HP 64793

H8/338/329 Emulator PC Interface

User's Guide

HEWLETT PACKARD

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Notice

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Printing History

New editions are complete revisions of the manual. The date on the title page changes only when a new edition is published.

A software code may be printed before the date; this indicates the version level of the software product at the time the manual was issued. Many product updates and fixes do not require manual changes, and manual corrections may be done without accompanying product changes. Therefore, do not expect a one-to-one correspondence between product updates and manual revisions.

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Using This Manual

This manual introduces you to the following emulators as used with the PC Interface.

- HP 64793A H8/338 emulator
- HP 64793B H8/329 emulator

Throughout this documentation, the following names are used to denote the microprocessors listed in the following table of supported microprocessors.

Model	Supported Microprocesorts	Reffered to as
HP 64793A (H8/338 emulator)	HD6473388CP	H8/338
	HD6433388CP	H8/338
	HD6413388CP	H8/338
	HD6473378CP	H8/337
	HD6433378CP	H8/337
	HD6413378CP	H8/337
	HD6433368CP	H8/336
HP 64793B (H8/329 emulator)	HD6473298P	H8/329
	HD6473298C	H8/329
	HD6433298P	H8/329
	HD6413298P	H8/329
	HD6433288P	H8/328
	HD6473278P	H8/327
	HD6473278C	H8/327
	HD6433278P	H8/327
	HD6413278P	H8/327
	HD6433268P	H8/326

For the most part, the H8/338 and H8/329 emulators all operate the same way. Differences between the emulators are described where they exist. Both the H8/338 and H8/329 emulators will be referred to as the "H8/338 emulator". In the specific instances where H8/329 emulator differs from H8/338 emulator, it will be described as the "H8/329 emulator".

This manual:

- Shows you how to use emulation commands by executing them on a sample program and describing their results.
- Shows you how to use the emulator in-circuit (connected to a target system).
- Shows you how to configure the emulator for your development needs. Topics include: restricting the emulator to real-time execution, selecting a target system clock source, and allowing the target system to insert wait states.

This manual does not:

- Show you how to use every PC Interface command and option; the PC Interface is described in the *HP 64700 Emulators PC Interface: User's Reference*.

Organization

Chapter 1	**Introduction to the H8/338 Emulator.** This chapter lists the H8/338 emulator features and describes how they can help you in developing new hardware and software.
Chapter 2	**Getting Started.** This chapter shows you how to use emulation commands by executing them on a sample program. This chapter describes the sample program and how to: load programs into the emulator, map memory, display and modify memory, display registers, step through programs, run programs, set software breakpoints, search memory for data, and use the analyzer.
Chapter 3	**"In-Circuit" Emulation.** This chapter shows you how to plug the emulator into a target system, and how to use the "in-circuit" emulation features.
Chapter 4	**Configuring the Emulator.** You can configure the emulator to adapt it to your specific development needs. This chapter describes the options available when configuring the emulator and how to save and restore particular configurations.
Chapter 5	**Using the Emulator.** This chapter describes emulation topics which are not covered in the "Getting Started" chapter (for example, coordinated measurements and storing memory).
Appendix A	**File Format Readers.** This chapter shows you what the "Reader" program accomplishes, and how to use it.

Notes

Contents

Illustrations

Introduction to the H8/338 Emulator

Introduction

The topics in this chapter include:

- Purpose of the H8/338 emulator.
- Features of the H8/338 emulator.

Purpose of the H8/338 Emulator

The H8/338 emulator is designed to replace the H8/338 microprocessor in your target system so you can control operation of the microprocessor in your application hardware (usually referred to as the *target system*). The H8/338 emulator performs just like the H8/338 microprocessor, but is a device that allows you to control the H8/338 directly. These features allow you to easily debug software before any hardware is available, and ease the task of integrating hardware and software.

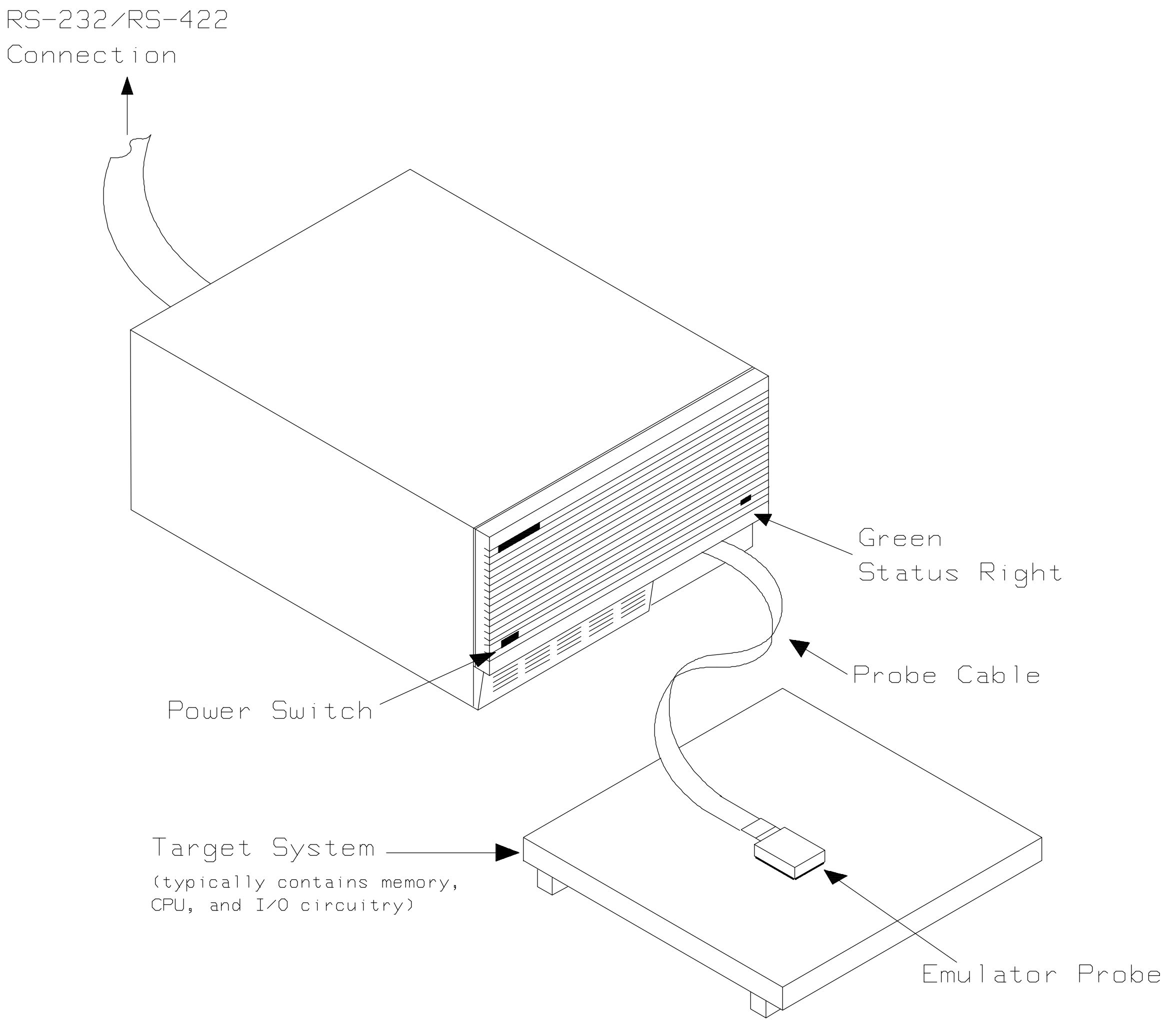


Figure 1-1. HP 64793 Emulator for the H8/338 Processor

Features of the H8/338 Emulator

This section introduces you to the features of the emulator. The chapters which follow show you how to use these features.

Supported Microprocessors

The HP 64793A H8/338 emulator and HP 64793B H8/329 emulators support the microprocesors listed in the following table.

Model	Supported Microprocessor
HP 64793A (H8/338 emulator)	HD6473388CP (H8/338) HD6433388CP (H8/338) HD6413388CP (H8/338) HD6473378CP (H8/337) HD6433378CP (H8/337) HD6413378CP (H8/337) HD6433368CP (H8/336)
HP 64793B (H8/329 emulator)	HD6473298P (H8/329) HD6473298C (H8/329) HD6433298P (H8/329) HD6413298P (H8/329) HD6433288P (H8/328) HD6473278P (H8/327) HD6473278C (H8/327) HD6433278P (H8/327) HD6413278P (H8/327) HD6433268P (H8/326)

Each model provides with an emulation probe designed for its support microprocessors. By replacing the emulation probe, the HP64893 can support processors other than its original support processors. Contact Hewlett-Packard to replace the emulation probe.

Clock Speeds

Maximum clock speed is 10 MHz (system clock).

Emulation Memory

H8/338 emulator is used with one of the following Emulation Memory Cards.

- HP 64726 128K byte Emulation Memory Card
- HP 64727 512K byte Emulation Memory Card
- HP 64728 1M byte Emulation Memory Card

The emulator uses 4K byte of emulation memory, and the rest os emulation memory is available for user program. You can define up to 15 memory ranges (at 128 byte boundaries and at least 128 byte in length). You can characterize memory ranges as emulation RAM, emulation ROM, target system RAM, target system ROM, or as guarded memory. The emulator generates an error message when accesses are made to guarded memory locations. You can also configure the emulator so that writes to the memory defined as ROM cause emulator execution to break out of target program execution.

Analysis

The H8/338 emulator is used with one of the following analyzer which allows you to trace code execution and processor activity.

- HP 64703 64-channel Emulation Bus Analyzer and 16-channel State/Timing Analyzer
- HP 64704 80-channel Emulation Bus Analyzer

The Emulation Bus Analyzer monitors the emulation processor using an internal analysis bus. The HP 64703 64-channel Emulation Bus Analyzer and 16-channel State/Timing Amalyzer allows you to probe up to 16 different lines in your target system.

Registers

You can display or modify the H8/338 internal register contents. This includes the ability to modify the program counter (PC) value so you can control where the emulator starts a program run.

Single-Step

You can direct the emulation processor to execute a single instruction or a specified number of instructions.

Breakpoints

You can set the emulator/analyzer interaction so that when the analyzer finds a specific state, emulator execution will break out of the user program into monitor.

You can also define software breakpoints in your program. The emulator uses one of H8/338 undefined opcodes (5770 hex) as software breakpoint interrupt instruction. When you define a software breakpoint, the emulator places the breakpoint interrupt instruction (5770 hex) at the specified address; after the breakpoint interrupt instruction causes emulator execution to break out of your program, the emulator replaces the original opcode. Refer to the "Using Software Breakpoints" section of "Getting Started" chapter for more information.

Reset Support

The emulator can be reset from the emulation system under your control; or your target system can reset the emulation processor.

Real-Time Operation

Real-time signifies continuous execution of your program without interference from the emulator. (Such interference occurs when the emulator temporarily breaks into the monitor so that it can access register contents or target system memory.) Emulator features performed in real time include: running and analyzer tracing. Emulator features not performed in real time include: display or modify of target system memory; load/dump of any target memory, display or modification of registers, and single step.

Limitations, Restrictions

Foreground Monitor

Foreground monitor is not supported for the H8/338 emulator.

Sleep and Software Standby Mode

When the emulator breaks into the emulation monitor, sleep or software standby mode is released.

Store Condition and Trace

Disassembling of program execution in the trace list is unreliable when the analyzer is used with store condition. Refer to the "Trace Analysis Considerations" section in Chapter 2.

Step Command and Interrupts

Step execution cannot be performed in the following cases.

- When the emulator is in the monitor and a suspended interrupt is existed.
- When the emulator is in the monitor and a level sensed interrupt is existed (including interrupts from internal I/O device).

In these cases, step command will fail, and the contents of registers will be the same as that before the issue of the step command.

RAM Enable Bit

The internal RAM of H8/338 processor can be enabled/disabled by RAME (RAM enable bit). However, once you map the internal RAM area to emulation RAM, the emulator still accesses emulation RAM even if the internal RAM is disabled by RAME.

2

Getting Started

Introduction

This chapter leads you through a basic, step by step tutorial that shows how to use the HP H8/338 emulator with the PC Interface.

This chapter will:

- Tell you what must be done before you can use the emulator as shown in the tutorial examples.
- Describe the sample program used for this chapter's examples.
- Briefly describe how PC Interface commands are entered and how emulator status is displayed.

This chapter will show you how to:

- Start up the PC Interface from the MS-DOS prompt.
- Define (map) emulation and target system memory.
- Load programs into emulation and target system memory.
- Enter emulation commands to view execution of the sample program.
- Creat and use a command file.

Before You Begin

Prerequisites

Before beginning the tutorial presented in this chapter, you must have completed the following tasks:

1. Connected the emulator to your computer. The *HP 64700 Series Installation/ Service* manual shows you how to do this.

2. Installed the PC Interface software on your computer. Software installation instructions are shipped with the media containing the PC Interface software. The *HP 64700 Emulators PC Interface: User's Reference* manual contains additional information on the installation and set up of the PC Interface.

3. In addition, it is recommended, although not required, that you read and understand the concepts of emulation presented in the Concepts of Emulation and Analysis manual. The *Installation/Service* also covers HP 64700 Series system architecture. A brief understanding of these concepts may help avoid questions later.

You should read the *HP 64700 Emulators PC Interface: User's Reference* manual to learn how to use the PC Interface in general. For the most part, this manual contains information specific to the H8/338 emulator.

A Look at the Sample Program

The sample program used in this chapter is listed in Figure 2-1. The program is a primitive command interpreter.

Using the various features of the emulator, we will show you how to load this program into emulation memory, execute it, monitor the program's operation with the analyzer, and simulate entry of different commands by using the "**M**emory **M**odify" emulation command.

```
                .GLOBAL         Init,Msgs,Cmd_Input
                .GLOBAL         Msg_Dest

                .SECTION        Table,DATA
Msgs
Msg_A           .SDATA          "THIS IS MESSAGE A"
Msg_B           .SDATA          "THIS IS MESSAGE B"
Msg_I           .SDATA          "INVALID COMMAND"
End_Msgs

                .SECTION        Prog,CODE
;*****************************************************
;*  Set up the Stack Pointer
;*****************************************************
Init            MOV.W           #Stack,R7
;*****************************************************
;* Clear previous command
;*****************************************************
Clear           MOV.B           #H'00,R0L
                MOV.B           R0L,@Cmd_Input
;*****************************************************
;* Read command input byte.  If no command has been
;* entered, continue to scan for it.
;*****************************************************
Scan            MOV.B           @Cmd_Input,R2L
                CMP.B           #H'00,R2L
                BEQ             Scan
;*****************************************************
;* A command has been entered.  Check if it is
;* command A, command B, or invalid command.
;*****************************************************
Exe_Cmd         CMP.B           #H'41,R2L
                BEQ             Cmd_A
                CMP.B           #H'42,R2L
                BEQ             Cmd_B
                BRA             Cmd_I
;*****************************************************
;* Command A is entered.  R3L = the number of bytes
;* in message A.  R4 = location of the message.
;* Jump to the routine which writes the message.
;*****************************************************
Cmd_A           MOV.B           #Msg_B-Msg_A,R3L
                MOV.W           #Msg_A,R4
                BRA             Write_Msg
;*****************************************************
;* Command B is entered.
;*****************************************************
Cmd_B           MOV.B           #Msg_I-Msg_B,R3L
                MOV.W           #Msg_B,R4
                BRA             Write_Msg
;*****************************************************
;* An invalid command is entered.
;*****************************************************
Cmd_I           MOV.B           #End_Msgs-Msg_I,R3L
                MOV.W           #Msg_I,R4
```

Figure 2-1. Sample Program Listing

```
;****************************************************
;* The destination area is cleared.
;****************************************************
Write_Msg       MOV.W           #Msg_Dest,R5
Clear_Old       MOV.B           #h'20,R6L
Clear_Loop      MOV.B           R0L,@R5
                ADDS.W          #1,R5
                DEC.B           R6L
                BNE             Clear_Loop
;****************************************************
;* Message is written to the destination.
;****************************************************
                MOV.W           #Msg_Dest,R5
Write_Loop      MOV.B           @R4+,R6L
                MOV.B           R6L,@R5
                ADDS.W          #1,R5
                DEC.B           R3L
                BNE             Write_Loop
;****************************************************
;* Go back and scan for next command.
;****************************************************
                BRA             Clear

                .SECTION        Data,COMMON
;****************************************************
;* Command input byte.
;****************************************************
Cmd_Input       .RES.B          1
                .RES.B          1
;****************************************************
;* Destination of the command messages.
;****************************************************
Msg_Dest        .RES.W          H'7f
Stack
                .END            Init
```

Figure 2-1. Sample Program Listing (Cont'd)

Data Declarations

The "Table" section defines the messages used by the program to respond to various command inputs. These messages are labeled **Msg_A, Msg_B,** and **Msg_I**.

Initialization

The program instruction at the **Init** label initializes the stack pointer.

Reading Input

The instruction at the **Clear** label clears any random data or previous commands from the **Cmd_Input** byte. The **Scan** loop continually reads the **Cmd_Input** byte to see if a command is entered (a value other than 0 hex).

Processing Commands

When a command is entered, the instructions from **Exe_Cmd** to **Cmd_A** determine whether the command was "A", "B", or an invalid command.

If the command input byte is "A" (ASCII 41 hex), execution is transferred to the instructions at **Cmd_A**.

If the command input byte is "B" (ASCII 42 hex), execution is transferred to the instructions at **Cmd_B**.

If the command input byte is neither "A" nor "B", an invalid command has been entered, and execution is transferred to the instructions at **Cmd_I**.

The instructions at **Cmd_A, Cmd_B,** and **Cmd_I** each load register R3L with the length of the message to be displayed and register R4 with the starting location of the appropriate message. Then, execution transfers to **Write_Msg** which writes the appropriate message to the destination location, **Msg_Dest**.

Prior to writing the message, **Clear_Old** clears the destination area. After the message is written, the program branches back to read the next command.

Sample Program Assembly

The sample program is written for and assembled with the HP 64876 H8/300 Assembler/Linkage Editor. For example, the following command was used to assemble the sample program.

```
C>h83asm cmd_rds.src /debug <RETURN>
```

In addition to the assembler listing (cmd_rds.lis), the "cmd_rds.obj" relocatable file is created.

Linking the Sample Program

The sample program can be linked with following command and generates the absolute file. The contents of "cmd_rds.k" linkage editor subcommand file is shown in Figure 2-2.

```
C>h8lnk /subcommand=cmd_rds.k
<RETURN>
```

In addition to the linker load map listing (cmd_rds.map), the "cmd_rds.abs" absolute file is created.

```
debug
input cmd_rds
start Table(1100),Prog(1000),Data(0fe80)
print cmd_rds
output cmd_rds
exit
```

Figure 2-2. Linkage Editor Subcommand File

Note

You need to specify "debug" command line option to both assembler and linker command to generate local symbol information. The "debug" option for the assembler and linker direct to include local symbol information to the object file.

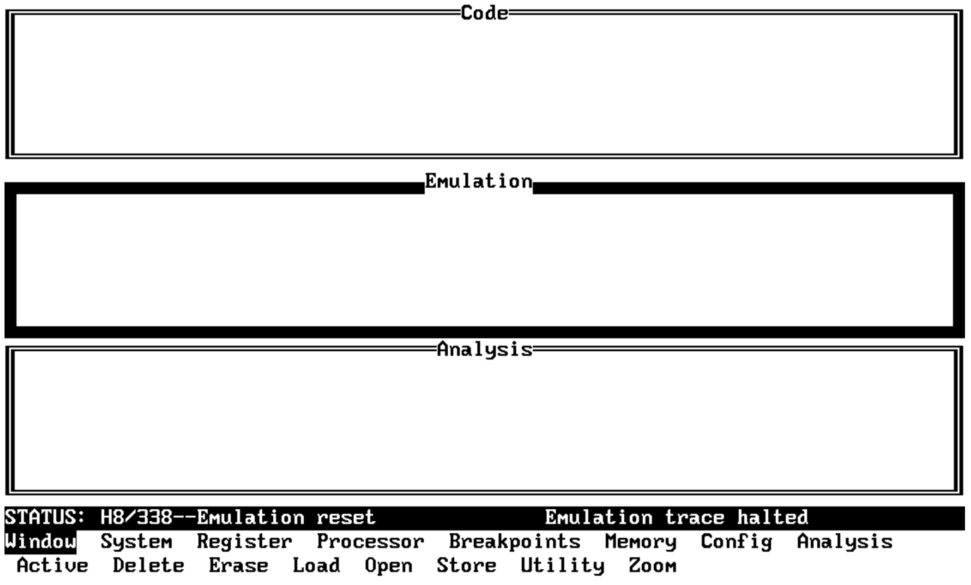
Starting Up the PC Interface

If you have set up the emulator device table and the **HPTABLES** shell environment variable as shown in the *HP 64700 Emulators PC Interface: User's Reference*, you can start up the H8/338 PC Interface by entering the following command from the MS-DOS prompt:

```
pch8338 <emulname>
```

where <emulname> is **emul_com1** if your emulator is connected to the COM1 port or **emul_com2** if it is connected to the COM2 port. If you edited the \hp64700\tables\64700tab file to change the emulator name, substitute the appropriate name for <emulname> in the above command.

In the command above, **pch8338** is the command to start the PC Interface; "<emulname>" is the logical emulator name given in the emulator device table. (To start the version of the PC Interface that supports external timing analysis, substitute **pth8338** for **pch8338** in this command.) If this command is successful, you will see the display shown in Figure 2-3. Otherwise, you will be given an error message and returned to the MS-DOS prompt.



```
STATUS: H8/338--Emulation reset              Emulation trace halted
Window  System  Register  Processor  Breakpoints  Memory  Config  Analysis
 Active  Delete  Erase  Load  Open  Store  Utility  Zoom
```

Figure 2-3. PC Interface Display

Selecting PC Interface Commands

This manual will tell you to "select" commands. You can select commands or command options by either using the left and right arrow keys to highlight the option and press the **Enter** key, or you can simply type the first letter of that option. If you select the wrong option, you can press the **ESC** key to move back up the command tree.

When a command or command option is highlighted, a short message describing that option is shown on the bottom line of the display.

Emulator Status

The status of the emulator is shown on the line above the command options. The PC Interface periodically checks the status of the emulator and updates the status line.

Modifying Configuration

You need to set up the emulation configuration before using the sample program. To access the emulation configuration display, enter:

```
Config, General
```

Defining the Reset Value for the Stack Pointer

Even though the H8/338 emulator has a background monitor, it requires you to define a stack pointer.

Use the arrow keys to move the cursor to the "Reset value for Stack Pointer" field, type **0ff80** and press **Enter**.

The stack pointer value will be set to the stack pointer (SP) on entrance to the emulation monitor initiated RESET state (the "Emulation reset" status).

Selecting your Processor

You need to select the processor you are going to emulate. Use the arrow keys to move the cursor to the "Processor type?" field. Use the **TAB** key to select the processor you are going to emulate. The default emulator configulation select H8/338 and H8/329 processor, when you use H8/338 and H8/329 emulator, respectively.

Saving the Configuration

To save the configuration, use the **Enter** key to exit the field in the last field. (The **End** key on Vectra keyboards moves the cursor directly to the last field.)

Mapping Memory

The H8/338 emulator contains high-speed emulation memory (no wait states required) that can be mapped at a resolution of 128 bytes.

The memory mapper allows you to characterize memory locations. It allows you to specify whether a certain range of memory is present in the target system or whether you will be using emulation memory for that address range. You can also specify whether the target system memory is ROM or RAM, and you can specify that emulation memory be treated as ROM or RAM. You can include function code information with address ranges to further characterize the memory block.

Blocks of memory can also be characterized as guarded memory. Guarded memory accesses will generate "break to monitor" requests. Writes to ROM will generate "break to monitor" requests if the "Enable breaks on writes to ROM?" configuration item is enabled (see the "Configuring the Emulator" chapter).

The memory mapper allows you to define up to 16 different map terms.

Caution

When you use the H8/338 internal ROM and RAM, you must map memory space where internal ROM and RAM are located as each emulation ROM and RAM.

Which Memory Locations Should Be Mapped?

Typically, assemblers generate relocatable files and linkers combine relocatable files to form the absolute file. The linker load map listing will show what locations your program will occupy in memory. A part of linker load map listing for the sample program (cmd_rds.map) is shown in Figure 2-4.

```
                                      ***     LINKAGE EDITOR LINK MAP LIST      ***

SECTION   NAME                         START      -      END         LENGTH
                                                              UNIT NAME
MODULE NAME

ATTRIBUTE  :   CODE  NOSHR

Prog                                H'00001000    -    H'0000104F   H'00000050
                                                              cmd_rds
cmd_rds

* TOTAL ADDRESS *                   H'00001000    -    H'0000104F   H'00000050

ATTRIBUTE  :   DATA  NOSHR

Table                               H'00001100    -    H'00001130   H'00000031
                                                              cmd_rds
cmd_rds

* TOTAL ADDRESS *                   H'00001100    -    H'00001130   H'00000031

ATTRIBUTE  :   DATA  SHR

Data                                H'0000FE80    -    H'0000FF7F   H'00000100
                                                              cmd_rds
cmd_rds

* TOTAL ADDRESS *                   H'0000FE80    -    H'0000FF7F   H'00000100
```

Figure 2-4. Sample Program Load Map Listing

From the load map listing, you can see that the sample program occupies locations in three address ranges. The code area, which contains the opcodes and operands which make up the sample program, occupies locations 1000 hex through 104f hex. The data area, which contains the ASCII values of the messages the program displays, is occupies locations 1100 hex through 1130 hex. The destination area, which contains the command input byte and the locations of the message destination and the stack, occupies locations fe80 hex through ff7f hex.

Two mapper terms will be specified for the example program. Since the program writes to the destination locations, the mapper block containing the destination locations should not be characterized as ROM memory.

To map memory for the sample program, select:

```
Config, Map, Modify
```

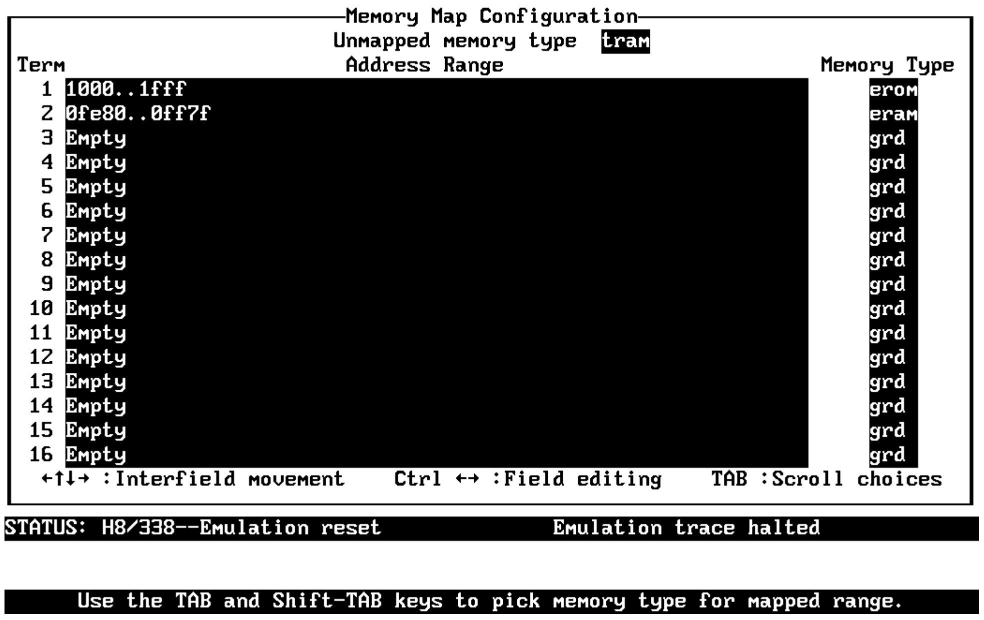
Using the arrow keys, move the cursor to the "address range" field of term 1. Enter:

```
1000..1fff
```

Move the cursor to the "memory type" field of term 1, and press the TAB key to select the **erom** (emulation ROM) type. Move the cursor to the "address range" field of term 2 and enter:

```
0fe80..0ff7f
```

Move the cursor to the "memory type" field of term 2, and press the TAB key to select the **eram** (emulation RAM) type. To save your memory map, use the **Enter** key to exit the field in the lower right corner. (The **End** key on Vectra keyboards moves the cursor directly to the last field.) The memory configuration display is shown in Figure 2-5.



```
                    Memory Map Configuration
                   Unmapped memory type  tram
Term                Address Range                        Memory Type
  1 1000..1fff                                             erom
  2 0fe80..0ff7f                                           eram
  3 Empty                                                  grd
  4 Empty                                                  grd
  5 Empty                                                  grd
  6 Empty                                                  grd
  7 Empty                                                  grd
  8 Empty                                                  grd
  9 Empty                                                  grd
 10 Empty                                                  grd
 11 Empty                                                  grd
 12 Empty                                                  grd
 13 Empty                                                  grd
 14 Empty                                                  grd
 15 Empty                                                  grd
 16 Empty                                                  grd
  ←↑↓→ :Interfield movement    Ctrl ←→ :Field editing    TAB :Scroll choices

STATUS: H8/338--Emulation reset            Emulation trace halted


   Use the TAB and Shift-TAB keys to pick memory type for mapped range.
```

Figure 2-5. Memory Configuration Display

When mapping memory for your target system programs, you may wish to characterize emulation memory locations containing programs and constants (locations which should not be written to) as ROM. This will prevent programs and constants from being written over accidentally, and will cause breaks when instructions attempt to do so.

Note

The memory mapper re-assigns blocks of emulation memory after the insertion or deletion of mapper terms. For example, if you modified the contents of fe80 hex through feff hex above, deleted term 1, and displayed locations fe80 hex through feff hex, you would notice the contents of those locations are not the same as they were before deleting the mapper term.

Loading Programs into Memory

If you have already assembled and linked the sample program, you can load the absolute file by selecting:

```
Memory, Load
```

File Format

Enter the format of your absolute file. The emulator will accept absolute files in the following formats:

- HP 64876 absolute.
- HP absolute.
- Raw HP64000 absolute.
- Intel hexadecimal.
- Tektronix hexadecimal.
- Motorola S-records.

The HP 64876 absolute file is generated with HP 64876 H8/300 Assembler/Linkage Editor. For this tutorial, choose the HP 64876 format.

HP 64876 Format: When you load HP 64876 format files, the PC Interface creates files (whose base names are the same as the absolute file) with the extensions ".HPA" and ".HPS". The ".HPA" file is in a binary format that is compatible with the HP H8/338 firmware. The ".HPS" file is an ASCII source file which contains the symbols to address mappings used by the PC Interface. Refer to "Using HP 64876 Format Reader" section in Appendix A for more information.

HP64000 Format: Your language tool may generate Raw HP64000 format absolute files (with extension .X, .L, .A). You can load these files by selecting "HP64000" or "Raw HP64000" as file format. When you select "HP64000", the PC Interface creates .HPA absolute file and .HPS symbol database. When you select "Raw HP64000", the PC Interface doesn't create these files.

Memory Type

The second field allows you to selectively load the portions of the absolute file which reside in emulation memory, target system memory, or both.

Since emulation memory is mapped for sample program locations, you can enter either "emulation" or "both".

Force Absolute File Read

This option is only available for HP 64876 and HP64000 formats. It forces the file format readers to regenarate the emulator absolute file (.hpa) and symbol data base (.hps) before loading the code. Normally, these files are only regenarated whenever the file you specify (the output of your language tools) is newer than the emulator absolute file and symbol data base.

For more information, refer to the "Using the HP 64869 Format Reader" section in Appendix A.

Absolute File Name

For most formats, you enter the name of your absolute file in the last field. Type **cmd_rds.abs**, and press **Enter** to start the memory load.

Using Symbols

The following pages show you how to display global and local symbols for the sample program. For more information on symbol display, refer to the *PC Interface Reference*.

Displaying Global Symbols

When you load HP 64876 or HP64000 format absolute files into the emulator, the corresponding symbol database is also loaded.

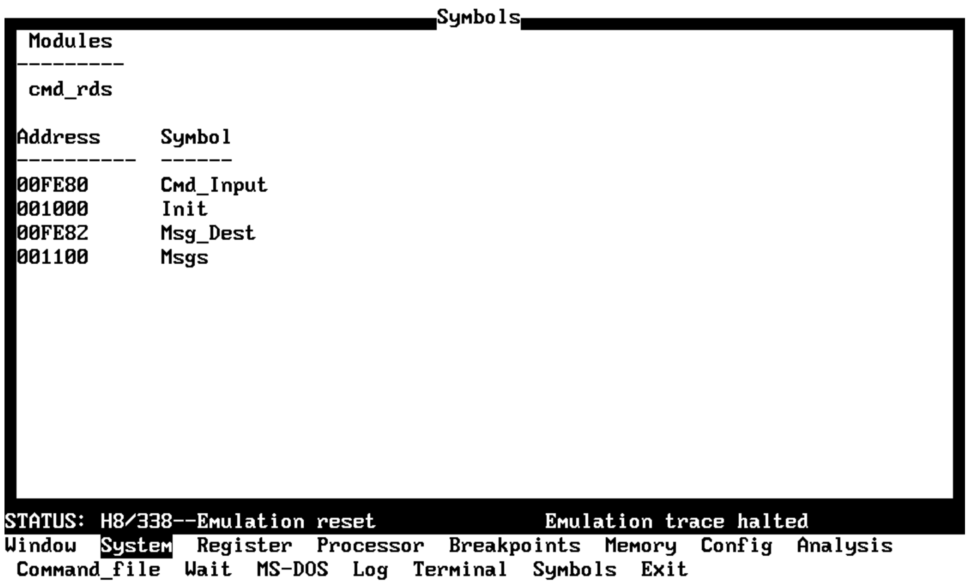
The symbols database can also be loaded with the "**S**ystem **S**ymbols **G**lobal **L**oad" command. This command is provided for situations where multiple absolute files are loaded into the emulator; it allows you to load the various sets of global symbols corresponding to the various absolute files. When global symbols are loaded into the emulator, information about previous global symbols is lost (that is, only one set of global symbols can be loaded at a time).

After global symbols are loaded, both global and local symbols can be used when entering expressions. Global symbols are entered as they appear in the source file or in the global symbols display.

To display global symbols, select:

```
System, Symbols, Global, Display
```

The symbols window automatically becomes the active window as a result of this command. You can press <CTRL>**z** to zoom the window. The resulting display follows.



```
                                    Symbols
 Modules
---------
 cmd_rds

Address      Symbol
----------   ------
00FE80       Cmd_Input
001000       Init
00FE82       Msg_Dest
001100       Msgs

STATUS: H8/338--Emulation reset              Emulation trace halted
Window  System  Register  Processor  Breakpoints  Memory  Config  Analysis
 Command_file  Wait  MS-DOS  Log  Terminal  Symbols  Exit
```

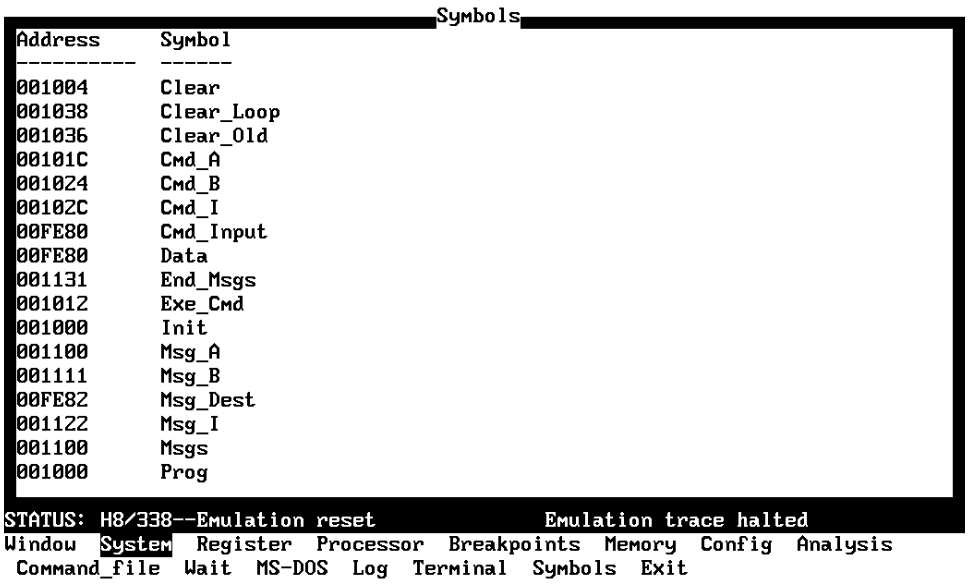
The global symbols display has two parts. The first parts lists all the modules that were linked to produce this object file. These module names are used by you when you want to refer to a local symbol, and are case-sensitive. The second part of the display lists all global symbols in this module. These names can be used in measurement specifications, and are case-sensitive. For example, if you wish to make a measurement using the symbol **Cmd_Input**, you must specify **Cmd_Input**. The strings **cmd_input** or **CMD_INPUT** are not valid symbol names here.

Displaying Local Symbols

To display local symbols, select:

`System, Symbols, Local, Display` (initials **S**, **S**, **L**, **D** in bold)

Enter the name of the module you want to specify (from the first part of the global symbols display; in this case, **cmd_rds**) and press **Enter**. The resulting display follows.



```
                                 Symbols
Address     Symbol
----------  ------
001004      Clear
001038      Clear_Loop
001036      Clear_Old
00101C      Cmd_A
001024      Cmd_B
00102C      Cmd_I
00FE80      Cmd_Input
00FE80      Data
001131      End_Msgs
001012      Exe_Cmd
001000      Init
001100      Msg_A
001111      Msg_B
00FE82      Msg_Dest
001122      Msg_I
001100      Msgs
001000      Prog

STATUS: H8/338--Emulation reset              Emulation trace halted
Window System  Register  Processor  Breakpoints  Memory  Config  Analysis
 Command_file  Wait  MS-DOS  Log  Terminal  Symbols  Exit
```

After you display local symbols with the "**S**ystem **S**ymbols **L**ocal **D**isplay" command, you can enter local symbols as they appear in the source file or local symbol display. When you display local symbols for a given module, that module becomes the default local symbol module.

If you have not displayed local symbols, you can still enter a local symbol by including the name of the module:

```
module_name:symbol
```

Remember that the only valid module names are those listed in the first part of the global symbols display, and are case-sensitive for compatibility with other systems (such as HP-UX).

When you include the name of an source file with a local symbol, that module becomes the default local symbol module, as with the "**S**ystem **S**ymbols **L**ocal **D**isplay" command.

Local symbols must be from assembly modules that form the absolute whose symbol database is currently loaded. Otherwise, no symbols will be found (even if the named assembler symbol file exists and contains information).

One thing to note: It is possible for a symbol to be local in one module and global in another, which may result in some confusion. For example, suppose symbol “XYZ” is a global in module A and a local in module B and that these modules link to form the absolute file. After you load the absolute file (and the corresponding symbol database), entering “XYZ” in an expression refers to the symbol from module A. Then, if you display local symbols from module B, entering “XYZ” in an expression refers to the symbol from module B, **not the global symbol**. Now, if you again want to enter “XYZ” to refer to the global symbol from module A, you must display the local symbols from module A (since the global symbol is also local to that module). Loading local symbols from a third module, if it was linked with modules A and B and did not contain an“XYZ” local symbol, would also cause “XYZ” to refer to the global symbol from module A.

Transfer Symbols to the Emulator

You can use the emulator’s symbol-handling capability to improve measurement displays. You do this by transferring the symbol database information to the emulator. To transfer the global symbol information to the emulator, use the command:

```
System, Symbols, Global, Transfer
```

Transfer the local symbol information for all modules by entering:

```
System, Symbols, Local, Transfer, All
```

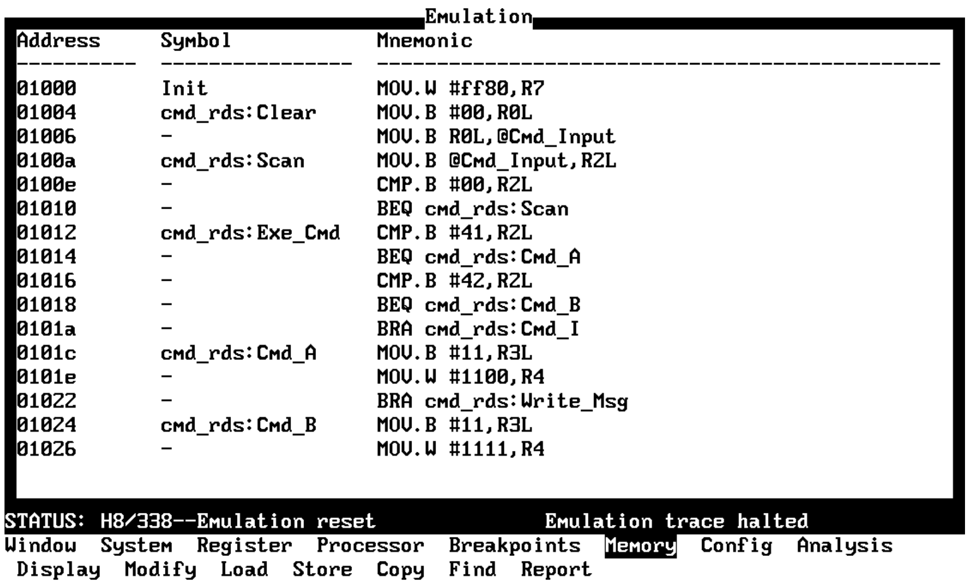
You can find more information on emulator symbol handling commands in the *Emulator PC Interface Reference*.

Displaying Memory in Mnemonic Format

Once you have loaded a program into the emulator, you can verify that the program has indeed been loaded by displaying memory in mnemonic format. To do this, select:

```
Memory, Display, Mnemonic
```

Enter the address range "1000..1026". (You could also specify this address range using symbols, for example, **"Init..Init+26"**.) The emulation window automatically becomes the active window as a result of this command. You can press <CTRL>**z** to zoom the memory window. The resulting display follows.



```
                              Emulation
Address     Symbol            Mnemonic
----------  ----------------  ----------------------------------------------
01000       Init              MOV.W #ff80,R7
01004       cmd_rds:Clear     MOV.B #00,R0L
01006       -                 MOV.B R0L,@Cmd_Input
0100a       cmd_rds:Scan      MOV.B @Cmd_Input,R2L
0100e       -                 CMP.B #00,R2L
01010       -                 BEQ cmd_rds:Scan
01012       cmd_rds:Exe_Cmd   CMP.B #41,R2L
01014       -                 BEQ cmd_rds:Cmd_A
01016       -                 CMP.B #42,R2L
01018       -                 BEQ cmd_rds:Cmd_B
0101a       -                 BRA cmd_rds:Cmd_I
0101c       cmd_rds:Cmd_A     MOV.B #11,R3L
0101e       -                 MOV.W #1100,R4
01022       -                 BRA cmd_rds:Write_Msg
01024       cmd_rds:Cmd_B     MOV.B #11,R3L
01026       -                 MOV.W #1111,R4

STATUS: H8/338--Emulation reset              Emulation trace halted
Window  System  Register  Processor  Breakpoints  Memory  Config  Analysis
 Display  Modify  Load  Store  Copy  Find  Report
```

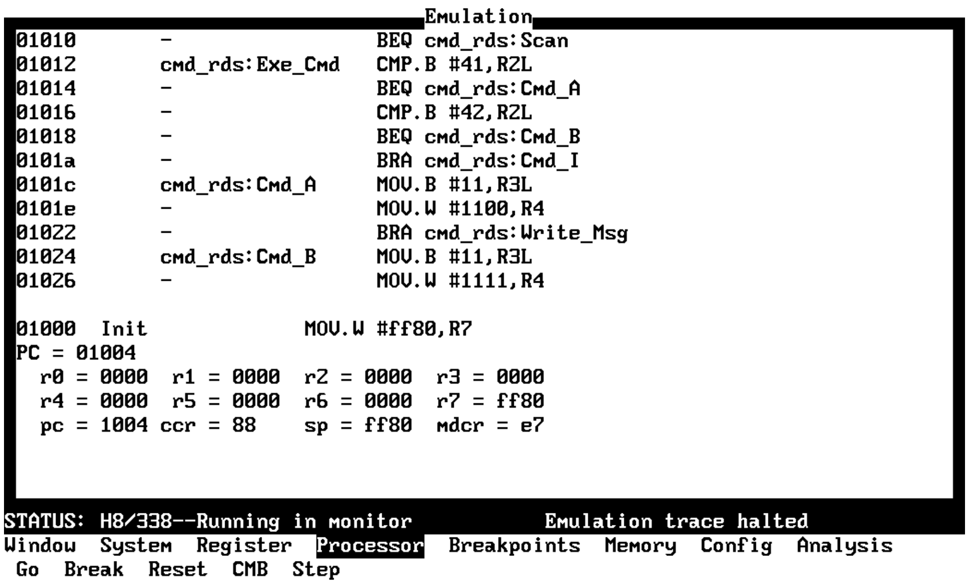
If you wish to view the rest of the sample program memory locations,you can select "**M**emory **D**isplay **M**nemonic" command again and enter the range "102a..104e".

Stepping Through the Program

The emulator allows you to execute one instruction or a number of instructions with step command. To begin stepping through the sample program, select:

```
Processor, Step, Address
```

Enter a step count of 1, enter the symbol **Init** (defined as a global in the source file), and press **Enter** to step from program's first address, 1000 hex. The executed instruction, the program counter address, and the resulting register contents are displayed as shown in the following listing.



```
                                  Emulation
01010       -                 BEQ cmd_rds:Scan
01012       cmd_rds:Exe_Cmd   CMP.B #41,R2L
01014       -                 BEQ cmd_rds:Cmd_A
01016       -                 CMP.B #42,R2L
01018       -                 BEQ cmd_rds:Cmd_B
0101a       -                 BRA cmd_rds:Cmd_I
0101c       cmd_rds:Cmd_A     MOV.B #11,R3L
0101e       -                 MOV.W #1100,R4
01022       -                 BRA cmd_rds:Write_Msg
01024       cmd_rds:Cmd_B     MOV.B #11,R3L
01026       -                 MOV.W #1111,R4

01000  Init             MOV.W #ff80,R7
PC = 01004
  r0 = 0000  r1 = 0000  r2 = 0000  r3 = 0000
  r4 = 0000  r5 = 0000  r6 = 0000  r7 = ff80
  pc = 1004 ccr = 88    sp = ff80  mdcr = e7

STATUS:  H8/338--Running in monitor           Emulation trace halted
Window  System  Register  Processor  Breakpoints  Memory  Config  Analysis
 Go  Break  Reset  CMB  Step
```

Note

You cannot display registers if the processor is reset. Use the "**P**rocessor **B**reak" command to cause the emulator to start executing in the monitor.

You can display registers while the emulator is executing a user program (if execution is not restricted to real-time); emulator execution will temporarily break to the monitor.

To continue stepping through the program, you can select:

```
Processor, Step, Pc
```

After selecting the command above, you have an opportunity to change the previous step count. If you wish to step the same number of times, you can press **Enter** to start the step.

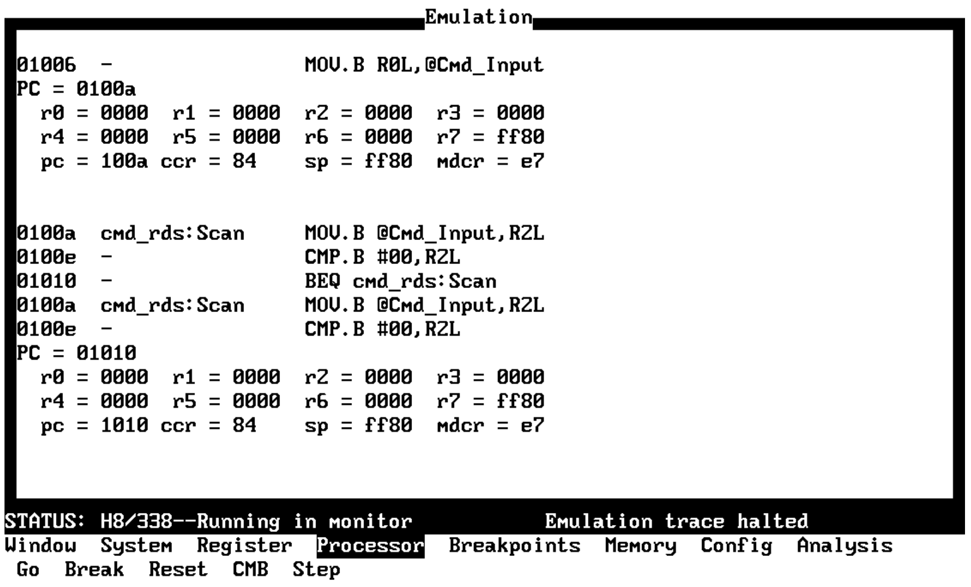
To repeat the previous command, you can press <CTRL>**r**.

Specifying a Step Count

If you wish to continue to step a number of times from the current program counter, select:

```
Processor, Step, Pc
```

The previous step count is displayed in the "number of instructions" field. You can enter a number from 1 through 99 to specify the number of times to step. Type 5 into the field, and press **Enter**. The resulting display follows.



```
                                    Emulation
01006  -                MOV.B R0L,@Cmd_Input
PC = 0100a
  r0 = 0000  r1 = 0000  r2 = 0000  r3 = 0000
  r4 = 0000  r5 = 0000  r6 = 0000  r7 = ff80
  pc = 100a ccr = 84    sp = ff80  mdcr = e7


0100a  cmd_rds:Scan     MOV.B @Cmd_Input,R2L
0100e  -                CMP.B #00,R2L
01010  -                BEQ cmd_rds:Scan
0100a  cmd_rds:Scan     MOV.B @Cmd_Input,R2L
0100e  -                CMP.B #00,R2L
PC = 01010
  r0 = 0000  r1 = 0000  r2 = 0000  r3 = 0000
  r4 = 0000  r5 = 0000  r6 = 0000  r7 = ff80
  pc = 1010 ccr = 84    sp = ff80  mdcr = e7


STATUS: H8/338--Running in monitor           Emulation trace halted
Window  System  Register  Processor  Breakpoints  Memory  Config  Analysis
 Go  Break  Reset  CMB  Step
```

When you specify step counts greater than 1, only the last register contents are displayed.

Modifying Memory

The preceding step commands show the sample program is executing in the **Scan** loop, where it continually reads the command input byte to check if a command has been entered. To simulate the entry of a sample program command, you can modify the command input byte by selecting:

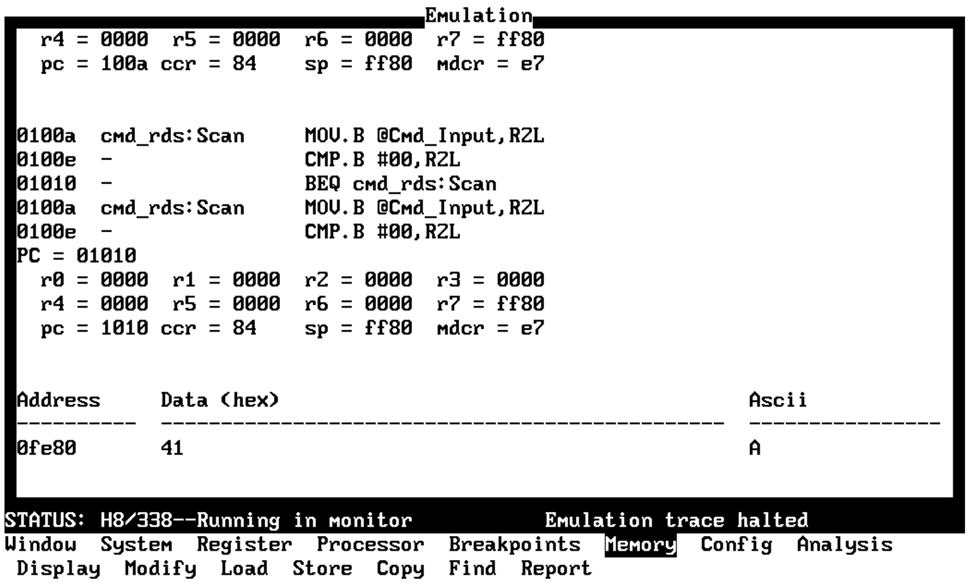
`Memory, Modify, Bytes`

Now enter the address of the memory location to be modified, an equal sign, and new value of that location, for example, "**Cmd_Input=41**". (The **Cmd_Input** label was defined as a global symbol in the source file.)

To verify that 41 hex was indeed written to **Cmd_Input** (fe80 hex), select:

`Memory, Display, Bytes`

Type the address "0fe80" or the symbol **Cmd_Input**, and press **Enter**. This command will automatically activate the memory window. The resulting display is shown below.



```
                                   Emulation
  r4 = 0000  r5 = 0000  r6 = 0000  r7 = ff80
  pc = 100a ccr = 84    sp = ff80  mdcr = e7


0100a  cmd_rds:Scan     MOV.B @Cmd_Input,R2L
0100e  -                CMP.B #00,R2L
01010  -                BEQ cmd_rds:Scan
0100a  cmd_rds:Scan     MOV.B @Cmd_Input,R2L
0100e  -                CMP.B #00,R2L
PC = 01010
  r0 = 0000  r1 = 0000  r2 = 0000  r3 = 0000
  r4 = 0000  r5 = 0000  r6 = 0000  r7 = ff80
  pc = 1010 ccr = 84    sp = ff80  mdcr = e7


Address     Data (hex)                                              Ascii
----------  -----------------------------------------------         ----------------
0fe80       41                                                      A

STATUS:  H8/338--Running in monitor           Emulation trace halted
Window  System  Register  Processor  Breakpoints  Memory  Config  Analysis
 Display  Modify  Load  Store  Copy  Find  Report
```

You can continue to step through the program as shown earlier in this chapter to view the instructions which are executed when an "A" (41 hex) command is entered.

Running the Program

To start the emulator executing the sample program, select:

Processor, Go, Pc

The status line will show that the emulator is "Running user program".

Searching Memory for Data

You can search the message destination locations to verify that the sample program writes the appropriate messages for the allowed commands. The command "A" (41 hex) was entered above, so the "Command A entered" message should have been written to the **Msg_Dest** locations. Because you must search for hexadecimal values, you will want to search for a sequence of characters which uniquely identify the message, for example, " A" or 20 hex and 41 hex. To search the destination memory location for this sequence of characters, select:

```
Memory, Find
```

Enter the range of the memory locations to be searched, 0fe82 hex through 0fea1 hex, and enter the data 20 hex and 41 hex. The resulting information in the memory window shows you that the message was indeed written as it was supposed to have been.

To verify that the sample program works for the other allowed commands, you can modify the command input byte to "B" and search for " B" (20 hex and 42 hex), or you can modify the command input byte to "C" and search for "IN" (49 hex and 4e hex).

Breaking into the Monitor

To break emulator execution from the sample program to the monitor program, select:

```
Processor, Break
```

The status line shows that the emulator is "Running in monitor".

While the break will occur as soon as possible, the actual stopping point may be many cycles after the break request (dependent on the type of instruction being executed and whether the processor is in a hold state).

Using Software Breakpoints

Software breakpoints are implemented in the H8/338 emulator by replacing opcodes with one of undefined opcodes (5770 hex) as software breakpoint instruction. In the following explanation, we call this code as **special instruction**. In the H8/338 emulator, software breakpoints are implemented by replacing opcodes with the special instruction. When you set a software breakpoint, the emulator replaces the opcode at the address specified with the special instruction. When the emulator executes this instruction in the user program, execution breaks to the monitor.

If the special instruction (undefined opcode, 5770 hex) was not inserted as the result of a "**B**reakpoints" command (in other words, it is part of the user program), the "Undefined software breakpoint" message is displayed above the status line. Up to 32 software breakpoints may be defined.

Note

You must set software breakpoints only at memory locations which contain instruction opcodes (not operands or data). If a software breakpoint is set at a memory location which is not an instruction opcode, the software breakpoint instruction will never be executed and the break will never occur.

Note

Because software breakpoints are implemented by replacing opcodes with the undefined opcode (5770 hex), you cannot define software breakpoints in target ROM. You can, however, use the Terminal Interface **cim** command to copy target ROM into emulation memory (see the *Terminal Interface: User's Reference* manual for information on the **cim** command).

Note

Software breakpoints should not be set, cleared, enabled, or disabled while the emulator is running user code. If any of these commands are entered while the emulator is running user code, and the emulator is executing code in the area where the breakpoint is being modified, program execution may be unreliable.

Defining a Software Breakpoint

To define a breakpoint at the address of the **Cmd_I** label of the sample program (102C hex), select:

```
Breakpoints, Add
```

Enter the local symbol "Cmd_I". After the breakpoint is added, the breakpoint window becomes active and shows that the breakpoint is set.

You can add multiple breakpoints in a single command by separating each one with a semicolon. For example, you could type "1012;101C;1032" to set three breakpoints.

Run the program by selecting:

```
Processor, Go, Pc
```

The status line shows that the emulator is running the user program. Modify the command input byte to an invalid command by selecting:

```
Memory, Modify, Bytes
```

Enter an invalid command, such as "Cmd_Input=75". The following messages result:

```
ALERT:  Software breakpoint: 0102C
STATUS: H8/338--Running in monitor
```

To continue program execution, select:

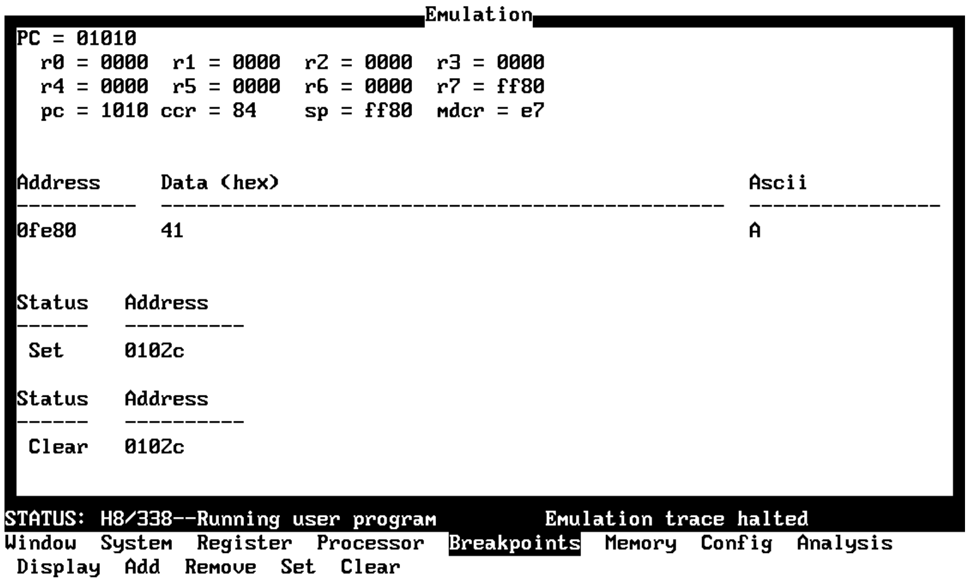
```
Processor, Go, Pc
```

Displaying Software Breakpoints

To view the status of the breakpoint, select:

Breakpoints, **D**isplay

The resulting display shows that the breakpoint has been cleared.



```
                                   Emulation
PC = 01010
  r0 = 0000  r1 = 0000  r2 = 0000  r3 = 0000
  r4 = 0000  r5 = 0000  r6 = 0000  r7 = ff80
  pc = 1010 ccr = 84    sp = ff80  mdcr = e7


Address     Data (hex)                                              Ascii
----------  ----------------------------------------------          ----------------
0fe80       41                                                      A


Status   Address
------   ----------
 Set     0102c

Status   Address
------   ----------
 Clear   0102c

STATUS: H8/338--Running user program         Emulation trace halted
Window  System  Register  Processor  Breakpoints  Memory  Config  Analysis
 Display  Add  Remove  Set  Clear
```

Setting a Software Breakpoint

When a breakpoint is hit, it becomes disabled. To re-enable the software breakpoint, you can select:

Breakpoints, **S**et, **S**ingle

The address of the breakpoint you just added is still in the address field; to set this breakpoint again, press **Enter**. As with the "**B**reakpoints **A**dd"command, the breakpoint window becomes active and shows that the breakpoint is set.

Clearing a Software Breakpoint

If you wish to clear a software breakpoint that does not get hit during program execution, you can select:

Breakpoints, **C**lear, **S**ingle

The address of the breakpoint set in the previous section is still in the address field; to clear this breakpoint again, press **Enter**.

Using the Analyzer

The H8/338 emulation analyzer has 48 trace signals which monitor internal emulation lines (address, data, and status lines). Optionally, you may have an additional 16 trace signals which monitor external input lines. The analyzer collects data at each pulse of a clock signal, and saves the data (a trace state) if it meets a "storage qualification" condition.

Note

Emulators which have the optional external analyzer will display the Internal/External options after the commands in the following examples. Select **Internal** to execute the examples.

Resetting the Analysis Specification

To be sure that the analyzer is in its default or power-up state, select:

```
Analysis, Trace, Reset
```

Specifying a Simple Trigger

Suppose you wish to trace the states of the sample program which follow the read of a "B" (42 hex) command from the command input byte. To do this, you must modify the default analysis specification by selecting:

```
Analysis, Trace, Modify
```

The emulation analysis specification is shown. Use the right arrow key to move the cursor to the "Trigger on" field. Type "a" and press **Enter**.

You'll enter the pattern expression menu. Press the up arrow key until the **addr** field directly opposite the pattern **a=** is highlighted. Type the address of the command input byte, using either the global symbol **Cmd_Input** or address 0fe80, and press **Enter**.

The "Data" field is now highlighted. Type 42xx and press **Enter**. 42 is the value of the "B" command and the "x"s specify "don't care" values.

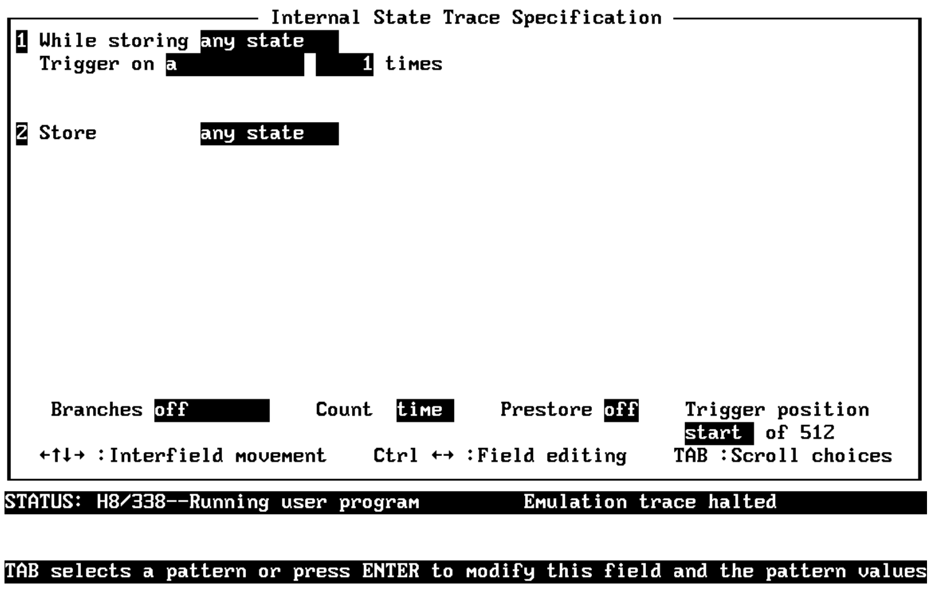
Now the "Status" field is highlighted. Use the TAB key to view the status qualifiers which may be entered.

H8/338 Analysis Status Qualifiers

Now the "Status" field is highlighted. Use the **Tab** key to view the status qualifiers which may be entered. The status qualifiers are defined as follows.

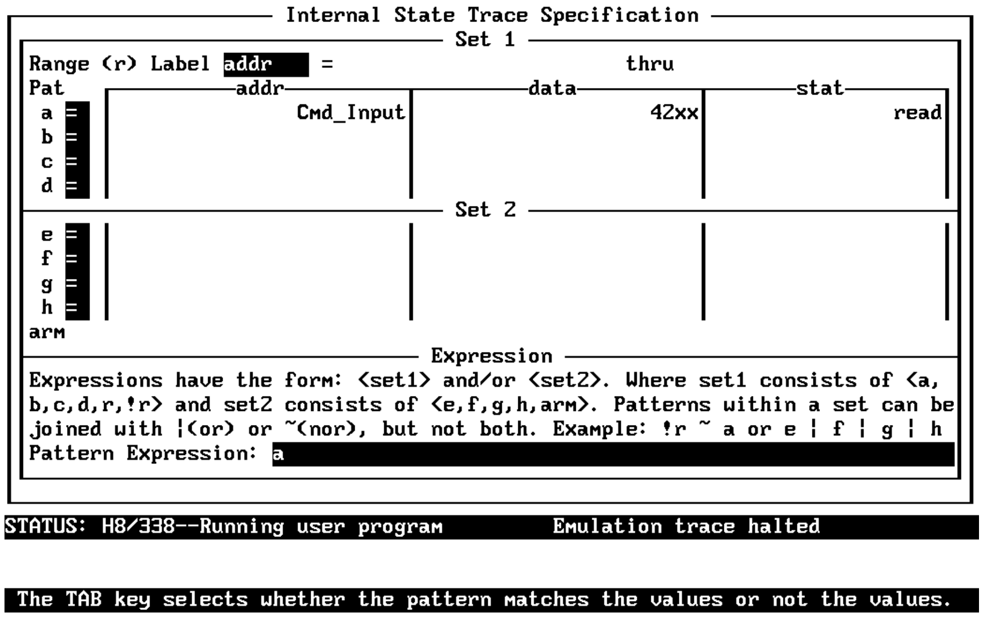
Qualifier	Status Bits (32..44)	Description
backgrnd	0 xxxx xxxx xxxxB	Background cycle
byte	x 1xxx xxxx xx1xB	Byte access
foregrnd	1 xxxx xxxx xxxxB	Foreground cycle
grd	x 10xx xxxx xxxxB	Guarded memory access
ifetch	x 1xxx xxx0 1101B	Fetch from internal ROM
intack	x xxx0 xxxx xxxxB	Interrupt acknowledge cycle
io	x 1xxx xxxx 0xxxB	Internal I/O access
memory	x 1xxx xxxx 1xxxB	Memory access
read	x 1xxx xxxx xxx1B	Read cycle
word	x 1xxx xxxx xx0xB	Word access
write	x 1xxx xxxx xxx0B	Write cycle
wrrom	x 1x0x xxxx xxx0B	Write to ROM cycle

Select the **read** status and press **Enter**. Figure 2-6 and 2-7 shows the resulting analysis specification. To save the new specification, use **End Enter** to exit the field in the lower right corner. You'll return to the trace specification. Press **End** to move to the trriger apec field. Press **Enter** to exit the trace specification.



```
─────────────── Internal State Trace Specification ───────────────
1 While storing any state
  Trigger on a                1 times

2 Store        any state

   Branches off          Count  time     Prestore off    Trigger position
                                                         start  of 512
  ←↑↓→ :Interfield movement    Ctrl ←→ :Field editing    TAB :Scroll choices
STATUS: H8/338--Running user program         Emulation trace halted

TAB selects a pattern or press ENTER to modify this field and the pattern values
```

Figure 2-6. Modifying the Trace Specification



```
                    Internal State Trace Specification
                                   Set 1
Range (r) Label addr    =                          thru
Pat        ---------addr----------------data----------------stat---------
  a =  |             Cmd_Input|               42xx|                read|
  b =  |                      |                   |                    |
  c =  |                      |                   |                    |
  d =  |                      |                   |                    |
                                   Set 2
  e =  |                      |                   |                    |
  f =  |                      |                   |                    |
  g =  |                      |                   |                    |
  h =  |                      |                   |                    |
arm
                                 Expression
Expressions have the form: <set1> and/or <set2>. Where set1 consists of <a,
b,c,d,r,!r> and set2 consists of <e,f,g,h,arm>. Patterns within a set can be
joined with ¦(or) or ~(nor), but not both. Example: !r ~ a or e ¦ f ¦ g ¦ h
Pattern Expression: a

STATUS: H8/338--Running user program         Emulation trace halted

 The TAB key selects whether the pattern matches the values or not the values.
```

Figure 2-7. Modifying the Pattern Specification

Starting the Trace

To start the trace, select:

```
Analysis, Begin
```

A message on the status line will show you that the trace is running. You do not expect the trigger to be found because no commands have been entered. Modify the command input byte to "B" by selecting:

```
Memory, Modify, Bytes
```

Enter "**Cmd_Input=42**". The status line now shows that the trace is complete.

Displaying the Trace

To display the trace, select:

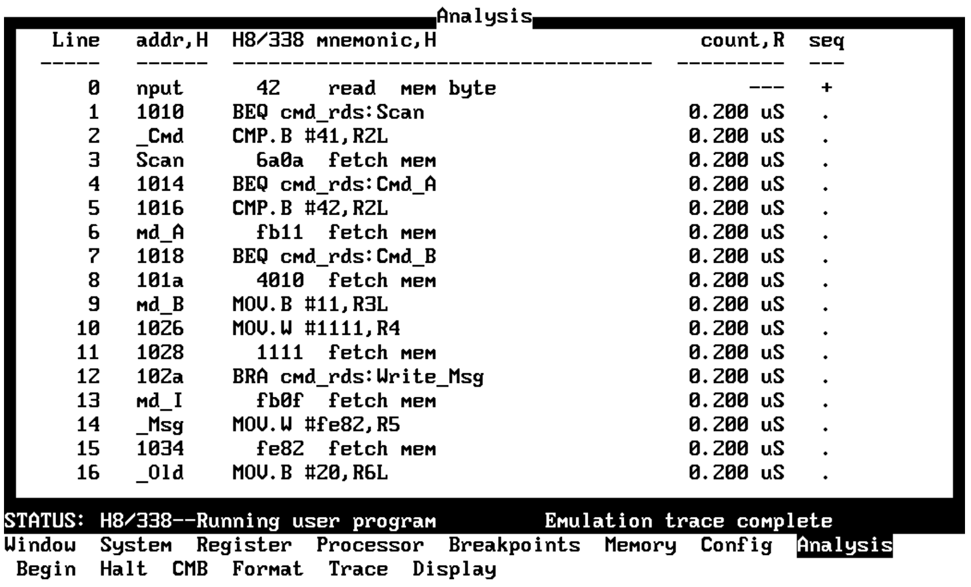
```
Analysis, Display
```

You are now given two fields in which to specify the states to display. Use the right arrow key to move the cursor to the "Ending state to display" field. Type "60" into the ending state field, press **Enter**, and use <CTRL>**z** to zoom the trace window.

Note

If you choose to dump a complete trace into the trace buffer, it will take a few minutes to display the trace.

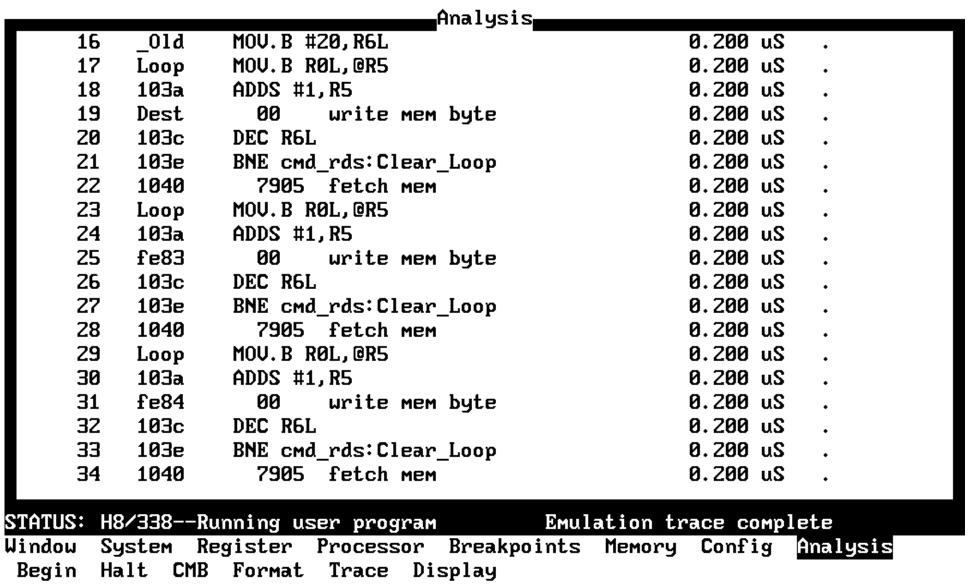
Use the **Home** key to get the top of the trace. The resulting trace is similar to the trace shown in the following display.



```
                                   Analysis
  Line   addr,H  H8/338 mnemonic,H                          count,R  seq
 -----   ------  ----------------------------------  ---------  ---
     0   nput      42    read  mem byte                         ---    +
     1   1010    BEQ cmd_rds:Scan                        0.200 uS    .
     2   _Cmd    CMP.B #41,R2L                           0.200 uS    .
     3   Scan      6a0a  fetch mem                       0.200 uS    .
     4   1014    BEQ cmd_rds:Cmd_A                       0.200 uS    .
     5   1016    CMP.B #42,R2L                           0.200 uS    .
     6   md_A      fb11  fetch mem                       0.200 uS    .
     7   1018    BEQ cmd_rds:Cmd_B                       0.200 uS    .
     8   101a      4010  fetch mem                       0.200 uS    .
     9   md_B    MOV.B #11,R3L                           0.200 uS    .
    10   1026    MOV.W #1111,R4                          0.200 uS    .
    11   1028      1111  fetch mem                       0.200 uS    .
    12   102a    BRA cmd_rds:Write_Msg                   0.200 uS    .
    13   md_I      fb0f  fetch mem                       0.200 uS    .
    14   _Msg    MOV.W #fe82,R5                          0.200 uS    .
    15   1034      fe82  fetch mem                       0.200 uS    .
    16   _Old    MOV.B #20,R6L                           0.200 uS    .

STATUS:  H8/338--Running user program        Emulation trace complete
Window  System  Register  Processor  Breakpoints  Memory  Config  Analysis
 Begin  Halt  CMB  Format  Trace  Display
```

Line 0 in the trace list above shows the state which triggered the analyzer. The trigger state is always on line 0. The other states show the exit from the **Scan** loop and the **Exe_Cmd** instructions.

To list the next lines of the trace, press the **PgDn** or **Next** key.



```
                                  Analysis
     16   _Old    MOV.B #20,R6L                        0.200 uS   .
     17   Loop    MOV.B R0L,@R5                        0.200 uS   .
     18   103a    ADDS #1,R5                           0.200 uS   .
     19   Dest      00    write mem byte               0.200 uS   .
     20   103c    DEC R6L                              0.200 uS   .
     21   103e    BNE cmd_rds:Clear_Loop               0.200 uS   .
     22   1040      7905  fetch mem                    0.200 uS   .
     23   Loop    MOV.B R0L,@R5                        0.200 uS   .
     24   103a    ADDS #1,R5                           0.200 uS   .
     25   fe83      00    write mem byte               0.200 uS   .
     26   103c    DEC R6L                              0.200 uS   .
     27   103e    BNE cmd_rds:Clear_Loop               0.200 uS   .
     28   1040      7905  fetch mem                    0.200 uS   .
     29   Loop    MOV.B R0L,@R5                        0.200 uS   .
     30   103a    ADDS #1,R5                           0.200 uS   .
     31   fe84      00    write mem byte               0.200 uS   .
     32   103c    DEC R6L                              0.200 uS   .
     33   103e    BNE cmd_rds:Clear_Loop               0.200 uS   .
     34   1040      7905  fetch mem                    0.200 uS   .

STATUS:  H8/338--Running user program         Emulation trace complete
```

Window System Register Processor Breakpoints Memory Config Analysis
Begin Halt CMB Format Trace Display

The resulting display shows the **Cmd_B** instructions and the branch to **Write_Msg** and the beginning of the instructions which move the "THIS IS MESSAGE B" message to the destination locations.

For a Complete Description

For a complete description of using the HP 64700 Series analyzer with the PC Interface, refer to the *HP 64700 Emulators PC Interface: Analyzer User's Guide*.

Trace Analysis Considerations

There are some points to be noticed when you use the emulation analyzer of H8/338 emulator.

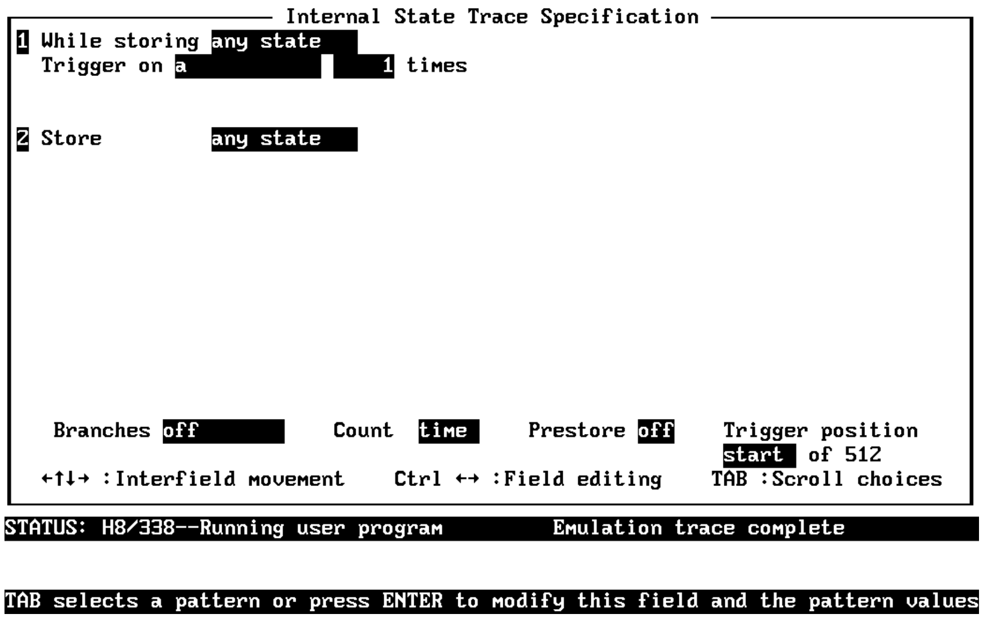
How to Specify Trigger Condition

You need to be careful to specify the condition on which the emulation analyzer should start the trace. Suppose you would like to start the trace when the prpogram begins executing **Exe_Cmd** routine. To reset the analysis specification:

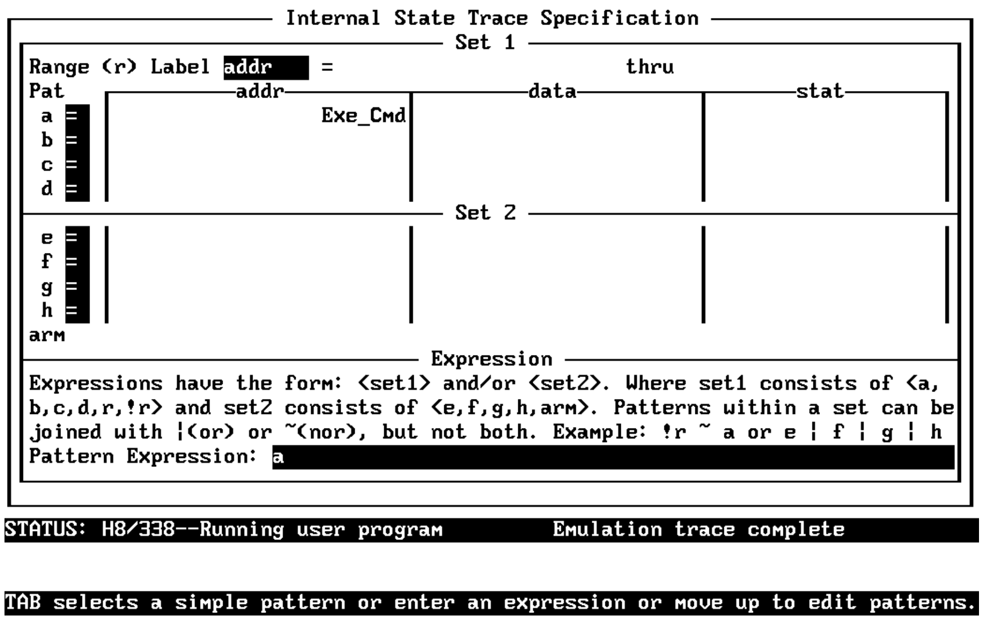
```
Analysis, Trace, Reset
```

Select the following command and modify the analysis specification as shown in the following displays.

```
Analysis, Trace, Modify
```



```
                   Internal State Trace Specification
1 While storing any state
  Trigger on a                  1 times


2 Store         any state









   Branches off          Count  time     Prestore off    Trigger position
                                                         start  of 512
  ←↑↓→ :Interfield movement    Ctrl ←→ :Field editing    TAB :Scroll choices
STATUS: H8/338--Running user program        Emulation trace complete


TAB selects a pattern or press ENTER to modify this field and the pattern values
```


```
                     Internal State Trace Specification
                                    Set 1
Range (r) Label addr    =                       thru
Pat          addr                data                stat
 a =                 Exe_Cmd
 b =
 c =
 d =
                                    Set 2
 e =
 f =
 g =
 h =
arm
                                  Expression
Expressions have the form: <set1> and/or <set2>. Where set1 consists of <a,
b,c,d,r,!r> and set2 consists of <e,f,g,h,arm>. Patterns within a set can be
joined with ¦(or) or ~(nor), but not both. Example: !r ~ a or e ¦ f ¦ g ¦ h
Pattern Expression: a

STATUS: H8/338--Running user program         Emulation trace complete

TAB selects a simple pattern or enter an expression or move up to edit patterns.
```

Start the trace and modify memory so that the program execution jumps to the **Exe_Cmd** routine:

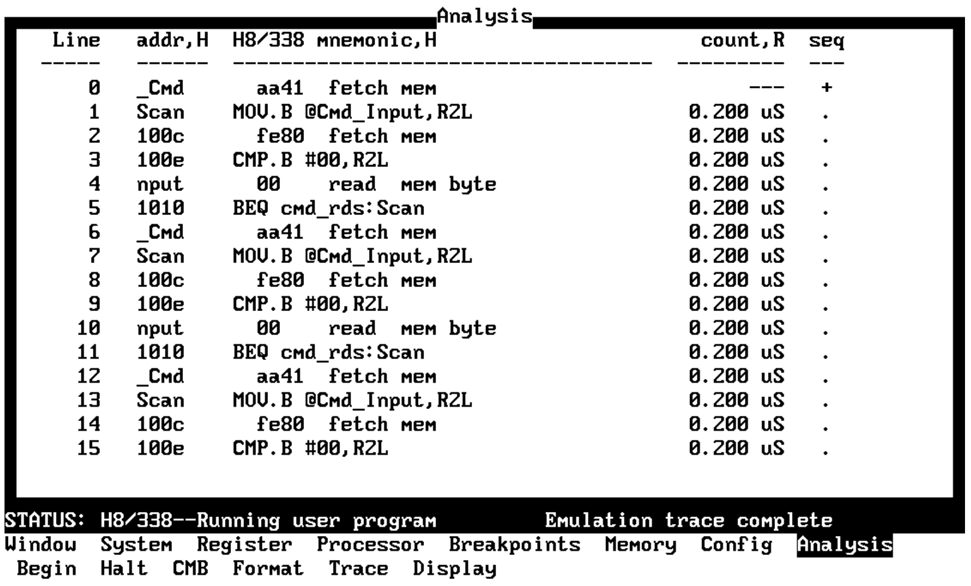
```
Analysis, Begin
Memory, Modify, Bytes
```

Enter "**Cmd_Input=41**".

Now display the trace:

```
Analysis, Display
```

Press **Enter** three times.



```
                                    Analysis
 Line   addr,H  H8/338 mnemonic,H                         count,R  seq
-----   ------  ---------------------------------  ---------  ---
    0   _Cmd      aa41  fetch mem                               ---    +
    1   Scan    MOV.B @Cmd_Input,R2L                 0.200 uS   .
    2   100c      fe80  fetch mem                    0.200 uS   .
    3   100e    CMP.B #00,R2L                        0.200 uS   .
    4   nput      00    read  mem byte               0.200 uS   .
    5   1010    BEQ cmd_rds:Scan                     0.200 uS   .
    6   _Cmd      aa41  fetch mem                    0.200 uS   .
    7   Scan    MOV.B @Cmd_Input,R2L                 0.200 uS   .
    8   100c      fe80  fetch mem                    0.200 uS   .
    9   100e    CMP.B #00,R2L                        0.200 uS   .
   10   nput      00    read  mem byte               0.200 uS   .
   11   1010    BEQ cmd_rds:Scan                     0.200 uS   .
   12   _Cmd      aa41  fetch mem                    0.200 uS   .
   13   Scan    MOV.B @Cmd_Input,R2L                 0.200 uS   .
   14   100c      fe80  fetch mem                    0.200 uS   .
   15   100e    CMP.B #00,R2L                        0.200 uS   .

STATUS: H8/338--Running user program         Emulation trace complete
Window  System  Register  Processor  Breakpoints  Memory  Config  Analysis
 Begin  Halt  CMB  Format  Trace  Display
```

This is not what we were expecting to see. As you can see at the first line of the trace, the address of **Exe_Cmd** routine appears on the address bus during the program executing **Scan** loop. This made the analyzer start trace. To avoid mis-trigger by this cause, set the trigger condition to the second instruction of the routine you want to trace:

Analysis, **T**race, Modify

Enter the pattern specification display, and modify the address specification to "Exe_Cmd+2".

To start the trace and complete the measurement:

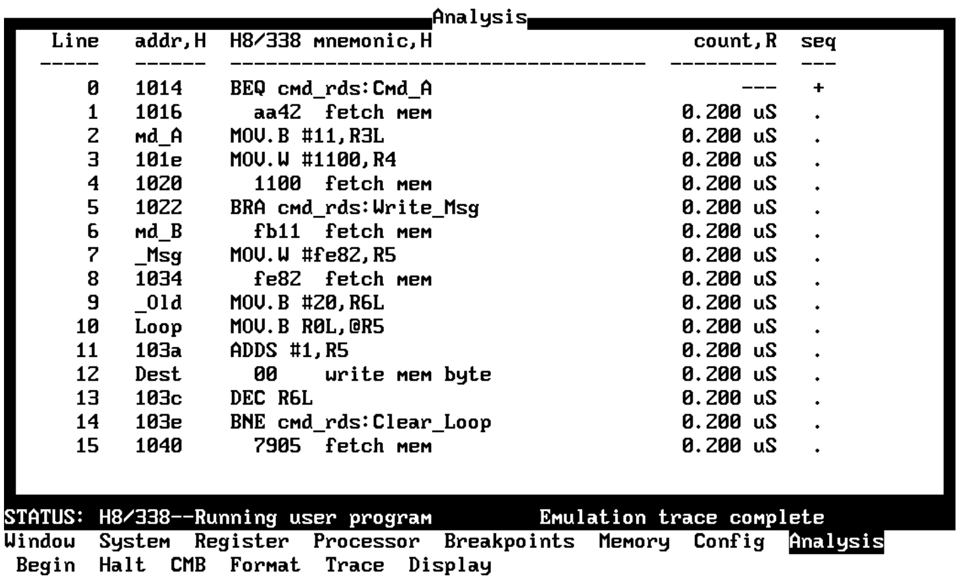
Analysis, **B**egin

Memory, Modify, **B**ytes

Enter "Cmd_Input=41".

Analysis, **D**isplay

Press **Enter** three times.



```
                                      Analysis
  Line   addr,H  H8/338 mnemonic,H                           count,R  seq
 -----   ------  ----------------------------------------  ---------  ---
     0   1014    BEQ cmd_rds:Cmd_A                               ---    +
     1   1016      aa42  fetch mem                          0.200 uS    .
     2   md_A    MOV.B #11,R3L                              0.200 uS    .
     3   101e    MOV.W #1100,R4                             0.200 uS    .
     4   1020      1100  fetch mem                          0.200 uS    .
     5   1022    BRA cmd_rds:Write_Msg                      0.200 uS    .
     6   md_B      fb11  fetch mem                          0.200 uS    .
     7   _Msg    MOV.W #fe82,R5                             0.200 uS    .
     8   1034      fe82  fetch mem                          0.200 uS    .
     9   _Old    MOV.B #20,R6L                              0.200 uS    .
    10   Loop    MOV.B R0L,@R5                              0.200 uS    .
    11   103a    ADDS #1,R5                                 0.200 uS    .
    12   Dest      00    write mem byte                     0.200 uS    .
    13   103c    DEC R6L                                    0.200 uS    .
    14   103e    BNE cmd_rds:Clear_Loop                     0.200 uS    .
    15   1040      7905  fetch mem                          0.200 uS    .

STATUS:  H8/338--Running user program         Emulation trace complete
Window  System  Register  Processor  Breakpoints  Memory  Config  Analysis
 Begin  Halt  CMB  Format  Trace  Display
```

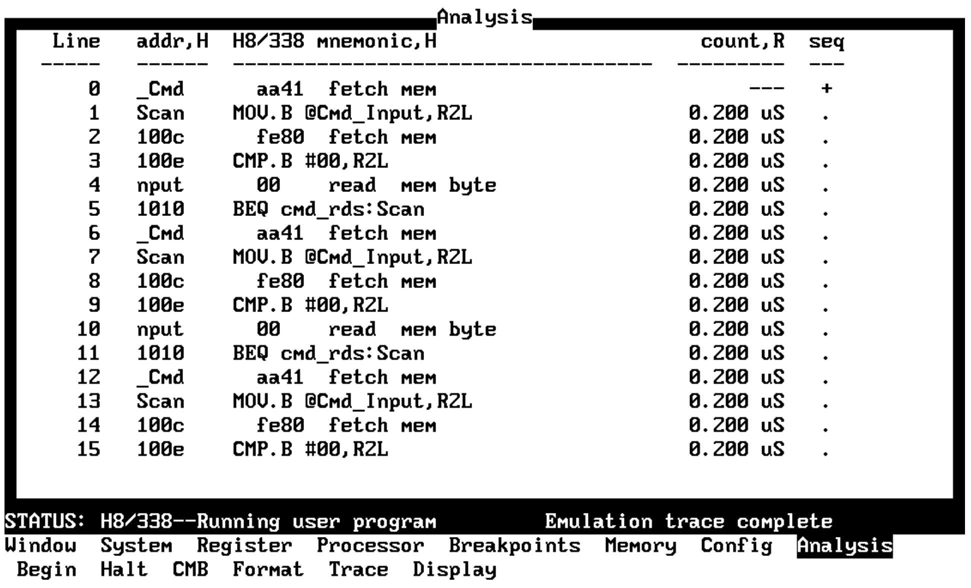
As you can see, the analyzer captured the execution of **Exe_Cmd** routine. If you need to see the execution of the instruction at the **Exe_Cmd** label, set the trigger position to "Center" when you modify the analysis specification.

Store Condition And Trace

When you specify store condition, disassembling of program execution is unreliable.

```
Analysis, Trace, Reset
Analysis, Begin
Analysis, Display
```

Press **Enter** three times. You will see a display similar to the following.

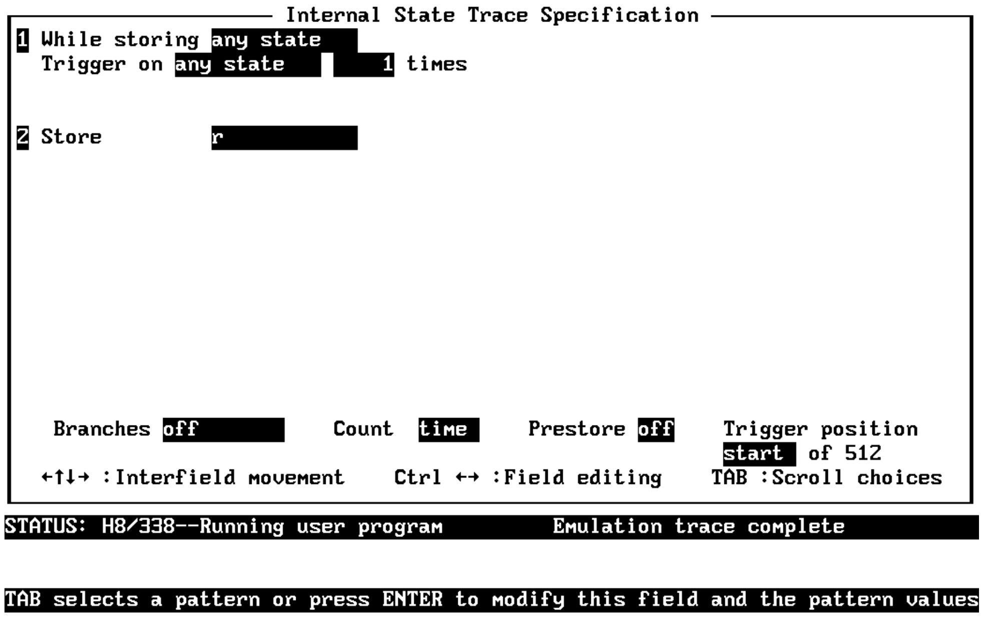

```
                                   Analysis
  Line   addr,H  H8/338 mnemonic,H                           count,R  seq
  -----  ------  -----------------------------------  ---------  ---
     0   _Cmd      aa41  fetch mem                              ---   +
     1   Scan    MOV.B @Cmd_Input,R2L                     0.200 uS   .
     2   100c      fe80  fetch mem                        0.200 uS   .
     3   100e    CMP.B #00,R2L                            0.200 uS   .
     4   nput      00    read  mem byte                   0.200 uS   .
     5   1010    BEQ cmd_rds:Scan                         0.200 uS   .
     6   _Cmd      aa41  fetch mem                        0.200 uS   .
     7   Scan    MOV.B @Cmd_Input,R2L                     0.200 uS   .
     8   100c      fe80  fetch mem                        0.200 uS   .
     9   100e    CMP.B #00,R2L                            0.200 uS   .
    10   nput      00    read  mem byte                   0.200 uS   .
    11   1010    BEQ cmd_rds:Scan                         0.200 uS   .
    12   _Cmd      aa41  fetch mem                        0.200 uS   .
    13   Scan    MOV.B @Cmd_Input,R2L                     0.200 uS   .
    14   100c      fe80  fetch mem                        0.200 uS   .
    15   100e    CMP.B #00,R2L                            0.200 uS   .

STATUS:  H8/338--Running user program         Emulation trace complete
Window  System  Register  Processor  Breakpoints  Memory  Config  Analysis
 Begin  Halt  CMB  Format  Trace  Display
```

The program is executing the **Scan** loop.

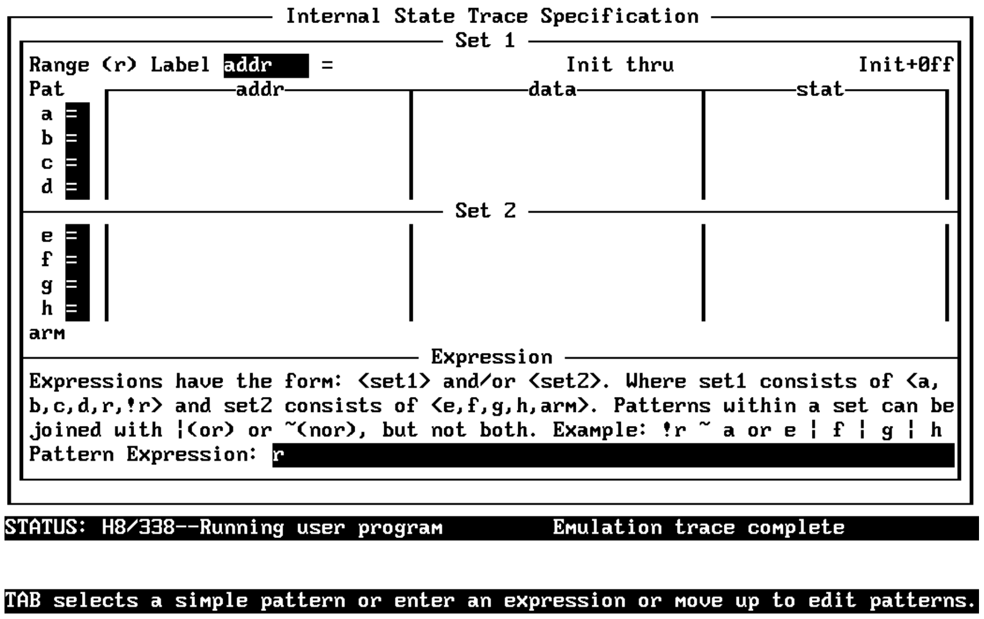
To trace only accesses to the address range **Init** through **Init+0ffh**:

```
    Analysis, Trace, Modify
```

Modify the trace specification as shown in the following displays.



```
─────────────────────── Internal State Trace Specification ─────────────────────
1 While storing any state
  Trigger on any state        1 times


2 Store         r









  Branches off          Count time       Prestore off      Trigger position
                                                           start  of 512
 ←↑↓→ :Interfield movement    Ctrl ←→ :Field editing    TAB :Scroll choices
STATUS: H8/338--Running user program         Emulation trace complete


TAB selects a pattern or press ENTER to modify this field and the pattern values
```

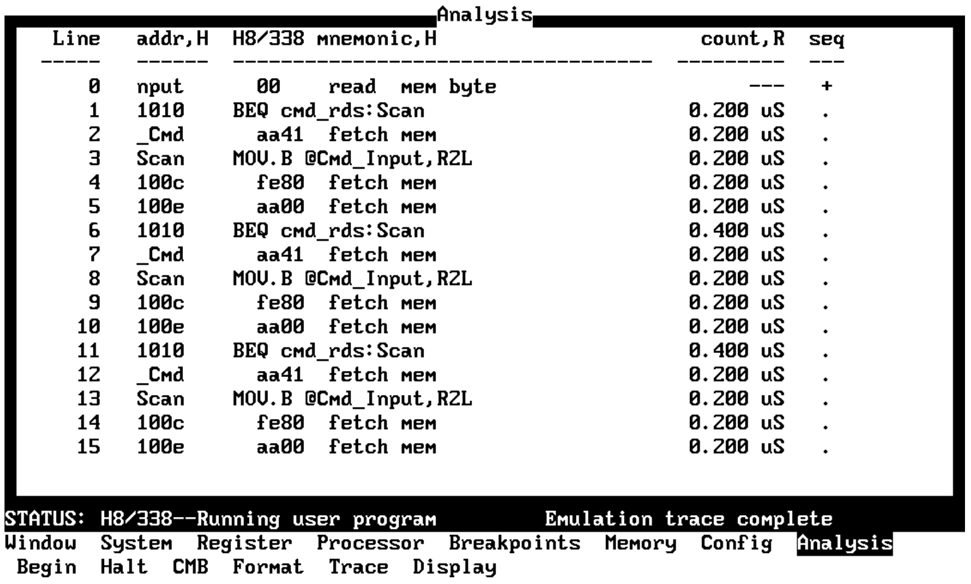


```
─────────────────────── Internal State Trace Specification ─────────────────────
 Range (r) Label addr    =                 Set 1
                                    Init thru                     Init+0ff
 Pat        ──────────addr──────────────────data──────────────────stat────
  a =
  b =
  c =
  d =
 ─────────────────────────────────────── Set 2 ───────────────────────────────
  e =
  f =
  g =
  h =
 arm
 ───────────────────────────────── Expression ────────────────────────────────
 Expressions have the form: <set1> and/or <set2>. Where set1 consists of <a,
 b,c,d,r,!r> and set2 consists of <e,f,g,h,arm>. Patterns within a set can be
 joined with ¦(or) or ~(nor), but not both. Example: !r ~ a or e ¦ f ¦ g ¦ h
 Pattern Expression: r
STATUS: H8/338--Running user program         Emulation trace complete


TAB selects a simple pattern or enter an expression or move up to edit patterns.
```

Start the trace and display the trace listing:

```
Analysis, Begin
Analysis, Display
```

Press **Enter** three times. You will see a display similar to the following.



```
                                     Analysis
  Line   addr,H  H8/338 mnemonic,H                      count,R  seq
 -----   ------  -----------------------------------  ---------  ---
     0   nput      00    read  mem byte                     ---   +
     1   1010    BEQ cmd_rds:Scan                      0.200 uS   .
     2   _Cmd      aa41  fetch mem                     0.200 uS   .
     3   Scan    MOV.B @Cmd_Input,R2L                  0.200 uS   .
     4   100c      fe80  fetch mem                     0.200 uS   .
     5   100e      aa00  fetch mem                     0.200 uS   .
     6   1010    BEQ cmd_rds:Scan                      0.400 uS   .
     7   _Cmd      aa41  fetch mem                     0.200 uS   .
     8   Scan    MOV.B @Cmd_Input,R2L                  0.200 uS   .
     9   100c      fe80  fetch mem                     0.200 uS   .
    10   100e      aa00  fetch mem                     0.200 uS   .
    11   1010    BEQ cmd_rds:Scan                      0.400 uS   .
    12   _Cmd      aa41  fetch mem                     0.200 uS   .
    13   Scan    MOV.B @Cmd_Input,R2L                  0.200 uS   .
    14   100c      fe80  fetch mem                     0.200 uS   .
    15   100e      aa00  fetch mem                     0.200 uS   .

STATUS:  H8/338--Running user program         Emulation trace complete
Window  System  Register  Processor  Breakpoints  Memory  Config  Analysis
 Begin  Halt  CMB  Format  Trace  Display
```

As you can see, the executions of CMP.B instruction are not disassembled. This occurs when the analyzer cannot get necessary information because of the store condition. Be careful when you use the analyzer with store condition.

Triggering the Analyzer by Data

You may want to trigger the emulation analyzer when specific data appears on the data bus. You can accomplish this by specifying "Data" in the "Find State" field of analysis specification display.

There are some points to be noticed when you trigger the analyzer in this way. You always need to specify the "Data" with 16 bits value even when access to the data is performed by byte access. This is because the analyzer is designed so that it can capture data on internal data bus (which has 16 bits width). The following table shows the way to specify the trigger condition by data.

Location of data	Access	Available "Data" Specification	
Internal ROM,RAM	word access	hhll	*1
		hhxx	*2
		xxll	*2
	byte access	ddxx	*2
Others	byte access *3	ddxx	

```
*1  hhll means 16 bits data
*2  dd,hh,ll mean 8 bits data
*3  H8/338 processor performs word access (MOV.W etc..) to
    external memory and internal I/O by two byte accesses.
```

For example, to trigger the analyzer when the processor performs word access to data 1234 hex in internal ROM, you can use 1234h, 12xxh, and 0xx34h as the "Data" specification.

To trigger the analyzer when the processor accesses data 12 hex in external ROM, you can use 12xxh as "Data" specification.

Notice that you always need to specify "xx" as the lower 8 bits value to capture byte access of the processor. Be careful to trigger the analyzer by data.

Using a Command File

You can use a command file to perform many functions for you, without having to manually type each function. For example, you might want to create a command file that maps memory, modifies configuration and loads program into memory for the sample program. To create such a command file:

```
System, Log, Input, Enable
```

Enter command file name "cmd_rds.cmd", and press **Enter**. This sets up a file to record all commands you execute. The commands will be logged to the file cmd_rds.cmd in the current directory. You can then use this file as a command file to execute these commands automatically.

First, to map the memory:

`Config, Map, Memory`

Map 1000 hex through 1fff hex to **erom** and fe80 hex through ff7f hex to **eram**. (As shown in Figure 2-5.)

To set up the reset value for the stack pointer:

`Config, General`

Use the arrow keys to move the cursor to the "Reset value for Stack Pointer" field, type 0ff80h, and press **Enter**.

To load the program into memory:

`Memory, Load`

Enter file format, memory type, and absolute file name, and press **Enter**.

Now we're finished logging commands to the file. To disable logging:

`System, Log, Input, Disable`

The command file cmd_rds.cmd will no longer accept command input. The file looks like this:

```
cmm
@tram
@1000H..2FFFH
@erom
@0FE00H..0FEFFH
@eram
@Empty
@grd
@Empty
@grd
@Empty
@grd
@Empty
@grd
@Empty
@grd
@Empty
@grd
@Empty
@grd
@Empty
@grd
@Empty
@grd
@Empty
@grd
@Empty
@grd
@Empty
@grd
```

```
@Empty
@grd
@Empty
@grd
cg
@y
@n
@y
@n
@n
@y
@y
@ext
@0FF80H
ml
@HP64869
@Both
@cmd_rds.abs
```

You can see a @symbol in front of some lines in the file. These represents data values, as opposed to commands.

Let’s execute the command file "cmd_rds.cmd".

System, **C**ommand_file

Enter "cmd_rds.cmd", press **Enter**. Watch the command file commands execute. As you can see, the sequence of commands you entered is automatically executed.

Resetting the Emulator

To reset the emulator, select:

Processor, **R**eset, **H**old

The emulator is held in a reset state (suspended) until a "**P**rocessor **B**reak", "**P**rocessor **G**o", or "**P**rocessor **S**tep" command is entered. A CMB execute signal will also cause the emulator to run if reset.

You can also specify that the emulator begin executing in the monitor after reset instead of remaining in the suspended state. To do this, select:

Processor, **R**eset, **M**onitor

Exiting the PC Interface

There are two different ways to exit the PC Interface. You can exit the PC Interface using the "locked" option which specifies that the current configuration will be present next time you start up the PC Interface. You can select this option as follows.

System, **E**xit, **L**ocked

Symbols are lost when you use the "System Exit Locked" command; however, you can reload them (after you reenter the PC Interface) with the "System Symbols Global Load" command.

The other way to exit the PC Interface is with the "unlocked" option which specifies that the default configuration will be present the next time you start up the PC Interface. You can select this option with the following command.

System, **E**xit, **U**nlocked

3

Using the H8/338 Emulator In-Circuit

When you are ready to use the H8/338 Emulator in conjunction with actual target system hardware, there are some special considerations you should keep in mind.

- installing the emulator probe
- properly configure the emulator

We will cover the first topic in this chapter. For complete details on in-circuit emulation configuration, refer to Chapter 4.

Installing the Target System Probe

Caution

The following precautions should be taken while using the H8/338 Emulator. Damage to the emulator circuitry may result if these precautions are not observed.

Power Down Target System. Turn off power to the user target system and to the H8/338 Emulator before inserting the user plug to avoid circuit damage resulting from voltage transients or mis-insertion of the user plug.

Verify User Plug Orientation. Make certain that Pin 1 of the target system microprocessor socket and Pin 1 of the user plug are properly aligned before inserting the user plug in the socket. Failure to do so may result in damage to the emulator circuitry.

Protect Against Static Discharge. The H8/338 Emulator contains devices which are susceptible to damage by static discharge. Therefore, operators should take precautionary measures before handling the user plug to avoid emulator damage.

Protect Target System CMOS Components. If your target system includes any CMOS components, turn on the target system first, then turn on the H8/338 Emulator; when powering down, turn off the emulator first, then turn off power to the target system.

Pin Guard

The H8/338/329 emulator is shipped with a pin guard to prevent impact damage to the target system probe pins. The guard should be left in place while you are not using the emulator.

H8/338 Emulator

H8/338 emulator is shipped with a non-conductive pin guard over the target system probe.

H8/329 Emulator

H8/329 emulator is shipped with a conductive plastic pin guard over the target system probe pins. When you **do** use the emulator, either for normal emulation tasks, or to run performance verification on the emulator, you must remove this conductive pin guard to avoid intermittent failures due to the target system probe lines being shorted together.

Pin Protector (H8/329 Only)

The target system probe of the H8/329 emulator has a pin protector that prevents damage to the probe when inserting and removing the probe from the target system microprocessor socket. **Do not** use the probe without a pin protector installed. If the target system probe is installed on a densely populated circuit board, there may not be enough room for the plastic shoulders of the probe socket. If this occurs, another pin protector may be stacked onto the existing pin protector.

Installing the Target System Probe

1. Remove the H8/338 microprocessor from the target system socket. Note the location of pin 1 on the processor and on the target system socket.

2. Store the microprocessor in a protected environment (such as antistatic foam).

3. Install the target system probe into the target system microprocessor socket.

4.

Note

When you are using the H8/338 emulator, we recommend that you use **ITT CANNON** "**LCS-84**" series 84 pin PLCC socket to make sure the contact between emulator probe and target system microprocessor socket.

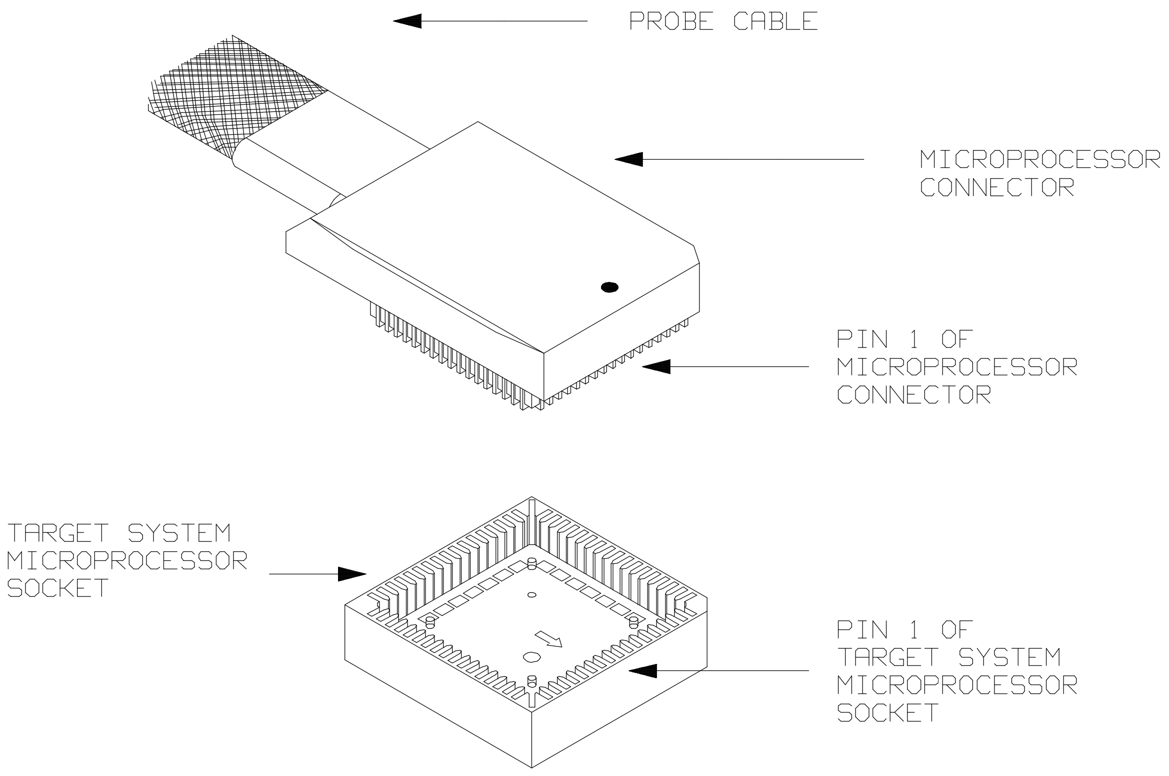

PROBE CABLE
MICROPROCESSOR CONNECTOR
PIN 1 OF MICROPROCESSOR CONNECTOR
TARGET SYSTEM MICROPROCESSOR SOCKET
PIN 1 OF TARGET SYSTEM MICROPROCESSOR SOCKET

Figure 3-1. Installing the Probe (H8/338 emulator)

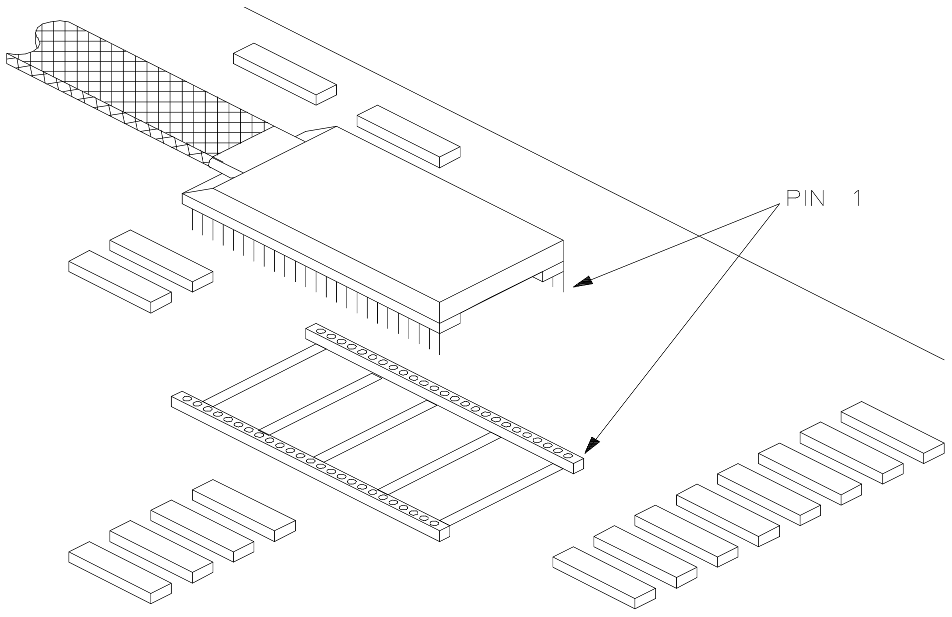


Figure 3-2. Installing the Probe (H8/329 emulator)

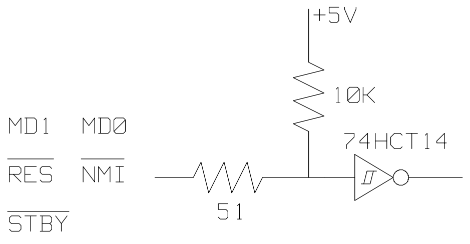
Pin State in Background

While the emulator is running the background monitor, probe pins are in the following state.

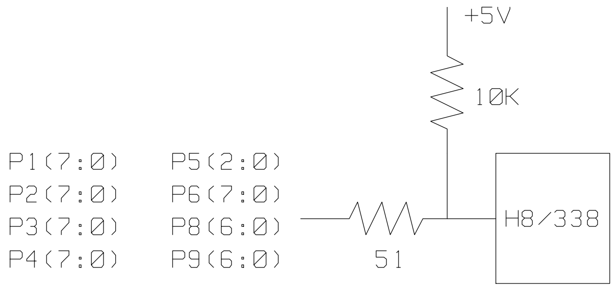
Address Bus	Same as foreground
Data Bus	Always high impedance otherwise you direct the emulator to modify target memory.
$\overline{\text{AS}}$	Same as foreground
$\overline{\text{RD}}$	Same as foreground
$\overline{\text{WR}}$	Always high otherwise you direct the emulator to modify target memory.
Others	Same as foreground

Target System Interface (H8/338)

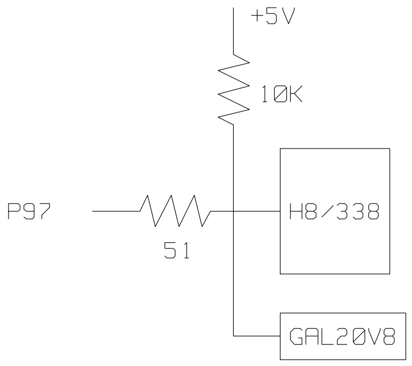
MD1 MD0 RES NMI STBY	These signals are connected to 74HCT14 through 51 ohm series resister and 10K ohm pull-up resister.



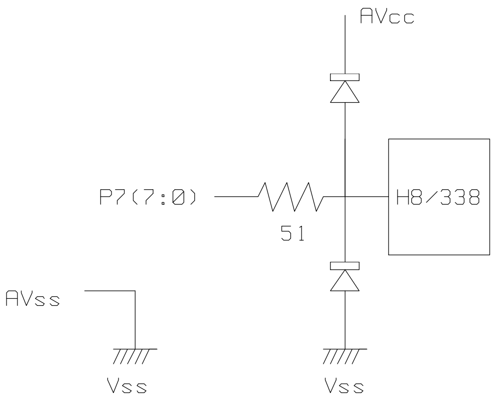
P1(7:0) P5(2:0) P2(7:0) P6(7:0) P3(7:0) P8(6:0) P4(7:0) P9(6:0)	These signals are connected to H8/338 emulation processor through 51 ohm series resister and 10K ohm pull-up resister.



P97 This signal are connected to H8/338 emulation processor and GAL20V8 through 51 ohm series resister.

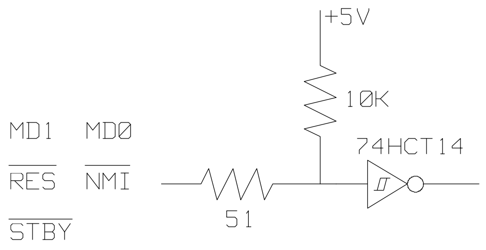


P7(7:0) These signals are connected to H8/338 emulation processor through 51 ohm series resister.

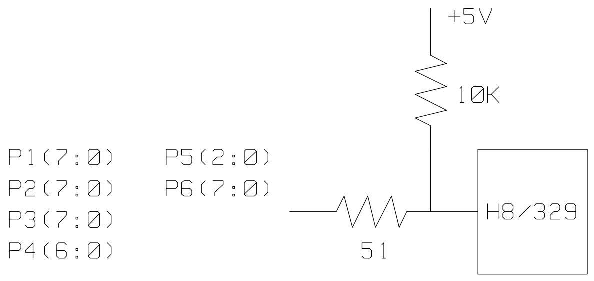


Target System Interface (H8/329)

MD1 MD0 $\overline{\textbf{RES}}$ $\overline{\textbf{NMI}}$ $\overline{\textbf{STBY}}$	These signals are connected to 74HCT14 through 51 ohm series resister and 10K ohm pull-up resister.

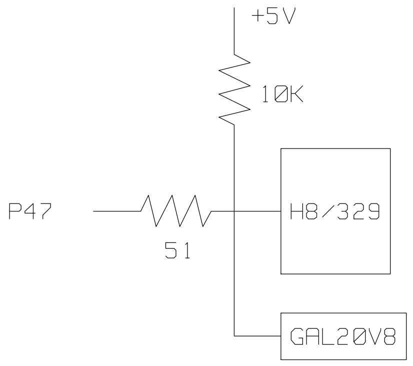


P1(7:0) P5(2:0) P2(7:0) P6(7:0) P3(7:0) P4(6:0)	These signals are connected to H8/329 emulation processor through 51 ohm series resister and 10K ohm pull-up resister.



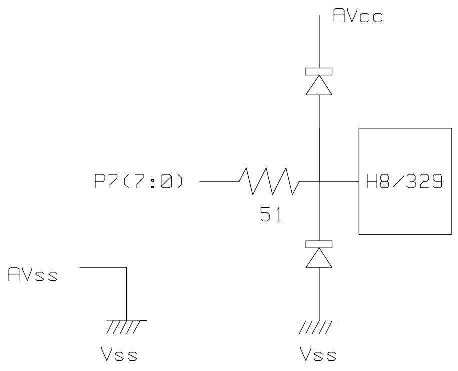
P47

This signal are connected to H8/329 emulation processor and GAL20V8 through 51 ohm resister.



P7(7:0)

These signals are connected to H8/329 emulation processor through 51 ohm series resister.



Running the Emulator from Target Reset

You can specify that the emulator begins executing from target system reset. When the target system /RES line becomes active and then inactive, the emulator will start reset sequence (operation) as actual microprocessor. To specify a run from reset state, select:

```
   Processor, Go, Reset
```

The status now shows that the emulator is "Awaiting target reset".

After the target system is reset, the status line message will change to show the appropriate emulator status.

4

Configuring the Emulator

Introduction

The H8/338 emulator is designed to help you in all stages of target system development. For instance, you can run the emulator out-of-circuit when developing and debugging your target system software and in-circuit when integrating your target system software with hardware. You can use the emulator’s internal clock or your target system clock. Emulation memory can be used along with your target system memory, and it can be mapped as RAM or ROM. And, there are many more options available.

The emulator is a flexible instrument and may be configured to suit your needs at any stage of the development process. This chapter describes the options available when configuring your emulator.

This chapter will:

- Show you how to access the emulator configuration options.
- Describe the emulator configuration options.
- Show you how to save a particular emulator configuration, and load it again at a later time.

Accessing the Emulator Configuration Options

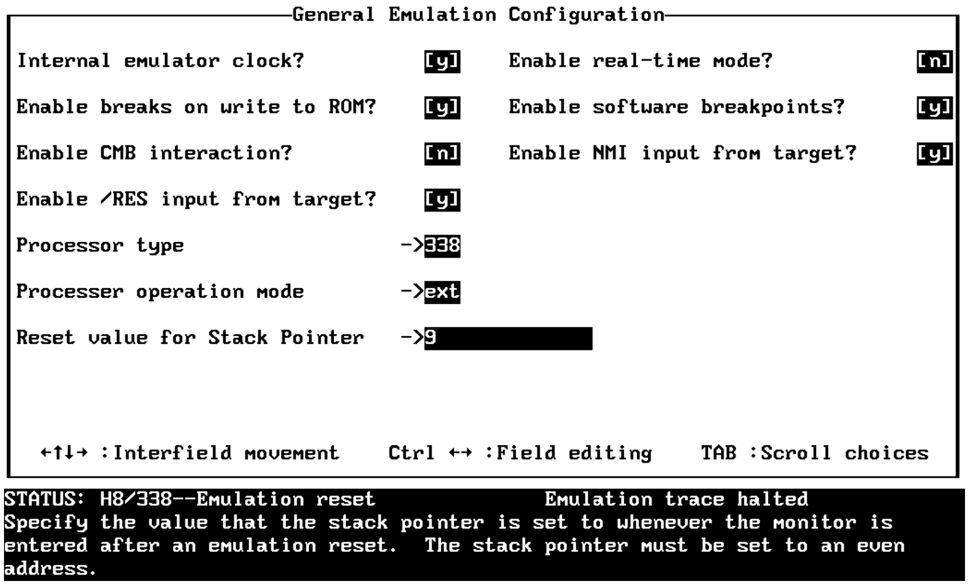
To enter the general configuration menu, Select:

Config, **G**eneral

When you position the cursor to a configuration item, a brief description of the item appears at the bottom of the display.

Note

It is possible to use the System Terminal window to modify the emulator configuration. However, if you do this, some PC Interface features may no longer work properly. We recommend that you only modify the emulator configuration by using the options presented in the PC Interface.



```
General Emulation Configuration
Internal emulator clock?            [y]   Enable real-time mode?          [n]
Enable breaks on write to ROM?      [y]   Enable software breakpoints?    [y]
Enable CMB interaction?             [n]   Enable NMI input from target?   [y]
Enable /RES input from target?      [y]
Processor type                    ->338
Processer operation mode          ->ext
Reset value for Stack Pointer     ->9

 ←↑↓→ :Interfield movement    Ctrl ←→ :Field editing    TAB :Scroll choices
STATUS: H8/338--Emulation reset              Emulation trace halted
Specify the value that the stack pointer is set to whenever the monitor is
entered after an emulation reset.  The stack pointer must be set to an even
address.
```

Figure 4-1. Emulator Configuration Display

Internal Emulator Clock?

This configuration question allows you to select the emulator’s clock source; you can choose either the internal clock oscillator or the target system clock. The default emulator configuration selects the internal clock.

Yes	Selects the internal clock oscillator as the emulator clock source. The emulators’ internal clock speed is 10 MHz(system clock).
No	Selects the clock input to the emulator probe from the target system. You must use a clock input conforming to the specifications for the H8/338 microprocessor. The maximum clock speed is 10 MHz (system clock).

You should always select the external clock option when using the emulator in-circuit to ensure that the emulator is properly synchronized with your target system.

Enable Real-Time Mode?

The "restrict to real-time" question lets you configure the emulator so that commands which cause the emulator to break to monitor and return to the user program are refused.

No	All commands, regardless of whether or not they require a break to the emulation monitor, are accepted by the emulator.
Yes	When runs are restricted to real-time and the emulator is running the user program, all commands that cause a break (except "Processor Reset", "Processor Break", "Processor Go", and "Processor Step") are refused. For example, the following commands are not allowed when runs are restricted to real-time:

- Display/modify registers.
- Display/modify target system memory.
- Display/modify internal I/O registers.
- Load/store target system memory.

Caution

If your target system circuitry is dependent on constant execution of program code, you should restrict the emulator to real-time runs. This will help insure that target system damage does not occur. However, remember that you can still execute the "Processor Reset", "Processor Break", and "Processor Step" commands; you should use caution in executing these commands.

Enable Breaks on Writes to ROM?

This question allows you to specify that the emulator break to the monitor upon attempts to write to memory space mapped as ROM. The emulator will prevent the processor from actually writing to memory mapped as emulation ROM; however, they cannot prevent writes to target system RAM locations which are mapped as ROM, even though the write to ROM break is enabled.

Yes	Causes the emulator to break into the emulation monitor whenever the user program attempts to write to a memory region mapped as ROM.
No	The emulator will not break to the monitor upon a write to ROM. The emulator will not modify the memory location if it is in emulation ROM.

Note

The **wrrom** analysis specification status option allows you to use "write to ROM" cycles as trigger and storage qualifiers.

Enable Software Breakpoints?

This question allows you to enable or disable the software breakpoints feature. The H8/338 emulator uses undefined opcode (5770 hex) as software breakpoint.

No The software breakpoints feature is disabled. This is specified by the default emulator configuration, so you must change this configuration item before you can use software breakpoints.

Yes Allows you to use the software breakpoints feature. When you set a software breakpoint, an undefined opcode (5770 hex) will be placed at the address specified. When the opcode 5770 hex is executed, program execution will break into the monitor.

When you define (add) a breakpoint, software breakpoints are automatically enabled.

Enable CMB Interaction?

Coordinated measurements are measurements synchronously made in multiple emulators or analyzers. Coordinated measurements can be made between HP 64700 Series emulators which communicate over the Coordinated Measurement Bus (CMB).

Multiple emulator start/stop is one type of coordinated measurement. The CMB signals READY and /EXECUTE are used to perform multiple emulator start/stop.

This configuration item allows you to enable/disable interaction over the READY and /EXECUTE signals. (The third CMB signal, TRIGGER, is unaffected by this configuration item.)

No The emulator ignores the /EXECUTE and READY lines, and the READY line is not driven.

Yes Multiple emulator start/stop is enabled. If the

```
Processor, CMB, Go,
```

command is entered, the emulator will start executing code when a pulse on the /EXECUTE line is received. The READY line is driven false while the emulator is running in the monitor; it goes true whenever execution switches to the user program.

Note

CMB interaction will also be enabled when the

Processor, CMB, Execute

command is entered.

Enable /NMI Input from Target?

This configuration allows you to specify whether or not the emulator responds to /NMI(non-maskable interrupt request) signal from the target system during foreground operation.

Yes	The emulator will respond to the /NMI request from the target system.
No	The emulator will not respond to the /NMI request from the target system.

The emulator does not accept any interrupt during background execution. Edge sensed interrupts are suspended while running the background monitor, and such interrupts will occur when context is changed to foreground. Level sensed interrupts and internal interrupts are ignored during in background operation.

Enable / RES Input from Target?

This configuration allows you to specify whether or not the emulator responds to /RES signal by the target system during foreground operation.

While running the background monitor, the emulator ignores /RES signal except that the emulator’s status is "Awaiting target reset".

(see the "Running the Emulation from Target Reset" section in the "In-Circuit Emulation" chapter).

Yes	The emulator will respond to /RES input during foreground operation.
No	The emulator will not respond to /RES input from the target system.

Processor Type? (H8/338 emulator)

This configuration defines the processor to be emulated by the H8/338 emulator.

338	When you are going to emulate H8/338 microprocessor, select this item. (The default emulation configuration selects this.)
337	When you are going to emulate H8/337 microprocessor, select this item.
336	When you are going to emulate H8/336 microprocessor, select this item.

Processor Type? (H8/329 emulator)

This configuration defines the processor to be emulated by the H8/329 emulator.

329	When you are going to emulate H8/329 microprocessor, select this item. (The default emulation configuration selects this.)
328	When you are going to emulate H8/328 microprocessor, select this item.
327	When you are going to emulate H8/327 microprocessor, select this item.
326	When you are going to emulate H8/326 microprocessor, select this item.

Processor Operation Mode?

This configuration defines operation mode in which the emulator works.

ext	The emulator will work using the mode setting by the target system. The target system must supply appropriate input to MD0 and MD1. If you are using the emulator out of circuit when "external" is selected, the emulator will operate in mode 3.
<mode_num>	When <mode_num> is selected, the emulator will operate in selected mode regardless of the mode setting by the target system.

Valid <mode_num> are following:

<mode_num>	**Description**
1	The emulator will operate in mode 1. (expanded mode without internal ROM)
2	The emulator will operate in mode 2. (expanded mode with internal ROM)
3	The emulator will operate in mode 3. (single chip mode)

Reset Value for Stack Pointer?

This question allows you to specify the value to which the stack pointer (SP) will be set on entrance to the emulation monitor initiated RESET state (the "Emulation reset" status).

The address specified in response to this question must be a 20-bit hexadecimal even address.

You **cannot** set this address at the following location.

- Odd address
- Internal I/O register address

When you are using the foreground monitor, this address should be defined in an emulation or target system RAM area which is not used by user program.

Note

We recommend that you use this method of configuring the stack pointer and the stack page register. Without a stack pointer and a stack page register, the emulator is unable to make the transition to the run state, step, or perform many other emulation functions. However, using this option **does not** preclude you from changing the stack pointer value or location within your program; it just sets the initial conditions to allow a run to begin.

Storing an Emulator Configuration

The PC Interface lets you store a particular emulator configuration so that it may be re-loaded later. The following information is saved in the emulator configuration.

- Emulator configuration items.
- Memory map.
- Break conditions.
- Trigger configuration.
- Window specifications.

To store the current emulator configuration, select:

```
Config, Store
```

Enter the name of file to which the emulator configuration will be saved.

Loading an Emulator Configuration

If you have previously stored an emulator configuration and wish to re-load it into the emulator, select:

Config, **L**oad

Enter the configuration file name and press **Enter**. The emulator will be re-configured with the values specified in the configuration file.

Notes

5

Using the Emulator

Introduction

In the "Getting Started" chapter, you learned how to load code into the emulator, how to modify memory and view a register, and how to perform a simple analyzer measurement. In this chapter, we will discuss in more detail other features of the emulator.

This chapter shows you how to:

- Making Coordinated Measurements.
- Store the contents of memory into absolute files.

This chapter also discusses:

- Display or Modify the H8/338 internal I/O registers.

Making Coordinated Measurements

Coordinated measurements are measurements synchronously made in multiple emulators or analyzers. Coordinated measurements can be made between HP 64700 Series emulators which communicate over the Coordinated Measurement Bus (CMB). Coordinated measurements can also be made between an emulator and some other instrument connected to the BNC connector.

This section will describe coordinated measurements made from the PC Interface which involve the emulator. These types of coordinated measurements are:

- Running the emulator on reception of the CMB /EXECUTE signal.
- Using the analyzer trigger to break emulator execution into the monitor.

Three signal lines on the CMB are active and serve the following functions when enabled:

/TRIGGER	Active low. The analyzer trigger line on the CMB and on the BNC serve the same logical purpose. They provide a means for the analyzer to drive its trigger signal out of the system or for external trigger signals to arm the analyzer or break the emulator into its monitor.
READY	Active high. This line is for synchronized, multi-emulator start and stop. When CMB run control interaction is enabled, all emulators are required to break to background upon reception of a false READY signal and will not return to foreground until this line is known to be in a true state.
/EXECUTE	Active low. This line serves as a global interrupt signal. Upon reception of an enabled /EXECUTE signal, each emulator is to interrupt whatever it is doing and execute a previously defined process, typically, run the emulator or start a trace measurement.

Running the Emulator at /EXECUTE

Before you can specify that the emulator run upon receipt of the /EXECUTE signal, you must enable CMB interaction. To do this, select:

```
Config, General
```

Use the arrow keys to move the cursor to the "Enable CMB Interaction?" question, and type "y". Use the **Enter** key to exit out of the lower right-hand field in the configuration display.

To specify that the emulator begin executing a program upon reception of the /EXECUTE signal, select:

```
Processor, CMB, Go
```

At this point you may either select the current program counter, or you may select a specific address.

The command you enter is saved and is executed when the /EXECUTE signal becomes active. Also, you will see the message "ALERT: CMB execute; run started".

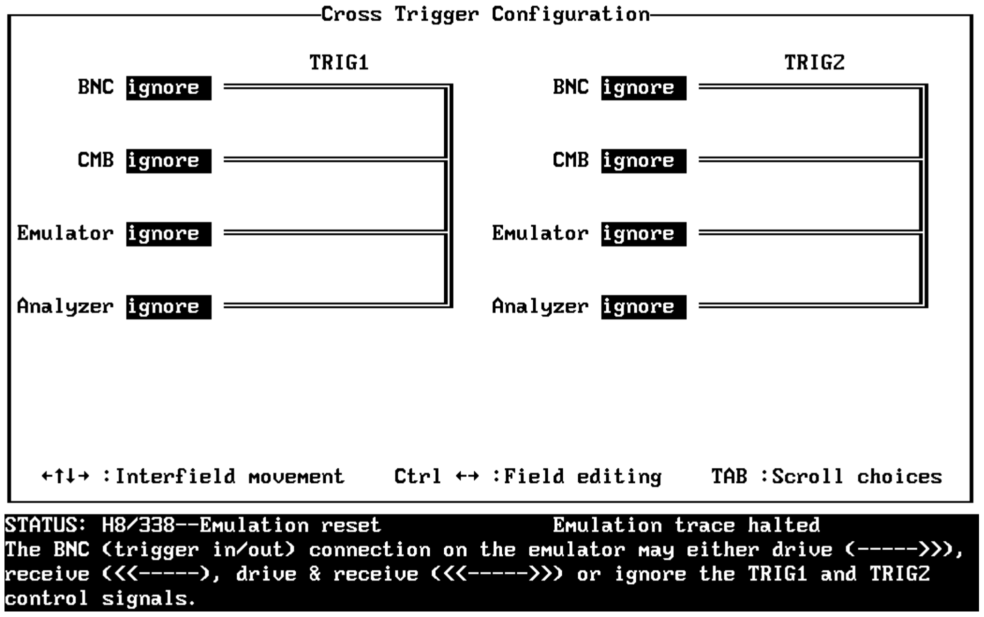
Breaking on the Analyzer Trigger

To cause emulator execution to break into the monitor when the analyzer trigger condition is found, you must modify the trigger configuration. To access the trigger configuration, select:

```
Config, Trigger
```

The trigger configuration display contains two diagrams, one for each of the internal TRIG1 and TRIG2 signals.

To use the internal TRIG1 signal to connect the analyzer trigger to the emulator break line, move the cursor to the highlighted "Analyzer" field in the TRIG1 portion of the display, and use the **Tab** key to select the "----->>" arrow which shows that the analyzer is driving TRIG1. Next, move the cursor to the highlighted "Emulator" field and use the **Tab** key to select the arrow pointing towards the emulator (<<-----); this specifies that emulator execution will break into the monitor when the TRIG1 signal is driven. The trigger configuration display is shown in figure 5-1.



```
──────────────────Cross Trigger Configuration──────────────────

                       TRIG1                                TRIG2
     BNC ignore  ═════════════╗            BNC ignore  ═════════════╗
                              ║                                     ║
     CMB ignore  ═════════════╣            CMB ignore  ═════════════╣
                              ║                                     ║
Emulator ignore  ═════════════╣       Emulator ignore  ═════════════╣
                              ║                                     ║
Analyzer ignore  ═════════════╝       Analyzer ignore  ═════════════╝



  ←↑↓→ :Interfield movement    Ctrl ←→ :Field editing    TAB :Scroll choices

STATUS: H8/338--Emulation reset             Emulation trace halted
The BNC (trigger in/out) connection on the emulator may either drive (----->>),
receive (<<-----), drive & receive (<<----->>) or ignore the TRIG1 and TRIG2
control signals.
```

Figure 5-1. Cross Trigger Configuration

Note

If your emulator is not configured with external analyzer, the "Timing" cross trigger option is not displayed.

Storing Memory Contents to an Absolute File

The "Getting Started" chapter shows you how to load absolute files into emulation or target system memory. You can also store emulation or target system memory to an absolute file with the following command.

```
Memory, Store
```

Note

The first character of the absolute file name must be a letter. You can name the absolute file with a total of 8 alphanumeric characters, and optionally, you can include an extension of up to 3 alphanumeric characters.

Caution

The "Memory Store" command writes over an existing file if it has the same name that is specified with the command. You may wish to verify beforehand that the specified filename does not already exist.

Register Classes and Names (H8/338 Emulator)

The following register classes and names are used with the display/modify registers commands in H8/338 emulator.

basic (*) class

Register name	**Description**
pc	Program counter
ccr	Condition code register
r0	Register 0
r1	Register 1
r2	Register 2
r3	Register 3
r4	Register 4
r5	Register 5
r6	Register 6
r7	Register 7
sp	Stack pointer
mdcr	Mode control register *1

sys class

(System control registers)

Register name	**Description**
stcr	Serial timer control register
syscr	System control register
mdcr	Mode control register
iscr	IRQ sense control register *1
ier	IRQ enable register

port class (I/O port)

Register name	Description
p1ddr	Port 1 data direction register *2
p2ddr	Port 2 data direction register *2
p3ddr	Port 3 data direction register *2
p4ddr	Port 4 data direction register *2
p5ddr	Port 5 data direction register *2
p6ddr	Port 6 data direction register *2
p8ddr	Port 8 data direction register *2
p9ddr	Port 9 data direction register *2
p1dr	Port 1 data register
p2dr	Port 2 data register
p3dr	Port 3 data register
p4dr	Port 4 data register
p5dr	Port 5 data register
p6dr	Port 6 data register
p7dr	Port 7 data register *1
p8dr	Port 8 data register
p9dr	Port 9 data register
p1pcr	Port 1 input pull up MOS control register
p2pcr	Port 2 input pull up MOS control register
p3pcr	Port 3 input pull up MOS control register

frt class (16 bit free running timer)

Register name	Description
tier	Timer interrupt enable register
frtcsr	Timer control/status register
frc	Free running counter
ocra	Output compare register A
ocrb	Output compare register B
frtcr	Timer control register
tocr	Timer output compare control register
icra	Input capture register A *1
icrb	Input capture register B *1
icrc	Input capture register C *1
icrd	Input capture register D *1

tmr0 class (8 bit timer 0)

Register name	Description
tcr0	Timer control register
tcsr0	Timer control/status register
tcora0	Timer constant register A
tcorb0	Timer constant register B
tcnt0	Timer counter

tmr1 class (8 bit timer 1)

Regsiter name	Description
tcr1	Timer control register
tcsr1	Timer control/status register
tcora1	Timer constant register A
tcorb1	Timer constant register B
tcnt1	Timer counter

pwm0 class (PWM timer 0)

Register name	Description
pwmtcr0	Timer control register
dtr0	Duty register
pwmtcnt0	Timer counter

pwm1 class (PWM timer 1)

Regsiter name	Description
pwmtcr1	Timer control register
dtr1	Duty register
pwmtcnt1	Timer counter

sci0 class (Serial communication interface 0)

Register name	Description
smr0	Serial mode register
brr0	Bit rate register
scr0	Serial control register
tdr0	Transmit data register
ssr0	Serial status register
rdr0	Receive data register *1

sci1 class (Serial communication interface 1)

Register name	Description
smr1	Serial mode register
brr1	Bit rate register
scr1	Serial control register
tdr1	Transmit data register
ssr1	Serial status register
rdr1	Receive data register *1

adc class (A/D converter)

Register name	Description
addra	A/D data register A *1
addrb	A/D data register B *1
addrc	A/D data register C *1
addrd	A/D data register D *1
adcsr	A/D control/status register
adcr	A/D control register

dac class

(D/A converter)

Register name	Description
dadr0	D/A data register 0
dadr1	D/A data register 1
dacr	D/A control register

NO CLASS

The following register names are not included in any register class.

Register name	Description
r0h	Register 0 H
r0l	Register 0 L
r1h	Register 1 H
r1l	Register 1 L
r2h	Register 2 H
r2l	Register 2 L
r3h	Register 3 H
r3l	Register 3 L
r4h	Register 4 H
r4l	Register 4 L
r5h	Register 5 H
r5l	Register 5 L
r6h	Register 6 H
r6l	Register 6 L
r7h	Register 7 H
r7l	Register 7 L

*1 Display only
*2 Modification only

Register Classes and Names (H8/329 Emulator)

The following register classes and names are used with the display/modify registers commands in H8/329 emulator.

basic (*) class

Register name	Description
pc	Program counter
ccr	Condition code register
r0	Register 0
r1	Register 1
r2	Register 2
r3	Register 3
r4	Register 4
r5	Register 5
r6	Register 6
r7	Register 7
sp	Stack pointer
mdcr	Mode control register *1

sys class

(System control registers)

Register name	Description
stcr	Serial timer control register
syscr	System control register
mdcr	Mode control register
iscr	IRQ sense control register *1
ier	IRQ enable register

port class (I/O port)

Register name	Description
p1ddr	Port 1 data direction register *2
p2ddr	Port 2 data direction register *2
p3ddr	Port 3 data direction register *2
p4ddr	Port 4 data direction register *2
p5ddr	Port 5 data direction register *2
p6ddr	Port 6 data direction register *2
p7ddr	Port 7 data direction register *2
p1dr	Port 1 data register
p2dr	Port 2 data register
p3dr	Port 3 data register
p4dr	Port 4 data register
p5dr	Port 5 data register
p6dr	Port 6 data register
p7dr	Port 7 data register *1
p1pcr	Port 1 input pull up MOS control register
p2pcr	Port 2 input pull up MOS control register
p3pcr	Port 3 input pull up MOS control register

frt class (16 bit free running timer)

Register name	Description
tier	Timer interrupt enable register
frtcsr	Timer control/status register
frc	Free running counter
ocra	Output compare register A
ocrb	Output compare register B
frtcr	Timer control register
tocr	Timer output compare control register
icra	Input capture register A *1
icrb	Input capture register B *1
icrc	Input capture register C *1
icrd	Input capture register D *1

tmr0 class (8 bit timer 0)

Register name	Description
tcr0	Timer control register
tcsr0	Timer control/status register
tcora0	Timer constant register A
tcorb0	Timer constant register B
tcnt0	Timer counter

tmr1 class (8 bit timer 1)

Regsiter name	Description
tcr1	Timer control register
tcsr1	Timer control/status register
tcora1	Timer constant register A
tcorb1	Timer constant register B
tcnt1	Timer counter

sci class (Serial communication interface)

Register name	Description
smr	Serial mode register
brr	Bit rate register
scr	Serial control register
tdr	Transmit data register
ssr	Serial status register
rdr	Receive data register *1

adc class (A/D converter)

Register name	Description
addra	A/D data register A *1
addrb	A/D data register B *1
addrc	A/D data register C *1
addrd	A/D data register D *1
adcsr	A/D control/status register
adcr	A/D control register

NO CLASS The following register names are not included in any register class.

Register name	Description
r0h	Register 0 H
r0l	Register 0 L
r1h	Register 1 H
r1l	Register 1 L
r2h	Register 2 H
r2l	Register 2 L
r3h	Register 3 H
r3l	Register 3 L
r4h	Register 4 H
r4l	Register 4 L
r5h	Register 5 H
r5l	Register 5 L
r6h	Register 6 H
r6l	Register 6 L
r7h	Register 7 H
r7l	Register 7 L

*1 Display only
*2 Modification only

A

File Format Readers

Using the HP 64000 Reader

An HP 64000 “reader” is provided with the PC Interface. The HP 64000 Reader converts the files into two files that are usable with your emulator. This means that you can use available language tools to create HP 64000 absolute files, then load those files into the emulator using the PC Interface.

The HP 64000 Reader can operate from within the PC Interface or as a separate process. When operating the HP 64000 Reader, it may be necessary to execute it as a separate process if there is not enough memory on your personal computer to operate the PC Interface and HP 64000 Reader simultaneously. You can also operate the reader as part of a “make file.”

What the Reader Accomplishes

Using the HP 64000 files (<file.X>, <file.L>, <scr1.A>, <scr2.A>, ...) the HP 64000 Reader will produce two new files, an “absolute” file and an ASCII symbol file, that will be used by the PC Interface. These new files are named: “<file>.hpa” and “<file>.hps.”

The Absolute File

During execution of the HP 64000 Reader, an absolute file (<file>.hpa) is created. This absolute file is a binary memory image which is optimized for efficient downloading into the emulator.

The ASCII Symbol File

The ASCII symbol file (<file>.hps) produced by the HP 64000 Reader contains global symbols, module names, local symbols, and, when using applicable development tools such as a “C” compiler, program line numbers. Local symbols evaluate to a fixed (static, not stack relative) address.

Note

You must use the required options for your specific language tools to include symbolic ("debug") information in the HP 64000 symbol files. The HP 64000 Reader will only convert symbol information present in the HP 64000 symbol files (<file.L>, <src1.A>, <src2.A>, ...).

The symbol file contains symbol and address information in the following form:

```
 module_name1
 module_name2
 ...
 module_nameN
global_symbol1  address
global_symbol2  address
...
global_symbolN  address
|module_name1|# 1234        address
|module_name1|local_symbol1  address
|module_name1|local_symbol2  address
...
|module_name1|local_symbolN  address
```

Each of the symbols is sorted alphabetically in the order: module names, global symbols, and local symbols.

Line numbers will appear similar to a local symbol except that "local_symbolX" will be replaced by "#NNNNN" where NNNNN is a five digit decimal line number. The addresses associated with global and local symbols are specific to the processor for which the HP 64000 files were generated.

Note

When the line number symbol is displayed in the emulator, it appears in brackets. Therefore, the symbol "MODNAME: line 345" will be displayed as "MODNAME:[345]" in mnemonic memory and trace list displays.

The space preceding module names is required. Although formatted for readability here, a single tab separates symbol and address.

The local symbols are scoped. This means that to access a variable named “count” in a source file module named “main.c,” you would enter “main.c:count” as shown below.

Module Name	**Variable Name**	**You Enter:**
main.c	count	main.c:count
main.c	line number 23	main.c: line 23

You access line number symbols by entering the following on one line in the order shown:

module name
colon (:)
space
the word “line”
space
the decimal line number

For example:

```
main.c: line 23
```

Location of the HP 64000 Reader Program

The HP 64000 Reader is located in the directory named \hp64700\bin by default, along with the PC Interface. This directory must be in the environment variable PATH for the HP 64000 Reader and PC Interface to operate properly. The PATH is usually defined in the “\autoexec.bat” file.

The following examples assume that you have “\hp64000\bin” included in your PATH variable. If not, you must supply the directory name when executing the Reader program.

Using the Reader from MS-DOS

The command name for the HP 64000 Reader is **RHP64000.EXE**. To execute the Reader from the command line, for example, enter:

```
RHP64000 [-q] <filename>
```

-q	This option specifies the "quiet" mode, and suppresses the display of messages.
<filename>	This represents the name of the HP 64000 linker symbol file (file.L) for the absolute file to be loaded.

The following command will create the files "TESTPROG.HPA" and "TESTPROG.HPS"

```
RHP64000 TESTPROG.L
```

Using the Reader from the PC Interface

The PC Interface has a file format option under the "**M**emory **L**oad" command. After you select HP64000 as the file format, the HP 64000 Reader will operate on the file you specify. After this completes successfully, the PC Interface will accept the absolute and symbol files produced by the Reader.

To use the Reader from the PC Interface:

1. Start up the PC Interface.
2. Select "**M**emory **L**oad." The memory load menu will appear.
3. Specify the file format as "HP64000." This will appear as the default file format.
4. Specify the name of an HP 64000 linker symbol file (TESTFILE.L for example).

Using the HP 64000 file that you specify (TESTFILE.L, for example), the PC Interface performs the following:

- It checks to see if two files with the same base name and extensions .HPS and .HPA already exist (for example, TESTFILE.HPS and TESTFILE.HPA).

- If TESTFILE.HPS and TESTFILE.HPA don't exist, the HP 64000 Reader produces them. The new absolute file, TESTFILE.HPA, is then loaded into the emulator.
- If TESTFILE.HPS and TESTFILE.HPA already exist but the create dates and times are earlier than the HP 64000 linker symbol file creation date/time, the HP 64000 Reader recreates them. The new absolute file, TESTFILE.HPA, is then loaded into the emulator.
- If TESTFILE.HPS and TESTFILE.HPA already exist but the dates and times are later than the creation date and time for the HP 64000 linker symbol file, the HP 64000 Reader will not recreate TESTFILE.HPA. The current absolute file, TESTFILE.HPA, is then loaded into the emulator.

Note

Date/time checking is only done within the PC Interface.

When running the HP 64000 Reader at the MS-DOS command line prompt, the HP 64000 Reader will always update the absolute and symbol files.

When the HP 64000 Reader operates on a file, a status message will be displayed indicating that it is reading an HP 64000 file. When the HP 64000 Reader completes its processing, another message will be displayed indicating the absolute file is being loaded.

The PC Interface executes the Reader with the "**-q**" (quiet) option by default.

If the Reader Won't Run

If your program is very large, the PC Interface may run out of memory while attempting to create the database file. If this occurs, you will need to exit the PC Interface and execute the program at the MS-DOS command prompt to create the files that are downloaded to the emulator.

Including RHP64000 in a Make File

You may wish to incorporate the “RHP64000” process as the last step in your “make file,” as a step in your construction process, to eliminate the possibility of having to exit the PC Interface due to space limitations describe above. If the files with “.HPA” and “.HPS” extensions are not current, loading an HP 64000 file will automatically create them.

Using the HP 64869 Reader

A HP 64869 format "reader" is provided with the PC Interface. The HP 64869 Reader converts a HP 64876 format file into two files that are usable with the HP 64736 emulator. This means you can use available language tools to create HP 64876 format absolute files, then load those files into the emulator using the H8/338 PC Interface.

The HP 64869 Reader can operate from within the PC Interface or as a separate process. Operation from within the PC Interface is available if there is enough memory on your personal computer to run the PC Interface and HP 64869 Reader simultaneously.

You can also run the reader as part of a "make file."

What the Reader Accomplishes

Using any HP 64876 format absolute file in the form "<file>.<ext>", the HP 64869 Reader will produce two new files, an "absolute" file and an ASCII symbol file, that will be used by the H8/330 PC Interface.

The Absolute File

During execution of the HP 64869 Reader, an absolute file (<file>.HPA) is created. This absolute file is a binary memory image which is optimized for efficient downloading into the emulator.

The ASCII Symbol File

The ASCII symbol file (<file>.HPS) produced by the HP 64869 Reader contains global symbols, module names, local symbols, and, when using applicable development tools like a "C" compiler, program line numbers. Local symbols evaluate to a fixed (static, not stack relative) address.

Note

You must use the required options for you specific language tools to include symbolic ("debug") information in the HP 64876 format absolute file.

The symbol file contains symbol and address information in the following form:

```
 module_name1
 module_name2
 ...
 module_nameN
global_symbol1                   address
global_symbol2                   address
...
global_symbolN                   address
|module_name|local_symbol1       address
|module_name|local_symbol2       address
...
|module_name|local_symbolN       address
|module_name|# 1234              address
```

Each of the symbols is sorted alphabetically in the order: module names, global symbols, and local symbols.

Line numbers will appear similar to a local symbol except that "local_symbolX" will be replaced by "#NNNNN" where NNNNN is a five digit decimal line number. Line numbers should appear in ascending order in both the line number itself and its associated address.

Note

When the line number symbol is displayed in the emulator, it appears as a bracketed number. Therefore, the symbol "modname:# 345" will be displayed as "modname:[345]" in mnemonic memory and trace list displays

The space preceding module names is required. Although formatted for readability here, a single tab separates symbol and address.

The local symbols are scoped. When accessing the variable named "count" in the source file module named "main.c", you would enter "main:count". Notice that the module name of the source file "main.c" is "main". see Table A-2.

Module Name	Variable Name	You Enter:
main	count	main:count
main	line number 23	main: line 23

Location of the HP 64869 Reader Program

The HP 64869 Reader is located in the directory named \hp64700\bin by default, along with the PC Interface. This directory must be in the environment variable PATH for the HP 64869 Reader and PC Interface to operate properly. This is usually defined in "\autoexec.bat" file.

Using the HP 64869 Reader from MS-DOS

The command name for the HP 64869 Reader is **RD64869.EXE**. You can execute the HP 64869 Reader from the command line with the command:

```
C:\HP64700\BIN\RD64869 [-q]
<filename> <RETURN>
```

where:

[-q]	specifies the "quiet" mode. This option suppresses the display of messages.
<filename>	is the name of the file containing the HP 64876 format absolute program.

The command

```
C:\HP64700\BIN\RD64869 TESTPROG.ABS
```

will therefore create the files "TESTPROG.HPA" and "TESTPROG.HPS".

Using the HP 64869 Reader from the PC Interface

The H8/338 PC Interface has a file format option under the "**M**emory, **L**oad" command. After you select this option, the HP 64869 Reader will operate on the file you specify. After this completes successfully, the H8/338 PC Interface will accept the absolute and symbol files produced by the Reader.

To use the Reader from the PC Interface, follow these steps:

1. Start up the H8/338 PC Interface.

2. Select "**M**emory, **L**oad". The memory load menu will appear.

3. Specify the file format as "HP64876". This will appear as the default file format.

4. Specify a file in HP 64876 format ("TESTFILE.ABS", for example,). The file extension can be something other than ".ABS", but cannot be ".HPA", ".HPT", or ".HPS".

Note

The "<filename>.HPT" file is a temporary file used by the HP 64869 Reader to process the symbols.

Using the HP 64876 format file that you specify (TESTFILE.ABS, for example), the PC Interface performs the following:

- Checks to see if two files with the same base name and extensions .HPS and .HPA already exist (for example, TESTFILE.HPS and TESTFILE.HPA).

- If TESTFILE.HPS and TESTFILE.HPA don't exist, the HP 64869 Reader produces them. The new absolute file, TESTFILE.HPA, is then loaded into the emulator.

- If TESTFILE.HPS and TESTFILE.HPA already exist but the create dates and times are earlier than the HP 64876 format file creation date/time, the HP 64869 Reader recreates them. The new absolute file, TESTFILE.HPA, is then loaded into the emulator.

- If TESTFILE.HPS and TESTFILE.HPA already exist but the dates and times are later than the creation date/time for the HP 64876 format file, the current absolute file, TESTFILE.HPA, is then loaded into the emulator.

Note

Date/time checking is only done within the PC Interface. When running the HP 64869 Reader at the MS-DOS command line prompt, the HP 64869 Reader will always update the absolute and symbol files.

When the HP 64869 Reader operates on a file, a status message will be displayed indicating that it is reading a HP 64876 format file. When the HP 64869 Reader completes its processing, another message will be displayed indicating the absolute file is being loaded.

If the Reader Won't Run

If your program is very large, then the PC Interface may run out of memory while attempting to create the database file used. If this condition occurs, you will need to exit the PC Interface and execute the program at the command prompt to create the files that are downloaded to the emulator.

Including RD64869 in a Make File

You may wish to incorporate the "RD64869" process as the last step in your "make" file, or as a step in your construction process, so as to eliminate the possibility of having to exit the PC Interface due to space limitations describe above. If the "-.HPA" and "-.HPS" files are not current, the process of loading an HP 64876 format file will automatically create them.

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