HEWLETT-PACKARD

SITE ENVIRONMENTAL REQUIREMENTS

FOR DISC AND DISC/TAPE DRIVES

HEWLETT PACKARD

SITE ENVIRONMENTAL REQUIREMENTS

FOR

DISC/TAPE DRIVES

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Each product listed in Appendix A meets either FCC classification A or B. Refer to the Electromagnetic Emissions heading in the appropriate table to determine the classification of the product.

FOR U.S.A. ONLY

The Federal Communications Commission (in 47 CFR 15.838) has specified that the following notice be brought to the attention of the users of this product.

FEDERAL COMMUNICATIONS COMMISSION
RADIO FREQUENCY INTERFERENCE
STATEMENT

Warning: This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing disc/tape drive in accordance with the specifications in Subpart J of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: reorient the receiving antenna; relocate the equipment with respect to the receiver; move the equipment away from the receiver; plug the equipment into a different branch circuit. If necessary, the user should consult the dealer or authorized field service representative for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: "How to Identify and Resolve Radio-TV Interference Problems". This booklet is available from the U.S. Government Printing Office, Washington, DC 20402. Stock No. 004-000-00345-4.

FEDERAL COMMUNICATIONS COMMISSION
RADIO FREQUENCY INTERFERENCE
STATEMENT

Warning: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

INTRODUCTION

SECTION I

GENERAL INFORMATION

This manual provides information regarding the environmental requirements of Hewlett-Packard disc/tape drives. These include operating and nonoperating (storage, transport or power down) requirements as well as recommended limits. Section II provides a generic description of each environmental item and Section III provides general information on site planning. Appendices A and B contain the specific environmental requirements, operational specifications and operational characteristics for each specific HP disc/tape drive.

Note: This manual applies only to HP disc/tape drives listed in Appendices A and B.

The environmental requirements cover both the actual physical location of the disc/tape drive and the associated area. While Hewlett-Packard provides consultation on the site environmental requirements, the scheduling, planning, preparation and verification of a site environment suitable for installation of a Hewlett-Packard disc/tape drive is the customer's responsibility. Hewlett-Packard Sales and Support Personnel are available during the pre-installation period to assist the customer.

The information in this manual covers only Hewlett-Packard disc/tape drives and accessories. The customer is responsible for meeting the site environmental requirements for the rest of the system components. If the disc/tape drive is to be installed on Hewlett-Packard computer equipment, appropriate site preparation documentation, including environmental requirements, will be provided for each system component.

Environmental requirements are those items required to ensure that HP disc/tape drives meet the published operational characteristics. Each environmental item has a specific measurable parameter or information that affects the operational characteristics of a HP disc/tape drive. Continual operation of the disc/tape drive outside the limits of the recommended environmental limits may result in degradation of disc/tape drive operation. The following items are considered environmental requirements:

- Temperature
- Humidity
- Shock
- Vibration
- Altitude
- Electromagnetic Susceptibility
- Power
- Contaminants
- Cooling Requirements
- Tilting

Contaminants (page 2-6) as yet have no measurable parameters except as rated for the disc/tape drive particulate filter. Chemical contaminants that can corrode disc/tape drive components are presently being researched by Hewlett-Packard. Operating a Hewlett-Packard disc/tape drive in an environment known to contain significant amounts of the listed contaminants will lead to disc/tape drive malfunctions requiring extensive servicing. Hewlett-Packard therefore recommends to our customers that HP disc/tape drives not be stored or operated in areas that contain the contaminants listed in Section 2 under corrosive contaminants.

CUSTOMER RESPONSIBILITY

The customer is responsible for furnishing all labor and materials for site preparation, site maintenance, conformance to local codes, and the compatibility of Hewlett-Packard products with local laws, codes and licenses. The customer is solely responsible for establishing and maintaining the site requirements specified at the site planning meeting. Failures resulting from such unspecified environmental or physical phenomena are not covered by warranty or maintenance agreement (examples include, but are not limited to, unusual shock or electrical damage, accident, fire or water damage, neglect, air conditioning failure, humidity control failure, damages during transportation by customer or causes other than ordinary use, or toxic or corrosive chemicals present in the air).

CUSTOMER ENGINEERING SERVICES

HP offers complete on-site customer engineering maintenance service on a world-wide basis. Charges for this service, quoted as a basic monthly maintenance charge (BMMC), are among the lowest in the industry, contributing to the low overall cost of ownership associated with the purchase of an HP disc/tape drive.

Provisions of the BMMC require compliance with the specifications and/or recommendations listed in this site environmental requirements manual unless escalation procedures are implemented. Conditions that are identified as having a detrimental effect on disc/tape drive performance (e.g., corrosive gases, noisy or unstable power source, etc.) must be corrected prior to installation.

For further details, contact your nearest Hewlett-Packard Sales and Support Office.

ENVIRONMENTAL REQUIREMENTS

SECTION II

INTRODUCTION

The quality and reliability features of a product must be developed early in the product design stage and carried through the manufacturing process. Hewlett-Packard seeks to design and build the finest quality and reliability into our products starting at the bread-board design stage.

Type testing is where a group of units are tested and the results of that testing is used to represent that particular product.

Due to the length of testing time, and in some cases the increased stress levels applied to the product, it is not practical to test each and every product manufactured to every environmental specification. However, certain tests are performed on each product as it completes the manufacturing cycle. This testing ensures that the product sold is as good as the product that was environmentally tested.

EFFECTS OF CLIMATE

All HP Disc/Tape Drives can operate in an environment suitable for human occupancy as long as moisture will not condense within the environment and room air does not contain chemical contaminants which may degrade disc/tape drive components. Along with the environment in which the disc/tape drive operates, the effects of outside temperature, humidity, altitude and other regional characteristics must be taken into consideration. For instance:

- At higher altitudes, the efficiency of a cooling fan decreases because of reduced air density. Consider keeping the disc/tape drive enclosure at a lower temperature to compensate for the reduced air density at the disc/tape drive air intake vents.
- In locations where extremes of temperature and humidity prevail, consider the effects of such conditions on the disc/tape drive when the main power is shut down. For instance, in northern regions, the effects of winter nighttime temperatures should be considered when the main power is shut off.
- In warm, humid regions, a fungus growth prevention program should be considered.
- In shoreline installations, the disc/tape drive site may require special air conditioners, dehumidifiers, and other items to reduce high humidity and corrosive salt in the air.

Reliability and performance are at maximum when operated within the recommended temperature and humidity range. See recommended temperature and relative humidity limits in Appendix A.

VIBRATION AND SHOCK

Vibration can cause slow degradation of mechanical parts and, when severe, can cause data errors in disc/tape drives; hence it should be avoided or controlled. Also, mechanical connections such as PCA connectors and cable connectors may be affected. The best preventive measure is to build the site away from vibration-generating sources, such as heavy industrial machinery (stamp mills, etc.). Care in handling the disc/tape drives will also avoid problems resulting from sudden shock. See vibration and shock requirements in Appendix A.

Random vibration is superior as a test technique in that all product resonances can be excited simultaneously. This is especially necessary with products whose performance characteristics are statistical in nature and can only be measured over a period of time, such as disc and tape drives. It is impractical to do a long duration single frequency test at every frequency. In addition, a sweep through the frequency range does not give adequate statistics for problem frequencies. Only random vibration offers both thoroughness and timeliness.

Some environments contain vibration at discrete frequencies whereas other environments contain broadband vibrations. Random vibration test and measurement techniques work for both environments. A frequency spectrum reveals the nature and magnitude of the vibration environment and can be compared directly to the spectra in this specification.

Random vibration testing has been used extensively in military and aerospace applications but does not have widespread use in commercial markets due to the high cost of test equipment. In our continuing effort to build quality products, the cost alone cannot justify a compromised test program. Because it is relatively new in this market, some explanation of terms and concepts is appropriate.

Random vibration is vibration whose magnitude is not specified for any given instant of time. The instantaneous magnitude of a random vibration is specified only by probability distribution functions giving probable fraction of the total time that the magnitude lies within a specified frequency range. Random vibration contains no periodic nor quasi-periodic constituents.

The magnitude of this distribution is measured in power spectral density, or PSD, which is the limiting mean square acceleration per unit bandwidth. It is measured in g^2/Hz and reveals how much energy is applied at a particular frequency.

A site can be qualified by comparing a frequency spectrum of the intended environment to the product specification spectra. The environment should be under the specification at every frequency. Exceptions will be evaluated on a case-by-case basis.

Figures 2-1 through 2-4 are the unpackaged operating and nonoperating vibration profiles used to test most HP disc/tape drives. The vibration test verifies the disc/tape drive's operational and mechanical integrity. Appendix A refers to the appropriate figure where applicable.

Figure 2-5 is the unpackaged operating and nonoperating shock profile used to test most HP disc/tape drives. The shock test also verifies the disc/tape drive operational and mechanical integrity. Appendix A indicates the maximum acceleration levels at which no data loss will occur and no operator intervention will be required.

ALTITUDE

Altitude must be considered for operating conditions. In the operating environment, the lower air density at extremely high altitudes may be insufficient to provide adequate cooling to the disc drive which may decrease performance and/or reliability. See altitude requirements in Appendix A.

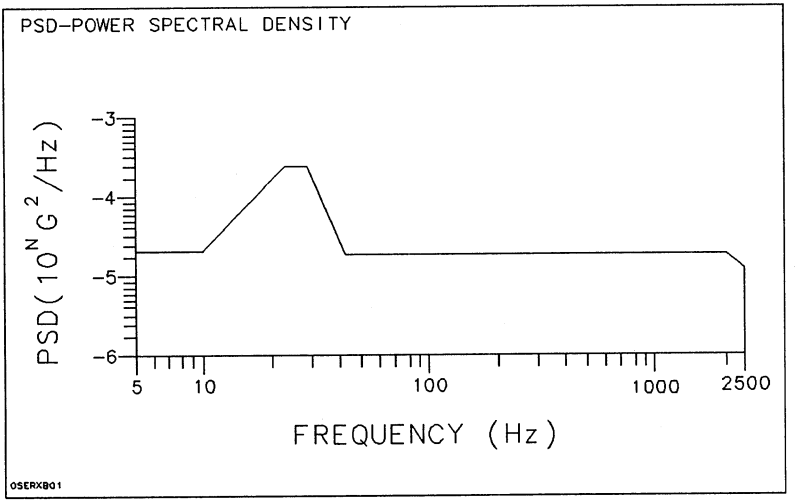

Figure 2-1. Random Vibration Profile 1: Operating

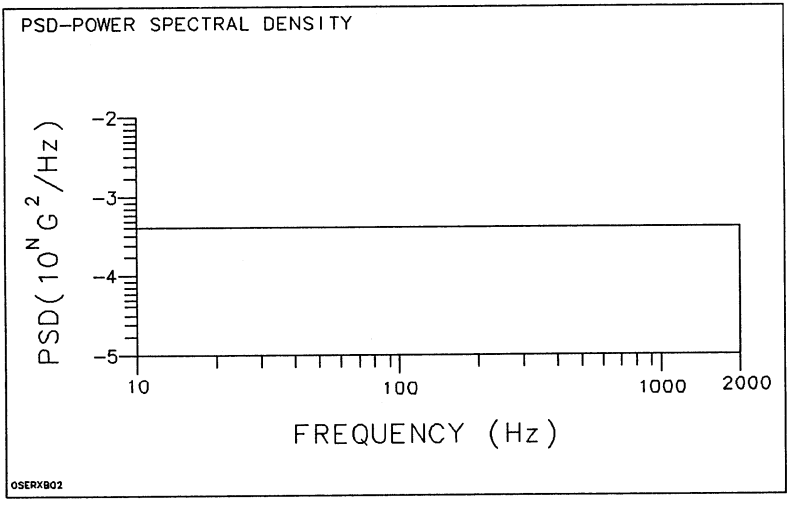

Figure 2-2. Random Vibration Profile 2: Nonoperating

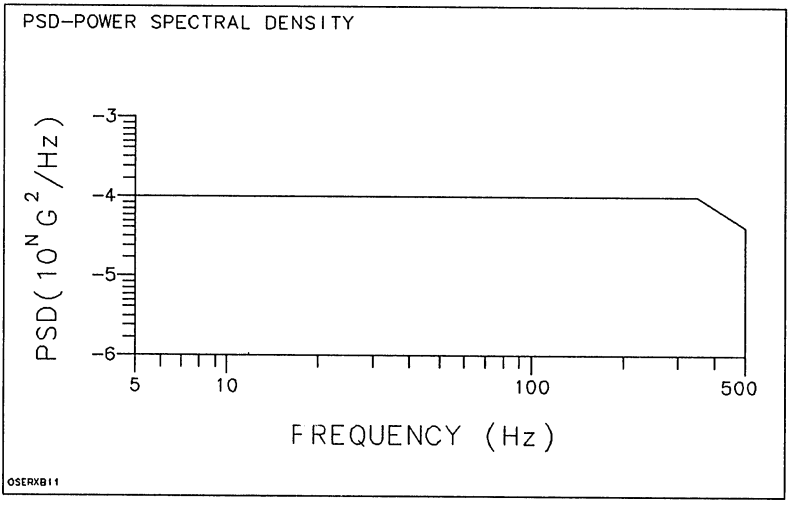

Figure 2-3. Random Vibration Profile 3: Operating

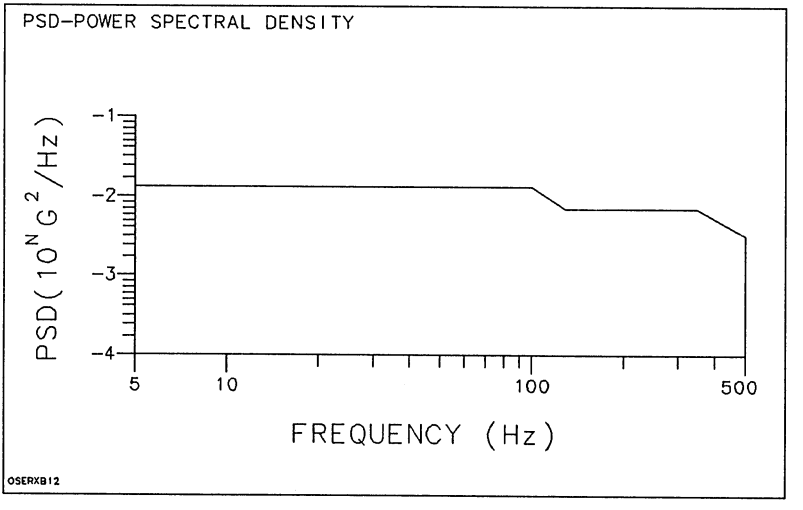

Figure 2-4. Random Vibration Profile 4: Nonoperating

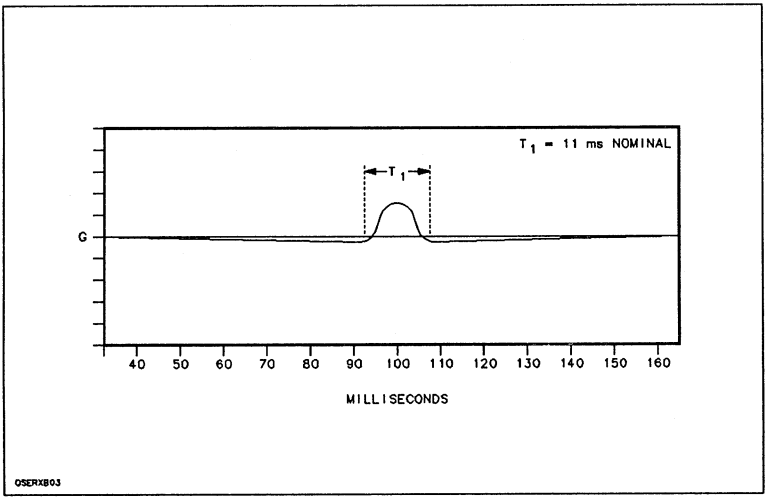

Figure 2-5. Shock Profile: Operating and Nonoperating

ELECTROMAGNETIC SUSCEPTIBILITY

INTRODUCTION

Every reasonable attempt is made to make Hewlett-Packard products resistant to electromagnetic interference (EMI). However, in order to minimize the possibility of experiencing difficulty it may be necessary to take unique steps. This may include but not be limited to the following:

- Improved grounding techniques.
- Placing the disc/tape drive in a grounded screen enclosure.
- Placing grounded copper screens on all windows.

RADIATED INTERFERENCE SUSCEPTIBILITY

Electronic equipment, including disc/tape drives, may exhibit unacceptable behavior if operation is attempted in environments where electromagnetic fields exist, such as near radio and TV transmitting towers, or near radar installations as found at airports. If radiated electromagnetic fields are suspected, or verified (such as by direct measurement using spectrum analyzers or field strength meters), precautions should be taken to shield the disc/tape drive products from the electromagnetic field.

CONDUCTED INTERFERENCE SUSCEPTIBILITY

Radio frequency noise may be introduced into a disc/tape drive through the ac power line as well as through the air as an electric field. Power line conditioners and line filters are very effective in eliminating conducted radio frequency interference (RFI).

ELECTROSTATIC DISCHARGE

Electrostatic discharge, commonly known as static electricity, may cause alteration of data, improper operation or electronic failure. Carpeting, low humidity, and leather-soled shoes may all contribute to unacceptable electrostatic fields. If static discharges are detected (as when touching door knobs, or metallic objects), humidifiers, antistatic mats and other antistatic procedures should be implemented.

MAGNETIC SUSCEPTIBILITY

Disc/tape drives, and magnetic media (tapes, floppy discs and removable disc packs), may all exhibit destruction of stored data if exposed to magnetic fields. Keep all magnetic materials away from magnetic media and recording devices.

POWER LINE IRREGULARITIES

In some geographic areas, available power that is used for the disc/tape drive may experience excessive voltage sags, surges, transients, outages, or other irregularities that are unacceptable for reliable disc/tape drive operation. Therefore, a power quality survey must be conducted. The results of the survey should be analyzed for correct voltage, current, phase, the absence of detrimental power line transients, and conducted interference that can cause a malfunction to occur as a disc/tape drive out-of-specification operation. If any item does not meet HP disc/tape drive requirements, corrective action must be taken to correct the situation. Power line irregularities may be divided into the following categories:

a. Line Dropout. The power distribution network may lose power for short periods of time. HP disc/tape drives recover gracefully from short duration line dropouts. To insure that long duration power line dropout will not affect the constant operation of any electrical device, an uninterruptible power supply (UPS) would be required. Line conditioners and regulators will not help in this situation.

b. Over or Under Voltage. Fluctuations from the nominal line voltage are experienced as the result of equipment being turned on or off both within the immediate vicinity and also over the entire power distribution network. A power failure many miles away may cause voltage fluctuations. In a worst case situation, (e. g. brown out), a UPS is one example of a device that can provide uninterrupted power.

c. Line Transients. Just as radio frequency noise may be transmitted over the ac power line, electrical noise may also be evidenced at the ac power outlet. Line transients may result in interrupted operation, blown fuses, or electrical failure. The surge waveforms used to test HP disc/tape drive power line transient response are shown in figure 2-6. The waveforms are described in the IEEE "Guide on Surge Voltages in AC Circuits up to 600V, Final Draft."

d. Neutral to Ground Noise. This is the noise exhibited between the neutral and ground lines.

e. Ground to Ground Noise. This is the noise exhibited between the disc/tape drive ground and ground earth.

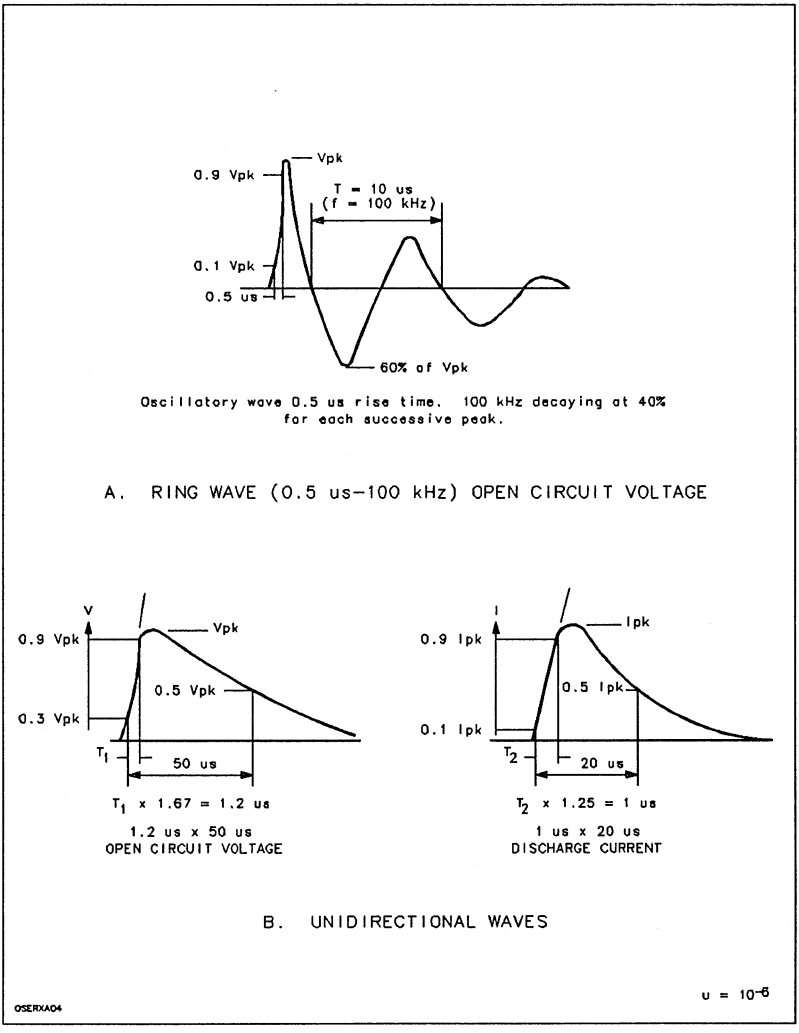

Figure 2-6. Surge Voltage Waveforms

f. Power Line Distortion. This is an undesired change in the original signal waveform that results in an unfaithful representation of the desired waveform. Waveform clipping is one example of this type of distortion. Noise in the form of extraneous signals superimposed on the desired waveform is not defined as distortion.

Power line conditioners may be helpful in regulating and conditioning (removing transients) ac power. Problems associated with power line irregularities are often very difficult to diagnose due to the unpredictable and intermittent nature of the problem.

CONTAMINANTS

Contaminants consist primarily of particulates or corrosives. Both may be airborne in atmospheric dust as a complex mixture of smokes, mists, fumes, dry granular particles, and fibers. The components of any mixture may consist of soot and smoke, silica, clay, organic materials, and metallic fragments. A sample may also include living organisms such as mold spores and bacteria. These components vary with locality, season of the year, direction and strength of the wind, and proximity of dust sources. Size of the particles also varies with differing conditions. Figure 2-7 shows size ranges of typically encountered airborne particles and figure 2-8 shows the relationship between some particles and the gap between the flying heads and oxide coating in a disc/tape drive. Avoid operation in particularly dusty areas, e.g., factory floors, sawmills, etc.

PARTICULATE CONTAMINANTS

Particulate contaminants consist primarily of dust particles which are of various physical compositions. These particles present a clear abrasive hazard to a disc/tape drive if introduced into the operating environment. In some instances, the particles are conductive and can short-circuit wiring in the disc/tape drives when an excessive amount accumulates. Also, film-forming particles and residues cause connector problems.

In environments that contain hydrocarbons, particulate accumulation on the printed circuit assemblies (PCA's) causes an increase in the internal disc/tape drive temperature. Continual accumulations of particulates eventually prevent the disc/tape drive from maintaining the correct amount of cooling on the PCA's. This causes the disc/tape drive to operate beyond the specified temperature range and a malfunction may occur as an out-of-specification operation.

The particulate upper limit is expressed as the arithmetic mean value in micrograms per cubic metre ($\mu g/m^3$) or micrograms per square centimetre per 30 days ($\mu g/cm^2/30$ days). If particulate limits are not available for a product, the limits will not be listed in the table for that product. Operating an HP disc/tape drive at the upper limit may require an increase in the number of times the absolute filter must be changed resulting in an increased basic monthly maintenance charge (BMMC).

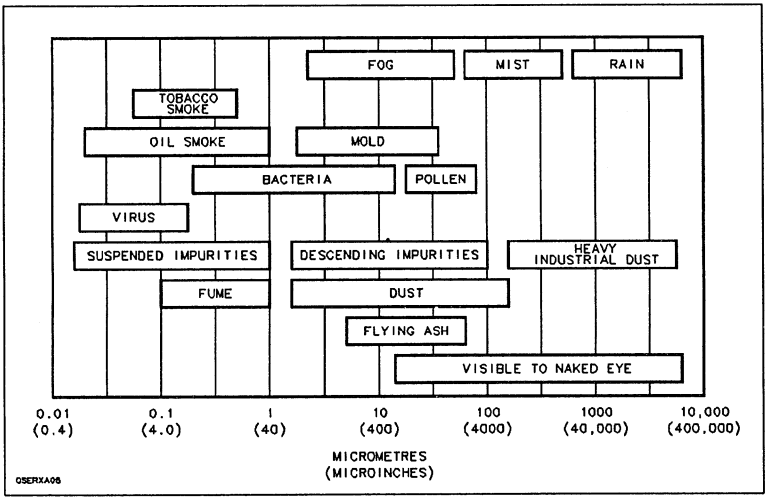

Figure 2-7. Size of Common Air Contaminants

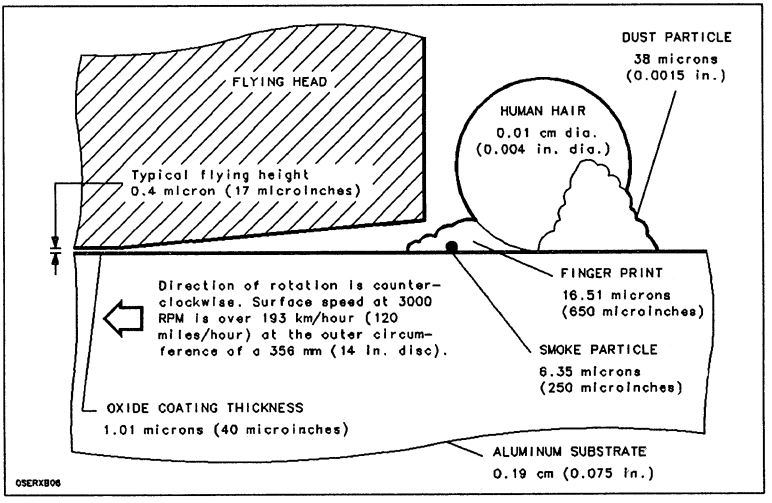

Figure 2-8. Contaminant Sizes Relative to Disc/Head Spacing

CORROSIVE CONTAMINANTS

Corrosion is a complex form of material deterioration and is generally defined as the destruction of material by chemical or electrochemical reaction with its environment. Some effects of corrosion in disc/tape drives are the destruction of magnetic surfaces on discs and tapes, deterioration of plastics used in the equipment, and general degradation of conformal coatings on printed circuit assemblies (PCA's). Many common problems can be avoided by isolating the disc/tape drive from contaminant producing machinery. Examples of this type are office copiers, milling machines, and equipment that produce corrosive vapors or particulates. However, in areas where the atmosphere contains large amount of various corrosive contaminants, more drastic measures must be taken to ensure clean air in the environment where the disc/tape drive is used. Most environments are corrosive to some degree. Examples are air and moisture; fresh, distilled, or salt water; urban and industrial atmospheres; steam and other gases such as chlorine, ammonia, hydrogen sulfide, sulfur dioxide, and fuel gases; mineral acids such as hydrochloric, sulfuric, and nitric. In general, inorganic materials are more corrosive than organic. For example, corrosion in the petroleum industry is due more to sodium chloride, sulfur, hydrochloric and sulfuric acids, and water than to oil, naphtha, or gasoline.

Corrosive environments such as that found in steel, acid, and paper manufacturing industries usually preclude the use of filtered ambient air for forced convection cooling. Corrosives generally cannot be filtered out by normal filtration methods, and the techniques that must be used are complex and costly. In these cases, the disc/tape drives must be enclosed in a highly controlled environment.

Although the term "environment" as used here refers only to atmospheric contaminants, there is a strong link between corrosion rates and temperature and humidity conditions. Many corrosion processes (film thickness buildup, etc.) accelerate rapidly at high humidities and temperatures. This means that corrosive environments that possess high temperatures and humidities should be of particular concern. The following are typical corrosive contaminants.

- Sulfur Dioxide. Sulfur dioxide is generally considered the most corrosive of the common contaminant gases. In combination with water, it forms sulfurous acid mist, an active and rapidly corrosive compound. It is known to produce molecular separation in polymers, and to cause spots on microfilm materials. This acid is found in industrial environments and causes deterioration of disc surfaces.

- Total Oxidants. The presence of strong oxidizing gases in the atmosphere, particularly ozone, is known to be potentially harmful to any organic material. The damaging effects most often encountered are the cross linking of elastomers, the cracking of stressed rubber, and the oxidation of silver.

- Hydrogen Sulfide. Hydrogen sulfide is a rapid corrosive agent, particularly to copper and silver. Hydrogen sulfide is a common atmospheric contaminant found near oil fields, sulfur springs, and marshy areas, and occasionally is emitted from industrial or sewage treatment activities.

- Ammonia. In sufficient concentrations, ammonia has been found to cause cracking of stressed brass, decrease insulation resistance, and increase loss factor in certain insulators.

- Halogens. Halogens are chemical elements that are fairly corrosive. The halogens are: fluorine, bromine, chlorine, and iodine. Halogens react strongly with metals and hydrogen to form halides. The metal halides are solid water-soluble salts such as table salt (sodium chloride). Halogens usually occur in salt deposits and sea water environments. Halogens (and their compounds) are widely used in medicine, photographic films, sanitation processes, disinfectants, insecticides, some textile processes, paints, bleaches and plastics.

COOLING REQUIREMENTS

A fan, internal to the disc/tape drive, provides adequate ventilation when the disc/tape drive is operated in the appropriate environment. To obtain maximum efficiency, allow the required clearances between the front and rear of the disc/tape drive. Air conditioning may be required to maintain the correct temperature. Install required air conditioning before installation of a HP disc/tape drive. See temperature and cooling requirements in Appendix A.

TILTING

Tilting the disc/tape drive more than the specified angle may result in longer seek times or no seek at all. These seek times may be greater than the specified seek time. See tilting requirements in Appendix A.

SITE PLANNING

SECTION III

3-1. INTRODUCTION

The purpose of site planning is to provide an optimum environment for computer products. By providing this optimum environment the customer will receive maximum satisfaction and success. As stated in the specification tables (refer to Appendix A), continually operating a product at an extreme of the environmental requirements can reduce the product reliability.

Since Hewlett-Packard is dedicated to customer satisfaction we have provided a set of recommended environmental specification for a majority of the products listed in Appendix A. By providing an environment that fits within the range of the recommended environmental specifications, the customer should receive maximum long term trouble free operation of their HP products.

3-2. ENVIRONMENTAL SPECIFICATIONS

Three different specifications are given for most environmental requirements.

- Recommended Specifications
- Operating Specifications
- Nonoperating Specifications

Recommended specifications are those specifications that Hewlett-Packard, through experience has determined will provide the maximum long-term success to our customers.

For those products in Appendix A that do not have a recommended specification for one of the environmental specifications it is recommended to the customers that they provide an environment that fits into the mid range of the operating specifications, where practical.

Operating specifications are those specifications that Hewlett-Packard, through *type testing*, has determined provides a safe (survival) operating range for the product. It also must be understood that continual operation at the extremes of this operating range results in stress on the the product and can result in early failure or less reliable operation. All possible combinations of stresses have not been type tested. The results of simutaneously applying worst case extremes of several environmental parameters are unpredictable.

Nonoperating specifications are designated limits for transit and storage of the product. Type testing has been completed to ensure that the HP product will operate when installed, if these nonoperating specifications have not been exceeded.

3-3. ENVIRONMENTS

There are basically two environments where Hewlett-Packard disc and disc/tape drives should be operated. The first is the controlled computer room environment. This environment is a physical area where all environmental elements (i. e. temperature, humidity, power, etc.) are controlled to fit the recommended specifications of the disc drives 100 percent of the time. Disc drives such as the HP 792X, HP 7933 and HP

7935 should be operated in this type of environment. These disc drives are typically connected to large computer systems that require this environmental control for maximum reliability. Under certain circumstances certain members of the HP 791X family fit into this category.

The second environment can be defined as the general office environment where personnel work on a full time basis and where environmental elements are subject to greater variations (within the recommended ranges) than those in a controlled computer room. Although they have the same recommended specifications as the HP 793X, members of the HP 791X and HP 794X series are typically operated in the environment with the following recommendations. It is recommended that the customer make every effort to reduce all adverse affects on the disc drive. This should include, but not be limited to, clean power, reduced temperature and humidity swings and reducing the circumstances where electrostatic discharge can cause reliability problems.

While many Hewlett-Packard disc drives have been operated successfully in environmental circumstances not optimally suited for reliable operations, there have also been circumstances where reliability has been adversely effected.

It is Hewlett-Packard's goal that our customers be highly successful in the use of our products. We therefore highly recommend that the time, energy and effort be made to provide a benign environment for our products. It will be to the long term benefit of our customers.

3-4. ACOUSTICS

There are two methods of specifying acoustic emissions: sound pressure level and sound power level. Sound pressure level is most commonly quoted because it yields a number significantly lower than sound power level. The disadvantage in comparing sound pressure levels is that the values are dependent upon test methods and measurement distances. For example, if sound pressure is measured from a long distance, the result is a very low number, although the product may be producing a lot of noise.

Sound power levels take measurement distance and method into account and yield the actual noise level emitted by the product. Sound pressure levels result from measuring only what reaches the sound meter. The only number valid to use for product comparisons is sound power level.

Where applicable, both numbers are quoted in the specification tables (Appendix A) to indicate the difference between the two numbers. Sound pressure numbers quoted are an average of nine points that lie on a parallelepiped whose surfaces are one metre from every product boundary.

APPENDIX A
HEWLETT-PACKARD
DISC/TAPE DRIVE SPECIFICATIONS

Table A-1. HP 7907A Disc Drive Specifications

PRODUCT SPECIFICATIONS AND CHARACTERISTICS

NOTE

The following information stipulates the operating specifications and characteristics of this device/subsystem when installed and operated within the limits specified under ENVIRONMENTAL REQUIREMENTS found elsewhere in this table.

Operating Specifications

DISC DRIVE OPERATING SPECIFICATIONS

Average controller overhead time:	4.0 ms
Average seek time:	30.0 ms
Average rotational delay:	8.5 ms
Average time to transfer 1 kbyte (at 625 kbytes/sec):	1.8 ms
Total average transaction time (excluding system overhead):	44.3 ms
Disc performance index:	22.6*

**Maximum disc transactions per second, for 1 kbyte transfers, less system overhead. (Refers to fundamental disc performance; true I/O rates are application dependent and must take into account system overhead, including the individual system configuration specifications.)*

DISC DRIVE DATA CAPACITY (formatted)

Item	Data Bits Per	Data Bytes Per	Sectors Per	Tracks Per	Heads Per
Byte	8				
Sector	2048	256			
Track	131,072	16,384	64		
Head	82,182,144	10,272,768	40,128	627	
Removable	164,364,288	20,545,536	80,256	1254	2
Total	328,728,576	41,091,072	160,512	2508	4

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-1. HP 7907A Disc Drive Specifications (cont.)

PHYSICAL CHARACTERISTICS

Weight	
Net:	24.9 kg (55 lb)
Shipping:	29.1 kg (64.2 lb)
Dimensions	
Height (with feet):	180.3 mm (7.1 in.)
Height (without feet):	174.1 mm (6.9 in.)
Width:	325.1 mm (12.8 in.)
Depth (includes HP-IB connector):	487.7 mm (19.2 in.)
Service Clearance Needed	
Front:	177.8 cm (7 in.)
Rear:	10.2 cm (4 in.)
Left side:	0 cm (0 in.)
Right side:	0 cm (0 in.)

Operating Characteristics

POWER CHARACTERISTICS

Voltages (true RMS):	
115V setting;	100V, 115V, 120V, single phase (inclusive tolerance range is 90V to 132V)
230V setting;	230V, 240V, single phase (inclusive tolerance range is 180V to 264V)
Frequency:	47.5 to 66 Hz
Maximum Power (during spin up):	
115V setting;	200 Watts (90V, 60Hz)
230V setting;	200 Watts (180V, 60Hz)
Typical Power:	
115V setting;	145 Watts (115V, 60Hz)
230V setting;	145 Watts (230V, 50Hz)
Maximum Current (occurs during spin-up):	
115V setting;	3.0A (true RMS at 90V, 60Hz)
230V setting;	1.7A (true RMS at 180V, 50Hz)
Typical Current:	
115V setting;	1.7A (true RMS at 115V, 60Hz)
230V setting;	1.0A (true RMS at 230V, 50Hz)

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-1. HP 7907A Disc Drive Specifications (cont.)

Line Dropout:	No effect on performance; no operator intervention required for dropout equal to or less than 1/2 cycle(s) of the ac line frequency (20 ms, 50 Hz; 16.7 ms, 60 Hz).

HEAT DISSIPATION

Maximum (during spin up):	200 Watts (683 Btu/hr; 172 Kcals/hr)
Typical:	145 Watts (495 Btu/hr; 125 Kcals/hr)

ACOUSTIC EMISSIONS

Average sound pressure level ($\overline{L}_{pA}$):	54 dB(A)
Sound power level (L_{WA}):	67 dB(A)

ELECTROMAGNETIC EMISSIONS

Radiated and conducted interference:

- HP 7907 -- For U.S.A., meets FCC docket 20780 for Class A computing peripheral devices.
- HP 7907 -- for Europe, meets VDE 0871 for Level B computing devices. FTZ licensed on some HP systems. Refer to your local sales representative for more information.

Magnetic operating:	<5 gauss on all surfaces
Magnetic nonoperating:	<5.25 milligauss at 4.6m (15 ft) on all surfaces

SAFETY

- CSA certified to CSA 22.2 No. 154.
- Meets all applicable safety standards of IEC 380 and IEC 435.
- UL listed to UL 114 and UL 478.

TILT

When mounted using an HP 19507A Rackmount Kit, the HP 7907 shall meet all performance specifications throughout a 360° rotation. Shock and vibration testing has not been performed on the HP 7907 while being tilted.

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-1. HP 7907A Disc Drive Specifications (cont.)

ENVIRONMENTAL REQUIREMENTS

Note: The environmental specifications listed herein apply when this device is not connected to a Hewlett-Packard (HP) system. When this device is connected with HP systems, the more stringent environmental and performance specifications listed for any single HP device within the HP system are applicable and supersede these specifications.

The following specifications were type-tested under controlled conditions. Hewlett-Packard maintains an active program of auditing production products to ensure these specifications remain true when products are again tested under the same conditions. The limits of these specifications do not represent optimum for long, trouble-free operation and are specifically not recommended for maximum customer satisification. The recommended conditions are stated separately where appropriate.

POWER REQUIREMENTS

Voltages (true RMS):	
115V setting;	100V, 115V, 120V, single phase (inclusive tolerance range is 90V to 132V)
230V setting;	230V, 240V, single phase (inclusive tolerance range is 180V to 264V)
Frequency:	47.5 to 66 Hz
Maximum Power:	
115V setting (during spin up);	270 Voltamps (90V, 60Hz)
230V setting;	306 Voltamps (230V, 50Hz)
Typical Power:	
115V setting;	195 Voltamps (90V, 60Hz)
230V setting;	230 Voltamps (230V, 50Hz)
Maximum Current (occurs during spin-up):	
115V setting;	3.0A (true RMS at 90V, 60Hz)
230V setting;	1.7A (true RMS at 180V, 50Hz)
Typical Current:	
115V setting;	1.7A (true RMS at 115V, 60Hz)
230V setting;	1.0A (true RMS at 230V, 50Hz)
Line Surge and Sag:	80% and 120% typical line voltage for 30 sec. 70% and 130% typical line voltage for 0.5 sec.
Line Dropout:	Must not exceed 1/2 cycle, 10 ms at 50 Hz or 1/2 cycle 8.3 ms at 60 Hz.

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-1. HP 7907A Disc Drive Specifications (cont.)

TEMPERATURE

Recommended operating range:	20°C to 25.5°C (68°F to 78°F)
Operating range:	10°C to 40°C (50°F to 104°F)
Nonoperating range:	-40°C to 75°C (-40°F to 167°F)
Maximum rate of change:	20°C (36°F) per hour

HUMIDITY

Operating:	5% to 95% relative humidity, noncondensing
Nonoperating:	5% to 95% relative humidity, noncondensing

VIBRATION*

Operating (See Figure 2-3)	Random vibration with power spectral density (PSD) of 0.0001 g^2/Hz from 5 to 350 Hz; -6 dB/octave from 350 to 500 Hz; PSD of 0.00005 g^2/Hz at 500 Hz.
Nonoperating (See Figure 2-4)	Random vibration with power spectral density (PSD) of 0.015 g^2/Hz from 5 to 100 Hz; -6 dB/octave from 100 to 137 Hz; PSD of 0.008 g^2/Hz from 137 to 350 Hz; -6 dB/ octave from 350 to 500 Hz; PSD of 0.0039 g^2/Hz at 500 Hz.

SHOCK*

Recommended operating range:	<1.0g
Operating:	2 g maximum at 11 ms, half sine waveform
Nonoperating:	20 g maximum at 11 ms, half sine waveform

*Shock and Vibration specifications assumes the product is in an upright position

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-1. HP 7907A Disc Drive Specifications (cont.)

ALTITUDE

Operating:	maximum 3 000 m (9,840 ft)
Nonoperating:	maximum 15 000 m (49,200 ft)

ELECTROMAGNETIC SUSCEPTIBILITY OPERATING RANGE

Radiated:	14 kHz to 1 GHz, <1 V/m
Recommended limit:	<0.5 V/m
Conducted:	30 Hz to 50 kHz, <3 V rms
Recommended limit:	<1 V rms
	50 kHz to 400 MHz, <1V peak-to-peak
Recommended limit:	<0.5 peak-to-peak
Electrostatic Discharge:	<15 kV
Recommended limit:	<5 kV
Magnetic:	<1 gauss, 47.5 to 190 Hz
Power line transients (per IEEE Standard P587.1/F):	
Oscillatory wave (100 kHz ringing wave);	<1.5 kV and <50 A (open circuit voltage)
Recommended limit:	<500V
Unidirectional wave (one 20 us wide pulse);	<1.0 kV and <100 A (open circuit voltage)
Recommended limit:	<500V

Table A-2. HP 7911, 7912 and 7914 Disc/Tape Drives Specifications

OPERATING SPECIFICATIONS

DISC DRIVE

	7911/7912	7914
Average controller overhead time:	4.0 ms	4.0 ms
Average seek time:	27.1 ms	28.1 ms
Average rotational delay:	8.3 ms	8.3 ms
Average time to transfer 1 kbyte:	1.2 ms	1.2 ms
Total average transaction time (excluding system overhead):	40.6 ms	41.6 ms
Disc performance index:	24.6*	24.0*

**Maximum disc transactions per second, for 1 kbyte transfers, less system overhead.*

Refers to fundamental disc performance; true I/O rates are application dependent and must take into account system overhead, including the individual system configuration specifications.

TAPE DRIVE

Speed

Read/write:	152.4 cm/s (60 in./s)
Search:	228.6 cm/s (90 in./s)

Data Transfer Rate

System dependent (35 kbytes/s maximum)

OPERATING CHARACTERISTICS

DISC DRIVE DATA CAPACITY (formatted)

Item	Data Bits Per	Data Bytes Per	Sectors Per	Tracks Per
Byte	8			
Word	16	2		
Sector	2,048	256		
Track	131,072	16,384	64*	
Head (7911,7912)	74,973,184	9,376,148	36,608	572*
Head (7914)	150,994,944	18,874,368	73,728	1,152*
HP 7911#	224,919,552	28,114,944	109,824	1,716
HP 7912#	524,812,228	65,601,536	256,256	4,004
HP 7914#	1,056,964,608	132,120,576	516,096	8,064

* Total number of tracks per 7911/7912 head is 582, and total number of tracks per 7914 head is 1,164. Eight tracks are used as spares for defective track allocation and two are used for maintenance tracks on all models. The 7914 has two additional tracks reserved for future use. Total number of sectors per track is 65, with one used as a spare.

\# The HP 7911, HP 7912, and HP 7914 utilize two heads per surface.

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-2. HP 7911, 7912 and 7914 Disc/Tape Drives Specifications (continued)

TAPE DRIVE DATA CAPACITY (HP 88140S/88140SC, 150 ft)

Item	Data Bits Per	Data Bytes Per	Data Words Per	Sectors Per	Tracks Per
Byte	8				
Word	16	2			
Block	8,192	1,024	512		
Track	8,372,224	1,046,528	523,264	1,022	
Cartridge	133,955,584	16,744,448	8,372,224	16,352*	16

*Total number of blocks per 150 ft. cartridge is 16,624 with 32 of them utilized as spares and 240 of them used as maintenance blocks.

TAPE DRIVE DATA CAPACITY (HP 88140L/88140LC, 600 ft)

Item	Data Bits Per	Data Bytes Per	Data Words Per	Sectors Per	Tracks Per
Byte	8				
Word	16	2			
Block	8,192	1,024	512		
Track	33,488,896	4,186,112	2,093,056	4,088	
Cartridge	535,822,336	66,977,792	33,488,896	65,408**	16

*Total number of blocks per 600 ft. cartridge is 65,776 with 128 of them utilized as spares and 240 of them used as maintenance blocks.

HEAT DISSIPATION

700 watts (2389 Btu/hr) maximum

ELECTROMAGNETIC EMISSIONS

Radiated and conducted interference:

- HP 7911/HP 7912/HP 7914 P/R-- For U.S.A., designed to meet FCC docket 20780 for Class A computing peripheral devices.
- HP 7911/HP 7912/HP 7914 P/R-- For Europe, designed to meet VDE 0871 for Level A computing devices. FTZ licensed on some HP systems. Refer to your local sales representative for more information.
- HP 7911/HP 7912/HP 7914 R-- The rackmount version is intended for installation in an overall product that will affect the emissions characteristics. It is recommended that end-use products be tested for RFI emissions.

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-2. HP 7911, 7912 and 7914 Disc/Tape Drives Specifications (continued)

Magnetic nonoperating:	<2 milligauss at 2m (7 ft) on all surfaces
Magnetic operating:	<5 gauss at any surface

ACOUSTIC EMISSIONS

HP 791X P Models average sound pressure level ($\overline{L_{pA}}$):	54 dB(A)
HP 791X P Models sound power level (L_{wA}):	68 dB(A)
HP 791X R Models--not specified due to a variety of rackmount configurations	

SAFETY

- HP 7911/HP 7912/HP 7914 P/R -- CSA certified to CSA 22.2 No. 154
- HP 7911/HP 7912/HP 7914 P/R -- Meet all applicable safety standards of IEC 380 and IEC 435.
- HP 7911/HP 7912/HP 7914 P -- UL listed to UL 114 and UL 478.
- HP 7911/HP 7912/HP 7914 R -- UL recognized to UL 114 and UL 478.

PHYSICAL CHARACTERISTICS

Dimensions	HP 7911R/7912R/7914R	HP 7911P/7912P/7914P
Height:	See figure A-2.	720 mm (28.3 in.)
Width:	See figure A-2.	354 mm (14.0 in.)
Depth:	See figure A-2.	711 mm (28.0 in.)
Weight		
Net:	67.2 kg (148 lb)	85.4 kg (188 lb)
Shipping:	89.9 kg (198 lb)	117.1 kg (258 lb)

POWER CHARACTERISTICS

Voltage:	100, 120, 220, 240V; +5%,-10%
Frequency:	50 Hz, 60 Hz; +10%, -5%*
Phase:	Single
Current:	8 amperes maximum at 120 Vac, 60 Hz
Power:	700 watts maximum
Line dropout:	No effect on performance; no operator intervention required for dropout equal to or less than one-half cycle of the ac line frequency (10.6 ms, 50 Hz; 8.3 ms, 60 Hz).

ENVIRONMENTAL REQUIREMENTS

Note: The environmental specifications listed herein apply when this device is not connected to a Hewlett-Packard (HP) system. When this device is connected with HP systems, the more stringent environmental and performance specifications listed for any single HP device within the HP system are applicable and supersede these specifications.

The following specifications were type-tested under controlled conditions. Hewlett-Packard

*The HP 7911/HP 7912/HP 7914 Disc/Tape Drives require a pulley and belt change when changing between 50 Hz and 60 Hz.

Table A-2. HP 7911, 7912 and 7914 Disc/Tape Drives Specifications (continued)

maintains an active program of auditing production products to ensure these specifications remain true when products are again tested under the same conditions. The limits of these specifications do not represent the optimum for long, trouble-free operation and are specifically not recommended for maximum customer satisification. The recommended conditions are stated separately where appropriate.

TEMPERATURE

Recommended operating range:	20°C to 25.5°C (68°F to 78°F)
Operating range:	10°C to 40°C (50°F to 104°F)
Nonoperating range:	-40°C to 60°C (-40°F to 140°F)
Maximum rate of change:	10°C (18°F) per hour

HUMIDITY

Operating:	20% to 80% relative humidity, noncondensing and with a maximum of 0.015 kg of water per kg of dry air. For example, this is equivalent to a maximum of 80% relative humidity at 24°C (75°F), a maximum of 50% relative humidity at 32°C (90°F), or a maximum of 32% relative humidity at 40°C (104°F).
Nonoperating:	10% to 90% relative humidity, noncondensing, and with wet bulb temperature not to exceed 25.6°C (78°F). For example this is equivalent to a maximum of 90% relative humidity at 27°C (81°F), a maximum of 50% relative humidity at 34°C (93°F), or a maximum of 32% relative humidity at 40°C (104°F).

VIBRATION

Operating: (See Figure 2-1) R Models Only	Random vibration with power spectral density (PSD) of 2.5 X 10^{-5} g^2/Hz from 5 to 10 Hz; 7.5 dB/octave from 10 to 25 Hz; PSD of 2.5 X 10^{-4} g^2/Hz from 25 to 30 hz; -24 dB/octave from 30 to 40 Hz; PSD of 2.5 X 10^{-5} g^2/Hz from 40 to 2000 Hz; -9.3 dB/octave from 2000 to 2500 Hz; PSD of 1.25 x 10^{-5} g^2/Hz at 2500 Hz.
Operating: P Models Only	Random vibration with power spectral density (PSD) of 9 X 10^{-6} g^2/Hz from 5 to 2500 Hz.
Nonoperating (See Figure 2-2)	Random vibration with power spectral density of 0.0005 g^2/Hz from 10 to 2000 Hz.

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-2. HP 7911, 7912 and 7914 Disc/Tape Drives Specifications (continued)

SHOCK

Recommended operating range:	<0.67 g's
Operating:	2g maximum at 11 ms, half sine waveform

ALTITUDE

Operating:	maximum 4 600 m (15,000 ft)
Nonoperating:	maximum 15 000 m (49,200 ft)

ELECTROMAGNETIC SUSCEPTIBILITY OPERATING RANGE

This disc drive has been successfully type tested under conditions of radiated and conducted interference. Operation at levels exceeding these may result in degraded performance and is not covered under warranty.

Radiated:	14 kHz to 1 GHz, up to 3 V/m
Recommended limit:	14 kHz to 1 GHz, <0.5 V/m
Conducted:	30 Hz to 50 kHz, <3V rms
Recommended limit:	<1 V rms
	50 kHz to 400 MHz, <1V peak-to-peak
Recommended limit:	<0.5 V/m
Electrostatic Discharge:	≤12.5 kV
Recommended limit:	<5 kV
Magnetic:	47.5 Hz to 198 Hz,<5 gauss
Power line transients (per IEEE Standard P587.1/F)	
Oscillatory wave (100 kHz ringing wave):	<1.5 kV
Recommended limit:	<500V
Unidirectional wave (one 20 us wide pulse):	<1.0 kV
Recommended limit:	<500V

POWER REQUIREMENTS

Recommended limit:	The daily average not to vary more than ±2% from the correct voltage
Voltage:	100, 120, 220, 240V; +5%,-10%
Frequency:	50 Hz, 60 Hz; +10%, -5%*
Recommended frequency:	47.5 to 52.5 Hz, 57 to 66 Hz
Phase:	Single
Current:	8 amperes maximum at 120 Vac, 60 Hz
Distortion:	5% peak and flat harmonic distortion
Line Surge and Sag:	80% and 120% typical line voltage for 30 sec.
	70% and 130% typical line voltage for 0.5 sec.

***The HP 7911/HP 7912/HP 7914 Disc/Tape Drives require a pulley and belt change when changing between 50 Hz and 60 Hz.**

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-2. HP 7911, 7912 and 7914 Disc/Tape Drives Specifications (continued)

TILT

Can be operated in any position; however, the disc drive drive should not be rotated about its axis (vertical axis for the HP 7914P; horizontal axis for the HP 7914R) at a rate greater than 0.2 radians/second due to gyroscopic effects. Rotation beyond this rate can cause errors which require reinitialization of the media.

COOLING REQUIREMENTS

Allow 76.2 mm (3 in.) in front and behind for adequate air flow.

SYSTEM CONFIGURATIONS **

- Total cable length is limited to one metre per equivalent HP-IB load.
- Each HP 7911, HP 7912, or HP 7914 places one equivalent load on each of the HP-IB lines.
- In addition to the external HP-IB cable provided, each HP 7911, HP 7912, and HP 7914 has an internal 1-metre HP-IB cable that must be considered when configuring the disc drive with a system.

**Consult the appropriate system configuration guide for specific constraints in conjunction with the host CPU.

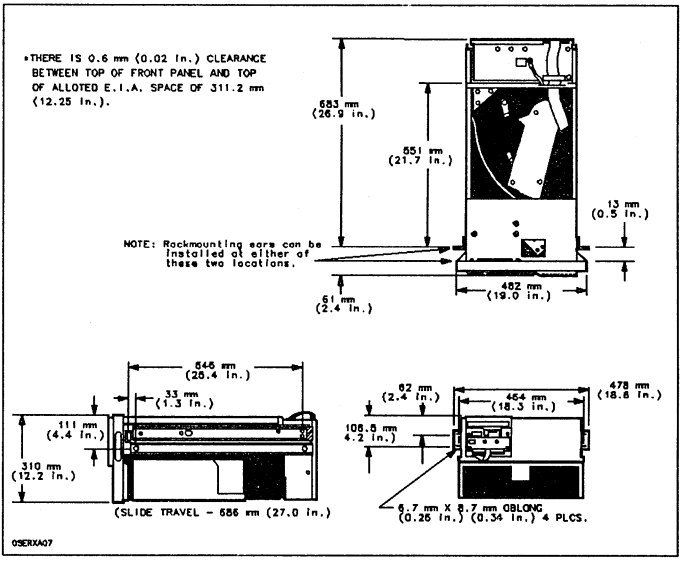

Figure A-1. HP 7911R/HP 7912R,/HP 7914R Dimensions

Table A-3. HP 7914ST Subsystem Specifications

PHYSICAL CHARACTERISTICS

DIMENSIONS

Height:	160.0 cm (62.9 in.)
Width:	63.0 cm (24.8 in.)
Depth:	81.0 cm (31.9 in.)

WEIGHT

Net (total):	
Standard:	269.0 kg (593 lb)
Option 114:	332.5 kg (733 lb)
Shipping (total):	
Standard (2 boxes):	294.8 kg (650 lb)
Option 114 (3 boxes):	383.7 kg (846 lb)

OPERATING CHARACTERISTICS

HEAT DISSIPATION

Standard:	1250 Watts (4266 Btu/hr) maximum
Option 240:	1300 Watts (4437 Btu/hr) maximum
Option 114:	1900 Watts (6485 Btu/hr) maximum
Option 240/114:	1950 Watts (6655 Btu/hr) maximum

ELECTROMAGNETIC EMISSIONS

Radiated and conducted interference:

- HP 7914ST -- For U.S.A., designed to meet FCC docket 20780 for Class A computing peripheral devices.
- HP 7914ST -- for Europe, designed to meet VDE 0871 for Level A computing devices. FTZ licensed on some HP systems. Refer to your local sales representative for more information.

Magnetic nonoperating:	<2 milligauss at 2m (7 ft) on all surfaces
Magnetic operating:	<5 gauss on all surfaces

POWER CHARACTERISTICS

Voltage:	120, 220, 240V, single phase; +5%, -10%
Frequency:	50 Hz or 60 Hz; +10%, -5%*
Power	
Standard:	860 watts maximum at 66 Hz, 120V
Option 114:	1,440 watts maximum at 66 Hz, 120V

***The HP 7914 Disc Drive requires a pulley and belt change when changing between 50 Hz and 60 Hz.**

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-3. HP 7914ST Subsystem Specifications (cont.)

Frequency:	50 Hz or 60 Hz; +10%, -5%*
Power	
Standard:	860 watts maximum at 66 Hz, 120V
Option 114:	1,440 watts maximum at 66 Hz, 120V
Current:	Maximum 16A at 120V, with two HP 7914R Disc Drives Maximum 8A at 220 or 240V, with two HP 7914R Disc Drives
Line Dropout:	No effect on performance; no operator intervention required for dropout equal to or less than one-half cycle of the ac line frequency (10.6 ms, 50 Hz; 8.3 ms, 60 Hz).

ACOUSTIC EMISSIONS

Average sound pressure level ($\overline{L_{pA}}$)[with one 7914 Disc Drive]:	52 dB(A)
Sound power level (L_{wA}) [with one 7914 Disc Drive]:	68 dB(A)
Average sound pressure level ($\overline{L_{pA}}$)[with two 7914 Disc Drives]:	54 dB(A)
Sound power level (L_{pA}) [with two 7914 Disc Drives]:	70 dB(A)

SAFETY

- CSA certified to CSA 22.2 No. 154.
- Meets all applicable safety standards of IEC 380 and IEC 435.
- UL listed to UL 114 and UL 478.

ENVIRONMENTAL REQUIREMENTS

Note: The environmental specifications listed herein apply when this device is not connected to a Hewlett-Packard (HP) system. When this device is connected with HP systems, the more stringent environmental and performance specifications listed for any single HP device within the HP system are applicable and supersede these specifications.

The following specifications were type-tested under controlled conditions. Hewlett-Packard maintains an active program of auditing production products to ensure these specifications remain true when products are again tested under the same conditions. The limits of these specifications do not represent optimum for long, trouble-free operation and are specifically not recommended for maximum customer satisification. The recommended conditions are stated separately where appropriate.

TEMPERATURE

Recommended operating range:	20°C to 25.5°C (68°F to 78°F)
Operating range:	15°C to 32°C (59°F to 90°F)

***The HP 7914 Disc Drive requires a pulley and belt change when changing between 50 Hz and 60 Hz.**

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-3. HP 7914ST Subsystem Specifications (cont.)

HUMIDITY	
Operating:	20% to 80% relative humidity, noncondensing and with maximum of 0.015 kg water per kg of dry air. For example, this is equivalent to a maximum of 80% relative humidity at 24°C (75°F), or a maximum of 50% relative humidity at 32° (90°F).
Nonoperating:	10% to 90% relative humidity, noncondensing, and wet bulb temperature not to exceed 25.6°C (78°F). For example, this is equivalent to a maximum of 90% relative humidity at 27°C (81°F), a maximum of 50% relative humidity at 34° (93°F), or a maximum of 32% relative humidity at 40°C (104°F).
VIBRATION (Tested in vertical axis only)	
Operating (See Figure 2-3)	Random vibration with power spectral density (PSD) of 0.0001 g^2/Hz from 5 to 350 Hz; -6 dB/octave from 350 to 500 Hz; PSD of 0.00005 g^2/Hz at 500 Hz.
Nonoperating (See Figure 2-4)	Random vibration with power spectral density (PSD) of 0.015 g^2/Hz from 5 to 100 Hz; -6 dB/octave from 100 to 137 Hz; PSD of 0.008 g^2/Hz from 137 to 350 Hz; -6 dB/octave from 350 to 500 Hz; PSD of 0.0039 g^2/Hz at 500 Hz.
SHOCK	
Recommended operating range:	<0.67 g's
Operating:	2 g maximum at 11 ms, half sine waveform
ALTITUDE	
Operating:	maximum 3 000m (9,840 ft)
Nonoperating:	maximum 15 000m (49,200 ft)
ELECTROMAGNETIC SUSCEPTIBILITY OPERATING RANGE	
Radiated:	14 kHz to 1 GHz, up to 1 V/m
Recommended limit:	14 kHz to 1 GHz, <0.5 V/m
Conducted:	30 Hz to 50 kHz, up to 3 V/m
	50 kHz to 400 MHz, <1V peak-to-peak
Recommended limit:	<0.5 V/m
Electrostatic Discharge:	<10.0 kV
Recommended limit:	<5kV
Magnetic:	<1 gauss, 47.5 to 198 Hz
Power line transients (per IEEE Standard P587.1/F)	
Oscillatory wave (100 kHz ringing wave):	<1.5 kV and <50 A (open circuit voltage)
Recommended limit:	<500V

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-3. HP 7914ST Subsystem Specifications (cont.)

Unidirectional wave (one 20 us wide pulse):	<1.0 kV and <100 A (open circuit voltage)
Recommended limit:	<500V

POWER REQUIREMENTS

Voltage:	120, 220, 240, single phase; +5%, -10%
Recommended limit:	The daily average not to vary more than ± 2% from the correct voltage
Frequency:	50 Hz or 60 Hz; +10%, -5%**
Recommended Limit:	47.5 to 52.5 Hz; 57 to 63 Hz
Power	
Standard:	860 watts maximum at 66 Hz, 120V
Option 114:	1,440 watts maximum at 66 Hz, 120V
Current:	Maximum 16A at 120V, with two HP 7914R Disc Drives
	Maximum 8A at 220 or 240V, with two HP 7914R Disc Drives
Distortion:	<5% peak and flat harmonic distortion
Line Surge and Sag:	80% and 120% typical line voltage for 30 sec.
	70% and 130% typical line voltage for 0.5 sec.

TILT

This product can be operated in any position; however, the disc drive should not be rotated about the horizontal axis perpendicular to its side at a rate greater than 0.2 radians/second due to gyroscopic effects. Rotation beyond this rate can cause errors which require reinitialization of the media.

**The HP 7914 Disc Drive requires a pulley and belt change when changing between 50 Hz and 60 Hz.

Table A-4. HP 7914TD Disc/Tape Subsystem Specifications

PHYSICAL CHARACTERISTICS

DIMENSIONS

Height:	161.3 cm (63.5 in.)
Width:	63.5 cm (25.0 in.)
Depth:	81.3 cm (32.0 in.)

WEIGHT

Net (total)	
Standard:	272.2 kg (600 lb)
Option 114:	339.4 kg (748 lb)
Shipping (total)	
Standard (2 boxes):	364.7 kg (804 lb)
Option 114 (3 boxes):	454.6 kg (1,002 lb)

OPERATING CHARACTERISTICS

ELECTROMAGNETIC EMISSIONS

Radiated and conducted interference:

- HP 7914TD -- For U.S.A., designed to meet FCC Docket 20780 for Class A computing peripheral devices.
- HP 7914TD -- For Europe, designed to meet VDE 0871 for Level A computing devices. FTZ licensed on some HP systems. Refer to your local sales representative for more information.

Magnetic nonoperating:	$\leq$ 2 milligauss at 2 m (7 ft) on all surfaces
Magnetic operating:	$\leq$ 5 gauss on all surfaces

POWER CHARACTERISTICS

Voltage:	120, 240V, single phase; +5%, -10% 220V, single phase; ±5% 208, 240V, 2 phase; +5%, -10%
Frequency:	50 Hz or 60 Hz; +10%, -5%*

***The HP 7914 Disc Drive requires a pulley and belt change when changing between 50 Hz and 60 Hz.**

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-4. HP 7914TD Disc/Tape Subsystem Specifications (cont.)

Power	
Standard:	925 watts maximum at 66 Hz, 120V
Option 114:	1,625 watts maximum at 66 Hz, 120V
Current:	Maximum 16A at 120V, with two 7914R Disc Drives Maximum 8A at 220 or 240V, with two 7914R Disc Drives
Line Dropout:	No effect on performance; no operator intervention required for dropout equal to or less than one-half cycle of the ac line.

ACOUSTIC EMISSIONS

Average sound pressure level ($\overline{L_{pA}}$) [with two 7914 Disc Drives]:	60 dB(A)
Sound power level (L_{wA}) [with two 7914 Disc Drives]:	76 dB(A)

SAFETY

- CSA certified to CSA 22.2 No. 154.
- Meets all applicable safety standards of IEC 380 and IEC 435.
- UL listed to UL 114 and UL 478.

ENVIRONMENTAL REQUIREMENTS

Note: The environmental specifications listed herein apply when this device is not connected to a Hewlett-Packard (HP) system. When this device is connected with HP systems, the more stringent environmental and performance specifications listed for any single HP device within the HP system are applicable and supersede these specifications.

The following specifications were type-tested under controlled conditions. Hewlett-Packard maintains an active program of auditing production products to ensure these specifications remain true when products are again tested under the same conditions. The limits of these specifications do not represent the optimum for long, trouble-free operation and are specifically not recommended for maximum customer satisification. The recommended conditions are stated separately where appropriate.

TEMPERATURE

Recommended operating range:	20°C to 25.5°C (68°F to 78°F)
Operating range:	10°C to 40°C (50°F to 104°F)
Nonoperating range:	-40°C to 60°C (-40°F to 140°F)
Maximum rate of change:	10°C (18°F) per hour

HUMIDITY

Operating:	20% to 80% relative humidity, noncondensing and with maximum of 0.015kg water per kg of dry air. For example, this is equivalent to a maximum of 80% relative humidity at 24°C (75°F), a maximum of 50% relative humidity at 32° (90°F), or a maximum of 32% relative humidity at 40°C (104°F).

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-4. HP 7914TD Disc/Tape Subsystem Specifications (cont.)

Nonoperating:	10% to 90% relative humidity, noncondensing and wet bulb temperature not to exceed 25.6 °C (78 °F). For example, this is equivalent to a maximum of 90% relative humidity at 27 °C (81 °F), a maximum of 50% relative humidity at 34 ° (93 °F), or a maximum of 32% relative humidity at 40 °C (104 °F).
VIBRATION	
Operating (See Figure 2-1)	Random vibration with power spectral density (PSD) of 2.5 X 10^{-5} g^2/Hz from 5 to 10 Hz; 7.5 dB/octave from 10 to 25 Hz; PSD of 2.5 X 10^{-4} g^2/Hz from 25 to 30 hz; -24 dB/octave from 30 to 40 Hz; PSD of 2.5 X 10^{-5} g^2/Hz from 40 to 2000 Hz; -9.3 dB/octave from 2000 to 2500 Hz; PSD of 1.25 x 10^{-5} g^2/Hz at 2500 Hz.
Nonoperating (See Figure 2-2)	Random vibration with a power spectral density of 0.0005 g^2/Hz from 10 to 2000 Hz.
SHOCK	
Recommended operating range:	<0.67 g's
Operating:	2g maximum at 11 ms, half sine waveform
ALTITUDE	
Operating:	maximum 3 000 m (9840 ft.)
Nonoperating:	maximum 3 000 m (9840 ft.)
ELECTROMAGNETIC SUSCEPTIBILITY OPERATING RANGE	
Radiated:	14 kHz to 1 GHz, up to 1 V/m
Recommended limit:	14 kHz to 1 GHz, <0.5 V/m
Conducted:	30 Hz to 50 kHz, up to 3 V/m
	50 kHz to 400 MHz, ≤1V peak-to-peak
Recommended limit:	<0.5 V/m
Electrostatic Discharge:	≤1.5 kV at the 7970 Tape Drive control panel
Recommended limit:	<750V
Magnetic:	≤1 gauss, 47.5 to 198 Hz
Power line transients (per IEEE Standard P587.1/F)	
Oscillatory wave (100 kHz ringing wave):	≤1.5 kV and ≤50A
Recommended limit:	<500V
Unidirectional wave (one 20 µs wide pulse):	1.0 kV
Recommended limit:	<500V

***The HP 7914 Disc Drive requires a pulley and belt change when changing between 50 Hz and 60 Hz.**

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-4. HP 7914TD Disc/Tape Subsystem Specifications (cont.)

POWER REQUIREMENTS

Voltage:	120, 240V, single phase; +5%, -10% 220V, single phase; ±5% 208, 240V, 2 phase; +5%, -10%
Frequency:	50 Hz or 60 Hz; +10%, -5%*
Recommended limit:	47.5 to 52.5 Hz; 57 to 63 Hz
Power	
Standard:	925 watts maximum at 66 Hz, 120V
Option 114:	1,625 watts maximum at 66 Hz, 120V
Current:	maximum 16A at 120V, with two 7914R Disc Drives maximum 8A at 220 or 240V, with two 7914R Disc Drives
Distortion:	5% peak and flat harmonic distortion
Line Surge and Sag:	80% and 120% typical line voltage for 30 sec. 70% and 130% typical line voltage for 0.5 sec.

***The HP 7914 Disc Drive requires a pulley and belt change when changing between 50 Hz and 60 Hz.**

TILT

The tape drive has not been tested for tilt. The disc drive can be operated in any position; however, the disc drive should not be rotated about the horizontal axis perpendicular to its side at a rate greater than 0.2 radians/second due to gyroscopic effects. Rotation beyond this rate can cause errors which require reinitialization of the media.

Table A-5. HP 7914CT Disc/Tape Drive Specifications

OPERATING SPECIFICATIONS

DISC DRIVE

Average controller overhead time:	4.0 ms
Average seek time:	28.1 ms
Average rotational delay:	8.3 ms
Average time to transfer 1 kbyte:	1.2 ms
Total average transaction time (excluding system overhead):	41.6 ms
Disc performance index:	24.0*

**Maximum disc transactions per second, for 1 kbyte transfers, less system overhead.*

Refers to fundamental disc performance; true I/O rates are application dependent and must take into account system overhead, including the individual system configuration specifications.

TAPE DRIVE

Speed

Read/write:	152.4 cm/s (60 in./s)
Search:	228.6 cm/s (90 in./s)

Data Transfer Rate

System dependent (35 kbytes/s maximum)

OPERATING CHARACTERISTICS

DISC DRIVE DATA CAPACITY (formatted)

Item	Data Bits Per	Data Bytes Per	Sectors Per	Tracks Per
Byte	8			
Word	16	2		
Sector	2,048	256		
Track	131,072	16,384	64*	
Head (7914)	150,994,944	18,874,368	73,728	1,152*
HP 7914#	1,056,964,608	132,120,576	516,096	8,064

* Total number of tracks per 7914 head is 1,164. Eight tracks are used as spares for defective track allocation and two are used for maintenance tracks on all models. The 7914 has two additional tracks reserved for future use. Total number of sectors per track is 65, with one used as a spare.

\# The HP 7914 uses two heads per surface.

Table A-5. HP 7914CT Disc/Tape Drive Specifications (continued)

TAPE DRIVE DATA CAPACITY (HP 88140S/88140SC, 150 ft)

Item	Data Bits Per	Data Bytes Per	Data Words Per	Sectors Per	Tracks Per
Byte	8				
Word	16	2			
Block	8,192	1,024	512		
Track	8,372,224	1,046,528	523,264	1,022	
Cartridge	133,955,584	16,744,448	8,372,224	16,352*	16

*Total number of blocks per 150 ft. cartridge is 16,624 with 32 of them utilized as spares and 240 of them used as maintenance blocks.

TAPE DRIVE DATA CAPACITY (HP 88140L/88140LC, 600 ft)

Item	Data Bits Per	Data Bytes Per	Data Words Per	Sectors Per	Tracks Per
Byte	8				
Word	16	2			
Block	8,192	1,024	512		
Track	33,488,896	4,186,112	2,093,056	4,088	
Cartridge	535,822,336	66,977,792	33,488,896	65,408**	16

*Total number of blocks per 600 ft. cartridge is 65,776 with 128 of them utilized as spares and 240 of them used as maintenance blocks.

HEAT DISSIPATION

700 watts (2389 Btu/hr) maximum

ELECTROMAGNETIC EMISSIONS

Radiated and conducted interference:

- HP 7914CT-- For U.S.A., designed to meet FCC docket 20780 for Class A computing peripheral devices.
- HP 7914CT-- For Europe, designed to meet VDE 0871 for Level A computing devices. FTZ licensed on some HP systems. Refer to your local sales representative for more information.

Magnetic nonoperating: <2 milligauss at 2m (7 ft) on all surfaces
Magnetic operating: <5 gauss at any surface

ACOUSTIC EMISSIONS

Average sound pressure level ($\overline{L}_{pA}$): 50 dB(A)
Sound power level (L_{wA}): 63 dB(A)

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-5. HP 7914CT Disc/Tape Drive Specifications (continued)

SAFETY

- HP 7914CT -- CSA certified to CSA 22.2 No. 154
- HP 7914CT -- Meets all applicable safety standards of IEC 380 and IEC 435.
- HP 7914CT -- UL listed to UL 114 and UL 478.

PHYSICAL CHARACTERISTICS

Dimensions

Height:	720 mm (28.3 in.)
Width:	375 mm (14.8 in.)
Depth:	777 mm (30.8 in. including baffle)

Weight

Net:	109 kg (239 lb)
Shipping:	Disc Drive: 135 kg (297 lb)
	Tape Drive: 9 kg (19 lb)

POWER CHARACTERISTICS

Voltage:	100, 120, 220, 240V; +5%,-10%
Frequency:	50 Hz, 60 Hz; +10%, -5%*
Phase:	Single
Current:	8 amperes maximum at 120 Vac, 60 Hz
Power:	700 watts maximum
Line dropout:	No effect on performance; no operator intervention required for dropout equal to or less than one-half cycle of the ac line frequency (10.6 ms, 50 Hz; 8.3 ms, 60 Hz).

ENVIRONMENTAL REQUIREMENTS

Note: The environmental specifications listed herein apply when this device is not connected to a Hewlett-Packard (HP) system. When this device is connected with HP systems, the more stringent environmental and performance specifications listed for any single HP device within the HP system are applicable and supersede these specifications.

The following specifications were type-tested under controlled conditions. Hewlett-Packard maintains an active program of auditing production products to ensure these specifications remain true when products are again tested under the same conditions. The limits of these specifications do not represent the optimum for long, trouble-free operation and are specifically not recommended for maximum customer satisification. The recommended conditions are stated separately where appropriate.

*The HP 7914CT Disc/Tape Drive require a pulley and belt change when changing between 50 Hz and 60 Hz.

Table A-5. HP 7914CT Disc/Tape Drive Specifications (continued)

TEMPERATURE

Recommended operating range:	20°C to 25.5°C (68°F to 78°F)
Operating range:	10°C to 40°C (50°F to 104°F)
Nonoperating range:	-40°C to 60°C (-40°F to 140°F)
Maximum rate of change:	10°C (18°F) per hour

HUMIDITY

Operating:	20% to 80% relative humidity, noncondensing, with a maximum of 0.015 kg of water per kg of dry air and wet bulb temperature not to exceed 24°C (75°F). For example, this is equivalent to a maximum of 80% relative humidity at 24°C (75°F), a maximum of 50% relative humidity at 32°C (90°F), or a maximum of 27% relative humidity at 40°C (104°F).
Nonoperating:	10% to 90% relative humidity, noncondensing, and wet bulb temperature not to exceed 25.6°C (78°F). For example, this is equivalent to a maximum of 90% relative humidity at 27°C (81°F), a maximum of 50% relative humidity at 34° (93°F), or a maximum of 32% relative humidity at 40°C (104°F).

VIBRATION

Operating:	Random vibration with power spectral density of 9×10^{-6} g^2/Hz from 10 to 2500 Hz.
Nonoperating (See Figure 2-2)	Random vibration with power spectral density of 0.0005 g^2/Hz from 10 to 2000 Hz.

SHOCK

Recommended operating range:	<0.67 g's
Operating:	2 g maximum at 11 ms, half sine waveform

ALTITUDE

Operating:	maximum 4 600m (15,000 ft)
Nonoperating:	maximum 15 000m (49,200 ft)

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-5. HP 7914CT Disc/Tape Drive Specifications (continued)

ELECTROMAGNETIC SUSCEPTIBILITY OPERATING RANGE

This disc drive has been successfully type tested under conditions of radiated and conducted interference. Operation at levels exceeding these may result in degraded performance and is not covered under warranty.

Radiated:	14 kHz to 1 GHz, up to 3 V/m
Recommended limit:	<0.5 V/m
Conducted:	30 Hz to 50 kHz, <3V rms
	50 kHz to 400 MHz, <1V peak-to-peak
Recommended limit:	<0.5 V/m
Electrostatic Discharge:	12.5 kV
Recommended limit:	<5 kV
Magnetic:	47.5 Hz to 198 Hz,<5 gauss
Power line transients (per IEEE Standard P587.1/F)	
Oscillatory wave (100 kHz ringing wave):	1.5 kV
Recommended limit:	<500V
Unidirectional wave (one 20 us wide pulse):	1.0 kV
Recommended limit:	<500V

POWER REQUIREMENTS

Recommended limit:	The daily average not to vary more that ±2% from correct value
Voltage:	100, 120, 220, 240V; +5%,-10%
Frequency:	50 Hz, 60 Hz; +10%, -5%
Recommended limit:	47.5 to 52.5 Hz; 57 to 63 Hz**
Phase:	Single
Current:	8 amperes maximum at 120 Vac, 60 Hz
Distortion:	5% peak and flat harmonic distortion
Line Surge and Sag:	80% and 120% typical line voltage for 30 sec.
	70% and 130% typical line voltage for 0.5 sec.
Neutral-to-Ground Noise:	<10V peak-to-peak
Recommended limit:	<1V peak-to-peak
Ground-to-Ground Noise:	<10V peak-to-peak
Recommended limit:	<1V peak-to-peak

TILT

This product can be operated in any position; however, the disc drive should not be rotated about its vertical axis at a rate greater than 0.2 radians/second due to gyroscopic effects. Rotation beyond this rate can cause errors which require reinitialization of the media.

COOLING REQUIREMENTS

Allow 76.2 mm (3 in.) in front and behind for adequate air flow.

****The HP 7914CT Disc/Tape Drive require a pulley and belt change when changing between 50 Hz and 60 Hz.**

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-5. HP 7914CT Disc/Tape Drive Specifications (continued)

SYSTEM CONFIGURATIONS **

- Total cable length is limited to one metre per equivalent HP-IB load.
- In addition to the external HP-IB cable provided, each HP 7914CT has an internal 1-metre HP-IB cable that must be considered when configuring the disc drive with a system.
- In an HP 7914CT, each controller places one equivalent load on the HP-IB lines.

**Consult the appropriate system configuration guide for specific constraints in conjunction with the host CPU.

Table A-6. HP 7933H, HP 7935H, HP 7933XP, and HP 7935XP Disc Drives Specifications

OPERATING SPECIFICATIONS

	HP 7933XP/ HP 7935XP	HP 7933H HP 7935H
Average controller overhead time:	4.5 ms	3.5 ms
Average seek time:	24.0 ms	24.0 ms
Average rotational delay:	11.1 ms	11.1 ms
Average time to transfer 1 kbyte:	1.0 ms	1.0 ms
Controller cache impact:	-16.6 ms*	0.0 ms*
Total average transaction time (excluding system overhead):	24.0 ms	39.6 ms
Disc performance index:	41.7 **	25.3 **

**The reduction in time is due to the reduced number of seeks required for a disc drive with controller cache. The actual performance improvement on a disc drive will vary, depending on the read hit rate and the read precentage; the listed values are based on a read hit rate of 70% and a read precentage of 70%.*

Hit rate is defined as the number of times the disc drive finds information in cache divided by the number of times the information is requested from the disc drive.

***Average disc transactions per second. Refers to fundamental disc drive performance; actual I/O rates are application dependent and must take into account system overhead, the system configuration, and the locality of data on the disc. The read hit rate and the read precentage will also have a significant impact on performance of the HP 793XP Disc Drive.*

OPERATING CHARACTERISTICS

DATA CAPACITY (formatted)

Item	Data Bits Per	Data Bytes Per	Sectors Per	Tracks Per
Byte	8			
Word	16	2		
Sector	2,048	256		
Track	188,416	23,552	92*	
Surface	248,897,536	31,112,192	121,532	1,321*
Drive	3,235,667,968	404,458,496	1,579,916	17,173

*Total number of tracks per surface is 1,339; six are used as spares for defective track allocation and 12 tracks are used for drive maintenance functions. Total number of sectors per track is 93, with one used as a spare.

HEAT DISSIPATION

1,100 watts (3,754 Btu/hr) average
1,300 watts (4,437 Btu/hr) maximum

Table A-6. HP 7933H, HP 7935H, HP 7933XP and HP 7935XP Disc Drives Specifications (continued)

ELECTROMAGNETIC EMISSIONS

Radiated and conducted interference:	• For U.S.A., designed to meet FCC Docket 20780 for Class A computing peripheral devices. • For Europe, designed to meet VDE 0871 for Level A computing devices. FTZ licensed on some HP systems. Refer to your local sales representative for more information.
Magnetic nonoperating:	<2 milligauss at 2 m (7 ft) on all surfaces
Magnetic operating:	<10 gauss at any surface

ACOUSTIC EMISSIONS

Average sound pressure level ($\overline{L}_{pA}$):	59 dB(A)
Sound power level (L_{wA}):	73 dB(A)

SAFETY

This disc drive meets all applicable safety standards of the following:
IEC 380 and 435
UL 114 and 478
CSA C22.2 no. 154

PHYSICAL CHARACTERISTICS

Dimensions	
Height:	82.5 cm (32.5 in.)
Width:	55.2 cm (21.7 in.)
Depth:	83.4 cm (32.8 in.)
Weight	
Net:	154 kg (340 lb)
Shipping:	192 kg (423 lb)

POWER CHARACTERISTICS

Voltage:	120, 208, 220, 240V; ±10%
Frequency:	47.5 to 63 Hz
Phase:	Single
Power:	1,300 watts maximum
Current (nominal worst case):	

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-6. HP 7933H, HP 7935H, HP 7933XP and HP 7935XP Disc Drives Specifications (continued)

Standard/ Option	Market Area	Voltage (VAC)	Disc Drive (A)	Accessory Outlet (A)	Total
Standard	USA	208	7.6	1.7	9.3
120	USA, Canada	120	13.0	3.0	16.0
210	Canada	208	7.6	1.7	9.3
220 221 222 223	Canada Continental Europe Switzerland Denmark	220	7.4	1.6	9.0
241 242	United Kingdom Australia, New Zealand	240	6.9	1.5	8.4

Line Dropout: No effect on performance; no operator intervention required for dropout equal to or less than one-half cycle of the ac line frequency (10.6 ms, 50 Hz; 8.3 ms, 60 Hz).

ENVIRONMENTAL REQUIREMENTS

Note: The environmental specifications listed herein apply when this device is not connected to a Hewlett-Packard (HP) system. When this device is connected with HP systems, the more stringent environmental and performance specifications listed for any single HP device within the HP system are applicable and supersede these specifications.

The following specifications were type-tested under controlled conditions. Hewlett-Packard maintains an active program of auditing production products to ensure these specifications remain true when products are again tested under the same conditions. The limits of these specifications do not represent the optimum for long, trouble-free operation and are specifically not recommended for maximum customer satisification. The recommended conditions are stated separately where appropriate.

TEMPERATURE

Recommended Operating range:	20°C to 25.5°C (68°F to 78°F)
HP 7933 Operating range:	10°C to 40°C (50°F to 104°F)
HP 7935 Operating range:	10°C to 32°C (50°F to 90°F)
Nonoperating range:	-40°C to 65°C (-40°F to 149°F)
Maximum rate of change:	20°C (36°F) per hour

Table A-6. HP 7933H, HP 7935H, HP 7933XP and HP 7935XP Disc Drives Specifications (continued)

HUMIDITY

Operating:	8% to 80% relative humidity, noncondensing and wet bulb temperature not to exceed 25.6°C (78°F). For example, this is equivalent to a maximum of 80% relative humidity at 28°C (82°F), a maximum of 50% relative humidity at 34° (93°F), or a maximum of 32% relative humidity at 40°C (104°F).
Nonoperating: (Without a media module installed)	5% to 95% relative humidity, noncondensing and wet bulb temperature not to exceed 29.5°C (85°F). For example, this is equivalent to a maximum of 95% relative humidity at 30°C (86°F), a maximum of 50% relative humidity at 39°C (102°F), a maximum of 23% relative humidity at 50°C (122°F), or a maximum of 8% relative humidity at 65°C (149°F).

VIBRATION

Operating (See Figure 2-1)	Random vibration with maximum power spectral density (PSD) of 2.5×10^{-5} g^2/Hz from 5 to 10 Hz; 7.5 dB/octave from 10 to 25 Hz; PSD of 2.5×10^{-4} g^2/Hz from 25 to 30 hz; -24 dB/octave from 30 to 40 Hz; PSD of 2.5×10^{-5} g^2/Hz from 40 to 2000 Hz; -9.3 dB/octave from 2000 to 2500 Hz; PSD of 1.25×10^{-3} g^2/Hz at 2500 Hz.
Nonoperating (See Figure 2-2)	Random vibration with a power spectral density of 0.0005 g^2/Hz from 10 to 2000 Hz.

SHOCK

Recommended Operating range:	<0.67 g's
Operating:	2 g maximum at 11 ms, half sine waveform
Nonoperating (Storage and Transit):	10 g maximum at 11 ms, half sine waveform

ALTITUDE

Operating:	maximum 3 000 m (9,840 ft)
Nonoperating:	maximum 15 000 m (49,200 ft)

ELECTROMAGNETIC SUSCEPTIBILITY OPERATING RANGE

These disc drives have been successfully type tested under conditions of radiated and conducted interference. Operation at levels exceeding these may result in degraded performance and is not covered under warranty.

Radiated:	14 kHz to 1 GHz, ≤2 V/m
Recommended limit:	<0.5 V/m
Conducted:	30 Hz to 50 kHz, <3V rms
	50 kHz to 400 MHz, <1V peak-to-peak

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-6. HP 7933H, HP 7935H, HP 7933XP and HP 7935XP Disc Drives Specifications (continued)

Recommended limit:	<0.5V rms
Electrostatic Discharge:	15 kV
Recommended limit:	<5 kV
Magnetic:	47.5 Hz to 198 Hz, <5 gauss
Power line transients (*per IEEE 587.1/F*):	
Oscillatory wave:	1.5 kV
Recommended limit:	<500V
Unidirectional wave:	1.0 kV
Recommended limit:	<500V

POWER REQUIREMENTS

Recommended limit:	The daily average not to vary more that ±2% from correct voltage
Voltage:	120, 208, 220, 240V; ±10%
Frequency:	47.5 to 63 Hz
Phase:	Single
Current (nominal worst case):	

Standard/ Option	Market Area	Voltage (VAC)	Disc Drive (A)	Accessory Outlet (A)	Total
Standard	USA	208	7.6	1.7	9.3
120	USA, Canada	120	13.0	3.0	16.0
210	Canada	208	7.6	1.7	9.3
220 221 222 223	Canada Continental Europe Switzerland Denmark	220	7.4	1.6	9.0
241 242	United Kingdom Australia, New Zealand	240	6.9	1.5	8.4

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-6. HP 7933H, HP 7935H, HP 7933XP and HP 7935XP Disc Drives Specifications (continued)

Power:	1,300 watts maximum
Distortion:	5% peak and flat harmonic distortion
Power Cords:	See figure A-2 for power cord requirements
Line Surge and Sag:	80% and 120% typical line voltage for 30 sec. 70% and 130% typical line voltage for 0.5 sec.
Neutral-to-Ground Noise:	≤2V peak-to-peak
Recommended limit:	<1V peak-to-peak
Ground-to-Ground Noise:	≤2V peak-to-peak
Recommended limit:	<1V peak-to-peak

COOLING REQUIREMENTS

Allow 50.8 cm (20 in.) in front and 76.2 cm (30 in.) behind for adequate air flow.

SYSTEM CONFIGURATIONS*

- Total cable length is limited to 1 metre per equivalent HP-IB load.
- This disc drive places one equivalent load on each of the HP-IB lines.

**Consult the appropriate system configuration guide for specific constraints in conjunction with the host CPU.*

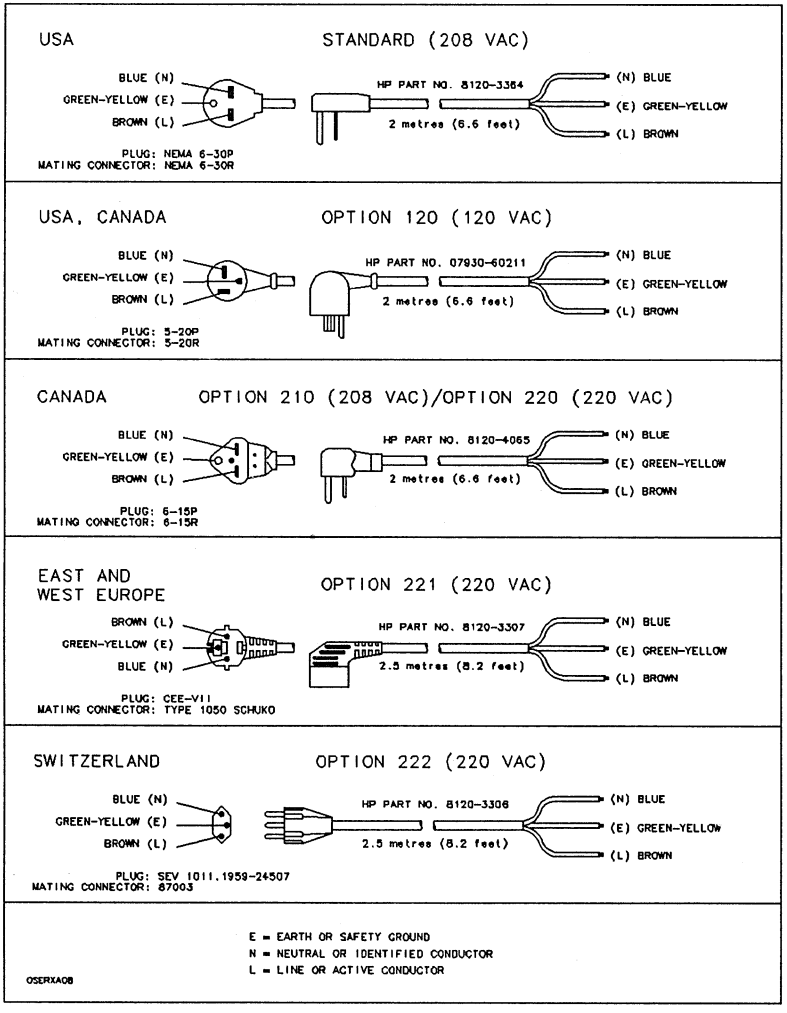

Figure A-2. HP 793X Standard and Optional Power Cords

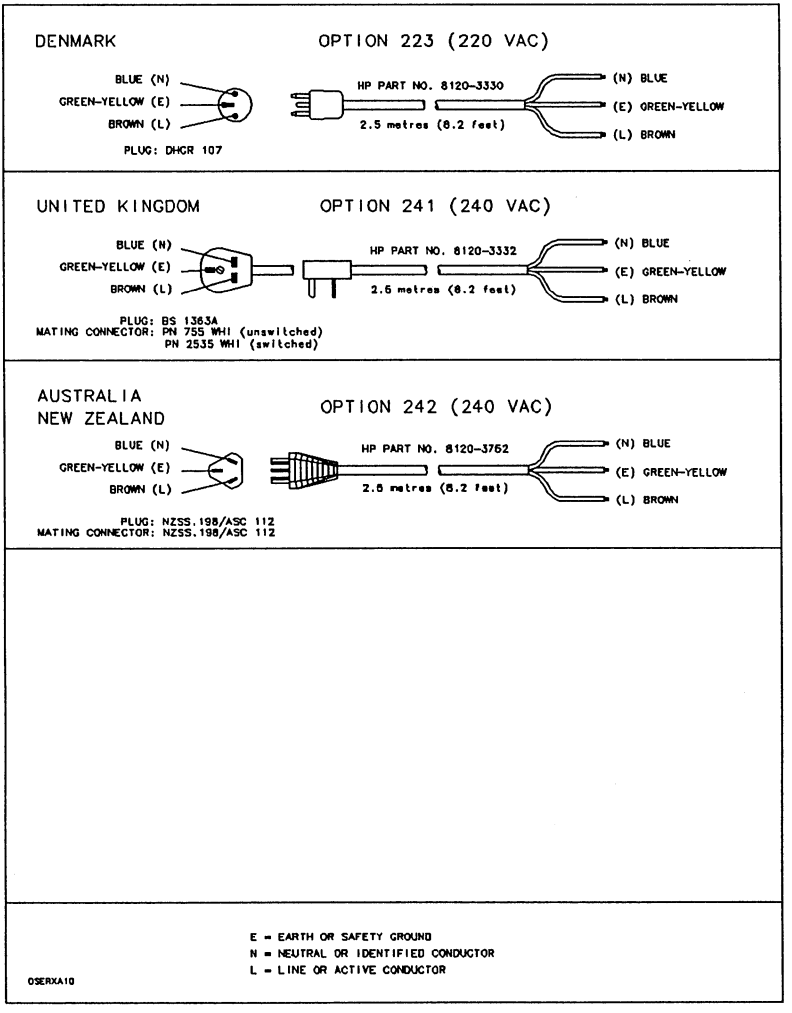

Figure A-2. HP 793X Standard and Optional Power Cords (continued)

Table A-7. HP 97935A Media Module Specifications

ENVIRONMENTAL REQUIREMENTS

Note: The environmental specifications listed herein apply when this device is not connected to a Hewlett-Packard (HP) system. When this device is connected with HP systems, the more stringent environmental and performance specifications listed for any single HP device within the HP system are applicable and supersede these specifications.

The following specifications were type-tested under controlled conditions. Hewlett-Packard maintains an active program of auditing production products to ensure these specifications remain true when products are again tested under the same conditions. The limits of these specifications do not represent the optimum for long, trouble-free operation and are specifically not recommended for maximum customer satisification. The recommended conditions are stated separately where appropriate.

AMBIENT TEMPERATURE

Recommended operating range:	20 °C to 25.5 °C (68 °F to 78 °F)
Operating range:	10 °C to 40 °C (50 °F to 104 °F)
Nonoperating range:	-40 °C to 65 °C (-40 °F to 149 °F)
Maximum rate of change:	20 °C (36 °F) per hour

HUMIDITY

Operating:	8% to 80% relative humidity, noncondensing and wet bulb temperature not to exceed 25.6 °C (78 °F). For example, this is equivalent to a maximum of 80% relative humidity at 28 °C (82 °F), a maximum of 50% relative humidity at 34 ° (93 °F), or a maximum of 32% relative humidity at 40 °C (104 °F).
Nonoperating:	8% to 80% relative humidity, noncondensing and wet bulb temperature not to exceed 25.6 °C (78 °F). For example, this is equivalent to a maximum of 80% relative humidity at 28 °C (82 °F), a maximum of 32% relative humidity at 40 ° (140 °F) or, a maximum of 15% relative humidity at 50 °C (122 °F).

Note: The media module must not be installed if there are signs of moisture condensation in or on the media module.

ALTITUDE

Operating:	maximum 3 000m (9,840 ft)
Nonoperating:	maximum 15 000m (49,213 ft)

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-7. HP 97935A Media Module Specifications

VIBRATION

Operating (See Figure 2-1)	Random vibration with maximum power spectral density (PSD) of 2.5 X 10^{-5} g^2/Hz from 5 to 10 Hz; 7.5 dB/octave from 10 to 25 Hz; PSD of 2.5 X 10^{-4} g^2/Hz from 25 to 30 hz; -24 dB/octave from 30 to 40 Hz; PSD of 2.5 X 10^{-5} g^2/Hz from 40 to 2000 Hz; -9.3 dB/octave from 2000 to 2500 Hz; PSD of 1.25 x 10^{-5} g^2/Hz at 2500 Hz.
Nonoperating (See Figure 2-2)	Random vibration with a power spectral density of 0.0005 g^2/Hz from 10 to 2000 Hz.

SHOCK*

Operating:	2 g maximum at 11 ms, half sine waveform
Nonoperating:	30 g maximum at 11 ms, half sine waveform

* The effect of excessive shock on a media module will be, in decreasing order of severity, head crash, premature failure of spindle and actuator, or error rate.

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-8. HP 7941A and 7945A Disc Drives Specifications

OPERATING SPECIFICATIONS

Average controller overhead time:	10.1 ms
Average seek time:	30 ms
Average rotational delay:	8.3 ms
Average time to transfer 1 kbyte (at 625 kbytes/sec):	2 ms
Total average transaction time (excluding system overhead):	50.4 ms
Disc performance index:	20*

**Maximum disc transactions per second, for 1 kbyte transfers, less system overhead.*

Refers to fundamental disc performance; true I/O rates are application dependent and must take into account system overhead, including the individual system configuration specifications.

DATA CAPACITY (formatted)

Item	Data Bits Per	Data Bytes Per	Sectors Per	Tracks Per	Heads Per
Byte	8				
Sector	2,048	256			
Track	65,536	8,129	32		
Head	63,438,848	7,929,856	30,976	968	
HP 7941A	190,316,544	23,789,568	92,928	2,904	3
HP 7945A	444,071,936	55,508,992	216,832	6,776	7

PHYSICAL CHARACTERISTICS

DIMENSIONS

Height:	130.0 mm (5.1 in.)
Width:	325 mm (12.8 in.)
Depth:	285 mm (11.2 in)

WEIGHT

Net (total):	
Standard:	9.9 kg (21.8 lb)
Shipping (total):	
Standard:	12.9 kg (28.5 lb)

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-8. HP 7941A and HP 7945A Disc Drives Specifications (cont.)

OPERATING CHARACTERISTICS

HEAT DISSIPATION

Maximum:	85 Watts (290 Btu/hr; 73 Kcals/hr)
Typical:	65 Watts (222 Btu/hr; 56 Kcals/hr)

ELECTROMAGNETIC EMISSIONS

Radiated and conducted interference:

- HP 7941A/7945A -- For U.S.A., designed to meet FCC docket 20780 for Class B computing peripheral devices.
- HP 7941A/7945A -- for Europe, designed to meet VDE 0871 for Level B computing devices. FTZ licensed on some HP systems. Refer to your local sales representative for more information.

Magnetic nonoperating:	<2 milligauss at 2m (7 ft) on all surfaces
Magnetic operating:	<5 gauss on all surfaces

POWER CHARACTERISTICS

Voltages (true RMS):

115V Setting;	100V, 115V, 120V, single phase (inclusive tolerance range is 90V to 132V)
230V setting;	220V, 240V, single phase (inclusive tolerance range is 180V to 264V)

Frequency:	47.5-66 Hz
Maximum Power:	115V setting; 85 Watts (90V, 60Hz) 230V setting; 85 Watts (198V, 50Hz)
Typical Power:	115 setting; 65 Watts (115V, 60Hz) 230V setting; 65 Watts (230V, 50Hz)
Maximum Current (occurs during spin-up):	115V setting; 1.6A (true RMS at 90V, 60Hz) 230V setting; 1.0A (true RMS at 180V, 50Hz)
Typical Current:	115V setting; 0.80A (true RMS at 115V, 60Hz) 230V setting; 0.50A (true RMS at 230V, 50Hz)
Line Dropout:	No effect on performance; no operator intervention required for dropout equal to or less than one cycle of the ac line frequency (20.0 ms, 50 Hz; 16.7 ms, 60 Hz).

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-8. HP 7941A and HP 7945A Disc Drives Specifications (cont.)

ACOUSTIC EMISSIONS

Average sound pressure level ($\overline{L}_{pA}$):	41 dB(A)
Sound power level (L_{wA}):	53 dB(A)

SAFETY

- CSA certified to CSA 22.2 No. 154.
- Meets all applicable safety standards of IEC 380 and IEC 435.
- UL listed to UL 114 and UL 478.

ENVIRONMENTAL REQUIREMENTS

Note: The environmental specifications listed herein apply when this subsystem is not connected to a Hewlett-Packard (HP) system. When this subsystem is connected with HP systems, the more stringent environmental and performance specifications listed for any single HP device within the HP system are applicable and supersede these specifications.

The following specifications were type-tested under controlled conditions. Hewlett-Packard maintains an active program of auditing production products to ensure these specifications remain true when products are again tested under the same conditions. The limits of these specifications do not represent the optimum for long, trouble-free operation and are specifically not recommended for maximum customer satisification. The recommended conditions are stated separately where appropriate.

TEMPERATURE

Recommended operating range:	20°C to 25.5°C (68°F to 78°F)
Operating range:	5°C to 45°C (41°F to 113°F)
Nonoperating range:	-40°C to 60°C (-40°F to 140°F)
Maximum rate of change:	10°C (18°F) per hour

HUMIDITY

Operating:	8% to 80% relative humidity, noncondensing, and wet bulb temperature not to exceed 29°C (84°F). For example, this is equivalent to maximum of 80% relative humidity at 32°C (90°F), a maximum of 65% relative humidity at 35°C (95°F), or a maximum of 46% relative humidity at 40°C (104°F).
Nonoperating:	5% to 90% relative humidity, noncondensing and wet bulb temperature not to exceed 29°C (84°F). For example, this is equivalent to a maximum of 95% relative humidity at 30°C (86°F), a maximum of 50% relative humidity at 38° (100°F), a maximum of 32% relative humidity at 45°C (113°F), or a maximum of 10% relative humidity at 60°C (140°F).

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-8. HP 7941A and HP 7945A Disc Drives Specifications (cont.)

VIBRATION

Operating (See Figure 2-3)	Random vibration with power spectral density (PSD) of 0.0001 g^2/Hz from 5 to 350 Hz; -6 dB/octave from 350 to 500 Hz; PSD of 0.00005 g^2/Hz at 500 Hz.
Nonoperating (See Figure 2-4)	Random vibration with power spectral density (PSD) of 0.015 g^2/Hz from 5 to 100 Hz; -6 dB/octave from 100 to 137 Hz; PSD of 0.008 g^2/Hz from 137 to 350 Hz; -6 dB/octave from 350 to 500 Hz; PSD of 0.0039 g^2/Hz at 500 Hz.

SHOCK

Recommended operating range:	<0.5 g's
Operating:	1.5 g maximum at 11 ms, half sine waveform
Nonoperating:	20 g maximum at 11 ms, half sine waveform

ALTITUDE

Operating:	maximum 4 600m (15, 000 ft)
Nonoperating:	maximum 15 000m (49,200 ft)

ELECTROMAGNETIC SUSCEPTIBILITY OPERATING RANGE

Radiated:	14 kHz to 1 GHz, up to 3 V/m
Recommended limit:	<0.5 V/m
Conducted:	30 Hz to 50 kHz, <3 V rms
	50 kHz to 400 MHz, <1V peak-to-peak
Recommended limit:	<0.5 rms
Electrostatic Discharge:	<15.0 kV
Recommended limit:	<5 kV
Magnetic:	<1 gauss, 47.5 to 198 Hz
Power line transients (per IEEE Standard P587.1/F)	
Oscillatory wave (100 kHz ringing wave):	<1.5 kV and <50 A (open circuit voltage)
Recommended limit:	<500V
Unidirectional wave (one 20 us wide pulse):	<1.0 kV and <100 A (open circuit voltage)
Recommended limit:	<500V

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-8. HP 7941A and HP 7945A Disc Drives Specifications (cont.)

POWER REQUIREMENTS

Voltages (true RMS):

115V Setting;	100V, 115V, 120V, single phase (inclusive tolerance range is 90V to 132V)
230V setting;	220V, 240V, single phase (inclusive tolerance range is 180V to 264V)

Frequency:	47.5-66 Hz
Maximum Power:	115V setting; 144 V-A (90V, 60Hz) 230V setting; 198 V-A (198V, 50Hz)
Typical Power:	115 setting; 92 V-A (115V, 60Hz) 230V setting; 115 V-A (230V, 50Hz)
Maximum Current (occurs during spin-up):	115V setting; 1.6A (true RMS at 90V, 60Hz) 230V setting; 1.0A (true RMS at 180V, 50Hz)
Typical Current:	115V setting; 0.80A (true RMS at 115V, 60Hz) 230V setting; 0.50A (true RMS at 230V, 50Hz)
Distortion:	<5% peak and flat harmonic distortion
Line Surge and Sag:	80% and 120% typical line voltage for 30 sec. 70% and 130% typical line voltage for 0.5 sec.

TILT

The drive shall meet all performance specifications when mounted in an upright orientation which maintains the horizontal plane of the device to within +/- 15 degrees of parallel to the horizon.

Table A-8. HP 7941A and HP 7945A Disc Drives Specifications (cont.)

	115V Setting	230V Setting	Phase	Frequency
Operating Voltage (true RMS):	90-132V	180-254V	Single	47.5-66 Hz
Maximum Operating Current (true RMS):	1.6A at 90V	1.0A at 180V	Single	60 Hz
Typical Operating Current (true RMS):	1.15A at 115V	0.70A at 230V	Single	60 Hz
Maximum Operating Power (Volt/Amps):	144VA at 90V	180VA at 180V	Single	60 Hz
Typical Operating Power (Volt/Amps):	132VA at 115V	161VA at 230V	Single	60 Hz
Maximum Operating Power (Heat):	85W at 90V	85W at 180V	Single	60 Hz
Typical Operating Power (Heat):	65W at 115V	65W at 230V	Single	60 Hz

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Table A-9. HP 7942A and 7946A Disc/Tape Drives Specifications

OPERATING SPECIFICATIONS

DISC DRIVE

Average controller overhead time:	10.1 ms
Average seek time:	30 ms
Average rotational delay:	8.3 ms
Average time to transfer 1 kbyte (at 625 kbytes/sec):	2 ms
Total average transaction time (excluding system overhead):	50.4 ms

Disc performance index: 20*

**Maximum disc transactions per second, for 1 kbyte transfers, less system overhead.*

Refers to fundamental disc performance; true I/O rates are application dependent and must take into account system overhead, including the individual system configuration specifications.

TAPE DRIVE

Tape Speed: Read/Write: 60 IPS; Search/Rewind: 90 IPS

Maximum sustained Transfer rate: 34 kbytes/second *

** Maximum sustained transfer rate does not necessarily reflect system throughput, which varies depending upon aplication, file structures, and driver implementation.*

DISC DRIVE DATA CAPACITY (formatted)

Item	Data Bits Per	Data Bytes Per	Sectors Per	Tracks Per	Heads Per
Byte	8				
Sector	2,048	256			
Track	65,536	8,129	32		
Head	63,438,848	7,929,856	30,976	968	
HP 7942A	190,316,544	23,789,568	92,928	2,904	3
HP 7946A	444,071,936	55,508,992	216,832	6,776	7

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-9. HP 7942A and 7946A Disc/Tape Drives Specifications

TAPE DRIVE DATA CAPACITY (formatted)

Item	Data Bits Per	Data Bytes Per	Words Per	Blocks Per	Tracks Per
Byte	8				
Word	16	2			
Block	8,192	1,024	512		
Track					
150ft.	8,372,224	1,046,578	523,264	1,022	
600ft.	33,488,896	4,186,112	2,093,056	4,088	
Cartridge					
150 ft.	133,955,584	16,744,448	8,372,224	16,352	16
600 ft.	535,822,336	66,977,792	33,488,896	65,408	16

PHYSICAL CHARACTERISTICS

DIMENSIONS

Height:	208.0 mm (8.19 in.)
Width:	325 mm (12.79 in.)
Depth:	285 mm (11.22 in)

WEIGHT

Net (total):	
Standard:	15.8 kg (34.8 lb)
Shipping (total):	
Standard:	19.6 kg (43.3 lb)

OPERATING CHARACTERISTICS

HEAT DISSIPATION

Maximum:	125 Watts (427 Btu/hr; 109 Kcals/hr)
Typical:	120 Watts (410 Btu/hr; 103 Kcals/hr)

ELECTROMAGNETIC EMISSIONS

Radiated and conducted interference:

- HP 7942A/7946A -- For U.S.A., designed to meet FCC docket 20780 for Class B computing peripheral devices.
- HP 7942A/7946A -- for Europe, designed to meet VDE 0871 for Level B computing devices. FTZ licensed on some HP

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Table A-9. HP 7942A and HP 7946A Disc Drives Specifications (cont.)

	systems. Refer to your local sales representative for more information.
Magnetic nonoperating:	<2 milligauss at 2m (7 ft) on all surfaces
Magnetic operating:	<5 gauss on all surfaces

POWER CHARACTERISTICS

Voltages (true rms):

115V Setting;	100V, 115V, 120V, single phase (inclusive tolerance range is 90V to 132V)
230V setting;	220V, 240V, single phase (inclusive tolerance range is 180V to 264V)

Frequency:	47.5-66 Hz
Maximum Power:	115V setting; 125 Watts (100V, 60 Hz) 230V setting; 125 Watts (264V, 50 Hz)
Typical Power:	115 setting; 120 Watts (115V, 60 Hz) 230V setting; 120 Watts (230V, 50 Hz)
Maximum Rated Current (occurs during spin-up):	115V setting; 2.3A (true rms at 90V, 60 Hz) 230V setting; 1.3A (true rms at 180V, 50 Hz)
Typical Current:	115V setting; 1.50A (true rms at 115V, 60 Hz) 230V setting; 0.80A (true rms at 230V, 50 Hz)
Line Dropout:	No effect on performance; no operator intervention required for dropout equal to or less than one cycle of the ac line frequency (20.0 ms, 50 Hz; 16.7 ms, 60 Hz).

ACOUSTIC EMISSIONS

Average sound pressure level ($\overline{L}_{pA}$):	40 dB(A)
Sound power level (L_{wA}):	52 dB(A)

SAFETY

- CSA certified to CSA 22.2 No. 154.
- Meets all applicable safety standards of IEC 380 and IEC 435.
- UL listed to UL 114 and UL 478.

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-9. HP 7942A and HP 7946A Disc Drives Specifications (cont.)

ENVIRONMENTAL REQUIREMENTS

Note: The environmental specifications listed herein apply when this device is not connected to a Hewlett-Packard (HP) system. When this device is connected with HP systems, the more stringent environmental and performance specifications listed for any single HP device within the HP system are applicable and supersede these specifications.

The following specifications were type-tested under controlled conditions. Hewlett-Packard maintains an active program of auditing production products to ensure these specifications remain true when products are again tested under the same conditions. The limits of these specifications do not represent optimum for long, trouble-free operation and are specifically not recommended for maximum customer satisification. The recommended conditions are stated separately where appropriate.

TEMPERATURE

Recommended operating range:	20°C to 25.5°C (68°F to 78°F)
Operating range:	5°C to 40°C (41°F to 104°F)
Nonoperating range:	-40°C to 60°C (-40°F to 140°F)
Maximum rate of change:	10°C (18°F) per hour

HUMIDITY

Operating:	20% to 80% relative humidity, noncondensing, and wet bulb temperature not to exceed 29°C (84°F). For example, this is equivalent to maximum of 80% relative humidity at 32°C (90°F), a maximum of 65% relative humidity at 35°C (95°F), or a maximum of 46% relative humidity at 40°C (104°F).
Nonoperating:	5% to 95% relative humidity, noncondensing and wet bulb temperature not to exceed 29°C (84°F). For example, this is equivalent to a maximum of 95% relative humidity at 30°C (86°F), a maximum of 50% relative humidity at 38° (100°F), a maximum of 32% relative humidity at 45°C (113°F), or a maximum of 10% relative humidity at 60°C (140°F).

VIBRATION

Figure 2-1 Operating (See Figure 2-1)	Random vibration with power spectral density (PSD) of 2.5 X 10^{-5} g^2/Hz from 5 to 10 Hz; 7.5 dB/octave from 10 to 25 Hz; PSD of 2.5 X 10^{-4} g^2/Hz from 25 to 30 hz; -24 dB/octave from 30 to 40 Hz; PSD of 2.5 X 10^{-5} g^2/Hz from 40 to 2000 Hz; -9.3 dB/octave from 2000 to 2500 Hz; PSD of 1.25 x 10^{-5} g^2/Hz at 2500 Hz.

Table A-9. HP 7942A and HP 7946A Disc Drives Specifications (cont.)

Nonoperating (See Figure 2-2)	Random vibration with power spectral density of 0.0005 g^2/Hz from 10 to 2000 Hz.

SHOCK

Recommend operating range:	<0.5 g's
Operating range:	1.5 g maximum at 11 ms, half sine waveform
Nonoperating Range:	20 g maximum at 11 ms, half sine waveform

ALTITUDE

Operating:	maximum 4 600m (15,000 ft)
Nonoperating:	maximum 15 000m (49,200 ft)

ELECTROMAGNETIC SUSCEPTIBILITY OPERATING RANGE

Radiated:	14 kHz to 1 GHz, up to 3 V/m
Recommended limit:	<0.5V
Conducted:	30 Hz to 50 kHz, <3 V rms
	50 kHz to 400 MHz, <1V peak-to-peak
Recommended limit:	<0.5V rms
Electrostatic Discharge:	<15.0 kV
Recommended limit:	<7 kV
Magnetic:	<1 gauss, 47.5 to 198 Hz
Power line transients (per IEEE Standard P587.1/F)	
Oscillatory wave (100 kHz ringing wave):	<1.5 kV and <50 A (open circuit voltage)
Recommended limit:	<500V
Unidirectional wave (one 20 us wide pulse):	<1.0 kV and <100 A (open circuit voltage)
Recommended limit:	<500V

Table A-9. HP 7942A and HP 7946A Disc Drives Specifications (cont.)

POWER REQUIREMENTS

Voltages (true rms):	
115V Setting;	100V, 115V, 120V, single phase (inclusive tolerance range is 90V to 132V)
230V setting;	220V, 240V, single phase (inclusive tolerance range is 180V to 264V)
Frequency:	47.5-66 Hz
Maximum Power:	115V setting; 207 V-A (90V, 60 Hz) 230V setting; 234 V-A (180V, 50 Hz)
Typical Power:	115 setting; 173 V-A (115V, 60 Hz) 230V setting; 184 V-A (230V, 50 Hz)
Maximum Current (occurs during spin-up):	115V setting; 2.3A (true rms at 90V, 60 Hz) 230V setting; 1.3A (true rms at 180V, 50 Hz)
Typical Current:	115V setting; 1.50A (true rms at 115V, 60 Hz) 230V setting; 0.80A (true rms at 230V, 50 Hz)
Distortion:	<5% peak and flat harmonic distortion
Line Surge and Sag:	80% and 120% typical line voltage for 30 sec. 70% and 130% typical line voltage for 0.5 sec.

TILT

The drive shall meet all performance specifications when mounted in an upright orientation which maintains the horizontal plane of the device to within +/- 15 degrees of parallel to the horizon.

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-10. HP 7957A and 7958A Disc Drives Specifications

OPERATING SPECIFICATIONS

Average controller overhead time:	3.0 ms
Average seek time (including settling):	29.0 ms
Average rotational delay:	8.3 ms
Average time to transfer 1 kbyte (at 853 kbytes/sec):	1.2 ms
Total average transaction time (excluding system overhead):	41.5 ms
Disc performance index:	24.1*

**Maximum disc transactions per second, for 1 kbyte transfers, less system overhead.*

Refers to fundamental disc performance; true I/O rates are application dependent and must take into account system overhead, including the individual system configuration specifications.

DATA CAPACITY (formatted)

Item	Data Bits Per	Data Bytes Per	Sectors Per	Tracks Per	Heads Per
Byte	8				
Sector	2,048	256			
Track	129,024	16,128	63		
Head	130,701,312	16,337,664	63,819	1,013	
HP 7957A	653,506,560	81,688,320	319,095	5,065	5
HP 7958A	1,045,610,496	130,701,312	510,552	8,104	8

PHYSICAL CHARACTERISTICS

DIMENSIONS

Height:	132 mm (5.2 in.)
Width:	325 mm (12.8 in.)
Depth:	285 mm (11.2 in)

WEIGHT

Net (total):	
Standard:	9.9 kg (21.8 lb)
Shipping (total):	
Standard:	12.9 kg (28.5 lb)

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-10. HP 7957A and HP 7958A Disc Drives Specifications (cont.)

OPERATING CHARACTERISTICS

HEAT DISSIPATION

Maximum:	85 Watts (290 Btu/hr; 73 kcals/hr)
Typical:	65 Watts (222 Btu/hr; 56 kcals/hr)

ELECTROMAGNETIC EMISSIONS

Radiated and conducted interference:

- HP 7957A/7958A -- For U.S.A., designed to meet FCC docket 20780 for Class B computing peripheral devices. These products comply with the limits for a Class B computing device persuant to Subpart J of part 15 fo the FCC Rules. See instructions if interference to radio reception is suspected.
- HP 7957A/7958A -- for Europe, designed to meet EMI level FTZ 1046/84 and provides a Manufacturer's Declaration. Refer to your local sales representative for more information.

Magnetic nonoperating:	<2 milligauss at 2m (7 ft) on all surfaces
Magnetic operating:	<5 gauss on all surfaces

POWER CHARACTERISTICS

Voltages (true RMS):

115V Setting;	100V, 115V, 120V, single phase (inclusive tolerance range is 90V to 132V)
230V setting;	220V, 240V, single phase (inclusive tolerance range is 180V to 264V)

Frequency:	47.5-66 Hz
Maximum Power:	115V setting; 85 Watts (90V, 60Hz) 230V setting; 85 Watts (198V, 50Hz)
Typical Power:	115 setting; 65 Watts (115V, 60Hz) 230V setting; 65 Watts (230V, 50Hz)
Maximum Current (occurs during spin-up):	115V setting; 1.6A (true RMS at 90V, 60Hz) 230V setting; 1.0A (true RMS at 180V, 50Hz)
Typical Current:	115V setting; 0.80A (true RMS at 115V, 60Hz) 230V setting; 0.50A (true RMS at 230V, 50Hz)
Line Dropout:	No effect on performance; no operator intervention required for dropout equal to or less than one cycle of the ac line frequency (20.0 ms, 50 Hz; 16.7 ms, 60 Hz).

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-10. HP 7957A and HP 7958A Disc Drives Specifications (cont.)

ACOUSTIC EMISSIONS

Average sound pressure level ($\overline{L_{pA}}$):	41 dB(A)
Sound power level (L_{wA}):	52 dB(A)

SAFETY

- CSA certified to CSA 22.2 No. 154.
- Meets all applicable safety standards of IEC 380 and IEC 435.
- UL listed to UL 114 and UL 478.

ENVIRONMENTAL REQUIREMENTS

Note: The environmental specifications listed herein apply when this subsystem is not connected to a Hewlett-Packard (HP) system. When this subsystem is connected with HP systems, the more stringent environmental and performance specifications listed for any single HP device within the HP system are applicable and supersede these specifications.

The following specifications were type-tested under controlled conditions. Hewlett-Packard maintains an active program of auditing production products to ensure these specifications remain true when products are again tested under the same conditions. The limits of these specifications do not represent the optimum for long, trouble-free operation and are specifically not recommended for maximum customer satisification. The recommended conditions are stated separately where appropriate.

TEMPERATURE

Recommended operating range:	20°C to 25.5°C (68°F to 78°F)
Operating range:	5°C to 45°C (41°F to 113°F)
Nonoperating range:	-40°C to 65°C (-40°F to 149°F)
Maximum rate of change:	10°C (18°F) per hour

HUMIDITY

Operating:	8% to 90% relative humidity, noncondensing, and wet bulb temperature not to exceed 29°C (84°F).
Nonoperating:	8% to 90% relative humidity, noncondensing and wet bulb temperature not to exceed 29°C (84°F).

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-10. HP 7957A and HP 7958A Disc Drives Specifications (cont.)

VIBRATION

Operating (See Figure 2-3)	Random vibration with power spectral density (PSD) of 0.0001 g^2/Hz from 5 to 350 Hz; -6 dB/octave from 350 to 500 Hz; PSD of 0.00005 g^2/Hz at 500 Hz.
Nonoperating (See Figure 2-4)	Random vibration with power spectral density (PSD) of 0.015 g^2/Hz from 5 to 100 Hz; -6 dB/octave from 100 to 137 Hz; PSD of 0.008 g^2/Hz from 137 to 350 Hz; -6 dB/octave from 350 to 500 Hz; PSD of 0.0039 g^2/Hz at 500 Hz.

SHOCK

Recommended operating range:	<.067g
Operating:	2 g maximum at 11 ms, half sine waveform
Nonoperating:	20 g maximum at 11 ms, half sine waveform

ALTITUDE

Operating:	maximum 4 500m (14,800 ft.)
Nonoperating:	maximum 15 000m (49,200 ft)

ELECTROMAGNETIC SUSCEPTIBILITY OPERATING RANGE

Radiated Electric Field:	14 kHz to 1 GHz, up to 3 V/m
Recommended limit:	<0.5 V/m
Conducted:	30 Hz to 50 kHz, <3 Vrms
	50 kHz to 400 MHz, <1V peak-to-peak
Recommended limit:	<0.5 Vrms
Electrostatic Discharge:	<15.0 kV
Recommended limit:	<5 kV
Magnetic Field:	<1 gauss, 47.5 to 198 Hz
Power line transients (per IEEE Standard P587.1/F)	
Oscillatory wave (100 kHz ringing wave):	<1.5 kV and <50 A (open circuit voltage)
Recommended limit:	<500V
Unidirectional wave (one 20 us wide pulse):	<1.0 kV and <100 A (open circuit voltage)
Recommended limit:	<500V

COOLING REQUIREMENTS

Allow 76.2 mm (3 in.) in front and behind for adequate air flow

Table A-10. HP 7957A and HP 7958A Disc Drives Specifications (cont.)

POWER REQUIREMENTS

Voltages (true RMS):

115V Setting;	100V, 115V, 120V, single phase (inclusive tolerance range is 90V to 132V)
230V setting;	220V, 240V, single phase (inclusive tolerance range is 180V to 264V)
Frequency:	47.5-66 Hz
Maximum Power:	115V setting; 184 V-A (90V, 60Hz) 230V setting; 230 V-A (200V, 50Hz)
Typical Power:	115 setting; 92 V-A (115V, 60Hz) 230V setting; 115 V-A (230V, 50Hz)
Maximum Current (occurs during spin-up):	115V setting; 1.6A (true RMS at 90V, 60Hz) 230V setting; 1.0A (true RMS at 180V, 50Hz)
Typical Current:	115V setting; 0.80A (true RMS at 115V, 60Hz) 230V setting; 0.50A (true RMS at 230V, 50Hz)
Distortion:	<5% peak and flat harmonic distortion
Line Surge and Sag:	80% and 120% typical line voltage for 30 sec. 70% and 130% typical line voltage for 0.5 sec.

TILT

The drive shall meet all performance specifications when mounted in an upright orientation which maintains the horizontal plane of the device to within +/- 15 degrees of parallel to the horizon.

Table A-10. HP 7957A and HP 7958A Disc Drives Specifications (cont.)

	115V Setting	230V Setting	Phase	Frequency
Operating Voltage (true RMS)	90-132V	180-254V	Single	47.5-66 Hz
Maximum Operating Current (true RMS)	1.6A at 90V	1.0A at 180V	Single	60 Hz
Typical Operating Current (true RMS)	1.15A at 115V	0.70A at 230V	Single	60 Hz
Maximum Operating Power (Volt/Amps)	184VA at 90V	230VA at 180V	Single	60 Hz
Typical Operating Power (Volt/Amps)	92VA at 115V	115VA at 230V	Single	60 Hz
Maximum Operating Power (Heat)	85W at 90V	85W at 180V	Single	60 Hz
Typical Operating Power (Heat)	65W at 115V	65W at 230V	Single	60 Hz

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Table A-11. HP 7936H, HP 7937H, HP 7936XP and HP 7937XP Disc Drives Specifications

PRODUCT SPECIFICATIONS AND CHARACTERISTICS

NOTE

The following information stipulates the operating specifications and characteristics of this device/subsystem when installed and operated within the limits specified under ENVIRONMENTAL REQUIREMENTS found elsewhere in this table.

Operating Specifications

DISC DRIVE OPERATING SPECIFICATIONS

	HP 7936XP/ HP 7937XP	HP 7936H HP 7937H
Average controller overhead time:	1.2 ms	<1.0 ms
Average seek time:	20.5 ms	20.5 ms
Average rotational delay:	8.3 ms (±10%)	8.33 ms
Average time to transfer 1 kbyte (at 1 Mbytes/sec):	1.0 ms	1.0 ms
Controller cache impact:	-15.8 ms*	0.0 ms*
Total average transaction time (excluding system overhead):	15.2 ms	30.80 ms
Disc performance index:	66.0 **	32.5**

**The reduction in time is due to the reduced number of seeks required for a disc drive with controller cache. The actual performance improvement on a disc drive will vary, depending on the read hit rate and the read precentage; the listed values are based on a read hit rate of 70% and a read precentage of 70% to 75%.*

Hit rate is defined as the number of times the disc drive finds information in cache divided by the number of times the information is requested from the disc drive.

***Average disc transactions per second. Refers to fundamental disc drive performance; actual I/O rates are application dependent and must take into account system overhead, the system configuration, and the locality of data on the disc. The read hit rate and the read precentage will also have a significant impact on performance of the HP 793XP Disc Drive.*

Table A-11. HP 7936H, HP 7937H, HP 7936XP and HP 7937XP Disc Drives Specifications

DISC DRIVE DATA CAPACITY (formatted)

Item	Data Bytes Per	Sectors Per	Tracks Per	Heads Per
Sector	256			
Track	31,488	123		
Surface	43,957,248	171,708	1,396	
HP 7936	307,700,736	1,201,956	9,772	7
HP 7937	571,444,224	2,232,204	18,148	13

PHYSICAL CHARACTERISTICS

Weight

Net:
Standard; 56.7 kg (125 lb)

Shipping:
Standard; 74.4 kg (164 lb)

Dimensions

Height: 271.6 mm (10.69 in.)
Width: 324.2 mm (12.76 in.)
Depth: 740.7 mm (29.16 in.)

Service Clearance Needed

A minimum of 790.6 mm (31.125 in.) in front.
A minimum of 76.2 mm (3.0 in.) is needed in the back for airflow

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Table A-11. HP 7936H, HP 7937H, HP 7936XP and HP 7937XP Disc Drives Specifications (cont'd)

Operating Characteristics

POWER CHARACTERISTICS

Voltages (true RMS):	
115V setting;	100V, 120V, single phase (inclusive tolerance range is 90V to 132V)
230V setting;	200, 208, 220V, 240V, single phase (inclusive tolerance range is 180V to 264V)
Frequency:	48 to 52 Hz; 58 to 62 Hz
Maximum Power:	
115V setting;	350 Watts (120V, 60Hz)
230V setting;	350 Watts (240V, 50Hz)
Typical Power:	
115V setting;	320 Watts (120V, 60Hz)
230V setting;	320 Watts (240V, 50Hz)
Maximum Current (occurs during spin-up):	
115V setting;	4.4A (RMS {for 9 sec.} at 90V, 50 Hz)
230V setting;	2A (RMS {for 9 sec.} at 180V, 50 Hz)
Typical Current:	
115V setting;	3.2A (RMS at 90V, 60 Hz)
115V setting;	2.8A (RMS at 100V, 60 Hz)
115V setting;	2.7A (RMS at 120V, 50 Hz)
115V setting;	2.6A (RMS at 120V, 60 Hz)
230V setting;	1.6A (RMS at 180V, 60 Hz)
230V setting;	1.5A (RMS at 200V, 60 Hz)
230V setting;	1.5A (RMS at 208V, 60 Hz)
230V setting;	1.4A (RMS at 220V, 60 Hz)
230V setting;	1.4A (RMS at 240V, 50 Hz)
230V setting;	1.4A (RMS at 240V, 60 Hz)

Line Dropout:
No effect on performance; no operator intervention required for dropout equal to or less than one cycle(s) of the ac line frequency (20.0 ms, 50 Hz; 16.7 ms, 60 Hz).

HEAT DISSIPATION

Maximum:	350 Watts (1194.6 Btu/hr; 88.2 Kcals/hr)
Typical:	320 Watts (1092 Btu/hr; 80.6 Kcals/hr)

Table A-11. HP 7936H, HP 7937H, HP 7936XP and HP 7937XP Disc Drives Specifications (cont'd)

ACOUSTIC EMISSIONS

Average Sound Pressure Level ($\overline{L}_{pA}$) (outside cabinet):	<55 dB(A)
Sound Power Level(L_{wA}) (outside cabinet):	<68 dB(A)

ELECTROMAGNETIC EMISSIONS

Radiated and conducted interference:

- HP 7936A/7937A -- For U.S.A., designed to meet FCC docket 20780 for Class B computing peripheral devices. These products comply with the limits for a Class B computing device persuant to Subpart J of part 15 of the FCC Rules. See instructions if interference to radio reception is suspected.

- HP 7936A/7937A -- for Europe, designed to meet EMI level FTZ 1046/84 and provides a Manufacturer's Declaration. Refer to your local sales representative for more information.

Magnetic operating:	<5 gauss on all surfaces
Magnetic nonoperating:	<2 milligauss at 2m (7 ft) on all surfaces

SAFETY

- CSA certified to CSA 22.2 No. 154.
- Meets all applicable safety standards of IEC 380 and IEC 435.
- UL listed to UL 114 and UL 478.

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-11. HP 7936H, HP 7937H, HP 7936XP and HP 7937XP Disc Drives Specifications (cont'd)

ENVIRONMENTAL REQUIREMENTS

NOTE

The following information stipulates the environmental parameters required for this device/subsystem to meet its operating specifications and characteristics. These requirements apply when this product/subsystem is not installed and operated with a Hewlett-Packard (HP) system. When installed and operated with HP systems, the more stringent environmental and performance specifications listed for any single HP device within the HP system are applicable and supersede these specifications.

POWER REQUIREMENTS

Voltages (true RMS):	
115V setting;	100V, 120V, single phase (inclusive tolerance range is 90V to 132V)
230V setting;	200V, 208V, 220V, 240V single phase (inclusive tolerance range is 180V to 264V)
Frequency:	48 to 52 Hz; 58 to 62 Hz
Maximum Power:	
115V setting;	350 Watts (120V, 60Hz)
230V setting;	350 Watts (240V, 60Hz)
Typical Power:	
115V setting;	320 Watts (120V, 60Hz)
230V setting;	320 Watts (240V, 60Hz)
Maximum Current (occurs during spin-up):	
115V setting;	594 V-A (90V, 60 Hz)
230V setting;	1206 V-A (180V, 60 Hz)
Typical Current:	
115V setting;	3.2A (RMS at 120V, 60 Hz)
230V setting;	1.4A (RMS at 180V, 60 Hz)
Distortion:	<5% peak and flat harmonic distortion
Line Surge and Sag:	80% and 120% typical line voltage for 30 sec. 70% and 130% typical line voltage for 0.5 sec.

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-11. HP 7936H, HP 7937H, HP 7936XP and HP 7937XP Disc Drives Specifications (cont'd)

TEMPERATURE

Recommended operating range:	20°C to 25.5°C (68°F to 78°F)
Operating:	0°C to +55°C (32°F to 131°F)
Nonoperating:	-40°C to +70°C (-40°F to +158°F)
Maximum rate of change:	Not to exceed 20°C (36°F) per hour

HUMIDITY

Operating:	5% to 95% relative humidity, noncondensing, and wet bulb temperature not to exceed 25.6°C (78°F). For example, this is equivalent to maximum of 95% relative humidity at 26°C (78.8°F), a maximum of 50% relative humidity at 34°C (93.2°F), or a maximum of 5% relative humidity at 55°C (131mdF).
Nonoperating:	5% to 95% relative humidity, noncondensing.

NOTE: Allow a minimum of four (4) hours for temperature/humidity stabilization before operating the product when moving it from one climate extreme to another.

VIBRATION

Operating (See Figure 2-3)	Random vibration with power spectral density (PSD) of 0.0001 g^2/Hz from 5 to 350 Hz; -6 dB/octave from 350 to 500 Hz in any direction.
Nonoperating (See Figure 2-4)	Random vibration with power spectral density (PSD) of 0.015 g^2/Hz from 5 to 100 Hz; -6 dB/octave from 100 to 137 Hz; then 0.008g^2/Hz from 137 to 350 Hz; -6 dB/ octave from 350 to 500 Hz; sine vibration acceleration level of 0.56, 5 to 500 Hz.

SHOCK

Recommend operating range:	<0.67 g
Operating:	2 g Maximum, 11 ms, half-sine. This product will operate with no operator intervention through a one (1) inch tilt drop about any of its base edges on a hard surface.
Nonoperating:	This product will survive a four (4) inch drop about any of its base edges on a hard surface.

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Table A-11. HP 7936H, HP 7937H, HP 7936XP and HP 7937XP Disc Drives Specifications (cont'd)

ALTITUDE

Operating:	maximum 4 600m (15,000ft)
Nonoperating:	maximum 15 000m (49,200 ft)

ELECTROMAGNETIC SUSCEPTIBILITY OPERATING RANGE

Radiated:	14 kHz to 1 GHz, up to 3 V/m
Recommended limit:	<0.5 V/m
Conducted:	30 Hz to 50 kHz, <3 Vrms
	50 kHz to 400 MHz, <1V peak-to-peak
Recommended limit:	<0.5 Vrms
Electrostatic Discharge:	<15.0 kV
Recommended limit:	<5 kV
Magnetic Field:	<5 gauss, 47.5 to 198 Hz
Power line transients (per IEEE Standard P587.1/F)	
Oscillatory wave (100 kHz ringing wave):	<1.5 kV (open circuit voltage) and <50 A
Recommended limit:	<500V
Unidirectional wave (one 20 us wide pulse):	<1.0 kV (open circuit voltage) and <100 A
Recommended limit:	<500V

TILT

The device shall meet all performance specifications within +/- 10 degrees from an upright position.

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Table A-12. HP 91514A Cabinet with HP 7936/7937 Disc Drives

PHYSICAL CHARACTERISTICS

DIMENSIONS

Height:	160.0 cm (63.0 in.)
Width:	90.0 cm (35.4 in.)
Depth:	82.5 cm (32.5 in.)

WEIGHT

Net (total):	
Cabinet:	180.0 kg (397 lb)
PDU:	36.1 kg (79.6 lb)
Disc Drives (8):	455 kg (1003 lb)
Total:	671.1 kg (1480 lb)
Shipping (total):	
Cabinet and PDU:	262 kg (578 lb)

OPERATING CHARACTERISTICS

HEAT DISSIPATION

Standard: 2600 Watts (8874 Btu/hr) maximum

ACOUSTIC EMISSIONS

Average Sound Pressure Level ($\overline{L_{pA}}$): <70 dB(A)

ELECTROMAGNETIC EMISSIONS

Radiated and conducted interference:

- HP HP 91514A -- For U.S.A., designed to meet FCC docket 20780 for Class B computing peripheral devices. These products comply with the limits for a Class B computing device pursuant to Subpart J of part 15 of the FCC Rules. See instructions if interference to radio reception is suspected.
- HP 91514A -- for Europe, designed to meet EMI level FTZ 1046/84 and provides a Manufacturer's Declaration. Refer to your local sales representative for more information.

SAFETY

- CSA certified to CSA 22.2 No. 220.
- Meets all applicable safety standards of IEC 380 and IEC 435.
- UL listed to UL 114 and UL 478.

Hewlett-Packard, in a continuing effort to offer excellent products at a fair value, reserves the right to change specifications, designs, and models without notice.

Table A-12. HP 91514A Cabinet with HP 7936/7937 Disc Drives (cont.)

POWER CHARACTERISTICS

Voltage (nominal):	200/208V, 220V/230V, 240V, +/- 10%
Frequency:	50, 60 Hz +/- 2 Hz

ENVIRONMENTAL REQUIREMENTS

NOTE

The following information stipulates the environmental parameters required for this device/subsystem to meet its operating specifications and characteristics. These requirements apply when this product/subsystem is not installed and operated with a Hewlett-Packard (HP) system. When installed and operated with HP systems, the more stringent environmental and performance specifications listed for any single HP device within the HP system are applicable and supersede these specifications.

TEMPERATURE

Recommended operating range:	20°C to 25.5°C (68°F to 78°F)
Operating:	5°C to +40°C (41°F to 104°F)
Nonoperating:	-40°C to +70°C (-40°F to +158°F)
Maximum rate of change:	Not to exceed 20°C (36°F) per hour.

HUMIDITY

Operating:	5% to 95% relative humidity, noncondensing, and wet bulb temperature not to exceed 25.6°C (78°F).
Nonoperating:	5% to 95% relative humidity, noncondensing.

NOTE: Allow a minimum of four (4) hours for temperature/humidity stabilization before operating the product when moving it from one climate extreme to another.

VIBRATION (Vertical Axis Only)

Operating (See Figure 2-3)	Random vibration with power spectral density (PSD) of 0.0001 g^2/Hz from 5 to 350 Hz; -6 dB/octave from 350 to 500 Hz (~0.21 g RMS), 30 minute duration.
Nonoperating (See Figure 2-4)	Random vibration with power spectral density (PSD) of 0.015 g^2/Hz from 5 to 100 Hz; -6 dB/octave from 100 to 150 Hz; then constant 150 to 350 Hz; -6 dB/ octave from 350 to 500 Hz (~1.76 g RMS), 10 minute duration.

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Table A-12. HP 91514A Cabinet with HP 7936/7937 Disc Drives (cont.)

SHOCK

Recommended operating range:	<0.67 g
Operating:	The unit is designed to operate without operator intervention through a one-quarter inch tilt drop about any of its base edges.
Nonoperating:	This product is designed to survive a one (1) inch tilt drop about any of its base edges.

ALTITUDE

Operating:	maximum 4 600m (15,000ft)
Nonoperating:	maximum 15 000m (49,200 ft)

ELECTROMAGNETIC SUSCEPTIBILITY OPERATING RANGE

Radiated:	14 kHz to 1 GHz, up to 3 V/m
Recommended limit:	<0.5 V/m
Conducted:	30 Hz to 50 kHz, <3 Vrms
	50 kHz to 400 MHz, <1V peak-to-peak
Recommended limit:	<0.5 Vrms
Electrostatic Discharge:	
	No performance degradation or data loss to 15 kV
	No component damage to 25 kV
Recommended limit:	<7.5 kV
Power line transients (per IEEE Standard P587.1/F)	
Oscillatory wave (100 kHz ringing wave):	<1.5 kV (open circuit voltage) and <50 A
Recommended limit:	<500V
Unidirectional wave (one 20 us wide pulse):	<1.0 kV (open circuit voltage) and <100 A
Recommended limit:	<500V

VENTILATION

The rear of the cabinet must be a minimum of two (2) feet from any solid surface to provide proper ventilation. There are no other special air conditioning requirements other than what may be required to maintain the specified temperature.

FLOOR LOADING

The fully loaded cabinet asserts a maximum floor load of 200 lbs per square foot and a maximum point load of 500 lbs. The location of the loaded cabinet should be verified against these numbers to ensure a safe installation.

POWER CORDS

Figure A-3 shows the cabinet power cord and the connector requirements.

Table A-12. HP 91514A Cabinet with HP 7936/7937 Disc Drives (cont.)

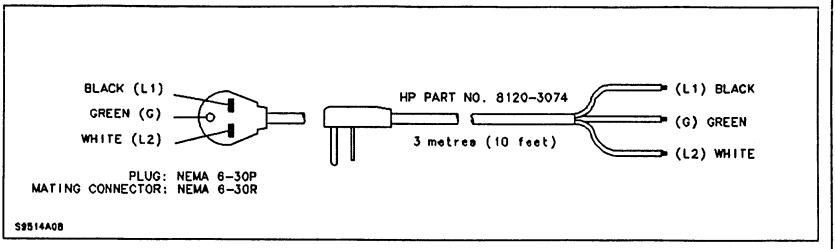

Figure A-3. PDU Power Cord

WALL CIRCUIT BREAKER REQUIREMENTS

When choosing wall circuit breaker for this installation refer to figure A-4. Trip characteristics for the wall circuit breaker and/or power conditioner must meet or exceed the supplied circuit breaker curve shown in figure A-4.

TRANSPORTATION SPECIFICATIONS

WARNING

Following installation of the drives, the cabinet may be moved short distances on its casters for proper positioning. However, do not move a loaded cabinet long distances over rough surfaces or down an incline.

The transportation specifications assume that the cabinet and PDU are packaged and mounted on a pallet.

IMPACT

The package will survive a vertical drop from 30 cm (12 inches) on the flat base.

The package will survive four rotational edge drops from 30 cm (12 inches) or up to maximum height before tipover, whichever is less.

SWEPT SINE VERTICAL VIBRATION

0.5 G (0 to peak) from 5 to 200 to 5 Hz resonant search; 1 octave per minute sweep rate; 5 minute resonant dwell at the package resonance.

RANDOM VERTICAL VIBRATION

Random vibration with power spectral density (PSD) of 0.015 g^2/Hz from 5 to 100 Hz; -6 dB/octave from 100 to 200 Hz (~1.57 g RMS); 30 minute duration.

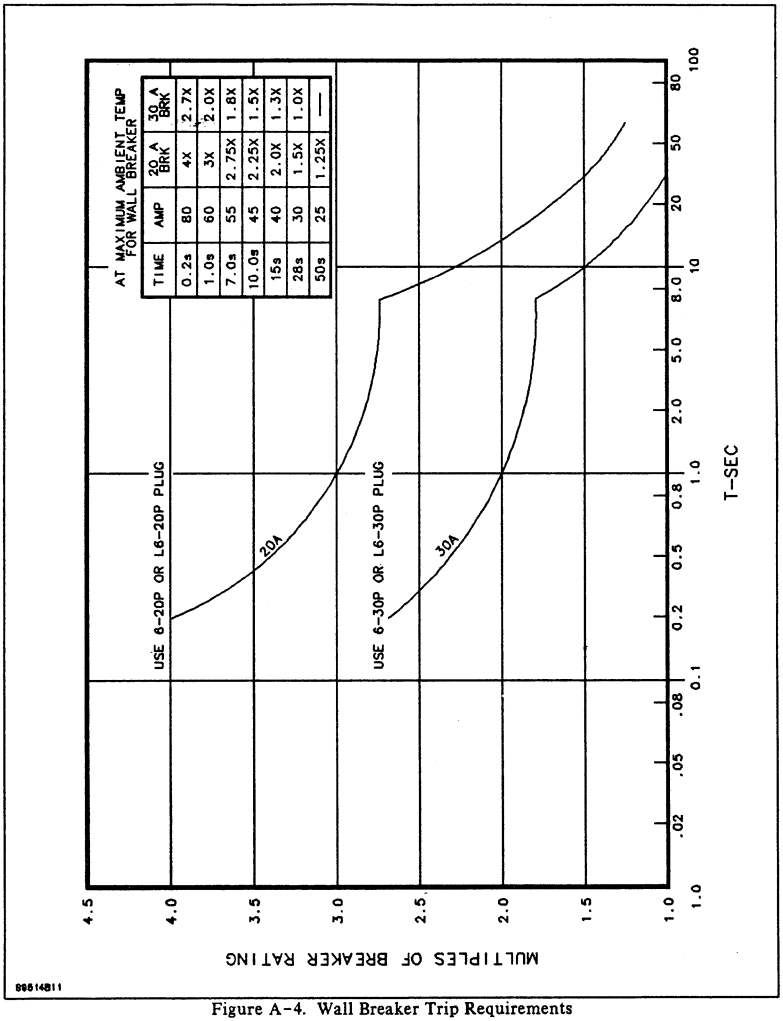

Figure A-4. Wall Breaker Trip Requirements

APPENDIX B

HEWLETT-PACKARD

DISC/TAPE DRIVE

AVERAGE CURRENT USEAGE

Appendix B

Table B-1. Average Current Usage By Product Type

PRODUCT TYPE	100 VOLTS 50Hz	100 VOLTS 60Hz	120 VOLTS 50Hz	120 VOLTS 60Hz	208 VOLTS 50Hz	208 VOLTS 60Hz	220 VOLTS 50Hz	220 VOLTS 60Hz	240 VOLTS 50Hz	240 VOLTS 60Hz
7906	9.4A	8.7A	8.1A	7.5A	4.3A	4.3A	4.5A	4.2A	2.5A	3.9A
791X	4.8A	4.9A	4.3A	4.2A			2.3A	2.3A	2.0A	2.1A
7920	7.7A	8.6A	6.6A	7.5A	3.3A	3.2A	3.7A	4.3A	3.4A	4.0A
7925	8.4A	7.8A	7.2A	6.6A			3.9A	3.8A	3.6A	3.5A
793X			11 0A	11.2A	6.0A	6.3A	5.8A	6.0A	5.4A	5.6A
	115VOLTS						230VOLTS			
794X	.87A	.87A					.48A	.49A		

APPENDIX C
HEWLETT-PACKARD
DISC/TAPE DRIVE
REFERENCE INFORMATION

Table C-1. Reference Information*

	Temperature	Humidity	Tilt	Shock	Vibration	AC Power	EMI	ESD
HP 7906								
Spec.	10-40 C	8-80%	+/- 20 deg.	N/S	N/S	+5 -10%	<0.5 V/m	<12.5 kV
Recomm.	20-25.5 C	N/S	N/S	<0.5g	Note 10	Note 8	<0.1 V/m	<500V
HP 7906D								
Spec.	10-40 C	8-80%	+/- 20 deg.	N/S	N/S	+5 -10%	<0.5 V/m	<12.5 kV
Recomm.	20-25.5 C	N/S	N/S	<0.5g	Note 10	Note 8	<0.1 V/m	<500V
HP 7920A								
Spec.	10-40 C	8-80%	N/S	N/S	N/S	+5 -10%	N/S	N/S
Recomm.	20-25.5 C	N/S	N/S	<0.5g	Note 10	Note 8	<0.1 V/m	<500V
HP 7920D								
Spec.	10-40 C	8-80%	N/S	N/S	N/S	+5 -10%	N/S	N/S
Recomm.	20-25.5 C	N/S	N/S	<0.5g	Note 10	Note 8	<0.1 V/m	<500V

*Notes-

1. Spec.-denotes specification
2. Recomm.-denotes recommended limit
3. N/S-denotes not specified
4. 10-40 C = 50-104 F
5. 20-25.5 C = 68-78 F
6. 10-40 C = 32-113 F
7. Humidity-noncondensing
8. AC Power-the daily average not to vary +/- 2% from the correct value
9. EMI-denotes radiated susceptibility
10. PSD of 4 X 10(-6) g(2)/Hz from 5 - 2500 Hz

Table C-1. Reference Information (cont'd)*

	Temperature	Humidity	Tilt	Shock	Vibration	AC Power	EMI	ESD
HP 7925A								
Spec.	10-40 C	8-80%	N/S	N/S	N/S	+5 -10%	N/S	N/S
Recomm.	20-25.5 C	N/S	N/S	<0.5g	Note 10	Note 8	<0.1 V/m	<500V
HP 7925D								
Spec.	10-40 C	8-80%	N/S	N/S	N/S	+5 -10%	N/S	N/S
Recomm.	20-25.5 C	N/S	N/S	<0.5g	Note 10	Note 8	<0.1 V/m	<500V
HP 7908								
Spec.	10-40 C	20-80%	<30 deg.	1g	<0.1g rms	N/S	<1 V/m	<12.5 kV
Recomm.	20-25.5 C	N/S	N/S	<0.67g	<0.05 rms	N/S	<0.2 V/m	<500V
HP 7910								
Spec.	0-45 C	8-80%	N/S	N/S	N/S	+5 -10%	N/S	N/S
Recomm.	20-25.5 C	N/S	N/S	<0.5g	N/S	N/S	<0.1 V/m	<500V

*Notes-

1. Spec.-denotes specification
2. Recomm.-denotes recommended limit
3. N/S-denotes not specified
4. 10-40 C = 50-104 F
5. 20-25.5 C = 68-78 F
6. 10-40 C = 32-113 F
7. Humidity-noncondensing
8. AC Power-the daily average not to vary +/- 2% from the correct value
9. EMI-denotes radiated susceptibility
10. PSD of 4 X 10(-6) g(2)/Hz from 5 - 2500 Hz

APPENDIX D
DISC/TAPE DRIVE
POWER CORD OPTIONS

POWER CORD OPTIONS

APPENDIX D

D-1. INTRODUCTION

Refer to the following figures and table for all power cord options.

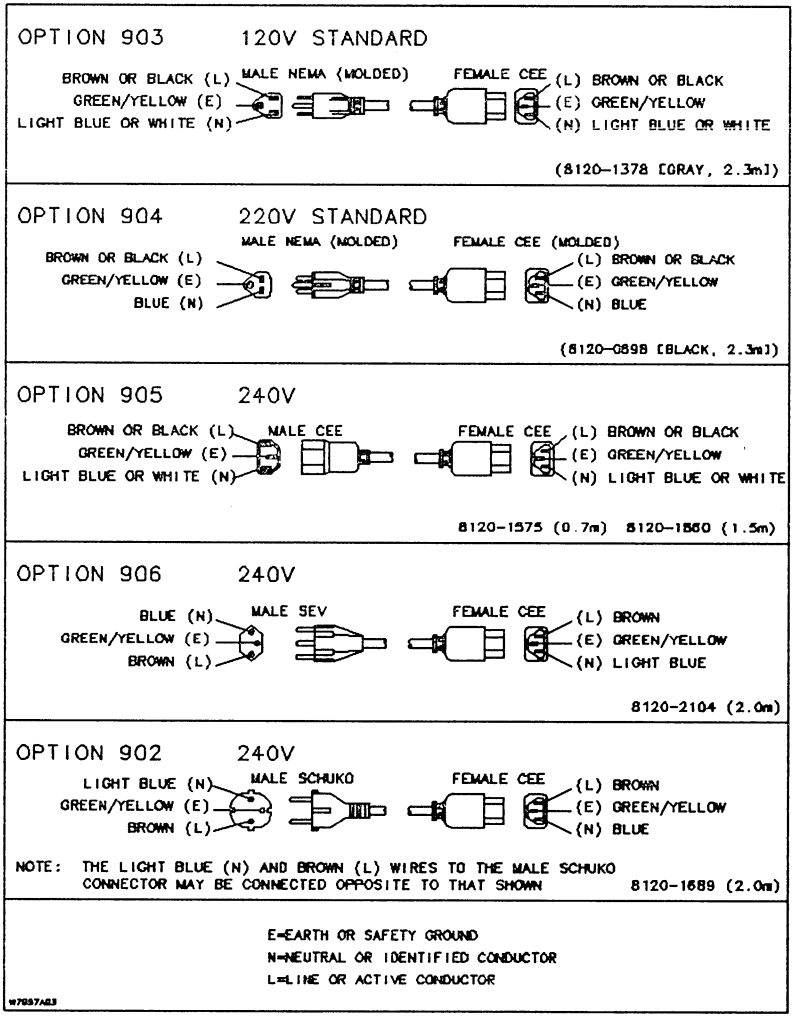

Figure D-1. Power Cord Options

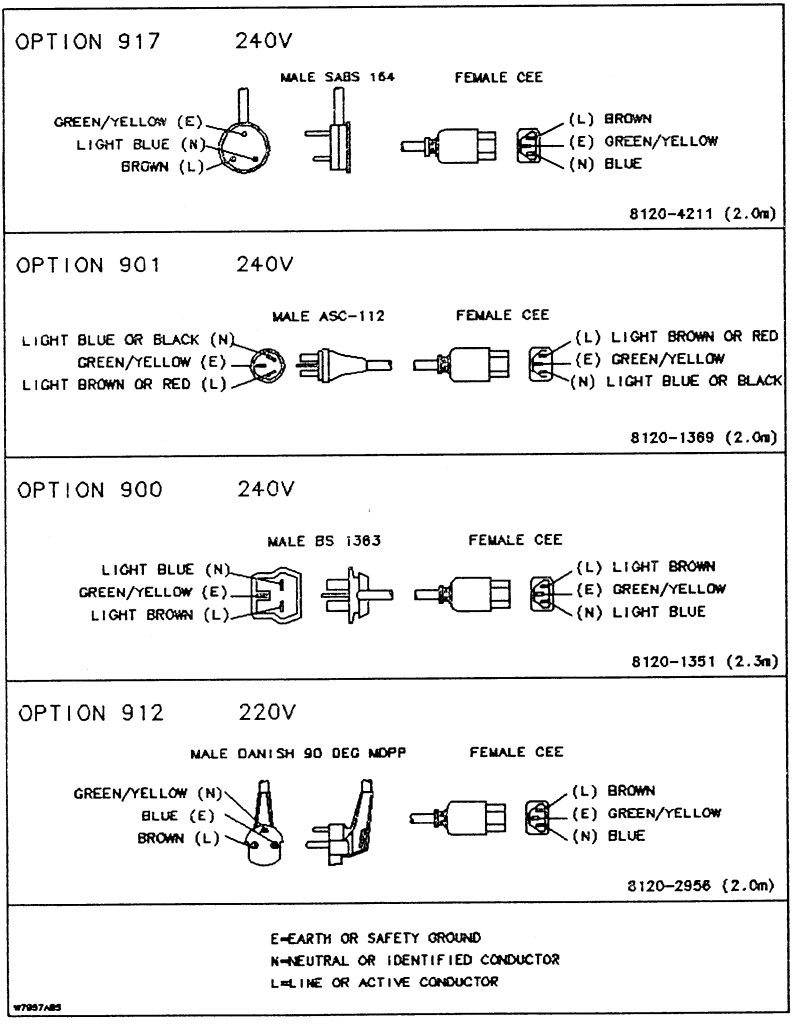

Figure D-1. Power Cord Options (cont'd)

Table 9-1. Power Cord Options By Country

CTRY. CODES	COUNTRY	HP OPT	MAINS V	Hz
531	Afghanistan	902	220	50
481	Albania	902	220	50
721	Algeria	902	220	50
951	American Samoa	903	120	50
762	Angola	902	220	50
357	Argentina	901	220	50
602	Australia	901	240	50
433	Austria	902	220	50
467	Azores	902	220	50
236	Bahamas	903	120	60
525	Bahrain	900	240	50
538	Bangladesh	902	240	50
272	Barbados	900	240	50
423	Belgium	902	220	50
208	Belize (Br. Honduras)	903	120	60
761	Benin (Dahomey)	902	220	50
232	Bermuda	903	120	60
335	Bolivia	902	220	50
793	Botswana	900	240	50
351	Brazil	903	120	60
781	Br. Indian Ocean Terr.	900	240	50
561	Brunei	900	240	50
487	Bulgaria	902	220	50
546	Burma	902	240	50
767	Burundi	902	220	50
243	Caicos	903	120	60
742	Cameroon	902	220	50
122	Canada	903	120	60
733	Canary Islands	902	220	50
941	Canton	900	240	50
244	Cayman Island	903	120	60
754	Central African Republic	902	220	50
756	Chad	902	220	50
337	Chile	902	220	50
570	China (Mainland)	901	220	50
583	China (Taiwan)	903	120	60
301	Columbia	903	120	60
789	Comoros	902	220	50
763	Congo (Brazzaville)	902	220	50
223	Costa Rica	903	120	60
239	Cuba	903	120	60
491	Cyprus	900	240	50
435	Czechoslovakia	902	220	50
409	Denmark	912	220	50
777	Djibouti	902	220	50
247	Dominican Republic	903	120	60
331	Ecuador	903	120	60
729	Egypt	902	220	50
211	El Salvador	903	120	60
941	Enderbury Island	900	240	50
738	Equatorial Guinea	900	240	50

Table 9-1. Power Cord Options By Country (cont'd)

CTRY. CODES	COUNTRY	HP OPT	MAINS V	Hz
447	Estonia	902	220	50
774	Ethiopia	902	220	50
372	Falkland Isl. (Is. Malvinas)	900	240	50
405	Finland	902	220	50
427	France	902	220	50
317	French Guiana	902	220	50
790	French Indian Ocean Areas	902	220	50
641	French Pacific Islands	902	220	50
283	French West Indies	903	120	50
755	Gabon	902	220	50
750	The Gambia	900	240	50
512	Gaza Strip	902	220	50
429	Germany, Demo. Rep. (E)	902	220	50
428	Germany, Fed. Rep. (W)	902	220	50
749	Ghana	900	240	50
472	Gibraltar	900	240	50
473	Gozo	902	220	50
484	Greece	902	220	50
101	Greenland	912	220	50
935	Guam	903	120	60
205	Guatemala	903	120	60
746	Guinea	900	240	50
312	Guyana	903	120	60
245	Haiti	903	120	60
215	Honduras	903	120	60
582	Hong Kong	900	220	50
437	Hungary	902	220	50
400	Iceland	902	220	50
533	India	902	240	50
560	Indonesia	902	220	50
507	Iran	902	220	50
505	Iraq	902	220	50
419	Ireland	900	240	50
508	Israel	903	220	50
475	Italy	902	220	50
748	Ivory Coast	902	220	50
241	Jamaica	903	120	50
588	Japan	903	100	50
511	Jordan	902	220	50
555	Kampuchea	903	120	50
779	Kenya	900	240	50
580	Korea, Republic of	903	100	60
513	Kuwait	902	240	50
553	Laos	903	220	50
449	Latvia	902	220	50
504	Lebanon	902	240	50
248	Leeward & Windward Isl.	903	120	50
799	Lesotho	900	240	50
765	Liberia	903	120	60
725	Libya	902	240	50
451	Lithuania	902	220	50

Table 9-1. Power Cord Options By Country (cont'd)

CTRY. CODES	COUNTRY	HP OPT	MAINS V	Hz
423	Luxembourg	902	220	50
566	Macao	900	240	50
759	Madeira Islands	902	220	50
788	Malagasy Republic	902	220	50
797	Malawi	900	240	50
557	Malaysia	900	240	50
745	Mali	902	220	50
473	Malta	902	220	50
741	Mauritania	902	220	50
785	Mauritius	900	240	50
201	Mexico	903	120	60
931	Midway Islands	903	120	60
161	Miquelon	902	220	60
574	Mongolia	902	220	50
714	Morocco	902	220	50
787	Mozambique	902	220	50
792	Namibia	902	240	50
536	Nepal	902	240	50
277	Netherlands Antilles	902	220	50
421	Netherlands (Holland)	902	220	50
614	New Zealand	901	220	50
219	Nicaragua	903	220	50
751	Niger	902	240	50
753	Nigeria	900	240	50
579	North Korea	902	100	60
403	Norway	902	220	50
523	Oman	902	240	50
686	Other Pacific Isl.	903	120	60
535	Pakistan	902	240	50
225	Panama	903	120	60
604	Papua New Guinea	901	220	50
353	Paraquay	902	220	50
333	Peru	903	220	60
565	Phillippines	903	120	60
455	Poland	902	220	50
471	Portugal	902	220	50
903	Puerto Rico	903	120	60
518	Qatar	900	240	50
791	Republic of So. Africa	902	240	50
485	Romania	902	220	50
769	Rwanda	902	220	50
758	St. Helena	900	240	50
161	St. Pierre Islands	902	220	60
417	Saudi Arabia	902	220	50
744	Senegal	902	220	50
780	Seychelles	900	240	50
747	Sierra Leone	900	240	50
559	Singapore	900	240	50
770	Somalia	902	220	50
568	Southern Asia	900	240	50
622	Southern Pacific Isl.	900	240	50

Table 9-1. Power Cord Options By Country (cont'd)

CTRY. CODES	COUNTRY	HP OPT	MAINS V	Hz
469	Spain	902	220	50
735	Spanish Africa	902	220	50
542	Sri Lanka (Ceylon)	902	240	50
732	Sudan	900	240	50
315	Suriname	903	120	60
795	Swaziland	900	240	50
401	Sweden	902	220	50
441	Switzerland	906	220	50
502	Syria	902	220	50
783	Tanzania	900	240	50
549	Thailand	903	220	50
274	Tobago	903	120	60
752	Togo	902	220	50
274	Trinidad	903	120	60
684	Trust Terr. of Pacific Isl.	903	120	60
723	Tunisia	902	220	50
489	Turkey	902	220	50
243	Turks Isl.	903	120	60
778	Uganda	900	240	50
520	United Arab Emirates	900	240	50
412	United Kingdom	900	240	50
760	Upper Volta	902	220	50
355	Uruguay	901	220	50
000	U.S.A.	903	120	60
461	USSR	902	220	50
307	Venezuela	903	120	60
552	Vietnam	903	120	50
911	Virgin Islands	903	120	60
933	Wake Island	903	120	60
764	Western Africa	902	220	50
737	Western Sahara	902	220	50
615	Western Samoa	901	240	50
522	Yemen (Aden)	900	240	50
521	Yemen (Sana)	900	240	50
479	Yugoslavia	902	220	50
766	Zaire	902	220	50
794	Zambia	900	240	50
796	Zimbabwe	900	240	50

SALES & SUPPORT OFFICES

Arranged alphabetically by country

Product Line Sales/Support Key

Key Product Line
A Analytical
CM Components
C Computer Systems
E Electronic Instruments & Measurement Systems
M Medical Products
P Personal Computation Products
*** Sales only for specific product line**
**** Support only for specific product line**

IMPORTANT:These symbols designate general product line capability.They do not insure sales or support availability for all products within a line, at all locations.Contact your local sales office for information regarding locations where HP support is available for specific products.

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If there is no sales office listed for your area, contact one of these headquarters offices.

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Bernal, Oeste
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61000 **ALENCON**
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Telex: 692315F
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Bâtiment Ampère
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Boite Postale 300
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Blue Star Ltd.
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TRIVANDRUM 695 013
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BERCA Indonesia P.T.
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M

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Eldan Electronic Instrument Ltd.
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Woluwedal
B-1200 **BRUSSELS**
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Tel: 36299
Telex: 70904 PROMAL MA
Cable: PROTELENG
A,E,M

MALTA
Philip Toledo Ltd.
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MRIEHEL
Tel: 447 47, 455 66, 4915 25
Telex: Media MW 649
E,M,P

MAURITIUS
Blanche Birger Co. Ltd.
18, Jules Koenig Street
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P

MEXICO
Hewlett-Packard de Mexico,
S.A. de C.V.
Rio Nio No. 4049 Desp. 12
Fracc. Cordoba
JUAREZ
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P

Hewlett-Packard de Mexico,
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Condominio Kadereyta
Circuito del Mezon No. 186 Desp. 6
COL. DEL PRADO - 76030 Qro.
Tel: 463-6-02-71
P

Hewlett-Packard de Mexico,
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Microcomputadoras Hewlett-Packard,
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8

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