# “Odin” SDR console

The “Odin” console provides a way to control PowerSDR using conventional radio controls. It provides a simple touchscreen display for immediate-use commands to supplement those on the PC itself. Odin connects to the PC using USB and uses CAT commands to control PowerSDR.



# Connecting to PowerSDR

The console connects to the PC using a USB cable. When powered up, the console will normally show its “splash” screen until it has connected to a program on the PC.

To connect power SDR:

* Start PowerSDR as normal
* Open the “Setup” menu
* Select the CAT Control tab
* On the CAT tab, click the “port” drop-down box
* Select the COM port for your Odin console (see below for help)
* Set Baud = 9600, Parity=none, Data=8, Stop=1
* **(Do NOT set Baud = 1200, or you may erase the Arduino!)**
* Click “Enable CAT”
* Click “OK” to close the setup window
* …. And you are ready to go!

Connection issues:

When installed it operates as a PC COM port; you can confirm its presence by running the PC device manager, and look at the “Ports (COM and LPT)” section. The console doesn’t know which COM port is assigned to it by the PC – only the PC knows that!

It may be necessary to install a USB serial port driver (see advice here: <https://www.arduino.cc/en/Guide/DriverInstallation>) to complete the connection. If you have used a third party Arduino processor, you may need different device drivers.

# Controls

There are pushbuttons and rotary encoders on the console:

* The VFO encoder is a high quality optical encoder, with 400-600 steps per revolution to give a high quality VFO tuning action.
* Dual encoders are provided under the display that can be set to control various receive and transmit functions
* A dual encoder to the right of the display can be set to any of the functions, but its top knob is intended to be a “multifunction” encoder. You can change the function “live” as follows:
  + Click the encoder
  + Turn the encoder to select the required function (the function is shown on the display)
  + Click the encoder to select that function
  + Turn the encoder to operate that function.
* Pushbuttons are available to control “on/off” type functions, or to step through a list of settings
* Some of the pushbuttons are illuminated, so the state is clear. Most are not illuminated.
* A touchscreen display is available to show commonly needed information, and to allow some settings to be controlled using softkey buttons. The displays are as follows:

## Pushbutton Functions

The console supports up to 21 pushbuttons. On the console, 4 of these are taken up by the “click” action of the rotary encoders; the remaining 17 are connected to tactile push switches.

|  |  |
| --- | --- |
| **Control** | **Description** |
| A/B VFO select | Selects operation of the A or B VFO |
| MOX | Press to initiate transmit; press again to return to RX |
| TUNE | Press to initiate TUNE; press again to cancel |
| AF MUTE | Mute the AF output. Press again to cancel. |
| Filter reset | Press to reset the “VAR1” IF filters to sensible settings for the current mode. For CW modes, the frequencies are centres on the CW sidetone frequency. |
| Band + | Steps up one band |
| Band – | Steps down one band |
| Mode + | Steps up one mode |
| Mode – | Steps down one mode |
| AGC speed | Steps through the available AGC speeds |
| NB step | Steps through the 3 NB modes |
| NR step | Steps through the 3 NR modes |
| SNB on/off | Turns on or off the SNB |
| ANF on/off | Turns on or off the ANF |
| RIT on/off | Turns on or off RIT |
| RIT + | Increments the RIT frequency by one step |
| RIT – | Decrements RIT by one step |
| A>B | Copies the A VFO to the B VFO |
| B>A | Copies the B VFO to the A VFO |
| A/B swap | Swaps the A & B VFOs |
| Split | Seelcts “SPLIT TX/RX” operation |
| CTUNE | Turns on or off “Click Tune” mode. |
| Lock | Turns on or off the VFO lock. |
| Radio Start/Stop | Turns on or off the PowerSDR radio operation |
| Squelch on/off | Turn on or off squelch. |
| Attenuation Step | Steps through the RF attenuation in 10dB steps |
| VOX on/off | Turns on or off VOX operation |
| Diversity Fast/Slow | Changes the speed at which the encoders move the “dot” on the screen. Click to select a finer resolution; click again to set a coarse resolution for faster movement around the circle. |
| Encoder click | Must be set for the “multifunction” encoder |

## Indicator Functions

The console supports up to 7 LED outputs for illuminated pushbuttons or discrete indicators. Each can be assigned to any function from the table below. Note however that the 7 outputs are wired to 7 specific pushbuttons to illuminate them on the console PCB.

|  |  |
| --- | --- |
| **Indicator** | **Description** |
| MOX | Indicates MOX initiated by the console. Not illuminated if activated by the PC. |
| TUNE | Indicates TUNE active |
| RIT on | Indicates RIT is enabled |
| Split selected | Indicates “split” TX/RX is enabled |
| CTune selected | Indicated “click tune” is active |
| Lock selected | Indicates the VFO lock is active |
| NB off/on | Indicates that an NB mode (NB or NB2) is active |
| NR off/on | Indicates that an NR mode (NR or NR2) is active |
| SNB | Indicates that the spectral noise blanker is active |
| ANF | Indicates that the Auto notch filter is active |
| Squelch on/off | Indicates that squelch is enabled. |
| VFO A/B Select | If lit, VFO is selected for the console. |

## Encoder Functions

The console supports several encoders which can be assigned several functions:

* Three “dual shaft” encoders with an upper and lower knob, normally with a pushbutton on the upper knob
* A single encoder, normally with a pushbutton
* A high resolution optical VFO encoder (400-600 pulses per revolution). This always tunes the currently selected VFO and cannot be reassigned.

|  |  |
| --- | --- |
| **Encoder Function** | **Description** |
| AF channel gain | Adjusts the AF gain for the channel |
| Master AF gain | Adjusts the AF gain for all channels |
| AGC | Adjusts the AGC threshold |
| Filter high cut | Adjusts the edge of the IF filter passband, to remove QRM at high audio frequencies. Uses “VAR1” filter. |
| Filter low cut | Adjusts the edge of the IF filter passband, to remove QRM at low audio frequencies. Uses “VAR1” filter. |
| Drive | Adjusts the TX Drive level |
| Mic Gain | Adjusts the microphone gain level |
| VFO A tune | Tunes the VFO A frequency. (It is intended this would be used if VFO B was selected for the main VFO encoder) |
| VFO B tune | Tunes the VFO B frequency. (It is intended this would be used if VFO A was selected for the main VFO encoder) |
| VOX gain | Adjusts the gain level for voice activated TX |
| VOX delay | Adjusts the “hang” time for voice activated TX |
| CW sidetone | Adjusts the CW tone frequency |
| CW speed | Adjusts the speed for keyer operations |
| Squelch | Adjusts the squelch threshold |
| Diversity Gain | Adjusts the gain for the dual RX “antenna diversity” mode. Use this control to move radially in/out from the centre of the diversity circle display. The diversity pushbutton toggles between fine and coarse movement. |
| Diversity Phase | Adjusts the phase for the dual RX “antenna diversity” mode. Use this control to move around an arc on the diversity circle display. The diversity pushbutton toggles between fine and coarse movement. |
| Multifunction | The multifunction encoder can be set to any of these functions by the user. Click the encoder and turn to set the function; click to activate the function. The single encoder to the right of the display is normally assigned “multifunction” |

# Display Screens

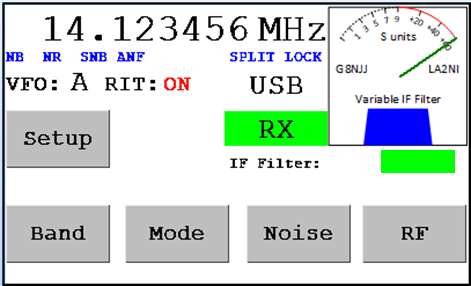
|  |  |
| --- | --- |
| Initial “Splash” screen:  This is displayed when the console is connected to a USB port and remains visible until a serial connection to a program (usually PowerSDR) has been established. |  |
| Main display:   * Shows VFO A/B, and selected mode & frequency, and RIT on/off * RX state (atten, NB/NR states) are shown under the frequency display in blue * VFO LOCK and SPLIT states are shown under the frequency display in blue * TX, RX and Tune are indicated in a colour display by the S meter. * The selected IF filter passband is shown in green; “suggested” settings are in blue * An S meter shows received signal level * Touch buttons select other screens. * The functions of “multi” and other encoders are shown at the edges. |  |
| In TX:  The meter shows TX power. TX is indicated by a red coloured control. |  |
| In you touch inside the frequency box:  The “enter frequency” screen is shown. A/B VFO is shown at top left.  You can edit the frequency using the backspace, 0-9 and . buttons to enter a new frequency in MHz. Press “Set MHz” to finish.  Remember to backspace to delete the old frequency first! |  |
| If you click “**Band**”: the band entry screen is displayed. The current band is highlighted, and VFO A/B is shown at top left.  Click on a button to change band.  “Close” returns to the main display. |  |
| If you click “**Mode**”: The mode entry screen is displayed. The current mode is highlighted, and VFO A/B is shown at top left.  Click on a button to change mode.  “Close” returns to the main display. |  |
| If you click “**Noise**”: The Noise settings screen is shown. The current settings are highlighted, and VFO A/B is shown at top left.  NR buttons can choose off / NR1 / NR2  NB buttons can choose off / NB1 / NB2  SNF and ANF are clicked to select “on”  “Close” returns to the main display. |  |
| If you click “**RF**”: The RF settings screen is shown. The current settings are highlighted, and VFO A/B is shown at top left.  AGC threshold can be changed by dragging the slider. AGC speed is selected using the 5 buttons. RX attenuation is set using the bottom 4 buttons.  “Close” returns to the main display. |  |
| If you click “**Setup**” A further screen is shown from which further settings can be accessed.  **Encoders** opened the “encoder edit” screen  **Buttons** opens the “button edit” screen  **Indicators** opens the “indicator edit” screen  **Console** opens the “general settings” screen  **Save** saves the settings to be used at power-up  **Close** returns to the main display. |  |
| General settings screen:  The baud rate for PC connection is shown and can be edited (not working yet)  Encoders can have two functions assigned. The “**2nd fn**” buttons choose the method to change between the two functions”  “**Encoder legends**” buttons turn on / off the strings at the bottom and side of the screen.  **Close** returns to the Setup screen.  The **Encoder Divide** controls give a way of choosing how many encoder “clicks” are sent to PowerSDR per “notch” they are turned. For the VFO tuning knob: this provides a simple way to adjust the tuning rate of the VFO encoder. For the other encoders with distinct noteches as they are turned, this should be set so that you get one “click” per mechanical notch that you feel as it moves. Use the I/O Test screen to confirm. |  |
| Encoder/button/Indicator edit screen:  This screen is used to change the function assigned to an indicator/pushbutton/encoder.  (The appearance depends on control type)  Use the +/- buttons at the top to choose a control. It function is then shown below.  Use the +/- buttons below to choose the required function.  **Accept** stores the setting.  **Close** returns to the setup screen; remember to press “SAVE” when you get back to that screen. |  |
| I/O test screen: This is for hardware testing of an assembled console PCB.  It shows:   * On/off states for pushbuttons; * Click counts for each encoder; * Indicator LEDs turned on/off with the top row of buttons.     **Back** returns to the “setup” screen |  |

# Variable IF Filter

A key receiver control to deal with QRM in crowded bands – particularly during busy contests – the variable filter passband. This gives a way to remove QRM from the lower and higher audio frequencies to allow desired signals to be heard.

The Odin console provides encoder functions to move the lower and upper audio frequency edges of the passband independently. This function is normally assigned to encoder 3. There is also a pushbutton action (also encoder 3) to reset the filters to a sensible start point.

The console also provides a display of the filter position, just below the S meter:



The blue display shows “suggested” starting points for the filters. These change with different operating modes.

The green display shows the actual filter settings, relative to the “suggested” ones. Low audio frequencies (bass) are to the left; high audio frequencies (treble) are to the right. The display shows that the upper and lower frequencies have been increased – probably to reject QRM from a frequency causing low audio interference.

It’s important to recognise that the encoder controls, and the display, relate to the audio frequencies. The action controlled in powerSDR is mode dependent, to lead to that outcome. The behaviours of the controls, in terms of the signals you hear, will be the same for both USB and LSB.

# Factory Settings for Controls

The functions assigned to all of the encoders, pushbuttons and LEDs are user configurable. The initial “factory” settings will be as follows:

## Encoder Functions

|  |  |  |
| --- | --- | --- |
| **Encoder** | **Main function** | **2nd Function** |
| 2A | AF Gain | AF Gain |
| 2B | AGC threshold | AGC threshold |
| 3A | Filter high | Filter high |
| 3B | Filter low | Filter low |
| 4A | Diversity Gain | Diversity Gain |
| 4B | Diversity Phase | Diversity Phase |
| 5A | Multifunction | Multifunction |
| 5B | Drive | Drive |

(This gives the end result of each being single function)

## Indicator/switch functions

|  |  |  |  |
| --- | --- | --- | --- |
| **Switch number** | **Indicator** | **Digital pin** | **Initial function** |
| SW1 | LED1 | 30 | Toggle VFO A / VFO B |
| SW2 | LED2 | 31 | MOX |
| SW3 | LED3 | 32 | TUNE |
| SW4 | LED4 | 33 | Click Tune |
| SW5 | LED5 | 34 | VFO LOCK |
| SW6 |  | 35 | A>B |
| SW7 |  | 36 | B>A |
| SW8 |  | 37 | SPLIT operation |
| SW9 | LED6 | 38 | RIT on |
| SW10 |  | 39 | RIT step up |
| SW11 |  | 40 | RIT step down |
| SW12 |  | 41 | Band down |
| SW13 |  | 42 | Mode down |
| SW14 |  | 43 | Radio start/stop |
| SW15 |  | 44 | Band up |
| SW16 |  | 45 | Mode up |
| SW17 |  | 9 | Atten |
| Encoder 2 push |  | 6 | AF MUTE |
| Encoder 3 push |  | 12 | Filter Reset |
| Encoder 4 push |  | 23 | Diversity speed |
| Encoder 5 push |  | 29 | Encoder action (for multi) |

Note Encoder 1 is the VFO encoder and has no pushbutton)

# Issues for Consideration

1. Currently there are “VFO A Tune” and “VFO B Tune” functions that can be assigned to the encoders. The main VFO knob is always assigned to the selected VFO tuning function; should the encoders only have an option to be “other VFO tune”?