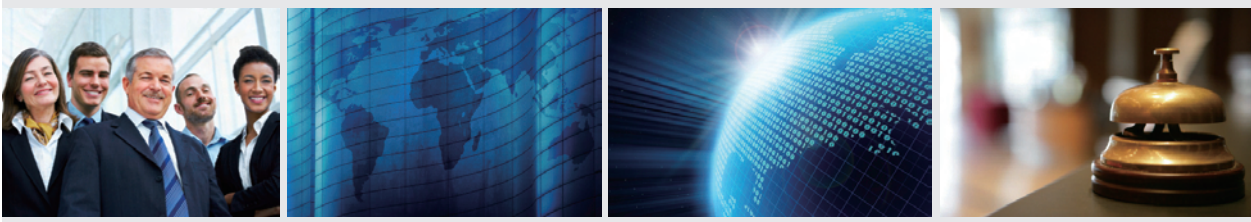# Lanner
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Network Application Platforms

Hardware platforms for next generation networking infrastructure

MR-320

User's Manual
Publication date:2010-07-23

>>

About

Overview

Icon Descriptions

The icons are used in the manual to serve as an indication of interest topics or important messages. Below is a description of these icons:

NOTE: This check mark indicates that there is a note of interest and is something that you should pay special attention to while using the product.

WARNING: This exclamation point indicates that there is a caution or warning and it is something that could damage your property or product.

Online Resources

The listed websites are links to the on-line product information and technical support.

Resource	Website
Lanner	http://www.lannerinc.com
Product Resources	http://assist.lannerinc.com
RMA	http://eRMA.lannerinc.com

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Compliances

CE

This product has passed the CE test for environmental specifications. Test conditions for passing included the equipment being operated within an industrial enclosure. In order to protect the product from being damaged by ESD (Electrostatic Discharge) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

FCC Class A

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Table of Contents

Chapter 1: Introduction

Based on a new generation high-performance OCTEON network processors (Models have CN50xx series single and dual core or CN30xx series single and dual core MIPS processor), the MR-320 offers up to 2 cnMIPS64 cores on a single chip. The chipset supports a variety of I/O interfaces including Gigabit Ethernet, USB and Mini-PCI interfaces. The built-in encryption TCP acceleration, and QoS engine provides reliable security functions at top speed. These advanced acceleration technologies are integrated in the 4 port Gigabit Ethernet switch and the dual Gigabit WAN port, making it a perfect platform for high quality voice, video and data services.

The Quick Start Guide will takes you through the basic steps necessary to install your MR-320 System.

Please refer to the chart below for a summary of the system's specifications.

System Specification

| Features	Descriptions	
Form Factor		Desktop
Platform	Processor	OCTEON CN3010/CN5020
	Max Speed	500MHz
	Processor Cores	1
	Instructions per Second (Max)	1G
	Encryption Engine	Yes
	Networking Engine	Yes
	QoS Engine	Yes
	TCP Acceleration	Yes
System Memory	Technology	DDR2 533MHz
	Capacity	512MB (1GB Max.)
	Storage Interface	CompactFlash (type II) x 1
	NOR Boot Flash	8/16 MB
Networking	No. of ports (Max)	2 GbE (RJ45 x 2) 4 GbE (RJ45 x 4)
	Controller	Marvell 88E1111 (RGMII interface), Marvell 88E6161 (RGMII interface)
I/O Interface	Console	DB9 x 1
	USB 2.0	1
Expansion		Mini-PCI x 1
Cooling	Processor	Passive CPU heatsink
Environmental Parameters	Temperature, Ambient Operating	0~40°C
	Temperature, Ambient Storage	-20~70°C
	Humidity (RH), Ambient Operating and Non-Operating	5% ~ 95%, non condensing
	Internal RTC	Yes
Physical Dimensions	Dimensions (WxHxD)	240 x 300 x155.5mm (9.4x1.2x6.1 in)
	Weight	1.3Kg
Power	Type / Watts	Adapter
	Input	AC 100-240V@50Hz~60Hz
	Output	DC 12V 2A
Approvals & Compliance		CE Emission, FCC Class A, RoHS
Ordering	System	MR-320A: CN5020-500,512MB MB-320C: CN5020-500,1GB

Chapter 1

Package Contents

Your package contains the following items:

- MR-320 Network Security Platform

- Power cable

- 1 crossover Ethernet cable (1.8 meters)

- 1 straight-through Ethernet cable (1.8 meters)

- 1 RJ-45 to DB-9 female console cable

- Serial-ATA hard drive cable

- 1 threaded screw set

- 1 ear bracket set (Optional)

- Drivers and user's manual CD.

Chapter 1

Front Panel Features
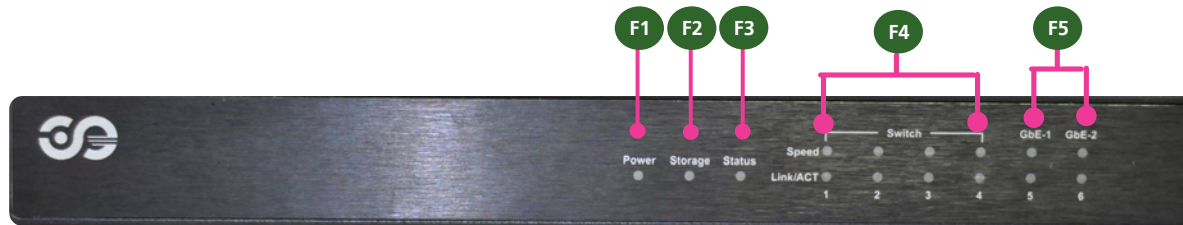
F1 Power Led:

Green indicates that the system is powered on.

F2 Storage LED

It is an LED indicator (amber) for the CompactFlash card. If the LED is on, it indicates that the system's storage is functional. If it is off, it indicates that the system's storage is not functional. If it is flashing, it indicates data access activities.

F3 Status

If the LED is green, it indicates that the system's operational state is normal. If it is amber, it indicates that the system is malfunctioning.

F4 Switch

These LEDs are indicators for the four ports of the switch module on the back panel.

Speed LED: If the LED is amber, it indicates that the connection speed is 1000Mbps. If the LED is green, it indicates that the connection speed is 100Mbps. And if it is off, it indicates that the speed is 10Mbps.
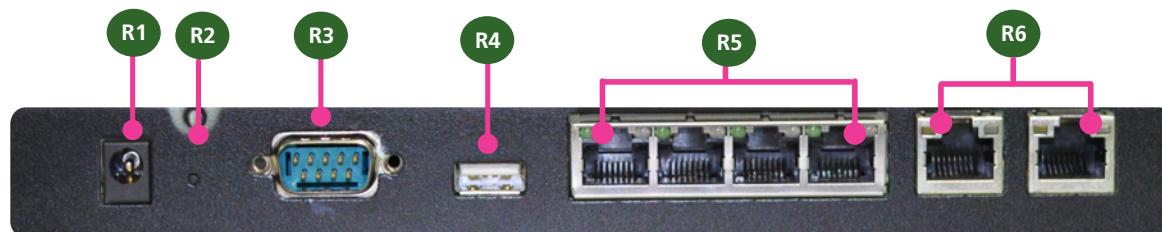
Link/ACT LED: If the LED is on, it indicates that the port is active. If it blinks, it indicates that there is traffic.

F5 GbE-1/GbE-2

These LEDs are indicators for the two Gigabit Ethernet ports which can serve as WAN connections on the back panel. For the LED behavior, refer to the above Speed and Link/ACT LED description of F4.

Rear Panel Features

R1 Power Adapter socket

It requires a DC 12V/2A power input. Only use the power adapter supplied with the MR-320 System.

R2 Reset Switch

It is a hardware reset switch. Use a pointed object to press it 5 seconds then release it to reset the system without turning off the power.

R3 RS-232 COM Port:

It requires a DB-9 Male Connector. Using suitable RS-232 cable, you can connect an appropriate device, for example, a terminal console for diagnostics.

Terminal Configuration Parameters: 115200 baud, 8 data bits, no parity, 1 stop bit , no flow control.

R4 USB 2.0 Ports

It connects to any USB devices, for example, a flash drive. Besides this external USB port, there is another one offered with the onboard pin header connectors (refer to *Jumper Setting* on *Chapter 3 Motherboard Information*)

R5 4 Ethernet LAN Port switch module (From left to right: LAN1 to LAN4)

Using suitable RJ-45 cable, you can connect MR-320 System to a computer, or to any other piece of equipment that has an Ethernet connection such as a hub or a switch.

R6 Gigabit WAN Port1(Left) and Port2(Right)

These two ports can be utilized for broadband connection to connect the device to an Internet service. Since the GbE-1 and GbE-2 ports are separate from the above mentioned switch module, implementation of routing is required for the LAN ports on the switch (R5) to connect the Internet.

Chapter 2:
Hardware Setup

Preparing the Hardware Installation

To access some components and perform certain service procedures, you must perform the following procedures first.

⚠️ **WARNING:** To reduce the risk of personal injury, electric shock, or damage to the equipment, remove the power cord to remove power from the server. The front panel Power On/Standby button (if there is one) does not completely shut off system power. Portions of the power supply and some internal circuitry remain active until AC power is removed.

1. Unpower the MR-320 and remove the power cord.

2. Unscrew the 8 threaded screws from the two sides and two screws at the rear of the top cover of the MR-320 System.

3. Slide the cover backwards and open the cover upwards.

Installing a CompactFlash Card

MR-320 provides one CompactFlash slot slot. Follow the procedures bellow to install a CompactFlash card.

1. Align CompactFlash card and the card slot with the arrow pointing toward the connector.

2. Push the card to insert into the connector.

3. Accessing the CompactFlash card

In the linux environment, you could access the CF card with the following commands:

```
MR320# mount /dev/cfa1 /mnt/cf
MR320# ls /mnt/cf
```

To put files on the CF Card, use the following procedures:

```
1.    Connect the CF card. It will usually be assigned as the following
      device:
          /dev/cfa1

2.    Mount the CF file system.
MR320#mount /dev/cfa1 /mnt/cf

3.    Copy program file(s) to CF.
MR320#cp hello.txt  /mnt/cf

4.    Unmount CF file system.
MR320#umount /mnt/cf
```

Chapter 3

Chapter 3:
Motherboard Information

Block Diagram

The block diagram depicts the relationships among the interfaces or modules on the motherboard. Please refer to the following figure for your motherboard's layout design.

Chapter 3
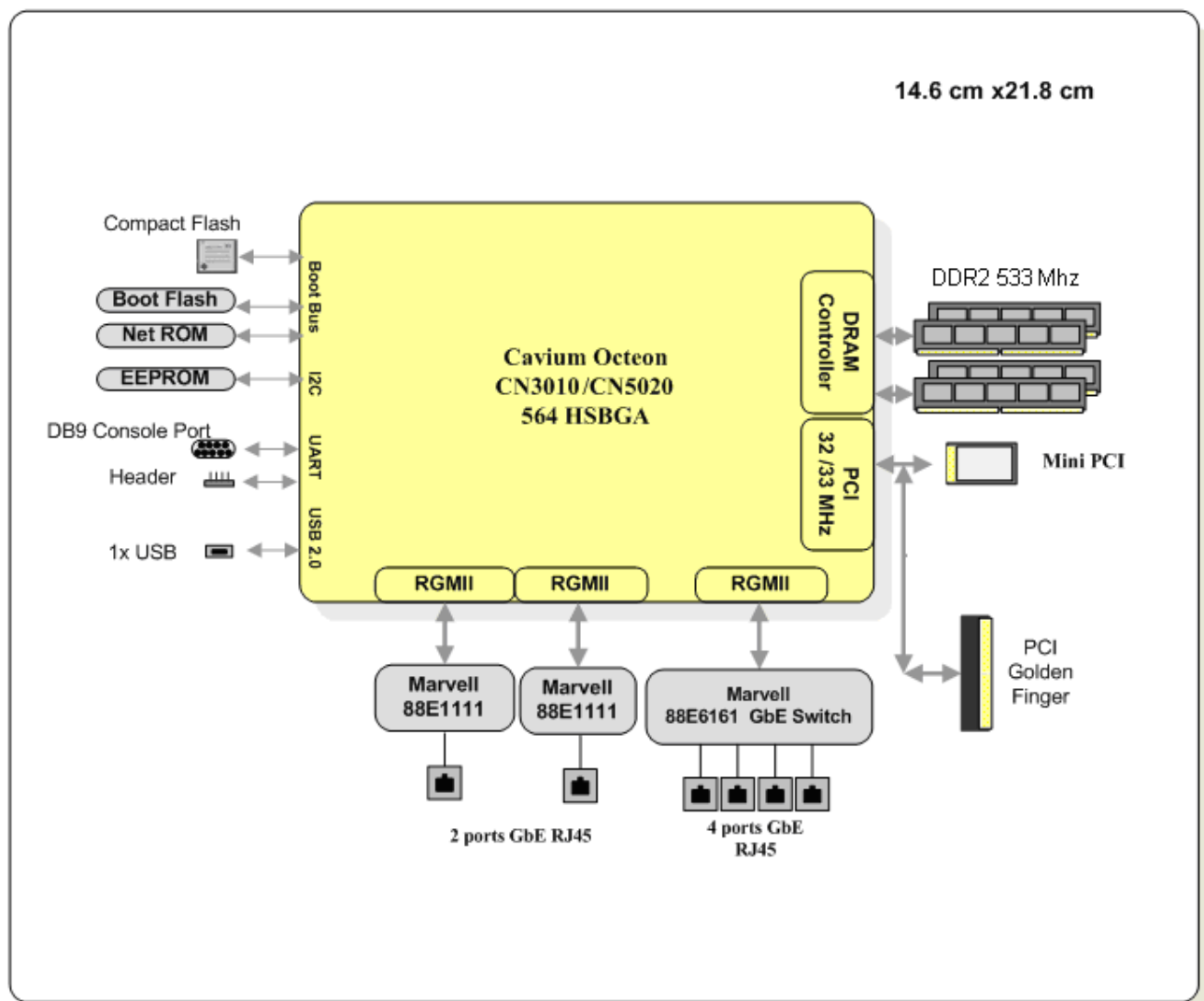
Board Dimension

The following diagram shows the physical dimension of the PCB board. (unit-inches)
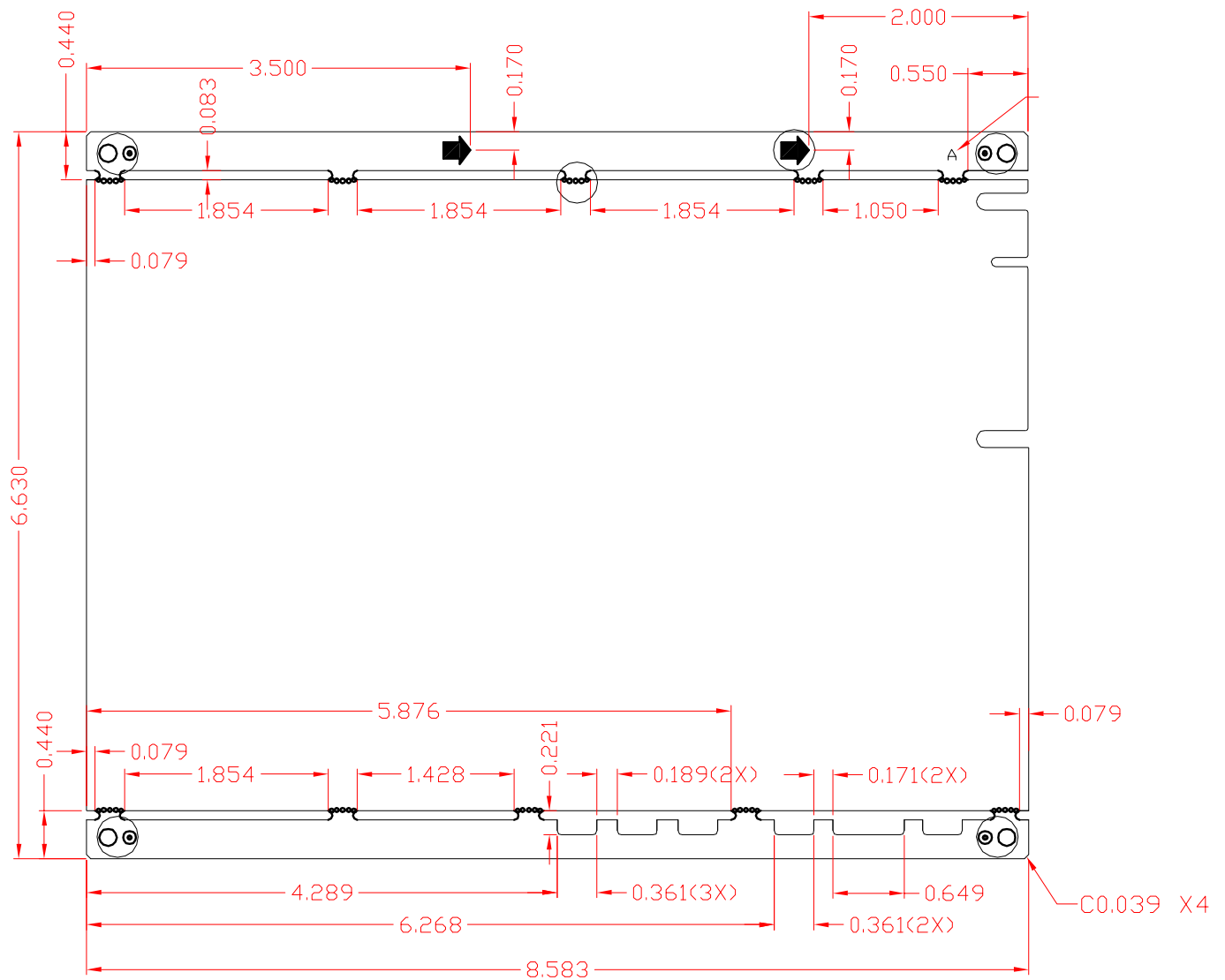
Motherboard Layout

The motherboard layout shows the connectors and jumpers on the board. Refer to the following picture as a reference of the pin assignments and the internal connectors.

M1 JTag(JP4)

M3 USB Interface Connector (JP2)

M4 JP1: Flash Mode Selector (JP1)

M5 NetROM Downloader (P3)

Mini-PCI Connector (PX1) **M2**

M6 CompactFlash Connector (P1)

146mm

Reset Switch (Sw1)

M13

M7

Bootloader Mode Jumper

M9

Internal Serial Port (JP6)

M8

External Serial Port (P3)

M10

USB2.0 Ports (P4)

M11

Ethernet Ports (P5)

M12

WAN Ports (P6, P7)

218mm
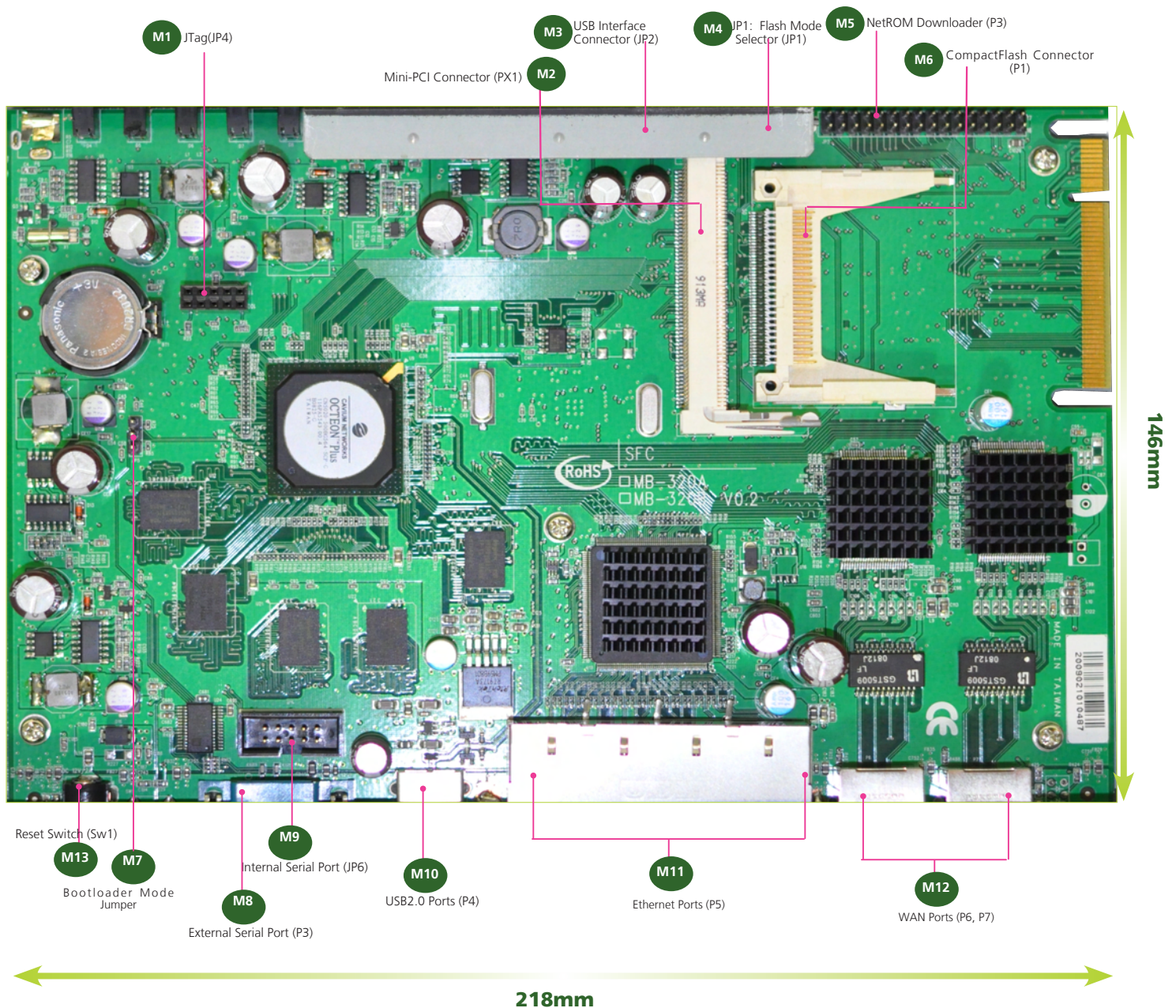
Jumper Settings

M1 Jtag (JP4): The Jtag is a debug port provided as a means for testing the main board and looking for possibility of field faults.

Function	JTAG_TDI	EJTAG_TRST_L	JTAG_TMS	3.3V	TAG_TCK
PIN NO.	5	4	3	2	1

```
 5  4  3  2  1
┌──┬──┬──┬──┬──┐
├──┼──┼──┼──┼──┤
└──┴──┴──┴──┴──┘
 6  7  8  9  10
```

PIN NO.	6	7	8	9	10
Function	EJTAG_RST#	NC	NC	NC	EJTAG_TDO

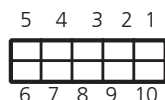**M2** Mini-PCI Connector (PX1): The 124-pin Mini-PCI slot enables a Mini-PCI expansion module to be connected to the board. For example, a Wi-Fi module or a SATA controller. The Mini-PCI bus has 32 bit data width with 66Mhz.

```
1
2
.
.
.
.
.
.
124
```

PIN NO.	FUNCTION	PIN NO.	FUNCTION
1	TIP	2	RING
3	8PMJ-3	4	8PMJ-1
5	8PMJ-6	6	8PMJ-2
7	8PMJ-7	8	8PMJ-4
9	8PMJ-8	10	8PMJ-5
11	LED1_GRNP	12	LED2_YELP
13	LED1_GRNN	14	LED2_YELP
15	CHSGND	16	RESERVED
17	INT-B	18	+5V
19	+3.3V	20	INT-A
21	RESERVED	22	RESERVED
23	GROUND	24	3.3VAUX
25	CLK	26	RST
27	GROUND	28	+3.3V
29	REO	30	GNT
31	+3.3V	32	GROUND
33	AD31	34	PME
35	AD29	36	RESERVED
37	GROUND	38	AD30
39	AD27	40	+3.3V
41	AD25	42	AD28
43	RESERVED	44	AD26
45	C_BE-3	46	AD24
47	AD23	48	IDSEL
49	GROUND	50	GROUND
51	AD21	52	AD22
53	AD19	54	AD20
55	GROUND	56	PAR
57	AD17	58	AD18
59	C_BE-2	60	AD16
61	IRDY	62	GROUND
63	+3.3V	64	FRAME
65	CLKRUN	66	TRDY
67	SERR	68	STOP
69	GROUND	70	+3.3V
71	PERR	72	DEVSEL
73	C_BE-1	74	GROUND
75	AD14	76	AD15
77	GROUND	78	AD13
79	AD12	80	AD11
81	AD10	82	GROUND
83	GROUND	84	AD9
85	AD8	86	C_BE-0
87	AD7	88	+3.3V
89	+3.3V	90	AD6
91	AD5	92	AD4
93	RESERVED	94	AD2
95	AD3	96	AD0
97	+5V	98	RESERVED-WIP
99	AD1	100	RESERVED-WIP
101	GROUND	102	GROUND
103	AC_SYNC	104	M66EN
105	AC_SDATA_IN	106	AC_SDATA_OUT
107	AC_BIT_CLK	108	AC_CODEC_ID0
109	AC_CODEC_ID1	110	AC_RESET
111	MOD_AUDIO_MON	112	RESERVED
113	AUDIO_GND	114	GROUND
115	SYS_AUDIO_OUT	116	SYS_AUDIO_IN
117	SYS_AUDIO_OUT GND118	118	SYS_AUDIO_IN GND
119	AUDIO_GND	120	AUDIO_GND
121	RESERVED	122	MPCIACT
123	VCC5VA	124	3.3AUX

M3 USB Interface Connector(JP2): It is for connecting the USB module cable. It complies with USB2.0 and support up to 480 Mbps connection speed. It is enabled by the OCTEON's integrated PHY through the I/O bridge.

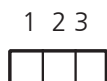| Function	USBGND	USBDP1	USBDM1	NC	USB_Port1_VBUS
PIN NO.	5	4	3	2	1

```
 5  4  3  2  1
┌──┬──┬──┬──┬──┐
├──┼──┼──┼──┼──┤
└──┴──┴──┴──┴──┘
 6  7  8  9  10
```
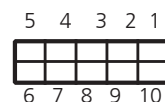
PIN NO.	6	7	8	9	10
Function	USB_Port2_VBUS	NC	USBDM2	USBDP2	USBGND

M4 Flash Mode Selector(JP1): It is a jumper for selecting the flash mode from either normal or Net mode. The Net mode is for debugging purpose. Adjust this jumper to the Net mode when connecting NetROM connector (JP3).
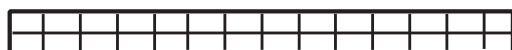
1 2 3

Pin No.	Function
Short 1-2	Normal
Short 2-3	Debug

M5 NetRom Connector(JP3): The Net ROM device is the tool for simulating the boot image during project developing stage. The NetROM eliminates the need to burn EPROMs or flash to debug code by utilizing the Ethernet to download the code images

32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

Pin No.	Function	Pin No.	Function
1	NET_A19	2	NET_A16
3	NET_A15	4	NET_A12
5	NET_A7	6	NET_A6
7	NET_A5	8	NET_A4
9	NET_A3	10	NET_A2
11	NET_A1	12	NET_A0
13	NET_D0	14	NET_D1
15	NET_D2	16	GND
17	NET_D3	18	NET_D4
19	NET_D5	20	NET_D6
21	NET_D7	22	NET_CE#
23	NET_A10	24	BOOT_OE#
25	NET_A11	26	NET_A9
27	NET_A8	28	NET_A13
29	NET_A14	30	NET_A17
31	NET_A18	32	5V

M6 CompactFlash Connector (P1): It is for connecting a Compact Flash card to be served as your system's storage. The connector is a CF Type II slot which could fit both CF Type I or CF Type II cards.

50 ... 26   25 24 ... 1
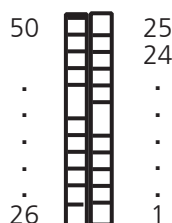
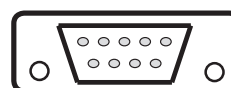| Pin No.	Function	Pin No.	Function
1	Ground	2	Data 3
3	Data 4	4	Data 5
5	Data 6	6	Data 7
7	CS1#	8	N.C.
9	Ground	10	N.C.
11	N.C.	12	N.C.
13	+5V	14	N.C.
15	N.C.	16	N.C.
17	N.C.	18	Addr 2
19	Addr 1	20	Addr 0
21	Data 0	22	Data 1
23	Data 2	24	N.C.
25	N.C.	26	N.C.
27	Data 11	28	Data 12
29	Data 13	30	Data 14
31	Data 15	32	CS3#
33	N.C.	34	IOR#
35	IOW#	36	+5V
37	IRQ 15	38	+5V
39	N.C.	40	N.C.
41	Reset#	42	IOCHRDY
43	DMA REQ#	44	DMA ACK#
45	CF Active	46	PDIAG#
47	Data 8	48	Data 9
49	Data 10	50	Ground

M7 Bootloader Mode Jumper (JP5): There are two bootloader modes on the MR-320 board; namely, failsafe and normal bootloader mode. Use this jumper to switch between them.

1
2
3

Pin No.	Function
Short 1-2	Failsafe
Short 2-3	Normal

M8 External Serial Port(P3): It is the RS-232 serial port.

Pin No.	Pin name
1	N.C.
2	CMA3
3	N.C.
4	N.C.
5	N.C.

1 2 3 4 5

9 8 7 6

Pin No.	Pin name
6	N.C.
7	MA5
8	N.C.
9	N.C.

M9 Serial Interface Connectors(JP6): It is for connecting the RS-232 serial port module cable.

Function	GND	N.C.	TXD 1	RXD 1	VCC3
PIN NO.	5	4	3	2	1

6 7 8 9 1 0

1 2 3 4 5
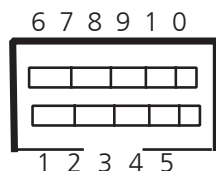
PIN NO.	10	9	8	7	6
Function	N.C.	N.C.	N.C.	N.C.	N.C.

M10 USB 2.0 Connector (P4): The system provides 2 USB type A connectors; one is external and the other one is internal (JP2).

Function	USB_Por2_VBUS	DM2	DP2	USBGND
PIN NO.	1	2	3	4

PIN NO.	6	5
Function	GND	GND

M11 Ethernet Switch (P5): The Ethernet switch of 4 Gigabit ports is provided by the Marvell Linkstreet 88E6161 PHY through RGMII. It has the following capabilities:

- Auto-adjusting among 10M/100M/1000M connection speed

- Auto-detecting between Half/Full-duplex mode

- Compliant with theIEEE 802.3 10Base-T/100Base-Tx/ 1000Base-T

- Compliant with IEEE802.3x flow control and Back Pressure

- Auto-negotiation between MDI and MDIX

- Store and Forward architecture

- 10K jumbo frame support

M12 Gigabit WAN Port(P6,P7): These two Gbe (RJ-45) ports are provided by the Marvell 88E1111 GbE PHY It has the following capabilities:

- Compliant with theIEEE 802.3 10Base-T/100Base-

Tx/ 1000Base-T

- Auto-adjusting between 10M/100M/1000M connection speed

- Auto-negotiation between MDI and MDIX crossover at all speeds of operation

- Auto-detection of fiber or copper operation

M13 Reset Switch (SW1): The reset switch can be used to restart the system without turning off the power.

1   2

Pin No.	Function
1	GND
2	Factory_Reset

Chapter 4: Building the Bootloader Image

Building the U-boot image

To rebuild u-boot for the EM-8230 board, run the following commands to compile the bootloader configuration file in the u-boot directory whose path is bootloader/u-boot/:

```
MR320# cd /bootloader/u-boot

MR320# make MR320_config

MR320# make
```

It will create a boot image file: u-boot-MR320.bin.

Updating the U-boot Image

There are two u-boot images in flash— the failsafe bootloader and the normal bootloader. The failsafe bootloader is programmed by Lanner before the board is shipped and cannot be updated. The failsafe bootloader provides a means to recover from a failed loading of the bootloader. The board also contains a normal bootloader as well, and that is upgradable. To upgrade the bootloader, , put the new bootloader image onto a compact flash card, insert the card to the Main board, and power it up.

```
Load the image into memory with the command:
MR320# fatload ide 0 100000 <bootloader image
                  filename>
```

```
Burn the new bootloader image with the command:
MR320# run bootloader_flash_update
```

```
Nuke environment variables on the flash.
MR320# run nuke_env
```

Reset the board. It will boot up with the new bootloader.

Another method is through the **tftp** over the network:

```
The physical address of the flash is: 0xbf400000
MR320#tftp 100000 <bootloader image filename>

MR320#run bootloader_flash_update
```
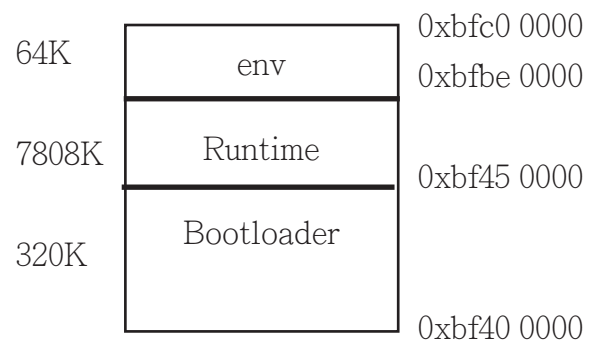
And then reset the board.

> **Note:** Remember to configure the Ethernet port first by setting the following variables:

```
MR320#setenv ipaddr 192.168.0.2
MR320#setenv serverip 192.168.0.1
MR320#saveenv
```

Below is the physical address of the flash memory and the SDRAM for your reference:

You could also accomplish the update through the serial port:

```
MR320# loadb 100000

## Total Size = 0x00795670 = 7951984 Bytes

## Start Addr = 0x00b000000
```

Recovering from a failsafe bootload

If booting from the normal bootloader fails, the failsafe bootloader can be used to recover the normal bootloader image. You can boot up with the failsafe bootloader image to recover the normal bootloader when it cannot bootup successfully.

Adjust jumper JP5 to Failsafe bootloader (refer to *jumper settings*, *Chapter 3*) on the main board. This will select failsafe bootloader to bootup, and then power on the board. The failsafe bootloader image should now boot and press "Crtl - C" to interrupt factory test. The bootloader prompt should identify itself as the failsafe bootloader. Following the instructions below to update normal-mode bootloader:

Power on the system, press "ctrl - C" while the following messages are displayed during the booting process:

Clearing DRAM........ done

BIST check passed.

Bus 0 (CF Card): OK

ide 0: Model: InnoDisk Corp. - iCF2000 512MB Firm: YUAN1026 Ser#:

Type: Hard Disk

Capacity: 495.6 MB = 0.4 GB (1015056 x 512)

Then, Execute the following procedures:

Load the image to the DRAM with the command:
MR320# fatload ide 0 100000 image-filename

Burn the new image with the command:
MR320# run bootloader_flash_update

Burn the new image with the command:
MR320#run bootloader_flash_update

Nuke environment variables on flash.
MR320# Failsafe bootloader#run nuke_env

Booting from the CompactFlash Card

Type the following command to load the program into the RAM:
MR320# fatload ide 0 <addr> <file name>

<addr> is the address in which the file will be loaded in memory.

For example: 21000000

<file name> is the name of the bootloader image on the CF

For Example :traffic-gen

Follow these procedures to boot programs from CF card:

boot diagnostic bin first by typing the command:
MR320# bootoct <addr> [coremask=<hexmask>]

then, boot linux kernel bin by typing the command

MR320#bootoctlinux <addr> [coremask=<hexmask>]

<addr> is the address where the program was loaded by using the fatload command listed above

<hexmask> optionally specifies which cores will execute the program on.

Note: To boot up the linux O.S. from the CompactFlash, use the following method as a guideline to make the Linux kernel and copy it on to the CF Card.

Build Linux for the MR-320.
$ cd $(OCTEON_ROOT_Directory)/linux
$ make -s clean
$ make -s kernel

Copy the Linux kernel to a compact flash.
$ mkdir -p /mnt/cfa1
$ mips64-octeon-linux-gnu-strip kernel_2.6/linux/ vmlinux.64
$ fdisk -l /dev/cfa1
$ mount /dev/cfa1 /mnt/cf
$ cp kernel_2.6/linux/vmlinux.64 /mnt/cf
$ sync
$ umount /mnt/cf

Chapter 5: Bootloader Functionalities

The bootloader has several functionalities including initializing the SDRAM and FLASH, downloading and upgrading Bootloader, as well as loading and executing the Operating System.

Here are some useful commands that can be used in the Bootloader environment:

Configuring/Save the environment variables:

We are setting the MR-320's IP address as an example:
MR320# setenv serverip 192.168.0.72
MR320# setenv ipaddr 192.168.0.2
MR320# saveenv

Saving Environment to Flash...

Un-Protected 1 sectors

Erasing Flash...

. done

Erased 1 sectors

Writing to Flash... done

Protected 1 sectors

Then, ping the Ethernet port of the system to check its connectivity:

MR320# ping 192.168.0.72

Interface 0 has 3 ports (RGMII)

Using octeth0 device

octeth0: Up 1000 Mbps Full duplex (port 0)

host 192.168.0.72 is alive

Query the Hard Disk information (IDE configura-

Use the following command to obtain the information of the hard disk which is the CompactFlash card in our case:

MR320# ide info

IDE device 0: Model: SanDisk SDCFJ-512 Firm: HDX 4.03 Ser#: 012004E0208S4048

Type: Removable Hard Disk

Capacity: 488.7 MB = 0.4 GB (1000944 x 512)

Query the CompactFlash Card information (IDE configuration information):

MR320# fatls ide 0

15779752 vmlinux.64

485741 hw-speed-usb

10308320 vmlinux-adk15p.64

13031504 vmlinux_cn3005_ipsec.64

9956160 vmlinux-ipfwd.64

26 smm.conf

26 smm.default

67 firebase.default

67 firebase.conf

29910520 vmlinux_3010se.64

36108 cavmodexp.ko

11 file(s), 0 dir(s)

MR320# fatload ide 0 b000000 vmlinux.64

reading vmlinux.64

20368280 bytes read

Reading the MII Register:

MR320# smi r 0x10 0x0 0x0

MR320# smi w 0x10 0x0 0x0 0x0

Reading/Writing the multichip mode switch through the SMI interface

smi w *smiaddr* (: smi address, in this case of our board it is: 0x10) *devaddr* (in this case our PHY address is 0x0~0x3 and the designated port address is 0x10~0x15) *regaddr*

or

smi r *smiaddr* (:smi address, in this case of our board it is: 0x10) devaddr (in this case our PHY address is 0x0~0x3 and the designated port address is 0x10~0x15regaddr

The following shows an example of this command:

```
MR320# smi r 0x10 0x0 0x0
or
For example, type  the following command:
MR320# smi w 0x10 0x0 0x0 0x0
```

Scanning and displaying PCI device information

```
MR320# pci

base address 0 = 0x80000000

base address 1 = 0x00000000

base address 2 = 0x00000000

base address 3 = 0x00000000

base address 4 = 0x00000000

base address 5 = 0x00000000

cardBus CIS pointer = 0x00000000

sub system vendor ID = 0x1033

sub system ID = 0x0035

expansion ROM base address = 0x00000000

interrupt line = 0x00

interrupt pin = 0x01

min Grant = 0x01

max Latency = 0x2a
```

I²C device configuration

```
 MR320# iprobe
Valid chip addresses: 51 68

MR320# imd 51 0.2

0000: 12 34 56 78 ab cd ef 00 ff ff ff ff ff ff ff ff .4Vx............

MR320# imw 51 0.2 33

MR320# imd 51 0.2

0000: 33 34 56 78 ab cd ef 00 ff ff ff ff ff ff ff ff 34Vx............
```

Read/Write CPU Register

```
MR320# write64 1070000000810 01
```

writing 0x0000000000000001 to address:
0x8001070000000810

```
MR320# read64 1070000000810
```

attempting to read from addr: 0x8001070000000810

0x8001070000000810: 0x0000000000000001

```
MR320# write64 1070000000888 02
```

writing 0x0000000000000002 to address:
0x8001070000000888

UART Configuration

```
MR320# setenv console_uart 1
```

Running the Operating System and Diagnostics

```
MR320# bootoctlinux <DRAM address>
```

For example:
```
MR320# bootoctlinux b000000
```

Appendix A

Appendix A:
Terms and Conditions

Warranty Policy

1. All products are under warranty against defects in materials and workmanship for a period of one year from the date of purchase.

2. The buyer will bear the return freight charges for goods returned for repair within the warranty period; whereas the manufacturer will bear the after service freight charges for goods returned to the user.

3. The buyer will pay for repair (for replaced components plus service time) and transportation charges (both ways) for items after the expiration of the warranty period.

4. If the RMA Service Request Form does not meet the stated requirement as listed on "RMA Service," RMA goods will be returned at customer's expense.

5. The following conditions are excluded from this warranty:

Improper or inadequate maintenance by the customer Unauthorized modification, misuse, or reversed engineering of the product Operation outside of the environmental specifications for the product.

RMA Service

Requesting a RMA#

6. To obtain a RMA number, simply fill out and fax the "RMA Request Form" to your supplier.

7. The customer is required to fill out the problem code as listed. If your problem is not among the codes listed, please write the symptom description in the remarks box.

8. Ship the defective unit(s) on freight prepaid terms. Use the original packing materials when possible.

9. Mark the RMA# clearly on the box.

> **Note:** Customer is responsible for shipping damage(s) resulting from inadequate/loose packing of the defective unit(s). All RMA# are valid for 30 days only; RMA goods received after the effective RMA# period will be rejected.

Appendix A

RMA Service Request Form

When requesting RMA service, please fill out the following form.   Without this form enclosed, your RMA cannot be processed.

RMA No:	Reasons to Return: □ Repair(Please include failure details) □ Testing Purpose
Company:	Contact Person:
Phone No.	Purchased Date:
Fax No.:	Applied Date:
Return Shipping Address: _____ Shipping by: □ Air Freight □ Sea □ Express_____ □ Others:_____	

Item	Model Name	Serial Number	Configuration

Item	Problem Code	Failure Status

*Problem Code:

01:D.O.A.	07: BIOS Problem	13: SCSI	19: DIO
02: Second Time R.M.A.	08: Keyboard Controller Fail	14: LPT Port	20: Buzzer
	09: Cache RMA Problem	15: PS2	21: Shut Down
03: CMOS Data Lost	10: Memory Socket Bad	16: LAN	22: Panel Fail
04: FDC Fail	11: Hang Up Software	17: COM Port	23: CRT Fail
05: HDC Fail	12: Out Look Damage	18: Watchdog Timer	24: Others (Pls specify)
06: Bad Slot			

Request Party

Confirmed By Supplier

Authorized Signature / Date

Authorized Signature / Date