

How to use the IC-R8600 as an SDR receiver

The IC-R8600 (version 1.30 or later) can output the In-phase/Quadrature data which is processed by the FPGA. Connect [I/Q OUT] to a PC's USB port, and you can control the IC-R8600 from a PC using the HSDR software.

① These instructions are based on using Microsoft® Windows® 10.

Procedure outline

To use HSDR, first follow the steps described below.

① See "About the HSDR software operations" that can be downloaded from the Icom website for detail about how to use the software.

Step 1 Confirming the IC-R8600 firmware version (See the IC-R8600 Instruction manual Section 13.)

Confirm the IC-R8600 firmware version is 1.30 or later.

① If the IC-R8600 firmware version is 1.20 or earlier, download the latest version from the Icom website, and update your IC-R8600.

<http://www.icom.co.jp/world/support/>

① See the IC-R8600 Instruction manual (Section 13) for detail about how to update the IC-R8600.

Step 2 Installing HSDR

You can use HSDR (freeware) as the SDR software.

Download HSDR from the HSDR website and install it.

<http://www.hdsdr.de/>

① Install HSDR before installing the IC-R8600 USB I/Q Package for HSDR.

Step 3 Installing the IC-R8600 USB I/Q Package for HSDR (p. 3)

To control the IC-R8600 from a PC using HSDR, download the IC-R8600 USB I/Q Package for HSDR from the Icom website, and install it.

<http://www.icom.co.jp/world/support/>

The IC-R8600 USB I/Q Package for HSDR contains "ExtIO_ICR8600.dll*" and the IQ driver.

* The DLL file is normally stored in the same folder that is installed HSDR as the default.

(Example: C:\Program Files\HSDR)

① **DO NOT** connect the IC-R8600 and a PC until the driver installation has been completed.

Step 4 Connecting the IC-R8600 and a PC (p. 5)

Connect the USB cable (User supplied) between the IC-R8600's [I/Q OUT] port and a PC's USB port, and then turn ON the IC-R8600.

Step 5 Using HSDR (See "About the HSDR software operations.")

See "About the HSDR software operations" for your reference of using the HSDR software with the IC-R8600.

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System requirements

Required items

- A PC
- An A/B type USB cable

Minimum system requirements

Operating System	Microsoft® Windows® 10 (32/64 bit) Microsoft® Windows® 8.1 (32/64 bit) (Except for Microsoft® Windows® RT) Microsoft® Windows® 7 (32/64 bit) ① In this guide, the OSs are described as “Windows 10,” “Windows 8.1,” and “Windows 7.”
USB port	USB 3.0 or 2.0
Remark	We recommend that you use the on-board sound chipset. The CPU may have a heavy load when an external sound device, such as USB audio converter, is used.

These are the minimum system requirements to use the IC-R8600 with the HSDR software. Because the system requirements may differ, depending on your PC environment (permanently running software such as antivirus software, peripheral devices, settings of OS and other software), the operation is not guaranteed.

Operation notes

- Before connecting or disconnecting a USB cable, turn OFF the IC-R8600.
 - To operate your PC and peripheral devices, follow the instructions provided in their manuals.
 - Depending on the PC performance, OS, condition, speed, and so on, the USB audio may be interrupted, or control by the PC software may get delayed.
 - If the CPU has a heavy load, the USB audio is easily interrupted. The settings of the audio player application may be changed after connecting the IC-R8600 to the PC.
- ① If the audio is interrupted:
- Set a lower sampling rate value in the HSDR software.
 - Close other application, if running.

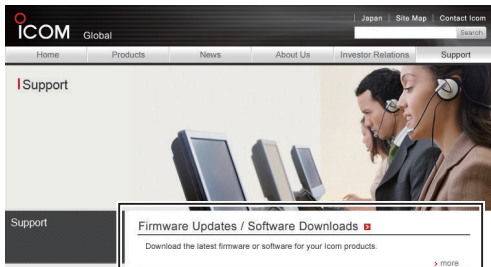
Installing the IC-R8600 USB I/Q Package for HSDR

◇ Downloading the IC-R8600 USB I/Q Package for HSDR

1. Access the Icom website.
<http://www.icom.co.jp/world/>
2. Click <Support>.



3. Click “Firmware Updates/Software Downloads.”



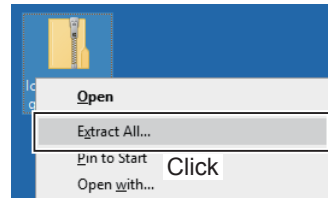
4. Click the desired file link.
5. Read “Regarding this Download Service” carefully, and then click <Agree>.



6. Click “Save as” in the displayed File Download dialog.
7. Select the location where you want to save the file, and then click <Save> in the displayed File Download dialog.
 - The file starts downloading.

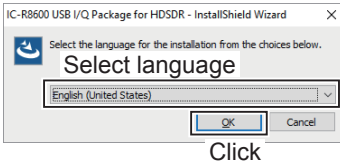
◇ Unzipping the firmware folder

1. Right-click the downloaded firmware folder (zip format).
 - Right-click menu is displayed.
 2. Click “Extract All...”
 - After unzipping, a folder is created in the same location as the downloaded folder.
- ① The unzipped folder contains “setup32.exe” and “setup64.exe.”

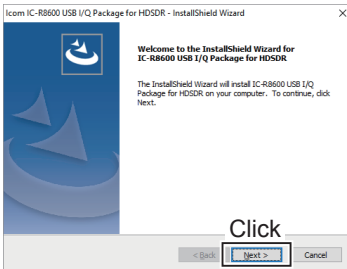


◇ Installing the IC-R8600 USB I/Q Package for HSDR

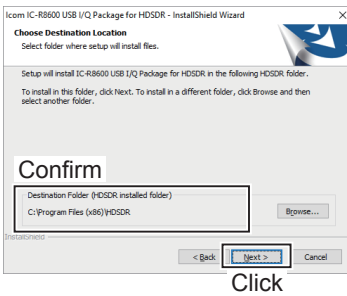
1. Double-click “setup32.exe” or “setup64.exe” contained in the unzipped folder.
 - ① “setup32.exe” is for a 32 bit operating system. “setup64.exe” is for a 64 bit operating system.
 - ① You can select whether or not to display the file extensions in the Folder Options screen.
 - ① If “User Account Control” is displayed, click <Yes> to continue.
2. Select “English” (or “Japanese”) and then click <OK>.
 - ① In this document, “English” is selected.



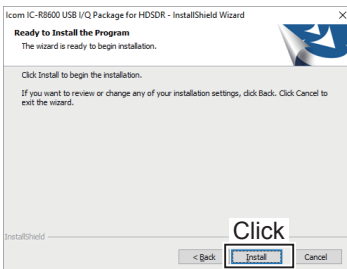
3. Click <Next>>.



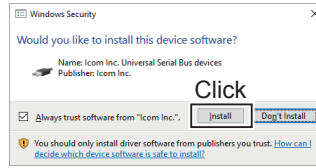
4. Confirm the destination folder, and then click <Next>>.
 - ① If you change the HSDR installed folder and install HSDR, click <Browse...> and select the HSDR installed folder.



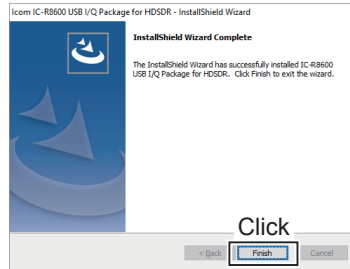
5. Click <Install>.



6. Click <Install>.



7. Click <Finish>.



NOTE:
 You can uninstall the Icom IC-R8600 USB I/Q Package for HSDR using the “Apps & features” in the “System” menu. To get started, click on Start > Settings > System > Apps & features.

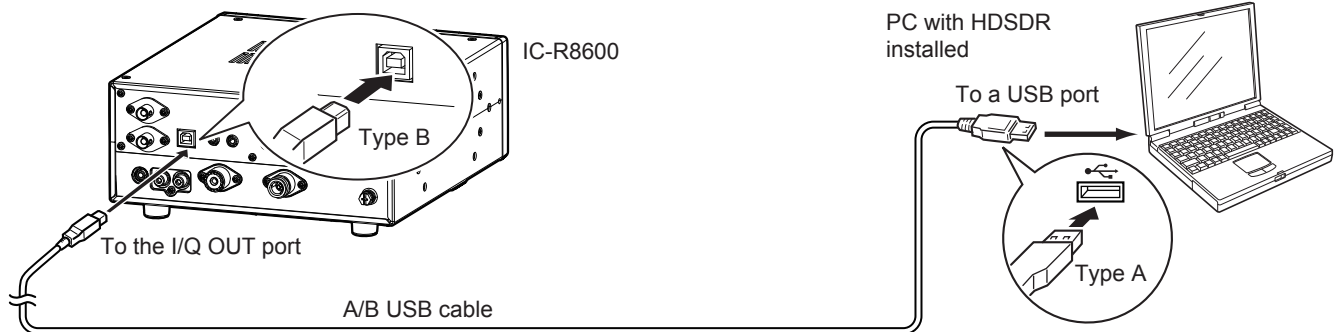
Connecting the IC-R8600 and a PC

Connect a USB cable (User supplied) between the IC-R8600's [I/Q OUT] port and a PC's USB port.

① When you connect a USB cable for the first time, a PC starts installing the driver after turning ON the IC-R8600.

NOTE:

- **DO NOT** connect the IC-R8600 to a PC through any USB hub.
- Depending on the length of a USB cable, the receiver may not operate properly even if it is recognized by the PC. Use as short a cable as possible.



◇ Confirming that the driver has been successfully installed

After the installation has been completed, use the PC's Device Manager to confirm that the driver has been successfully installed.

To open the Device Manager screen

Windows 10

1. Click the folder icon on the taskbar.
2. Right-click "This PC," and then click "Properties."
3. Click "Device Manager."

Windows 8.1

1. Click the folder icon on the taskbar.
2. Right-click "This PC," and then click "Properties."
3. Click "Device Manager."

Windows 7

1. Click the folder icon on the taskbar.
2. Right-click "Computer," and then click "Properties."
3. Click "Device Manager."

To confirm the driver

1. Open the Device Manager screen.
① If "User Account Control" is displayed, click <Yes>.
2. Confirm that "IC-R8600 I/Q OUT Port (WinUSB)" is displayed.
 - Windows 10/8.1:
Double-click "Universal Serial Bus devices."
 - Windows 7:
Double-click "USBDevice."

NOTE: If "IC-R8600 I/Q OUT Port (WinUSB)" is not displayed, the driver may not have been properly installed. Install the driver again, following "Installing the IC-R8600 USB I/Q Package for HSDR". (p. 3)

About the HSDR software operations for the IC-R8600

These instructions describe how to use the HSDR software. Before reading this guide, please read “How to use the IC-R8600 as an SDR receiver” that can be downloaded from the Icom website, for details on how to install the software and connect a receiver to the PC.

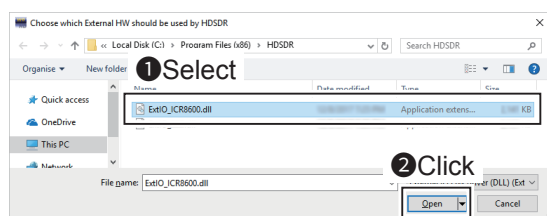
<http://www.icom.co.jp/world/support/>

① These instructions are based on using:

- Microsoft® Windows® 10
- IC-R8600 USB I/Q Package for HSDR ver 1.00
- HSDR version 2.76

Start up HSDR

1. Turn ON the receiver.
2. Double-click HSDR icon to start up HSDR.
 - ① When you use some ExtIO-DLL files, select “ExtIO_ICR8600.dll” in the displayed screen.



- ① If you use the RC-28 REMOTE ENCODER, see page 4.
- ① The receiver automatically enters to the remote control mode when the HSDR software connects to the receiver. In the remote control mode, you cannot operate the receiver on its panel.

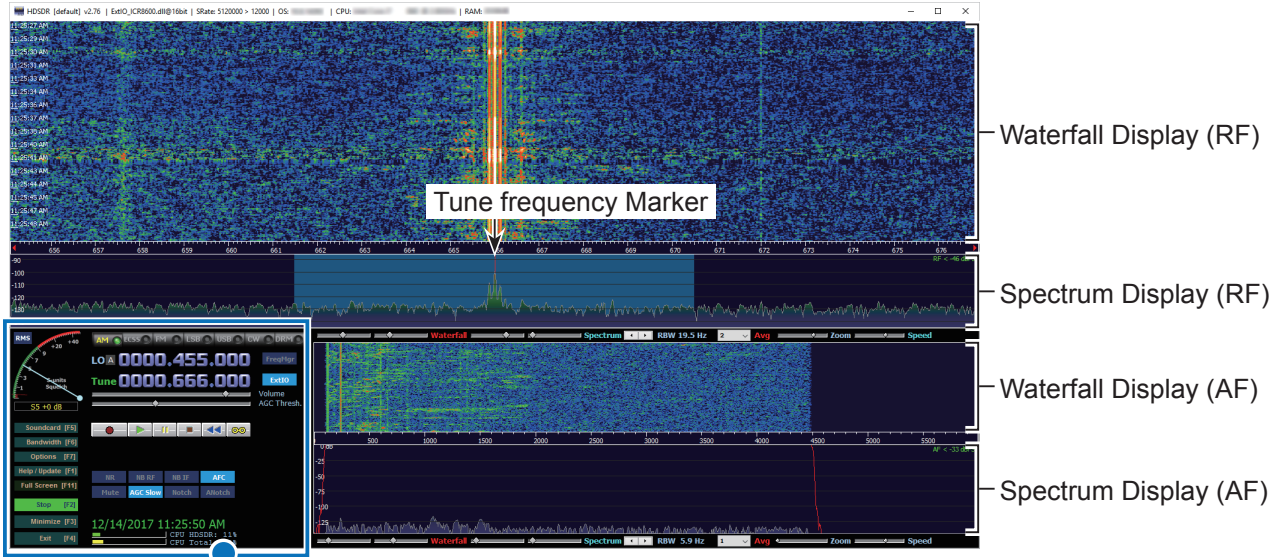
TIP: If the audio cannot be heard, push [F5] of the PC's keyboard to display the Sound Card selection screen, and then select the appropriate audio device.

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Main Screen



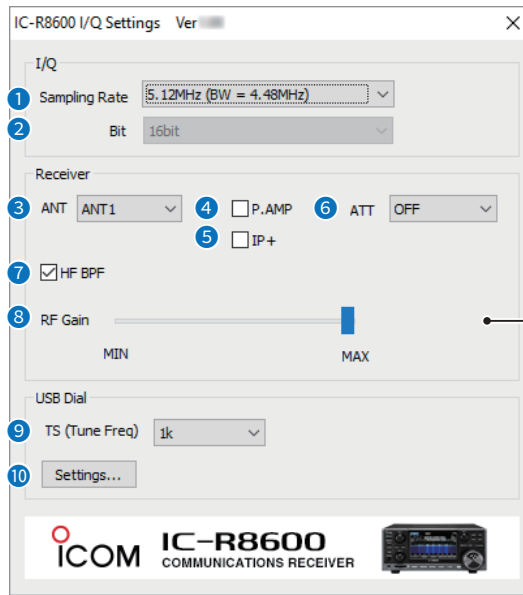
This block contains a detailed screenshot of the software control panel with several annotations:

- Click to set the Tune frequency.** (Points to the Tune frequency field)
- Click to set the LO frequency.** (Points to the LO frequency field)
- Click to select the receiving mode.** (Points to the mode selection buttons: AM, ECSS, FM, LSB, USB, CW, DRM)
- Click to display the IC-R8600 I/Q Settings screen. (p. 3)** (Points to the ExtIO button)
- Adjust the audio level.** (Points to the Volume slider)
- Click to display the Sound Card selection screen.** (Points to the Soundcard [F5] button)
- Click to select the sampling rate value.** (Points to the Bandwidth [F6] button)
- The needed output sampling rate depends on the receiving mode.** (Points to the Options [F7] button)
- Click to start or stop receiving.** (Points to the Stop [F2] button)
- Click to quit the software.** (Points to the Exit [F4] button)
- The receiver automatically returns to the normal (Local) mode after closing the software.** (Points to the Exit [F4] button)

(This is only an example.)

IC-R8600 I/Q Settings Screen

NOTE: The Receiver settings are automatically set to the receiver when the HDSDR software connects to the receiver.



1 Sampling Rate

(Default: 5.12MHz (BW = 4.48MHz))

Select the sampling rate value of the signal that is input to a PC.

- ① If the audio is interrupted, select a lower sampling rate value.
- ① If the sampling rate value is too low, a sharp spike (a DC) is displayed at the LO frequency position. See page 5 about how to remove a sharp spike.

2 Bit

(Default: 16bit)

Select bit depth of the signal that is input to a PC.

- ① If **Sampling Rate** (1) is set to “5.12MHz (BW = 4.48MHz),” bit depth is set to “16bit.”

3 ANT

(Default: ANT1)

Select antenna connector ANT1, ANT2, or ANT3.

- ① While operating between 30 and 3000 MHz frequency band, only the ANT1 connector can be used.

4 P.AMP

(Default: OFF)

Select whether or not to enable the Preamplifier function.

The preamp amplifies received signals in the receiver front end to improve the signal-to-noise ratio and sensitivity.

A preamp is used when receiving weak signals.

5 IP+

(Default: OFF)

Select whether or not to enable the IP Plus function.

The IP Plus function improves the Intermodulation Distortion (IMD) quality by optimizing the direct sampling system performance.

6 ATT

(Default: OFF)

Select the attenuator setting.

The attenuator prevents a desired signal from becoming distorted when a very strong signal is near the frequency, or when a very strong electric field, such as from a broadcasting station, is near your location.

7 HF BPF

(Default: ON)

Select whether or not to use the receiver’s BPF when operating the HF band.

- ① If an excessively strong signal is received, turn ON this function.

8 RF Gain

(Default: MAX)

Adjust the RF gain (sensitivity).

9 TS (Tune Freq)

(Default: 1k (except for FM mode)
25k (FM mode))

Select the tuning steps when you set the Tune frequency using the RC-28.

- ① If the TS function is OFF, the tuning step is set to 10 Hz.
- ① When rotating [Main dial] to set the LO frequency, the tuning step depends on **Sampling Rate** (1).

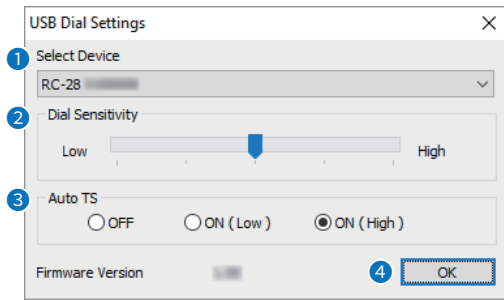
10 <Settings...>

Click to display the USB Dial Settings screen. (p. 4)

Tuning steps when you set the LO frequency using the RC-28

Sampling Rate	TS is ON	TS is OFF
5.12MHz	1MHz	100kHz
3.84MHz		
1.92MHz		
960kHz	100kHz	10kHz
480kHz		
240kHz		
120kHz		
60kHz	10kHz	1kHz
30kHz		

USB Dial Settings Screen



1 Select Device

Select the RC-28 to operate the receiver with, through the HSDR software.

2 Dial Sensitivity (Default: 3)

Adjust the dial sensitivity to one of 5 levels. When a low level is set, the dial speed is reduced for finer tuning control. When a high level is set, the dial speed increases.

3 Auto TS (Default: ON (High))

When you rotate the dial rapidly, the tuning speed may accelerate, depending on this setting.

OFF: Normal tuning steps, even during rapid rotation.

ON (Low): Approximately two times faster.

ON (High): When the tuning step is set to 1 kHz or smaller steps, the tuning speed is approximately five times faster. When the tuning step is set to larger than 1 kHz, the tuning speed is approximately two times faster.

4 <OK>

Click to save the settings and close the screen.

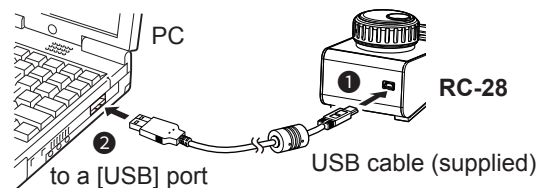
Using the RC-28

If you connect an optional RC-28 REMOTE ENCODER to the PC, you can use HSDR and feel like you are operating the actual receiver's main dial.

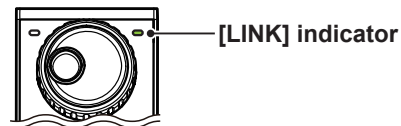
1. Connect the RC-28 to the PC that has HSDR installed.

NOTE: DO NOT connect the RC-28 to the PC with other than the supplied USB cable or through any USB hub. The RC-28 may not work properly.

- ① When you connect the RC-28 to the PC for the first time, wait until "Device driver software installed successfully." is displayed.



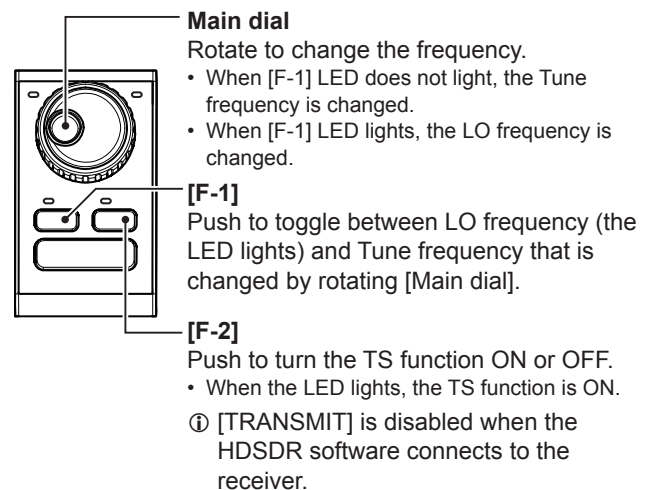
2. Start up HSDR.
 - The [LINK] indicator on the RC-28 lights green.



3. Now you can control the assigned functions of HSDR using the RC-28.

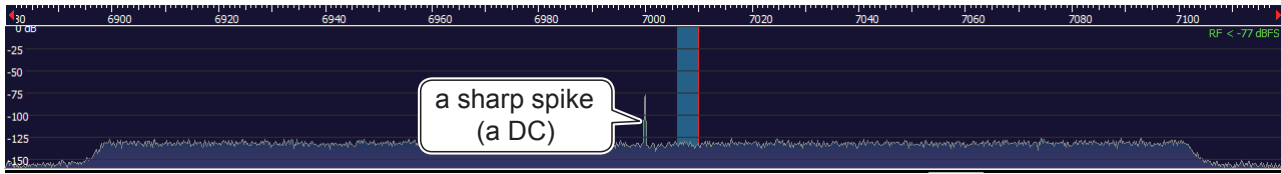
NOTE:

If the [LINK] indicator does not light, check **Select Device** in the USB Dial Settings screen is set to the RC-28's serial number. (Example: RC-28 02XXXXX)



To remove a sharp spike when setting a low sampling rate value

If the sampling rate value is too low, a sharp spike (a DC) is displayed at the LO frequency position. The DC is a constant offset in voltage, the Left and Right (I and Q) ADCs produce, due to error.



To remove the sharp spike:

- Set a higher sampling rate value.
- or
- Adjust the IQ balance. (Option [F7] → Calibration Settings → DC Removal Calibration for RX)

To adjust the IQ balance

1. Set **RF Gain** to "MIN" on the IC-R8600 I/Q Settings screen. (p. 3)
 - Only the sharp spike is displayed.
2. Open "DC Removal Calibration for RX."
3. Click the displayed mode to set "IIR-Highpass (Auto)."
 - The software automatically adjusts the IQ balance.
4. Set **Mode** to "Constant (On)."
 - ① If this setting remains "IIR-Highpass (Auto)," the software removes signals near the LO frequency.
5. Adjust **RF Gain** on the IC-R8600 I/Q Settings screen.

NOTE: When you change the sampling rate value, adjust the IQ balance again.