RIGOL

Calibration Guide

DG2000 Function/Arbitrary Waveform Generator

Oct. 2010
RIGOL Technologies, Inc.

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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.

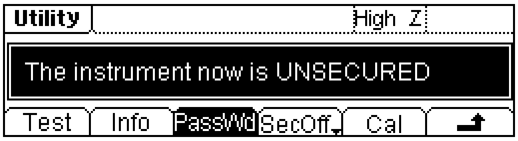

Figure 1-1 Input the Calibration Password

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 S**").

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

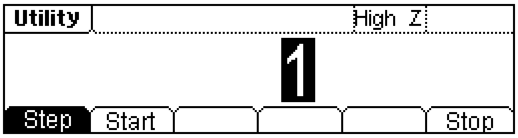

Figure 1-2 Calibration Starting Menu

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.

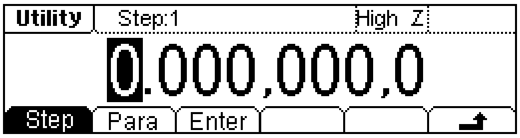

Figure 1-3 Calibration Parameter Setting

Table 1-2 Calibration Parameter Setting

Menu	Description
Step	Select the step of the calibration operation to be performed.
Para	Press the key to 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 other testing devices with the same accuracy instead.

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 14 items (3.1 to 3.14). 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.

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 3-1 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 (Internal Timebase) 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.

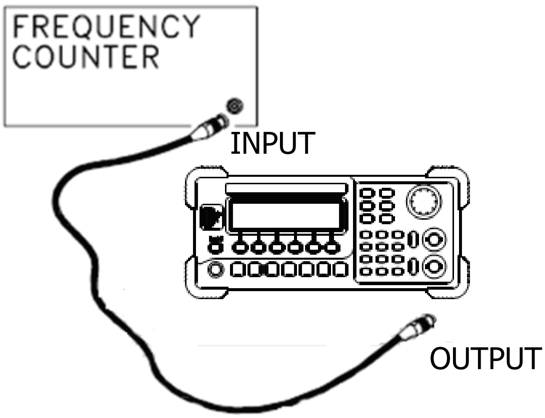

Figure 3-1 Frequency (Internal Timebase) Adjustment Connection

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

Table 3-2 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 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.

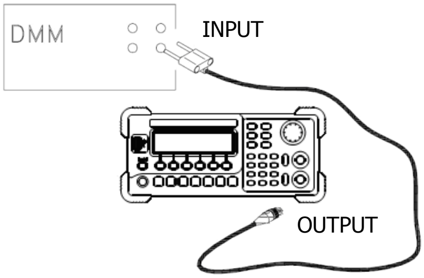

Figure 3-2 Offset DAC Connection

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 3-3 Offset DAC Steps

Expected Value			**Description**
Step	DC Level	Output Impedance	
4	+0.025 V	HighZ	Output of -30 dB range
5	-0.025 V	HighZ	Output of -30 dB range
6	+0.0625 V	HighZ	Output of -20 dB range
7	-0.0625 V	HighZ	Output of -20 dB range
8	+0.25 V	HighZ	Output of -10 dB range
9	-0.25 V	HighZ	Output of -10 dB range
10	+0.625 V	HighZ	Output of 0 dB range
11	-0.625 V	HighZ	Output of 0 dB range
12	+2.5 V	HighZ	Output of +10 dB range (Amplifier In)
13	-2.5 V	HighZ	Output of +10 dB range (Amplifier In)
14	+6.25 V	HighZ	Output of +20 dB range (Amplifier In)
15	-6.25 V	HighZ	Output of +20 dB range (Amplifier In)
16[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.

3.4 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.

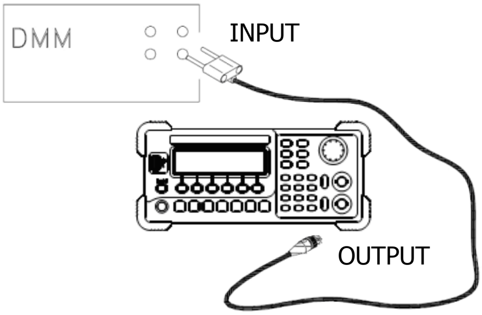

Figure 3-3 AC Amplitude Adjustment Connection

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	
17	+0.010 V	HighZ	Output of -30 dB range
18	-0.010 V	HighZ	Output of -30 dB range
19	+0.020 V	HighZ	Output of -30 dB range
20	-0.020 V	HighZ	Output of -30 dB range
21	+0.04 V	HighZ	Output of -20 dB range
22	-0.04 V	HighZ	Output of -20 dB range
23	+0.09 V	HighZ	Output of -20 dB range
24	-0.09 V	HighZ	Output of -20 dB range
25	+0.15 V	HighZ	Output of -10 dB range
26	-0.15 V	HighZ	Output of -10 dB range
27	+0.25 V	HighZ	Output of -10 dB range
28	-0.25 V	HighZ	Output of -10 dB range
29	+0.50 V	HighZ	Output of 0 dB range

30	-0.50 V	HighZ	Output of 0 dB range
31	+0.80 V	HighZ	Output of 0 dB range
32	-0.80 V	HighZ	Output of 0 dB range
33	+1.5 V	HighZ	Output of +10 dB range (Amplifier In)
34	-1.5 V	HighZ	Output of +10 dB range (Amplifier In)
35	+2.5 V	HighZ	Output of +10 dB range (Amplifier In)
36	-2.5 V	HighZ	Output of +10 dB range (Amplifier In)
37	+5 V	HighZ	Output of +20 dB range (Amplifier In)
38	-5 V	HighZ	Output of +20 dB range (Amplifier In)
39	+8 V	HighZ	Output of +20 dB range (Amplifier In)
40	-8 V	HighZ	Output of +20 dB range (Amplifier In)
41[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.

3.5 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 four-wire resistance for measurement to reduce error caused by the resistance of the test lead and the contact resistance between the probe and the testing point. Set the DMM as 100NPLC synthesizer (transmission line cycles, clock cycles per ADC sample). The connecting method is as shown in the figure below.

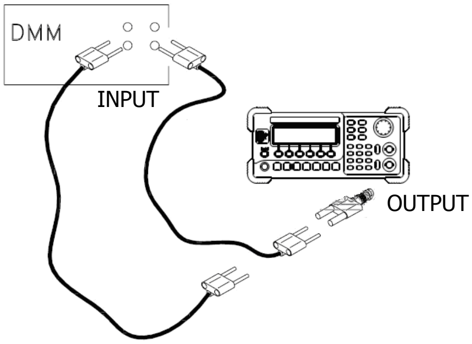

Figure 3-4 Output Impedance Adjustment Connection

2. Use the DMM to measure the resistance value according to each of the output measurements in the table below 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 3-5 Output Impedance Adjustment Steps

Step	Expected Value	Description
42	50 Ω	-30 dB range with distortion filter
43	50 Ω	-20 dB range with distortion filter
44	50 Ω	-10 dB range with distortion filter
45	50 Ω	0 dB range with distortion filter
46	50 Ω	+10 dB range with distortion filter
47	50 Ω	+20 dB range without distortion filter
48[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.

3.6 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.

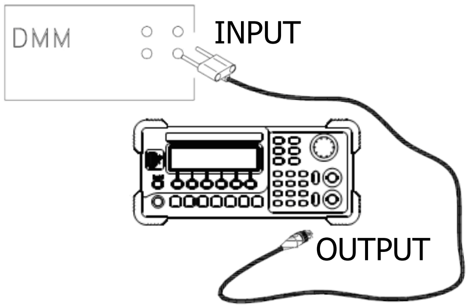

Figure 3-5 Low Frequency Flatness Adjustment Connection

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	
49	Sine	HighZ	100 Hz	0.56 Vrms	Flatness for 0 dB, Elliptical Filter
50	Sine	HighZ	1 kHz	0.56 Vrms	Flatness for 0 dB, Elliptical Filter
51	Sine	HighZ	10 kHz	0.56 Vrms	Flatness for 0 dB, Elliptical Filter
52	Sine	HighZ	20 kHz	0.56 Vrms	Flatness for 0 dB, Elliptical Filter
53	Sine	HighZ	30 kHz	0.56 Vrms	Flatness for 0 dB, Elliptical Filter
54	Sine	HighZ	40 kHz	0.56 Vrms	Flatness for 0 dB, Elliptical Filter
55	Sine	HighZ	100 kHz	0.56 Vrms	Flatness for 0 dB, Elliptical Filter
56	Sine	HighZ	100 Hz	0.56 Vrms	Flatness for 0 dB, Linear Phase Filter
57	Sine	HighZ	1 kHz	0.56 Vrms	Flatness for 0 dB, Linear Phase Filter
58	Sine	HighZ	10 kHz	0.56 Vrms	Flatness for 0 dB, Linear Phase Filter
59	Sine	HighZ	20 kHz	0.56 Vrms	Flatness for 0 dB, Linear Phase

					Filter
60	Sine	HighZ	30 kHz	0.56 Vrms	Flatness for 0 dB, Linear Phase Filter
61	Sine	HighZ	40 kHz	0.56 Vrms	Flatness for 0 dB, Linear Phase Filter
62	Sine	HighZ	100 kHz	0.56 Vrms	Flatness for 0 dB, Linear Phase Filter
63	Sine	HighZ	100 Hz	1.7 Vrms	Flatness for +10 dB, Elliptical Filter
64	Sine	HighZ	1 kHz	1.7 Vrms	Flatness for +10 dB, Elliptical Filter
65	Sine	HighZ	10 kHz	1.7 Vrms	Flatness for +10 dB, Elliptical Filter
66	Sine	HighZ	20 kHz	1.7 Vrms	Flatness for +10 dB, Elliptical Filter
67	Sine	HighZ	30 kHz	1.7 Vrms	Flatness for +10 dB, Elliptical Filter
68	Sine	HighZ	40 kHz	1.7 Vrms	Flatness for +10 dB, Elliptical Filter
69	Sine	HighZ	100 kHz	1.7 Vrms	Flatness for +10 dB, Elliptical Filter
70	Sine	HighZ	100 Hz	5.6 Vrms	Flatness for +20 dB, Elliptical Filter
71	Sine	HighZ	1 kHz	5.6 Vrms	Flatness for +20 dB, Elliptical Filter
72	Sine	HighZ	10 kHz	5.6 Vrms	Flatness for +20 dB, Elliptical Filter
73	Sine	HighZ	20 kHz	5.6 Vrms	Flatness for +20 dB, Elliptical Filter
74	Sine	HighZ	30 kHz	5.6 Vrms	Flatness for +20 dB, Elliptical Filter
75	Sine	HighZ	40 kHz	5.6 Vrms	Flatness for +20 dB, Elliptical Filter
76	Sine	HighZ	100 kHz	5.6 Vrms	Flatness for +20 dB, Elliptical Filter
77	Sine	HighZ	100 Hz	5.6 Vrms	Flatness for +20 dB, Linear Phase Filter
78	Sine	HighZ	1 kHz	5.6 Vrms	Flatness for +20 dB, Linear Phase Filter
79	Sine	HighZ	10 kHz	5.6 Vrms	Flatness for +20 dB, Linear Phase Filter
80	Sine	HighZ	20 kHz	5.6 Vrms	Flatness for +20 dB, Linear Phase Filter
81	Sine	HighZ	30 kHz	5.6 Vrms	Flatness for +20 dB, Linear Phase Filter

82	Sine	HighZ	40 kHz	5.6 Vrms	Flatness for +20 dB, Linear Phase Filter
83	Sine	HighZ	100 kHz	5.6 Vrms	Flatness for +20 dB, Linear Phase Filter
84[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.

3.7 0 dB Range Flatness Adjustment

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

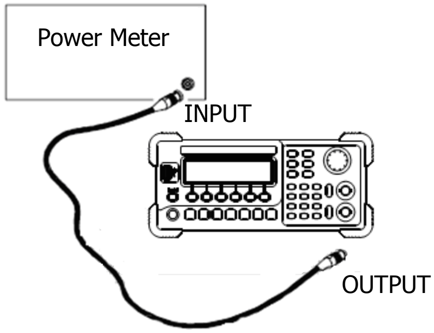

Figure 3-6 Output Flatness Adjustment Connection

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 3-7 0 dB Range Flatness Adjustment Steps

Output Signal of the Signal Generator					**Description**
Step	Type	Output	Frequency	Amplitude	
85	Sine	50 Ω	100 kHz	2 dBm	Flatness for 0 dB, Elliptical Filter
86	Sine	50 Ω	200 kHz	2 dBm	Flatness for 0 dB, Elliptical Filter
87	Sine	50 Ω	500 kHz	2 dBm	Flatness for 0 dB, Elliptical Filter
88	Sine	50 Ω	1.5 MHz	2 dBm	Flatness for 0 dB, Elliptical Filter
89	Sine	50 Ω	5 MHz	2 dBm	Flatness for 0 dB, Elliptical Filter
90	Sine	50 Ω	10.1 MHz	2 dBm	Flatness for 0 dB, Elliptical Filter
91	Sine	50 Ω	25.1 MHz	2 dBm	Flatness for 0 dB, Elliptical Filter
92	Sine	50 Ω	40.1 MHz	2 dBm	Flatness for 0 dB, Elliptical Filter
93	Sine	50 Ω	50.1 MHz	2 dBm	Flatness for 0 dB, Elliptical Filter
107	Sine	50 Ω	100 kHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
108	Sine	50 Ω	200 kHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
109	Sine	50 Ω	500 kHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
110	Sine	50 Ω	1.5 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter

111	Sine	50 Ω	5 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
112	Sine	50 Ω	10.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
113	Sine	50 Ω	25.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
114	Sine	50 Ω	30.1 MHz	2 dBm	Flatness for 0 dB, Linear Phase Filter
115[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 +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 3-8 +10 dB Range Flatness Adjustment Steps

Output Signal of the Signal Generator					**Description**
Step	Type	Output	Frequency	Amplitude	
116	Sine	50 Ω	100 kHz	12 dBm	Flatness for +10 dB, Elliptical Filter
117	Sine	50 Ω	200 kHz	12 dBm	Flatness for +10 dB, Elliptical Filter
118	Sine	50 Ω	500 kHz	12 dBm	Flatness for +10 dB, Elliptical Filter
119	Sine	50 Ω	1.5 MHz	12 dBm	Flatness for +10 dB, Elliptical Filter
120	Sine	50 Ω	5 MHz	12 dBm	Flatness for +10 dB, Elliptical Filter
121	Sine	50 Ω	10.1 MHz	12 dBm	Flatness for +10 dB, Elliptical Filter
122	Sine	50 Ω	25.1 MHz	12 dBm	Flatness for +10 dB, Elliptical Filter
123	Sine	50 Ω	40.1 MHz	12 dBm	Flatness for +10 dB, Elliptical Filter
138[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 +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 3-9 +20 dB Range Flatness Adjustment Steps

Output signal of the signal Generator					**Description**
Step	Type	Output	Frequency	Amplitude	
139	Sine	50 Ω	100 kHz	22 dBm	Flatness for +20 dB, Elliptical Filter
140	Sine	50 Ω	200 kHz	22 dBm	Flatness for +20 dB, Elliptical Filter
141	Sine	50 Ω	500 kHz	22 dBm	Flatness for +20 dB, Elliptical Filter
142	Sine	50 Ω	1.5 MHz	22 dBm	Flatness for +20 dB, Elliptical Filter
143	Sine	50 Ω	5 MHz	22 dBm	Flatness for +20 dB, Elliptical Filter
144	Sine	50 Ω	10.1 MHz	22 dBm	Flatness for +20 dB, Elliptical Filter
145	Sine	50 Ω	25.1 MHz	22 dBm	Flatness for +20 dB, Elliptical Filter
146	Sine	50 Ω	40.1 MHz	22 dBm	Flatness for +20 dB, Elliptical Filter
147	Sine	50 Ω	50.1 MHz	22 dBm	Flatness for +20 dB, Elliptical Filter
161	Sine	50 Ω	100 kHz	22 dBm	Flatness for +20 dB, Linear Phase Filter
162	Sine	50 Ω	200 kHz	22 dBm	Flatness for +20 dB, Linear Phase Filter
163	Sine	50 Ω	500 kHz	22 dBm	Flatness for +20 dB, Linear Phase Filter
164	Sine	50 Ω	1.5 MHz	22 dBm	Flatness for +20 dB, Linear Phase Filter
165	Sine	50 Ω	5 MHz	22 dBm	Flatness for +20 dB, Linear Phase Filter
166	Sine	50 Ω	10.1 MHz	22 dBm	Flatness for +20 dB, Linear Phase Filter
167	Sine	50 Ω	25.1 MHz	22 dBm	Flatness for +20 dB, Linear Phase Filter
168	Sine	50 Ω	30.1 MHz	22 dBm	Flatness for +20 dB, Linear Phase Filter
169[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 Pulse Edge Time Adjustment

The pulse edge time calibration constant is used to set the slope and offset of the rise time output from the signal generator. The following steps set the signal generator to output pulse with 100 Hz frequency and 5 ms pulsewidth.

1. Set the input impedance of the oscilloscope to 50 Ω (if your oscilloscope does not have a 50 Ω input impedance, use an external terminal) to measure the rise time (10％ to 90％ of the waveform amplitude) of the waveform. The connection schematic diagram is as shown in the figure below.

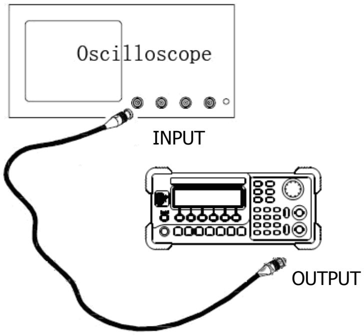

Figure 3-7 Pulse Adjustment Connection

2. Use the oscilloscope to measure the rise time of the pulse 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 3-10 Pulse Edge Time Adjustment Steps

Output Signal of the Signal Generator				**Description**	
Step	Output	Frequency	Amplitude	Pulse Width	
170	50 Ω	100 Hz	1 Vpp	5 ns	Fastest transition range 0
171	50 Ω	100 Hz	1 Vpp	12 ns	Mid transition range 0
172	50 Ω	100 Hz	1 Vpp	20 ns	Fastest transition range 1
173	50 Ω	100 Hz	1 Vpp	180 ns	Slowest transition range 1
174	50 Ω	100 Hz	1 Vpp	220 ns	Fastest transition range 2
175	50 Ω	100 Hz	1 Vpp	3.8 μs	Slowest transition range 2
176	50 Ω	100 Hz	1 Vpp	4.2 μs	Fastest transition range 3
177	50 Ω	100 Hz	1 Vpp	58 μs	Slowest transition range 3
178	50 Ω	100 Hz	1 Vpp	62 μs	Fastest transition range 4
179	50 Ω	100 Hz	1 Vpp	1 ms	Slowest transition range 4

180	50 Ω	100 Hz	1 Vpp	5 ns	Fastest transition range 0
181	50 Ω	100 Hz	1 Vpp	12 ns	Mid transition range 0
182	50 Ω	100 Hz	1 Vpp	20 ns	Fastest transition range 1
183	50 Ω	100 Hz	1 Vpp	180 ns	Slowest transition range 1
184	50 Ω	100 Hz	1 Vpp	220 ns	Fastest transition range 2
185	50 Ω	100 Hz	1 Vpp	3.8 μs	Slowest transition range 2
186	50 Ω	100 Hz	1 Vpp	4.2 μs	Fastest transition range 3
187	50 Ω	100 Hz	1 Vpp	58 μs	Slowest transition range 3
188	50 Ω	100 Hz	1 Vpp	62 μs	Fastest transition range 4
189	50 Ω	100 Hz	1 Vpp	1 ms	Slowest transition range 4
190[1]	ENDSTEP_CAL_EDGETIME (Pulse edge time 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 Pulse Width Adjustment

The pulse width calibration constant is used to set the falling edge delay of the pulse output from the signal generator. The following steps set the signal generator to output pulse (8 MHz).

1. Set the sample mode of the oscilloscope as average to measure the pulse width. Set the input impedance of the oscilloscope to 50 Ω (if your oscilloscope does not have a 50 Ω input impedance, use external terminal). The connection schematic diagram is as shown in Figure 3-7.

2. Use the oscilloscope to measure the width of the pulse 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 Pulse Width Adjustment Steps

Output Signal of the Signal Generator					**Description**
Step	Output	Frequency	Amplitude	Pulse Width	
191	50 Ω	8 MHz	1 Vpp	30 ns	Narrow Pulse Width
192	50 Ω	8 MHz	1 Vpp	42 ns	Wide Pulse Width
193[1]	ENDSTEP_CAL_PULSEW (Pulse width 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.

3.12 Duty Cycle Adjustment

The duty cycle calibration constant is used to set the duty cycle of the square waveform output from the signal generator. The following steps set the signal generator to output 25.1 MHz square waveform.

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). The connection schematic diagram is as shown in Figure 3-7.

2. Use the oscilloscope to measure the duty cycle of the square 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 3-12 Pulse Width Adjustment Steps

Output Signal of the Signal Generator					**Description**
Step	Output	Frequency	Amplitude	Duty Cycle	
194	50 Ω	25.1 MHz	1 Vpp	30%	Only input the duty cycle got from the measurement
195	50 Ω	25.1 MHz	1 Vpp	70%	Only input the duty cycle got from the measurement
196[1]	ENDSTEP_CAL_DUTY (Duty cycle 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 AM Adjustment

AM calibration constant is used to set the signal generator to output modulated waveform. In the following steps, the signal generator uses Sine waveform as carrier waveform to modulate the DC signal.

1. Connect the DMM and signal generator as shown in Figure 3-2.

2. Use the DMM to measure the voltage value of the DC 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 AM Adjustment Steps

Output Signal of the Signal Generator					**Description**
Step	Output Impedance	Sine Frequency	Sine Amplitude	DC Level	
197	HighZ	1 kHz	0.03 Vpp	0.0106 Vrms	Input the Vrms value
198	HighZ	1 kHz	0.06 Vpp	0.0212 Vrms	Input the Vrms value
199	HighZ	1 kHz	0.1 Vpp	0.03536 Vrms	Input the Vrms value
200	HighZ	1 kHz	0.2 Vpp	0.07072 Vrms	Input the Vrms value
201	HighZ	1 kHz	0.3 Vpp	0.106 Vrms	Input the value
202	HighZ	1 kHz	0.6 Vpp	0.212 Vrms	Input the Vrms value
203	HighZ	1 kHz	1.0 Vpp	0.3536 Vrms	Input the Vrms value
204	HighZ	1 kHz	2.0 Vpp	0.7072 Vrms	Input the Vrms value
205	HighZ	1 kHz	3.0 Vpp	1.06 Vrms	Input the Vrms value
206	HighZ	1 kHz	6.0 Vpp	2.12 Vrms	Input the Vrms value
207	HighZ	1 kHz	10.0 Vpp	3.536 Vrms	Input the Vrms value
208	HighZ	1 kHz	20.0 Vpp	7.072 Vrms	Input the Vrms value
209[1]	ENDSTEP_CAL_AM (AM 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 Pulse Amplitude Adjustment

The pulse amplitude calibration constant is used to set the amplitude of the pulse output from the signal generator. The following steps set the signal generator to output Sine or pulse waveform with 100 kHz, 5 Vpp frequency.

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). The connection schematic diagram is as shown in Figure 3-7.

2. Use the oscilloscope to measure the peak value of the 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 3-14 Pulse Amplitude Adjustment Steps

Output Signal of the Signal Generator					**Description**
Step	Type	Output	Frequency	Amplitude	
210	Sine	HighZ	100 kHz	5 Vpp	Only input the peak value got from the measurement.
211	Pulse	HighZ	100 kHz	5 Vpp	Only input the peak value got from the measurement.
212[1]	ENDSTEP_CAL_PULSE_AMP (Pulse 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.

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 needto 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 **.