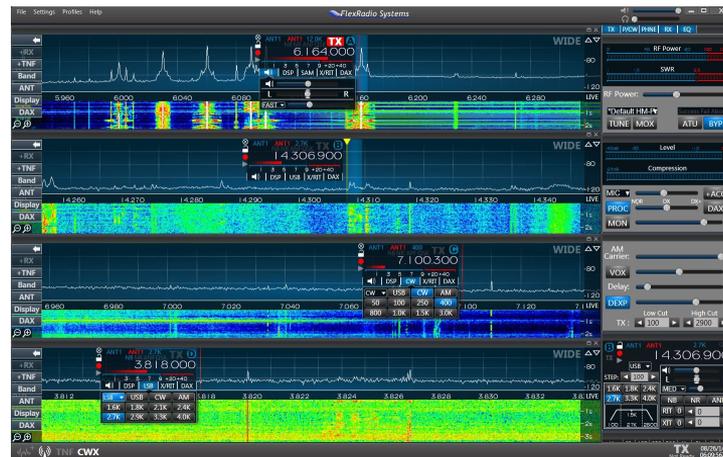




SDR & Flex Radio

SLSRC Meeting 10/27/17

Kyle Krieg (NØKTK)
www.nøktk.com
kylekrieg@gmail.com





What is a SDR?

SDR (Software Defined Radio) - is a radio where components that have been traditionally implemented in hardware (mixers, filters, amps, modulators/demodulators, detectors, etc), are instead implemented in software.



ICOM 7300



FlexRadio 6000 series



What makes an SDR a SDR?

Modulation using software & changeable? - YES

Digital Signal Processing in software? - YES

Control surface reconfigurable? - YES

Can add new features & new controls - YES

Radio controlled by software? - YES





Benefits of SDR's

Would your radio allow you to transmit a new mode? (FM, AM, SSB, CW). Most radios have fixed modes.

Does your radio allow you to define the button/knob settings? Most radios are vendor defined buttons & knobs.

Does your radio allow you to add a new feature or control?
Most radios have fixed features.





Disadvantages of SDR's

Must have a computer or interface to control the radio.

Analog to digital conversion and CPU clock cycles comes at a price.

Software reliability instead of a hardware based solution.

User adaption, I NEED KNOBS!





Getting Started - What do I need?



Computer - any computer made in the past 5 years can run almost any of the SDR software packages



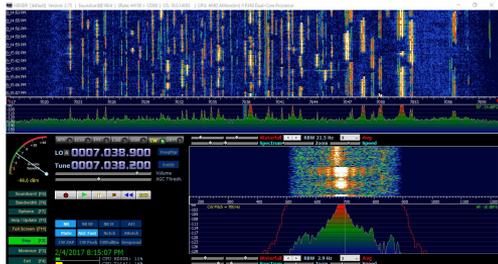
SDR Software - downloaded from the internet, typically a free open source package



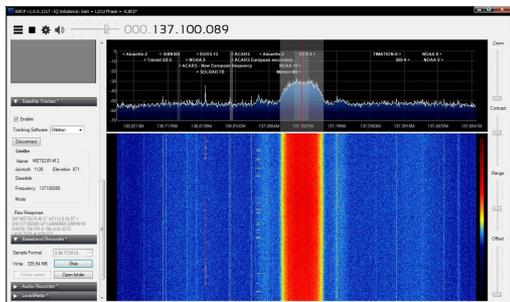
SDR Dongle - typically a USB hardware device with small antenna attached



SDR Software



HDSDR - www.hdsdr.de. Free SDR software, most popular, has built in drivers for most of the RTL-SDR dongles and IF output.



SDR# - www.sdrplay.com. Free SDR software. Designed to work with Airplay SDR, but will work with almost any RTL-SDR hardware.

For Mac and Linux try the following SDR packages : Linrad & GQRX



SDR Hardware



RTL-SDR - www.rtl-sdr.com. Amazon \$25 bucks, can be used with almost any SDR software package. Good cheap entry level dongle.



SDRPlay- www.sdrplay.com \$200, can be used with almost any SDR software package. Really good reviews with SDR community.



SDR Hardware (cont')



Kiwi SDR - www.kiwisdr.com. \$299, software is open source and very configurable. Can stream signals to the web via sdr.hu account. Hardware is a Beagle board + SDR add on.



Hack RF - www.greatscottgadgets.com. \$350, open source. One of the original SDRs in the hacker community. Has very minimal TX (50mA) capabilities.



Amateur Radio SDR's (RX/TX)



ELAD FM Duo

<http://shop.elad-usa.com/>

HF + 6m
QRP
Cost \$1200



ICOM IC7300

<http://shop.elad-usa.com/>

HF + 6m
100W
#15 on Sherwood
Engineering Receiver Test
Cost \$1400



FlexRadio 6000 Series

<http://www.flexradio.com>

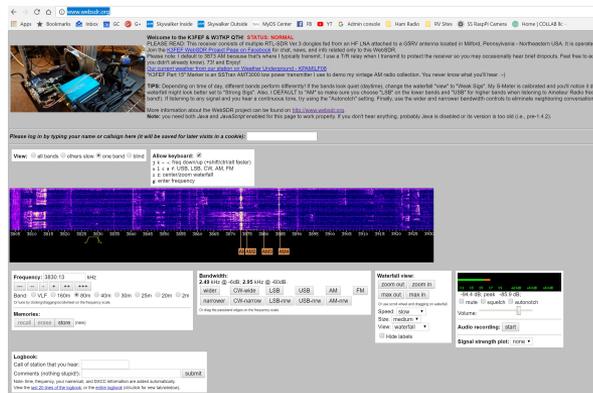
HF + 6m
100W
#1 on Sherwood
Engineering Receiver Test
Cost \$2000 to \$7000



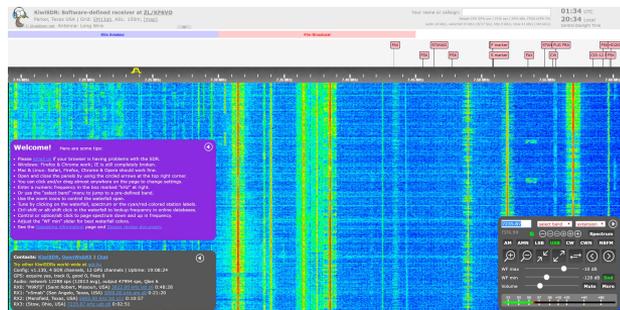
SDR Resources (Web Listening)



WebSDR - <http://www.websdr.org/>



Kiwi SDR - WebSDR - <http://http://kiwisdr.com/>





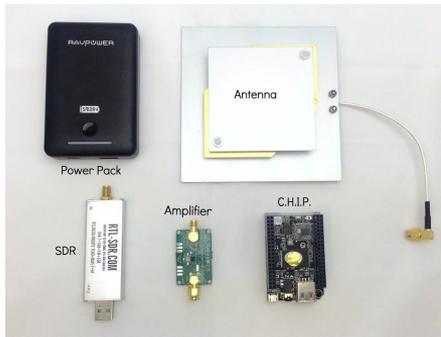
SDR Projects (Non Amateur Radio)



Flight Aware

www.flightaware.com

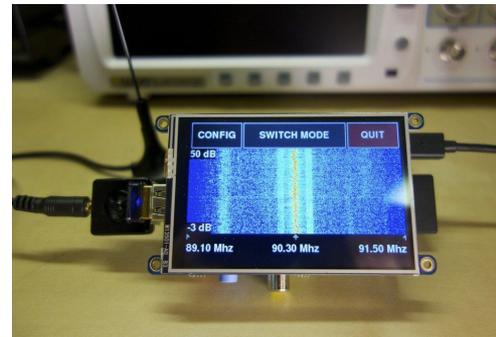
Ground station airplane tracking. Total investment is around \$100 bucks.



Outernet

www.outernet.com

Free satellite downlink (20m a day) for internet access to remote locations.



Portable SDR

<https://www.rtl-sdr.com/a-portable-sdr-project/>

Cheap portable scanner with a Raspberry Pi and display



SDR Projects (Amateur Radio)



Pocket SDR

www.kickstarter.com

Kickstarter project for
QRP portable operation



[larger image](#)

- 15m/12m/10m

Built SoftRock RXTX Ensemble Transceiver \$124.00

The SoftRock RXTX Ensemble is a 1 watt SDR transceiver, built for oper.

- 160m
- 80m/40m
- 40m/30m/20m
- 30m/20m/17m

Softrock Transceiver

www.fivedash.com

Transceiver kits with
board and components.



SDR Resources (More Info)

RTL-SDR.COM

RTL-SDR (RTL2832U) and software defined radio news and projects. Also featuring Airspy, HackRF, FCD, SDRplay and more.

- HOME
- ABOUT RTL-SDR
- QUICK START GUIDE
- FEATURED ARTICLES
- SOFTWARE
- SIGNAL ID WIKI
- FORUM
- RTL-SDR STORE
- GUIDE BOOK
- CONTACT

List of software-defined radios

From Wikipedia, the free encyclopedia

This article provides a list of commercially available **software-defined radio** receivers.

Name	Type	Frequency range	Max bandwidth	TX capable	Sampling rate	Panadapters / Receivers	Host interface	Windows	Linux	Mac	FPGA	Base price
ADAT ADT-200A ^[1]	Pre-built	10 kHz – 30 MHz (planned modules for 50–54 MHz, 70.0–70.5 MHz, and 144–148 MHz)	0.5–100 kHz		?	1/3	Embedded system (no computer needed), USB, Internet remote	Yes, with option R-1 & ADAT Commander	?	?		CHF 5,220
AD-FMCOMMS2-EBZ ^[2]	Pre-built	2400 – 2500 MHz		Yes	61.44 MSPS	2/2	FMC (to Xilinx board) then USB 2.0 or Gigabit Ethernet.	Yes	Yes	Yes		US\$750

https://en.wikipedia.org/wiki/List_of_software-defined_radios

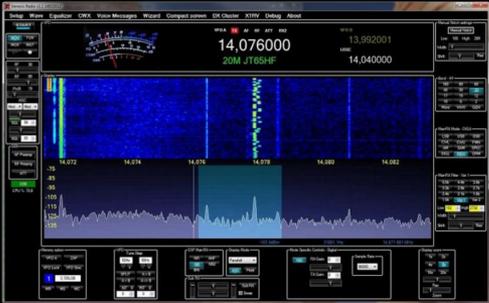


SDR Resources (More Info)



Software Defined Radio (SDR) for Amateur Radio – An Overview

Steve Dick, K1RF
February 11, 2015
Comm Center
100 Fairfield Ave
Norwalk, CT



<http://gnarc.org/wp-content/uploads/2015/02/Software-Defined-Radio-SDR-for-Amateur-Radio-2015-02-11.pdf>



SDR's on Sherwood Engineering

<http://www.sherweng.com/table.html> - out of the top 25 receiving radios on the list, 12 are SDR's

Device Under Test	Min SDR	ADC Value	dB	Min SDR	Min SDR	Min SDR	Min SDR	Min SDR	Min SDR	Min SDR	Min SDR	Min SDR	Min SDR	Min SDR
Model 21012 FunkRadio System 8100 Hardware Updated	-118 -110M	3.0 1.0M	1W	130 preamp OFF	2.0 0.15M	145 131	10 10	D Band Pass	115	99	208.2	100*	208.2	
Model 21017 Ecom8 K1C 2nd stage 8100	-119 -120M	1.5 0.6M	3	110	0.2M 0.08M	144 146	10 10	D Band Pass	110	107M	20	100*	200*	
Model 21017 Ecom8 K1C 2nd stage 8100	-119 -120M	1.5 0.6M	3	110	0.2M 0.08M	144 146	10 10	D Band Pass	110	100M	20	100M	2	
Model 21017 Ecom8 K1 (S3 Gain Rec'd) New Substation	-118 -114M	0.9 0.3M	3	141	0.2M 0.2M	145 147	10 10	D Band Pass	108	102M	20	100*	100*	
Model 21020 Soni SC-2011	-123 -110M	8.5 1.8M	3	149	0.6M 0.15M	148 133	10 10	A 7th Preval	109	110M	100	100M	2	
Model 21022 Ecom8 PT800A Hardware Rev 1.00	-118 -140*	5.4 1.0M	3	142	0.4M 0.15M	144 149	10 10	A 7th Preval	100	100	0.45	100*	2	
Model 21022 Ecom8 K31	-122 -118M	12 1.1M	3	118	0.8M 0.08M	144 145	10 10	D Band Pass	110	100	20	100*	2	
Model 21029 PT800A K1	-119 -114M	1.0 0.3M	3	127*	0.2M 0.15M	133 135	10 10	D Band Pass	95*	104	20	100*	2	
Model 21040 Ecom8 K1	-118 -119M	0.9 0.3M	3	140*	0.3M 0.15M	138	10	D Band Pass	105	104	20	100M	2	
Model 21076 Soni AN-2100 Tuned 1215.001	-111 -112M	1.0 adjustable 1.0M	3	123	0.3M 0.37M	131 137	10 10	D Band Pass	91	99	20	99M	2	
Model 21089 Ecom8 K1	-123 -110M	0.15 0.3M	3	125	0.8M 0.4M	147	10	D Band Pass	100*	99	20	99	2	
Model 21077 FunkRadio System 8100 Not Sampled system	-116 -114M	1.0 1.0M	1W	130 preamp OFF	2.0 0.25M	151 151	10 10	D Band Pass	117*	99	208.2	90M	208.2	
Model 21086 FunkRadio System FLEX-5000A	-123 -119M	2.0 0.9M	3	123*	1.3M 0.3M	123 123	10 10	D Band Pass	98	99	20	98	2	
Model 21086 Soni SC-2011	-123 -110M	2.7 0.6M	3	110	0.7M 0.3M	126 126	10 10	D Band Pass	100*	97*	20	97*	2	
Model 21020 Soni SC-2011	-111 -124M	1.9 0.8M	3	133	0.2M 0.15M	131 147	10 10	D Band Pass	81	100M	100M	91M	2	
Model 21746 Tos Tec Oscin	-127 -119M	0.8 0.3M	3	137	0.4M 0.25M	130	10	D Band Pass	100*	96	20	93	2	
Model 21017 Ecom8 Direct Conversion Mode	-127 -110M	2.2 0.6M	3	137	0.4M 0.15M	136 141	10 10	D Bandpass	100*	104	20	97*	2	
Model 21023 Tos Tec Agonized V1	-126 -119M	3.2 1.0M	3	137	0.15M 0.25M	127 134	10 10	D Band Pass	97*	91	20	97*	2	
Model 21018 Tos Tec Eagle	-124 -110M	0.9 0.9M	3	129	0.7M 0.3M	143	10	D Band Pass	97*	93	20	97*	2	
Model 21089 FunkRadio System FLEX-5000	-121 -110M	2.1 1.0M	3	110*	1.5M 0.3M	120 118	10 10	D Band Pass	97*	97*	20	97*	2	
Model 21012 FunkRadio System 8100 Priority Updated	-111 -110M	1.0 1.0M	1W	130 preamp OFF	2.1 0.3M	143 148	10 10	D High & Low Pass	110	89	208.2	89M	208.2	
Model 21018 Ecom8 TS-5000 Rev 20 system Direct Conversion Mode For 50 Channels For 50 Channels #18.00	-118 -119M	1.8 0.9M	3	144*	0.4M 0.15M	140	10	D Band Pass	97*	104	20	98*	2	



Flex Radio Demo

The screenshot displays the FlexRadio Systems software interface, showing four frequency monitors and various control panels.

Monitor 1 (Top): Frequency 6.164.000. Mode: TX. Antenna: ANT1 12.0K. DSP: DSP | SAM | X/RIT | DAX. Frequency range: 5.960 to 6.280.

Monitor 2: Frequency 14.306.900. Mode: TX. Antenna: ANT1 2.7K. DSP: DSP | USB | X/RIT | DAX. Frequency range: 14.260 to 14.340.

Monitor 3: Frequency 7.100.300. Mode: TX. Antenna: ANT1 400. DSP: DSP | CW | X/RIT | DAX. Frequency range: 6.960 to 7.120.

Monitor 4 (Bottom): Frequency 3.818.000. Mode: TX. Antenna: ANT1 2.7K. DSP: DSP | LSB | X/RIT | DAX. Frequency range: 3.812 to 3.832.

Control Panels (Right Side):

- RF Power:** RF Power slider (0 to 100), SWR meter (1.0 to 3.0).
- TUNE MOX ATU BYP:** Buttons for TUNE, MOX, ATU, and BYP.
- Compression:** Level slider (-40dB to 0dB).
- MIC:** MIC dropdown, +ACC button, PROC button, MON button.
- AM Carrier:** AM Carrier slider.
- VOX:** VOX slider.
- Delay:** Delay slider.
- DEXP:** DEXP slider.
- TX:** TX slider (Low Cut 100, High Cut 2900).
- Bottom Panel:** ANT1 2.7K, TX 14.306.900, USB mode, STEP: 100, MED slider, R button, frequency range 1.6K to 4.0K, RTT 0, XT 0.

Status (Bottom Right): TX Not Ready, 08/26/14, 06:09:56Z.