Floppy Disk Subsystem
AED 2500

Features

▲ **Random access storage**
  for minicomputers
  programmable calculators
  intelligent terminals, etc.

▲ **Three drives in one cabinet**

▲ **Field-proven reliability**

▲ **Low cost**

▲ ADVANCED ELECTRONICS DESIGN, INC.

Floppy Disk Cartridge

- Keyed Insertion guide.
- 64 tracks per disk.
- 2,048 words per track.
- 131,072 words per disk.
- 64 microseconds per word.
- Soft errors — 10^{-9}.
- Hard errors — 10^{-12}.

The Data Disk is comprised of a flexible (Floppy) Disk permanently jacketed in a Lexan® cartridge. The Disk is a polyester substrate covered with a digital oxide which is protected by a video formulation to reduce head wear. The Lexan cartridge contains a substance which cleans and lubricates the disk as it rotates. One index hole in the disk permits a light emitting diode to illuminate a photocell in the Drive which signifies the beginning of a track. 32 equally-spaced sector holes signal the start of individual records. The media is guaranteed error-free for one million passes over a given track; however, the AED 2500 has a special circuit which lifts the read-write head on any Drive which is innactive for five seconds or more, thus further adding to media life.

®Registered trademark E.I. Dupont Company.

Floppy Disk Drive

- Access — 10 msec per track
- Latency — 160 msec per rev.
- Head load — 40 msec.
- 10,000 hour parts warranty.
- MTBF — 2,000 hours.
- MTTR — one-half hour.
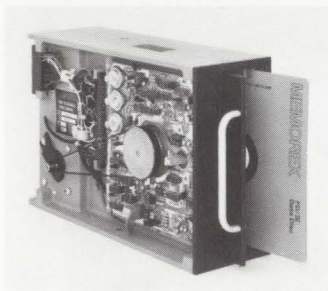
With over 10,000 in the field, the Memorex 651 has undisputed leadership in Floppy Disk Drives for minicomputers. The Data Disk mounts through a spring-loaded front panel door. A special keyway in the Disk Drive prevents improper loading. Closing the door automatically brings the disk ring in contact with the drive hub, centering the media, and rotates it at 375 rpm. A stepper-motor positions the read-write head over one of 64 tracks. Data is transferred at the rate of 64 microseconds per word. The contoured, ultra-smooth heads load in 40 milliseconds to provide contact recording on the surface-hardened magnetic disk. Sealed ball bearings are used throughout to assure maintenance free, long life. A Write Protect Tab placed on the Data Disk deactivates the Write Circuit.

Drive Electronics
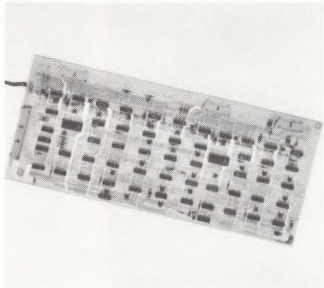
- Separate Drive circuits.
- Overlapped seek.
- Track and sector control.
- Switch selectable address.

Each Floppy Disk Drive is provided individual Drive Electronics, rather than time-sharing a common circuit. Thus, one Drive may be transferring data, while the other Drives are simultaneously seeking independent addresses. Once the Formatter has gated the track and sector address into a particular Drive Electronics, the head is stepped from track to track until an internal comparator detects the correct address has been reached. Unit addresses of 0, 1, 2 or 3 as selected by the Control Panel switches are presented by the Drive Electronics to the Formatter. Thus, a Data Disk containing data or programs with a specific unit address may be placed in any Drive.

PC board shows chips for dual-drive.

Control Panel

- Bootstrap in 160 msec.
- Selectable Drive Addresses.
- Status Register lights.
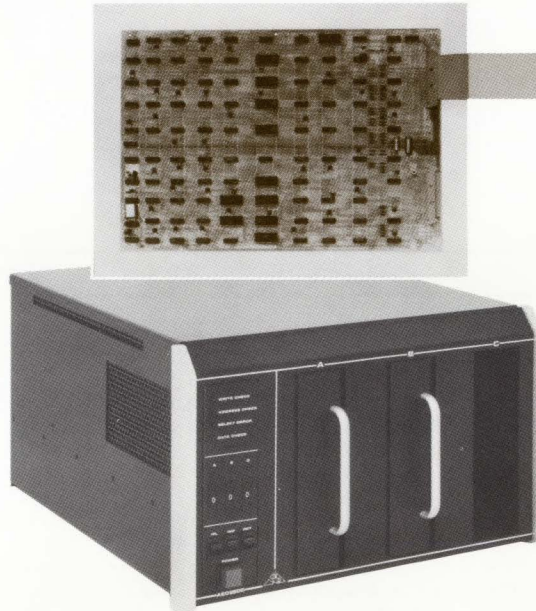- Write Protect by track.
- Illuminated Power Switch.
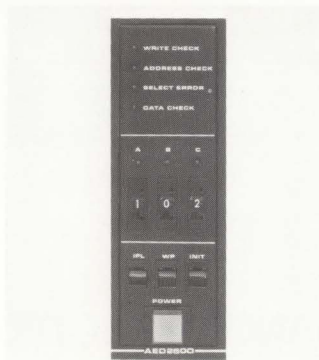
The AED 2500 Control Panel combines simplicity with versatility. The LED's light only when a particular Drive is active. The column of LED's at the top, display the contents of the Status Register, thus are invaluable if an error occurs in accessing a disk or if a bit has been altered on a disk. Each LED in the center row will light when the corresponding Drive is reading or writing. The Unit Select Switches permit Drives A, B, and C to be Units 0, 1, 2 or 3 in any combination, a useful feature because any Disk may be placed in any available Drive. The IPL Switch reads up to 2,048 words into core from track 00 of Disk 0, for quick restarts. Address marks and Address CRC bits are placed on blank disk by the INITIALIZE Switch. During INITIALIZE, individual tracks may be WRITE PROTECTED with the WP switch. The Power Switch is illuminated whenever AC line voltage is applied to the Power Supply. The Control Panel may be recessed and covered by the addition of the Optional Door Panel.
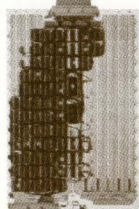
Formatter
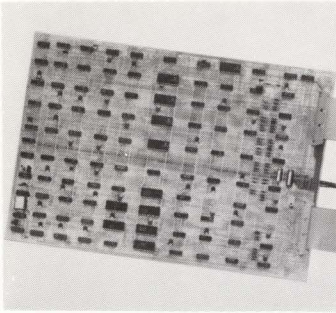
- 16 bidirectional data lines and 7 function lines.
- Automatic IPL bootstrap.
- Read before write address verification.
- 16 bit polynomial CRC authenticates data.
- Separate address CRC.
- Zero-fills incomplete data records

The Formatter provides the logic, timing and control functions necessary to write into and read out binary data from one to four Drives and associated Drive Electronics. Through a 50-wire ribbon cable, the Formatter provides a common bus to the Interface of any minicomputer, microprocessor, programmable calculator or intelligent terminal. The 32 hard sectors in the Data Disk are grouped by the Formatter as 32, 16, 8, 4 or 2 sectors. The Formatter also provides a Track Mode, thereby accomodating from 64 to 2,048 16 bit words per record on each of 64 tracks. The IPL feature permits the user to quickly load up to 2,048 computer words into memory, thereby restoring the system from a cold start without troublesome toggling or tapes. A 16 term polynomial is used as a CRC (Cyclical Redundancy Check) for each data record. A separate CRC is performed on each address.
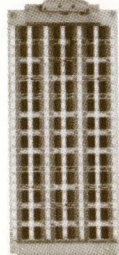
Floppy Disk Subsystem
AED 2500

NOVA

PDP-8A
-8E
-8M

PDP-11's

Unibus
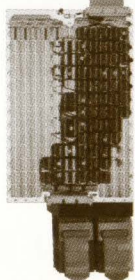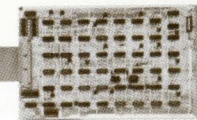
Varian 620's
V73

Interdata
70's
7/16
7/32

Design your own Interface compatible with our TTL 23-wire Formatter Bus.

TI 980A

HP 2000's

MONROE
1800

ALPHA-16
LSI
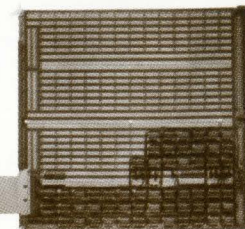
PDP-8L, -12

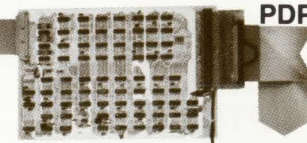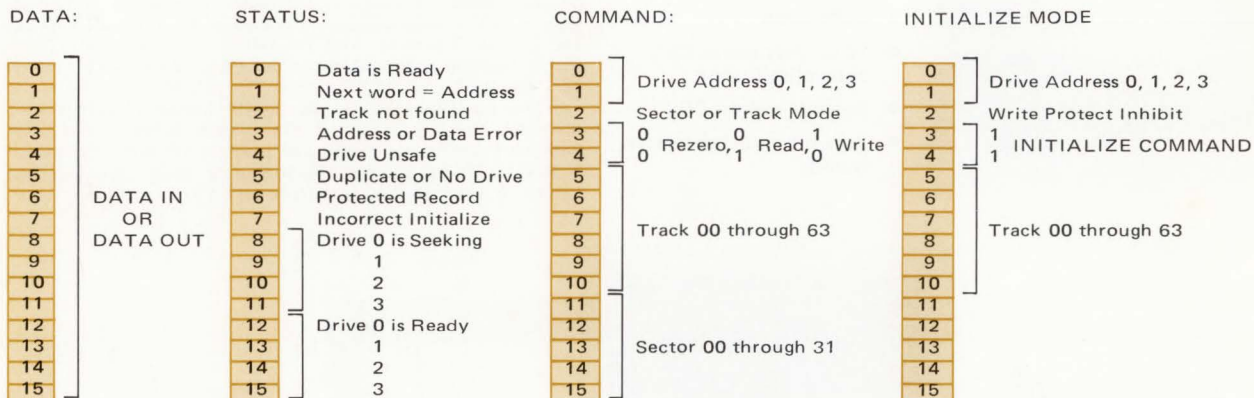Illustration shows AED Interfaces available July 1974.
Ask us for our expanded list of Interfaces.

FORMATTER INSTRUCTIONS

Number of sectors per track (jumper selectable)	— 32	16	8	4	2
Corresponding number of 16 bit words per sector (record)	— 64	128	256	512	1,024

Track Mode — 2,048 16 bit words

CRC (Cyclical Redundancy Check) — 16 bit polynomial. One for Data Records, one for Sector/Track Address verification.

REGISTERS

DATA:

0
1
2
3
4
5
6 DATA IN
7 OR
8 DATA OUT
9
10
11
12
13
14
15

STATUS:

0	Data is Ready
1	Next word = Address
2	Track not found
3	Address or Data Error
4	Drive Unsafe
5	Duplicate or No Drive
6	Protected Record
7	Incorrect Initialize
8	Drive 0 is Seeking
9	1
10	2
11	3
12	Drive 0 is Ready
13	1
14	2
15	3

COMMAND:

0	
1	Drive Address 0, 1, 2, 3
2	Sector or Track Mode
3	0 Rezero, 0 Read, 1 Write
4	0 1 0
5	
6	
7	Track 00 through 63
8	
9	
10	
11	
12	
13	Sector 00 through 31
14	
15	

INITIALIZE MODE

0	
1	Drive Address 0, 1, 2, 3
2	Write Protect Inhibit
3	1
4	1 INITIALIZE COMMAND
5	
6	
7	
8	Track 00 through 63
9	
10	
11	
12	
13	
14	
15	

SPECIFICATIONS

SYSTEM:	1 Drive	2 Drives	3 Drives	4 Drives
VOLTAGE	Either 115 ± 11 Volts AC	—	—	—
	or 230 ± 23 Volts AC	—	—	—
CURRENT @ 115 V AC:	2.0 Amperes	3.2 Amperes	4.3 Amperes	5.5 Amperes
@ 230 V AC:	1.0 Amperes	1.6 Amperes	2.2 Amperes	2.8 Amperes
AC LINE FREQUENCY:	Either 60 ± .5 Hz	—	—	—
	or 50 ± .5 Hz	—	—	—
Weight	72 lb.	89 lb.	106 lb.	106 + 72 = 178 lb.
	32 kg.	40 kg.	48 kg.	81 kg.

SIZE: Basic Cabinet: Height 10.5 in., Width 17.8 in., Depth 18.6 in. Expansion Cabinet: Same
267 mm, 452 mm, 473 mm.

TEMPERATURE: $60°F - 95°F (11°C - 32°C)$

RELATIVE HUMIDITY TOLERANCE: 20% to 80% with a maximum wet bulb temperature of $78°F (25°C)$

OPTIONS

Extra Floppy Disk Drives

Drive A is included with the basic AED 2500; however, two additional Floppy Disk Drives, B & C, with their associated FD/E Drive Electronics may be mounted in the same cabinet. The Formatter will also control a fourth Drive, D, which must be mounted in the Expansion Cabinet.

Expansion Cabinet

This additional Cabinet is provided to house Drive D and Storage Bins. The cabinet includes a Power Supply, Control Panel, and an Extender Cable for Drive D. For dual-AED 2500 systems, an additional Drive D from the second system may also be mounted here.

Extender Cable

An Extender Cable is available for servicing the Floppy Disk Drive outside the AED 2500 Cabinet. Signal and AC power are included in this cable.

Storage Bin

This open compartment accomodates up to 15 Floppy Disk envelopes in vertical orientation for easy access from the front of the AED 2500 and Expansion Cabinets. One Storage Bin takes the space of one drive in the basic AED 2500.

Chassis Slides

The basic AED 2500 and Expansion Cabinets are provided with rubber feet for table-top mounting. One set of Chassis Slides is required for each Cabinet if rack mounting is desired. Slides and mounting hardware conform to RETMA/EIA standards.

Door Panel

The Control Panel switches and indicators may be recessed behind this Door Panel, which has a retaining knob.

PDP-11 Interface Cable

This cable is compatible with the UNIBUS® on the PDP-11.

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WARRANTY & SERVICE

The AED 2500 and its OPTIONS are guaranteed to be free from defects due to workmanship, materials, or design for a period of 90 days from date of invoice. During this Warranty Period the buyer ships the malfunctioning part or system to us Freight Collect. We repair and return it Freight Collect.

SOFTWARE

Each AED 2500 with an AED Interface includes a Floppy Disk with Diagnostics for check-out. Documentation and, where appropriate, a punched paper tape are also provided.

Software Drivers, compatible with computer manufacturers OS and AEDOS are available for certain computers. Please contact us for specifics.

ADVANCED ELECTRONICS DESIGN, INC.

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