ISA-30/80/132/265
Spectrum Analyzer
Operation Manual
Ver 1.0

Read this manual before using the equipment.
Keep this manual with the equipment

LIG Nex1

Safety Symbols

Where these symbols or indications appear on the equipment or in this manual, they have the following meanings.

WARNING. *Risk of hazard which cause injury to human body or danger to life, If a WARNING appears on the equipment, and in this manual, do not proceed until its suitable conditions are understood and met*

CAUTION. *Risk of hazard that caused fire or serious damage to the equipment or other equipment. Do not proceed until its suitable conditions are met.*

GROUND. *Ground terminal to chassis (earth).*

For Symbols

WARNING

1. ALWAYS refer to the operation manual when working near locations at which the alert mark shown on the left is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced.
   Moreover, this alert mark is sometimes used with other marks and descriptions indicating other dangers.

2. When supplying power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. If a grounded 3-pin outlet is not available, use a conversion adapter and ground the green wire, or connect the frame ground on the rear panel of the equipment to ground. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock and equipment damage.

Repair

WARNING

3. The user cannot repair this equipment. DO NOT attempt to open the cabinet or to disassemble internal parts. Only trained service personnel or staff from your sales representative with knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to internal parts.

Falling Over

4. This equipment should be used in the correct position, If the cabinet is turned on its side, etc., it will be unstable and may be damaged if it falls over as a result of receiving a slight mechanical shock.

For Symbols

CAUTION 

Cleaning

1. Keep the power supply and cooling fan free of dust.
   - ○ Clean the power inlet regularly. If dust accumulates around the power pins, there is a risk of fire.
   - ○ Keep the cooling fan clean so that the ventilation holes are not obstructed. If the ventilation is obstructed, the cabinet may overheat and catch fire.

Check Terminal

CAUTION 

2. The ratings of RF input/output connector.
   - ○ Maximum DC voltage ratings :
     RF Input connector : 0 VDC
   - ○ Maximum RF power ratings :
     RF Input power : +30 dBm
   - ○ NEVER input >+30 dBm or >0 VDC power to RF Input.
   - ○ Excessive power may damage the internal circuits.

Replacing Memory Backup Battery

3. A Primary Lithium Battery supplies the power for CMOS backup. This battery should only be replaced by a battery of the same type **(MAXELL : CR2032H)**; since we can only make replacement, contact the nearest us representative when replacement is required.

   Note : The battery life is about 7 years. Early battery replacement is recommended

CAUTION 

Do not throw the battery away but dispose of it according to your country's requirement

For Symbols

CAUTION 

Storage Medium

4. This equipment stores data using hard disk.
Hard Disk may be damage due to strong vibration or improper electrical shock.
If you want to exchange damaged hard disk, connect the nearest our agency.

CAUTION 

Adjustment and Delete of Important files : This product has basic program in the hard disk (C:\Program Files). If you adjust or delete the window basic folder, improper system operation is occurring. System damages by users mistake is compensated for yours.

We CANNOT COMPENSATE FOR ANY IMPROPER USE.

Product Damage Precaution

5. **Use Proper Power Source** : Do not operate this product from a power source that applies more than the specified voltage.

Provide Proper Ventilation : To prevent product overheating, maintain proper ventilation.

Do Not Operate With Suspected Failures : If you suspect there is damage to this product, have it inspected by qualified service personnel.

CAUTION 

Do Not Attempt To Operate If Protection May Be Impaired : If the equipment appears damaged or operated abnormally, protection may be impaired. Do not attempt to operate the equipment under these conditions. Refer all questions of proper equipment operation to qualified service personnel

For Symbols

CAUTION 

Place-related Warning

6. **Object and Liquid Entry** : Never push objects of any kind into equipment through openings as they may touch dangerous voltage points or short out parts that could result in a fire or electric shock. Never spill liquid of any kind on the equipment. Do not use this equipment near water for example, near a bathtub, wash bowl, kitchen sink, or laundry tub, in a wet basement, or near a swimming pool, and the like. Keep the equipment away from damp air, water and dust. Unexpected trouble may be caused when the equipment is placed in a damp or dusty place.

CAUTION 

Flammable and Explosive Substance : Avoid using this equipment where there are gases, and where there are flammable and explosive substances in the immediate vicinity.

Unstable Location : Do not place this equipment on an unstable cart, stand, tripod, bracket, or table. This equipment may fall, causing serious injury to a person, and serious damage to the equipment. Do not place or use the equipment in a place subject to vibration.

Warranty

We will repair this equipment fee of charge if a malfunction occurs within 2 years after shipment due to a manufacturing fault, provided that warranty is rendered void under any or all of the following conditions.

- The fault is outside the scope of the warranty conditions described in the operation manual.
- The fault is due to wrong operation, misuse, or unauthorized modification or repair of the equipment by the customer.
- The fault is due to severe usage clearly exceeding normal usage.
- The fault is due to improper or insufficient maintenance by the customer.
- The fault is due to natural disaster including fire, flooding and earthquake, etc.
- The fault is due to use of non-specified peripheral equipment, peripheral parts, consumables, etc.
- The fault is due to use of non-specified power supply or in non-specified installation location.

In addition, this warranty is valid only for the original equipment purchaser. It is not transferable if the equipment is resold.

We will not accept liability for equipment faults due to unforeseen and unusual circumstances, nor for faults due to mishandling by the customer.

Front Panel Power Switch

If the equipment is in the standby state, the front power switch of this equipment turns on the power when it is pressed.
If the switch is pressed continuously for about 5 seconds in the power off state, the equipment enters the standby state to prevent malfunction caused by accidental touching.

In the power on state, if the power plug is removed from the outlet, then reinserted, the power will not be turned on. Also, if the line is disconnected due to momentary power supply interruption or power failure, the power will not be turned on even when power is restored.

This is to prevent incorrect data from being acquired when the line is disconnected and reconnected.

For example, if the sweep is 1.000 seconds and data acquisition requires a long time, momentary power supply interruption (power failure) might occur during measurement and the line could be recovered automatically to power on. In such a case, the equipment may mistake incorrect data for correct data without recognizing the momentary power supply interruption.

If this equipment enters the standby state due to momentary power supply interruption or power failure, check the state of the measuring system and press the front power switch to restore power to this equipment.

Caution) Unusual power off may be the cause of damage to hard disk in the system or instruments. Recommend the stable power supply.

DETECTION MODE

This equipment is a spectrum analyzer, which uses a digital storage system. The spectrum analyzer makes level measurements in frequency steps obtained by dividing the frequency span by the number of measurement data points (551~8192). Because of this operation it is desired to use the following detector modes associated with the appropriate measurements.

Measurement	Detector mode
○ Normal spectrum	POS PEAK
○ Random noise	SAMPLE OR AVERAGE
○ Pulsed noise	NORMAL
○ Occupied frequency bandwidth (for analog communication systems)	SAMPLE
○ Occupied frequency bandwidth (for digital communication systems)	POS PEAK or SAMPLE

When a detection mode is specified as one of the measurement methods, make the measurement in the specified detection mode.

China RoHS
Substance Declaration Table

部件名称 Part Name	有毒有害物質 Toxic or hazardous substances and elements					
	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr(VI))	多溴联苯 Polybrominated Biphenyls (PBB)	多溴二苯醚 Polybrominated Biphenyls (PBB)
印刷电路板组件 (Printed Circuit Assembly)	X	X	X	X	X	X
射频托盘组件 (RF Module Assembly)	X	X	X	X	X	X
单体框架组件 (Main Frame Assembly)	X	X	X	X	X	X
液晶显示 (Display)	X	X	X	O	X	X
机械硬件 (Mechanical Hardware)	X	O	X	X	X	X
电源 (Power Supply)	X	X	X	X	X	X
金属片 (Metal Chassis)	X	O	O	X	O	O
光驱 (ODD)	X	O	X	O	O	O
塑料部件 (Plastic Parts)	X	O	X	O	X	X
电缆组件 (Cable & Wire)	X	O	X	O	X	X
附属品 (Accessory)	X	X	X	X	X	X

O: 表明该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006标准规定的限量要求之下。

O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement specified in SJ/T11363-2006.

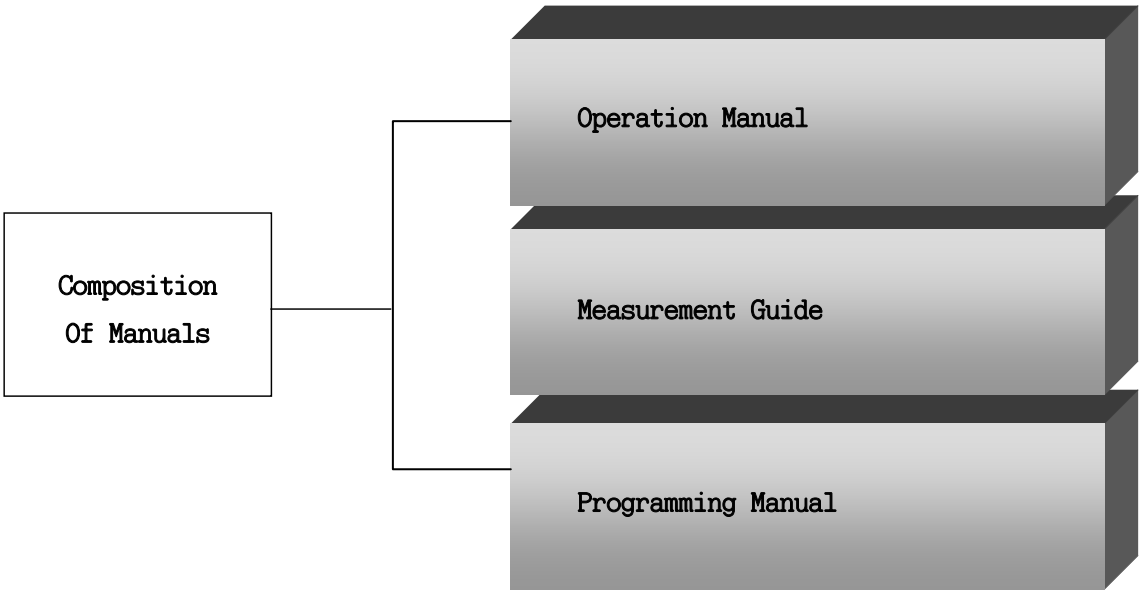
X: 表明该有毒有害物质至少在该部件的某一均质材料中的含量均在SJ/T11363-2006标准规定的限量要求。

X: Indicates that this toxic or hazardous substance contained in at least one of the homogenous materials used for this part is above the limit requirement specified in SJ/T11363-2006.

ABOUT THIS MANUAL

Composition of SIGNAL ANALYZER Manuals

The Spectrum analyzer manuals of the standard type are composed of the following three parts.



Operation Manual : Provides information on the SIGNAL ANALYZER outline. Preparation before use, panel description, Operation procedure, soft-key menu and performance tests.

Measurement Guide : Provides basic measurements with examples of typical measurements.

Programming Manual : Provides information on RS-232C remote control, GPIB remote control and sample programs.

COMPOSITION OF OPERATION MANUAL

This Manual is composed of 8 sections. The profile of each section is shown below.

Section Composition	Explanation
SECTION 1 GENERAL	Product outline, options, applicable parts, peripheral devices, and specifications
SECTION 2 PREPARATIONS BEFORE USE	Operations to be accomplished before applying power
SECTION 3 PANEL DESCRIPTION	Description of the front and rear panels
SECTION 4 MENU TREE	Description of the soft-key menu
SECTION 5 OPERATION PROCEDURES	Operation procedures for operation guide
SECTION 6 PERFORMANCE TESTS	Tests used for checking performance
SECTION 7 STORAGE AND TRANSPORTATION	Cautions on storage and transportation
SECTION 8 STSTEM RESTORATION	OS restoration and Installation Vaccine

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SECTION 6 PERFORMANCE TESTS

SECTION 1
GENERAL

This section outlines the SPECTRUM ANALYZER (henceforth called “Equipment”) and explains the composition of this manual, the configuration of the equipment with the options, the optional accessories, peripherals for expanding the equipment capabilities, and the equipment specifications.

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SECTION 1
GENERAL

PRODUCT OUTLINE

The equipment is a portable type spectrum analyzer suited for spectrum analysis of radio equipment where the efficiency of frequency usage is increased and equipment is increasingly speeded and digitized.
The equipment adopts the synthesizer local system and can cover all frequencies from 1kHz to 3 ㎓ / 8 ㎓ / 13.2 ㎓ / 26.5 ㎓(SPECTRUM ANALYZER) excellent in basic performance such as distortion, frequency/level accuracy, and easy operation, by following the display of the soft-key menu screen.
Cost performance with rich options is excellent to cover with various applications.
Equipped with high accuracy calibration spectrums and an attenuator, it can accurately calibrate switching errors of LOG/LIN scales, various resolution bandwidth, variable reference level, etc.
Since frequency response data is corrected by built in calibration data, allowing high-accuracy level measurement for a wide range.
This unit provides the MEASURE function that can perform measurement of various applications without requiring the intervention of external controllers. Therefore, the performance evaluation of radio equipment can be easily done in terms of frequency, noise, occupied frequency bandwidth, etc.

■ Application

This unit is useful for the production, building and maintenance of electronic equipment and devices for the following.

- o AM/FM radio equipment
- o Digital cellular telephone/cordless telephone
- o Satellite broadcasting and TV equipment
- o Small capacity microwave equipment
- o Wireless LAN equipment

EQUIPMENT CONFIGURATION

This paragraph describes the configuration of the equipment with the various options to expand the functions.

Options

The below table shows options of the equipment which is sold separately.

Model Number	Name	Remarks
	Tracking Generator Connector & Cable Assembly	

※ Please specify the model number, name, and quantity when ordering.

SPECIFICATIONS

NOTE : A thirty minutes warm up time shall apply.

1. Electrical Specifications
2. General Characteristics
3. Environmental Specifications
4. Safety & EMC Specifications

1. Electrical Specifications

1.0 Frequency

1.1 Frequency Range (ISA-30) 1 kHz ~ 3 GHz at AC Coupled

Range	Band	LO Harmonics
1kHz to 3GHz (AC)	0	1

Frequency Range (ISA-80) 1 kHz ~ 8 GHz at AC Coupled

Range	Band	LO Harmonics
1kHz to 3GHz	0	1
2.9GHz to 8GHz	1	1

Frequency Range (ISA-132) 1 kHz ~ 13.2 GHz at AC Coupled

Range	Band	LO Harmonics
3Hz to 3GHz	0	1
2.9GHz to 6.4GHz	1	1
6.3GHz to 13.2GHz	2	2

Frequency Range (ISA-265) 1 kHz ~ 26.5 GHz at AC Coupled

Range	Band	LO Harmonics
3Hz to 3GHz	0	1
2.9GHz to 6.4GHz	1	1
6.3GHz to 13.2GHz	2	2
12.9GHz to 26.5GHz	3	4

1.2 Frequency Accuracy : Marker Frequency x reference error + 3% x span + 50% x RBW

1.3 Frequency Counter

1.3.1 Accuracy : ±((Reference frequency accuracy X Marker Frequency accuracy)
±(Counter Resolution X 1 LSB))

1.3.2 Resolution : 1Hz, 10Hz, 100Hz, 1000Hz

1.3.3 Sensitivity ≤-45dBm (@ 2MHz<freq<13.2GHz , span<3MHz)
≤-40dBm (@ 13.2GHz<freq<26.5GHz , span<3MHz)

1.4 Frequency SPAN

1.4.1 Range : 1 Hz/Div to FULL SPAN, ZERO SPAN

1.4.2 Accuracy : ≤ ±1%

1.5 Stability

1.5.1 Residual FM : ≤100×N Hz_{P-P}, 1s (N=Local Harmonic order)
: N=1 (1kHz~3GHz) / N=1 (2.9GHz~6.4GHz)
: N=2 (6.3GHz~13.2GHz) / N=4 (13.1GHz~26.5GHz)

1.5.2 Noise Sidebands : -112 / -115 (spec/typical@ Frequency=1GHz, Offset=10KHz)
Room temperature (20℃ ~ 30℃)

1.6 Frequency Ref. Accuracy

1.6.1 Temperature : ≤ ±1 ppm (HSO option : ±0.1 ppm)

1.6.2 Aging per year : ≤ ±1 ppm (HSO option : ±0.1 ppm)

2.0 Amplitude

2.1 Measurement : +30 dBm to DANL

2.2 Displayed Average Noise Level

≤-135 dBm, 100kHz ~ 10MHz
≤-143 dBm, 10MHz ~ 2GHz
≤-141 dBm, 2GHz ~ 13.2GHz
≤-138 dBm, 13.2GHz ~ 18GHz
≤-133 dBm, 18GHz ~ 26.5GHz

2.3 1dB Compression Point : -10 dBm @ Input RF ATT 0 dB (~ 3GHz)
-10 dBm @ Input RF ATT 0 dB (3GHz~ 26.5GHz)

2.4 Displayed Range : 0.1~1 dB/Div (@ 0.1dB step) [Log Scale)
1~20 dB/Div (@ 1 dB step) [Log Scale]
10 divisions [Linear scale]

2.5 Amplitude Units

2.5.1 LOG Display Mode : dBm, dBmV, dBμV, dBpW

2.5.2 LINEAR Display Mode : mV, μV , pW, nW

2.6 Display Linearity : ±0.1 dB (@ Input mixer level ≤ -20dBm)
±0.13 dB (@ -20dBm < Input mixer level ≤ -10dBm)

2.7 Frequency Response : ±0.5 dB, 1 MHz ~ 3.0GHz
±1.0 dB, 3.0GHz ~ 6.4GHz
±1.5 dB, 6.4GHz ~ 13.2GHz
±2.0 dB, 13.2GHz ~ 22GHz
±2.5 dB, 22GHz ~ 26.5GHz
@ 10 dB RF attenuation, room temperature (20℃ ~ 30℃)

2.8 Attenuator

2.8.1 Range : 0 to 55 dB (Manual or Auto)

2.8.2 Resolution : 5 dB steps

2.8.3 Accuracy :
±0.5 dB @ 100MHz (ISA-30, ISA-80)
±0.5 dB @ Frequency < 13.2GHz (ISA-132, ISA-265)
±0.8 dB @ 13.2GHz < Frequency < 26.5GHz (ISA-132, ISA-265))

2.9 Reference Level

2.9.1 Range : +30 dBm to -170 dBm, 0.1 dB step [Log Scale]
7.07nV ~ 7.07 V, 1% step [Linear Scale]

2.9.2 Accuracy : 0 dB

2.10 Residual Spurious : ≤ -90 dBc @ 1MHz < Frequency < 26.5GHz
(Input terminated , 0 dB attenuator)

2.11 3rd Order Intermodulation Distortion
: +8 dBm , 10MHz<Frequency<200 MHz (-30 dBm input, 0 dB attenuation)
≤ +12 dBm , 200MHz<Frequency<26.5GHz (-30 dBm input, 0 dB attenuation)

2.12 Other Input Related Spurious : ≤ -55 dBc, -30 dBm input

2.13 Resolution Bandwidth

2.13.1 Selections : 30Hz to 5MHz (1-2-3-5 steps)

2.13.2 Accuracy : ≤ ±3% @ 500Hz ~ 500KHz
≤ ±10% @ 1MHz ~ 5MHz

2.13.3 Selectivity : < 5:1 (60 dB / 3 dB)

2.13.4 Switching Error : ≤ ±0.05 dB
(Refer to 5 kHz RBW, 100MHz center frequency)

2.14 Video Filter

2.15.1 Selections : 1Hz to 3MHz (1-2-3-5 steps)

2.15 FFT Filter

2.15.1 Selections : 1Hz to 300Hz (1-2-3-5 steps)

2.15.2 Accuracy : ≤ 1%

2.15.3 Selectivity : < 4.5:1 (60 dB / 3 dB)

3.0 Sweep

3.1 Range : 10 ms to 2000 sec (SPAN ≥ 10Hz)

1 μs to 2000 sec (@ ZERO SPAN)

3.2 Accuracy : ≤ ±0.5 % (Span ≥ 10Hz)

≤ ±0.5 % (@ ZERO SPAN)

3.3 Data Points : 101 to 8192 points (SPAN ≥ 10Hz)

3 to 8192 points (@ ZERO SPAN)

3.4 Trigger

3.4.1 Source : External (Rear Panel), Video, Free Run, Burst

3.4.2 Offset : 1us ~ 500ms (Span ≥ 10Hz)

-150ms ~ 500ms (@ ZERO SPAN)

4.0 Display

4.1 Type : 7“ Wide Color TFT LCD, Touch Support

4.2 Resolution : 800(horizontal) X 480(vertical) pixels

5.0 Inputs

5.1 RF Input

5.1.1 Connector : N Female, 50 ohm (3GHz, 8GHz, 13.2GHz)
APC 2.92mm (26.5GHz)

5.1.2 VSWR : ≤ 1.5 : 1 (10MHz < Freq. < 3GHz @ 10 dB ATT)

≤ 1.8 : 1 (3GHz < Freq. < 13.2GHz @ 10 dB ATT)

≤ 2.0 : 1 (13.2GHz < Freq. < 26.5GHz @ 10 dB ATT)

6.0 Outputs

6.1 IF Output : 21.4 MHz (3rd IF), BNC Female, 50 ohm

6.2 Cal Signal Output : 40MHz , -20dBm ± 1.0dB @ 50 ohm

6.3 Sweep Gate Output : 0 ~ 5VDC (TTL level), BNC Female

7.0 Internal Memory : 80 Gbytes, Removable Hard Disk (size of memory)

8.0 Demodulation

8.1 AM Demodulation Range : 100%

8.2 FM Demodulation deviation : ≤ 100kHz

9.0 Digitizer

8.1 Maximum analysis bandwidths : 30MHz

8.2 ADC Resolution : 14 bits

8.3 Dynamic Range : 85dB

8.4 Residual FM : < 1% (nominal)

8.5 Capture Memory : 128 Mbytes (32M samples)

9.0 FM Demodulation

9.1 Deviation Range : ≤ 100KHz

9.2 Input Level Range : -60 dBm ~ 0 dBm

10.0 External Trigger Input

10.1 Connector : BNC female, Rear Panel

10.2 Impedance : 10 Kohm (nominal)

10.3 Trigger Level : TTL Level

11.0 Serial Interface

11.1 Type : RS-232-C

11.2 Connector : 9 Pin D-Sub Female

12.0 GPIB Interface

12.1 Interface : SH1. AH1. T6. L4. SR1. RL1. PP0. DC1. E2, LEO. TEO

12.2 Specifications : IEEE 488.2, 24 Pin Female

13.0 LAN Interface : 10/100/1000 Base/T, Connector RJ45

14.0 USB Interface : USB 2.0 (Front 2EA, Rear 2EA)

15.0 External Reference

15.1 Frequency : 10MHz

15.2 Level : +5 dBm (@ Output Level)

15.3 Connector : BNC female

2. General Characteristics

1.0 Dimensions : 373mm x 194mm x 401mm [Without handles and down-feet]
384mm x 203mm x 437mm [With handles and down-feet]

2.0 Weight : 11 kg (ISA-30) / 12.8 kg (ISA-80) /
13 kg (ISA-132) / 13.4 kg (ISA-265)

3.0 Power Requirements (standard)

3.1 Source Voltage and Frequency : 100 to 240VAC, 50/60Hz

3.2 Power Consumption : 120 Watts Maximum (without option)

4.0 Warm-up Time : Thirty minutes

3. Environmental Specifications : MIL-PRF-28000F, Class 3

1.0 Temperature Range

1.1 Storage : -40℃ to +71℃

1.2 Operating : 0℃ to +50℃

2.0 Humidity : 5 ~ 95 % (5~75% above 30℃, 5~45% above 40℃)

3.0 Vibration : Random (5~500Hz), Sinusoidal (5~55Hz)

4.0 Shock : 30G, Half-Sine

5.0 Altitude : Storage and Operation up to 4600 meters

4. Safety & EMC Specifications

1.0 Safety : EN61010-1:2001 (2nd Edition)

2.0 EMC : EN 61326-1:2006

EN 55022-1:2006

EN 55024:1998+A1+A2

EN 61000-3-2:2000+A2

EN 61000-3-3:1995+A1+A2

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SECTION 2
PREPARATIONS BEFORE USE

This section explains the preparations and safety procedures that should be performed before using the equipment. The safety procedures are to prevent the risk of injury to the operator and damage to the equipment.
Ensure that you understand the contents of the pre-operation preparations before using the equipment.
For connecting the GPIB cable and setting the GPIB address, see the remote control operation in Programming Manual.

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SECTION 2
PREPARATIONS BEFORE USE

INSTALLATION SITE AND ENVIRONMENTAL CONDITIONS

Locations to Be Avoided

The equipment operates normally at temperatures from 0 to 50℃. However, for best performance, the following situations should be avoided.

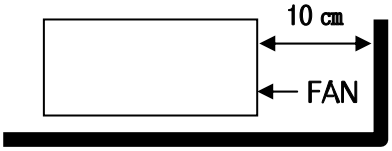
- Where there is severe vibration.
- Where the humidity is high.
- Where the equipment will be exposed to direct sunlight.
- Where the equipment will be exposed to active gases.

In addition to meeting the above conditions, to ensure long term trouble free operation, the equipment should be used at room temperature and in a location where the power supply voltage does not fluctuate greatly.

CAUTION

If the equipment is used at normal temperatures after it has been used or stored for a long time low temperatures, there is a risk of short circuiting caused by condensation.
To prevent this risk, do not turn the equipment on until it has been allowed to dry out sufficiently.

To suppress any internal temperature increase, the equipment has a fan on the rear panel. As shown in the diagram below, leave a gap of at least 10 ㎝ between the rear panel and wall, nearby equipment or obstructions so that fan ventilation is not blocked.



WALL

CAUTION

SAFETY MEASURES

This paragraph explains the safety procedures, which should be followed under all circumstances to prevent the risk of an accidental electric shock, damage to the equipment or a major operation interruption.

Power On

WARNING

○ Before Power on	The equipment must be connected to protective ground. If the power is switched on without taking this precaution, there is a risk of receiving an accidental electric shock. In addition, it is essential to check the power source voltage. If an abnormal voltage that exceeds the specified value is input, there is accidental risk of damage to the equipment and fire.

In the following, special notes on safety procedures are extracted from sections other than section 2.
To prevent accidents, read this section together with the related sections before beginning operation.

By pushing the front switch in the equipment, change the stand-by state to active state.
The equipment using window operation system has initial window booting display and operates the equipment after finishing the window booting.

(* If the equipment doesn't start automatically normal, you click the HSA icon in the display twice)

Input Level to RF Input

Frequency range : 1k Hz to 3 GHz
1k Hz to 8 GHz
1k Hz to 13.2 GHz
1k Hz to 26.5 GHz

Measurement level : The maximum signal level that can be applied to the RF input connector is +30 dBm.

WARNING

The RF Input circuit is not protected against excessive power.
If a signal exceeding +30 dBm is applied, the input attenuator and internal circuit will be damaged.

Do not input over 0 VDC to the RF input connector

PREPARATIONS BEFORE POWER ON

The equipment operates normally when it is connected to an 100 VAC to 250 VAC (automatic voltage selected automatically) 50/60 Hz AC power supply. To prevent the following, take the necessary procedures described on the following pages before power is supplied.

- Accidental electric shock.
- Damage caused by abnormal voltage.
- Ground current problems.

To protect the operator, the following WARNING and CAUTION notices are attached to the rear panel of the equipment.

WARNING

TO AVOID ELECTRIC SHOCK,
THE PROTECTIVE GROUNDING CONDUCTOR
MUST BE CONNECTED TO GROUND.
DO NOT REMOVE COVERS.
REFER SERVICING TO QUALIFIED PERSONNEL.

CAUTION

FOR CONTINUED FIRE PROTECTION
REPLACE ONLY WITH SPECIFIED
TYPE AND RATED FUSE.

WARNING

Disassembly, adjustment, maintenance, or other access inside this equipment is to be performed qualified personnel only. Maintenance of this equipment should be performed only by trained service personnel who are familiar with the risk involved of fire and electric shock. Potentially lethal voltages existing inside this equipment, if contacted accidentally, may result in personal injury or death, or in the possibility of damage to precision components.

Always follow the instructions on the following pages.

Protective Grounding

Grounding with frame ground (FG) terminal

When there is no grounded AC power-supply outlet, the protective frame ground (FG) terminal on the rear panel must be connected directly to ground potential.

WARNING

If power is applied without protective grounding, there is a risk of accidental electric shock. The protective frame ground (FG) terminal on the rear frame, or the ground pin of the supplied power cord must be connected to ground potential before power is supplied to the equipment.

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SECTION 3
PANEL DESCRIPTION

In this section the front and rear panels are described.

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SECTION 3
PANEL DESCRIPTION

In this section, the front and rear panels are described.

- Fig. 3-1 Front panel
- Fig. 3-2 Rear panel

In this manual, the key on the front panel is called as a hard key and it is expressed as boxed letter. In case of the key of menu(F1 ~ F8) is called as a soft key and it is expressed as italic.

Example] FREQ *Center*

TABLE OF FRONT AND REAR PANEL FEATURES

NO	Panel Marking	Explanation of Function
①	LCD	This is a liquid crystal display. It displays the trace of waveforms, the parameter settings, the value of marker, and the soft menu keys, etc.
②	F1 ~ F8 NEXT	These are the soft keys for selecting the soft key menus linked to the panel key operation.
③	FREQ	This is input section of the frequency parameter data.
	SPAN	This is input section of the span parameter data.
	AMPL	This is input section of the amplitude parameter data.
	MEAS	This key sets the measurement functions.

NO	Panel Marking	Explanation of Function
④	MAKER	This key sets the marker.
	MKR>	This key sets the marker value to a specified parameter.
	PEAK	This key is related to the peak search function.
	FUNC	This key sets the function which related with a marker.
	COUPLE	This key sets detect-mode.
	BW	This key sets the RBW and VBW.
	CONTROL	This key sets the selected measure function.
	SWEEP	This key sets the sweep time as well as the number of data.
⑤	SYSTEM	This key sets the configuration of system.
	SOURCE	This key is used for selecting the source.
	MODE	This key alters a variety of measurement modes.
	SETUP	This key sets the environment pursuant to measurement modes.
	LIMIT	This key sets the limit line.
	DISPLAY	This key sets the display functions.
	AUX	This key sets the auxiliary function such as FM/AM Demodulation.
	TRACE	This key sets the trace and video-average.
⑥	NUMERIC	This key is used for settings the numeric data and moving the curse. [<-] This key is used for adjusting the wrong input data. [0…9, '.' , '+/- '] Numeric data setting key
⑦	SCROLL KNOB	This key is used for scrolling the parameters.
⑧	STEP KEY	These keys are used for up/down the parameters.

NO	Panel Marking	Explanation of Function
⑨	RF INPUT	This is the RF input connector.
⑩	CAL. OUT	This is an output of audio signal.
⑪	PHONE	This is a connector for USB equipments.
⑫	TG Out	This is an output of Tracking Generator. (Option)
⑬	Front USB	This is a connector for mouse.
⑭	STBY/ON	Power switch is on. The power on condition is fetched from the STBY condition when the key is pressed momentary. The equipment is returned to the STBY condition from the power on condition when the key is pressed again for about 1 second.
⑮		This Key is used for returning windows.
	File	This key manages the file.
	SAVE	This key is used for saving the waveforms status and limit lines.
	PRINT	This key is used for printing.
	PRESET	This sets the measurement parameters to the default values.
	TUNE	Also calibration menus are included under this key.
	TRIG	This key is used for auto tuning function.
	SINGLE	This key sets the trigger functions.
		One sweep is executed by pressing this key.

NO	Panel Marking	Explanation of Function
⑯	SWEEP GATE	This is an output connector for Sweep Gate signal.
⑰	EXT TRIG	This is an input connector for the external trigger.
⑱	3rd IF OUT	This is an output connector for 3rd IF signal..
⑲	RS-232C	This is the RS-232C connector. Connect it to system controller
⑳	Removal HDD	This is a removable storage. (Please, Don't remove it on operation).
㉑	EXT VGA	This is VGA output for external monitor.
㉒	ETHERNET	This is an Ethernet connector for network connection.
㉓	REF. OUT 10MHz	This is an output connector for reference frequency. When other equipment is used with this signal analyzer, the output signal of this connector is used for reference signal.
㉔	REF. IN 10MHz	This is an input connector for reference frequency. When external reference signal connected to this connector, the present condition is displayed on the top of right side on display panel.
㉕	AC Inlet	This is the fused AC power inlet to which the supplied power-cord is connected.
㉖	Rear USB	This is a connector for USB equipment.
㉗	GPIB	This is for use with the GPIB interface. It is the connector to an external system controller.
㉘	FG	This is the frame ground terminal.
㉙	FAN	This is the cooling fan ventilating internally generated heat. Leave a clearance of a 10 ㎝ around the fan.

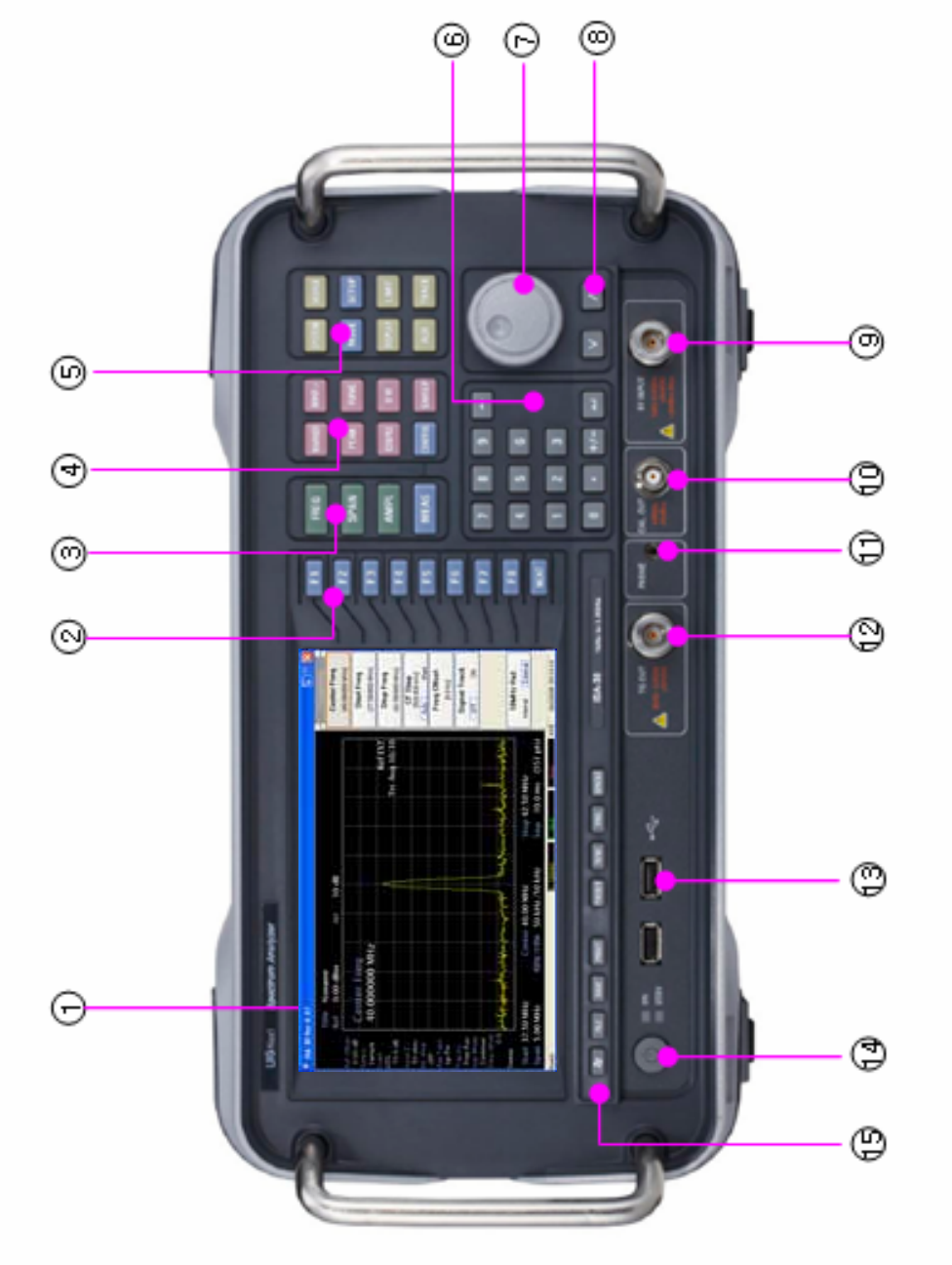

Fig 3-1. Front Panel

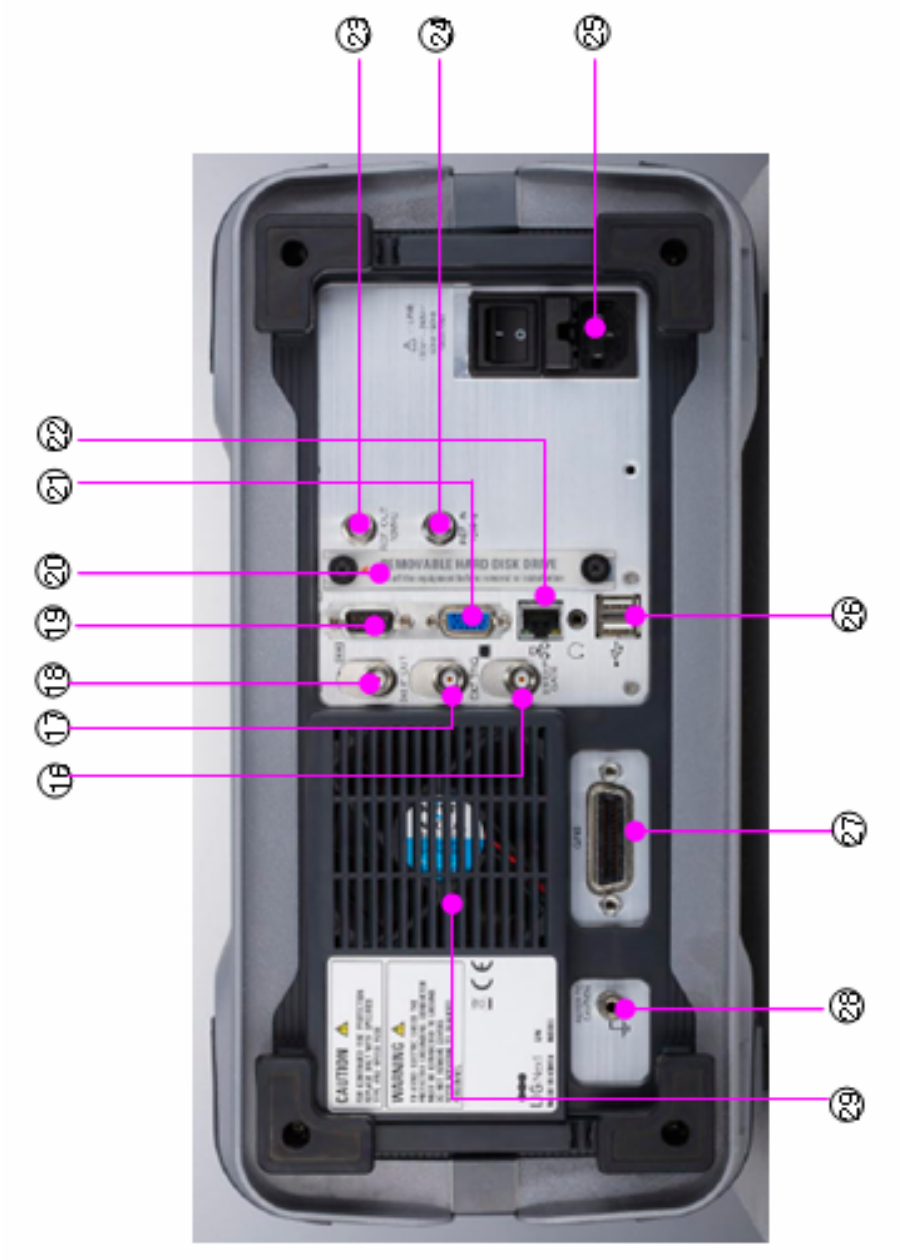

Fig 3-2. Rear Panel

TABLE OF I/O CONNECTORS

CONNECTOR	TYPE	IN/OUT	SIGNAL	LOCATION
AC INPUT	IEC 320 Socket	INPUT	AC Power	REAR ㉕
RF INPUT	Type N Female (2.92mm Female)	INPUT	1kHz～3/ 8/ 13.2GHz 1kHz～26.5GHz	FRONT ⑨
CAL. OUT	BNC Female	OUTPUT	40 ㎒, -20dBm	FRONT ⑩
EXT TRIG	BNC Female	INPUT	TTL Level	REAR ⑰
SWP GATE	BNC Female	OUTPUT	TTL Level	REAR ⑯
3rd IF OUT	BNC Female	OUTPUT	21.4 MHz, 2 dBm	REAR ⑱
REF IN	BNC Female	INPUT	10 MHz	REAR ㉔
REF OUT	BNC Female	OUTPUT	10 MHz	REAR ㉓
GPIB	24-Pin Champ	IN/OUT	Refer to Pin Spec. (Table 2)	REAR ㉗
RS-232C	9-Pin, D-sub Female	IN/OUT	Refer to Pin Spec. (Table 3)	REAR ⑲
ETHERNET	10/100/1000 Base-T	IN/OUT	Refer to Pin Spec. (Table 6)	REAR ㉒
USB	USB 2.0 Support	IN/OUT	Refer to Pin Spec. (Table 5)	FRONT ⑬ REAR ㉖
EXT VGA	15-Pin, D-sub Female	OUTPUT	Refer to Pin Spec. (Table 4)	REAR ㉑

Table 1. I/O Connector

GPIB CONNECTOR

The IEEE-488 GPIB Connector complies with ANSI/IEEE Standard 488.2-1987.

PIN NUMBER	SIGNAL	PIN NUMBER	SIGNAL
1	DIO 1	13	DIO 5
2	DIO 2	14	DIO 6
3	DIO 3	15	DIO 7
4	DIO 4	16	DIO 8
5	EQI	17	REN
6	DAV	18	Ground
7	NRFD	19	Ground
8	NDAC	20	Ground
9	IFC	21	Ground
10	SRQ	22	Ground
11	ATN	23	Ground
12	Ground	24	Ground

Table 2. Pin-Out for IEEE-488 GPIB Connector

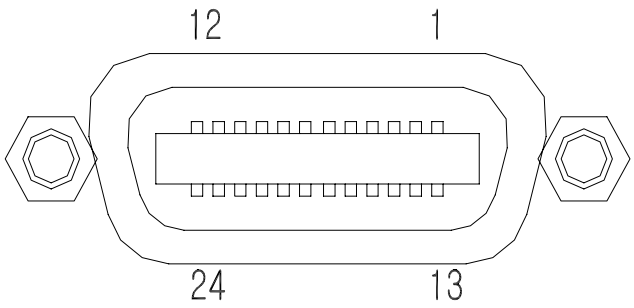

Figure 3-3. IEEE-488 GPIB Connector

RS-232C CONNECTOR

PIN NUMBER	SIGNAL
1	DCD
2	RXD
3	TXD
4	DTR
5	Ground
6	DSR
7	RTS
8	CTS
9	RI (NC)

Table 3. Pin-Out for RS-232C Connector

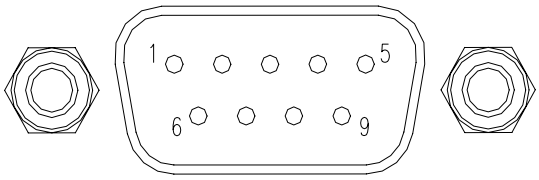

Figure 3-4. RS-232C Connector

EXT VGA CONNECTOR

PIN NUMBER	SIGNAL
1	RED
2	GREEN
3	BLUE
4	NC
5	Digital GND
6	RGND
7	GGND
8	BGND
9	VCC
10	Digital GND
11	NC
12	DDC Data
13	HSYNC
14	VSYNC
15	DDC Clock

Table 4. Pin-Out for EXT VGA Connector

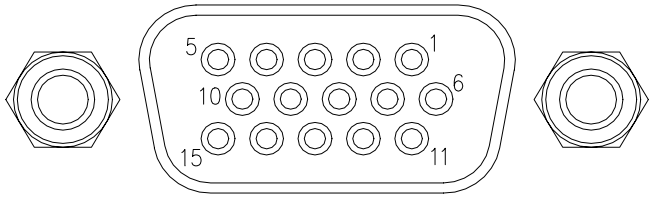

Figure 3-5. EXT VGA Connector

USB CONNECTOR

PIN NUMBER	Signal
1	USB VCC
2	DATA-
3	DATA+
4	USB GND

Table 5. Pin-Out for USB

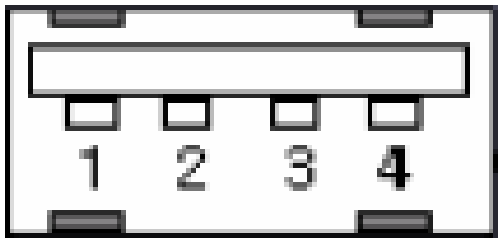

Figure 3-6. USB Connector

ETHERNET CONNECTOR

PIN NUMBER	Signal
1	TX+
2	TX-
3	RX+
4	NC
5	NC
6	RX-
7	NC
8	NC

Table 6. Pin-Out for ETHERNET

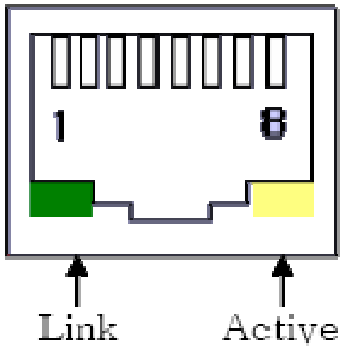

Figure 3-7. ETHERNET CONNECTOR

SECTION 4
MENU TREE

TABLE OF CONTENTS

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SECTION 4
MENU TREE

In this section, soft menu functions and its system hierarchy are described using a menu tree.
Contents to noted about the tree are shown below

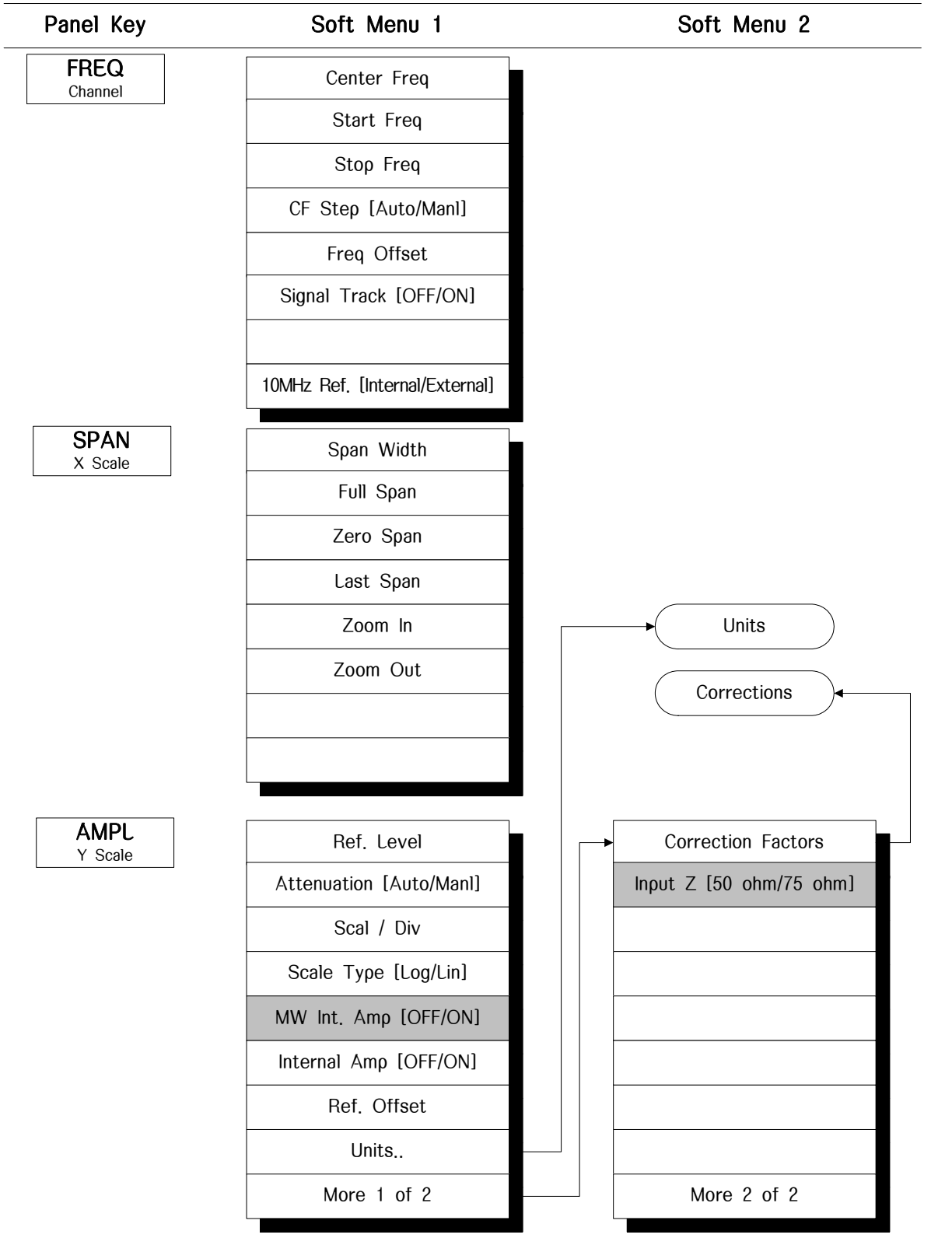
(1) Panel key indicates a hard key on the panel.

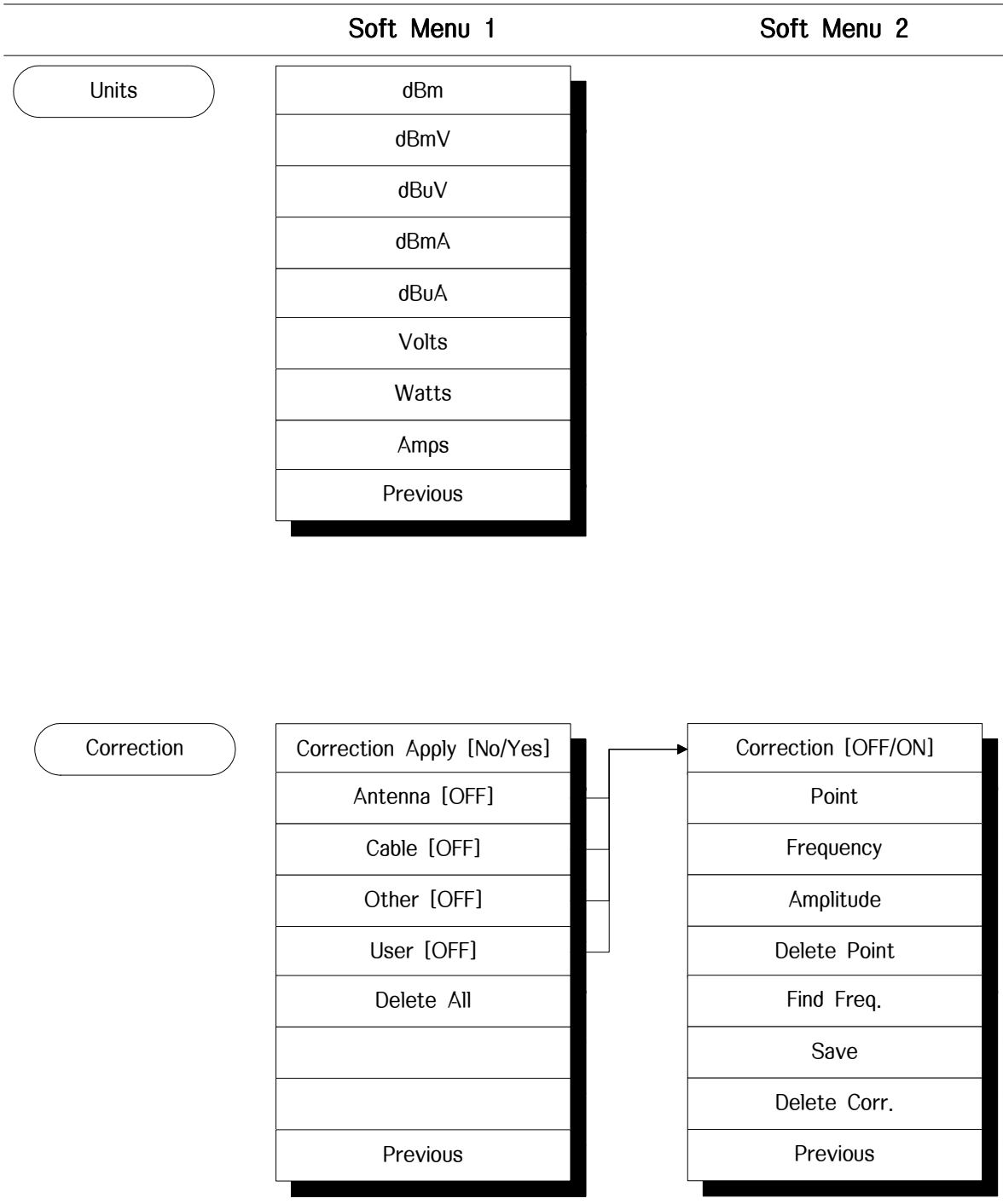
(2) SOFT MENU 1 are displayed on the screen when the panel key is pressed. SOFT MENU 2 indicates another menu below the SOFT MENU 1.

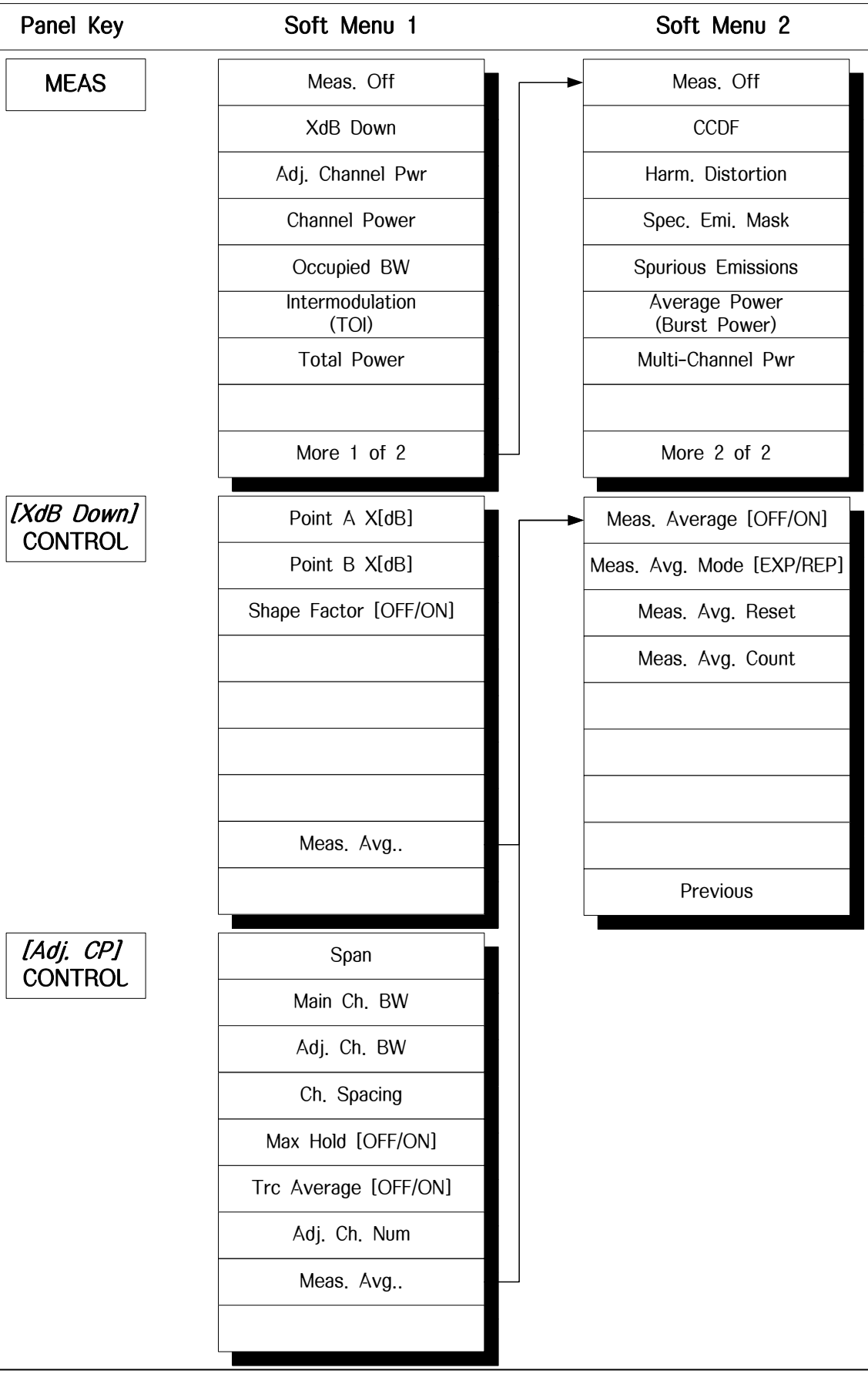
(3) When the *Prev.*. key is pressed on SOFT MENU 2 keys.
It will go to SOFT MENU 1 menu.

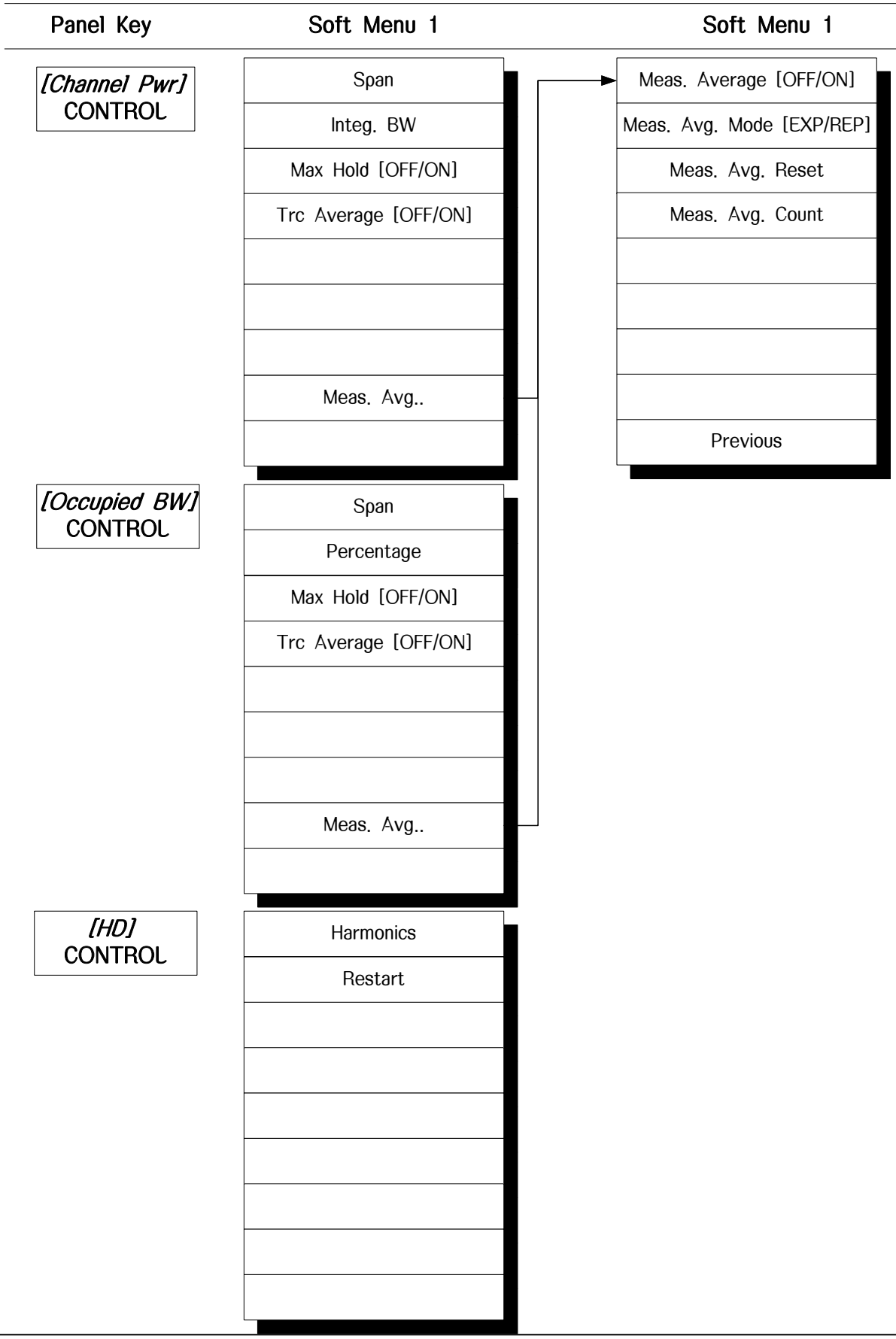
(4) The menu of disabled option or disabled function key will not operate with white letter on the function menu.

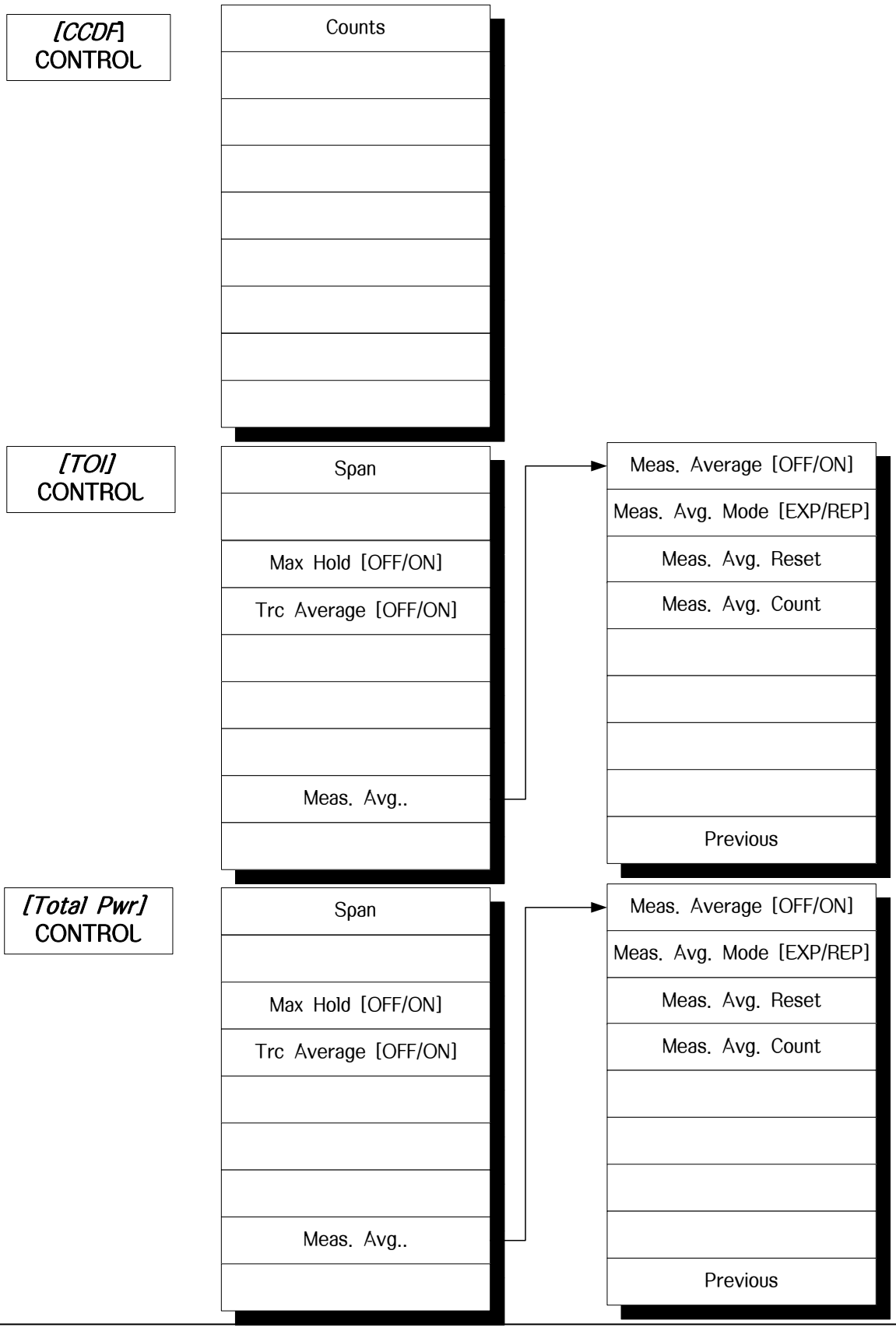
MENU TREE

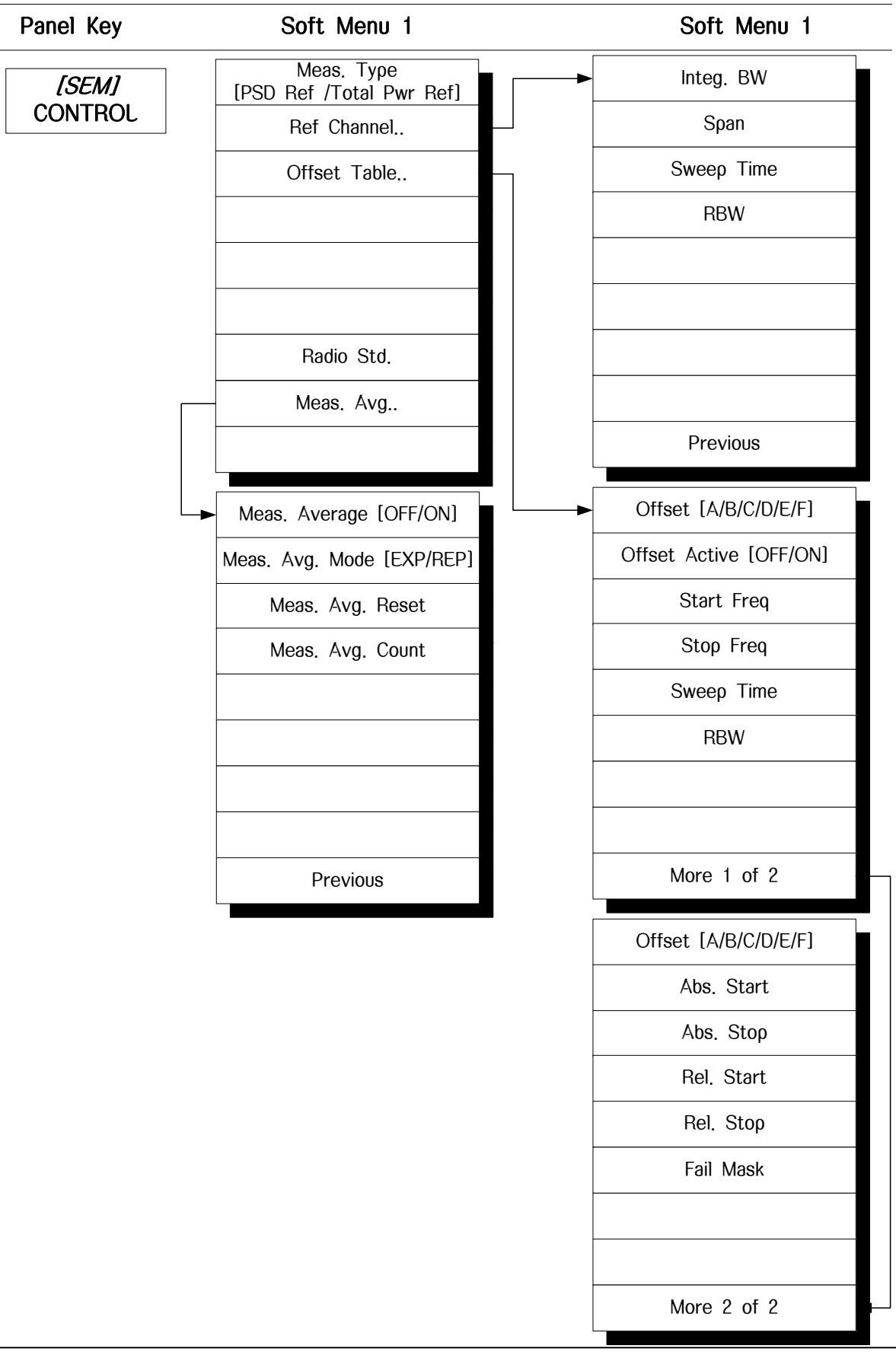

Panel Key
Soft Menu 1
Soft Menu 2
FREQ
Channel
Center Freq
Start Freq
Stop Freq
CF Step [Auto/Manl]
Freq Offset
Signal Track [OFF/ON]
10MHz Ref. [Internal/External]
SPAN
X Scale
Span Width
Full Span
Zero Span
Last Span
Zoom In
Zoom Out
Units
Corrections
AMPL
Y Scale
Ref. Level
Attenuation [Auto/Manl]
Scal / Div
Scale Type [Log/Lin]
MW Int. Amp [OFF/ON]
Internal Amp [OFF/ON]
Ref. Offset
Units..
More 1 of 2
Correction Factors
Input Z [50 ohm/75 ohm]
More 2 of 2

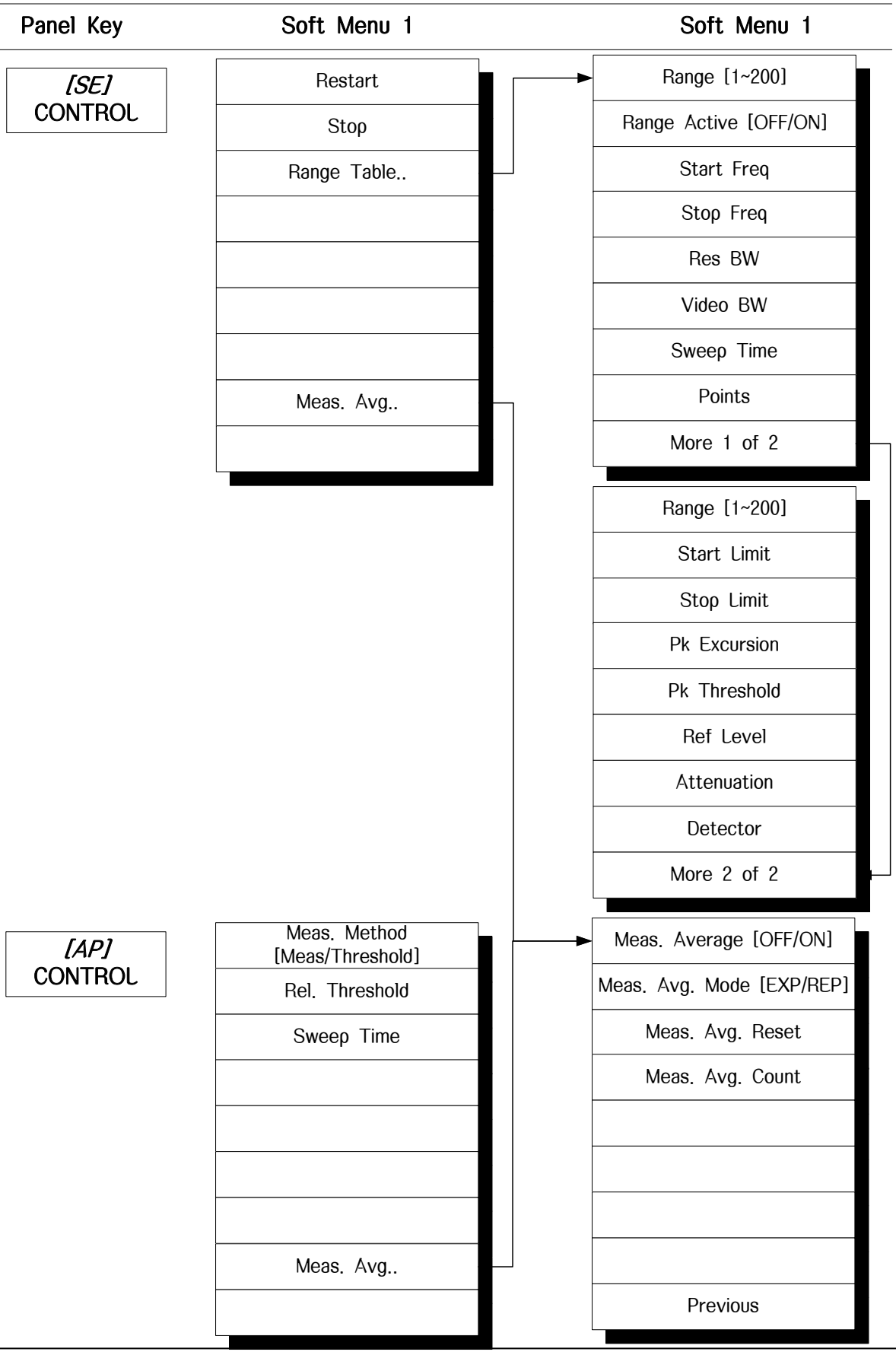

Soft Menu 1
Soft Menu 2
Units
dBm
dBmV
dBuV
dBmA
dBuA
Volts
Watts
Amps
Previous
Correction
Correction Apply [No/Yes]
Antenna [OFF]
Cable [OFF]
Other [OFF]
User [OFF]
Delete All
Previous
Correction [OFF/ON]
Point
Frequency
Amplitude
Delete Point
Find Freq.
Save
Delete Corr.
Previous

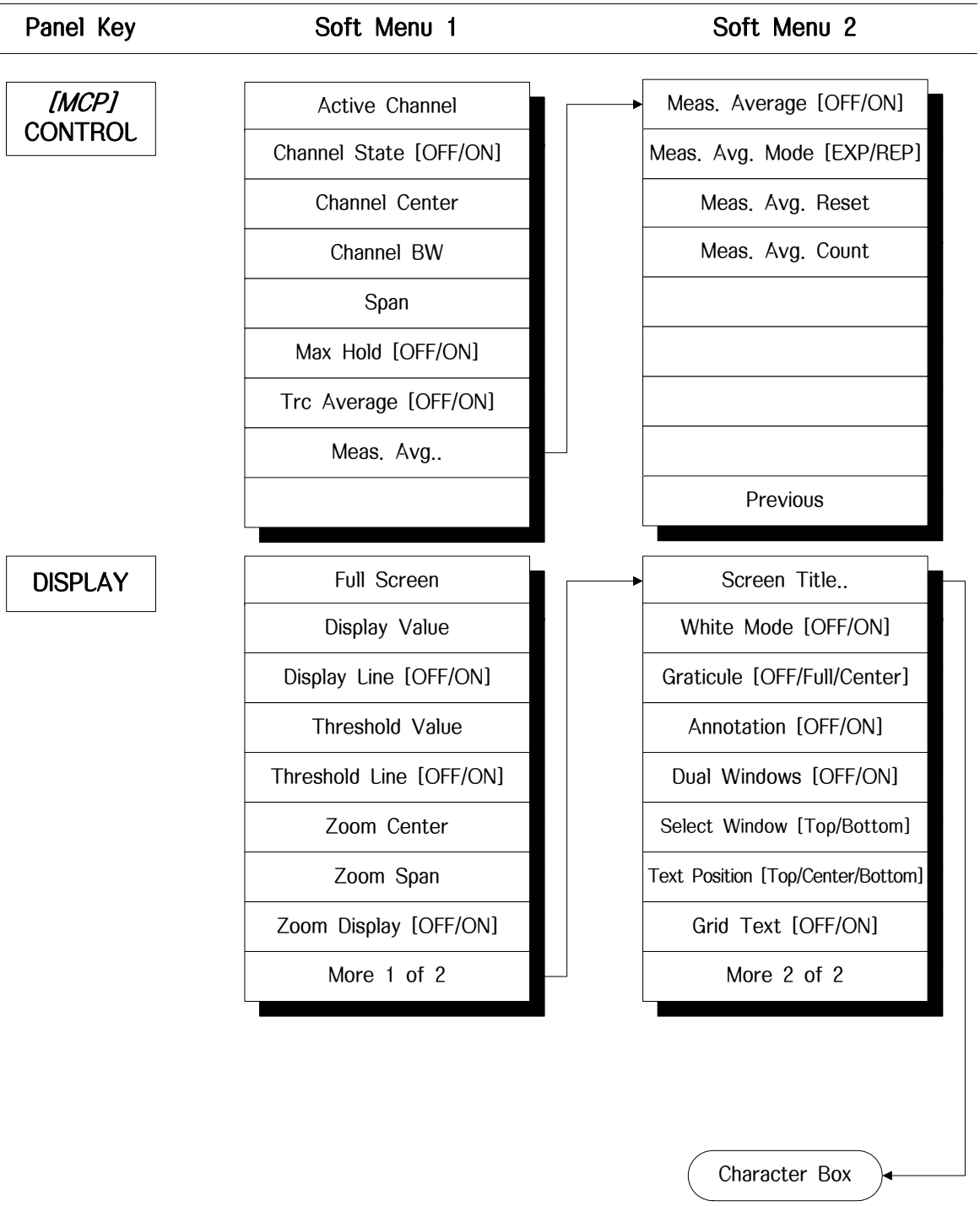

Panel Key
Soft Menu 1
Soft Menu 2
MEAS
Meas. Off
XdB Down
Adj. Channel Pwr
Channel Power
Occupied BW
Intermodulation (TOI)
Total Power
More 1 of 2
Meas. Off
CCDF
Harm. Distortion
Spec. Emi. Mask
Spurious Emissions
Average Power (Burst Power)
Multi-Channel Pwr
More 2 of 2
[XdB Down] CONTROL
Point A X[dB]
Point B X[dB]
Shape Factor [OFF/ON]
Meas. Avg..
Meas. Average [OFF/ON]
Meas. Avg. Mode [EXP/REP]
Meas. Avg. Reset
Meas. Avg. Count
Previous
[Adj. CP] CONTROL
Span
Main Ch. BW
Adj. Ch. BW
Ch. Spacing
Max Hold [OFF/ON]
Trc Average [OFF/ON]
Adj. Ch. Num
Meas. Avg..

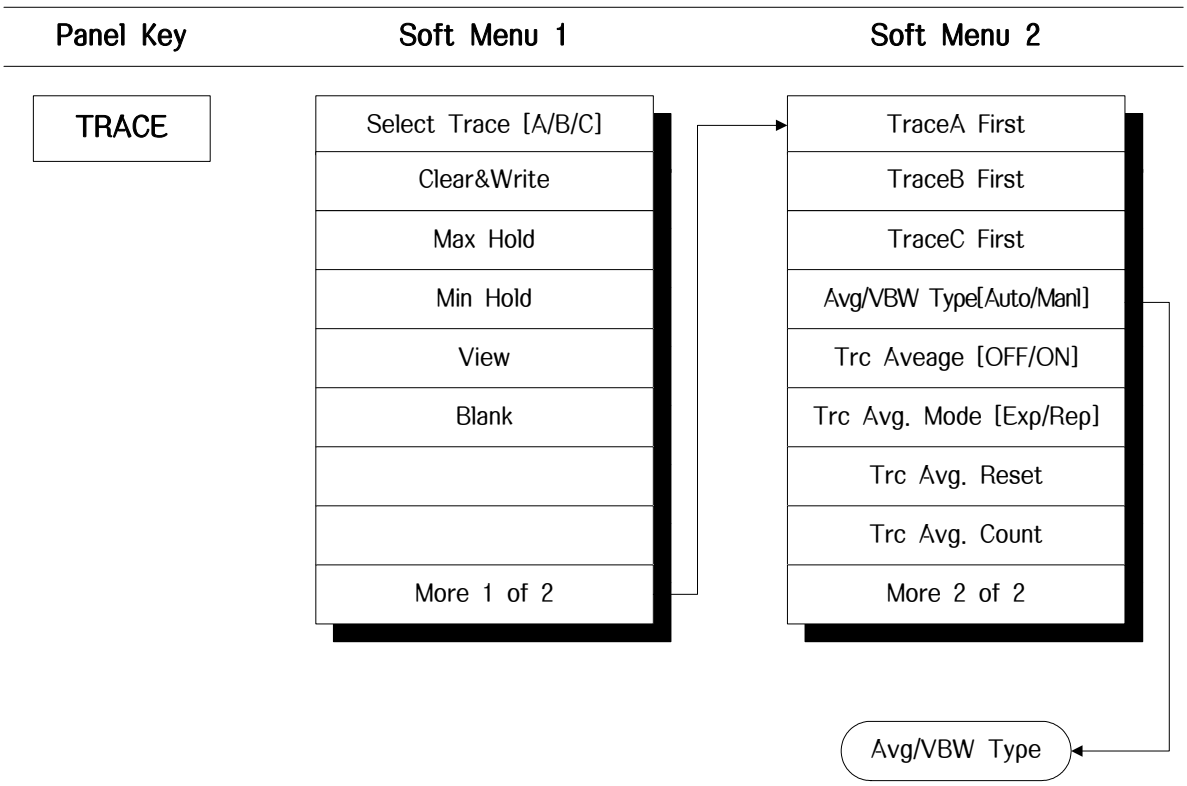

Panel Key
Soft Menu 1
Soft Menu 1
[Channel Pwr] CONTROL
Span
Integ. BW
Max Hold [OFF/ON]
Trc Average [OFF/ON]
Meas. Avg..
Meas. Average [OFF/ON]
Meas. Avg. Mode [EXP/REP]
Meas. Avg. Reset
Meas. Avg. Count
Previous
[Occupied BW] CONTROL
Span
Percentage
Max Hold [OFF/ON]
Trc Average [OFF/ON]
Meas. Avg..
[HD] CONTROL
Harmonics
Restart

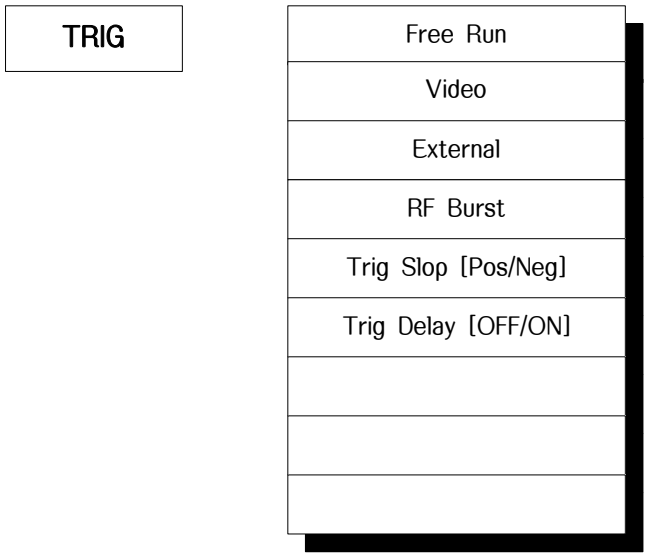

Panel Key
Soft Menu 1
Soft Menu 1
[CCDF] CONTROL
Counts
[TOI] CONTROL
Span
Max Hold [OFF/ON]
Trc Average [OFF/ON]
Meas. Avg..
Meas. Average [OFF/ON]
Meas. Avg. Mode [EXP/REP]
Meas. Avg. Reset
Meas. Avg. Count
Previous
[Total Pwr] CONTROL
Span
Max Hold [OFF/ON]
Trc Average [OFF/ON]
Meas. Avg..
Meas. Average [OFF/ON]
Meas. Avg. Mode [EXP/REP]
Meas. Avg. Reset
Meas. Avg. Count
Previous

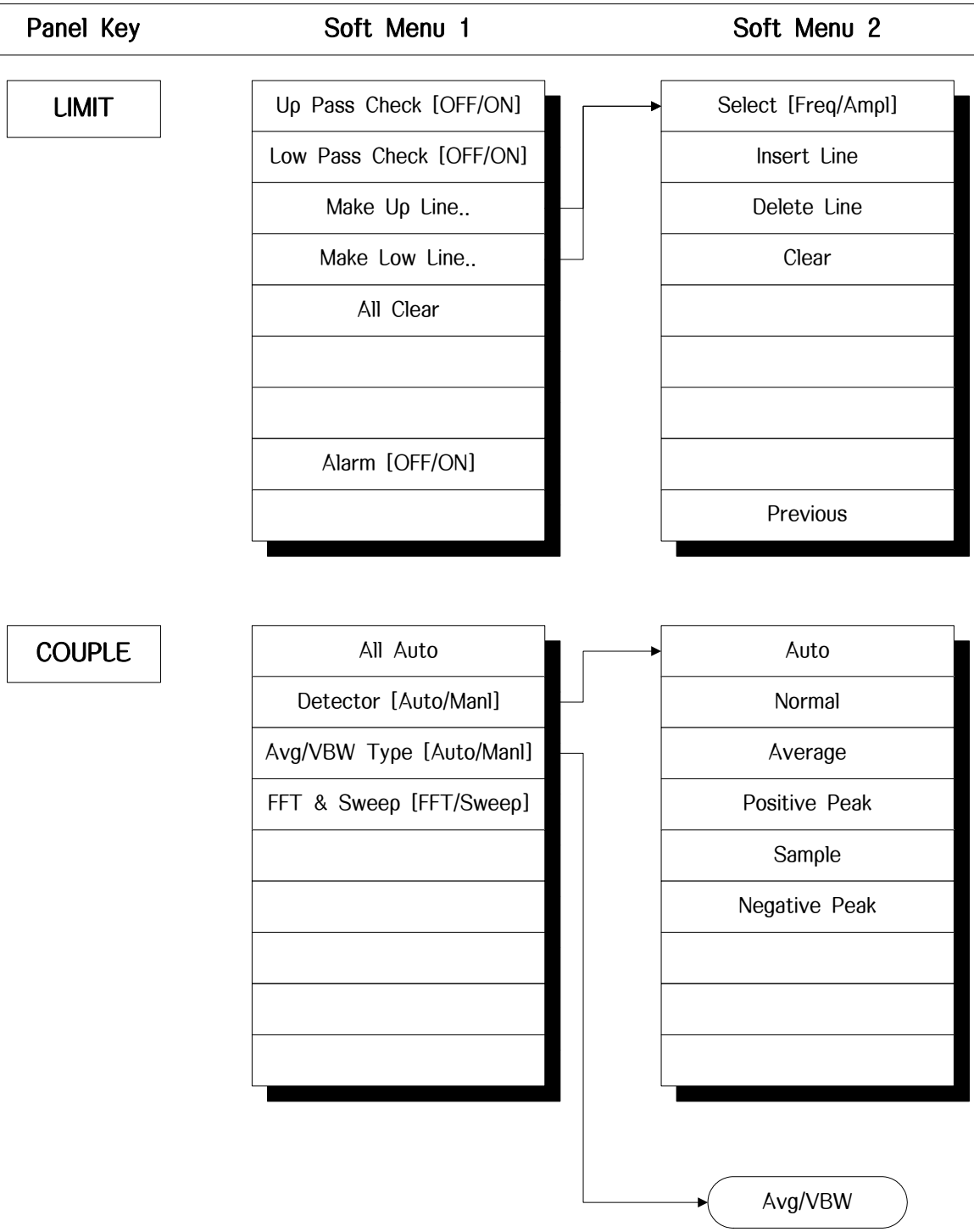

Panel Key
Soft Menu 1
Soft Menu 1
[SEM]
CONTROL
Meas. Type
[PSD Ref /Total Pwr Ref]
Ref Channel..
Offset Table..
Radio Std.
Meas. Avg..
Integ. BW
Span
Sweep Time
RBW
Previous
Meas. Average [OFF/ON]
Meas. Avg. Mode [EXP/REP]
Meas. Avg. Reset
Meas. Avg. Count
Previous
Offset [A/B/C/D/E/F]
Offset Active [OFF/ON]
Start Freq
Stop Freq
Sweep Time
RBW
More 1 of 2
Offset [A/B/C/D/E/F]
Abs. Start
Abs. Stop
Rel. Start
Rel. Stop
Fail Mask
More 2 of 2


Panel Key
Soft Menu 1
Soft Menu 1
[SE]
CONTROL
Restart
Stop
Range Table..
Meas. Avg..
Range [1~200]
Range Active [OFF/ON]
Start Freq
Stop Freq
Res BW
Video BW
Sweep Time
Points
More 1 of 2
Range [1~200]
Start Limit
Stop Limit
Pk Excursion
Pk Threshold
Ref Level
Attenuation
Detector
More 2 of 2
[AP]
CONTROL
Meas. Method [Meas/Threshold]
Rel. Threshold
Sweep Time
Meas. Avg..
Meas. Average [OFF/ON]
Meas. Avg. Mode [EXP/REP]
Meas. Avg. Reset
Meas. Avg. Count
Previous

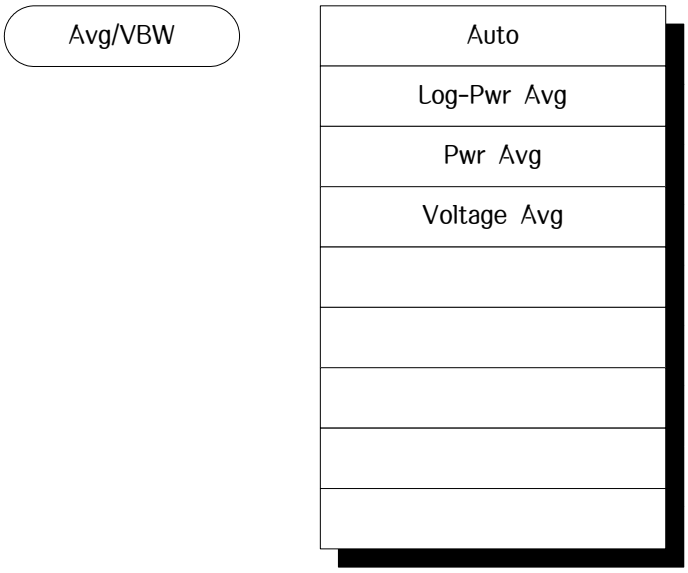

Panel Key
Soft Menu 1
Soft Menu 2
[MCP]
CONTROL
Active Channel
Channel State [OFF/ON]
Channel Center
Channel BW
Span
Max Hold [OFF/ON]
Trc Average [OFF/ON]
Meas. Avg..
Meas. Average [OFF/ON]
Meas. Avg. Mode [EXP/REP]
Meas. Avg. Reset
Meas. Avg. Count
Previous
DISPLAY
Full Screen
Display Value
Display Line [OFF/ON]
Threshold Value
Threshold Line [OFF/ON]
Zoom Center
Zoom Span
Zoom Display [OFF/ON]
More 1 of 2
Screen Title..
White Mode [OFF/ON]
Graticule [OFF/Full/Center]
Annotation [OFF/ON]
Dual Windows [OFF/ON]
Select Window [Top/Bottom]
Text Position [Top/Center/Bottom]
Grid Text [OFF/ON]
More 2 of 2
Character Box

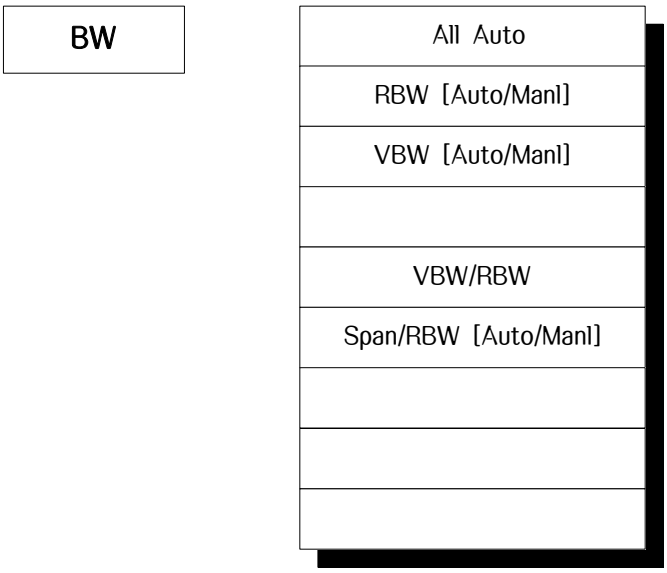

Panel Key
Soft Menu 1
Soft Menu 2
TRACE
Select Trace [A/B/C]
Clear&Write
Max Hold
Min Hold
View
Blank
More 1 of 2
TraceA First
TraceB First
TraceC First
Avg/VBW Type[Auto/Manl]
Trc Aveage [OFF/ON]
Trc Avg. Mode [Exp/Rep]
Trc Avg. Reset
Trc Avg. Count
More 2 of 2
Avg/VBW Type


TRIG
Free Run
Video
External
RF Burst
Trig Slop [Pos/Neg]
Trig Delay [OFF/ON]

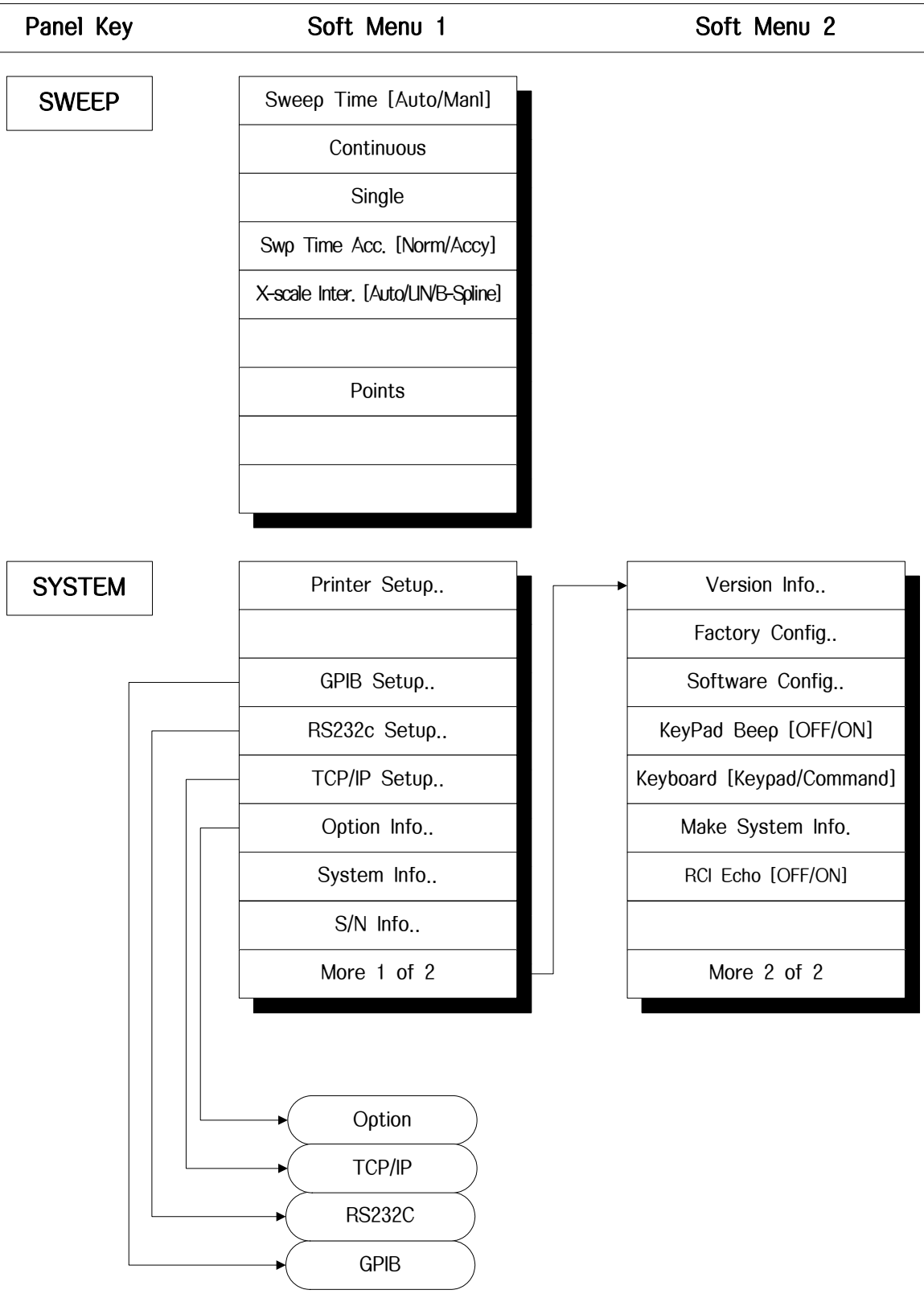

Panel Key
Soft Menu 1
Soft Menu 2
LIMIT
Up Pass Check [OFF/ON]
Low Pass Check [OFF/ON]
Make Up Line..
Make Low Line..
All Clear
Alarm [OFF/ON]
Select [Freq/Ampl]
Insert Line
Delete Line
Clear
Previous
COUPLE
All Auto
Detector [Auto/Manl]
Avg/VBW Type [Auto/Manl]
FFT & Sweep [FFT/Sweep]
Auto
Normal
Average
Positive Peak
Sample
Negative Peak
Avg/VBW

Panel Key	Soft Menu 1	Soft Menu 2

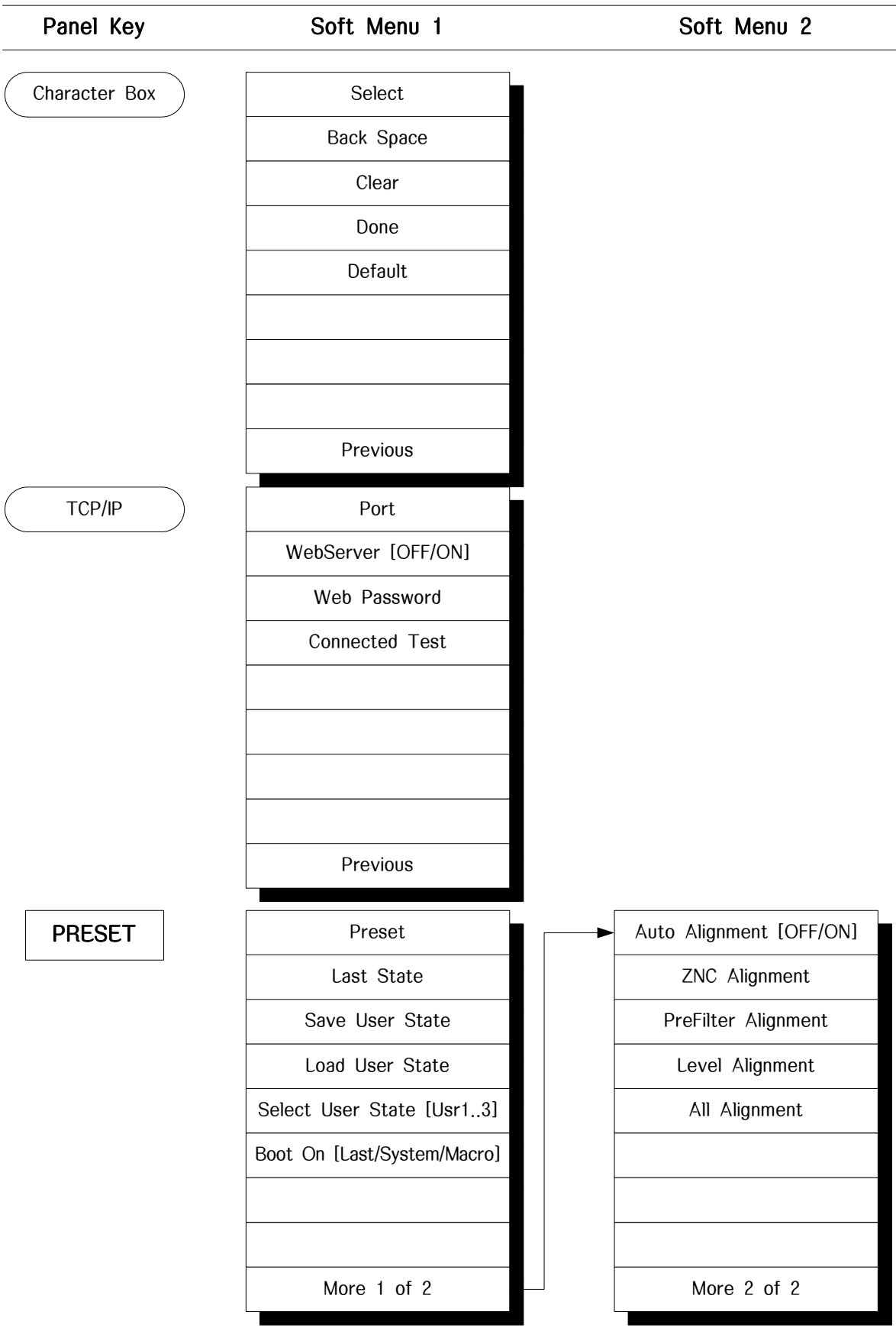


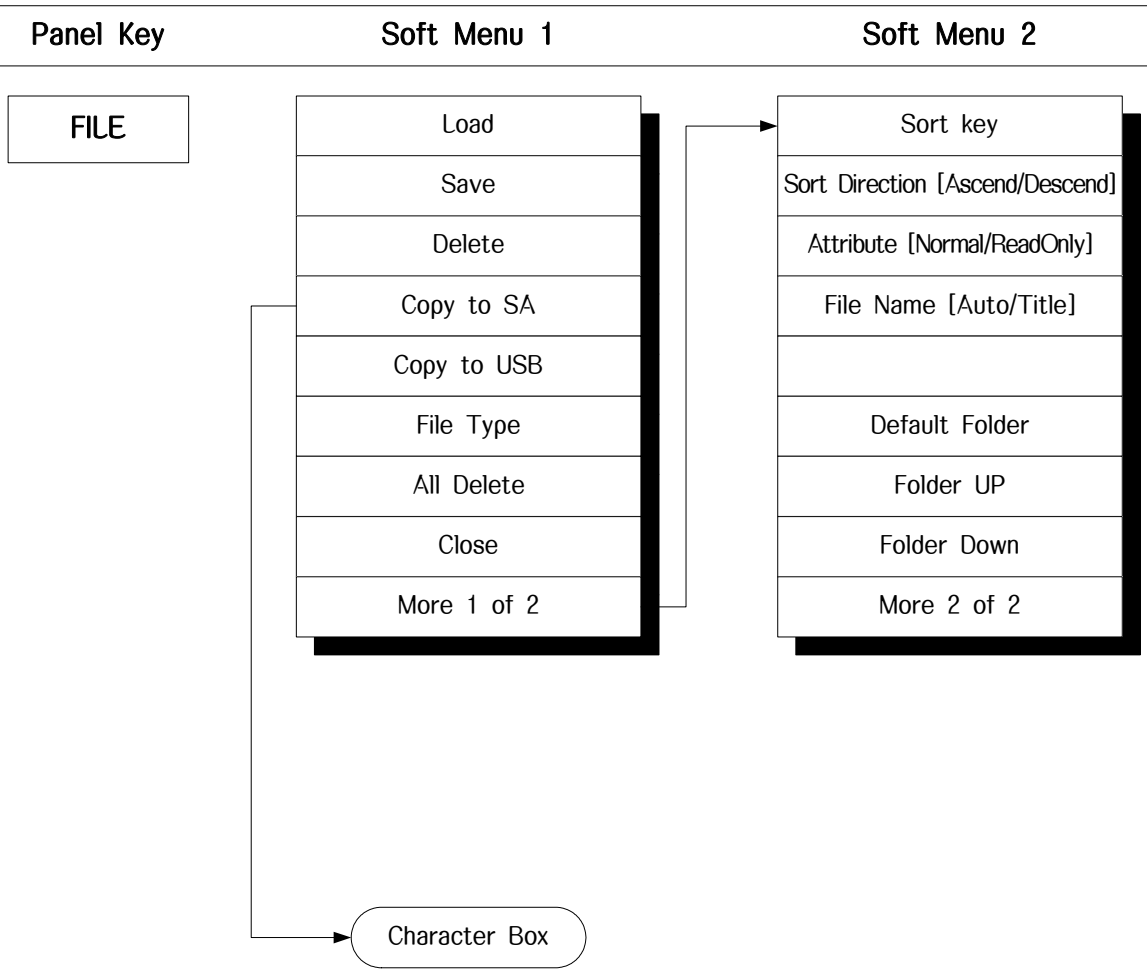


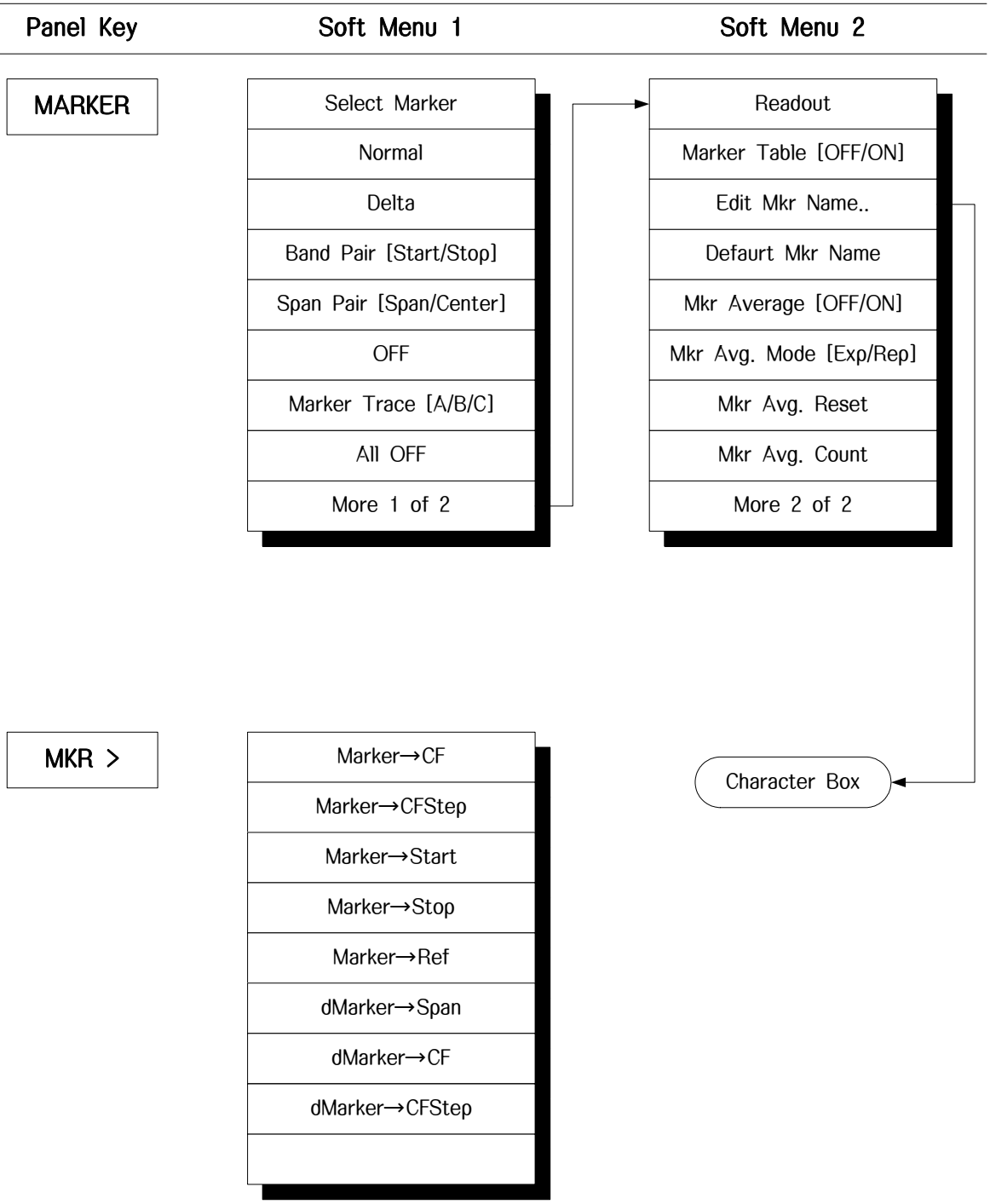
Panel Key	Soft Menu 1	Soft Menu 2
AUX	Am Demod. [OFF/ON]	
	FM Demod. [OFF/ON]	
	Audio Sound [OFF/ON]	
	Audio Level	
	Spectrum View [OFF/ON]	
	Window Type	
SOURCE	TG	Tracker [OFF/ON]
	SG	Output Lvl
		Normal [OFF/ON]
		Power Swp [OFF/ON]

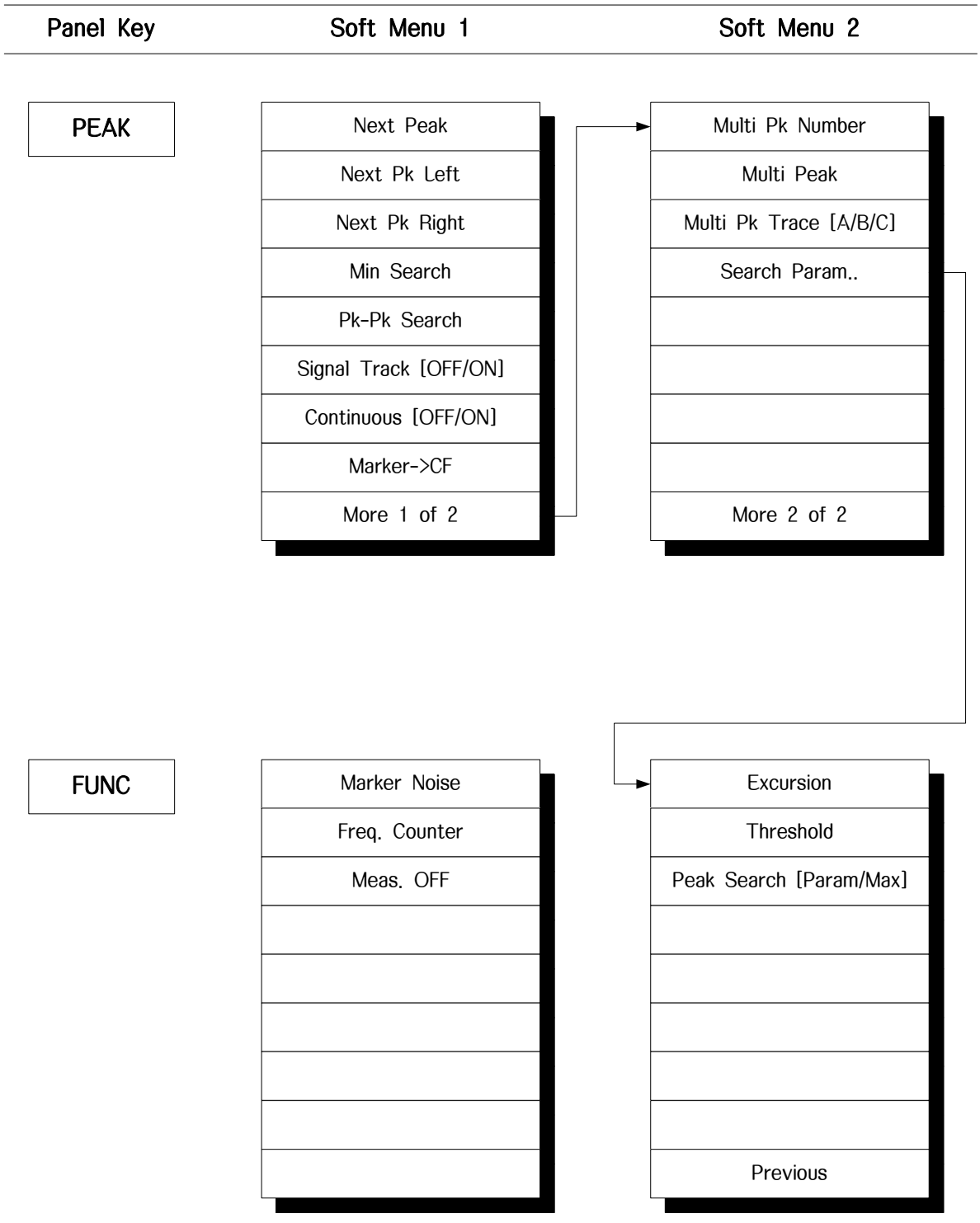

Panel Key
Soft Menu 1
Soft Menu 2
SWEEP
Sweep Time [Auto/Manl]
Continuous
Single
Swp Time Acc. [Norm/Accy]
X-scale Inter. [Auto/LIN/B-Spline]
Points
SYSTEM
Printer Setup..
GPIB Setup..
RS232c Setup..
TCP/IP Setup..
Option Info..
System Info..
S/N Info..
More 1 of 2
Version Info..
Factory Config..
Software Config..
KeyPad Beep [OFF/ON]
Keyboard [Keypad/Command]
Make System Info.
RCI Echo [OFF/ON]
More 2 of 2
Option
TCP/IP
RS232C
GPIB

Panel Key	Soft Menu 1	Soft Menu 2
RS232C	Baud Rate	
	Data Length	
	Stop Bit	
	Parity Bit	
	Previous	
GPIB	Set Address	
	Previous	
OPTION	Option Activate	
	Display Option	
	Previous	


Panel Key
Soft Menu 1
Soft Menu 2
Character Box
Select
Back Space
Clear
Done
Default
Previous
TCP/IP
Port
WebServer [OFF/ON]
Web Password
Connected Test
Previous
PRESET
Preset
Last State
Save User State
Load User State
Select User State [Usr1..3]
Boot On [Last/System/Macro]
More 1 of 2
Auto Alignment [OFF/ON]
ZNC Alignment
PreFilter Alignment
Level Alignment
All Alignment
More 2 of 2


Panel Key
Soft Menu 1
Soft Menu 2
FILE
Load
Save
Delete
Copy to SA
Copy to USB
File Type
All Delete
Close
More 1 of 2
Sort key
Sort Direction [Ascend/Descend]
Attribute [Normal/ReadOnly]
File Name [Auto/Title]
Default Folder
Folder UP
Folder Down
More 2 of 2
Character Box


Panel Key
Soft Menu 1
Soft Menu 2
MARKER
Select Marker
Normal
Delta
Band Pair [Start/Stop]
Span Pair [Span/Center]
OFF
Marker Trace [A/B/C]
All OFF
More 1 of 2
Readout
Marker Table [OFF/ON]
Edit Mkr Name..
Defaurt Mkr Name
Mkr Average [OFF/ON]
Mkr Avg. Mode [Exp/Rep]
Mkr Avg. Reset
Mkr Avg. Count
More 2 of 2
MKR >
Marker→CF
Marker→CFStep
Marker→Start
Marker→Stop
Marker→Ref
dMarker→Span
dMarker→CF
dMarker→CFStep
Character Box


Panel Key
Soft Menu 1
Soft Menu 2
PEAK
Next Peak
Next Pk Left
Next Pk Right
Min Search
Pk-Pk Search
Signal Track [OFF/ON]
Continuous [OFF/ON]
Marker->CF
More 1 of 2
Multi Pk Number
Multi Peak
Multi Pk Trace [A/B/C]
Search Param..
More 2 of 2
FUNC
Marker Noise
Freq. Counter
Meas. OFF
Excursion
Threshold
Peak Search [Param/Max]
Previous

<BLANK>

SECTION 5
OPERATING PROCEDURES

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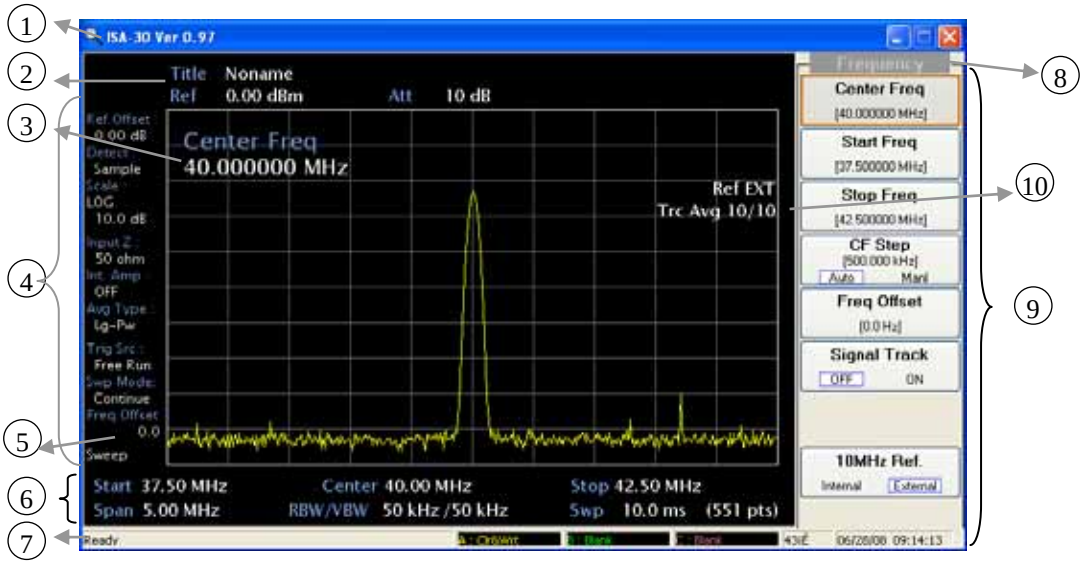
SECTION 5
OPERATING PROCEDURES

SCREEN LAYOUT



① Title window	: Manufacturer, Display Model.
② Upper display window	: Displaying screen subject, reference level, scale, attenuation and marker parameter.
③ Parameter window	: Displaying current active menu parameter.
④ Wave display window	: Displaying current active waveform.
⑤ Left display window	: Displaying information of trigger and operating mode.
⑥ Lower display window	: Displaying Freq. Info., RBW, VBW, Sweep time, the number of points.
⑦ Status display window	: Displaying current job processing status and waveform status.
⑧ Menu name	: Displaying the current soft menu name.
⑨ Soft key menu	: Displaying available auxiliary function of selected hard key.
⑩ Effective data / Average number display	: Displaying the accuracy of current signal waveform. : Displaying the number of signal waveform average performance. Displaying confirmation of frequency input.

CONTROL USING BY KEY-BOARD AND MOUSE

Equipment connected keyboard can be controlled by using the keyboard.
(System is setting functionality of menu's Keyboard to Keypad : Refer to 5-67* Keyboard Item)

Keyboard keys, as shown below, each connected.
Each key is connected to below.

- F1~F9: Soft key (F1~F8) and Next (F9) key
- 0~9 / - /.(Periods) / ← (Backspace) : Number key of keypad and Hard key
- Left / Right Cursor key (← →): Scroll knob
- Upper / Lower Cursor key (↑ ↓): Step key
- A~Z: Hard key (Refer to below table)

Hardkey	Keyboard	Hardkey	Keyboard	Hardkey	Keyboard
FREQ	FR	DISPLAY	DI	BW	BW
SPAN	SP	TRACE	TRA	AUX	AU
AMPL	AM	TRIG	TRI	SOURCE	SO
MEAS	ME	LIMIT	LI	SWEEP	SW
CONTROL	CON	COUPLE	COU	SYSTEM	SY
PRESET	PRE	FUNC	FU	START	ST
FILE	FI	SAVE	SA	PRINT	PRI
MARKER	MA	SINGLE	SI	PEAK	PE
MKR >	MK				

Sorf-key cab be operated by mouse. If mouse is equipped with wheel, wheel operation is responded to scroll-knob.

FREQ / SPAN FUNCTIONS

The frequency of equipment is set in either of two modes.

- Center – Span Mode.
- Start – Stop Mode.

The lower and upper span limits are 1 kHz to 3GHz (ISA-30) / 8.0GHz (ISA-80) / 13.2GHz (ISA-132) / 26.5GHz (ISA-265), respectively.

Frequency span limits if you typed is the minimum spanning escape (10 Hz) changes.

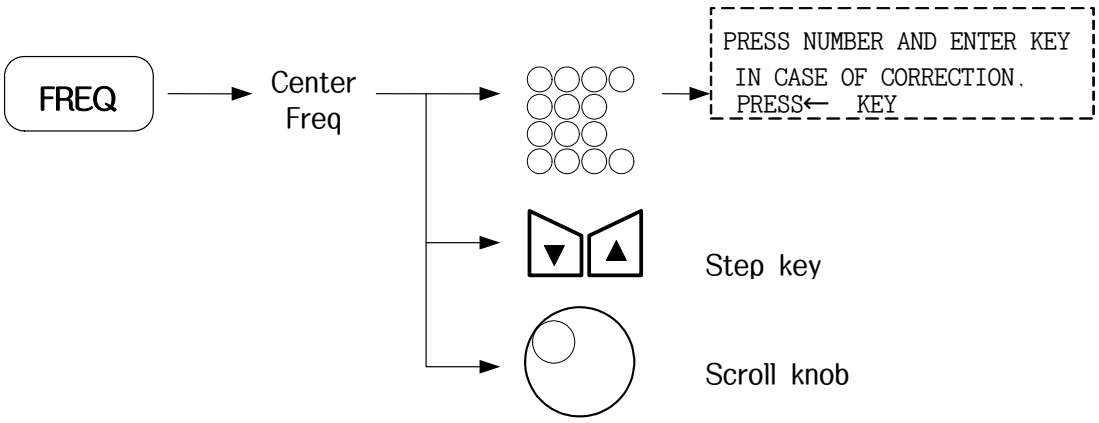
The [FREQ] key is used as the header key for setting the frequency.
The [SPAN] key is used as the header key for setting the frequency span.

Center – Span Mode Frequency Data Entry

1) Setting the center frequency

To set the center frequency, perform the following key operations. :

(Numeric key, step key, and scroll knob are said DATA ENTRAY SECTION)



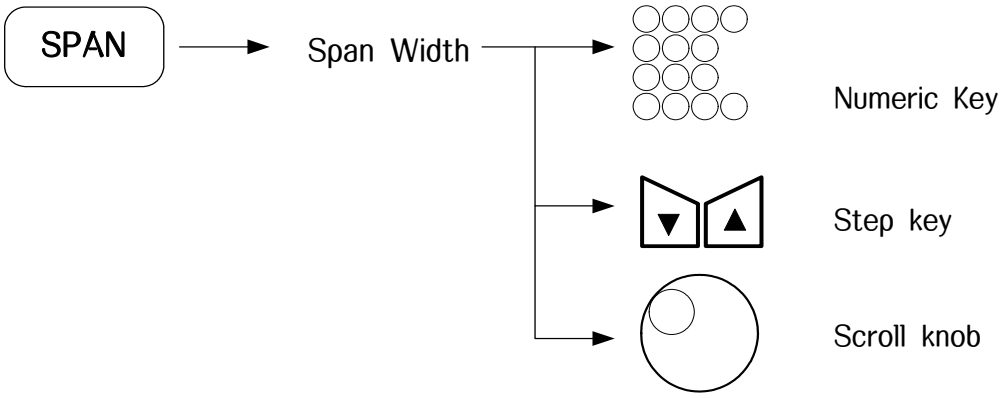
The step size of step up-down key is 1/10 of current frequency span. (CF Step was set in MNL)

The step size of scroll knob is 1/500 of the current frequency span.

Span can be changed if center move to near the boundary.

2) Setting the frequency span

To set the frequency span, perform the following key operations. :



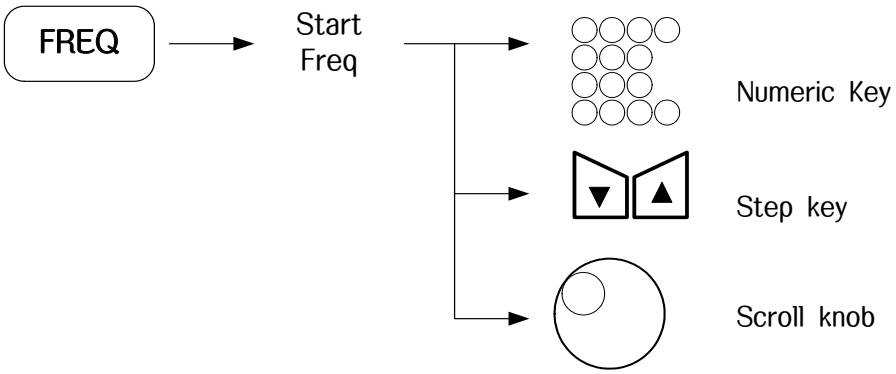
Span range is 10 Hz ~ 3 GHz/8 GHz/13.2 GHz/26.5 GHz.

Changes in a 1, 2, 5 step sequence ; 1k, 2k, 5k, ……, 100k, 200k, 500k, …
The step size of scroll knob is 1/100 of the current frequency span.

Start – Stop Mode Frequency Data Entry

1) Setting the start frequency

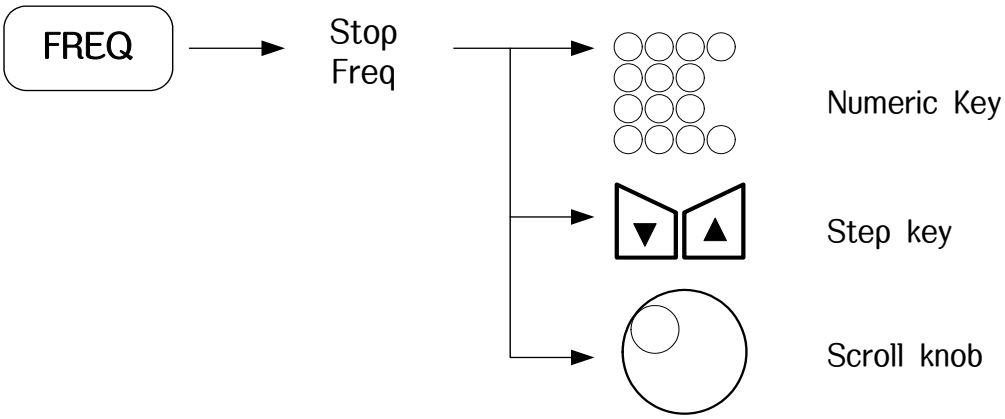
To set the start frequency, perform the following key operations. :



The step size of step up-down key is 1/10 of current frequency span.
The step size of scroll knob is 1/500 of the current frequency span.

2) Setting the stop frequency

To set the stop frequency, perform the following key operations. :

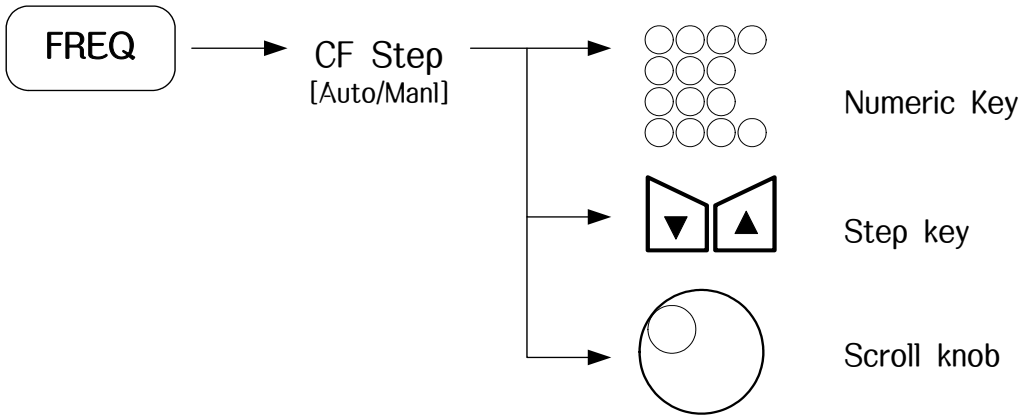


The step size of step up-down key size is 1/10 of the current frequency span.
The step size of scroll knob is 1/500 of the current frequency span.

NOTE : The start and the stop frequency are also determined by setting the center and the span frequency. For example, if the center frequency is 40 ㎒ and the span frequency is 20 ㎒, the start and the stop frequency are determined as 30 ㎒ and 50 ㎒ respectively.

Setting Center Frequency Step

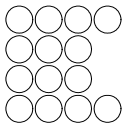
To set the start frequency, perform the following key operations. :



The CF Step mode is changed from AUTO to MNL mode by pressing *CF Step* soft key.
In CF Step MNL(Manual) mode, the step size can be set by the DATA ENTRY SECTION.
If CF Step [AUTO/MNL] "AUTO" is selected, the CF Step size will be 1/10 of the current span.

Setting Frequency Offset

To set frequency offset, perform the following key operations. :

FREQ → Freq. Offset →  Numeric Key

The Freq. Offset mode is changed from OFF to ON mode by pressing *Freq. Offset* soft key. In Freq. Offset [ON] mode, the frequency-offset size can be set by the numeric key. The settable frequency offset is up to ±1 THz.

Setting 10MHz Reference Frequency

Uses for external device to synchronize with the kind you can choose a 10MHz reference frequency.

FREQ → 10MHz Ref. [Internal/External]

If you use external device based reference frequency, signals to find correct suit should be set to External.

Setting Signal Tracing

The maximum level point always moves to the center position of horizontal axis when signal tracing is on.

FREQ → Signal Track [OFF / ON]

The signal tracing is ON or OFF.

Note : Span is changed to minimum span in case of following.

1) Center frequency is smaller than minimum frequency(0Hz) or greater than maximum frequency (3/ 8/ 13/ 26.5 GHz)
2) Start frequency is greater than stop frequency.
3) Stop frequency is smaller than start frequency.

Setting Full Span

To set full span and leave the other parameters, perform the following key operations. : Set to start frequency is 0 ㎐ and stop frequency is 3 ㎓/8 ㎓/13.2 ㎓/26.5 ㎓.

SPAN ⟶ FULL Span

Setting Zero Span

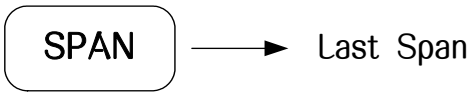
This equipment can operate as a selective level meter in which the horizontal axis is changed as a time axis by setting the frequency span to 0 ㎐.
The rising and falling edges of the signal burst wave can also be observed and measured. Performing any of the following key operations allows the equipment to operate in the zero span(span=0 ㎐) mode.

SPAN ⟶ Zero Span

SPAN ⟶ Span Width ⟶ 0 ⟶ Hz

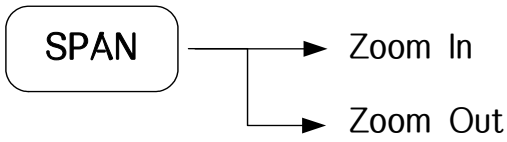
Return to the Previous Span

The previous span is returned by the following key operation. :



Zoom In / Zoom Out

The Zoom In function changes the span from the current span to 1/2 of the current span. The Zoom Out function changes the span form the current span to 2 times the current span.
At this time, The center frequency is not changed.

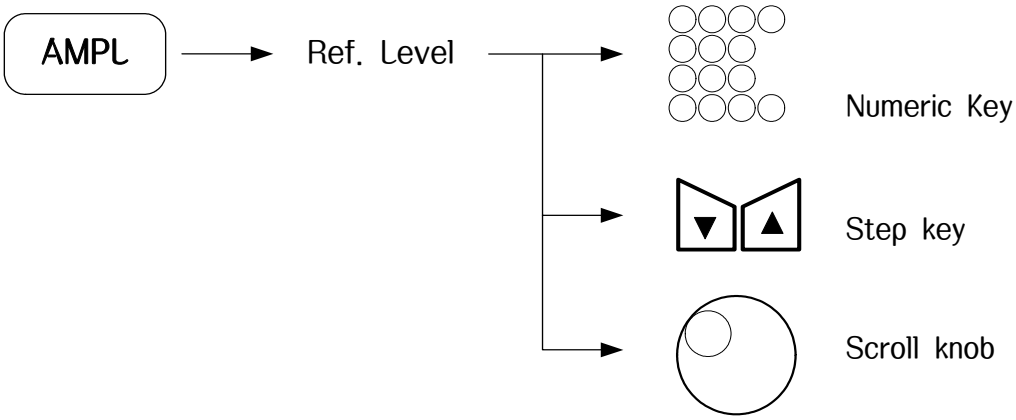


AMPLITUDE FUNCTIONS

The AMPL key displays the header key for setting the amplitude.

Setting Reference Level

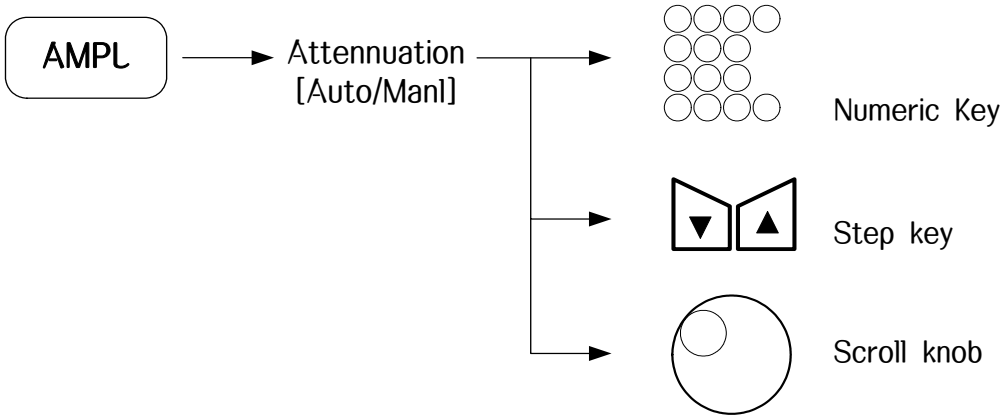
Set the reference level (top graticule) by performing the following key operations. :



The step size is the 1 division of current scale. (ref : Setting Amplitude Scale 5-14)
The step size of scroll knob is 1 dB.

Setting Input Attenuation

Perform the following key operation to set the input attenuator level.



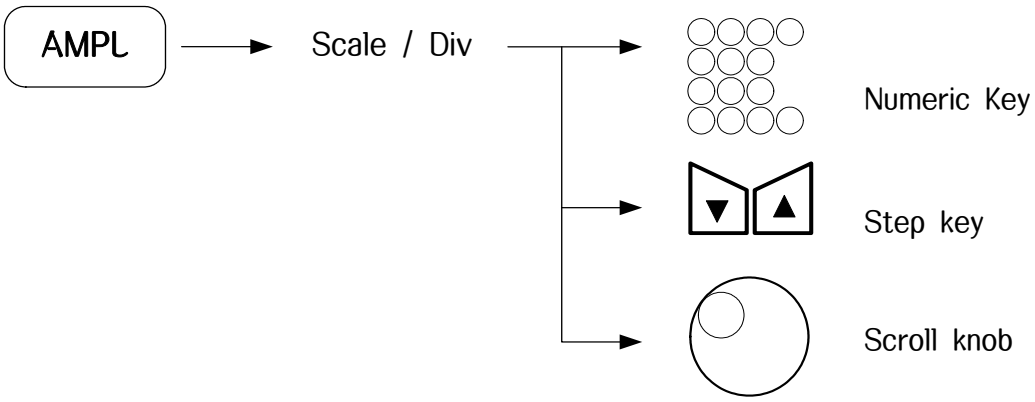
The Atten. mode [AUTO or MNL] is changed by pressing the *Attenuation [Auto/Manl]* soft key. In Atten MNL (manual) mode, the step size of the input attenuator can set by the numeric keys, step keys, and scroll knob. (Range 0 to 55 dB) (ref : Input Attenuator at 5-19)

If Atten "AUTO" is selected, the input attenuator will be coupled by the current reference level automatically.

Setting Amplitude Scale

In log scale, this equipment provides the 0.1 to 20 dB/DIV scales.
In linear scale, the equipment uses the Full Scale.
To set the amplitude scale, perform the following key operations. :

- Log Detector Mode



The amplitude scale is changed into a 1, 2, 5 step sequence by pressing the step key.
The step size of scroll knob is 0.1(@ 0.1 ~ 1.0 dB/Div) and 1 (@ 1.0 ~ 20.0 dB/Div).

Selecting Log / Linear Detector Mode

To set the amplitude scale to log scale or linear scale, perform the following key operations. :

(1) Setting log detector

AMPL ⟶ Log

(2) Setting linear detector

AMPL ⟶ Lin

Even if mode is changed between log and linear detector modes, the reference level is constant.

Log detector mode use dBm reference unit and Linear detector mode use Volt reference unit.

Setting Internal Amp

Set the internal amp to operate by performing the following key operations. :

AMPL ⟶ Int Amp [OFF / ON]

This function can use from 1MHz to 3GHz.

CAUTION 

Operate only in lower than –20 dBm input signal level. Otherwise this equipment will damage.

Setting MW Amp

Set the MW amp to operate by performing the following key operations. :

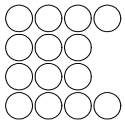
AMPL → MW Int. Amp [OFF / ON]

This function can use from 1GHz to 26.5GHz.

CAUTION **Operate only in lower than –20 dBm input signal level. Otherwise this equipment will damage.**

Setting the Reference Level Offset

Set the reference level offset by performing the following key operations. :

AMPL → Ref. Offset →  Numeric Key

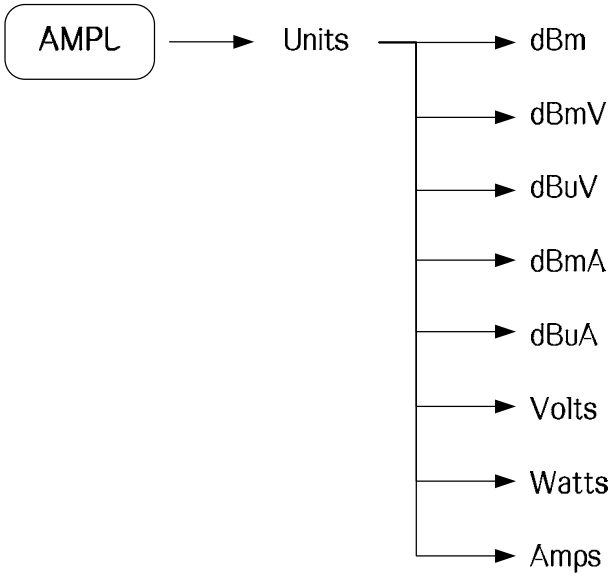
The reference level offset size is from -300 dB to 300 dB.

Setting Amplitude Units

In log scale, this equipment provides the eight types of reference level units : dBm(dBmW), dBmV, dBuV, dBmA, dBuA, Volts, Watts, Amps.

To select one of the reference level units, perform the following key operations. :

The reference level unit of the linear scale is only VOLTS.



Setting Amplitude Correction

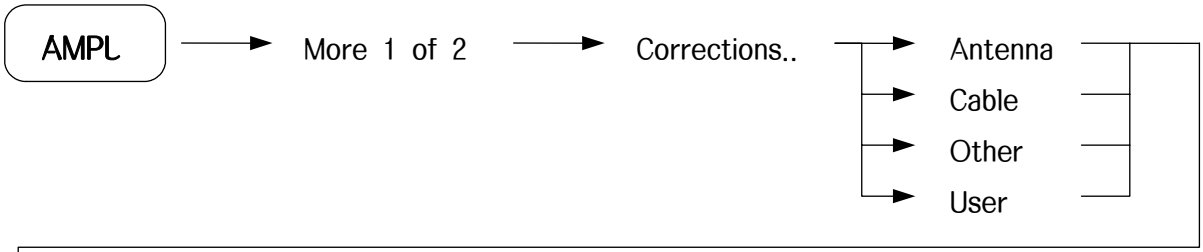
Setting amplitude correction allows a user to specify the correction of measurement environment.

The equipment provides the four types of the amplitude correction.

- Antenna Correction
- Cable Correction
- Etc Correction
- User Correction

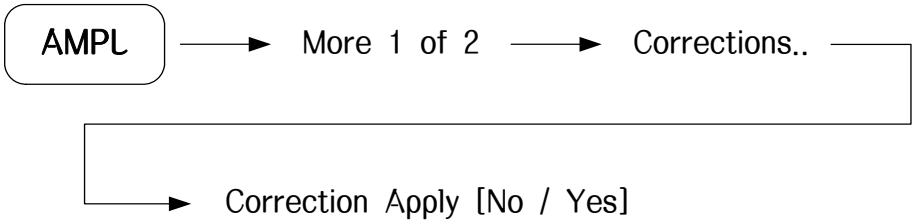
The amplitude correction performs the four types of correction at the same time or only executes the singular correction.

To set the amplitude correction, perform the following key operations. :



Correction [OFF/ON]	: Select using of calibrations OFF/ ON
Point	: Select index of calibration data Range : 1 ~ (present data number +1).
Frequency	: Set frequency of calibration.
Amplitude	: Set amplitude calibration value.
Delete Point	: Delete of selected calibration data
Find Freq.	: Move to data of frequency calibrated data.
Save	: Save calibrated data into file.
Delete Correction	: Delete entirely calibrated data.

Not to use the total correction, perform the following key operation. :



Setting Input Impedance

To select on of the input impedance, perform the following key operations. :

A use of the *Input Z [50 / 75]* soft key sets input impedance of the 50 ohm or 75 ohm. When Input *Z [75]* is selected, this gives the method that user can use this equipment in such environment as ignore reflection and calculate considering purely impedance matching.

Input Attenuator

To set the input attenuator, perform the following key operations. :

AMPL ⟶ Attenuation [AUTO / MNL]

1) Auto Mode

When a signal is input with the same level as the reference level, the input attenuator value in the AUTO mode is controlled so that high accuracy measurements can be made without being influenced by gain compression and the noise level can be reduced. While Auto is selected, the input attenuator is automatically set to optimum value according to the reference level.

Reference Level Range	Attenuation Auto
25.1 dBm to 30.0 dBm	40
20.1 dBm to 25.0 dBm	35
15.1 dBm to 20.0 dBm	30
10.1 dBm to 15.0 dBm	25
5.1 dBm to 10.0 dBm	20
0.1 dBm to 5.0 dBm	15
Less than 0 dBm	10

2) Manual Setting

However, when you want to measure a low level signal by raising the sensitivity, set the input attenuator manually as shown in the table below :

Reference Level Range	Attenuation Manual
+30 dBm to –170 dBm	55
+30 dBm to –170 dBm	50
+30 dBm to –170 dBm	45

+30 dBm to –170 dBm	40
+25 dBm to –170 dBm	35
+20 dBm to –170 dBm	30
+15 dBm to –170 dBm	25
+10 dBm to –170 dBm	20
+5 dBm to –170 dBm	15
0 dBm to –170 dBm	10
-5 dBm to –170 dBm	5
-10 dBm to –170 dBm	0

Note) You can change to set only using Number-Key in 5dB and 0dB.

MEASURMENT FUNCTIONS

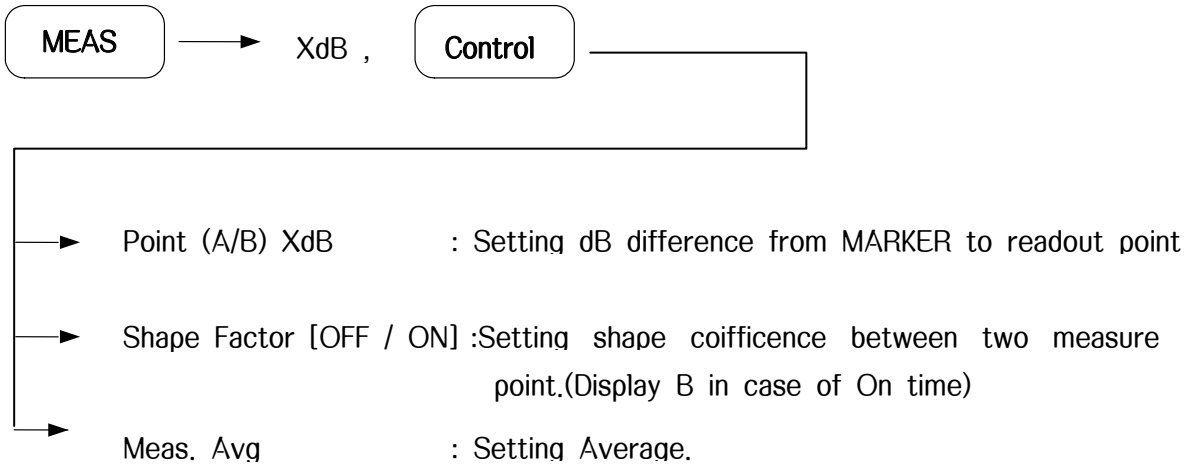
The equipment provides the following measurement functions. :

- X dB Down Measurement
- Adjacent Channel Power Measurement
- Channel Power Measurement
- Occupied Bandwidth Measurement
- Harmonic Distortion Measurement
- CCDF Measurement
- Intermodulation (TOI) Measurement
- Total Power Measurement
- Spectrum Emission Mask Measurement
- Spurious Emissions Measurement
- Average Power (Burst Power) Measurement
- Multi Channel Power Measurement

The measurement can be made in singular or continuous sweep mode by using the *Continuous [OFF/ON]* soft key. Each measurement should close by pressing the MEAS of *Meas. Off.*

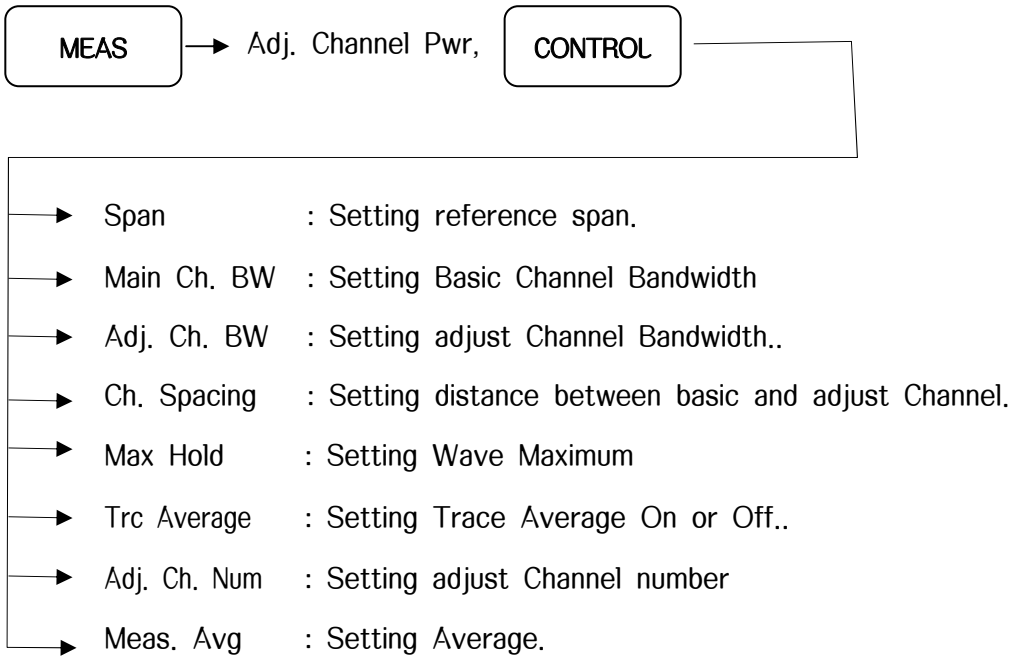
X dB Down Measurement

The X dB Down function displays the frequency difference between a reference marker (◇) and another marker (→ ←) that is X dB down from the reference marker.
The relative dB range that can be specified for X from the screen dynamic range is selected by using the step key or scroll knob. The default value is 3 dB and 60dB. If the measurement of A point and B point is performed at the same time, the shape factor of signal can be measured.
To use the X dB Down measurement function, perform the following key operations. :



Adjacent Channel Power Measurement

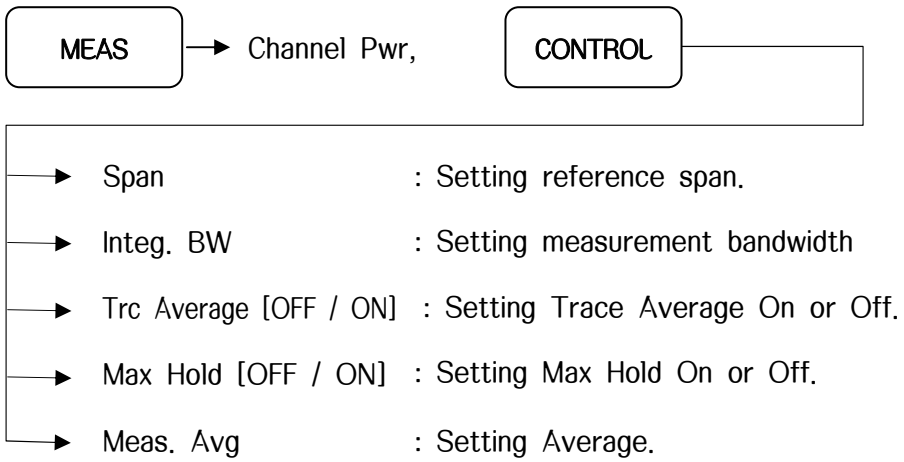
The ACP measurement function measures the center of signal (designated by three marker lines) and the power of adjacent channels.



The measurement configuration is done by using the data entry section (numeric keys, step keys or scroll knob) after each soft key [*Main Ch. BW, Adj. Ch. BW, Ch. Spacing*] is pressed.
To get more stable measurement value, the average measurement value can be got by performing (Key-ON) the *Meas Avg* key. (ref : Averaging measurement at 5- 25)

Channel Power Measurement

Measuring the power and power spectral density in the channel bandwidth specified by user.



The measurement configuration is done by using the data entry section (numeric keys, step keys or scroll knob) after each soft key [*Integ. BW, Span*] is pressed. These BW and spacing can be adjusted by regarding the warning or error message on the bottom of the result window.

To get more stable measurement value, the average measurement value can be got by performing(Key-ON) the *Average* soft key of CONTROL. (ref : Averaging measurement at 5- 26)

The center frequency, reference level, and channel bandwidth must be set by user.

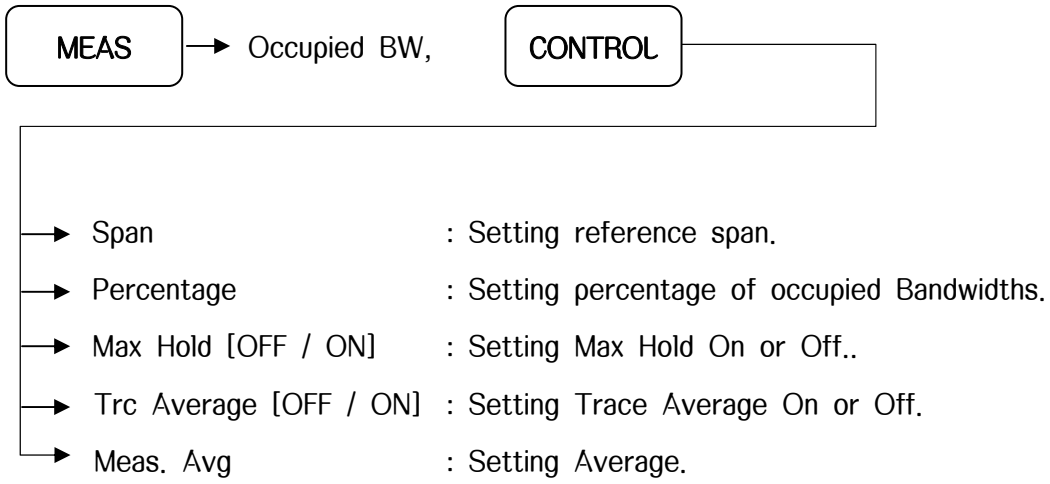
Occupied Bandwidth Measurement

Measurement the occupied bandwidth of the signal measured by user on the screen.
The equipment has an OBW measurement function that can be calculated from the measurement data displayed on the screen. It is function for calculating the frequency band that contains a specified percentage of the total power. The default value is 98%, and measurement range between 0.01% and 100% can be specified.
The results of the occupied bandwidth (OBW) and the occupied bandwidth channel power (OBW CHP) are shown in the result display area.

OBW Measurement Procedure

(1) Set the center frequency & normal marker to the known carrier frequency and set the frequency, span, resolution bandwidth (RBW), and sweep time to AUTO mode.

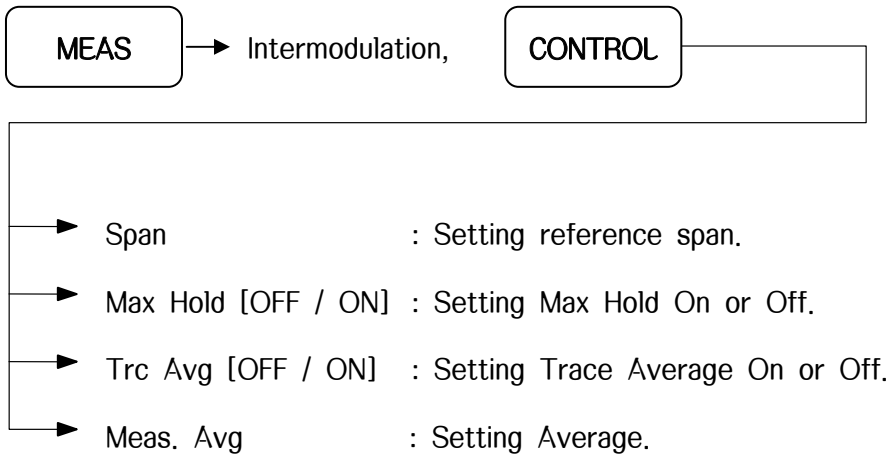
(2) Calculate the Occupied Bandwidth by performing the following key operations :



(3) To change percentage of the occupied bandwidth, then use the numeric keys to set a new percentage. At this time, the measurement lines will be adjusted automatically.
OBW Span value is equally changed with Span value.

Intermodulation (TOI) Measurement

Measurement the IP3 in the Span specified by user.

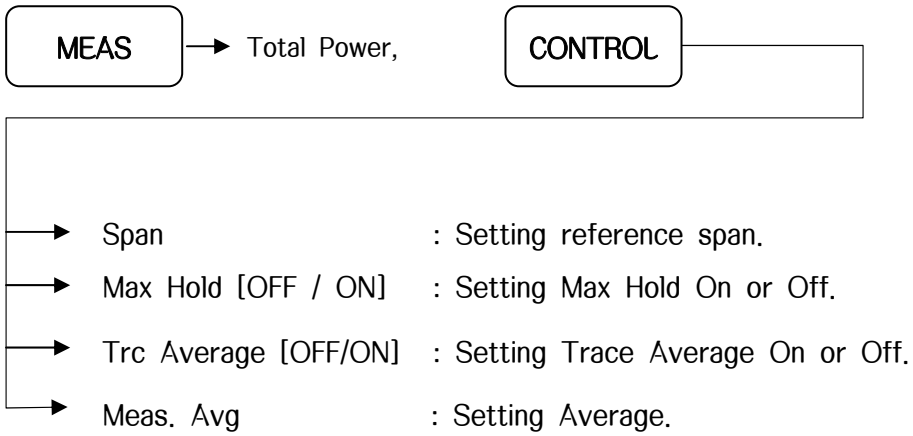


The measurement configuration is done by using the data entry section, after each soft key [*Span*] is pressed.

To get more stable measurement value, the average measurement value can be got by performing (Key-ON) the *Meas. Avg* soft key. (ref : Averaging measurement at 5- 25)

Total Power Measurement

Measuring the power and power spectral density in the Span specified by user.
Difference between total power measurement and channel power measurement is that channel in the channel power is the span in the total power measurement.



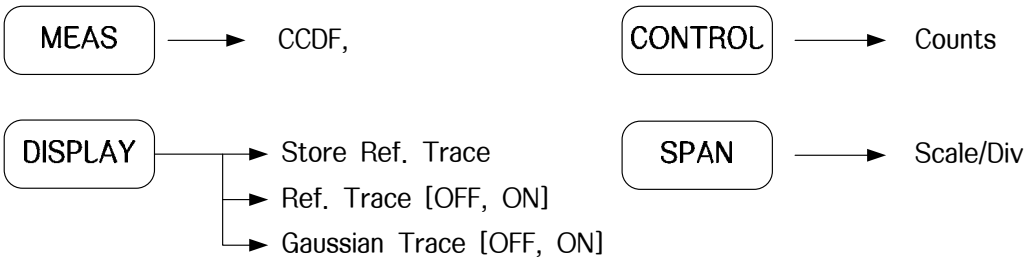
The measurement configuration is done by using the data entry section, after each soft key [*Span*] is pressed.
To get more stable measurement value, the average measurement value can be got by performing (Key-ON) the *Meas. Avg* soft key. (ref : Averaging measurement at 5- 25)
.

CCDF Measurement

This function is measuring CCDF of present center frequency at span is 5MHz.
The Horizontal axis shows dB value above average power and the vertical axis shows time percentage value above assigned value.

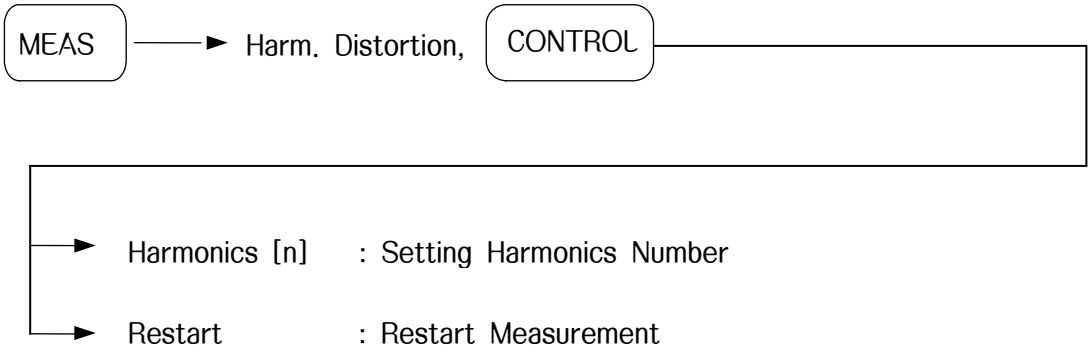
- The Green line shows Gaussian wave in the CCDF measurement display.
- The yellow line shows present measured wave.
- The purplr line shows reference wave. .Press [DISPLAY], *Store Ref. State* soft-key, then save the present wave to reference wave.
- Press [CONTROL], *Counts* soft-key, then set the point number of accumulated data. (Input range of the point is from 1 kpts to 4000 kpts .)
- Using [BW] *RBW* soft-key in CCDF measurement, you can set 3dB bandwidth between 10kHz and 5MHz.
- Using [SPAN], *Scale/Div* soft-key, you can change the measured bandwidth.

At CCDF measurement and setting display, use the following key.



Harmonic Distortion Measurement

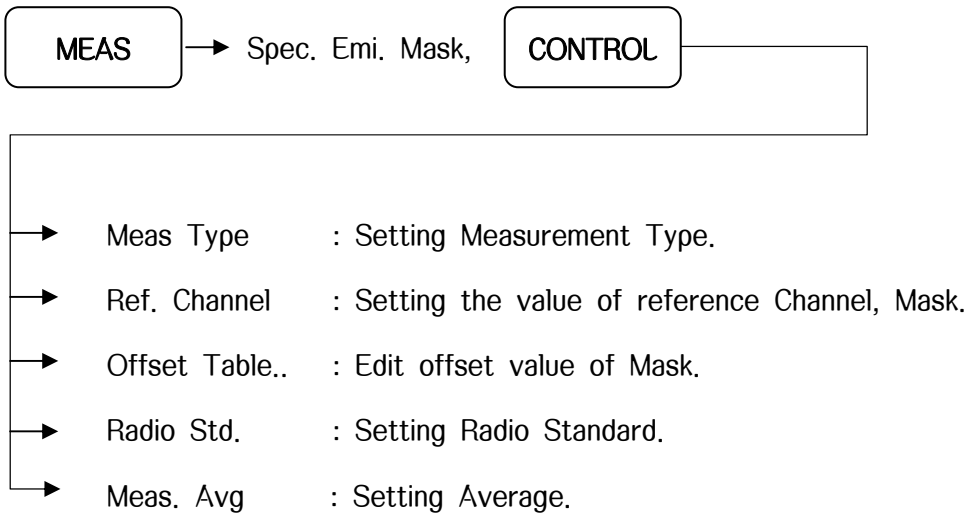
This function is measuring the harmonics of a single carrier signal and computing the total harmonic distortion. The carrier signal becomes the maximum peak on the display and the total harmonic distortion is calculated from the measured harmonics.
When measuring the Nth Harmonic, the analyzer will choose the optimum resolution bandwidth (RBW) to capture the best harmonic signal.



Harmonics value means the number of Nth harmonic. Harmonics value can set 2 to 5 and default is 2. Recommend SPAN value is less than 4 ㎒ for accuracy measurement.

Spectrum Emission Mask Measurement

Measuring the Pass/Fail State according to the reference channel mask.



The measurement type is either Total Pwr Ref method using Total Power or PSD Ref method using Power Spectral Density.

This equipment supports the following four standards for SEM.

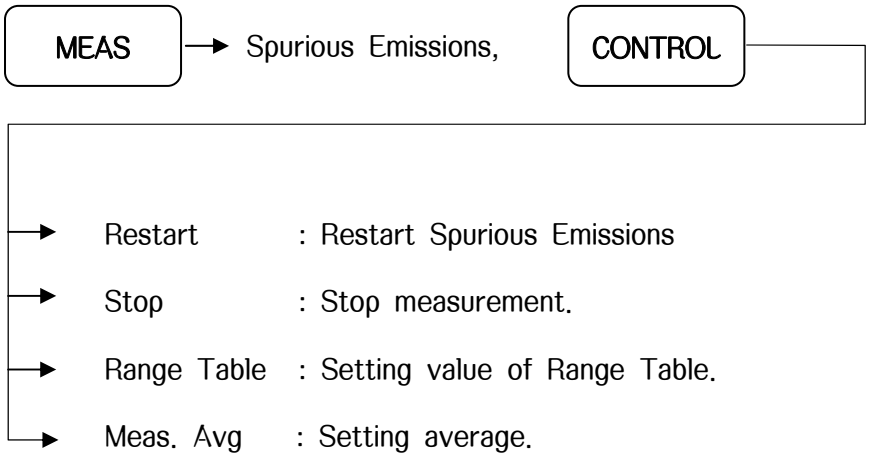
- WLAN 802.11a/g
- WLAN 802.11b/T
- W-CDMA (3GPP) Base
- W-CDMA (3GPP) Mobile

Using offset table, you can set 6 regions (A to F), sweep range, RBW, Absolute / Relative Mask Region, Fail application respectively.

To get more stable measurement value, the average measurement value can be got by performing (Key-ON) the *Meas. Avg* soft key. (ref : Averaging measurement at 5- 25)

Spurious Emissions Measurement

Measurement the Pass/Fail State of Spur according to Range Table.



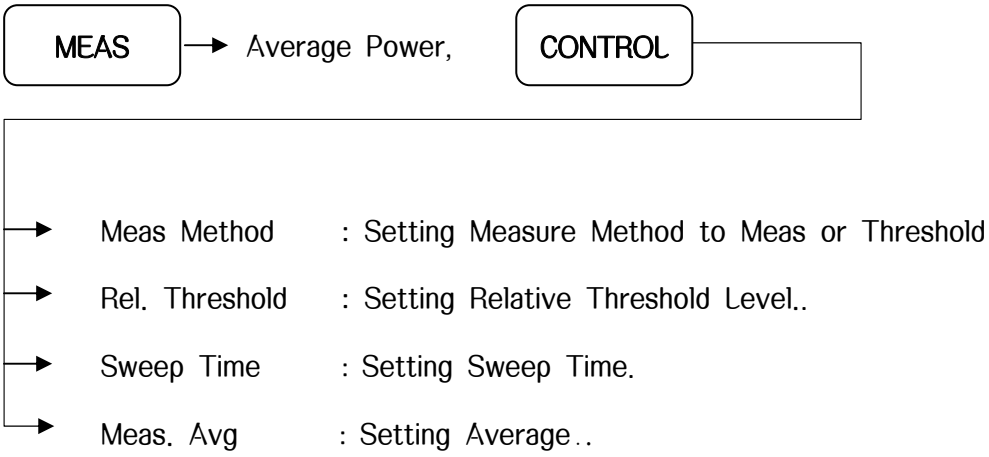
If you use the range table, you can distinguish a total 200 ranges (Range settings duplicate allowed) and set ranges respectively such as RBW, VBW, sweep time, input attenuation and peak parameters.

The measured spurs were displayed 10 numbers each range by amplitude in the bottom table and spurs beyond the limits displayed by red color.

To get more stable measurement value, the average measurement value can be got by performing (Key-ON) the *Meas. Avg* soft key. (ref : Averaging measurement at 5- 25)

Average Power Measurement

Measure the average power of the burst signals in the frequency specified by user.



Measuring Average Power, the span is varied to the zero span at current center frequency. Center frequency and reference must set by user previously.
In case of transforming the measurement mode, a trigger is changed by the Burst trigger.
If the input signal has not burst signals, current mode measurement is not operate.

To get more stable measurement value, the average measurement value can be got by performing (Key-ON) the *Meas. Avg* soft key. (ref : Averaging measurement at 5- 25)

Closing Window

Present measuring window is closed and measurement mode is ending.

MEAS → Meas. Off

Averaging Measurement

Measurement result is averaged as the designated number of times and then the further stable measurement result is displayed. To set the averaging measurement, perform the following key operations. :

CONTROL →
- Meas. Average [OFF / ON] : Setting Average On or Off.
- Meas. Avg. Mode [Exp / Rep] : Setting Average Mode.
- Meas. Avg. Reset : Reset Average Number.
- Meas. Avg. Count : Setting Average Number

- Meas. Avg. Repeat Mode: If the specified averaging number is exceeds, all existing data set initially and then restart averaging.
- Meas. Avg. Expornential Mode: If the specified averaging number is exceeds, remove only first data obtained and then restart averaging including the newly entered data.

DISPLAY FUNCTIONS

The equipment provides functions related to the screen display, such as Display line, Threshold line, Graticule, Annotation, Screen Title, and Partition window.

- Full Screen : Displays the maximum enlarged graticule.
- Display Line : Displays the horizontal line top of the graticule.
- Threshold Line : Displays the horizontal line bottom of the graticule.
- Zoom Display : Displays the enlarged part of signal waveform under screen.
- Screen Title : Edit the title of screen on the top of the screen.
- White Mode : Economy mode for screen save and printing.
- Graticule : The displayed coordinate at the background of signal waveform screen
- Annotation : Displays the information of waveform in the annotation window(=left and bottom)
- Dual Window : Fix the signal waveform at one screen as a status of the View and displays the progress of the signal waveform at another screen
- Setting Text Position : Setting the position of parameter window on the [Top/Center/Bottom]
- Level Display : Displays the value of level corresponding to the graticule in the left of signal displays.

Full Screen

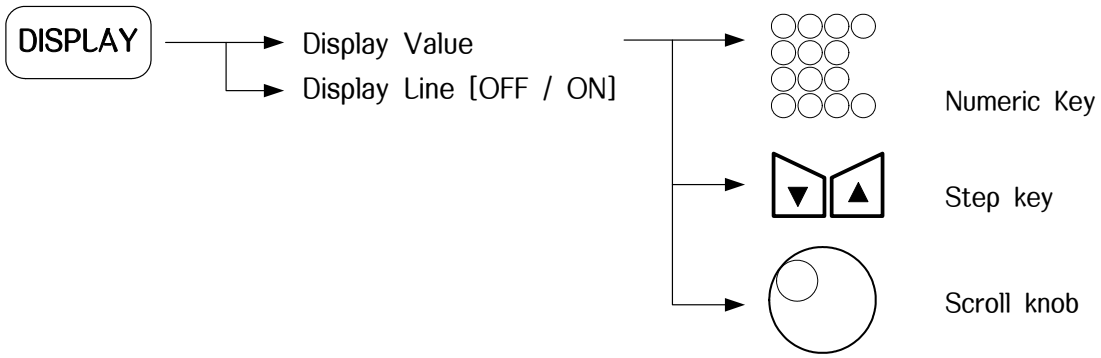
The Full Screen is function to watch only the maximum enlarged graticule. The Left and bottom display window, the soft key are not displayed at the Full Screen status.
To use the Full Screen status, perform the following key operations. :

DISPLAY → Full Screen

If you want to the general status, press the any keys

Display Line

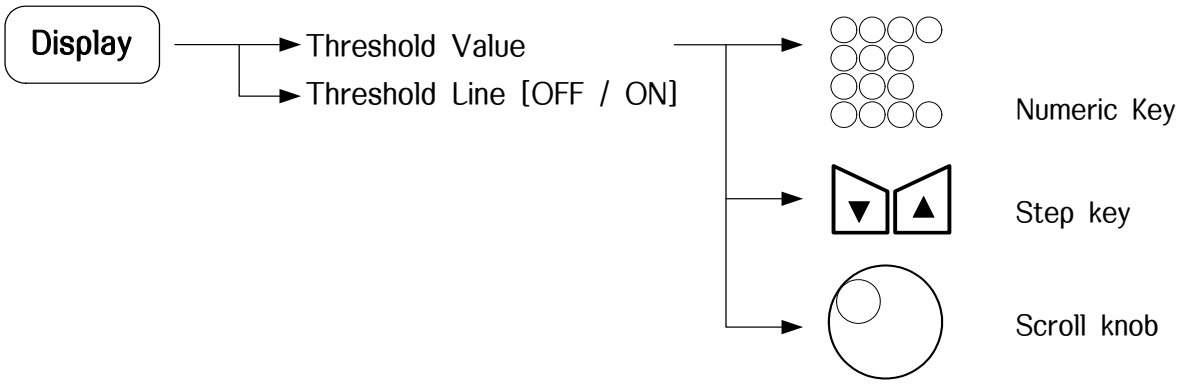
The Display Line is a horizontal cursor line that runs across the screen for making level comparisons. It can be set between the reference level and the lowest level with the numeric key or step key or scroll knob.
In the OFF setting, the display line disappears from the screen.



The step size of the step up down key is 1 division of the vertical range.
The step size of the scroll knob is 0.1 dB.

Threshold Line

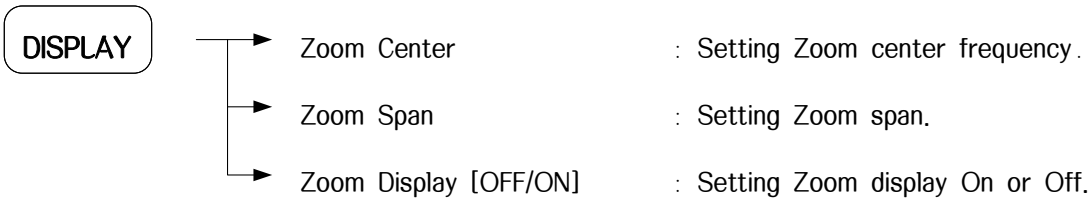
The Threshold Line is a horizontal line such that the waveform is displayed above the threshold line. It can be set between the reference level and the lowest level with the numeric keys or step keys or scroll knob. In the OFF setting, the threshold line disappears from the screen.



The step size of the step up down keys is 1 division of the vertical range.
The step size of the scroll knob is 0.1 dB.

ZOOM Screen

Zoom selected portion of signal is shown to the bottom display.



Zoom center and Zoom span can be changed by entering data input.

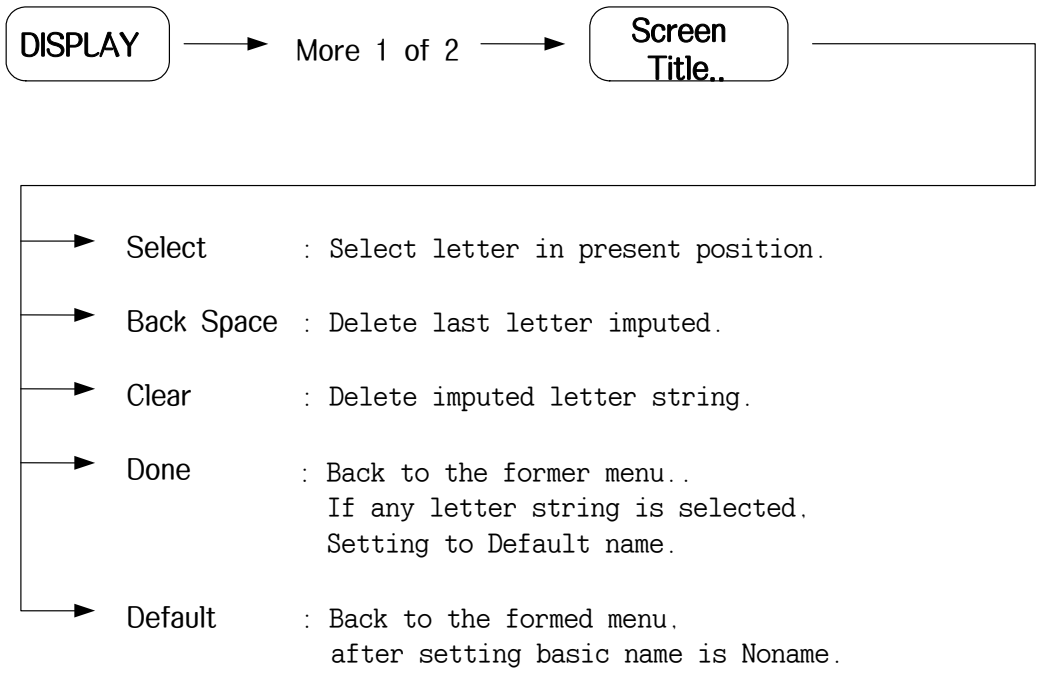
Screen Title

A title of current screen displaying the spectrum or the waveform can be labeled with this function. User can use the screen title as filename for a printer and file function. (ref : Filename 5-78)

To make or edit the screen title, perform the following key operations.

When *Screen Title..* soft key is pressed, the screen title part changes to the edit window, also edit menu appeared in soft menu area. In Edit mode all hard key will suspended. Edit menu helps to edit the screen title.

Scroll knob is used for selecting the character for input. The character bar appears in Status Window in a bottom of the graticule and character can be selected by scroll knob.



White Mode

In this mode, screen background color is changed into the white color for saving the ink or toner.

DISPLAY → More 1 of 2 → White Mode [OFF / ON]

Graticule

This menu selects the graticule ON or OFF.
To delete the graticule on the screen, perform the following key operations. :

DISPLY → More 1 of 2 → Graticule [OFF/Full/Center]

Press OFF, hide grid line.
Press Full, show grid line typed of grid.
Press Center, show the display only at the center line.

Annotation

This key selects the annotation ON or OFF.
To delete the annotations on the screen, perform the following key operations.

DISPLAY → More 1 of 2 → Annotation [OFF / ON]

Dual Window

This key divides the graticule in two. Fix the signal waveform at one screen as a status of the View and displays the progress of the signal waveform at another screen.
To use the Dual Window, perform the following key operations. :

DISPLAY → More 1 of 2 → Dual Window [OFF / ON]

To select the window for change, perform the following key operations. :

DISPLAY → More 1 of 2 → Select Window [Top / Bottom]

Setting Text Position

This changes the parameter window appearing at the graticule,
To set position of the parameter window, perform the following key operations. :

DISPLAY → More 1 of 2 → Text Position [Top/Center/Bottom]

Auxiliary Level Display

This key displays the auxiliary value of level in the left display.

DISPLAY → More 1 of 2 → Grid Test [ON/OFF]

TRACE FUNCTIONS

The [TRACE] hard key displays menu for the trace function.

Select Trace

The equipment provides three trace memories, A, B and C.
The trace memory is selected by the following key operations. :

TRACE → Select Trace [A / B / C]

Clear & Write

To change waveform into the Clear & Write status in the selected trace memory, select the following menu. :

TRACE → Clear & Write

If *Clear & Write* soft key is pressed, the new data will clear the existing trace memory data and be written at the trace memory.
If trace A and B are the same display method, only finally selected trace is displayed and other trace is disabled. To display the specific trace at the foremost, select desirous trace. Then, *Clr&Wrt* is displayed at the desirous trace of the graticule.

Max Hold

The new data for each trace point is compared with previous data, then stores and displays the level with the large value. Thus signal waveform accumulates the maximum values for each point.

TRACE → Max Hold

The MaxHold is displayed at the active trace of status display window.

Min Hold

The new data for each trace point is compared with previous data, then stores and displays the level with the small value. Thus signal waveform accumulates the minimum values for each point.

TRACE → Min Hold

The MinHold is displayed at the active trace of status display window.

View

When *View* soft key is pressed, saves the current trace signal waveform and displays the stored trace at the screen. Then, signal waveform is fixed
To return to the normal write mode, press the *Clear & Write* soft key again.

TRACE → View

The View is displayed at the active trace of status display window.

Blank

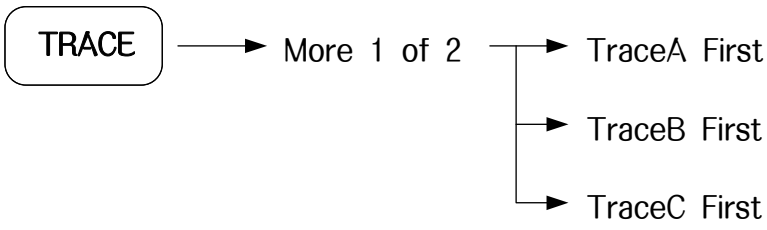
When this key is pressed, trace data is erased from the screen, but the content of the memory still remains.
If you press the *View* soft key, Blank is redisplayed.

TRACE → Blank

The Blank is displayed at the active trace of status display window.

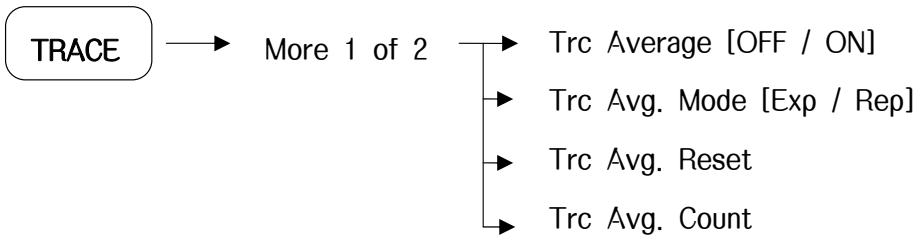
Trace Array

Trace Array is function for selecting the trace displaying at first front, when many traces are overlapped at the graticule.
To select the trace displaying at first front, perform the following key operations. :



Averaging Function

The averaging function calculates the average data at each vertical axis point for each sweep and displays the results.
The averaging function improves the S/N ratio depending on the averaging rate and the number of sweep repetitions.
About the averaging method (ref : Averaging Setting at 5-25.)
To use the averaging function, perform the following key operations. :



Averaging by video filter has the disadvantage that the sweep time becomes longer when the video bandwidth is narrowed to improve the averaging effect.
On the other and, digital video averaging function smoothes the trace display by averaging the digital data after analog to digital conversion at each sweep, without narrowing the video bandwidth (VBW).

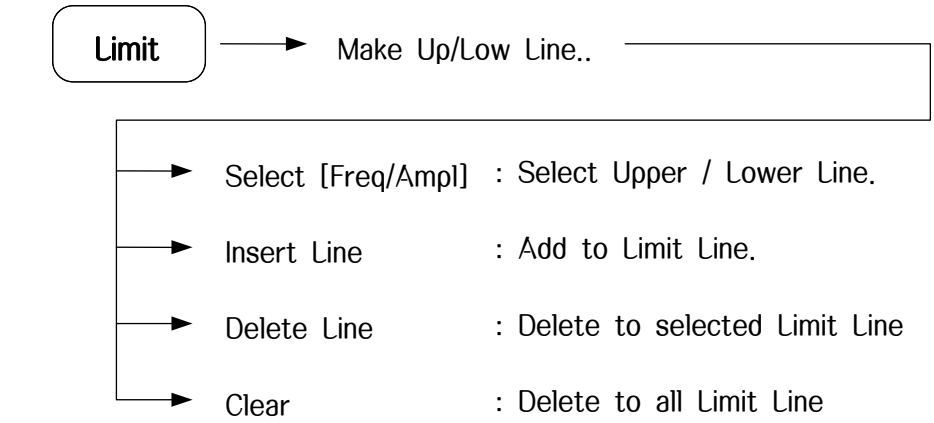
LIMIT LINE FUNCTIONS

The [LIMIT] hard key displays the menu of the limit line function
The LIMIT LINE FUNCTION displays two lines, which can be set to show permissible upper and lower bounds on the spectral waveform. Comparison of measured data with the limit lines is very easy.

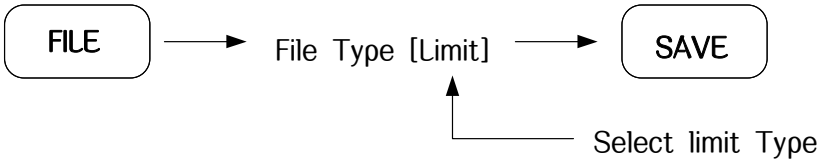
- **Drawing Limit Line**

1) Make Limit Draw.. : Appears the limit line edit menu.
2) Select [Freq/Ampl] : Selects the limit line to edit.
3) Input data using data input part.
4) Insert Line : Add to editing low.
Repeat 2) to 4) for making the limit line.

In editing, it is possible for unessential data to delete using Delete Line Key.
It is possible to delete limit line data using Clear Key.



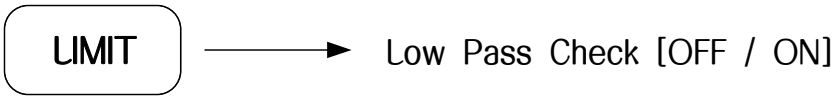
According to necessary, saves data of limit line. Then, the environment setting value is together saved.
To save the limit line, perform the following key operations. :



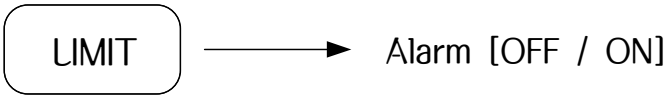
- **Setting the PASS/FAIL mode**

Pass/Fail result window is displayed on the top of right, range is inspected. When the spectral waveform is within the upper limit line and lower limit, PASS is displayed on the screen. If not, FAIL is displayed on the screen. The number of generation is displayed on the right of Fail sign.

When ON is selected, the upper limit line is checked.

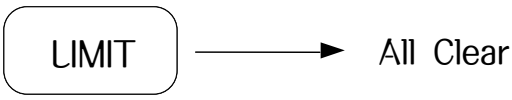


When ON is selected, the lower limit line is checked.



When ON is selected, Alarm is operated if fail.

- **Close the Limit Line Function**



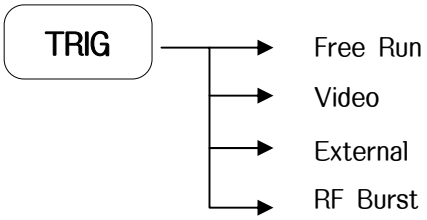
When this key is selected, clear the limit line function.

TRIGGER FUNCTIONS

The TRIG hard key displays the menu for using the trigger function.

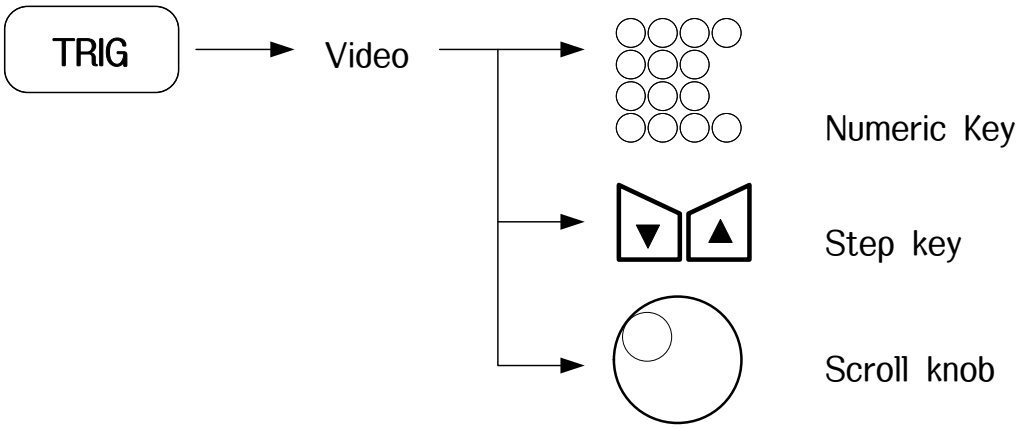
Trigger Source

The trigger mode of equipment is generally set into Free Run.
In the Triggered mode, Video, Line, External or RF Burst can be selected as the trigger source. To select the Trigger Source, perform the following key operations. :



Video Trigger

When the Video Trigger source is selected, the sweep is started in synchronization with the positive leading edge of the detected waveform that is greater than trigger level.
To select trigger level, perform the following key operations. :



The trigger level is controlled by the step up-down keys or the scroll knob.
The trigger level is displayed by line on the screen.

External Trigger

This function starts sweep in synchronization with the external trigger source.
Sweep is started in synchronization with the positive leading edge of the signal waveform input to the EXT TRIG input connector on the rear panel.
Trigger execution requires TTL input signals.

TRIG ⟶ External

Selecting Trigger Edge

Select the type of trigger edge.
Two trigger edge type : Positive, Negative.

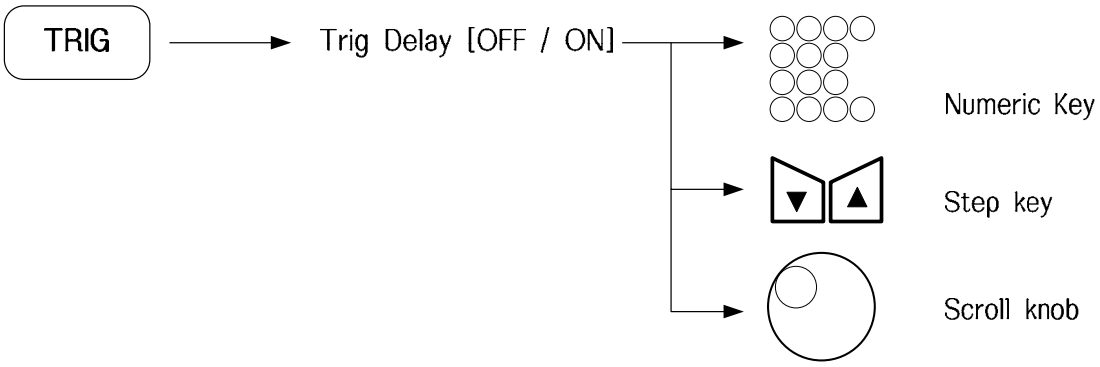
TRIG ⟶ Trig Slop [Pos / Neg]

Trigger Delay

When the trigger mode is set to Triggered mode (Trigger source is selected as Video, External or Line only) the trigger point is usually positioned at the left end of the screen. However, this means that it is not possible to see the waveform before the trigger point and the waveform beyond the right end of the screen.
With the equipment, a waveform before (or after the end of the display) the trigger point can be displayed by changing the delay time.

NOTE : Trigger delay works in Zero Span mode only.

To set the delay time, perform the following key operations. :



The delay time is set numeric keys, the scroll knob and the step up-down keys in zero span mode. Range of delay time is –150ms to +150ms.
A minus value of the delay time means the Pre-Trigger mode is used. It means shows the waveform of before trigger point.
A plus value of the delay time means the Post-Trigger mode is used. It means shows the waveform of after trigger point.

COUPLED FUNCTIONS

This function sets the signal detection mode and the Avg/VBW Type of equipment.
Equipment is well set by using the *All Auto* soft key in compliance with measurement environment.
Couple function related to the All Auto Function, the Detector Mode and the Setting Averaging Method.

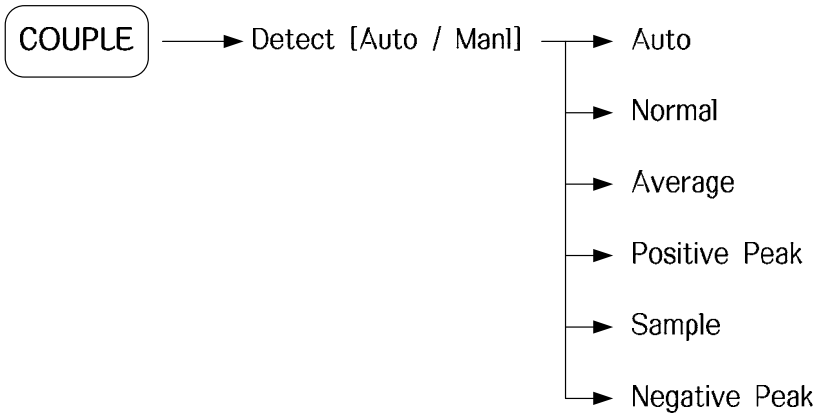
- Detector Mode
- Setting Averaging Method

Detect Mode

Signal Analysis has five signal detect mode.

- Normal
- Average
- Positive Peak
- Sample
- Negative Mode

Select signal detect mode using follow key operation.



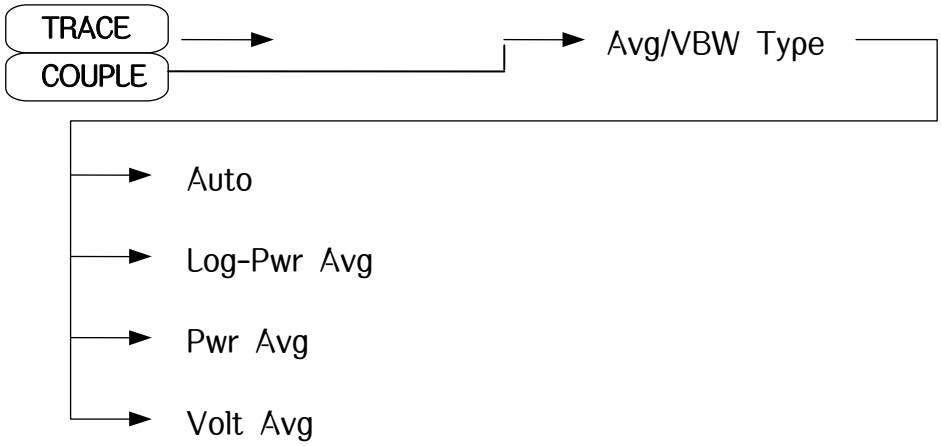
Mode	Contents
Normal	The odd number point of horizontal axis displays the minimum value among oversampling data for 1 display point and even number point of horizontal axis displays the maximum value. The Normal detection mode is used to detect noise type signal and CW type signal.
Sample	Stores the instantaneous signal level at each sample point the trace memory. The Sample detection mode is primarily used for noise level measurement, and time domain measurement.
Pos Peak	Compare the maximum level point present between the current display point and next display point, then stores the maximum value in the trace memory corresponding to the current display point.
Neg Peak	Compares the minimum level point present between the current display point and next display point, then stores the minimum value in the trace memory corresponding to the current display out. The negative Peak detection mode is often used to measure the lower envelope side of a modulated waveform.
Average	The Average detection mode stores the average data between Pos Peak and Neg Peak. Reduce the random noise level without reducing the video filter bandwidth or using the trace averaging function. This allows averaged displays with faster sweep rates. User uses one out of three type(Log-Pwr, Pwr, Voltage) by Avg/VBW setting.

Setting Averaging Method

Equipment support the next three averaging method

- Log-Power Averaging : Averaging the signal waveform to dB-scale.
- Power Averaging : Averaging the signal waveform to Power-scale(RMS).
- Volt Averaging : Averaging the signal waveform to Volt-scale.

Set the Averaging Method by performing the following key operations. :



Setting FFT & Sweep

Equipment use the FFT sweep method below the 30MHz RBW basically.
This key also can using below the 30MHz RBW in the general sweep method.

NOTE : RBW is limited minimum 30MHz in the general sweep method.

BANDWIDTH FUNCTIONS

To be that equipment can automatically select the optimum setting, RBW, VBW, Sweep Time and Input Attenuation are initially set to Auto mode.
Bandwidth function has three hard key.

- [BW] : Bandwidth function
- [AMPL] : Amplitude function
- [SWEEP] : Sweep function

Auto Bandwidth Function

In the Bandwidth Function, there are two modes. One is Auto Mode and the other is Manual Mode.
To set RBW, VBW, Sweep Time, and Input Attenuation to Auto Mode, perform the following key operations. :

BW ⟶ All Auto

1) Auto mode of input attenuator

The Attenuation value of Input attenuator is set in compliance with the amplitude of signal waveform by the set value. (ref : Input Attenuator 5-20)

Reference Level Range	Attenuation Auto
25.1 dBm to 30.0 dBm	40
20.1 dBm to 25.0 dBm	35
15.1 dBm to 20.0 dBm	30
10.1 dBm to 15.0 dBm	25
5.1 dBm to 10.0 dBm	20
0.1 dBm to 5.0 dBm	15
Less equal 0 dBm	10

2) Auto mode of Span and RBW

The ratio of Span/BW is changed to initial value(96).

RBW Bandwidth is approximately equal to Span divided by 96.

3) Auto mode of Video Mode and Resolution Bandwidth

Resolution bandwidth is adjusted to Video bandwidth one to one in Auto Mode.

4) Auto mode of Sweep time

Sweep time is optimally set by span, resolution bandwidth and video bandwidth.

Setting the Resolution Bandwidth(RBW)

(1) Auto Mode

If frequency span is varied, the RBW is automatically set by setting value of the *Span/RBW* soft key. (The standard setting value of *Span/RBW* = 96)

Then, if the VBW, Sweep Time, and Input Attenuator values are automatically set, the respective parameters are set to the optimum values by under function.

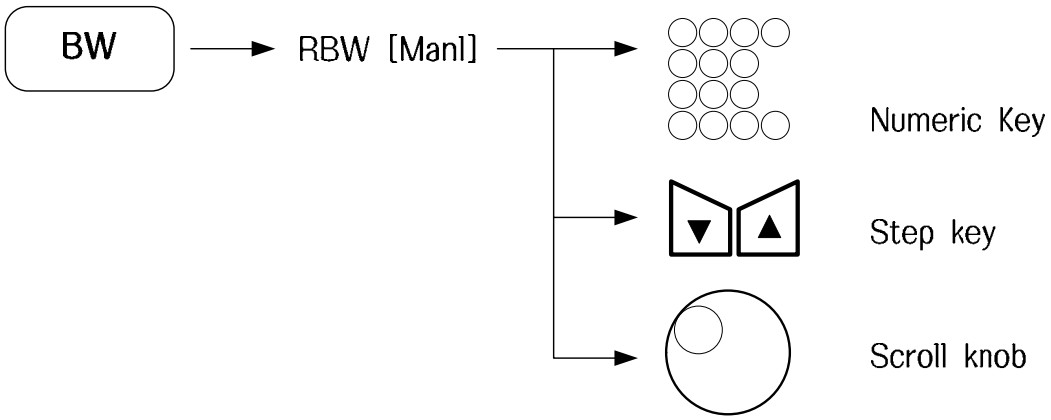
In case of Span/RBW = a, VBW/RBW = b

i) Occasion of Span > 500 MHz, RBW = 5MHz, VBW = 3MHz, Sweep Time = set to the optimum values.

ii) Occasion of Span <= 500 MHz, RBW = Span/a Hz, VBW = RBW * b Hz, Sweep Time = set to the optimum values.

(2) Manual Mode

In order to set RBW in the manual mode, perform the following key operations. :



If VBW is Auto Mode, the VBW value is varied defend on the value of RBW. But the RBW value was not varied even changed the value of VBW.

NOTE : If RBW is below 30MHz and not zero-span mode, equipment is displayed by FFT analysis. In the FFT analysis mode, sweep time cannot changing bu manually.

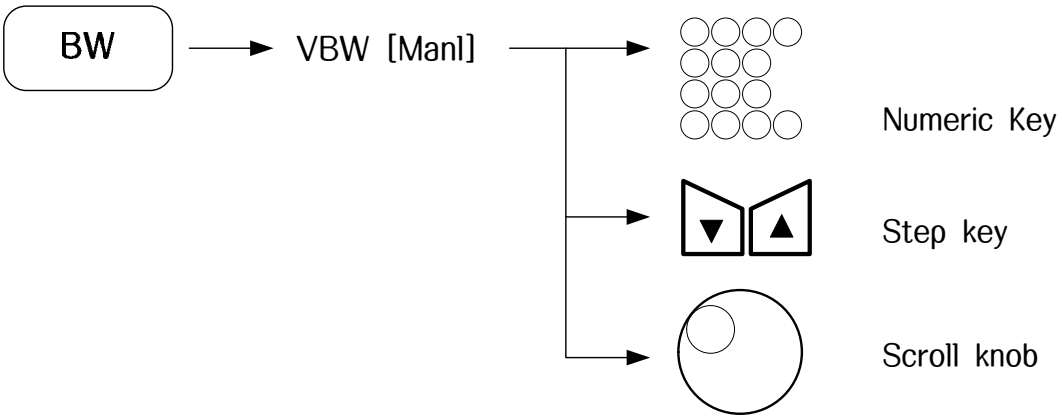
Setting the Video Bandwidth(VBW)

(1) Auto Mode

When VBW is set to Auto Mode, the VBW is set according to the RBW value.

(2) Manual Mode

To set the VBW, perform the following key operations. :

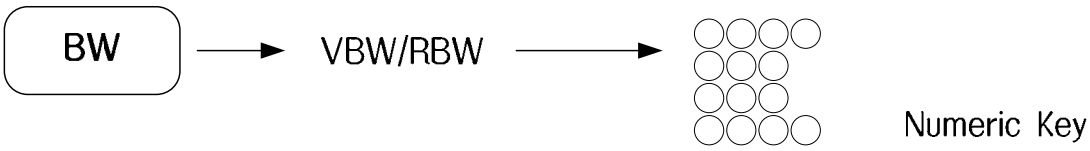


When wanting to average the noise by making the VBW narrow without regard to RBW set value, or when wanting to make the VBW wide to observe the waveform of signals modulated at a high frequency, use MANUAL setting.

The VBW value can be manually set from 1 Hz to 3 MHz by 1, 2, 3, 5 step.

Setting the Ratio of VBW & RBW

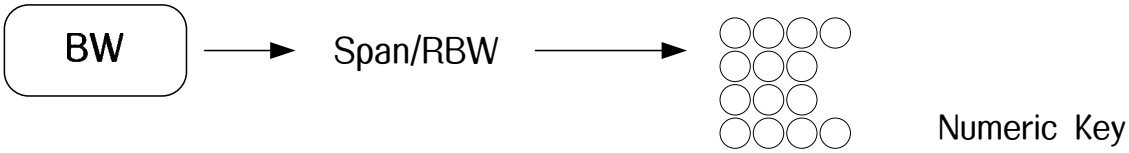
To change the RBW and VBW to regular ratio in the Auto Mode, perform the following key operations. :



The possible input range is from 0.000001 to 3,000,000.

Setting the Ratio of Span & RBW

To change the ratio of RBW changing in compliance with Span in the Auto Mode, perform the following key operations. :



The possible input range is from 2 to 10,000.

AUX FUCNTIONS

The equipment provides analog demodulation and audio monitor functions.

- AM Demodulation
- FM Demodulation
- Audio ON/OFF, Audio level control.
- Frequency Spectrum View

AM Demodulation

The AM demodulation function displays the amplitude demodulated waveform.
By pressing this key, the horizontal axis changes to the time axis. The carrier frequency is the center frequency.
To use AM demodulation function, perform the following key operations. :

AUX ⟶ AM Demod. [OFF / ON]

The *AM Demod.* soft key toggles AM demodulation ON and OFF.

NOTE : If the AM demodulation function is operating, the RBW and VBW are fixed to 100kHz and the bandwidth setting key is not operating.
The marker displays the modulation depth at a current point.

FM Demodulation

The FM demodulation function displays the frequency-demodulated waveform.
By pressing this key, the horizontal axis changes to the time axis. The carrier frequency is the center frequency.
To use FM demodulation function, perform the following key operations. :

AUX → FM Demod. [OFF / ON]

The *FM Demod.* soft key toggles FM demodulation ON and OFF.

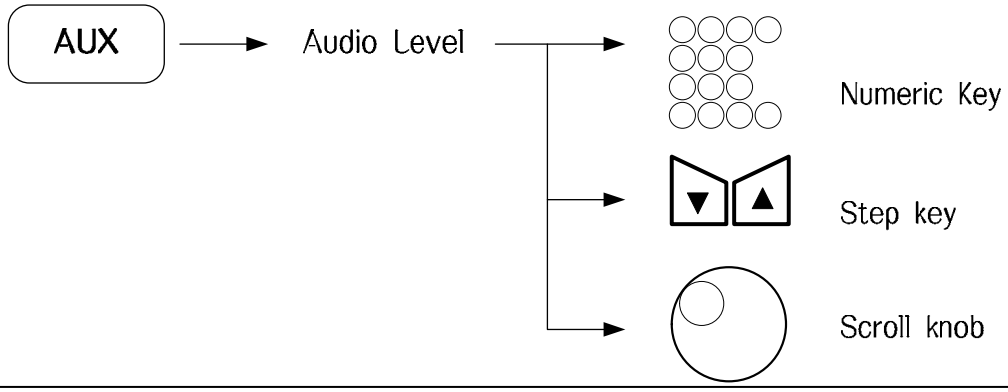
NOTE : If the FM demodulation function is operating, the RBW and VBW are fixed to 100kHz and the bandwidth setting key is not operating.
The marker displays the modulation depth at a current point.

Audio Monitor

The equipment has an internal speaker and Phone Jack at the front panel.
***Audio Sound* soft key :** used to turn ON the internal speaker.

AUX → Audio Sound [ON / OFF]

***Audio Level* soft key :** used to control the audio level, which can be adjusted by DATA ENTRY. The possible audio level is 1-100. The default value is 1.



Spectrum Display

This function displays a spectrum graph each frequency at the bottom of the signal waveform display.
Nine windows can be used for the spectrum display. (Rectangle, Flat_Top, Hanning, Hamming, Black Man, Bartlett, Triangle, Kaiser, Bman_Harris)

Auto Tune

Detects the maximum peak point in full span and displays its spectrum in the center of the screen and then changes to a small span width.

TUNE

Note : At auto Tune operation, input by key pad doesn't permitted.
Signal below -70 dBm may be not search.

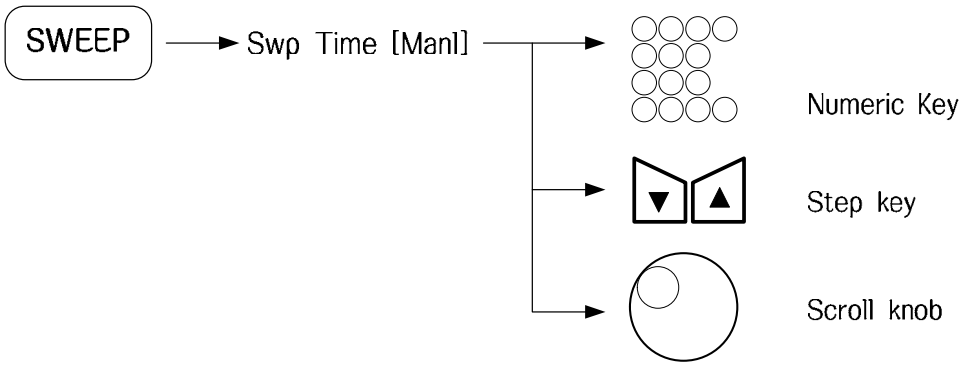
SWEEP FUCNTIONS

The Sweep Function is associated with Sweep Time, Sweep Mode, and the number of display data of equipment.

- Sweep Time
- Continuous Sweep Mode
- Single Sweep Mode
- The number of display data

Setting the Sweep Time

To set the sweep time in the Manual Mode, perform the following key operations. :



The following shows the Auto Sweep Time Range. :

- Not the Zero Span : 20 ms ~ 2000 sec
- Zero Span : 1 us ~ 2000 sec

Continuous Sweep Mode

When the trigger source is not Free Run, the sweep is executed each time trigger conditions are met. When the trigger source is set to Free Run, the sweep is executed continuously.

To set the Continuous Sweep Mode, press the following keys. :

SWEEP → Continuous

Single Sweep Mode

When the trigger source is set to Free Run, the sweep is executed once immediately after the *Single* soft key is pressed. When the trigger source is not Free Run, the sweep is executed only once when the trigger conditions are met.

To set the Single Sweep Mode, press the following keys. :

SWEEP → Continuous

Or

SINGLE

Setting the Sweep Time Accuracy

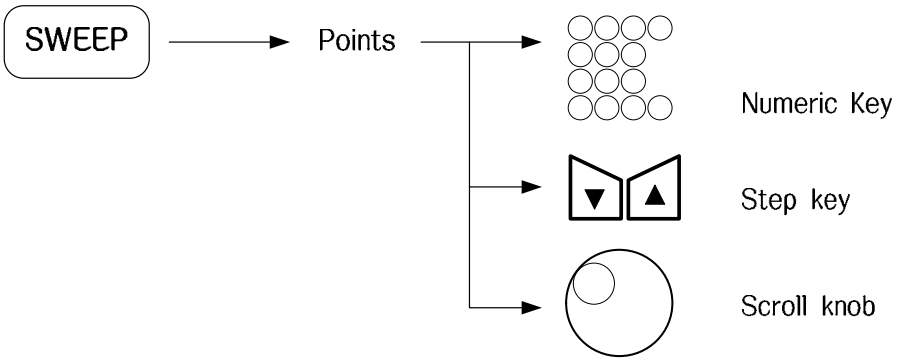
To be the more accurate measurement, properly increasing the sweep time is good.
If Sweep Time Accuracy is set to the *Accy*, the current sweep time of equipment is automatically increased.
To set the Sweep Time Accuracy, press the following keys. :

SWEEP → Swp Time Acc. [Norm/Accy]

Initial value is *Normal*.

Setting the Data Points

To display the more accurate data, the equipment can change the number of data displaying on the screen. If the number of data points is increased, marker movement is more detailed and the more accurate value can be displayed. On the other hand, data processing time is more required.
To set the Data Points, press the following keys. :



The following shows the Data Points Range. :

- Not the Zero Span : 101 ~ 8192 points
- Zero Span : 3 ~ 8192 points

SYSTEM CONFIGURATION

The system parameters of the equipment can be set depending on the used objective. The [SYSTEM] hard key is the header key related to set system configuration.

The equipment supports the spectrum mode, Phase Noise, CDMA, EMI and CATV mode. The spectrum mode is default and other is for optional.

GPIB Address Set

Set the GPIB address by using the step keys and scroll knob by performing the following key operations. :

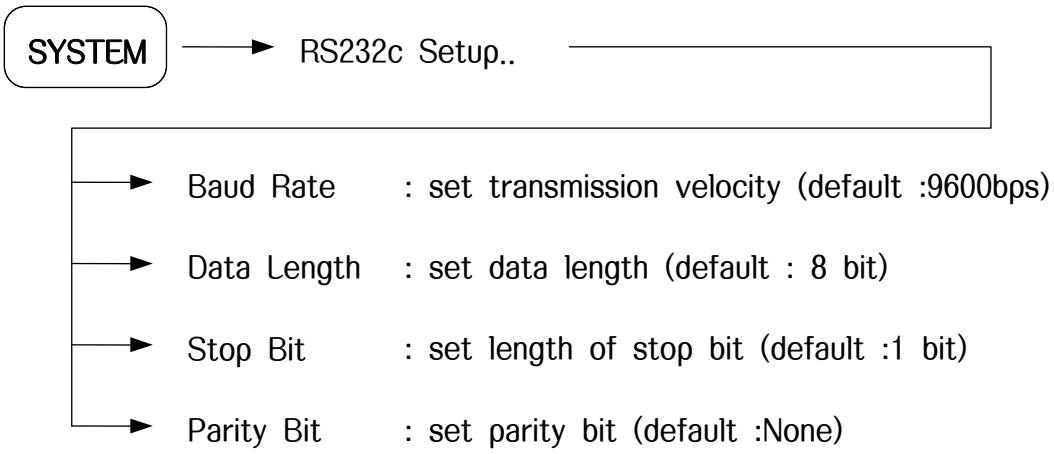
SYSTEM → GPIB Setup.. → Set Address

GPIB Address Range : 1 ~ 30

GPIB Address Default : 7

RS-232C Configuration

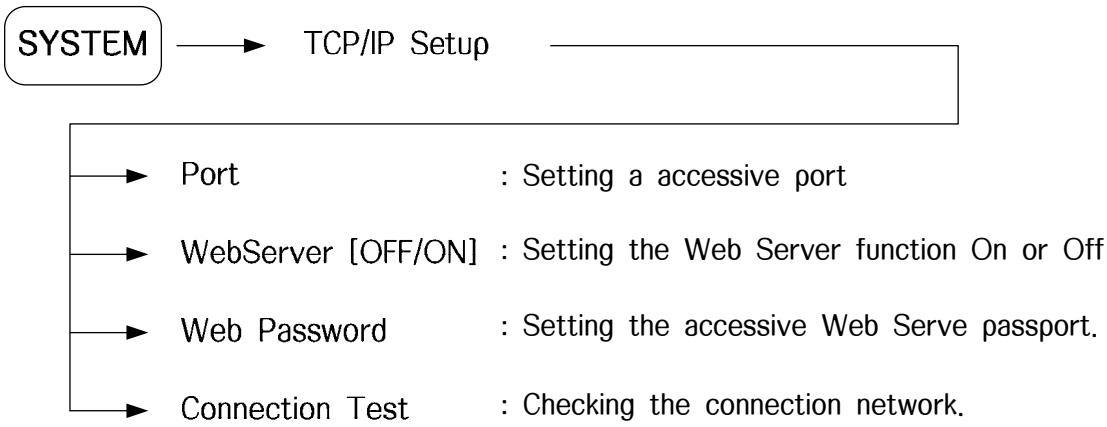
The system can be remotely controlled using an RS-232C interface.
To set up RS-232C protocol, perform the following key operations. :



Note : The State of outer interface information (GPIB and RE232C) doesn't change if power turns off

TCP/IP Configuration

The system can be controlled using an Ethernet.

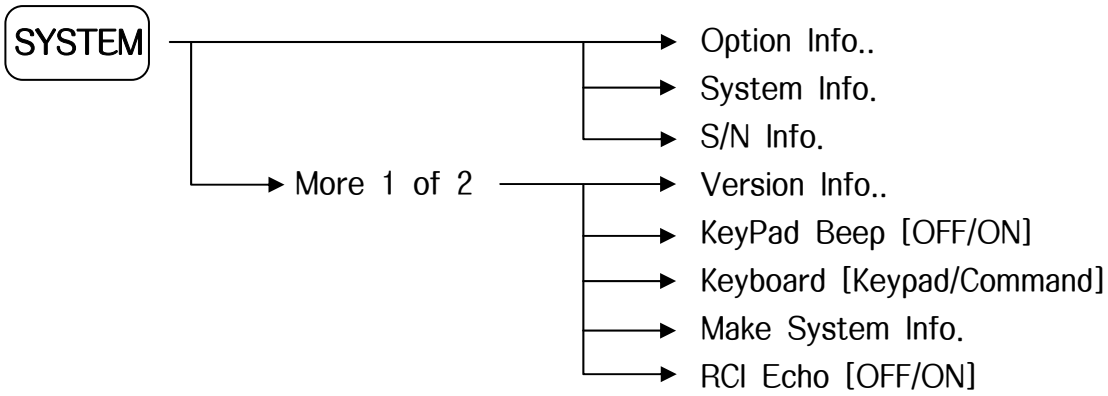


System Information

System Info. shows information of inner installed module.
S/N Info. shows serial number information of inner installed module.
Version Info. shows the current software version information. :

Using the *Make System Info soft key,* information is saved automatically a specific fold. This information is efficiently used in assistance of A/S.

Option Info. displays present option specification and used by another option.
Operation of *KeyPad Beep* is alarming at pushing keypad.



PRESET FUNCTIONS

The PRESET hard key is the header key for the preset and calibration functions.

.

- Preset
- Last State
- Save User State
- Load User State
- Boot On [Last / System / Macro]
- Auto Align [OFF / ON]

Preset

Pushing the *Preset* soft key returns all of the analyzer parameter to the following values.

PRESET ⟶ Preset

- **Factory Initial Set up**

Center Frequency	: 1.5 GHz/ 4.0 ㎓/ 6.6 ㎓/ 13.25 GHz
Frequency Span	: 3GHz/ 8.0GHZ/ 13.2 ㎓/ 26.5 GHz
Reference Level	: 0 dBm
Detector	: LOG
Scale	: 10 dB/DIV
Sweep Time	: 20 ms, AUTO mode
RBW	: 5 ㎒, AUTO mode
VBW	: 3 ㎒, AUTO mode
ATTEN	: 10 dB, AUTO mode
Trigger	: Free Run
Marker	: OFF
Display Line	: OFF
Threshold Line	: OFF
Trace Detector Mode	: Normal

Last State

Pressing the *Last State* soft key returns all of the analyzer parameters back to the last state values that was the status of before system power off.

PRESET → Last State

Save / Load User State

If the *Save User State* soft key is pressed, current setting slot of User State is saved into current parameter.

PRESET → Save User State

If the *Load User State* soft key is pressed, saved in current setting slot of User State is read. If any saved record doesn't exist, error message is viewed in the display window.

PRESET → Load User State

If the *Select User State* soft key is pressed, cab be select slot to Save or Load.
User State has three slots.

PRESET → Select User State [Usr1/Usr2/Usr3]

Boot ON

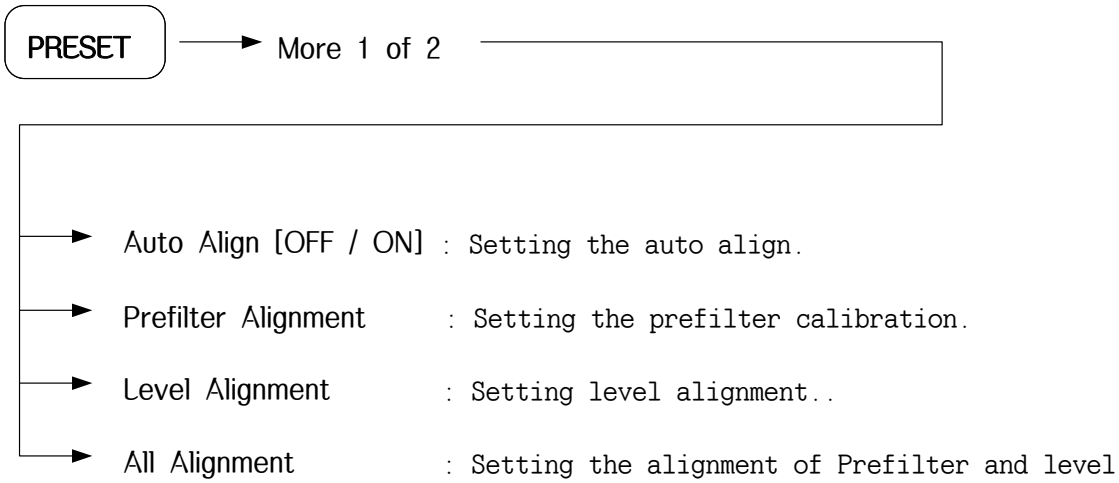
This function set the system condition of power on state.
When System was selected, the every setting condition is the same as preset state.
When Last was selected, the power on state is the set to recent state that was the status of before system power off.

PRESET → Boot On [Last / System / Macro]

Basic status is the System.

Calibration Mode

This function set the system into minimize hardware's viration(temperature, operation time, etc) and more precise measurement.



Note : If calibration is executing, keypad input doesn't operate.

FILE AND SAVE FUNCTIONS

The equipment can save the system parameter, limit line data, and waveform data(Trace) to an internal Hard Disc or Storage Removable Device. Also this data can be recalled and used.

Internal Memory

The internal Memory uses HDD in the equipment
The internal Memory can save the following data and waveform. (ref : File type 5-25)

Save Parameters and Waveform

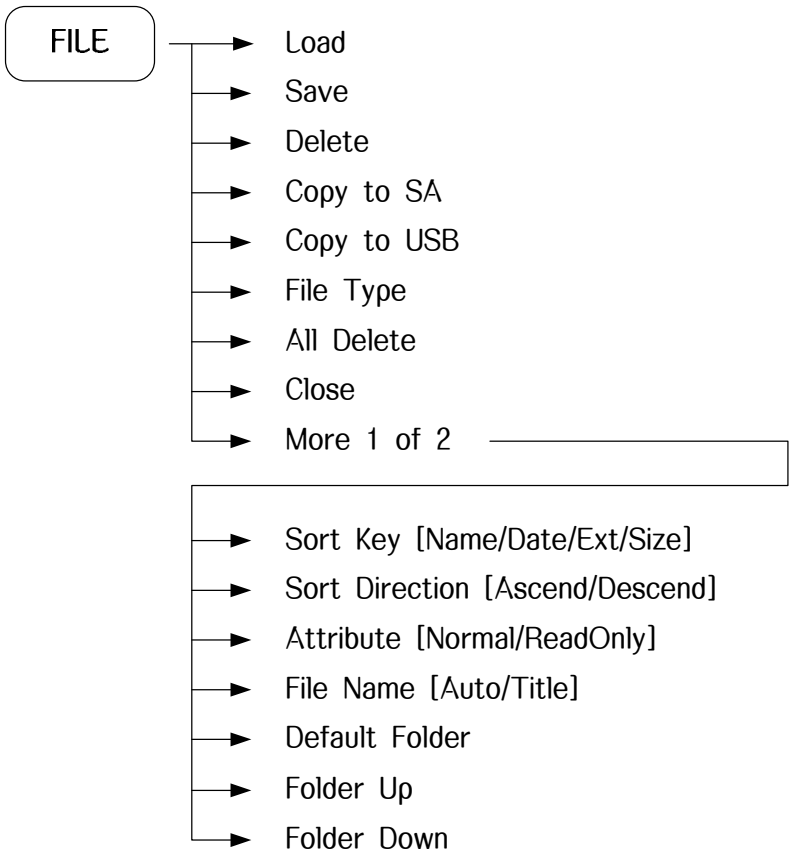
The SAVE hard key is the header key for saving parameters and waveforms.
To save the current system parameters, waveform data and limit line data to the internal Hard Disc or Storage Removable Device, press SAVE hard key only.
Then, the file type and destination is configured in compliance with the FILE Menu setting. (ref : File Type 5-74) File name is decided by Auto or Title set in the Filename soft key. (ref : File Type 5-75) Auto generation method automatically generates from ext_0000.ext to ext_9999.ext, screen title method generates filename as the current same screen title.

File Management

FILE hard key will display File Management Menu in the internal Hard Disc or Storage Removable Device.

When FILE hard key is pressed, the file directory window will be displayed. To select the file, use scroll knob or step key. Other Hard key will close the file directory window.

Perform the following key operations for accessing File Management Menu. :



Load : You can load the selected file with system by pressing this soft key.

Save : You can save the file into selected file type.

Delete : Access menu keys that allow you to delete selected file.

File Type : Select the file type for display in file directory window. Also decide the file type for saving when press the [SAVE] hard key.

File Type	Extension	Comments
All	*	All Files (Only for View)
Status	STS	System status file
Trace	TRC	Trace data file
Limit	LMT	Limit data file
Bitmap	BMP	Screen image file
JPEG	JPG	Screen image file
PNG	PNG	Screen image file
CSV	CSV	Trace data file
Antenna	ANT	Antenna calibration file
Cable	CBL	Cable calibration file
Other	OTH	Other calibration file
User	USR	User calibration file

All Delete : Delete all the files in current file directory.

Close: Close the file directory.

Sort Key : Select the sorting field in directory. The kind of filed are filename, extension, size, date. Select field in turn by press *Sort Key* soft key.

Sort Key : Choose the direction of sorting. By pressing *Sort Direct* soft key, can select Ascend or Descend.

Attribute : Change the current file characteristic. Normal characteristic can delete or change, Read Only characteristic can not.

Filename : Select filename create mode. In Auto mode, filename was generating sequentially from FILE0000 to FILE9999 without regard for current disc.
In Title mode, filename is screen title.

Default Folder : Change the save place into the standard folder of standard drive. (E:\SaveData)

Folder Up : Move to higher level folder than the current folder.

Folder Down : Move to the inner of selected folder.

START BUTTON

The window start () hard key is using to minimize screen.

Pressing the window start hard key, appears a window task bat and start menus.

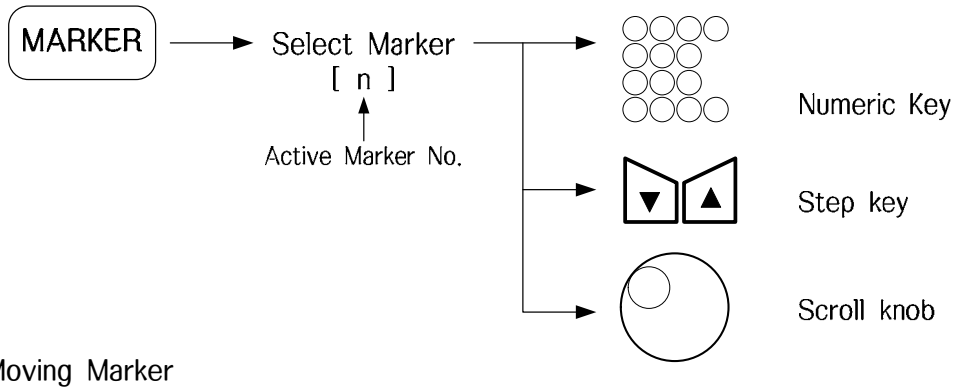
MARKER FUNCTIONS

The inner key section is used as the header key for setting the marker functions.
A [MARKER] key displays menu for MARKER. Key related to Marker hard key is [Mkr>] key and [FUNC] key. The number of settable marker is up to 9.

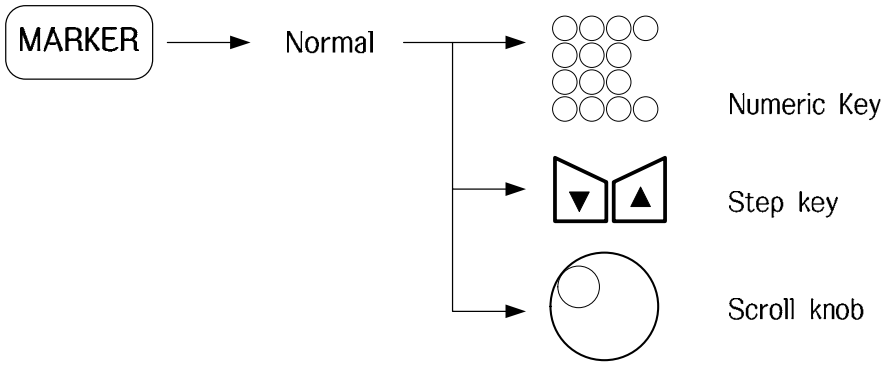
Selecting & Changing Marker Position

Press [MARKER] key, activated Marker 1 as default. Single Marker is indicated by ◇ on the waveform. Use the step up down key to move the active MARKER position in 1division steps.
When the up step key is pressed, the marker position is moved to the right direction.
The down step key direction is left. The scroll knob step size is 1/(data points) of the horizontal line(span) also be used Numeric key.

1) Selecting Marker



2) Moving Marker



Normal Marker

A Normal marker is indicated by ◇ on the waveform. The frequency and level of marker position are digitally displayed in the upper display window.
The normal marker is initially set to ON. When the current state is another marker mode, or when the normal marker is set to OFF, perform the following key operations to set the normal marker ON.

MARKER → Normal

The normal marker displays the absolute amplitude level.

Note : In the zero span, the x-axis of the MARKER displays time.

Delta Marker

In the delta marker mode, the reference marker is indicated by ▽.
To set the delta marker to ON, perform the following key operations. :

MARKER → Delta

When the Delta marker is set to ON, reference marker is displayed and fixed at the Normal marker position. Then, Normal marker is moved, the frequency(time) and level differences of between the reference marker and the current marker are displayed digitally as Delta marker values.
By pressing the *Delta* soft key in the delta marker mode, the current Normal marker position is reset into the reference marker.

Band Pair

By using the *Band Pair* soft key, the width of between Normal marker and Delta marker can be adjusted.

MARKER ⟶ Band Pair [Start]

By selecting the *Band Pair [Start]* soft key, Delta marker position is changed.

MARKER ⟶ Band Pair [Stop]

By selecting the *Band Pair [Stop]* soft key, Normal marker position is changed.

Span Pair

By using the *Span Pair* soft key, the width of between Normal marker and Delta marker can be moved with fixed status at the same time, also width of between two markers can be increased or decreased.

MARKER ⟶ Span Pair [Span]

By selecting the *Span Pair [Span]* soft key, the width of between Normal marker and Delta marker is changed.

MARKER ⟶ Span Pair [Center]

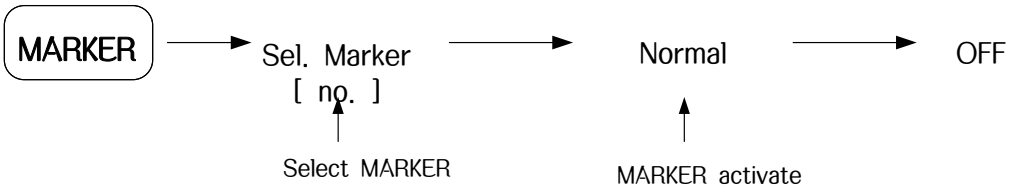
By selecting the *Span Pair [Span]* soft key, width of between two markers can be changed with fixed status.

Marker Off by Reverse Step

The markers are turned off from the screen by the following key operations. :

MARKER ⟶ OFF

The markers are disappeared by reverse step by continuously pressing soft *OFF* soft key. If you want turn off the specific marker, perform the following key operations. :



Setting the MKR Trace

The marker can be settable trace A, B or C. (ref : Trace Functions 5-25)
First, activate the marker for location.
By performing the following key operations, set the trace for marker position.

MARKER ⟶ Marker Trace [A / B / C]

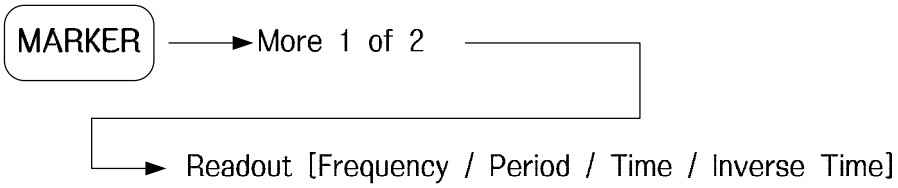
Off All Marker

To delete all markers, perform the following key operations. :

MARKER → All OFF

Setting the Marker Readout Mode

Access the following menu keys that allow you to change the active marker readout.



Frequency : Sets the marker readout to Frequency.
Period : Sets the marker readout to Period.(Reverse of frequency)
Time : Sets the marker readout to Time.(Range : within sweep time)
Inverse Time : Sets the marker readout to Inverse Time.

Setting the Marker Table

The *Marker Table* soft key toggles Marker Table ON and OFF.
When the marker table is ON, compresses the graticule and displays marker information in a table under screen. The information includes the marker number, marker type, frequency, amplitude and marker readout status.

MARKER → More 1 of 2 →

Setting the Marker Name

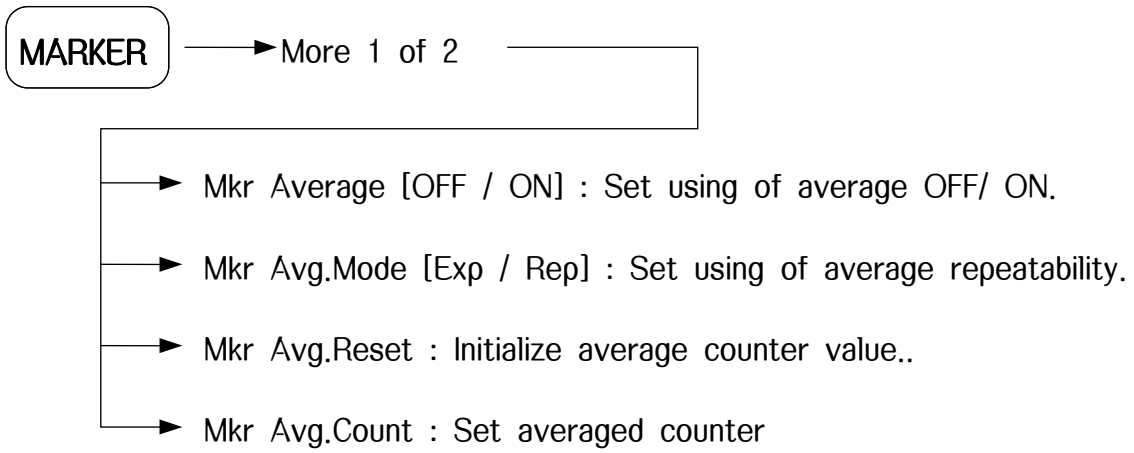
By using *Edit Mkr Name* soft key, each marker can be endowed with characteristic name. (ref : Setting Window Title 5-25)

Default Marker Name

By using *Default Mkr Name* soft key, can restore the marker name initially (Initial status marker name is displayed into 1~9 numeral)

Marker Averaging Function

Marker Value Averaging Function can easily interpret the marker value by averaging the variation of marker value,



SETTING PARAMETERS USING MARKER VALUES

The marker value can be set as the parameter value of the observation frequency/span function, reference level, and so on.
This facilitates the observation of the desired waveform.

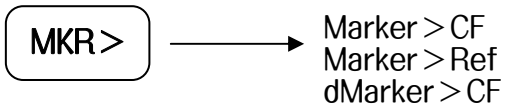
To set parameters using the marker value, the following settings are possible. :

- *Marker>CF* : Set the marker value to the center frequency.
- *Marker>CFstep* : Set the marker value to the center frequency step size.
- *Marker>Start, Stop* : Set the marker value to the start/stop frequency value.
- *Marker>Ref* : Set the marker value to the reference level.
- *dMarker >Span* : Set the delta marker value to the span.
- *dMarker>CFStep* : Set the delta marker value to the center frequency.
- *dMarker>CFstep* : Set the delta marker value to the center frequency step size.

In Zero Span Mode(=Time Domain), only *Marker>Ref* is valid.

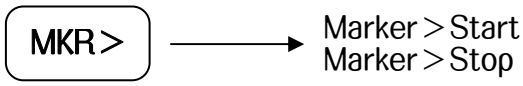
Marker > CF / Marker > Ref

Set the current marker frequency or level to the center frequency or the reference level.
To execute the MARKER Shift, perform the following key operations. :



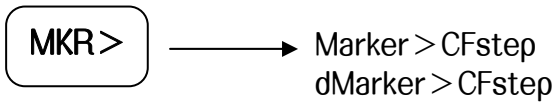
Marker > Start / Marker > Stop

Sets the current marker frequency to the start or stop frequency.
To execute the MARKER Shift, perform the following key operations. :



Marker > CFstep / dMarker > CFstep

Sets the marker frequency to the center frequency step size (resolution determined by up down keys.)



Although this action does not cause any change to appear on the screen, when the center frequency is changed with step key, in case of *Marker > CFstep,* the center frequency is changed with a multiple of current frequency.
This facilitates observation of harmonics.

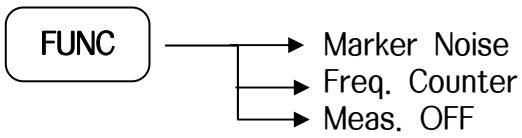
dMarker > Span

In the delta marker mode, this operation sets the difference frequency between reference frequency and current marker frequency to span frequency.

MKR > ⟶ dMarker > Span

SETTING MARKER FUNCTION

Usable the MARKER functions.



MKR Noise : Interpret the reference average noise level with 1Hz noise power bandwidth.

Freq.Counter : Measure the accurate frequency value and amplitude of the current marker position by Marker Counter Function. Marker Counter Resolution can be set to 1kHz, 100Hz, 10Hz, 1Hz.

Meas. OFF : Dissolve the Marker Function.

PEAK SEARCH FUNCTIONS

The equipment has the following four marker search functions. :

- Peak Search
- Next Peak Search
- Next Left Peak Search
- Next Right Peak Search
- Minimum Search
- Peak to Peak Search

Peak Search

Peak Search detects the maximum level point from the entire trace and moves activated marker to that point.
Execute peak search by performing the following key operations. :

PEAK

When no marker exists, marker 1 is activated.

Next Peak Search

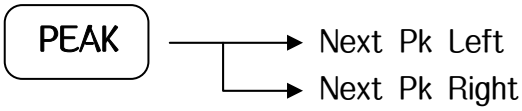
Next Peak search detects the next largest peak relative to the current marker level and moves the marker to that point. (When there are two or more peaks with the same level on the screen, the left most peak is detected.)
Execute Next Peak search by performing the following key operations :

PEAK ⟶ Next Peak

The next largest peak can be detected and the marker can be moved to each of those peaks by executing Next Peak Search consecutively.

Peak Left Search / Peak Right Search

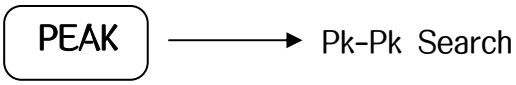
PEAK LEFT Search and PEAK RIGHT Search detect the adjacent peak level to the right or left of the current marker and move the marker to that point.



The adjacent peak in the right or left can be detected and the marker moves to that peak by executing *Next Pk Left* or *Next Pk Right* menu consecutively.

Peak to Peak Search

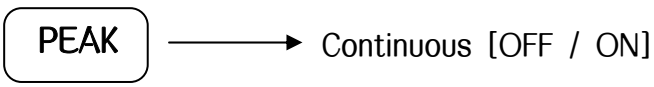
Find and display the frequency (or time, if in zero span) and amplitude differences between the highest and lowest trace points.



If you search Peak to Peak again, you should current activated marker off.

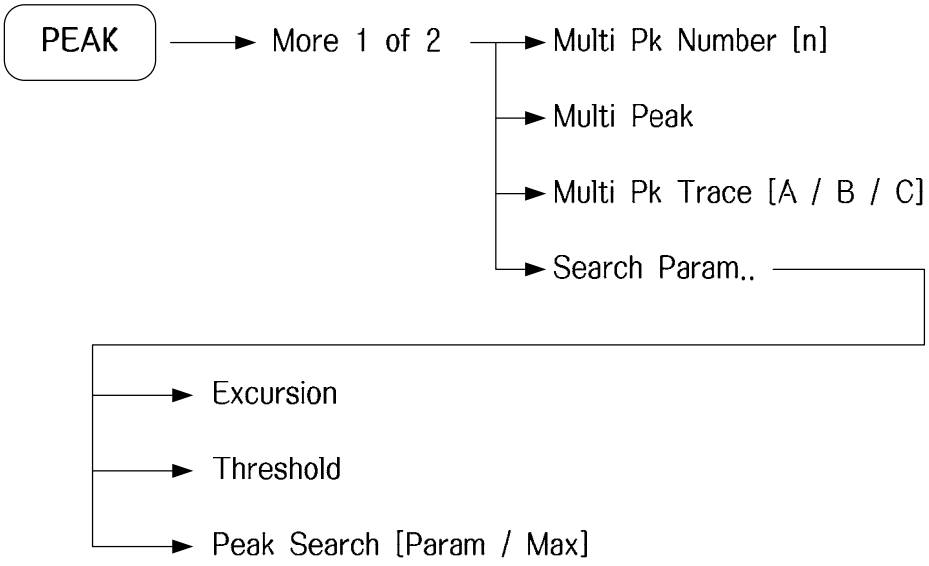
Continuous Peak Search

When Continuous soft key is ON status, equipment continuously searches the peak of screen.



Setting the Peak Search Parameters

Accesses the following menu keys.



Multi Pk Number[n] : Set the number of search marker in the *Multi Peak Search*.
n : 1 ~ 9

Multi Peak : This function is used for multiple peak searching.
Instantly the set number of marker will position in order of level of peak on one sweep waveform.
If the only one peak exists with met the condition, all the markers(=the *n* markers) will be gathered on that one peak.

Multi Pk Trace [A / B / C] : Select the trace to execute the *Multi Peak Search*.

Excursion : Sets the minimum amplitude variation of signals that the marker can identify as a peak.
If a value of 10dB is selected, the marker moves only to peaks that rise and fall more than 10dB above the peak threshold value.
For setting the excursion value, use the numeric keys or scroll knob in the *Search Param* is *Manual* mode.

Threshold : Sets a lower boundary to the active trace. The value of the peak threshold level can be changed using the numeric keys or the scroll knob. The threshold level does not influence the trace memory or marker position.

Peak Search [Param/Max] : If Param mode is set, find peak dependent on setting value of Excursion and Threshold. If Max mode is set, find maximum peak value of displayed trace.

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SECTION 6
PERFORMANCE TESTS

In this section, measuring instruments along with setup and operation procedures necessary for conduction performance tests is described.

TABLE OF CONTENTS

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SECTION 6
PERFORMANCE TESTS

REQUIREMENT FOR PERFORMANCE TESTS

Performance tests are used as preventive maintenance to prevent degradation of the equipment performance before it occurs. Use the performance tests whenever necessary such as at acceptance and periodic inspection to verify performance after repair.

- Frequency Span Readout Accuracy
- Reference Oscillator Frequency Accuracy
- Frequency Counter Accuracy
- Resolution Bandwidth(RBW) and Selectivity and Switching Error
- Phase noise
- Residual FM Noise
- Average Noise Level
- Input Attenuator Switching Error
- Frequency response
- Spurious Response
- Second Harmonic Distortion
- 3rd Order Intermodulation
- Spurious relating with Input
- Input VSWR
- Trigger [EXT, Video]
- Pre Amplifier

Execute the performance tests at regular intervals as preventive maintenance for important evaluation items. We recommend that the performance be inspected regularly once or twice a year. If the specifications are not meet at the performance test, please contact us.

INSTRUMENTS REQUIRED FOR PERFORMANCE TEST

Recommended Instrument (Model number)	Required Performance		Test Item
	Item	Specification	
Signal Generator (Agilent E8257D)	Frequency Range Resolution Output Level Range Output Level resolution SSB Phase noise External reference Output	250 ㎑～26.5 ㎓ 1 ㎑ -130～ +18 dBm 0.01 dB ≤-100 dBc/㎐ (at 10 ㎑ offset) 10 ㎒	Frequency-span readout accuracy Frequency Counter accuracy Resolution Bandwidth, selectivity Phase noise Residual FM Noise Displayed Average Noise Level Input Attenuator switching error Frequency response Second harmonic distortion 3rd Order Intermodulation
[Agilent E4432B]	Frequency Range Resolution Output Level Range Output Level resolution SSB Phase noise	250 ㎑～3 ㎓ 1 ㎑ -136 ～ +10 dBm 0.01 dB ≤-120 dBc/㎐ (at 20 ㎑ offset)	Spurious relating with Input Input VSWR Pre Amplifier
Power Meter (Agilent EPM441BB)	Frequency range Measure Range Power resolution	9 ㎑ ～ 110 ㎓ -70dBm ～ +44dBm 0.001dB	Frequency Response
Power Sensor (Agilent E9304A)	Frequency range VSWR (max) Power range	9 ㎑ ～ 6 ㎓ 1.13 (9 ㎑ ～ 2 ㎓) 1.19 (2 ㎓ ～ 6 ㎓) -60dBm ～ +20dBm	Frequency Response
Power Sensor (Agilent E4413A)	Frequency range VSWR (max) Power range	50 ㎒ ～ 26.5 ㎓ 1.21 (50 ㎒ ～ 100 ㎒) 1.19 (100 ㎒ ～ 8 ㎓) 1.21 (8 ㎓ ～ 18 ㎓) 1.26 (18 ㎓ ～ 26.5 ㎓) -70dBm ～ +20dBm	Frequency Response

Recommended Instrument (Model number)	Required Performance		Test Item
	Item	Specification	
50ohm Terminator (Agilent 909F)	Frequency Range VSWR	DC ~ 6 ㎓ (~ 18 ㎓) 1.005 (DC ~ 5 ㎓) 1.01 (5 ~ 6 ㎓) 1.15 (6 ~ 18 ㎓)	Average noise level Spurious Response
Power Splitter (Agilent 11636B)	Frequency range Input / Output Impedance	DC ~ 26.5 ㎓ 50Ω	3rd Order Intermodulation
Frequency Counter (HP 5328B)	Resolution	0.1 ㎐ ~ 1 ㎒	Reference Oscillator frequency Accuracy
Network Analyzer (Agilent E8363B)	Frequency range	10 ㎒ ~ 40 ㎓	Input VSWR
Arbitrary Wave Generator [Tektronix AFG310]	Frequency range	0.01 ㎐ ~ 16 ㎒	Trigger Response

Extracts part of performance which can cover the measurement range of the test item.

PERFORMANCE TEST

For test item other than oscillator frequency stability, warm-up the equipment for at least fifteen minutes and test the performance after the equipment stabilizes completely.
Also begin measurements after taking the warm-up time of the calibration instrument into full consideration. In addition, the test should be conducted at room temperature little AC power supply voltage fluctuation, and should be free of noise, vibration, dust humidity, etc.

Frequency Span Readout Accuracy

Using the setup shown in the figure below, set the frequencies corresponding the 1st and 9th vertical division from the left side of the screen scale with the Signal Generator. The frequency difference between the peak levels at the 1st and 9th vertical division is equal to the frequency span × 0.8.

1) Specification

- Frequency span accuracy : ≤±1%

2) Test Instrument

- Signal Generator : E8257D
- RF Cable : SMA [male] ~ SMA [male]
- BNC Cable : BNC [male] ~ BNC [male]
- Adapter : N [male] ~ SMA [female]
  (Reference) Use additional adapter→3.5mm[male]~N[female] (ISA-265 Model)
- 10dB Attenuator : SMA [female] ~ SMA [female]

3) Setup

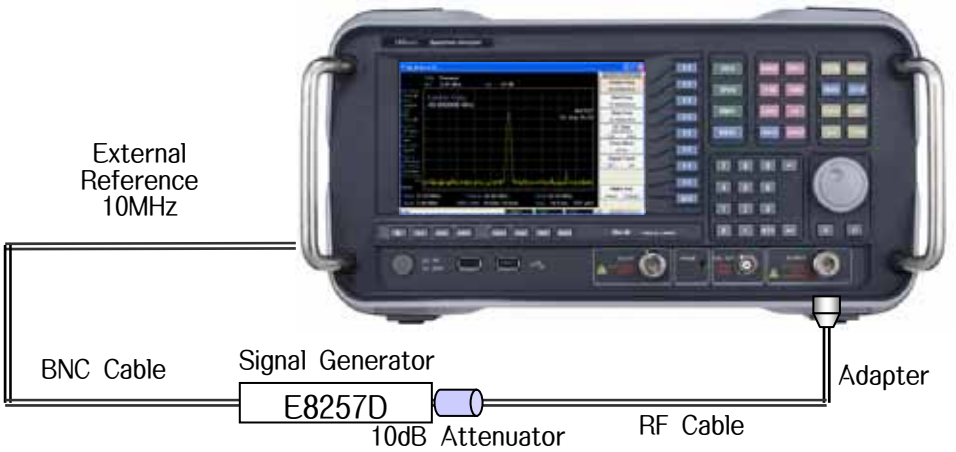


Figure 6-1. Frequency Span Readout Accuracy Test

4) Procedure

Step	Procedure
1	Set the power switch on the equipment front panel to ON.
2	Press the [PRESET], *Preset* key.
3	Set the equipment as follows : [Center Freq.] : 1500 ㎒ [SPAN] : 10 ㎒ [RBW] : Auto [VBW] : Auto [Ref. Level] : -10 dBm [Sweep Time] : 50 ms [Span<5 ㎓] , 200 ms [Span>5 ㎓]
4	Set the Signal Generator output frequency equal to the center frequency in the following table : [Frequency] : 1500 ㎒ [Power] : -15dBm
5	Adjust the E8257D output frequency to set the signal peak at the 1st division from the left and of the screen scale. Record the frequency of F1. F1 = center frequency - (span/10 X 4)
6	After setting the E8257D output frequency to the F2 frequency adjust it to set the signal peak at the 9th division. Record the frequency of F2. F2 = center frequency + (span/10 X 4)
7	Calculate (F2 - F1) / (Span × 0.8) and check the value is within the specified range shown in the table on the next page.
8	Repeat the step 5 to 10 for each frequency span with center frequency range between the maximum and minimum values shown in the following table.
9	Calculate the Frequency Span accuracy by using the following equation :

$$\text{Frequency span accuracy} = \frac{(\text{Span} \times 0.8) - [\text{Frequency (F2)} - \text{Frequency (F1)}]}{(\text{Span} \times 0.8)} \times 100$$

Equipment		Signal Generator (㎒)		Specification (±1 %)
Center Frequency	Span	F2	F1	Accuracy
1500 ㎒	10 ㎒ 50 ㎒ 2000 ㎒ 3000 ㎒			
4700 ㎒	10 ㎒ 50 ㎒ 2000 ㎒ 3000 ㎒			
9700 ㎒	10 ㎒ 40 ㎒ 80 ㎒ 2000 ㎒ 3000 ㎒			
19700 ㎒	10 ㎒ 50 ㎒ 160 ㎒ 2000 ㎒ 5000 ㎒ 10000 ㎒ 13600 ㎒			

Reference Oscillator Frequency Stability

Frequency stability is tested by measuring the 10 ㎒ reference oscillator. Stability is determined by measuring frequency variation at ambient temperatures of 0℃ and 50℃.

1) Specification
   - o Frequency : 10 ㎒
   - o Aging rate : ≤±1 PPM (± 0.1 PPM @ HSO Option)
     After 24 hour warm-up at 25℃ ± 5℃
   - o Temperature stability : ≤±1 PPM (± 0.1 PPM @ HSO Option)
     one year at 0 and 50℃ referred to the frequency measured at 25℃

2) Test Instruments
   - o Frequency Counter : HP 5328B
   - o BNC Cable : BNC [male] ~ BNC [male]

3) Setup

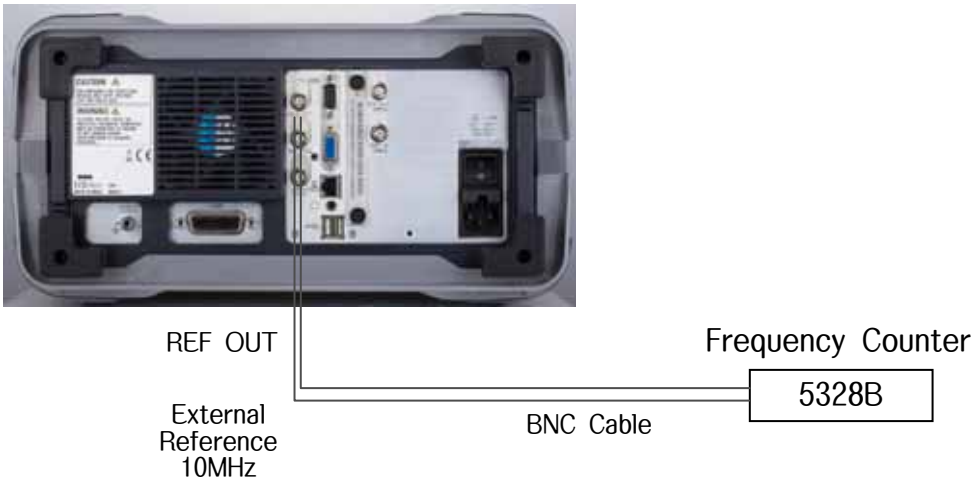


Figure 6-2. Reference Oscillator Frequency Stability Test

4) Procedure

■ Temperature stability

Test condition : Test this performance in a vibration free variable temperature chamber.

Step	Procedure
1	Set up the equipment in a constant-temperature chamber at 25℃.
2	Set the Line and Power switches on the equipment to ON and wait until the equipment internal temperature stabilizes. (Approx. 1.5 hours after the chamber temperature stabilize).
3	When the internal temperature stabilizes, measure the frequency by using the counter with 0.1㎐ resolution.
4	Change the chamber temperature to 50℃.
5	When the chamber temperature and the equipment internal temperature stabilizes, measure the frequency be using the counter.
6	Calculate the stability by using the following equation.
7	Repeat the step 5 to 6 in the 0℃ chamber temperature.

$$Frequency\ Stability(50^{o}C) = \frac{(counter\ reading\ at\ 50^{o}C) - (counter\ reading\ at\ 25^{o}C)}{(counter\ reading\ at\ 25^{o}C)}$$

$$Frequency\ Stability(0^{o}C) = \frac{(counter\ reading\ at\ 0^{o}C) - (counter\ reading\ at\ 25^{o}C)}{(counter\ reading\ at\ 25^{o}C)}$$

Frequency Counter Accuracy

Examine the frequency counter accuracy.

1) Specification

- Accuracy : ± [(Reference frequency accuracy×Marker frequency accuracy) ± (counter resolution×1 LSB)]
- Resolution : 1 ㎐, 10 ㎐, 100 ㎐, 1000 ㎐
- Sensitivity : -45dBm @ 2 ㎒ < Frequency < 13.2 ㎓ [Span<3 ㎒]
  -40dBm @ 13.2 ㎓ < Frequency < 26.5 ㎓ [Span<3 ㎒]

2) Test Instruments

- Signal Generator : E8257D
- RF Cable : SMA [male] ~ SMA [male]
- BNC Cable : BNC [male] ~ BNC [male]
- Adapter : N [male] ~ SMA [female]
  (Reference) Use additional adapter→3.5mm[male]~N[female] (ISA-265 Model)
- 10dB Attenuator : SMA [female] ~ SMA [female]

3) Setup

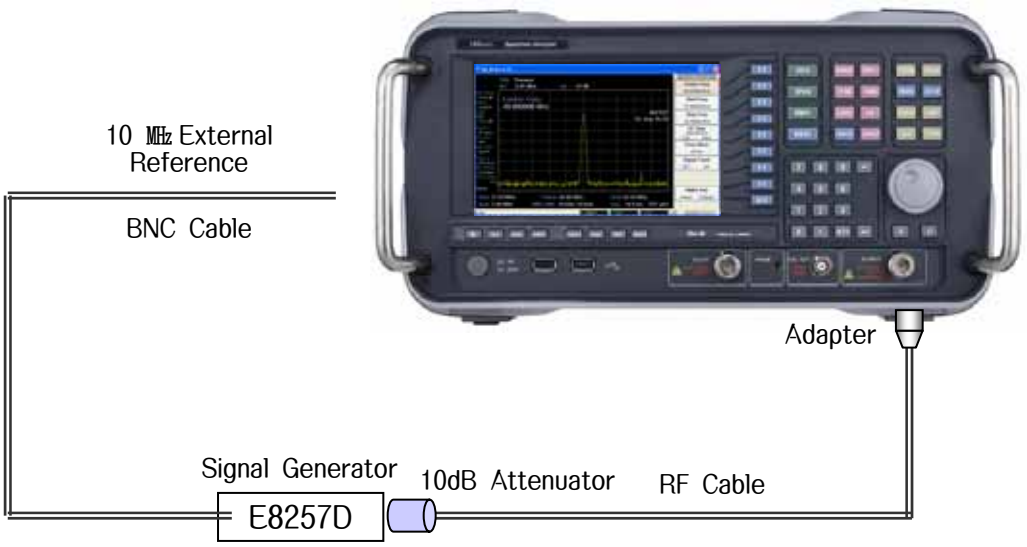


Figure 6-3. Frequency Counter Accuracy Test

4) Procedure

Step	Procedure
1	Set the power switch on the equipment front panel to ON.
2	Press the [PRESET], *Preset* key.
3	Set up the equipment as shown below : [Center Freq.] : 2.9 ㎓ [SPAN] : 200 ㎑ [Ref. Level] : -20 dBm [Attenuation] : 0 dB [RBW] : Auto [VBW] : Auto
4	Set the Signal Generator as shown below : [Frequency] : 2.9 ㎓ [Power] : -50 dBm
5	Press [PEAK], [FUNC], *Freq. counter* Key.
6	Read out the frequency counter value.
7	Measure the frequency counter value with changing frequency counter value [1 ㎐→10 ㎐→100 ㎐→1000 ㎐]

Spectrum Analyzer	Signal Generator		Result
Center	Center	Power Level	
2.9 ㎓	2.9 ㎓	-50 dBm	
6.3 ㎓	6.3 ㎓	-45 dBm	
13.1 ㎓	13.1 ㎓	-45 dBm	
26.4 ㎓	26.4 ㎓	-40 dBm	

Resolution Bandwidth(RBW) and Selectivity and Switching Error

Resolution Bandwidth (RBW)

When there are two input signals with a frequency difference corresponding to the 3dB bandwidth (of IF final stage) the signals can be resolved as two waveforms. This is called resolution bandwidth.

RBW accuracy and selectivity

The accuracy is defined by the coincidence between setting of RBW and 3dB bandwidth of signal.

The selectivity is defined by the ratio of the filter width, in Hz, at the –60dB point, to the filter width, in Hz, at the –3dB point, as shown in the following formula.

To test the resolution bandwidth and selectivity, first measure the resolution bandwidth (3dB bandwidth), then the 60dB bandwidth and calculate the 60dB/3dB bandwidth ratio.

RBW switching error

The switching error is defined as the shift in amplitude when the RBW filter is switched.

1) Specification

- Accuracy : ≤ ±3% at 3 dB (500 Hz~500 kHz, 1-2-3-5 step)
  ≤ ±10% at 3 dB (1 MHz~5 MHz, 1-2-3-5 step)
- Selectivity
  (60dB/3dB Bandwidth) : < 5:1 (1 Hz~5 MHz, 1-2-3-5 step)
- Switching error : ± 0.05 dB (RBW 5 kHz reference)

2) Test Instruments

- Signal Generator : E8257D
- RF Cable : SMA [male] ~ SMA [male]
- BNC Cable : BNC [male] ~ BNC [male]
- Adapter : N [male] ~ SMA [female]

  (Reference) Use additional adapter→3.5mm[male]~N[female] (ISA-265 Model)

3) Setup

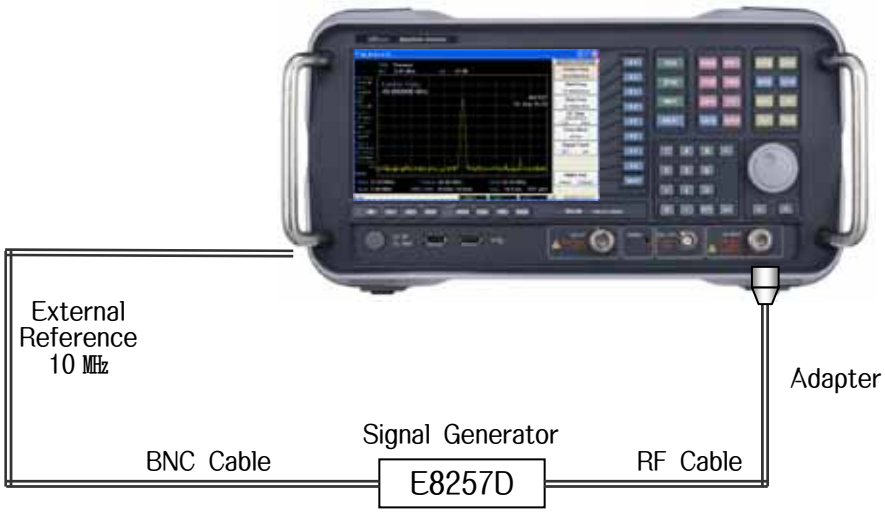


Figure 6-4. Resolution Bandwidth and Selectivity and Error Test

4) Procedure

○ RBW Accuracy

Step	Procedure
1	Set the power switch on the equipment front panel to ON.
2	Press the [PRESET], *Preset* key.
3	Set up the equipment as shown below :
	[Center Freq.] : 1101 ㎒
	[SPAN] : 15 ㎒
	[Ref. Level] : -10 dBm
	[RBW] : 5 ㎒
	[VBW] : Auto
	[Scale/Div] : 2 dB/Div
	[Sweep time] : 50 ms
4	Set the Signal Generator as shown below :
	[Frequency] : 1101 ㎒
	[Power] : -10 dBm
5	Press [PEAK], [MKR>], *Marker→Ref* key and match the peak of the signal trace to the top line Ref Level on the screen.
6	Press [SINGLE], *Single* key to execute a single sweep, then check that the single sweep has been completed.
7	Press [MEAS], *X dB Down*, [CONTROL], *PointA XdB Point [-3.0]* softkey and then measured value.
8	Press [SWEEP], *Continuous* soft key.
9	Repeat the step 5 to 9 for the other resolution bandwidth according to the combinations of resolution bandwidth and frequency span shown in the follow table.
10	Calculate RBW filter accuracy :

$$\text{Accuracy} = \frac{(\text{RBW} - \text{Measured Value})}{\text{RBW}} \times 100\%$$

Equipment			Marker Δ3dB bandwidth			Accuracy	Remark
Center	RBW	Span	Minimum	Measure	Maximum		
1101 ㎒	1 ㎑	3 ㎑					
	2 ㎑	6 ㎑					
	3 ㎑	9 ㎑					
	5 ㎑	15 ㎑					
	10 ㎑	30 ㎑					
	20 ㎑	60 ㎑					
	30 ㎑	90 ㎑					
	50 ㎑	150 ㎑					
	100 ㎑	300 ㎑					
	200 ㎑	600 ㎑					
	300 ㎑	900 ㎑					
	500 ㎑	1.5 ㎒					
	1 ㎒	3 ㎒					
	2 ㎒	6 ㎒					
	3 ㎒	9 ㎒					
	5 ㎒	15 ㎒					

9501 MHz	1 kHz	3 kHz					
	2 kHz	6 kHz					
	3 kHz	9 kHz					
	5 kHz	15 kHz					
	10 kHz	30 kHz					
	20 kHz	60 kHz					
	30 kHz	90 kHz					
	50 kHz	150 kHz					
	100 kHz	300 kHz					
	200 kHz	600 kHz					
	300 kHz	900 kHz					
	500 kHz	1.5 MHz					
	1 MHz	3 MHz					
	2 MHz	6 MHz					
	3 MHz	9 MHz					
	5 MHz	15 MHz					
20001 MHz	1 kHz	3 kHz					
	2 kHz	6 kHz					
	3 kHz	9 kHz					
	5 kHz	15 kHz					
	10 kHz	30 kHz					
	20 kHz	60 kHz					
	30 kHz	90 kHz					
	50 kHz	150 kHz					
	100 kHz	300 kHz					
	200 kHz	600 kHz					
	300 kHz	900 kHz					
	500 kHz	1.5 MHz					
	1 MHz	3 MHz					
	2 MHz	6 MHz					
	3 MHz	9 MHz					
	5 MHz	15 MHz					

○ RBW Selectivity

Step	Procedure
1	Set the power switch on the equipment front panel to ON.
2	Press the [PRESET], *Preset* key.
3	Set the equipment as shown below : [Center Freq.] : 108 ㎒ [SPAN] : 5 ㎒ [Ref. Level] : -10 dBm [Attenuation] : Auto [RBW] : ‘1 ㎒ [VBW] : Auto [Sweep time] : 50 ms
4	Set the Signal Generator as shown below : [Frequency] : 108 ㎒ [Power] : 0 dBm
5	Press [PEAK], [MKR>], *Marker→Ref* key and match the peak of the signal trace to the stop line Ref Level on the screen.
6	Press [SINGLE], *Single* key to execute a signal sweep, then check that the single sweep has been completed.
7	Press [MEAS], *X dB Down..*, [CONTROL] *,PointA X[dB] point[-60]* set key and then measure the X dB Relate.
8	Press [SWEEP], *Continuous* key. Change the RBW and frequency spans according to the combinations of RBW and frequency span shown in the follow table.
9	For 3 dB bandwidth, used the value table [Item RBW Accuracy]
10	Calculate RBW Selectivity.

$$Selectivity = \frac{60\ dB\ Bandwidth}{3\ dB\ Bandwidth\ (or\ 6\ dB\ Bandwidth)}$$

Equipment			3dB BW	60dB BW	Selectivity	Remark
Center	RBW	Span				
108 ㎒	300 ㎐ 30 ㎑ 300 ㎑ 1 ㎒	1.8 ㎑ 180 ㎑ 1.8 ㎒ 6 ㎒				

○ RBW Switching error

Step	Procedure
1	Set the power switch on the equipment front panel to ON.
2	Press the [PRESET], *Preset* key.
3	Set up the equipment as shown below :

[Center Freq.]	: 100 ㎒
[SPAN]	: 9 ㎒
[Ref. Level]	: -10 dBm
[Attenuation]	: Auto
[RBW]	: 3 ㎑
[VBW]	: Auto
[Scale/Div]	: 10 dB/Div
[Sweep time]	: 100 ms

4	Set the Signal Generator as shown below :

[Frequency]	: 100 ㎒
[Power]	: -5 dBm

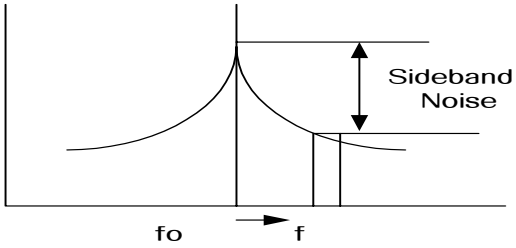
5	Press [PEAK], [MKR>], *Marker→CF* key to move the signal peak to the center and the top of the screen.
6	Press [MARKER], *Delta* key that in order to set to the marker to delta marker.
7	Set sequentially RBW and SPAN as shown in the table (300 ㎐/1.5 ㎑ ~ 3 ㎒ /15 ㎒).
8	Press [PEAK] key to conduct peak search and move the current marker to the peak point of the signal spectrum.
9	Read the Δ marker level value.
10	Repeat the step 7 to 9.

Equipment			3dB BW	60dB BW
Center	RBW	Span		
100 ㎒	1 ㎑	3 ㎑		
	2 ㎑	6 ㎑		
	3 ㎑	9 ㎑		
	5 ㎑	15 ㎑		
	10 ㎑	30 ㎑		
	20 ㎑	60 ㎑		
	30 ㎑	90 ㎑		
	50 ㎑	150 ㎑		
	100 ㎑	300 ㎑		
	200 ㎑	600 ㎑		
	300 ㎑	900 ㎑		
	500 ㎑	1.5 ㎒		
	1 ㎒	3 ㎒		
	2 ㎒	6 ㎒		
	3 ㎒	9 ㎒		
	5 ㎒	15 ㎒		

9000 MHz	1 kHz	3 kHz		
	2 kHz	6 kHz		
	3 kHz	9 kHz		
	5 kHz	15 kHz		
	10 kHz	30 kHz		
	20 kHz	60 kHz		
	30 kHz	90 kHz		
	50 kHz	150 kHz		
	100 kHz	300 kHz		
	200 kHz	600 kHz		
	300 kHz	900 kHz		
	500 kHz	1.5 MHz		
	1 MHz	3 MHz		
	2 MHz	6 MHz		
	3 MHz	9 MHz		
	5 MHz	15 MHz		
19000 MHz	1 kHz	3 kHz		
	2 kHz	6 kHz		
	3 kHz	9 kHz		
	5 kHz	15 kHz		
	10 kHz	30 kHz		
	20 kHz	60 kHz		
	30 kHz	90 kHz		
	50 kHz	150 kHz		
	100 kHz	300 kHz		
	200 kHz	600 kHz		
	300 kHz	900 kHz		
	500 kHz	1.5 MHz		
	1 MHz	3 MHz		
	2 MHz	6 MHz		
	3 MHz	9 MHz		
	5 MHz	15 MHz		

Phase noise

Sideband noise measured the noise of local oscillator signal measured at an offset from the carrier frequency. It is important to use a signal source with 10dB or better sideband noise performance than the equipment.



1) Specification

- Phase noise : Outer Temperature 20℃
  : -92 dBc/Hz @ Frequency=1 ㎓, 1kHz Offset
  -112 dBc/Hz @ Frequency=1 ㎓, 10kHz Offset
  -112 dBc/Hz @ Frequency=1 ㎓, 100 ㎑ Offset
  -136 dBc/Hz @ Frequency=1 ㎓, 1MHz Offset
  -144 dBc/Hz @ Frequency=1 ㎓, 10MHz Offset

2) Test Instruments

- Signal Generator : E8257D
- RF Cable : SMA [male] ~ SMA [male]
- BNC Cable : BNC [male] ~ BNC [male]
- 10dB Attenuator : SMA [female] ~ SMA [female]
- Adapter : N [male] ~ SMA [female]

(Reference) Use additional adapter→3.5mm[male]~N[female] (ISA-265 Model)

3) Setup

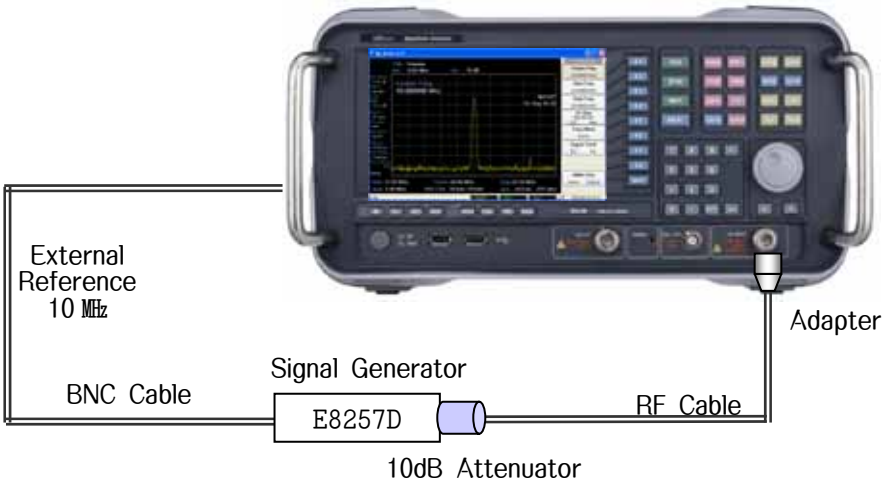


Figure 6-5. Phase Noise Test

4) Procedure

Step	Procedure
1	Set the power switch on the equipment front panel to ON.
2	Press the [PRESET], *Preset* key.
3	Set up the equipment as shown below :
	[Center Freq.] : 1 ㎓
	[SPAN] : 100 ㎑
	[Ref. Level] : -10 dBm
	[Attenuation] : 0 dB
	[RBW] : 1 ㎑
	[VBW] : Auto
	[Scale/Div] : 10 dB/Div
	[Sweep time] : Auto
4	Set up the Signal Generator as shown below :
	[Frequency] : 1 ㎓
	[Power] : 0 dBm
5	Press [PEAK], [MKR>], *Marker→CF* key and *Marker→Ref* to move the signal spectrum peak to the center and the top of the screen.
6	Press the [MARKER], *Delta* that in order to set to the marker to Δ marker.
7	Set the Δ marker to frequency of 10 ㎑ and read marker value (amplitude). Calculate Sideband noise.
8	Sideband noise = Measured Value (Δ marker value) – 10log (RBW/1 ㎐)

Example]

Offset frequency	RBW	Measured value	Sideband Noise
10 ㎑	1 ㎑	-65 dBc	-95 dBc/㎐

Residual FM Noise

Measure the purity of frequency.

1) Specification : ≤100×N Hz $_{P-P}$, 1s , RBW 1 ㎑, VBW 1 ㎑
(N : LO harmonic mixing mode)

2) Test Instruments

- Signal Generator : E8257D
- RF Cable : SMA [male] ~ SMA [male]
- Adapter : N [male] ~ SMA [female]

(Reference) Use additional adapter→3.5mm[male]~N[female] (ISA-265 Model)

3) Setup

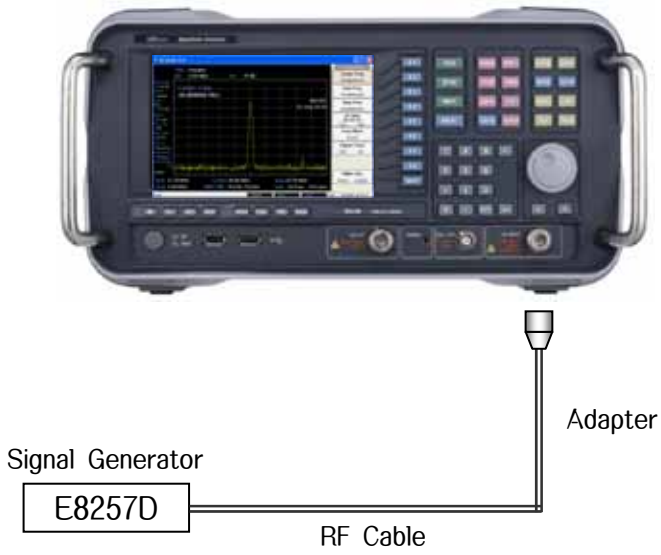


Figure 6-6. Residual FM Test

4) Procedure

Step	Procedure
1	Set the power switch on the equipment front panel to ON.
2	Press the [PRESET], *Preset* key.
3	Set up the equipment as shown below :
	[Center frequency] : 3 ㎓
	[Ref. Level] : -20 dBm
	[SPAN] : 10 ㎑
	[RBW] : 1 ㎑
	[VBW] : 1 ㎑
	[Sweep time] : 500 ms
	[Log Scale] : 1 dB/Div
4	Set the signal generator 83650B as show below :
	[Frequency] : 3 ㎓
	[Power] : -20 dBm
5	Press [MARKER], *Normal* and Press [SPAN], *Zero Span.*
6	Change frequency of signal generator and Press [MARKER], *Delta* key when the equipment marker level is –25 dBm.
7	Record frequency of signal generator(A).
8	Go on Change frequency when the equipment delta marker level is –27 dBm.
9	Record frequency of signal generator(B).
10	Press [SINGLE], *Single* key and check peak to peak value(C).

Residual FM = (B – A) / 2 X C

Average Noise Level

The internal noise of the signal analyzer is measured with this test.

1) Specification

- Average noise level : [RBW : 1 Hz , VBW : 1 Hz]
  ≤ -143 dBm, 10 MHz ~ 2 GHz
  -135 dBm, 100 kHz ~ 10 MHz
  -143 dBm, 10 MHz ~ 2 GHz
  -141 dBm, 2 GHz ~ 13.2 GHz
  -138 dBm, 13.2 GHz ~ 18 GHz
  -133 dBm, 18 GHz ~ 26.5 GHz

2) Test Instruments

- 50 ohm terminator : 909F

3) Set up

Figure 6-7. Average Noise level Test

4) Procedure

Step	Procedure
1	Set the power switch on the equipment front panel to ON.
2	Press the [PRESET], *Preset* key.
3	Set up the equipment as shown below :
	[Center frequency] : 2.91 GHz
	[SPAN] : Zero
	[Ref. Level] : -40dBm
	[Attenuation] : 0dB
	[RBW] : kHz
	[VBW] : 3 Hz
	[Detector mode] : Average
	[Sweep Time] : Average
4	Terminate the RF Input with a 50Ω terminator.
5	Change the equipment as shown below.
6	Press [TRACE], *More.. , Trc Average.. [ON] , Trc Avg. Count [9]* key.
7	Wait until the 9 sweeps has been competed.
8	Press [PEAK] key to execute peak search. At this point read the level value at the marker. If a spurious signal exists within span, move the marker to a flat noise region and then read the level value at the marker*.
9	With changing the center frequency, repeat the step 6 to 8.

Note : DANL(displayed average noise level) is distinguished from residual spurious response.

DANL is also called noise floor, that is, a flat noise level caused by the signal analyzer's internally generated noise with no input signal.

Residual spurious response is a discrete response, that is, a CW-like noise seen on a signal analyzer display without input signal.

Center Frequency	Span	Average noise level	Remark
501 Hz	1 kHz		10 MHz less than
11 MHz 50 MHz 101 MHz 201 MHz 301 MHz … 2.9 GHz 3.0 GHz	1 kHz		10 MHz more than [ISA-30]
6.3 GHz 6.4 GHz … 7.9 GHz 8.0 GHz	1 kHz		10 MHz 이상 [ISA-80]
8.1 GHz 8.2 GHz … 13.1 GHz 13.2 GHz	1 kHz		10 MHz 이상 [ISA-132]
13.3 GHz 13.4 GHz … 26.4 GHz 26.5 GHz	1 kHz		10 MHz more than [ISA-265]

Input Attenuator Switching Error

This test measures the switching error when the amount of attenuation in the RF input section is switched.

1) Specification

- Input Attenuator switching error
  : ±0.5dB by steps @frequency=100 ㎐ (Only ISA-30 model)
  ±0.5dB by steps less than 13.2 ㎓
  ±0.8dB by steps at 13.2 ㎓~ 26.5 ㎓

2) Test Instruments

- Signal Generator : E8257D
- RF Cable : SMA [male] ~ SMA [male]
- BNC Cable : BNC [male] ~ BNC [male]
- Adapter : N [male] ~ SMA [female]
  (Reference) Use additional adapter→3.5mm[male]~N[female] (ISA-265 Model)
- 10dB Attenuator : SMA [female] ~ SMA [female]

3) Setup

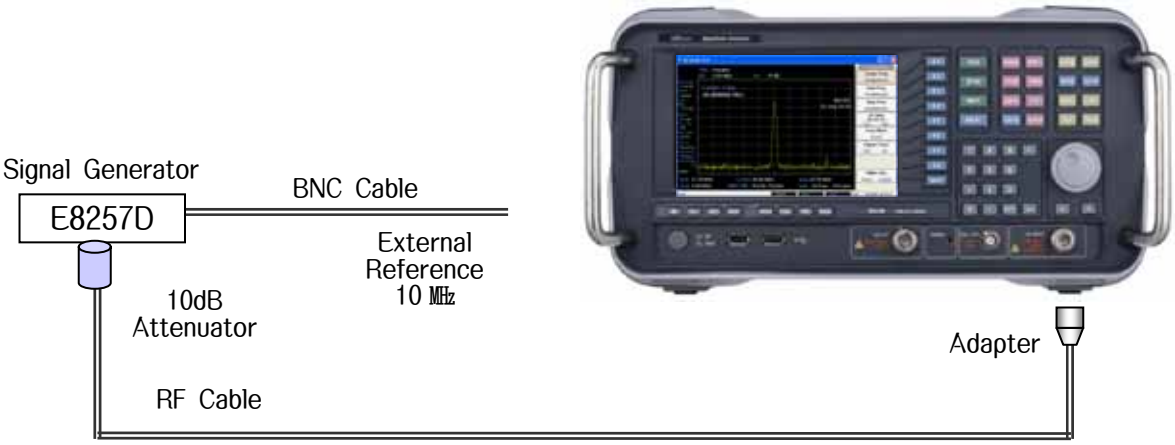


Figure 6-8. Input Attenuator Switching Error Test

4) Procedure

Step	Procedure
1	Set the power switch on the equipment front panel to ON.
2	Press the [PRESET], *Preset* key.
3	Set up the equipment as shown below :
	[Center frequency] : 100 ㎒
	[SPAN] : 50 ㎑
	[Ref. Level] : -10 dBm
	[Attenuation] : 0 dB
	[RBW] : 3 ㎑
	[VBW] : 3 ㎑
	[Sweep time] : 50 ms
	[Average] : ON
4	Set the signal generator 83650B as show below :
	[Frequency] : 100 ㎒
	[Power] : -10 dBm
5	Press [PEAK], [Mkr>], *Mkr→CF* and *Mkr→Ref* key to set the spectrum waveform peak to the center and top of the screen.
6	Press [MARKER], *Delta* key , check the marker level is 0.
7	Press [AMPL], *Attenuation [MNL],* increasing attenuator 5 dB step, read the delta marker level and write down on table.
8	Press [MARKER], *OFF.*
9	Repeat the step 5 to 8 for other value in table. In each turn set the input attenuator to measure in 7 step.
10	When end the measurement, the result compares with spec in the table.

Center Frequency [MHz]	Input Attenuator		Delta Marker level	Spec
	Before change ATT	After change ATT		
100	0 dB 5 dB 10 dB 15 dB 20 dB 25 dB 30 dB 35 dB 40 dB 45 dB 50 dB	5 dB 10 dB 15 dB 20 dB 25 dB 30 dB 35 dB 40 dB 45 dB 50 dB 55 dB		±0.5dB
2900	0 dB 5 dB 10 dB 15 dB 20 dB 25 dB 30 dB 35 dB 40 dB 45 dB 50 dB	5 dB 10 dB 15 dB 20 dB 25 dB 30 dB 35 dB 40 dB 45 dB 50 dB 55 dB		±0.5dB
8000	0 dB 5 dB 10 dB 15 dB 20 dB 25 dB 30 dB 35 dB 40 dB 45 dB 50 dB	5 dB 10 dB 15 dB 20 dB 25 dB 30 dB 35 dB 40 dB 45 dB 50 dB 55 dB		±0.5dB

13200	0 dB 5 dB 10 dB 15 dB 20 dB 25 dB 30 dB 35 dB 40 dB 45 dB 50 dB	5 dB 10 dB 15 dB 20 dB 25 dB 30 dB 35 dB 40 dB 45 dB 50 dB 55 dB		±0.5dB
26500	0 dB 5 dB 10 dB 15 dB 20 dB 25 dB 30 dB 35 dB 40 dB 45 dB 50 dB	5 dB 10 dB 15 dB 20 dB 25 dB 30 dB 35 dB 40 dB 45 dB 50 dB 55 dB		±0.8dB

Frequency Response

Generally, when one or more signals with a different frequency but the same amplitude are applied to the unit, the signal analyzer displays the same amplitude for each signal on the screen.

1) Specification

- Frequency response : ±0.5 dB below, (1 ㎒ ~ 3.0 ㎓)
  ±1.0 dB below, (3.0 ㎓ ~ 8.0 ㎓)
  ±1.5 dB below, (6.4 ㎓ ~ 13.2 ㎓)
  ±2.0 dB below, (13.2 ㎓ ~ 22.0 ㎓)
  ±2.5 dB below, (22.0 ㎓ ~ 26.5 ㎓)
  (10dB Attenuation)

2) Test Instruments

- Signal Generator : E8257D
- Power Meter : E4418B
- Power Sensor : E9304A, E4413A
- RF Cable : SMA [male] ~ SMA [male]
- BNC Cable : BNC [male] ~ BNC [male]
- Adapter : N[male]~SMA[female], N[female]~SMA [female]

(Reference) Use additional adapter→3.5mm[male]~N[female] (ISA-265 Model)

3) Setup

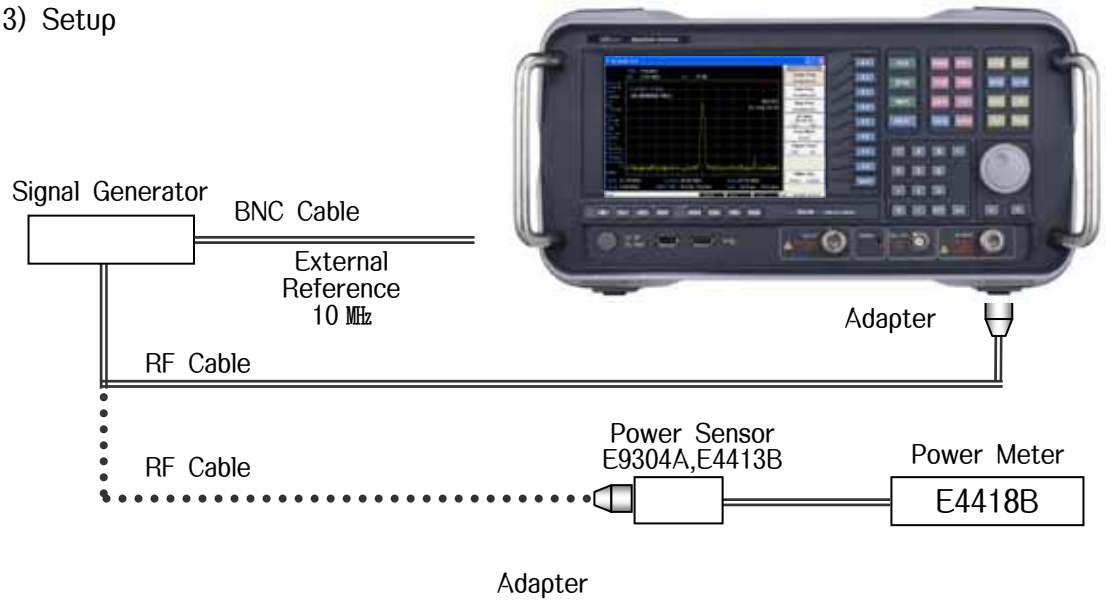


Figure 6-9. Frequency Response Test

4) Procedure

Step	Procedure
1	Calibrate the Power Meter to the Power sensor.
2	Connect the Power sensor to the Signal Generator with RF cable and Adapter as Figure 6-9.
3	Set the Signal Generator as shown below : Frequency : 300 ㎑ Power : 0 dBm
4	Set the Power Meter to measure frequency 10 ㎒
5	Read Power Meter display and write in below table.
6	Change the Signal Generator output frequency and measure the Power Meter frequency as below table and write values in the table.
7	Disconnect the Signal Generator from the Power Sensor.
8	Connect the Power Sensor to the test equipment with RF cable and adaptor.
9	Set up the equipment as shown below : Center frequency : 300 ㎑ Ref. Level : 0 dBm SPAN : 50 ㎑ RBW : 3 ㎑ VBW : 3 ㎑ Sweep Time : 50 ms
10	Press PEAK key and the marker level and write to the bellow table.
11	Change the Signal Generator output frequency and the test equipment frequency as the below table and write values in the table.
12	Calculate the frequency response. Error = display marker peak value(B) – power meter value(A)

Signal Generator	Frequency	Power Meter value [dBm]	Marker peak value [dBm]	Error	Remark
E8257D	300 kHz 1 MHz 10 MHz 50 MHz 100 MHz 200 MHz … 2.9 GHz 3.0 GHz				ISA-30
E8257D	3.1 GHz 6.4 GHz … 7.9 GHz 8.0 GHz				ISA-80
E8257D	13.3 GHz 13.4 GHz … 26.4 GHz 26.5 GHz				ISA-132
E8257D	13.3 GHz 13.4 GHz … 26.4 GHz 26.5 GHz				ISA-265

Spurious Response

This test measures spurious frequency levels in the equipment.
The RF Input is terminated and 0 dB Input attenuation is selected.

1) Specification : ≤-90 dBm (Input terminated, 0 dB attenuation)

2) Test Instruments
   - o 50 ohm Termination : 909F

3) Setup

Figure 6-10. Residual Response Test

4) Procedure

Step	Procedure
1	Set the power switch on the equipment front panel to ON.
2	Press the [PRESET], *Preset* key.
3	Set up the equipment as shown below : [Center frequency] : 10 ㎒ [SPAN] : 10 ㎒ [Ref. Level] : -30 dBm [Attenuation] : 0 dB [RBW] : 10 ㎑ [VBW] : 1 ㎑ [Sweep Time] : Auto
4	Terminate the RF Input with a 50Ω terminator
5	Press [DISPLAY], *Display Line [ON]*, *Display Value* key and rotate knob to –95 dBm.
6	Press [SINGLE], *Single* key. Wait for completion of the sweep.
7	Any residual responses must be below the display line.
8	Press [PEAK] key and record marker amplitude.
9	Set center frequency step to 9 ㎒ using [FREQ], *CF Step [MNL]*, *CF Step* and change the center frequency. Follow the proceeding step 6 to 8.

Frequency	Marker Amplitude [dBm]	Equipment Spec. [dBm]
10 ㎒		< -90
⋮		
13.2 ㎓		
⋮		
26.45 ㎓		

Second Harmonic Distortion

The main point of the test is to apply a signal with harmonic distortion that is lower than the equipment internal harmonic distortion [at least 20dB below] to the equipment and measure the level difference between the fundamental signal and the second harmonic.
A low-distortion signal source can be obtained by an applying signal to the equipment after passing the signal through a low-pass filter (LPF).

1) Specification

- IP2 (Second Order Intercept Point : -30dBm Input, 0 dB attenuation)
  ≥ +40 dBm, 100 ㎒ ~ 1.5 ㎓
  ≥ +80 dBm, 1.5 ㎓ ~ 26.5 ㎓

2) Test Instruments

- Signal Generator : E8257D
- RF Cable 1 : N [male] ~ N [male]
- RF Cable 2 : SMA [male] ~ SMA [male]
- BNC Cable : BNC [male] ~ BNC [male]
- LPF : With attenuation of 70 dB or more at twice the fundamental frequencies
- Adapter : N [male] ~ SMA [female]

(Reference) Use additional adapter→3.5mm[male]~N[female] (ISA-265 Model)

3) Setup

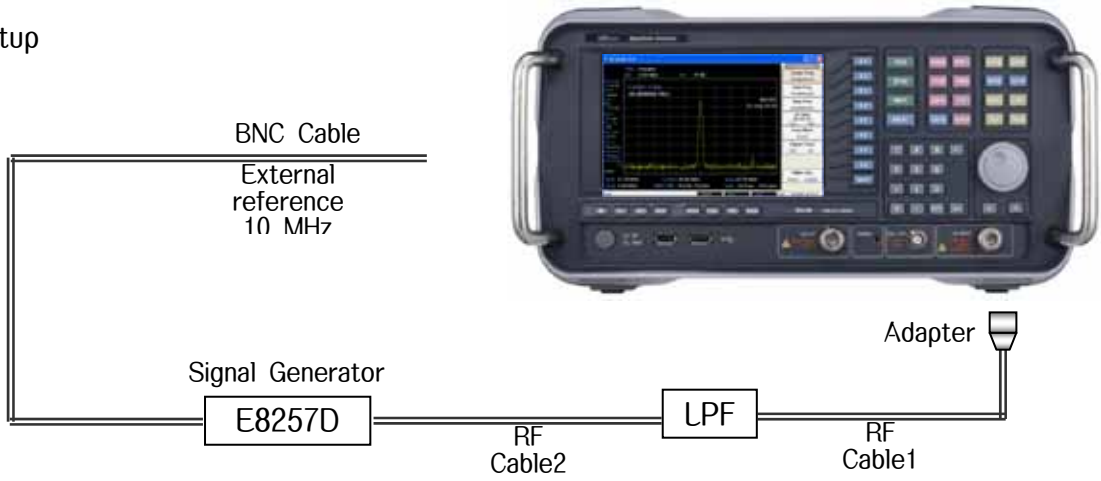


Figure 6-11. Second Harmonic Distortion Test

4) Procedure

Step	Procedure
1	Set the power switch on the equipment front panel to ON.
2	Press the [PRESET], *Preset* key.
3	Set up the equipment as shown below : [Center frequency] : 95 ㎒ [SPAN] : 10 ㎑ [Ref. Level] : -10 dBm [Attenuator] : 0 dB [RBW] : 1 ㎑ [VBW] : 30 ㎐ [Sweep time] : Auto
4	Set the Signal Generator as shown below : [Frequency] : 95 ㎒ [Power] : -30 dBm
5	Adjust the Signal Generator level that the signal measured is –30 dBm on the equipment.
6	Set the Center Frequency to twice the fundamental frequency to display the second harmonic on the screen.
7	Press [PEAK], [MKR>], *Marker→>CF* key and calculate the difference from –30dBm. Write to table.
8	According to table adjust the frequency and LPF, repeat the step 3 to 7.

Signal Generator		Second harmonic		
Output power	Frequency	Marker level	dBc	Frequency
-30dBm	95 ㎒ 245 ㎒ 495 ㎒ 995 ㎒			190 ㎒ 490 ㎒ 990 ㎒ 1990 ㎒

3rd Order Intermodulation

Two Signal Generator provide the signals required for measuring third order intermodulation. It is difficult when the input level is –30dBm because the intermodulation signal is very close in level to the noise.

1) Specification (IP3 : Third Order Intercept Point, -15 dBm Input)
   ≥ +8 dBm, 10 ㎒ ~ 200 ㎒
   ≥ +12 dBm, 200 ㎒ ~ 26.5 ㎓

2) Test Instruments
   - Signal Generator 1,2 : E8257D
   - Power Splitter : 11636B
   - RF Cable 1,2,3 : SMA [male] ~ SMA [male]
   - BNC Cable 1,2 : BNC [male] ~ BNC [male]
   - Adapter : T-BNC [female], N [male] ~ SMA [female]
     (Reference) Use additional adapter→3.5mm[male]~N[female] (ISA-265 Model)
   - 3dB, 6dB Attenuator : SMA [female] ~ SMA [female]

3) Setup

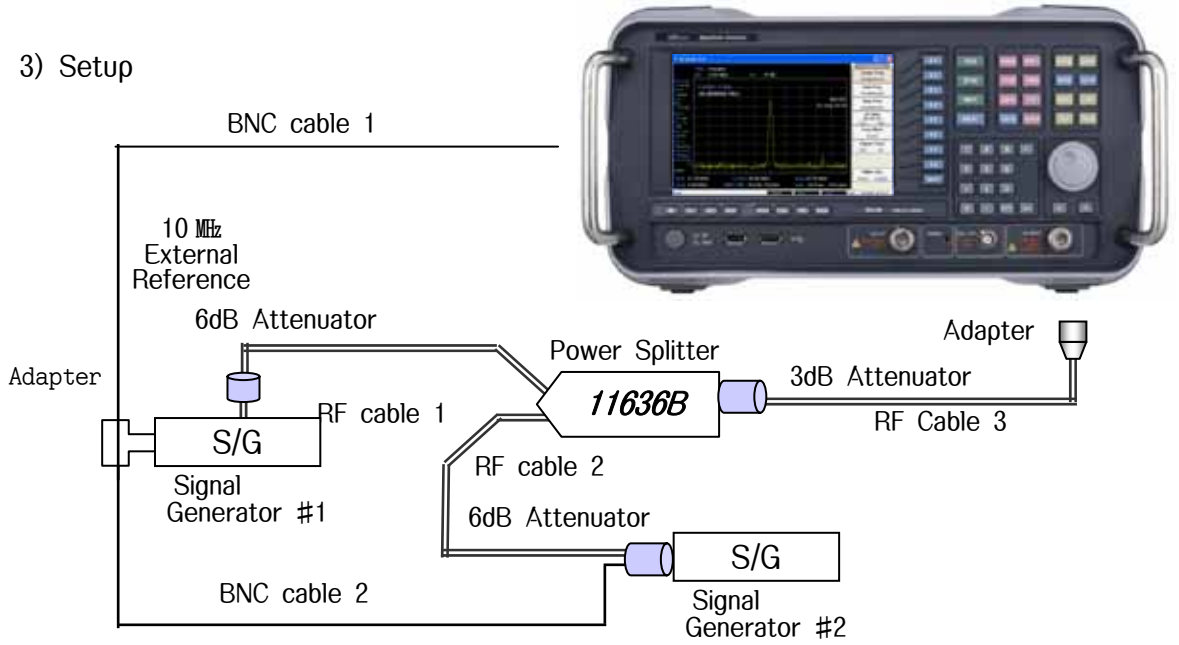


Figure 6-12. 3rd Order intermodulation Test

4) Procedure

o Power meter calibration

Step	Procedure
1	Set up synthesized signal generators as shown on previous page.

Signal Generator 1

Frequency	: 10 ㎒
Power	: -5 dBm

Signal Generator 2

Frequency	: 10.1 ㎒
Power	: -5 dBm

Step	Procedure

2 Set up the equipment as shown below :

Center frequency	: 100 ㎒
Ref. Level	: -10 dBm
SPAN	: 500 ㎑
Attenuation	: 0 dB
RBW	: 3 ㎑
VBW	: 50 ㎐

3 Adjust signal generator 1,2 level so that power meter reads –15 dBm.

4 Press [PEAK] key to set the normal marker to one at the two signals at –15 dBm.

5 Press [MARKER], *Delta* key.

6 Move normal marker to peak of the inter-modulation product signal(left side of signal generator 1). Read level difference and write in the following table.

7 Repeat the step 3 to 6 for other frequency in the following table.

Signal Generator(-15 dBm)		3rd order Inter-modulation distortion	
#1 (MHz)	#2 (MHz)	Δ marker (dBc)	Specification(dBc)
10 20 … 80 90	10.1 20.1 … 80.1 90.1		-70 (1 ㎒ ~ 100 ㎒)
100 200 … 25300 25400	100.1 200.1 … 25300.1 25400.1		-84 (100 ㎒ ~26.5 ㎓)

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Spurious relating with Input

This test measures the spurious frequency level relating with Input in the equipment.

1) Specification : ≤-55 dBc (Input level –30dBm, 0 dB attenuation)

2) Test Instruments

- Signal Generator : E8257D
- RF Cable : SMA [male] ~ N [female]
- BNC Cable : BNC [male] ~ BNC [male]
- LPF : N [male] ~ N [female]
- Adapter : N [male] ~ N [male]

  (Reference) Use additional adapter→3.5mm[male]~N[female] (ISA-265 Model)
- 10dB Attenuator : SMA [female] ~ SMA [female]

3) Setup

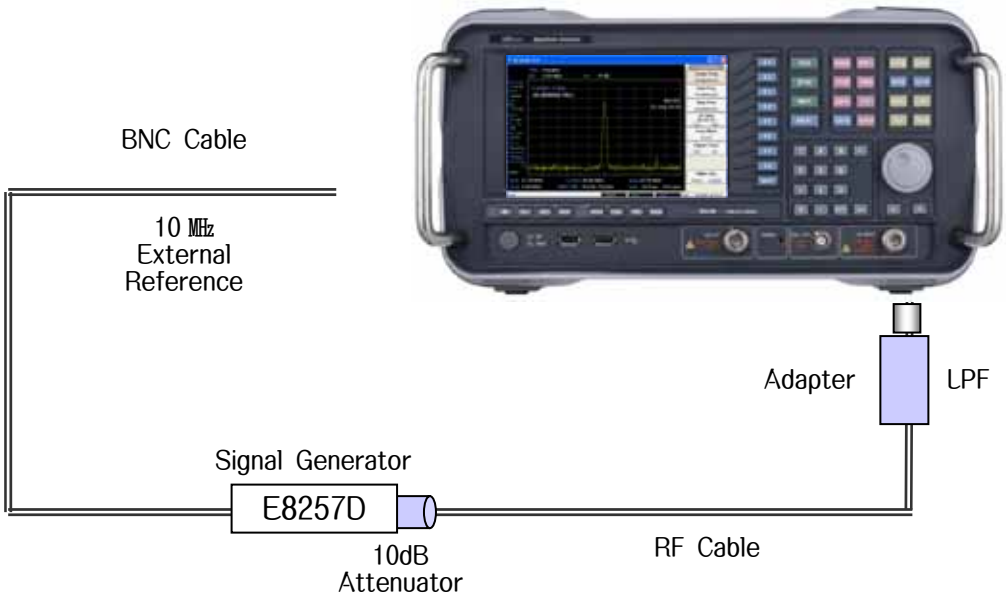

Figure 6-13. Spurious relating with Input Test

4) Procedure

Step	Procedure
1	Set the power switch on the equipment front panel to ON.
2	Press the [PRESET], *Preset* key.
3	Set up the equipment as shown below : [Center frequency] : 100 ㎒ [SPAN] : 50 ㎒ [Ref. Level] : -20 dBm [Attenuation] : 0 dB [RBW] : 10 ㎑ [VBW] : 1 ㎑
4	Set the Signal Generator as shown below : [Frequency] : 100 ㎒ [Power] : -20 dBm
5	Press [PEAK], [Mkr>], Marker→Ref Key, then set the peak value of the signal analyzer to reference level.
6	Measure spurious level in the ±10.7 ㎒ delta frequency, then write frequency more than –60 dBc and spurious level.
7	Repeat the step 5 to 6 increasing 100 ㎒ frequency step to 26.5 ㎓ in the signal analyzer and signal generator.

Input VSWR

This test verifies the Input VSWR of the equipment.

1) Specification

10 ㎒ ~ 3.0 ㎓≤ 1.5 : 1 @ 10 dB Attenuation
3.0 ㎓ ~ 13.2 ㎓≤ 1.8 : 1 @ 10 dB Attenuation
13.2 ㎓ ~ 26.5 ㎓≤ 2.0 : 1 @ 10 dB Attenuation

2) Test Instruments

- Network Analyzer : E8363B
  ※ Frequency Range : 10 ㎒ ~ 40 ㎓
- Calibration Cable : 85133-60016 [2.4mm –2.92mm , Female]
  85131-60017 [2.4mm –2.92mm , Male]
- Calibration Kit : N4692-6003
- Adapter : SMA [female] ~ N [male]
  (Reference) Use additional adapter→3.5mm[male]~N[female] (ISA-265 Model)

3) Setup

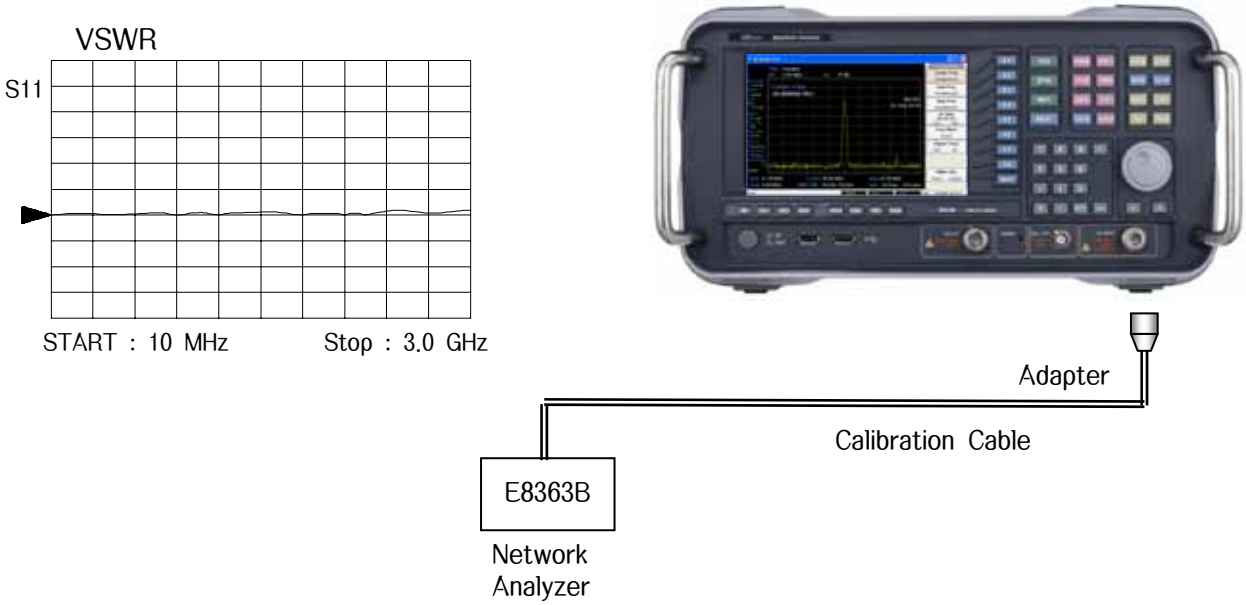

Figure 6-14. Input VSWR Test

4) Procedure

Step	Procedure
1	Set the power switch on the equipment front panel to ON.
2	Press the [PRESET], *Preset* key.
3	Set up the equipment as shown below : [Center frequency] : 100 ㎒ [Attenuation] : 10 dB [Ref. Level] : -10 dBm [SPAN] : Zero span
4	Set up the Network Analyzer(E8363B) as shown below : [Start frequency] : 10 ㎒ [Stop frequency] : 3.0 ㎓ [Output Level] : -20 dBm
5	Connect cable to Network Analyzer and calibrate following each equipment calibration procedure.
6	Connect the cable in Network Analyzer to signal analyzer and measure the VSWR. Compare with specification.
7	Set up the Network Analyzer(E8363B) as shown below : [Start frequency] : 3.0 ㎓ [Stop frequency] : 6.4 ㎓ [Output Level] : -20 dBm
8	Repeat the step 5 to 6.
9	Repeat the step 7 to 8 in Band 2, 3.

Frequency Range		Measurement(Max)	Specification
Band0	10 ㎒ ~ 3.0 ㎓		≤ 1.5 : 1
Band1	3.0 ㎓ ~ 6.4 ㎓		≤ 1.8 : 1
Band2	6.4 ㎓ ~ 13.2 ㎓		≤ 1.8 : 1
Band3	13.2 ㎓ ~ 26.5 ㎓		≤ 2.0 : 1

Trigger [EXT, Video]

This test measures standard operations of the Trigger in the equipment.

1) Specification : EXT, Video

2) Test Instruments
   - o Arbitrary Function Generator : AFG310
   - o RF Cable : SMA [male] ~ BNC [male]
   - o BNC Cable : BNC [male] ~ BNC [male]
   - o Adapter : N [male] ~ SMA [female]

   (Reference) Use additional adapter→3.5mm[male]~N[female] (ISA-265 Model)

3) Setup

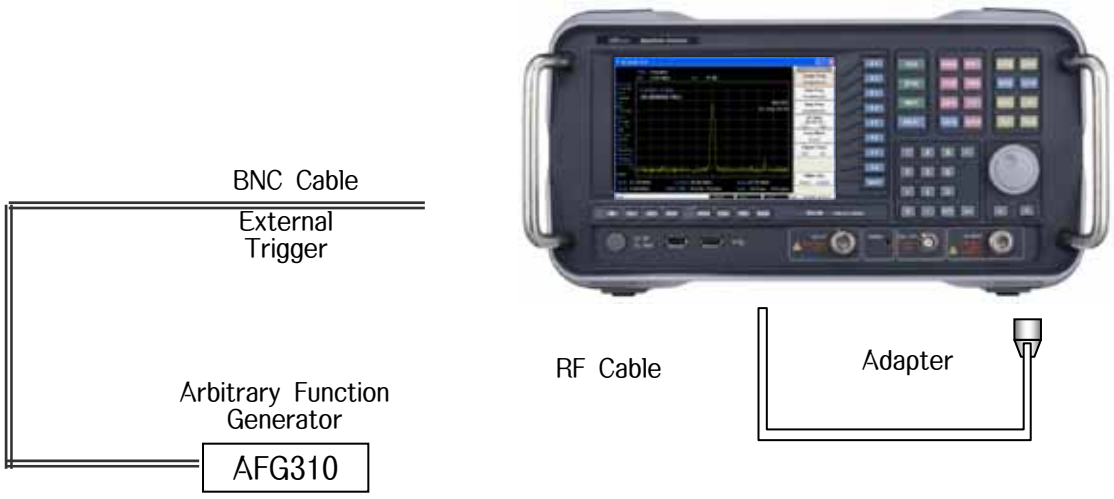

Figure 6-15. Trigger Test

4) Procedure 1 [EXT Trigger]

Step	Procedure
1	Following is a procedure of examining the EXT Trigger.
2	Set up the equipment as shown below :
	Center frequency : 10 ㎒
	SPAN : 10 ㎒
	Ref. Level : 0 dBm
	Attenuation : Auto
	RBW : 30 ㎑
	VBW : 30 ㎑
	TRIG : Free Run
4	Set the Arbitrary Function Generator as shown below :
	Function : SQUA
	Frequency : 0.5 ㎐
	Amplitude : 3.3 V
5	Set the Trigger to External in the equipment.
6	Check the noise level in the screen is renewed.

5) Procedure 3 [Video Trigger]

Step	Procedure
1	Following is a procedure of examining the Line Trigger.
2	Set up the equipment as shown below :

Center frequency	: 10 ㎒
SPAN	: Zero Span
Ref. Level	: 0 dBm
Attenuation	: Auto
RBW	: 30 ㎑
VBW	: 30 ㎑
Sweep Time	: 2ms
TRIG	: Free Run
Trig Slop	: Pos
Trig Delay	: 0 usec

3 Set the Arbitrary Function Generator as shown below :

Function	: SQUA
Frequency	: 10 ㎒
Amplitude	: 0.1 V
Modulation	: FM
FM Modulation	: Sine
FM Frequency	: 1 ㎑
FM Deviation	: 50 ㎑

4 Set the Trigger to Video in the equipment.

5 Adjusting with Trigger level, check in the starting point of sine wave in the screen is starting the upper line of the Video Trigger.

6 Press *Trig Slop, NEG* key

7 Adjusting with Trigger level, check in the starting point of sine wave in the screen is starting the lower line of the Video Trigger

8 Check the Trigger delay.

Trig Delay , On → -1>0>0>usec, → 1>0>0>usec

Pre Amplifier

Examine the standard operation of the Pre Amplifier.

1) Specification : Peak < ±1 dBm (1 ㎒ ~ 3.0 ㎓)

2) Test Instruments

- o Signal Generator : E8257D
- o RF Cable : SMA [male] ~ N [male]
- o BNC Cable : BNC [male] ~ BNC [male]
- o Adapter : N [male] ~ N [male]

  (Reference) Use additional adapter→3.5mm[male]~N[female] (ISA-265 Model)
- o 10dB Attenuator : SMA [female] ~ SMA [female]
- o LPF : N [female] ~ N [male]

3) Setup

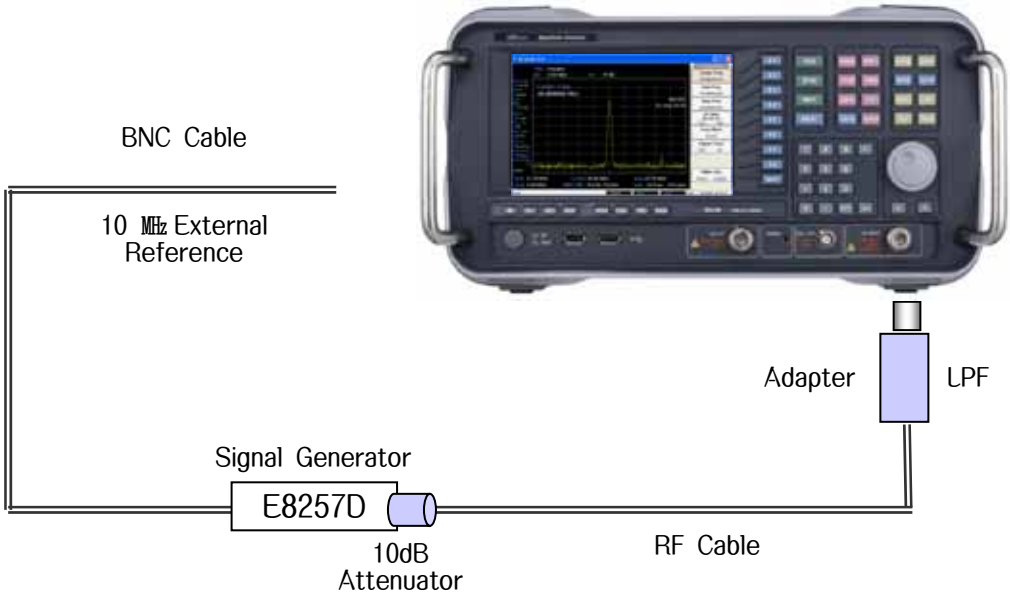

Figure 6-16. Pre Amplifier Test

4) Procedure

Step	Procedure
1	Set the power switch on the equipment front panel to ON.
2	Press the [PRESET], *Preset* key.
3	Set up the equipment as shown below :
	[Center frequency] : 100 ㎒
	[Ref. Level] : -40 dBm
	[Attenuation] : Auto
	[SPAN] : 10 ㎒
	[RBW] : Auto
	[VBW] : Auto
	[Sweep Time] : Auto
	[Average] : On
4	Set the Signal Generator as shown below :
	[Frequency] : 100 ㎒
	[Power] : -50 dBm
5	PreAmp OFF then measure Peak level after 10 Average.
6	Shift 2.5 ㎒ at the Peak frequency then measure noise level.
7	PreAmp On after Average OFF
8	Measure Peak level after 10 Average.
9	Shift 2.5 ㎒ at the Peak frequency, then measure noise level.
10	Repeat the step 5 to 9 according to the frequency [1500 ㎒, 2900 ㎒].

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SECTION 7
STORAGE AND TRANSPORTATION

This section describes the long-term storage, repacking and transportation of the equipment as well as the regular care procedures and the timing.

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SECTION 7
STORAGE AND TRANSPORTATION

CLEANING

Always turn the equipment POWER switch OFF and disconnect the power plug from the AC power inlet before cleaning the cabinet.

To clean the external cabinet :

- Use a soft, dry cloth for wiping off.
- Use a cloth moistened with diluted neural cleaning liquid if the instrument is very dirty of before long term storage.
  After insuring that the cabinet has been thoroughly dried, use a soft, dry cloth for wiping off.
- If loose screw is found, tighten them with the appropriate tools.

CAUTION

Never use benzene, thinner, or alcohol to clean the external cabinet : it may damage the coating, or cause deformation or discoloration.

STORAGE PRECAUTIONS

This paragraph describes the precautions to take for long term storage of the equipment.

Precautions before storage

1. Before storage, wipe dust, finger marks, and other dirt off of the equipment.
2. Avoid storing the equipment where :
   1) It may be exposed to direct sunlight or high dust levels.
   2) It may be exposed to active gases.
   3) It may be exposed to extreme temperatures (＞50℃) or high humidity (＞90%).

Recommended storage precautions

The recommended storage conditions are as follows :

- Temperature ..... 0 to 50℃
- Humidity ..... 10% to 60%

REPACKING AND TRANSPORTATION

The following precautions should be take if the equipment must be returned to us for servicing.

Repacking

Use the original packing materials. If the equipment is packed in other materials, observe the following packing procedure :

1) Wrap the equipment in plastic sheet or similar material.
2) Use a corrugated paper, wooden box, or aluminum case, which allows shock-absorbent material to be inserted on all sides of the equipment.
3) Secure the container with packing straps, adhesive tape or bands.

Transportation

Do not subject the equipment to severe vibration during transport. It should be transported under the recommended storage conditions.

SERVICE

If the equipment is damaged or does not operate as specified, contact your nearest our dealer or business office (refer to the rear cover in this manual) for repair. When you request repair, provide the following information :

1) Model number and serial number on rear panel.
2) Fault description : Symptom, operation procedure before fault (include peripheral or equipment and plot of connection circuit), circumstance (temperature, humidity, time, date, place), guess of yours etc.
3) Name of a personnel-in-charge and address for contact when fault confirmed or at completion of repair.

SECTION 8
SYSTEM RESTORATION

This section contains information for restoration of system of faults on the software error.

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SECTION 8
SYSTEM RESTORATION

OPERATION SYSTEM

Signal Analyzer uses Microsoft's Windows XP for basic operation system.
Windows OS is easy to use but may have possibility of easy to incur.
Through signal analyzer doesn't operate Windows operation system; it has restoration solution in hard memory to recover initial state.

Caution  You must act this course, after error adjustment such as program reinstall and disk inspection of Windows doesn't regular act.

Recovering Booting System

Phoenix Recover Pro 6

Internal restoration solution of this equipment is Recover Pro 6 MFG manufactured by Phoenix.
Recover Pro 6 consists of Phoenix Always which always reboots regardless state of operation system and Phoenix Recover Pro which can system backup and restore.

You can find more precise description at website of manufactured by Phoenix.
Website : www.phoenix.com

System Recovering Recover Pro

You can back into initial state with proceeding follow step.

.

Note) If you proceed this step, system driver is initialized into basic driver (C: Drive).
Data which are made from shipment are disappearing.
Mouse and Key board must be connected to proceed this step.

- Step for system restoration

1) Press power button which is located in front panel of signal generator.
2) If Fig 8-1is appeared in display window, press ESC key and press F4 several time.

Fig 8-1. Display System Boot

3) If booting sequence display is appearing, select Hard Disk.
4) Display about Phoenix Always appear.
   - If not Phoenix Always display but Windows booting display is appearing, pushing power button , making stand by state and repeating step 2 ~ step 3 several times.

5) Among Always display (Fig 8-2) menu, push Protect / Recover.

6) Push Phoenix Recover Pro 6 menu.

7) Push Advanced Tab.

8) Select Factory Restore.

9) If caution sentence about system restarting appear, press OK.

10) If system is rebooted, then operate Phoenix Recover Pro program.

11) Select Recover Boot Partition.

12) If display about request for acting, then select Yes.

13) After finishing system restoration, start Windows butting.

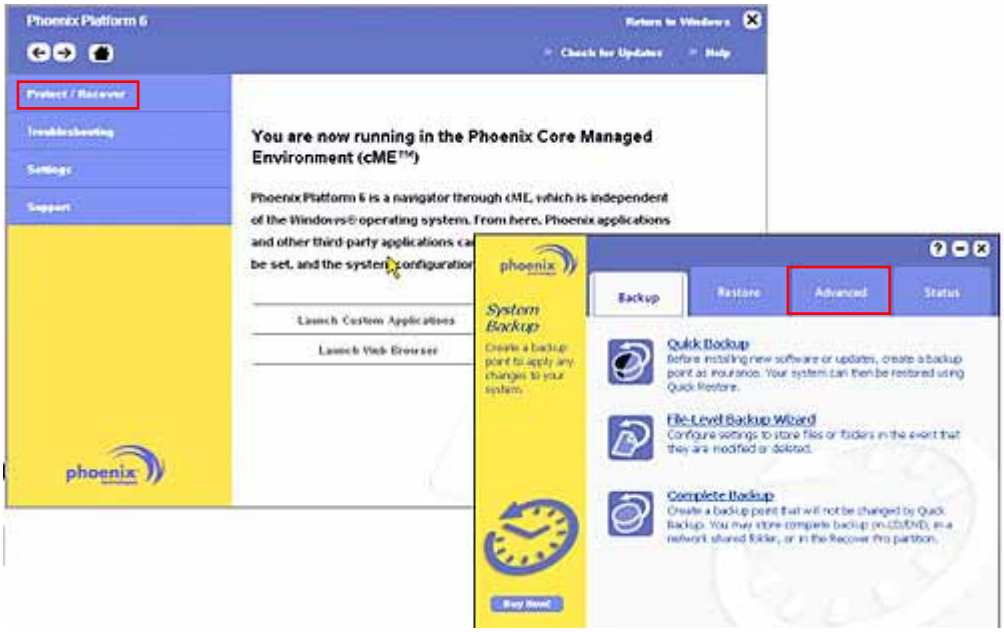

Fig 8-2 Phoenix Always

Virus Elimination

We present our customers for a vaccine licensed program about 1 year. (used as virus suspection and elimination)

- Vaccine Program : Kaspersky ® Antivirus 6.0

Note) License will be supplied in equipment. If you buy not us or agency but others routine, then license will not supply.
This license is only valid for 1 year.
If you want to extend period, you can extend through web site (www.kasperskylab.co.kr)

Note) We will not question about vaccine software supplied with bundle.

Contact us : LIG Nex1 Co., Ltd.
Prudential Tower 11F ~ 12F, 838
Yoksam-dong, Kangnam-gu, Seoul, Korea
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