

Accredited Standards Committee\*  
**NCITS, Information Technology**



**Doc. No.:** T11.2/00-443v1  
**Date:** August 07, 2000  
**Project:** FC0 MJS ad hoc  
**Ref. Doc.:**  
**Reply to:** Dennis Petrich  
Schelto Van Doorn  
Bill Ham

To: Membership of T11.2

From: Dennis Petrich, chair MJS working group  
Bill Ham, Secy MJS working group

Subject: Approved minutes of T11.2 FC0 MJS working group on  
June 05, 2000

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**Agenda**

1. Opening remarks and introductions
2. Attendance and membership
3. Approve agenda
4. Document distribution
5. Review minutes of previous meeting
6. Review old action items
7. Call for patents
8. Discussions/presentations
  - 8.1 Error location analysis - Tom Waschura, Synthesys
  - 8.2 Correlating BER tests with different TIA clock marker modes, Dennis Petrich, Wavecrest
  - 8.3 Near end crosstalk test methods comparison, Dean Vermeersch, Tyco/AMP
  - 8.4 Error rate thresholding - Dave Instone, Xyratex
9. Reexamine the name of the group, Ham
10. BER and eye diagrams (the no man's land?)
11. Target applications for the group
12. Status of MJS-2 sections - Ham
  - 12.1 Creation of the structure of the MJS-2 document - Ham
  - 12.2 MJS-2 section assignment summary
  - 12.3 MJS-2 pilot sections
13. Review action items
  - 13.1 Old action items from past meetings
  - 13.2 New action items from this meeting
14. Next meetings
15. Adjourn

## Results of Meeting

### 1. Opening remarks and introductions

Dennis Petrich led the meeting. He opened the meeting at 9:00 AM and thanked the host, Robert Mejia of HP, for hosting the meeting. Bill Ham took these minutes. This meeting was split between Monday, June 05, 2000 and Thursday, June 08, 2000. These minutes cover both days.

### 2. Attendance and membership

Attendance at plenary meetings does count toward minimum attendance requirements for T11.2 membership. Working group meetings are open to any person or organization directly and materially affected by T11.2's scope of work but do not count toward minimum attendance for T11.2 membership.

The following people attended the meeting:

Name	Status/Company	Tel
Allan Liu	a AGILENT	408-435-6193
Dean Vermeersch	o AMP	717-986-3143
Jason Chen	o BITBLTZ	408.586.9886 ex40
Bill Ham	p COMPAQ	978-828-9102
Edward Grivna	p CYPRESS	(612) 851-5046
Greg McSorley	a EMC	(508) 480-8050
Hossein Hashemi	p EMULEX	714-513-8226
Kamran Mansoori	o EMULEX	(714) 513-8011
Rich Feldman	p GADZOOX	(408) 360-6048
Jay Reeves	o HP	(208) 396-3367
Todd Hayden	o HP	208.396.6888
Ed Jackson	o IBM	303.381.4243
Kevin Demsky	o IBM	507-253-5799
Schelto Van Doorn	p INFINEON	408-501-5665
John Pfeil	o LSI LOGIC	(719) 533-7436
Michael Jenkins	p LSI LOGIC	408-433-7901
Brian Herzing	a METHODE	708-867-9600
Rich Taborek	o NSERIAL	408-845-6102
Dean Wallace	p QLOGIC	949-389-6480
Allen Kramer	p SEAGATE	612-402-2624
John Schroeder	p SMITHS INDUSTRIES	(616) 241-7574
Mike Jensen	o ST MICROELECTRONICS	612.841.6430
Frank Samela	o STRATOS	708.867.9600
Tom Waschura	o SYNTHESYS	650.364.1853
Tom Lindsay	p VIXEL	425-806-4074



A T11.2 reflector is operational over the T11 site.

The committee forms its agenda by the following:

1. A call (reminder) for presentations by the chair 3 weeks in advance
2. Those wanting to be on the agenda submit request including:  
title  
presenter  
time required  
abstract
3. Chair creates agenda and posts 2 weeks in advance of the meeting
4. At the meeting it is the chairs's discretion to allow additional presentations

5. Review minutes of previous meeting

The minutes of the last MJS working group were reviewed with some minor editorial changes. Bill Ham moved and Dennis Petrich seconded that the minutes as modified be accepted. Motion passed without objection. The amended minutes will be posted to the ftp site under a document number with an "ap" in the document name.

Action item: Ham will get the document number and do the posting.

6. Review old action items

The old action items were reviewed and the status was updated.

7. Call for patents

Below is the formal call for patents which was issued by Dennis at the meeting:

**PATENTS**

- A call is hereby issued for the existence of patents required to implement the results of any & all T11 projects to be disclosed. It is necessary for the holders to agree to license those patents in conformance with the ANSI patent policy if the project on which they read is to proceed*

Page 4

\*Operating under the procedures of The American National Standards Institute.

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*T11.2 is not involved in this process @ all !*

❑ *The contact @ ANSI is the General Counsel, Ms. Amy Marasco -(212)642-4954 or amarasco@ansi.org*

❑ *Patent policy description @ [www.ansi.org/proctbl.html](http://www.ansi.org/proctbl.html), section 1.2.11*

❑ *IBM has declared that it has patents which apply to the practice of FC & SBCON. The contact is:*

*Tom Slattery, Program Director, IBM Corporation, North Castle Drive, Armonk, New York 10504*

*Tel: (914) 765-4351, Fax: (914) 765-4390, Email: [tmslatt@us.ibm.com](mailto:tmslatt@us.ibm.com)*

*Thanks to Stuart Berman of Vixel for tracking down this new contact*

There was no response to this call for patents.

## 8. Discussions/presentations

### 8.1 Error location analysis - Tom Waschura, Synthesys

Tom presented material on products that his company works with. These products dealt with several important attributes of error distributions.

The "eye contour process" described is an example of using the BER at different threshold points.

Tom agreed to put his presentation on the web site and to provide copies of certain reference material:

### 8.2 Correlating BER tests with different TIA clock marker modes, Dennis Petrich, Wavecrest

Dennis showed data that neither clocks nor pattern markers are needed to get excellent correlation between the TIA and the BERT measurements (for the Wavecrest instruments). The threshold levels for both the TIA and the BERT were essentially at the same point which allowed the good correlation. Therefore, this method is useable for measurement of fully functional systems independent of encoding and protocols used provided the errors are occurring near the nominal zero switching level. This presentation will be placed on the web site.

### 8.3 Near end crosstalk test methods comparison, Dean Vermeersch, Tyco/AMP

Dean presented the material in document 00-353v0. He showed the differences between the eye diagram, the single pulse method, and the square wave method. The single pulse method did the best job of correlating with the cross talk intensity. The square wave had severe effects from resonance and reflections. The effects of the test fixtures were also significant but his newest fixture had very little effect on the measurement.

The jitter content was a very significant part of the DJ in the eye diagram testing results.

### 8.4 Error rate thresholding - Dave Instone, Xyratex

During the Thursday meeting, under the leadership of Dave Instone, the ad hoc developed a specific set of requirements for the specification of the error rate parameters and these were delivered to the appropriate T11.3 folks for further discussion and inclusion in the appropriate protocol documents.

### 9. Reexamine the name of the group, Ham

Bill Ham noted that the present name of the group may not be serving us well. Jitter is not a term that most people can relate to and more importantly, the work of this ad hoc is not directed at the narrow definitions of jitter that is assumed by even skilled technical folks. Therefore, support for doing the work is more difficult to secure and understanding the need for the continuing effort could be significantly enhanced by renaming the group. It was noted that this is the only effort in the industry aimed at this vital area for high speed signals.

After much discussion Bill Ham moved and Dave Instone seconded that the name "Methodology for Signal Quality Specification" be adopted for the group. Motion passed 4/2/9.

Dave Instone moved and Mike Jenkins seconded that the above motion be reconsidered at the next meeting. Motion passed with one abstention.

Reflector discussion is encouraged on this subject.

### 10. BER and eye diagrams (the no man's land?)

A discussion about how to address the common situation where a few errors are detected at the system level over many hours of operation and it may not be clear what to do to improve the situation. When errors are detected at any level it may cause concern even if the system formally satisfies the specified bit error rate requirements. Furthermore, the common mis-conception of eye diagrams derived from scope measurements being suitable for jitter measurements in low error rate applications is likely to create poor choices for improving the performance since there will be no indication in the eye diagram that the root cause is a jitter mechanism.

Errors from non signal mechanisms can also cause low error rate symptoms. Diagnosing and improving the referenced situation requires special consideration for adequate signal characterization.

Therefore, it was recommended that a section be added to MJS-2 to explain how to use MJS methodologies in this common situation. Ham volunteered to draft a starting document for this section.

#### 11. Target applications for the group

A discussion concerning the applications for the group output was generated:

There are two buckets:

- (1) where the application is planning to use the work already
- (2) where a de facto service is offered to help technologies that are presently not connected to the MJS work efforts

There is presently no intention to modify the MJS work to support bucket 2 applications.

Bucket 1:

FC (happens naturally)  
GBE (references to MJS already exist)  
Xaui (single lane)  
Infiniband, Hari  
1394B (references MJS already)  
10GFC  
10GBE  
Serial ATA (defacto)

Bucket 2:

USB 2.0  
OC-192

In general any serial bit streams for example:

Optical internetworking forum (OIF)  
Asynchronous serial interconnect (MPEG)  
SMPTE 292M, 259M  
DS3?  
T1/E1 (1.544 Mb, 2.048 Mb)

Application to General eye diagrams measurements e. g. satellite communications,

Relation to Parallel schemes that have timing alignment requirements between lines in the primary transmission connection, e.g. SCSI, Source synchronous (HSPI), parallel optics, HIPPI, SCI...

Therefore, the MJS-2 group is important to many important efforts in the industry but now a better recognition of exactly where the work fits is possible. Its present place in T11 is mainly for convenience.

## 12. Status of MJS-2 sections - Ham

### 12.1 Creation of the structure of the MJS-2 document - Ham

Thursday AM:

Following is the presently agreed organization of the MJS-2 document with names of those responsible for specific sections:

Sections 1 thru 5 - Ham

1. Introduction
  - 1.1. Document scope and purpose
  - 1.2. Document organization
2. T11.2 Membership
3. References
4. Definitions and conventions
  - 4.1. Conventions
  - 4.2. Acronyms
  - 4.3. Definitions
5. Scope
  - 5.1. Motivation and goals
  - 5.2. Authority

- 6. Jitter overview
  - 6.1. FC-0 and MJS (-1) interface overview - Ham
  - 6.2. Fibre channel storage implementation - copy if possible
  - 6.3. Jitter contribution elements - Wavecrest Mike Li
    - 6.3.1. Reference times - TBD
    - 6.3.2. Signal amplitude effects - TBD
    - 6.3.3. Generalized jitter concepts - TBD
    - 6.3.4. Deterministic contributors (copy)
    - 6.3.5. Random contributors (copy)
  - 6.4. Improved Bit Error Rate vs. Jitter Model (copy from MJS-1) - Tom Lindsay if mods needed
    - 6.4.1. Description of Mathematical Model
    - 6.4.2. Random Jitter
    - 6.4.3. Addition of Deterministic Jitter
  - 6.5. Equalization - Mike Jenkins
    - 6.5.1. Filtering
    - 6.5.2. Pre-emphasis
    - 6.5.3. Adaptive transmitters
    - 6.5.4. Adaptive receivers
    - 6.5.5. Distributed
  - 6.6. Separation of jitter components - Tom Lindsay
    - 6.6.1. Need to separate components
    - 6.6.2. General considerations
    - 6.6.3. Mathematical basis
    - 6.6.4. Accuracy and precision
    - 6.6.5. Tools
  - 6.7. Jitter accumulation and transfer- Tom Lindsay
  - 6.8. Data rate considerations
  - 6.9. Effects of parallel paths - skew, cross talk, imbalance
  - 6.10. Pattern dependent random jitter - Mike Jenkins
  - 6.11. Jitter methodologies (copy from MJS if relevant)
    - 6.11.1. Current practice and specifications
    - 6.11.2. Jitter measurement definitions
- 7. Jitter test methodologies - Ham
  - 7.1. Goals - Ham
  - 7.2. Level 1 and level 2 tests - Ham
  - 7.3. System considerations - TBD
  - 7.4. Component considerations - TBD
  - 7.5. Instrumentation considerations - TBD
    - 7.5.1. LESB
    - 7.5.2. BER
    - 7.5.3. FC compliant
    - 7.5.4. Non-FC compliant
    - 7.5.5. Built in test features
  - 7.6. Test fixture considerations - Ham
  - 7.7. System / environmental noise considerations
  - 7.8. Reference standards / calibration considerations
  - 7.9. Data output format considerations
  - 7.10. Jitter output test methodologies (copy from MJS)  
(need effect of high pass filter discussion)

- 7.10. Jitter tolerance test methodologies (copy from MJS)
  - (need reference to jitter output section for tolerance test conditions)
- 8. Requirements for specific tests
  - [Only one example is shown for simplicity - need to generate a comprehensive list - this will be a very long section]
  - 8.1. Optical Gamma T output (started already)
    - 8.1.1. FC device (requires full protocol signals to work) - Rich Feldman (Bert and scope methods only)
      - 8.1.1.1. Overview
      - 8.1.1.2. Test Fixtures
      - 8.1.1.3. Instrumentation
      - 8.1.1.4. Calibration
      - 8.1.1.5. Test execution
      - 8.1.1.6. Data output formats
      - 8.1.1.7. Acceptable values
    - 8.1.2. FC protocol neutral component - TBD
      - 8.1.2.1. Overview
      - 8.1.2.2. Test Fixtures
      - 8.1.2.3. Instrumentation
      - 8.1.2.4. Calibration
      - 8.1.2.5. Test execution
      - 8.1.2.6. Data output formats
      - 8.1.2.7. Acceptable values
  - 8.2. Copper Gamma T output
    - 8.2.1. FC device transmitter (requires full protocol signals to work) - Dave Instone?
      - 8.2.1.1. Overview
      - 8.2.1.2. Test Fixtures
      - 8.2.1.3. Instrumentation
      - 8.2.1.4. Calibration
      - 8.2.1.5. Test execution
      - 8.2.1.6. Data output formats
      - 8.2.1.7. Acceptable values
    - 8.2.2. FC protocol neutral component - TBD
      - 8.2.2.1. Overview
      - 8.2.2.2. Test Fixtures
      - 8.2.2.3. Instrumentation
      - 8.2.2.4. Calibration
      - 8.2.2.5. Test execution
      - 8.2.2.6. Data output formats
      - 8.2.2.7. Acceptable values
  - 8.3. Copper Beta R tolerance (already started)
    - 8.3.1. FC device (requires full protocol signals to work) - Allen Kramer
      - 8.3.1.1. Overview
      - 8.3.1.2. Test Fixtures
      - 8.3.1.3. Instrumentation
      - 8.3.1.4. Calibration
      - 8.3.1.5. Text execution
      - 8.3.1.6. Data output formats
      - 8.3.1.7. Acceptable values

- 8.4. Optical Gamma R tolerance - Tom Lindsay
  - 8.4.1. FC device (requires full protocol signals to work)
    - 8.4.1.1. Overview
    - 8.4.1.2. Test Fixtures
    - 8.4.1.3. Instrumentation
    - 8.4.1.4. Calibration
    - 8.4.1.5. Text execution
    - 8.4.1.6. Data output formats
    - 8.4.1.7. Acceptable values
  - 8.4.2. FC protocol neutral component
    - 8.4.2.1. Overview
    - 8.4.2.2. Test Fixtures
    - 8.4.2.3. Instrumentation
    - 8.4.2.4. Calibration
    - 8.4.2.5. Test execution
    - 8.4.2.6. Data output formats
    - 8.4.2.7. Acceptable values

Further sections will be added to section 8 for all interoperability points and all versions - these sections will re-use major parts of the above sections

#### 9. 10 Examples

- 9.1. Jitter budget allocations - TBD
- 9.2. Jitter tolerance specification - TBD
- 9.3. Revised jitter output allocation tables - TBD
- 9.4. Separation of jitter components - Dennis Petrich
- 9.5. Jitter accumulation (+ or-) - Mike Jenkins
- 9.6. Amplitude to phase conversion - TBD
- 9.7. Proper use of eye diagrams and masks - TBD

#### Annex A - Implementation strategies - TBD

- A.1 Repeaters
- A.2 Latency
- A.3 Bandwidth

[These following annexes are extracted from MJS-1 for reference - need to consider what we need for MJS-2.]

#### Annex B

##### Improved Test Bit Sequences

- B.1 Test bit sequence characteristics
  - B.1.1 Low Frequency Pattern
  - B.1.2 Low transition density patterns
    - B.1.2.1 Half-rate square pattern
    - B.1.2.2 Quarter-rate square pattern
    - B.1.2.3 Ten contiguous runs of 3
  - B.1.3 Composite patterns
- B.2 Compliant jitter test bit sequences
  - B.2.1 Random test bit sequence
    - B.2.1.1 Background - fibre channel frame
    - B.2.1.2 Original RPAT

- B.2.1.3 Compliant RPAT (CRPAT)
- B.2.2 Compliant Receive Jitter Test Bit Sequence
  - B.2.2.1 Receive Jitter Tolerance Pattern
  - B.2.2.2 Compliant Receive Jitter Tolerance Pattern
- B.2.3 Supply Noise Test Bit Sequences
  - B.2.3.1 Supply Noise SPAT
  - B.2.3.2 Supply Noise CSPAT
- B.3 System Jitter Testing Issues

#### Annex C

##### Jitter Tolerance Test Methodologies

- C.1 Calibration of a Signal Source using the BERT Scan Technique
- C.2 Sinusoidal Jitter Modulation
- C.3 Direct Time Synthesis

#### Annex D

##### Jitter Output Test Methodologies

- D.1 Jitter Output Test Methodologies
- D.2 Time Domain Measurement - Scope and BERT Scan
  - D.2.1 Overview
  - D.2.2 Golden PLL
  - D.2.3 Time Domain Scope Measurement
  - D.2.4 BERT Scan
- D.3 Time Interval Analysis
  - D.3.1 Introduction
  - D.3.2 "Clock-less" Jitter Measurement
  - D.3.3 TIA Data Reduction Procedure
  - D.3.4 Total Jitter Calculation
  - D.3.5 Power Density Spectrum of Jitter
  - D.3.6 Data Dependent (ISI) Jitter Measurement
  - D.3.7 Jitter Measurements with a "Pattern Marker and known pattern"
  - D.3.8 Jitter Measurement Using a Sampling Oscilloscope (DDJ and PWD)
- D.4 Frequency Domain Measurement (Spectrum Analyzer)

#### Annex E

##### Practical Measurements

- E.1 Introduction
- E.2 Basic architecture
- E.3 Instrumentation interface adapters
  - E.3.1 Balanced copper
    - E.3.1.1 Source and sink adapters for balanced copper variants
      - E.3.1.1.1 Balanced-unbalanced
      - E.3.1.1.2 Balanced - balanced (alternative 1)
      - E.3.1.1.3 Balanced - balanced (alternative 2)
    - E.3.1.2 Tap adapters for balanced copper variants
      - E.3.1.2.1 Balanced-balanced (alternative 1)
      - E.3.1.2.2 Balanced - balanced (alternative 2)
      - E.3.1.2.3 Balanced-Unbalanced
    - E.3.1.3 Extracting a balanced trigger signal
  - E.3.2 Unbalanced copper
    - E.3.2.1 Source and sink adapters for unbalanced copper variants (alternative 1)

- E.3.2.2 Source and sink adapters for unbalanced copper variants (alternative 2)
- E.3.2.3 Tap adapters for unbalanced copper variants (alternative 1)
- E.3.2.4 Tap adapters for unbalanced copper variants (alternative 2)
- E.3.3 Optical
  - E.3.3.1 Source interface adapters
  - E.3.3.2 Sink interface adapter
  - E.3.3.3 Optical tap
- E.3.4 Specific tests
- E.3.5 Description of baluns
  - E.3.5.1 Balun requirements
    - E.3.5.1.1 Core and transmission-line requirements
    - E.3.5.2 Specific wound core construction details
      - E.3.5.2.1 Alternative 1 - wound toroid construction
      - E.3.5.2.2 Alternative 2 - wound toroid construction
      - E.3.5.2.3 Alternative 3 - wound bead construction
    - E.3.5.3 Connection of wound cores into baluns
    - E.3.5.4 Other source/sink adapter components

#### Annex F

##### Practical Examples for Jitter Compliance

- F.1 Introduction
- F.2 Elements contributing to jitter
- F.3 Hubs
- F.4 Retiming hubs
- F.5 Repeating hubs

#### Annex G

Choosing the Corner Frequency:  $f_c / 1\ 667$

## 12.2 MJS-2 section assignment summary

The following people have signed up for specific sections:

Allen Kramer, Seagate  
 Tom Lindsay, Vixel  
 Bill Ham, Compaq  
 Mike Li, Wavecrest  
 Mike Jenkins, LSI  
 Rich Feldman, Gadzoox  
 Dennis Petrich, Wavecrest  
 Brian Herzing, Methode

The following people have indicated that they would be willing to contribute to specific sections of the document but do not have specific sections assigned yet:

Douglas Nast, Boeing  
Ron Miller, Brocade  
Ed Grivna, Cypress Semiconductor

Summary of MJS-2 sections and owners with percentage completion ():

Sections 1 thru 6.2 - Ham (20%)  
[6.0 is the overview section]  
6.3. Jitter contribution elements - Wavecrest Mike Li (0%)  
6.4. Improved Bit Error Rate vs. Jitter Model (copy from MJS-1) - Tom Lindsay if mods needed (95%)  
6.5. Equalization - Mike Jenkins (10%)  
6.6. Decomposition of jitter components from total jitter - Tom Lindsay (50%)  
6.7. Jitter accumulation and transfer- Tom Lindsay (50%)  
6.8. Budget allocation for components - Tom Lindsay (0%)  
6.9. Data rate considerations  
6.10. Effects of parallel paths - skew, cross talk, imbalance - TBD  
6.11. Pattern dependent random jitter - Mike Jenkins (0%)  
    7.1. Goals - Ham (10%)  
    7.2. Level 1 and level 2 tests - Ham (80%)  
    7.6. Test fixture considerations - Ham (50%)  
    7.7. System / environmental noise considerations  
    7.8. Reference standards / calibration considerations - Dennis Petrich (0%)  
    7.9. Data output format considerations  
  
7.10. Jitter tolerance test methodologies (copy from MJS)  
7.11. Jitter output test methodologies (copy from MJS)  
8.1.1. Optical Gamma T FC device (requires full protocol signals to work) - Rich Feldman (Bert and scope methods only) (20%)  
8.1.1. Optical Gamma T FC device (requires full protocol signals to work) - Dennis Petrich (TIA methods) (0%)  
8.1.2. Optical Gamma T FC protocol neutral component - Brian Herzing (0%)  
8.2. Copper Gamma T output - Robert Mejia (5%)  
8.2. Copper Gamma R output.- FC device transmitter (requires full protocol signals to work) - Dave Instone?  
8.3.1. Copper Beta R tolerance FC device (requires full protocol signals to work) - Allen Kramer (20%)  
8.4. Delta T output - Tom Lindsay (0%)  
8.4.2.1. 8.4. Delta R output - Tom Lindsay (0%)  
9. Examples  
9.1. Jitter budget allocations for components - TBD  
9.2. Jitter tolerance specification - TBD  
9.3. Revised jitter output allocation tables - TBD  
9.4. Separation of jitter components - Mike Li (20%)  
9.5. Jitter accumulation (+ or -) - Mike Jenkins (0%)  
9.6. Amplitude to phase conversion - TBD  
9.7. Proper use of eye diagrams and masks - TBD

Page 14

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Annex assignments are still TBD.

### 12.3 MJS-2 pilot sections

Detailed review of the previously created pilot sections was undertaken. Dennis and Tom Lindsay agreed to provide details for these sections before the next meetings.

### 13. Review action items

[Note: section was not discussed in detail at the meeting but describes the practice being used in the MJS-2 minutes for presenting and reporting status on the action items. The practice is straightforward but has not previously been written down.]

This section contains the action items agreed during the meeting. Only action items with identified people who are responsible to do the action are recorded. Once an action item has been created there are two ways to get an action item removed from this list: (1) complete the action item - preferred method - and (2) the action item has become no longer relevant or appropriate because events have changed since the action item was created. It is possible for an action item to be transferred to another person but that will not remove it from the list and the new owner will be listed along with the record that the ownership has changed.

There are two divisions under this item: (1) old action items which were created in earlier meetings and (2) new action items which were created during this meeting. There is no tracking of the meeting where the action item was originally created (other than by looking back at previous minutes.)

All action items that were completed by the time the action items were reviewed are given the designation "done". The done action items will remain on the list in the draft and approved minutes for the meeting in which the action item was reported to have been completed. This is to ensure that the person responsible for the action item get the credit/blame for the work. Action items which were reported done in one meeting will be removed from the list for the minutes of the next meeting.

#### 13.1 Old action items from past meetings

Status as of this meeting is shown:

1. Dennis Petrich to add definition of Gaussian noise source in terms of amplitude to phase conversion  
Status: move to MJS-2
2. Dennis to conduct a review of the replies to the letter to suppliers requesting development of golden PLL's  
Status: Only one golden PLL exists (1G for GBIC's from Tektronix) - no other implementation is presently known that meets the MJS requirements. PLL's with known properties may be useful for jitter compliance testing if one can extrapolate to the required specifications for the PLL.

Currently available PLL's do not allow direct level 1 compliance testing with methods that require recovered clocks.

3. Dennis to create a proposal for a technique for generating an arming signal from a serial bit stream and the software to deal with the random insertion or deletion of fill words.  
Status: done but not yet uploaded
4. Ham to create and post a rev 0 draft MJS-2 document based on the existing MJS-1 document and the discussions reported above in this meeting.  
Status: done

#### 13.2 New action items from this meeting

1. Ham will get the document number for the minutes and do the posting to the web site  
Status: new
2. Ham to post a reflector note soliciting comment to develop a more acceptable name for the present MJS group.  
Status: new
3. Tom Waschura to put his presentation on Error positioning on web site  
Status: done
4. Tom Waschura to provide a copy of Neil Bergano's paper relating to signal to noise eye diagrams  
Status: done
5. Tom Waschura to provide a copy of the Digital Video jitter specs  
Status: done

6. Bill Ham to determine how to document the Link Error Rate reporting standard  
Status: new

7. Bill Ham to post the error rate parameter recommendations from the MJS group  
Status: new

14. Next meetings

The next working group meeting will be requested for Monday August xx, 2000, in Seattle, WA from 9AM to 5PM. A second meeting on Thursday AM from 9:30 AM to 12:30 PM will be focused on editing the MJS-2 document.

No interim meetings are presently planned.

15. Adjourn

The meeting adjourned at 11:50 on Thursday.