COMPAQ

Alpha Microprocessors Motherboard Debug Monitor

User's Guide

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Contents

Preface

1 Introduction

2 Getting Started

3 Remote Debugging

4 User Commands

A Support

Index

Figures

Tables

Preface

Introduction

This document describes the software features of an Alpha microprocessor motherboard. The motherboard software is intended to provide software monitor and debug capabilities to customers who use an Alpha microprocessor motherboard as a development platform for creating their own Alpha microprocessor-based systems.

Audience

This document is for anyone who develops software or hardware to be used with an Alpha microprocessor. The Alpha Microprocessors Motherboard Debug Monitor (Debug Monitor) supports the following products:

- Alpha 21264 Motherboard (AlphaPC 264DP)
- Alpha 21164 Motherboard (AlphaPC 164SX)
- Alpha 21164 Motherboard (AlphaPC 164LX)

Content Overview

The information in this document is organized as follows:

- Chapter 1 is an introduction to the Debug Monitor.
- Chapter 2 describes how to use this Debug Monitor.
- Chapter 3 describes how to use remote debugging.
- Chapter 4 lists all Debug Monitor commands.
- Appendix A contains information about customer support services and associated documentation.

Conventions

In this document, the term motherboard refers to the AlphaPC 264DP Motherboard, the AlphaPC 164SX Motherboard, and the AlphaPC 164LX Motherboard, unless otherwise noted.

The following conventions are used in this document:

Convention	**Definition**
A percent sign (%)	Indicates a Tru64 UNIX operating system command prompt.
A pound sign (#)	Indicates a Tru64 UNIX superuser prompt and indicates that these commands are performed from the root directory level.
Square brackets ([])	Denote optional syntax.
Boldface type	Indicates Debug Monitor command text.
DP264>	Indicates the motherboard command prompt.
Italic type	Emphasizes important information, indicates variables in command syntax, and denotes complete titles of documents.
`Monospaced type`	Indicates an operating system command, a file name, or a directory path name.

All numbers are decimal unless otherwise indicated. Where there is ambiguity, numbers other than decimal have a subscript indicating their base.

1

Introduction

1.1 Overview

The Alpha Microprocessors Motherboard Debug Monitor can be used to load code into the system and perform other software debug functions, such as memory read/write and instruction breakpointing. You can develop your code on a host system and load the software into the motherboard through a serial port, Ethernet port, user-supplied floppy drive, or the extra ROM socket. The full source code is provided with a free license, allowing you to use and modify this code as you desire.

1.2 General Features

The Debug Monitor offers the ability to:

- Download files via serial and Ethernet ports, ROM socket, and user-supplied floppy drive.
- Examine and deposit the motherboard system register, CPU internal processor registers (IPRs), and I/O mapped registers.
- Examine and modify DRAM and I/O mapped memory.
- Disassemble CPU instructions in memory.
- Transfer control to programs loaded into memory.
- Perform native debugging, including breakpoints and single stepping.
- Perform full source-level debugging using the DIGITAL Ladebug debugger (Ladebug) for Tru64 UNIX running on a remote host that communicates through an Ethernet connection.

1.3 Recommended Host System

The recommended host system for software development is an Alpha system running the Windows NT or Tru64 UNIX operating systems. Alpha hardware is the platform upon which the initial set of portable development tools is provided. The native Tru64 UNIX and Windows NT software development tools are used in conjunction with the portable tools.

The Tru64 UNIX operating system also supports the bootstrap protocol (BOOTP) for downloading executable images to the motherboard and Ladebug for remote debugging. The examples in this manual that pertain to a host system are based on Alpha hardware running the Tru64 UNIX operating system.

2

Getting Started

2.1 Overview

This chapter describes how to set up your motherboard and host system.

2.2 System Requirements

The minimum configuration that you need in order to use your motherboard is a power supply and a terminal. However, to take full advantage of the motherboard, you need an Alpha host development system running the Windows NT or Tru64 UNIX operating systems.

2.3 Configuring Your System

This section describes how to connect your motherboard to the following:

- A terminal
- A PC running communication software
- A system running Windows NT
- An Alpha system running Tru64 UNIX

You need to provide a power supply for the motherboard. See your motherboard's user's manual for more information about requirements for your power supply.

2.3.1 Connecting to a Terminal

To connect the motherboard to a terminal, connect the terminal communication line to serial port 1 of the motherboard. Your terminal should be set to match the baud rate of the motherboard. The most current and reliable source for this information is your motherboard's user manual.

After the terminal and the motherboard are connected and the motherboard is powered on, the terminal screen should display the banner and prompt. For example:

```
DECchip 21264 (DP264) Debug Monitor
 Version:   Tue May 04 16:55:54 EDT 1999
 Bootadr: 0x100000,  memSize:  0x2000000 (32MB)

DP264>
```

Note: Using a terminal in this manner is the most effective way to quickly verify that your motherboard was not damaged during shipping. You can use the onboard ROM to load and boot software through a compatible ROM. However, to download a file, you need a system running terminal emulation software that has the capability of performing text dumps through the serial connection or through an Ethernet connection to a host system that supports the BOOTP protocol.

2.3.2 Connecting to a PC

Communication (terminal emulation) software running on a PC can also be used to communicate with the motherboard. To connect the motherboard to a PC, connect the terminal communication line to serial port 1 of the motherboard as described for the terminal.

2.3.3 Connecting from a System Running Windows NT

A system running the Windows NT operating system supports serial communication with the motherboard. To configure a COM port, follow these steps:

1. Choose the `Program Manager` icon.
2. Choose the `Accessories` icon.
3. Choose the `Terminal` icon.
4. Set the following terminal characteristics:

Terminal Setting	**Value**
Data bits	8 bit
Transmit/receive speed	9600 baud
Character format	No parity
Stop bits	1

Save these settings in a file. For example, settings for the DP264 could be saved in a file called `dp264.trm`.

For consistency, all examples and command descriptions assume that the motherboard serial port 1 is connected to COM1.

2.3.4 Connecting from a System Running Tru64 UNIX

Tru64 UNIX supports serial communications and Ethernet communications with the motherboard.

An Alpha system running the Tru64 UNIX operating system supports serial communication through the following two ports that can be connected to the motherboard:

- /dev/tty00
- /dev/tty01

For consistency, all examples and command descriptions assume that the motherboard serial port 1 is connected to port /dev/tty00.

To enable these ports for use with the motherboard, follow these steps:

1. Log in as superuser.
2. Modify the following two files:

   ```
   /etc/remote
   /etc/inittab
   ```

   a. Add the following two lines to the `/etc/remote` file. These lines define a device to connect to when using the Tru64 UNIX `tip` command.

      ```
      port_name0:dv=/dev/tty00:br#9600:pa=none:
      port_name1:dv=/dev/tty01:br#9600:pa=none:
      ```

      The *port_name* refers to an arbitrary name that you assign to that port.

   b. Modify the `/etc/inittab` file to disable logins on the two serial communication ports by setting the third field to `off`. For example, modify the `tty00` and `tty01` lines as follows:

      ```
      tty00:23:off:/usr/sbin/getty /dev/tty00 9600
      tty01:23:off:/usr/sbin/getty /dev/tty01 9600
      ```

3. Reboot the system or issue the following command to ensure that the modified files take effect:

   ```
   # /sbin/init q
   ```

2.3.4.1 Connecting to a Serial Port

After you modify the `/etc/remote` and `/etc/inittab` files, you can connect to the serial port under the Tru64 UNIX operating system using the Tru64 UNIX `tip` command. If the connection is successful, the motherboard prompt displays, and you are ready to use the Debug Monitor **load** or **boot** commands to download your file. For example:

```
% tip port_name0
DP264>  load
Send File now ...
```

Type ~> to cause the Tru64 UNIX `tip` command to send the file to the motherboard.

2.3.4.2 Setting Up the Host System as a BOOTP Server

The bootstrap protocol (BOOTP) needs to be defined so that the commands **netload** and **netboot** work correctly. To set up a Tru64 UNIX system as a BOOTP server, follow these steps:

1. Modify the `/etc/inetd.conf` file. This file enables both the BOOTP and the TFTP daemons. The TFTP daemon is required by the BOOTP daemon.

   a. Add the following line to specify the directories that can be accessed by the TFTP daemon:

      ```
      tftp dgram udp wait root /usr/sbin/tftpd tftpd /directory1/directory2
      ```

      If no directory is specified, all files with public access can be accessed by the TFTP daemon.

   b. To start the BOOTP daemon, enter the following line:

      ```
      bootps dgram udp wait root /usr/sbin/bootpd bootpd -d -d -d
      ```

2. If BOOTP is already running on your system, you want to stop it. To stop BOOTP, enter the following commands:

   ```
   # ps uax | grep bootpd
   # kill -KILL process_id_number
   # ps uax | grep inetd
   # kill -HUP process_id_number
   ```

3. To restart BOOTP, enter the following command:

   ```
   # /sbin/init q
   ```

   The changes made to the `/etc/inetd.conf` file will now take effect.

4. Modify the `/etc/bootptab` file to specify the Ethernet hardware address of the motherboard and the IP address assigned to that node. Contact your network administrator to obtain an IP address. Refer to the literature supplied with your Ethernet card to obtain information about the hardware address. If the hardware address is accessible through software, you can use the **einit** command to display it. For example, the following lines modify this file for the DP264:

   ```
   remote_system_name0:ht=ethernet:ha=BA9876543210:ip=16.123.45.67:\
   :hd=/directory1:bf=filename:vm=auto:
   ```

   BOOTP checks this file to see if it has changed each time it receives a request. If it has changed, the new file is read. The *directory* and *filename* are the defaults for the **netload** and **netboot** commands. If no argument is specified with either command, the file loaded is `/directory1/filename`.

Verify the BOOTP Server

To verify that the BOOTP server has been set up properly, you can look at the `daemon.log` file. This file shows directories accessed for the **netload** or **netboot** commands.

```
# tail -f /var/adm/sylog.dated/dated_dir/daemon.log
```

The following example displays a boot request from an example daemon log file:

```
May 5 10:40:28 eval bootpd[328]:request from hardware address
BA9876543210

May 5 10:40:28 eval bootpd[328]:found: dp264 (BA9876543210) at
(16.123.45.67)

May 5 10:40:28 eval bootpd[328]:file /users/eval/boot/size.dp264
not found

May 5 10:40:28 eval bootpd[328]:vendor magic field is 0.0.0.0

May 5 10:40:28 eval bootpd[328]:sending RFC1048-style reply
```

You can refer to the Tru64 UNIX man pages for more information about `bootp`, `bootpd`, `tftp`, `tftpd`, `inet`, `inetd`, and `init`.

2.3.4.3 Setting Up the Host System as a Ladebug Client

The Debug Monitor supports remote debugging for Tru64 UNIX host systems with Ladebug. The Ladebug software does not accept numeric Internet addresses. You can give your motherboard an internet name in the `/etc/hosts` file. In the `/etc/hosts` file, the format is the Internet protocol (IP) address followed by the host system name. For example:

```
12.345.67.89     remote_system_name0
```

2.4 Installing the Debug Monitor Firmware

This section explains how to program the Debug Monitor firmware into a flash ROM on the motherboard by using the fail-safe booter. For more details about the fail-safe booter, see the user’s manual for your motherboard.

1. Put the Debug Monitor firmware on a floppy diskette.
2. Set the switch on the motherboard to the position which loads the fail-safe booter. See your motherboard’s user manual for this information.
3. Insert the floppy diskette into your system.
4. Reset the system.
5. Load the file from the floppy diskette into main memory by using the **flload** command:

```
DP264>flload dp264dbm.rom
```

6. The DP264> prompt displays. Enter the **flash** command:

```
DP264>flash
Image source address: 0×300000
Searching for Standard ROM image header: Found.
  Header Size......... 0×38 (56) bytes
  Image Checksum..... 0×ff4b (65355)
  Memory Image Size... 0×31300 (201472 = 196 KB)
  Compression Type ... 0
  Image Destination.. 0×0000000000300000
  Header Version.... 2
  Firmware ID....... 0 - Alpha Evaluation Board Debug Monitor
  ROM Image Size.... 0×31300 (201472 = 196 KB)
  Firmware ID (Opt.) .. 0301009810291137
  ROM offset......0×00000000
  Header Checksum..... 0×7ac1

Enter destination offset or press RETURN for default [0]: (Return)

Flash offset   : 0×0
Image size w/ header: 201528 (Block 0 to 3 inclusive).
```

```
    !!!!! Warning! About to overwrite flash memory !!!!!
          Press Y to proceed, any other key to abort.
Y
Writing Flash Block: 0V 1V 2V 3V...
```

7. The Debug Monitor is now in flash memory.

To restore the firmware:

1. Use the **flasherase** command to erase the Debug Monitor from flash memory:

   ```
   flasherase 0 3ffff
   ```

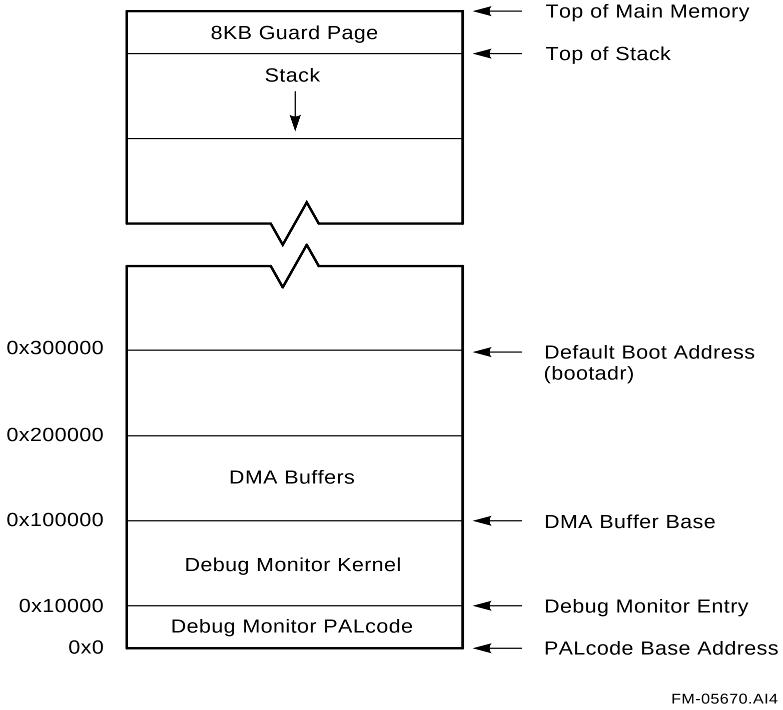
2. Run the normal update procedure described in your motherboard’s user’s manual by using the firmware update diskette supplied with your motherboard or downloading firmware from the Alpha OEM website described in Appendix A .

2.5 Debug Monitor Memory Map

The Debug Monitor image is loaded from the system ROM into memory at physical address 0 by the SROM initialization code. At startup, the Debug Monitor determines the amount of memory present in the motherboard based on parameters that are passed in from the SROM initialization code. One of these parameters determines the top of main memory. Refer to your motherboard’s user’s manual for more information about the SROM initialization code and supported memory configurations.

Figure 2–1 shows the basic outline for the Debug Monitor memory map.

Figure 2–1 Debug Monitor Memory Map



The Debug Monitor image consists of PALcode at physical address 0 and the Debug Monitor kernel at physical address 10000_{16}. After loading the image into memory, the SROM initialization code begins execution of the image in PALmode at the PALcode base address.

The PALcode used in the Debug Monitor was designed to support Tru64 UNIX and was later adapted to the Debug Monitor. Refer to the *Alpha Architecture Reference Manual* and the *PALcode for Alpha Microprocessors System Design Guide* for more information about Tru64 UNIX PALcode.

2.5.1 Stack

PALcode starts execution of the Debug Monitor kernel at physical address 10000_{16}. Upon entry to the Debug Monitor kernel, the Debug Monitor establishes the initial stack pointer at the first 8KB boundary below the top of main memory. From there the stack grows downward.

2.5.2 DMA Buffers

Various devices used with the motherboard require direct memory access (DMA). The device drivers provided in the Debug Monitor for these devices are designed to perform their DMA within a 1MB range starting at 1 megabyte (physical address 100000_{16}). At startup, the Debug Monitor initializes the I/O subsystem with DMA windows that include this range. The device drivers included with the Debug Monitor that require DMA are the Ethernet and diskette drivers. Although the **ebuff** command can be used to change the base of the Ethernet buffers, the buffers must remain within this 1MB window.

2.6 Downloading Files

The motherboard supports loading files into memory from a serial port, the Ethernet, and a diskette. The user can either load the file into memory, or load and execute the file in a single step. The following table shows the commands for the specific I/O devices. See Chapter 4 for more details about these commands.

I/O Device	Use this command to load into memory...	Use this command to load into memory and execute...
ROM socket	romload	romboot
Serial port	load	boot
Ethernet	netload	netboot
Diskette	flload	flboot

The default boot address (bootadr) is 300000_{16}. However, you can change the default boot address with the **bootadr** command. The new setting is then stored in the battery-backed RAM.

2.7 Execution Commands

After your program is loaded, you are ready to execute it. If the command loads and executes a program, you may want to re-execute the program during the motherboard session. The Debug Monitor has two commands to execute programs: **go** and **jtopal**. See Chapter 4 for more details about these commands.

2.8 Resetting the Debug Monitor

If the software hangs the motherboard, then the hardware reset on the board can be used to reset to the Debug Monitor command line. For information about connecting the reset signals, see your motherboard's user's manual.

3

Remote Debugging

The Debug Monitor supports remote debugging for Tru64 UNIX host systems with Ladebug. The Ladebug software provides the full source-level debugging capabilities of most programs that run on the motherboard, including the Debug Monitor.

This chapter describes some debugging hints to use with the Debug Monitor and the remote debugger. This chapter also describes the guidelines for writing programs that allow you to take full advantage of remote debugging.

3.1 What Is a Debugger?

A debugger is a tool that helps you locate run-time programming errors or bugs. You use the debugger on executable programs created when a program has been compiled and linked successfully.

3.2 What Is a Remote Debugger?

A remote debugger is a tool that helps you locate run-time programming errors or bugs in a program running on a remote system. The remote system can be a system that cannot support a full programming environment by itself. You use a remote debugger on executable programs compiled and linked for the remote system.

3.3 Remote Debug Server

The Debug Monitor’s remote debug server (the part of the monitor that communicates with Ladebug) uses interrupts and an Ethernet device. Interrupts are used by the Debug Monitor to poll the Ethernet device for messages from Ladebug. Any program that changes the interrupt handler must instruct the debug server when to poll the Ethernet.

3.4 Programming Guidelines

The following sections describe the programming guidelines for remote debugging.

3.4.1 The Run-Time Environment

When a program is started by the Debug Monitor’s **go** command, it is started at the appropriate IPL to enable real-time clock interrupts (usually IPL 4). If a program *does not* install its own interrupt handler, then the Debug Monitor will handle all interrupts. If a program *does* install its own interrupt handler using the Write System Entry

Address PAL call, then it must be prepared to handle all interrupts as described in the following sections. When a program completes normally, the Debug Monitor reinstalls its own interrupt handler.

3.4.2 Types of Programs

For the purposes of this chapter, programs may be classified into the following three types:

- Programs that do not use the Ethernet or do not include their own interrupt handler
- Programs that do not use the Ethernet but do include their own interrupt handler
- Programs that use the Ethernet

3.4.2.1 Restriction

There is only one restriction for programs that do not use the Ethernet and that use the Debug Monitor interrupt handler. Do *not* disable the real-time clock interrupt and the Ethernet interrupts for long periods.

Long delays may cause Ladebug to behave as if there is a problem with the Ethernet link to the target. If network delays are insignificant, Ladebug will tolerate periods of up to 10 seconds with interrupts disabled, although it will normally warn the user of possible network problems if interrupts are disabled for more than a second. Ethernet interrupts are disabled at IPL 3 or more, and real-time clock interrupts are disabled at IPL 5 or more. Writing to the control registers of the Ethernet device or to the real-time clock can also disable the interrupts. It is possible to set breakpoints or to single step uninterruptible code. There is no restriction on the time that can be spent at the breakpoint.

Programs that define or install their own interrupt handler must ensure that the Debug Monitor polls the Ethernet device often enough to receive all the messages sent to it by Ladebug. An easy way to do this is to use the `ladbx_poll` function. When this function is called, the following occurs:

- All frames that have been received on the Ethernet device are read.
- All remote debug frames are processed and acted upon.
- Any Ethernet interrupt is cleared.

The `ladbx_poll` function is a void function that takes no arguments. It must be called often enough to allow the Debug Monitor to respond promptly to all received Ethernet frames. To ensure that this function gets called at the proper time, enable either Ethernet or timer interrupts (or both) and call it every time an interrupt occurs.

Programs cannot share an Ethernet device with the Debug Monitor. The Debug Monitor can drive a selection of different types of Ethernet devices on ISA or PCI cards, and an individual Ethernet device can be selected with the Debug Monitor **edevice** command.

3.4.3 PALcode Environment

Most programs will be able to use the Tru64 UNIX compatible PALcode included with the Debug Monitor; however, for the programs that install their own PALcode, the following guidelines must be followed:

- For remote debug to work, the following Tru64 UNIX PALcode calls must be implemented according to the interface described in the UNIX section of the *Alpha Architecture Reference Manual*.

  IMB
  RDUSP
  RTI
  WPIPL
  WRENT

- The interface to the system must conform to the standards described in the UNIX section of the *Alpha Architecture Reference Manual.*
- The debug server uses the DBGSTOP PAL call to implement breakpoints. The program must contain an identical implementation of the DBGSTOP PAL call.

  This PAL call, rather than the BPT PAL call, is used because complex programs (such as operating systems) are likely to reset the EntIF system entry point during initialization.

- The program reset PALcode routine must preserve the address of the debug entry point through the installation of the new PALcode. For the motherboard PALcode, this address is held in the PAL temporary register with symbolic name ptEntDbg. The user-defined PALcode must also either preserve the address of the interrupt entry point (ptEntInt) or set the IPL to a level that prevents all interrupts until the program sets up its own interrupt handler containing a call to `ladbx_poll`.

3.5 Ladebug Command Line Options

Versions 1.3 or later of Ladebug provide the command line options shown in Table 3–1 to support remote debugging.

Table 3–1 Ladebug Command Line Options

Command Line Option	Description
-rn *node_name*	Specifies IP node name of the target node. Required for remote debug. No default.
-pid *process_id*	Specifies the process id of the process to be debugged. The Ladebug software debugs a running process rather than loading a new process.
-rfn *arbitrary string*	Specifies the file name (or other identifier) of the image to be loaded on a remote system. Defaults to the local object file name. Passed to the remote system uninterrupted. Will often have to be quoted to avoid shell command line interpretation on the local system. Can be used only with -rn; do not combine with -pid.

Table 3–1 Ladebug Command Line Options (Continued)

Command Line Option	Description
-rinsist	Connects to a running remote process using the connect insist protocol message instead of the connect protocol message. This option functions as a request to the server to connect to the client even if some other client is already connected. (The previously connected client is disconnected.) Use only with -rn and -pid.
-rp *debug protocol name*	Specifies the remote debug protocol to be used. The valid value and default is `ladebug_preemptive`.
-rt *transport protocol name*	Specifies the transport protocol to be used for remote debug. The valid value and default is `UDP`.

Note: The debug server can be used only to debug already loaded processes; therefore, the pid option must always be specified. Because the Debug Monitor is not a multiprocessing system, the process id specified with this option is ignored.

Because using the Debug Monitor with Ladebug is a subset of general Ladebug usage, the only meaningful command line has the following format, using both the `-rn` option and the `-pid` option:

```
%ladebug size.out -rn dp264 -pid 0
```

This example connects to the server on the node with IP node name `dp264` and asks to debug the process with pid `0`. The local object file is called `size.out`. Depending upon your network environment, you may need to fully specify the IP node name, such as `dp264.mysite.hlo.dec.com`.

3.6 Building the Executable File

To build the executable file for remote debugging, follow these steps:

1. Compile your source files using the -g option. This preserves the symbolic information in the source files.
2. Link the source files with the -N and -T*x* options; where *x* is the load address for the executable on the motherboard.
3. Use the CSTRIP utility to strip the coff header from the executable file. Keep the unstripped executable file.

3.7 Starting a Ladebug Session

The Debug Monitor **ladebug** command configures the motherboard as a remote debugger target. Communication is performed through the Ethernet connection.

To debug a program running on a motherboard using Ladebug running on a remote host, follow these steps:

1. Set up the host Tru64 UNIX machine as described in Chapter 2.
2. Start the motherboard.
3. Load the program into memory on the motherboard.

4. Set a breakpoint in the program.
5. Execute the program. The program will stop at the breakpoint and print the instruction line at that location.
6. Issue the **ladebug** command. This causes the motherboard to wait for a connection from Ladebug.
7. From the host system, enter the command to start Ladebug and cause it to connect to the motherboard.

The following example shows how to set up a sample session:

```
DP264> netload size
Ethernet Base Address: 360, DMA Mask: 1 = DRQ5
Init Block Address 100000
Init Done.
Ethernet BA-98-76-54-32-01
Attempting BOOTP...success.
      my IP address: 16.123.45.67
  server IP address: 16.123.45.69
 gateway IP address: 16.123.45.69
Loading from /users/eval/boot/size ...
####
DP264> stop 200000
DP264> go
Executing at 0x200000...

00200000:  23DEFFF0         lda    sp, -16(sp)
DP264> ladebug
Ethernet Base Address: 360, DMA Mask: 1 = DRQ5
Init Block Address 100000
Init Done.
Client connected : client is FFFFFFFFA0107F10
```

The following command, entered from the host system, starts Ladebug and causes it to connect to the DP264:

```
% ladebug size.out -rn dp264 -pid 0
Welcome to the Ladebug Debugger Version 1.3.1
 ------------------
object file name: size.out
machine name: dp264
process id: 0
Reading symbolic information ...done
Connected to remote debugger
(ladebug)
```

The `(ladebug)` in the previous example is the Ladebug prompt. You are now ready to debug a process that is running on the DP264. To end this session and return to the Debug Monitor command prompt, use the Ladebug `quit` command to disconnect from the server.

Refer to the Ladebug documentation for more information about how to run Ladebug.

4

User Commands

4.1 Overview

This chapter describes how to use the Alpha Microprocessors Motherboard Debug Monitor commands.

The Debug Monitor supports advanced command line editing, including cursor key movements and an Emacs-like editing interface. In addition, a history buffer has been added to facilitate repetition of commands.

Table 4–1 shows the command line editing keypad.

Table 4–1 Command Line Editing Keypad

Keys	Description
. (period)	Repeats the last command entered.
↑(up arrow) Ctrl/P[1]	Scrolls up (older entries) the history buffer.
↓ (down arrow) Ctrl/N	Scrolls down (newer entries) the history buffer.
← (left arrow) Ctrl/B	Moves the cursor one character to the left.
→ (right arrow) Ctrl/F	Moves the cursor one character to the right.
Backspace Delete Ctrl/H	Deletes the character preceding the cursor.
Ctrl/D	Deletes character at cursor position.
Ctrl/K	Deletes text from cursor to end of line.
Ctrl/R	Refreshes the current line.
Ctrl/U	Erases the current line of command text.
End[2] Ctrl/E	Moves to the end of the line.
Esc/B	Moves the cursor to the previous word.
Esc/Backspace Esc/DELETE	Deletes the previous word.
Esc/D	Deletes the next word.

Table 4–1 Command Line Editing Keypad (Continued)

Keys	Description
Esc/F	Moves the cursor to the next word.
Home[2] Ctrl/A[1]	Moves to the beginning of the line.
Insert	Toggles between insert and overwrite mode.
Return Ctrl/J Ctrl/M	Enters the current command.

[1] If you connected to the motherboard through the Tru64 UNIX `tip` command, you must press Ctrl/P twice to obtain the normal effect of Ctrl/P.

[2] This key requires that the keyboard be connected directly to the motherboard.

4.2 Using the Commands

This section describes the Debug Monitor command categories.

- Download and execution commands

  The motherboard software basic load command expects to receive Motorola S-records that are stored in the appropriate memory location. The Ethernet port provides improved download performance by using the Internet BOOTP protocol (a UDP-based protocol). This feature allows the motherboard system to determine its Internet address, the address of a boot server, and the name of a file to boot. The Debug Monitor also supports loading files from a floppy drive or the secondary ROM socket.

  The execution commands can be used to transfer control to a program in memory. These commands begin executing a program in memory at the specified address, or automatically with a download command.

- Examine and modify memory commands

  These commands are used to examine and change memory in various formats beginning at a specified address and ending at a specified address. Quadwords (64 bits), longwords (32 bits), halfwords (16 bits), and bytes (8 bits) are all supported by these commands.

- PCI commands

  These commands are used to access PCI configuration space.

- Utility commands

  These commands are used to display and modify the date and time, display the version of the Debug Monitor, and obtain information about commands implemented in the current version.

- Debug commands

  These commands are used to debug software. Debug commands display internal CPU registers and provide debug capabilities, including breakpoints and single stepping.

- Miscellaneous commands

  These commands are used to read and write the system register, perform an interrupt acknowledge cycle, call a subroutine, and connect to serial communication ports.
- Ethernet commands

  These commands are used to set up and verify the status of the Ethernet port.
- Diagnostic commands

  These commands are used to verify that the motherboard is working properly.

4.3 User Commands Quick Reference

Table 4–2 contains a summary of all Debug Monitor commands. The commands are grouped by category and function.

Table 4–2 Command Summary Table

Command	Parameters	Description
Download and Execution Commands		
load	address	Downloads a file through the active serial port using the XMODEM protocol.
boot	address	Downloads a file through the active serial port using the XMODEM protocol and begins execution.
netload	file, address	Downloads the specified file through the Ethernet port at the current boot address or specified address.
netboot	file, address	Downloads the specified file through the Ethernet port and begins execution.
flcd	drive_pathname	Changes the current working directory to the specified drive or path.
flcopy	source_file, destination_file	Copies the specified file to another location.
fldir	drive_pathname	Displays a list of files in the current or specified directory.
flload	file, address	Downloads the specified diskette file.
flboot	file, address	Downloads the specified diskette file and begins execution.
flread	first_sector, bytes, dest_address, iterations, drive	Reads logical sectors from a diskette.
flwrite	first_sector, image_size, source_address, iterations, drive	Writes data by logical sectors to a diskette.
flsave	file_name, start_address, file_size	Saves the specified memory range to the specified file.
romload	type, address	Loads the specified image from ROM to the specified address.
romboot	type, address	Loads the specified image from ROM and begins execution.

Table 4–2 Command Summary Table (Continued)

Command	**Parameters**	**Description**
romlist	none	Lists the ROM image headers contained in ROM.
romverify	type, address	Compares an image in memory to an image in ROM.
bootadr	address	Sets default boot address.
bootopt	type	Selects the operating system and firmware type to be used on the next power-up.
go	start_address	Starts execution at the specified address.
jtopal	start_address	Starts execution at the specified address in PALmode.
init	none	Reinitializes the Debug Monitor.
Examine and Modify Memory Commands		
emb	address, iterations, silent	Examines and displays a byte of data in memory.
eml	address, iterations, silent	Displays longword of data at the specified memory address.
emq	address, iterations, silent	Displays quadword of data at the specified memory address.
emw	address, iterations, silent	Examines and displays a word of data in memory.
ddmq	address, data, iterations	Deposits the specified quadword of data in the specified memory address.
dmb	address, data, iterations	Deposits the specified byte of data in the specified memory address.
dml	address, data, iterations	Deposits the specified longword of data in the specified memory address.
dmq	address, data, iterations	Deposits the specified quadword of data in the specified memory address.
dmw	address, data, iterations	Deposits the specified word of data in the specified memory address.
mt	none	Measures memory bandwidth.
pq	start_address, end_address, iterations, silent	Prints memory in quadword (64-bit) format.
pl	start_address, end_address, iterations, silent	Prints memory in longword (32-bit) format.
pw	start_address, end_address, iterations, silent	Prints memory in word (16-bit) format.
pb	start_address, end_address, iterations, silent	Prints memory in byte (8-bit) format.
cq	address	Edits memory quadwords (64-bit).

Table 4–2 Command Summary Table (Continued)

Command	Parameters	Description
cl	address	Edits memory longwords (32-bit).
cw	address	Edits memory words (16-bit).
cb	address	Edits memory bytes (8-bit).
fill	start_address, end_address, fill_value	Fills the specified memory block with the specified 32-bit pattern.
copy	start_address, end_address, destination	Copies a memory range to the specified address.
compare	start_address, end_address, compare_address	Compares a memory range to a specified address.
dis	start_address, end_address	Displays memory as CPU instructions.
sum	start_address, end_address	Prints a checksum of a memory range.
rl	register, iterations, silent	Reads a longword from a register port in I/O address space.
rw	register, iterations, silent	Reads a word from a register port in I/O address space.
rb	register, iterations, silent	Reads a byte from a register port in I/O address space.
wl	register, data, iterations	Writes a longword to a register port in I/O address space.
ww	register, data, iterations	Writes a word to a register port in I/O address space.
wb	register, data, iterations	Writes a byte to a register port in I/O address space.
mrl	address, iterations, silent	Reads a longword from memory in I/O address space.
mrw	address, iterations, silent	Reads a word from memory in I/O address space.
mrb	address, iterations, silent	Reads a byte from memory in I/O address space.
mwl	address, data, iterations	Writes a longword to memory in I/O address space.
mww	address, data, iterations	Writes a word to memory in I/O address space.
mwb	address, data, iterations	Writes a byte to memory in I/O address space.

Table 4–2 Command Summary Table (Continued)

Command	Parameters	Description
sq	start_address, end_address, string, inverse	Searches the specified memory range by quadwords for the specified pattern.
sl	start_address, end_address, string, inverse	Searches the specified memory range by longwords for the specified pattern.
sw	start_address, end_address, string, inverse	Searches the specified memory range by words for the specified pattern.
sb	start_address, end_address, string, inverse	Searches the specified memory range by bytes for the specified pattern.
PCI Commands		
pcishow	id, bus, function	Displays the contents of each PCI slot and current PCI to system address space mapping.
prl	pci_address, id, bus, function	Reads a longword from the specified address in PCI configuration space.
prw	pci_address, id, bus, function	Reads a word from the specified address in PCI configuration space.
prb	pci_address, id, bus, function	Reads a byte from the specified address in PCI configuration space.
pwl	pci_address, id, data, bus, function	Writes a longword to a specified address in PCI configuration space.
pww	pci_address, id, data, bus, function	Writes a word to a specified address in PCI configuration space.
pwb	pci_address, id, data, bus, function	Writes a byte to a specified address in PCI configuration space.
Utility Commands		
date	yymmddhhmmss	Modifies or displays the date and time.
flash	source_address, destination_offset, bytes_to_write	Programs data into flash memory.
flasherase	starting_offset, bytes_to_erase	Erases data from flash memory.
fwupdate	none	Loads and runs the firmware update utility.
help	command_name	Displays a list of commands or displays parameter fields and syntax if a command is specified.
apropos	keyword	Displays help text containing the specified keyword.
ident	start_address, end_address	Displays RCS ID strings found in the specified memory range.
sysshow	none	Displays SROM parameters.
version	none	Displays the Debug Monitor firmware version information.

Table 4–2 Command Summary Table (Continued)

Command	Parameters	Description
swpipl	ipl	Sets or displays the current interrupt priority level (IPL) of the CPU.
mces	mces_data	Sets or displays the machine check error summary register.
wrfen	value	Enables/disables floating point.
Debug Commands		
preg	address	Displays CPU general-purpose registers.
pfreg	address	Displays CPU floating-point registers.
creg	register_number, value	Modifies CPU general-purpose registers.
cfreg	register_number, value	Modifies CPU floating-point registers.
stop	address	Sets a breakpoint at the specified address.
bpstat	none	Displays the current breakpoint status.
step	none	Executes a machine instruction by stepping into the first instruction of the function being called.
next	none	Executes a machine instruction without stepping into subroutines.
cont	none	Continues execution from a breakpoint.
delete	address	Removes breakpoint from the specified address.
ladebug	none	Starts a Ladebug server for a remote debug session.
Miscellaneous Commands		
cominit	none	Initializes communications ports.
iack	none	Performs an interrupt acknowledge cycle.
rmode	mode	Sets the **dis** command register display mode.
setty	port	Specifies the port used for Debug Monitor interaction.
setbaud	port, baud_rate	Sets the communication port baud rate. The default is 9600.
tip	port	Connects to a specified serial communication port.
vinit	none	Initializes the video controller.
Ethernet Commands		
edevice	device_number	Selects a registered Ethernet device.
eshow	none	Displays all registered Ethernet devices.
ereg	none	Displays the Ethernet controller registers.
estat	none	Displays Ethernet statistics.
einit	none	Initializes Ethernet controller and displays the Ethernet hardware address.
estop	none	Stops the Ethernet controller.
ebuff	address	Sets the base address for Ethernet DMA buffers.

Table 4–2 Command Summary Table (Continued)

Command	Parameters	Description
edmp	status	Sets or clears display of packets received or transmitted.
eprom	status	Sets or clears flag for receiving all packets (promiscuous mode).
arpshow	none	Displays all known address resolution protocol (ARP) entries.
Diagnostic Commands		
beep	duration, frequency	Causes speaker to beep for the specified duration and frequency.
mcheck	state	Controls the reporting of hardware error conditions (machine checks).
memtest	iterations, start_address, end_address, increment, mcheck, stop_drivers	Tests memory range. Uses longword accesses to memory.

4.4 User Commands

This section contains complete descriptions and examples of the Debug Monitor commands. The commands are listed in alphabetical order.

4.4.1 apropos — Display Help Descriptions

The **apropos** command displays help descriptions for the specified keyword.

Format

apropos keyword

Parameters

keyword

Specifies the string to match in the **help** command text.

Description

The **apropos** command is an additional form of help. This command searches the help file and displays all matches for the specified keyword.

Example

```
DP264> apropos load
load:
  Downloads S records through a serial port
  syntax: load
  arguments:

boot:
  Downloads S records through a serial port and begins execution
  syntax: boot
  arguments:

netload:
Downloads  file  via  the  Ethernet  port  to  address. Address defaults
to bootadr
  syntax: netload file address
  arguments: <opt str> <opt hex>

netboot:
  Downloads file through the Ethernet port and begins execution
  syntax: netboot file address
  arguments: <opt str> <opt hex>

          Hit any key to continue. Control-C to quit...
```

4.4.2 arpshow — Display Known Address Resolution Protocol Entries

The **arpshow** command displays all known address resolution protocol (ARP) entries.

Format

arpshow

Parameters

None.

Description

The **arpshow** command displays an IP routing table entry. If there are no ARP entries, nothing is shown for that device. The Ethernet device number displayed matches the number that is displayed when the **eshow** and **edevice** commands are entered.

Example

```
DP264> arpshow

Arp Table Contents (at 0x00074570):

   Ethernet Device 0
   IP Address: 16.123.45.67
   MAC Address: BA-98-76-54-32-10
```

4.4.3 beep — Test Speaker

The **beep** command tests the speaker.

Format

beep duration frequency

Parameters

duration

Specifies the duration of the beep in milliseconds.

frequency

Specifies the frequency in hertz.

Description

The **beep** command causes the speaker to beep for the specified duration and frequency.

Example

```
DP264> beep 1000 4000
```

4.4.4 boot — Download File Using XMODEM Protocol

The **boot** command downloads a file through the active serial port using the XMODEM protocol and begins execution.

Format

boot [address]

Parameters

address

Specifies the address at which to download the file. The default is the boot address.

Description

The **boot** command uses the XMODEM protocol to download a file through the active serial port. The program is loaded to the supplied address or to the boot address if an address is not specified. The program is then automatically executed.

Example

In this example, a Tru64 UNIX host system is connected to the motherboard on device `/dev/tty01`. The `sx` command sends a file using XMODEM.

```
% echo boot 300000 > /dev/tty01
% sx -kt 10 /users/eval1/demo2/size </dev/tty01 >/dev/tty01
Sector nnn
% tip /dev/tty01
DP264>
```

4.4.5 bootadr — Display or Modify Default Boot Address

The **bootadr** command allows you to display or modify the default boot address.

Format

bootadr [address]

Parameters

address

Specifies the starting address at which a program is loaded. Programs loaded with the **netboot** command automatically begin program execution at this address. The default address is 300000_{16}.

Description

The boot address is the address at which your programs load and begin execution. The **bootadr** command sets the default address for the load commands to begin execution or to download your program into memory. If the **bootadr** command is specified without an address, the command displays the current default boot address. If you set the boot address value, the value is stored in battery-backed RAM.

Example

This example sets the starting address to 20000_{16}. The next file that is loaded begins execution from this address.

```
DP264> bootadr 20000
```

4.4.6 bootopt — Select Operating System and Firmware

The **bootopt** command selects the operating system and firmware type to be used on the next power-up.

Format

bootopt [type]

Parameters

type

Specifies the operating system type. If the specified image is not found at power-up, the first image is booted. If there are no ROM headers, the whole ROM will be loaded at address 0.

Description

The **bootopt** command selects the operating system and associated firmware type that will be used the next time you power up your motherboard. If no type is specified, a list of predefined types is displayed along with the current selection. Use the **romlist** command to display the images contained in the ROM. You can specify the type as a number or a name.

Type_number	Type_name	Description
0	DBM	Alpha Motherboard Debug Monitor
1	NT	Windows NT
2	VMS	OpenVMS
3	UNIX	Tru64 UNIX
7	LINUX	Linux, MILO
8	VXWORKS	VxWorks
10	SROM	Serial ROM

The **bootopt** command can also be used to select a ROM image based on its position in the ROM. Specifying the type as #0 selects the whole ROM. Specifying the type as #1 selects the first image; #2 selects the second image, and so on.

Example

```
DP264> bootopt
Predefined bootoptions are...
  “0” “Alpha Evaluation Board Debug Monitor” “DBM”
  “1” “The Windows NT Operating System” “NT”
  “2” “OpenVMS” “VMS”
  “3” “Tru64 UNIX” “UNIX”
  “7” “Linux” “Milo”
  “8” “VxWorks. Real-Time Operating System” “VxWorks”
  “10” “Serial ROM (SROM)” “SROM”
O/S type selected: “OpenVMS”
....Firmware type: “Alpha SRM Console”
DP264> bootopt 0
O/S type selected: “Alpha Evaluation Board Debug Monitor”
....Firmware type:  “Alpha Evaluation Board Debug Monitor”
DP264> bootopt nt
O/S type selected: “The Windows NT Operating System”
....Firmware type: “Windows NT Firmware”
```

```
DP264> bootopt #1
Firmware image 1 selected.
....Firmware type: “Unknown”
DP264> bootopt unix
O/S type selected: “Tru64 UNIX”
....Firmware type: “Alpha SRM Console”
DP264> bootopt #0
Load and boot entire ROM at address zero.
....Firmware type: “Unknown”
DP264> bootopt
Predefined bootoptions are...
 “0” “Alpha Evaluation Board Debug Monitor” “DBM”
 “1” “The Windows NT Operating System” “NT”
 “2” “OpenVMS” “VMS”
 “3” “Tru64 UNIX” “UNIX”
 “7” “Linux” “Milo”
 “8” “VxWorks. Real-Time Operating System” “VxWorks”
 “10” “Serial ROM (SROM)” “SROM”
Load and boot entire ROM at address zero.
....Firmware type: “Unknown”
```

4.4.7 bpstat — Display Breakpoint Status

The **bpstat** command displays the current breakpoint status.

Format

bpstat

Parameters

None.

Description

The **bpstat** command lists the breakpoints set with the **stop** command. The disassembled instructions for that location are also displayed.

Example

```
DP264> stop 200000
DP264> stop 200FC0
DP264> bpstat
{break} at 00200000:  23DEFFF0         lda    sp, -16(sp)
{break} at 00200FC0:  27BB0001        ldah    r29, 1(r27)
```

4.4.8 cb — Edit Memory Bytes

The **cb** command allows you to edit memory bytes (8-bit).

Format

cb [address]

Parameters

address

Specifies the address of the memory byte you want to change.

Description

The **cb** command allows you to modify the contents of a specified memory address. If no address is specified, then the next byte is selected. The Debug Monitor displays the address followed by the current data and a colon (:). For example:

```
0200090:  1D :
```

To modify the contents of this memory location, type the new data after the colon and press the Return key. To end the editing of memory locations, type any nonalphanumeric character except a period (.). The nonalphanumeric character can be typed after the modified byte (on the same line). To leave the current location unchanged, press the Return key on an empty line.

Example

In this example, the bytes at 300000_{16} and 300003_{16} have been modified, leaving the ones at 300001_{16} and 300002_{16} unchanged.

```
DP264> pb 300000 300008
00300000: 1f 04 ff 47 1f 04 ff 47 45 00 60 c3 00 00 00 00 ...G...GE.‘.....
DP264> cb 300000
00300000:  1f: aa
00300001:  04:
00300002:  ff:
00300003:  47: dd
00300004:  1f: ;
DP264> pb 300000 300008
00300000: aa 04 ff dd 1f 04 ff 47 45 00 60 c3 00 00 00 00 .......GE.‘.....
```

4.4.9 cfreg — Modify CPU Floating-Point Register

The **cfreg** command modifies the saved CPU floating-point register state.

Format

cfreg register_number value

Parameters

register_number

Identifies the register.

value

Specifies the new value of the register in hexadecimal numbers.

Description

The **cfreg** command modifies the saved CPU floating-point register state to contain the specified value.

The program register contents are stored in memory to the saved-state area when a breakpoint is encountered. Modifications to a register using the **cfreg** command are applied to that register when execution of the program is resumed using the **step** or the **cont** command.

Example

```
DP264> pfreg
Floating Point Registers
register file @: 0000C840
f00: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
f04: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
f08: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
f12: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
f16: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
f20: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
f24: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
f28: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
PC:  000000000000000D  PS:  000000000000000D
DP264> cfreg 12 ababababab
DP264> cfreg 14 fefefefefe
DP264> pfreg
Floating Point Registers
register file @: 0000C840
f00: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
f04: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
f08: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
f12: 000000ABABABABAB 0000000000000000 000000FEFEFEFEFE 0000000000000000
f16: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
f20: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
f24: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
f28: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
PC:  000000000000000D  PS:  000000000000000D
```

4.4.10 cl — Edit Memory Longwords

The **cl** command allows you to edit memory longwords (32-bit).

Format

cl [address]

Parameters

address

Specifies the address of the memory longword you want to change.

Description

The **cl** command allows you to modify the contents of a specified memory address. If no address is specified, then the next longword is selected. The Debug Monitor displays the address followed by the current data and a colon (:). For example:

```
00200090:  E7E0101D :
```

To modify the contents of this memory location, type the new data after the colon and press the Return key. To end the editing of memory locations, type any nonalphanumeric character except a period (.). The nonalphanumeric character can be typed after the modified byte (on the same line). To leave the current location unchanged, press the Return key on an empty line.

Example

In this example, the memory data at address 0 has been modified from 91E01122 to E7E01021.

```
DP264> cl 0
00000000:  91E01122: e7e01021
DP264> pl 0 0
00000000: E7E01021 00000000 00000000 00000000 !...............
```

4.4.11 cominit — Initialize Communications Ports

The **cominit** command initializes communications ports.

Format

cominit

Parameters

None.

Description

The **cominit** command initializes communications ports.

Example

```
DP264> cominit
```

4.4.12 compare — Compare Memory Range

The **compare** command compares a memory range to a specified address.

Format

compare start_address end_address compare_address

Parameters

start_address

Specifies the memory address at which to start the comparison.

end_address

Specifies the last address that will be compared.

compare_address

Specifies the address to be compared to the memory range.

Description

The **compare** command compares each longword (32 bits) within a specified range in memory to another specified location. It then prints the data that differ.

Example

```
DP264> copy 3fff80000 3fffd0000 400000
DP264> fill 400200 400220
DP264> fill 400400 400440 ffffffff
DP264> compare 3fff80000 3fffd0000 400000
3FFF80200: 64 86 00 E7 64 00 80 FF   00400200: 00 00 00 00 00 00 00 00
3FFF80208: 7B 06 78 C3 44 A0 10 C0   00400208: 00 00 00 00 00 00 00 00
3FFF80210: F4 9B 10 E0 C3 80 00 80   00400210: 00 00 00 00 00 00 00 00
3FFF80218: 00 CC 00 64 83 00 84 74   00400218: 00 00 00 00 00 00 00 00
3FFF80400: E2 39 37 05 49 99 76 26   00400400: FF FF FF FF FF FF FF FF
3FFF80408: 4B 96 16 C4 4A 36 B7 C1   00400408: FF FF FF FF FF FF FF FF
3FFF80410: 4A 16 04 36 43 00 90 D6   00400410: FF FF FF FF FF FF FF FF
3FFF80418: 6E 0D 00 C0 E2 20 00 08   00400418: FF FF FF FF FF FF FF FF
3FFF80420: 75 40 00 D6 76 42 00 D6   00400420: FF FF FF FF FF FF FF FF
3FFF80428: 76 97 00 08 65 88 00 D6   00400428: FF FF FF FF FF FF FF FF
3FFF80430: 66 95 00 39 67 00 80 FF   00400430: FF FF FF FF FF FF FF FF
3FFF80438: 79 7B 44 00 39 67 99 36   00400438: FF FF FF FF FF FF FF FF
3FFFD0000: FF FF FF FF FF FF FF FF   00450000: 2D 00 00 00 00 00 00 00
```

4.4.13 cont — Continue Execution from Breakpoint

The **cont** command continues execution from a breakpoint.

Format

cont

Parameters

None.

Description

The **cont** command continues from a breakpoint. The program continues until another breakpoint or the end of the program is reached.

Example

```
DP264> stop 100000
DP264> go
Executing at 0x100000...
00100000:  C1000003          br    r8, 100010
DP264> step
00100010:  2F880007       ldq_u    r28, 7(r8)
DP264> step
00100014:  A49E0000         ldq    r4, 0(sp)
DP264> cont
This simple program prints the sizes of
various data types in bytes.
  char   =  1
  short  =  2
  int    =  4
  long   =  8
  float  =  4
  double =  8
```

4.4.14 copy — Copy Memory Block

The **copy** command copies the specified memory range to the new specified address.

Format

copy start_address end_address destination

Parameters

start_address

Specifies the starting address for this copy.

end_address

Specifies the last address to be included in this copy.

destination

Specifies the new starting address for the memory range.

Description

The **copy** command copies the data from the specified block of memory to a new location in memory. The original location is unchanged.

Example

This example displays the original location and the destination before and after the **copy** command.

```
DP264> pl 8000000
08000000: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000010: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000020: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000030: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000040: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000050: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000060: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000070: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
DP264> pl 9000150
09000150: 00000000 00000000 00000000 00000000 ................
09000160: 00000000 00000000 00000000 00000000 ................
09000170: 00000000 00000000 00000000 00000000 ................
09000190: 00000000 00000000 00000000 00000000 ................
090001A0: 00000000 00000000 00000000 00000000 ................
090001B0: 00000000 00000000 00000000 00000000 ................
090001C0: 00000000 00000000 00000000 00000000 ................
DP264> copy 8000000 8000080 9000150
DP264> pl 9000150
09000150: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
09000160: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
09000180: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
09000190: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
090001A0: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
090001B0: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
090001C0: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
DP264> pl 8000000
08000000: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000010: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000020: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000030: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000040: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000050: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000060: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000070: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
```

4.4.15 cq — Edit Memory Quadwords

The **cq** command allows you to edit memory quadwords (64-bit).

Format

cq [address]

Parameters

address

Specifies the address of the memory quadword you want to change.

Description

The **cq** command allows you to modify the contents of the specified memory address. If no address is specified, then the next quadword is selected. The Debug Monitor displays the address followed by the current data and a colon (:). For example:

```
00200090:  00000000E7E0101D :
```

To modify the contents of this memory location, type the new data after the colon and press the Return key. To end the editing of memory locations, type any nonalphanumeric character except a period (.). The nonalphanumeric character can be typed after the modified byte (on the same line). To leave the current location unchanged, press the Return key on an empty line.

Example

This example modifies only quadword 200020_{16}.

```
DP264> cq 200020

00200020:  0000000004000000: 0000000011111111
00200028:  0000000000000000:
00200030:  3402010400120106:
00200038:  0402010004020100:
00200040:  FBFDFEFFFFFDFEFF: ;
DP264> pq 200000
00200000: FA7D7299CE7F3299 DA65FA99DA7D32D9 .2...r}..2}...e.
00200010: FFFFFFFBFBFFFFDB FFFFFFFFFFFFFFFF ................
00200020: 0000000011111111 0000000000000000 ................
00200030: 3402010400120106 0402010004020100 .......4........
00200040: FBFDFEFFFFFDFEFF FBFDFEFFFBFDFEFF ................
00200050: CFE7FF99CB6FF799 EEE7FBFBFFFFFFFF ..o.............
00200060: 0000000004020000 0000000000000000 ................
00200070: 1402010620100106 050A050004020100 ... ............
```

4.4.16 creg — Modify Register State

The **creg** command modifies the saved CPU general-purpose register state.

Format

creg register_number value

Parameters

register_number

Identifies the register.

value

Specifies the new value of the register in hexadecimal numbers.

Description

The **creg** command modifies the saved CPU general-purpose register state to contain the specified value.

The program register contents are stored in memory to the saved-state area when a breakpoint is encountered. Modifications to a register using the **creg** command are applied to that register when execution of the program is resumed using the **step** or **cont** command.

Example

```
DP264> preg
General Purpose Registers
register file @: 0000C040
r00: 0000000000000020 0000000000000005 000000000000C000 000000000000000D
r04: 00000000000003F8 0000000000000000 0000000000000000 000000000000000D
r08: FFFFFC000005F470 0000000000027340 0444306453605341 0A110C485F6EA26E
r12: 208090EA6024C19C 882C08AA92065B2D 4100610AE100244F 9E2891ACA8A9D984
r16: 0000000000100000 000000000000000D 0000000000000006 0000000000000030
r20: 0000000E20026335 5619A46B2B1A5125 0000000000000000 000000000000000D
r24: 0000000000000003 0000000000000000 FFFFFC0000042C3C 0000000000100000
r28: FFFFFC02C0000000 FFFFFC000006C1E0 0000000000FFDF40 0000000000000003
PC:  000000000000000D   PS:  000000000000000D
DP264> creg 04 555
DP264> preg
General Purpose Registers
register file @: 0000C040
r00: 0000000000000020 0000000000000005 000000000000C000 000000000000000D
r04: 0000000000000555 0000000000000000 0000000000000000 000000000000000D
r08: FFFFFC000005F470 0000000000027340 0444306453605341 0A110C485F6EA26E
r12: 208090EA6024C19C 882C08AA92065B2D 4100610AE100244F 9E2891ACA8A9D984
r16: 0000000000100000 000000000000000D 0000000000000006 0000000000000030
r20: 0000000E20026335 5619A46B2B1A5125 0000000000000000 000000000000000D
r24: 0000000000000003 0000000000000000 FFFFFC0000042C3C 0000000000100000
r28: FFFFFC02C0000000 FFFFFC000006C1E0 0000000000FFDF40 0000000000000003
PC:  000000000000000D   PS:  000000000000000D
```

4.4.17 cw — Edit Memory Words

The **cw** command allows you to edit memory words (16-bit).

Format

cw [address]

Parameters

address

Specifies the address of the memory word you want to change.

Description

The **cw** command allows you to modify the contents of the specified memory address. If no address is specified, then the next word is selected. The Debug Monitor displays the address followed by the current data and a colon (:). For example:

```
00200090:  101D :
```

To modify the contents of this memory location, type the new data after the colon and press the Return key. To end the editing of memory locations, type any nonalphanumeric character except a period (.). The nonalphanumeric character can be typed after the modified byte (on the same line). To leave the current location unchanged, press the Return key on an empty line.

Example

This example modifies words 200094_{16} through 200098_{16}.

```
DP264> pw 200090
00200090: 3BB9 CA6D FFB9 CFE7 3FBF FFFF 33F9 CE67.;m......?...3g.
002000A0: 0000 0400 0000 0000 0000 0000 0000 0000................
002000B0: 8166 309A 4166 3402 8960 0402 8D46 359Af..0fA.4‘...F..5
002000C0: FEFF FFFD FEFF FBFD FEFF FBFD FEFF FBFD................
002000D0: 3399 DA65 BB99 CFF7 37BF FFFF 33D9 CE67.3e......7...3g.
002000E0: 0000 0000 0000 0000 0000 0000 0000 0000................
002000F0: 8142 2012 0166 3402 8140 0402 4504 049A B..f..4@....E..
00200100: FEFF FFFD FEFF FBFD FEFF FBFD FEFF FBFD..............
DP264> cw 200090
00200090:  3BB9:
00200092:  CA6D:
00200094:  FFB9: ffff
00200096:  CFE7: 0000
00200098:  3FBF: 0101
0020009A:  FFFF: ;
DP264> pw 200090 20009A
00200090: 3BB9 CA6D FFFF 0000 0101 FFFF 33F9 CE67.;m..........3g.
```

4.4.18 date — Display or Modify Date and Time

The **date** command displays or modifies the date and time.

Format

date [yymmddhhmmss]

Parameters

yymmddhhmmss

To modify the date, supply the year, month, day, hour, minute, and second.

Description

If the **date** command is specified alone, the month, day, time, and year is displayed. If you supply a parameter, the date is modified.

Example

This example displays the current date and time setting.

```
DP264> date
Jun  1 12:58:19 1999
```

These examples show how to modify the date and time setting.

```
DP264> date 930211000000
DP264> date
Feb 11 00:00:04 1999
DP264> date 930211135700
DP264> date
Feb 11 13:57:02 1999
```

4.4.19 ddmq — Deposit Quadword in Memory

The **ddmq** command deposits a quadword of data in the specified memory location.

Format

ddmq address data [iterations]

Parameters

address

Specifies the memory address.

data

Specifies the quadword of data to be stored.

iterations

Specifies how many times the command is executed. The default is 1.

Description

The **ddmq** command deposits the specified quadword of data in the specified memory location. A memory barrier (MB) instruction is executed after the store to force the stored data out of the chip.

Example

```
DP264> ddmq d0000 00000000FC04FF00
```

4.4.20 delete — Remove Breakpoint from Address

The **delete** command removes a breakpoint from the specified address.

Format

delete address

Parameters

address

Specifies the address from which to delete the breakpoint.

Description

The **delete** command removes a breakpoint from the specified address. You can use an asterisk (*) to remove all breakpoints.

Example

```
DP264> delete 00200050
```

4.4.21 dis — Disassemble Instructions

The **dis** command displays memory as CPU instructions.

Format

dis [start_address [end_address]]

Parameters

start_address

Specifies the address at which to start disassembling instructions. If the start_address is *not* specified, the address of the last **load** command, the last breakpoint, or the last **dis** command is used.

end_address

Specifies the address at which to end disassembling instructions. The default is the start_address plus 32 bytes (8 instructions).

Description

The **dis** command disassembles instructions starting with the specified address. You can specify an address range of instructions to be disassembled. If no parameters are specified, then the command starts with the current address and disassembles the next eight instructions. If a file is downloaded to memory, then the default starting address for the **dis** command is the first memory location in the downloaded file. If a breakpoint is encountered, then the default starting address is the breakpoint address.

The **rmode** command is used to select whether the hardware or software register names are displayed when instructions are disassembled. The hardware register names are shown by default. The **rmode** setting is stored in nonvolatile RAM.

Example

```
DP264> dis 243a0
000243A0:     43020122          subl        r24, r2, r2
000243A4:     48441722          sll         r2, 0x20, r2
000243A8:     74420050          mt          r2, cc
000243AC:     64630082          mf          r3, pt2
000243B0:     209F07E1          lda         r4, 2017(zero)
000243B4:     48855724          sll         r4, 0x2A, r4
000243B8:     44640103          bic         r3, r4, r3
000243BC:     47203019          and         r25, 0x1, r25
DP264> dis
000243C0:     4B037698          srl         r24, 0x1B, r24
000243C4:     4703F118          bic         r24, 0x1F, r24
000243C8:     47190418          bis         r24, r25, r24
000243CC:     4B055738          sll         r24, 0x2A, r24
000243D0:     44780403          bis         r3, r24, r3
000243D4:     746300A2          mt          r3, A2
000243D8:     77FF0055          mt          zero, flushIc
000243DC:     77FF0000          mt          zero, 0
DP264>
```

4.4.22 dmb — Deposit Byte of Data in Memory

The **dmb** command deposits the specified byte of data in the specified memory location.

Format

dmb address data [iterations]

Parameters

address

Specifies the memory address.

data

Specifies the longword of data to be stored.

iterations

Specifies how many times the command is executed. The default is 1.

Description

The **dmb** command deposits the specified byte of data in the specified memory location. A memory barrier (MB) instruction is executed after the store to force the stored data out of the chip.

Example

```
DP264> dmb d0000 FC04FF00
```

4.4.23 dml — Deposit Longword of Data in Memory

The **dml** command deposits the specified longword of data in the specified memory location.

Format

dml address data [iterations]

Parameters

address

Specifies the memory address.

data

Specifies the longword of data to be stored.

iterations

Specifies how many times the command is executed. The default is 1.

Description

The **dml** command deposits the specified longword of data in the specified memory location. A memory barrier (MB) instruction is executed after the store to force the stored data out of the chip.

Example

```
DP264> dml d0000 FC04FF00
```

4.4.24 dmq — Deposit Quadword in Memory

The **dmq** command deposits the specified quadword of data in the specified memory location.

Format

dmq address data [iterations]

Parameters

address

Specifies the memory address.

data

Specifies the quadword of data to be stored.

iterations

Specifies how many times the command is executed. The default is 1.

Description

The **dmq** command deposits the specified quadword of data in the specified memory location. A memory barrier (MB) instruction is executed after the store to force the stored data out of the chip.

Example

```
DP264> dmq d0000 00000000FC04FF00
```

4.4.25 dmw — Deposit Word in Memory

The **dmw** command deposits the specified word of data in the specified memory location.

Format

dmw address data [iterations]

Parameters

address

Specifies the memory address.

data

Specifies the quadword of data to be stored.

iterations

Specifies how many times the command is executed. The default is 1.

Description

The **dmw** command deposits the specified word of data in the specified memory location. A memory barrier (MB) instruction is executed after the store to force the stored data out of the chip.

Example

```
DP264> dmw d0000 00000000FC04FF00
```

4.4.26 ebuff — Set Memory Address for Ethernet Buffers

The **ebuff** command sets the base address for the Ethernet transmit receive buffers.

Format

ebuff [address]

Parameters

address

Specifies the address for the transmit and receive buffers. The default is 100000_{16}.

Description

The **ebuff** command sets the address in physical memory where the transmit and receive buffers are located. If specified without an address, this command displays the current location of the buffers in memory.

Example

```
DP264> ebuff 180000
```

4.4.27 edevice — Set Debug Monitor to Use Ethernet Device

The **edevice** command selects the registered Ethernet device that the Debug Monitor will use.

Format

edevice [device_number]

Parameters

device_number

Specifies the net device number of any registered Ethernet device. If no device number is provided, the current device number is displayed.

Description

The **edevice** command sets the Debug Monitor to use one of the registered Ethernet devices. Use the **eshow** command to display all of the registered Ethernet devices.

Example

```
DP264> eshow

All registered Ethernet devices:

 Net    Type
 Device

 0      AM79C960
 1      WD3003
 2      Alpha 21340
 3*     Alpha 21340

DP264> edevice 1
```

4.4.28 edmp — Set Display of Packets

The **edmp** command displays packets received or transmitted to the terminal screen.

Format

edmp [status]

Parameters

status

Determines whether packets are displayed. Status can be 1 (on) or 0 (off).

Description

The **edmp** command sets or clears the display of packets received or transmitted to the screen. If this command is entered with no status, then the current status is displayed.

Example

```
DP264> edmp
packet dumps are OFF.
DP264> eprom 1
DP264> edmp 1
```

4.4.29 einit — Initialize Ethernet Controller

The **einit** command initializes the Ethernet controller.

Format

einit

Parameters

None.

Description

The **einit** command initializes the Ethernet controller and displays the Ethernet hardware address.

Example

```
DP264> einit
Ethernet Base Address: 360, DMA Mask: 1 = DRQ5
Init Block Address 80000
Init Done.
Ethernet BA-98-76-54-32-10
```

4.4.30 emb — Specify Display of Data

The **emb** command examines and displays a byte of data in memory.

Format

emb address [iterations [silent]]

Parameters

address

Specifies the memory address.

iterations

Specifies how many times the command is executed. The default is 1.

silent

Specifies whether or not the data is displayed. Setting this parameter to 1 causes the data to be read but not displayed. The default is 0 (data is displayed).

Description

The **emb** command displays a byte of data from the specified memory location.

Example

```
DP264> emb d0000
FC04FF00
```

4.4.31 eml — Specify Display of Data

The **eml** command examines and displays a longword of data in memory.

Format

eml address [iterations [silent]]

Parameters

address

Specifies the memory address.

iterations

Specifies how many times the command is executed. The default is 1.

silent

Specifies whether or not the data is displayed. Setting this parameter to 1 causes the data to be read but not displayed. The default is 0 (data is displayed).

Description

The **eml** command displays a longword of data from the specified memory location.

Example

```
DP264> eml d0000
FC04FF00
```

4.4.32 emq — Display Quadword in Memory

The **emq** command examines and displays a quadword of data in memory.

Format

emq address [iterations [silent]]

Parameters

address

Specifies the memory address.

iterations

Specifies how many times the command is executed. The default is 1.

silent

Specifies whether or not the data is displayed. Setting this parameter to 1 causes the data to be read but not displayed. The default is 0 (data is displayed).

Description

The **emq** command displays a quadword of data from the specified memory location.

Example

```
DP264> emq d0000
00000000FC04FF00
```

4.4.33 emw — Display Word in Memory

The **emw** command examines and displays a word of data in memory.

Format

emw address [iterations [silent]]

Parameters

address

Specifies the memory address.

iterations

Specifies how many times the command is executed. The default is 1.

silent

Specifies whether or not the data is displayed. Setting this parameter to 1 causes the data to be read but not displayed. The default is 0 (data is displayed).

Description

The **emw** command displays a word of data from the specified memory location.

Example

```
DP264> emw d0000
00000000FC04FF00
```

4.4.34 eprom — Set Flag for Receiving Packets

The **eprom** command sets or clears a flag for receiving all packets (promiscuous mode).

Format

eprom [status]

Parameters

status

Determines whether packets are displayed. Status can be 1 (on) or 0 (off).

Description

The **eprom** command sets a flag for receiving packets. If status is set to 1 (on), then promiscuous mode is turned on and packets can be continuously received. If this command is entered with no status, then the current status is displayed. The default status is 0 (off).

Example

```
DP264> eprom
Promiscuous Mode is DISABLED.
DP264> eprom 1
```

4.4.35 ereg — Display Ethernet Controller Registers

The **ereg** command displays the Ethernet controller registers.

Format

ereg

Parameters

None.

Description

The **ereg** command displays the Ethernet controller registers. This command's output is dependent on the Ethernet device selected for the motherboard. For example, the ISA-based AM79C960 controller must be in stop mode (write 0 to register port 372 and write 4 to data port 370) to view most of its registers.

Example

```
DP264> ww 372 0
DP264> ww 370 4
DP264> ereg
Ethernet Controller Base Address 360,  CSR 0...126
0   0004   1   0000   2   0008   3   0000   4   1115   5   8000   6   1200
7   0000   8   0000   9   0000   10  0000   11  0000   12  0008   13  1A2B
14  D637   15  4080   16  0000   17  0008   18  0CC8   19  0008   20  1F88
21  0008   22  1308   23  0008   24  0018   25  0008   26  0030   27  0008
28  0028   29  0008   30  0038   31  0008   32  FFFF   33  FDFF   34  0040
35  0008   36  0018   37  0008   38  FFFF   39  FDFF   40  F9C0   41  8308
42  FFC4   43  0308   44  F9C0   45  8308   46  3CFD   47  FFFF   48  FFFF
49  FFFF   50  FFFF   51  FFFF   52  DFFF   53  7EFF   54  FFFF   55  FFFD
56  EFFF   57  FFFF   58  FFFF   59  EFFF   60  0038   61  0008   62  F000
63  8308   64  1F88   65  0008   66  FFC4   67  0308   68  8000   69  0235
70  0202   71  0000   72  FFFC   73  FFFF   74  FFFF   75  FFFF   76  FFFC
77  FFFF   78  FFFE   79  FFFF   80  E810   81  FFFF   82  0000   83  FFFF
84  0038   85  0008   86  F000   87  FFFF   88  3003   89  2000   90  FFFF
91  FFFF   92  FFFE   93  FFFF   94  0235   95  FFFF   96  1308   97  8308
98  F9C0   99  0235   100 FFFF   101 FFFF   102 FFFF   103 FFFF   104 0000
105 0202   106 FFFF   107 FFFF   108 8000   109 0235   110 FFFF   111 FFFF
112 0000   113 FFFF   114 00A2   115 FFFF   116 FFFF   117 FFFF   118 FFFF
119 FFFF   120 FFFF   121 FFFF   122 FFFF   123 FFFF   124 FC00   125 FFFF
126 0000

Ethernet Controller ISACSR0 ... 7
0 0005   1 0005   2 0003   3 0000   4 0000   5 0084   6 0008   7 0090
```

4.4.36 eshow — Display Ethernet Devices

The **eshow** command displays all of the registered Ethernet devices.

Format

eshow

Parameters

None.

Description

The **eshow** command displays all of the installed device drivers and works for all of the motherboards. To set the Debug Monitor to use one of these devices, see the **edevice** command. An asterisk following the net device number indicates the selected Ethernet device to be used by the Debug Monitor Ethernet commands.

Example

```
DP264> eshow

 All registered Ethernet devices:

 Net      Type
 Device

 0       AM79C960
 1       WD3003
 2       Alpha 21340
 3*      Alpha 21340
```

4.4.37 estat — Display Ethernet Statistics

The **estat** command displays Ethernet statistics.

Format

estat

Parameters

None.

Description

The **estat** command displays Ethernet statistics kept by the Ethernet device driver.

Example

```
DP264> estat
                 secs:              7            mc bytes rcv:  130075
            bytes rcv:        1297171             mc frms rcv:     625
            bytes snt:              0           frms snt dfrd:       0
             frms rcv:           3129        frms snt - cllsn:       0
             frms snt:              0   frms snt - mult cllsn:       0

   snd flrs - xs cllsn:             0          snd flrs - def:       0
         snd flrs - cc:             0          rcv flrs - fcs:       0
       snd flrs - shrt:             0         rcv flrs - ferr:       0
        snd flrs - opn:             0           rcv flrs flen:       0
       snd flrs - flen:             0               data ovrn:       0
         cllsn chk flr:             0
```

4.4.38 estop — Stop Ethernet Controller

The **estop** command stops the Ethernet controller.

Format

estop

Parameters

None.

Description

The **estop** command allows you to stop sending or receiving packets from an Ethernet device selected with the **edevice** command.

Example

```
DP264> eshow
All registered Ethernet devices:

        Net     Type
        Device
        0*      Alpha 21340
        1       AM79C960
DP264> edevice
Using network device 0
DP264> estop

Stopping network device 0 in PCI slot 20:
```

4.4.39 fill — Specify Address for Fill Value

The **fill** command fills a specified memory block with the specified 32-bit pattern.

Format

fill start_address end_address [fill_value]

Parameters

start_address

Specifies the start address for the fill value.

end_address

Specifies the end address for the fill value. The fill value includes the end_address.

fill_value

Specifies a longword hexadecimal number as the fill value for the specified address. The default is 0.

Description

The **fill** command fills a specified block of memory with a specified value. The data or fill value specified is placed in memory starting at the first address specified, and it fills through the last (or end) address specified.

Example

This example displays the original value in address range 08000000 through 08000080 and the value of the same address range after the **fill** command.

```
DP264> pl 8000000
08000000: E7E01021 00000000 00000000 00000000 !...............
08000010: 00000000 00000000 00000000 00000000 ................
08000020: E7E01095 00000000 00000000 00000000 ................
08000030: 00000000 00000000 00000000 00000000 ................
08000040: 00000000 00000000 00000000 00000000 ................
08000050: 00000000 00000000 00000000 00000000 ................
08000060: 00000000 00000000 00000000 00000000 ................
08000070: 00000000 00000000 00000000 00000000 ................
DP264> fill 8000000 8000080 1f1f1f1f
DP264> pl 8000000 8000080
08000000: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000010: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000020: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000030: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000040: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000050: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000060: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000070: 1F1F1F1F 1F1F1F1F 1F1F1F1F 1F1F1F1F ................
08000080: 1F1F1F1F 00000000 00000000 00000000 ................
```

4.4.40 flash — Program Data into Flash Memory

The **flash** command programs data into flash memory.

Format

flash [source_address [destination_offset [bytes_to_write]]]

Parameters

source_address

Specifies the address in memory of the data to be programmed into the flash. The default is the default boot address (see **bootadr**).

destination_offset

Specifies the offset, in bytes, into the flash where the first byte of source data will be programmed. If not provided, you are prompted with a default destination_offset value. The destination_offset combined with the size of the data to be written must fit within the remaining space in the flash. Also note that ROM images containing the standard Makerom header must be longword aligned. See the MAKEROM chapter of the *Alpha Microprocessors Motherboard Software Design Tools User's Guide*.

bytes_to_write

Specifies how many bytes to write beginning at the source_address. This parameter causes the flash command to ignore any standard header that might be included in the source data. This value defaults to the value in the image size field of the standard header. If not specified and if there is no standard image at the beginning of the source data, this value is assumed to be the remaining space in the flash.

Description

The **flash** command programs the flash memory on the motherboards containing this type of memory. It reads data from memory at the specified source address and programs it into the flash at the specified offset. The amount of data written can be specified by the user or determined by the **flash** command.

Example

```
DP264> netload pc64dbm.rom
Attempting BOOTP...
Loading /users/eval/pc64/pc64dbm.rom at 300000
 My IP address:     16.123.45.67
 Server IP address: 16.123.45.69
###################File loaded
DP264> flash
Image source address : 0x300000
Standard image header: Found.
      Header Size......... 56 bytes
      Image Checksum...... 0x6eeb (28395)
      Memory Image Size... 0x30B2C (199468 = 194 KB)
      Compression Type.... 0
      Image Destination... 0x0000000000300000
      Header Version...... 2
      Firmware ID  (Opt.). 0 - Alpha Evaluation Board Debug Monitor
      FROM Image Size....... 0x30B2C (199468 = 194 KB)
      Firmware ID (Opt.).. 0200009511221015  ..”....
      ROM offset.......... 0x00000000
      Header Checksum..... 0x71fb

Enter destination offset or press RETURN for default [0]:
```

```
Flash offset         : 0x0
Image size w/ header : 199524  (Segment 0 to 3 inclusive).

        !!!!! Warning: About to overwrite flash memory !!!!!
              Press Y to proceed, any other key to abort.

Update canceled by user.
DP264> flash
Image source address : 0x300000
Standard image header: Found.
      Header Size......... 56 bytes
      Image Checksum...... 0x6eeb (28395)
      Memory Image Size... 0x30B2C (199468 = 194 KB)
      Compression Type.... 0
      Image Destination... 0x0000000000300000
      Header Version...... 2
      Firmware ID.........0 - Alpha Evaluation Board Debug Monitor
      ROM Image Size...... 0x30B2C (199468 = 194 KB)
      Firmware ID (Opt.).. 0200009511221015  ..”....
      ROM offset.......... 0x00000000
      Header Checksum..... 0x71fb

Enter destination offset or press RETURN for default [0]: 40000
Flash offset         : 0x40000
Image size w/ header : 199524  (Segment 4 to 7 inclusive).

        !!!!! Warning: About to overwrite flash memory !!!!!
              Press Y to proceed, any other key to abort.

Writing Flash Block: 4W 5W 6W 7W
Verifying Flash Block: 4V 5V 6V 7V
DP264> romlist
ROM image header found at offset: 0x040000
     Header Size......... 56 bytes
     Image Checksum...... 0x6eeb (28395)
     Memory Image Size... 0x30B2C (199468 = 194 KB)
     Compression Type.... 0
     Image Destination... 0x0000000000300000
     Header Version...... 2
     Firmware ID......... 0 - Alpha Evaluation Board Debug Monitor
     ROM Image Size...... 0x30B2C (199468 = 194 KB)
     Firmware ID (Opt.).. 0200009511221015  ..”....
     ROM offset.......... 0x00000000
     Header Checksum..... 0x71fb

! Change the Image Destination field from 300000 to 400000
! Note that because no changes were performed to the Header
! Checksum field after the change, a header checksum
! error will be reported with romlist.
DP264> dml 500000 400000
DP264> flash 500000 40018 4
Image source address : 0x500000

Flash offset         : 0x40018
Data image size      : 4 (Segment 4 to 4 inclusive).

        !!!!! Warning: About to overwrite flash memory !!!!!
              Press Y to proceed, any other key to abort.

Writing Flash Block: 4W
Verifying Flash Block: 4V
```

```
DP264> romlist
ROM image header found at offset: 0x040000
   Header Size......... 56 bytes
   Image Checksum...... 0x6eeb (28395)
   Memory Image Size... 0x30B2C (199468 = 194 KB)
   Compression Type.... 0
   Image Destination... 0x0000000000400000
   Firmware ID......... 0 - Alpha Evaluation Board Debug Monitor
   ROM Image Size...... 0x30B2C (199468 = 194 KB)
   Firmware ID (Opt.).. 0200009511221015  ..”....
   ROM offset.......... 0x00000000
   Header Checksum..... 0x71fb
ERROR: Bad ROM header checksum. 0x79fb
```

4.4.41 flasherase — Erase Data from Flash Memory

The **flasherase** command erases data from flash memory.

Format

flasherase [starting_offset [bytes_to_erase]]

Parameters

starting_offest

Specifies the offset, in bytes, into the flash where data will be erased. If not provided, the entire flash will be erased.

bytes_to_erase

Specifies how many bytes to erase. If not specified, all bytes from the starting_offset through the rest of the flash will be erased.

Description

The **flasherase** command clears flash memory on boards equipped with flash. The area to be erased, that is, filled with zeros, can be specified or calculated by the **flasherase** command.

Example

```
DP264> romlist
ROM image header found at offset: 0x000000
  Header Size......... 0x38 (56) bytes
  Image Checksum...... 0x45b0 (17840)
  Memory Image Size... 0xBA40 (47680 = 46 KB)
  Compression Type.... 0
  Image Destination... 0x0000000000300000
  Header Version...... 2
  Firmware ID......... 6 - Alpha Evaluation Board Fail-Safe Booter
  ROM Image Size...... 0xBA40 (47680 = 46 KB)
  Firmware ID (Opt.).. 0202009702121228  (.......
  ROM offset.......... 0x00000000
  Header Checksum..... 0xfad4

ROM image header found at offset: 0x010000
  Header Size......... 0x38 (56) bytes
  Image Checksum...... 0xc63c (50748)
  Memory Image Size... 0x280B4 (164020 = 160 KB)
  Firmware ID (Opt.).. 0202009706130904  ........
  ROM offset.......... 0x00000000
  Header Checksum..... 0x94a5
DP264> flasherase 40000
Flash offset         : 0x40000
Bytes to be erased   : 786432 (Block 4 to 15 inclusive).
        !!!!! Warning: About to overwrite flash memory !!!!!
           Press Y to proceed, any other key to abort.
Writing Flash Block: 4V 5V 6V 7V 8V 9V 10V 11V 12V 13V 14V 15V
```

4.4.42 flboot — Download and Execute File from Diskette

The **flboot** command downloads the specified file from the diskette and begins execution of that file.

Format

flboot file [address]

Parameters

file

Specifies the name of the file to access on the diskette.

address

Specifies the address at which to load the file. The default is the boot address.

Description

The **flboot** command downloads the specified file into the specified address or the boot address. The downloaded file automatically begins execution in PALmode as if a **jtopal** command had been entered.

Example

```
DP264> flboot  size2
High Density selected

size2    .           20 bytes  11/21/1999 13:42:20
loading...
cluster:   2 sector:  33 buffer:  200000
done...
Jumping to 0x200000...
```

4.4.43 flcd — Display or Change Working Directory or Drive

The **flcd** command displays or changes the current working directory or drive.

Format

flcd [drive_pathname]

Parameters

drive_pathname

Specifies the new drive and working directory.

Description

The **flcd** command allows you to change the current working directory for the current drive. It can also be used to switch to a different default drive. If no parameters are specified, then the default drive and working directory are displayed.

Drives are specified by using the letters A through Z. The path is a list of subdirectories separated by a slash (/) for Tru64 UNIX users or a backslash (\) for DOS users. The top-level directory (known as the root directory) is represented by a slash (/) or backslash (\). A path can be an absolute or relative path. An absolute path begins with the root directory, whereas a relative path begins with the current working directory.

Subdirectory entries also contain two special entries that can be used to specify a path. One period (.) represents the current directory and two periods (..) represent the directory above the current level.

Example

```
DP264> flcd
a:\
DP264> fldir
High Density selected
10/04/99  02:07p                 203088 rom.cmp
10/04/9999  02:08p                 203140 rom.rom
10/06/99  10:05a            <DIR>       dir1
10/06/99  10:05a            <DIR>       dir3
                                1048576 bytes free
DP264> flcd dir1
a:\dir1\
DP264> fldir
High Density selected
10/06/99  10:05a            <DIR>       .
10/06/99  10:05a            <DIR>       ..
10/06/99  10:05a            <DIR>       dir2
                                1048576 bytes free
DP264> flcd /dir1/dir2
a:\dir1\dir2\
DP264> fldir
High Density selected
10/06/99  10:05a            <DIR>       .
10/06/99  10:05a            <DIR>       ..
                                1048576 bytes free
DP264> flcd ../../dir3
a:\dir1\dir2\..\..\dir3\
DP264> fldir
High Density selected
10/06/99  10:05a            <DIR>       .
10/06/99  10:05a            <DIR>       ..
04/28/99  05:50p                     71 diff.lst
                                1048576 bytes free
DP264> flcd b:
b:\
DP264> fldir
```

```
High Density selected
09/07/99  10:28a                      6688 srom
10/03/99  05:59p                    202980 rom.rom
                                   1247232 bytes free
```

4.4.44 flcopy — Copy File

The **flcopy** command copies a file to another location.

Format

flcopy source_file destination_file

Parameters

source_file

Specifies the file to be copied. If no drive and path are specified, the default drive and path are used.

destination_file

Specifies the name of the copied file. If no drive and path are specified, the default drive and path are used. Note that a destination file name must always be specified, even if copying to a subdirectory.

Description

The **flcopy** command allows you to copy a file to another destination. An optional drive and path specification may be specified for either the source or destination file name. If they are not specified, then the default drive and path are used.

Example

```
DP264> flcd \dir3
a:\dir3\
DP264> fldir
High Density selected
10/06/99  10:05a          <DIR>       .
10/06/99  10:05a          <DIR>       ..
04/28/99  05:50p                   71 diff.lst
                              1048064 bytes free
DP264> flcopy diff.lst ..\dir1\dir2\diff2.lst
High Density selected
Copying files...
Done...
DP264> fldir ..\dir1\dir2\
High Density selected
10/06/99  10:05a          <DIR>       .
10/06/99  10:05a          <DIR>       ..
10/06/99  10:48a                   71 diff2.lst
                              1047552 bytes free
DP264> flcopy diff.lst b:\diff2.lst
High Density selected
High Density selected
Copying files...
Done...
DP264> fldir b:\
High Density selected
09/07/99  10:28a                 6688 srom
10/03/99  05:59p               202980 rom.rom
10/06/99  10:53a                   71 diff2.lst
                              1246720 bytes free
```

4.4.45 fldir — Display File Listing

The **fldir** command displays a list of files in the current or specified directory.

Format

fldir [drive_pathname]

Parameters

drive_pathname

Specifies the drive or subdirectory.

Description

The **fldir** command displays a directory of files in the current or specified directory.

Drives are specified by using the letters A through Z. The path is a list of subdirectories separated by a slash (/) for Tru64 UNIX users or a backslash (\) for DOS users. The top-level directory (known as the root directory) is represented by a slash (/) or backslash (\). A path can be an absolute or relative path. An absolute path begins with the root directory, whereas a relative path begins with the current working directory.

Subdirectory entries also contain two special entries that can be used to specify a path. One period (.) represents the current directory and two periods (..) represent the directory above the current level.

Example

```
DP264> flcd
a:\

DP264> fldir
High Density selected
10/04/99  02:07p                 203088 rom.cmp
10/04/99  02:08p                 203140 rom.rom
10/06/99  10:05a            <DIR>       dir1
10/06/99  10:05a            <DIR>       dir3
                                1048064 bytes free
DP264> fldir /dir1
High Density selected
10/06/99  10:05a            <DIR>       .
10/06/99  10:05a            <DIR>       ..
10/06/99  10:05a            <DIR>       dir2
                                1048064 bytes free
DP264> flcd dir1\dir2
a:\dir1\dir2\
DP264> fldir ..\..\dir3
High Density selected
10/06/99  10:05a            <DIR>       .
10/06/99  10:05a            <DIR>       ..
04/28/99  05:50p                     71 diff.lst
                                1048064 bytes free
DP264> fldir b:\
High Density selected
09/07/99  10:28a                   6688 srom
10/03/99  05:59p                 202980 rom.rom
                                1247232 bytes free
```

4.4.46 flload — Download File from Diskette

The **flload** command downloads the specified file from the diskette.

Format

flload file [address]

Parameters

file

Specifies the name of the file to access on the diskette.

address

Specifies the address at which to load the file. The default is the boot address.

Description

The **flload** command downloads the specified file into the specified address or the boot address. The program can then be executed with the **go** or **jtopal** commands.

Example

```
DP264> bootadr
00200000
DP264> flload size2
High Density selected

size2    .           20 bytes  11/21/1999 13:42:20
loading...
cluster:   2 sector:  33 buffer:  200000
done...
```

4.4.47 flread — Read Logical Sectors from Diskette

The **flread** command reads logical sectors from a diskette.

Format

flread [first_sector [bytes [dest_address [iterations [drive]]]]]

Parameters

first_sector

Specifies the first logical sector of diskette to read. The default is sector 0 (the boot sector).

bytes

Specifies the number of bytes to be read from the diskette. The default sector is one sector.

dest_address

Specifies the beginning address where data will be loaded. The default is the boot address.

iterations

Specifies the number of times to repeat the reading of the sector range. The default is 1.

drive

Specifies the diskette drive number to use: 0 or 1. The default is 0.

Description

The **flread** command reads the data from the specified logical sectors of a diskette into memory. The iterations parameter can be used to repeat the task a specified number of times.

Example

```
DP264> flread 1
High Density selected
Reading 0 bytes to 0x300000 starting at sector 1.
Done... 512 (0X200) bytes transferred
DP264> flread 1 1500
High Density selected
Reading 1500 bytes to 0x300000 starting at sector 1.
Done... 1536 (0X600) bytes transferred
DP264> flread 1 1500 400000
High Density selected
Reading 1500 bytes to 0x400000 starting at sector 1.
Done... 1536 (0X600) bytes transferred
DP264> flread 1 1500 400000 3
High Density selected
Reading 1500 bytes to 0x400000 starting at sector 1.
Done... 1536 (0X600) bytes transferred
         2 iterations remaining
Done... 1536 (0X600) bytes transferred
         1 iterations remaining
Done... 1536 (0X600) bytes transferred
```

4.4.48 flsave — Write Memory Range to File

The **flsave** command writes a memory range to a file.

Format

flsave file_name start_address file_size

Parameters

file_name

Specifies the name of the file to be created with the data. If no drive or path is specified, the file is created in the default working directory.

start_address

Specifies the address in memory to start writing to the file.

file_size

Specifies the size in bytes of the file to write.

Description

The **flsave** command writes a section of memory to a file. The file name can specify a drive and path.

Example

```
DP264> flsave test.txt 300000 34526
High Density selected
Saving range 0x300000 to 0x334525 to file  test.txt
DP264> flsave b:\test.txt 300000 34526
High Density selected
Saving range 0x300000 to 0x334525 to file  b:\test.txt
```

4.4.49 flwrite — Write Data to Diskette's Logical Sectors

The **flwrite** command writes data to logical sectors on a diskette.

Caution: This is a destructive command. You must be careful which sectors you write to because you may render the disk unusable.

Format

flwrite [first_sector [image_size [source_address [iterations [drive]]]]]

Parameters

first_sector

Specifies the first logical sector of diskette to be written. The default is sector 0 (the boot sector).

image_size

Specifies the number of bytes to write to the diskette. The default is one sector.

source_address

Specifies the beginning address where data to be written resides. The default is the boot address.

iterations

Specifies the number of times to repeat the writing of the sector range. The default is 1.

drive

Specifies the diskette drive number to use: 0 or 1. The default is 0.

Description

The **flwrite** command writes data from memory to the specified logical sectors of a diskette.

The iterations parameter can be used to repeat the task a specified number of times.

Example

```
DP264> flwrite 30
High Density selected
Writing 0 bytes from 0x400000 starting at sector 30.
Done... 512 (0X200) bytes transferred
DP264> flwrite 30 3400
High Density selected
Writing 3400 bytes from 0x400000 starting at sector 30.
Done... 3584 (0XE00) bytes transferred
DP264> flwrite 30 3400 300000
High Density selected
Writing 3400 bytes from 0x300000 starting at sector 30.
Done... 3584 (0XE00) bytes transferred
DP264> flwrite 30 3400 300000 2
High Density selected
Writing 3400 bytes from 0x300000 starting at sector 30.
Done... 3584 (0XE00) bytes transferred
         1 iterations remaining
Done... 3584 (0XE00) bytes transferred
```

4.4.50 fwupdate — Load and Run Firmware Update from Diskette

The **fwupdate** command loads and runs the firmware update utility from diskette.

Format

fwupdate

Parameters

None.

Description

The **fwupdate** command loads and executes the firmware update utility (fwupdate.exe) from diskette. The utility gets loaded into physical address 900000_{16} (physical location 9 MB), and gets executed in PALmode.

This command expects the diskette to be formatted with a FAT file structure.

Example

```
DP264> fwupdate
 ...follow instructions to update firmware for
       Windows NT Firmware, the Debug Monitor, or the Alpha SRM Console ...
```

4.4.51 go — Begin Executing Instructions

The **go** command begins execution of instructions at the specified address.

Format

go [start_address]

Parameters

start_address

Specifies the address at which to start executing the instructions.

Description

The **go** command jumps to a location in memory and begins executing instructions. If no address is specified, then the execution of instructions begins at the boot address.

Example

This example starts executing instructions at address 100000_{16}.

```
DP264> go 100000
```

4.4.52 help — Display Command Information

The **help** command displays a list of commands currently available. If you specify a command keyword, information about the specified command is displayed.

Format

h[elp] [command_keyword]

Parameters

command_keyword

Indicates any command name that appears in the list when you type the **help** command. An asterisk (*) displays help for all commands.

Description

The **help** command displays a list of command keywords implemented in the current release. The command can be abbreviated to one letter, **h**. If you specify a command with a command keyword, then a brief description and syntax for the specified command is displayed. You can use an asterisk (*) in place of a command keyword to display all help information.

Example

The **help** command without a parameter displays a list of all commands implemented in the current version of the software. When specified with a parameter, it displays more information about that command keyword.

```
DP264> help
A brief help description is available for each of the
following commands.

load       boot       netload    netboot    flcd       flcopy
fldir      flboot     flload     flread     flwrite    flsave
romboot    romlist    romload    romverify  bootadr    bootopt
go         jtopal     init       emb        emw        eml
emq        ddmq       dmb        dmw        dml        dmq
pq         pl         pw         pb         cq         cl
cw         cb         fill       copy       compare    dis
sum        rl         rw         rb         wl         ww
wb         mrl        mrw        mrb        mwl        mww
mwb        sq         sl         sw         sb         pcishow
prl        prw        prb        pwl        pww        pwb
flash      flasherase fwupdate   date       apropos    help
h          ident      version    sysshow    swpipl     mces
wrfen      preg       pfreg      creg       cfreg      stop
bpstat     next       n          step       s          cont
delete     ladebug    iack       rmode      setty      setbaud
tip        cominit    vinit      edevice    eshow      ereg
estat      einit      estop      ebuff      edmp       eprom
arpshow    mcheck     beep       memtest    mt

         Hit any key to continue. Control-C to quit...

DP264>  help *
Displays help for all commands in the command list.
```

4.4.53 iack — Perform Interrupt Acknowledge Cycle

The **iack** command performs an interrupt acknowledge cycle.

Format

iack

Parameters

None.

Description

The **iack** command allows you to perform an interrupt acknowledge cycle. Two **iack** commands are required to read the interrupt vector.

Example

```
DP264> iack
FF
DP264> iack
07
```

4.4.54 ident — Identify Revision of Files

The **ident** command displays revision control system (RCS) ID strings found in the specified memory range.

Format

ident [start_address [end_address]]

Parameters

start_address

Specifies a hexadecimal number that represents a legal address at which to start searching for RCS keywords. The default value is the boot address.

end_address

Specifies a hexadecimal number that represents a legal address at which to end the search for RCS keywords. The default value is the boot address plus 70_{16}.

Description

The **ident** command identifies the revision of files used to build images that were loaded into memory by searching for all occurrences of the pattern $keyword: ...$ in the specified memory range. This command is based on the assumption that RCS was used for version control on the source files on the host development system. RCS is supplied with the Tru64 UNIX operating system.

Example

```
DP264> ident 0 80000
Id: crt_startup.s,v 1.3 1999/06/18 20:30:03 fdh Rel $
Id: crt.c,v 1.1 1999/06/08 19:56:39 fdh Rel $
Id: dis.c,v 1.1 1999/06/08 19:56:40 fdh Rel $
Id: ffexec.c,v 1.2 1999/06/09 20:23:05 fdh Rel $
Id: ffsrec.c,v 1.1 1999/06/08 19:56:41 fdh Rel $
Id: cmd.c,v 1.6 1999/06/18 17:32:36 fdh Rel $
Id: pReg.c,v 1.1 1999/06/08 19:56:41 fdh Rel $
Id: rw.c,v 1.1 1999/06/08 19:56:42 fdh Rel $
Id: netboot.c,v 1.1 1999/06/08 19:56:30 fdh Rel $
Id: amd.c,v 1.2 1999/06/08 22:32:57 berent Rel $
Id: tftp.c,v 1.1 1999/06/08 19:56:31 fdh Rel $
Id: netutil.c,v 1.1 1999/06/08 19:56:31 fdh Rel $
Id: boots.c,v 1.2 1999/06/08 22:32:57 berent Rel $
Id: listener.c,v 1.2 1999/06/08 22:32:57 berent Rel $
Id: kernel.c,v 1.5 1999/06/18 17:49:34 fdh Rel $
Id: bptable.c,v 1.1 1999/06/08 19:56:33 fdh Rel $
Id: kutil.s,v 1.1 1999/06/08 19:56:36 fdh Rel $
Id: comms.c,v 1.2 1999/06/08 22:32:06 berent Rel $
Id: server_read_loop.c,v 1.1 1999/06/08 19:56:38 fdh Rel $
Id: packet-handling.c,v 1.2 1999/06/08 22:32:06 berent Rel $
Id: printf.c,v 1.1 1999/06/08 19:56:24 fdh Rel $

         Hit any key to continue. Control-C to quit...
```

4.4.55 init — Reinitialize the Debug Monitor

The **init** command reinitializes the Debug Monitor.

Format

init

Parameters

None.

Description

The **init** command restarts the Debug Monitor by jumping to the PALcode base address in PALmode. It is analogous to using the **jtopal** command with the PALbase address.

Example

```
DP264> init
Stopping network device 0 in PCI slot 18:
Jumping to 0x000000...
==========  Starting Debug Monitor!!!  =============
```

4.4.56 jtopal — Set to PALmode and Execute Instructions

The **jtopal** command sets the environment to PALmode and begins execution of instructions at the specified address.

Format

jtopal [start_address]

Parameters

start_address

Specifies the address at which to start executing instructions. The default is the boot address.

Description

The **jtopal** command emulates the hardware mechanism for entering PALcode. When instructions contain PALcode, you must set the environment to PALmode to properly execute instructions. This command is required for executing downloaded images entered in PALmode, such as a serial ROM or debug ROM image. The **jtopal** command sets the environment to PALmode and then jumps to the specified location in memory to begin executing instructions.

Example

This example starts executing instructions at address 100000_{16}.

```
DP264> jtopal 100000
```

4.4.57 ladebug — Start Ladebug Remote Debugger

The **ladebug** command starts the Ladebug server for a remote debug session.

Format

ladebug

Parameters

None.

Description

The **ladebug** command configures the motherboard as a remote debugger target. You can connect to the motherboard from the Ladebug source-level debugger running on a Tru64 UNIX host. Communication is performed through the Ethernet connection. The Ladebug software provides the full source-level debugging capabilities of most programs running on the motherboard, including the Debug Monitor.

To debug a program running on a motherboard using Ladebug running on a remote host, follow these steps:

1. Load the program into memory on the motherboard.
2. Set a breakpoint in the program.
3. Execute the program. The program will stop at the breakpoint and print the instruction line at that location.
4. Issue the **ladebug** command. This causes the motherboard to wait for a connection from Ladebug.
5. From the host system, enter the command to start up Ladebug and cause it to connect to the motherboard.

Refer to the Ladebug documentation for more information.

Example

```
DP264> netload size
Ethernet Base Address: 360, DMA Mask: 1 = DRQ5
Init Block Address 100000
Init Done.
Ethernet BA-98-76-54-32-10
Attempting BOOTP...success.
      my IP address: 16.123.45.67
  server IP address: 16.123.45.69
 gateway IP address: 16.123.45.69
Loading from /users/eval/boot/size ...
####
DP264> stop 200000
DP264> go
Executing at 0x200000...

00200000:  23DEFFF0         lda    sp, -16(sp)
DP264> ladebug
Ethernet Base Address: 360, DMA Mask: 1 = DRQ5
Init Block Address 100000
Init Done.
Client connected : client is FFFFFFFFA0107F10
```

The following command, entered from the host system, starts Ladebug and causes it to connect to the DP264:

```
% ladebug size.out -rn dp264 -pid 0
```

The following information is displayed on the host system:

```
Welcome to the Ladebug Debugger Version 1.3.1
     ------------------
     object file name: size.out
     machine name: dp264
     process id: 0
     Reading symbolic information ...done
     Connected to remote debugger
     (ladebug)
```

The `(ladebug)` in the previous example is the Ladebug prompt. You are now ready to debug a process that is running on the DP264.

4.4.58 load — Download File Using XMODEM Protocol

The **load** command downloads a file through the active serial port using the XMODEM protocol.

Format

load [address]

Parameters

address

Specifies the address at which to download the file. The default is the boot address.

Description

The **load** command uses the XMODEM protocol to download a file through the active serial port. The program is loaded to the supplied address or the boot address if an address is not specified. The program can then be executed with the **go** or **jtopal** commands.

Example

In this example, a Tru64 UNIX host system is connected to the motherboard on device `/dev/tty01`. The `sx` command sends a file using XMODEM.

```
% echo load 300000 > /dev/tty01
% sx -kt 10 /users/eval1/demo2/size </dev/ttya01 >/dev/tty01
Sector nnn
%tip /dev/tty01
DP264>
```

4.4.59 mces — Set or Display Machine Check Error Summary

The **mces** command sets or displays the machine check error summary register.

Format

mces [mces_data]

Parameters

mces_data

Specifies the value to be written to the machine check error summary register.

Description

The machine check error summary register controls machine check and system-correctable error handling. The **mces** command provides direct user access to the rdmces and wrmces PALcode instructions that are defined by the *Alpha Architecture Reference Manual*.

This register is also affected by the **mcheck** command.

Example

In the following example, a zero is written to the machine check error summary register:

```
DP264> mces
Machine Check Error Summary: 08
DP264> mces 0
Machine Check Error Summary: 00
```

4.4.60 mcheck — Control Machine Checks

The **mcheck** command controls the reporting of hardware error conditions (machine checks).

Format

mcheck state

Parameters

state = on

Enables all machine check reporting.

state = off

Disables all machine check reporting.

state = system

Enables machine check reporting for hardware errors detected external to the CPU.

state = cpu

Enables machine check reporting for hardware errors detected by the CPU.

Description

The **mcheck** command controls the reporting of hardware error conditions. A machine check indicates that a hardware error condition was detected. Different error conditions are detected by the CPU or system logic external to the CPU. To help to ensure the availability of the Debug Monitor for hardware debug, machine check reporting is disabled when the Debug Monitor starts up. This condition makes the Debug Monitor firmware more fail-safe than conventional firmware when hardware integrity is questionable. Therefore, when using the Debug Monitor, machine checks can be enabled on demand by the **mcheck** command to facilitate low-level hardware debug.

Because some machine checks are reported through interrupt requests at interrupt priority level (IPL) 6, the **mcheck** command could change the current IPL. If the current IPL is lower than 7, the current IPL will not be affected. See the description of the **swpipl** command for more information about the IPL.

The **mcheck** command could also modify the machine check error summary register. See the **mces** command for more information about the machine check error summary register.

Example

In the following example, all machine check and correctable error reporting are enabled before running the memory test. The errors displayed in this example are correctable, and without machine checks enabled, these memory errors would be corrected by the CPU.

```
DP264> mcheck on
Old BC_CTL = 0x00028051  &  BC_CFG = 0x01E21772
New BC_CTL = 0x00020041  &  BC_CFG = 0x01E21772
CIA_CACK_EN = 0x8  &  CIA_MCR = 0x2001FE21
DP264> mces
Machine Check Error Summary: 00
DP264> memtest
Walking 1’s ... range 0x0008a420:0x03ffc000
Processor Correctable Machine Check: Interrupt vector = 0x630
      EI_STAT: FFFFFFF0C4FFFFFF      EI_ADDR: FFFFFF00001231AF
FILL_SYNDROME: 0000000000000019          ISR: 0000000100600000
Processor Correctable Machine Check: Interrupt vector  = 0x630
      EI_STAT: FFFFFFF0C4FFFFFF      EI_ADDR: FFFFFF00009231AF
FILL_SYNDROME: 0000000000000019         ISR: 0000000100600000
```

4.4.61 memtest — Perform Tests on Memory Range

The **memtest** command tests a memory range.

Format

memtest [iterations [start_address [end_address [increment [mcheck [stop_drivers]]]]]]

Parameters

iterations

Specifies the number of times the memory range test will run. The default iteration is 1.

start_address

Specifies the address at which to start the memory test. The default is the current address.

end_address

Specifies the address at which to end the memory test.

increment

Defines the step size. The default is longword access (4).

mcheck

Specifies the machine check state as defined by the **mcheck** command (see the **mcheck** command). The mcheck state is specified during the start of the memory test. Possible selections are: on, off, cpu, and system. The default is on.

stop_drivers

Specifies if device drivers should be stopped before the start of the memory test. A nonzero value stops all device drivers. A zero value specifies that drivers should not be stopped. The default is stopped.

Description

The **memtest** command performs a set of memory tests on the specified address range. This test uses longword accesses to memory. The tests include walking 1s and walking 0s as well as alternating 1s and 0s.

While conducting the memory test, correctable read data errors may be encountered, indicating memory integrity problems. However, if hardware error reporting is disabled, the CPU corrects the correctable errors without reporting them. To alleviate this problem, the mcheck parameter must specify the machine check conditions while running the memory test.

Device drivers that use main memory for DMA access while the memory test is running may cause *unpredictable* results. To prevent the memory test from conflicting with the device drivers, the stop_drivers parameter must be set to a nonzero value.

Example

```
DP264> memtest 2 8000000 8ffffff 4 on 1
```

4.4.62 mrb — Display Byte from Memory I/O Space

The **mrb** command reads a byte from memory in the register port in I/O address space.

Format

mrb address [iterations [silent]]

Parameters

address

Specifies the address in memory I/O space.

iterations

Specifies how many times the data is read. The default is 1.

silent

Specifies whether or not the data is displayed. Setting this field to 1 causes the data to be read but not displayed. The default is 0 (data is displayed).

Description

The **mrb** command displays the byte from the specified memory location in the memory I/O space. For example, on the DP264, the byte is read from the ISA extension slot.

Example

```
DP264> mrb d0000
FF
```

4.4.63 mrl — Display Longword from Memory I/O Space

The **mrl** command reads a longword from memory in the register port in I/O address space.

Format

mrl address [iterations [silent]]

Parameters

address

Specifies the address in memory I/O space.

iterations

Specifies how many times the data is read. The default is 1.

silent

Specifies whether or not the data is displayed. Setting this field to 1 causes the data to be read but not displayed. The default is 0 (data is displayed).

Description

The **mrl** command displays the longword from the specified memory location in the memory I/O space. For example, on the DP264, the longword is read from the ISA extension slot.

Example

```
DP264> mrl d0000
FC04FF00
```

4.4.64 mrw — Read Word from Memory I/O Space

The **mrw** command reads a word from memory in the register port in I/O address space.

Format

mrw address [iterations [silent]]

Parameters

address

Specifies the address in memory I/O space.

iterations

Specifies how many times the data is read. The default is 1.

silent

Specifies whether or not the data is displayed. Setting this field to 1 causes the data to be read but not displayed. The default is 0 (data is displayed).

Description

The **mrw** command displays the word from the specified memory location in the memory I/O space. For example, on the DP264, the word is read from the ISA extension slot.

Example

```
DP264> mrw d0000
FF00
```

4.4.65 mt — Measure Memory Bandwidth

The **mt** command measures memory bandwidth.

Format

mt

Parameters

None.

Description

The **mt** command measures memory bandwidth.

Example

```
DP264> mt
```

4.4.66 mwb — Write Byte to Memory I/O Space

The **mwb** command writes a byte to memory in the register port in I/O address space.

Format

mwb address data [iterations]

Parameters

address

Specifies the address in memory I/O space where the byte is written.

data

Specifies byte data.

iterations

Specifies how many times the data is read. The default is 1.

Description

The **mwb** command specifies the memory location in I/O memory space to write data in byte format.

Example

```
DP264> mrb d0000
FF
DP264> mwb d0000 0
DP264> mrb d0000
00
```

4.4.67 mwl — Write Longword to Memory I/O Space

The **mwl** command writes a longword to memory in the register port in I/O address space.

Format

mwl address data [iterations]

Parameters

address

Specifies the address in memory I/O space where the longword is written.

data

Specifies longword of data.

iterations

Specifies how many times the data is read. The default is 1.

Description

The **mwl** command writes a longword to memory in I/O address space. For example, on the DP264, the longword is written to the ISA extension slot.

Example

```
DP264> mwl d0000 fc04ff00
```

4.4.68 mww — Write Word to Memory I/O Space

The **mww** command writes a word to memory in the register port in I/O address space.

Format

mww address data [iterations]

Parameters

address

Specifies the address in memory I/O space where the word is written.

data

Specifies word of data.

iterations

Specifies how many times the data is read. The default is 1.

Description

The **mww** command writes a word to memory I/O space. For example, on the DP264, a word is written to the ISA extension slot.

Example

```
DP264> mrw d0000
FF00
DP264> mww d0000 a5a5
DP264> mrw d0000
A5A5
```

4.4.69 netboot — Download and Execute File

The **netboot** command downloads the specified file through the Ethernet port and begins execution of that file.

Format

netboot [file [address]]

Parameters

file

Specifies a legal file name to be downloaded to the motherboard. The default is to load the file specified in the `bootptab` file.

address

Specifies the address at which to download the file. The default is the boot address.

Description

The **netboot** command uses BOOTP to download the specified file through the Ethernet port. The Ethernet port is selected through the **edevice** command. The downloaded file automatically begins execution in PALmode. This command has the same effect as using the **netload** command followed by the **jtopal** command.

A default file and directory path may be defined in the `bootptab` file. See Section 2.3.4.2 for more information.

If you specify an address, this address becomes the default boot address. This value, however, is not set in battery-backed RAM.

Example

This example downloads and begins execution of a file called `size`.

```
DP264> netboot size
Ethernet Base Address: 360, DMA Mask: 1 = DRQ5
Init Block Address 80000
Init Done.
Ethernet BA-98-76-54-32-10
Attempting BOOTP...success.
       my IP address: 16.123.45.67
   server IP address: 16.123.45.69
  gateway IP address: 16.123.45.69
Loading from /users/eval/boot/size ...
###
Jumping to 0x100000...

  char   =  1
  short  =  2
  int    =  4
  long   =  8
  float  =  4
  double =  8

Alpha 21264 Evaluation Board (DP264) Debug Monitor
  Version: Wed Feb 10 19:52:24 EST 1999
  Bootadr: 0x100000, memSize: 0x2000000
```

4.4.70 netload — Download File to Default Boot Address

The **netload** command downloads the specified file through the Ethernet port to the default boot address.

Format

netload [file [address]]

Parameters

file

Specifies a legal file name to be downloaded to the motherboard. The default is to load the file specified in the `bootptab` file.

address

Specifies the address at which to download the file. The default is the boot address.

Description

The **netload** command uses BOOTP to download the specified file through the Ethernet port. The Ethernet port is selected using the **edevice** command. The program is loaded into the default boot address. You can set up or change the boot address with the **bootadr** command. The program can then be executed with the **go** or **jtopal** command.

A default file and directory path may be defined in the `bootptab` file. See Section 2.3.4.2 for more information.

If you specify an address, this address becomes the default boot address. This value, however, is not set in battery-backed RAM.

Example

In this example, a file called `size` is loaded into the default boot address.

```
DP264> netload size
Ethernet Base Address: 360, DMA Mask: 1 = DRQ5
Init Block Address 80000
Init Done.
Ethernet BA-98-76-54-32-10
Attempting BOOTP...success.
       my IP address: 16.123.45.67
   server IP address: 16.123.45.69
  gateway IP address: 16.123.45.69
Loading from /users/eval/boot/size ...
###
```

4.4.71 next — Execute Next Machine Instruction

The **next** command executes the machine instruction without stepping into subroutines.

Format

n[ext]

Parameters

None.

Description

Use the **step** command and the **next** command to execute a machine instruction. When the instruction contains a subroutine, the **step** command steps into the subroutine being called and the **next** command executes the subroutine being called.

Example

In the following example, the **step** command used at address 200034 steps to the first instruction of the function being called at address 2000c0. The **next** command used at address 2000ec executes the function being called and steps to the next instruction at address 2000f0.

```
DP264> dis
00200030:  a77d8010        ldq    r27, 32784(r29)
00200034:  6b5b4000        jsr    r26, r27
00200038:  27ba0001       ldah    r29, 1(r26)
0020003c:  23bdc148        lda    r29, 49480(r29)
DP264> step
00200030:  a77d8010        ldq    r27, 32784(r29)
DP264> step
00200034:  6b5b4000        jsr    r26, r27
DP264> step
002000c0:  27bb0001       ldah    r29, 1(r27)
        .
        .
        .
DP264> dis
002000e8:  a77d8040        ldq    r27, 32832(r29)
002000ec:  6b5b46b8        jsr    r26, r27
002000f0:  27ba0001       ldah    r29, 1(r26)
DP264> step
002000e8:  a77d8040        ldq    r27, 32832(r29)
DP264> step
002000ec:  6b5b46b8        jsr    r26, r27
DP264> next
002000f0:  27ba0001       ldah    r29, 1(r26)
DP264>
```

4.4.72 pb — Display Memory Byte

The **pb** command displays the specified memory byte (8-bit).

Format

pb [start_address [end_address [iterations [silent]]]]

Parameters

start_address

Specifies a hexadecimal number that represents a legal address at which to start the display. The default is the current address.

end_address

Specifies a hexadecimal number that represents a legal address at which to end the display. The default is the current address plus 127 bytes.

iterations

Specifies how many times the data is read. The default is 1.

silent

Specifies whether or not the data is displayed. Setting this field to 1 causes the data to be read but not displayed. The default is 0 (data is displayed).

Description

The **pb** command displays the specified memory in byte format. If no address is specified, then the current memory byte and the following 127 bytes are displayed. The field displayed after the bytes represents the translation of the memory contents in ASCII characters. If the memory contents can be translated to an ASCII character, then that character is displayed; otherwise, a dot is displayed.

The silent and iterations fields are often used together to continuously perform read operations, thus, avoiding slowdowns caused by displaying the data. The repeating cycles can be monitored with test equipment.

Example

This example displays 128 bytes from memory starting with 100000 in byte format.

```
DP264> pb 100000
00100000: 03 00 00 C1 00 00 00 00 10 D9 10 00 00 00 00 00 ................
00100010: 07 00 88 2F 00 00 9E A4 05 14 C1 43 06 14 A1 40 .../.......C...@
00100020: 22 77 80 48 06 04 C2 40 F0 82 DC B4 F8 82 9C B4 “w.H...@.......
00100030: 00 83 BC B4 3E 15 C5 43 20 00 FE B7 08 83 FC B3 ....>..C .......
00100040: 07 00 00 D0 04 04 E2 47 19 10 00 D0 80 00 00 00 .......G........
00100050: 1F 04 FF 47 00 00 00 00 00 00 00 00 00 00 00 00 ...G............
00100060: 3E 15 C6 43 28 00 1E B4 36 01 00 D0 18 80 9C A4 >..C(...6.......
00100070: 05 34 E0 43 09 03 00 D0 20 80 9C A4 05 54 E0 43 .4.C.... ....T.C
```

4.4.73 pcishow — Display PCI Slots and Mapping

The **pcishow** command displays the contents of each PCI slot and the current PCI-to-system address space mapping.

Format

pcishow bus id function

Parameters

bus

Specifies which bus to show. The default value is 0.

id

Specifies a decimal number that represents the slot assigned to the PCI device.

function

Specifies which funtion to read from. The default value is 0.

Description

The **pcishow** command applies only to PCI motherboards.

Example

```
DP264> pcishow

PCI Address Mapping windows are:
        (1) PCI Base = 0x00100000, Size = 0x00100000
                Translated Base = 0x00100000

Bus = 0
        primary = 0, secondary = 0, subordinate = 0
        PCI I/O space = 1000, PCI Mem space = 3F00000
        PCI I/O base = B000, PCI Mem base = 200000
PCI slot 18, vendor = 0x1011, device = 0x4
        PCI IO Base = 0x0, PCI IO Size = 0x0
        PCI Mem Base = 0x2000000, PCI Mem Size = 0x2000000
        Display controller
PCI slot 19, vendor = 0x8086, device = 0x484
        PCI IO Base = 0x0, PCI IO Size = 0x0
        PCI Mem Base = 0x0, PCI Mem Size = 0x0
        Non-VGA compatible device
PCI slot 17, vendor = 0x1011, device = 0x2
        PCI IO Base = 0xB000, PCI IO Size = 0x80
        PCI Mem Base = 0x4000000, PCI Mem Size = 0x80
        Ethernet controller
PCI slot 20, vendor = 0x1000, device = 0x1
        PCI IO Base = 0xB400, PCI IO Size = 0x100
        PCI Mem Base = 0x4001000, PCI Mem Size = 0x100
        Non-VGA compatible device
DP264>
```

4.4.74 pfreg — Display Floating Point Register State

The **pfreg** command displays the saved CPU floating-point register state.

Format

pfreg [address]

Parameters

address

Specifies an alternate address for the saved-state area.

Description

The **pfreg** command displays the contents of the CPU floating-point registers stored in the saved-state area. A register state is stored when a breakpoint is encountered or the PALcode reset flow is entered.

Example

```
DP264> pfreg
Floating Point Registers
register file @: 0000C840
f00: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
f04: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
f08: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
f12: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
f16: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
f20: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
f24: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
f28: 0000000000000000 0000000000000000 0000000000000000 0000000000000000
PC:  000000000000000D   PS:  000000000000000D
```

4.4.75 pl — Display Memory Longword

The **pl** command displays the specified memory longword (32-bit).

Format

pl [start_address [end_address [iterations [silent]]]]

Parameters

start_address

Specifies a hexadecimal number that represents a legal address at which to start the display. The default is the current address.

end_address

Specifies a hexadecimal number that represents a legal address at which to end the display. The default is the current address plus 127 bytes.

iterations

Specifies how many times the data is read. The default is 1.

silent

Specifies whether or not the data is displayed. Setting this field to 1 causes the data to be read but not displayed. The default is 0 (data is displayed).

Description

The **pl** command displays the specified memory in longword format. If no address is specified, then the current memory longword and the following 31 longwords are displayed. The field displayed after the longword represents the translation of the memory contents in ASCII characters. If the memory contents can be translated to an ASCII character, then that character is displayed; otherwise, a dot is displayed.

The silent and iterations fields are often used together to continuously perform read operations, thus, avoiding slowdowns caused by displaying the data. The repeating cycles can be monitored with test equipment.

Example

This example displays memory longwords.

```
DP264> pl 0
00000000: E7E01021 00000000 00000000 00000000 !...............
00000010: 00000000 00000000 00000000 00000000 ................
00000020: E7E01095 00000000 00000000 00000000 ................
00000030: 00000000 00000000 00000000 00000000 ................
00000040: 00000000 00000000 00000000 00000000 ................
00000050: 00000000 00000000 00000000 00000000 ...............
00000060: 00000000 00000000 00000000 00000000 ................
00000070: 00000000 00000000 00000000 00000000 ................
DP264> pl
00000090: 00000000 00000000 00000000 00000000 ................
000000A0: 00000000 00000000 00000000 00000000 ................
000000B0: 00000000 00000000 00000000 00000000 ................
000000C0: 00000000 00000000 00000000 00000000 ................
000000D0: 00000000 00000000 00000000 00000000 ................
000000E0: 74420082 644200A9 74210081 64210024 ..Bt..Bd..!t$.!d
000000F0: 48405682 F0400013 E4400003 77DE009E .V@H..@...@....w
00000100: 67DE009F 44205401 47E09402 744200A9 ...g.T D...G..Bt
```

```
DP264> pl 100000
00100000: C1000003 00000000 0010D910 00000000 ................
00100010: 2F880007 A49E0000 43C11405 40A11406 .../.......C...@
00100020: 48807722 40C20406 B4DC82F0 B49C82F8 “w.H...@........
00100030: B4BC8300 43C5153E B7FE0020 B3FC8308 ....>..C .......
00100040: D0000007 47E20404 D0001019 00000080 .......G........
00100050: 47FF041F 00000000 00000000 00000000 ...G............
00100060: 43C6153E B41E0028 D0000136 A49C8018 >..C(...6.......
00100070: 43E03405 D0000309 A49C8020 43E05405 .4.C.... ....T.C
DP264> pl 100000 100000
00100000: C1000003 00000000 0010D910 00000000................
```

4.4.76 pq — Display Memory Quadword

The **pq** command displays the specified memory quadword (64-bit).

Format

pq [start_address [end_address [iterations [silent]]]]

Parameters

start_address

Specifies a hexadecimal number that represents a legal address at which to start the display. The default is the current address.

end_address

Specifies a hexadecimal number that represents a legal address at which to end the display. The default is the current address plus 127 bytes.

iterations

Specifies how many times the data is read. The default is 1.

silent

Specifies whether or not the data is displayed. Setting this field to 1 causes the data to be read but not displayed. The default is 0 (data is displayed).

Description

The **pq** command displays the specified memory in quadword format. If no address is specified, then the current memory quadword and the following 15 quadwords are displayed. The field displayed after the quadword represents the translation of the memory contents in ASCII characters. If the memory contents can be translated to an ASCII character, then that character is displayed; otherwise, a dot is displayed.

The silent and iterations fields are often used together to continuously perform read operations, thus, avoiding slowdowns caused by displaying the data. The repeating cycles can be monitored with test equipment.

Example

`This example displays memory quadwords.`

```
DP264> pq
00000000: 00000000E7E01021 0000000000000000 !...............
00000010: 0000000000000000 0000000000000000 ................
00000020: 00000000E7E01095 0000000000000000 ................
00000030: 0000000000000000 0000000000000000 ................
00000040: 0000000000000000 0000000000000000 ................
00000050: 0000000000000000 0000000000000000 ................
00000060: 0000000000000000 0000000000000000 ................
00000070: 0000000000000000 0000000000000000 ................
DP264> pq 100000
00100000: 00000000C1000003 000000000010D910 ................
00100010: A49E00002F880007 40A1140643C11405 .../.......C...@
00100020: 40C2040648807722 B49C82F8B4DC82F0 “w.H...@........
00100030: 43C5153EB4BC8300 B3FC8308B7FE0020 ....>..C .......
00100040: 47E20404D0000007 00000080D0001019 .......G........
00100050: 0000000047FF041F 0000000000000000 ...G............
00100060: B41E002843C6153E A49C8018D0000136 >..C(...6.......
00100070: D000030943E03405 43E05405A49C8020 .4.C.... ....T.C
```

4.4.77 prb — Read Byte from PCI Configuration Space

The **prb** command reads a byte (8 bits) from the specified address in the PCI configuration space.

Format

prb pci_address id bus function

Parameters

pci_address

Specifies the address in PCI space.

id

Specifies a decimal number that represents the slot assigned to the PCI device.

bus

Specifies which bus to read from. The default value is 0.

function

Specifies which function to read from. The default value is 0.

Description

The **prb** command reads a byte from the specified address in the PCI configuration space for a device specified by the id. If the motherboard does not support PCI, then this command is not implemented. If your system configuration supports multiple PCI buses, use the parameters to specify the PCI device. Use the **pcishow** command to view the available PCI devices.

Example

```
DP264> prb 0 19
86
```

4.4.78 preg — Display General-Purpose Registers

The **preg** command displays the saved CPU general-purpose register state.

Format

preg [address]

Parameters

address

Specifies an alternate address for the saved-state area.

Description

The **preg** command displays the contents of the CPU general-purpose registers stored in the saved-state area. A register state is stored when a breakpoint is encountered or the PALcode reset flow is entered.

Example

```
DP264> preg
General Purpose Registers
register file @: 0000C040
r00: 0000000000000020 0000000000000005 000000000000C000 000000000000000D
r04: 00000000000003F8 0000000000000000 0000000000000000 000000000000000D
r08: FFFFFC000005F470 0000000000027340 0444306453605341 0A110C485F6EA26E
r12: 208090EA6024C19C 882C08AA92065B2D 4100610AE100244F 9E2891ACA8A9D984
r16: 0000000000100000 000000000000000D 0000000000000006 0000000000000030
r20: 0000000E20026335 5619A46B2B1A5125 0000000000000000 000000000000000D
r24: 0000000000000003 0000000000000000 FFFFFC0000042C3C 0000000000100000
r28: FFFFFC02C0000000 FFFFFC000006C1E0 0000000000FFDF40 0000000000000003
PC:  000000000000000D   PS:  000000000000000D
```

4.4.79 prl — Read Longword from PCI Configuration Space

The **prl** command reads a longword (32 bits) from the specified address in the PCI configuration space.

Format

prl pci_address id bus function

Parameters

pci_address

Specifies the address in PCI space.

id

Specifies a decimal number that represents the slot assigned to the PCI device.

bus

Specifies which bus to read from. The default value is 0.

function

Specifies which function to read from. The default value is 0.

Description

The **prl** command reads a longword from the specified address in the PCI configuration space for a device specified by the id. If the motherboard does not support PCI, then this command is not implemented. If your system configuration supports multiple PCI buses, use the parameters to specify the PCI device. Use the **pcishow** command to view the available PCI devices.

Example

```
DP264> prl 0 19
04848086
```

4.4.80 prw — Read Word from PCI Configuration Space

The **prw** command reads a word (16 bits) from the specified address in the PCI configuration space.

Format

prw pci_address id bus function

Parameters

pci_address

Specifies the address in PCI space.

id

Specifies a decimal number that represents the slot assigned to the PCI device.

bus

Specifies which bus to read from. The default value is 0.

function

Specifies which function to read from. The default value is 0.

Description

The **prw** command reads a word from the specified address in the PCI configuration space for a device specified by the id. If the motherboard does not support PCI, then this command is not implemented. If your system configuration supports multiple PCI buses, use the parameters to specify the PCI device. Use the **pcishow** command to view the available PCI devices.

Example

```
DP264> pcishow

PCI Address Mapping windows are:
        (1) PCI Base = 0x00100000, Size = 0x00100000
                Translated Base = 0x00100000
Bus = 0
        primary = 0, secondary = 0, subordinate = 1
        PCI I/O space = 1000, PCI Mem space = 100000
        PCI I/O base = B000, PCI Mem base = 200000
PCI slot 17, vendor = 0x1011, device = 0x1
        PCI IO Base = 0x0, PCI IO Size = 0x0
        PCI Mem Base = 0x0, PCI Mem Size = 0x0
        PCI-PCI bridge
PCI slot 19, vendor = 0x8086, device = 0x484
        PCI IO Base = 0x0, PCI IO Size = 0x0
        PCI Mem Base = 0x0, PCI Mem Size = 0x0
        Non-VGA compatible device
Bus = 1
        primary = 0, secondary = 1, subordinate = 1
        PCI I/O space = 1000, PCI Mem space = 100000
        PCI I/O base = B000, PCI Mem base = 200000
PCI slot 6, vendor = 0x1011, device = 0x2
        PCI IO Base = 0xB000, PCI IO Size = 0x80
        PCI Mem Base = 0x200000, PCI Mem Size = 0x80
        Ethernet controller
```

```
DP264> prw 0 6 1
1011
DP264> prw 0 19
8086
```

4.4.81 pw — Display Memory Word

The **pw** command displays the specified memory word (16-bit).

Format

pw [start_address [end_address [iterations [silent]]]]

Parameters

start_address

Specifies a hexadecimal number that represents a legal address at which to start the display. The default is the current address.

end_address

Specifies a hexadecimal number that represents a legal address at which to end the display. The default is the current address plus 127 bytes.

iterations

Specifies how many times the data is read. The default is 1.

silent

Specifies whether or not the data is displayed. Setting this field to 1 causes the data to be read but not displayed. The default is 0 (data is displayed).

Description

The **pw** command displays the specified memory in word format. If no address is specified, then the current memory word and the following 63 words are displayed. The field displayed after the word represents the translation of the memory contents in ASCII characters. If the memory contents can be translated to an ASCII character, then that character is displayed; otherwise, a dot is displayed.

The silent and iterations fields are often used together to continuously perform read operations, thus, avoiding slowdowns caused by displaying the data. The repeating cycles can be monitored with test equipment.

Example

This example displays eight memory addresses starting with 100000_{16} in word format.

```
DP264> pw 100000
00100000: 0003 C100 0000 0000 D910 0010 0000 0000 ................
00100010: 0007 2F88 0000 A49E 1405 43C1 1406 40A1 .../.......C...@
00100020: 7722 4880 0406 40C2 82F0 B4DC 82F8 B49C “w.H...@........
00100030: 8300 B4BC 153E 43C5 0020 B7FE 8308 B3FC ....>..C .......
00100040: 0007 D000 0404 47E2 1019 D000 0080 0000 .......G........
00100050: 041F 47FF 0000 0000 0000 0000 0000 0000 ...G............
00100060: 153E 43C6 0028 B41E 0136 D000 8018 A49C >..C(...6.......
00100070: 3405 43E0 0309 D000 8020 A49C 5405 43E0 .4.C.... ....T.C
```

4.4.82 pwb — Write Byte to PCI Configuration Space

The **pwb** command writes a byte (8 bits) to an address in the PCI configuration space.

Format

pwb pci_address id data bus function

Parameters

pci_address

Specifies which address to write to.

id

Specifies a decimal number that represents the slot assigned to the PCI device.

data

Specifies the value that is written to the pci_address.

bus

Specifies which bus to write to. The default value is 0.

function

Specifies which function to write from. The default value is 0.

Description

The **pwb** command writes a byte to the specified address in the PCI configuration space for a device specified by the id. If the motherboard does not support PCI, then this command is not implemented. If your system configuration supports multiple PCI buses, use the parameters to specify the PCI device. Use the **pcishow** command to view the available PCI devices.

Example

```
DP264> prb 4f 19
3F
DP264> pwb 4f 19 2f
DP264> prb 4f 19
2F
```

4.4.83 pwl — Write Longword to PCI Configuration Space

The **pwl** command writes a longword (32 bits) to an address in the PCI configuration space.

Format

pwl pci_address id data bus function

Parameters

pci_address

Specifies which address to write to.

id

Specifies a decimal number that represents the slot assigned to the PCI device.

data

Specifies the value that is written to the pci_address.

bus

Specifies which bus to write to. The default value is 0.

function

Specifies which function to write from. The default value is 0.

Description

The **pwl** command writes a longword to the specified address in the PCI configuration space for a device specified by the id. If the motherboard does not support PCI, then this command is not implemented. If your system configuration supports multiple PCI buses, use the parameters to specify the PCI device. Use the **pcishow** command to view the available PCI devices.

Example

```
DP264> pwl 4f 19 0000a6f3
```

4.4.84 pww — Write Word to PCI Configuration Space

The **pww** command writes a word (16 bits) to an address in the PCI configuration space.

Format

pww pci_address id data bus function

Parameters

pci_address

Specifies which address to write to.

id

Specifies a decimal number that represents the slot assigned to the PCI device.

data

Specifies the value that is written to the pci_address.

bus

Specifies which bus to write to. The default value is 0.

function

Specifies which function to write from. The default value is 0.

Description

The **pww** command writes a word to the specified address in the PCI configuration space for a device specified by the id. If the motherboard does not support PCI, then this command is not implemented. If your system configuration supports multiple PCI buses, use the parameters to specify the PCI device. Use the **pcishow** command to view the available PCI devices.

Example

```
DP264> pww 4f 19 4
DP264> prw 4f 19
0004
```

4.4.85 rb — Read Byte from I/O Address Space

The **rb** command reads a byte (8 bits) from a register port in I/O address space.

Format

rb register [iterations [silent]]

Parameters

register

Specifies the register from the I/O address space.

iterations

Specifies how many times the data is read. The default is 1.

silent

Specifies whether or not the data is displayed. Setting this field to 1 causes the data to be read but not displayed. The default is 0 (data is displayed).

Description

The **rb** command reads a byte from the specified register in I/O address space.

Example

```
DP264> rb 370
04
```

4.4.86 rl — Read Longword from I/O Address Space

The **rl** command reads a longword (32 bits) from a register port in I/O address space.

Format

rl register [iterations [silent]]

Parameters

register

Specifies the register from the I/O address space.

iterations

Specifies how many times the data is read. The default is 1.

silent

Specifies whether or not the data is displayed. Setting this field to 1 causes the data to be read but not displayed. The default is 0 (data is displayed).

Description

The **rl** command reads a longword from the specified register in I/O address space.

Example

```
DP264> rl 370
0000A6F3
```

4.4.87 rmode — Set dis Command Register Display Mode

The **rmode** command sets the **dis** command register display mode.

Format

rmode [mode]

Parameters

mode

Determines the mode. If set (1), the software register names are displayed. If cleared (0), the hardware register names are displayed. The default is 0.

Description

The **rmode** command specifies whether hardware register names, such as r16, or software register names, such as a0, are displayed with the **dis** command.

The following table displays the Tru64 UNIX Alpha microprocessor register usage.

Hardware Register Name	Software Register Name	Use and Linkage
r0	v0	Used for expression evaluation and to hold integer function results.
r1...r8	t0...t7	Temporary registers; not preserved across procedure calls.
r9...r14	s0...s5	Saved registers; their values must be preserved across procedure calls.
r15	FP or s6	Frame pointer or a saved register.
r16...r21	a0...a5	Argument registers; used to pass the first six integer type arguments; their values are not preserved across procedure calls.
r22...r25	t8...t11	Temporary registers; not preserved across procedure calls.
r26	ra	Contains the return address; used for expression evaluation.
r27	pv or t12	Procedure value or a temporary register.
r28	at	Assembler temporary register; not preserved across procedure calls.
r29	GP	Global pointer.
r30	SP	Stack pointer.
r31	zero	Always has the value 0.

If you enter the command without a parameter, then the current mode is displayed. The **rmode** setting is stored in battery-backed RAM.

Example

```
DP264> rmode
rmode = 0
DP264> dis 243a0
000243A0:  43020122        subl    r24, r2, r2
000243A4:  48441722         sll    r2, 0x20, r2
000243A8:  74420050          mt    r2, cc
000243AC:  64630082          mf    r3, pt2
000243B0:  209F07E1         lda    r4, 2017(zero)
000243B4:  48855724         sll    r4, 0x2A, r4
000243B8:  44640103         bic    r3, r4, r3
000243BC:  47203019         and    r25, 0x1, r25
DP264> dis
000243C0:  4B037698         srl    r24, 0x1B, r24
000243C4:  4703F118         bic    r24, 0x1F, r24
000243C8:  47190418         bis    r24, r25, r24
000243CC:  4B055738         sll    r24, 0x2A, r24
000243D0:  44780403         bis    r3, r24, r3
000243D4:  746300A2          mt    r3, A2
000243D8:  77FF0055          mt    zero, flushIc
000243DC:  77FF0000          mt    zero, 0
DP264> rmode 1
DP264> dis 243a0
000243A0:  43020122        subl    t10, t1, t1
000243A4:  48441722         sll    t1, 0x20, t1
000243A8:  74420050          mt    t1, cc
000243AC:  64630082          mf    t2, pt2
000243B0:  209F07E1         lda    t3, 2017(zero)
000243B4:  48855724         sll    t3, 0x2A, t3
000243B8:  44640103         bic    t2, t3, t2
000243BC:  47203019         and    t11, 0x1, t11
DP264> dis
000243C0:  4B037698         srl    t10, 0x1B, t10
000243C4:  4703F118         bic    t10, 0x1F, t10
000243C8:  47190418         bis    t10, t11, t10
000243CC:  4B055738         sll    t10, 0x2A, t10
000243D0:  44780403         bis    t2, t10, t2
000243D4:  746300A2          mt    t2, A2
000243D8:  77FF0055          mt    zero, flushIc
000243DC:  77FF0000          mt    zero, 0
DP264>
```

4.4.88 romboot — Load and Execute Image from ROM

The **romboot** command loads the specified image from ROM and begins execution.

Format

romboot [type] [address]

Parameters

type

Specifies the image to load into ROM. If the type is specified as #0, then any header information is ignored and the entire contents of the ROM is loaded. The default is to load and execute the first image in the system ROM.

address

Specifies the starting address for loading the image into ROM.

Description

The **romboot** command loads and executes the operating system and associated firmware from the system ROM. Use the **romlist** command to display the images contained in the ROM. You can specify the type as a number or a name.

Type_number	Type_name	Description
0	DBM	Alpha Motherboard Debug Monitor
1	NT	Windows NT
2	VMS	OpenVMS
3	UNIX	Tru64 UNIX
7	LINUX	Linux, MILO
8	VXWORKS	VxWorks
10	SROM	Serial ROM

The **romboot** command can also be used to select a ROM image based on its position in the ROM. Specifying the type as #0 selects the entire ROM. Specifying the type as #1 selects the first image; #2 selects the second image, and so on.

You can specify an address to override what is in the image file header. You may also use the **bootadr** command. Use the system reset to reset the motherboard to the initial booted state.

Example

```
DP264> romboot
Searching for ROM image #1
Header Size......... 52 bytes
Image Checksum...... 0x581A (22554)
Image Size (Uncomp). 117160 (114 KB)
Compression Type.... 0
Image Destination... 0x0000000000300000
Header Version...... 1
Firmware ID......... 0 - Alpha Evaluation Board Debug Monitor
ROM Image Size...... 117160 (114 KB)
Firmware ID (Opt.).. 0000000000000000  ASCII: ........
Header Checksum..... 0x8F5C
```

```
Loading ROM to address  00300000
Image checksum verified. 0x581A
Loaded 117160 bytes starting at 300000 to 31C9A8
Jumping to 0x300000...
DP264> romboot #2
Searching for ROM image #2
   Header Size......... 52 bytes
   Image Checksum...... 0xD38C (54156)
   Image Size (Uncomp). 211728 (206 KB)
   Compression Type.... 0
   Image Destination... 0x0000000000300000
   Header Version...... 1
   Firmware ID......... 1 - Windows NT Firmware
   ROM Image Size...... 211728 (206 KB)
   Firmware ID (Opt.).. 0305109502131030  ASCII: 0.......
   Header Checksum..... 0xCED2
Loading ROM to address  00300000
Image checksum verified. 0xD38C
Loaded 211728 bytes starting at 300000 to 333B10
Jumping to 0x300000...
DP264> romboot unix
Searching for the “Alpha SRM Console”.
The specified ROM image was not found
DP264> romboot nt
Searching for the “Windows NT Firmware”.
   Header Size......... 52 bytes
   Image Checksum...... 0xD38C (54156)
   Image Size (Uncomp). 211728 (206 KB)
   Compression Type.... 0
   Image Destination... 0x0000000000300000
   Header Version...... 1
   Firmware ID......... 1 - Windows NT Firmware
   ROM Image Size...... 211728 (206 KB)
   Firmware ID (Opt.).. 0305109502131030  ASCII: 0.......
   Header Checksum..... 0xCED2
Loading ROM to address  00300000
Image checksum verified. 0xD38C
Loaded 211728 bytes starting at 300000 to 333B10
Jumping to 0x300000...
```

4.4.89 romlist — List ROM Image Headers

The **romlist** command lists the ROM image headers contained in ROM.

Format

romlist

Parameters

None.

Description

The **romlist** command searches the system ROM for any ROM image headers that might be present. It then prints a summary for each header found.

Example

```
DP264> romlist

ROM image header found at offset: 0x000000
   Header Size......... 52 bytes
   Image Checksum...... 0x8111
   Image Size (Uncomp). 129552 (126 KB)
   Compression Type.... 0
   Image Destination... 0x0000000000300000
   Header Version...... 1
    Firmware ID.......... 0 - Alpha Evaluation Board Debug Monitor
   ROM Image Size...... 129552 (126 KB)
   Firmware ID (Opt.).. 0000000000000000  ASCII: ........
   Header Checksum..... 0xA839

ROM image header found at offset: 0x040000
   Header Size......... 52 bytes
   Image Checksum...... 0xD38C
   Image Size (Uncomp). 211728 (206 KB)
   Compression Type.... 0
   Image Destination... 0x0000000000300000
   Header Version...... 1
   Firmware ID......... 1 - Windows NT Firmware
   ROM Image Size...... 211728 (206 KB)
   Firmware ID (Opt.).. 0305109502131030  ASCII: 0.......
   Header Checksum..... 0xCED25
DP264>
```

4.4.90 romload — Load OS and Firmware from ROM

The **romload** command loads the specified image from ROM to the specified address.

Format

romload [type] [address]

Parameters

type

Specifies the image to load into ROM. If the type is specified as #0, then any header information is ignored and the entire contents of the ROM is loaded. The default is to load the first image in the system ROM.

address

Specifies the starting address for loading the image into ROM.

Description

The **romload** command loads the operating system and associated firmware from the system ROM. Use the **romlist** command to display the images contained in the ROM. You can specify the type as a number or a name.

Type_number	Type_name	Description
0	DBM	Alpha Motherboard Debug Monitor
1	NT	Windows NT
2	VMS	OpenVMS
3	UNIX	Tru64 UNIX
7	LINUX	Linux, MILO
8	VXWORKS	VxWorks
10	SROM	Serial ROM

The **romload** command can also be used to select a ROM image based on its position in the ROM. Specifying the type as #0 selects the entire ROM. Specifying the type as #1 selects the first image; #2 selects the second image, and so on.

You can specify an address to override what is in the image file header. You may also use the **bootadr** command. Use the **jtopal** command to execute the image.

Example

```
DP264> romload #0
Loading entire ROM.
Loading ROM to address 00200000
Loaded 1048576 bytes from 200000 to 300000
DP264>
DP264> romload #1
Searching for ROM image #1
   Header Size......... 52 bytes
   Image Checksum...... 0x581A (22554)
   Image Size (Uncomp). 117160 (114 KB)
   Compression Type.... 0
   Image Destination... 0x0000000000300000
   Header Version...... 1
   Firmware ID...........0 - Alpha Evaluation Board Debug Monitor
   ROM Image Size...... 117160 (114 KB)
   Firmware ID (Opt.).. 0000000000000000  ASCII: ........
   Header Checksum..... 0x8F5C
Loading ROM to address  00300000
Image checksum verified. 0x581A
Loaded 117160 bytes from 300000 to 31C9A8
DP264>
DP264> romload
Searching for ROM image #1
   Header Size......... 52 bytes
   Image Checksum...... 0x581A (22554)
   Image Size (Uncomp). 117160 (114 KB)
   Compression Type.... 0
   Image Destination... 0x0000000000300000
   Header Version...... 1
    Firmware ID.......... 0 - Alpha Evaluation Board Debug Monitor
   ROM Image Size...... 117160 (114 KB)
   Firmware ID (Opt.).. 0000000000000000  ASCII: ........
   Header Checksum..... 0x8F5C
Loading ROM to address  00300000
Image checksum verified. 0x581A
Loaded 117160 bytes from 300000 to 31C9A8
DP264>
DP264> romload unix
Searching for “Alpha SRM Console”.
The specified ROM image was not found
DP264>

DP264> romload nt
Searching for “Windows NT Firmware”.
   Header Size......... 52 bytes
   Image Checksum...... 0xD38C (54156)
   Image Size (Uncomp). 211728 (206 KB)
   Compression Type.... 0
   Image Destination... 0x0000000000300000
   Header Version...... 1
   Firmware ID......... 1 - Windows NT Firmware
   ROM Image Size...... 211728 (206 KB)
   Firmware ID (Opt.).. 0305109502131030  ASCII: 0.......
   Header Checksum..... 0xCED2
Loading ROM to address  00300000
Image checksum verified. 0xD38C
Loaded 211728 bytes from 300000 to 333B10
DP264>
```

4.4.91 romverify — Compare Memory Image to ROM Image

The **romverify** command compares an image in memory to an image in the ROM.

Format

romverify [type [address]]

Parameters

type

Specifies the name or number of an image in the ROM to compare against memory. If the type specified is #0, then any header information is ignored and the entire contents of the ROM are compared. If the type is #*n*, the *n*th image in the ROM will be used (#2 is the second entry). The default is to compare the first image in the system ROM.

address

Specifies the starting address for comparing the image in the ROM. The bootadr is the default.

Description

The **romverify** command compares an image in memory to an image in the ROM. Use the **romlist** command to display the images contained in the ROM. You can specify the type as a number or a name.

Type_number	Type_name	Description
0	DBM	Alpha Motherboard Debug Monitor
1	NT	Windows NT
2	VMS	OpenVMS
3	UNIX	Tru64 UNIX
7	LINUX	Linux, MILO
8	VXWORKS	VxWorks
10	SROM	Serial ROM

Examples

```
DP264> romload #0 300000
Loading entire ROM.
Loading ROM to address 00300000
Loaded 1048576 bytes starting at 0x300000 to 0x3fffff
DP264> romverify #0
Comparing entire ROM to image at 0x300000.
Images match.
DP264> netload PC164dbm.rom
Attempting BOOTP...
Loading PC164dbm.rom at 0x300000
 My IP address:     192.168.0.107
 Server IP address: 192.168.0.114
################
File loaded successfully.  Size = 0x28380 (164736)
DP264> romverify dbm
Searching for the "Alpha Evaluation Board Debug Monitor".
Comparing to image at 0x300000.
Images match.
DP264> romverify 0 300000
```

```
Searching for the "Alpha Evaluation Board Debug Monitor".
Comparing to image at 0x300000.
Images match.
DP264> romverify #1 300000
Searching for ROM image #1
Comparing to image at 0x300000.
Images do not match.
DP264> romverify #2 300000
Searching for ROM image #2
Comparing to image at 0x300000.
Images match.
```

4.4.92 rw — Read a Word from I/O Address Space

The **rw** command reads a word (16 bits) from a register port in I/O address space.

Format

rw register [iterations [silent]]

Parameters

register

Specifies the register from the I/O address space.

iterations

Specifies how many times the data is read. The default is 1.

silent

Specifies whether or not the data is displayed. Setting this field to 1 causes the data to be read but not displayed. The default is 0 (data is displayed).

Description

The **rw** command reads a word from the specified register in I/O address space.

Example

```
DP264> rw 372
0000
DP264> rw 370
A6B3
```

4.4.93 sb — Search Memory by Bytes

The **sb** command searches memory by bytes (8-bit).

Format

sb start_address end_address string [inverse]

Parameters

start_address

Specifies the address at which to begin the search.

end_address

Specifies the address at which to end the search.

string

Specifies the search string.

inverse

Specifies whether to search for a matching string (0) or a nonmatching string (1). The default is 0 (search for a matching string).

Description

The **sb** command searches memory by byte chunks for the specified string. You can use an asterisk (*) as a wildcard character for single-character matching.

Example

```
DP264> pl 100000 100080
00100000: C3E00007 00000000 00000000 00000000 ................
00100010: 00000000 00000000 00000000 00000000 ................
00100020: 221F0000 26100012 6BF00000 00000000 ...″...&...k....
00100030: 00000000 00000000 00000000 00000000 ................
00100040: 00000000 00000000 00000000 00000000 ................
00100050: 00000000 00000000 00000000 00000000 ................
00100060: 00000000 00000000 00000000 00000000 ................
00100070: 00000000 00000000 00000000 00000000 ................
00100080: 00000000 00000000 00000000 00000000................
DP264> sb 100000 100080 2*
val = 20  mask = F0
occurrence at 00100023 22
occurrence at 00100027 26
DP264> sb 100000 100080 1*
val = 10  mask = F0
occurrence at 00100022 1F
occurrence at 00100024 12
occurrence at 00100026 10
DP264> sb 100000 100080 1f
val = 1F  mask = FF
occurrence at 00100022 1F
```

4.4.94 setbaud — Set Port's Baud Rate

The **setbaud** command sets the baud rate for the specified communication port connection.

Format

setbaud port baud_rate

Parameters

port

Specifies the number identifier for the keyboard or serial port.

baud_rate

Specifies the baud rate for the specified port. The default is 9600.

Description

The **setbaud** command sets the baud rate for the specified keyboard or serial communication port. The baud rate can be set to 1200, 2400, 9600, 19200, or 38400.

The following table shows the port identifier numbers.

Port ID	Port Name
0	Keyboard port
1	Serial communication port 1
2	Serial communication port 2

Example

```
DP264> setbaud 1 2400
```

4.4.95 setty — Specify Port for Debug Monitor

The **setty** command sets the Debug Monitor to the specified port.

Format

setty port

Parameters

port

Specifies the number identifier for the keyboard or serial port.

Description

The **setty** command specifies the port used for Debug Monitor interaction. The following table shows the port identifier numbers.

Port ID	Port Name
0	Keyboard port
1	Serial communication port 1
2	Serial communication port 2

Example

```
DP264> setty 1
```

4.4.96 sl — Search Memory by Longwords

The **sl** command searches memory by longwords (32-bit).

Format

sl start_address end_address string [inverse]

Parameters

start_address

Specifies the address at which to begin the search.

end_address

Specifies the address at which to end the search.

string

Specifies the search string.

inverse

Specifies whether to search for a matching string (0) or a nonmatching string (1). The default is 0 (search for a matching string).

Description

The **sl** command searches memory by longword chunks for the specified string. You can use an asterisk (*) as a wildcard character for single-character matching.

Example

```
DP264> pl 100000
00100000: C3E00007 00000000 00000000 00000000 ................
00100010: 00000000 00000000 00000000 00000000 ................
00100020: 221F0000 26100012 6BF00000 00000000 ...”...&...k....
00100030: 00000000 00000000 00000000 00000000 ................
00100040: 00000000 00000000 00000000 00000000 ................
00100050: 00000000 00000000 00000000 00000000 ................
00100060: 00000000 00000000 00000000 00000000 ................
00100070: 00000000 00000000 00000000 00000000 ................
DP264> sl 100000 100070 2*******
val = 20000000  mask = F0000000
occurrence at 00100020 221F0000
occurrence at 00100024 26100012
DP264> sl 100000 100070 2*1*****
val = 20100000  mask = F0F00000
occurrence at 00100020 221F0000
occurrence at 00100024 26100012
```

4.4.97 sq — Search Memory by Quadwords

The **sq** command searches memory by quadwords (64-bit).

Format

sq start_address end_address string [inverse]

Parameters

start_address

Specifies the address at which to begin the search.

end_address

Specifies the address at which to end the search.

string

Specifies the search string.

inverse

Specifies whether to search for a matching string (0) or a nonmatching string (1). The default is 0 (search for a matching string).

Description

The **sq** command searches memory by quadword chunks for the specified string. You can use an asterisk (*) as a wildcard character for single-character matching.

Example

```
DP264> pq
00000000: 00000000C3E00007 0000000000000000 ................
00000010: 0000000000000000 0000000000000000 ................
00000020: 26100002221F0000 000000006BF00000 ...”...&...k....
00000030: 0000000000000000 0000000000000000 ................
00000040: 0000000000000000 0000000000000000 ................
00000050: 0000000000000000 0000000000000000 ................
00000060: 0000000000000000 0000000000000000 ................
00000070: 0000000000000000 0000000000000000 ................
DP264> sq 100000 100080 2
val = 2  mask = FFFFFFFFFFFFFFFF
value not found
DP264> sq 100000 100080 26100002221F0000
value = 26100002221F0000  mask = FFFFFFFFFFFFFFFF
occurrence at 00000020 26100002221F0000
```

4.4.98 step — Execute Next Instruction

The **step** command executes the next instruction.

Format

s[tep]

Parameters

None.

Description

Use the **step** command and the **next** command to execute a machine instruction. When the instruction contains a subroutine call, the **step** command steps into the subroutine being called and the **next** command executes that subroutine.

In the following example, the **step** command used at address 00200034 steps to the first instruction of the subroutine being called at address 002000c0. The **next** command used at address 002000ec executes the subroutine being called and steps to the next instruction at address 002000f0.

Example

```
DP264> dis
00200030:  a77d8010        ldq    r27, 32784(r29)
00200034:  6b5b4000        jsr    r26, r27
00200038:  27ba0001       ldah    r29, 1(r26)
0020003c:  23bdc148        lda    r29, 49480(r29)
DP264> step
00200030:  a77d8010        ldq    r27, 32784(r29)
DP264> step
00200034:  6b5b4000        jsr    r26, r27
DP264> step
002000c0:  27bb0001       ldah    r29, 1(r27)
        .
        .
        .
DP264> dis
002000e8:  a77d8040        ldq    r27, 32832(r29)
002000ec:  6b5b46b8        jsr    r26, r27
002000f0:  27ba0001       ldah    r29, 1(r26)
DP264> step
002000e8:  a77d8040        ldq    r27, 32832(r29)
DP264> step
02000ec:   6b5b46b8        jsr    r26, r27
DP264> next
002000f0:  27ba0001       ldah    r29, 1(r26)
DP264>
```

4.4.99 stop — Set Breakpoint

The **stop** command sets a breakpoint.

Format

stop address

Parameters

address

Specifies the address at which the breakpoint is set.

Description

The **stop** command sets a breakpoint at the specified address. When a breakpoint is encountered, all current register values are stored in memory and can be viewed with the **preg** and **pfreg** commands.

Example

```
DP264> stop 100000
DP264> go
Executing at 0x100000...
00100000:  C1000003          br    r8, 100010
DP264> stop 100200
DP264> go
Executing at 0x100000...
00100200:  4A671793         sra    r19, 0x38, r19
DP264> cont
00100200:  4A671793         sra    r19, 0x38, r19
This simple program prints the size of
various data types in bytes.
  char   =  1
  short  =  2
  int    =  4
  long   =  8
  float  =  4
  double =  8
Alpha 21264 Evaluation Board (DP264) Debug Monitor
  Version: Fri Apr 09 20:50:11 EDT 1999
  Bootadr: 0x100000, memSize: 0x2000000
```

4.4.100 sum — Compute Checksum in Range

The **sum** command computes the checksum of the data in the specified range.

Format

sum start_address end_address

Parameters

start_address

Specifies the address at which the checksum check begins.

end_address

Specifies the address at which the checksum check ends.

Description

The **sum** command prints the checksum of the data contained in the specified memory range. The algorithm used computes a 16-bit checksum and is compatible with the standard BSD4.3 algorithm provided in most implementations of UNIX (sum), thus allowing easy comparisons of images in the motherboard's memory with those on the UNIX host.

Example

```
DP264> netload pc64dbm.rom
Alpha 21340 (0): Initializing
        Hardware address = BA-98-76-54-32-10
        Trying 10 Base T
        Switching to AUI
MAC address:  BA-98-76-54-32-10
Attempting BOOTP...
Loading /sae_share/boot/user1/pc64/pc64dbm.rom at 0x300000
  My IP address:     16.123.45.67
  Server IP address: 16.123.45.69
###################
File loaded successfully.  Size = 0x30B80 (199552)
DP264> sum 300000 330B7F
0xe5cc 58828
```

4.4.101 sw — Search Memory by Words

The **sw** command searches memory by words (16-bit).

Format

sw start_address end_address string [inverse]

Parameters

start_address

Specifies the address at which to begin the search.

end_address

Specifies the address at which to end the search.

string

Specifies the search string.

inverse

Specifies whether to search for a matching string (0) or a nonmatching string (1). The default is 0 (search for a matching string).

Description

The **sw** command searches memory by word chunks for the specified string. You can use an asterisk (*) as a wildcard character for single-character matching.

Example

```
DP264> pl 100000 100080
00100000: C3E00007 00000000 00000000 00000000 ...............
00100010: 00000000 00000000 00000000 00000000 ................
00100020: 221F0000 26100012 6BF00000 00000000 ...”...&...k....
00100030: 00000000 00000000 00000000 00000000 ................
00100040: 00000000 00000000 00000000 00000000 ................
00100050: 00000000 00000000 00000000 00000000 ................
00100060: 00000000 00000000 00000000 00000000 ................
00100070: 00000000 00000000 00000000 00000000 ................
00100080: 00000000 00000000 00000000 00000000 ................
DP264> sw 100000 100080 2*1*
val = 2010  mask = F0F0
occurrence at 00100022 221F
occurrence at 00100026 2610
```

4.4.102 swpipl — Set or Display IPL

The **swpipl** command sets or displays the interrupt priority level (IPL) of the CPU.

Format

swpipl [ipl]

Parameters

ipl

Specifies the IPL ranging from 0 to 7 as defined for Tru64 UNIX by the *Alpha Architecture Reference Manual*.

Description

The **swpipl** command reports the current IPL when no parameter is provided. When a value of 0 to 7 is provided to the **swpipl** command, the current IPL is set to that value. This command uses the swpipl PALcode instruction for Tru64 UNIX defined by the *Alpha Architecture Reference Manual*. The CPU arbitrates interrupt requests based on the IPL. When the current IPL is lower than a pending interrupt request, the CPU will raise the IPL while it services that interrupt. At IPL 7, no interrupt requests are handled. To avoid interrupt complexities when debugging hardware, the Debug Monitor is designed for minimal use of interrupts. Therefore, at startup, the IPL is set to 7 and can be lowered on demand using the **swpipl** command. Other commands that affect the IPL are the **mcheck** and the **ladebug** commands.

In the following example, the IPL is lowered from 6 to 4.

Example

```
DP264> swpipl
Current Interrupt Priority Level: 6
DP264> swpipl 4
DP264> swpipl
Current Interrupt Priority Level: 4
DP264>
```

4.4.103 sysshow — Display ROM Parameters

The **sysshow** command displays all SROM parameters.

Format

sysshow

Parameters

None.

Description

The **sysshow** command displays the system status passed from the SROM at initialization or reset. Refer to your motherboard's user's manual for more information about the SROM parameters displayed.

Example

```
DP264> sysshow
abox_ctl :      428
bcr0     :     64C0     bcr1     :  10064C0
bcr2     :        0     bcr3     :        0
bmr0     :   F00000     bmr1     :   F00000
bmr2     :        0     bmr3     :        0
srom_rev :     1805     proc_id  :        4
mem_size :  2000000     cycle_cnt:     1771
signature: DECB0001     proc_mask:        1
sysctx   :        0     valid    :        1
```

4.4.104 tip — Connect to Serial Communication Port

The **tip** command connects to the specified serial communication port.

Format

tip port

Parameters

port

Specifies the serial port.

Description

The **tip** command is a subset of the Tru64 UNIX `tip` command. It allows you to connect directly from the motherboard to the specified serial communication port. You can specify 1 for serial port 1, or specify 2 for serial port 2.

Example

In this example, the host system is connected to serial port 1.

```
DP264> tip 1
```

4.4.105 version — Display Debug Monitor Firmware Version

The **version** command displays the current Debug Monitor firmware version information.

Format

version

Parameters

None.

Description

The **version** command displays the current Debug Monitor firmware version information. This information is also displayed in the banner when you power up the motherboard.

Example

```
DP264> version
Wed Feb 10 19:52:24 EST 1999
```

4.4.106 vinit — Initialize Video Controller

The **vinit** command initializes the video controller.

Format

vinit

Parameters

None.

Description

The **vinit** command initializes the video controller.

Example

```
DP264> vinit
```

4.4.107 wb — Write Byte to I/O Address Space

The **wb** command writes a byte (8 bits) to a register port in I/O address space.

Format

wb register data [iterations]

Parameters

register

Specifies which register to write to.

data

Specifies the value that is written to the register.

iterations

Specifies how many times the data is read. The default is 1.

Description

The **wb** command writes a byte to the specified register in I/O address space.

Example

```
DP264> rb 280
28
DP264> wb 280 68
DP264> rb 280
68
```

4.4.108 wl — Write Longword to I/O Space

The **wl** command writes a longword (32 bits) to a register port in I/O address space.

Format

wl register data [iterations]

Parameters

register

Specifies which register to write to.

data

Specifies the value that is written to the register.

iterations

Specifies how many times the data is read. The default is 1.

Description

The **wl** command writes a longword to the specified register in I/O address space.

Example

```
DP264> wl 370 0000a6f3
```

4.4.109 wrfen — Write Floating-Point Enable

The **wrfen** command enables or disables floating point.

Format

wrfen value

Parameters

value

Specifies a value of 0 or 1 that is written into the processor's floating-point enable register.

Description

The **wrfen** (write floating-point enable) command writes bit zero of the value passed to the floating-point enable register in the CPU. The value of FEN is also updated to the PCB.

Example

```
DP264> wrfen 1
```

4.4.110 ww — Write Word to I/O Address Space

The **ww** command writes a word (16 bits) to a register port in I/O address space.

Format

ww register data [iterations]

Parameters

register

Specifies which register to write to.

data

Specifies the value that is written to the register.

iterations

Specifies how many times the data is read. The default is 1.

Description

The **ww** command writes a word to the specified register in I/O address space. For example, on the DP264, the word is written to the ISA extension slot.

Example

```
DP264> ww 370 4
DP264> rw 370
0004
```

A
Support

A.1 Customer Support

The Alpha OEM website provides the following information for customer support.

URL	Description
http://www.digital.com/alphaoem	Contains the following links: • **Developers' Area:** Development tools, code examples, driver developers' information, and technical white papers • **Motherboard Products:** Motherboard details and performance information • **Microprocessor Products:** Microprocessor details and performance information • **News:** Press releases • **Technical Information:** Motherboard firmware and drivers, hardware compatibility lists, and product documentation library • **Customer Support:** Feedback form

A.2 Alpha Documentation

The following table lists some of the available Alpha documentation. You can download Alpha documentation from the Alpha OEM World Wide Web Internet site:

http://www.digital.com/alphaoem

Click on **Technical Information**.
Then click on **Documentation Library**.

Title	Order Number
Alpha Architecture Reference Manual[1]	EY–W938E–DP
Alpha Architecture Handbook	EC–QD2KC–TE
Alpha 21164 Microprocessor Hardware Reference Manual	EC–QP99C–TE
Alpha 21164 Microprocessor Data Sheet	EC–QP98C–TE

Title	Order Number
Alpha 21164PC Microprocessor Hardware Reference Manual	EC–R2W0A–TE
AlphaPC 264DP Product Brief	EC–RBD0A–TE
AlphaPC 264DP User’s Manual	EC–RB0BA–TE
AlphaPC 264DP Technical Reference Manual	EC–RB0DA–TE
AlphaPC 164SX Motherboard Product Brief	EC–R57CA–TE
AlphaPC 164SX Motherboard Windows NT User’s Manual	EC–R57DB–TE
AlphaPC 164SX Motherboard DIGITAL UNIX User’s Manual	EC–R8P7B–TE
AlphaPC 164SX Motherboard Technical Reference Manual	EC–R57EB–TE
AlphaPC 164LX Motherboard Product Brief	EC–R2RZA–TE
AlphaPC 164LX Motherboard Windows NT User’s Manual	EC–R2ZQF–TE
AlphaPC 164LX Motherboard Tru64 UNIX User’s Manual	EC–R2ZPC–TE
AlphaPC 164LX Motherboard Technical Reference Manual	EC–R46WC–TE
Alpha Motherboards Software Developer’s Kit Product Brief	EC–QXQKD–TE
Alpha Motherboards Software Developer’s Kit Read Me First	EC–QERSJ–TE
Alpha Microprocessors Motherboard Software Design Tools User’s Guide	EC–QHUWE–TE
Alpha Microprocessors SROM Mini-Debugger User’s Guide	EC–QHUXD–TE

[1] Not available on website. To purchase the *Alpha Architecture Reference Manual*, contact your local sales office or call Butterworth-Heinemann (DIGITAL Press) at 1–800–366–2665.

Index