst stated that if all of the nodes support "MRK Initialize" then this will always work. Comments were made that this will not work, because the MRK does not have an address. Horst received comments to add a few characteristics to the material he already has. He added the criteria that if the node has not received the MRK in LP\_Time and no LIP has occurred, then he sends the LIP.

Comments were made that the MRK primitive (or other primitives to be defined in FC-AL-3) could be used for heart beat and other back ground health and monitoring tools which would not use any bandwidth; however, Dal Allan stated that frames have very nice properties, and should be used. He said the goal to save bandwidth is not a high driver. Dal stated that when we add spatial reuse and bandwidth doubling, why do we want to save on bandwidth. Comments were made that primitives are not guaranteed to be delivered, end to end, and frames are guaranteed. He stated that we should use frames where possible. and not just load up functions in primitives even if they have addresses.

- Discussion on FC-AL-3

Dal Allan

Dal Allan, ENDL Associates, conducted an open discussion in the group to receive comments on what the group should do next. Michael Hoard, Boeing Defense and Space, gave a brief summary regarding the "Joint FCA and FCLC Meeting" to be held after the T11 Plenary. Scott Darnel, E-Systems, stated that he has customers asking for mode switching devices to handle FC-AL, FC-SL, and register insertion. Scott stated that we need to work on the state machine. Bill Galloway, Compaq Computer, stated that we should not force any change on FC-AL-1 devices. Discussion explored dynamic mode change, where a brand new device would actively change operating mode within the same run time to support old devices. Five people indicated support for a dynamic mode change operation. Other comments were made that did not support dynamic mode change. Dal defined dynamic to be "after boot time," the device can change its mode of operation to be something other than what it was at boot time. Comments were made that there are only a few mode changes that are of interest, and support was for only a limited set of mode changes to address specific problems, not to have a large number of rapid changes.

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Dal stated that if you want to work with the lowest common denominator, then at LIP you can make decisions as an integrator which mode to select based on the percentage of old and new devices. He stated the old devices may be configured together as much as possible, and for the limited set that are mixed together, they may gravitate to the lowest common denominator. This provides a useful tool box to the system integrator, who may manage the assets, using the hubs, etc. Comments were made regarding the ability to work with a drive that has been misplaced. Additional comments were made that users may by-pass a drive that is misplaced. Comments were made that there are many grey areas here.

Comments were made that mode change is a desirable thing from a system level, and it is not as apparent to the device level what the benefits are. Comments were made that mode change is needed due to disaster recovery, to account for cases when the walls come down and you have available assets which were never intended to be adjacent, but now they are adjacent. Dal stated that we need a mode change which works, is desirable, and can be tested. Ed Gardner, Ophidian Designs, stated that dynamic mode change will introduce a severe level of testing challenges, but we will probably need some kind of service like that anyway. Bill Galloway, Compaq Computer, said that SCSI devices have had several generations of mode change behaviors built up over the years, this is not new.

Dal Allan asked the group, "do we agree that we need a transition to go to a different mode," yes, the group agreed. Dal asked the reverse, "do we need to go back." Comments were made to effect the change at LIP time, and switch in and out the old and new devices. Dal stated that what they could do is LIP, and place all of the old devices on the port A loop, and place all the new devices on the port B loop. Comments were made that any change we make has to come up in FC-AL mode initially. Comments were made that the FC-AL-3 project proposal states the goal includes provision for backwards compatibility. The project statement was read, and clearly stated that the new devices have to be interoperable with existing FC-AL devices. Comments were made that the only way to do this is to have two different modes of transfer (protocol stacks) implemented within the single chip.

Comments were made that this is totally unacceptable, and that their company would only build one or the other protocol mode of operation (not two protocols in one chip). Norm Harris, Adaptec, stated that he wants longevity, so that new devices talk to old devices, just like SCSI. Comments were made that the need is to have a single part number, which works with any of the devices out there. Bill Galloway, Compaq Computer, stated the issue is the Raid Controller needs to see all of the drives (not just some of the drives which would be the case with single operating mode devices), and we should not force the user to have to buy a new Raid Controller to talk to new devices (and this new Raid Controller would potentially not talk to old devices using the same line of reason). Michael Hoard, Boeing Defense and Space, stated that if new devices could not talk to old devices, the user would be effectively installing a partition in memory, which would restrict (not eliminate, but slow down due to bridge-bottle-necks and additional intermediate copies) the level of memory access transparency due to physical layout of specific end and intermediate devices. Dal stated the need to "not burden the new FC-AL-3 device" is not valid because it is not a device level issue, it goes all the way to infrastructure, you can not cause people to have to go out to buy a new infrastructure. Dal stated that the penalty for being new is to support two protocol stacks.

Comparisons were made that 100 Base Ethernet also supports 10 Base. Comments were made that the need may be there, but are the benefits worth the effort, and the penalty of the extra cost. Comments were made that we need a migration path, that is evolutionary. The question was asked do we do anything now, or not. Norm Harris, Adaptec, asked what can we do that will incrementally change FC-AL-2, but will give us 80 or 90% of what we need. Dal stated that we should put off the decision until February, when we collect input on what needs to be done in the industry, via the FCA and FCLC.

Dal asked the group to vote on whether we can agree on whether devices should support any transition to another mode at all. Comments were made that do we want this to be in FC-AL-3. Comments were made that the group could go into a maintenance mode, and delay making any protocol changes. Horst Truedstedt, ENDL Associates, stated that maybe we need to have a small group study the problem. Bob Snively, Sun Microsystems, stated that the mistake was in not getting marketing input. Norm Harris, Adaptec, stated that we need sponsors, who would mature the ideas. Michael Hoard, Boeing Defense and Space stated that we need to address efficiency in developing and coordinating proposals, perhaps have a small group to explore the issues, collect data via surveys, compile a data base which is visible to all participants, and address the process in an open and inclusive manner.

Roger Cummings, DPT, stated that he is taking a back seat on this, because he wants the next steps to be market driven. Dal stated that if the marketing organizations want to go off and do this, they can do it. You do not need to

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get the working group to bless the activity. Dal stated that he has not seen to date the organizations support bringing in any guidance on these matters, but that could change. Dal stated that FC-AL-3 is an open document, and we need to wait for market basis, from the marketing and board room input to provide support. Bob Snively, Sun Microsystems, said that he did not want to see another “three company group” come in at the last minute to make a proposal. Bob said the Torn proposal is further along than many people had anticipated. Bob said that the market will decide on the use of switches, 2 Gbit, and improvements in FC-AL. Bob concluded by saying he would like to proceed with Torn, as defined, and see Torn placed in FC-AL-3 (and let the market decide).

Dal took an action to put together a list of desired FC-AL-3 features, including a) register insertion (ie Torn), b) transition mechanism, c) any new mode is optional, d) ensure devices interoperability with legacy drives (can work and share data etc with legacy devices), e) login credit that works and is done correctly, f) minor tweaks to FC-AL-2 (not a new architecture, evolutionary enhancements that improve performance and take advantage), g) old mode is optional and is compatible, h) old mode is required and is compatible, I) define power up operation and initialization, j) allow for power up diagnostics, k) specify hub behavior. Dal then walked the group through consecutive votes to understand where the group is thinking. Question about a) and f); Dal stated that these are not mutually exclusive.

Vote: For, Against

- a) 15, 9
- b) 26, 0
- c) 25, 0
- d) 24, 0
- e) 27, 2
- f) 26, 2 (Comments were made that the tweaks need to be compatible)
- g) 6, 21
- h) 22, 5
- I) 20, 4
- j) 15, 4
- k) 17, 3

Dal stated that the only thing we can derive from this is that the FC-AL-3 device will come up in FC-AL mode, and shall have two protocol stacks if necessary. Dal stated that we now know what we want to work on, but the project needs to be approved tomorrow. Dal stated that as proposals come in then the people making proposals are automatically placed in charge of that section. Dal stated that these items are areas which the group is open to receive proposals.

- FC-AL-2 Reserved Ordered Set Handling

Ed Gardner

Ed Gardner, Ophidian Designs, presented changes to clauses 3.1.10 (Definitions). 6 (Ordered Sets), and 8.4 (LPSM). Ed presented a list of ordered sets and definitions of what the ordered sets will be. He stated that he is not inventing any new sets, he is using only sets which have already been considered for use, and is only renaming some of the ordered sets, and keeping all the unused sets, as reserved.

Ed stated that he has two bytes which are the same in the ARB, he said that a device must check the first byte, but can not successfully transition to open until it has compared the second byte and found it equal to the first byte, and

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found that the device has won arbitration. Ed stated that this makes sense because if the response field of the ordered set is for you then you respond to it, if it is not yours then you do not respond to it.

Discussion explored the use of ARByx. Comments were made that back when this was addressed, the group could not do anything because some people implemented looking at the first byte, others implemented looking at the second byte. Today y is always equal to x. Ed's recommendation was to distinguish between the first and second byte fields, so that the existing devices can do what they are already doing; however, the potential could be there to take advantage of cases (tomorrow) when y is not equal to x.

Discussion explored the technical details of Ed's proposal, some people stated that the proposal includes some very detailed technical issues, others stated that these do not have large technical implications. Comments were made that the problem is that there are two definitions of OPNyy. Comments were made that OPNyy opens half duplex, and OPNyx opens a full duplex operation. Bill Martin, Gadzoox, suggested that we use OPNab, and then parse out the definitions below this. Comments were made that the group should have gone back to clean up the ARB after they started to treat y and x separately. This was not done. Comments were made that the early devices would lock up with a bad ARB, you could latch up the current fill word on a bad ARB.

Comments were made that the intention of this proposal is to allow devices to not have to do an exhaustive compare to find out if the AL-PA is valid or not. Ed drew a figure itemizing the current OPNyx sets: a) OPNnd, b) OPNfd, c) OPNyr, d) OPNfr. Comments were made that to make these changes, a large number of changes to the document would need to be done. Charles Binford, Symbios Logic, stated that he needs to see more words to define Ed's proposal, and decide what is the intended function that people are targeting. Discussion stated that devices do not have enough time to check all 40 bits at the same time. The question is how many bits do people need to check. The hardware impact is that you have to do a hard compare using potentially up to 128 comparitors. The second approach is to make a decision on the first 30 bits. Bill Martin, Gadzoox, stated that you can make a decision in 30 bits, if you assume the last 10 bits are valid and end in negative running disparity. Comments were made that if the disparity is incorrect then you do not have a valid transmission character, and you have nothing.

Ed Gardner, Ophidian Designs, stated that if the disparity is wrong then we have already acted on it, but the next transmission word out is the current fill word, and you have probably just screwed up the disparity of the next received word. Bob Snively stated that the compare operation is not as complex as some have indicated, and there are only three sets to compare; he stated that he is implicitly checking 40 bits. Charles Binford stated that the value in doing this is simply to nail it down to something, so that we know what we are checking, and we will know what the end devices are checking. Dal stated that FC-AL-1 specifies compliance at the transmitter, but does not address which field to check at the receiver. The goal here is to nail down which field to check at the receiver.

Neil Wanamaker, Crossroads Systems, stated that the group should set up 127 values of valid fill words in reserve for future use. Horst Truustedt, ENDL Associates, stated that we already have that. Jim Commes, Seagate, stated that once you set a word into the current fill word there is no way to get rid of it. Jim suggested that you need to do a full check on the 40 bits to make sure that the word is valid for use as a current fill word. Dal stated that you can not make a full decision until the 41st bit.

Ed Gardner, Ophidian Designs, drew a hand written slide to step through a series of questions, which are the following...

Recognize Fill Word:

Check \_\_40\_\_ bits of IDLE

Vote: 11 for, 6 against

Check \_\_20\_\_ bits of ARB

(Jim Coomes will check on this to see if it is possible)

Recognize Addressed Primitives:

OPN Check \_\_30\_\_ bits

LIP (20 for LIP and 30 for fg and src)

LPE Check \_\_30\_\_ bits

LPB

MRK

ARB



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Priority is measured using Byte 3 (Horst stated that Byte 4 is subject to change at a future time in a foot note)

Check \_40\_ bits to win ARB

Recognize R\_RDY check \_\_40\_\_ bits (to check  $y = x$  to win arbitration)

The group decided that they would go back to the ranch and check with people on what they are doing, and whether they could make a decision in January. Dal stated that the objective is to only check 20 bits. Horst stated that primitive sequences should also be checked. Remarks were made that Horst's comment represent a historical point, and does not reflect the present situation.

Bill Martin stated that we could create a new type of open, he described it as an OPN\_First. Question was asked for FC-AL-2, does the node which does not support MRK have to strip out the MRK which has its address in the second byte field (or can the device ignore it). The group stated that this should be addressed in FC-AL-2. Dal stated that since we agreed to go with checking 40 bits on the IDLE, then we need to check 40 on R\_RDY and SOF, EOF, etc. He stated that we will need this, if we want to go to further definitions of an IDLE category for command buffers, and control buffers, and data, and priority buffers, etc.

- January Agenda

Dal Allan

Dal Allan, ENDL Associates, summarized that in January we will start Tuesday afternoon and work on FC-AL-2 until Wednesday afternoon, then Tape Wednesday afternoon, and then Thursday will be FC-AL-2 all day. Therefore there will be two days of FC-AL-2, and one half day of Tape. Dal stated that he did not expect any FC-AL-3 draft documents, but would probably work with some FC-AL-3 items, or FC-AL-X items. Bill Martin stated that he hoped Horst would have all of the comments complete by January. Bill asked about the letter ballot comments. Horst responded yes. Dal stated that FC-AL-2 will be finished in January, with the objective to forward FC-AL-2 in February.

a) Comments resolution

b) Initialization

c) How many bits to check in ARB

Comments were made that the Interphase PLUG Fest is January 12 - 16. Comments were made that we now only have one and a half days for input on FC-AL-2. Dal asked whether anyone has implemented FC-AL-2, Jim Coomes, Seagate, and Matt Wakely, HP, stated that they have implemented all the required elements that are in FC-AL-2, v5.7. Matt stated that the current work around (in rev 5.7 of fc-al-2) that mandates that the node which sources LIP(F8)s shall change them to LIP(F7)s does not fix the problem (of LIP(F8)s continually circulating around the loop). Because the only way it would work is if the node which caused the problem (sourcing the LIP(F8)s) recovered and could strip out the LIP(F8)s. Matt stated that how likely is this, probably never happens that way (the failing node is probably bypassed). Matt stated that right now in FC-AL-2 the sending of LIP(F7)s (to strip the LIP(F8)s) in the "initializing state" is mandatory, it does not solve the problem, and it should be taken out. Discussion explored the possibility of whether devices that can initialize on LIP(F7), and not be burdened with LIP(F8).

Dal reflected on the development of SCSI, and the leadership of SCSI who decided that at times the group had screwed up, and committed to make necessary changes to ensure the standard works technically.

Matt Wakely, HP, provided text...

21 - State 8 Initializing:

Delete: "during loop recovery ... if LIP(F8) is recognized, the LPSM shall set the received LIP to LIP(F7) and XTION to OPEN\_INIT

22 - State 9 OPEN\_INIT:

ERR.INIT must be implemented by nodes not able to initialize on LIP(F8).

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Discussion then explored whether the need is still there to require devices to transmit a minimum of twelve LIPs. Dal stated that this proposal would create a parallel universe and require new primitives to be sent out in different states.

The group made the decision to use the following language, "those nodes in state 8, only those devices which use the ERR.INIT behavior, shall be required to send out 12 LIPs during the initializing state." Then place in an informative note, "you should send the LIPs of the type you want."

Discussion then identified that it should be optional that the device should be able to send out 12 LIPs of the type they want. Matt stated that he wanted to send out the LIPs that he is receiving. Charles Binford stated that HP is doing what they have done in the past, and Jim Coomes is modifying their code and this is solving the problem.

Bob Snively stated that now it will be very difficult for the LIPs to make it all the way around the loop. All of the devices will be putting out the LIPs of their choice. Dal stated that what we are doing is trying to fix a problem that is out there in the market. Matt Wakely stated that why nodes need to forward the LIPs they receive is to ensure that a node upstream which has found a problem may report the problem to the host initiator which can start to cure the problem. Bob Snively stated that he wants to implement the simplest initialization method possible. Horst stated that only those people who need to do this are those which fall asleep when they receive a LIP(F8) and never wake up because the loop is filled with LIP(F8), forever. Others disagreed, Bill Martin stated that when you have FC-AL-2 devices you will not solve the problem. Dal stated that we have a work around for the old Seagate drives, and we need to just accept the work-around.

Vote for Matt's proposal, for 15, against 0. Horst stated that if you do not support ERR.INIT then you can not go to sleep, and thou shalt go through initialization.

- Power-On

Horst Truustedt

Horst Truustedt, ENDL Associates, provided a presentation on power-on issues. The topics of his presentation are listed below. (NOTE: could people who attended this session send more information to include into the minutes, send email to michael.a.hoard@boeing.com, thank you)

- 12 LIP's for initialization
- Power-on behavior
  - o non-participating
  - o bypassed
  - o retransmit received words
  - o CFW is IDLE on loss-of-sync (It's LIP(F8) now)
  - o CFW IDLE
  - o Enable
  - o Initialize
  - o 8.2.3.1 remove IDLE note

- FC-0 / FCW Joint Report

Schelto Van Doorn

Schelto Van Doorn, Siemens, provided the following FC-0 / FCW joint report:

- Going to 2 Gbaud speeds
- "LVDS like" interface for transceivers (different from IEEE LVDS) for 2 and 4 Gbaud intracabinet, 50\*. Also applicable to 1 Gbaud. May apply to parallel (10-bit) interface as well as serial.
- 10 km low-cost variant spec ready for letter ballot.
- No interest on 30 km single-mode link?
- Planning for PI '98 (Physical Interface) document.
- Explanation of DMD problem.

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Meeting adjourned.

**1997 FCW Meeting Schedule:**

13 - 15 January 1998	San Jose, CA. (FCW Ad Hoc Meeting)
9 - 13 February 1998	San Diego, CA. (T11 Plenary Week)
16 - 17 March 1998	San Diego, CA. (T10 Plenary Week)
20 - 24 April 1998	Palm Springs, CA. (T11 Plenary Week)
4 - 5 May 1998	CO Springs, CO. (T10 Plenary Week)
8 - 12 June 1998	St Petersburg Beach, FL. (T11 Plenary Week)
13 - 14 July 1998	Portland, ME. (T10 Plenary Week)
10 - 14 August 1998	Portsmouth, UK. (T11 Plenary Week)
14 - 15 September 1998	St Petersburg Beach, FL. (T10 Plenary Week)
5 - 9 October 1998	Ft. Lauderdale, FL. (T11 Plenary Week)
2 - 3 November 1998	Palm Springs, CA. (T10 Plenary Week)
14 - 18 December 1998	Tucson, AZ. (T11 Plenary Week)

**Attendance:**

ADAPTEC	Norman H. Harris
AMDAHL	Scott Carlson
ANCOR COMMUNICATIONS	Robert Cornelius
AUSPEX SYSTEMS	Jerry Lee
BOEING	Michael Hoard
BROCADE COMMUNICATIONS	Jeffrey Stai
C&M CORP.	Joseph Basista
CLARIION	Dave Ford
CMD TECHNOLOGY	Stephen O'Neil
COMPAQ COMPUTER CORP.	Bill Galloway
	Carl Zeitler
COMPUTING DEVICES INTERNATIONAL	Robert K. Pedersen
CROSSROADS SYSTEMS	Brian R. Smith
	Neil T. Wanamaker
DIGITAL EQUIPMENT CORP.	Douglas Hagerman
	Sid Snyder
EMF ASSOCIATES	Edwin S. Lee III
EMULEX	David Baldwin
ENDL	Dal Allan
ENDL ASSOCIATES	Horst L. Truestedt
EXABYTE CORP.	Jim Jones
FUJITSU COMPUTER PRODUCTS OF AMER	Mike Fitzpatrick
FUJITSU/INTELLISTOR	Kevin Pokorney
G2 NETWORKS INC.	Roland Lee
	Rich Taborek
GADZOOX NETWORKS	William R. Martin

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HEWLETT PACKARD

Brad Culp

Joe Steinmetz

Matt Wakeley

Stewart Wyatt

HITACHI COMPUTER PRODUCTS -HICAM

Paul R. Boulay

IBM AUSTIN

John Scheible

IBM TUCSON

Robert Basham

IBM U.K.

Adge Hawes

ILC DATA DEVICE CORP.

Michael Hegarty

Donald Spolar Jr.

INTERPHASE

Ravi Anantharaman

LOCKHEED MARTIN

Rick Allison

LOCKHEED MARTIN FEDERAL SYSTEMS

Tom Gaska

LSI LOGIC

Curtis A. Ridgeway

Harmel S. Sangha

MOLEX

Jay H. Neer

MYLEX

Colin L. Schaffer

NAVAL AIR WARFARE CENTER

John T. Paul

NETWORK SYSTEMS CORP.

David Peterson

OPHIDIAN DESIGNS

Edward A. Gardner

PANASONIC BROADCAST TV SYSTEMS

Fred Van Roessel

QLOGIC

Skip Jones

QUANTUM CORP.

James McGrath

Pak Seto

RAYTHEON E-SYSTEMS

Scott Darnell

ROCKWELL-COLLINS

Earl E. Rydell

SEAGATE TECHNOLOGY

James Coomes

Gene Milligan

SRB CONSULTING

Gary Warden

STORAGETEK

Dale LaFollette

SUN MICROSYSTEMS

Robert N. Snively

SYMBIOS INC.

David Allen

Charles Binford

John Lohmeyer

Graeme Weston-Lewis

TASC INC. (JASA)

David Camacho

TEXAS INSTRUMENTS

Richard M. Prentice

UNISYS

Arlan Stone

WESTERN DIGITAL CORP.

Jeffrey L. Williams

XYRATEX

Neil Edmunds