

# RouterBOARD Groove

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## User's Manual

The RouterBOARD **Groove** comes preinstalled in an outdoor enclosure, with built-in wireless, an N-Male antenna connector, and one 10/100 Ethernet connector which supports MDI-X auto detection. The device is packaged with a 24V power adapter, a PoE injector and two mounting loops. Groove is available in four versions: CPE and AP models of both 2GHz and 5GHz variants.



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3. Out-of-warranty devices and devices not covered by warranty sent to MikroTik will be returned to the sender at sender's cost.

RMA Instructions are located on our webpage here: <http://rma.mikrotik.com>

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## Specifications

|                                | 2Hn  | A-2Hn   | 5Hn  | A-5Hn  |
|--------------------------------|--|---|--|--|
| <b>CPU</b>                     | AR7241 400MHz  | AR7241 400MHz   | AR7241 400MHz  | AR7241 400MHz  |
| <b>Memory</b>                  | 32MB   | 64MB  | 32MB   | 64MB   |
| <b>Data storage</b>            | NAND chip  | NAND chip   | NAND chip  | NAND chip  |
| <b>Ethernet</b>                | One 10/100 Mbit/s Ethernet port supporting Auto-MDI/X          | One 10/100 Mbit/s Ethernet port supporting Auto-MDI/X               | One 10/100 Mbit/s Ethernet port supporting Auto-MDI/X          | One 10/100 Mbit/s Ethernet port supporting Auto-MDI/X              |
| <b>Wireless</b>                | Built-in 2GHz 802.11b/g/n 1x1 MIMO, N-male connector, CPE mode | Built-in 2GHz 802.11b/g/n 1x1 MIMO, N-male connector CPE or AP mode | Built-in 5GHz 802.11a/n 1x1 MIMO, N-male connector, CPE mode   | Built-in 5GHz 802.11a/n 1x1 MIMO, N-male connector, CPE or AP mode |
| <b>Extras</b>                  | Reset switch, Beeper, Voltage monitor, Temperature monitor     | Reset switch, Beeper, Voltage monitor, Temperature monitor          | Reset switch, Beeper, Voltage monitor, Temperature monitor     | Reset switch, Beeper, Voltage monitor, Temperature monitor         |
| <b>LEDs</b>                    | 5 wireless signal LEDs, ethernet activity LED (configurable)   | 5 wireless signal LEDs, ethernet activity LED (configurable)        | 5 wireless signal LEDs, ethernet activity LED (configurable)   | 5 wireless signal LEDs, ethernet activity LED (configurable)       |
| <b>Power</b>                   | Passive 9-30V PoE only. 16KV ESD protection on RF port         | Passive 9-30V PoE only. 16KV ESD protection on RF port              | Passive 9-30V PoE only. 16KV ESD protection on RF port         | Passive 9-30V PoE only. 16KV ESD protection on RF port             |
| <b>Dimensions</b>              | 177x44x44mm, 193g. Must be mounted with ethernet pointing down | 177x44x44mm, 193g. Must be mounted with ethernet pointing down      | 177x44x44mm, 193g. Must be mounted with ethernet pointing down | 177x44x44mm, 193g. Must be mounted with ethernet pointing down     |
| <b>Operational Temperature</b> | -30C to +70C   | -30C to +70C  | -30C to +70C   | -30C to +70C   |
| <b>Power consumption</b>       | Up to 0,19A at 24V (4.56W)                                     | Up to 0,19A at 24V (4.56W)  | Up to 0,19A at 24V (4.56W)                                     | Up to 0,19A at 24V (4.56W)   |
| <b>RouterOS</b>                | V5, License L3   | V5, License L4  | V5, License L3   | V5, License L4   |
| <b>Package contains</b>        | Groove unit, mounting loops, PoE injector, 24V power adapter   |   |  |  |

## Wireless specifications

|                       | Groove 2Hn / A-2Hn   | Groove 5Hn / A-5Hn   |
|-----------------------|--|--|
| <b>RX sensitivity</b> | <b>802.11b/g:</b> -92 dBm @ 6Mbps to -75 dBm @ 54 Mbps<br><b>802.11n:</b> -92 dBm @ MCS0 to -71 dBm @ MCS7 40MHz | <b>802.11a:</b> -93 dBm @ 6Mbps to -77 dBm @ 54 Mbps<br><b>802.11n:</b> -93 dBm @ MCS0 to -71 dBm @ MCS7 |
| <b>TX power</b>       | <b>802.11b/g:</b> 27dBm @ 6Mbps to 24dBm @ 54 Mbps<br><b>802.11n:</b> 27dBm @ MCS0 to 20dBm @ MCS7               | <b>802.11a:</b> 23dBm @ 6Mbps to 19dBm @ 54 Mbps<br><b>802.11n:</b> 22dBm @ MCS0 to 15dBm @ MCS7         |
| <b>Modulations</b>    | <b>OFDM:</b> BPSK, QPSK, 16 QAM, 64QAM <b>DSSS:</b> DBPSK, DQPSK, CCK  | <b>OFDM:</b> BPSK, QPSK, 16 QAM, 64QAM <b>DSSS:</b> DBPSK, DQPSK, CCK                                    |

## Hardware Guide

### Input/Output Ports

#### Ethernet ports

Device is compatible with passive (non-standard) Power over Ethernet. The board accepts voltage input from 8 to 30 V DC. It is suggested to use higher voltages for power over long cables because of better efficiency (less power is lost in the cable itself and power supply is more efficient).

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 port supports automatic cross/straight cable correction (Auto MDI/X), so you can use either straight or cross-over cable for connecting to other devices.

## LEDs

Ethernet LED is on when the board is powered. It is the first LED from the bottom.

There are five LEDs which show wireless signal strength:

- 1 - on, if wireless client is connected to AP (usually  $\geq -89\text{dBm}$ )
- 2 - on, if signal strength  $\geq -82\text{dBm}$  (bad signal)
- 3 - on, if signal strength  $\geq -75\text{dBm}$
- 4 - on, if signal strength  $\geq -68\text{dBm}$
- 5 - on, if signal strength  $\geq -61\text{dBm}$  (good signal = all LEDs on)

It is possible to disable this function (turn all these LEDs off or re-assign them) via software configuration.

## User's Guide

### Mounting

The Groove is to be mounted **vertically**, so that the Ethernet cable points **downwards**.

If you wish to tighten the Groove to a pole, you can do it with the provided mounting loops. The Groove comes bundled with two mounting loops - guide the loops around the Groove through the provided edge markings, and around the pole where it will be mounted. You should avoid connecting a loose Ethernet cable to the Ethernet port, secure the cable to a wall or the pole, so that the cable weight is not pulling the port. It is recommended to secure the Ethernet cable less than 2m from the Groove device. This is to ensure that the cable doesn't damage the port by its weight, or doesn't fall out.

### First use

The device is assembled and ready for deployment. You must mount the antenna on the built-in N-male connector before turning on the device via PoE!

1. Mount an antenna on the built in N connector. Any antenna can be used, which works in the frequencies supported by the chosen Groove model
2. Plug the supplied PSU into a power socket, and connect it to the supplied PoE injector
3. Connect the "DATA" end of the injector to a switch or any other device, and the other end (which says "DATA+POWER") to an Ethernet cable leading to the Groove device
4. Open **192.168.88.1** in your web browser to start Quickset and configure the Groove. You might need to adjust your PC IP address to connect to this IP. For advanced configuration guides, see: <http://wiki.mikrotik.com/wiki/Category:Manual>

In case IP connection is not available, *Winbox* can be used to connect to the MAC address of the device. More information here: [http://wiki.mikrotik.com/wiki/First\\_time\\_startup](http://wiki.mikrotik.com/wiki/First_time_startup)

### Grounding

It is recommend using a FTP (foil screened twisted pair) cable – in this case, one end of the cable would be plugged into the SXT, the other end of the cable will be connected to the buildings grounding installation. If possible, also connect a grounding wire to the provided grounding connection behind the SXT case door.

### Powering

Power over Ethernet (PoE) on the Ethernet port: 8-30V DC (12-28 V suggested) non-standard PoE powering support. 24V PSU is supplied with the device

RouterBOARD Groove series devices are compatible with non-standard (passive) Power over Ethernet injectors (except power over data lines) and accept powering over up to 100m (330 ft) long Ethernet cable connected to the Ethernet port (**J4**). The board **does not** work with IEEE802.3af compliant 48V power injectors.

### Expansion Slots and Ports

1. Built in 2GHz 802.11b/g wireless, 1x1 MIMO, station mode
2. One 10/100 Ethernet port, supporting automatic cross/straight cable correction (Auto MDI/X), so you can use either straight or cross-over cable for connecting to other network devices. The Ethernet port accepts 8-30V DC powering from a passive PoE injector.

### Buttons and Jumpers

- RouterOS reset jumper hole (no direct access, board has removed from case) – resets RouterOS software to defaults. Must short circuit the metallic sides of the hole (with a screwdriver, for example) and boot the device. Hold screwdriver in place until RouterOS configuration is cleared.
- RouterBOOT reset button (access through the plastic door) has two functions:
  - Hold this button during boot time until LED light starts flashing, release the button to **reset RouterOS configuration** (same result as with reset hole)
  - Hold this button during boot time longer, until LED turns off, then release it to make the device **look for Netinstall servers**.

### Booting options

In case you wish to boot the device from network, for example to use MikroTik Netinstall, hold the RESET button of the device when starting it until the LED light turns off, and Groove will start to look for Netinstall servers.

### 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 **Error! Reference source not found.** 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 Groove series devices. If your device is preinstalled with an earlier RouterOS release, please upgrade RouterOS to v5.14 or newer.

## 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
[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: Groove A-5Hn
    serial-number: 2B9F015A92DE
    current-firmware: 2.38
    upgrade-firmware:2.38
[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.

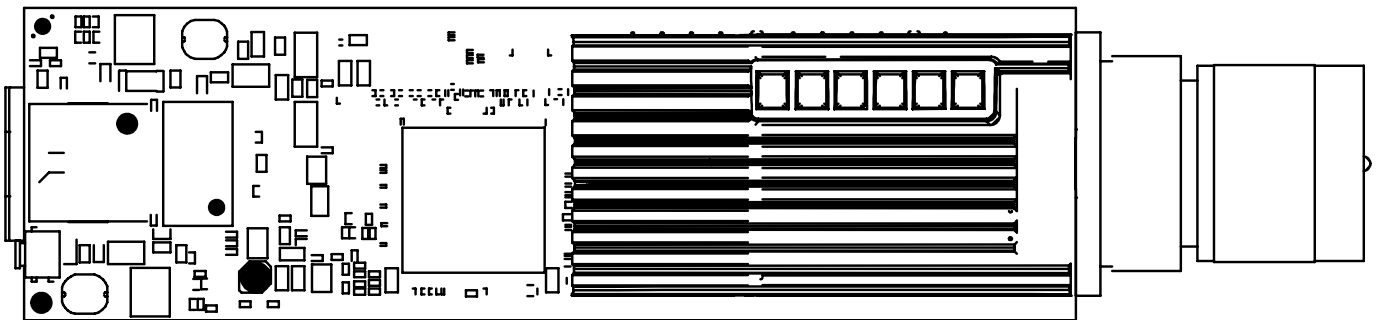
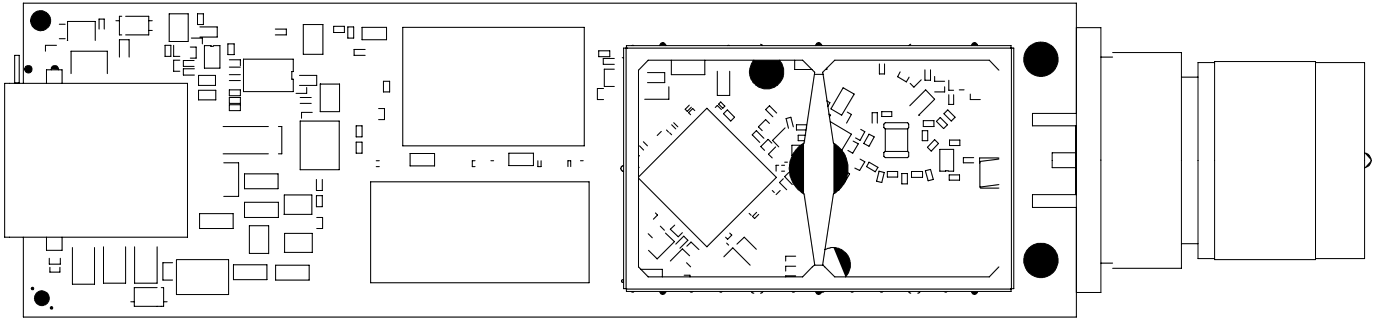
```
[admin@MikroTik] > system routerboard settings print
    boot-device: nand-if-fail-then-ethernet
    boot-protocol: bootp
    force-backup-booter: no
[admin@MikroTik] >
```

## Appendix

### 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   |

### System Board View and Layout



You can download the board dimensions and case design files (PDF and DXF) from [www.routerboard.com](http://www.routerboard.com)