3.0GHz Spectrum Analyzer

SPA-3000

USER MANUAL

The information in this manual was correct at the time of printing. However, Good Will continues to improve products and reserves the rights to change specification, equipment, and maintenance procedures at any time without notice.

Com-Power Corporation

114 Olinda Drive, Brea, California 92823

Table of Contents

SAFETY INSTRUCTIONS

This chapter contains important safety instructions that you must follow when operating SPA-3000 and when keeping it in storage. Read the following before any operation to insure your safety and to keep the best condition for SPA-3000.

Safety Symbols

These safety symbols may appear in this manual or on SPA-3000.

 WARNING	Warning: Identifies conditions or practices that could result in injury or loss of life.
 CAUTION	Caution: Identifies conditions or practices that could result in damage to SPA-3000 or to other properties.
	DANGER High Voltage
	Attention Refer to the Manual
	Protective Conductor Terminal
	Earth (ground) Terminal

Safety Guidelines

General Guideline

CAUTION

- Make sure that the RF input level and the Tracking Generator output reversed power level do not exceed +30dBm.
- Do not supply an input signal to the Tracking Generator output.
- Do not place any heavy object on SPA-3000.
- Avoid severe impacts or rough handling that leads to damaging SPA-3000.
- Do not discharge static electricity to SPA-3000.
- Use only mating connectors, not bare wires, for the terminals.
- Do not block or obstruct the cooling fan vent opening.
- Do not perform measurement at power source and building installation site (Note below).
- Do not disassemble SPA-3000 unless you are qualified as service personnel.

(Note) EN 61010-1:2001 specifies the measurement categories and their requirements as follows. SPA-3000 falls under category II.

- Measurement category IV is for measurement performed at the source of low-voltage installation.
- Measurement category III is for measurement performed in the building installation.
- Measurement category II is for measurement performed on the circuits directly connected to the low voltage installation.

Power Supply

WARNING

- AC Input voltage: 100 ~ 240 V AC, 50/60Hz
- DC Input voltage: 12V DC, 40W maximum
- The power supply voltage should not fluctuate more than 10%.
- Connect the protective grounding conductor of the AC power cord to an earth ground, to avoid electrical shock.

Battery

CAUTION

- Rating: 10.8V Li-Ion battery pack x 2
- Turn Off the main power switch before installing or taking out the battery packs.

Fuse ⚠ WARNING	• Fuse type: T1.6A/ 250V • Make sure the correct type of fuse is installed before power up. • To ensure fire protection, replace the fuse only with the specified type and rating. • Disconnect the power cord before fuse replacement. • Make sure the cause of fuse blowout is fixed before fuse replacement.
Cleaning SPA-3000	• Disconnect the power cord before cleaning. • Use a soft cloth dampened in a solution of mild detergent and water. Do not spray any liquid into SPA-3000. • Do not use chemical or cleaner containing harsh material such as benzene, toluene, xylene, and acetone.
Operation Environment	• Location: Indoor, no direct sunlight, dust free, almost non-conductive pollution (Note below) • Relative Humidity: < 90% • Altitude: < 2000m • Temperature: 18°C to 28°C (Note) EN 61010-1:2001 specifies the pollution degrees and their requirements as follows. SPA-3000 falls under degree 2. Pollution refers to "addition of foreign matter, solid, liquid, or gaseous (ionized gases), that may produce a reduction of dielectric strength or surface resistivity". • Pollution degree 1: No pollution or only dry, non-conductive pollution occurs. The pollution has no influence. • Pollution degree 2: Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected. • Pollution degree 3: Conductive pollution occurs, or dry, non-conductive pollution occurs which becomes conductive due to condensation which is expected. In such conditions, equipment is normally protected against exposure to direct sunlight, precipitation, and full wind pressure, but neither temperature nor humidity is controlled.
Storage Environment	• Location: Indoor • Relative Humidity: < 85% • Temperature: 0°C to 40°C

Power cord for the United Kingdom

When using SPA-3000 in the United Kingdom, make sure the power cord meets the following safety instructions.

NOTE: This lead / appliance must only be wired by competent persons

WARNING: THIS APPLIANCE MUST BE EARTHED

IMPORTANT: The wires in this lead are coloured in accordance with the following code:

Green/ Yellow:	Earth
Blue:	Neutral
Brown:	Live (Phase)

As the colours of the wires in main leads may not correspond with the colours marking identified in your plug/appliance, proceed as follows:

The wire which is coloured Green & Yellow must be connected to the Earth terminal marked with the letter E or by the earth symbol ⏚ or coloured Green or Green & Yellow.

The wire which is coloured Blue must be connected to the terminal which is marked with the letter N or coloured Blue or Black.

The wire which is coloured Brown must be connected to the terminal marked with the letter L or P or coloured Brown or Red.

If in doubt, consult the instructions provided with the equipment or contact the supplier.

This cable/appliance should be protected by a suitably rated and approved HBC mains fuse: refer to the rating information on the equipment and/or user instructions for details. As a guide, cable of 0.75mm2 should be protected by a 3A or 5A fuse. Larger conductors would normally require 13A types, depending on the connection method used.

Any moulded mains connector that requires removal /replacement must be destroyed by removal of any fuse & fuse carrier and disposed of immediately, as a plug with bared wires is hazardous if a engaged in live socket. Any re-wiring must be carried out in accordance with the information detailed on this label.

GETTING STARTED

This chapter describes SPA-3000 in a nutshell, including its main features, package contents, and front / rear / display panel introduction. After going through the overview, follow the Power-up sequence and Functionality check section to properly setup SPA-3000.

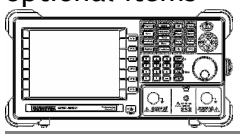
SPA-3000 Characteristics

SPA-3000 is a middle- to high-range digital storage spectrum analyzer suitable for wide range of applications, such as production testing, research, and field verification.

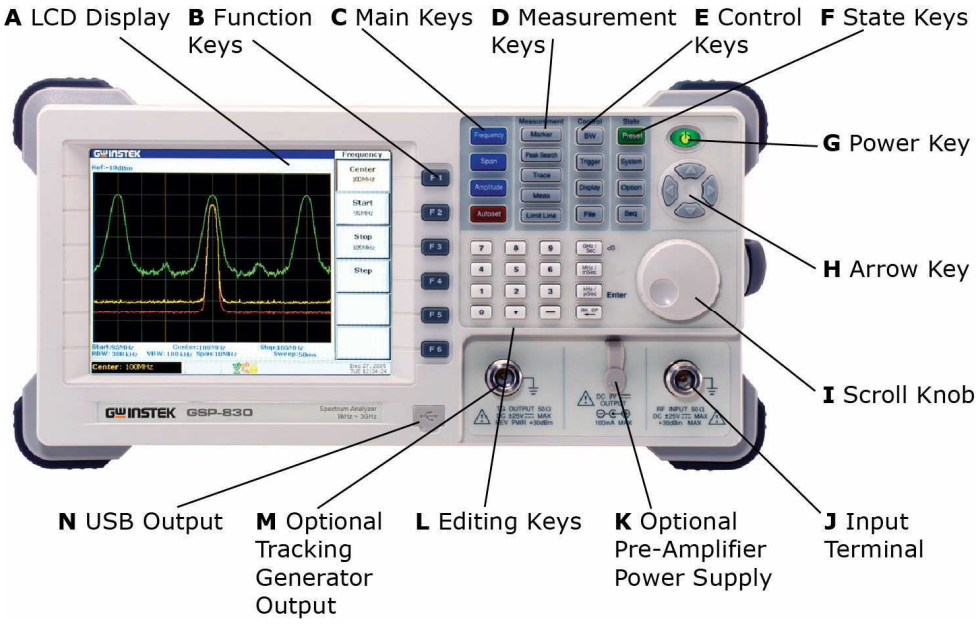
Performance	• Low noise floor: -117dBm @600MHz, 3k RBW • Fast sweep: 50ms ~ 25.6s range • Compact size: 330(W) x 170(H) x 340(D) mm • Light weight: 5.8kg (without options)
Features	• Autoset • 5 markers with Delta Marker and Peak functions • 3 traces • Power measurements: ACPR, OCBW, N-dB, Phase Jitter • Pass/Fail test with Limit Line editing • Split windows with separate settings • Sequence programming (user-defined macro) • 6.4" TFT color LCD, 640 x 480 resolution • Phone output (available in optional Demodulator) • AC/DC/Battery multi-mode power operation
Interface	• USB host for storage device connection • USB slave/GPIB for PC software connection and remote control • Direct VGA display image output • Reference signal input/output for synchronization • External trigger signal input

Package Contents

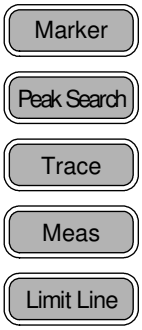
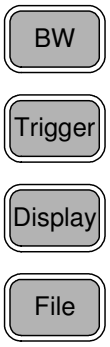
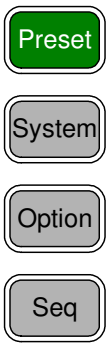
Contact your dealer in case there is a missing item.

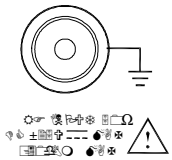
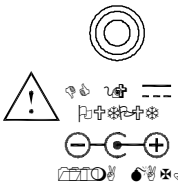
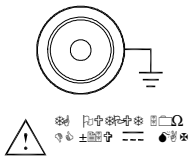
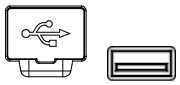
SPA-3000 + pre-installed optional items 	The following, , are factory installed items. • 9kHz & 120kHz RBW (*) • GPIB interface
Peripherals	• Power cord • User Manual (this document)

Front Panel Overview



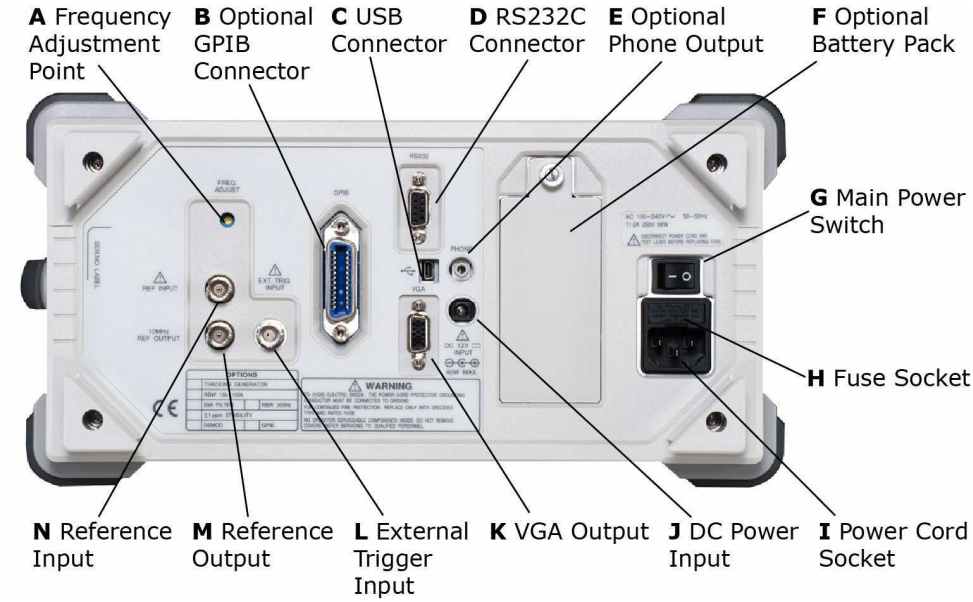
A	LCD Display	TFT Color display, 640x480 resolution. For display setting details, see page114.	
B	F1~F6 Function Keys	F 1 ~ F 6	Soft keys linked to the menu that appears on the right side of the display.
C	Main Keys	Frequency Span Amplitude Autoset	**Frequency key** (page44), together with **Span key**, configures horizontal (frequency) scale. **Amplitude key** (page51) configures vertical (amplitude) scale and input impedance. **Autoset key** (page62) automatically configures the most appropriate horizontal and vertical scale for input signal.

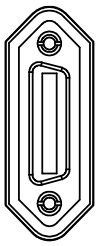
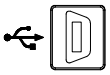
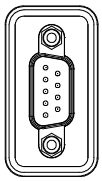
D	Measurement keys		**Marker key** (page65) activates markers and places them on specified locations. **Peak Search key** (page72) searches peak signals and configures peak ranges/orders. **Trace key** (page77) activates trace signals, configures them, and runs trace math operations. **Measurement key** (page87) configures and runs 4 types of power measurements: ACPR, OCBW, N-dB, and Phase jitter. **Limit Line key** (page96) configures high/low limit lines and runs Pass/Fail test.
E	Control keys		**BW key** (page102) configures RBW/VBW width, sweep time length, and waveform averaging number. **Trigger key** (page110) selects trigger type, sets trigger running mode / delay / frequency, and activates external trigger input. **Display key** (page114) configures LCD dimmer, edits and shows display line/title, and activates split windows. **File key** (page120) saves/recalls/deletes trace waveform, limit line, amplitude correction, sequence (macro), and panel setup. It also saves display image through USB port.
F	State Keys		**Preset key** (page43or130) resets SPA-3000 to a predefined state. **System key** configures date/time (page139), GPIB/RS232C interface (page133), and language (page143). Shows system information (page135) and self test result (page138). Saves/recalls panel setup (page132). **Option key** configures Tracking Generator (page150), Demodulator (page152), Battery (page156), and External reference frequency (page140). **Seq key** (page144) edits and runs sequence (user-defined macro).

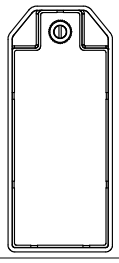
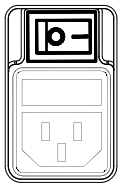
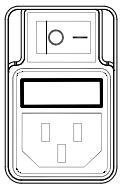
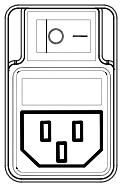
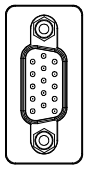
G	Power Key		Power key selects the power state between Standby mode (Red LED On) and Power On mode (Green LED On). For main power On/Off, use the Power switch on the rear panel. For power up sequence, see page22.
H	Arrow Key		Arrow key selects parameters in various occasions; Up/Right for increasing, Down/Left for decreasing.
I	Scroll Knob		Scroll knob sets or selects parameters in various occasions. In some cases, it works in tandem with the Arrow key.
J	Input Terminal		Input terminal accepts RF input signal. Maximum +30dBm, 50Ω.
K	Pre-Amplifier Power Supply Terminal		Accessory power supply terminal.
L	Numerical Keys	Numerical keys set various parameters. In some cases, they work in tandem with the Arrow key / Scroll knob.	
M	TG Output Terminal		Not available with SPA-3000
N	USB Output Connector		USB host, typeA, male connector saves and recalls data or display image (page120).

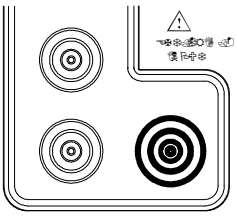
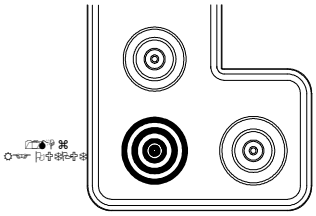
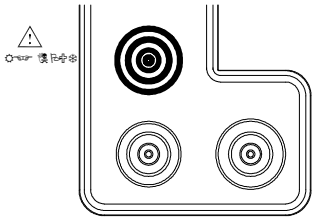
Example	Key sequence
9kHz	9 kHz / µSec Enter
−3.8dB	− 3 • 8 GHz / Sec dB
1.0mS	1 • 0 MHz / mSec
9 + Enter	9 kHz / µSec Enter
Correction	BK SP

Rear Panel Overview

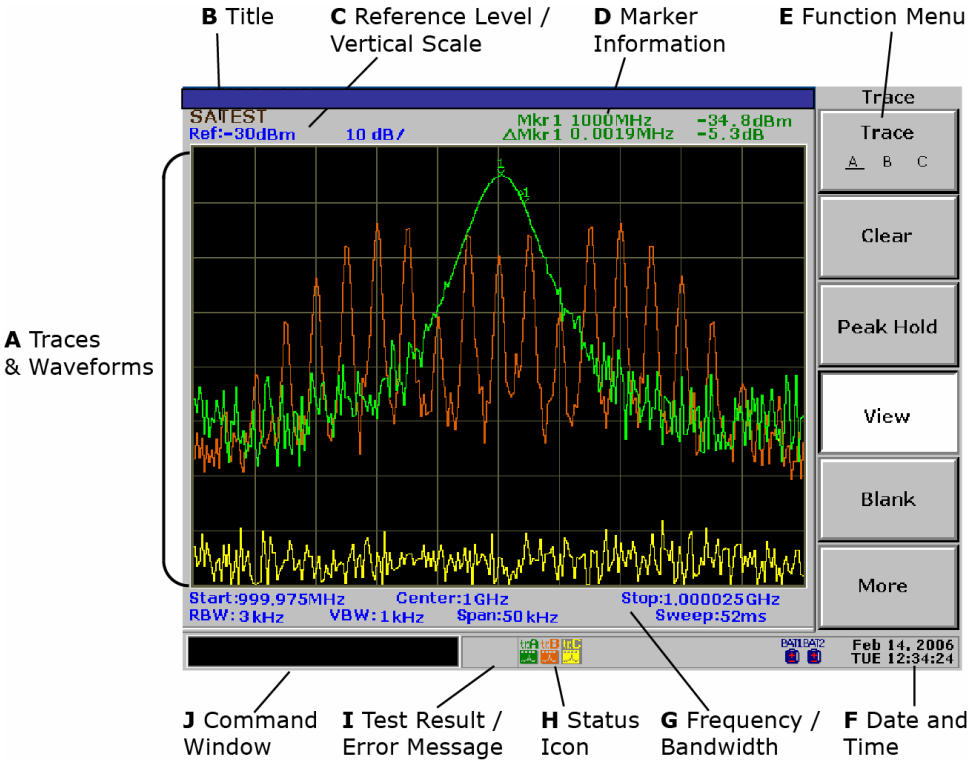


A	Frequency Adjustment Point		Adjusts the internal reference signal frequency; for service operation only.
B	GPIB Connector (Optional)		Optional 24 pin female GPIB connector for remote control (page166). For interface setting details, see page134.
C	USB Connector		Type B mini connector for PC software connection (page158) and remote control (page166). For interface setting details, see page133.
D	RS232C Connector		9 pin female connector for PC software connection (page158) and remote control (page166). For interface setting details, see page133.

E	Phone Output (Optional)		3.5mm phone jack for audio output. Available when the optional Demodulator is installed. For details, see page152.
F	Battery Pack (Optional)		Optional battery pack for portable usage. Installed together with DC operation module. For details, see page156.
G	Main Power Switch		The main switch for turning On/Off the power. For Power up sequence, see page22.
H	Fuse Socket		Stores T1.6A 250V rating fuse. For fuse related safety instructions, see page8.
I	Power Cord Socket		Accepts the AC power cord, 100~240V, 50/60Hz rating. For power related safety instructions, see page8.
J	DC Power Input		Optional power input, DC 12V, 40W max rating. Installed together with the battery pack. For details, see page157.
K	VGA Output		15pin, female VGA connector that outputs 640 x 480 resolution display image to an external monitor. For details, see page118.

L	External Trigger Input		Accepts a trigger signal from an external device. For details, see page110.
M	Reference Output		Outputs +5V TTL, 10MHz reference signal used for synchronizing SPA-3000 with external device. For details, see page140.
N	Reference Input		Accepts a signal from an external device, used for synchronization with SPA-3000. For details, see page142.

Display Overview



A	Traces & Waveforms	Input signal and trace that appears on the main display area. Input signal & TraceA: Green, TraceB: Red, TraceC: Yellow. For trace details, see page77.
B	Title	Title of the current display. For details, see page116.
C	Reference Level/Scale	Reference amplitude level and vertical scale. For amplitude details, see page51.
D	Marker Information	The frequency and amplitude for the active marker / delta marker. For marker details, see page65.
E	Function Menu	The menu associated with F1~F6 function keys on the right side of the display.
F	Date and Time	Current date and time. For setup details, see page139.
G	Frequency/ Bandwidth	Upper line: shows the Start/Stop frequency (page47) and the Center frequency (page45). Lower line: shows the Video bandwidth (page105), the Resolution bandwidth (page103), the frequency Span (page45), and the Sweep time (page108).

H	Status Icon	The icons showing various system conditions. See the below Status Icon Overview for details.
I	Test Result/ Error Message	The result of the Pass/Fail test using the Limit lines (page100) or the system error messages (page135).
J	Command Window	Shows the current status of the selected menu or the entered parameters such as frequency and amplitude.

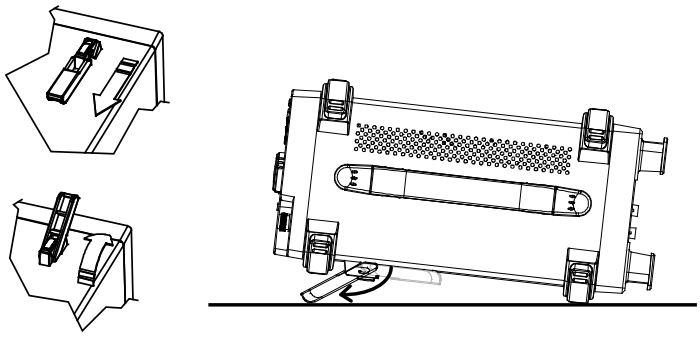
Status Icon Overview

Amplitude (page51)	 External gain On, Amplitude correction On, Input impedance 75Ω, Input impedance calibration On	
Peak Search (page72)	 Peak Track On	
Trace (page77)	TraceA:green  , B:red  , C:yellow 	
	 Clear mode	 Average On
	 Peak Hold mode	 View mode, Trace math
BW (page102)	 RBW, VBW manual mode	 Sweep time manual mode
Trigger (page110)	 Video trigger mode	 External trigger signal On
Battery level (page156)	 Fully charged	 50% ~ 25%
	 75% ~ 50%	 Less than 25%
Options	 TG normalization activated (page150)	 External Reference Signal used (page140)
	 ±1ppm Stability module installed (page140)	
Sequence(page144)	 Sequence currently running	
USB	 USB flash drive is detected (page121), or USB remote control connection is detected (page167)	

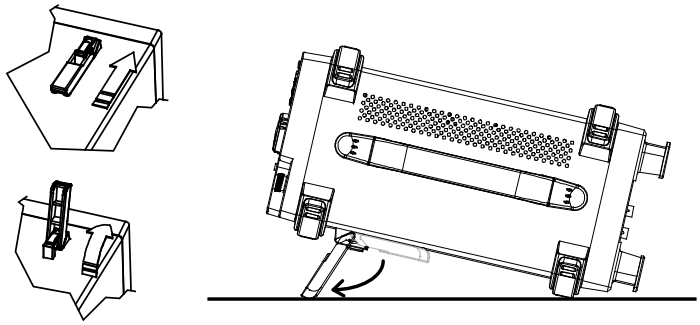
Tilt Stand & Power Up

Tilt stand

Low angle

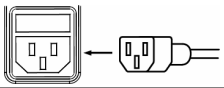


High angle

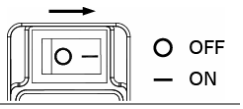


Power Up

1. Connect the Power cord to the rear panel socket.



2. Turn On the Main power switch.



3. The ON/STBY key on the front panel turns red.

4. Press the ON/STBY key. Its color turns green and the display becomes active.

Error Check

- This section assumes that SPA-3000 is already powered up (page22).

1. Check system error

Check the bottom of the display, next to the command window, to see if there is any error message.

(EXT Unlock)

Contact the service center if any of the following messages appears.

EXT Unlock	External reference input is not working properly.
Ref Unlock	Internal reference signal is not working properly.
LO1 Unlock	Local oscillator 1 is not working properly.
LO3 Unlock	Local oscillator 3 is not working properly.

2. Check self test result

View SPA-3000's self-diagnosis test result. Press the System key→ F6 (More) → F2 (Self Test).

The test automatically runs at each power-up. The underline shows the result, Pass or Fail. Contact the service center if any of the items fails.

GPIB Pass Fail	F 1	GPIB module connectivity (available only when installed)
Flash Pass Fail	F 2	Internal Flash memory for storing the system code/data
SDRAM Pass Fail	F 3	Internal SDRAM for running the system code
RTC Pass Fail	F 4	Internal real time clock for configuring the date and time

Functionality Check

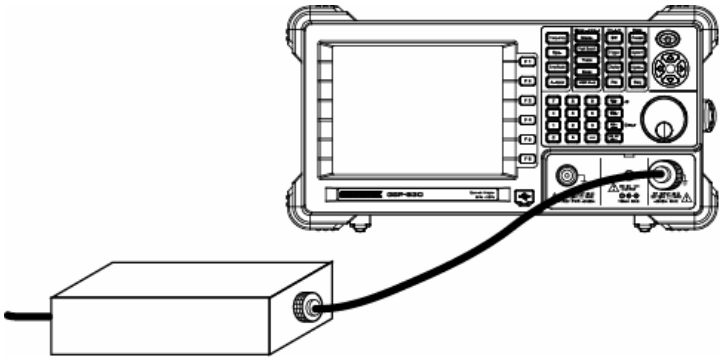
- This section assumes SPA-3000 is already powered up (page22).
- Before operating SPA-3000 in a new environment, run these steps to make sure it is functionally stable.

1. Feed a signal

Input a signal to check if SPA-3000 correctly shows the waveform on the display. There are two ways to feed an input signal.

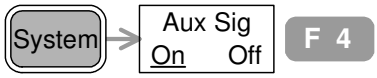
Feed the DUT signal

If the Device Under Test is already available, connect the output signal to the RF input terminal. The signal amplitude must be less than +30dBm.



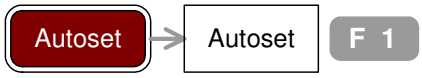
Feed the internal auxiliary signal

You can also use the internal auxiliary signal, 100MHz/−30dBm. No cable connection is required in this case. Activate the signal by pressing the System key→ F4 (Aux Sig On).



2. View signal

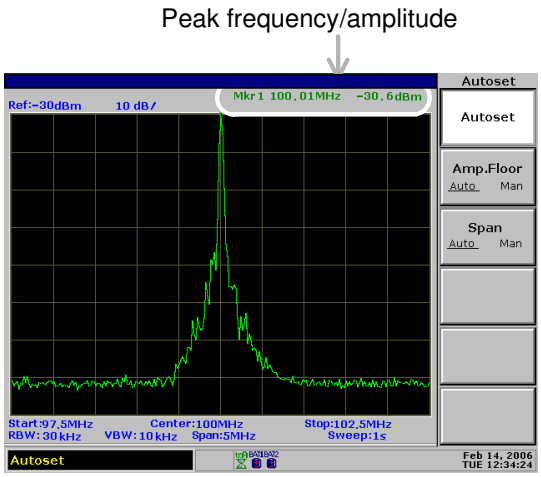
Press the Autoset key→ F1 (Autoset).



SPA-3000 automatically configures the horizontal and vertical scales and shows the signal.

Check the peak frequency and amplitude that appear on the top right corner of the display. To move the marker, use the Scroll knob or Left/Right key.

Internal auxiliary signal, -30dBm @100MHz



If the displayed value does not match the actual signal, contact the service center.

QUICK REFERENCE

This chapter collects all the key sequences for panel operations, the menu contents on the display, and the factory installed setting recalled by the Preset key. Use this chapter as a handy reference when you need quick access to the intended operation, and when you need to get an overview of SPA-3000 functionalities.

Operation Shortcuts

Here is the list of operations introduced in this manual and their shortcuts.

Frequency and Span

Set Center Frequency and Span	Frequency→ F1, Span→ F1
Set Start and Stop Frequency	Frequency→ F2, F3
Set Frequency Step	Frequency→ F4
Activate Full Span (3.0GHz)	Span→ F2
Activate Zero Span (Time Domain)	Span→ F3
Recall Last Span	Span→ F4

Amplitude

Set Reference Level	Amplitude→ F1
Select Vertical Scale	Amplitude→ F2
Select Unit (dBm/dBmV/dBuV)	Amplitude→ F3→ F1~F3
Set External Offset	Amplitude→ F4
Activate Amplitude Correction	Amplitude→ F5→ F2
Select Amplitude Correction Set	Amplitude→ F5→ F1→ F1
Delete Amplitude Correction Item	Amplitude→ F5→ F1→ F2
Delete Amplitude Correction Set	Amplitude→ F5→ F1→ F3→ F1, F2
Undo Correction Item/Set Deletion	Amplitude→ F5→ F1→ F4
Save Amplitude Correction Set	Amplitude→ F5→ F1→ F5
Select Input Impedance (50Ω/75Ω)	Amplitude→ F6→ F1
Set Input Impedance Offset	Amplitude→ F6→ F2

Autoset

Run Autoset	Autoset→ F1
Set Amplitude Floor	Autoset→ F2
Set Frequency View Span	Autoset→ F3

Marker

Activate Normal Marker	Marker→ F1, F2
Activate Delta Marker	Marker→ F1, F2, F3
Activate All Normal Markers	Marker→ F6→ F3
Move Marker to Peak	Marker→ F4 or Peak Search→ F1
Move Marker and Peak to Center	Marker→ F4, F5 or Peak Search→ F5
Track Marker on Peak	Peak Search→ F6→ F4
Move Marker to Various Locations	Marker→ F6→ F4→ F1~F5
Show Marker Table	Marker→ F6→ F2
Put Marker on Trace	Marker→ F6→ F1

Peak Search

Search Peak Signal	Peak Search→ F1 or Marker→ F4
Search Next Peak	Peak Search→ F2, F3 (right), F4 (left)
Search Peak and Move to Center	Peak Search→ F5 or Marker→ F4, F5
Track Marker on Peak	Peak Search→ F6→ F4
Search Minimum Amplitude	Peak Search→ F6→ F5
Show Peak Table	Peak Search→ F6→ F1
Sort Peaks in Peak Table	Peak Search→ F6→ F2
Set Peak Threshold	Peak Search→ F6→ F3

Trace

Activate Trace	Trace→ F1
Update Trace in Real-Time (Default)	Trace→ F2
View Peak Hold Trace	Trace→ F3
Freeze Trace	Trace→ F4
Hide Trace	Trace→ F5
View Averaged Trace	Trace→ F6→ F1 or BW→ F4
Run Trace Math	Trace→ F6→ F2→ F1~F5
Select Signal Detection Mode	Trace→ F6→ F3→ F1~F5

Power Measurement

Activate ACPR	Meas→ F2
Set ACPR Main Channel Bandwidth	Meas→ F1→ F1
Set ACPR Channel Space	Meas→ F1→ F2
Set Adjacent Channel Offset	Meas→ F1→ F4→ F2, F4
Set Adjacent Channel Bandwidth	Meas→ F1→ F4→ F1, F3
Move ACPR Channel Up	Meas→ F4
Move ACPR Channel Down	Meas→ F5
Activate OCBW	Meas→ F3
Set OCBW Channel Bandwidth	Meas→ F1→ F1
Set OCBW Channel Space	Meas→ F1→ F2
Set OCBW %	Meas→ F1→ F3
Move OCBW Channel Up	Meas→ F4
Move OCBW Channel Down	Meas→ F5

Activate N dB	Meas→ F6→ F1
Set N dB Value	Meas→ F6→ F2
Activate Phase Jitter	Meas→ F6→ F3
Set Phase Jitter Offset	Meas→ F6→ F4→ F1(Start), F2(Stop)

Limit Line

Activate Limit Line	Limit Line→ F1 (High), F2 (Low)
Select Limit Line for Edit	Limit Line→ F3→ F1
Activate Limit Line Edit Table	Limit Line→ F3→ F2
Delete Limit Line Table Item	Limit Line→ F3→ F3 (Delete)
Delete All Table Item	Limit Line→ F3→ F4→ F1, F2
Undo Last Deletion	Limit Line→ F3→ F5
Run Pass/Fail Test	Limit Line→ F4
Select Pass/Fail Condition	Limit Line→ F5

Bandwidth

Select RBW	BW→ F1
Select VBW	BW→ F2
Set Sweep Time	BW→ F3
Set Trace Average Number	BW→ F4 or Trace→ F6→ F1
Reset RBW/VBW/Sweep to Auto	BW→ F5

Trigger

Select Free Run (Default)	Trigger→ F1
Select Video/External Trigger	Trigger→ F2
Select Trigger Mode	Trigger→ F3
Set Trigger Delay	Trigger→ F4
Set Trigger Frequency	Trigger→ F5
Run Trigger (in Single/Continuous)	Trigger→ F6

Display

Change Dimmer Level	Display→ F1
Show Display Line	Display→ F2
Clear Title	Display→ F3→ F1
Enter Title	Display→ F3→ F2~F4
Show Title	Display→ F3→ F5
Activate Split Display	Display→ F4→ F1 (Upper), F2 (Lower)
Alternate Upper/Lower Sweep	Display→ F4→ F3
Switch Split Display to Full Screen	Display→ F4→ F4

File

Select Copy Source File	File→ F1→ F1→ F1~F5
Select Copy Destination File	File→ F1→ F2→ F1~F5
Edit Copied File Name	File→ F1→ F3
Copy Selected File	File→ F1→ F4
Select File for Deletion	File→ F2→ F1→ F1~F5
Delete Selected File	File→ F2→ F2
Rename File	File→ F3→ F1
Confirm New File Name	File→ F3→ F2
Save Display Image to USB Drive	File→ F4→ F1→ F2
Rename File in USB Drive	File→ F4→ F1→ F1

Preset

Recall Preset Panel Setting	Preset

System

Save Setup	System→ F1→ F1~F2 (Select), F3 (Save)
Recall Setup	System→ F1→ F1~F2(Select),F4(Recall)
Set GPIB Address	System→ F2
Show RS-232C Configuration	System→ F3→ F1~F4
Activate Auxiliary Signal	System→ F4
Set Date	System→ F6→ F1→ F1→ F1~F4
Set Time	System→ F6→ F1→ F2→ F1~F3
Activate Clock Display	System→ F6→ F1→ F3
View Self Test Result	System→ F6→ F2→ F1~F4

View System Configuration	System→ F6→ F4
Select Language	System→ F6→ F5→ F1

Option (some items listed is not available with SPA-3000)

Activate Tracking Generator	Option→ F1→ F1
Set Tracking Generator Amplitude	Option→ F1→ F2
Normalize Tracking Generator	Option→ F1→ F3→ F1 (No), F2 (Yes)
Activate Normalized TG	Option→ F1→ F4
Set Ref Level for TG Normalization	Option→ F1→ F5
Activate FM Demodulator	Option→ F2→ F1
Activate AM Demodulator	Option→ F2→ F2
Activate Phone Output	Option→ F2→ F3
Set Phone Output Volume	Option→ F2→ F4
Set Squelch Level	Option→ F2→ F5
View Battery Level	Option→ F3
Set Ext. Reference Signal Frequency	Option→ F4

Sequence

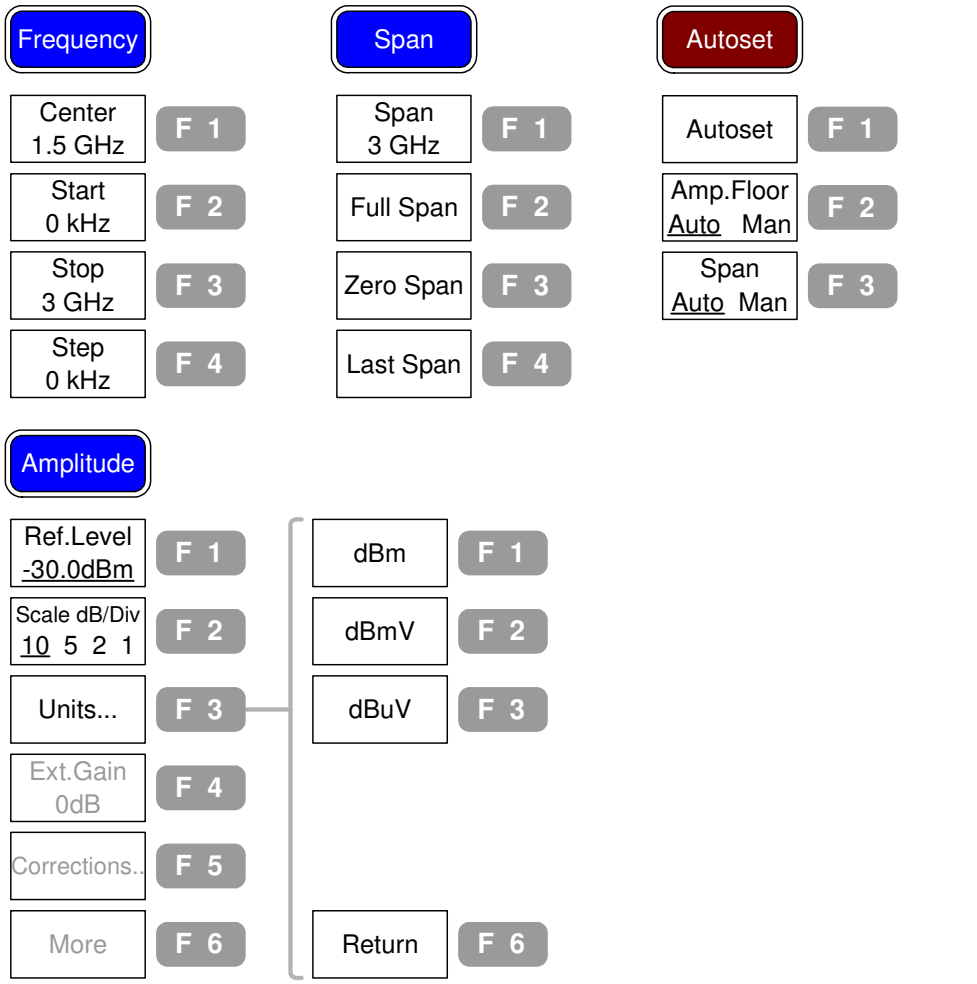
Select Sequence Set	Sequence→ F1, F2
Start Sequence Edit	Sequence→ F3→ F1
Insert 100ms Delay	Sequence→ F3→ F2
Insert Pause in Sequence	Sequence→ F3→ F3
Insert Another Sequence Set	Sequence→ F3→ F4→ F1~F2
Stop Sequence Edit	Sequence→ F3→ F5

Insert Item to Sequence Set	Sequence→ F3→ F6→ F1
Save Sequence Set	Sequence→ F3→ F6→ F2
Delete Sequence Item	Sequence→ F3→ F6→ F3
Delete Sequence Set	Sequence→ F3→ F6→ F4→ F1, F2
Undo Sequence Item/Set Delete	Sequence→ F3→ F6→ F5
Select Sequence Run Mode	Sequence→ F4→ F1
Run Sequence	Sequence→ F4→ F2
Delete All Sequence Set	Sequence→ F5→ F1 (No), F2 (Yes)

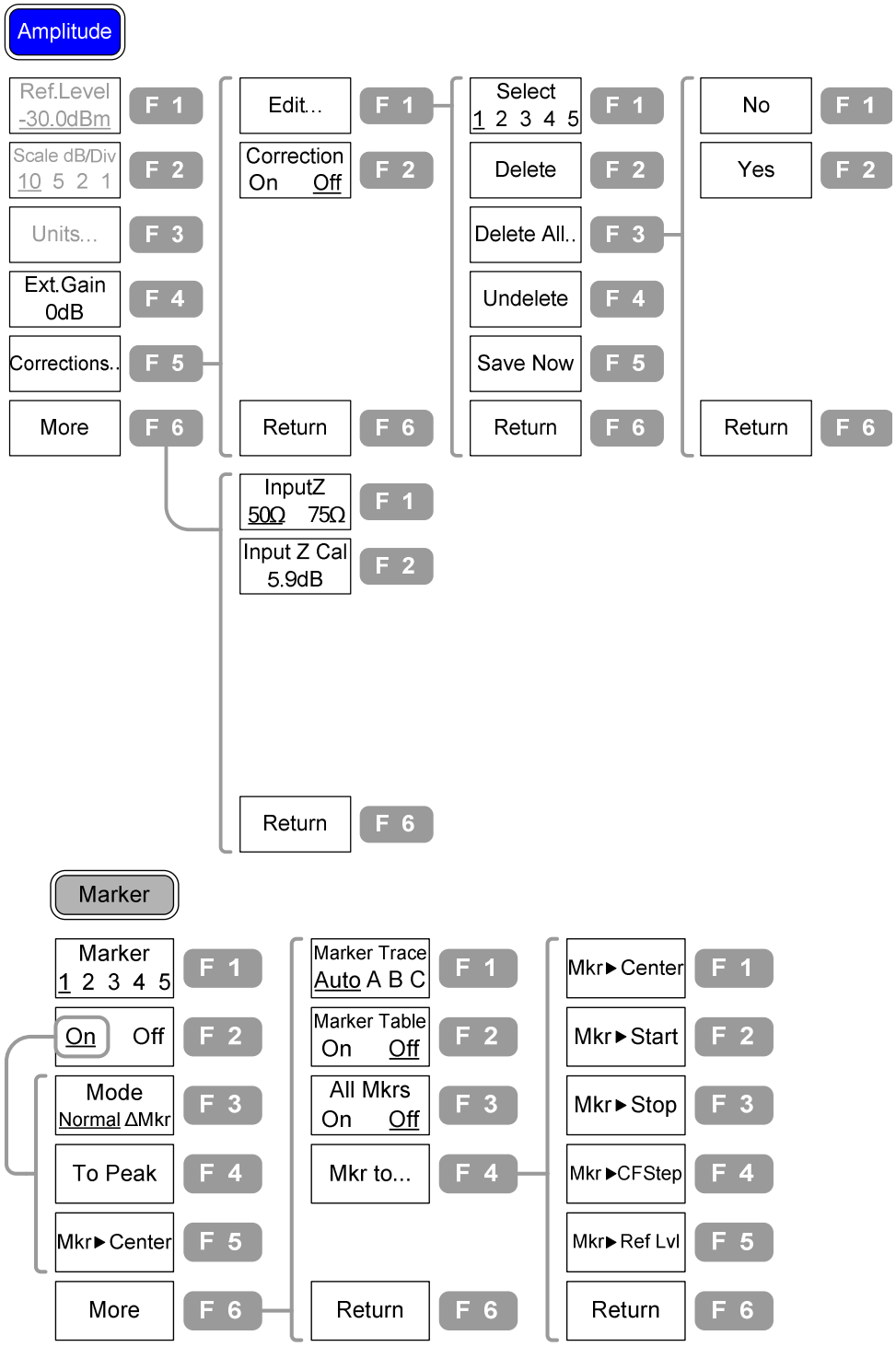
Menu Tree

Preset key does not have menu.

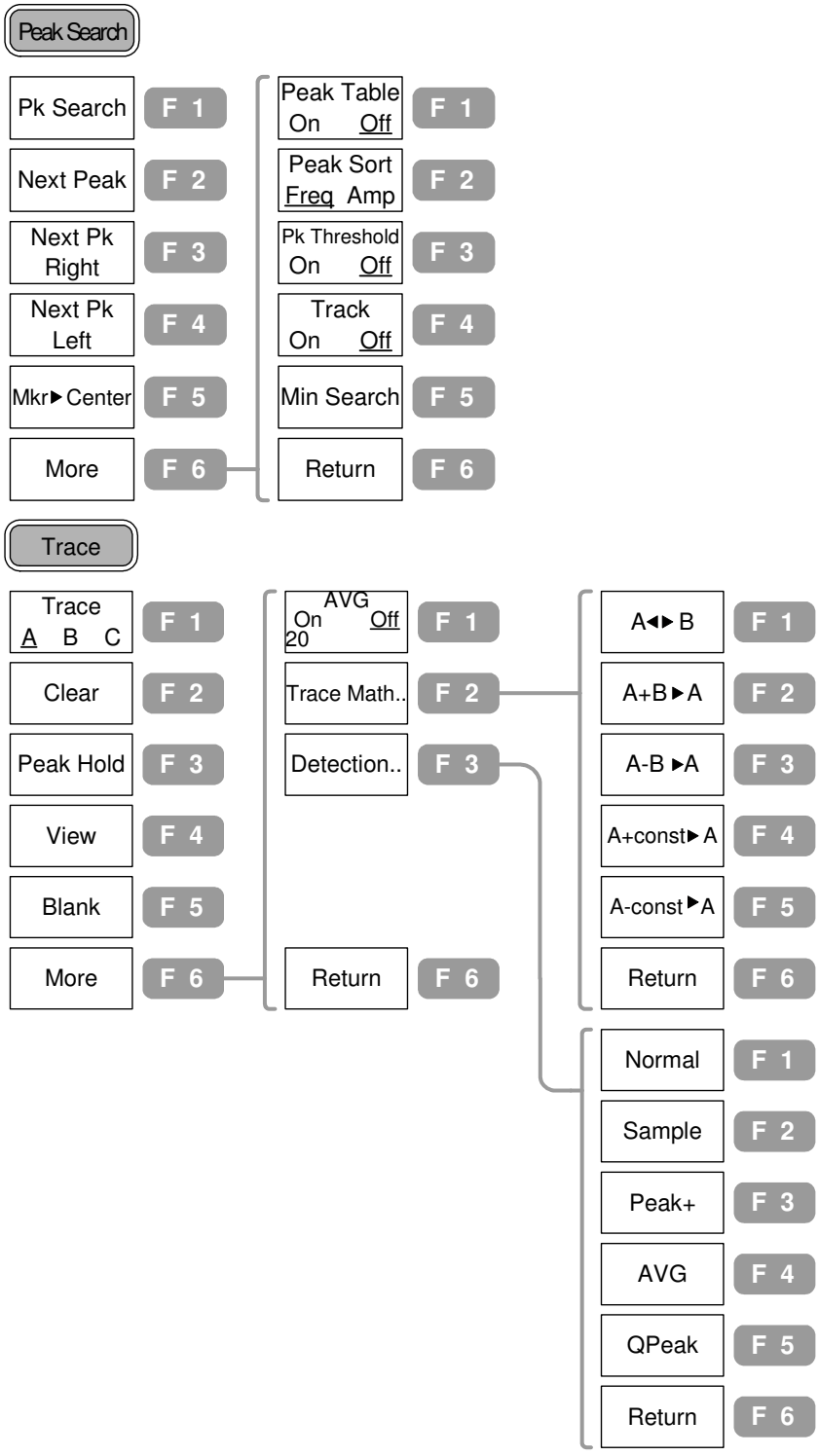
Frequency, Span, Autoset, Amplitude(1 of 2)



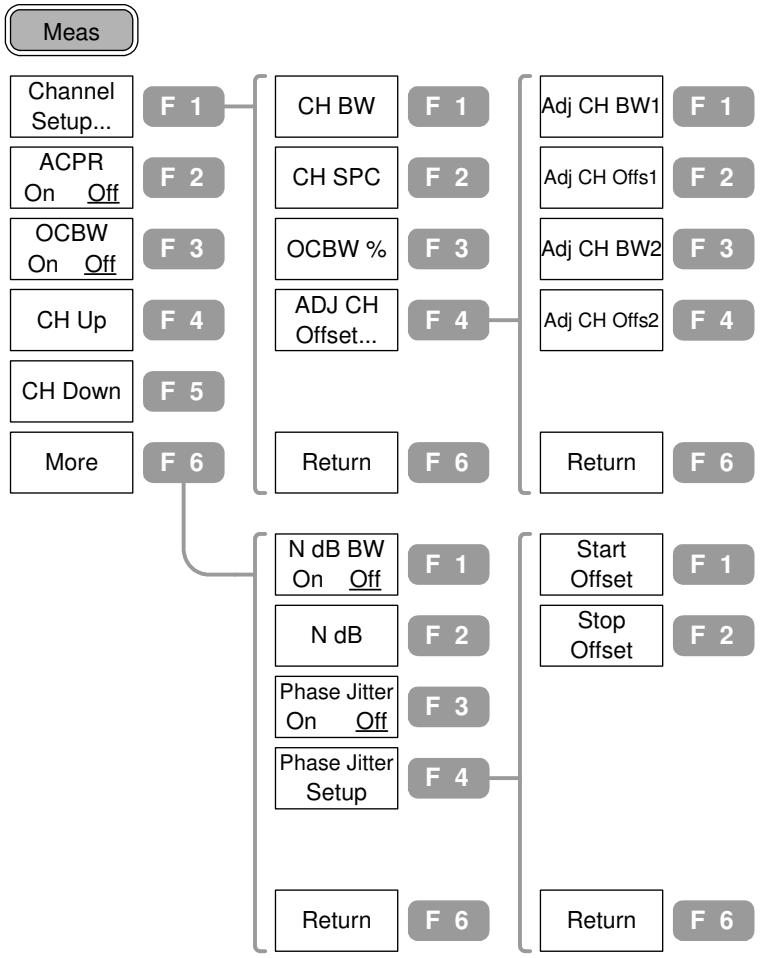
Amplitude (2 of 2), Marker

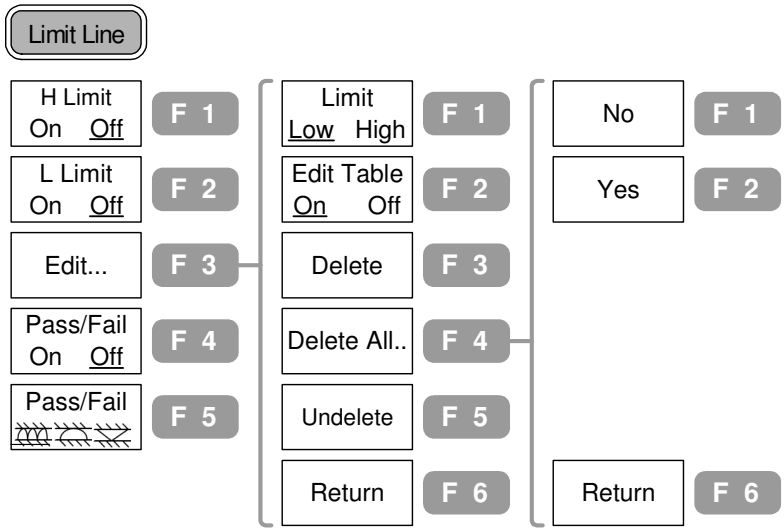


Peak Search, Trace

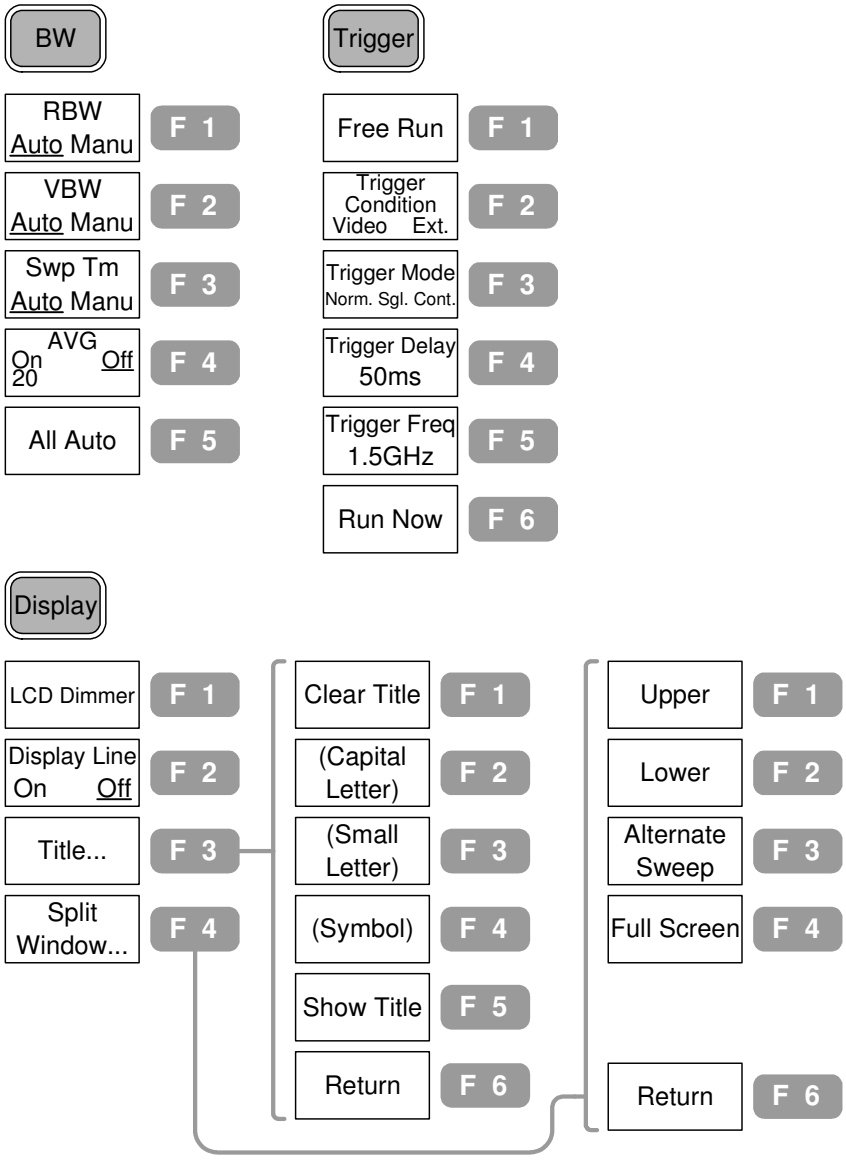


Measurement, Limit Line

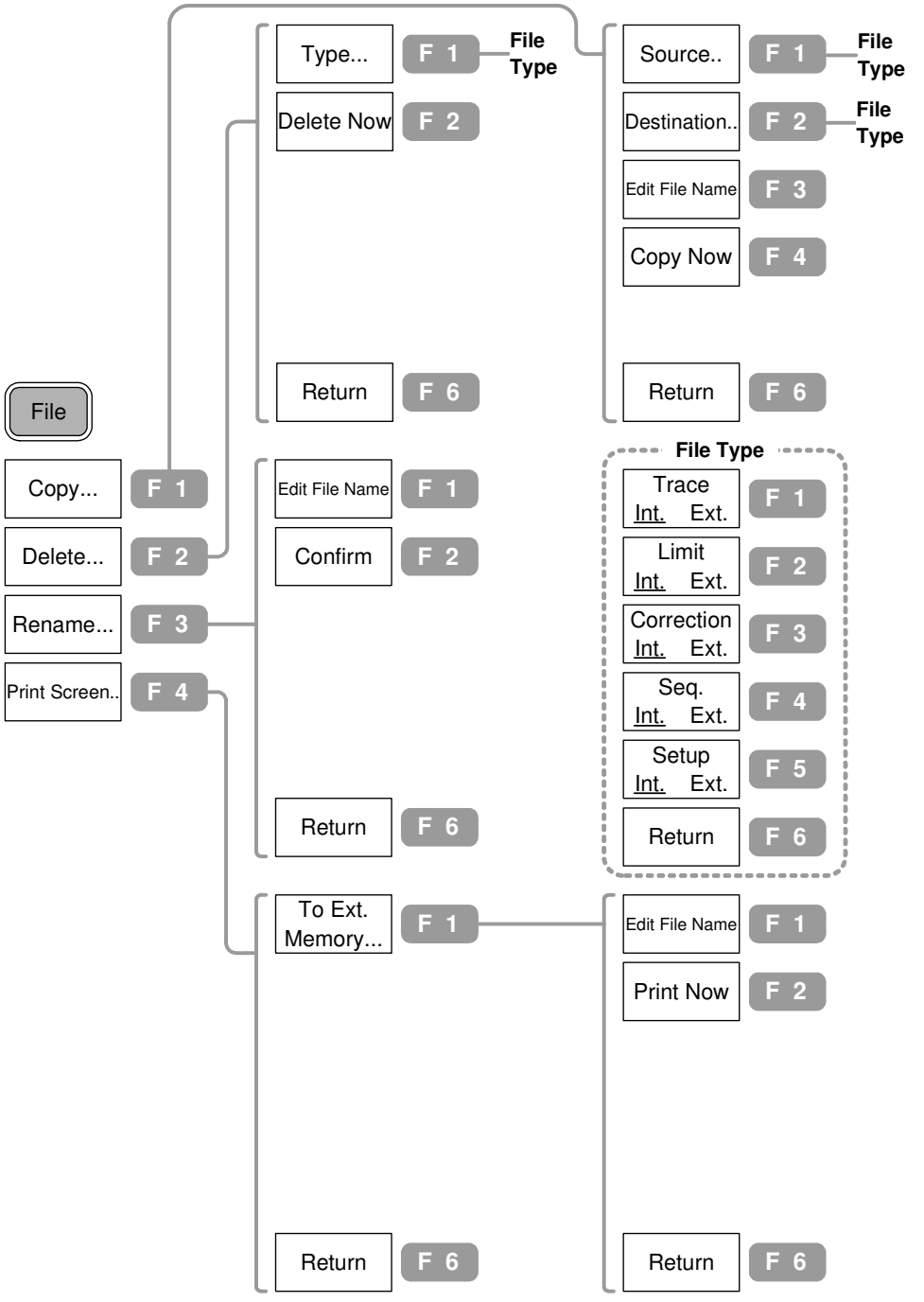




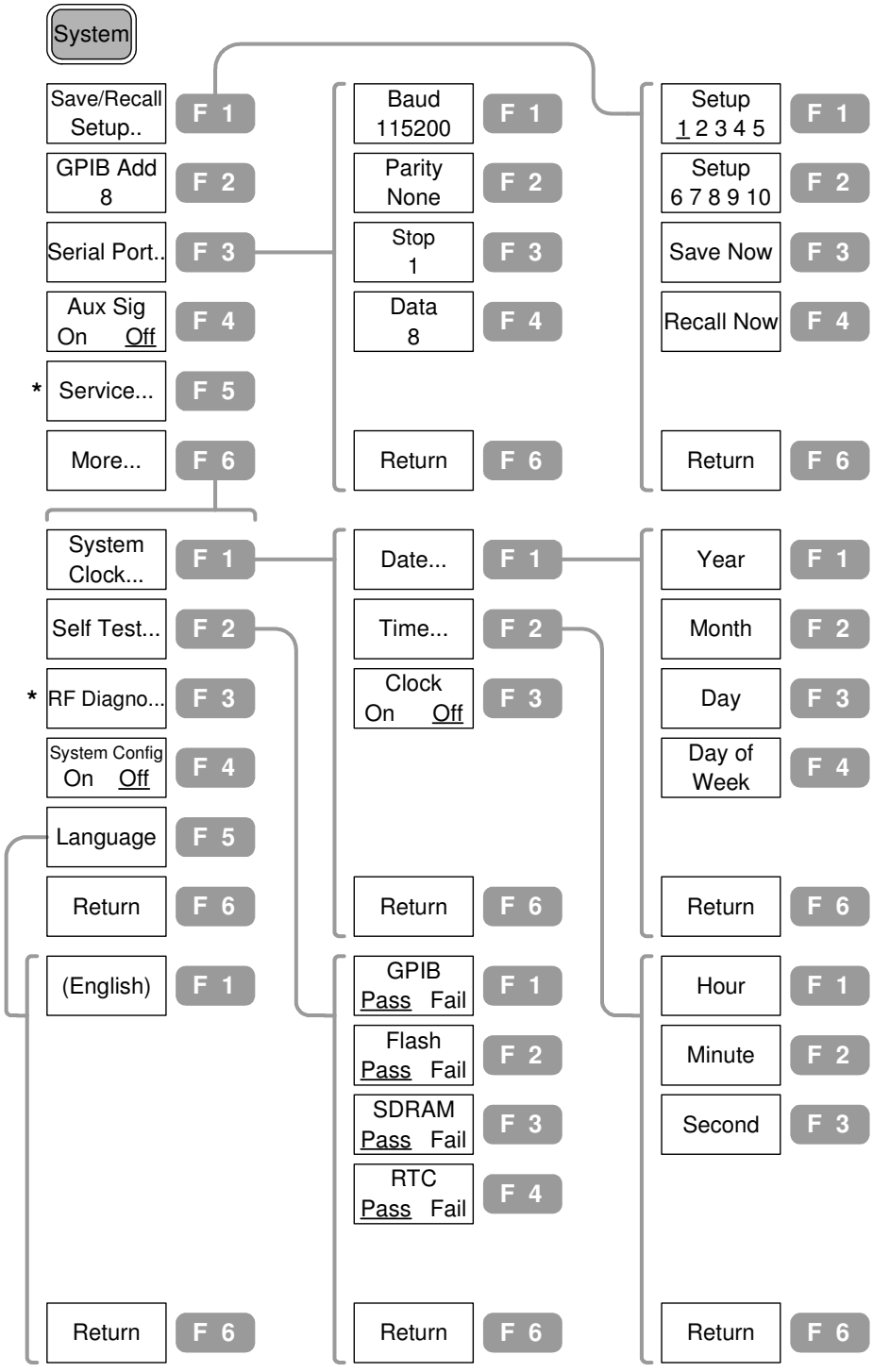
BW, Trigger, Display



File

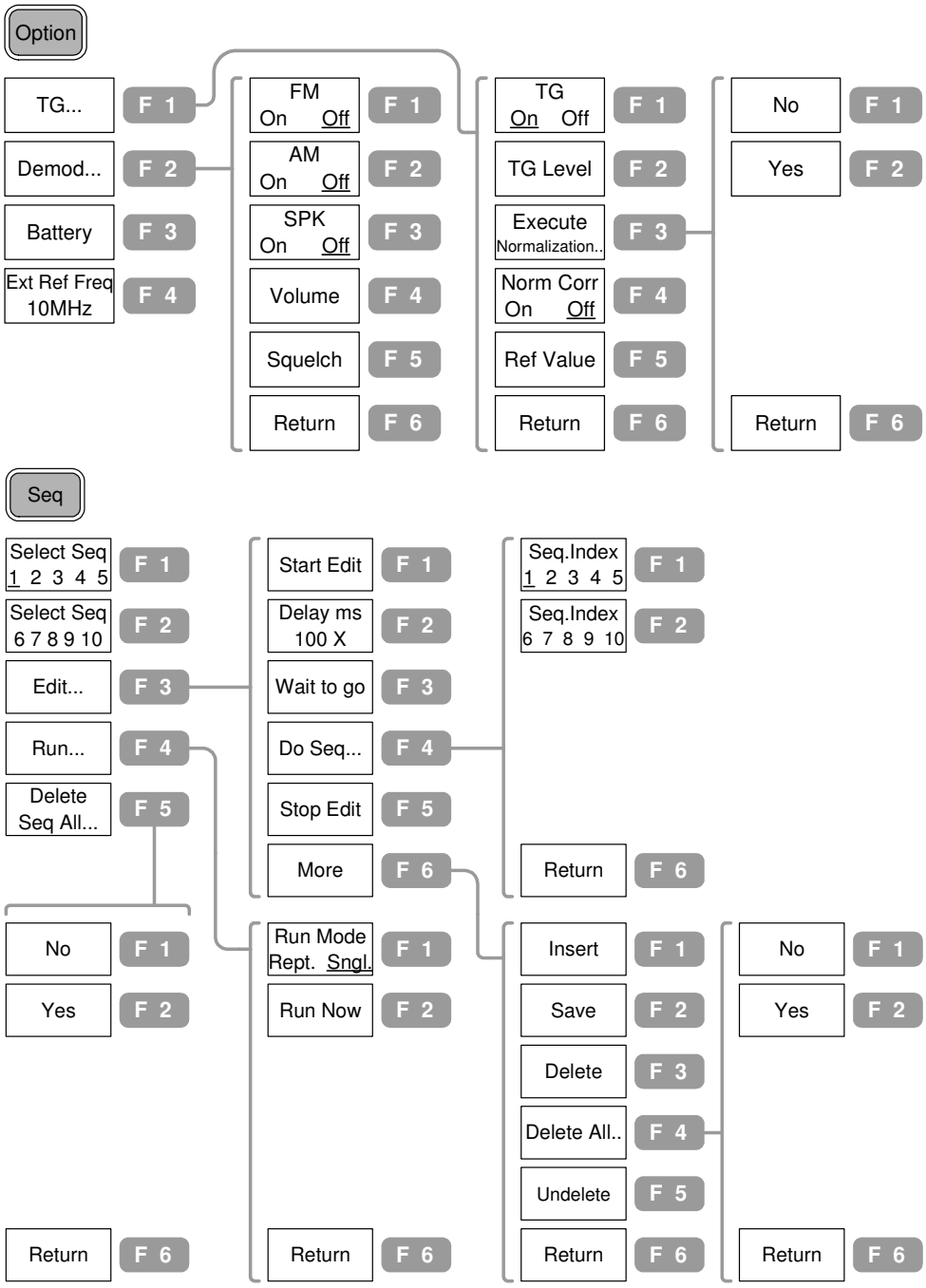


System



* Submenu only for service personnel

Option, Sequence



Preset Contents

These are the settings that appear when pressing the Preset key 

.

Frequency	Center: 1.5GHz Start: 0Hz	Stop: 3GHz Step: 1MHz
Span	3GHz	
Amplitude	Ref.level: 0dBm Unit: dBm Correction: Off	Scale: 10dB/ External Gain: 0dB Input Z: 50Ω
Autoset	Amplitude Floor: Auto	Span: Auto
Marker	Marker: Off Marker Table: Off	Marker Trace: Auto All Marker: Off
Peak Search	Peak Table: Off Peak Threshold: Off	Peak Sort: Freq Peak Track: Off
Trace	Trace: A AVG: Off	Mode: Clear Detection: Normal
Meas	ACPR: Off CH SPC: 0 CH BW: 600MHz OCBW %: 0 N dB: Off	OCBW: Off Adj CH Offs1: 600MHz Adj CH Offs2: 1200MHz Adj CH BW1&2:600MHz Phase Jitter: Off
Limit Line	H & L Limit: Off	Pass/ Fail: Off
BW	RBW: Auto SwpTime: Auto	VBW: Auto Average: Off
Trigger	Trigger Delay: 50ms Trigger Mode: Normal	Trigger Freq: 1.5GHz
Display	LCD Dimmer: 5 Split Window Lower: Off	Display Line: Off Split Window Upper: Off
File	Copy Type: Int. Trace Rename Type: Ext. Trace	Delete Type: Int. Trace
System	GPIB Add: 2 Aux Sig: Off	System Config: Off Language: English
Option	External Ref Freq: 10MHz TG Norm Corr: Off Demod AM: Off	TG Output: Off TG Ref Value: 0dBm Demod FM: Off
Sequence	Sequence: 1	Run Mode: Single

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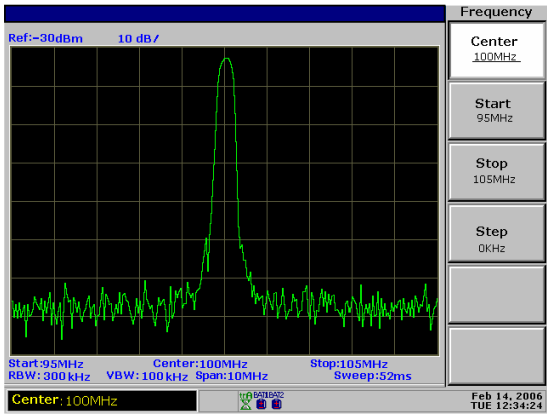
FREQUENCY/SPAN

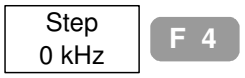
Frequency key, together with **Span** key, sets the frequency scale. Two methods are available. Center-and-Span method defines the center point and the surrounding frequency range. Start-and-Stop method defines the beginning and the end of the frequency range. Special span settings are available at full/zero span. You can also recall the last span setting.



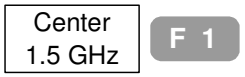
View Signal (Center and Span)

Center-and-Span method defines the Center frequency and the left/right bandwidth (Span) to locate the signal.

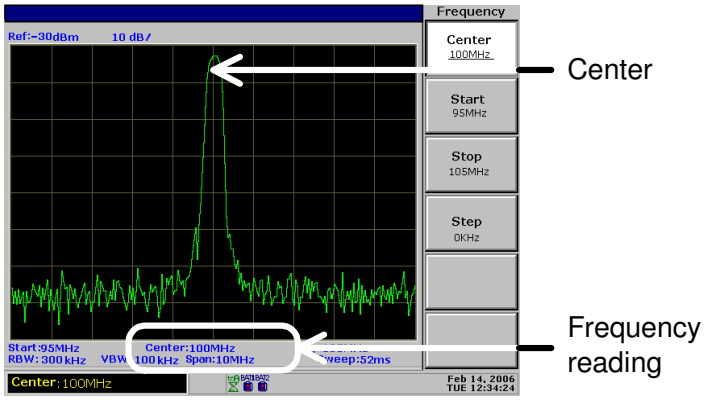
Set frequency adjustment step

Background	Frequency adjustment step defines the Arrow key resolution for Center, Start, and Stop frequency.	
Panel operation	1. Press the Frequency key.	
	2. Press F4 (Step).	
	3. Enter the value using the numerical keys, Arrow key, and Scroll knob.	
Range	0.0kHz ~ 3.0GHz * Arrow key and Scroll knob resolution: 1/10 of Span	

Set Center Frequency

Panel operation	1. Press the Frequency key.	
	2. Press F1 (Center).	
	3. Enter the value using the numerical keys, Arrow key, and Scroll knob.	
Range	0.0kHz ~ 3.0GHz Arrow key and Scroll knob resolution: step value	
Note	• Center frequency/span automatically changes according to start/stop frequencies setting, and vice versa.	

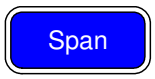
Display



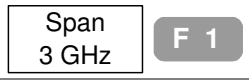
Set Frequency Span

Panel operation

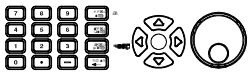
1. Press the Span key.



2. Press F1 (Span).



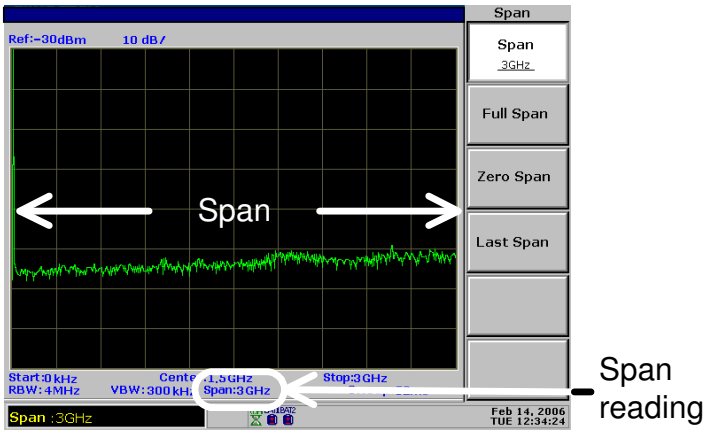
3. Enter the value using the numerical keys, Arrow key, and Scroll knob.



Range

2kHz ~ 3GHz
* Arrow key & Scroll knob resolution: 1-2-5 sequence (0 [zero span], 2kHz, 5kHz, 10kHz, 20kHz, 50kHz, ...1GHz, 2GHz, 3GHz)

Display



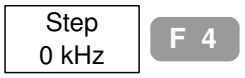
Note

- Center frequency/span automatically changes according to start/stop frequency settings, and vice versa.

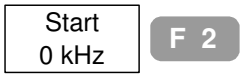
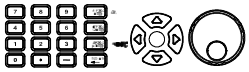
View Signal (Start and Stop)

Start-and-Stop method defines the beginning (Start) and the end (Stop) of the frequency range.

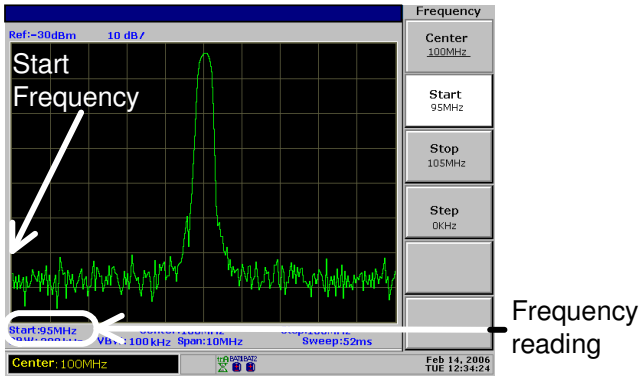
Set frequency adjustment Step

Background	Frequency adjustment step defines the Arrow key resolution for Center, Start, and Stop frequency.	
Panel operation	1. Press the Frequency key.	
	2. Press F4 (Step).	
	3. Enter the value using the numerical keys, Arrow key, and Scroll knob.	
Range	0.0kHz ~ 3.0GHz * Arrow key and Scroll knob resolution: 1/10 of Span	

Set Start frequency

Panel operation	1. Press the Frequency key.	
	2. Press F2 (Start).	
	3. Enter the value using the numerical keys, Arrow key, and Scroll knob.	
Range	0.0kHz ~ 3.0GHz (Start Frequency ≤ Stop Frequency) Arrow key and Scroll knob resolution: Step value	
Note	• Center frequency/span automatically change according to start/stop frequency settings, and vice versa.	

Display

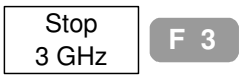


Set Stop frequency

Panel operation

1. Press the Frequency key.

2. Press F3 (Stop).

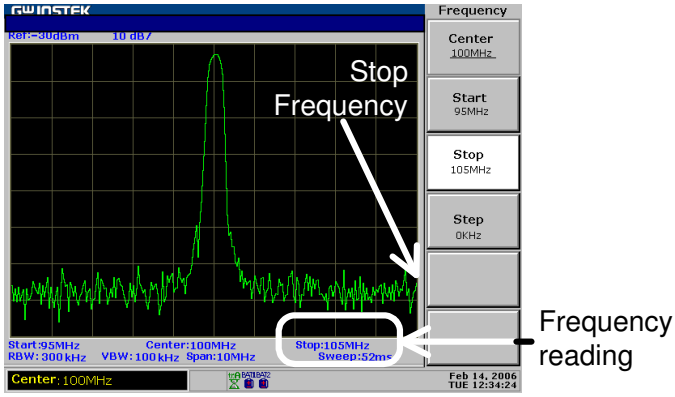


3. Enter the value using the numerical keys, Arrow key, and Scroll knob.

Range

0.0kHz ~ 3.0GHz (Start Frequency ≤ Stop Frequency)
* Arrow key resolution: Step value
* Scroll knob resolution: 1/500 of Span

Display



Note

- Center frequency/span automatically change according to start/stop frequency settings, and vice versa.

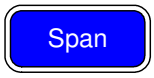
Full/Zero Span

Full or Zero Span sets the span to extreme values: 3.0GHz (full) or 0kHz (zero). They provide faster ways to view signals in certain situations, such as in time domain (zero span) for viewing modulation or in full span for viewing frequency unknown signal.

Display Full Frequency Span (3.0GHz)

Panel operation

1. Press the Span key.



2. Press F2 (Full Span).

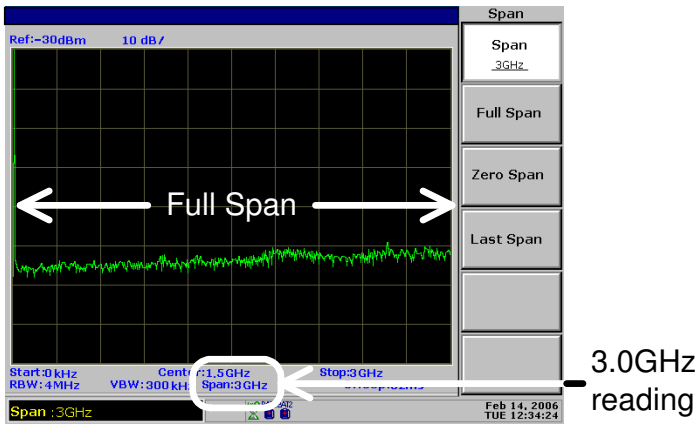
Range

3.0GHz (fixed)

Full span also sets these parameters to fixed values.

- Center Frequency: 1.5GHz
- Start frequency: 0.0kHz
- Stop frequency: 3.0GHz

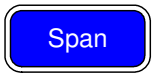
Display



Display Zero Span (time domain view)

Panel operation

1. Press the Span key.



2. Press F3 (Zero Span).

Range

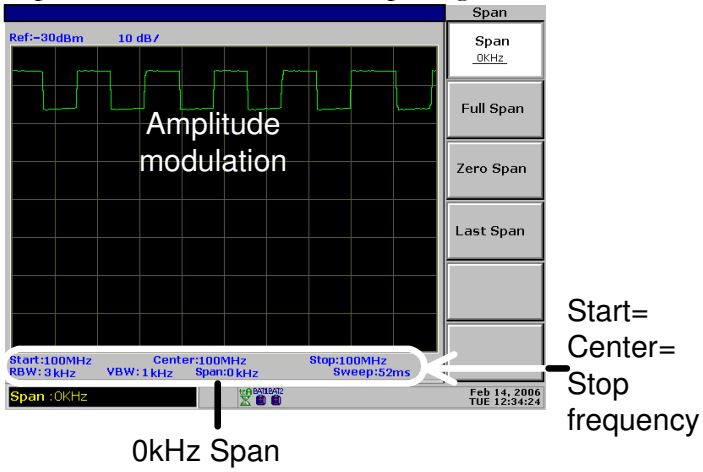
Center frequency (fixed)

Zero span also sets these parameters to fixed values.

- Start frequency: same as the Center frequency
- Stop frequency: same as the Center frequency

Display

The diagram shows an example of observing the amplitude modulation of the input signal.

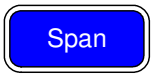


Note

- Make sure the RBW setting is large enough when using Zero Span for viewing amplitude modulation. For RBW setting details, see page103.

Recall the Last Span Setting

Panel operation

1. Press the Span key. 

2. Press F4 (Last Span). 

3. The span setting goes back to the previous one.

Nesting level

1 level

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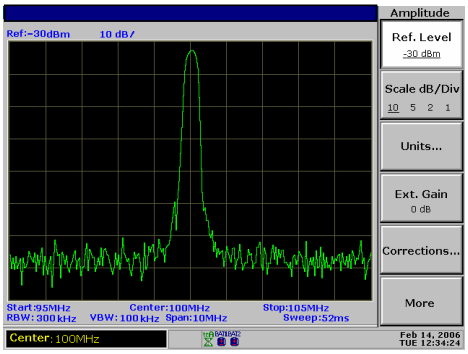
AMPLITUDE

Amplitude key sets the vertical scale of the display, including the upper limit (Reference Level), vertical range/unit (Amplitude Scale and Unit), and compensation for external gain or loss (External Offset). Amplitude Correction adjusts the frequency response distortion caused by external networks. Pre-Amplifier is an optional item that boosts the level of weak input signal before entering SPA-3000. You can also set input impedance level according to the application needs.



Set Vertical Scale

Vertical display scale is defined by the reference amplitude level, vertical amplitude range, measurement unit, and external gain/loss setting.

Set reference amplitude level

The reference level defines the uppermost display level.

Panel operation

1. Press the Amplitude key.

2. Press F1 (Ref.Level).

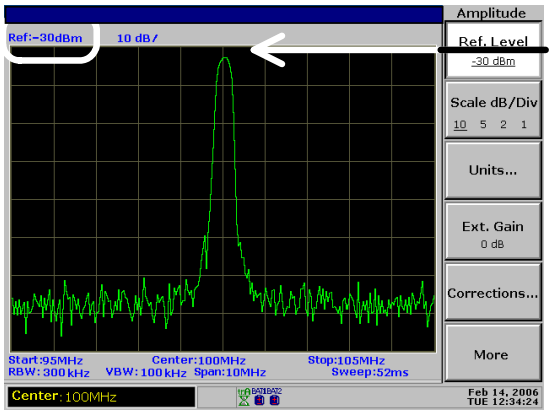
3. Enter the value using the numerical keys, Arrow key, and Scroll knob.

Range

dBm	−110 ~ +20 dBm, 0.1dB resolution
dBmV	−63.01 ~ +66.99 dBmV, 0.01dB resolution
dBuV	−3.01 ~ +126.99 dBuV, 0.01dB resolution

Display

Reference Level Reading



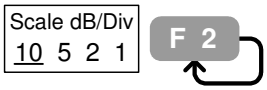
Reference level

Select Amplitude scale

Panel operation

1. Press the Amplitude key.

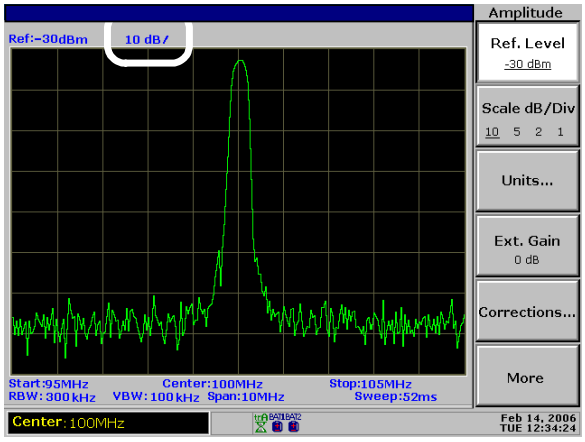
2. Press F2 (Scale dB/Div) repeatedly to select the scale.



Range 10, 5, 2, 1 dB/Div

Display

Scale reading



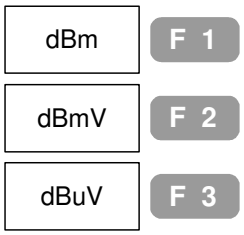
Select Amplitude Unit

Panel operation

1. Press the Amplitude key.

2. Press F3 (Units).

3. Select and press the unit from F1 (dBm), F2 (dBmV), and F3 (dBuV).



4. Press F6 (Return) to go back to the previous menu.

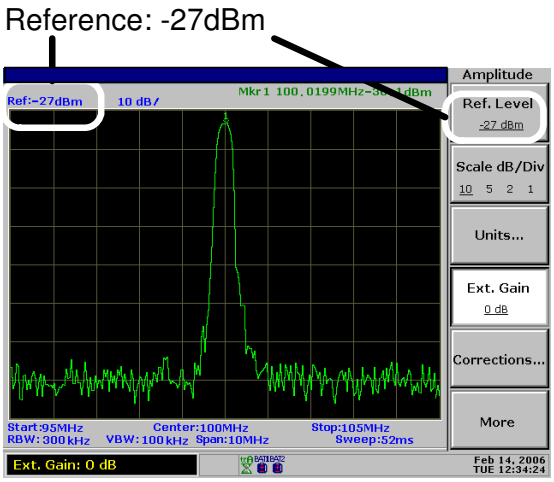
Range

dBm	−110 ~ +20 dBm
dBmV	−63.01 ~ +26.99 dBmV
dBuV	−3.01 ~ +126.99 dBuV

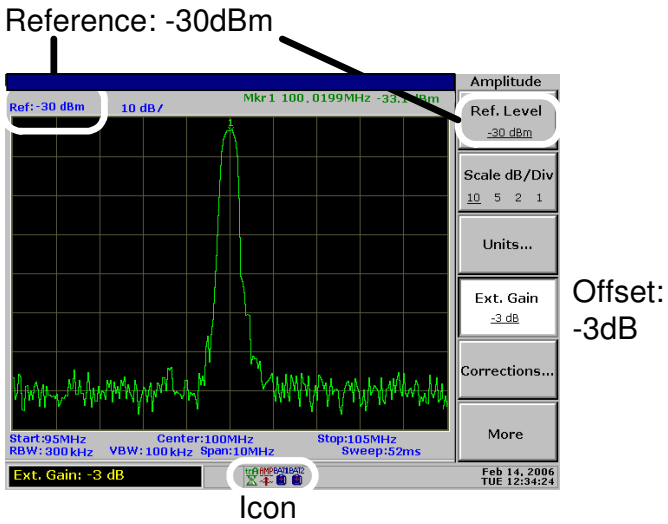
Set External Offset level

Background	External offset compensates amplitude gain or loss caused by an external network or device.
Panel operation	1. Press the Amplitude key. 
	2. Press F4 (Ext.Gain). 
	3. Enter the value using the numerical keys. 
Range	−20.0dB ~ +20.0dB, 0.1dB resolution
Icon	 Amplitude icon appears at the bottom of the display when the external offset level is changed.

Example Before (Offset: 0dB)



After (Offset: −3dB)

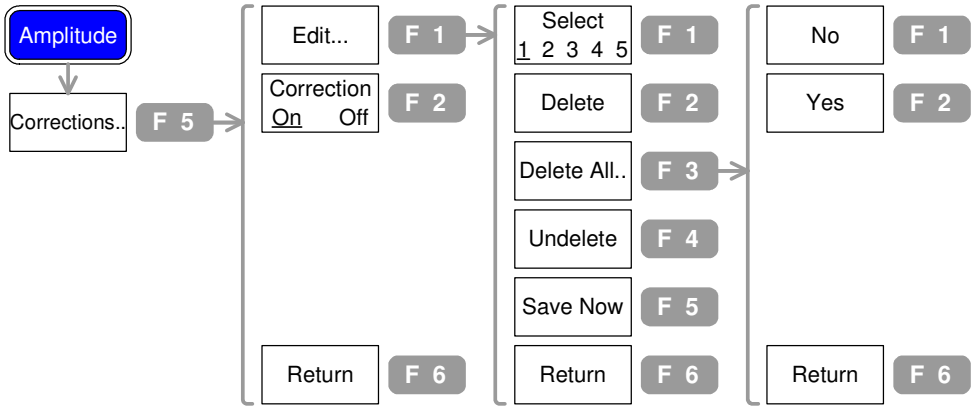


Amplitude Correction

Overview

Background	Amplitude correction adjusts SPA-3000's frequency response by changing amplitude for specific frequencies.

Menu tree

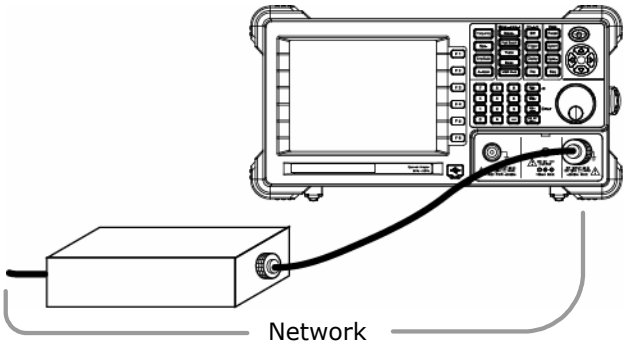


Range	Correction set	5 set, 30 correction points each
	Amplitude	−40 ~ +40dB per correction point, 0.1dB resolution
	Frequency	9kHz ~ 3.0GHz, 1kHz resolution
Icon		Amplitude icon appears at the bottom of the display when amplitude correction is On.

Correct amplitude step by step

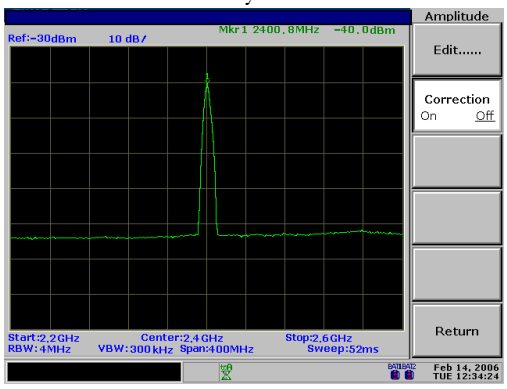
Example description	In this example, the network between SPA-3000 and DUT distorts the waveform and pushes the level down at around 2.4GHz. Amplitude correction can fix the level.	
Correction level	In this example the amplitude around 2.4GHz is boosted by +1 ~ +3dB.	
	2.2GHz	+2.5dB
	2.3GHz	+1.3dB
	2.4GHz	+2.8dB
	2.5GHz	+2.5dB
	2.6GHz	+1.2dB

Diagram



Waveform (before correction)

The frequency response is distorted (non-flat) and the level is attenuated by 2 ~ 3dB.

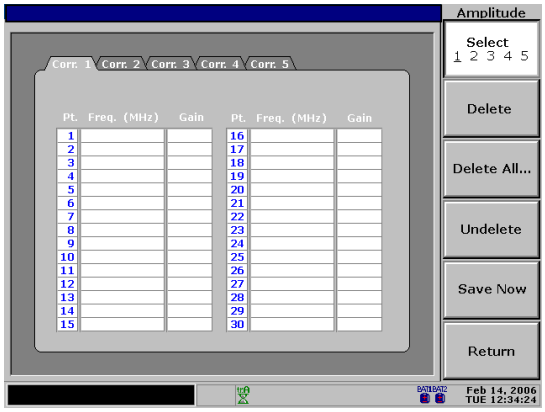


1. Enter correction edit mode

1. Press the Amplitude key. 

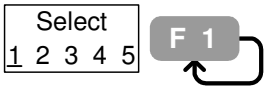
2. Press F5 (Corrections). 

3. Press F1 (Edit). The display shows the correction sets. 

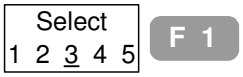


2. Select correction set

Press F1 (Select) repeatedly to select the correction set. 5 sets, 30 points each, are selectable.

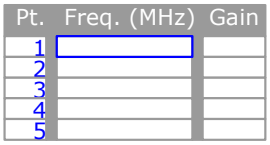


Example: correction set 3 selected



3a. Add correction point

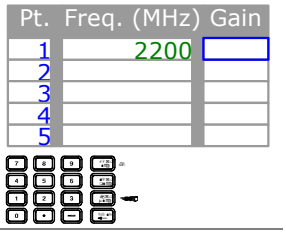
1. Make sure that the cursor is pointing to the first empty frequency point.



2. If necessary, move the cursor using the Up/Down key.

3. Enter the frequency in MHz using the numerical keys. 9.0kHz ~ 3.0GHz.

4. The cursor automatically moves to the Gain side. Enter the gain in dB using the numerical keys. −40dB ~ +40dB.

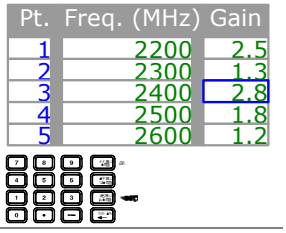


5. Repeat the above procedure for all correction data. The points are automatically sorted by the frequency (low → high).

3b. Modify correction point

1. Move the cursor using the Arrow key.

2. Enter the new frequency or gain using the numerical keys.



3c. Delete correction point

1. Move the cursor to the target using the Arrow key.

2. Press F2 (Delete). The frequency and gain are deleted together.

3. To undo the last deletion, press F4 (Undelete).

Undelete F 4

Example: point 3 deleted

Pt.	Freq. (MHz)	Gain
1	2200	2.5
2	2300	1.3
3	2400	2.8
4	2500	1.8
5	2600	1.2

→

Pt.	Freq. (MHz)	Gain
1	2200	2.5
2	2300	1.3
3	2500	1.8
4	2600	1.2
5		

4. Save correction set

1. Press F5 (Save Now). The edited data is saved internally.

Save Now F 5

2. Press F6 (Return) to go back to the previous menu.

Return F 6

5. Activate correction

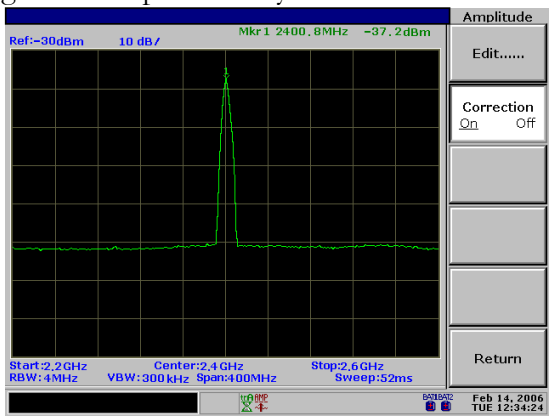
1. Press F2 (Correction On) to turn On the correction.

Correction On Off F 2

2. The amplitude icon appears at the bottom of the display.

After correction

Frequency response becomes linear (original), and the gain is compensated by +2 ~ +3dB.



Delete entire correction set data

Panel operation

1. Press the Amplitude key.

Amplitude

2. Press F5 (Corrections).

Corrections.. F 5

3. Press F1 (Edit). The display shows the correction sets.

Edit... F 1

4. Press F1 (Select) repeatedly to select the correction set.

Select 1 2 3 4 5 F 1

5.	Press F3 (Delete All).	Delete All.. F 3
6.	Select and press F1 (No) or F2 (Yes) for confirm. The whole data in the specified correction set is deleted.	No F 1 Yes F 2
7.	Press F6 (Return) repeatedly to go back to previous menus.	Return F 6

Recall existing correction set

Panel operation

1.	Press the Amplitude key.	Amplitude
2.	Press F5 (Corrections).	Corrections.. F 5
3.	Press F1 (Edit). The display shows the correction sets.	Edit... F 1
4.	Press F1 (Select) repeatedly to select the correction set.	Select 1 2 3 4 5 F 1
5.	Press F6 (Return) to go back to the previous menu.	Return F 6
6.	Press F2 (Correction On) to activate the correction.	Correction On Off F 2

Save/copy/delete/rename correction file

Background

Correction files can be saved, copied, deleted, or renamed using the file utility. Press the File key to access each function.

File

Save/Copy	Press F1 (Copy). For detailed step, see page122.	Copy... F 1
Delete	Press F2 (Delete). For detailed step, see page125.	Delete... F 2
Rename	Press F3 (Rename). For detailed step, see page127.	Rename... F 3

Use Pre-Amplifier PAM-9300 (Optional)

Not available at this time. Please call for availability.

Select input impedance (50Ω/75Ω)

Background

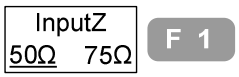
In most cases, the default 50Ω is appropriate. Use 75Ω when specifically required, such as in Cable TV signals.

Panel operation

1. Press the Amplitude key.

2. Press F6 (More).

3. Press F1 (Input Z 50Ω/75Ω) to select the impedance.



4. When 75Ω is selected, the amplitude icon appears at the bottom of the display.

Set impedance offset (75Ω only)

Background

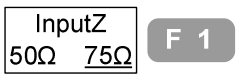
Impedance transformation to 75 Ω is also available through external devices such as impedance converter module (GW part No.ADP-101). In these cases an external loss will be induced. The impedance offset can compensate this effect.

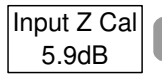
Panel operation

1. Press the Amplitude key.

2. Press F6 (More).

3. Make sure 75Ω is selected in F1 (Input Z).



	4. Press F2 (Input Z Cal).	Input Z Cal 5.9dB 
	5. Enter the offset using the numerical keys.	
Range	−10dB~+10dB, 0.1dB resolution	

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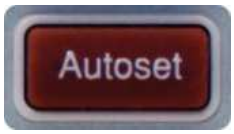
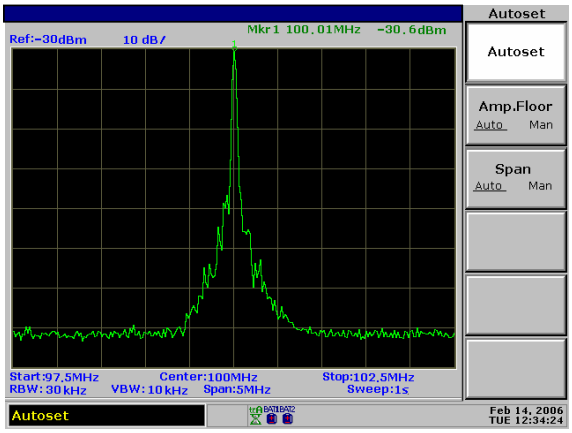
AUTOSET

Autoset function checks the input signal configuration and automatically setup the suitable horizontal and vertical scale. The amplitude floor for limiting the search range, and frequency observation span for limiting the viewing range are customizable according to the application needs.



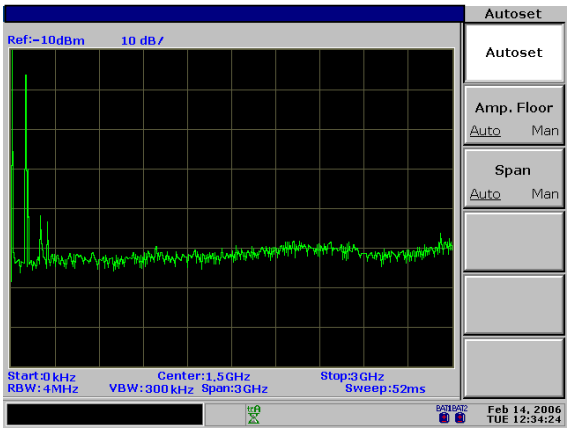


Run Autoset (search full amplitude range)

Panel operation	1. Press the Autoset key.		
	2. Press F1 (Autoset).		
Search range	Amplitude	dBm	−80 ~ +20dBm
		dBmV	−33.01~+66.99dBmV
		dBuV	+26.99~+126.99dBuV
	Frequency	0kHz ~ 3.0GHz	
	* These ranges are applicable when both Amplitude floor (F2) and Span limit (F3) are set to Auto.		

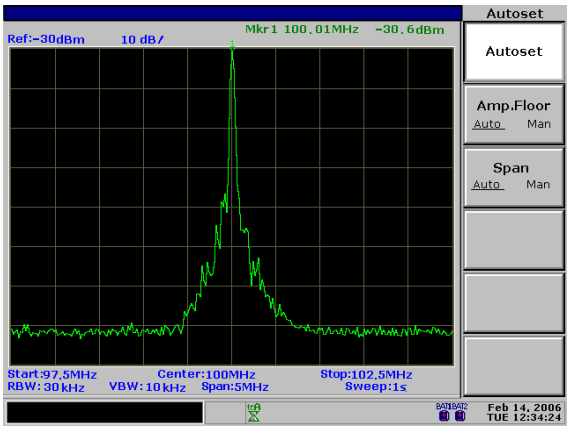
Example: before Autoset

Start frequency: 0kHz	Stop frequency: 3GHz
Span: 3GHz	Signal peak: 100MHz
Center frequency: 1.5GHz	Reference level: −10dBm



Example: after Autoset

Start frequency: 97.5MHz	Stop frequency: 102.5MHz
Span: 5MHz	Signal peak: 100MHz
Center frequency: 100MHz	Reference level: −30dBm



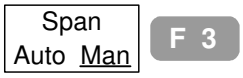
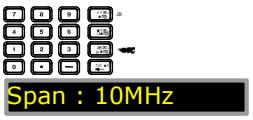
RBW/VBW/Sweep Setting after Autoset

All the three BW related parameters, RBW, VBW, and Sweep, will be reset to Auto mode when using Autoset, regardless of their previous settings.

Limit vertical search range

Background	You can set the amplitude floor so that the signals lower than the setting will be ignored from Autoset search.	
Panel operation	1. Press the Autoset key.	
	2. Press F2 (Amp. Floor) to switch the range from Auto (whole range) to manual (limited range).	
	3. Enter the amplitude in dB, using the numerical keys. The Command window shows the setting.	
Range	**dBm**	−80 ~ +20dBm, 0.1dB resolution
	dBmV	−33.01 ~ +66.99dBmV, 0.01dB resolution
	dBuV	+26.99 ~ +126.99dBuV, 0.01dB resolution

Limit horizontal view range

Background	You can change the frequency span limit in the display to get a better view of the Autoset result. By default, the frequency span after Autoset is set at 5MHz (Auto).	
Panel operation	1. Press the Autoset key.	
	2. Press F3 (Span) to switch the range between Auto (5MHz fixed limit) to Manual.	
	3. Enter the frequency using the numerical keys. The Command window shows the setting.	
Range	Zero span, 2kHz ~ 3GHz (Manual) 5MHz fixed (Auto)	

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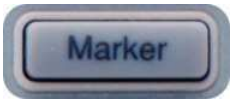
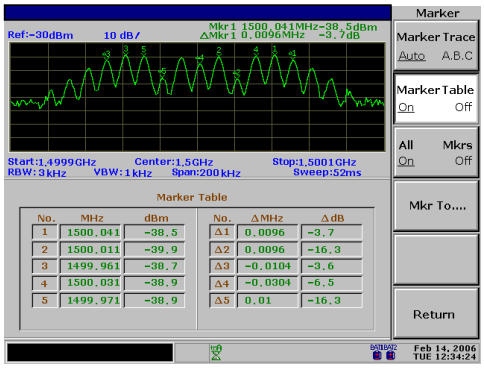
MARKER

A **Marker** shows the frequency and amplitude of a waveform point. SPA-3000 can activate up to 5 Markers or Marker pairs simultaneously. Marker Table helps editing and viewing multiple Markers in a single display. You can also enable/disable all Markers at once. Delta Marker shows the frequency and amplitude difference between the reference Marker. SPA-3000 can automatically move the Marker to various locations including peak signal, center frequency, and start/stop frequency. More Marker operations regarding signal peaks are also available in the **Peak Search** function.

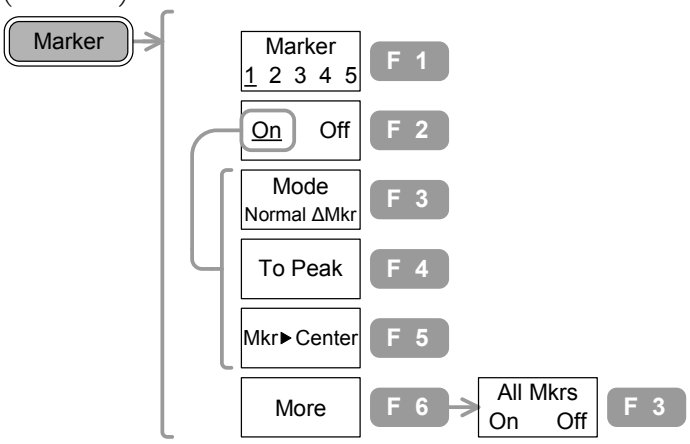




Activate/de-activate marker(s)

Menu tree

F3 ~ F5 are available only when the Marker is On (activated).



Range		
	Normal marker	5
	Delta marker	5 pairs
	Amplitude	−120 ~ +20dBm, 0.1dB resolution −73.01~+66.99dBmV, 0.01dB resolution −13.01~+126.99dBuV, 0.01dB resolution
	Frequency	0kHz ~ 3.0GHz

Activate normal marker(s)

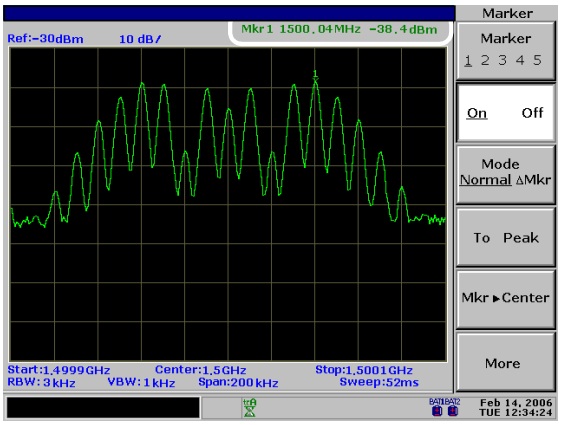
Panel operation

1.	Press the Marker key.	Marker
2.	Press F1 (Marker) repeatedly to select the marker ID from 1 to 5.	Marker 1 2 3 4 5 → F 1
3.	Press F2 (On) and turn On the selected marker.	On Off → F 2
4.	Make sure Normal is selected in F3. If necessary, press and select Normal.	Mode Normal ΔMkr → F 3
5.	Repeat the above steps for the number of markers required.	

Display

The upper right corner of the display shows the active marker.

Marker ID, Frequency, Amplitude



Activate all 5 normal markers at once

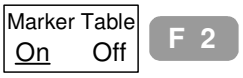
Panel operation

1. Press the Marker key.

2. Press F6 (More).

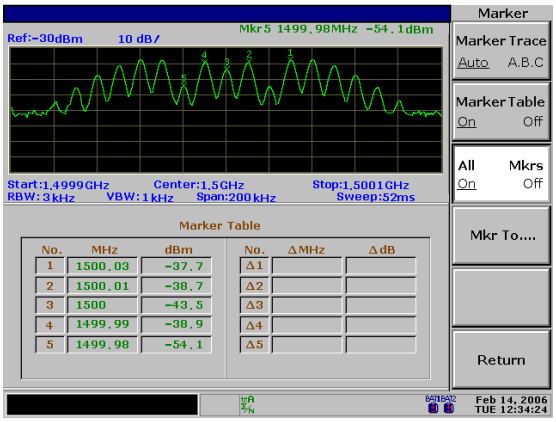
3. Press F3 (All Mkrs On) to turn On all 5 normal markers.

4. To view all marker status, press F2 (Marker Table On). The frequency and the amplitude of the markers appear in table list.



Display

The upper right corner of the display shows the active marker status.

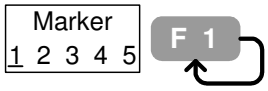


Activate delta marker(s)

Panel operation

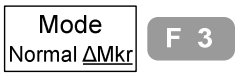
1. Press the Marker key.

2. Press F1 (Marker) repeatedly to select the marker ID from 1 to 5.



3. Press F2 (On) and turn On the selected marker.

4. Make sure Δ (delta) is selected in F3. If necessary, press and select ΔMkr.

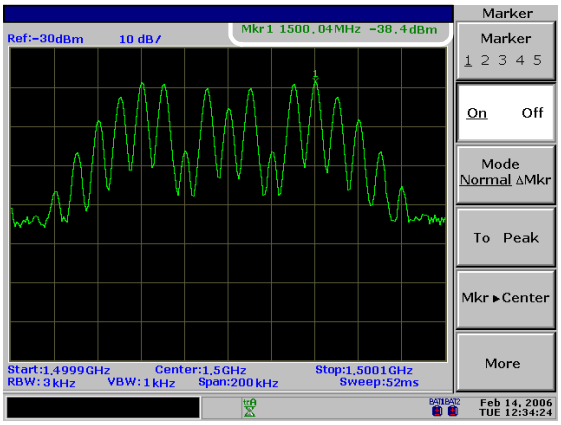


5. Repeat the above steps for the number of markers required.

Display

The upper right corner of the display shows the active delta marker pair.

Marker ID, Frequency, Amplitude



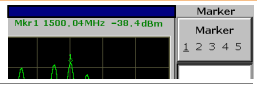
Move marker(s)

This section assumes at least one marker is already activated (page66). Marker frequency positions can be set manually, or to specific locations using the menu shortcuts.

Move marker manually

Panel operation

1. Check the active marker at the top right corner of the display.

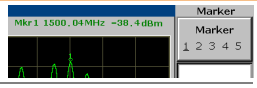


2. Move the marker using the Left/Right key and Scroll knob, or enter the frequency directly using the numerical keys.

Move marker to the highest peak

Method 1

1. Check the active marker at the top right corner of the display.



2. Press the Marker key.

3. Press F4 (To Peak).

Method 2

1. Another method (the same effect) is to press the Peak Search key.

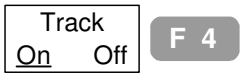
2. Press F1 (Pk Search).

Method 3 (marker tracked to the peak)

1. Another method moves marker to the peak and also tracks it. Press the Peak Search key.

2. Press F6 (More).

3. Press F4 and Turn On the Track.

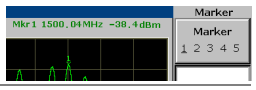


4. The peak tracking icon appears at the bottom of the display.

Move marker and the highest peak to the center

Method 1

1. Check the active marker at the top right corner of the display.



2. Press the Marker key. — Marker
3. Press F4 (To Peak). The marker moves to the signal peak. — To Peak / F 4
4. Press F5 (Mkr→ Center). The signal peak moves to the center. — Mkr▶Center / F 5

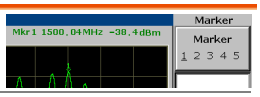
Method 2

1. Another method (the same effect) is to press the Peak Search key. — Peak Search
2. Press F5 (Mkr→ Center) to find out the signal peak, then to move it to the center. — Mkr▶Center / F 5

Move marker to various locations

Panel operation

1. Check the active marker at the top right corner of the display.

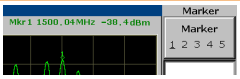


2. Press the Marker key. — Marker
3. Press F6 (More). — More / F 6
4. Press F4 (Mkr to...) — Mkr to... / F 4
5. Select the destination and press F1 (Center) ~ F5 (Ref Lvl).
   Center: center frequency — Mkr▶Center / F 1
   Start: start frequency — Mkr▶Start / F 2
   Stop: stop frequency — Mkr▶Stop / F 3
   CF Step: set the marker frequency as the frequency step value — Mkr▶CFStep / F 4
   Ref Lvl: reference amplitude level — Mkr▶Ref Lvl / F 5
6. Press F6 (Return) to go back to the previous menu. — Return / F 6

Move marker to a trace

Panel operation

1. Check the active marker at the top right corner of the display.



2. Press the Marker key.

3. Press F6 (More).

4. Press F1 (Marker Trace).

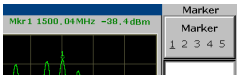
Range

Auto	The marker moves to the active signal/trace.
Trace A	The marker moves to Trace A.
Trace B	The marker moves to Trace B.
Trace C	The marker moves to Trace C.

Show Markers in Table

Panel operation

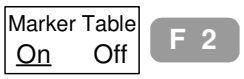
1. Check the active marker at the top right corner of the display.



2. Press the Marker key.

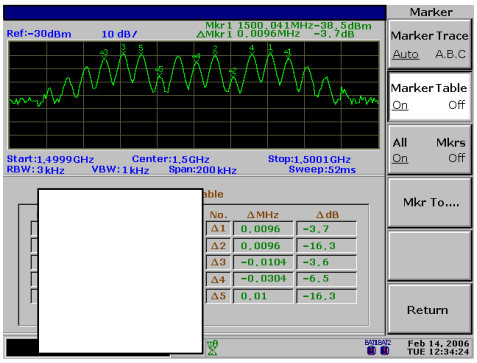
3. Press F6 (More).

4. Press F2 (Marker Table On).



5. The marker ID, frequency, and amplitude list appears at the lower half of the display, updated in real time.

Display



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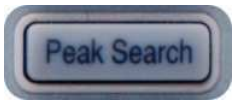
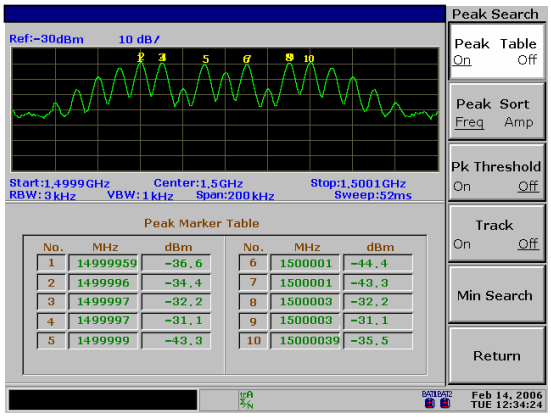
PEAK SEARCH

Peak search automatically finds out the signal peaks in various conditions, such as next highest peak and minimum peak. Peak Search overlaps its feature with **Marker** function, and it is best to use the two together. All peaks can be viewed at once in the peak table, with amplitude threshold and sorting order configurable.

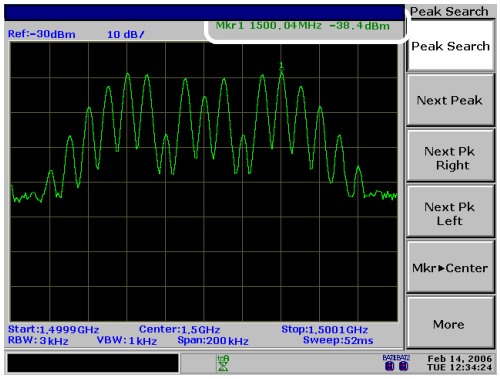




Search Signal Peaks

Peak Search puts a marker on the target signal peak. If no marker has been activated, SPA-3000 automatically activates marker 1. The peak signal frequency and amplitude appear at the top right corner of the display.

Marker ID, Frequency, Amplitude



Search signal peak

Method 1	1. Press the Peak Search key.	Peak Search
	2. Press F1 (Pk Search).	Pk Search F 1
Method 2	1. Another method is to use the Marker key. Make sure the marker is already activated (page66).	
	2. Press the Marker key.	Marker
	3. Press F4 (To Peak).	To Peak F 4
Method 3 (marker tracked to the peak)	1. Another method continuously tracks the peak signal. Press the Peak Search key.	Peak Search
	2. Press F6 (More).	More F 6
	3. Press F4 (Track On).	Track On Off F 4
	4. The peak tracking icon appears at the bottom of the display.	PTK

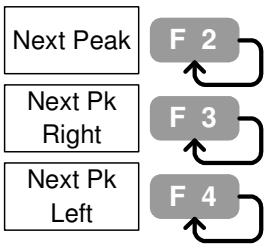
Search the next highest peak

The marker keeps moving to the next highest peak, in descending order.

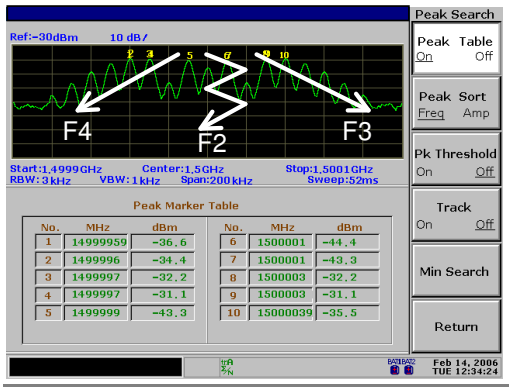
Panel operation

1. Press the Peak Search key.

2. Press F2 ~ F4 repeatedly.
   Next Peak: moves the marker to the next highest peak.
   Next Pk Right: moves the marker to the next highest peak on the right side (higher frequency).
   Next Pk Left: moves the marker to the next highest peak on the left side (lower frequency)



Display



Search the highest peak and move to the center

Method 1

1. Press the Peak Search key.

2. Press F1 (Pk Search).

Method 2

1. Another method (the same effect) is to press the Marker key. Make sure the marker is already activated (page66).
2. Press the Marker key.

3. Press F4 (To Peak).

4. Press F5 (Mkr→ Center).

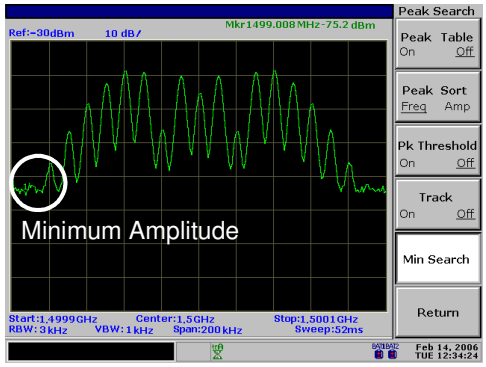
Search the minimum amplitude

Panel operation

1. Press the Peak Search key.

2. Press F6 (More).

3. Press F5 (Min Search). The active marker moves to the deepest valley in the trace.



Show Peak Table

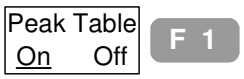
Activate peak table

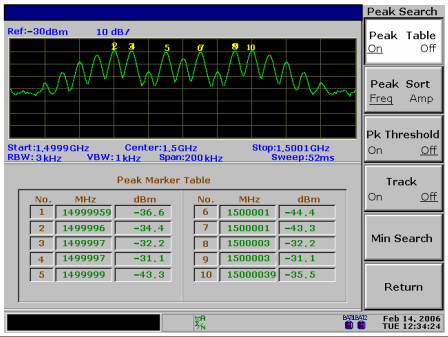
Panel operation

1. Press the Peak Search key.

2. Press F6 (More).

3. Press F1 (Peak Table On).





Range 10 peaks maximum

Set peak threshold

Only the peaks below the threshold amplitude will be listed in the table.

Panel operation

1. Press the Peak Search key. 

2. Press F6 (More). 

3. Press F1 (Peak Table On). 

4. Press F3 (Pk Threshold On). 

5. A horizontal line appears on the display. SPA-3000 searches and lists peaks only below this threshold amplitude.
6. Use the Arrow key or the Scroll knob to move the threshold line. 

Sort peaks

The peaks are sorted in order of ascending frequency / descending amplitude.

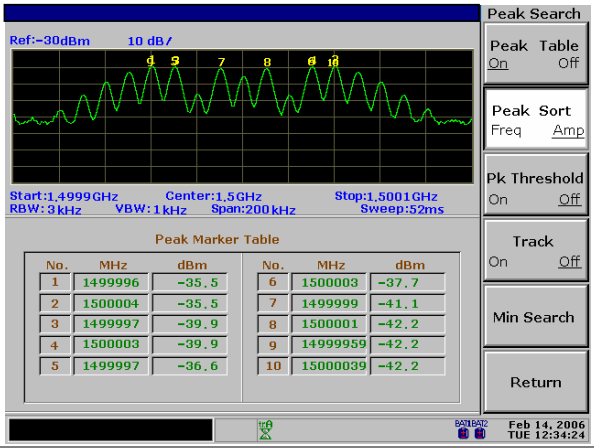
Panel operation

1. Press the Peak Search key. 

2. Press F6 (More). 

3. Press F2 (Peak Sort) to switch between frequency and amplitude sorting. 

Example: amplitude sort



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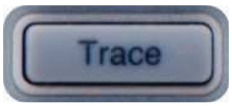
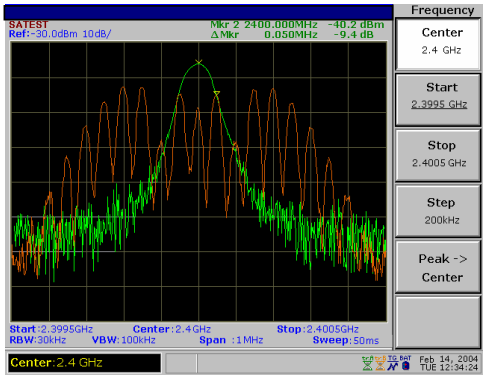
TRACE

Trace keeps track of waveform variants. Three traces, A, B, and C, are available for accumulating the peak level, freezing the current waveform shape, and averaging the waveform. Trace math operations are available using trace A and B.

Detection modes configure the way SPA-3000 samples the input analog signal for digitizing.





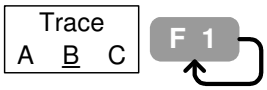
View traced waveform

Select (activate) trace

Panel operation

1. Press the Trace key.

2. Press F1 (Trace) repeatedly to select the trace.



Range

A (green)	The default trace which is always activated. Together with trace B, runs trace math operation (page82).
B (amber)	Together with trace A, runs trace math operation (page82).
C (yellow)	

View real-time updated trace (default)

Background

The trace is updated at every sweep. Old trace is cleared up and a new trace according to the latest measurement is drawn on the display.

Panel operation

1. Press the Trace key.

2. Press F2 (Clear).

3. The clear mode icon appears at the bottom of the display.

View peak-hold trace

Background

In peak hold mode, the amplitude of the new trace is compared with the last one at each sweep. Only the higher amplitude replaces old trace points, thus holding the highest (peak) value.

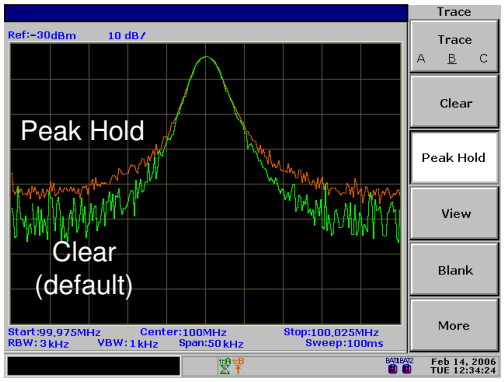
Panel operation

1. Press the Trace key.

2. Press F3 (Peak Hold).

3. The peak hold mode icon appears at the bottom of the display.

Display



Freeze trace

Panel operation

1. Press the Trace key. — Trace
2. Press F4 (View). — View F 4
3. The view mode (freeze) icon appears at the bottom of the display.

Hide trace

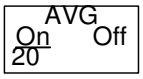
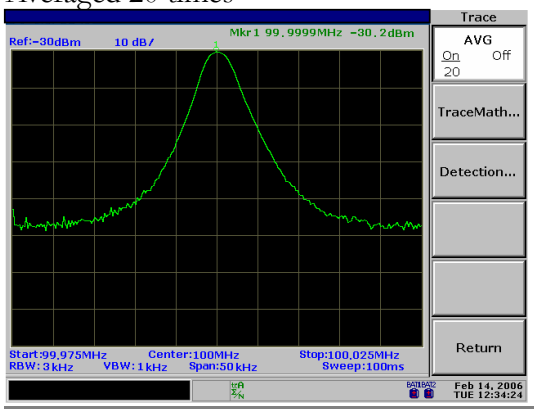
Panel operation

1. Press the Trace key. — Trace
2. Press F5 (Blank). — Blank F 5
3. The trace disappears from the display. To bring back the trace again, press F2 (Clear). — Clear F 2

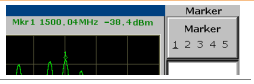
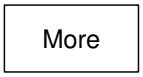
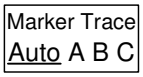
View averaged trace

Panel operation (Method1)

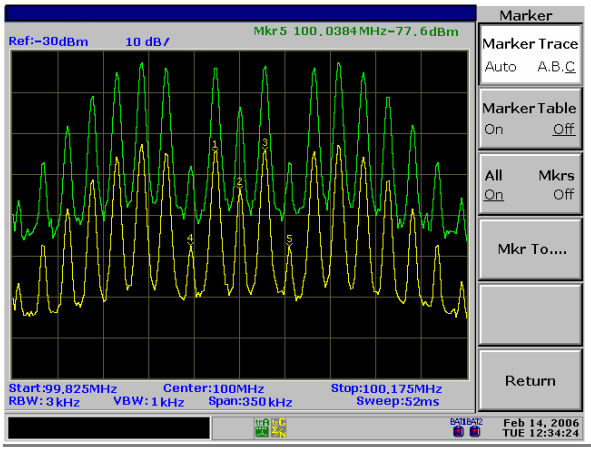
1. Press the Trace key. — Trace
2. Press F6 (More). — More F 6
3. Press F1 (AVG On) to turn On the average mode. — AVG On Off 20 F 1
4. The average mode icon appears at the bottom of the display.

	5. Enter the average number using the numerical keys.	
Method2	1. Press the BW key.	
	2. Press F4 (AVG On) to turn On averaging.	 F 4
	3. Enter the average time using the numerical keys.	
Range	1 ~ 100	
Example: after average	Averaged 20 times	

Move Marker to Trace

Panel operation	1. Check the active marker at the top right corner of the display.	
	2. Press the Marker key.	
	3. Press F6 (More).	 F 6
	4. Press F1 (Marker Trace).	 F 1
Range	Auto: The marker moves to the active signal or trace.	
	Trace A: The marker moves to Trace A.	
	Trace B: The marker moves to Trace B.	
	Trace C: The marker moves to Trace C.	

Display	Marker on Trace C



Save/copy/delete/rename trace file

Background	Trace files can be saved, copied, deleted, or renamed using the file utility. Press the File key to access each function.	File
Save/Copy	Press F1 (Copy). For detailed step, see page122.	Copy... F 1
Delete	Press F2 (Delete). For detailed step, see page125.	Delete... F 2
Rename	Press F3 (Rename). For detailed step, see page127.	Rename... F 3

Run Trace Math

Background

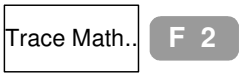
You can run various mathematical operations between TraceA and TraceB. Both traces have to be activated (page78) in advance. After the math operation, the traces mode changes into View (page79).

Panel operation

1. Press the Trace key.

2. Press F6 (More).

3. Press F2 (Trace Math).



4. Select and press the type of math operation from F1 ~ F5.

A↔B: swaps trace A and B.

A+B→ A: Adds trace A and B.

A−B→ A: Subtracts trace B from trace A.

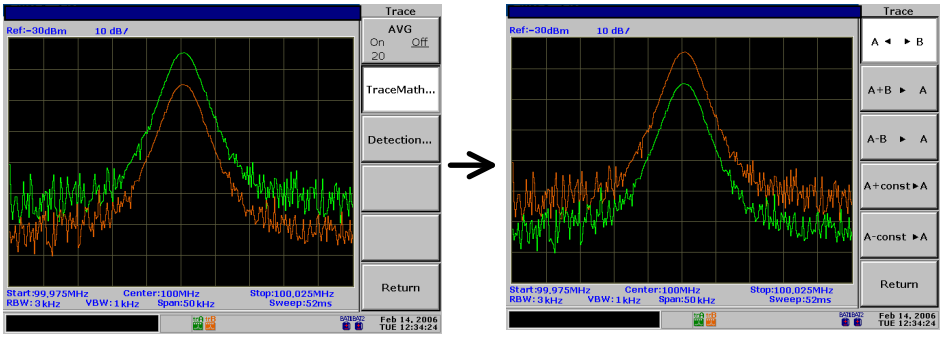
A+const→ A: Adds a constant value to trace A.

A−const→ A: Subtracts a constant value from trace A.

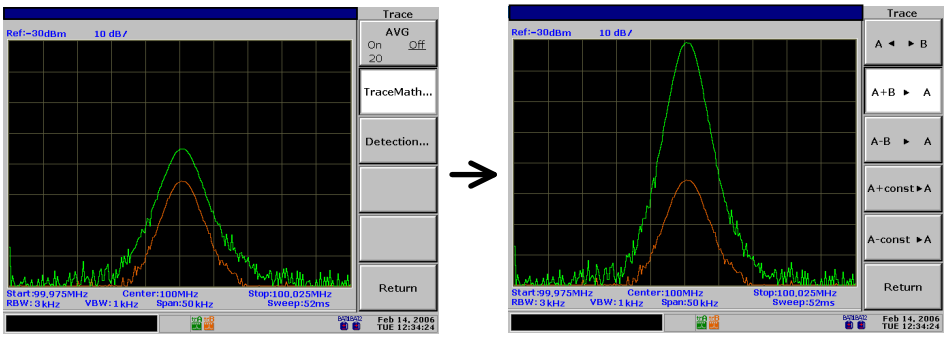
5. When **A+const / A−const** are selected, enter the constant value using the numerical keys. Range: −40 ~ +40dB

6. The trace math icon appears at the bottom of the display.

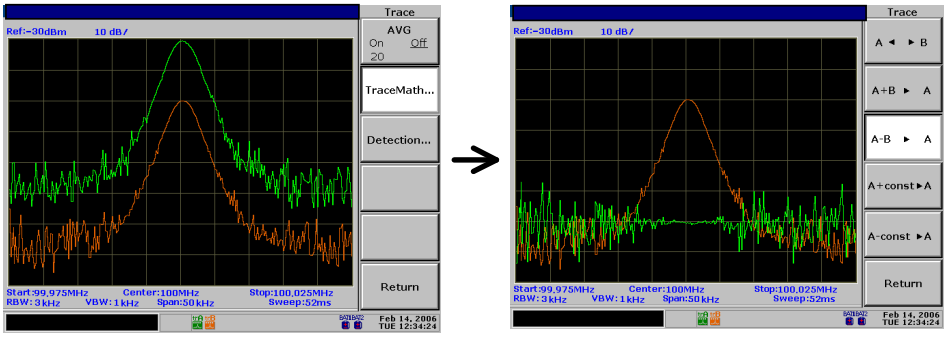
Example: A↔B



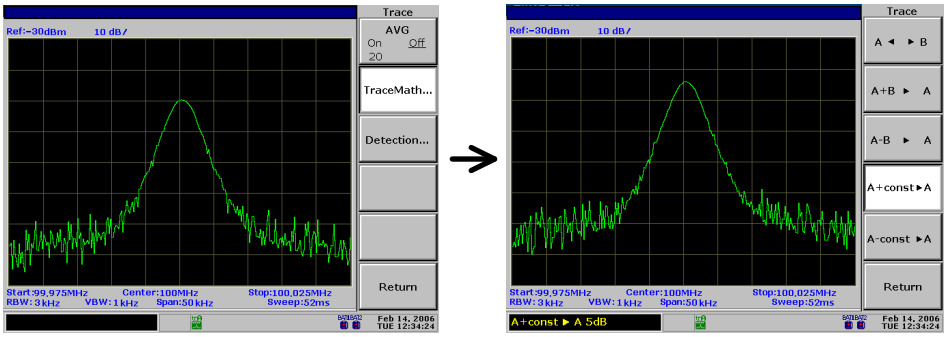
Example: A+B→ A



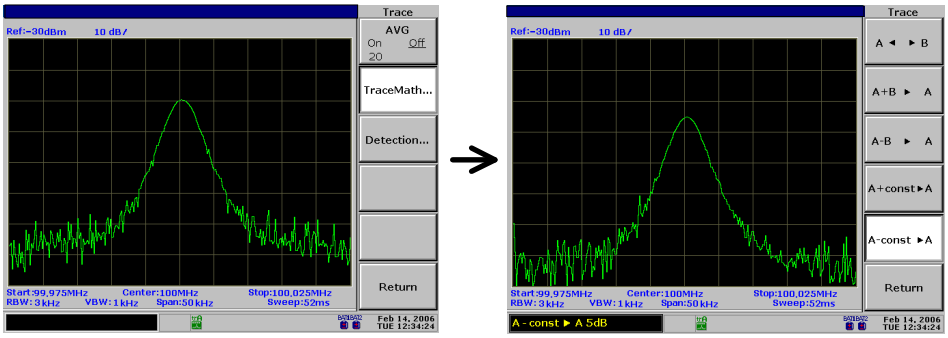
Example: A–B→ A



Example: A+constant→ A (5 dB)



Example: A–constant→ A (5 dB)



Select Signal Detection Mode

Background

In order to show the incoming signal on the display, SPA-3000 first converts the input signal to a video signal, digitizes it, then use a detector to pick up the samples to be displayed. By configuring the detection mode, certain signals can be viewed more clearly/sharply.

Panel operation

1. Press the Trace key.	Trace	
2. Press F6 (More).	More	F 6
3. Press F3 (Detection).	Detection..	F 3
4. Select the signal detection type from F1 ~ F5 and press it. See below for description of each type.	Normal	F 1
	Sample	F 2
	Peak+	F 3
	AVG	F 4
	QPeak	F 5
5. Press F6 (Return) to go back to the previous menu.	Return	F 6

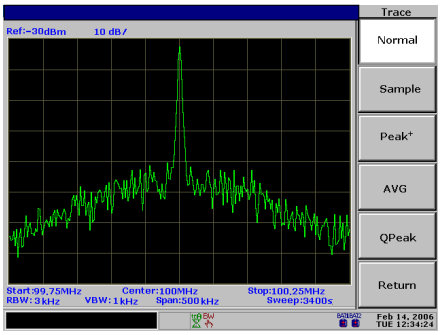
Parameter

Normal	The default mode. When the signal level is constantly increasing or decreasing detects the positive peaks. Otherwise, detecting mode switches between positive peak and negative peaks. Useful for picking up burst phenomenon while avoiding too much noise.
Sample	Detects signals randomly. Useful when detecting noise-like signals, but tend to miss burst phenomenon.
Peak+ (positive peak)	Detects positive peak signals. Useful for detecting sinusoid signal, but tend to pick up more noise than other modes.

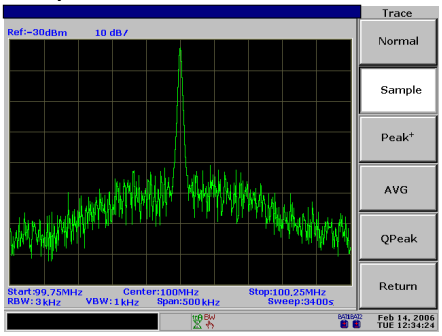
AVG (average)	Available when the optional EMI filter is installed. Detects the average power level of the samples, using low pass filter. Useful for reducing the noise level. For EMI filter details, see page154.
QPeak (quasi-peak)	Available when the optional EMI filter is installed. Detects the quasi-peak power level of the samples. Useful for viewing in zero span without missing signal variations. For EMI filter details, see page154.

Example

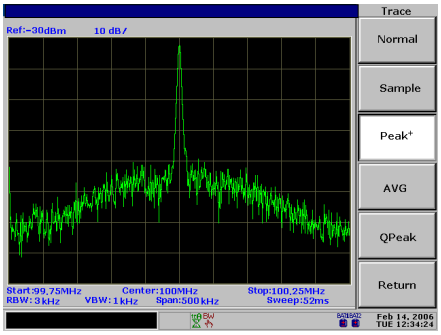
Normal detection mode



Sample detection mode



Peak+ detection mode



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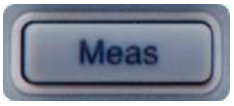
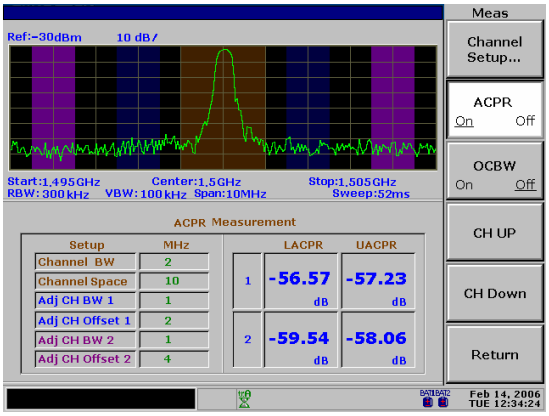
POWER MEASUREMENT

Power Measurement function includes four types of frequently used complex measurement items: ACPR, OCBW, N dB, and Phase Jitter. Each item is configurable and updated in real-time.





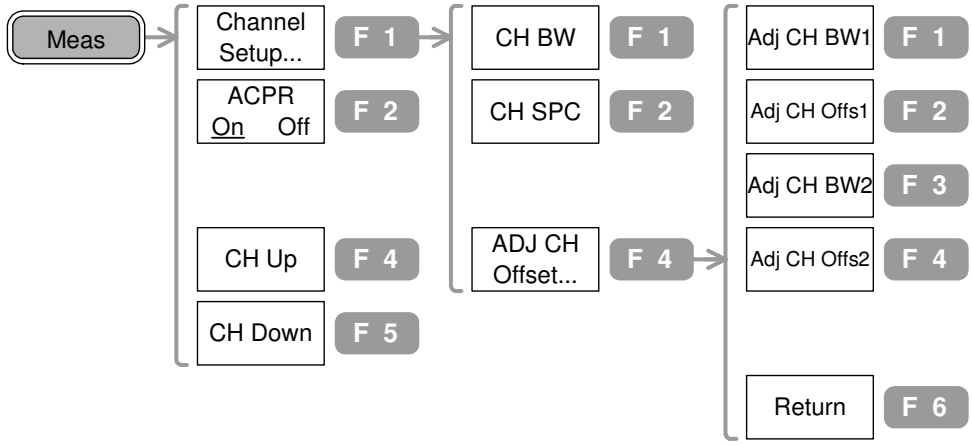
ACPR Measurement

Overview

Background

ACPR (Adjacent Channel Power Ratio), or ACLR (Adjacent Channel Leakage Ratio) in other term, refers to the amount of leakage power coming from the main radio channel which affects adjacent channels as signal distortion.

Menu tree



Parameter

Channel bandwidth	The frequency bandwidth that the target channel occupies. 1kHz ~ 3.0GHz
Channel space	The frequency distance between each main channel. 1kHz ~ 3.0GHz
Adjacent channel bandwidth 1 & 2	The frequency bandwidth that the adjacent channels 1 & 2 occupy. 1kHz ~ 3.0GHz
Adjacent channel offset 1 & 2	The frequency distance between the adjacent channel 1 & 2 and the main channel. 1kHz ~ 3.0GHz

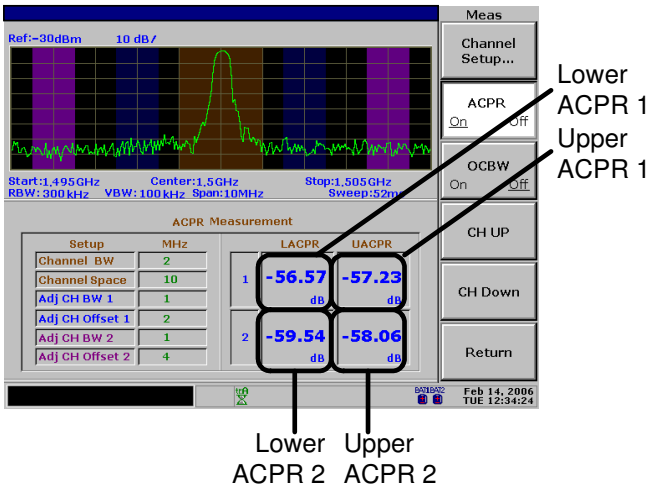
ACPR measurement step

1. Activate ACPR

1. Press the Measurement key.

2. Press F2 (ACPR On).

3. The display switches to ACPR mode, showing and updating ACPR result on the lower half.



2. Set channel BW

1. Press F1 (Channel Setup).

2. Press F1 (CH BW).

3. Enter the channel BW using the numerical keys, in MHz.
Range: 1kHz ~ 3.0GHz

4. The value is updated at the channel BW column.

3. Set channel space

1. Press F2 (Channel SPC).

2. Enter the channel space using the numerical keys, in MHz.
Range: 1kHz ~ 3.0GHz

3. The value is updated at the channel space column.

4. Set adjacent channel1 bandwidth	1. Press F4 (ADJ CH Offset).	ADJ CH Offset... F 4
	2. Press F1 (Adj CH BW1).	Adj CH BW1 F 1
	3. Enter the adjacent channel 1 bandwidth using the numerical keys. Range: 1kHz ~ 3.0GHz	
	4. The value is updated at the Adj CH BW1 column.	
5. Set adjacent channel1 offset	1. Press F2 (Adj CH Offs1).	Adj CH Offs1 F 2
	2. Enter the adjacent channel 1 offset using the numerical keys. Range: 1kHz ~ 3.0GHz	
	3. The value is updated at the Adj CH Offset1 column.	
6. Set adjacent channel2 bandwidth	1. Press F3 (Adj CH BW2).	Adj CH BW2 F 3
	2. Enter the adjacent channel 2 bandwidth using the numerical keys. Range: 1kHz ~ 3.0GHz	
	3. The value is updated at the Adj CH BW2 column.	
7. Set adjacent channel2 offset	1. Press F4 (Adj CH Offs2).	Adj CH Offs2 F 4
	2. Enter the adjacent channel 2 offset using the numerical keys. Range: 1kHz ~ 3.0GHz	
	3. The value is updated at the Adj CH Offset2 column.	
8. Move channel up/down	1. Press F6 (Return) twice.	Return F 6 x2

2.	Press F4 (CH Up) or F5 (CH Down) to switch the measurement to the next channel.	CH Up F 4 CH Down F 5

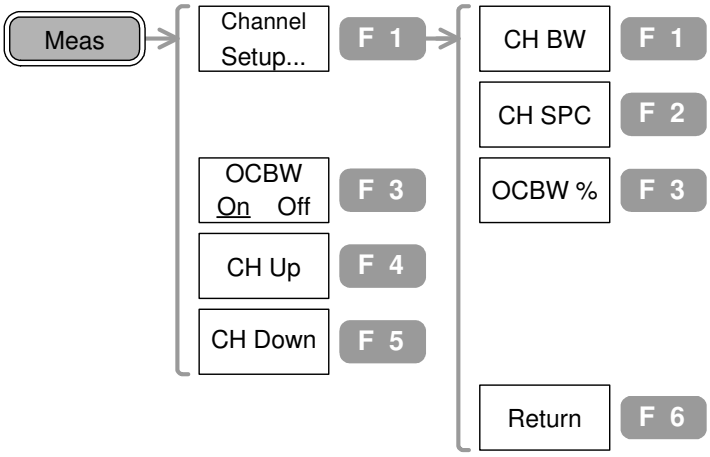
OCBW Measurement

Overview

Background

OCBW (OCcupied BandWidth) refers to the bandwidth of the channel that consumes (occupies) the specified amount of power.

Menu tree



Parameter

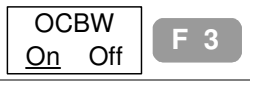
Channel bandwidth	The frequency bandwidth that the target channel occupies. 1kHz ~ 3.0GHz, 1kHz resolution
Channel space	The frequency distance between each main channel. 1kHz ~ 3.0GHz, 1kHz resolution
OCBW %	The ratio of occupied bandwidth as the amount of power consumed. 0.0% ~ 100.0%, 0.1% resolution

OCBW measurement step

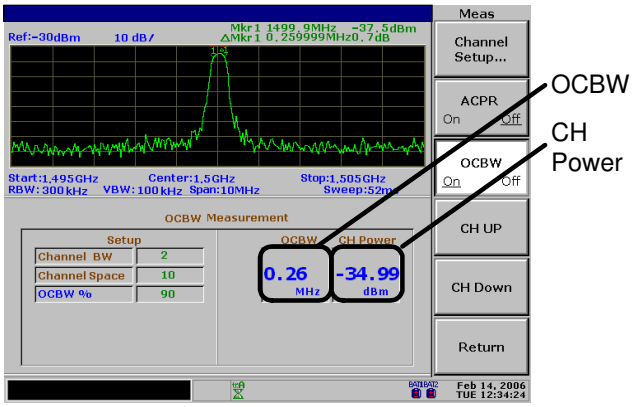
1. Activate OCBW

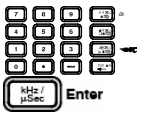
1. Press the Measurement key.

2. Press F3 (OCBW On).



3. The display switches to OCBW mode, showing and updating OCBW result on the lower half.

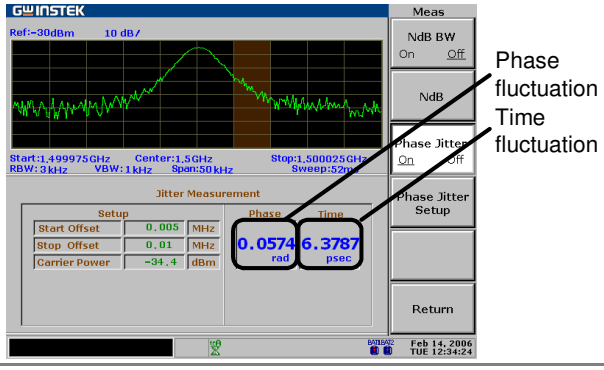


2. Set channel BW	1. Press F1 (Channel Setup).	Channel Setup...	F 1
	2. Press F1 (CH BW).	CH BW	F 1
	3. Enter the channel BW using the numerical keys, in MHz. Range: 1kHz ~ 3.0GHz		
	4. BW column updates the value.	Setup: Channel BW 2	
3. Set channel space	1. Press F2 (Channel SPC).	CH SPC	F 2
	2. Enter the channel space using the numerical keys, in MHz. Range: 1kHz ~ 3.0GHz		
	3. Space column updates the value.	Channel Space 10	
4. Set OCBW %	1. Press F3 (OCBW %).	OCBW %	F 3
	2. Enter the OCBW % using the numerical keys and Enter key. Range: 0.0% ~ 100%		
	3. OCBW % column updates the value.	OCBW % 90	
5. Move channel up/down	1. Press F6 (Return) twice.	Return	F 6
	2. Press F4 (CH Up) or F5 (CH Down) to switch the measurement to the next channel.	CH Up CH Down	F 4 F 5

N dB Measurement

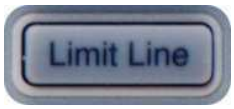
Background	N dB refers to the frequency bandwidth of a channel that covers the specified amplitude.	
Parameter	N dB	0.1dB ~ 80.0dB, 0.1dB resolution
1. Activate N dB	1. Press the Measurement key.	Meas
	2. Press F6 (More).	More F 6
	3. Press F1 (N dB BW On).	N dB BW On Off F 1
	4. The display switches to N dB mode, showing and updating N dB result on the lower half.	
		02
2. Set amplitude	1. Press F2 (NdB) to set the amplitude which the BW covers.	N dB F 2
	2. Enter the amplitude using the numerical keys. Range: 0.1dB ~ 70.0dB	

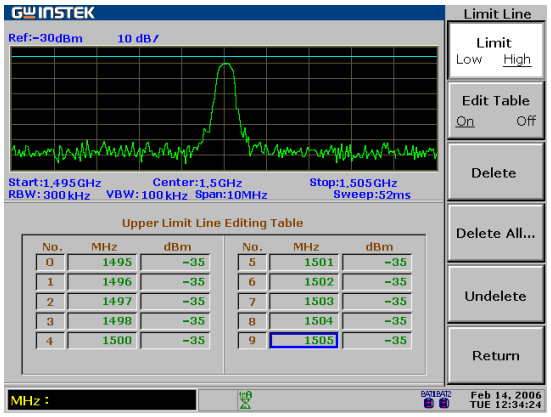
Phase Jitter Measurement

Background	Phase Jitter refers to the amount of phase fluctuation that leads to shortening or lengthening the Center frequency.		
Parameter	**Start offset**	Beginning frequency offset in reference to the center frequency. 0.0MHz ~ ½ of Span, 0.1MHz resolution	
	Stop offset	End frequency offset in reference to the center frequency. 0.0MHz ~ ½ of Span, 0.1MHz resolution	
1. Activate Phase Jitter	1. Press the Measurement key.	Meas	
	2. Press F6 (More).	More	F 6
	3. Press F3 (Phase Jitter On).	Phase Jitter On Off	F 3
	4. The display switches to Phase jitter mode, showing and updating Phase jitter result on the lower half.		
2. Set start/stop offset	1. Press F4 (Phase Jitter Setup).	Phase Jitter Setup	F 4
	2. Press F1 (Start Offset) and F2 (Stop Offset) to set the amount of beginning/end offset.	Start Offset Stop Offset	F 1 F 2
	3. Enter the offset using the numerical keys. Range: 0.0MHz ~ ½ of Span		

LIMIT LINE

Limit Line sets the upper and lower amplitude limit over the entire frequency range. The limit lines can be used to detect whether the input signal level is above, below, or within the target amplitude. The result, pass or fail, is shown at the display bottom in real-time.





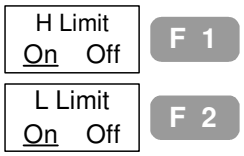
Edit Limit Line

Parameters	Editing point	Maximum 10 points for each High and Low limit line.
	Frequency	9kHz ~ 3.0GHz per editing point.
	Amplitude	Per editing point: −130 ~ +20dBm −83.01dBmV ~ +66.99dBmV −23.01dBuV ~ +126.99dBuV

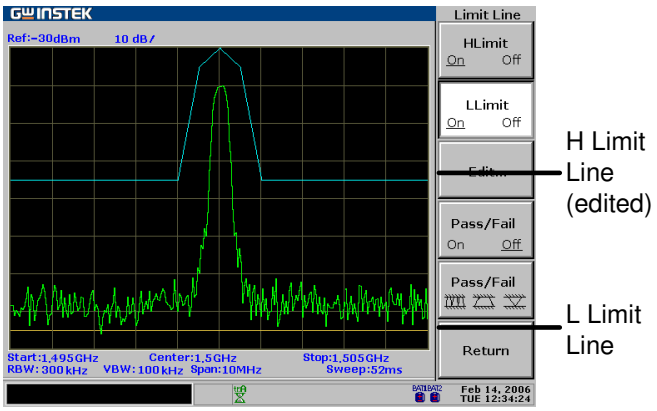
1. Activate Limit Line

1. Press the Limit Line key.

2. Press F1 (H Limit On) and/or F2 (L Limit On) to activate the upper/lower limit line.



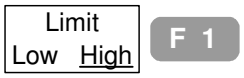
3. The limit line appears on the display.
Blue: —— H limit line
Yellow: —— L limit line



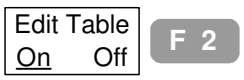
2. Activate limit line editing table

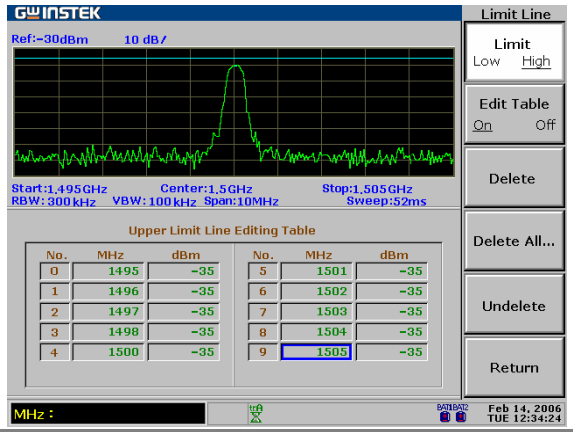
1. Press F3 (Edit).

2. Press F1 (Limit) to select the limit line to be edited.



3. Press F2 (Edit Table On). The editing table appears on the bottom half of the display.





3a. Add a limit line point

1. Make sure that the cursor is pointing to the first empty frequency point. Use the Up/Down key to move the cursor, if necessary.
10 points are available for upper and lower limit line each.

No.	MHz	dBm
1		
2		
3		
4		
5		

2. If necessary, move the cursor to different frequency points using the Arrow key.

3. Enter the frequency in MHz using the numerical keys.
9.0kHz ~ 3.0GHz.

4. The cursor automatically moves to the Gain side. Enter the gain in dB using the numerical keys.
Range: −130dB ~ +20dBm

No.	MHz	dBm
1	98	
2		
3		
4		
5		

5. Continue the above steps for the points needed.

3b. Delete a limit line point

1. Move the cursor to the deletion point using the Arrow key.

2. Press F3 (Delete) to delete the point (frequency and amplitude together).

No.	MHz	dBm
1	98	-40
2	100	-30
3	102	-40
4		
5		

→

No.	MHz	dBm
1	98	-40
2	102	-40
3		
4		
5		

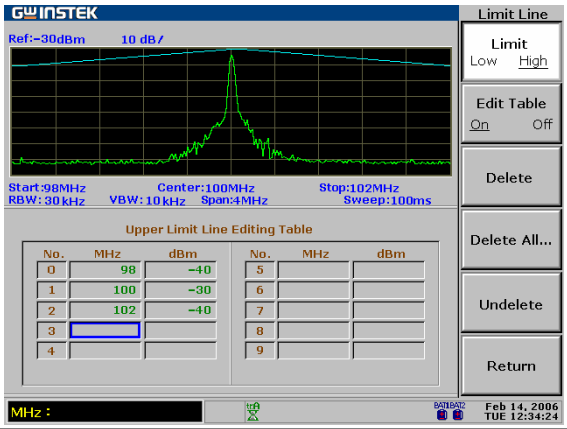
	3. To undo deletion, press F5 (Undelete).	Undelete	F 5
3c. Delete the whole limit line data	1. Press F4 (Delete All).	Delete All..	F 4
	2. Press F1 (No) or F2 (Yes) to confirm deletion. All 10 limit line points will be deleted.	No Yes	F 1 F 2
	3. Press F6 (Return) to go back to the previous menu.	Return	F 6
	4. To undo deletion, press F5 (Undelete).	Undelete	F 5
4. Switch upper/lower limit line	If necessary, press F1 (Limit) to start editing the other limit line. Repeat the above steps.	Limit Low High	F 1

Example

Limit Line data (high)

Point No.	Frequency (MHz)	Amplitude (dBm)
1	98MHz	−40dBm
2	100MHz	−30dBm
3	102MHz	−40dBm

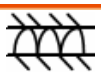
Resulted line



Run Pass/Fail test

This section assumes the limit line is already defined.

Pass/Fail condition

	Checks whether all the waveform amplitude stays between the high limit and low limit lines.
	Checks whether the peak amplitude of the waveform stays between the high and low limit lines.
	Checks whether the minimum amplitude of the waveform stays between the high and low limit lines.

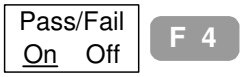
1. Select condition

1. Press the Limit Line key.

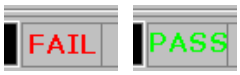
2. Press F5 (Pass/Fail) repeatedly to select the condition.

2. Run Pass/Fail test

1. Press F4 (Pass/Fail On) to activate the test.

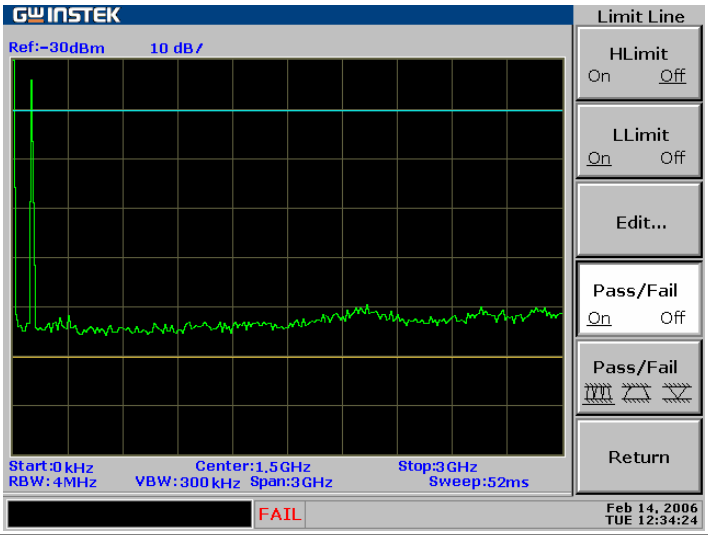


2. The test result appears at the bottom of the display.



Display

Result: failed



Note

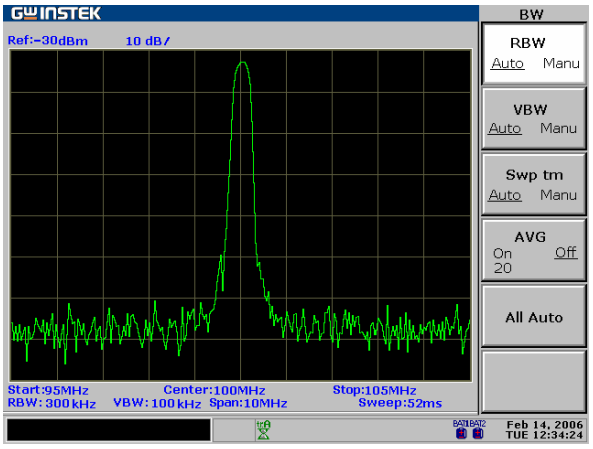
If the high or low limit line is not defined, Pass/Fail test uses the highest or lowest display level as limit line.

Save/copy/delete/rename limit line file

Background	Limit line files can be saved, copied, deleted, or renamed using the file utility. Press the File key to access each function.	File
Save/Copy	Press F1 (Copy). For detailed step, see page122.	Copy... F 1
Delete	Press F2 (Delete). For detailed step, see page125.	Delete... F 2
Rename	Press F3 (Rename). For detailed step, see page127.	Rename... F 3

BANDWIDTH

BW (BandWidth) feature configures how narrow SPA-3000 can sort out different signal peaks (resolution), and how fast the display can be updated (sweep time). Averaging the waveform is also available for smoothing noise level. The resolution and the sweep time (+averaging) are in a trade-off relationship, so configuration should be done with care.



Select RBW (Resolution BandWidth)

Background

RBW (Resolution Bandwidth) defines the width of the IF (intermediate frequency) filter that is used to separate signal peaks from one another. The narrower the RBW, the greater the capability to separate signals at close frequencies. But it also makes the sweep time longer under specific frequency span; the display is updated less frequently. See page106 for the reference to select the suitable RBW.

Panel operation

1. Press the BW key.

2. Press F1 (RBW) to select Auto or Manual.

3. When Manu (manual) is selected, use the Arrow key or Scroll knob to change it.

4. The selected RBW appears in the command window.

Mode

Auto	RBW is automatically set. See page106 for the setting.
Manual 	RBW is manually selected. The BW icon appears at the bottom of the display.

Range

See page106 for RBW reference setting according to the frequency span.

RBW	Recommended span	Standard/ Optional
300Hz	Span<30kHz	Optional (300Hz RBW)
3kHz	Span<300kHz	Standard
9kHz	300kHz≤Span<600kHz	Optional (EMI Filter - page154)
10kHz	300kHz≤Span<1MHz	Optional (10k/ 100kHz RBW)
30kHz	300kHz≤Span<6MHz	Standard

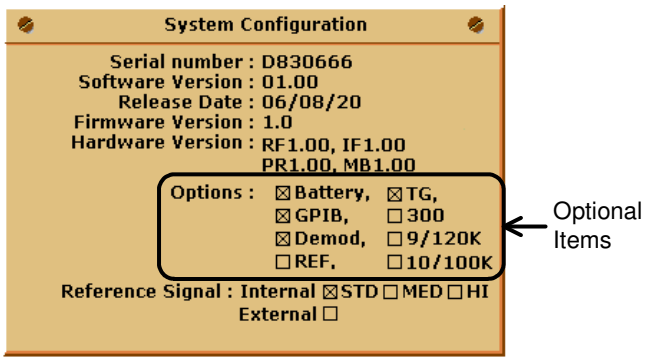
100kHz	6MHz≤Span<20MHz	Optional (10k/100kHz RBW)
120kHz	6MHz≤Span<19MHz	Optional (EMI Filter – page154)
300kHz	6MHz≤Span<60MHz	Standard
4MHz	60MHz≤Span	Standard

Check RBW installation status

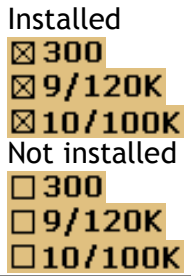
1. Press the System key.

2. Press F6 (More).

3. Press F4 (System Config On) to turn On the system configuration window.



4. Check the optional items corner and see the RBW installation status (checkmark – installed, blank – not installed)



5. Press F4 (System Config Off) to close the system configuration window.

Note

9k/120kHz RBW (EMI Filter) and 10k/100kHz RBW are exclusive; cannot be installed together. For a new RBW option install, contact service personnel.

Select VBW (Video BandWidth)

Background	VBW (Video Bandwidth) defines the smoothness of the trace on the display. Combined with RBW, Video BandWidth defines the ability to sort out target signal from surrounding noise or adjacent peaks. See page106 for reference to select the suitable VBW.	
Panel operation	1. Press the BW key.	
	2. Press F2 (VBW) to select Auto or Manual.	
	3. When Manu (manual) is selected, use the Arrow key or Scroll knob to change it.	
	4. The selected VBW appears in the command window.	
Mode	**Auto**	VBW is automatically set. See page106 for setting.
	Manual 	VBW is manually set. The VBW icon appears at the bottom of the display.
Range	10Hz ~ 1MHz in 1-3 steps VBW is automatically selected according to the RBW in Auto mode. See page106 for the setting list. Use this for the reference when manually selecting the VBW.	
Note	• SPA-3000 automatically changes the VBW according to RBW selection.	

RBW/VBW Auto Mode Contents

Background

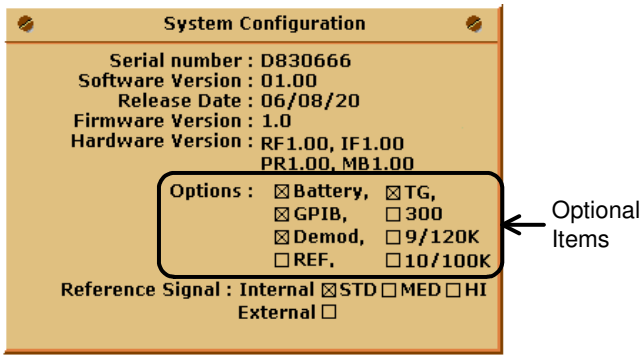
- The following applies when selecting Auto for RBW and VBW setting. Use them as a reference when manually selecting the RBW and VBW.
- The RBW/VBW range differs according to system configuration, especially the optional item installation.

Check the RBW installation status

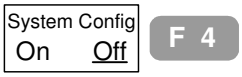
1. Press the System key.

2. Press F6 (More).

3. Press F4 (System Config On) to turn On the system configuration window.



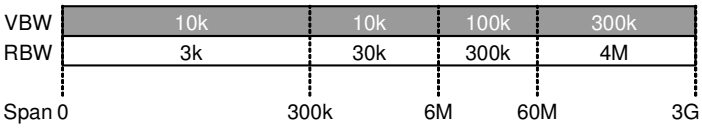
4. Press F4 (System Config Off) to close the system configuration window.



Standard configuration

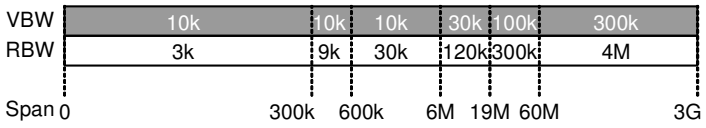
Optional item	Install	Configuration
EMI Filter(9k/120k RBW)	No	☐9/120K
300Hz RBW	No	☐300
10k/100kHz RBW	No	☐10/100K

(Logarithmic scale, unit in Hz)



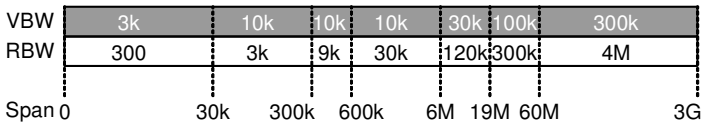
Standard + 9k/120kHz RBW configuration	Optional item	Install	Configuration
	EMI Filter (9k/120k RBW)	Yes	☒9/120K
	300Hz RBW	No	☐300
	10kHz/100kHz RBW	No	☐10/100K

(Logarithmic scale, unit in Hz)



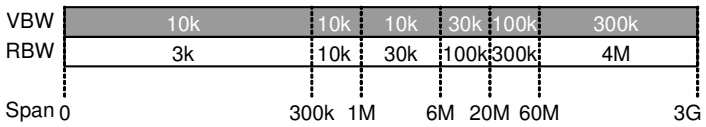
Standard + 300/9k/120kHz RBW configuration	Optional item	Install	Configuration
	EMI Filter (9k/120k RBW)	Yes	☒9/120K
	300Hz RBW	Yes	☒300
	10kHz/100kHz RBW	No	☐10/100K

(Logarithmic scale, unit in Hz)



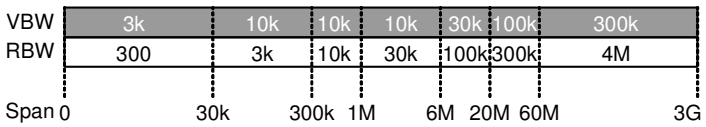
Standard + 10k/100kHz RBW configuration	Optional item	Install	Configuration
	EMI Filter (9k/120k RBW)	No	☐9/120K
	300Hz RBW	No	☐300
	10kHz/100kHz RBW	Yes	☒10/100K

(Logarithmic scale, unit in Hz)

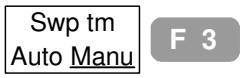


Standard + 300/10k/100kHz RBW configuration	Optional item	Install	Configuration
	EMI Filter (9k/120k RBW)	No	☐9/120K
	300Hz RBW	Yes	☒300
	10kHz/100kHz RBW	Yes	☒10/100K

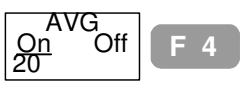
(Logarithmic scale, unit in Hz)



Set Sweep time

Background	Sweep time defines the display update rate. Note that the sweep time and RBW/VBW are in trade-off. Faster sweep time updates display more frequently but makes RBW and VBW wider, reducing the capability to separate signals at close frequencies.	
Panel operation	1. Press the BW key.	
	2. Press F3 (Swp tm) to switch between Auto and Manual setting.	
	 In Manual mode, the Manual Sweep Time icon appears.	
	3. When Manual is selected, enter the sweep time using the numerical keys.	
Mode	Auto	Sweep time is automatically set.
	Manual	Sweep time is manually set.
Range	50ms ~ 12.8s, 1us resolution	
Note	When in Auto mode, GSP830 is optimized for fast sweep time. For narrower RBW settings, like 300 Hz and 3 KHz, this optimization will cause the phase noise slightly higher. To reduce the phase noise level, please slow down the sweep time using manual setting.	

Average Waveform

Background	SPA-3000 averages the waveform for a configured number, then shows on the display. This feature smoothes the noise level to a great extent, but slows down the display update rate.	
Panel operation (Method1)	1. Press the BW key.	
	2. Press F4 (AVG On) to turn On averaging.	

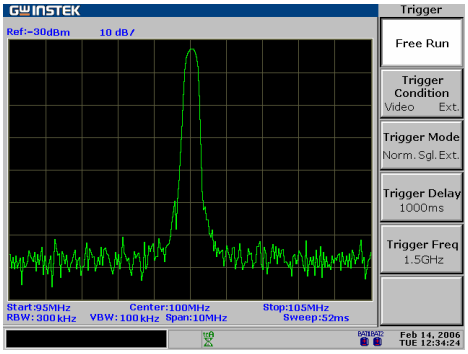
	3. Enter the average time using the numerical keys.	
Panel operation (Method2)	1. Press the Trace key.	Trace
	2. Press F6 (More).	More F 6
	3. Press F1 (AVG On) to turn On the average mode.	AVG On Off 20 F 1
	4. The average mode icon appears at the bottom of the display.	
	5. Enter the average number using the numerical keys.	
Parameter	1 ~ 200	Only available when Average is On.

Reset RBW/VBW/SweepTime to Auto

Panel operation	1. Press the BW key.	BW
	2. Press F5 (All Auto). RBW, VBW, and Sweep time setting all changes to Auto.	All Auto F 5
RBW/VBW/Sweep Setting after Autoset	All the three BW related parameters, RBW, VBW, and Sweep, will be reset to AUTO mode when using Autoset, regardless of their previous settings.	

TRIGGER

Trigger function sets the signal conditions upon which SPA-3000 triggers capturing waveforms, including frequency, amplitude, and delay. External signal can be used in case a special condition is required.



Free Run (Default)

In free run, SPA-3000 captures all incoming signals (no triggering condition).

Panel operation	1. Press the Trigger key.	Trigger
	2. Press F1 (Free Run).	Free Run F 1

Activate video trigger

Panel operation	1. Press the Trigger key.	Trigger
	2. Press F2 (Trigger Condition). Select Video.	Trigger Condition Video Ext. F 2
	3. The video trigger icon appears at the bottom of the display.	LVL
	4. Enter the trigger level (amplitude) using the numerical keys. The value appears in the command window.	Video: -20dBm
	5. Press F5 (Trigger Freq) to set the frequency at which SPA-3000 checks the trigger condition.	Trigger Freq 1.5GHz F 5
	6. Enter the trigger frequency using the numerical keys.	
	7. To de-activate triggering, press F1 (Free Run).	Free Run F 1

Trigger level range	dBm	−130 ~ +20dBm
	dBmV	−83.01 ~ +66.99dBmV
	dBuV	−23.01 ~ +126.99dBuV
Trigger frequency range	0 ~ 3.0GHz	

Activate external trigger

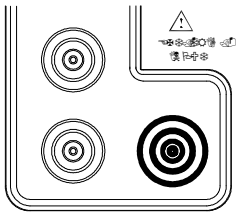
Panel operation

1. Press the Trigger key.

2. Press F2 (Trigger Condition). Select Ext.

3. The Ext. trigger icon appears at the bottom of the display.

4. Connect the external trigger signal to the rear panel terminal. The positive edge between 0V and 5V triggers SPA-3000.



Input level range

0 ~ 5V, positive edge trigger

Select trigger mode

Panel operation

1. Press the Trigger key.

2. Press F3 (Trigger Mode) repeatedly to select the trigger modes.

3. When Sgl (single) or Cont. (continuous) is selected, you can use F6 (Run Now) to manually start the triggering.

Modes

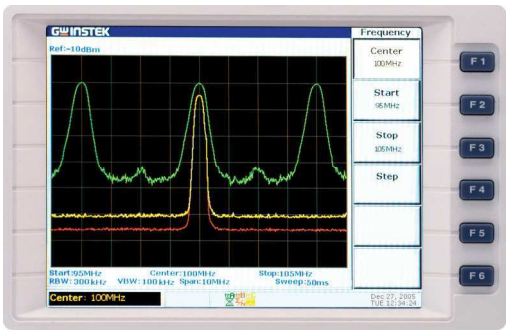
Normal	SPA-3000 captures signal every time the triggering condition occurs.
Single	SPA-3000 captures signal when the first triggering condition occurs, then stops capturing altogether.
Continuous	SPA-3000 captures signal when the first triggering condition occurs, then switches to Free Run mode; continues capturing all input signals regardless of their conditions.

Set trigger delay

Background	Trigger delay sets the amount of time between the moment of trigger condition and when SPA-3000 starts capturing signal.	
Panel operation	1. Press the Trigger key.	
	2. Press F4 (Trigger Delay).	
	3. Enter the delay time using the numerical keys.	
Delay range	0, 10us ~ 100s, 1us resolution	

DISPLAY

Display setting configures the LCD screen dimmer level and display layout, including display line, title, and split window. Display line provides a convenient reference line for measuring amplitude. Split window allows two simultaneous waveforms shown on the display. The VGA terminal on the rear panel outputs the LCD screen contents in 640x480 resolution.



Change Display Brightness

Panel operation

1. Press the Display key. 

2. Press F1 (LCD Dimmer). 

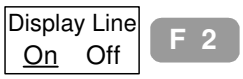
3. Change the brightness using the Left/Right key or Scroll knob. 

Range 0 (darkest) ~ 5 (brightest)

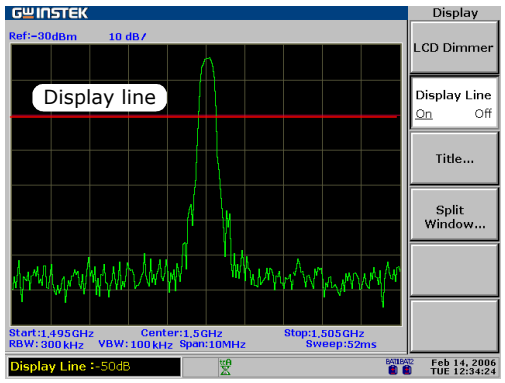
Activate Display Line

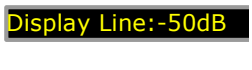
Panel operation

1. Press the Display key. 

2. Press F2 (Display Line On). 

3. The line appears on the display.



4. The display line level appears in the command window. 

5. Move the line using the Arrow key or Scroll knob. 

Note Display line is NOT available when the display splits.

- Split window (page117)
- Limit Line editing (page97)
- Power measurements (page87)

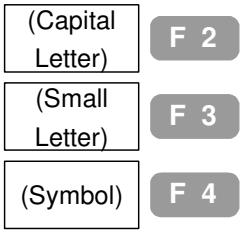
Enter Display Title

Panel operation

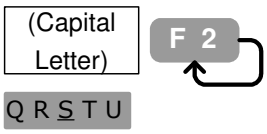
1. Press the Display key.

2. Press F2 (Title).

3. Select the character from F2 ~ F4 and press it.



4. Here is how to type in the capital letter "S". Press F2 (Capital Letter) repeatedly until the cursor reaches S.



5. Press the Enter key. S appears in the command window.

6. Continue the above until all the characters are entered.

(SATEST)

7. Press F5 (Show Title).

8. The entered title appears at the top left corner of the display.

9. To erase the title, press F1 (Clear Title).

Parameter

Capital letter	Upper case alphabet, A to Z.
Small letter	Lower case alphabet, a to z.
Symbol	Commonly used 14 symbols as shown below.

\ # / _ -
. * : & (
) < > %

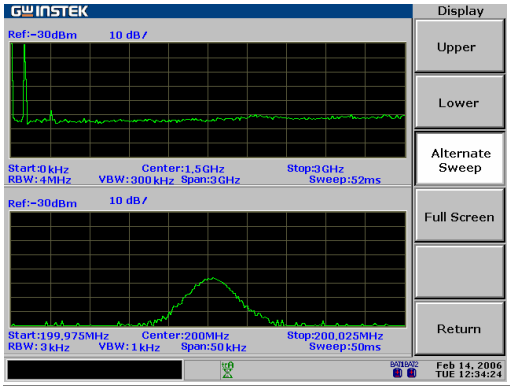
Use Split Display

Panel operation

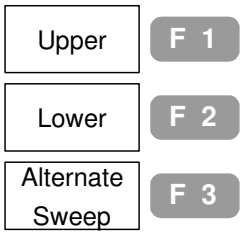
1. Press the Display key.

2. Press F4 (Split Window).

3. The display splits into upper and lower screen. The lower display retains the original vertical and horizontal scale. The upper display shows full scale.



4. Select the active display (the waveform is updated) by pressing F1 (Upper) or F2 (Lower). Pressing F3 (Alternate Sweep) updates both displays alternately.



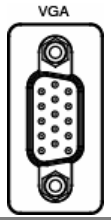
5. To go back to the original single display, press F4 (Full Screen). The currently active window gets expanded.

* Switching to Full Screen from the Alternate Sweep mode is not recommended, since it is not predictable which display, upper or lower, will be selected.

Use VGA Output

Panel operation

Connect an external monitor to rear panel VGA output terminal. The output is always On.



Parameter

Connector type	VGA 15pin, female
Resolution	640 x 480

Save Display Image to USB Flash Drive

Panel operation

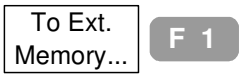
1. Connect the USB flash drive to front panel USB terminal.

Compatibility	USB 1.1/2.0
Connector	TypeA host, female

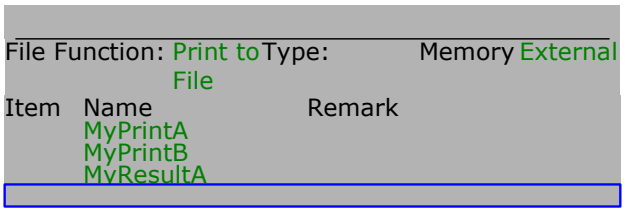
2. Press the File key.

3. Press F4 (Print Screen).

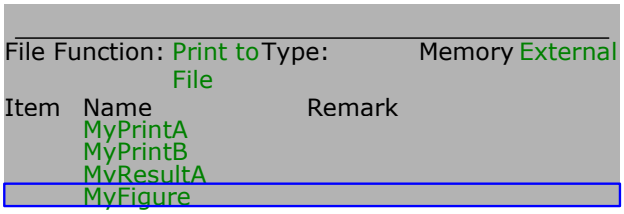
4. Press F1 (To Ext. Memory).



5. The USB flash drive contents appear in the window.

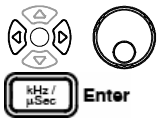


6. To save the display image, press F2 (Print Now). A new *.bmp file is created in the USB flash drive.



7. If you want to edit the file name, press F1 (Edit File Name).

8. The character table appears at the bottom of the display. Move the cursor inside the table using the Left/Right key and Scroll knob. Press the Enter key to confirm the character.



9. When completed, press F1 (Edit File Name) again. The file name is confirmed.

FILE

File function manages file operations; copy, delete, and name change. The file format and contents include trace waveform, limit line, amplitude correction, sequence set (user defined macro), and panel setup. The file source and destination are selectable between internal and external (USB flash drive). File function also saves display image to USB flash drive.

File Location and File Type

File location	Internal	The SPA-3000 internal memory. The number of file is fixed (see below).
	External	The USB flash drive connected to the front panel terminal. There is no practical limit on the number of files.   The USB icon turns On when the flash drive is detected.
		Compatibility: USB 1.1/2.0
		Connector: TypeA host, female
File type	Trace	Trace waveform data. For details, see page77. File format: *.tra 13 files are available internally: Trace A/B/C (current trace), Trace 1~10 (stored trace).
	Limit	Limit Line data. For details, see page96. File format: *.lmt 12 files are available internally: LimitHL (current high limit line), LimitHL1~5 (stored high limit line), LimitLL (current low limit line), LimitLL1~5 (stored low limit line).
	Correction	Amplitude correction data. For details, see page55. File format: *.cor 5 files are available: Correction 1 ~ 5.
	Seq.	Sequence data. For details, see page144. File format: *.seq 10 files are available: Sequence 1 ~ 10.

Setup	Panel setup data. For details, see page132. File format: *.set 10 files are available: Setup 1 ~ 10.

File Copy Step

1. Connect USB flash drive (for external file)

When using the USB flash drive (external file) for source or destination, connect the drive to front panel terminal.

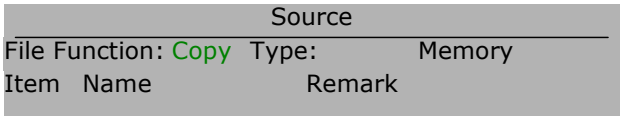
The USB icon turns On when the flash drive is detected.

2. Select source file

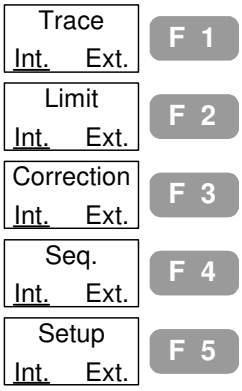
1. Press the File key.

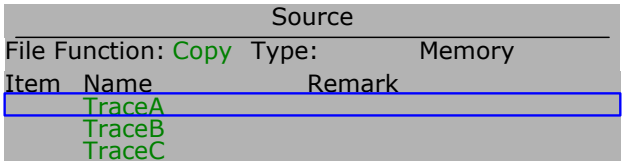
2. Press F1 (Copy).

3. Press F1 (Source). The source file copy window appears.

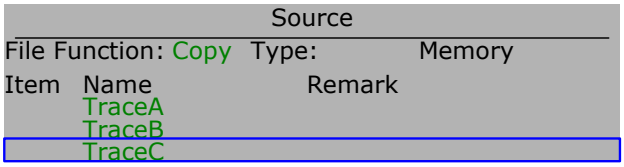


4. Select the file type from F1 ~ F5 and press it.
Then select Int (internal) or Ext (external).
The display gets updated accordingly. The below example shows Trace file, internal.





5. Use the Up/Down key to move the cursor to the copy source file location. (Example: TraceC selected)



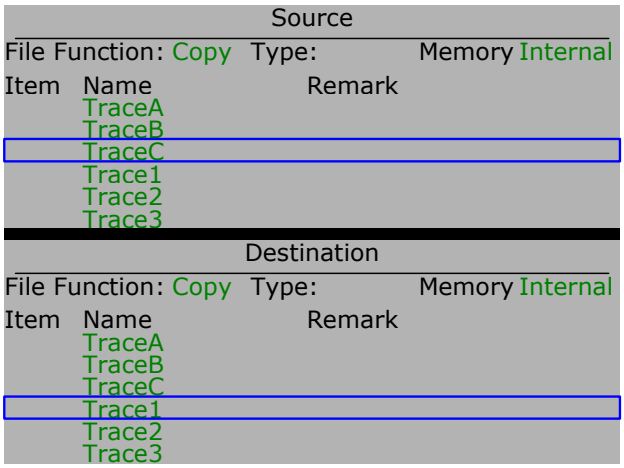
6. Press F6 (Return). The copy source file information is retained.

Return F 6

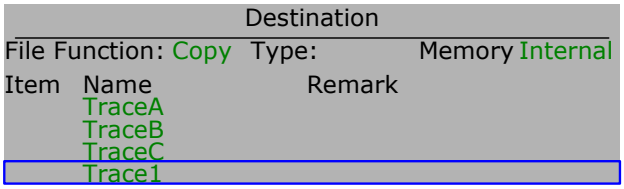
3. Select destination file

1. Press F2 (Destination). The destination file copy window becomes active (lower half of the display). File type is automatically selected according to the previous Copy source file type selection.

Destination.. F 2



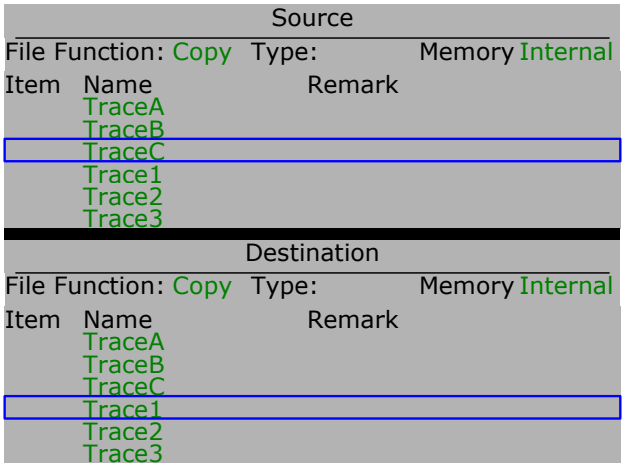
2. Use the Up/Down key to move the cursor to the copy destination file location. (Example: Trace1 selected)



3. Press F6 (Return). The copy destination file information is retained.

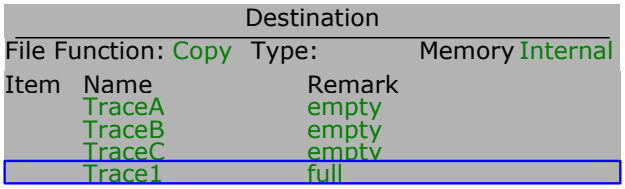
4. Copy file

1. The copy source and destination files are highlighted (Example: source – TraceC, destination – Trace1)



2. Press F4 (Copy Now).

3. If the destination file attribute (Remark) has been empty, it changes into full.

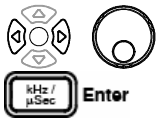


5. Edit file name (external file, if necessary)

1. Move the cursor to the file using the Up/Down key.

2. Press F3 (Edit File Name).

3. The character table appears at the bottom of the display. Move the cursor inside the table using the Left/Right key and Scroll knob. Press the Enter key to confirm the character.



Char Table
ABCDEFGHIJKLMNOPQRSTUVWXYZabcdef ghijklmnopqrstuvwxyz0123456789

4. When completed, press F3 (Edit File Name) again. The file name is confirmed.

Edit File Name F 3

File Delete Step

1. Connect USB flash drive (for external file)

When using the USB flash drive (external file) for source or destination, connect the drive to front panel terminal.

The USB icon turns On when the flash drive is detected.

2. Select source file

1. Press the File key.

File

2. Press F2 (Delete).

Delete... F 2

3. Press F1 (Type). The file deletion window appears.

Type... F 1

Source
File Function: Delete Type: Memory
Item Name Remark

4. Select the file type from F1 ~ F5 and press it.
Then select Int (internal) or Ext (external).
The display gets updated accordingly. The below example shows Trace file, internal.

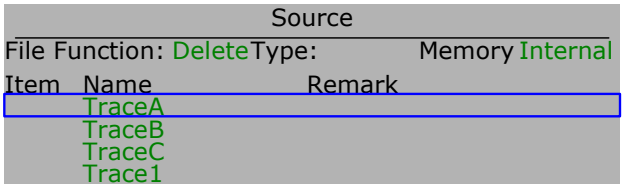
Trace Int. Ext. F 1

Limit Int. Ext. F 2

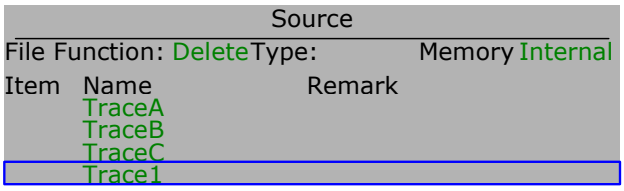
Correction Int. Ext. F 3

Seq. Int. Ext. F 4

Setup Int. Ext. F 5



5. Use the Up/Down key to move the cursor to the file location. (Example: Trace1 selected)



6. Press F6 (Return). The file location is retained.

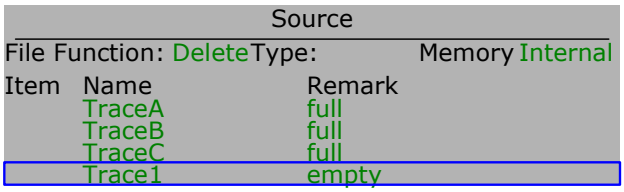
Return F 6

3. Delete file

1. Press F2 (Delete Now).

Delete Now F 2

2. Internal file: the file attribute (Remark) changes into Empty. In case of external file, the file itself is deleted.



File Rename Step

Background

File rename is allowed only for external (USB flash drive) file. Rename operation is also available during file copy (page122) and display image save (page128).

1. Connect USB flash drive

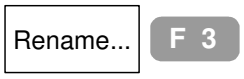
When using the USB flash drive (external file) for source or destination, connect the drive to front panel terminal.

The USB icon turns On when the flash drive is detected.

2. Select file

1. Press the File key.

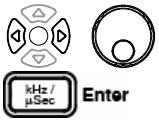
2. Press F3 (Rename). The USB flash drive contents appear on the display.



3. Move the cursor to the file using the Up/Down key.

4. Press F3 (Edit File Name).

5. The character table appears at the bottom of the display. Move the cursor inside the table using the Left/Right key and Scroll knob. Press the Enter key to confirm the character.



Char Table
ABCDEFGHIJKLMNOPQRSTUVWXYZabcdef
ghijklmnopqrstuvwxyz0123456789

6. When completed, press F2 (Confirm). The file name is confirmed.

Save Display Image to USB Flash Drive

Panel operation

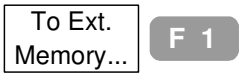
1. Connect the USB flash drive to front panel USB terminal.

The USB icon turns On when the flash drive is detected.

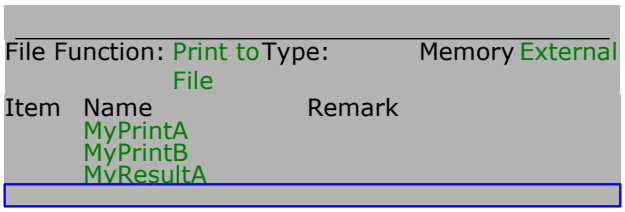
2. Press the File key.

3. Press F4 (Print Screen).

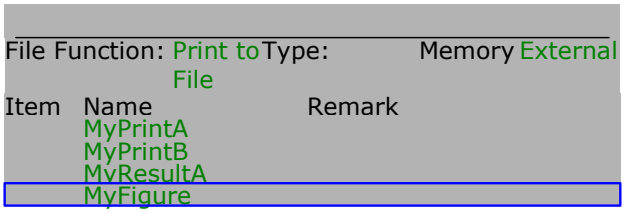
4. Press F2 (To Ext. Memory).



5. The USB flash drive contents appear in the window.

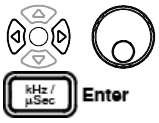


6. To save the display image, press F2 (Print Now). A new *.bmp file is created in the USB flash drive.



7. If you want to edit the file name, press F1 (Edit File Name).

8. The character table appears at the bottom of the display. Move the cursor inside the table using the Left/Right key and Scroll knob. Press the Enter key to confirm the character.



Char Table
ABCDEFGHIJKLMNOPQRSTUVWXYZabcdef ghijklmnopqrstuvwxyz0123456789

9. When completed, press F1 (Edit File Name) again. The file name is confirmed.

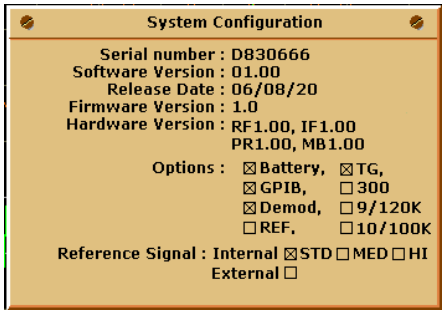
PRESET

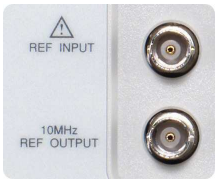
Pressing the Preset key brings back SPA-3000 to the below state. The same content is also shown in page43.

Frequency	Center: 1.5GHz Start: 0Hz	Stop: 3GHz Step: 1MHz
Span	3GHz	
Amplitude	Ref.level: 0dBm Unit: dBm Correction: Off	Scale: 10dB/ External Gain: 0dB Input Z: 50Ω
Autoset	Amplitude Floor: Auto	Span: Auto
Marker	Marker: Off Marker Table: Off	Marker Trace: Auto All Marker: Off
Peak Search	Peak Table: Off Peak Threshold: Off	Peak Sort: Freq Peak Track: Off
Trace	Trace: A AVG: Off	Mode: Clear Detection: Normal
Meas	ACPR, OCBW: Off CH SPC: 0 CH BW: 600MHz OCBW %: 0	N dB, Phase Jitter: Off Adj CH Offs1: 600MHz Adj CH Offs2: 1200MHz Adj CH BW1&2: 600MHz
Limit Line	H & L Limit: Off	Pass/ Fail: Off
BW	RBW, VBW, Swptime: Auto	Average: Off
Trigger	Trigger Delay: 50ms Trigger Mode: Normal	Trigger Freq: 1.5GHz
Display	LCD Dimmer: 5 Split Window Lower: Off	Display Line: Off Split Window Upper: Off
File	Copy Type: Int. Trace	Delete Type: Int. Trace
System	GPIB Add: 2 Aux Sig: Off	System Config: Off Language: English
Option	External Ref Freq: 10MHz TG Norm Corr: Off Demod AM: Off	TG Output: Off TG Ref Value: 0dBm Demod FM: Off
Sequence	Sequence: 1	Run Mode: Single

SYSTEM

System key configures and displays the system settings, including self-test result, date/time setting, and synchronization with other devices. The panel setting can be saved into file and recalled later, even in other SPA-3000s.



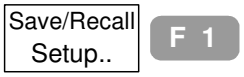


Save/Recall Panel Setting

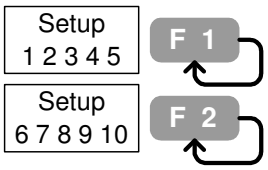
Panel operation

1. Press the System key.

2. Press F1 (Save/Recall Setup).



3. Press F1 or F2 repeatedly to select the setup file.



4. Press F3 (Save Now) or F4 (Recall Now) to save or recall the panel setup file.

File contents

Setup file contains the following information.

- Reference amplitude level
- Amplitude unit, scale
- Start/stop frequencies
- Center and span frequencies
- VBW, RBW, and sweep time
- Tracking Generator level
- Tracking Generator normalization data

Copy/delete/rename setup file

Background

Setup files can be copied, deleted, or renamed using the file utility. Press the File key to access each function.

Copy

Press F1 (Copy). For detailed step, see page122.

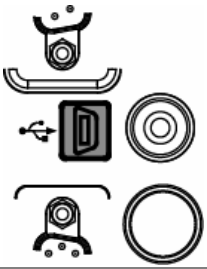
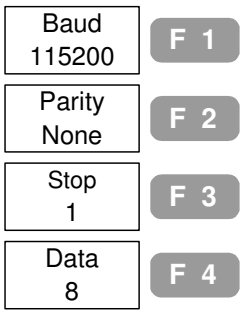
Delete

Press F2 (Delete). For detailed step, see page125.

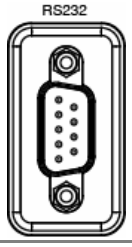
Rename

Press F3 (Rename). For detailed step, see page127.

Configure Communication Interface

Background	Communication interface is used in the following occasions. The interface configuration is introduced in the relevant chapter too.	
	PC software (page158)	USB slave, RS-232C
	Remote control (page166)	USB slave, RS-232C, GPIB (optional)
Interface type	USB slave	USB 1.1 or 2.0, TypeB mini, female connector. Used in PC software connection and remote control.
	RS-232C	D-sub 9 pin, female connector. Used in PC software connection and remote control.
	GPIB (optional)	24pin female connector. Used in remote control.
USB slave port configuration	No need for panel configuration: Just connect a USB cable to the rear panel. Type B mini, female, USB1.1/2.0	
RS-232C configuration	1. The RS-232C configuration can be checked from the system menu. Press the System key.	
	2. Press F3 (Serial Port).	
	3. The RS-232C port configuration appears. Configure the PC according to this setting. Baud: 115200 Parity: None Stop bit: 1 Data bit: 8	

4. Connect RS-232C cable to the rear panel terminal.
   9 pin, female



GPIB configuration (optional)

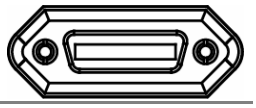
GPIB interface is a factory installed optional item. Contact service personnel for a new installation.

1. Press the System key.

2. Press F2 (GPIB Add).

3. Select GPIB address using the Arrow key or Scroll knob. Configure the PC according to this setting.

4. Connect GPIB cable to the rear panel terminal.



Check GPIB installation status

1. To check the GPIB installation status, press the System key.

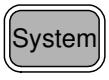
2. Press F6 (More).

3. Press F4 (System Config).

4. The system configuration window appears. When the GPIB module is installed correctly, the check box is marked.

Check GPIB self-test result

1. To check the internal GPIB functionality result, press the System key.



2. Press F6 (More).	More...	F 6
3. Press F2 (Self Test).	Self Test...	F 2
4. The GPIB result appears at F1. If the result is Fail (underlined), contact service personnel.	GPIB Pass Fail	F 1

GPIB constraints

Keep these rules when using GPIB interface.

- Altogether less than 15 devices & 20m cable length, 2m between each device on the bus
- Unique address assigned for each device
- At least 2/3 of the GPIB devices turned On
- No loop or parallel structure allowed

View System Information

View system error

Panel operation

View the bottom of the screen, the error message area. If there is a system error, the message appears in red color.

(EXT Unlock)

Here is the error list.

EXT Unlock	External reference input is not working properly.
Ref Unlock	Internal reference signal is not working properly.
LO1 Unlock	Local oscillator 1 is not working properly.
LO3 Unlock	Local oscillator 3 is not working properly.

View system configuration

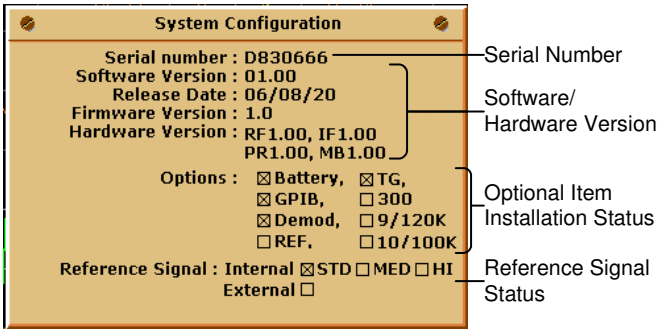
Panel operation

1. To check system configuration, press the System key.

2. Press F6 (More).

3. Press F4 (System Config On).

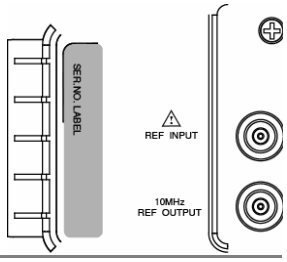
4. The system configuration window appears. Four types of information are listed from the top.
   - Serial number
   - Software and hardware version
   - Optional items installation
   - Reference signal selection



5. To close the configuration window, press F4 again (System Config Off).

Serial number

The serial Number for device identification. This number is necessary for various service level operations. The same number is pasted on the rear panel.



Software/hardware version

Shows versions and release date of hardware, software, and firmware. Used for service level operations.

Optional item installation status

Shows which optional item is currently installed.
☒: installed, ☐: uninstalled.

Sign	Description
Battery	Battery pack / DC input module (page156)
GPIB	GPIB interface (page134)
Demod	Demodulator (page152)
REF	Internal reference signal with middle range stability in ±1ppm stability module (page189).
300	300Hz RBW (page103)
9/120K	9k/120kHz RBW(page103) included in the EMI Filter(page154)
10/100K	10k/100kHz RBW (page103)

Reference signal status

Checked radio button shows the reference signal used.
For reference signal usage, see page140.
☒: enabled, ☐: disabled.

Sign	Description
Internal STD	Internal reference signal, standard stability
Internal MED	Internal reference signal, medium stability. Available when the ±1ppm stability module (page189) is installed.
Internal HI	Internal reference signal, high stability (reserved).
External	External reference signal.

View self-test result

SPA-3000 runs a series of internal tests upon power-up.

Background	SPA-3000 runs a series of internal tests upon power-up. If any of the test result shows fail, contact service personnel.	
Panel operation	1. Press the System key.	System
	2. Press F6 (More).	More... F 6
	3. Press F2 (Self Test).	Self Test... F 2
	4. The result appears in F1 ~ F4. (The GPIB result appears only when the module is installed)	GPIB Pass Fail F 1 Flash Pass Fail F 2 SDRAM Pass Fail F 3 RTC Pass Fail F 4
	5. Press F6 (Return) to go back to the previous menu.	Return F 6

Item	**GPIB**	The optional GPIB interface connection. Available only when the GPIB module is installed (page136).
	Flash	Internal flash memory area for storing the system code and data.
	SDRAM	Internal SDRAM area on which the code runs.
	RTC	The real-time clock that controls the date and time setting (page139).

Set Date/Time

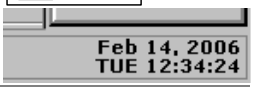
1. Activate clock display

1. Press the System key.

2. Press F6 (More).

3. Press F1 (System Clock).

4. Press F3 (Clock On). The clock appears on the bottom right side of the display.



2. Set date

1. Press F1 (Date).

2. Press F1 (Year) ~ F4 (Day of Week). Enter the value using the numerical keys. Press the Enter key to confirm the value.

The clock display changes accordingly.

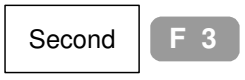
Year	2000 ~ 2064
Month	1 ~ 12 (translated to Jan ~Dec)
Day	1 ~ 31
Day of Week	1 ~ 7 (translated to Sun ~Sat)

3. Set time

1. Press F1 (Date).

2. Press F1 (Year) ~ F3 (Second). Enter the value using the numerical keys. Press the Enter key to confirm the value.

The clock display changes accordingly.



Hour	0 ~ 23
Minute	0 ~ 59
Second	0 ~ 59

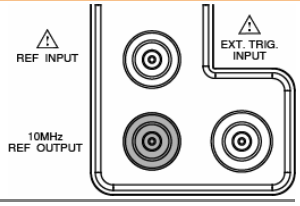
Synchronize SPA-3000 with Other Device

Using the reference frequency input/output on the rear panel, SPA-3000 can synchronize its internal frequency with other device. SPA-3000 can become the master (output the reference signal to other device) or the slave (input the reference signal from other device).

GSP as a master (internal reference signal)

Panel operation

Connect the reference signal output terminal on the rear panel to the other device's reference input.



Signal type

Output level	10MHz, 5V TTL signal (assuming the load impedance is infinite)
Output impedance	50Ω

Stability check

1. Press the System key.

2. Press F6 (More).

3. Press F4 (System Config On).

The system configuration window appears. The Internal Reference Signal sign **Internal** shows the status. ☒: enabled, ☐: disabled.

STD	Internal reference signal, standard stability
MED	Internal reference signal, median stability. Available when the ±1ppm stability module (page189) is installed. The MED icon appears at the bottom of the display.

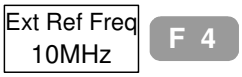
HI	Internal reference signal, high stability (reserved).

GSP as a slave (external reference signal)

Panel operation

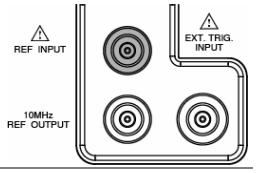
1. Press the Option key.

2. Press F4 (Ext Ref Freq) to enable external reference signal.



3. Use the Arrow key to select the external reference frequency.

4. Connect the external reference signal to the input terminal on the rear panel.



5. The external reference signal icon appears at the bottom of the display.

Frequency

10 types are available (units in MHz).

1.0	1.544	2.048	5.0	10.0
10.24	13.0	15.36	15.4	19.2

Status check

1. Press the System key.

2. Press F6 (More).

3. Press F4 (System Config On).

The system configuration window appears. The External Reference Signal sign External shows the status.
☒: enabled, ☐: disabled.

Select Menu Language

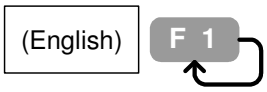
Panel operation

1. Press the System key.

2. Press F6 (More).

3. Press F5 (Language).

4. Press F1 repeatedly to select the menu language.



Language type

English → Simplified Chinese → Other selections (differs according to the region) → English

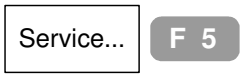
Service operation menu

The following functions are intended only for service personnel.

Optional items maintenance

1. Press the System key.

2. Press F5 (Service).



3. In order to continue, you need to type in the password into the command window.

RF diagnosis

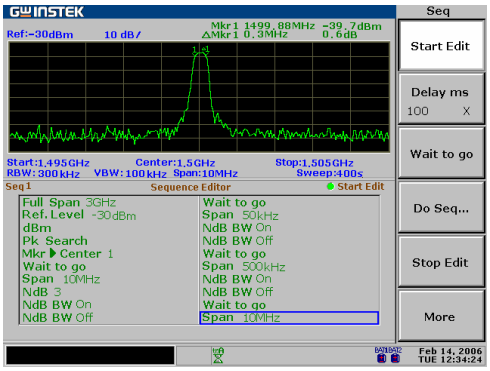
1. Press the System key.

2. Press F6 (More).

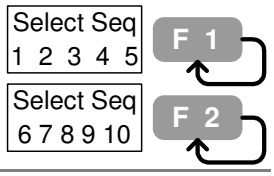
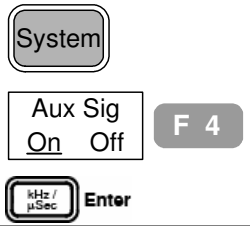
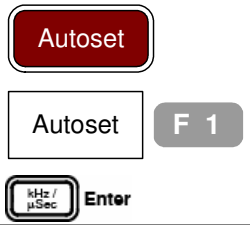
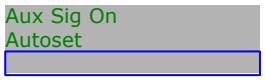
3. Press F3 (RF Diagno) to see the RF diagnosis result.

SEQUENCE

Sequence function records and playbacks user-defined macro (measurement steps). 10 sequences are available in repeat or single running mode, each with 20 steps available for all panel operations. Delay and pause features allows observing measurement result during the sequence.



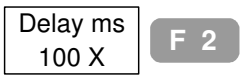
Edit Sequence

1. Select sequence	1. Press the Sequence key.	
	2. Press F1 (sequence 1 ~ 5) or F2 (sequence 6 ~ 10) repeatedly to select the sequence ID.	
2. Start editing	1. Press F3 (Edit).	
	2. Press F1 (Start Edit).	
	3. The Start Edit sign on the middle of the display turns green.	
2a. Add step	20 steps are available for each sequence. Every key operation can be recorded as a step. Press the Enter key each time to confirm step entering. (In some cases this is not necessary: check if the item appears in the window).	
	Example: Activate system auxiliary signal 1. Press the System key. 2. Press F4 (Aux Sig On). 3. Press the Enter key.	
	Example: Run Autoset 1. Press the Autoset key. 2. Press F1 (Autoset). 3. Press the Enter key.	
	The result looks like this.	

2b. Add delay

The delay function inserts a waiting period between steps.

1. Press F2 (Delay ms).



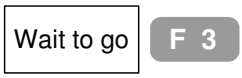
2. Enter the time of delay period (100ms) insertion using the numerical keys. For example, pressing 5 times inserts 500ms (5 * 100ms).

Range 1 ~ 100, 100ms resolution

2c. Pause sequence

Stops executing the sequence until the user press F1 (Continue). Useful for observing the result of particular action (for example ACPR measurement).

1. Press F3 (Wait to go).



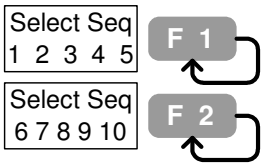
2. When the sequence is running, F1 (Continue) menu appears on the menu.

2d.Insert another sequence

Inserts a whole sequence set.

1. Press F4 (Do Seq).

2. Press F1 (sequence 1 ~ 5) or F2 (sequence 6 ~ 10) repeatedly to select the inserted sequence.



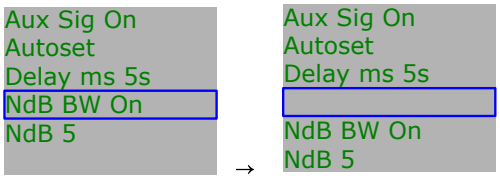
Note You cannot insert the currently edited sequence.

2e. Insert blank space

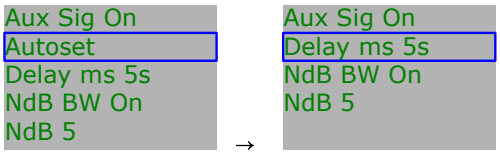
1. Press F6 (More).

2. Use the Up/Down key to move the cursor to the insertion point.

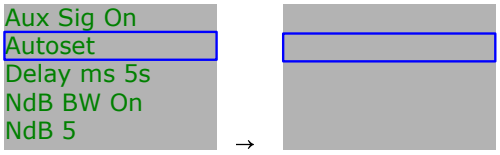
3. Press F1 (Insert). A new blank space will be created.



	4. Press F6 (Return) to go back to the previous menu.	Return F 6
2f. Delete step	1. Press F6 (More).	More F 6
	2. Use the Up/Down key to move the cursor to the deletion point.	
	3. Press F3 (Delete). The step will be deleted.	Delete F 3



	4. To undo deletion, press F5 (Undelete).	Undelete F 5
	5. To go back to the previous menu, press F6 (Return).	Return F 6
2g. Delete all steps in a sequence	1. Press F6 (More).	More F 6
	2. Press F4 (Delete All).	Delete All.. F 4
	3. Press F2 (Yes) to confirm, or F1 (No) to cancel. All steps will be deleted.	No F 1 Yes F 2



	4. To undo deletion, press F5 (Undelete).	Undelete F 5

	5. Press F6 (Return) to go back to the previous menu.	Return F 6
3. Stop editing	1. Press F5 (Stop Edit).	Stop Edit F 5
	2. The Start Edit sign on the middle of the display turns gray.	Start Edit
4. Save the edited sequence	1. Press F6 (More).	More F 6
	2. Press F2 (Save). The sequence is saved.	Save F 2
	3. Press F6 (Return) to go back to the previous menu.	Return F 6

Delete all sequences

Panel operation	1. Press the Sequence key.	Seq
	2. Press F5 (Delete Seq All).	Delete Seq All... F 5
	3. Press F2 (Yes) to confirm, or F1 (No) to cancel. All 10 sequences will be deleted.	No F 1 Yes F 2
	4. To go back to the previous menu, press F6 (Return).	Return F 6
Note	Delete Seq All cannot be recovered – the Undelete function is not applicable.	

Run Sequence

This section assumes that the sequence is already edited.

1. Select sequence	1. Press the Sequence key	Seq
	2. Press F1 (sequence 1 ~ 5) or F2 (sequence 6 ~ 10) repeatedly to select the sequence.	Select Seq 1 2 3 4 5 F 1 Select Seq 6 7 8 9 10 F 2

2. Select running mode	1. Press F4 (Run).	Run... F 4
	2. Press F1 (Run Mode) to select the running mode, repeat (Rept) or single (Sngl).	Run Mode Rept Sngl F 1
	Repeat Repeats running a sequence until F6 (Stop) is pressed. Note: F6 (Stop) menu appears only when the sequence is running.	
	Single Runs the sequence once.	
3. Run sequence	1. Press F2 (Run Now).	Run Now F 2
	2. The sequence icon appears at the bottom of the display.	SEQ
	3. To stop running, press F6 (Stop). In the single mode, the sequence automatically stops when all steps are completed.	Stop F 6

Save/copy/delete/rename sequence file

Background	Sequence files can be saved, copied, deleted, or renamed using the file utility. Press the File key to access each function.	File
Save/Copy	Press F1 (Copy). For detailed step, see page122.	Copy... F 1
Delete	Press F2 (Delete). For detailed step, see page125.	Delete... F 2
Rename	Press F3 (Rename). For detailed step, see page127.	Rename... F 3

TRACKING GENERATOR

The optional **Tracking Generator** generates a sweep signal with its sweep time and its frequency range matching the SPA-3000 system. The amplitude is maintained to a constant value over the entire frequency range, which is very useful for testing the frequency response of the Device Under Test.

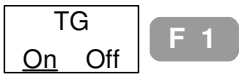
Activate tracking generator

1. Activate TG output

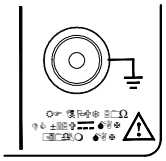
1. Press the Option key.

2. Press F1 (TG).

3. Press F1 (TG On).



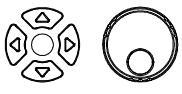
4. The tracking generator output becomes activated.



2. Set TG output level

1. Press F2 (TG Level).

2. Change the TG output level using the Arrow key and Scroll knob.



Range 0 ~ −50dBm

Normalize tracking generator

1. Set reference level

1. Press the Option key. 

2. Press F1 (TG). 

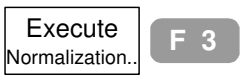
3. Press F5 (Ref Value). 

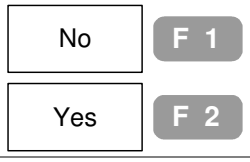
4. Set the reference value using the Arrow key or Scroll knob. 

   Normalization target level is set at Reference value, regardless of the TG output level.

   Range −130 ~ +20dBm

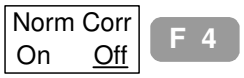
2. Run normalization

1. Press F3 (Execute Normalization). 

2. Press F2 (Yes) to confirm, or F1 (No) to cancel. Normalization runs. 

3. Press F6 (Return) to go back to the previous menu. 

3. Activate normalization

1. To enable normalization, press F4 (Norm Corr On). 

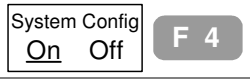
2. Normalization is activated and the TG icon appears. 

Check TG installation status

1. Run normalization

1. Press the System key. 

2. Press F6 (More). 

3. Press F4 (System Config On). The configuration appears. 

4. The TG sign shows the installation status, installed (checked) or not installed (unchecked).

   Installed
   ☒TG
   Not installed
   ☐TG

DEMODULATOR

The optional FM/AM **Demodulator** recovers AM or FM modulated baseband signal. The demodulated signal can be output from the rear panel mono phone jack.

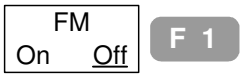
Activate Demodulation

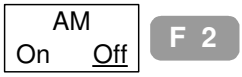
Panel operation

1. Press the Option key.

2. Press F2 (Demod).

3. Select Frequency Modulation or Amplitude Modulation by pressing F1 (FM On) or F2 (AM On).

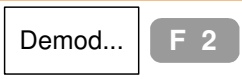




Activate phone output

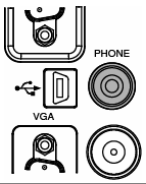
Panel operation

1. Press F2 (Demod).



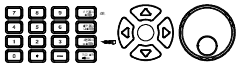
2. Press F3 (SPK On).

3. The rear panel phone output becomes active.
   3.5mm, mono (stereo plug)

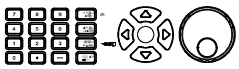


Note The FM or AM must be activated before SPK On.

Set phone output volume

Panel operation	1. Press F2 (Demod).	Demod... F 2
	2. Press F4 (Volume).	Volume F 4
	3. The volume level appears in the command window.	VOLUME: 30
	4. Change the output volume using the Numerical keys, Arrow key, or Scroll knob.	
Volume level	0 ~ 63	

Cut off phone output noise (squelch)

Panel operation	1. Press F2 (Demod).	Demod... F 2
	2. Press F5 (Squelch).	Squelch F 5
	3. The squelch level appears in the command window. Output level lower than the setting is muted.	SQUELCH
	4. Change the squelch level using the Numerical keys, Arrow key, or Scroll knob.	
Squelch level	0 ~ 4	

Check Demodulator installation status

Panel operation	1. Press the System key.	System
	2. Press F6 (More).	More... F 6
	3. Press F4 (System Config On). The configuration appears.	System Config On Off F 4
	4. The Demodulator sign shows the installation status, installed (checked) or not installed (unchecked).	Installed ☒ Demod Not installed ☐ Demod

EMI FILTER

The optional **EMI filter** is used for specific measurement situations such as EMI average detection, where higher level of sensitivity is required than the standard configuration. When this module is installed, SPA-3000 gets two additional features: Average/Quasi-peak detection mode, and 9k/120k RBW. For a new installation, contact the service center.

Select AVG/ QPeak signal detection mode

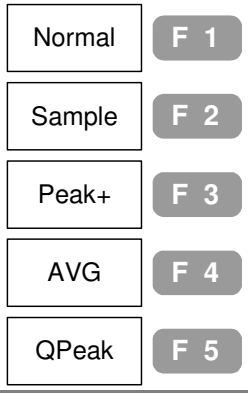
Panel operation

1. Press the Trace key.

2. Press F6 (More).

3. Press F3 (Detection).

4. The signal detection mode appears. When the EMI filter is installed, F4 (AVG) and F5 (QPeak) becomes available. For signal detection mode details, see page85.



Parameter

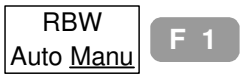
AVG (average)	Detects the average power level of the samples using a low pass filter. Useful for smoothing the noise level.
QPeak (quasi-peak)	Detects the quasi-peak power level of the samples. Useful for viewing in zero span without missing signal variations.

Select 9kHz/120kHz RBW

Panel operation

1. Press the BW key.

2. Press F1 (RBW Manu).



3. Select 9kHz/120kHz RBW using the Scroll key. The RBW value appears in the command window.

Note

In the automatic mode, RBW is selected according to the internal reference setting.
For reference RBW/VBW setting, see page106.

Check EMI filter installation status

Panel operation

1. Press the System key.

2. Press F6 (More).

3. Press F4 (System Config On). The system configuration window appears.

4. The 9/120k RBW sign shows the installation status, installed (checked) or not installed (unchecked).

Installed
☒9/120K
Not installed
☐9/120K

Note

EMI filter (9k/120k RBW) and 10k/100k RBW are exclusive. They cannot be installed together.

BATTERY / DC OPERATION

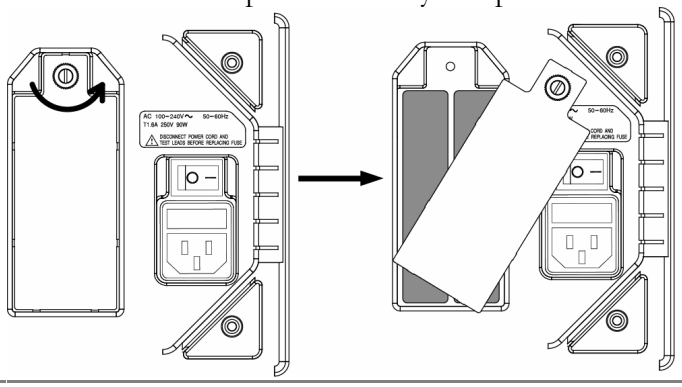
Battery/DC operation kit is an optional item for using SPA-3000 in outdoor environment, such as field operation using battery and automobile using DC outlet.

Battery Operation

Package removal / insertion

Turn Off the main power switch before inserting or removing the battery pack.

Take out the battery when not in use for a long time. Turn the knob to open the battery compartment.



Check Battery level

1. Press the Option key. 

2. Press F3 (Battery). The level icon appears at display bottom. 

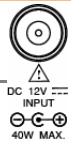
	Fully charged		50% ~ 25%
	75% ~ 50%		Less than 25%

Note Regardless of this operation, SPA-3000 shows the icon for 5 seconds every 30 minutes.

Parameter

Usage time	3 hours (typical)
Charge time	3 hours (typical)

DC Operation

Panel operation Connect the DC power cable to the rear panel input connector. 

Rating 12V, 40W max

Note DC power cable (with lighter plug for automobile usage) is available as another optional item, GTL-401 (page189).

Check Battery/DC module installation status

Panel operation

1. Press the System key. 

2. Press F6 (More). 

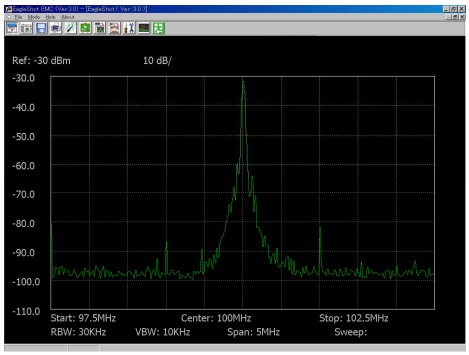
3. Press F4 (System Config On). The configuration appears. 

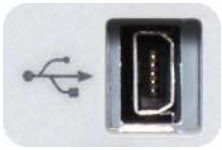
4. The Battery sign shows the installation status, installed (checked) or not installed (unchecked).

Installed
☒ Battery
Not installed
☐ Battery

PC SOFTWARE

The proprietary PC software for remote operation is downloadable from GoodWill Instruments website. It monitors the waveform and allows panel operations from the familiar PC environment, including large display and keyboard/mouse operation.





Install Software

PC requirement

Software	OS	Windows 2000/XP
Hardware	USB	1 USB host connector, 1.1 or 2.0 compatible

Software download

1. Website access

Access http://www.gwinstek.com.tw/. Click the Download menu on the left task bar.

2. Download page

The Software download screen appears. Select Spectrum Analyzer from the drop down menu.

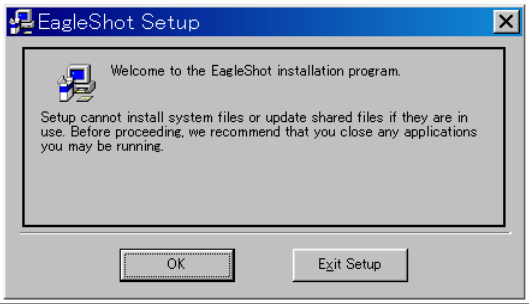
3. Download

Click the PC software name under SPA-3000 section and download the software package to your local PC.

Installation step

1. Activate setup software

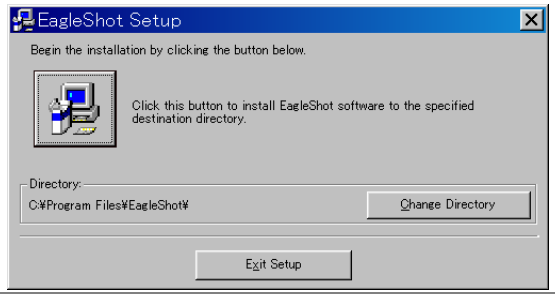
1. Unpack the zip file.
2. Double click Setup.exe.
3. The setup screen opens. Close all other applications and click OK. If you need to quit setup, press Exit Setup.



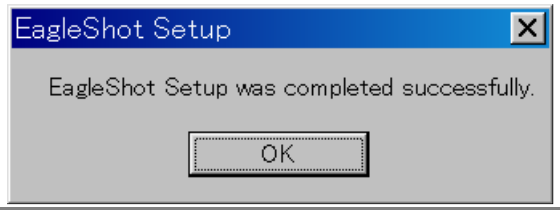
2. Start installation

1. If you install to a specific directory, click the Change Directory button.

2. Click the icon to start installation.



3. When the successful installation message appears, click OK.



Connect Software

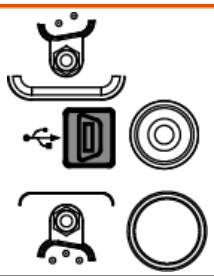
This section assumes the software is already installed.

Configure interface

USB slave, or RS-232C is available.

Configure USB

No need to configure anything on SPA-3000 side. Just connect the USB cable to the rear panel. Type B mini, female connector

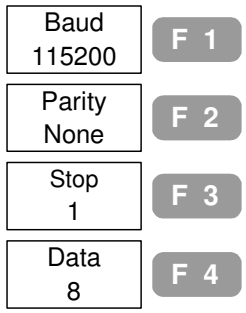


Configure RS-232C

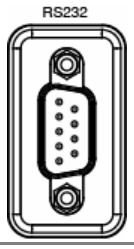
1. The RS-232C configuration can be checked from the system menu. Press the System key.

2. Press F3 (Serial Port).

3. The RS-232C port configuration appears. Configure the PC according to this setting.
   Baud: 115200
   Parity: None
   Stop bit: 1
   Data bit: 8



4. Connect the RS-232C cable to the rear panel terminal.
   9 pin, female

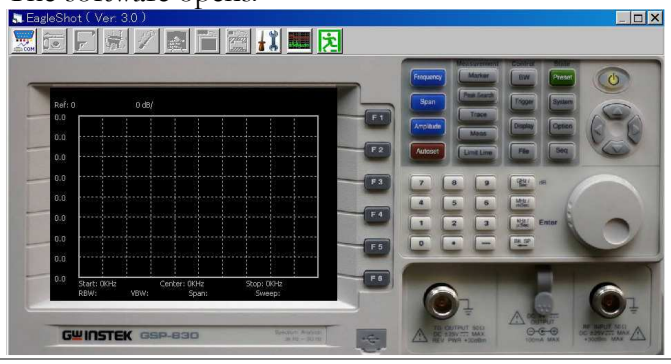


Invoke software

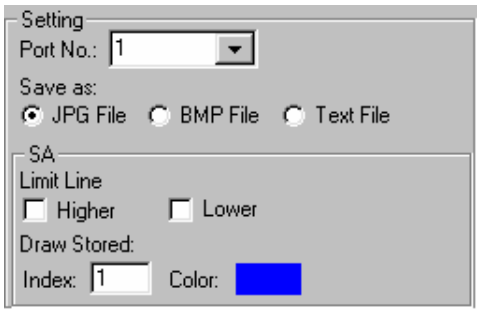
PC operation

1. Invoke the software from startup menu.

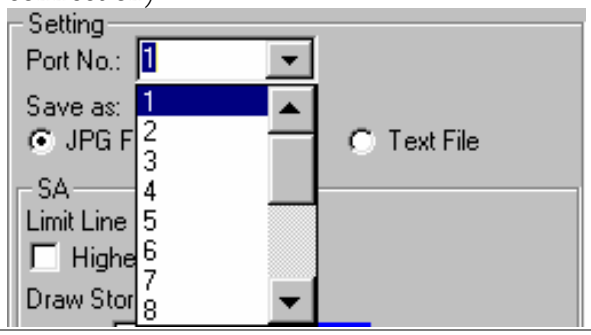
2. The software opens.



3. Click the setting icon. The parameter setting window appears.



4. Select the connection port (COM port for serial connection)

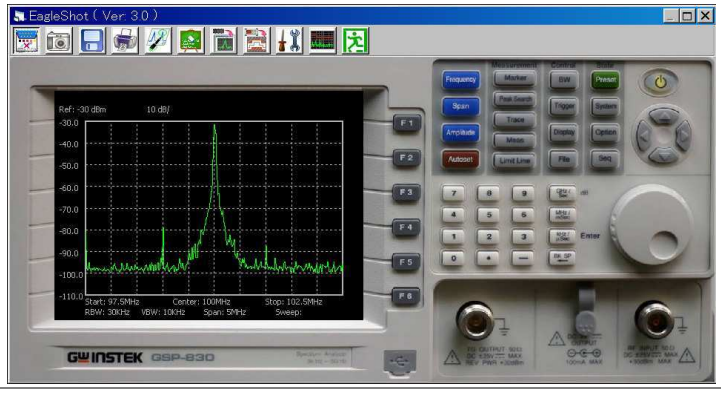


Port selection Select the port specified in the PC configuration. To check the configuration in PC, go to Control panel → System properties → Hardware tab → Device Manager.

5. Click the Setting icon again to close the setting window 

6. Click the Open COM Port icon. The connection is established when the other icons becomes active. 

Functionality check Click the Capture icon. Make sure the waveform shown in SPA-3000 display is captured correctly. 



Use Software

Establish connection

Operation step

1. Press the setting icon and open the parameter setting window. 

Comment [IK1]:

2. Select the serial port terminal. 

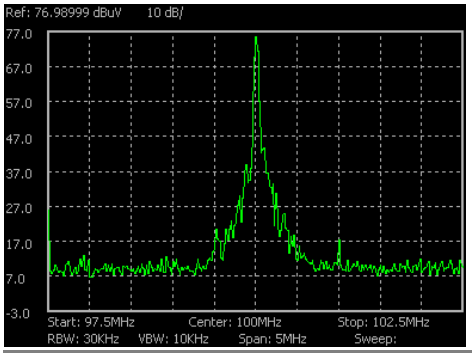
3. Press the COM port icon. The connection is established when the other icons becomes active. 

Port setting Select the port specified in the PC configuration. To check the configuration in PC, go to Control panel → System properties → Hardware tab → Device Manager.

Capture waveform

Operation step Click the capture icon. The current waveform is captured and appears on the screen. 

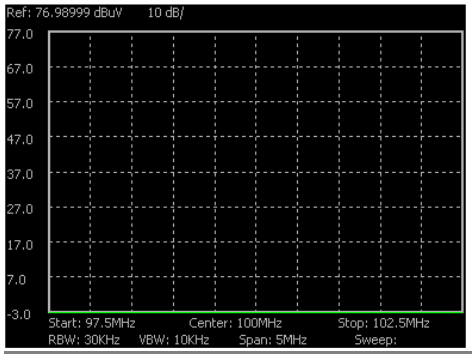
Display



Clear waveform

Operation step Click the clear trace icon. The waveform is cleared from the screen. 

Display



Save waveform

Operation step

1. Press the setting icon. Select the file format from *.jpg/*.bmp (screen snapshot), *.txt (measurement data).

2. Press the save icon. The Windows standard save dialogue window opens. Select the directory and save the file.

File format

The *.txt file contains the following information.

- Frequency (MHz) and Amplitude for all waveforms
- Amplitude reference level, unit, and scale
- Start, Stop, Center frequency, and frequency span
- RBW, VBW, and sweep time
- Date and time (if already configured)

Printout screen image

Operation step

Click the print icon. The Windows standard printout dialogue opens. Select the printer and printout the screen image.

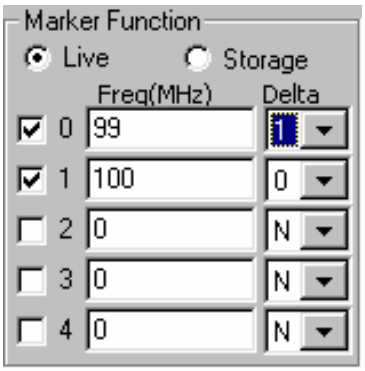
Note

The screen image contrast will be reversed (background color becomes white).

Use marker

Operation step

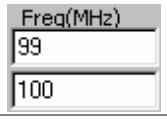
1. Click the marker icon. The marker function window appears.



2. Select Live or Storage.

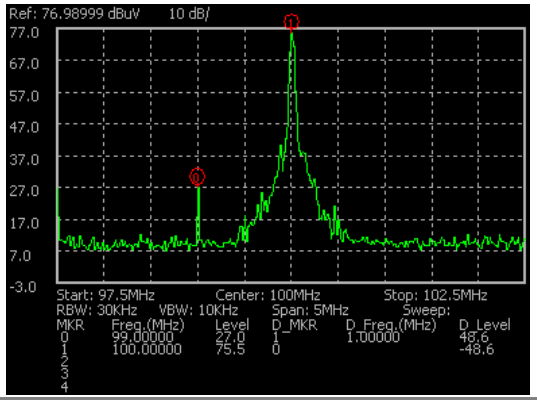
3. Check the marker ID box. 5 markers, 0 to 4, are available.

4. Enter the frequency to each marker.



5. Select normal (N) or delta marker. Example: Marker0 & Delta 1: the delta marker shows the difference between marker0 and marker1.

6. The display gets updated with markers in red color and marker values listed on the bottom.

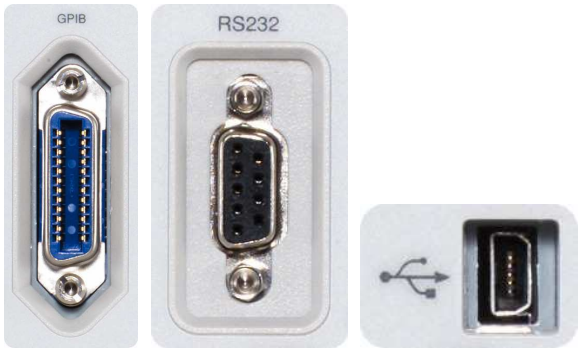


Exit program

Operation step	Click the exit icon or press Alt key + F4. 

REMOTE CONTROL

SPA-3000 supports remote control which is partially based on IEEE 488.2 and SCPI standard. The command set covers most of the panel operations. Three interfaces are available: USB slave, RS-232, and GPIB (optional).

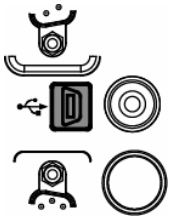


Configure Interface

Interface type	USB slave	USB 1.1 or 2.0, TypeB mini, female connector.
	RS-232C	D-sub 9 pin, female connector.
	GPIB (optional)	24pin female connector.

USB slave port configuration

No need for panel configuration:
Just connect a USB cable to the rear panel.
Type B mini, female, USB1.1/2.0



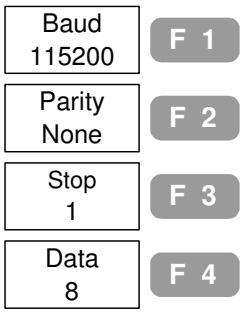
The USB icon turns On when the connection is detected.

RS-232C configuration

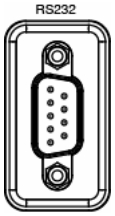
1. The RS-232C configuration can be checked from the system menu. Press the System key.

2. Press F3 (Serial Port).

3. The RS-232C port configuration appears.
Configure the PC according to this setting.
Baud: 115200
Parity: None
Stop bit: 1
Data bit: 8



4. Connect the RS-232C cable to the rear panel terminal.
9 pin, female

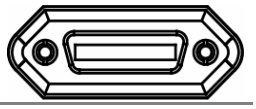


GPIB (optional) configuration

GPIB interface is a factory installed optional item.
Contact the service center for a new installation.

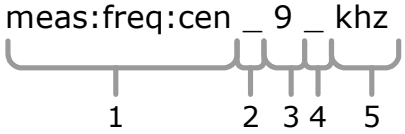
1. Press the System key.

2. Press F2 (GPIB Add).

	3. Select the GPIB address using the Left/Right key or Scroll knob. Configure the PC accordingly.	
	4. Connect the GPIB cable to the rear panel terminal.	
Check GPIB installation status	1. To check the GPIB installation status, press the System key.	System
	2. Press F6 (More).	More... F 6
	3. Press F4 (System Config).	System Config On Off F 4
	4. The system configuration window appears. GPIB sign shows installed (checked) or not installed (unchecked)	Installed ☒ GPIB Not installed ☐ GPIB
Check GPIB self-test result	1. To check the internal GPIB functionality test result, press the System key.	System
	2. Press F6 (More).	More... F 6
	3. Press F2 (Self Test).	Self Test... F 2
	4. The GPIB result appears at F1. If the result is Fail (underlined), contact the service center.	GPIB Pass Fail F 1
GPIB constraints	Keep these rules when using the GPIB interface. • Altogether less than 15 devices & 20m cable length, 2m between each device on the bus • Unique address assigned for each device • At least 2/3 of the GPIB devices turned On • No loop or parallel structure allowed	
Functionality Check	Run this query command from the terminal. *idn? This should return the Manufacturer, Model number, Serial number, and Firmware version. GW, SPA-3000, P920130, V3.01	

Command Syntax

The commands are partially compatible with IEEE488.2 (1992) and SCPI (1994) standard. Commands are NON-case sensitive.

Example command		
	1: Command Header	2: Single space
	3: Parameter1	4: Single space
	5: Parameter2	
Command Header	Several command header elements (nodes) can be concatenated to form a complex command. The above example can be separated into: meas: (root node) + freq: + cen:	
Parameter example	0/1	0 or 1.
	1~4	Integer between 1, 2, 3, or 4.
	0.01~5	Decimal number between 0.01 and 5.
	khz	Unit (non-case sensitive)
Message Terminator	Marks the end of a command line. Any of the following is acceptable.	
	CR^END	Line feed code (hexadecimal 0D) with END message
	CR	Line feed code
	<dab>^END	Last data byte with END message
Message Separator	; (semicolon)	Command separator.

Command Set

- Commands are **non**-case sensitive.
- Underline means a single space (100_mhz→ 100 mhz).

Frequency

meas:freq:cen?	Returns the center frequency in kHz. Example: 1000000 khz
meas:freq:cen	Sets the center frequency. Example: meas:freq:cen_100_mhz
meas:freq:st?	Returns the start frequency in kHz. Example: 1000000 khz
meas:freq:st	Sets the start frequency. Example: meas:freq:st_100_mhz
meas:freq:stp?	Returns the stop frequency in kHz. Example: 1000000 khz
meas:freq:stp	Sets the stop frequency. Example: meas:freq:stp_100_mhz
meas:freq:ss?	Returns the frequency step size in kHz. Example: 1000000 khz
meas:freq:ss	Sets the frequency step. Example: meas:freq:ss_100_mhz
meas:freq:cen:fw	Moves the center frequency one step size forward.
meas:freq:cen:bw	Moves the center frequency one step size backward.

Span

meas:span?	Returns the frequency span. Example: 10000 khz
meas:span	Sets the frequency span. Example: meas:span:10_mhz
meas:span:full	Sets the frequency span to full.
meas:span:zero	Sets the frequency span to zero.
meas:span:last	Recalls the last frequency span setting.

Amplitude

meas:refl:unit?	Returns the reference level unit. Parameter: 1 (dBm), 2 (dBmV), 3 (dBuV)
meas:refl:unit	Sets the reference level unit. Parameter: 1 (dBm), 2 (dBmV), 3 (dBuV) Example: meas:refl:unit:_1 (dBm)
meas:refl?	Returns the reference level in current unit. Example: −30 (−30dBm when the unit is dBm)
meas:refl	Sets the reference level in current unit. Example: meas:refl:_−30 (−30dBm when in dBm)
meas:refl:scale?	Returns the amplitude scale. Parameter: 1(10dB/Div), 2(5dB/Div), 3(2dB/Div), 4(1dB/Div)
meas:refl:scale	Sets the amplitude scale. Parameter: 1(10dB/Div), 2(5dB/Div), 3(2dB/Div), 4(1dB/Div) Example: meas:refl:scale_1 (10dB/Div)
meas:refl:exg?	Returns the external gain/loss in dB. Example: −6 (−6dB)
meas:refl:exg	Sets the external gain/loss in dB. Example: meas:refl:exg_−6 (−6dB)
meas:refl:corr:edit	Sets the amplitude correction data (frequency, amplitude). Need to specify the table index and the number of correction. Example: meas:refl:corr:edit_1_CR_2,100,−40,150,−30 (table index1, 2 data, 100MHz/−40dB, 150MHz/−30dB)
meas:refl:corr:edit:del	Deletes an amplitude correction point. Need to specify set index and point index. Example: meas:refl:corr:edit:del_5_30 (delete set 5, point 30)
meas:refl:corr:edit:delall	Deletes all point in an amplitude correction set. Need to specify set index. Example: meas:refl:corr:edit:delall_5 (delete set No.5)
meas:refl:corr:edit:quit	Quits the amplitude correction mode.
meas:refl:corr:on?	Returns the activated amplitude correction set. Parameter: none, 1 ~ 5 (correction set)
meas:refl:corr:on?	Returns the amplitude correction set is active or inactive. Need to specify the set index. Parameter: on, off Example: meas:refl:corr:on_1? (set No.1 is activated?)

meas:refl:corr:on	Activates the amplitude correction set. Specify the set index. Example: meas:refl:corr:on_1 (activate set No.1)
meas:refl:corr:off	Deactivates the amplitude correction set. Specify set index. Example: meas:refl:corr:off_1 (deactivate set No.1)
meas:inputz?	Returns the input impedance. Parameter: 50, 75
meas:inputz	Sets the input impedance. Parameter: 50, 75 Example: meas:inputz_50 (50Ω)
meas:inputz:cal?	Returns the input impedance calibration value in dB.
meas:inputz:cal	Sets the input impedance calibration value in dB. Example: meas:inputz:cal_5.9 (5.9dB)

Autoset

meas:autoset:run	Runs autoset.
meas:autoset:amp:auto	Sets the autoset amplitude floor setting to auto mode.
meas:autoset:amp:man	Sets the autoset amplitude floor setting to manual mode. Need to specify the amplitude in dB. Example: meas:autoset:amp:man_20 (20dB)
meas:autoset:amp:mode?	Returns the autoset amplitude floor setting mode. Parameter: auto, manual
meas:autoset:span:auto	Sets the autoset frequency span setting to auto mode.
meas:autoset:span:man	Sets the autoset frequency span setting to manual mode. Need to specify the unit. Example: meas:autoset:span:man_100_khz (100kHz)
meas:autoset:span:mode?	Returns the autoset frequency span setting mode. Parameter: auto, manual

Marker & Peak Search

meas:mark:on?	Returns marker On/Off. Need to specify the marker ID. Parameter: on, off Example: meas:mark:on_1? (marker 1 On?)
meas:mark:on	Turn On marker. Parameter: 1~5 (marker ID), all (all markers) Example: meas:mark:on_1 (marker 1 On)
meas:mark:off	Turn Off marker. Parameter: 1 ~ 5 (marker ID), all (all markers) Example: meas:mark:off_1 (marker 1 Off)

meas:mark:norm	Sets a marker to normal mode. Parameter: 1 ~ 5 (marker ID) Example: meas:mark:norm_1 (marker 1 normal mode)
meas:mark:norm:freq?	Returns the frequency of a normal marker. Need to specify the marker ID. Example: meas:norm:freq_1? (normal marker 1 frequency?)
meas:mark:norm:level?	Returns the amplitude of a normal marker. Need to specify the marker ID. Example: meas:norm:level_1? (normal marker 1 amplitude?)
meas:mark:delta	Sets a marker to delta mode. Also sets the relative frequency. Parameter: 1 ~ 5 (marker ID) Example: meas:mark:delta_1 (marker 1 in delta mode) Example: meas:mark:delta_1_10_mhz (marker 1 in delta mode, relative frequency 10MHz)
meas:mark:delta:freq?	Returns the relative frequency of a delta marker. Need to specify the marker ID. Example: meas:delta:freq_1? (frequency of delta marker 1?)
meas:mark:delta:level?	Returns the relative amplitude of a delta marker. Need to specify the marker ID. Example: meas:delta:level_1? (amplitude of delta marker 1?)
meas:mark:tomin	Moves a marker to minimum peak. Parameter: 1 ~ 5 (marker ID) Example: meas:mark:tomin_1 (marker 1 to minimum peak)
meas:mark:topeak	Moves a normal/delta marker to the peak. Parameter: 1 ~ 5 (marker ID) Example: meas:mark:topeak_1 (marker 1 to peak)
meas:mark:tonp	Moves a normal/delta marker to the next peak. Parameter: 1 ~ 5 (marker ID) Example: meas:mark:tonp_1 (marker 1 to the next peak)
meas:mark:tonpr	Moves a normal/delta marker to the next right peak. Parameter: 1 ~ 5 (marker ID) Example: meas:mark:tonpr_1 (marker 1 to the next right pk)
meas:mark:tonpl	Moves a normal/delta marker to the next left peak. Parameter: 1 ~ 5 (marker ID) Example: meas:mark:tonpl_1 (marker 1 to the next left peak)

meas:mark:tocen	Moves a normal/delta marker to the center frequency. Parameter: 1 ~ 5 (marker ID) Example: meas:mark:tocen_1 (marker 1 to the center freq)
meas:mark:tost	Moves a normal/delta marker to the start frequency. Parameter: 1 ~ 5 (marker ID) Example: meas:mark:tost_1 (marker 1 to the start frequency)
meas:mark:tostp	Moves a normal/delta marker to the stop frequency. Parameter: 1 ~ 5 (marker ID) Example: meas:mark:tostp_1 (marker 1 to stop frequency)
meas:mark:toss	Moves a normal/delta marker to the center frequency + step. Parameter: 1 ~ 5 (marker ID) Example: meas:mark:toss_1 (marker 1 to center freq + step)
meas:mark:torefl	Moves a normal/delta marker to the reference level. Parameter: 1 ~ 5 (marker ID) Example: meas:mark:torefl_1 (marker 1 to the reference level)
meas:mark:trace	Moves a normal/delta marker to a trace. Parameter: 1 ~ 5 (marker ID), followed by 0 (auto), 1 (traceA), 2 (traceB), 3 (traceC) Example: meas:mark:trace_1_2 (marker 1 to traceB)
meas:mark: marktable:on	Activates marker table.
meas:mark: marktable:off	Deactivates marker table.
meas:mark: peaktable:on	Activates peak table.
meas:mark: peaktable:off	Deactivates peak table.
meas:mark: peaktable:sortf	Sorts peak table by frequency.
meas:mark: peaktable:sorta	Sorts peak table by amplitude.
meas:mark: peaktrack:on	Turns On peak track. Parameter: 1 ~ 5 (marker ID) Example: meas:mark:peaktrack:on_1 (marker 1 tracks peak)
meas:mark: peaktrack:off	Turns Off peak track. Parameter: 1 ~ 5 (marker ID) Example: meas:mark:peaktrack:off_1 (marker 1 no more tracks peak)

meas:mark: peakthres:on	Turns On peak threshold and sets amplitude. Parameter: peak threshold in dB. Example: meas:mark:peakthres:on_−30 (−30dB threshold)
meas:mark: peakthres:off	Turns Off peak threshold.

Trace

meas:tra	Sets the mode for a trace. Parameter: 1 (traceA), 2 (traceB), 3 (traceC), followed by 1 (clear), 2 (peak hold), 3 (view), 4 (blank) Example: meas:tra_1_2 (traceA set to peak hold mode)
meas:tra:avg:on	Turns On average mode and sets average number for a trace. Parameter: 1(traceA), 2(traceB), 3(traceC), followed by No. Example: meas:tra:avg:on_1_20 (Average trace A 20 times)
meas:tra:avg:off	Turns Off the average mode. Parameter: 1 (traceA), 2 (traceB), 3 (traceC) Example: meas:tra:avg:off_1 (traceA average mode Off)
meas:tra:read?	Returns trace data. Parameter:1(traceA), 2(traceB), 3(traceC), all(all three traces) Example: meas:read_1? (traceA data)
meas:tra:a<>b	Swaps trace A and B.
meas:tra:a+b>a	Adds trace B to A.
meas:tra:a−b>a	Subtracts trace B from A.
meas:tra:const?	Returns the constant value to be added or subtracted.
meas:tra:const	Sets the constant value to be added or subtracted.
meas:tra:a+const>a	Adds a constant value to traceA.
meas:tra:a−const>a	Subtracts a constant value from traceA.
meas:tra:det?	Returns the detection mode. Parameter: 1(normal), 2(sample), 3(peak+), 4(avg), 5(qpeak)
meas:tra:det	Sets the detection mode. Parameter: 1(normal), 2(sample), 3(peak+), 4(avg), 5(qpeak) Example: meas:tra:det_4 (set the detection mode to average)

Power measurement

meas:ch:bw?	Returns the main channel bandwidth. Example: 1000 khz
meas:ch:bw	Sets the main channel bandwidth. Need to specify the unit. Example: meas:ch:bw_1_mhz (1MHz)
meas:adjc:bw?	Returns the adjacent channel bandwidth in kHz. Need to specify the channel. Example: meas:adjc:bw_2? (adjacent channel2 bandwidth)
meas:adjc:bw	Sets the adjacent channel bandwidth. Need to specify the channel and unit. Example: meas:adjc:bw_2_1_mhz (adjacent channel2 bandwidth 1MHz)
meas:adjc:offs?	Returns the adjacent channel offset in kHz. Specify channel. Example: meas:adjc:offs_2? (adjacent channel2 offset)
meas:adjc:offs	Sets the adjacent channel offset. Specify channel and unit. Example: meas:adjc:offs_2_1_mhz (adjacent ch2 offs 1MHz)
meas:acpr?	Returns ACPR measurement activation status. Parameter: on, off
meas:acpr	Turns On/Off ACPR measurement. Parameter: on, off Example: meas:acpr_on (ACPR On)
meas:acpr:lower?	Returns the lower ACPR result. Need to specify 1 or 2. Example: meas:acpr:lower_2? (lower ACPR 2 result?)
meas:acpr:upper?	Returns the upper ACPR result. Need to specify 1 or 2. Example: meas:acpr:upper_2? (upper ACPR 2 result?)
meas:acpr:chup	Moves the ACPR channel up.
meas:acpr:chdown	Moves the ACPR channel down.
meas:chspc?	Returns the channel space in kHz.
meas:chspc	Sets the channel space. Need to specify the unit. Example: meas:chspc_10_mhz (10MHz)
meas:ocbw?	Returns the OCBW activation/deactivation status. Parameter: on, off
meas:ocbw	Turns On/Off OCBW. Parameter: on, off Example: meas:ocbw_on
meas:ocbw:bw?	Returns the power measurement channel space in kHz.
meas:ocbw:per?	Returns OCBW percentage.

meas:ocbw:per	Sets OCBW percentage. Example: meas:ocbw:per_90 (90%)
meas:ndb?	Returns N dB activation/deactivation status. Parameter: on, off
meas:ndb	Turns On/Off N dB. Parameter: on, off Example: meas:ndb_on
meas:ndb:ndb?	Returns N dB.
meas:ndb:ndb	Sets N dB. Example: meas:ndb:ndb_3 (3 dB)
meas:ndb:bw?	Returns N dB bandwidth. Example: 1000 khz
meas:jitter?	Returns Phase Jitter activation/deactivation status. Parameter: on, off
meas:jitter	Turns On/Off Phase Jitter. Parameter: on, off Example: meas:jitter_on
meas:jitter:stoffs?	Returns Phase Jitter start offset. Example: 0 khz
meas:jitter:stoffs	Sets Phase Jitter start offset. Need to specify the unit. Example: meas:jitter:stoffs_0_khz
meas:jitter:stpoffs?	Returns Phase Jitter stop offset. Example: 50 khz
meas:jitter:stpoffs	Sets Phase Jitter stop offset. Need to specify the unit. Example: meas:jitter:stpoffs_50_khz
meas:jitter:phase?	Returns Phase Jitter phase result in radian. Example: 1.234 rad
meas:jitter:time?	Returns Phase Jitter time result in pico second. Example: 1.234 psec

Limit line

meas:lmtline:on	Turns On limit line. Parameter: 0 (low limit line), 1 (high limit line) Example: meas:lmtline:on_0 (low limit line On)
meas:lmtline:off	Turns Off limit line. Parameter: 0 (low limit line), 1 (high limit line) Example: meas:lmtline:off_0 (low limit line Off)
meas:lmtline:passfail	Turns On/Off Pass/Fail test. Parameter: on, off Example: meas:lmtline:passfail_on (Pass/Fail test On)
meas:lmtline:passfail:criterion?	Returns Pass/Fail test criteria. Parameter: 1 (pass if all signals are in the zone), 2 (pass if the peaks are in the zone), 3 (pass if valleys are in the zone)

meas:lmtline: passfail:criterion	Sets Pass/Fail test criteria. Parameter: 1 (pass if all signals are in the zone), 2 (pass if the peaks are in the zone), 3 (pass if valleys are in the zone) Example: meas:lmtline:passfail:criterion_3
meas:lmtline:table?	Returns limit line table On/Off. Parameter: on, off
meas:lmtline:table	Turns On/Off limit line table. Parameter: on, off Example: meas:lmtline:table_on (limit line table On)
meas:lmtline:edit	Sets the limit line table data. Need to specify 0 (low limit line), 1(high limit line) / limit line points. Example: meas:lmtline:edit_0_CR_3,100,–20,110,–30,120,–25 (low limit line, 3 points, 100MHz/–20dB, 110MHz/–30dB, 120MHz/–25dB)
meas:lmtline:edit: delall	Delete all points in limit line table. Parameter: 0 (low limit line), 1(high limit line) Example: meas:lmtline:edit:delall_0 (delete low lline table)

BW

con:rbw:auto	Sets RBW to auto.
con:rbw?	Returns the RBW (resolution bandwidth). Parameter: 0 (10kHz), 1 (300Hz), 2 (3kHz), 3 (9kHz), 4 (30kHz), 5 (120kHz), 6 (300kHz), 7 (4MHz), 8 (100kHz)
con:rbw:man	Selects the RBW. Parameter: 0 (200Hz), 1 (300Hz), 2 (3kHz), 3 (9kHz), 4 (30kHz), 5 (120kHz), 6 (300kHz), 7 (4MHz) Example: con:rbw:man_1 (sets RBW to 300Hz)
con:rbw:mode?	Returns RBW mode. Parameter: auto, manual
con:vbw:auto	Sets VBW to auto.
con:vbw?	Returns the VBW (video bandwidth). Parameter: 0 (10Hz), 1 (30Hz), 2 (100Hz), 3 (300Hz), 4 (1kHz), 5 (3kHz), 6 (10kHz), 7 (30kHz), 8 (100kHz), 9 (300kHz), 10 (1MHz)
con:vbw:man	Selects the VBW. Parameter: 0 (10Hz), 1 (30Hz), 2 (100Hz), 3 (300Hz), 4 (1kHz), 5 (3kHz), 6 (10kHz), 7 (30kHz), 8 (100kHz), 9 (300kHz), 10 (1MHz) Example: con:vbw:man_4 (sets VBW to 1kHz)
con:vbw:mode?	Returns VBW mode. Parameter: auto, manual
con:swt:auto	Sets the sweep time to auto.
con:swt:man	Sets the sweep time in msec. Example: con:swp:man_5 (sets the sweep time to 5ms)
con:swt:mode?	Returns the sweep time mode. Parameter: auto, manual
con:allcouple	Sets the RBW, VBW, and sweep time to auto.

Trigger

con:trig:freerun	Sets the trigger to free run mode.
con:trig:video	Sets the trigger to video mode. Also sets the trigger level in current unit. Example: con:trig:video_−20 (video mode On, −20dBm)
con:trig:single	Sets the trigger condition to single.
con:trig:cont	Sets the trigger condition to continuous.
con:trig:ext	Sets the trigger to external mode.
con:trig:delay	Sets the trigger delay in msec. Example: con:trig:delay_1000 (1000ms delay)
con:trig:freq	Sets the trigger frequency in MHz. Example: con:trig:freq_1 (1MHz)

Display

con:disp:dim	Selects the display dimmer level. Parameter: 0 ~ 5 Example: con:disp:dim_2 (dimmer level 2)
con:disp:dl	Turns On/Off display line. Parameter: on, off Example: con:disp:dim_on (display line On)
con:disp:dl:level	Sets the display line level in current unit. Example: con:disp:dl:level_−50 (display line at −50dBm)
con:disp:title:show	Sets and shows the display title. The title is case sensitive. Example: con:disp:title:show_SAtest (title is SAtest)
con:disp:title:clr	Clears the display title.
con:disp:split:upper	Turns On and sweeps upper window in split window mode.
con:disp:split:lower	Turns On and sweeps lower window in split window mode.
con:disp:split:alt	Sweeps the upper and lower window alternatively in split window mode.
con:disp:split:full	Goes back to full screen mode.

File

con:file:copy:typesel	Selects the type of copied file. Parameter: 0 (trace), 1 (limit line), 2 (correction), 3 (sequence), 4 (setup) Example: con:file:copy:typesel_2 (copy amplitude correct file)
con:file:copy	Copies file. Need to specify the source and destination file. Parameter: ta/tb/tc (traceA/B/C), t1~10 (trace1~10), lh/ll (high/low limit line), lh1~5 (high limit line 1~5), ll1~5 (low limit line 1~5), c1~5 (correction set 1~5), q1~10 (sequence 1~10), file name in external USB flash drive Example: con:file:copy_t10_ta (copy from trace10 to traceA) Example: con:file:copy_ta_mytrace (copy from traceA to a file in external USB flash named mytrace)
con:file:del:typesel	Deletes the type of copied file. Parameter: 0 (trace), 1 (limit line), 2 (correction), 3 (sequence), 4 (setup) Example: con:file:del:typesel_2 (delete amplitude correct file)

con:file:del	Deletes file. Need to specify the source and destination file. Parameter: ta/tb/tc (traceA/B/C), t1~10 (trace1~10), lh/ll (high/low limit line), lh1~5 (high limit line 1~5), ll1~5 (low limit line 1~5), c1~5 (correction set 1~5), q1~10 (sequence 1~10), file name in external USB flash drive Example: con:file:del_t10 (delete trace10) Example: con:file:del_myspace (delete a file names myspace in extrenal USB flash drive)
con:file:rename	Renames a file in external USB flash drive. Need to specify the original and changed name. Example: con:file:rename_myspace_myfile (change a file named myspace to myfile)
con:file:prtsc:tofile	Saves the display image to external USB flash drive. Need to specify the file name. Example: con:file:prtsc:tofile_myscreen (saves the display image to a file named myscreen)

Preset

con:preset	Presets SPA-3000.

System

con:sys:setup:save	Save the current system setting to setup file. Parameter: 1~10 Example: con:sys:setup:save_1 (save current setup to setup1)
con:sys:setup:recall	Recalls a system setting from setup file. Parameter: 1~10 Example: con:sys:setup:recall_1 (recall setting in setup1 file)
con:sys:gpibaddr?	Returns the current GPIB address.
con:sys:gpibaddr	Sets the GPIB address. Example: con:sys:gpib:addr_2 (set GPIB address to 2)
con:sys:auxsig	Turns On/Off the auxiliary signal. Parameter: on, off Example: con:sys:auxsig_on (auxiliary signal On)
con:sys:clock:date?	Returns the current date setting. Parameter: year / month / day / day of week 1 (Sun) ~ 7 (Sat) Example: 2006 6 24 7 (June 24th, Saturday, 2006)

con:sys:clock:date	Sets the date. Parameter: year / month / day / day of week 1 (Sun) ~ 7 (Sat) Example: con:sys:clock:date_2006_6_24_7 (Jun24, Sat, 2006)
con:sys:clock:time?	Returns the current time setting. Parameter: hour / minute / second Example: 13 30 26 (1p.m., 30 minutes, 26 second)
con:sys:clock:time	Sets the time. Parameter: hour / minute / second Example: con:sys:clock:time_13_30_26 (1p.m., 30min, 26sec)
con:sys:clock:show	Turns On/Off clock display. Parameter: on, off Example: con:sys:clock:show_on (clock display On)
con:sys:selftest?	Returns the self test result. Parameter: 0 (fail), 1 (pass) in the following order: GPIB/Flash/SDRAM/RTC Example: 1 1 0 1 (GPIBpass,Flashpass,SDRAMfail,RTCpass)
con:sys:lang	Selects language. Parameter: 1 (English), 2 (Simplified Chinese) Example: con:sys:lang_2 (switch to simplified Chinese)
con:sys:ser?	Returns the serial number. Example: EE8300000
con:sys:swver?	Returns the software version. Example: 01.00 06/07/28 (version 1.00, 2006 July 28th)
con:sys:fwver?	Returns the firmware version. Example: 01.00 (version 1.00)
con:sys:hwver?	Returns hardware version in following order. RF, IF, DSP, MB Example: 01.00 01.00 01.01 01.00 (RF: version 1.00, IF: version 1.00, DSP: version 1.01, MB: version 1.00)
con:sys:optstatus?	Returns optional items installation status in the following order. 300HzRBW, EMIFilter, 10k/100kHzRBW, TG, Demodulator, Medref (±1ppm stability) Parameter: 0 (not installed), 1 (installed) Example: 0 0 1 1 1 (TG, Demodulator, Medref are installed)

Option

con:opt:tg	Turns On/Off Tracking Generator (TG). Parameter: on, off Example: con:opt:tg_on (TG On)
con:opt:tg:level?	Returns the TG level.

con:opt:tg:level	Sets the TG level.
con:opt:tg:norm	Turns On/Off TG normalization. Parameter: on, off Example: con:opt:tg:norm_on (normalization On)
con:opt:tg:offset	Sets the TG offset level.
con:opt:ge:refval?	Returns the TG reference value.
con:opt:ge:refval	Sets the TG reference value.
con:opt:dm:fm	Turns On/Off FM in the demodulator. Parameter: on, off Example: con:opt:dm:fm_on (FM On)
con:opt:dm:am	Turns On/Off AM in the demodulator. Parameter: on, off Example: con:opt:dm:am_on (AM On)
con:opt:dm:spk	Turns On/Off phone output in the demodulator. Parameter: on, off Example: con:opt:dm:spk_on (phone output On)
con:opt:dm:vol	Sets the demodulator phone output volume.
con:opt:dm:sql?	Returns the demodulator squelch level.
con:opt:dm:sql	Sets the demodulator squelch level.
con:opt:bat?	Returns the battery level.
con:opt:extreffreq?	Returns the external reference frequency.
con:opt:extreffreq	Sets the external reference frequency.

Sequence

con:seq:runmode	Selects the sequence run mode. Parameter: 1 (repeat mode), 2 (single mode) Example: con:seq:runmode_2 (sequence runs in sing mode)
con:seq:runseq	Runs the sequence. Parameter: sequence index, 1 ~ 10 Example: con:seq:runseq_2 (run sequence 2)
con:seq:stopseq	Stops the running sequence.
con:seq:delallseq	Deletes all programmed sequence.
con:seq:delseq	Deletes a sequence. Parameter: sequence index, 1 ~ 10 Example: con:seq:delseq_2 (delete sequence 2)

FAQ

- I pressed the Power (On/Standby) key on the front panel but nothing happens.
- I cannot even see the default green line on the display.
- I connected the signal but it does not appear on screen.
- I want to see which optional items are installed.
- The SPA-3000 performance does not match the specification.

I pressed the Power (On/Standby) key on the front panel but nothing happens.

Make sure you turned On the rear panel Power switch. For details, see page22.
Note that after proper sequence, it takes around 10 seconds for the display to become active.

I cannot even see the default green line on the display.

Check if the Trace Blank (hide trace from the display) is On for TraceA, the default waveform. Press the Trace key→ F1 (select TraceA)→ F2 (Clear) to recover the trace. For details, see page78.

I connected the signal but it does not appear on screen.

Run the Autoset and let SPA-3000 find the best display scale for your target signal. Press the Autoset key, then press F1 (Autoset). For details, see page62.

I want to see which optional items are installed.

Check the optional item status in the system information window. Press the System key → F6 (More) → F4 (System Config On). For details, see page136.

The Pre-amplifier (page60) is a completely external item, therefore does not appear in the system information menu.

The SPA-3000 performance does not match the specification.

Make sure the device is powered On for at least 30 minutes, within +20°C~+30°C. This is necessary to stabilize the unit to match the specification.

If there is still a problem, please contact your local dealer or GWInstek at marketing@goodwill.com.tw.

Appendix

SPA-3000 Specification

Frequency	Frequency Range	9kHz ~ 3.0GHz
	Aging Rate	± 10ppm, 0-50° C, 5ppm/yr
	Span Range	2kHz ~ 3.0GHz in 1/2/5 sequence, full span, zero span
	Phase Noise	-80dBc/Hz @ 1GHz 20kHz Offset typ.
	Sweep Time Range	50 ms ~ 25.6s
Resolution Bandwidth	RBW Range	3kHz, 30kHz, 300kHz, 4MHz
	RBW Accuracy	15%
	VBW Range	10Hz ~ 1MHz in 1-3 steps
Amplitude	Measurement Range	−103dBm ~ +20dBm: 1 MHz ~ 15MHz, Ref Lvl ≥−30dBm −120 ± 1dBm ~ +20dBm: 15MHz ~ 600MHz, Ref Lvl @−50dBm −117 ± 1dBm ~ +20dBm: 600MHz ~2.3GHz, Ref Lvl @−50dBm −115 ± 1dBm ~ +20dBm: 2.3GHz ~ 3GHz, Ref Lvl @ −50dBm
	Overload Protection	+30dBm, 25VDC
	Reference Level Range	−110dBm ~ +20dBm
	Accuracy	±1dB @100MHz
	Frequency Flatness	±1dB
	Display Range Linearity	±1dB over 70dB
Dynamic Range	Average Noise Floor	−135dBm/Hz: 1MHz ~ 15MHz, Ref Lvl ≥−30dBm −152 ±1dBm/Hz: 15MHz ~ 600MHz, Ref Lvl @−50dBm −149 ±1dBm/Hz: 600MHz ~2.3GHz, Ref Lvl @−50dBm −147 ±1dBm/Hz:

		2.3GHz ~ 3GHz, Ref Lvl @−50dBm
	Third Intermodulation	<-70dBc @-40dBm Input, Ref Level ≥−30dBm
	Harmonic Distortion	<-60dBc RF Input < -40dBm, Ref Level @−30dBm
	Non-Harmonic Spurious	<-110dBm @3kHz RBW
General	Display	640 x 480 high-res color TFT LCD
	Internal Memory	10 Traces, 10 Setup Info, 10 Limit Lines, 5 Corrections, 10 Sequences
	Markers	10 markers for peaks: 5 normal-delta marker pairs Functions: Delta, Peak, Marker Track
	Trace Detection	3 traces with Peak, Maximum hold, Freeze, Average, and Trace Math
	Power Measurement	ACPR, OCBW, Channel power, N dB BW, and Phase Jitter
	Autoset Function	Auto tuning the measurement result for observation
	Sequence	Automated test by user defined macros without any remote control
Connectors	RF Input	Type: N Female, 50Ω nominal RF input VSWR: <2:1, @Ref Lvl 0dBm
	External Reference Clock Input	Type: BNC Female, 1M, 1.544M, 2.048M, 5M, 10M, 10.24M, 13M, 15.36M, 15.4M, 19.2M
	External Trigger Input	Type: BNC Female, +5V TTL signal
	Ref. Clock Output	Type: BNC Female, 10MHz
	DC Input	Jack: 5.5mm, 12V
	RS-232C	Sub-D 9pins Female
	USB Connector	Front Panel: Type A Rear Panel: Type B mini
	DC Voltage Output	SMB Male, +9V/100mA max output
Power Source	AC Input	100V ~ 240V, 50/60Hz
Accessories	Contents	User Manual x1, Power Cord x1
Dimensions & Weight	Dimension	330 (W) × 170(H) × 340(D) mm
	Weight	Approx. 6kg
Atmospherics	Ambient Temperature	18℃ ~ 28℃ for operation 0℃ ~ 40℃ for storage
	Relative Humidity	<90% for operation

Comment [IK2]:

			<85% for storage

Optional Items Specifications

Opt.01 Tracking Generator (*2)	Frequency Range	9kHz ~ 3.0GHz
	Amplitude Range	-50dBm ~ 0 dBm
	Amplitude Accuracy	±1dB @100MHz, 0dBm
	Amplitude Flatness	±1dB @0dBm
	Harmonics	<-30dBc typical
	Reverse Power	+30dBm
	Impedance	Type: N female, 50Ω nominal
	TG Output VSWR	< 2:1
Opt.02 Battery Pack	Battery Type	10.8V Li-Ion battery pack x 2
Opt. 03 ±1ppm Stability (*2)	Output Range	±1ppm, 0~50°C
	Aging Rate	±1ppm / year
Opt. 04 300Hz RBW (*2)	RBW Selection	300Hz, 3dB bandwidth
	RBW Accuracy	20%
Opt. 05 9kHz & 120kHz RBW (*1, 2)	RBW Selections	9kHz and 120kHz, 6dB bandwidth
	RBW Accuracy	15%
Opt. 06 10kHz & 100kHz RBW (*1, 2)	RBW Selections	10kHz and 100kHz, 3dB bandwidth
	RBW Accuracy	15%
Opt. 07 AM/FM Demodulator and 10kHz & 100kHz RBW (*1, 2)	Demodulation	AM, FM
	Output	Internal Speaker, 3.5mm stereo jack wired for mono operation
	RBW Selections	10kHz and 100kHz, 3dB bandwidth
	RBW Accuracy	15%
Opt. 08 GPIB Interface	Compliant standard	IEEE 488.2 bus
GKT-001 General Kit Set	ADP-002	SMA (J/F) to N (P/M) adaptor x 2
	ATN-100	10dB Attenuator, N (J)~N(P) x 1
	GTL-303	RF Cable assembly (RD316, SMA(P), 60cm) x 2

	GSC-002	Kit box x 1
GKT-002 CATV Kit set	ADP-001	BNC (J/F) to N (P/M) adaptor x 2
	ADP-101	BNC (P/M) 50Ω to BNC (J/F) 75Ω adaptor x 2
	GTL-304	RF Cable assembly (RG223, N(P)-N(J), 30cm) x 2
	GSC-003	Kit box x 1
GKT-003 RLB Kit set	GAK-001	Termination, 50Ω, N(P) x 1
	GAK-002	Cap with chain, N(P) x 1
	GTL-302	RF Cable assembly (RG223+N(P), 30cm) x 2
	GSC-004	Kit box x 1
GTL-401 DC Power Cord	DC power cord with DC Jack and lighter plug, current 5A	
GAP-801 10dB Preamplifier	Frequency range	9kHz ~ 6GHz
	Gain	-dB typical
GSC-001 Soft Carrying Case	Soft Carrying Case	

* Note:
1. Among Opt. 05 to 07, only one item can be installed to given SPA-3000.
2. The following are factory installed items. Opt. 01, 03, 04, 05, 06, 07

Declaration of Conformity

We
GOOD WILL INSTRUMENT CO., LTD.
(1) No.7-1, Jhongsing Rd., Tucheng City, Taipei County, Taiwan
(2) No. 69, Lu San Road, Suzhou City (Xin Qu), Jiangsu Sheng, China
declare, that the below mentioned product
Type of Product: Digital Spectrum Analyzer
Model Number: SPA-3000
are herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Law of Member States relating to Electromagnetic Compatibility (89/336/EEC, 92/31/EEC, 93/68/EEC) and Low Voltage Directive (73/23/EEC, 93/68/EEC).
For the evaluation regarding the Electromagnetic Compatibility and Low Voltage Directive, the following standards were applied:

◎ EMC

EN 61326-1: Electrical equipment for measurement, control and laboratory use — EMC requirements (1997 + A1:1998 + A2:2001 + A3:2003)	
Conducted Emission Radiated Emission EN 55011: Class A 1998 + A1:1999 + A2:2002	Electrostatic Discharge EN 61000-4-2: 1995 + A1:1998 + A2:2001
Current Harmonics EN 61000-3-2: 2000 + A2:2005	Radiated Immunity EN 61000-4-3: 2002 + A1:2002
Voltage Fluctuations EN 61000-3-3: 1995 + A1:2001	Electrical Fast Transients EN 61000-4-4: 2004
----------	Surge Immunity EN 61000-4-5: 1995 + A1:2001
----------	Conducted Susceptibility EN 61000-4-6: 1996 + A1:2001
----------	Power Frequency Magnetic Field EN 61000-4-8: 1993 + A1:2001
----------	Voltage Dip/ Interruption EN 61000-4-11: 2004

◎ Safety

Low Voltage Equipment Directive 73/23/EEC
Safety Requirements IEC/EN 61010-1: 2001

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