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SG6000 RF Signal Generator User Manual



DS Instruments' various signal generator models are all designed to be as intuitive as possible, either being controlled by the front panel, or from the USB/Ethernet interface. **Buttons and front panel modes are similar across all models.**

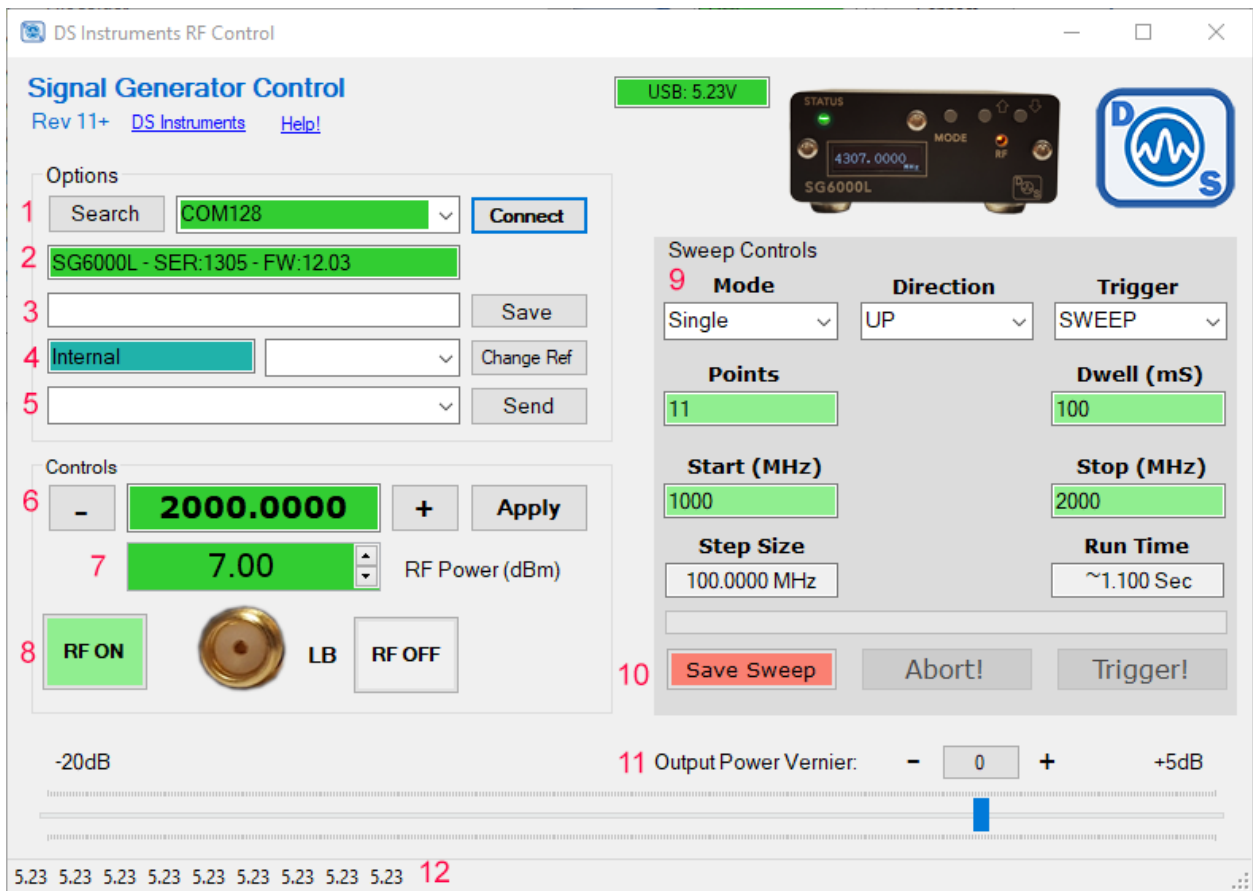
Stand-Alone Use Quick Setup:

- Connect your device to a standard USB port or 5 Volt power source using the included USB cable. A desktop, laptop computer, or smart-phone charger should work. Avoid using **unpowered** USB hubs or **long** USB cables. Blue USB 3.0 ports are **preferred** due to their high current capabilities.
- Connect an external 10MHz reference source to the rear reference MCX connector if desired. If no external source is detected, the unit will use its own internal source. Searching for an external frequency only occurs at boot-up, do not connect an external reference **after** the unit is already powered up.
- Press the red power button *if available* on your device. The screen will display the model number and firmware version. The unit will beep indicating boot-up and the green power LED should light up.
- The unit is now ready to accept front panel changes or a data connection from the control software.
- To cycle between front control modes, **hold** the MODE button down until there is a beep (~0.5 seconds). The default mode is integer frequency, followed by fractional frequency, power output level, power vernier, RF output on-off, and save system state.
- The **RFO** led indicates that the device is successfully locked to the reference and providing the desired frequency on the rear SMA output port.

SCPI/COM/Computer Control Use Quick Setup:

- Connect your device to a standard computer USB port using a high-quality USB cable.
- Connect an external 10MHz reference source to the rear MCX connector if desired. If no external source is detected, the unit will use its own internal source. Reference auto-detection can be overridden in the GUI if desired.
- Press the red power button *if available* on your device. The screen will display the model number and firmware version. The unit will beep indicating boot-up and the green power LED should light up.
- Windows should now install the standard virtual COM port driver. Wait for this to complete.

- Download and open the DS Instruments Signal Generator Control GUI from the website. Install any .NET framework updates from Microsoft if needed.
- Select a COM port from the top select list and press CONNECT to try to control the unit. If the select box turns green then a connection has been established. The model number and firmware versions will appear in the green info box. If this box is turns red, the wrong COM port was selected or an error has occurred.
- At this point a user can enter a frequency and click APPLY or setup a frequency sweep.
- The blue RFO led on the front of the SG unit indicates that it is successfully locked and outputting the desired frequency on the output port
- The physical control buttons will be **disabled** when a COM port connection is established to prevent any accidental bumping of the buttons when under computer control.



Control Software Feature Descriptions

1. COM / Ethernet search and connect – Lists any COM ports or DSI IP addresses found
2. Info Box – Displays information about the connected device
3. Custom Name – Lets the user save a TAG ID, Name, or inventory number to non-volatile memory
4. Reference frequency source – Sets internal, external or auto detect for the 10MHz reference input
5. Custom Command – Type or select a custom SCPI serial command to send to the connected device
6. Frequency – Step or enter a frequency to generate
7. RF Output Power – Adjust the output power in calibrated 0.5dB steps
8. RF Enabled – Set the RF output port to ON or OFF
9. Sweep Settings – Set the bounds, number of points, direction, and type of frequency sweep
10. Sweep Control – Save the current sweep settings to the device, start or abort the sweep

11. Fine Power Tune – Adjust output power in fine (~0.05dB) increments between the 0.5dB steps.
12. Message Bar – Displays feedback information sent from the device

Control Software Notes

- If reference auto-detection is misbehaving with your input signal, it can be forced to external or internal using the select box and “Change Ref” button. A SG reset is recommended after this setting is changed.
- “Send Command” allows a user to send a raw SCPI command to the Signal Generator, in USB mode the GUI will also display any response from the device in the message bar at the bottom.
- The Vernier setting allows fine power output level setting between the 0.5dB steps. Highest power output results when the slider is farthest to the right.
- If the USB voltage box goes into the red, performance will be unpredictable or an error will be indicated by the device. Try finding a better USB power source or cable.
- If the device encounters any errors it will start blinking red, to query what the error is, send the SCPI command “SYST:ERR?”.

Hardware

- The MCX **10MHz reference** input will accept sine or square wave input between -10 and +10dBm.
- The **sweep trigger** MCX input is pulled high to +3.3V internally, when pulled low the saved sweep will be initiated. Sweep parameters must be loaded from the GUI for this trigger to be activated. This input is **5-volt tolerant**. Brining the input back high will not stop the sweep or have any other effect.

Sweeping Details

- The Sweep **mode** control lets the user configure a continuous or single sweep.
- **Direction** UP increases frequency from Start to Stop, DOWN starts the sweep at the stop frequency.
- The **Trigger** option changes the functionality of the physical trigger input pin between activating the complete sweep, or just the next STEP. This is only available in certain firmware versions.
- The **Points** field determines how many independent frequency points are calculated total. This can be from 2 to 10000.
- The **Dwell** time field controls how long the synthesizer will pause at each new frequency point. Minimum value is ~3ms.
- The **Start** and **Stop** frequency settings control the beginning and end of the sweep.
- The **Step Size** and **Run Time** are system calculated values based on the above values. Run time is only a close estimate of the ideal value, not including actual minor system overhead and phase lock loop delays.
- The **Save Sweep** button transfers these values from the GUI to the signal generator CPU. This button is critical to press after values are updated in the control software.
- The **Abort** button immediately stops the device mid sweep.
- The **Trigger** button emulates the physical trigger input pin by sending a command to start the sweep now.

The screenshot shows a 'Sweep Controls' panel with the following settings and controls:

Mode	Direction	Trigger	
Single	UP	SWEEP	
Points	11	Dwell (mS)	100
Start (MHz)	1000	Stop (MHz)	2000
Step Size	100.0000 MHz	Run Time	~1.100 Sec

At the bottom of the panel are three buttons: 'Save Sweep' (red), 'Abort!' (grey), and 'Trigger!' (grey).

Notes

- A complete SCPI command list is located on the website (<https://www.dsinstruments.com/downloads/>)
- Tech support email can be reached at support@dsinstruments.com