

# 600MB FMD

## Magnetic Disk System

### Product Overview



The Perkin-Elmer 600MB Fixed Module Drive (FMD) is an extra-large capacity, high-performance magnetic storage system particularly suited to applications requiring reliable large databases. For use with all Perkin-Elmer 32-bit computer systems, the FMD provides storage for the most demanding user requirements. The 600MB FMD product is software supported by a test program, a formatter program, the LSU bootloader, and the OS driver. Currently, utilities which do not use the standard OS driver are not supported.

The basic configurations available provide the user with a fully formatted disk drive (fixed media) and an Intelligent Disk Controller (IDC) capable of handling up to four drives. The disk drive contains built-in operator and diagnostic panels. In addition, each basic configuration provides a test program, a formatter program, a 30 ft. cable, and complete drive and controller documentation. Also available are an expansion drive, a dual-port option, and a 1.9 MB fixed-head-per-track (HPT) storage option.

### Features

- Formatted capacity: 552 million bytes (basic configuration)
- Write Protect
- Optional 1.9MB head/track storage
- Optional dual port
- 25 ms average moving head track seek time
- 8.3 ms average rotational latency time
- Interface and format compatibility with other Perkin-Elmer disk systems
- Sealed head disk assembly (HDA)
- Daisy-chaining interface capability
- Remote power sequencing
- Phase-locked oscillator/data separator
- NRZ-to-MFM data encoder with write compensation
- Automatic error checking and correction (ECC)
- On-board diagnostics in drive and IDC

### Product Description

The 600MB FMD is a fixed media Winchester type drive. The Winchester technology is present in the head/disk media assembly where the heads are sealed with the media, and removed as a single unit for maintenance only. The HDA can be exchanged in 15 minutes. This arrangement reduces contamination within the drive, resulting in a very high Mean-Time-Between-Failure rate.

Seek times range from 10 ms track-to-track to a maximum of 50 ms. On the average, only 25 ms are required to position the heads. Rotation speed is 3600 RPM, resulting in an average rotational latency of only 8.3 ms. The data transfer rate is 1.2 million bytes per second.

The FMD unit consists of a stand alone cabinet and frame containing a head-disk assembly (HDA), a drive motor and brake, power supplies, and a logic chassis. The HDA is a sealed disk

pack that can be removed only by field service personnel. The unit contains 40 read/write heads and one servo head. The heads are low mass, lightly loaded to allow contact start/stop operation and low flying heights. A highly accurate closed loop servo system is used to ensure extremely rapid and precise head positioning.

The FMD can be configured with a fixed-head-per-track assembly option that contains 96 heads and adds 1,935,360 bytes of unsectored capacity. This option permits extra-high-speed access.

A dual port option is also available which permits two-controller access to the FMD. Either controller can hold the device in a select/reserve mode. At the controller release command, the device reverts to an unselected state. A priority-select feature is also provided. All FMDs are prewired for dual-port installation in the field.

## Specifications

### Format Parameters

Capacity:  
679,795,200 bytes unformatted  
681,730,560 bytes unformatted with fixed heads (96)  
552,468,000 bytes formatted  
554,040,860 bytes formatted with fixed heads (96)  
Byte Density Track: 20,160 bytes unformatted  
Cylinders: 843  
Tracks/Cylinder: 40  
Total Tracks: 33,720  
Byte Density/Cylinder: 806,400 bytes formatted

### Drive Performance

Data Transfer Rate: 1209K bytes/second (9.67 MHz)  
Seek Time:  
Minimum: 10 ms  
Average: 25 ms  
Maximum: 50 ms  
Average Rotational Latency: 8.3 ms  
Spindle Speed: 3600 r/min.  
Mean time between failure (MTBF): 6000 Hr.  
Mean time to repair (MTTR): 1.5 Hr.

### Dimensions

Height: 920mm (36.2 in.)  
Width: 584mm (23 in.)

Depth: 965mm (38 in.)  
Unit weight: 288kg (635 lb.)  
Shipping weight: 730 lbs.  
Controller Dimensions; one 381mm x 381mm (15" x 15") multiwire circuit board.  
Minimum clearance needed at front and back: 914mm (36 in.)

### Power

AC Voltage, 60Hz: nominal 208-230.  
AC Voltage, 50Hz: nominal 220-240.  
AC Plug Type: 1 phase, 2 pole, 3 wire, 20 A 250 V  
Hubbell #2321; needs wall receptacle  
Hubbell #2326, or drop receptacle  
Hubbell #2323.  
Disk static: 0.81KVA @ 2630 BTU/hr.  
Disk in motion: 1.52KVA @ 4675 BTU/hr.  
Start Current: 50 AMP  
Run Current: 6.7 AMP

### Environmental

Operating Temperature: 10°C to 35°C (50° to 95°F)  
Operating Humidity: 20% to 80%, non-condensing  
Operating Altitude Range: -300m to 2000m (-980 ft. to 6560 ft.)

## Product Numbers

92-126F00	600 MB FMD Disk Drive, 1 port, with IDC Controller, (M46-742), 208VAC, 60Hz.	92-188F00	600 MB FMD Disk Expansion, 208VAC, 60Hz.
92-126F01	600 MB FMD Disk Drive with Dual Port Option with IDC Controller, (M46-742), 208VAC, 60Hz.	92-188F01	600 MB FMD Disk Expansion with Dual Port Option 208VAC, 60Hz.
92-126F02	600 MB FMD Disk Drive, 1 port, with Head per Track Option with IDC Controller, (M46-742), 208VAC, 60Hz.	92-188F02	600 MB FMD Disk Expansion with Head Per Track Option 208VAC, 60Hz.
92-126F03	600 MB FMD Disk Drive, 1 port, with IDC Controller, 230VAC, 50Hz.	92-188F03	600 MB FMD Disk Expansion, 230VAC, 50Hz.

## Related Documentation

47-032	Intelligent Disk Controller (IDC) Maintenance Manual	91-351	Fixed Module Drive Hardware Maintenance Manual Volume 1 of 2
50-007	Intelligent Disk Controller (IDC) Programming Manual	91-352	Fixed Module Drive Hardware Maintenance Manual Volume 2 of 2
91-350	Fixed Module Drive Hardware Reference Manual	91-353	Fixed Module Drive Troubleshooting Manual

## Safety Standards

The 600MB Fixed Module Drive product has been UL, CSA, and FCC approved; and is designed for VDE approval. This equipment complies with

requirements in part 15 of FCC rules for class A computing devices.

## Worldwide Sales Offices

**U.S.A. Offices:**  
ALABAMA: Huntsville; ARIZONA: Phoenix;  
CALIFORNIA: Los Angeles, Sacramento, San Diego, Santa Clara, Tustin; COLORADO: Denver;  
CONNECTICUT: Fairfield, Hartford; FLORIDA: Orlando;  
GEORGIA: Atlanta; ILLINOIS: Chicago, Springfield;  
KANSAS: Kansas City; MARYLAND: Rockville;  
MASSACHUSETTS: Boston; MICHIGAN: Detroit;  
MISSOURI: St. Louis; NEW JERSEY: Cherry Hill, West Long Branch; NEW MEXICO: Albuquerque; NEW YORK: Binghamton, Lake Success, New York City, Rochester; OHIO: Cleveland, Dayton; OKLAHOMA: Oklahoma City, Tulsa; PENNSYLVANIA: Pittsburgh;  
TEXAS: Dallas, Houston; VIRGINIA: Richmond;  
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### Major Subsidiaries:

Major subsidiaries located in AUSTRALIA: Adelaide, Albany, Brisbane, Canberra, Melbourne, Perth, Sydney; and NEW ZEALAND: Wellington; BELGIUM: Brussels; CANADA: Calgary, Montreal, Ottawa, Toronto, Vancouver; ENGLAND: Manchester, Slough; FRANCE: Arcueil, Bordeaux, Grenoble, Lille, Lyon, Perigueux, Toulouse; GREECE: Athens; ITALY: Milan; WEST GERMANY: Dusseldorf, Frankfurt, Munich, and AUSTRIA: Vienna; NETHERLANDS: Gouda; SINGAPORE; HONG KONG; JAPAN: Tokyo. Other countries are served by a network of distributors.

The information contained herein is intended to be a general description and is subject to change with product enhancement.

# PERKIN-ELMER

## Data Systems Group

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# Mass Storage Modules

**FIXED AND REMOVABLE MEDIA  
MAGNETIC DISC SYSTEMS**

## PRODUCT OVERVIEW

Perkin-Elmer fixed and removable media storage modules are large-capacity, high-performance magnetic storage systems ideally suited for applications requiring reliable medium to large data bases. Used with Perkin-Elmer 32-bit computer systems, the Mass Storage Modules (MSM) provide storage for the most demanding user requirements. Complete capabilities are provided by standard Perkin-Elmer operating system software.

The basic configurations available provide the user with a fully formatted disc drive (fixed or removable media) and a disc controller capable of handling four storage modules.

## FEATURES

- IBM 3330 and 3350 type technology
- Removable or fixed media
- 8.3ms average rotational latency time
- 30ms average moving head track seek time
- Formatted capacity: 67 million bytes or 256 million bytes (basic configuration)
- Optional 1.6MB head/track storage (fixed media only)
- Write protect
- Optional Dual port

## PRODUCT CHARACTERISTICS

The removable media modules (MSM80 and MSM300) contain IBM 3330-type technology in the head/media area using multiplatter removable disc packs. The fixed media modules (MSM80F and MSM80F/HPT) contain the newer IBM 3350-type technology in the head/media area where the multiple platters are fixed within the unit.

Seek times range from 7ms track-to-track to a maximum of 55ms. On the average, only 30ms are required to position the heads. Rotation speed for all the modules is 3600 RPM, resulting in an average rotational latency of only 8.3ms. The data transfer rate across the family is 1.2 million bytes per second.

A highly accurate closed loop servo system is used to insure extremely rapid and precise head positioning by providing a feedback loop to the voice coil actuator mechanisms within the disc drives. The servo system uses one of the recording surfaces as a reference in positioning and data location for the remaining data heads.

Data security can be assured with the write protect feature by electronically inhibiting write functions. Additional data security is provided also by prohibiting any writing upon detection of seek errors, track position errors, loss of rotation speed, or loss of voltage. On the removable media units, pack damage is prevented by a positive pack interlock mechanism. Further assurance is taken by

retracting the heads when a voltage error or rotational speed loss occurs.

The MSM80F and MSM80F/HPT drives are fixed media "Winchester" drives. Winchester technology as it applies to these drives is in the head/disc media assembly where the heads are sealed with the media, and removed as a singular unit for maintenance only. This reduces contamination within the drive which results in a very high Mean-Time-Between Failure.

## SOFTWARE SUPPORT

The Perkin-Elmer Mass Storage Module family is supported by a standard Perkin-Elmer 32-bit operating system. Complete data recovery facilities are included, which invoke data strobe offset and track offset sequences for data recovery in the event of read errors. In a standard configuration, the system must have a removable magnetic media device to enable adequate service diagnostic support and system software loading.

## PRODUCT NUMBERS

### MSM80 Series

- M46-600** Model MSM80 — 67MB removable media mass storage module, drive and 1x4 controller. Includes a fully formatted disc pack, write protect feature, damage preventing pack interlock, pedestal cabinet, a controller capable of handling up to 4 disc drives and required cables. 60Hz.
- M46-601** Model MSM80E — 67MB removable media mass storage module, expansion drive, 60Hz.
- M46-602** Same as M46-600 (MSM80), 50Hz.
- M46-603** Same as M46-601 (MSM80E), 50Hz.
- M46-691** Model MSM80F — 67MB fixed media mass storage module, drive and 1x4 controller. The MSM80F is rack mountable and has switch selectable write protect, 60Hz.
- M46-692** Same as M46-691 (MSM80F), 50Hz.
- M46-693** Model MSM80F/HPT — 67MB fixed media mass storage module plus 1.6MB of head per track storage. This package includes the disc drive and controller. The MSM80F/HPT is rack mountable and has switch selectable write protect.
- M46-694** Same as M46-693 (MSM80F/HPT), 50Hz.
- M46-695** Model MSM80FE — 67MB fixed media mass storage module, expansion drive, 60Hz.
- M46-696** Same as M46-695 (MSM80FE), 50Hz.

- M46-697** Model MSM80FE/HPT — 67MB fixed media mass storage module plus 1.6MB of head per track storage expansion drive, 60Hz.
- M46-698** Same as M46-697 (MSM80FE/HPT), 50Hz.

### MSM300 Series

- M46-604** Model MSM300 — 256MB removable media mass storage module, drive and 1x4 controller. Includes a fully formatted disc pack, write protect feature, damage preventing pack interlock, freestanding low noise acoustic cabinet, controller, and cables. 60Hz.
- M46-605** Model MSM300E - 256MB removable media mass storage module expansion drive. 60Hz.
- M46-606** Same as M46-604 (MSM300), 50Hz.
- M46-607** Same as M46-605 (MSM300E), 50Hz.

### Dual Port Options

#### Factory Installed

- M46-622** MSM80E Dual Port
- M46-624** MSM300E Dual Port
- M46-699** MSM80F or MSM80F/HPT Dual Port

#### Field Upgrade

- M46-626** MSM80E Dual Port
- M46-628** MSM300E Dual Port

### RELATED DOCUMENTATION

- 29-518** MSM Programming Manual
- 29-644** MSM System Maintenance Manual
- 29-585** MSM Drive Maintenance Manual (MSM80)
- 29-586** MSM Drive Maintenance Manual (MSM300)
- 29-729F01** MSM Drive Maintenance Manual (MSM80F and MSM80F/HPT)
- 29-729F02** MSM Drive Maintenance Manual (MSM80F and MSM80F/HPT)
- 29-729F03** MSM Drive Maintenance Manual (MSM80F and MSM80F/HPT)

SPECIFICATION	MSM80	MSM80F	MSM80F/HPT	MSM300
<b>Capacity</b>				
Disc Platters	5, Removable	5, Fixed	5, Fixed	12, Removable
Byte Density/Track	20,160			
Track Density (TPI)	384	340	340	384
Cylinders	823			
Tracks/Cylinders	5	5	5	19
Bytes/Sector	256			
Sectors/Track	64			
Formatted Capacity (moving head)	67MB	67MB	67MB	256MB
Formatted Capacity (fixed head)	—	—	1.6MB	—
<b>Drive Performance</b>				
Average Track Seek	30ms			
Average Rotational Latency	8.3ms			
Average Start Time	25 sec. (35 max.)	30 sec. maximum		25 sec. (35 max.)
Average Stop Time	30 sec. (35 max.)	30 sec. maximum		30 sec. (35 max.)
<b>Dimensions</b>				
Height mm (inches)	864 (34)	259 (10.2)	259 (10.2)	919 (36.2)
Width mm (inches)	483 (19)	426 (17)	426 (17)	584 (23)
Depth mm (inches)	864 (34)	762 (30)	762 (30)	914 (36)
Weight kg (lbs)	110.3 (243)	57 (125)	57 (125)	249 (550)
Controller Dimensions	2 Printed Circuit Boards 381 x 381 mm (15 x 15 inches)			
<b>Storage Module Power</b>				
AC Voltage, 60Hz	120VAC	120VAC	120VAC	208VAC
Phase	Single	Single	Single	Single
Start Current	30amps	14amps	14amps	37amps
Run Current	8.9amps	4.7amps	4.7amps	8.6amps
AC Voltage, 50Hz	220VAC	220/240VAC	220/240VAC	220VAC
Phase	Single	Single	Single	Single
Start Current	22amps	14amps	14amps	42amps
Run Current	4.6amps	2.7amps	2.7amps	9.2amps
Controller Power	+ 5VDC, 8 amperes			
Environmental Temperature	15° - 32.2 °C (59-95 °F) operating With maximum gradient of 6.7 °C (12 °F) per hour			
Humidity	20-80% RH no condensation			

# PERKIN-ELMER

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Manufacturing facilities, and Sales/Service offices throughout the world.

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Printed in U.S.A. February, 1981



# LP 300 and LP 600 Line Printers

## PRODUCT DESCRIPTION

The Perkin-Elmer LP300 and LP600 printers are a family of impact type, solid horizontal character font, "band" line printers. The advanced design and modular construction make these printers easily adaptable to the computer industry's myriad of user applications. The microprocessor-based electronics provide state-of-the-art technology for reliable performance and simplicity of operation. Numerous standard features and optional character sets are now offered as a result of this advanced design.

The LP300 and LP600 are truly operator-oriented units. Operator controls are minimized and located according to their frequency of use and mode of operation. Paper and ribbon are easily loaded from the front. A cartridge ribbon system reduces handling and makes ribbon changing quick and easy. A wide paper chute with horizontal and vertical alignment scales simplifies paper loading. The specially designed steel character band can also be changed by the operator and can be installed in less than one minute. As an additional operator aid, the printer's status is constantly monitored. If an off-line condition occurs, a digital display illuminates and identifies the problem and indicates if it is correctable by the operator.

The design of the LP Series printers is based on a field-proven hammer actuation device used in conjunction with new magnetic materials that provides a multiple copy capability with extremely low power consumption. Integrated circuit hammer drivers and microprogrammed control minimize the number of printed circuit boards and maximize printer reliability.

## FEATURES

- Choice of print speeds — 300 LPM or 600 LPM
- 132 columns
- Microprocessor Controlled
- Full Line Buffer
- Cartridge Ribbon System
- Horizontal and Vertical Forms Alignment Scales
- Self Test with Diagnostic Display
- Modular Design
- Standard Top-of-Form Spacing
- Operator Changeable Character Band
- Etched Steel Character Band

## OPERATIONAL CHARACTERISTICS

Both units use microprocessor-based electronics to control the electrical and mechanical functions, and provide internal diagnostic testing to detect and indicate to the operator printer misoperations and malfunctions. The microprocessor-based logic controls the seven major modules and subsystems of the printer. This logic also keeps the number of major assemblies to a minimum, thus ensuring high product reliability and reducing overall maintenance costs.

Printing takes place when the contents of the full line buffer containing the data to be printed matches the character coming into position on the rotating band. The steel band rotates counter clockwise at a constant velocity and carries the characters. A series of friction-free electromagnetically controlled print hammers are actuated and driven against the paper, ribbon and the band to form the characters. Band motion is initiated automatically whenever data is transmitted over the interface. When the interface remains inactive for approximately three seconds, the band motor drive will turn off, causing both the band and ribbon motion to cease.

Two pin feed sprockets driven by a stepper motor and timing belt are used for paper movement; up to six-part forms can be accommodated. A solenoid-actuated paper clamp minimizes multipart "blousing" and prevents lateral movement of the paper during printing. Paper motion sensors and detectors are an integral part of the printer. When a low paper condition exists, a paper low sensor causes the printer to go off-line after completion of the current line being printed. Also, if a loss of motion for a maximum of eight lines occurs, the printer goes off-line after completing the current line.

Both the LP300 and LP600 contain a Vertical Format Unit (VFU). This 12-channel tape-controlled unit allows the operator to handle a variety of form lengths and allows rapid paper slewing within individual forms. Data requirements are punched on paper tape and loaded into printer memory which then provides the synchronization between the form and the VFU. The LP300 and LP600 printers are supported by standard line printer drivers contained in the Perkin-Elmer OS/16 and OS/32 operating systems.

## SPECIFICATIONS

Feature	Model	
	LP300	LP600
Throughput (lines/minute)	(min/max)	
64 USASCII Character Set	255/317	600/655
96 USASCII Character Set	171/255	449/600
Character Spacing		
Horizontal (characters/inch)	10	
Vertical (lines/inch)	6/8 (switch selectable)	
Characters per line	132	
Line Advance Time	30 ms (max)	
Paper Slew Speed	15 ips (min)	
Form Width	76-406MM (3/16 in.)	
Tape Controlled Vertical Format Unit	STD	
Full Line Buffer	STD	
Ribbon Cartridge	STD	
Phasing Control	STD	
Paper Low Sensor	STD	
Ribbon Motion Sensor	STD	
Single Line Feed Switch	STD	
Electronic Top of Form Switch	STD	
Fault Condition Indicator and Clear Switch	STD	
Self Test	STD	
Diagnostic Display	STD	
Penetration Control for up to six-part form	STD	
Automatic Motor Control	STD	

## Physical Dimensions

Height: 38 cm (14.9 inches) Depth: 64 cm (25.2 inches)  
 Width: 77 cm (30.3 inches) Weight: 68 kg (150 lbs.)

# PERKIN-ELMER

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## Electrical Requirements

Voltage: 90 to 132 VAC  
 180 to 250 VAC  
 Frequency: 50/60 Hz ± 2 Hz  
 Phase: Single  
 Power: Standby: 250 watts (maximum)  
 Printing: 350 watts (maximum)

## Environmental Standards

	Operating	Storage	Transit
Temperature:			
°C	10° to 38°	-10° to 50°	-40° to 71°
°F	50° to 100°	14° to 127°	-40° to 160°
Humidity (Non-Condensing):	20% to 80%	10% to 90%	95% max
Altitude:	0 to 3000m	0m to 3000m	0 to 10,000m

## PRODUCT NUMBERS

- M46-300** LP300 Line Printer (90-132 VAC, 60 Hz)  
 A 300 line/minute 132 column line printer without character band. Includes interface and cables.
- M46-301** Same as M46-300 except (90-132 VAC, 50 Hz)
- M46-302** Same as M46-300 except (180-250 VAC, 60 Hz)
- M46-303** Same as M46-300 except (180-250 VAC, 50 Hz)
- M46-304** LP600 Line Printer (90-132 VAC, 60 Hz)  
 A 600 line/minute 132 column line printer without character band. Includes interface and cables.
- M46-305** Same as M46-304 except (90-132 VAC, 50 Hz)
- M46-306** Same as M46-304 except (180-250 VAC, 60 Hz)
- M46-307** Same as M46-304 except (180-250 VAC, 50 Hz)
- M46-309** LP Printer pedestal and paper shelf.
- M46-310** LP Printer acoustical package. Provides additional acoustical noise suppression. Includes pedestal.
- M46-311** LP Printer Ribbons (a package of 6)
- M46-312** LP300 USASCII 64 Character Set
- M46-313** LP300 USASCII 96 Character Set
- M46-314** LP300 United Kingdom 96 Character Set
- M46-316** LP300 German 96 Character Set
- M46-319** LP600 USASCII 64 Character Set
- M46-320** LP600 USASCII 96 Character Set
- M46-321** LP600 United Kingdom 96 Character Set
- M46-323** LP600 German 96 Character Set

## RELATED DOCUMENTATION

- 29-696 LP300 Operator's Guide  
 29-697 LP300 Field Maintenance Guide  
 29-698 LP300 Schematics  
 29-699 LP600 Operator's Guide  
 29-700 LP600 Field Maintenance Guide  
 29-701 LP600 Schematics  
 29-668 LP Controller Instruction Manual  
 29-669 LP Controller Programming Manual

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