

January 13, 1992

X3T9.2/91-64 REV 3

TO: X3T9.2 Committee

FROM: David Steele  
NCR, Microelectronics Products Division  
1635 Aeroplaza Drive  
Colorado Springs, CO 80916  
Telephone: (719) 596-5795 ext. 363

SUBJ: **Fast Single-Ended and Other Recommended Changes to  
SCSI-3 Parallel Interface**

### **5.1 Physical Description**

Add to end of second paragraph or add to Annex A - When mixing SCSI devices of different widths, care must be taken not to exceed the skew allowances provided by the Cable Skew Delay and Deskew Delay SCSI bus timing values (see 7.0). To accomplish this may require restricting SCSI device input capacitance, stub length, cable length and the number of SCSI devices to less than the specified maximum allowable value and close adherence to the cable recommendations made in section 5.2.

Modify last sentence of fourth paragraph to read - Use of single-ended drivers and receivers with the fast synchronous data transfer option is recommended only for a restricted set of conditions. Recommendations for single-ended systems which use the fast synchronous data transfer option are made in sections 5.2.3, 6.1.1 and 6.1.2.

### **5.2 Cable Requirements**

Modify first paragraph to read - The characteristic impedance of the cable should be 95 +/- 15 ohms. There are successful single-ended implementations using cables with characteristic impedances outside of this range. However, system integrity in single-ended implementations is improved when the characteristic impedance of the cable is between 80 and 110 ohms. Cable parameters other than cable impedance are critical to system integrity. See Annex (TBD) (use document X3T9.2/90-134 as basis for annex) for information concerning the measurement of cable parameters.

### 5.2.3 Cable Requirements for Fast Synchronous Data Transfer

Modify characteristic impedance to read -  
Characteristic Impedance: 80 to 110 ohms

Add to end of section 5.2.3 - In single-ended systems which use the fast synchronous data transfer option, it is particularly important to follow the cable recommendations made in section 5.2. In addition, it is recommended that cable lengths be restricted to less than 3 meters. There are successful single-ended implementations using cables longer than 3 meters. However, to maintain system integrity may require restricting SCSI device input capacitance, stub length and the number of SCSI devices to less than the specified maximum allowable value and close adherence to the cable recommendations made in section 5.2

### 6.1.1 Single-Ended Output Characteristics

Add to end of section 6.1.1 - It is recommended that single-ended systems which use the fast synchronous data transfer option have the following output characteristics when measured at the SCSI device's connector:

all signals;  
Rise and Fall Time = 5 ns minimum

See Annex (TBD) for information concerning the measurement of rise and fall times. (The intention here is to provide a simple test circuit for measuring the 10-90% rise and fall times. The circuit suggested last month in San Diego is a 20 pF capacitor on the driver output with a 47 ohm resistor to 2.5 volts.)

ACK, REQ and DATA BUS signals;  
It is recommended that the ACK, REQ and DATA BUS signals use three state drivers to actively negate these signals. The three state output drivers for these signals should have the following electrical characteristics when driving in the negated state:

$I_{OH}$ (High-level output current) = 24.0 mA maximum at  
 $V_{OH}$  = 3.0 volts dc

#### NOTE:

To maintain compatibility with the most common implementations of Alternative 2 Termination,  $I_{OH}$  may need to be further restricted. The suggested specification for a P Cable with the ACK, REQ and DATA BUS signals employing three state drivers is:

$I_{OH}$ (High-level output current) = 7.12 mA maximum at  
 $V_{OH}$  = 3.24 volts dc.

### 6.1.2 Single-Ended Input Characteristics

In order to support more than 8 SCSI devices on a cable, the  $I_{IL}$  and  $I_{IH}$  specification should be changed as follows:

$I_{IL}$ (Low-level input current)=-20 to 0 uA at  $V_I=0.5$  volts dc  
 $I_{IH}$ (High-level input current)=0 to 20 uA at  $V_I=2.7$  volts dc

Add to end of section 6.1.2 - It is recommended that single-ended systems which use the fast synchronous data transfer option have the following input characteristics:

all signals;

Minimum input hysteresis = 0.3 volts dc

ACK and REQ signals;

It is recommended that SCSI receivers on the ACK and REQ signals be capable of tolerating the narrow voltage transients that can occur during the negation transition of these signals. These transients are frequently the result of voltage reflections from stub capacitances and the mixing of cables of different characteristic impedances. As a minimum, it is recommended that the ACK and REQ input receivers not change logic state as the result of a voltage swing on the input signal of amplitude less than or equal to 1.0 volt and is of less than or equal to 10 ns in duration.

### 6.4 SCSI Bus

Add after second paragraph - When more than 8 SCSI devices are used on a cable, signal quality may be degraded. This is particularly a concern in single-ended implementations. There are successful single-ended implementations using more than 8 SCSI devices on a cable. However, to maintain system integrity may require restricting SCSI device input capacitance, stub length and cable length to less than the specified maximum allowable value and close adherence to the cable recommendations made in section 5.2

### 6.5.1 Signal Values

Add to end of paragraph - See section 6.1.1 for additional recommendations concerning the use of active negation drivers.