ENDL
CONSULTING

D.W. (BILL) SPENCE
P.O. BOX 752
ROUND ROCK, TX 78680
PH. & FX: 512-255-0339

MEMORANDUM -- 04 Nov 1991

TO: John Lohmeyer, Chairman, X3T9.2

FROM: Bill Spence

SUBJECT: Proposed Specifications for High-end S/E Terminator

PROPOSAL

1. In the SCSI-3 Physical Interface Document, par. 6.1 (p 32), under Alternative 2:
   - Delete provision a).
   - For provision c) substitute the following
     The termination device shall source current to the signal line whenever its voltage is below 2.5 volts. This current shall not exceed 24 ma for any line voltage above 0.2 volts.
   - Immediately after provision c), insert the following
     IMPLEMENTORS NOTE: Where the majority of the length of the SCSI bus is made up of round shielded cables of single-ended impedance 90 ohms and less, the more closely the sourced current is maintained to 24 ma, the better the noise margin achieved in signal negation.

JUSTIFICATION

In X3T9.2/90-123R1 (31 Aug 1991) and in many other presentations, it has been established that achieving noise margin in the negated signal depends on the product of line impedance and current in the asserted line. 90-123R1 included the following table:

					Vs1/Vs2		
Case	Vtp	Voc	Ro	I	R=90	R=79	R=68
B		2.85	110	22.3	2.41/2.60	2.16/2.45	#1.91/2.27
C	4.7	2.82	132	18.3	2.05/2.40	#1.85/2.25	#1.65/2.10
D	4.25	2.55	132	16.3	#1.87/2.17	#1.69/2.05	#1.51/1.91#

- below the "legal" minimum of 2.0 v.

Case B: The regulated 110-ohm terminator, designed by Paul Boulay to establish essentially the maximum legal current and thus the maximum Vs1.

Case C: The nominal best with the 132-ohm terminator.

Case D: "Worst" best case with the 132-ohm terminator: Vtp is at the "legal" minimum of 4.25 v. No Vs1 reaches the "legally" required 2.0 v.

The calculations were based on an asserted line voltage of 0.4 v. By whatever increment asserted signal levels are lower, so will all Vs1 and Vs2 be lower.

Vs1 is the initial voltage step achieved on the release of a line driven in assertion at an interior point of the bus. Vs2 is achieved as soon as the Vs1 wave travels to an end of the bus. It was pointed out that as long as one of the devices in a data transfer is at (or very near to) the end of the bus, that only Vs2 is of concern--i.e., a signal negated in the interior of the bus is only interpreted after it reaches the end of the bus and achieves Vs2 level, and a signal negated at the end of the bus is at Vs2 level immediately.

In a "linear" terminator--i.e., one representable by a Thevenin equivalent circuit of a fixed voltage source behind a fixed resistance--even Vs2 in many cases gives less noise margin than desired--i.e., is less than 2.4 v. But more complex terminator circuits permit much better performance. In the "ideal" terminator characteristic presented in X3T9.2/91-167 (2 Oct 1991) and approximated in its mid-region by the Trung Le/Aeronics terminator, much more current is available after a signal step Vs1 reaches a terminated end of the bus. Thus the signal increment from Vs1 to Vs2 becomes greater. Brief calculations show that if the current remains constant at a level approaching 24 ma until the voltage reaches the upper clamped level, Vs2 will always be at the upper clamped level.

In such circuits, the concept of a single-valued linear impedance for the terminator becomes inapplicable, hence my proposal to strike any impedance specification. The remainder of my proposal is intended to highlight the terminator's role in sourcing current into the asserted line and open the way to new, more powerful terminator concepts.

This proposal reflects the recommendation of the 10/10 Driver/Terminator SSWG Meeting in Irvine that the standard no longer reserve 3.2 ma of the 48 ma max allowed driver current for Iol from the SCSI receivers on the bus line.