X3T9.2/90-55

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DATE : March 14, 1990

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RE : Presentation and Minutes of the DCS Working Group at Costa Mesa, March 6-7, 1990.

The Diagnostic Command Set Working Group took the tact of taking a giant step backwards. Much of the previous debate(s) centered around the philosophical merits of Diagnostics in SCSI. I proposed that to answer this question, possibly once and for all, we needed to understand the fundamental requirements (i.e., requests from the X3B7.1 subcommittee and other ongoing efforts), attempt to create a SCSI fit and then review the question of "Is there a need?". My point being that if DCS could not be "SCSI-ized" then it would be irrelevant whether the need exists...nobody could (or would) support it.

Thus, the SSWG went through 18 fundamentals, discussing the merits of each individually and attempting to put them in a SCSI context. The presentation that was made is included in the subsequent pages as well as the response to each topic.

Above and beyond the 18 "fundamentals", some general comments prevailed. These included:

(1). Stick with SEND DIAGNOSTIC and RECEIVE DIAGNOSTIC RESULTS and the page structure implied. A direct command set may be more trouble than it is worth.

(2). Don't make the implementation totally dependent on current technology as it is sure to change, maybe before any DCS specification can be approved.

(3). Diagnostics hurts a lot in a multi-tasking environment.

(4). Diagnostic mode really means Diagnostic extension.

(5). The business issue of sending diagnostic code out with product could be debated until the end of time.

(6). There is a long road ahead...

Generally, though, the topic is being discussed in earnest and may yet find some type of a home in SCSI-3.

Sincerely,

Doug Pickford
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# PURPOSE OF SSWG

*PROPOSED:*

1. *ESTABLISH THE NEED FOR DIAGNOSTICS (I.E, CREATE SUPPORT WITHIN THE COMMITTEE)*

2. *AGREE TO A FUNCTIONAL DIAGNOSTIC MODEL WHICH IS TRULY NOT DEPENDENT ON SCSI.*

3. *USE THE SSWG TO "SCSI-IZE" THE FUNCTIONAL MODEL, THEN MAKE A FORMAL PROPOSAL TO THE COMMITTEE.*

*WHAT EXISTS:*

1. *A REFERENCE POINT DOCUMENT WHICH MIXES FUNCTIONAL OBJECTIVES AND OPERATIONAL SPECIFICS. THIS MAY HAVE CONTRIBUTED TO CURRENT CONFUSION. (090-022)*

   *WHAT OCCURRED: Approached proposal #2 on an item by item basis, attempting to understand if #3 is possible and/or agreeable. The idea here was that this would lead to more meaningful discussions about proposal #1.*

# *DIAGNOSTIC FUNDAMENTALS*

1. *FUNDAMENTAL CONCEPT: Not limited to Rigid Disk Drives.*

*SCSI IMPLEMENTATION / SUGGESTIONS:*

*Design in the same manner as current SCSI; with a common core and unique command sets, etc. per device type.*

*COMMITTEE RESPONSE: If objective can be accomplished with what exists today in SCSI-2, nothing should be added to SCSI-3 simply to serve the purpose of DCS.*

2. FUNDAMENTAL CONCEPT: Diagnostics is a superset of "Logical" SCSI, (except where compromising to the definition of SCSI diagnostics)

SCSI IMPLEMENTATION / SUGGESTIONS: Identical logical opcodes. Certain Error Recovery parameters cannot be enabled.

COMMITTEE RESPONSE: Diagnostics should be an extension to the current definition, and not this "new mode".

3. *FUNDAMENTAL CONCEPT:* Provide levels of protection

*SCSI IMPLEMENTATION / SUGGESTIONS:*

*SCSI Suggestion:*

*Level 1 - Physical Addressing*

*Level 2 - Access to "Advisory" Parameters*

*Level 3 - Access to Physical operating parameters (Head offsets windows, etc.)*

*COMMITTEE RESPONSE:* There was a large amount of disagreement to the philosophical implications of this concept. If diagnostics is an "extension" to the current definition of SCSI, then no "modes" are implied. This may contradict with the idea of "levels of protection". Complete resolution not achieved.

4. *FUNDAMENTAL CONCEPT:* Diagnostics mode can be enabled via the interface (i.e., not hardware, etc.)

*SCSI IMPLEMENTATION / SUGGESTION:*

Mode Select - Control Page. Use 2 mode bits (Previously reserved)

00 : Logical SCSI

01 : Diagnostics Mode

10 : Reserved

11 : Reserved

*COMMITTEE RESPONSE:* Use the change definition command. This can be viewed in the same light as the relationship between SCSI-1 and SCSI-2. (i.e., maintain "extension" philosophy). Further, it was mentioned that some XX byte password which was highly encrypted might have a place here.

5. *FUNDAMENTAL CONCEPT: Diagnostic Mode can be terminated without cycling power, but cycling power will return operation to Logical SCSI.*

*SCSI IMPLEMENTATIONS / SUGGESTIONS:*

* *Power Cycle*
  *Reset*
  *Bus device reset*
  *Mode Select*

  > *All capable of returning mode to Logical SCSI.*

* *Unit Attention gets posted on mode transition Diagnostic to Logical.*

*COMMITTEE RESPONSE: 1) Diagnostic knowledge, (i.e., the state of being capable of doing diagnostic type things) must be retained across power cycles, 2) Mode Select in the implementation section should be changed to CHANGE DEFINITION. 3) A "FORMAT UNIT" should be required if medium has been altered while the diagnostic extenstion was accessible.*

6. *FUNDAMENTAL CONCEPT:* *There must be a a method of determining compliance and current mode. ( And level of supported)*

## *SCSI IMPLEMENTATIONS / SUGGESTIONS:*

- *Provide Mode and Diagnostic level bits within INQUIRY.*
- *Mode and level control via "Write Buffer" Firmware upgrades.*

*COMMITTEE RESPONSE:* *Use test unit ready or some other commonly used command and have it fail when the diagnostic extension is active.*

7. *FUNDAMENTAL CONCEPT:* *Absolute adherance to mode settings in Diagnostic mode.*

*SCSI IMPLEMENTATION / SUGGESTIONS:*

*Add Physical Parameters page (s) includes SECTOR GEOGRAPHY, ENTIRE CYLINDER AREA, CURRENT PHYSICAL PARA-METERS such as Track offset, Data Sep., Peak Detection Thresholds, etc.*

*Check Condition on fields not settable (as opposed to accepting parameters as advisory)*

*COMMITTEE RESPONSE:* *Exception was taken to the word "advisory". Further, there was a great deal of discussion on why these things were needed. I don't believe all parties were satisfied with the answers.*

8. *FUNDAMENTAL CONCEPT: Units for physical parameters must be standardized.*

*SCSI IMPLEMENTATION / SUGGESTIONS:*

*Track offset*

*Data Separator*

*Peak Detection Threshold*

*Data Window*

*Others:*

*COMMITTEE RESPONSE: A better statement of the Fundamental Concept might be:*

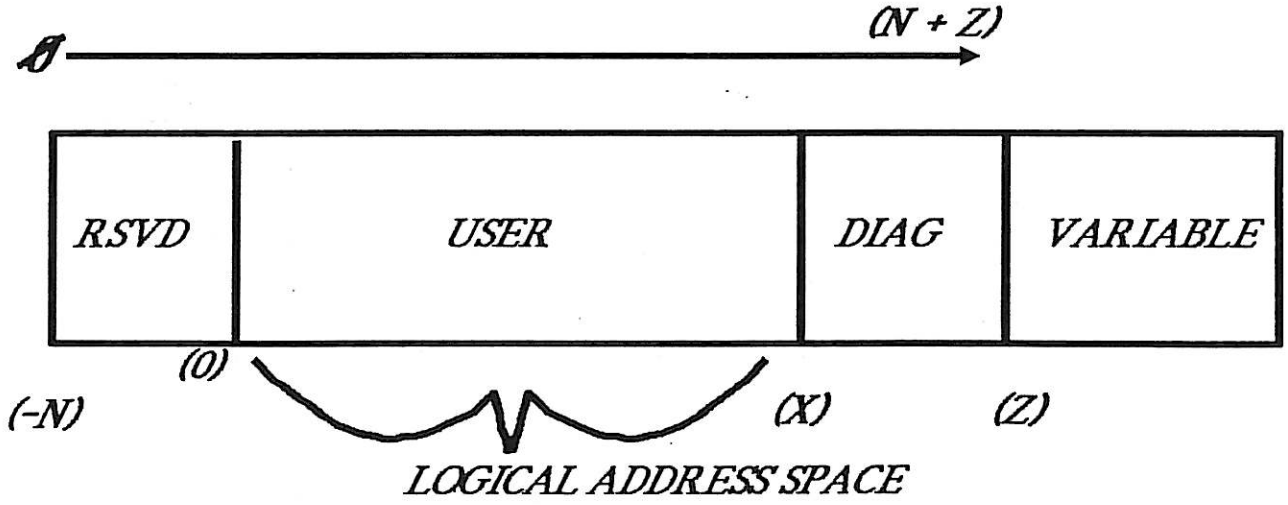
*Units for physical parameters should be useful. Not attempt was made to define what this might specifically mean. Further, there was mention that time could change the definition of "useful".*

9. *FUNDAMENTAL CONCEPT:* *Prevention of permanent operational damage is advisable.*

*SCSI IMPLEMENTATION / SUGGESTIONS:*

+ *System cylinders are reported but cannot be written.*
+ *Drive parameters cannot be set outside of operational limitations.*

*COMMITTEE RESPONSE:* *1) Suggestion #1 should be changed to read "All Cylinders are reported, if possible, but cannot necessarily to read or written. 2) For suggestion #2, it was mentioned that a report of actual vs. nominal might be of use. Below is a diagram of the cylinder map in its crudest form: (possible delineation)*



10. *FUNDAMENTAL CONCEPT: All commands are of the "direct" nature.*

*SCSI IMPLEMENTATION / SUGGESTIONS:*

- *Remove restriction of DATA IN/DATA OUT in same connection.*
- *Translate Address is a direct command.*

*COMMITTEE RESPONSE: This caused a great deal of debate. The idea of variable length CDB, fixed 32 byte CDB or using diagnostic pages (as is today in SCSI-2) wre discussed. The concept of DATA IN / DATA OUT coinciding in the same connection was rejected out of hand because of potential chip implications. Diagnostic pages may be making a comeback.*

*11. FUNDAMENTAL CONCEPT: A mechanism shall be provided to prevent a "normal" initiator from issuing diagnostic commands to a target in diagnostic mode.*

*SCSI IMPLEMENTATION / SUGGESTIONS:*

* *Single Initiator mode with no disconnects. (Ease of Implementation .....)*

*<u>COMMITTEE RESPONSE:</u> The use of implied reservations when a diagnostic extension is active, maybe a very strong implementor's note suggesting extensive use of RESERVE/RELEASE when operating in a multi-initiator environment. I believe the bias was towards putting integrity responsibility on the user not the target.*

12. *FUNDAMENTAL CONCEPT:* *Provide modes to remove "Logical" translations that SCSI implies.*

*SCSI IMPLEMENTATION / SUGGESTIONS:*

* *Absolute, Physical commands*

*COMMITTEE RESPONSE:* *Clarification was needed when defining ABSOLUTE. Agreement was reached on: a location relative to a fixed location, for example, INDEX. But INDEX can move so it was asked "Can there ever be an absolute location which can be reliably accessed." Discussion ended with the thought that targets will simply give back what they believe to be absolute sector 6 (for example). But, does this defeat the purpose? Maybe track formats w/o skews solves some problems.*

## 13. FUNDAMENTAL CONCEPT:

*Access to the following:*

- *User Data*
- *Entire sector minus gaps.*

### SCSI IMPLEMENTATION / SUGGESTIONS:

- *Commands to support this*
- *Mode pages to describe sector fields*

*COMMITTEE RESPONSE: Concern that technology evolution may invalidate traditional sector component definitions (GAP1, PLO, SYNC, GAP2, ID, etc.). Could this be overcome? Concept of a "master sector" menu was presented, where this menu consisted of all possible sector components, and the target returned which ones were used, in what order, what size, etc.*

## 14. FUNDAMENTAL CONCEPT:

*Ability to set physical drive margins (Above 'Set Limits')*

## SCSI IMPLEMENTATION / SUGGESTIONS:

*SCSI Suggestion: See (13)*

*COMMITTEE RESPONSE: The presumption here is that other drive parameters exist which can be controlled via SCSI could be defined above and beyond today's SCSI.*

15. *FUNDAMENTAL CONCEPT: Provide means for Disk Erasure; prevent access to embedded servo areas.*

*DC ERASE / AC ERASE*

*SCSI IMPLEMENTATION / SUGGESTIONS:*

*Inability to support results in CHECK CONDITION status*

*COMMITTEE RESPONSE: As stated, the concept is very difficult to provide. Often it was understood that the idea was to determine head/ media/channel noise characteristics, the Concept was re-formulated to read: "Provide a relative figure of merit for the probability of error at particular spots on the media".*

16. *FUNDAMENTAL CONCEPT:* *Provide limited area format (e.g., format track, format sector).*

*SCSI IMPLEMENTATION / SUGGESTIONS:*

*Provide a limited disk space where setting of skews, use of access to sector layout, etc. may result in non-prescribed results, but is permitted.*

*COMMITTEE RESPONSE:* *This was restated as "Provide an override to the existing SCSI FORMAT UNIT", which does not allow the ideas in the IMPLEMENTATION / SUGGESTIONS sections.*

17. *FUNDAMENTAL CONCEPT: Defect Management is bypassed in Diagnostic mode. ( Allows sequential access to disk)*

*SCSI IMPLEMENTATION / SUGGESTIONS:*

*Works in conjunction with setting of skews and and limited formats as well as physical parameter setting.*

*COMMITTEE RESPONSE: This may be a user dependent entity. Maybe a better solution would be "reporting only" when Defect Management gets invoked.*

*When possible a switch would be nice to have a global on/off switch. The default when the diagnostic extension is active would be off.*

18. *FUNDAMENTAL CONCEPT: Error Recovery is never imposed in Diagnostic mode (includes ECC, R/W retries, seek recovery)*

*SCSI IMPLEMENTATION / SUGGESTIONS:*

*Use normal error reporting mechanisms to report every error which occurs. (Potential extension to LOG SELECT / LOG SENSE).*

*COMMITTEE RESPONSE: Felt that the concept was covered elsewhere, but that there was credence to extending log select / log sense..*