Using HDSDR with the SDRplay Module

Overview

The SDRplay Radio combines together the Mirics flexible tuner front-end and USB Bridge to produce a SDR platform capable of being used for a wide range of worldwide radio and TV standards. This document provides an overview of the HDSDR installation process and operation of SDRplay plug-in. The document covers installation of the SDRplay device drivers, HDSDR, the SDRplay plug-in, basic usage of the HDSDR interface is also covered.
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1. Installation of the SDRplay Device Driver

The first step in getting the SDRplay module installed is to download the SDRplay device driver from the SDRplay website. The device driver comes in an installation package with the Mirics API. The API provides the user with a DLL and associated documentation such that the SDRplay module can be controlled from within a software program.
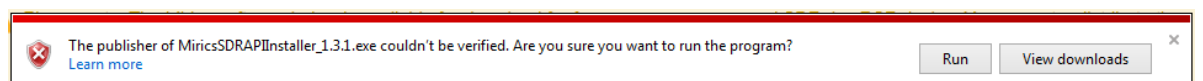
- Firstly ensure the SDRplay module is disconnected from the PC. Then download the *Windows API and Hardware Driver installer* from the Platforms, Windows section of the SDRplay website.
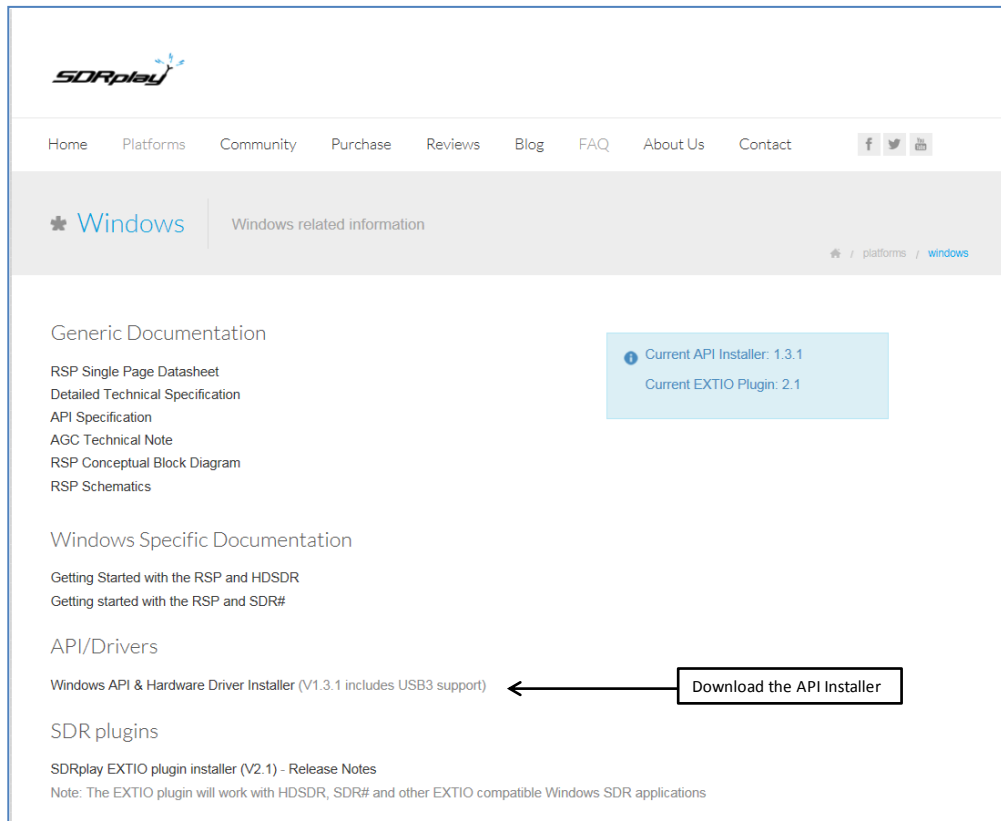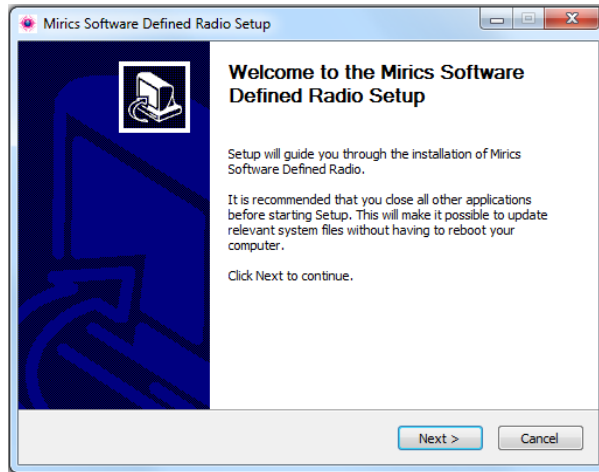

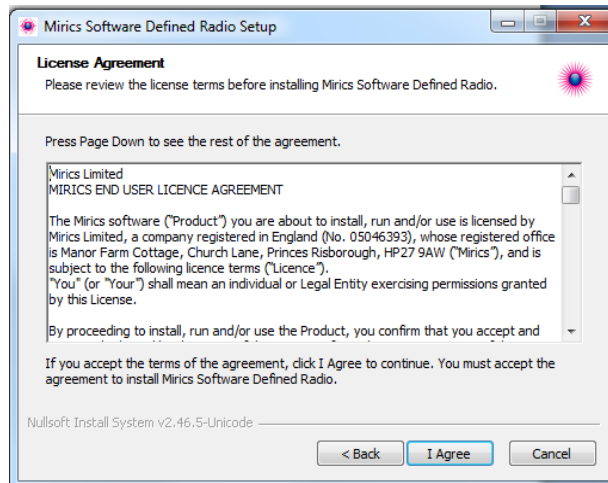
- When prompted to do so select run
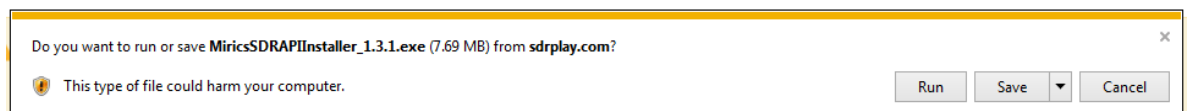
- You might be warned that the publisher could not be verified, in this case click run.
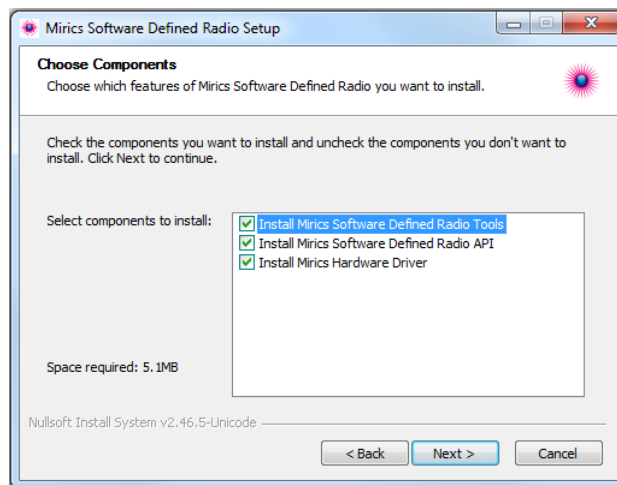
- The installation will process will begin click next and follow the onscreen instructions.
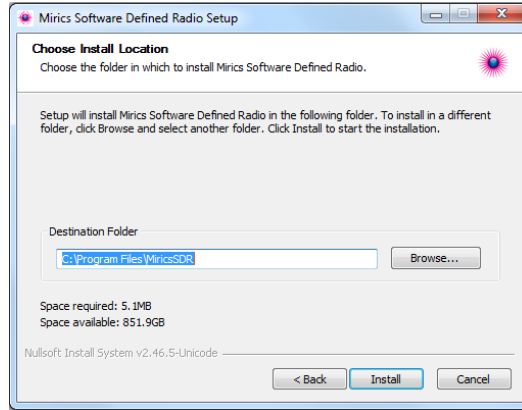

- Click *I Agree* to accept the license agreement

- Ensure that all three components are selected and then select next

- Select a directory in which to install the software. A default directory is proposed.

- The installation of the driver will begin, after installation is complete there is an option to provide feedback
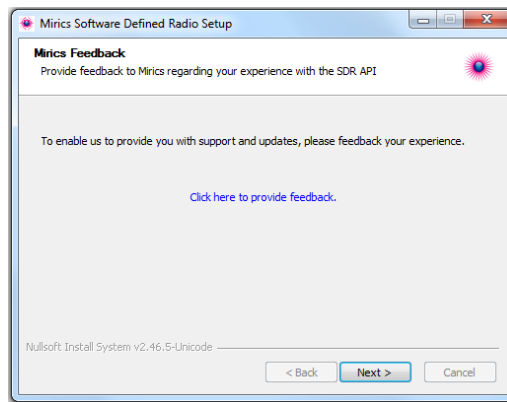
- Finally when the installation process is complete click finish
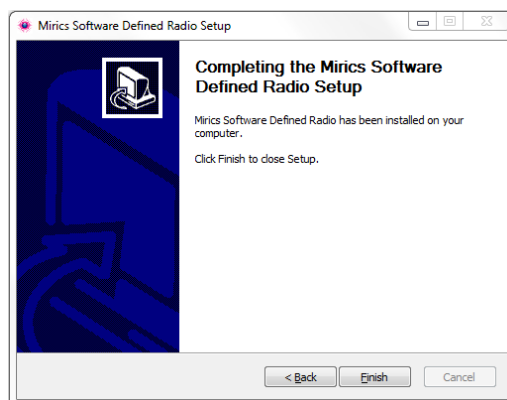
- Finally plug in the SDRplay module into one of the USB ports. You should be presented by a pop up box in the lower right hand icon tray telling you the driver has been installed correctly.

2. Installation of HDSDR

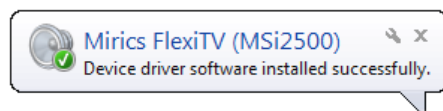HDSDR is a third party SDR radio interface that can be used in conjunction with the SDRplay module to receive various different signals. To use this software there are two installations that need to be followed. Firstly HDSDR software needs to be downloaded and installed. Secondly the SDRplay ExtIO plug-in needs to be installed. The first step in the process is to download the HDSDR software and install it on the local machine

- The HDSDR software can be found from http://www.hdsdr.de/. Click the download button

- Once the download button is clicked you will be prompted to download the HDSDR installation program. Click Run to begin the installation process.

- You might be warned that the publisher could not be verified, in this case click Run.
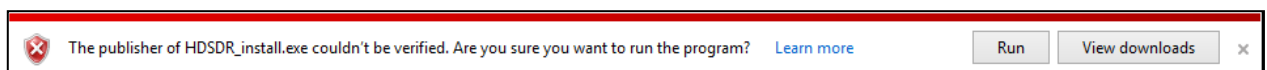
- Once the installer begins click next to continue
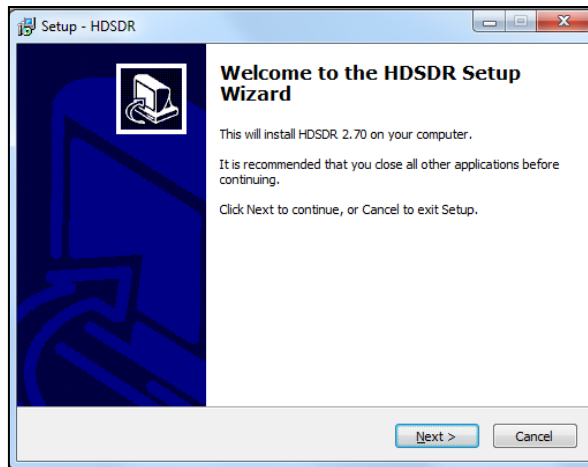
- Accept the license agreement and then click Next to proceed
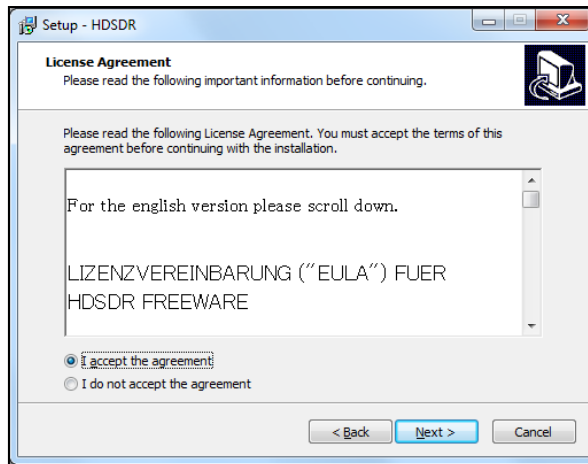
- Make a careful note of where the software ends up being installed on your PC and then click Next
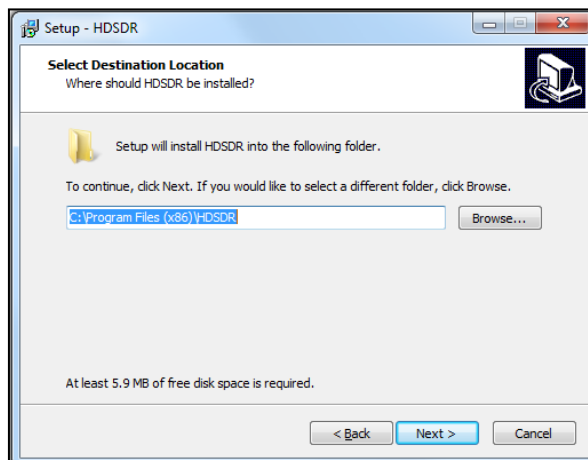
- HDSDR will provide an option to change the default shortcut in the start menu
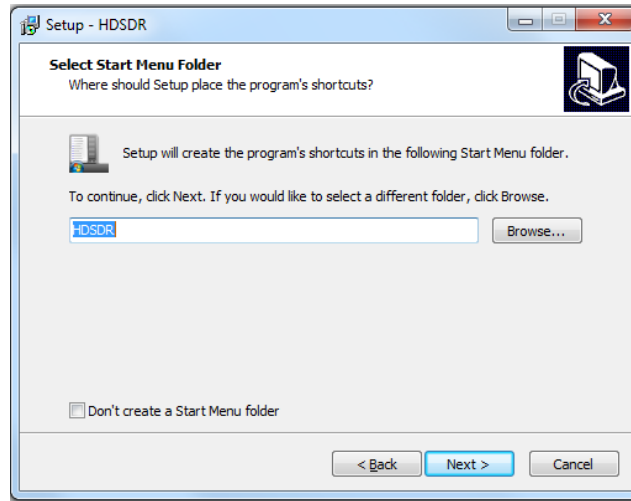
- An option to create a desktop shortcut or quick launch icon is presented. Select the desired options then Click Next
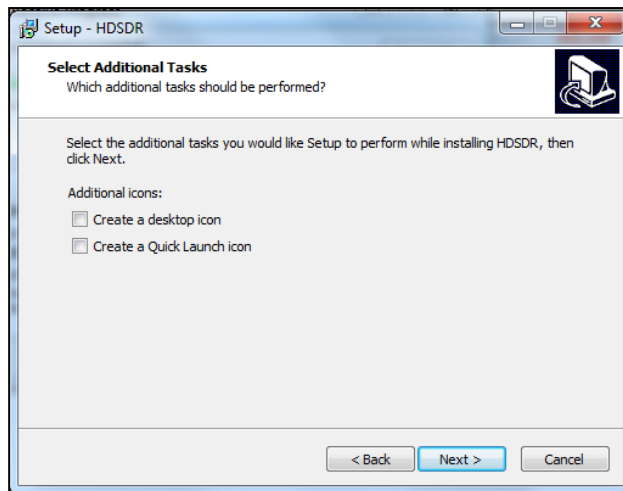
- To complete the installation click Install
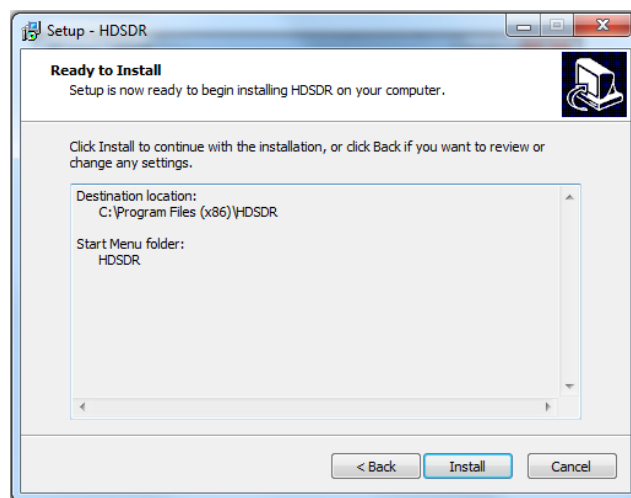
- To complete the installation click Finish. Before HDSDR will recognise the SDRplay module the SDRplay ExtIO plug in must be installed.
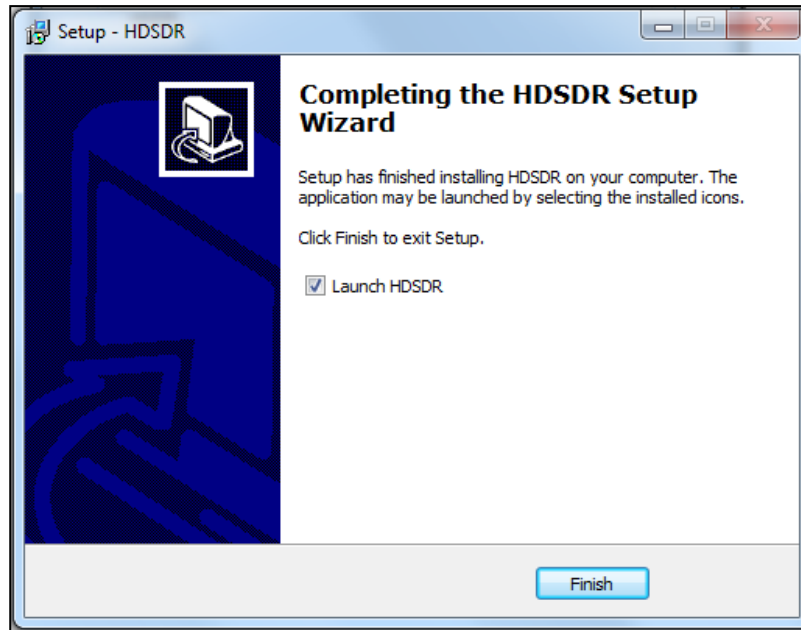
3. Installation of the SDRplay ExtIO Plug-in

The final step is to install the SDRplay EXTIO plug-in. This is the module that will allow HDSDR to communicate with the SDRplay module.

- Download the SDRplay ExtIO plug-in from the SDRplay Platforms, Windows section of the website.
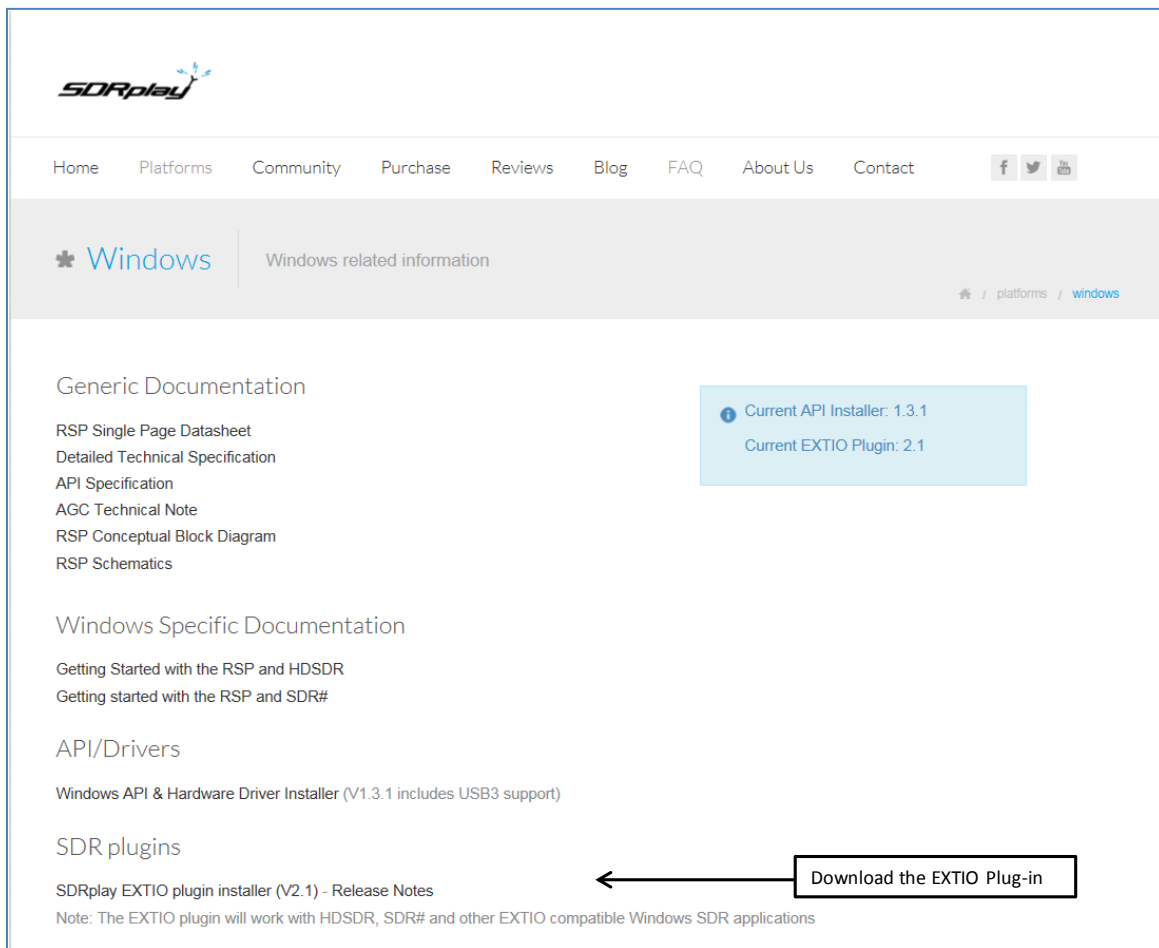
- When prompted click run to begin the installation of the SDRplay ExtIO plug-in.
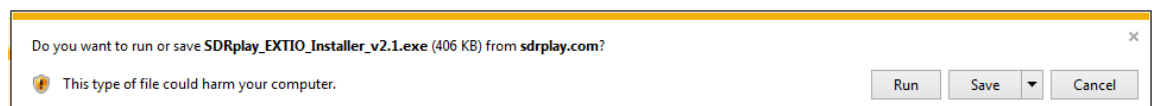
- You might be warned that the publisher could not be verified, in this case click run.
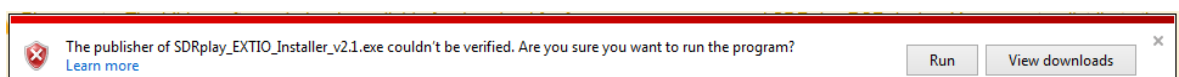
- The initialisation of the SDRplay ExtIO plug-in will begin, click Next to continue
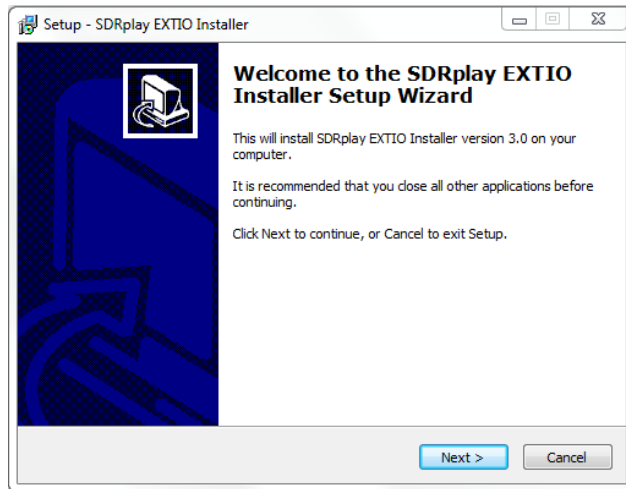
- In order to install the plug-in the installer needs to know the location of the HDSDR program. To do this click browse.
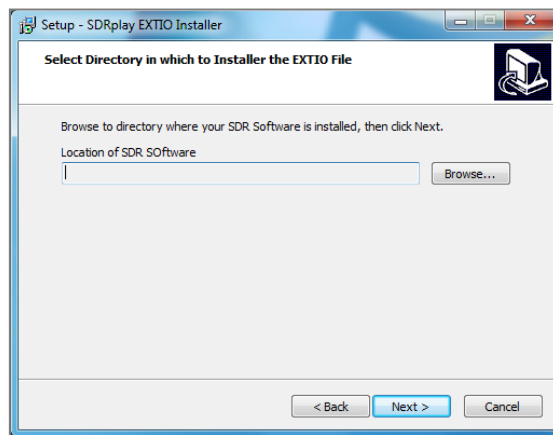
- Navigate to the HDSDR installation directory, then click on the HDSDR.exe and then click Open to identify to the correct path to the installation program.
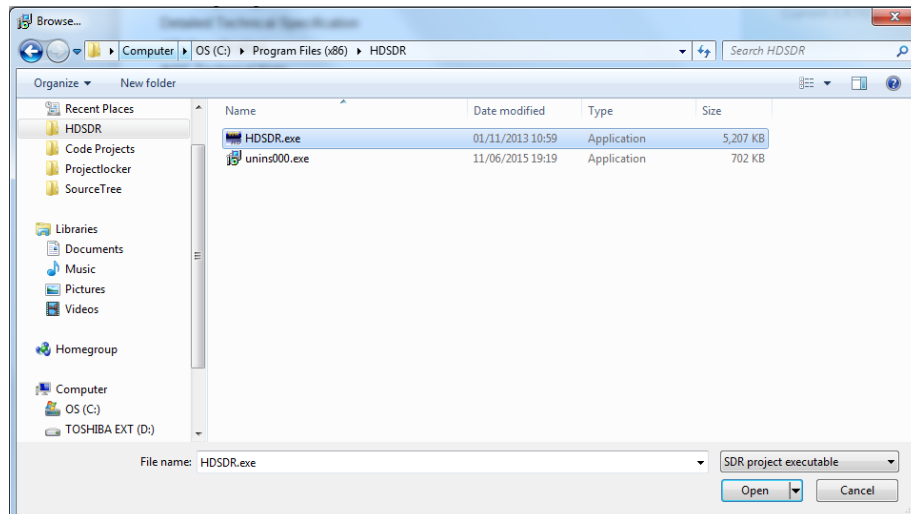
- After Open has been clicked you should see the path presented in the installation dialog box, Click Next.
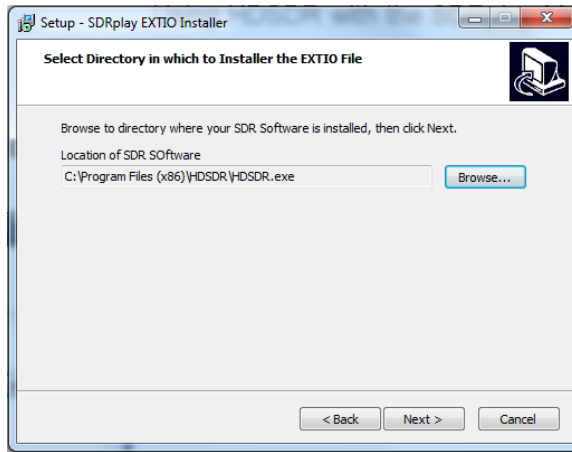
- The installation of the plug-in will commence when completed the Install button is clicked.
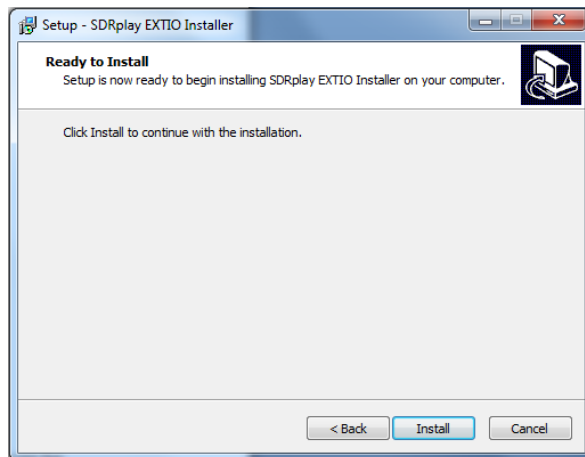
- This completes all the steps that are necessary to get SDRplay working with the HDSDR software interface.

4. Using HDSDR with the SDRplay module

When HDSDR has been started for the first time you will see the main screen as shown below.
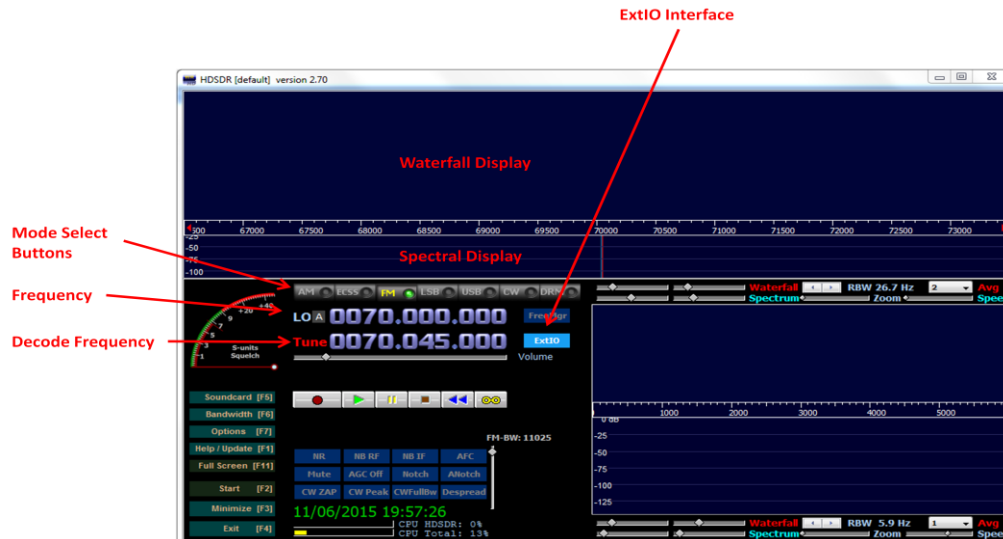
- **Mode Select buttons** – Used to select the required modulation format. Select either AM, FM, lower sideband (LSB), upper sideband (USB) or CW

- **Frequency** – Used to select the desired frequency of the tuner. This will be the frequency to which the centre of the display will be set.

- **Decode Frequency** – This sets the position of the red line and represents the frequency at which signals will be decoded within the pass band.

- **ExtIO Interface** – Select this button to bring up the SDRplay specific interface for controlling the radio.
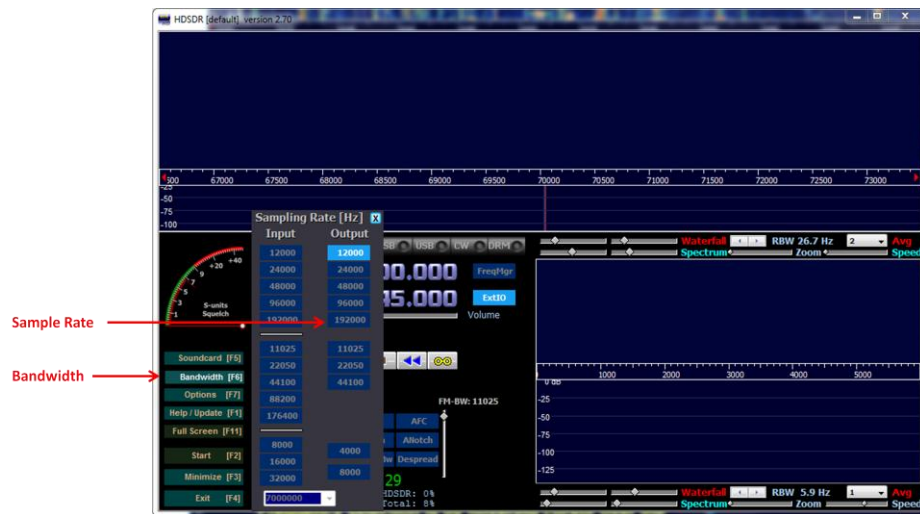
The HDSDR **bandwidth** button controls output sampling rate. The default setting is 12,000Hz. For WFM (wide band FM) you need to move this to 192000Hz

Selecting the **Options** button and then **Input Channel Calibration for Rx** will allow the user to calibrate the IQ offset. This will be important when operating in zero IF mode. If you are experiencing strong image signals you will need to adjust the amplitude and phase sliders to achieve optimum image rejection. Initially the raw sliders should be set for course tuning. The fine sliders can then be used to fine tune the settings and achieve maximum image rejection. In addition **the Rx DC removal mode** should be set to Auto to remove any unwanted DC components from the system.
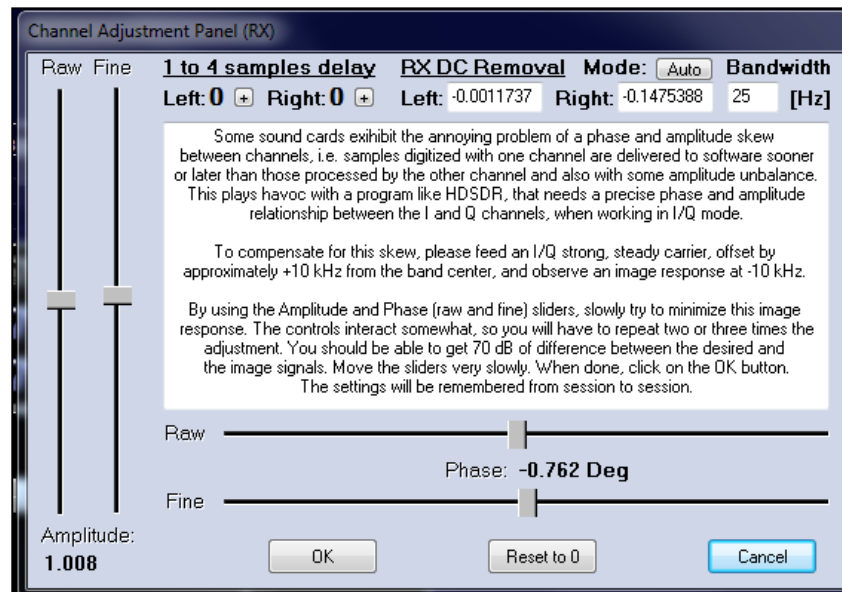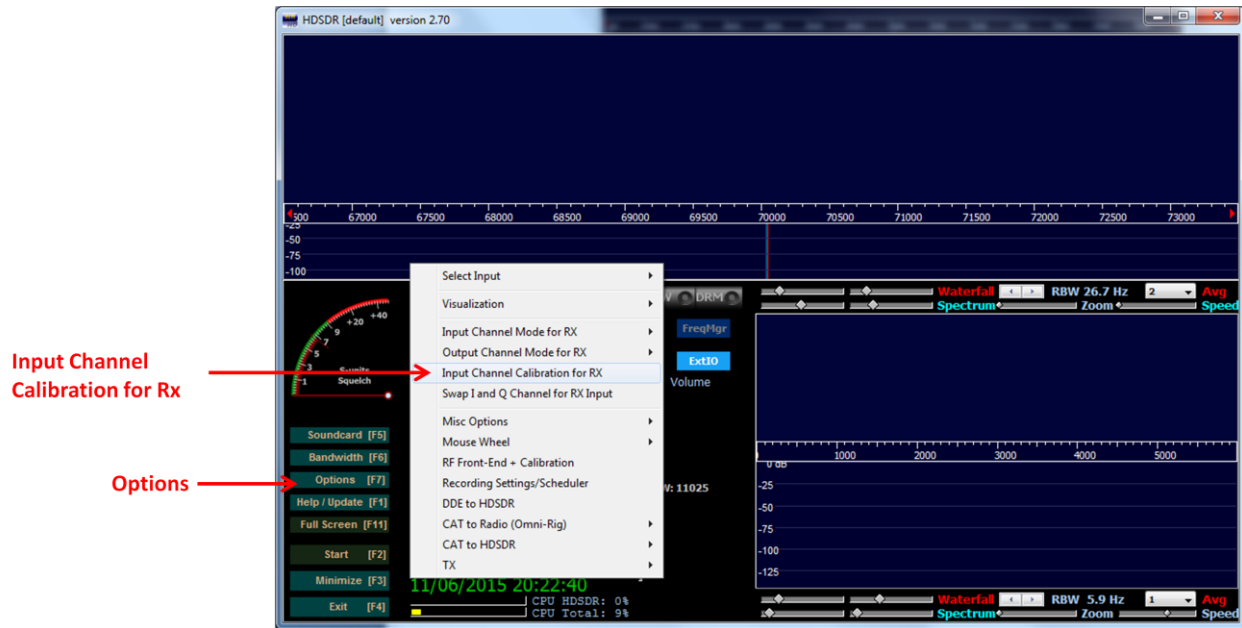
To configure SDR play specific settings click the ExtIO interface button on the main HDSDR display. The EXTIO controller dialog gives an overview of the SDRplay receiver architecture coupled with the different parameters that can be configured.
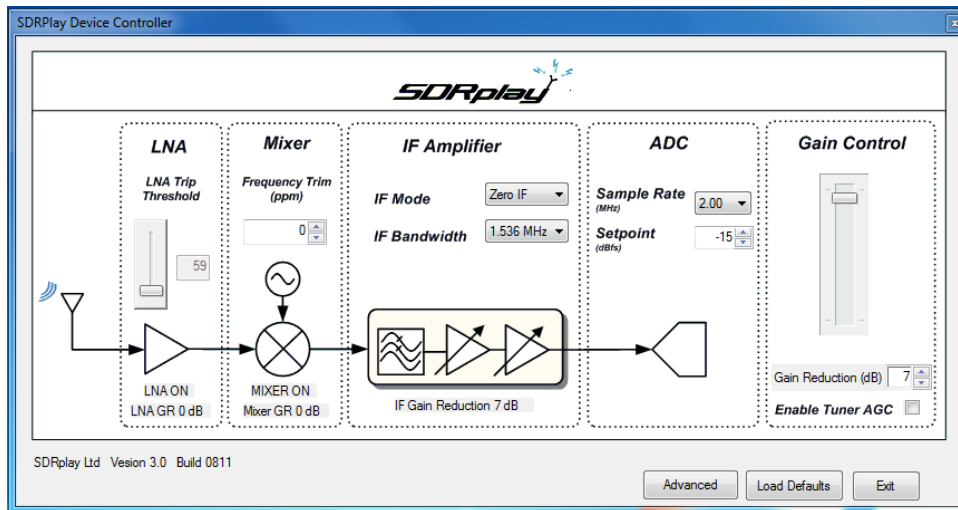
LNA Trip Threshold – The point at which the LNA turns on/off within the gain reduction range can be controlled by value in the LNA Trip Threshold. By lowering the value the LNA will turn off closer to maximum gain. Increasing the value means that the LNA will stay on for longer thus providing better noise performance but at the added risk of overload.

Frequency Trim – The SDRplay uses a crystal as its reference and as such there will be some inherent frequency offset. The frequency trim allows trimming of the reference crystal frequency to adjust errors in absolute frequency.

IF Mode – Sets the tuner into either Zero IF mode or Low IF mode. The IF bandwidth drop down menu will automatically update with the appropriate selection of IF filter bandwidths.

IF Bandwidth – Sets the bandwidth of the IF filter. The selections available will depend on the IF mode selected. For the full range of IF bandwidths selections then the tuner must be operating in ZIF mode.

Sample Rate – Sets the sampling frequency of the ADC. When operating in Low IF mode the sample rates choice is restricted.

Setpoint – Sets the target level power at which AGC routine will attempt adjust the power on the ADC input. A larger value will position the signal near the top of the ADC range. A lower value will reduce the signal power and hence levels at the ADC input.

Gain Control Slider – The gain control slider can be used to set the gain of the receiver. Maximum gain occurs at the top of the slider, minimum gain at the bottom of the slider.

Gain Reduction – The gain reduction value controls the amount of gain, in dB, that the maximum tuner gain will be reduced by. For example a gain reduction of 50 represents 50dB below maximum receiver gain. This value is tied to the gain control slider.

Enable Tuner AGC – This enables a software AGC leveling routine within the plug-in that attempts to change the gain reduction value to achieve a specified signal power at the ADC input. The level which the routine will adjust the ADC input power towards is defined in the Setpoint control box. In this mode it is not possible to adjust the tuner gain reduction manually.

Load Defaults – This button loads a predefined set of defaults back into the receiver.

Advanced – This button loads the advanced dialog box allowing manipulation of the advanced tuner settings.

Exit – Close the SDRplay control dialog box.

The Advanced dialog box allows manipulation of the tuner DC compensation options and the Block Converter LO frequency.
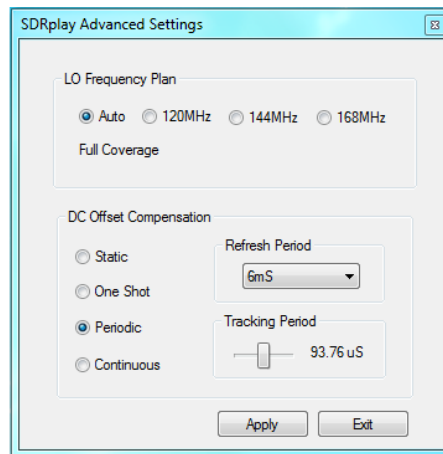
LO Frequency Plan

For frequencies below 60MHz and between 250MHz and 420MHz the SDRplay receiver uses a block converter to convert the spectrum to a useable frequency range. There are three LO's that can be applied to the block converter when it is in use. Each one gives a different frequency coverage range when operating between 250MHz and 420MHz. For frequencies below 60MHz any of the LO's can be applied and coverage maintained. In AUTO mode the 120MHz LO setting will be applied below 60MHz and between 250MHz and 420MHz the LO will be automatically changed to provide continuous coverage. In addition to the AUTO mode you can also fix a particular LO frequency. This can be particularly useful to move any image frequencies around which appear in band from the block converter. Care will need to be taken though as the LO will need to be applied bearing in mind any coverage gaps. These gaps are highlighted when a particular LO is selected.

DC Offset Compensation – Used to select an appropriate DC compensation mode for the tuner. Four possible modes are available

- **Static** – The tuner will take a single measure of the DC offset and maintain this value. Care should be taken to avoid large DC offsets when changing frequencies or gain settings. A change in mode to either continuous or periodic will be required to remove any DC offsets after large frequency or gain changes have been applied.

- **One Shot** – In this mode a short sample of the DC offset will be measured and corrected every time the receiver gain is updated using the gain slider. The length of the sample taken can be set using *Tracking Period* slider. This mode can be useful when using the AGC as the correction will be applied as the signal is leveled by the AGC routine. The system will then hold this value static until further gain changes are made. Care should be taken in this mode to not to build up large DC offsets when the AGC is off and the gain is not being adjusted.

- **Periodic** – This is the mode we recommend as a default. In this mode the DC offset will be compensated for at regular periodic intervals. The compensation interval can be selected using the *Refresh Period* drop down menu. Much like in one-shot mode the *Tracking Period* slider can be used to set the length of the sample window. In this mode the DC compensation is regularly applied so gain and frequency changes can be made freely.

- **Continuous**– In this mode the DC compensation will be applied all the time. Whilst this provides the most robust solution in term of minimizing the DC offset, the disadvantage is that it will produce a "hole" in the centre of the spectrum as the compensation works to cancel out any signals present within the bandwidth of the compensation loop.

For more information contact support@sdrplay.com

5. Legal Information

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