MONITOR

MTR-89

595-2508

Operation Manual







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INTRODUCTION

This Manual describes the functions and operation of the Z89 Monitor Program, MTR-89, that is contained in a read-only memory (ROM) in your Z89. Some of the major features of MTR-89 are:

Memory contents display and alteration. Program execution control. Floppy diskette boot-strap routine.

In addition, MTR-89 can be instructed (by means of a flag byte maintained in read/write memory) to bypass some or all of its normal functions. In this manner, a sophisticated user can augment or replace these functions.

THEORY OF OPERATION

This section supplements the information in the "Operations" and "Circuit Description" sections of your Z89 Operations Manual. In order to use all of the features of MTR-89, it is necessary to understand the Z80 operation codes and the circuit of your Z89. This section gives you details of the operation of MTR-89. The listing of MTR-89 is given in Appendix A.

Power Up and Reset

MTR-89 initializes the Z89 whenever you power-up or RESET. To power-up, use the switch on the back of the Z89. To RESET, simultaneously press the RESET key and the right-hand SHIFT key on the keyboard. MTR-89 sounds the electronic "bell" and resets to its normal state. During the initialization procedure, MTR-89 determines the high limit of continuous RAM in your Z89. Once this high limit has been determined, the Z80's stack pointer is set to this value. Then MTR-89 enters a loop waiting for you to enter a command.

Clock Interrupts

The Clock Interrupt is a crucial element in the operation of the Z89. It is a level one interrupt and is generated on the Z89 CPU board every 2 ms (millisecond). MTR-89 maintains "TICCNT" which counts up one every 2 ms. See the listing in Appendix A for the location of TICCNT.

Note that MTR-89 uses interrupts, so you should not disable interrupts for a long period of time. MTR-89 also requires a stack pointer at the top of memory with at least 80 bytes.

General Operations

When you RESET or power-up your Z89, MTR-89 responds by clearing the screen and displaying "H:". This tells you that it is ready to respond to your typed commands. When you type in something, MTR-89 will either accept it or give a beep, indicating an error.

If the letter you enter is the first letter of one of MTR-89's commands, it will display the remaining letters of the word. If the letter is not the start of a command, MTR-89 will sound the "bell" and ignore the letter.

The DELETE key will kill a partially entered line and cause MTR-89 to return to the "H:" prompt. You can use this to correct typing errors.

NOTE: In this manual, the symbol " \triangle " means type a space and "s" means type a RETURN.

The following is a list of the acceptable MTR-89 commands. You type the first letter of the command, and MTR-89 will supply the remainder of the word. You have to press the RETURN key before MTR-89 will respond.

TABLE OF MTR-89 COMMANDS

Substitute — Display or alter memory.
Go — Start a program
Program Counter — Set an address in the PC
Boot — Boot from a diskette

These commands are described in the remainder of this Manual.

DISPLAYING AND ALTERING MEMORY

One of the major features of MTR-89 is its ability to examine the contents of any Z89 memory location and to modify the contents of that location if it is in RAM.

The Substitute command is used to display memory locations. After a memory location has been displayed, its value can be changed before you proceed to something else. There is an example showing the Substitute procedure at the end of the description. You may jump ahead to it at any time.

To start the substitution process, first type "S". MTR-89 will respond by completing the word "Substitute". You should then enter the address of the memory location you want to inspect, followed by a RETURN. This address **must** be given in split-octal. Refer to Appendix B for the definitions of octal and split-octal.

MTR-89 will respond by re-displaying the address with leading zeros. Following the address, MTR-89 will display the contents of that memory location in octal.

Once the value of the memory location has been displayed, you may change it. To change it, simply type in the new value (in octal). The new value will be inserted after you complete the next step.

NOTE: MTR-89 will use the last three digits that you enter. That is, the entry "12345" will be entered as "345". You may use this to correct errors as entries are made.

After you have inspected or changed the value of a memory location, you have three options. First, you can cause MTR-89 to advance to the next memory location and display it by pressing the Space Bar. Second, you can cause MTR-89 to retrieve the previous memory location and display it by pressing the minus key, "—". Finally, you can cause MTR-89 to return to its initial "H:" by pressing the RETURN key.

The following example shows these features. To help you follow what you enter and what the computer responds, your entries and the computer's responses are shown on different lines. If a new line is really used, the new line will start at the left of the page. Otherwise, the output is shown just down a line.

EXAMPLE

| Н: | | a amout an |
|------------|------------|------------|
| s | | computer |
| | | you |
| ubst | | computer |
| | 2146 😭 | you |
| 002146 041 | | computer |
| | Δ | you |
| 002147 011 | | computer |
| | Δ | you |
| 002150 040 | | computer |
| | - | you |
| 002147 011 | | computer |
| | (A) | you |
| Н: | | computer |
| S | | you |
| ubsti | itute | computer |
| | 40100 😡 | you |
| 040100 xxx | | computer |
| | 123 A | you |
| 040101 xxx | | computer |
| | *** | you |
| 040100 123 | | computer |
| | ©R) | you |
| H: | | computer |

PROGRAM EXECUTION CONTROL

MTR-89 allows you to start a program that you have loaded into memory. It also offers a form of breakpointing.

The standard way of starting a program is to use the Go command. After you type in "G", MTR-89 responds "o". You should then type in the address (in split octal) where you want execution of your program to start. For example, if you have loaded a program at 040100, you can start it with:

```
H: Go 40100 @
```

MTR-89 allows another method of starting programs. MTR-89 maintains in its working memory a value for the Program Counter. If you enter "G" and then a RETURN after MTR -89 prints "o", MTR-89 will use the value in the PC as the starting address of your program.

To set the value in the Program Counter, you use the "P" command. After you enter "P", MTR-89 will respond "rogram Counter" and you can then enter the value you want. For example:

```
H: Program Counter 40100@9
H: Go@9
```

Your program will now be started at 40100.

If you do not enter a value after "P", but simply press RETURN, then MTR-89 will display the current value of the PC on the next line. You can change the PC by typing in a new value or you can leave it un-altered by pressing RETURN. For example:

```
H: Program Counter @ 277377 40100 @
```

(You type the second number.)

When you are debugging an assembly language program, you can use MTR-89 to set breakpoints at various places in the program. To set a breakpoint, use the Substitute command and put an HLT (166 octal) instruction where you want your program to stop.

When your program reaches the breakpoint HLT instruction, it will return to MTR-89, display an "H", and then advance to a new line and display "H:". You can now use any of the MTR-89 commands.

To continue your program, you will first have to restore the byte in the location where you placed the breakpoint HLT. Since the computer had to execute the HLT instruction, the PC will point one beyond where you placed the HLT. To continue, you will have to decrease the PC value by one.

Do this by entering the "P" command and a RETURN. When the current value of the PC is shown, subtract one from it, and enter this value as the new value for the PC. Remember that you have to subtract in octal, so ten minus one is seven!

Alternatively, you can use the "Go" command to start the program from whatever address you want, including from the place where you put the HLT.

Note that if the program that you are debugging uses keyboard interrupts, MTR-89 and your program may "fight" for keyboard input! Your program will always see every character because it gets them by an interrupt. MTR-89 is continually testing if a character is available, and it will never see some of the characters that you enter.

ADVANCED CONTROL

One of the advanced features of MTR-89 is its provisions allowing sophisticated users to augment or replace MTR-89's functions. This is usually done in conjunction with assembly language programs, although it is sometimes possible to use these features in BASIC using the PEEK and POKE commands.

The following discussion refers to symbols and locations in MTR-89. In order to make the most of this information, you should refer to the listing of MTR-89 that is in Appendix A. Note that at the end of the listing the definitions of RAM locations from 40.000 to 40.077 and 41.120 to 41.125 are given. Following these is a symbol reference table that will help you find where symbols are used in the program.

The Tick Counter (TICCNT)

MTR-89 maintains in memory a 16-bit (2 byte) tick counter named TICCNT. This counter is incremented when the clock interrupts occur. As long as interrupts are enabled, this will occur every 2 ms. You may set TICCNT to any value and change it as often as you like. The low-order byte of TICCNT is in location 40.033 (8219 decimal) and the high-order byte is in 40.034.

Using Interrupts

All Z89 interrupts cause control to be transferred into the lowest 64 bytes of memory. Since MTR-89 occupies this area, it processes all interrupts first. Except for level zero interrupts (RESET function), you can supply a routine to process interrupts yourself.

Control is passed out of MTR-89 through the UIVECs (user interrupt vector) that are located at 40.037 and following. Each vector is three bytes long, and contains a JMP instruction to an interrupt processing routine. MTR-89 calls or jumps to the appropriate UIVEC, and control is passed to the processing routine. The exit from an interrupt processing routine should be the return instruction, RET.

I/O Interrupts

Interrupts numbered 3 through 7 are I/O interrupts of devices that you connect to your Z89. MTR-89 does not process these interrupts, but simply passes them on to a program in RAM by jumping to the appropriate UIVEC.

Zenith Data Systems software (except MTR-89) use interrupt 3 for input and output to and from the keyboard and screen. Additionally, interrupts 4 and 7 are reserved for certain applications. These programs set UIVEC themselves. If you want to use interrupts, your program has to place the appropriate jump in the appropriate UIVEC.

Clock Interrupts

The level one interrupt is generated by hardware in your Z89 every 2 ms. MTR-89 always processes these interrupts, but you can force it to pass control to your routine once it is done.

To do this, set the appropriate jump in the first UIVEC locations. Then set the UO.CLK bit (001) in .MFLAG (40.010). MTR-89 will then pass each clock interrupt to your routine when it finishes its own processing.

Single Instructions and Breakpoint Interrupts

Level two interrupts are generated by the single-instruction hardware contained in the Z89. When a single-instruction interrupt occurs, MTR-89 processes it, and jumps to the location specified by the second UIVEC.

If you have set up UIVEC for level two interrupts, you can use RST-2 as a breakpoint instruction. Control will be returned to the location specified by the second UIVEC.

FLOPPY BOOT

MTR-89 contains the code necessary to boot-up an operating system from a floppy disk. Two forms of "Boot" let you select the device (5-1/4" or Z47) and drive number (0-2 or 0-3). "Boot Primary" refers to the device that you will use most often. "Boot Secondary" provides you with a convenient way to boot from your alternate device, if you have one.

BOOT PRIMARY

The primary boot device is selected by switch SW501 sections 4, 1, and 0 on the CPU Logic Circuit Board. This switch is preset for 5-1/4" primary device. You may change the switch sections to select Z47 primary device.

H: Boot @

Enter "B" and "RETURN"

H: Bootd @

5-1/4" drive primary:

Enter "B" and d(drive) = 0, 1, or 2 followed by "RETURN"

OR

Z47 primary:

Enter "B" and d(drive) = 0, 1, 2, or 3 followed by "RETURN"

BOOT SECONDARY

H:Boot SD 😪

Enter "B", "S", and "RETURN"

H:Boot SDd @

5-1/4" secondary:

Enter "B" and "S"

and d(drive) = 0, 1, or 2 followed by "RETURN"

OR

Z47 secondary:

Enter "B" and "S"

and d(drive) = 0, 1, 2, or 3 followed by "RETURN"

Use the "DELETE" key to abort the boot command and return to the monitor.

ERRORS

The console will display a "?" if any of the following conditions occur:

- 1. The boot device does not respond within 15 seconds.
- The "DELETE" key is pressed.
- 3. Switch SW501 section 2 is set to "0".
- 4. A disk error occurs.

SWITCH SW501

The sections of SW501 (on the Z89 CPU logic circuit board) have been redefined as follows:

| SWITCH SECTION | DESCRIPTION |
|-----------------------------|--------------------------------|
| 7 6 5 4 3 2 1 0 | |
| X X X X X X 0 0 | Port 174/177 = 5-1/4" drive |
| X X X X X X 0 1 | Port $174/177 = Z47$ |
| X X X X 0 0 X X | Port 170/173 = unused |
| X X X X 0 1 X X | Port $170/173 = Z47$ |
| X X X 0 X X X X | Boot primary from port 174/177 |
| X | Boot primary from port 170/173 |
| X X O X X X X X | Memory test |
| X X 1 X X X X X | Normal |
| $X \ 0 \ X \ X \ X \ X \ X$ | Baud = 9600 |
| 0 X X X X X X X | Normal |

APPENDIX A

MTR-89 LISTING

This appendix contains a listing of MTR-89. It contains all the control for primitive keyboard input and screen output. MTR-89 needs RAM locations available in locations 40.000 to 40.077 and 41.120 to 41.125, and it also needs 80 bytes of stack area in high memory.

The first few pages of the listing show definitions that are used. The last portion of the listing contains references to the symbols that are used in MTR-89. Just before this cross reference listing is the definition of RAM locations in 40.000 through 40.077.

To allow compatibility with other hardware, the MTR-89 code is segmented throughout memory. The Memory Test entry point is 7.375 and the Floppy Speed Test (5-1/4" drive) entry point is 7.372.

| MTR89 - H89 HONITOR #09:01:00. | Zenith Data Systems UNIX H8/H89 Cross Assembler PA |
|---|---|
| ut. INTRODUCTION. | 15:27:17 28-MAY-80 |
| *** | MTR89 - HB9 MONITOR ISSUE 09.01.00 |
| : | HTR89 IS A MODIFICATION OF MTR88 BY REX CHEN IN MAY, 1980. HTR89 IS IDENTICAL TO THE MTR88 IN THAT ALL ENTRY POINTS TO THE CURRENT ROUTINES REMAIN UNCHANGED AND ALL ROUTINES REMAIN UNALTERED WITH THE FOLLOWING EXECPTIONS: |
| : : : | (1), ALL CODE WHICH SUPPORTS THE CASSETTE IS REMOVED. THIS INCLUDES THE LOAD ("L") AND BUMP ("D") COMMANDS AS WELL AS ALL OF THE DEVICE DRIVERS. (2), "TYPE SPACES TO DETERMINE BAUD RATE" MESSAGE IS REMOVED. (3), THE BOOTSTRAP FOR THE Z-47 IS INSTALLED. |
| • | |
| 4 * * * * * * * * * * * * * * * * * * * | HTRBB IS AN ADAPTATION OF PAM/B ORIGINALLY WRITTEN FOR THE HEATH HB COMPUTER BY J, G, LETWIN IN 1974 AND MODIFIED BY R. N. BORCHARDT IN 1979 FOR USE IN THE HEATH HBB/HB9 COMPUTERS. |
| | MTRBB FROUIDES COMPATABILITY WITH PAM/8 SUCH THAT ALL ROUTINES HAVE RETAINED PREVIOUSLY DESCRIBED ENTRY POINTS AND ENTRY AND EXIT CONDITIONS. ROUTINES WHICH ARE NOT APPLICABLE SUCH AS THOSE PERTAINING TO THE FRONT PANEL DISPLAY HAVE BEEN DELETED. |
| : : : | COPYRIGHT 05/1976, WINTER CORPORATION 902 N. 9TH ST. 902 N. 9TH ST. LAFAYETTE, IND. |
| : | COPYRIGHT 01/1979, HEATH COMPANY BENTON HARBOR, MI. |
| : : | COPYRIGHT '05/1980, ZENITH DATA SYSTEMS INC. SI, JOSEPH, MI. |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

| INTRODÜCTION. | | | 15:27:17 28-MAY-80 |
|---------------|---|------------------|--|
| 000,000 | 4.4 | . RAM. | EQU 1 |
| 000,001 | 4 4 N | | IF ENDIF |
| | 10.1 0.1 | * | MTR88 - H88/H89 MONITOR, |
| | , 64 64 64 64 64 64 64 64 64 64 64 64 64 6 | * * * | THIS PROGRAM RESIDES (IN ROM) IN THE LOW 2048 BYTES OF THE HEATH H88/H89 COMPUTERS. |
| | | ** | INTERRUPTS. |
| | 0 0 0 110 4 | * * * | HTRB8 IS THE PRIMARY PROCESSOR FOR ALL INTERRUPTS. THEY ARE PROCESSED AS FOLLOWS: |
| | 8 8 8 | * * | |
| | 67 | * * | |
| | 690 | * * | 1 CLOCK INTERRUPT, NORMALLY TAKEN BY MTR88, |
| | 71 | * * | SETTING BIT *UO.CLK* IN BYTE *. MFLAG* ALLOWS USER PROCESSING (VIA A JUMP THROUGH *UIVEC*). |
| | ۲ / ۲ م | * * | CONTAINS: |
| | 75 | ** | (STACK+0) = RETURN ADDRESS (TO MTR88) (STACK+2) = (STACKPTR+14) |
| | . 44 | * * | (STACK+4) = (AF) (STACK+6) = (BC) |
| | 96. | * * | (STACK+8) = (bÉ) (STACK+10) = (HL) |
| | 8 8 3 3 3 | *** | (STACK+12) = (PC) THE USER'S ROUTINE SHOULD RETURN TO MTR88 VIA A *RET* WITHOUT ENABLING INTERRUPTS. |
| | æ.œ. 4.№ | ** | 2 SINGLE STEP INTERRUPTS RECEIVED WHEN IN |
| | 86 | * * | INE ENTRY: |
| | 888 | * * | (STACK+0) ≈ (STACKPTR+12) (STACK+2) = (AF) |
| | 90 | ** | (STACK+4) = (BC) (STACK+4) = (HE) |
| | 26 | £ * | (STACK+8) ≠ (HL) |
| | 300 | * * | (SIACK+10) = (FC) THE USER'S ROUTINE SHOULD HANDLE IT'S OWN RETURN |
| | 95 | * * | FROM THE INTERRUPT. |
| | 86 | * * * | THE FOLLOWING INTERRUPTS ARE VECTORED DIRECTLY THROUGH *UIVEC*. THE USER ROUTINE MUST HAVE SETUP A JUMP IN *UIVEC* BEFORE ANY |
| | 100 | * | THESE INTERRUPTS MAY OCCUR. |

| introduction. | 15:27:17 28-MAY-80 |
|---|--|
| | 3 I/O 3. CAUSES A DIRECT JUMP THROUGH KUIVEC*+6 4 I/O 4. CAUSES A DIRECT JUMP THROUGH KUIVEC*+9 5 I/O 5. CAUSES A DIRECT JUMP THROUGH KUIVEC*+15 6 I/O 4. CAUSES A DIRECT JUMP THROUGH KUIVEC*+15 7 I/O 2. CAUSES A DIRECT JUMP THROUGH KUIVEC*+18 |
| ** | ASSEMBLY CONSTANTS |
| 808180814 | XIEXI MIR88 |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| *************************************** | |

| 1177, ## 10 PGRTS 10 PGRTS 10 PGRTS 11 PGRTS | |
|--|--|
| 118X *** ALL REFERENCES TO THE H88/H8 | |
| 120x * Z80 NMI OF THE H88/H89 122x | PORTS ARE TRAPPED BY THE |
| 122X * INFORMATION SEE THE NO 123X 124X TP.PAD EQU 360Q 125X QP.STG EQU 360Q 126X QP.DIG EQU 360Q 126X QP.STG EQU 360Q 126X W. H88.GT EQU 360Q 126X M. H88.GT EQU 362Q 130X H88.ST EQU 00000001B 132X H88.ST EQU 00000001B 133X H88.ST EQU 0000001B 135X H88.ST EQU 00000011B 135X H88.ST EQU 00000011B 141X W. CASSETTE FORTS 144X M88.A EQU 00000011B 143X M H88.A EQU 00000011B 143X M H88.A EQU 00000011B 143X M H88.A EQU 00000011B 155X M. EQU 371Q 371Q 155X M. EQU 002Q 150Q 155X M. EQU 002Q 150Q 155X M. EQU 012Q 157Q 157Q M. EQU 012Q 157Q 157Q M. EQU 012Q 157Q 157Q M. EQU 015Q 157Q 157Q M. EQU 015Q 157Q 157Q M. EQU 015Q 157Q 157Q 157Q 157Q 157Q 157Q 157Q 1 | . Z (|
| 123X 124X IP.PAD EQU 360Q 126X OP.DIG EQU 360Q 126X OP.DIG EQU 360Q 127X GP.SEG EQU 360Q 127X GP.SEG EQU 361Q 128X 129X 129X 129X 130X H88B.CK.EQU 0000000B 131X H88B.CK.EQU 0000000B 133X H88B.CK.EQU 0000000B 133X H88S.FR EQU 0000000B 133X H88S.FR EQU 0000000B 135X H88S.FR EQU 0000000B 135X H88S.FR EQU 0000000B 135X H88S.FR EQU 0000000B 135X H88S.FR EQU 0000011B 145X ** CASSETTE FORTS 145X ** CASSETTE FORTS 145X ** CASSETTE FORTS 145X ** CASSETTE FORTS 155X ** AST EQU 002Q 155X ** AST EQU 002Q 155X ** AST EQU 002Q 155X A.ST EQU 002Q 155X A.ST EQU 002Q 155X A.FE EQU 002Q | FF. KON (NOF.) . TOK, BUNK. |
| 124x IF.Pau ERU 360R 126x OF.CIL ERU 360R 126x OF.CIL ERU 360R 128x # H88/H89 CDNIROL FORT 130x H88.CTL ERU 362R 131x H888.CTL ERU 362R 133x H888.RE ERU 0000001B 133x H888.RE ERU 0000001B 135x H888.RE ERU 0000001B 137x H888.NE ERU 0000001B 137x H888.DV ERU 00001100B 137x H888.DV ERU 00001100B 141x # CASSETTE FORTS 145x ** CASSETTE FORTS 145x ** ASCII CHARACTERS. 155x ** ASCII CHA | |
| 126X OF.DIG ERU 3640 127X GP.5EG ERU 3640 128X * H88/H89 CONTROL FORT 130X H88 CTL ERU 3620 131X H88B.CK ERU 0000001B 132X H88B.SE ERU 0000001B 135X H88B.SH ERU 1000000B 135X H88S.M ERU 0000001B 135X H88S.M ERU 0000001B 135X H88S.M ERU 0000011B 140X H88S.M ERU 0000011B 150X M.E. ERU 3710 150X M.E. ERU 00100 11770 | - Co |
| 127X GP.SEG EQU 3419, 129X * 123X H88.CTL EQU 352Q 132X H88.CTL EQU 0000001B 132X H88.SM EQU 0000001B 133X H88.SM EQU 0000000B 135X H88.NM EQU 00010000B 135X H88.NM EQU 0001100B 140X H88.O EQU 0000011B 142X H88.A EQU 0000011B 142X * CASSETTE FORTS 144X * 145X * 155X * | buteut port |
| 1289 | C.QUIPUT, PORT |
| 130X H88.CTL EQU 362Q 131X H888.CK EQU 0000001B 134X H888.M EQU 1000000B 135X H888.M EQU 1000000B 135X H888.M EQU 00010000B 135X H888.DV EQU 0001100B 139X ** CASETTE FORTS 141X ** CASSETTE FORTS 142X ** CASSETTE FORTS 145X ** CASSETTE FORTS 155X ** ASTV EQU 372Q 155X ASTV EQU 372Q 155X ASTV EQU 000Q 155X ASTV EQU 010Q 155X ASTV EQU 01 | |
| 131X H88P.CK EQU 0000001B 132X H88P.SE EQU 0000001B 134X H88S.M EQU 1000000B 135X H88S.M EQU 1000000B 135X H88S.M EQU 0001000B 135X H88S.M EQU 0000110B 135X H88S.M EQU 0000011B 141X ** CASSETTE FORTS 145X ** CASSETTE FORTS 155X M EQU 371Q 149X IP-TP EQU 370Q 155X ** ASTN EQU 002Q 155X ** ASTN EQU 010Q 155X ASTN EQU 012Q 155X ASTN EQU 012 | OR CLOCK AND SINGLE STEP |
| 132X H888.SS EQU 0000001B 134X H88.SM EQU 1000000B 135X H888.RT EQU 1000000B 135X H888.PV EQU 0001100B 135X H888.PV EQU 0000111B 138X H888.Q EQU 0000011B 141X ** CASSETTE FORTS 146X X** CASSETTE FORTS 146X TP. TFC EQU 371Q 145X X** CASSETTE FORTS 155X A SYN EQU 370Q 155X X** CASSETTE FORTS 155X A SYN EQU 002Q 155X A STX EQU 001QQ 155X A STX EQU 010QQ 155X A STX EQU 010QQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQ | - : |
| 134X H88 SW EQU 362Q 135X H88S.AT EQU 10000008 137X H88S.BE EQU 000100008 139X # 6QU 00011008 140X H88S.O EQU 00001108 141X * CASETTE FORTS 145X * CASETTE FORTS 145X TF FF EQU 371Q 145X TF FF EQU 371Q 145X TF FF EQU 370Q 150X APPTE EQU 370Q 155X APPTE EQU 002Q 155X APPT | WABLE/DISABLE |
| 136X H889.AT EQU 1000000B 136X H889.BE EQU 0100000B 137X H889.DV EQU 0001100B 137X # 888.0 EQU 0000011B 141X # 888.4 EQU 0000011B 142X H885.4 EQU 0000011B 145X ** CASSETTE FORTS 146X TP. TFC EQU 371Q 149X IP. TFC EQU 371Q 149X IP. TFD EQU 370Q 152X ** ASTN EQU 002Q 153X # ASTN EQU 010Q 155X A STN EQU 010Q 155X A STN EQU 010Q 155X A STN EQU 010Q 155X A BEL EQU 010Q 155X A BEL EQU 010Q 155X A BEL EQU 012Q 155X A BEL EQU 013Q | |
| 136X H888,BR EQU 0100000B 137X H888,M EQU 0001000B 139X ** 140X H888,0 EQU 00001100B 141X ** 142X H888,4 EQU 0000011B 143X ** 145X ** 145X ** 145X ** 145X ** 145X ** 145X ** 155X H88,4 EQU 371Q 149X IP.TPC EQU 371Q 149X IP.TPC EQU 370Q 152X ** 152X ** 152X ** 155X A.SYN EQU 002Q 155X A.STX EQU 002Q 155X A.STX EQU 000Q 155X A.STX EQU 010Q 155X A.BES EQU 010Q 155X A.EE EQU 015Q | |
| 137X H88S.M EQU 0001000B 138X H88S.DV EQU 0001100B 140X H88S.O EQU 0000111B 141X * 142X H88S.4 EQU 0000011B 145X * CASSETTE FORTS 146X TP.TFC EQU 371Q 149X IP.TFC EQU 372Q 152X ** ASCII CHARACTERS. 152X ** ASCII CHARACTERS. 155X A.STN EQU 002Q 155X A.STN EQU 002Q 155X A.STN EQU 002Q 155X A.STN EQU 002Q 155X A.STN EQU 010Q 155X A.ER EQU 010Q 155X A.ER EQU 010Q 155X A.ER EQU 015Q | |
| 138X H88S.DV EQU 0001000B 140X H88S.0 EQU 00001100B 141X H88S.4 EQU 0000011B 145X ** CASSETTE PORTS 145X X CASSETTE PORTS 147X IP.TPC EQU 371Q 149X IP.TPC EQU 371Q 149X IP.TPD EQU 370Q 150X A.STX EQU 002Q 155X X* ASCII CHARACTERS. 155X A.STX EQU 002Q 155X A.CT EQU 015Q 155X A.STX EQU 015Q | JEMAL OFERATION SUITCH |
| 139X * 140X H88S.0 EQU 0000011B 141X ** H88S.4 EQU 00000011B 145X ** CASSETTE FORTS 146X TF.FFC EQU 371Q 149X IP.FFC EQU 371Q 149X IP.FFD EQU 370Q 150X A.F.F. EQU 370Q 155X ** ASCII. CHARACTERS. 155X ** ASCII. CHARACTERS. 155X A.STX EQU 002Q 155X A.STX EQU 002Q 155X A.STX EQU 002Q 155X A.STX EQU 002Q 155X A.STX EQU 010Q 155X A.EF EQU 015Q | 1 DEVICE AT 174-1770 |
| 140X H88S.0 EQU 00001100B 141X * | DEVICE AT 170-1730 |
| 141X # 885.4 EQU 00000011B 142X # 143X * 145X ** CASSETTE PORTS 146X 147X IP.TPC EQU 371Q 149X OP.TPC EQU 371Q 150X OP.TPC EQU 370Q 153X # ASCII CHARACTERS. 155X ** ASCII CHARACTERS. 155X ** ASCII CHARACTERS. 155X A.STX EQU 002Q 155X A.STX EQU 000Q 155X A.CF EQU 010Q 150X A.CF EQU 015Q 175Q 150X A.CF EQU 015Q 150X A.CF EQU 015Q 150X A.CF EQU 015Q 150X A.CF EQU 015Q 150X A.CF EQU 177Q 177Q 177Q 177Q 177Q 177Q 177Q 17 | E INSTALLED AT 170-1730 |
| 142X H8BS.4 ERU 00000011B 145X ** CASSETTE FORTS 146X P. TPC ERU 371R 149X DP. TPC ERU 371R 149X DP. TPC ERU 371R 149X DP. TPD ERU 370R 150X AP. TPD ERU 370R 155X ** ASTX ERU 022R 155X A.STX ERU 002R 155X A.STX ERU 010R 155X A.STX ERU 010R 155X A.EE ERU 015R 156X A.EE ERU 015R 156X A.EE ERU 015R 156X A.EE ERU 015R 156X A.EE ERU 015R | 17.179-1739 = 247 |
| 145X ** CASSETTE PORTS 146X IP.TFC EQU 371Q 149X IP.TFC EQU 371Q 149X IP.TFD EQU 370Q 150X A.ST EQU 370Q 155X ** A\$CII CHARACTERS. 155X A.STX EQU 002Q 155X A.STX EQU 002Q 155X A.BEL EQU 002Q 155X A.BEL EQU 010Q 155X A.EE EQU 012Q 155X A.EE EQU 015Q 155X A.EE EQU 015Q | IT 174-1770 = H17 IT 124-1270 = 242 |
| 145X ** CASSETTE FORTS 146X 147X IP.TFC EQU 371Q 149X IP.TFC EQU 371Q 149X IP.TFD EQU 371Q 152X ** AST EQU 370Q 153X 154X A.STX EQU 002Q 155X A.STX EQU 010Q 155X A.STX EQU 012Q 155X A.STX EQU 015Q | |
| 140x IF.TFC EQU 371Q 149X OF.TFC EQU 371Q 149Y IF.TFD EQU 370Q 150X OF.TFD EQU 370Q 153X ** ASCII CHARACTERS. 154X A.SYN EQU 002Q 155X A.STX EQU 002Q 155X A.STX EQU 002Q 155X A.BEL EQU 002Q 155X A.BEL EQU 002Q 155X A.BEL EQU 002Q 156X A.E. EQU 012Q 159X A.E. EQU 012Q 159X A.E. EQU 012Q 150X A.E. EQU 012Q 150X A.E. EQU 015Q | |
| 148X 1FT ERU 3710, 149X 1FTFE ERU 3710, 149X 1FTFE ERU 3700, 150X 1FTFE ERU 3700, 153X ** ASCII.CHARACTERS, 153X ** ASCII.CHARACTERS, 153X A.STX ERU 0020, 155X A.BEL ERU 0070, 155X A.BEL ERU 0120, 159X A.LF ERU 0150, 159X A.EE ERU 0150, 150X A.EE ERU 1570, | |
| 149X IP.TPD EQU 3700 152X ** ASCII CHARACTERS. 153X A.SYN EQU 0220 155X A.STX EQU 0020 155X A.BEL EQU 0020 157X A.BEL EQU 0070 158X A.LF EQU 0120 159X A.CR EQU 0150 160X A.ESC EQU 0150 | 2 = |
| 150X AP.TFD ERU 3708 153X 153X 153X 155X A.SYN ERU 0028 155X A.BEL ERU 0078 156X A.BEL ERU 0108 159X A.LF ERU 0128 159X A.LF ERU 0128 159X A.LF ERU 0128 159X A.EE ERU 0128 159X A.EE ERU 0128 159X A.EE ERU 0128 159X A.EE ERU 0158 | |
| 152X ** 153X 153X 153X 153X 154X A.SYN EQU 026Q 155X A.BEL EQU 002Q 155X A.BEL EQU 012Q 155X A.LF EQU 012Q 159X A.LF EQU 012Q 159X A.CF EQU 015Q 150X A.EF EQU 012Q 151X A.EF EQU 012Q 151X A.EF EQU 012Q | |
| 153X 154X A.SYN ERU 0260 155X A.BEL ERU 0070 157X A.BEL ERU 0070 157X A.LF ERU 0120 159X A.LF ERU 0120 159X A.CF ERU 0150 160X A.ESC ERU 0150 | |
| 154X A,SYN EQU 026Q 155X A.STX EQU 002Q 156X A.BEL EQU 007Q 158X A.LF EQU 012Q 159X A.LF EQU 012Q 159X A.EF EQU 015Q 160X A.ESC EQU 033Q | |
| . 155x A.STx EQU 002Q 156x A.BEL EQU 007Q 157x A.BKS EQU 010Q 159X A.LF EQU 012Q 159X A.CF EQU 015Q 160X A.ESC EQU 033Q 161X A.DEL EQU 177Q | |
| 156X A:BEL ERU 007R 157X A:BKS ERU 010G 159X A.LF ERU 012G 159X A:CR ERU 015G 160X A:ESC ERU 033G | |
| 158X A.LF EQU 0100 159X A.LF EQU 0120 159X A.ER EQU 0150 160X A.ESC EQU 0330 161X A.DEL EQU 1770 | |
| 159x A.CR EQU 015Q 160x A.ESC EQU 033Q 161x A.DEL EQU 177Q | ACTRA |
| 160X A.DEL EQU 1770 | INCREMENTAL STATES OF THE STAT |
| 161X A.DEL EQU 177Q | N CHRRICER FR |
| | UT CHARACTER |
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| | * | NY PANEL HARTIMARE | |
|--|-------------------------|--|--|
| निसंस्त्रीचा चाराचाचाचा ह | | | CONTROL BITS+ |
| निन्न निन्निन्न ह | CB.SSI | : | SINGLE STEP INTERRUPT |
| न जनमन्त्र : | 6X CB, MTL EQU | 0100000E | MUNI INTERRUPT ENABLE |
| चित्रंचित्रं ह | CR.SPK | | SPEAKER ENABLE |
| | * | DISPLAY MODE FLAGS (IN) | (*AOK-804) |
| | 4000 | : | APPARENT PETATE |
| T T T T T T T T T T T T T T T T T T T | 3X DM.MW EQU | | MEMORY WRITE |
| : " | DM.RR DM.RW | a m | REGISTER READ REGISTER WRITE |
| | * | MACHINE INSTRUCTIONS. | |
| · · | F 3 | | F |
| | 11.11 21.11 21.11 | : | |
| - T | - Z E | | |
| 000,323 | MI.OUT | : | OUTFUT |
| ************************************** | MILDA | : | Fut |
| **** | MI.ANI | | E P |
| | TY TE | : | |
| *** | MILLEXA | | (BYTE |
| | MI,LDXB | : : : | LD IX, (BYTE B) |
| , | MILLDYA | : | IY, (BYTE |
| | MITTEL | | AF. AF. |
| | MI CIXA | : | (IX) (BYTE |
| | MILLIXB | : | (IX) (BYTE |
| 000,375 0000,351 | 94X MI.JIYA EQU | 11111101B | JP (IY) (BYTE A) JP (IY) (BYTE B) |
| | | SE OFTION BITS. | |
| 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ** | THESE BITS ARE SET IN | CELL . MFLAG. |
| | 1X UO HLT EQU | : | DISABLE HALT PROCESSING |
| | 15.00 15.00 15.00 | | TRUNI PHINEL Y UPDATE |
| 000,001 000,000 000,000 | 4X UO.CLK EQU 5 XTEX | XXXXXXXXX J 00000001B XXI Z47DEF | ALLOW PRIVATE INTERRUPT PROCESSING DEFINE 247 EQUATES |
| | | : | |
| | | | |

| | 2008 2009 2009 2009 | * * * | DISKI | DISK INTERFACE CONSTANTS | |
|--------------------|------------------------------|-------------|----------------------------|--------------------------|--|
| 77 | XX2. | ¥ . | Č | @ Y \$ | A STATE OF THE PROPERTY OF THE |
| 000.17.1 | ZZTZ. | D.DAT | EQU | D+STA+1 | INTERFACE UATA PORT |
| 000,001 | 213X 214X 214X | in Til | EDI | 000000018 | |
| 000.040 | 210X | NOU . | EGU | 00100001 | DONE |
| | 3, X415. | S. DTR. | ERU | 10000008 | DATA IRANSFER REQUEST |
| 900,002 | 21/X) 21/8 X (4 | • | EQU | 00000010B | RESET COMMAND. |
| | XX 2000 | * * * | CONTROLLER | LLER STATUS REGISTER | |
| 000,200 | ×.∪ | SUNE | EGU | 1000000B | LINIT NOT REALY |
| 0.00.1.00. | · U. | S. WP. | | 01000000 В | WRITE PROTECTED DRIVE. |
| | | * | AUXILL | ARY STATUS REGISTER | |
| | ~: | ; ; ; | | | |
| 000,100 | ~ · | 000.00 | EQU | 0100000B | O DOUBLE DENS |
| 060,000 | T. A | 35 G 15 U |))))) | # 00000 to 0000 | STREET A MATLAGE RENGALIT |
| .000,0003 | A Xogg | | EGU | 0000011B | نسي ۽ |
| | | | | | |
| | * * 2000 2000 2000 | * | DISK | COMMENDS | |
| 000.000 | 234X | C. BOOT | EGU | Ö | |
| 200 000 | | 1, 1, KS.T. | .E.G. | | |
| 000.000 000.000 | 237X II | C EC. LSC | EQU | M K | AUX, SIAIUS SECTOR COUNT |
| 000.000 | 238X I | IC. RAD | EGU | 4 | READ ADDR. OF LAST SECTOR ACCESSED |
| 000,005 | 1 X322 | C, REA | EQU. | io. | READ SECTORS |
| 000,000 | 240X L | 10.8K. | بر 1000 1000 1000 | 10 | WRITE SECTORS |
| 000,010 | 242X | C. WRIB | FOU | , 00 | STATES STATES STATES STATES |
| 000,011 | 243X | C. WRD | EQU | 10 | |
| 000,012 | 244X D | C.WRIE | EQU | 10 | WRITE SECTORS BUFFERED & DELETE |
| 000,013 | 2,45X D | C.CPY | EQU | | |
| 000,014 | 246X D | C. FREC | EGU | 71 h | TORRAPH INT SU |
| 000.016 | 248X D | C. FRE | ERU | 4 | IBM |
| 000,017 | 249X | C.FRM3 | EGU | | |
| | | | | | |

| H89 MONITOR | \$00.10.90 | | | enith Dat | ď. |
|--|--|--------------------------|-------------------------------------|--|----|
| EQUATES FOR 247 | | | | 15:27:19 28-MAY-80 | : |
| | * * XIUC | USEFUL FLAGS | FLAGS | | : |
| 000,000 000,040 000,100 000,140 | 2552X UNT.0 2553X UNT.0 2554X UNT.1 2555X UNT.1 | EQU EQU EQU EQU | 00100000B 01000000B 01000000B | UNIT 1 UNIT 2 UNIT 2 UNIT 3 | |
| 001,000 000,200 000,000 | | EQU EQU XTEXT | 256 128 H17DEF | SECTOR SIZE = 256 BYTES SECTOR SIZE EQUATES FOR H17 BOOT ROM | |
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| | % × × × × × × × × × × × × × × × × × × × | H17 C | CONTROL INFORMATION | *20 |
|---------------------------|---|------------------|----------------------|--|
| 721 | 264X | . = | 776 | DICK PONTED! |
| | 266X | | X (5.0) | |
| 000.000 | 26.7X. UF. HP. | | | HOLE, DETECT |
| 000.000 | 268X DF, TO | | 0000001018 | TRACK O DETECT |
| 000.010 | 270X DF . SD | EQC. | 000010008 | SYNC RETECT |
| | 271× | | | |
| 000.001 | 272X DF.WG | m : | 0000001B | WRITE GATE ENABLE |
| 000 004 | 2007 - 11 - 1000 000 - 11 - 1000 | u ı | | 14.175 SELECT. 0 |
| 000:000 | 275X DF.DS2 | | 00001000B | DRIVE SELECT 1 |
| 000.020 | 276X DF . MO | : w | 0001000 | MOTOR ON (BOTH DRIVES) |
| . 000 . 040 | 27.2X, DE, DI. | ш | 00100001 | |
| 000+100 | 278X DF.ST | ш | 0100000010 | |
| | 27.9X. DE JWR | : | 10000000E | WRITE ENABLE RAM |
| | 780X | | | |
| | 282X | | | |
| | 283X ** | DISK | UART FORTS AND C | AND CONTROL FLAGS. |
| | 284X | | # 1 | |
| 000,174 | 285X UP. DP | EQU | 07CH | DATA PORT |
| 000.175 | 286X UP.FC | EGU | 07DH | FIL CHARACTER |
| .000,175 | 287X, UF, ST. | ERU | 07pH | STATUS FLAGS |
| 000.176 | 288X UF.SC | EGU | 07ЕН | SYN CHARACTER (OUTPUT) |
| | 289X, UP, 5R. | EQU | 97EH | SYNC.RESET.(INPUT) |
| 000.001 | 290X 291X 115 . 5.114 | - C | 31000000 | |
| 000,002 | 292X UF ROR | 7.07 1.07 | 000000108 | STATE AND CORRESS CONTRACTOR CONT |
| 000,004 | 293X UF, RPE | EGU | 00000100E | RECEIVER PARITY ERROR |
| 000,100 | 294X UF.FCT | EGU | 0100000B | FILL CHAR TRANSMITTED |
| 000,200 | 295X, UE, TBM. | ERU | 10000000t | TRANSMITTER BUFFER EMPTY |
| | 296X | | | |
| | 2.7.4. 2.9.8.x | | | |
| | 299X ** | CHARAC | HARACTER DEFINITIONS | |
| | | | | |
| 000.375 | C. DSYN | EGU. | OFFI | PREFIX SYNC CHARACTER |
| • | | \ \ \ \ | nosego | חבים בתחובט |
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| 235 335 | 335 Maria Edu 36256 Matir For Holle Routine En 335 Maria Edu 36275 Matir Edu Hall For Holle Routine En 335 Maria Edu 36275 Matir Edu 335 Maria Edu 36275 Matir Edu Edu 335 Maria Edu 335 | 036,235 | ** MISCELLA | EQUS EQUATES FROM H17 BO | Z BOOT ROM. |
|---|--|--|--|--|---|
| 1922 340 | 12.52 34.00 18.0 | 036,271 000,130 037,132 | WHE EQU WNH EQU BOOTAL EQU BOOTAL EQU | | FOR HOLE ROUTINE ENTRY FO FOR NO HOLE ROUTINE ENTRY ER OF RAM TO CLEAR SLEAK START LOCATION |
| 027 027 350X EIXIT EQU 34027A 2012 2012 351X ERFTCNT EQU 1264 200 353X D.DECNT EQU 1264 353 D.DECTINE | 027 027 350X EIXIT EQU 340274 2012 351X ERPTCNT EQU 402644 200 353 D.OECNT EQU 40264 353 D.OECNT EQU 40264 353 D.OECNT EQU 40264 353 D.OECNT EQU 40264 353 D.OECNT EQU 40264 | 330,252 300,037 341,061 341,061 333,366 334,077 | ###################################### | 3702026 372126 312126 410616 340376 340376 3400706 400706 | ZERO RAM ROUTINE DISK UNIT NUMBER STORAGE USER INTERRUPT VECTOR ZIJ TIMER INTERRUPT HANDLER LOCATION RESET ZIZ ROUTINE LOCATION READ ZIZ ROUTINE LOCATION SET DEVICE PARAMETER RAM LOCATION |
| | | 40.206 336.073 336.027 300.012 40.264 | SUP3 EDU3 ENTT EQU ERPTCNT EQU D.OECNT EQU | | SET DEVICE FARAMETER ENTRY EI/RET LOCATION ERROR COUNT NE 8251 USART BITS |
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| 51 USART BIT DEFINITIONS | fions. | | | | \$40.400 \qua |
|--|---|-------------------------------|---|---|--|
| | | | | | 012/123 |
| | 356X | . ** | 8251 US | USART BIT DEFINITIONS. | TIONS |
| | 357X | * | | | |
| | | * | FORT AI | ADDRESSES | |
| 000.000 | | Ime | Hou | 0 | REGISTER 19 |
| 000,001 | | USR | EQU | · · · · · · · · · · · · · · · · · · · | STATUS REGISTER IS NEXT |
| 000,372 | 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 | SC. UART. | £0,U | 3720 | |
| | 366X | : | | | : |
| | 367X 368X | * * | MODE | INSTRUCTION CONTRO | L BITS. |
| 000.100 | 369X | UMI.1B | EGU | 01000000B | 1 STOP BIT |
| 000,300 | 371X | UMI SE | | 11000001 | 2 STOP BITS |
| 000,040 | 372X | UMI.FE | | 0010000E | EVEN PARITY |
| | 373X | LMI.PA | | 00010000 | USE PARITY |
| 000,000 | | UNITE | | 000001008 | 6 BIT CHARACTERS |
| 000,010 | 376X | UMI.LZ | | 00001000B | TER |
| 000.014 | 377X | UMI.L8 | | 00001100B | 8 BIT CHARACTERS |
| 000.001 | 378X | UMILIX | ERU. | 000000018 | Χ. : |
| 000,002 | 3797 | UMI:16X | | 000000108 | CLUCN X 16 CLUCN X 64 |
| | 381X | | - | | |
| | | ×. | KARARAN. | YOU HOW I YOU | +°p-+¤ |
| αου•ποα | 384X | UCI.IR. | ERU | 01,00,00,0E | : |
| 000.040 | 385X | UCI.RO | EGU | 00100000B | READER-ON CONTROL FLAG |
| 000,020 | 7007 | יים דינו דינו |))) (| 00001000 | #PONCY PERMIT II |
| 200.000 | XXXX | UCI.IE | E C | 0000010B | ENABLE INTERFUETS FLAG |
| 000,001 | 389X | UCI.TE | EGU | 00000001B | IT ENABLE |
| | | | () · · · · · · · · · · · · · · · · · · | 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 11.10.10.10.10.10.10.10.10.10.10.10.10.1 |
| | X 7 & Y | ¥ | n - H - N | REAL CONTHINE | - : |
| 000.040 | 393X | USK.FE | EGU | 0010000B | FRAMING ERROR |
| .000,020 | 39.4X. | USR.OE | ERU | 0001000E | OVERRUN ERROR |
| 000,010 | 300X | USR FE | EGU | 00001000B | FORTITY ERROR HOSNOWITHING GROTY |
| 000 | 107K | 100 X 1 VE | 707 | 000000108 | RECEIVER READY |
| 000.000 | X X X X X X X X X X X X X X X X X X X | HSR. TXR |) E | 0000001E | TRANSMITTER READY |
| 042,200 | 399 | | XTEXT | U8250 | DEFINE 8250 ACE BITS |
| 000.001 000.002 000.002 002.000 | 0.40.00 0.40.0 | USR.TXE USR.RXR USR.TXR | ERU ERU ERU XTEXT | 00000100R 00000010B 000000010B 00000001R | MPTY Y EADY CE BIT |

| 402X ** 8250 UART CONTROL AND BIT DEFINITIONS. 403X AC DLY EQU 3500 STRIPE CONTROL AND BIT DEFINITIONS. 403X AC DLY EQU 3500 STRIPE CONTROL AND BIT DEFINITIONS. 403X WITHE EQU 0 DIVISION ENTER FOR THE FORD AND ALLY WITHER EQU 1 DIVISION ENTER FOR THE FORD ALLY WITHER EQU 1 DIVISION ENTER FOR THE FORD ALLY WITHER EQU 1 DIVISION ENTER FOR THE FORD ALLY WITHER EQU 1 DIVISION ENABLE FOREIGN FROIDING FOREIGN FOR ALLY WITHER EQU 1 DIVISION ENABLE FOREIGN FROIDING FOREIGN FOREI | | | | | 15:27:24 28-MAY-80 |
|--|---|--|-------------|------------|--|
| 402X 4% 9250 UMRT CONTROL AND RIT DEFINITIONS. 400X SC.ACE EQU 3500 SYSTEM CONSOCIES RELAY FOR 8250 ACC 400X ACC FLV EQU 100 SYSTEM CONSOCIES RELAY FOR 8250 ACC 400X ACC FLV EQU 1 100 SYSTEM CONSOCIES RELAY FOR 8250 ACC 400X ACC FLV EQU 1 100 SYSTEM CONSOCIES RELAY FOR 8250 ACC 400X ACC FLV EQU 1 100 SYSTEM CONSOCIES RELAY FOR 8250 ACC 400X ACC FLV EQU 1 100 SYSTEM CONSOCIES RELAY FOR FOLLOW FOR ACC 410X | | | | | |
| 100 | | *: XX 0:0 | 8250 | CONTROL | BIT DEFINI |
| 405X AC.DLY EGU 110 220 HIL. SEC. DELAY FOR S250 405X UR.RER EGU 0 RECETUER BUFFER REGISTER (READ 405X UR.THR EGU 0 DIVISOR LATCH (LEST SIGNIFICAN) 410X UR.DLL EGU 0 DIVISOR LATCH (LEST SIGNIFICAN) 411X UR.DLL EGU 1 DIVISOR LATCH (HOST SIGNIFICAN) 412X UR.LER EGU 1 DIVISOR LATCH (HOST SIGNIFICAN) 413X UR.LER EGU 0 DIVISOR LATCH (HOST SIGNIFICAN) 413X UR.LER EGU 1 DIVISOR LATCH (HOST SIGNIFICAN) 413X UR.LER EGU 1 DIVISOR LATCH (HOST SIGNIFICAN) 413X UR.LER EGU 1 DIVISOR LATCH (HOST SIGNIFICAN) 413X UR.LER EGU 3 DOXOGOODIB ENABLE FRENCHIP IND. REGISTER 413X UR.LER EGU 3 DOXOGOODIB ENABLE FRENCHIP IND. REGISTER 413X UR.LER EGU 3 DOXOGOODIB ENABLE FRENCHIP IND. REGISTER 413X UR.LER EGU 3 DOXOGOODIB ENABLE FRENCHIP IND. REGISTER 422X UR.LER EGU 000000001 B BIT WARDS 422X UR.LER EGU 000000010 B BIT WARDS 422X UR.LER EGU 000000010 B BIT WARDS 422X UR.LER EGU 00000010 B BIT WARDS 422X UR.LER EGU 00000000 B BIT WARDS 422X UR.LER EGU 0000000 B BIT WARDS 422X UR.LER EGU 00000000 B BIT WARDS 422X UR.LER EGU 000000000 B BIT WARDS 422X UR.LER EGU 00000000 B BIT WARDS 422X UR.LER EG | 000,350 | O4X SC | ш | 3500 | CONSOLE PORT 1F 8250 |
| A097 UR.RBR EGU O | 000.156 | 05X AC | :ω : | 110 | * SEC. DELAY FOR 8250 |
| 11.2 UK. DLL | 000*000 | | : LLI | 0 | ECEIVER BUFFER REGISTER |
| 413 UR. DLL EQU 0 | 000.000 | | : : : | 0 | REGISTER CURITE ONLY |
| 14.3 | 000.000 | Ę, | ш | • | LATCH (LEAST |
| 415.4 IR. BERU 1 INTERRUPT ENABLE REGISTER 415.4 UC.FRE GRU 00000010B ENABLE TRANSPERTURE TRESSTER 415.4 UC.FRE GRU 0000010B ENABLE FREELY FINDING FREISTER 415.4 UC.FRE GRU 0000010B ENABLE FREELY FINDING FREISTER 422.4 UC.HST ERU 0000010B ENABLE FREELY INTERRUPT FRUDING LO. 423.4 UC.HST ERU 00000010B INTERRUPT INTERRUPT FRUDING LO. 423.4 UC.FRE GRU 00000010B INTERRUPT INTERRUPT FRUDING LO. 423.4 UC.FRE GRU 00000010B SBT WARS BERTON ENABLED TO ENABLE GRU 00000010B SBT WAS BERTON ENABLE GRU 0000010B BERTON ENGEN ENABLE GRU 0000010B BERTON ENGEN | 000.001 | | Ш | ₩ | (MOST |
| 17 17 17 17 17 17 17 17 | 000.001 | 414X 415X UR.I | : W | | INTERRUPT ENABLE REGISTER |
| 418X. UC. RSI. EUU 0000100B ENABLE MODEN STATUS INTERRUPT 423X UC. RSI. EUU 0000100B ENABLE MODEN STATUS INTERRUPT 423X UC. RSI. EUU 0000110B INTERRUPT IDENTIFICATION REGIST 423X UC. SEM. EUU 00000110B INTERRUPT IDENTIFICATION REGIST 423X UC. SEM. EUU 00000001B STI. MODEN STATUS INTERRUPT IDENTIFICATION REGIST A23X UC. SEM. EUU 00000001B STI. MODEN STATUS INTERRUPT IDENTIFICATION REGIST A33X UC. SEM. EUU 00000001B STI. MODEN STATUS INTERRUPT IDENTIFICATION REGIST A33X UC. SEM. EUU 00000000B STI. RREAL A33X UC. SEM. EUU 0000000B STI. RASANITIER SHIFT REGISTER EPE A33X UC. SEM. EUU 0000000B STI. RASANITIER SHIFT REGISTER EPE A33X UC. SEM. EUU 0000000B STI. RASANITIER SHIFT REGISTER EPE A33X UC. SEM. EUU 0000000B STI. RASANITIER SHIFT REGISTER EPE A33X UC. SEM. EUU 0000000B STI. RASANITIER SHIFT REGISTER EPE A33X UC. SEM. EUU 0000000B STI. RASANITIER SHIFT REGISTER EPE A33X UC. SEM. EUU 0000000B STI. RASANITIER SHIFT REGISTER EPE A33X UC. SEM. EUU 0000000B STI. RASANITIER SHIFT REGISTER EPE A33X UC. SEM. EUU 0000000B STI. RASANITIER SHIFT REGISTER EPE A33X UC. SEM. EUU 0000000B STI. RASANITIER SHIFT REGISTER EPE A33X UC. SEM. EUU 0000000B STI. RASANITIER SHIFT REGISTER END 00000000B STI. RASANITIER SHIFT REGISTER END 0000000B STI. RASANITIER EUU 0000000B STI. RASAN | 000,001 | 416X UC+E | min | 0000001B | ENARLE RECEIVED DATA AVAILABLE INTERRUPT |
| 419X UC.MSI EGU 00001009 ENABLE MODER STATUS INTERRUPT 420X UR.IIR EGU 2 421 | 000,004 | 418X UC.R | а ш | 000001008 | ENABLE RECEIVE STATUS INTERRUPT |
| 422X UG. IIE EQU 00000010B INTERRUPT IDENTIFICATION REGISTER 423X UG. IIE EQU 00000110B INTERRUPT ID NITERRUPT ID CAND. 10. MEANS. UG. IIE EQU 00000110B INTERRUPT ID NITERRUPT ID CAND. 10. MEANS. UG. III EQU 00000110B INTERRUPT ID NITERRUPT ID CAND. 10. MEANS. UG. 6BW EQU 00000011B INTERRUPT ID NITERRUPT ID CAND. 10. MEANS. UG. 6BW EQU 00000011B INTERRUPT ID NITERRUPT ID CAND. 10. MEMBED 00000011B INTERRUPT ID NITERRUPT ID NITERRUPT ID CAND. 10. MEMBED 00000011B INTERRUPT ID NITERRUPT ID NITERR | 000.010 | 419X UC.M | :Ш | 00001000B | ENABLE MODEM STATUS INTERRUPT |
| 422X UC.IID EQU 00000018 INTERRUFT INTERRUFT FENDING CO MEANS 422X UC.IID EQU 00000110B INTERRUFT INTERRUFT FENDING CO MEANS 422X UC.IID EQU 0000001B INTERRUFT INTERRUFT FENDING CO MEANS 422X UC.IID EQU 0000001B S BIT WORDS 422X UC.6BW EQU 00000001B D BIT SERVING REGISTER 422X UC.6UC EQU 0000001B D BIT SERVING REGISTER EMPTY 422X UC.6UC EQU 0000001B D BIT SERVING REGISTER EMPTY 422X UC.6UC EQU 0000001B D BIT SERVING REGISTER EMPTY 422X UC.6UC EQU 0000001B D BIT SERVING REGISTER EMPTY 422X UC.6UC EQU 0000001B S FRENKT TERRUFT REDITTER HOLDING REGISTER EMPTY 422X UC.6UC EQU 00000001B S FRENKT TERRUFT REDITTER EMPTY 422X UC.6UC EQU 00000001B S FRENKT TERRUFT REDITTER EMPTY 423X UC.6UC EQU 00000001B S FRENKT TERRUFT REDITTER EMPTY 423X UC.6UC EQU 00000001B S FRENKT TERRUFT TER | 200 | | :1 | | |
| 422X UC.IID EQU 00000110B INTERRUFT ID TOWN TO THE CONTROL REGISTER 422X UR.LCK EQU 3 00000010B 5 BIT WORDS 422X UC.5BW EQU 00000011B 8 BIT WORDS 432X UC.5BW EQU 00000011B 8 BIT WORDS 432X UC.5BW EQU 000000100B 78 BIT WORDS 432X UC.5BW EQU 000000100B 78 BIT WORDS 432X UC.5BF EQU 00000000B 78 BIT WORDS 432X UC.5BF EQU 0000000B 78 BIT WORDS 78 ELECTED 433X UC.5BF EQU 0000000B 78 ELECT FAILY CONTROL REGISTER 433X UC.5BF EQU 0000000B 78 ELECT FAILY CONTROL REGISTER 433X UC.5BF EQU 0000000B 78 ELECT FAILY CONTROL REGISTER 433X UC.5BF EQU 0000000B 78 ELECT TO SEND 0000000B 78 ERENT TO SEND 000000B 78 ERENT TO SEND 0000000B 78 ERENT TO SEND 00000000B 78 ERENT TO SEND 0000000B 78 ERENT TO SEND 00000000B 78 ERENT TO SEND 0000000B 78 ERENT TO SEND 0000 | 000.002 | , Y C | ul lu | 2000000018 | IDENTIFICATION REGISTER |
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| 432X UC.EFS EQU 00010000B STICK FARITY SELECT 433X UC.SKF EQU 00100000B STICK FARITY 433X UC.SKF EQU 10000000B STICK FARITY 435X UC.DL EQU 10000000B DIVISOR LATCH ACCESS 435X UC.BL EQU 00000001B DIVISOR REGISTER 435X UC.RT EQU 00000001B READLEST TO SEND 441X UC.QL EQU 00000000B READLEST TO SEND 443X UC.LQQ EQU 00001000B DUT 2 444X UC.LQQ EQU 00001000B DATA READY A 444X UC.LQQ EQU 00001000B PATA READY 444X UC.RE EQU 00000000B PREAK INTERNOT 444X UC.RE EQU 00000000B PRE | 000,010 | 431X UC.F | ; w | 000010008 | BLE: |
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| 10000000 100000000 | 000.040 | 433X UC, SI | W L | 00100000B | STICK PARITY |
| 436X 436X 437X UR.MCR EQU 437X UC.MTR EQU 437X UC.MTR EQU 437X UC.MTR EQU 441X UC.QU1 EQU 600000010B REQUEST TO SEND 444X 443X UC.QR EQU 600000010B DATA READY 444X UR.LSR EQU 600000010B DATA READY 445X UC.QR EQU 60000010B DATA READY 445X UC.QR EQU 60000100B PARITY ERROR 448X UC.GR EQU 60000100B PARITY ERROR 448X UC.FE EQU 60000100B FRAMING ERROR 450X UC.THE EQU 60001000B TRANSMITTER WHIFT REGISTER 651X UC.THE EQU 60001000B TRANSMITTER WHIFT REGISTER 652X UC.DRS EQU 60000010B TRANSMITTER SHIFT REGISTER 653X UR.MSR EQU 60000010B DELTA CLEAT TO SEND 655X UC.DRS EQU 60000010B TRANSMITTER SHIFT REGISTER 655X UC.DRS EQU 600000100B TRANSMITTER SHIFT REGISTER 655X UC.DRS EQU 60000010B TRANSMITTER SHIFT REGISTER 655X UC.DRS EQU 60000010B TRANSMITTER SHIFT REGISTER 655X UC.DRS EQU 60000010B TRANSMITTER SHIFT READY 655X UC.DRS EQU 60000010B TRANSMITTER SHIFT READY 655X UC.DRS EQU 60000010B TRANSMITTER SHIFT READY 655X UC.DRS EQU | 000 - 200 | 430 X430 X | ul lu | 10000000 | OF FREST |
| 437X UR.MCR EQU 4 MODEM CONTROL REGISTER 438X UC.NTR EQU 00000010B REQUEST TO SEND 440X UC.0U1 EQU 0000100B DUT 1 441X UC.0U1 EQU 0000100B DUT 2 442X UC.LOG EQU 0001000B DATA READY 444X UR.LSR EQU 0000001B DATA READY 445X UC.DR EQU 0000001B DATA READY 445X UC.DR EQU 00000100B FARITY ERROR 445X UC.DR EQU 0000100B FARITY ERROR 445X UC.PE EQU 0000100B FARITY ERROR 445X UC.FE EQU 0000100B FARITY ERROR 450X UC.TRE EQU 0010000B TRANSMITTER HOLDING REGISTER 450X UC.TRE EQU 0100000B TRANSMITTER HOLDING FEGISTER 451X UC.TSE EQU 0100000B TRANSMITTER SHIFT REGISTER 452X UC.DRS EQU 0000001B DELTA CLEAT TO SEND 455X UC.DRS EQU 0000001B TRANSMITTER SHIFT REGISTER 455X UC.DRS EQU 00000010B DELTA DATA SET READY 455X UC.DRS EQU 00000010B DELTA SET READY 455X UC.DRS EQU 00000010B TRAILING EDGE OF RING | | 436X | | | |
| 438X UC.RTS EQU 00000018 REQUEST TO SEND 440X UC.DU1 EQU 000000108 REQUEST TO SEND 011 1 1 2 441X UC.DU1 EQU 00001000B DU1 1 1 0 SEND 041X 1 1 0 SEND 011 1 1 1 0 SEND 011 2 443X UC.LGG EQU 00001000B DOTA READY 443X UC.DR EQU 00000018 DATA READY 445X UC.PR EQU 00000100B PARITY ERADY 445X UC.PR EQU 00000100B PARITY ERADR 445X UC.PR EQU 00000100B PARITY ERADR 445X UC.PR EQU 00001000B PARITY ERADR 450X UC.THE EQU 0010000B TRANSMITTER HOLDING REGISTER 450X UC.THE EQU 0100000B TRANSMITTER HOLDING A53X UC.PR EQU 0100000B TRANSMITTER HOLDING REGISTER 454X UC.DCS EQU 00000010B TRANSMITTER SHIFT REGISTER 454X UC.DCS EQU 00000010B DELTA DATA SET READY 455X UC.DCS EQU 00000010B DELTA DATA SET READY 455X UC.DCS EQU 00000010B DELTA DATA SET READY 456X UC.TER EQU 00000010B TRAILING EDGE OF RING | 000.004 | 437X UR.M | · Wi | 4 | MODEN CONTROL REGISTER |
| 440X UC.KIS ERU 000000010B REGUEST TO SEND 440X UC.QU1 ERU 0000100B DUT 1 441X UC.QU2 ERU 0000100B DUT 2 442X UC.LOG ERU 0000100B LOGF 443X UR.LSR ERU 0000001B DATA READY 445X UC.PE ERU 0000010B PARITY EREGESTER 445X UC.PE ERU 0000100B PARITY ERROR 445X UC.PE ERU 0000100B PARITY ERROR 449X UC.FE ERU 0000100B FRAMING ERROR 449X UC.FE ERU 0010000B FRAMING ERROR 450X UC.THE ERU 0100000B TRANSMITTER HULDING REGISTER 451X UC.TSE ERU 0100000B TRANSMITTER SHIFT REGISTER 452X BASS UC.DES ERU 0000010B DELTA CLEAR TO SEND 455X UC.DES ERU 0000010B DELTA SET READY 455X UC.DER ERU 0000010B DELTA SET READY 455X UC.DER ERU 0000010B DELTA SET READY 455X UC.DER ERU 0000010B DELTA SET READY | 000.001 | 438X UC. E | ا بلتا : | 0000000 | DATA TERMINAL READY |
| 441X UC.COUZ EQU 00001000B CUUT 2 442X UC.LOO EQU 00001000B COOF COOF COOF COOF COOF COOF COOF COO | 000 100 0 000 100 0 | 469X UC. R | u L | 0000001018 | REQUEST TO SEND |
| 442X UC.LOO EQU 00001000B LOOF 443X 444X UR.LSR EQU 0000001B DATA READY 445X UC.DR EQU 00000010B DATA READY 445X UC.PE EQU 0000010B PARITY ERDR 447X UC.PE EQU 0000100B PARITY ERROR 449X UC.FE EQU 0000100B PARITY ERROR 449X UC.FE EQU 00001000B PREAN INTER HOLDING REGISTER 450X UC.THE EQU 0010000B TRANSMITTER HOLDING REGISTER 451X UC.TSE EQU 0100000B TRANSMITTER HOLDING REGISTER 451X UC.DES EQU 0000001B DELTA CLEAR TO SENT 455X UC.DES EQU 0000001B DELTA DATA SET READY 455X UC.DER EQU 0000010B DELTA DATA SET READY 456X UC.TER EQU 0000010B TRAILING EDGE OF RING | 000,010 | 441X UC.01 | اللها: : | 000010008 | 007 2 |
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| 7.7.7.7.7.8.4.6.2.9.6.2.9.6.2.9.6.2.9.8.9.8.9.8.9.8.9.8.9.8.9.8.9.8.9.8.9 | 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 443X | ا | ь | |
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| 447% UC.FE EQU 00000100B FARITY ERROR 448% UC.FE EQU 00001000B FRAMING ERROR 449% UC.BI EQU 0001000B BREAN INTERRUPT 450% UC.THE EQU 0010000B TRANSMITTER HOLDING REGISTER 451% UC.TSE EQU 01000000B TRANSMITTER SHIFT REGISTER E 453% UR.HSR EQU 60000001B BELTA CLEAR TO SEND 455% UC.DDR EQU 00000010B BELTA DATA SET READY 456% UC.TER EQU 00000010B TRAILING EDGE OF KING | 000,002 | 4 6 X | نيا ا | 000000108 | |
| 448X UC.FE EQU 00001000B FRAMING ERROR 449X UC.BI EQU 00010000B BREAN INTERRUPT 450X UC.THE EQU 00100000B TRANSMITTER HOLDING REGISTER 451X UC.TSE EQU 01000000B TRANSMITTER SHIFT REGISTER E 452X 453X UR.MSR EQU 6 454X UC.DCS EQU 0000001B DELTA CLEAR TO SEND 455X UC.DDR EQU 00000010B DELTA DATA SET READY 456X UC.TER EQU 00000010B TRAILING EDGE OF KING | 000.000 | 447X | : : | 00000100B | PARITY ERROR |
| 449% UC.BI EQU 00010000B BREAN INTERRUPT 450% UC.THE EQU 00100000B TRANSMITTER HOLDING REGISTER 451% UC.TSE EQU 01000000B TRANSMITTER SHIFT REGISTER E 453% UR.MSR EQU 6 MODEM STATUS REGISTER 453% UC.DC. DC. EQU 0000001B DELTA CLEAR TO SEND 455% UC.DDR EQU 00000010B DELTA DATA SET READY 456% UC.TER EQU 00000100B TRAILING EDGE OF KING | 000,010 | 8. X | Ш | 00001000B | FRAMING ERROR |
| 450X UC.1RE ENU 00100000B TRANSMITTER HOLDING REGISTER E 451X UC.1SE EQU 0000000B TRANSMITTER SHIFT REGISTER E 452X UR.MSR EQU 6 0000001B DELTA CLEAR TO SEND 455X UC.DDR EQU 00000010B DELTA DATA SET READY 456X UC.1ER EQU 00000010B TRAILING EDGE OF RING | 000.020 | 4 10 X X | ш. | 0001000B | 1 |
| 452X 452X 453X UR. HSR EQU 60000001B DELTA CLEAR TO SEND 454X UC. DCS EQU 60000001B DELTA CLEAR TO SEND 455X UC. DDR EQU 60000010B DELTA DATA SET READY 456X UC. TER EQU 60000100B TRAILING EDGE OF RING | 000 - 100 | K.X つ:ロ ひ:ロ | и. | 01000000 | TOTER F |
| 006 453X UR.MSR EQU 6 MODEM STATUS REGISTER 001 454X UC.DCS EQU 0000001B DELTA CLEAR TO SEND 002 455X UC.DDR EQU 0000010B DELTA DATA SET READY 004 456X UC.TER EQU 00000100B TRAILING EDGE OF RING | | 25.X | | 4 | u - |
| 201 454X UC.DCS EQU 00000001B DELTA CLEAR TO SEND 502 455X UC.DDR EQU 00000010B DELTA DATA SET READY 504 456X UC.TER EQU 00000100B TRAILING EDGE DF RING | 000.000 | 53X UR | ш | 9 | HODEM STATUS REGISTER |
| 304 TRAILING ENG 0000010B TELING EDGE OF KING | 000,001 | 14X UC. | iii-L | 000000118 | DELTA CLEAR TO SEND |
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| | CLEAR TO SEND DATA TREADY RECEIVED LINE SIGNAL DETECT |
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| | VECTURS | | | | 10:Z/:Z0 Z8-MAY-80 |
|---|--|------------------|---|--|--|
| | 465 465 465 | * * | INTERRUPT | UPT VECTORS, | |
| | 890 | * | LEVEL | 0 - RESET | |
| | 4 | * * | THIS | INTERRUPT' MAY NOT BE | I BE PROCESSED BY A USER PROGRAM. |
| 000,000 | 471 472 | | i. | . RAM. | |
| 000.000 | 484 485 | | ELSE ORG | ₩00 | |
| : | 486 | | ENDIF | | |
| 000,000 303 000 004 000,003 041 012 040 000,006 303 073 000 | 8 8 9 0 8 0 0 | INITO INITO.O | F X T | INITOX H.FRSRAM+FRSL-1 INIT | DO WAS EXTENSION OF INITIALIZATION (HL) F. RAM DESTINATION FOR CODE INITIALIZE |
| 000.001 | 4:4 7:90 | | T I | • RAM• | |
| 377,073 | 2.44 2.49 2.40 3.40 | | ERRPL | INIT-1000A | BYTE IN WORD 10A MUST BE 0 |
| | 498 | * | LEVEL 1 | - CLOCK | |
| 000,001 | 44.99 000 000 000 | | H 0 | , RAM. | |
| 000.010 | | INT | EQU | 100 | INTERRUPT ENTRY FOINT |
| 000.000 | .000 000 000 000 000 000 000 000 000 00 | | ERRNZ ENDIF | *-110 | INTO TAKES UP ONE BYTE |
| 000.014 024 000 | | | CALL | SAVALL | SAVE USER REGISTERS |
| .016303 | 511. 511. 512. | | 1 | CLOCK .RAM. | PROCESS, CLOCK, INTERRUPT. |
| 377,201 | (10 m) (10 m) (10 m) | | ERRPL | CLGCK-1000A | EXTRA BYTE MUST BE 0 |
| | 10.1 | * | LEVEL 2 | - SINGLE STEP | |
| | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | **** | IF THIS THEN IT SINGLE USER PR | F THIS INTERRUPT IS RECEIVED WHEN HEW IT IS ASSUMED TO BE GENERATED SINGLE STEPPING OR BREAKPOINTING). | DEIVED WHEN NOT IN MONITOR MODE, E GENERATED BY A USER PROGRAM E GENERATED BY A USER PROGRAM THROUGH (UIVEC+3 |
| 000,001 | : : (a) (a) (b) (b) (b) (b) (b) (b) (b) (b) (b) (b | | IF ELSE | . RAM. | |

| MTR89 - H89 | MTR89 H89 MONITOR \$09:01:00 | 01.00. | | | | Zenith Data Systems UNIX H8/H89 Cross Assembler FA |
|------------------------------|------------------------------|---|----------|--|--|--|
| GE 15. HARDWARE INTERRUPT | ITERRUPT VECTORS | .m | | | | 15:27:26 28-MAY-80 |
| 000.000 | | 0.00 0.00 0.00 0.00 0.00 | | ERRNZ ENDIF | *-21A | INT1 TAKES EXTRA BYTE |
| 000,021 | 315.132.000. | 0 H 0 H | | CALL | SAVALL | SAVE REGISTERS (A) = (CTLFLG) |
| 040,011 | 303 244 001 | 0 10 5 16 5 4 | | a de la companya de l | 81PR18 | STEP RETURN |
| | | | * * * | I/O IN | I/O INTERRUPT VECTORS. | |
| | | | * * | INTERR | INTERRUPTS 3 THROUGH 7 | ARE AVAILABLE FOR GENERAL I/O USE. |
| | | 5440 1440 1440 1440 | **** | THESE | INTERRUPTS ARE NO DCCUR. UNLESS. THE. | THESE INTERRUPTS ARE NOT SUPPORTED BY MTR88, AND SHOULD NEVER.OCCUR.UMLESS.IHE.USER.HAS.SUPPLIED.HANDLER.ROUTINES. (THROUGH UIVEC) |
| 000,001 | | 0 0 n 4 4 4 5 4 6 | | IF F | . RAM. | |
| 000+030 | | 0.0 0.4 0.4 0.4 0.4 | | OKG ENDIF | 30A | |
| 050,000 | 303.045.040. | 0.0 4.0 9.49 | INTS | g H. | UIVEC±6 | JUMP TO USER ROUTINE |
| 250,000 | 5064064064 | 550 | | DB | | HEATH PART NUMBER 444-40 |
| | | : | | | | |
| 000.001 | | 5.50 5.50 6.40 | | H | . RAM. | |
| 000,040 | | ក្សា ស្រួស ស្រួ ស្រួ | | ELSE ORG FNDTF | 40A | |
| 0.40.40.040 | 303.050.040 | 000 000 000 000 | INTA | UMF | UIVECAP | JUMP TO USER ROUTINE |
| 000.4.043. | 044122. | 560 | | | 440,1220,1140,1 | .440x,1220r,1140x,1020r,440SUPFORTCODE |
| | | | | | | |
| 000.001 | | 10 10 10 10 10 10 10 10 10 10 10 10 10 1 | | 14. 14 14. 14 14. 14. 14. 14. 14. 14. 14. 14. 14. 14. | . KAR. | |
| 000,050 | | 566 566 767 | | ORG FADIF | SOA | |
| 000.050 | 303.053.040 | 5568 568 | INTS | J.W. | UIVEC+12 | JUMP TO USER ROUTINE |
| | | 570 | | : | | |
| | | 572 573 | * * * | | _ : | |
| | | 577 | * * 1 | EXTRY | (A) = MILLISECO NONE | MILLISECOND DELAY COUNT/2 |
| | | 0/0 | * | USES | | |

| MTR89'-'H89' | MTR89 - H89 MONITOR *** #09:01:00: GF 14 | 51.00. | | | | ې نو. |
|------------------------|---|--|------|----------------|---|---|
| HARDWARE IN | HARDWARE INTERRUPT VECTORS | ro. | | | | 15:27:27 28-MAY-80 |
| 000,000 | | 577 578 578 | | 1 F | . Ram. | |
| 000.000 | | | | ERRNZ | ¥-000A | |
| 000,053 | 365 | : : | | PUSH | PSW SAVE COUNT | |
| 000 • 000 000 • 000 | 257 | : | | XRA UMP | A BONT SOUND HORN HRNO FROCESS AS HORN | N. C. |
| | | 10.10 | | | XXX | |
| 090.000 | | 1 (1) (1) (1) (1) (2) (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4 | | ELSE ORG | #09 | |
| 090.000 | 000,000,000,000,000 | | INTE | JMF | UIVEC+15. JUMP. ID. USER. ROUTINE | SDUTINE |
| 000,063 | 076 320 303 235 001 | 5995 5995 597 597 | 60. | MOI JMP | A.CB.SSI+CB.CLI+CB.SPK OFF MONITOR MODE SST1 | ONITOR MODE LIGHT |
| 000,001 | | 599 600 601 | | 11 17 55 | • RAM. | |
| 000.070 | | 602 | : | ORG ENDIF | 70A | |
| .0000+0000. | 000,070303061040 | : | INT. | JMF. | UIVEC+18JUMP.TO.USER.ROUTINE | ROUTINE |
| | | | | | | |
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| Mail | *************************************** | | | | *********************** | · · · · · · · · · · · · · · · · · · · |
|---|---|-------------------------------------|-----|---|--|--|
| 11. 11. 13. CALLED WHENEVER A HARDWARE MASTER-CLERR 11. | | 608 | : | NIT | INITIALIZE SYSTE | X |
| 13 | | 610 | | | S.CALLER WHENEVER | A HARDWARE MASTER-CLEAR IS INITIATED. |
| 15 15 15 15 15 15 15 15 | | 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 | : : | | TR88 CONTROL CEL HOW MUCH MEMORY THE MONITOR LOOP. | LS IN RAM. EXISTS, SETUP STACKPOINTER, AND |
| STATE STAT | | 615 616 617 | - | TRY | FROM MASTER CLE INTO MTR88 MAIN | AR L00P |
| STATE STAT | 000,000 | 619 | | L L | · RAM. | |
| COPPY *FRSROW* INTO RAMPORE BYTE | 000.000 | 6 6 6 6 2 14 C | | ERKNZ ERBIF | *-730 | |
| 167 625 100 | | 623 624 | | LDAX | | COPY **PROGRAM INTO RAX |
| 034 053 000 627 INR E INCREMENT SOURCE 629 5INCR EQU 4000A SEARCH INCREMENT 630 SINCR EQU 4000A SEARCH INCREMENT 631 MUI D.SINCR/256 (DE) = SEARCH INCREMENT 632 (DE) = SEARCH INCREMENT 633 MUI D.SINCR/256 (DE) = SEARCH INCREMENT 634 635 MUI D.SINCR/256 (DE) = SEARCH INCREMENT 635 MUI D.SINCR/256 (DE) = SEARCH INCREMENT 635 MUI D.SINCR/256 (DE) = SEARCH INCREMENT 636 637 MUI D.SINCR/256 (DE) = SEARCH INCREMENT 636 637 MUI D.SINCR/256 (DE) = SEARCH INCREMENT 636 637 MUI D.SINCR/256 (DE) = SEARCH INCREMENT 637 MOV D.S. SET STATE MEMORY 656 657 MOV D.S. MOV | : : | 625 625 | | 2X 20 20 | | MOUE BYTE DECREMENT DESTINATION |
| 429 429 429 429 429 429 420 521 621 622 624 632 431 632 634 635 634 635 634 635 634 635 634 635 634 635 634 635 634 635 634 637 638 638 638 638 638 638 638 638 638 638 | 034 302 073 | | | INE | | INCREMENT SOURCE IF NOT DONE |
| 026 004 631 041 000 034 632 041 000 034 633 042 | | : | | EQU | 4000A | SEARCH INCREMENT |
| VACO | | 631 | | | | |
| 167 635 # DETERMINE MEMORY LIMIT. 636 436 437 431 439 | 104 041 000 | : | | LXI | H.START-SINCR | |
| 167 637 INIT1 MOV M,A RESTORE VALUE READ 031 638 DAD D A,M INCREMENT TRIAL ADDRESS 176 640 DCR M INIT1 IF MEMORY CHANGED 045 641 DR M INIT1 IF MEMORY CHANGED 045 644 INIT2 DCX H 649 ELSE A49 ELSE AEMORY LIMIT 371 646 IF AFAM. SET STACKPOINTER = MEMORY LIMIT 651 ENDIF BOTH H 652 FUSH H 654 CONFIGURE LOAD/DUMP WART 655 * CONFIGURE LOAD/DUMP WART 655 # WVI A,UHI,1B+UMI,16X 656 WVI GP,1FC SET BIT, NO PARITY, 1 STOP, X | | 635 | : | DETERMI | NE MEMORY LIMIT. | |
| 031 638 DAD D INCREMENT TRIAL ADDRESS 045 640 DOR H TRY TO CHANGE IT 276 641 CMP H TRY TO CHANGE IT 276 642 UNE INIT1 IF MEMORY CHANGED 643 UNE INIT1 IF MEMORY CHANGED 644 INIT2 DCX H 654 ELSE 646 ELSE 645 INIT2 DCX H 655 FUSH H 657 SFHL SET STACKPOINTER = MEMORY LIMIT 658 FUSH H 658 FUSH H 7 RY TO CHANGED 648 INIT2 DCX H 649 INIT2 DCX H 651 ENDIF SET STACKPOINTER = MEMORY LIMIT 652 FUSH H 653 FUSH H 654 FUSH H 655 FUSH H 655 653 FUSH H 655 654 FUSH H 656 655 FUSH H 657 FUSH H 658 657 FUSH H 658 657 FUSH H 658 657 FUSH H 659 WVI A,UHI.1BHUMI.16X 658 659 WVI OP.1FC SET 8 BIT. NO PARITY. 1 STOP. X | : | 637 | INI | MOV | M, M | RESTORE VALUE READ |
| 276 641 CMP H 302 107 000 642 JNE INIT1 IF MEMORY CHANGED 643 JNT2 JNE INIT2 IF MEMORY CHANGED 644 JNT2 JNE IF MEMORY CHANGED 645 JF FERM ELSE 646 JF JF JF 650 SPHL SET STACKPOINTER = MEMORY LIMIT 651 ENDIF H SET STACKPOINTER = MEMORY LIMIT 652 FUSH H H SET SET WALL 653 FUSH H H SET SET URN ADDRESS 654 FUSH H SET SET URN ADDRESS 655 FUSH H A,UHI: 18 HUH: 16 K 658 HVI A,UHI: 18 HUH: 16 K 658 HVI OUT OPA: 1FC 658 HVI OPA: 1FC SET SET | : | 639 | | 0 X 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | E C X | INCREMENT TRIAL ADDRESS (A) = CURRENT MEMORY VALUE |
| 053 644 INIT2 DCX H 645 646 IF .RAM. 646 ELSE .RAM. 647 ELSE .RAM. 650 SFH 651 ENDIF 652 FUSH H 654 SET *PCKPOINTER = MEMORY LIMIT 651 ENDIF 654 FUSH H 655 FUSH H 655 CDNFIGURE LOAD/DUMP UART 656 657 * CDNFIGURE LOAD/DUMP UART 658 MVI A.UMI.1B+UMI.16X 659 MVI OP.1FC SET 8 BIT. NO PARITY. 1 STOP. X | 276 | : | | E E | ¥ F Z | THE MEMORY OF AMERICA |
| 053 644 INIT2 DCX H 645 646 371 646 1F | | : | | 1 | | AT DEFICAL CONTROLS |
| 371 650 8PHL SET STACKPOINTER = MEMORY LIMIT 651 ENDIF | 7 | 644 | INI | DCX | X | |
| 371 650 SPHL SET STACKPOINTER = MEMORY LIMIT 651 ENDIF 652 ENDIF 652 FUSH H SET **PC** VALUE ON STACK CIMIT 652 FUSH H FEROR SET **PC** VALUE ON STACK 653 FUSH H FEROR SET 'RETURN ADDRESS' 655 FUSH H A.UHI.1B+UMP UART 658 657 ** CONFIGURE LOAD/DUMP UART 658 657 ** CONFIGURE LOAD/DUMP UART 658 659 WVI A.UHI.1B+UMI.16X 659 WVI 60.TFC SET 8.BIT. NO PARITY. 1.810P. X | 4. | 649 | | ELSE | | |
| 345 653 PUSH H 041 322 000 654 LXI 455 FUSH H 656 657 * CONFIGURE LOAD/DUMP UART 076 116 659 WVI A,UMI.IB+UMI.LB+ 323 371 660 0UT 0P.TPC | ۸. | 651 | | SPHL | | - MEMORY LIMIT |
| 041 322 000 654 LXI H,ERROR 345 655 FUSH H 656 657 * CONFIGURE LOAD/DUMP UART 658 WVI A,UMI.IB+UMI.LB+ 323 371 660 0UT OP.TPC | 345 | : | | FUSH | | SET *PC* VALUE ON STACK |
| 550 * CONFIGURE LOAD/DUMP UART 658 * CONFIGURE * 116 * 659 * WVI A,UMI.IB+UMI.LB+ 30 323 371 660 0UT OP.TPC | 345 | : | | PUSH | H EKKUK | SET 'RETURN ADDRESS' |
| 26 076 116 659 MUI A,UMI.1B+UMI.LB+ 30 323 371 660 DUT 0P.TPC | | 657 | : | CONFIGU | RE LOAD/DUMP UAR | |
| | 26 076 1 30 323 3 | 629 629 640 | | MVI OUT | A,UMI.18+UMI.L8 | UMI,16X SET 8 BIT: NO PARITY, 1 STOP, X16 |

| | TIME SUBROUTINES | ES | | | | |
|---|--|-----------------|----------------|---|--------------------------------------|--|
| | | | 3 | CAHAI | MALIA - GAUF ALL REGISTERS ON STACK. | TERS ON STACK. |
| | | 0. 4 0. 4 | £.* | | | |
| | | 665 | * | SAVALL | VALL IS CALLED WHEN AN INTERRUPT IS. | N INTERRUPT IS ACCEPTED, IN ORDER TO |
| | | 999 | * | SAVE THI | E CONTENTS OF THE | E REGISTERS ON THE STACK. |
| | | 299 | * | | | |
| | | 899 | * ; | ENTRY | CALLED DIRECTLY | CALLED INTECLIT FROM INTERNATIONS STACK. I PEGINTERS PURHFULN STACK. |
| | | 470 | · * | | IF NOT YET IN M | DNITOR MODE, REGPTR = ADDRESS OF REGISTERS |
| | | 671 | * | | ON STACK. | |
| | | 672 | * | | (DE) = ADDRESS (| ADDRESS OF CTLFLG |
| | | 673 | | 16 | ROM | |
| 100.000 | | 675 | | ELSE | | |
| 000.000 | | 929 | | ERRNZ | *-132A | |
| | | 677 | | ENDIF | | |
| | 747 | 6/8 6/8 | SAUALI | XTHL | | SET HJL ON STACK TOP |
| | 100 100 100 100 100 100 100 100 100 100 | 989 | | PUSH | | |
| | 305 | 681 | | FUSH | A | |
| | 365 | 682 | | FUSH | TOT. | (1.F) = RETURN ADDRESS |
| | 000 010 140 | ÷ | | | H•10 | |
| 000.142 | VI. | | | DAD | ů. G | (H+L) = ADDRESS OF USERS SP |
| | | 989 | | | į. | WIN STORY OF THE WIND A SHIP A STATE OF THE WAS THE WAS THE STORY OF THE STATE OF T |
| | | 687 | * * | KEFLACE | בר מיני מיני | |
| | | 688 689 | × × | PUSH | 3 | SET ON STACK AS 'REGISTER' |
| | | 969 | * | PUSH | | SET RETURN ADDRESS |
| | | 69 | * | Z. | D.CTLFLG | (A) 1 P1 P1 P |
| | | 769 | × | LUHA | | |
| 000.143 | 303 105 004 | : | | JAG | SAVALLX | GO TO SAVALL EXTENSION |
| | | 269 | | | | |
| 000.001 | | 696 696 | | 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1 | • EBA | |
| | | 869 | ** | ENTRY | POINT FOR THE 280 | Z80 NMI |
| | | 669 | * | | | |
| | | 700 | | | | |
| 000.000 | | 702 | | ERRNZ | Н99-* | Z80 NMI ADDRESS |
| | | 703 | | ENDIF | | |
| 000 | 404 114 00A | | FXF | ŭ. | ¥ | |
| 5 F. 4 F. 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 |);); (); (); | : | | | | |
| 000,001 | | 707 | | L. | , RAM. | |
| 000 | | 80 / 20 8 | | ELSE FRRNZ | SAVALLR-151A | DO NOT CHANGE ORGANIZATION |
| 22. | | 710 | | ENDIF | | |
| | | 711 | | : | | CONTRACTOR TO THE CONTRACT AND CONTRACTOR OF |
| ** | | 7 2 2 2 2 2 2 2 | SAVALLR | | * | SAVALL EXIENSION RETURN HUDGESS |
| 000.151 | 057 | 714 | | CMA | CB.MT: +CB.SST | SAUE REGISTER ADDR IF USER OR SINGLE-STEP |
| 000,154 | 310 | 716 | | RZ | | RETURN IF WAS INTERRUPT OF MONITOR LOOP |
| | | | | LXI | H,2 | |
| | | : | | | | |

| MYKB9 - H89 MONITOR #09:01:00 GE 19 INTERRUPT TIME SUBROUTINES | 8 | | | Zehith Data Systems UNIX H8/H89 Choss Assembler PA 15:27:28 28-MAY-80 |
|--|---|---|--|--|
| 000,161 042 035 040 | 719. | SHLD RET | REGPIR | |
| | 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 | CUI IS | CHECK FOR USER CALLED TO SEE E CLOCK INTERRU | CUI - CHECK FOR USER INTERRUPT PROCESSING. CUI IS CALLED TO SEE IF THE USER HAS SPECIFIED PROCESSING. |
| 000,000 | 725 727 728 729 | 11 11 11 11 11 11 11 11 11 11 11 11 11 | .RAM. *~165A | |
| 040,010 000,165 000,000 000,166 017 | 732 733 733 culi 734 735 735 | | AMELAG B UG.CLK-1 UIVEC | REFERENCE TO MFLAG (A) = .MFLAG CODE ASSUMED = 01 IF SPECIFIED, TRANSFER TO USER |
| | 737 737 738 740 | RETURN | ETURN TO FROGRAM FROM INTERRUPT. | M_INTERRUPT. |
| 0000+0000 | 741 742 743 | ELSE ERRNZ ENDIF | *-172A | |
| 000,172 361 000,173 361 000,175 301 | 745 745 746 747 748 | 9099 | 75 S. A. | REMOVE FAKE 'STACK REGISTER' |
| | 749 750 751 | R E T T T T T T T T T T T T T T T T T T | Œ | |
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| 2 | | | | | : |
|-------------------------|--------|------------------|---|--------------------------------------|---|
| ROCESS CLOCK INTERRUPT | | | | | 08-1HH-8Z |
| | 754 | | CLOCK | LOCK - PROCESS CLOCK INTERRUPT | ŅTĒĶĶUPT |
| | 755 | * * * | CLOCK | S ENTÉRED WHENEV ED. | LOCK IS ENTÉRED WHENEVER A MILLISECOND CLOCK INTERRURT IS |
| | 759 | | TICCNT | ICCNT IS INCREMENTED EVERY INTERRUPT | VERY INTERRUPT. |
| 000,001 | 761 | | IF | · KAM. | |
| 000.000 | 76.7 | | E R SE E R R Z E L R Z E L R Z | *-2014 | |
| 201 | | CLOCK | LHLD | TICONT | |
| m | | | INX | H | INGREBENT TIEGOUNT |
| 213 | : | | LDA OUT | CTLFLG OP.CTL | CLEAR CLOCK INTERRUPT FLIR-FLOP |
| | 77 | * | EXIT CL | CLOCK INTERRUPT. | |
| 215 | : | | LXI | B,CTLFLG R | (A) = CTLFLG |
| 000,221 346 040 | : | | ANI NNI NNI | OB.ATC INTXIT | . Z |
| 226 013 | | | DCX | B CTLFLG-,MFLAG-1 | |
| 227 | 787 | | LDAX ERRNZ | B UO.HLT-2000 | (A) = ,MFLAG ASSUME HIGH-DRDER |
| | : | | RAL | CLK4 | SKIPLIT |
| | 78, | * | NOT IN | MONITOR MODE. | CHECK FOR HALT |
| 4 076 012 | : | , m' | I) | A 110 | (A) = INDEX OF *F* REG |
| 4 315 05 1. 136 | | | WOV. | M. X. | 7 TO TO THE |
| 000,242 043 | 7 9 9 | ~ | X | E E | . ⟨₽¿E⟩. E.P.C. CONIENTS. |
| : • ⊌ | 79. | n err | LIPAX | | |
| 376 | | 10.50 | CPI | MI.HLT CUI1 | CHECK FOR HALT |
| 3 076 007 | : | | MOI | A, A, BEL | DING BELL |
| 5 315 302 | : | 0.0 | K.T. | ₩.c. A, ′H′ | 'H' FOR HALT |
| 2 315 302. 5 303 322 | 003 80 | 0.1 | JAR | WCC ERROR | |
| | 80.8 | ** ** | JE | ERROR | IF HALT, BE IN MONITOR MODE |
| | 8.8 | ₹ | NONE OF | THE ABOUE, SO | ALLOW USER FROCESSING OF CLOCK INTERRUPT |
| 000.270 | 000 | 6 7 CLK4 8 | Eau | * cuii | ALLOW USER PROCESSING OF CLOCK |
| | : | | | | |

| MTR89"-"H89"MONITOR | MONI TOR #09; | .00:10:60# | | | | Zehith Data Systems UNIX H8/H89 Chdss AssemblerPA |
|----------------------|--------------------|--|-----|-------------|-----------------------------|---|
| GE 21 MEMORY TEST | | | | | | 15;27;29 28-HAY-80 |
| | | 811 | | THIS IS | S ONLY A FORTION OF | DF THE DYNAMIC RAM TEST!! |
| | | 812 813 | * * | | ORE MAN | |
| 000.273 | 041 000 000 | : | : | : | O. H | |
| 000,276 | 174 | | | ¥0. | I. | |
| 000.300 | 265 302 276 000 | : : | | ORA LNZ | L DYMEM7 | IF (B,C) NOT ZERD |
| 000,304 | 303 207 007 | | | J. | | TRY AGAIN BY INCREMENTING ONCE MORE |
| | | 822 823 833 | * | HAVE A | FAILURE PRIOR TO | REACHING END OF MEMORY! |
| 000.307 | 353 041 047 001 | 8 8 8 6 6 2 6 6 4 7 6 6 | : : | XCHG LXI | | DISPLAY ERROR MESSAGE |
| X12.000 | 335 | 8 5 5 6 8 7 8 6 8 7 8 6 8 7 8 6 | * | 98 | IX,DY9.3 MI,LDXA,MI,LDXB | RETURN ADDRESS |
| 000 315 | 315 003 | 830 | | ma | DY9.3 | |
| 000,317 | 363 306 007 | : | | 美 | byHs6 | |
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