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Macintosh SCSI: Description (1 of 2)

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TOPIC ---

This is the first part of a two-part article on the Small Computer Systems Interface (SCSI) used in Macintosh computers.

DISCUSSION --

History

Small Computer Systems Interface (SCSI or Scuzzy), a second generation development, was submitted to ANSI in 1982 for acceptance as a systems interface between computers and other peripherals. In its first generation, it was known as SASI or Shugart Associates Systems Interface, which Shugart developed for the commercial market between 1980 and 1982, designing it primarily as a system interface for disk drives. While employing the multiuser and bus arbitration of SASI, SCSI adds features and host processors on the bus. SCSI also insures full user device independence and allows the bus to handle differential drivers and receivers, increasing the speed and distance capability of the bus.

The European Computer Manufacturers Association (ECMA) is currently working on their own version of the SCSI document. No specific release date has been mentioned.

Function

With its simple arbitration scheme and well-defined command set, the SCSI bus can form the backbone of multi-processing and smart I/O systems that coordinate as many as eight SCSI adapters and controllers. Each SCSI controller can govern as many as eight peripherals, with an option to expand that number to 2048 (per SCSI controller). The network may be as long as 25 meters for differentially driven signals or 6 meters long for single-driven devices.

Bus access and user arbitration

Two arrangements can interface the unit with the SCSI bus:

1. 50 pin
    a. Differential driven signals
    b. Maximum data transfer rate per user: 4 Megabytes
2. 25 pin
    b. Single-wire driven signals
    b. Maximum data transfer rate per user: 1.5 Megabytes

Apple Macintosh Plus supports a data transfer rate of 320 Kbytes/second. The Macintosh also uses a DB-25 connector identical to the RS-232 interface - which may lead to user identification problems in the future.

The network interface specifies the eight data lines (0 to 7) on the SCSI connector as device-ID lines, which serve as user addresses. SCSI resolves bus contention by address priority along with the status of the BSY (busy) and SEL (Select) lines. To initiate a transaction, a device first checks the control lines to determine if the bus is in use. If the BSY and SEL lines are not active, the device sets BSY and its own specified user-ID line (0 to 7). The highest selected line wins bus access, with all the other users deferring.

The ANSI specification does not detail address priority. Generally, assign higher priority to devices that are not fully buffered or that have smaller buffers. Lower priority should go to devices, such as printers, that have large buffers because they can allow deferred bus access to a greater degree than the buffers of limited storage devices.

The highest priority user first asserts its ID. After that, while still maintaining its device-ID line, the user raises the SEL line to signal bus arbitration, then raises the device-ID line of the device it wishes to communicate with, and then drops BSY, whereupon the selected device then raises BSY to complete the sequence. Once the arbitration stage is over, the devices move into either the MESSAGE or the COMMAND stage.

Bus utilization

Like ABLAP protocol, bus arbitration reduces network overhead time by not requiring data transfer between network users. Another measure of efficiency is the channel usage involved in actual data transfer, not in system control or system status, with system degradation increasing as more users try to get on the bus. Results from a test at NCR indicate that SCSI achieves better than 50% channel usage, well above the 30% channel usage designers generally consider as the maximum allowed. These results were obtained in laboratory conditions, but it still appears that SCSI is a great improvement over other data transfer schemes between multiple processors on a common bus.

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