RF Signal Generator

SG8-HP01M
SG8-HPSS01M

Test Program

Rev. 1.1

Advantex LLC

December 13, 2011

Russian Federation, 111250, Moscow,
Krasnokazarmennaya st., 13/1
tel. +7 (495) 721-47-74, +7(495) 728-08-03
info@advantex.ru
http://advantexrf.com

Document Revisions

Rev.	Date	Description
1.0	November 5, 2011	Test program for SG8-HP01M-C2U42HP315 and SG8-HPSS01M-C2U42HP315
1.1	December 13, 2011	STAT:QUES? command replaced with STAT:QUES:COND in figure 5 Revised center frequency list of REF Out phase noise test Revised RF Out and REF Out normalized phase noise mask Revised the specified max value of low bound of the calibration area Revised REF Out level range

Contents

List of Figures

List of Tables

This document specifies methods and facilities for verification of the following devices:

SG8-HP01M-C2U42HP315 – SG8 RF Signal Generator 10 MHz – 8 GHz (base configuration)

SG8-HPSS01M-C2U42HP315 – SG8 RF Signal Generator 10 MHz – 8 GHz (with additional spur suppression option)

Recommended calibration interval: 1 year.

1 Test Summary

Table 1: Test summary

Test #	Test Name	Section thereof
	Mechanical Test Set	
1.1	Mechanical defects / damages test (case, display, connectors)	6.1 on page 10
	Power-On Test Set	
2.1	Power-on, display, keyboard, rotary knob operation test	6.2.1 on page 10
2.2	EEPROM integrity test	6.2.2 on page 11
	PLL Lock Test	
3.1	PLL lock test at 1GHz+1Hz	6.3 on page 11
3.2	PLL lock test at 1GHz-1Hz	
	Remote Control Interfaces	
4.1	USB *IDN? response	6.4.1 on page 12
4.2	RS-232 *IDN? response	6.4.2 on page 13
	RF Level Calibration Area / RF Level Accuracy	
5.1	Min. value of high bound of calibration area	6.5 on page 13
5.2	Max. value of low bound of calibration area	
6.1	Absolute accuracy at Pout=0..+20dBm	
6.2	Absolute accuracy within calibration area	
	RF Out Frequency / Spectrum	
7.1	Frequency accuracy	6.6.1 on page 14
7.2	Normalized phase noise	6.6.2 on page 16
	REF Out	
8.1	REF Out level	6.7.1 on page 17
8.2	REF Out phase noise	6.7.2 on page 19
	REF In Sensitivity	
9.1	External reference signal 20MHz, +10dBm PLL lock	6.8 on page 19
9.2	External reference signal 150MHz, -10dBm PLL lock	
	Analog Inputs	

(continued on next page)

(continued Table 1, beginning on the preceding page)

Test #	Test Name	Section thereof
10.1	Mic In	6.9.1 on page 20
10.2	AUX In / TRIG	6.9.2 on page 22

2 Test Facilities

Table 2: Equipment used in tests

Description	Equipment examples	Actual	Required	Test #
Average power sensor	R&S NRP-Z22	VSWR<1.2 (10 MHz to 8 GHz) Uncertainty for absolute power measurements, Ta=20 to 25°C: • 10 to 100 MHz, -57 to +20 dBm: 0.079 dB • 10 to 100 MHz, +20 to +30 dBm: 0.088 dB • 100 MHz to 4 GHz, -57 to +20 dBm: 0.085 dB • 100 MHz to 4 GHz, +20 to +30 dBm: 0.098 dB • 4 GHz to 12.4 GHz, -57 to +20 dBm: 0.116 dB • 4 GHz to 12.4 GHz, +20 to +30 dBm: 0.125 dB	Ta=20 to 25°C, 10 MHz to 8 GHz, -10 to +26: 0.25 dB 0 to +20: 0.15; Remote Control.	6, 8.1

(continued on next page)

(continued Table 2, beginning on page 6)

Description	Equipment examples	Actual	Required	Test #
Signal Source Analyzer	R&S FSUP8	Frequency range: 1 MHz to 8 GHz; Phase noise at 1 GHz center frequency: • 1 kHz offset: -130 dBc/Hz • 10 kHz offset: -139 dBc/Hz • 100 kHz offset: -150 dBc/Hz • 1 MHz offset: -160 dBc/Hz • 10 MHz offset: -165 dBc/Hz Measurement uncertainty, 100 Hz to 10 MHz offset: $<$ 1 dB Temperature stability: ±0.08 ppm (+5 to +40°C) Aging: ±0.1 ppm/year	Frequency range: 1 MHz to 8 GHz; Phase noise referred to 1 GHz: • 1 kHz offset: -120 dBc/Hz • 10 kHz offset: -130 dBc/Hz • 100 kHz offset: -130 dBc/Hz • 1 MHz offset: -145 dBc/Hz • 10 MHz offset: -150 dBc/Hz Measurement uncertainty, 1 kHz to 10 MHz offset: $<$ 2.5 dB; Remote Control.	7.2, 8.2
Spectrum Analyzer	ADVANTEST R3267	Frequency range: 100 Hz to 8 GHz; Min RBW: 1 Hz Temperature stability: ±0.1 ppm (0 to +40°C) Aging: ±0.1 ppm/year	Frequency range: 10 MHz to 8 GHz; Min RBW: 30 Hz	3, 9
Frequency Counter	EZ DIGITAL FC-3000	Time base: ±1 ppm Frequency range: to 100 MHz	Time base: ±1 ppm Frequency range: DC to 3 GHz	7.1
Signal Generator	R&S SMC100A (B-101)	Frequency range: 9 kHz to 1.1 GHz	Frequency range: 20 MHz to 150 MHz	9

(continued on next page)

(continued Table 2, beginning on page 6)

Description	Equipment examples	Actual	Required	Test #
PC		Intel Pentium Dual Core 3GHz, 200GB HDD; Interfaces: 2xUSB, RS-232, Ethernet; Software: WinXP, Tcl/Tk, R&S®NRP-Toolkit, VISA and IVI-COM drivers for equipment remote control, R&S®NRPZ_VXIPNP v2.1.5, MCR v7.14	Hardware: CPU 2GHz, 100GB HDD; Interfaces: 2xUSB and RS-232 (D-sub, 9-pin, male), Ethernet; Software: WinXP, Tcl/Tk, VISA and IVI-COM drivers for equipment remote control, R&S®NRP-Toolkit v2.1.10, R&S®NRPZ_VXIPNP v2.1.5, MCR v7.14	4, 5, 6, 7.2, 8.2
DC Voltage Source	Mastech HY1502D	0 to 15 VDC, 2A	0 to +3 VDC, Isource $>$ 10 mA, Rout $<$ 100Ω	10.2
Voltmeter	Fluke 15B	VDC measuring range: 0.1 mV to 1kV Accuracy: 0.5% + 3 LSD units	0 to +3 VDC, 5% accuracy	10.2
Microphone	Genius MIC-01A	100 Hz - 10 kHz, 3.5mm jack, 2.2 kΩ	2-pin electret condenser, +3VDC via 3kΩ	10.1

Other equipment can be used if it meets the requirements listed above. All equipment which is essential for measurements should be calibrated and have calibration certificates.

3 Requirements for qualification of verification officers

The officers who carry out the verification should be certified as verification officers and with practical experience in the field of radio engineering measurements at least 2 years.

It's strongly recommended to learn SG8 Operation Manual before the verification.

4 Test conditions

Test conditions should be the following (if not explicitly specified):

- Ambient temperature: Ta=23^{+5}_{-3} °C (for Test #6 Ta=23^{+2}_{-3} °C)
- Humidity: 20 to 70% RH
- Air pressure: 750±30 mmHg
- AC Power Voltage: 220±20 V AC
- AC Frequency: 50±1 Hz, harmonics ≤ 5%

5 Preparing to verification

1. Please, read the SG8 Operation Manual and manuals for all instruments used in test process.
2. Check the conditions conform to the specified above.
3. Before the powering on verify that safety requirements are met (i.e. grounding, allowable signal level ranges, etc.)
4. Wait for 15 min for warming up the instrument.

6 Verification Tests

After the test, it is assigned a status, which is one of the following:

SKIPPED – means that this test was skipped for some reason (it's indicated in notes)

FAILED – the test is failed

PASSED – the test is passed, all tested values are in their specified ranges, all is OK.

Status can be accompanied by the resolution or note. Predefined resolutions are the following:

requires re-calibration

re-calibrated – when previous test was marked as "requires re-calibration" or some parts corresponding to the test were re-calibrated

requires adjustment

adjusted – when previous test was marked as "requires adjustment" or some parts corresponding to the test were adjusted

needs repair

repaired – when previous test was marked as "needs repair" or some parts corresponding to the test were repaired.

to be replaced

replaced – when previous test was marked as "to be replaced" or some parts corresponding to the test were replaced.

It is recommended to add the description to the assigned status and resolution.

6.1 Mechanical Test Set

Inspect the following for any defects or damage:[1]

Case — The case, legs and other visible mechanical parts should not have any damages or deep scratches.

Display — The display should be intact and have no any scratches on the visible surface.

Connectors — Inspect RF Out (N-Type), REF In and REF Out (SMA-Type), AUX In (BNC-Type), Mic In, RS-232 and USB connectors. All blades (tabs) of the central contact of N-type connector should not be damaged. SMA and N-type connectors should have undamaged thread. It can by verified by winding a special connector cap with specified thread or appropriate plug.

If all conditions listed above are met then status "PASSED" is assigned, otherwise "FAILED", and detailed description is placed in the "notes" section.

6.2 Power-On Test Set

6.2.1 Power-on, display, keyboard, rotary knob operation test

1. Power on the instrument.
2. After 2-5 seconds the display should light up, and data relevant to the current operation mode should appear.
3. Check the menu buttons (`RET`, `UP`, `DOWN`, `SEL/OPT`). They should operate as stated in the manual.
4. Check the keyboard:

[1] If the instrument is not stated as new (i.e. when the instrument is returned for recalibration or repair), it may have scratches or small damages of the case or display which have no impact on its functionality and characteristics.

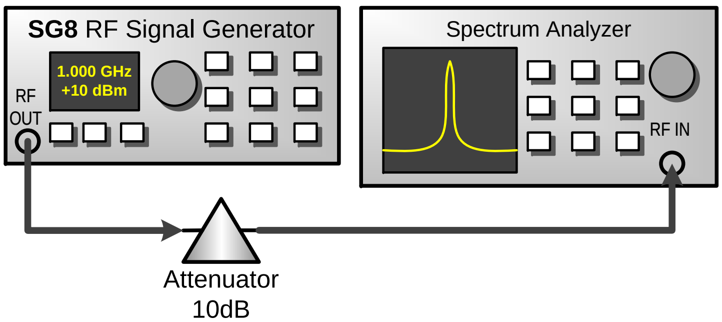

Figure 1: PLL lock test setup

(a) Select any numerical field, for example Center Frequency in CW mode. Press sequentially `1`, `2`,..`9`, "." and `0` key. The digits and dot should appear on the screen.

(b) Press `BCK` key, the last entered digit should be erased.

(c) Deactivate the field by pressing `DOWN` or `UP` menu button.

(d) Select Center Frequency field in CW mode. Press sequentially `Hz`, `kHz`, `MHz`, `GHz` keys. The current frequency value should be expressed in Hz, kHz, MHz, GHz accordingly.

(e) Select Level field in CW mode. Enter any valid value and press dBm key. New entered value should be displayed.

(f) To check the operation keys, select the Center Frequency field in CW mode and try to evaluate the following sequences: CDE (see Operating Manual) for commands "−", "+", "×", "÷".

5. Check the rotary knob: select the Center Frequency field in CW mode, click the knob to activate the field, then rotate the knob – displayed field should change its value according to the rotation.

If all conditions listed above are met then status "PASSED" is assigned, otherwise "FAILED", and detailed description is placed in the "notes" section.

6.2.2 EEPROM integrity test

Enter Info menu item. Verify that Part Number, Serial Number and Date fields have sound values, and that Part Number and Serial Number displayed on the screen are the same as specified on the rear panel of the instrument. If so, then status "PASSED" is assigned, otherwise "FAILED".

6.3 PLL Lock Test

Connect the instrument as shown in figure 1. Configure a spectrum analyzer as follows:

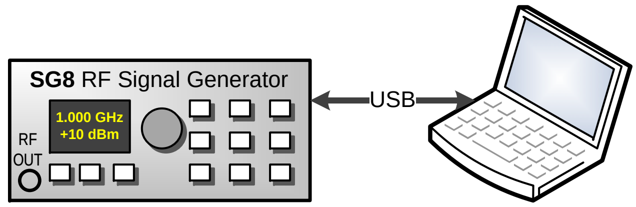

Figure 2: USB Test Setup

```
Center frequency = 1 GHz;
Span = 1 MHz;
RBW = 1 kHz;
VBW = 100 Hz;
Ref level = 0 dBm;
```

Configure SG8 as follows:

```
Mode = CW;
Level = +10 dBm;
```

Set frequency:

1. 1 000 000 001 Hz – spectrum should have stable shape corresponding to the sine wave (assign “PASSED”). If not – PLL lock at low tune voltage is failed (assign “FAILED” status).

2. 999 999 999 Hz – spectrum should have stable shape corresponding to the sine wave (assign “PASSED”). If not – PLL lock at high tune voltage is failed (assign “FAILED” status).

6.4 Remote Control Interfaces

6.4.1 USB Test

Connect the instruments as shown in figure 2. Launch Hyper Terminal application and configure as described in Operating Manual.

Type the following SCPI command:

```
*IDN?
```

SG8 should response with the following string: *<Manufacturer>,<Part Number>,<Serial Number>,<Firmware Revision>*, like this

```
Advantex,SG8-HP01M-C2U42HP315,57065-9090-001,R1.0
```

If SG8 responded, the test is passed, if not – failed.

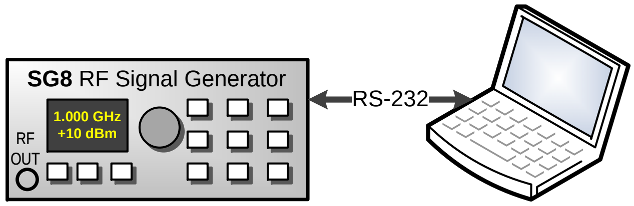

Figure 3: RS-232 Test Setup

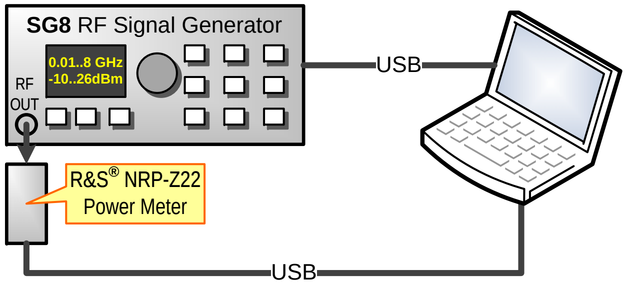

Figure 4: RF level accuracy and calibration area test setup

6.4.2 RS-232 Test

Connect the instruments as shown in figure 3. Repeat the test as described in section 6.4.1 on the facing page.

6.5 RF Level Accuracy and Calibration Area

1. Connect the instruments as shown in figure 4.

2. Make certain that ambient temperature resides in +20 to +25 °C to obtain maximum accuracy.

3. Launch **SG8_Level_Scan** application, specify start, stop and step values, and click "Scan" button. The algorithm is shown in figure 5. The application has the following files on its output: `SG8_level_`*<Serial_No>*`.csv` and `SG8_status_`*<Serial_No>*`.csv`. File `SG8_level_`*<Serial_No>*`.csv` contains measured power level at given frequency and power which were set to SG8. First row of the file contains the list of frequency values in MHz, first column of the file contains the list of power values in dBm which were set to the instrument (table 3). Values are delimited by semicolon ";". File `SG8_status_`*<Serial_No>*`.csv` has the same format as described above, but contains status of measured values. Zero value means that point corresponding to the frequency and power which were set, is in calibration area, other value means that measured point is outside of calibrated area.

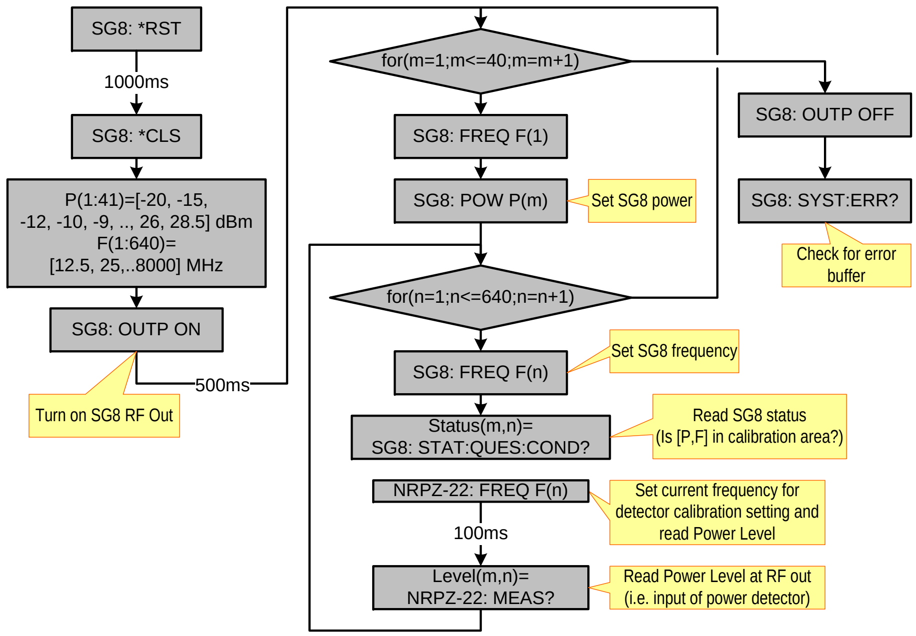

Figure 5: SG8 Level Scan algorithm

4. Launch **SG8_TP_LevelScan** application, select `SG8_level_<Serial_No>.csv` and `SG8_status_<Serial_No>.csv` files, then press “Process” button. The application finds minimum and maximum errors (the difference between set and measured values) in calibrated area and in area from 0 to +20 dBm. Also it outputs level scan graph and absolute error contour graph which are included to test report.

5. Compare the minimum and maximum error values with the specified in table 4. If they are in specified ranges, the tests are passed.

6.6 RF Out Frequency / Spectrum

6.6.1 Frequency accuracy

1. Connect the instruments as shown in figure 6.

2. Set frequency F_o=100 MHz and level according to sensitivity of Frequency Counter input.

3. Measure the frequency F_i at Frequency Counter input.

4. Frequency accuracy (relative frequency error) can be found from the following equation: $E_{ppm} = \frac{F_i - F_o}{F_o} \cdot 10^6$ [ppm].

Table 3: Level scan files format

(a) Level scan (file SG8_level_<Serial_No>.csv)

dBm\MHz;	12.5;	25;	...	8000
-20;	-22;	-21.5;	...	-18
-15;	-14;	-14.3;	...	-14
...	...	...	...	...
28.5;	27.1;	27.2;	...	25.3

(b) Status scan (SG8_status_<Serial_No>.csv)

dBm\MHz;	12.5;	25;	...	8000
-20;	8;	8;	...	8
...	...	...	...	...
-5;	0;	0;	...	0
...	...	...	...	...
28.5;	8;	8;	...	8

Table 4: Specified level errors and calibration area bounds

Test#	Description	Value
5.1	Min. value of high bound of calibration area	+22 dBm
5.2	Max. value of low bound of calibration area	−8 dBm
6.1	Absolute accuracy at Pout=0..+20dBm	±0.2dB
6.2	Absolute accuracy within calibration area	±0.5dB

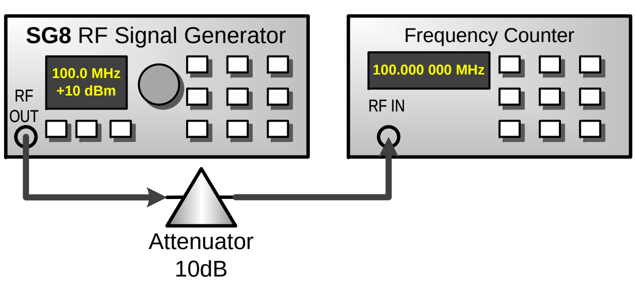

Figure 6: Frequency accuracy test setup

Table 5: Specified frequency accuracy

Description	Value	Unit
Relative frequency error	±(5−Frequency Counter Relative Error)	ppm

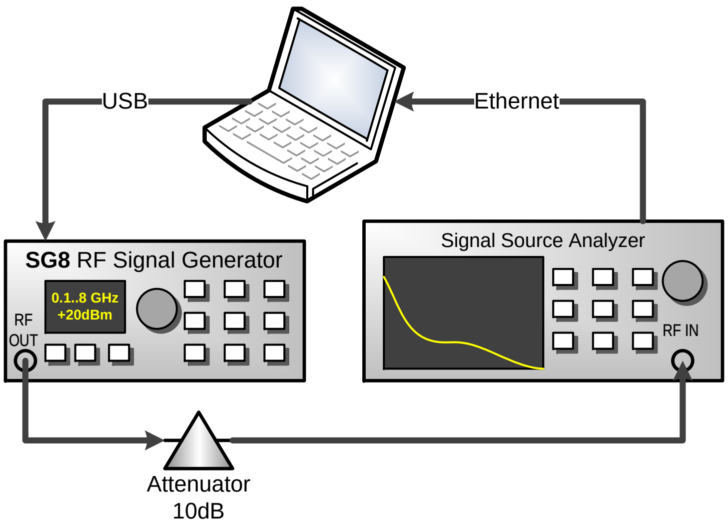

Figure 7: Phase noise test setup

5. If relative frequency error is within specified range (see table 5), the test is passed.

Frequency can also be measured with aid of spectrum analyzer if its time base meets the requirements specified in table 2.

1. To measure frequency this way, connect the instruments as shown in figure 1.
2. Set to SG8 frequency: 1 GHz, power: +10 dBm.
3. Enter the following settings for spectrum analyzer – center frequency: 1 GHz, span: 10 kHz, RBW: 100 Hz, VBW: 10 Hz, Ref level: 0 dBm.
4. Call the CF marker function, read frequency value shown on the display of spectrum analyzer.
5. Follow the instructions above to determine E_{ppm} and compare its value with the specified in the table 5.

6.6.2 Normalized phase noise

1. Connect the instruments as shown in figure 7.

Table 6: Phase noise file format

CF-GHz\Offset-Hz;	1000;	1100;	...	10000000
0.5;	-122;	-123;	...	-135
1;	-116;	-117;	...	-135
...	...	...	...	...
8;	-100;	-101;	...	-140

Table 7: Normalized phase noise mask for RF Out

Offset, kHz	1	10	100	1000	10000
Phase noise, dBc/Hz	−100	−115	−115	−115	−125

2. Launch the **SG8_RFOut_PhaseNoise** application. It sets power +20 dBm and center frequency from the following values: 0.5, 1, 2, 3, 4, 5, 6, 7, 8 GHz. The graph of phase noise is measured at each center frequency and at offsets from 1 kHz to 10 MHz. The application has `SG8_RFout_PhN_<Serial_No>.csv` at the output, file format is described in table 6. First row contains frequency offset in Hz, first column – center frequencies in GHz.

3. Launch **SG8_TP_PhaseNoise** application, select file `SG8_RFout_PhN_<Serial_No>.csv` and press "Process" button. The application calculates normalized phase noise (referred to 1 GHz) according to the following equation $\Phi_{1GHz} = \Phi_{Fc} - 20\log\frac{Fc[GHz]}{1[GHz]}$, then finds maximum values for any center frequency at offsets frequencies specified in table 7, and prints a plot figure. The plot and file are included in the test report.

4. If normalized phase noise for any center frequency is lower than specified mask, the test is passed.

6.7 REF Out

6.7.1 REF Out Level

1. Connect the instruments as shown in figure 8.

2. Turn on the REF Out output (see Operating Manual).

3. Measure the signal level at REF Out output.

4. If level is within specified range (see table 8), the test is passed.

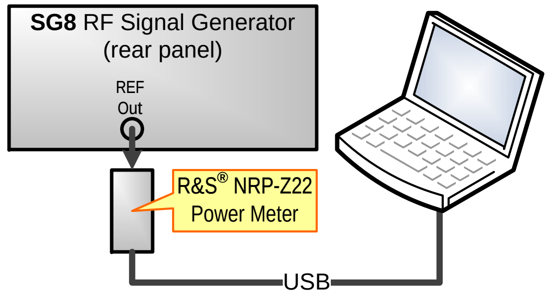

Figure 8: REF Out level test setup

Table 8: REF Out level range

	min	max
REF Out level, dBm	−5	+10

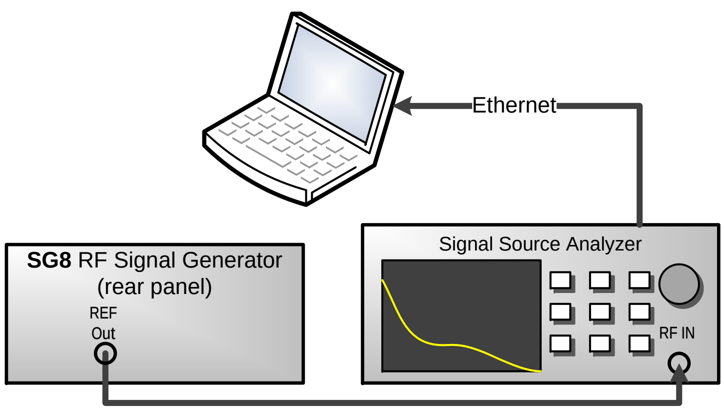

Figure 9: REF Out phase noise

Table 9: Normalized phase noise mask for REF Out

Offset, kHz	1	10	100	1000	10000
Phase noise, dBc/Hz	−110	−125	−125	−125	−125

6.7.2 REF Out Phase Noise

1. Connect the instruments as shown in figure 9.
2. Turn on the REF Out output (see Operating Manual).
3. Launch the **SG8_REFOut_PhaseNoise** application. It has `SG8_REFout_PhN_<Serial_No>.csv` at the output, file format is similar to the shown in table 6 except it has only one row – for center frequency equal to internal reference (147 MHz).
4. Launch **SG8_TP_PhaseNoise** application, select file `SG8_RFout_PhN_<Serial_No>.csv` and press "Process" button. The application calculates normalized phase noise (referred to 1 GHz), then finds maximum values at offsets frequencies specified in table 9, and prints a plot. The plot and file are included in the test report.
5. If normalized phase noise is lower than specified mask, the test is passed.

6.8 REF In Sensitivity

Connect the instruments as shown in figure 10.

Turn on the external reference frequency input (REF In), see SG8 Operating Manual.

Configure a spectrum analyzer as follows:

```
Center frequency = 1 GHz;
Span = 1 MHz;
RBW = 1 kHz;
VBW = 100 Hz;
Ref level = 0 dBm;
```

Configure SG8 as follows:

```
Mode = CW;
Level = +10 dBm;
Frequency = 1 GHz.
```

Carry out the following tests:

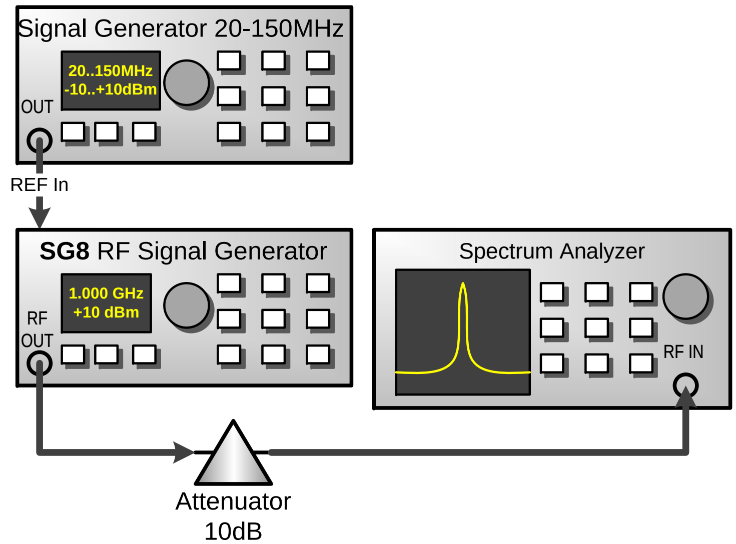

Figure 10: REF In sensitivity test setup

Test #9.1. For external reference signal set frequency 20 MHz and level +10 dBm. Set SG8 external reference frequency value to 20 MHz. Spectrum, displayed on spectrum analyzer, should have stable shape corresponding to the sine wave (assign "PASSED"). If not – PLL lock at 20 MHz and +10 dBm reference is failed (assign "FAILED" status).

Test #9.2. For external reference signal set frequency 150 MHz and level −10 dBm. Set SG8 external reference frequency value to 150 MHz. Spectrum, displayed on spectrum analyzer, should have stable shape corresponding to the sine wave (assign "PASSED"). If not – PLL lock at 150 MHz and −10 dBm reference is failed (assign "FAILED" status).

6.9 Analog Inputs

6.9.1 Mic In

1. Connect the instrument as shown in figure 11.
2. Set the gain value to 64 (see Operating Manual).
3. Set FM operation mode with external signal source.
4. Say something to microphone, graphical signal indicator should display the signal level. Indicator represents full ADC range. If indicator shows appropriate signal level (see fig. 11), the test is passed.

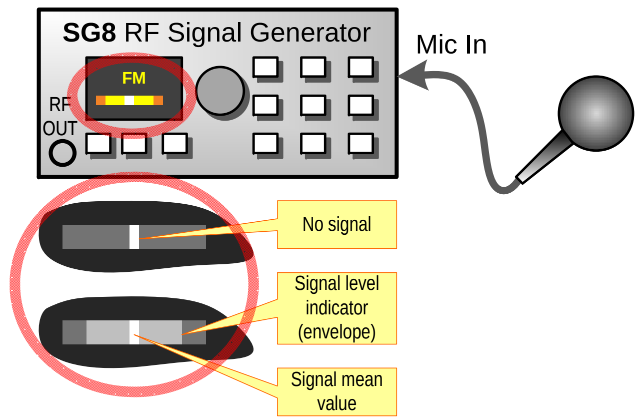

Figure 11: Mic In test setup

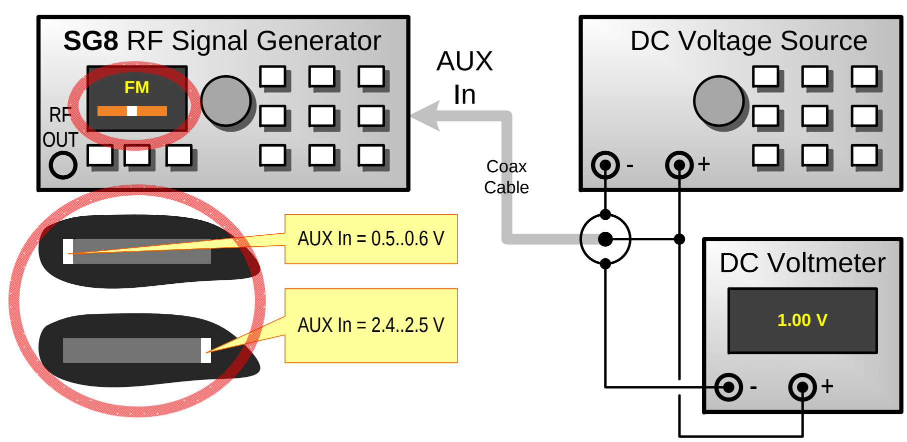

Figure 12: AUX In test setup

6.9.2 AUX In / TRIG

1. Connect the instrument as shown in figure 12.
2. Set the gain value to 1 (see Operating Manual).
3. Set FM operation mode with external signal source.
4. Adjust the DC voltage from 0.5..0.6 V to 2.4..2.5 V, mean value indicator should shift from left side to the right (see fig. 12). If so, the test is passed.

7 Results of Verification

The results of verification are included in document titled “Instrument Test Report” which contains test results summary table and detailed measured data with specified accuracies of equipment used in test. Figures of level scan, absolute level accuracy contour plot, normalized RF Out and REF Out phase noise plots should also be included in test report. Each test should have status and may have resolution or note with description of the non-conformance to the test requirements.

If all tests have status “PASSED”, the verified instrument is accompanied by the document titled “Calibration Certificate” which actually has the same content as Instrument Test Report. There are two types of Calibration Certificate – for new product (Factory Standard Calibration), and for not new, when customer returns the instrument for re-calibration or repair (Factory Standard Re-calibration). The latter case differs from the first one by requirements specified for the Test #1.

Files which contain measured data are enclosed to Calibration Certificate on digital media, like CD, or can be sent via email on demand.

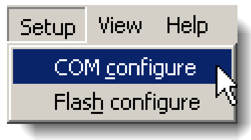

Figure 13: COM-port configuration menu

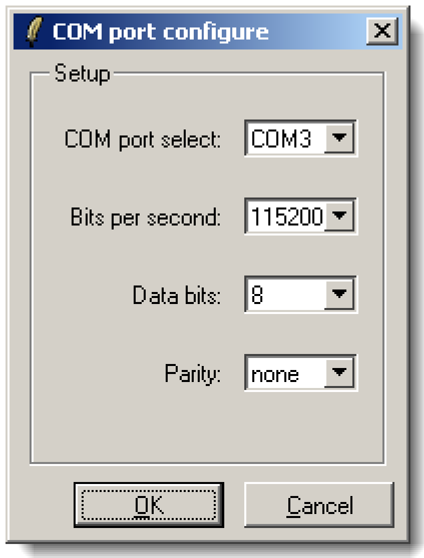

Figure 14: COM-port settings

8 Annex

8.1 SG8_Level_Scan Application

This application automates RF signal level measurements at series of given frequencies and power levels set to the SG8 instrument. It operates according the algorithm described in figure 5. To produce the files with level and status scan data (see table 3) follow steps below:

1. Launch the application.
2. Select Setup ▷ COM configure menu item (fig. 13) and configure COM-port settings (fig. 14). COM-port settings should be the as described in Operating Manual. Please note, that even if you use USB cable, it is also presented in the system as a COM-port due to USB-to-UART bridge driver.
3. Specify start, stop and step values for level and frequency (item 1, fig. 15). It's recommended to use 1 dB level grid, since step used in calibration

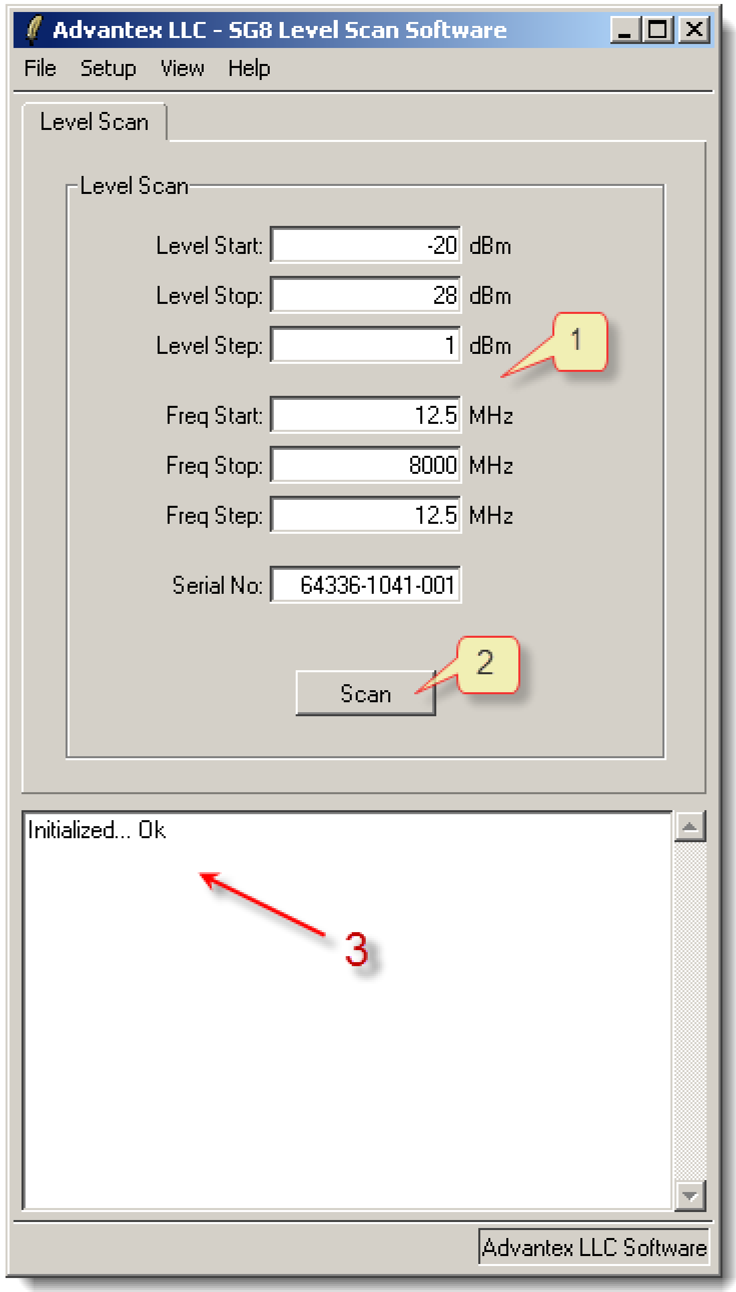

Figure 15: SG8_Level_Scan application

algorithm equals 2 dB. So we can pick up data right between calibrated points where the error potentially reaches its maximum value. It's also valid for the frequency grid. Calibration points are as follows: from 10 MHz to 100 MHz 1 MHz step is used, from 100 MHz to 1 GHz 10 MHz step is used, from 1 GHz to 8 GHz 25 MHz step is used. So if 12.5 MHz grid is used, there will be always some points which are not coincident to calibration points.

4. Press "Scan" button (item 2, fig. 15), current frequency and level values will be displayed in log window (item 3, fig. 15). As soon as the application reaches its end point, the string "`Done in .. minutes and .. seconds`" appears in the log window, and two files appear in the application directory – `SG8_level_`*<Serial_No>*`.csv` and `SG8_status_`*<Serial_No>*`.csv`. These two files contain scanned data that should be processed by **SG8_TP_LevelScan** application (see next section).

8.2 SG8_TP_LevelScan Application

This application takes level and status scan files and finds minimums and maximums in calibrated and specified areas on power-frequency plane. It also creates figures with level scan plot and absolute level accuracy contour plot. Follow the instructions below:

1. Select level scan file (`SG8_level_`*<Serial_No>*`.csv`), item 1, figure 16.

2. Select status scan file (`SG8_status_`*<Serial_No>*`.csv`), item 2, figure 16.

3. Change the default values of specified area if required, item 3. The default values are shown in the figure.

4. Press "Process" button (item 4).

5. Save absolute accuracy contour plot (item 5, figure 17) and level scan plot (item 6).

6. Table, see item 7, figure 17, contains min and max error values in calibrated area. Level set and frequency fields correspond to the coordinates of these extreme points on power-frequency plane. High bound (low bound) min and max fields correspond to the curve representing high bound (low bound) of calibrated area. It is also displayed in the level scan plot with thick red dotted line.

7. Table, item 8, contains min/max errors and its coordinates in area specified by Spec Frequency and Spec Power min/max fields. By default it's 0 to +20 dBm, 12.5 to 8000 MHz. If specified area is not within scanned area, it's automatically recalculated to be so.

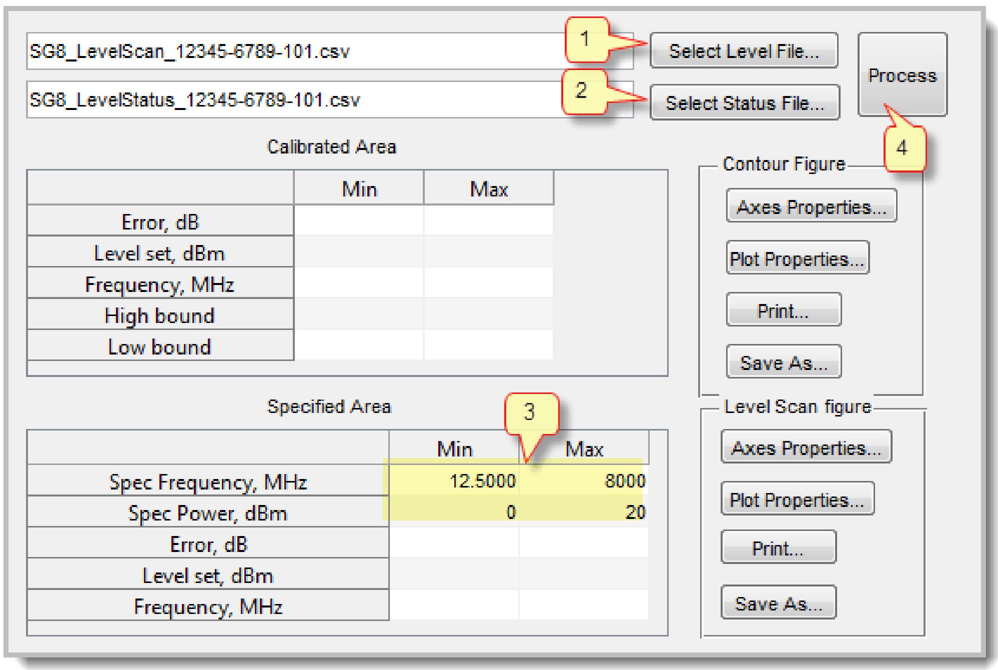

Figure 16: **SG8_TP_LevelScan** application – selecting files and specifying area

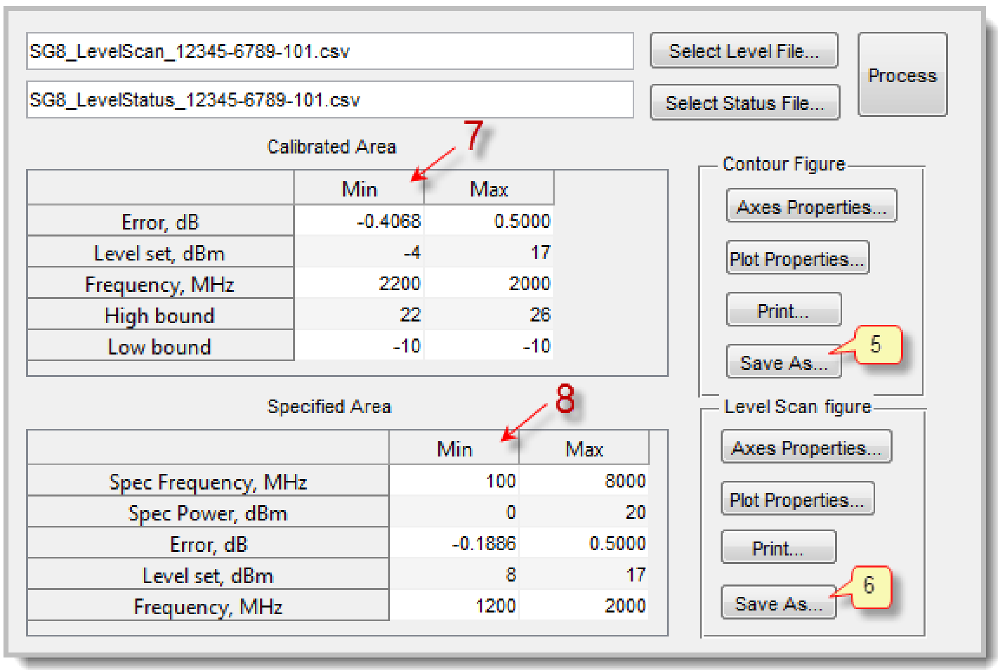

Figure 17: **SG8_TP_LevelScan** application – reading min/max values and saving plot figures

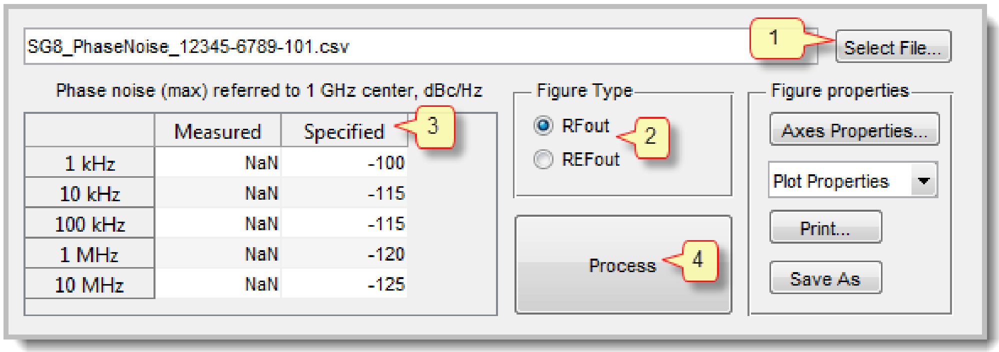

Figure 18: **SG8_TP_PhaseNoise** application – selecting file and specifying phase noise mask

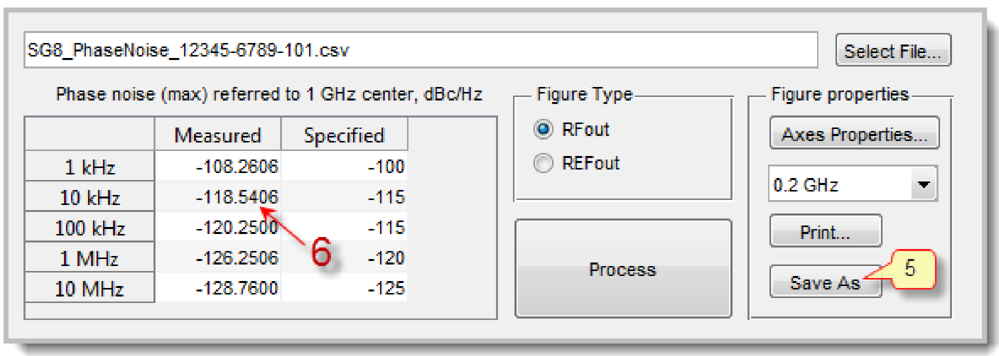

Figure 19: **SG8_TP_PhaseNoise** application – reading max phase noise values and saving plot figure

8.3 SG8_TP_PhaseNoise Application

This application takes RF Out or REF Out phase noise scan file and calculates normalized phase noise referred to 1 GHz, then it finds maximums at specified offsets and saves the plot, so you can compare measured values with specified mask. Follow the instructions below:

1. Select phase noise file: `SG8_RFout_PhN_<Serial_No>.csv` – for RF Out and `SG8_REFout_PhN_<Serial_No>.csv` – for REF Out (item 1, figure 18).
2. Select the option corresponding the selected file (item 2).
3. Modify default mask values if needed (item 3).
4. Press "Process" button (item 4).

5. Save the plot (item 5, figure 19).
6. Table (item 6) contains maximum values of normalized phase noise over all set of center frequencies at specified offsets.