MVME172LX

Installation and Configuration Guide

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Preface

This guide describes how to install the MVME172LX Board Support Package (BSP) for use with the Spectra development environment on SunOS, Solaris, and HP-UX versions of UNIX, and Windows NT.

Spectra BSP Installation and Configuration Guides do not supply technical information about a target board beyond what may be needed to run the Spectra development environment on properly configured hardware. Consult the board manufacturer's documentation provided with your target board for details about issues such as serial communication, power lines, memory modules, placement in a card cage, switch settings, daughterboards, port configurations, and start-up procedures.

If you need to set up the target board in an unconventional manner to suit your application, you should investigate the consequences for hardware and software.

Package Contents

Your BSP contains a CD-ROM, one or more Spectra boot PROMs, and this installation guide.

System Requirements

This section lists hardware and software requirements for the MVME172LX board.

Hardware

Table P-1 lists hardware requirements for the MVME172LX.

Table P-1. Hardware Requirements

Item	Description
Host	Sun-4 workstation running SunOS version 4.1.3 (or later versions) or Solaris 2.4 (or later versions) in SunOS binary compatibility mode HP 700 workstation running HP-UX 9.0 (or later versions) PC-compatible system running Windows NT 4.0 (or later versions)
Target	Motorola MVME172LX

Software

Before you install this BSP, you must install your Spectra cross-development environment software and the Microtec compiler toolkit specified in the *Release Notes*.

Vital Statistics

This section lists board specifications, on-board devices, supported Microtec components, and minimum target RAM size for the MVME172LX board.

Board Specifications

Table P-2 lists board specifications for the MVME172LX board.

Table P-2. MVME172LX Board Specifications

Board Item	Description
Board name	Motorola MVME172LX
CPU type	MC68060 or MC68LC060
Clock frequency	60MHz (MC68060) or 64MHz (MC68LC060)
Floating-point unit	Included in CPU in boards using MC68060
Memory Configuration	Variable, minimum 4MB
RAM	32-bit DRAM with parity
EPROM	4 Mbit (512 Kbit x 8 EPROM)
NVRAM	8 KB RAM/clock with battery backup
FLASH	2MB
SRAM	128KB with battery backup

On-Board Devices

Table P-3 lists the on-board devices found on the MVME172LX board.

Table P-3. MVME172LX On-Board Devices

Devices	Description
Timers	Six 32-bit tick timers, 2 watchdog timers
Serial I/O	Two to four channels on Z85230 serial communication controller
Ethernet	Intel i82596
SCSI	NCR 53C710 SCSI I/O controller
MMU	Available
VME	VMEchip2

Supported Microtec Components

This BSP supports the following components:

- IFX (I/O and File Executive)
- Remote procedure calls
- RTL (Run-Time Library)
- SNX (STREAMS and TCP/IP Networking Executive)
- Spectra Backplane
- VRTXsa Run-Time Kernel
- VRTX32 Run-Time Kernel
- XRAY Pro debug suite
- XRAY debugger
- Xpert Profiler

Target RAM Size — Minimum Requirement

240 KB (with tuning, Xtrace only)

Notational Conventions

This guide uses the notational conventions shown in Table P-4 (unless otherwise noted).

Table P-4. Notational Conventions

Symbol	Name	Usage
{ }	Curly Braces	Enclose a list from which you must choose an item.
[ ]	Square Brackets	Enclose optional items.
. . .	Ellipsis	Indicates that you may repeat the preceding item zero or more times.
|	Vertical Bar	Separates alternative items in a list.
	Punctuation	Punctuation such as commas (**,**) and colons (**:**) must be entered as shown.
	`Typewriter Font`	Represents code or user input in interactive examples.
	Italics	Represents a descriptive item that should be replaced with an actual item.
	Bold	Represents elements that need to stand out from the main body of text.

Related Publications

Refer to the following publications for further information about Microtec products:

- *Getting Started (UNIX Hosts).*
- *Getting Started (Windows Hosts).*
- *Spectra Backplane Concepts.*
- *Board Support Package (BSP) Developer's Guide and Reference.*
- *Debug Shell (XSH) User's Guide and Reference.*
- *Configuration Tool (Xconfig) User's Guide and Reference.*
- *I/O and File Executive (IFX) Programmer's Guide and Reference.*

- *STREAMS and TCP/IP Networking Executive (SNX) and SNMP Programmer's Guide and Reference.*
- *Run-Time Library (RTL) Programmer's Guide and Reference.*

Questions and Suggestions

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If you have questions or suggestions regarding this product, please contact your Microtec support representative. Contact numbers are listed on the back cover of this document.

Establishing the Spectra Connection 1

This chapter provides information about the procedures you need to perform to successfully start using your board support package (BSP).

Creating Boot PROMs

Your BSP may include one or more Spectra boot PROMs containing a bootstrap program and communication software for your target board.

If boot PROMs are not supplied, or if you wish to make new boot PROMs, use Xconfig to create the boot image using the command line:

```
xconfig boot.def mo172.def microtec.def
```

For more information on creating boot PROMs, see the Microtec *Board Support Package (BSP) Developer's Guide and Reference*.

Installing Boot PROMs Into the Target Hardware

Set the jumper settings and install the PROMs as described in the section *Hardware Setup* in Chapter 2, *Configuration Information*. Where necessary, also consult the board manufacturer's documentation.

Install the board in the backplane and apply power.

Cabling

If a console connection is provided or the bridge is serial, use a serial cable to connect the target and the host. For details, see the section *Cables* in Chapter 2, *Configuration Information*.

Configuring Ethernet or Serial Interfaces

Chapter 2, *Configuration Information*, provides details of the serial and Ethernet interfaces.

The **Bridge** for this target is either:

- **logio_ether_1_id** (detail; see the section *Ethernet Connection*)

  or

- **logio_serial_2_id** (see the section *Serial Connection*)

Ethernet Connection

Assign the board an Ethernet address.

Some boards store the Ethernet address in a nonvolatile or battery backed-up RAM area. This address may require configuration. For instructions on how to configure the Ethernet address, see the section, *Supplementary Notes* in Chapter 2, *Configuration Information*.

Assigning the Board an IP Address

If the target board does not have an IP address (this will be the case for new boards), then you or your system administrator must assign one to the board. Consult the network and system administration documentation provided by the workstation vendor for information on this procedure.

Serial Connection

Use the **serial_server** program to communicate with the target using a serial packet interface.

To use the **serial_server** program, perform the following steps:

1. Update the file **/etc/remote**.
2. Update the file **$SPECTRA/host/etc/connconf**.
3. Start the **serial_server** program.

Updating /etc/remote

See Chapter 2, *Configuration Information*, to determine the baud rate, parity, stop bits, and number of bits for the bridge device.

Generally, these values are:

- Baud: 19200 (9600 on slower boards)
- Parity: none
- Stop bits: 1
- Bits: 8

Edit the file **/etc/remote** to create an entry with the above communication parameters.

Example

In the following example, entries are created for **/dev/ttya** and **/dev/ttyb** (for baud rates of 4800, 9600, 19200, and 38400). The entry name is listed first; its parameters follow on a separate line. The entry name can be anything, but should be descriptive. For instance, the entry name for **/dev/ttya** at 4800 baud is **mo172a4800**.

```
mo172a4800:\
      :dv=/dev/ttya:br#4800:el=^C^S^Q^U^D:ie=%$:oe=^D:
mo172a9600:\
      :dv=/dev/ttya:br#9600:el=^C^S^Q^U^D:ie=%$:oe=^D:
mo172a19200:\
      :dv=/dev/ttya:br#19200:el=^C^S^Q^U^D:ie=%$:oe=^D:
mo172a38400:\
      :dv=/dev/ttya:br#38400:el=^C^S^Q^U^D:ie=%$:oe=^D:
mo172b4800:\
      :dv=/dev/ttyb:br#4800:el=^C^S^Q^U^D:ie=%$:oe=^D:
mo172b9600:\
      :dv=/dev/ttyb:br#9600:el=^C^S^Q^U^D:ie=%$:oe=^D:
mo172b19200:\
      :dv=/dev/ttyb:br#19200:el=^C^S^Q^U^D:ie=%$:oe=^D:
mo172b38400:\
      :dv=/dev/ttyb:br#38400:el=^C^S^Q^U^D:ie=%$:oe=^D:
```

The parameters are named to reflect the real **tty** channel on the workstation.

Updating $SPECTRA/host/etc/connconf

For each **/etc/remote** entry, create a logical name to be used by XSH as follows:

target_name entry_name host_name port_number baud_ rate

target_name The name you will use when executing **serial_server** on the host. **serial_server** is executed on the host for a serial packet-based bridge to the host machine from the target.

entry_name The name of the specific entry mapped to the *target_name* in the **/etc/remote** file. This file sets the parameters for the connection.

host_name The workstation with a physical serial connection to the target.

Example

The following example shows the notation used by Microtec for a workstation called **sun29**:

```
mo172a48      mo172a4800      sun29 2000  4800
mo172b48      mo172b4800      sun29 2001  4800
mo172a96      mo172a9600      sun29 2002  9600
mo172b96      mo172b9600      sun29 2003  9600
mo172a19      mo172a19200     sun29 2004  19200
mo172b19      mo172b19200     sun29 2005  19200
mo172a38      mo172a38400     sun29 2006  38400
mo172b38      mo172b38400     sun29 2007  38400
```

In the first line of the above example, `mo172a48`, the target name for starting **serial_server**, is mapped to the serial parameter `mo172a4800`, as defined by the **/etc/remote** *entry_name* on the host machine `sun29`. The Xtrace Protocol will use UDP port number `2000` to communicate to the target `mo172a48`, and a baud rate of `4800` will be used to transmit the serial packets to and from the target.

> **Note**
>
> All board names in the **connconf** file must be unique. Do not use the same board name under NIS and in the **connconf** file.

Starting serial_server

Connect a serial cable from the workstation to the target board. Start **serial_server** for the corresponding host port and baud rate.

For example, if the host port on workstation **sun29** is **/dev/ttyb**, and if the serial bridge ID is configured for a baud rate of 19200, invoking:

```
serial_server mo172b19 &
```

lets the `serial_server` program communicate with the target **mo172b19** (assuming the **connconf** and **/etc/remote** files contain entries matching the previous examples).

Connecting to the Target With XSH

The following examples assume a board with an Ethernet name of **foo.eng.mri.com** or **serial_server** name of **mo172b19**.

Ethernet

```
xsh
Spectra Cross-Development Shell; XSH 4.6B
Copyright (C) 1991-1996 Microtec

>connect foo.eng.mri.com
foo.eng.mri.com connected (non-os mode)
foo.eng.mri.com>
Cold reset on target foo.eng.mri.com
FF80AED4 2F02             MOVE.L       D2,-(SP)
foo.eng.mri.com>
```

Serial

```
xsh -t mo172b19
Spectra Cross-Development Shell; XSH 4.6B
Copyright (C) 1991-1996 Microtec

mo172b19 connected (non-os mode)
mo172b19>
Cold reset on target mo172b19
0005A720 9421FFc0stwu               1,0xffffffc0(1)
mo172b19>
```

Special Notes for Serial Ports

Configure a serial port for either **serial_packet_device** or **serial_tty_device** by manually changing the configuration in the **devcnfg.c** file. There is no Xconfig option for the BSP. The default for the BSP is listed in subsequent sections.

A serial port configured as **serial_packet_device** can only be used as a bridge. **vconsole** output can also be directed to this port if a hardware timer provides a tick. A **serial_packet_device** does not accept **tty** output directly since that output is not in packet form.

A serial port configured as **serial_tty_device** can only be used for **tty** input/output. This port cannot operate as an Xtrace bridge.

For this BSP in general:

```
Serial Port #1: tty,       19200
Serial Port #2: packet     19200
Serial Port #3: tty,       9600
.
.
.
Serial Port #n: tty,       9600
```

Configuration Information 2

This chapter provides configuration information for the MVME172LX.

Software Configuration

This section describes the memory map, default files, device driver configuration parameters, and Xconfig variables.

Memory Map

The following memory map (Figure 2-1) uses default **mo172** boot PROMs. The map is defined in **mo172.def**. If any inconsistencies exist, **mo172.def** supersedes this map.

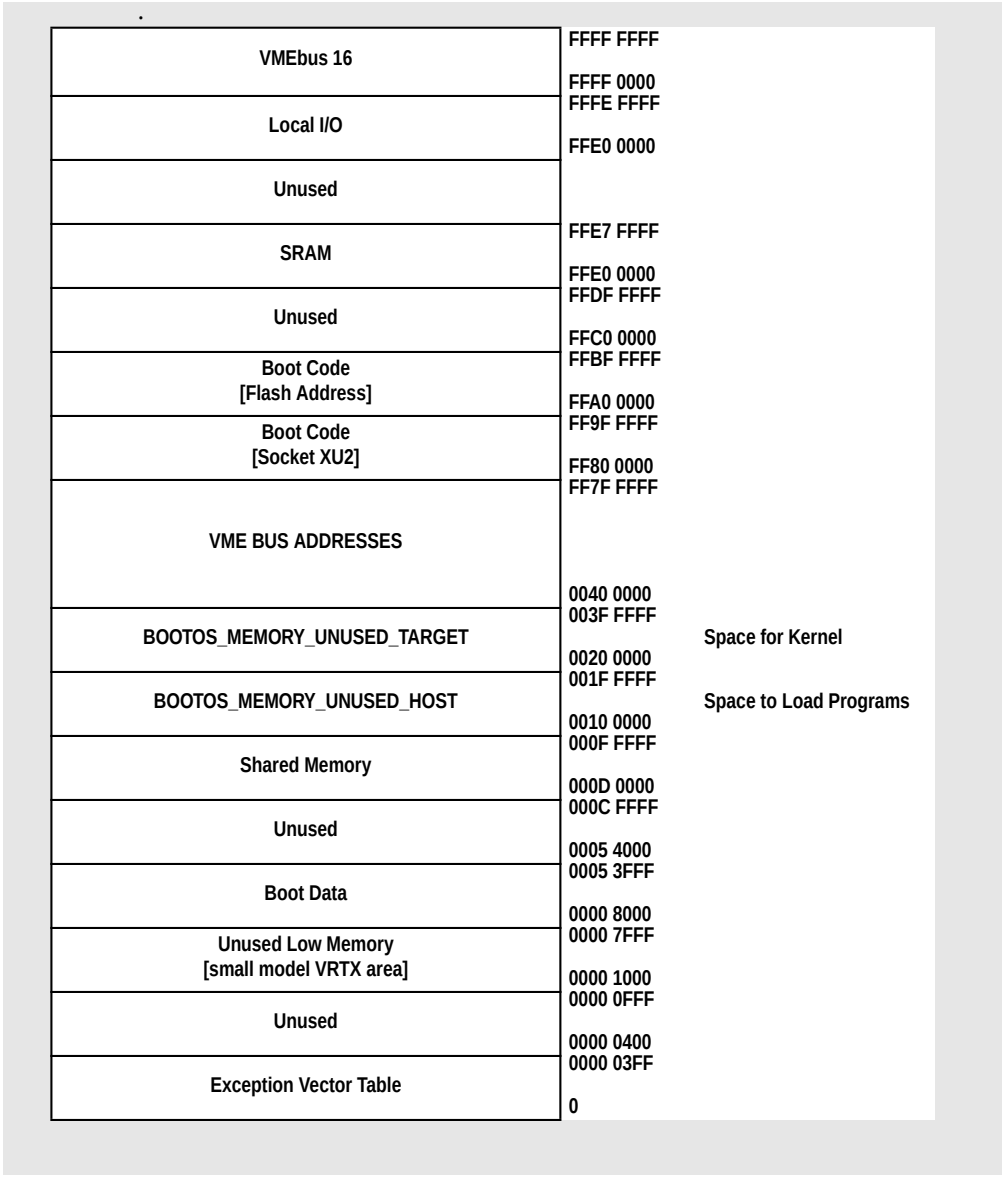

Figure 2-1. Memory Map

Default File

Use the **mo172.def** default file to configure the system for the bridge in boot PROMs.

Bridge

The *logio* device to be used as a bridge is **logio_ether_1_id** (Front Panel / Ethernet Port).

Console

By default, the console is **logio_serial_1_id** (Front Panel Serial Port 1 / Console).

Device Driver Configuration Parameters

This section describes the timer, serial, and Ethernet device driver parameters.

Timer

Table 2-1 and Table 2-2 list the timer device driver configuration parameters for the MVME172LX board.

Table 2-1. Timer 1 Device Driver Configuration Parameters

Component	Parameter
ID	logio_timer_1_id
Name	MC2chip
Port	timer 1
Module name	moasctmr
Interface	timer_1 interface
Vector	0x59
Default interrupt rate	10 ms

Table 2-2. Timer 2 Device Driver Configuration Parameters

Component	Parameter
ID	logio_timer_2_id
Name	MC2chip
Port	timer 2
Module name	mopcc162
Interface	timer_1 interface
Vector	0x58
Default interrupt rate	10 ms

Serial

Table 2-3 and Table 2-4 list the serial device driver configuration parameters for the MVME172LX board.

Table 2-3. Serial 1 Device Driver Configuration Parameters

Component	Parameter
ID	logio_serial_1_id
Location	MVME 172 Front Panel, Serial Port 1 / Console
Name	Zilog Z85230 SCC Serial Communication Controller
Port	A
Module name	zi8530
Interface	serial_2 interface
Vector	Tx — 0x78, Rx — 0x7C, RxError — 0x7E
Packet/tty	tty
Baud	19200
Bits	8
Parity	None

(cont.)

Table 2-3. Serial 1 Device Driver Configuration Parameters (cont.)

Component	Parameter
Stop bits	1
Ctrl_port	0xFFF45005
Data_port	0xFFF45007

Table 2-4. Serial 2 Device Driver Configuration Parameters

Component	Parameter
ID	logio_serial_2_id
Location	MVME 172 Front Panel, Serial Port 2
Name	Zilog Z85230 SCC Serial Communication Controller
Port	B
Module name	zi8530
Interface	serial_2 interface
Vector	Tx — 0x70, Rx — 0x74, RxError — 0x76
Packet/tty	packet
Baud	19200
Bits	8
Parity	None
Stop bits	1
Ctrl_port	0xFFF45001
Data_port	0xFFF45003

Ethernet

Table 2-5 lists the Ethernet device driver configuration parameters for the MVME172LX board.

Table 2-5. Ethernet Device Driver Configuration Parameters

Component	Parameter
ID	logio_ether_1_id
Location	Front Panel / Ethernet Port
Name	Intel 82596 Ethernet Controller
Module name	in82596a
Interface	ether_1 interface
Vector	0x57
Rx Buffers	64
Tx Buffers	12

Xconfig Variables

Table 2-6 lists the Xconfig variables for the MVME172LX board.

Table 2-6. Xconfig Variables

Variable	Default Value	Description
board.target	m68060	68060 target
board.name	mo172	MVME172LX
board.boot.code	0xFF800000	Start of BOOT CODE section either in ROM or RAM
board.boot.data	0x8000	Start of BOOT DATA section in RAM

Hardware Setup

This section describes the PROMs, cables, jumper settings, and board layout for the MVME172LX board.

PROMs

Table 2-7 lists the parameters for PROMs used with the MVME172LX board.

Table 2-7. MVME172LX PROM Parameters

Component	Parameter
XU2	JEDEC 32-pin DIP organized as 512 Kbit x 8
PROM type	27C040
Speed	150 ns or faster Slower PROMs may work but have not been tested.

Cables

For the MVME172LX board, configure a cable as follows:

Host		Target
RS232		RJ45 Jack
xmit	2 < - - - - - - - - - - >	4 xmit
recv	3 < - - - - - - - - - - >	5 recv
gnd	7 < - - - - - - - - - - >	3,6 gnd

Connect cables in the front panel of the board.

For more information about cabling, see the Motorola *MVME172 VME Embedded Controller Installation and Use* manual.

Jumper Settings

Use the factory default settings for the MVME172LX board listed in Table 2-8. If these settings are different from the board manufacturer's manual, the manual takes precedence.

Table 2-8. MVME172LX Factory Default Jumper Settings

Jumper Location	Jumper Pins	Description
J1	1-2	System Controller
J12	1-2	on-board SCSI bus terminator enabled
J14	1-3, 2-4	SRAM backup power source; Primary and secondary source VMEbus +5V Standby
J20		Defines EPROM / Flash configuration:
	3-4, 5-6, 9-11, 10-12	128Kbit x 8 EPROMs
	3-4, 9-11, 10-12	256Kbit x 8 EPROMs
	5-6, 8-10, 9-11	512Kbit x 8 EPROMs
	7-9, 8-10	1 Mbit x 8 EPROMs
	1-2, 7-9, 8-10	1 Mbit x 8 (Flash disabled)
J21	1-2	user-definable
	3-4	user-definable
	5-6	user-definable
	7-8	Open = PROM, Connected = Flash
	9-10	user-definable
	11-12	user-definable
	13-14	user-definable
	15-16	user-definable

Board Layout

Figure 2-2 shows the board layout for the MVME172LX.

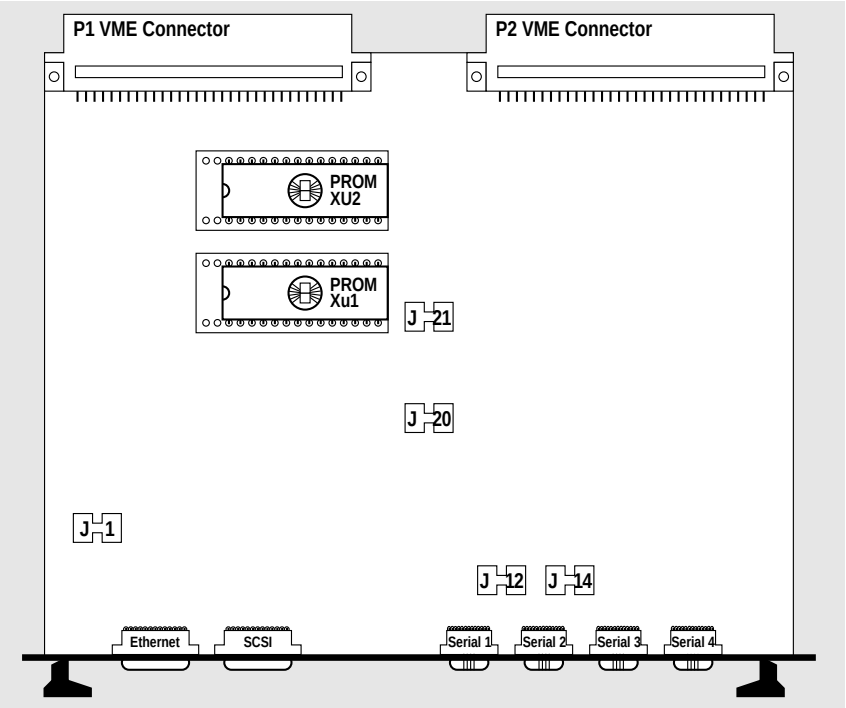

Figure 2-2. MVME172LX Board Configuration

Supplementary Notes

Setting the MPU Clock Speed

In order for the BSP to operate properly, the MPU clock speed stored in the board information block in NVRAM on the MVME172LX board needs to be set to the correct speed. To check the current setting:

```
172-Bug>cnfg
Board (PWA) Serial Number = "2679461     "
Board Identifier          = "PWA-MVME172-313 "
Artwork (PWA) Identifier  = "01-W3183F04A    "
MPU Clock Speed           = "60  "
.
.
.
```

To change the setting, use the 172-Bug command **cnfg;m**. For details on setting the correct speed, see the Motorola *MVME172 VME Embedded Controller Installation and Use* manual.

Booting Directly From the Spectra PROM

The quickest method of booting the board is directly from the Spectra boot PROM, as follows:

1. Use the file **mo172.def** to generate a **boot.hex** image in the current directory:

   ```
   xconfig boot.def mo172.def microtec.def
   ```

2. Burn this image into a blank PROM and place the PROM into socket XU2 on the MVME172LX board.

3. Make certain J21 pins 7-8 are open, then apply power to the board.

See Chapter 1, *Establishing the Spectra Connection*, for details on connecting to the board from your workstation.

Downloading Bridge Into RAM Using 172-Bug

You can use the 172-Bug debug monitor to download the bridge via serial connection into target memory when PROMs are not available:

1. Using the file **mo172ram.def** provided in the distribution, invoke **xconfig** to generate the file **boot.hex.tmp** image in the current directory:

```
xconfig boot.def mo172ram.def microtec.def
```

2. From the current directory, start a **tip** session to the MVME172LX:

```
Copyright Motorola Inc. 1988 - 1997, All Rights Reserved

MVME172 Debugger/Diagnostics Release Version 1.2 -
01/21/97 COLD Start

Local Memory Found =00800000 (&8388608)

MPU Clock Speed =60Mhz

172-Bug>lo 0
~>Local File Name? boot.hex.tmp

5962 lines transferred in 4minutes 34seconds
!

172-Bug>
172-Bug>
```

3. Press the **Return** key to display the prompt:

```
172-Bug>go 10000c
Effective address: 0010000C
```

Note

If 172-Bug is at 9600 baud, and the Spectra console is at 19200 baud, garbled characters will be displayed. Allow three sequences of characters to be displayed before exiting **tip**.

In some cases, **tip** will lock the serial port if it attempts to exit while garbled data is being transmitted to the port. Exit **tip** and then restart it at 19200. Any reset from the XSH prompt will display the correct console characters. You can change the default baud rate from 19200 to 9600 by modifying the entry in **devcnfg.c**.

Ethernet Address Failure

If the RAM chip backup battery fails, the board will lose its Ethernet address and revert to the default of 08:00:3E:20:00:00 or 08:00:3E:2F:FF:FF. The correct Ethernet address should be 08:00:3E:2*X:XX:XX*, where *X:XX:XX* represents the last five digits of the Ethernet address.

To correct the failed Ethernet address:

1. Identify the Ethernet address failure.
2. Enter the boot shell.
3. Set the Ethernet address and exit the boot shell.
4. Reset the board.

Identifying the Ethernet Address Failure

The following sequence shows a board with the incorrect Ethernet address 08:00:3E:2F:FF:FF:

```
Attempting boot via shell
Spectra Boot version 4.1
Copyright (c) 1992-1996 Microtec
Warm reset
Type any key within 2 seconds to get shell prompt
Timeout, exiting shell
Attempting boot via rarp
Ethernet address is 8:0:3e:2f:ff:ff
```

Entering the Boot Shell

Reset the board and press a key at the console prompt to enter the shell:

```
Attempting boot via shell
Spectra Boot version 4.1
Copyright (c) 1992-1996 Microtec
Warm reset
Type any key within 2 seconds to get shell prompt
boot>
```

Setting the Ethernet Address and Exiting the Boot Shell

At the boot prompt, enter the correct Ethernet address for the board and exit:

```
boot> setenv ETHER_ADDR 08:00:3E:2X:XX:XX
boot> exit
```

For example:

```
boot> setenv ETHER_ADDR 08:00:3e:20:18:47
boot> exit
```

Wait for a message resembling the following:

```
Attempting boot via rarp
Ethernet address is 8:0:3e:20:18:47
```

After the RARP program runs, the new board address will be set.

Resetting the Board

Once the new Ethernet address is displayed, press the reset button on the board to reinitialize the Ethernet chip for the new address.

A message similar to the following is displayed:

```
Attempting boot via rarp
Ethernet address is 8:0:3e:20:18:47
Attempting boot via shell
Spectra Boot version 4.1
Copyright (c) 1992-1996 Microtec
Warm reset
Type any key within 2 seconds to get shell prompt
Timeout, exiting shell
Attempting boot via rarp
Ethernet address is 8:0:3e:20:18:47
IP address is 138.121.2.171
RARP server is 0:0:8e:6:3:43 138.121.2.248
Attempting boot via xtrace
```

If the battery-backed RAM is operational, this permanently sets the Ethernet address.

Using 172-Bug to Set the Ethernet Address

You can also use the Motorola 172-Bug PROMs to correct the board's Ethernet address. See the Motorola *MVME172 VME Embedded Controller Installation and Use* manual for more information.

Note

The board's Ethernet address is printed on a sticker attached to the P2 connector.

Board Configurations Tested

The MVME172LX board may be ordered in several different configurations. This BSP was developed with the intention of using a single boot image (PROM) for any MVME172LX board, so the BSP boot image should run on any version.

The following configuration has been tested:

- MVME172-313 (MC68060), 8MB DRAM

Note

The BSP is shipped, by default, to operate with parity DRAM. In order to operate on boards which have ECC DRAM, the BSP boot image needs to be rebuilt using the startup code **crt0ecc.s** in place of the standard **crt0.s**:

```
cd $SPECTRA/target/xsp/mo172/microtec
mv crt0.o crt0.parity.o
$USR_MRI/bin/asm68k -p 68060 -o crt0.o ../common/crt0ecc.s
```

Proceed with **xconfig** as described in *Creating Boot PROMs* in Chapter 1, *Establishing the Spectra Connection*.

Timers

A watchdog timer is not used. Both Timer1 and Timer2 from the MC2chip are configured to generate interrupts every 10 milliseconds. Timer1 is used by Xtrace. Timer2 is unused. Interrupts from Timer2 are disabled at the MC2chip. Timer3, Timer4, and two additional timers in the VMEchip2 are not programmed.

Flash/PROM Configuration

Using jumper J21, you can interchange Flash and PROM addresses. The default configuration file for the BSP is written for EPROM at 0xff800000. When you install the MVME172LX BSP, control is immediately transferred to the BSP.

For more information about using jumper J21 and the memory map, see the Motorola *MVME172 VME Embedded Controller Installation and Use* manual.

VMEchip2 and Boot Code

The start-up code, **crt0.s**, performs minimal initialization of the VMEchip2 (if the chip is present). Depending upon the application, VMEchip2 initialization should be customized. If DRAM is present, the DRAM base address is 0 and the SRAM base address is 0xffe00000. If there is no DRAM, the SRAM base address is configured to 0. Consequently, you can use the same PROMs regardless of the memory configuration.

Boards Without Ethernet

The default bridge is Ethernet. If Ethernet is not present, use the serial bridge. This release does not support auto-configuration, which would automatically reconfigure the bridge to **serial_2** if no Ethernet was found. If Ethernet is not present, create new PROMs using **serial_2** as the bridge. Remove **ether_1 device** from the devices list to avoid crashing the board when it attempts to initialize the nonexistent Ethernet facility.

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