

What Is the Difference between NI and Ettus Research USRP Devices?

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概览

[USRP \(Universal Software Radio Peripheral\) devices](#) are industry-leading commercial off-the-shelf software defined radios (SDRs). Thousands of engineers around the world use USRP SDRs to rapidly design, prototype, and deploy wireless systems. They are marketed and sold under two different brand names: NI and [Ettus Research](#). Let's explore the different NI USRP SDRs, such as the USRP-2954, and Ettus Research USRP SDRs, such as the USRP N320.

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Introduction

以下统计表显示了NI和Ettus Research USRP SDR之间的主要区别:



Hardware	 <p>Sold as Modular Kits & Preassembled Some Units Not CE Certified Stand-Alone and Embedded Options Available</p>	 <p>Sold Preassembled CE Certified Based on Popular Configurations of NI Ettus Products</p>
Software	<p>Open-Source Software: GNU Radio, UHD, C++/Python FPGA Framework: RFNoC (Verilog/VHDL) Popular Development Tools: Redhawk, MATLAB, and Other</p>	<p>Unified Host/FPGA Design Flow with LabVIEW/LabVIEW FPGA Uses NI-USRP Driver Ability to Import/Export Third-Party Tools (MATLAB, and more)</p>
Support	<p>Open Community and Email Support Extended Support Contracts Available Extensive Online Knowledge Base: ettus.com</p>	<p>Supported by NI Technical Support Engineering Extended Support Contracts Available</p>

表1.Ettus Research SDR和NI SDR之间的主要区别

Modular Versus Preassembled Hardware

NI and Ettus Research USRP SDRs have two main hardware differences: How the hardware is delivered, and which hardware options are available.

NI USRP SDRs are sold preassembled inside an enclosure, whereas some of the Ettus Research USRP SDRs are sold modularly as kits with the RF daughterboard and motherboard sold separately. For example, the USRP-2945 from NI is the same hardware as an X310 motherboard plus two TwinRX daughterboards. Refer to Table 2 to compare the equivalent USRP models from NI and Ettus Research:

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NI Part Number	Ettus Research Part Number
n/a	B200mini/B205mini
USRP-2900	B200
USRP-2901	B210
USRP-2920	N210 and WBX
USRP-2921	N210 and XCVR2450
USRP-2922	N210 and SBX
USRP-2930	N210 and WBX and GPSDO
USRP-2932	N210 and SBX and GPSDO
n/a	N310
n/a	N320/N321
USRP-2974	USRP-2974
USRP-2940	X310 and WBX
USRP-2942	X310 and SBX
USRP-2943	X310 and CBX
USRP-2944	X310 and UBX
USRP-2945	X310 and TwinRX
USRP-2950	X310 and WBX and GPSDO
USRP-2952	X310 and SBX and GPSDO
USRP-2953	X310 and CBX and GPSDO
USRP-2954	X310 and UBX and GPSDO
USRP-2955	X310 and TwinRX and GPSDO
n/a	E310/E311/E313/E320

Table 2. NI versus Ettus Research SDR Model Numbers

One of the benefits of a preassembled USRP SDR is that, prior to shipping, the device undergoes production testing as an assembled unit; but, when it is sold as a kit, each component is tested individually. However, purchasing the motherboard and daughterboard separately offers more flexibility, as some combinations are not available as a single, preassembled device. Some of the latest, most advanced radios sold under the Ettus Research name—such as the USRP N310, USRP N320, USRP N321, and the new NI Ettus USRP X410—are solely sold as preassembled radios.

Best of Both Worlds: New NI and Ettus Research Radio Technology

The NI Ettus USRP X410 is the first in a line of new radios that combines the strength of both NI and Ettus Research. This preassembled radio supports both the popular open-source tool flows such as USRP Hardware Driver (UHD) and GNU Radio as well as LabVIEW. The new SDR is built on the Xilinx Zynq UltraScale+ RF System-on-Chip (RFSoc) and outfitted with high-performance RF transmitter and receiver hardware to deliver NI's most powerful software defined radio to date. The RFSoc provides a foundation of embedded processor and programmable FPGA, integrated with data converters (analog-to-digital/digital-to-analog converters). The quad-core Arm® processor facilitates stand-alone operation (embedded mode) or host-based mode with an external host machine to run your application.

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Figure 1. The NI Ettus USRP X410

Programming in LabVIEW Versus Open-Source Software

While the various USRP models from NI and Ettus Research are based on the same radio hardware, the software support and user preferences vary. NI USRP devices have been predominantly adopted by LabVIEW users with the NI-USRP LabVIEW driver. Ettus Research devices are supported by a common open-source UHD. In addition to these two options, both NI and Ettus Research radios have options to leverage the powerful MathWorks MATLAB® design environment.

USRP LabVIEW Tool Flow Benefits

The abstracted LabVIEW design environment helps accelerate wireless system design and makes FPGA programming accessible to those without HDL design expertise. If you have third-party IP that you want to incorporate, such as MathWorks MATLAB software or VHDL Hardware Description Language (VHDL) code, you can import it directly from LabVIEW to provide a higher-level starting point and accelerate your application design.

USRP Open-Source Tool Flow Benefits

All Ettus Research USRP SDRs and NI USRP SDRs are supported by the UHD, which is published by NI under open-source licenses. This driver facilitates application development on USRP hardware in C/C++ and offers crossplatform support for multiple industry-standard development environments and frameworks, such as RF Network-on-Chip (RFNoC), GNU Radio, HDL Coder, and MathWorks MATLAB and Simulink® software. As dual-licensed software, the UHD is available under the open-source GNU General Public License version 3 and an alternative, less-restrictive license for volume OEM customers deploying Ettus Research hardware.

While NI USRP SDRs are natively supported by the UHD, you also can [provision Ettus Research USRP SDRs with an NI equivalent to use the LabVIEW workflow](#).

Despite the native UHD support of all NI USRP SDRs, the FPGA image shipped with the unit may not be compatible with the latest version of the driver. Please check the firmware and FPGA image of each device to ensure that the UHD works properly.

Learn more about how you can [use this open-source software with Ettus software defined radios](#) to prototype multichannel wireless communication systems.

See Table 3 for a summary of supported software.

	USRP Hardware Driver	NI-USRP
OS	Windows Linux Mac OS	Windows NI Linux Real-Time
Programming Languages—Host	GNU Radio C/C++ MATLAB Software/Simulink Software Python	LabVIEW 2018 and Newer
Programming Languages—FPGA	VHDL Verilog RFNoC (Open-Source FPGA Framework)	LabVIEW FPGA

Table 3. NI and Ettus Research Driver Software Support Comparison

Summary

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Although the two brands seem distinct, the USRP SDRs under the Ettus Research brand and the NI brand are more alike than different. In both cases, the hardware is the same, and in most cases, both sets of hardware are supported by both the NI-USRP driver and the UHD.

Next Steps

- [View the Ettus Research USRP SDR Catalog](#)
- [View the NI USRP SDR Catalog](#)
- [Let's Choose the Right USRP for Your Application](#)

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