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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.

Edition 1 B3752-97000, July 1996
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Do Not Service or Adjust Alone

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

Do Not Substitute Parts or Modify Instrument

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Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

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Safety Symbols

General definitions of safety symbols used on equipment or in manuals are listed below.

Instruction manual symbol: The product is marked with this symbol when it is necessary for the user to refer to the instruction manual.

Alternating current.

Direct current.

On (Supply).

Off (Supply).

Frame (or chassis) terminal. A connection to the frame (chassis) of the equipment which normally include all exposed metal structures.
Warning

This Warning sign denotes a hazard. It calls your attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death to personnel.

Caution

This Caution sign denotes a hazard. It calls your attention to a procedure, practice, condition, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

Note

Note denotes important information. It calls attention to a procedure, practice, condition or the like, which is essential to highlight.
In This Book

The HP B3752A Debug User Interface, which is used with the HP E3471A Emulator, is a high-level language debugger for the Hitachi H8S/2000 Series.

This book describes processor-specific functions and usage of the HP B3752A Debug User Interface.

For common functions and usage of the HP Debug User Interface, refer to the HP Debug User Interface User’s Guide.

For installation of the HP Debug User Interface, refer to the HP Debug User Interface Installation Guide.

Note
Contents

1 Connecting the Target System

2 Configuring the Emulator

   Hardware Options 21
   Setting the Hardware Options 22
   Clock Source 23
   Restrict to Real Time 24
   Quick-Break Mode 25
   Respond to Target System NMI 25
   Respond to Target System Reset 26
   Break on Write to ROM 26
   Language Tool Type 27
   Processor Type 27
   Processor Operation Mode 28
   Stack Pointer Reset Value 28

   Memory Map 29
   Setting the Memory Map 31
   On-Chip ROM 32
   On-Chip RAM 33
   On-Chip Peripheral Module Registers 33

   Configuration Commands 34

3 Language Tools

   Hitachi Language Tools 39
   Command Options 39

   IAR Language Tools 41
   Command Options 41
 Contents

4 Emulation Status

5 Trace

Trace Clock Speed 49

Data and Status Conditions 50
Data Condition 50
Status Condition 51

6 Windows

Register Window 55
Peripheral Window 56

7 Restrictions and Limitations

Index
Connecting the Target System
Connecting the Target System

This chapter shows you how to connect the emulator to your target system.
To connect the HP E3471A Emulator and the target system, the **PGA adapter** (attached to the emulator product), the **QFP cable** and the **QFP socket/adapter** (attached to the QFP cable product) are used.

**Caution**

To prevent the emulator and the target system from being damaged, be sure to follow the cautions below when handling them.

- **To prevent damage by static discharge, use the emulator in a place resistant to static electricity.**
- **Be sure to turn off the emulator and the target system before connecting them.**
- **Be sure that orientation of each connector is right.**
- **Check that the ground line of the emulator and that of the target system are properly connected.**
- **When turning the system on, switch on the target system first and then the emulator.**
- **When turning the system off, switch off the emulator first then the target system.**
The **PGA adapter** is a board assembly to adapt ribbon cables of the emulator to the QFP cable. The **QFP cable** is a cable assembly to connect the PGA adapter to the QFP socket/adapter on the target system. Use one of the following QFP cables.

**Table 1-1. Supported Processors of Each QFP Cable**

<table>
<thead>
<tr>
<th>Processor</th>
<th>Package (Pitch)</th>
<th>QFP Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>H8S/2653/55</td>
<td>TQFP-120 (.4 mm)</td>
<td>HP E3471B</td>
</tr>
<tr>
<td>H8S/2653/55</td>
<td>QFP-128 (.5 mm)</td>
<td>HP E3471C</td>
</tr>
<tr>
<td>H8S/2241/42/45/46</td>
<td>QFP/TQFP-100 (.5 mm)</td>
<td>HP E3471D</td>
</tr>
</tbody>
</table>

The **QFP socket/adapter** is a part to adapt the QFP adapter or the QFP cable to the target system. You must solder this part to your target system. The QFP socket/adapter can be used as a "socket" to mount a real processor. The following QFP socket/adapters are provided.

**Table 1-2. QFP Socket/Adapters**

<table>
<thead>
<tr>
<th>Processor</th>
<th>Package (Pitch)</th>
<th>QFP Socket/Adapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>H8S/2653/55</td>
<td>TQFP-120 (.4 mm)</td>
<td>HP E3471-61620</td>
</tr>
<tr>
<td>H8S/2653/55</td>
<td>QFP-128 (.5 mm)</td>
<td>HP E3471-61621</td>
</tr>
<tr>
<td>H8S/2241/42/45/46</td>
<td>QFP/TQFP-100 (.5 mm)</td>
<td>HP E3471-61622</td>
</tr>
</tbody>
</table>

**NOTE**

To mount a real processor on the QFP socket/adapter HP E3471-61621, the **socket-cap HP E3471-61631** is required.
To connect the emulator and the target system,

1. Verify both the emulator and the target system are turned off.

2. Solder the QFP socket/adapter to the target system.

3. Attach ribbon cables of the emulator to the PGA adapter.

4. Attach the QFP cable to the PGA adapter.

5. Align pin #1 of the QFP cable and the QFP socket/adapter, then fix them with four screws.

6. Turn on the target system and then the emulator.

**Caution**

Do not apply excessive force to the QFP cable. It may cause damage to the QFP cable, the QFP socket/adapter and the target system.

**Figure 1-1. Connecting the Target System**
Note
Configuring the Emulator
Configuring the Emulator

This chapter shows you how to set the following items to configure the emulator.

- Hardware Options
- Memory Map
Hardware Options

The emulator can be configured to suit developments of various target systems and user programs by setting the hardware options. The HP E3471A Emulator has the following hardware options.

- Clock Source
- Restrict to Real Time
- Quick-Break Mode
- Respond to Target System NMI
- Respond to Target System Reset
- Break on Write to ROM
- Language Tool Type
- Processor Type
- Processor Operation Mode
- Stack Pointer Reset Value

Note
When using the analyzer boards HP 64703/04A, setting the trace clock speed is also required.
Refer to "Trace Clock Speed" in Chapter 5.
Setting the Hardware Options

To set the hardware options,

1. Choose Settings→Configuration→Hardware... (Alt, S, C, H) from the control menu of the Debug window.

2. Set the hardware options using the Emulator Configuration dialog box.

3. Click the OK button.

**Note**

In the Emulator Configuration dialog box, the option button checked means **Yes**, the option button not checked means **No**.

**Note**

Setting the hardware options will drive the emulator into a reset state.

![Emulator Configuration Dialog Box](image)

**Figure 2-1. Emulator Configuration Dialog Box**
Clock Source

This option allows you to select whether the processor's clock is sourced by the emulator's internal clock or by the target system.

Internal

The processor's clock is sourced by the internal clock.

Select this setting when the emulator is not connected to the target system.

The internal clock speed is 10 MHz.

External

The processor's clock is sourced by the target system.

Select this setting when the emulator is connected to the target system.

When using the card cage HP 64700B, usable clock speed is 32 kHz to 25 MHz. When using the HP 64700A, the minimum speed is limited to 2 MHz. When the emulator is connected to a low voltage target system, the maximum speed is limited to 13 MHz.
Restrict to Real Time

The emulator has to break to the monitor to access processor registers and target memory. While running the user program, this break is done implicitly and called "temporary break".

With temporary breaks, the user program cannot be executed in real time. This may cause unexpected result if your target system circuitry is dependent on constant execution time of the program code.

This option allows you to select whether the emulator is restricted to real-time runs.

Yes

The emulator is restricted to real-time runs.

While running the user program, all commands that cause a temporary break are refused. The user program is guaranteed to be executed in real time.

Commands to display/modify registers and target memory are not allowed when the emulator is running the user program. However, you can still execute the run control commands such as reset, break, run, step.

No

The emulator is not restricted to real-time runs.

All commands, regardless of whether or not they require a break to the monitor, are accepted by the emulator.
Quick-Break Mode
This option allows you to select whether the emulator does "quick" temporary break to access processor registers and target memory while running the user program.

Yes  The emulator does quick temporary break.
In this setting, at 20 MHz clock speed, the time spent in the monitor during a quick break to display registers, is about 200 microseconds.
The emulator responds to no interrupts while running the monitor. This setting may solve problems caused by slower interrupt response time.

No  The emulator does not do quick temporary break.
In this setting, a temporarily break to display registers will take about 3 milliseconds.

Respond to Target System NMI
This option allows you to select whether the emulator responds to the NMI signal from the target system.

Yes  The emulator responds to the NMI signal from the target system.
While running the user program, the emulator starts an NMI exception process if the NMI signal is asserted. While running the monitor, the emulator suspends an NMI request; the request will be serviced upon return to the user program.

No  The emulator always ignores the NMI signal from the target system.

Note
Regardless of this option setting, while running the monitor, the emulator responds to no interrupts including NMI.
The emulator suspends interrupt requests while running the monitor; the requests will be serviced upon return to the user program.
Respond to Target System Reset
This option allows you to select whether the emulator responds to the RES and STBY signals from the target system.

Yes The emulator responds to the RES and STBY signals from the target system.
While running the user program, the emulator enters a reset state if the RES or STBY signal is asserted.
While running the monitor, the RES and STBY signals are ignored.

No The emulator always ignores the RES and STBY signals.

Note The emulator does not support hardware standby mode.
The STBY signal from the target system is connected to the reset signal in the emulator. So, if the STBY input is asserted, the emulator enters a reset state instead of hardware standby mode.

Note Regardless of this option setting, while running the monitor, the RES and STBY signals are ignored.

Note The emulator cannot break to the monitor during a reset state by the target system.

Break on Write to ROM
This option allows you to select whether the emulator breaks to the monitor when the user program writes to the on-chip ROM or a memory area mapped as ROM.

Yes The emulator breaks to the monitor when the user program writes to the on-chip ROM or a memory area mapped as ROM.

No The emulator does not break to the monitor upon a write to ROM.
Language Tool Type
This option allows you to specify language tools which is used to create the user program.

**Hitachi**  The user program created with the Hitachi language tools can be debugged.

**IAR**     The user program created with the IAR language tools can be debugged.

**Note** When using the IAR language tools, the following commands cannot be used.
- Display a back trace.
- Return to a caller routine.

Processor Type
This option allows you to select the emulation processor.

**H8S/2653**  The emulator emulates the H8S/2653.

**H8S/2655**  The emulator emulates the H8S/2655.

**H8S/2241**  The emulator emulates the H8S/2241.

**H8S/2242**  The emulator emulates the H8S/2242.

**H8S/2245**  The emulator emulates the H8S/2245.

**H8S/2246**  The emulator emulates the H8S/2246.
**Processor Operation Mode**
This option allows you to select the processor operation mode.

- **Mode_1** The emulator operates in mode 1.
- **Mode_2** The emulator operates in mode 2.
- **Mode_3** The emulator operates in mode 3.
- **Mode_4** The emulator operates in mode 4.
- **Mode_5** The emulator operates in mode 5.
- **Mode_6** The emulator operates in mode 6.
- **Mode_7** The emulator operates in mode 7.

---

**Note**
The emulator ignores the MD2 to MD0 inputs, and uses this option setting instead.

**Stack Pointer Reset Value**
This option allows you to specify the value that the stack pointer (SP, ER7) is set to when the monitor is entered after emulation reset.
The stack pointer must be set to a 32-bit even address. Normally, specify the default value of the user program.
Memory Map

The HP E3471A Emulator memory mapper allows you to define up to 16 different map terms. The minimum size of each map term is 1k bytes. You can specify one of the following memory types to each map term.

- **eram**: Emulation RAM.
  - This area operates as read/write emulation memory.

- **erom**: Emulation ROM.
  - This area operates as read only emulation memory. When the user program writes to this area, the data is not written. And, you can configure the emulator to break to the monitor at an attempted write to this area.

- **tram**: Target RAM.
  - This area operates as read/write target memory.

- **trom**: Target ROM.
  - This area operates as read only target memory. You can configure the emulator to break to the monitor when the user program writes to this area.

- **grd**: Guarded memory.
  - This area operates as an access-prohibited area. When the user program attempts to access to this area, the emulator breaks to the monitor. Access with emulator commands are also prohibited.

The memory type of other area (area of no map terms defined) can be defaulted to **tram**, **trom** or **grd**.
Chapter 2: Configuring the Emulator

**Memory Map**

**Note**
The emulation memory cannot operate as a burst ROM accessed in one clock burst cycle. Do not map the emulation memory to the one-clock burst ROM space.

**Note**
The emulation memory cannot be accessed through the write data buffer. Do not enable the write data buffer when the emulation memory is used.

**Note**
The target system cannot perform direct memory access to the emulation memory.

**Note**
The DMA controller (DMAC) cannot perform single address transfer to the emulation memory.

![Figure 2-2. Memory Map Dialog Box](image)

Figure 2-2. Memory Map Dialog Box
Setting the Memory Map

To set the memory map,

1 Choose Settings→Configuration→Memory Map... (Alt, S, C, M) from the control menu of the Debug window.

2 Set the memory map using the Memory Map dialog box.

- **Setting a map term**
  1. Specify an area to the Address Range text box.
  2. Select a memory type in the Attribute option box.
  3. Click the Apply button.

- **Deleting a map term**
  1. Select a map term in the Map Term list box.
  2. Click the Delete button.

- **Deleting all map terms**
  1. Click the Del.All button.

- **Setting a memory type of other area**
  1. Select a memory type in the Other option box.

3 Click the Close button.

**Note** Setting the memory map will drive the emulator into a reset state.
On-Chip ROM

The emulator has a substitute memory for the on-chip ROM. The on-chip ROM is assigned automatically to this memory regardless of the memory map settings. You don't have to map this area.

If you define a map term of this area, the map term is handled as that for external address space overlapped with the on-chip ROM.

When the user program writes to the on-chip ROM, the data is not written. And, you can configure the emulator to break to the monitor at an attempted write to this area.

Note

When the on-chip ROM is greater than 64k bytes, pay attention to the external address enable bit (EAE) of the bus control register L (BCRL).

For example, in case of H8S/2655, the initial value of EAE is 1. The memory area 10000H to 1FFFFH is assigned to external address space or a reserved area, not to the on-chip ROM. Emulator commands always handle this area as the on-chip ROM regardless of the EAE setting. However, the user program accesses this area in compliance with the EAE setting.

In other words, when EAE is set to 1, you can load a program into the on-chip ROM. However, when the program is executed from the memory area 10000H to 1FFFFH, instructions will be fetched from external address space or a reserved area, not from the on-chip ROM. In this case, you have to set EAE to 0 before starting program execution.

Note

The external address space overlapped with the on-chip ROM can be accessed by the user program, but cannot be accessed by emulator commands.

Note

Do not map the on-chip ROM area as guarded memory. Access with emulator commands will be prohibited.
On-Chip RAM
The emulator has a substitute memory for the on-chip RAM. The on-chip RAM is assigned automatically to this memory regardless of the memory map settings. You don’t have to map this area. If you define a map term of this area, the map term is handled as that for external address space overlapped with the on-chip RAM.

Note
Do not map the on-chip RAM area as guarded memory. Access with emulator commands will be prohibited.

On-Chip Peripheral Module Registers
The on-chip peripheral module registers work as the on-chip peripheral module registers regardless of the memory map settings. You don’t have to map this area.

Note
Do not map the on-chip peripheral module register area as guarded memory. Access with emulator commands will be prohibited.
Configuration Commands

You can also configure the emulator by configuration files or command files. The HP B3752A Debug User Interface has the following configuration commands. Case is not significant in both commands and parameters.

The hardware option commands and the memory map commands must be placed between its own start and end commands.

<table>
<thead>
<tr>
<th>Command</th>
<th>Parameter 1</th>
<th>Parameter 2</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>config</td>
<td>start</td>
<td></td>
<td>Start of Hardware Option Commands</td>
</tr>
<tr>
<td>config</td>
<td>clk</td>
<td>internal</td>
<td>external</td>
</tr>
<tr>
<td>config</td>
<td>rrt</td>
<td>enable</td>
<td>disable</td>
</tr>
<tr>
<td>config</td>
<td>qbrk</td>
<td>enable</td>
<td>disable</td>
</tr>
<tr>
<td>config</td>
<td>nmi</td>
<td>enable</td>
<td>disable</td>
</tr>
<tr>
<td>config</td>
<td>trst</td>
<td>enable</td>
<td>disable</td>
</tr>
<tr>
<td>config</td>
<td>rmbreak</td>
<td>enable</td>
<td>disable</td>
</tr>
<tr>
<td>config</td>
<td>language</td>
<td>Hitachi</td>
<td>IAR</td>
</tr>
<tr>
<td>config</td>
<td>chip</td>
<td>&lt;processor type&gt;</td>
<td>Processor Type</td>
</tr>
<tr>
<td>config</td>
<td>mode</td>
<td>&lt;mode number&gt;</td>
<td>Processor Operation Mode</td>
</tr>
<tr>
<td>config</td>
<td>ramp</td>
<td>&lt;sp value&gt;</td>
<td>Stack Pointer Reset Value</td>
</tr>
<tr>
<td>config</td>
<td>end</td>
<td></td>
<td>End of Hardware Option Commands</td>
</tr>
<tr>
<td>map</td>
<td>start</td>
<td></td>
<td>Start of Memory Map Commands</td>
</tr>
<tr>
<td>map</td>
<td>&lt;map range&gt;</td>
<td>&lt;memory type&gt;</td>
<td>Setting Map Term</td>
</tr>
<tr>
<td>map</td>
<td>other</td>
<td>&lt;memory type&gt;</td>
<td>Setting Memory Type of Other Area</td>
</tr>
<tr>
<td>map</td>
<td>end</td>
<td></td>
<td>End of Memory Map Commands</td>
</tr>
</tbody>
</table>

enable | disable Specify enable when Yes, disable when No.

<processor type> Specify one of the following emulation processors.
- H8S/2653
- H8S/2655
- H8S/2241
- H8S/2242
- H8S/2245
- H8S/2246

<mode number> Specify a number from 1 to 7 for the processor operation mode.
Specify a 32-bit even address except the on-chip peripheral module register area. Normally, specify the default value of the user program.

Specify an area to be mapped.

**Format:** `<start address>..<end address>`

Specify one of the following memory types.

- eram
- erom
- tram
- trom
- grd

For a memory type of other area, eram and erom cannot be specified.

```plaintext
# Configuration File
# Hardware Options
config start
config chip H8/2245
config clk internal
config mode 6
config nmi enable
config qbrk enable
config rrt disable
config rsp 0fffffc00
config trst enable
config rombreak enable
config language IAR
config end

# Memory Map
map start
map 0400000..040ffff eram
map 0600000..063ffff trom
map 0a00000..0bfffff grd
map other tram
map end
```

Figure 2-3. Configuration File Example
Note
Language Tools
Language Tools

This chapter describes language tools which can be used with the HP B3752A Debug User Interface.
Hitachi Language Tools

The HP B3752A Debug User Interface can debug user programs created with the following Hitachi language tools.

<table>
<thead>
<tr>
<th>Tool</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C Compiler</td>
<td>ch38</td>
<td>H8S, H8/300 Series C Compiler</td>
</tr>
<tr>
<td>Assembler</td>
<td>asm38</td>
<td>H8S, H8/300 Series Cross Assembler</td>
</tr>
<tr>
<td>Linker</td>
<td>lnk</td>
<td>H Series Linkage Editor</td>
</tr>
</tbody>
</table>

For version numbers of language tools supported by the HP B3752A Debug User Interface, contact your nearest HP support office.

Command Options

This section describes important command options when using the Hitachi language tools.

C Compiler

-debug

Generates debug information.

You must always specify this option. Modules without debug information cannot be debugged.

-optimize=<level>

Specifies an optimization level. When 1 is specified, it performs optimizations. When 0 is specified, it performs no optimizations.
The following functions do not work correctly with optimized modules.
- Display a back trace.
- Return to a caller routine.
- Display and modify a variable located on a stack area.

If you need above functions, specify an optimization level 0.

**Assembler**

- **-debug**
  Generates debug information.
  You must always specify this option. Modules without debug information cannot be debugged.

**Linker**

- **-debug**
  Generates debug information.
  You must always specify this option. Programs without debug information cannot be debugged.
IAR Language Tools

The HP B3752A Debug User Interface can debug user programs created with the following IAR language tools.

<table>
<thead>
<tr>
<th>Tool</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C Compiler</td>
<td>icch8</td>
<td>IAR H8 C-Compiler</td>
</tr>
<tr>
<td>Assembler</td>
<td>ah8</td>
<td>IAR H8 Assembler</td>
</tr>
<tr>
<td>Linker</td>
<td>xlink</td>
<td>IAR Universal Linker</td>
</tr>
<tr>
<td>Converter</td>
<td>iar2ieee</td>
<td>UBROF to IEEE-695 Converter</td>
</tr>
</tbody>
</table>

The converter is not required when using the linker which can generate the IEEE-695 format.

For version numbers of language tools supported by the HP B3752A Debug User Interface, contact your nearest HP support office.

**Note**

When using the IAR language tools, the following commands cannot be used.
- Display a back trace.
- Return to a caller routine.

**Command Options**

This section describes important command options when using the IAR language tools.

**C Compiler**

- `-r` Generates debug information.
  You must always specify this option. Modules without debug information cannot be debugged.

- `-s <level>` Specifies a speed optimization level in 0 to 9. Modules which are optimized at level 7 or higher cannot be debugged.
-z <level> Specifies a speed optimization level in 0 to 9. Modules which are optimized at level 7 or higher cannot be debugged.

Assembler

-r Generates debug information. You must always specify this option. Modules without debug information cannot be debugged.

Linker

-F <format> Specifies an output file format. When debug is specified, it generates the UBROF format. When ieee695 is specified, it generates the IEEE-695 format. When the linker cannot generate the IEEE-695 format, you must convert the output file from the UBROF format to the IEEE-695 format by the converter.

Converter

No command options are required.
Emulation Status
Emulation Status

This chapter describes the emulation status messages which are displayed in the Debug window.
An emulation status message is displayed in the Debug window. The HP B3752A Debug User Interface has the following emulation status messages.

- **Emulation reset**
  The emulator is resetting the processor.
  Emulation reset is always power-on reset.

- **Running in monitor**
  The emulator is executing the monitor.

- **Running user program**
  The emulator is executing the user program.

- **Awaiting target reset**
  The emulator is awaiting a reset signal from the target system.
  When a "run from reset" command is executed, the emulator enters this state. During this state, the emulator cannot break to the monitor.

- **Target reset**
  The target system is resetting the processor.
  When the emulator accepts the RES or STBY signal from the target system while running the user program, the emulator enters this state. During this state, the emulator cannot break to the monitor.

  **Note**
  The emulator does not support hardware standby mode.
  The STBY signal from the target system is connected to the reset signal in the emulator. So, if the STBY input is asserted, the emulator enters a reset state instead of hardware standby mode.

- **Bus grant**
  A bus-released state.
  When the emulator accepts the BREQ signal from the target system, the emulator enters this state.
Chapter 4: Emulation Status

- **Sleep or standby**
  Sleep or software standby mode.
  
  Sleep and software standby modes are cleared when the emulator breaks to the monitor. When entering the monitor, the program counter (PC) points to the next instruction from the SLEEP instruction.

- **Slow clock**
  The processor's clock is abnormally slow or stopped.
  
  When setting a hardware option to use the processor's clock sourced by the target system, turning off the target system or a broken-down clock on the target system may cause this state.

- **No bus cycles**
  A state with no bus cycles.
  
  The WAIT signal from the target system may cause this state.

- **Unknown state**
  An abnormal state.

![Debug Window](image)

**Figure 4-1. Debug Window**
Trace
Trace

This chapter describes trace functions specific to the HP B3752A Debug User Interface.
Trace Clock Speed

When using the analyzer boards HP 64703/04A, setting the trace clock speed is required. The analysis capability of time and state count depends on this setting. To set the trace clock speed, choose Settings→Trace Clock Speed→ (Alt, S, S,) from the control menu of the Trace window.

**Very Fast (V)** Select this setting when the processor’s clock speed is greater than 20 MHz.

Neither state nor time counting is available.

**Fast (F)** Select this setting when the processor’s clock speed is between 16.6 MHz and 20 MHz.

Only state counting is available.

**Slow (S)** Select this setting when the processor’s clock speed is less than or equal to 16.6 MHz.

Both state and time counting are available.

The analyzer boards HP 64794A/C/D have no trace clock speed setting.
Data and Status Conditions

This section describes the data and status conditions in the following dialog boxes of the HP B3752A Debug User Interface.

- Trace Trigger Store Condition dialog box.
- Trace Pattern dialog box of sequential trace.

**Data Condition**

The data bus to the emulation analyzer is 16-bit width. Access size and address influence whether upper or lower byte data is valid.

- A word access is traced as one word access regardless of the bus width. Therefore, when accessing in word, both upper and lower byte data are always valid.
- When accessing in byte, only upper byte data is valid at an even address. Only lower byte data is valid at an odd address.
- A longword access is divided into two word accesses.

**Note**

The analyzer captures memory cycles of single address transfer by the DMA controller (DMAC). However, the data value of this memory cycles cannot be captured, and will be an unknown value.

**Note**

The data transfer controller (DTC) is connected to the on-chip RAM with a 32-bit data bus. The analyzer captures memory cycles through this data bus as one word access. Only lower word data is captured. Upper word data cannot be captured.
Use "x" for invalid byte data to set the data condition as examples shown in the following table.

### Table 5-1. Data Condition Settings

<table>
<thead>
<tr>
<th>Access Size</th>
<th>Address</th>
<th>Upper Byte</th>
<th>Lower byte</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Byte</td>
<td>Even</td>
<td>Valid</td>
<td>-</td>
<td>0a5xx</td>
</tr>
<tr>
<td></td>
<td>Odd</td>
<td>-</td>
<td>Valid</td>
<td>0xx5a</td>
</tr>
<tr>
<td>Word</td>
<td>Even</td>
<td>Valid</td>
<td>Valid</td>
<td>0a55a</td>
</tr>
</tbody>
</table>

**Status Condition**

You can specify the following items as the status condition.

- **fetch** Instruction fetch cycle.
- **data** Data access cycle.
- **read** Read cycle.
- **write** Write cycle.
- **io** Access cycle to the on-chip peripheral module register area.
- **byte** Byte access cycle.
- **word** Word access cycle.
  A longword access is divided into two word accesses.
  A longword access and a word access cannot be distinguished from each other.
- **cpu** CPU cycle.
- **dma** DMA controller (DMAC) cycle.
- **dtc** Data transfer controller (DTC) cycle.
- **intack** Interrupt acknowledge cycle.
  When entering sleep or software standby mode, an
interrupt acknowledge cycle happens. However, this cycle does not happen at interrupts to clear those modes. When the emulator breaks to the monitor, an interrupt acknowledge cycle may also happen.

**wrrom**
Write cycle to the on-chip ROM or an area mapped as ROM.

**grd**
Access cycle to an area mapped as guarded memory.

Figure 5-1. Trace Pattern Dialog Box
Windows
Windows

This chapter describes windows specific to the HP B3752A Debug User Interface.
Register Window

In the Register window of the HP B3752A Debug User Interface, the internal registers of the CPU can be displayed and modified.

- Program Counter (PC)
- Condition-Code Register (CCR)
- Extended Control Register (EXR)
- General Registers (ER0 to ER7)
- Stack Pointer (SP)
- Multiply-Accumulate Registers (MACH, MACL)
- Mode Control Register (MDCR)

![Figure 6-1. Register Window](image)
Peripheral Window

In the Peripheral window of the HP B3752A Debug User Interface, all registers of the following on-chip peripheral modules can be displayed and modified.

- System Control Registers
- Interrupt Controller
- Bus Controller
- DMA Controller (DMAC)
- Data Transfer Controller (DTC)
- I/O Ports
- 16-Bit Timer Pulse Unit (TPU)
- Programmable Pulse Generator (PPG)
- 8-Bit Timer
- Watchdog Timer (WDT)
- Serial Communication Interface (SCI)
- A/D Converter
- D/A Converter

Figure 6-2. Peripheral Window
Restrictions and Limitations
Restrictions and Limitations

This chapter describes restrictions and limitations.
The HP B3752A Debug User Interface and the HP E3471A Emulator have the following restrictions and limitations.

- **IAR Language Tools**
  
  When using the IAR language tools, the following commands cannot be used.
  
  - Display a back trace.
  - Return to a caller routine.

- **Burst ROM**
  
  The emulation memory cannot operate as a burst ROM accessed in one clock burst cycle. Do not map the emulation memory to the one-clock burst ROM space.

- **Write Data Buffer**
  
  The emulation memory cannot be accessed through the write data buffer. Do not enable the write data buffer when the emulation memory is used.

- **Direct Memory Access**
  
  The target system cannot perform direct memory access to the emulation memory.

- **Single Address Transfer**
  
  The DMA controller (DMAC) cannot perform single address transfer to the emulation memory.

  The analyzer captures memory cycles of single address transfer. However, the data value of this memory cycles cannot be captured, and will be an unknown value.

- **Reset and Standby**
  
  While running the monitor, the RES and STBY signals from the target system are ignored.
Chapter 7: Restrictions and Limitations

- **Interrupts**
  While running the monitor, the emulator responds to no interrupts.
  
The emulator suspends interrupt requests in the monitor; the requests will be serviced upon return to the user program.

- **Data Transfer Controller**
  The data transfer controller (DTC) is connected to the on-chip RAM with a 32-bit data bus. The analyzer captures memory cycles through this data bus as one word access. Only lower word data is captured. Upper word data cannot be captured.

- **Watchdog Timer**
  When entering the monitor, the watchdog timer (WDT) stops counting regardless of its mode, watchdog or interval. And, it resumes counting upon return to the user program.

- **Sleep and Software Standby Modes**
  Sleep and software standby modes are cleared when the emulator breaks to the monitor.

  When entering the monitor, the program counter (PC) points to the next of the SLEEP instruction.

- **Hardware Standby Mode**
  The emulator does not support hardware standby mode.

  The STBY signal from the target system is connected to the reset signal in the emulator. So, if the STBY input is asserted, the emulator enters a reset state instead of hardware standby mode.
# Index

<table>
<thead>
<tr>
<th>Letter</th>
<th>Term</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>analyzer board</td>
<td>49</td>
</tr>
</tbody>
</table>
| B      | background cycles | 34  
burst ROM | 30, 59 |
| C      | clock | 23, 34, 46, 49  
command file | 34-36  
configuration | 20  
commands | 34-36  
file | 34-36 |
| D      | data condition | 50-52  
data transfer controller (DTC) | 50-51, 60  
dialog box |  
Emulator Configuration dialog box | 22  
Memory Map dialog box | 31  
Trace Pattern dialog box | 50  
Trace Trigger Store Condition dialog box | 50 |
|        | direct memory access | 30, 59  
DMA controller (DMAC) | 30, 50-51, 56, 59 |
| E      | emulation memory | 29-30, 59  
emulation status | 44-45 |
| G      | guarded memory | 29, 32-33, 52 |
| H      | hardware options | 21-28  
commands | 34  
hardware standby mode | 26, 45, 60 |
| I      | interrupts | 25, 52, 60 |
| L      | language tools | 27, 34, 38  
Hitachi language tools | 27, 39-40  
IAR language tools | 27, 41-42, 59  
low voltage PGA adapter | 23 |
Index

M  map term, 29-34
    memory map, 29-33
    commands, 34
    memory type, 29-35

O  on-chip peripheral module registers, 33, 51, 56
    bus control register L (BCRL), 32
    on-chip RAM, 33, 50, 60
    on-chip ROM, 32
    operation mode, 28, 34-35

P  program counter (PC), 46, 55, 60

Q  quick break, 25

R  real time, 24, 34

S  sequencial trace, 50
    signal
        BREQ, 34, 45
        MD2 to MD0, 28
        NMI, 25
        RES, 26, 45, 59
        STBY, 26, 45, 59-60
        WAIT, 46
    single address transfer, 30, 50, 59
    sleep mode, 46, 52, 60
    software standby mode, 46, 52, 60
    stack pointer (SP, ER7), 28, 34-35, 55
    status condition, 50-52

T  trace, 48, 50-52
    clock speed, 49
    count, 49

W  watchdog timer (WDT), 56, 60
    window
        Debug window, 22, 31, 45-46
        Peripheral window, 56
        Register window, 55
    write data buffer, 30, 59
    write to ROM, 26, 29, 32, 34