RIGOL

Calibration Guide

DG1022 Function/Arbitrary Waveform Generator

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RIGOL Technologies, Inc.

Guaranty and Declaration

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1 Calibration Instruction

1.1 Calibration Time Interval

Regular calibration should be performed on your instrument according to your measurement accuracy requirement. A one-year calibration time interval can fulfill most of your applications, a calibration time interval longer than one year can not ensure the accuracy.

1.2 Recommended Adjustments

No matter how long is your calibration time interval, **RIGOL** recommends that you perform complete readjustment within the calibration time limit, which can ensure the performance of the signal generator until the next calibration.

1.3 Calibration Time

The signal generator can perform auto calibration under the control of the PC. A complete calibration and verification test under the control of the PC takes about 30 minutes if the instrument has already been warmed up (refer to "**Testing Notice**"). It takes about 2.5 hours if you use the recommended testing instruments to adjust the instrument manually. **Note that this manual only introduces manual calibration.**

1.4 Calibration Security

The Calibration password is used to prevent accidental and unauthorized calibration of the signal generator. The instrument is encrypted when you use it for the first time and you need to enter the correct password to decrypt the signal generator to perform calibration.

Press Utility → Test → PassWd to input the correct password and the system displays "**The instrument now is UNSECURED**". At this point, SecOn switches to SecOff as shown in the figure below.

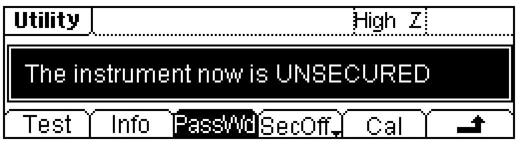

Figure 1-1 Input the Calibration Password

The password is set to "12345" when the signal generator is deliveried from the factory. This password is stored in the non-volatile memory and will not change at power-off or after remote interface reset.

1.5 Basic Calibration/Adjustment Procedures

The recommended procedures of instrument calibration are presented below. This is only a general description of a complete calibration and detailed operations will be presented in "**Calibration Process**".

1. Read the "**Testing Notice**".

2. Decrypt the signal generator (refer to "**Calibration Security**").

3. Press Cal (refer to **Figure 1-1**) to enter the calibration starting menu.

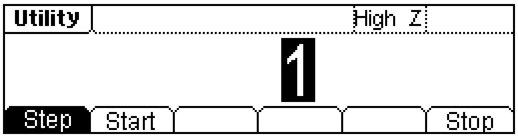

Figure 1-2 Calibration Starting Menu

Table 1-1 Calibration Starting Menu

Menu	Description
Step	Select the step of the calibration operation to be performed.
Start	Start to perform the calibration step.
Stop	Stop the calibration step and return to the previous menu.

4. Select Step and use the knob or keyboard to input the calibration step and the default is "1". If only the specified N step of the calibration is needed, input the desired calibration step.

5. Select Start to open the calibration parameter setting menu.

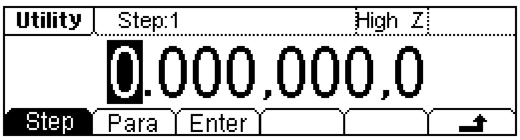

Figure 1-3 Calibration Parameter Setting

Table 1-2 Calibration Parameter Setting

Menu	Description
Step	Select the step of the calibration operation to be performed.
Para	Press this key and input the measured value.
Enter	Finish the value input of the current step and enter the next step.

6. The signal generator displays the parameters currently need calibration together with their default output signal values. To finish a step of calibration, you only need to read the reading on the testing instrument and press Para to input the reading. Then, the signal generator will adjust automatically.

7. Press Enter and the instrument enters the next calibration step automatically.

Tip

Select ↵ in the "Calibration Parameter Setting" menu to cancel the current calibration. Select Stop in the "Calibration Starting" menu to stop the calibration. The instrument will be encrypted automatically after the calibration finishes.

1.6 To Stop the Calibration

You may need to stop the calibration during the calibration process and you can power off the instrument or press any of the other function keys at the panel to stop the calibration at any time.

You need to perform the calibration again if the instrument is powered off during the calibration. The calibration data will be stored in the internal memory if you press any of the other function keys to stop the calibration and you can re-enter the calibration interface to execute other calibration steps. The signal generator will store the calibration constants to the Flash only after you execute the "**To Save the Calibration Data**" operation.

Notice

If you stop the calibration when the signal generator is writing the calibration constant to the Flash, you may lost all the calibration constants and you need to perform all the calibrations again.

2 Testing Devices and Notice

2.1 Testing Devices

The testing devices recommended to be used to perform the calibration are as shown in the table below. If you do not have the specified device, use alternative testing devices with the same accuracy.

Table 2-1 Recommended Testing Devices

Device	Specifications	Recommended Model	Usage*
Oscilloscope	Bandwidth: 300 MHz Sample Rate: 2 GSa/s	RIGOL DS1302CA	P, T
Digital Multimeter (DMM)	AC Volts (True-RMS, AC Coupled) Accuracy: ±0.06% (300 kHz) DC Volts Accuracy: 0.0015% Resistance Accuracy: 0.002%	Agilent 34401A	P, T
Frequency Counter	Accuracy: 0.1 ppm	Agilent 53131A	P, T
Power Meter	Absolute Accuracy: ±0.02dB (log) or ±0.5% (linear) Relative Accuracy: ±0.04dB (log) or ±1.0% (linear)	Agilent E4418B	P, T

Note*: P= Performance Verification, T= Troubleshooting.

2.2 Testing Notice

To get the optimum effect, all the test steps must comply with the following advices:

1. Make sure the temperature of the environment is between 18°C and 28°C. The calibration should be done in 23°C±1°C in ideal situation.
2. Make sure the relative humidity of the environment is lower than 80％.
3. Make sure the instrument has been working continuously for 1 hour.
4. The cable used in the test should be as short as possible and the impedance of the cable should meet the requirement.
5. Only use RG-58 or similar 50 Ω cables.

3 Calibration Process

The calibration process contains 17 items (3.1 to 3.17). When the calibration begins, you can choose to start from any of the items but the steps within each single item must be performed in sequence.

Table 3-1 Calibration Steps Preview

Channel	Calibration Steps	Name of the Calibration Items
CH1&CH2	1	Self-test
	2～3	Frequency (Int) Adjustment
CH1	4～22	AC Amplitude (high-impedance) Adjustment
	23～35	offset DAC
	36～57	Low Frequency Flatness Adjustment
	58～79	Output Impedance Adjustment
	80～89	0 dB Range Flatness Adjustment
	90～99	+10 dB Range Flatness Adjustment
	100～109	+20 dB Range Flatness Adjustment
CH2	304～319	AC Amplitude (high-impedance) Adjustment
	323～333	offset DAC
	336～350	Low Frequency Flatness Adjustment
	355～373	Output Impedance Adjustment
	380～389	0 dB Range Flatness Adjustment
	390～399	+10 dB Range Flatness Adjustment
CH1&CH2	280～281	Frequency (Ext) Adjustment
	285～293	Phase Adjustment
	254	Save the calibration data
	255	Restore the initial calibration value

3.1 Self-test

The first step of the calibration is self-test which is used to check whether the signal generator is working normally.

1. Press Utility → Test → PassWd and enter the password to decrypt the instrument. Then, press Cal → Start to perform the calibration from the first step.

   Table 3-2 Self-test Step

Step	Description
1	Perform self-test. The main output is disabled automatically during the self-test.

2. To continue the calibration, the instrument must be repaired if the self-test of the signal generator fails.

3.2 Frequency (Int) Adjustment

The signal generator stores a frequency calibration constant to make sure that the output is 10 MHz.

1. Set the scale accuracy of the frequency counter as 0.1 ppm and its input impedance as 50 Ω (connect an external 50 Ω terminal if your frequency counter does not have a 50 Ω input impedance). The connecting method is as shown in the figure below.

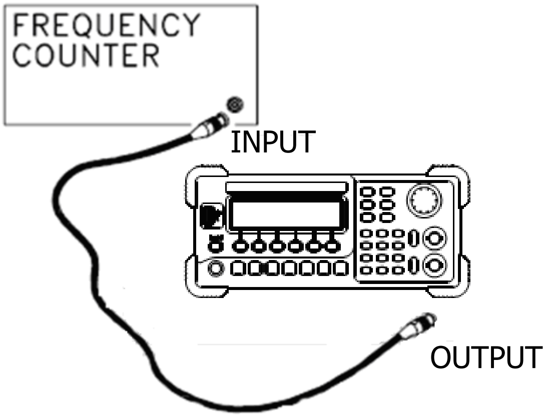

Figure 3-1 Frequency (Internal Timebase) Adjustment Connection

2. Use the frequency counter to measure the frequency of the output signal.

Table 3-3 Frequency (Internal Timebase) Adjustment Steps

Expected Value			**Description**
Step	Frequency	Amplitude	
2	<10 MHz	1 Vpp	Output frequency is slightly less than 10 MHz (e.g. 9,999,945.73 Hz)
3[1]	ENDSTEP_CAL_FREQ (Frequency adjustment finishes)		

Note[1]: this step is only for display and you need not to input any value. Press Enter to enter the next step.

3. Press Para and use the keyboard on the panel to input the measurement value.

3.3 CH1 AC Amplitude Adjustment

AC amplitude adjustment is used to adjust the amplitude accuracy of the AC output and needs to calibrate all the attenuation channels with high output impedance. The gain coefficient is obtained through two measurements (first measure the positive level output from the DAC and then measure the negative level output from the DAC). Thus, such steps always appear in pairs.

1. Connect the DMM and signal generator as shown in the figure below.

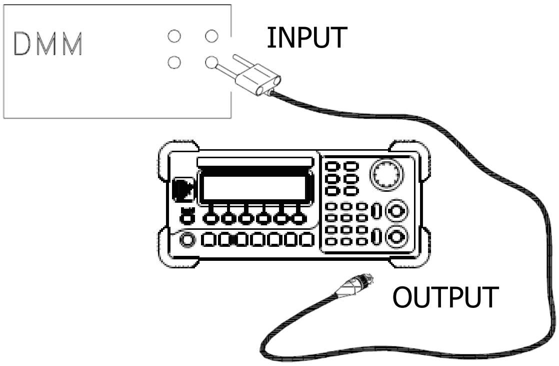

Figure 3-2 AC Amplitude Adjustment Connection

2. Use the DMM to measure the DC voltage output from the signal generator.

3. At the end of each step, select Para to input the measurement value following the sequence in the table below.

Table 3-4 AC Amplitude Adjustment Steps

Expected Value			**Description**
Step	DC Level	Output Impedance	
4	0.021 Vpp	HighZ	Output of -30 dB range
5	0.038 Vpp	HighZ	Output of -30 dB range
6	0.055 Vpp	HighZ	Output of -30 dB range
7	0.070 Vpp	HighZ	Output of -30 dB range
8	0.13 Vpp	HighZ	Output of -30 dB range
9	0.19 Vpp	HighZ	Output of -30 dB range
10	0.21 Vpp	HighZ	Output of -10 dB range
11	0.40 Vpp	HighZ	Output of -10 dB range
12	0.59 Vpp	HighZ	Output of -10 dB range
13	0.61 Vpp	HighZ	Output of 0 dB range
14	1.26 Vpp	HighZ	Output of 0 dB range

15	1.9 Vpp	HighZ	Output of 0 dB range
16	2.1 Vpp	HighZ	Output of +10 dB range
17	4 Vpp	HighZ	Output of +10 dB range
18	5.9 Vpp	HighZ	Output of +10 dB range
19	6.5 Vpp	HighZ	Output of +20dB range
20	13.2 Vpp	HighZ	Output of +20 dB range
21	19.9 Vpp	HighZ	Output of +20 dB range
22[1]	ENDSTEP_CAL_ACAMPLITUDE (AC amplitude adjustment finishes)		

Note[1]: this step is only for display and you need not to input any value. Press Enter to enter the next step.

3.4 CH1 Offset DAC

Offset DAC is used to calibrate the DC offset of the main DAC output and needs to calibrate all the attenuation channels with high output impedance. The offset coefficient is obtained through two measurements (first measure the positive level output from the DAC and then measure the negative level output from the DAC). Thus, such testing steps always appear in pairs.

1. Connect the DMM and the signal generator as shown in the figure below.

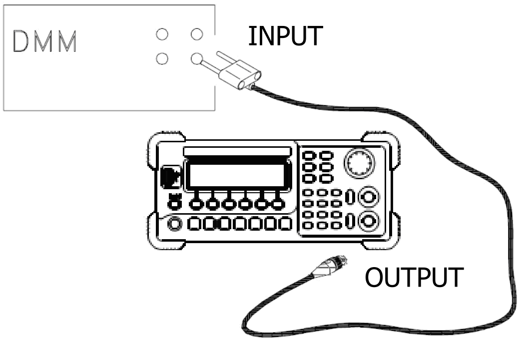

Figure 3-3 Offset DAC Connection

2. Use the DMM to measure the DC voltage output from the signal generator.

3. At the end of each step, select Para to input the measurement value following the sequence in the table below.

Table 3-5 Offset DAC Steps

Expected Value			Description
Step	DC Level	Output Impedance	
23	+0.025 V	HighZ	Output of -30 dB range
24	-0.025 V	HighZ	Output of -30 dB range
25	+0.0625 V	HighZ	Output of -20 dB range
26	-0.0625 V	HighZ	Output of -20 dB range
27	+0.25 V	HighZ	Output of -10 dB range
28	-0.25 V	HighZ	Output of -10 dB range
29	+0.625 V	HighZ	Output of 0 dB range
30	-0.625 V	HighZ	Output of 0 dB range
31	+2.5 V	HighZ	Output of +10 dB range
32	-2.5 V	HighZ	Output of +10 dB range
33	+6.25 V	HighZ	Output of +20 dB range

34	-6.25 V	HighZ	Output of +20 dB range
35[1]	ENDSTEP_CAL_OFFSETDAC (Offset DAC finishes)		

Note[1]: this step is only for display and you need not to input any value. Press Enter to enter the next step.

3.5 CH1 Low Frequency Flatness Adjustment

Low frequency flatness adjustment is used to adjust the 3 attenuation channels (using elliptical filter, with low passband ripples, applicable to Sine and Square) and the other two amplification channels (using linear phase filter, applicable to Ramp, Noise and arbitrary waveforms) of the signal generator.

1. Set the DMM to measure the Vrms voltage value and connect the instruments as shown in the figure below.

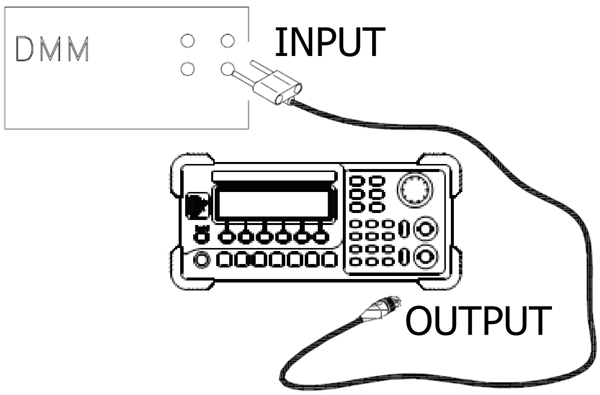

Figure 3-4 Low Frequency Flatness Adjustment Connection

2. Use the DMM to measure the Sine waveform output from the signal generator.

3. At the end of each step, select Para to input the measurement value following the sequence in the table below.

Table 3-6 Low Frequency Flatness Adjustment Steps

Output Signal of the Signal Generator					Description
Step	Type	Output	Frequency	Amplitude	
36	Sine	HighZ	100 Hz	0.56 Vrms	Flatness for 0 dB, Linear Phase Filter
37	Sine	HighZ	1 kHz	0.56 Vrms	Flatness for 0 dB, Linear Phase Filter
38	Sine	HighZ	10 kHz	0.56 Vrms	Flatness for 0 dB, Linear Phase Filter
39	Sine	HighZ	20 kHz	0.56 Vrms	Flatness for 0 dB, Linear Phase Filter
40	Sine	HighZ	30 kHz	0.56 Vrms	Flatness for 0 dB, Linear Phase Filter
41	Sine	HighZ	40 kHz	0.56 Vrms	Flatness for 0 dB,

					Linear Phase Filter
42	Sine	HighZ	100 kHz	0.56 Vrms	Flatness for 0 dB, Linear Phase Filter
43	Sine	HighZ	100 Hz	1.7 Vrms	Flatness for +10 dB, Linear Phase Filter
44	Sine	HighZ	1 kHz	1.7 Vrms	Flatness for +10 dB, Linear Phase Filter
45	Sine	HighZ	10 kHz	1.7 Vrms	Flatness for +10 dB, Linear Phase Filter
46	Sine	HighZ	20 kHz	1.7 Vrms	Flatness for +10 dB, Linear Phase Filter
47	Sine	HighZ	30 kHz	1.7 Vrms	Flatness for +10 dB, Linear Phase Filter
48	Sine	HighZ	40 kHz	1.7 Vrms	Flatness for +10 dB, Linear Phase Filter
49	Sine	HighZ	100 kHz	1.7 Vrms	Flatness for +10 dB, Linear Phase Filter
50	Sine	HighZ	100 Hz	5.6 Vrms	Flatness for +20 dB, Linear Phase Filter
51	Sine	HighZ	1 kHz	5.6 Vrms	Flatness for +20 dB, Linear Phase Filter
52	Sine	HighZ	10 kHz	5.6 Vrms	Flatness for +20 dB, Linear Phase Filter
53	Sine	HighZ	20 kHz	5.6 Vrms	Flatness for +20 dB, Linear Phase Filter
54	Sine	HighZ	30 kHz	5.6 Vrms	Flatness for +20 dB, Linear Phase Filter
55	Sine	HighZ	40 kHz	5.6 Vrms	Flatness for +20 dB, Linear Phase Filter
56	Sine	HighZ	100 kHz	5.6 Vrms	Flatness for +20 dB, Linear Phase Filter
57[1]	ENDSTEP_CAL_LOWFREQFLAT (Low frequency flatness adjustment finishes)				

Note[1]: this step is only for display and you need not to input any value. Press Enter to enter the next step.

3.6 CH1 Output Impedance Adjustment

Output impedance adjustment is used to adjust the output impedance. The measurement of the output impedance constant uses the distortion filter of the signal generator and all the six attenuation/amplification channels of the signal generator.

1. Set the DMM to use AC voltage for measurement. The (CH1) output terminal of the signal generator is connected to the AC voltage intput terminal of the DMM via a 50 Ω impedance matcher. The connecting method is as shown in the figure below.

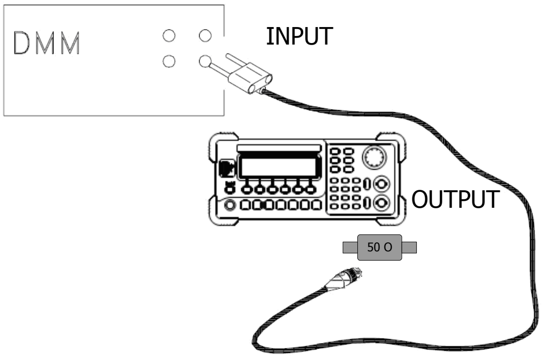

Figure 3-5 Output Impedance Adjustment Connection

2. Use the DMM to measure the output voltage of the signal generator according to each of the output measurements in the table below. The internal resistance of the signal generator is obtained indirectly through the voltage measurement and the expected measurement value should be 50 Ω.

3. At the end of each step, select Para to input the measurement value following the sequence in the table below.

Table 3-7 Output Impedance Adjustment Steps

Step	Expected Value	Description (Signal Generator Output)
58	50 Ω	0.038 V
59	50 Ω	0.125 V
60	50 Ω	0.375 V
61	50 Ω	1 V
62	50 Ω	1.5 V
63	50 Ω	3 V
64	50 Ω	4.5 V

65	50 Ω	6.5 V
66	50 Ω	11 V
67	50 Ω	0 V
68	50 Ω	17 V
69	50 Ω	8.5 V
70	50 Ω	5.5 V
71	50 Ω	3.25 V
72	50 Ω	2.25 V
73	50 Ω	1.5 V
74	50 Ω	0.75 V
75	50 Ω	0.5 V
76	50 Ω	0.187 V
77	50 Ω	0.0625 V
78	50 Ω	0.019 V
79[1]	ENDSTEP_CAL_IMPENDANCE (Output impedance adjustment finishes)	

Note[1]: this step is only for display and you need not to input any value. Press Enter to enter the next step.

3.7 CH1 0 dB Range Flatness Adjustment

1. Connect the power meter and signal generator as shown in the figure below.

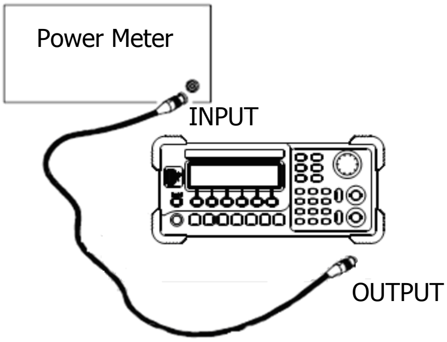

Figure 3-6 Output Flatness Adjustment Connection

2. Use the power meter to measure the dBm value of the output signal of the signal generator.

3. At the end of each step, select Para to input the measurement value following the sequence in the table below.

Table 3-8 0 dB Range Flatness Adjustment Steps

Output Signal of the Signal Generator					Description
Step	Type	Output	Frequency	Amplitude	
80	Sine	50 Ω	100 kHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
81	Sine	50 Ω	500 kHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
82	Sine	50 Ω	1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
83	Sine	50 Ω	5 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
84	Sine	50 Ω	10.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
85	Sine	50 Ω	11.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
86	Sine	50 Ω	15.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
87	Sine	50 Ω	18.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
88	Sine	50 Ω	20.1 MHz	2 dBm	Flatness for 0 dB, Linear

					Phase Filter
89[1]	ENDSTEP_CAL_ 0dBFLAT (0 dB range flatness adjustment finishes)				

Note[1]: this step is only for display and you need not to input any value. Press Enter to enter the next step.

3.8 CH1 +10 dB Range Flatness Adjustment

1. Connect the power meter and signal generator as shown in Figure 3-6.

2. Use the power meter to measure the dBm value of the output signal of the signal generator.

3. At the end of each step, select Para to input the measurement value following the sequence in the table below.

Table 3-9 +10 dB Range Flatness Adjustment Steps

Output Signal of the Signal Generator					Description
Step	Type	Output	Frequency	Amplitude	
90	Sine	50 Ω	100 kHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
91	Sine	50 Ω	500 kHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
92	Sine	50 Ω	1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
93	Sine	50 Ω	5 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
94	Sine	50 Ω	10.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
95	Sine	50 Ω	11.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
96	Sine	50 Ω	15.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
97	Sine	50 Ω	18.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
98	Sine	50 Ω	20.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
99[1]	ENDSTEP_CAL_10dBFLAT (+10 dB range flatness adjustment finishes)				

Note[1]: this step is only for display and you need not to input any value. Press Enter to enter the next step.

3.9 CH1 +20dB Range Flatness Adjustment

1. Connect the power meter and signal generator as shown in Figure 3-6.

2. Use the power meter to measure the dBm value of the output signal of the signal generator.

3. At the end of each step, select Para to input the measurement value following the sequence in the table below.

Table 3-10 +20 dB Range Flatness Adjustment Steps

Output signal of the signal Generator					**Description**
Step	Type	Output	Frequency	Amplitude	
100	Sine	50 Ω	100 kHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
101	Sine	50 Ω	500 kHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
102	Sine	50 Ω	1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
103	Sine	50 Ω	5 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
104	Sine	50 Ω	10.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
105	Sine	50 Ω	11.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
106	Sine	50 Ω	15.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
107	Sine	50 Ω	18.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
108	Sine	50 Ω	20.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
109[1]	ENDSTEP_CAL_20dBFLAT (+20 dB range flatness adjustment finishes)				

Note[1]: this step is only for display and you need not to input any value. Press Enter to enter the next step.

3.10 CH2 AC Amplitude Adjustment

AC amplitude adjustment is used to adjust the amplitude accuracy of the AC output and needs to calibrate all the attenuation channels with high output impedance. The gain coefficient is obtained through two measurements (first measure the positive level output from the DAC and then measure the negative level output from the DAC). Thus, such steps always appear in pairs.

1. Connect the DMM and signal generator as shown in the figure below.

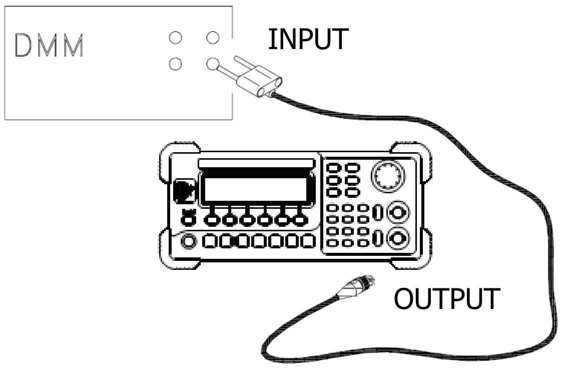

Figure 3-7 AC Amplitude Adjustment Connection

2. Use the DMM to measure the DC voltage output from the signal generator.

3. At the end of each step, select Para to input the measurement value following the sequence in the table below.

Table 3-11 AC Amplitude Adjustment Steps

Expected Value			**Description**
Step	DC Level	Output Impedance	
304	0.021 Vpp	HighZ	Output of -30 dB range
305	0.038 Vpp	HighZ	Output of -30 dB range
306	0.055 Vpp	HighZ	Output of -30 dB range
307	0.070 Vpp	HighZ	Output of -20 dB range
308	0.13 Vpp	HighZ	Output of -20 dB range
309	0.19 Vpp	HighZ	Output of -20 dB range
310	0.21 Vpp	HighZ	Output of -10 dB range
311	0.40 Vpp	HighZ	Output of -10 dB range
312	0.59 Vpp	HighZ	Output of -10 dB range
313	0.61 Vpp	HighZ	Output of 0 dB range
314	1.26 Vpp	HighZ	Output of 0 dB range

315	1.9 Vpp	HighZ	Output of 0 dB range
316	2.1 Vpp	HighZ	Output of +10 dB range
317	4 Vpp	HighZ	Output of +10 dB range
318	5.9 Vpp	HighZ	Output of +10 dB range
319[1]	ENDSTEP_CAL_ACAMPLITUDE (AC amplitude adjustment finishes)		

Note[1]: this step is only for display and you need not to input any value. Press Enter to enter the next step.

3.11 CH2 Offset DAC

Offset DAC is used to calibrate the DC offset of the main DAC output and needs to calibrate all the attenuation channels with high output impedance. The offset coefficient is obtained through two measurements (first measure the positive level output from the DAC and then measure the negative level output from the DAC). Thus, such testing steps always appear in pairs.

1. Connect the DMM and the signal generator as shown in the figure below.

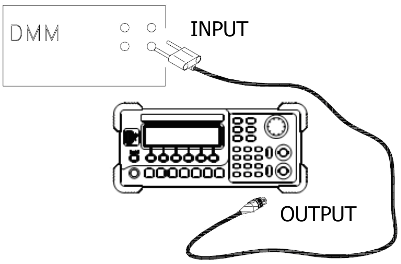

Figure 3-8 Offset DAC Connection

2. Use the DMM to measure the DC voltage output from the signal generator.
3. At the end of each step, select Para to input the measurement value following the sequence in the table below.

Table 3-12 Offset DAC Steps

Expected Value			**Description**
Step	DC Level	Output Impedance	
323	+0.025 V	HighZ	Output of -30 dB range
324	-0.025 V	HighZ	Output of -30 dB range
325	+0.0625 V	HighZ	Output of -20 dB range
326	-0.0625 V	HighZ	Output of -20 dB range
327	+0.25 V	HighZ	Output of -10 dB range
328	-0.25 V	HighZ	Output of -10 dB range
329	+0.625 V	HighZ	Output of 0 dB range
330	-0.625 V	HighZ	Output of 0 dB range
331	+2.5 V	HighZ	Output of +10 dB range
332	-2.5 V	HighZ	Output of +10 dB range
333[1]	ENDSTEP_CAL_OFFSETDAC (Offset DAC finishes)		

Note[1]: this step is only for display and you need not to input any value. Press Enter to enter the next step.

3.12 CH2 Low Frequency Flatness Adjustment

Low frequency flatness adjustment is used to adjust the 3 attenuation channels (using elliptical filter, with low passband ripples, applicable to Sine and Square) and the other two amplification channels (using linear phase filter, applicable to Ramp, Noise and arbitrary waveforms) of the signal generator.

1. Set the DMM to measure the Vrms voltage value and connect the instruments as shown in the figure below.

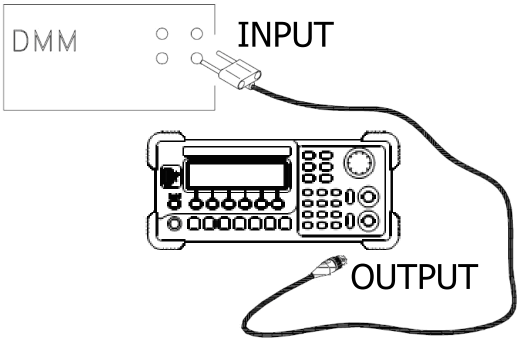

Figure 3-9 Low Frequency Flatness Adjustment Connection

2. Use the DMM to measure the Sine waveform output from the signal generator.

3. At the end of each step, select Para to input the measurement value following the sequence in the table below.

Table 3-13 Low Frequency Flatness Adjustment Steps

Output Signal of the Signal Generator					**Description**
Step	Type	Output	Frequency	Amplitude	
336	Sine	HighZ	1 kHz	0.56 Vrms	Flatness for 0 dB, Linear Phase Filter
337	Sine	HighZ	100 Hz	0.56 Vrms	Flatness for 0 dB, Linear Phase Filter
338	Sine	HighZ	10 kHz	0.56 Vrms	Flatness for 0 dB, Linear Phase Filter
339	Sine	HighZ	30 kHz	0.56 Vrms	Flatness for 0 dB, Linear Phase Filter
340	Sine	HighZ	60 kHz	0.56 Vrms	Flatness for 0 dB, Linear Phase Filter
341	Sine	HighZ	80 kHz	0.56 Vrms	Flatness for 0 dB, Linear Phase Filter
342	Sine	HighZ	100 kHz	0.56 Vrms	Flatness for 0 dB,

					Linear Phase Filter
343	Sine	HighZ	1 kHz	1.7 Vrms	Flatness for +10 dB, Linear Phase Filter
344	Sine	HighZ	100 Hz	1.7 Vrms	Flatness for +10 dB, Linear Phase Filter
345	Sine	HighZ	10 kHz	1.7 Vrms	Flatness for +10 dB, Linear Phase Filter
346	Sine	HighZ	30 kHz	1.7 Vrms	Flatness for +10 dB, Linear Phase Filter
347	Sine	HighZ	60 kHz	1.7 Vrms	Flatness for +10 dB, Linear Phase Filter
348	Sine	HighZ	80 kHz	1.7 Vrms	Flatness for +10 dB, Linear Phase Filter
349	Sine	HighZ	100 kHz	1.7 Vrms	Flatness for +10 dB, Linear Phase Filter
350[1]	ENDSTEP_CAL_LOWFREQFLAT (Low frequency flatness adjustment finishes)				

Note[1]: this step is only for display and you need not to input any value. Press Enter to enter the next step.

3.13 CH2 Output Impedance Adjustment

Output impedance adjustment is used to adjust the output impedance. The measurement of the output impedance constant uses the distortion filter and all the six attenuation/amplification channels of the signal generator.

1. Set the DMM to use AC voltage for measurement. The (CH2) output terminal of the signal generator is connected to the AC voltage intput terminal of the DMM via a 50 Ω impedance matcher. The connecting method is as shown in the figure below.

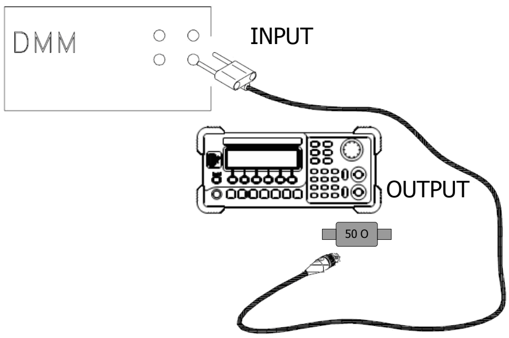

Figure 3-10 Output Impedance Adjustment Connection

2. Use the DMM to measure the output voltage of the signal generator according to each of the output measurements in the table below. The internal resistance of the signal generator is obtained indirectly through the voltage measurement and the expected measurement value should be 50 Ω.

3. At the end of each step, select Para to input the measurement value following the sequence in the table below.

Table 3-14 Output Impedance Adjustment Steps

Step	Expected Value	Description (Signal Generator Output)
355	50 Ω	0.038 V
356	50 Ω	0.125 V
357	50 Ω	0.375 V
358	50 Ω	1 V
359	50 Ω	1.5 V
360	50 Ω	3 V
361	50 Ω	4.5 V
362	50 Ω	0 V
363	50 Ω	2.25 V

364	50 Ω	1.5 V
365	50 Ω	0.75 V
366	50 Ω	0.5 V
367	50 Ω	0.187 V
368	50 Ω	0.0625 V
369	50 Ω	0.019 V
370	50 Ω	0 V
371	50 Ω	2 V
372	50 Ω	2 V
373[1]	ENDSTEP_CAL_IMPENDANCE (Output impedance adjustment finishes)	

Note[1]: this step is only for display and you need not to input any value. Press Enter to enter the next step.

3.14 CH2 0 dB Range Flatness Adjustment

1. Connect the power meter and signal generator as shown in the figure below.

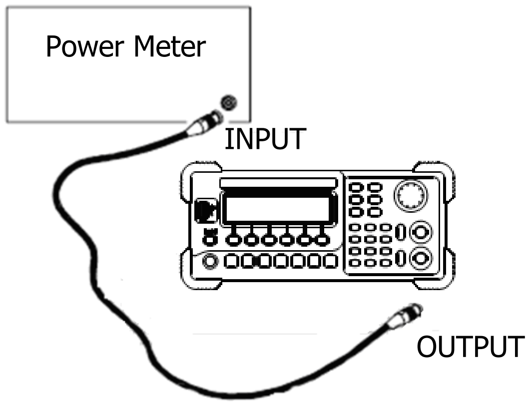

Figure 3-11Output Flatness Adjustment Connection

2. Use the power meter to measure the dBm value of the output signal of the signal generator.

3. At the end of each step, select Para to input the measurement value following the sequence in the table below.

Table 3-15 0 dB Range Flatness Adjustment Steps

Output Signal of the Signal Generator					**Description**
Step	Type	Output	Frequency	Amplitude	
380	Sine	50 Ω	100 kHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
381	Sine	50 Ω	500 kHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
382	Sine	50 Ω	1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
383	Sine	50 Ω	5 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
384	Sine	50 Ω	10.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
385	Sine	50 Ω	11.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
386	Sine	50 Ω	15.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
387	Sine	50 Ω	18.1 MHz	2 dBm	Flatness for 0 dB, Linear

					Phase Filter
388	Sine	50 Ω	20.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
389[1]	ENDSTEP_CAL_ 0dBFLAT (0 dB range flatness adjustment finishes)				

Note[1]: this step is only for display and you need not to input any value. Press Enter to enter the next step.

3.15 CH2 +10 dB Range Flatness Adjustment

1. Connect the power meter and signal generator as shown in Figure 3-11.

2. Use the power meter to measure the dBm value of the output signal of the signal generator.

3. At the end of each step, select Para to input the measurement value following the sequence in the table below.

Table 3-16 +10 dB Range Flatness Adjustment Steps

Output Signal of the Signal Generator					Description
Step	Type	Output	Frequency	Amplitude	
390	Sine	50 Ω	100 kHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
391	Sine	50 Ω	500 kHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
392	Sine	50 Ω	1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
393	Sine	50 Ω	5 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
394	Sine	50 Ω	10.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
395	Sine	50 Ω	11.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
396	Sine	50 Ω	15.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
397	Sine	50 Ω	18.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
398	Sine	50 Ω	20.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
399[1]	ENDSTEP_CAL_10dBFLAT (+10 dB range flatness adjustment finishes)				

Note[1]: this step is only for display and you need not to input any value. Press Enter to enter the next step.

3.16 Frequency (Ext) Adjustment

1. Set the scale accuracy of the frequency counter as 0.1 ppm and its input impedance as 50 Ω (if your frequency counter does not have a 50 Ω input impedance, you need to connect an external 50 Ω terminal). The connecting method is as shown in the figure below. Connect the 10 MHz Out of the frequency counter with the 10 MHz In of the signal generator and the CH1 output terminal of the signal generator with the input terminal of the frequency counter.

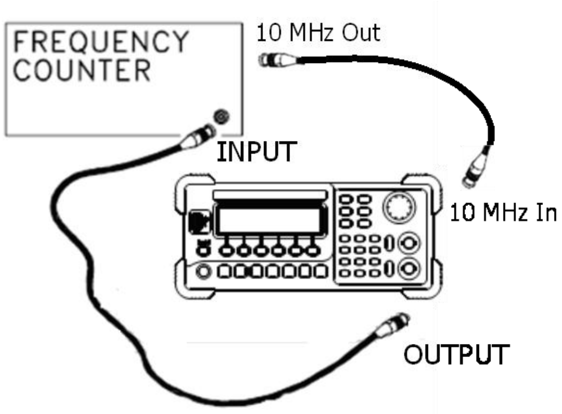

Figure 3-12 Frequency (External Timebase) Adjustment Connection

2. Use the frequency counter to measure the output frequency of the signal generator.

Table 3-17 Frequency (Internal Timebase) Adjustment Steps

Expected Value			Description
Step	Frequency	Amplitude	
280	<10 MHz	1 Vpp	Output frequency is slightly less than 10 MHz (e.g. 9,999,945.73 Hz)
281[1]	ENDSTEP_CAL_FREQ (Frequency adjustment finishes)		

Note[1]: this step is only for display and you need not to input any value. Press Enter to enter the next step.

3. Press Para and use the keyboard on the panel to input the measurement value.

3.17 Phase Adjustment

1. Set the input impedance of the oscilloscope to 50 Ω (if your oscilloscope does not have a 50 Ω input impedance, use external terminal). Connect the two output terminals of the signal generator to two input channels of the oscilloscope respectively. The connecting method is as shown in the figure below.

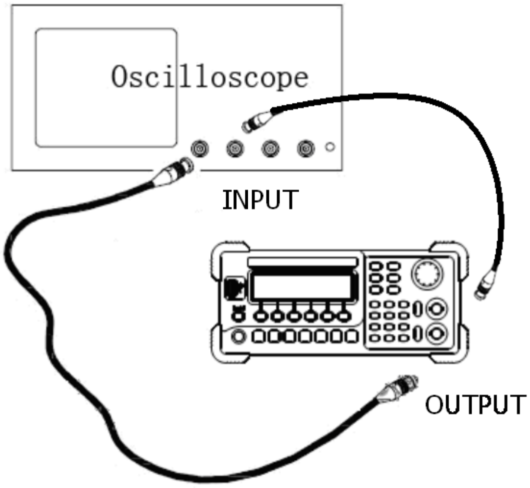

Figure 3-13 Phase Adjustment Connection

2. First, please send the following commands to the signal generator via the remote interface:
OUTPUT:LOAD INFINITY
OUTPUT:LOAD:CH2 INFINITY
APPLY:SIN 1KHZ,5VPP,0
APPLY:SIN:CH2 1KHZ,5VPP,0
OUTPUT ON
OUTPUT:CH2 ON

The signal generator will exit the calibration interface (the previous calibration parameters are still stored in the internal memory) after receiving the above-mentioned commands.

3. Re-enter the calibration interface (press Utility → Test → PassWd and enter the password to decrypt the signal generator. Then press Cal→ Step). Perform the relative operations following the sequence in the table below and press Para at the end of each step to input the measurement value (A-B).

Table 3-18 Phase Adjustment Steps

Step	Description
285	Send the following commands to the oscilloscope via the remote interface: :TIM:SCAL 0.000000500 :STOP :MEASURE:EDGEP1_X? CHANNEL1——record the current A value :MEASURE:EDGEP1_X? CHANNEL2——record the current B value Input the A-B result into the signal generator (in s).
286	The same as 285.
287	The same as 285.
288	The same as 285.
289	The same as 285.
290	The same as 285.
291	The same as 285.
292	The same as 285.
293[1]	ENDSTEP_CAL_FREQ (Frequency adjustment finishes)

Note[1]: this step is only for display and you need not to input any value. Press Enter to enter the next step.

At this point, all the calibration operations are finished.

4 To Save the Calibration Data

Table 4-1 To Save the Calibration Data

Step	Description
254	Perform this step to save the calibration data to the non-volatile memory of the instrument after finishing "**Calibration Process**".

5 To Restore Initial Calibration Value

Table 5-1 To Restore Initial Calibration Value

Step	Description
255	The signal generator has an initial calibration value (empirical value, not factory default). Perform this step to restore the default calibration value. It is recommended that users perform the complete "**Calibration Process**" to get more accurate output.

6 Calibration Prompting Messages

The following prompting messages may appear during the calibration.

1. **Performing Self-Test, Please wait...**
   The system needs some time to finish the self-test, so please wait patiently.

2. **Self-Test Passed**.
   This message is displayed if the system passes the self-test successfully.

3. **The instrument now is UNSECURED**.
   After the message is displayed to indicate that the correct password has been input, users can perform the calibration operation and at this point, the instrument is unsecured.

4. **Performing Calibration, Please wait....**
   The instrument enters the calibration execution menu to prepare to start the calibration, so please wait patiently.

5. **Incorrect secure code, please try again**.
   Users need to input the secure code to calibrate the signal generator. The entered secure code is incorrect and users need to enter the correct code.

6. **Please first complete step****.
   If users want to finish the selected calibration step during the calibration of the instrument, they must start from step **.