WINCHESTER PERIPHERAL CHASSIS FIELD SERVICE MANUAL

Order Number: 121968-002

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REV	REVISION HISTORY	DATE
-001	Original issue.	5/82
-002	Adds technical data to Chapters 1,2,4, and 5 to include description of the Level 3 Power Supply.	12/82

This manual is intended for the Customer Engineer who will be providing field service support for the Winchester peripheral chassis installed on the Series II or Series III Microcomputer Development System. This manual is divided into five chapters and one appendix that contain the following information:

- Chapter 1, General Information, provides functional descriptions and specifications of the field replaceable subassemblies of the Winchester peripheral chassis.
- Chapter 2, Configuration, illustrates the jumper configurations and switch settings for the iMDX 704 disk controller and the Winchester drive assembly.
- Chapter 3, SIIWIN.CE Test, describes the C.E. diagnostic tests for troubleshooting the Winchester subsytem. Test execution times, diagnostic initialization procedures, are troubleshooting techniques are included.
- Chapter 4, Removal and Replacement, describes the removal and replacement procedures (with illustrations) for the field replaceable units on the Winchester subsystem.
- Chapter 5, Illustrated Parts List, provides identification and orientation of the field replaceable units of the Winchester subsytem.
- Appendix A, STFS Test Commands, provides a summary of the STFS commands used to aid the C.E. in running the test diagnostics.

Additional documentation is provided in the following manuals:

Winchester Peripheral Chassis Installation and Checkout Manual
Order Number: 121766

Winchester Peripheral Chassis ISIS-II(W) Supplement
Order Number: 121899

CE Diagnostic System Test Operating Instructions for Series II Systems Order Number: 121619

Intellec Series III Field Service Manual Order Number: 121640

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CHAPTER 1
GENERAL INFORMATION

1-1. INTRODUCTION

The Winchester peripheral chassis is a stand alone 35 megabyte (unformatted) disk drive. It provides an additional on-line mass storage capacity of 22 megabytes (formatted) when installed on a Series II or Series III development system. When the peripheral chassis is attached to a Series II or Series III, the system must run under the ISIS-II(W) operating system; the Winchester drive is identified as units F0 (:F0:) through F3 (:F3:). Table 1-1 lists the supported configurations for the various drive combinations.

Table 1-1. Drive Configurations

Configuration	Device Unit Number :F0:	:F1:	:F2:	:F3:	:F4:	:F5:	:F6:	:F7:	:F8:	:F9:
W + DD	W	W	W	W	DD	DD	(DD)	(DD)		
W + SD	W	W	W	W	SD	SD	(SD)	(SD)		
W + IS	W	W	W	W	IS	*				
W + DD + SD	W	W	W	W	DD	DD	(DD)	(DD)	SD	SD
W + DD + IS	W	W	W	W	DD	DD	(DD)	(DD)	IS	*
W + SD + IS	W	W	W	W	SD	SD	(SD)	(SD)	IS	*

W = Winchester Disk
DD = Double-Density Flexible Disk
SD = Single-Density Flexible Disk
IS = Integrated Single-Density Flexible Disk
* = Not Available
(DD),(SD) = Optional to Configuration

1-2. SUBASSEMBLY IDENTIFICATION/FUNCTIONAL DESCRIPTION

The field replaceable subassemblies for the Series II/III Winchester peripheral chassis include the iMDX 704 controller, the iMDX 712 subsystem rear panel, and the iMDX 761 Winchester chassis. Housed within the Winchester chassis is the disk drive, a 300 watt power supply, scrambler board, line filter, circuit breaker, fans, and required signal cables and wire assemblies.

The following list identifies the major field replaceable units and provides a brief functional description of each one.

iMDX 704 Controller is an iSBC 215B disk controller with modified firmware. It allows the CPU to access any location on a specific selected disk and perform read and write operations.

iMDX 712 Subsystem rear panel is a modification to the host system rear panel. It contains the modified interface connector cutout for the internal signal cable and external signal cable.

iMDX 761 Winchester peripheral chassis houses the disk drive which contains 22 megabytes of formatted memory capabilities. The Head Disk Assembly is a sealed unit containing the drive spindle assembly, drive motor, voice coil actuator, head carriage assembly, read/write heads, three magnetic discs, and air filter assemblies. The Read/Write Digital Control Board contains the circuitry for the read/write circuitry, command execution, and information transfers across the user interface. The Servo Motor Control Board contains circuitry for driving the spindle motor, processing the servo signals from the servo read head and controlling head carriage position.

The requisite power supply (level 1 or level 3) inputs voltages of 110 VAC 50 Hz or 220 VAC 60 Hz and provides the drive with the necessary operating dc voltages.

The scrambler PWA reroutes control signals from the disk controller to the Winchester drive through the 50 pin ribbon cable.

1-2. SPECIFICATIONS

Specifications for the Winchester peripheral chassis are outlined in the following table.

Table 1-2. Specifications

Drive Characteristics	
Type:	Winchester sealed disc
Tracks per Inch:	480
Sectors per Track:	70
Tracks per Surface:	525
Recording Surfaces:	5

Table 1-2. Specifications (Continued)

Drive Characteristics (Continued)	
Recording Technique:	MFM (modified frequency modulation
Bytes per Sector:	128
Track Density:	6670 bits/in. (innermost track)
Transfer Rate:	6.4 megabytes/second
Rotational Speed:	3600 rpm
Access Times	
Track to Track:	10 ms max
Full Stroke:	90 ms
Physical Characteristics	
Width:	16.9 in (42,9 cm)
Height:	11.3 in (28,7 cm)
Depth:	24.3 in (61,7 cm)
Weight:	55 lbs (25 kg)
Electrical Characteristics	
AC Power Requirements: (Chassis)	110 Vac, 60 Hz, 5A (max) 220 Vac, 50 Hz, 3A (max)
DC Power Requirements: (Controller)	5 Vdc, 2.5A (typ), 3.25A (max)
Environmental Characteristics	
Chassis	
Temperature:	15°C to 35°C operating -9°C to 60°C storage
Humidity:	10% to 90% non-condensing
Controller	
Temperature:	0°C to 55°C operating -55°C to 85°C storage
Humidity:	To 90% non-condensing
Equipment Supplied	
iMDX 750-(A/B) Winchester Subsystem	
iMDX 761-(A/B)1:	Peripheral chassis with 35-Mbyte Winchester drive
iMDX 704:	iSBC 215B controller with firmware

Table 1-2. Specifications (Continued)

Equipment Supplied (Continued)	
iMDX 2009:	ISIS-II(W) software diskettes and literature kit
iMDX 712:	Series II/III backpanel and internal cable and external interface cable
Model: 505	Integrated Processor Card (IPC)

-(A) designation indicates 115 volt operation;-(B) designation indicates 230 volt operation.

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CHAPTER 2
CONFIGURATION

2-1. INTRODUCTION

This chapter will provide the Customer Engineer with information and data relating to the jumper configurations on the iMDX 704 disk controller and the switch settings on the Winchester drive read/write digital control board and iMDX 704 disk controller. The disk controller and the read/write digital control board can be configured to perform in several operating environments. The switch settings on the two boards and the relocatable jumpers on the disk controller are specific for use on the Series II and Series III development systems. It is important to verify these switches and jumpers are set correctly to ensure reliable results from the diagnostics run on the C.E. test diskette. Table 2-1, and figures 2-1 and 2-2 provide the correct settings for these two printed boards. Figure 2-2 provides a wiring diagram for the Winchester peripheral chassis.

2-2. iMDX 704 CONTROLLER

The iMDX 704 controller is an iSBC 215B disk controller with the necessary modified firmware to run the Winchester disk drive. The switch settings and jumpers should have been verified during the installation and check-out procedures; however, these settings should also be verified during a trouble call. Follow these steps:

1. Power down the Winchester before turning off the development system by typing:

   :F4:SPINDN<cr>

2. Turn off the development system, unplug the ac cord, and remove the front panel. Pull the disk controller (the printed board located above all other boards) out of the card cage.

3. Verify the position of all jumper configurations (refer to figure 2-1 and table 2-1).

4. Verify that the address switches are set correctly (see figure 2-1). The wake-up address for the controller is 5H (S2-8 and S2-10 'on'). All other switches are off.

Table 2-1. iMDX 704 Jumper Configuration

Function	Jumper
Drive Compatibility: Determines specific disk drive. Set as shown in figure 2-1 for Winchester peripheral subsystem.	W1, W2, W5, W6-10, W13-17, W22
Interrupt Priority Level: Selects controller's internal interrupt request signal. Left open as shown in figure 2-1.	W19
Any Request: Determines conditions when controller will surrender bus. With one Winchester drive, controller will relinquish control to any device, lower or higher priority. Jumper is placed between pins W18-1and W18-3	W18
Common Bus Request: Determines bus arbitrations access frequency. For compatibility with other drive options, the controller must arbitrate for the bus on each access. Jumper is placed between W23-1 and W23-2.	W23
Voltage Selection: Selects the voltage source. W20 and W21 are left open.	W20, W21
iSBX Multimodule Interface: A set of five jumper locations that determine the configuration of the iSBX bus interface. Of the five locations, jumpers are installed between W3-1 and W3-2, W4-1 and W4-2. W11, W12, and W24 are left open.	W3, W4, W11, W12, W24

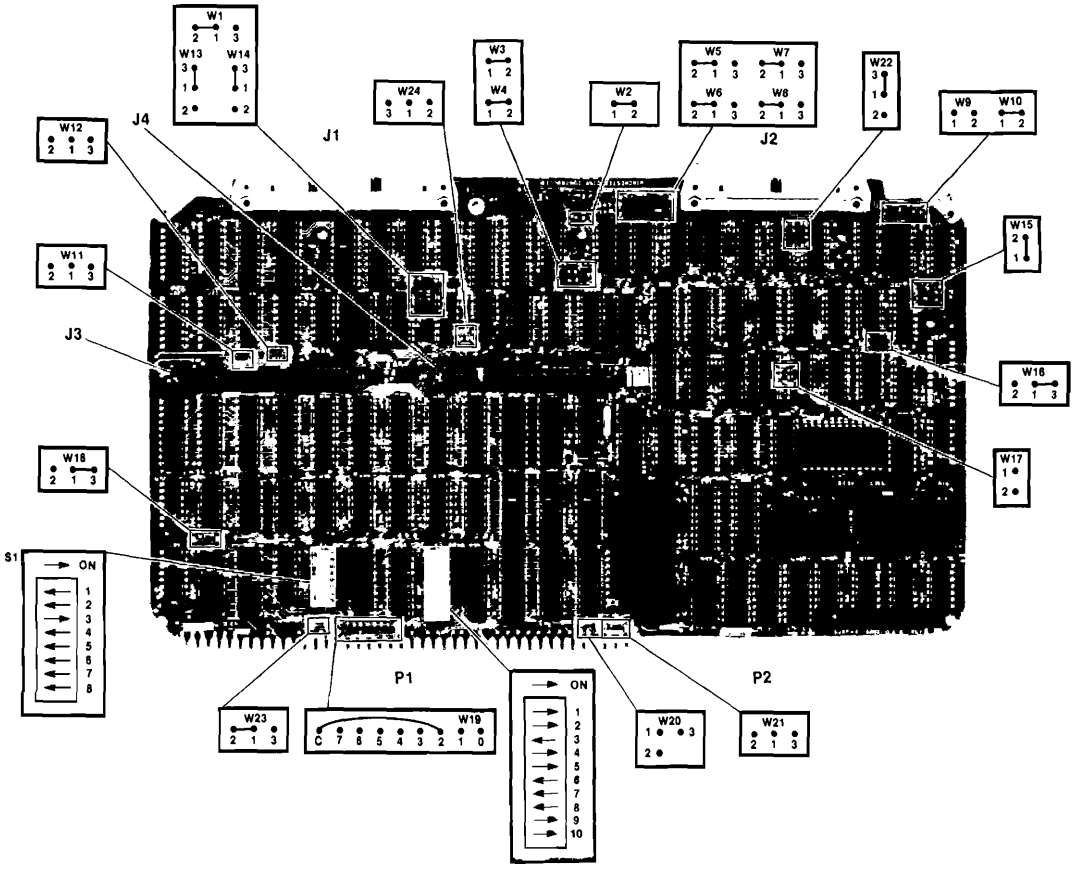


Figure 2-1. Controller Jumper/Switch Configuration

2-3. READ/WRITE BOARD SWITCH POSITIONS

Mini-dip type switches are provided on the read/write digital control board to select the drive address, write protect functions and number of sectors. The actual number of sectors is the sum of the bits selected. The switch settings on 6K select drive address 1 and enable the Transmit Write Clock and the Write Protect. The eight switches on 5H represent a binary bit position from 1 to 128, thus, setting switches 2, 3, and 7 will select 70 sectors per track. Refer to figure 2-2 for switch locations on the board and their respective settings.

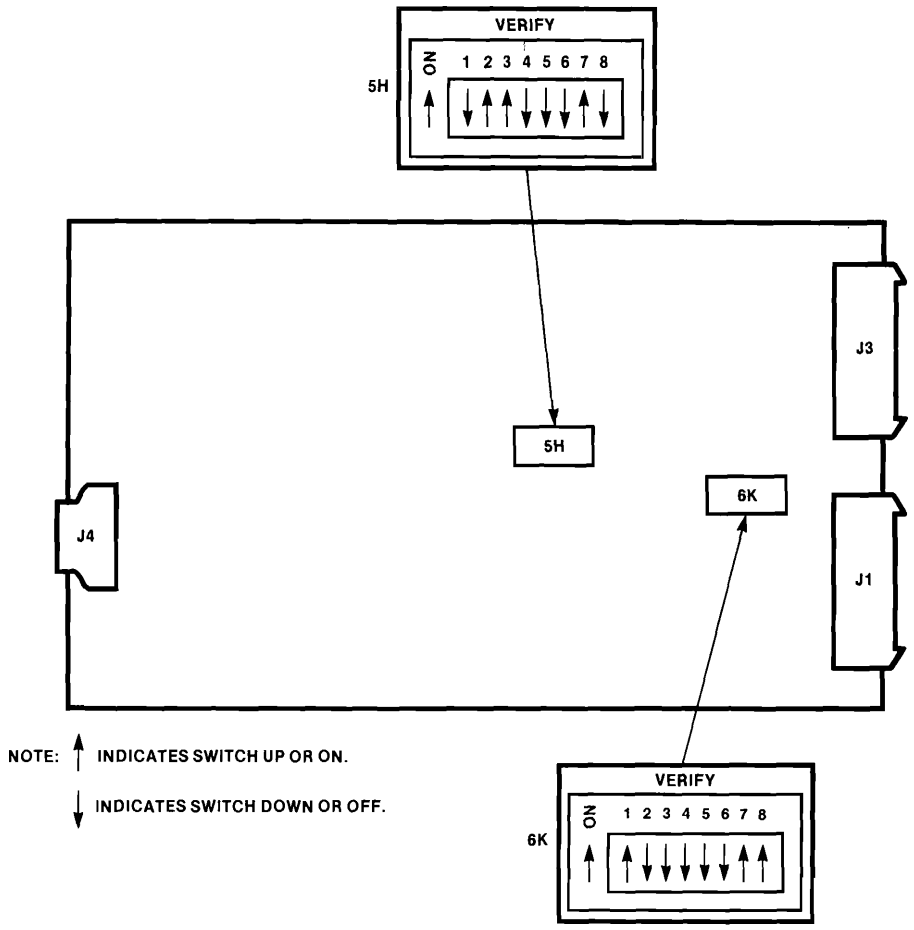


Figure 2-2. Drive Switch Settings

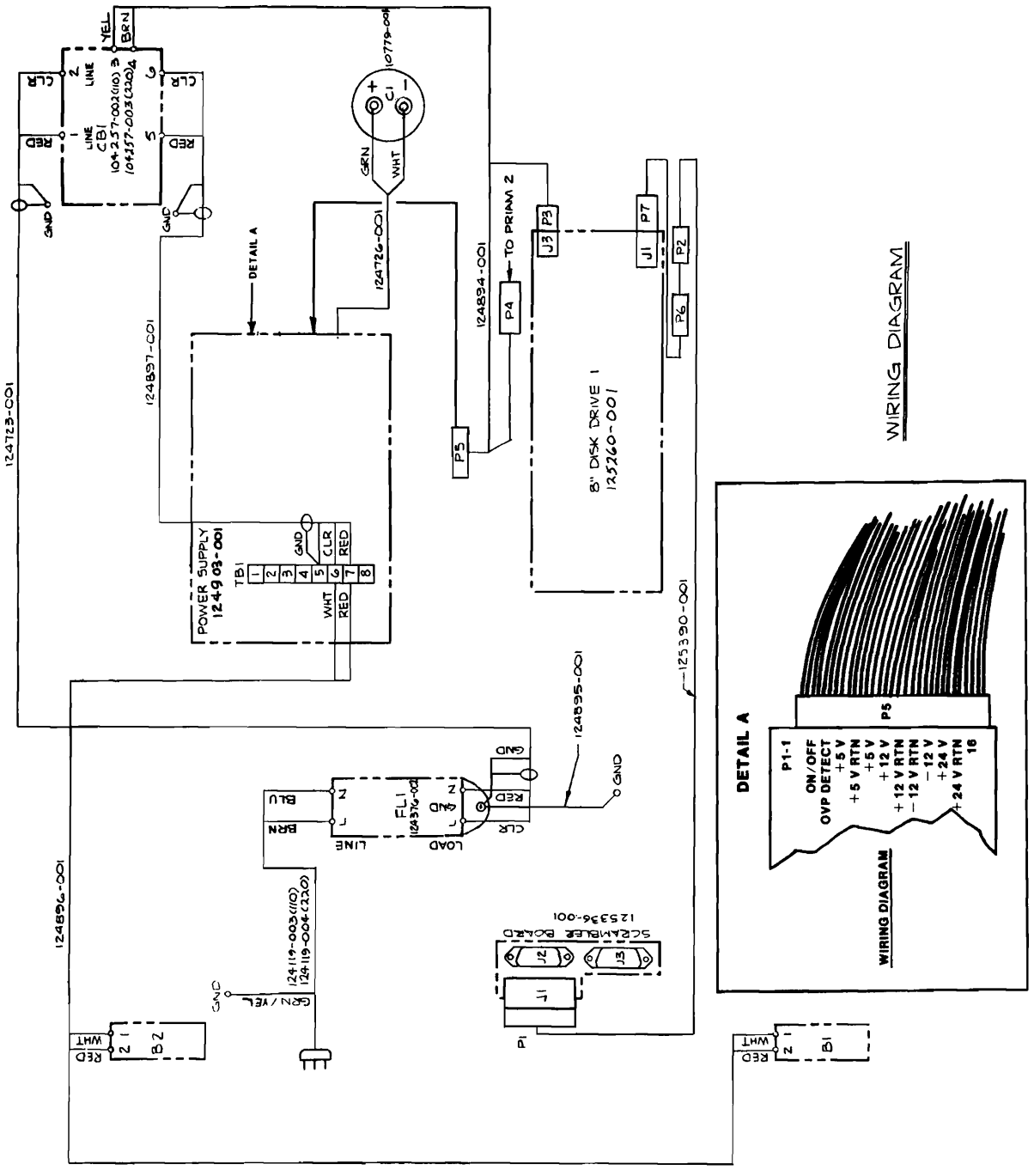


Figure 2-3. Wiring Diagram for Single Drive Configuration

3-1. INTRODUCTION

This chapter describes the diagnostic test routines used by the CE to troubleshoot a faulty subassembly installed on the Series II and Series III Winchester Peripheral Chassis development system. Section 3-2. describes in brief the CE diagnostic test routines while Section 3-3. contains test execution times and diagnostic initialization procedures. Section 3-4. provides a listing of error messages and a troubleshooting guide based on analyzing test results to determine the probable failing subassembly.

3-2. SIIWIN.CE TEST DESCRIPTION

Test descriptions of the SIIWIN.CE Winchester Diagnostic are contained in the following table.

Table 3-1. Winchester Peripheral CE Test Description

Test No.	Test Description
0H	Reset Test. Resets the controller and initializes the Winchester drive.
1H	Transfer Status Test. Checks communication lines between controller and drive by enabling the transfer error status function.
2H	Buffer I/O Test. Verifies the transfer of data between the controller and drive.
3H	ROM Checksum Test. Checks the controller ROM by running the on-board ROM checksum test.
4H	RAM Window Test. Checkes 2K bytes of on-board RAM by walking ones and then zeroes through memory.
5H	RAM Address Test. Verifies RAM address lines.
6H	Format Test. Formats and verifies diagnostic tracks on the Winchester drive.

Table 3-1. Winchester CE Test Description (continued)

Test No.	Test Description
7H	Micro-Diagnostic Test. Executes on-board ROM-based diagnostics to verify fundamental controller-drive functions.
8H	Seek/Verify Test. Checks seek and verify functions by verifying a sector on the last track of the drive and a sector on the first track of the drive.
9H	Worst Case Seek Test. Checks seek and verify function by executing a worst case seek sequence.
AH	Write/Read Test. Verifies write and read functions by writing and reading the diagnostic tracks.
BH	Drive Selection Test. Verifies the drive select lines for each platter.
CH	Platter/Head Selection Test. Verifies that each recording surface and head can be selected and accessed individually.
DH	Sector Selection Test. Verifies that each sector of a track can be addressed.
EH	Overlap Seek Test. Verifies that the controller can properly handle overlapped operations.
FH	Track Verify Test. Verifies data fields on a predetermined number of tracks.
10H	Platter Verify Test. Verifies data fields on all drive tracks.
11H	Alternate Track Test. Checks alternate track capability by accessing the first and last diagnostic tracks.
12H	Zero Fill Test. Verifies the controller's ability to fill partial sectors with zeros.
13H	Data Overrun Test. Reads the area immediately following partial sectors to determine if overrun (extra) data is being written.

Table 3-1. Winchester CE Test Descriptions (continued)

Test No.	Test Description
14H	Auto-Increment Test. Verifies the controller's ability to automatically increment to the next sector, head, or cylinder.
15H*	Write/Read/Compare Test. Writes the worst case data pattern (6DB6H) to all sectors and verifies the pattern. Writes the complement pattern (9249H) and verifies that pattern.
16H*	Write All/Read/Compare Test. Writes a unique data pattern to all drive sectors, then reads and compares the data with the original patterns.
17H*	Format Entire Drive(s). This utility formats all attached drives. All sectors are formatted as data sectors. An interleave factor of four is used.

WARNING

The last three tests (identified by asterisks) are not included in the Winchester Peripheral Customer Confidence Test because of their destructive nature. The execution of these tests will destroy the data currently stored on the drives. Before running tests 15H, 16H, and 17H, make sure that the customer has back up for all data.

3-3. INDIVIDUAL TEST TIMES

A number of the individual tests in the CE diagnostic test require a significant amount of time to execute. Table 3-2 outlines the approximate test times of these tests; those tests omitted from the table execute in 10 seconds or less.

Table 3-2. Test Execution Times

Test No.	Test Name	Time
00H	Reset Test	1 minute
09H	Worst Case Seek	2.5 minutes
10H	Platter Verify	10 minutes
15H*	Write/Read/Compare	2-2.5 hours
16H*	Write All/Read/Compare	2-2.5 hours
17H*	Format Entire Drive	5 minutes

*Denotes destructive test (destroys data on disk); they are automatically excluded during test initialization.

3-3. CE DIAGNOSTIC INITIALIZATION PROCEDURES

The following section describes the procedures used to initiate the CE Diagnostic Test. The development system must be powered up before power can be applied to the Winchester Peripheral Chassis.

NOTE

Any deviation from the displays in the following procedures denotes an error.

1. Insert the test diskette labelled ISIS II (W) V4.2 into drive :F4:.

2. Press the "RESET" switch on the front panel of the mainframe and then on the keyboard, press the "F" key and read from the CRT:

   ISIS-II(W), X 424

3. On the keyboard, type:

```
:F4:STFS
```

4. The following display should appear on the CRT:

```
ISIS-II STFS, V1.1
```

5. On the keyboard, type:

```
INI (Initialize) :F4:SIIWIN.CE
```

6. The following display should appear on the CRT:

```
WINCHESTER CUSTOMER ENGINEER DIAGNOSTIC
     FOR ISIS-II(W) PERIPHERAL CHASSIS X012

I/O MAP SWITCHES MUST BE SET AT 0005H,
ALL INITIALIZE NUMBERS MUST BE DECIMAL
IS THE DATA ON THIS UNIT BACKED-UP (Y or N) Y
```

NOTE

The destructive tests 15H, 16H, and 17H will be automatically ignored if N; automatically included if Y.

```
DO YOU WANT TO USE THE INITIALIZATION DEFAULTS (Y or N) Y
PASS
MIN/VERSION 1.07
USER RETURN
*;
*; If the above test passed, press(CNTL + E) to continue
*^E
```

7. If the above test failed, it could be due to cable connections or incorrect switch settings on the drive. On the keyboard, type: EXIT (and depress the RETURN key) and verify the test equipment set-up. If the above test passed, then on the keyboard, simultaneously depress the CNTL and E keys and read the CRT:

```
*^E^E
*Load :F4:WCALL Nolines
*Load :F4:SIIWIN.CE Nocode Nolines
*Recognize 0 to 14
*Ignore B,E,F,10
*Debug = FF
*Test 0 to A,C,D,11 to 14
0000H RESET TEST                "PASSED"
0001H TRANSFER STATUS           "PASSED"
                                    DIAGNOSTICS
```

```
0002H BUFFER I/O TEST              "PASSED"
0003H ROM CHECKSUM TEST            "PASSED"
0004H RAM WINDOW TEST              "PASSED"
0005H RAM ADDRESS TEST             "PASSED"
0006H FORMAT TEST                  "PASSED"
0007H MICRO-DIAGNOSTICS            "PASSED"
0008H SEEK/VERIFY TEST             "PASSED"
0009H WORST CASE SEEK TEST         "PASSED"
000AH WRITE/READ TEST              "PASSED"
000CH PLATTER/HEAD TEST            "PASSED"
000DH SECTOR SELECTION             "PASSED"
0011H ALTERNATE TRACK TEST         "PASSED"
0012H ZERO FILL TEST               "PASSED"
0013H DATA OVERRUN TEST            "PASSED"
0014H AUTO-INCREMENT TEST          "PASSED"
*;
*Summary 0 to A,C,D,11 to 14 EO
0001H COMPLETE ITERATIONS
*;
*; Test complete, press CNTL and E to exit
*^E
```

8. If any of the above test have failed; on the keyboard, type: EXIT (and depress the RETURN key).
   If all the above test have passed, simultaneously on the keyboard, depress the "CNTL" and "E" keys and read CRT:

```
*^E^E
*Exit
-:f4:Restor
```

9. When testing is complete, enter the following command:

```
:F4:LOGOFF (cr)
```

10. The CRT screen will clear and the following message will displayed on the CRT:

```
DRIVE SPUN DOWN
```

11. Observe that the "RUN" light on the IPC goes out. This is not an error.

12. Remove the test diskette from the drive :f4:

13. Turn the power switch on the front panel of the Winchester peripheral chassis to "OFF" position.

14. Depress the power switch on the front panel of the mainframe. The switch light will go off.

3-4. TROUBLESHOOTING

The following table explains the probable subassembly failures as determined by the diagnostic test executions. The failing test number is the primary factor used to isolate failures to a field replaceable subassembly. Failing test numbers and the respective subassemblies are as follows:

Test Number	Subassembly
0 to 5	Controller
6,7	Controller/Cables/Drive
8 to D	Drive
E	Drive/Controller
F to 17	Drive

The CE should check each test's results as they may indicate the relationship between two or more subassemblies. For example, if tests 0 through 5 pass but test 8 fails, the drive should be considered faulty. Another example is, if test 2 and tests 8 through A fail, the controller is the probable cause and should be replaced. A bad controller can cause the drive tests to fail as can a faulty cable.

Table 3-3 lists additional messages that the test may display during test execution.

Table 3-3. SIIWIN.CE Messages

Error Code	Description
FORMAT	Format error
LBUF	I/O buffer error
DIAG	Micor-Diagnostic error
READID	Read sector ID error
READ	Read error
RESET	Reset error
SEEK	Seek error
TRANST	Transfer error status error
WRTBUF	Write controller buffer to disk error
WRITE	Write error
VERIFY	Verify error

Table 3-3. SIIWIN.CE Messages (continued)

Status Message	Description
DIAGNOSTIC FAULT	Micro-Diagnostice fault
DRIVE FAULT	Read/Write, position, power, or speed fault in selected drive
INVALID COMMAND	Invalid command issued to drive
INVALID ADDR	Cylinder address beyond available tracks
SELECTED UNIT NOT READY	Selected unit not ready or not responding
WRITE PROTECTION FAULT	Attempted write to write protected unit
END OF MEDIA	End of media detected
EFECTIVE ALTERNATE	Alternate cylinder also defective
SECTOR NOT FOUND	Desired sector not found
ILLEGAL SECTOR SIZE	Test suite sector size variable does not match actual disk sector size

Soft Error Status Message	Description
SYNC NOT FOUND	Read electronics unable to synchronize on either ID or data field
DATA FIELD	Correctable error found in data field (note retry count)
ID FIELD	Correctable error found in ID field (note retry count)
CYLIN. ADDR MISC	ID field contains address different than expected address
SEEK ERROR	Seek error detected

Table 3-3. SIIWIN.CE Messages (continued)

Time Out Error Message	Description
NON-INTERRUPT TIME-OUT	Controller has not posted an operation complete response for a function that does not use the operation complete interrupt
INTERRUPT TIME-OUT	Controller has not interrupted for an operation complete
TIME-OUT ON SEEK COMPLETE	Controller has not posted a seek complete response.

INTEL	CHAPTER 4 REMOVAL AND REPLACEMENT

4-1. INTRODUCTION

This chapter contains the removal and replacement procedures for the defined field replaceable units in the Winchester Peripheral Chassis and Series II Development System. Step-by-step instructions and illustrations are provided for efficient service operations and to ensure personnel and equipment safety.

4-2. REMOVAL AND REPLACEMENT REQUIREMENTS

The following procedures must be performed in sequential order to avoid damage to the equipment or loss of data:

1. If the system is operational, perform a power-down operation; type SPINDN.
2. Turn off the power to the Winchester Peripheral Chassis and wait for the drive to stop (about 30 sec).
3. Loosen the front panel by pulling out the fastener located in each corner, and remove the panel.
4. Move the locking lever to the right, then up and to the left, to lock the head into position. (See figure 4.2).

CAUTION

Damage to the drive heads and recording surfaces will occur if the peripheral chassis is moved prior to setting the head lock lever in the LOCK position.

5. Remove power from the Winchester chassis.
6. Turn off the Series II development system.

CAUTION

Always remove power from the Winchester drive before removing power from the development system. Otherwise the data content of the drive may be damaged.

4-3. 215B DISK CONTROLLER REMOVAL

To remove the 215B disk controller from the Series II and Series III chassis proceed as follows:

1. Ensure that all power is removed from the development system and remove the card cage front panel.

2. Disconnect the Winchester subsystem interface internal cable from the controller by detaching the cable's P1 connector from the controller's J1 connector and the cable's P2 connector from the controller's J2 connector.

3. Remove the controller PWA from the card cage, noting its position with respect to any other PWA's in the card cage. To keep the Winchester 215B controller from monopolizing the bus in the presence of other Intel disk controllers, the 215B controller is given the lowest priority (i.e., must be located above all other disk controllers in the card cage).

4-4. 215B DISK CONTROLLER REPLACEMENT

To replace the 215B controller board in the development system chassis, follow these steps:

1. Insert the controller board into a vacant slot in the card cage so that it is above all other disk controllers. Slide the board partially into the slot.

2. Connnect the Winchester subsystem interface internal cable to the controller, mating the cable's P1 connector with the controller's J1 connector and P2 with J2. Note that the white dot on the cable connectors aligns with pin 1 of the controller's J1/J2 connectors (pin 1 is indicated by a triangle on the top of the connector). Slide the controller board all the way into its slot.

3. Replace the card cage front panel.

4-5. WINCHESTER INTERFACE INTERNAL CABLE REMOVAL

To remove the Winchester interface internal cable refer to the procedures in section 4-4 (Controller Removal) and section 4-7 (Rear Panel Removal) and perform those procedures. Use the following steps to remove the cable from the Series II/III chassis.

1. Remove the development system top cover.

WARNING

Hazardous voltages are present within the development system. Make sure that the power is off and that the line cord is removed before proceeding.

2. Disconnect the internal cable from the Winchester disk controller by detaching the cable's connectors P1 and P2 from the controller's connectors J1 and J2.

3. Remove the socket screw assembly from the rear panel at J10 and remove the internal cable from the development system.

4-6. WINCHESTER INTERFACE INTERNAL CABLE REPLACEMENT

To replace the internal cable in the Series II/III chassis proceed as follows:

1. Attach internal cable to external signal cable at J10 on the development system's rear panel and replace the socket assembly screws.

2. Route the internal cable along the side of the development system chassis and through the front opening into the card cage area. Make sure that the cable assembly is not pinched between the IOC and the power supply.

3. Secure the rear panel to the development system with four screws previously removed.

4. Reconnect P1 and P2 to the controller's J1 and J2 respectively, noting that the white dot on the cable connectors aligns with pin 1 of the controller's J1/J2 connectors (pin 1 is indicated by a triangle on the top of the connnector).

4-7. REAR PANEL REMOVAL

To remove the rear panel of the Series II or Series III chassis proceed as follows:

1. Power-down the development system and attached peripherals, disconnect power cord(s), and disconnect all cables attached to the development system's rear panel. Refer to figure 4-1 for cable connections.

2. If the development system includes the low-profile drive chassis, remove the two aluminum ground strips between the system and drive chassis and lift the chassis off of the development system.

3. Remove the development system top cover.

WARNING

Hazardous voltages are present within the development system. Make sure that the power is off and that the line cord is removed before proceeding.

4. Refer to figure 4-1 and disconnect the cables from connectors J14, J15, and J16. If the development system includes an integral flexible disk drive, disconnect the cables from connectors J17 and J18. Disconnect any associated cable ground braids at the IOC.

5. Refer to figure 4-1 and remove the rear panel mounting screws. Pull the panel away from the chassis and disconnect the Winchester interface internal cable assembly from the panel's J10 connector slot.

6. Place the rear panel assembly face down on a padded flat surface and remove the eleven screws that secure the IOC board to the rear panel.

4-8. REAR PANEL REPLACEMENT

Install the development system rear panel following these steps:

1. Reinstall the internal cable assembly's P10 connector to the inside of the rear panel's J10 connector slot.

2. Position the rear panel assembly in place on the back of the development system and secure it with the four previously removed screws.

3. Reconnect the remaining cables and ground braids to their appropriate connectors on the IOC board (connectors J14 through J18; see figure 4-1).

4. Replace the development system's top cover and, if included, the low-profile drive chassis. Reconnect all cables and ground strips that were previously removed.

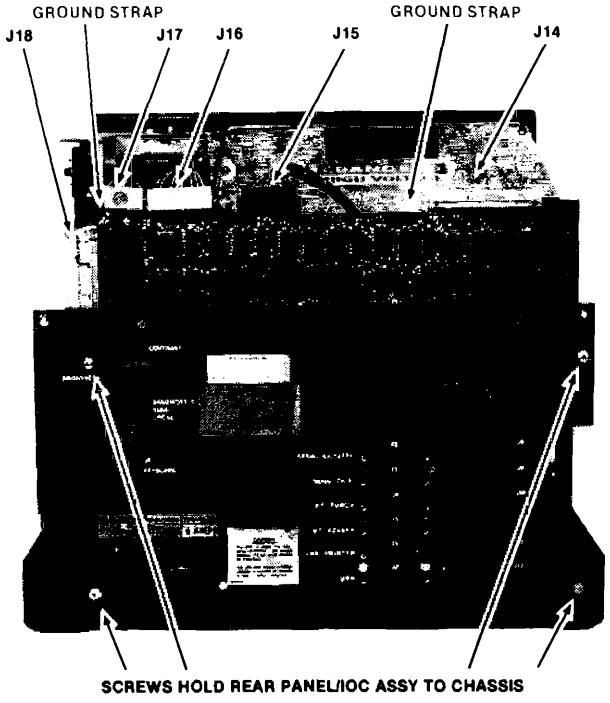


Figure 4-1 Rear Panel Removal

4-9. DRIVE ASSEMBLY REMOVAL

To remove the drive assembly from the Winchester chassis proceed as follows:

1. Ensure that the Winchester drive is turned off and ac power has been removed.

2. Remove the front panel to the Winchester unit and inspect to see that the head/spindle lock lever is in the LOCK position (refer to figure 4-2).

CAUTION

Damage to the heads and/or platter surfaces will occur if the drive assembly is moved and the heads are NOT LOCKED in place.

3. Refer to figure 4-3 and remove the nine screws from the top drive mounting bracket.

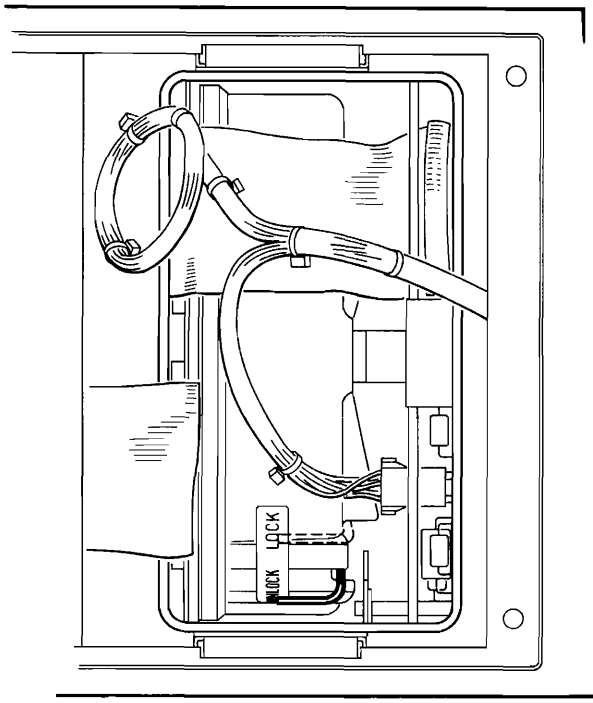


Figure 4-2. Drive Locking Lever

4. Carefully lift bracket up from drive assembly and set it to rest on the power supply frame. The blue capacitor required for the level 1 power supply is still attached to the bracket and still connected to the level 1.

5. Disconnect the dc power cable connector P5 at jumper J5 if the level 1 power supply is present, or at P1 if the level 3 power supply is present. Remove cover from the On/Off circuit breaker.

6. Detach the drive cable assembly from the circuit breaker, noting the wire position (yellow wire above brown wire).

7. Disconnect the 50 pin ribbon cable connector P7 from the drive assembly connector J3.

8. Remove the four bottom bracket mounting screws that hold the drive assembly to the chassis and lift out the drive. The bottom mounting bracket is still attached to the drive and will provide it with a stable base. Leave the bracket attached unless the drive itself requires replacement.

4-10. DRIVE ASSEMBLY REPLACEMENT

To replace the drive assembly in the Winchester chassis follow these procedures:

1. If the bottom mounting bracket was removed from the drive assembly, replace it and tighten those three screws.

2. Place the drive assembly in the chassis frame (refer to figure 4-3 for proper alignment) and tighten the four mounting screws to secure the drive in the chassis.

3. Reconnect the 50 pin ribbon cable connector P7 to connector J3 on the drive. Reconnect the dc power cable assembly connector P5 to the level 1 power supply at cable assembly connector J5 or to the level 3 supply at P1, whichever supply is installed in the chassis.

5. Reconnect the yellow and brown wires (from the drive) to the On/Off circuit breaker (the yellow wire will be above the brown wire). Replace the circuit breaker cover.

6. Replace the top mounting bracket (reconnect the capacitor ground leads if they were removed) and secure to drive assembly with the nine screws.

4-11. READ/WRITE DIGITAL CONTROL BOARD REMOVAL

To remove the Read/Write control board from the drive assembly first remove the entire drive assembly from the chassis. Refer to section 4-8. Refer to figure 4-4 and proceed as follows:

1. Disconnect connector J2 from connector P2 and detach the 50 pin ribbon cable from connector J3.

2. Remove the six small screws that hold the Read/Write board to the drive frame. Remove the board.

4-12. READ/WRITE DIGITAL CONTROL BOARD REPLACEMENT

1. Guide the board to the drive frame and replace the six small screws previously removed. Tighten securely.

2. Reconnect the 50 pin ribbon cable to connector J3 and connector J2 to P2.

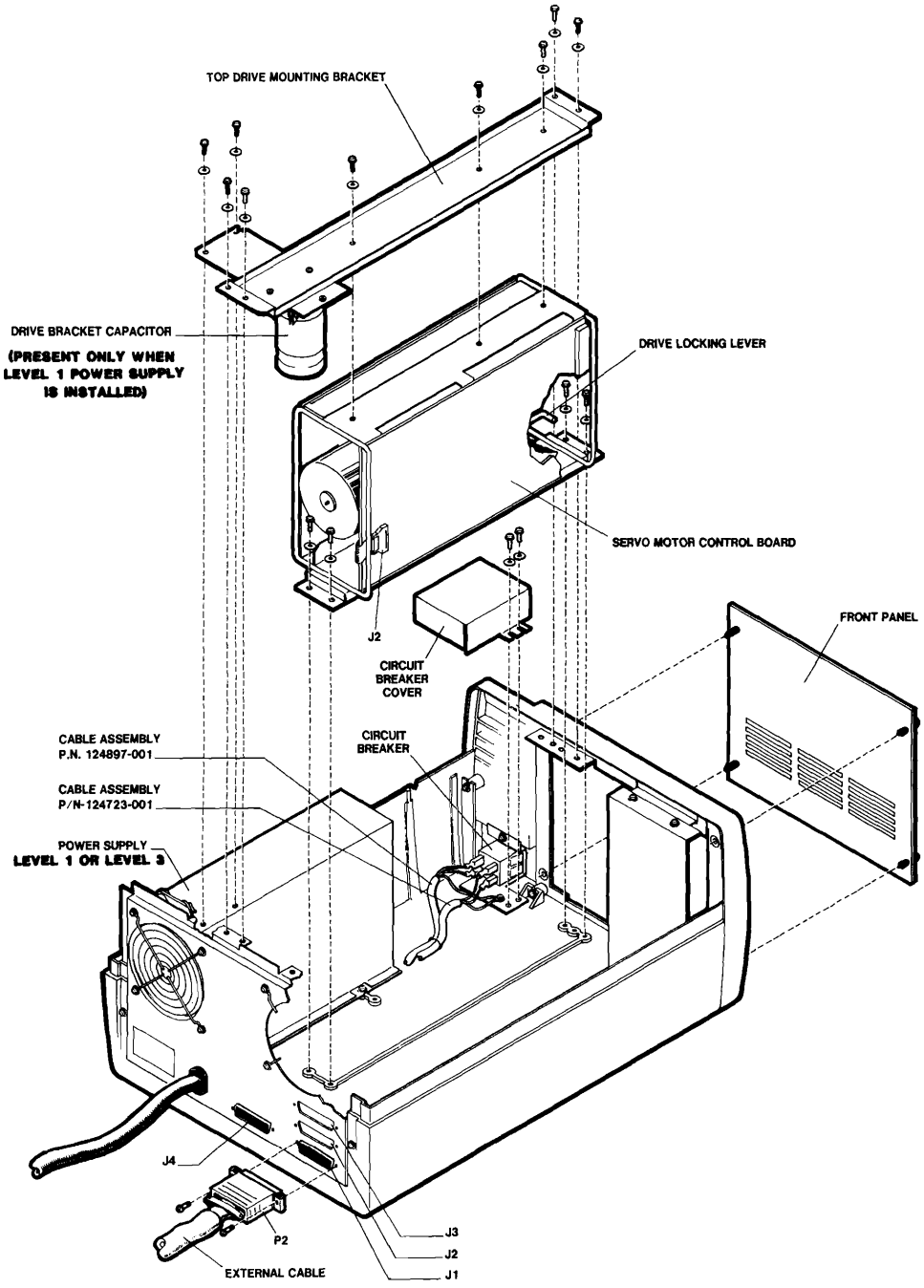


Figure 4-3. Drive Assembly Removal

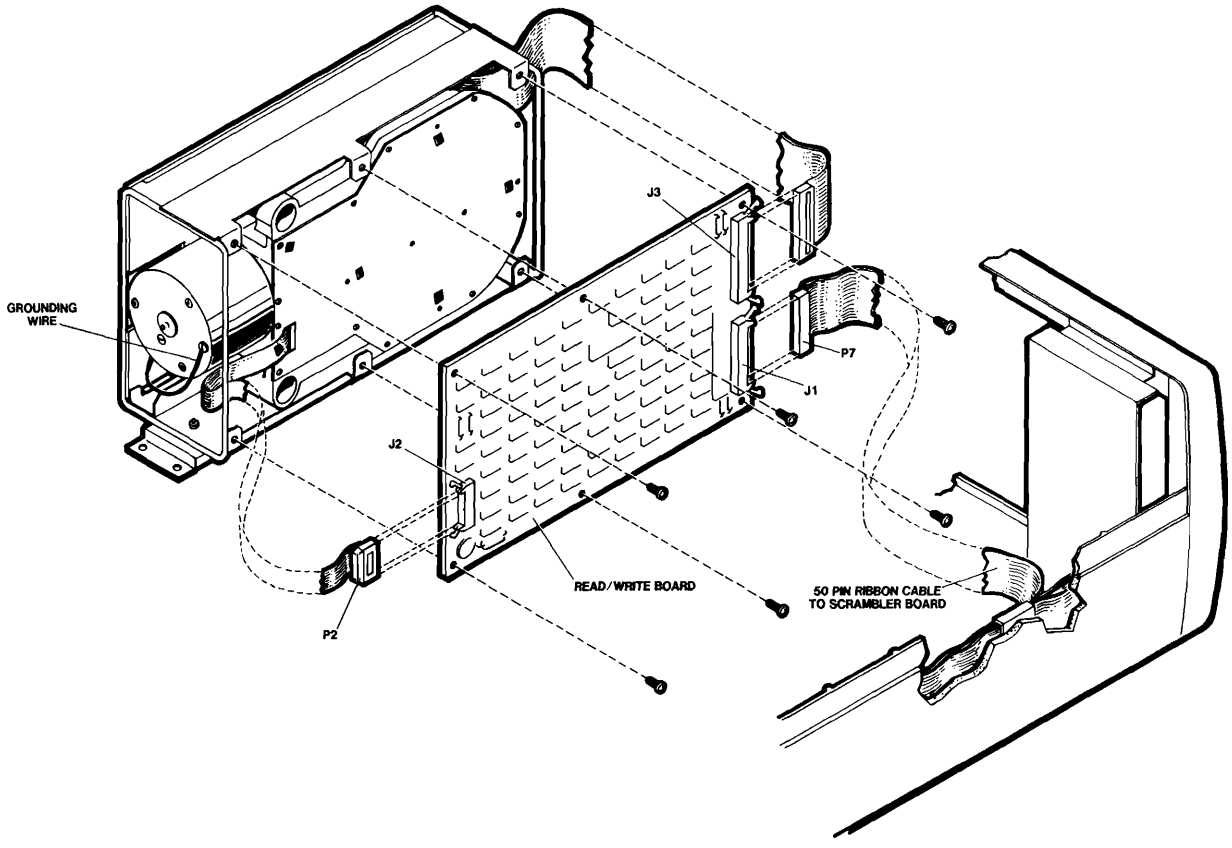


Figure 4-4. Read/Write Control Board Removal

4-13. SERVO MOTOR CONTROL BOARD REMOVAL

To remove the servo motor control board from the drive the drive must first be removed from the chassis. Refer to section 4-8 then proceed as follows:

1. Position the drive assembly so that the servo board is facing you with the slotted area on your right as shown in figure 4-5.

2. Remove the four hex stand-off nuts from the board and slowly pull the board away from the drive about an inch.

3. Detach the two thin wire cables from the sockets on the board at J4 and J5.

CAUTION

These cables are brittle and will break if twisted or crimped. Should such damage occur, the drive will have to be replaced.

4. Cut the tie-wrap located near the Read/Write board and remove connector P3 from connector J3 (a 6 pin white plastic connector).

5. Remove the 8 pin white plastic connector P1 from the connector at J1.

6. Disconnect the ribbon cable P2 from connector J2 on the Read/Write board noting the routing path for reassembly.

CAUTION

Ribbon cable must be disconnected at the Read/Write board ONLY. It is soldered in the jumper connection on the servo board.

7. Disconnect the ground lead from the linear motor at E3 on the servo board.

4-14. SERVO MOTOR CONTROL BOARD REPLACEMENT

1. Weave ribbon cable P2 as shown in figure 4-5 between the drive reinforcing bar. Mate connector P2 to the connector J2 on the Read/Write board.

2. Reattach connectors P1 to J1 and P3 to J3.

3. Connect the narrow ribbon cable to J4 observing proper "connector to socket" orientation (see figure 4-5).

4. Connect the wide ribbon cable to J5 observing proper "connector to socket" orientation (see figure 4-5).

CAUTION

These cables are brittle and will break if twisted of crimped. Should such damage occur, the drive will have to be replaced.

5. Reattach the grounding lead from the linear motor to E3 on the servo board.

6. Replace the four hex stand-off screws that secure the servo board to the drive frame.

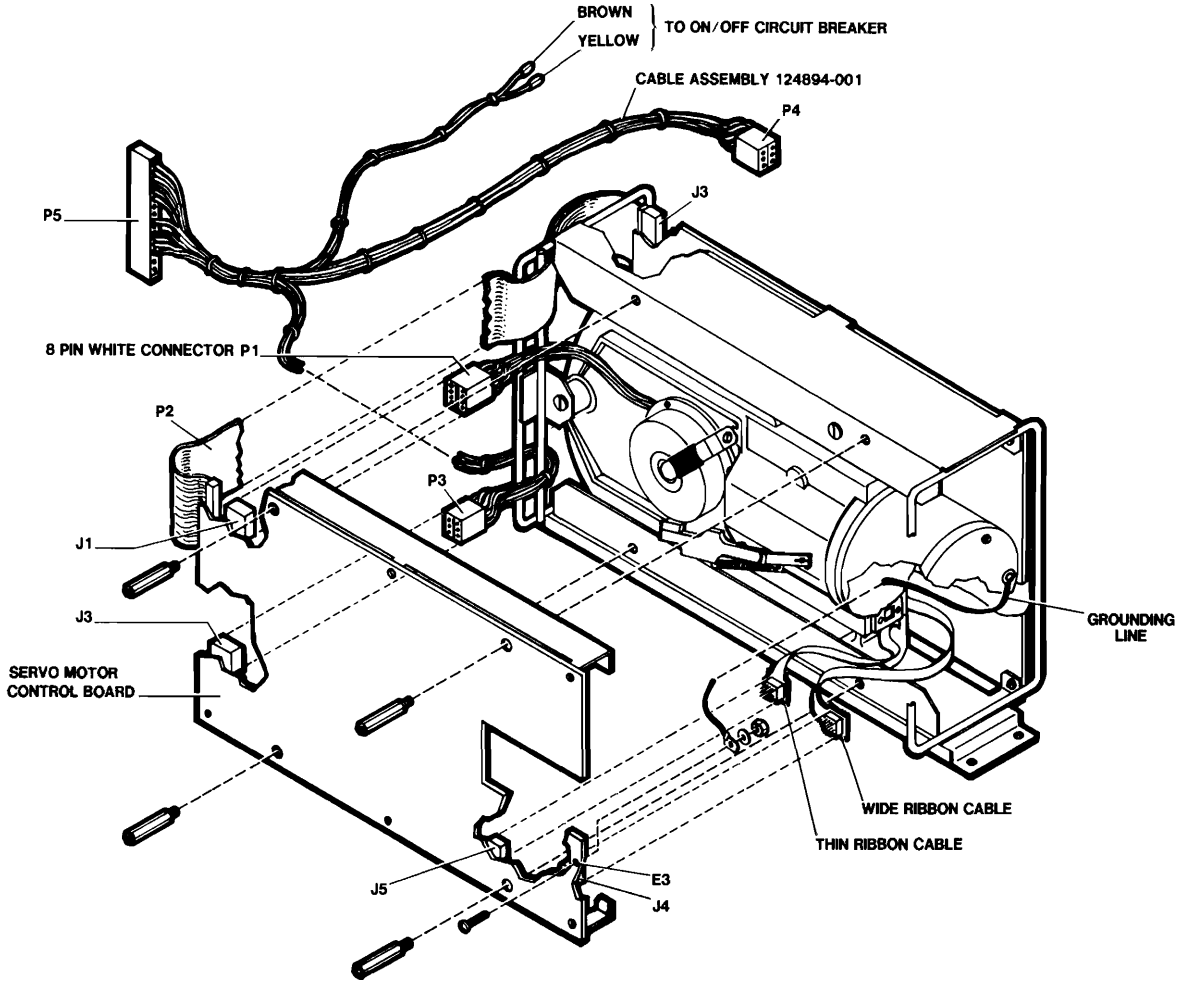


Figure 4-5. Servo Motor Control Board Removal

4-15. AC FILTER REMOVAL

To remove the ac filter from the chassis proceed as follows:

1. Remove the two screws holding the filter cover to the chassis and remove the cover (see figure 4-6).

2. Remove the two screws holding the filter to the base. Detach the ac cord wires at the line end and the circuit breaker wires at the load end. Detach ground leads at the load end base of the filter and remove the filiter from the chassis.

4-16. AC FILTER REPLACEMENT

Follow these steps to replace a filter in the Winchester chassis:

1. Place filter in the chassis and reconnect the ac line end wires (brown wire nearest rear panel and blue wire nearest drive; see figure 4-6).

2. Reconnect the circuit breaker wires to the load end of filter (white wire nearest rear panel and red wire nearest drive; see figure 4-6). Replace circuit breaker and chassis grounds to mounting bracket and secure them at the load end of the filter. Replace remaining screw and tighten.

3. Replace the ac filter cover, making sure none of the cable assemblies are crimped between the cover and the filter mounting bracket.

4-17. FAN REMOVAL

To remove the fan(s) from the rear panel of the chassis proceed as follows:

1. Disconnect the two wire leads from the fan housing, noting their orientation for proper position during reassembly (white wire nearest rear panel).

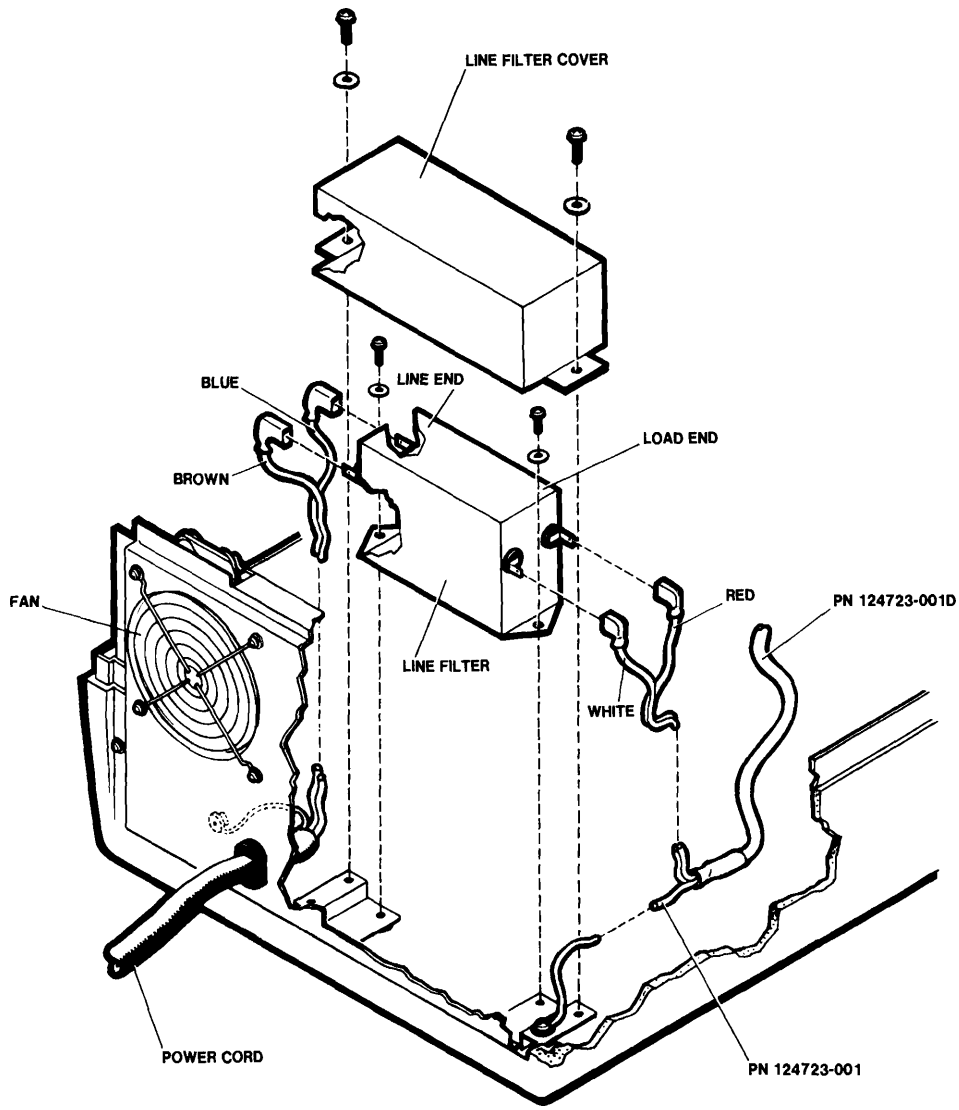
2. Refer to figure 4-7 and remove the four long screws holding the fan housing to the rear panel and guide the fan housing out of the chassis.

4-18. FAN REPLACEMENT

Replace the fan in the rear panel as follows:

1. Guide the fan assembly into the space on the inside of the rear panel, insert the mounting screws and tighten.

2. Replace previously removed wire assembly leads on the fan housing (white wire nearest the rear panel).



121968-4

Figure 4-6. AC Filter Removal

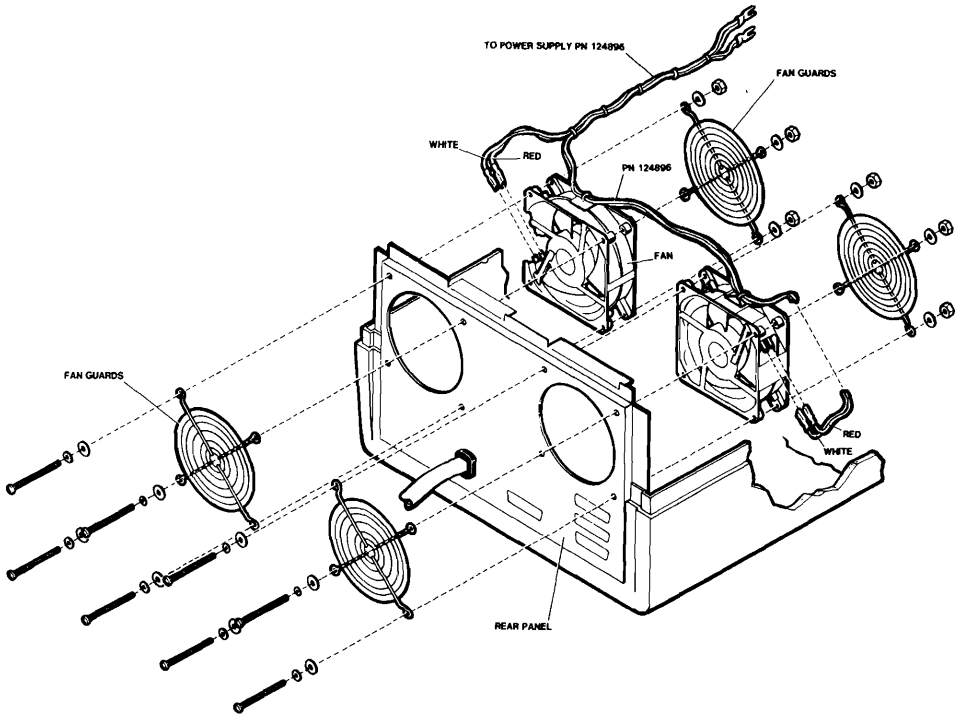


Figure 4-7. Fan Removal 121968-5

4-19. SCRAMBLER BOARD REMOVAL

Use the following procedure to remove the scrambler board from the Winchester chassis:

1. Refer to figure 4-8 and disconnect the 50 pin ribbon cable P1 from the scrambler board connector J6.

2. Remove the three small philips screws from the outside of the chassis rear panel.

3. Disconnect the external cable from the rear panel at slot J1.

4. Remove the four socket assembly screws from the rear panel slots J4 and J1 and lift the scrambler board out of the chassis.

4-20. SCRAMBLER BOARD REPLACEMENT

Install the scrambler board in the chassis following these steps:

1. Refer to figure 4-8. and guide the scrambler board in between the ac filter cover and rear panel, aligning J1 with slot J1 and J4 with slot J4 on the panel.

2. Replace the three small screws on the rear panel to secure the board to the inside of the rear panel.

3. Reconnect the external cable assembly (see section 4-23) to the scrambler board at slot J1 on the rear panel and replace the four socket assembly screws.

4. Reconnect the 50 pin ribbon cable connector P1 to the connector J1 on the scrambler board.

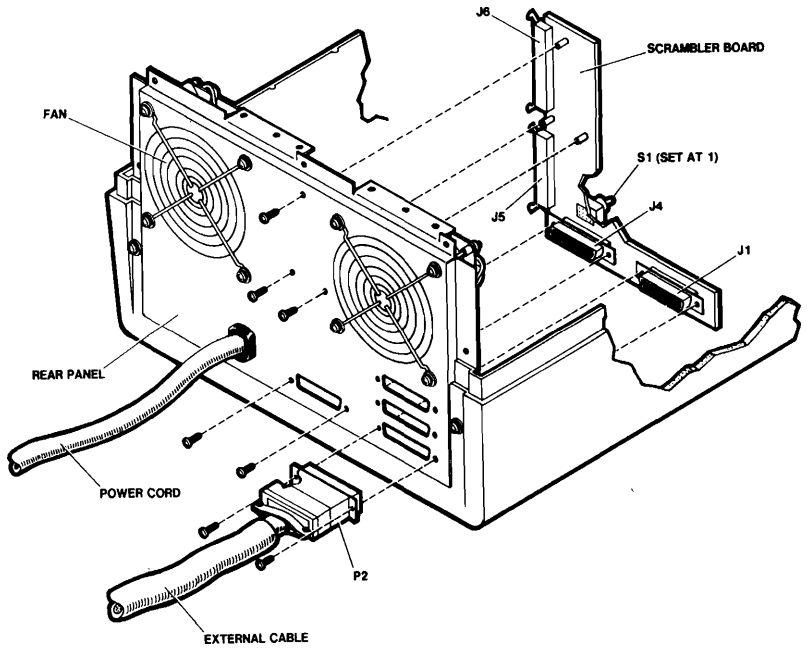


Figure 4-8. Scrambler Board Removal 121968-6

4-21. POWER SUPPLY REMOVAL

Procedures for removing the level 1 or level 3 power supply are essentially the same. Note that for the level 3 supply there is no capacitor on the the mounting bracket to disconnect. Also, the dc power cable assembly P5 plugs directly into the level 3 power supply at P1 (located on the circuit breaker end of the supply) rather than to the power supply cable assembly jumper J5 on the level 1 power supply. Refer to figure 4-9 and detail A and proceed as follows:

1. Remove the top drive mounting bracket and disconnect the leads from the attached capacitor (if present).

2. Remove the plastic shield on the power supply at TB1. (It may prove necessary to remove the ac filter cover in order to have adequate space to use your screwdriver).

3. Disconnect the wire assemblies at TB1 noting wire orientation for proper reassembly (see figure 4-9).

4. Disconnect the dc power cable connector P5 from the power supply jumper J5 if the level 1 supply is present. If the level 3 power supply is present in the chassis, disconnect P5 from P1.

5. Loosen the two slip screws at each end of the power supply frame and remove the two inboard screws from the power supply mounting bracket.

6. Slide the power supply frame away from the chassis wall to clear the slip screws and lift out of chassis.

4-22. POWER SUPPLY REPLACEMENT

Install the power supply in the chassis using these procedures:

1. Guide the power supply frame into the chassis (see figure 4-9) between the fan and circuit breaker. Align the frame with the slip screws and tighten.

2. Replace the two inboard screws on the power supply frame and tighten to the chassis bottom.

3. Reconnect the wire assemblies to TB1 and TB2 (if necessary) referring to figure 2-3 for proper wire location. Replace the plastic shield over TB1 and attach to the power supply with the two screws.

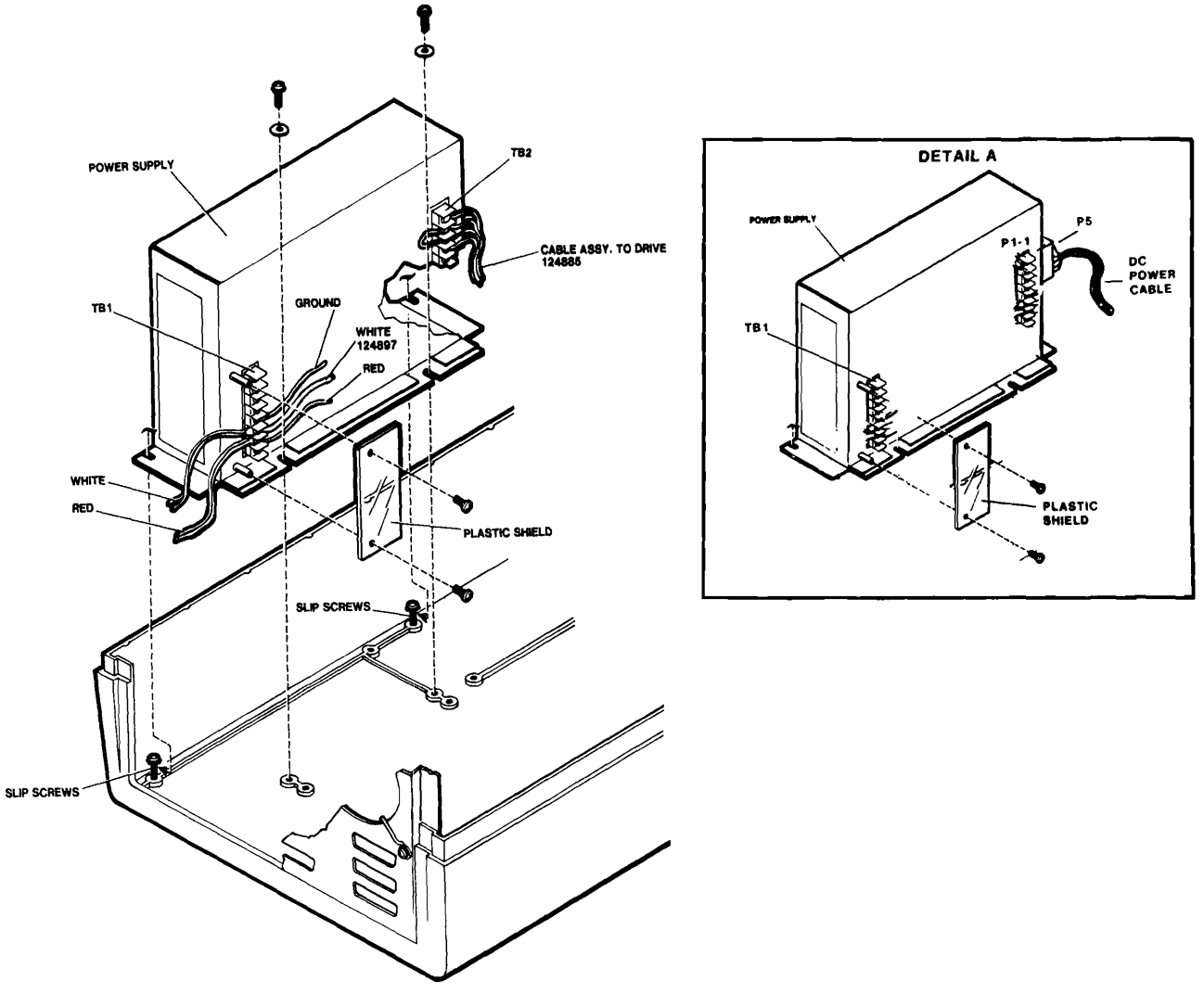


Figure 4-9. Power Supply Removal

4. Reconnect the dc power cable assembly connector P5 to the installed power supply. The connection will be to the cable assembly jumper J5 if the level 1 power supply is installed or to P1 at the end of the level 3 power supply.

5. If the ac filter cover was removed, replace it; ensuring the wires are not crimped between it and the chassis.

6. Reconnect the ground leads to the capacitor on the mounting bracket (green lead to positive, white to negative) if the level 1 power supply is installed. Replace the top mounting bracket and tighten the nine screws in place.

4-23. EXTERNAL CABLE REMOVAL

To remove the external cable from the system follow these steps:

1. Remove the two socket assembly screws from J10 on the development system rear panel. Unplug the external cable P2 from the slot J10.

2. Remove the two socket assembly screws from slot J1 on the Winchester rear panel and unplug the cable from connector J1.

4-24. EXTERNAL CABLE REPLACEMENT

To install the external cable, proceed as follows:

1. Plug the external cable into the Series II or Series III rear panel at J10 and replace the socket assembly screws.

2. Plug the external cable into the Winchester chassis rear panel at slot J1 and replace the socket assembly screws.

5-1. INTRODUCTION

This chapter contains the part numbers and descriptions of the field replaceable units of the Series II and Series III Winchester Peripheral Chassis. This information is presented in Table 5-1 with the cable assemblies being grouped respective of their origin. Figure 5-1 is an illustrated exploded view of the major subassemblies (cable assemblies are deleted) contained in the chassis.

5-2. WINCHESTER PARTS LISTING

Table 5-1 contains the description and part numbers of all field replaceable units in the Series II Winchester Peripheral Chassis.

Table 5-1. Parts List

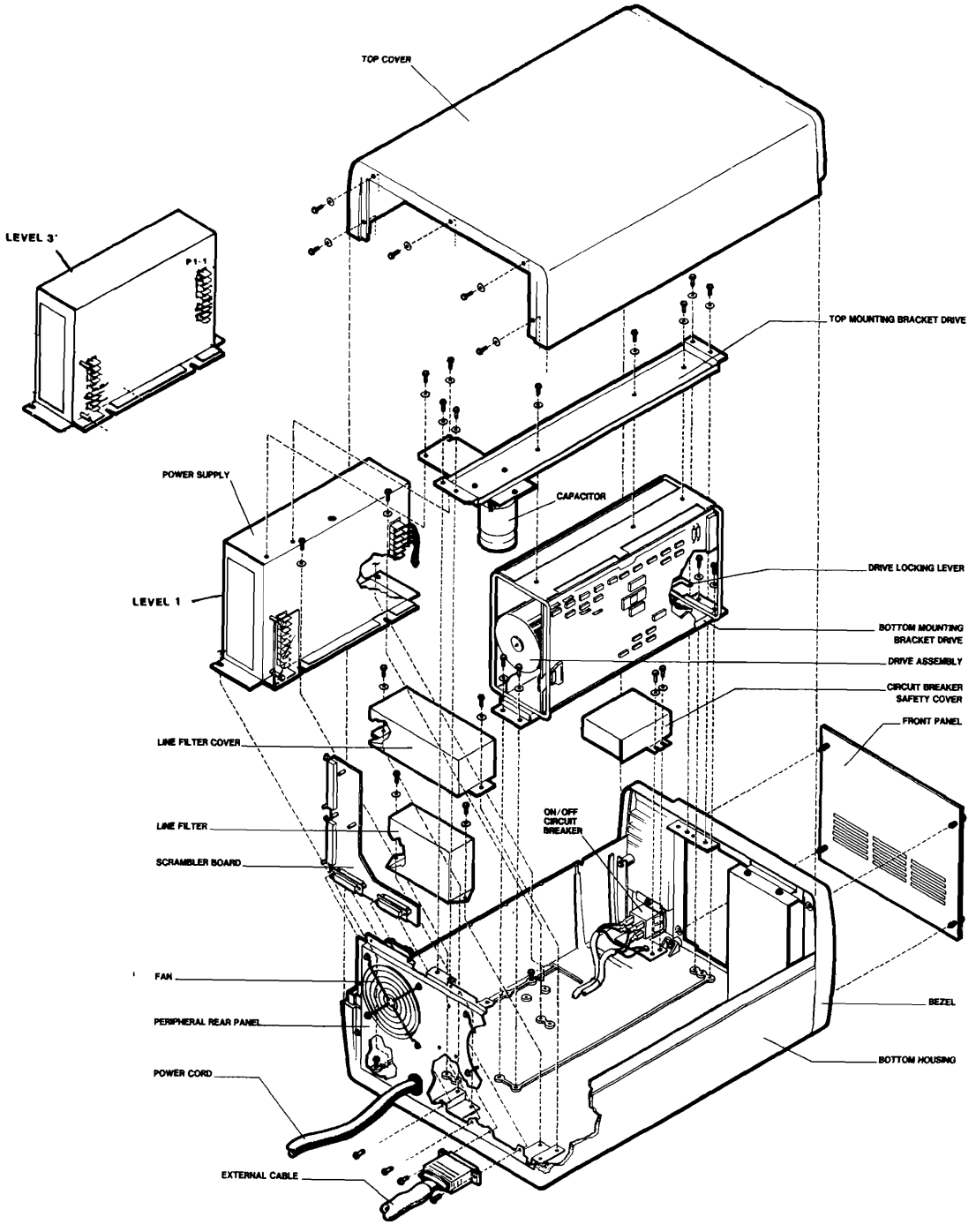
Part No.	Description
	Winchester Chassis
107752-001	Rubber Bumper strip
107760-001	Cab Access Latch Grip RCP (nylatch grommet)
107760-002	Cab Access Latch Grip (nylatch plunger)
123946-001	Intel Logo
123952-002	Top Cover
123953-002	Bottom Housing Peripheral Box
123954-002	Bezel Peripheral Box
124236-001	Panel, Front
125368-001	Panel, Rear
	Winchester Drive Assembly
107779-001	Capacitor, 50V (only when level 1 P/S present)
124246-001	Bottom Mounting Bracket, Drive
124247-001	Top Mounting Bracket, Drive
124885-001	Cable Assembly, Power Drive Adapter
124894-001	Cable Assembly to Power Supply
125260-001	Formatted Winchester Drive
125390-001	Cable Assembly Signal Drive

Table 5-1. Parts Listing (Continued)

Part No.	Description
	Power Supply
124726-001	Cable Assembly to Capacitor
124896-001	Harness Assembly to Fan
124898-001	Jumper
125009-001	Level 1 Power Supply
124903-001	Level 3 Power Supply
	On/Off Circuit Breaker
104257-002	On/Off Circuit Breaker (110 VAC)
104257-003	On/Off Circuit Breaker (220 VAC)
124240-001	On/Off Circuit Breaker Mounting Bracket
124897-001	On/Off C.B. Cable Assembly to Power Supply
124923-001	On/Off Circuit Breaker Safety Cover
	Line Filter
124376-002	Spec Contr DWG Line Filter
124723-001	Cable Assembly to On/Off Circuit Breaker
124895-001	Filter Grounding Jumperg
125159-001	Filter Bracket
125160-001	Filter Cover
	Real Panel Area
103001-001	Fan (110 VAC)
103001-002	Fan (220 VAC)
124119-003	Power Cord (110 VAC)
124119-004	Power Cord (220 VAC)
125336-001	Scrambler PWA
	Series II Subassemblies
125218-001	Development System Rear Panel
125309-001	External Cable
125336-001	Hard Disk Controller
125367-001	Internal Cable

5-3. WINCHESTER CHASSIS EXPLODED VIEW

Figure 5-1 presents an illustrated exploded view of the major subassemblies (cable assemblies are deleted) contained within the Winchester Peripheral Chassis.



*DOES NOT REQUIRE CAPACITOR (MOUNTED ON TOP MOUNTING BRACKET DRIVE)

Figure 5-1. Winchester Chassis Exploded View

INTEL

APPENDIX A
STFS TEST COMMANDS

The Customer Engineer diagnostics are based on the System Test Foundation Software (STFS). The individual STFS test commands are described in table A-1. Please note that any of the commands can be abbreviated to the first three letters of the command name (the TEST command also can be abbreviated with the letter T). Commands are entered following the STFS prompt (*) and are terminated by pressing the RETURN key (indicated by <cr>).

Table A-1. STFS Command Summary

Command Name	Abbrev-iation	Command Description
BASE	BAS	Displays or changes the default base for most numeric data shown on CRT. The initial default base is hexadecimal. This command is the output companion to the SUFFIX command.
CLEAR	CLE	Sets the test summary tables test execution and error counts to zero for the test(s) specified (if no test is specified, the entire table is cleared).
COUNT/END	COU/END	Sets up a loop composed of several STFS commands. Maximum number of iterations for loop is specified by number following keyword. The extent of the command is defined by the use of the END command.
DEBUG	DEB	Sets, clears, or reports the status of the debug switch that controls display or error messages.
DESCRIBE	DES	Describes the status (recognized or ignored) for the test(s) specified; (if no test is specified, the status of all tests is displayed).

Table A-1. STFS Command Summary (Cont'd)

Command Name	Abbrev-iation	Command Description
ERRORONLY	ERR	Displays or modifies the status of the erroronly variable; typically disables the output of any data except when failure occurs during test execution.
ESCAPE	ESC	Interrupts test execution and returns control to STFS. The escape sequence is initiated by pressing the ESC key.
EXIT	EXI	Ends test session and returns control to ISIS.
FINISH	FIN	Clears remaining variables in a test if it was stopped prior to test completion.
IGNORE	IGN	Prevents execution of specified test(s). An ignored test must be recognized before it can be executed.
INITIALIZE	INI	Invokes the test program and initializes summary table and internal values.
LIST	LIS	Outputs a copy of all prompts, input line echoes and all error messages displayed on the ISIS:CO: device to a disk file. It will overwrite present data in a given ISIS file if named.
RECOGNIZE	REC	Enables previously ignored test(s) to be executed.
REPEAT/END	REP/END	Sets up a loop composed of several STFS commands. The escape sequence is initiated by pressing the ESC key.
SUFFIX	SUF	Displays or changes the default base for most numeric data that is entered by the operator without a base designating suffix.

Table A-1. STFS Command Summary (Cont'd)

Command Name	Abbrev-iation	Command Description
SUMMARY	SUM	Displays a test activity table listing the number of times each test was run and the number of times each test returned an error.
TEST	TES, T	Invokes all/specified tests. Several parameters are available to specify test conditions.
VARIABLE	V	Displays or modifies the status of the user variables.

A-1. LINE EDITING

Line editing commands may be used to correct or modify command entries at any time before the RETURN key is pressed. Table A-2 lists and summarizes the line editing commands supported at the Series II or Series III terminal.

Table A-2. Line Editing Commands

Edit Commands	System Response
CONTROL + P	Inputs next character literally
CONTROL + R	Echoes entire input line
CONTROL + X	Deletes entire input line
CONTROL + Z	Same as CONTROL + X above
SHIFT + DELETE	Deletes last charactrer typed in input line
BACKSPACE	Same as SHIFT + DELETE above

A-2. COMMAND NOTATIONAL CONVENTIONS

Table A-3 summarizes the notational conventions used in the description of the test manager commands.

Table A-3. Command Notational Convention

Notation	Description
UPPERCASE	Elements in uppercase are specific keywords that must be entered exactly as shown (or abbreviated as described in table A-1).
lowercase underlined	Elements in lowercase and underlined identify tokens. Select and enter a specific identifier from each set.
[ ]	Brackets indicate optional arguments or parameters. When two or more elements are enclosed in brackets, all elements are optional, but only one element may be entered.
{ }	Braces indicate that only one of the elements can be entered.
. . .	Ellipses indicate the the preceding argument may be repeated.
punctuation	Punctuation other than ellipses, braces, and brackets must be entered as shown.
<cr>	Indicates that the carriage return key must be pressed.

A-4. STFS COMMANDS

The following paragraphs describe each of the STFS test commands and provide the syntax and example entries for each command. In the examples, the command prompt for user imput is indicated by an asterisk (*). Test lines without an asterisk are output messages from the test program or from the STFS test manager.

BASE COMMAND

The BASE command displays or changes the default base for most numeric data shown on the CRT. The initial default base is hexadecimal. This command is output companion to the SUFFIX command.

Syntax for the BASE command is as follows:

```
        ┌─  Y      ─┐     Y      = Binary (base 2)
        │   O or Q  │     O/Q    = Octal (base 8)
BASE    │=  T       │     T      = Decimal (base 10)
        │   H       │     H      = Hexadecimal (base 16)
        │   ASCII   │     ASCII  = ASCII value of each byte
        └─        ─┘
```

Example entries for the BASE command are as follows:

1. To display output default base:

   *BASE<cr>

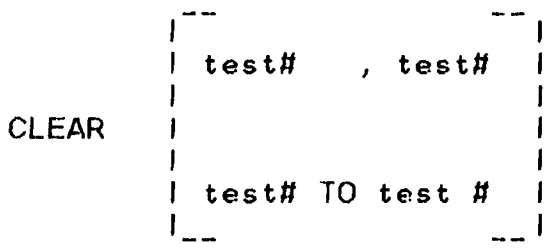
2. To set output default base to binary:

   *BAS = Y<cr>

CLEAR COMMAND

Execution and error counts for each individual test accumulate in a test activity summary table. The CLEAR command allows the user to set the execution and error counts for any or all tests to zero. The CLEAR command does not affect test status (ignored or recognized); nor does test status affect the summary table. (See the SUMMARY command for instructions on displaying the test activity summary table).

Syntax for the CLEAR command is as follows:



Example entries for the CLEAR command are as follows:

1. To clear all execution and error counts:

   *CLEAR<cr>

2. To clear execution and error counts for test 14 through 20H (inclusive):

   *CLE 14 TO 20<cr>

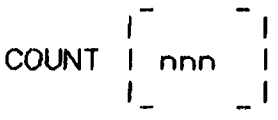
3. To clear execution and error counts for tests 3, 5, and CH:

   *CLE 3, 5, C<cr>

COUNT/END COMMAND BLOCK

The COUNT/END command block sets up a loop composed of several STFS commands. The loop block is introduced by the COUNT keyword and the maximum number is iterations is specified by the number following the keyword. The extent of the COUNT command block is defined by the use of the END command.

Syntax for the COUNT/END command is as follows:




```
.*
.*
.*
```

Example entry for the COUNT/END command are as follows:

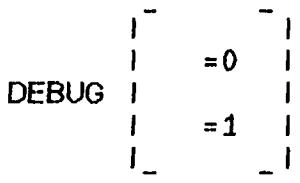
To loop tests 10H and CH 100 times:

```
*COUNT  100T<cr>
.*TEST 10<cr>
.*TEST  C<cr>
.*END<cr>
```

DEBUG COMMAND

The DEBUG command is used to set, clear, or display the status of the DEBUG switch. When DEBUG = 1, error messages are displayed. When DEBUG = 0 (default), error message are suppressed.

Syntax for the DEBUG command is as follows:



Example entries for the DEBUG command are as follows:

1. To display current DEBUG status:

   *DEBUG<cr>
   0000H

2. To set the DEBUG switch to display error messages:

   *DEB=1<cr>

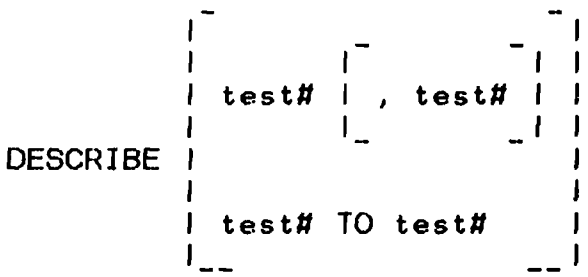
3. To clear the DEBUG switch to suppress error messages:

   *DEB-0<cr>

DESCRIBE COMMAND

The DESCRIBE command displays the test number and test name for any or all the tests in the test program currently loaded into memory. Also displayed is the test status (ignored or recognized).

Syntax for the DESCRIBE command is as follows:



Example entries for the DESCRIBE command are as follows:

1. To describe all the tests of a test program:

```
*DES<cr>
0000H CPU TEST
0001H ON-BOARD RAM MEMORY TEST
0002H FAILSAFE TIME TEST          ***IGNORED***
0003H OFF-BOARD RAM MEMORY TEST
0004H 8253 TIMER TEST
0005H 8259A INTERRUPT TEST
0006H BUS ARBITRATION TEST
0007H PROM CHECKSUM TEST
*
```

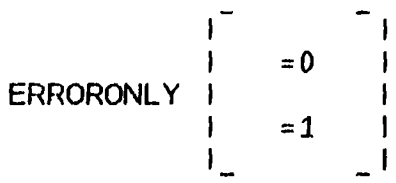
2. To describe tests 1 through 4 of a test program:

```
*DESCRIBE 1 TO 4<cr>
0001H ON-BOARD RAM MEMORY TEST
0002H FAILSAFE TIME TEST          ***IGNORED***
0003H OFF-BOARD RAM MEMORY TEST
0004H 8253 TIMER TEST
*
```

ERRORONLY COMMAND

The ERRORONLY command is used to set, clear, or display the status of the ERRORONLY switch. When ERRORONLY=1, all messages for tests that pass are suppressed. When ERRORONLY=0, (default), messages for tests that pass are displayed.

Syntax for the ERRORONLY command is as follows:



Example entries for the ERRORONLY command are as follows:

1. To display current ERRORONLY status:

   *ERRORONLY<cr>
   0000H

2. To set the ERRORONLY switch to suppress error messages for tests that pass:

   *ERR=1<cr>

3. To clear the ERRORONLY switch to display error messages for tests that pass:

   *ERR=0<cr>

EXIT COMMAND

The EXIT command terminates the test session and returns control to ISIS.

Syntax for the EXIT command is as follows:

```
EXIT
```

The following example terminates a test session:

```
EXIT<cr>
.
```

FINISH COMMAND

The FINISH command clears any remaining variables in a test if that test was stopped prior to test completion. Normally the test tables are returned to a preset configuration for the next execution.

Syntax for the FINISH command is as follows:

```
*FINISH
```

Example entry for the FINISH command is as follows:

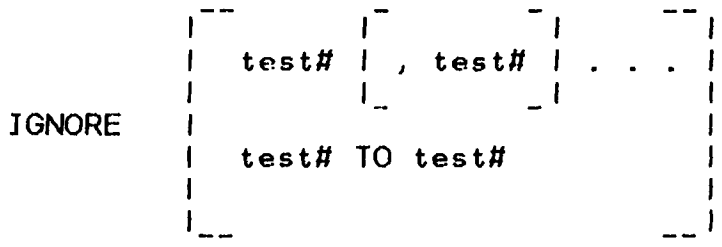
To reset Test 0001H variables:

```
*FIN<cr>
```

IGNORE COMMAND

The IGNORE command prevents specified tests from being invoked by the TEST command. Once ignored, the specified tests cannot be executed until enabled by the RECOGNIZE command.

Syntax for the IGNORE command is as follows:



Example entries for the IGNORE command are as follows:

1. To ignore all tests:

   *IGNORE<cr>

2. To ignore tests 14 through 20H (inclusive):

   *IGN 14 TO 20<cr>

3. To ignore tests 3, 9, and C:

   *IGN 3, 9, C<cr>

INITIALIZE COMMAND

This command is used to load the program (typically the system test program) and initialize STFS in preparation for performing the required testing.

Syntax for the INITIALIZE command is as follows:

INITIALIZE (file name)

Example entry for the INITIALIZE command is as follows:

To initialize the CE diagnostic program:

*INI :F4:SIIWIN.CE<cr>

LIST COMMAND

The list command causes a copy of all subsequent output, including prompts, user input, line echo, and test messages to be sent to the line printer or teletype.

Syntax for the LIST command is as follows:

LIST :LP:

Example entry for the LIST command is as follows:

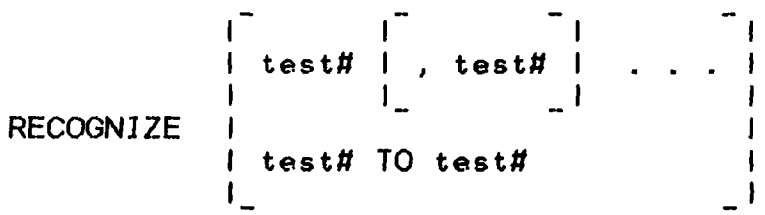
To send subsequent test displays to the line printer:

*LIST<cr>

RECOGNIZE COMMAND

The RECOGNIZE command permits tests previously specified as ignored to be invoked by the TEST command.

Syntax for the RECOGNIZE command is as follows:



Example entries for the RECOGNIZE command are as follows:

1. To recognize all tests:

   *RECOGNIZE<cr>

2. To recognize tests F through 15H (inclusive):

   *REC F TO 15<cr>

3. To recognized tests 1 through 4 (inclusive), test B, and test 14H:

   *REC 1 TO 4, B, 14<cr>

REPEAT/END COMMAND BLOCK

The REPEAT/END command block repeats the sequence of commands entered within the command block. All commands entered after the REPEAT command and before the END command are looped the specified number of times. If the number of repeats is not specified, the sequence repeats forever. The number of repeat iterations (nnn) may be specified in hexadecimal (H) (the default base), decimal (T), octal (O or Q), or binary (Y) number bases. The maximum number of iterations specified by (nnn) is 65,535T. Note that a nested prompt (.*) is issued for all commands entered in the REPEAT/END command block, including the END command.

Syntax for the REPEAT/END command block is as follows:

```
REPEAT (nnn)
 command
 command
 ...
END
```

The following example runs a series of tests 1000 times and displays the execution and error count for test 6 after each pass through the sequence:

```
*REPEAT 1000T<cr>
.*ERR=1<cr>
.*DEB=1<cr>
.*TEST 0 TO C<cr>
.*SUM 6<cr>
.*END
```

The test sequence begins execution immediately following the last carriage return (<cr>).

SUFFIX COMMAND

The SUFFIX command is used to display or change the default base for most numeric data that is entered by the operator without a base designating suffix. Similar to the BASE command, the initial default base is hexidecimal.

Syntax for the SUFFIX command is as follows:

```
           |-   Y         -|   Y      = Binary (base 2)
           |    O or Q     |   O or Q = Octal (base 8)
           |    T          |   T      = Decimal (base 10)
SUFFIX     | =  H          |   H      = Hexidecimal (base 16)
           |    ASCII      |   ASCII  = ASCII value of each byte
           |_             _|
```

Example entries of the SUFFIX command are as follows:

1. To display input default base:

   *SUFFIX<cr>

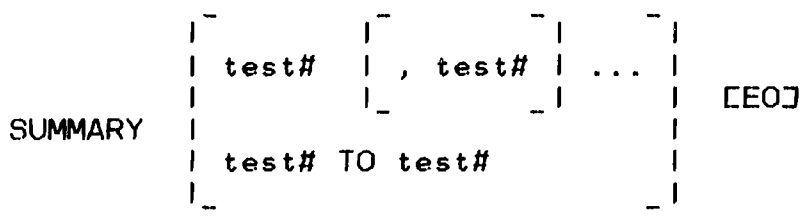
2. To change the default base to decimal:

   *SUF = H<cr>

SUMMARY COMMAND

The SUMMARY command displays the test activity summary table for any or all tests in the test program. The summary table contains the following information about each test: (1) test number, (2) test name, (3) execution count, and (4) error count. The summary table will also list the ignored tests. The counts in the summary table accumulate until the test program is reinitialized or until the CLEAR command is entered. If the errors only (EO) switch is selected, only the tests that have failed one or more times will be included in the summary display.

Syntax for the SUMMARY command is as follows:



Example entries for the SUMMARY command are as follows:

1. To display the summary table entry for test 9:

```
*SUMMARY 9<cr>
0009H FLOPPY DISK SEEK TEST  0005 FAILED IN 0017 TRIALS
*
```

2. To display all tests that failed:

```
*SUM EO<cr>
0004H ON-BOARD RAM TEST      0001 FAILED IN 0017 TRIALS
0009H FLOPPY DISK SEEK TEST  0005 FAILED IN 0017 TRIALS
00AH PROM CHECKSUM TEST      0017 FAILED IN 0017 TRIALS
*
```

TEST COMMAND

The TEST command loads and executes specified tests in numerical order (regardless of the order in which the test numbers are entered). When no test numbers are specified, all tests are executed. Tests specified as ignored are not invoked by the TEST command.

To terminate a test sequence, press the ESC key.

TEST Command Parameters

The TEST command uses a REPEAT element with any one of four modifiers: FOREVER, nnnn, UNTIL ERROR, and UNTIL NOERROR.

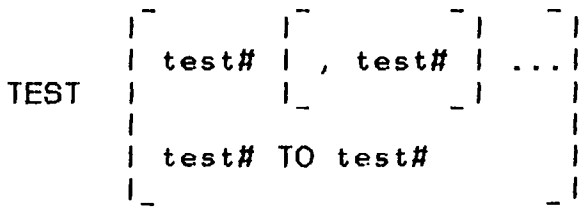
If REPEAT FOREVER is used with the TEST command (or REPEAT without a modifier), the specified tests execute in numerical order regardless of errors until the ESC key is pressed.

If REPEAT nnnn is used with the TEST command, the specified tests loop nnnn times. When nnnn=0, the first specified test test is loaded into memory but is not executed. The modifier nnnnmay be hexadecimal (H), decimal (T), octal (O or Q), or binary (Y). The default number base is hexadecimal. The maximum number of iterations specifiable by nnnn is 65,535T.

If REPEAT UNTIL ERROR is used with the TEST command, the specified tests loop until one test returns an error condition.

If REPEAT UNTIL NOERROR is used with the TEST command, the specified tests loop until all tests pass.

Syntax for the TEST command is as follows:



Example entries for the TEST command are as follows:

1. To run all (recognized) tests:

   *TEST<cr>

2. To run a sequence of test 50 times:

   *T 3 TO 1B 50t<cr>

3. To loop test A indefinitely:

   *T A REPEAT FOREVER<cr>

4. To loop tests 3, 5, 7, and 9 until an error occurs:

   *T 3, 5, 7, 9 REP UNTIL ERROR<cr>

5. To loop all tests until the entire sequence passes:

   *TES REP UNT NOERROR<cr>

VARIABLE COMMAND

The VARIABLE command is used to display or modify the status of the user variables. There are 16 variables reserved by STFS which allows the operator to use the variables either as switches that only recognize one of two values or as levels where several values have significance.

Syntax for the VARIABLE command is as follows:

V (expression) [expression]

Example entries for the VARIABLE command are as follows:

1. To display the user variable:

   *V(2)

2. To modify the user variable:

   *V(1) = 01H

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