X310 Getting Started Guides

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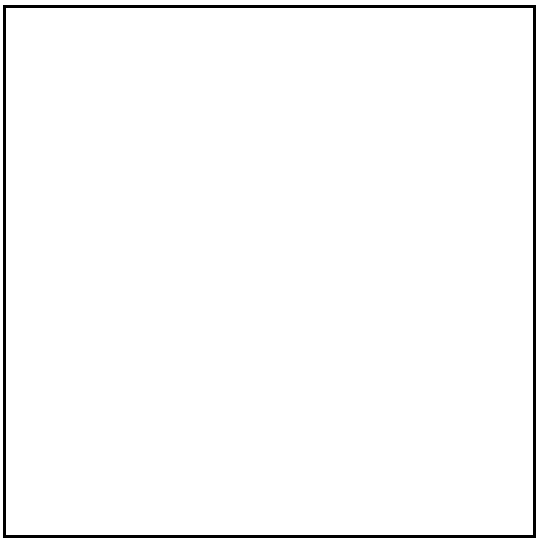
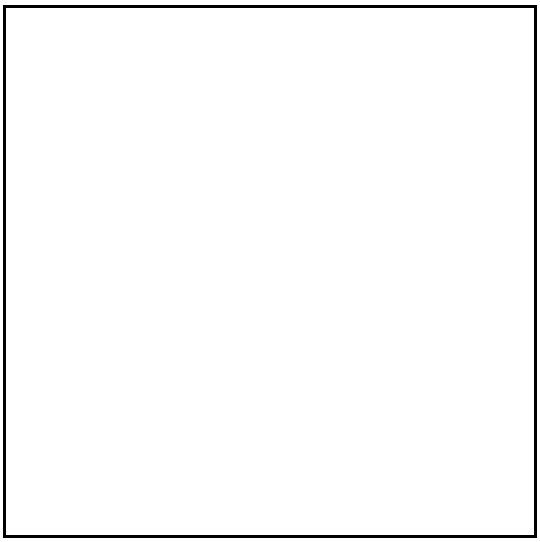
- USRP X300/X310
- 1 Gigabit Ethernet Cable
- SFP Adapter for 1 GigE
- Power Supply and US Cord
- USB 2.0 JTAG Debug Cable
- Four SMA-Bulkhead Cables
- Getting Started Guide





Make sure that your kit contains all the items listed above. If any items are missing, please contact your sales agent or Ettus Research Technical support immediately.

- A host computer with an available 1 GigE, 10 GigE, or PCI-Express port

All Ettus Research products are individually tested before shipment. The USRP? is guaranteed to be functional at the time it is received by the customer. Improper use or handling of the USRP? can easily cause the device to become non-functional. Listed below are some examples of actions which can prevent damage to the unit:

- Never allow metal objects to touch the circuit board while powered.
- Always properly terminate the transmit port with an antenna or 50? load.
- Always handle the board with proper anti-static methods.
- Never allow the board to directly or indirectly come into contact with any voltage spikes.
- Never allow any water, or condensing moisture, to come into contact with the boards.
- Always use caution with FPGA, firmware, or software modifications.

 Never apply more than -15 dBm of power into any RF input.

 Always use at least 30dB attenuation if operating in loopback configuration

The USRP X300/X310 and compatible RF daughterboards are shipped separately. To operate the device you will need to install the RF daughterboards and supplied bulkhead cables. This can be accomplished by removing the top plate of the USRP X300/X310, which is secured with two screws. After installation, the daughterboards and cables should be secured with the hardware provided. The device must be powered off when installing daughterboards to avoid potential damage. For a detailed step by step guide to assembling your X300/X310, see the USRP X Series Quick Start (Daughterboard Installation) guide.

In order to use your Universal Software Radio Peripheral (USRP?), you must have the software tools correctly installed and configured on your host computer. A step-by-step guide for doing this is available at the Building and Installing the USRP Open-Source Toolchain (UHD and GNU Radio) on Linux, OS X and Windows Application Notes. Release 3.8.4 or later of the USRP Hardware Driver, UHD, is required. It is recommended to use the latest

stable version of UHD that is available.

If you have a USB stick with the Live SDR Environment installed on it, then you may boot your host computer from that. The LiveUSB SDR Environment does not require anything to be installed on your host computer, and contains a Linux-based environment with the UHD software and the GNU Radio framework already installed. More information about the Live SDR Environment is available at the Live SDR Environment Getting Started Guides page.

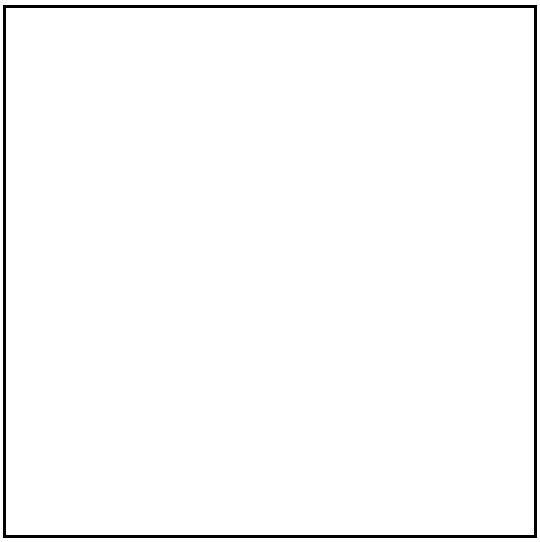
This USRP X300/X310 supports multiple, high-speed, low-latency interface options. This kit includes all of the components necessary to communicate with the device through a 1 Gigabit Ethernet interface. To setup the device, follow these basic instructions:

- Configure the host Ethernet adapter to use an IP address of "192.168.10.1" and a subnet mask of "255.255.255.0".
- Slide the SFP Adapter into the SFP "Port 0".
- Using the supplied Ethernet cable, connect the adapter to a host computer.
- The Green Led above SFP "Port 0" should illuminate.
- To test communications, ping the USRP device at address "192.168.10.2"

For more detailed on network setup, please see the section Interfaces and Connectivity of the X300/X310 Hardware Resources page. For help troubleshooting connectivity issues with your X3x0 device, see Troubleshooting X300/X310 Device Discovery Issues.

The USRP X300/X310 also supports 10 Gigabit Ethernet and PCI-Express. To use these interfaces, we recommend our high-speed interface kits. For more information about these interface kits, please see the section Interfaces and Connectivity of the X300/X310 Hardware Resources page.

Once the software tools are installed on the host computer, or using the Live SDR Environment, verify the correct operation of the USRP by running the utility programs on the host computer. More information is available at the Verifying the Operation of the USRP Using UHD and GNU Radio Application Note.



This General Purpose Input/output (GPIO) breakout kit provides access to general purpose digital I/O signals with simple terminal blocks, and a prototyping area where wires and components can be soldered. Each GPIO pin is connected to an FPGA digital line allowing it to be configured as an input, or an output, using the various software frameworks that support the USRP? GPIO.

These GPIO signals can serve the following functions:

- Control of external devices, such as power amplifiers and RF switches
- Provide output signals that can help with debugging
- Provide observables to be analyzed by oscilloscopes or other external equipment
- Accept input from external devices for local, software-based triggering
- Implement a protocol line such as SPI or I2C

- 1 GPIO Breakout Board
- 1 DB-15, 1-meter cable
- GPIO Quick Reference

The GPIO signals exposed with this breakout kit are routed directly to the USRP device's FPGA with limited protection circuitry. However, the user must take precautionary measures to ensure input/output signals meet the specifications shown in this document. Over voltage, excess current draw, and other conditions can damage the USRP device and void the warranty. Special care should be taken when the USRP is powered off.

The GPIO breakout board can be mounted directly to the DB15 connector of a USRP ? device, or mounted remotely with the cable provided in this kit. The screws on the DB15 connector of the breakout board must be removed to mount the board directly. For remote mounting, the breakout board is supplied with rubber standoffs to avoid scratching surfaces, and several through-holes for hard mounting with screws or other hardware (not provided).

When used with UHD, or other third party frameworks that leverage UHD, the GPIO expansion can be controlled with simple API calls. For more information, on the C++ API, and examples of how to use the GPIO in frameworks such as GNU Radio, please see the Application Notes section of the Ettus Research Knowledge Base.

Parameter	Typical
Configured as Input	
Default Voltage Standard	3.3V LVCMOS
Voltage High Threshold	2.0V
Voltage Low Threshold	0.8V
Voltage Input Limits (no damage)	-0.3V/3.45V
Configured as Output	
Voltage Standard	3.3V LVCMOS
Voltage High Output	2.8V
Voltage Low Output	0.4V
Current Source Capability	5 mA

Output Source Impedance	>33 ohms typical