PANEL MONITOR

XCON-8

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INTRODUCTION

This Manual describes the functions and operations of the Heath H8 Panel Monitor Program, XCON-8, which resides permanently in a ROM on the H8 CPU board. XCON-8 provides a sophisticated front panel display and keyboard emulation as well as handling master clear and interrupt operations. Some of the major features of XCON-8 are:

- Memory contents display and alteration.
- Register contents display and alteration.
- Program execution control (both breakpoint and single instruction operation).
- Self-contained bootstraps for program loading and dumping.
- Port input and output routines.

In addition to the above features, XCON-8 can be instructed (by means of a flag byte contained in the H8 RAM) to bypass some or all of its normal functions so the sophisticated user can augment or totally replace them.

Communication with the Panel Monitor is accomplished through three devices: the keypad, the 7-segment displays, and the audio alert. The user enters commands and values through the 16-key keypad, and XCON-8 responds visually through the front panel displays. In addition to the front panel displays, XCON-8 provides the keypad entry and function feedback to the built-in speaker. Appropriate signals (short, medium, and long beeps) indicate that commands and data are accepted or rejected.

THEORY OF OPERATION

This section will supplement the information contained in the "Operation" and "Circuit Description" sections of your H8 Operation Manual. In order to fully understand how XCON-8 operates, you must be familiar with the H8 front panel and CPU. A thorough knowledge of the 8080 instruction set and its architecture is also essential.

Power Up and Master Clear

XCON-8 initializes the H8 whenever you power-up or master clear (RST). You initiate the power-up operation by turning on the rear panel Power switch. You can master clear by simultaneously depressing both the lower right-hand (RSTØ) and lower left-hand (Ø) keys of the H8 front panel keypad. Both power-up and RST cause a level zero (highest priority) interrupt and result in a long beep from the audio alert.

During initialization, XCON-8 enters a routine which determines the high limit of continuous RAM. Once the high limit of available RAM is determined, the H8 stack pointer (SP) is set to this value. XCON-8 then determines if the RAM starts at Ø, and copies itself from ROM into that RAM space. Control is passed to the front panel command loop. Using this feature, you can immediately determine the total amount of continuous memory above 8K by displaying the stack pointer value.

Clock Interrupts

The Clock Interrupt is a crucial element in the operation of the H8 front panel system. This level one interrupt is generated by the front panel hardware every 2,000 μS. XCON-8 uses this interrupt to check for some keyboard commands, to check for user program breakpoints, and to refresh the front panel displays.

XCON-8 performs these functions using a series of subroutines which are executed as necessary when indicated by the interrupts. For this reason, all user programs must maintain a valid stack (at high memory) containing at least 80 free bytes at all times. If this stack space is not available and XCON-8 is running (it can be disabled; see the Advanced Control Section), unpredictable software damage can occur in your program. In the same manner, if your program should execute a DI (Disable Interrupt) instruction, no front panel services including the RTM (Return To Monitor) function are available until an EI (Enable Interrupt) instruction is executed or until a master clear (RST/Ø) is performed.

XCON-8 Modes /Using RST and RTM

XCON-8 is always in either the monitor mode or the user mode. In the monitor mode no user program is executing, XCON-8 loops reading the keypad and refreshing the displays. All commands entered via the keypad are valid; however, the RTM command is meaningless.

When your program is being executed, XCON-8 is in the user mode and the MON LED on the front panel is extinguished. Only two keyboard commands are valid in this mode: RST (master clear) and RTM (Return To Monitor). NOTE: Both of these commands are dual key commands. No single key command is recognized, so a user program may have free use of the entire keypad.

You can return XCON-8 to the monitor mode by using the RTM command (simultaneously press the Ø and the # keys). This command stops program execution at the end of the current instruction, stores the current value of each register, and returns XCON-8 to the monitor mode. You can then continue your program by pressing the GO key. The RST command (simultaneously press the Ø and the / keys) performs the master clear operation described earlier and does not save any register values.

Normally, when a user program is running, XCON-8 is also running. Thus, if XCON-8 is displaying the contents of the HL register pair and the user program is started, it continues to display the contents of this register pair as the program is run. If the user program changes the contents of the HL pair, the change is immediately reflected in the front panel displays. In a similar manner, if a memory location is displayed when a user program is started, it is displayed during the time the user program is run. If the user program changes the contents of the display memory location, the front panel display changes.

Since XCON-8 does not recognize keypad commands in the user mode, the RTM command must be used before the memory location or register being displayed is changed to a new location or a different register. Once you select the new location or different register, you can resume program execution by pressing GO.

NOTE: XCON-8 requires about 10% of the H8 CPU's resources to process the display interrupts. Programs which are compute-bound may be slowed down by simultaneous operation of XCON-8. In this situation, you may wish to turn off the clock interrupts to improve execution time. See "Using Interrupts" on Page 1-24.

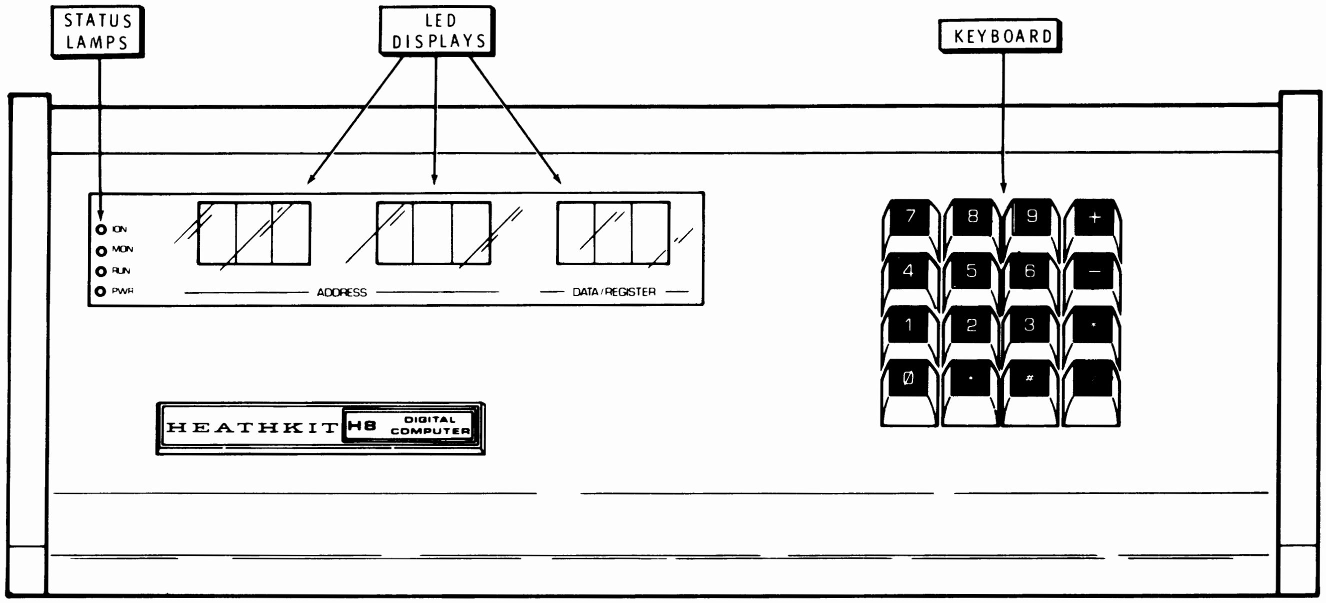


Figure 1-1

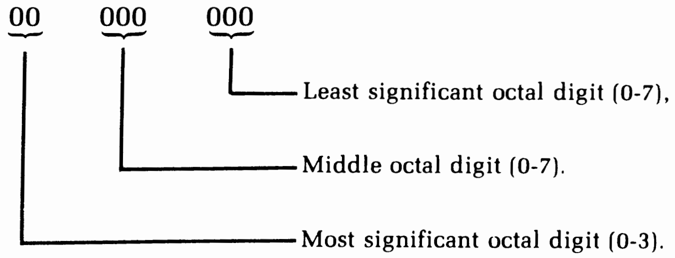
H8 Displays

You must understand the H8 front panel presentation in order to use XCON-8. The display is made up of 9 digits, in three groups of three digits each. See Figure 1-1. Each group of three digits displays one byte (eight bits) of information. This information may be the contents of a designated register or memory location, or it may be the address of a memory location itself. The register names are also displayed.

All binary numbers are converted to octal format for display on the H8 front panel. The following table shows binary to octal conversion.

BINARY NUMBER	OCTAL NUMBER
000	0
001	1
010	2
011	3
100	4
101	5
110	6
111	7

Each byte is displayed as two-and-one-half octal digits. The octal numbers lie in the range of 000 to 377 for binary numbers in the range 00000000 to 11111111, as shown below.


00 000 000
Least significant octal digit (0-7).
Middle octal digit (0-7).
Most significant octal digit (0-3).

NOTE: As there are only eight bits in a byte, the most significant octal digit only represents two bits and is therefore displayed as 0 to 3. If the user should inadvertently enter the octal digits 4 to 7 into the most significant digit, the most significant bit is lost. Losing this bit converts 4 through 7 into the digits 0 through 3 respectively.

Also note that 16-bit numbers, such as memory addresses and certain register contents, are still displayed as two eight-bit numbers. Therefore, the H8 front panel representation of the number is made up of **two** groups of three octal numbers in the range of 000 to 377. This representation of 16-bit binary numbers is known as **offset octal**, and is used consistantly throughout all H8 displays of 16-bit numbers. Offset octal must not be confused with octal. For example:

$$\underbrace{1\,1}_{3}\,\underbrace{1\,1\,1}_{7}\,\underbrace{1\,1\,1}_{7}\quad\underbrace{1\,1}_{3}\,\underbrace{1\,1\,1}_{7}\,\underbrace{1\,1\,1}_{7}$$

A 16-bit binary number

Offset octal representation (377 377)

$$\underbrace{1}_{1}\,\underbrace{1\,1\,1}_{7}\,\underbrace{1\,1\,1}_{7}\,\underbrace{1\,1\,1}_{7}\,\underbrace{1\,1\,1}_{7}\,\underbrace{1\,1\,1}_{7}$$

A 16-bit binary number

True Octal representation (177777)

The lower example shows true octal representation of a 16-bit binary number. This is **not** used by the H8 front panel displays or any H8 software. Occasionally you will see offset octal numbers printed with a decimal point separating the upper and lower bytes. For example:

$$\underbrace{377}_{\text{Hi Byte}}.\underbrace{377}_{\text{Lo Byte}}$$

H8 Keypad

The H8 Keypad consists of 16 keys, as shown in Figure 1-1 on Page 1-7. When the keypad is operating under the control of XCON-8, it exhibits a number of unique properties.

- Each keystroke is verified by a short beep from the audio alert.
- Octal digits are entered using the keys 0 through 7.
- Holding a key down continuously repeats the key's function.
- The + key increments memory port or register locations.
- The – key decrements memory port or register locations.
- The * key cancels previous keypad entries.
- The ALTER key causes XCON-8 to enter the alter mode.
- The MEM key causes XCON-8 to enter the display memory mode.
- The REG key causes XCON-8 to enter the register mode.

Many of the keys on the keypad have multiple functions, depending on the XCON-8 mode being used. In the register mode, for example, the numeric keys (1-6) call the register indicated in the upper left-hand corner of the key. When the XCON-8 is in neither the register nor the memory mode, the keys perform the functions indicated in the lower right-hand corner of the key.

The # and / keys have additional special functions, as indicated earlier. When the / key is pressed simultaneously with the Ø key, the RST (master clear) sequence is initiated. When the # sign key is pressed simultaneously with theØ key, the RTM (Return To Monitor) function is initiated, the user program is stopped, and XCON-8 regains control.

Each key is covered in greater detail as the various function are discussed.

DISPLAYING AND ALTERING MEMORY LOCATIONS

One of the major features of XCON-8 is its ability to examine the contents of any H8 memory location and to modify the contents of that memory location if it is RAM.

When the H8 is first powered up, XCON-8 is in the display memory mode. This mode is indicated by all digits displaying octal numbers and no decimal points being on.

Specifying a Memory Address

If you wish to display or alter the contents of a memory location, you must first place XCON-8 in the memory address mode and then enter the desired memory address. Place XCON-8 in the memory address mode (if not already there) by pressing the MEM (Memory) key. Specify the address to be displayed or altered by entering the 6-digit address (offset octal).

When you press the MEM key, all the decimal points will light. This indicates that the address may now be entered. Once the full 6-digit address is entered, the decimal points turn off, indicating that address entry is completed. After all 6 digits are entered, the address is displayed in the left-most six displays, and the contents of the addressed memory location are displayed in the right-hand 3 digits.

NOTE: As you press each key, including the MEM key, a short beep indicates successful entry. As each group of three octal digits is successfully entered, a medium beep is sounded. The sequence by which you specify a memory address is shown in Figure 1-2.

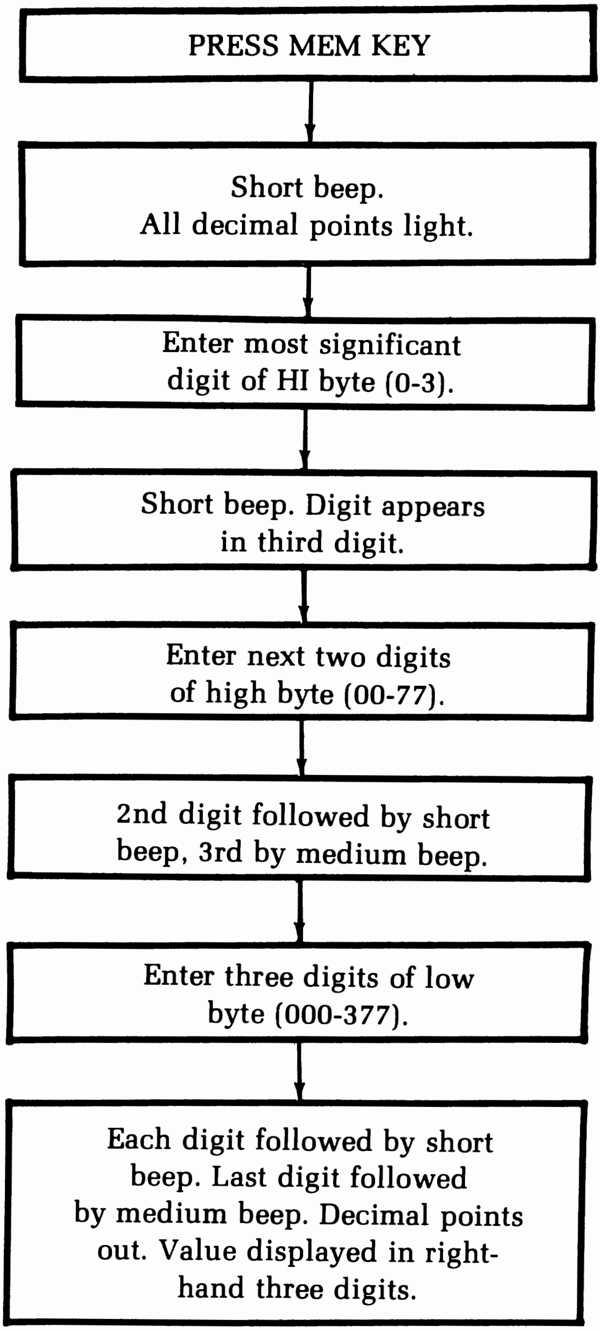

PRESS MEM KEY
Short beep. All decimal points light.
Enter most significant digit of HI byte (0-3).
Short beep. Digit appears in third digit.
Enter next two digits of high byte (00-77).
2nd digit followed by short beep, 3rd by medium beep.
Enter three digits of low byte (000-377).
Each digit followed by short beep. Last digit followed by medium beep. Decimal points out. Value displayed in right-hand three digits.

Figure 1-2
Entering a memory address through XCON-8.

NOTE: If you press a non-octal digit key as one of the six address digits, an error is flagged (a long beep). Once this error is flagged, the XCON-8 considers the address complete and extinguishes the decimal points. The entire sequence must be repeated.

Altering a Memory Location

Before you can alter a memory location, you must first display the contents of the memory location by specifying the memory address as described in the preceding paragraphs. After you specify the memory address, press the ALTER key. This will cause XCON-8 to enter the memory alter mode.

When XCON-8 enters the memory alter mode, a single decimal point rotates from right to left through all 9 digits. You can now alter the contents of the displayed location by entering the new octal value (three digits on the keypad). When the three digits have been entered, acoustical verification (a short beep) is given **and the memory address is incremented.** You can then alter this new location by entering three more digits or pressing one of the following keys, causing the monitor to perform the indicated function:

KEY	FUNCTION
+	Increment the address.
–	Decrement the address.
MEM	Specify a new memory address (leave the memory alter mode).
REG	Specify a register for display (leave the memory alter mode).
ALTER	Exit from the alter mode (into the display mode).

NOTE: XCON-8 automatically increments the memory address as each entry (3 octal digits) is complete. Therefore, you may load a program in sequential locations very rapidly. Each location is modified by simply entering the three octal digits.

The following example reviews each step as the H8 is turned on; the memory address mode is entered; and the location 040 123 is addressed, altered to 345, checked, and closed.

DISPLAY	COMMENTS
X X X X X X X X X	Random memory display at power up (X=random number.)
X.X.X. X.X.X. X.X.X.	MEM key pressed. (In memory address mode, a short beep.)
X.X.0. X.X.X. X.X.X.	0 key pressed. (Short beep.)
X.0.4. X.X.X. X.X.X.	4 key pressed. (Short beep.)
0.4.0. X.X.X. X.X.X.	0 key pressed. (Medium beep.) Contents of location 040 XXX displayed.)
0.4.0. X.X.1. X.X.X.	1 key pressed. (Short beep. Contents of 040 XX1 displayed.)
0.4.0. X.1.2. X.X.X.	2 key pressed. (Short beep. Contents of 040 X12 displayed.)
0 4 0 1 2 3 X X X	3 key pressed. (Medium beep. Contents of desired location 040 123 displayed, decimal points out.)
0.4.0 1.2.3 X.X.X	ALTER key pressed. (Short beep. Decimal points **rotate**.)
0.4.0. 1.2.3. X.X.3.	3 key pressed. (Short beep. Decimal points **rotate**.)
0.4.0. 1.2.3. X.3.4.	4 key pressed. (Short beep. Decimal points **rotate**.)
0.4.0. 1.2.4. X.X.X.	5 key pressed. (Medium beep. Address increments one location. Decimal points **rotate**.)
0.4.0 1.2.3 3.4.5	−key pressed. (Short beep. Address decrements one location. Decimal points **rotate**.)
0 4 0 1 2 3 3 4 5	ALTER key pressed. (Short beep. Decimal points go out.)

Stepping Through Memory

When XCON-8 is either in the display memory or alter memory modes, the + and − keys increment and decrement the memory address. Each time you press the key, XCON-8 increments (or decrements) the memory address one location. If you hold the key down, the auto-repeat function of XCON-8 causes the memory address to increment or decrement repeatedly (approximately one location every second).

DISPLAYING AND ALTERING REGISTERS

XCON-8 can display and alter the contents of the 8080 CPU registers, just as it displays and alters the contents of H8 memory locations. Although the process is quite similar, a few special features should be noted.

Specifying a Register for Display

Press the REG key to specify that a register is to be displayed. After you press the REG key, press a second key (SP through PC, see the Table below) to specify the desired register or register pair.

When the REG key is pressed, six decimal points light, indicating that you must now select a register. NOTE: Simply pressing the REG key causes a register name to appear in the right-hand digits. However, you must select a register using the Register Select key before a register is definitely selected and its true contents are displayed. Once a register is selected, the decimal points are extinguished.

The contents of the selected register pair are displayed in the six left-most displays. The register name (or names) are displayed in the two right-most digits of the right-hand three displays. The registers are selected and displayed in accordance with the following table:

KEY	LEFT 3 DIGITS	MIDDLE 3 DIGITS	RIGHT PAIR	COMMENTS
SP (1)	000 to 377	000 to 377	SP	Stack pointer
AF (2)	000 to 377	000 to 377	AF	AF Register pair
BC (3)	000 to 377	000 to 377	bC	BC Register pair
DE (4)	000 to 377	000 to 377	dE	DE Register pair
HL (5)	000 to 377	000 to 377	HL	HL Register pair
PC (6)	000 to 377	000 to 377	Pc	Program counter

NOTE: The contents of any single eight-bit register may lie in the range of 000 to 377 octal. The stack pointer (SP) and the program counter (PC) are 16-bit registers and are displayed as two sets of three octal numbers. Each 3-digit grouping corresponds to one byte (8 bit number). When a register pair is displayed, the left three digits correspond to the left register and the middle three digits correspond to the right register. For example:

256 312 AF

Register A contains 256 and register F contains 312.

Altering the Contents of a Selected Register

To alter the contents of a register (or register pair), you must first specify it as described in the preceding paragraphs. After you select the register or register pair, press the ALTER key. This will cause the six left-hand decimal points to rotate right to left, indicating that you may enter 6 digits to alter the contents of the indicated register or register pair.

Alternately, you may press one of the following command keys.

KEY	FUNCTION
+	Changes the register pair being displayed.
–	Changes the register pair being displayed.
MEM	Specify a new memory address (leave the alter register mode).
REG	Specify a new register for display (leave the alter register mode).
ALTER	Exit the register alter mode.

NOTE: Stack pointer register (SP) is not a direct display of the real stack pointer register, but simply a copy of the real stack pointer register and is used for display purposes only. The stack pointer cannot be altered from the front panel. To alter the stack pointer register, an SPHL (SPHL = 371) instruction must be written into memory. The desired new stack pointer value is then placed in the HL register pair. XCON-8 single instruction mode is used to execute the SPHL swap instructions, loading the stack pointer with the contents loaded in the HL register pair.

Stepping Through the Registers

Use + and – keys to change the register pair being displayed. For example, if the DE register pair is being displayed, pressing the + key causes the next sequential register pair to be displayed (the HL pair). In the same manner, pressing the – key causes the register to decrement to the preceding pair. For example, if the DE pair is being displayed, pressing the – key displays the BC register pair. NOTE: Holding down either the + key or the – key causes the display to continuously increment or decrement through all the six registers/register pairs.

PROGRAM EXECUTION CONTROL

XCON-8 supports three basic program execution control facilities:

- Beginning or starting execution.
- Breakpointing.
- Single instruction.

Each of these execution controls permits the programmer to execute the desired portions of a program and examine its effects. He may execute the entire program, or a small group of instructions, or a single program instruction.

Initiating Program Execution

To begin the execution of a program residing in H8 memory, place the address of the first instruction to be executed in the PC (program counter). Use the methods described in "Displaying and Altering Registers" (Page 1-14). Once the address of this first instruction is placed in the program counter, press the GO key and program execution will begin. NOTE: Unless the program disables the front panel, the display continues to be actively updated, although the front panel commands are no longer active (except for RST and RTM). If the program counter is displayed when you press the GO key, XCON-8 continuously monitors the program counter.

Breakpointing

Breakpointing permits the programmer to execute small portions of a program and then return to XCON-8. Breakpointing is especially useful when a program is being "debugged." Small portions of the program may be executed and their results observed. If there is an error, it may be corrected before an entire program is involved.

When the H8 executes a program and encounters a halt instruction, it re-enters XCON-8 and sounds the alarm. All of the registers are preserved and the program counter points to the address **following** the address of the halt instruction. Thus, you can breakpoint a program from the front panel by inserting halt instructions (HLT = 166) at the desired points throughout the program. When a particular section of the program is tested and the breakpoint feature is no longer required, you can change the halt to a "no operation" (NOP = 000). Once the halts are changed to NOPs, execution of the NOP simply passes control to the next successive instruction. Program execution for breakpointing uses the GO key as previously described.

NOTE: If you temporarily replace an existing instruction with a halt, you must restore the instruction before resuming program execution. The contents of the program counter point to the address **following** the halt. Therefore, if the instruction which replaced the halt is to be executed, when the program continues, the contents of the program counter must be decremented one location before execution is resumed.

Single Instruction Operation

Any user program may be operated in the single instruction mode. This procedure is identical to the GO command, except that the SI key is pressed rather than the GO key. When the SI key is pressed, a single **instruction** (not a single machine cycle) is executed and then control is returned to XCON-8. Single instruction operation is available for careful inspection of program results and for executing special programs, such as swapping the HL register pair with the stack pointer as discussed in "Altering the Contents of a Selected Register" (Page 1-15).

Interrupting a Program During Execution

You can interrupt a running program (with all registers preserved at the point of interruption) by pressing RTM & Ø. You can then examine and/or alter the contents of various memory locations and all the registers as required. Resume execution of the program at the next sequential instruction by simply pressing the GO key. NOTE: Although all registers and memory locations are preserved when RTM & Ø are pressed, it is very difficult to stop a program at an exact location. Therefore, use the breakpoint feature if you want to stop the program at an exact location.

LOAD/DUMP ROUTINES

XCON-8 contains a routine that lets you load and dump memory contents from or to a tape. This feature is especially important, as most computers require one of two successive "boot strap" routines to be hand-loaded before a desired program can be loaded into the main memory. All these "boot strap" routines are contained within the XCON-8 ROM, and use sophisticated error checking techniques. Thus, a program can be loaded or dumped by simply pressing a single key.

Loading From Tape

To load from a tape, ready the reader device with the tape to be loaded prior to executing the load command. Place XCON-8 in the display memory mode and press the LOAD key. Once the LOAD key is pressed, XCON-8 starts the tape transport and scans the tape for the first file record.

No change will be seen on the front panel displays until XCON-8 finds the first file. When the first file record is located, XCON-8 checks it to see if it is the first (or only) record in a sequence, and the record is a memory dump record. If it is not a memory dump record, a number two error is flagged (see "Tape Errors" on Page 1-20).

Once a correct record is found, loading proceeds. The loading procedure places the entry point address of the program being loaded in the H8 program counter. The H8 memory is then loaded. The displays continuously show the address being loaded and the data being loaded at these addresses. When the load is complete, XCON-8 sounds a long beep and displays the final memory address. If the load is faulty, a number one error is displayed and the audio alarm continuously beeps. (See "Tape Errors," Page 1-20.)

NOTE: You may abort a partial load by using the CANCEL key. Naturally, the load image resulting from this action is incorrect, and should not be executed.

Dumping to Tape

Before dumping a memory image onto tape, the following three dump parameters are required:

- The entry point address (the program starting address).
- The dump starting address.
- The dump ending address.

Set the desired entry point address by placing this value in the program counter (PC). This value will be placed in the program counter whenever you load the program so execution will begin at this address when you press the GO key.

Place the dump starting address into the first two H8 RAM cells. These are: 040 000 (offset octal) and 040 001 (offset octal). NOTE: The low order byte of the address should be placed into location 040 000 and the high order byte of the starting address should be placed into location 040 001.

Enter the dump ending address as a memory address using the # (MEM) key. Then ready the tape transport and press the DUMP key. As the tape dump takes place, the number of bytes left to be dumped and the contents of the memory location being dumped are displayed on the front panel. You can abort a dump by using the CANCEL key. If the CANCEL key is used, an incomplete dump image is left on the tape. This cannot be loaded at a future date. NOTE: A successful load automatically sets up the following three dump parameters:

A. The program starting locations are stored in locations 040 000 and 040 001.
B. The program ending location is displayed.
C. The program counter contains the program entry point.

Figure 1-3A shows the steps of a typical dump sequence and Figure 1-3B shows the steps of a typical load sequence.

1. Set PC to 040 100; (040 100 = entry address).
2. Set 040 000 to 100 (100 = low byte of dump start).
3. Set 040 001 to 040 (040 = high byte of dump start).
4. Enter memory address 052 340 (052 340 = end address of dump).
5. Be sure tape is ready.
6. Press DUMP.

Figure 1-3A
The H8 memory image dump.

1. Be sure tape is ready.
2. Press LOAD.

Figure 1-3B
The H8 memory image load.

Copying a Tape

The beginning and final address of the load image are placed at the appropriate points. Thus, to copy a tape, simply load the tape as described in "Loading From Tape" (Page 1-18). Then ready the dump tape drive and press the DUMP key. A dump then takes place, including entry point, initial address, and final address.

In a similar manner, to load, alter, and then dump, enter only the ending address. The other parameters are unchanged from the load if locations 040 000, 040 001 or the program counter have not been modified during the altering procedure.

Tape Errors

XCON-8 detects two types of tape errors: record errors and checksum errors. In either case, when an error is detected, the tape transport is halted. The error number is then displayed in the center three digits (001 for a checksum error, 002 for a record error) and the alarm is repeatedly sounded. To halt the alarm and return to the command mode, press the CANCEL key.

RECORD ERRORS

The following are typical causes of record errors.

- Attempting to load a file which is not a memory image. For example, loading an editor text file or a BASIC program file.
- Attempting to start a load in the middle of a load image. Therefore missing the initialization information at the start of the file.
- A tape error which causes a portion of the load image to be missed so the next record read is not in the proper sequence.

CHECKSUM ERRORS

A checksum error is flagged when the CRC (Cyclical Redundancy Check) checksum following a record does not match the CRC calculated by PAM-8. This error means that the record is either incorrectly recorded or the load is faulty. In either case, the load should be attempted again. If successive loads result in repeated failures, the original tape must be suspected as faulty.

I/O FACILITIES

XCON-8 supports two commands that allow you to perform input and output functions on H8 I/O ports. These front panel instructions permit simple manipulation of the H8 I/O ports without your having to write extensive routines to perform these functions.

Inputting From a Port

To input from a port, press the # key. Then enter three zero digits and the three-digit address (octal) of the desired port. NOTE: The front panel should now display 000 AAA, where AAA is the port address and 000 is meaningless. Press the IN key to read the port, the value is displayed in the three left-most digits of the front panel display.

Outputting to a Port

To output to a specified port, press the # key. Then enter the value to be supplied to the port in the three left-most displays. The port address is entered into the middle three displays. The display is of the form VVV AAA, where V stands for value, and A for address. Pressing the OUT key causes the value to be outputted to the indicated port.

Addressing Port Pairs

Frequently, ports are assigned in pairs, where one of the two port addresses is the control and status register and the other port is the data port. Address port pairs by using the + and − key to change ports. Once the initial port has been defined, the + key increments the port address to a new higher numbered port, and the − key is used to decrement to a lower numbered port.

ADVANCED CONTROL

One of the advanced features of XCON-8 is its provisions allowing sophisticated users to augment or replace XCON-8's functions. Augmenting or replacing XCON-8 functions is usually done in conjunction with assembly language programs. Sometimes it is possible to implement these features by using the POKE and PEEK commands in BASIC.

16-Bit Tick Counter (TICCNT)

XCON-8 maintains a 16-bit (2 byte) tick counter known as TICCNT. The value of this counter is incremented each time a clock interrupt is processed. As an interrupt occurs once every 2 mS, the counter is incremented once every 2 mS. As long as clock interrupts are not disabled, this value can be used by any program to compute elapsed time. The tick counter may be set to any desired value, but it should not be frequently reset, as this interferes with the front panel refresh cycle. The contents of the tick counter are contained in memory locations 040 033 (the least significant byte) and 040 034 (the most significant byte).

Using the Keypad

When your program is running, XCON-8 does not recognize any single key command. Thus, all single key patterns are available for your program. To read keypad patterns, you can use one of two routines. First, you may take an input from port IP. PAD; or second, your program may use XCON-8 RCK (read Console Keypad) routine. The input port IP. PAD is permanently assigned to port location 360. Inputting a binary number from this port detects which of the 16 keys are depressed.

The RCK routine provides keypad decoding, keypad debounce routines, auto-repeat routines, and acoustical feedback.

NOTE: If you use two key combinations, each key must reside in a separate bank. The first bank includes keys 0-7 and the second bank includes keys 8-#. RCK cannot decode two key combinations.

Display Usage

When a user program is running, XCON-8 normally displays the contents of the selected register or memory location. However, you may disable this process and display any arbitrary segment pattern, or completely disable the display to provide greater computational through-put. The display usage is primarily controlled by setting various bits in the .MFLAG memory cell. This memory cell is found at location 040 010.

MANUAL UPDATING

By setting the UO.DDU bit in the .MFLAG memory location, you can instruct XCON-8 to continue refreshing the front panel displays and to disable updating. When this is done, XCON-8 continues to refresh the LED's from a 9-byte block of RAM cells found at locations 040 013 thorugh 040 023. When the UO.DDU bit is set in .MFLAG, the contents of these bytes are not altered in any manner by XCON-8.

You can use this technique to display numbers, letters, or arbitrary bar patterns on the front panel displays. For instance, your program may alter the display by inserting any value into FPLEDS. The front panel LED segments will display a decimal integer if you use the octal to 7-segment pattern (DODA) display.

MANUAL DISPLAY REFRESHING

By setting the UO.NFR (User Option.No Front Panel Refresh) bit in the .MFLAG memory cell, you can instruct XCON-8 to stop refreshing the front panel displays. Setting the UO.NFR bit does not disable the clock interrupts; therefore, the tick counter (TICCNT) is still incremented. But XCON-8 does not refresh the displays from the information contained in the FPLEDS bytes.

NOTE: If you desire, you may write a program to refresh the front panel LED displays. Usually this is done using the clock interrupts. If you undertake an independent front panel refresh program, take extreme care to avoid burning the displays due to excessive refreshing. **The total power dissipated in the LEDs is determined by the refresh cycle, and too frequent refreshing will result in excessive display heating.**

Using Interrupts

All H8 interrupts cause control to be transferred into the low 64 bytes of memory. XCON-8 occupies this memory space so all interrupts are first processed by XCON-8. Except for level zero interrupts, which are used as master clears, you can supply an interrupt processing routine for each of the seven additional interrupts. The following sections explain the use of each of these interrupts.

I/O INTERRUPTS

Interrupts numbered 3 through 7 are I/O interrupts. XCON-8 does not process these interrupts in any way. When a level 3 through level 7 interrupt is received, XCON-8 immediately transfers to the user interrupt vectors contained in memory locations 040 037 through 040 064. Each location must contain a jump instruction pointing to the appropriate program location which processes these interrupts.

NOTE: If any of these interrupts occur, you must supply a processing routine for them. This routine must be complete including both entry and exit processing. When you use H8 interrupts, you must use only the available vector which is 6 to insure compatibility with future H8 products. You may also use 2 if you will not be using BUG-8.

CLOCK INTERRUPTS

The level one interrupts are generated by the front panel hardware every 2 mS. XCON-8 normally processes these interrupts. However, by setting a processing vector in UIVEC and setting the UO.INT bit in the .MFLAG cell, XCON-8 enters the users routine each time a clock interrupt is generated.

SINGLE INSTRUCTION AND BREAKPOINT INTERRUPTS

Level two interrupts are generated by the single instruction hardware contained on the CPU card. When a single instruction is requested, the result of the interrupt is processed by XCON-8. If the single instruction interrupt was generated by XCON-8 in response to a Monitor Mode Single Instruction register condition, XCON-8 processes it. Otherwise, XCON-8 jumps to the user level two interrupt vector (UIVEC). Since the level two interrupt does not affect XCON-8, a level two restart instruction can be used as a breakpoint instruction by the user programs.

FLOPPY BOOT

XCON-8 contains the code necessary to boot-up an operating system from a floppy disk. Two forms of "Boot" let you select the device (H17 or H47) 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 SW1 sections 4, 1, and 0 on the extended configuration board. This switch is preset for H17 primary device. You may change the switch sections to select H47 primary device.

DISPLAY	ACTION	COMMENTS
Pri H 17	Press "1"	Boot H17 primary
	or	
Pri H 47	Press "1"	Boot H47 primary

BOOT SECONDARY

SEC H 17	Press "2"	Boot H17 secondary
	or	
SEC H 47	Press "2"	Boot H47 secondary

You may use the "CANCEL" key to abort the boot command and return to the monitor.

AUTO BOOT

If Switch SW1 section 7 is set to 1, the floppy disk will boot from the primary device automatically at power-up and master clear.

NOTE: We do not recommend auto-booting with a diskette in the drive and the door closed at power-up. Damage could occur to the diskette if you attempt to do so. Rather, power-up the H8 and H17 (H47), insert the diskette, and close the door within 15 seconds. Rebooting with Auto-Boot is the prime reason for its implementation. Software may accomplish this by executing an RST Ø.

BOOT FROM DRIVE OTHER THAN DRIVE Ø

Primary and secondary Boot are both designed to access drive Ø on either the H17 or the H47. However, if you have not selected Auto Boot, you may boot from H47 drive 1 or 2 or H17 drive 1, 2, or 3 by following this procedure:

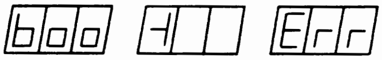
1. Use XCON-8 "Altering the Contents of a Selected Register" procedures to set register A to the drive number that you want to boot from.

2. If you are booting from a primary alternate drive, simply press "GO."

3. If you are booting from a secondary alternate drive, set register PC to 007 367 (the secondary drive address) and press "GO."

NOTE: Register PC is already set for the primary drive address (007 364) at power-up and master clear.

ERRORS

The front panel will display  if any of the following conditions occur:

1. The boot device does not respond within 15 seconds.

2. Switch SW1 is set to an undefined setting.

3. A disk error occurs.

NOTE: The "boot Err" message will only remain on the display a few seconds. XCON-8 will then return to the panel monitor mode.

SWITCH SW1

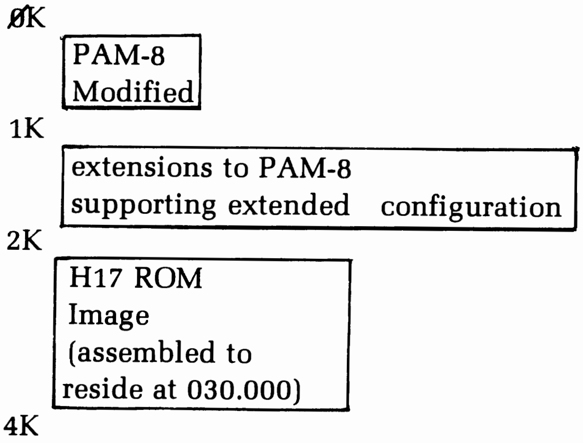
The sections of SW1 (on the HA8-8 Extended Configuration Board) have been defined as follows:

SWITCH SECTION	DESCRIPTION
7 6 5 4 3 2 1 0	
X X X X X X 0 0	Port 174/177 = H17
X X X X X X 0 1	Port 174/177 = H47
X X X X 0 0 X X	Port 170/173 = unused
X X X X 0 1 X X	Port 170/173 = H47
X X X 0 X X X X	Boot primary from port 174/177
X X X 1 X X X X	Boot primary from port 170/173
0 X X X X X X X	Normal
1 X X X X X X X	Auto-Boot

Note that switches 5 and 6 are reserved.

MEMORY MAP

The lower 4K of memory is used as follows:



ØK

PAM-8 Modified

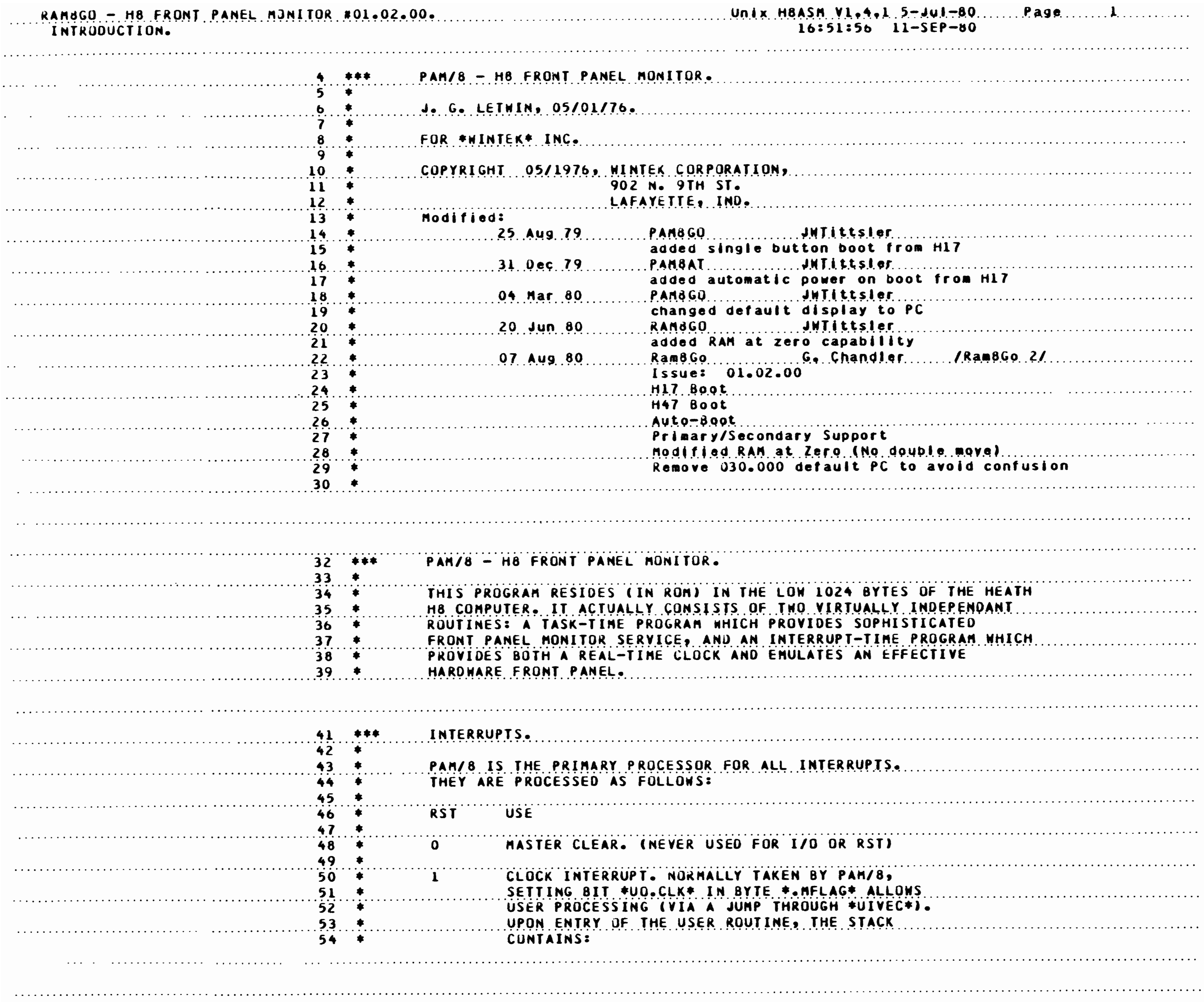
1K

extensions to PAM-8 supporting extended configuration

2K

H17 ROM Image (assembled to reside at 030.000)

4K



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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                 Unix H8ASM V1.4.1 5-Jul-80    Page   1
 INTRODUCTION.                                                      16:51:56  11-SEP-80

    ***     PAM/8 - H8 FRONT PANEL MONITOR.
    *
    *       J. G. LETWIN, 05/01/76.
    *
    *       FOR *WINTEK* INC.
    *
    *       COPYRIGHT  05/1976, WINTEK CORPORATION,
    *                            902 N. 9TH ST.
    *                            LAFAYETTE, IND.
    *       Modified:
    *               25 Aug 79       PAM8GO          JWTittsler
    *                               added single button boot from H17
    *               31 Dec 79       PAM8AT          JWTittsler
    *                               added automatic power on boot from H17
    *               04 Mar 80       PAM8GO          JWTittsler
    *                               changed default display to PC
    *               20 Jun 80       RAM8GO          JWTittsler
    *                               added RAM at zero capability
    *               07 Aug 80       Ram8Go          G. Chandler      /Ram8Go 2/
    *                               Issue:  01.02.00
    *                               H17 Boot
    *                               H47 Boot
    *                               Auto-Boot
    *                               Primary/Secondary Support
    *                               Modified RAM at Zero (No double move)
    *                               Remove 030.000 default PC to avoid confusion
    *


    ***     PAM/8 - H8 FRONT PANEL MONITOR.
    *
    *       THIS PROGRAM RESIDES (IN ROM) IN THE LOW 1024 BYTES OF THE HEATH
    *       H8 COMPUTER. IT ACTUALLY CONSISTS OF TWO VIRTUALLY INDEPENDANT
    *       ROUTINES: A TASK-TIME PROGRAM WHICH PROVIDES SOPHISTICATED
    *       FRONT PANEL MONITOR SERVICE, AND AN INTERRUPT-TIME PROGRAM WHICH
    *       PROVIDES BOTH A REAL-TIME CLOCK AND EMULATES AN EFFECTIVE
    *       HARDWARE FRONT PANEL.


    ***     INTERRUPTS.
    *
    *       PAM/8 IS THE PRIMARY PROCESSOR FOR ALL INTERRUPTS.
    *       THEY ARE PROCESSED AS FOLLOWS:
    *
    *       RST     USE
    *
    *       0       MASTER CLEAR. (NEVER USED FOR I/O OR RST)
    *
    *       1       CLOCK INTERRUPT. NORMALLY TAKEN BY PAM/8,
    *               SETTING BIT *UO.CLK* IN BYTE *.MFLAG* ALLOWS
    *               USER PROCESSING (VIA A JUMP THROUGH *UIVEC*).
    *               UPON ENTRY OF THE USER ROUTINE, THE STACK
    *               CONTAINS:
```

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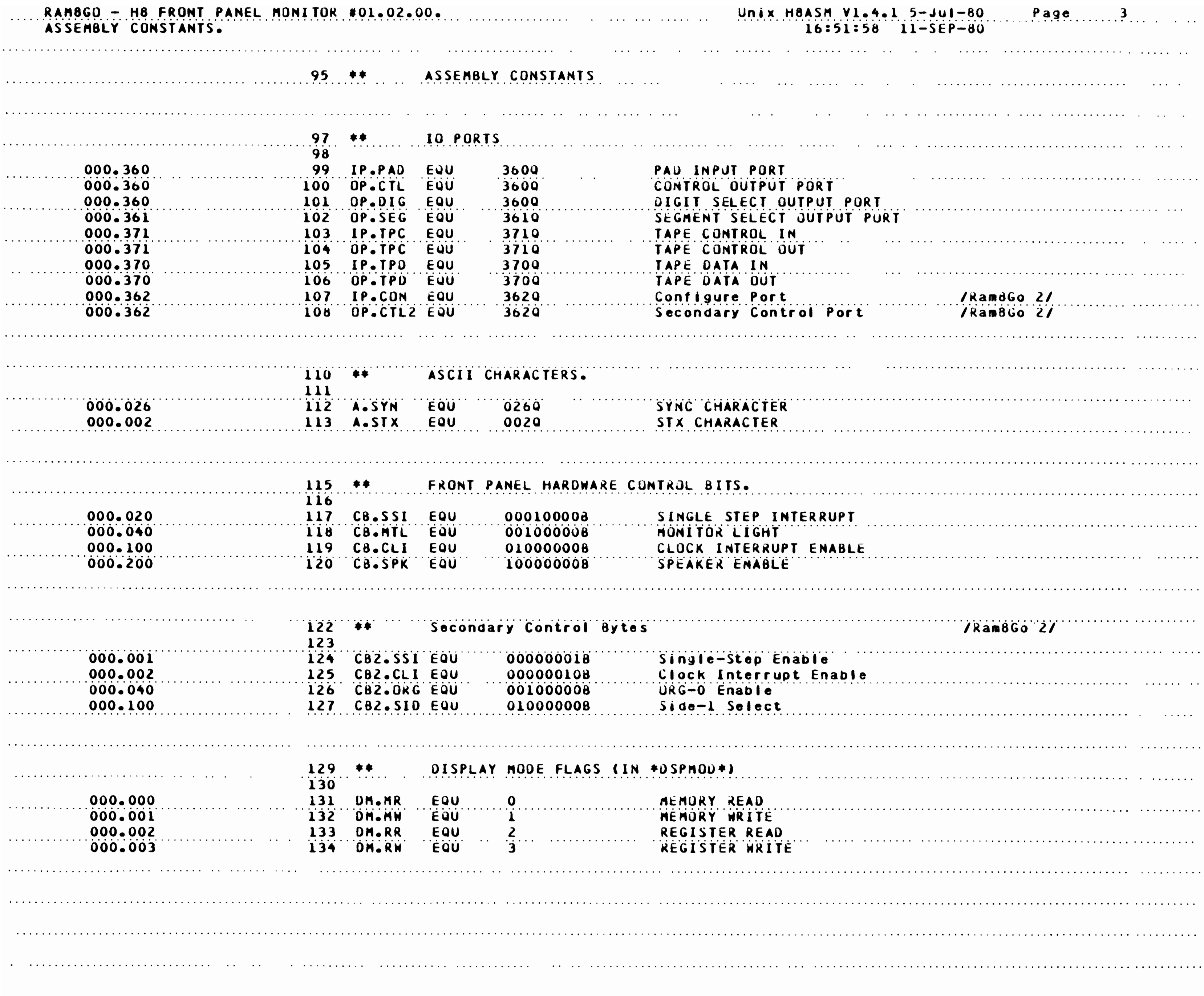
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.               Unix H8ASM V1.4.1 5-Jul-80     Page     2
 INTRODUCTION.                                                     16:51:58  11-SEP-80

                        55  *              (STACK+0)   = RETURN ADDRESS (TO PAM/8)
                        56  *              (STACK+2)   = (STACKPTR+14)
                        57  *              (STACK+4)   = (AF)
                        58  *              (STACK+6)   = (BC)
                        59  *              (STACK+8)   = (DE)
                        60  *              (STACK+10)  = (HL)
                        61  *              (STACK+12)  = (PC)
                        62  *              THE USER'S ROUTINE SHOULD RETURN TO PAM/8 VIA
                        63  *              A *RET* WITHOUT ENABLING INTERRUPTS.
                        64  *
                        65  *      2       SINGLE STEP. SINGLE STEP INTERRUPTS GENERATED
                        66  *              BY PAM/8 ARE PROCESSED BY PAM/8.
                        67  *              ANY SINGLE STEP INTERRUPT RECEIVED WHEN IN
                        68  *              USER MODE CAUSES A JUMP THROUGH *UIVEC*+3.
                        69  *              STACK UPON USER ROUTINE ENTRY:
                        70  *              (STACK+0)   = (STACKPTR+12)
                        71  *              (STACK+2)   = (AF)
                        72  *              (STACK+4)   = (BC)
                        73  *              (STACK+6)   = (DE)
                        74  *              (STACK+8)   = (HL)
                        75  *              (STACK+10)  = (PC)
                        76  *              THE USER'S ROUTINE SHOULD HANDLE IT'S OWN RETURN
                        77  *              FROM THE INTERRUPT.
                        78  *
                        79  *
                        80  *      THE FOLLOWING INTERRUPTS ARE VECTORED DIRECTLY THROUGH *UIVEC*.
                        81  *      THE USER ROUTINE MUST HAVE SETUP A JUMP IN *UIVEC* BEFORE ANY
                        82  *      OF THESE INTERRUPTS MAY OCCUR.
                        83  *
                        84  *      3        I/O 3. CAUSES A DIRECT JUMP THROUGH *UIVEC*+6
                        85  *
                        86  *      4        I/O 4. CAUSES A DIRECT JUMP THROUGH *UIVEC*+9
                        87  *
                        88  *      5        I/O 5. CAUSES A DIRECT JUMP THROUGH *UIVEC*+12
                        89  *
                        90  *      6        I/O 6. CAUSES A DIRECT JUMP THROUGH *UIVEC*+15
                        91  *
                        92  *      7        I/O 7. CAUSES A DIRECT JUMP THROUGH *UIVEC*+18
```



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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                            Unix H8ASM V1.4.1 5-Jul-80     Page     3
ASSEMBLY CONSTANTS.                                                            16:51:58  11-SEP-80

                            95  **      ASSEMBLY CONSTANTS

                            97  **      IO PORTS
                            98
     000.360                99  IP.PAD  EQU     360Q            PAD INPUT PORT
     000.360               100  OP.CTL  EQU     360Q            CONTROL OUTPUT PORT
     000.360               101  OP.DIG  EQU     360Q            DIGIT SELECT OUTPUT PORT
     000.361               102  OP.SEG  EQU     361Q            SEGMENT SELECT OUTPUT PORT
     000.371               103  IP.TPC  EQU     371Q            TAPE CONTROL IN
     000.371               104  OP.TPC  EQU     371Q            TAPE CONTROL OUT
     000.370               105  IP.TPD  EQU     370Q            TAPE DATA IN
     000.370               106  OP.TPD  EQU     370Q            TAPE DATA OUT
     000.362               107  IP.CON  EQU     362Q            Configure Port                  /Ram8Go 2/
     000.362               108  OP.CTL2 EQU     362Q            Secondary Control Port          /Ram8Go 2/

                           110  **      ASCII CHARACTERS.
                           111
     000.026               112  A.SYN   EQU     026Q            SYNC CHARACTER
     000.002               113  A.STX   EQU     002Q            STX CHARACTER

                           115  **      FRONT PANEL HARDWARE CONTROL BITS.
                           116
     000.020               117  CB.SSI  EQU     00010000B       SINGLE STEP INTERRUPT
     000.040               118  CB.MTL  EQU     00100000B       MONITOR LIGHT
     000.100               119  CB.CLI  EQU     01000000B       CLOCK INTERRUPT ENABLE
     000.200               120  CB.SPK  EQU     10000000B       SPEAKER ENABLE

                           122  **      Secondary Control Bytes                                 /Ram8Go 2/
                           123
     000.001               124  CB2.SSI EQU     00000001B       Single-Step Enable
     000.002               125  CB2.CLI EQU     00000010B       Clock Interrupt Enable
     000.040               126  CB2.ORG EQU     00100000B       ORG-0 Enable
     000.100               127  CB2.SID EQU     01000000B       Side-1 Select

                           129  **      DISPLAY MODE FLAGS (IN *DSPMOD*)
                           130
     000.000               131  DM.MR   EQU     0               MEMORY READ
     000.001               132  DM.MW   EQU     1               MEMORY WRITE
     000.002               133  DM.RR   EQU     2               REGISTER READ
     000.003               134  DM.RW   EQU     3               REGISTER WRITE
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                          Unix H8ASM V1.4.1 5-Jul-80     Page     4
ASSEMBLY CONSTANTS.                                                          16:51:58  11-SEP-80

                        136  **       Configuration Flags                                        /Ram8Go 2/
                        137
      000.003           138  CN.174M EQU      00000011B       Port 174Q Device-Type Mask
      000.014           139  CN.170M EQU      00001100B       Port 170Q Device-Type Mask
      000.020           140  CN.PRI  EQU      00010000B       Primary/Secondary:  1 => Primary == 170Q
      000.040           141  CN.MEM  EQU      00100000B       Memory Test/Normal
      000.100           142  CN.BAU  EQU      01000000B       Baud Rate:  0 => 9600; 1 => 19200
      000.200           143  CN.ABO  EQU      10000000B       Auto-Boot:  1 => Auto-Boot
                        144
      000.000           145  CND.H17 EQU      00B             H-17 Disk               Valid only in CN.174M
      000.000           146  CND.NDI EQU      00B             No Disk Installed       Valid only in CN.170M
      000.001           147  CND.H47 EQU      01B             H-47


                        149  **       Boot Constants (H17 Rom Dependant)                         /Ram8Go 2/
                        150
      041.061           151  AIO.UNI EQU      41061A          Boot Device Unit Number
      037.132           152  BOOTA   EQU      37132A          Disk Constants ROM Source
      000.130           153  BOOTAL  EQU        130Q          Disk Constants Length
      000.012           154  ERPTCNT EQU        10            Soft Error Retry Count
      036.073           155  R.SDP.  EQU      36073A          Common ROM Code
      034.031           156  ROMCLK  EQU      34031A          H17 Clock Vector


                        158  **       Segment Definitions                                        /Ram8Go 2/
                        159
      000.001           160  S0       EQU     00000001B
      000.002           161  S1       EQU     00000010B
      000.004           162  S2       EQU     00000100B
      000.010           163  S3       EQU     00001000B
      000.020           164  S4       EQU     00010000B
      000.040           165  S5       EQU     00100000B
      000.100           166  S6       EQU     01000000B
      000.200           167  S7       EQU     10000000B


                        169  **       Key Definitions                                            /Ram8Go 2/
                        170
      000.257           171  K.PLUS   EQU     10101111B                +
      000.217           172  K.MINU   EQU     10001111B                -
      000.157           173  K.STAR   EQU     01101111B                *
      000.117           174  K.DIVD   EQU     01001111B                /
      000.057           175  K.NUMB   EQU     00101111B                #
      000.017           176  K.DOT    EQU     00001111B                .
      000.000           177           XTEXT   TAPE            TAPE DEFINITIONS
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                              Unix H8ASM V1.4.1 5-Jul-80      Page    5
ASSEMBLY CONSTANTS.                                             $TAPE           16:52:05  11-SEP-80

                         179X **      TAPE EQUIVALENCES.
                         180X
    000.001              181X RT.MI   EQU     1               RECORD TYPE - MEMORY DUMP IMAGE
    000.002              182X RT.BP   EQU     2               RECORD TYPE - BASIC PROGRAM
    000.003              183X RT.CT   EQU     3               RECORD TYPE - COMPRESSED TEXT
    000.004              184X RT.NB   EQU     4               RECORD TYPE - NEW BASIC PROG.
    000.005              185X RT.BD   EQU     5               RECORD TYPE - BASIC DATA
    000.006              186X RT.PD   EQU     6               RECORD TYPE - BASIC PROG. AND DATA
                         187X
                         188X **      BLOCK SIZE FOR INTER-PRODUCT COMMUNICATION.
                         189X
    002.000              190X BLKSIZ  EQU     512
                         191X
                         192X **      IO PORT VALUES.
                         193X
    000.370              194X TD.IN   EQU     370Q            TAPE DATA IN
    000.370              195X TD.OUT  EQU     370Q            TAPE DATA OUT
    000.371              196X TS.IN   EQU     371Q            TAPE STATUS IN
    000.371              197X TS.OUT  EQU     371Q            TAPE STATUS OUT


                         199  **      MACHINE INSTRUCTIONS.
                         200
    000.166              201  MI.HLT  EQU     01110110B       HALT
    000.311              202  MI.RET  EQU     11001001B       RETURN
    000.333              203  MI.IN   EQU     11011011B       INPUT
    000.303              204  MI.JMP  EQU     11000011B       Jump                          /Ram8Go 2/
    000.323              205  MI.OUT  EQU     11010011B       OUTPUT
    000.072              206  MI.LDA  EQU     00111010B       LDA
    000.346              207  MI.ANI  EQU     11100110B       ANI
    000.021              208  MI.LXID EQU     00010001B       LXI D


                         210  **      USER OPTION BITS.
                         211  *
                         212  *       THESE BITS ARE SET IN CELL .MFLAG.
                         213
    000.200              214  UO.HLT  EQU     10000000B       DISABLE HALT PROCESSING
    000.100              215  UO.NFR  EQU     CB.CLI          NO REFRESH OF FRONT PANEL
    000.002              216  UO.DDU  EQU     00000010B       DISABLE DISPLAY UPDATE
    000.001              217  UO.CLK  EQU     00000001B       ALLOW PRIVATE INTERRUPT PROCESSING


    000.000              219          XTEXT   HOSEQU
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                              Unix H8ASM V1.4.1 5-Jul-80    Page     6
ASSEMBLY CONSTANTS.                                                HDOSEQU         16:52:09  11-SEP-80

                            221X **       HDOS SYSTEM EQUIVALENCES.
                            222X *
                            223X
   024.000                  224X S.GRT0  EQU      24000A              SYSTEM AREA FOR  GRT0
   025.000                  225X S.GRT1  EQU      25000A              SYSTEM AREA FOR  GRT1
   026.000                  226X S.GRT2  EQU      26000A              SYSTEM AREA FOR  GRT2
                            227X
   030.000                  228X ROMBOOT EQU      30000A              ROM BOOT ENTRY
                            229X
   040.100                  230X         ORG      40100A              FREE SPACE FROM PAM-8
                            231X
   040.100                  232X         DS       8                   JUMP TO SYSTEM EXIT
   040.110                  233X D.CON   DS       16                  DISK CONSTANTS
   040.130                  234X SYDD    EQU      *                   SYSTEM DISK ENTRY POINT
   040.130                  235X D.VEC   DS       24*3                SYSTEM ROM ENTRY VECTORS
   040.240                  236X D.RAM   DS       31                  SYSTEM ROM WORK AREA
   040.277                  237X S.VAL   DS       36                  SYSTEM VALUES
   040.343                  238X S.INT   DS       115                 SYSTEM INTERNAL WORK AREAS
   041.126                  239X         DS       16
   041.146                  240X S.SOVR  DS       2                   STACK OVERFLOW WARNING
   041.150                  241X         DS       42200A-*            SYSTEM STACK
   001.032                  242X STACKL  EQU      *-S.SOVR            STACK SIZE
                            243X
   042.200                  244X STACK   EQU      *                   LWA+1 SYSTEM STACK
   042.200                  245X USERFWA EQU      *                   USER FWA
   042.200                  246          XTEXT    EDRAM


                            248X **       EDRAM - DISK RAM WORKAREA DEFINITION.
                            249X *
                            250X *        ZEROED UPON BOOTING UP.
                            251X *
                            252X *        HDSEQU MUST BE CHANGED WHEN THIS DECK IS CHANGED.
                            253X
                            254X
   040.240                  255X         ORG      D.RAM
                            256X
   040.240                  257X D.TT    DS       1                   TARGET TRACK (CURRENT OPERATION)
   040.241                  258X D.TS    DS       1                   TARGET SECTOR (CURRENT OPERATION)
                            259X
   040.242                  260X D.DVCTL DS       1                   DEVICE CONTROL BYTE
                            261X
   040.243                  262X D.DLYMO DS       1                   MOTOR ON DELAY COUNT
   040.244                  263X D.DLYHS DS       1                   HEAD SETTLE DELAY COUNTER
                            264X
   040.245                  265X D.TRKPT DS       2                   ADDRESS IN D.DRVTB FOR TRACK NUMBER
   040.247                  266X D.VOLPT DS       2                   ADDRESS IN D.DRVTB FOR VOLUME NUMBER
                            267X
   040.251                  268X D.DRVTB DS       2*4                 TRACK NUMBER AND VOLUME NUMBER FOR 4 DRIVES
                            269X
   040.261                  270X D.HECNT DS       1                   HARD ERROR COUNT
   040.262                  271X D.SECNT DS       2                   SOFT ERROR COUNT
   040.264                  272X D.OECNT DS       1                   OPERATION ERROR COUNT
                            273X
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                      Unix H8ASM V1.4.1 5-Jul-80     Page     7
ASSEMBLY CONSTANTS.                                       EDRAM          16:52:15  11-SEP-80

                    274X *        GLOBAL DISK ERROR COUNTERS
                    275X
 040.265            276X D.ERR    DS      0                BEGINNING OF ERROR BLOCK
 040.265            277X D.E.MDS  DS      1                MISSING DATA SYNC
 040.266            278X D.E.HSY  DS      1                MISSING HEADER SYNC
 040.267            279X D.E.CHK  DS      1                DATA CHECKSUM
 040.270            280X D.E.HCK  DS      1                HEADER CHECKSUM
 040.271            281X D.E.VOL  DS      1                WRONG VOLUME NUMBER
 040.272            282X D.E.TRK  DS      1                BAD TRACK SEEK
 040.273            283X D.ERRL   DS      0                LIMIT OF ERROR COUNTERS
                    284X
                    285X *        I/O OPERATION COUNTS
                    286X
 040.273            287X D.OPR    DS      2
 040.275            288X D.OPW    DS      2
                    289X
 000.037            290X D.RAML   EQU     *-D.RAM
 040.277            291           XTEXT   EDVEC


                    293X **       JMP VECTORS FOR ROM CODE
                    294X *
                    295X *        SEE DISK ROM FOR ADDRESSES
                    296X *
                    297X *        HOSEQU MUST BE ALTERED WHEN THIS TABLE IS ALTERED.
                    298X
 040.130            299X          ORG     D.VEC
                    300X
 040.130            301X D.SYDD   DS      3                JMP   R.SYDD (MUST BE FIRST)
 040.133            302X D.MOUNT  DS      3                JMP   R.MOUNT
 040.136            303X D.XOK    DS      3                JMP   R.XOK
 040.141            304X D.ABORT  DS      3                JMP   R.ABORT
 040.144            305X D.XIT    DS      3                JMP   R.XIT
 040.147            306X D.READ   DS      3                JMP   R.READ
 040.152            307X D.READR  DS      3                JMP   R.READR
 040.155            308X D.WRITE  DS      3                JMP   R.WRITE
 040.160            309X D.CDE    DS      3                JMP   R.CDE
 040.163            310X D.DTS    DS      3                JMP   R.DTS
 040.166            311X D.SDT    DS      3                JMP   R.SDT
 040.171            312X D.MAI    DS      3                JMP   R.MAI
 040.174            313X D.MAO    DS      3                JMP   R.MAO
 040.177            314X D.LPS    DS      3                JMP   R.LPS
 040.202            315X D.RDB    DS      3                JMP   R.RDB
 040.205            316X D.SDP    DS      3                JMP   R.SDP
 040.210            317X D.STS    DS      3                JMP   R.STS
 040.213            318X D.STZ    DS      3                JMP   R.STZ
 040.216            319X D.UDLY   DS      3                JMP   R.UDLY
 040.221            320X D.WSC    DS      3                JMP   R.WSC
 040.224            321X D.WSP    DS      3                JMP   R.WSP
 040.227            322X D.WNB    DS      3                JMP   R.WNB
 040.232            323X D.ERRT   DS      3                JMP   R.ERRT
 040.235            324X D.DLY    DS      3                JMP   R.DLY
 040.240            325           XTEXT   H17DEF
```

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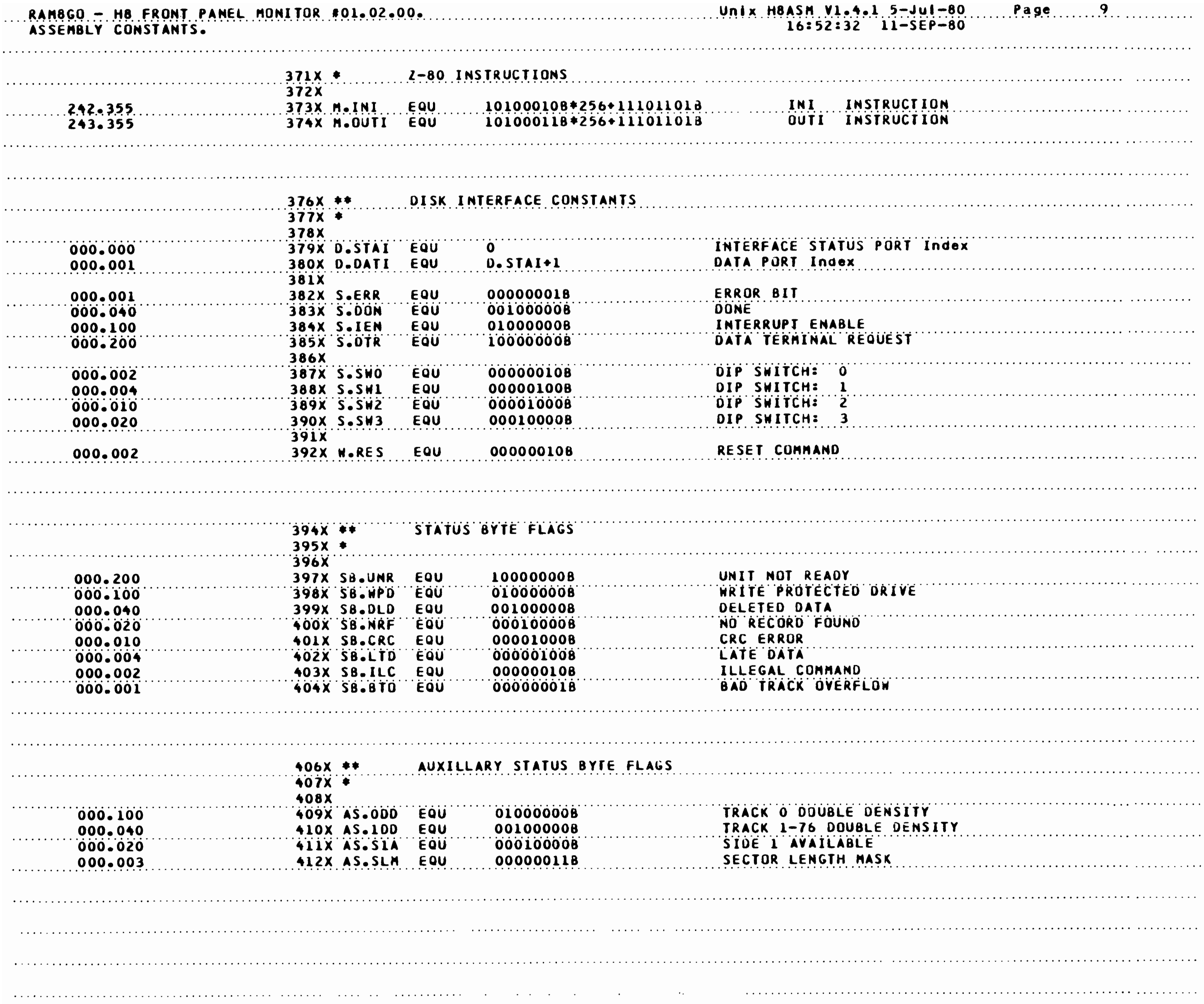
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                      Unix H8ASM V1.4.1 5-Jul-80      Page     8
ASSEMBLY CONSTANTS.                                        H17          16:52:28  11-SEP-80

                        327X **      H17 CONTROL INFORMATION.
                        328X
   000.177              329X DP.DC   EQU      07FH            DISK CONTROL PORT
                        330X
   000.001              331X DF.HD   EQU      00000001B       HOLE DETECT
   000.002              332X DF.TO   EQU      00000010B       TRACK 0 DETECT
   000.004              333X DF.WP   EQU      00000100B       WRITE PROTECT
   000.010              334X DF.SD   EQU      00001000B       SYNC DETECT
                        335X
   000.001              336X DF.WG   EQU      00000001B       WRITE GATE ENABLE
   000.002              337X DF.DSO  EQU      00000010B       DRIVE SELECT 0
   000.004              338X DF.DS1  EQU      00000100B       DRIVE SELECT 1
   000.010              339X DF.DS2  EQU      00001000B       DRIVE SELECT 2
   000.020              340X DF.MO   EQU      00010000B       MOTOR ON (BOTH DRIVES)
   000.040              341X DF.DI   EQU      00100000B       DIRECTION (0=OUT)
   000.100              342X DF.ST   EQU      01000000B       STEP COMMAND (ACTIVE HIGH)
   000.200              343X DF.WR   EQU      10000000B       WRITE ENABLE RAM
                        344X
                        345X
                        346X
                        347X **      DISK UART PORTS AND CONTROL FLAGS.
                        348X
   000.174              349X UP.DP   EQU      07CH            DATA PORT
   000.175              350X UP.FC   EQU      07DH            FILL CHARACTER
   000.175              351X UP.ST   EQU      07DH            STATUS FLAGS
   000.176              352X UP.SC   EQU      07EH            SYN CHARACTER (OUTPUT)
   000.176              353X UP.SR   EQU      07EH            SYNC RESET (INPUT)
                        354X
   000.001              355X UF.RDA  EQU      00000001B       RECEIVE DATA AVAILABLE
   000.002              356X UF.ROR  EQU      00000010B       RECEIVER OVERRUN
   000.004              357X UF.RPE  EQU      00000100B       RECEIVER PARITY ERROR
   000.100              358X UF.FCT  EQU      01000000B       FILL CHAR TRANSMITTED
   000.200              359X UF.TBM  EQU      10000000B       TRANSMITTER BUFFER EMPTY
                        360X
                        361X
                        362X
                        363X **      CHARACTER DEFINITIONS.
                        364X
   000.375              365X C.DSYN  EQU      0FDH            PREFIX SYNC CHARACTER
   040.240              366          XTEXT    H47DEF


                        368X **      H47DEF  -  H47 Constant Definitions
                        369X *
```



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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                Unix H8ASM V1.4.1 5-Jul-80   Page    9
ASSEMBLY CONSTANTS.                                                 16:52:32  11-SEP-80

                    371X *       Z-80 INSTRUCTIONS
                    372X
 242.355            373X M.INI   EQU    10100010B*256+11101101B     INI   INSTRUCTION
 243.355            374X M.OUTI  EQU    10100011B*256+11101101B     OUTI  INSTRUCTION


                    376X **      DISK INTERFACE CONSTANTS
                    377X *
                    378X
 000.000            379X D.STAI  EQU    0                       INTERFACE STATUS PORT Index
 000.001            380X D.DATI  EQU    D.STAI+1                DATA PORT Index
                    381X
 000.001            382X S.ERR   EQU    00000001B               ERROR BIT
 000.040            383X S.DON   EQU    00100000B               DONE
 000.100            384X S.IEN   EQU    01000000B               INTERRUPT ENABLE
 000.200            385X S.DTR   EQU    10000000B               DATA TERMINAL REQUEST
                    386X
 000.002            387X S.SW0   EQU    00000010B               DIP SWITCH:  0
 000.004            388X S.SW1   EQU    00000100B               DIP SWITCH:  1
 000.010            389X S.SW2   EQU    00001000B               DIP SWITCH:  2
 000.020            390X S.SW3   EQU    00010000B               DIP SWITCH:  3
                    391X
 000.002            392X W.RES   EQU    00000010B               RESET COMMAND


                    394X **      STATUS BYTE FLAGS
                    395X *
                    396X
 000.200            397X SB.UNR  EQU    10000000B               UNIT NOT READY
 000.100            398X SB.WPD  EQU    01000000B               WRITE PROTECTED DRIVE
 000.040            399X SB.DLD  EQU    00100000B               DELETED DATA
 000.020            400X SB.NRF  EQU    00010000B               NO RECORD FOUND
 000.010            401X SB.CRC  EQU    00001000B               CRC ERROR
 000.004            402X SB.LTD  EQU    00000100B               LATE DATA
 000.002            403X SB.ILC  EQU    00000010B               ILLEGAL COMMAND
 000.001            404X SB.BTO  EQU    00000001B               BAD TRACK OVERFLOW


                    406X **      AUXILLARY STATUS BYTE FLAGS
                    407X *
                    408X
 000.100            409X AS.0DD  EQU    01000000B               TRACK 0 DOUBLE DENSITY
 000.040            410X AS.1DD  EQU    00100000B               TRACK 1-76 DOUBLE DENSITY
 000.020            411X AS.S1A  EQU    00010000B               SIDE 1 AVAILABLE
 000.003            412X AS.SLM  EQU    00000011B               SECTOR LENGTH MASK
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                          Unix H8ASM V1.4.1 5-Jul-80     Page    10
ASSEMBLY CONSTANTS.                                     DD.COM           16:52:35  11-SEP-80

                         414X **      DISK COMMANDS
                         415X *
                         416X
    000.000              417X          ORG     0
    000.000              418X DD.BOOT DS       1                         BOOT
    000.001              419X DD.RST  DS       1                         READ STATUS
    000.002              420X DD.RAS  DS       1                         READ AUX. STATUS
    000.003              421X DD.LSC  DS       1                         LOAD SECTOR COUNT
    000.004              422X DD.RAD  DS       1                         READ ADDRESS OF LAST SECTOR ACCESSED
    000.005              423X DD.REA  DS       1                         READ SECTORS
    000.006              424X DD.WRI  DS       1                         WRITE SECTORS
    000.007              425X DD.REAB DS       1                         READ SECTORS BUFFERED
    000.010              426X DD.WRIB DS       1                         WRITE SECTORS BUFFERED
    000.011              427X DD.WRD  DS       1                         DD.WRI  + DELETED
    000.012              428X DD.WRBD DS       1                         DD.WRIB + DELETED
    000.013              429X DD.CPY  DS       1                         COPY
    000.014              430X DD.FRM0 DS       1                         FORMAT IBM SD
    000.015              431X DD.FRM1 DS       1                         FORMAT     SD
    000.016              432X DD.FRM2 DS       1                         FORMAT IBM DD
    000.017              433X DD.FRM3 DS       1                         FORMAT     DD
    000.020              434X DD.RRDY DS       1                         Read Ready (conflict with DD.SPF0)


                         436X **      Special De-Bug Functions
                         437X *
                         438X
    000.020              439X          ORG     010H
    000.020              440X DD.SPF0 DS       1                         SPECIAL FUNCTION  0
    000.021              441X DD.SPF1 DS       1                         SPECIAL FUNCTION  1
    000.022              442X DD.SPF2 DS       1                         SPECIAL FUNCTION  2
    000.023              443X DD.SPF3 DS       1                         SPECIAL FUNCTION  3
    000.024              444X DD.SPF4 DS       1                         SPECIAL FUNCTION  4
    000.025              445X DD.SPF5 DS       1                         SPECIAL FUNCTION  5


                         447X **      Special Heath Functions
                         448X *
                         449X
    000.200              450X          ORG     080H
    000.200              451X DD.SDC  DS       1                         SET DRIVE CHARACTERISTICS
    000.201              452X DD.ST   DS       1                         SEEK TO TRACK
    000.202              453X DD.DS   DS       1                         DISK STATUS
    000.203              454X DD.RDL  DS       1                         READ LOGICAL
    000.204              455X DD.WTL  DS       1                         WRITE LOGICAL
    000.205              456X DD.RDBL DS       1                         READ BUFFERED LOGICAL
    000.206              457X DD.WTBL DS       1                         WRITE BUFFERED LOGICAL
    000.207              458X DD.WTDL DS       1                         WRITE DELETED DATA LOGICAL
    000.210              459X DD.WDLB DS       1                         WRITE BUFFERED DELETED DATA LOGICAL
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.  Unix H8ASM V1.4.1 5-Jul-80    Page    11
ASSEMBLY CONSTANTS.                             16:52:39  11-SEP-80

                 461X **      Useful Flags
                 462X *
                 463X
   000.000       464X UNT.0   EQU     00000000B            Unit: 0
   000.040       465X UNT.1   EQU     00100000B            Unit: 1
   000.100       466X UNT.2   EQU     01000000B            Unit: 2
   000.140       467X UNT.3   EQU     01100000B            Unit: 3
                 468X
   000.140       469X UNT.M   EQU     UNT.0!UNT.1!UNT.2!UNT.3 Unit Mask
                 470X
                 471X
                 472X
   000.000       473X SID.0   EQU     00000000B            Side: 0
   000.200       474X SID.1   EQU     10000000B            Side: 1
                 475X
   000.200       476X SID.M   EQU     SID.0!SID.1          Side Mask
                 477X
                 478X
                 479X
   000.037       480X SEC.M   EQU     00011111B            Track Mask
                 481X
                 482X
                 483X
   004.000       484X SSIZ.M  EQU     1024                 Maximum Sector Size
                 485X
                 486X
                 487X *C.128  EQU     128
                 488X *C.256  EQU     256
                 489X *C.26   EQU     26
   000.211       490          XTEXT   U8251           DEFINE 8251 USART BITS
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                   Unix H8ASM V1.4.1 5-Jul-80     Page    12
8251 USART BIT DEFINITIONS.                                        16:52:48  11-SEP-80

                        493X **       8251 USART BIT DEFINITIONS.
                        494X *
                        495X
                        496X **       PORT ADDRESSES
                        497X
   000.000              498X UDR      EQU     0               DATA REGISTER IS EVEN
   000.001              499X USR      EQU     1               STATUS REGISTER IS NEXT
                        500X
   000.372              501X SC.UART EQU      372Q            CONSOLE USART ADDRESS (IFF 8251)
                        502X
                        503X
                        504X **       MODE INSTRUCTION CONTROL BITS.
                        505X
   000.100              506X UMI.1B  EQU      01000000B       1 STOP BIT
   000.200              507X UMI.HB  EQU      10000000B       1 1/2 STOP BITS
   000.300              508X UMI.2B  EQU      11000000B       2 STOP BITS
   000.040              509X UMI.PE  EQU      00100000B       EVEN PARITY
   000.020              510X UMI.PA  EQU      00010000B       USE PARITY
   000.000              511X UMI.L5  EQU      00000000B       5 BIT CHARACTERS
   000.004              512X UMI.L6  EQU      00000100B       6 BIT CHARACTERS
   000.010              513X UMI.L7  EQU      00001000B       7 BIT CHARACTERS
   000.014              514X UMI.L8  EQU      00001100B       8 BIT CHARACTERS
   000.001              515X UMI.1X  EQU      00000001B       CLOCK X 1
   000.002              516X UMI.16X EQU      00000010B       CLOCK X 16
   000.003              517X UMI.64X EQU      00000011B       CLOCK X 64
                        518X
                        519X **       COMMAND INSTRUCTION BITS.
                        520X
   000.100              521X UCI.IR  EQU      01000000B       INTERNAL RESET
   000.040              522X UCI.RO  EQU      00100000B       READER-ON CONTROL FLAG
   000.020              523X UCI.ER  EQU      00010000B       ERROR RESET
   000.004              524X UCI.RE  EQU      00000100B       RECEIVE ENABLE
   000.002              525X UCI.IE  EQU      00000010B       ENABLE INTERRUPTS FLAG
   000.001              526X UCI.TE  EQU      00000001B       TRANSMIT ENABLE
                        527X
                        528X **       STATUS READ COMMAND BITS.
                        529X
   000.040              530X USR.FE  EQU      00100000B       FRAMING ERROR
   000.020              531X USR.OE  EQU      00010000B       OVERRUN ERROR
   000.010              532X USR.PE  EQU      00001000B       PARITY ERROR
   000.004              533X USR.TXE EQU      00000100B       TRANSMITTER EMPTY
   000.002              534X USR.RXR EQU      00000010B       RECEIVER READY
   000.001              535X USR.TXR EQU      00000001B       TRANSMITTER READY
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                     Unix H8ASM V1.4.1 5-Jul-80     Page    13
HARDWARE INTERRUPT VECTORS                                              16:52:52  11-SEP-80

                           538  ***     INTERRUPT VECTORS.
                           539  *
                           540

                           542  **      LEVEL 0 - RESET
                           543  *
                           544  *       THIS 'INTERRUPT' MAY NOT BE PROCESSED BY A USER PROGRAM.
                           545
  000.000                  546          ORG     00A
                           547
  000.000                  548  RAM8GO  EQU     *               RAM8GO Address                  /Ram8Go 2/
                           549
                           550  *
  000.000  021 000 000     551  INIT0   LXI     D,RAM8GO        ROM COPY OF RAM                 /Ram8Go 2/
  000.003  303 016 004     552          JMP     XINIT           DO EXTENDED INITIALIZATION (ROM)/RAM8GO JUN80/
  000.006  303 073 000     553          JMP     INIT            INITIALIZE
  377.073                  554          ERRPL   INIT-1000A      BYTE IN WORD 10A MUST BE 0

                           556  **      LEVEL 1 - CLOCK
                           557
  000.010                  558  INT1    EQU     10Q             INTERRUPT ENTRY POINT
                           559
  000.000                  560          ERRNZ   *-11Q           INT0 TAKES UP ONE BYTE
  000.011  315 132 000     561          CALL    SAVALL          SAVE USER REGISTERS
  000.014  026 000         562          MVI     D,0
  000.016  303 201 000     563          JMP     CLOCK           PROCESS CLOCK INTERRUPT
  377.201                  564          ERRPL   CLOCK-1000A     EXTRA BYTE MUST BE 0

                           566  **      LEVEL 2 - SINGLE STEP
                           567  *
                           568  *       IF THIS INTERRUPT IS RECEIVED WHEN NOT IN MONITOR MODE,
                           569  *       THEN IT IS ASSUMED TO BE GENERATED BY A USER PROGRAM
                           570  *       (SINGLE STEPPING OR BREAKPOINTING). IN SUCH CASE, THE
                           571  *       USER PROGRAM IS ENTERED THROUGH (UIVEC+3
                           572
  000.020                  573  INT2    EQU     20A             LEVEL 2 ENTRY
                           574
  000.000                  575          ERRNZ   *-21A           INT1 TAKES EXTRA BYTE
  000.021  315 132 000     576          CALL    SAVALL          SAVE REGISTERS
  000.024  032             577          LDAX    D               (A) = (CTLFLG)
  040.011                  578  .       SET     CTLFLG
  000.025  303 244 001     579          JMP     STPRTN          STEP RETURN
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                    Unix H8ASM V1.4.1 5-Jul-80     Page    14
HARDWARE INTERRUPT VECTORS                                            16:52:54  11-SEP-80

                          581  ***     I/O INTERRUPT VECTORS.
                          582  *
                          583  *       INTERRUPTS 3 THROUGH 7 ARE AVAILABLE FOR GENERAL I/O USE.
                          584  *
                          585  *       THESE INTERRUPTS ARE NOT SUPPORTED BY PAM/8, AND SHOULD
                          586  *       NEVER OCCUR UNLESS THE USER HAS SUPPLIED HANDLER ROUTINES
                          587  *       (THROUGH UIVEC)
                          588
    000.030               589          ORG     30A
    000.030  303 045 040  590  INT3    JMP     UIVEC+6          JUMP TO USER ROUTINE
                          591
    000.033  064 064 064  592          DB      '44470'          Heath Part Number               /Ram8Go 2/


    000.040               594          ORG     40A
    000.040  303 050 040  595  INT4    JMP     UIVEC+9          JUMP TO USER ROUTINE
                          596
    000.043  100 112 107  597          DB      100Q,112Q,107Q,114Q,100Q       Support Code    /Ram8Go 2/


    000.050               599          ORG     50A
    000.050  303 053 040  600  INT5    JMP     UIVEC+12         JUMP TO USER ROUTINE
                          601
                          602
                          603  **      DLY - DELAY TIME INTERVAL.
                          604  *
                          605  *       ENTRY   (A) = MILLISECOND DELAY COUNT/2
                          606  *       EXIT    NONE
                          607  *       USES    A,F
                          608
    000.053  365          609  DLY     PUSH    PSW              SAVE COUNT
    000.054  257          610          XRA     A                DONT SOUND HORN
    000.055  303 143 002  611          JMP     HRNO             PROCESS AS HORN


    000.060               613          ORG     60A
    000.060  303 056 040  614  INT6    JMP     UIVEC+15         JUMP TO USER ROUTINE
                          615
                          616
    000.063  076 320      617  GO.     MVI     A,CB.SSI+CB.CLI+CB.SPK  OFF MONITOR MODE LIGHT
    000.065  303 235 001  618          JMP     SST1             RETURN TO USER PROGRAM


    000.070               620          ORG     70A
    000.070  303 061 040  621  INT7    JMP     UIVEC+18         JUMP TO USER ROUTINE
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                       Unix H8ASM V1.4.1 5-Jul-80     Page    15
MASTER CLEAR PROCESSING                                               16:52:55  11-SEP-80

                          624  **      INIT - INITIALIZE SYSTEM
                          625  *
                          626  *       INIT IS CALLED WHENEVER A HARDWARE MASTER-CLEAR IS INITIATED.
                          627  *
                          628  *       SETUP PAM/8 CONTROL CELLS IN RAM.
                          629  *       DECODE HOW MUCH MEMORY EXISTS, SETUP STACKPOINTER, AND
                          630  *       ENTER THE MONITOR LOOP.
                          631  *
                          632  *       ENTRY   FROM MASTER CLEAR
                          633  *       EXIT    INTO PAM/8 MAIN LOOP
                          634
                          635
000.073  032              636  INIT    LDAX    D               COPY *PRSROM* INTO RAM
000.074  167              637          MOV     M,A             MOVE BYTE
000.075  053              638          DCX     H               DECREMENT DESTINATION
000.076  034              639          INR     E               INCREMENT SOURCE
000.077  302 073 000      640          JNZ     INIT            IF NOT DONE
                          641
004.000                   642  SINCR   EQU     4000A           SEARCH INCREMENT
                          643
000.102  026 004          644          MVI     D,SINCR/256     (DE) = SEARCH INCREMENT
000.104  041 000 040      645          LXI     H,START         (HL) = FIRST RAM                 /RAM8GO JUN80/
                          646
                          647  *       DETERMINE MEMORY LIMIT.
                          648
000.107  303 000 004      649  INIT1   JMP     XINIT1          JUMP TO FREE SPACE               /RAM8GO JUN80/
                          650
000.112  110 105 101      651          DB      'HEATH'                                          /RAM8GO JUN80/
000.000                   652          ERRNZ   *-000117A                                        /RAM8GO JUN80/
                          653
                          654  *       RETURN TO INLINE CODE WITH HL SET TO FIRST NON-EXISTANT LOCATION
                          655
000.117  053              656  INIT2   DCX     H
000.120  371              657          SPHL                    SET STACKPOINTER = MEMORY LIMIT -1
000.121  041 364 007      658          LXI     H,DEFPC                                          /Ram8Go 2/
000.124  345              659          PUSH    H               Set *PC* value on stack          /Ram8Go 2/
000.125  315 254 007      660          CALL    PATCH1          Tape UART/Auto-Boot              /Ram8Go 2/
000.130  345              661          PUSH    H               Set Return Address               /Ram8Go 2/
000.131  257              662          XRA     A               Leave addresses the same  & A=0 /Ram8Go 2/
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                      Unix H8ASM V1.4.1 5-Jul-80     Page    16
INTERRUPT TIME SUBROUTINES                                               16:52:56  11-SEP-80

                          665  **     SAVALL - SAVE ALL REGISTERS ON STACK.
                          666  *
                          667  *      SAVALL IS CALLED WHEN AN INTERRUPT IS ACCEPTED, IN ORDER TO
                          668  *      SAVE THE CONTENTS OF THE REGISTERS ON THE STACK.
                          669  *
                          670  *      ENTRY   CALLED DIRECTLY FROM INTERRUPT ROUTINE.
                          671  *      EXIT    ALL REGISTERS PUSHED ON STACK,
                          672  *              IF NOT YET IN MONITOR MODE, REGPTR = ADDRESS OF REGISTERS
                          673  *              ON STACK.
                          674  *              (DE) = ADDRESS OF CTLFLG
                          675
                          676
000.132  343              677  SAVALL  XTHL                    SET H,L ON STACK TOP
000.133  325              678          PUSH    D
000.134  305              679          PUSH    B
000.135  365              680          PUSH    PSW
000.136  353              681          XCHG                    (D,E) = RETURN ADDRESS
000.137  041 012 000      682          LXI     H,10
000.142  071              683          DAD     SP              (H,L) = ADDRESS OF USERS SP
000.143  345              684          PUSH    H               SET ON STACK AS 'REGISTER'
000.144  325              685          PUSH    D               SET RETURN ADDRESS
000.145  021 011 040      686          LXI     D,CTLFLG
000.150  032              687          LDAX    D               (A) = CTLFLG
000.151  057              688          CMA
000.152  346 060          689          ANI     CB.MTL+CB.SSI   SAVE REGISTER ADDR IF USER OR SINGLE-STEP
000.154  310              690          RZ                      RETURN IF WAS INTERRUPT OF MONITOR LOOP
000.155  041 002 000      691          LXI     H,2
000.160  071              692          DAD     SP              (H,L) = ADDRESS OF 'STACKPTR' ON STACK
000.161  042 035 040      693          SHLD    REGPTR
000.164  311              694          RET


                          696  **     CUI - CHECK FOR USER INTERRUPT PROCESSING.
                          697  *
                          698  *      CUI IS CALLED TO SEE IF THE USER HAS SPECIFIED PROCESSING
                          699  *      FOR THE CLOCK INTERRUPT.
                          700
                          701
040.010                   702  .       SET     .MFLAG          REFERENCE TO MFLAG
000.165  012              703  CUI1    LDAX    B               (A) = .MFLAG
000.000                   704          ERRNZ   UO.CLK-1        CODE ASSUMED = 01
000.166  017              705          RRC
000.167  334 037 040      706          CC      UIVEC           IF SPECIFIED, TRANSFER TO USER
                          707
                          708  *      RETURN TO PROGRAM FROM INTERRUPT.
                          709
000.172  361              710  INTXIT  POP     PSW             REMOVE FAKE 'STACK REGISTER'
000.173  361              711          POP     PSW
000.174  301              712          POP     B
000.175  321              713          POP     D
000.176  341              714          POP     H
000.177  373              715          EI
000.200  311              716          RET
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                    Unix H8ASM V1.4.1 5-Jul-80     Page    17
PROCESS CLOCK INTERRUPTS                                               16:52:57  11-SEP-80

                        719  ***     CLOCK - PROCESS CLOCK INTERRUPT
                        720  *
                        721  *       CLOCK IS ENTERED WHENEVER A MILLISECOND CLOCK INTERRUPT IS
                        722  *       PROCESSED.
                        723  *
                        724  *       TICCNT IS INCREMENTED EVERY INTERRUPT.
                        725
                        726
000.201  052 033 040    727  CLOCK   LHLD    TICCNT
000.204  043            728          INX     H
000.205  042 033 040    729          SHLD    TICCNT          INCREMENT TICCOUNT
                        730
                        731  **      REFRESH FRONT PANEL.
                        732  *
                        733  *       THIS CODE DISPLAYS THE APPROPRIATE PATTERN ON THE
                        734  *       FRONT PANEL LEDS. THE LEDS ARE PAINTED IN REVERSE ORDER,
                        735  *       ONE PER INTERRUPT. FIRST, NUMBER 9 IS LIT, THEN NUMBER 8,
                        736  *       ETC.
                        737
                        738
000.210  041 010 040    739          LXI     H,.MFLAG
000.213  176            740          MOV     A,M
000.214  107            741          MOV     B,A             (B) = CURRENT FLAG
000.215  346 100        742          ANI     UO.NFR          SEE IF FRONT PANEL REFRESH WANTED
000.217  043            743          INX     H
000.000                 744          ERRNZ   CTLFLG-.MFLAG-1
000.220  176            745          MOV     A,M             (A) = CTLFLG
000.221  112            746          MOV     C,D             (C) = 0 IN CASE NO PANEL DISPLAY
000.222  302 237 000    747          JNZ     CLK3            IF NOT
000.225  043            748          INX     H               (H,L) = (REFIND)
000.000                 749          ERRNZ   REFIND-CTLFLG-1
000.226  065            750          DCR     M               DECREMENT DIGIT INDEX
000.227  302 234 000    751          JNZ     CLK2            IF NOT WRAP-AROUND
000.232  066 011        752          MVI     M,9             WRAP DISPLAY AROUND
000.234  136            753  CLK2    MOV     E,M
000.235  031            754          DAD     D               (H,L) = ADDRESS OF PATTERN
000.236  113            755          MOV     C,E
000.237                 756  CLK3    EQU     *               (A) = CTLNLG
000.237  261            757          ORA     C               (A) = INDEX + FIXED BITS
000.240  323 360        758          OUT     OP.DIG          SELECT DIGIT
000.242  176            759          MOV     A,M
000.243  323 361        760          OUT     OP.SEG          SELECT SEGMENT
                        761
                        762  *       SEE IF TIME TO DECODE DISPLAY VALUES.
                        763
000.245  056 033        764          MVI     L,#TICCNT
000.247  176            765          MOV     A,M
000.250  346 037        766          ANI     37Q             EVERY 32 INTERRUPTS
000.252  314 161 003    767          CZ      UFD             UPDATE FRONT PANEL DISPLAYS
                        768
                        769  *       EXIT CLOCK INTERRUPT.
                        770
000.255  001 011 040    771          LXI     B,CTLFLG
000.260  012            772          LDAX    B               (A) = CTLFLG
000.261  346 040        773          ANI     CB.MTL
000.263  302 172 000    774          JNZ     INTXIT          IF IN MONITOR MODE
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                    Unix H8ASM V1.4.1 5-Jul-80      Page    18
PROCESS CLOCK INTERRUPTS                                              16:52:58  11-SEP-80

    000.266  013             775         DCX      B
    000.000                  776         ERRNZ    CTLFLG-.MFLAG-1
    000.267  012             777         LDAX     B                (A) = .MFLAG
    000.000                  778         ERRNZ    UO.HLT-200Q      ASSUME HIGH-ORDER
    000.270  027             779         RAL
    000.271  332 313 000     780         JC       CLK4             SKIP IT
                             781
                             782   *     NOT IN MONITOR MODE. CHECK FOR HALT
                             783
    000.274  076 012         784         MVI      A,10             (A) = INDEX OF *P* REG
    000.276  315 052 003     785         CALL     LRA.             LOCATE REGISTER ADDRESS
    000.301  136             786         MOV      E,M
    000.302  043             787         INX      H
    000.303  126             788         MOV      D,M              (D,E) = PC CONTENTS
    000.304  033             789         DCX      D
    000.305  032             790         LDAX     D
    000.306  376 166         791         CPI      MI.HLT           CHECK FOR HALT
    000.310  312 322 000     792         JE       ERROR            IF HALT, BE IN MONITOR MODE
                             793
                             794   *     CHECK FOR 'RETURN TO MONITOR' KEY ENTRY.
                             795
    000.313                  796   CLK4  EQU      *
    000.313  333 360         797         IN       IP.PAD
    000.315  376 056         798         CPI      56Q              SEE IF '0' AND '#'
    000.317  302 165 000     799         JNE      CUI1             IF NOT, ALLOW USER PROCESSING OF CLOCK
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                        Unix H8ASM V1.4.1 5-Jul-80     Page    19
 MTR - MAIN EXECUTIVE LOOP.                                                 16:52:58  11-SEP-80

                      ***     ERROR - COMMAND ERROR.
                      *
                      *       ERROR IS CALLED AS A 'BAIL-OUT' ROUTINE.
                      *
                      *       IT RESETS THE OPERATIONAL MODE, AND RESTORES THE STACKPOINTER.
                      *
                      *       ENTRY   NONE
                      *       EXIT    TO MTR LOOP
                      *               CTLFLG SET
                      *               .MFLAG CLEARED
                      *       USES    ALL


000.322               ERROR   EQU     *
000.322  041 010 040          LXI     H,.MFLAG
000.325  176                  MOV     A,M                  (A) = .MFLAG
000.326  346 275              ANI     377Q-UO.DDU-UO.MFR        RE-ENABLE DISPLAYS
000.330  167                  MOV     M,A                  REPLACE
000.331  043                  INX     H
000.332  066 360              MVI     M,CB.SSI+CB.MTL+CB.CLI+CB.SPK   RESTORE *CTLFLG*
000.000                       ERRNZ   CTLFLG-.MFLAG-1
000.334  373                  EI
000.335  052 035 040          LHLD    REGPTR
000.340  371                  SPHL                         RESTORE STACK POINTER TO EMPTY STATE
000.341  315 136 002          CALL    ALARM                ALARM FOR 200 MS


                      **      MTR - MONITOR LOOP.
                      *
                      *       THIS IS THE MAIN EXECUTIVE LOOP FOR THE FRONT PANEL EMULATOR.


000.344               MTR     EQU     *
000.344  373                  EI

000.345  041 345 000  MTR1    LXI     H,MTR1
000.350  345                  PUSH    H                    SET 'MTR1' AS RETURN ADDRESS
000.351  001 007 040          LXI     B,DSPMOD                  (BC) = #DSPMOD
000.354  012                  LDAX    B
000.355  346 001              ANI     1                    (A) = 1 IF ALTER
000.357  057                  CMA
000.360  062 006 040          STA     DSPROT               SET FLAG BIT IF ALTER

                      *       READ KEY

000.363  315 260 003          CALL    RCK                  READ CONSOLE KEYSET
000.366  052 024 040          LHLD    ABUSS
000.371  376 012              CPI     10
000.373  322 005 001          JNC     MTR4                 IF IN 'ALWAYS VALID' GROUP
000.376  137                  MOV     E,A                  SAVE VALUE
040.007               .       SET     DSPMOD
000.377  012                  LDAX    B                    (A) = DSPMOD
001.000  017                  RRC
001.001  332 051 001          JC      MTR5                 IF IN ALTER MODE
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                         Unix H8ASM V1.4.1 5-Jul-80     Page    20
MTR - MAIN EXECUTIVE LOOP.                                                  16:52:59  11-SEP-80

     001.004  173                        MOV     A,E            (A) = CODE

                                   *     HAVE A COMMAND (NOT A VALUE)

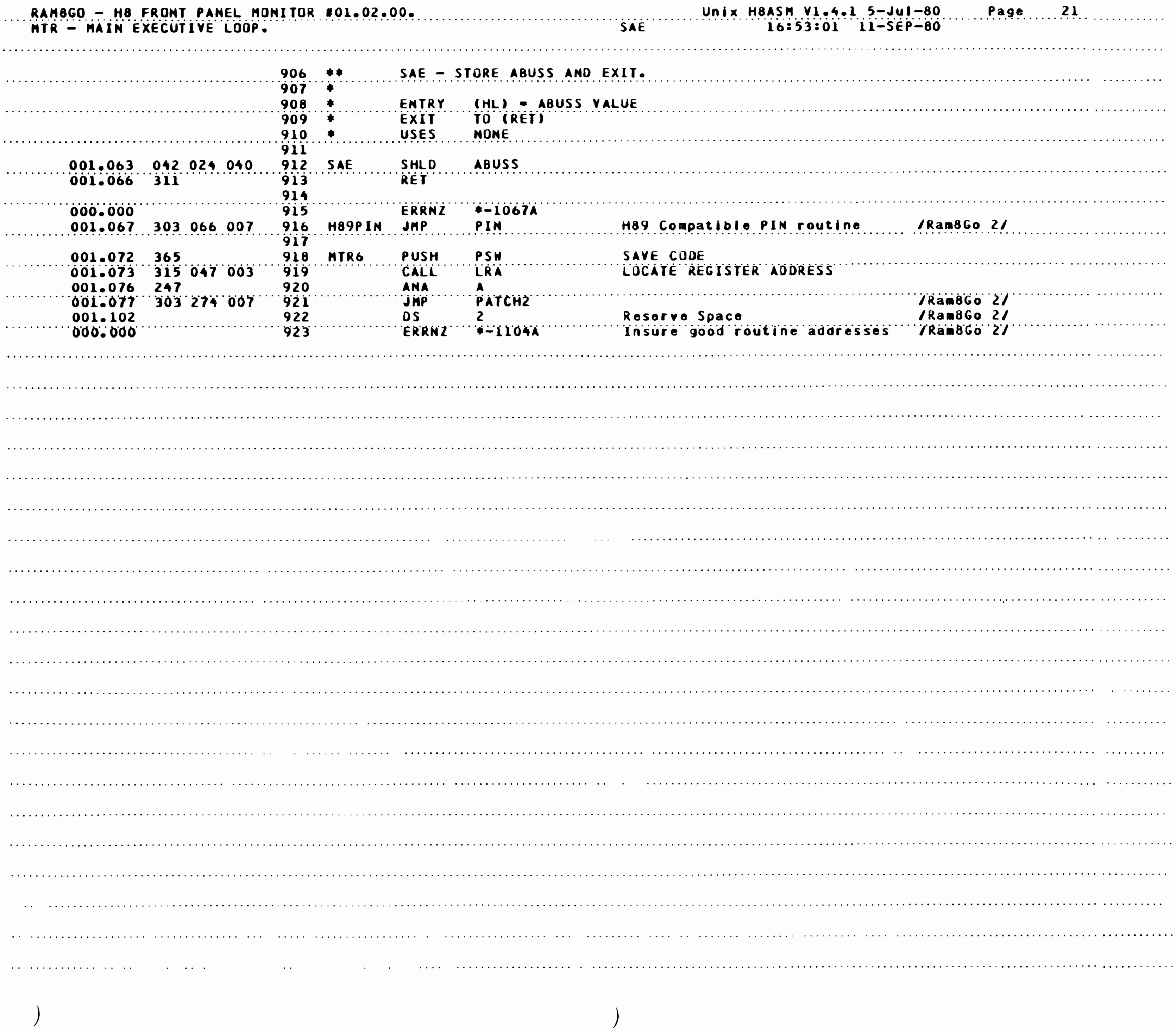
     001.005  326 004            MTR4    SUI     4              (A) = COMMAND
     001.007  332 160 004                JC      EXTCMD         Extended Commands                /Ram8Go 2/
     001.012  137                        MOV     E,A
     001.013  345                        PUSH    H              SAVE ABUSS VALUE
     001.014  041 035 001                LXI     H,MTRA
     001.017  026 000                    MVI     D,0
     001.021  031                        DAD     D              (H,L) = ADDRESS OF TABLE ENTRY
     001.022  136                        MOV     E,M
     001.023  031                        DAD     D              (H,L) = ADDRESS OF PROCESSOR
     001.024  343                        XTHL                   SET ADDRESS, (H,L) = (ABUSS)
     001.025  021 005 040                LXI     D,REGI         (D,E) = ADDRESS OF REG INDEX
     040.007                       .     SET     DSPMOD
     001.030  012                        LDAX    B              (A) = DSPMOD
     001.031  346 002                    ANI     2              SET 'Z' IF MEMORY
     001.033  012                        LDAX    B              (A) = DSPMOD
     001.034  311                        RET                    JUMP TO PROCESSOR


     001.035                     MTRA    EQU     *              JUMP TABLE
     001.035  165                        DB      GO-*           4 - GO
     001.036  141                        DB      IN-*           5 - INPUT
     001.037  143                        DB      OUT-*          6 - OUTPUT
     001.040  165                        DB      SSTEP-*        7 - SINGLE STEP
     001.041  220                        DB      RMEM-*         8 - CASSETTE LOAD
     001.042  332                        DB      WMEM-*         9 - CASSETTE DUMP
     001.043  067                        DB      NEXT-*         + - NEXT
     001.044  104                        DB      LAST-*         - - LAST
     001.045  102                        DB      ABORT-*        * - ABORT
     001.046  060                        DB      RSW-*          / - DISPLAY/ALTER
     001.047  116                        DB      MEMM-*         # - MEMORY MODE
     001.050  034                        DB      REGM-*         . - REGISTER MODE



                                   **    PROCESS MEMORY/REGISTER ALTERATIONS.
                                   *
                                   *     THIS CODE IS ENTERED IF
                                   *
                                   *     1) AM IN ALTER MODE, AND
                                   *     2) A KEY FROM 0-7 WAS ENTERED.

     001.051  017                MTR5    RRC
     001.052  173                        MOV     A,E            (A) = VALUE
     001.053  332 072 001                JC      MTR6           IS REGISTER
     001.056  067                        STC                    INDICATE 1ST DIGIT IS IN (A)
     001.057  315 066 003                CALL    IOB            INPUT OCTAL BYTE
     001.062  043                        INX     H              DISPLAY NEXT LOCATION
```



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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                        Unix H8ASM V1.4.1 5-Jul-80     Page    21
MTR - MAIN EXECUTIVE LOOP.                                   SAE          16:53:01  11-SEP-80

                          906  **     SAE - STORE ABUSS AND EXIT.
                          907  *
                          908  *      ENTRY   (HL) = ABUSS VALUE
                          909  *      EXIT    TO (RET)
                          910  *      USES    NONE
                          911
   001.063  042 024 040   912  SAE    SHLD    ABUSS
   001.066  311           913         RET
                          914
   000.000                915         ERRNZ   *-1067A
   001.067  303 066 007   916  H89PIN JMP     PIN              H89 Compatible PIN routine      /Ram8Go 2/
                          917
   001.072  365           918  MTR6   PUSH    PSW              SAVE CODE
   001.073  315 047 003   919         CALL    LRA              LOCATE REGISTER ADDRESS
   001.076  247           920         ANA     A
   001.077  303 274 007   921         JMP     PATCH2                                           /Ram8Go 2/
   001.102                922         DS      2                Reserve Space                   /Ram8Go 2/
   000.000                923         ERRNZ   *-1104A          Insure good routine addresses   /Ram8Go 2/
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                          Unix H8ASM V1.4.1 5-Jul-80      Page    22
MONITOR TASK SUBROUTINES.                                                 16:53:01  11-SEP-80

                             927  **      REGM - ENTER REGISTER DISPLAY MODE.
                             928  *
                             929  *       ENTRY   (A) = DSPMOD
                             930
001.104  076 002             931  REGM    MVI     A,2                 SET DISPLAY REGISTER MODE
040.007                      932  .       SET     DSPMOD
001.106  002                 933          STAX    B                   SET DISPLAY REGISTER MODE
000.000                      934          ERRNZ   DSPMOD-DSPROT-1
001.107  013                 935          DCX     B                   (BC) = #DSPROT
001.110  257                 936          XRA     A
001.111  002                 937          STAX    B                   SET ALL PERIODS ON
001.112  315 260 003         938          CALL    RCK                 READ KEY ENTRY
001.115  075                 939          DCR     A                   DISPLACE
001.116  376 006             940          CPI     6
001.120  322 322 000         941          JNC     ERROR               NOT 1-6
001.123  007                 942          RLC
001.124  022                 943          STAX    D                   SET NEW REG IND
040.005                      944  .       SET     REGI
001.125  311                 945          RET


                             947  **      R$W - TOGGLE DISPLAY/ALTER MODE.
                             948  *
                             949  *       ENTRY   (A) = DSPMOD
                             950  *               (BC) = ADDRESS OF DSPMOD
                             951
040.007                      952  .       SET     DSPMOD
001.126  356 001             953  R$W     XRI     1
001.130  002                 954          STAX    B
001.131  311                 955          RET


                             957  **      NEXT - INCREMENT DISPLAY ELEMENT.
                             958  *
                             959  *       ENTRY   (HL) = (ABUSS)
                             960  *               (DE) = ADDRESS OF REGIND
                             961
001.132  043                 962  NEXT    INX     H
001.133  312 063 001         963          JZ      SAE                 IF MEMORY, STORE ABUSS AND EXIT
                             964
                             965  *       IS REGISTER MODE.
                             966
040.005                      967  .       SET     REGI
001.136  032                 968          LDAX    D                   (A) = REGI
001.137  306 002             969          ADI     2                   INCREMENT REG INNEX
001.141  022                 970          STAX    D                   WRAP TO *SP*
001.142  376 014             971          CPI     12
001.144  330                 972          RC                          IF NOT TOO LARGE, EXIT
001.145  257                 973          XRA     A                   OVERFLOW
001.146  022                 974          STAX    D
001.147  311                 975  ABORT   RET
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                              Unix H8ASM V1.4.1 5-Jul-80    Page   23
MONITOR TASK SUBROUTINES.                                                          16:53:02  11-SEP-80

                            977  **     LAST - DECREMENT DISPLAY ELEMENT.
                            978  *
                            979  *      ENTRY   (HL) = (ABUSS)
                            980  *              (DE) = ADDRESS OF REGIND
                            981
                            982
001.150  053                983  LAST   DCX     H
001.151  312 063 001        984         JZ      SAE                 IF MEMORY, STORE AND EXIT
                            985
                            986  *      IS REGISTER MODE.
                            987
040.005                     988  .      SET     REGI
001.154  032                989  LST2   LDAX    D                   (A) = REGI
001.155  326 002            990         SUI     2
001.157  022                991         STAX    D
001.160  320                992         RNC                         IF OK
001.161  076 012            993         MVI     A,10                UNDERFLOW TO *PC*
001.163  022                994         STAX    D
001.164  311                995         RET
                            996


                            998  **     MEMM - ENTER DISPLAY MEMORY MODE.
                            999  *
                           1000  *      ENTRY   (BC) = ADDRESS OF DSPMOD
                           1001
001.165  257               1002  MEMM   XRA     A                   (A) = 0
040.007                    1003  .      SET     DSPMOD
001.166  002               1004         STAX    B                   SET DISPLAY MEMORY MODE
000.000                    1005         ERRNZ   DSPMOD-DSPROT-1
001.167  013               1006         DCX     B                   (BC) = #DSPROT
001.170  002               1007         STAX    B                   SET ALL PERIODS ON
001.171  041 025 040       1008         LXI     H,ABUSS+1
001.174  303 062 003       1009         JMP     IOA                 INPUT OCTAL ADDRESS


                           1011  **     IN - INPUT DATA BYTE.
                           1012  *
                           1013
                           1014  **     OUT - OUTPUT DATA BYTE.
                           1015  *
                           1016  *      ENTRY   (HL) = (ABUSS)
                           1017
001.177  006 333           1018  IN     MVI     B,MI.IN
001.201  021               1019         DB      MI.LXID             SKIP NEXT INSTRUCTION
001.202  006 323           1020  OUT    MVI     B,MI.OUT
001.204  174               1021         MOV     A,H                 (A) = VALUE
001.205  145               1022         MOV     H,L                 (H) = PORT
001.206  150               1023         MOV     L,B                 (L) = IN/OUT INSTRUCTION
001.207  042 002 040       1024         SHLD    IOWRK
001.212  315 002 040       1025         CALL    IOWRK               PERFORM IO
001.215  154               1026         MOV     L,H                 (L) = PORT
001.216  147               1027         MOV     H,A                 (H) = VALUE
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                          Unix H8ASM V1.4.1 5-Jul-80    Page    24
MONITOR TASK SUBROUTINES.                                  IN                 16:53:03  11-SEP-80

      001.217  303 063 001  1028          JMP     SAE              STORE ABUSS AND EXIT
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                          Unix H8ASM V1.4.1 5-Jul-80     Page    25
*GO* AND *STEP* FUNCTIONS                                                 16:53:03  11-SEP-80

                        1033  **      GO - RETURN TO USER MODE
                        1034  *
                        1035  *       ENTRY   NONE
                        1036
  001.222  303 063 000  1037  GO      JMP     GO.               ROUTINE IS IN WASTE SPACE


                        1039  **      SSTEP - SINGLE STEP INSTRUCTION.
                        1040  *
                        1041  *       ENTRY   NONE
                        1042
  001.225               1043  SSTEP   EQU     *                 SINGLE STEP
  001.225  363          1044          DI                        DISABLE INTERRUPTS UNTIL THE RIGHT TIME
  001.226  072 011 040  1045          LDA     CTLFLG
  001.231  356 020      1046          XRI     CB.SSI            CLEAR SINGLE STEP INHIBIT
  001.233  323 360      1047          OUT     OP.CTL            PRIME SINGLE STEP INTERRUPT
  001.235  062 011 040  1048  SST1    STA     CTLFLG            SET NEW FLAG VALUES
  001.240  341          1049          POP     H                 CLEAN STACK
  001.241  303 172 000  1050          JMP     INTXIT            RETURN TO USER ROUTINE FOR STEP


                        1052  **      STPRTN - SINGLE STEP RETURN
                        1053
  001.244               1054  STPRTN  EQU     *
  001.244  366 020      1055          ORI     CB.SSI            DISABLE SINGLE STEP INTERRUPTION
  001.246  323 360      1056          OUT     OP.CTL            TURN OFF SINGLE STEP ENABLE
  040.011               1057  .       SET     CTLFLG
  001.250  022          1058          STAX    D
  001.251  346 040      1059          ANI     CB.MTL            SEE IF IN MONITOR MODE
  001.253  302 344 000  1060          JNZ     MTR
  001.256  303 042 040  1061          JMP     UIVEC+3           TRANSFER TO USER'S ROUTINE


                        1063  **      RMEM - LOAD MEMORY FROM TAPE.
                        1064  *
                        1065
  001.261  041 244 002  1066  RMEM    LXI     H,TPABT
  001.264  042 031 040  1067          SHLD    TPERRX            SETUP ERROR EXIT ADDRESS
                        1068  *       JMP     LOAD
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                          Unix H8ASM V1.4.1 5-Jul-80     Page    26
*GO* AND *STEP* FUNCTIONS                                      LOAD        16:53:04  11-SEP-80

                        1070 ***     LOAD - LOAD MEMORY FROM TAPE.
                        1071 *
                        1072 *       READ THE NEXT RECORD FROM THE CASSETTE TAPE.
                        1073 *
                        1074 *       USE THE LOAD ADDRESS IN THE TAPE RECORD.
                        1075 *
                        1076 *       ENTRY   (HL) = ERROR EXIT ADDRESS
                        1077 *       EXIT    USER P-REG (IN STACK) SET TO ENTRY ADDRESS
                        1078 *               TO CALLER IF ALL OK
                        1079 *               TO ERROR EXIT IF TAPE ERRORS DETECTED.
                        1080
                        1081
001.267                 1082 LOAD    EQU     *
001.267  001 000 376    1083         LXI     B,1000A-RT.MI*256-256   (BC) = - REQUIRED TYPE AND #
001.272  315 265 002    1084 LOAO    CALL    SRS             SCAN FOR RECORD START
001.275  157            1085         MOV     L,A             (HL) = COUNT
001.276  353            1086         XCHG                    (DE) = COUNT, (HL) = TYPE AND #
001.277  015            1087         DCR     C               (C) = - NEXT #
001.300  011            1088         DAD     B
001.301  174            1089         MOV     A,H
001.302  305            1090         PUSH    B               SAVE TYPE AND #
001.303  365            1091         PUSH    PSW             SAVE TYPE CODE
001.304  346 177        1092         ANI     177Q            CLEAR END FLAG BIT
001.306  265            1093         ORA     L
001.307  076 002        1094         MVI     A,2             SEQUENCE ERROR
001.311  302 205 002    1095         JNE     TPERR           IF NOT RIGHT TYPE OR SEQUENCE
001.314  315 325 002    1096         CALL    RNP             READ ADDR
001.317  104            1097         MOV     B,H
001.320  117            1098         MOV     C,A             (BC) = P-REG ADDRESS
001.321  076 012        1099         MVI     A,10
001.323  325            1100         PUSH    D               SAVE (DE)
001.324  315 052 003    1101         CALL    LRA.            LOCATE REG ADDRESS
001.327  321            1102         POP     D               RESTORE (DE)
001.330  161            1103         MOV     M,C             SET P-REG IN MEM
001.331  043            1104         INX     H
001.332  160            1105         MOV     M,B
001.333  315 325 002    1106         CALL    RNP             READ ADDRESS
001.336  157            1107         MOV     L,A             (HL) = ADDRESS, (DE) = COUNT
001.337  042 000 040    1108         SHLD    START
                        1109
001.342  315 331 002    1110 LOA1    CALL    RNB             READ BYTE
001.345  167            1111         MOV     M,A
001.346  042 024 040    1112         SHLD    ABUSS           SET ABUSS FOR DISPLAY
001.351  043            1113         INX     H
001.352  033            1114         DCX     D
001.353  172            1115         MOV     A,D
001.354  263            1116         ORA     E
001.355  302 342 001    1117         JNZ     LOA1            IF MORE TO GO
                        1118
001.360  315 172 002    1119         CALL    CTC             CHECK  TAPE CHECKSUM
                        1120
                        1121 *       READ NEXT BLOCK
                        1122
001.363  361            1123         POP     PSW             (A) = FILE TYPE BYTE
001.364  301            1124         POP     B               (BC) = -(LAST TYPE, LAST #)
001.365  007            1125         RLC
```

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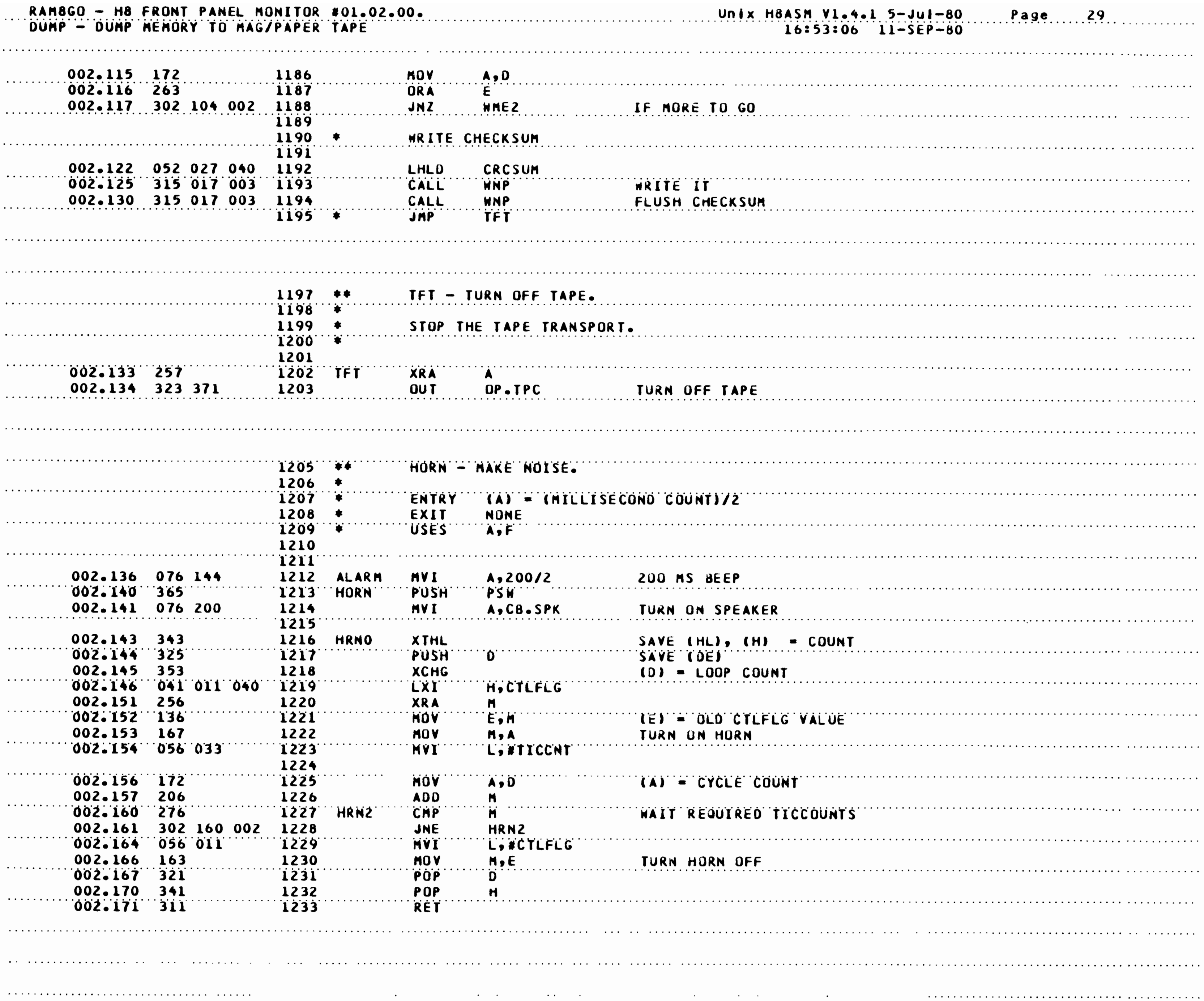
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                               Unix H8ASM V1.4.1 5-Jul-80     Page    27
*GO* AND *STEP* FUNCTIONS                                           LOAD            16:53:05  11-SEP-80

    001.366  332 133 002  1126          JC      TFT               ALL DONE - TURN OFF TAPE
    001.371  303 272 001  1127          JMP     LOAD              READ ANOTHER RECORD
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                     Unix H8ASM V1.4.1 5-Jul-80     Page    28
DUMP - DUMP MEMORY TO MAG/PAPER TAPE                                16:53:05  11-SEP-80

                           1130  ***    DUMP - DUMP MEMORY TO MAG TAPE.
                           1131  *
                           1132  *      DUMP SPECIFIED MEMORY RANGE TO MAG TAPE.
                           1133  *
                           1134  *      ENTRY   (START) = START ADDRESS
                           1135  *              (ABUSS) = END ADDRESS
                           1136  *              USER PC = ENTRY POINT ADDRESS
                           1137  *      EXIT    TO CALLER.
                           1138
                           1139
 001.374                   1140  WMEM   EQU     *
 001.374  041 244 002      1141         LXI     H,TPABT
 001.377  042 031 040      1142         SHLD    TPERRX             SETUP ERROR EXIT
                           1143
 002.002  076 001          1144  DUMP   MVI     A,UCI.TE
 002.004  323 371          1145         OUT     OP.TPC             SETUP TAPE CONTROL
 002.006  076 026          1146         MVI     A,A.SYN
 002.010  046 040          1147         MVI     H,32               (H) = # OF SYNC CHARACTERS
 002.012  315 024 003      1148  WME1   CALL    WNB
 002.015  045              1149         DCR     H
 002.016  302 012 002      1150         JNZ     WME1               WRITE SYN HEADER
 002.021  076 002          1151         MVI     A,A.STX
 002.023  315 024 003      1152         CALL    WNB                WRITE STX
 002.026  154              1153         MOV     L,H                (HL) = 00
 002.027  042 027 040      1154         SHLD    CRCSUM             CLEAR CRC 16
 002.032  041 001 201      1155         LXI     H,RT.MI+80H*256+1         FIRST AND LAST MI RECORD
 002.035  315 017 003      1156         CALL    WNP                WRITE HEADER
 002.040  052 000 040      1157         LHLD    START
 002.043  353              1158         XCHG                       (D,E) = START ADDRESS
 002.044  052 024 040      1159         LHLD    ABUSS              (H,L) = STOP ADDR
 002.047  043              1160         INX     H                  COMPUTE WITH STOP+1
 002.050  175              1161         MOV     A,L
 002.051  223              1162         SUB     E
 002.052  157              1163         MOV     L,A
 002.053  174              1164         MOV     A,H
 002.054  232              1165         SBB     D
 002.055  147              1166         MOV     H,A                (HL) = COUNT
 002.056  315 017 003      1167         CALL    WNP                WRITE COUNT
 002.061  345              1168         PUSH    H
 002.062  076 012          1169         MVI     A,10
 002.064  325              1170         PUSH    D                  SAVE (DE)
 002.065  315 052 003      1171         CALL    LRA.               LOCATE P-REG ADDRESS
 002.070  176              1172         MOV     A,M
 002.071  043              1173         INX     H
 002.072  146              1174         MOV     H,M
 002.073  157              1175         MOV     L,A                (HL) = CONTENTS OF PC
 002.074  315 017 003      1176         CALL    WNP                WRITE HEADER
 002.077  341              1177         POP     H                  (HL) = ADDRESS
 002.100  321              1178         POP     D                  (DE) = COUNT
 002.101  315 017 003      1179         CALL    WNP
                           1180
 002.104  176              1181  WME2   MOV     A,M
 002.105  315 024 003      1182         CALL    WNB                WRITE BYTE
 002.110  042 024 040      1183         SHLD    ABUSS              SET ADDRESS FOR DISPLAY
 002.113  043              1184         INX     H
 002.114  033              1185         DCX     D
```



```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                              Unix H8ASM V1.4.1 5-Jul-80     Page    29
DUMP - DUMP MEMORY TO MAG/PAPER TAPE                                            16:53:06  11-SEP-80

    002.115  172          1186          MOV     A,D
    002.116  263          1187          ORA     E
    002.117  302 104 002  1188          JNZ     WME2            IF MORE TO GO
                          1189
                          1190   *      WRITE CHECKSUM
                          1191
    002.122  052 027 040  1192          LHLD    CRCSUM
    002.125  315 017 003  1193          CALL    WNP             WRITE IT
    002.130  315 017 003  1194          CALL    WNP             FLUSH CHECKSUM
                          1195   *      JMP     TFT



                          1197   **     TFT - TURN OFF TAPE.
                          1198   *
                          1199   *      STOP THE TAPE TRANSPORT.
                          1200   *
                          1201
    002.133  257          1202   TFT    XRA     A
    002.134  323 371      1203          OUT     OP.TPC          TURN OFF TAPE



                          1205   **     HORN - MAKE NOISE.
                          1206   *
                          1207   *      ENTRY   (A) = (MILLISECOND COUNT)/2
                          1208   *      EXIT    NONE
                          1209   *      USES    A,F
                          1210
                          1211
    002.136  076 144      1212   ALARM  MVI     A,200/2         200 MS BEEP
    002.140  365          1213   HORN   PUSH    PSW
    002.141  076 200      1214          MVI     A,CB.SPK        TURN ON SPEAKER
                          1215
    002.143  343          1216   HRNO   XTHL                    SAVE (HL), (H)  = COUNT
    002.144  325          1217          PUSH    D               SAVE (DE)
    002.145  353          1218          XCHG                    (D) = LOOP COUNT
    002.146  041 011 040  1219          LXI     H,CTLFLG
    002.151  256          1220          XRA     M
    002.152  136          1221          MOV     E,M             (E) = OLD CTLFLG VALUE
    002.153  167          1222          MOV     M,A             TURN ON HORN
    002.154  056 033      1223          MVI     L,#TICCNT
                          1224
    002.156  172          1225          MOV     A,D             (A) = CYCLE COUNT
    002.157  206          1226          ADD     M
    002.160  276          1227   HRN2   CMP     M               WAIT REQUIRED TICCOUNTS
    002.161  302 160 002  1228          JNE     HRN2
    002.164  056 011      1229          MVI     L,#CTLFLG
    002.166  163          1230          MOV     M,E             TURN HORN OFF
    002.167  321          1231          POP     D
    002.170  341          1232          POP     H
    002.171  311          1233          RET
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                 Unix H8ASM V1.4.1 5-Jul-80     Page    30
TAPE PROCESSING SUBROUTINES                                         16:53:07  11-SEP-80

                      **      CTC - VERIFY CHECKSUM.
                      *
                      *       ENTRY   TAPE JUST BEFORE CRC
                      *       EXIT    TO CALLER IF OK
                      *               TO *TPERR* IF BAD
                      *       USES    A,F,H,L


002.172  315 325 002  CTC     CALL    RNP               READ NEXT PAIR
002.175  052 027 040          LHLD    CRCSUM
002.200  174                  MOV     A,H
002.201  265                  ORA     L
002.202  310                  RZ                        RETURN OF OK
002.203  076 001              MVI     A,1               CHECKSUM ERROR
                      *       JMP     TPERR             (B) = CODE


                      **      TPERR - PROCESS TAPE ERROR.
                      *
                      *       DISPLAY ERR NUMBER IN LOW BYTE OF ABUSS
                      *
                      *       IF ERROR NUMBER EVEN, DONT ALLOW #
                      *       IF ERROR NUMBER ODD, ALLOW #
                      *
                      *       ENTRY   (B) = PATTERN


002.205  062 024 040  TPERR   STA     ABUSS
002.210  107                  MOV     B,A               (B) = CODE
002.211  315 133 002          CALL    TFT               TURN OFF TAPE

                      *       IS #, RETURN (IF PARITY ERROR)

002.214  346                  DB      MI.ANI            FALL THROUGH WITH CARRY CLEAR
002.215  170          TER3    MOV     A,B

002.216  017                  RRC
002.217  330                  RC                        RETURN IF OK

                      *       BEEP AND FLASH ERROR NUMBER

002.220  334 136 002  TER1    CC      ALARM             ALARM IF PROPER TIME
002.223  315 252 002          CALL    TPXIT             SEE IF *
002.226  333 360              IN      IP.PAD
002.230  376 057              CPI     00101111B         CHECK FOR #
002.232  312 215 002          JE      TER3              IF #
002.235  072 034 040          LDA     TICCNT+1
002.240  037                  RAR                       'C' SET IF 1/2 SECOND
002.241  303 220 002          JMP     TER1
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                      Unix H8ASM V1.4.1 5-Jul-80     Page    31
TAPE PROCESSING SUBROUTINES                                TPABT          16:53:10  11-SEP-80

                           **      TPABT - ABORT TAPE LOAD OR DUMP.
                           *
                           *       ENTERED WHEN LOADING OR DUMPING, AND THE '*' KEY
                           *       IS STRUCK.


002.244  257                TPABT  XRA     A
002.245  323 371                   OUT     OP.TPC          OFF TAPE
002.247  303 322 000               JMP     ERROR



                           **      TPXIT - CHECK FOR USER FORCED EXIT.
                           *
                           *       TPXIT CHECKS FOR AN '*' KEYPAD ENTRY. IF SO, TAKE
                           *       THE TAPE DRIVER ABNORMAL EXIT.
                           *
                           *       ENTRY   NONE
                           *       EXIT    TO *RET* IF NOT '*'
                           *                (A) = PORT STATUS
                           *               TO (TPERRX) IF '*' DOWN
                           *       USES    A,F


002.252  333 360            TPXIT  IN      IP.PAD
002.254  376 157                   CPI     01101111B       *
002.256  333 371                   IN      IP.TPC          READ TAPE STATUS
002.260  300                       RNE                     NOT '*', RETURN WITH STATUS
002.261  052 031 040               LHLD    TPERRX
002.264  351                       PCHL                    ENTER (TPERRX)



                           **      SRS - SCAN RECORD START
                           *
                           *       SRS READS BYTES UNTIL IT RECOGNIZES THE START OF A RECORD.
                           *
                           *       THIS REQUIRES
                           *       AT LEAST 10 SYNC CHARACTERS
                           *       1 STX CHARACTER.
                           *
                           *       THE CRC-16 IS THEN INITIALIZED.
                           *
                           *       ENTRY   NONE
                           *       EXIT    TAPE POSITIONED (AND MOVING), CRCSUM =0
                           *               (DE) = HEADER BYTES
                           *               (HA) = RECORD COUNT
                           *       USES    A,F,D,E,H,L


002.265                     SRS    EQU     *
002.265  026 000            SRS1   MVI     D,0
002.267  142                       MOV     H,D
002.270  152                       MOV     L,D             (HL) = 0
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                      Unix H8ASM V1.4.1 5-Jul-80     Page    32
TAPE PROCESSING SUBROUTINES                                SRS          16:53:10  11-SEP-80

002.271  315 331 002       SRS2    CALL    RNB             READ NEXT BYTE
002.274  024                       INR     D
002.275  376 026                   CPI     A.SYN
002.277  312 271 002               JE      SRS2            HAVE SYN
002.302  376 002                   CPI     A.STX
002.304  302 265 002               JNE     SRS1            NOT STX - START OVER

002.307  076 012                   MVI     A,10
002.311  272                       CMP     D               SEE IF ENOUGH SYN CHARACTERS
002.312  322 265 002               JNC     SRS1            NOT ENOUGH
002.315  042 027 040               SHLD    CRCSUM          CLEAR CRC-16
002.320  315 325 002               CALL    RNP             READ LEADER
002.323  124                       MOV     D,H
002.324  137                       MOV     E,A
                           *       JMP     RNP             READ COUNT



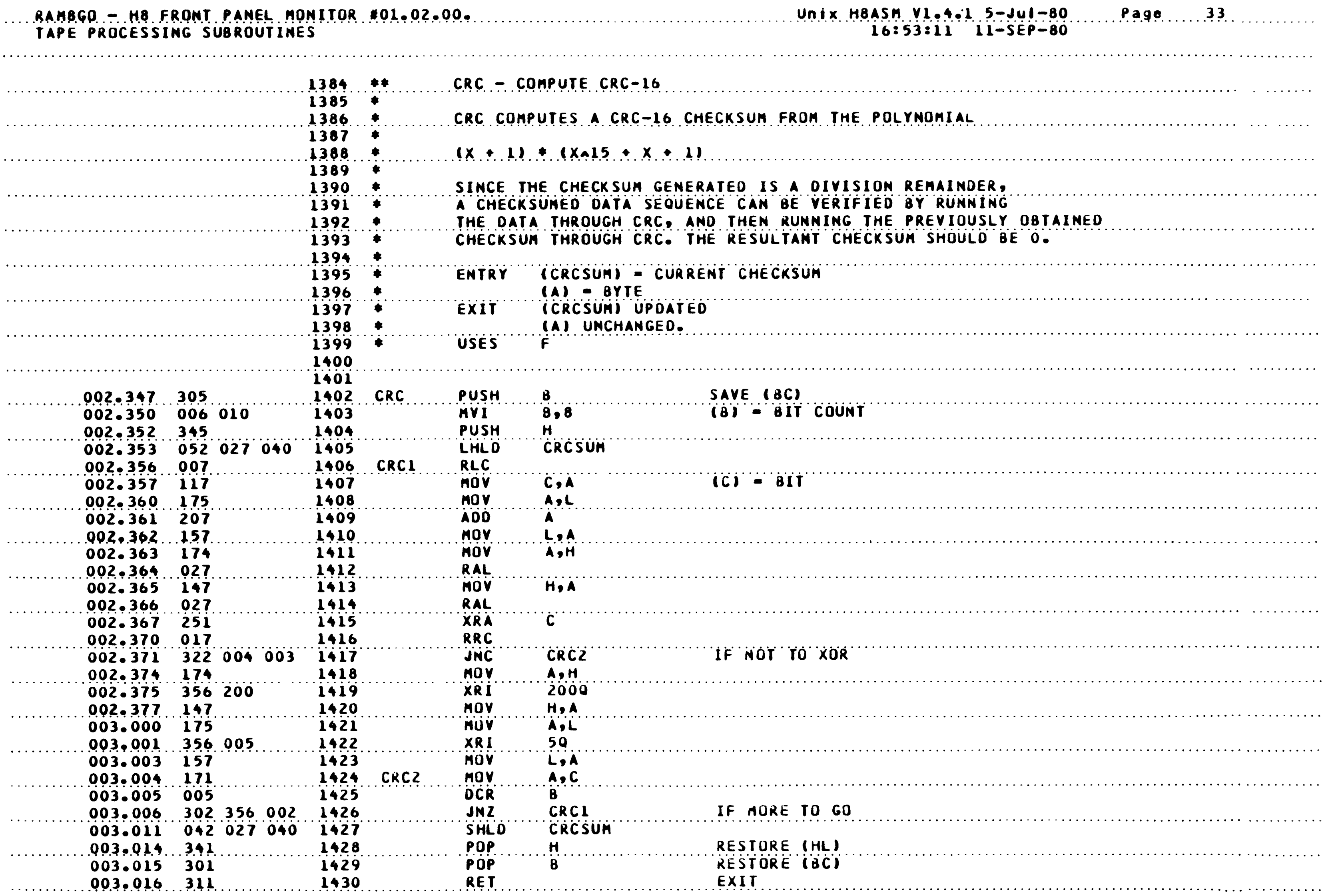
                           **      RNP - READ NEXT PAIR.
                           *
                           *       RNP READS THE NEXT TWO BYTES FROM THE INPUT DEVICE.
                           *
                           *       ENTRY   NONE
                           *       EXIT    (H,A) = BYTE PAIR
                           *       USES    A,F,H


002.325  315 331 002       RNP     CALL    RNB             READ NEXT BYTE
002.330  147                       MOV     H,A
                           *       JMP     RNB             READ NEXT BYTE



                           **      RNB - READ NEXT BYTE
                           *
                           *       RNB READS THE NEXT SINGLE BYTE FROM THE INPUT DEVICE.
                           *       THE CHECKSUM IS TAKEN FOR THE CHARACTER.
                           *
                           *       ENTRY   NONE
                           *       EXIT    (A) = CHARACTER
                           *       USES    A,F


002.331  076 064           RNB     MVI     A,UCI.RO+UCI.ER+UCI.RE  TURN ON READER FOR NEXT BYTE
002.333  323 371                   OUT     OP.TPC
002.335  315 252 002       RNB1    CALL    TPXIT           CHECK FOR *, READ STATUS
002.340  346 002                   ANI     USR.RXR
002.342  312 335 002               JZ      RNB1            IF NOT READY
002.345  333 370                   IN      IP.TPD          INPUT DATA
                           *       JMP     CRC             CHECKSUM
```



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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.              Unix H8ASM V1.4.1 5-Jul-80      Page    33
TAPE PROCESSING SUBROUTINES                                    16:53:11  11-SEP-80

                         **      CRC - COMPUTE CRC-16
                         *
                         *       CRC COMPUTES A CRC-16 CHECKSUM FROM THE POLYNOMIAL
                         *
                         *       (X + 1) * (X^15 + X + 1)
                         *
                         *       SINCE THE CHECKSUM GENERATED IS A DIVISION REMAINDER,
                         *       A CHECKSUMED DATA SEQUENCE CAN BE VERIFIED BY RUNNING
                         *       THE DATA THROUGH CRC, AND THEN RUNNING THE PREVIOUSLY OBTAINED
                         *       CHECKSUM THROUGH CRC. THE RESULTANT CHECKSUM SHOULD BE 0.
                         *
                         *       ENTRY   (CRCSUM) = CURRENT CHECKSUM
                         *               (A) = BYTE
                         *       EXIT    (CRCSUM) UPDATED
                         *               (A) UNCHANGED.
                         *       USES    F


002.347  305             CRC     PUSH    B                SAVE (BC)
002.350  006 010                 MVI     B,8              (B) = BIT COUNT
002.352  345                     PUSH    H
002.353  052 027 040             LHLD    CRCSUM
002.356  007             CRC1    RLC
002.357  117                     MOV     C,A              (C) = BIT
002.360  175                     MOV     A,L
002.361  207                     ADD     A
002.362  157                     MOV     L,A
002.363  174                     MOV     A,H
002.364  027                     RAL
002.365  147                     MOV     H,A
002.366  027                     RAL
002.367  251                     XRA     C
002.370  017                     RRC
002.371  322 004 003             JNC     CRC2             IF NOT TO XOR
002.374  174                     MOV     A,H
002.375  356 200                 XRI     200Q
002.377  147                     MOV     H,A
003.000  175                     MOV     A,L
003.001  356 005                 XRI     5Q
003.003  157                     MOV     L,A
003.004  171             CRC2    MOV     A,C
003.005  005                     DCR     B
003.006  302 356 002             JNZ     CRC1             IF MORE TO GO
003.011  042 027 040             SHLD    CRCSUM
003.014  341                     POP     H                RESTORE (HL)
003.015  301                     POP     B                RESTORE (BC)
003.016  311                     RET                      EXIT
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                        Unix H8ASM V1.4.1 5-Jul-80     Page    34
TAPE PROCESSING SUBROUTINES                                               16:53:12  11-SEP-80

                           1432  **      WNP - WRITE NEXT PAIR.
                           1433  *
                           1434  *       WPT WRITES THE NEXT TWO BYTES TO THE CASSETTE DRIVE.
                           1435  *
                           1436  *       ENTRY   (H,L) = BYTES
                           1437  *       EXIT    WRITTEN.
                           1438  *       USES    A,F
                           1439
                           1440
003.017  174               1441  WNP     MOV     A,H
003.020  315 024 003       1442          CALL    WNB
003.023  175               1443          MOV     A,L
                           1444  *       JMP     WNB               WRITE NEXT BYTE


                           1446  **      WNB - WRITE BYTE
                           1447  *
                           1448  *       WNB WRITES THE NEXT BYTE TO THE CASSETTE TAPE.
                           1449  *
                           1450  *       ENTRY   (A) = BYTE
                           1451  *       EXIT    NONE.
                           1452  *       USES    F
                           1453
                           1454
003.024  365               1455  WNB     PUSH    PSW
003.025  315 252 002       1456  WNB1    CALL    TPXIT             CHECK FOR *, READ STATUS
003.030  346 001           1457          ANI     USR.TXR
003.032  312 025 003       1458          JZ      WNB1              IF MORE TO GO
003.035  076 021           1459          MVI     A,UCI.ER+UCI.TE ENABLE TRANSMITTER
003.037  323 371           1460          OUT     OP.TPC            TURN ON TAPE
003.041  361               1461          POP     PSW
003.042  323 370           1462          OUT     OP.TPD            OUTPUT DATA
003.044  303 347 002       1463          JMP     CRC               COMPUTE CRC
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                         Unix H8ASM V1.4.1 5-Jul-80    Page   35
SUBROUTINES                                                                 16:53:13  11-SEP-80

                         1467  **      LRA - LOCATE REGISTER ADDRESS.
                         1468  *
                         1469  *       ENTRY   NONE.
                         1470  *       EXIT    (A) = REGISTER INDEX
                         1471  *               (H,L) = STORAGE ADDRESS
                         1472  *               (D,E) = (0,A)
                         1473  *       USES    A,D,E,H,L,F
                         1474
                         1475
                         1476
003.047  072 005 040     1477  LRA     LDA     REGI
003.052  137             1478  LRA.    MOV     E,A
003.053  026 000         1479          MVI     D,0
003.055  052 035 040     1480          LHLD    REGPTR
003.060  031             1481          DAD     D               (DE) = (REGPTR)+(REGI)
003.061  311             1482          RET


                         1484  **      IOA - INPUT OCTAL ADDRESS.
                         1485  *
                         1486  *       ENTRY   (H,L) = ADDRESS OF RECEPTION DOUBLE BYTE.
                         1487  *       EXIT    TO *RET* IF ERROR.
                         1488  *               TO *RET*+1 IF OK, VALUE IN MEMORY.
                         1489  *       USES    A,D,E,H,L,F
                         1490
                         1491
003.062  315 066 003     1492  IOA     CALL    IOB             INPUT BYTE
003.065  053             1493          DCX     H


                         1495  **      IOB - INPUT OCTAL BYTE.
                         1496  *
                         1497  *       READ ONE OCTAL BYTE FROM THE KEYSET.
                         1498  *
                         1499  *       ENTRY   (H,L) = ADDRESS OF BYTE TO HOLD VALUE
                         1500  *               'C' SET IF FIRST DIGIT IN (A)
                         1501  *       EXIT    TO *RET* IF ALL OK
                         1502  *               TO *ERROR* IF ERROR
                         1503  *       USES    A,D,E,H,L,F
                         1504
                         1505
                         1506
003.066  026 003         1507  IOB     MVI     D,3             (D) = DIGIT COUNT
003.070  324 260 003     1508  IOB1    CNC     RCK             READ CONSOLE KEYSET
                         1509
003.073  376 010         1510          CPI     8
003.075  322 322 000     1511          JNC     ERROR           IF ILLEGAL DIGIT
                         1512
003.100  137             1513          MOV     E,A             (E) = VALUE
003.101  176             1514          MOV     A,M
003.102  007             1515          RLC                     SHIFT 3
003.103  007             1516          RLC
```

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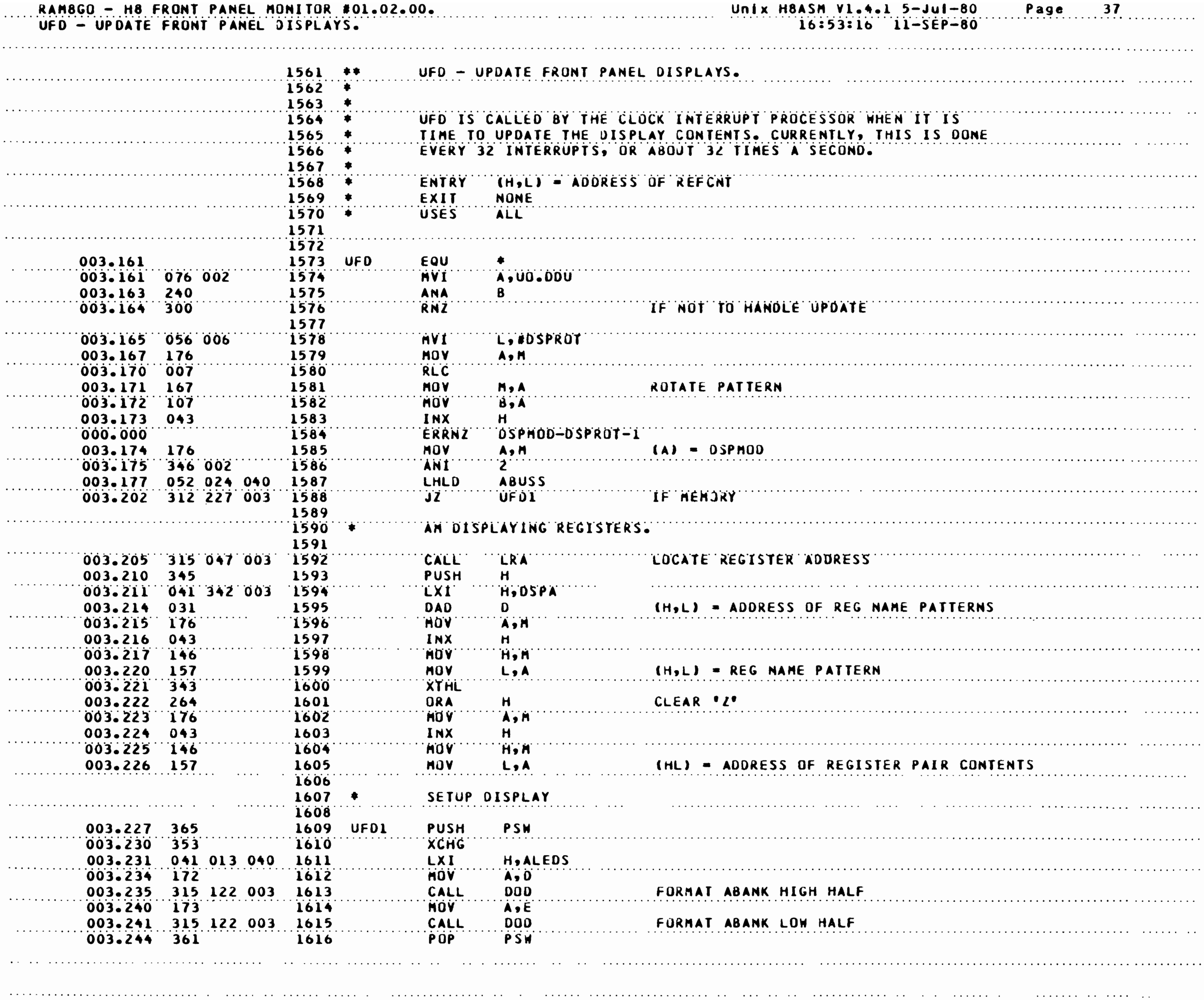
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                        Unix H8ASM V1.4.1 5-Jul-80    Page    36
SUBROUTINES                                                          16:53:16  11-SEP-80

    003.104  007          1517            RLC
    003.105  346 370      1518            ANI     370Q
    003.107  263          1519            ORA     E
    003.110  167          1520            MOV     M,A             REPLACE
    003.111  025          1521            DCR     D
    003.112  302 070 003  1522            JNZ     IOB1            IF NOT DONE
    003.115  076 017      1523            MVI     A,30/2          BEEP FOR 30 MS
    003.117  303 140 002  1524            JMP     HORN


                          1526  **        DOD - DECODE FOR OCTAL DISPLAY.
                          1527  *
                          1528  *         ENTRY   (H,L) = ADDRESS OF LED REFRESH AREA
                          1529  *                 (B) = *OR* PATTERN TO FORCE ON BARS OR PERIODS
                          1530  *                 (A) = OCTAL VALUE
                          1531  *         EXIT    (H,L) = NEX DIGIT ADDRESS
                          1532  *         USES    A,B,C,D,H,L
                          1533
                          1534
    003.122  325          1535  DOD       PUSH    D
    003.123  026 003      1536            MVI     D,DODA/256
    003.125  016 003      1537            MVI     C,3
    003.127  027          1538  DOD1      RAL                     LEFT 3 PLACES
    003.130  027          1539            RAL
    003.131  027          1540            RAL
    003.132  365          1541            PUSH    PSW             SAVE FOR NEXT DIGIT
    003.133  346 007      1542            ANI     7
    003.135  306 356      1543            ADI     #DODA
    003.137  137          1544            MOV     E,A             (D) = INDEX
    003.140  032          1545            LDAX    D               (A) = PATTERN
    003.141  250          1546            XRA     B
    003.142  346 177      1547            ANI     177Q
    003.144  250          1548            XRA     B
    003.145  167          1549            MOV     M,A             SET IN MEMORY
    003.146  043          1550            INX     H
    003.147  170          1551            MOV     A,B
    003.150  007          1552            RLC
    003.151  107          1553            MOV     B,A
    003.152  361          1554            POP     PSW             (A) = VALUE
    003.153  015          1555            DCR     C
    003.154  302 127 003  1556            JNZ     DOD1            IF MORE TO GO
    003.157  321          1557            POP     D
    003.160  311          1558            RET                     RETURN
```



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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                        Unix H8ASM V1.4.1 5-Jul-80     Page   37
UFD - UPDATE FRONT PANEL DISPLAYS.                                        16:53:16  11-SEP-80

                          1561  **     UFD - UPDATE FRONT PANEL DISPLAYS.
                          1562  *
                          1563  *
                          1564  *      UFD IS CALLED BY THE CLOCK INTERRUPT PROCESSOR WHEN IT IS
                          1565  *      TIME TO UPDATE THE DISPLAY CONTENTS. CURRENTLY, THIS IS DONE
                          1566  *      EVERY 32 INTERRUPTS, OR ABOUT 32 TIMES A SECOND.
                          1567  *
                          1568  *      ENTRY   (H,L) = ADDRESS OF REFCNT
                          1569  *      EXIT    NONE
                          1570  *      USES    ALL
                          1571
                          1572
003.161                   1573  UFD    EQU     *
003.161  076 002          1574         MVI     A,UO.DDU
003.163  240              1575         ANA     B
003.164  300              1576         RNZ                         IF NOT TO HANDLE UPDATE
                          1577
003.165  056 006          1578         MVI     L,#DSPROT
003.167  176              1579         MOV     A,M
003.170  007              1580         RLC
003.171  167              1581         MOV     M,A                 ROTATE PATTERN
003.172  107              1582         MOV     B,A
003.173  043              1583         INX     H
000.000                   1584         ERRNZ   DSPMOD-DSPROT-1
003.174  176              1585         MOV     A,M                 (A) = DSPMOD
003.175  346 002          1586         ANI     2
003.177  052 024 040      1587         LHLD    ABUSS
003.202  312 227 003      1588         JZ      UFD1                IF MEMJRY
                          1589
                          1590  *      AM DISPLAYING REGISTERS.
                          1591
003.205  315 047 003      1592         CALL    LRA                 LOCATE REGISTER ADDRESS
003.210  345              1593         PUSH    H
003.211  041 342 003      1594         LXI     H,DSPA
003.214  031              1595         DAD     D                   (H,L) = ADDRESS OF REG NAME PATTERNS
003.215  176              1596         MOV     A,M
003.216  043              1597         INX     H
003.217  146              1598         MOV     H,M
003.220  157              1599         MOV     L,A                 (H,L) = REG NAME PATTERN
003.221  343              1600         XTHL
003.222  264              1601         ORA     H                   CLEAR 'Z'
003.223  176              1602         MOV     A,M
003.224  043              1603         INX     H
003.225  146              1604         MOV     H,M
003.226  157              1605         MOV     L,A                 (HL) = ADDRESS OF REGISTER PAIR CONTENTS
                          1606
                          1607  *      SETUP DISPLAY
                          1608
003.227  365              1609  UFD1   PUSH    PSW
003.230  353              1610         XCHG
003.231  041 013 040      1611         LXI     H,ALEDS
003.234  172              1612         MOV     A,D
003.235  315 122 003      1613         CALL    DOD                 FORMAT ABANK HIGH HALF
003.240  173              1614         MOV     A,E
003.241  315 122 003      1615         CALL    DOD                 FORMAT ABANK LOW HALF
003.244  361              1616         POP     PSW
```

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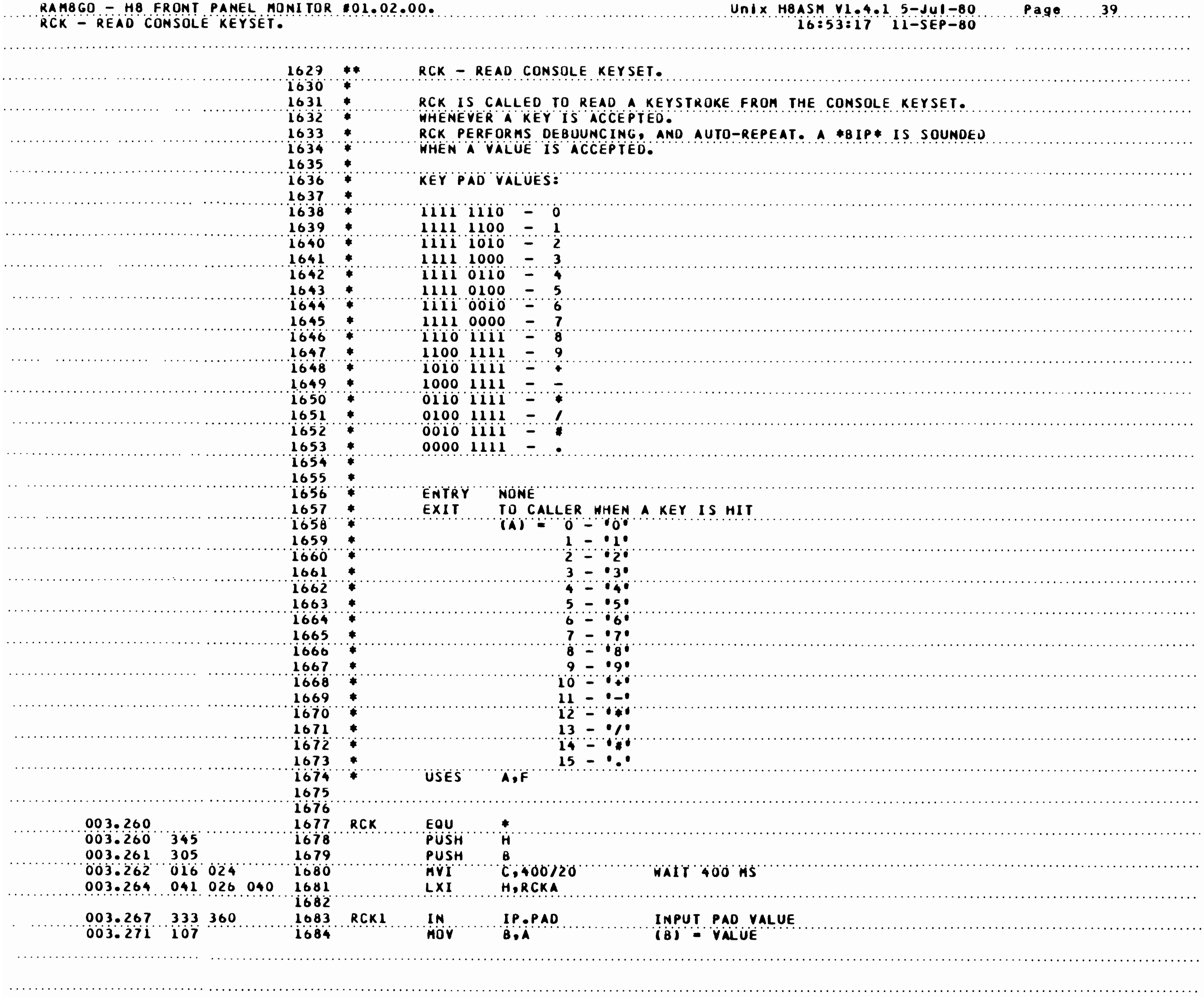
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                          Unix H8ASM V1.4.1 5-Jul-80     Page    38
UFD - UPDATE FRONT PANEL DISPLAYS.                                           16:53:17  11-SEP-80

      003.245  032           1617         LDAX    D
      003.246  312 122 003   1618         JZ      DUD               IF MEMORY, DECODE BYTE VALUE
                             1619
                             1620   *     IS REGISTER. SET REGISTER NAME.
                             1621
      003.251  066 377       1622         MVI     M,377Q            CLEAR DIGIT
      003.253  341           1623         POP     H
      003.254  042 022 040   1624         SHLD    DLEDS+1
      003.257  311           1625         RET
```



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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                    Unix H8ASM V1.4.1 5-Jul-80    Page    39
RCK - READ CONSOLE KEYSET.                                              16:53:17  11-SEP-80

                         1629  **     RCK - READ CONSOLE KEYSET.
                         1630  *
                         1631  *      RCK IS CALLED TO READ A KEYSTROKE FROM THE CONSOLE KEYSET.
                         1632  *      WHENEVER A KEY IS ACCEPTED.
                         1633  *      RCK PERFORMS DEBOUNCING, AND AUTO-REPEAT. A *BIP* IS SOUNDED
                         1634  *      WHEN A VALUE IS ACCEPTED.
                         1635  *
                         1636  *      KEY PAD VALUES:
                         1637  *
                         1638  *      1111 1110  -  0
                         1639  *      1111 1100  -  1
                         1640  *      1111 1010  -  2
                         1641  *      1111 1000  -  3
                         1642  *      1111 0110  -  4
                         1643  *      1111 0100  -  5
                         1644  *      1111 0010  -  6
                         1645  *      1111 0000  -  7
                         1646  *      1110 1111  -  8
                         1647  *      1100 1111  -  9
                         1648  *      1010 1111  -  +
                         1649  *      1000 1111  -  -
                         1650  *      0110 1111  -  *
                         1651  *      0100 1111  -  /
                         1652  *      0010 1111  -  #
                         1653  *      0000 1111  -  .
                         1654  *
                         1655  *
                         1656  *      ENTRY    NONE
                         1657  *      EXIT     TO CALLER WHEN A KEY IS HIT
                         1658  *               (A) =  0 - '0'
                         1659  *                      1 - '1'
                         1660  *                      2 - '2'
                         1661  *                      3 - '3'
                         1662  *                      4 - '4'
                         1663  *                      5 - '5'
                         1664  *                      6 - '6'
                         1665  *                      7 - '7'
                         1666  *                      8 - '8'
                         1667  *                      9 - '9'
                         1668  *                     10 - '+'
                         1669  *                     11 - '-'
                         1670  *                     12 - '*'
                         1671  *                     13 - '/'
                         1672  *                     14 - '#'
                         1673  *                     15 - '.'
                         1674  *      USES     A,F
                         1675
                         1676
 003.260                 1677  RCK    EQU      *
 003.260  345            1678         PUSH     H
 003.261  305            1679         PUSH     B
 003.262  016 024        1680         MVI      C,400/20          WAIT 400 MS
 003.264  041 026 040    1681         LXI      H,RCKA
                         1682
 003.267  333 360        1683  RCK1   IN       IP.PAD            INPUT PAD VALUE
 003.271  107            1684         MOV      B,A               (B) = VALUE
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                    Unix H8ASM V1.4.1 5-Jul-80    Page    40
RCK - READ CONSOLE KEYSET.                                              16:53:18  11-SEP-80

    003.272  076 012      1685          MVI     A,20/2
    003.274  315 053 000  1686          CALL    DLY                 WAIT 20 MS
    003.277  170          1687          MOV     A,B
    003.300  276          1688          CMP     M
    003.301  302 310 003  1689          JNE     RCK2                HAVE A CHANGE
    003.304  015          1690          DCR     C  •
    003.305  302 267 003  1691          JNZ     RCK1                WAIT N CYCLES
                          1692
                          1693  *       HAVE KEY VALUE
                          1694
    003.310  167          1695  RCK2    MOV     M,A                 UPDATE RCKA
    003.311  356 376      1696          XRI     376Q                INVERT ALL BUT GROUP 0 FLAG
    003.313  017          1697          RRC
    003.314  322 326 003  1698          JNC     RCK3                HIT BANK 0
    003.317  017          1699          RRC
    003.320  017          1700          RRC
    003.321  017          1701          RRC
    003.322  017          1702          RRC
    003.323  322 267 003  1703          JNC     RCK1                NO HIT AT ALL
    003.326  107          1704  RCK3    MOV     B,A                 (B) = CODE
    003.327  076 002      1705          MVI     A,4/2
    003.331  315 140 002  1706          CALL    HORN                MAKE BIP
    003.334  170          1707          MOV     A,B
    003.335  346 017      1708          ANI     17Q
    003.337  301          1709          POP     B
    003.340  341          1710          POP     H
    003.341  311          1711          RET                         RETURN
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                         Unix H8ASM V1.4.1 5-Jul-80      Page    41
SEGMENT PATTERNS AND CONSTANTS.                               SEG            16:53:20  11-SEP-80

                           1715  **      DISPLAY SEGMENT CODING:
                           1716  *
                           1717  *       BYTE = 76 543 210
                           1718  *
                           1719  *        1
                           1720  *       6 2
                           1721  *        0
                           1722  *       5 3
                           1723  *        4
                           1724  *          7



                           1728  **      REGISTER INDEX TO 7-SEGMENT PATTERN
                           1729
  003.342                  1730  DSPA    DS      0
  003.342  244 230         1731          DW      1001100010100100B   SP
  003.344  220 234         1732          DW      1001110010010000B   AF
  003.346  206 215         1733          DW      1000110110000110B   BC
  003.350  302 214         1734          DW      1000110011000010B   DE
  003.352  222 217         1735          DW      1000111110010010B   HL
  003.354  230 316         1736          DW      1100111010011000B   PC


                           1738  **      OCTAL TO 7-SETMENT PATTERN
                           1739
  003.356                  1740  DODA    DS      0
  003.356  001             1741          DB      00000001B       0
  003.357  163             1742          DB      01110011B       1
  003.360  110             1743          DB      01001000B       2
  003.361  140             1744          DB      01100000B       3
  003.362  062             1745          DB      00110010B       4
  003.363  044             1746          DB      00100100B       5
  003.364  004             1747          DB      00000100B       6
  003.365  161             1748          DB      01110001B       7
  003.366  000             1749          DB      00000000B       8
  003.367  040             1750          DB      00100000B       9


                           1752  **      IO ROUTINES TO BE COPIED INTO AND USED IN RAM.
                           1753  *
                           1754  *       MUST CONTINUE TO 3777A FOR PROPER COPY.
                           1755  *       THE TABLE MUST ALSO BE BACKWARDS TO THE FINAL RAM
                           1756
  003.371                  1757          ORG     4000A-7
                           1758
  003.371                  1759  PRSROM  EQU     *
  003.371  001             1760          DB      1               REFIND
  003.372  000             1761          DB      0               CTLFLG
  003.373  000             1762          DB      0               .MFLAG
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                            Unix H8ASM V1.4.1 5-Jul-80      Page    42
CONSTANTS AND TABLES.                                          IOROM        16:53:23  11-SEP-80

     003.374  002         1763        DB       DM.RR            DSPMOD  DISPLAY REGISTER        /PAM8GO 04MAR80/
     003.375  000         1764        DB       0                DSPROT
     003.376  000         1765        DB       0                REGI    Show  *SP*              /Ram8Go 2/
     003.377  311         1766        DB       MI.RET
                          1767
     000.000              1768        ERRNZ *-4000A
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                    Unix H8ASM V1.4.1 5-Jul-80     Page    43
EXTENDED MEMORY SIZING                                 XINIT1          16:53:23  11-SEP-80

                         **      XINIT1 - SIZE MEMORY                                      /RAM8GO JUN80/
                         *
                         *       XINIT1 IS JUMPED TO DURING PAM8'S MEMORY SIZING
                         *       THIS ROUTINE DIFFERS FROM THE STANDARD PAM8 FUNCTION
                         *       IN THAT IT IS NON-DESTRUCTIVE TO WHAT MAY BE RAM BELOW
                         *       040000A, AND IT WILL NOT WRAP-AROUND IN A 64K RAM SYSTEM
                         *
                         *       ENTRY   JUMPED TO FROM OLD INIT1
                         *               (DE) = SEARCH INCREMENT
                         *               (HL) = FIRST RAM SEARCH LOCATION
                         *       EXIT    (HL) = FIRST LOCATION WHERE NO RAM FOUND
                         *                      (OR ZERO IF RAM THROUGH 64K)
                         *               (E)  = 0 AS REQUIRED

004.000  176                     XINIT1  MOV     A,M                 GET THE VALUE OF THE CURRENT TRIAL ADDRESS
004.001  065                             DCR     M                   ATTEMPT TO CHANGE IT
004.002  276                             CMP     M                   COMPARE IT TO ITS OLD VALUE
004.003  167                             MOV     M,A                 RESTORE OLD VALUE
004.004  312 117 000                     JZ      INIT2               THERE WAS NO CHANGE => NO RAM
004.007  031                             DAD     D                   INCREMENT THE SEARCH ADDRESS
004.010  322 000 004                     JNC     XINIT1              HAS NOT WRAPPED AROUND
004.013  303 117 000                     JMP     INIT2               BACK INTO INLINE CODE
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                            Unix H8ASM V1.4.1 5-Jul-80     Page    44
EXTENDED INITIALIZATION SEQUENCE                                 XINIT          16:53:27  11-SEP-80

                           1797  **     XINIT - EXTENDED INITIALIZATION                              /Ram8Go 2/
                           1798  *
                           1799  *      DECIDE IF THERE IS RAM AT ZERO,
                           1800  *        IF THERE IS, THEN COPY RAM FRONT PANEL AND H17 ROM TO
                           1801  *               APPROPRIATE POSITIONS
                           1802  *      JUMP BACK TO INLINE INIT
                           1803  *
                           1804  *      Modified to only do one move directly to RAM.                /Ram8Go 2/
                           1805  *
                           1806  *      ENTRY   (DE) = RAM8GO                                        /Ram8Go 2/
                           1807  *
                           1808  *      EXIT    (DE) = PRSROM
                           1809  *              (HL) = PRSRAM+PRSL-1
                           1810  *              RAM AT ZERO SET UP IF PRESENT
                           1811  *
                           1812
   030.000                 1813  H17ROM  EQU     030000A          H17 Rom Address
   010.000                 1814  H17ROML EQU     2*1024           Length of H17 ROM
                           1815
   004.016  257            1816  XINIT   XRA     A
   004.017  062 066 040    1817          STA     CTLFLG2          Initialize the flag
                           1818
                           1819  *       Copy check routine to RAM
                           1820
   004.022  016 012        1821          MVI     C,XINAL
   004.024  021 146 004    1822          LXI     D,XINA
   004.027  041 004 040    1823          LXI     H,XINB
   004.032  032            1824  XIN1    LDAX    D
   004.033  167            1825          MOV     M,A
   004.034  023            1826          INX     D
   004.035  043            1827          INX     H
   004.036  015            1828          DCR     C
   004.037  302 032 004    1829          JNZ     XIN1
                           1830
                           1831  *       Check for RAM at Zero
                           1832
   004.042  041 000 000    1833          LXI     H,RAM8GO
   004.045  072 066 040    1834          LDA     CTLFLG2
   004.050  107            1835          MOV     B,A              Save original in B
   004.051  366 362        1836          ORI     OP.CTL2          Turn on RAM at Zero
   004.053  021 061 004    1837          LXI     D,XIN2           DE = return address
   004.056  303 004 040    1838          JMP     XINB
   004.061  312 135 004    1839  XIN2    JZ      XIN5             No change with decrement
                           1840
                           1841  *       Copy ROM to RAM
                           1842
   004.064  001 000 010    1843          LXI     B,RAM8GOL        Length to Copy
   004.067  021 000 000    1844          LXI     D,RAM8GO
   004.072  032            1845  XIN3    LDAX    D                Move RAM8GO into place
   004.073  022            1846          STAX    D
   004.074  023            1847          INX     D
   004.075  013            1848          DCX     B
   004.076  170            1849          MOV     A,B
   004.077  261            1850          ORA     C
   004.100  302 072 004    1851          JNZ     XIN3             Not all moved yet
                           1852
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                        Unix H8ASM V1.4.1 5-Jul-80      Page    45
EXTENDED INITIALIZATION SEQUENCE                            XINIT           16:53:29  11-SEP-80

                       1853  *       Copy H17 ROM to its final resting place (RIP)
                       1854
004.103  001 000 010   1855          LXI     B,H17ROML
004.106  041 000 030   1856          LXI     H,H17ROM
004.111  032           1857  XIN4    LDAX    D                  Move H17 ROM into place
004.112  167           1858          MOV     M,A
004.113  023           1859          INX     D
004.114  043           1860          INX     H
004.115  013           1861          DCX     B
004.116  170           1862          MOV     A,B
004.117  261           1863          ORA     C
004.120  302 111 004   1864          JNZ     XIN4               Not all moved yet
                       1865
004.123  072 066 040   1866          LDA     CTLFLG2
004.126  366 040       1867          ORI     CB2.ORG
004.130  062 066 040   1868          STA     CTLFLG2
004.133  323 362       1869          OUT     OP.CTL2            Turn on Ram at 0
                       1870
004.135  021 371 003   1871  XIN5    LXI     D,PRSROM           RESTORE NORMAL VALUES
004.140  041 012 040   1872          LXI     H,PRSRAM+PRSL-1
                       1873
004.143  303 073 000   1874          JMP     INIT               RETURN TO INLINE CODE
                       1875
004.146  323 362       1876  XINA    OUT     OP.CTL2            Select RAM
004.150  176           1877          MOV     A,M
004.151  065           1878          DCR     M
004.152  276           1879          CMP     M                  check for a change
004.153  170           1880          MOV     A,B
004.154  323 362       1881          OUT     OP.CTL2            Select ROM
004.156  353           1882          XCHG
004.157  351           1883          PCHL
000.012                1884  XINAL   EQU     *-XINA
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                     Unix H8ASM V1.4.1 5-Jul-80    Page    46
Extended Command Table                                                   16:53:32  11-SEP-80

                              1887  ***     Extended Command Table                                /Ram8Go 2/
                              1888  *
                              1889
   004.160  306 004           1890  EXTCMD  ADI     4
   004.162  207               1891          ADD     A               A = 2 * A
   004.163  021 177 004       1892          LXI     D,EXTCMDA
   004.166  157               1893          MOV     L,A
   004.167  046 000           1894          MVI     H,0
   004.171  031               1895          DAD     D               *(HL) = Processor Address
   004.172  176               1896          MOV     A,M
   004.173  043               1897          INX     H
   004.174  146               1898          MOV     H,M
   004.175  157               1899          MOV     L,A             HL = Processor Address
   004.176  351               1900          PCHL                    Enter Processor
                              1901
   004.177  322 000           1902  EXTCMDA DW      ERROR           '0'     Illegal
   004.201  253 004           1903          DW      PRIBOO          '1' => Primary Boot
   004.203  236 004           1904          DW      SECBOO          '2' => Secondary Boot
   004.205  322 000           1905          DW      ERROR           '3'     Illegal


                              1907  **      AUTOB   - Auto Boot                                   /Ram8Go 2/
                              1908  *
                              1909  *       AUTOB performs an auto boot of the primary device.
                              1910  *
                              1911  *       ENTRY:  NONE
                              1912  *
                              1913  *       EXIT:   To PRIBOO
                              1914  *
                              1915  *       USES:   ALL
                              1916  *
                              1917
   004.207  041 010 040       1918  AUTOB   LXI     H,.MFLAG
   004.212  176               1919          MOV     A,M
   004.213  346 275           1920          ANI     377Q-UO.DDU-UO.NFR
   004.215  167               1921          MOV     M,A             Enable Display Update, and Re-Fresh
   004.216  043               1922          INX     H
   000.000                    1923          ERRNZ   CTLFLG-.MFLAG-1
   004.217  066 360           1924          MVI     M,CB.SSI+CB.MTL+CB.CLI+CB.SPK
   004.221  076 377           1925          MVI     A,-1
   004.223  062 006 040       1926          STA     DSPROT          All Periods OFF
   004.226  373               1927          EI
   004.227  052 035 040       1928          LHLD    REGPTR
   004.232  371               1929          SPHL
   004.233  303 253 004       1930          JMP     PRIBOO          Boot PRImary device
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                    Unix H8ASM V1.4.1 5-Jul-80    Page    47
Boot Routines                                                  16:53:34  11-SEP-80

                        1933 ***     PRIBOO  - Primary Boot                              /Ram8Go 2/
                        1934 *
                        1935 *       PRIBOO is called to boot from the primary boot device
                        1936 *       as defined in the configuration port IP.CON.  The
                        1937 *       alternate entry, SECBOO, is called to boot from the
                        1938 *       secondary boot device.  If the CN.PRI switch is one,
                        1939 *       then address 170 is the primary device, otherwise,
                        1940 *       address 174 is the boot device.  From there, the
                        1941 *       configuration switch further determines device type
                        1942 *       with the appropriate masks.
                        1943 *
                        1944
004.236  257            1945 SECBOO  XRA     A
004.237  062 061 041    1946 SECBOO. STA     AIO.UNI                 Zero Boot Unit
004.242  001 140 005    1947         LXI     B,MSGSEC
004.245  333 362        1948         IN      IP.CON
004.247  057            1949         CMA                             Invert Primary Flag
004.250  303 264 004    1950         JMP     BOO1                    Boot Secondary Device
                        1951
004.253  257            1952 PRIBOO  XRA     A
004.254  062 061 041    1953 PRIBOO. STA     AIO.UNI
004.257  001 135 005    1954         LXI     B,MSGPRI
004.262  333 362        1955         IN      IP.CON
                        1956
004.264  061 200 042    1957 BOO1    LXI     SP,STACK        Initialize the stack-pointer
004.267  346 020        1958         ANI     CN.PRI
004.271  333 362        1959         IN      IP.CON
004.273  365            1960         PUSH    PSW
004.274  312 317 004    1961         JZ      BOO2                    174 is the device to boot
                        1962
                        1963 *       Boot Device is 170
                        1964
004.277  076 170        1965         MVI     A,170Q
004.301  062 120 041    1966         STA     BDA                     Save Boot Device Address
004.304  361            1967         POP     PSW
004.305  346 014        1968         ANI     CN.170M                 Mask Device Type
004.307  312 143 005    1969         JZ      BERR                    No Device Installed at 170
000.000                 1970         ERRNZ   CND.NDI                 No-Device-Installed Flag
004.312  017            1971         RRC
004.313  017            1972         RRC                     Device Type converted to index
004.314  303 327 004    1973         JMP     BOO3
                        1974
                        1975 *       Boot Device is 174
                        1976
004.317  076 174        1977 BOO2    MVI     A,174Q
004.321  062 120 041    1978         STA     BDA             Save Boot Device Address
004.324  361            1979         POP     PSW
004.325  346 003        1980         ANI     CN.174M         Mask out device type
                        1981
                        1982 *       Initialize Vectors and Display
                        1983
004.327  365            1984 BOO3    PUSH    PSW             Save Device Index
004.330  305            1985         PUSH    B
                        1986
004.331  076 320        1987         MVI     A,CB.SSI+CB.CLI+CB.SPK
004.333  062 011 040    1988         STA     CTLFLG          Turn off monitor mode
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                          Unix H8ASM V1.4.1 5-Jul-80     Page    48
Boot Routines                                                                16:53:40  11-SEP-80

                          1989
004.336  076 007          1990          MVI     A,7
004.340  041 037 040      1991          LXI     H,UIVEC
004.343  066 303          1992  B004    MVI     M,MI.JMP          Stuff Interrupt Vectors
004.345  043              1993          INX     H
004.346  066 002          1994          MVI     M,#EIRET
004.350  043              1995          INX     H
004.351  066 007          1996          MVI     M,EIRET/256
004.353  043              1997          INX     H
004.354  075              1998          DCR     A
004.355  302 343 004      1999          JNZ     B004
                          2000
004.360  257              2001          XRA     A
004.361  062 122 041      2002          STA     TIMEOUT           Zero Time-Out Counter
004.364  041 031 034      2003          LXI     H,ROMCLK          H17 Rom Clock Routine
004.367  042 124 041      2004          SHLD    USRCLK
004.372  041 221 005      2005          LXI     H,CLKINT
004.375  042 040 040      2006          SHLD    UIVEC+1           Initialize Clock Interrupt Vector
                          2007
005.000  001 132 037      2008          LXI     B,BOOTA
005.003  021 110 040      2009          LXI     D,D.CON
005.006  315 151 007      2010          CALL    SMOV              Initialize Rom/Ram Vectors
005.011  130              2011          DB      BOOTAL
                          2012
005.012  041 240 040      2013          LXI     H,D.RAM
005.015  006 037          2014          MVI     B,D.RAML
005.017  315 323 007      2015          CALL    $ZERO             Zero Memory
                          2016
005.022  072 010 040      2017          LDA     .MFLAG
005.025  366 003          2018          ORI     UO.CLK+UO.DDU     Enable Clock Int. turn off Display Update
005.027  062 010 040      2019          STA     .MFLAG
                          2020
005.032  301              2021          POP     B
005.033  021 013 040      2022          LXI     D,FPLEDS
005.036  315 151 007      2023          CALL    SMOV
005.041  003              2024          DB      MSGLEN
005.042  056 006          2025          MVI     L,9-MSGLEN
005.044  076 377          2026          MVI     A,-1
005.046  022              2027  B005    STAX    D                 Blank some
005.047  023              2028          INX     D
005.050  055              2029          DCR     L
005.051  302 046 005      2030          JNZ     B005
                          2031
005.054  361              2032          POP     PSW
005.055  021 101 005      2033          LXI     D,B006
005.060  325              2034          PUSH    D                 Force Boot to return to B006
                          2035
005.061  062 121 041      2036          STA     BDF               Save Boot Device Flag
005.064  207              2037          ADD     A                 A = 2 * A
005.065  157              2038          MOV     L,A
005.066  046 000          2039          MVI     H,0
005.070  021 125 005      2040          LXI     D,BOOA
005.073  031              2041          DAD     D
005.074  176              2042          MOV     A,M
005.075  043              2043          INX     H
005.076  146              2044          MOV     H,M
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                    Unix H8ASM V1.4.1 5-Jul-80     Page    49
Boot Routines                                                           16:53:41  11-SEP-80

     005.077  157           2045          MOV     L,A              HL = Device Processor Address
     005.100  351           2046          PCHL
                            2047
     005.101  072 010 040   2048  8006    LDA     .MFLAG
     005.104  346 375       2049          ANI     377Q-UO.DDU      Turn on Display Update
     005.106  062 010 040   2050          STA     .MFLAG           Restore original front panel mode
     005.111  052 124 041   2051          LHLD    USRCLK
     005.114  042 040 040   2052          SHLD    UIVEC+1          Clear Time-Out Vector to just user vector
     005.117  332 322 000   2053          JC      ERROR            Boot Routines return here
                            2054
     005.122  303 200 042   2055          JMP     USERFWA


                            2057  **      Device Processors
                            2058  *
                            2059
     005.125                2060  BOOA    EQU     *
                            2061
     000.000                2062          ERRNZ   *-BOOA/2-CND.H17
     005.125  032 006       2063          DW      BH17
                            2064
     000.000                2065          ERRNZ   *-BOOA/2-CND.H47
     005.127  152 006       2066          DW      BH47
                            2067
     005.131  143 005       2068          DW      BERR             Illegal Device
     005.133  143 005       2069          DW      BERR
                            2070
                            2071
     005.135  230 336 337   2072  MSGPRI  DB      10011000B,11011110B,11011111B          'Pri'
     000.003                2073  MSGLEN  EQU     *-MSGPRI
                            2074
     005.140  244 214 215   2075  MSGSEC  DB      10100100B,10001100B,10001101B          'SEC'
     000.000                2076          ERRNZ   *-MSGSEC-MSGLEN
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                          Unix H8ASM V1.4.1 5-Jul-80     Page    50
BERR    - Boot Error                                                      16:53:43  11-SEP-80

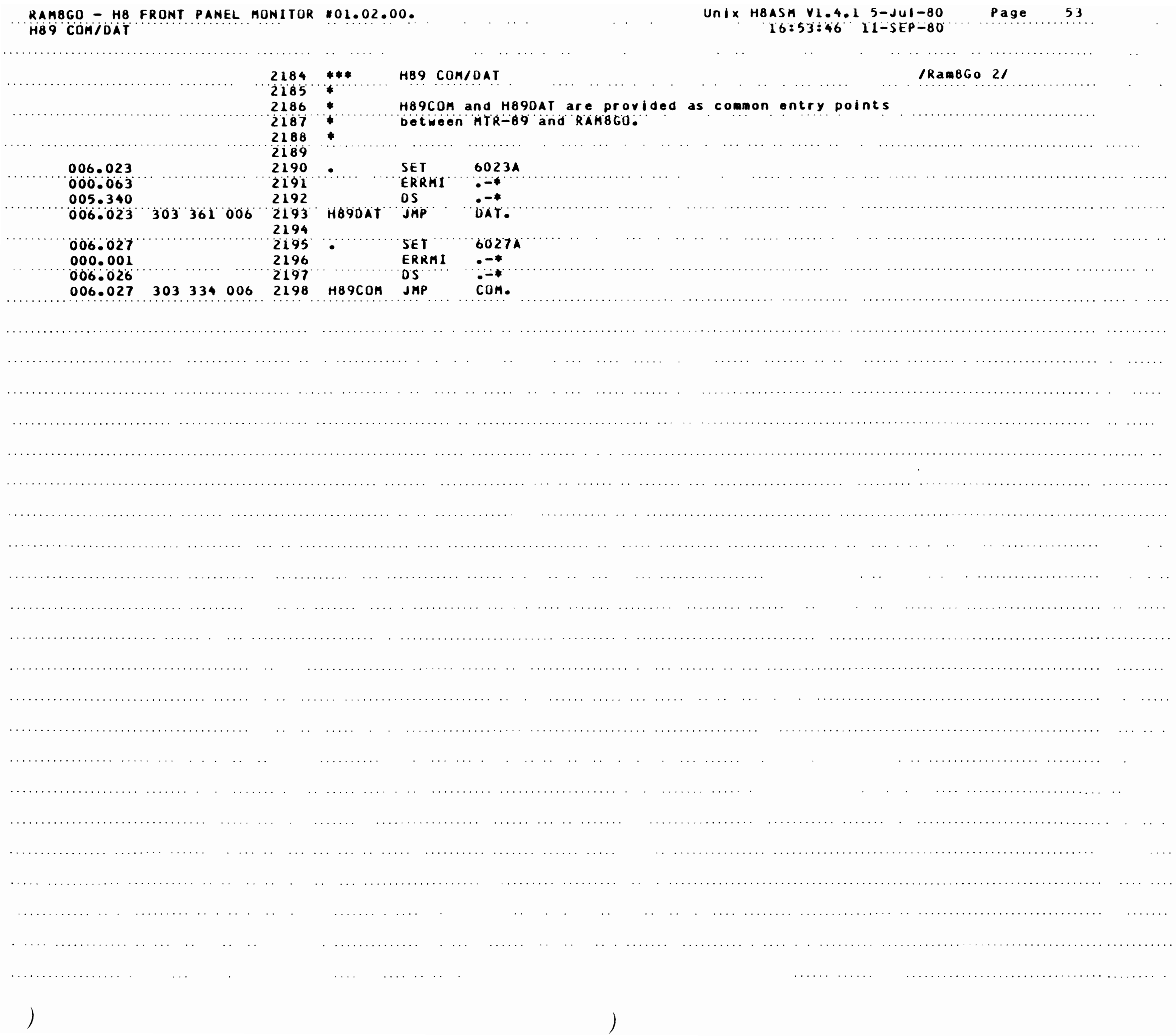
                         2080  **     BERR    - Boot Error                                  /Ram8Go 2/
                         2081  *
                         2082  *      BERR handles boot errors.
                         2083  *
                         2084
005.143  072 010 040     2085  BERR   LDA     .MFLAG
005.146  366 002         2086         ORI     UO.DDU          Disable Display Update
005.150  062 010 040     2087         STA     .MFLAG
                         2088
005.153  001 210 005     2089         LXI     B,BERRA
005.156  021 013 040     2090         LXI     D,FPLEDS
005.161  315 151 007     2091         CALL    $MOV            Set up Error Message in LED's
005.164  011             2092         DB      BERRAL
                         2093
005.165  001 000 000     2094         LXI     B,BERRB         BC = Time-Out Count
005.170  013             2095  BERR1  DCX     B
005.171  170             2096         MOV     A,B
005.172  261             2097         ORA     C
005.173  312 322 000     2098         JZ      ERROR           Done displaying message
                         2099
005.176  333 360         2100         IN      IP.PAD
005.200  376 157         2101         CPI     K.STAR          *
005.202  312 322 000     2102         JZ      ERROR           Cancel was hit
005.205  303 170 005     2103         JMP     BERR1
                         2104
005.210  206             2105  BERRA  DB      377Q-S0-S3-S4-S5-S6       b
005.211  306             2106         DB      377Q-S0-S3-S4-S5          o
005.212  306             2107         DB      377Q-S0-S3-S4-S5          o
005.213  362             2108         DB      377Q-S0-S2-S3             t
005.214  377             2109         DB      377Q
005.215  377             2110         DB      377Q
005.216  214             2111         DB      377Q-S0-S1-S4-S5-S6       E
005.217  336             2112         DB      377Q-S0-S5                r
005.220  336             2113         DB      377Q-S0-S5                r
000.011                  2114  BERRAL EQU     *-BERRA
                         2115
000.000                  2116  BERRB  EQU     0               Time-Out Count  (Full Wrap)
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                    Unix H8ASM V1.4.1 5-Jul-80    Page    51
Clock Interrupt Processor                                              16:53:44  11-SEP-80

                         2119  ***     CLKINT  - Clock Interrupt Processor                   /Ram8Go 2/
                         2120  *
                         2121  *       CLKINT processes the clock interrupts by:
                         2122  *
                         2123  *               Checking for abort
                         2124  *               Checking for Time-Out
                         2125  *               Passing the Interrupts on to the user
                         2126  *
                         2127  *       This clock routine is only to be used at boot
                         2128  *       time.
                         2129  *
                         2130
005.221  365             2131  CLKINT  PUSH    PSW
005.222  333 360         2132          IN      IP.PAD
005.224  376 157         2133          CPI     K.STAR
005.226  312 322 000     2134          JZ      ERROR                   Cancel is down, so abort the BOOT
                         2135
005.231  072 033 040     2136          LDA     TICCNT
005.234  247             2137          ANA     A
005.235  302 331 005     2138          JNZ     CKI3                    Not time to increment internal timer
                         2139
005.240  072 122 041     2140          LDA     TIMEOUT
005.243  074             2141          INR     A
005.244  062 122 041     2142          STA     TIMEOUT
005.247  376 036         2143          CPI     30
005.251  332 331 005     2144          JC      CKI3                    Not the end yet
                         2145
                         2146  *       Time-Out Error
                         2147
005.254  072 121 041     2148          LDA     BDF                     A  = Boot device flag
005.257  376 000         2149          CPI     CND.H17
005.261  302 305 005     2150          JNZ     CKI1                    Not an H17
                         2151
                         2152  *       Abort H17
                         2153
005.264  257             2154          XRA     A
005.265  062 243 040     2155          STA     D.DLYMO
005.270  072 242 040     2156          LDA     D.DVCTL                 A  = Device Control
005.273  346 200         2157          ANI     DF.WR                   Remove all but Ram/Write
005.275  062 242 040     2158          STA     D.DVCTL
005.300  323 177         2159          OUT     DP.DC                   Turn of Motor
005.302  303 317 005     2160          JMP     CKI2
                         2161
                         2162  *       Abort H47
                         2163
005.305  376 001         2164  CKI1    CPI     CND.H47
005.307  302 317 005     2165          JNZ     CKI2                    Should never happen
005.312  315 033 007     2166          CALL    DBD.                    Reset H47
005.315  002 000         2167          DB      W.RES,D.STAI
000.000                  2168          ERRNZ   CKI2-*
                         2169
                         2170  *       Restore User Clock Vector
                         2171
005.317  052 124 041     2172  CKI2    LHLD    USRCLK                  Restore User Clock
005.322  042 040 040     2173          SHLD    UIVEC+1
005.325  373             2174          EI
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                            Unix H8ASM V1.4.1 5-Jul-80     Page    52
Clock Interrupt Processor                                                  16:53:46  11-SEP-80

      005.326  303 143 005  2175         JMP     BERR             Boot Time-Out Error
                            2176
      005.331  361          2177  CKI3   POP     PSW
      005.332  345          2178         PUSH    H
      005.333  052 124 041  2179         LHLD    USRCLK
      005.336  343          2180         XTHL
      005.337  311          2181         RET                      Enter User's Clock Routine
```



```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                    Unix H8ASM V1.4.1 5-Jul-80     Page     53
H89 COM/DAT                                                          16:53:46  11-SEP-80

                       2184  ***     H89 COM/DAT                                        /Ram8Go 2/
                       2185  *
                       2186  *       H89COM and H89DAT are provided as common entry points
                       2187  *       between MTR-89 and RAM8GO.
                       2188  *
                       2189
006.023                2190  .       SET     6023A
000.063                2191          ERRMI   .-*
005.340                2192          DS      .-*
006.023  303 361 006   2193  H89DAT  JMP     DAT.
                       2194
006.027                2195  .       SET     6027A
000.001                2196          ERRMI   .-*
006.026                2197          DS      .-*
006.027  303 334 006   2198  H89COM  JMP     COM.
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                          Unix H8ASM V1.4.1 5-Jul-80     Page    54
BH17 - Boot H17                                                          16:53:47  11-SEP-80

                      2201  **      BH17  - Boot H17                                        /RamBGo 2/
                      2202  *
                      2203  *       BH17 boots the specified unit of an H-17 disk.  The
                      2204  *       unit to boot is specified in AIO.UNI.
                      2205  *
                      2206  *       ENTRY:  AIO.UNI = Unit of H-17 to boot.
                      2207  *               all H-17 Ram Vectors Initialized
                      2208  *
                      2209
006.032  001 146 006  2210  BH17    LXI     B,BH17A
006.035  021 020 040  2211          LXI     D,FPLEDS+3+2
006.040  315 151 007  2212          CALL    SMUV              Move in H17 Message
006.043  004          2213          DB      BH17AL
                      2214
006.044  257          2215          XRA     A
006.045  323 177      2216          OUT     DP.DC             Turn off disk
                      2217
006.047  041 111 007  2218          LXI     H,R.SDP
006.052  042 206 040  2219          SHLD    D.SDP+1           Re-Vector set device parameter for SY2:
                      2220
006.055  036 012      2221  BH170   MVI     E,10              Watch for 10 holes
006.057  315 126 006  2222  BH171   CALL    BH174             Watch inter-hole gap
006.062  346 001      2223          ANI     DF.HD
006.064  312 057 006  2224          JZ      BH171
006.067  315 126 006  2225  BH172   CALL    BH174             Watch entire hole
006.072  346 001      2226          ANI     DF.HD
006.074  302 067 006  2227          JNZ     BH172
006.077  035          2228          DCR     E
006.100  302 057 006  2229          JNZ     BH171             Find another hole
                      2230
006.103  315 141 040  2231  BH173   CALL    D.ABORT
006.106  021 200 042  2232          LXI     D,USERFWA
006.111  001 000 011  2233          LXI     B,9*256
006.114  041 000 000  2234          LXI     H,0
006.117  315 147 040  2235          CALL    D.READ
006.122  332 055 006  2236          JC      BH170             Error Reading Sectors, keep trying
                      2237
006.125  311          2238          RET
                      2239
006.126  072 061 041  2240  BH174   LDA     AIO.UNI
006.131  107          2241          MOV     B,A
006.132  004          2242          INR     B
006.133  257          2243          XRA     A
006.134  315 304 007  2244          CALL    BITS              Select device
000.000               2245          ERRNZ   DF.DS0-2
000.000               2246          ERRNZ   DF.DS1-4
000.000               2247          ERRNZ   DF.DS2-8
006.137  366 020      2248          ORI     DF.MO             Turn on motor
006.141  323 177      2249          OUT     DP.DC             Turn on Motor and drive select
006.143  333 177      2250          IN      DP.DC             Look at the drive status
006.145  311          2251          RET
                      2252
006.146  222          2253  BH17A   DB      377Q-S0-S2-S3-S5-S6     'H'
006.147  377          2254          DB      377Q
006.150  363          2255          DB      377Q-S2-S3              '1'
006.151  361          2256          DB      377Q-S1-S2-S3           '7'
```

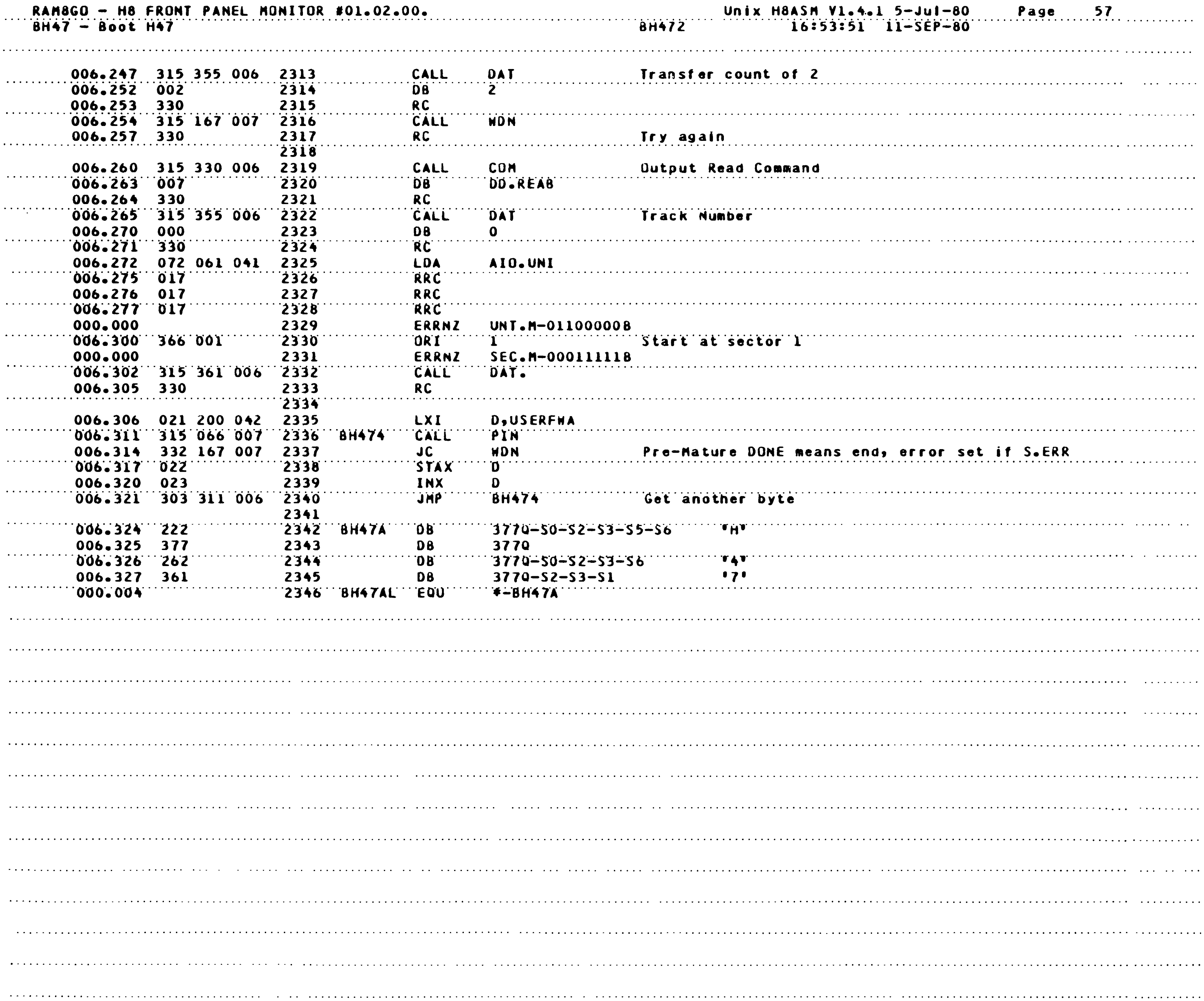
```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                              Unix H8ASM V1.4.1 5-Jul-80     Page    55
BH17 - Boot H17                                                                  16:53:49  11-SEP-80

      000.004                2257  BH17AL  EQU     *-BH17A
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                                  Unix H8ASM V1.4.1 5-Jul-80     Page    56
BH47 - Boot H47                                                               16:53:49  11-SEP-80

                            2260  **      BH47     - Boot H47                                       /Ram8Go 2/
                            2261  *
                            2262  *       BH47 boots the specified unit of an H-47 disk.  The
                            2263  *       unit to boot is specified in AIO.UNI.
                            2264  *
                            2265  *       ENTRY:  AIO.UNI = Unit of H-47 to boot.
                            2266  *               all H-17 Ram Vectors initialized
                            2267  *
                            2268
006.152  001 324 006        2269  BH47    LXI      B,BH47A
006.155  021 020 040        2270          LXI      D,FPLEDS+3+2
006.160  315 151 007        2271          CALL     SMOV              Move in H-47 Message
006.163  004                2272          DB       BH47AL
                            2273
006.164  315 200 006        2274  BH471   CALL     BH472
006.167  320                2275          RNC                        NO errors at boot
                            2276
006.170  076 372            2277          MVI      A,500/2           Wait 1/2 Second
006.172  315 053 000        2278          CALL     DLY
006.175  303 164 006        2279          JMP      BH471             Errors, so try again


                            2281  **      BH472
                            2282  *
                            2283
                            2284  *       Wait for Done
                            2285
006.200  315 033 007        2286  BH472   CALL     OBD.
006.203  002 000            2287          DB       W.RES,D.STAI
006.205  315 167 007        2288          CALL     WDN
006.210  330                2289          RC                         Try again
                            2290
                            2291  *       Wait for Device Ready
                            2292
006.211  315 134 007        2293  BH473   CALL     RRDY
006.214  330                2294          RC
006.215  315 134 007        2295          CALL     RRDY              L  = Ready Bits
006.220  330                2296          RC
                            2297
006.221  072 061 041        2298          LDA      AIO.UNI
006.224  107                2299          MOV      B,A
006.225  257                2300          XRA      A
006.226  315 304 007        2301          CALL     BITS
006.231  245                2302          ANA      L
006.232  302 211 006        2303          JNZ      BH473             Specified Unit is not ready
                            2304
                            2305  *       Boot the Device
                            2306
006.235  315 330 006        2307          CALL     COM               Output Load Sector Count Command
006.240  003                2308          DB       DD.LSC
006.241  330                2309          RC
006.242  315 355 006        2310          CALL     DAT               Output data
006.245  000                2311          DB       0
006.246  330                2312          RC
```



```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                          Unix H8ASM V1.4.1 5-Jul-80    Page    57
BH47 - Boot H47                                               BH472          16:53:51  11-SEP-80

   006.247  315 355 006  2313          CALL    DAT              Transfer count of 2
   006.252  002          2314          DB      2
   006.253  330          2315          RC
   006.254  315 167 007  2316          CALL    WDN
   006.257  330          2317          RC                       Try again
                         2318
   006.260  315 330 006  2319          CALL    COM              Output Read Command
   006.263  007          2320          DB      DD.REAB
   006.264  330          2321          RC
   006.265  315 355 006  2322          CALL    DAT              Track Number
   006.270  000          2323          DB      0
   006.271  330          2324          RC
   006.272  072 061 041  2325          LDA     AIO.UNI
   006.275  017          2326          RRC
   006.276  017          2327          RRC
   006.277  017          2328          RRC
   000.000               2329          ERRNZ   UNT.M-01100000B
   006.300  366 001      2330          ORI     1                Start at sector 1
   000.000               2331          ERRNZ   SEC.M-00011111B
   006.302  315 361 006  2332          CALL    DAT.
   006.305  330          2333          RC
                         2334
   006.306  021 200 042  2335          LXI     D,USERFWA
   006.311  315 066 007  2336  BH474   CALL    PIN
   006.314  332 167 007  2337          JC      WDN              Pre-Mature DONE means end, error set if S.ERR
   006.317  022          2338          STAX    D
   006.320  023          2339          INX     D
   006.321  303 311 006  2340          JMP     BH474            Get another byte
                         2341
   006.324  222          2342  BH47A   DB      377Q-S0-S2-S3-S5-S6      'H'
   006.325  377          2343          DB      377Q
   006.326  262          2344          DB      377Q-S0-S2-S3-S6         '4'
   006.327  361          2345          DB      377Q-S2-S3-S1            '7'
   000.004               2346  BH47AL  EQU     *-BH47A
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                     Unix H8ASM V1.4.1 5-Jul-80     Page    58
Subroutines                                              COM            16:53:52  11-SEP-80

                        2350  **      COM     - Command                                   /Ram8Go 2/
                        2351  *
                        2352  *       COM output a command byte.
                        2353  *
                        2354  *       ENTRY:  *(RET+1)= Command byte
                        2355  *
                        2356  *       EXIT:   PSW     = 'C' Set   if    ERROR
                        2357  *                         'C' Clear if NO error
                        2358  *
                        2359  *       USES:   PSW,BC
                        2360  *
                        2361
 006.330  343           2362  COM     XTHL
 006.331  176           2363          MOV     A,M             A = command byte
 006.332  043           2364          INX     H
 006.333  343           2365          XTHL                    Restore return address
                        2366
 006.334  365           2367  COM.    PUSH    PSW
 006.335  315 167 007   2368          CALL    WDN
 006.340  332 352 006   2369          JC      COM1            Error
 006.343  361           2370          POP     PSW
 006.344  315 037 007   2371          CALL    OBD             Output to data port
 006.347  001           2372          DB      D.DATI
 006.350  247           2373          ANA     A
 006.351  311           2374          RET
                        2375
 006.352  063           2376  COM1    INX     SP              Ignore saved PSW
 006.353  063           2377          INX     SP
 006.354  311           2378          RET


                        2380  **      DAT     - Data                                      /Ram8Go 2/
                        2381  *
                        2382  *       DAT outputs data to the boot H47 with a DTR handshake.
                        2383  *
                        2384  *       ENTRY:  *(RET+1)= data to output
                        2385  *
                        2386  *       EXIT:   To RET+1
                        2387  *
                        2388  *       USES:   PSW,BC
                        2389  *
                        2390
 006.355  343           2391  DAT     XTHL
 006.356  176           2392          MOV     A,M             A  = Data
 006.357  043           2393          INX     H
 006.360  343           2394          XTHL
                        2395
 006.361  365           2396  DAT.    PUSH    PSW
 006.362  315 222 007   2397          CALL    WTR
 006.365  332 377 006   2398          JC      DAT1            Error
 006.370  361           2399          POP     PSW
 006.371  315 037 007   2400          CALL    OBD             Output to Data Port
 006.374  001           2401          DB      D.DATI
 006.375  247           2402          ANA     A
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                         Unix H8ASM V1.4.1 5-Jul-80     Page    59
Subroutines                                                 DAT             16:53:54  11-SEP-80

   006.376  311              2403           RET
                             2404
   006.377  063              2405  DAT1     INX      SP              Discard Saved Data
   007.000  063              2406           INX      SP
   007.001  311              2407           RET


                             2409  **       EIRET    - EI RETurn                                      /Ram8Go 2/
                             2410  *
                             2411  *        EIRET is a simple routine which Re-Enables Interrupts,
                             2412  *        and executes a RETurn instruction
                             2413  *
                             2414
   007.002  373              2415  EIRET    EI
   007.003  311              2416           RET


                             2418  **       IBD      - Input from Boot Device                         /Ram8Go 2/
                             2419  *
                             2420  *        IBD inputs data from the Boot Port as saved at boot time.
                             2421  *
                             2422  *        ENTRY:   BDA      = Boot Device Address
                             2423  *                 *(RET+1)= Port Index
                             2424  *
                             2425  *        EXIT:    A        = Data input from port
                             2426  *                 IOWRK destroyed
                             2427  *
                             2428  *        USES:    PSW
                             2429  *
                             2430
   007.004  343              2431  IBD      XTHL
   007.005  365              2432           PUSH     PSW
   007.006  325              2433           PUSH     D
   007.007  126              2434           MOV      D,M             D  = Port Index
   007.010  043              2435           INX      H
   007.011  072 120 041      2436           LDA      BDA
   007.014  202              2437           ADD      D
   007.015  353              2438           XCHG
   007.016  147              2439           MOV      H,A             H  = Actual Output Address
   007.017  056 333          2440           MVI      L,MI.IN
   007.021  042 002 040      2441           SHLD     IOWRK           Stuff Instruction and Port
   007.024  353              2442           XCHG
   007.025  321              2443           POP      D
   007.026  361              2444           POP      PSW
   007.027  343              2445           XTHL
   007.030  303 002 040      2446           JMP      IOWRK           Do the actual input
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                      Unix H8ASM V1.4.1 5-Jul-80    Page   60
Subroutines                                                 OBD         16:53:55  11-SEP-80

                          2448  **      OBD     - Output to Boot Device                         /Ram8Go 2/
                          2449  *
                          2450  *       OBD outputs the data to the indexed Boot Device.
                          2451  *
                          2452  *       ENTRY:  BDA      = Boot Device Address
                          2453  *               *(RET+1)= Port Address Index
                          2454  *
                          2455  *       EXIT:   IOWRK destroyed
                          2456  *               Data output to the port
                          2457  *
                          2458  *       USES:   PSW,IOWRK
                          2459  *
                          2460
  007.033  343            2461  OBD.    XTHL
  007.034  176            2462          MOV     A,M             A  = data byte to output
  007.035  043            2463          INX     H
  007.036  343            2464          XTHL
                          2465
  007.037  343            2466  OBD     XTHL
  007.040  365            2467          PUSH    PSW
  007.041  325            2468          PUSH    D
  007.042  126            2469          MOV     D,M             D  = Port Index
  007.043  043            2470          INX     H
  007.044  072 120 041    2471          LDA     BDA             A  = Boot Device Address
  007.047  202            2472          ADD     D
  007.050  353            2473          XCHG
  007.051  147            2474          MOV     H,A             H  = Actual Device address
  007.052  056 323        2475          MVI     L,MI.OUT
  007.054  042 002 040    2476          SHLD    IOWRK           Stuff Instruction and address
  007.057  353            2477          XCHG
  007.060  321            2478          POP     D
  007.061  361            2479          POP     PSW
  007.062  343            2480          XTHL
  007.063  303 002 040    2481          JMP     IOWRK           Do the actual I/O


                          2483  **      PIN     - Port In                                       /Ram8Go 2/
                          2484  *
                          2485  *       PIN inputs a byte of data from the H-47 with
                          2486  *       a data-transfer-ready handshake.
                          2487  *
                          2488  *       ENTRY:  NONE
                          2489  *
                          2490  *       EXIT:   PSW     = 'C' Set   if    ERROR
                          2491  *                         'C' Clear if NO error
                          2492  *                          A  = data
                          2493  *
                          2494  *       USES:   PSW
                          2495  *
                          2496
  007.066  315 004 007    2497  PIN     CALL    IBD
  007.071  000            2498          DB      D.STAI
  007.072  346 240        2499          ANI     S.DTR+S.DON
  007.074  312 066 007    2500          JZ      PIN             Not done, and not ready to transfer
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                          Unix H8ASM V1.4.1 5-Jul-80     Page    61
Subroutines                                                   PIN          16:53:56  11-SEP-80

                              2501
    007.077  346 040          2502           ANI      S.DON
    007.101  067              2503           STC
    007.102  300              2504           RNZ                          Error because done before DTR
                              2505
    007.103  315 004 007      2506           CALL     IBD
    007.106  001              2507           DB       D.DATI
    007.107  247              2508           ANA      A
    007.110  311              2509           RET


                              2511  **       R.SDP    - Set-Up Device Parameters                          /Ram8Go 2/
                              2512  *
                              2513  *        R.SDP sets up arguments forthe specific unit.
                              2514  *
                              2515  *                 D.DVCTL = Motor ON
                              2516  *                 D.TRKPT = Address of device track number
                              2517  *
                              2518  *        Modified to access drive 3, or sy2:.
                              2519  *
                              2520  *        ENTRY:   AIO.UNI = Unit Number
                              2521  *
                              2522  *        EXIT:    HL      = D.TRKPT
                              2523  *
                              2524  *        USES:    PSW,HL
                              2525  *
                              2526
    007.111  076 012          2527  R.SDP    MVI      A,ERPTCNT
    007.113  062 264 040      2528           STA      D.DECNT              Set the max error count for the operation
    007.116  072 061 041      2529           LDA      AIO.UNI
    007.121  365              2530           PUSH     PSW
    007.122  376 002          2531           CPI      1+1
                              2532
    007.124  332 073 036      2533           JC       R.SDP.               Unit 0 or 1
    000.000                   2534           ERRNZ    DF.DS0-2
    000.000                   2535           ERRNZ    DF.DS1-4
                              2536
    007.127  076 003          2537           MVI      A,3                  Unit 2
    000.000                   2538           ERRNZ    DF.DS2-8
    007.131  303 073 036      2539           JMP      R.SDP.


                              2541  **       RRDY     - Read Ready                                        /Ram8Go 2/
                              2542  *
                              2543  *        RRDY checks to see if the drive specified in
                              2544  *        AIO.UNI is ready.
                              2545  *
                              2546  *        ENTRY:   AIO.UNI = unit number
                              2547  *
                              2548  *        EXIT:    L       = Ready Bits
                              2549  *
                              2550  *        USES:    PSW,L
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                                   Unix H8ASM V1.4.1 5-Jul-80      Page    62
Subroutines                                                            RRDY            16:53:57  11-SEP-80

                          2551  *
                          2552
   007.134  315 330 006   2553  RRDY     CALL    COM
   007.137  020           2554           DB      DO.RRDY
   007.140  315 066 007   2555           CALL    PIN
   007.143  330           2556           RC                       Bad Error(Pre-mature DONE)
   007.144  157           2557           MOV     L,A              L  = Ready Bits
   007.145  315 167 007   2558           CALL    WDN
   007.150  311           2559           RET                      Unit return ERROR


                          2561  **       SMOV    - Short Move                                          /Ram8Go 2/
                          2562  *
                          2563  *        SMOV performs a short (<256) byte move)
                          2564  *
                          2565  *        ENTRY:  BC       = source
                          2566  *                DE       = destination
                          2567  *                *RET     = byte count
                          2568  *
                          2569  *        EXIT:   RET+1
                          2570  *
                          2571  *        USES:   PSW,BC,DE,L
                          2572  *
                          2573
   007.151  343           2574  SMOV     XTHL
   007.152  176           2575           MOV     A,M
   007.153  043           2576           INX     H
   007.154  343           2577           XTHL
   007.155  157           2578           MOV     L,A              L  = Byte Count
                          2579
   007.156  012           2580  SMOV.    LDAX    B
   007.157  022           2581           STAX    D
   007.160  003           2582           INX     B
   007.161  023           2583           INX     D
   007.162  055           2584           DCR     L
   007.163  302 156 007   2585           JNZ     SMOV.            Move more bytes
                          2586
   007.166  311           2587           RET


                          2589  **       WDN     - Wait for Done                                       /Ram8Go 2/
                          2590  *
                          2591  *        WDN waits for the done bit to be set.  A time-out
                          2592  *        is kept track of in order that the command may be
                          2593  *        re-tried.
                          2594  *
                          2595  *        ENTRY:  NONE
                          2596  *
                          2597  *        EXIT:   PSW      = 'C' set   if there is an error or time-out
                          2598  *                           'C' clear if no error
                          2599  *
                          2600  *        USES:   PSW,BC
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                     Unix H8ASM V1.4.1 5-Jul-80     Page   63
Subroutines                                                WDN           16:53:58  11-SEP-80

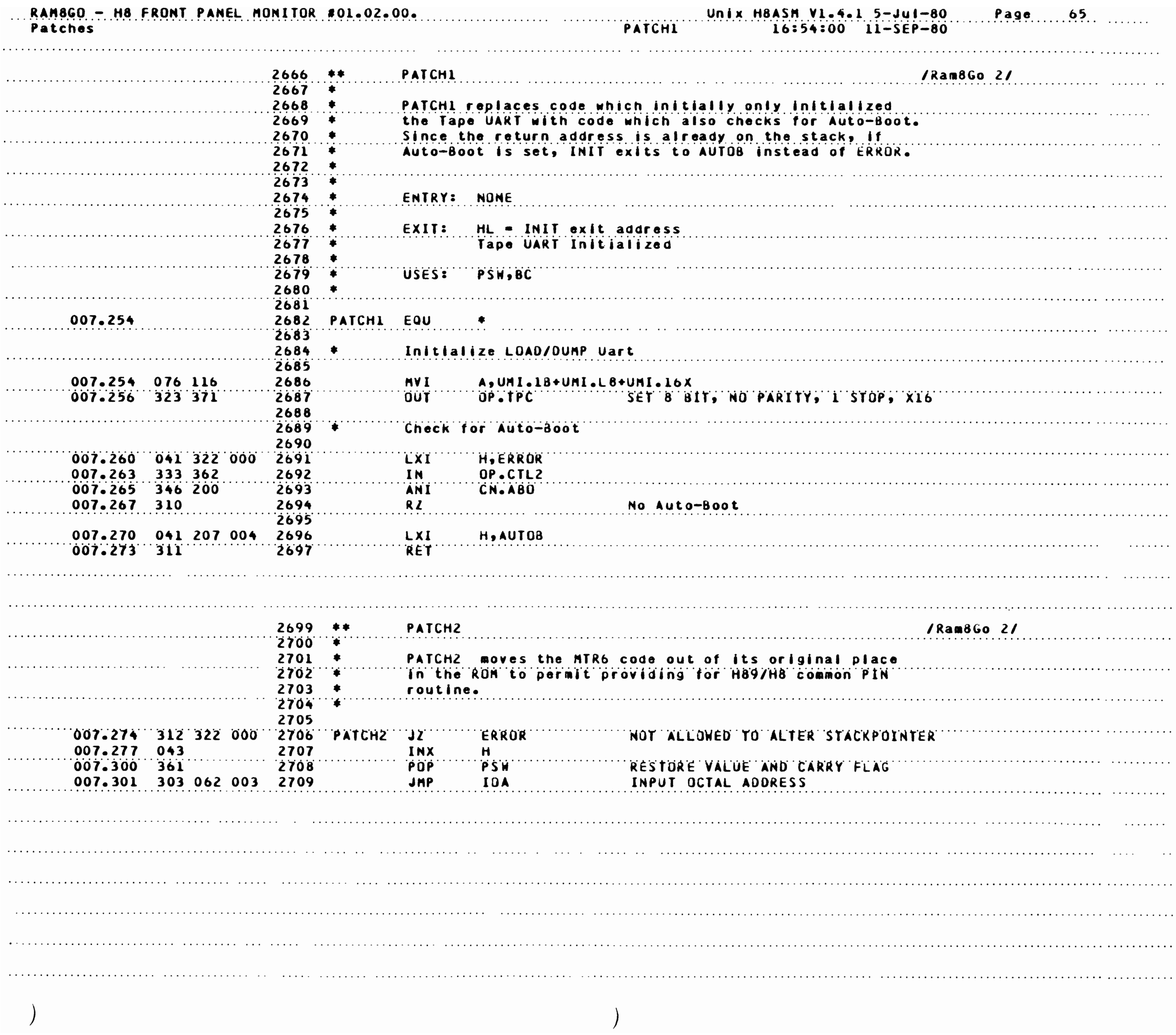
                           2601  *
                           2602
007.167  001 000 175       2603  WDN     LXI     B,WDNA
                           2604
007.172  013               2605  WDN1    DCX     B
007.173  170               2606          MOV     A,B
007.174  261               2607          ORA     C
007.175  067               2608          STC
007.176  310               2609          RZ                      Time-Out
                           2610
007.177  315 004 007       2611          CALL    IBD
007.202  000               2612          DB      D.STAI
007.203  346 040           2613          ANI     S.DON
007.205  312 172 007       2614          JZ      WDN1            Wait longer
                           2615
007.210  315 004 007       2616          CALL    IBD             Error is only valid after DONE is set
007.213  000               2617          DB      D.STAI
007.214  346 001           2618          ANI     S.ERR
007.216  067               2619          STC
007.217  300               2620          RNZ                     Error from H47
                           2621
007.220  247               2622          ANA     A               Clear Error flag
007.221  311               2623          RET
                           2624
175.000                    2625  WDNA    EQU     32000           Time-Out Counter



                           2627  **      WTR     - Wait for Transfer Request                       /RamBGo 2/
                           2628  *
                           2629  *       WTR waits for a transfer request.  It checks for DONE
                           2630  *       first, and if it is found, flags an error.  The code
                           2631  *       will also time-out waiting for  *S.DTR*.
                           2632  *
                           2633  *       ENTRY:  NONE
                           2634  *
                           2635  *       EXIT:   PSW      = 'C' set   if    ERROR
                           2636  *                          'C' clear if NO error
                           2637  *
                           2638  *       USES:   PSW,BC
                           2639  *
                           2640
007.222  001 000 175       2641  WTR     LXI     B,WTRA          BC = time-out count
                           2642
007.225  315 004 007       2643  WTR1    CALL    IBD             Check for DONE
007.230  000               2644          DB      D.STAI
007.231  346 040           2645          ANI     S.DON
007.233  067               2646          STC
007.234  300               2647          RNZ                     DONE is set, must be problems
                           2648
007.235  013               2649          DCX     B
007.236  170               2650          MOV     A,B
007.237  261               2651          ORA     C
007.240  067               2652          STC
007.241  310               2653          RZ                      Time-out ERROR
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                         Unix H8ASM V1.4.1 5-Jul-80     Page    64
Subroutines                                                  WTR            16:53:59  11-SEP-80

                          2654
    007.242  315 004 007  2655           CALL    IBD
    007.245  000          2656           DB      D.STAI
    007.246  346 200      2657           ANI     S.DTR
    007.250  312 225 007  2658           JZ      WTR1           No DTR yet
                          2659
    007.253  311          2660           RET
                          2661
    175.000               2662   WTRA    EQU     32000          Time-Out count
```



```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                 Unix H8ASM V1.4.1 5-Jul-80     Page    65
Patches                                            PATCH1          16:54:00  11-SEP-80

                          **      PATCH1                                                  /Ram8Go 2/
                          *
                          *       PATCH1 replaces code which initially only initialized
                          *       the Tape UART with code which also checks for Auto-Boot.
                          *       Since the return address is already on the stack, if
                          *       Auto-Boot is set, INIT exits to AUTOB instead of ERROR.
                          *
                          *
                          *       ENTRY:  NONE
                          *
                          *       EXIT:   HL = INIT exit address
                          *               Tape UART Initialized
                          *
                          *       USES:   PSW,BC
                          *

007.254                   PATCH1  EQU     *

                          *       Initialize LOAD/DUMP Uart

007.254  076 116                  MVI     A,UMI.1B+UMI.L8+UMI.16X
007.256  323 371                  OUT     OP.TPC              SET 8 BIT, NO PARITY, 1 STOP, X16

                          *       Check for Auto-Boot

007.260  041 322 000              LXI     H,ERROR
007.263  333 362                  IN      OP.CTL2
007.265  346 200                  ANI     CN.ABO
007.267  310                      RZ                          No Auto-Boot

007.270  041 207 004              LXI     H,AUTOB
007.273  311                      RET


                          **      PATCH2                                                  /Ram8Go 2/
                          *
                          *       PATCH2  moves the MTR6 code out of its original place
                          *       in the ROM to permit providing for H89/H8 common PIN
                          *       routine.
                          *

007.274  312 322 000      PATCH2  JZ      ERROR               NOT ALLOWED TO ALTER STACKPOINTER
007.277  043                      INX     H
007.300  361                      POP     PSW                 RESTORE VALUE AND CARRY FLAG
007.301  303 062 003              JMP     IDA                 INPUT OCTAL ADDRESS
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                              Unix H8ASM V1.4.1 5-Jul-80     Page    66
Boot Common Decks                                                                  16:54:01  11-SEP-80

     007.304                2712         XTEXT   BITS                                                  /Ram8Go 2/


                            2714X **     BITS     -  BIT SET
                            2715X *
                            2716X *      BITS SETS THE SPECIFIED BIT IN THE ACCUMULATOR.
                            2717X *
                            2718X *      ENTRY:  A       = ORIGINAL  A
                            2719X *              B       = NUMBER OF BIT TO SET ( 7=HIGH,...,0=LOW )
                            2720X *
                            2721X *      EXIT:   A       = ORIGINAL  A  WITH  BIT(B) SET
                            2722X *
                            2723X *      USES:   PSW
                            2724X *
                            2725X
     007.304  305           2726X BITS   PUSH    B
                            2727X
     007.305  365           2728X        PUSH    PSW
     007.306  076 200       2729X        MVI     A,10000000B
     007.310  004           2730X        INR     B
     007.311  007           2731X BITS1  RLC
     007.312  005           2732X        DCR     B
     007.313  302 311 007   2733X        JNZ     BITS1
                            2734X
     007.316  117           2735X        MOV     C,A
     007.317  361           2736X        POP     PSW
     007.320  261           2737X        ORA     C
                            2738X
     007.321  301           2739X        POP     BC
     007.322  311           2740X        RET
     007.323                2741         XTEXT   ZERO                                                  /Ram8Go 2/


                            2743X **     $ZERO - ZERO MEMORY
                            2744X *
                            2745X *      $ZERO ZEROS A BLOCK OF MEMORY.
                            2746X *
                            2747X *      ENTRY   (HL) = ADDRESS
                            2748X *              (B) = COUNT
                            2749X *      EXIT    (A) = 0
                            2750X *      USES    A,B,F,H,L
                            2751X
                            2752X
     007.323  257           2753X $ZERO  XRA     A
     007.324  167           2754X ZRO1   MOV     M,A
     007.325  043           2755X        INX     H
     007.326  005           2756X        DCR     B
     007.327  302 324 007   2757X        JNZ     ZRO1                IF MORE
     007.332  311           2758X        RET
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                        Unix H8ASM V1.4.1 5-Jul-80     Page    67
Secondary Entry Vectors                                                16:54:02  11-SEP-80

                                2761  ***     Secondary Entry Vectors                                        /Ram8Go 2/
                                2762  *
                                2763
     007.364                    2764  .       SET     2*1024-12         Start the vectors at the end
     000.031                    2765          ERRMI   .-*
     007.364                    2766          ORG     .
                                2767
     007.364  303 254 004       2768  DEFPC   JMP     PRIBOO.           Enter Primary Boot
                                2769
     007.367  303 237 004       2770          JMP     SECBOO.           Enter Secondary Boot
                                2771
     007.372  303 372 007       2772          JMP     *                 H89 Compatibility
                                2773
     007.375  303 375 007       2774          JMP     *                 H89 Compatibility
                                2775
     010.000                    2776  RAM8GOL EQU     *-RAM8GO          Length of RAM8GO
                                2777
     000.000                    2778          ERRNZ   2*1024-*          Copy of H17 ROM starts here
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                         Unix H8ASM V1.4.1 5-Jul-80     Page    68
RAM CELLS                                                                   16:54:03  11-SEP-80

                      2781
                      2782  **      THE FOLLOWING ARE CONTROL CELLS AND FLAGS USED BY THE KEYSET
                      2783  *       MONITOR.
                      2784
   040.000            2785          ORG     40000A          8192
   040.000            2786  START   DS      2               DUMP STARTING ADDRESS
   040.002            2787  IOWRK   DS      2               IN OR OUT INSTRUCTION
   040.004            2788  XINB    EQU     *               Transient Routine Area          /Ram8Go 2/
   040.004            2789  PRSRAM  EQU     *               FOLLOWING CELLS INITIALIZED FROM ROM
   040.004            2790          DS      1               RET
                      2791
   040.005            2792  REGI    DS      1               INDEX OF REGISTER UNDER DISPLAY
   040.006            2793  DSPROT  DS      1               PERIOD FLAG BYTE
   040.007            2794  DSPMOD  DS      1               DISPLAY MODE
                      2795
   040.010            2796  .MFLAG  DS      1               USER FLAG OPTIONS
                      2797  *                               SEE *UO.XXX* BITS DESCRIBED AT FRONT
                      2798
   040.011            2799  CTLFLG  DS      1               FRONT PANEL CONTROL BITS
   040.012            2800  REFIND  DS      1               REFRESH INDEX (0 TO 7)
   000.007            2801  PRSL    EQU     *-PRSRAM        END OF AREA INITIALIZED FROM ROM
                      2802
   040.013            2803  FPLEDS  EQU     *               FRONT PANEL LED PATTERNS
   040.013            2804  ALEDS   DS      1               ADDR 0
   040.014            2805          DS      1               ADDR 1
   040.015            2806          DS      1               ADDR 2
                      2807
   040.016            2808          DS      1               ADDR 3
   040.017            2809          DS      1               ADDR 4
   040.020            2810          DS      1               ADDR 5
                      2811
   040.021            2812  DLEDS   DS      1               DATA 0
   040.022            2813          DS      1               DATA 1
   040.023            2814          DS      1               DATA 2
                      2815
   040.024            2816  ABUSS   DS      2               ADDRESS BUSS
   040.026            2817  RCKA    DS      1               RCK SAVE AREA
   040.027            2818  CRCSUM  DS      2               CRC-16 CHECKSUM
   040.031            2819  TPERRX  DS      2               TAPE ERROR EXIT ADDRESS
   040.033            2820  TICCNT  DS      2               CLOCK TIC COUNTER
                      2821
   040.035            2822  REGPTR  DS      2               REGISETR CONTENTS POINTER
                      2823
   040.037            2824  UIVEC   DS      0               USER INTERRUPT VECTORS
   040.037            2825          DS      3               JUMP TO CLOCK PROCESSOR
   040.042            2826          DS      3               JUMP TO SINGLE STEP PROCESSOR
   040.045            2827          DS      3               JUMP TO I/O 3
   040.050            2828          DS      3               JUMP TO I/O 4
   040.053            2829          DS      3               JUMP TO I/O 5
   040.056            2830          DS      3               JUMP TO I/O 6
   040.061            2831          DS      3               JUMP TO I/O 7
                      2832
   040.064            2833  NMIRET  DS      2               Used by H-88/H-89               /Ram8Go 2/
   040.066            2834  CTLFLG2 DS      1               Control byte for OPZ.CTL        /Ram8Go 2/
                      2835
                      2836
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                  Unix H8ASM V1.4.1 5-Jul-80      Page    69
RAM CELLS                                                            16:54:05  11-SEP-80

     041.120                 2837           ORG     41120A
                             2838
     041.120                 2839   BDA     DS      1               Boot Device Address            /Ram8Go 2/
     041.121                 2840   BDF     DS      1               Boot Device Flag               /Ram8Go 2/
     041.122                 2841   TIMEOUT DS      1               Counter for Time-Out           /Ram8Go 2/
     041.123                 2842           DS      1                                              /Ram8Go 2/
     041.124                 2843   USRCLK  DS      2               Secondary User Clock for Boot  /Ram8Go 2/
                             2844
     041.126                 2845           END
Assembly complete
 2845 statements
    0 errors detected
26126 bytes free
```

```
RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                          XREF V1.2.1
Cross Reference Table                                               Page   70

 $ZERO   007323   2015    2753L
 .       007364    578S    702S   852S   871S   932S   944S   952S   967S   988S  1003S  1057S  2190S
                  2191    2192   2195S  2196   2197   2764S  2765   2766
 .MFLAG  040010    702     739    744    776    817    823   1918   1923   2017   2019   2048   2050
                  2085    2087   2796L
 A.STX   000002    113E   1151   1341
 A.SYN   000026    112E   1146   1339
 ABORT   001147    887     975L
 ABUSS   040024    848     912   1008   1112   1159   1183   1264   1587   2816L
 AIO.UNI 041061    151E   1946   1953   2240   2298   2325   2529
 ALARM   002136    827    1212L  1278
 ALEDS   040013   1611    2804L
 AS.ODD  000100    409E
 AS.1DD  000040    410E
 AS.S1A  000020    411E
 AS.SLM  000003    412E
 AUTOB   004207   1918L   2696
 BDA     041120   1966    1978   2436   2471   2839L
 BDF     041121   2036    2148   2840L
 BERR    005143   1969    2068   2069   2085L  2175
 BERR1   005170   2095L   2103
 BERRA   005210   2089    2105L  2114
 BERRAL  000011   2092    2114E
 BERRB   000000   2094    2116E
 BH17    006032   2063    2210L
 BH170   006055   2221L   2236
 BH171   006057   2222L   2224   2229
 BH172   006067   2225L   2227
 BH173   006103   2231L
 BH174   006126   2222    2225   2240L
 BH17A   006146   2210    2253L  2257
 BH17AL  000004   2213    2257E
 BH47    006152   2066    2269L
 BH471   006164   2274L   2279
 BH472   006200   2274    2286L
 BH473   006211   2293L   2303
 BH474   006311   2336L   2340
 BH47A   006324   2269    2342L  2346
 BH47AL  000004   2272    2346E
 BITS    007304   2244    2301   2726L
 BITS1   007311   2731L   2733
 BLKSIZ  002000    190E
 BOO1    004264   1950    1957L
 BOO2    004317   1961    1977L
 BOO3    004327   1973    1984L
 BOO4    004343   1992L   1999
 BOO5    005046   2027L   2030
 BOO6    005101   2033    2048L
 BOOA    005125   2040    2060E  2062   2065
 BOOTA   037132    152E   2008
 BOOTAL  000130    153E   2011
 C.DSYN  000375    365E
 CB.CLI  000100    119E    215    617    822   1924   1987
 CB.MTL  000040    118E    689    773    822   1059   1924
 CB.SPK  000200    120E    617    822   1214   1924   1987
 CB.SSI  000020    117E    617    689    822   1046   1055   1924   1987
 CB2.CLI 000002    125E
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                                    XREF V1.2.1
Cross Reference Table                                                          Page   71

  CB2.ORG 000040      126E     1867
  CB2.SID 000100      127E
  CB2.SSI 000001      124E
  CKI1    005305     2150     2164L
  CKI2    005317     2160     2165     2168     2172L
  CKI3    005331     2138     2144     2177L
  CLK2    000234      751      753L
  CLK3    000237      747      756E
  CLK4    000313      780      796E
  CLKINT  005221     2005     2131L
  CLOCK   000201      563      564      727L
  CN.170M 000014      139E     1968
  CN.174M 000003      138E     1980
  CN.ABD  000200      143E     2693
  CN.BAU  000100      142E
  CN.MEM  000040      141E
  CN.PRI  000020      140E     1958
  CND.H17 000000      145E     2062     2149
  CND.H47 000001      147E     2065     2164
  CND.NDI 000000      146E     1970
  COM     006330     2307     2319     2362L    2553
  COM.    006334     2198     2367L
  COM1    006352     2369     2376L
  CRC     002347     1402L    1463
  CRC1    002356     1406L    1426
  CRC2    003004     1417     1424L
  CRCSUM  040027     1154     1192     1247     1347     1405     1427     2818L
  CTC     002172     1119     1246L
  CTLFLG  040011      578      686      744      749      771      776      823     1045     1048     1057     1219     1229
                     1923     1988     2799L
  CTLFLG2 040066     1817     1834     1866     1868     2834L
  CUI1    000165      703L      799
  D.ABORT 040141      304L     2231
  D.CDE   040160      309L
  D.CON   040110      233L     2009
  D.DATI  000001      380E     2372     2401     2507
  D.DLY   040235      324L
  D.DLYHS 040244      263L
  D.DLYMO 040243      262L     2155
  D.DRVTB 040251      268L
  D.DTS   040163      310L
  D.DVCTL 040242      260L     2156     2158
  D.E.CHK 040267      279L
  D.E.HCK 040270      280L
  D.E.HSY 040266      278L
  D.E.MDS 040265      277L
  D.E.TRK 040272      282L
  D.E.VOL 040271      281L
  D.ERR   040265      276L
  D.ERRL  040273      283L
  D.ERRT  040232      323L
  D.HECNT 040261      270L
  D.LPS   040177      314L
  D.MAI   040171      312L
  D.MAO   040174      313L
  D.MOUNT 040133      302L
  D.OECNT 040264      272L     2528
```

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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                              XREF V1.2.1
Cross Reference Table                                                   Page  72

  D.OPR   040273     287L
  D.OPW   040275     288L
  D.RAM   040240     236L     255    290    2013
  D.RAML  000037     290E    2014
  D.RDB   040202     315L
  D.READ  040147     306L    2235
  D.READR 040152     307L
  D.SDP   040205     316L    2219
  D.SDT   040166     311L
  D.SECNT 040262     271L
  D.STAI  000000     379E     380    2167   2287   2498   2612   2617   2644   2656
  D.STS   040210     317L
  D.STZ   040213     318L
  D.SYDD  040130     301L
  D.TRKPT 040245     265L
  D.TS    040241     258L
  D.TT    040240     257L
  D.UDLY  040216     319L
  D.VEC   040130     235L     299
  D.VOLPT 040247     266L
  D.WNB   040227     322L
  D.WRITE 040155     308L
  D.WSC   040221     320L
  D.WSP   040224     321L
  D.XIT   040144     305L
  D.XOK   040136     303L
  DAT     006355    2310     2313   2322   2391L
  DAT.    006361    2193     2332   2396L
  DAT1    006377    2398     2405L
  DD.BOOT 000000     418L
  DD.CPY  000013     429L
  DD.DS   000202     453L
  DD.FRM0 000014     430L
  DD.FRM1 000015     431L
  DD.FRM2 000016     432L
  DD.FRM3 000017     433L
  DD.LSC  000003     421L    2308
  DD.RAD  000004     422L
  DD.RAS  000002     420L
  DD.RDBL 000205     456L
  DD.RDL  000203     454L
  DD.REA  000005     423L
  DD.REAB 000007     425L    2320
  DD.RRDY 000020     434L    2554
  DD.RST  000001     419L
  DD.SDC  000200     451L
  DD.SPF0 000020     440L
  DD.SPF1 000021     441L
  DD.SPF2 000022     442L
  DD.SPF3 000023     443L
  DD.SPF4 000024     444L
  DD.SPF5 000025     445L
  DD.ST   000201     452L
  DD.WDLB 000210     459L
  DD.WRBD 000012     428L
  DD.WRD  000011     427L
  DD.WRI  000006     424L
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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                                      XREF V1.2.1
Cross Reference Table                                                           Page   73

   DD.WRIB 000010     426L
   DD.WTBL 000206     457L
   DD.WTDL 000207     458L
   DD.WTL  000204     455L
   DEFPC   007364     658     2768L
   DF.DI   000040     341E
   DF.DS0  000002     337E    2245     2534
   DF.DS1  000004     338E    2246     2535
   DF.DS2  000010     339E    2247     2538
   DF.HD   000001     331E    2223     2226
   DF.MO   000020     340E    2248
   DF.SD   000010     334E
   DF.ST   000100     342E
   DF.TO   000002     332E
   DF.WG   000001     336E
   DF.WP   000004     333E
   DF.WR   000200     343E    2157
   DLEDS   040021    1624     2812L
   DLY     000053     609L    1686     2278
   DM.MR   000000     131E
   DM.MW   000001     132E
   DM.RR   000002     133E    1763
   DM.RW   000003     134E
   DOD     003122    1535L    1613     1615     1618
   DOD1    003127    1538L    1556
   DODA    003356    1536     1543     1740L
   DP.DC   000177     329E    2159     2216     2249     2250
   DSPA    003342    1594     1730L
   DSPMOD  040007     839      852      871      932      934      952     1003     1005     1584     2794L
   DSPROT  040006     843      934     1005     1578     1584     1926     2793L
   DUMP    002002    1144L
   EIRET   007002    1994     1996     2415L
   ERPTCNT 000012     154E    2527
   ERROR   000322     792      816E     941     1295     1511     1902     1905     2053     2098     2102     2134     2691
                     2706
   EXTCMD  004160     861     1890L
   EXTCMDA 004177    1892     1902L
   FPLEDS  040013    2022     2090     2211     2270     2803E
   GO      001222     879     1037L
   GO.     000063     617L    1037
   H17ROM  030000    1813E    1856
   H17ROML 010000    1814E    1855
   H89COM  006027    2198L
   H89DAT  006023    2193L
   H89PIN  001067     916L
   HORN    002140    1213L    1524     1706
   HRNO    002143     611     1216L
   HRN2    002160    1227L    1228
   IBD     007004    2431L    2497     2506     2611     2616     2643     2655
   IN      001177     880     1018L
   INIT    000073     553      554      636L     640     1874
   INIT0   000000     551L
   INIT1   000107     649L
   INIT2   000117     656L    1790     1793
   INT1    000010     558E
   INT2    000020     573E
   INT3    000030     590L
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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                              XREF V1.2.1
Cross Reference Table                                                   Page   74

  INT4     000040      595L
  INT5     000050      600L
  INT6     000060      614L
  INT7     000070      621L
  INTXIT   000172      710L      774     1050
  IOA      003062     1009      1492L    2709
  IOB      003066      903      1492     1507L
  IOB1     003070     1508L     1522
  IOWRK    040002     1024      1025     2441     2446     2476     2481     2787L
  IP.CON   000362      107E     1948     1955     1959
  IP.PAD   000360       99E      797     1280     1309     1683     2100     2132
  IP.TPC   000371      103E     1311
  IP.TPD   000370      105E     1381
  K.DIVD   000117      174E
  K.DOT    000017      176E
  K.MINU   000217      172E
  K.NUMB   000057      175E
  K.PLUS   000257      171E
  K.STAR   000157      173E     2101     2133
  LAST     001150      886       983L
  LOA0     001272     1084L     1127
  LOA1     001342     1110L     1117
  LOAD     001267     1082E
  LRA      003047      919      1477L    1592
  LRA.     003052      785      1101     1171     1478L
  LST2     001154      989L
  M.INI    242355      373E
  M.OUTI   243355      374E
  MEMM     001165      889      1002L
  MI.ANI   000346      207E     1270
  MI.HLT   000166      201E      791
  MI.IN    000333      203E     1018     2440
  MI.JMP   000303      204E     1992
  MI.LDA   000072      206E
  MI.LXID  000021      208E     1019
  MI.OUT   000323      205E     1020     2475
  MI.RET   000311      202E     1766
  MSGLEN   000003     2024      2025     2073E    2076
  MSGPRI   005135     1954      2072L    2073
  MSGSEC   005140     1947      2075L    2076
  MTR      000344      834E     1060
  MTR1     000345      837       837L
  MTR4     001005      850       860L
  MTR5     001051      855       899L
  MTR6     001072      901       918L
  MTRA     001035      864       878E
  NEXT     001132      885       962L
  NMIRET   040064     2833L
  OBD      007037     2371      2400     2466L
  OBD.     007033     2166      2286     2461L
  OP.CTL   000360      100E     1047     1056
  OP.CTL2  000362      108E     1836     1869     1876     1881     2692
  OP.DIG   000360      101E      758
  OP.SEG   000361      102E      760
  OP.TPC   000371      104E     1145     1203     1294     1377     1460     2687
  OP.TPD   000370      106E     1462
  OUT      001202      881      1020L
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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                          XREF V1.2.1
Cross Reference Table                                               Page   75

  PATCH1   007254     660     2682E
  PATCH2   007274     921     2706L
  PIN      007066     916     2336    2497L   2500    2555
  PRIBOO   004253    1903     1930    1952L
  PRIBOO.  004254    1953L    2768
  PRSL     000007    1872     2801E
  PRSRAM   040004    1872     2789E   2801
  PRSROM   003371    1759E    1871
  R$W      001126     888      953L
  R.SDP    007111    2218     2527L
  R.SDP.   036073     155E    2533    2539
  RAM8GO   000000     548E     551    1833    1844    2776
  RAM8GOL  010000    1843     2776E
  RCK      003260     847      938    1508    1677E
  RCK1     003267    1683L    1691    1703
  RCK2     003310    1689     1695L
  RCK3     003326    1698     1704L
  RCKA     040026    1681     2817L
  REFIND   040012     749     2800L
  REGI     040005     870      944     967     988    1477    2792L
  REGM     001104     890      931L
  REGPTR   040035     693      825    1480    1928    2822L
  RMEM     001261     883     1066L
  RNB      002331    1110     1337    1362    1376L
  RNB1     002335    1378L    1380
  RNP      002325    1096     1106    1246    1348    1362L
  ROMBOOT  030000     228E
  ROMCLK   034031     156E    2003
  RRDY     007134    2293     2295    2553L
  RT.BD    000005     185E
  RT.BP    000002     182E
  RT.CT    000003     183E
  RT.MI    000001     181E    1083    1155
  RT.NB    000004     184E
  RT.PD    000006     186E
  S.DON    000040     383E    2499    2502    2613    2645
  S.DTR    000200     385E    2499    2657
  S.ERR    000001     382E    2618
  S.GRT0   024000     224E
  S.GRT1   025000     225E
  S.GRT2   026000     226E
  S.IEN    000100     384E
  S.INT    040343     238L
  S.SOVR   041146     240L     242
  S.SW0    000002     387E
  S.SW1    000004     388E
  S.SW2    000010     389E
  S.SW3    000020     390E
  S.VAL    040277     237L
  S0       000001     160E    2105    2106    2107    2108    2111    2112    2113    2253    2342    2344
  S1       000002     161E    2111    2256    2345
  S2       000004     162E    2108    2253    2255    2256    2342    2344    2345
  S3       000010     163E    2105    2106    2107    2108    2253    2255    2256    2342    2344    2345
  S4       000020     164E    2105    2106    2107    2111
  S5       000040     165E    2105    2106    2107    2111    2112    2113    2253    2342
  S6       000100     166E    2105    2111    2253    2342    2344
  S7       000200     167E
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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                              XREF V1.2.1
Cross Reference Table                                                    Page   76

   SAE      001063      912L      963      984     1028
   SAVALL   000132      561       576      677L
   SB.BTO   000001       404E
   SB.CRC   000010       401E
   SB.DLD   000040       399E
   SB.ILC   000002       403E
   SB.LTD   000004       402E
   SB.NRF   000020       400E
   SB.UNR   000200       397E
   SB.WPD   000100       398E
   SC.UART  000372       501E
   SEC.M    000037       480E     2331
   SECBOO   004236     1904       1945L
   SECBOO.  004237     1946L      2770
   SID.0    000000       473E      476
   SID.1    000200       474E      476
   SID.M    000200       476E
   SINCR    004000       642E      644
   SMOV     007151     2010       2023     2091     2212     2271     2574L
   SMOV.    007156     2580L      2585
   SRS      002265     1084       1333E
   SRS1     002265     1334L      1342     1346
   SRS2     002271     1337L      1340
   SSIZ.M   004000       484E
   SST1     001235      618       1048L
   SSTEP    001225      882       1043E
   STACK    042200       244E     1957
   STACKL   001032       242E
   START    040000      645       1108     1157     2786L
   STPRTN   001244      579       1054E
   SYDD     040130       234E
   TD.IN    000370       194E
   TD.OUT   000370       195E
   TER1     002220     1278L      1285
   TER3     002215     1271L      1282
   TFT      002133     1126       1202L    1266
   TICCNT   040033      727        729      764     1223     1283     2136     2820L
   TIMEOUT  041122     2002       2140     2142     2841L
   TPABT    002244     1066       1141     1293L
   TPERR    002205     1095       1264L
   TPERRX   040031     1067       1142     1313     2819L
   TPXIT    002252     1279       1309L    1378     1456
   TS.IN    000371       196E
   TS.OUT   000371       197E
   UCI.ER   000020       523E     1376     1459
   UCI.IE   000002       525E
   UCI.IR   000100       521E
   UCI.RE   000004       524E     1376
   UCI.RO   000040       522E     1376
   UCI.TE   000001       526E     1144     1459
   UDR      000000       498E
   UF.FCT   000100       358E
   UF.RDA   000001       355E
   UF.ROR   000002       356E
   UF.RPE   000004       357E
   UF.TBM   000200       359E
   UFD      003161      767       1573E
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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                                     XREF V1.2.1
Cross Reference Table                                                          Page   77

  UFD1     003227      1588      1609L
  UIVEC    040037       590       595       600       614       621       706      1061      1991      2006      2052      2173      2824L
  UMI.16X  000002       516E     2686
  UMI.1B   000100       506E     2686
  UMI.1X   000001       515E
  UMI.2B   000300       508E
  UMI.64X  000003       517E
  UMI.H8   000200       507E
  UMI.L5   000000       511E
  UMI.L6   000004       512E
  UMI.L7   000010       513E
  UMI.L8   000014       514E     2686
  UMI.PA   000020       510E
  UMI.PE   000040       509E
  UNT.0    000000       464E      469
  UNT.1    000040       465E      469
  UNT.2    000100       466E      469
  UNT.3    000140       467E      469
  UNT.M    000140       469E     2329
  UO.CLK   000001       217E      704      2018
  UO.DDU   000002       216E      819      1574      1920      2018      2049      2086
  UO.HLT   000200       214E      778
  UO.NFR   000100       215E      742       819      1920
  UP.DP    000174       349E
  UP.FC    000175       350E
  UP.SC    000176       352E
  UP.SR    000176       353E
  UP.ST    000175       351E
  USERFWA  042200       245E     2055      2232      2335
  USR      000001       499E
  USR.FE   000040       530E
  USR.OE   000020       531E
  USR.PE   000010       532E
  USR.RXR  000002       534E     1379
  USR.TXE  000004       533E
  USR.TXR  000001       535E     1457
  USRCLK   041124      2004      2051      2172      2179      2843L
  W.RES    000002       392E     2167      2287
  WDN      007167      2288      2316      2337      2368      2558      2603L
  WDN1     007172      2605L     2614
  WDNA     175000      2603      2625E
  WME1     002012      1148L     1150
  WME2     002104      1181L     1188
  WMEM     001374       884      1140E
  WNB      003024      1148      1152      1182      1442      1455L
  WNB1     003025      1456L     1458
  WNP      003017      1156      1167      1176      1179      1193      1194      1441L
  WTR      007222      2397      2641L
  WTR1     007225      2643L     2658
  WTRA     175000      2641      2662E
  XIN1     004032      1824L     1829
  XIN2     004061      1837      1839L
  XIN3     004072      1845L     1851
  XIN4     004111      1857L     1864
  XIN5     004135      1839      1871L
  XINA     004146      1822      1876L     1884
  XINAL    000012      1821      1884E
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RAM8GO - H8 FRONT PANEL MONITOR #01.02.00.                    XREF V1.2.1
Cross Reference Table                                         Page   78

  XIN8     040004      1823       1838     2788E
  XINIT    004016       552       1816L
  XINIT1   004000       649       1786L    1792
  ZR01     007324      2754L      2757

30454 bytes free
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