POTTER

DD4740
DISKETTE DRIVE

FLEXIBLE DISK DRIVE FOR SYSTEMS MANUFACTURERS

FEATURES ☐ Compatible with IBM 3740 System ☐ Compact ☐ Random Access Replaces Cassettes ☐ Easy Self-Centering Loading ☐ Higher Reliability

APPLICATIONS ☐ Minicomputers ☐ Program Loading ☐ Point-of-Sale ☐ Storage for Programs, Data, Work Area, Tables, Etc. ☐ Data Entry Systems ☐ Data Logging ☐ Process Control ☐ Communications Terminals

The Potter Diskette Drive is a compact disk drive storage device that uses flexible diskettes, each with over three million bits storage capacity. When the diskette is interchanged with IBM 3740 entry terminals, programming format capacity is 242,944 bytes, and 26 addressable sectors are added to each of 74 tracks. The Potter drive accesses any addressable position on the diskette in random sequence, then provides data transfer at a peak rate of a quarter million bits per second. The diskette is easily handled and mailed.

The electronic system designer now has a memory unit for many uses such as computers, communications terminals and data entry machines. Compared to tape cartridges or cassettes, high data reliability and random access are among the Potter advantages.

Potter's simple design, using components long tested in data processing, assures easy maintenance. The DD4740 Diskette Drive is compact (9.90″x6.13″x12.88″) and mounts vertically or horizontally.

The POTTER DD 4740 Diskette Drive

Applications

Potter's new diskette drive uses the small, flexible diskette that activates IBM's 3740 entry stations and terminals. The Potter drive has more applications in data processing systems than any other storage system in its price range. All data storage (whether permanent or interchangeable) in the speed and capacity range of the DD 4740 can now be assured of greater reliability and other advantages over tape cassette or cartridge systems.

DATA ENTRY SYSTEMS using the Potter diskette drive substitute the easily handled, clean diskette for punch cards and eliminate a host of card handling, storage, and transporting inconveniences along with their noisy and dust-producing machines. For most record layouts, an operator's accurate production for the day can be accelerated and accumulated on one diskette. Compared to tape cassettes, large disk, or multiple keyboard entry systems, the Potter DD 4740 holds an operator's work on one, individually loaded and handled diskette. This permits flexible job scheduling and reduction in software required to operate the entry system. And, because the diskette is compatible with IBM 3740 entry devices, its data can readily be entered into the host computer.

Data Entry Systems

COMMUNICATIONS TERMINALS, whether programmable or not, are being designed more and more with storage capability. The Potter diskette drive provides advantageous storage compared to tape cassettes or cartridges. This is particularly true for the high reliability required in remote locations, and the ease of reread for verification of data affected by transmission uncertainties. Additional data files in unlimited numbers can be transmitted/received by changing diskettes, a simple file change for even an untrained employee. Remote stations can use the Potter unit to accumulate manually entered data preparatory to transmission.

Communications Terminals

MINICOMPUTERS can replace cassettes and provide random access to data with the DD 4740. The Potter diskette drive unit also offers high speed read/write with a changeable data base, adequate for most minicomputer uses that previously required expensive, metal disk files.

PROGRAMS IN COMPUTERS, MINICOMPUTERS, OR PERIPHERAL CONTROLLERS can easily be entered or changed through the diskette drive. One example is the program in a Read Only Memory. Any program load is facilitated. Operating systems, diagnostic programs and revision of stored tables can be entered expeditiously.

STORAGE with random access, for small capacity data processing machines becomes economical with Potter's DD4740. Programmable calculators can use it for programs and intermediate data storage. Word processing machines can store text and editing programs.

DATA LOGGING describes a series of DD4740 applications in which data is gathered at intervals and removed for periodic processing. *Point-of-Sale* recording in the retail industry can use the Potter unit to accumulate style, color, size, other identifying information and quantitative information at the time of sale. Accumulated records can then be hand carried on diskettes or transmitted to central EDP systems. *Process control* readings can be logged, or auxiliary programs stored, on the Potter diskette and later processed by a controlling system. Warehouse or factory *material movements* may be entered and held on remotely located Potter diskette drives. Later this information may be transmitted and consolidated for daily entry to operating reports.

Applications for the Potter DD4740 Diskette Drive are almost unlimited.

POTTER Advantages

RELIABILITY reaches a new high for a memory featuring changeable media with this capacity and price and offering fast access to additional data. The design goal is one recoverable ("soft") error in 10^9 bits, and one nonrecoverable ("hard") error in 10^{12} bits.

INDUSTRY COMPATIBLE diskette permits the customer to design his system to interchange data with the IBM 3740 entry/transmission system. The Potter DD4740 can read and write in the same format as IBM.

RANDOM ACCESS allows direct addressing of any data in the file. File organization and addressing is accomplished by programming.

EASE OF OPERATION begins with simplicity of handling, mailing and storing the diskette without worrying about damage to recorded data. Also, the Potter drive is easily loaded by simply inserting the diskette and closing the lid. The rest is done automatically.

CHECKING DATA is easy on a diskette compared to tape cassette. The Potter unit can reread, read after write, rewrite etc., by sequential program commands, while the head is still positioned at one track.

PRICE for the Potter DD4740 drive is a new low in the industry for a reliable, disk memory.

Operation

DISKETTE — The diskette, flexible disk, or "floppy" disk is a data storage medium that also offers manual interchange of files. The 1973 version used in IBM's 3740 series of Data Entry Systems differs from the units used in prior years. The diskette, for IBM 3740 and Potter DD4740, is made of flexible mylar-like material with an oxide coat. It is permanently enclosed in an 8" x 8" (20.3 x 20.3 cm) thick plastic envelope, lined with material that gently wipes the diskette surface. Access to the recording surface is gained by a read/write head through a slot in the envelope. In another position, a hole in the diskette is sensed through a hole in the envelope to index the start of tracks.

Data and record addresses are organized on the diskette surface into concentric tracks, the outermost one numbered 00, and the innermost track numbered 76. Leaving a short space between the end of a track and its beginning, the user can record 40,624 bits on a track, or 3,128,048 bits on 77 tracks using the whole surface. When using the Potter diskette drive compatibly with IBM, permanent programming maintains 26 addressable sectors in each track and reads/writes in EBCDIC characters. This reduces storage capacity to 3,328 data bytes per track on 73 data tracks, or 242,944 bytes on the disk surface.

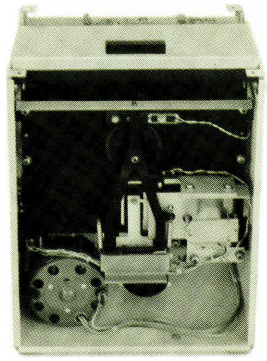
Because the diskette is protected from damage, it can be handled easily and quickly by untrained personnel and can be sent through the mail, etc., without special or costly precautions.

LOADING — An operator loads the drive by inserting a diskette with the aperture side in first. The envelope fits conveniently; there is nothing to align, thread, or turn on. She then closes a cover over the diskette slot and instantly, automatically, the diskette is centered, and the motor starts to rotate the diskette. Unloading is just as simple beginning with opening the cover and removing the diskette.

DRIVE OPERATION — Fast loading and unloading is assured by the design of the mechanism within the Diskette Drive. When the

access cover is closed, a cone shaped idler moves into the 1½ inch center hole of the diskette. As a result, the diskette is always perfectly centered regardless of the envelope position. The idler loads the diskette by friction against a rotating hub, and provides a positive coupling. The hub is part of a spindle driven by a belt from the AC motor.

A three-phase stepper motor with integral lead screw assures fast track access. A carriage and nut assembly containing the head is mounted on the lead screw. This carriage, in turn, is guided by two independent, parallel rods. Each command to the stepper motor translates into a 15 degree rotation of the lead screw and a .021 inch radial step of the carriage. An anti-backlash mechanism ensures consistent positioning. Stepper motor electronics include additional features to achieve fast head settling time. These features reduce the velocity of the stepper as it approaches detent position. Settling time is under 25 milliseconds.



Diskette Drive — Front View

Contact between head and diskette is controlled by a spring-loaded pressure pad mounted on the carriage and nut assembly, on the opposite side from the head. The pressure pad, and a diskette envelope guidance system, remain open until the drive cover is closed; then they are activated by a solenoid. The solenoid is also used to unload the head when read/write operation is not being performed, prolonging the life of the head and diskette. A circuit is provided at the interface connector for this purpose.

An index hole in the diskette is sensed by a light emitting diode (LED) and phototransistor. The index hole is used to locate the start of each track, and it can also be used to check rotational speed. A LED and phototransistor are also used to sense track 00 when the head is in position over this track. Track 00 sensing is used to safeguard against further outward movement of the head, and to calibrate the unit.

The Potter read/write head is single gap with erase. Read electronics consist of amplifier, a zero crossing detector, and pulse shaper. The design uses filters and shaping networks to achieve optimum signal detection with maximum noise rejection. The dynamic range of usable signal exceeds 35 DB, providing excellent read reliability under all conditions. Read circuits are disconnected from write with Field Effect Transistor (FET) switches. FET switches provide maximum isolation during write and minimum bias currents during read. The read electronics achieve peak performance with double frequency encoded recording, which has a maximum bit frequency of 250,000 bits/second. Read data is presented to the interface as a serial pulse train encoded in double frequency.

Write electronics use a three-stage amplifer. Data in the form of a serial, double frequency, pulse train are converted into flux transitions by a write driver. An additional Potter feature provides low write current when writing on the high numbered tracks. As density of recording increases, the DD4740 improves resolution with lower current. Additionally, the write electronics section contains a safety circuit that inhibits writing whenever power to the unit is shut off. Write inhibit also prevents accidental erasure due to power failure.

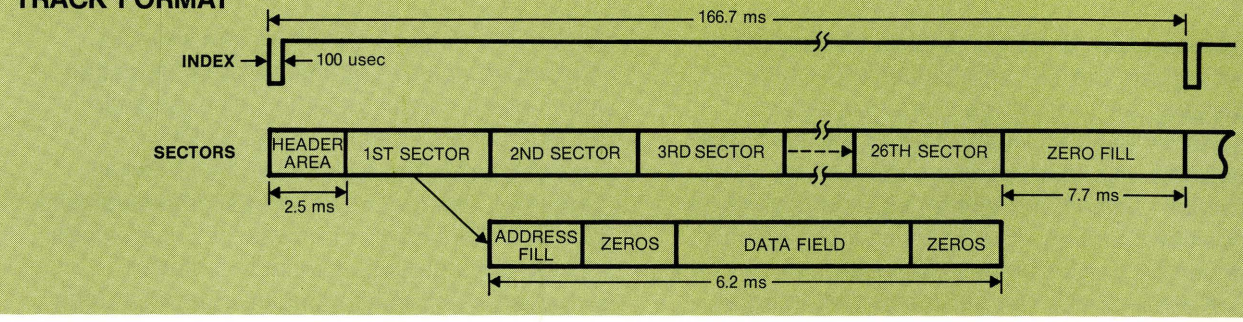
Electronics associated with the stepper motor are drivers, decoders, and an up-down counter. Inputs to the drive electronics are seek-in and seek-out pulses; each pulse advances the motor one step in a designated direction. Outside control of the DD4740 must supply the correct number and direction of pulses for each seek, through an interface connector.

INSTALLATION, MOUNTING — Drives may be installed for top loading or front (side) loading. The diskette rotates in a vertical plane or, when side loaded, it may rotate in a horizontal plane. The drive is mounted using a flange integral with the case at top. Additional mounting points are provided on the sides for slide or other type installation. A bezel that snaps over the front end conceals mounting details.

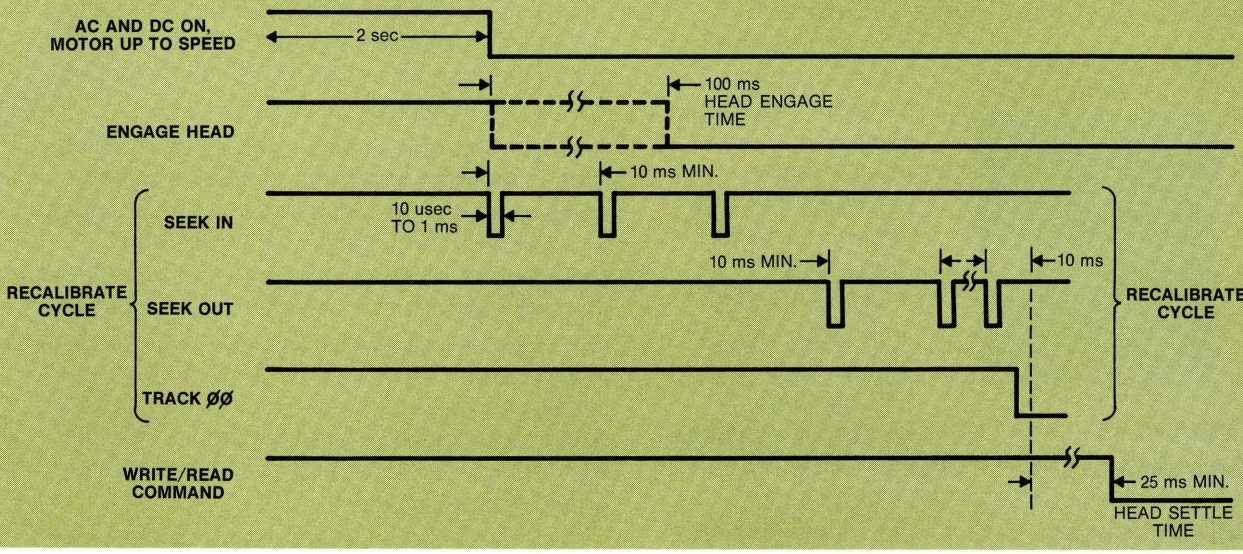
Front and rear panels are each held by two quarter turn fasteners. Removal of covers affords complete access to all components.

SERVICING — The head can be cleaned through the diskette loading slot whenever needed. For any other servicing, the entire Diskette Drive is simply pulled from its installation, and the covers removed.

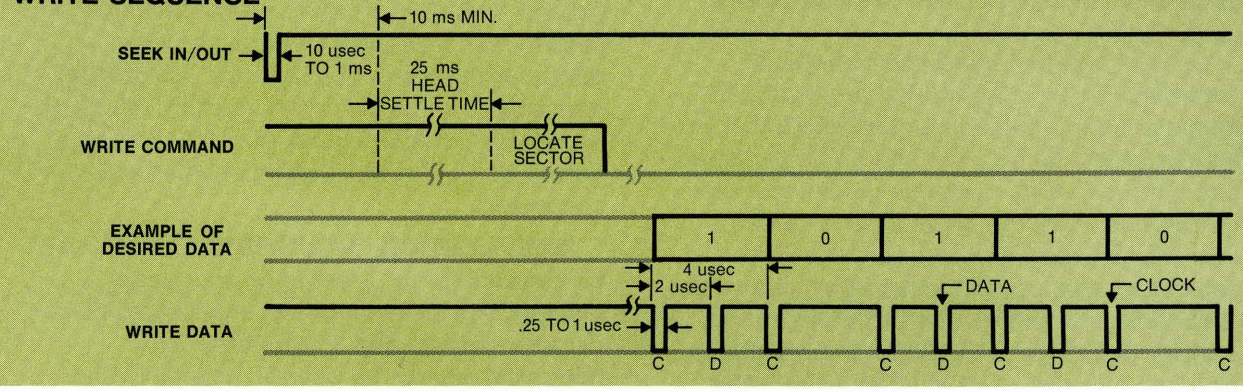
TRACK FORMAT



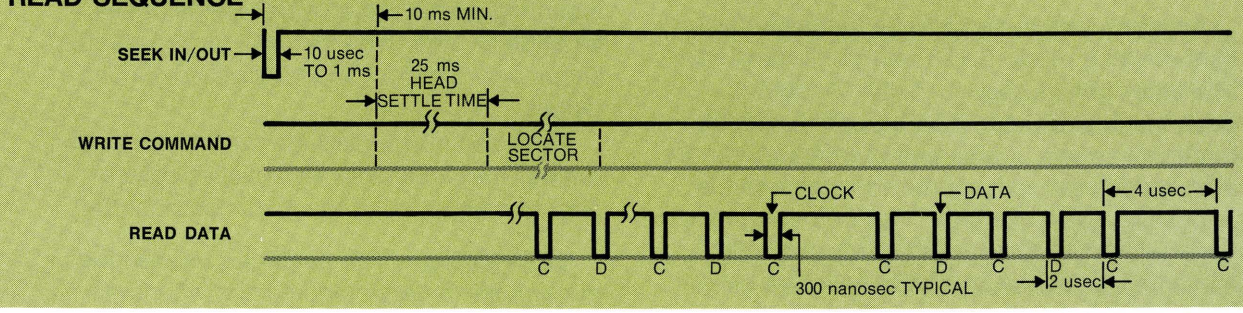
TURN ON SEQUENCE



WRITE SEQUENCE



READ SEQUENCE



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PERFORMANCE SPECIFICATION

Diskette Medium	IBM 2305830 or equivalent		
Protective sealed envelope	8 x 8 x 1/16 inch with slot for access		
Diskette within envelope	7.88 inches diameter .003 inches thick, flexible material, iron oxide coated		
Track spacing	48/inch, or .021 inch		
Beginning of track	Indexed by hole in disk		
Diskette Capacity depends upon system compatibility with IBM 3740:	**Maximum Available Capacity**	**Compatible with IBM 3740 Series**	
Tracks, 48/inch	77	#00 index records #01-73 data #74, 75 spares	
Coding	—	8 bits/byte	
Sector format, per track	minimum 1 sector	26 sectors: 5 address and 128 data bytes/sector	
Track storage	40,624 bits	130 address bytes 3328 data bytes	
Diskette storage	3,128,048 bits	(1) 1898 80 col. punch cards, or (2) 242,944 data bytes	
Recording density	3270 bits/inch max.		
Rotation speed	360 rpm, or 167 ms/revolution		
Latency	167 ms max., 83 ms average		
Recording system	Double frequency		
Data Transfer rate	250,000 bits/second		
Access time, head movement	10 ms track-to-track		
Settling time	25 ms nominal		
Head load at start-up	100 ms		
Logic levels	Logic 0 +5V ±.5V; Logic 1 0 ±.5V		
Power required	+24V ±5%, 2 amperes +5V ±5%, .5 ampere −15V ±5%, .25 ampere 60Hz, 115 VAC ±10%, 1 ampere		
Connector	1 mating connector supplied with each unit		
Cable length max. between connectors	50 ft.		
Operating Environment is limited by the flexible diskette:			
Temperature	40°-100°F.		
Relative humidity, without condensation	20%-80%		
Non-operating storage, without media:			
Temperature	32°-120°F.		
R.H. without condensation	10%-80%		
Dimensions	9.90″ wide x 6.13″ deep x 12.88″ high*		

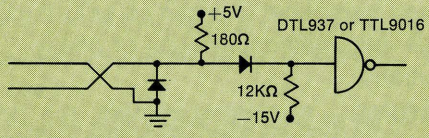
*A bezel extends .5″ in width and .625″ in depth on each side at one end in addition to dimensions given. Bezel contains cover for loading.

INTERFACE:

Logic and Command Interface — All status, command and data lines to or from the disk drive are negative going DTL/TTL +5/0 volt signals where 0 volts = the active state.

Logic 0 (inactive state) = +5V ±0.5V, Logic 1 (active state) = 0 ±0.5V, Sink 30 ma.

Data and command signals to the drive should be driven by a type 944 DTL integrated circuit with a 10,000 ohm pull up resistor to +5 volts or equivalent TTL type 9009. Data and reply lines from the disk drive should be terminated with the following recommended circuit.



Interconnecting Cable — One PC board mating connector is supplied with each disk drive.

The maximum cable length from connector pin to connector pin is 50 feet *(15 meters)*.

All inputs and outputs require twisted pairs, one line per function, one for ground. All wires should be 22 AWG minimum with at least one twist/inch *(1 twist/25 mm)*.

INPUT COMMANDS:

Signal	Mnemonic	Description
Seek Track "In"	SKIN	Ground going pulse 1-10 μsec. wide. Each pulse causes head to advance toward spindle and away from home position.

INPUT COMMANDS Cont.:

Signal	Mnemonic	Description
Seek Track "Out"	SKOT	Ground going pulse 1-10 μsec. wide. Each pulse causes head to retract away from spindle toward home position.
Engage Head	ENGH	Ground level maintains head engaged.
Write Command	WCMD	Ground level maintains unit in a write condition. High level maintains unit in read condition.
Write Data	WDAT	Ground going pulse train. Each pulse will cause a flux change on the disk.
Low Current Select	LCSL	Ground going level, reduces write current at the higher tracks.

OUTPUT SIGNALS:

Signal	Mnemonic	Description
Index	INDX	Ground going pulses approximately 100 μsec. wide, occurring every revolution.
Read Data	RRDT	Ground going pulse train 200 μsec. wide.
Track φ	TKφφ	Ground level when head is home, i.e., track φφ.
Unit Select (option)	USEL	Ground going level provides unit selection in multidisk systems.

POTTER INSTRUMENT CO., INC.

Marketing Headquarters, 532 Broad Hollow Road
Melville, N. Y. 11746 Phone: (516) 694-9000
TWX: 510-224-6485 TELEX: 967861

Potter Instrument Company, Ltd., Station House-5th Floor, Harrow Road, Wembley, Middlesex, England
Deutsche Potter Instrument Co., GmbH., Berliner Allee, Herold Center, 2 Norderstedt 3, Hamburg, Germany

Regional Sales Offices: Potter Instrument Company, Inc., 532 Broad Hollow Road, Melville, New York 11746
Potter Instrument Company, Inc., 4510 West 77th Street, Suite 275, Minneapolis, Minnesota 55435
Potter Instrument Company, Inc., 9050 E. Telegraph Road, Suite 205, Downey, California 90240