



# **ESF-80 MONITOR USERS MANUAL**

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Since the ESF-80 MONITOR has been released, several users have called in with questions regarding use and enhancements to the program. This application note should answer many of the questions raised and makes several helpful suggestions for the use of your ESF-80 MONITOR. Please be sure to read and review your user's manual thoroughly before using this program. In that way you may best enjoy the utility of the program with a minimum of frustration.

### Start-Up and Checkout

The ESF-80 MONITOR has been designed for ease of use. 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 the 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 your drive.
- 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 MONITOR was saved without autostart. To start the program, type SYSTEM, press ENTER, type /17152, and press ENTER.
- 8) Whether started manually or loaded with autostart, the ESF-80 MONITOR should respond with:

ESF-80 RELOCATOR-BASE:4300  
NEW BASE ADDR:

- 9) At this time a value like 7400 may be entered. The ESF-80 MONITOR will relocate itself and the sign-on message:

ESF-80 MONITOR                      VER 2.1  
?

will appear. At this time you should exercise the commands shown in the user manual to become familiar with, and get a "feel" for the operation of the ESF-80 MONITOR.

### Making a Back-Up Copy

When making a back-up copy of your ESF-80 MONITOR, it is recommended that you first turn off your Expansion Interface if you have one in your microcomputer system. Once that is done, you may follow the steps in Section 6.1 of the user's manual for making your back-up copy.

### 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 its cassette copy function.

For users who wish to use the monitor for a few functions and then go on to BASIC programming, the following table represents relocation addresses which may be used.

THESE ADDRESSES MAY BE USED ONLY IF YOU PRESSED  
"ENTER" IN RESPONSE TO THE "MEMORY SIZE?" PROMPT  
AT POWER-UP.

<u>TRS-80 Configuration</u>	<u>RELOCATION ADDRESS</u>	<u>RETURN ADDRESS</u>
16K	7400 Hex	29696 Decimal
32K	B400 Hex	46080 Decimal
48K	F400 Hex	62464 Decimal

The last column represents the address, in decimal, to which the MONITOR is relocated. If RESET is pressed, or for some other reason you exit the MONITOR and go to BASIC, you may return to ESF-80 by typing SYSTEM, pressing ENTER, typing a "/" followed by the return address and ENTER. For example, if the ESF-80 is relocated to 7400 hex, you may return by typing SYSTEM, pressing ENTER, typing /29696, and pressing ENTER.

You may want to place your ESF-80 MONITOR in "protected" memory so that you may reference it at any time, as long as power is not turned off. To do so, you must:

- 1) Specify a "top of memory" value when the TRS-80 MEMORY SIZE? prompt occurs. The recommended values are listed below.

<u>TRS-80 Configuration</u>	<u>MEMORY SIZE</u>
16K	30464 Decimal
32K	46848 Decimal
48K	63236 Decimal

- 2) When the ESF-80 is loaded, the relocation values are as follows:

<u>TRS-80 Configuration</u>	<u>RELOC. ADDR.</u>	<u>RETURN ADDR.</u>
16K	7700 Hex	30464 Decimal
32K	B700 Hex	46848 Decimal
48K	F700 Hex	63232 Decimal

### ESF Tape Status Codes

When using the Write Program (WP) command, the ESF-80 MONITOR returns with the message:

(nn)TAPE STATUS

where nn is a two-digit code. Although the codes may be derived from information in the Stringy Floppy manual, they are given below for reference purposes.

<u>Code</u>	<u>Meaning</u>
00	No error
01	Wafer is WRITE PROTECTED
02	Not enough tape to save program
08	PARITY ERROR detected
10	CHECKSUM ERROR detected
40	File does not VERIFY

### Going from ESF-80 to BASIC

The user may transfer control from ESF-80 to BASIC in two different ways. The first way is to use the RESET button on the back, left side of the keyboard unit. The other is to type the command:

GO 1A19

This address is the one documented in several RADIO SHACK publications as the re-entry point to BASIC. Some users have noted that on the next typed command after transferring to BASIC, the message:

?OM ERROR

appears. This message apparently occurs only once and can be ignored.

### User Comments

User comments on the operation of the ESF-80 MONITOR are greatly appreciated. Please send any correspondence concerning operation, enhancements, bug reports or general suggestions to EXATRON, attention Vern Tallman. All written correspondence will be answered.

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## ESF-80 MONITOR USERS MANUAL

### 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
IC	Inspect and change memory
DM	Display a memory dump in hex
CH	Display a memory dump as ASCII characters
SC	Store a constant through memory between specified addresses
GO	Go to a specified address or return following a breakpoint
SB	Set breakpoint
CB	Clear breakpoint

PR	Print register names and their contents
AR	Alter the contents of a 16-bit register or 16-bit register pair
LC	Load SYSTEM format cassette tape into memory and display addresses for writing to ESF wafer
WP	Write specified area of memory out to the ESF drive
CC	Copy SYSTEM format cassette tape back to the cassette recorder

The ESF-80 MONITOR occupies about 2K 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 4 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. Upon loading, the screen will clear and the following message will appear:

ESF-80 RELOCATOR — BASE: 4300  
NEW BASE ADDR:

The user should enter the hexadecimal address to which he wants the monitor moved. If an illegal character is typed, the message will be reissued. When a proper address has been entered the monitor will be moved and initiated, resulting in the following message and prompt for command.

ESF-80 MONITOR      VER 2.1  
?

The new base address for the monitor must be greater than 43C0 hexadecimal. If it is desired to relocate the monitor to the very top of memory, you should reserve 1994 bytes when the power-up MEMORY SIZE? request appears. This is so that the TRS-80 will not use the very top memory for the stack or other functions.

### 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

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

IC 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 may then press ENTER if no change is desired,

or type in the new hex value followed by ENTER for a change.

```
IC 7234
7334 8C      (ENTER for no change)
7235 97 AC   (AC is entered as a new value)
```

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

DM 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, 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".

```
DM 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

CH 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.

```
CH 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, the next sequential block of memory is 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:

SC constant, start address, end address

The constant is assumed to be 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,

SC 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

GO  
or  
GO 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

SB 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

GO

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, CB. 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 CB is entered and no breakpoint is current set.

### 3.8 Print Registers

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

PR

the following display will appear.

AF'	xxxx	
BC'	xxxx	
DE'	xxxx	
HL'	xxxx	xxxx = register contents in
AF	xxxx	hexadecimal
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:

AR 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 AR HL' the monitor will respond with the contents such that the display would appear as follows

AR 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

### 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, LC, 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: WP #, start address, end address,  
entry address

where the start, end, and entry addresses will be hexadecimal values. The Write Program (WP) 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 MICRO-CHESS 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
- 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:

WP file #, start address, end address, entry  
address

The file # must be a 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.

### 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, CC, 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 not 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.

## 5.0 WARRANTY

The ESF-80 MONITOR *Wafer* is guaranteed to be free from defects. If the program cannot be loaded, return to Exatron for replacement.

The ESF-80 MONITOR program is distributed on an "AS IS" basis without warranty. Neither Exatron nor the ESF Owners Association shall have any liability or responsibility to customer or any other

person or entity with respect to any liability, loss or damage caused or alleged to be caused directly or indirectly by programs sold by Exatron or the ESF Owners Association. This exclusion of responsibility and liability includes but is not limited to any interruption of service, loss of business or anticipatory profits or consequential damages resulting from use or operation of such computer programs.

## 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 some of the 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 Reset button when the Relocator asks for a new base address
3. Insert initialized wafer
4. Type @SAVE#,17152,2173,17152
5. Remove Write Enable reflector
6. If you are making a copy for a friend ask him to send \$8.00 to the Owners Association. Otherwise you are stealing from Vern Tallman and the Owners Association. A copy of the manual will be mailed to the new owner of the ESF-80 MONITOR Wafer.