



FW Installation and Test Manual

Scientific Micro Systems, Inc.

FW Installation and Test Manual

FW INSTALLATION AND TEST MANUAL

Document No.: 3000500
Revision: G
Date: Aug 12, 1983

Applicable Product Numbers:
Installation and Test Program
Diskette 1001941 Rev. N and up
Cartridge Tape 1002069 Rev. A

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INTRODUCTION

I. INTRODUCTION

This manual describes the FW Installation and Test (FWIT) utility programs.

The installation utilities help you install add-on storage systems such as those in the FW series. The installation programs also help in the initial set up of DSX and MDX microcomputer systems.

The test programs verify the quality of disk systems when they are installed and help maintain the disks. For example, disk manufacturers typically ship their disks with a listing of known flaws. The flaw management program DEFECT uses this information to create a flaw map that prevents the disk drive from using any bad sectors.

Some of the FWIT utility programs supplement functions available through the operating system. For example, both FWIT and RT-11 include programs that format floppy disks, and you can use whichever format program is more convenient.

II. VERSIONS OF FW INSTALLATION AND TEST UTILITIES

Because the FW Installation and Test utilities perform both routine functions and stand-alone functions, users typically have multiple versions of the programs:

A. Stand-Alone Installation and Test Utilities

SMS distributes stand-alone FW Installation and Test utilities on diskette or cartridge tape, depending on your system. Since your operating system may not be available during an installation, the diskette or tape contains a FWIT.SAV file that can be loaded (booted) by the boot program in the SMS controller. Use the following procedure to load the FWIT utilities:

- 1) Insert the diskette or tape in a drive.
- 2) Toggle the system RESET switch (or type 173000G if running console ODT's).
- 3) Wait for the prompt DRV (W0, F0, T)?
- 4) Using uppercase letters, enter F0, F1, or T to indicate which drive holds the bootable diskette or tape. No carriage return is required.

If the load operation succeeds, FWIT responds by displaying a menu of commands. You can run any of the FWIT utility or test programs. The program is resident in memory, so you can remove the diskette or tape. If the program won't boot, refer to your OEM manual.

Before you test a disk, be sure to make copies of any files that you want to restore after the test. Tests that write to the system disk destroy the working copy of the operating system. You can save the contents of the system disk with the FWIT BACKUP command. Do the backup before running any destructive tests on the disk. After you complete all tests, restore the disk with the LOAD command. Tests that do not write to the disk, such as the SCAN test, can be run without first performing a backup.

When running FWIT, ^C aborts the current command and displays the command menu again. To exit from FWIT, you must toggle the system RESET switch. Two other controls that may be useful are ^S and ^Q. When FWIT sends more than one full screen of information to you terminal, information scrolls off the screen. Use ^S to stop the scrolling; use ^Q to resume scrolling. Some terminals have a "NO SCROLL" key that performs this function.

NOTE: SMS formats every Winchester disk during quality assurance testing and encloses a flaw map listing in the cabinet. Do not reformat the disk unless you are familiar

VERSIONS OF FW INSTALLATION AND TEST UTILITIES

with the flaw map installation procedures described in the next section of this manual.

B. Operating System Resident

RT-11 operating systems purchased from SMS include a copy of the Installation and Test utilities. (The RSX-11M operating system prohibits the running of FWIT because it cannot allow anyone to test a disk that may be accessed by other users. Systems that use RSX-11M must run FWIT from the bootable diskette or cartridge tape.) RT-11 users can type the following to run the utilities:

```
.R FWIT
```

FWIT responds by displaying a menu of its commands. You can copy diskettes or cartridge tapes, format diskettes, and backup the Winchester disk. Although the test commands are also available, you should use them very carefully, if at all. Most of the tests write test patterns on the disk, which destroys any data on the disk.

To exit from FWIT, toggle the system RESET switch. You must provide a bootable version of the operating system if you ran a test that wrote over the system disk.

If you purchased your operating system from someone other than SMS, you can copy the necessary files from the stand-alone version of the utilities onto your system disk.

C. Floppy - Winchester Utilities (FWU)

The Floppy - Winchester utilities are a subset of FWIT. These utilities copy and format blank floppy diskettes. Running FWU may be more convenient than FWIT because you don't have to reload the operating system when you exit from FWU. Type the following to run FWU:

```
.R FWU
```

To exit from FWU, use the EXIT command or type ^C.

FWIT COMMANDS
Entering Commands

III. FWIT COMMANDS

This section describes the FWIT commands. The FWU commands, which differ slightly from FWIT commands, are described in Section IV.

A. Entering Commands

When the FWIT utilities are successfully loaded into memory, the system displays this command menu:

```
FW INSTALLATION & TEST 04-MAY-83 V14

MENU      COMMAND      COMMENT
-----
COPY.....C.....FLOPPY 0 TO FLOPPY 1
COPY.....H.....TAPE 0 TO TAPE 1
DEFECT.....D.....FLAW MANAGEMENT
FORMAT.....F.....FORMAT BLANK FLOPPY
FORMAT.....O.....FORMAT BLANK WINI
BACKUP.....B.....SAVE CONTENTS
LOAD.....L.....RESTORE CONTENTS
WRITE.....W.....WRITE A BLOCK
READ.....R.....READ A BLOCK
GETID.....G.....DISPLAY DEVICE ID
TEST.....T.....TEST SYSTEM
INIT.....I.....INIT DATA PATTERN
SCAN.....S.....READ FOR FLAWS
QA.....Q.....QA TEST MODE
ERROR.....E.....QA TEST ERRORS
```

All commands must be entered in uppercase letters. You may find it helpful to set the "CAPS LOCK" or "SHIFT LOCK" on your keyboard.

Enter a command by typing the letter for the command followed by a carriage return. For example, to format a floppy disk, type F. If you type the wrong letter, use the BACK SPACE, DELETE, or RUBOUT key to correct the entry before you type Carriage Return. FWIT displays the command menu again if you request an illegal function. Thus, entering the letter A, which is not a valid FWIT command, simply re-displays the command menu.

When you enter a valid command letter, FWIT displays a list of current parameters for that command and, if applicable, a menu of sub-commands. Check the display to be sure you typed the correct command letter. You can return to the main command menu by typing ^C. You can also use ^C to abort most commands and return to the main menu even after the command starts executing. However, some of the disk testing utilities must run to completion once program execution begins.

A typical parameter displayed by a command is the format (RX01, RX02, or IBM) to be used when formatting a blank floppy disk. After displaying the parame-

FWIT COMMANDS

Entering Commands

ter list for the command, FWIT issues this prompt:

CONTINUE AS SPECIFIED (Y OR N)?

This prompt lets you run the utility using the default parameters supplied by FWIT (enter Y), or change the parameters (enter N). You can also type ^C to return to the main command menu. If you type N, FWIT prompts you for each parameter associated with the command, one after the other. Type a carriage return if you don't want to change the current parameter. Otherwise, supply a new value, followed by a carriage return, to change the current parameter.

The FWIT utilities validate the parameter values you supply and reject invalid values. The utilities issue an error message and then prompt you again for the parameter.

When you have completed the parameter list, FWIT again issues the CONTINUE AS SPECIFIED (Y OR N)? prompt. If you are satisfied with the parameters as entered, type Y to run the utility. Otherwise, type N to step through the parameter list again. Type ^C to return to the main menu without running the utility.

When a utility program runs to completion, FWIT returns to the main menu to let you enter another command. You must toggle the system RESET switch and re-boot the system to exit from FWIT.

The remainder of this section describes the individual FWIT commands in detail. The command descriptions appear in the same sequence as in the main command menu. Within the examples, entries typed by the user are underlined. The characters <CR> indicate a carriage return typed by the user.

FWIT COMMANDS

C (Copy Diskette) Command

C (COPY DISKETTE) COMMAND

FUNCTION

The basic function of the C (COPY DISKETTE) command is to duplicate the contents of diskette F0 on diskette F1. Additional functions for this command include the following:

- o Copy a portion of a diskette to another diskette.
- o Copy a diskette or a portion of a diskette to a Winchester disk.
- o Copy a portion of a Winchester disk to a diskette.

Used together, the last two functions let you duplicate diskettes even though the system has only one floppy drive. Copy the diskette to the Winchester; mount a formatted, write-enabled diskette in the floppy drive; then copy the diskette image from the Winchester back to the new diskette. The diskettes copied to and from the Winchester disk must have the same sector length as the Winchester. Copying between disks with different sector lengths does not cause a warning or error, but the TO disk cannot be read back.

The C (COPY DISKETTE) command is designed for duplicating diskettes, not for copying a number of files. Use your operating system utilities (COPY, PIP) for copying files. Copy the desired files before you run FWIT. Some operating system utilities (FILEX) may be able to copy files between disks with different formats.

COMMAND/RESPONSE:

SELECT COMMAND: C

FROM DEVICE=F0, CYLIN=0, HEAD=0, SECTOR=1, RECORDS=ALL
TO DEVICE=F1, CYLIN=0, HEAD=0, SECTOR=1

CONTINUE AS SPECIFIED (Y OR N)?

Where:

FROM DEVICE specifies which disk is to be copied and must be F0, F1, W0, or W1.

CYLIN, HEAD, and SECTOR collectively specify a physical disk address. For the FROM disk, this is the address of the first sector to be copied. For the TO disk, this is the first address where the copied information is to be written. Physical disk addresses must be entered as decimal numbers. Cylinders and heads are numbered

FWIT COMMANDS

C (Copy Diskette) Command

from 0 through the maximum allowed for the specific device. Sectors are numbered from 1 through the maximum allowed per track on the device. See the appropriate OEM manual.

RECORDS specifies the number of sectors to be copied and can be a decimal number in the range 0 through 65535. Zero and ALL both transfer the maximum number of sectors. If you enter a number greater than the maximum possible, the system transfers as many sectors as it can, but does not issue an error message.

TO DEVICE specifies the disk to which information is to be copied and must be F0, F1, W0, or W1. The FROM and TO devices cannot be the same.

CONVENTIONS:

If you want to copy F0 to F1, make sure that drive F1 contains a write-enabled diskette with the same format as diskette F0, then type Y:

In IBM format, cylinder 0, head 0, always has 128 bytes per sector, regardless of the format of the remainder of the disk. The C command duplicates this cylinder as it appears on the FROM diskette, then copies the remainder of the diskette using its specified number of bytes per sector. RX02 diskettes do not use cylinder 0, so the copy actually begins with cylinder 1.

EXAMPLE

The C (copy diskette) command in this example copies the contents of diskette F0 to the Winchester disk W0. If the system is equipped with only one floppy drive, a subsequent C command (not shown in the example) might be used to copy the data to a second diskette.

```
SELECT COMMAND: C

FROM DEVICE=F0, CYLIN=0, HEAD=0, SECTOR=1, RECORDS=ALL
TO DEVICE=F1, CYLIN=0, HEAD=0, SECTOR=1

CONTINUE AS SPECIFIED (Y OR N) N

FROM DEVICE (F0, F1, W0, OR W1)? <CR>

FROM CYLINDER (0-MAX)? <CR>

FROM SECTOR (1-MAX)? <CR>

NUMBER OF SECTORS TO TRANSFER (0-65535)? <CR>

TO DEVICE (F0, F1, W0, OR W1)? W0
```

FWIT COMMANDS

C (Copy Diskette) Command

TO CYLINDER (0-MAX)? 225

TO HEAD (0-MAX)? <CR>

TO SECTOR (1-MAX)? <CR>

FROM DEVICE=F0, CYLIN=0, HEAD=0, SECTOR=1, RECORDS=ALL
TO DEVICE=W0, CYLIN=225, HEAD=0, SECTOR=1

CONTINUE AS SPECIFIED (Y OR N)? Y

****DONE****

When copying to a Winchester disk, the user must be certain that the copy will not destroy useful data on the disk. Before running FWIT, use the operating system utilities to locate enough free space on the disk to accept the copied data.

FWIT COMMANDS

H (Copy Cartridge Tape) Command

H (COPY CARTRIDGE TAPE) COMMAND

FUNCTION

The H (Copy Cartridge Tape) command copies the contents of the tape in drive 0 to the tape in drive 1.

COMMAND/RESPONSE

SELECT COMMAND: H

COPY TAPES FROM TAPE 0 TO TAPE 1
PUT SOURCE TAPE IN TAPE 0, PUT TAPE DRIVE 0 ON LINE
PUT DESTINATION TAPE IN TAPE 1, PUT TAPE DRIVE 1 ON LINE
CONTINUE AS SPECIFIED (Y OR N)? Y

CONVENTIONS

HARDWARE NOTE

To use this command, your system must include two tape drives and two tape controllers. The first unit must use the default vector and CSR strapping. The second unit must be strapped for vector 214 and CSR address 172524.

The H (Copy Tape) command has no optional parameters.

The H (Copy Tape) command reads a block from tape #0, then writes it to tape #1. The maximum block length is 16KB.

If a read or write error occurs, the command aborts the copy operation and the system halts. Typically, this happens when you are copying to a defective tape. Re-boot the system, insert a different tape, and try again.

When selected, the H (Copy Tape) command immediately checks the Command and Status Register of each tape controller. If there is a bus timeout or a controller is not present, the command issues this message:

UNEXPECTED SYSTEM BUS ERROR... CHECK YOUR COMPUTER

If this message occurs, make sure that both tape drives are powered up and on line.

FWIT COMMANDS

H (Copy Cartridge Tape) Command

EXAMPLE

SELECT COMMAND H

COPY TAPES FROM TAPE #0 TO TAPE #1
PUT SOURCE TAPE IN TAPE 0, PUT TAPE DRIVE #0 ON LINE
PUT DESTINATION TAPE IN TAPE #1, PUT TAPE DRIVE #1 ON LINE
CONTINUE AS SPECIFIED (Y OR N)? Y

COPYING TAPE #0 TO #1

DONE

FWIT COMMANDS
D (Defect) Command

D (Defect) COMMAND

FUNCTION

The D (Defect) command requests you to specify the Winchester disk to be used in subsequent operations and then displays a menu of its subcommands.

The D (Defect) subcommands enter, update, or display flaw map information for Winchester disks.

COMMAND/RESPONSE

SELECT COMMAND: D

SELECT WINCHESTER (W0 OR W1) W0

MENU	COMMAND	COMMENT
INIT	I	INIT FLAW MAP
ENTER	E	ENTER MANUFACTURER'S DATA
MAP	M	DISPLAY BAD SECTOR MAP
UPDATE	U	ENTER NEW FLAWS TO OLD MAP
RETRIEVE	R	RECALL MANUFACTURER'S DATA
AUTO	A	AUTO FLAW MAP INSTALLATION

SELECT SUBCOMMAND (E,M,U,R,A,OR I):

CONVENTIONS

Use ^C to exit from the D (Defects) command and return the main menu.

When a D (Defect) subcommand runs to completion, the D command terminates. Control returns to the FWIT utilities, which display the prompt "SELECT COMMAND," but not the main menu. If you want to run another D (Defect) subcommand, you must again type the letter D. Exercise caution, because the I, E, and R subcommand codes have very different functions as FWIT utilities.

Flaw Management

Even a new, unused disk may have flaws in its recording surface. These flawed areas are not suitable for recording data. SMS FW controllers provide a complete flaw mapping facility that prevents errors by automatically skipping over any flawed sector.

Most disk drive manufacturers ship their disks with a list of known defects. However, the manufacturer cannot know how you are going to format the disk

FWIT COMMANDS

D (Defect) Command

(bytes per sector, gap sizes, etc.), so they cannot predict which sectors will contain errors. Therefore, most manufacturers provide flaw data in the following "raw" format:

- o Cylinder
- o Head
- o Distance (offset) from the index in bytes
- o Length of the flaw in bits

The D (Defect) subcommands convert this raw data into a sector map that enables the controller to skip flawed sectors. This map, called a flaw map, is stored at cylinder 0, head 0, sector 1 on each Winchester disk. A backup copy of the flaw map is stored at cylinder 0, head 1, sector 1 on each Winchester disk.

The FW controller reads the flaw map into its internal memory when system power is turned on or when the RESET switch is toggled. When flaw mapping is enabled, the controller neither reads nor writes flawed sectors while logical addressing is used. Physical addressing, where you specify cylinder, head, and sector numbers, can access flawed sectors.

The FW controller includes a strap (or switch) that allows you to disable flaw mapping. With flaw mapping disabled, the controller can read or write any sector on the disk. Disabling flaw mapping may yield slightly more disk storage, but at the risk of a fatal error if the controller encounters a sector with a flaw that the error correction logic cannot correct.

If flaw mapping is enabled but there is no valid flaw map on the disk, the controller issues a "FLAW MAP NOT VALID" message. Use the D (Defect) subcommands to correct the flaw map.

EXAMPLE

Refer to the examples given for the individual D (Defect) subcommands.

FWIT COMMANDS
D (Defect) Command
I (Init) Subcommand

I (Init) SUBCOMMAND

FUNCTION

The I (Init) command builds a flaw map and writes it on the selected Winchester disk. This flaw map is empty except for information about the flaw map itself.

COMMAND/RESPONSE

SELECT COMMAND: D

SELECT WINCHESTER (W0 OR W1) W0

MENU	COMMAND	COMMENT
INIT	I	INIT FLAW MAP
ENTER	E	ENTER MANUFACTURER'S DATA
MAP	M	DISPLAY BAD SECTOR MAP
UPDATE	U	ENTER NEW FLAWS TO OLD MAP
RETRIEVE	R	RECALL MANUFACTURER'S DATA
AUTO	A	AUTO FLAW MAP INSTALLATION

SELECT SUBCOMMAND (E,M,U,R,A,OR I): I

CONTINUE AS SPECIFIED (Y OR N)? Y

TRACK WITH FLAW--> CYLIN=0 HEAD=0
FLAWED SECTORS=1 2 3 4 5 6

TRACK WITH FLAW--> CYLIN=0 HEAD=1
FLAWED SECTORS=1 2 3 4 5 6

NO FLAWS IN MAP

DONE

CONVENTIONS

The TRACK WITH FLAW messages are a map of the flaw map, not an indication that those sectors are bad.

Installing a flaw map is typically done only when installing a new disk or system, or when rebuilding a disk that has been completely written over during testing.

FWIT COMMANDS

D (Defect) Command
E (Enter) Subcommand

E (Enter) SUBCOMMAND

FUNCTION

The E (Enter) subcommand converts the raw flaw data provided by the disk manufacturer into logical sector numbers and writes the result in the disk's flaw map.

COMMAND/RESPONSE

SELECT COMMAND: D

SELECT WINCHESTER (W0 OR W1) W0

MENU	COMMAND	COMMENT
INIT	I	INIT FLAW MAP
ENTER	E	ENTER MANUFACTURER'S DATA
MAP	M	DISPLAY BAD SECTOR MAP
UPDATE	U	ENTER NEW FLAWS TO OLD MAP
RETRIEVE	R	RECALL MANUFACTURER'S DATA
AUTO	A	AUTO FLAW MAP INSTALLATION

SELECT SUBCOMMAND (E,M,U,R,A,OR I): E

HEAD OFFSET (1-MAX)?

CYLINDER OFFSET (1-MAX)?

INTERLEAVE FACTOR (1-MAX/2)?

0=CYL, HD, OFF, LEN

1=CYL, HD, SEC, OFF

SELECT DATA TYPE (0 OR 1, DEFAULT=0):

FLAW=0

CYL, HD, OFFSET, LEN (BITS):

CONTINUE AS SPECIFIED (Y OR N)?

where:

The HEAD OFFSET, CYLINDER OFFSET, and INTERLEAVE FACTOR prompts request you to enter information about the format of your disk. These terms are defined under the F (Format Floppy Disk) command.

FWIT COMMANDS

- D (Defect) Command
- E (Enter) Subcommand

The SELECT DATA TYPE prompt allows you to specify the format of the raw flaw data provided by the disk manufacturer. Currently, most disks provided by SMS use format 0. Check the data provided by the manufacturer to determine its data type. Some manufacturers do not supply the length of the flaw, which requires you to enter an arbitrary value. Format 1 applies only to disks formatted by the manufacturer. Because you may reformat the disk using a different sector length, FWIT is unable to calculate the actual sector location of the flaw. When format 1 is specified, FWIT can only mark the entire track as flawed.

The FLAW=0 prompt requests you to enter the raw data for the first flaw. When you make the entry, FWIT increments its flaw counter and prompts FLAW=1 for the next entry.

When you have entered all the raw data, type a carriage return in response to the CYL, HD, OFFSET, LEN(BITS) prompt. FWIT displays the CONTINUE AS SPECIFIED (Y OR N)? Type N to make another entry. Type Y to install the flaw map. FWIT displays the flaw map on the console. If you have made an error, rerun the E (Enter) subcommand.

CONVENTIONS

Several of the D (Defects) subcommands can alter the flaw map:

- E Enter manufacturer's data
- U Enter new flaws to existing map
- A Automatic installation of flaw map

Additionally, The O (Format Winchester) command can alter the flaw map. However, there are advantages to entering the manufacturer's data with the E (Enter) subcommand. The R (Retrieve) subcommand recalls only the data entered via the E subcommand, while the M (Map) subcommand displays the entire flaw map. Being able to differentiate between new flaws and original flaws can be helpful in diagnosing disk problems.

EXAMPLE

SELECT COMMAND: D

SELECT WINCHESTER (W0 OR W1) W0

MENU	COMMAND	COMMENT
------	---------	---------

INIT	I	INIT FLAW MAP
ENTER	E	ENTER MANUFACTURER'S DATA
MAP	M	DISPLAY BAD SECTOR MAP

FWIT COMMANDS

D (Defect) Command

E (Enter) Subcommand

UPDATE	U	ENTER NEW FLAWS TO OLD MAP
RETRIEVE	R	RECALL MANUFACTURER'S DATA
AUTO	A	AUTO FLAW MAP INSTALLATION

SELECT SUBCOMMAND (E,M,U,R,A,OR I): E

HEAD OFFSET (1-MAX)? 1

CYLINDER OFFSET (1-MAX)? 1

INTERLEAVE FACTOR (1-MAX/2)? 1

0=CYL, HD, OFF, LEN

1=CYL, HD, SEC, OFF

SELECT DATA TYPE (0 OR 1, DEFAULT=0): 0

FLAW=0

CYL, HD, OFFSET, LEN(BITS): 20,0,625,5

FLAW=1

CYL, HD, OFFSET, LEN(BITS): 105,0,1024,15

FLAW=2

CYL, HD, OFFSET, LEN(BITS): 145,1,8694,1

CONTINUE AS SPECIFIED (Y OR N)? Y

FWIT installs the manufacturer's section of the flaw map and then displays the new map:

TRACK WITH FLAW--> CYLIN=0 HEAD=0
FLAWED SECTORS=1 2 3 4 5 6

TRACK WITH FLAW--> CYLIN=0 HEAD=1
FLAWED SECTORS=1 2 3 4 5 6

TRACK WITH FLAW--> CYLIN=20 HEAD=0
FLAWED SECTORS=2

TRACK WITH FLAW--> CYLIN=105 HEAD=0
FLAWED SECTORS=2

TRACK WITH FLAW--> CYLIN=145 HEAD=1
FLAWED SECTORS=15 16

DONE

Remember, the first two entries in the flaw map identify the map itself. The next three entries show the conversion of the offset and length specifications

FWIT COMMANDS

D (Defect) Command

E (Enter) Subcommand

into sector numbers.

Notice that the last flaw entry marks both sectors 15 and 16 as flawed, even though the manufacturer's data specifies a flaw length of only one bit. Soft-sectored disks, such as the Q2000 series, define sectors under software control rather than using a clock track to define the beginning and end of a sector. Normal variations in the disk rotation speed, caused by tolerances within the drive and by AC power fluctuations, allow the physical location of a sector to shift slightly. Gaps between sectors ensure that they cannot overlap. In this particular case, FWIT determined that there is some possibility that either sector 15 or 16 could eventually migrate enough to include this flaw in its recorded area. Therefore, FWIT marks both sectors as flawed.

FWIT COMMANDS

D (Defect) Command

M (Map) Subcommand

M (Map) SUBCOMMAND

FUNCTION

The M (Map) subcommand reads the flaw map from the selected Winchester disk and displays its contents.

COMMAND/RESPONSE

SELECT COMMAND: D

SELECT WINCHESTER (W0 OR W1) W0

MENU	COMMAND	COMMENT
INIT	I	INIT FLAW MAP
ENTER	E	ENTER MANUFACTURER'S DATA
MAP	M	DISPLAY BAD SECTOR MAP
UPDATE	U	ENTER NEW FLAWS TO OLD MAP
RETRIEVE	R	RECALL MANUFACTURER'S DATA
AUTO	A	AUTO FLAW MAP INSTALLATION

SELECT SUBCOMMAND (E,M,U,R,A,OR I): M

TRACK WITH FLAW--> CYLIN=0 HEAD=0
FLAWED SECTORS=1 2 3 4 5 6

TRACK WITH FLAW--> CYLIN=0 HEAD=1
FLAWED SECTORS=1 2 3 4 5 6

TRACK WITH FLAW--> CYLIN=20 HEAD=0
FLAWED SECTORS=2

TRACK WITH FLAW--> CYLIN=105 HEAD=0
FLAWED SECTORS=2

TRACK WITH FLAW--> CYLIN=145 HEAD=1
FLAWED SECTORS=15 16

DONE

CONVENTIONS

The M (Map) subcommand has no options.

FWIT COMMANDS
D (Defect) Command
U (Update) Subcommand

U (Update) SUBCOMMAND

FUNCTION

The U (Update) subcommand adds flaws to an existing flaw map.

COMMAND/RESPONSE

SELECT COMMAND: D

SELECT WINCHESTER (W0 OR W1) W0

MENU	COMMAND	COMMENT
INIT	I	INIT FLAW MAP
ENTER	E	ENTER MANUFACTURER'S DATA
MAP	M	DISPLAY BAD SECTOR MAP
UPDATE	U	ENTER NEW FLAWS TO OLD MAP
RETRIEVE	R	RECALL MANUFACTURER'S DATA
AUTO	A	AUTO FLAW MAP INSTALLATION

SELECT SUBCOMMAND (E,M,U,R,A,OR I): U

ENTER CYLINDER:

ENTER HEAD:

ENTER SECTOR:

where:

CYLINDER, HEAD, AND SECTOR specify the location of the flaw. The Update subcommand does not accept raw flaw data.

Terminate the Update subcommand by entering a carriage return to any of its prompts. FWIT displays the updated flaw map when the Update subcommand terminates.

CONVENTIONS

WARNING

Updating the flaw map can corrupt files that reside on the disk. If a sector you add to the flaw map happens to fall within an existing file, data previously recorded in the

FWIT COMMANDS

D (Defect) Command

U (Update) Subcommand

newly flawed sector cannot be accessed. Always backup your files before an operation that may affect data integrity.

The Update subcommand re-issues the prompt if you enter an illogical value. For example, if you specify head 5 for a disk with only four heads, Update re-issues the ENTER HEAD prompt.

The ENTER SECTOR prompt accepts only one sector number at a time. If a track has more than one flawed sector, you must respond to the CYLINDER/HEAD/SECTOR prompts for each sector added to the flaw map. If an entire track (not cylinder) is flawed, you can enter -1 in response to the SECTOR prompt.

RSX-11M users can determine whether the flaw map should be updated by examining the system's error log. The SMS error correction logic is usually so effective that users are not aware that disk errors may be occurring. However, the system log keeps a historical record of all system errors. The user should check the error log periodically to check for sectors with multiple errors. Random errors are expected, so don't add a sector that has failed only once. A sector that fails repeatedly should be added to the flaw map before it causes an uncorrectable error.

WARNING

When you reformat a Winchester disk, the manufacturer's raw flaw data is retained and used to create a new flaw map. Flaws entered via the Update subcommand cannot be retained since the flaw may reside in a different sector after the disk is reformatted. If a disk has a known flaw that is not included in the raw flaw data, perform the SCAN test until it reports the flaw and then update the flaw map. The flaw map should contain all known flaws before you load any data back onto the disk.

EXAMPLE

For this example, assume that cylinder 37, head 1, sectors 11 and 12 are weak or failing. The following Update subcommand adds these sectors to the flaw map shown for the Enter and Map subcommands:

SELECT COMMAND: D

SELECT WINCHESTER (W0 OR W1) W0

MENU	COMMAND	COMMENT
INIT	I	INIT FLAW MAP
ENTER	E	ENTER MANUFACTURER'S DATA

FWIT COMMANDS

D (Defect) Command
U (Update) Subcommand

MAP	M	DISPLAY BAD SECTOR MAP
UPDATE	U	ENTER NEW FLAWS TO OLD MAP
RETRIEVE	R	RECALL MANUFACTURER'S DATA
AUTO	A	AUTO FLAW MAP INSTALLATION

SELECT SUBCOMMAND (E,M,U,R,A,OR I): U

ENTER CYLINDER: 37

ENTER HEAD: 1

ENTER SECTOR: 11

ENTER CYLINDER: 37

ENTER HEAD: 1

ENTER SECTOR: 12

ENTER CYLINDER: <CR>

FWIT updates the flaw map, writes it to the disk, and displays the updated flaw map:

TRACK WITH FLAW--> CYLIN=0 HEAD=0
FLAWED SECTORS=1 2 3 4 5 6

TRACK WITH FLAW--> CYLIN=0 HEAD=1
FLAWED SECTORS=1 2 3 4 5 6

TRACK WITH FLAW--> CYLIN=20 HEAD=0
FLAWED SECTORS=2

TRACK WITH FLAW--> CYLIN=37 HEAD=1
FLAWED SECTORS=11 12

TRACK WITH FLAW--> CYLIN=105 HEAD=0
FLAWED SECTORS=2

TRACK WITH FLAW--> CYLIN=145 HEAD=1
FLAWED SECTORS=15 16

****DONE****

Notice that the new entry is not simply added at the end of the flaw map. FWIT always maintains the map in ascending sequence, which allows the controller to search the flaw map using an efficient binary search. Because the time required to search the map is only a fraction of the disk's average latency, flaw mapping usually has no effect on system throughput.

FWIT COMMANDS

D (Defect) Command

R (Retrieve) Subcommand

R (Retrieve) SUBCOMMAND

FUNCTION

The R (Retrieve) subcommand displays the raw flaw information for the selected disk.

COMMAND/RESPONSE

SELECT COMMAND: D

SELECT WINCHESTER (W0 OR W1) W0

MENU	COMMAND	COMMENT
INIT	I	INIT FLAW MAP
ENTER	E	ENTER MANUFACTURER'S DATA
MAP	M	DISPLAY BAD SECTOR MAP
UPDATE	U	ENTER NEW FLAWS TO OLD MAP
RETRIEVE	R	RECALL MANUFACTURER'S DATA
AUTO	A	AUTO FLAW MAP INSTALLATION

SELECT SUBCOMMAND (E,M,U,R,A,OR I): U

RAW DEFECT DATA FOR WINCHESTER

CYLIN=20, HEAD=0, BYTE=625, LENGTH=1
CYLIN=105 HEAD=0, BYTE=1024, LENGTH=2
CYLIN=145, HEAD=1, BYTE=8684, LENGTH=1

CONVENTIONS

The Retrieve subcommand has no options.

The Retrieve subcommand displays only the flaw data entered with the Enter subcommand. This data also appears in the flaw map (see the Map subcommand), along with any subsequent additions to the flaw map. The information provided by the Enter and Retrieve subcommands allows you to separate original flaws from flaws that develop while the disk is in use. This information can help in diagnosing disk problems.

The Retrieve subcommand shown above displays the raw flaw data entered as an example for the Enter subcommand.

FWIT COMMANDS
D (Defect) Command
A (Auto) Subcommand

A (Auto) SUBCOMMAND

FUNCTION

The A (Auto) subcommand scans a Winchester disk looking for flaws. If the Auto subcommand finds any flaws, it updates the flaw map accordingly.

COMMAND/RESPONSE

SELECT COMMAND: D

SELECT WINCHESTER (W0 OR W1) W0

MENU	COMMAND	COMMENT
INIT	I	INIT FLAW MAP
ENTER	E	ENTER MANUFACTURER'S DATA
MAP	M	DISPLAY BAD SECTOR MAP
UPDATE	U	ENTER NEW FLAWS TO OLD MAP
RETRIEVE	R	RECALL MANUFACTURER'S DATA
AUTO	A	AUTO FLAW MAP INSTALLATION

SELECT SUBCOMMAND (E,M,U,R,A,OR I): A

NUMBER OF PASSES (0-65536)? 1

WARNING...DRIVE UNDER TEST MUST CONTAIN FORMATTED MEDIA
DATA FIELDS ARE WRITTEN OVER
CONTINUE AS SPECIFIED (Y OR N)? Y
TRACK WITH FLAW--> CYLIN=0 HEAD=0
FLAWED SECTORS=1 2 3 4 5 6

TRACK WITH FLAW--> CYLIN=0 HEAD=1
FLAWED SECTORS=1 2 3 4 5 6

Where

NUMBER OF PASSES specifies the number of scans to be performed.

CONVENTIONS

The Auto subcommand above shows the results for a disk without any flaws.

FWIT COMMANDS

D (Defect) Command
A (Auto) Subcommand

WARNING

Updating the flaw map with the Auto subcommand can corrupt files that reside on the disk. If a sector you add to the flaw map happens to fall within an existing file, data previously recorded in the newly flawed sector cannot be accessed. Always backup your files before an operation that may affect data integrity.

The Auto subcommand adds flawed sectors to the flaw map as it finds them and displays a message that identifies the type of error and its location. After completing the specified number of passes, the Auto subcommand displays the updated flaw map. The subcommand cannot display the flaw map when you manually reset the system or turn off the power.

Marginal spots on a disk surface may fail immediately, or they may wait until they have been accessed many times. Because of this, you should always enter the manufacturer's flaw data before running the Auto subcommand.

EXAMPLE

The following Auto subcommand adds two flaws to the flaw map shown in previous examples:

SELECT COMMAND: D

SELECT WINCHESTER (W0 OR W1) W0

MENU	COMMAND	COMMENT
INIT	I	INIT FLAW MAP
ENTER	E	ENTER MANUFACTURER'S DATA
MAP	M	DISPLAY BAD SECTOR MAP
UPDATE	U	ENTER NEW FLAWS TO OLD MAP
RETRIEVE	R	RECALL MANUFACTURER'S DATA
AUTO	A	AUTO FLAW MAP INSTALLATION

SELECT SUBCOMMAND (E,M,U,R,A,OR I): A

NUMBER OF PASSES (0-65536)? 1

WARNING...DRIVE UNDER TEST MUST CONTAIN FORMATTED MEDIA
DATA FIELDS ARE WRITTEN OVER
CONTINUE AS SPECIFIED (Y OR N)? Y

SECTOR=9, HEAD=2, CYLIN=7, ERROR=18 FLAW INSTALLED IN MAP
SECTOR=16, HEAD=2, CYLIN=8, ERROR=18 FLAW INSTALLED IN MAP

FWIT COMMANDS

D (Defect) Command

A (Auto) Subcommand

TRACK WITH FLAW--> CYLIN=0 HEAD=0
FLAWED SECTORS=1 2 3 4 5 6

TRACK WITH FLAW--> CYLIN=0 HEAD=1
FLAWED SECTORS=1 2 3 4 5 6

TRACK WITH FLAW--> CYLIN=7 HEAD=2
FLAWED SECTORS=9

TRACK WITH FLAW--> CYLIN=8 HEAD=2
FLAWED SECTORS=16

TRACK WITH FLAW--> CYLIN=20 HEAD=0
FLAWED SECTORS=2

TRACK WITH FLAW--> CYLIN=37 HEAD=1
FLAWED SECTORS=11 12

TRACK WITH FLAW--> CYLIN=105 HEAD=0
FLAWED SECTORS=2

TRACK WITH FLAW--> CYLIN=145 HEAD=1
FLAWED SECTORS=15 16

Error 18 indicates that the sector contains a CRC error. Error messages are described in Appendix A.

FWIT COMMANDS

F (Format Floppy) Command

F (FORMAT FLOPPY) COMMAND

FUNCTION

The F (Format Floppy) command prepares a diskette for use in a system. At a minimum, the Format command specifies the data encoding format used on the disk and writes sector ID's throughout the diskette.

Optionally, the Format command can specify how data is to be arranged on the disk under certain conditions.

Also, the Format command can initiate a scan of the formatted diskette to be sure that it is free of errors.

COMMAND/RESPONSE

SELECT COMMAND: F

DEVICE=F0, SECTOR LENGTH=256, DENSITY=DEC RX02, HEAD OFFSET=1
CYLINDER OFFSET=1, INTERLEAVE=1, SCAN=ENABLED

CONTINUE AS SPECIFIED (Y OR N)? Y

SCAN PASSES COMPLETED=1, ERRORS COUNTED=0

****DONE****

Where

Responding "Y" to the CONTINUE prompt specifies the default format shown in the command parameter list.

Responding "N" to the CONTINUE prompt tells the command to issue at least two additional prompts:

SELECT DEVICE (F0 OR F1): F0

SELECT FORMAT (0=RX01, 1=RX02/RX03, 2=IBM2/IBM3, 3=OTHER): 0

Where

The SELECT DEVICE prompt allows you to format a floppy disk in either drive F0 or F1, if your system includes two floppy drives. F0 is the default drive; type a carriage return or F0 to continue to the next prompt.

FWIT COMMANDS

F (Format Floppy) Command

The SELECT FORMAT prompt allows you to specify the data encoding format for the disk. Additionally, format codes 0, 1, and 2 imply default sector lengths:

<u>CODE</u>	<u>FORMAT</u>	<u>SECTOR</u>	<u>LENGTH</u>
0	RX01		128
1	RX02/RX03		256
2	IBM2/IBM3		512

When you enter code 0, 1, or 2, the Format command displays the updated parameters and the CONTINUE prompt. Type N to re-enter either parameter; type Y to format the disk.

Format code 3 allows you to specify each parameter of the disk format. When you enter format code 3, the Format command displays the following prompts, one at a time:

DENSITY (0=SINGLE, 1=RX02, 2=IBM DOUBLE)?
SECTOR LENGTH (0=128, 1=256, 2=512, 3=1024)?
HEAD OFFSET (1-MAX)?
CYLINDER OFFSET (1-MAX)?
INTERLEAVE FACTOR (1-MAX)?
INHIBIT SCAN AFTER FORMAT (Y OR N)?

Where

DENSITY controls the data encoding format on the disk. Enter 0 for IBM/RX01 single density (FM encoding, which is the same for both IBM and RX01), 1 for RX02 (modified MFM encoding), or 2 for IBM double density (MFM encoding).

SECTOR LENGTH must be 128, 256, 512, or 1024. Enter code 0, 1, 2, or 3, respectively. Together, density and sector length determine the capacity of the disk. Smaller sectors reduce disk capacity because the sectors are separated by gaps that cannot be used.

CYLINDER and HEAD offsets allow you to specify the positioning of the next sector when these physical boundaries are crossed.

NOTE: SMS recommends the default value of 1 for head and cylinder offset and interleave factors for floppy diskettes. Users who want absolute compatibility with IBM standards may want to use cylinder offsets and interleaving. Users who want optimum performance can try tuning disk access with head and cylinder offsets, but the results are difficult to measure and can degrade performance.

FWIT COMMANDS

F (Format Floppy) Command

CYLINDER OFFSET attempts to increase efficiency when accessing a multi-sector record, but the next consecutive sector is on the next cylinder. For example, assume that the following illustration represents two tracks on a disk, and the system is trying to read blocks 24, 25, 26, and 27:

```
-----  
Cylin 1: |23|24|25|00|01|02|03|04|05|06|07|08|19|10|11  
-----  
Cylin 2: |59|50|51|26|27|28|29|30|31|32|33|34|35|36|37  
-----  
          ^  
          |  
        cylinder  
        boundary
```

After reading block 25, the drive must reposition the head to cylinder 2 to read blocks 26 and 27. Because the disk keeps rotating while the head moves, the head reaches cylinder 2 just in time to miss the desired blocks and must wait for the disk to make almost one full revolution. One way to avoid waiting is to offset the cylinders so that the desired data passes under the head soon after it is positioned:

```
-----  
Cylin 1: |23|24|25|00|01|02|03|04|05|06|07|08|19|10|11  
-----  
Cylin 2: |43|44|45|46|47|48|49|50|51|26|27|28|29|30|31  
-----  
          ^           ^  
          |           |  
        offset provides  
        time for head movement
```

The offset is specified as a number of sectors, and can range from one (no offset) through the maximum number of sectors per track. Practically, a cylinder offset equal to about one-quarter of a disk revolution provides optimum performance. This example follows the RX01 conventions (sector length=128, tracks per sector=26, cylinder offset=6).

Notice that using or not using cylinder offset causes no errors; the system simply reads the data the next time it comes around on the disk. Cylinder offset is just a technique that may improve floppy disk performance.

HEAD OFFSET is another technique that may improve performance.

Switching from head 0, track 1 to head 1 track 1 is much faster than moving from head 0, track 1 to head 0, track 2. However, it takes a

FWIT COMMANDS

F (Format Floppy) Command

little time for the electronics to stabilize. Using a head offset attempts to provide enough time for the electronics to stabilize before the desired data sector arrives at the head.

The offset is specified as a number of sectors, and can range from one (no offset) through the maximum number of sectors per track. Because the relatively slow speed of a floppy diskette (360 rpm versus 3600 rpm for a Winchester disk) provides enough time for head switching, SMS recommends a head offset of 1 (no offset) for floppy disks. However, SMS recommends an offset of 2 (one sector) for Winchester disks.

The INTERLEAVE FACTOR is a technique that reduces the nominal throughput rate. SMS recommends that the default value 1 (no interleaving) be used.

Some early floppy disk controllers were slow and could not read two consecutive sectors without an error. RX01 standards call for an interleave factor of 2, which has the effect of arranging a track as follows:

```
-----  
Track 1: |00|13|01|14|02|15|03|16|04|17|05|18|06|19|07|  
-----
```

If the system attempts to access sectors 00, 01, 02, and 03, the intervening sectors give the controller time to recover.

The interleave factor is specified as a number of sectors, and can range from one (no interleave) through the maximum number of sectors per track. As mentioned previously, SMS disk controllers do not require interleaving.

The INHIBIT SCAN prompt allows you to suppress the scan for errors that, by default, follows the disk format operation. Inhibit the scan if you are reformatting a disk known to be free of flaws. Otherwise, the minute or two it takes to perform the scan assures you that the disk is unlikely to fail.

FWIT COMMANDS

O (Format Winchester) Command

O (FORMAT WINCHESTER) COMMAND

FUNCTION

The O (Format Winchester) command prepares a disk for use in a system. The Format command specifies the data encoding format used on the disk and writes address marks throughout the disk to identify each sector.

Optionally, the Format command can specify how data is to be arranged on the disk under certain conditions.

Also, the Format command can initiate a scan of the formatted disk to be sure that it is free of errors.

COMMAND/RESPONSE

SELECT COMMAND: O

DEVICE=W0, SECTOR LENGTH=512, DENSITY=WINCHESTER, HEAD OFFSET=2
CYLINDER OFFSET=1, INTERLEAVE=1, SCAN=ENABLED

CAUTION...DISKS SUPPLIED BY SMS ARE PREFORMATTED.
DON'T RE-FORMAT UNLESS YOU ARE FAMILIAR WITH
FLAW MAP INSTALLATION PROCEDURES (TYPE CTRL C TO ABORT)

CONTINUE AS SPECIFIED (Y OR N)?

Where

The DEVICE . . . prompt shows the default values to be used for the format operation if you continue.

Notice that the command warns you that SMS disks are already formatted.

Type N in response to the CONTINUE AS SPECIFIED prompt if you want to alter any of the default specifications. SMS recommends that you alter only the DEVICE and SECTOR LENGTH specifications if you continue. The uses of the HEAD OFFSET, CYLINDER OFFSET, INTERLEAVE, and SCAN parameters are explained under the F (Format Floppy Diskette) command.

If you type N in response to the CONTINUE AS SPECIFIED prompt, FWIT displays each format parameter to give you an opportunity to alter its value:

FWIT COMMANDS

0 (Format Winchester) Command

```
SELECT DEVICE (W0 OR W1): W1
SECTOR LENGTH (1=256, 1R=256 RECOVERY, 2=512, 2R=256 RECOVERY)? <CR>
HEAD OFFSET (1-MAX)? <CR>
CYLINDER OFFSET (1-MAX)? <CR>
INTERLEAVE FACTOR (1-MAX)? <CR>
INHIBIT SCAN AFTER FORMAT (Y OR N)? <CR>
```

Where

The SELECT DEVICE prompt allows users with two Winchester disk systems to select either disk W0 or W1.

The SECTOR LENGTH prompt requests you to select a sector length of 256 or 512.

The RECOVERY option is for use only in countries where power supplies may vary from the designated frequency of 50 or 60 Hz. (SMS systems can tolerate wide voltage variations. See the appropriate OEM manual for further information.) Frequency variations may cause a disk to run slow one day and faster the next. The RECOVERY option compensates for such differences by lengthening the gaps between sectors, but at the cost of reducing storage by one sector per track.

SMS recommends that you allow the remainder of the prompts to retain their default values by typing a carriage return. After you respond to all the prompts, FWIT again displays the values selected for the format operation:

```
DEVICE=W1, SECTOR LENGTH=512, DENSITY=WINCHESTER, HEAD OFFSET=2
CYLINDER OFFSET=1, INTERLEAVE=1, SCAN=ENABLED
```

CONVENTIONS

While formatting floppy diskettes may be a common occurrence, formatting a Winchester disk should not be. Formatting a Winchester destroys all data that may have been recorded on that disk. Be certain to backup a used Winchester disk before using the 0 command.

FWIT COMMANDS
B (Backup) Command

B (Backup) COMMAND

FUNCTION

The B (Backup) command copies a duplicate image of the selected Winchester disk to floppy disks or to cartridge tape.

COMMAND/RESPONSE

SELECT COMMAND: B

SELECT WINCHESTER (Y OR N)? W

SELECT DEVICE (F0, F1, OR T0): F0

INSERT NON-WRITE PROTECTED, FORMATTED DISK IN DRIVE=F0 (DISK # 1)
CONTINUE AS SPECIFIED (Y OR N)? Y

(FWIT copies disk # 1)

REMOVE DISK, REMOVE WRITE PROTECT TAB, LABEL & DATE

INSERT NON-WRITE PROTECTED, FORMATTED DISK IN DRIVE=F0 (DISK # 2)

.
.
.

CONVENTIONS

Because the Backup command creates a duplicate image of the selected Winchester disk, floppy disks must be formatted with the same sector length as the Winchester. FWIT issues an error message and terminates the Backup command when the sector lengths are different. If this happens, use the G (Get ID) command to find the sector length for the Winchester, then format the floppy disk to match. Format the floppy disks using IBM double density for maximum storage.

Before running Backup to floppy disks, format enough disks to hold the contents of the Winchester. As a guide, it takes nine double sided, double density floppy disks to hold the contents of a 10MB Winchester. It takes about forty seconds to backup or load a double sided diskette (1.25MB).

Notice that the INSERT . . .DISK prompt displays a count of the disks to help you label them.

FWIT COMMANDS

B (Backup) Command

Backup your Winchester disks whenever there is a possibility that the integrity of the data they contain might be compromised. For example, a system is subject to physical damage when it is moved. Also, you should perform a backup before using any FWIT command that writes on the Winchester disk.

The RT-11 operating system adds files to the disk sequentially, starting at the lowest numbered sectors. Unused higher numbered sectors are filled with zeros. RT-11 users can perform a partial backup for disks that are only partly filled. Each double sided, double density diskette holds just over 2400 RT-11 data blocks. Check the disk directory to determine the number of diskettes required. Perform the partial backup by terminating the Backup command (use ^C or system RESET) after the last required diskette has been written. Load the diskettes in the sequence in which they were written. For maximum efficiency, squeeze the disk before running Backup.

EXAMPLE

The following is an example of performing a backup to cartridge tape. Tape is a convenient medium for backup since a 600' tape can hold over 21 Mbytes of data.

SELECT COMMAND: B

SELECT WINCHESTER (Y OR N)? W0

SELECT DEVICE (F0, F1, OR T0): T0

VERIFY TAPE LENGTH SWITCH SETTING ON FRONT PANEL TO TAPE TYPE
INSERT NON-WRITE PROTECTED, TAPE IN DRIVE T0 (TAPE #1)
PUT DRIVE ON LINE

CONTINUE AS SPECIFIED (Y OR N)? Y

BACKING UP TO TAPE

****DONE****

FWIT COMMANDS
L (Load) Command

L (LOAD) COMMAND

FUNCTION

The L (Load) command restores data previously stored on floppy disks or cartridge tape by a Backup command to the selected Winchester disk.

COMMAND/RESPONSE

```
SELECT COMMAND: L

SELECT WINCHESTER (W0 OR W1): W0

SELECT DEVICE (F0, F1, OR T0): F0

INSERT DISK FOR RELOAD IN DRIVE=F0 (DISK # 1)
CONTINUE AS SPECIFIED (Y OR N)? Y

INSERT DISK FOR RELOAD IN DRIVE=F0 (DISK # 2)
CONTINUE AS SPECIFIED (Y OR )? Y
.
.
.
**DONE**
```

CONVENTIONS

Notice that the INSERT DISK prompt includes a counter (DISK # 1) to help you reload diskettes in the sequence in which they were recorded. Actually, the Backup command identifies each disk so that you can reload them in any sequence, with one exception: the last disk recorded by Backup contains an end-of-file indications that terminates the Load command; this disk must always be loaded last.

WARNING

If you have more than one version of FWIT, always use the same version to perform both the Backup and Load commands. Because of continuing improvements to the program, SMS cannot ensure that a backup produced by one version will reload under another version.

FWIT COMMANDS
W (Write) Command

W (WRITE) COMMAND

FUNCTION

The W (Write) command allows you to enter data to be written to a specific physical disk address.

After the command parameters have been selected, the write command requests the data to be written, one word at a time.

COMMAND/RESPONSE

SELECT COMMAND: W

WRITE F0, CYLIN=0, HEAD=0, SECTOR=1, OFF=NONE
RETRY=ENABLED

CONTINUE AS SPECIFIED (Y OR N)? N

Where

The Write command can have either or two default parameter lists. The parameter list shown above appears when you execute a Write command without first executing a Read command. For typical applications, you will not use these default specifications since cylinder 0 of a floppy disk is either unused (RX01/RX02) or has a special format (IBM).

The Read and Write commands share the list of selected parameters. If you have executed a Read command, the default parameter list for a subsequent Write command will contain the values selected for the previous Read command. This parameter sharing makes it very simply for you to read a portion of the disk and then modify it.

If you want to modify the default parameter list, type N in response to the CONTINUE AS SPECIFIED prompt. FWIT then requests you to enter each parameter:

DEVICE (F0, F1, W0, OR W1)?

CYLINDER (0 - MAX)?

HEAD (0 - MAX)?

SECTOR (1 - MAX)?

DISABLE RETRIES (Y OR N)?

FWIT COMMANDS
W (Write) Command

Where

DEVICE, CYLINDER, HEAD, AND SECTOR request the physical disk address where data is to be written. If the device is a floppy disk, the Write command also requests you to enter the CYLINDER OFFSET used for the disk, if any.

The DISABLE RETRIES prompt allows you to enable or disable retries. If you are trying to diagnose a problem with a floppy disk, for example, you might want to disable retries. Leaving retries enabled can mask a write error by successfully writing a weak sector on a retry. Error 18 (data CRC) is the most common error for floppy disks and usually indicates a problem with the disk media.

After you select the command parameters, the Write command prompts you to enter the desired data:

WORDS=n
ENTER AN OCTAL WORD:

Where

The WORDS= prompt is a counter that indicates the number of words already entered. Remember, each octal word maps into two bytes.

The ENTER . . . WORD prompt requests a six-digit octal number terminated by a carriage return. The octal number must be in the range 000000 through 777777. If you enter fewer than six digits, Write provides zero-fill to the left. Thus, 12 is equivalent to 000012. If you enter too many digits, Write truncates excess digits from the left. Thus, 76543210 is equivalent to 543210.

Terminate the Write command by typing a carriage return in response to the ENTER prompt. The Write command writes the entered data to the specified sector.

CONVENTIONS

The system can only read or write a complete sector. The Write command accumulates the octal words you enter in a buffer the length of one sector. If you enter less than a sector's worth of data and there has been no previous Read command, the remainder of the buffer is filled with zeros.

Typically, the Read and Write commands are used together. The Read command accesses a sector, which the Write command then updates and rewrites. The user might execute another Read command to be sure the data was written correctly.

FWIT COMMANDS

W (Write) Command

When a Read command precedes the Write command, the Read command controls both the amount of data read and the amount written.

Typing a carriage return when the WORDS=0 prompt appears writes back to disk the data read in by the last Read command. If there has been no Read command, the contents of the write buffer are written to the selected disk. There is no logical reason to write an undefined buffer to disk; if you want to cancel the Write command, use ^C or toggle the system RESET switch.

FWIT COMMANDS
R (Read) Command

R (READ) COMMAND

FUNCTION

The R (Read) command reads disk data from the specified physical address and displays an octal representation of the data on the user's console device.

COMMAND/RESPONSE

SELECT COMMAND: R

READ F0, CYLIN=0, HEAD=0, SECTOR=1, OFF=NONE, WORDS=4096

RETRY=ENABLED

CONTINUE AS SPECIFIED (Y OR N)? N

Where

The READ command can have either of two default parameter lists. The parameter list shown above appears when you execute a Read command without first executing another Read or Write command. For typical applications, you will not use these default specifications since cylinder 0 of a floppy disk is either unused (RX01/RX02) or has a special format (IBM).

The Read and Write commands share the list of selected parameters. If you have executed a Read or Write command, the default parameter list for a subsequent Read command will contain the values selected for the previous command. This parameter sharing makes it very simple for you to read a portion of the disk and then modify it.

If you want to modify the default parameter list, type N in response to the CONTINUE AS SPECIFIED prompt. FWIT then requests you to enter each parameter:

DEVICE (F0, F1, W0, OR W1)?

CYLINDER (0 - MAX)?

HEAD (0 - MAX)?

SECTOR (1 - MAX)?

ENTER WORD COUNT (4096 MAX):

DISABLE RETRIES (Y OR N)?

FWIT COMMANDS
R (Read) Command

Where

DEVICE, CYLINDER, HEAD, AND SECTOR request the physical disk address of the data to be read. If the device is a floppy disk, the Read command also requests you to enter the CYLINDER OFFSET used for the disk, if any.

ENTER WORD COUNT requests the number of words to be read and displayed on the console device. The Read command display consists of octal words where each word equals two bytes. Specifying a large word count when the console device is a video terminal causes the display to scroll off the top of the screen. Some terminals have a "NO SCROLL" key that allows you to stop and start the display scroll. If your terminal does not have this key, type ^S to stop the display and ^Q to resume the display.

The DISABLE RETRIES prompt allows you to enable or disable retries. If you are trying to diagnose a problem with a floppy disk, for example, you might want to disable retries. Leaving retries enabled can mask a read error by successfully reading a weak sector on a retry. Error 18 (data CRC) is the most common error for floppy disks and usually indicates a problem with the disk media.

CONVENTIONS

The system can only read or write a complete sector. The Read command reads as many complete sectors as required to satisfy the specified word count. If the word count does not fall on a sector boundary, the octal data display terminates at the specified word. However, the remainder of that sector resides in the read buffer so that a subsequent Write statement can write the whole sector correctly.

Following the octal display, the Read command displays the beginning address of the read buffer. Programmers who are familiar with console ODT can modify the contents of the buffer. You can "patch" the disk by writing back the modified data.

The Read and Write commands allow you to access a disk while bypassing the operating system. This allows you to attempt operations that are prohibited by the operating system. As a "worst case" example, assume that the directory of a floppy disk is physically damaged because of improper handling. Without the directory, the operating system cannot find any files on the diskette, even though the files themselves may still be valid. Depending on the condition of the diskette, you may be able to recover the files by using the Read and Write commands.

FWIT COMMANDS
R (Read) Command

EXAMPLE

The following Read command reads the specified sector and then displays the first ten words of the sector on the console device:

```
SELECT COMMAND: R

READ F0, CYLIN=0, HEAD=0, SECTOR=1, OFF=NONE, WORDS=4096
RETRY=ENABLED

CONTINUE AS SPECIFIED (Y OR N)? N

DEVICE (F0, F1, W0, OR W1)? W0

CYLINDER (0-MAX)? 10

HEAD (0-MAX)? 0

SECTOR (1-MAX)? 1

ENTER WORD COUNT (4096 MAX): 10

DISABLE RETRIES (Y OR N)? N

READ W0, CYLIN=10, HEAD=0, SECTOR=1, OFF=NONE, WORDS=10
RETRY = ENABLED

CONTINUE AS SPECIFIED (Y OR N)? Y

061440 066171 067151 062544 020162 063157 071546 072145 033075 027051
BUFFER ADDRESS=126410

**DONE**
```

FWIT COMMANDS
G (Get ID) Command

G (GET ID) COMMAND

FUNCTION

The Get ID command reads the ID record from the specified disk and displays it on the console device.

COMMAND/RESPONSE

```
SELECT COMMAND: G  
SELECT DEVICE (F0, F1, W0, OR W1): F0  
CYLINDER=1, HEAD=0, SECTOR=14  
BYTES PER SECTOR = 256  
DENSITY = DEC RX02  
SINGLE SIDED DISKETTE
```

OR

```
SELECT DEVICE (F0, F1, W0, OR W1): W0  
CYLINDER =0, HEAD=0, SECTOR=12  
BYTES PER SECTOR = 512  
DENSITY = WINCHESTER
```

Where

CYLINDER, HEAD, and SECTOR identify the location from which the ID record was read.

BYTES PER SECTOR and DENSITY identify the format of the disk.

CONVENTIONS

The Get ID command has no optional parameters.

FWIT COMMANDS
T (Test) Command

T (TEST) COMMAND

FUNCTION

The T (Test) command displays a menu of its subcommands.

It should be noted that all SMS products are thoroughly tested and must run for at least 72 hours without any fatal errors before they are released to customers. Most users require the tests provided by this command only for diagnosing intermittent errors that may occur as hardware ages.

COMMAND/RESPONSE

SELECT COMMAND: T

MENU	COMMAND	COMMENT
FW	F	CONTROLLER SELF TEST
SEEK	S	RANDOMLY SEEK DRIVES
RANDOM	R	RANDOMLY READ-WRITE
ERRORS	E	ERROR SUMMARY
TAPE TEST	T	WRITE-READ & FIND EOT
ORDER	O	ORDERLY WRITE-READ

SELECT SUBTEST (F, S, R, E, T, OR O):

*****MAINTENANCE TESTS AS PER OEM MANUAL*****

CONVENTIONS

The Test command comprises a number of subcommands designed to exercise some portion of the hardware. Most of the tests are designed to run continuously until a fatal error occurs, so they require exclusive access to the tested device for long periods of time. Plan to perform testing when the system is normally idle, such as over night or over a weekend. You can manually stop a test by typing ^C. Avoid using system RESET to stop testing because error counters kept in memory are cleared when you reset.

FWIT COMMANDS

T (Test) Command

F (Controller Self Test) Subcommand

F (Controller Self Test) SUBCOMMAND

FUNCTION

The F (Controller Self Test) subcommand displays a menu of five subtests. These subtests are used for the adjustment and maintenance of floppy disk drives. When any one of these subtests is run, the controller also performs a self test by checking its byte processor, performing a CRC check on its ROM, and so on.

Few users will ever need to use these tests. These tests enable technicians to adjust and align floppy disk drive. Most of the tests are used in conjunction an oscilloscope and other specialized tools.

COMMAND/RESPONSE

SELECT SUBTEST (F, S, R, E, T, OR O): F

SUBTEST	COMMENT
0	SYSTEM TEST ALL READY DRIVES
1	SELECT, LOAD, & SEEK FLOPPY
2	SELECT, LOAD, & UNLOAD FLOPPY
3	SELECT, LOAD, & STEP FLOPPY
4	WRITE 1'S

SELECT SUBTEST (0-4):

CONVENTIONS

Subtest 0 operates on all floppy disk drives that are ready when the test is selected. The test performs a seek to a random cylinder number, then verifies whether the seek was successful. The test continues until interrupted or until a seek error occurs. If a seek error occurs, the test is terminated for the faulty drive.

Subtests 1 through 4 all issue the following prompts:

SELECT FLOPPY TRACK (0-76):

SELECT FLOPPY (F0 OR F1):

CONTINUE AS SPECIFIED (Y OR N)?

Subtest 1 selects the specified floppy disk, loads the read/write heads, and then performs a seek to the specified track. The test prints an error message

FWIT COMMANDS

T (Test) Command

F (Controller Self Test) Subcommand

if the operation fails. This test performs only one seek, but does not terminate by itself. If no error message appears, use ^C to return to the main menu of FWIT commands.

Subtest 2 selects the specified floppy, loads the read/write heads, performs a seek to the specified track, and then repeatedly loads and unloads the read/write heads over that track. You should hear a clicking sound as the heads snap open and reload on the track. This subtest runs until an error occurs or until you stop it with a ^C. Do not let this test run too long. The repeated loading of the heads can cause excessive wear to the specified track.

Subtest 3 selects the specified floppy, loads the read/write heads, performs a seek to the specified track, and then steps back and forth between the specified track and an adjacent track. This test also runs until stopped by an error or the user.

Subtest 4 writes all one's (octal 177777) to the specified track. If no error condition occurs, this test terminates normally and displays the ****DONE**** message.

*****WARNING*****

This test writes one's throughout the entire track, writing over sector ID's and sector gaps. You must reformat the diskette if it is to be used again.

FWIT COMMANDS
T (Test) Command
S (Seek) Subcommand

S (Seek) SUBCOMMAND

FUNCTION

The S (Seek) subcommand executes overlapped seeks on all the selected drives.

COMMAND/RESPONSE

```
SELECT SUBTEST (F, S, R, E, T, OR O): S  
SELECT TEST DRIVES (F0, F1, W0, OR W1): F0  
WARNING...DRIVES UNDER TEST MUST CONTAIN FORMATTED MEDIA  
CONTINUE AS SPECIFIED (Y OR N)? Y  
HALT ON ERROR (Y OR N)? N
```

Where

The SELECT...DRIVES prompt allows you to include any number of the system's disks in the test. Every drive selected for the test must contain formatted media.

The HALT prompt allows you to stop the test as soon as any drive fails. If you enter N, the test terminates for any drive that has a fatal error, but continues for any other drives included in the test.

CONVENTIONS

The Seek subcommand does not write any data to the disks under test, so you need not backup the disks before running this subcommand.

If you run this test on an unformatted disk, the drive for that disk "fails" the test immediately.

The Seek subcommand keeps a count of the number of successful seeks and the number of seek errors. Use the Test command's E (Errors) subcommand to display these figures. Notice that the Test command keeps its own set of counters that must be displayed by the E subcommand. Although the FWIT main menu includes an Error command, this command does not report errors discovered by any of the Test subcommands.

When a seek error occurs, FWIT adds one to the error count. FWIT then attempts to get the access arm back into register by performing a seek to the track 0 indicator. The test continues if the registration attempt succeeds.

FWIT COMMANDS

T (Test) Command

S (Seek) Subcommand

If the arm cannot be brought back into register, a fatal error occurs, and the test terminates for that drive.

This test continues until all selected drives fail (or any one drive fails, if you requested a halt on error) or until you stop it by typing ^C.

FWIT COMMANDS

T (Test) Command

R (Random Write-Read) Subcommand

R (Random Write-Read) SUBCOMMAND

FUNCTION

The R (Random Write-Read) subcommand uses a random number generator to generate a disk address. The test seeks out that address and writes a data pattern. The test then reads back the data and compares it to the data written. If the data has changed or some other error is detected, the test displays an error message and adds one to the error counter.

The Random Write-Read subcommand also has a number of optional parameters, as described below.

COMMAND/RESPONSE

SELECT SUBTEST (F, S, R, E, T, OR O): R

SELECT TEST DRIVES (F0, F1, W0, OR W1):

Specify one or more drives to be tested.

WARNING...DRIVES UNDER TEST MUST CONTAIN FORMATTED MEDIA
DATA FIELDS WRITTEN OVER

CONTINUE AS SPECIFIED (Y OR N)? Y

Enter N to return to the main menu. Enter Y to continue.

CHANGE TEST OPTIONS (Y OR N)?

Enter N to run the test using all default options. Enter Y
to change the options.

ENTER WORD COUNT (4096 MAX):

Enter the number of words to be written and read in each
pass. If you want a display of compare failures, make the
word count equal to the sector size (i.e., use a word count
of 256 for a 512 byte sector).

USE DELETED DATA ADDRESS MARKS? (Y OR N)

Some floppy disks use two kinds of address marks.
Most SMS customers never use diskettes with deleted data
address marks and should respond N to this prompt. A
carriage return defaults this entry to N.

FWIT COMMANDS

T (Test) Command

R (Random Write-Read) Subcommand

Users who exchange diskettes with other systems and programmers who write their own diskette drivers or operating systems may encounter deleted data address marks. Enter Y to allow this test to write to sectors with deleted data address marks as well as standard address marks.

USE PHYSICAL ADDRESSING (Y OR N)?

Type Y or carriage return to specify physical addressing (cylinder, head, and sector number). Type N if you want the test to address the disk using logical sector numbers.

ENABLE RETRY AFTER ERROR (Y OR N)?

This test normally runs with retries disabled. Type Y to enable retries. Type N or carriage return to leave the default in effect.

USE SOFT OFFSETTING (Y OR N)?

The write-read tests normally do not use a cylinder offset. Type N or carriage return to leave this default in effect. Type Y to specify a cylinder offset of 1/4 of a track. Notice that cylinder offsets have no practical value for a random test.

INHIBIT ERROR MESSAGE PRINTOUT (Y OR N)?

The write-read tests normally display a message when an error is detected. Type N or carriage return to leave this default in effect. Type Y to disable error messages.

INHIBIT COMPARE FAILURE PRINTOUTS (Y OR N)?

The write-read tests normally do not display an error message when the data read back does not match the data written. This is because the user must specify a word count that exactly matches the sector size, since comparing fields with unequal lengths always fails. Type Y or carriage return to leave this default in effect. Type N to enable error messages.

ENABLE FLOPPY ECC (Y OR N)?

The write-read tests normally run with error correction disabled since the purpose of the test is to detect errors. Type N or carriage return to leave this default in effect. Type Y to enable error correction. The FWD0100 controller can correct single bit errors on floppy disks.

FWIT COMMANDS

T (Test) Command

R (Random Write-Read) Subcommand

ENABLE WINCHESTER ECC (Y OR N)?

The write-read tests normally run with error correction disabled since the purpose of the test is to detect errors. Type N or carriage return to leave this default in effect. Type Y to enable error correction. The FWD0100 controller can correct up to error of up to six bits on Winchester disks.

HALT ON ERROR (Y OR N)?

The write-read tests normally only when a fatal error occurs. Read errors are reported through the E (Errors) command. Type N or carriage return to leave this default in effect. Type Y to halt whenever an error occurs. If the host CPU is an LSI-11, console ODT is available when the test halts. Type P to resume testing.

SELECT DATA PATTERN (OCTAL):

If you type a carriage return in response to this prompt, the write-read tests generate and write random data. You can enter an octal number to specify the data pattern of your choice. Typical data patterns require the system to write strings of alternating zero's and one's such as octal 111 (001001001), 333 (011011011), or 5 (101101101).

The write-read test begins as soon as you type a carriage return to terminate this entry.

FWIT COMMANDS
T (Test) Command
E (Errors) Subcommand

E (Errors) SUBCOMMAND

FUNCTION

The E (Errors) subcommand displays a summary of the errors detected by the S (Seek), R (Random Write-Read), and O (Orderly Write-Read) subcommands.

COMMAND/RESPONSE

```
SELECT SUBTEST (F, S, R, E, T, OR O): E  
TEST PASSES COMPLETED=587, ERRORS COUNTED=0  
  
**DONE**
```

Where

One pass consists of a write, read, and compare operation or one seek and its verification.

CONVENTIONS

The counters used for passes and errors have a maximum capacity of 65,535. When a counter reaches 65,535, FWIT displays a message to indicate the counter overflow, resets the counter to zero, and then resumes the test. The overflow of one counter does not affect the other counter. It is relatively easy to overflow the PASSES counter. For example, running the Seek subcommand on four disks can overflow the counter in a matter of minutes. By contrast, the ERRORS counter should seldom contain a large value, much less overflow. A very large error count probably indicates a severely flawed or damaged diskette, or a drive that is failing or in need of a thorough head cleaning.

FWIT COMMANDS

T (Test) Command

O (Orderly Write-Read) Subcommand

O (Orderly Write-Read) SUBCOMMAND

FUNCTION

The O (Orderly Write-Read) subcommand is identical to the Random Write-Read test except that the O subcommand writes and reads sectors sequentially until it fills an entire disk. The test writes a data pattern to the sector, reads back the data and compares it to the data written. If the data has changed or some other error is detected, the test displays an error message and adds one to the error counter.

COMMAND/RESPONSE

SELECT SUBTEST (F, S, R, E, T, OR O): O

SELECT TEST DRIVES (F0, F1, W0 OR W1): F0

WARNING...DRIVES UNDER TEST MUST CONTAIN FORMATTED MEDIA
DATA FIELDS WRITTEN OVER

CONTINUE AS SPECIFIED (Y OR N)? Y

CHANGE TEST OPTIONS (Y OR N)> Y

•
•
•

Where

The test options for the O subcommand are identical to the options for the R (Random Write-Read) subcommand except for the ENTER WORD COUNT option. The O subcommand does not need a word count since the test writes and reads only complete sectors.

Refer to the description of the R (Random Write-Read) subcommand for a description of the test options.

FWIT COMMANDS
I (Init) Command

I (INIT) COMMAND

FUNCTION

The I (Init) command writes a known data pattern across the entire writable surface of the selected disks.

COMMAND/RESPONSE

```
SELECT COMMAND: I
SELECT DEVICE (F0, F1, W0, OR W1): F0
DATA PATTERN (OCTAL)? 133333
WARNING...DRIVE UNDER TEST MUST CONTAIN FORMATTED MEDIA
DATA FIELDS ARE WRITTEN OVER
CONTINUE AS SPECIFIED (Y OR N)? Y

**DONE**
```

Where

The SELECT DRIVE prompt allows you to specify the drive or drives to include in this operation.

The DATA PATTERN prompt requests an octal value that represents the bit stream to be written. The prompt repeats if the value entered is not a legal octal value. The value shown above is actually the default used when the prompt is terminated with a carriage return. The default value yields the binary string 011011011011.

CONVENTIONS

The Init command writes the specified value to every sector of the disk except sectors listed in the flaw map of a Winchester disk.

FWIT COMMANDS
S (Scan) Command

S (SCAN) COMMAND

FUNCTION

The S (Scan) command reads the selected disk one or more times to find any flawed sectors. The command displays a summary of errors detected.

COMMAND/RESPONSE

```
SELECT COMMAND: S  
SELECT DEVICE (F0, F1, W0, OR W1): W0  
NUMBER OF PASSES (0-65535): 2  
SCAN PASSES COMPLETED=2, ERRORS COUNTED=0  
**DONE**
```

Where

The SELECT DEVICE prompt requests you to identify the disk to be scanned. Only one disk can be scanned at a time.

NUMBER OF PASSES specifies the number of times the disk is to be read. A carriage return specifies one pass. Zero specifies an infinite scan. When the NUMBER OF PASSES equals zero, you must terminate the scan manually by typing ^C, pressing the RESET switch, or turning off the power.

CONVENTIONS

The Scan command does not read sectors listed in the flaw map of a Winchester disk.

When a read error occurs, the Scan command adds the sector address to its error list and performs one retry. If the retry fails and error correction is enabled, the Scan command attempts to correct the error, and then flags the error as CORRECTABLE or NOT CORRECTABLE. The NOT CORRECTABLE message appears for all read errors when error correction is disabled.

SMS recommends the use of error correction with Winchester disks. If the Scan command reveals a sector with a non-correctable error, that sector should be added to the flaw map.

Sectors with a persistent correctable error should also be added to the flaw map. Even though the error is correctable, some flaw in the sector causes the error. The sector actually could have more than one flaw. The possibility of

FWIT COMMANDS
S (Scan) Command

a miscorrection increases significantly and endangers data integrity when a sector has multiple flaws. Error correction on Winchester disks is not a substitute for flaw mapping. To ensure data integrity, use error correction to supplement flaw mapping.

SMS advises against the use of error correction for normal operations with floppy disks. Floppies use a simpler error correction technique than Winchester disks and are more likely to miscorrect a multiple bit error. If the Scan command finds flaws on a new floppy diskette, use a different diskette. (Notice that the Format command normally scans each new diskette for errors.) If the diskette contains data, the FWIT Read command with retries enabled may be able to recover it.

EXAMPLE

The following example uses the Scan command to find a correctable error on a Winchester disk, and then uses Defects Update subcommand to add the bad sector to the flaw map:

```
SELECT COMMAND: S

SELECT DEVICE (F0, F1, W0, OR W1): W0

NUMBER OF PASSES (0-65535): 2

SECTOR=14, HEAD=5, CYLIN=830, ERROR=18 PASS=1 CORRECTABLE
SECTOR=14, HEAD=5, CYLIN=830, ERROR=18 PASS=1 CORRECTABLE
SCAN PASSES COMPLETED=2, ERRORS COUNTED=2

**DONE**

SELECT COMMAND: D

SELECT WINCHESTER (W0 OR W1) W0

MENU      COMMAND      COMMENT
-----
INIT      I          INIT FLAW MAP
ENTER    E          ENTER MANUFACTURER'S DATA
MAP      M          DISPLAY BAD SECTOR MAP
UPDATE   U          ENTER NEW FLAWS TO OLD MAP
RETRIEVE R          RECALL MANUFACTURER'S DATA
AUTO     A          AUTO FLAW MAP INSTALLATION

SELECT SUBCOMMAND (E,M,U,R,A,OR I): U
```

FWIT COMMANDS
S (Scan) Command

ENTER CYLINDER: 830

ENTER HEAD: 5

ENTER SECTOR: 14

ENTER CYLINDER: <CR>

When you terminate the Update subcommand by typing a carriage return in response to one of the ENTER prompts, FWIT responds by displaying the updated flaw map:

TRACK WITH FLAW--> CYLIN=0 HEAD=0
FLAWED SECTORS=1 2 3 4 5 6

TRACK WITH FLAW--> CYLIN=0 HEAD=1
FLAWED SECTORS=1 2 3 4 5 6

TRACK WITH FLAW--> CYLIN=145 HEAD=0
FLAWED SECTORS=6 7

TRACK WITH FLAW--> CYLIN 830 HEAD=5
FLAWED SECTORS=14

****DONE****

FWIT COMMANDS

Q (QA Test) Command

Q (QA Test) COMMAND

FUNCTION

The Q (QA Test) command links together a number of the commands and subcommands previously described in this manual so that a Winchester disk can easily be formatted and tested. Although the QA Test is designed primarily for SMS Quality Assurance technicians, the test is available to all users. The QA Test incorporates the following FWIT commands and subcommands:

- o O (Format Winchester Disk)
- o D (Defect Management) Note: This optional command is performed only if no flaw map has been installed.
- o I (Init Data Pattern)
- o S (Scan)
- o R (Random Write-Read) subcommand of the T (Test) command
- o S (Seek) subcommand of the T (Test) command

The QA Test includes a loop count feature that allows the user to repeat the Init, Scan, Random Write-Read, Seek portions of the test as many as 65,535 times. Additionally, the user can specify either the number of passes or number of minutes each repeatable command should run during each loop through the test.

COMMAND/RESPONSE

```
SELECT COMMAND: Q
ENTER NUMBER OF PASSES FOR SCAN (0-65535) 15
ENTER NUMBER OF MINUTES FOR RANDOM TEST (0-65535) 30
ENTER NUMBER OF MINUTES FOR SEEK TEST (0-65535) 5
LOOP MODE (Y OR N)? N
```

Where

The responses shown for the prompts above are the default values assigned if you type a carriage return for the prompt.

FWIT COMMANDS

Q (QA Test) Command

The Random Write-Read and Seek commands are timed and require the use of the Line Time Clock and LTC interrupts. For the timed commands, an entry of zero omits the test from the loop. Otherwise, enter the number of minutes the command is to run each time the loop is executed. For example, 120 represents 120 minutes or two hours.

Notice that you cannot specify an indefinite scan (number of passes for scan = 0) as you can when the Scan is run as a separate command. Otherwise, the QA Test loop could not run to completion automatically. If you enter a zero or a value greater than 65535, FWIT issues the prompt again.

Respond N to the LOOP MODE prompt to inhibit the loop mode, in which case the command terminates after a single pass through the test. If you respond Y, the command continues with the following prompt:

```
ENTER LOOP COUNT (1-65535)
```

Where

The prompt requests you to enter a decimal number to specify the number of times the test loop is to be executed. A single carriage return inhibits the loop mode and has the same effect as entering an N for the LOOP MODE prompt. FWIT issues the prompt again if you enter a value outside the range 1 through 65535.

After a valid LOOP COUNT is entered, the command displays the default parameters for the disk format:

```
*FORMATTING PROCESS INITIATED*
```

```
DEVICE=W0, SECTOR LENGTH=512, DENSITY=WINCHESTER, HEAD OFFSET=2  
CYLINDER OFFSET=1, INTERLEAVE=1, SCAN=DISABLED
```

```
FORMAT WINCHESTER ??
```

```
CONTINUE AS SPECIFIED (Y OR N)?
```

Where

```
*** CAUTION IS REQUIRED HERE ***
```

Responding either Y or N here writes over the previous contents of the disk. If you don't want to format and/or test the disk, type ^C to return to the main menu.

Type N to inhibit the format operation and proceed immediately to the Init, Scan, Random Write-Read, and Seek commands.

Type Y to format the disk using the default parameters shown above. If you want to modify the disk format parameters, type ^C to return to the main menu. Use the O command to format the disk, then use the D command to enter the raw flaw data. If you still want to test

FWIT COMMANDS

Q (QA Test) Command

the disk, use the Q command, but be sure to answer N when this CONTINUE AS SPECIFIED prompt appears.

If you type Y and no flaw map is installed, FWIT invokes the E subcommand of the D command to allow you to enter the raw flaw data.

After the formatting operation, the QA Test runs automatically until the loop count has been satisfied. The command issues the following informational messages:

DATA PATTERN INITIATED

SCAN INITIATED

SECTOR=13, HEAD=1, CYLIN=347, ERROR=18 PASS=1

RANDOM TEST INITIATED

TEST PASSES COMPLETED=470, ERRORS COUNTED=0

SEEK TEST INITIATED

TEST PASSES COMPLETED=2438, ERRORS COUNTED=0

LOOP MODE INITIATED, LOOP COUNT=1

Where

A similar set of messages appears for each iteration of the loop.

The set of messages shown above is somewhat unusual in that the Scan detected an error. This seldom happens if the raw flaw data has been installed correctly.

CONVENTIONS

As mentioned previously, every disk shipped by SMS is formatted and tested. Customers should use the QA Test very carefully because it writes over all data that resides on the disk.

The QA Test normally does not report any errors if the raw flaw data has been installed correctly. When errors occur, compare the head and cylinder numbers against the manufacturer's data to be sure that the raw data was entered correctly. It may be necessary to rerun the E (Enter) subcommand of the D (Defects) command. If the QA Test finds a new error on the disk, use the U (Update) subcommand of the D command to add the flaw to the flaw map.

FWIT COMMANDS

E (QA Test Errors) Command

E (QA Test Errors) COMMAND

FUNCTION

The E (QA Test Errors) command displays a summary of all errors detected by the Q Command.

COMMAND/RESPONSE

```
SELECT COMMAND:  E
                ERROR CODE=18, COUNT=5
                ERROR CODE=17, COUNT=1
                TOTAL ERRORS COUNTED=6
```

CONVENTIONS

The E command has no optional parameters.

The response shown above represents a worst case situation, probably caused by testing a disk with flaws known to the manufacturer, but without a flaw map installed on the disk. More typically, the E command responds with the message NO ERRORS REPORTED. This message also appears when you run the E command without first running the QA Test command.

IV. FLOPPY-WINCHESTER UTILITIES

INTRODUCTION

The Floppy-Winchester Utilities (FWU) are a set of convenience features derived from FWIT. FWU provides convenient facilities for formatting floppy diskettes and for copying diskettes in systems that have only one diskette drive. To run FWU, you simply type the following command:

.R FWU

FWU runs as a program and returns control to the operating system upon termination. By contrast, FWIT runs as a stand-alone subsystem and must be terminated with a system RESET. After a RESET, you must re-enter the system TIME and DATE, if you use those facilities.

FWU provides the following commands:

- F Format floppy diskettes to one of four standard formats.
- G Get ID displays format information for the specified diskette.
- C Copy a diskette by writing a temporary copy to the Winchester, then copying the temporary file to a scratch diskette.
- C/ Copy a temporary file produced by a previous C command to a scratch diskette.
- H Display a Help menu of the FWU commands.
- E Exit FWU and return control to the operating system.

All FWU commands must be entered using uppercase letters. You may find it helpful to set the "CAPS LOCK" or "SHIFT LOCK" on your keyboard. If you fail to use uppercase or enter an illegal command, FWU displays its Help menu.

FWU COMMANDS

F (Format Diskette) Command

F (FORMAT DISKETTE) COMMAND

The F (Format Diskette) command formats the current diskette to one of four standard formats.

COMMAND/RESPONSE

```
.R FWU
  FLOPPY-WINCHESTER UTILITY VERSION 1.3
  TYPE H FOR HELP
ENTER COMMAND: F
  FLOPPY UNIT NUMBER? (0 OR 1) 0
  FLOPPY FORMAT (RX01,RX02,IBM1,IBM2)? RX02
  ARE YOU SURE? Y

  *** BEGIN FORMATTING ***
  *** BEGIN VERIFY ***
  DO YOU WANT TO FORMAT ANOTHER FLOPPY? N
ENTER COMMAND:
```

Where

FLOPPY UNIT NUMBER must be 0 or 1.

FLOPPY FORMAT must be RX01, RX02, IBM1 or IBM2. If you enter the format incorrectly -- RX1 for RX01, for example -- FWU issues this prompt again.

The ARE YOU SURE? prompt gives you an opportunity to continue the formatting operation or to abort the command. Type Y to format the diskette. Type N to abort the command and return to the ENTER COMMAND: prompt.

CONVENTIONS

The RX01 and RX02 formats provide 128 or 256 bytes per sector, respectively. These formats also the standard DEC interleave of 2 and cylinder offset of 6. The IBM1 format provides 128 bytes per sector using the IBM 3740 Interchange format. The IBM2 format provides 512 bytes per sector on a single or double sided diskette.

The RX01, RX02 and IBM1 formats can be used for double sided diskettes, but FWU warns you that double sided diskettes are non-standard for those formats. These non-standard diskettes can be useful within an SMS system, but are probably not compatible for interchange with other systems. Use FWIT to produce any other non-standard diskette formats.

FWU COMMANDS

G (Get ID) Command

G (GET ID) COMMAND

THE G (Get ID) command reads the ID block of the specified diskette and displays format information about the diskette.

COMMAND/RESPONSE

```
.R FWU
FLOPPY-WINCHESTER UTILITY VERSION 1.3
TYPE H FOR HELP
ENTER COMMAND: G
  FLOPPY UNIT NUMBER? (0 OR 1) 0
  IBM DOUBLE DENSITY (SMS STANDARD)
  512 BYTES PER SECTOR
  DOUBLE SIDED
ENTER COMMAND:
```

Where

FLOPPY UNIT NUMBER must be 0 or 1.

CONVENTIONS

The G (Get ID) command has no optional parameters other than the unit number.

EXAMPLE

The GetID command issues a warning if a double sided diskette results in a non-standard format:

```
ENTER COMMAND: G
  FLOPPY UNIT NUMBER? (0 OR 1) 0
  RX01 DEC FORMAT
  256 BYTES PER SECTOR
  DOUBLE SIDED
```

```
***CAUTION-DOUBLE SIDED RX01,RX02, OR IBM1 IS NOT A STANDARD FORMAT***
ENTER COMMAND:
```

FWU COMMANDS
C (Copy) Command

C (COPY) COMMAND

The C (Copy) command produces one or more copies of a floppy diskette. This command is designed for use on systems with only one floppy drive. The command copies the diskette to the Winchester disk, then writes that copy back to a scratch diskette.

COMMAND/RESPONSE

```
ENTER COMMAND: C
INSERT THE FLOPPY TO BE COPIED AND ENTER THE UNIT NUMBER:

FLOPPY UNIT NUMBER? (0 OR 1)

THE FORMAT OF THE FLOPPY BEING COPIED IS:
RX02 DEC FORMAT
256 BYTES PER SECTOR

ENTER FILE NAME OR <CR> FOR DEFAULT (FW2:SMSTMP.TMP)? CR
ARE YOU SURE? TYPE Y OR N Y
WRITE ENABLE A SCRATCH DISKETTE AND INSERT IT INTO THE FLOPPY UNIT:
NOTE: SCRATCH DISKETTE MUST BE FORMATTED THE SAME AS THE ONE COPIED

HIT RETURN WHEN READY? CR
*** END OF OPERATION ***
DO YOU WANT TO MAKE ANOTHER COPY? N
```

Where

FLOPPY UNIT NUMBER must be 0 or 1. Since this command is designed for systems with a single diskette drive, the unit number should always be 1. If you have a system with two diskette drives, use the FWIT C (Copy) command.

The ENTER FILE NAME prompt allows you to name the temporary Winchester file to hold the copy of the floppy disk. The default file name is adequate for most purposes. However, if you copy a number of original diskettes, each temporary file must have a unique file name.

The ARE YOU SURE? prompt allows you to copy the diskette or abort the command and return to the ENTER COMMAND prompt. Type Y to continue, or N to abort the command.

FWU COMMANDS

C (Copy) Command

After you have inserted a scratch diskette, FWU asks you to HIT RETURN WHEN READY? The scratch diskette must have the same format as the diskette being copied; FWU does not allow a change in formats when copying diskettes. FWU issues an error message if the scratch diskette has the wrong format. FWU continues to issue this prompt until you insert a diskette with the correct format. Type CR to continue the command. You can abort the command by typing ^C.

If you want to make multiple copies of the source diskette, respond Y to the DO YOU WANT TO MAKE ANOTHER COPY? prompt. Type N to return to the ENTER COMMAND: prompt.

CONVENTIONS

FWU creates a .TMP file to store the contents of the diskette being copied. However, you can assign any legal file name to the temporary file. If you copy multiple source diskettes, each temporary file must have a unique name.

You should delete temporary files as soon as you are through with them. Temporary files can consume large amounts of space on the Winchester disk very quickly. For example, copying a double sided diskette in IBM2 format requires 1.2 Mbytes of disk space. If you intend to make many copies of the source diskette, you may want to keep the temporary file indefinitely. If you copy additional diskettes in the interim, each new source diskette must have a temporary file with a unique name.

FWU COMMANDS

C/ (Copy TMP File) Command

C/ (COPY TMP FILE) COMMAND

The C/ (Copy TMP File) command writes to diskette a copy of a temporary file stored on a Winchester disk by a previous FWU C command.

COMMAND/RESPONSE

```
ENTER COMMAND C/FW2:filnam.TMP
FLOPPY UNIT NUMBER? (0 OR 1) 0
THE FORMAT OF THE FLOPPY COPYING TO IS:
  RX02 DEC FORMAT
  256 BYTES PER SECTOR

WRITE ENABLE A SCRATCH DISKETTE AND INSERT IT INTO THE FLOPPY UNIT:
NOTE: SCRATCH DISKETTE MUST BE FORMATTED THE SAME AS THE ONE COPIED

HIT RETURN WHEN READY? CR
*** END OF OPERATION ***

DO YOU WANT TO MAKE ANOTHER COPY?
```

Where

FLOPPY UNIT NUMBER must be 0 or 1. Since this command is intended for systems with only one floppy drive, the unit number should be 0. If your system has two floppy drives, use the FWIT coy command.

The HIT RETURN prompt allows you to continue the command by typing a carriage return or aborting the command by typing ^C.

If you want to make multiple copies, type Y in response to the DO YOU WANT TO MAKE ANOTHER COPY prompt. Type N to return to the ENTER COMMAND prompt.

CONVENTIONS

This command differs from other FWU commands because the command name also includes the name of the file to be copied. The characters C/FW2: are the fixed portion of the command name; the remainder of the command name must be the name of a temporary file created by a previous FWU C command.

Temporary files created by the FWU C command consume a lot of space on your Winchester disk. You should delete temporary files as soon as you a finished with them.

FWU COMMANDS

C/ (Copy TMP File) Command

One common use for the C/ command occurs when you are making multiple copies of a diskette, but find that you don't have enough properly formatted diskettes. FWU allows you format additional diskettes and then use the C/ command to make the remaining copies from the temporary file.

FWU COMMANDS
H (Help) Command

H (HELP) COMMAND

The H (Help) command displays a menu of the FWU commands.

COMMAND/RESPONSE

ENTER COMMAND: H

VALID COMMAND ARE: (NOTE:MUST BE UPPER CASE)

F ...Format Floppy to one of the following standard formats:

RX01 (DEC Single density,128 bytes ps,single sided,2:1+6Interleave)

RX02 (DEC Double density,256 bytes ps,single sided,2:1+6Interleave)

IBM1 (IBM 3740,single density,128 bytes,Interchange Format,No Intlv)

IBM2 (SMS Standard,Double density,512 bytes per sector ,
Single or Double Sided,No Interleave)

NOTE: For non-standard formats use FWIR (INSTALLATION AND TEST)

G ...Determine Format of Diskette in Unit. (GET ID)

C ...Copy (Reproduce) a floppy on a configuration with only one drive.

Copies from the floppy to the Winchester and creates a .TMP file
and then Transfers the RT-11 file back to a scratch floppy.

C/FW2:filnam.TMP

...Copies from the Winchester to the floppy the file requested.

Default device is (FW2:) Default extension is (.TMP)

NOTE:File to be copied must have been created with the C Command!

CONVENTIONS

The H (Help) Command has no optional parameters.

FWU automatically displays the Help menu if you enter an illegal command. Remember that all command must be entered in uppercase letters.

FWU COMMANDS
E (Exit) Command

E (EXIT) COMMAND

The E (Exit) command terminates FWU (Floppy-Winchester Utilities) and returns control the the operating system.

COMMAND/RESPONSE

ENTER COMMAND: E

·
·

CONVENTIONS

The E command has no optional parameters.



APPENDIX A. ERROR MESSAGES

A. ERROR MESSAGES

DECIMAL ERROR CODE	MEANING
0	No error
1	ILLEGAL HEAD ADDRESS The host passed the controller a head address outside the range of the drive being accessed. Head number start at 1 and range through the maximum allowed for the device.
2	ILLEGAL SECTOR ADDRESS The host passed the controller a sector number outside the range of allowable values. Sector addressing starts at sector 1 and ranges through the maximum possible for the drive type and disk format.
3	ILLEGAL CYLINDER ADDRESS The host passed the controller a cylinder number outside the range of the drive being accessed. Cylinder numbers start at 0.
4	ILLEGAL LOGICAL ADDRESS The host passed the controller a logical address outside the allowable range. Logical addresses range from 1 through the number of unflawed sectors on the disk. This error may occur if you attempt to load (L command) a Winchester from a diskette that was not created by the Backup command.
5	REGISTRATION TIMEOUT This error occurs when when a Winchester disk does not report seek complete, or the controller cannot find a track 0 indication. This error can also occur if strap C is not installed on a Shugart SA4000 control board.
6	Reserved for internal controller uses (illegal word count in compatible mode)
7	ILLEGAL DRIVE TYPE This error occurs when the system attempts to access a Winchester disk, but the formatter board drive type switches are set to the NOT USED position.

APPENDIX A. ERROR MESSAGES

- 8 **FORMAT ERROR**
 This error indicates an incorrect sector length. For example, the host may expect 128-byte sectors, but the diskette contains 256-byte sectors.
- 9 **HEAD SELECT ERROR**
 If the controller cannot find the requested sector after one complete disk revolution, it reads an ID to determine whether the proper head was selected. This message indicates that it was not.
- 10 **WRITE PROTECT ERROR**
 The system has attempted to format or write to a protected diskette. If the data on the diskette is no longer required, it can be used for a scratch diskette by removing the adhesive label from the write-protect notch. Otherwise, insert a different diskette.
- 11 **DELETED DATA ERROR**
 The current floppy contains address marks (AM's) for sectors with deleted (control) data, but the DL bit in the unit designator word is 0, which disallows deleted data AM's. If the DL bit is 1, sectors with deleted data AM's are skipped and no error is reported.
- 12 **KEY WORD ERROR**
 The host passed the controller an incorrect key word for a Set Mode command.
- 13 **DMA ERROR**
 The controller detected a parity error or attempted to access non-existent memory while attempting to access host memory.
- 14 **DISK OVERRUN**
 An attempt has been made to read or write past the end of the disk.
- 15 **HEAD POSITIONING OR SEEK ERROR**
 If an error occurs after the heads are positioned over the desired cylinder, the controller reads an ID to determine whether the heads actually reached the desired cylinder. If not, the controller reports this error. If a seek error occurs while retries are disabled, the host should initialize the disk to re-register the heads.
- 16 **NO ADDRESS MARKS ON TRACK**
 The controller cannot find any valid address marks on the track of a diskette. Unformatted diskettes usually cause this error.

APPENDIX A. ERROR MESSAGES

- 17 SECTOR ID NOT FOUND
 The controller cannot find the requested sector. This usually indicates a problem in the drive or a flawed disk.
- 18 DATA CRC OR NON-CORRECTABLE ECC
 The controller recomputes the CRC value each time it reads a sector and compares that value with the CRC recorded with the sector. This error indicates that the values do not agree. CRC errors often indicate a flawed disk.
- 19 MISSING DATA ADDRESS MARK
 Although the controller found the desired sector, its data address mark is missing or invalid. This error may indicate a flawed disk or a faulty drive. However, performing a read from a Winchester after a Write ID for the same sector always causes this error since Write ID does not produce a valid data AM.
- 20 DATA LATE OR DMA LATENCY ERROR
 The controller was unable to complete a transfer to memory because the host could not respond quickly enough. Typically, this error occurs only when some other DMA device is hogging the bus.
- 21 DATA TRANSFER TIMEOUT
 The controller will timeout any host memory access request after 20 msec.
- 22 DISKETTE DENSITIES DON'T MATCH
 The host passed the controller a diskette density specification that does not match the current diskette.
- 23 MEDIA NOT READABLE
 The controller is not able to maintain phase lock with the current diskette. This usually indicates a severely flawed diskette or, less frequently, a faulty drive.
- 24 DRIVE NOT READY
 The drive being accessed is not ready because it does not contain a diskette, or the diskette is inserted incorrectly.
- 25 DRIVE IN USE
 A second command has been issued to a drive that is already busy executing a seek command.
- 26 ILLEGAL FORMAT FOR RX02
 The IL bits of the unit designator word specify RX02 offset and interleave, but the current diskette is not formatted with the required 26 sectors per track.

APPENDIX A. ERROR MESSAGES

- 27 **FLAW MAP NOT VALID**
 The flaw mapping switch on the formatter is enabled, but the Winchester disk has no valid flaw map. Every attempt to access the disk causes this error until a flaw map is installed or flaw mapping is disabled. Conversely, changing the setting of the flaw map switch after the disk is in use causes every logical address to be in error by at least six sectors (the length of the flaw map). In this case, every attempt to access the disk causes a CRC or an ECC error.
- 28 **ILLEGAL COMMAND**
 The host passes an illegal command to the controller.
- 29 not used
- 30 **WINCHESTER ID CRC ERROR**
 The controller detected a CRC error while reading the ID field.
- 31 **WINCHESTER WRITE FAULT**
 A write fault indication from the Winchester disk cannot be cleared. This can be caused by a faulty drive or a cabling problem. Before assuming that the drive is faulty, carefully inspect the cable between the controller and the drive. Be sure the connections are tight and that there are no crimped, frayed, or broken wires.
- 32 not used
- 33 **FLAWED SECTOR ACCESS ERROR**
 There has been an attempt to access a flawed sector on a Winchester disk. Such an attempt requires the use of physical addressing. The controller automatically skips flawed sectors when logical addressing is used.
- 34 **MISSING WINCHESTER DATA SYNCHRONIZATION MARK OR DMA ACCESS FAILS**
 This error typically indicates a faulty drive. However, can occur when the controller initiates a direct memory access that is not allowed to complete.
- 35-47 not used
- 48-63 These messages reserved for use by SMS.

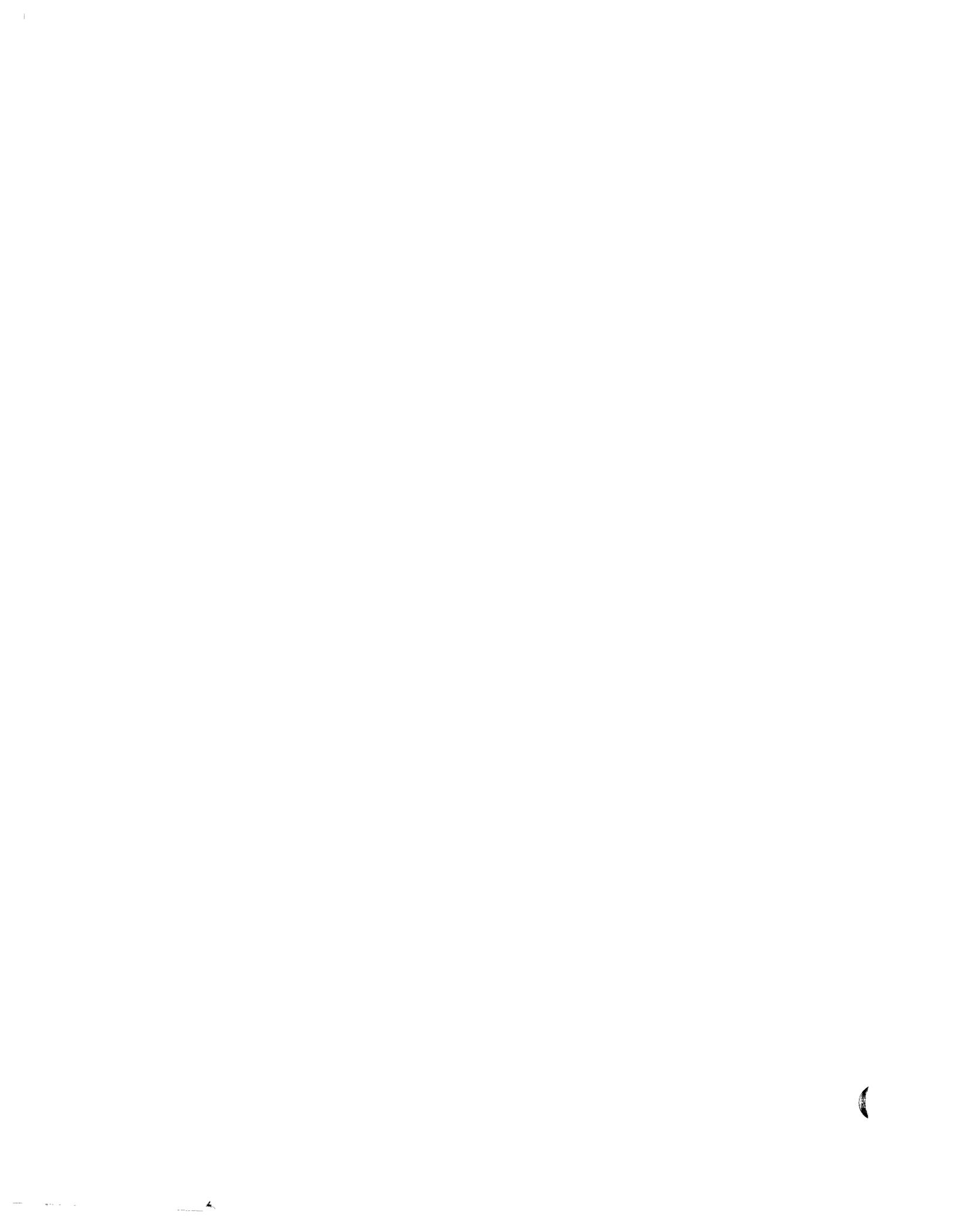
B. BOOT PROGRAM

FWIT can be loaded from diskette or cartridge tape. Program loading is initiated when you toggle the system RESET switch (or type 173000G if using console ODT's). This transfers control to a bootstrap program in PROM on the interface board. This program requests you to name the device to be used for loading FWIT. FWIT can be loaded from F0, F1, or T0.

The bootstrap reads the boot block from the specified device. The boot block controls the reading of the entire FWIT.SAV file. Also, the boot block issues a Set Mode command since FWIT runs in the extended mode. If the load is successful, control passes to FWIT, which displays its main command menu. You can remove the diskette or tape when the menu display appears.

If FWIT.SAV cannot be found or if a read error occurs during loading, one of the following messages appears:

OCTAL ERROR CODE	<u>MEANING</u>
272 or 302	FWIT.SAV not in directory (diskette) or not found (tape)
474	Read error (check data bus register, FWDBR, for error code)



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