Manual for low radiation wireless router with JRS Eco 100 firmware

The wifi password is
the 8-digit PIN number listed on the label on your router.

To allow Apple® and Android® devices to wake up the router from sleep mode, connect them to hidden network ‘jrs’ -see p.6

This manual explains everything you need to know to set up and control your router running JRS Eco 100 firmware.

Download the latest manual from www.jrseco.com/manuals.
The version number of this copy is listed below.

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Register and stay informed!

Register your router via www.jrseco.com/register to receive email notifications about important updates and to manually download firmware updates.

The JRS Eco 100 wireless router: 100% radiation-free in stand-by

An ordinary wifi router broadcasts beacon signals 24 hours a day, 10 times a second. This generates a considerable amount of radiation in the home, clearly measurable.

Wireless on demand. The unique **JRS Eco 100** firmware, running on a fast Asus® router, enables a Full Eco standby mode with 0% electromagnetic emissions when no wireless devices are connected.

The router switches the wireless signal back on immediately when you enable wifi on your device or open the list of available networks. Even when wireless is active, it has an up to 90% reduced pulse frequency (see Appendix 1).

The globally unique **JRS Eco 100** technology is compatible with all brands and models of wireless devices: Android®, Apple®, Windows® and others. You don't lose any wifi speed, range or stability.

JRS Eco 100 is a special firmware / operating system for specific models of Asus routers. It is an extension of the original Asus firmware.

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Table of Contents

1. Is a router running JRS Eco firmware safe in terms of exposure to wifi radiation?

A wifi router emits electromagnetic radiation, which is shown to be possibly unsafe in numerous scientific studies, even if the emissions are below current official exposure limits. A number of studies are listed on our website at www.jrseco.com/science. You can reduce your exposure by limiting the duration of exposure and by increasing the distance between your body and the antennas. Any wifi device has antennas, either internal or external.

Although the JRS Eco firmware measurably reduces router electromagnetic field (EMF) emissions, JRS offers no other than legally required safety guarantees regarding the electromagnetic radiation of the router running the JRS Eco firmware, and use is at your own risk and responsibility.

Wifi is two-way traffic. Both the router and your wireless devices emit EMFs. **Although the Eco firmware greatly reduces router radiation during stand-by and partly during operation, it does not reduce radiation from your wireless devices.** For each piece of data sent from the wifi router, a confirmation is sent back by your device. Wifi radiation from devices is very strong and you keep the device very close to your body. Especially in data-intensive applications such as video, wifi radiation from the device is high. Even when the router is off, your wireless device will still emit wifi radiation as long as its wifi is turned on. Most devices will intermittently send out wifi network scans, looking for available wifi networks.

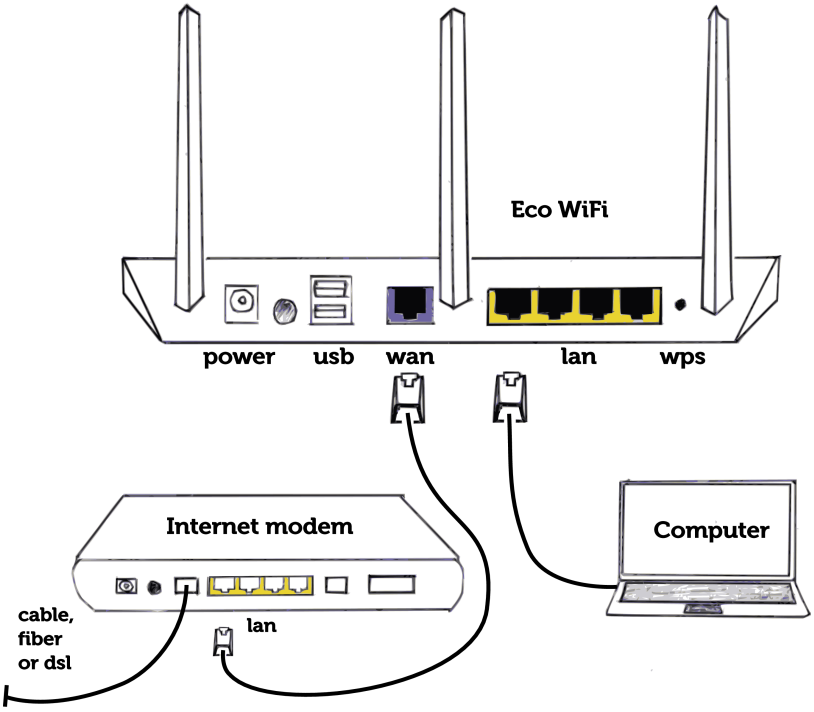
Make sure to keep proper distance from the router when wifi is active. Position the router well away from places where you spend many hours a day, especially from sleeping areas (unless the wifi is turned off at night).

By using the JRS Eco firmware you agree to be aware of the risks and that the use of the router and firmware is at your own risk. It may be possible to reduce the transmit power of your computer's wifi adapter by adjusting its settings with the Windows® Device Manager. You can minimize your exposure to electromagnetic radiation by working with a wired Internet connection. A hardwired Internet connection is radiation-free.

The router manual from Asus proposes the use of the AiMesh system which allows multiple Asus routers to be interconnected wirelessly. This is not supported by the JRS Eco firmware and will increase wifi radiation, because all wireless signals then need to be transmitted multiple times, hopping from one mesh node to another.

2. Installing your Eco wireless router

The figure below shows how to connect the router to your Internet modem.



1. Connect the included Ethernet cable from the blue WAN port of the Eco router to a free LAN port of your Internet modem. Hardwiring a computer is optional.
2. Mount the antennas on the Eco router. If a plug adapter was included in your shipment, push the power adapter in as far as it will go. Connect the power adapter to the router and plug the adapter into a power outlet.
3. **Important! If your Internet modem has wifi built in, switch it off.** If you don't know how, ask the customer service of your provider for help. See Chapter 5 in this manual for more details.

In almost all cases the router will automatically detect the connection type, provided you have wired it correctly to your Internet modem/router. If you are not getting Internet through the Eco router, please inform with your Internet Service Provider about the required settings.

3. Connecting your wireless devices to the router

One thing is different from ordinary wifi routers. This has to do with the Eco 100 router's special zero emission sleep mode.

To guarantee your device can wake up the Eco 100 router from sleep mode, on modern Android® and Apple® wireless devices, you need to connect to the hidden network 'jrs'. You need to manually set this up once in your device, then it will remember the credentials.

- **In the wifi menu of your device, select 'Add network', 'Other network' or similar, and then manually enter the SSID / network name 'jrs'**
- **Select security WPA2 (personal)**
- **The wifi password is the 8-digit PIN number listed on the label on your router.**
- **In Android, if Advanced options are available, set 'Hidden Network' to Yes.**

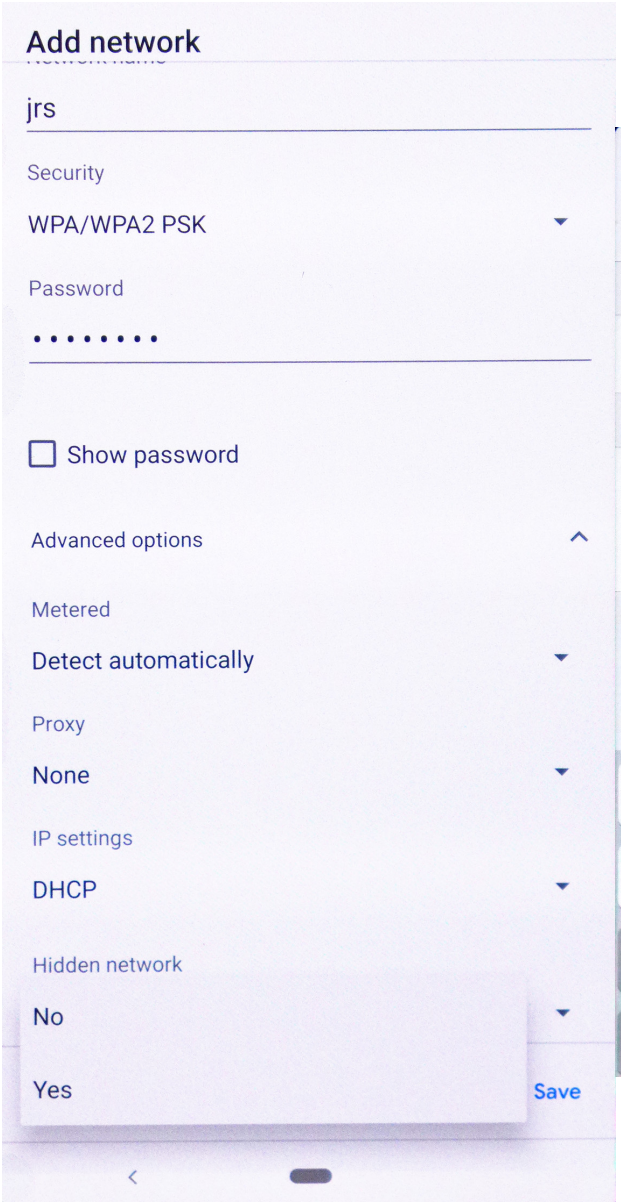
It's fine to simply connect to the visible wifi network 'JRSeco100'. Connecting to the hidden network 'jrs' only needs to be done on devices that you want to be able to wake the router from sleep mode.

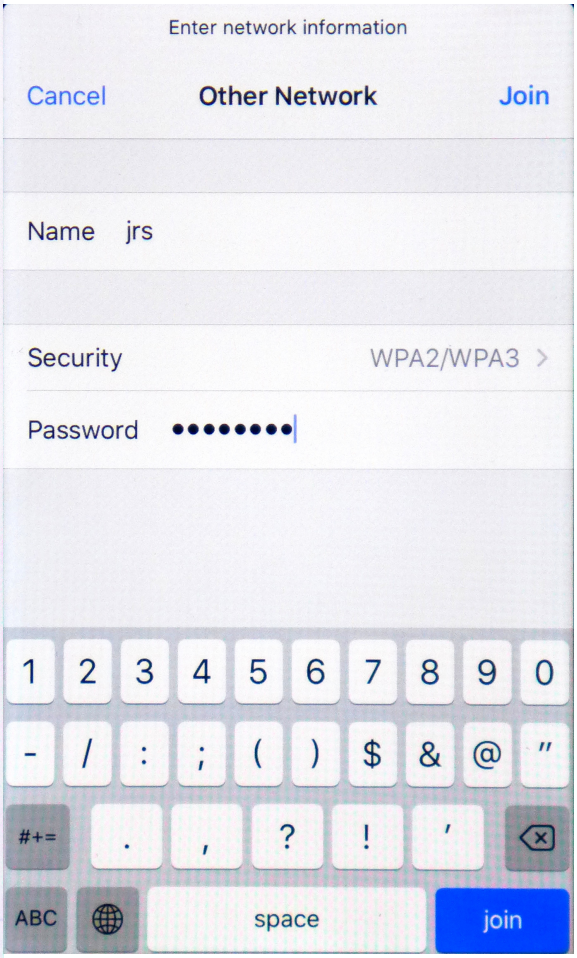
The screen shots on the next page show how to connect from an Android phone (left) and from an iPhone (right). To make this 'Add network' screen appear on an **Android** phone, you either need to click on the menu icon and then press "Add network" or you need to click on the '+'-sign at the right top in the list of available wireless networks.

On an **iPhone or iPad**, you need to click on 'Other network' at the bottom of the list of available wifi networks. Enter 'jrs' for network name. Select WPA2 at 'security' and enter the wifi password that you set for the visible network. Set Hidden network to Yes if this advanced option is available. For a Macbook, you can google 'connect hidden ssid mac os'.

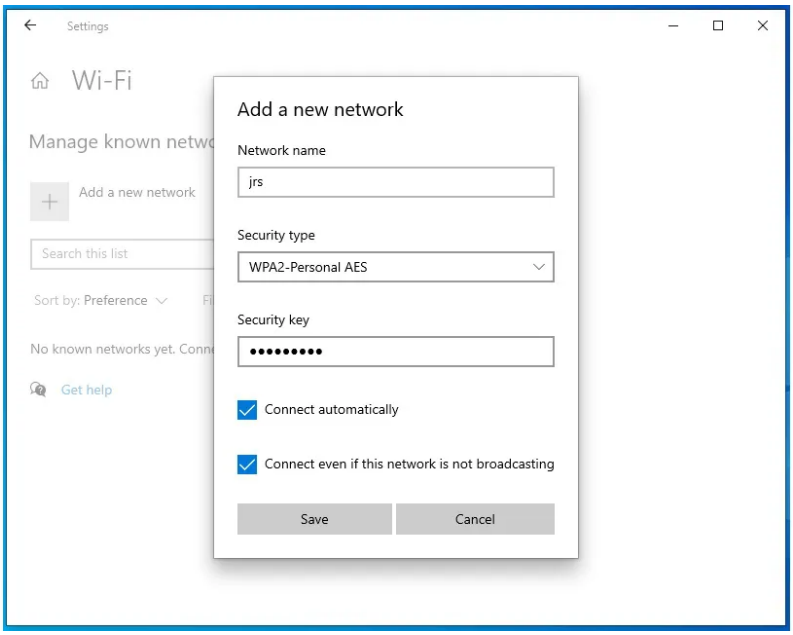
There is also a 5 GHz hidden network labeled *jrs5*.

From now on, always connect to this hidden network and 'Forget' the visible networks on your devices, in case you already entered the wifi password for those.





On **Windows**, connecting to the hidden ‘jrs’ network is only needed when you have set Windows to use random hardware addresses. Open the Settings and then go to Network & Internet. Select Wi-Fi and click “Manage known networks”. Then click the “+ Add a network” button. Enter ‘jrs’ for the network name. Select WPA2 at ‘security’ and enter the wifi password that you set for the visible network. Check the box that says “Connect automatically”. Also check the box that says “Connect even if the network is not broadcasting.”



3.1. Why the hidden ‘jrs’ network?

Connecting to the hidden ‘jrs’ network is needed on devices that do so-called MAC (hardware) address randomization. It is usually not required on devices older than about 5 years or on Windows® devices.

If the wifi network doesn't appear in the list of available wifi networks on your wireless device when the Eco 100 router is in Full Eco sleep mode, that is when you need to connect your device to the hidden 'jrs' network.

The hidden network does not add to the emissions, because both network beacons (visible + hidden) are sent in one single 'pulse'.

4. Dual band

Most modern wifi routers are dual band, meaning they broadcast two wifi networks: one at 2.4 GHz and the other at 5 GHz. The Eco router also emits two wifi networks: one called ‘JRSeco100’ and another ‘JRSeco100-5’. The range is best on the 2.4 GHz network because 5 GHz is attenuated more by walls and ceilings. On the 5 GHz network, the maximum wifi throughput speed (about 400 Megabits p/s) can be achieved. On 2.4 GHz the max. speed is about 150 Mbps.

If you prefer, switching off 5 GHz will reduce wifi radiation from the router even more. You can do it from the JRS tab on the Wireless page. First set the Band selector to 5 GHz, then set Enable Radio to No and click on Apply at the bottom of the page.

The 2.4 GHz **needs** to remain turned on in order for the Full Eco functionality to work properly.

5 GHz does not have anything to do with 5G. These are two different things that are totally unrelated but often mixed up. 5G is the new (fifth) generation of networks for mobile telephony, which will work at higher frequencies and will require many more transmitters.

5. Important: Turning off the built-in wifi of your Internet modem

If your Internet modem has wifi built in, switch it off, to eliminate unnecessary wifi radiation and interference. If you don't know how, ask the customer service of your provider for help. See also below.

You need to retain your Internet modem because it provides the conversion of the Internet signal to ADSL, cable or fiber, the specifics of which depend on your Internet provider. If your Internet modem has built-in wifi, this needs to be turned off in order to minimize wifi radiation and interference. You don’t need that wifi signal anymore because the wifi function is taken over by the Eco router.

On some Internet modems you can simply turn off the wifi with a switch on your modem. Usually the built-in wifi can be turned off in the settings menu of your Internet modem, which can be reached through a web browser by typing in the correct address, an IP number. Alternatively you may search for a do-it-yourself manual on the Internet by typing the provider name and the make and model of your Internet modem.

We regularly receive questions on how to do this. Please understand that we cannot support all the different providers and modems. This is outside of our scope of influence. However remember that turning off the built-in wifi is always possible. If you don’t know how, ask your provider’s customer service to help you.

If your Internet provider also operates a public wifi network through its Internet modems, please make sure to also turn this public wifi network off. In some cases you need to do this on a separate web page of the Internet provider with a personal login. You can check if your modem is not emitting any wifi anymore by holding your smart phone next to it and scanning for wifi networks. Make sure there is no strong wifi network on top of the list with the name of the public network.

6. Using the Eco 100 router

If you have just installed the Eco 100 router, its wifi signal will be active and waiting for the first wireless device to connect.

In order to recognize which devices are yours, the router automatically keeps a list of devices that you have previously connected to it: the registration list. Once you have connected the first wireless device to the router, this device will be automatically registered in the list, and the router will switch into Beacon Eco mode (a.k.a. Learning mode). After one day it automatically switches to **Full Eco mode**, in which the Eco 100 router is fully radiation-free in stand-by.

Once the router is in Full Eco sleep mode, it will only wake up in the following two situations:

1. **It receives a connection request from a device with a MAC (hardware) address that is in the registration list.**
2. **It receives a connection request from a device with any MAC (hardware) address, for the hidden network named 'jrs'.**

Your wireless device will send the above connection requests if you enable wifi or open the list of available networks. Type 2 requests will only be sent by your device if you have manually entered the credentials for the hidden 'jrs' network as explained on p.6.
When no wireless devices are connected to the router, it will turn off the beacon signal in standby, thereby reducing unnecessary emissions.

6.1. Full Eco mode, Beacon Eco mode and Legacy Eco-wifi mode.

In Beacon Eco mode, also called learning mode, the router sends responses to connection requests from all devices, whether they are on the register list or not, so that you can easily connect all your wifi devices.

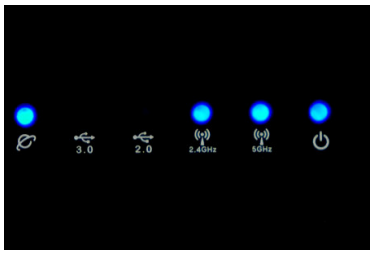
As soon as no new devices have been registered for one day, the Eco 100 router automatically permanently switches from Beacon Eco mode to Full Eco mode and remains there. In Full Eco mode, the router only sends responses to connection requests from devices which are on the registration list. In Full Eco mode standby, the router is completely radiation-free.

In both modes, the beacon signal is turned off fully in standby.

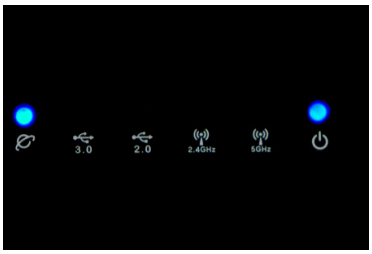
You can lock the router into Beacon Eco mode. This can be useful if you want to make it easier to connect with unregistered devices, or if some wireless devices do not work properly with Full Eco mode. The Lock setting is explained in Chapter 9.

6.2. Meaning of the lights on the router

Wifi on (active)

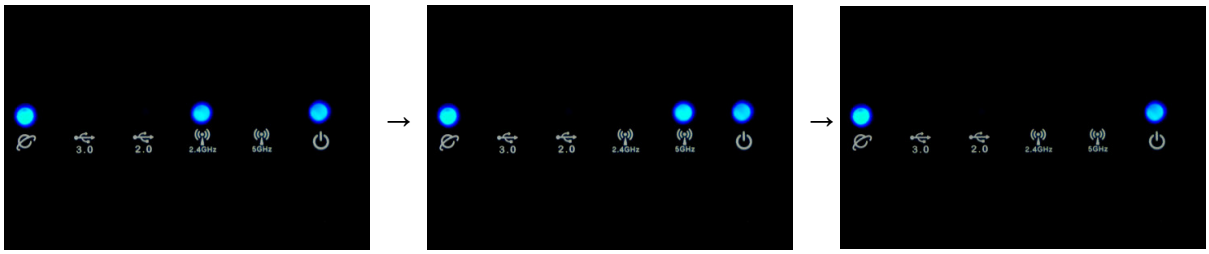


Wifi off



Beacon Eco mode (learning mode) standby

Beacon signal off, router responds to all connection requests.

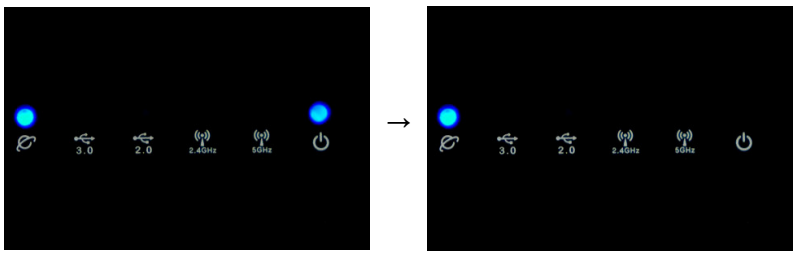


1 sec. *1 sec.* *1 sec.*

(repeats every 3 seconds)

Full Eco mode standby

Zero electromagnetic emissions. Beacon signal off, router responds only to connection requests from registered devices.



3 sec. *1 sec.*

(repeats every 4 seconds)

7. How to connect a new wireless device to the Eco 100 router when it is in sleep mode

If the router is in Full Eco standby mode, it will not wake up for any unregistered devices, and on your device the wifi network will not be visible in the list of available networks. If you would still like to connect an unregistered device, you can do it in one of these ways:

- First connect to the router with a registered device, to wake up the router from sleep mode. Then connect with the unregistered device.
- You can press the wifi button on the side of the router to activate wifi.
- Connect the new wireless device to the hidden network *jrs* as explained on p.6.

8. Manually turning the wifi signal off and on

Using the wifi on/off button on the side of the Eco router, on selected models, the wifi signal can be manually turned off, while the hardwired Ethernet ports keep functioning. Wifi emissions are completely stopped while you can keep working using the hardwired ports. If the wifi indicator lights go off, the wifi is turned off. To turn the wifi back on, push the button again.

9. The router settings menu

In the Asus router settings menu, there is a separate tab for the JRS Eco 100 functionality. You can access the router settings menu as follows:

1. In your web browser, go to http://router.asus.com and login. (This is not a page from the Internet but is generated locally by the router itself.)
2. **The default login name is ‘admin’ and the password is the PIN number listed on the label on your router.**
3. Click on Wireless (under Advanced Settings) and then click on the tab labeled JRS.

9.1. Detailed JRS Eco 100 settings

See p.16-17 of this manual for a screen shot.

- *Current status:* Shows whether the Eco 100 router is in standby mode or active. Will show a message when the registration list is empty.

- *JRS Eco 100 mode (Default: Full Eco mode):* Here you can select the mode of operation for the Eco 100 router.

  - **JRS Full Eco mode:** Automatically switches the wifi signal off fully in standby, when no devices are connected. The router only responds to connection requests from registered devices. Reduces emissions when the wifi signal is active by lowering the beacon pulsation frequency.
  - **JRS Beacon Eco mode:** The sending of beacon signals is automatically turned off when no devices are connected. The Eco 100 router still responds to probe / connection requests from unregistered devices. This mode is also called Learning mode. Reduces emissions when the beacon signal is active by lowering the beacon pulsation frequency.
  - **Legacy JRS Eco wifi mode:** You can also set the router to Legacy Eco-wifi mode, in which it still features a 90% reduced beacon pulse interval, but will not turn off the beacon signal.

- *Lock Beacon Eco Mode (Default: No):* When set to No, and the Eco 100 router is in Beacon Eco mode, it automatically goes into Full Eco mode when no new devices register during 1 day. Set this option to Yes to keep the router in Beacon Eco mode. This can be useful if you want to make it easier to connect with unregistered devices, and may have the advantage of better compatibility with some devices.

- *Match hidden network (Default: Yes):* If the wifi network doesn't appear on your wireless device when the Eco 100 router is in Full Eco standby, connect it to hidden (Other network) *jrs* or *jrs5*. See also Chapter 3 (‘Connecting your wireless devices to the router’). When 'Match hidden network' is set to Yes (default), the Eco router will set the same password and security (e.g. WPA2) for these hidden networks as you have set for your main wifi networks. When set to No, you are able to set a custom name and password for the hidden networks on the Guest Network page.

- *Ignore connection requests for 5 GHz network (Default: No):* When set to Yes, the Eco router will not leave standby mode upon receiving connection requests at 5 GHz. Most devices also send connection requests at 2.4 GHz. If set to Yes, it may avoid unnecessary activation of the wifi signal.

- *JRS Eco 100 timeout (20-900, default: 120):* When no devices are connected to the Eco 100 router, and this number of seconds has passed, the router will go into standby. This is also the interval at which the registration list is updated with new devices. Setting it to a lower value will make the router deactivate wifi sooner after the last device has disconnected, but has the disadvantage that if it is woken up from standby, and you don't connect soon enough after opening the list of available networks on your device, the router may have already turned off again.

- *Maximum number of entries allowed in registration list (1-64, default: 64):* If a new device registers, the oldest entries are automatically deleted to make space.

- *Automatically update to latest version of JRS Eco 100 firmware when available (default: Yes):* At the default setting, the router automatically updates its JRS Eco firmware when a new firmware is available, and you don't need to manually update. Setting this to No will turn automatic updates off and the router will never contact the JRS server. Please keep in mind that there may be important security patches in firmware updates.

- *Band:* Use the band selector to display settings for 2.4 GHz or 5 GHz. The settings below the band selector are specific to each band.

- *Enable Radio:* Enable or disable 2.4 or 5 GHz wifi transmitter. The 2.4 GHz NEEDS to be turned on in order for the Full Eco functionality to work properly. When you turn off 2.4 GHz altogether, the Full Eco mode / Beacon Eco mode is not functional and the wifi will remain turned on, albeit still with 90% reduction in pulsation frequency. If you set 'Enable Radio' to No for 5 GHz, this will also disable the jrs5 hidden network and any guest networks at 5 GHz.

- *JRS Eco 100 registration lists:* This shows the registered devices for which the router will wake up from standby. The registration lists for 2.4 GHz and 5 GHz are separate. You can switch the band selector to view the other list. If 'Connected Now' is shown next to a device, this means its wifi is active and is currently connected to the router, which will keep the router active. The registration lists are stored in non-volatile flash memory and remain even if you turn the power off. You can clear a list by clicking the 'Clear list' button.

***- Tx power adjustment (4-100mW / 4%-100% [EU] or 4-1000 mW [US]):* To reduce radiation even further, you can lower the transmit (Tx) power.**

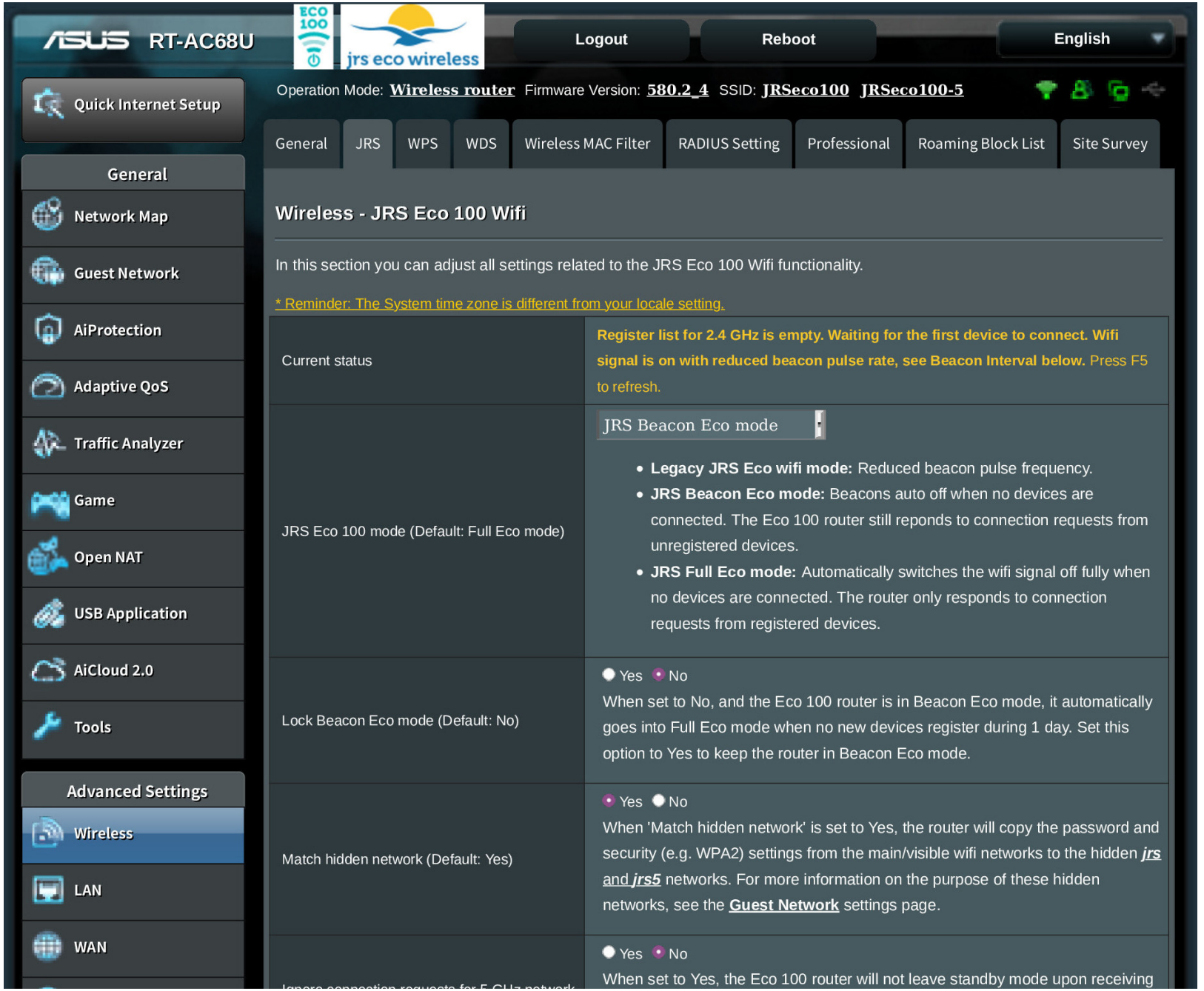
The JRS Eco 100 firmware offers fine tuning of the transmission power in small steps. The lowest possible setting is 4mW. The lower the setting, the lower your exposure to EMFs. This will reduce the router's range. See also Appendix 1.

The transmission power is best set to the lowest value at which the desired wifi coverage is achieved reliably, and no higher. This depends on the size of your

office or house, the type of walls and floors (wood, stone, or reinforced concrete), and the quality of the wifi receivers in the used laptops/tablets/mobile phones etc.

There are two settings: one for 2.4 GHz and another for 5 GHz. You can switch between them by changing the Band selector.

The wifi signal strength may affect download/upload speeds and stability. Just give it a try and see what is the lowest setting that still works for you. You may need to set the router to a different wifi channel in the Wireless -> General tab, to avoid interference from neighboring wifi routers and be able to have good range at a low transmit power. Using the Site Survey tab on the Wireless page, you can find out which channels are occupied. For more details about this procedure, see Troubleshooting 10.5.



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- *Enable wireless scheduler:* Here you can set times at which the wifi is automatically turned off fully, whether wireless devices are connected or not.

To switch on wifi manually during off times, press the wifi on/off button on the side of the router. The router will resume its on-/off schedule at the next set time.

- *Beacon Interval (20-65535, default: 1000):* This setting is important for emissions reduction. The reduction percentage with regard to ordinary wifi routers is shown. For a detailed explanation see Appendix 1. Setting the beacon interval higher that 1000 ms may cause problems with certain wireless devices.

The reduced pulse frequency of the Eco router may not be compatible with your wireless device. This especially happens with the 5 GHz connections. In this case you can adjust the Beacon Interval setting on the JRS settings tab. This will increase the pulse frequency. If you are having trouble connecting at 2.4 GHz, you can lower the beacon interval to 800 ms. For the 5 GHz channel you may need to reduce it even further, if the 5 GHz network is not showing on your wireless device. After changing the value, it may take a few minutes for the 5 GHz network to come back up.

9.2. Changing the passwords and wifi network name

The wifi password is unique to your router, because each router has a different PIN number, so you can safely leave it as it is. Still, if you want, you can customize the password and wifi network name in the router settings menu at *http://router.asus.com*. The wifi password is set on the Wireless -> General page. There is one setting for the 2.4 GHz network and another for 5 GHz. You can change between them using the Band selector.

If you want to change the name and/or password for the hidden ‘jrs’ network, you can do this on the Guest Network page, but first please see ‘Match hidden network’ in 9.1.

The administrator password for logging into the router settings menu is set on the Administration -> System page and also defaults to the PIN number.

9.3. Adding a guest network

To add a guest network, go to the Guest Network page, and then click on the first ‘Enable’ button at 2.4 GHz.

Then enter the desired network name at 'Network Name (SSID)', set Authentication Method to WPA2-Personal and enter the wifi password at 'WPA Pre-Shared Key'. Then click on the Apply button.

10. Troubleshooting

10.1. How to reset the router to factory default settings

If you've changed the administrator password, and you can't remember it, or you simply want to start with a clean slate, you can reset the router as follows. This will return all settings to the default values. Turn off the power to the router and then turn it back on while keeping the WPS button pressed. You may need to hold for up to 30 seconds. When the power light starts flashing rapidly, release the WPS button. Then the router will restart, which takes about 5 minutes. The JRS Eco firmware will remain on the router after resetting.

10.2. The router does not go into Full Eco standby mode. What can I do?

When the router is in Full Eco standby mode, the 2.4 and 5 GHz wifi lights should be off and every 4 seconds the power light should go out for 1 second. If this doesn't happen, the router is not in Full Eco standby mode. There are a number of possible causes.

- Please check whether the router is in 'Full Eco' mode in the drop-down menu on the JRS tab of the Wireless page in the Asus settings menu. The first day after installation, the router will be in Beacon Eco mode, a.k.a. learning mode. After one day it will go into Full Eco mode.
- The Full Eco functionality does not work if Enable Radio if set to Off for the 2.4 GHz wifi.
- Please check in the registration list, which is shown at the bottom of the tab JRS on the Wireless page of the router settings menu. If there are devices showing 'Connected Now', these are the devices keeping the router awake and you need to turn wifi off on those devices. There are two registration lists: one for the 2.4 GHz network and one for the 5 GHz network. You need to check them both. You can switch between lists by changing the Band selector. Even if your wireless devices are not connected but their wifi is still on, they may still be transmitting connection requests which will keep the router awake. For example, this could include your smart TV if it is still plugged in. You can push the Clear List button to have the router automatically build up the list from scratch, so you can observe look step-by-step which device keeps the router awake.
- You may need to turn off the 'improve location accuracy' setting on your wireless device or turn off Location services altogether. If the setting is on, your device will keep emitting wifi scans even if wifi is turned off!
- If all of the above doesn't help, try whether restarting the router solves the problem.

10.3. The router does not wake up from Full Eco standby mode when I turn on wifi on my wireless device

If the wifi network doesn't appear in the list of available wifi networks on your wireless device when the Eco 100 router is in Full Eco standby, you need to connect your device to the hidden 'jrs' network as explained in Chapter 3 (Connecting your wireless devices to the router).

10.4. I cannot connect to the wireless network

- If the wifi network isn't listed in the list of available networks or your device keeps displaying 'connecting to network', cancel the connection, and then reconnect. Alternatively you can switch on the wifi on the device (using e.g. the wifi slider on your phone), wait 5 seconds, then switch its wifi off and on again.
- There could be a problem with the settings on your wifi device (laptop/mobile phone), for example the wrong type of security setting has been selected or the wrong password has been typed in. Try to use 'forget network' or similar so that you can enter the settings/password again.
- The reduced pulse frequency of the Eco router may not be compatible with your wireless device. This especially happens with the 5 GHz connections. In this case you can lower the Beacon Interval setting on the JRS settings tab. This will increase the pulse frequency. See also 9.1.
- You may decide to lock the router into Beacon Eco mode, or set it in Legacy Eco-wifi mode. These modes may offer better compatibility with your wireless devices while still reducing wifi emissions considerably.

10.5. My devices cannot find the Eco wifi network, connection keeps dropping or is slow

When other wifi networks are in the area, for example neighboring wireless routers or other wireless transmitters working on the same wifi frequency as the Eco router, interference may occur which causes these problems. Also if the built-in wifi of your Internet modem is not turned off, and that includes the public wifi network or wifispots it may be transmitting, these can interfere heavily with the Eco router signal.

In most cases the solution for connection problems is to set the Eco router to another channel. Set the router to a fixed channel instead, not to Auto. To find the best channel you may follow this procedure:

- Go to the router settings menu by entering *http://router.asus.com* in the address bar of your browser. Login with the administrator credentials you created

when setting up the router. Go to the Wireless page (under Advanced Settings) and click on the Site Survey tab. When scanning is finished, a table is shown. Copy/paste or note down the results, especially the Control Channel and Band columns. They show all occupied wifi channels. These are the channels you should not set the Eco router to. From this list of wifi network names you could also see if the wifi of your internet modem has not yet been switched off.

- Go to the Wireless → General tab and set the Band selector to 2.4 GHz. Then set Control Channel to a free channel, one that was not occupied in the Site Survey list. Try to keep multiple channels of spacing between the Eco router and any interferer channels, because wifi channels partly overlap. Only channels 1, 6 and 11 are non-overlapping. Click on Apply at the bottom of the page. Next, you can do the same for 5 GHz.
- If there are no free channels, look at the signal strength of the other wifi networks. Choose a channel on which only a weak network is present. Also try to avoid having very strong interferers right above or below the selected channel.
- Set Channel Bandwidth to 20 MHz for 2.4 GHz and to 40 MHz for 5 GHz.
- To boost the range, you can increase the transmit power using the Tx power adjustment slider on the Wireless page → JRS tab. There are two settings: one for 2.4 GHz and one for 5 GHz. You can switch between them using the Band selector.
- Optionally: lower the 'beacon interval' to 800 for 2.4 GHz in the JRS tab of the Wireless page. For the 5 GHz channel you may need to reduce it even further.

10.6. I can connect to the Eco wifi network but can’t get on the Internet

Connect your device to the Asus router either wirelessly or via an Ethernet cable plugged into one of the four LAN ports. Enter *http://router.asus.com* in the address bar of your browser, log in to the Asus settings menu and hover over the network icon in the right top. The screen should show ‘WAN-connected’. If it doesn’t, please follow the procedure below.

Solution 1: First, please check whether the connection between the Eco-wifi router and the Internet modem is properly made. The Ethernet cable should run from the blue WAN port of the Eco router to a port labeled ‘LAN’ on your Internet modem, preferably port no. 1. See the figure on p.5.

Solution 2: Your Internet modem/router may be configured in so-called Bridge Mode. A router or other device you connect to its LAN port is then directly

connected to the provider's network. Usually only one unique device (MAC/hardware address) is allowed to be connected to the provider's network. When this place has been taken by the previous setup, the network needs to be reset. **Unplug all Ethernet cables from your modem and turn off your Internet modem for a full five minutes.** Then turn it back on, wait until it has finished starting up and then reconnect the Eco-wifi router to LAN port 1 of the Internet modem. You may also contact your Internet provider's customer service for assistance.

Solution 3: Go to WAN settings in the router settings menu via http://router.asus.com. Set WAN Connection Type to Automatic IP and click on Apply. Then go to LAN settings. Set the LAN address to 192.168.4.1. Click on Apply.

11. Frequently asked questions

Since we are using only the hidden "jrs" network on the Eco 100 router, is there a way to hide and/or remove its visible network counterpart from being listed as an available network to join?

Yes, you can remove the visible networks completely and have only the hidden *jrs* (and *jrs5*) networks:

- Go to the Wireless -> JRS menu and turn off the 'Match Hidden Network' option. Then click Apply.
- Go to Guest network and deactivate / delete the *jrs* and *jrs5* networks.
- Go to Wireless -> General and set the Band selector to 2.4 GHz. Change the SSID (network name) of the 2.4 GHz network to *jrs*. Set the option 'hidden' to yes. Click on Apply.
- Set the Band selector to 5 GHz. Change the SSID of the 5 GHz network to *jrs5*. Set the option 'hidden' to yes. Click on Apply.

Will the Eco 100 router work correctly with my wifi connected doorbell / fire detector / thermostat?

We can't test with all of the multitude of wireless devices in the world, therefore we can't guarantee operation with all of them. Please take into account that a wifi connected device like a doorbell, fire alarm or thermostat will likely keep the Eco 100 router 'awake' all the time so the router cannot go into the Full Eco standby mode. In such a case you will see the device listed as 'Connected now' in the registration list on the JRS tab in the router settings menu. Even when wifi is active, the router still offers a 90% reduced pulse frequency. Still, we strongly advise you to install wired alternatives, or ones that are not connected via wifi.

What happens when I turn off the wifi on the router using the wifi on/off button or the scheduler, but leave the phone's wifi on?

The phone may keep sending connection requests regularly when wifi is enabled on the phone and no wifi network is currently connected, looking for available wifi networks. It will therefore keep emitting wifi radiation in regular intervals. Depending on make and model of your phone, and the settings, the phone may or may not cease emitting wifi radiation in standby. When the screen is off, the phone is not necessarily in standby! This depends on app activity and on the OS settings.

If the last user leaves home with wifi on his phone switched on, stays away for a few hours, then returns home without ever switching off wifi on the phone, would that require him to perform an active action in order to reconnect to the Eco 100 router home network? Would he need to manually trigger reconnection by opening the network list?

He doesn't need to open the network list. Just activating the screen on the phone is enough. The phone will then transmit connection request signals that the Eco 100 router will receive which will trigger it to wake up. When a phone's wifi is switched on, the phone will usually keep scanning for wifi networks in regular intervals (see also above).

How can I configure the Eco router in Access Point mode, a.k.a. configuring it as a switch?

The default mode is the so-called Router mode, in which routing takes place between the WAN port and the LAN ports/wifi, whereby the WAN port is located in a different subnet. Wifi and hardwired ports are both located on the LAN side. Alternatively, in the Access Point mode no routing takes place. The Asus behaves as a simple network switch and all IP addresses are located in the same LAN subnet - there is only one single network. Your Internet modem will then, by means of its DHCP server, assign IP addresses to the devices connected to the Asus. This can be useful, for example, for devices connected to the Asus to reach a Network Attached Storage device connected to your Internet modem, or to achieve seamless roaming of wireless devices between multiple Eco routers. (In the latter case, you also need to match SSIDs and wireless passwords between all Eco routers.)

To set the Asus in Access Point mode, in the router settings menu, go to the Administration page and click on the Operation Mode tab. Select Access Point (AP) Mode and click on Save. The router will now reboot. Please note that now the router settings menu cannot be reached at *http://router.asus.com* anymore.

Instead you will need to enter the IP number of the Asus router into the browser address bar to access the router settings menu. To find out the IP number, you can try the Asus Device Discovery app on Android or iPhone (not the Asus router app or other apps). You can also do it via Windows, with the Asus Device Discovery utility on the CD that comes with the router.

Can I use the ASUS app to control the device? Am I able to control individual device access, or set times for individual device access (parental controls etc.)?

Yes, you can use the Asus app to control the router settings, because the JRS Eco firmware is an extension of the Asus firmware. The Eco specific settings cannot be controlled from the app, those can only be configured from a browser by accessing *http://router.asus.com*.

Appendix 1. Eco wireless router reducing electromagnetic emissions, also when wifi is active

Any wifi router transmits two main types of packets:

1. **Beacon packets containing the name of the wifi network.** The largest problem is, that in ordinary wifi routers, these are transmitted 10 times per second 24/7, both in standby and during usage. The Eco router reduces the pulsation frequency of this beacon signal to once per second.
2. **Data packets.** Data packets are only transmitted during usage, for example when loading a web page, when an app is requesting information from the Internet, or your device is downloading updates etc.

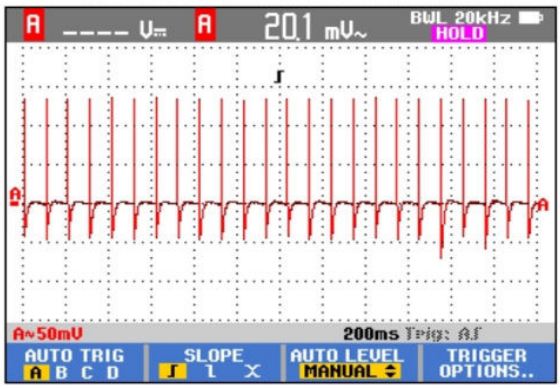
The beacon packets are transmitted continuously 10x per second, and the data packets only when data is loaded from the Internet. For example, a website that you visit using your Internet browser. The beacon pulses thus account for a large proportion of electrosmog.

The Eco router emits 90% fewer beacon pulses per second than regular wifi routers. This is achieved by adjusting the beacon interval. The higher the beacon interval, the less radiation the router emits measurably. With an ordinary wifi router, the beacon interval is 100 milliseconds, which corresponds to 10 pulses every second. The beacon interval at 2.4 GHz for the Eco router is 1000 milliseconds: 10 times less pulses per second. Practice has shown that this is the highest value where nearly all devices, like laptops, mobile phones, and tablets, still function reliably without hiccups in the wireless connection.

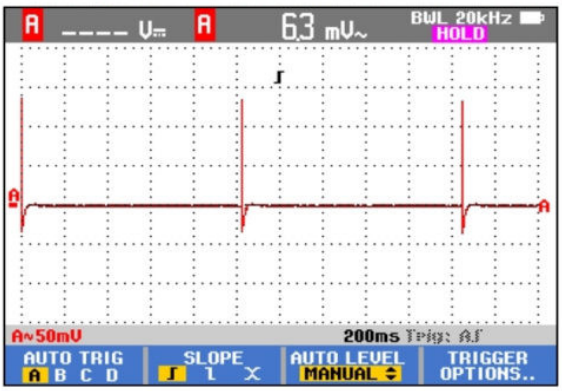
If some of your devices can’t see the 5 GHz network, it may be necessary to lower the beacon interval for 5 GHz. This should not be necessary for the 2.4 GHz network. See also *‘Beacon interval’* in 9.1.

Measurements

The reduced pulse frequency of the beacon signal in the Eco routers has been measured by EMF Consult Norway. The oscilloscope images below show the measured electromagnetic emission versus time, on a 200 milliseconds x-axis scale:



Ordinary wifi router with 10 beacon pulses/sec.



Eco router with 1 beacon pulses/sec.

In addition, the Eco router offers an automatic full switch-off of the beacon signal, as already explained in this manual.

Reducing the strength of the pulses

While the average pulse strength of the Eco router beacon signals is 10 times reduced, because of the reduced pulse rate as explained above, the peak pulse strength in the default setting is similar as with ordinary routers. This is because transmit power is inextricably linked to the range of the router, a physical fact that, unfortunately, cannot changed.

You can reduce the peak transmit power by adjusting its setting. The Eco router offers fine adjustment of the range with a 1 milliwatt step size. The router is shipped with a standard setting of 30mW (42mW for 5 GHz) which can be lowered to 4mW. See ‘Tx power adjustment’ earlier in this manual. See 9.1 ("Tx power adjustment") earlier in this manual.

This product is protected by patents.

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