Ettus Research

USRP2

The Next Generation of Software Radio Systems

THE USRP2

The USRP2 builds on the success of the original USRP, offering higher performance and increased flexibility at a very low price. Higher-speed and higher precision ADCs and DACs allow for wider band signals while at the same time increasing dynamic range. A large field programmable gate array (FPGA) which is optimized for DSP applications allows for processing complex waveforms at high sample rates. A Gigabit Ethernet interface allows applications to simultaneously send 50 MHz of RF bandwidth in and out of the USRP2.

In the USRP2, high sample rate processing, like digital up- and down conversion, takes place in the FPGA. Lower sample rate operations can be performed on the host computer, or can even be done in the FPGA, which contains a 32-bit RISC microprocessor and has a significant amount of free space for user designs. The larger FPGA allows the USRP2 to be used as a standalone system without a host computer in many cases. USRP2 configurations and firmware are stored in a Secure Digital (SD) flash card, to allow for easy programming without special hardware.

Multiple USRP2 systems can be connected together to form fully coherent multiple antenna systems for MIMO with as many as 8 antennas. The master oscillator can be locked to an external reference, and there is a 1 pulse per second (1PPS) input for precise timing applications.

FEATURES

- Two 100 MS/s 14-bit analog to digital converters
- Two 400 MS/s 16-bit digital to analog converters
- Digital downconverters with programmable decimation rates
- Digital upconverters with programmable interpolation rates
- Gigabit Ethernet Interface
- 2 Gbps high-speed serial interface for expansion
- Capable of processing signals up to 100 MHz wide
- Modular architecture supports a wide variety of RF daughterboards
- Auxiliary analog and digital I/O support complex radio controls such as RSSI and AGC
- Fully coherent multi-channel systems (MIMO capable) with up to 8 antennas
- 1 Megabyte of on-board high-speed SRAM

HARDWARE

The USRP2 can simultaneously receive and transmit on two antennas in real time. All sampling clocks and local oscillators are fully coherent, thus allowing you to create MIMO (multiple input, multiple output) systems.

In the USRP2, high sample-rate processing takes place in the field programmable gate array (FPGA), while lower sample-rate processing happens in the host computer. The two onboard digital downconverters (DDCs) mix, filter, and decimate (from 100 MS/s) incoming signals in the FPGA. Two digital upconverters (DUCs) interpolate baseband signals to 100 MS/s before translating them to the selected output frequency. The DDCs and DUCs combined with the high sample rates also greatly simplify analog filtering requirements.

Daughterboards mounted on the USRP2 provide flexible, fully integrated RF front-ends. A wide variety of available daughterboards allows you to use different frequencies for a broad range of applications.

Available daughterboards include:

- BasicRX: Receiver for use with external RF hardware
- BasicTX: Transmitter for use with external RF hardware
- LFRX: DC to 30 MHz receiver
- LFTX: DC to 30 MHz transmitter
- TVRX: 50 to 860 MHz receiver
- DBSRX: 800 MHz to 2.4 GHz receiver

- WBX: 50 MHz to 2.2 GHz transceiver
- RFX400: 400-500 MHz transceiver
- RFX900: 750-1050 MHz transceiver
- RFX1200: 1150-1450 MHz transceiver
- RFX1800: 1.5-2.1 GHz transceiver
- RFX2400: 2.3-2.9 GHz transceiver
- XCVR2450: 2.4 GHz and 5 GHz dual-band transceiver

OPEN SOURCE

The entire USRP2 design is open source, including schematics, firmware, drivers, and even the FPGA and daughterboard designs. When combined with the open source GNU Radio software, you get a completely open software radio system enabling host-based signal processing on commodity platforms. No software or licenses need to be purchased. It provides a complete development environment to create your own radios.

While most often used with GNU Radio software, the USRP2 is flexible enough to accommodate other options. Some users have created their own SDR environments for the USRP2, while others have integrated the USRP2 into the LabView and Matlab/Simulink environments.

SPECIFICATIONS

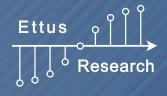## Supported Operating Systems
- Linux
- Mac OS X

Input
2 input Channels or 1 I-Q Pair

Sample Rate:	100 Ms/s
Resolution:	14 bits
SFDR:	88 dB

Output
2 Output Channels or 1 I-Q Pair

Sample Rate:	100 Ms/s
Resolution:	16 bits
SFDR:	80+ dB

Auxiliary I/O
High-Speed Digital I/O: 32 bits
Analog Input: 4 channels
Analog Output: 4 channels

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