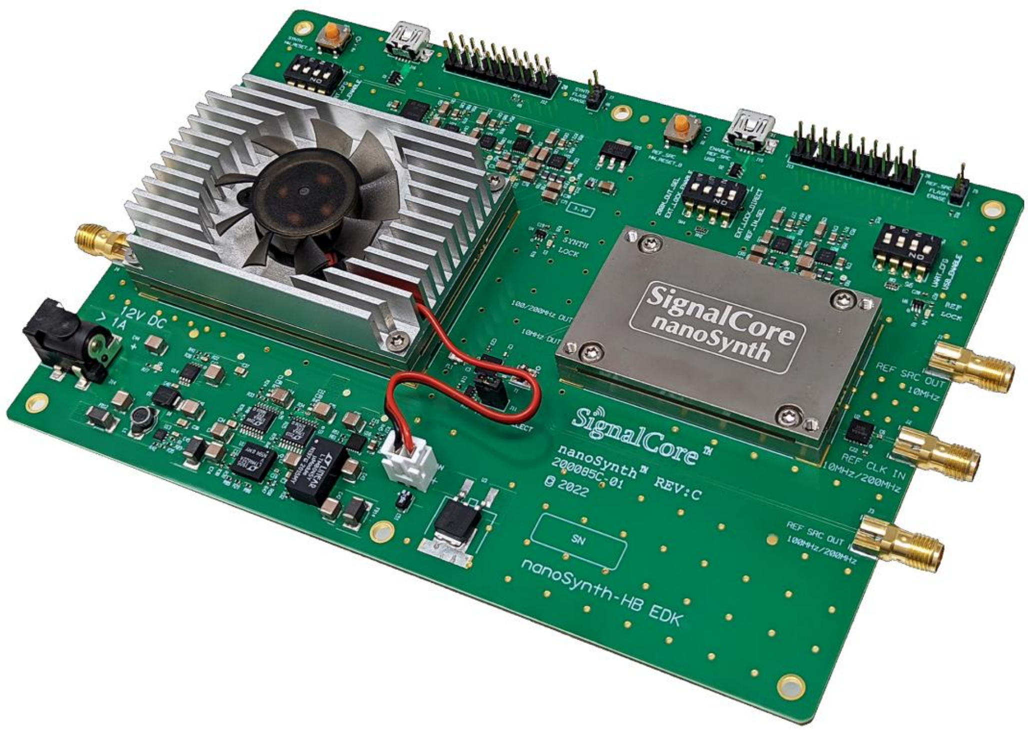

nanoSynth

Evaluation Development Kit

SC801A/SC802A/SC803A

Rev 1.0

www.signalcore.com

Table of Contents

1 Verifying the Contents of Your Shipment

The contents of the product package should include the following items:

- One nanoSYnth-HB EDK board kit
- One 12V power supply wall adapter
- Two USB cables
- One USB flash drive contains software, board design files, and product documents

Inspect the shipping carton for visible damage. If carton is damaged, please notify both the carrier and SignalCore immediately.

ESD CAUTION

The SC801A EDK ships in antistatic packaging to prevent damage from electrostatic discharge (ESD). The device should always be stored inside an antistatic bag when it is not in use, as ESD can cause damage to the electronic components on the board. Properly ground yourself and use ESD good practices when handling the product.

Open the shipping carton and remove all contents. If the contents show visible damage and/or are missing, please contact SignalCore immediately.

2 nanoSynth-HB Evaluation Board Description

Figure 1 below shows the evaluation board with arrows pointing to its various functions, which are described in Table 1.

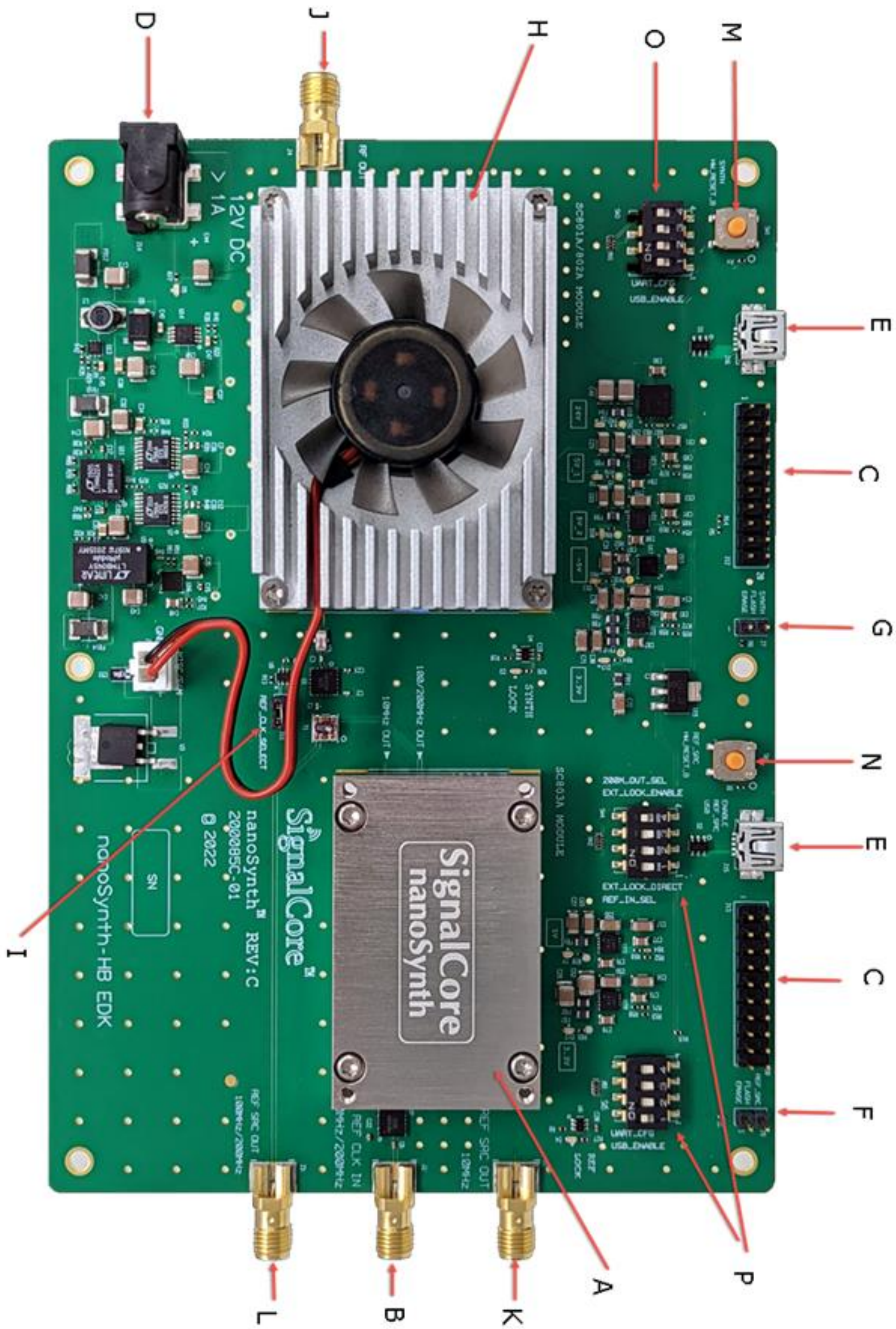

Figure 1 EDK board

Item	Description
A	SC803A reference source module
B	Reference input SMA connector. When J11, the REF_CLK_SELECT, pins are jumped this reference is passed to the SC803A reference source module, otherwise this signal is passed directly to the SC801A/SC802A. The reference frequency must be 200 MHz if clocking the SC801A/SC802A directly. See the SC803A for allowable frequencies and recommended input power.
C	Digital I/O pins for serial communication for the respective device. See schematics at the end of this document.
D	12V power jack, 2.5x5.5mm
E	Mini-B type USB connector for USB communication to the devices
F	Reference flash erase. Do not jump/short pin together. Doing so and depressing reset will erase the device flash memory.
G	Synthesizer flash erase. Do not jump/short pin together. Doing so and depressing reset will erase the device flash memory.
H	SC801A/SC802A synthesizer module with attached heatsink
I	Reference Clock Select. Selects to use the onboard SC803A (pins jumped) or an external 200 MHz source (pins open) for the SC801A/SC802A. If external clock source is used, the recommended power is 7-10 dBm.
J	RF Out
K	10 MHz Reference out from the SC803A.
L	Reference out (100/200 MHz) from the SC803A.
M	SC801A/802A reset button.
N	SC803A reset button
O	Configuration switches for the SC801A/SC802A. Configuration switches for the SC803A. For more information see product datasheet.
P	Configuration switches for the SC803A. For more information see product datasheet.

Table 1

3 Control Software and Device Driver

The nanoSynth-HB EDK comes with a USB flash drive that contains all software needed to control and program the onboard nanoSynth devices, namely the SC801A or SC802A as well as the SC803A reference source. Insert the USB drive into the host computer and navigate to the ***device_name\win*** directory that contains the setup files for the devices. If the host operating system is 64 bits, run the **Setup64*.exe* executable, else run the **Setup32*.exe* excutable for 32 bits OS. These setup files for the device will install a software front panel (SFP) to quickly control the device, programming API for software development, and the necessary drivers. Follow the instructions to finish the installation. Note that the LabVIEW 2010 Runtime has to be installed into the system to enable the SFP to work, and there are a couple of ways to do that. You may choose to install it during the software installation process, where a **Dependencies** window (Figure 2) would prompt to select the installation of the LabVIEW runtime (LVRT). If you did not remember to install the LVRT during software installation, you may navigate the USB drive to the ***\LabVIEW Run-Time Engine\LVRTE2010_f2Patch-64*** and run the ***setup.exe*** excutable for 64 bits OS.

Once software installation is completed and the device is powered up and connected to the host via USB, it will show up in the Windows Device Manager as a SignalCore USB Device and the SFP will appear in the [Start] menu. See Figure 3.

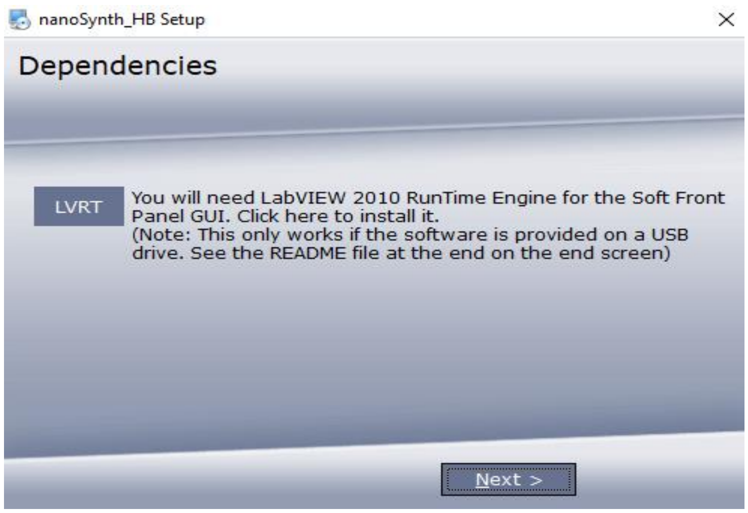

Figure 2 Prompt to install LabVIEW runtime

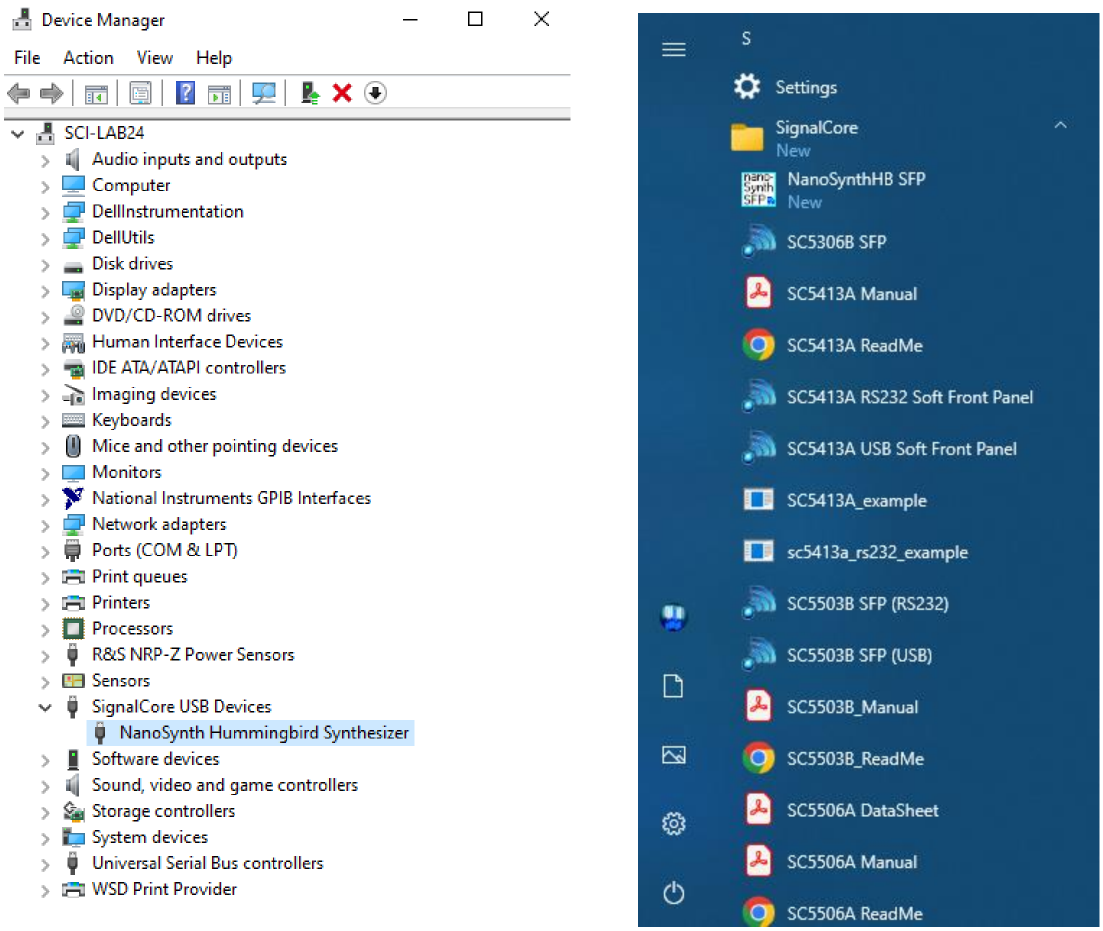

Figure 3Device Manager Screen and [Start]

4 Using the SC801A/SC802A Soft Front Panel

The SFP can be launched by clicking the START->Programs->SignalCore->nanoSynth-HB SFP once the control software and device driver are installed. This executable is written in LabVIEW and its source code is available in the installation directory. The LabVIEW function library used to develop this application is also available in the installation directory, and its functions are simply wrappers of the API (nanohb.dll). The startup screen of the SFP is shown in Figure 4, which show the devices detected in the host computer in a popup window. Pull down on the menu to select the device corresponding serial number and interface.

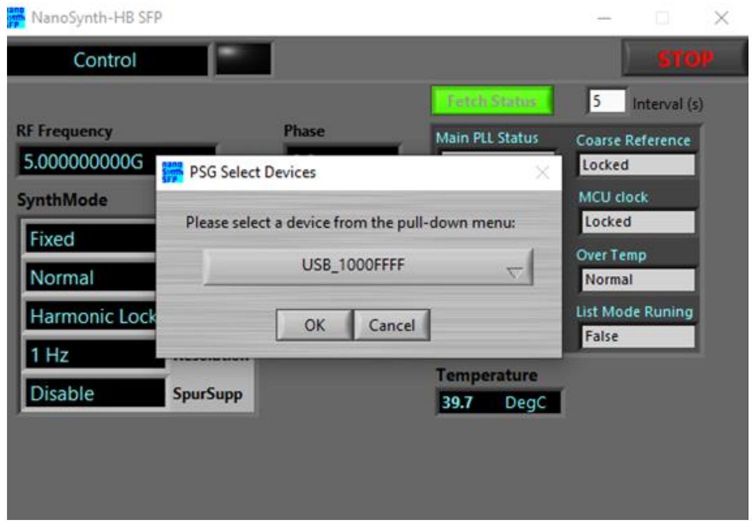

Figure 4. SFP launch

The very first tab in the SFP window is the [Control] tab. You may select other tabs by clicking the upper left box as shown in Figure 5 below.

Figure 5 Tab listing various windows to view

4.1 The Control Tab

This tab has most of the control function for the device you may change the frequency, adjust the signal phase, configure the synthesizer modes, and apply the software trigger to start, stop, or step the list or sweep frequencies. The behavior of the trigger is set up by the list mode configuration function and is discussed in section 4.2. These controls are on the left side of the tab window as seen in Figure 6. Details on the synthesizer mode setting are as follows:

- RF Mode – This toggles the device to generate a fix frequency or set it up ready for sweep/list mode triggering.
- Loop Gain – This toggles the synthesizer phase lock-loop gain between normal and narrow. Narrow loop gain helps to suppress farther out spurious signals, spurs greater than 1 MHz away from carrier center. However, this could increase noise in the spectral region close the carrier.
- Lock Mode – The synthesizer uses 2 phase lock modes for synthesis, Harmonic and Integer-N. Harmonic mode provides the best phase noise however spurs signals may occur more frequent. Integer-N mode has less spur occurrences, but the close-in phase noise is higher. The user may choose between the modes and weigh the benefits of that choice for a particular application.
- Resolution – This selects the frequency resolution between 1 Hz or 1 mHz, the default is 1 Hz. Choosing 1 mHz places more computational accuracy on the device’s 32 bit microcontroller and the resulting frequency is more likely to have rounding off errors to the order of 10e-5 Hz. This rounding off error is less likely for 1 Hz resolution computations.
- SpurSupp – This enables and disables spur suppression. When it is enabled, the device tries to bounce between the 2 lock modes, as mentioned above, to avoid noticeable spurs using a lookup table.

On the right side of the tab window are the current device operating status indicators, as well as the current temperature of the device. To update the device, select [Fetch Status] and set the time interval between each status update from the device. The [Fetch Status] turns bright green if it is active.

Figure 6 The control window

4.2 The Configuration Sweep/List Tab

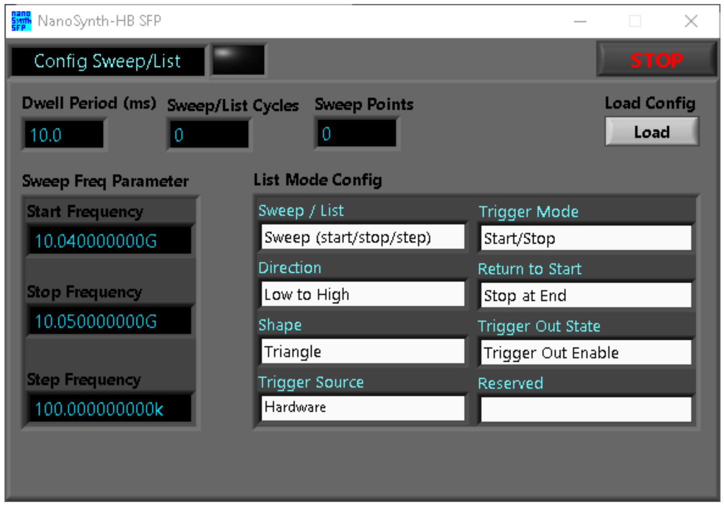

Figure 7 The Sweep configuration window

This tab window is used to configure the device to automatically change the frequencies based on a list or "sweep frequency parameters". In this window we configure the sweep list of frequencies using 3 parameters: the start and stop frequencies, and the step frequency size. These parameters are inside the "Sweep Freq Parameter" sub-window, see Figure 7. The dwell period sets the time that the signal spends at a frequency before changing to the next. The sweep/list cycles value sets the number of cycles the sweep goes through from beginning to end before stopping. If its value is set to zero, the sweep will cycle indefinitely. The number of sweep points is calculated from the 3 sweep frequency parameters.

4.2.1 List Mode Configuration Sub-Window

This sub-window sets the behavior of the sweep, and its parameters are discussed below.

4.2.1.1 Sweep/List

The parameter instructs the device to either use the frequency points calculated by the 3 sweep parameters mentioned above, namely the start, stop, and step frequencies, or from a user input list of frequencies. User input list will be discussed in the next tab section.

4.2.1.2 Sweep Direction

The sweep can be chosen to start at the beginning of a list and incrementally step to the end or vice versa.

4.2.1.3 Sweep Waveform

The list of frequency points may be swept in a saw-tooth or triangular manner. If sawtooth is selected, the device will return to the starting point upon reaching the last frequency point. Plotting frequency versus time reveals a sawtooth pattern. If triangular is selected, the device will sweep linearly from the starting point, then reverse its direction after the last (highest or lowest) frequency and sweeps backward toward the start point, mapping out a triangular waveform on a frequency versus time graph.

4.2.1.4 Trigger Source

This selects whether the trigger source is software or hardware. If the source is hardware, a falling edge on Trigger-In pin will trigger the device. Hardware trigger does not have the variable latency associated with software trigger, and thence it provides better timing control.

4.2.1.5 Trigger Mode

If this mode is set to “start/stop”, the first trigger is be interpreted as a start signal to begin the sweep process and progressively move through the frequency points with a delay. A subsequent trigger will stop the sweep. If it is set to “step” then each trigger will only advance the frequency once; the signal remains indefinitely until the next trigger.

4.2.1.6 Return to Start

If this is select, the device returns to the start frequency of the sweep after a set number of cycles, otherwise it will remain at the end frequency of the sweep.

4.2.1.7 Trigger Out State

If trigger out is enable, the Trigger-Out pin pulses once for every frequency change.

4.3 List Entry Tab

This is where the list of frequencies and their corresponding delays are entered, frequency is entered in Hz and delay in milliseconds. A maximum of 2048 points can be entered, see Figure 8.

Figure 8 List entry window

Once the frequencies and corresponding delays are entered in the columns, click the [Download to Buffer] button to write the data points to the device memory buffer. If the user wants to store this data permanently in the device EEPROM memory, click the [Save Buffer to EEPROM] button. To retrieve EEPROM data into program memory, click the [Read EEPROM to Buffer] button.

4.4 The Device Information Tab

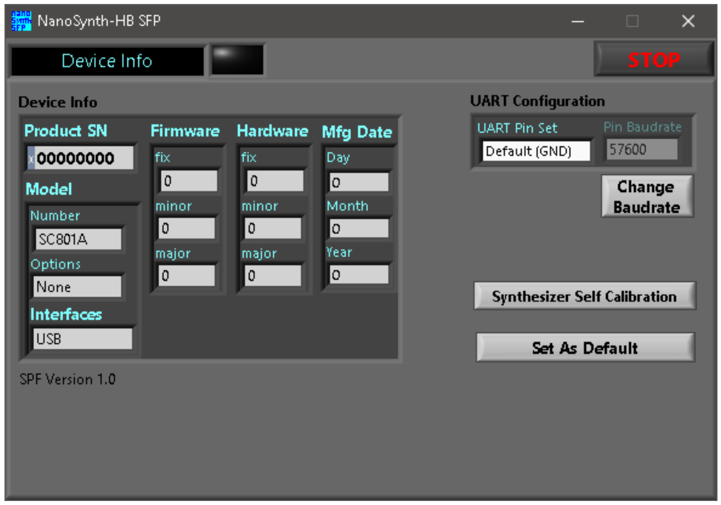

Figure 9 The device information window

This tab window shows information pertaining to the device such as serial number, model information, hardware and firmware revision, manufactured date, and serial port configuration. If the UART Pin is physically grounded (zero state), its baud rate defaults to 57600. If the pin is pulled high (set to 1) and upon powerup the baud rate will be set to the rate stored in memory as default. To set a new baud rate, first change the rate by selecting the “pin Baudrate”, followed by clicking [Change Baudrate], and finally clicking [Set As Default]. When the [Set As Default] button is clicked, all the current settings in all the tabs will be stored and used as the default powerup state.

5 Using the SC803A Soft Front Panel

5.1 The Control Window

The control tab, Figure 10, shows the operating state of the device such as the output and input reference frequencies, the reference configuration, and the other current status. The device configuration is set via hardware pins by default. However, these pins can be overridden by selecting ‘True’ for “OverrideHwPins”. Doing so allow the user to set the different reference input and output frequencies, and lock and unlock from external reference sources programatically.

Figure 10 SC803A control window

5.2 The Information Window

The information window is similar to that of the SC801A/SC802A, and details are provided in section 4.4.

6 Revision Table

Revision	Revision Date	Description
1.0	8/2/2022	Initial Release