Technical FAQ

Contents

For the UHD Getting Started documentation please refer to:

uhd.ettus.com

UHD Manual

For the GNU Radio Getting Started documentation please refer to:

http://gnuradio.org/redmine/projects/gnuradio/wiki

For information specific to the USRP E100 series please refer to:

http://ettus-apps.sourcerepo.com/redmine/ettus/projects/usrpe1xx/wiki

Our current USRP product line includes the Bus Series with the USRP1and USRP B100, the Embedded Series with the USRP E100 and E110 hardware and the Networked Series including the USRP N200 and N210 software defined radios. There are many factors to consider when selecting the appropriate USRP model. Several specifications to differentiate each USRP device are listed below.

- 16 MHz of RF bandwidth with 8 bit samples
- 8 MHz of RF bandwidth with 16 bit samples (RX Only)
- USB 2.0 high speed connectivity
- MIMO with a single USRP device the motherboard has two daughterboard slots (2 RX + 2 TX connectors)
- FPGA: Altera Cyclone
- ADCs: 12-bits 64 MS/s
- DACs: 14-bits 128 MS/s

- 16 MHz of RF bandwidth with 8 bit samples
- 8 MHz of RF bandwidth with 16 bit samples
- USB 2.0 high speed connectivity
- Motherboard has one RTX daughterboard slot (1 RX + 1 TX connectors)
- Onboard FPGA processing
- FPGA: Xilinx Spartan 3A-1400 FPGA
- ADCs: 12-bits 64 MS/s
- DACs: 14-bits 128 MS/s
- Ability to lock to external 5 or 10 MHz clock reference
- TCXO Frequency Reference (~2.5ppm)
- Flexible clocking from 10 MHz to 64 MHz
- FPGA code can be changed with Xilinx® ISE® WebPACK? tools

- (EOL ? this product is no longer available for sale through Ettus Research)
- 50 MHz of RF bandwidth with 8 bit samples
- 25 MHz of RF bandwidth with 16 bit samples
- Gigabit Ethernet connectivity
- MIMO capable - requires two or more USRP2 devices as motherboard has one daughterboard slot (1 RX + 1 TX connectors)
- Onboard FPGA processing
- FPGA: Xilinx Spartan XC3S2000
- ADCs: 14-bits 100 MS/s
- DACs: 16-bits 400 MS/s
- Ability to lock to external 5 or 10 MHz clock reference

- 50 MHz of RF bandwidth with 8 bit samples
- 25 MHz of RF bandwidth with 16 bit samples
- Gigabit Ethernet connectivity
- MIMO capable - requires two or more USRP N200 devices as motherboard has one daughterboard slot (1 RX + 1 TX connectors)
- Onboard FPGA processing
- FPGA: Xilinx Spartan XC3SD1800A
- ADCs: 14-bits 100 MS/s
- DACs: 16-bits 400 MS/s
- Ability to lock to external 5 or 10 MHz clock reference
- TCXO Frequency Reference (~2.5ppm)
- Optional internal GPS locked reference oscillator
- FPGA code can be changed with Xilinx® ISE® WebPACK? tools

- 50 MHz of RF bandwidth with 8 bit samples
- 25 MHz of RF bandwidth with 16 bit samples
- Gigabit Ethernet connectivity
- MIMO capable - requires two or more USRP N210 devices as motherboard has one daughterboard slot (1 RX + 1 TX connectors)
- Onboard FPGA processing
- FPGA: Xilinx Spartan XC3SD3400A
- ADCs: 14-bits 100 MS/s
- DACs: 16-bits 400 MS/s
- Ability to lock to external 5 or 10 MHz clock reference
- TCXO Frequency Reference (~2.5ppm)
- Optional internal GPS locked reference oscillator
- FPGA code can only be changed with the paid version of the Xilinx® ISE® Design Suite tools

- Designed for embedded applications (runs a full distribution of Linux)
- 720 MHz OMAP3 (ARM Cortex A8 processor & TI C64x+ DSP)
- 512MB RAM
- 4GB microSD Card
- 100 Mbit Ethernet connectivity
- Motherboard has one RTX daughterboard slot (1 RX + 1 TX connectors)
- Onboard FPGA processing
- FPGA: Xilinx Spartan XC3SD1800A
- ADCs: 12-bits 64 MS/s
- DACs: 14-bits 128 MS/s
- TCXO Frequency Reference (~2.5ppm)
- Flexible clocking from 10 MHz to 64 MHz

- Designed for embedded applications (runs a full distribution of Linux)
- 720 MHz OMAP3 (ARM Cortex A8 processor & TI C64x+ DSP)
- 512MB RAM
- 4GB microSD Card
- 100 Mbit Ethernet connectivity
- Motherboard has one RTX daughterboard slot (1 RX + 1 TX connectors)
- Onboard FPGA processing
- FPGA: Xilinx Spartan XC3SD3400A
- ADCs: 12-bits 64 MS/s
- DACs: 14-bits 128 MS/s
- TCXO Frequency Reference (~2.5ppm)
- Flexible clocking from 10 MHz to 64 MHz

The GPSDO kit is compatible with a specific set of USRP models and revisions. Compatibility is determined by hardware characteristics, and therefore incompatible models cannot be upgraded to be made compatible. Before purchasing a GPSDO kit please verify whether it will be compatible with the USRP device you intend to use with it. The compatible models and revisions are:

- USRP N200 Rev 2.0
- USRP N200 Rev 3.0
- USRP N200 Rev 4.0

- USRP N210 Rev 2.0
- USRP N210 Rev 3.0
- USRP N210 Rev 4.0

- USRP E100 Rev 4.0
- USRP E110 Rev 4.0

Please note the USRP hardware revision is on the label on the back of the unit.

The GPSDO kit is not compatible with the USRP1, USRP2, USRP B100 and any revision of the USRP N200/210 and E100/110 series not listed above.

The available resources on the FPGA will vary depending on the code written for it. Based on the 27 March 2012 FPGA code build, the following resources are available:

- General Logic
- Memory: 3% free
- DSP Resources: The FPGA does not have DSP resources

- General Logic:
  - Flip Flops: 41% free
  - LUTs: 9% free
- Memory: 52% free

- DSP Resources: 64% free

- General Logic:
    - ♦ Flip Flops: 59% free
    - ♦ LUTs: 37% free
- Memory: 68% free
- DSP Resources: 76% free

- General Logic:
    - ♦ Flip Flops: 55% free
    - ♦ LUTs: 39% free
- Memory: 25% free
- DSP Resources: 67% free

- General Logic:
    - ♦ Flip Flops: 69% free
    - ♦ LUTs: 78% free
- Memory: 50% free
- DSP Resources: 78% free

- General Logic:
    - ♦ Flip Flops: 29% free
    - ♦ LUTs: 6% free
- Memory: 10% free
- DSP Resources: 13% free

The default username and password for the USRP E100 and USRP E110 of the Embedded Series is:

- Username: root
- Password: usrpe

All new hardware designed or updated after the release of the UHD (USRP Hardware Driver) will only be supported by UHD.

Currently the following daughterboards require the UHD driver:

- TVRX2, Dual 50-860 MHz receiver
- DBSRX2, 800-2400 MHz receiver
- SBX, 400 MHz to 4.4 GHz Transceiver

All daughterboards are compatible with all USRP models except for the first 500 USRP1 software defined radios manufactured in 2005. At that time all daughterboards had an onboard local oscillator so the USRP1 did not provide a clock signal required by most of the current daughterboards. The only daughterboards currently compatible with the first 500 USRP1 are the BasicRX, BasicTX, LFRX and LFTX as they do not require a clock signal.

To identify if you have one of the first 500 USRP1 devices, please refer to the serial number as it will be between 1 and 500.

Although unsupported, a workaround exists and can be accessed on the following page: USRP Serial Below 500 on GNU Radio

Yes, we have antennas for nearly every daughterboard which we sell. Please see the ordering page for pictures and specifications.

The UHD (USRP Hardware Driver) supports all Ettus Research hardware on the following operating systems:

- Linux (2.6 kernel, any distribution)
- Mac OSX (PPC and Intel)
- Windows 7/Vista/XP/2000
- NetBSD and FreeBSD

Primary development is done on Linux.

Yes. Schematics for select USRP devices and daughterboards are available. You can find them here:

http://files.ettus.com/schematics

The USRP hardware is sold as test equipment. If you choose to use your USRP hardware and daughterboards to transmit using an antenna, it is your responsibility to make sure you are in compliance with all laws for the country, frequency and power levels in which the device is used. Additionally, some countries regulate reception in certain frequency bands. Again, it is the responsibility of the user to maintain compliance with all local laws and regulations.

The most direct and easy way to create a complete radio system is to use one of our complete RF frontend daughterboards including the TVRX2, DBSRX2, WBX, SBX, RFX-series and XCVR2450.

However, you can use the BasicRX and BasicTX with your own external RF hardware. For reception, a gain and filtering must be added in the front of the BasicRX daughterboard. This can be done pretty easily with Mini-Circuits® parts, or the 10.7 MHz IF output of common scanners and receivers. The BasicRX board handles signals up to around 300MHz directly. For higher frequencies downconverting is needed.

Yes, the BasicTX will put out about 1mW up to about 50 MHz. A simple connectorized amplifier (Mini-Circuits®, for example) will achieve a greater range. You may also want to add some filtering.

All current USRP software defined radios require 6V at 3A. The USRP power supply shipped with all USRP software defined radios has the following specifications:

- Input: 90-264 Vac at 50 to 60Hz
- Output: 6Vdc at 3A
- Interchangeable input plugs provided: NA, EU, UK, AU
- Safety Approvals: UL/cUL, GS, CE, FCC, RCM
- EMC/EMI: FCC class B, CE, VCCI class II

The DC plug is a 2.1mm center conductor, 9.5mm barrel, 5.5mm outer diameter standard plug.

The USRP power supplies accept 90-264Vac at 50 or 60Hz, and come with interchangeable plugs that allow use in most parts of the world.

Not all SD Cards are compatible with the USRP2; therefore we recommend using the Kingston 2GB SD cards with part number KGS SD2GB as we have found they work reliably. For our customers' convenience, we still stock replacement SD cards available for $10. Please contact sales@ettus.com if you require a replacement SD card.

Add this please