RFSPACE CLOUDSDR

GETTING STARTED GUIDE

Table of Contents

Legal Notices

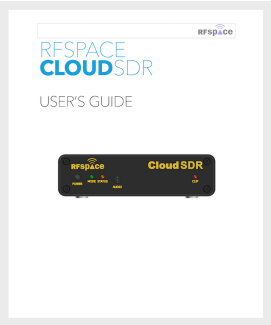
This User Guide provides user information and is provided "as is." RFSPACE and its affiliated companies, directors, officers, or employees assume no responsibility for any typographical, technical, content or other inaccuracies in this User Guide. RFSPACE reserves the right to revise this User Guide or withdraw it at any time without prior notice. The latest version can be found at www.rfspace.com.

Warranty Period

RFSPACE warrants this hardware product against defects in materials and workmanship under normal use for a period of ONE (1) YEAR from the date of retail purchase by the original end-user purchaser . If a hardware defect arises and a valid claim is received within this Warranty Period, at its option and to the extent permitted by law, RFSPACE will either (1) repair the hardware defect at no charge, using new or parts equivalent to new in performance and reliability, (2) exchange the product with a product that is new or equivalent to new in performance and reliability and is at least functionally equivalent to the original product, or (3) refund the purchase price of the product. When a product or part is exchanged, any replacement item becomes your property and the replaced item becomes RFSPACE's property. When a refund is given, the product for which the refund is provided must be returned to RFSPACE and becomes RFSPACE's property.

Supplied Accessories

The CloudSDR ships with a US prong 4.5V or 5.0V power supply and Ethernet cable. The power supply is 90-264 Volt capable and can be used with a plug adapter for use in other countries. The SpectraVue and CloudSetup software is available online at http://www.rfspace.com.



Precautions

CAUTION! There are no user replaceable parts inside.

CAUTION! Never put the receiver in any unstable place . This may cause damage to the receiver or might cause personal injury.

CAUTION! Never exceed 5.5 volts on DC input jack. Internal circuitry will shut down the radio, but damage might still occur.

CAUTION! Never transmit into the antenna input connector or transmit into antennas in close proximity to the CloudSDR antennas. This might cause damage to the sensitive front end circuitry. When using adjacent antennas, make sure an RF limiter or relay is installed on the RF input port. Damage to input RF circuitry might result in costly repairs.

CAUTION! Never operate the receiver with wet hands. Make sure antenna does not touch high voltage power lines.

WARNING! Do not store or operate the device at temperatures below 0°C (+32°F) or above +40°C (+104°F).

Hardware Specifications

SPECIFICATIONS		
Direct sampling frequency range	0.009 - 56 MHz	
Antenna ports	0.009 - 56 MHz, 56 - 1002 MHz	*HF, VHF-UHF (Usable to 1600 MHz)*
ADC Fs / SNR / SFDR	122.88 MHz / 74 dBFS / 91 dB	
I/Q mode output sample rates	0.00375 MHz - 1.2288 MHz	*24 bit processing/output IQ pairs*
	2.048 MHz	*24 bit processing, 16 bit output IQ pairs*
Spectrum analyzer I/Q modes	2.458 MHz - 12.288 MHz	*16 bit / 131072 FFT points*
Spectrum analyzer real mode	56 MHz wide / 122.88 MHz sample rate	*16 bit / 262144 FFT point*
Minimum discernible signal	-137 dBm/Hz / -135 dBm/Hz	*in 500 Hz BW PGA on/off at 15 MHz*
Clipping point	-15 dBm	*at 30 MHz*
Cloud mode audio compression	G726,G711, Raw	*phase continuous*
Cloud mode demodulation	AM,FM,WFM,SSB,CW,SAM,DSB,ASK,OOK,PSK31,RAW IQ	
Cloud mode audio rates	16 kb/s - 64 kb/s	audio is 8 KHz sample rate
Cloud mode RAW IQ	500 samples/sec - 16 ksamples/sec	*at 8 bits resolution after AGC*
Cloud mode spectrum display	0.001 MHz - 10 MHz wide / 4096 FFT points	*with simultaneous demod*
TCXO	<2.5ppm over 0-40 °C	
Remote server boot time	10 seconds	*availability online after power cycle*
Power comsumption	4.5 - 5 Volts - 0.8 Amps	
Compliance	CE, FCC, IC	
Dimensions	4.8 x 4.0 x 1.2 inches	
Serial Port	RS-232 levels for external radio control and debug	
Warranty	1 year parts and labor. International shipping paid by customer	

Introduction

The CloudSDR radio is a high performance networked software defined radio with 0.009-56 MHz and 56-1002 MHz frequency coverage (usable to 1600 MHz+). The CloudSDR uses a high performance ADC running at 122.88 MHz with an optimized frontend. The output IQ bandwidth is configurable via software up to a maximum of 1.288 MHz at 24 bits or 2.048 MHz at 16 bits. All internal processing and filtering is done using 24bit IQ pairs. PC communications are handled over a 100 base-T port using TCP control packets. The IQ streams to the PC via UDP packets.

The CloudSDR is compatible with the SpectraVue, SDR-Radio, SDR#, CuteSDR, gnu GNURADIO and other software. The SpectraVue software includes demodulation and I/Q capture of spectrum at up to a 2.048 MHz BW. For those interested in writing their own applications, RFSPACE supplies a fully documented protocol for communicating with the hardware as well as an open source application for MacOS, Windows and Linux. The CloudSDR just needs the center frequency, attenuator, output sample rate and mode to begin streaming data. The CloudSDR utilizes straight TCP/IP/UDP and ethernet for all communications. This offers the highest possible performance due to the highly optimized ethernet drivers on PC, Mac and Linux systems.

The CloudSDR packets are fully routable. This means that the receiver can be placed at remote locations. Multiple receivers can also be combined and it's data transported over a higher data rate ethernet pipe using simple switches and routers. In this application, each CloudSDR can be set to a different IP address or port.

The CloudSDR includes a low bandwidth internet mode for remote operation. In this mode, the radio performs all demodulation and spectral FFTs onboard. The compressed data is then sent to the client over a TCP link. This allows the placement of the CloudSDR anywhere in the world with an internet connection. The RemoteSDRclient and Android SDRanywhere applications are used as clients.

Front Panel

1. Mode LED indicator. Used to indicate if the receiver is booting or operating in IQ or Cloud mode.
2. Status LED indicator. Used to indicate if the receiver is connected and active.
3. Stereo audio jack. Used to monitor the demodulated audio in Cloud mode or to output IQ baseband.
4. Clip LED indicator. Blinks red if the ADC full scale level is exceeded. Select the minimum attenuator required to minimize clipping. Do not exceed max input levels to prevent input circuitry damage. The clip LED also blips during external or internal triggering or to show a missing 10 MHz external reference when enabled.

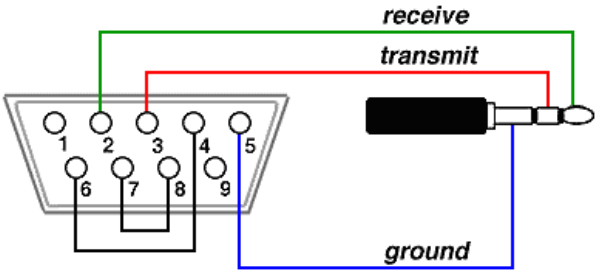
Rear Panel

5. HF/VHF input SMA connector. This is the RF input connector for 0.009 - 56 MHz.

6. Trigger/1PPS input. This connector is used to trigger IQ captures or tag the IQ stream (TBD). Max level is 3.3V LVTTL/LVCMOS.

7. VHF/UHF input SMA connector. This is the high frequency RF input connector for 56 - 1002+ MHz.

8. Bidirectional RS-232 3.5mm control jack. This port is used for debug and external radio control. Connection diagram shows wiring used to connect to PC. Switch pins 2/3 to connect to a radio or use a null modem adapter.



9. 100 Base-T Ethernet connection. Connects to PC or router for IQ mode. Connects to WAN or router for Cloud mode.

10. Reference input connector. This input is used to frequency lock the CloudSDR to 10 MHz. +1V max.

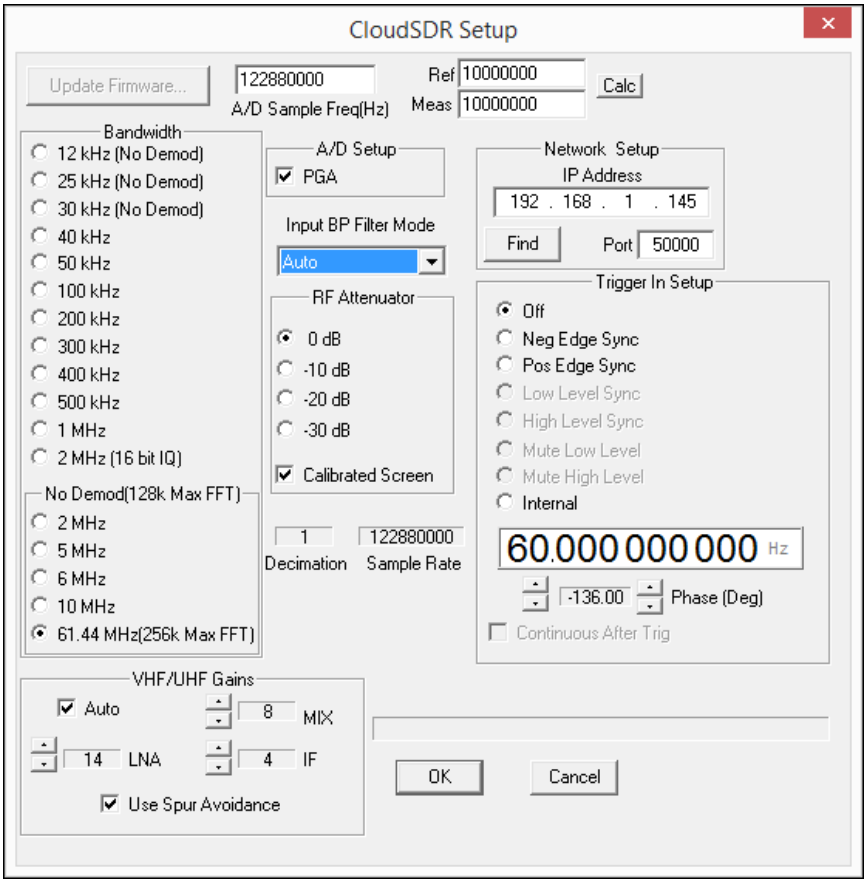
11. Power input. 4.5V - 5.0V input. Do not exceed 5.5 Volts or radio will power off.

Installation

The CloudSDR ships configured for IQ streaming mode and with DHCP turned on. This mode is the most common mode of operation. In this mode, the radio streams the raw IQ stream to the PC where software like SpectraVue processes the data.

Connect the CloudSDR Ethernet port to the router and connect the power cable to the CloudSDR. The radio will obtain an IP address from the DHCP server. Open SpectraVue and select the CloudSDR Set-up. The Find button will search for the CloudSDRs present in the network. Select the CloudSDR you wish to operate and click OK. Exit the setup menu and start SpectraVue by pressing Start or F12.

If you need to configure the CloudSDR with a manual IP address or you wish to connect the CloudSDR directly to a PC, follow the instructions for the CloudSetup application on the next page.

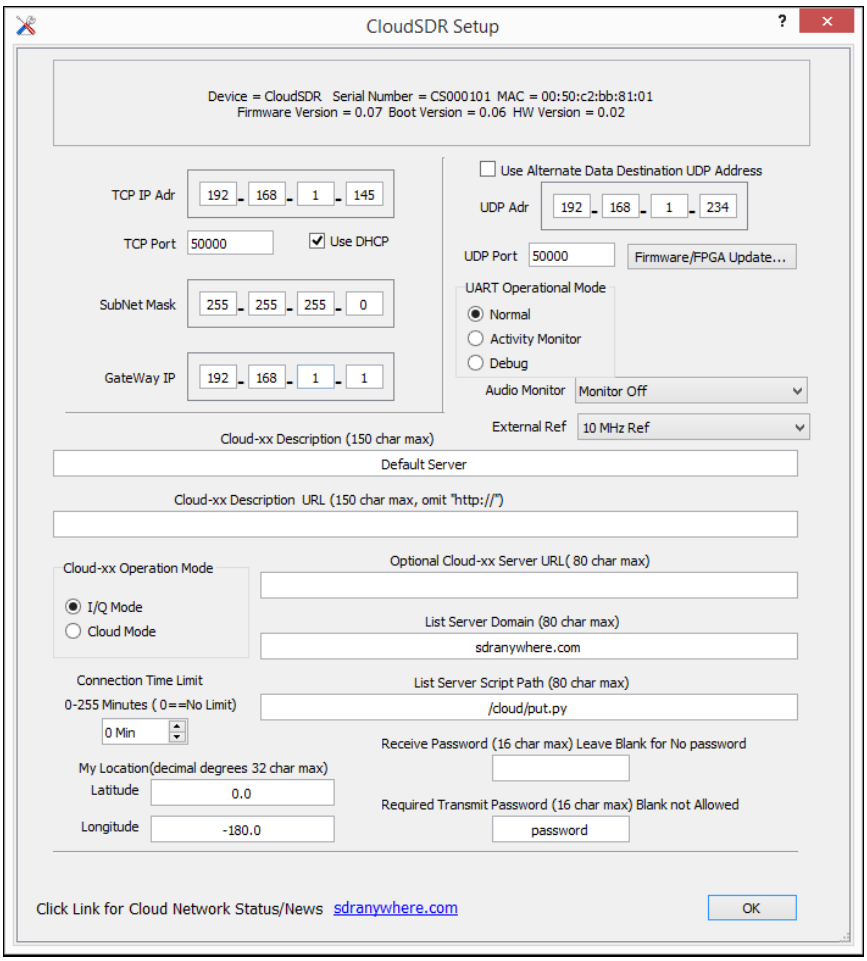


CloudSDR Setup in SpectraVue software.

CloudSetup Application

The CloudSetup application is used to configure the CloudSDR mode of operation, network parameters and input/output connectors. The I/Q mode is used to communicate with software like SpectraVue. The Cloud mode, enables the internal low bandwidth server mode so that the CloudSDR can be accessed over the internet using software like RemoteSdrClient or SDRanywhere.

This application is also used for firmware upgrades and to enable and disable the 10 MHz reference and control port. There is a full software manual for it in the CloudSDR section of the RFSPACE webpage.

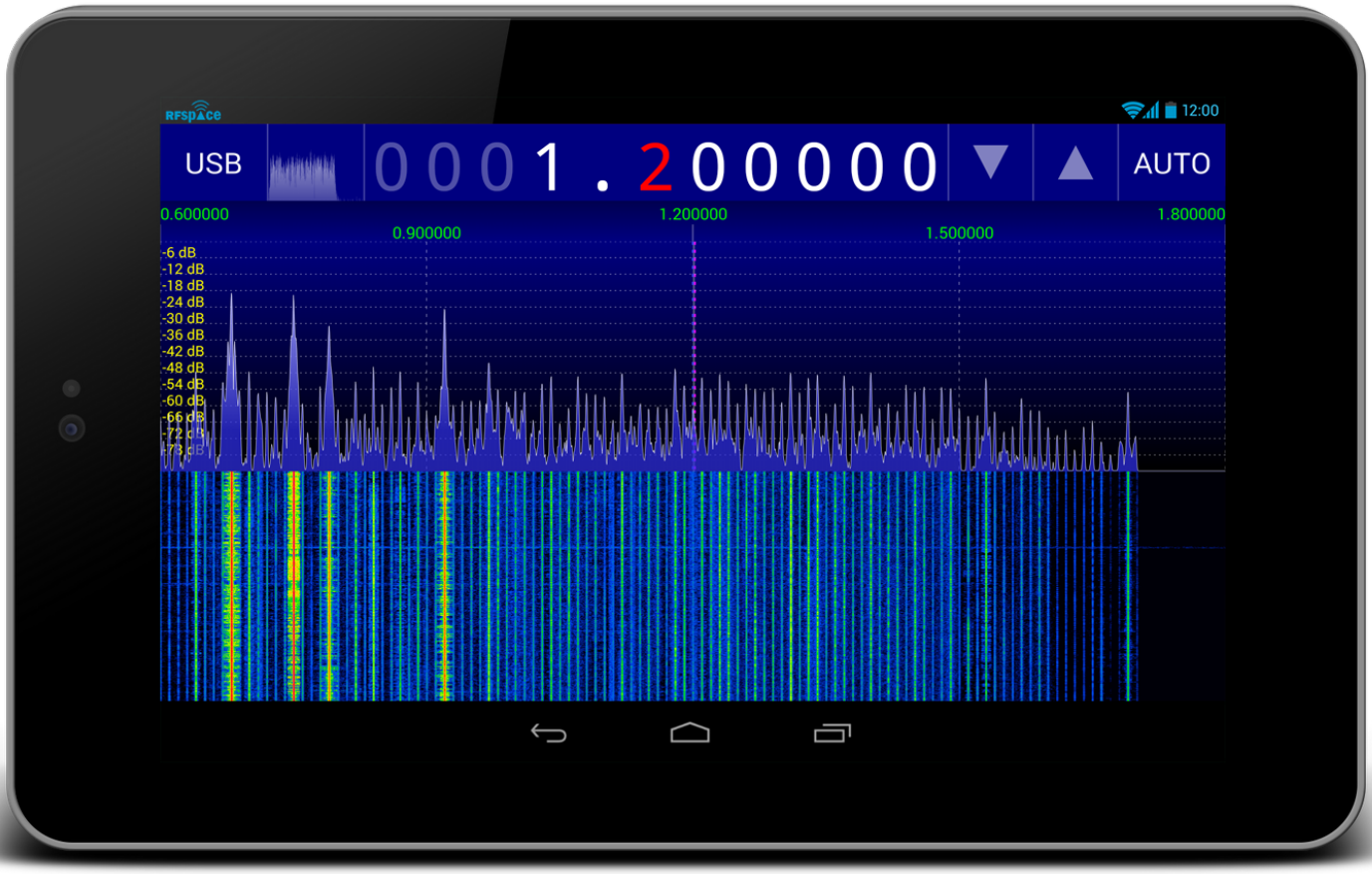


CloudSetup software.

SDRanywhere Android App

The SDRanywhere application is an Android app that allows remote operation of an RFSPACE CloudSDR radio from anywhere in the world. The SDRanywhere application receives the demodulated audio and waterfall information from a remote radio.

To download. Browse to http://www.sdranywhere.com and install the .APK file from your Android device.



CloudSDR Interface Specs

Please contact info@rfspace.com for the latest version of the CloudSDR Interface Specification Document.

CuteSDR

RFSPACE supplies a simple, open-source application for the CloudSDR radio. This application is written using the QT framework and will compile for MacOS, Windows and Linux operating systems. This software is supplied with a free license to be used by RFSPACE customers wishing to create their own applications.

information at : http://sourceforge.net/projects/cutesdr/

RemoteSDRclient

RFSPACE supplies a simple, open-source application for the CloudSDR radio operating in the low bandwidth Cloud mode. This application is written using the QT framework and will compile for MacOS, Windows and Linux operating systems. This software is supplied with a free license to be used by RFSPACE customers wishing to create their own applications.

information at : http://sourceforge.net/projects/remotesdrclient/files/

Compliance

This equipment has been tested and found to comply with the limits for a Class B digital device as applicable, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. The user must use the accessories and cables supplied by the manufacturer to get optimum performance from the product.

FOR HOME OR OFFICE USE