

A Communications Receiver to Build Part 3 of 3

Part 3 – The software:

So, this is the final part to putting a communications receiver together out of readily available parts that anyone can buy to create an amazing radio that will not cost you an arm and a leg. The impetus behind this was simply dollars and cents. I, like many who read this, am a senior citizen that lives mostly on a pension and there are not a lot of spare thousands lying around to use on new radio equipment like a communications receiver. The want is there but the budget precludes going out and buying a high-priced radio. Hence this series of articles that will help you put together something that not only works well but will not cost a lot. At the same time, you get to learn some tried and true techniques that allow you to create something that you can be proud of that is strictly yours and as I have been saying for decades, gives you the satisfaction of creating something homebrew that gives you bragging rights. “Yeah, I made it myself.” I encourage everyone to get into homebrew equipment and keep on learning how to do something different and through which you can create some great new toys for your hobby.

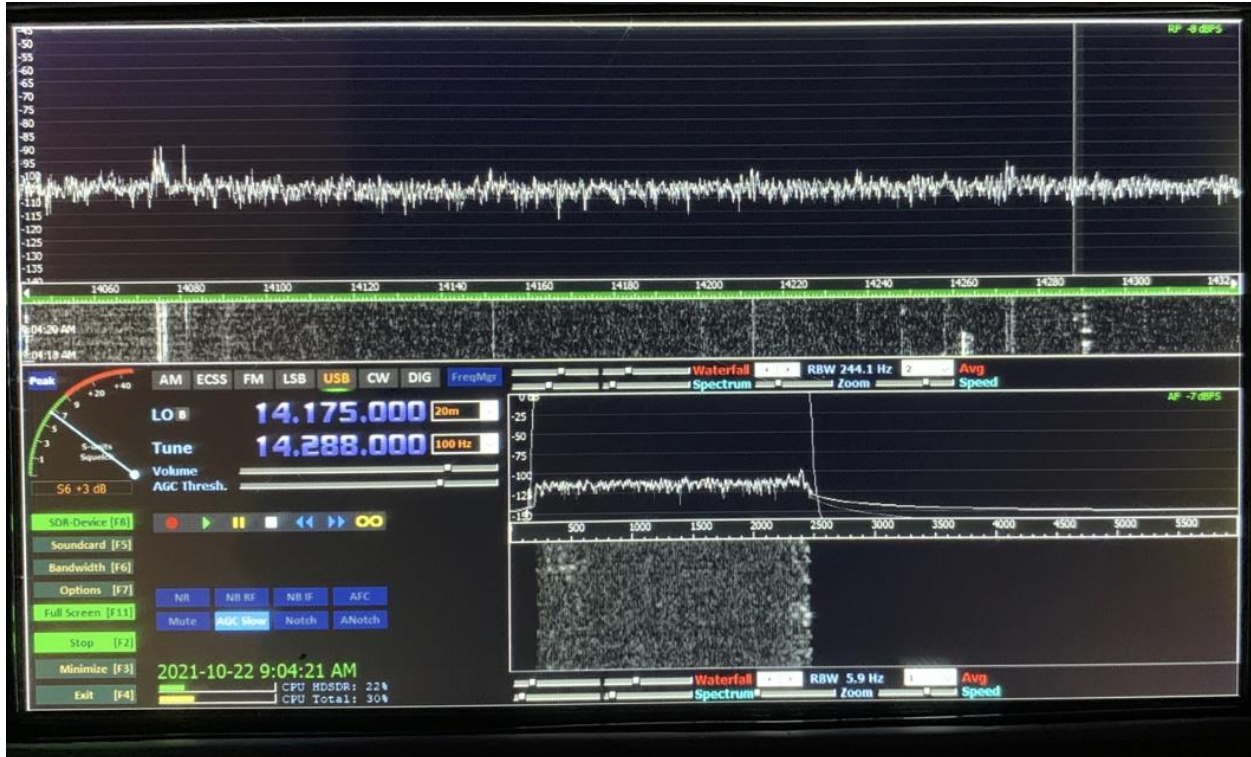
My choice of software for this little radio, like other parts of the project, had some criteria that it had to fulfill:

1. It had to be of sufficient resolution to work on a 7” touchscreen
2. It had to work with an integrated encoder for tuning
3. It had to adequately cover from 10 kHz to 2 GHz continuously
4. It had to have an integrated waterfall display
5. It had to have an integrated spectrum display
6. It had to work on the Mini PC that I had chosen as a platform
7. It had to work on MS Windows 10
8. It had to be easy to use and configure
9. It had to start when the unit was turned on
10. It had to work with a Bluetooth mouse and keyboard
11. It had to work with the SDRPlay series of SDR receivers
12. It had to have an analogue looking “S” meter display

There are several different software packages out there that work well with the SDRPlay radios. I have chosen two that I find work well with this arrangement. If I were working with a different computer platform my choices would be a bit more limited so hence the reason for using Windows as the OS. Here are the packages:

First is HSDR – A very versatile and reliable software package written by Alberto di Bene I2PHD. It provides an ideal solution for most SDR receivers and has an excellent interface that is easy to learn and integrate with an SDRPlay receiver. The software is free to use and is upgraded from time to time and is good choice for this platform. You can download it directly from <http://hdsdr.de/index.html> or from <https://www.sdrplay.com/> It comes with everything you will need to get it up and running in only a few minutes. Read the instructions carefully and follow their advice. You will need to load the EXIO drivers for the particular model of SDRPlay receiver you are using. Once integrated HSDR will provide you with dozens of options to

change if you wish including the layout and the colours that are used on the display. You can enter the frequency directly on the keyboard, touch on a signal on the waterfall or the spectrum



and it will take you to it immediately. Then simply fine tune it by using the tuning knob on the radio. Here is a look at the display that I have chosen to use when I use HSDR on this receiver:

I mentioned before that I have used HSDR for many years on my main computer for the shack and that it is integrated with Ham Radio Deluxe which is used to control all my transceivers that have serial control. HSDR uses DDE (Dynamic Data Exchange) to do the integration job and works very well in a situation where you want to be able to control the software and the rig at the same time. For these applications, however, it isn't necessary for me to control anything else because this is a stand-alone receiver. Mentioning it was primarily to show that this software package is extremely versatile for not only this application but for many others as well that integrate with it.

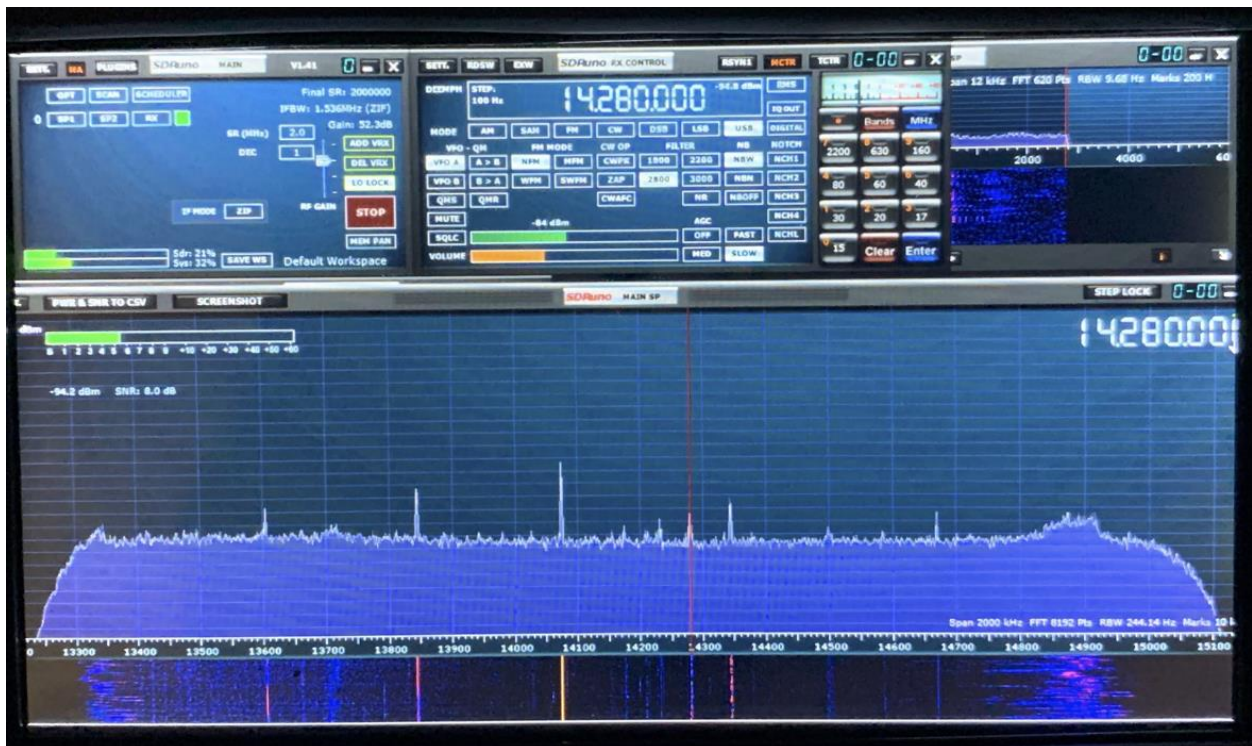
The things I like about the display on HSDR is the "S" meter on the left and the ability to reduce the size of the waterfall display and show more of the spectrum display. It also has the signal strength displayed in dBm as a graph on the left hand side which allow you to keep an eye on noise conditions and where the noise floor is for any particular antenna being used. In the case shown above the noise floor is -105 dBm on my active, 3-foot loop antenna.

Because the size of the display is physically small, you can use the Ctrl + and - keys on the keyboard to adjust the size to get a closer look at the section you want to look at. This is especially helpful when looking at some of the smaller options on the display like the band you are wanting to change to or the resolution of the Tuning encoder. It is also useful when looking at the options display after pressing F7.

Speaking of active shortcuts on the HSDR display, I encourage you to use the keyboard shortcuts in order to save your eyes for other things like looking at your extensive antenna farm or something. F2 starts and stops the radio and pressing it again starts it again. Another most important one is to use the F11 key to minimize and expand the display so that you can get to the bottom taskbar and adjust other things on the computer like the audio volume if necessary.

So, HSDR is one of the programs I have used on this radio and the other one is SDRuno by SDRPlay.

SDRuno: SDRPlay puts out its own software to be used with its hardware and unlike many other manufacturers that do so, this stuff really is top drawer. SDRuno is a comprehensive, Communications Receiver package that covers the entire range that the receivers are capable of. It is free on the <https://www.sdrplay.com/> site and simple to install and works on the MS Windows 10 platform beautifully. The features on this software are so extensive that I couldn't possibly describe them all but will give you some highlights that I find useful.



The display is broken up into modules on this package that can be moved around to where you want them and adjust the size as you see fit. So, in my case I like to have the main stop and start module on the left followed by the frequency and mode in the middle and the audio display on the right. I always put the spectrum display on the bottom with the waterfall under it. This is configurable by you as to what you want to display. You can turn the waterfall off, combine it with spectrum or just have the waterfall if that is your preference.

In the centre display you can change frequency by touching the display and entering the new frequency directly on your keyboard. So, for instance if you want to go to a favorite net frequency, just type it in and press enter, and you are there. If you want to change bands, go to the Bands tab, and choose either High or Low Ham Bands and the buttons will display them below. The bands are broken up into ham bands and SW bands and they have others such as Air Band and FM. The list is long. Pressing any one of them will take you directly to the band and will display the entire band from top to bottom across the display.

The “S” meter display is great too and shows the level in “S” units on the bargraph and below it displays the level in dBm as well as the Signal to Noise “SNR” on any signal being received. Expanding the display using the magnification functions on the PC helps greatly in showing things that are a bit small to look at when looking at the full display.

Here is a list from the excellent SDRuno manual on keyboard shortcuts with Windows 10.

10. Keyboard shortcuts

RX control window

↑ = up frequency step
↓ = down frequency step
CTRL-S = save frequency to memory bank
Space Bar = start frequency edit
ESC = Aborts direct frequency input
A = AM
C = CW
D = DSB
E = DIGITAL
F = FM
L = LSB
M = Medium band FM
N = Narrow band FM
O = Stereo wideband FM
S = SAM
T = Toggle RX<->TX
U = USB
W = Wideband FM
SP1 window
V = Center on VFO
+ = Zoom in
- = Zoom out

Main window

* = Start/Stop Recording
B = Open/Close Memory panel
K = Toggle LO LOCK
CTRL-W = Save Workspace

Memory window

F2 = Edit current cell.
CTRL-F = Show/hide files pane
CTRL-S = save frequency to memory bank
B = Open Memory panel
Ins = Inserts a new row
Del = Deletes the current row

And, while I'm at it, I want to mention that SDRPlay has created a series of videos and an absolutely incredible manual on how to use the SDRUno software. It is easy to find anything and can be accessed by going to:

https://www.sdrplay.com/docs/SDRplay_SDRUno_User_Manual_1.22.pdf

Another amazing resource that you can access on their site is a support catalogue with dozens of videos from users and staff on how to use the software and the setup and configurations available for all the models. It is available here; <https://www.sdrplay.com/apps-catalogue/>

One of the applications I want to learn about is the one on how to use the RSPduo as a diversity receiver. Diversity reception is where you use two separate receivers with two separate antennas to reduce noise and give you a better SNR than you would get using only one receiver. If you are interested in seeing how it works I encourage you to watch this video:

<https://video.search.yahoo.com/search/video?fr=mcafee&ei=UTF-8&p=diversity+reception+youtube&type=E211US876G0#id=1&vid=e0e126b4ef7c5a18ca416826b4817bc4&action=click>

There are lots of other applications out there that the RSPduo can provide that you might want to look up too. Just type into Google "Diversity receiving".

CAUTION: One thing I wanted to make sure you think about before putting one of these little radios together is to make sure you have a way to protect the front end from near field RF energy from other antennas you are transmitting on. You can damage the receiver front end permanently making it a brick simply by applying too much RF energy into the input terminals. That means that having a receiving antenna too close to a transmitting antenna will destroy the radio in nano seconds. Make sure you put some sort of protection on the front end such as what I wrote about a couple of months ago in one of my blurbs or disconnect the antenna(s) before using your other radios. You will be unhappy if you forget to do that simple task.

So that's all I need to say about the software that I use on this incredible Communications Receiver. Suffice to say, I love to learn more and more about it as time goes on and it allows me to get the most, I can get out of it. Give it a try and build yourself a beautifully little radio that will provide you with years of amazing listening for a very small price.

