

Icom IC-7600 IF Scope Display Using An RTL-SDR Dongle and HDSDR for Point and Click Tuning

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Harry Tankin, WE1X

This paper describes how to implement external point-and-click tuning of the Icom IC-7600 using HDSDR software together with a simple, non-invasive and reversible hardware modification developed by Stefan Wagener, VE4NSA. This modification working in concert with HDSDR allows the operator to (1) display the IC-7600's scope on an external monitor, (2) achieve better resolution of the scope display, and (3) tune the IC-7600 by pointing the mouse to the desired signal on the HDSDR's panadapter and clicking. VFO, band and mode changes made by the IC-7600 are tracked by HDSDR and vice versa.

Although one can use the HDSDR and rig's scopes at the same time, the quality and control of the panadapter function is so far superior that I no longer use the IC-7600's native display.

Thanks to Two Great Hams

Before moving forward I must extend my appreciation and thanks to two individuals who went the extra mile (or kilometer) to provide assistance. First, to Stefan Wagener, VE4NSA not only for designing a wonderful hardware mod, but providing clear and concise documentation. Simply excellent work. Second, to Mario Taeubel, DG0JBJ. Mario is the author and keeper of HDSDR. Apart from delivering and maintaining excellent software, Mario devoted time and patience to resolve several implementation nits. Without their help this effort would have been a major struggle. Thanks guys!

Why HDSDR

After initially performing Stefan's hardware mod I used **SDR#**. Although SDR# works well, its functionality was limited to display of the IC-7600's scope and control of resolution. The software did not track and display the rig's mode, band and VFO, nor did it provide point-and-click control. While it did a great job as a software panadapter, I wanted something more.

I then tried Simon Brown's **SDR-Radio console**. The current v1.5 does not support RTL-SDR dongles. The pending v2.0 in the form of a "technical preview" does. While this pending release works, I found it a bit complicated and like SDR# it did not offer point-and-click control. While that may change with its official release I wanted to move on.

HDSDR was next. In March I was successful getting HDSDR to display the Icom's scope. While this worked fine I sensed there was a way to implement point-and-click and contacted Mario. With his help we got it working.

Step 1: Stefan Wagener's Hardware Mod

Stefan's mod "*IC-7600 IF tap for RTL-SDRs*" can be found in the IC-7600 Yahoo Group files section as `ic7600_rtl_sdr.pdf`.

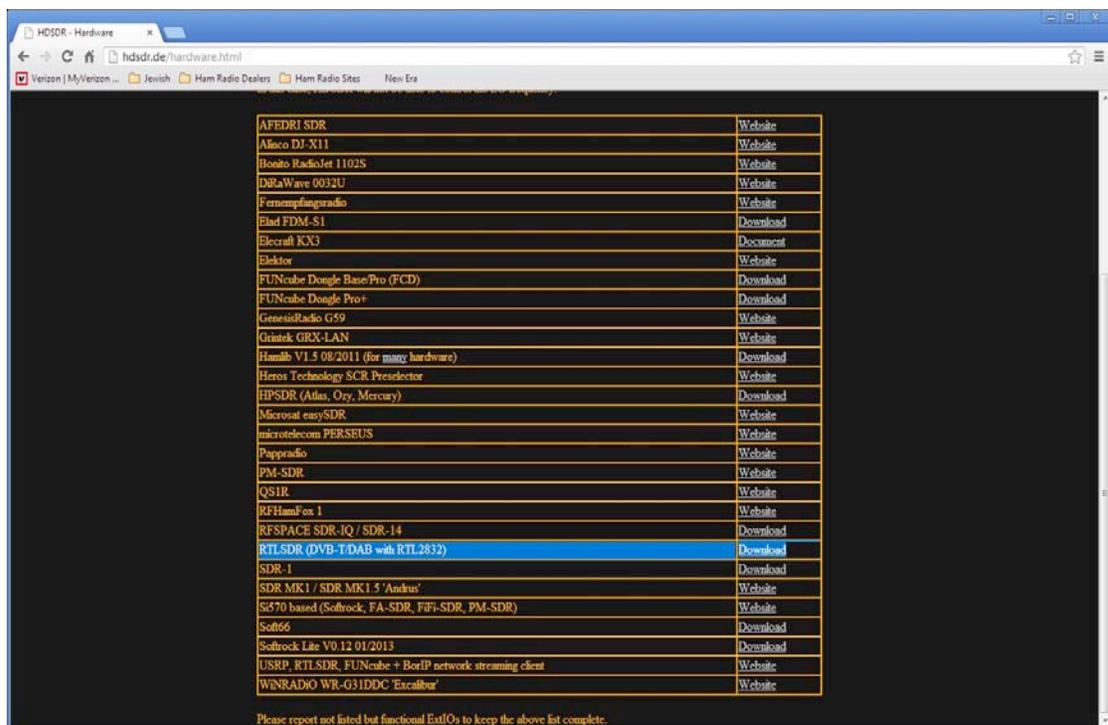
Although this is a simple, non-invasive and reversible hardware modification there are risks. Therefore I will repeat Stefan's warning:

This modification might damage your radio, void the warranty, and/or cause personal injury. You are doing this at your own risk and the author does not make any express or implied warranty, or assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any information provided within this document!

With that said, if you want to pursue the modification read Stefan's documentation, secure the necessary materials and follow his instruction.

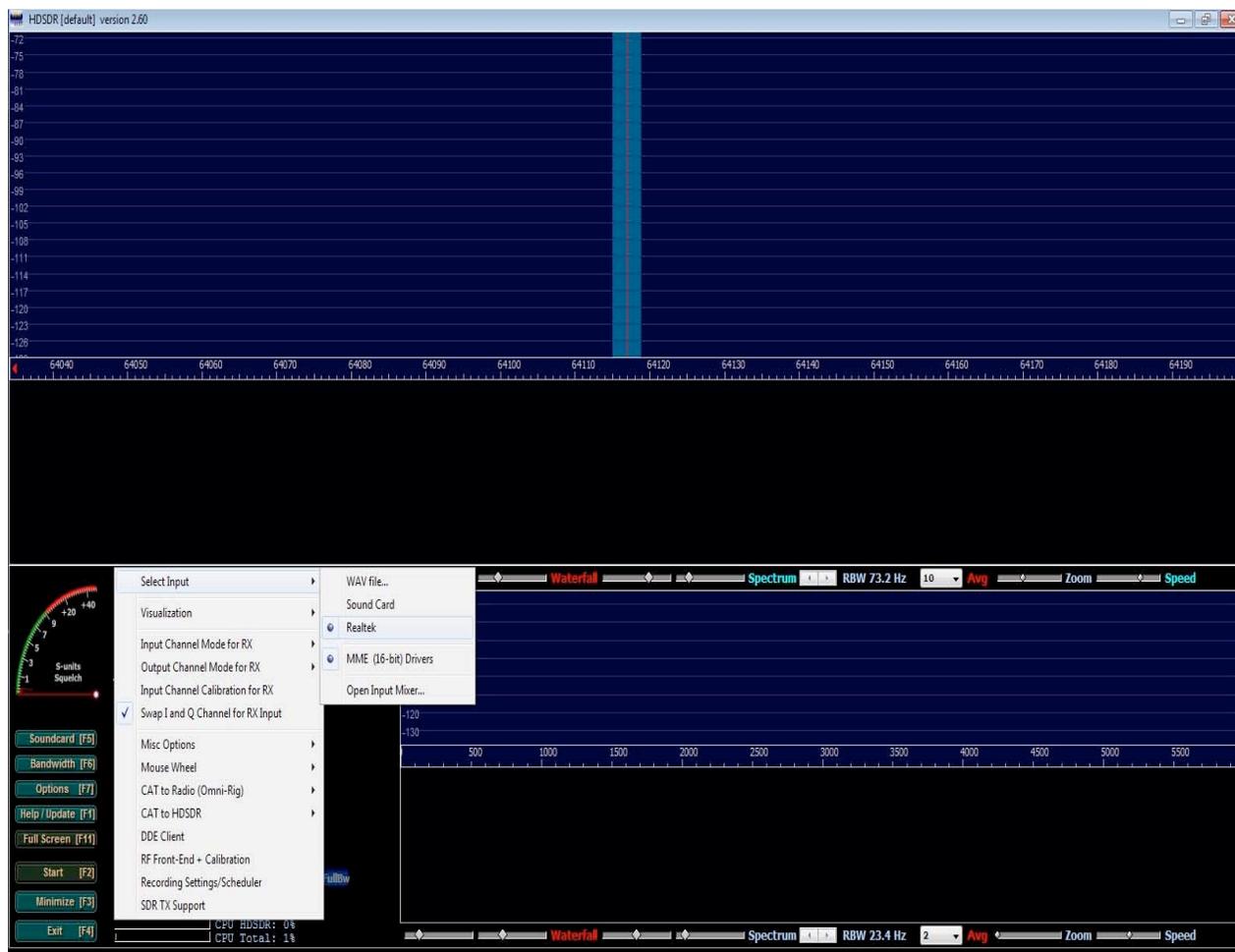
Step 2: Install and Configure HDSDR

1. HDSDR may be found at www.hdsdr.de. Review the material on the website and download the software.
2. Go the "Hardware" page and identify the RTL dongle you are using. In my case I'm using the **Terratec T Stick Plus**.

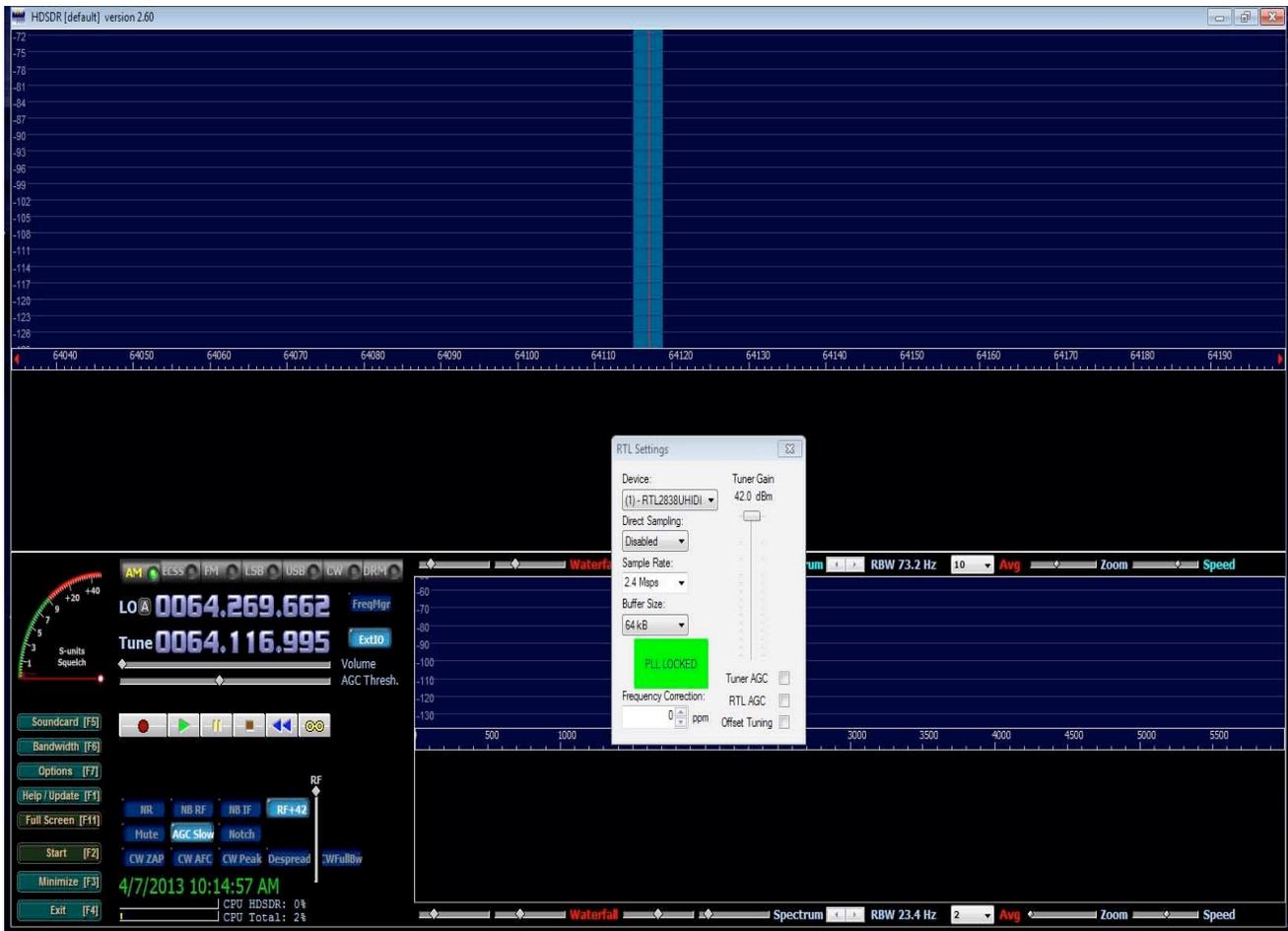


3. Download the appropriate driver. The driver may be in the form of an **ExtIO.dll**.
4. Place the driver in the folder containing the HDSDR executable.
5. Launch HDSDR but do not start the application.
6. HDSDR needs to be configured as follows:

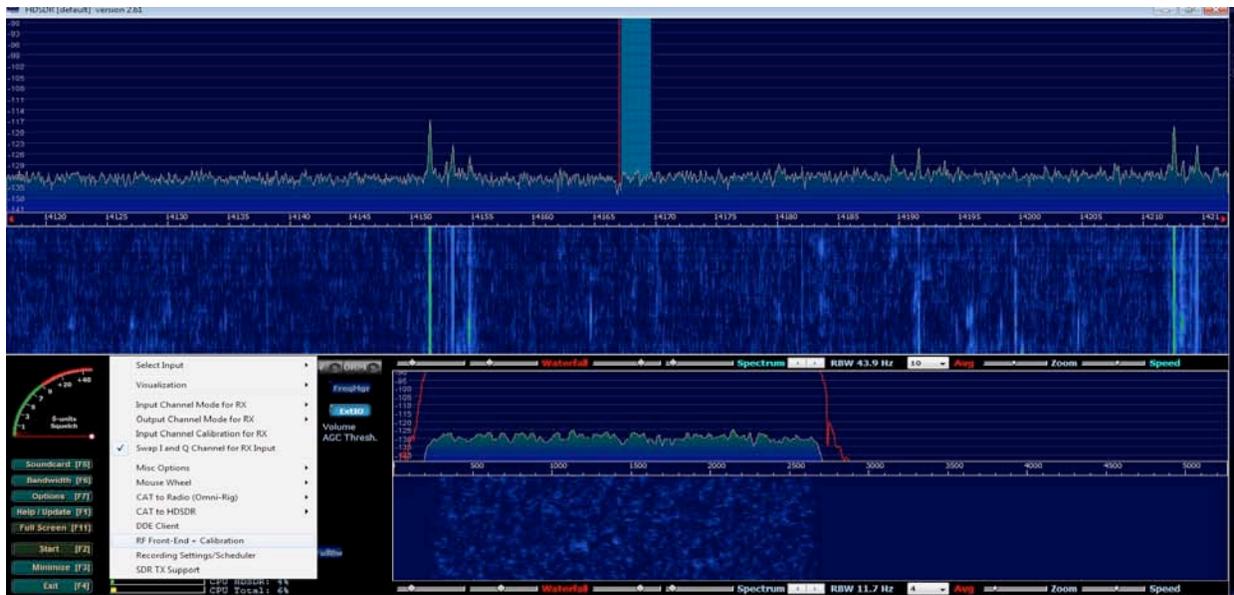
- (a) Select Input. Go to the HSDR “Options” button, click and select “Select Input”. Options will vary depending on your particular dongle. In my case “Realtek” was the option.



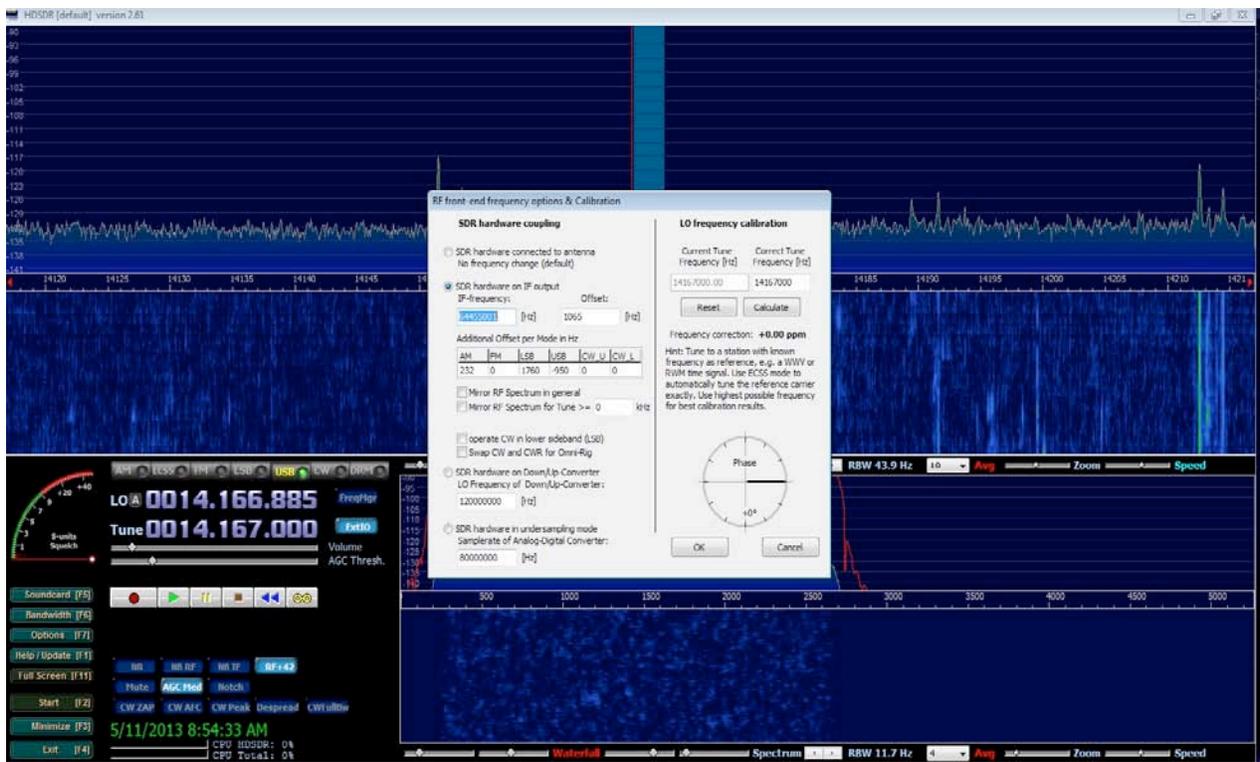
- (b) If you wish you can check the dongle's settings or make setting changes either by double clicking on the selected input identified above or clicking on the ExtIO button on the HSDR panel.



(c) Now set the IF frequency. Click on the “Options” button and select “RF Front-End + Calibration”



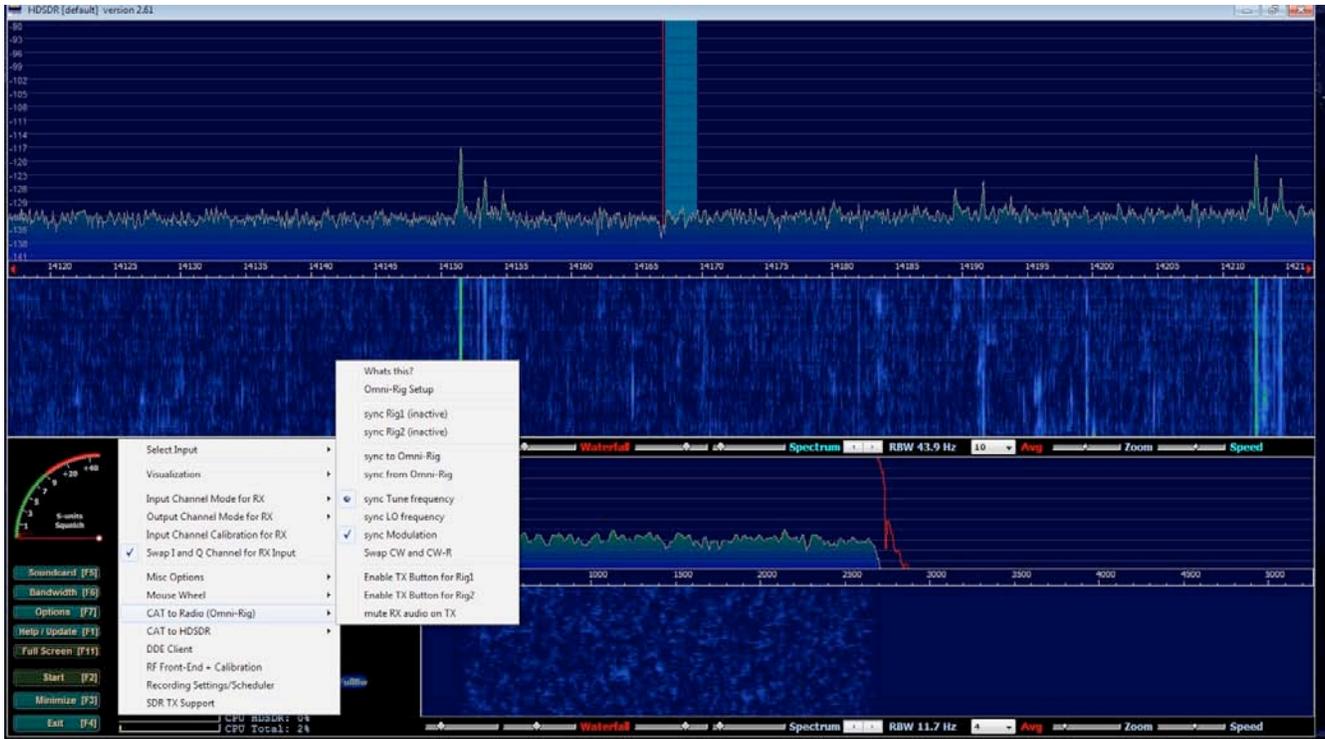
(d) In the window that appears select “*SDR Hardware on IF output IF-Frequency*”. Enter the IC-7600's IF of 64.455 as 64455000. Note that I had some funky issues with my ExtIO.dll and had to experiment with this setting. You may or may not have similar issues.



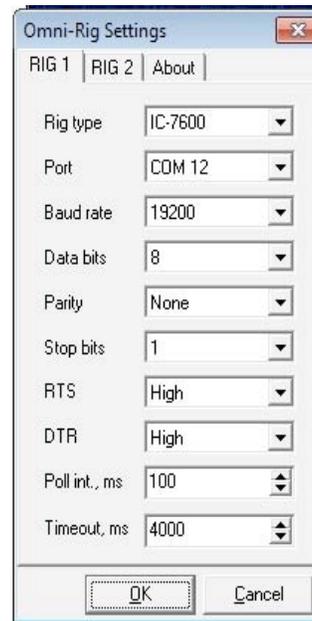
(e) At some point you may want to get back the the *RF Front-End + Calibration*

screen and input your offsets. This will make tuning via different modes far easier and accurate. Alan Reeves G4ZFQ has an excellent write-up on how to do this. Go to <https://sites.google.com/site/g4zfqradio/hdsdr-if-pano> for details..

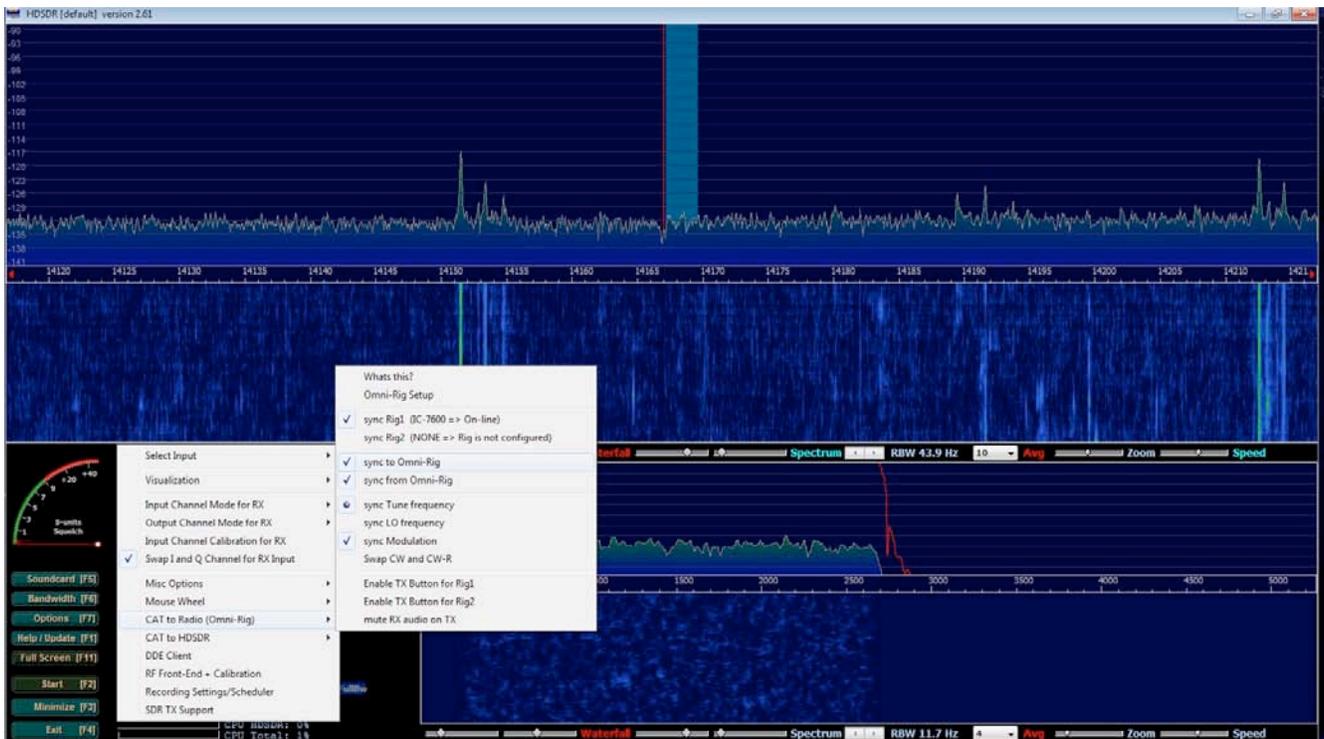
- (f) HSDR achieves rig control with the IC-7600 using **OmniRig**. At this time HSDR does not employ other rig control tools or applications such as HRD/DM780. OmniRig appears to be the only option.
- (g) Once again click on the HSDR “Options” button and now select “CAT to Radio (OmniRig)”.



- (h) Select “OmniRig Setup” and configure as shown. In use COM 12 and the 7600's “Remote” port. Click “OK”

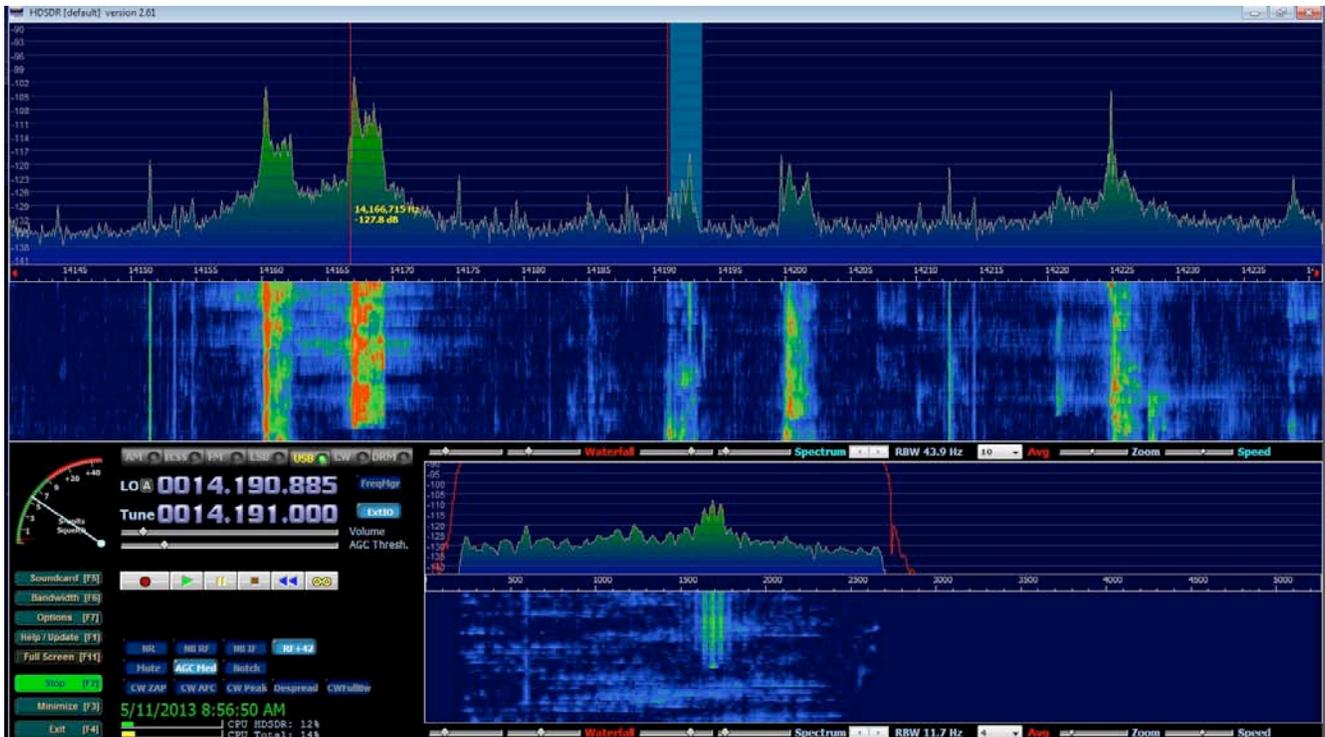


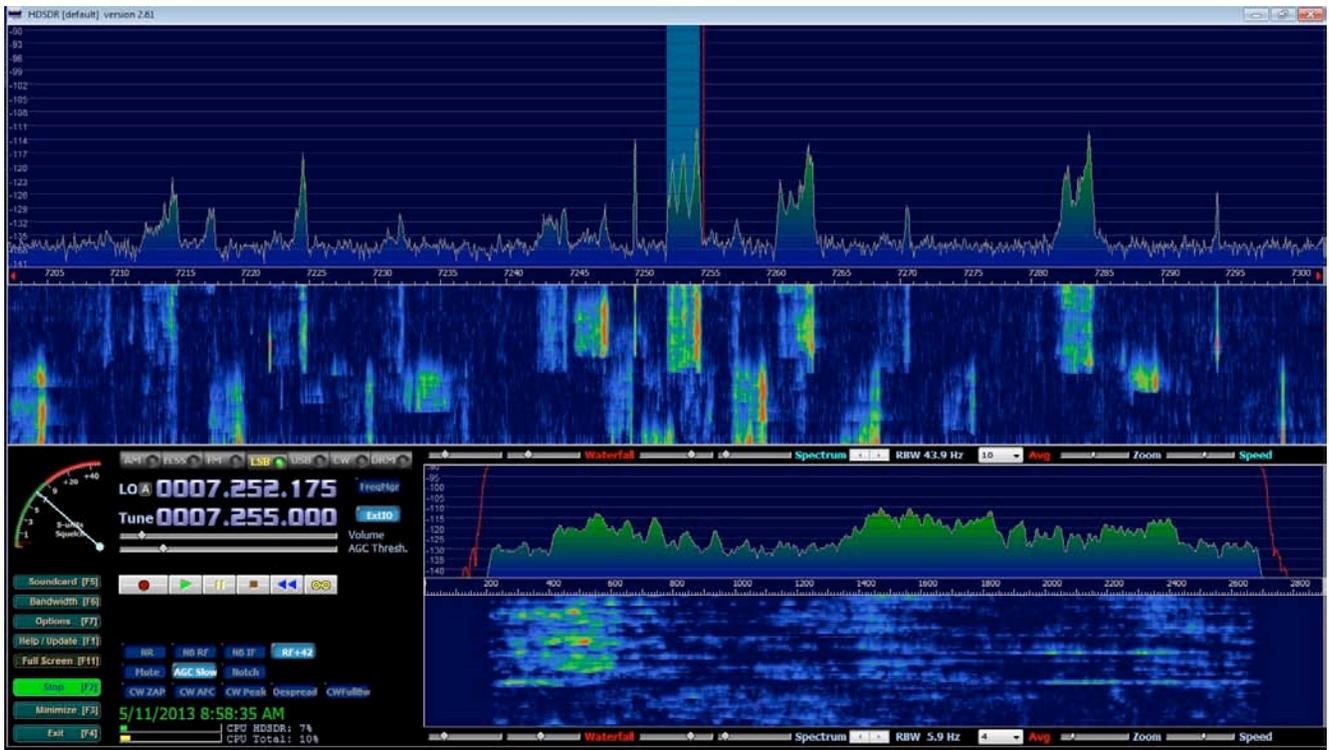
- (i) Once again click on the “Options” button and select “CAT to Radio (OmniRig)”. You will now select “sync Rig 1”, “sync to Omni-Rig”, “sync from OmniRig”, “sync Modulation” and “sync Tune Frequency”.



- (j) Finally ensure the “Swap I and Q Channel for RX Input” is selected under “Options”.

7. You can now start HSDR by clicking on the “*Start*” button.
8. The IC-7600's IF scope display should now appear on HSDR. You will have both a spectrum and waterfall displays. Note the smaller spectrum and waterfall displays are for AF.
9. As you tune the IC-7600, change bands and change modes HSDR should follow and vice versa.
10. Below are screen shots of 20m USB and 40m LSB.





Using HRD/DM780

With my typical trial-and-error way of doing things I've found my Terratec T Stick Plus dongle, IC-7600 and HSDR work quite well together. For me this is a tremendous improvement over the rig's native scope display.

HRD/DM780

Previous endeavors to integrate HSDR with HRD/DM780 required rather involved efforts of creating and managing multiple instances of HRD as described in r2.0 of this paper. While this approach worked, it was rather complex and potentially prone to operator error.

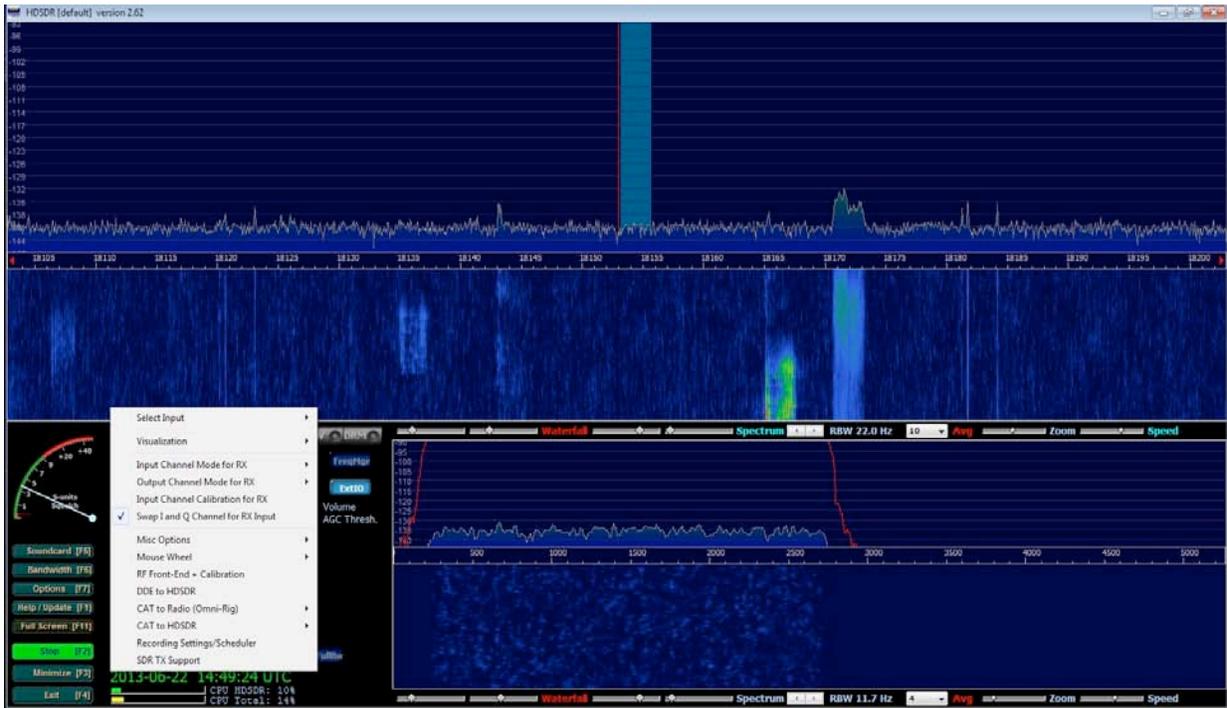
With the active support of Mario Taeubel, DG0JBJ, HSDR v2.62 now supports an easy to configure direct integration with HRD/DM780. Again, many thanks to Mario for going the extra distance to make this happen.

Step 1:

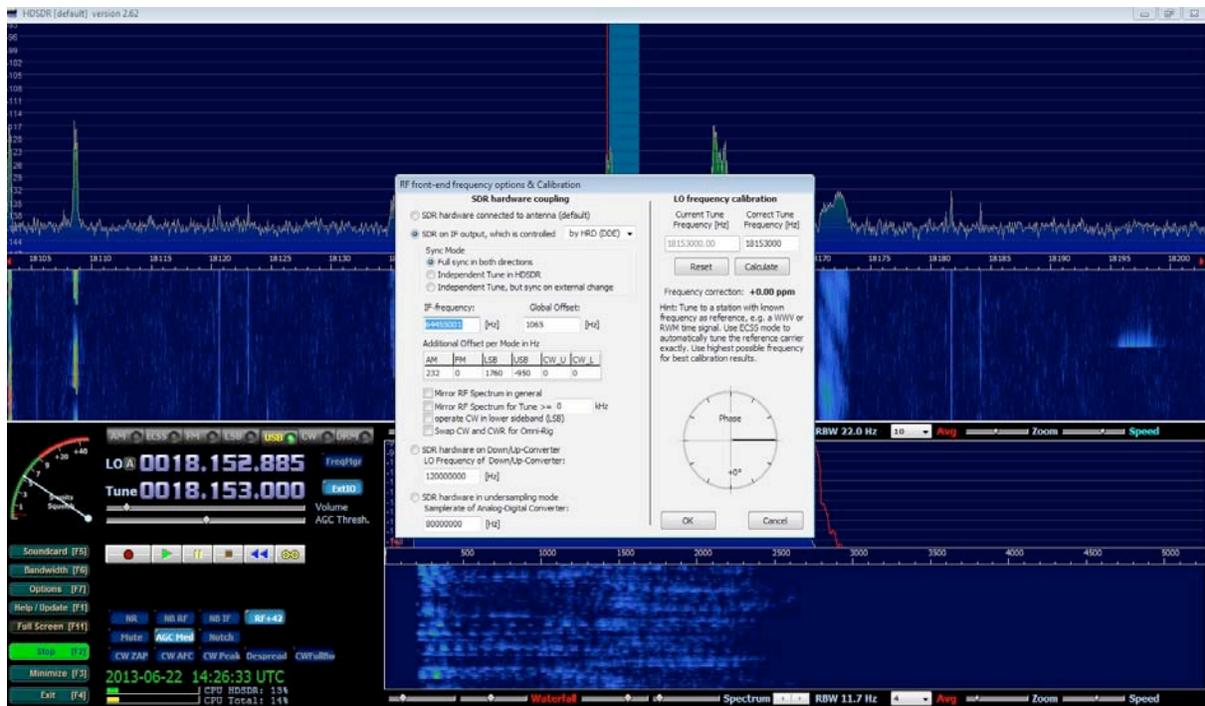
1. Assuming you have already installed HSDR upgrade to version 2.62.
2. Click the HSDR *Options* button and **deselect** *OmniRig sync to Rig1 or Rig2*.
3. Shut down HSDR.
4. Launch HRD and connect to the IC-7600.

Step 2:

1. Launch HDSDR v.2.62.
2. Click the HDSDR *Options* button and select *RF Front-End + Calibration*.



3. In the *RF Front-End Options + Calibration* window:
 - (a) Select *SDR on IF output*, which is controlled by....
 - (b) and select *by HRD (DDE)* from the drop down menu.
 - (c) Ensure your IF and off-set frequencies are correct as described earlier in this paper.
 - (d) Click OK.

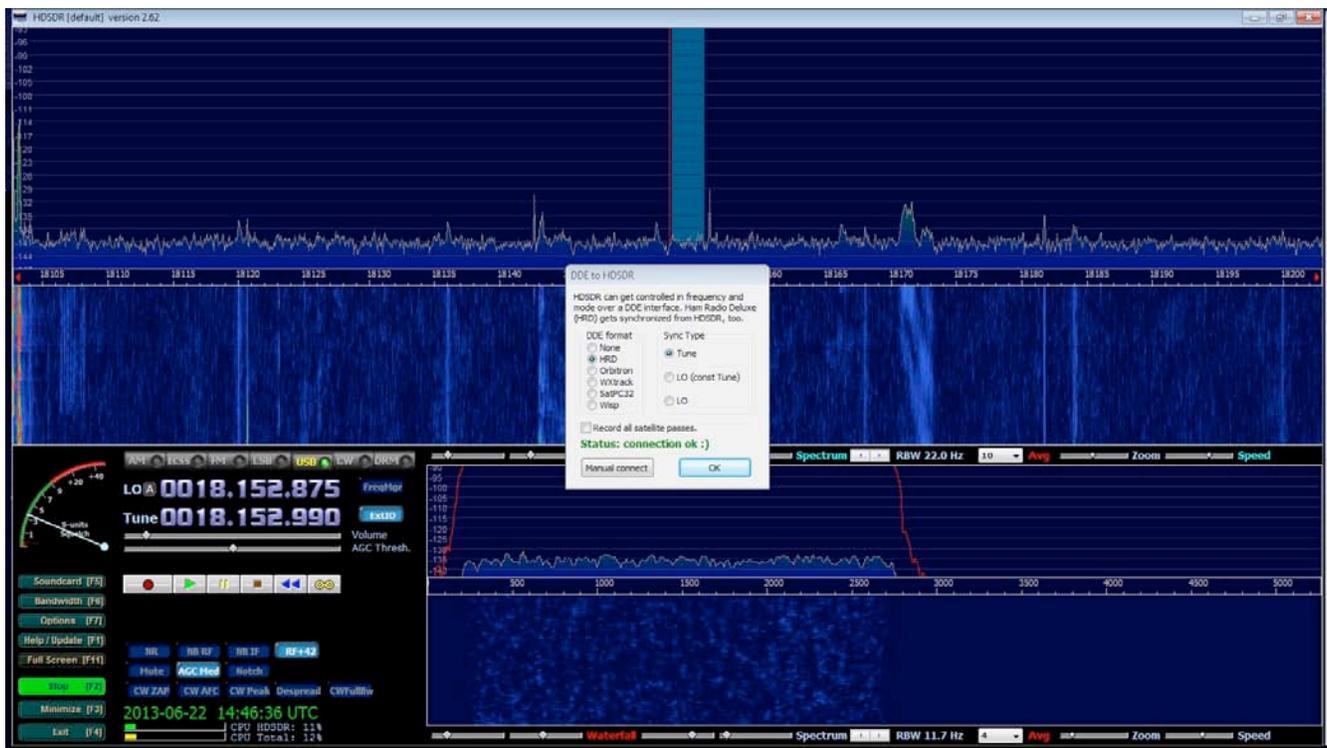


4. Return to the Options button and select *DDE to HDSDR*.

5. In the DDE to HDSDR window:

(a) Select HRD

(b) Click either *Manual Connect* or *OK*. With HRD already running you should see a green status message: *Status: connection ok* :). If you receive a red status message to the effect that the connection has failed it is likely HRD is not running. If that's the case then simply launch HRD.



This integration works very well. The IC-7600 controls HRD/DM780 and HSDR, click-and-point from HSDR drives the rig and HRD/DM780, and all key functions synch. The one limitation is when tuning via the IC-7600's VFO the refresh rate on HSDR lags by several seconds. Note that this appears only to happen if the HRD Logbook is open. I have asked for support from HRD directly and the community forum albeit with no success.

Going Forward

As with most things I do there's always room for improvement. As you try this modification and gain experience I would appreciate any constructive feedback. Feel free to reach out as helping hams and continuous learning are key aspects of this hobby I enjoy the most.

73s,

Harry WE1X

harrytheham@verizon.net