



DIRECT INTERFACE TO:
5 1/4" WINCHESTER DISKS
and
5 1/4" MINIFLOPPY DISKS
or
8" SLIMLINE FLOPPY DISKS

SMS "FLINCHESTER" CONTROLLER

FEATURES

- Single controller for up to (2) 5 1/4" Winchester fixed disks and (2) 5 1/4" minifloppy disks or (2) 8" slim line floppy disks.
- Supports 5 1/4" Seagate ST506/412 compatible Winchester fixed disks.
- Supports 5 1/4" Shugart SA410/460 compatible minifloppy disks.
- Supports 8" slim line floppies that are Shugart SA810/860 or Tandon TM848 compatible.
- DEC RX02 floppy disks interface compatible.
- DEC RX01, RX02, RX03, IBM 3740 and IBM 2/2D 8" disk format compatible.
- 5 1/4" floppy disk simulates modified RX01, RX02, IBM double density floppy formats.
- Full 22 bit Q-bus addressing.
- Dual board configuration.
 - LSI-11 quad height formatter board that can be mounted separately or in Q-bus backplane.
 - LSI-11 dual height interface board.
 - or
 - PDP-11 quad height interface board.
- High performance DMA operations.
- Bootstrap operation from either floppy or fixed disk.
- Comprehensive self test.
- Selectable device register and interrupt vector address.
- Programmable sector sizes 128, 256, 512, or 1024 bytes for floppy; 256 or 512 bytes for fixed disks.
- Bad sector management and 6 bit burst ECC for fixed disks.
- Single +5 volt power supply.
- Complete RT-11 and RSX-11M software support for extended functions.
- Complete standalone software for system installation and test.
- Software compatible with SMS FWD0101/FWD1101 8" Winchester/floppy controller.

DESCRIPTION

The FWD0106 is a complete LSI-11 controller for both floppy disk and the latest 5 1/4" Winchester fixed disks. It is composed of two PC boards; a formatter and interface board which is plug compatible with the LSI-11 Q-bus.

The FWD1106 is a complete PDP-11 controller for both floppy and 5 1/4" Winchester disks. It is composed of two PC boards; quad height interface compatible with DEC Unibus and the same formatter board used in the FWD0106. Mounting provisions and power for the formatter board must be provided separately when used in a PDP-11 configuration.

The FWD0106/FWD1106 operates in one of two modes; DEC RX02 compatible mode or extended mode. The desired mode can be selected programmatically. The FWD0106/FWD1106 is hardware, software and format compatible with the DEC RX02 floppy disk system. All standard DEC software and XXDP diagnostics will operate without modification when the controller is used in the compatible mode. Bootstrap and diagnostic functions are also included to eliminate the need for additional PC boards in a DEC computer system.

The extended mode provides additional commands for read/write of the fixed disk and for high performance data transfer operations for both floppy and fixed disk. A high performance DMA interface permits up to 65 Kbyte data transfers with minimum CPU overhead. Data is transferred continuously across disk track boundaries and successive sectors to minimize user written software drivers and to reduce the frequency of CPU interrupts. Optional sector interleave and track offset formats allow optimal performance characteristics to be tailored for a specific user configured system. The controller supports IBM 3740, IBM 2D, and DEC RX01/RX02/RX03 floppy formats.

The controller uses intelligent DMA techniques to perform disk functions such as READ, WRITE and FORMAT. In compatible mode, the controller receives one of eight RX02 compatible commands through the command status register and emulates all RX02 operations. In the extended mode, sixteen additional commands are recognized. A disk operation is specified through a command and a series of parameter words sent to the controller. Parameters specified include disk address, word count, buffer address, etc. The disk operation is initiated by setting control bits in the command and status register. After the operation completes, additional status may be read through appropriate command sequences. Bad

sector management is supported for a Winchester fixed disk through commands which allow the host to read/write a flaw map unique to a disk drive. The controller automatically compensates for bad sectors during read/write operations by references to the flaw map. When power is applied the flaw map is read from the Winchester and stored in controller memory.

FORMATTER

Single quad height PC board compatible with DEC LSI-11 Q-bus. The formatter board may be mounted in and powered with a quad wide Q-bus slot. The formatter board may be optionally mounted and powered outside the Q-bus backplane. Self test switches and LED's have provisions for remote access.

INTERFACE

Single dual height PC board compatible with DEC LSI-11 Q-bus or quad height PC board compatible with DEC PDP-11 Unibus. A 40 pin flat ribbon connector on the PC board is used to cable between formatter and interface PC boards. Includes logic for emulating DEC hardware, controlling DMA operations, generating interrupts, etc. The device address and interrupt vector is jumper selectable.

Disk Format Capacity

5 1/4" Winchester Disk

Drive	No. Heads	No. Cylinders	Sector Track	Formatted Capacity
ST506	4	153	17	5.3M
ST412	4	306	17	10.6M

5 1/4" Minifloppy

Density	Sectors/Cylinder	Bytes/Sector	Formatted Capacity (bytes)
RX01	26	128	.25M
RX02	26	256	.5M
IBM DOUBLE	18	512	.7M

8" Floppy

Density	Sector/Track Side	No. Heads	Bytes/Sector	Formatted Capacity (bytes)
RX01	26	1	128	.25M
RX02	26	1	256	.5M
RX03	26	2	256	1.0M
IBM SINGLE	26	1	128	.25M
IBM SINGLE	26	2	128	.5M
IBM DOUBLE	16	1	512	.6M
IBM DOUBLE	16	2	512	1.2M

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Drive Specifications

Type	Average Access Time	No. Heads	No. Cylinders	Average Latency ms	Transfer Rate Kbytes/Sec
ST506 5 1/4" Winchester	95	4	153	8.3	625
ST412 5 1/4" Winchester	85	4	306	8.3	625
SA460 5 1/4" Floppy	158	2	80	100	31.25
MPI 92 5 1/4" Floppy	133	2	80	100	31.25
MT100-4 5 1/4" Floppy	90	2	80	100	31.25
SA810 8" Floppy	77	1	77	83.3	62.50
SA860 8" Floppy	77	2	77	83.3	62.50
TM848-1 8" Floppy	77	1	77	83.3	62.50
TM848-2 8" Floppy	77	2	77	83.3	62.50

CONTROLLER SPECIFICATIONS

MECHANICAL

Formatter Board

- Quad height PC board plug compatible with LSI-11 backplane. Provisions also for mounting outside of backplane.

Interface Board LSI-11

- Dual height PC board plug compatible with LSI-11 backplane.

Interface Board PDP-11

- Quad height PC board plug compatible with PDP-11 backplane.

Formatter/Interface

- 40 pin 3M connector (3515-0000), maximum cable length 15 feet.

ENVIRONMENT

Controller

- 0° C to 50° C system ambient operating temperature. 10% to 90% relative humidity.

POWER

Formatter Board

- 4.7 Amps (max.) @ +5 volts.

Interface Board LSI-11

- 2.90 Amps (max.) @ +5 volts.

Interface Board PDP-11

- 3.10 Amps (max.) @ +5 volts.



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