RouterBOARD 200 Series

User's Manual

Rev. Q (22-Nov-2005)

Copyright

Trademarks

Limited Warranty

Hardware. MikroTikls SIA warrants all RouterBOARD 200 series equipment for the term of one year from the shipping date to be free of defects in materials and workmanship under normal use and service. All parts will be repaired or replaced with similar or functionally equivalent parts by MikroTikls SIA during the warranty term, except in case the returned parts have mechanical, electrical or other accidental or intended damages caused by improper use or due to wind, rain, fire or other acts of nature.

Parts (or systems) must be shipped pre-paid to our facility in Riga, Latvia. All items must have a Return Material Authorization (RMA) which you can get by contacting us via email, telephone or fax. RMA must be printed, signed, and enclosed with the shipment, also the RMA number must be written on the package itself. Parts sent without following the proper procedure will be treated as those not to be repaired or replaced due to the above mentioned conditions. Items proved to be free of defects in our lab will be returned to the customer at the customer's expense. Those that do meet the warranty repair requirements will be repaired or replaced, and returned to the customer's location at our expense, extending the warranty term for the time the items are being shipped to and from our facility and replaced or repaired.

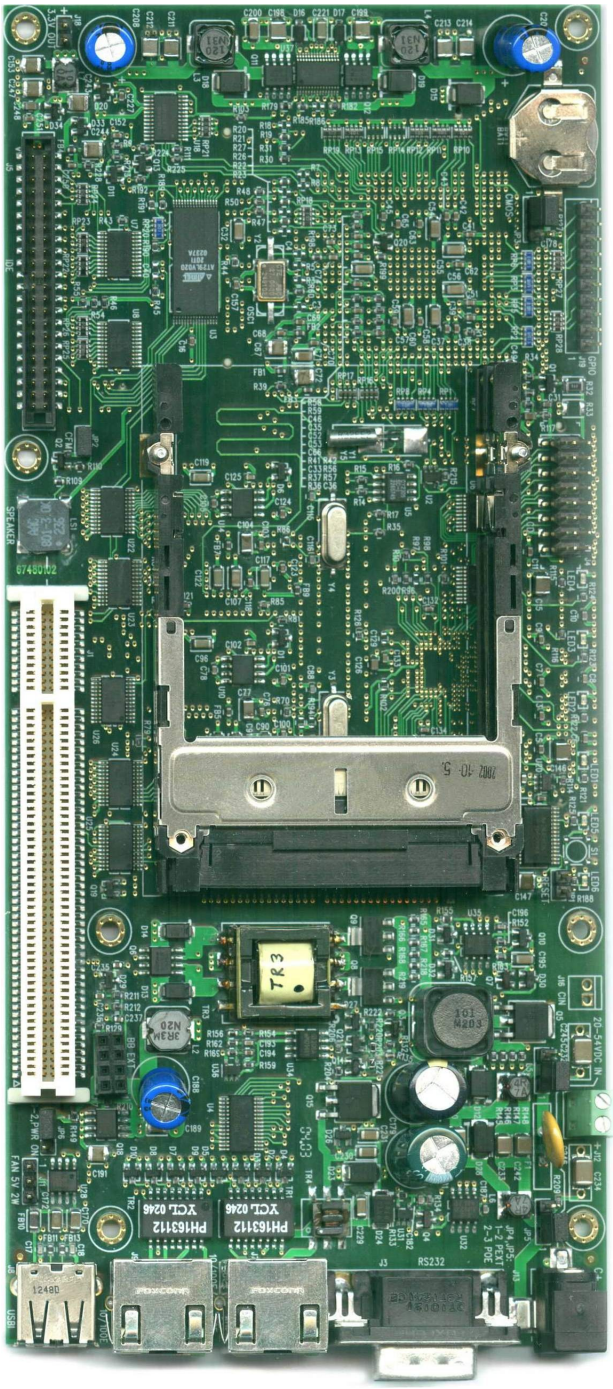
Manual. This manual is provided “as is” without a warranty of any kind, expressed or implied, including, but not limited to, the implied warranty of merchantability and fitness for a particular purpose. The manufacturer has made every effort to ensure the accuracy of the contents of this manual, however, it is possible that it may contain technical inaccuracies, typographical or other errors. No liability is assumed for any inaccuracy found in this publication, nor for direct or indirect, incidental, consequential or other damages that may result from such an inaccuracy, including, but not limited to, loss of data or profits.

Caution

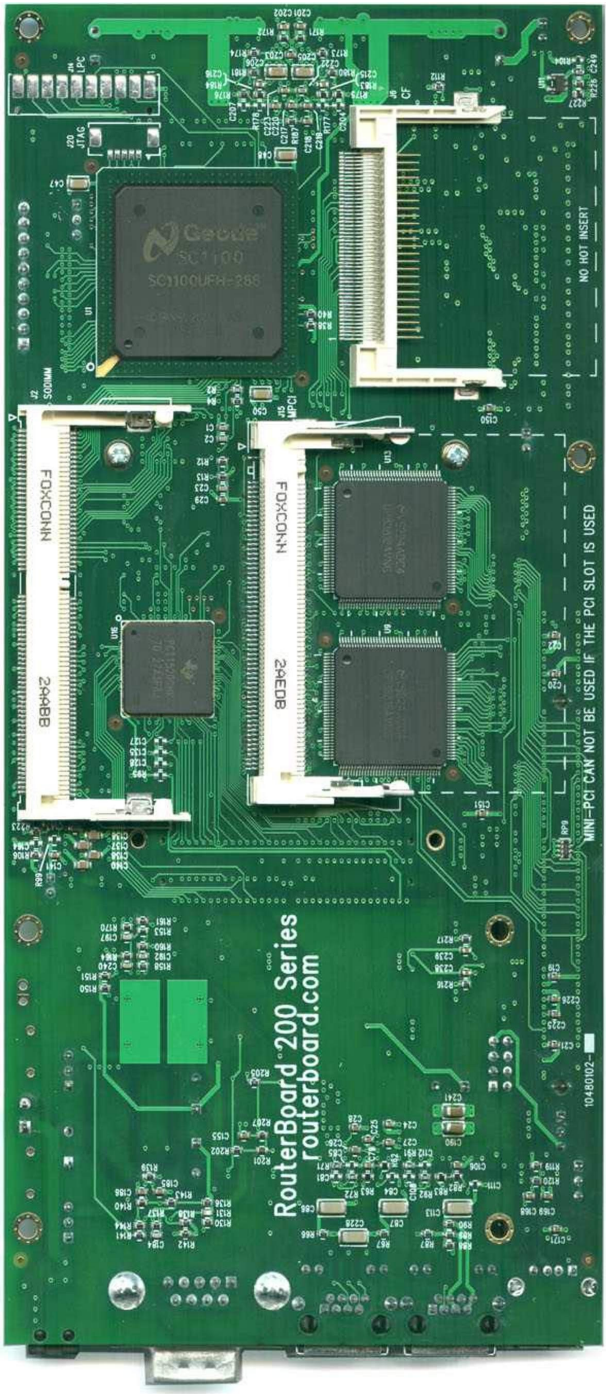
To avoid damage of the system, use the correct DC input voltage range.

Table of Contents

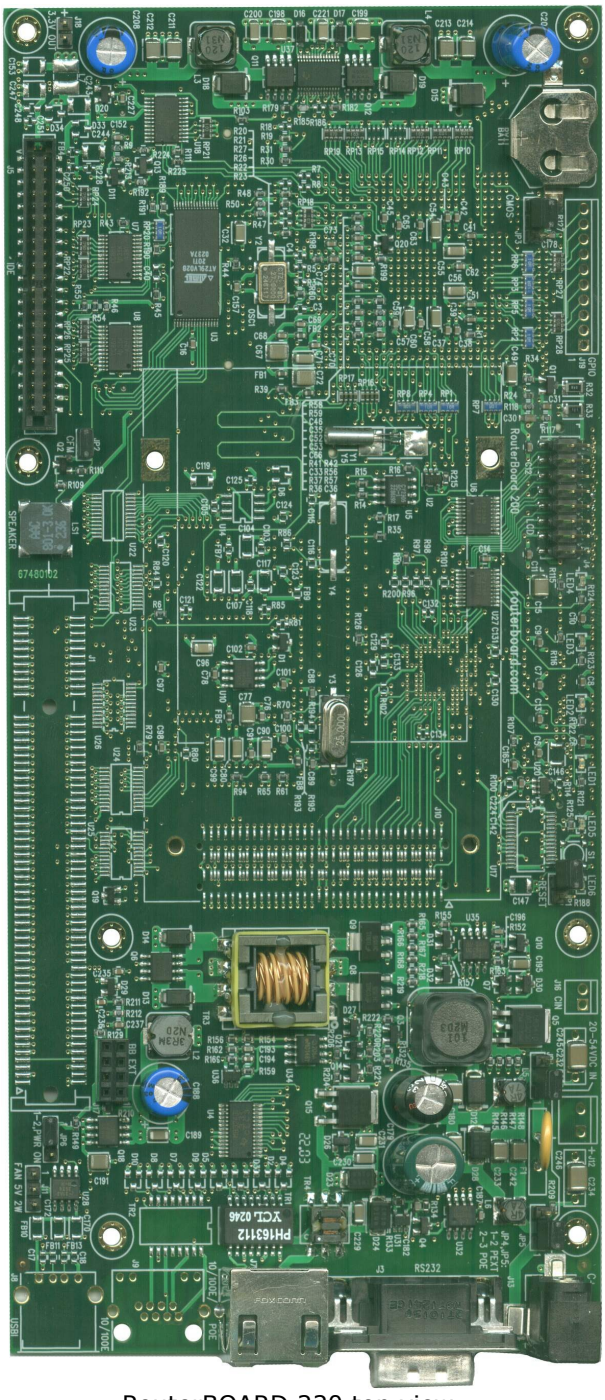
System Board View



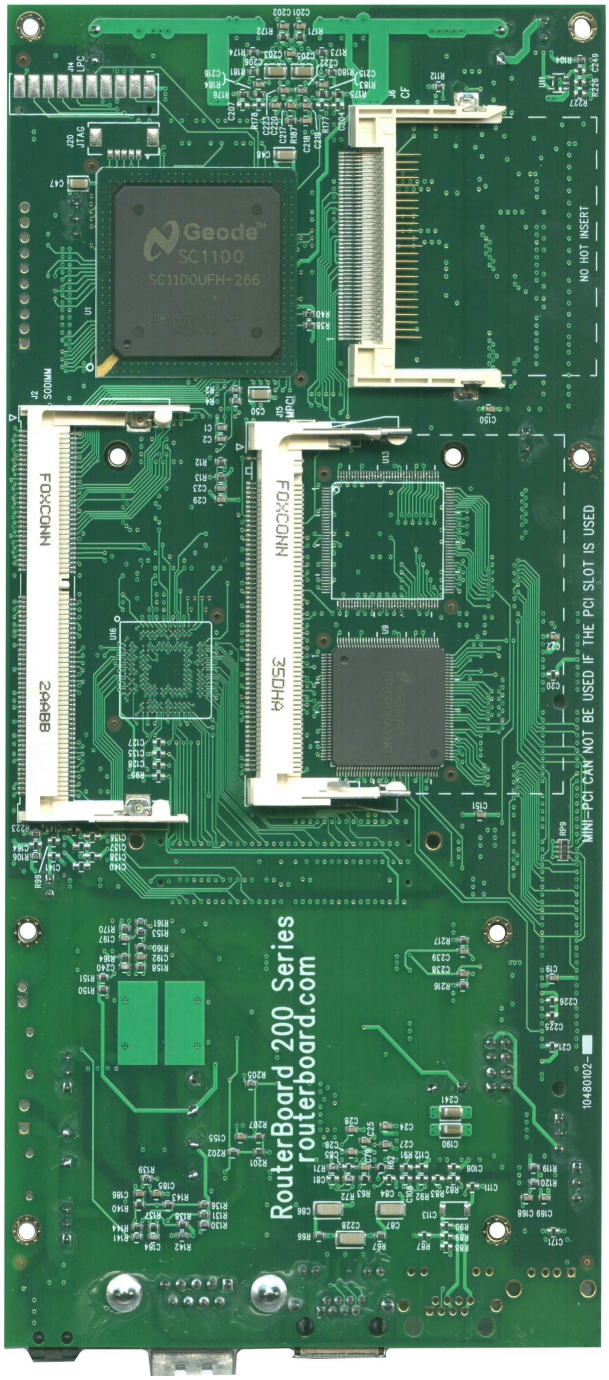
RouterBOARD 230 top view



RouterBOARD 230 bottom view

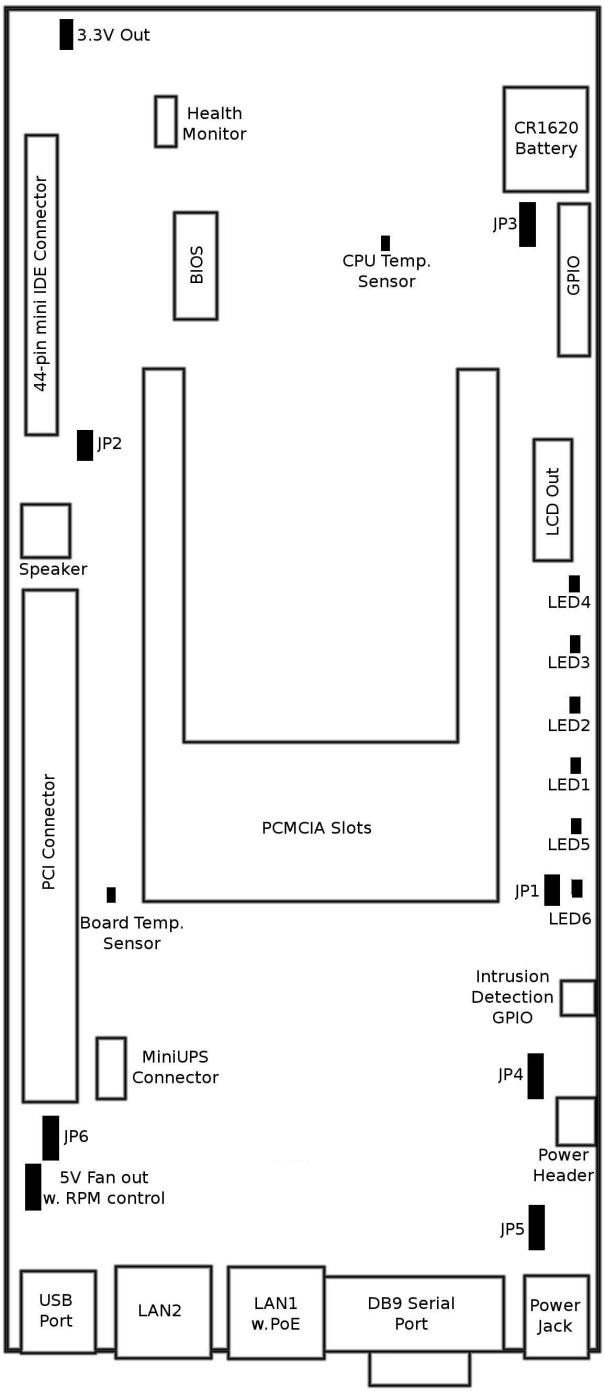


RouterBOARD 220 top view

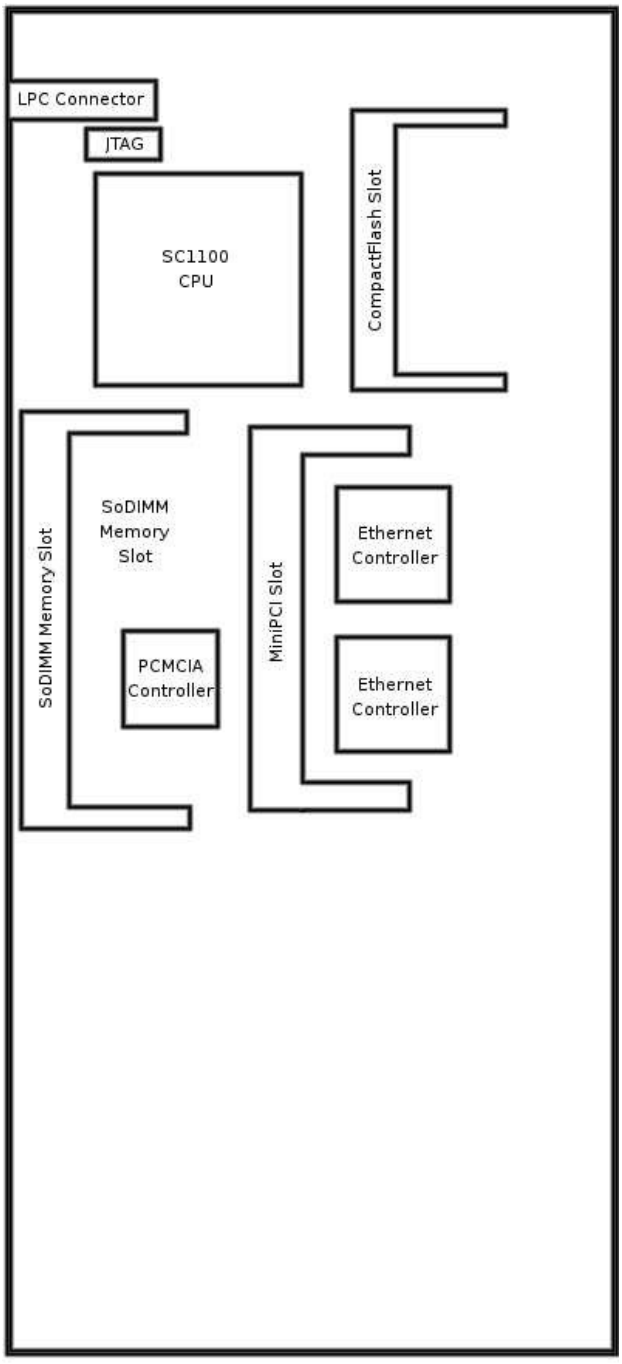


RouterBOARD 220 bottom view

System Board Layout

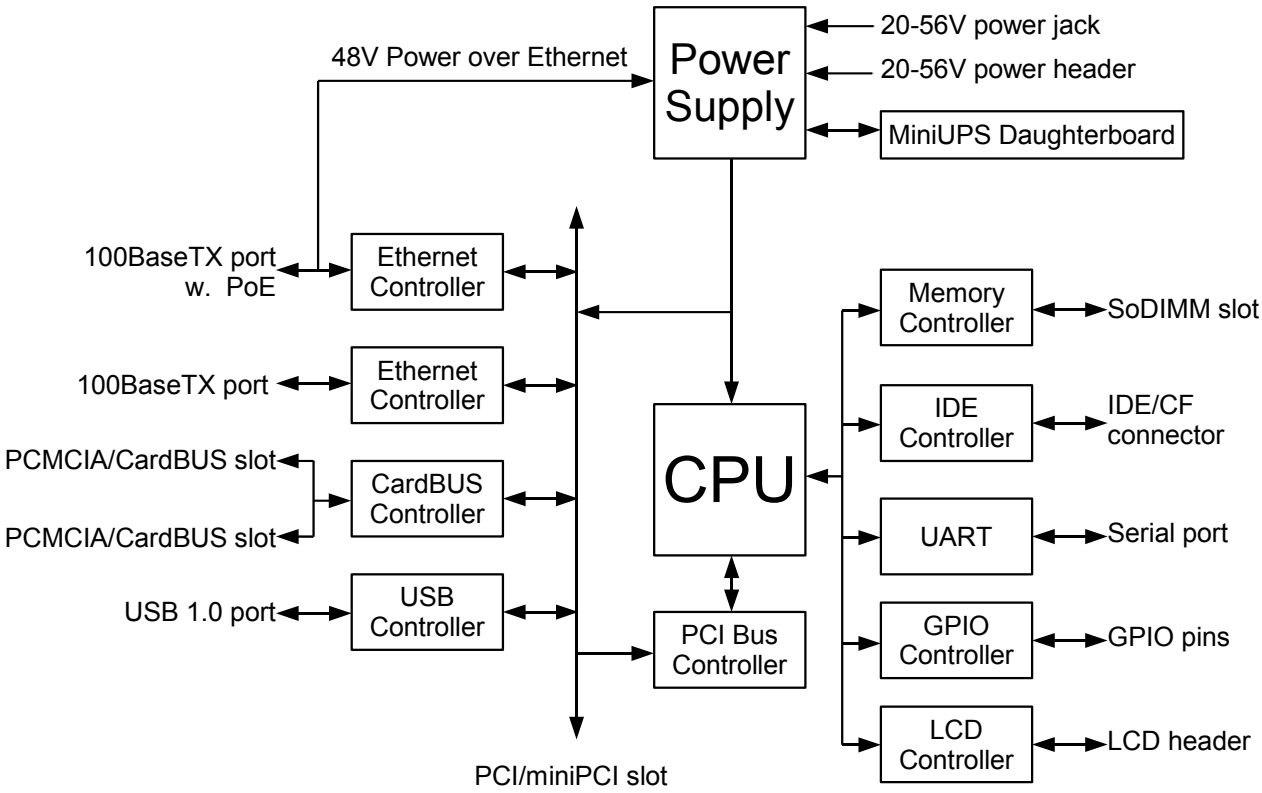


Top view



Bottom view

Block Diagram



Specifications

	RouterBOARD 220	RouterBOARD 230
CPU	233MHz or 266MHz NSC SC1100 CPU (Intel Pentium MMX architecture)	
Memory slot	SoDIMM (up to 512MBytes SDRAM; only accepts standard SoDIMM size; some PC66 modules will not work)	
BIOS	2Mbit Flash BIOS	
Hard drive connectors	CompactFlash type I/II (also supports IBM/Hitachi Microdrive) 44-pin boxhead ATA/IDE connector (for 2.5'' ATA drives)	
Ethernet	**One** NSC DP83816 10/100 Mbps Fast Ethernet port	**Two** NSC DP83816 10/100 Mbps Fast Ethernet ports
MiniPCI slot	One MiniPCI Type IIIA/IIIB slot	
PCI slot	**No** PCI	**One** PCI 2.1 slot with universal powering (+/-12V, +5V, +3.3V)
PCMCIA slot	**No** PCMCIA/CardBUS	**Two** PCMCIA/CardBUS slots
Serial port	One DB9 RS-232C asynchronous serial port	
USB port	**No** USB	**One** USB 1.0 port
LEDs	Power, MiniUPS, 4 user LEDs	
LCD connector	Parallel LCD header	
Temperature sensors	CPU area, PCI area, LM87 health monitor chip area	
Voltage monitor	CPU core, +3.3V, +5V, +12V voltage monitoring	
Intrusion detector	Hardware Intrusion Detection header	
Watchdog	Two independent watchdog controllers	
GPIO	Header for 6 GPIO	
ACCESS.bus (I^2O)	SCL and SDA header	
Speaker	mini PC-Speaker	
Power options	IEEE802.3af Power over Ethernet: 48V DC Onboard power jack/header: 20 to 56V DC, -20 to -56V DC (including -48V DC telecom power)	
Power output	3.3V DC out header 5V DC 400mA (2W) out header with RPM control	
Dimensions	10.5 cm x 21.5 cm (4.13 in x 8.46 in)	
Weight	143g (5.0 oz)	209g (7.4 oz)
Temperature	Operational: -20°C to +70°C (-4°F to 158°F)	
Humidity	Operational: 70% relative humidity (non-condensing)	
Power consumption	3.8-4.4W without extension cards. Maximal – 15W with base voltage 5V: +12V: 100mA (1.2W) -12V: 100mA (1.2W) +5V: 3A (15W) +3.3V: 1.2A (4W)	

Hardware Guide

Memory and Storage Devices

SoDIMM Memory

You can use any standard-sized SoDIMM PC100 or PC133 SDRAM memory modules. The PC66 modules, which do not accept timing frequency more than 66MHz might not work reliably on RouterBOARD 200 series boards, so use of these modules is not recommended. The RouterBIOS automatically adjusts the timing parameters of an inserted module to its maximal values.

There are some SoDIMM modules that violate the maximal hight dimension defined by the SoDIMM standard. For example, some 512MB SDRAM modules are about two times higher than the standard allows. These modules can not be used in the RouterBOARD 200 series computers.

CompactFlash Interface

You can use any CompactFlash Type I or II cards, as well as IBM/Hitachi Microdrive hard drives. JP2 jumper may be used to choose whether the inserted storage device will be ATA Master or Slave device.

Warning! The RouterBOARD 200 series boards do not support hot insert of CompactFlash/Microdrive devices.

44 pin 2.5" ATA Interface

You can use any ATA (IDE) hard drive with 44 pin interface. Generally, 2.5'' hard drives for notebooks have this interface. Note that you can not connect a standard ATA drive to the RouterBOARD as all standard ATA hard drives require +12V, but the 44 pin connector only supplies +5V and -5V.

Extension Slots

PCI Slot (RouterBOARD 230 only)

PCI v.2.1 slot with universal powering is compatible with all PCI expansion cards available on the market. Supplied power:

+12V: 100mA (1.2W)
-12V: 100mA (1.2W)
5V: 3A (15W)
3.3V: 1.2A (4W)

MiniPCI Slot

MiniPCI Type IIIA slot has 3.3V and 5V power signaling with the same output power as PCI connector. This slot also accepts MiniPCI Type IIIB standard cards.

Note that only AR5212 and newer Atheros MAC chips are stable with RouterBOARD 230, if connected with a multiport MiniPCI-to-PCI adapter (such as RouterBOARD 14 four-port MiniPCI-to-PCI adapter). This note only applies to the RouterBOARD 200 platform with multiple Atheros-based cards.

Warning! Do not install PCI and MiniPCI adapters simultaneously. This configuration will not work and may damage equipment.

PCMCIA Extension Slots (RouterBOARD 230 only)

The RouterBOARD 230 series has two independent PCMCIA/CardBUS slots controlled by Texas Instruments PCI1250 chip with serialized IRQ (SERIRQ).

Input/Output Ports

LAN1 Port with PoE

This Fast Ethernet port is recognized as first LAN interface in most OSs. If is fully compatible with IEEE802.3af Power over Ethernet standard and accepts 48V input voltage. To use PoE power option, both JP4 and JP5 **must** be switched to the **3-2** position.

The RouterBOARD 51 power injector may be used to power the board with up to 150m (492 ft) long Ethernet cable.

See **Connector Index** for pinout of the standard cable required for PoE. All cables made to EIA/TIA 568A/B cable specifications will work correctly with PoE. Note that this is a standard host Ethernet port and if it is required to connect to another host, then a cross-over cable should be used. **Note** that the IEEE Ethernet standard requires a minimum 2m long cable (6.5 foot).

LAN2 Port (RouterBOARD 230 only)

The second Fast Ethernet port does not have PoE power option and thus is used only as a separate Ethernet port. Note that this is a standard host Ethernet port and if it is required to connect to another host, then a cross-over cable should be used. **Note** that the IEEE Ethernet standard requires a minimum 2m long cable (6.5 foot).

USB Port (RouterBOARD 230 only)

The USB port is fully compliant with USB 1.0 standard. Booting from USB floppies, USB FlashCards or other USB drives currently is **not** supported.

GPIO Header

General Purpose Input/Output (GPIO) header is a set of six user programmable input and/or output interfaces. Sample code is given in the **RouterBOARD 200 SDK**.

ACCESS.bus

ACCESS.bus is a two-wire synchronous serial interface compatible with Intel's SMBus and Philips' I^2O. The ACCESS.bus allows bidirectional communication with a wide range of low-cost devices and memories. Sample code is given in the **RouterBOARD 200 SDK**.

Intrusion Detection – J16

This is programmable jumper that may be found useful for intrusion detection, or, for example, as a serial console reset switch. Sample code is given in the **RouterBOARD 200 SDK**.

LCD Out Header

LCD output header is used to connect parallel LCD devices. Supports LCDs sold by MikroTik. Sample code is given in the **RouterBOARD 200 SDK**.

LPC Connector

Low Pin Count (LPC) interface is based on Intel Low Pin Count Interface specification, revision 1.0. It provides all required signals as well as two optional.

DB9 Serial Port

The RS232C standard male DB9 asynchronous serial port may be used for initial configuration. TxD (pin 3) of this port has -12V DC power when idle, and DTR (pin 4) of this port always has +12V DC power (all voltages given when not loaded).

LEDs

User LEDs – LED1, LED2, LED3, LED4

User LEDs may be programmed at user's option. See **RouterBOARD SDK** for more details.

MiniUPS LED – LED5

LED is lit when the board is powered from MiniUPS.

Power LED – LED6

LED is on when the board is powered

CMOS Battery

The RouterBOARD can use CR1620 Lithium Coin Battery for preserving the BIOS configuration stored in CMOS, and also for powering real-time clock (RTC) while off the utility power. This configuration and RTC may be reset by switching JP3 to the 2-3 position shortly.

User's Guide

Assembling the Hardware

First to use the board:

- Configure jumpers. The board should have 6 jumpers already set in some positions. The Jumper Index chapter of this manual describes all possible jumper positions
- Insert SoDIMM memory module. Use standard-sized PC100 or PC133 SoDIMM SDRAM modules
- Connect boot device (optional as you may boot the RouterBOARD from network)
- Install PCI, MiniPCI, PCMCIA cards. Note that you may not use both PCI and MiniPCI cards simultaneously
- Install the board in a case
- Connect other peripherals and cables. **Note** that the IEEE Ethernet standard requires a minimum 2m long cable (6.5 foot).

You can also order an assembled system with RouterBOARD, memory module and extension cards of your choice already installed in a case.

Powering

Power options:

- Power jack/header:
  20V to 56V DC
  -20V to -56V DC (including -48V telecom power)
- IEEE802.3af Power over Ethernet (PoE):
  48V DC

RouterBOARD 200 series boards are equipped with a reliable 15W power supply that accepts a wide range of input voltage. The board has a power jack (5.5mm outside and 2mm inside diameter, female, pin positive plug) and a power header for input voltage of 20V to 56V DC. To use the power jack/header, both JP4 and JP5 **must** be switched to the **1-2** position.

Note that to power the board from -48V (telecom power wires), connect GND power wire to the positive contact of the board, and -48V wire to the negative contact. Positive contact is the center pin in the power jack, and the nearest to the power jack square (▫) contact on the J12 power header (there is a small '+' sign near it).

RouterBOARD 200 series are also compliant with IEEE802.3af Power over Ethernet standard and accept 48V powering over up to 150m (492 ft) long Ethernet cable. To use this option, both JP4 and JP5 **must** be switched to the **2-3** position.

Power Consumption

Supplied power:

+12V: 100mA (1.2W)
-12V: 100mA (1.2W)
5V: 3A (15W)
3.3V: 1.2A (4W)

Power consumption (tested with 48V power supply):

Empty board: 77mA (3.7W)
Board with 64Mb RAM: 78mA (3.8W)
Board with 64Mb RAM and CF storage: 80..90mA (4..4.4W)
Board with 64Mb RAM, CF storage and 2 PCMCIA cards: 100mA (4.8W)
Board with 64Mb RAM, CF storage, 2 PCMCIA cards and a MiniPCI card: 110mA (5.3W)
Board with 64Mb RAM, CF storage, 2 PCMCIA cards and a MiniPCI card, full load: 130..140mA (6.3..6.8W)

Booting options

First, RouterBIOS is started. It displays some useful information on the onboard RS232C asynchronous serial port, which is set to 9600bit/s, 8 data bits, 1 stop bit, no parity, hardware (RTS/CTS) flow control by default. The BIOS may be configured to boot the system from an internal storage device, and/or using EtherBoot protocol. See the respective section of this manual for how to configure booting sequence and other BIOS parameters.

Internal Storage Device

The RouterBOARD may be started from an internally connected storage device, such as CompactFlash module, Microdrive hard drive or ATA drive, that is recognized as ATA Master device.

EtherBoot Protocol

EtherBoot protocol allows you to boot the RouterBOARD 200 series computer from an image stored on a TFTP server. EtherBoot is a protocol very similar to the well-known PXE. It uses BOOTP (DHCP) protocol to get a valid IP address, and TFTP protocol to download an executable (ELF) image to boot from (the server's IP address and the image name must be sent by the BOOTP server). See www.etherboot.org for more information an protocol details.

To boot the RouterBOARD computer with EtherBoot protocol you need the following:

- An ELF image for BIOS to boot from (for example, you can create an ELF image from Linux kernel and INITRD image using mkelfImage utility)
- A TFTP server which to download the image from
- A BOOTP/DHCP server (may be installed on the same PC as the TFTP server) to give an IP address, TFTP server address and boot image name

See the RouterBIOS section on how to configure BIOS to boot using EtherBoot protocol. You can also press [Ctrl]+[E] while the BIOS is checking memory or waiting for a key combination to force EtherBoot mode.

Note that you must connect the RouterBOARD you want to boot, and the BOOTP and TFTP servers to the same broadcast domain (i.e., there must not be any routers between them).

Operating System Support

System Architecture

RouterBOARD 200 series embedded boards are fully compatible with the standard IA32 PC architecture

(also known as x86 or as i386) with PCI bus.

CPU. RouterBOARD 200 series has the National Semiconductor Geode SC1100 integrated processor that is binary compatible with Intel Pentium MMX processors. When compiling programs, you can specify 586 machine architecture with MMX command extensions (this is usually called "Pentium MMX") to get best performance. You can also use any programs compiled for i8086, i386, i486 or Pentium instruction sets.

Ethernet. RouterBOARD 200 series has one or two onboard Ethernet ports with National Semiconductor DP83816 controllers. Linux 2.4 and up and the latest BSD systems have the driver for this chip in the kernel. The driver for Linux 2.2 is downloadable from www.routerboard.com.

USB. RouterBOARD 230 has a standard OHCI compatible USB controller.

PCMCIA. RouterBOARD 230 has a generic dual-port Texas Instruments PCI1520 PCMCIA/CardBUS controller, which is supported by Linux *yenta_socket* driver. The controller chip has serialized IRQ (SERIRQ) hardwired to IRQ 11. The RouterBIOS writes this information to the *PCI configuration space registers*. The Linux v2.4 kernel PCMCIA/CardBUS driver automatically finds this without any special settings. Other card service software that does not use the *PCI configuration space registers* may require special settings or require that IRQ 11 be configured manually.

The **RouterBOARD SDK** describes programming **LED**s, **Watchdog**, **ACCESS.bus** and **GPIO**.

MikroTik RouterOS

MikroTik RouterOS (starting from version 2.7) is fully compatible with RouterBOARD 200 series embedded boards.

No additional patches required.

Linux

RouterBIOS is able to boot LILO and GRUB Linux loaders. Linux kernels 2.2, 2.4 and 2.6 were tested.

No additional patches required.

OpenBSD

RouterBIOS is able to boot OpenBSD (version 3.4 was tested).

No additional patches required.

FreeBSD

RouterBIOS is able to boot FreeBSD (versions 4.9 and 5.1 were tested).

It is recommended to patch the FreeBSD kernel. You can download patches from www.routerboard.com.

DOS

RouterBIOS is able to boot DOS (MS DOS 6.22 was tested)

Note that as there are no standard USB keyboard drivers for DOS, you might want to use only serial console, redirecting video output to the serial port (in BIOS, enable parameter **vga-to-serial**)

RouterBIOS

RouterBIOS provides minimal functionality to boot an Operating System. It supports PCI video cards as well as serial console via the onboard serial port at the boot time. The BIOS supports booting from CompactFlash, IBM MicroDrive, ATA drive (no booting from external devices like PCI or USB is currently supported) and from a network server (using EtherBoot protocol).

Supported OSs:

- RouterOS starting with version 2.7
- Linux
- OpenBSD

- FreeBSD
- NetBSD
- DOS

BIOS License

The RouterBIOS uses GNU/GPL LinuxBIOS, Etherboot, and ADLO. To get a CD with the corresponding source code for the GNU/GPL covered programs in RouterBIOS, wire transfer $45 to MikroTikls SIA, Pernavas 46, Riga, LV-1009, Latvia. Please contact MikroTikls SIA (sales@mikrotik.com) for our current account information and wire transfer instructions. Offer valid until 2010.

Boot Errors

After power-on, all user LEDs (LEDs 1 to 4) are switched on for a short time (to determine that all LEDs are working). If there are errors happened during the BIOS initialization, an error code is displayed with user LEDs (note that if LED5 is on, then there is a serious hardware damage, and RouterBOARD may not be used anymore):

LED2 is on – no RAM detected
LED1 and LED2 are on – testing of the 1st megabyte of RAM failed

BIOS Configuration

BIOS parameters may be configured through the onboard RS232C asynchronous serial interface. To connect to it, use a standard null-modem cable (pin-out is given in the Appendix). By default, the port is set to 9600bit/s, 8 data bits, 1 stop bit, no parity, hardware (RTS/CTS) flow control.

To enter the BIOS configuration screen, press any key (or only [Delete] key (or [Backspace] key – see the note for the respective configurable option), depending on the actual configuration) just after the BIOS is asking for it:

```
RouterBIOS v1.3.0 MikroTik (tm) 2003-2004

RouterBOARD 220 (CPU revision B1)
CPU frequency: 233 MHz
  Memory size:  64 MB

Press any key within 1 second to enter setup.

 RouterBIOS v1.3.0
What do you want to configure?
   d - boot delay
   k - boot key
   s - serial console
   l - debug level
   o - boot device
   b - beep on boot
   v - vga to serial
   t - ata translation
   p - memory settings
   m - memory test
   u - cpu mode
   f - pci back-off
   r - reset configuration
   g - bios upgrade through serial port
   c - bios license information
   x - exit setup
your choice:
```

To select a menu point, press the key written at the beginning of this line. Pressing [Enter] selects the

option marked with '*'.

Configurable Options

boot delay - how much time to wait for a key stroke while booting (0..10 seconds; 1 second by default).

boot key - which key will cause the BIOS to enter configuration mode during **boot delay** (any key | <Delete> key only; any key by default). Note that in some serial terminal programs, it is impossible to use the [Delete] key to enter the setup – in this case it might be possible to do this with the [Backspace] key.

serial console – to configure initial serial console bitrate (1200 | 2400 | 4800 | 9600 | 19200 | 38400 | 57600 | 115200; 9600 bps by default).

debug level – BIOS debug level (none | low | high; low by default). If set to **high**, the BIOS displays much information about the boot process, that may be used for debugging.

boot device – initial boot device(s) (IDE | Etherboot | Etherboot (timeout 15s), IDE | Etherboot (timeout 1m), IDE | Etherboot (timeout 5m), IDE | Etherboot (timeout 15s), IDE | Etherboot (timeout 30m), IDE | IDE, try Etherboot first on next boot (15s) | IDE, try Etherboot first on next boot (1m) | IDE, try Etherboot first on next boot (5m) | IDE, try Etherboot first on next boot (30m); IDE default).

beep on boot – whether to beep during boot procedure (yes | no; yes by default).

vga to serial – whether to map VGA output to the serial console (yes | no; yes by default). Should be enabled if working via serial terminal.

ata translation – configures ATA block translation mode (auto | none | lba | large; auto by default). Should be left by default in most cases. Only if the installed OS is configured to use other translation methods, you may have to adjust this parameter manually.

memory settings – SDRAM memory speed (optimal | fail-safe; auto by default). When set to **optimal**, the BIOS tries to determine the correct memory settings by itself. Set to **fail-safe** if you are experiencing memory-related errors (generally random, not reproducible errors and freezes). In this case, minimal timing parameters are used, so most memory modules will work reliably.

memory test – whether to test all the RAM during boot procedure (yes | no; no by default). If set to **no** then the first megabyte of RAM is tested anyway. Enabling this option may cause longer boot process.

cpu mode – whether to enter CPU suspend mode on HTL instruction (power save | regular; power save by default). Most OSs use HLT instruction during CPU idle cycle. When CPU is in suspend mode, it consumes less power, but in low-temperature conditions (below 0°C) it is recommended to choose **regular** mode, so that overall system temperature would be higher.

pci back-off – When enabled, external PCI masters can access system memory even when a CPU cycle has been retried (enabled | disabled; enabled by default). If you are experiencing uncommon problems with PCI/PCMCIA/CardBUS interfaces (including RouterBOARD is rebooting or hanging up once in a while), try to disable this.

reset configuration – whether to reset all the BIOS settings to their respective default values (yes | no; no by default).

bios upgrade through serial port – receive a new BIOS image using XModem protocol

bios license information – prints the BIOS license agreement.

How to choose PCI Back-off value

Common practice, how to choose the **pci back-off** parameter value:

- Keep enabled if you are using Atheros PCMCIA cards
- Enable on newer RouterBOARD 200 boards (with 266MHz CPU clock) with Atheros MiniPCI cards in RouterBOARD 14 (4-port MiniPCI-PCI) adapter
- Disable on older RouterBOARD 200 boards (with 233MHz CPU clock) with Atheros MiniPCI cards in RouterBOARD 14 (4-port MiniPCI-PCI) adapter

- Disable it if you are using newer RouterBOARD 200 boards (with 266MHz CPU clock) with external PCI Ethernet cards.
- Enable for all boards produced since May 2003, there should be no issues with any PCI devices.

All of these practices has been defined experimentally, so they may or may not apply to your particular case.

BIOS Upgrading

The BIOS is needed to recognize all the hardware and boot the system up. Newer BIOS versions might have support for more hardware, so it's generally a good idea to upgrade the BIOS once a newer version is available. You can upgrade the BIOS through the onboard serial port using XModem protocol (programs available for all major OSs). For example, you can use HyperTerminal for Windows or Minicom for Linux to upload the BIOS. The BIOS image is available for download on www.routerboard.com.

If you are using a Microsoft Windows series operating system, you can use the remote upgrading application available on www.routerboard.com. This program uses EtherBoot protocol to send the image to the RouterBOARD. See the respective manual section on how to use EtherBoot client on the RouterBOARD 200 series computers.

You can download from www.routerboard.com a special disk image (this image is a standard raw image you can write on a CompactFlash or on an ATA drive with a program like PhysDiskWrite for Windows or dd for UNIX/Linux), which You can use to boot the RouterBOARD from. This program will upgrade the BIOS to the latest version.

The BIOS upgrading is supported also from MikroTik RouterOS. The procedure is described in the MikroTik RouterOS manual.

Appendix

Connector Index

J1	PCI female slot	
J2	SoDIMM slot	
J3	RS232C male DB9 port	
J4	LCD male header	
	1	VCC +5V
	2	GND
	3	RS (Register Select, AFDX)
	4	Contrast adjust (controlled)
	5	E (Enable signal, INITX)
	6	R/W (Data read/write or SLINX)
	7	Data 1
	8	Data 0
	9	Data 3
	10	Data 2
	11	Data 5
	12	Data 4
	13	Data 7
	14	Data 6
	15	Backlit GND (controlled)
	16	Backlit VCC +5V
J5	44-pin mini IDE connector for 2.5'' IDE HDD drives	
J6	CompactFlash slot	
J7	RJ45 Fast Ethernet 100Base-TX port with optional IEEE802.3af PoE extension	
	1	TX+ Data
	2	TX- Data
	3	RX+ Data
	6	RX- Data
J8	USB Type A connector	
J9	RJ45 Fast Ethernet 100Base-TX port	
	1	TX+ Data
	2	TX- Data
	3	RX+ Data
	6	RX- Data
J10	Dual PCMCIA/Cardbus slot	

J11	5V 400mA (2W) Fan output (male header)	
	1	GND
	2	VCC +5V
	3	Fan speed control
J12	Power header (positive contact is a square ( ) contact with a small '+' sign near it)	
J13	Power jack (positive contact is the central pin)	
J14	Low Pin Count (LPC) connector	
	1	VCC +3.3V
	2	PCICLK
	3	GND
	4	LFRAME
	5	LPC_ROM
	6	LAD3
	7	LAD2
	8	LAD1
	9	LAD0
	10	RESETX
J15	MiniPCI Type IIIA connector	
J16	Intrusion Detection jumper	
J17	MiniUPS daugterboard female header (proprietary pinout)	
	1,2	+5V DC 0.8A output; or power input for the board, +5V ±5% DC
	3,4	Ground
	5	Ext. power state (0 – no power, 3.8V – power ok), connected to GPWIO0 CPU signal
	6	Battery low signal, associated with GPWIO1 CPU signal
	7	UPS control, read from JP6 (0 – 2-3 position; 1 – 1-2 position)
	8	External RouterBOARD power switch (set in “1” to switch the board off)
J18	3.3V output (positive pin is marked with a small '+' sign)	
J19	GPIO header	
	1	VCC +3.3V
	2	GND
	3	SDA1 (ACCESS.bus Port 1 Serial Data Line)
	4	SCL1 (ACCESS.bus Port 1 Serial Clock Line)
	5	GPIO 47
	6	GPIO 41
	7	GPIO 40
	8	GPIO 38
	9	GPIO 20
	10	GPIO 18

J20	IEEE1149.1 Boundary Scan Architecture (JTAG) connector	
	1	TDO (Test Data Output)
	2	TDI (Test Data Input)
	3	TCK (Test Clock)
	4	TMS (Test Mode Select)
	5	TRST# (JTAG Test Reset)

Jumper Index

JP1	Reset	
	Open	Normal operation
	Close	Force immediate reboot
JP2	CompactFlash ATA Master/Slave select	
	Open	CompactFlash is ATA Slave device
	Close	CompactFlash is ATA Master device
JP3	Clear CMOS Data	
	1-2	Normal operation
	2-3	Clear CMOS data
JP4 JP5	Power source select	
	1-2	External powering (jack or header)
	2-3	IEEE802.3af Power over Ethernet
JP6	MiniUPS select	
	1-2	Use only utility power without MiniUPS (default; disables MiniUPS)
	2-3	Use MiniUPS daugterboard

Ethernet Cables

RJ45 Pin	Color	Function	RJ45 pin for Straight cable (MDI, EIA/TIA568A)	RJ45 pin for Crossover cable (MDI-X, EIA/TIA568B)
1	Green	TX+ Data	1	3
2	Green/White	TX- Data	2	6
3	Orange	RX+ Data	3	1
4	Blue	-	4	4
5	Blue/White	-	5	5
6	Orange/White	RX- Data	6	2
7	Brown	-	7	7
8	Brown/White	-	8	8

Serial Console (Null-modem) Cable

DB9f	Function	DB9f	DB25f
1 + 6	CD+DSR	4	20
2	RxD	3	2
3	TxD	2	3
4	DTR	1 + 6	6 + 8
5	GND	5	7
7	RTS	8	5
8	CTS	7	4