



# **ESF~80 MONITOR USERS MANUAL**

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## 1.0 INTRODUCTION

The ESF-80 MONITOR has been designed to provide the user both a machine language debug tool and a vehicle which will ease and facilitate the transition from cassette storage to storage on the Exatron Stringy Floppy wafer. The ESF-80 MONITOR has been designed with a relocater so that the monitor may be moved to a convenient spot in memory prior to its use. Although the utility functions provided should be of general use to any user, it is assumed that experienced programmers will be using the functions specifically provided for machine language program debug. Refer to the last page of this manual for a statement of warranty.

The specific functions provided in the ESF-80 MONITOR are summarized below and described in detail in the following section:

COMMAND	FUNCTION
M	Inspect and change memory
D	Display a memory dump in hex
A	Display a memory dump as ASCII characters
S	Store a constant through memory between specified addresses
G	Go to a specified address or return following a breakpoint
B	Set breakpoint
K	Clear breakpoint
R	Print register names and their contents
X	Alter the contents of a 16-bit register or 16-bit register pair
L	Load SYSTEM format cassette tape into memory and display addresses for writing to ESF wafer
W	Write specified area of memory out to the ESF drive
C	Copy SYSTEM format cassette tape back to the cassette recorder
T	Write specified area of memory out to cassette tape in SYSTEM format
P	Display/change printer status
Z	Return to Level II BASIC

The ESF-80 MONITOR occupies about 2.7K bytes of memory and therefore may be operated with either a 4K or 16K Level II TRS-80 configured with an Exatron Stringy Floppy. The ESF-80 MONITOR is copyrighted and distributed exclusively on ESF wafers.

For the purposes of discussion the ESF-80 MONITOR functions are divided into three groups: relocater, debug aids, and utility functions. For each function a general description is supplied along with the command syntax, expected feedback, and program limitations. Whenever a hexadecimal input is required, any number of digits may be entered. If fewer than four are entered, they are assumed to be the least significant digits. The ESF-80 MONITOR has been designed to allow the user to enter more than four characters on a hexadecimal entry (in case the first digits were in error). In such a case, the last four digits entered are interpreted as the desired hex value.

## 2.0 ESF-80 RELOCATOR

The ESF-80 RELOCATOR is a program specifically designed to adjust the address references of the ESF-80 MONITOR and move it to a user-specified address. To conserve memory, the relocater does not relocate itself along with the monitor. Therefore, the ESF-80 MONITOR must be reloaded each time the user wishes it to reside in a different part of memory.

When the ESF-80 MONITOR is loaded, it resides near the bottom of RAM memory at address 4300 hexadecimal. To load and use the program, the steps are as follows:

- 1) Power up your TRS-80 Level II System.
- 2) Press ENTER in response to MEMORY SIZE? prompt.
- 3) Type SYSTEM and press ENTER.
- 4) Type /12345 and press ENTER.  
At this time the Stringy Floppy sign-on message should appear.
- 5) Place the ESF-80 MONITOR wafer in drive #0.
- 6) Type @LOADn and press ENTER.  
The value n should represent the file # for the ESF-80 MONITOR on your tape. For most people the program will be the first file and @LOAD1 is the command to be typed.
- 7) If the TRS-80 responds with READY after loading, your ESF-80 was saved without autostart. To start, type SYSTEM, press ENTER, type /17152 and press ENTER.
- 8) When started, the ESF-80 MONITOR should respond with:  
ESF-80 RELOCATOR-BASE:4300  
NEW BASE ADDR:
- 9) At this time, a value like 7100 may be entered. The ESF-80 MONITOR will relocate itself and the sign-on message:  
ESF-80 MONITOR                      VER x.x  
?  
will appear. At this time you should exercise the commands shown in the rest of this manual in order to get a "feel" for the operation of the ESF-80 MONITOR.

## 2.1 ESF-80 RELOCATION AND PROTECTION

The ESF-80 MONITOR may be relocated to any spot in memory when loaded in. It is recommended that the program be loaded into "high" memory so as not to conflict with the Cassette Copy function.

The following addresses may be used for relocating the program into upper memory. Note that these are not "protected" - that is, if you reset and perform some BASIC functions, the ESF-80 MONITOR may get altered.

TRS-80 Size	HEX ADDR	RETURN ADDR
16K	7100	28928
32K	B100	45312
48K	F100	61696

To protect the program so that you may go from the monitor to BASIC and back, it is necessary to provide the TRS-80 with an upper address for its memory usage. Then the ESF-80 MONITOR should be relocated into this protected area where it will not be altered. The following addresses should be specified on power-up when the MEMORY SIZE? prompt occurs.

TRS-80 Size	MEMORY SIZE	RELOC ADDR	RETURN ADDR
16K	29695	7400	29696
32K	46079	B400	46080
48K	62463	F400	62464

If when loading SYSTEM format tapes, the TRS-80 goes back to MEMORY SIZE?, there's a chance that your cassette tape was loading into the same memory locations occupied by the ESF-80 MONITOR. In that case, reload the ESF-80 MONITOR and relocate it to "low" memory by either pressing ENTER (in which case it doesn't get moved) or enter a low memory address such as 5000. Your cassette tape should now load without overlaying the ESF-80 MONITOR.

### 3.0 DEBUG AIDS

The Debug Aids supplied with the ESF-80 MONITOR consist of:

- a. Inspect and Change
- b. Memory Dump
- c. Character Dump
- d. Store Constant
- e. Go To
- f. Set Breakpoint
- g. Clear Breakpoint
- h. Print Registers
- i. Alter Register

These functions are provided to aid in the debug of machine language programs. Specific details on machine language programming are beyond the scope of this manual and available in several commercially available texts.

#### 3.1 Inspect and Change Memory

The Inspect and Change function allows the user to look at the contents of specified addresses in memory and alter those contents if desired. To call up the function, the user types:

M address

The address is interpreted as the last four hex digits entered. Entering a non-hexadecimal digit will terminate the inspect and change function and the general prompt for command "?" will be displayed.

When a valid address is entered, the address and its contents are displayed on the next line. The operator options then are as follows:

- a. Type in a new value followed by ENTER. In this case the value is stored and the next address and contents are displayed.
- b. Use the down-arrow to view the next location.
- c. Use the up-arrow to view previous locations.
- d. Use the ENTER key to view the current location repeatedly. This is useful for looking at I/O interfaces. For example, if you type "M 37E8" you will see the bits at the printer interface. By continually pressing ENTER and toggling your printer SELECT switch, you'll see that control line toggle.

The following example illustrates the use of the memory change function.

```
M 7234
7234 8C      (DOWN-ARROW for no change)
7235 97      AC (AC is entered as a new value)
7236 F2      (Next value is then displayed - use
7235 AC      UP-ARROW to back up)
```

When a new value is entered, the last two hex digits are interpreted as the desired value. Non-hex characters will terminate the inspect and change function.

### 3.2 Memory Dump

The Memory Dump provides a paged display of memory contents in hexadecimal. The display format consists of ten lines, each containing a start address followed by 16 bytes of hex data separated by space codes.

The specific call-up sequence is to type:

D address

where "address" is where the dump is to begin. The address is interpreted as the last four hexadecimal digits entered. Entry of a non-hex character will terminate the memory dump function and return control to the ESF-80 MONITOR command prompt "?".

As shown below, after the ten lines are displayed, a prompt for MORE? appears. By continuing to press ENTER or DOWN-ARROW, the dump continues with 10 lines of 16 bytes starting at the next sequential address following the last piece of data on the prior "page". Typing an UP-ARROW will show the previous page of memory.

```
D 7234
7234 15 76 23 14 85 61 72 AC D1 F4 BC E3 C1 40 D9 C8
7244 81 92 A0 C3 58 74 16 CA BF DE A1 76 52 81 94 20
      .
      .
      .
      .
      .
7C44 21 3F 4D CE 9B 12 40 57 71 62 83 4F 20 3D 89 20
MORE?
```

### 3.3 Character Dump

The Character Dump allows the user to observe the contents of memory as ASCII characters. The specific characters which are displayed, after clearing the most significant bit, include hex codes 20 - 5A inclusive. Values which fall

outside that range are displayed as space codes. The format used for display is similar to the Memory Dump in that "pages" of memory are shown as 10 lines of 16 characters separated by space codes. The command syntax is:

A address

The address is assumed to be the last four hex digits entered. After pressing ENTER, the 10 lines of 16 characters are displayed as shown below.

```
A 7234
7234 A C Z 1 - * K 3 - 2 5 E X - 5 7
7244 K Z   3 9 5 /   4 2   X ? 9 B F
      .
      .
      .
72C4 4   9 5       K L Z   4 7 / *   A
MORE?
```

By continuing to press ENTER or DOWN-ARROW, the next sequential block of memory is displayed; the UP-ARROW will cause the previous 160 byte page to be displayed. Pressing any key other than ENTER will terminate the function and return to the ESF-80 MONITOR command prompt "?".

### 3.4 Store Constant

The Store Constant function allows the operator to store a specified constant in memory between two specified addresses. The command syntax is:

S constant,start address,end address

The constant is assumed to be the last two digits of the first value entered with the start and end addresses being four digits each. The delimiter between the input parameters may be a comma or a space. For example:

S 0,4300,4400

would store the constant zero from 4300 hex to 4400 hex inclusive.

Entry of any non-hexadecimal digit will result in the message ERROR being displayed followed by the ESF-80 MONITOR prompt for command.

### 3.5 Go To

The Go To command has a dual purpose in the ESF-80 MONITOR. Specifically, it is used to either give control to a specific address in a user program or may be used to continue execution after incurring a breakpoint. The command syntax is:

G  
or  
G address

If no address is specified, execution will continue from wherever the last breakpoint occurred. Otherwise, control will be passed to the hexadecimal address entered by the operator. Entry of a non-hexadecimal character will result in an ERROR message and a new prompt for command.

### 3.6 Set Breakpoint

The breakpoint is probably one of the most useful tools for debugging a machine language program. By using the Set Breakpoint function, the user may cause execution of a program to be diverted to the ESF-80 MONITOR so that registers and/or memory contents may be examined. The command syntax is simply:

B address

The ESF-80 MONITOR goes to the address specified, removes and saves three bytes and replaces them with a CALL instruction to a breakpoint routine within the monitor. Now, when the user program reaches the breakpoint address, control is passed to the ESF-80 MONITOR and the message

BREAK AT address

will appear. All registers are saved, the breakpoint CALL instruction is removed, and the original three bytes are restored. When ready, the user may resume execution by just entering the command:

G

When setting a breakpoint, the user should be certain that the address specified is on an instruction boundary. In addition, if after setting a breakpoint it is decided that a breakpoint is desired at a different address, use the CLEAR BREAKPOINT before setting a new one.

### 3.7 Clear Breakpoint

Breakpoints are removed through two procedures. As described in the previous section, a breakpoint is removed when program execution reaches the breakpoint address. The other method used to remove breakpoints is to type in the Clear Breakpoint command, K. If a breakpoint has been set, it will be removed and the original program bytes restored at the breakpoint address. An ERROR message will be displayed if K is entered and no breakpoint is currently set.

### 3.8 Print Registers

The contents of the Z-80 registers may be examined via the print Register command. After entering the command:

R

the following display will appear.

AF'	xxxx	
BC'	xxxx	
DE'	xxxx	
HL'	xxxx	xxxx = register contents in hexadecimal
AF	xxxx	
BC	xxxx	
DE	xxxx	
HL	xxxx	
IX	xxxx	
IY	xxxx	
SP	xxxx	

The registers marked with the prime (') character represent the alternate register set at the time control was passed to the ESF-80 MONITOR.

### 3.9 Alter Register

The contents of any of the Z-80 registers displayed through the Print Register may be altered by using the Alter Register function. The form of the command is:

X register name

The register name consists of three characters. For the alternate register set this includes the prime (') character. For all other register names, a space code should be entered as the third character. After entering a correct name, the ESF-80 MONITOR will respond by displaying the current contents and wait for a possible change.

For example if the operator types X HL', the monitor will respond with the contents such that the display would appear as follows:

X HL' A3C2

If a hexadecimal value is entered, it is saved as the new contents of the specified register. Entry of no value will not affect the register value. A non-hexadecimal entry will result in an ERROR message.

#### 4.0 UTILITIES

The utilities supplied as part of the ESF-80 MONITOR are meant to provide a convenient transition tool for those with SYSTEM format machine language cassette tapes. The following functions are discussed in subsequent sections.

- a. Load Cassette
- b. Write Program to ESF Wafer
- c. Copy Cassette
- d. Write Program to Cassette Tape
- e. Display/change Printer Status
- f. Return to BASIC

Note: For functions that utilize the cassette recorder, the ESF-80 MONITOR will not turn off the motor if an error occurs during a tape read. This is so that the recorder does not put a "glitch" on your tape.

##### 4.1 Load Cassette

The Load Cassette function serves the purpose of loading a SYSTEM format tape into TRS-80 memory and also displaying the start address, end address, and entry point address such that it may then be written onto an ESF wafer. After entering the command, L, the ESF-80 MONITOR will respond by clearing the screen and displaying the message:

READY TAPE TO READ

Place the desired tape in the cassette recorder, press PLAY and hit ENTER on the keyboard. The monitor will begin reading the tape, display the file name from the tape and indicate that loading is in progress by blinking an asterisk in the upper right corner of the display. During the loading process, checks are made for proper tape format. If the volume is incorrect, one of the following error messages will appear:

- a. CHECKSUM ERROR
- b. HEADER CODE ERROR
- c. DATA BLOCK HEADER ERROR

Adjust the volume control and repeat the Load Cassette function.

When loading is complete, the ESF-80 MONITOR will respond with the message:

TO SAVE: W #,start address,end address,entry address

where start, end, and entry addresses are hexadecimal values. The Write Program (W) command, described in the next section, may then be used to write the program to ESF wafer.

The following cautions must be observed with the Load Cassette function:

- a) The tape must be SYSTEM format. Some tapes currently marketed such as MICROCHESS and TIME TREK by Personal Software will not load due to a non-standard format.
- b) The ESF-80 MONITOR must be located in an area of memory that doesn't conflict with the program being loaded. If in doubt, locate the ESF-80 MONITOR near the top of memory. If that doesn't work, try a lower location.
- c) Some tapes having "self protection" lockouts may not load properly.

#### 4.2 Write Program

The Write Program command provides a mechanism for writing an area of memory out to the ESF drive. The form of the command is:

W file #,start address,end address,entry address

The file # must be hexadecimal value from 1 - 63 and the addresses must be valid hexadecimal values. The start and end address represent the actual boundaries in memory where the program resides. The entry address represents the location where program execution should begin. All values must be provided. Entry of a non-hexadecimal character will result in an ERROR message followed by a prompt for a new command.

For users having multiple drive systems, the Write Program function will use the default drive. When the area is written, the ESF-80 will respond with the message:

xx (TAPE STATUS)

where xx are the Stringy Floppy status codes.

CODE	MEANING
00	No error
01	Wafer is WRITE-PROTECTED
02 or 04	Not enough tape to save the program
08	PARITY ERROR
10	CHECKSUM ERROR
40	File does not VERIFY

### 4.3 Copy Cassette

The Copy Cassette function will allow the user to load a SYSTEM format tape and write it back out to his cassette recorder. After entering the command, C, the monitor will clear the screen and display the message:

READY TAPE TO READ.

Prepare the cassette recorder and press ENTER on the keyboard. The file name will appear and an asterisk will flash in the upper right corner of the display to indicate a load in progress. During the load, the same error conditions are monitored as for the Load Cassette function. When loading is complete, the ESF-80 MONITOR will respond with the message:

READY TAPE TO WRITE

Prepare the cassette recorder, in the RECORD mode, with the tape to be written and press enter. During the writing of the tape, the asterisks will also flash. When writing is complete, the ESF-80 MONITOR prompt for command, "?", will appear.

The following cautions must be observed when using the Copy Cassette function:

- a) The tape to be copied is loaded into memory at address 4300 hexadecimal. Therefore, the ESF-80 MONITOR should be located in upper memory in order to copy cassette tapes.
- b) The program loaded via the Copy Cassette function is formatted in memory specifically for writing back out to cassette. If the program is to be executed also, it should be reloaded using the Load Cassette function.

### 4.4 Write Program to Cassette Tape

The Write to Cassette Tape function fills out the family of tape functions within the ESF-80 MONITOR. This function allows the user to write a specified area of memory out to cassette tape as a named file in SYSTEM format. The resulting program can then be reloaded any time using the Level II SYSTEM command and the assigned file name. To write the file, the syntax is

T name,start address,end address,autostart address

Before the command is entered, the cassette recorder should have been placed in the RECORD mode. If no autostart address is desired, a 0 may be entered in which case the ESF-80 MONITOR will use an entry point back to Level II BASIC as the autostart address.

#### 4.5 Display/Change Printer Status

The ESF-80 MONITOR has a printing function built into its command set. With this function enabled, anything displayed on the video display is also outputted to the printer. The function is enabled by typing

P 1      to set PRINTER STATE 1 (or ON)

P 0      to set PRINTER STATE 0 (or OFF)

By just typing "P" and pressing ENTER the ESF-80 MONITOR will respond by reporting the current PRINTER STATE.

#### 4.6 Return to BASIC

By entering the command "Z", the ESF-80 MONITOR will return to Level II BASIC.

## ESF-80 USERS

### NOTICE

Version 3.2 of the ESF-80 Monitor has been updated to accomodate timing changes which appear in the new two-ROM TRS-80's. Users of those computers had been experencing problems loading cassette tapes with the ESF-80 Monitor. Although the problem has been fixed, please note that the program has grown by 21 bytes. The Backup procedure called out on Page 16, step 4 should read:

4. Type @SAVE 1,17152,2711,17152

\* \* \* N O T I C E \* \* \*

\* \* \* L I M I T E D   W A R R A N T Y \* \* \*

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## 5.0 FROM THE AUTHOR

Thank you for your purchase. We hope that you are fully satisfied with your ESF-80 MONITOR. We strive to maintain the highest standards in our software and related products. Should you have any difficulty with any of our products, please let us know. Exatron and the contributing ESF owners welcome any comments or suggestions concerning any of our current programs or products you would like to see available in the future. Your satisfaction is always our main goal.

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Several substantial revisions/additions were made to this version of the ESF-80 MONITOR due to suggestions and comments from users. Please send any correspondence concerning operation, enhancements, bug reports or general comments to me at the following address:

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## 6.0 ESF OWNERS ASSOCIATION

The ESF Owners Association exists not only to keep you, the ESF user, informed of Stringy Floppy applications and technical information, but also to serve as a distributor of applications programs involving ESF use. The goal is to provide useful and reliable software at a reasonable price. Fees charged for programs are divided between the program author and the ESF Owners Association. The funds received by ESFOA are used to finance literature, mailing, reproduction, distribution costs and the ESF HOT LINE. By encouraging your friends to purchase their programs from ESFOA you are benefiting not only yourself, as a member of the owners association, but also you are continuing to provide the incentive to authors for the generation of more software of the same high quality.

### 6.1 Backup Copy Procedure for ESF-80 MONITOR

1. Load your ESF-80 MONITOR.
2. Press ENTER when the Relocator asks for a new base address.
3. Insert initialized wafer and type Z.
4. Type @SAVE 1,17152, 2711,17152
5. Remove Write Enable reflector.