



**Manual for low radiation wireless access point
with JRS Eco 100 Wifi firmware**





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

Every 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. The unique JRS[®] Eco 100 wifi router automatically switches to Full Eco stand-by mode when no wifi devices are connected, which reduces the radiation to zero. When you reconnect to the wifi, the JRS Eco 100 router automatically switches on again.

When you first install your **JRS Eco 100** router, it will go into learning mode so you can easily connect all of your wifi devices. The router automatically keeps a list of devices you have connected to it. Then it automatically switches to **Full Eco mode**, in which the **JRS Eco 100** router is fully radiation-free in stand-by.

As soon as the **JRS Eco 100** router receives a connection request from a wireless device in the router's registration list, and only then, the router will switch on the wifi signal again. Your wireless device will send such a connection request if you enable the wifi or open the list of available networks.

The globally unique **JRS Eco 100** technology is compatible with all brands and models of wireless devices: Android[®], Apple[®], Windows[®] etc. and you do not lose any wifi speed, range or stability. The **JRS Eco 100** also offers a reduced beacon signal pulse rate, just like the previous generation JRS Eco wifi, even during use. For a detailed explanation, see **Appendix 1: 90% reduced pulse frequency**.

JRS Eco 100. The world's first Full Eco wifi router.

The **JRS Eco 100** functionality, which automatically turns off the wifi signal completely in stand-by, is unique to the **JRS Eco 100** operating system and is not available on ordinary routers.

What about other settings? Often you can't adjust the transmitting power in ordinary routers or only in rough steps. The JRS Eco 100 firmware offers fine tuning of the transmission power with a step size of 1 milliwatt, which is an improvement on the regular Asus[®] firmware.



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To what extent does an Eco router reduce my exposure to wifi radiation?

Wifi is two-way traffic. Although the Eco router greatly reduces the radiation of your router during stand-by and partly during operation, it does not reduce the radiation of your wireless devices. For each piece of data sent from the wifi router, a confirmation is sent back by your device. Wifi radiation from the devices is very strong and you keep the device very close to your body. Especially in data-intensive applications such as video, the wifi radiation is very high.

By working with a wired Internet connection, you can minimize your exposure to electromagnetic radiation. You may be able to reduce the transmit power of your computer's wifi adapter with the Windows® Device Manager. A hardwired Internet connection is radiation-free and minimizes health risk.



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Quick Start Instructions

To install your JRS® Eco 100 firmware on the Asus® router, follow the 3-step guide below. Please note: if you don't do this, the router will not be low radiation!

-1-

Login to your account at www.jrseco.com. In My Account, click Orders, and then click the View button next to your order number. Now download the **JRS Eco 100** firmware file for your router by right-clicking on it and selecting 'Save (Link) As...' or similar. You don't need to open the file but you will need it in step 3.

-2-

Unpack the Asus router and connect it to your Internet modem according to the instructions provided in the box. Connect to the router via wifi or a LAN cable and go to router.asus.com. Follow the Asus Wizard to set up the router.

-3-

In the Asus menu, click on Administration and then on the tab 'Firmware Upgrade'. Click the Browse button and select the **JRS Eco 100** firmware file saved in step 1. Then click the Upload button and wait 3 minutes for the process to finish. Congratulations! Your **JRS Eco 100** firmware is now installed.

To allow newer devices (iPhones®, iPads® and newer Android® devices) to wake up the router from Full Eco stand-by, connect them to hidden Other network 'jrs' with security WPA2 and the same wifi password you set in step 2.



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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. 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. You don't need that wifi signal anymore because the wifi function is taken over by the Eco-wifi router.

On some Internet modems you can simply turn off the wifi with a switch on your modem, or login to a settings menu. We regularly receive questions about 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.

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. 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.

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.

Dual band

The Eco-wifi router is a dual band router and emits two wifi networks: one at the 2.4GHz frequency and one at 5 GHz. The range is best on the 2.4GHz network because 5GHz is attenuated more by walls and ceilings. The maximum AC wifi throughput speed (over 400Mbps) can be achieved on the 5GHz network. If you want to minimize the EM radiation you have the option of turning off the 5GHz network in the settings menu.



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Using the JRS Eco 100 router

JRS® Eco 100 is a special firmware for specific models of Asus routers. The JRS Eco 100 firmware is an extension of the original Asus firmware.

All modern wireless devices like phones and tablets send a connection request signal when they search for a wifi connection, for example when you open the list of available wireless networks or turn on wifi on your device. As soon as the Eco 100 router receives this signal from a wireless device on the router's registration list, and only then, will the router switch on the wifi signal. For this purpose the router automatically keeps a list of devices that you have previously connected to it: the registration list.

If you have just installed the Eco 100 router, it goes into learning mode (Beacon Eco mode) so that it can easily store all your wifi devices in the registration list. If no new devices have been registered for one day, the Eco 100 router automatically switches from Beacon Eco mode to Full Eco mode. It then only responds to connection requests from registered devices.

Beacon Eco mode versus Full Eco mode

In Beacon Eco mode, also called learning mode, the Eco 100 router sends responses to connection requests from all devices, whether they are on the register list or not. 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 later in this manual.

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.

Waking up the Eco 100 router from Full Eco standby, MAC randomization

If the wifi network doesn't appear on your wireless device when the Eco 100 router is in Full Eco standby, your device likely uses MAC (hardware) address randomization. In this case you need to connect your device to hidden Other network *jrs* or *jrs5* with security WPA2 and the same wifi password you set for the main wifi network. The router automatically creates two hidden wifi networks for this purpose. You can rename them if you like. See also the 'Match hidden network' setting later in this manual.

How do I connect a new wireless device to the Eco 100 router?

If you have just installed the Eco 100 router, its wifi signal will be active and connecting the first device to it is no different from connecting to an ordinary wifi router.

Once you have connected the first wireless device to it, this device will be automatically registered by the router, and the router will switch into Beacon Eco mode (learning mode). When you disconnect your device from the router, and no devices are connected to the router anymore, it will turn off the beacon signal in standby, thereby reducing unnecessary emissions. The router will only turn on its beacon signal for wireless devices that are on the registration list. It will however still respond to connection requests from unregistered devices.

1. When the router is in Beacon Eco mode, and you try to connect to it with an unregistered device, it is possible that your wireless device keeps displaying 'connecting to network'. There is an easy procedure to resolve this. If 'connecting to network' keeps being displayed, cancel the connection, and then reconnect. Alternatively you can first 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. Now you should be able to connect.

You only need to do this the first time you connect, when the device is not registered yet. Then the Eco 100 router automatically saves the unique address of your device in the registration list and the next time you connect, it should go smoothly.

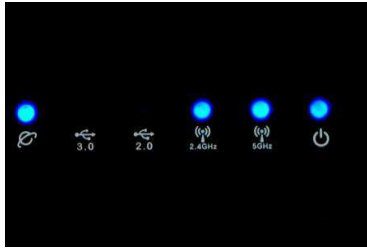
2. Another way to connect an unregistered device to the Eco 100 router is to first connect with a previously registered device, so that the router goes out of standby mode. Then connect with the unregistered device.
3. You can also press the wifi button on the side of the router.
4. Finally, it is also possible to connect your device to hidden Other network *jrs* or *jrs5* with security WPA2 and the same wifi password you set for the main network. You then need to enter the wifi network name.

Once the router is in Full Eco standby mode, on unregistered devices the wifi network name will not be visible in the list of available networks. You can still use methods 2-4 to connect however, and have the router register the new device.

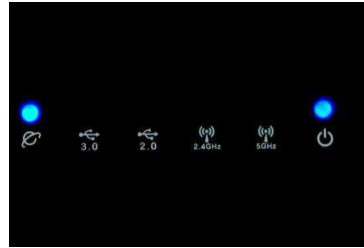
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Meaning of the LED patterns

Wifi on (Active)



Wifi off



Beacon Eco Mode (learning mode) standby

Beacon signal off, router responds to all connection requests.



1 sec.

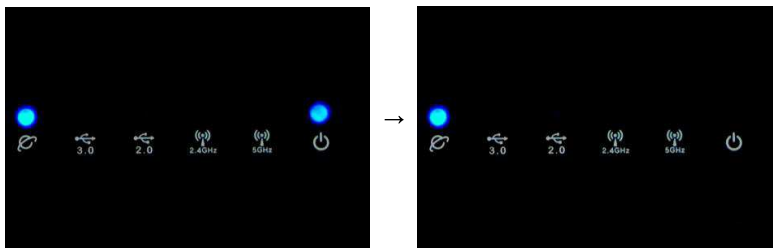
1 sec.

1 sec.

(repeats every 3 seconds)

Full Eco Mode standby

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



3 sec.

1 sec.

(repeats every 4 seconds)

<ul style="list-style-type: none"> Network Map Guest Network AiProtection Adaptive QoS Traffic Analyzer USB Application AiCloud 2.0 Tools 	<ul style="list-style-type: none"> Advanced Settings <li style="background-color: #34495e; color: white;">Wireless LAN WAN IPv6 VPN Firewall Administration System Log Network Tools 	<h3>Wireless - JRS Eco 100 Wifi</h3> <p>In this section you can adjust all settings related to the JRS Eco 100 Wifi functionality.</p> <p><i>* Reminder: The System time zone is different from your locale setting.</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; padding: 5px;">Current status</td> <td style="padding: 5px;"> <p style="color: yellow;">Register list for 2.4 GHz is empty. Waiting for the first device to connect. Wifi signal is on with reduced beacon pulse rate, see Beacon Interval below. 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How to access the JRS Eco 100 settings page

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

1. Start your web browser.
2. Go to <http://router.asus.com> and login.
3. Click on Wireless (under Advanced Settings) and then click on the tab labeled JRS.

Detailed JRS Eco 100 settings

Current status

Shows whether 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 emission when active by lowering the beacon pulse frequency.
- **JRS Beacon Eco mode:** The sending of beacon signals is automatically turned off when no devices are connected. The Eco 100 router still reponds to probe / connection requests from unregistered devices. This mode is also called Learning mode. Reduces emission when active by lowering the beacon pulse frequency.
- **Legacy JRS Eco wifi mode:** Reduces emission by lowering the beacon pulse frequency. Beacon signal will not be switched off in standby like in the other modes.

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 Other network *jrs* or *jrs5*. When 'Match hidden network' is set to

Yes (default), the Eco 100 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 100 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.

Band

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

Enable Radio

Enable or disable 2.4 or 5 GHz network. Please note that the Full Eco and Beacon Eco modes need the 2.4 GHz network to be turned on to be able to function correctly, because many devices don't always send connection requests at 5GHz.

JRS Eco 100 registration list for jrs

The registration lists for 2.4GHz and 5GHz are separate. You can switch the band selector to view the other list. The 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 (4-100, default: 42)

To reduce radiation even further, you can lower the transmit (Tx) power. This will reduce the router's range.

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.



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The lowest possible setting is 4mW. The actual measured transmission power at that setting (measured by JRS) is a factor of 10-20x below the default setting. The lower the setting, the lower your exposure to EMFs.

Enable wireless scheduler

Here you can set times at which the wifi is automatically turned off fully.

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 emission reduction. The reduction percentage with regard to ordinary wifi routers is shown. For a detailed explanation see Appendix 1.

The reduced pulse frequency of the Eco-wifi may not be compatible with your wireless device. This especially happens with the 5GHz 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 5GHz channel you may need to reduce it even further, if the 5GHz network is not showing on your wireless device

Manually turning on and off the wifi-signal

Using the wifi on/off button on the side of the Eco-wifi, the wifi signal can be manually turned off, while the LAN / Ethernet ports keep functioning. The 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 radio back on, follow the same procedure.

Full reset of the Eco-wifi

To reset the router, so that all passwords, settings etc. are returned to default values, use the following procedure. All Eco functionality will remain after the reset.

1. Pull the power plug out of the outlet.
2. Push the WPS-button and keep it pressed.
3. Put the power plug in the outlet and wait until the power light starts blinking rapidly.
4. Keep the WPS-button pressed for another 3 seconds and then release it.

Firmware updates

Update the router only with firmware provided by JRS or you will lose Eco functionality.

Troubleshooting

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-wifi may not be compatible with your wireless device. This especially happens with the 5GHz connections. In this case you can adjust the Beacon Interval setting on the JRS settings tab. This will increase the pulse frequency.
- 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.

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

When other wifi networks are in the area, for example neighbouring wireless routers or other wireless transmitters working on the same wifi frequency as the Eco-wifi 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-wifi signal.

In most cases the solution for connection problems is to set the Eco-wifi router to another channel. It is best to set the router to a fixed channel instead of to Auto. To find the best channel you may follow this procedure:

- * Go to the Site Survey tab on the Wireless page and wait until scanning is finished. Here you can see which channels are occupied by neighboring wifi routers. This way you can choose a free channel for your own router.
- * If there are no free channels, look at the signal strength of the other wifi networks. The signal strength ranges from approx. -80dBm (very weak) to -30dBm (very strong). 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 the new channel in the General tab under 'Control Channel'.



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Optionally: lower the 'beacon interval' to 800 for 2.4 GHz in the JRS tab of the Wireless page. For the 5GHz channel you may need to reduce it even further.

If the 5GHz network is not showing on your wireless device

Lower the 'beacon interval' for 5 GHz in the JRS tab of the Wireless page.

I can connect to the eco-wifi network but cannot get on the internet

Go to router.asus.com in the address bar of your browser, log in and hover over the network icon. The screen should show 'WAN-connected'. If it doesn't, please follow the procedure below.

Solution 1: Your internet modem may be configured in so-called Bridge Mode. Whatever router or other device you connect to its LAN port is then directly connected to the provider's network. Often only one unique device (MAC 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. **Try to turn off your internet modem for a full five minutes.** Then turn back on and reconnect the eco-wifi router to LAN port 1 of your internet modem. You may also contact your internet provider's customer service for assistance.

Solution 2: Alternatively you may need to 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 labelled 'LAN' on your Internet modem, preferably port no. 1.

Appendix 1.

Eco-wifi: reducing electromagnetic emission, 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 100 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.

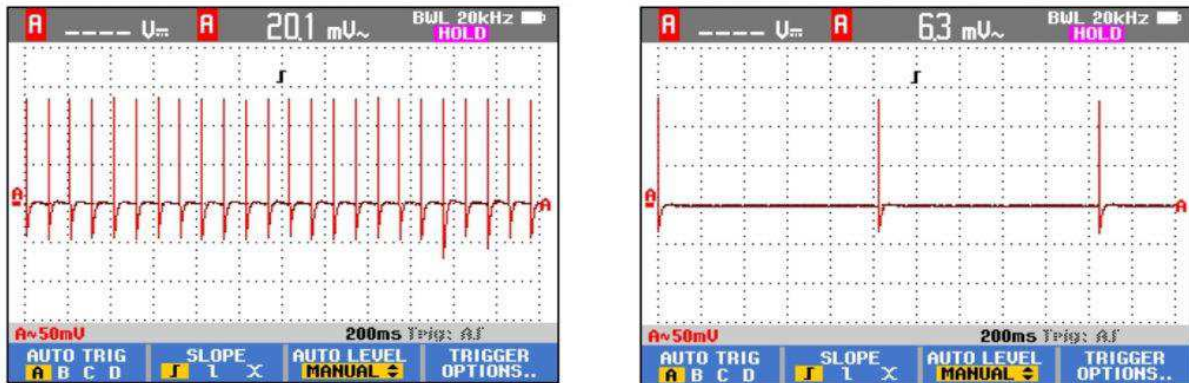
The beacon packets are transmitted continuously 10x per second, and the data packets only when data is loaded from the Internet. For example, a website that you visit using your Internet browser. The beacon pulses thus account for a large proportion of electrosmog.

The JRS Eco-wifi 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-wifi 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 5GHz network, it may be necessary to lower the beacon interval for 5GHz. This should not be necessary for the 2.4GHz network.

Measurements

The reduced pulse frequency of the beacon signal in the Eco-wifi 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-wifi router with 1 beacon pulse/sec.

In addition, the Eco 100 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-wifi 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 transmission power is inextricably linked to the range of the router, a physical fact that, unfortunately, cannot be changed.

You can reduce the transmit power by adjusting its setting. The Eco-wifi 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.

