DOCUMENT INFORMATION

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Each "Revision Description" shall also include the appropriate page number(s).
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letter located in the right hand margin of the paragraph that has changed.
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acceptable). All pages of this drawing shall carry the same revision letter as
shown on this page.

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Written By:	MIKE WAITE
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DISC DRIVE ERS FOR

MODEL NUMBERS

7957B   7958B   7959B

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1.0 PURPOSE AND SCOPE

1.1 PURPOSE

This document defines all product specifications and operating
characteristics that may be offered on a warranted basis in 7957B, 7958B, and
7959B disc drives.

1.2 SCOPE

In addition to product capabilities, this document describes all mechanical,
electrical, environmental, and reliability specifications for the top level
product. It does not cover specifications for individual sub-assemblies.
Sub-assembly IMS documents should be consulted for such details.

Also, this document does not cover specifics of the CS80 command set
implemented by the 795XB disc controller. Consult the FALSTAFF III
CONTROLLER ERS and the FALSTAFF III UTILITY ERS for these details.

2.0 RELATED DOCUMENTS

1) HP 9753X Series Product Description

2) HP 9753X Series OEM Product Manual

3) 795XB/796XB Controller ERS   (A-5959-3912-1)

4) 795XB/796XB Controller Utilities ERS   (A-5959-3913-1)

5) Falstaff II Power-On Self-Test Description

6) Falstaff III Reliability Plan (includes specification and test definitions)

7) Controller Board IMS   (A-07957-60010-3)

8) Panasonic Power Supply Specification

3.0 GENERAL DESCRIPTION

3.1 Product Overview

The 7957B, 7958B, and 7959B disc drives are high performance, random access, fixed media mass storage devices. They are packaged in a compact 130mm high "Rosebud" style desktop cabinet that looks identical to the 7941/45. Formatted capacities are 81, 152, and 304 megabytes, respectively.

Seek times less than 18 msec, full HPIB bandwidth data transfer rate, and a high performance HPIB controller combine to yield performance that will meet or exceed 791X levels. In addition, the drives will be extremely rugged, with unsurpassed shock, vibration, and temperature performance.

Factory cost at introduction will be under $1800 for the 7959B, under $1700 for the 7958B, and under $1600 for the 7957B. It is expected that this combination of mid-range capacity, low cost, high performance, and compact size will quickly make the 795XB the preferred choice over today's 7941/45 and 7912/14 products.

The drives are based on Hewlett-Packard designed and built disc mechanisms. The 7959B uses the HP 97536A mechanism, while the 7958B uses the HP 97533A, and the 7957B uses the HP 97532A. All mechanisms use 5.25" thin film media with thin film read/write heads. Each has a rotary actuator with one head per surface, and all use embedded servo on each surface. The interface to the mechanism conforms to the ESDI industry standard.

The 795XB series have four major sub-assemblies: the disc mechanism, HPIB Controller PCA, power supply, and cabinet (with associated cables, etc.)

The standard configuration for this product is the desktop package. The desktop unit can also be installed into any floor mount "pod" style cabinets that accept "Rosebud" stack-modules (the feet must be removed from the drive package in this case). The drives can also be installed in 19" EIA racks using the 19500B Rackmount Kit.

3.0 GENERAL DESCRIPTION (cont'd)

3.2 Feature Summary

* Multi-user capabilities with low entry cost
    - 304, 152, and 81 megabyte capacities
    - High performance (greater than or equal to 7914)
    - Unsurpassed shock/temperature performance

* Compact 130 mm Rosebud stack-module package

* HPIB/CS80 interface

* 794X/5XA software compatible (in both on-line and diagnostic modes)

* Environmental specifications broader than 791X, 794X, or 795XA

* Improved serviceability/reliabiity through new controller features
    - Autosparing
    - Gate Array which reduces component count

* Improved performance
    - Reduced F/W overhead (0.8 msec)
    - Enhanced channel utilization algorithm during both reads and
      writes

3.0 GENERAL DESCRIPTION (cont'd)

3.3 Products and Configurations

3.3.1 Standard Configuration

The standard configuration for either drive is a desktop enclosure.

```
7957B     81 Mbyte desktop unit
7958B    152 Mbyte desktop unit
7959B    304 Mbyte desktop unit
```

3.3.2 Options

```
Option 015:  230 Volt operation
Option 550:  Delete HPIB cable
```

3.3.3 Accessories

```
19500B    19" EIA Rackmount Kit
92211A    Pod-type floor mount cabinet
```

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4.0 PHYSICAL CHARACTERISTICS

4.1 Desktop

Length - 285 mm (11.2")

Width - 325 mm (12.8")

Height - 132 mm (5.2") with cabinet feet
         129 mm (5.1") without cabinet feet

Weight - 10.6 kg (23.2 lb)

Shipping weight - 13.6 kg (29.9 lb)

4.2 Rackmount

The desktop package is placed on a 19500B Rackmount Tray. See 19500B
documentation for rack mount specifications.

5.0 PRODUCT CAPABILITIES

5.1 Capacity

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		
7957B Hd	163,731,456	20,466,432	79,947	1,269	
58/9B Hd	202,825,728	25,353,216	99,036	1,572	
HP 7957B	654,925,824	81,865,728	319,788	5,076	4
HP 7958B	1,216,954,368	152,119,296	594,216	9,432	6
HP 7959B	2,433,908,736	304,238,592	1,188,432	18,864	12

5.2 Seek Times:

	TYPICAL	WORST CASE
Track-to-track	3 milliseconds	4 milliseconds
Average	17 milliseconds*	19 milliseconds
Full stroke	32 milliseconds	36 milliseconds
Incremental Head Switch	3 milliseconds	4 milliseconds

* Aggressive seeks option turned on.

5.3 Spindle Speed

3348.2 RPM +/- 1%

8.96 millisecond average latency

5.4 Transfer Rates

Burst: 1000 kbytes/sec

Typical: 853 kbytes/sec (multi-sector transfers with all sectors
                             contiguous within one track)

5.5 HPIB Controller Firmware Overhead

0.8 milliseconds per read or write request

6.0 ENVIRONMENTAL SPECIFICATIONS

6.1 Temperature

6.1.1 Operating   5 to 45 degrees C (41 to 113 degrees F)

6.1.2 Non-Operating   -40 to +65 degrees C (-40 to +149 degrees F)

6.1.3 Recommended   20 to 25.5 degrees C (68 to 78 degrees F)

6.1.4 Slew Rate   <= 20 degrees C per hour

6.1.5 SPECIAL NOTE:
        If shipment or storage is at temperatures of 32 degrees F or
        below, allow two hours of warmup at room temperature before
        operating. Failure to do so may result in severe damage to
        the unit.

6.2 Humidity

6.2.1 Operating *   8-80% non-condensing

6.2.2 Non-Operating* 8-80% non-condensing

6.2.3 Non-Operating Humidity Supersoak *
                        +65 C @ 80% relative humidity for 24
                        hours, no permanent damage (other than
                        cosmetic change to internal and exterior
                        plated metal surfaces)

        * Excludes all conditions which can cause condensation in or
          on the disc drive.

6.3 Shock

6.3.1 Operating [half sine, duration <= 11 ms]

        <= 4g peak, no data loss, and no damage

6.3.2 Non-Operating

        20g peak half sine, <= 11 ms duration, no damage or data loss

6.3.3 RECOMMENDED LIMIT: <1g peak in operating or non-operating state

6.0 ENVIRONMENTAL SPECIFICATIONS (cont'd)

6.4 Vibration

6.4.1 Operating - Random vibration with power spectral density (PSD) of 0.0001 g E2/Hz from 5 to 350 Hz; -6 dB/octave from 350 to 500 Hz; PSD of 0.00005 g E2/Hz at 500 Hz, with no performance degradation beyond 10%, no damage, or no intervention by the operator required.

6.4.2 Non-Operating - Random vibration with power spectral density (PSD) of 0.015 g E2/Hz from 5 to 100 Hz; -6 dB/octave from 100 to 137 Hz; PSD of 0.008 g E2/Hz from 137 to 350 Hz; -6 dB/octave from 350 to 500 Hz; PSD of 0.0039 g E2/Hz at 500 Hz.

6.5 Altitude

6.5.1	Operating	Maximum	4,572 m	(15,000 ft)
		Minimum	- 305 m	(-1000 ft)
6.5.2	Non-Operating	Maximum	15,240 m	(50,000 ft)
		Minimum	- 305 m	(-1000 ft)

6.6 Electrostatic Discharge (ESD) Susceptibility

6.6.1 < 15 kV with no data loss or decrease in performance beyond 10%

6.6.2 15 - 25 kV with no damage

6.6.3 RECOMMENDED LIMIT: Below 5 kV

6.7 Electromagnetic Field Susceptibility

6.7.1 Radiated   14 kHz to 1 gHz: <= 3 V/m

RECOMMENDED LIMIT: below 0.5 V/m

6.7.2 Magnetic   47.5 to 198 Hz: <= 1 gauss

RECOMMENDED LIMIT: not available

6.0 ENVIRONMENTAL SPECIFICATIONS (cont'd)

6.8 Electromagnetic Emissions

6.8.1 Magnetic:

Operating (at product surface)	AC <= 5 gauss
	DC <= 5 gauss
Non-Operating (any surface)	<= 2 mgauss @ 7 ft

6.8.2 Radiated: (Standalone Product)
at least 6 dB below FCC Class A
at least 2 dB below VDE Level B

6.8.3 Conducted:
at least 2 dB below VDE Level B

6.9 Acoustic Emissions

<= 5.4 Bels sound power

6.10 Heat Dissipation

6.10.1 Maximum: 85 Watts

6.10.2 Typical: 65 Watts

6.11 Tilt

The drive will meet all specifications when mounted in an upright orientation
which maintains the horizontal plane of the device within plus or minus 15
degrees of any axis.

7.0 POWER SPECIFICATIONS

7.1 Input Voltage (rms)   [see chart below]

7.2 Input Frequency   [see chart below]

7.3 Maximum Current (rms) [see chart below]

7.4 Typical Current (rms) [see chart below]

7.5 Maximum Power   [see chart below]

7.6 Typical Power   [see chart below]

Setting	Input Voltage (V rms)	Frequency (Hz)	Current (A rms) (Max/Typical)	Power (V-A) Max/Typical
115 V	90-132	47.5-66	1.8 / 1.0	144 / 92
230 V	180-264	47.5-66	1.2 / 0.6	198 / 115

7.0 POWER SPECIFICATIONS (cont'd)

7.7 Power Fail Recovery

On loss of power, no damage or data loss will occur.

7.8 Transient Susceptibility

7.8.1 Oscillatory (100 kHz ringing wave): < 1.5 kV and < 50 A

RECOMMENDED LIMIT: < 500 V

7.8.2 Unidirectional (one 20 usec pulse): < 1.0 kV and < 100 A

RECOMMENDED LIMIT: < 500 V

Transients within the ranges above will cause no operator
perceivable degradation in performance or damage.

7.9 Conducted Susceptibility

Power line noise below the following levels will cause no operator
perceivable errors, data loss, or damage.

30 Hz to 50 kHz   <= 3V rms

50 kHz to 400 MHz   <= 1V p-p

RECOMMENDED LIMIT: below 0.5 V rms, any frequency

7.10 Line Surge/Sag From Nominal

+ or - 20% of typical line voltage for 30 seconds, or + or - 30% of typical
line voltage for 0.5 seconds will cause no damage, data loss, or require no
operator intervention.

7.11 Distortion

< 5% with flat harmonic distortion

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8.0 INTERFACE SPECIFICATIONS

8.1 Mechanical/Electrical

This product interfaces to host computer systems via HPIB as implemented by HP's proprietary MEDUSA interface chip.

8.2 Command Set

The 7957B, 7958B, and 7959B use a CS80 implementation that is software compatible with the 795XA and 796XB products. This compatibility is guaranteed for all on-line commands and status conditions, and also for all diagnostic and utility commands as well.

8.3 Host CPU Software Compatibility – On–Line & Diagnostic

The 7957B, 7958B, and 7959B are "plug-compatible" with all host system hardware/software implementations that support the 795XA. All OS, utility, and diagnostic software for such systems will be compatible.

In the event the host system does not use the CS80 DESCRIBE feature to acquire configuration information, minor updates to system software may be needed in order to utilize the drive's full address space.

8.4 HPIB Identify Bytes

Responses to an HPIB identify are as follows:
```
7957B:    02H, 2CH
7958B:    02H, 2DH
7959B:    02H, 2EH
```

8.0 INTERFACE SPECIFICATIONS (cont'd)

8.5 CS80 'DESCRIBE' Command Response

In response to a CS80 'describe' command, the 795XB disc controller will return the following information to the attached computer.

```
----------------------------------------
        CONTROLLER DESCRIPTION FIELD
----------------------------------------
INSTALLED UNIT (1 bit for each unit) :
**** 1000 0000 0000 0001 ****
MAXIMUM TRANSFER RATE: 1000 K-BYTES/SEC
CONTROLLER TYPE:  0
(INTEGRATED SINGLE-UNIT CONTROLLER)
```

```
-----------------------------------------------------------------
   UNIT  0  DESCRIPTION FIELD            7959B    7958B    7957B
-----------------------------------------------------------------
```

	7959B	7958B	7957B
GENERIC DEVICE TYPE: 0 (FIXED DISC)			
HP PRODUCT NUMBER	079591	079581	079571
NUMBER OF BYTES PER BLOCK	256	256	256
NUMBER OF BLOCKS WHICH CAN BE BUFFERED .	64	64	64
RECOMMENDED BURST SIZE	0	0	0
BLOCK TIME (microseconds)	265	265	265
CONTINUOUS AVG TRANS RATE (KBYTES/SEC) .	768	768	768
OPTIMAL RETRY TIME (tens of millisec) ..	80	80	80
ACCESS TIME PARAMETER	500	500	500
MAXIMUM INTERLEAVE FACTOR	1	1	1

```
FIXED VOLUME BYTE (one bit per vol):
**** 0000 0001 ****
REMOVEABLE VOLUME BYTE (one bit per vol):
**** 0000 0000 ****
```

```
---------------------------------------------
    VOLUME  0  DESCRIPTION FIELD
---------------------------------------------
```

	7959B	7958B	7957B
MAXIMUM CYLINDER ADDRESS	1571	1571	1268
MAXIMUM HEAD ADDRESS	11	5	3
MAXIMUM SECTOR ADDRESS	62	62	62
MAXIMUM SINGLE-VEC ADDRESS	1188431	594215	319787
CURRENT INTERLEAVE FACTOR	1	1	1

9.0 RELIABILITY

9.1 Data Error Rate:

9.1.1 Definitions

A recoverable error is a data error that has been successfully corrected by use of either retries or ECC (error correction code). Unrecoverable implies that neither retries or ECC could recover incorrect data.

9.1.2 On-Line Data Error Rate

When running under the file system control of any HP machine, and when operated within environmental specifications, the following error rates are warranted:

RECOVERABLE <= 10 recoverable errors in 1.0 E11 bits
                    transferred

UNRECOVERABLE <= 10 unrecoverable errors in 1.0 E13 bits
                    transferred

9.1.3 Data Error Rate Under Internal Utilities

The 795XB disc controller can execute special utility programs contained in controller firmware. Among other functions, these utilities perform special error rate tests. The internal error rate tests can only be initiated by a diagnostic program running on a host computer, and are not accessible by a user interacting through a standard HP file system. The error rate tests are intended to be used for diagnostic purposes, and hence report more detailed information than would be supplied under file system access. Much of this detailed "error" information is not indicative of impaired storage or retrieval capabilities, but is monitored in the factory for process control purposes. Many of these "errors" would never be seen by a user or operator running under file system control. As a result, the recoverable data error rate allowed when running these tests is slightly higher than that allowed under file system access. The unrecoverable error rate remains unchanged.

Recoverable <= 10 recoverable errors in 1.0 E10 bits
                    transferred

Unrecoverable <= 10 unrecoverable errors in 1.0 E13 bits
                    transferred.

9.0 RELIABILITY (cont'd)

9.2 Seek Error Rate

The seek error rate is <= 1 error in 10 E6 seeks.

9.3 Failure Rate

Warranty failure rate at ship release: <= 4%

Warranty failure rate within 12 months of ship release: <= 3%

9.4 Lifetime Power-On Hours & Start/Stop Cycles

Minimum Useful Life: 5 years or 40,000 hours

Start/Stop Cycles: 7,000

10.0 SERVICEABILITY

10.1 BMMC

The maintenance charges, as of Dec. 1, 1987, for the 795XB drives are listed below:

	7957B	7958B	7959B
FMMC:	$14.00	$15.00	$16.00
BMMC:	$28.00	$29.00	$30.00
SMMC:	$35.00	$37.00	$39.00

The products also have a media retention option to the service contract. This option, R01, allows customers with sensitive data to keep their HDA upon failure.

10.2 Mean Time to Repair (MTTR)

Since the drive has only three field replaceable assemblies and has extensive diagnostic tools, the mean time to repair has been estimated at 1/2 hour. This figure is based on the assumption that the CE has been trained on the product and has a working knowledge of the diagnostic tools.

10.3 Preventive Maintenance Cycle

There are no operating or maintenance adjustments on the 795XB Disc Drives. Therefore, an annual PM is not required.

10.0 SERVICEABILITY (cont'd)

10.4 Special Service Features

Because of their nature, disc drives continue to develop media defects throughout their useful life. As a result, the local CE is called out in many cases to spare out thsse defects. The 795XB disc drives include a special feature intended to greatly reduce this type of service call. This new feature, called autosparing, allows the disc drive to automatically spare out any marginal or unrecoverable media defects occurring during normal operation. Although normally available, this feature may be deselected by the host during the "Set Options" command.

A further enhancement of the autosparing feature provides the user with the capability to initialize media and spare defects offline. This additional feature may be invoked by selecting unused positions of the HPIB thumbwheel and then powering up the drive.

The drives have an extensive power-on self-test that tests the general functionality of the mechanism, the controller PCA, and the ESDI interface linking them. Pass/fail results are displayed on the two LEDs on the disc drive's front panel. See Section 12.3 for an LED state table.

System diagnostic capabilities include support on the following utilities:

        HP1000:   EXER
        HP3000:   CS80 UTIL
        HP85:   EX795X

The drives are also supported on the Response Center's Predictive Support program. If a customer opts for this capability, the drives' logs are monitored periodically to ensure that predetermined threshold values for faults and data errors have not been exceeded. If a threshold is exceeded, a service call is generated.

The 795XB drives that are on HP3000 systems also have the capability for Remote Support from the Response Centers. This program gives the Response Centers the ability to access systems remotely and perform diagnostics on the disc drive, thus possibly preventing a service call.

If, in the troubleshooting process the CE needs to verify that the mechanism is bad, cables W1 and W3 are long enough to allow a replacement mechanism to be tested without removing the suspect mechanism from the cabinet. This feature saves time for the CE by making troubleshooting easier and more efficient.

11.0 REGULATORY COMPLIANCE

11.1 RFI

      11.1.1 USA: Complies with the limits for a Class B computing device pursuant to Sub part J of Part 15 of the FCC Rules.

      11.1.2 EUROPE: Meets EMI level FTZ 1046/84 and provides manufacturer's declaration.

11.2 Safety

      11.2.1 CSA certified to CSA 22.2 No. 154

      11.2.2 Meets all applicable safety standards of IEC 380 and IEC 435

      11.2.3 UL listed to UL 114 and UL 478

      11.2.4 VDE 0730 Part II

12.0 OPERATOR CONTROLS AND INDICATORS

12.1 Power-On Switch

The power-on switch is located on the bottom left-hand corner of the front panel. A switch on the back of the drive allows conversion from 115V operation to 230V operation. This switch should be properly adjusted to operate at the customer's existing line voltage.

12.2 HPIB Address Switch

A thumb wheel on the back panel is used as the HPIB Address Switch. Positions 0-7 select the HPIB address; the drive should be powered off when changing the HPIB address between positions 0-7. Positions 8 and 9 are used in conjunction with the offline format and autospare capability.

12.3 Fault/On-Line Indicator

The fault/on-line indicator is the red/green display on the front panel that signals the operating status of the drive. The table on the next page shows the states of the indicator for various conditions of the drive.

12.3 Fault/On-Line Indicator (cont'd)

```
+----------+----------+------------------------------------+
|   RED    |  GREEN   |       DRIVE STATUS                 |
+----------+----------+------------------------------------+
|   ON     |   ON     | On for 5 seconds at POWER ON       |
|          |          | while controller runs self test   |
|          |          | and disc mechanism spins up.       |
|          |          |                                    |
|          |          | If either controller self test or |
|          |          | mechanism spin up fails, then      |
|          |          | both LEDs remain on.               |
|          |          |                                    |
|   OFF    | Flashing | On for 10 seconds for mechanism    |
|          |          | self test.                         |
|          |          |                                    |
|   ON     |   OFF    | Disc drive has failed mechanism    |
|          |          | self test.                         |
|          |          |                                    |
|          |          | The disc drive may still be        |
|          |          | accessed by the Host CPU to run    |
|          |          | diagnostics.                       |
|          |          |                                    |
|   OFF    |   ON     | Disc drive is in a ready state.    |
|          |          |                                    |
|   OFF    | Flashing | Disc drive is active (i.e., pro-   |
|          |          | cessing a command).                |
+----------+----------+------------------------------------+
```

LED STATE TABLE

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