

SVA1000X

Spectrum Analyzer

Service Manual

SM0701X-E01A

Guaranty and Declaration

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Product Certification

SIGLENT guarantees this product conforms to the national and industrial standards in China as well as the ISO9001: 2008 standard and the ISO14001: 2004 standard. Other international standard conformance certification is in progress.

General Safety Summary

Carefully read the following safety precautions to avoid any personal injury or damage to the instrument and any products connected to it. To avoid potential hazards, please use the instrument as specified.

Use Proper AC Power Line

Only the power cord designed for the instrument and authorized for its use by the local country should be used.

Ground the Instrument

The instrument is grounded through the protective earth conductor of the power line. To avoid electric shock, please make sure the instrument is grounded correctly before connecting its input or output terminals.

Connect the Probe Correctly.

If a probe is used, do not connect the ground lead to high voltage since it has isobaric electric potential as the ground.

Look Over All Terminals' Ratings

To avoid fire or electric shock, please look over all ratings and safe use instructions for the instrument. Before connecting the instrument, please read the manual carefully to gain more information about the ratings.

Use Proper Overvoltage Protection

Make sure that no overvoltage (such as that caused by a thunderstorm) can reach the product, or else the operator might be exposed to danger of electrical shock.

Electrostatic Prevention

Operate the instrument in an electrostatic discharge protective area environment to avoid damages induced by static discharge. Always ground both the internal and external conductors of the cable to release static before connecting.

Maintain Proper Ventilation

Inadequate ventilation may cause an increase of the instrument's temperature, which will eventually damage the instrument. So keep well ventilated and inspect the intake and fan regularly.

Avoid Exposed Circuit or Components

Do not touch exposed contacts or components when the power is on.

Do Not Operate Without Covers

Do not operate the instrument with covers or panels removed.

Use Only the Specified Fuse.

Keep Product Surfaces Clean and Dry.

To avoid the influence of dust and/or moisture in the air, please keep the surface of the device clean and dry.

Do Not Operate in Wet Conditions.

In order to avoid short circuiting to the interior of the device or electric shock, please do not operate the instrument in a humid environment.

Do Not Operate in an Explosive Atmosphere.

In order to avoid damage to the device or personal injury, it is important to operate the device away from an explosive atmosphere.

Safety Terms and Symbols

Terms on the product. These terms may appear on the product:

DANGER Indicates direct injuries or hazards may occur.

WARNING Indicates potential injuries or hazards that may occur.

CAUTION Indicates potential damage to the instrument or other property that may occur.

Symbols on the product. These symbols may appear on the product:



**Hazardous
Voltage**



**Protective
Ground**



Warning



**Earth Chassis
Ground**

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General Features

General Features

Siglent's SVA1000X family of spectrum analyzers offer a frequency range of 9 kHz to 1.5 GHz. With their light weight, small size, and friendly user interface, the SVA1000X's present a bright easy-to-read display, powerful and reliable automatic measurements, and plenty of impressive features. Applications are many, but include research and development, education, production, maintenance, and many more.

Table 1-1 General features

Model	SPAN	RBW	Phase noise	DANL
SVA1015X	9 kHz~1.5 GHz	1 Hz~1 MHz	< -99 dBc/Hz@1 GHz, 10 kHz offset	-155 dBm/Hz,

- ◆ All-Digital IF Technology
- ◆ Frequency Range from 9 kHz to 1.5 GHz
- ◆ Up to 1.5 GHz Tracking Generator
- ◆ Vector Network Analyzer
- ◆ Distance-to-Fault
- ◆ Modulation Analysis
- ◆ Advanced Measurement Kit
- ◆ EMI Filter and Quasi Peak Detector Kit
- ◆ 10.1 inch WVGA (1024x600) Display, Multi-Touch Screen
- ◆ Remote Control via internal Web Browser as well as EasySpectrum, a Windows compatible software tool

Prepare Information

Before initiating performance verification or any adjustments, it is recommended to follow these procedures. The following topics are discussed in this chapter.

- How to perform functional checks
- How to operate four standard interface tests
- How to use the self-calibration routine
- How to recall factory Default settings

For more detailed information about analyzers operation, please refer to the SVA1000X User Manual.

Functional check

There are three types of checks used to determine if the spectrum analyzer is operating properly.

Power-on Inspection

The normal operating voltage for SVA1000X series spectrum analyzers is in the range of 100-240 VRMS, 50 Hz/ 60 Hz/ 440 Hz.

Please use the power cord provided as accessories to connect the instrument to the power source as shown in the figure below.

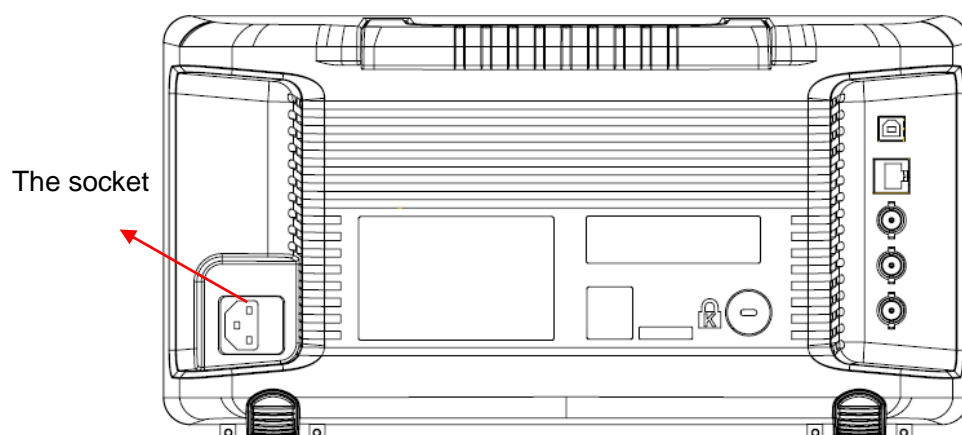


Figure 1-1 Connect power cord

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Note: To avoid electric shock, make sure that the instrument is correctly grounded to the earth before connecting AC power.

Press the power-on button located at the lower left corner of the front panel and some keys will illuminate for about 6 seconds. Then, the boot screen will appear on the display.

The front panel is shown in the figure below.



Figure 1-2 Front Panel



Figure 1-3 Rear Panel

Interface Test

The SVA1000X series spectrum analyzer is designed with four standard interfaces: USB Host, USB Device, LAN and a 3.5 mm mono jack for an earphone. Being connected to other instruments via these interfaces enables the analyzer to achieve even more enhanced capabilities. In order to ensure the analyzer is operating properly, it is recommended to first test the interfaces.

USB Host Test

To test if the USB Host interface is working normally.

Tools:

- USB memory device (U disk)

Steps:

1. Insert a U disk into the USB Host interface on the front panel of the spectrum analyzer.
2. An icon shaped like a U disk appears on the upper right of the screen, as shown in figure below. The icon appearance indicates the U disk has been successfully recognized.

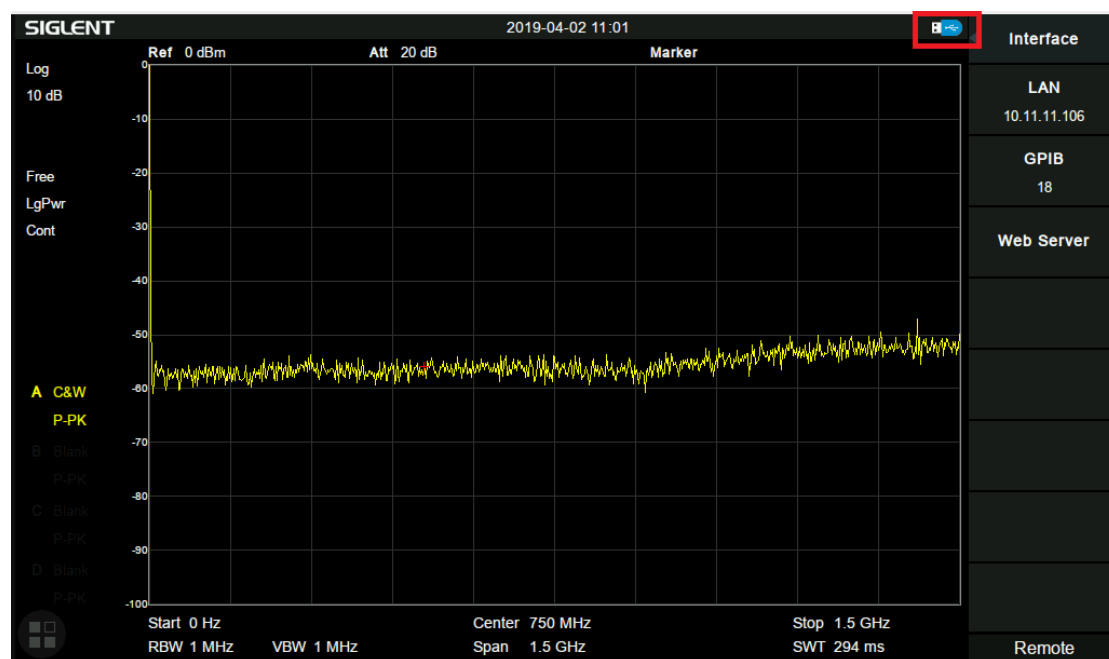


Figure 2-1 USB drive has been properly recognized

USB Device Test

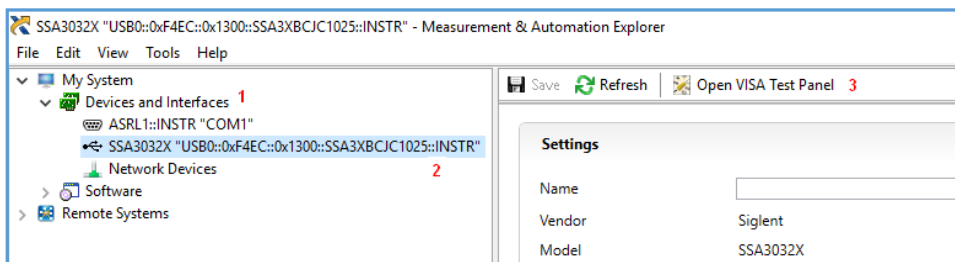
To test if the USB Device interface works normally.

Tools:

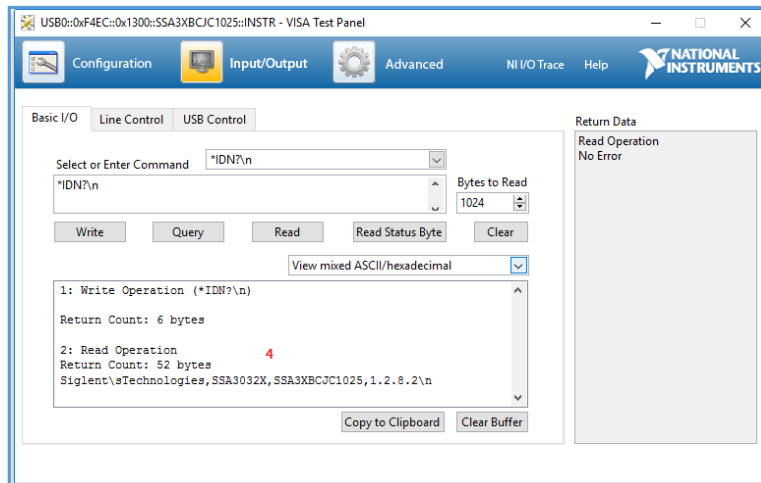
- A computer with USB interface that is compatible with running National Instruments NI-MAX software
- A standard USB cable (Type A-B)
- NI-MAX software

Steps:

1. Download and install National Instruments NI MAX software by following the installation instructions provided by National Instruments.
2. Connect the analyzer USB Device port and the computer using an USB cable.
3. Run NI MAX software. Click “Device and interface” at the upper left corner of the NI software interface and immediately displays the “USBTMC” device symbol.



4. Click “Open VISA Test Panel” option button, and then the following Interface will appear. Then click the “Input/Output” option button and click the “Query” option button in order to view the Read operation information.



LAN Port Test

Use to test the LAN interface functionality.

Tools:

- A computer with functional LAN interface and DHCP activated.
- A standard LAN cable

Steps:

1. Connect the spectrum analyzer and the computer using a LAN cable via LAN interface.
2. Press **System** -> **Interface** -> **LAN**, Set the IP Config to DHCP, as the figure below shows. The analyzer will set the IP Address and Subnet Mask and Gateway automatically in this network.

Write down the displayed IP address. It will be used in later steps.

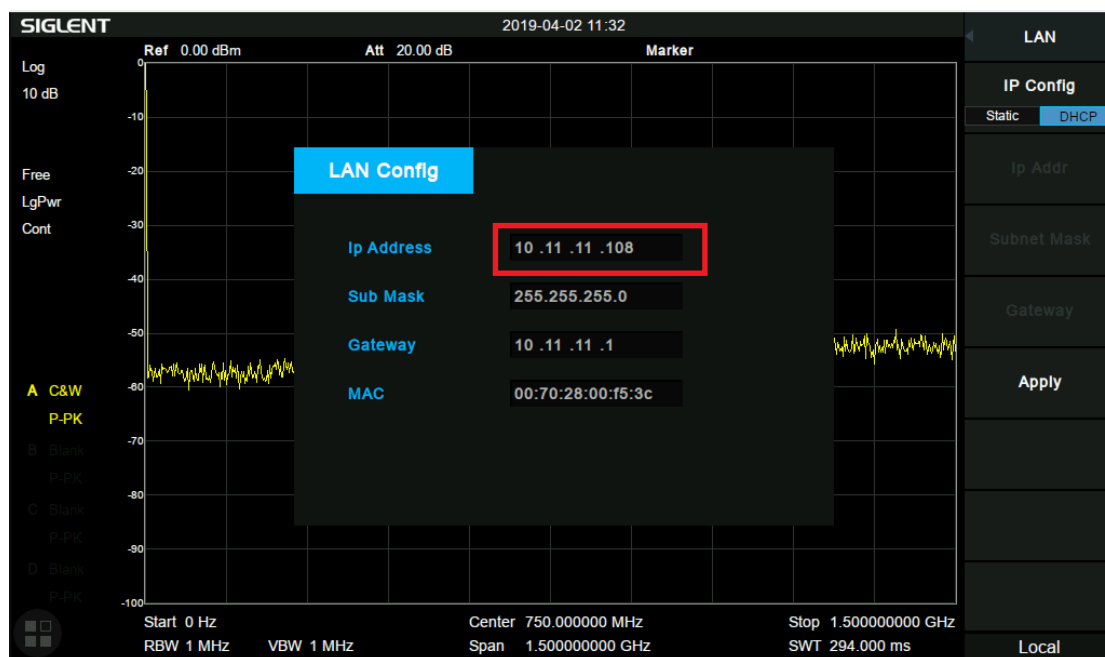
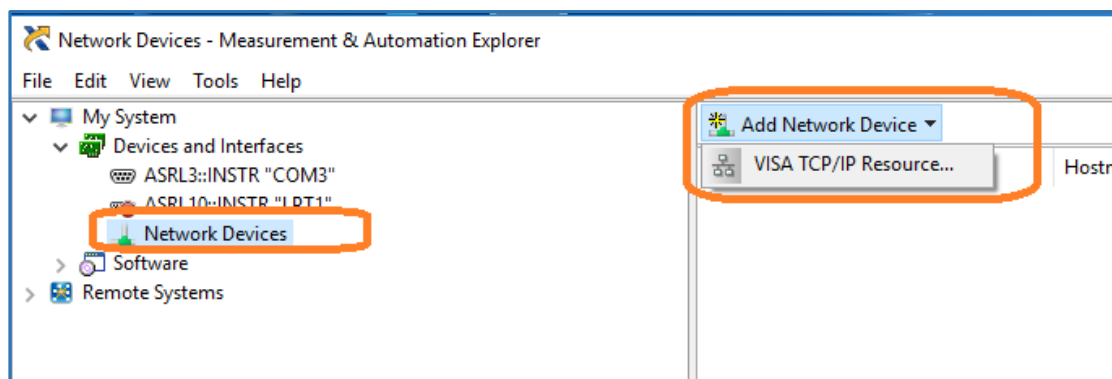


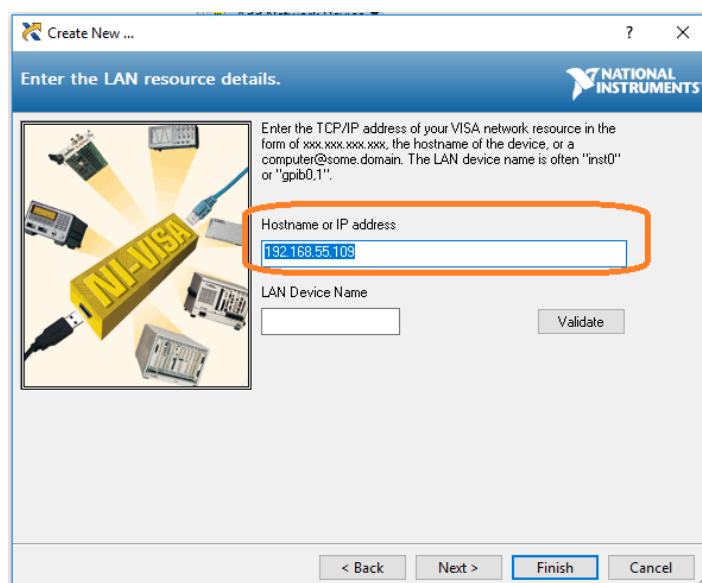
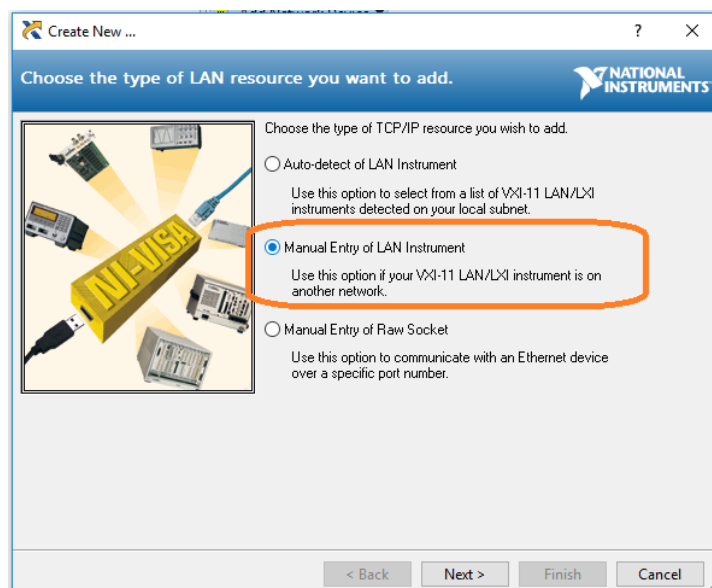
Figure 2-2 IP configuration interface

3. Run NI max software. Click “Device and interfaces” at the upper left corner of the NI software interface, select “Network Devices”, Add Network Device, and select VISA TCP/IP Resource as shown:.

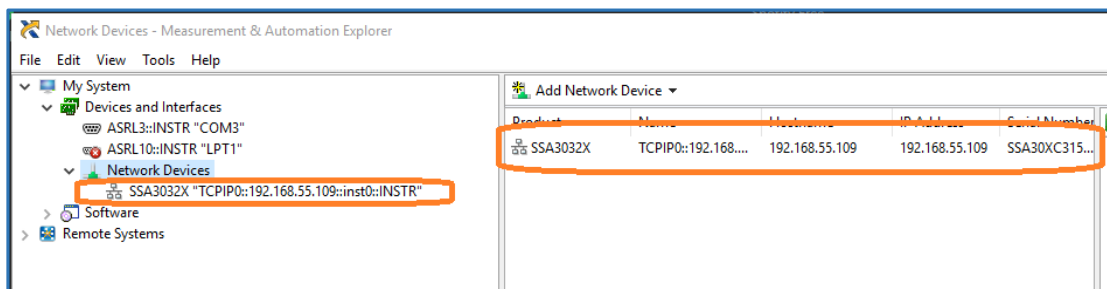


4. Select Manual Entry of LAN instrument, select Next, and enter the IP address as shown. Click Finish to establish the connection:

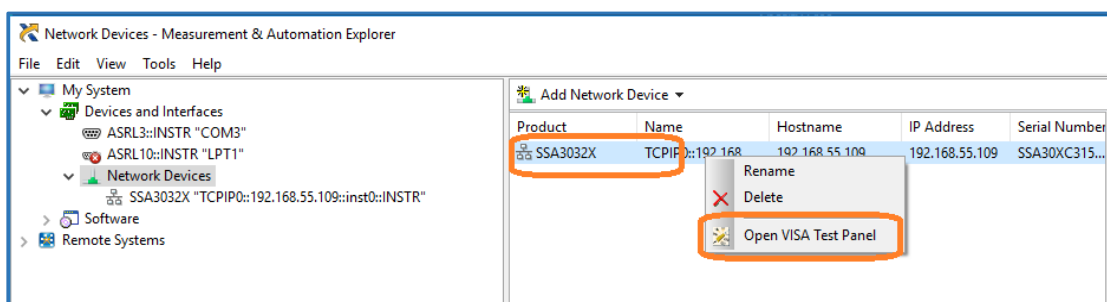
NOTE: Leave the LAN Device Name BLANK or the connection will fail.



4. After a brief scan, the connection should be shown under Network Devices:

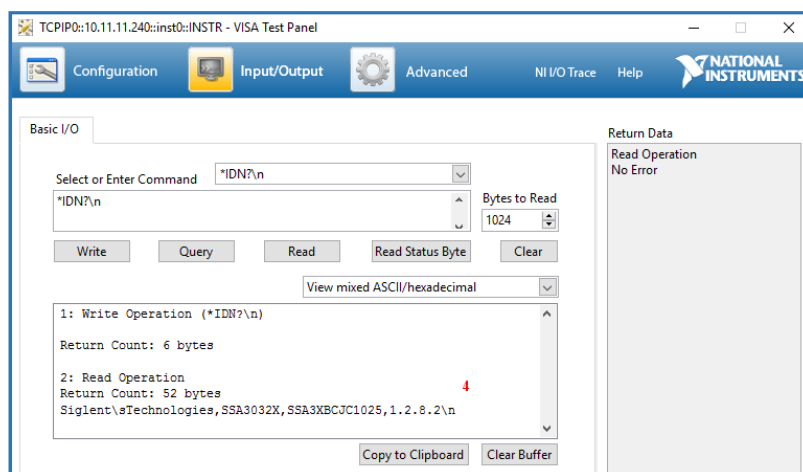


5. Right-click on the product and select Open NI-VISA Test Panel:



6. Click “Input/Output” option button and click “Query” option button. If everything is correct, you will see the Read operation information returned as shown below.

NOTE: The *IDN? command (known as the Identification Query) should return the instrument manufacturer, instrument model, serial number, and other identification information.



Performance Verification Test

This chapter explains testing the spectrum analyzer in order to verify performance specifications. For accurate test results, please let the test equipment and the analyzer warm up 30 minutes before testing.

Here is the required equipment:

Table 3-1 Test equipment

Equipment	Specification	Qty.	Recommended
Signal Generator	9 kHz~3 GHz	2	R&S SMB100A
Power Meter	6 GHz	1	R&S NRP-Z91
Frequency Counter	10 MHz	1	SIGLENT SDG1050 With OCXO
Low-pass Filter	Cut-off 50 MHz	1	
Power divider	6 GHz	1	
SMA-N Cable	6 GHz	2	
N-N Cable	6 GHz	2	
BNC Cable	2 GHz	1	

Absolute Amplitude accuracy Test

Specification

Absolute amplitude accuracy	Preamp off	±0.4 dB, input signal -20 dBm
	Preamp on	±0.5 dB, input signal -40 dBm

20 °C to 30 °C, $f_c = 50$ MHz, RBW = 1 kHz, VBW = 1 kHz, peak detector, attenuation = 20 dB

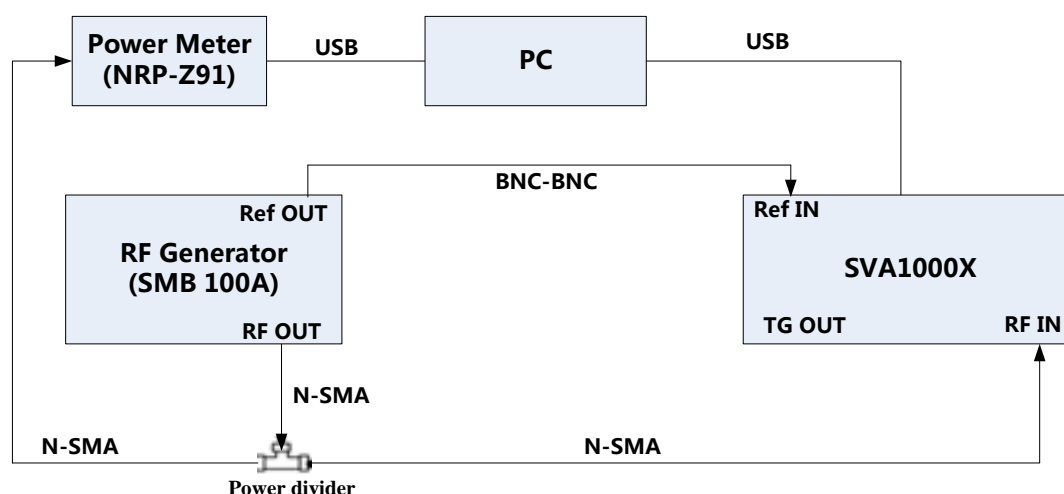


Figure 3-1 Absolute amplitude accuracy connections

Steps:

1. Connect the spectrum analyzer, signal generator and power meter as in figure 3-1
2. Set the signal generator to output a sine waveform with 50 MHz frequency and -20 dBm amplitude and enable the output
3. Configure the spectrum analyzer:
 - (a) Set the center frequency to 50 MHz
 - (b) Set the span to 1 MHz
 - (c) Set the attenuation to 20 dB
 - (d) Set the RBW and the VBW to 1 kHz
 - (e) Press **Trace** -> set the Times to 10, wait for trace average
4. Record measurement value P1 of the power meter
5. Press **Peak** to find the maximum value of the spectrum analyzer and record the result P2
6. Absolute amplitude accuracy = P1 – P2
7. Change the preamplifier on and set the output amplitude of the signal generator to -40dBm. Repeat steps 3 to 6 and record the results.

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Record:

Preamp off			
Frequency	P1 (Power Meter)	P2 (Spectrum Analyzer)	P1- P2
50 MHz			
Preamp on			
Frequency	P1 (Power Meter)	P2 (Spectrum Analyzer)	P1- P2
50 MHz			

Frequency Response Test

Specification

Preamp off	± 0.8 dB	± 0.4 dB, typ.
Preamp on	± 0.9 dB	± 0.5 dB, typ.

20 °C to 30 °C , attenuation = 20 dB, reference frequency 50 MHz

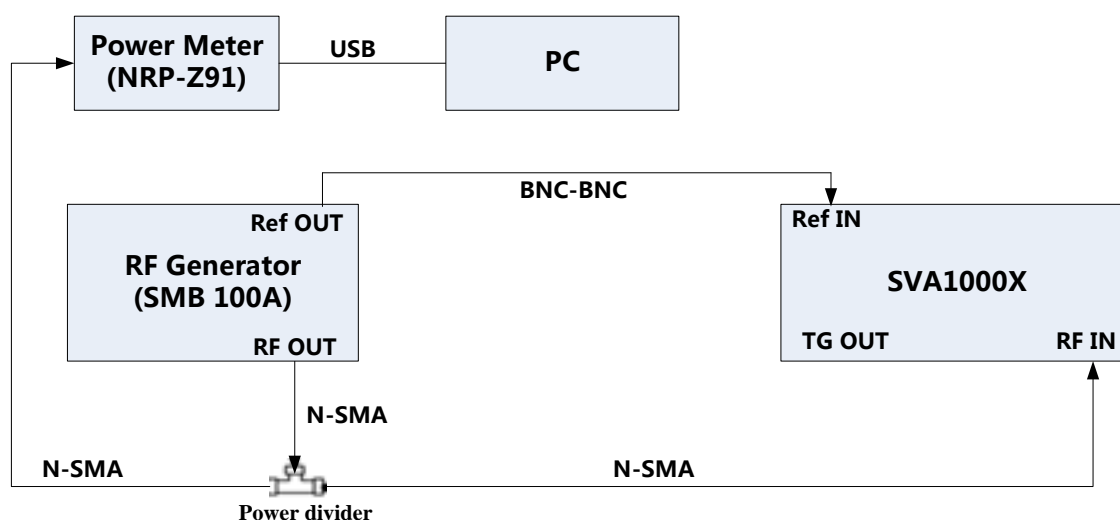


Figure 3-2 Frequency response connections

Steps:

1. Connect the spectrum analyzer, signal generator and power meter as figure 3-2 shows
2. Set the signal generator to output a sine waveform with 50 MHz frequency and -20 dBm amplitude and enable output
3. Read the measurement of the power meter record the result as reference value P1
4. Configure the spectrum analyzer:
 - (a) Set the center frequency to 50 MHz
 - (b) Set the span to 1 MHz
 - (c) Set the attenuation to 20 dB
 - (d) Press **Peak** to find the maximum value and record as reference value P2
5. Modify the output frequency of the signal generator at 100 kHz, 1 MHz, 10 MHz, 100 MHz, 1 GHz, 1.5 GHz
6. Read the measurement of the power meter record the result as A1, SYSTEM ERROR = A1 – P1
7. Modify the center frequency of the spectrum analyzer so that it matches the signal generator and find the peak value A2, calculate the GLOBAL

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$$\text{ERROR} = A2 - P2$$

8. Frequency response = |GLOBAL ERROR - SYSTEM ERROR|, compare the calculated result with the specification
9. Enable the preamplifier and set the output amplitude of the signal generator to -40dBm. Repeat steps 3 to 8 and record the results.

Record:

Preamp off						
Frequency	P1 (PM)	P2 (SA)				
50 MHz						
Frequency	A1(PM)	A2(SA)	A1 – P1 (System Error)	A2 – P2 (Global Error)	Frequency Response	Pass/Fail
100 kHz						
1 MHz						
10 MHz						
100 MHz						
1 GHz						
1.5 GHz						

Preamp on						
Frequency	P1 (PM)	P2 (SA)				
50 MHz						
Frequency	A1(PM)	A2(SA)	A1 – P1 (System Error)	A2 – P2 (Global Error)	Frequency Response	Pass/Fail
100 kHz						
1 MHz						
10 MHz						
100 MHz						
1 GHz						
1.5 GHz						

Display Average Noise Level (DANL) Test

Specification

	Frequency	RBW=10 Hz
Preamp Off	100 kHz ~1 MHz	-91 dBm, -97 dBm (typ.)
	1 MHz~10 MHz	-114 dBm, -120 dBm (typ.)
	10 MHz~1 GHz	-118 dBm, -124 dBm (typ.)
	1 GHz~1.5 GHz	-111 dBm, -117 dBm (typ.)
Preamp On	100 kHz ~1 MHz	-110 dBm, -118 dBm (typ.)
	1 MHz~10 MHz	-137 dBm, -142 dBm (typ.)
	10 MHz~1 GHz	-140 dBm, -146 dBm (typ.)
	1 GHz~1.5 GHz	-132 dBm, -138 dBm (typ.)

20 °C to 30 °C, attenuation = 0 dB, sample detector, trace average >50

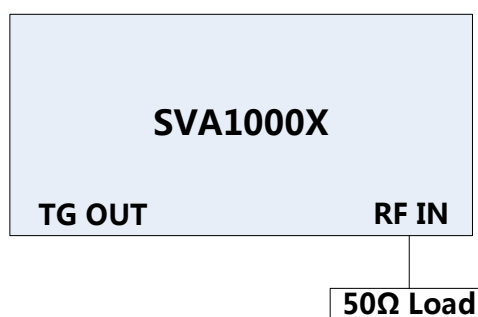


Figure 3-3 DANL verification connections

Step:

1. Connect a 50Ω load to the RF IN port of the spectrum analyzer as the figure shows
2. Configure the spectrum analyzer:
 - (a) Set the start frequency to 100 kHz and the stop frequency to 1MHz
 - (b) Set the RBW to 10Hz and the VBW to 1Hz
 - (c) Set the detect type to Sample
3. Press **Trace** -> Avg Times and wait for trace average
4. Press **Peak** to find the maximum noise level of this frequency range, record the marker value N
5. Change the frequency range according to the specification table and set the RBW to suitable value, repeat step 2 to 5 and test other frequency range.

Record:

	Frequency	RBW=10 Hz	Amplitude	Pass/Fail
Preamp	500.5 kHz	-91 dBm, -97 dBm (typ.)		

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Off	5.005 MHz	-114 dBm, -120 dBm (typ.)		
	50.005 MHz	-118 dBm, -124 dBm (typ.)		
	500.005 MHz	-118 dBm, -124 dBm (typ.)		
	1.500000 GHz	-111 dBm, -117 dBm (typ.)		
Preamp On	500.5 kHz	-110 dBm, -118 dBm (typ.)		
	5.005 MHz	-137 dBm, -142 dBm (typ.)		
	50.005 MHz	-140 dBm, -146 dBm (typ.)		
	500.005 MHz	-140 dBm, -146 dBm (typ.)		
	1.500000 GHz	-132 dBm, -138 dBm (typ.)		

Phase Noise Test

Specification

Phase noise	<-95 dBc/Hz @10 kHz offset, <-99 dBc/Hz (typ.)
	<-96 dBc/Hz @100 kHz offset, <-98 dBc/Hz (typ.)
	<-115 dBc/Hz @1 MHz offset, <-120 dBc/Hz (typ.)

20 °C to 30 °C , attenuation = 0 dB, fc = 1 GHz

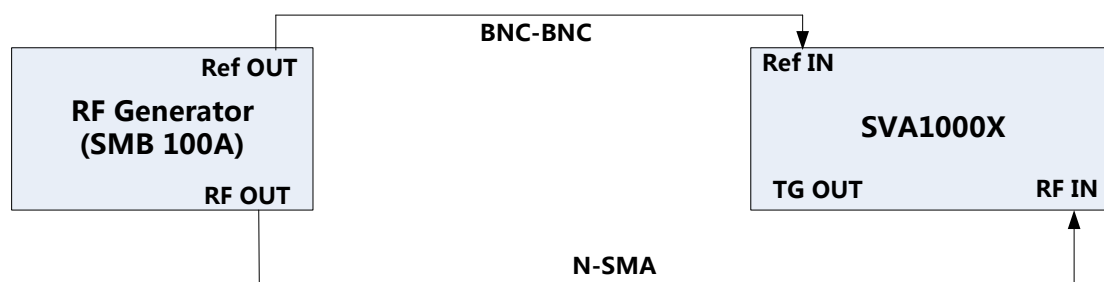


Figure 3-4 Phase noise verification connections

Step:

1. Connect the signal generator and spectrum analyzer as figure 3-4 shows
2. Configure the spectrum analyzer:
 - (a) Set the center frequency to 1 GHz
 - (b) Set the span to 50 kHz
 - (c) Set the RBW to 100 Hz
 - (d) Set the attenuation = 0 dB
 - (e) Set the detect type to Sample
3. Set the signal generator to output a sine waveform with 1000 MHz frequency and -20 dBm amplitude and enable the output
4. Press **Trace** -> avg Times 100 and wait for trace average
5. Press **peak** to find the maximum value, record the peak value P1
6. Change marker type to delta and input 10 kHz, press **Marker Fn** -> Noise Marker, record the marker value P2
7. Phase noise = P2 - P1, compare the calculate result with specification

Record:

Offset @1 GHz	P1	P2	P2 - P1	Pass/Fail
10 kHz				
100 kHz				
1 MHz				

TOI Test

Specification

IIP3	+8 dBm
------	--------

$f_c \geq 50$ MHz, two -20 dBm tones at input mixer spaced by 100 kHz, attenuation = 0 dB, preamp off, 20 °C to 30 °C

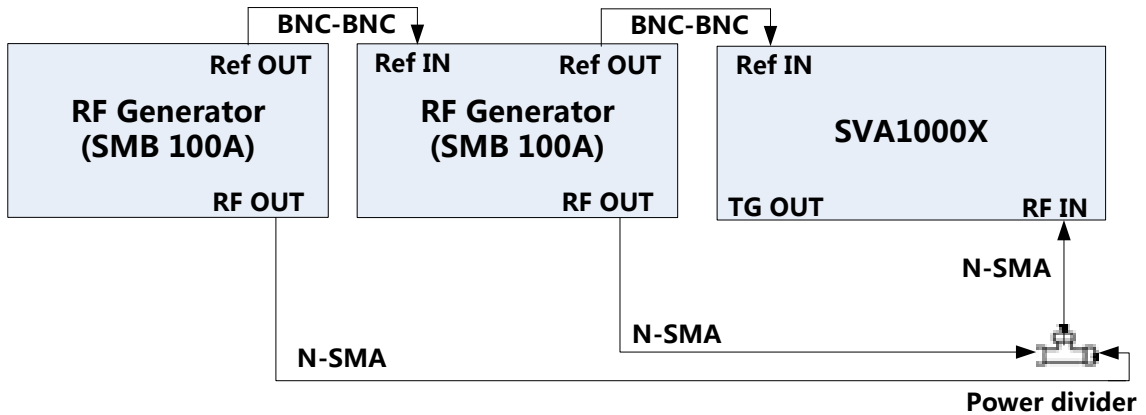


Figure 3-5 TOI verification connections

Step

1. Connect double signal generators to a power divider and the output of the divider to RF IN port of spectrum analyzer
2. Configure the spectrum analyzer:
 - (a) Set the center frequency to 1 GHz
 - (b) Set the span to 1 MHz
 - (c) Set the RBW to 10 kHz
 - (d) Set the attenuation = 0 dB
3. Set the signal generator A to output a sine waveform with 1000 MHz frequency and -20 dBm amplitude and enable output
4. Set the signal generator B to output a sine waveform with 1000.1 MHz frequency and -20 dBm amplitude and enable output
5. Press **Trace** -> avg Times 100, and wait for trace average
6. Press **Peak** to find the maximum value, then change the marker type to delta and press **Next Peak** twice, record delta amplitude value DELTA
7. $IIP3 = -20\text{dBm} - \text{DELTA}/2$, check if the calculate result $\geq +8$ dB

Record:

Offset	DELTA	IIP3	Pass/Fail
500.5 MHz			
1000.5 MHz			

Frequency Accuracy Test

Specification

Reference frequency	10.000000 MHz
Initial calibration accuracy	< 1 ppm

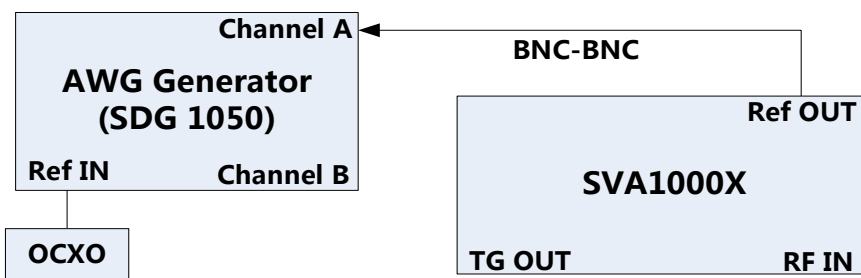


Figure 3-6 Connecting test instruments for frequency accuracy

Steps:

1. Connect ref out port of the spectrum analyzer to the channel A of the SDG1050, which is referenced by an OCXO
2. Set the SDG1050 to frequency counter mode, and set the frequency ref to 10.000000 MHz
3. Check if the frequency deviation ≤ 1 ppm

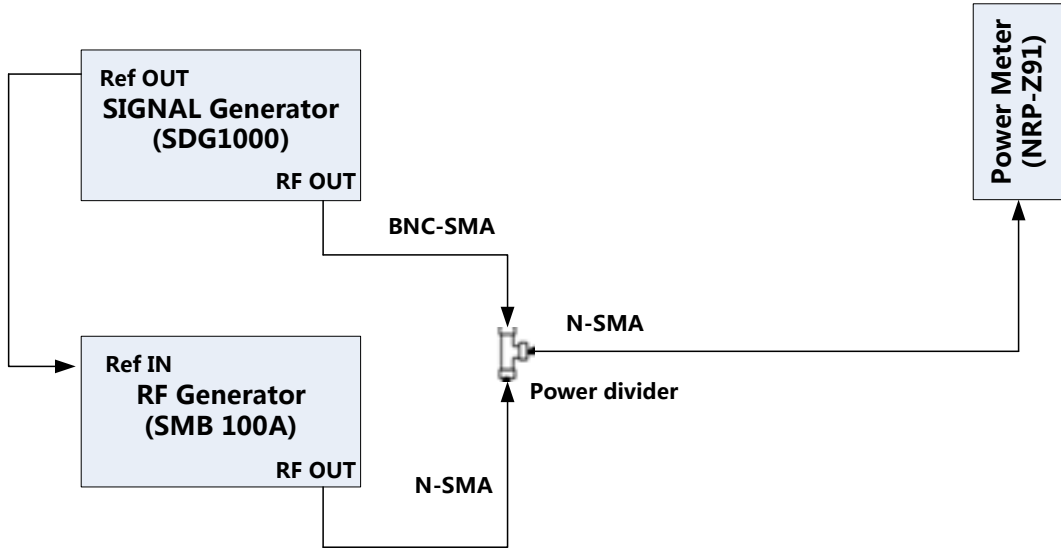
Record:

Frequency	Frequency Deviation	Pass/Fail
10.000000 MHz		

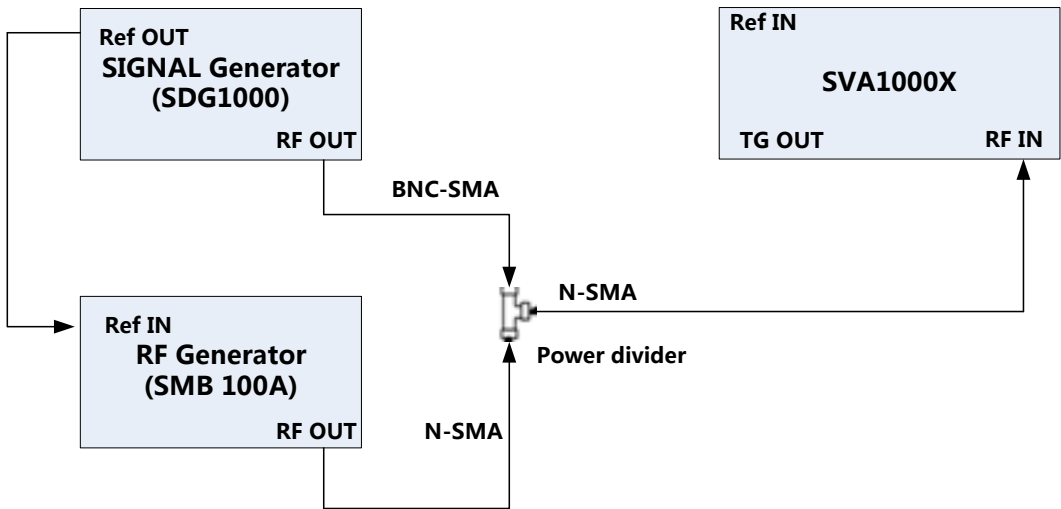
1dB Gain Compression Test

Specification

1dB Gain Compression	> -5 dBm
20 °C to 30 °C, fc = 50 MHz, attenuation = 0 dB, preamp off	



(a)



(b)

Figure 3-7 connecting test instruments for 1dB Gain Compression Test

Steps:

1. Connect the signal generator, RF generator and power meter as figure 3-7(a) shows
2. Set the output frequency of the signal generator 50 MHz and the amplitude to -25 dBm. Set the output frequency of the RF generator to 53 MHz and

the amplitude to -5 dBm.

3. Enable the output of the signal generator and disable the output of the RF generator. Observe the measurement value of the power meter. Adjust the output amplitude of the signal generator until the reading of the power meter becomes -25 dBm.
4. Enable the output of the RF generator and disable the output of signal generator. Observe the measurement value of the power meter. Adjust the output amplitude of the RF generator until the reading of the power meter becomes -5 dBm.
5. Disconnect the power divider and power meter and connect the power divider with the spectrum analyzer, as shown in Figure 3-7(b).
6. Enable the output of the signal generator and disable the output of the RF generator.
7. Configure the spectrum analyzer:
 - a) Set the center frequency to 50 MHz.
 - b) Set the span to 100 kHz.
 - c) Set the reference level to -25 dBm.
 - d) Set the input attenuation to 0 dB.
 - e) Set the resolution bandwidth to 1 kHz.
 - f) Set the sweep time to auto and the auto sweep time to accuracy.
8. Press **Peak** to find the maximum value and record as reference value P1.
9. Enable the output of the signal generator and the output of the RF generator, find the peak value P2.

Record:

P1	P2	P1 – P2

Second Harmonic Distortion Test

Specification

Second Harmonic Distortion Test	< -65 dBc
---------------------------------	-----------

20 °C to 30 °C, $f_c = 50\text{MHz}$, attenuation = 0 dB, preamp off, mixer level = -30 dBm

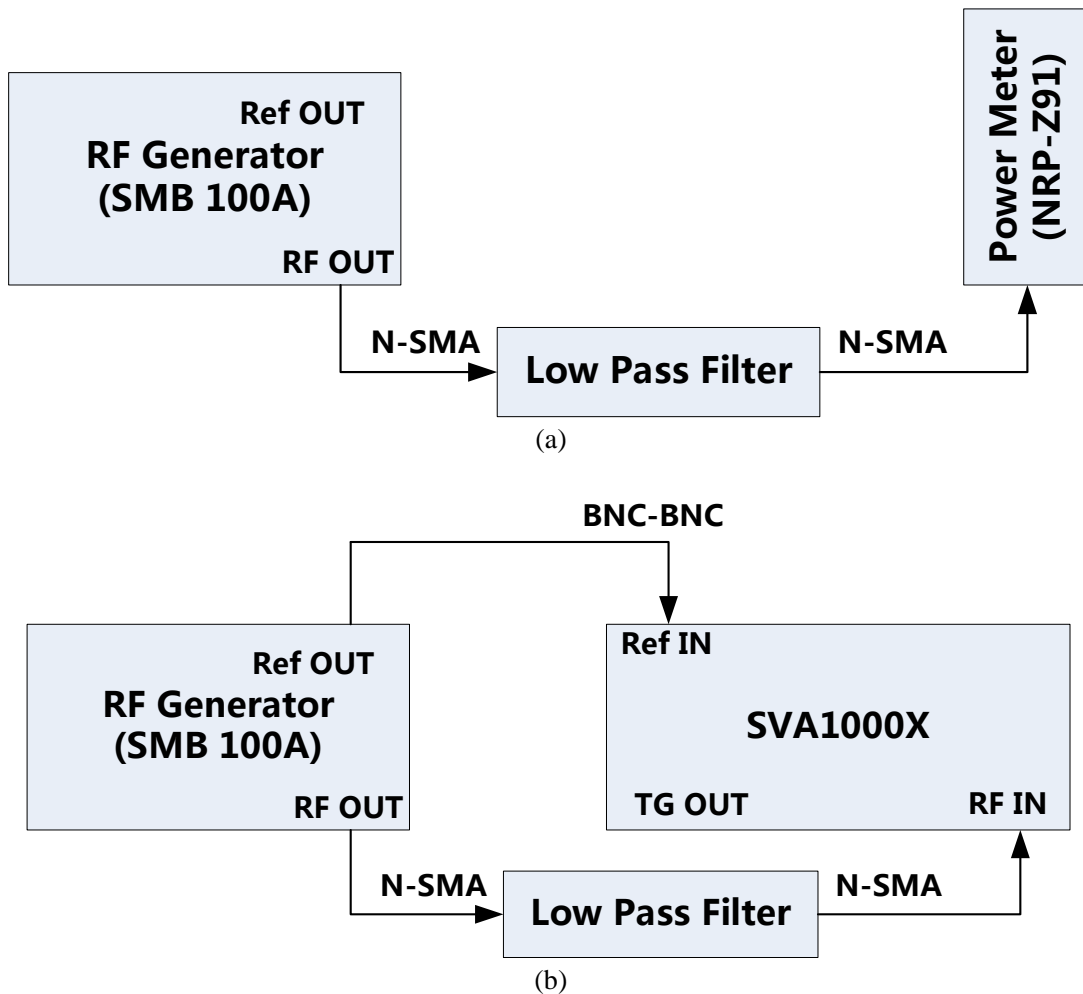


Figure 3-8 connecting test instruments for Second Harmonic Distortion Test

Steps:

1. Connect the RF generator, 50MHz low pass filter and power meter as figure 3-8(a) shows
2. Set the output frequency of the RF generator to 50 MHz and the amplitude to -30 dBm. Observe the measurement value of the power meter. Adjust the output amplitude of the RF generator until the reading of the power meter becomes -30 dBm.
3. Connect the RF generator, 50MHz low pass filter and spectrum analyzer as figure 3-8(b) shows. Enable the output of the RF generator.

4. Configure the spectrum analyzer:
 - a) Set the center frequency to 50 MHz.
 - b) Set the span to 10 kHz.
 - d) Set the reference level to -30 dBm.
 - e) Set the input attenuation to 0 dB.
 - f) Set the resolution bandwidth to 300 Hz.
 - g) Set the video bandwidth to 10 Hz.
 - h) Set the sweep time to auto and the auto sweep time to accuracy.

5. Press **Peak** to find the maximum value P1. Then, Set the center frequency to 100 MHz, Press **Peak** to find the maximum value P2.

Record:

P1	P2	P1 – P2

Input Attenuation Error Test

Specification

Input Attenuation Error Test	$< \pm 0.5$ dB
20 °C to 30 °C, $f_c = 50$ MHz, preamp off, mixer level = -30 dBm	

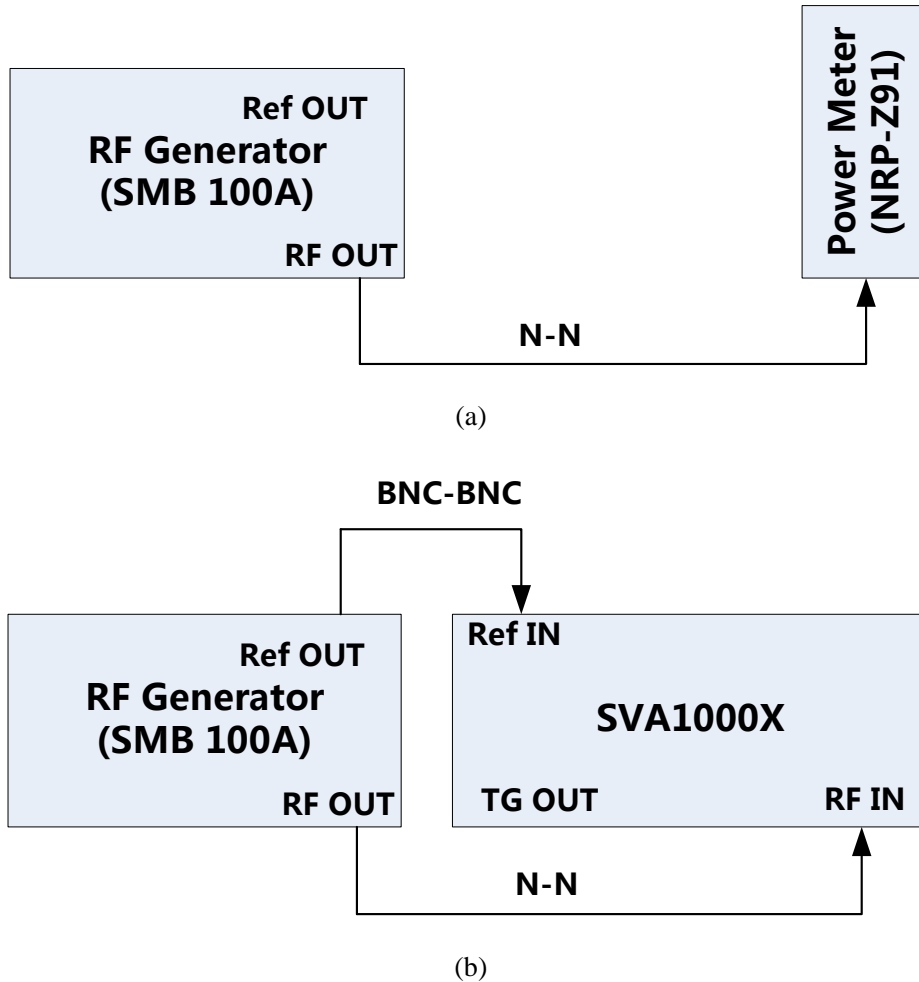


Figure 3-9 Connecting test instruments for Input Attenuation Error Test

Steps:

1. Connect the RF generator and power meter as figure 3-9(a) shows
2. Set the output frequency of the RF generator to 50 MHz and the amplitude to -30 dBm. Observe the measurement value of the power meter. Adjust the output amplitude of the RF generator until the reading of the power meter becomes -30 dBm. Read the output amplitude from the RF generator, record it as P_{-30} .
3. Adjust the output amplitude of the RF generator until the reading of the power meter becomes -25, -20, -15, -10, -5, 0 dBm respectively. Record these values as P_{-25} , P_{-20} , P_{-15} , P_{-10} , P_{-5} , and P_0 .

4. Connect the RF generator and spectrum analyzer as figure 3-2(b) shows
5. Set the output frequency of the RF generator to 50 MHz and the amplitude to P₋₁₀.
6. Configure the spectrum analyzer:
 - a) Set the center frequency to 50 MHz.
 - b) Set the span to 10 kHz.
 - c) Set the reference level to 0 dBm.
 - d) Set the input attenuation to 20 dB.
 - e) Set the resolution bandwidth to 1 kHz and the video bandwidth to 10 Hz.
 - f) Set the sweep time to auto and the auto sweep time to accuracy.
7. Press **Peak** to find the maximum value. Record it as reference value P (ATT = 20 dB).
8. Change the output amplitude of the RF generator to P₋₃₀. Set the input attenuation of the spectrum analyzer to 0dB. Press **Peak** to find the maximum value. Record it as reference value P (ATT = 0 dB).
9. Repeat the step 8, record the value

P (ATT = 5 dB),
 P (ATT = 10 dB),
 P (ATT = 15 dB),
 P (ATT = 25 dB),
 P (ATT = 30 dB).

Error (ATT = 0 dB) = P (ATT = 0 dB) - P (ATT = 20 dB),
 Error (ATT = 5 dB) = P (ATT = 5 dB) - P (ATT = 20 dB),
 Error (ATT = 10 dB) = P (ATT = 10 dB) - P (ATT = 20 dB),
 Error (ATT = 15 dB) = P (ATT = 15 dB) - P (ATT = 20 dB),
 Error (ATT = 25 dB) = P (ATT = 25 dB) - P (ATT = 20 dB),
 Error (ATT = 30 dB) = P (ATT = 30 dB) - P (ATT = 20 dB).

Record:

	P ₀₋₃₀	ATT	P (ATT = 0~30 dB)	Error
P ₀		0		
P ₋₅		5		
P ₋₁₀		10		
P ₋₁₅		15		
P ₋₂₀		20		----
P ₋₂₅		25		
P ₋₃₀		30		

Tracking Generator (TG) Test

Specification

Frequency range	5 MHz ~1.5 GHz
Output level	-20 dBm ~ 0 dBm
Output flatness	+/-3 dB

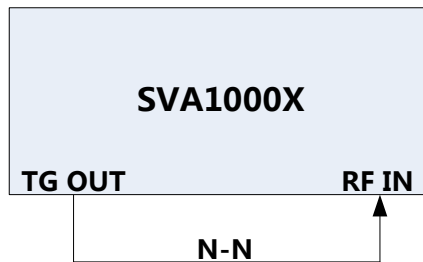


Figure 3-10 Connecting test instruments for TG Output

Steps:

1. Connect the RF IN port and TG OUT port by an N-N cable as figure 3-10 shows
2. Configure the spectrum analyzer:
 - (a) Open the TG mode
 - (b) Set the span to full span
 - (c) Set the Ref level to 0 dB
 - (d) Set the RBW and VBW to Auto
3. Press **Peak** to find the maximum value of the TG output, record the maximum value P1, check if $P1 < TG \text{ level} + 3dB$
4. Press **Peak** -> Search config -> Peak type -> min, to find the minimum value of the TG output, record the maximum value P2, check if $P2 > TG \text{ level} - 3dB$

Record:

TG level	P1	P1-TG level	Pass/Fail
0 dBm			
-10 dBm			
-20 dBm			
TG level	P2	P2-TG level	Pass/Fail
0 dBm			
-10 dBm			
-20 dBm			

Assembly Procedures

This chapter describes how to remove the major modules from the SVA1000X spectrum analyzer. To install the removed modules or replace new modules, please follow the corresponding operating steps in reverse order.

This chapter includes the following topics:

- **Security Consideration** which describes security information needed to consider while operating.
- **List of Modules** in which the modules to remove are listed.
- **Required Tools** which describes the tools needed to perform the procedures.
- **Disassembly Procedures** which describes in detail how to remove and install the modules.

Security Consideration

Only qualified personnel should perform the disassembly procedures. Whenever possible, disconnect the power before you begin to remove or replace the modules. Otherwise, possible personal injuries or damages to the components may occur.

Avoid Electrical Shock Hazardous voltages exist on the LCD module and power supply module. To avoid electrical shock, first disconnect the power cord from the analyzers and then wait at least three minutes for the capacitors in the analyzers to discharge before you begin disassembly.

Preventing ESD Electrostatic discharge (ESD) can damage electronic components. When doing any of the procedures in this chapter, use proper ESD precautions. As a minimum, place the analyzers on a properly grounded ESD mat and wear a properly grounded ESD strap.

List of Modules

The following removable modules are listed in the order of performing disassembly procedures.

Table 4-1 List of modules

Number of Module	Module
1	Rear Panel
2	Front-Panel
3	Rear Metal Cover
4	Front Metal Cover
5	Power Supply Module
6	Main Boards
8	Keyboard Module
9	Display Module

Required Tools

Use these tools to remove or replace the modules in the analyzers:

- Multifunctional screwdriver
- Antistatic gloves
- Custom screw hexagonal nut tool or long nose pliers

Disassembly Procedures

This section describes how to remove and install the modules listed above in the spectrum analyzer in detail. Complete disassembly will be best achieved through the following operating steps.

Removing the Rear Panel



Figure 4-1 Removing the Rear Panel Screws

Removal steps:

1. Remove each rear panel screws as shown in figures above.
2. Press the place of the front panel as the arrows point in the first figure and remove the rear panel from the machine.

To install the rear metal cover, please perform these steps in reverse order.

Removing the Front Panel



Figure 4-2 Removing the front panel

Removal steps:

1. Place the analyzer face down on a soft surface such as an anti-static mat.
2. Remove the six screws located on the rear panel. In this same position, remove the four screws located on the standing legs.
3. Lift the rear panel up and off carefully.

To install the rear panel, please follow these same steps in reverse order.

Removing the Rear Metal Cover

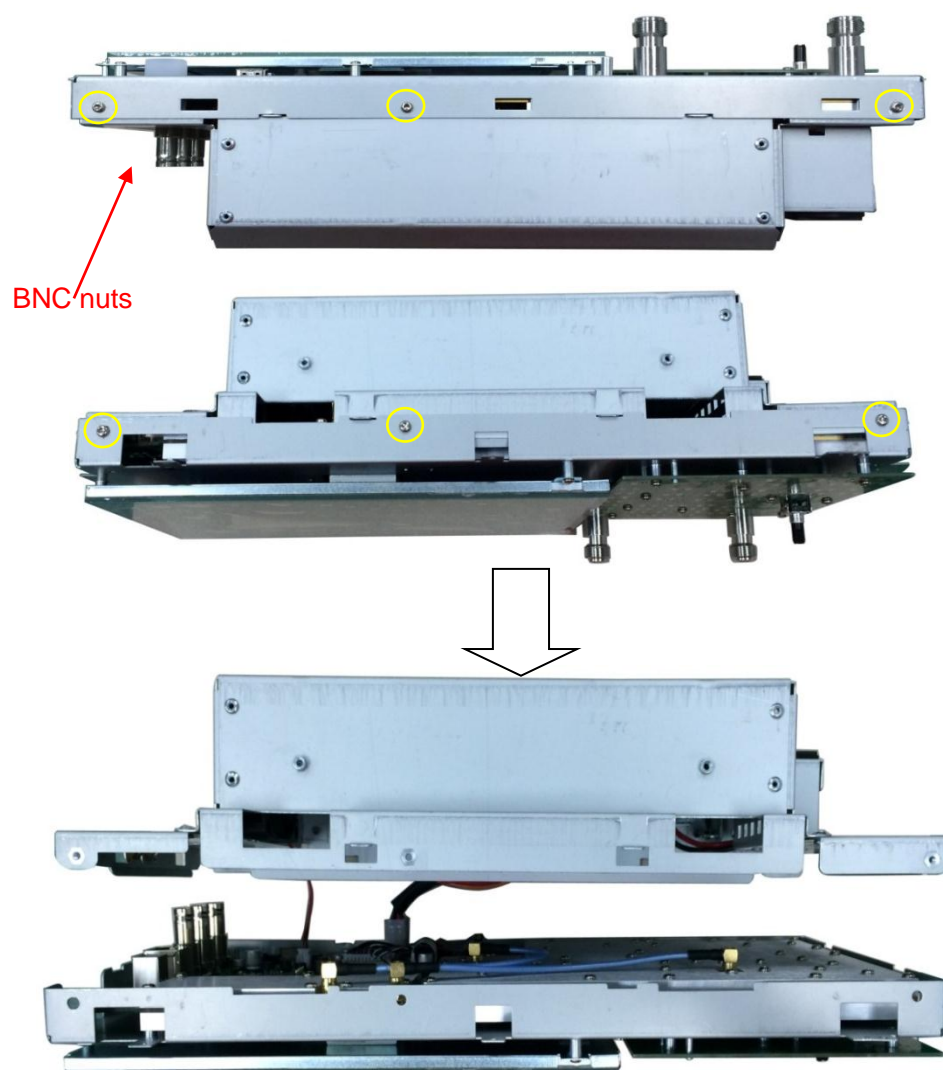


Figure 4-3 Removing the rear metal cover

Removal steps:

1. Place the analyzer down on a soft surface such as an anti-static mat.
2. Remove the screws located on the rear metal cover.
3. Remove three nuts from the Back BNC terminal.
4. Disconnect the power cable and fan cable connected to the main board module from the power supply module.
5. The edge of the rear metal cover is sharp, please lift the rear metal cover up and off carefully to avoid personal injury.

To install the rear metal cover, please perform these steps in reverse order.

Removing the Main Board, Channel Board



Figure 4-4 View of front panel subassembly with main board

Removal steps:

1. Place the analyzer back side down on a soft surface such as an anti-static mat.
2. Remove the screws located on the metal shelf and each board.
3. Remove the RF board, TG board, Digital board from the metal shelf.

To install the front panel, please perform these steps in reverse order.

Removing the LCD, Keyboard

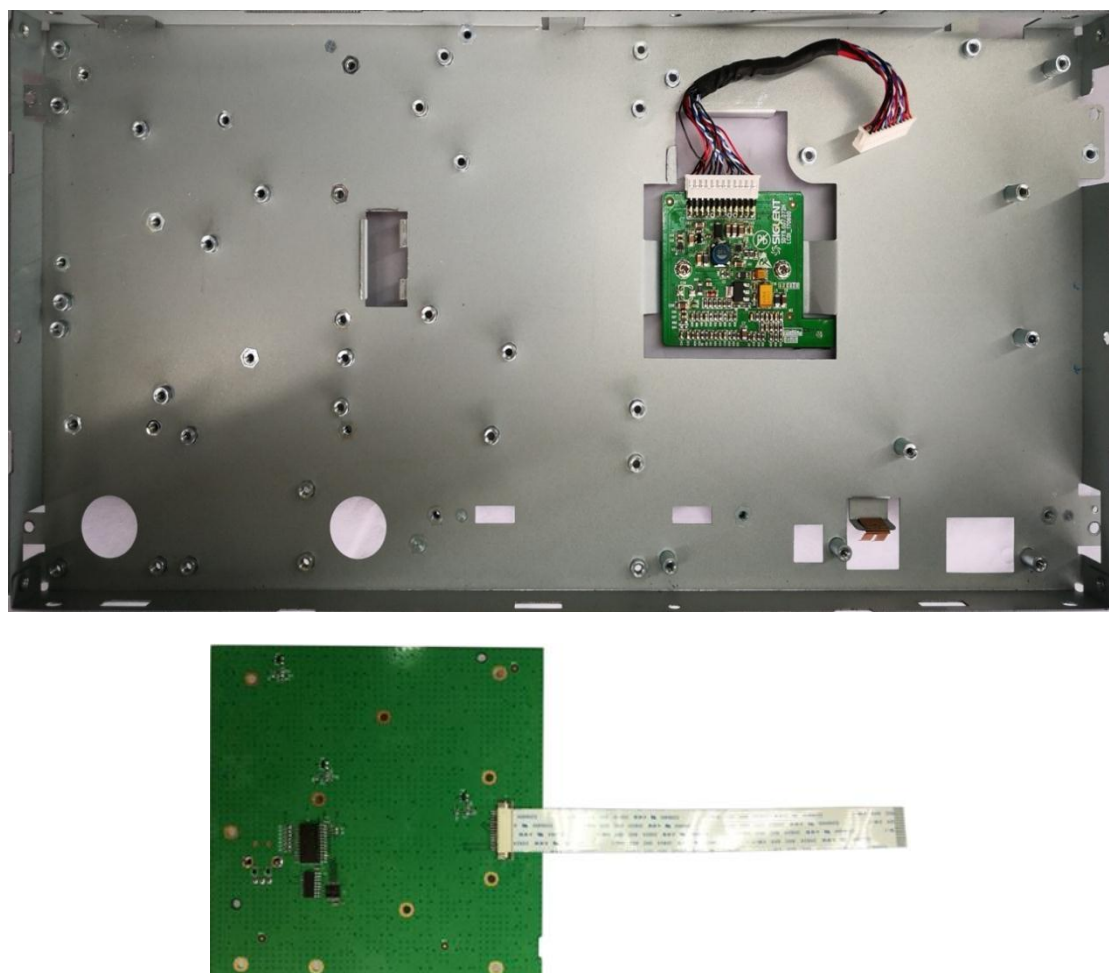


Figure 4-5 Removing the LCD and keyboard

Removal steps:

1. Remove the silicone keypad.
2. Remove the four screws located on the edge of the display module.
3. Remove the six screws located on the channel board.
4. Remove the seven screws located on the keyboard.
5. Disconnect the cable that connected the keyboard and the channel board.
6. Separate the modules carefully.

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