Scientific Micro Systems

FD0800 FD1800

PDP-8E/PDP-8A FLOPPY DISK CONTROLLER

PRELIMINARY



Direct Interface To:

Orbis 76/77 Shugart 800 Calcomp 140 Pertec 400/500 Innovex 210 GSI 110

FEATURES

- Low Cost—\$440 in quantity 100.
- Single (8.5"x15.7") hex PC board plug compatible with PDP-8A Omnibus; or single (8.5"x10.5") quad PC board with second PC board mounted to it for PDP-8E.
- Up to 4 Drives (daisy chain configuration) with overlapped head seek.
- IBM 3740 format compatible (256,256 bytes/diskette). Optional high capacity data format (325,248 bytes/diskette).
- High data throughput via PDP-8E/PDP-8A DMA requiring no CPU intervention during data transfer.
- Up to 4K 12 bit words may be transferred in a single operation.

DESCRIPTION

The SMS FD0800/FD1800 is a complete PDP-8E/PDP-8A compatible floppy disk controller. It is packaged on quad/hex PC boards for controlling up to 4 daisy chained floppy disk drives. High data rates are sustained through use of PDP-8E/PDP-8A DMA data transfer. Large data files may be read or written in a single operation without PDP-8E/PDP-8A CPU intervention. Data is transferred continuously across disk track boundaries and successive sectors to reduce the complexity of user written PDP-8E/PDP-8A software drivers.

An "intelligent" DMA channel technique is used to perform disk functions such as SEEK, READ, WRITE, COMPARE, and FORMAT. A disk operation is

- Simplifies user's PDP-8E/PDP-8A software disk driver development.
- Automatic head unload after 4 seconds if no disk activity.
- Error retry of 10 times during data transfer requests.
- Jumper selectable DMA priority.
- Jumper selectable device addresses.
- Utilizes LSI bipolar microprocessor for reduced circuit count.
- Single +5 volts power supply (may be powered from PDP-8E/PDP-8A).
- Bootstrap mode automatically loads and starts PDP-8E/PDP-8A program from disk.

specified by loading parameters of the operation in a 6 word I/O Request Packet (IORP) area in PDP-8E/PDP-8A memory. Parameters specified include disk request function, disk track and sector address, PDP-8E/PDP-8A data buffer address, PDP-8E/PDP-8A data buffer length, next IORP address, etc. The disk operation is then initiated by simply issuing an I/O command to the controller. The FD0800/FD1800 then utilizes the IORP information to complete the disk request, return status, and interrupt the PDP-8E/PDP-8A. The PDP-8E/PDP-8A driver software is simplified since no CPU intervention is required during data transfer, and all status and error conditions are automatically updated in the IORP by the FD0800/FD1800.

Floppy Disk Drive Interface

A 50 pin 3M connector containing all logic signals is provided on the FD0800/FD1800 PC board for direct connection to most floppy disk drives. The FD0800/FD1800 supports from 1 to 4 drives connected in a daisy chain configuration. Floppy disk drive power and ground connections must be provided separately.

Disk Format

The FD0800/FD1800 performs all formatting and control functions required to read and write data according to IBM 3740 specifications. The IBM 3740 format provides 256,256 bytes of storage per diskette (26 sectors/track. 77 tracks/diskette).

For higher storage capacity, the FD0800-1/FD1800-1 accommodates diskettes with 325,248 bytes of storage. It utilizes IBM soft sectored format with 384 bytes/sector (256 12 bit words/sector), 11 sectors/track, and 77 tracks/diskette.

PDP-8E/PDP-8A Hardware Interface

The FD0800/FD1800 is a single DEC guad/hex PC board (with an additional piggy back board for PDP-8E) which plugs directly into the PDP-8E/PDP-8A Omnibus. The Omnibus interface includes logic for driving and receiving Omnibus signals, controlling DMA (data break) operations, generating interrupts and recognizing device address. The device address is jumper selectable between 70-778.

PDP-8E/PDP-8A Software Interface

All disk operations are initiated by issuing appropriate I/O commands to the FD0800/FD1800 or setting appropriate bits in the IORP. The disk operation is specified via 6 word I/O Request Packet (IORP) stored in PDP-8E/PDP-8A I/O command. Basic controller error status is available from the controller by issuing a PDP-8E/PDP-8A I/O command.

PDP-8E/PDP-8A I/O Commands

The PDP-8E/PDP-8A I/O commands and IOT instruction code assignments are shown below.

Instruction Code	Command	Accumulator Contents
		0 1011
67x0	CLEAR	Y Y
		YY: Clear function parameters
67x1	TEST	Skip on done bit $= 1$
67x2	READ	0 1 8 9 10 11 B D E C M A
		Read Status of controller. B: Busy M: DMA error D: Done C: Command error A: Abort E: Error
67x3	ADDRESS	0 1 2 3 4 5 6 7 8 9 10 11
		MEX: Extended memory address for IORP.
		0 11
67x4	START	IORP Address
67x6	RESET	Reset controller

I/O Request Packet (IORP)

The IORP specifies all parameters of a disk operation. The PDP-8E/PDP-8A software driver loads these parameters into the IORP memory block and then initiates the disk request by issuing commands to the FD0800/FD1800. The bit assignments of the IORP words follow.

I/O Request Packet (IORP) Word 0 1 2 3 4 5 6 7 8 9 10 11 IQA F M P D Request Word M: Extended memory address E. Function code Interrupt enable P: Preserve Packet L: D: Drive unit address Q: Queued request A: Disk address type 1 2 3 4 1011 0 RED 1 S Status Word S: Secondary status R: Request status Error information E: Operation initiated D: Secondary status Ŀ. identification 7 0 6 11 Sector Track Disk Address Word A = 10 1 2 11

		Absolute Sector		A= 0
	0	· · ·	11	
Buffer Address Word		Data Buffer Length		
	0		11	
Buffer Length Word		Next IORP Address		
	0		11	
Queued Request Word		Data Buffer Address		

Disk Functions

The 7 disk functions specified in the F field of the IORP Request Word are:			
Function	Description		
READ ($F = 0$)	Reads a block of data from disk into PDP-8E/PDP-8A memory.		
COMPARE (F = 1)	Reads a block of data from the disk and compares it with the contents of PDP-8E/PDP-8A memory.		
READID (F = 2)	Reads next disk sector ID information.		
SEEK (F = 3)	Steps head to specified track. Verifies correct positioning.		
WRITE (F = 4)	Writes a block of data from PDP-8E/PDP-8A memory to the disk.		
FORMAT ($F = 5$)	Initializes track to IBM soft-sectored format.		
STATUS (F = 6)	Returns status to the S field of the IORP Status Word.		

Specifications

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Mechanical	FD0800 is a single (8.5"x10.5") DEC quad PC board with a small second PC board mounted to it. Plug and electrically compatible with PDP-8E Omnibus. Requires two slot positions except when mounter in end slot of PDP-8E Omnibus.		
	FD1800 is a single (8.5"x15.7") DEC hex PC board for PDP-8A. Plug and electrically compatible with Omnibus.		
	Disk drive interface: One 50 pin 3M connector (3425-0000)		
Power	4.5 amps (nominal) @ $+5$ volts. (Can be powered from PDP-E/PDP-8A).		
Environment	0°-50°C system ambient operating temperature. 10% to 90% relative humidity.		
	550000 40		