

JAN 8 1974



FEATURES

- Utilizes 2315 or 5440-type cartridge
- Single or dual disk models
- One interface for all models
- 100 or 200 tpi, 1500 or 2400 rpm
- Track offset compensation
- Stores up to 100 megabits in 8¾ inches of panel space
- Write protection for each disk
- Variable formats
- Internal power supply

Perlec's D3000 series disk drives offer the utmost in reliability, versatility and economy for your fast access storage requirements. These moving head disk drives have capacities in the 25 to 100 megabit range and come equipped with a built-in power supply.

To best suit your system and storage requirements there are D3000 models for either 2315 or 5440-type cartridges, plus dual-disk units which include a fixed disk along with the removable cartridge. To match your data transfer capabilities you can choose either 1500 or 2400 rpm. All models are offered with high density 2200 bpi as standard configuration.

Although there are several options in speeds and densities, there is a common interface for all

versions. This feature reduces your system design costs and assures you freedom to change and update your disk storage facility as required. And all models — whether top-loading or front-loading — have exactly the same dimensions and appearance in your system.

The compactness, versatility, and low cost of D3000 series disk drives make these units easy to design into your system. If your system application is batch processing, information retrieval, process control, data entry, small business processing, graphics, point of sale, document reader systems — or for any application requiring large high-speed secondary storage — you'll benefit by looking at the D3000 series disk drives.

D3000 PERFORMANCE

- These disk drives offer you the performance of bigger, higher-cost units. Here are a few points to judge by:

— **Average access time is 35 milliseconds.**

- The head positioning mechanism uses advanced voice coil and optical sensing technology. This mechanism not only gives you virtually wear-free performance, but also makes possible the D3000's fast access capability. In extended life testing, individual positioners have been cycled in excess of 100 million seek operations without degradation of performance.

— **Spindle speed is controlled within ± 1 percent**

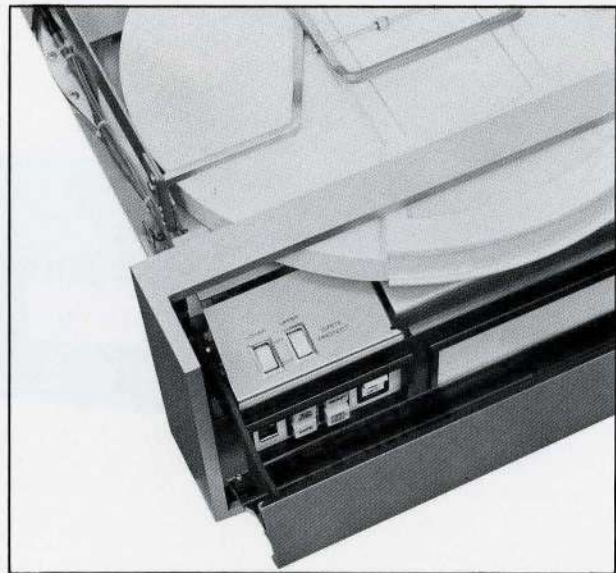
- Incorporating sophisticated A.C. servo techniques, the synchronous motor provides exceptionally accurate speed control of the disks.

— **Recoverable error rate of less than one error in 10^{10} bits transferred.**

- A special Trak-Set feature lets you reliably read a disk, recorded on another machine, that has an inadvertent track misalignment. Trak-Set enables you to automatically compensate for the offset via software control. You can also use this capability to test margins, at the nominal track location, providing you with additional assurance of proper adjustment. Designed to handle extreme environmental

conditions, the drive mechanism is thermally compensated to maintain low error rates over wide temperature ranges.

- There are other performance features, like individual write-protect in dual-disk units which enables the user to inhibit write operations on either disk, independent of which disk is selected. An indicator shows the write-protect status for each disk.



D3000 SERIES VERSATILITY

- The D3000 series handles every requirement of a mini, or midi-computer disk storage system. There is a model for all applications needing up to 100 million bits storage. For large systems requirements, up to four drives can be daisy-chained and operated by a single controller.
- To simplify and further reduce your design effort, all models have the same basic interface and the same mechanical dimensions. Whether single or dual disk, front or top-loading, and regardless of capacity, your mechanical and electrical design is the same.
- For those special requirements it's easy to expand your D3000 disk facility by adding more drives. Just connect the cables, set the

device addresses on the convenient front panel select switch, and you have a multiple-drive system.

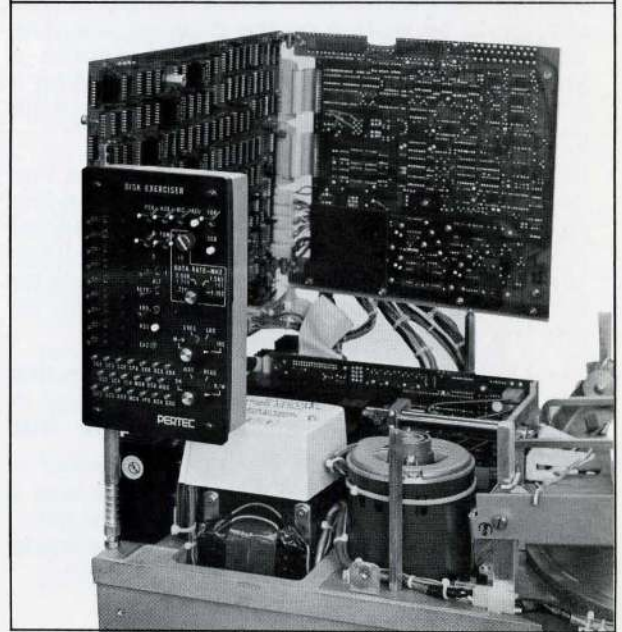
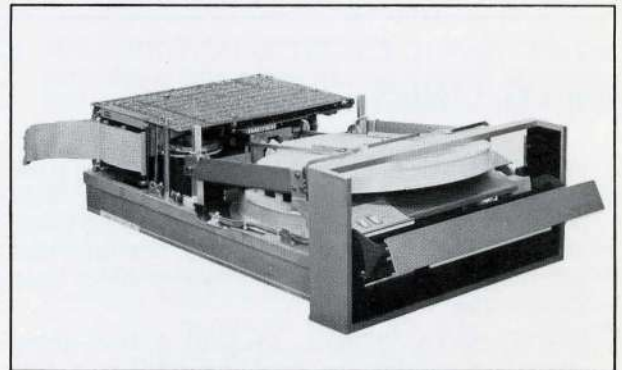
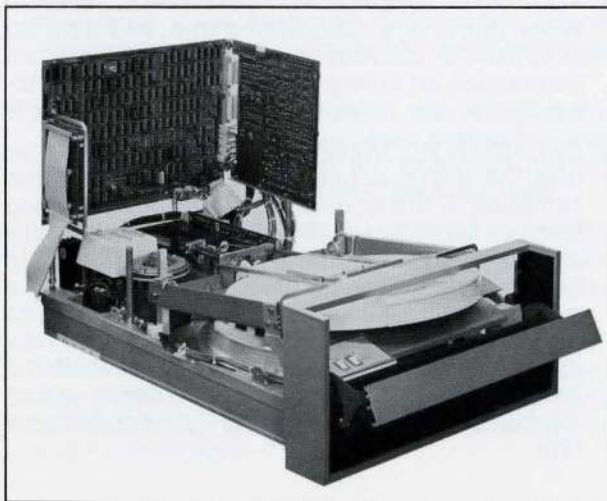
- D3000 series versatility extends also to format. Here are your sectoring choices:
 - Mechanical, for 8, 12, 16, 24, 32, or 48 sectors. Electronic, (with either multi-notch or index-notch-only cartridges) your choice of 30 different sectoring arrangements from 6 to 128 sectors.
- Through the use of plug-in programming arrays, Pertec configures the D3000 to meet your exact system requirements. If it's necessary to change sectors, it's easily accomplished in the field.

D3000 RELIABILITY

- Utilizing techniques and production methods learned from shipping over thirty thousand peripheral drives, Pertec tests every positioner assembly, every circuit board, and each critical component at the sub-assembly level. All D3000 disk drives are heat-soaked, in an attempt to force infinitesimal component failure. In addition, every unit must pass a complete computerized quality assurance test. Only after the computer verifies that all parameters of the drive performance specifications are met is the D3000 ready for shipping. For additional quality assurance, on a selective basis, we regularly submit the D3000 drives to a complete, full temperature range, computer-operated, environmental test. It's this care and attention that assures you of a unit that will do your job day after day, year after year.
- To be sure that your drive stays on-line and trouble-free, it is equipped with an air-cleaning system to keep contamination out of the disk and head areas. The only air that enters the drive after the cartridge is loaded enters through a 0.3-micron filter. In addition, the start-up operation provides an air-purge cycle to speed-up cleaning and to stabilize the disk temperature. During the purge cycle, the disk rotational velocity is increased. The resulting air flow dislodges particles which may be on the disk surface. Also, during the purge cycle, the heads are loaded to insure against head crashing. As the disk slows to normal speed the flying height of the heads is reduced to normal. On top loaders there is even a brush cycle during which the disk surfaces are gently cleaned with nylon brushes.

D3000 SERVICEABILITY

- Pertec emphasizes easy maintenance. Equipped with slides, the D3000 is designed with the serviceman in mind. It has built-in, and easily-accessible, hinged circuit boards which eliminate the need for extender boards thus enabling the serviceman to troubleshoot faults without having to unplug boards. The D3000 manual contains all there is to know about the unit, with all the drawings, tests, and procedures to keep it doing its job for you. There is a special plug-in exerciser available to help your maintenance people. Pertec will train your people, too, either at Pertec's plant or yours.
- For the multiple model user — most spares are common to both top and front-loading versions of the D3000 series. So you need to stock only a small number of items, of only a few types.



D3000 ECONOMY

- In OEM quantities, the D3000 drive can give you memory costs as low as 0.003 cents per bit. This, plus other economies attained through the commonality of spares, ease of maintenance, low training costs, and single interface

design give you the lowest cost of ownership achievable. Additional savings can be yours when you purchase Pertec tape and disk drives under one OEM agreement.

D3000 INTERFACE

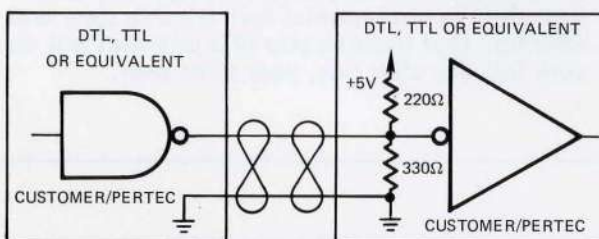
Although the D3000 interface is designed for easy integration into your system we offer the F3000 formatter to further simplify your interface task. We also offer interfaces that are compatible with competitive drives.

Additional interface data may be obtained by requesting the D3000 Engineering Specifications.

With the logic levels negative true the interface is compatible with TTL, DTL, and similar types of logic elements. All input/output line levels at the interface point are considered true when the level is at $+0.2 \pm 0.2V$.

TYPICAL INTERFACE

LOGIC LEVELS: True = Low = $+0.2 \pm 0.2V$
False = High = $+3.0, +2.3 - 0.6V$



INPUT LINES

- **WRITE ENABLE.** (1 line) When this line is true, the write electronics are conditioned for writing data. When this line is at a high logic level, all write electronics are disabled. The data that will be written is controlled by the Write Data Signal line.
- **WRITE DATA SIGNAL.** (1 line) A true-going voltage transition on this line causes a flux change to be written on the disk surface. The double-frequency recording mode causes a flux change at the cell boundary, providing a clock for reading data. A flux change within the cell marks a data bit "1".
- **HEAD SELECT.** (1 line) The level on this line determines which head and corresponding storage surface is selected. In dual platter models a low true level selects the top storage surface of the selected platter. In single platter models a low true level selects head zero (0) and the top storage surface.
- **PLATTER SELECT.** (1 line) The level on this line determines which platter is selected in dual-platter-equipped machines. A low true level selects the removable platter.
- **ERASE ENABLE.** (1 line) When this line is at a low true level, and other safety conditions exist, the erase current is turned on in the selected erase head.
- **RESTORE.** (1 line) A low true level on this line (bracketing the trailing edge of the Cylinder Demand Address Strobe by at least 0.5 microseconds) will position the heads over cylinder 000. This line is used to re-initialize the heads as a diagnostic check in the event that a header disagreement has occurred.
- **READ ENABLE.** (1 line) A low true level signal on this line enables the Read Clock and Read Data Output lines. The signal on the line must be held true during the entire read cycle.
- **ACTIVATE EMERGENCY UNLOAD.** (1 line). When this line is conditioned true, and held for at least 1.0 microsecond, the disk drive will commence an emergency unload. It is not necessary for the drive to be Selected or Ready.
- **CYLINDER ADDRESS STROBE.** (1 line) A true level (.5 microseconds minimum) initiates the sampling of the Cylinder Demand Address and Restore input lines. (The Restore line has priority over Cylinder Demand Address lines.) In the case of a seek operation, when a legal address is presented on the Cylinder Demand Address lines, the positioner will seek the new cylinder. If an illegal address is presented, the positioner will not move and an illegal status will be reported on the Illegal Cylinder Address line.

- **CYLINDER DEMAND ADDRESS.** (9 lines) These lines allow parallel positioner addressing while accessing a particular track. The address is interpreted by its binary value with a low true level corresponding to a binary one.
- **UNIT SELECT.** (4 lines) A true logic level on one of these four lines will connect the appropriate drive to the common input/output bus. The line designated as Unit Select "1" is the only line utilized when a single unit is used.
- **TRACK OFFSET.** (2 lines) These lines provide a means of margin testing and a method for recovery of marginal data. A true level on either

the TRACK OFFSET PLUS or the TRACK OFFSET MINUS will slightly offset the heads in the desired direction from the normal track center. A true level on both track offset lines leaves the head in the normal track center while reducing the read amplifier gain.

- **START/STOP DISK DRIVE.** (1 line) This is a level which, when true, and certain operational criteria are met, allows the controller to start and stop the disk drive remotely. This line parallels the function of the RUN/STOP switch-indicator, therefore, priority is achieved by whichever is actuated first.

OUTPUT LINES

- **READ DATA.** (1 line) This line transmits the digital interpretation of the read data. The read data signal transition will occur midway between read clock pulses if a "one" bit is stored and will be reset at the clocks' leading edge.
- **READ CLOCK.** (1 line) This is a pulse which, when the leading edge goes true, defines the beginning of the next bit cell. The duration of the pulse is determined by the bit cell time (i.e., speed of the disk).
- **SECTOR PULSE.** (1 line) This is a true going pulse, 7.2 μ sec (nominal) in duration, which divides the disk surface into "N" equal segments.
- **INDEX PULSE.** (1 line) This line provides a true pulse, 8.2 microseconds (nominal) in duration, for each disk revolution. It will occur just prior to the sector zero (0) pulse.
- **SECTOR COUNT.** (7 lines) These lines, when true, define in binary value the sector of the selected platter which is under the read/write head. The seven-bit binary sector counter is incremented 3.2 μ sec (nominal) before each sector pulse and is reset to zero 3.2 μ sec (nominal) before the following index pulse. Sector number zero (0) is indicated by false levels on all lines.
- **FILE PROTECTED.** (1 line) A true level on this line indicates that the selected platter is write-protected regardless of the command on the WRITE ENABLE or ERASE ENABLE line.
- **DUAL PLATTER.** (1 line) A true level on this line indicates that the selected drive is a dual-disk unit. When high, or false, the selected drive is a single-platter device.
- **READY.** (1 line) A true level on this line indicates that the unit is selected and is in a state of readiness, and capable of responding to user commands.

- **ILLEGAL CYLINDER ADDRESS.** (1 line) This line, when true, indicates that a positioning address greater than the range of legal addresses is being attempted. Its transition will occur 1 μ sec after the trailing edge of the address strobe. When this condition is detected the positioner will not move.
- **MALFUNCTION DETECTED.** (1 line) This line provides a true pulse having a width of at least 200 nanoseconds which indicates that a unit malfunction has occurred.
- **BUSY SEEKING.** (4 lines) A true level on any one of these lines indicates that the selected unit is in the process of executing a seek. Triggered by the leading edge of the Cylinder Demand Address Strobe, this line will stay true for 2 μ sec minimum when an illegal address or a current position address is requested. Under a correct address condition this line will stay true for a maximum of 60 milliseconds.
- **DOUBLE TRACK DRIVE.** (1 line) This line when true indicates that the selected drive is a 200-tpi unit. When false it indicates a 100-tpi unit.
- **INTERNAL TEMPERATURE GO.** (1 line) In 200-tpi models a true level on this line indicates that the temperature differential between the inserted pack and internal drive mechanism is within the established range to assure compatibility from drive to drive. If drive to drive compatibility is not desired, this line may be ignored.
- **TERMINATION VOLTAGE.** This line supplies user termination voltage of +3.5v at a maximum of 800 milliamps. The controller end is to be decoupled to ground by a capacitor of at least three microfarads.

AVAILABLE MODELS

The D3000 series disk drives have similar appearances and are physically interchangeable in a rack installation. The following table summarizes the available configuration by model number.

CARTRIDGE TYPE	CONFIGURATION	100 TPI – TRACK DENSITY		200 TPI – TRACK DENSITY	
		SINGLE PLATTER	DUAL PLATTER	SINGLE PLATTER	DUAL PLATTER
2315 FRONT LOAD	1500 RPM	D3331	D3341	D3431	D3441
	2400 RPM	D3332	D3342	D3432	D3442
5440 TOP LOAD	1500 RPM	D3311	D3321	D3411	D3421
	2400 RPM	D3312	D3322	D3412	D3422

BASIC CONFIGURATIONS AND STANDARD FEATURES

- Read/Write heads and circuits
- Head-select circuits
- Positioner mechanism and electronics
- Data/clock separator circuits
- Sector/index mark electronics
- Start/Stop sequence control logic
- Spindle, motor, and control circuits
- Write protect circuits
- Daisy-chain capability
- Failure-detector logic
- Cartridge receiver
- Air filter and pressurizer system
- External I/O connector
- Safety interlocks
- Operator controls and indicators
- Choice of sector number
- Internal power supply
- Operation/maintenance manual

AVAILABLE OPTIONS

- Color-coordinated panel to match your system
- Portable exercisers for test and maintenance
- 100 tpi/200 tpi interface compatibility

SPECIFICATIONS

	Model			
	D333X-D331X	D343X-D341X	D334X-D332X	D344X-D342X
Recording Technique	Frequency Doubling			
Bit Density	2200 bpi	2200 bpi	2200 bpi	2200 bpi
Track Spacing	0.019 in./100 tpi	0.005 in./200 tpi	0.010 in./100 tpi	0.005 in./200 tpi
Data Rate	1.562 MHz at 1500 rpm - 2.5 MHz at 2400 rpm			
Recording Medium	2315 cartridge or 540 cartridge available			
CAPACITY ¹				
Bits per Cartridge				
Fixed			25,000,000	50,000,000
Removable	25,000,000	50,000,000	25,000,000	50,000,000
Bits per Drive	25,000,000	50,000,000	50,000,000	100,000,000
Sectors per Track ²	N	N	N	N
Tracks per Unit	406	812	812	1624
Cylinders per Unit	203	406	203	406
SPEED				
Rotation (rpm)	1500 ±1% or 2400 ±1%			
Latency Average	20 ms at 1500 rpm 12.5 ms at 2400 rpm			
Positioning (Incl. settle)				
Track-to-Track	9 ms			
Average	35 ms			
Maximum	60 ms			
PHYSICAL				
Width	Standard 19-inch panel width			
Depth	26-inch rack depth; 3¼-inch front overhang			
Height	8¾-inches			
Weight	130 pounds (incl. slides)			
POWER REQUIRED				
AC Power	95-250V By Transformer Tap Changes 48-52 Hz and 58-62 Hz			
Allowable Voltage Variation	±10% of Nominal			
ENVIRONMENT — 100 tpi				
Temperature				
Operating	+50°F to +104°F (10°C to 40°C)			
Non-operating	+14°F to +149°F (-10°C to 65°C)			
ENVIRONMENT — 200 tpi				
Temperature				
Operating	+60°F to +100°F (15°C to 38°C)			
Non-operating	+14°F to +149°F (-10°C to 65°C)			
Relative Humidity	5% to 85% (without condensation)			
Altitude	Sea level to 7500 ft.			

¹capacities in unformatted mode

²8, 12, 16, 24, 32 and 48 available on mechanical sectoring.

6, 8, 10, 12, 14, 16, 18, 20, 24, 28, 30, 32, 36, 40, 42, 48, 56, 60, 64, 70, 72, 80, 84, 90, 96, 112, 120, 126 and 128 available on electronic sectoring.

