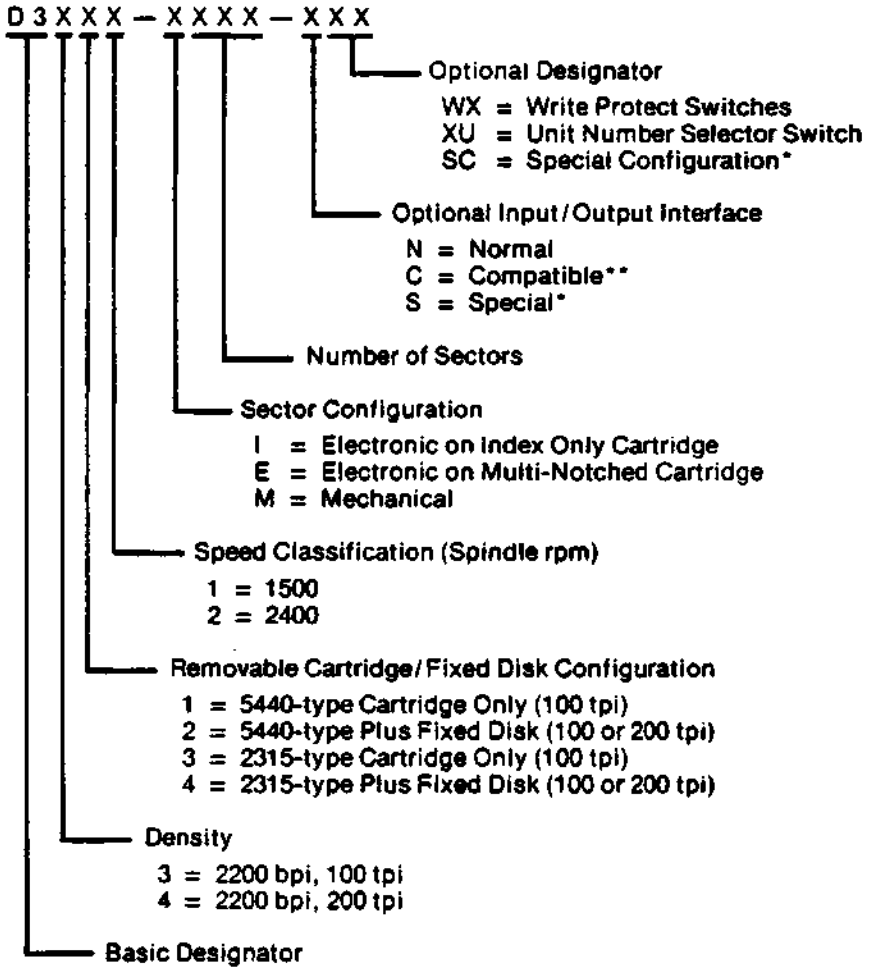
SECTION I
GENERAL DESCRIPTION AND SPECIFICATIONS

1.1 INTRODUCTION

This section provides a physical description, functional description, and specifications for the D3000 Series Disk Drive, Models D3300 and D3400, manufactured by the PERTEC Division of PERTEC Computer Corporation, Chatsworth, California.

1.1.1 MODEL IDENTIFICATION

To simplify identification of D3000 Series Disk Drives, Figure 1-1 illustrates the breakdown of code combinations employed by PERTEC.



*As specifically ordered; not described in this manual.

**Electrically compatible with controllers designed to interface to another manufacturer's disk drive.

Figure 1-1. Model Identification

Referring to Figure 1-1, the following illustrates the ease of identification, using Model D3322-I064-NWU as an example.

(1) D3 is the basic prefix used on all D3000 Series.

(2) 3 in the third position indicates a 100 tpi device.

(3) 2 in the fourth position indicates a 5440-type cartridge plus fixed disk.

(4) 2 in the fifth position indicates a spindle speed of 2400 rpm.

(5) I in the sixth position indicates that the 5440-type cartridge to be utilized has a normal index notch only.

(6) 064 in the seventh, eighth, and ninth positions indicate a 64-sector device.

(7) N in the tenth position indicates a Normal (standard) interface configuration option.

(8) W in the eleventh position indicates the unit is provided with Write Protect switches.

(9) U in the twelfth position indicates the unit is provided with Unit Number Selector switch.

1.2 PURPOSE OF EQUIPMENT

The disk drive has the capability of recording digital data on IBM 2315- or 5440-type cartridges utilizing the double-frequency method of recording. Spindle speeds up to 2400 rpm and data storage of up to 101.5 megabits are provided by the D3000 Series Disk Drive. Data recorded on the removable media can be recovered when played back on any D3000 Series having the same cartridge type, density, format, and speed.

The D3000 is a rotating magnetic memory capable of storing and retrieving data in digital form. The storage media is an aluminum disk coated on both surfaces with a layer of ferromagnetic material suspended in a binder. Data are stored serially in concentric tracks on both surfaces of the disk.

The basic disk drive is available as a single-disk or dual-disk device. All models are capable of accepting removable media with the removable disk enclosed in a cartridge assembly. Depending on the model, the disk drive will accept either the top loading 5440-type or the front loading 2315-type cartridge.

Single-disk models have provisions for the removable cartridge only; dual-disk models have provisions for the removable cartridge and a fixed disk enclosed within the drive housing.

The disk drive is intended for use in conjunction with a formatter or controller to provide rapid access mass memory for small and medium size computers.

An integral power supply is included in the disk drive and operates directly from single phase power.

1.3 PHYSICAL DESCRIPTION OF EQUIPMENT

The top loading configuration of the D3000 Disk Drive utilizes a 5440-type cartridge and is shown in Figure 1-2; the front loading configuration utilizes a 2315-type cartridge and is shown in Figure 1-3.

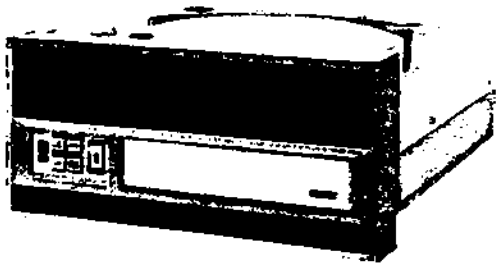


Figure 1-2. D3000 Disk Drive, Top Load Model

Figure 1-3. D3000 Disk Drive, Front Load Model

All electrical and mechanical components necessary to operate the disk drive are mounted internally within the housing of the drive. The housing is designed to be mounted in a standard 19-inch EIA rack, or utilized as a table top unit.

All models are equipped with the necessary electronics to provide recording and retrieval of stored data.

Access to the interior of the disk drive is gained by removing the dust cover. This cover is mounted to the base assembly and protects the interior of the drive from dust and other environmental contaminants.

The operational controls, which include indicators that are illuminated when the relevant functions are being performed, are mounted on the front control panel. These controls are accessible to the operator at all times. Power is supplied through a strain-relieved cord having a standard 3-prong plug. Interface signals are routed through the interface cables to input/output connectors located within the disk drive housing.

The major electronic assemblies are located near the rear of the drive. These assemblies are mounted to allow ready access without the use of extender cards or other special tools.

1.4 FUNCTIONAL DESCRIPTION

Data storage is accomplished by utilizing the non-contact method of magnetic recording. The disk recording media is rotated at a constant speed and the recording heads, capable of either reading or writing, are flown over the surface of the disk on a gas-film bearing and positioned to the appropriate track by the use of a voice-coil type of linear motor positioner. This type of disk drive, which utilizes a single head per surface, is referred to as a moving-head disk drive.

Addressing of the stored data is accomplished by specifying the desired head position and the applicable segment of the disk surface. The read/write electronics are capable of non-simultaneous reading or writing of data on a single surface at a given time.

Figure 1-4 is a functional block diagram of the disk drive, which consists of the disk drive control logic, start and stop control plus auxiliary controls, and the necessary select and enable gating.

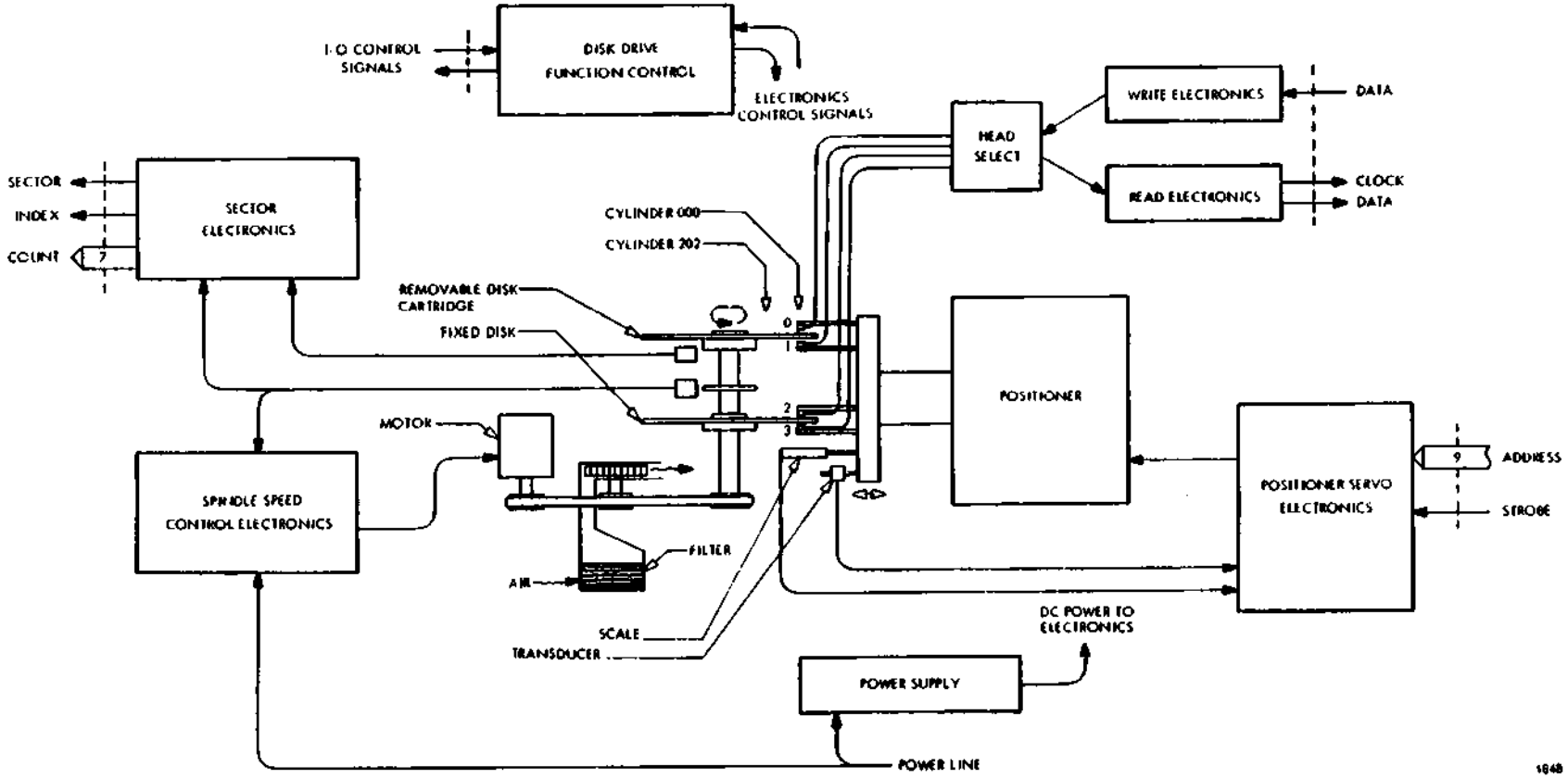


Figure 1-4. Functional Block Diagram

The positioner servo electronics comprise a major functional block. As the disk rotates at a fixed speed, and the recording heads are flown over the disk surface, the positioner is controlled in both the velocity and position modes. The positioner moves to the correct address under control of the positioner servo control electronics. Data are then written on the desired surface by selecting the corresponding head through the head select network.

The read/write electronics are subdivided into three functional blocks consisting of the head select network, the write electronics, and the read channel. Write data causes write current to be switched according to the pulse train on the WRITE DATA SIGNAL line. The storage surface will then be magnetized accordingly.

During retrieval of the stored data, the corresponding head is again selected by the head select network and the signal obtained from the read/write head is processed by the read channel into separate READ DATA and READ CLOCK signals for transmission via the interface. The particular segment of the disk which is passing under the read/write head is specified by the sector pulse and sector count lines from the sector electronics.

Control of the rotational speed of the disk is accomplished by the speed control electronics group which establishes a known, fixed speed for the disk rotation within ±1 percent speed tolerance. The sector electronics block provides pulses at the interface which electrically subdivides the disk into a number of sectors for the purpose of addressing data stored on the disk. Figure 1-5 illustrates the subdivision of a platter into 8 sectors by means of mechanical sectoring.

The air system consists of an absolute filter preceded by a pre-filter, and a blower driven by the same motor which provides drive to the disk spindle. This air system provides a well-filtered flow of clean air in the disk area to remove contaminants.

Power to the various electronic circuits is provided by an integral power supply. This power provides dc voltages at suitable levels derived from the line voltage.

All major components are mounted to the base assembly. An aluminum alloy casting is the basic component of the base assembly. Mounted onto the casting is the drive mechanism which consists of a precision spindle, an ac induction drive motor, a squirrel cage blower, and an idler system. Power to rotate the blower and spindle is transmitted from the drive motor by means of a flat belt. The idler system provides constant tension of the belt and compensates for stretch of the belt.

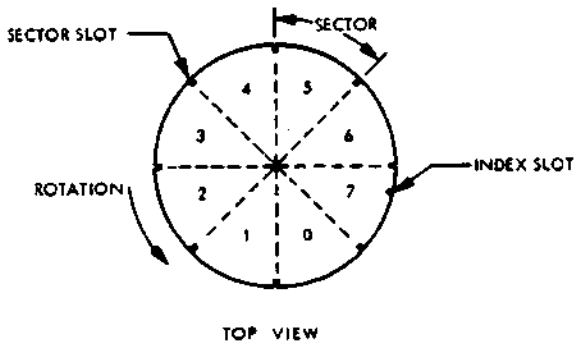


Figure 1-5. Mechanical Sectoring

Mounted to the spindle assembly is a ring with equally spaced notches and one additional notch spaced midway between two of the other notches; this is referred to as the Phase Lock Ring and is used for sectoring and speed control.

In dual disk models, a fixed disk is mounted to the spindle assembly; it is referred to as the lower disk but is not removable in the same manner as the cartridge. The second disk is contained within the removable cartridge and is driven by a magnetic clutch which is located on top of the spindle assembly. A precision ground cone on the end of the spindle suitably locates the hub of the disk which is mounted in the cartridge. Rotary motion is imparted to both disks simultaneously.

The blower is rotated while the drive motor is running and the disk is spinning. Air flow from the blower travels through the disk area and purges the air of any contaminants in this area. Air is drawn in at the lower front part of the front bezel and passes through a high efficiency absolute filter located in the lower front portion of the base assembly.

Air is ducted to the squirrel cage blower and thence to the area below the fixed disk. Suitable vanes on the spindle provide additional pumping action to cause air to flow into the area of the upper disk. Air is exhausted at the rear of the disk drive. As a function of exhausting the air, the electronics package is provided with suitable cooling.

Additional cooling is provided through convection cooling of the heatsink assemblies mounted at the rear of the base assembly. Power transistors mounted on these heatsink assemblies are used in the power supply regulators and the positioner power amplifiers.

The base assembly provides mounting attachment points for the rack mounting slides, switch brackets, front bezel, and the supporting structure for the printed circuit boards and dust cover.

The positioner, in conjunction with the positioner servo and control electronics, is used to position the read/write heads to one of a possible 203 or 406 cylinders. Figure 1-6 defines the relationship between disk, cylinder, and track as used throughout this document.

The positioner assembly consists of a large permanent magnet, a carriage which utilizes ball bearings, a magnetic velocity transducer, and a photo-electric position transducer. Attached to the carriage are the read/write heads, and the positioner coil (voice coil).

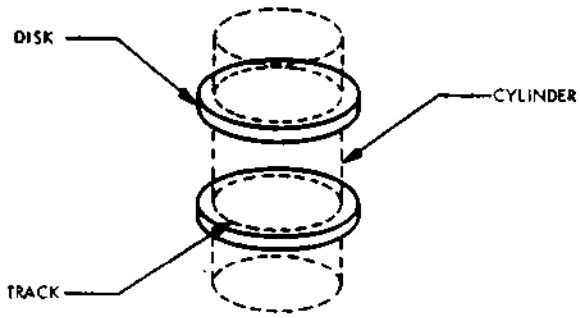


Figure 1-6. Disk, Cylinder, Track Relationship

The positioner is a moving coil type of linear motor wherein the signal applied to the coil results in a magnetic field which reacts with the magnetic field of the permanent magnet. The force thus produced is used for purposes of controlling the position of the carriage. Speed of the positioner carriage movement is controlled by sensing its instantaneous velocity utilizing the magnetic velocity transducer.

The magnetic velocity transducer consists of a moving magnet within a fixed coil. The position of the positioner carriage is sensed by using the optical detent type of position transducer.

NOTE

There is no actual mechanical detenting of the positioner carriage. The positioning at a given cylinder is achieved entirely by electronic techniques.

Dc power to various electronic circuits is provided by the power supply which takes the line voltage input, transforms it to a suitable voltage level, then rectifies and filters the output of the transformer. The output is then provided to the power regulators located on the Servo PCBA.

Also contained on the power supply assembly are the motor start capacitors for the ac induction drive motor and a small Motor Control PCBA. The Motor Control PCBA contains ground isolation and power control circuitry for operating the drive motor. This PCBA is separate from other PCBAs in order to isolate the line voltage.

1.5 MECHANICAL AND ELECTRICAL SPECIFICATIONS

The mechanical and electgrical specifications summary for the disk drive is shown in Table 1-1.

1.5.1 INTERFACE SPECIFICATIONS

Levels:

True = Low = $+0.2 \pm 0.2$v

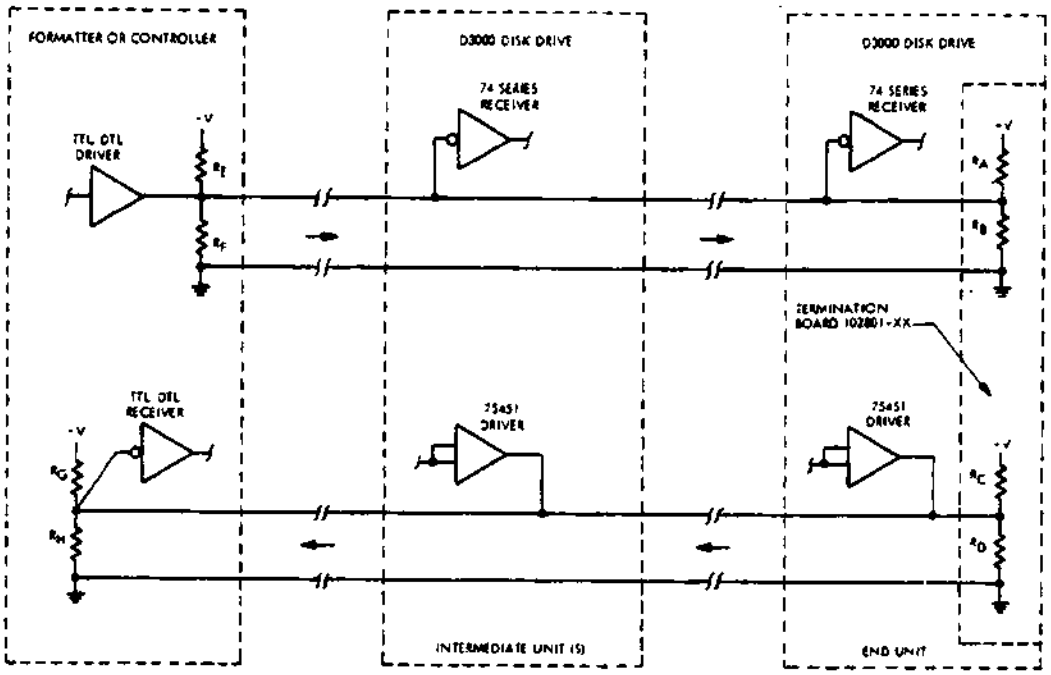
False = High = $+3.0 \begin{smallmatrix} +2.3\text{v} \\ -0.6\text{v} \end{smallmatrix}$

The interface circuits are designed so that any disconnected wire results in a false signal.

Figure 1-7 shows the configuration for which the drivers and receivers have been designed.

Table 1-1
Mechanical and Electrical Specifications

	100 tpi Models	200 tpi Models
Storage Capacity (Unformatted) Single Disk Models at 2200 bpi Dual Disk Models at 2200 bpi	 25.375 megabits 50.750 megabits	 50.75 megabits 101.5 megabits
Cylinders/Tracks Single Disk Models Dual Disk Models	 203 cylinders/406 tracks 203 cylinders/812 tracks	 406 cylinders/812 tracks 406 cylinders/1624 tracks
Sectors	6, 8, 10, 12, 14, 16, 18, 20, 24, 28, 30, 32, 36, 40, 42, 48, 56, 60, 64	6, 8, 10, 12, 14, 16, 18, 20, 24, 28, 30, 32, 36, 40, 42, 48, 56, 60, 64
Bits per Inch/Tracks per Inch	2200 bpi/100 tpi	2200 bpi/200 tpi
Data Transfer Rate 2200 bpi, 1500 rpm 2200 bpi, 2400 rpm	 1.56250 megabits per second 2.50000 megabits per second	 1.56250 megabits per second 2.50000 megabits per second
Disk Speed	1500 or 2400 rpm (±1%)	1500 or 2400 rpm (±1%)
Latency Time (Average) 1500 rpm Models 2400 rpm Models	 20 milliseconds) ±1%) 12.5 milliseconds (±1%)	 20 milliseconds (±1%) 12.5 milliseconds (±1%)
Head Positioner	Voice Coil Linear Motor with Optical Detent	Voice Coil Linear Motor with Optical Detent
Seek Time Adjacent Track Average (One-third Stroke) Maximum (Full Stroke)	 9 milliseconds maximum 35 milliseconds maximum 60 milliseconds maximum	 10 milliseconds maximum 40 milliseconds maximum 65 milliseconds maximum
Start Time	57 seconds maximum	57 seconds maximum
Stop Time	22 seconds maximum	22 seconds maximum
Removable Media Type	IBM 5440 or 2315 type cartridge	IBM 5440 or 2315 type cartridge
Read/Write Heads Type Number Recording Mode	 Ramp Loaded, Radially Aligned 2 or 4 (One per Disk Surface) Double Frequency	 Ramp Loaded, Radially Aligned 2 or 4 (One per Disk Surface) Double Frequency (2200 bpi)
Dimensions Height Width Depth from Mounting Surface Front Projection from Mounting Surface Total Depth	 222.25 mm (8¾ inches) maximum 482.6 mm (19 inches) 660.5 mm (26 inches) 82.6 mm (3¼ inches) 742.9 mm (29¼ inches)	 222.25 mm (8¾ inches) maximum 482.6 mm (19 inches) 660.5 mm (26 inches) 82.6 mm (3¼ inches) 742.9 mm (29¼ inches)
Mounting	Standard EIA	Standard EIA
Weight (Excluding Slides and Cartridge) Top Loading Models Front Loading Models	 57.6 kg (116 pounds) (including Integral Power Supply) 50.8 kg (112 pounds) (including Integral Power Supply)	 57.6 kg (116 pounds) (including Integral Power Supply) 50.8 kg (112 pounds) (including Integral Power Supply)
Operating Temperature	10°C to 40°C (50°F to 104°F)	15.6°C to 38.0°C (60°F to 100°F)
Non-Operating Temperature	−10°C to 65°C (14°F to 149°F)	−10°C to 65°C (14°F to 149°F)
Operating Humidity	5% to 85% Non-Condensing	5% to 85% Non-Condensing
Storage Humidity	to 95% Non-Condensing at 40°C to 80% Non-Condensing at 65°C	to 95% Non-Condensing at 40°C to 80% Non-Condensing at 65°C
Operating Altitude	0 to 2286 meters (0 to 7500 feet)	0 to 2286 meters (0 to 7500 feet)
Non-Operating Altitude	0 to 6706 meters (0 to 20,000 feet)	0 to 6706 meters (0 to 20,000 feet)
Power Volts ac Watts (Maximum on High Line) (Typical) Hertz	 95, 100, 110, 115, 125, 190, 200, 210, 215, 220, 225, 230, 235, 240, 250 1100 Peak (Start/Stop Cycles Only) 400 48 to 52, and 58 to 62	 95, 100, 110, 115, 125, 190, 200, 210, 215, 220, 225, 230, 235, 240, 250 1100 Peak (Start/Stop Cycles Only) 400 48 to 52, and 58 to 62
Electronics	All Silicon	All Silicon
Underwriters Laboratory	UL Approved	UL Approved
Canadian Standard	CSA Certified	CSA Certified



D3000 INSTALLATION CONFIGURATION	USE TERMINATION BOARD PART NO.	CORRESPONDING VALUES AT D3000 DISK DRIVE					TYPICAL VALUES AT CONTROLLER					NOTES AND COMMENTS
		R_A	R_B	R_C	R_D	-V	R_E	R_F	R_G	R_H	-V	
D3000 STANDARD MULTIPLE UNIT INSTALLATION VOLTAGE SUPPLIED BY DISK DRIVE (DAISY CHAIN)	102801-03	220	330	220	330	+5.0	220	330	220	330	+5.0	MAY ALSO BE USED FOR SINGLE UNIT INSTALLATION
D3000 STANDARD SINGLE UNIT INSTALLATION	102801-02	220	330	NONE	NONE	+5.0	NONE	NONE	220	330	+5.0	
COMPATIBLE WITH D5000 DAISY CHAIN TYPE INTERFACE	102801-04	120	NONE	120	NONE	+3.5	120	NONE	120	NONE	+3.5	
COMPATIBLE WITH D5000 SINGLE UNIT TYPE INTERFACE	102801-05	270	NONE	120	NONE	+3.5	180	NONE	120	NONE	+3.5	
D3000 STANDARD MULTIPLE UNIT INSTALLATION VOLTAGE SUPPLIED BY CONTROLLER (DAISY CHAIN)	102801-06	220	330	220	330	+5.0	220	330	220	330	+5.0	MAY BE USED FOR SINGLE UNIT INSTALLATION
SPECIAL DESIGN BY CUSTOMER	102801-01											ORDER DRAWINGS: 102800, 102801, 102835, 102836, 102841, 102770

Figure 1-7. Interface Configuration