

User Guide

Synthesized Signal Generators



Table of Contents

1 - General Information	4
1.1. User-Guide Scope	4
1.2. Support Contacts.....	4
1.3. Warranty & RMA Returns	4
1.4. End of Life.....	4
1.5. Definitions	4
2 - About Mini-Circuits Synthesized Signal Generators.....	5
2.1. Introduction	5
2.2. Key Features.....	5
2.3. Intended Applications	5
2.4. Model Selection Guide.....	6
2.5. Environmental Specifications.....	6
2.6. Supported Software Environments.....	6
2.7. Conformity	7
2.8. Accessories and Options	8
2.8.1. SSG-15G-RC Package	8
2.8.2. SSG-30G(HP)-RC Package	8
2.8.3. SSG-6xxxRC Package	8
2.9. Service and Calibration.....	9
2.10. Safety & Precautions	9
3 - Software Setup	10
3.1. System Requirements	10
3.2. Software Downloads & Resources	10
3.3. Software Installation	10
4 - Hardware Setup.....	12
4.1. Signal Generator Panel Schematics.....	12
4.1.1. SSG-6xxxRC Series Panels	12
4.1.2. SSG-30G(HP)-RC Panels (Including SSG-15G-RC).....	13
4.2. Signal Generator Setup (Except SSG-30G(HP)-RC Models)	13
4.3. SSG-30G(HP)-RC Setup	14
4.4. Reference and Trigger Signal Setup	14
5 - Using Mini-Circuits' GUI	15
5.1. Getting Started.....	15
5.1.1. USB Control	15
5.1.2. Ethernet Control.....	16

Table of Contents (continued)

- 5.2. Main Screen Operation 18
 - 5.2.1. Main Screen Functions 18
 - 5.2.2. Frequency Scroll Bar Step Size screen 19
 - 5.2.3. Power Scroll Bar Step Size screen..... 20
- 5.3. Sweep & Hop Modes..... 21
 - 5.3.1. Common Functions..... 21
 - 5.3.2. Frequency Sweep 23
 - 5.3.3. Power sweep 24
 - 5.3.4. Hop Mode..... 25
- 5.4. Pulse Source Modes 26
 - 5.4.1. Common Functions..... 26
 - 5.4.2. Free Run Pulse Source 27
 - 5.4.3. Triggered Pulse Source 28
 - 5.4.4. Square Pulse Source 29
 - 5.4.5. External Modulation Pulse Source 30
 - 5.4.6. Dynamic Pulse Mode 31
 - 5.4.7. Pulse Width Limits 32
 - 5.4.8. Pulse Rate Limit 32
- 5.5. Multi-Generator Control 33
- 5.6. On Power-Up Configuration 34
- 5.7. Calibration Tracking Status..... 35
- 5.8. Reference and Trigger Signals 36
 - 5.8.1. Reference Signals 36
 - 5.8.2. Trigger Signals..... 36
- 5.9. Ethernet Configuration 37
 - 5.9.1. Default IP Configuration 37
 - 5.9.2. Default Static / “Link-Local” IP Address..... 37
 - 5.9.3. Recovery of IP Configuration via USB 37
 - 5.9.4. Default Factory Setting..... 37
 - 5.9.5. Ethernet Settings Screen 38
 - 5.9.6. Ethernet Configuration Tool..... 40
- 5.10. Firmware Update 41
 - 5.10.1. Requirements 41
 - 5.10.2. Process 41
- 5.11. Firmware Recovery 43
 - 5.11.1. Recovery Steps (SSG-6xxxRC models) 43
 - 5.11.2. Recovery Steps (All Other Models)..... 44

6 - Revision History..... 45

7 - Contact 46

1 - General Information

1.1. User-Guide Scope

This user guide provides general introduction, installation instructions and operating information for Mini-Circuits' SSG (Synthesized Signal Generator) series and its Graphical User Interface (GUI) application measurement software.

1.2. Support Contacts

We are here to support you every step of the way. For technical support and assistance, please contact us at the email address below or refer to our website for your local support:

- testsolutions@minicircuits.com
- https://www.minicircuits.com/contact/worldwide_tech_support.html

1.3. Warranty & RMA Returns

Mini-Circuits provides a limited time warranty with all products. Please contact your account manager or refer to our website for full details: <https://www.minicircuits.com/support/ordering.html>

If you have any questions or concerns with your product, please contact us in the first instance through testsolutions@minicircuits.com. Our team will work with you promptly to understand and resolve any issues. As a software-controlled instrument, it is usually possible to resolve issues remotely without requiring the unit to be returned to the factory.

In the event that a return to the factory is necessary, Mini-Circuits will provide an RMA number and full return instructions.

1.4. End of Life

Please contact testsolutions@minicircuits.com to review environmentally friendly end of life disposal options.

1.5. Definitions

Note:

- A note advises on important information you may need to ensure proper operation of the equipment.
- There is no risk to either the equipment or the user.



Caution:

- A caution advises about a condition or procedure which can cause damage to the equipment.
- There is no danger to the user.



Warning:

- A warning alerts to a possible risk to the user and steps to avoid it.
- Do NOT proceed until you are sure you understand the warning.

2 - About Mini-Circuits Synthesized Signal Generators

2.1. Introduction

The Mini-Circuits SSG wideband synthesized signal generator series covers the frequency range of 1 MHz to 30 GHz with up to 85 dB dynamic range. Signal generator models feature a 50Ω RF output, 10 MHz reference in and out connections and LVTTTL trigger in and out ports, making them a low-cost replacement for conventional RF/Microwave signal generators.

The provided user-friendly software and USB cable connect the generator to a notebook or a PC with a USB port, providing the additional benefits of frequency and power sweeps, pulse mode output, GUI, easy interface with most lab test software, and much more. SSG models are powered by the supplied AC/DC adaptor. All models support remote control via Ethernet, see *section 2.4* and individual data sheets for details.

2.2. Key Features

- Wide dynamic range
- Wide frequency range
- RF, Reference, and Trigger in/out ports
- HTTP and Telnet control
- SSH secure communication available on some models (refer to model datasheets)
- Frequency and power sweep and hop modes (up, down, or bi-directional)
- Synchronized multi-generator sweep mode (up, down, or bi-directional)
- CW and pulse modulation
- Easy installation and operation
- USB HID (Human Interface Device) for “plug & play” operation (no driver installation required)
- User-friendly graphical user interface (GUI) for Windows
- API DLL for Windows and direct USB programming support for Linux

For additional details, performance data and graphs, outline drawing, ordering information and environmental specifications, see our catalog at: <https://www.minicircuits.com/WebStore/RF-Synthesized-Signal-Generators.html>

2.3. Intended Applications

Mini-Circuits synthesized signal generators are intended for indoor use in:

- Lab and test equipment setups for both manual and automated measurement.
- Production line testing.
- Field testing.

The SSG series can be used by anyone familiar with the basics of electronics measurements or electronic control systems.

2.4. Model Selection Guide

Parameter	SSG-30GHP-RC	SSG-30G-RC	SSG-15G-RC	SSG-6000RC	SSG-6001RC
Frequency range (MHz)	10 – 30000	10 – 30000	10 – 15000	25 – 6000	1 – 6000
Power range (dBm)	-38 to +28	-47 to +23	-50 to +16	-65 to +14	-70 to +15
Frequency resolution (Hz)	0.1	0.1	0.1	3	3
Power resolution (dBm)	0.5	0.5	0.1*	0.25	0.25
Minimum dwell time (ms)	0.01	0.01	0.01	20	20
Maximum pulse rate (kHz)	2000	2000	2000	90.909	33.333
DC power supply (V)	6 & 12	6 & 12	6	12	12
DC current consumption (A)	1.85 & 0.8	1.85 & 0.8	1.85	0.85	1.3
Ethernet speed	100 Mbps	100 Mbps	100 Mbps	10 Mbps	10 Mbps
Ethernet protocols	HTTP / Telnet / SSH	HTTP / Telnet / SSH	HTTP / Telnet / SSH	HTTP / Telnet	HTTP / Telnet

*Increased non-monotonic behavior may be observed at power steps below 0.5 dB.

For detailed model performance, data and graphs, outline drawing, ordering information and environmental specifications click on the model part number.

2.5. Environmental Specifications

Mini-Circuits' synthesized signal generators are intended for operation in office, laboratory, or production test environments. With the provided power adaptor, they can meet requirements for overvoltage category 2 as specified by IEC. Do not use in any condition which exceeds the published environmental specifications.

Condition	Specification
Operating temperature	0°C to +50°C
Humidity	5% to 85% RH (non-condensing)
Altitude	Up to 5000 m (16400 ft.)
Pollution degree	2 - Normally only non-conductive pollution occurs (per IEC 61010)

2.6. Supported Software Environments

Mini-Circuits' synthesized signal generators have been tested in the following operating systems:

- 32-bit systems: Windows 7 or later.
- 64-bit systems: Windows 7 or later; Linux.

Custom automation programs can be created in most modern programming environments, including Python, C#, LabVIEW, MatLab and more.

Refer to the [programming manual](#) for more information on signal generator programming.

2.7. Conformity

Mini-Circuits' synthesized signal generators conform to the following international standards:

Standard	Meaning
CE	<p>Meets the requirements of the following applicable European directives and carries the CE marking accordingly:</p> <ul style="list-style-type: none"> • Low Voltage – Directive 2014/35 • Electromagnetic Compatibility – Directive 2014/30/EU • Restriction of the Use of certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) – Directive 2011/65/EU
UKCA	<p>Meets the requirements of the following applicable UK directives and carries the UKCA marking accordingly:</p> <ul style="list-style-type: none"> • Electrical Equipment (Safety) Regulations 2016 • Electromagnetic Compatibility Regulations 2016 • The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012
FCC	<p>This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.</p>
USB 2.0	<p>The models meet the specifications of the Universal Serial Bus version 2.0 communication standard as described by USB-IF.</p>
USB HID	<p>The models meet the requirements for Universal Serial Bus Human Interface Devices according to USB-IF's Device Class Definition for Human Interface Devices firmware revision 1.11.</p>
TCP/IP	<p>Ethernet communication complies with the specifications of the Transmission Control Protocol (TCP) and Internet Protocol (IP) as defined in RFC 791 and RFC 793.</p>
HTTP	<p>The models support all requirements for communicating with the Hypertext Transfer Protocol (HTTP) as defined in RFC 1945.</p>
Telnet	<p>The models support all requirements for communicating with the Telnet protocol, as defined in RFC 854.</p>
SSH	<p>All models except SSG-6xxxRC series support the requirements for SSH protocol as defined by RFCs 4250-4253, 4419, 5647, 5656 and 6668.</p>

2.8. Accessories and Options

For additional details and ordering information see specific model datasheet.

2.8.1. SSG-15G-RC Package

SSG-15G-RC comes with the following accessories included:

- 6V AC/DC power adaptor
- 110-220V power cord
- 6.6 ft (2.0 m) USB cable: USB type A (Male) to USB type Mini-B (Male)
- 5.0 ft (1.5 m) Trigger/Reference cable (x2): BNC (male) to SMB (Female)

Additional ordering options are available:

- 3.3 ft (1.0 m) USB cable: USB type A (Male) to USB type Mini-B (Male)
- 5.0 ft (1.5 m) Ethernet cable: RJ45 (Male) to RJ45 (Male) Cat 5E cable
- Calibration service

2.8.2. SSG-30G(HP)-RC Package

SSG-30G(HP)-RC is an assembled kit containing an 1x **SSG-15G-RC** unit and an 1x **FX-30G(HP)-RC** unit.

SSG-30G(HP)-RC comes with the following accessories included:

- 6V AC/DC power adaptor
- 12V AC/DC power adaptor
- 2x 110-220V power cord
- 6.6 ft (2.0 m) USB cable: USB type A (Male) to USB type Mini-B (Male)
- 5.0 ft (1.5 m) Trigger/Reference cable (x2): BNC (male) to SMB (Female)
- 6.0 in (15.0 cm) Control cable: Used for connecting the SSG and FX modules

Additional ordering options are available:

- 3.3 ft (1.0 m) USB cable: USB type A (Male) to USB type Mini-B (Male)
- 5.0 ft (1.5 m) Ethernet cable: RJ45 (Male) to RJ45 (Male) Cat 5E cable
- Calibration service

2.8.3. SSG-6xxxRC Package

SSG-6xxxRC comes with the following accessories included:

- 12V AC/DC power adaptor
- 110-220V power cord
- 2.7 ft (0.8 m) USB cable: USB type A (Male) to USB type B (Male)
- 5.0 ft (1.5 m) Ethernet cable: RJ45 (Male) to RJ45 (Male) Cat 5E cable

Additional ordering options are available:

- 6.8 ft (2.1 m) USB cable: USB type A (Male) to USB type B (Male)
- 11.0 ft (3.4 m) USB cable: USB type A (Male) to USB type B (Male)
- Bracket mounting kit
- Calibration service

2.9. Service and Calibration

The only user-performed service possible for SSG modules is external cleaning of the case and connectors as needed. Do not use any detergents or spray cleaning solutions. The case can be cleaned with a soft, slightly dampened cloth and the connectors with an alcohol solution. Do not allow any liquid ingress into the case or connectors.

The recommended calibration cycle for Mini-Circuits' SSG series Synthesized Signal Generators is once every two years or every 4160 operating hours (see *section 5.7* on automatic tracking of operation time). Calibration service is available from Mini-Circuits. For details, see the "Ordering, Pricing & Availability Information" link from individual model pages on the website.

2.10. Safety & Precautions

Mini-Circuits' synthesized signal generators contain no user serviceable parts and should not be opened. Discontinue use and contact Mini-Circuits in the event of visible damage to any parts.

Please observe the following safety precautions at all times when using Mini-Circuits' signal generator modules:



Caution:

- Use the power cord provided with the generator.
- Ensure the generator air vents are clear.
- Do not provide inputs to the generator exceeding the limits specified in the datasheet.



Warning:

- Properly ground all equipment to reduce the risk of accidental electrical shock.

3 - Software Setup

3.1. System Requirements

The minimum requirements for the installation of the Mini-Circuits SSG software package and API on the host PC are:

- Microsoft Windows 7 or later (32- or 64-bit).
- Intel i3 or equivalent (recommended).

Control method	Required support
USB control	USB HID
Ethernet control	Network connection

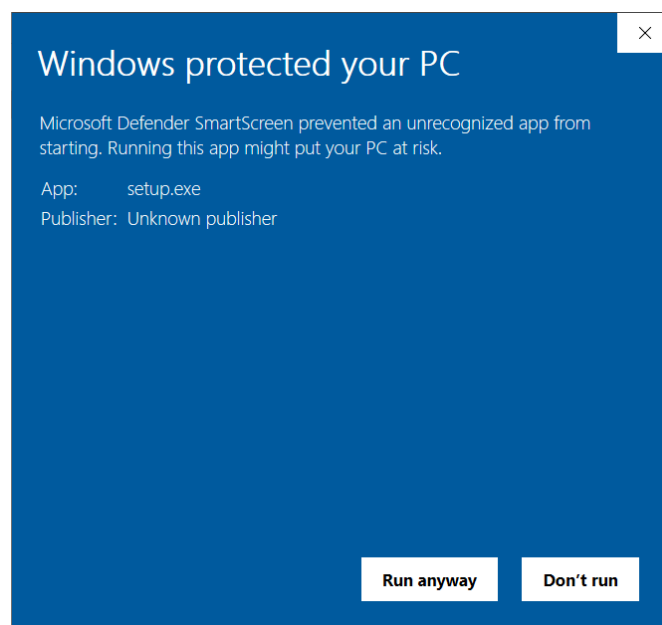
3.2. Software Downloads & Resources

The full SSG software package (including GUI, API and documentation) is available for download from:

- <https://www.minicircuits.com/softwaredownload/sg.html>

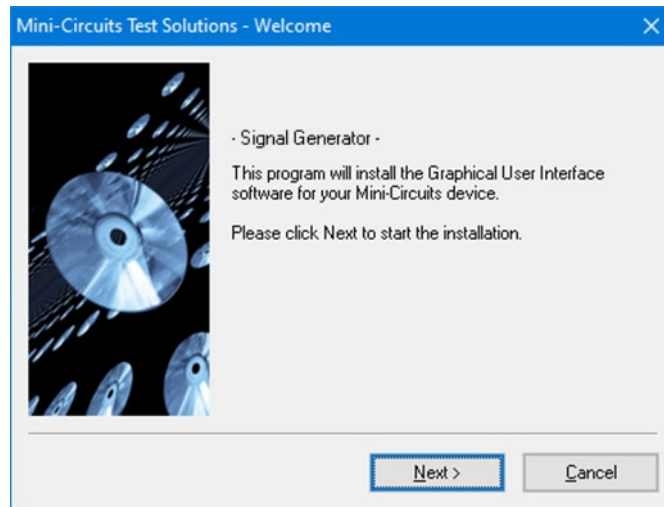
3.3. Software Installation

- Save all work in progress and close any other programs that may be running.
- Download the “GUI Setup Package” software from the Mini-Circuits website. Extract the downloaded zip file and begin the installation process and double-click the **Setup.exe** icon.
- If Microsoft Defender SmartScreen provides a warning about an unrecognized app, select **More Info** and then **Run Anyway**.

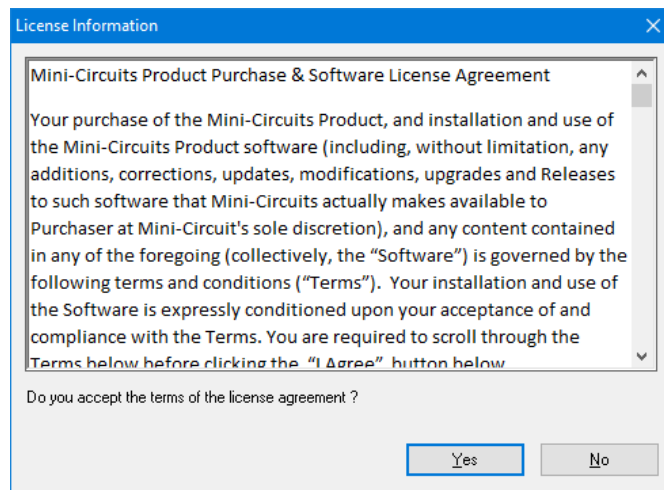


- If prompted by Windows User Account Control, enter user credentials for an account allowing software installation.

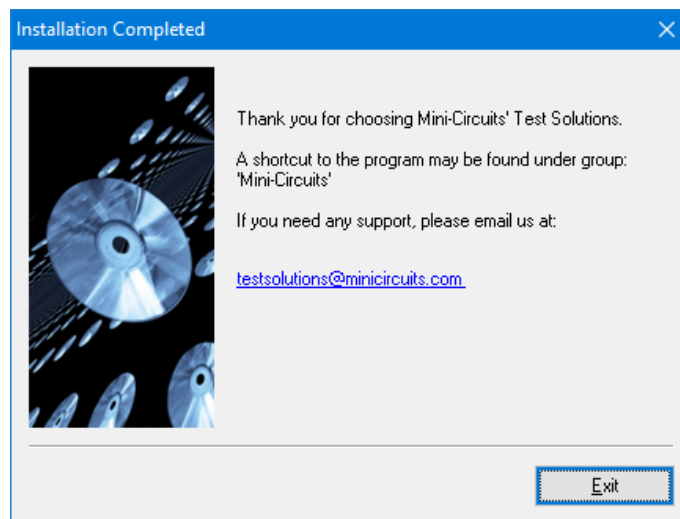
- Click **Next** to begin the installation.



- Click **Yes** to accept the license agreement.



- Click **Exit** on the final window confirming that installation completed successfully.



In the event of any issues with installation, please contact testsolutions@minicircuits.com for support.

4 - Hardware Setup

Before connecting the SSG unit, ensure any connected power supplies are turned off and the control software (either the supplied GUI software or a customer-written application) is shut down.



Warning:

- Ensure the 110-220V_{AC} power supply socket you use to power the signal generator is intact and connected to a proper ground.



Caution:

- Ensure the power adaptor matches the generator. Connecting an SSG unit to an incorrect power supply may cause damage or incorrect operation.

4.1. Signal Generator Panel Schematics

4.1.1. SSG-6xxxRC Series Panels

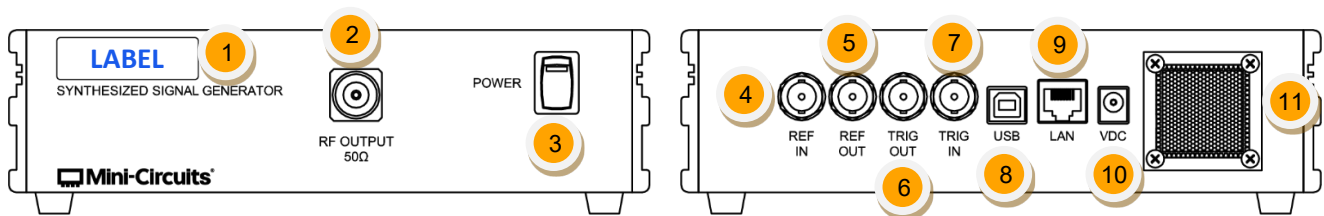


Figure 4.1.1: Front panel (left) and rear panel (right)

#	Name	Descriptions
1	Model name and frequency range	Label showing the model's name and frequency range
2	RF output	N-Type Female connector for RF output
3	Power switch / Power LED	On/Off power switch + a power LED on switch: <ul style="list-style-type: none"> • Static LED indicates model is on. • Blinking LED indicates model power or temperature exceeds the specified limits.
4	Reference input	External reference input – if no signal is detected, the generator will default to internal reference (see <i>section 5.8</i> for details).
5	Reference output	Output for the generator's internal 10 MHz reference (BNC female).
6	Trigger output	Trigger output, see model datasheets for voltage levels (SMB jack).
7	Trigger input	Trigger input, see model datasheets for voltage levels (SMB jack).
8	USB socket	USB type B socket for USB control of generator.
9	LAN socket	RJ45 socket for Ethernet control of generator (see <i>section 5.1.2</i> for details).
10	Power supply	Power supply connection, note power supply specifications for each model.
11	Fan cover	Fan cover and ventilation slots on the side of the generator must be kept clear to allow airflow.

4.1.2. SSG-30G(HP)-RC Panels (Including SSG-15G-RC)

SSG-30G(HP)-RC models are assembled from an SSG-15G-RC source module and an FX-30G(HP)-RC frequency extender module.

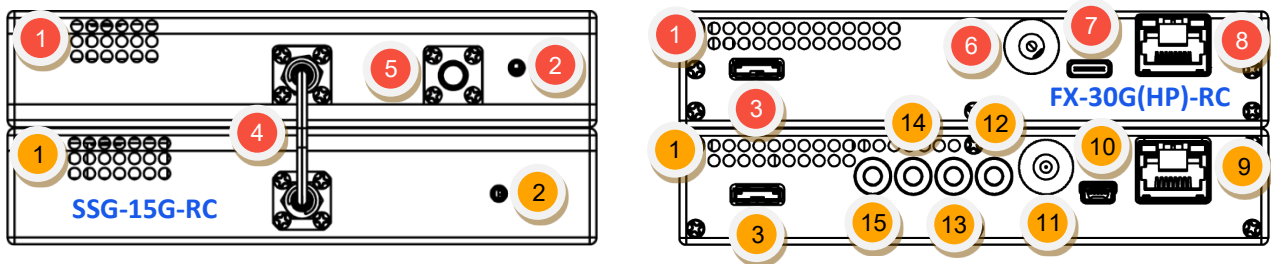


Figure 4.1.2a and Figure 5.1.2b: FX-30G(HP)-RC (top unit) and SSG-15G-RC (bottom unit) – front panel (left) and rear panel (right)

#	Module	Name	Description
1	FX-30G(HP)-RC SSG-15G-RC	Ventilation holes	Front and rear ventilation holes must be kept clear to allow uninterrupted airflow in the modules.
2	FX-30G(HP)-RC SSG-15G-RC	Power LED	Static LED indicates module is on. Blinking LED indicates module power or temperature exceeds the specified limits.
3	FX-30G(HP)-RC SSG-15G-RC	Digital control	Serial control interconnection between SSG and FX modules. Connect together using the included CBL-0.5FT-MMD+ control cable.
4	FX-30G(HP)-RC SSG-15G-RC	IF signal	IF signal path from SSG to FX module.
5	FX-30G(HP)-RC	RF output	SSG-30G(HP)-RC signal generator output (2.92 mm female).
6	FX-30G(HP)-RC	12 V _{DC}	12V DC power supply connection (both modules must be connected to their respective power supplies).
7	FX-30G(HP)-RC	USB socket	USB type C socket for stand-alone operation of the FX-30G-RC.
8	FX-30G(HP)-RC	LAN socket	Ethernet control for stand-alone operation of the FX-30G-RC.
9	SSG-15G-RC	LAN socket	Ethernet control of SSG-30G(HP)-RC (see section 5.1.2 for details).
10	SSG-15G-RC	USB socket	USB type Mini-B socket for USB control of SSG-30G(HP)-RC.
11	SSG-15G-RC	6 V _{DC}	6V DC power supply connection (both modules must be connected to their respective power supplies).
12	SSG-15G-RC	Trig Out	Trigger output, see model datasheets for voltage levels (SMB jack).
13	SSG-15G-RC	Trig In	Trigger input, see model datasheets for voltage levels (SMB jack).
14	SSG-15G-RC	Ref In	External reference input, if no signal is detected the generator will default to internal reference (see section 5.8 for details).
15	SSG-15G-RC	Ref Out	Output for the generator's internal 10MHz reference (BNC female).

4.2. Signal Generator Setup (Except SSG-30G(HP)-RC Models)

- Connect the SSG unit to a 110-220V_{AC} power supply socket using the supplied power adaptor and cord.
- **(USB option)** Connect a USB cable between the SSG unit's USB port and the PC's USB port.
- **(Ethernet option)** Connect an Ethernet cable to the SSG unit's LAN port and an available network port. Note the SSG's LAN port lights up with one steady light and another blinking light (may take a few seconds, depending on your network).
- Turn on the SSG unit. Note that the power LED lights up (on units with a fan you will also hear the fan start working).

4.3. SSG-30G(HP)-RC Setup

- Connect the provided CBL-0.5FT-MMD+ control cable between the FX-30G(HP)-RC and the SSG-15G-RC modules.
- Connect the supplied 6V DC power adapter to the SSG-15G-RC DC input connector.
- Connect the supplied 12V DC power adapter to the FX-30G(HP)-RC DC input connector.
- Note that the power LEDs of both units light up.
- Connect a USB or a LAN cable between the SSG-15G-RC unit and the PC/network.

Note:

- USB and Ethernet ports of FX-30G(HP)-RC are not used when configured as SSG-30G(HP)-RC.

4.4. Reference and Trigger Signal Setup

- To use an external reference, connect the SSG unit's **Ref. In** port to an external signal of power matching the levels specified in the datasheets.
- The SSG unit constantly produces a 10 MHz internal reference signal (see datasheets for power levels). To synchronize it with other devices, connect the **Ref. Out** port of the SSG to the devices in question.
- The trigger in and trigger out of the SSG generator can be used simultaneously. Connect whichever you wish to use and set the operation mode in the software (See *section 5.3 and 5.4* for using Mini-Circuits GUI, or the programming handbook for setting the trigger option in your own software).

See *section 5.8* for further details.

Note:

- Connecting a signal which does not match the specified reference frequency may result in incorrect operation of the SSG.



Caution:

- Check Maximum safe input power for **Reference In** and **Trigger In** ports in the individual model datasheets. Exceeding these levels may cause permanent damage to the SSG unit's reference or trigger port circuitry.
- Keep the SSG unit's air vents unobstructed. Prolonged operation of the SSG with obstructed air vents may result in the unit over-heating and eventual damage to the SSG unit.

5 - Using Mini-Circuits' GUI

All signal generator models are supplied along with API programming objects (DLL files) to allow easy control by most common lab test software (see [programming manual](#) for details) and with a Windows GUI program to control the model manually.

5.1. Getting Started

To start the program, use the **Start** menu or navigate to the location the **Mini-Circuits Synthesized Signal Generator** software was installed in and run the program.

Once running, the user will be required to pick one of the available control modes: USB, HTTP, Telnet, or SSH control.

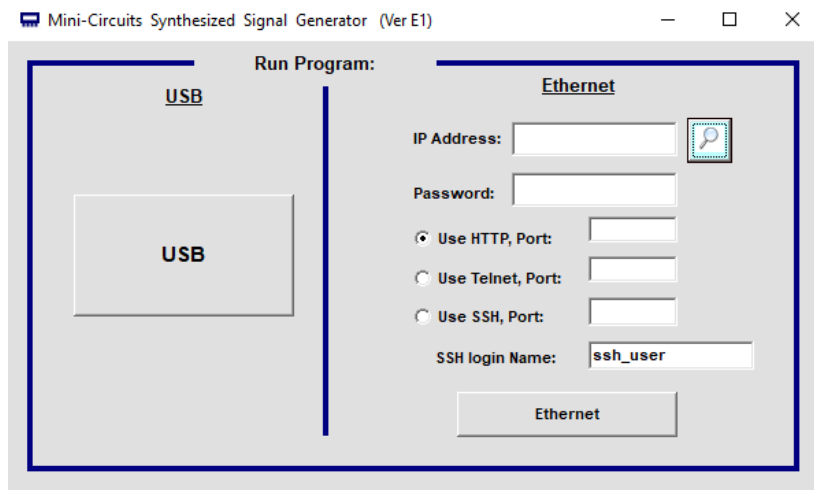
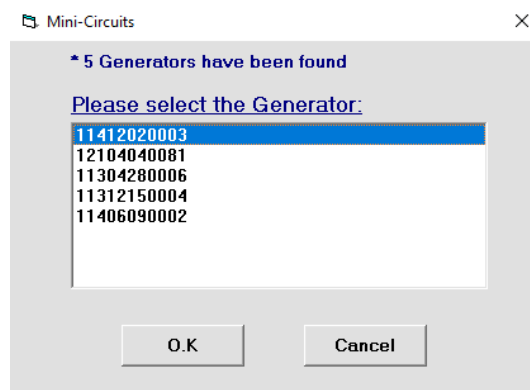


Figure 5.1: Startup screen

5.1.1. USB Control

Clicking the **USB** button in the startup screen will start the unit in USB control. In case the program does not detect a unit connected to the PC via USB or if there are no connected units then an alert will pop-up. If the alert persists even when a unit is connected, then check the unit's USB LED indicator or the USB cable's integrity.

If multiple units are connected to the PC via USB, the unit selection screen will appear with a list of the connected models' serial numbers.



Note:

- The program can handle up to 24 units connected simultaneously.

5.1.2. Ethernet Control

To use Ethernet control with a supporting unit, either enter its IP address on the startup screen (ports for HTTP/Telnet/SSH would also be required if using non-default ports) or click on the **search icon** next to it to find all Mini-Circuits signal generators connected to the network.

Note:

- When connecting to the unit with Ethernet control for the first time you may need to connect using default IP address or change the factory default Ethernet configuration to match your network configuration. See [section 5.9](#) or the [programming manual](#) for details.

After clicking on the **search icon**, the IP search will pop up with a list of signal generators' IP addresses and their assigned ports on the left side of the screen, and full details of each unit on the right. Click the IP address of the desired unit and press **Select**. The search window will close and the IP address, along with the related assigned ports, will be entered in the IP address field of the startup screen automatically.

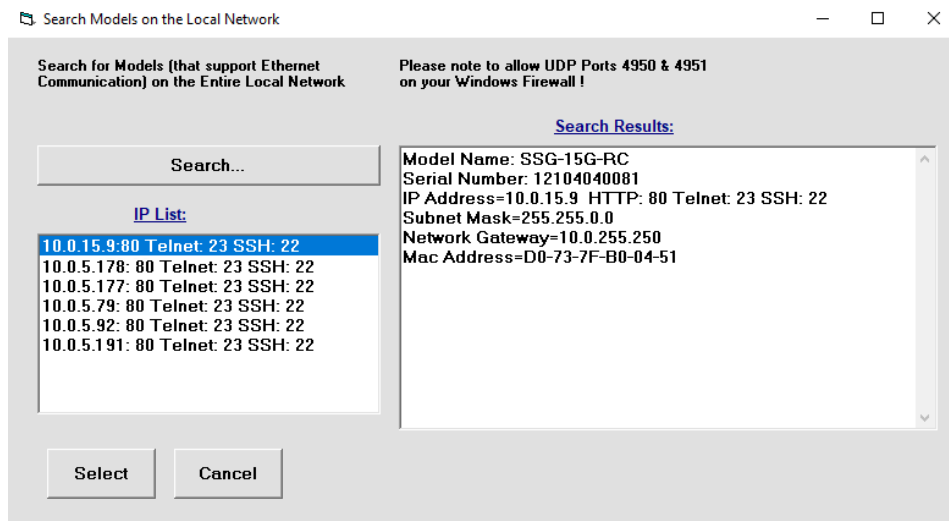


Figure 5.1.2a: Ethernet IP search window

Note:

- To refresh the list of units found click on the **Search...** button.
- The search function uses ports UDP 4950 and UDP 4951 for communication. Ensure your firewall allows access to them.

Once the IP address has been entered, input the password if one has been set (see *section 5.9*). Proceed to select the communication protocol you wish to use (HTTP, Telnet, or SSH) and click on the **Ethernet** button to begin.

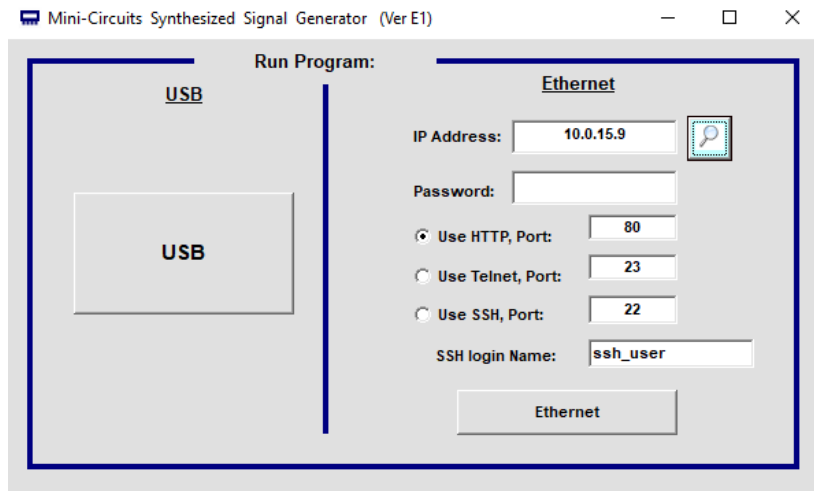


Figure 5.1.2b: Startup screen with Ethernet fields filled-in

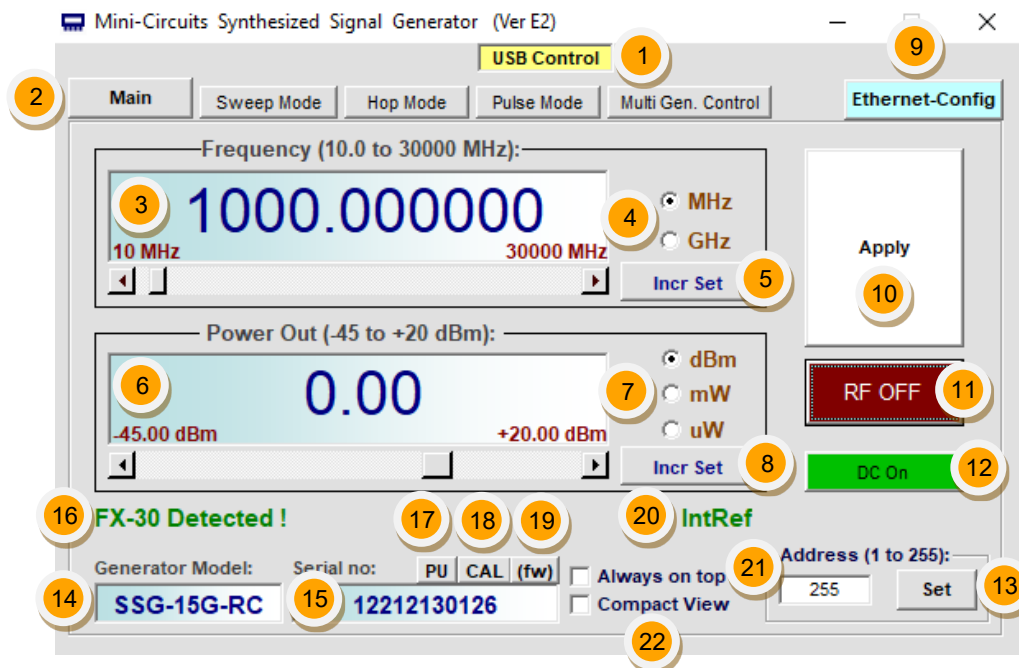
Telnet or HTTP text commands can also be used to control the module. This can be achieved in one of the ways below:

- Type the command in the address field of your internet browser.
- Implement a Get/Post HTTP function in your selected application (for HTTP).
- Establish a Telnet connection.

A full list of the possible commands and queries is available in Mini-Circuits Programming handbook, and in a text file on the downloaded software (see *section 3.3*), in the Ethernet directory.

5.2. Main Screen Operation

Once the control method has been selected, the main screen of the GUI program will appear.



5.2.1. Main Screen Functions

#	Name	Descriptions
1	Control method	The control method chosen to operate the SSG unit.
2	Output mode row	These buttons allow the user to switch between output modes to enable swept, hopped, or pulsed output sequences. Changing modes will not, on its own, cause a change in the generator output signal.
3	Frequency display	Shows the signal frequency and can be changed by dragging the scroll bar beneath the display for a large change, clicking on the arrows at either side of the scroll bar for a small change, or typing in the desired value.
4	Frequency units	Select either MHz or GHz units for the frequency display.
5	Frequency Incr. Set	Opens the Frequency Scroll Bar Step Size window (see section 5.2.2) which allows setting the frequency step size applied from the scroll bar and the arrows.
6	Power display	Shows the signal output power and can be changed by dragging the scroll bar beneath the display for a large change, clicking on the arrows at either side of the scroll bar for a small change, or typing in the desired value.
7	Power units	Select dBm, mW or μ W units for the power display.
8	Power Incr. Set	Opens the Power Scroll Bar Power Step Size window (see section 5.2.3) which allows setting the power step size applied from the scroll bar and the arrows.
9	Ethernet configuration	Opens the dedicated Ethernet configuration screen (see section 5.9.5). Available only in USB control for SSG-6xxxRC models.
10	Apply	Applies the power and frequency settings shown in the frequency and power display fields to the generator. This is needed when typing values in the fields in question.
11	RF On / Off	Toggles the output signal between RF On/Off. The button will always show the current state of the generator (On - green background, Off - red background).
12	DC On / Off	Toggles the RF circuitry board On/Off (shows the current generator state; On - green background, Off - red background). In off mode, the DC power consumption is reduced to a minimum (all communication protocols remain active).

#	Name	Descriptions
13	Address (1 - 255)	Shows the address of the connected generator. Can be set by entering an integer in the 1-255 range and clicking Set . When creating your own program to control the generator via USB, you can address the generator by either its serial number or this address. For more information see the generator programming guide.
14	Generator model	Displays the model P/N of the generator in use.
15	Serial number	Displays the serial number of the generator in use.
16	SSG-30G(HP)-RC operation label	For SSG-30G(HP)-RC models, the "FX-30 Detected" label will be shown here, with a generator model name of SSG-15G-RC. This indicates that the complete SSG-30G(HP)-RC assembly is operating normally.
17	Power-up configuration (PU)	Clicking on the button will open the power up state window, allowing you to set the conditions the generator will assume on power up (see <i>section 5.6</i>).
18	CAL	Calibration tracking status. Clicking on the button will open Calibration tracking window (see <i>section 5.7</i> for details).
19	(fw)	Firmware revision status. Clicking on the button will open Firmware info window (see <i>section 5.10</i> for details).
20	IntRef / ExtRef	A notice advising the current reference status (see <i>section 5.8</i> for details).
21	Always on top	Click here to keep the generator screens on top of other applications.
22	Compact view	Reduces screen to minimal required functions. When enabled a popup alert will appear. Confirming the action will shift the program to compact view.

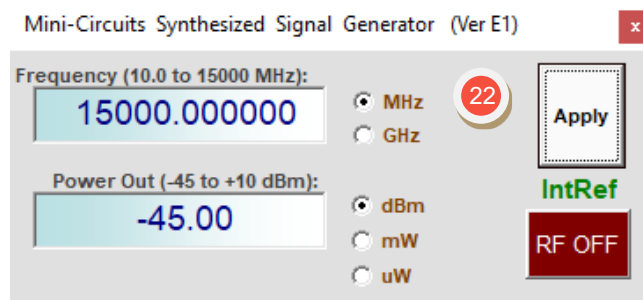
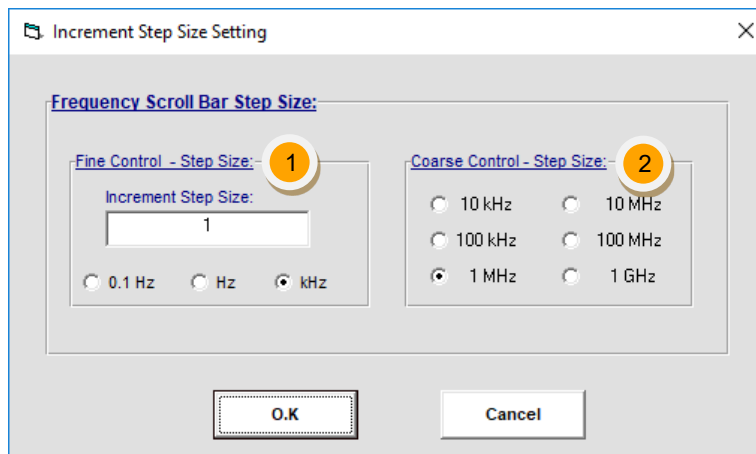


Figure 5.2.1: Mini-Circuits SSG GUI in a compact screen variation

5.2.2. Frequency Scroll Bar Step Size screen

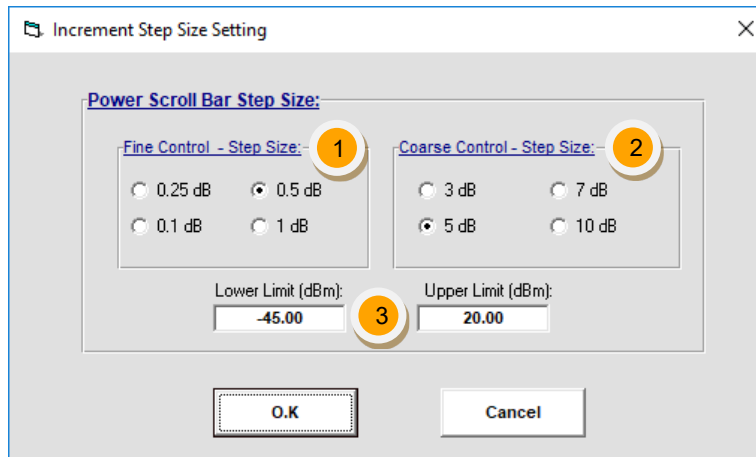
This screen allows you to set the step size for the frequency scroll bar and its arrows. To access the window, click the **Incr Set** button in the frequency display section on the main screen.



#	Name	Descriptions
1	Fine control	Sets the minimum frequency step size (in Hz or kHz) when clicking on the main screen arrows. Note the model's frequency resolution when setting this.
2	Coarse control	Sets the minimum frequency step size (10 kHz to 1 GHz step) when dragging the frequency scroll bar.

5.2.3. Power Scroll Bar Step Size screen

This screen allows you to set the step size for the power output scroll bar and its arrows. Additionally, users can set the minimum and maximum limits for the generator's power output. To access the window, click the **Incr Set** button in the frequency display section on the main screen.



#	Name	Descriptions
1	Fine control	Sets the minimum power change (in dB) when clicking on the main screen arrows.
2	Coarse control	Sets the minimum power change (in dB) when dragging the power scroll bar.
3	Lower/upper limit	Sets the minimum and maximum power value (in dBm) for the output RF signal. This is especially useful when the generator is connected to an amplifier or other device with a maximum input power specification that cannot be exceeded.

Note:

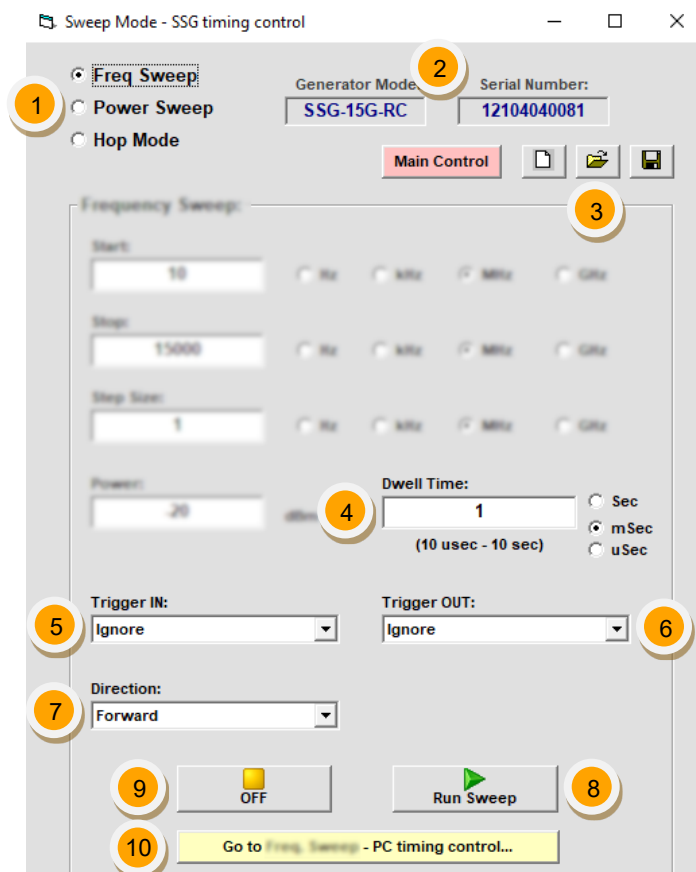
- Please note that power steps are always in dB, regardless of the display units set on the main screen.

5.3. Sweep & Hop Modes

This screen allows the user to set power or frequency sweeps of the output signal, or to specify an arbitrary list of power & frequency settings (Hop Mode) for a single generator. For synchronized sweeps of multiple generators see *section 5.5*.

5.3.1. Common Functions

A number of functions at the top and bottom of the screen remain the same regardless of the selected work mode (only the middle section of the screen changes). The common functions are:



#	Name	Descriptions
1	Work modes	Sets the middle screen to one of 3 working modes: <ul style="list-style-type: none"> • Frequency Sweep mode (see <i>section 5.3.2</i>). • Power Sweep mode (see <i>section 5.3.3</i>). • Hop (arbitrary list) mode (see <i>section 5.3.4</i>).
2	Unit P/N and SN	Displays the current unit's part number and serial number.
3	Icons	Icons to perform tasks (from left to right): <ul style="list-style-type: none"> • Clear current sweep/list settings. • Load a previously saved sweep/list. • Save current sweep/list settings.
4	Dwell time	The duration of each point in the sweep. Units can be set to Sec, mSec, or μ Sec. Check individual model datasheets for minimum dwell time.

#	Name	Descriptions
5	Trigger in	Controls what trigger input is required. Options are: <ul style="list-style-type: none"> • Ignore: No trigger input, the generator will sweep continuously. • Before each point: A trigger input is required before switching to the next point in the sweep. • Before cycle: A trigger input is required before commencing each sweep/restarting the list.
6	Trigger out	Controls when the generator will produce a trigger output. Options are: <ul style="list-style-type: none"> • Ignore: No trigger produced. • At each point: A trigger produced at the start of each point in the sweep. • At end of cycle: No trigger produced for individual points in the sweep. However, a trigger will be produced at the end of every cycle of the sweep pattern.
7	Direction	Controls the sweep direction. Options are: <ul style="list-style-type: none"> • Forward: Sweep goes from start point to stop point, before repeating. • Reverse: Sweep goes from stop point to start point, before repeating. • Bi-Directional: Sweep goes from start point to stop point, then sweeps backwards to start point before repeating the process again.
8	Run sweep	Starts the sweep with the specified parameters. Once started, additional changes in parameters will have no effect until after the sweep is stopped and started anew.
9	Off	Stops the current sweep.
10	PC timing control	Closes the sweep window and transfers to antiquated Sweep & Hop control screen with the timing of each point controlled by the PC instead of the generator. This method introduces additional communication delays between the PC and generator.

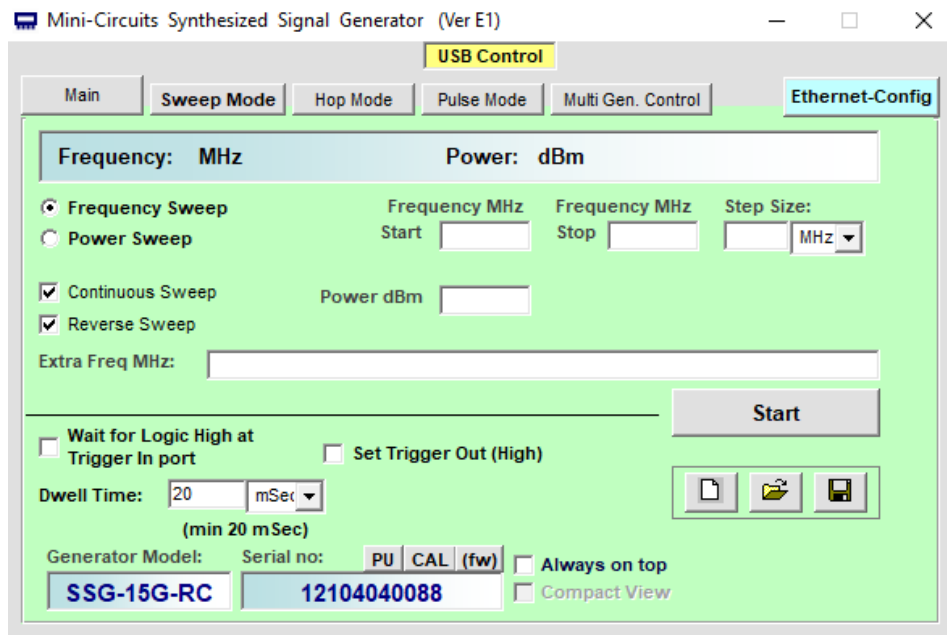


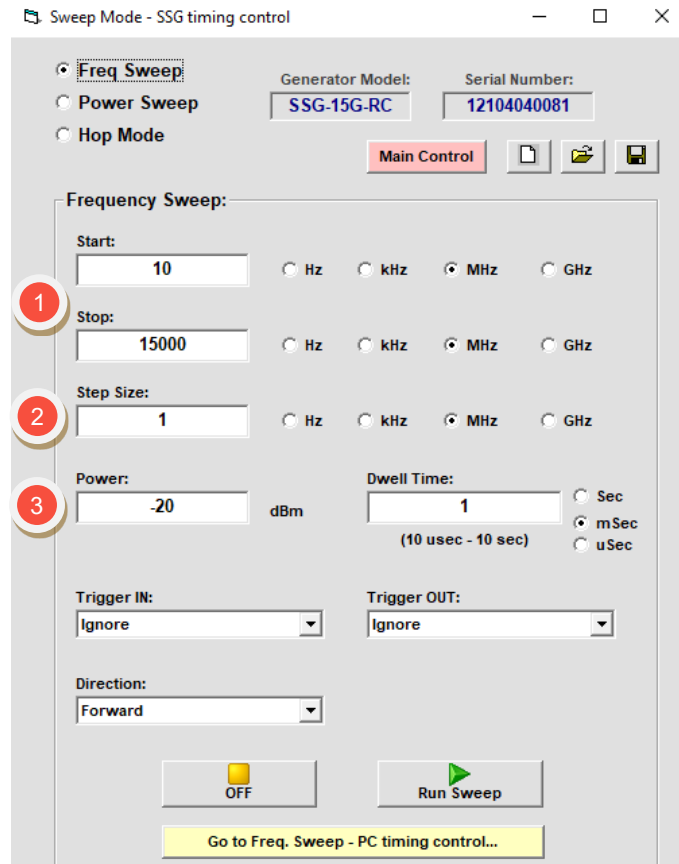
Figure 0: Antiquated Sweep & Hop control screen

Note:

- SSG models use a trigger of “1”.
- Any command sent to the generator during the Sweep/Hop will result in stopping the sequence.

5.3.2. Frequency Sweep

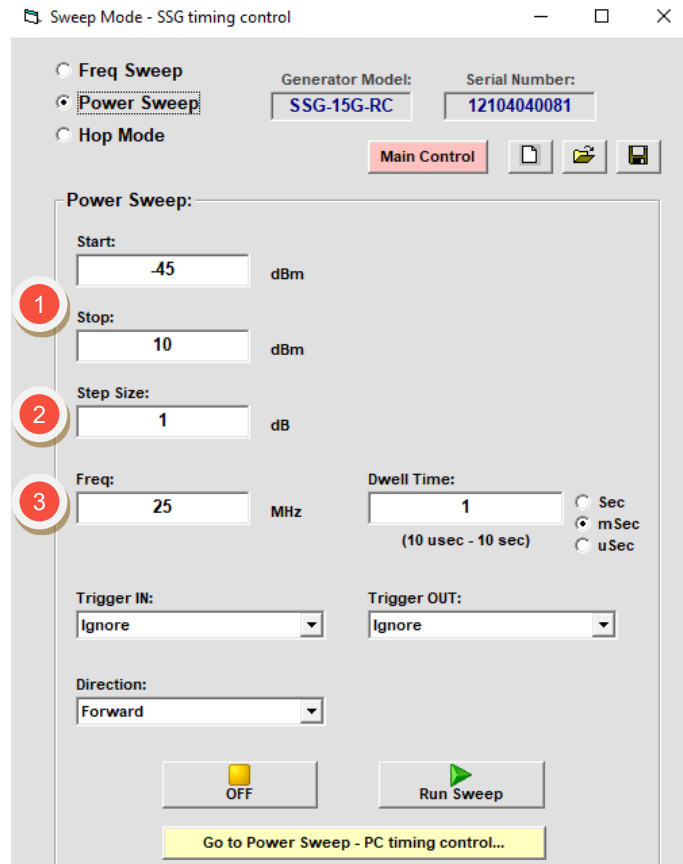
This mode generates a frequency sweep at a specified power level.



#	Name	Descriptions
1	Start/stop	The starting and ending points of the frequency sweep. Units can be set to Hz, kHz, MHz or GHz.
2	Step size	The frequency delta between two sequential points in the sweep. Units can be set to Hz, kHz, MHz or GHz.
3	Power	Power level, in dBm, for all the points in the frequency sweep.

5.3.3. Power sweep

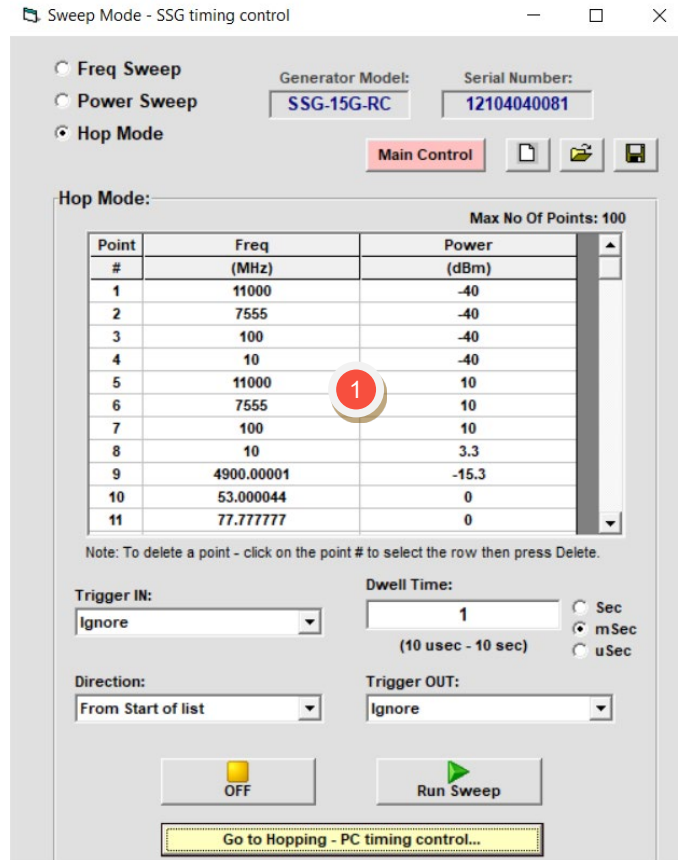
This mode generates a power sweep at a specified set frequency.



#	Name	Descriptions
1	Start/stop	The starting and ending points of the power sweep. Units are in dBm.
2	Step size	The power delta, in dB, between two sequential points in the sweep.
3	Frequency	Frequency, in MHz, for all the points in the power sweep.

5.3.4. Hop Mode

This mode sweeps through a list of arbitrary frequency and power points.



Filling the table of entries:

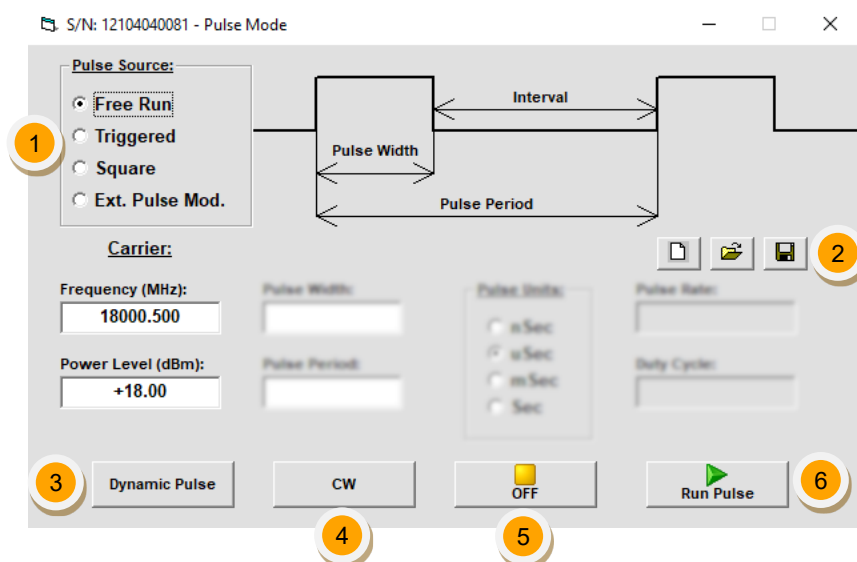
- Type the desired values of your list in the table.
- All entries must have both power and frequency values within the generator's specified range.
- To delete a point entered click on the number at the leftmost column then the delete button.

5.4. Pulse Source Modes

This screen allows the user to specify a pulsed RF signal in one of several formats: free run, triggered, square, and external pulse mode.

5.4.1. Common Functions

A number of functions at the top and bottom of the screen remain the same regardless of the selected work mode (only the middle section of the screen changes). The common functions are:



#	Name	Descriptions
1	Pulse source	Selects the type of pulsed RF signal to generate.
2	Icons	Icons to perform tasks (from left to right): <ul style="list-style-type: none"> • Clear current pulse settings. • Load a previously saved pulse setting. • Save current pulse settings.
3	Dynamic pulse	Allows setting a sequence of up to 100 different pulses (SSG-15G-RC & SSG-30G-RC only).
4	CW	Begins generating a CW RF signal at the specified frequency and power levels.
5	Off	Stops RF output, same as clicking on the RF On/Off button on the main screen.
6	Run pulse	Begins generating a pulsed RF signal according to the conditions specified.

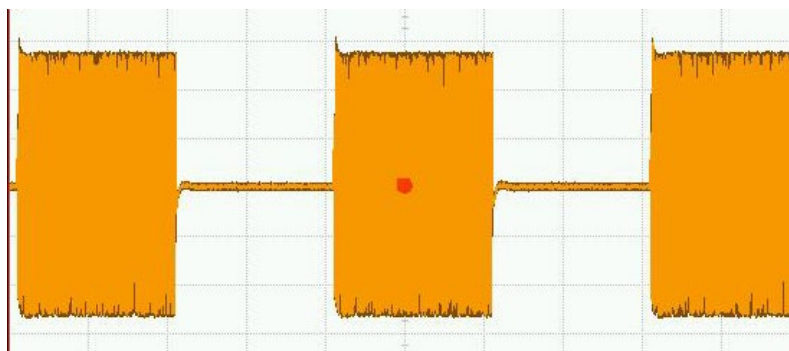
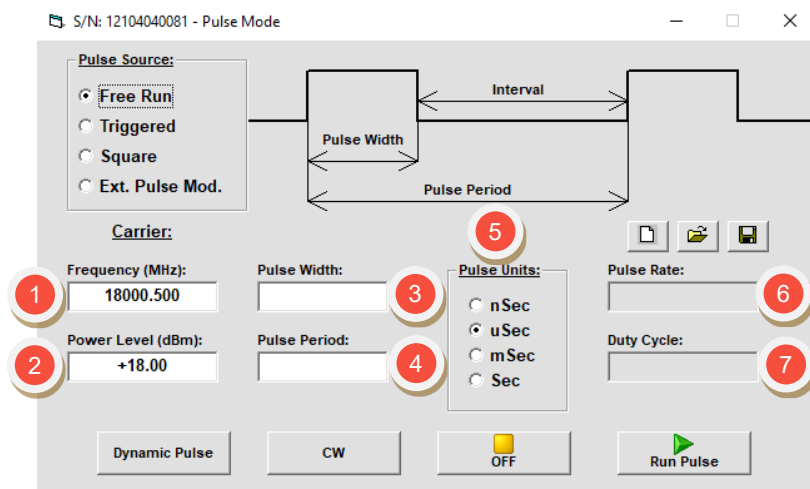


Figure 0: A pulsed RF signal plot

5.4.2. Free Run Pulse Source

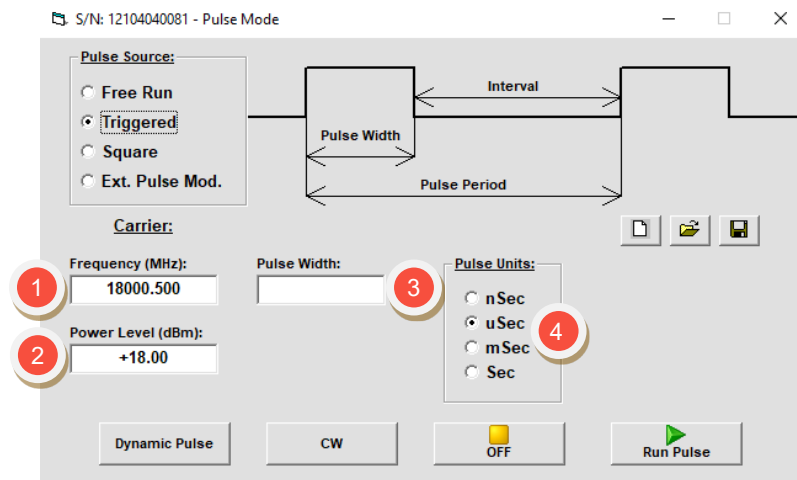
This mode can generate a sequence of RF pulses with selected pulse width (resolution 1 μ Sec, see model datasheet for minimum pulse width) and total pulse period. The signal will be generated continuously with the specified carrier wave until stopped.



#	Name	Descriptions
1	Frequency	The carrier frequency, in MHz, for the pulse width active period.
2	Power level	Power level of the carrier signal in dBm (of the active RF pulses).
3	Pulse width	Duration of the active RF pulse, in the specified time unit (integer number).
4	Pulse period	Time between the start of two consecutive RF pulses in the specified time unit (must be greater than pulse width).
5	Pulse units	Specifies the time unit for pulse width and pulse period as micro-seconds (μ Sec), milliseconds (mSec) or seconds (Sec).
6	Pulse rate	Shows the calculated frequency at which the pulses repeat, based on the values entered.
7	Duty cycle	Shows the calculated ratio between pulse width and pulse period.

5.4.3. Triggered Pulse Source

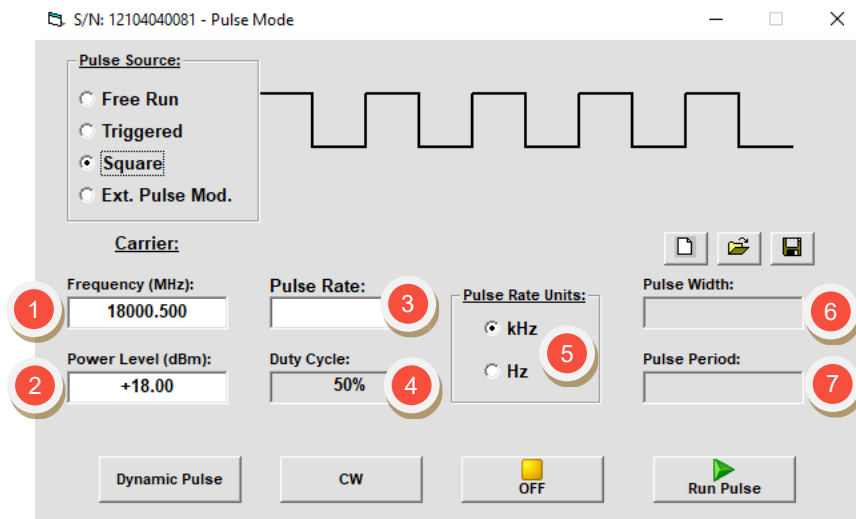
This mode can generate RF pulses with selected pulse width (1 μ Sec resolution), each of which starts on an external trigger, with the specified carrier wave.



#	Name	Descriptions
1	Frequency	Frequency of the carrier wave, in MHz, for the generated RF pulses.
2	Power level	Power level, in dBm, of the active pulses.
3	Pulse width	Duration of the active pulse, in the specified time unit (minimum 1 μ Sec).
4	Pulse units	Specifies the time unit for pulse width as microseconds (uSec), milliseconds (mSec) or seconds (Sec).

5.4.4. Square Pulse Source

This mode can generate RF pulses of set 50% duty cycle with selected pulse rate and the specified carrier wave.

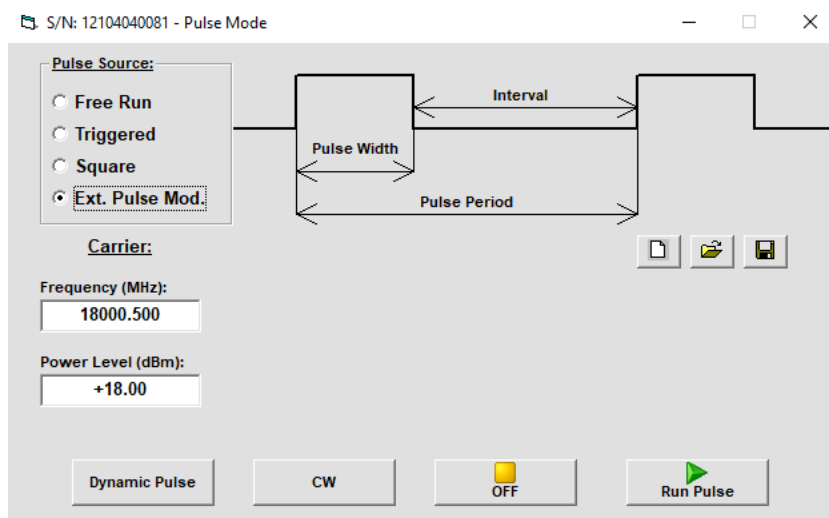


#	Name	Descriptions
1	Frequency	Frequency of the carrier wave, in MHz, for the generated RF pulses.
2	Power level	Power level, in dBm, of the active pulses.
3	Pulse rate	Frequency of the pulse sequence in the specified unit. (See section 5.4.8 for limits on pulse rate values).
4	Duty cycle	Shows the set ratio between pulse width and pulse period. Fixed at 50% in square pulse source.
5	Pulse rate units	Specifies the frequency units for pulse rate as Hz or kHz.
6	Pulse width	Shows the calculated duration of the active portion of each cycle based on the values entered.
7	Pulse period	Shows the calculated time between the start of two consecutive pulses based on the values entered.

5.4.5. External Modulation Pulse Source

In this mode, the “Trigger In” port will act as a “Modulation In” port, and the generator will produce a pulse modulated signal modulated according to the external pulse pattern input at the “Trigger In” port. As long as a logic level high or “1” is present at the “Trigger In” port, the generator will produce the specified RF signal. When “Trigger In” port is at a logic level low or “0”, no RF signal will be produced.

As the pulse characteristics are set by the external signal source, there are no control options to affect it in this screen.



The mode is not available in all firmware revisions. Consult the table below for supported units:

Model	SSG-6000RC	SSG-6001RC	SSG-15G-RC	SSG-30G(HP)-RC
Firmware revision	A5	A4	All revisions	All revisions

Note:

- Limitations of pulse rate will vary according to model. See specific model datasheet for details.

5.4.6. Dynamic Pulse Mode

Dynamic pulse mode is available only with the SSG-15G-RC and SSG-30G(HP)-RC models.

The mode allows setting a sequence of up to 100 different pulses with pulse width, pulse period and RF signal power and frequency set individually for each signal.

To start working in this mode, click on the **Dynamic Pulse** button.

Pulse #	RF Freq (MHz)	RF Power (dBm)	P.Width (usec)	Interval (usec)
1	10	10	0.5	150
2	100	-25	10	150
3	100	-25	99	150
4	12500	-25	50	5000
5	12500	-20	50	5000
6	12500	-15	50	5000
7	12500	-10	50	5000
8	12500	-5	50	5000
9	12500	0	50	5000
10	750.000005	0	12.55	150
11	750.000015	0	12.55	150
12	750.000025	0	12.55	150
13	750.000035	0	12.55	150

Notes: Min Pulse Width is 0.1 usec, Min interval is: 4.5 usec (fix Freq. & fix pwr) or 7 usec (fix Freq) or 150 usec.
Max number of lines is: 100
To remove a line - click on the line # to select then press Delete.

Run continuously
Number of Cycles:

Filling the table of entries:

- Enter the signal parameters for each entry: RF frequency, RF power, pulse width and interval.
- Under **Number of Cycles**, enter the number of times for the sequence to run. Alternatively, check **Run continuously** for the sequence run repeatedly until stopped.
- Click **Run** for the sequence to start.

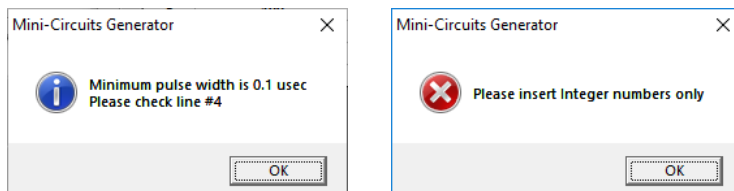
Notes:

- Pulse width can be set as low as 0.1 μ s, however performance may degrade at low pulse width.
- Pulse interval has different limits depending on if either **(1)** frequency and power are constant, **(2)** only frequency is constant, or **(3)** both frequency and power vary. See individual model datasheet for specifics.

5.4.7. Pulse Width Limits

In “Free Run” and “Triggered” pulse modes, the pulse width has a minimum resolution of 1 μ sec and must be specified as an integer. In dynamic pulse mode the minimum pulse width is 0.1 μ sec.

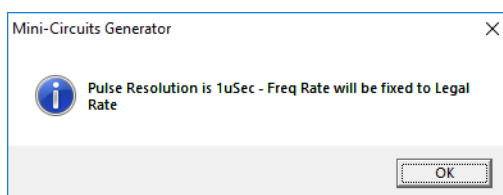
If the value entered does not meet these requirements, an alert will appear when attempting to generate a pulsed RF signal. Click **OK** to dismiss the alert and then adjust the pulse width to a legal value before attempting to run it again.



5.4.8. Pulse Rate Limit

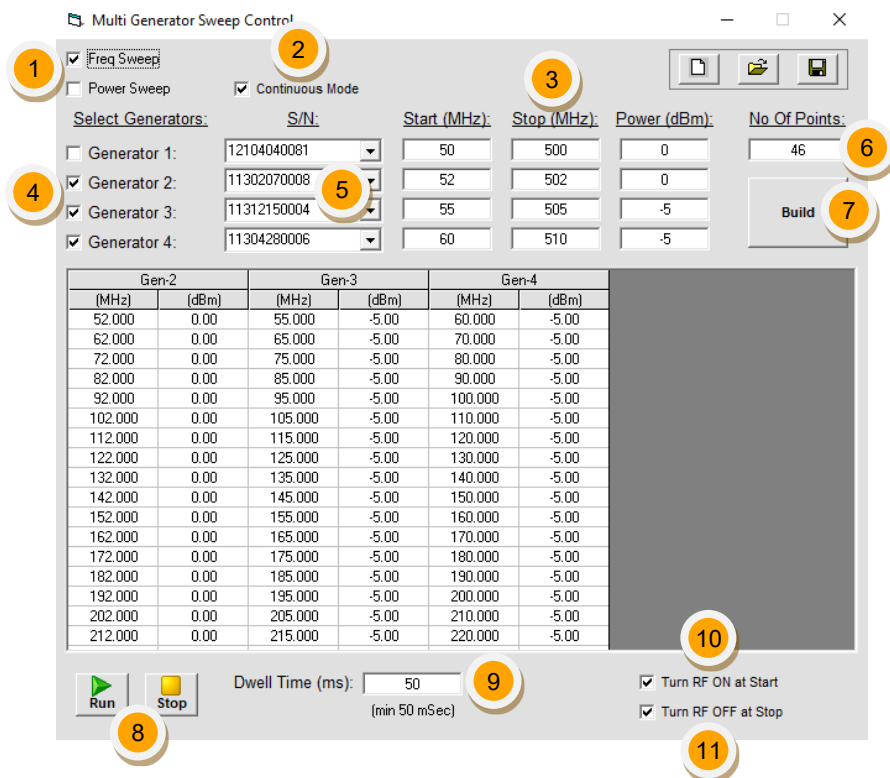
In “Square” pulse mode, the pulse rate must be specified with a value such that the calculated pulse width is a multiple of 1 μ Sec.

If the value entered would result in an illegal pulse width, an alert will appear when attempting to generate the RF signal. Clicking **OK** will dismiss the alert and adjust the pulse rate automatically to the nearest legal frequency.



5.5. Multi-Generator Control

This screen allows the user to specify frequency or power sweeps of up to 4 generators at once from a single screen.



#	Name	Descriptions
1	Freq / Power sweep	Toggles between two sweep modes: Frequency and Power.
2	Continuous Mode	Repeats the sweep in a continuous loop until stopped.
3	Data entry columns	Data type changes based on the selected sweep mode. <ul style="list-style-type: none"> Frequency sweep: Columns are "Start (MHz)", "Stop (MHz)", and "Power (dBm)" and function the same way as the single generator frequency sweep (see <i>section 5.3.2</i>). Power sweep: Columns are "Start (dBm)", "Stop (dBm)", and "Frequency (MHz)" and function the same way as the single generator power sweep (see <i>section 5.3.3</i>).
4	Enable generators	Select how many generators you want to sweep by clicking on the checkboxes.
5	S/N	Use the drop boxes to select which of the connected generators will be swept. Make sure the power and frequency range of each generator match their specified sweep range.
6	No. of points	Specify how many points there will be in each sweep. Note: While each generator can have a different start and end sweep points, they all will have the same number of points in the sweep.
7	Build	Generates the table of frequency and power points based on the entered data.
8	Run / Stop	Run / Stop the sweep sequence according to the generated table of entries. While the sweep is running the current output of each generator will be highlighted in the table.
9	Dwell time (ms)	Specifies (in milliseconds) the time the generators will hold each point before moving on to the next point in the sweep. Minimum dwell time is 50 mSec.
10	Turn RF On at Start	All the selected generators will switch to RF On at sweep start. If this option is not selected, you need to go to the main screen of each generator to select RF On before starting a sweep.
11	Turn RF Off at Stop	All the selected generators will switch to RF Off as soon as the sweep is stopped. If this option is not selected, the generators will continue outputting the last signal when clicking on Stop or the sweep ends.

5.6. On Power-Up Configuration

Clicking on the **PU** button in the main screen will open the “On Power-Up Configuration” window.

The user has the option to set one of 3 options:

- **Factory default** – Maximum frequency and minimum power.
- **Last known state** – The state is saved once every 3 minutes.
- **User defined state** – Specific power and frequency levels set by the user.

Additionally, the user can specify if the unit will start with the RF output turned **On** at the above specified settings, or if it will start turned **Off** (recommended).

When connecting the FX-30G(HP)-RC, the user also has the option of setting RF interconnect cable loss and slope.

The factory default for both values is 0.

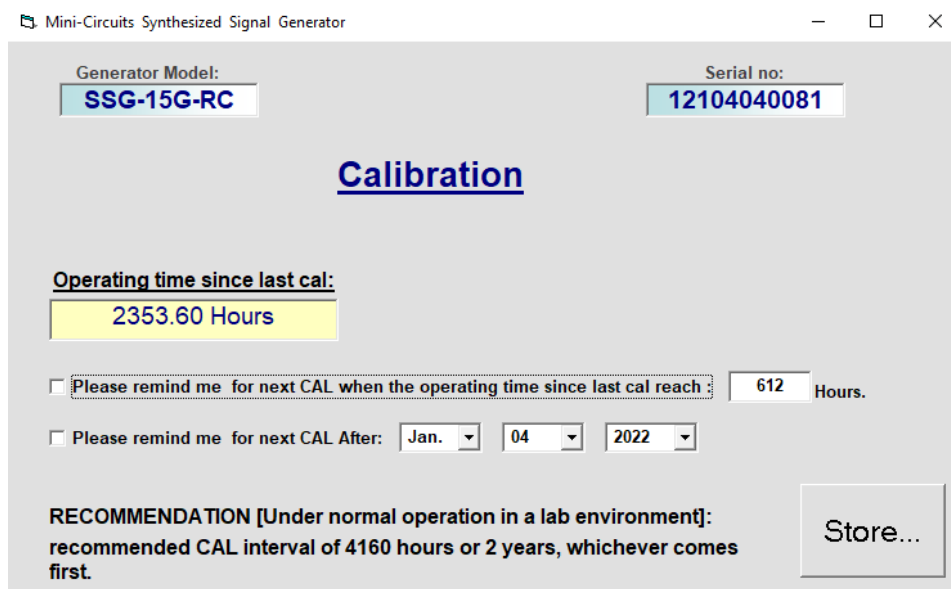
Notes:

- This function is not supported by SSG-6001RC.

5.7. Calibration Tracking Status

Clicking on the **CAL** button in the main screen will open the “Calibration Tracking” window.

The calibration tracking window shows the total operation time passed since the unit’s last calibration. It allows users to schedule calibration reminders based on either operating time (recommended interval 4160 hours) or date (recommended interval 2 years).



Once the condition selected for the calibration reminder is reached, the **CAL** button in the main screen will be colored red, and a pop-up alert will start appearing upon starting the program.



The function is not available in all firmware revisions. Consult the table below for supported units:

Model	SSG-6000RC	SSG-6001RC	SSG-15G-RC	SSG-30G(HP)-RC
Firmware revision	A2	All revisions	All revisions	All revisions

Note:

- Upgrading from a firmware version which does not support operating time tracking to one which does, will result in the operating time being counted from when the firmware was upgraded, instead of from the last calibration.

5.8. Reference and Trigger Signals

Mini-Circuits Synthesized Signal Generators can operate either with an external reference allowing them to be synchronized to the rest of the test setup, or with their own internal reference to simplify the setup. Additionally, they can provide a 10 MHz reference to synchronize other devices and provide or accept LVTTTL triggers.

5.8.1. Reference Signals

When using external reference, the green **IntRef** notice on the main screen will change to an **ExtRef** notice. This will happen automatically whenever a signal of sufficient strength is connected to the **Reference In** port. If the alert flickers, or the RF output signal is excessively noisy, check the connections to the source of the reference signal and ensure the signal strength at the generator's reference in port is greater than the minimum signal strength noted in the datasheet for the model.

The **Reference Out** signal is a 10 MHz sinusoid (check individual model data sheet for specific power level). Ensure the device you intend to synchronize with can accept such a signal before connecting the reference.

5.8.2. Trigger Signals

Before using the trigger in or trigger out you need to specify in the software (GUI or user prepared) the trigger conditions. See *sections 5.3 and 5.5* for using trigger options with sweep or hop functions via the supplied GUI, or the generator programming manual for preparing your own software to use the trigger function.

The **Trigger Out** of SSG models is normally "0" (0 V) and rises to "1" (3.3 V) whenever a trigger out is required. The signal then drops back to "0" after a few milliseconds.

When a **Trigger In** option is selected, the SSG models will trigger at a rising edge. The SSG will register a trigger as short as 100 nSec.

During "Internal Pulse" modulation, SSG-6000RC and SSG-6001RC produce a trigger out at the start of every pulse automatically.

5.9. Ethernet Configuration

5.9.1. Default IP Configuration

Mini-Circuits' signal generators ship from the factory with DHCP enabled by default so in most cases an IP address will be assigned automatically when the device is connected to the network. Once a valid IP address has been assigned and identified it can be re-configured via the Ethernet connection (for example, to set a static IP configuration) using our GUI, Ethernet configuration tool, or the programming API.

5.9.2. Default Static / "Link-Local" IP Address

A default "link-local" IP address will be assumed when DHCP is enabled if the device does not receive a valid response from a DHCP server. This also applies when a module with DHCP enabled is connected directly via an Ethernet cable to a PC (instead of via a network). The default static / link-local IP address for all Mini-Circuits devices with the relevant firmware is 169.254.10.10.

This can be used as a method to configure a specific static IP address for a new device straight out of the box, without resorting to a USB connection or even Mini-Circuits' GUI. Just connect the module directly to the PC, open the HTML Ethernet configuration tool (see *section 5.9.6*), connect to the module using the 169.254.10.10 default IP and proceed to set the new configuration as needed.

Consult the table below for which firmware revision is required for your unit to support this feature:

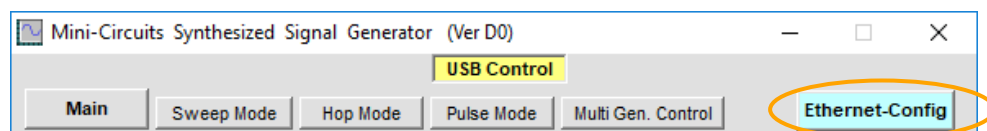
Model P/N	Firmware revision
SSG-6xxxRC	B1 and newer
SSG-15G-RC	C6 and newer
SSG-30G(HP)-RC	C6 and newer

5.9.3. Recovery of IP Configuration via USB

If at any time an Ethernet connection cannot be established (for example, if the current IP address is not valid on the network) then the settings can always be reset by connecting to the device using USB and the GUI or programming API.

5.9.4. Default Factory Setting

Default factory settings for SSG models are Dynamic IP (DHCP) using port 80 for HTTP or port 23 for Telnet (see *Figure 5.9.5*). To change these settings, click on the **Ethernet-Config** button in the GUI, or use Mini-Circuits' Ethernet configuration tool (see *section 5.9.6*).



5.9.5. Ethernet Settings Screen

The Ethernet Settings screen will open showing the current configuration. *Figure 5.9.5* shows the factory default of the module.

If these settings are appropriate for your local network, then you do not need to access the setup before connecting the module to the network and can proceed to connecting it via Ethernet as described in *section 4.2*.

After making the changes you want, click on **Store** and the changes will be saved to the module's memory.

Note:

- For units with older firmware revisions (*see section 5.9.2*), users will need to change Ethernet configuration via USB control to match their network setup if no DHCP server is available.
- This screen is available only in USB control for SSG-6xxxRC models.
- It is not advised to set the HTTP, Telnet, and SSH ports to use the same port.

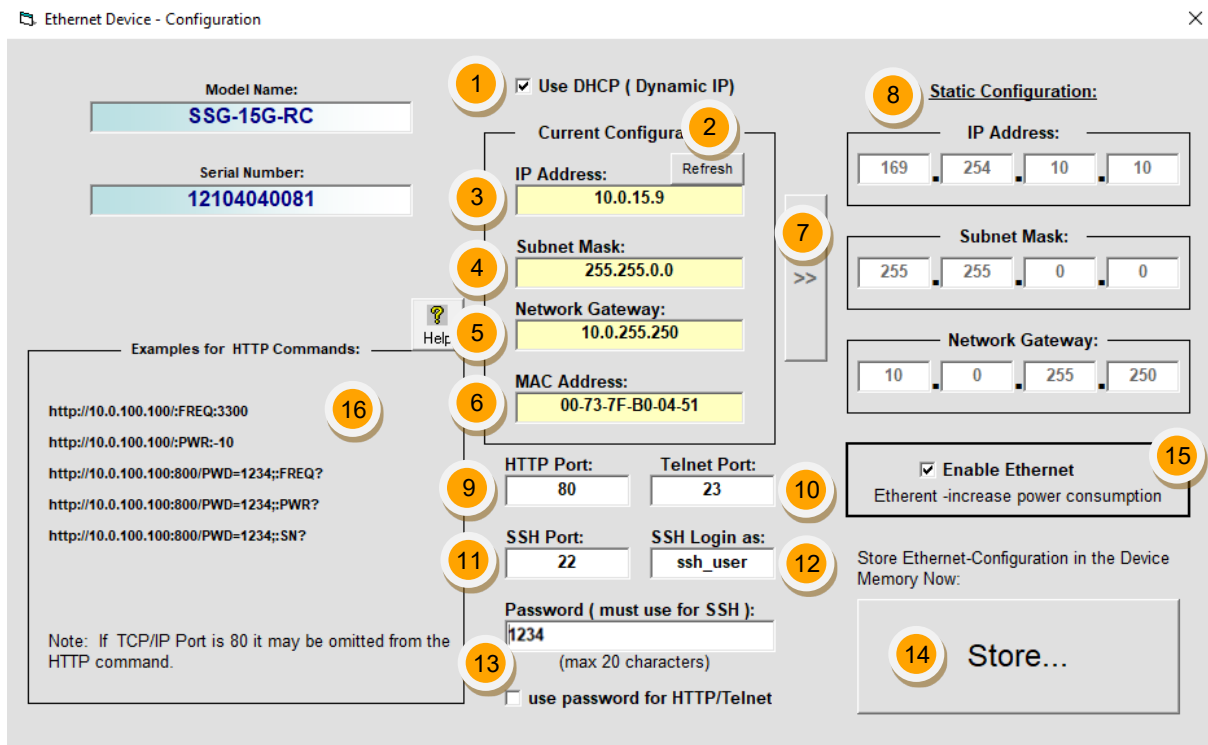


Figure 5.9.5: Ethernet Settings screen (showing factory default state)

#	Name	Descriptions
1	Use DHCP	When selected the attenuator will query the server for appropriate parameters with no input from the user.
2	Refresh	Request IP address, gateway and subnet mask from server.
3	IP Address	The IP address of the unit on the network. When DHCP is selected this is assigned by the server and will change according to the server.
4	Subnet Mask	The network's subnet mask. When DHCP is selected this is assigned by the server and will change according to the server.
5	Network gateway	IP address of the network gateway. When DHCP is selected this is assigned by the server and will change according to the server.
6	MAC Address	Media Access Control address – a unique, unchanging identifier for the attenuator unit.
7	Copy state	Copies current state of dynamic IP to static IP, not available when DHCP is selected.
8	Static Configuration	When DHCP is not selected the user must specify the values below which will not be changed by the server.
9	HTTP Port	Specify the port to use for HTTP communication on the network (default 80). Note that port address does not get assigned by the server when DHCP is selected.
10	Telnet Port	Specify the port to use for Telnet communication on the network (default 23).
11	SSH Port	Specify the port to use for SSH communication on the network (default 22). (Not supported on SSG-6xxxRC models).
12	SSH Login	Login ID for SSH protocol. Factory default is "ssh_user". (Not supported on SSG-6xxxRC models).
13	Password	To restrict remote access to the attenuator in HTTP or Telnet mode, select Use Password and enter the desired password below (up to 20 characters). In SSH protocol Password is required at all times.
14	Store	Saves the current Ethernet settings into the device's memory.
15	Ethernet Enable	Allows turning on or off Ethernet circuitry to reduce current consumption while in USB control. Factory default is having Ethernet active.
16	HTTP command examples	A short list of useful HTTP commands. For more programming help, refer to the programming manual .

5.9.6. Ethernet Configuration Tool

The Ethernet configuration can also be changed via Ethernet control. To make changing the Ethernet configuration easier for users operating in a non-Windows environment or otherwise can't use the provided GUI, Mini-Circuits created the Ethernet configuration tool.

https://www.minicircuits.com/softwaredownload/MCL_PTE_Ethernet_Config.zip

Note:

- Javascript must be enabled in your browser to use the configuration tool.
- This function is not available for SSG-6xxxRC models.

To use the configuration tool:

- Type the IP address in the field in step 1 (if you assigned a password for the unit type it as well).
- If you set the device to some port other than 80, enter the port as well in the same field, then click **Read Current Configuration**.
- The fields in step 2 will be populated with the current state of the device. Enter the updated information in the relevant fields.
- Click **Set New Configuration** to end the process.

The screenshot shows a web browser window displaying the "Mini-Circuits Test Solutions - Ethernet Configuration Tool (Ver. X1)". The browser's address bar shows the file path: file:///F:/LAB4WIN/00/MCL_PTE_Ethernet_Config(X1).HTML. The page has a navigation bar with links for "MCL UViewer Login", "Login Page", "Arena > Log In", and "Other Bookmarks", along with a search box. The main content is divided into two steps:

Step 1: Enter the current IP address and password for your device

1. Devices ship with DHCP enabled and no password set
2. If DHCP is not present the device will revert to default IP 169.254.10.10 and subnet mask 255.255.0.0

IP Address: Password:

Step 2: Enter the new IP configuration to set for your device

1. Please ensure a valid configuration is entered which will not clash with other devices on your network
2. To recover an invalid / incompatible IP configuration, connect by USB and use the provided GUI / API

Model Name:

Serial number:

DHCP Enabled

Static IP:

Subnet Mask:

Network Gateway:

HTTP Port:

Telnet Port:

Use Password

Password:

5.10. Firmware Update

All Mini-Circuits units are shipped with the latest available firmware and an update is usually not required. Mini-Circuits occasionally makes firmware update files available as a courtesy to add additional features or correct known issues.

Please contact testsolutions@minicircuits.com for details.



Caution:

- The firmware update process has the potential to render the device inoperable in the event of communication failure. Updates should only be carried out with a stable PC and USB connection, and in-line with Mini-Circuits' guidelines.
- A recovery option is available to restore units rendered inoperable by an incorrect upgrade process (see *section 5.11* for details).

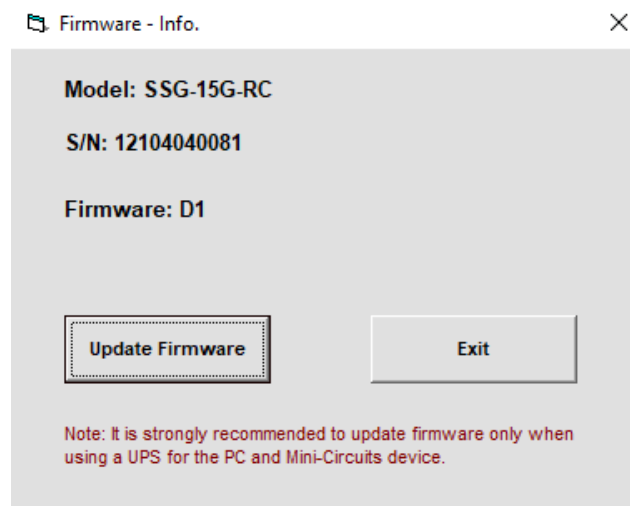
5.10.1. Requirements

To update a unit's firmware, a Windows computer with an installation of Mini-Circuits' Signal Generator software is required. Additionally, a suitable upgrade file provided by Mini-Circuits' Test Solutions department needs to be available on hand.

5.10.2. Process

To start the upgrade process, follow the below instructions carefully:

- Connect only the unit to be upgraded to the PC via USB (see *section 5.1.1*) and start Mini-Circuits' Signal Generator GUI program.
- After selecting **USB** connection, click the **(fw)** button on the main screen (above the unit's serial number display).
- The "Firmware – Info" window will list the currently installed firmware revision. Chose **Update Firmware** to proceed or **Exit** to cancel the process.



- For SSG-6xxxRC models, navigate to the location of the upgrade file you received from Mini-Circuits' Test Solutions and chose it. The selected file should then be installed on the unit with the process taking up to a minute.

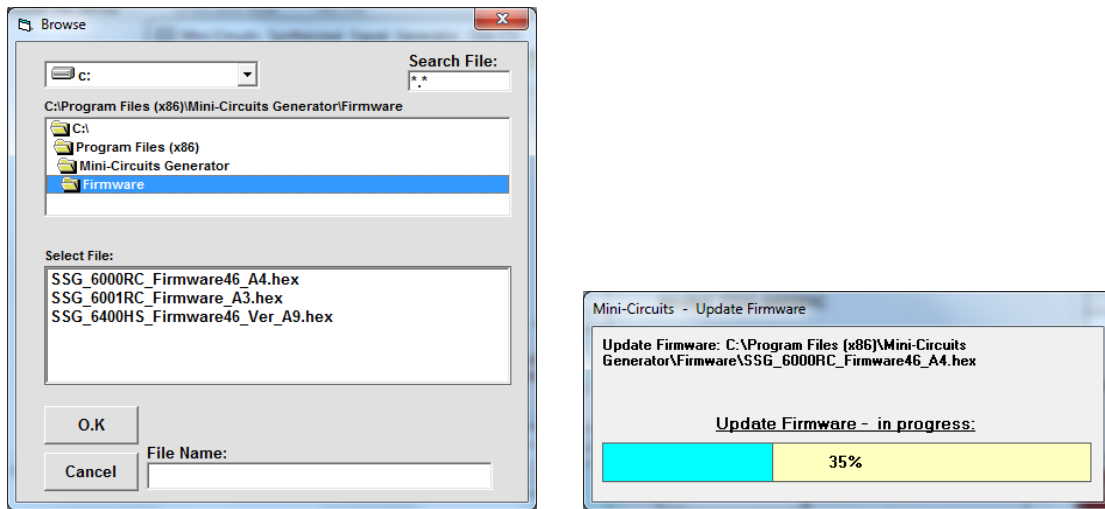


Figure 5.10a: Left – Browse Window ; Right – Progress Bar Window

- For all other models, a confirmation window will pop-up, after which the user will need to:
 - Click **Connect / Disconnect** and wait for the device to be connected.
 - Click **Load Hex File** and navigate to the firmware's (file ending with .hex) location on your PC.
 - Click **Upgrade Firmware** and wait for the program to finish.

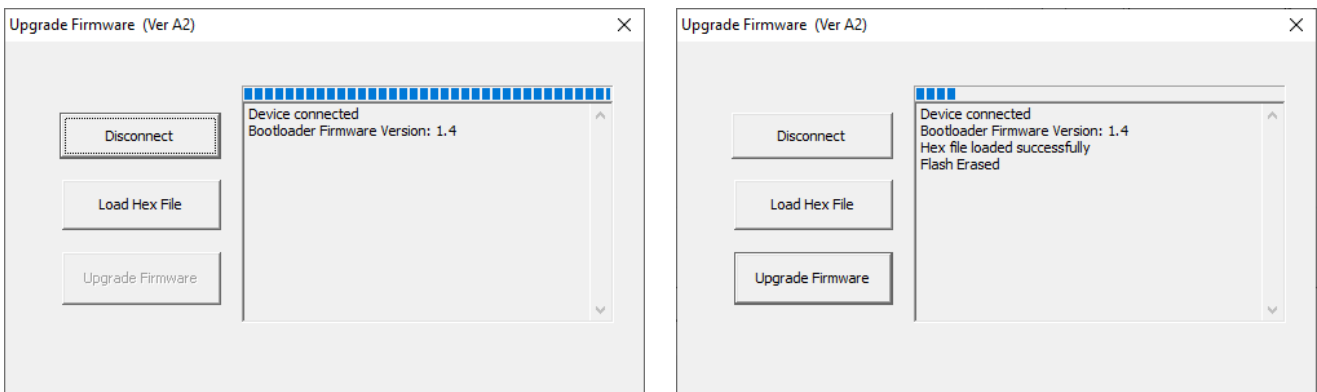


Figure 5.10.2b: Left – Unit connection step; Right – Firmware upgrade step

Caution:



- Do not disconnect the unit or shut down the program while the firmware is being updated. Doing so may damage the unit.
- Attempting to start a second GUI session while the firmware is being updated may cause the firmware to be corrupted. It is therefore recommended not to attempt to start any additional GUI sessions until after the firmware upgrade has been completed.

- After the firmware has been updated a confirmation alert will appear. Click **OK** to shut down and restart the program.
- If the firmware upgrade was interrupted this can result in partial installation rendering the device inoperable. Refer to *section 5.11* to check if your unit supports the feature.

5.11. Firmware Recovery

Mini-Circuits models feature a firmware recovery option for cases where the unit's firmware has become corrupted rendering it no longer accessible (for example, due to an interrupted firmware upgrade).

Consult the table below to check if your unit supports the firmware recovery feature:

Model P/N	Serial number
SSG-6000RC	12305239999
SSG-6001RC	12305249999
SSG-15G-RC	All units
SSG-30G(HP)-RC	See note

Note:

- SSG-30G(HP)-RC is composed of an SSG-15G-RC module and an FX-30G(HP)-RC module.



Caution:

- Ensure you have the firmware file ready before attempting a recovery process.
- Contact testsolutions@minicircuits.com if you do not have the .hex firmware file.

5.11.1. Recovery Steps (SSG-6xxxRC models)

Follow the below recovery steps for all SSG-6xxxRC models:

- Connect the unit to the PC via USB.
- Start Mini-Circuits' Signal Generator GUI program and allow it time to attempt and establish a connection with the unit.
- If the connection attempt has failed, an alert would appear advising the user of a corrupt firmware.
- Click **Yes** to proceed with the firmware recovery and refer to *section 5.10.2* on how to proceed.

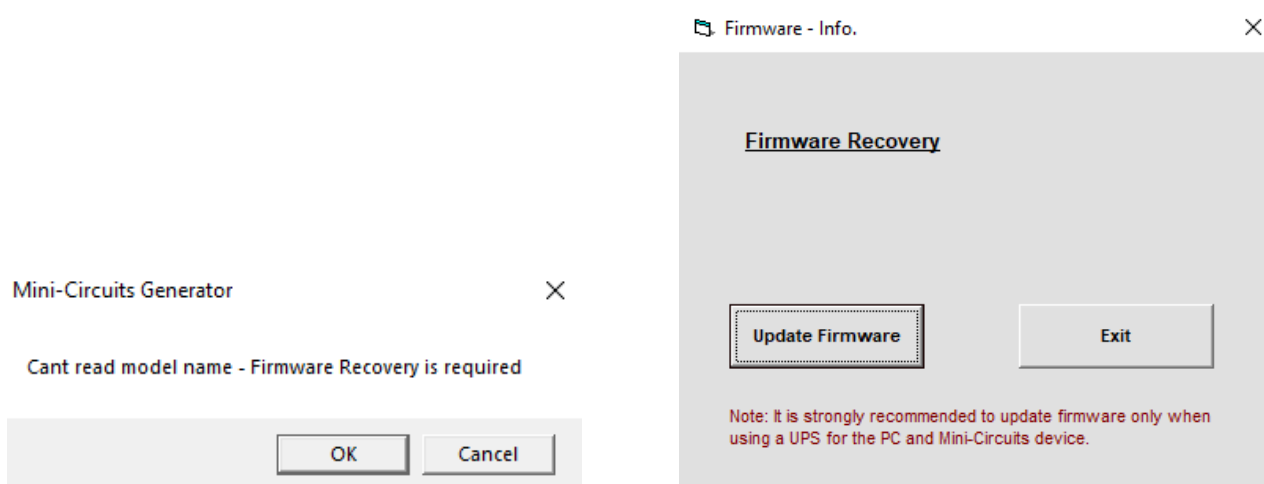


Figure 5.11.1: A corrupted firmware alert (left) and firmware recovery window (right)

5.11.2. Recovery Steps (All Other Models)

Follow the below recovery steps for SSG-15G-RC and FX models only:

- Connect the unit to the PC via USB.
- Navigate to the directory where the models' GUI has been installed.
- Locate and run the "UpgradeFirmware.exe" utility program.
- Click **Connect / Disconnect** and wait for the device to be connected.
- Click **Load Hex File** and navigate to the firmware's (file ending with *.hex*) location on your PC.
- Click **Upgrade Firmware** and wait for the program to finish.

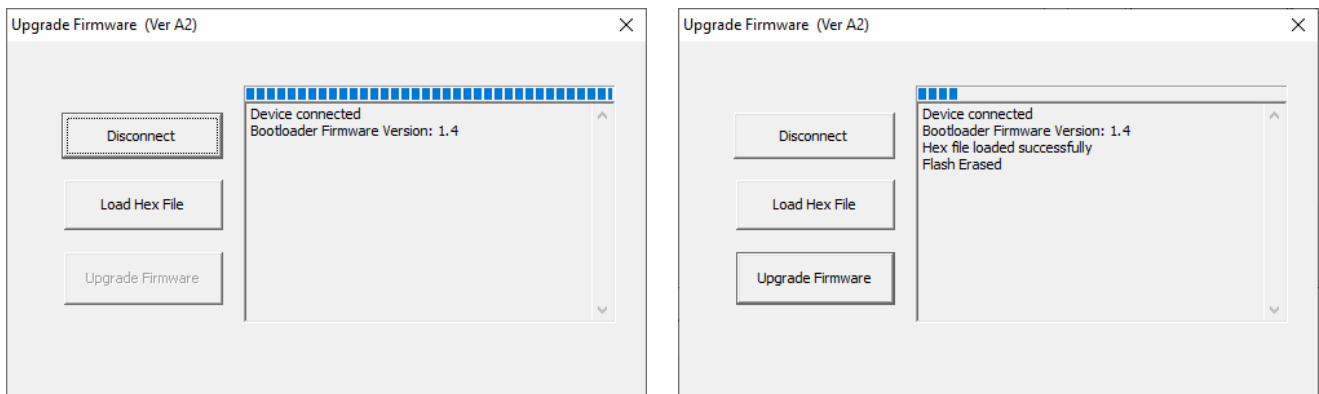


Figure 5.11.2: Left – Unit connection step; Right – Firmware upgrade step

6 - Revision History

Revision OR (Mar 25, 2014):

- Initial revision of the user guide.

Revision A (Nov 25, 2014):

- Updated to a unified legal notice for all PTE models.

Revision B (Mar 20, 2015):

- Removed model: SSG-6000.
- Added models: SSG-60001RC, SSG-6400HS.
- Added and expanded sections on the following functions: Modulation, Pulse modulation, Power-up state.
- Added a warning on upgrading firmware using old GUI.

Revision C (Feb 04, 2016):

- Corrected typos in section “Service and Calibration”.
- Updated “Firmware upgrade” section to match latest format.

Revision D (Apr 16, 2019):

- Removed models: SSG-4000HP, SSG-4000LH, SSG-6400HS.
- Added model: SSG-15G-RC.
- Expanded “Firmware upgrade” section to include instructions for upgrading firmware on SSG-15G-RC.
- Clarified “Power-up” settings are currently only available on SSG-6000RC.

Revision E (Aug 28, 2019):

- Added “Dynamic pulse” function for SSG-15G-RC.
- Updated installation process instructions.

Revision F (Sep 13, 2021):

- Added CE, FCC, and UKCA compliance notes in “Conformity” section.
- Added “Environmental specification” section.
- Updated outline drawing of SSG-15G-RC.
- Updated “Revision history” section to match latest format.

Revision G (Jul 13, 2023):

- Added models: SSG-30G-RC, SSG-30GHP-RC.
- Updated user-guide format: Re-written and restructured sections to support format update.

Revision H (Aug 03, 2023):

- Fixed errors in document.

7 - Contact

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