RouterBOARD 1200

User's Manual

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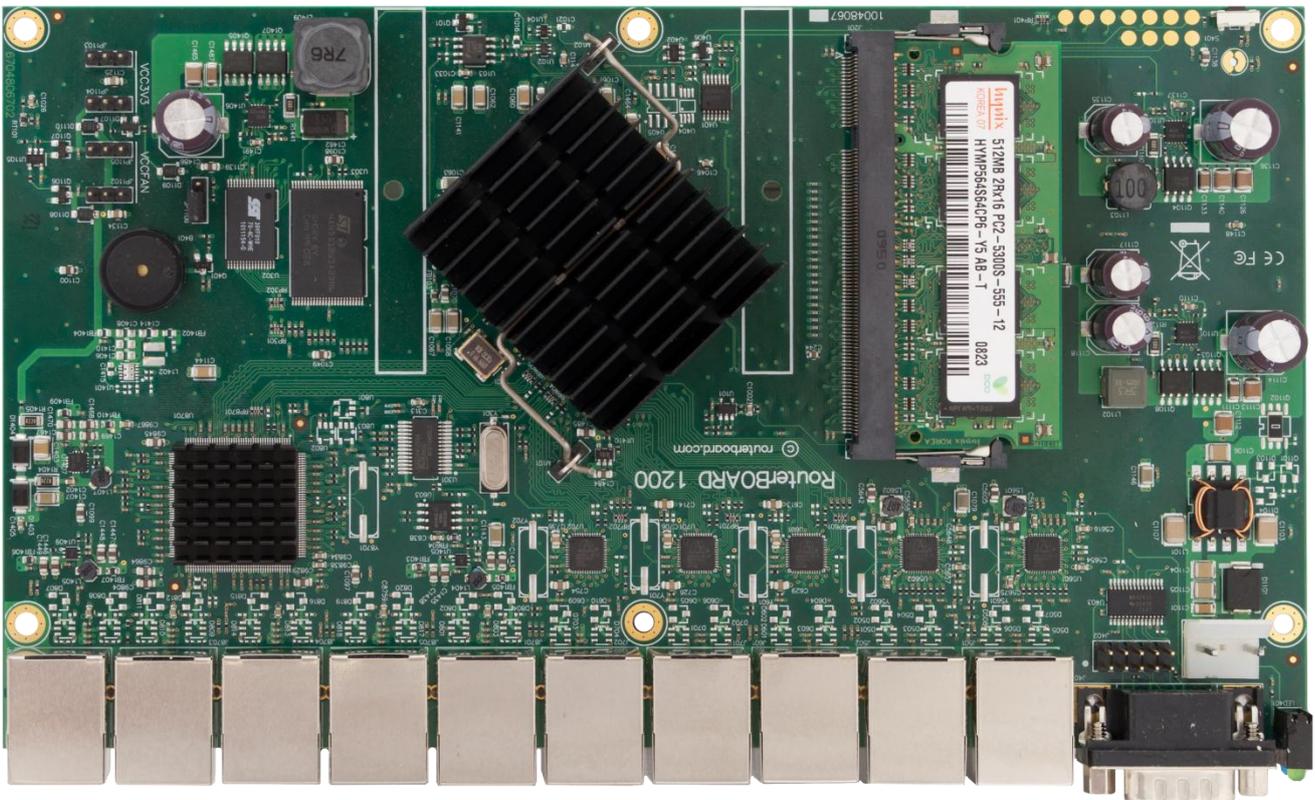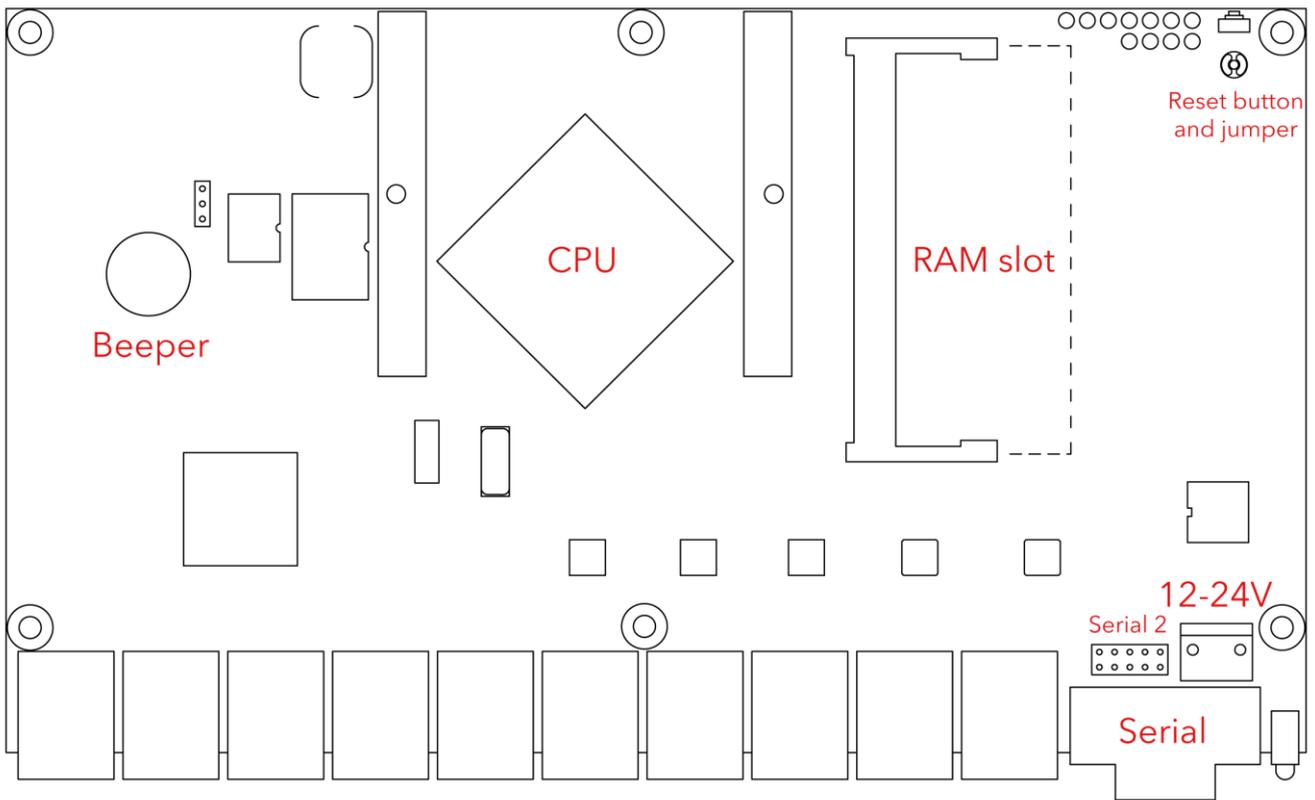
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System Board View and Layout

You can download the board dimensions and case design files (PDF and DXF) from www.routerboard.com

Specifications

	RouterBOARD 1200
CPU	PPC460GT network processor
Memory	SODIMM slot, no onboard module, populated by 512MB SODIMM DDR RAM module
Boot loader	RouterBOOT
Data storage	64MB onboard NAND memory chip
Ethernet	Ten 10/100/1000 Mbit/s Ethernet ports supporting Auto-MDI/X
MiniPCI slot	-
Expansion	-
CompactFlash slots	-
Serial port	DB9 RS232C asynchronous serial port, alternate serial port jumper
LEDs	Power and User LED
Beeper	+
Power at the board	**Power jack**: 12-24VDC
Power at the case	**IEC C14** jack: 110-220VDC
Fans	-
Dimensions	1U case: 44 x 176 x 442 mm
Weight	365g board only, 1200g assembled with case
Temperature	Operational: -20°C to +65°C (-4°F to 149°F)
Humidity	Operational: up to 70% relative humidity (non-condensing)
Power consumption	12W min/25W max
RouterOS	RouterOS v5, Level6 license

Hardware Guide

Memory and Storage Devices

Memory

There is no onboard memory, but the device has a SODIMM slot for one DDR2 module, it is recommended to use modules with at least 667MHz (PC-4200). The device supports modules of up to 2GB, but due to software limitations, RouterOS will be able to use only 1.5GB of it.

Storage Device

The device is equipped with one 512MB NAND nonvolatile memory chip.

Input/Output Ports

Ethernet ports

There are ten ethernet ports. There is one switch group with five ports. Ports Ether1-Ether5 are in this group.

All cables made to EIA/TIA 568A/B cable specifications will work correctly (see **Connector Index** for pinout). Note that this port supports automatic cross/straight cable correction (Auto MDI/X), so you can use either straight or cross-over cable for connecting to other network devices.

DB9 Serial Port

The RS232C standard male DB9 asynchronous serial port may be used for initial configuration, or for attaching a modem or any other RS232 serial device. TxD (pin 3) of this port has -5V DC power when idle. Some signals are not connected, so this implementation may not be considered to support full hardware flow-control, so software flow-control (XON/XOFF) or none at all should be used.

IDC10 Serial Port

An alternate serial port is provided on the board (inside the case). See Appendix „IDC10 serial port" for the pinout.

LEDs

Power LED

Power LED is on when the board is powered.

User LED

User LED may be programmed at user's option. It is lit by default when the board starts up, then it is turned off when the bootloader runs kernel.

User's Guide

Assembling the Hardware

In most cases you do not need to use any additional boot devices, as you can boot the RouterBOARD from the onboard NAND memory. To disassemble the case, you will need a Phillips P2 screwdriver.

Powering

The device can only be powered by the power jack, it doesn't support PoE. The 1U rackmount has a built in standard IEC power jack which supports both 110 and 220V.

Inside the case, **J11** power connector can be used, it accepts 12-24V DC. By default, it connects to the built-in PSU.

Booting options

First, RouterBOOT loader is started. It displays some useful information on the onboard RS232C asynchronous serial port, which is set to 115200bit/s, 8 data bits, 1 stop bit, no parity by default. Also supports hardware (RTS/CTS) flow control. The loader may be configured to boot the system from the onboard NAND module or from Ethernet network.

By default, RouterOS is started. This is the operating system of all RouterBOARD routers. Please see detailed configuration guide here: http://wiki.mikrotik.com/wiki/Category:Manual#list

Onboard NAND Storage Device

The RouterBOARD may be started from the onboard NAND storage chip. As there is no partition table on the device, the boot loader assumes the first 4MiB form a YAFFS filesystem, and executes the file called "kernel"

stored in the root directory on that partition. It is possible to partition the rest of the medium by patching the kernel source.

Booting from network

Network boot works similarly to PXE or EtherBoot protocol, and allows you to the device from an executable image stored on a TFTP server. It uses BOOTP or DHCP (configurable in boot loader) protocol to get a valid IP address, and TFTP protocol to download an executable (ELF) kernel image combined with the initial RAM disk (inserted as an ELF section) to boot from (the TFTP server's IP address and the image name must be sent by the BOOTP/DHCP server).

To boot the RouterBOARD computer from Ethernet network you need the following:

- An ELF kernel image for the loader to boot from (you can embed the kernel parameters and initrd image as ELF sections called *kernparm* and *initrd* respectively)
- A TFTP server which to download the image from
- A BOOTP/DHCP server (may be installed on the same machine as the TFTP server) to give an IP address, TFTP server address and boot image name

See the RouterBOOT section on how to configure loader to boot from network.

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

Operating System Support

MikroTik RouterOS starting from version v5 is fully compatible with RouterBOARD 1200 series devices. If your device is preinstalled with an earlier RouterOS release, please upgrade RouterOS to v5.6 or newer.

Software Reset

It is possible to reset all software configuration by using the Software Reset jumper (C1138) during the power-up. No confirmation or passwords will be asked, so use with caution. This feature can be disabled in the "**system routerboard settings**" menu by switching the "**enable-jumper-reset**" parameter to "**no**".

Simply use a metal object to short circuit the metallic reset jumper while booting.

RouterBOOT

The RouterBOOT firmware (also referred as Bootloader here) provides the basic functionality to boot an Operating System. It supports serial console via the onboard serial port at the boot time. The loader supports booting from the onboard NAND device and from a network server (see the respective section for details on this protocol).

Boot Loader Configuration

Loader parameters may be configured through the onboard RS232C DB9 asynchronous serial interface. To connect to it, use a standard null-modem cable. By default, the port is set to 115200bit/s, 8 data bits, 1 stop bit, no parity. **Note** that the device also implements the hardware (RTS/CTS) flow control.

To enter the loader 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 boot loader is asking for it:

```
RouterBOOT booter 2.33

RouterBoard 1200

CPU frequency: 666 MHz
  Memory size: 1024 MB

Press any key within 2 seconds to enter setup

RouterBOOT-2.33
What do you want to configure?
   d - boot delay
   k - boot key
   s - serial console
   n - silent boot
   o - boot device
   f - cpu frequency
   r - reset booter configuration
   e - format nand
   g - upgrade firmware
   i - board info
   p - boot protocol
   b - booter options
   t - do memory testing
   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 '*'.

boot delay – how much time to wait for a key stroke while booting (1..9 seconds; **2 second** by default).

boot key – which key will cause the loader 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; **115200** bps by default).

boot device – initial boot device (boot over Ethernet | boot from NAND, if fail then Ethernet | boot from CompactFlash only | boot Ethernet once, then NAND | boot Ethernet first, then CompactFlash | boot from NAND only; **boot from NAND, if fail then Ethernet** by default). You can also select **boot chosen device** option to boot from the device selected immediately, without saving the setting.

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

format nand – perform a low-level NAND format. During this operation, all previously marked bad sectors are retested to find out if they are faulty indeed.

upgrade firmware – receive a new boot loader image using XModem protocol over serial line or using DHCP/BOOTP and TFTP protocols through the Ethernet network (upgrade firmware over ethernet | upgrade firmware over serial port).

board info – prints the serial number, boot loader version, CPU frequency, memory size and MAC addresses of the onboard Ethernet ports

boot protocol – network booting protocol (bootp protocol | dhcp protocol; **bootp protocol** by default).

do memory testing – performs a full memory test.

cpu-frequency –

selects a memory and CPU frequency combination to increase or decrease performance of the device

```
 * a - MEM:333DDR        CPU:666MHz
   b - MEM:400DDR        CPU:800MHz
   c - MEM:400DDR        CPU:1GHz
   d - MEM:500DDR        CPU:1GHz
   e - MEM:533DDR        CPU:1.066GHz
   f - MEM:400DDR        CPU:1.200GHz
```

Boot Loader Upgrading

The boot loader is needed to initialize all the hardware and boot the system up. Newer loader versions might have support for more hardware, so it's generally a good idea to upgrade the loader once a newer version is available.

The boot loader upgrading is possible from MikroTik RouterOS, from within the "/system routerboard" menu. Updates are included with each RouterOS update. The procedure is described in the MikroTik RouterOS manual: http://wiki.mikrotik.com/wiki/Manual:Bootloader_upgrade

You can also upgrade the loader 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 boot loader. Alternatively if you have a DHCP/BOOTP and TFTP servers available, you can specify the loader image as a boot image and choose the **bios upgrade over ethernet** option in the boot loader configuration menu. The loader will get the image from the TFTP server and upgrade itself. The most current loader image is available for download on www.routerboard.com.

Primary Boot Loader

There are two boot loaders present on the NOR flash memory chip. Secondary is the main one, that is executed by default. This is the one that can be upgraded. In case something goes wrong in the upgrade process, or you have set some incorrect settings that render it unusable, you can load the Primary boot loader by holding the Software Reset 1 button (**S401**), connecting the power, and then releasing the button/jumper. The Primary boot loader has the default settings, which can not be changed. It is also not possible to upgrade it.

RouterOS functions

The default OS of RouterBOARD devices is RouterOS, when the *routerboard.npk* package is installed, RouterOS can configure some RouterBOARD hardware settings without the need to enter RouterBOOT menu through the serial console.

Health monitor

This menu shows the current voltage and temperature status. There are two temperature sensors on the device:

```
[admin@MikroTik] > system health print
           voltage: 12.4V
       temperature: 40C
   cpu-temperature: 47C
[admin@MikroTik] >
```

Firmware information

This menu displays RouterBOARD model number, serial number, the current boot loader version and the version available in the current software packages installed.

```
[admin@MikroTik] > system routerboard print
        routerboard: yes
              model: "rb1200"
      serial-number: "154201C1DD3C"
   current-firmware: "2.27"
   upgrade-firmware: "2.27"
[admin@MikroTik] >
```

The firmware version can be upgraded from **RouterOS** by using "**/system routerboard upgrade**" command.

Firmware Settings

Boot loader settings are also accessible through this menu.

```
[admin@MikroTik] > system routerboard settings print
            baud-rate: 115200
           boot-delay: 2s
          boot-device: nand-if-fail-then-ethernet
       enter-setup-on: any-key
        boot-protocol: bootp
   enable-jumper-reset: yes
[admin@MikroTik] >
```

The Software Reset jumper (see System Board View and Layout), which resets both boot loader settings and RouterOS settings by default, can be disabled in this menu (it will still reset the boot loader settings).

If you have some device connected to the serial port, and signals from it cause the RouterBOOT to be loaded, you can set „setup key" to be something more specific than „any key".

Appendix

Connector Index

J401		RS232C male DB9 serial port
	2	RxD (Receive Data)
	3	TxD (Transmit Data)
	5	GND
	7	RTS (Request to Send)
	8	CTS (Clear to Send)
J402		Alternate serial port (see 11 for pinout)
Ether1-5 (Group one) Ether5-10		RJ45 Gigabit Ethernet 1000Base-T ports
J11		Power Jack (12/24V DC)

Button Index

S401	Software Reset 1 button. Loads the Primary boot loader (see "Primary Boot Loader")
C1138	Software Reset 2 jumper hole. Resets RouterOS settings (see „Software Reset")

Ethernet Cables

RJ45 Pin	Color	Function (100Mbit)	Function (1Gbit)	RJ45 pin for Straight cable (MDI, EIA/TIA568A)	RJ45 pin for Crossover cable (MDI-X, EIA/TIA568B)
1	Green	TX+ Data	Data A+	1	3
2	Green/White	TX- Data	Data A-	2	6
3	Orange	RX+ Data	Data B+	3	1
4	Blue	-	Data C+	4	4
5	Blue/White	-	Data C-	5	5
6	Orange/White	RX- Data	Data B-	6	2
7	Brown	-	Data D+	7	7
8	Brown/White	-	Data D-	8	8

Serial Null-modem (Console) Cable with Loopback

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

N/C – not connected.

IDC10 serial port

J402 is a IDC10 type serial port connector.
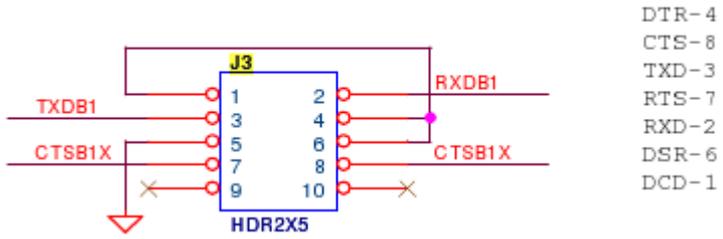
DTR-4
CTS-8
TXD-3
RTS-7
RXD-2
DSR-6
DCD-1

DTR	4
CTS	8
TXD	3
RTS	7
RXD	2
DSR	6
DCD	1
GND	5

Pins 1,4,6 are connected together. Pin 9 and pin 10 are not connected