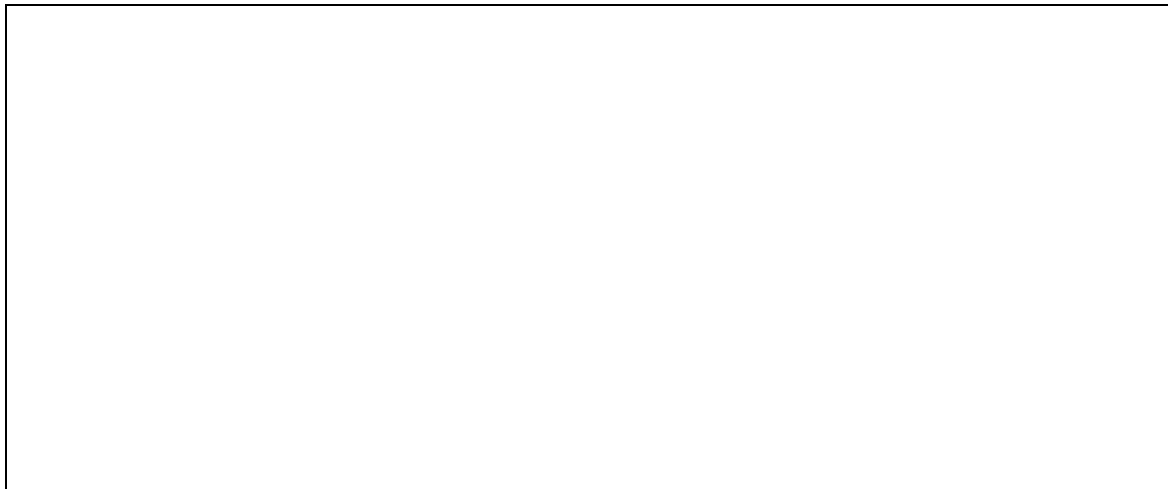


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Hardware



Asus_RT-N16

The ASUS RT-N16 is a single band (2.4 GHz) N300 Gigabit Router with 128MB RAM and 32MB Flash ROM. Note that SFE accelerated NAT (K3X build 33006+) is required to achieve high WAN speeds with an IPv4 SPI firewall. For speed tests without SFE, see [Performance](#).

Hardware Specifications

RAM	128 MB (2*64MB): Samsung K4N511163QZ-HC25 or Samsung K4T51163QG-HCE6
Flash	32 MB (MACRONIX MX29GL256EHTI2I-90Q)
NVRAM	32K
CPU	Broadcom 4716@480MHz[1] (Broadcom spec is 533)
USB ports	USB2.0 x 2
Power Supply	12V - 1,25A max (Upgrading the Power Supply)
RJ-45 Ethernet Ports	WAN (1), LAN (4), both 10/100/1000 Mb/s
Antennas	3 x external detachable 2dBi antennas
WiFi Frequency Range	2.4GHz ~ 2.5GHz
802.11n	up to 300Mbps
802.11g	up to 54Mbps
802.11b	up to 11Mbps
Switch Chip	Broadcom BCM53115SKFBG
LED Color	Blue

[1] Run `cat /proc/cpuinfo` in a terminal (like puTTY) to get the full CPU details.

Main board



This shows the main board for the Asus RT N16 along with the location for the JTAG headers.

Install DD-WRT from Factory Firmware

Please note: Details of the DD-WRT firmware build variations are found here. More current build information can be found in the Peacock announcement thread. See Where do I download firmware? for links.

Overview

- ◇ Restore Factory Default settings (Clear NVRAM)
- ◇ Install the INITIAL trailed build **22118 K2.6_mini_RT-N16.trx** of DD-WRT
- ◇ Restore Factory Default settings (Clear NVRAM) or via DD-WRT webGUI
- ◇ Upgrade to the temporary **21530 K3X custom build** (from 2013)
- ◇ Restore Factory Default settings (Clear NVRAM), or via DD-WRT webGUI
- ◇ Upgrade to recent **working K3X mega or big build** (*.trx and N16 in the name)

See Where do I download firmware for links and research New Build and model-specific threads.

Procedure

1. Download the INITIAL trailed DD-WRT firmware: (2013) 22118 K2.6_mini_RT-N16.trx

2. Restore Factory Default settings in the Asus GUI. Asus factory default username/password is admin/admin. Let the router reboot. Plug the PC into a LAN port on the router and disconnect other connections.
3. Flashing the INITIAL Firmware to the router (the one where the file name ends in .trx)
4. Set the router in "Recover mode" (same as other Asus routers)
 - Use ASUS Firmware Restoration Utility to upload the new firmware (from router CD or [here](#)). or search for Asus Recovery Utility.
 - You need to set the PC to Static IP 192.168.1.2 ([Static IP guide](#))
 - Set the router in recovery mode by holding in the reset button when plugging in the power. The power light should now be blinking slowly, meaning the router is in restore/recovery mode and ready for the new firmware. Upload and wait for the router to reset on its own (may take anywhere from 3 to 15 minutes).

Note on Asus Recovery Utility: The recover utility is just a tftp server with added wait timer, but standard tftp tools can also be used to upload firmware. Just remember to do the proper 3 minutes or more wait for the unit to reboot itself, after the 10 to 30sec tftp completion. See: [TFTP](#), [ASUS TFTP](#)
5. After the reboot from flashing, wait for the device to show the password change screen for DD-WRT. Enter **root** as the user and anything for the password as you will do the user/pass procedure again after the final flash.
6. Reset to Factory Settings.
 - ◆ *Method A* - Use the DD-WRT GUI. Go to *Administration->Factory Defaults*, click Yes then select *Apply*.
 - ◆ *Method B* - WPS button [hard reset](#). The following procedure will clear out the NVRAM and set dd-wrt back to default values:
 - ◇ With the unit powered off, press and hold the Red WPS button on the back of the unit.
 - ◇ Without releasing the WPS button plug the power in, and hold the WPS button for 30 seconds
 - ◇ When releasing the WPS button the unit will reboot and Factory Default settings will be loaded.

Note on Asus hardware reset for NVRAM clear: do not use the Reset button. See [Eko's post](#)
7. Reset is recommended BEFORE and AFTER flashing and may be required for large jumps to avoid issues.
8. Upgrade to the custom transition firmware [dd-wrt.v24-21530_NEWD-2_K3.x_big.bin \(Alt\)](#)
 - ◆ NOTE: 21530 is not a regular released beta build
9. Use the web GUI to upload. *Administration->Firmware Upgrade* and select Reset to Defaults.
10. Upgrade to a recent *working* K3X big build from the betas folder, this time do not reset settings.

See [Where do I download firmware](#) for links and research New Build and model-specific threads.

Congratulations! Please consider donating to DD-WRT as we are an open-source community providing free software to upgrade consumer routers with commercial-grade capabilities.

Also read [Basic Wireless Settings](#) and [Advanced Wireless Settings](#) to learn how to get the most WiFi data speed out of your new N-Router.

Troubleshooting

IF the router won't provide a Power LED after updating to the K3.x file...then there is a problem with the flash chip and it needs to be cleared (except the CFE). Issue the following commands via telnet/SSH or the

Commands window under the Admin tab.

```
mtd erase nvram mtd erase ddwrt mtd erase linux
```

This will clear the flash chip...now start the process again with the K2.6 mini build

Notes about K3X

Do NOT issue "erase nvram" command from CLI...this unit only has 64K of nvram...the CLI thinks it has 128K and the firmware thinks its 256k...this means doing an "erase nvram" removed other parts of the flash chip (likely firmware partition "dd-wrt" or "linux")

Note: build 21530 seems to have wireless issues...it broadcasts the ssid...but you can't connect to it...however, if in repeater bridge mode, you can contact it through the host AP at the router's IP address.

Notes

- NAT Loopback (Port Forwarding) is broken in builds 15760-19969 (see [this thread](#) for a workaround)
 - ◆ 15962, 17990, & 18000 are Recommended Builds which would require this workaround
- Special thanks to Eko for making the initial work on getting the RT-N16 to work with DD-WRT!

Upgrading DD-WRT

If DD-WRT is already loaded on your router, you can flash firmware using these steps

1. Download firmware from one of the sites listed: [Where do I download firmware](#)
 - ◆ Go to the Broadcom K3X folder, then download the ***K3.x-big-RT-N16.trx file.
 2. Open the DD-WRT's web interface in your web browser and open <http://192.168.1.1/> (the default).
 - ◆ Admin page: Reset with Restore Factory Default settings and let the router reboot.
 3. Open the DD-WRT's web interface in your web browser. Upload/upgrade the firmware using the
 4. Administration tab -> "Firmware Upgrade" button.
 5. Click "browse" button -> select the downloaded file -> click "Upgrade" button. It will take about 2-5 minutes to upload and write the flash. Your browser should reboot when it is done.
 - ◆ Admin page: Reset with Restore Factory Default settings. (Only necessary if coming from an old build)
 - ◆ Alternative: on the Upgrade page, select "Reset to Default settings" for "After flashing, reset to". This is to automatically reset to Factory Default settings when it reboots, though this may not be reliable.
- Note: For newer builds, please read the "New Build" or router-specific threads. See [Where do I download firmware](#) for more info on New build threads.

Restore to Asus Firmware

1. Download the latest ASUS firmware from the ASUS web site [\[1\]](#). Or use [FTP](#).

2. Rename the Asus firmware file from .trx to .bin
3. Do a Restore Factory Default settings to Clear NVRAM in DD-WRT
4. Go to the DD-WRT firmware upgrade page and select the renamed ASUS firmware
5. After the flash finishes, and the router has rebooted, you see the ASUS GUI. If not, clear browser cache.
6. Do a Factory Reset to clear the NVRAM using the Asus GUI

Recovery Mode

To access recovery mode, press the WPS button (not the reset button like other ASUS), then plug in power, and tftp the firmware you want to flash. GUI Factory Reset before and after every flash to make sure you don't have any nvram problems or conflicts. On this router, the reset button only resets the nvram partition.

De-Brick Methods

1. Hard reset to factory defaults by holding in the red WPS button while plugging in the power. Eko Forum note
2. Recovery mode, to upload a different firmware.
3. Internal serial connector, using CFE commands. Use 3.3V TTL level signaling. For example: US shop FTDI Serial Adapter is small and reliable, providing: Virtual serial port via PC USB to 3.3V-TTL (Rx, Tx) signaling. UK outlet
4. Try to reset/reload the firmware using the TJTAG software and the internal JTAG connector.

Known Issues, Bugs, and Workarounds

- Hardware fix (capacitor) for RT-N16 wireless drop-outs [2]
- UPNP is currently not working for the RT-N16, so for now leave the feature disabled unless you want a full CPU Load. **FIXED** with SVN Changeset #13527
- Access Restriction with MAC-Filter doesn't work on Asus RT-N16. **FIXED** Ticket #1319 (as of 12/18/09)
- On this router the reset button will only bring you to recovery mode. If you wish to restore defaults, use the Red WPS button while plugging power in. Post By Eko
- Rflow data reports only on upload traffic (Ticket #1139). Further discussion in this thread (only affects those using/enabling Rflow).
- USB hard drives after build 15407: "The devs of dd-wrt have removed the loading of file system drivers from the startup of the firmware. They are now loaded on demand with automount. Well, this presents a problem for those of us with USB HDD that automount doesn't detect. In order to load the file system drivers at startup you need to add the following to save startup in the commands tab" for more, see TechInfoDepot DD-WRT Notes

NVRAM K2.6 Limitation

This is included for historical reference. Use the installation instructions above to flash a K3X build.

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- The RT-N16 only has 32K of NVRAM on k2.6 builds, and due to CFE limitations, some reported reboots and resets due to running out of NVRAM. K3X builds have expanded the default nvram partition via software.
- However, getting K3X to run on this model can be tricky, `erase nvram` can cause a soft brick, requiring TFTP. redhawk0's procedure is [here](#), also read the RT-N16 Condensed thread starting [here](#)

NVRAM Usage Reduction

- Using traff (Traffic graph in Status_Internet.asp) or UPnP will cause the NVRAM to fill up quickly, causing router functions like ddns to stop functioning. Upon the next reboot the router will reset it self to firmware defaults. Disable traff and/or UPnP to prevent this, or flush the traff stats occasionally.
- Note on traff: Status -> WAN -> (at the bottom) Data Administration -> button "Delete" flushes the traff stats. Services -> Services -> WAN Traffic Counter -> ttraff Daemon: Disable -> Apply settings, will stop the collection of traff data. You may however just choose to reset/delete traff data every month, and the traff data will not take much room in the NVRAM
- Note on UPnP: Access to UPnP settings: NAT/QoS -> UPnP. In newer builds (Spring 2012) UPnP is disabled by default.
- Note on monitoring NVRAM usage. In newer builds (spring 2012) NVRAM usage/max is displayed on the front Web GUI at "Space Usage"

NVRAM Reduction Scripts

- Save the following as a startup script, it will remove initialized variables that are stored in NVRAM and currently have no value assigned to them (This cleared up nearly 5K of NVRAM in my experience).

```
#!/bin/bash
rm /opt/tmp/nvramshow
nvram show >> /opt/tmp/nvramshow
i=0
while read -r line; do
val=${line#*=}
var=${line%*=}
if [[ "$val" == "" ]]; then
    nvram unset $var
fi
i=`expr $i + 1`
if [[ $i == 50 ]]; then
    sleep 2
    i=0
fi
done < /opt/tmp/nvramshow
exit 0
```

Simpler version: Instead of outputting to a file to check if each var is empty, use grep to find empty vars:

1. Check current size and empty var count

```
root# nvram show | grep =$ | wc -l
size: 30273 bytes (2495 left)
414
```

2. Clean up

Asus_RT-N16

```
root# for line in `nvram show | grep =$ `; do var=${line%*=}; nvram unset $var; done
```

- This can be saved as a startup script. Alternatively, to avoid further NVRAM usage, save to JFFS or USB with a JFFS partition. Save your script to /jffs/etc/config, give it a .startup extension, make it executable, then DD-WRT will run it after every boot.

3. Check again....

```
root# nvram show | grep =$ | wc -l
size: 24307 bytes (8461 left)
0
```

4. Saved almost 6K

```
root# echo "$((8461 - 2495))"
5966
```

Performance

This is without SFE accelerated NAT.

Test Description	Throughput - (Mbps)
WAN - LAN	141.1
LAN - WAN	143.3
Total Simultaneous	155.9
Max. Connections	200
Firmware Version	1.0.0.6

Sources: [3] Testing methods: [4], [5]

Overclocking

By factory default the cpu is clocked at 480 MHz and the Ram at 240 MHz. Overclocking at CPU 532 MHz / Ram 266 MHz can be achieved with these commands in a Telnet/SSH session :

- nvram set clkfreq=532,266
- nvram get clkfreq [to verify]
- nvram commit && reboot

Note :

- Not recommended: instability issues can arise from overclocking / overheating
- See also [Overclocking BCM 47xx CPU's](#) for more info
- Adding a heat sink or fan to the SoC is recommended

More information here (with pictures) to prevent overheating issues with heat sinks:

- <http://www.dd-wrt.com/phpBB2/viewtopic.php?t=69261> and
- <http://www.dd-wrt.com/phpBB2/viewtopic.php?t=70202> or

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- <http://www.dd-wrt.com/phpBB2/viewtopic.php?p=442803> again
- <http://www.dd-wrt.com/phpBB2/viewtopic.php?t=73175&highlight=rtn16>

Links

- [Original forum support thread \(100 pages\) was condensed into a new support thread](#) for the RT-N16.
- [Upgrading the power supply adapter](#) for higher current (amperage)
- [RT-N16 @ techinfodepot](#)

Reviews

- <http://blog.itechtalk.com/2010/review-on-asus-rt-n16-router/>
- <http://www.smallnetbuilder.com/wireless/wireless-reviews/31058-asus-rt-n16-gigabit-n-router-reviewed>