AARONIA AG
WWW.AARONIA.COM

Manual
RF Signal-Generator

Please read the following manual carefully before using your Aaronia RF Signal Generator. This manual contains important information on how to properly operate this device.

Table of Contents

1. Introduction

Dear customer,

By purchasing this Signal Generator you acquired a professional RF-Generator, which allows to generate RF/Microwave Signals up to 4,4GHz (BSPG 4 and BPSG 4 OEM) or up to 6GHz (BPSG 6 and BPSG 6 OEM).

This product fulfills the requirements of the applicable European and national guidelines.

1.1. Liability

This document was compiled with great care and checked for accuracy.

But nevertheless mistakes cannot be excluded. We do not take over any liability. We cannot guarantee the completeness, the correctness and the accuracy of information.

We reserve ourselves the right to change our products, specifications and documentations without any notice. We have no obligation for revision of documents and manuals we delivered in the past.

1.2. Warranty

Despite the greatest care in development and production of this device and the included software; Aaronia AG takes only liabilities for certain purposes, if this has been assured in writing. No warranty can be assumed for the performance and flawlessness of the software for all usage conditions and cases and for the results produced when utilized by the user. No additional guarantees or assurances are made regarding marketability, freedom of defect of title, integration or usability for certain purposes unless they are required in accordance with the law and cannot be limited. Justified guarantee claims are limited to the right of require rectification or replacement delivery. Regarding infringements, violations of patents, rights of ownership or the freedom from interference by third parties, Aaronia AG cannot warrant or guarantee that it is free of error.

1.3. Safety Guidelines

In the event of any damages resulting from failure to follow these operating instructions the claim under guarantee is discharged. We accept no liability for consequential damages.
In the event of property and personal damages resulting from improper handling or failure to follow safety advice, Aaronia AG accepts no liability.
For reasons of safety and admissibility (CE) the unauthorized conversion and/or alteration of the product is not permitted.

As voltage source please only use a proper mains socket (100-240Volt, 50/60Hz). Make sure that the cable isn't squeezed or damage by sharp edges.
In order to avoid any damage, please read this user manual carefully before starting to use the device.
The commissioning should only be performed by qualified and instructed personnel.

Never expose the device to water. Never use it outdoors while it is raining. Otherwise the sensitive electronics could be damaged.
Avoid to high temperatures. Do not leave the device on a heating, in direct sunlight or in your car.
Only clean it externally with a damp cloth.

This device is sensitive to shock. So never drop the device and for safekeeping and transport please use the carrycase.

Even though the device is well secured through the use of counter-sunk screws, it should still not be reachable by children as it could easily be diverted from its intended use.

This devices that is connected with mains voltage and derived voltages, is not meant for the hands of children.

Consider the regulations for prevention of industrial accidents for electrical installations and equipment, by government safety organization in industrial facilities.

In schools, educational establishments, hobby and self-help workshops the operation of this product must be supervised by trained personnel.

> WARNING
> Please note the applicable legislation and restrictions to use and own this signal generator!
> We are not liable for any damages, directly or indirectly, resulting from the use of the field generator.
>
> Please also take care not to damage any test equipment connected to the Signal Generator, as the output power of up to +18dBm may damage the input of connected Spectrum Analyzers, Oscilloscopes, etc.
>
> The improper or illegal use of the signal generator is strictly prohibited!
> With the purchase of this equipment you automatically accept these conditions.

1.4. Scope of delivery

BPSG 4 and BPSG 6

1)	*Generator*
2)	*Adapter plates (blue) with screws (OEM versions only)*
3)	*Transport Case*
4)	*International Power supply*
5)	*USB Cable*
6)	*SMA Tool*
7)	*SMA Adapter (f/f) (non-OEM versions only)*
	Accessories (optional)
8)	*SMA Cable (1,5 or 10m)*
9)	*17600mAh Powerbank*
10)	*SMA to N Adapter*
11)	*12V Car Power Adapter*
12)	*20dB Attenuator*

BPSG 4 OEM and BPGS 6 OEM

Please check the package contents for completeness before first operation. Report missing parts immediately to Aaronia or to your Aaronia dealer.
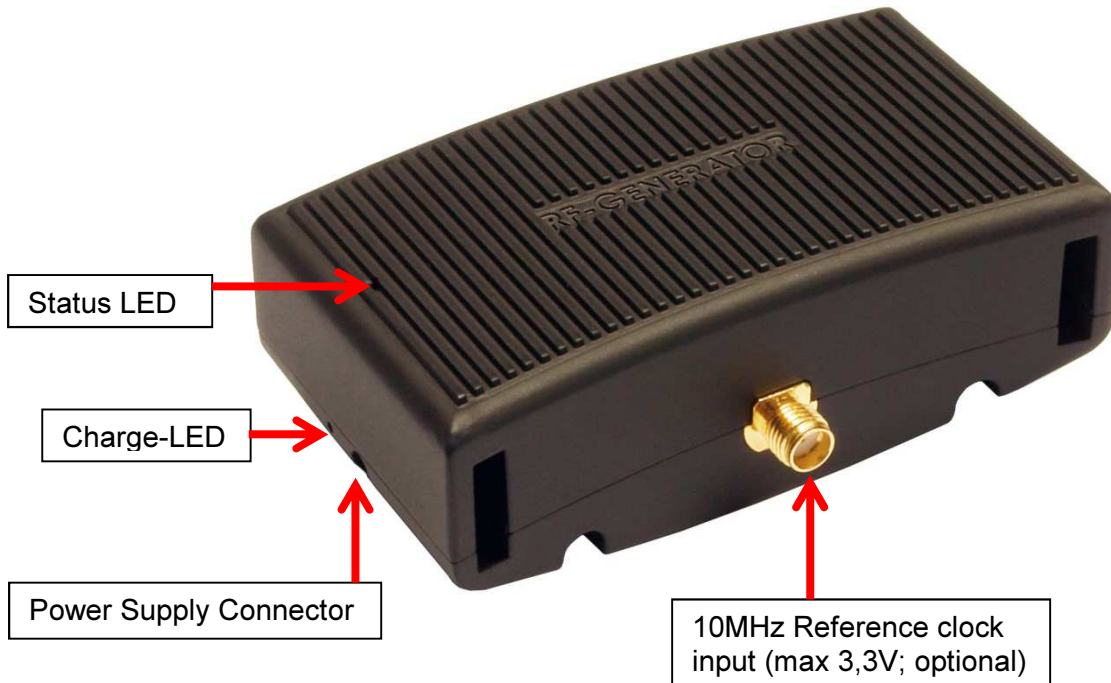
2. Technical data

	BPSG 4	BPSG 6	BPSG 4 OEM	BPSG 6 OEM
Design	Portable Signal Generator	Portable Signal Generator	OEM Signal Generator	OEM Signal Generator
Frequency range	35MHz to 4,4GHz	23,5MHz to 6GHz	35MHz to 4,4GHz	23,5MHz to 6GHz
Accuracy:	min. +/-1dB, typ. +/-0,5dB	min. +/-1dB, typ. +/-0,5dB	min. +/-1dB, typ. +/-0,5dB	min. +/-1dB, typ. +/-0,5dB
Connector	SMA	SMA	SMA	SMA
Max Output Level	+17dBm	+18dBm	+17dBm	+18dBm
Min Output Level	-48dBm	-45dBm	-48dBm	-45dBm
Modulations	AM / FM / PM	AM / FM / PM	AM / FM / PM	AM / FM / PM
Interface	USB 2.0 / 1.1	USB 2.0 / 1.1	USB 2.0 / 1.1	USB 2.0 / 1.1
Battery Operation	Up to 4 hours	Up to 4 hours	Up to 4 hours	Up to 4 hours
Warranty*:	2 years	2 years	2 years	2 years
Weight:	150gr	150gr	150gr	150gr
Dimensions				
Length:	81mm	81mm	81mm	81mm
Width:	61mm	61mm	61mm	61mm
Height:	29mm	29mm	25mm	25mm
Case:	Aluminum	Aluminum	Aluminum	Aluminum
Weight Case:	700gr	700gr	700gr	700gr
Length Case:	30 cm	30 cm	30 cm	30 cm
Width Case:	18 cm	18 cm	18 cm	18 cm
Height Case:	6,5 cm	6,5 cm	6,5 cm	6,5 cm

*No warranty on batteries

3.   Hardware

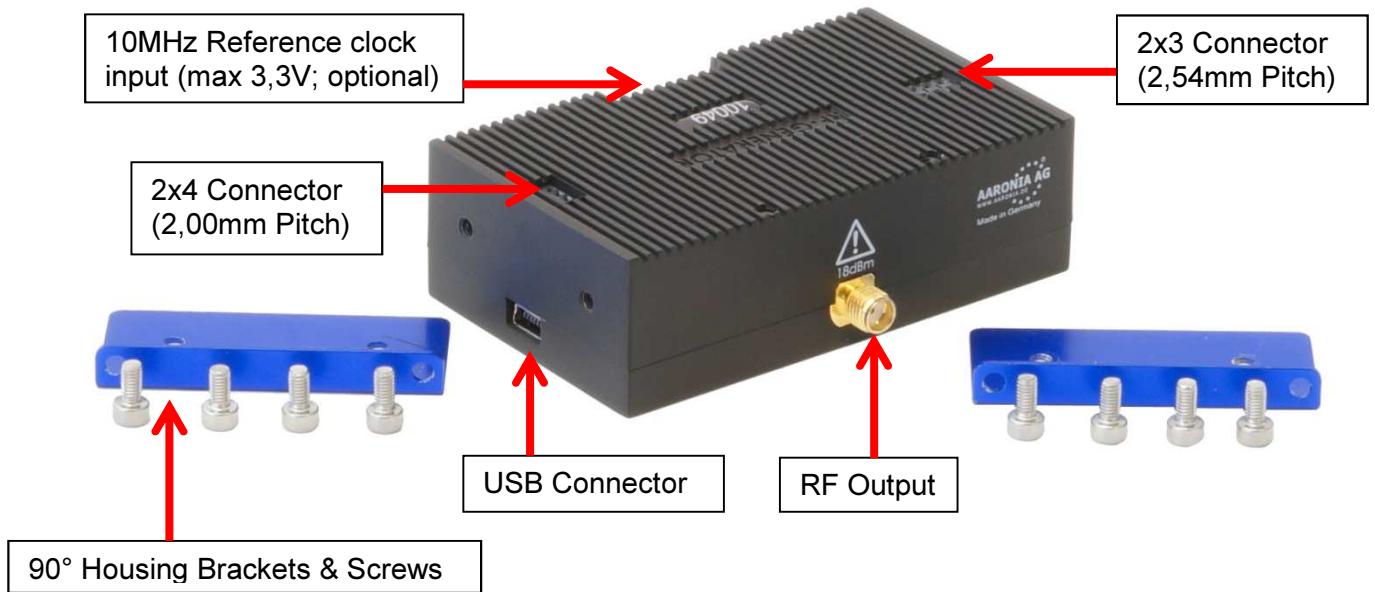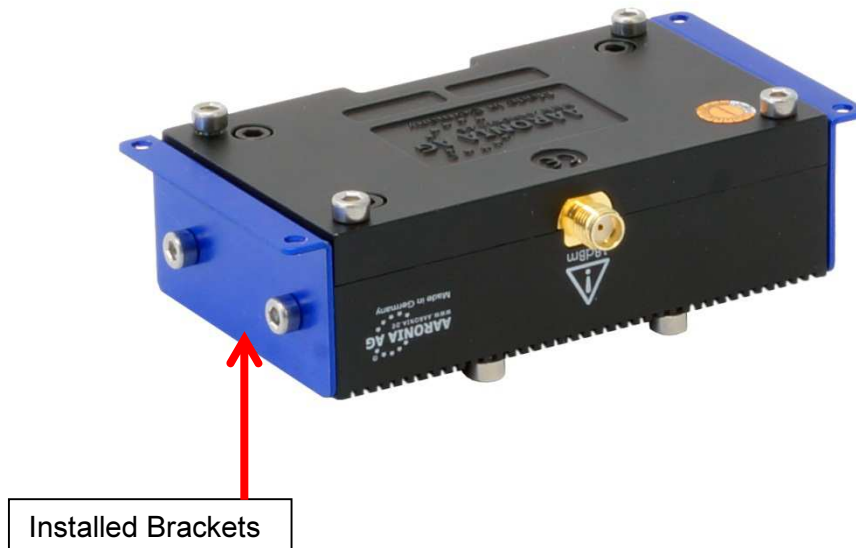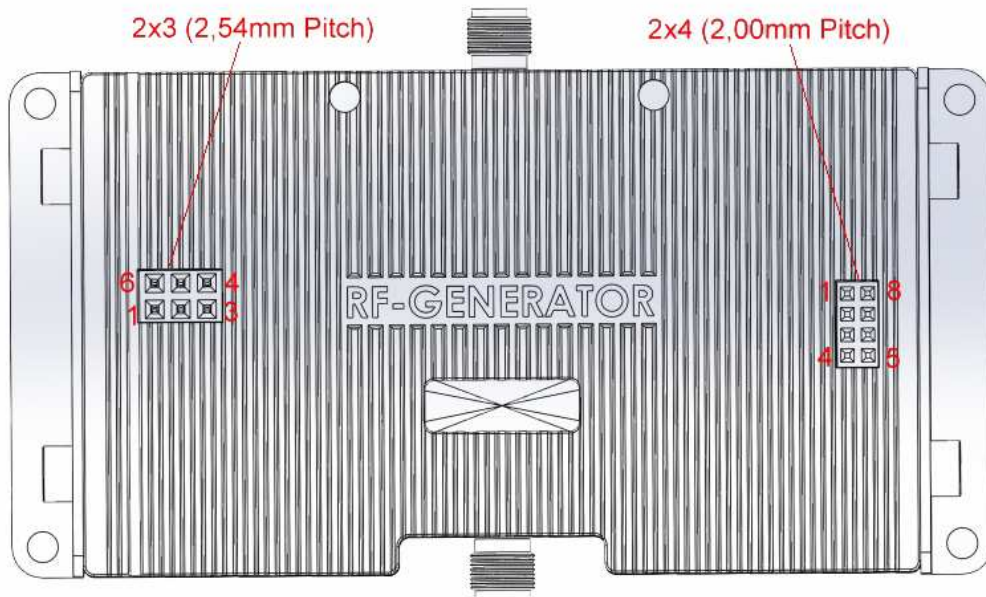### 3.1.   Connectors (BPSG 4 and BPSG 6)

Front view:

Status LED

Charge-LED

Power Supply Connector

10MHz Reference clock input (max 3,3V; optional)

Backview:

RF Output

ON/OFF Switch

USB Connector (no charging capability)
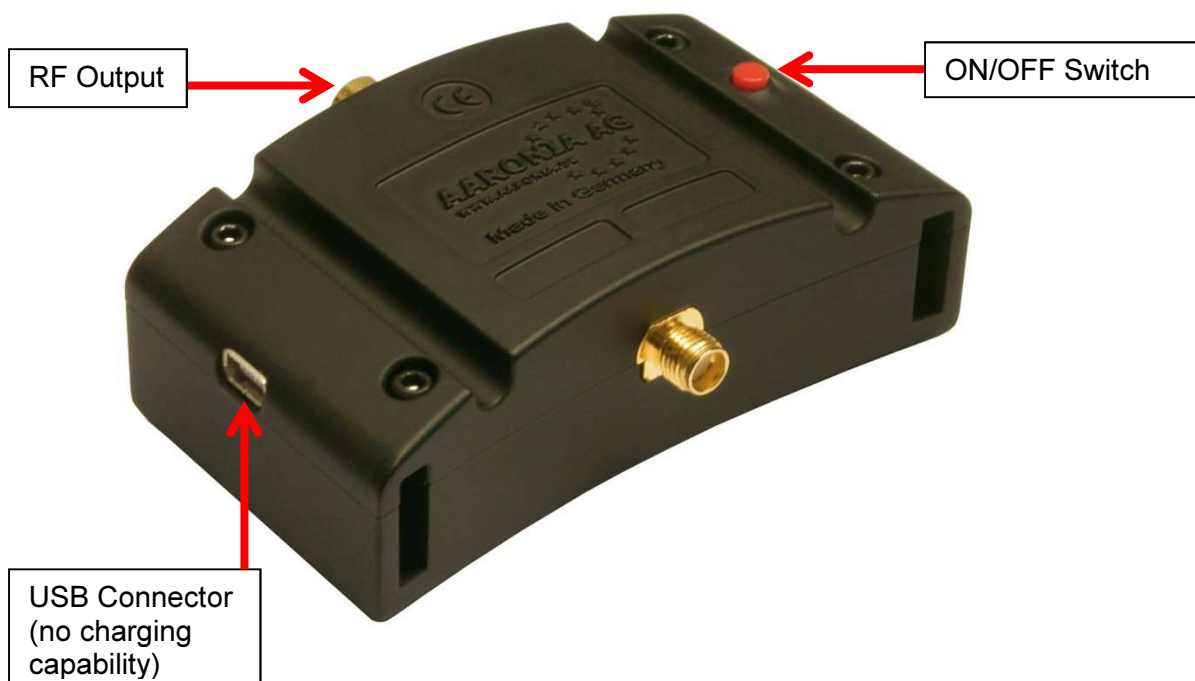
3.2. Connectors (BPSG 4 OEM and BPSG 6 OEM)

10MHz Reference clock input (max 3,3V; optional)

2x3 Connector (2,54mm Pitch)

2x4 Connector (2,00mm Pitch)

USB Connector

RF Output

90° Housing Brackets & Screws

Backview:

Installed Brackets

3.3. Pin-Layout OEM Versions

Connector 2X3:

- Pin 1: "Lock Detect" Output; 3,3V, max 10mA (Anode; Can connect directly to a LED, other PIN needs to connect to GND)
- Pin 2: 12V DC in (Charge Input, needs 1A = 12W)
- Pin 3: "Power ON" Output; 3,3V, max 10mA (Anode; Can connect directly to a LED, other PIN needs to connect to GND)
- Pin 4: "Battery Charge Finished" output, 3,3V, max 10mA (Anode; Can connect directly to a LED, other PIN needs to connect to GND)
- Pin 5: "On/OFF and Start/Stop"; TTL, with low level (0V) (Can also be used to directly connect a Push Button) Switch the Generator On/Off or Start/Stop the batch programs
- Pin 6: GND

Connector 2X4:

- Pin 1: USB 5V (For USB)
- Pin 2: USB- (For USB)
- Pin 3: USB+ (For USB)
- Pin 4: "Battery Charging" output, 3,3V, max 10mA (Anode; Can connect directly to a LED, other PIN needs to connect to GND)
- Pin 5: GND (For USB)
- Pin 6: GND (For USB)
- Pin 7: GND (For USB)
- Pin 8: GND (For USB)

3.4. Battery / Power supply

All BPSG Signal Generators come with internal LiPo-Battery which offers 3 – 4 hours run-time.

The charging time for the LiPo-Battery is about 90 minutes. The Charge-LED will turn red at the beginning of the charging process. When charging is complete, the Charge-LED turns green.

By pressing the ON/OFF switch, you can turn the Generator on and off. When the Generator is turned on, the ON/OFF LED lights red.

For a continuous operation, the included power supply can be used.

You can connect also other DC sources with 12V. As connecting plug a 3,5mm jack plug has to be used. The connecting plug has to be poled as follows: The inner pole is "+" and the outer pole is "-". With our optional power adapter for the cigarette lighter (see our pricelist) you can charge or operate signal generator also in the car.

4. Application Examples

- Attenuation tests
- EMC - radiated immunity pre-compliance testing
- Generating modulations (AM, FM, PM)
- Wireless communications systems
- Microwave point to point backhaul radios
- Software Defined Radio (SDR)
- Radar
- Automated Test Equipment (ATE)
- Sweeping and hopping
- Scalar Network Analyzers (SNA)
- Complex waveform electronic warfare (EW)
- Phase Lock Loop (PLL) Synthesizer Design
- Local Oscillator (LO) replacement
- Hobbyist radio development and many more...

5. First Operation

The first step should be the installation of the included Generator software. The software is necessary to control the BPSG, change its settings, save sweep profiles and for firmware updates.

Therefore, please use the included CD, open the Auto-Installer and follow the described steps.

Once installed please connect your BPSG with the included USB-Cable to the PC and power it on. The software automatically recognizes the BPSG.

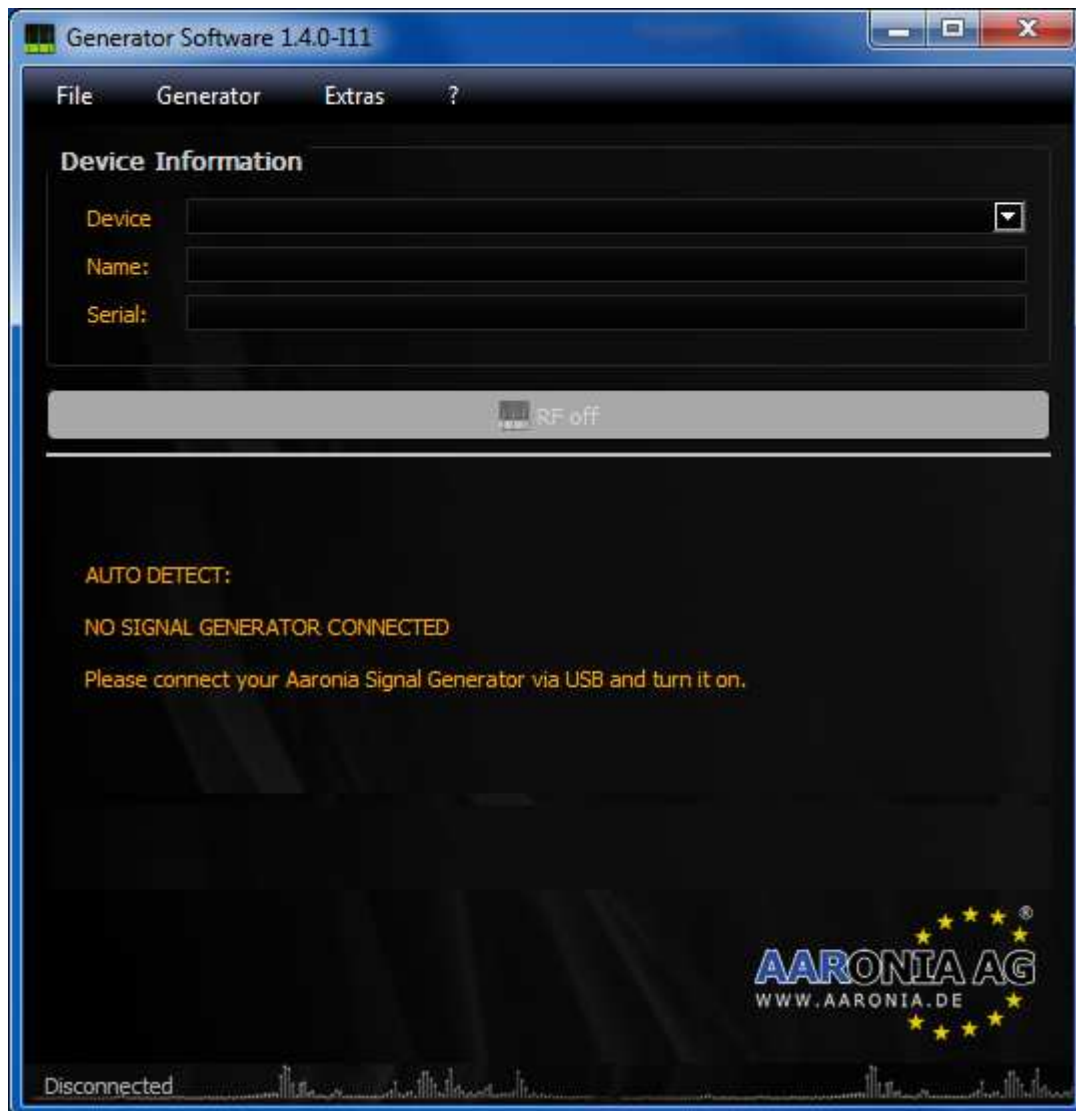## 6. Software

6.1. Main Window

Figure: SW-01

Figure SW-01 shows the main window of the software without the connected generator. The operating functions of the generator are deactivated.

Figure: SW-02

Figure SW-02 shows the main Manual Mode software window in RF On Mode with a generator connected and powered on via USB. The operating functions are activated.

6.2. General Controls

(1) Main Menu
- File
  - Quit
    > Ends the program

- Generator
  - Device Information
    > Displays the device information for a connected generator (see item 6.x.x.)

- Extras
  - Firmware Update
    > Displays the firmware update dialog (see item 6.x.x.)
  - Select Language
    > Selects the display language (see item 6.x.x.)

        o Styles
           > Selects the design of the user interface

- ?
        o Help
           > Displays the user manual
        o About
           > Displays information about the software

(2) Device Information
- Device
  > Displays a drop-down menu with available generators (connected and powered on via USB)

- Name
  > Displays the name of the currently selected generator

- Serial
  > Displays the serial number of the currently selected generator

(3) RF On/Off Button
    > Switches the RF output of the currently selected generator on or off

(4) Tabs for Switching Mode
- Manual Mode
  > Generates the appointed frequency with the appointed level

- Program Mode
  > Run or create batch programs

- Advanced Mode
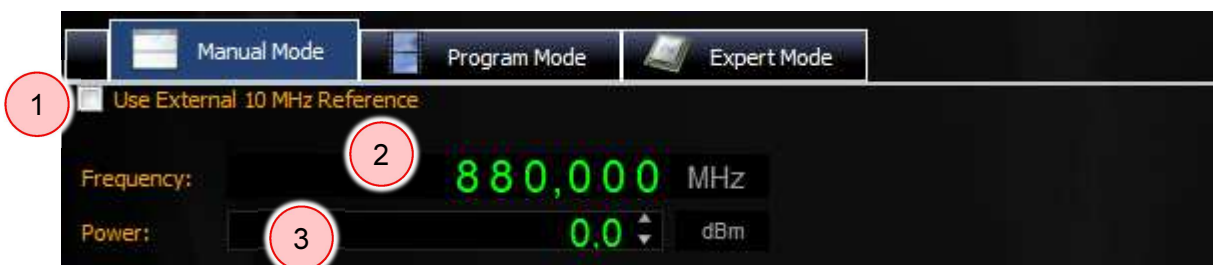 > This mode is only intended for advanced users

6.3. Manual Mode

Figure: SW-03

(1) An external reference of 10 MHz may be selected here.
(2) Entry of the frequency of the output signal (dependent on generator type).
(3) Signal level.
The signal can be switched on and off at the output using the RF on/off button – refer to Figure: SW-02 (3).

6.4. Program Mode

Figure: SW-04

(1) List of available batch programs. Double-clicking activates the corresponding program.
(2) An external reference of 10 MHz may be selected here.
(3) Display of the current frequency and power output.
(4) Opens the batch program editor.
The signal can be switched on and off at the output using the RF on/off button – refer to Figure: SW-02 (3).

6.4.1. Program Editor

Figure: SW-05

(1) The list of batch programs. When one is selected, it is displayed on the right-hand side. When the dialog is opened, the current program of the generator is selected.
(2) Create a new empty program using the "New" button.
Create a copy of the selected program using the "Copy" button.
Delete the selected program using the "Delete" button.
Save all programs using the "Save" button.
Rename a selected program using the "Rename" button.
Refresh all programs using the "Reload" button.
(3) An external reference of 10 MHz can be selected here.
(4) Mode of the program part. See also the explanation of each individual mode (refer to 6.4.2.).
(5) The data of the current program part. See also the explanation of each individual mode.
(6) List of program parts. Usually you will only have one program. But you can combine different sweeps, in which case there is a duration time of how long the program part remains active for each sweep. A duration time of 0 is interpreted as infinite.
(7) The "Add" button adds the settings from (4) or (5) as a new program part.
The "Modify" button saves the current settings for the selected program part. This is done automatically if the program is changed (1), saved (2), sent to the device (9).
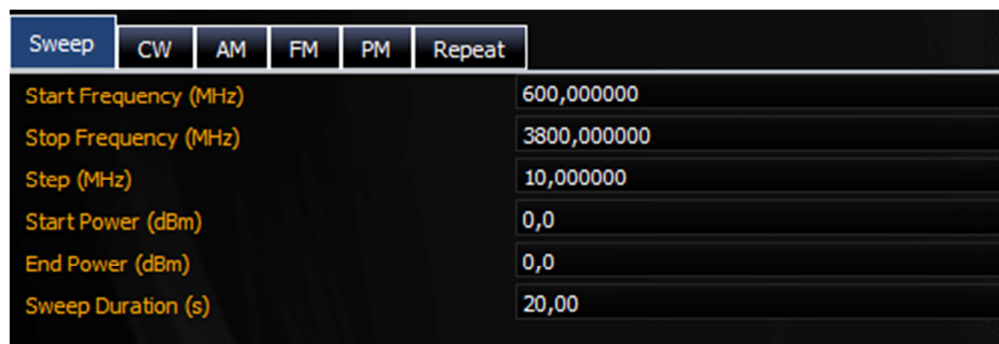The "Delete" button deletes the selected program part.
The "Clear" button deletes all program parts from the list.

(8) For advanced users only: shows the device-specific translation of the program. This function is not required for operation.
(9) Writes the current settings to the device.
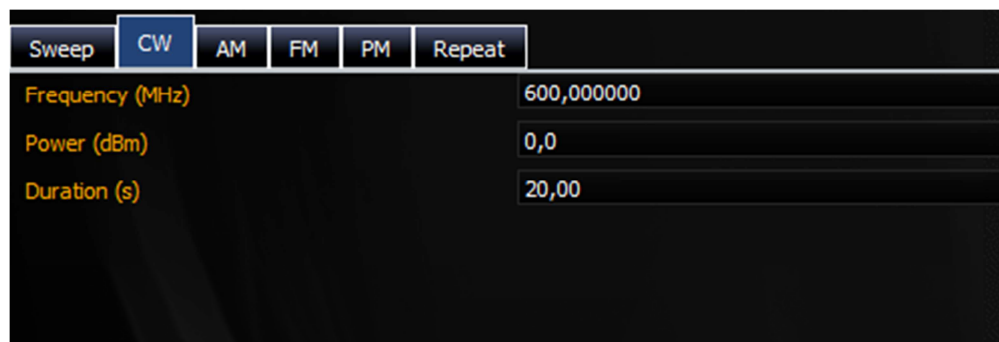
6.4.2. Program Modes

6.4.2.1. Sweep

Sweep	CW	AM	FM	PM	Repeat
Start Frequency (MHz)					600,000000
Stop Frequency (MHz)					3800,000000
Step (MHz)					10,000000
Start Power (dBm)					0,0
End Power (dBm)					0,0
Sweep Duration (s)					20,00

Figure: SW-06

Uniformly runs through a frequency range from start to stop. If no increment is specified, then the smallest possible increment is selected.
Since Start and End Power can be set separately, you can also run a Power Ramp or both simultaneously.

6.4.2.2. Constant Wave

Sweep	CW	AM	FM	PM	Repeat
Frequency (MHz)					600,000000
Power (dBm)					0,0
Duration (s)					20,00

Figure: SW-07

Selects a frequency and a level for the selected time.
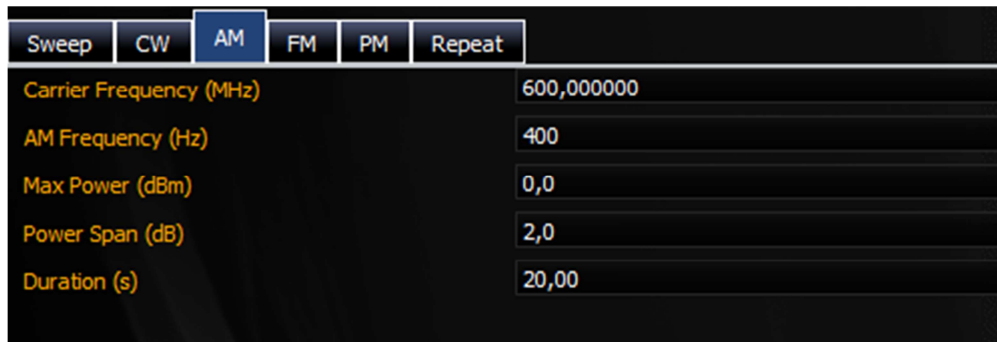
6.4.2.3. Amplitude Modulation

Figure: SW-08

The carrier frequency is output amplitude-modulated. The modulated frequency can be adjusted from 1 Hz up to 17 kHz. At high frequencies in the kHz range, the accuracy is partially limited to 50 Hz steps.
Max Power determines the maximum of the modulation. The minimum amplitude is Max Power minus Power Span. Depending on the device, it may be that the maximum Span of 31.5 dB cannot be reached.
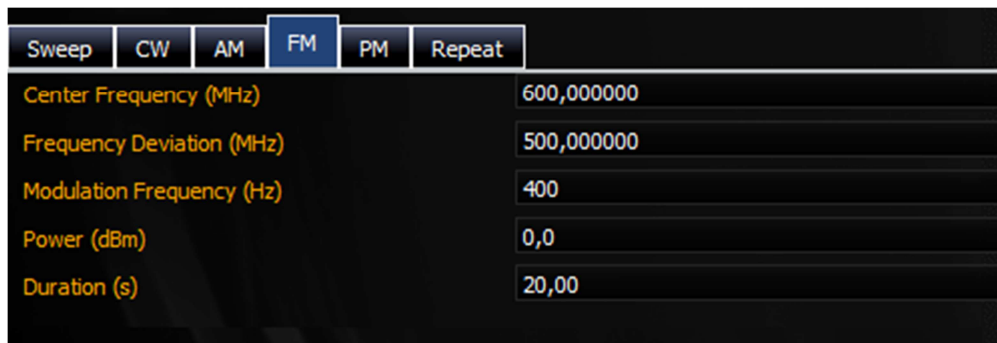
6.4.2.4. Frequency Modulation

Figure: SW-09

The following table shows the possible settings for the FM mode:

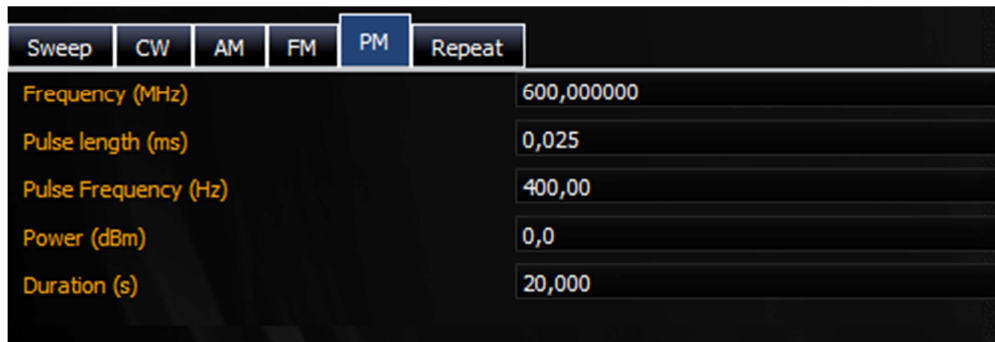| Center Frequency		Frequency Deviation		Modulation Frequency	
from	To	from	to	from	to
100 MHz	399 MHz	1 MHz	3 MHz	1 Hz	100 Hz
400 MHz	499 MHz	1 MHz	3 MHz	1 Hz	80 Hz
500 MHz	599 MHz	1 MHz	3 MHz	1 Hz	70 Hz
600 MHz	899 MHz	1 MHz	3 MHz	1 Hz	60 Hz
900 MHz	949 MHz	1 MHz	3 MHz	1 Hz	50 Hz
950 MHz	2800 MHz	1 MHz	1 MHz	1 Hz	10 Hz
2801 MHz	5999 MHz	1 MHz	1 MHz	1 Hz	4 Hz

6.4.2.5. Pulse Modulation

Figure: SW-10

The output level is switched to be in time with the Pulse Frequency for the duration of the pulse length. A pulse length of 0 results in a pulse of about 8 microseconds. The pulse frequency can be selected from 0.01 Hz (100 seconds) to 15 kHz.
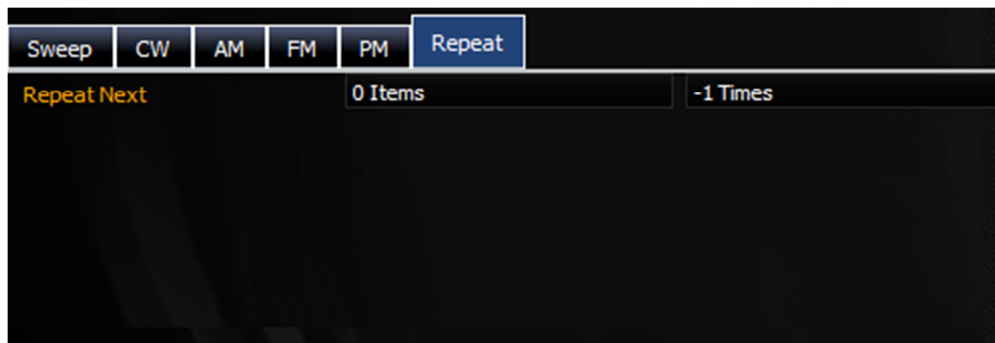
6.4.2.6. Repeat

Figure: SW-11

If a program consists of several parts, then you can repeat individual elements or groups here. If the number is set to -1, then the group will be repeated indefinitely. The items determine the group size.
Typically, a program consists of just one part. At the end, it therefore repeats again from the beginning.
This implicit repetition is canceled with a repeat. This makes it possible to send a sequence only after turning on the device and then turning off the output.
In the process, the last setting is always retained. Should the device not send any more levels at the end, you may then close the program with a CW at a level of -50 dBm.

6.5. Advanced Mode

Figure: SW-12

This mode is only intended for advanced users.

With "Manual Input," you can specify the current frequency and the current level. Pressing enter sends the data. The actual frequency is displayed under "Effective."

Under "Chip Settings," various settings for the chip can be manipulated. The "Poweroutput" is possibly of interest here. If this is reduced, the overall level of the device can be set even lower. However, it will lose its calibration in the process. If settings are changed, then they are transferred by pressing "Send."

Under "Chip Registers," you can directly manipulate the register values. With "Continuous," you can continuously scan them to see the latest chip settings. The "Chip Settings" are synchronized with the Register Settings. By pressing Default, all registers are reset to the default settings.

Under "Internal Registers," you can observe individual registers of the program sequence control. With "Dump Memory," the flash content can be read and saved in a file.

We recommend that only advanced users use this window and only if they are familiar with the hardware! Aaronia offers no support for the Advanced Mode.

6.6. Device Information

Figure: SW-13

With "Device," a generator can be selected from the list of available generators. "Refresh"
updates this list.
"Firmware Version," "Serial," and "Name" displays the corresponding data of the generator.
The name of the generator can be changed and written with "Write Info."
In order to guarantee proper functioning, the interpreter version of the software and the
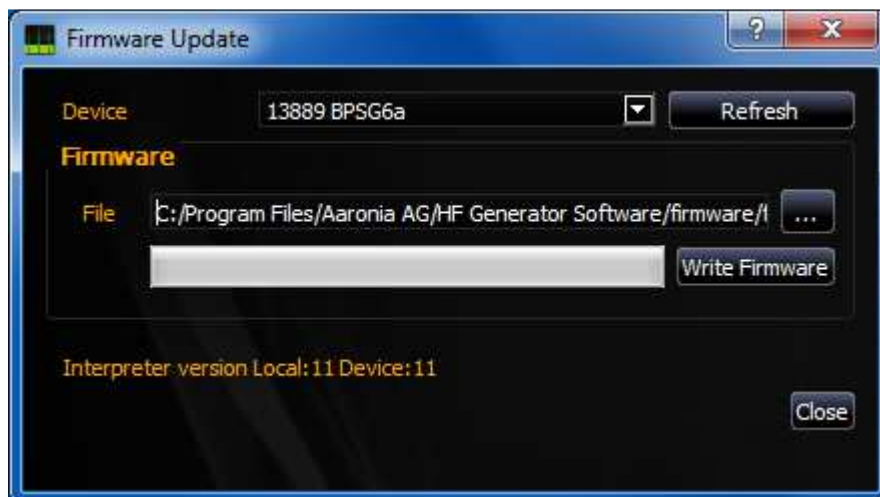connected generator must be identical.

6.7. Firmware Update

Figure: SW-14

First, close the software. Disconnect the USB connection from all connected generators. Put
the generator to be updated into bootloader mode. Turn on and immediately shut off the
device 3 times consecutively. The generator's Power LED indicator now lights up solid green.
Connect the USB cable to the generator, and open the software. Open "Firmware Update" in
the "Tools" menu. "Bootloader" should be selected in the "Device" drop-down menu.

Select the appropriate firmware file, and start the update process by pressing "Write Firmware." The progress is indicated by a bar. When the update process is finished, close the dialog using the "Close" button. Then briefly interrupt the generator's USB connection. The generator is now available again.

6.8. Printable Version of the software
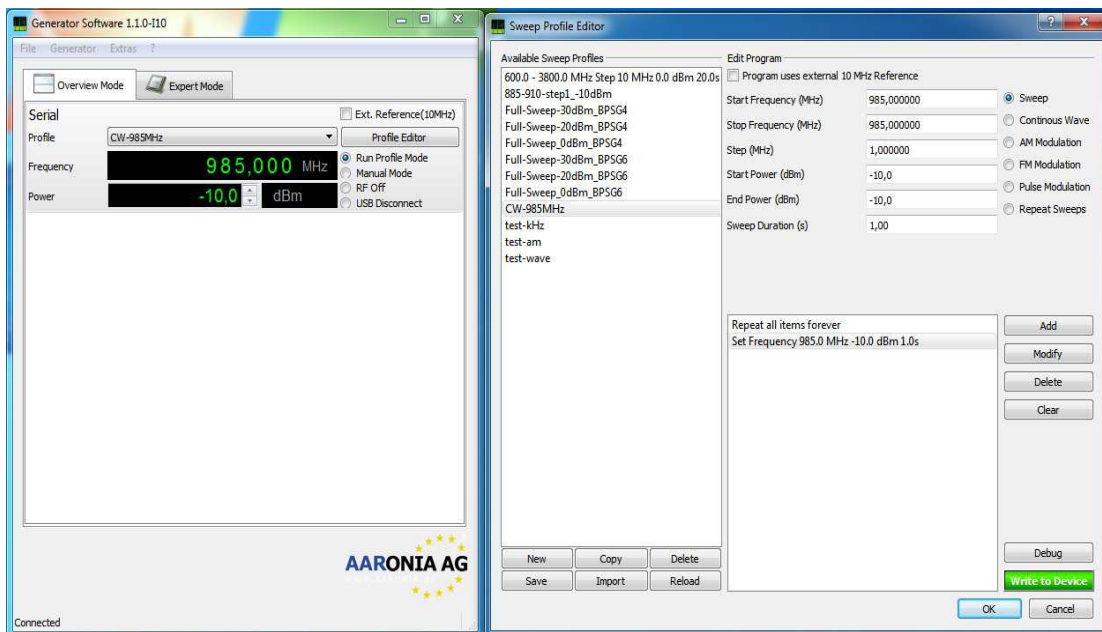
If it is required to print a software window, you can easily switch to a default window style. Open the "Extras" menu in the menu bar and press the "Unload Stylesheet (F11 key)" entry. The application reloads with the default window settings of your operating system.

The design setting will be stored automatically as default design when the application will be launched again.

6.9. Languages

The generator software supports different languages. Open the "Extras" menu and choose "Select Language". A dialog will be shown. Select your language if it is available. Press the "Ok" button to activate the language.
The language setting will be stored automatically as default language when the application will be launched again.

7. Forum

Please visit our Support- and Forum-Website:

www.spectran-developer.net

Here you can find, amongst others, a forum with a lot of helpful tips & tricks, especially about handling the Signal Generators. This Forum is open for the public. After a short registration process, you can place your questions and exchange information with other Aaronia users.

Here you can find a variety of helpful tips & tricks covering all of the Aaronia products, including the BPSG Signal Generators. The Forum is searchable and open to the public, but after a simple registration process, you can also post questions and exchange information with other Aaronia users.