# RIGOL

**User's Guide**

# DSA1000&DSA1000A Series
# Options&Accessories

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**RIGOL Technologies, Inc.**

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# Content

# DSA1000&DSA1000A Options&Accessories

Options and accessories provided by DSA1000&DSA1000A series spectrum analyzer are as shown in the table below. If needed, please contact **RIGOL** or the local distributors. This manual only introduces the functions of some options. For the option with remark in the table below, refer to the dedicated manual.

| | Description | Order Number |
|---|---|---|
| Model | Spectrum Analyzer, 9 kHz to 3 GHz, with preamplifier | DSA1030A |
| | Spectrum Analyzer, 9 kHz to 3 GHz, with preamplifier, with track generator | DSA1030A-TG |
| | Spectrum Analyzer, 9 kHz to 3 GHz | DSA1030 |
| | Spectrum Analyzer, 9 kHz to 3 GHz, with track generator | DSA1030-TG |
| Standard Accessories | Front Panel Cover | FPCS-DSA1000 |
| | Quick Guide (Hard Copy) | - |
| | CDROM (User Guide, Programming Guide) | - |
| | USB Data Cable | - |
| | Power Cable Conforming to the Standard of the Country | - |
| Options | Preamplifier (for DSA1030 and DSA1030-TG) | PA-DSA1030 |
| | Advanced Measurement Kit (for DSA1030 and DSA1030-TG) | AMK-DSA1000 |
| | DSA PC Software[1] | Ultra Spectrum |
| Optional Accessories | Include: N-SMA Cable, BNC-BNC Cable, N-BNC Adaptor, N-SMA Adaptor, 75 Ω – 50 Ω Adaptor, 900 MHz/1.8 GHz Antennas, 2.4 GHz Antennas[2] | DSA Utility Kit |
| | Include: N(F)-N(F) Adaptor (1pcs), N(M)-N(M) Adaptor (1pcs), N(M)-SMA(F) Adaptor (2pcs), N(M)-BNC(F) Adaptor (2pcs), SMA(F)-SMA(F) Adaptor (1pcs), SMA(M)-SMA(M) Adaptor (1pcs), BNC T Type Adaptor (1pcs), 50Ω SMA Load (1pcs), 50Ω Impedance Adaptor (1pcs)[2] | RF Adaptor Kit |
| | Include: 50Ω to 75Ω Adaptor (2pcs)[2] | RF CATV Kit |

| | |
|---|---|
| Include: 6dB Attenuator (1pcs), 10dB Attenuator (2pcs) [2] | RF Attenuator Kit |
| 30dB High Power Attenuator, Max Power 100W[2] | ATT03301H |
| N(M)-N(M) RF Cable[2] | CB-NM-NM-75-L-12G |
| N(M)-SMA(M) RF Cable[2] | CB-NM-SMAM-75-L-12G |
| RF Demo Kit (Transmitter) [2] | TX1000 |
| RF Demo Kit (Receiver) [2] | RX1000 |
| VSWR Bridge (1 MHz to 2 GHz) [2] | VB1020 |
| VSWR Bridge (800 MHz to 4 GHz) [2] | VB1040 |
| Rack Mount Kit | RM-DSA1000 |
| Soft Carrying Bag | BAG-DSA1000 |
| USB to GPIB Interface Converter for Instrument | USB-GPIB |
| 11.1 V, 147 Wh Li-ion Battery Pack | BAT (China Only) |
| Desk Mount Instrument Arm | ARM |

**Note:**

[1] For more details of this option, refer to the help document of Ultra Spectrum (you can call the manual by clicking the icon [?] in the upper right corner of the software, or download the manual from www.rigol.com.

[2] For more details, refer to the corresponding manual (included in the option package in CD or hard copy form, or download the manual from www.rigol.com).

# Preamplifier

Turning on the preamplifier reduces the displayed average noise level in order to distinguish small signals from the noise when working with small signals. For the instruments supported option PA-DSA1030, pressing the front panel key **AMPT**, a corresponding menu will appear on the right of the screen. Then, press **RF Preamp** to turn on or off the preamplifier. An icon will be displayed on the left of the screen when the preamplifier is on. The preamplifier will be disabled automatically when the input attenuation is set higher than 30 dB.

As seen from the measurement result figures when the preamplifier is off and on, small input signals can be measured by the analyzer when the preamplifier is on.
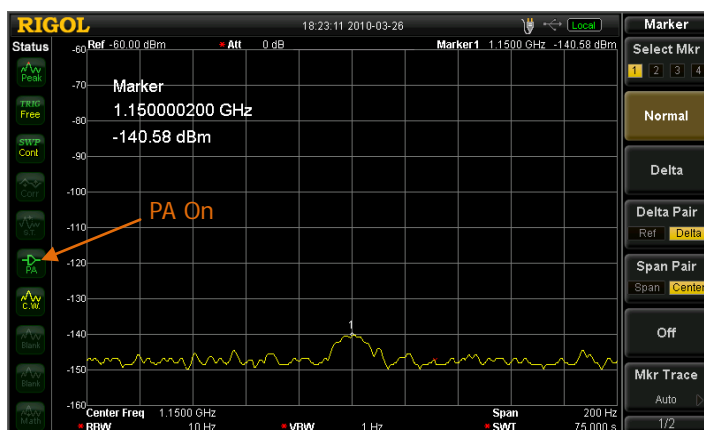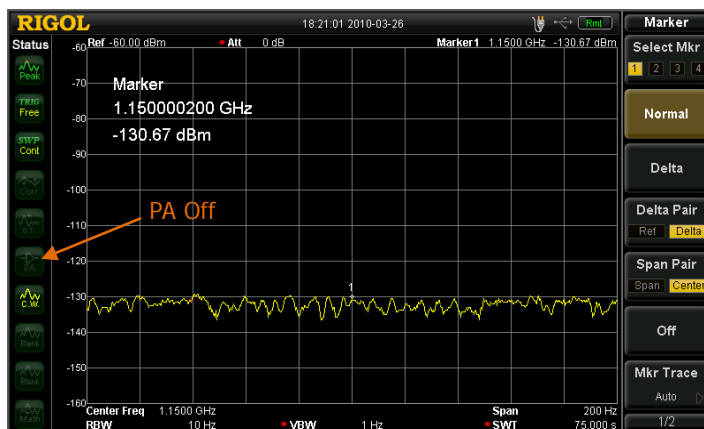
# Advanced Measurement Functions

Option AMK-DSA1000 provides plenty of advanced measurement functions including T-Power (Time domain Power), ACP (Adjacent Channel Power), Chan Pwr (Channel Power), OBW (Occupied Bandwidth), EBW (Emission Bandwidth), C/N Ratio, Harmo Dist (Harmonic Distortion), TOI (Third Order Intermodulation) and Pass/Fail. The measure mode can be **Single** or **Continuous** and you can control the measurement status: **Restart**, **Pause** or **Resume**.

Pressing the front panel key **Meas**, the corresponding menu will appear on the right of the screen. Press **Meas Fctn** and choose a measurement function. The screen will be divided into two windows. The upper one is for basic measure, displaying sweep trace, and the lower one shows the measurement results.

1. **T-Power (Time domain Power)**

   Enables the Zero Span Mode and calculates the power within time domain. The measurable power types are Peak, Average and RMS.



Measured Result          Parameters
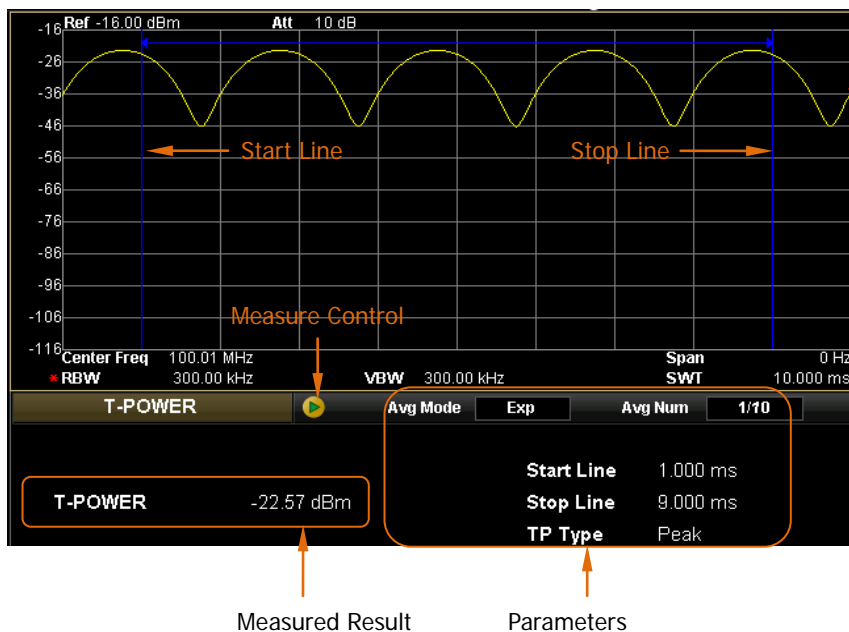
## 2. ACP (Adjacent Channel Power)

Measures the power of the main channel and the adjacent channels and calculates the power difference between the main and each of the adjacent channels. When enabled, both the span and resolution bandwidth of the analyzer are adjusted to be smaller automatically.
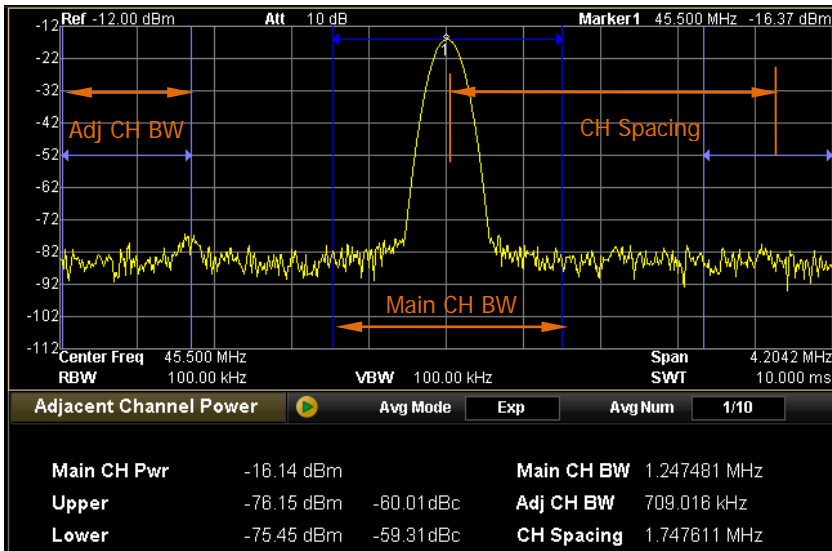


## 3. Chan Pwr (Channel Power)

Measures the power and the power density within a specified channel bandwidth. The span and bandwidth are automatically set to smaller values in this measurement type.
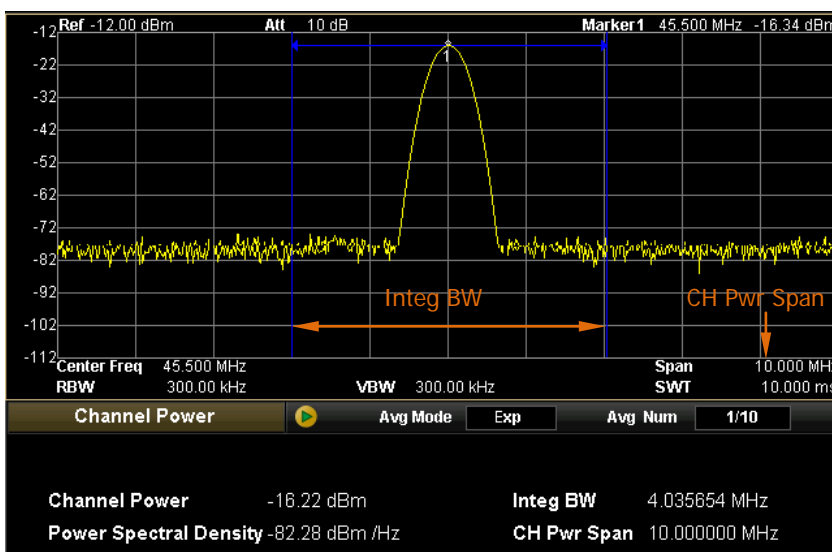
**4. OBW (Occupied Bandwidth)**

Calculates the power within whole bandwidth by integral operation and works out the occupied bandwidth by this value based on the specified power ratio. The center frequency difference between the measured channel and the analyzer will also be given in the measurement results.
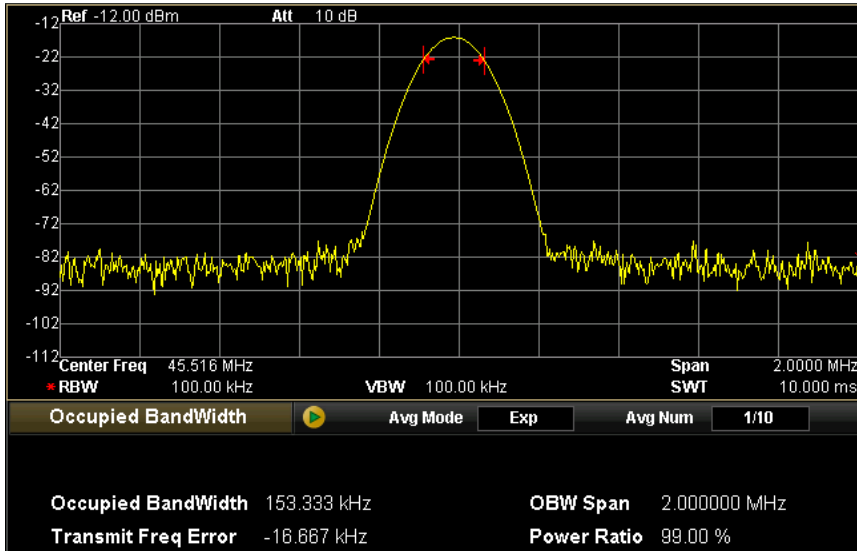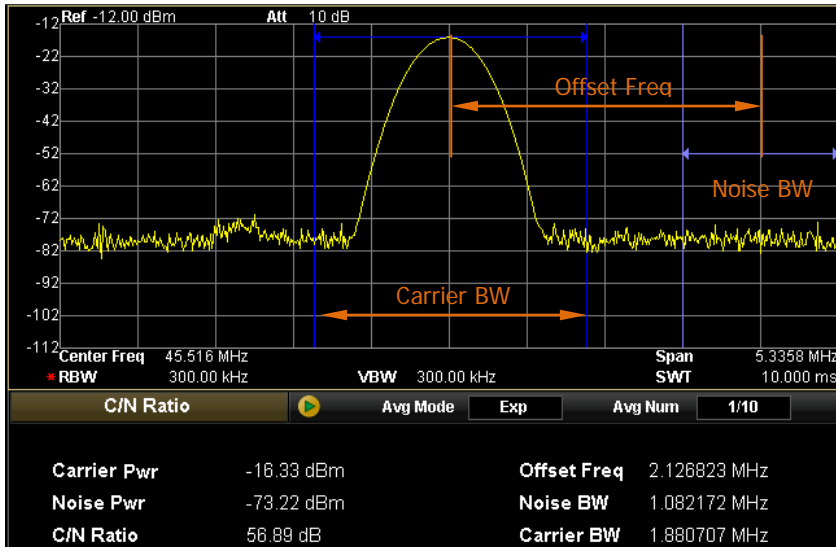


**5. EBW (Emission Bandwidth)**

Measures the bandwidth of the two points at both sides of the max signal when the amplitude of this max signal falls off X dB within the span range.
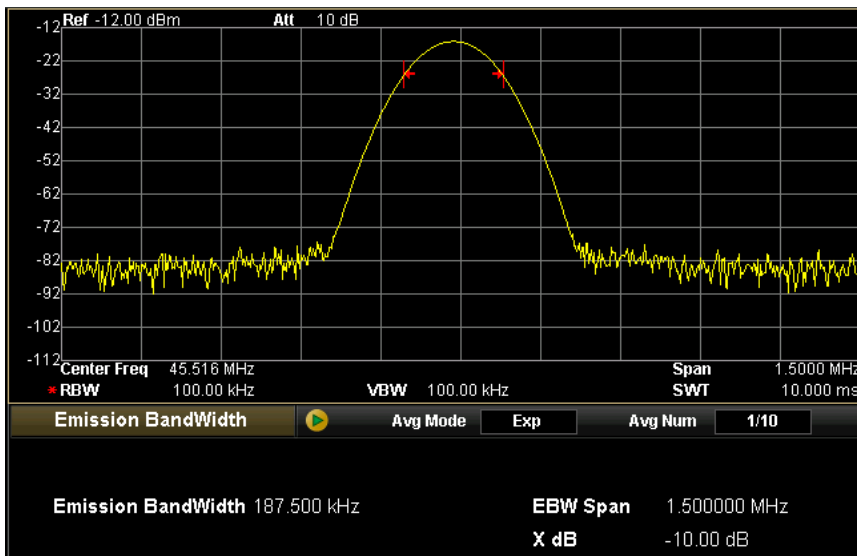
### 6. C/N Ratio

Measures the power of both the carrier and the noise within specified bandwidth and calculates their ratio.
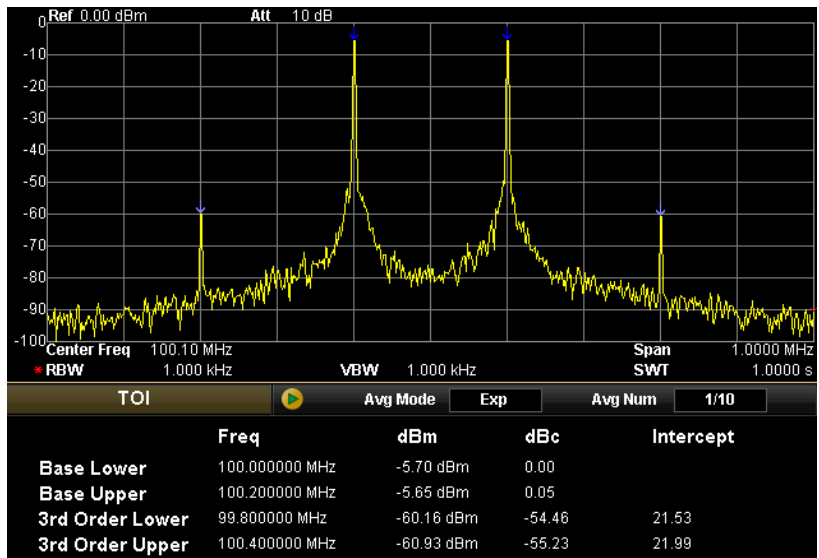


### 7. Harmo Dist (Harmonic Distortion)

Measures each order harmonic power and THD (Total Harmonic Distortion) of carrier. The available range is up to 10 orders. And the fundamental wave amplitude of the carrier must be higher than -50 dBm or else the measurement will be invalid.
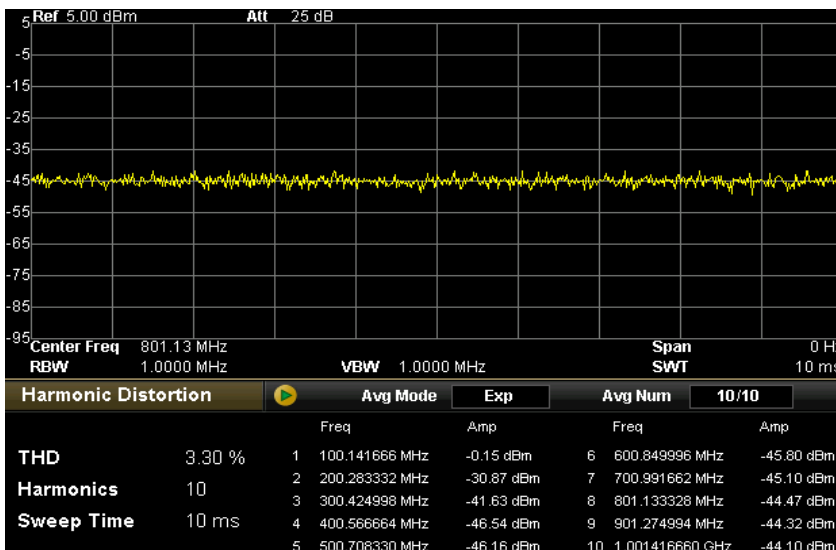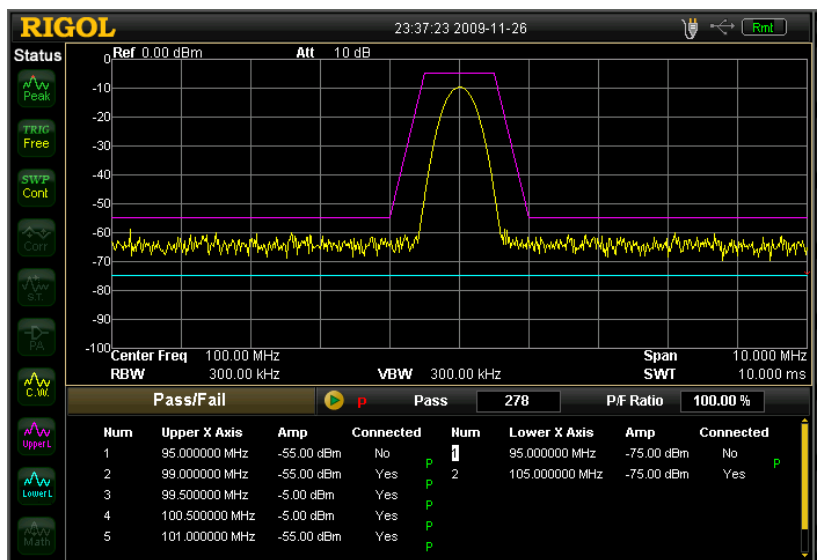
**8. TOI (Third Order Intermodulation)**

Measures the parameters of the TOI production generated by two signals which have the same amplitude and similar frequency. The measured results include the frequency and amplitude of the Base Lower, Base Upper, 3rd Order Lower and 3rd Order Upper signals, as well as the Intercept of both the 3rd Order Lower and 3rd Order Upper signals.



| | Freq | dBm | dBc | Intercept |
|---|---|---|---|---|
| Base Lower | 100.000000 MHz | -5.70 dBm | 0.00 | |
| Base Upper | 100.200000 MHz | -5.65 dBm | 0.05 | |
| 3rd Order Lower | 99.800000 MHz | -60.16 dBm | -54.46 | 21.53 |
| 3rd Order Upper | 100.400000 MHz | -60.93 dBm | -55.23 | 21.99 |

**9. Pass/Fail**

Compares the measured curve with the pre-edited, if the related rules are met, the result will be "Pass", or else is "Fail".



| Num | Upper X Axis | Amp | Connected | Num | Lower X Axis | Amp | Connected |
|---|---|---|---|---|---|---|---|
| 1 | 95.000000 MHz | -55.00 dBm | No | 1 | 95.000000 MHz | -75.00 dBm | No |
| 2 | 99.000000 MHz | -55.00 dBm | Yes | 2 | 105.000000 MHz | -75.00 dBm | Yes |
| 3 | 99.500000 MHz | -5.00 dBm | Yes | | | | |
| 4 | 100.500000 MHz | -5.00 dBm | Yes | | | | |
| 5 | 101.000000 MHz | -55.00 dBm | Yes | | | | |

# USB-GPIB Interface Converter

By using **RIGOL** USB-GPIB interface converter, the spectrum analyzer could be connected to a GPIB Bus Controller on PC. That is, the analyzer has been expanded GPIB interface and could finish all sorts of work more easily through GPIB instructions. And the main performance characters are shown below.

- Enable GPIB control of the analyzer through the USB Host port.
- GPIB primary address of the analyzer can be assigned through the host instrument (PC).
- Powered by USB Host, do not need external power supply.
- LED indicator provides the power status.

Connect the USB interface of the converter to the USB Host interface of the analyzer, and connect the GPIB interface to the GPIB Bus Controller on PC.
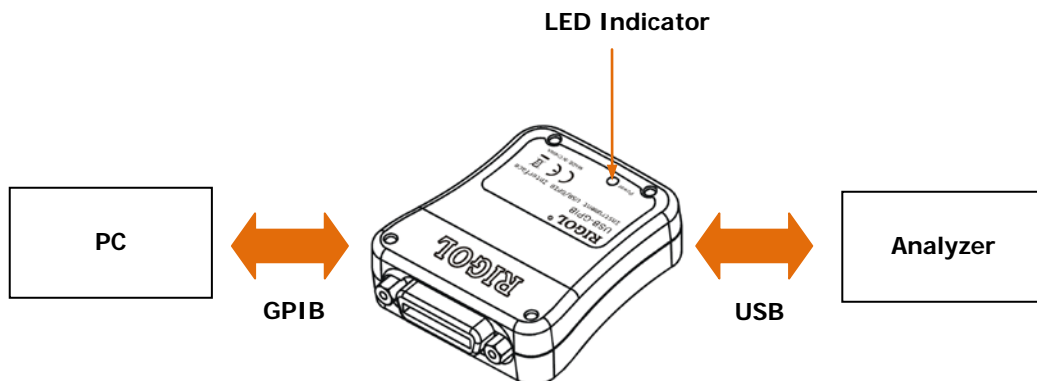
# Lithium Battery (China Only)

The spectrum analyzer provides optional rechargeable battery. Please install the battery according to the method as shown in the figure below.
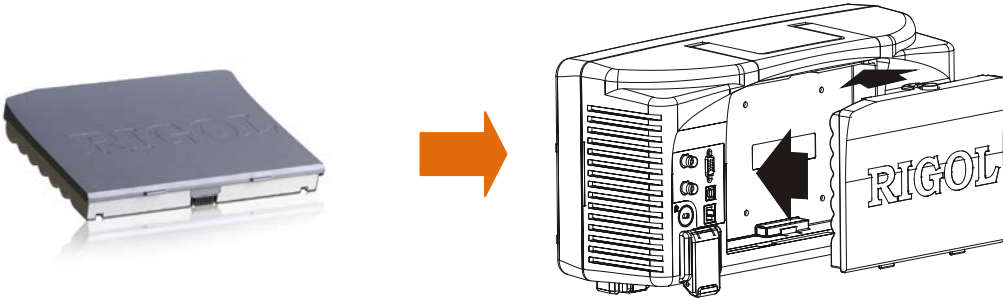


## Use the Battery

The battery status indicator ▮▮▮ at the front panel indicates the installation status and the current amount of electricity of the battery.

- Green: battery electricity>80%
- Orange: 20%< battery electricity <80%
- Red: battery electricity <20%
- Off: the battery is not installed or the battery contains no electricity

## Charge the Battery

The battery contains a certain amount of electricity before leaving the factory. For a charge, please install the battery. Then, connect the AC power and turn on the power switch at the rear panel to charge the battery. The battery status indicator ▮▮▮ at the front panel indicates the charge progress. If the battery status indicator does not go on, the battery contains no electricity currently. If the battery status indicator still does not go on after the battery has been charged for half an hour, please cut off the AC power and check whether the battery is correctly installed or whether it is damaged.

Note that about 10 hours are required for the battery to be fully charged.

## Battery Specifications

| Main Specifications | Ratings | Comments |
|---|---|---|
| Conventional Capacity | 15400 mAh | 0.1 C Charging, 0.2 C Discharging (at 25±2 ℃ temperature) |
| Minimum Capacity | 14100 mAh | |
| Conventional Voltage | 11100 mV | |
| Power | 147 Wh | |
| Material | Lithium Battery Pack | |
| L×W×H | 207mm×163mm×40mm | |
| Weight | <1100 g | |
| Operating Temperature | Standard Charging Temperature Range 0~45 ℃ | Humidity 45%~85%RH |
| | Discharging Temperature Range 0~60 ℃ | |
| Storage Temperature Range | <30 ℃ (the recommended value) | You must charge to 60%~70% every three months during the storage period. |

# Front Panel Cover

The cover is provided to avoid damage to the front panel of the analyzer during transportation.



Before putting your analyzer into action, remove the front panel cover by releasing latches at both sides, and sliding in the direction of the arrows as shown in the figure below.
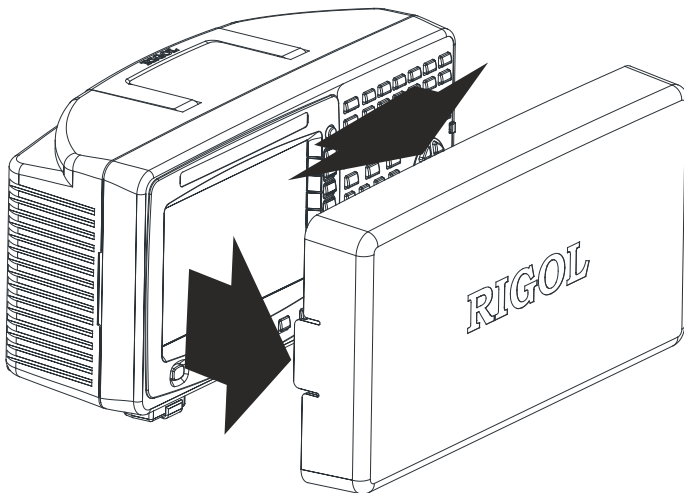
# Desk Mount Instrument Arm

Using an arm, the analyzer could be mounted on the workdesk to save your operation space. The height and angle of the instrument could be adjusted freely to acquire a supreme comfort and efficiency making measurement and observation conveniently. To use the arm, please order the related option.

The effects figures of an analyzer installed to an arm are given below.

# Rack Mount Kit

The analyzer could be installed in 19-inch standard machine cabinet, shown below.

## 1. Kit Parts List

| No. | Name | Qty. | Part Number | Description |
|---|---|---|---|---|
| 1-1 | Front Panel | 1 | RM-DSA-1-01 | |
| 1-2 | Support Board | 1 | RM-DSA-1-02 | |
| 1-3 | Left Plate | 1 | RM-DSA-1-03 | |
| 1-4 | Right Plate | 1 | RM-DSA-1-04 | |
| 1-5 | Fixed Figure | 2 | RM-DSA-1-05 | |
| 1-6 | Rear Support Bar | 1 | RM-DSA-1-06 | |
| 2-1 | M4 Screw | 20 | RM-SCREW-01 | M4*6 Phil-Slot Pan Head Machine Screw Nail |
| 2-2 | M6 Screw | 4 | RM-SCREW-02 | M6*16 Phil-Slot Pan Head Machine Screw Nail |
| 2-3 | M6 Nut | 4 | RM-SCREW-03 | M6*5 Square Machine Female Screw Contain Lock Blade |
| 2-4 | M4 Screw | 4 | RM-SCREW-04 | M4*8 Cross Recessed Pan Head Screw |

2-1          2-2          2-3          2-4
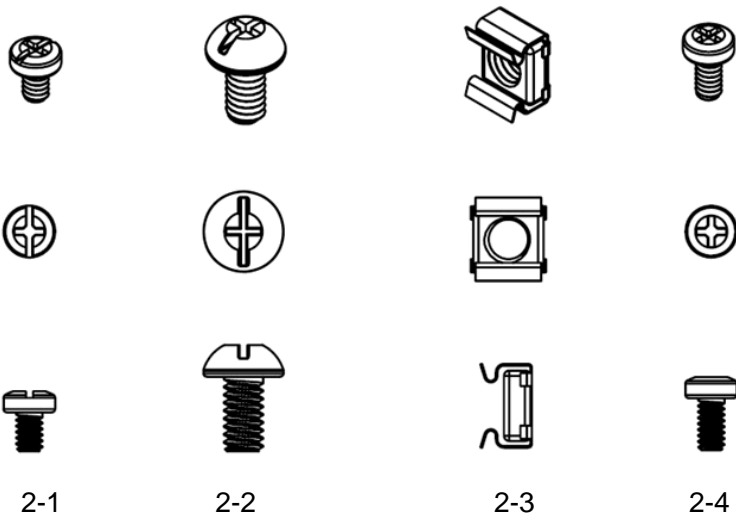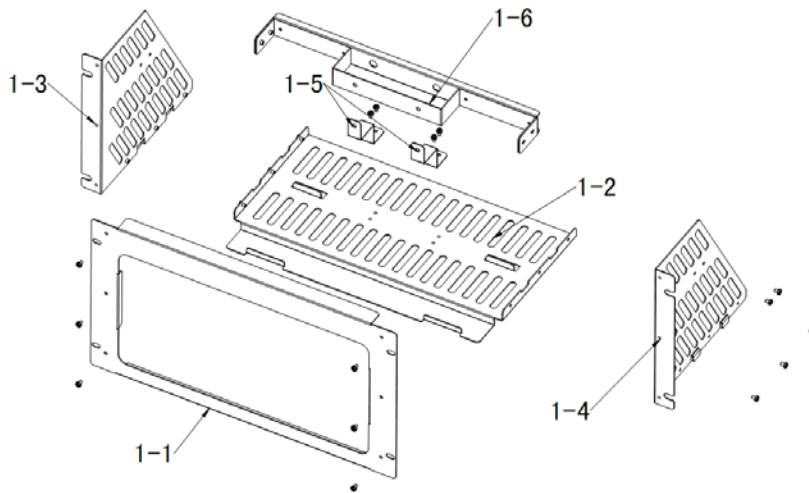
## 2.   Installation Tool

PH2 Phillips Screwdriver (recommended)

## 3. Space Requirements for Installation

The following requirements must be fulfilled by the machine cabinet in which the instrument is mounted.

● Dimension of the machine cabinet must be standard 19-inch.
● At least 6U (266.7mm) space should be provided by the machine cabinet.
● The depth inside the machine cabinet should not be less than 300 mm.

The dimension of the instrument after being installed is shown below.
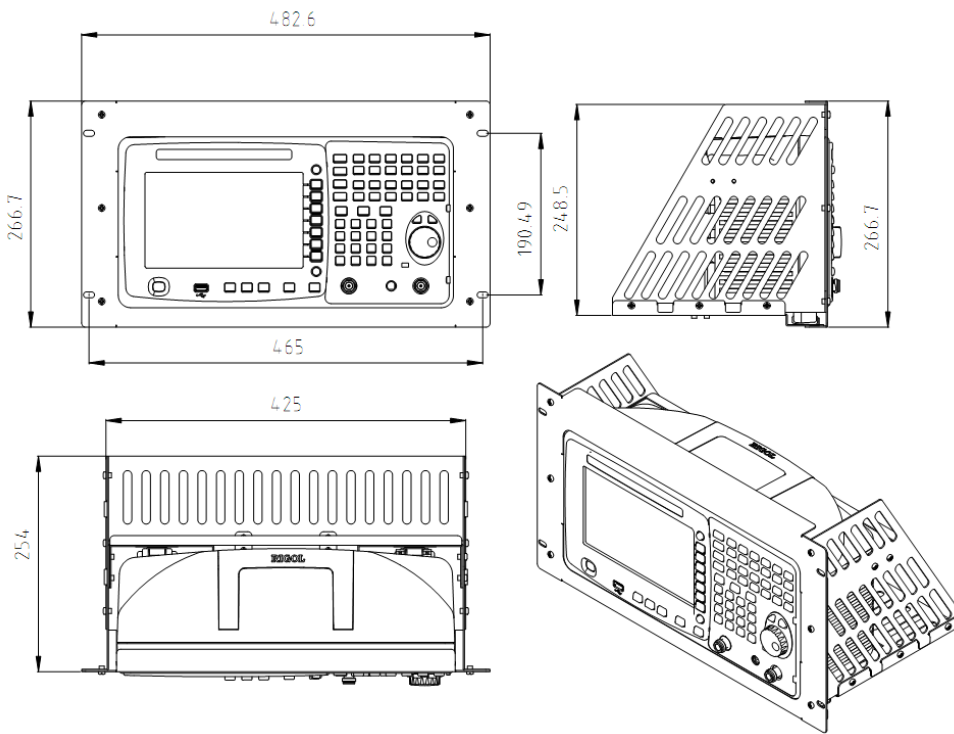
## 4.  Installation Procedures

A PH2 Phillips Screwdriver is recommended. Note that the instrument will be damaged or installed in rack incorrectly if the installation is not proper. Thus, only authorized operators can execute the installation operation.

**1)**  Install the right and left palate: aim the detents of right and left plate at the openings on support board and insert respectively, then fix them using six M4 screws.
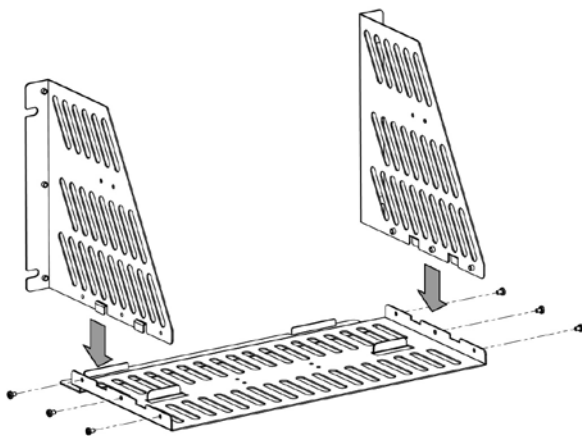
**2)**  Place the instrument: Remove the battery by pressing the button on top of it, and then place the instrument into the confined position on the Support Board.
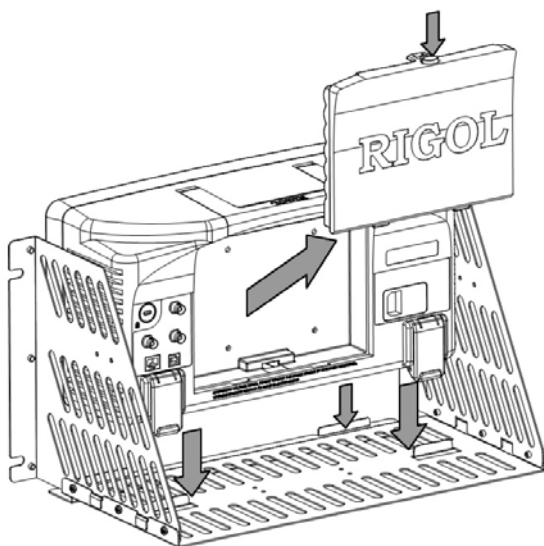
**3)** Fix the instrument: Fix a "Rear Support Bar" and two "Fixed Figure" on the instrument using four M4*8 Screws. Locate the instrument on proper location and then fixed the "Rear Support Bar" and "Fixed Figure" on the left/right board and the Support Board using eight M4*6 Screw.
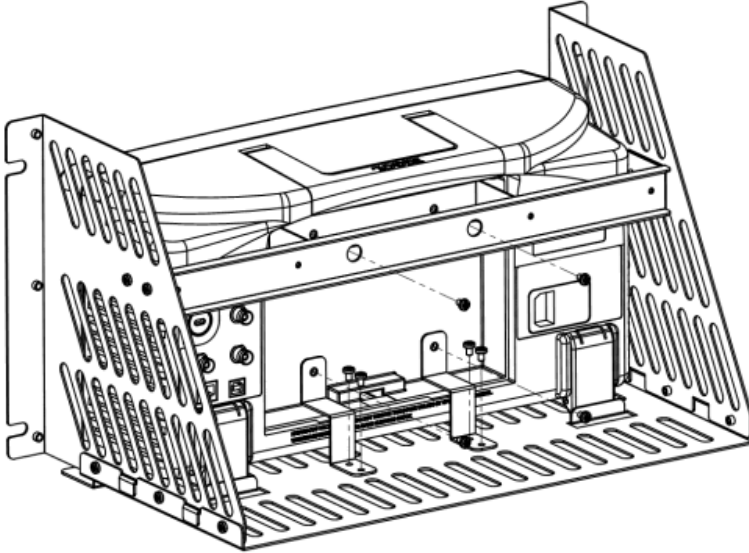


**4)** Mount Front Panel: Let the screw holes fitting well together, and aiming the instrument front panel at the opening of the Front Panel of the machine rack and fix them with six M4 screws.
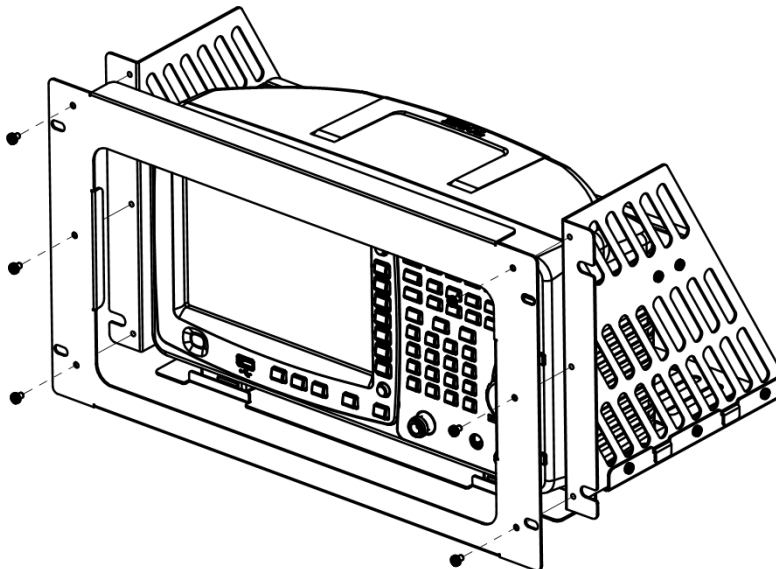
**5)** Load into machine cabinet: mount the rack with instrument-fixed into a standard 19-inch machine cabinet respectively using four M6 screws and square nuts.
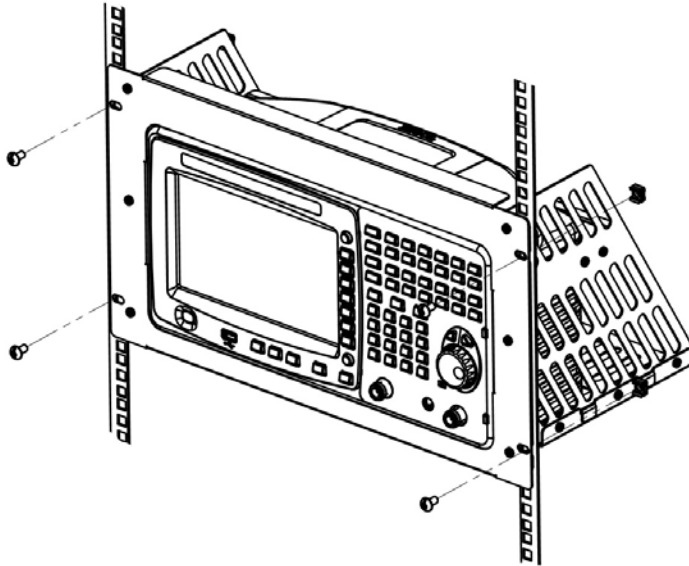


**6)** Notice: The rack holds a height of 6U, and the holes those in compliance with the arrow direction are the mounting holes for rack.
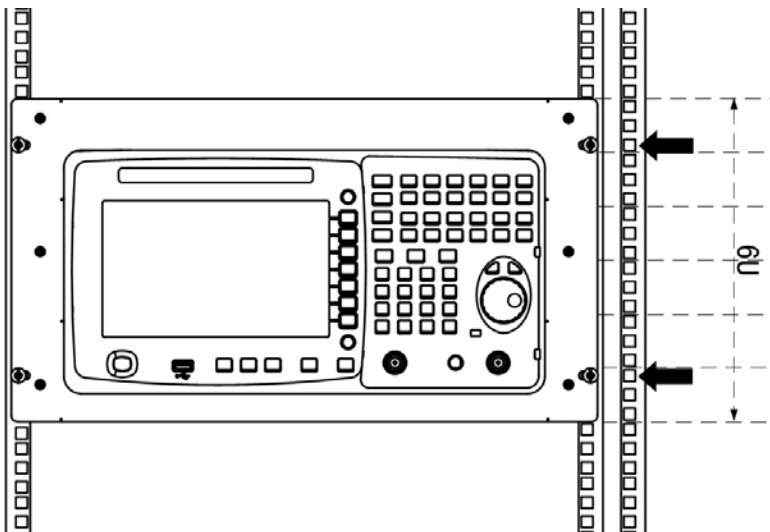
# Soft Carrying Bag

The bag is designed by **RIGOL** for utility model measurement instruments. It has reasonable structure as adopting some improvements according to the instrument and practical application. It is in conformity with human engineering and could help you to carry instrument and its accessories easily with comforts and conveniences.

## Main features

- Could be held by hand, one-shoulder or shoulders. In addition, one of the belts could be adjusted as neck strap through the vertical strap loop, while another one as waist strap. In this condition, the operator could execute the measurement work, and it could reduce the load on shoulders.
- Soft bag body. And the shoulder straps and belts are equipped by sponge to increase the contact area of the case on human body. It is in conformity with human engineering and provides greatly comforts.
- A strap collection box at the bottom of the case is designed to collect the straps while using belts and ensure the straps do not prevent user's work.
- Many pockets inside for organizing the instrument accessories; have strong accommodating function.
- The built-in water-proof bag can accommodate the case body entirely to avoid damage from water or rain and ensure its normal use and service life; while not in use, fold it up and place it in the hidden pocket outside of the case body and without preventing normal applications.

**Held by shoulders**  **Held by Neck&Waist**  **Carried by Hand**
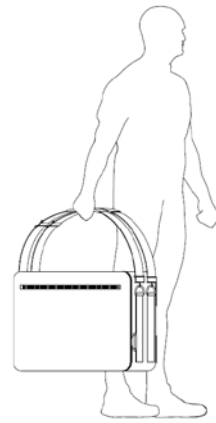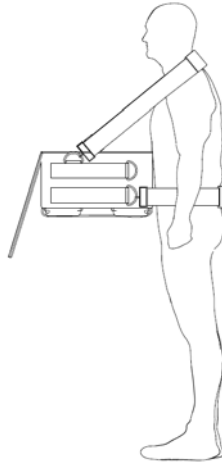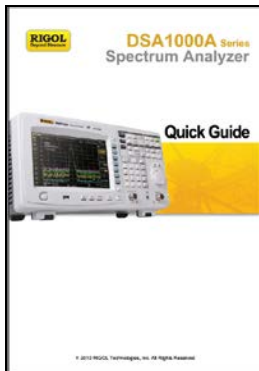
# Other Accessories

Accessories along with the instrument are shown below. Note that the pictures here are for your reference only. Some differences may exist.



Power Cord



USB Cable



Quick Guide



CDROM[1]



Front Panel Cover

**Note:** [1] The CD contains *User's Guide*. If there are some modifications on it, Please be according to the version on the **RIGOL** website.