To:	X3T9.2 -- Connectors	X3T9.2/92-93 Rev 2
From:	Bill Ham (DEC)	
SUBJECT:	SCSI-3 Connector Framework (Revised)	
DATE:	June 22, 1992	

BACKGROUND:

For various reasons we seem to be having difficulty in keeping the requirements for an effective standard and the desires of integrators, cable assembly vendors, and connector vendors pointing in the same direction. A framework that may help in refocussing us towards a common path is suggested below. This framework needs to be more thoroughly fleshed out through cooperation and participation from all affected. The value of this framework is directly related to the data that can be found to put in it. Data available to date is included.

HIGH LEVEL FRAMEWORK:

There are four points that seem to cover most of the issues:

(1) True compatibility for both connector sides in a multivendor environment

(2) Different application requirements

(3) Availability and multisourcing

(4) Real technical properties

True compatibility means that all of the requirements needed by the application are satisfied: continuity and isolation, service life, shielding, mechanical interfacing including all securing devices, cost, and simultaneous availability of both sides when needed.

Different applications have different requirements.

The breadth of compatible types available now for different styles is probably very different. This feature has major impact to total design freedom for devices, adapters, terminators, and cables

Real technical properties -- this must include both the intrinsic design style properties and the performance properties in a multi vendor environment.

With all these variables a framework appears essential to construct an effective standard.

LOWER LEVEL FRAMEWORK (for SCSI-3 connectors):

Another level of detail is given for (2), (3) and (4) above. Compatibility is the result of (2), (3) and (4).

A seven level division of the basic applications is suggested.

BASIC APPLICATIONS FEATURES (2):

(A) Mating cycles

Presently there is an agreed minimum requirement of 50 cycles. There is much discussion about needing up to 3000 cycles for certain laptop/notebook applications. Clearly these two applications are vastly different and may require different connector solutions.

(B) Shielding

Presently there are only two options: shielded or unshielded. It has long been recognized that these two require different solutions. However, if friction securing is adequate shielded and unshielded can intermate.

(C) Mounting/support mechanism

There are three main types: panel or bulkhead, free floating on cable, or PWB.

(D) Back side connections

These include IDC, thru hole, true SMT (non-intrusive), compliant pin, straight, right angle and others.

(E) PWB assembly process compatibility

The primary issue here is the ability to withstand the higher temperatures of the SMT PWB assembly process. This is determined mainly by the materials of construction for the connector and does not imply that the connector itself is non-intrusive. Although this is not strictly an end user application feature it is still a critical feature with respect to the PWB design options. The two important options are SMT process compatible or not.

(F) Securing mechanism

Jack screws and friction seem to be the options here. The thread on the jack screws is likely to be considered a variable however by some.

(G) Physical access

This refers to blind, open, external, internal and the like.

AVAILABILITY AND MULTISOURCING (3):

A matrix of the present types is constructed below. Some data generated at the May SCSI meeting is shown along with data supplied through June 19, 1992. There are no present plans to make further updates to this matrix.

MATRIX OF PRESENTLY AVAILABLE HIGH DENSITY 68 PIN CONNECTORS
(SUPPLIERS NAME GIVEN IF PRODUCTION TOOLED BY DEC 1992, X = NOT TOOLED)

STYLE =>	TAB AND RECEPTICLE		RIBBON STYLE A MDR (NEC SPEC)		RIBBON STYLE B EDGE CARD (IBM SPEC)	
BACK END TYPE	SHIELD	UNSHIELD	SHIELD	UNSHIELD	SHIELD	UNSHIELD
THRU HOLE PWB (NOT SMC) VERTICAL	FUJITSU HONDA YAMAICHI	FUJITSU? HONDA YAMAICHI	DDK 3M FUJITSU HIROSE	3M DDK	SMC ONLY	X
RT ANGLE	FUJITSU HONDA T&B YAMAICHI	YAMAICHI HONDA AMP	3M FUJITSU DDK YAMAICHI HIROSE	3M DDK YAMAICHI	SMC ONLY	BURNDY
THRU HOLE PWB SMT ASSY COMPAT VERTICAL	AMP MOLEX (NOV) FUJITSU	X	AMP 3M	3M	AMP(Q492) MOLEX (OCT)	X
RT ANGLE	AMP MOLEX T&B FUJITSU(SEPT)	X	AMP 3M	3M	AMP MOLEX BURNDY	BURNDY
TRUE SMT PWB (NON-INTRUSIVE) VERTICAL	X	X	3M	3M	X	X
RT ANGLE	AMP (AUG)	X	X	X	X	X
COMPLIANT PIN (VERTICAL)	AMP HONDA(JUL)	X	X	X	X	X
STRADDLE MOUNT (SMT)	X	AMP HONDA(M&F)	X	X	X	X

TOTAL "X'S" :	7	6	10
TOTAL SHIELDED "X'S":	2	3	4

(CONTINUED)

MATRIX OF PRESENTLY AVAILABLE HIGH DENSITY 68 PIN CONNECTORS

(SUPPLIERS NAME GIVEN IF PRODUCTION TOOLED BY DEC 1992, X = NOT TOOLED)

STYLE =>	TAB AND RECEPTICLE		RIBBON STYLE A MDR (NEC SPEC)		RIBBON STYLE B EDGE CARD (IBM SPEC)	
BACK END TYPE	SHIELD	UNSHIELD	SHIELD	UNSHIELD	SHIELD	UNSHIELD
PANEL/BULKHEAD UNSHIELD CABLE 0.025 RIBBON	AMP HONDA	NA	3M DDK	NA	MOLEX (OCT)	NA
0.050 RIBBON	AMP HONDA FUJITSU	NA	DDK? 3M AMP YAMAICHI HIROSE	NA	BURNDY?	NA
DISCRETE WIRE	AMP HONDA FUJITSU	NA	3M DDK FUJITSU	NA	X	NA
INTERNAL CABLE (UNSHIELDED) 0.025 RIBBON	NA	AMP HONDA	NA	3M DDK	NA	MOLEX(DEC)
0.050 RIBBON	NA	AMP YAMAICHI	NA	DDK? YAMAICHI	NA	BURNDY
UNSHIELD ROUND	NA	YAMAICHI AMP	NA	3M DDK YAMAICHI	NA	BURNDY MOLEX (JAN)
EXTERNAL CABLE ROUND SHIELDED	AMP MOLEX HONDA FUJITSU T&B	NA	AMP 3M FUJITSU DDK YAMAICHI HIROSE	NA	BURNDY MOLEX AMP(Q4)	NA
FLAT SHIELDED 0.025	X	NA	FUJITSU 3M	NA	X	NA
0.050	X	NA	3M	NA	X	NA

TOTAL "X'S" :	2	0	3
TOTAL SHIELDED "X'S":	2	0	3

90

REAL TECHNICAL PROPERTIES (4):

Following is a collection of the technical properties that appear to be the most important based on numerous discussions.

(a) Mating cycles to failure:

If the connector is infrequently mated/demated the main concern seems to be noble metal wear thru. Failure will be caused by corrosion. If the connector is frequently mated corrosion is much less of a concern. Failure here is more likely due to mechanical wear or handling damage. Failure data in both modes seems essential to objective reaction.

(b) Mechanical robustness:

There are three stress conditions that apply:

(1) Handling and plugging -- both blind and open
(2) Torque on jack screws
(3) Stress transmitted through the cable

(c) Defect detectability and repairability:

Some defects can be visually detected, others will only be operationally visible. The visual defects are generally much easier to d al with. Some defects can be repaired by the user, others require ,nificant hardware replacement.

(d) Ability to deal with dirt

The effectiveness of the connector wipe in moving "dirt" out of the way is a key parameter.

(e) Tolerance differences between suppliers and the intrinsic ability to tolerate specific kinds of variability

(f) ESD exposure sensitivity to pins

(g) Robustness to EMI (due to high contact resistance)

A second matrix is suggested to map these technical features with the connector styles.

TECHNICAL PROPERTIES OF 68 PIN SCSI CONNECTORS

(DATA SHOWN IS FROM SOURCE INDICATED -- P IS MY PRESENT IMPRESSION BASED ON DISCUSSIONS AT ANSI (formal and informal -- need real data)

STYLE =>	TAB AND RECEPTICLE	RIBBON STYLE A MDR	RIBBON STYLE B EDGE CARD
COMPATIBLE => SUPPLIERS	AMP, HONDA, FUJITSU, T&B, MOLEX, YAMAICHI	3M, AMP, DDK, HIROSE, FUJITSU, YAMAICHI, JAE?	BURNDY, MOLEX, AMP
TECHNICAL PROPERTY			
CORROSION LIMITED MATING CYCLES (DOUBLING OF RES IN MIXED FLOWING GAS) BATTELLE CLASS II	1500 (AMP) 500 (FUJITSU)	1500 (3M)	1500 (IBM)
WEAR LIMITED MATING CYCLES (DOUBLING OF RES DURING TEST)	> 1500	> 1500	> 1500
ROBUSTNESS HANDLING/MATING	BENT PINS/ (P) DAMAGED PLASTIC LIKELY W/O CARE	BENT PINS (P) POSSIBLE BUT HARD	BENT PINS (P) POSSIBLE BUT HARD
JACK SCREW TORQUE SENSITIVITY	VERY GOOD (P)	OK (P)	OK- (P)
CABLE STRESS SENSITIVITY	VERY GOOD (P)	OK (P)	OK- (P)
DETECTABILITY OF DEFECTS	GOOD TO POOR (P)	MODERATE TO POOR (P)	MODERATE TO POOR (P)
FIELD REPAIRABILITY OF DEFECTS	GOOD (P)	POOR (P)	MODERATE (P)
EFFECTIVENESS IN DIRT	GOOD (P)	MODERATE (P)	MODERATE (P)
MULTI VENDOR TOLERANCE RISK	VERY GOOD (P)	VERY GOOD (P)	GOOD (P)
ESD SUSCEPTIBILITY	?	LOW (3M)	LOW TO MODERATE (IBM/3M DATA) CONFLICTING RESULTS
EMI SUSCEPTABILITY	?	?	?

OTHER MISC DATA:

	TAB AND RECEPTACLE	RIBBON A	RIBBON B
OVERALL INDUSTRY EXPERIENCE WITH CONNECTOR STYLE:	> 15 MILLION	> 8 MILLION	> 1 MILLION
HARD TECHNICAL DATA PRESENTED TO ANSI:	LITTLE RECENTLY	SOME	SOME
HARD TECHNICAL DATA CLAIMED TO EXIST:	LIMITED TO VERIFICATION OF REQUIREMENTS	VERIF OF REQMNTS	MUCH (IBM)
SPECIFIC MATERIAL SUBMITTED TO ANSI DESCRIBING THE CONNECTOR SYSTEM:	YES (PRESENTLY IN DRAFT STANDARD)	LITTLE	ADEQUATE TO UNDERSTAND
STATUS WITH OTHER STANDARDS GROUPS:	IPI, HIPPI, EIA, IEC	?	IEC, ...

OVERALL SUMMARY:

.ALL THREE TYPES EACH APPEAR TO BE EXCELLENT IN SOME FEATURES WHILE PERHAPS REQUIRING SPECIAL CARE IN OTHERS

.IF THERE WERE ANY FATAL FLAWS THE INDUSTRY USAGE WOULD NOT BE AS HIGH AS SHOWN

.WITH APPROPRIATE CAUTIONS EACH APPEARS CAPABLE OF BEING USED FOR SCSI-3 APPLICATIONS

.THE TAB AND RECEPTACLE STYLE HAS RISK OF LARGELY COSMETIC AND REPAIRABLE DAMAGE DURING MATING AND DEMATING BUT APPEARS EXCELLENT IN WITHSTANDING IN-SERVICE STRESSES, IN COVERAGE OF APPLICATION SPACES, AND IN ACCEPTANCE INTO STANDARDS

.THE MDR STYLE IS EXCELLENT IN ITS BROAD COVERAGE OF THE APPLICATION SPACES AND OF AVOIDING ANY SPECIAL TECHNICAL PROBLEM AREAS -- APPEARS WEAK IN FORMAL ACCEPTANCE INTO STANDARDS

.THE EDGE CARD STYLE IS EXCELLENT IN ITS ROBUSTNESS DURING MATING AND DEMATING -- APPEARS WEAKER IN COVERAGE OF APPLICATION SPACES AND APPEARS WEAKER IN WITHSTANDING IN-SERVICE STRESSES (KEY DATA MISSING HERE)