

This package contains a section of the

CE SERVICE HANDBOOK FOR HP 1/4-INCH TAPE DRIVES

and consists of the following document:

HP 35401A TAPE DRIVE

Part no. 35401-90905

Insert this section into a handbook binder P/N
9282-0683.

NOTE

The tabset consists of model numbers for all CPB tape drives to be documented in the CE Service Handbook. Not all of these sections are available at this printing - refer to periodic announcements in the CSD service publication *Customer Support News* for part numbers and availability.

This handbook is intended as a reference of most-frequently-used material for the trained HP Customer Engineer. The information is condensed from other manuals related to the product and is not intended as a substitute for these manuals (see Related Manuals, page iii).

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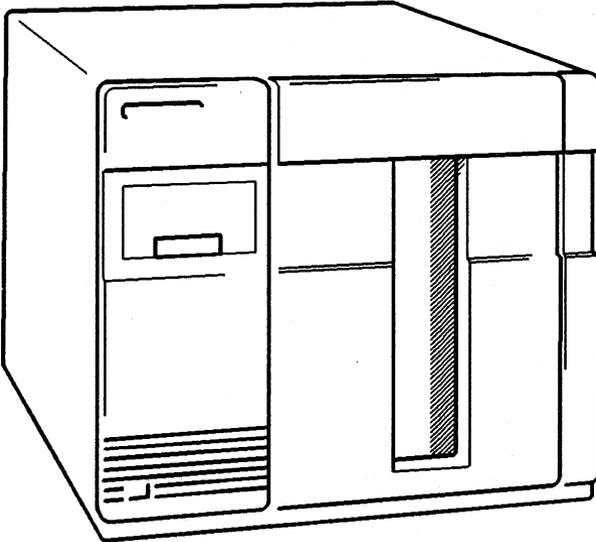
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MAINTENANCE PRECAUTIONS

When working on Printed Circuit Assemblies in this product a "Static Discharge Work-station" should be used. Further to this it should be noted that the tape drive's front door cannot be operated manually, power must be applied to the unit and the eject button pressed before the door opens automatically. Any attempt to force the front door open will result in permanent mechanical damage to the tape drive mechanism.

RELATED MANUALS

| <u>Part No.</u> | <u>Title</u> |
|-----------------|--|
| 5955-3442 | <i>CS/80 Instruction Set Programming Manual</i> |
| 5955-3462 | <i>CS/80 External Exerciser Reference Manual</i> |
| 35401-90902 | <i>HP 35401A User's Manual</i> |
| 35401-90904 | <i>HP 35401A Hardware Support Manual</i> |
| 35401-90951 | <i>HP 35401A Applications Guide</i> |
| 35401-90921 | <i>CS/80 Programmatic Support Manual</i> |



The HP 35401A Tape Drive

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SAFETY CONSIDERATIONS

GENERAL - This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation.

SAFETY SYMBOLS



Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the product against damage.



Indicates hazardous voltages.



Indicates earth (ground) terminal.

WARNING

The **WARNING** sign denotes a hazard. It calls attention to a procedure or practice which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a **WARNING** sign until the indicated conditions are fully understood and met.

CAUTION

The **CAUTION** sign denotes a hazard. It calls attention to an operating procedure or practice which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a **CAUTION** sign until the indicated conditions are fully understood and met.

SAFETY EARTH GROUND - This is a safety class I product and is provided with a protective earthing terminal. An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be

made inoperative and be secured against any unintended operation.

BEFORE APPLYING POWER - Verify that the product is configured to match the available main power source according to the input power configuration instructions provided in this manual.

If this product is to be operated with an autotransformer make sure that the common terminal is connected to the earth terminal of the main power source.

SERVICING

WARNING

Any servicing, adjustment, maintenance, or repair of this product must be performed only by service-trained personnel.

Adjustments described in this manual may be performed with power supplied to the product while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Capacitors inside this product may still be charged after the product has been disconnected from the main power source.

To avoid a fire hazard, fuses with the proper current rating and of the specified type (normal blow, time delay, etc.) must be used for replacement.

To install or remove a fuse, first disconnect the power cord from the device. Then, using a small flat-bladed screw-driver, turn the fuseholder cap counterclockwise until the cap is released. Install either end of a properly rated fuse into the cap. Next, insert the fuse and fuseholder cap into the fuseholder by pressing the cap inward and then turning it clockwise until it locks in place.

1-1. PRODUCT DESCRIPTION

The HP 35401A is a high-capacity 1/4-inch cartridge tape drive. Its characteristics are given below:

1-2. FEATURES

- 536.8 Mbytes capacity (maximum)
- Up to 8 cartridges per magazine
- Standard 1/4-inch cartridge tapes
- HP 9144/791X (Linus) compatible
- Built-in diagnostic capability

1-3. PHYSICAL SPECIFICATION

Net weight: 22.5 kg (50.5 lb)
Height: 260 mm (10.2 inches)
Depth: 575 mm (22.8 inches)
Width: 325 mm (12.8 inches)

1-4. ELECTRICAL SPECIFICATION

Line Voltage: 90-132 volts or 180-264 Volts (switch selectable)
Line Frequency: 47-66 Hz
Power Consumption: 60 Watts (typical)

1-5. ENVIRONMENTAL SPECIFICATION

The HP 35401A Tape Drive is designed to meet the class B requirements of the HP Corporate Environmental Specification. However, the conditions under which the Tape drive will operate are limited to those allowed for the media.

Temperature:
Operating: +5°C to +40°C
Non-operating: -40°C to +45°C

Humidity: 20% to 80% with maximum wet bulb temperature (non-condensing) not to exceed 26°C

1-6. PERFORMANCE SPECIFICATION

DATA CAPACITY (FORMATTED)

67.1 Mbytes per "L" cartridge (600ft)
16.7 Mbytes per "S" cartridge (150ft)
16 tracks per cartridge
4096 user blocks/track (600ft cartridge)
1024 user blocks/track (150ft cartridge)
6 frames/block (4 for data, 2 for error correction)
256 bytes/frame
8 cartridges maximum per magazine
536.8 Mbytes total maximum per magazine.

DATA TRANSFER RATE

Maximum sustained: 2 Mbytes/min (SYSTEM DEPENDENT)

Maximum sustained transfer rate does not necessarily reflect system throughput which varies depending upon application, file structure and host tape driver specification.

Tape read/write speed: 60 inches per second

Tape search/rewind speed: 90 inches per second

ACCESS TIME

Cartridge select time: 10 seconds (min), 30 seconds (max) (transit time from magazine to drive)

Cartridge load/unload times in drive:

Load: 2 minutes 15 seconds (600ft)
1 minute 15 seconds (150ft)

Unload: 1 minute 30 seconds (600ft)
35 seconds(150 ft)

The Total Access Time is the sum of the cartridge select time and the cartridge load/unload time.

ENCODING TECHNIQUE:

MFM, Bit Density = 10,000 Bits/inch (bpi)

HARD ERROR RATE:

1 in 10^{11} transferred

1-7. OPTIONS AND ACCESSORIES

In addition to the standard drive, there is an option 100. The drive itself is standard, but instead of the blank 600 foot cartridge normally supplied, there is a 150 foot cartridge tape. This is a patch tape which holds revised software (the driver DD,33 and physical utilities ASAVE and ARSTR) to support HP 1000 host systems. The part number of this tape is HP 93561J.

The following items are included with the standard drive:

- 35401-90902 HP 35401A User's Manual

- 35401-90903 HP 35401A Quick Reference Guide
- 35401-90951 HP 35401A Applications Guide
- 35401-90921 CS/80 Programmatic Support Manual
- HP 92192C Tape Cartridge Magazine
- HP 88140LC Tape Cartridge (600 foot, 67 Mbyte)
- HP 92193E Cleaning Cartridge Kit
- 8500-1251 Tape Head Cleaning Solution
- HP 10833A 1.0 meter HP-IB Cable
- Power Cord, suitable for country of destination

The following accessories are available:

- 35401-90904 HP 35401A Hardware Support Manual
- 35401-90905 HP 35401A Customer Engineer Handbook
- HP-IB Cables:
 - 0.5 meter: HP 10833D
 - 1.0 meter: HP 10833A
 - 2.0 meter: HP 10833B
 - 4.0 meter: not recommended
- HP 88140SC Package of five 16.7 Mbyte, 150 foot tape cartridges
- HP 88140LC Package of five 67.0 Mbyte, 600 foot tape cartridges
- HP 92192C Cartridge Magazine
- HP 92193E Tape Cleaning Kit
- HP 92193P Replenishment Kit for above
- HP 92211R Design Plus mobile mini-rack system cabinet
- HP 92211S Rail kit for 92211R. Contains 4 sets of rails and module locks.
- HP 92211T Filler Panel Kit for HP 92211R. Contains 20X26mm high snap-in panels to fill the space not occupied by equipment.

The following items are needed to repackage the drive for shipment:

| | |
|-------------|-----------------------------------|
| 35401-80069 | Door Opener Tab |
| 35401-80058 | Spring Clip (Tray Holder - 2 off) |
| 35401-80095 | Foam Packaging (End Pieces) |

1-8. 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

Units shipped will meet the requirements of the country of destination.

1-9. SERVICE KIT

The only service kit available for the HP 35401A is listed below. Please note that this kit should be ordered from CPB (Div C600);

| | |
|-------------|-----------------------|
| 35401-67100 | Expensed Tool Package |
|-------------|-----------------------|

1-10. CONSUMABLES

- HP 88140SC Package of five 16.7 Mbyte, 150 foot tape cartridges
- HP 88140LC Package of five 67.0 Mbyte, 600 foot tape cartridges
- HP 92193E Tape Cleaning Kit
- HP 92193P Replenishment Kit for above

2-1. ENVIRONMENTAL REQUIREMENTS

Refer to section 1-5 (page 1-1) for the HP 35401A environmental specification. For more detailed environmental requirements data, refer to the CEO Site Prep Handbook, part no. 5958-2370.

2-2. INSTALLATION

The following manuals are required to install the HP 35401A:

- Site Environmental Requirements for Disc/Tape drives, part number 5955-3456.
- HP 35401A User's Manual part number 35401-90902

In addition, there are several installation guides:

- Installing the HP 35401A with HP 3000 series 37 systems, part number 35401-90907
- Rack Mounting Kit Installation Instructions, part number 35490-90901
- Installing the HP 35401A with an HP 7936 or HP 7937 Disc Drive, part number 35401-90918.

2-3. CONTROLS AND INDICATORS

Figures 2-1 and 2-2 show the location of the tape drive controls and indicators.

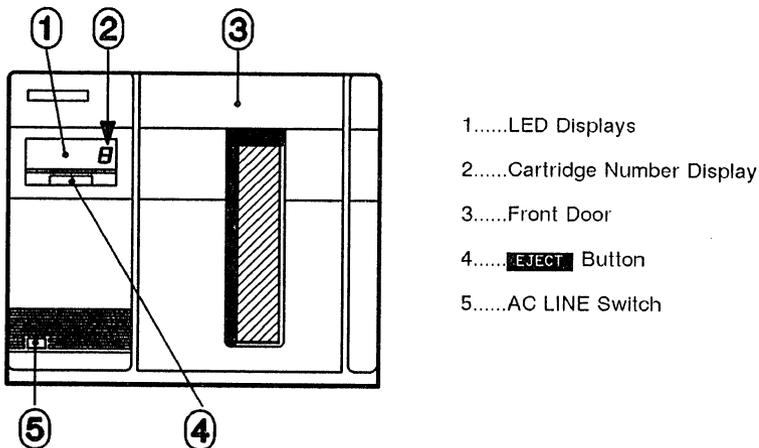


Figure 2-1. The Front Panel

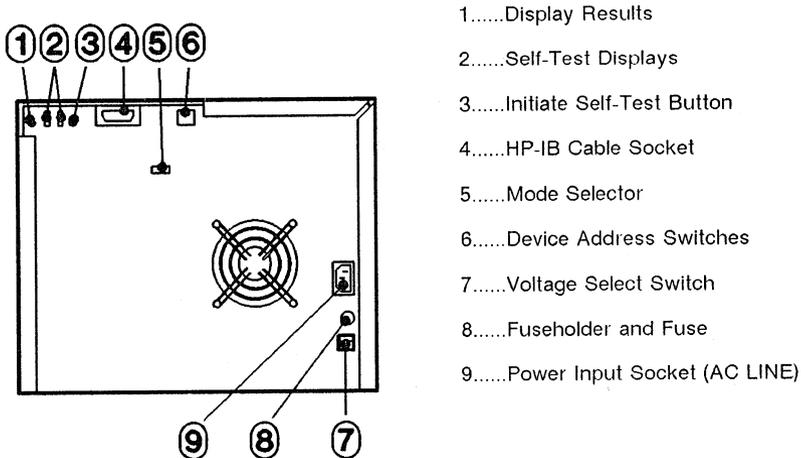


Figure 2-2. The Rear Panel

2-4. INSTALLATION CHECKLIST

- 1) Verify input AC voltage, fuse rating and selector switch settings
- 2) Connect HP-IB cable and set address select switch
- 3) Power up and perform self-test (refer to section 5)

2-5. AC POWER: VOLTAGE SELECTION/FUSES/CORDS

Voltage Selection:

CAUTION

Disconnect the power cord from the tape drive AC LINE connector before changing the VOLTAGE SELECTOR switch.

Slide the VOLTAGE SELECTOR switch to the proper position (115v or 230v) for the supply available.

Fuse:

WARNING

Remove the power cord from the tape drive before removing or replacing the fuse.

Replace the fuse with one of the same type and rating.

The same fuse is used for 115V and 230V operation:
HP part number 2110-0003, 3.0A, 250V AC, Normal Blow.

Power cords:

See Figure 2-3. for the range of available power cords.

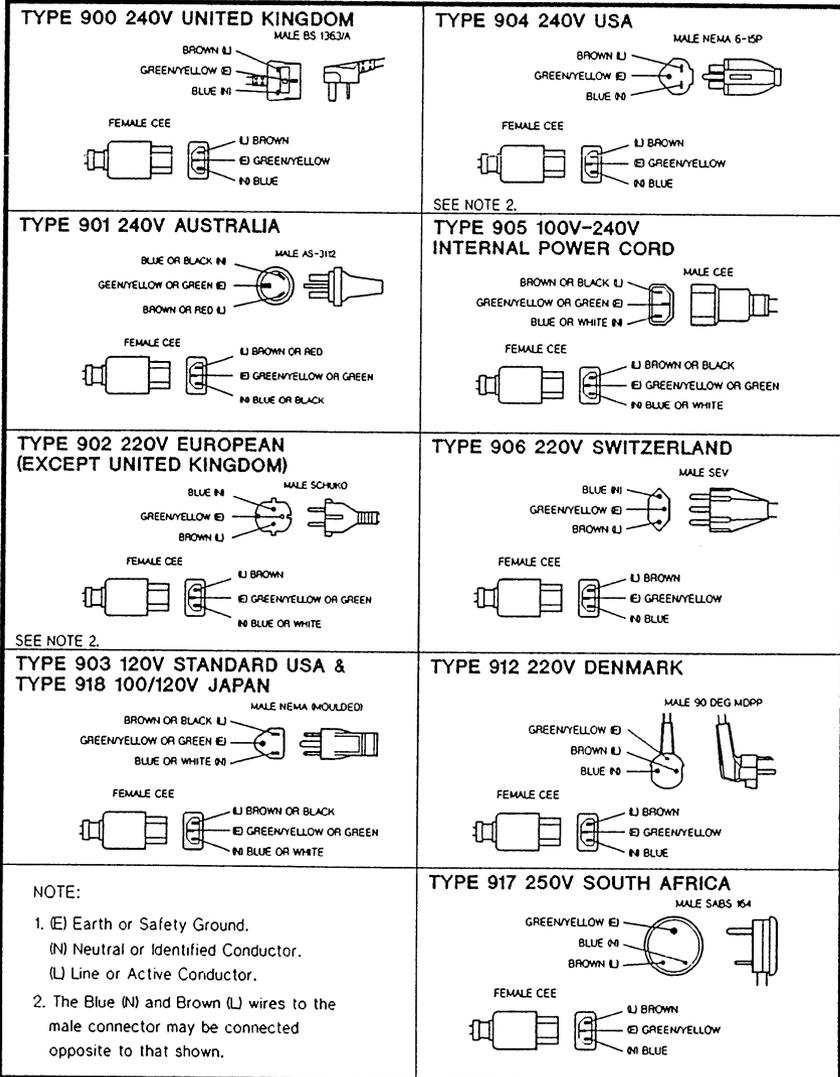


Figure 2-3. Available Power Cords

2-6. HP-IB INTERCONNECTION

WARNING

Do not connect or disconnect the HP-IB cable to the tape drive if the host system bus is active.

Do not power the tape drive up or down while still connected to the host if the host bus is active.

A 1-meter HP-IB cable is supplied with the HP 35401A. Other cables are available from CPC (PCE). See page 1-3.

2-7. HP-IB DEVICE ADDRESS

Set the HP-IB address according to Figure 2-4 and Table 2-1.

NOTE

When setting the HP-IB address switches, disregard any marking on the switch body. Set the switches according to the markings on the rear panel.

To register the new address, you must either power-cycle the drive or initiate a self-test by pressing the self-test pushbutton.

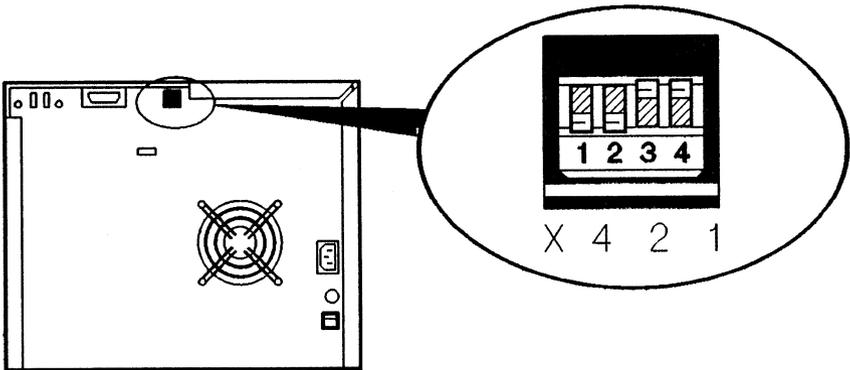


Figure 2-4. HP-IB Address Setting

Table 2-1. HP-IB Addresses

| Switch | Settings | HP-IB Address |
|--------|----------|---------------|
| X | 4 2 1 | |
| | 0 0 0 | 0 |
| | 0 0 1 | 1 |
| | 0 1 0 | 2 |
| | 0 1 1 | 3 |
| | 1 0 0 | 4 |
| | 1 0 1 | 5 |
| | 1 1 0 | 6 |
| | 1 1 1 | 7 |

2-8. PREVENTIVE MAINTENANCE

There is no scheduled PM on the HP 35401A.

2-9. HEAD CLEANING

Head cleaning should be carried out at least once a week and after using every magazine which has at least one new cartridge. Most importantly, The head should be cleaned if data errors are being experienced.

Head cleaning has been simplified by the introduction of the HP 92193E cleaning cartridge. Full instructions for use will be found with the cleaning cartridge kit.

3-1. CONFIGURATION

The Tape Drive has the capability of operating in two modes. These are the Sequential mode and the Selective mode. Each may be configured by setting the mode select switch on the rear panel (see Figure 3-1.).

SEQUENTIAL MODE

The Sequential mode is the simpler of the two, where the cartridges are accessed in order from the bottom to the top of the magazine. The cartridges may vary in capacity from one to another (16.7 or 67 Mbyte). The Tape Drive loads the cartridges in that order unless the operation is aborted by the host or the operator.

During Sequential operation the host computer has knowledge only of the cartridge which is currently loaded in the drive. Because of this, the cartridges must be put into the magazine in the order in which they are to be accessed.

SELECTIVE MODE

For this mode the host is aware of up to 8 cartridges; any one of which may be loaded and on-line at a time. The cartridges may vary in capacity from one another, and the order of access of the cartridges depends entirely upon the host computer program.

Random access may be made to any of the cartridges in the magazine using the Load command.

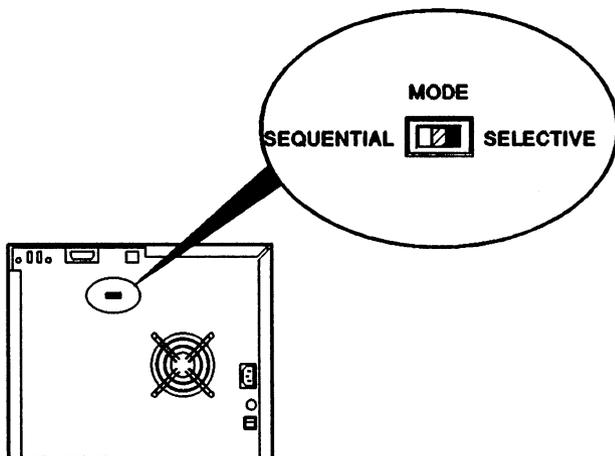


Figure 3-1. The Mode Select Switch

NOTE

On the Host Dependent Controller PCA, there is a moveable jumper. It is found adjacent to connector J2 (see Figure 3-2) and should be in position W2.

The HDC was previously also used in other disc and disc/tape drives.

Where this controller is used either in a single tape or disc drive, the jumper should be in position W2. Where a combined disc/tape drive has just one controller, the jumper should be in position W3.

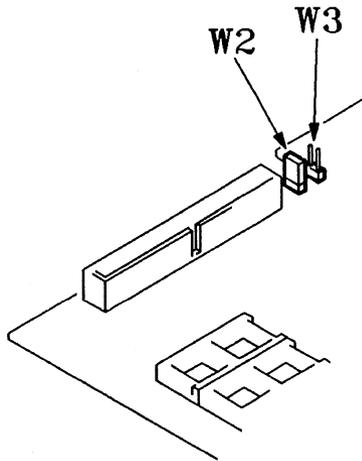


Figure 3-2. Configuring the HDC PCA

4-1. SELF-TEST

Refer to Section 5 for self-test and diagnostic information.

4-2. FRA LOCATION AND LAYOUT

See Figures 8-1 to 8-3 for FRA locations and cabling layout.

4-3. TEST ERROR CODES

Table 4-1. Test Error Codes.

| FAULT CODE | FIELD REPLACEABLE ASSEMBLY | PART No. | EXCHANGE ASSEMBLY |
|-------------------|-----------------------------------|-----------------------|--------------------------|
| U0, A0 | NOT DISCERNIBLE | | |
| U0, A1 | DRIVE MECHANISM | 09144-67501 | 09144-69501 |
| U0, A2 | DDC PCA | 09144-66512 | 09144-69522 |
| U0, A3 | RWS PCA | 09144-66518 | 09144-69518 |
| U0, A5 | HDC PCA | 07940-60195 | 07940-69195 |
| U0, A7 | RWS PCA | 09144-66518 | 09144-69518 |
| U0, A8 | HEAD STEPPER MOTOR | CHANGE MECHANISM | |
| U0, A9 | SPINDLE MOTOR | CHANGE MECHANISM | |
| U1, A1 | MDC PCA | 35401-60091 | |
| U1, A2 | VERTICAL MOTOR | CHANGE AUTO MECHANISM | |
| U1, A3 | HORIZONTAL MOTOR | CHANGE AUTO MECHANISM | |
| U1, A4 | MICROSWITCH PCA | 35401-60094 | |
| U1, A5 | FLEXIBLE PCA | CHANGE AUTO MECHANISM | |
| U1, A6 | MECHANISM | 35401-60000 | 35401-69000 |
| U1, A7 | HORIZONTAL CARRIAGE ASSEMBLY | CHANGE AUTO MECHANISM | |
| U1, A8 | CABLING (HDC/MDC/DDC DC-1B) | 35401-61601 | |
| U2, A5 | HDC PCA | 07940-60195 | 07940-69195 |

This section provides service information to help you to mend a faulty Tape Drive. Fault-finding is quickly achieved by using the comprehensive self-test and diagnostic facilities built into the unit.

5-1. SAFETY CONSIDERATIONS

GENERAL - This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation.

SAFETY SYMBOLS



Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the product against damage.



Indicates hazardous voltages.



Indicates earth (ground) terminal.

WARNING

The **WARNING** sign denotes a hazard. It calls attention to a procedure or practice which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a **WARNING** sign until the indicated conditions are fully understood and met.

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BEFORE APPLYING POWER - Verify that the product is configured to match the available main power source according to the input power configuration instructions provided in this manual.

If this product is to be operated with an autotransformer make sure that the common terminal is connected to the earth terminal of the main power source.

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To avoid a fire hazard, fuses with the proper current rating and of the specified type (normal blow, time delay, etc.) must be used for replacement.

To install or remove a fuse, first disconnect the power cord from the device. Then, using a small flat-bladed screw driver, turn the fuseholder cap counterclockwise until the cap releases. Install either end of a properly rated fuse into the cap. Next, insert the fuse and fuseholder cap into the fuseholder by pressing the cap inward and then turning it clockwise until it locks in place.

5-2. TROUBLESHOOTING STRATEGY

The HP 35401A is repaired to the Field Replaceable Assembly (FRA) level. A combination of exchange and non-exchange parts from the PrSD exchange program are used to achieve this.

To aid troubleshooting, the Tape Drive has self-test capabilities and diagnostic routines which may be initiated at power-on, by the operator or through the host. The results of these self-tests are listed in section 5-5. They provide an indication of the failed FRA(s), which can then be removed and replaced.

5-3. MINIMUM CONFIGURATION

The minimum configuration for host-initiated diagnostics comprises the Tape Drive linked to its HP 3000 or HP 9000 host for online or offline diagnostics. Alternatively, the existing host may be replaced by an HP 85 and diagnostics be performed using the CS/80 External Exerciser tape. If neither of these hosts are available for performing diagnostics then the Tape Drive's own internal diagnostics may be used.

5-4. TROUBLESHOOTING PROCEDURES

When troubleshooting the Tape Drive, the first thing to consider is whether the fault is repeatable or intermittent. This can be determined to some extent by repeating the self-test procedures several times. A repeatable fault usually causes the same self-test result to be presented each time the self-test is performed. By contrast, an intermittent fault occurring at random intervals may not always cause a self-test failure.

In the case of a repeatable fault, the self-test will identify the the failing FRA with a 95% certainty. In the event that more than one FRA is listed as the possible cause of the failure, replace the FRAs, one at a time, in the order given in the self-test display.

NOTE

Cable faults (such as an open-circuit conductor or a loose connector) may present a multiple FRA failure message. The FRAs listed will be the FRAs at either end of the defective cable.

All cabling should therefore be checked before replacing any FRAs.

Testing circuitry with a meter or oscilloscope should be restricted to checking the operation of the power supply. All other circuits are adequately tested by the system diagnostics and self-tests.

Test points are available on the PSU PCA next to the output connector J2. (see Figure 9-1, sheet 1). These should be checked with a digital voltmeter to confirm the correct voltages compared with Table 5-1. They should then be checked with an oscilloscope to determine the peak-to-peak ripple voltage.

Table 5-1. Power Supply Voltages

| Test Point | Specification | Ripple (P-P) |
|-------------------|-----------------------------------|---------------------|
| +5V | +5\pm 150mV | 50mV |
| +12V | +12 \pm 360mV | 100mV |
| -12V | -12 \pm 600mV | 100mV |
| +12VP | +12 \pm 1V | 100mV |
| PVAL | 3.5V min | - |

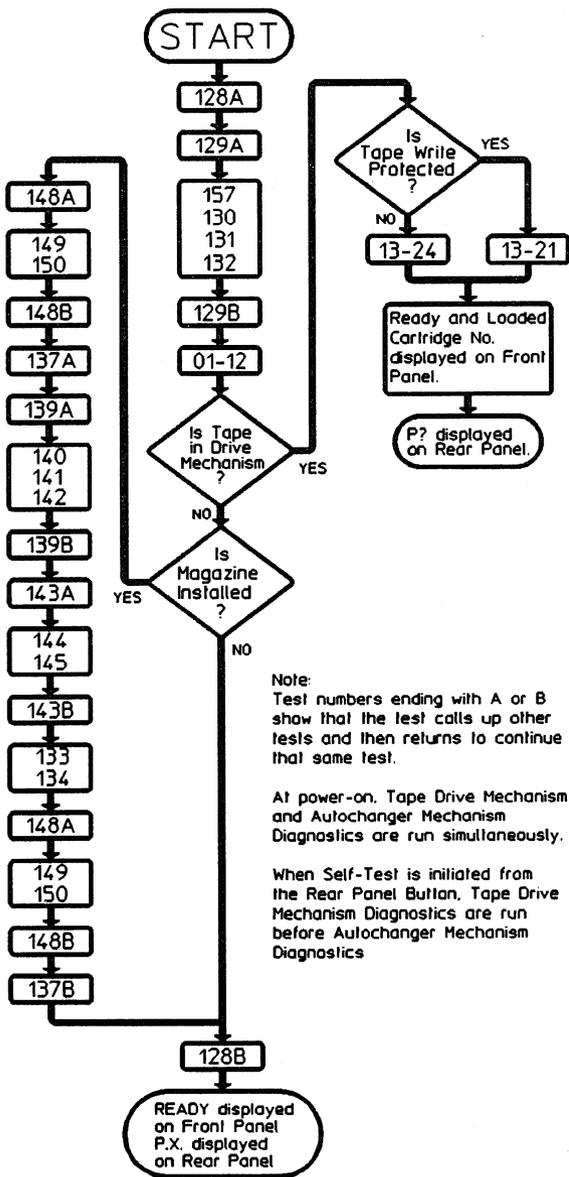


Figure 5-1. Self-Test Sequence Flowchart
(See Table 5-2. for a description of individual tests.)

5-5. ERROR CODES

As a result of self-tests the following codes may be displayed by the self-test displays on the rear panel.

The Units which may be faulty are given by the following displays:

- U. 0.** Unit 0, the Drive Mechanism, DDC & RWS PCAs
- U. 1.** Unit 1, the Autochanger Mechanism & MDC PCA
- U. 2.** Unit 2, the Internal Controller (HDC PCA)

For Unit 0, the Drive Mechanism, the Field Replaceable Assemblies that may be shown as faulty are:

- A. 0.** Not Discernible - an assembly failed and the test showed that it was good
- A. 1.** Drive Mechanism (including Spindle Motor and Head Stepper Motor)
- A. 2.** Device Dependent Controller (DDC)
- A. 3.** Read/Write/Servo Assembly (RWS)
- A. 4.** Probably a dirty tape head
- A. 5.** Host Dependent Controller (HDC)
- A. 7.** Read/Write/Servo Assembly (RWS)
- A. 8.** Head Stepper Motor (Not Separately Replaceable)
- A. 9.** Spindle Motor and Optical Sensor (Not Separately Replaceable)

| |
|-------------|
| NOTE |
|-------------|

There is no error code **A. 6.**

The Power Supply is faulty if either of the full stops (i.e., **■** **■**) are not illuminated.

For Unit 1, the Autochanger Mechanism, the FRAs that may be shown as faulty are:

- A. 1.** MDC PCA
- A. 2.** Vertical Motor (Change Auto. Mech.)
- A. 3.** Horizontal Motor (Change Auto. Mech.)
- A. 4.** Micro-switch PCA
- A. 5.** Flexible PCA (Change Auto. Mech.)
- A. 6.** Mechanism
- A. 7.** Horizontal Carriage Assembly (Change Auto. Mech.)

A. 8. Cabling (HDC/MDC/DDC DC-IB)

If any of these faults are displayed on the self-test displays confirmation may be obtained by connecting an exchange autochanger mechanism in place of the original. (See section 5-7).

If there is a Unit 2 failure, in the Internal Controller (on the HDC), the error code sequence shown on the rear panel differs from Unit 0 or Unit 1 failure sequences (see section 5-5). The sequence is:

F. X. Fail with address "X"

U. 2. Unit 2 fails. The display does not cycle through Units 0 and 1 because the self-test routine checks the controller first. Having found a fault there, it then stops.

A. 5. Host Dependent Controller. This is the only FRA than can fail when there is only a Unit 2 failure.

If the front panel **FAULT** display is illuminated, but the test results give a Pass Condition, either there is a system error or the tape cartridge is faulty. If this has occurred then the cartridge will automatically have been unloaded and the **READY** display will be lit. Loading another cartridge and repeating the test would help to establish whether it was a faulty cartridge.

Next in the self-test sequence the individual failing tests may be indicated. The following tables give the test numbers with a brief description of each test and the MSFRAs.

Table 5-2 shows the test errors which may be displayed as a result of initiating a self-test. Table 5-3 shows the errors which may be displayed at any time while the Tape Drive is in use, as the result of a fault.

5-6. INITIATING DIAGNOSTICS FROM A HOST COMPUTER

TEST PHILOSOPHY (complete self-test 00)

The test philosophy is that the Host executes a Transparent Loopback test (Read and Write) to verify functionality of the HP-IB interface and a large portion of the HDC board. If this test is unsuccessful, the host computer knows that the MSFRA (Most Suspected Field Replaceable Assembly) is the HDC assembly.

Having completed the Loopback test, the host computer instructs the HDC to Initiate Diagnostics. The parameters passed with the command tells the HDC whether to start the diagnostic at the top of the hierarchical chart, or at some lower level, and the number of times to repeat the test.

The HDC controls all levels of Diagnostic Testing. This means that the diagnostic code residing on the HDC is sent memos to execute diagnostic commands. The diagnostic code then instructs the DDC to execute its diagnostics. The diagnostic code then instructs the Servo circuitry to execute its diagnostics. Then, by using both the DDC and the Servo, the diagnostic code executes a test of the Read/Write circuitry. This must be done since there is no self-test hardware on the R/W circuitry.

If the command is to test from the beginning, the diagnostic code issues commands in a sequential order until either the test is completed or a failure is discovered. The diagnostic code then terminates the testing and updates the MSFRA and the failing

test number which are located in the Request Status summary and the back panel displays.

If the command is to execute a specific test, the diagnostic code sends the appropriate processor (e.g., DDC or RWS assembly) the command to execute the specific test. The HDC does not fail to send the message because it thinks that there is a failure higher up than the unit to be tested. For example, the diagnostic code sends a command to the DDC which tests the Read/Write circuitry even if the DDC appears to be bad.

TEST DESCRIPTIONS

HDC/DDC INTERFACE

The HDC/DDC Interface test consists of a loopback test. The diagnostic code sends the DDC a Loopback Command with an accompanying nibble (4 bits). The DDC reads this nibble, inverts it (ones complement), duplicates it into an upper nibble, and sends it back to the diagnostic code. This is done for 8 bytes. The diagnostic code decides if the correct data (the entire byte) is received and if not, declares that the DDC is faulty, with the HDC as the alternative MSFRA.

DEVICE-DEPENDENT CONTROLLER

The testing for the DDC is the self-test that is executed after every power-on. This tests >95% of the circuitry on the DDC and the results are completely independent from other circuitry, with the exception of the HDC and power supply.

This test includes testing out the microcomputer and the write and read circuitry, via internal loopback. The test stops short of sending signals to or receiving signals from the Read/Write circuitry. If the self-test fails, the DDC sends a Failing Response to the diagnostic code which causes the MSFRA to be the DDC.

If the DDC passes the self-test, it sends a Passing Response to the diagnostic code.

HDC/DDC/SERVO INTERFACE

The HDC/DDC/Servo Interface test consists of a loopback test. The diagnostic code sends the Servo a Loopback Command with an accompanying byte. The Servo reads this byte, inverts it (ones complement), and sends it back to the diagnostic code. This is done for 14 bytes. The diagnostic code decides if the correct data is received and if not, declares that the Servo is faulty, with the DDC and HDC as the alternative MSFRAs.

SERVO CIRCUITRY

The testing of the Servo circuitry tests >95% of the circuitry. The microcomputer and associated digital circuitry is tested.

The capstan motor electronics and optical sensor electronics are tested for functionality. The motor and optical sensor are then tested for functionality.

The testing for the head stepper is to determine if voltage is being sent to the motor. If there is voltage, the Servo assumes the motor works.

NOTE

Other testing (i.e., determining if a signal from the head disappears when the gap moves off the tape) is needed to verify that the head does indeed move because the head is run open loop.

READ/WRITE CIRCUITRY

The testing of the Read/Write circuitry depends on the Servo circuitry being functional. The test first tests out the read channel. It accomplishes this using the adjustable gain of the read amplifier and the Overthreshold circuitry. This checks out the functionality of the heads, pre-amps, multiplexer, and part of the secondary amplifier. A failure on one of these, but not all, is probably indicative of a damaged or dirty Head. Otherwise the failure is on the Read/Write circuitry.

If the read channel is operational, the write channel is checked. This is done by creating one block of random data, writing the data to a scratch block of the tape, reading it back, and verifying that the read data was identical to the written data. In the event of a failure this is done repetitively on different tracks to ensure that the tape is not at fault. This is done using both head channels.

AVAILABLE TESTS

The discrete unit tests are accessible to the Host via CS/80 Commands. These tests are defined as shown in Table 5-2.

5-7. USING THE SERVICE CABLE ASSEMBLY

The service cable assembly (35401-61602) can be used to verify an autochanger mechanism fault, without having to remove the suspect unit:

- 1 Remove the top shroud.
- 2 Place a new mechanism next to the Tape Drive.
- 3 Remove the cable from connector J4 on the MDC PCA and plug in the service cable.
- 4 Connect the 20-way socket to the flexible PCA on the new mechanism.
- 5 Connect the 14-way connector to the microswitch PCA and the 10-way connector to the vertical motor PCA.
- 6 Leave the 5-way connector unattached.
- 7 Power-up the unit and see if the fault has now gone.

Table 5-2. Diagnostic/Self-Test Errors (TERRORS)

| NUMBER | | CAUSE OR TEST DESCRIPTION | SUSPECT HARDWARE |
|---------------------|-----|--|----------------------|
| DEC | HEX | | |
| UNIT 0 TESTS | | | |
| 00 | 00 | Complete test of Tape Drive | |
| 01 | 01 | HDC-DDC interface. Read Servo Status | DDC, HDC |
| 02 | 02 | DDC Board | |
| 03 | 03 | a) Microcomputer test | DDC |
| 04 | 04 | b) Read/Write loopback | DDC |
| 05 | 05 | HDC-DDC Read/Write loopback. | DDC, HDC |
| 06 | 06 | HDC-DDC-Servo Interface | Servo, DDC, HDC |
| 07 | 07 | Servo Circuitry | |
| 08 | 08 | a) Microcomputer | RWS |
| 09 | 09 | b) Spindle Motor Drive Circuit | RWS, Drive Mechanism |
| 10 | 0A | c) Tachometer | RWS, Drive Mechanism |
| 11 | 0B | d) Spindle Motor | RWS, Drive Mechanism |
| 12 | 0C | e) Head Stepper Circuit | RWS, Drive Mechanism |
| 13 | 0D | Test the read portion of the RWS PCA Start by executing a Put Gaps on Tape command. This will assume unit works and a Key Found signal can be generated. A failure of this command will cause the test to continue through the read tests, trying to diagnose what caused the failure. If the read tests all pass, the testing will halt and this test number will be the failing test. | RWS PCA, DDC |

Table 5-2. Diagnostic/Self-Test Errors (TERRORS) continued

| NUMBER | | CAUSE OR TEST DESCRIPTION | SUSPECT HARDWARE |
|--------|-----|--|---------------------|
| DEC | HEX | | |
| 14 | 0E | With Read Gain set to minimum and Channel 0 positioned on the tape, enable Read with Read Head 0 and check for Overthreshold not being set. | RWS, DDC, HDC |
| 15 | 0F | With Read Gain set to minimum and Channel 0 positioned on the tape, enable Read with Write Head 0 and check for Overthreshold not being set. | RWS, DDC, HDC |
| 16 | 10 | With Read Gain set to a maximum and Channel 0 positioned on the tape, enable Read with Read Head 0 and check for Overthreshold being set. | RWS, DDC |
| 17 | 11 | With Read Gain set to maximum and Channel 0 positioned on the tape, enable Read with Write Head 0 and check for Overthreshold being set. | RWS, DDC, HDC |
| 18 | 12 | With Read Gain set to a minimum and Channel 1 positioned on the tape, enable Read with Read Head 1 and check for Overthreshold not being set. | RWS, DDC, HDC |
| 19 | 13 | With Read Gain set to a minimum and Channel 1 positioned on the tape, enable Read with Write Head 1 and check for Overthreshold not being set. | RWS, DDC, HDC |
| 20 | 14 | With Read Gain set to a maximum and Channel 1 positioned on the tape, enable Read with Read Head 1 and check for Overthreshold being set. | RWS, DDC |
| 21 | 15 | With Read Gain set to maximum and Channel 1 positioned on the tape, enable Read with Write Head 1 and check for Overthreshold being set. | RWS, DDC |
| 22 | 16 | Test the Write portion of the RWS PCA. | RWS |

Table 5-2. Diagnostic/Self-Test Errors (TERRORS) continued

| NUMBER | | CAUSE OR TEST DESCRIPTION | SUSPECT HARDWARE |
|---------------------|-----|---|------------------------------|
| DEC | HEX | | |
| 23 | 17 | After the edge of tape has been found and the tape wound to BOT, execute a Locate and Write to track 0, Key 4 with Channel 0. Read back the written data and verify it is the same data that was written. If not, return an error. | RWS, DDC, Drive Mechanism |
| 24 | 18 | Execute a Locate and Write to track 7, Key 5 with Channel 1. Read back the written data and verify it is the same data that was written. If not, return an error. | RWS, DDC, Drive Mechanism |
| UNIT 1 TESTS | | | |
| 128 | 80 | Test entire autochanger mechanism subsystem. There is an initial check of the MDC. If it passes, some sensors are checked to see if a mechanism diagnostic is allowed. It is run if the Vertical Home sensor is active; the cartridge-under-arm (CUA) and Write-Protect sensors show no cartridge (cleaning or normal) is under the arm; and the Magazine sensor is active (there is a magazine present). If these conditions are all true then the mechanism diagnostic (No. 137) is executed. If no magazine is loaded then no mechanism diagnostics are executed. | N/A |
| 129 | 81 | MDC PCA Test all but motor drivers and controllers. No mechanism movement. DC-IB, NOVRAM and one channel of the 8253 timer IC are tested. This test calls test Nos 157, 130, 131, 132, exiting at the first failure. | MDC |

Table 5-2. Diagnostic/Self-Test Errors (TERRORS) continued

| NUMBER | | CAUSE OR TEST DESCRIPTION | SUSPECT HARDWARE |
|--------|-----|--|-----------------------|
| DEC | HEX | | |
| 130 | 82 | Data/Control Interface Bus (DC-IB) A loopback register is provided in the MDC, so that the last value written to the MDC can be read back. This register is exercised with a series of data patterns. The test passes if no integrity errors are encountered. | MDC, HDC, DC-IB Cable |
| 131 | 83 | NOVRAM Power interruption during this test will leave the NOVRAM corrupted for the next power-on. If a magazine is loaded then no test is performed, and the test always passes. If the sensor detects no magazine present, then a superficial non-volatility test is performed. The mechanism logs are not tested, but can be by using the Clear Logs Utility (see section 10 of HSM). | MDC, DC-IB Cable |
| 132 | 84 | 8253 Timer IC Functional check of third channel of timer. Also measures period of count provided by on-board oscillator by comparison with HDC clock. It calibrates the counter from this clock to allow for component tolerances. | N/A |
| 133 | 85 | Eject Solenoid Visual check: solenoid activated and deactivated after half a second. | N/A |
| 134 | 86 | Arm Solenoid Visual check: solenoid activated and deactivated after half a second. | N/A |

Table 5-2. Diagnostic/Self-Test Errors (TERRORS) continued

| NUMBER | | CAUSE OR TEST DESCRIPTION | SUSPECT HARDWARE |
|--------|-----|---|---------------------|
| DEC | HEX | | |
| 137 | 89 | <p>Mechanism</p> <p>Starts with vertical axis check (No. 139). If this passes, it moves horizontal carriage assembly to a height suitable for horizontal axis check (No. 143). If this also passes, then the eject solenoid (No. 133) and arm solenoid (No. 134) checks are performed. Finally, the mechanism is moved to the "home" position. Testing is aborted when the first failure is detected. WARNING: Ensure the mechanism path is clear before running this diagnostic.</p> | N/A |
| 138 | 8A | <p>Half Mechanism Test</p> <p>This test performs as complete a check of the mechanism as is possible allowing for the door being open (and a magazine loaded). It is called during a complete self-test when the magazine is absent. Vertically it performs the same functions as Test No. 137, but horizontally the test is abbreviated. WARNING: Ensure the mechanism path is clear before running this diagnostic.</p> | N/A |
| 139 | 8B | <p>Vertical Axis Movement</p> <p>This test executes the vertical motor (No. 140), vertical sensors (No. 141) and vertical travel (No. 142) tests to check all FRAs associated with vertical movement. WARNING: Ensure the mechanism path is clear before running this diagnostic.</p> | N/A |

Table 5-2. Diagnostic/Self-Test Errors (TERRORS) continued

| NUMBER | | CAUSE OR TEST DESCRIPTION | SUSPECT HARDWARE |
|--------|-----|--|--|
| DEC | HEX | | |
| 140 | 8C | <p>Vertical Motor</p> <p>Vertical motor is powered-up. Vertical counter channel and vertical slot and home sensors are examined for evidence of vertical movement. If no evidence is found, then the horizontal axis is tested in the same way to see if the fault is unique to either motor/encoder or the MDC or cable connecting them.</p> | Vertical Motor, MDC |
| 141 | 8D | <p>Vertical Sensors</p> <p>By moving the vertical motor, the test checks that the vertical home and vertical slot sensors change state as the vertical movement is attempted. It checks that the vertical slot sensor becomes active at the correct heights above the vertical home sensor.</p> <p>WARNING: Ensure the mechanism path is clear before running this diagnostic.</p> | Autochanger Mechanism, Vertical Motor, Microswitch PCA |
| 142 | 8E | <p>Vertical Travel</p> <p>Platform moved from top to bottom of vertical axis to check that it is the correct length. It checks that the mechanism path is unobstructed and that there is little or no backlash in the vertical gearbox.</p> <p>WARNING: Ensure the mechanism path is clear before running this diagnostic.</p> | Autochanger Mechanism, Vertical Motor |
| 143 | 8F | <p>Horizontal Axis Movement</p> <p>This test executes the horizontal motor (No. 144) and horizontal sensor (No. 145) tests, to check all FRAs associated with horizontal movement. Testing is aborted when the first failure is detected.</p> <p>WARNING: Ensure the mechanism path is clear before running this diagnostic.</p> | N/A |

Table 5-2. Diagnostic/Self-Test Errors (TERRORS) continued

| NUMBER | | CAUSE OR TEST DESCRIPTION | SUSPECT HARDWARE |
|--------|-----|---|--|
| DEC | HEX | | |
| 144 | 90 | <p>Horizontal Motor</p> <p>Horizontal motor is powered-up. Counter channel and horizontal B and C sensors are examined for evidence of horizontal movement. If no evidence is found, then the vertical axis is similarly tested to see if the fault is unique to either motor/encoder or is caused by the MDC or connecting cable.</p> | Horizontal Motor, MDC |
| 145 | 91 | <p>Horizontal Sensors</p> <p>By moving the horizontal motor, the test checks that the horizontal B or C sensors change state as axis movement is performed. It then checks that the correct sequence of sensor states occurs as the arm moves along the horizontal axis.</p> <p>WARNING: Ensure the mechanism path is clear before running this diagnostic.</p> | Horizontal Carriage |
| 148 | 94 | <p>Find Home</p> <p>At power-on this test is used to move the mechanism to the horizontal home position. It calls the horizontal home test (No. 149), followed by the vertical home test (No. 150).</p> | N/A |
| 149 | 95 | <p>Find Horizontal Home</p> <p>The mechanism is moved to home to prepare for a mechanism diagnostic (half or full).</p> | Autochanger Mechanism, Horizontal Motor |
| 150 | 96 | <p>Find Vertical Home</p> <p>The mechanism is moved to vertical home position to prepare for a mechanism diagnostic (half or full).</p> | Autochanger Mechanism, Microswitch PCA |

Table 5-2. Diagnostic/Self-Test Errors (TERRORS) continued

| NUMBER | | CAUSE OR TEST DESCRIPTION | SUSPECT HARDWARE |
|---------------------|-----|---|---------------------|
| DEC | HEX | | |
| 157 | 9D | <p>Front Panel Display</p> <p>Activate each LED segment on front panel for visual check. Starts with all LEDs illuminated then all LEDs off. Then LEDs activated in sequence: READY, UNLOAD, FAULT, PROTECT, LOAD and BUSY. Then the segments of the seven-segment display are illuminated in sequence.</p> | Front Panel PCA |
| UNIT 2 TESTS | | | |
| 01 | 01 | <p>Kernal RAM test</p> <p>This RAM is tested first and is then used for the remainder of the HDC tests. The first 1K of RAM is tested during this test.</p> | HDC PCA |
| 02 | 02 | <p>HDC Checksum test</p> <p>Performs a checksum on the Executive EPROM.</p> | HDC PCA |
| 03 | 03 | <p>RAM test</p> <p>Tests the rest of the RAM not tested in the Kernel RAM test.</p> | HDC PCA |
| 04 | 04 | <p>DMA test</p> <p>Checks input and output paths of the DMA circuitry.</p> | HDC PCA |
| 05 | 05 | <p>Timer test</p> <p>Checks the on-board HDC timer (period = 1.024 msec)</p> | HDC PCA |
| 06 | 06 | <p>HP-IB Interface test</p> <p>Performs a check on the 8291 HP-IB interface IC.</p> | HDC PCA |
| 07 | 07 | <p>DDC Checksum test</p> <p>This test fails if either of the Unit code checksums does not agree with their expected values.</p> | HDC PCA |

Table 5-2. Diagnostic/Self-Test Errors (TERRORS) continued

| NUMBER | | CAUSE OR TEST DESCRIPTION | SUSPECT HARDWARE |
|---------------|------------|---|--------------------------------|
| DEC | HEX | | |
| 08 | 08 | <p>Configuration test</p> <p>This test fails if the wrong Unit code for the DDC is installed.</p> | DDC ROMS on HDC, U121 and U151 |
| 136 | 88 | <p>Processor test</p> <p>If this test fails, the rear display remains at 88. No external command or operation can be interpreted if the Processor has failed.</p> | HDC PCA |

Table 5-3. Run-Time Drive Errors (DERRORS)

| NUMBER | | CAUSE | SUSPECT HARDWARE |
|--------|-----|--|--|
| DEC | HEX | | |
| 16 | 10 | Success | None |
| 17 | 11 | Vertical motor jammed or counter stopped | Vertical motor, cables |
| 18 | 12 | Horizontal motor jammed or counter stopped | Horizontal motor, cables |
| 19 | 13 | Vertical motor did not stop at the end of its travel | Belt tension, motor |
| 20 | 14 | Horizontal motor did not stop at the end of its travel | Belt tension, motor |
| 21 | 15 | Invalid sensor state - vertical, HB, HC, or CUA sensors in wrong state | Failed sensors, cables |
| 22 | 16 | Faulty count | Slack mechanism or gearbox |
| 23 | 17 | Not used | None |
| 24 | 18 | Not used | None |
| 25 | 19 | Magazine not present | No magazine, door open, sensor failed |
| 26 | 1A | Load timed-out. Tape Drive mechanism took too long to load cartridge. | Cabling, MDC |
| 27 | 1B | Not used | None |
| 28 | 1C | Not used | None |
| 29 | 1D | Clear received from host | None |
| 30 | 1E | Cartridge not loaded in drive mechanism, when attempt is made to activate "cartridge present" sensor | CUA sensors, cartridge removed illegally |
| 31 | 1F | Unload failed | MDC |

Table 5-3. Run-Time Drive Errors (DERRORS) continued.

| NUMBER | | CAUSE | SUSPECT HARDWARE |
|--------|-----|---|---|
| DEC | HEX | | |
| 32 | 20 | Cleaning cartridge found during preload | None |
| 33 | 21 | Invalid parameter specified in load or unload | None |
| 34 | 22 | Vertical slot not reached | Jammed mechanism, failed sensor, blocked slot, cable, MDC |
| 35 | 23 | Vertical slot passed | Slack mechanism or gearbox, failed sensor, blocked slot, cable, MDC |
| 36 | 24 | Faulty vertical count | Slack mechanism or gearbox |
| 37 | 25 | Faulty horizontal count | Slack mechanism or gearbox |
| 38 | 26 | Unable to load. Tape mechanism diagnostics have failed. | |
| 39 | 27 | Cleaning cycle time-out. Cleaning cycle did not complete. | |
| 40 | 28 | Not used | None |
| ↓ | ↓ | | |
| 48 | 30 | Not used | None |
| 49 | 31 | HB sensor invalid | Sensor, cable, MDC |
| 50 | 32 | HC sensor Invalid | Sensor, cable, MDC |
| 51 | 33 | HB and HC sensors invalid | Sensors, cables, MDC |
| 52 | 34 | VH sensor invalid | Sensor, cable, MDC |
| 53 | 35 | VH and HB sensors invalid | Sensors, cables, MDC |
| 54 | 36 | VH and HC sensors invalid | Sensors, cables, MDC |

Table 5-3. Run-Time Drive Errors (DERRORS) continued.

| NUMBER | | CAUSE | SUSPECT HARDWARE |
|--------|-----|--|----------------------|
| DEC | HEX | | |
| 55 | 37 | VH, HB and HC sensors invalid | Sensors, cables, MDC |
| 56 | 38 | CUA sensor invalid | Sensor, cable, MDC |
| 57 | 39 | CUA and HB sensors invalid | Sensors, cables, MDC |
| 58 | 3A | CUA and HC sensors invalid | Sensors, cables, MDC |
| 59 | 3B | CUA, HB and HC sensors invalid | Sensors, cables, MDC |
| 60 | 3C | CUA and VH sensors invalid | Sensors, cables, MDC |
| 61 | 3D | CUA, VH and HB sensors invalid | Sensors, cables, MDC |
| 62 | 3E | CUA, VH and HC sensors invalid | Sensors, cables, MDC |
| 63 | 3F | CUA, VH, HB and HC sensors invalid | Sensors, cables, MDC |
| 177 | B1 | Recoverable dual errors (one byte) Two frames were bad (CRC error or missing) which were recoverable through XOR circuitry. (Marginal or recoverable) | None |
| 178 | B2 | Single frame error (one byte) Only one frame with bad CRC or missing. (Marginal or recoverable) | None |
| 179 | B3 | Unrecoverable data (one byte) Combination of frame CRC errors or missing frames such that data could not be recovered through XOR circuitry. (Marginal, recoverable or unrecoverable) | None |

Table 5-3. Run-Time Drive Errors (DERRORS) continued.

| NUMBER | | CAUSE | SUSPECT HARDWARE |
|--------|-----|---|------------------|
| DEC | HEX | | |
| 180 | B4 | DMA handshake error (one byte) Overflow or underflow has occurred between HDC and DDC. (Marginal, recoverable or unrecoverable) | HDC, DDC |
| 181 | B5 | DMA failure (one byte) Not enough frames detected during read or read-while-write. (Marginal recoverable, or unrecoverable) | HDC, DDC |
| 185 | B9 | Key error (one byte) One key past target, keys past target, bad key CRC, time-out of key sync, wrong key sent or verify failed. This error occurs during transfer, not seek to target or seek to perform retries. (Marginal, recoverable, unrecoverable, or latency induced) | DDC |
| 186 | BA | Seek error (one byte) Seek to target required retries or failed because of time-out or keys past target. (Unit fault) | DDC |
| 187 | BB | Seek to a jump spare (one byte) A latency was induced due to seeking to a jump spare during a transaction (Latency induced) | DDC |
| 190 | BE | Reposition failure (one byte) Reposition of tape to next target address after tape access command required retries or failed. (Unit fault) | DDC |

Table 5-3. Run-Time Drive Errors (DERRORS) continued.

| NUMBER | | CAUSE | SUSPECT HARDWARE |
|--------|-----|---|---|
| DEC | HEX | | |
| 193 | C1 | <p>Log overflow (two bytes)</p> <p>Log indicated in postbyte overflowed. (Possible loss of entries)</p> <p>0 = Manufacturer's block 1 = Sparing table 2 = Error rate test log 3 = Runtime error log 4 = Use log (Maintenance track overflow)</p> | <p>Tape Drive Subsystem: DDC RWS Drive Mechanism</p> |
| 194 | C2 | <p>Unable to read log (two bytes)</p> <p>Log indicated in postbyte could not be read in multiple retries. (For sparing table, this could mean that it was never written or errors preclude it from being written. For other logs, if log was never written this error will not occur. Log will be returned as empty.) Postbyte log codes are defined above. (Unrecoverable data, uninitialized media, unit fault)</p> | <p>Uninitialized cartridge, Tape Drive Subsystem: DDC RWS Drive Mechanism</p> |
| 195 | C3 | <p>Unable to write log (two bytes)</p> <p>Log indicated in postbyte could not be written on any track in multiple retries. Postbyte log codes are defined above. (Unrecoverable data)</p> | |
| 196 | C4 | <p>Log only written on one track (two bytes)</p> <p>Log indicated in postbyte could only be written on one track rather than the usual two. Postbyte log codes are defined above. (Unrecoverable data)</p> | |

Table 5-3. Run-Time Drive Errors (DERRORS) continued.

| NUMBER | | CAUSE | SUSPECT HARDWARE |
|--------|-----|---|------------------|
| DEC | HEX | | |
| 200 | C8 | <p>Servo error (two bytes)</p> <p>Command to servo processor was not successfully executed. Postbyte contains status returned by servo processor:</p> <p>00H = Power on state (servo processor is reset) FFH = Busy/Active 1(T)H = Rewind/T = track 2(T)H = Forward/T = track 3(T)H = Stopped/T = track 40H = Invalid command 41H = Loss of speed control 44H = Cannot find edge of tape 48H = Pre-pos gaps, no keys 50H = Cannot calibrate speed 61H = Unspool likely, no keys found 64H = EOT active 68H = BOT active (Unit fault)</p> | |
| 206 | CE | <p>Load error (two bytes)</p> <p>This cartridge failed the load sequence. Failure is recorded in postbyte:</p> <p>1 = Load diagnostics failed 2 = Seek to EOT failed 3 = Speed calibration failed 4 = Gain set failed 5 = Seek to BOT failed 6 = Edge find failed (Unit fault)</p> | |
| 207 | CF | <p>Unload error (two bytes)</p> <p>This cartridge did not successfully complete the normal unload sequence (logs may not have been updated). Failure is recorded in postbyte:</p> <p>1 = Diagnostic result indicated a hardware failure so normal unload was not attempted.</p> <p>2 = Seek to EOT failed (Unit fault)</p> | |

Table 5-3. Run-Time Drive Errors (DERRORS) continued.

| NUMBER | | CAUSE | SUSPECT HARDWARE |
|--------|-----|--|------------------|
| DEC | HEX | | |
| 209 | D1 | Not certified This cartridge is not certified. (Uninitialized media) | None |
| 210 | D2 | Certify command failed Attempt to certify a cartridge failed. Possible reasons are: 1 Requires >80% of the spares to be used up. 2 Can't write spares table to tape. 3 Error rate test failed due to log overflow or seek failure. 4 Transfer canceled 5 Certify specified with 0 loops. (Uninitialized media) | |
| 216 | D8 | Hardware fail (one byte) Attempt to access the tape (with a non-diagnostic command) when previous diagnostic command, power-on or load diagnostics indicated a hardware failure. (Unit fault) | |
| 217 | D9 | Write circuit failure (one byte) Attempt to perform a write command when write circuitry has failed power-on or load diagnostics or has failed a diagnostic command. (Unit fault) | |
| 223 | DF | No buffers in system (one byte) No buffers are available to complete a transaction. (Controller fault) | |

The only adjustments to be made in the Tape Drive concern the autochanger mechanism drive belts. The horizontal belt tension is adjustable, whereas the vertical drive belts have self-adjusting tensioners.

The vertical drive belts, however, have to be checked for position. If either belt slips over the toothed pulley at the bottom of the mechanism, the result is that the platform assembly is no longer parallel with the mechanism.

6-1. SAFETY CONSIDERATIONS

GENERAL - This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation.

SAFETY SYMBOLS



Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the product against damage.



Indicates hazardous voltages.



Indicates earth (ground) terminal.

WARNING

The **WARNING** sign denotes a hazard. It calls attention to a procedure or practice which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a **WARNING** sign until the indicated conditions are fully understood and met.

CAUTION

The **CAUTION** sign denotes a hazard. It calls attention to an operating procedure or practice which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a **CAUTION** sign until the indicated conditions are fully understood and met.

SAFETY EARTH GROUND - This is a safety class I product and is provided with a protective earthing terminal. An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and be secured against any unintended operation.

BEFORE APPLYING POWER - Verify that the product is configured to match the available main power source according to the input power configuration instructions provided in this manual.

If this product is to be operated with an autotransformer make sure that the common terminal is connected to the earth terminal of the main power source.

SERVICING

WARNING

Any servicing, adjustment, maintenance, or repair of this product must be performed only by service-trained personnel.

Adjustments described in this manual may be performed with power supplied to the product while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Capacitors inside this product may still be charged after the product has been disconnected from the main power source.

To avoid a fire hazard, fuses with the proper current rating and of the specified type (normal blow, time delay, etc.) must be used for replacement.

To install or remove a fuse, first disconnect the power cord from the device. Then, using a small flat-bladed screw driver, turn the fuseholder cap counterclockwise until the cap releases. Install either end of a properly rated fuse into the cap. Next, insert the fuse and fuseholder cap into the fuseholder by pressing the cap inward and then turning it clockwise until it locks in place.

6-2. REQUIRED TOOLS/EQUIPMENT

In addition to the Customer Engineer toolkit and the TORX kit, a drive-belt tension-checking tool (35401-60030) is needed to make the required adjustments.

6-3. PREPARATION FOR ADJUSTMENTS

Before making any adjustments in the Tape Drive, take the following steps to prepare it for service:

- 1 Set the AC line switch to the **OFF** (push-button out) position. Disconnect the power cord from the AC line socket on the rear of the Tape Drive.
- 2 Disconnect the HP-IB cable assembly from the connector on the rear panel.
- 3 Place the Tape Drive on the anti-static mat and connect the wrist strap to the pad. When the top shroud is removed, ground the frame of the Tape Drive to the mat.

CAUTION

Ensure that the anti-static wrist strap is attached to your wrist before removing or replacing any components in the Tape Drive.

6-4. SETTING HORIZONTAL BELT TENSION

To check or adjust the horizontal drive belt tension you must proceed through the preparation section (6-3) and remove the top shroud.

The horizontal carriage assembly should be positioned at the middle or top of its travel and at the forward limit of its travel. If it is not there, gently move it by hand to the correct position.

CAUTION

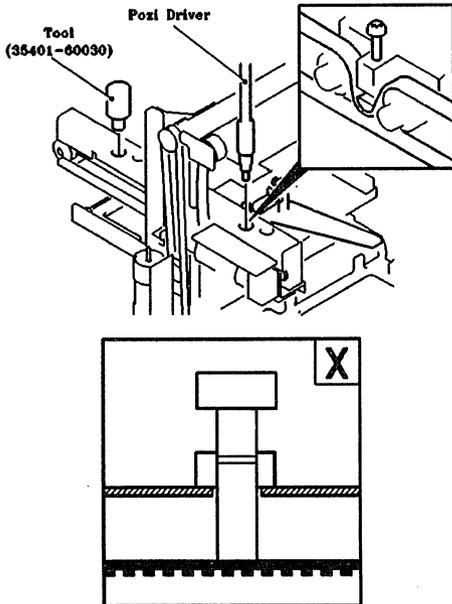
Gently apply force to the center of the platform to move it up or down. Parts of the mechanism could be permanently deformed if force is applied elsewhere.

Take care not to open the door with the horizontal carriage assembly forward and near the bottom of its travel. The door would damage the arm on the assembly.

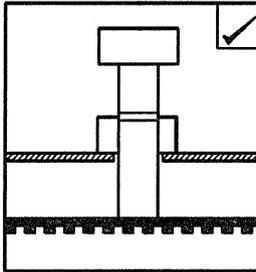
Gently move the flexible PCA away from over the holes in the horizontal sensor bar.

The belt tension may be checked by placing the tool (35401-60030) through the hole in the horizontal sensor bar, as shown in Figure 6-1. (Near the middle of the belt length). If the tension is correct, a single groove will show above the sliding collar resting on the horizontal sensor bar. If the belt is too tight, then two grooves will show above the collar. If the belt is too slack, then no grooves will show.

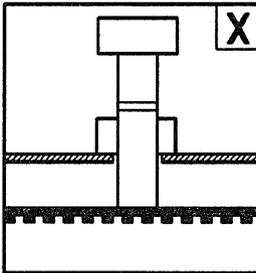
If the tension is not correct, it should be adjusted using a Pozidrive screwdriver, as shown in Figure 6-1. Slacken the belt first by unscrewing the T10 screw and pressing down on the belt. Then tighten the belt until the belt tension tool just shows one groove.



Belt too slack



Tension correct



Belt too tight

Figure 6-1. Belt Tension Adjustment

6-5. SETTING VERTICAL BELT POSITION

If either of the vertical drive belts slips over the toothed pulleys, the platform assembly will no longer be parallel with the tape mechanism. (This can occur if the platform is moved too fast or too hard at one side by hand). This makes vertical movement of the platform noticeably stiff, and can cause loading problems.

A baseplate from a discarded cartridge (or a full cartridge, if you don't have a baseplate) can be used to check whether the platform assembly is parallel with the mechanism, as follows:

- 1 Perform the preparation for adjustment procedure outlined in section 6-3.
- 2 Disconnect the autochanger cable from socket J4 on the MDC PCA (see section 6-14 of the HP 35401A Hardware Support Manual).
- 3 Gently move the horizontal carriage to the home position.
- 4 Slide the baseplate part way onto the platform (if a full cartridge is used, lift the Cartridge Under Arm).

- 5 Starting with the platform slightly above vertical home, lower it gradually until the baseplate is close to the two machined lugs on the base casting (see Figure 6-2).

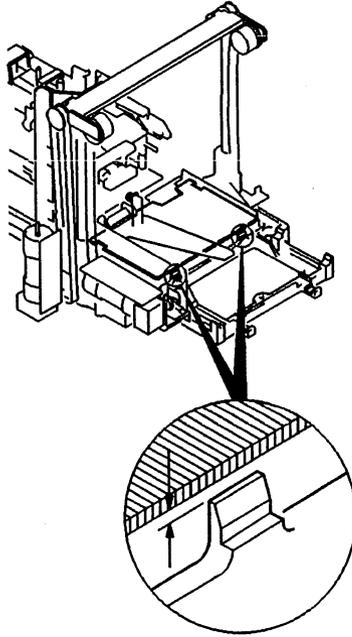


Figure 6-2. Checking the Platform Assembly

The gaps between the baseplate and the lugs should be the same on each side. If not, remove the cartridge baseplate and perform the platform levelling procedure, as follows:

- 1 With a flat-bladed screwdriver, completely slacken one of the belt tensioners and slip the belt over the teeth on the bottom pulley.
- 2 Re-tighten the belt tensioner and use the cartridge baseplate again to see if the platform assembly is now level. If not, repeat this procedure until the assembly is level.
- 3 Check that the platform assembly now moves freely vertically.
- 4 Power up the drive and check that the mechanism functions correctly during self-test.

NOTE

Some toothed belts have marks which can assist in the levelling procedure (see Figure 6-3).

Platform Levelling Marks

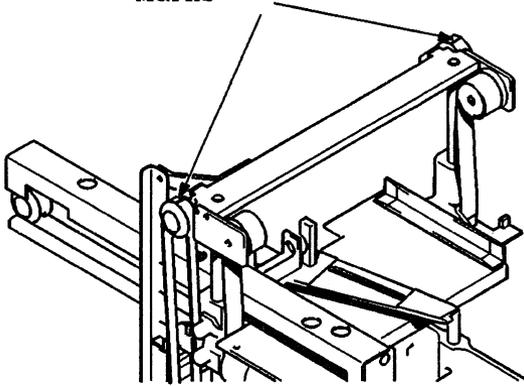


Figure 6-3. Platform Levelling

With the horizontal carriage at the lower limit of its travel, these marks can be seen near the top bar and should be level.

If not, use the marks as a guideline when adjusting the toothed belts, but remember to use the cartridge baseplate as a final check, as outlined earlier.

7-1. INTRODUCTION

This section is not applicable for this product.

REPLACEABLE PARTS

SECTION

8

This section provides listings of all field-replaceable parts and an illustrated parts breakdown for the subsystem.

8-1. REPLACEABLE PARTS INFORMATION

Replaceable parts for the subsystem are listed in disassembly order in table 8-1 and illustrated in figure 8-1. In the table, attaching parts are listed immediately after the item they attach. Items in the DESCRIPTION column are indented to indicate relationship to the next higher assembly. In addition, the symbol "---X---" follows the last attaching part for that item. Indentation of the items in the tables is as follows:

Major Assembly

*Replaceable Assembly

*Attaching Parts for Replaceable Assembly

**Subassembly or Component Part

**Attaching parts for Subassembly or Component Part

The replaceable parts listings provide the following information for each part:

- FIG. & INDEX NO. The figure and index number which indicates where the replaceable part is illustrated.
- HP PART NO. The Hewlett-Packard part number for each replaceable part.
- DESCRIPTION. A description of each replaceable part. Refer to table 9-4 in the HSM (35401-90904) for an explanation of abbreviations used in the description column.
- MFR CODE. The 5-digit code that denotes a typical manufacturer of a part. Refer to table 9-5 in the HSM (35401-90904) for a list of manufacturers who correspond to the codes.
- MFR PART NO. The manufacturer's part number of each replaceable part.
- UNITS PER ASSY. The total number of each part used in the major assembly.

The MFR CODE and MFR PART NO. for common hardware items are listed as 00000 and OBD (order by description) respectively, because these items can usually be purchased locally.

8-2. ILLUSTRATED PARTS BREAKDOWN

See Figures 8-1 and 8-2 for an exploded view of the HP 35401A Tape Drive.

See Figure 9-3 for details of preparing a replacement drive mechanism prior to fitting.

8-3. EXCHANGE ASSEMBLIES

The following assemblies are included in the current exchange program:

09144-69501 DRIVE MECHANISM
09144-69518 R/W /SERVO PCA
09144-69512 DDC PCA
07940-69195 HDC PCA
35401-69000 AUTOCHANGER MECH.

8-4. REPLACEABLE PARTS LIST

See Table 8-1 for a list of Field Replaceable Parts.

8-5. SERVICE KIT

The only service kit supplied for the HP 35401A is:

ETP (Expensed Tools Package) (35401-67100) includes extra tools and equipment to aid servicing.

For Detail A
See Sheet 2

For Detail B
See Sheet 3

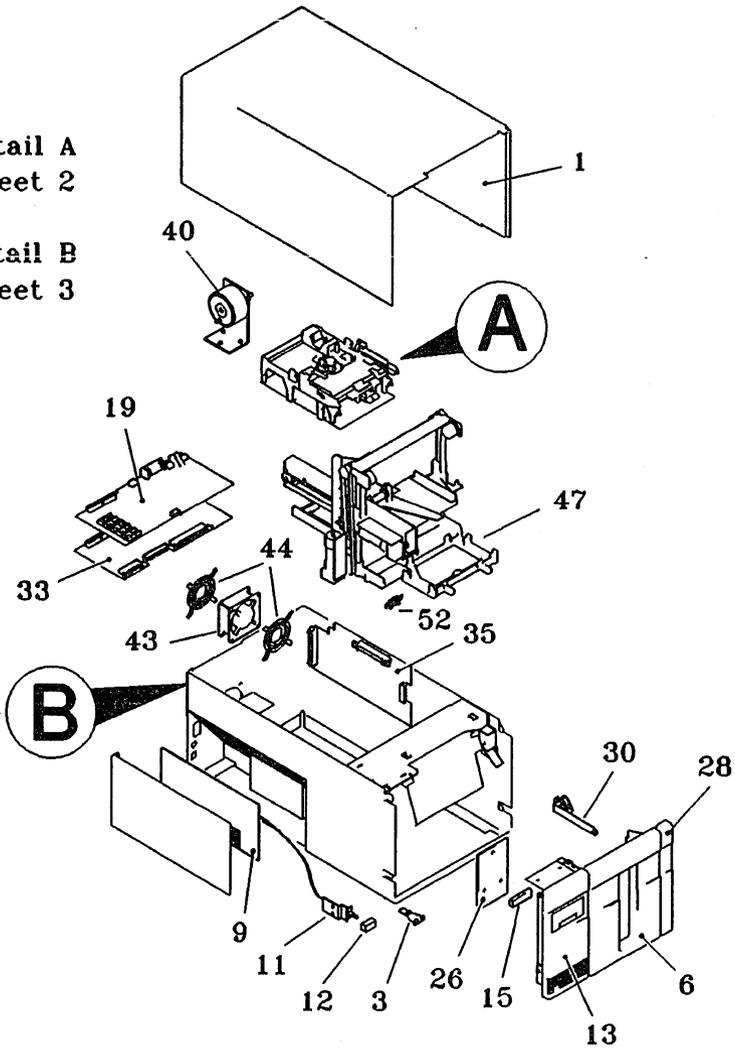


Figure 8-1. HP 35401 Exploded View (sheet 1 of 3)

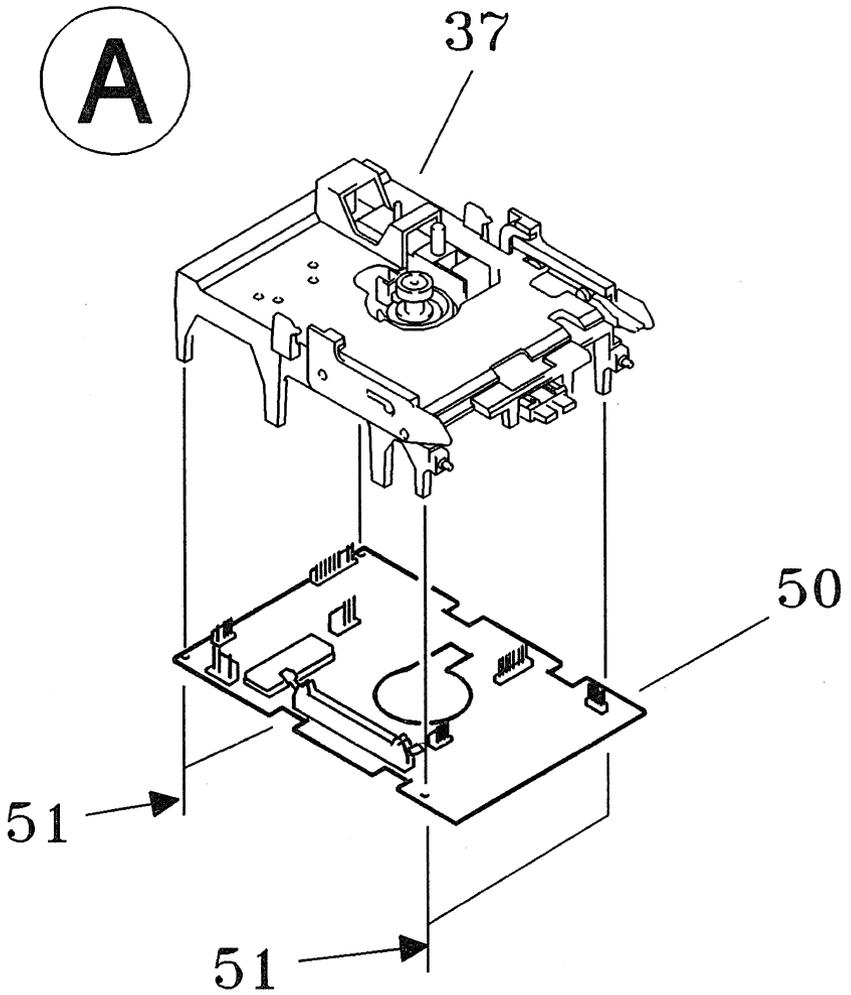


Figure 8-2. HP 35401 Exploded View (sheet 2 of 3)

B

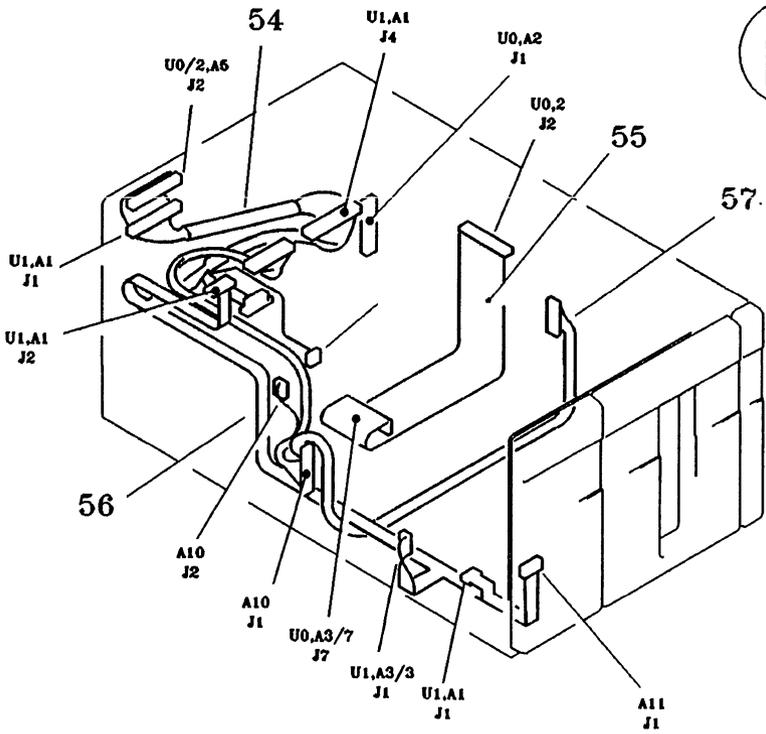


Figure 8-3. HP 35401A Cabling Layout (sheet 3 of 3)

Table 8-1. Replaceable Parts

| FIG.& INDEX NO. | HP PART NO. | DESCRIPTION | MFR. CODE | MFR. PART NO. | UNITS PER ASSY. |
|-----------------------|----------------|---|--------------|------------------|-----------------------|
| | 35401A | 1/4 INCH CARTRIDGE TAPE DRIVE | 28480 | 35401A | REF |
| 1 | 35401-60020 | *TOP SHROUD (Attaching Parts) | 28480 | 35401-60020 | 1 |
| 2 | 0515-0372 | *SCREW, machine, pnh, T10, M3.0 by 0.5, 8mm long, w/scw - - - X - - - | 28480 | 0515-0372 | 6 |
| 3 | 09121-48303 | **FRONT FOOT - - - X - - - | 28480 | 09121-48303 | 2 |
| 4 | 35401-60097 | **MOTOR PCA (Attaching Parts) | 28480 | 35401-60097 | 2 |
| 5 | 0515-0430 | **SCREW, machine, pnh, T10, M3.0 by 0.5 6mm long, w/scw - - - X - - - | 00000 | 0BD | 3 |
| 6 | 35401-60034 | *DOOR ASSEMBLY (Attaching Parts) | 28480 | 35401-60034 | 1 |
| 7 | 0515-0374 | *SCREW, machine, pnh, T10, M3.0 by 0.5 10mm long, w/scw - - - X - - - | 00000 | 0BD | 2 |
| 8 | 35401-40000 | *CARTRIDGE MAGAZINE - - - X - - - | 28480 | 35401-40000 | 1 |
| 9 | 09133-67120 | *PSU ASSEMBLY A10 (Attaching Parts) | 28480 | 09133-67120 | 1 |
| 10 | 0515-0430 | *SCREW, machine, pnh, T10, M3.0 by 0.5 6mm long, w/scw - - - X - - - | 00000 | 0BD | 8 |
| 11 | 35401-67200 | **BOWDEN CABLE ASSEMBLY KIT - - - X - - - | 28480 | 35401-67200 | 1 |
| 12 | 5041-1203 | **KEY CAP, WHITE (for AC line switch) - - - X - - - | 28480 | 5041-1203 | 1 |
| 13 | 35401-60032 | *FRONT PANEL ASSEMBLY (Attaching Parts) | 28480 | 35401-60032 | 1 |
| 14 | 0515-0372 | *SCREW, machine, pnh, T10, M3.0 by 0.5 8mm long, w/scw | 00000 | 0BD | 5 |
| 15 | 35401-40004 | **EJECT PUSH-BUTTON - - - X - - - | 28480 | 35401-40004 | 1 |
| 16 | 35401-60033 | *DOOR LOCK BRACKET ASSEMBLY (Attaching Parts) | 28480 | 35401-60033 | 1 |
| 17 | 0515-0372 | *SCREW, machine, pnh, T10, M3.0 by 0.5 8mm long, w/scw | 00000 | 0BD | 8 |
| 18 | 0515-0374 | *SCREW, machine, pnh, T10, M3.0 by 0.5 10mm long w/scw - - - X - - - | 00000 | 0BD | 1 |

Table 8-1. Replaceable Parts (continued)

| FIG.& INDEX NO. | HP PART NO. | DESCRIPTION | MFR. CODE | MFR. PART NO. | UNITS PER ASSY. |
|-----------------------|----------------|---|--------------|------------------|-----------------------|
| 19 | 07940-60195 | *HOST DEPENDENT CONTROLLER PCA UO U2 A5 (Attaching Parts) | 28480 | 07940-60195 | 1 |
| 20 | 09144-893XX | *EPROM, HDC (U151) | 28480 | 09144-893XX | 1 |
| 21 | 09144-895XX | *EPROM, HDC (U121) | 28480 | 09144-895XX | 1 |
| 22 | 35401-895XX | *EPROM, MDC (U161) | 28480 | 35401-895XX | 1 |
| 23 | 35401-896XX | *EPROM, MDC (U131) | 28480 | 35401-896XX | 1 |
| 24 | 35401-897XX | *EPROM, EXEC (U101) | 28480 | 35401-897XX | 1 |
| 20-21 | 09144-103XX | **ROM KIT (2 X HDC ROMs) | 28480 | 09144-103XX | 1 |
| 22-24 | 35401-103XX | **ROM KIT (2 X MDC & 1 X EXEC ROM) | 28480 | 35401-103XX | 1 |
| 25 | 0380-0644 | *STAND-OFF, HEX, 6-32, 0.3271n long - - - X - - - | 00000 | OBD | 2 |
| 26 | 35401-60093 | *FRONT PANEL PCA A11 (Attaching Parts) | 28480 | 35401-60093 | 1 |
| 27 | 0624-0512 | *SCREW, tapping, pnh, T9, 4-20, 0.375in - - - X - - - | 00000 | OBD | 3 |
| 28 | 35401-60035 | *END PANEL ASSY (Attaching Parts) | 28480 | 35401-60035 | 1 |
| 29 | 0515-0372 | *SCREW, machine, pnh, T10, M3.0 by 0.5 8mm long, w/scw - - - X - - - | 00000 | OBD | 3 |
| 30 | 35401-60031 | *GOVERNOR ARM ASSEMBLY KIT (Attaching Parts) | 28480 | 35401-60031 | 1 |
| 31 | 35401-80078 | *CIRCLIP | 28480 | 35401-80078 | 1 |
| 32 | 35401-20062 | *BUSH - - - X - - - | 28480 | 35401-20062 | 1 |
| 33 | 35401-60091 | *MDC PCA U1 A1 (Attaching Parts) | 28480 | 35401-60091 | 1 |
| 34 | 0515-0430 | *SCREW, machine, pnh, T10, M3.0 by 0.5 6mm long, w/scw - - - X - - - | 00000 | OBD | 1 |
| 35 | 09144-66512 | *DDC PCA UO A2 | 28480 | 09144-66512 | 1 |
| 36 | 09144-10355 | *DDC PROCESSOR (U35) - - - X - - - | 28480 | 09144-10355 | 1 |
| 37 | 09144-67501 | *DRIVE MECHANISM ASSEMBLY UO A1 (Attaching Parts) | 28480 | 09144-67501 | 1 |
| 38 | 0515-1349 | *SCREW, machine, pnh, T10, M3.0 by 0.5 30mm long, w/scw | 00000 | OBD | 2 |
| 39 | 0515-0665 | *SCREW, machine, pnh, T10, M3.0 by 0.5 14mm long, w/scw - - - X - - - | 00000 | OBD | 2 |
| 40 | 35401-80064 | *EJECT SOLENOID (Attaching Parts) | 28480 | 35401-80064 | 1 |
| 41 | 35401-80063 | *PIN, SELF-LOCKING | 28480 | 35401-80063 | 1 |
| 42 | 0515-0665 | *SCREW, machine, pnh, T10, M3.0 by 0.5 14mm long w/scw | 00000 | OBD | 3 |
| 42a | 2190-0464 | *WASHER - - - X - - - | 00000 | OBD | 3 |

Table 8-1. Replaceable Parts (continued)

| FIG.& INDEX NO. | HP PART NO. | DESCRIPTION | MFR. CODE | MFR. PART NO. | UNITS PER ASSY. |
|-----------------------|----------------|--|--------------|------------------|-----------------------|
| 43 | 35401-68503 | *FAN (including cable and connector) | 28480 | 35401-68503 | 1 |
| 44 | 07941-00026 | **FAN GRILLE (Attaching Parts) | 28480 | 07941-00026 | 2 |
| 45 | 0624-0661 | **SCREW, tapping, pnh, T20, 10-14 0.625in long | 00000 | 0BD | 4 |
| 46 | 0624-0696 | **SCREW, tapping, pnh, T20, 10-14 0.468in long - - - X - - - | 00000 | 0BD | 4 |
| 47 | 35401-60000 | *AUTOCHANGER ASSEMBLY (complete) U1 A6 (Attaching Parts) | 28480 | 35401-60000 | 1 |
| 48 | 0515-0372 | *SCREW, machine, pnh, T10, M3.0 by 0.5 8mm long, w/scw | 00000 | 0BD | 4 |
| 49 | 0515-0430 | *SCREW, machine, pnh, T10, M3.0 by 0.5 6mm long, w/scw - - - X - - - | 00000 | 0BD | 2 |
| 50 | 09144-66518 | **READ/WRITE /SERVO PCA UO A3, A7 (Attaching Parts) | 28480 | 09144-66518 | 1 |
| 51 | 0515-0104 | **SCREW, machine, pnh, pozi, M3.0 by 0.5 8mm long - - - X - - - | 00000 | 0BD | 4 |
| 52 | 35401-60094 | **MICROSWITCH PCA U1 A4 (Attaching Parts) | 28480 | 35401-60094 | 1 |
| 53 | 0515-0430 | **SCREW, machine, pnh, T10, M3.0 by 0.5 6mm long - - - X - - - | 00000 | 0BD | 2 |
| 54 | 35401-61601 | *CABLE, HDC/MDC/DDC | 28480 | 35401-61601 | 1 |
| 55 | 35401-61607 | *CABLE, DRIVE MECHANISM/DDC | 28480 | 35401-61607 | 1 |
| 56 | 35401-61600 | *CABLE, MDC/FRONT PANEL | 28480 | 35401-61600 | 1 |
| 57 | 35401-61603 | *CABLE ASSEMBLY, POWER | 28480 | 35401-61603 | 1 |
| 58 | 8120-1351 | *CORDSET BS1363/CEE | 28480 | 8120-1351 | 1 |
| 59 | 8120-1369 | *CORDSET ASC112/CEE | 28480 | 8120-1369 | 1 |
| 60 | 8120-1689 | *CORDSET GMBH/CEE | 28480 | 8120-1689 | 1 |
| 61 | 8120-1378 | *CABLE ASSEMBLY 18 AWG | 28480 | 8120-1378 | 1 |
| 62 | 8120-1575 | *CABLE ASSEMBLY 18 AWG | 28480 | 8120-1575 | 1 |
| 63 | 8120-4753 | *CABLE ASSEMBLY 16 AWG | 28480 | 8120-4753 | 1 |
| 64 | 8120-2104 | *CORDSET SEV/CEE | 28480 | 8120-2104 | 1 |
| 65 | 8120-2956 | *CORDSET MDP/CEE | 28480 | 8120-2956 | 1 |
| 66 | 8120-1860 | *CORDSET CEE/CEE 5 foot | 28480 | 8120-1860 | 1 |
| 67 | 8120-4211 | *CABLE ASSEMBLY | 28480 | 8120-4211 | 1 |
| 68 | 9211-5381 | *PACKING OUTER BOX | 28480 | 9211-5381 | 1 |
| 69 | 35401-80095 | *FOAM END CAP | 28480 | 35401-80095 | 1 |
| 70 | 9211-5379 | *ACCESSORY BOX | 28480 | 9211-5379 | 1 |
| 71 | 9222-1244 | *PLASTIC BAG | 28480 | 9222-1244 | 1 |
| 72 | 35401-80043 | *MAGAZINE FOAM BLOCK | 28480 | 35401-80043 | 1 |
| 73 | 35401-80069 | *DOOR OPENER TAB | 28480 | 35401-80069 | 1 |
| 74 | 35401-80058 | *SPRING CLIP | 28480 | 35401-80058 | 2 |
| | 35401-60016 | *FASTENER KIT | 28480 | 35401-60016 | 1 |

Table 8-2. Expensed Tools Package (35401-67100)

| FIG.& INDEX NO. | HP PART NO. | DESCRIPTION | MFR. CODE | MFR. PART NO. | UNITS PER ASSY. |
|-----------------------|----------------|-------------------------|--------------|------------------|-----------------------|
| | 35401-90904 | HARDWARE SUPPORT MANUAL | 28480 | 35401-90904 | 1 |
| | 35401-90905 | CE HANDBOOK | 28480 | 35401-90905 | 1 |
| | 8710-1570 | HEX BALLDRIVER | 28480 | 8710-1570 | 1 |
| | 8710-0805 | WRENCH-RATCHET BOX | 28480 | 8710-0805 | 1 |
| | 9211-3769 | CARTON | 28480 | 9211-3769 | 1 |
| | 9220-0007 | PLASTIC BAG | 28480 | 9220-0007 | 1 |
| | 35401-60030 | BELT SETTING TOOL | 28480 | 35401-60030 | 1 |
| | 35401-20067 | DOOR ALIGNMENT TOOL | 29480 | 35401-20067 | 1 |

9-1. INTRODUCTION

This section contains diagrams of cable layouts, order of disassembly and steps required to prepare a replacement drive mechanism.

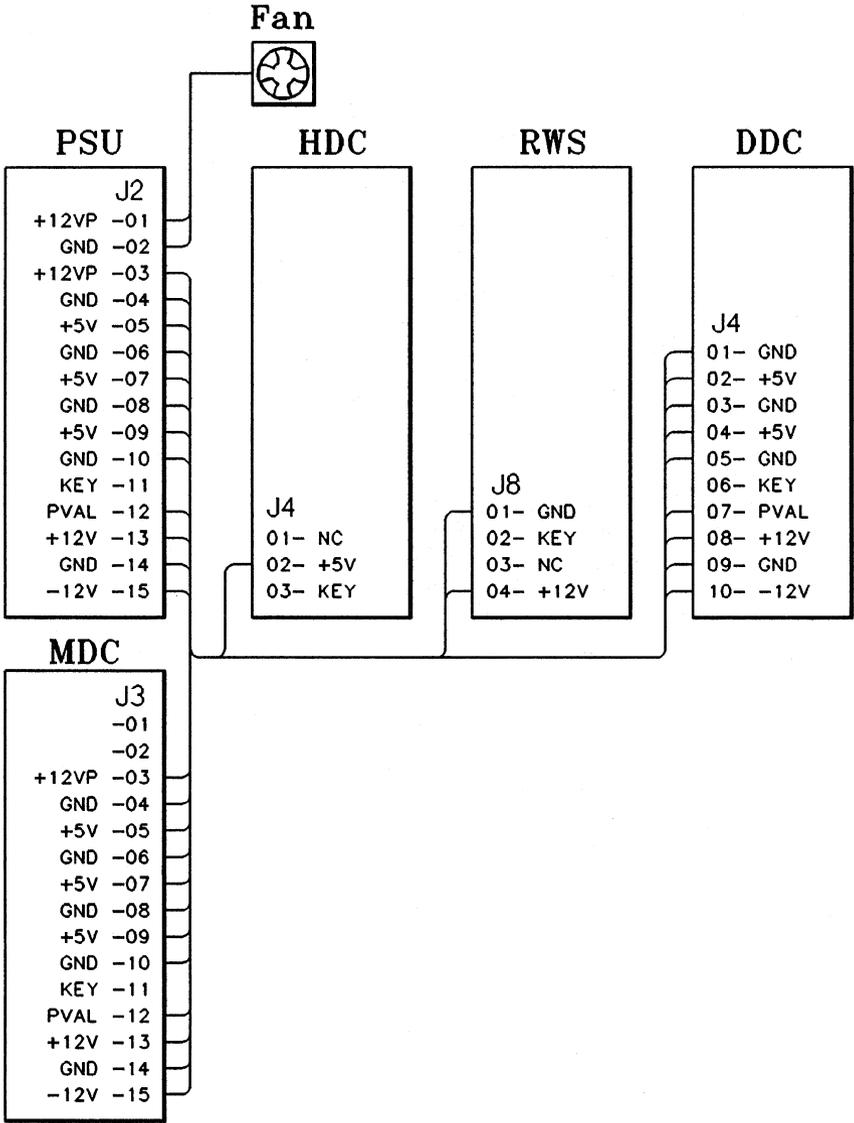


Figure 9-1. Cabling Diagram (sheet 1 of 4)

Front Panel
PCA

MDC

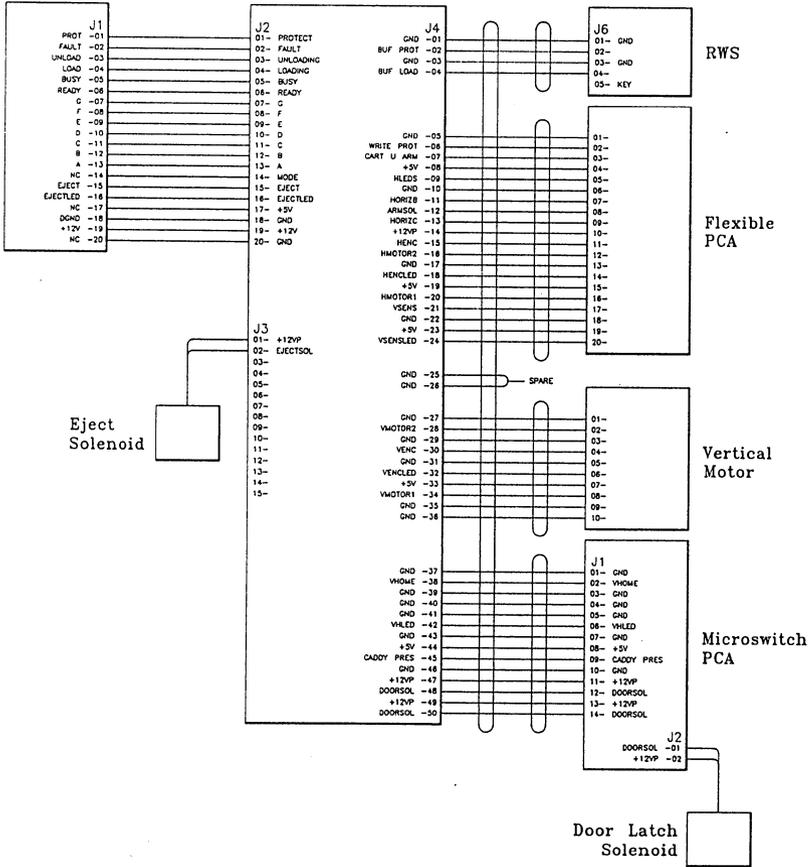


Figure 9-1. Cabling Diagram (sheet 2 of 4)

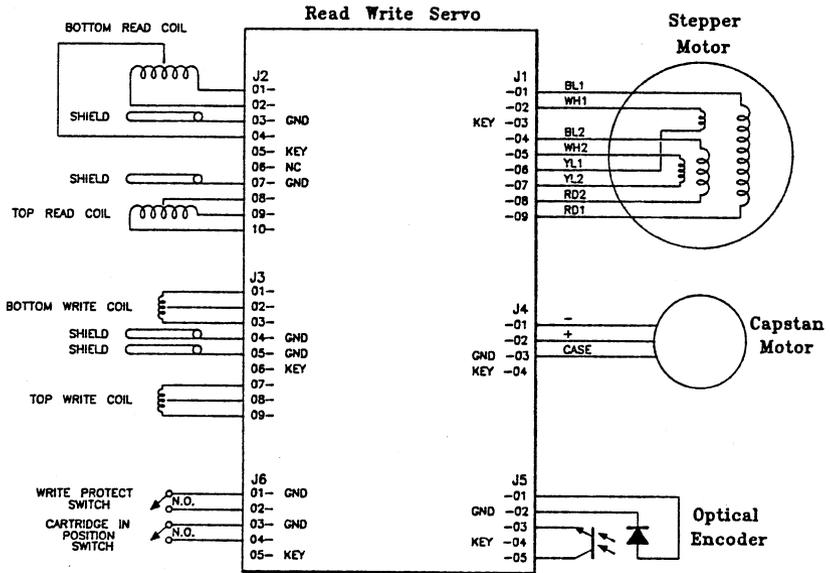


Figure 9-1. Cabling Diagram (sheet 3 of 4)

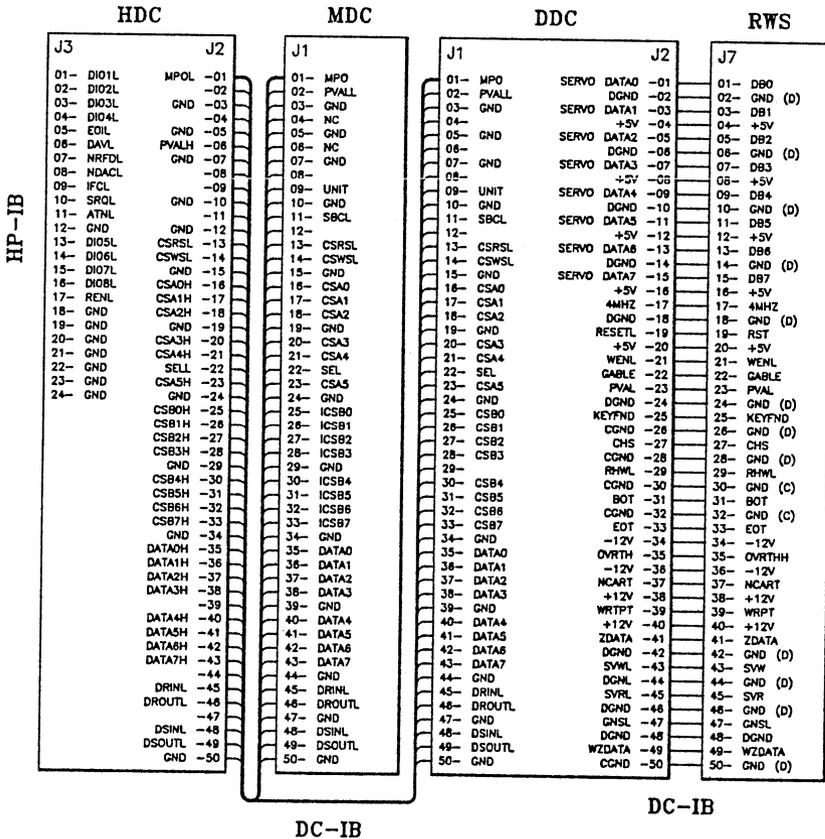


Figure 9-1. Cabling Diagram (sheet 4 of 4)

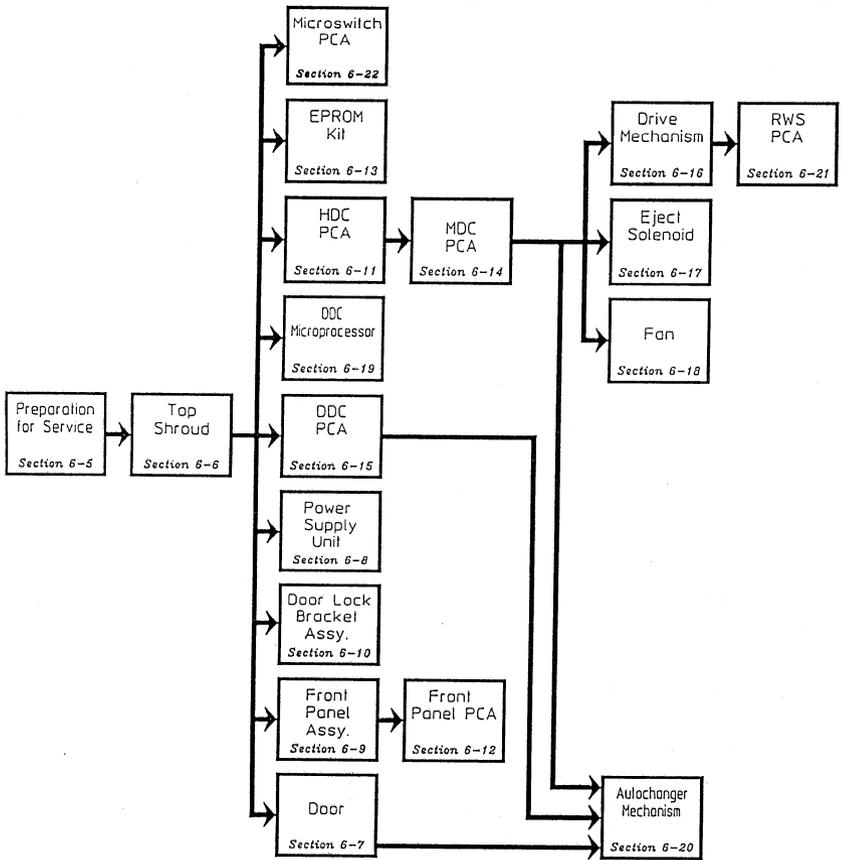
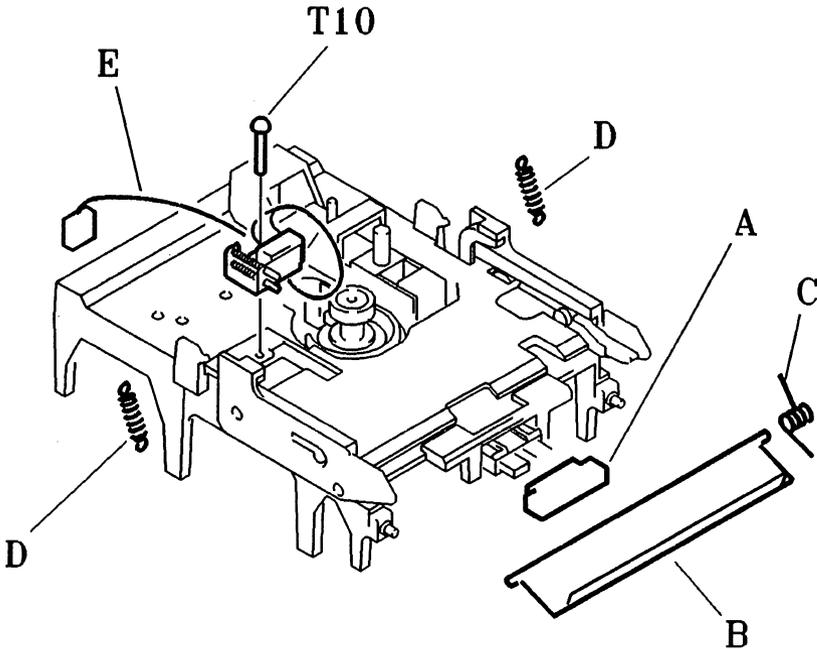


Figure 9-2. Order of Disassembly

9-2. DRIVE MECHANISM REPLACEMENT

If the drive mechanism has failed, it should be replaced by an exchange assembly 09144-69501. This is a bare mechanism (common to an HP 9144A Tape Drive) to which parts must be added from the assembly being replaced. The procedure for converting the replacement drive mechanism is as follows:

- 1) Begin by removing the RWS PCA from the faulty drive mechanism, as detailed in section 6-21 (paragraphs 10 to 15) of the Hardware Support Manual.
- 2) If the RWS PCA was mounted on four stand-off pillars, unscrew the pillars and discard them. These are not needed on the replacement mechanism.
- 3) Refer to the figure below and prepare the replacement drive mechanism by pulling off the eject pushbutton (A).
- 4) Remove the front door flap (B) and spring (C) by spreading the cartridge guides.
- 5) Remove the two coil springs (D) from the eject mechanism.
- 6) Remove the cartridge sensor microswitches (E), and remove the microswitch cable from the cable clip under the mechanism.



7) Now refer to Figure 9-3, and continue constructing the replacement drive mechanism.

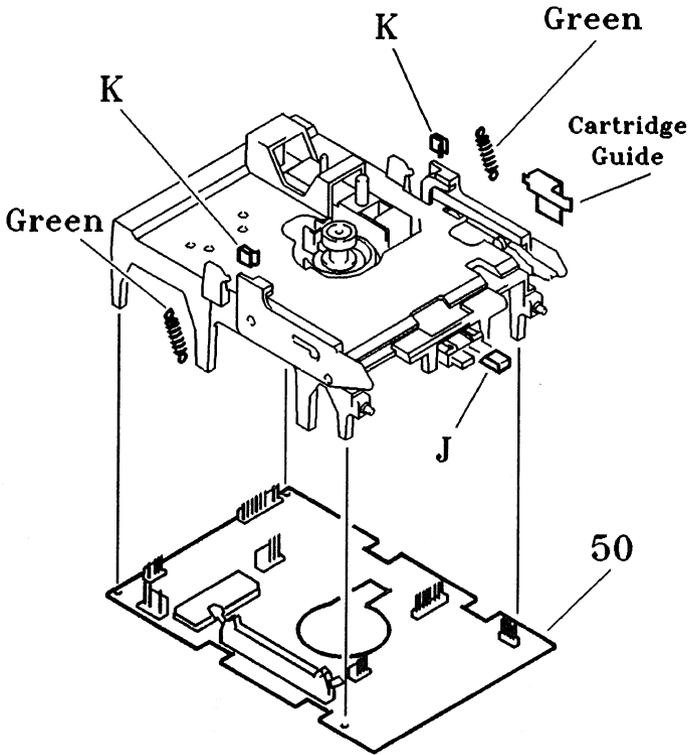


Figure 9-3. Replacement Drive Mechanism

NOTE

The springs and clips referred to in this section are contained in a Fastener Kit (part no. 35401-60016), together with various screws, retainers etc.

- 1) Remove the eject mechanism coil springs from the faulty mechanism and fit them to the replacement mechanism. These springs are green and have less tension.
- 2) Remove the spring clip (J) from above the eject pushbutton on the faulty mechanism and fit it to the replacement. This clip prevents the eject mechanism from latching.
- 3) Remove the two spring clips (K) from the cartridge guides on the faulty mechanism. Fit them to the replacement so that they prevent the eject arms from entering the slots in the cartridge guides.

- 4) Loosen the screw holding the eject solenoid lever, and remove the lever from the eject pushbutton on the faulty mechanism. Attach it to the replacement mechanism.
- 5) Attach the RWS PCA to the replacement mechanism and follow the steps given in section 6-21 of the Hardware Support Manual (in reverse order) to reassemble the Tape Drive.

10-1. INTRODUCTION

Please refer to the related manuals listed on page iii of the front matter for more information on the 35401A.

For information on the host system please refer to the applicable system manuals and handbook.

11-1. INTRODUCTION

The support matrix in Table 11-1 provides a summary of the firmware changes which have been made to the HP 35401A.

Seven service notes exist at the time of printing. See Table 11-2 for details.

Table 11-1. Support Matrix

| REV DATE CODE (Service Note No.) | DDC Eprom U35 | HDC Eproms U151 U121 | MDC Eproms U161 U131 | EXEC Eprom U101 |
|---|------------------|------------------------------|----------------------------|--------------------|
| REV B 2616 | 09144-89812 | 09144-89209 09144-89519 | 35401-89502 35401-89602 | 35401-89701 |
| REV C 2628 | 09144-89812 | 09144-89209 09144-89519 | 35401-89503 35401-89603 | 35401-89701 |
| REV D 2645 (35401-1) | 09144-89812 | 09144-89324* 09144-89524* | 35401-89504 35401-89604 | 35401-89701 |
| REV E 2822 (35401-7) | 09144-89812 | 09144-89325 09144-89525 | 35401-89505 35401-89605 | 35401-89701 |

* The HDC Eproms changed due to a problem with the HP 9144A (see service note 4). Units after the serial prefix 2721 have this code. Units prior to 2721 and after 2628 contain 09144-89209 and -89519.

There are three current service kits for the HP 35401A:

09144-10311 common to the HP 9144A, contains HDC Eproms
 09144-10355 common to the HP 9144A, contains DDC Eprom
 35401-10303 HP 35401A firmware, i.e. EXEC code and MDC Eproms

Table 11-2. Service Notes

SERVICE NOTE 1

Dated: 12th April 1986

Units affected: All units prior to S/N prefix 2645E

New ROM Update Kit: P/N 35401-10302

Contains:

1 - EXEC EPROM

1 - 35401-89504 MDC EPROM (U161)

1 - 35401-89604 MDC EPROM (U131)

FIRMWARE UPDATE

(Required for HP3000 & HP9000 systems)

Purpose:

This service note documents a ROM firmware update to the HP 35401A which is required to support this product on the HP3000 and HP9000 Computers. Beginning with serial number prefix 2645E, the HP 35401A 1/4 inch cartridge autochanger will be produced with firmware which finalizes the support of the drive on the HP3000 and HP9000 computer systems.

Problem:

If an HP 35401A contains "old" firmware, the following might happen:

HP3000 Systems

1) The first tape of a HP3000 SYSDUMP or the last tape of a HP3000 STORE might be overwritten if a powerfail occurs while the tape is going through the unload sequence. In this instance, the tape would go through a load sequence when power is restored instead of completing the unload sequence.

As a consequence of this, the first tape of a SYSDUMP would be overwritten by data destined for the second tape, or the last tape of a STORE set would be overwritten by a further STORE process being started.

2) If a write-protected cartridge is detected during a multi-cartridge write operation, an error condition may occur which would display an "F" in the HP 35401A's front panel status display. This error will cause the tape operation to abort.

HP9000 Systems

1) On the HP9000/500 HP-UX systems the HP 35401A may appear to hang under the following condition. If a 600ft tape is unloaded, and the next tape is 150ft, then the front panel display will remain showing LOAD, READY and the number of the tape.

Table 11-2. Service Notes (continued)

SERVICE NOTE 1 (continued)

Solution:

If an HP 35401A with a serial number prefix prior to 2645E is configured into an HP3000 or HP9000 system, then an upgrade to firmware is needed. An upgrade kit, part number 35401-10302 is available from CPE/PCE. It contains the Exec Eprom as well as the two MDC Eproms.

CPB (Div C600) will accept billings for 0.5 hour labor, travel and the cost of the upgrade kit. The Customer Service Order (CSO) must contain the system serial number.

Table 11-2. Service Notes (continued)

SERVICE NOTE 2

Dated: 2nd June 1987

Units affected: All units

New Part Number: 35401-60018

Replaces Part Number: 35401-80038

BOWDEN CABLE/COUPLING ASSEMBLY

Purpose:

To inform the field of a design change.

Problem:

There is a risk of damaging the bowden cable assembly while changing the power supply in the field.

Solution:

The design of the bowden cable assembly has been improved to eliminate the risk of damage. Up to serial prefix number 2647E01650 it is strongly recommended that if the power supply is changed, the bowden cable is also replaced using P/N 35401-60018.

Action:

NOTE ON FITTING THE BOWDEN CABLE ASSEMBLY
TO THE POWER SUPPLY

It is important that the screw clamping the plastic power switch extension shaft is only tightened to hand tight, otherwise the plastic can snap.

Table 11-2. Service Notes (continued)

SERVICE NOTE 3

Dated: 7th July 1987

Units affected: All units

DOOR LOCK MECHANISM

Purpose:

To inform the field of a design change.

Problem:

Unreliable door lock mechanism.

Solution:

The design of the door lock mechanism has been changed to improve reliability, simplify the manufacturing process and reduce the manufacturing cost. The new design mechanism is fitted to all drives from serial number 2706.

The new design mechanism is backwards compatible with the old door lock, and fitting is exactly the same. The old style mechanism locked the door on both sides, whereas the new mechanism locks on the right-hand side only. This eliminates the need for the left-hand lock lever and connecting bar. The two solenoids will still be fitted until manufacturing stocks are exhausted. The design change also eliminates the need for the left-hand door lock packing clip.

Table 11-2. Service Notes (continued)

SERVICE NOTE 4

Dated: 3rd June 1987

Units affected: All units

New Part Numbers:

09144-89324

09144-89524

Replaces Part Numbers:

09144-89209

09144-89519

FIRMWARE CHANGE TO REV 10

Purpose:

To inform the field of a design change.

Problem:

During the manufacturing process of the HP'9144A, it has been noticed that a tape will sometimes despool while being loaded into the mechanism. This problem is of no concern to the customer, after the tape has been successfully loaded.

Solution:

The problem has been fixed by changing the firmware code in the HDC. If this problem is seen in the field, the firmware should be updated to p/n 09144-89324 and 09144-89524. The new firmware has been incorporated into the drives with serial number prefix 2721E onwards, and these drives should not exhibit the problem of despooling.

We do not believe that this problem will be seen in the field, but if it is, please call Technical Marketing at CPB on 44 272 799910.

Table 11-2. Service Notes (continued)

SERVICE NOTE 5

Dated: 10th November 1987

Units affected: All units

DESIGN CHANGES

Purpose:

To notify the field of 4 design changes that have been made to the HP 35401A tape drive. These changes are currently in production and can be made to all units existing in the field today.

Action:

1. BOWDEN CABLE CHANGE

New Kit Part Number: 35401-67200

Replaces Part Number: 35401-60018

Service Inventory: Return for Update

A change has been made to the way the Bowden cable, attaching the front panel switch to the PSU, is secured to the brackets at either end of the cable. This ensures that the ON/OFF switch operates successfully, without fouling on the front panel moulding.

Details for installing the new Bowden cable will be included with the parts in the kit.

2. RAISE TAPE MECHANISM

When loading a cartridge into the tape mechanism, there can be a problem with the cartridge base plate catching on the mechanism guides. This can be solved by raising the mechanism using "packers".

If you see this problem in the field, please contact CPB Technical Marketing (44 272 799910 or via the desk node CPB SUPPORT /HPC600/06) with details of the fault and your name and address. We will then send you the "packers" and details for installing them.

Please note that this item is not set up as a replaceable part and can only be obtained from CPB.

(For reference, the internal part number is 35401-00024).

Table 11-2. Service Notes (continued)

SERVICE NOTE 5 (continued)

3. FLEXIBLE PCB RETAINING CLIP

The clip has been redesigned to ensure that the flexible PCB always springs in an upward direction to avoid it becoming trapped between the autochanger horizontal arm and the tape mechanism.

NOTE: This part is not a field replaceable item. This information is to inform the field that the clip design has changed from unit serial number prefix 2752, and that exchange autochangers also after this prefix will have the new design.

4. EJECT COLLAR

New Part Number:
35401-80063 PIN
35401-80064 EJECT SOLENOID

Replaces Part Number:
35401-20015 EJECT COLLAR
35401-60010 EJECT SOLENOID

Service Inventory: Return for Update

This change has been made to resolve the problem where the eject collars have fallen off and the unit has been unable to load cartridges into the tape mechanism. A new self-locking pin has been introduced, and hence a new eject solenoid has been introduced with a longer pin and countersunk hole to accommodate the pin.

This change has been performed on drives from serial number prefix 2748 or later.

Table 11-2. Service Notes (continued)

SERVICE NOTE 6

Dated: 7th July 1988

Units affected: All units

NEW DOOR ASSEMBLY

Purpose:

To notify the field of the introduction of a new door assembly fitted to the HP 35401A. This is fitted to all units with a serial number prefix of 2818 or later.

The new door has undergone a design change for improved operation and reliability. A new form of damping is used, giving even damping over the opening range. The locking assembly is also changed to one of a positive lock.

Solution:

There are five major assemblies in the redesigned door assembly. These are available using the following part numbers.

| | |
|----------------------------|-------------|
| Governor Arm Assembly | 35401-60031 |
| Control Panel Assembly | 35401-60032 |
| Door Lock Bracket Assembly | 35401-60033 |
| Door Assembly | 35401-60034 |
| Right Hand Panel Assembly | 35401-60035 |

A kit of these parts will be available, along with the necessary fasteners, alignment tool and fitting instructions. This is for upgrade from the previous design. A service note will be issued when this kit is available.

Table 11-2. Service Notes (continued)

SERVICE NOTE 7

Dated: 16th August 1988

Units affected: All units

FIRMWARE UPGRADE

Purpose:

To inform the field of a firmware upgrade on the HP 35401.

Problem:

With the introduction of the HP 9145 32-track 1/4-inch tape drive, a new 32-track XTD cartridge is to be used. These cartridges cannot be used in 16-track drives. This change ensures that the hardware fault flag is set in the drive if a 32-track cartridge load is attempted.

On less than 1% of 3000 systems booting with 1/4-inch tape, drive message sequence errors or watchdog timer errors have occurred. This can be overcome by reloading the tape. By implementing this firmware change, the transfer length is prevented from being altered during the freeload, thus eliminating the problem.

Solution:

All drives manufactured with a serial number prefix 2823E will have updated unit code firmware that resolves both the above problems. This firmware is located on the Host Dependent Controller PCA (HDC). The upgrade is available as follows:

35401-10303 MERLIN ROM KIT containing:

35401-89505 EPROM REV E
35401-89605 EPROM REV E
35401-89701 EPROM REV A

This is an upgrade of the previous kit: 35401-10302.

Manual Part Number: 35401-90905
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