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1

3.0 GHz Spectrum Analyzer

Product Specifications

In this chapter, the product specification of AT6030D Spectrum Analyzer will be explained.

Chapter 1. Product Specifications

1-1. Product Specifications

Frequency

- ► Range : 9 kHz to 3.0 GHz
- ► Resolution : minimum 1 Hz
- ► Span Range : 100 Hz / div to 300 MHz / div
  Selection of 1,2,5 steps (automatic), ZERO Span, FULL Span (9 kHz to 3.0 GHz)
- ► Frequency Selection : Start, Stop, Center, Span set-up
- ► Span Accuracy : ±3 % of the Indicated Span Width
- ► Readout Accuracy : ≤±(Indicated frequency × Reference frequency accuracy + Span × Span accuracy + 50% of RBW)
- ► Phase Noise : ≤−90 dBc/Hz @10 kHz offset

Amplitude

- ► Range : +20 dBm ~ −105 dBm
- ► Avg. Noise Level (1 kHz RBW, 10 Hz VBW)
  ≤−105 dBm : 150 kHz ~ 1 GHz
  ≤−100 dBm : 1 GHz ~ 2.4 GHz, 50 kHz ~ 150 kHz
  ≤−95 dBm : 2.4 GHz ~ 3 GHz
- ► Amplitude Unit : dBm, dBmV, dBuV, V, mV, uV, W, mW, uW
- ► Display Scale Linearity
  ≤±1.5 dB / 70 dB (10 dB / div), ≤±1.5 dB / 40 dB (5 dB / div)
  ≤±0.5 dB / 8 dB (1 dB / div), ≤±0.5 dB / 16 dB (2 dB / div)
- ► Frequency Response (0 dB attenuation) : −3.5 dB ~ 1.5 dB (100 kHz ~ 10 MHz)
  ±1.5 dB (10 MHz ~ 3 GHz)
- ► Reference Level
  Range : −90 dBm to +20 dBm
  Resolution : 0.1 dB step
  Accuracy : ±1.5 dB
- ► Second Harmonic Distortion : ≤−60 dBc, −40 dBm input
- ► Intermodulation Distortion : ≤−70 dBc, −40 dBm input

► Residual Spurious : ≤−85 dBm (Input terminated, 0 dB attenuation)

► Other Input Spurious : ≤−60 dBc, −30 dBm input

► Resolution Bandwidth

Selections : 1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, 300 kHz, 1 MHz, 3 MHz, 9 kHz, 120 kHz

Accuracy : ±20 %

Selectivity : 60 dB / 3 dB ratio < 15 : 1

60 dB / 6 dB ratio < 12 : 1 (9 kHz, 120 kHz)

Switching Error : ≤±1.0 dB (1 kHz Reference RBW)

Video Bandwidth : 10 Hz to 3 MHz in 1-3-10 step

Sweep

► Time : 100 ms to 1000 sec, 40 ms to 1000 sec (zero span)

► Accuracy : ≤±20 %

► Trigger Source : External (rear), Video, Free run, Line

► Trigger Mode : continuous, single

► Trigger Level : TTL level

Storage

► Trace Storage : maximum 900 waveforms

► Setup Storage : maximum 3,000 states

Screen Display

► Type : 6.4″ color TFT LCD screen

► Display Resolution : 640 (H) × 480 (V) active display area

► Marker Mode : Peak search, Delta marker, Marker to Center,

Marker to Reference (8 markers maximum)

Input

► RF Input Connector : N-type Female, 50 Ω nominal

► VSWR : 150 kHz to 3.0 GHz, VSWR < 1.5 : 1 (with 0 dBm Ref Level)

► Maximum Input Level : 0 Vdc, +20 dBm

Standard Frequency (10 MHz, Ref.)

- Temperature Stability : ±0.5 ppm
- Aging : ±0.5 ppm / Year
- Connector : BNC female
- Input Level : −5 dBm to +15 dBm
- Output Level : 10 MHz, +8 dBm nominal

Interface

- RS-232C
- Printer

  Driver : PCL3 or PCL5, HP, EPSON, SAMSUNG, CANON etc. supports most of printers

  Connector : for standard 25 pin female D-Sub parallel printer, support USB
- USB 2.0 Host

  Printer Driver : Supports most of printers including HP, EPSON, SAMSUNG, CANON, etc.

  USB Storage Device : supports 1.1, 2.0, for storing image files, supports GIF format
- Ethernet (Option)

  10-Base-T Ethernet : supports Internet remote control
- GPIB Interface (Option) : IEEE 488 bus

General Specifications

- Size : 350 (width) × 195 (height) × 375 (length) mm
- Weight : 10 kg
- Warming-up Time : More than 20 minutes for precise measurement
- Power

  Supply Electrical Power : 100-240 VAC at 50 / 60Hz

  Consumption Power : 80 watts maximum (when an option is not built in)
- Operating Temperature : 0 ℃ to 40 ℃
- Temperature for Storage : −20 ℃ to 70 ℃
- RF Emissions, Immunity

  RF emissions : EN 550011

AT6030D

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3.0 GHz Spectrum Analyzer

Preparation for Use

In this chapter, components of the analyzer and confirmation methods of packing state, and operation methods when the power was on for the first time, are included. Also, the requirements of power of the analyzer are explained.

Chapter 2. Preparation for Use

2-1. Initial Inspection

Please inspect all packing boxes and check if they contain all contents. Keep the packing box and packing materials until the inspection by an analyzer is completed.

There is information on accessories offered along with an analyzer in Table 2-1. Please contact ATTEN customer support center when the contents are lacking or there is something wrong with the analyzer.

If you need cleaning, please clean only with wet cloth.

WARNING ! **To prevent an electric shock, please separate main power supply of the spectrum analyzer before cleaning.**
Please clean the surface of the case with dry cloth or wet cloth.
Please do not clean the inside of the case.

[Table 2-1] Accessories Offered Along With an Analyzer

Name of Accessories	Explanation
Operating Manual CD	It will be basically offered.
Power Cable (AC Power Cable 3 Holes)	It will be basically offered.

2-2. Requirements for Power

This analyze is a portable device, and does not need the additionally established devices except for the connection with power.
You need not select line power.

[Table 2-2] Requirements for AC Power

Electric Pressure	100 - 120 VAC (50 - 60 Hz)
Electric Pressure	220 - 240 VAC (50 - 60 Hz)
Power Consumption When Using	Less than 80W

2-3. Fuse Check

When there is no spare fuse offered along with the device, the fuse to change should match the fuse in the fuse holder, power, and rating electric current (250 VAC, 3.15 A type T 5 × 20 mm).

A fuse should be established in the fuse holder located in the upper part of a power switch on the back board.

WARNING ! **To prevent the danger of fire, please use only the same type and rating of power fuse when changing it. The use of a fuse with different rating may incur the damage to the device.**

2-4. Power Cable

The analyzer uses a power cable with three lines in accordance with the international safety standard. When it is connected to a power socket concerned, this cable grounds a cabinet of the device.

When there is no grounded AC power socket, FG terminal on the rear panel should be grounded.

WARNING ! **Use a grounded power cable with three lines, or connect the analyzer to a protective ground.**
If you turn on the power without following these warnings, you might have the danger of electric shock.
Also, you need to check the electric pressure of power. When power exceeding the standard value, comes into the analyzer, the analyzer might be damaged or be caught in a fire.

2-5. Environment Conditions

The analyzer operates in 0 ℃ to 40 ℃ in general. However, in order to keep the best performance, it needs to avoid the following.

- Where there is severe vibration,
- Where there is high moisture,
- Where the device should be exposed to a direct ray,
- Where the electric pressure of power should be widely changed,

WARNING ! **If you use the analyzer in the normal temperature, after using or keeping it in a low temperature for a long time, there is a danger that it might get short-circuited due to condensation. Thus, in order to prevent such a danger, please do not supply power until the analyzer is fully dried.**

WARNING ! **In order to prevent the inner temperature of the device from rising, there is a freezing fan on the rear panel of the analyzer. You should leave at least 10 cm between the back panel and a wall or nearby device, or barrier, so that a ventilating hole does not get clogged.**

2-6. Turning on Power

Please connect a power code to the analyzer, before using the analyzer.

Please press the On key.

In order to use the analyzer, please check the operating temperature, and heat the analyzer for about 10 minutes before measuring.

When you intend to use an external 10 MHz signal as a standard frequency, please connect the external standard signal to a 10 MHz REF IN connector on the rear panel.
A signal level should be over -5 dBm.

AT6030D

3

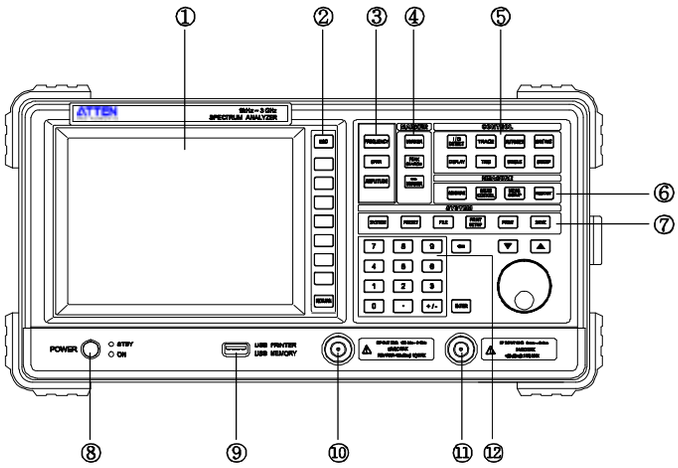
3.0 GHz Spectrum Analyzer

Starting

In this chapter, the function of the analyzer and outline of display indication will be explained. Also, you will learn the basic measuring methods.

Chapter 3. Starting

3-1. Function of a Front Panel



[Figure 3-1] Outline of a Function of a Front Board

1. It is 6.4″ TFT-LCD.
   It indicates wave type, parameter set-up, indicated value, and menu key label.

2. A menu key is beside a screen, and there is no label indicated on it. The menu key label appears in a form of a button on an LCD screen beside the key. Most of keys of which their labels are indicated on the front panel of the analyzer, can be used via the menu key with functions concerned.

3. FREQUENCY, SPAN, and AMPLITUDE keys activates the main functions of the analyzer, and make it possible to use menus with functions concerned.
   FREQUENCY key is an input part of frequency parameter data.
   SPAN key is an input part of span parameter data.
   AMPLITUDE key is an input part of amplitude parameter data.

4. MARKER function controls marker, reading frequency, and amplitude on the trace of the analyzer, and automatically finds out a signal of the highest amplitude.
   MARKER key is for setting a marker.
   PEAK SEARCH key is related to the peak search function.
   MARKER → This key is for setting a marker value as a specific parameter.

5. CONTROL function controls the broadband of resolution and sweep time, and make it possible to use a menu controlling a device display. Also, it makes it possible to set the variable of other analyzer necessary for measurement.
   I/O DETECT key is for setting input and output of a Ref. 10 MHz signal, and Detect Mode.
   TRACE key is related to the set-up of trace on an LCD screen.
   AUTOSET key is for searching for voluntary signal, and automatically setting a measuring parameter.
   BW/AVG key is for setting functions including RBW, VBW, and AVG.
   DISPLAY key is for setting a screen indicating functions.
   TRIG key is for setting a trigger function.
   SINGLE key is for performing the single sweep.
   SWEEP key is for setting a sweep time and sweep mode.

6. MEASURE makes it possible to use key menus for performing the measurement by the analyzer. Once the measurement gets started, you can use an additional menu key that defines the set-up of the current measurement function by using a MEAS SETUP key. MEAS CONTROL and RESTART make it possible to use additional measurement controlling function.
   MEASURE key is for performing the measurement function.
   MEAS CONTROL is for controlling the measurement function.
   MEAS SETUP key is for setting the measurement function.
   RESTART key is for restarting the measurement.

7. The function within a SYSTEM key, affects the entire state of the analyzer. You can make diverse set-up and arrangement by using this SYSTEM key.
   PRESET key is initializing the analyzer to an established state.
   FILE key menu makes it possible to save the current trace state in a memory of the analyzer or USB flash memory, or make it to be loaded from them.
   SAVE key immediately perform the currently defined saving function.
   PRINT SETUP menu key makes it possible to set printing stuffs.
   PRINT key immediately sends printing data to a printer.

8. This is a power switch. It is used when the main power switch on the back panel is on. If you lightly press the key, there comes the power under STBY condition. If you click the key for three seconds, it can revert to a STBY condition from the state of turning on of the power.

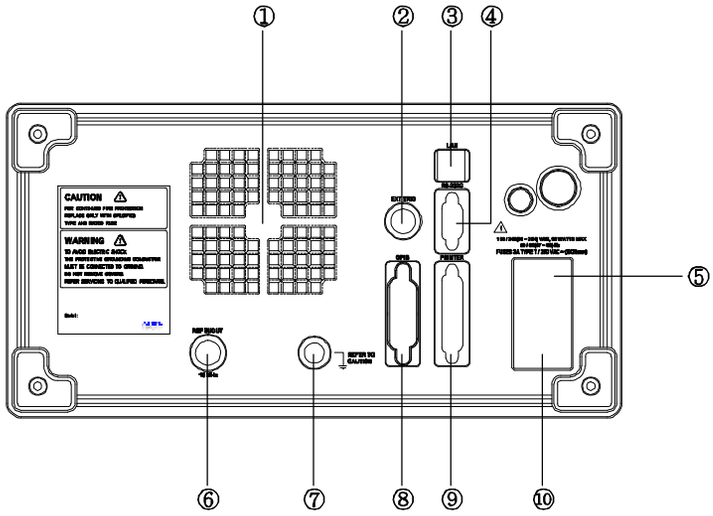
9. This is a USB Connector for USB Flash memory and USB printer.

10. It is a Tracking Generator or CDMA Signal Generator input connector.
    (It is not supplied when there is no option.)

11. It is an RF input connector.

12. A data controlling key including a step key, knob, and number key pad, makes it possible to change the value of the currently activated functions.
    The data controlling key is used for changing the value of functions including central frequency, starting frequency, resolution band, and a marker location.
    Data controlling changes the current functions in a stipulated way of functions concerned. For instance, the central frequency may adjust value precisely by using a knob, or change the value to be accurate value by using a step key or number key pad step by step.
    The knob makes it possible to successively change the functions such as central frequency, reference level, and a marker location. When you turn the knob clockwise, the value will go up. As for making successive changes, the scope of adjustment will be determined upon the scale of the scope of measurement.
    The knob makes it possible to change central frequency, starting or suspending frequency, or reference level. When the central frequency or reference level is adjusted, a signal may move from the right to the left, or goes up or down in accordance with the revolution of the knob before a new sweep is actually performed.
    The number key pad is used for inputting accurate value on the currently established functions of the analyzer. A decimal point might be used with a number part. If not, the decimal number will be located at the end of the number.
    The input of a number will be completed only when pressing a unit key. Once the input of the number gets started, a unit key label will appear on a menu key. The unit key will be changed upon the currently activated function. For instance, unit keys on frequency span are GHz, MHz, kHz, and Hz, and a unit key of reference level is dBm.

3-2. Function of a Rear Panel



[Figure 3-2] Outline of the Function of a Rear Panel

1. Fan cooling heats arisen from the inside of a device

2. External trigger input connector

3. Connector for communication via Ethernet

4. RS − 232C connector

5. AC main power switch (including fuse)

6. Input/Output connector of the standard frequency, When the external standard frequency is inputted in this connector, a user may be able to use this port by operating keys on a front panel.

7. Frame grounding circuit

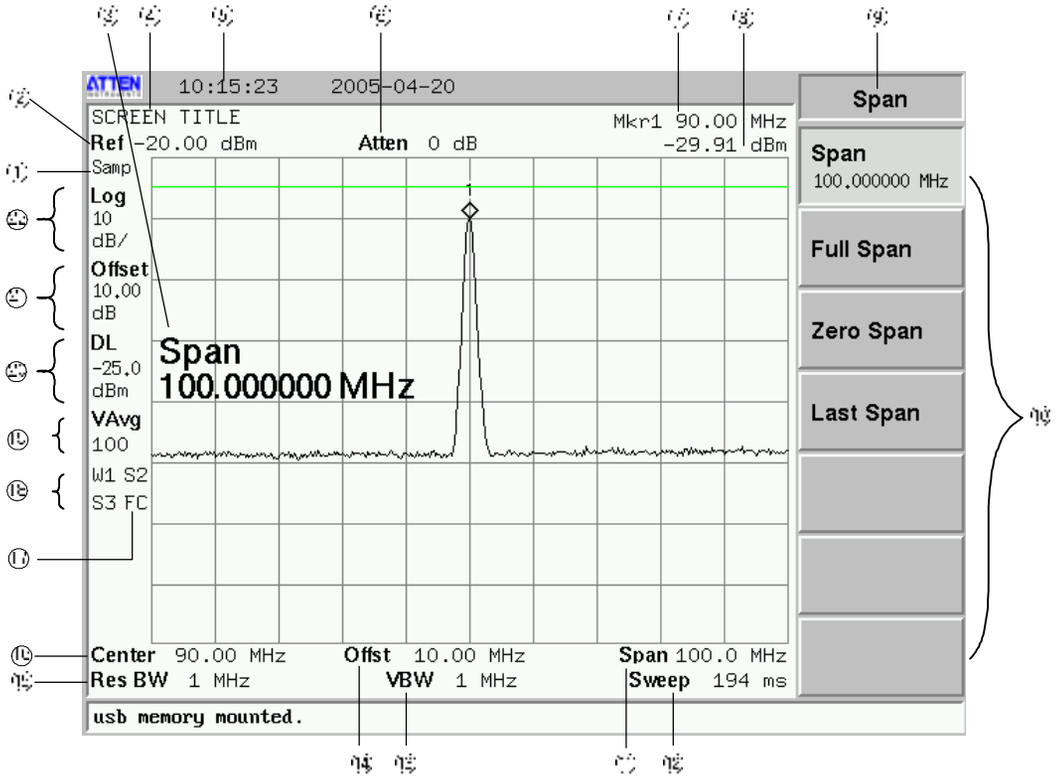
8. GPIB connector

9. Connector for the use of a printer

10. AC power switch connecting a power code offered (including a fuse)
    Includes two protective fuses for excessive electric current.

3-3. Explanation of a Display

The below is an example of an item that might be shown on a display of the analyzer. Please refer to the below explanation for the explanation for a display item. A function key indicates a key setting a function conforming to the item concerned.



[Figure 3-3] Indication of a Screen

[Table 3-1] Explanation of a Screen

Item	Explanation	Function Key
1	Detect mode	**I/O DETECT >> Detect**
2	Reference level	**AMPLITUDE >> Ref Level**
3	Activating function block	Subject to changes in accordance with the selection of a key
4	Screen title	**DISPLAY >> Title >> Change Title**
5	Time and date	**SYSTEM >> Time/Data**
6	Attenuation	**AMPLITUDE >> Attenuation**
7	Marker frequency	**Marker**
8	Marker amplitude	**Marker**
9	Menu title	Subject to changes in accordance with the selection of a key

Item	Explanation	Function Key
10	Menu	Subject to changes in accordance with the selection of a key
11	Frequency span or Stop frequency	**SPAN** or **FREQUENCY >> Stop Freq**
12	Sweep time	**SWEEP >> Sweep Time**
13	Video bandwidth	**BW/AVG >> Video BW**
14	Frequency offset	**FREQUENCY >> Freq Offset**
15	Resolution bandwidth	**BW/AVG >> Res BW**
16	Center frequency or starting frequency	**FREQUENCY >> Center Freq** or **FREQUENCY >> Start Freq**
17	Trigger / Sweep	**TRIG, SWEEP**
18	Trace mode	**TRACE**
19	Video avg.	**BW/AVG >> Average**
20	Display line	**DISPLAY >> Display Line**
21	Amplitude offset	**AMPLITUDE >> Ref Level Offset**
22	Amplitude scale	**AMPLITUDE >> Scale/Div**

[Table 3-2] Explanation of a Screen on Trace Mode

Screen Code	Explanation
W	Clear Write
M	Max Hold
V	View
S	Blank
m	Min Hold

[Table 3-3] Explanation of a Screen on Trigger Mode

Screen Code	Explanation
F	Free Run
L	Line trigger
V	Video trigger
E	External trigger

[Table 3-4] Explanation of a Screen on Sweep Mode

Screen Code	Explanation
C	Continuous sweep
S	Single sweep

3-4. Outline of a Key

All key labeled as FREQUENCY, SYSTEM and MARKER, are an example of a key on a front panel.
If you press a key on the front panel, a menu will appear on the right of the display LCD.

A menu shows functions other than functions that can be directly used by a key on the front board. If you intend to activate a menu concerned, please press a menu key concerned. The menu indicated will be changed in accordance with a key selected on the front panel.

When the value of the function concerned of the menu can be changed, it can be said that the function concerned becomes activated. The label of the activated function will be emphasized after the menu key concerned is pressed. For instance, please press AMPLITUDE key. Then, the function labeled with Ref level, which is a basic selection key on the amplitude menu will be activated. Next, Ref Level will show up on an activated function block, and you can input data.

Menus with the indication of on and off can be used for turning on and off of the functions concerned of the menus. If you intend to activate the function, please press a menu key so that there appears an underline below On. If you intend to inactivate the function, please press a menu key so that there appears an underline below Off.

Functions with the indication of Auto and Man can manually change value or can be automatically connected with other functions. The value of functions can be manually changed by using a number key pad, scroll knob, or step key. If you intend to automatically connect the functions, please press a menu key so that there can be an underline below Auto.

3-5. Measurement Methods

The 80 MHz standard signal of the inside of an analyzer can be used as a test signal.

1. First, please turn on the device by pressing On. Please wait until the work for power approval and alignment are completed.

2. Please press SYSTEM >> Power On/Preset >> Preset Type >> Factory in order, and select a Factory Preset.

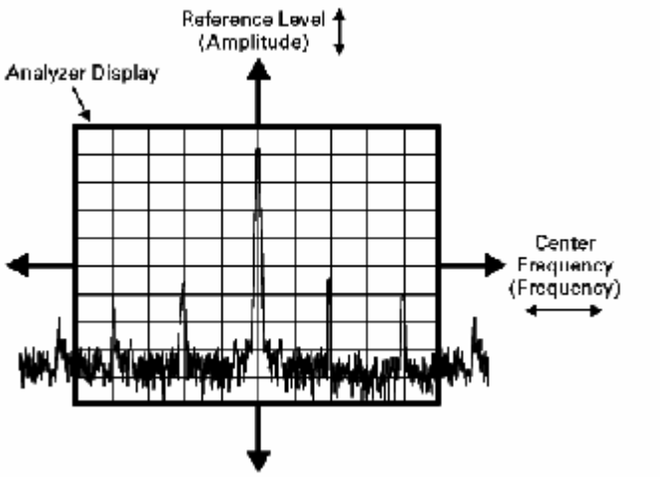
3. Please press a **PRESET** key. Turn on the 80 MHz standard signal of the inside of the analyzer by pressing **I/O DETECT >> Ref Out (On)**.

4. Please set frequency by pressing a **FREQUENCY** key.
   A Center Freq of a Frequency menu on the activated function block on the left of a screen becomes emphasized, and thus indicates that the center frequency function got activated. The activated function block is a space within the lattice on the screen showing an activated function message. The activated function value may be changed by using a scroll knob, step key, or number key pad. Please set the center frequency as 80 MHz by pressing 80 MHz with a number key pad. Also, you can use a scroll knob and a step key for setting the center frequency.

5. Please set a span by pressing a **SPAN** key.
   Span is indicated on an activated function block, and a span button on the span menu is emphasized, thus, they show that it is an activated function. Please reduce span to 20 MHz by using a scroll knob, or pressing a step down key (↓) or 20 MHz.

6. Please set amplitude.
   If the maximum value of a signal does not show up on a screen, please control the amplitude level on a screen. Please press an AMPLITUDE key. Ref Level 0.0 dBm will show up on an activated function block. Ref Level button will be emphasized, thus, it will show that reference level is an activated function. Reference level is the highest lattice on the screen, and is set as 0.0 dBm. When you change the value of this reference level, the amplitude level on the highest lattice line will be changed. If you want to arrange the maximum value of a signal on the upper part of a screen by using a scroll knob, a step key, or a number key pad, please use the reference level function. The

figure 3-4 fully shows the relationship between the central frequency and reference level. The box in the figure shows a display of the analyzer. The change of the center frequency changes the horizontal location of the display. The change of reference level changes the vertical location of a signal on the display. If you increase a span, the scope of frequency shown horizontal on the display will increase.



[Figure 3-4] Relationship Between Frequency and Amplitude

7. Please set a marker.

   The marker function measures the frequency and amplitude of a signal. You can find out the frequency and amplitude of a signal by placing a diamond-shaped marker on the maximum value of the signal.

   If you intend to activate the marker, please press a marker key. A normal button will be emphasized, thus, it shows that the marker is the activated function. Please place a marker on the maximum value of a signal by turning a scroll knob. Also, you can automatically place a marker on the peak of trace by using a PEAK SEARCH key.

   The decipherment result of the marker frequency and amplitude will show up on an activated function block, and on the upper right corner of the display. If you are to determine the amplitude of a signal, please check the decipherment result of the marker.

   When other function is activated, you can find the marker frequency and amplitude on the ecipherment result of the marker on the upper right corner of the display.

3-6. Summary of Measurement

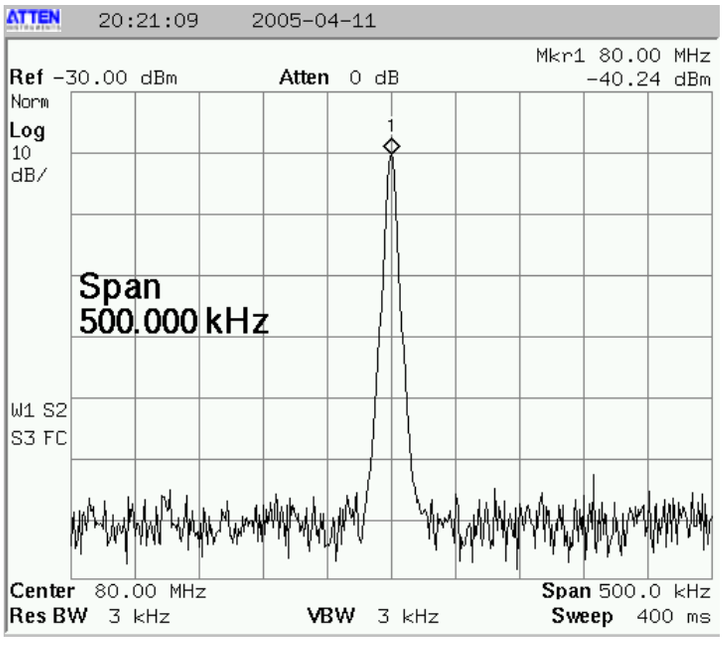
1. Please press **SYSTEM >> Power On/Preset >> Preset Type >> Factory** in order. Please press a PRESET key. Turn on the 80 MHz standard signal of the inside of the analyzer by pressing I/O DETECT >> Ref Out (On).

2. Please set the center frequency by pressing the following key : **FREQUENCY, 8, 0, MHz**

3. Please set a span by pressing the following key : **Span, 5, 0, 0, kHz**

4. The 80 MHz standard signal of the inside of the analyzer is about -40 dBm. Please adjust reference level to -30 dBm. If necessary, please activate reference level by pressing an amplitude key, and locate the signal on the upper side of a screen by changing reference level by using a scroll knob or step key.

5. Please determine the amplitude and frequency of a signal. You can move a marker to the maximum value of a signal by pressing PEAK SEARCH or MARKER. Please read amplitude and frequency. It should be indicated as the figure 3-5. The frequency is indicated horizontally, and the amplitude vertically.



[Figure 3-5] Decipherment of Amplitude and Frequency

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3.0 GHz Spectrum Analyzer

Menu Structures

In this chapter, the function of menus and the diagram of class will be explained by using menu structures.

Chapter 4. Menu Structure

4-1. Frequency

Frequency

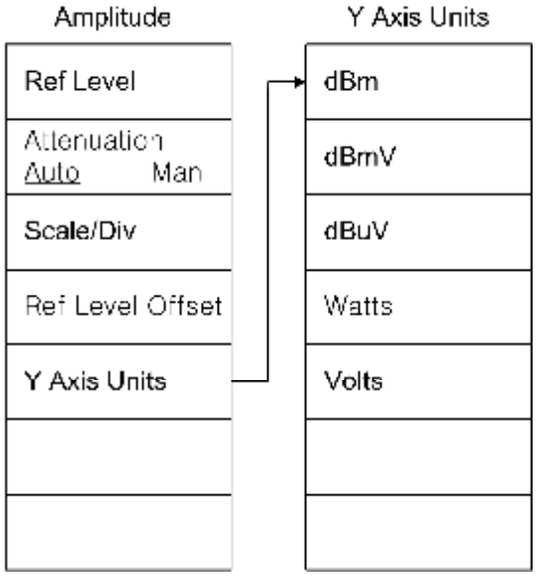
Center Freq
Start Freq
Stop Freq
CF step Auto Man
Freq Offset
Signal Track On Off

4-2. Span

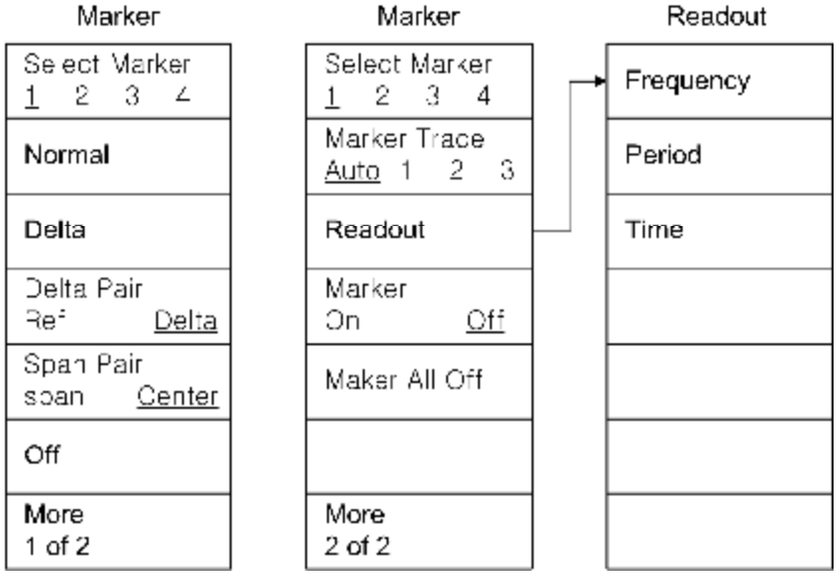
Span

Span
Full Span
Zero Span
Last Span

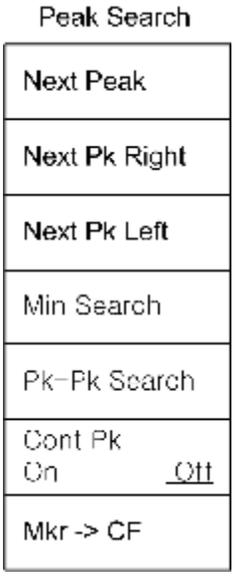
4-3. Amplitude



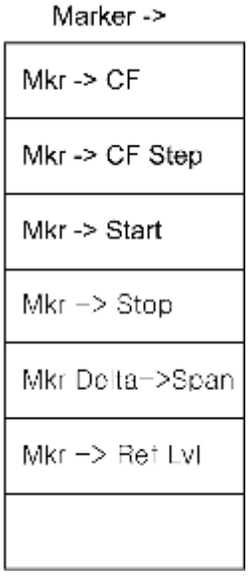
4-4. Marker



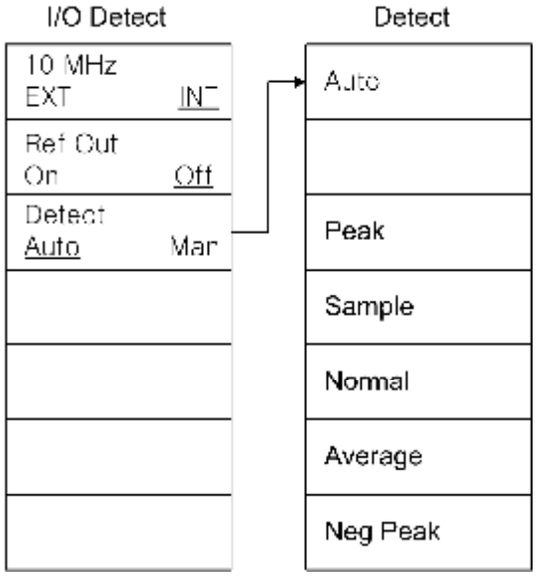
4-5. Peak Search



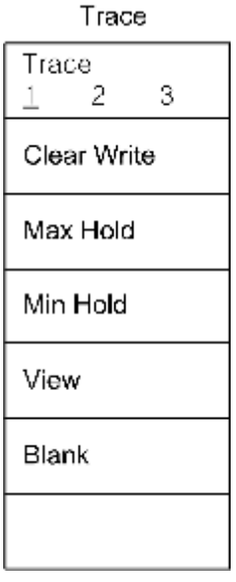
4-6. Marker →



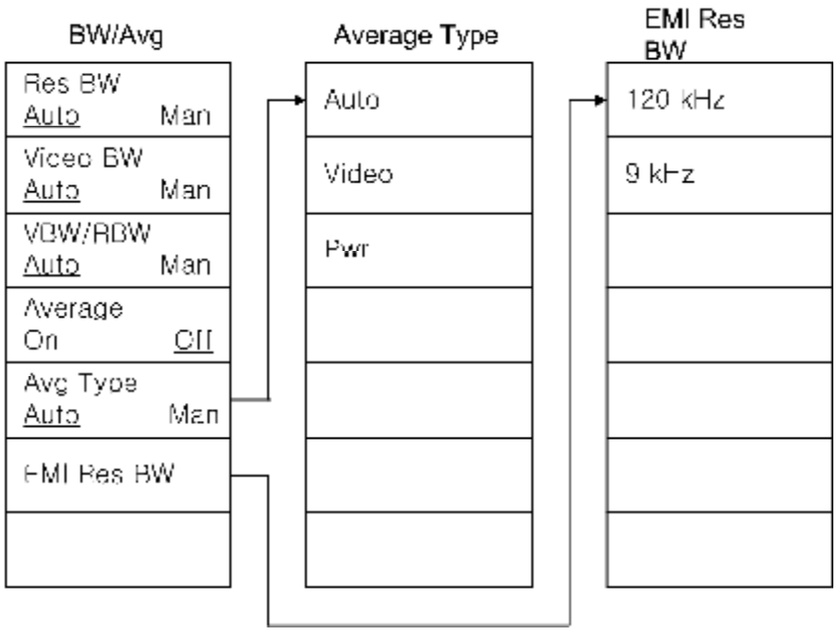
4-7. I/O DETECT



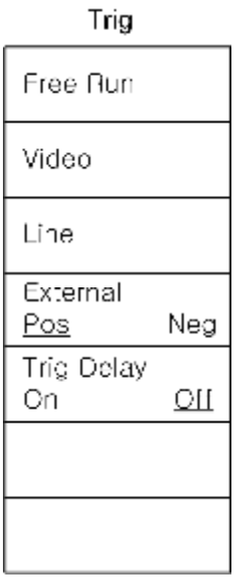
4-8. Trace



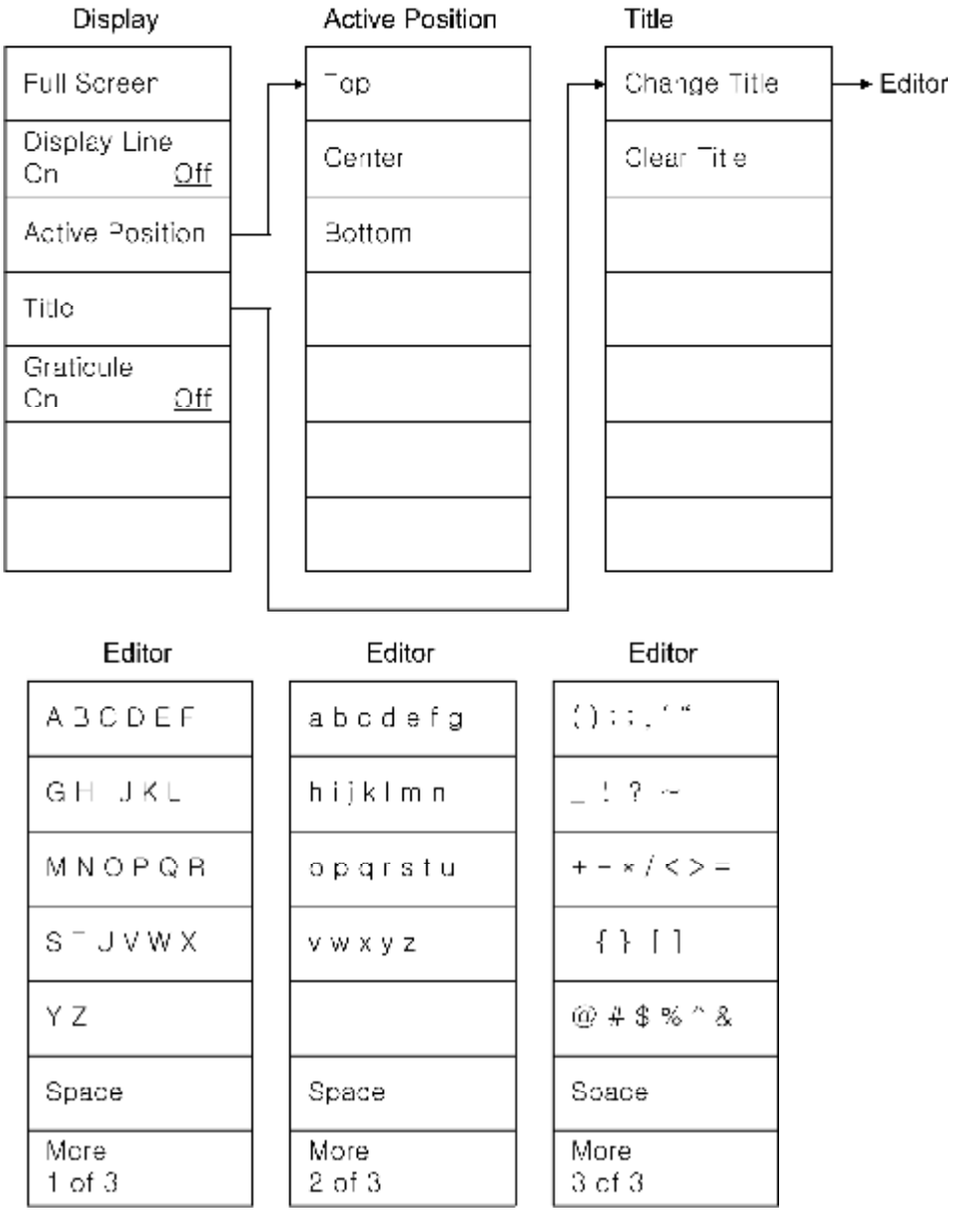
4-9. BW/Avg



4-10. Trig



4-11. Display


Display
Active Position
Title
Full Screen
Display Line On Off
Active Position
Title
Graticule On Off
Top
Center
Bottom
Change Title
Clear Title
Editor
Editor
Editor
Editor
A B C D E F
G H I J K L
M N O P Q R
S T U V W X
Y Z
Space
More 1 of 3
a b c d e f g
h i j k l m n
o p q r s t u
v w x y z
Space
More 2 of 3
( ) : ; , ' "
_ ! ? ~
+ - × / < > =
{ } [ ]
@ # $ % ^ &
Space
More 3 of 3

4-12. Sweep

Sweep

Sweep Time Auto Man
Sweep Single Cont

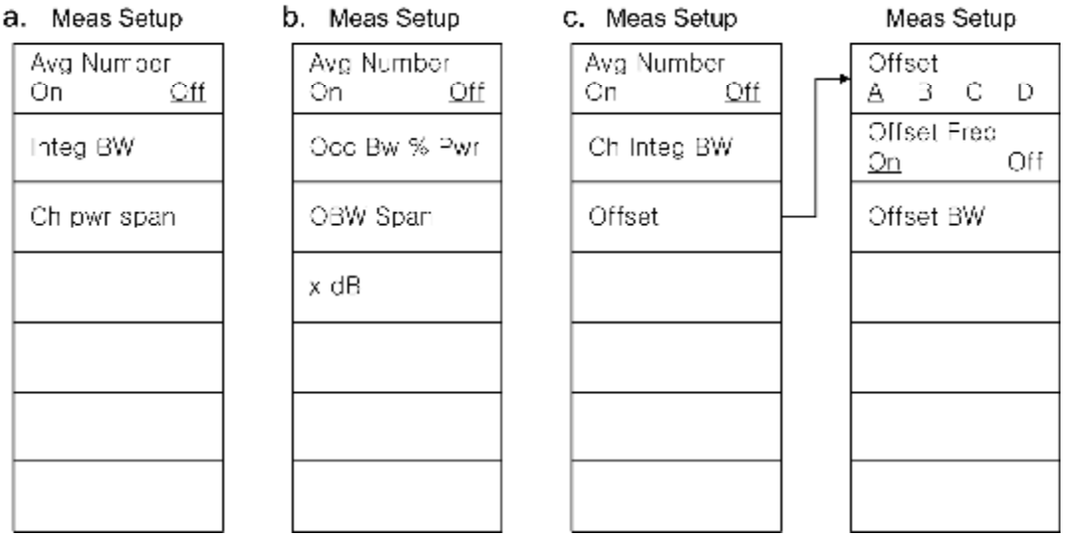
4-13. Measure

Measure

Meas Off
Channel Pwr
Occupied BW
ACP

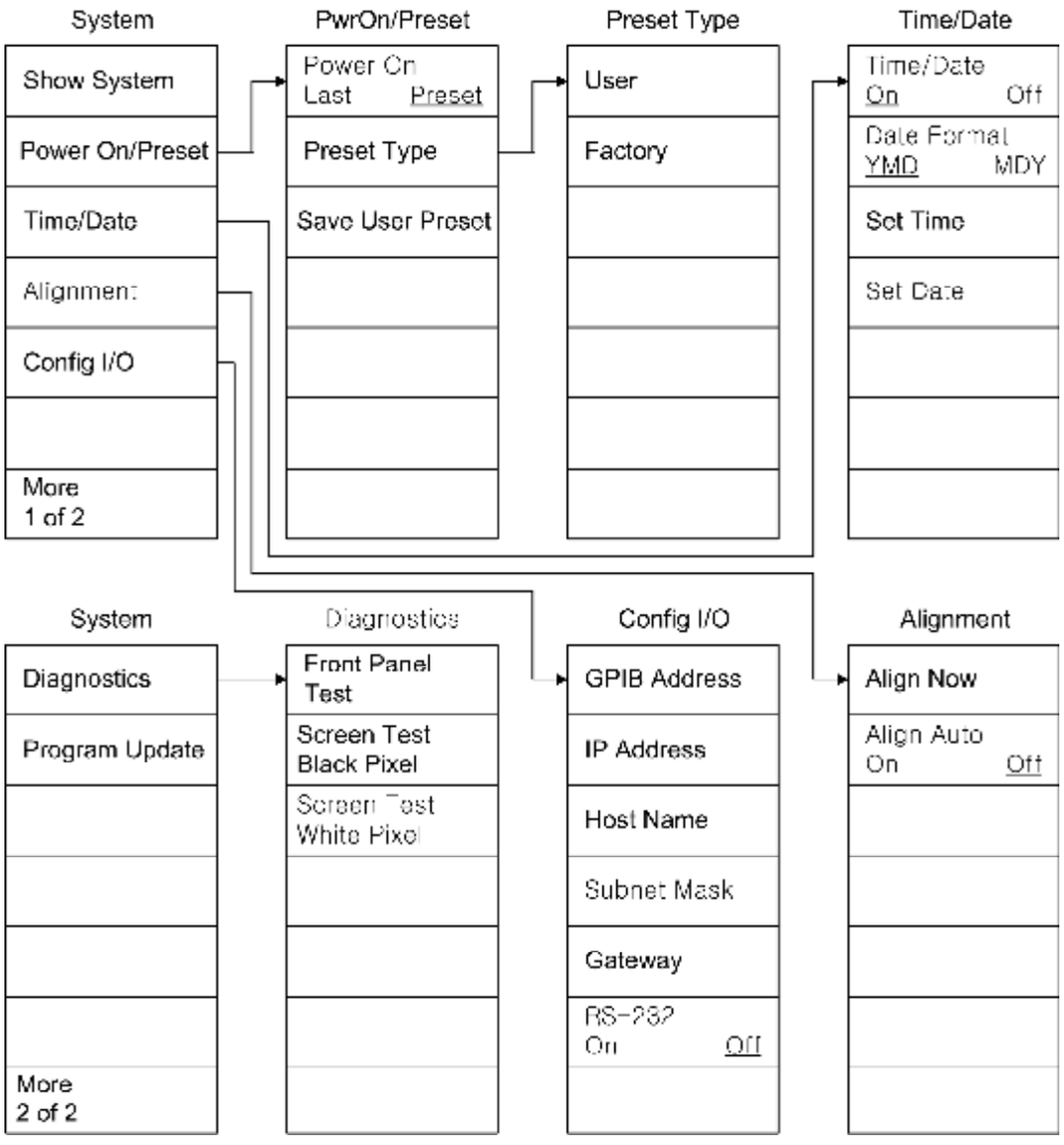
4-14. Measure Control

4-15. Measure Setup

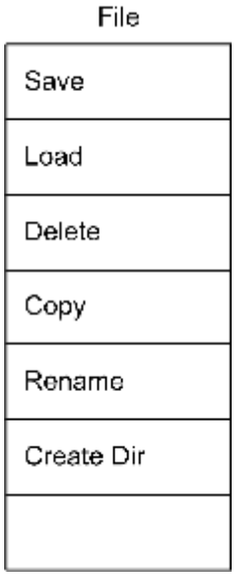


※ a. Channel Power / b. Occupied BW / c. ACP

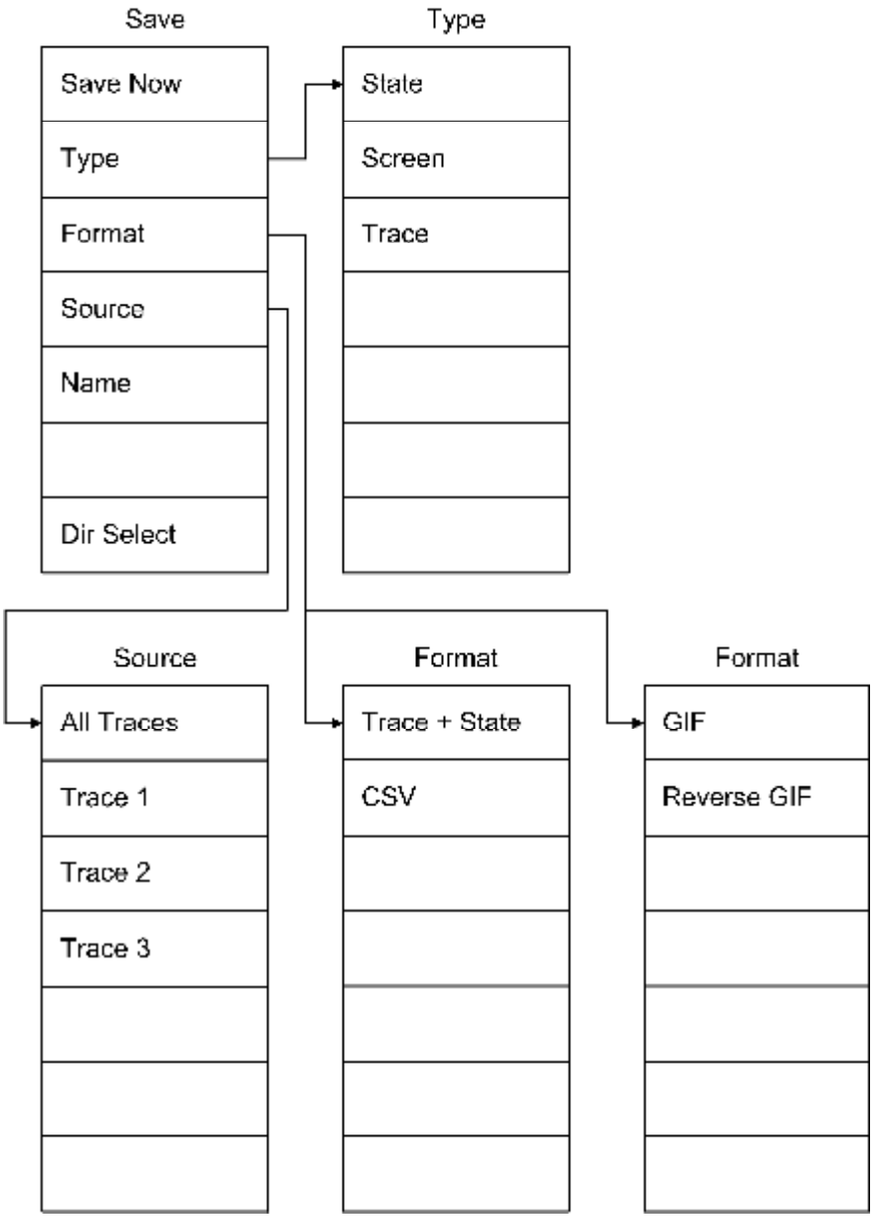
4-16. System


System
Show System
Power On/Preset
Time/Date
Alignment
Config I/O
More
1 of 2
PwrOn/Preset
Power On
Last Preset
Preset Type
Save User Preset
Preset Type
User
Factory
Time/Date
Time/Date
On Off
Date Format
YMD MDY
Set Time
Set Date
System
Diagnostics
Program Update
More
2 of 2
Diagnostics
Front Panel
Test
Screen Test
Black Pixel
Screen Test
White Pixel
Config I/O
GPIB Address
IP Address
Host Name
Subnet Mask
Gateway
RS-232
On Off
Alignment
Align Now
Align Auto
On Off

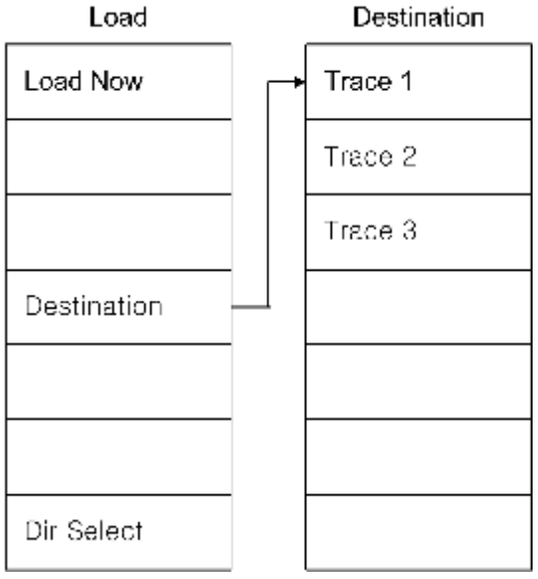
4-17. File



4-18. File (Save)

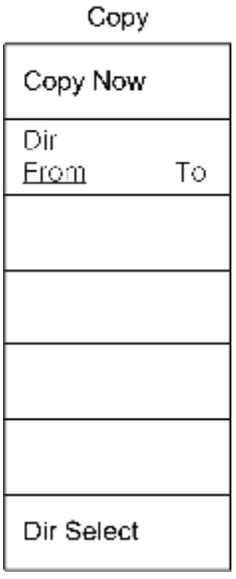


4-19. File (Load)

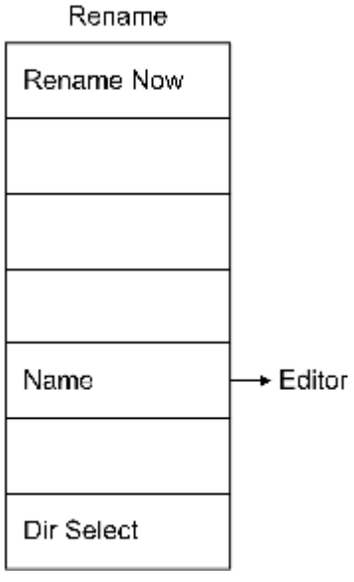


4-20. File (Delete)

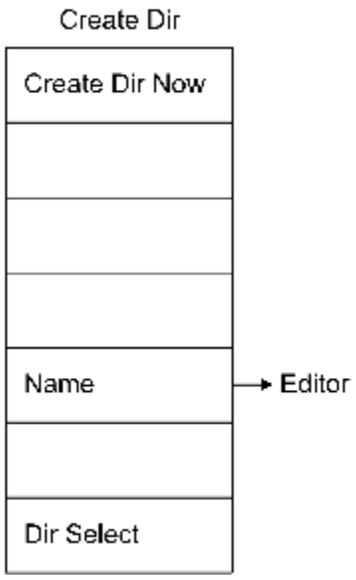
4-21. File (Copy)



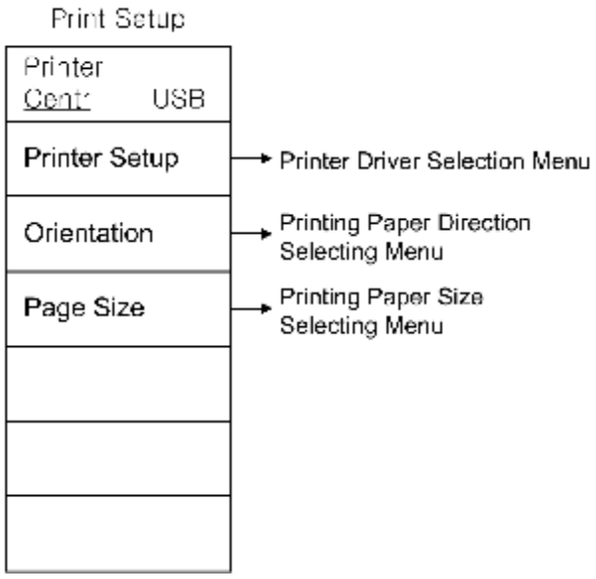
4-22. File (Rename)



4-23. File (Create Dir)



4-24. Print Setup



5

3.0 GHz Spectrum Analyzer

Explanation on the Front Key

In this chapter, keys on the front board will be arranged in alphabetical order, and explained with related menu keys.

Chapter 5. Explanation of a Key on the Front Panel

5-1. AMPLITUDE

It makes it possible to activate the function of changing reference level, and change menus related to amplitude. The amplitude menu indicates or corrects data on a vertical axis.

■ **Ref Level**

You can change reference level. This function is basically activated when you press an amplitude key. Reference level is a value expressed on the upper part of a lattice line on a display. If you change the value of reference level, the reference level indicated on the upper part of a lattice line on the display will be changed. You can change reference level by using a step key, a scroll knob, or a number key pad. If you press any number among 0 ~ 9 on a number key pad, a unit menu of the current reference level will appear.

AMPLITUDE >> Ref Level

■ **Attenuation Auto Man**

Set the value of input attenuation to a 10 dB unit. The input attenuation of the analyzer reduces the power level of an input signal entering the input mixer. When there appears an underline below Auto, the appropriate input value of attenuation will be automatically established in accordance with the currently established reference level. You can change the input attenuation value by using a step key, a scroll knob, or a number key pad.

If you press any number among 0 ~ 9 on a number key pad, a unit menu will appear.

AMPLITUDE >> Attenuation

■ **Scale/Div**

It sets the log unit on the vertical lattice sector on a display. The scope of Scale/Div value is 1 dB ~ 20 dB per vertical lattice sector, and can be changed by 1 dB unit. You can change the input attenuation value by using a step key, a scroll knob, or a number key pad. If you press any number among 0 ~ 9 on a number key pad, a unit menu will appear.

AMPLITUDE >> Scale/Div

■ **Ref Level Offset**

It adds the offset value to the currently indicated reference level. The reference level offset value can be inputted only on the same number key pad. If you input the reference level offset value, trace or input attenuation value will not be changed. The reference level offset is used when there is a gain or loss of level between the inputs of a device under test, and the analyzer. Accordingly, a signal level measured by the analyzer can be thought to be the input level of the device for changing external amplitude. When the reference level offset is inputted, the value will show up below the offset on the left of the screen. (it is different from the frequency offset indicated below the lower part of a display.) In order to remove offset, please press Ref Level Offset, 0, dB. Also, if you press Preset, the reference level offset value will be established as 0 dB.

AMPLITUDE >> Ref Level Offset

■ **Y Axis Units**

It displays a menu for changing an amplitude unit. You can change the amplitude unit by pressing dBm, dBmV, dBμV, Volts or Watts.

AMPLITUDE >> Y Axis Units

5-2. BW/Avg

It activates the resolution bandwidth function, and sets the bandwidth function and trace average function.

■ **Resolution BW Auto Man**

The 3 dB resolution bandwidth of the analyzer can be changed to 1 kHz ~ 3 MHz on 1. 3. 10. sequence by using a scroll knob or a step key. When a usable bandwidth is inputted on a number key pad, the most similar bandwidth will be used. When the resolution band decreases, a sweep time will increase for keeping the correction of amplitude.

Also, the resolution bandwidth is connected to a span. When a span decreases, the resolution band will also decrease. If the resolution bandwidth is changed, the video band will be changed for keeping the ratio of VBW/RBW when in automatic connection mode. When it is not connected, "#" mark will appear beside the Res BW on a display. If you intend to connect the resolution bandwidth again, please press Resolution BW(Auto), You can change the resolution bandwidth by using a step key, a scroll knob, or a number key pad. If you press any number among 0 ~ 9 on a number key pad, a unit menu will appear.

BW/AVG >> Res BW

■ **Video BW Auto Man**

You can change the analyzer post-detective filter up to 10 Hz ~ 3 MHz on 1. 3. 10 sequence by using a scroll knob or a step key. When the usable bandwidth is inputted on a number key pad, the most similar bandwidth will be used. When the video bandwidth decreases, a sweep time will increase for keeping the correction of amplitude. When it is not connected, "#" mark will appear beside VBW on the lower part of the analyzer display. If you intend to connect the resolution bandwidth again, please press Video BW(Auto), You can change the video bandwidth by using a step key, a scroll knob, or a number key pad. If you press any number among 0 ~ 9 on a number key pad, a unit menu will appear.

BW/AVG >> Video BW

■ **VBW/RBW Auto Man**

Select ratio between video bandwidth and resolution bandwidth. When a signal response near the noise level, is visually indicated, it can be established below 1 for reducing noise. A scroll knob and a step key change the ratio on 1, 3, 10 sequence. You can

change the ratio by using a step key, a scroll knob, or a number key pad. If you press any number among 0 ~ 9 on a number key pad, a unit menu will appear.

BW/AVG >> VBW/RBW

■ **Average On Off**

It turns on or off the trace average function. When the trace average function is on, and the detector is in automatic mode, it will be changed to the sample mode.

BW/AVG >> Average

■ **EMI Res BW**

It makes it possible to select among the resolution bandwidth of 120 kHz, 9 kHz. This function is established to be none, when the resolution bandwidth is established with other value by using a Resolution BW key.

BW/AVG >> EMI Res BW

■ **Avg Type Auto Man**

It displays a menu that makes it possible to select an average type.

- **Video**

  After taking the average of data in the current trace memory, put it on the trace memory again, and display it. When the average type video is selected, VAvg will be indicated on the left of display LCD.

  BW/AVG >> Avg Type >> Video

- **Pwr**

  After taking the average by converting data in the current trace memory, to a linear power level, then convert it again to a log scale, and then display it. When the average type is selected, PAvg will be indicated on the left of display LCD.

  BW/AVG >> Avg Type >> Pwr

5-3. Display

It is a menu setting the parts indicated including a title, display line, and the indication of lattice, on the analyzer.

■ **Full Screen**

It makes the measuring window indicated all over the display. If you press a key indicating a new menu, the full screen function will be cancelled.

DISPLAY >> Full Screen

■ **Display Line On Off**

It activates the display line. The value of the display line is indicated on the activated function block, or on the left of the display. The display line can be adjusted by using a step key, a scroll knob, or a number key pad. If you press any number among 0 ~ 9 on a number key pad, a unit menu will appear. If you intend to turn off the display line, please press Display Line(Off).

DISPLAY >> Display Line

■ **Active Position**

It makes it possible to change the location of the activated function block on a display.

DISPLAY >> Active Position

■ **Title**

It makes it possible to change or delete the title of a display.

- **Change Title**

  It enables you to write a title on a title indication line on the upper part of a display. If you press Change Title, the Alpha Editor menu including usable letters and signs will appear. The title of a display will be kept until you press the change title again, or withdraw trace saved along with the previous title.

  You can delete the display title by using the delete function.

  DISPLAY >> Title >> Change Title

- **Clear Title**

  Delete the title on the title indication line on the upper part of a display. Once deleted, it cannot be restored again.

  DISPLAY >> Title >> Clear Title

- **Graticule On Off**

  It turns on or off the display.

  DISPLAY >> Graticule

5-4. File

It is a menu usable for loading, saving, and managing data from the memory inside the analyzer. The file menu key opens a conversation box equivalent to the function selected.

■ **Save**

It enables you to save the analyzer state, trace, and screen data on the internal memory. If you intend to save the file, please perform the following steps.

1. Pleases select data type to save by pressing a menu key concerned. As for trace, you should select 1. 2. 3 or all on a source menu key.

2. Pleases select a format you want in a Format conversation box

3. If you intend to change a file name to save, please change the name by using a name menu key.

4. Please press a save now menu key after determining a location to save. When changing a directory to save, please change the location to save by using a step key and a dir select menu key.

- **State**

  The state file saves the set-up of a device. You can save the analyzer state on a memory with State.

- **Trace**

  Trace can be saved independently or along with the analyzer state. Although CSV type can

be read in a form of a spread sheet of a PC, it cannot be drawn to the analyzer. If you save trace 1. 2 or 3, the trace selected can be saved along with the state. If you save the trace as All, the trace are all saved along with State in a .trc single file.

- **Screen**

  It enables you to save a screen image on a file, and to select GIF and Reverse GIF file format. The screen image cannot be read with the analyzer.

■ Load

You can load the analyzer state and trace from the internal memory to the analyzer.
If you intend to load a file, please perform the following steps.

1. Put a select bar on a file to load by using a step key. You cannot load GIF file by the analyzer. As for trace file, please select trace 1. 2 or 3 on Destination.

2. If you are ready to load, please press a Load Now menu key.

- **State**

  The state file includes the set-up of the analyzer. If you load the state, the most of set-up is restored to the value previously saved.

- **Trace**

  Trace can be loaded along with the analyzer state when saved. If you load Trace, it will be in View mode. If you load Trace, it will go to Trace 1 except for Trace All returning to a location of the state that each trace is saved. Trace + State type only can be loaded.

■ Delete

It deletes a file as a memory of the analyzer.

■ Copy

It copies a file on other directories of the internal analyzer or USB flash memory.

■ Rename

It changes a file name.

■ **Create Dir**

It creates a new directory on the internal memory of the analyzer.

5-5. FREQUENCY

It activates the center frequency set-up function, and displays the menu of the frequency function. The value of the center frequency or starting and stop frequency are shown below the lattice of the display.

The analyzer allows the frequency input of the scope exceeding the designated frequency. However, it prohibits the use of frequency exceeding the scope of frequency of the analyzer.

■ **Center Freq**

It sets the center frequency. The center frequency can be changed by using a step key, scroll knob, or a number key pad. If you press any number among 0 ~ 9 on a number key pad, a unit menu will appear.

FREQUENCY >> Center Freq

■ **Start Freq**

It sets the start frequency. The left and right of the lattice conform to the start and stop frequencies. When the function of changing this start frequency gets activated, the start frequency and stop frequency will be indicated on a location indicating the center frequency under the lattice and a span. The start frequency can be changed by using a step key, scroll knob, or a number key pad. If you press any number among 0 ~ 9 on a number key pad, a unit menu will appear.

FREQUENCY >> Start Freq

■ **Stop Freq**

It sets the stop frequency. The left and right of the lattice conform to the start and stop frequencies. When the function of changing this stop frequency gets activated, the start frequency and stop frequency will be indicated on a location indicating the center frequency under the lattice and a span. The stop frequency can be changed by using a step key, scroll knob, or a number key pad. If you press any number among 0 ~ 9 on a number key pad, a unit menu will appear.

FREQUENCY >> Stop Freq

■ **CF Step Auto Man**

It changes the center frequency step. The scale of the center frequency step is changed, and the center frequency button on the frequency menu is emphasized, thus, the center frequency function gets activated. Then, a step key will change the center frequency in accordance with the scale of the center frequency step. The center frequency step function is useful for finding out harmonics or side band exceeding the current frequency span of the analyzer. When selecting Auto, the scale of the center frequency step will be established as one lattice (10% of a span). It can be changed by using a step key, scroll knob, or a number key pad. If you press any number among 0 ~ 9 on a number key pad, a unit menu will appear.

FREQUENCY >> CF Step

■ **Freq Offset**

It enables you to input the frequency offset value. The offset can be inputted only in a number key pad. Even if you input the offset, there is no change in trace. If you intend to remove the offset, please press Freq Offset, 0, Hz. When the frequency offset is inputted, the value will show up on the lower part of the display. (it is different from the reference level offset indicated on the left of the display.)

FREQUENCY >> Freq Offset

■ **Signal Track On Off**

When it is On, the peak of the current trace memory is indicated in the center after the sweep is over. Signal Track function gets inactivated in a zero span.

FREQUENCY >> Signal Track

5-6. I/O DETECT

■ **10 MHz**

It selects the use of the 10 MHz standard signal of the analyzer. When Int(Internal) is selected, use the standard signal of the inside of the analyzer, and output the 10 MHz standard signal with a port on the back. When Ext(External) is selected, use a signal coming into the standard frequency input/output port on the back as the 10 MHz standard frequency.

I/O DETECT >> 10 MHz

■ **Ref Out (f = 80MHz) On Off**

It turns on or off the internal 80 MHz standard signal. When the internal amplitude standard signal is on, RF input cannot be used.

I/O DETECT >> Ref Out

■ **Detect**

It enables you to select among Peak, Sample, Normal, Average, and Neg Peak detection modes.

- **Peak**

  When selected, the peak is shown on the upper part of the left of the display. The detection of the peak is mainly used for detecting a signal on the noise level.

  Find out the maximum level between the current display indicating point and the next indicating point, and save the level on a trace memory where it meets the current indicating point.

- **Sample**

  When selected, the Samp is shown up on the upper part of the left of the display.

  The detection of a sample is used for indicating noise or a signal similar to noise.

  The inspecting signal level on the current display point is saved on a trace memory.

- **Normal**

  When selected, the Norm is shown up on the upper part of the left of the display.

  The detection of normal is the detection mode combining the accurate signal measurement of the peak, and the noise display function of the detection of a sample.

- **Average**

  When selected, the Avg is shown up on the upper part of the left of the display. It saves the average data between the detection of the Peak and the Neg Peak. It is used for reducing VBW or irregular noise without using the trace average function. This function makes the indication of the averaged value to be with swifter sweep speed.

- **Neg Peak**

  When selected, the NPk is shown up on the upper part of the left of the display.

  The detection of the Neg Peak is used for searching for a similar signal below the noise level. Find out the minimal level between the current display indicating point and the next indicating point, and save the level on a trace memory where it meets the current indicating point.

  I/O DETECT >> Detect

5-7. Marker

You can turn on or off by selecting a marker type and number. The marker is a diamond-shaped letter showing a point. There can be four couples of markers at the maximum on the display at the same time. Only one couple can be controlled at one time. The marker controlled is called “activated” marker. If you press Marker, the Normal menu key gets activated.

■ **Select Marker 1 2 3 4**

Select one marker among 4 markers. Then, a marker already on, is activated when selected. When the marker is designated to a different trace while it is already on, the marker will be inactivated on trace concerned when selected.

MARKER >> Select Marker

■ **Normal**

When the marker is not yet indicated, a single frequency marker on the currently selected marker will be activated on the center frequency. When the marker is already indicated, it becomes activated on a selected location. The marker number is indicated on the marker. The indications on the activated function block and the right of the display show the frequency and amplitude of a marker. If you press Normal, the Delta function goes out, and the activated marker moves to the location of the Delta marker.

MARKER >> Normal

■ **Delta**

The second marker gets activated on the location of the first marker. (When there is no marker, two markers appear on the center of the display.) The amplitude and frequency of the first marker were fixed. The marker number is indicated on the Delta marker, and the same number is indicated on the standard marker as R. (For instance, 1R) The indications on the activated function block and the right of the display show the difference between the frequency and amplitude of two markers.

MARKER >> Delta

■ **Delta Pair Ref Delta**

It converts to a mode that two markers can be independently adjusted. When you press Delta Pair, there is a conversion between Reference marker and Delta. The reference

marker number is indicated on the marker as R, (for instance, 1R) and Delta marker is indicated as a marker number.

MARKER >> Delta Pair

■ **Span Pair Span Center**

It converts to a mode that two markers can be independently adjusted. If you press Span pair, there is a conversion between a span and the center marker. The reference marker number is indicated on the marker as R, (for instance, 1R) and Delta marker is indicated as a marker number. If you adjust a span, the difference between the two markers will be changed. If you change the center, the center point of the two markers will be changed.

MARKER >> Span Pair

■ **Off**

Turn off the selected marker with Select Marker 1 2 3 4 keys. It removes a marker indication on the display.

MARKER >> Off

■ **Marker Trace Auto 1 2 3**

It designates a marker on trace. If you press Marker Trace Auto 1 2 3, a marker on trace 1 will be activated when there is no marker on. While the marker is currently activated, press Marker Trace Auto 1 2 3 until there shows up an underline on 1, 2, or 3. The current activated marker will move to selected trace. If you select Auto mode, the marker will automatically move to the selected trace.

MARKER >> Marker Trace

■ **Readout**

It changes the activated marker value.

- **Frequency**

  It sets the marker value as frequency. It is a basic value when it is not on zero span,

  The following keys are used.

- **Period**

  It sets the marker value as a period. It shows the reverse value of the frequency.

- **Time**

  It sets the marker value as a time. It is a basic value when it is on zero span.

  MARKER >> Readout

■ **Marker Table On Off**

It shows a marker table on the display. The information includes marker number, trace number, X axis value, and the amplitude.

MARKER >> Marker Table

■ **Marker All Off**

It turns off all markers. Also, it deletes the marker indication.

MARKER >> Marker All Off

5-8. Marker →

■ **Mkr → CF**

It sets the marker frequency as the center frequency. On Delta marker mode, Mkr → CF sets the center frequency as the marker delta value. Mkr → CF cannot be used when it is on zero span.

MARKER → >> Mkr → CF

■ **Mkr → CF Step**

It changes the scale of the center frequency step so that it can match the activated marker value. In order to see the scale of the step, please press FREQUENCY >> CF Step. As for marker delta mode, the scale of the step is established as the difference between a marker and the frequency. Mkr → CF Step cannot be used when it is on zero span.

MARKER → >> Mkr → CF Step

■ **Mkr → Start**

It sets the marker frequency as the start frequency. On delta marker mode, Mkr → Start sets the start frequency as the marker delta value. Mkr → Start cannot be used when it is on zero span.

MARKER → >> Mkr → Start

■ **Mkr → Stop**

It sets the marker frequency as the stop frequency. On delta marker mode, Mkr → Stop sets the stop frequency as the marker delta value. Mkr → Stop cannot be used when it is on zero span.

MARKER → >> Mkr → Stop

■ **Mkr Delta → Span**

It sets the start and stop frequencies as the delta marker. Mkr Delta → Start cannot be used when the marker is off, or is on zero span.

MARKER → >> Mkr Delta → Span

■ **Mkr Delta → CF Step**

It sets the difference between markers as the scale of the center frequency. If you want to see the scale of the step, please press FREQUENCY >> CF Step. Mkr Delta → CF Step cannot be used when the marker is off, or is on zero span.

MARKER → >> Mkr Delta → CF Step

■ **Mkr → Ref Lvl**

It sets the analyzer so that reference level can be the amplitude of a marker. On delta mode, Mkr → Ref Lvl sets the reference level as the difference of amplitudes between markers.

MARKER → >> Mkr → Ref Lvl

5-9. Meas Control

It enables you to temporarily stop the power measurement function usable on a measure key menu, or resume it. Also, the Meas Control enables you to select continuous sweep or single sweep.

■ **Restart**

It repeats measurement from the beginning.

MEAS CONTROL >> Restart

■ **Measure Cont Single**

Measure(Single) indicates the measurement result through one-time measurement sweep. Measure(Cont) successively performs measurement, and shows the result by every measurement sweep.

MEAS CONTROL >> Measure

■ **Pause**

It temporarily stops measurement. If you press Pause, it makes conversion between the temporary pause of measurement and resume.

The key label makes conversion between Pause and Resume.

MEAS CONTROL >> Pause

■ **Resume**

It resumes the temporarily suspended measurement. The key label makes conversion between Pause and Resume.

MEAS CONTROL >> Resume

5-10. Meas Setup

It indicates the measurement set-up menu. The indicated set-up menu shows differently in accordance with selected measurement (ACP, Channel Power, Occupied BW, etc.) on the measure menu.

■ ACP Meas Setup

It sets the adjacent channel power measurement function.

- **Avg Number On Off**

  In order to designate the average measurement number, please press Avg Number (On). When each sweep is over, the average value will appear. Avg Number (Off) inactivates the average measurement.

  MEAS SETUP >> Avg Number

- **Ch Integ BW**

  It designates the scope used in calculating the power on the center channel.

  MEAS SETUP >> Ch Integ BW

- **Offset BW**

  It designates the scope used in calculating the power on the adjacent channel.

  MEAS SETUP >> Offset >> Offset BW

- **Offset Freq**

  It designates the difference between the center frequency of the center channel, and the center frequency of the adjacent channel.

  MEAS SETUP >> Offset >> Offset Freq

■ Channel Power Meas Setup

It sets the channel power measurement function.

- **Avg Number On Off**

  In order to designate the average number, please press Avg Number (On). The average value will appear when each sweep is over. Avg Number (Off) inactivates the average measurement.

MEAS SETUP >> Avg Number

- **Integ BW**

  It sets the scope of making calculation of channel power.

  MEAS SETUP >> Integ BW

- **Chan pwr span**

  It sets the span of the analyzer on the channel power measurement.

■ Occupied BW Meas Setup

It sets the occupied bandwidth measurement function.

- **Avg Number On Off**

  In order to designate the average number, please press Avg Number (On). The average value will appear when each sweep is over. Avg Number (Off) inactivates the average measurement.

  MEAS SETUP >> Avg Number

- **OBW span**

  It sets the span of the analyzer on the occupied bandwidth measurement.

  MEAS SETUP >> OBW Span

- **Occ BW % Pwr**

  It changes the ratio of signal power used for determining the occupied bandwidth.

  MEAS SETUP >> Occ BW % Pwr

5-11. MEASURE

It performs diverse measurement functions including the adjacent channel power, channel power, and occupied bandwidth

■ **Meas Off**

It turns off the measurement function.

MEASURE >> Meas Off

■ **ACP**

It calculates power in the center and adjacent channel of a signal. A marker point can be established as a measurement set-up menu while ACP is selected.

If you press Meas Setup while ACP is selected, you can set the adjacent channel power measurement parameter. If you press Meas Control when ACP is selected, the measurement can be temporarily suspended or resumed or makes conversion between continuous or single modes.

MEASURE >> ACP

■ **Channel Power**

It calculates power and power spectrum density on a channel bandwidth designated by a user. A marker on the display indicates the end of the channel bandwidth. The marker selects Channel Power, and can be established as a Meas Setup menu. It operates on single or continuous sweep mode.

If you press Meas Set-up after selecting Channel Power, you can set the channel power measurement parameter. If you press Meas Control after selecting Channel Power, you can temporarily suspend or resume measurement or make conversion between continuous or single sweep modes.

MEASURE >> Channel Pwr

■ **Occupied BW**

The basic value of measurement is 99% of occupied bandwidth power. The measurement operates on single or continuous sweep mode.

If you press Meas Set-up after selecting Occupied BW, you can set the occupied bandwidth power measurement parameter. If you press Meas Control after selecting Occupied BW, you can temporarily suspend or resume measurement or make conversion between continuous or single sweep modes.

MEASURE >> Occupied BW

5-12. Preset

It sets the state of the analyzer to the state of being delivered from a factory, while pressing Preset (when Preset (Factory) is selected). As for the set-up of the state of a free set, please refer to the following table of conditions of free set. If you are to select Preset (Factory), press SYSTEM >> Power On/Preset >> Preset Type (Factory).

[Table 5-1] Conditions of Free Set

Amplitude Unit	dBm
Indication and Lattice Display	On
Attenuation	30 dB
Center Frequency	1.5 GHz
Start Frequency	0 Hz
Stop Frequency	3.0 GHz
CF Step	10% of a span
Detect	Normal
Display Line	-25 dBm, display turns off.
Frequency Offset	0 Hz
Log Scale	10 dB per sector
Reference Level	0 dBm
Reference Level Offset	0 dB
Marker	Off
Resolution Bandwidth	3 MHz (Auto)
Video Bandwidth	3 MHz (Auto)
VBW/RBW Ratio	1.000
Video Avg.	Off
Span	3.0 GHz
Sweep	Continuous
Title	Clear
Trace 1	Clear-Write
Trace 2	Blank
Trace 3	Blank
Trigger	Free Run

5-13. Print

Please press a print key if you want to immediately output the screen with the currently defined printer. The screen will remain temporarily suspended until the data transmission is completed.(there is no more sweep proceeded.) As for the set-up of a printer, please refer to the explanation of a Print Set-up key in this chapter.

5-14. Print Setup

It defines a printer, and selects a printer option.

■ **Printer**

Determine whether to output printed data via a Centronics printer port or USB printer port.

PRINT SETUP >> Printer

■ **Printer Setup**

Select a printer driver concerned on the inside of the analyzer.

PRINT SETUP >> Printer Setup

■ **Orientation**

Select between Portrait or Landscape print.

PRINT SETUP >> Orientation

■ **Page Size**

Select a paper to print.

PRINT SETUP >> PageSize

5-15. Return

It returns to the previous menu. If you repeatedly press this key, it will return to the menu previously selected.

5-16. Peak Search

It moves a marker to the maximum label by detecting the largest label among waves outputted from the current screen, in the entire trace. If there is no peak, the marker will not move. When there is no mark indicated, marker 1 will appear.

■ **Next Peak**

It detects the second largest peak next to the current marker label, and moves it to the place. If you successively performs it, you can detect the peak that you can find the next, and move the marker to each peak.

PEAK SEARCH >> Next Peak

■ **Next PK Right**

It moves to the next peak of the right of the current marker. In order to be recognized as the signal peak, the level of the signal should be moved after it increase or decrease as much as the value of excursion (6 dB). When there is no peak on the right, the marker does not move.

PEAK SEARCH >> Next PK Right

■ **Next PK Left**

It moves to the next peak on the left of the current marker. In order to be recognized as the signal peak, the level of the signal should be moved after it increase or decrease as much as the value of excursion (6 dB). When there is no peak on the left, the marker does not move.

PEAK SEARCH >> Next PK Left

■ **Min Search**

It moves a marker on the current trace to the minimal level.

PEAK SEARCH >> Min Search

■ **PK-PK Search**

It finds out and indicates the difference between frequencies between the highest tracer point and the lowest tracer point (or when the span is 0), and the amplitude.

PEAK SEARCH >> PK-PK Search

■ **Continuous Pk On Off**

When it is On, the marker is located on the highest level of trace, and when the sweep is over, it successively detects the highest level, and locates the marker.

PEAK SEARCH >> Continuous Pk

■ **Mkr → CF**

It sets the center frequency of the analyzer as the marker frequency. On delta mode, Mkr → CF sets the center frequency as the marker delta value. Mkr → CF cannot be used when it is on zero span.

PEAK SEARCH >> Mkr → CF

5-17. Single Sweep

When the analyzer is on continuous sweep mode, it converts to a single sweep. When the analyzer is already on single sweep mode, it performs a new sweep once if the trigger meets the conditions.

■ **SINGLE**

SWEEP >> Sweep

5-18. SPAN

It activates the span function, and makes it possible to change the span.

■ **Full Span**

It sets the span as the entire frequency scope of the analyzer.

SPAN >> Full Span

■ **Zero Span**

It changes the frequency span as 0.

SPAN >> Zero Span

■ **Last Span**

It changes the frequency span of the analyzer to the previous span.

SPAN >> Last Span

5-19. Sweep

■ **Sweep Time Auto Man**

It sets the time for the analyzer to take for sweeping the currently established frequency span. If the sweep time is reduced, the sweep speed increases. The sweep time can be changed by using a step key, a scroll knob, or a number key pad. If you press any number among 0 ~ 9 on a number key pad, a unit menu will appear.

SWEEP >> Sweep Time

■ **Sweep Cont Single**

It makes a conversion between continuous sweep mode and single sweep mode. If you press Sweep (Single), the analyzer will be established as single sweep mode. To check the sweep on single sweep mode, please press the single on the front panel. When Sweep (Cont) is selected, the next sweep will follow after it is triggered.

SWEEP >> Sweep

5-20. System

The System menu appears.

■ Power On Preset

If you press the Power On Preset button, the following menus will appear.

- **Power On Last Preset**

  It determines the state of the analyzer when you turn on the analyzer. When the function of turning on power is established as Preset, the state of the analyzer becomes the same of pressing Preset while the analyzer is turned on. When the function of turning on power is established as Last, the state of the analyzer will be restored to the previous state where the power was still on.

  Although you press Preset, the set-up (Last or Preset) of the function of turning on power is not changed, To change the set-up of the state of the analyzer restored when inputting power, please use the Power On/Preset menu key.

- **Preset Type Factory User**

  If you press Preset (Factory), it becomes initialized in accordance with the composition of the original state of the analyzer, which was established in delivery. If you press Preset (User), you can set the analyzer as saved by the Save User Preset key. Also, if you press Preset (Factory) and Preset (User), the initialization of the device gets started. (Please refer to the Preset in this chapter.)

  Save User Preset

  When you press Save User Preset, the current state of the analyzer is saved on the User Preset register.

■ Time/Date

There appears a menu that you can change time and date.

- **Time/Date**

  It turns on and off the time and date.

SYSTEM >> Time/Date >> Time/Date

- **Date Format**

  It changes the display type of a date from MM-DD-YY to DD-MM-YY.

  SYSTEM >> Time/Date >> Date Format

- **Set Time**

  It sets the time. Please input the time in accordance with the 24 hrs HHMMSS form by using a number key pad, and press Enter. The effective time values (HH) are 00 ~ 23. The effective MM and SS values are 00 ~ 59.

  SYSTEM >> Time/Date >> Set Time

- **Set Date**

  It sets a date. Please input a date in accordance with YYYYMMDD form by using a number key pad, and press Enter. The effective YYYYs are from 2000 to 2037. The effective MM value is 01 ~ 12, and the DD is 01 ~ 31. Use the following keys.

  SYSTEM >> Time/Date >> Set Date

■ Alignments

It enables you to accurately acquire frequency and level by arranging the internal circuit of the analyzer.

- **Align Now**

  It immediately starts the arrangement of a system.

  SYSTEM >> Align Now

- **Align Auto**

  Off turns off the automatic arrangement. When you select On, the arrangement work of the analyzer will be automatically made every 30 minutes.

  SYSTEM >> Align Auto

■ Show System

There are the model number, serial number, firmware version, the version of each board within the device, and the state of the set-up of an option of the analyzer.

SYSTEM >> Show System

■ Diagnostics

- **Front Panel Test**

  It enables you to check the function of keys on each front panel. Whenever you press the key, the number beside the name of each key will be increased. If you turn a knob, the number of pulse will be counted. If you intend to terminate it, please press Esc.

  SYSTEM >> Diagnostics >> Front Panel Test

- **Screen Test Black Pixel**

  It displays the pixels of a display LCD screen as all black.

  SYSTEM >> Diagnostics >> Screen Test Black Pixel

- **Screen Test White Pixel**

  It displays the pixels of a display LCD screen as all white.

  SYSTEM >> Diagnostics >> Screen Test White Pixel

■ Program Update

AT6030D offers convenient ways to update firmware. Copy firmware update file downloaded from a corporate website on a USB flash memory. Equip the USB flash memory to the front USB port, and press a menu key concerned. Then you will see a file list, and then press an update menu key while placing a file selection bar on an update file. Then, there will be a message of "Program update success. Reboot AT6030D." On a status window on the most lower part of display LCD, when the update was successful, and if you turn on the power of the analyzer and turn on it again, the updated file will be applied to the analyzer.

SYSTEM >> Program Update

5-21. Trig

It selects trigger mode of the analyzer.

■ **Free Run**

When sweep is over, it will immediately start the next sweep.

TRIG >> Free Run

■ **Video**

It is synchronized with an ascending angle of detection wave bigger than trigger level, thus, it will start sweep.

TRIG >> Video

■ **Line**

It is synchronized with AC power frequency, it will start sweep. Line trigger is conveniently used when observing waves related to power.

TRIG >> Line

■ **External Pos Neg**

It is synchronized with external trigger source, thus, it will start sweep. The sweep starts from the ascending/descending angle of the signal wave form inputted on EXT TRIG input connector of the back panel. To start the trigger, TTL input signal is required.

TRIG >> External

■ **Trig Delay On Off**

You can set the delay of the time that the analyzer is awaiting, or turn it on or off before starting sweep after receiving the external trigger signal. This function can be used only when it is an external trigger.

TRIG >> Trig Delay

5-22. Trace

It saves and establishes amplitude information drawn on the display LCD screen. Each trace is composed of a series of data memories including the amplitude information. The analyzer renews trace information whenever the sweep is over.

■ **Trace 1 2 3**

Select trace 1, trace 2, and trace 3. Please press a trace key until there appears an underline below the trance number that you want.

TRACE >> Trace

■ **Clear Write**

It deletes data previously saved in trace memory selected, it saves amplitude data newly acquired after sweep, and indicate amplitude data on display LCD screen. This function is applied to trace 1 when inputting power.

TRACE >> Clear Write

■ **Max Hold**

Keep the current amplitude data of each point of trace memory selected, and renew the current trace memory with new amplitude data when the bigger level than the amplitude data of the current trace memory among amplitude data newly acquired from sweep, is acquired.

TRACE >> Max Hold

■ **Min Hold**

Keep the current amplitude data of each point of trace memory selected, and renew the current trace memory with new amplitude data when the smaller level than the amplitude data of the current trace memory among amplitude data newly acquired from sweep, is acquired.

TRACE >> Min Hold

■ **View**

Keep the amplitude data of trace memory selected, and indicate it on display LCD. Trace memory does not be renewed even after sweep. When inactivating trace by pressing

Blank, you can read trace data saved by pressing View.

TRACE >> View

■ **Blank**

Save amplitude data on the selected trace, and delete it on the display. The trace memory selected will not be renewed even after sweep. This function will be applied to trace 2 and 4 when inputting AC power.

TRACE >> Blank

AT6030D

6

3.0 GHz Spectrum Analyzer

Function Test

In this chapter, function test is explained, and information on the function test performing methods is included.

Chapter 6. Function Test

6-1. Definition of Function Test

The function test means a test on diverse functions of the analyzer, and is to check whether the analyzer normally operates. Before inspection or after repair, it is better check the operation the analyzer. The objective of the function test lies in testing a device operating on the scope of stipulated temperature suited to the standard of the device with the minimal test device.

6-2. Test Explanation

The following is the explanation on the test, thus, it lists up each test standard, explanation on the test objective or measurement value, lists of the specifications of devices necessary for the test performance, test configuration, and test procedure by step. In terms of the test objective, the operation of the device should be tested in the scope of stipulated temperature for operation, suited to the standard of the device. You should perform test only after the stipulated heating time has passed.

In this chapter, the following tests are explained.

1. Displayed average noise level
2. Frequency readout accuracy
3. Frequency response
4. Reference level accuracy
5. Resolution bandwidth switching error
6. Display scale linearity
7. Second harmonic distortion

6-3. Displayed Average Noise Level

■ **Test Standard**

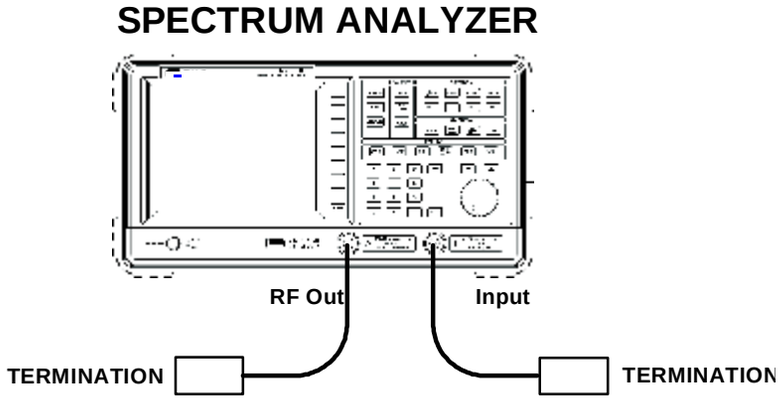
Frequency Range	Measured Frequency	Display Line Center Value
10 MHz ~ 1.0 GHz	1.0 GHz	-105 dBm
1.0 GHz ~ 2.4 GHz	2.0 GHz	-100 dBm
2.4 GHz ~ 3.0 GHz	3.0 GHz	-95 dBm

■ **Explanation on the Test**

The displayed average noise level means a noise level within the inside of the analyzer itself, and becomes the standard for measuring a small power signal. It is measured within the scope of designated frequency, and the actual measurement will be performed in the representative frequency by frequency bandwidth. The input of the analyzer is terminated as 50 Ω.

■ **Requirements for the Device**

Termination (50 Ω Type-N(m))



[Figure 6-1]

■ Test Procedures (10 MHz ~ 1.0 GHz)

1. Please press the Preset of the analyzer. Wait until the Preset procedure is over.

   FREQUENCY >> Center Freq >> 1.0 GHz

   SPAN >> 20 kHz

   AMPLITUDE >> - 70 dBm

   BW/AVG >> 1 kHz

   Video BW >> 10 Hz

2. Please press the following key on the analyzer.

   BW/AVG >> Average (On) >> 10 >> Enter

   Please wait until Avg 10 appears on the left of the lattice. (The analyzer performs ten times of sweeps.)

3. Please press the following value on the analyzer.

   DISPLAY >> Display Line (On)

   Please ignore the remaining response, and adjust the display line to appear in the center of noise.

4. Please record the average noise level read in the display line.

■ Test Procedures (1.0 GHz ~ 2.0 GHz)

1. Please press the Preset of the analyzer. Wait until the Preset procedure is over.

   FREQUENCY >> Center Freq >> 2.0 GHz

   SPAN >> 20 kHz

   AMPLITUDE >> - 70 dBm

   BW/AVG >> 1 kHz

   Video BW >> 10 Hz

2. Please press the following key on the analyzer.

   BW/AVG >> Average (On) >> 10 >> Enter

   Please wait until Avg 10 appears on the left of the lattice. (The analyzer performs ten times of sweeps.)

3. Please press the following key on the analyzer.

   DISPLAY >> Display Line (On)

   Please ignore the remaining response, and adjust the display line to appear in the center of noise.

4. Please record the average noise level read in the display line.

■ Test Procedures (2.0 GHz ~ 3.0 GHz)

1. Please press the Preset of the analyzer. Wait until the Preset procedure is over.

   FREQUENCY >> Center Freq >> 3.0 GHz

   SPAN >> 20 kHz

   AMPLITUDE >> - 70dBm

   BW/AVG >> 1 kHz

   Video BW >> 10 Hz

2. Please press the following key on the analyzer.

   BW/AVG >> Average (On) >> 10 >> Enter

   Please wait until Avg 10 appears on the left of the lattice. (The analyzer performs ten times of sweeps.)

3. Please press the following key on the analyzer.

   DISPLAY >> Display Line (On)

   Please ignore the remaining response, and adjust the display line to appear in the center of noise.

4. Please record the average noise level read in the display line.

6-4. Frequency Readout Accuracy

■ **Test Standard**

Span	Minimum	Maximum
100 kHz	0.999996000 GHz	1.000004000 GHz
10 MHz	0.999649500 GHz	1.000350500 GHz

■ **Explanation on the Test**

The frequency readout accuracy of the analyzer is tested with an input signal of frequency that is already known. For accurate test, you can use the same standard frequency to the analyzer and the signal generator.

The standards of calculating the specification of the analyzer are as follows.

Frequency readout accuracy : ±(frequency readout value × accuracy of the standard oscillator + span x span accuracy + RBW × 0.5)

Example of the frequency readout accuracy : When frequency 1 GHz, Span 100 kHz, RBW 1 kHz,

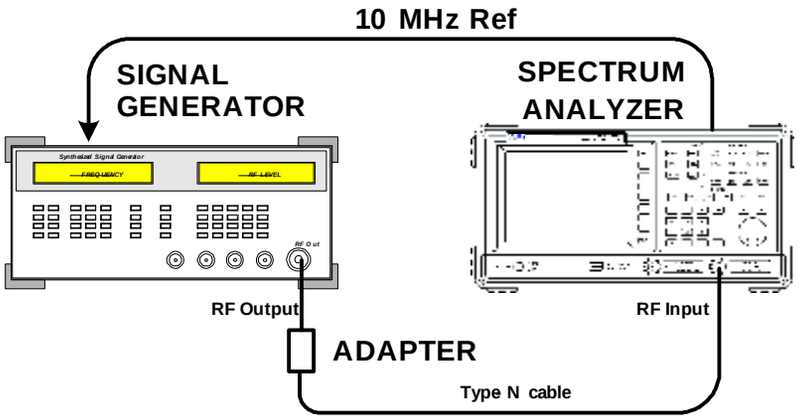
Example of calculation : $(1 \times 10^9$ Hz × 0.5 × 10^{-6} / year.ref.error) = 500 Hz
(100 kHz × 3 %) = 3000 Hz
(1 kHz × 0.5) = 500 Hz
Total **è** ±(500 Hz + 3000 Hz + 500 Hz = 4000 Hz)

■ **Requirements for the device**

Signal generator (10 MHz ~ 3 GHz)
Adaptor : Type-N(f)
Cable : Type-N, 100 cm
BNC, 100 cm

■ **Test Procedures**

Please connect the device as the figure 6-2. Connect the 10 MHz REF OUT of the analyzer to the 10 MHz REF IN of a signal generator.



[Figure 6-2]

1. Please set the control device as follows, after pressing INSTRUMENT PRESET of a signal generator.

   FREQUENCY >> 1.0 GHz

   AMPLITUDE >> - 10 dBm

2. Please wait until the Preset procedures are over, after pressing the Preset of the analyzer.

   Please set the analyzer by pressing the following keys.

   FREQUENCY >> 1.0 GHz

   SPAN >> 100 kHz

   BW/AVG >> Res BW >> 1 kHz

   Video BW >> 1 kHz

3. Please measure the frequency value by pressing the **PEAK SEARCH** of the analyzer. When the device is normally operating, the measured frequency should be between 0.999996000 GHz ~ 1.000004000 GHz.

4. Please set the analyzer as follows.

   SPAN >> 10 MHz

   BW/AVG >> Res BW >> 100 kHz

   Video BW >> 100 kHz

5. Please measure the frequency value by pressing the **PEAK SEARCH** of the analyzer. When the device is normally operating, the measured frequency should be between 0.999649500 GHz ~ 1.000350500 GHz.

6-5. Frequency Response (Flatness)

■ **Test Standard**

Frequency	Minimum (dB)	Maximum (dB)
100 kHz ~ 10 MHz	-3.5	1.5
10 MHz ~ 3 GHz	-1.5	1.5

■ **Explanation on the Test**

The output of a signal generator is transmitted to the power sensor and the analyzer through a power splitter. To make the indicated signal to be placed on the center horizontal lattice of the analyzer, adjust the power level of the signal generator to 80 MHz. It is measured in diverse spots in accordance with the model under test. Remove errors due to source amplitude by measuring the signal source amplitude with a power meter. Before starting the measurement, adjust the zeroing of the power meter.

■ **Requirements for the Device**

Signal generator

Adaptor : Type-N(f) ~ BNC(f)

BNC(f) ~ SMA(m)

Cable : Type-N 150 cm

Both-ends BNC 100 cm

Power meter

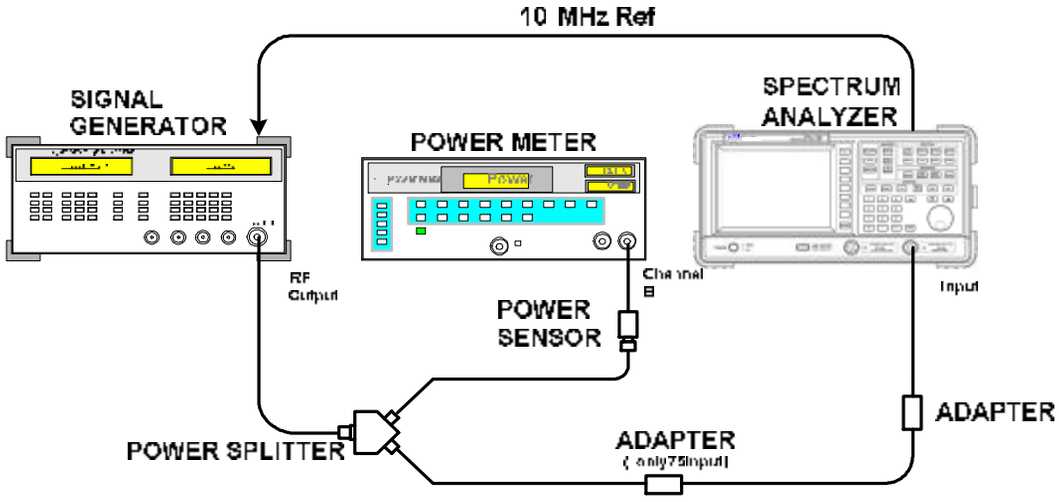
Power sensor

Power splitter

■ **Test Procedures**

Adjust the zeroing of the power meter and power sensor.

Please connect the device as the figure 6-3



[Figure 6-3]

1. Please set a signal generator as follows.

   FREQUENCY >> 80 MHz

   AMPLITUDE >> - 30 dBm

2. Please wait until the Preset procedures are over, after pressing the Preset of the analyzer.

   Please set the analyzer by pressing the following keys.

   FREQUENCY >> 80 MHz

   CF Step >> 50 MHz

   SPAN >> 20 kHz

   AMPLITUDE >> - 30 dBm

   AMPLITUDE >> - 30 dBm >> Attenuation >> 0 dB

   Scale/Div >> 2 dB

   BW/AVG >> 10 kHz

   Video BW >> 3 kHz

   PEAK SEARCH

3. Please adjust the frequency of the signal generator so that the marker frequency value is between - 34 dBm + / - 0.10 dB.

4. Please refer to the table 6-1, Frequency Response Report. Please input 80 MHz of the marker reading value on an amplitude column of the analyzer as indicated.

5. Please input the power meter reading value on an amplitude column of the power meter.

6. Calculate the 80 MHz frequency response error with the following formula, and record the result on a response error column.
   Frequency response error **=** Amplitude of the analyzer **-** Amplitude of a power meter

7. Please perform the following steps by set-up of the center frequency in the table 6-1.
   1) Adjust source to the following frequency in the center frequency column.
   2) Perform the calibration of the power meter to the new test frequency.
   3) Adjust the center frequency of the analyzer by pressing FREQUENCY, Center Freq, "n", MHz.
      (here, "n" is the following test frequency in the table 6-1.)
   4) Press PEAK SEARCH.
   5) Input the reading value of the power meter on the power meter amplitude column.
   6) Input the reading value of the analyzer on the amplitude column.
   7) Calculate the frequency response error with the following formula, and record the result on a response error column.

   Frequency response error = Amplitude of the analyzer – Amplitude of the power meter
   The frequency response error should be smaller than the designated scale.

[Table 6-1]

Center Frequency	Amplitude of the Analyzer	Amplitude of the Wattmeter (Wattmeter)	Frequency Response Error	Test Standard of Frequency Response Error (dB)
80 MHz				±1.5
300 MHz				±1.5
500 MHz				±1.5
1000 MHz				±1.5
1500 MHz				±1.5
2000 MHz				±1.5
2500 MHz				±1.5
3000 MHz				±1.5

6-6. Reference Level Accuracy

■ **Test Standard**

[Table 6-2]

Reference Level	Minimum Standard (dB)	Maximum Standard (dB)
0 dBm	-1.5	1.5
-10 dBm	-1.5	1.5
-20 dBm	-1.5	1.5
-30 dBm	-1.5	1.5
-40 dBm	-1.5	1.5
-50 dBm	-1.5	1.5
-60 dBm	-1.5	1.5
-70 dBm	-1.5	1.5

■ **Explanation on the Test**

Apply an input 80 MHz CW signal to the analyzer. Then, reference level of source amplitude and the analyzer will decrease to 10 dB level. The marker function of the analyzer will be used for measuring the difference between amplitudes by step. The reference level accuracy will be tested on a log scale.

■ **Requirements for the Device**

Signal generator

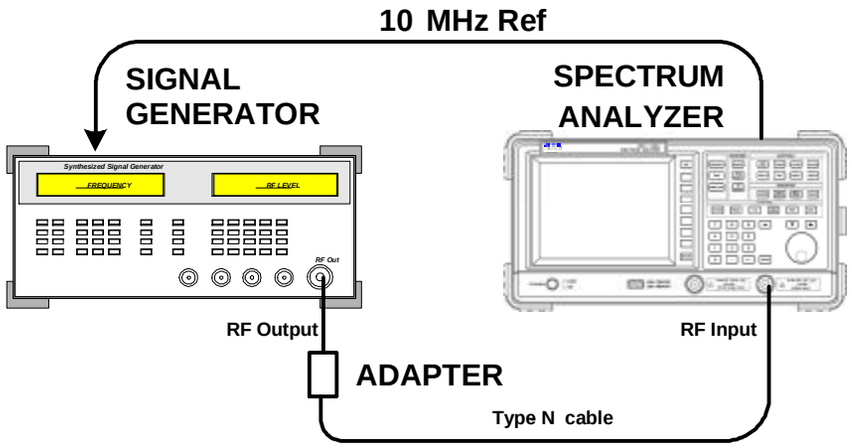
Adaptor : Type-N(m) ~ BNC(f)

Cable : Type-N, 150 cm

BNC, 100 cm

■ **Test Procedures**

Please connect the device as figure 6-4.



[Figure 6-4]

1. Please set the signal generator as follows.

   FREQUENCY >> 80 MHz

   AMPLITUDE >> -30 dBm

2. Please wait until the preset procedure is over, after pressing the Preset of the analyzer.

   Please press SYSTEM >> Alignments >> Align Now. Set the analyzer by pressing the following keys.

   FREQUENCY >> 80MHz

   SPAN >> 50 kHz

   AMPLITUDE >> -30 dBm

   BW/AVG >> Res BW >> 1 kHz

   Video BW >> 30 Hz

3. Please press the MARKER SEARCH of the analyzer. Make the marker amplitude of the analyzer to be between -30 dBm +/- 0.10 dBm by adjusting the amplitude of the signal generator. Please record the power level of the signal generator on the amplitude standard of the signal generator of table 6-2.

4. Please adjust the power level of the signal generator and the reference level of the analyzer in accordance with table 6-2, since the standard of the 4th step result was established. (The output power of the signal

generator and the reference level of the analyzer will be changed on 10 dB step.)

5. Please record data measured by the analyzer in accordance with the changes of the power level of the signal generator and the reference level of the analyzer, on the marker reading value of the analyzer of table 6-2.

[Table 6-2]

Analyzer Reference Level	Amplitude of the Signal Generator (dBm)	Minimum (dB)	Analyzer Marker Level Value (dBm)	Maximum (dB)
-30 dBm	Standard +	-1.5		1.5
-20 dBm	Standard + (10 dB)	-1.5		1.5
-10 dBm	Standard + (20 dB)	-1.5		1.5
-0 dBm	Standard + (30 dB)	-1.5		1.5
-40 dBm	Standard + (-10 dB)	-1.5		1.5
-50 dBm	Standard + (-20 dB)	-1.5		1.5
-60 dBm	Standard + (-30 dB)	-1.5		1.5
-70 dBm	Standard + (-40 dB)	-1.5		1.5

6-7. Resolution Bandwidth Switching Error

■ **Test Standard**

Resolution Bandwidth	Minimum (dB)	Maximum (dB)
1 kHz	0 (standard)	0 (standard)
3 kHz	- 1.0 dB	1.0 dB
9 kHz	- 1.0 dB	1.0 dB
10 kHz	- 1.0 dB	1.0 dB
30 kHz	- 1.0 dB	1.0 dB
100 kHz	- 1.0 dB	1.0 dB
120 kHz	- 1.0 dB	1.0 dB
300 kHz	- 1.0 dB	1.0 dB
1 MHz	- 1.0 dB	1.0 dB
3 MHz	- 1.0 dB	1.0 dB

■ **Explanation on the Test**

In order to measure the resolution bandwidth switching error, set the standard of the amplitude while the resolution bandwidth remains 1 kHz. The scope of the resolution bandwidth will be changed to 3 MHz ~ 3 kHz, and it will be compared with the standard specification since the deviation of the amplitude is measured on each set-up by the marker delta function. The span changes upon necessity, thus keeps the similar ratio of lengths and breadths.

■ **Requirements for the Device**

There is no necessary device.

■ **Test Procedures**

1. Please wait until the Preset procedures are over, after pressing the Preset of the analyzer.
   Please set the analyzer by pressing the following keys.

2. **SYSTEM >> Alignments >> Align Now**
   I/O DETECT >> Ref Out (f = 80 MHz) (On)
   FREQUENCY >> 80 MHz

SPAN >> 50 kHz

AMPLITUDE >> - 30 dBm

Scale/Div >> 2 dB

BW/AVG >> 1 kHz

Video BW >> 1 kHz

3. After pressing **AMPLITUDE**, adjust reference level until a signal appears below the reference level by using a scroll knob. Normally, the signal is located on the center of display.

   MARKER SEARCH

   MARKER >> Delta

4. Please set the resolution bandwidth and span of the analyzer in accordance with table 6-3.

5. After pressing PEAK SEARCH, please record the △ Mkr 1 amplitude value on table 6-3.

6. As for the set-up of other resolution bandwidth and span shown on table 6-3, please repeat the 3rd and 4th steps.

   The △ Mkr 1 amplitude value should be between the scope shown on the test standard.

[Table 6-3]

Resolution Bandwidth Set-up	Span Ste-up	△ Mkr 1 Amplitude Value
1 kHz	50 kHz	0 (standard)
3 kHz	50 kHz	
9 kHz	50 kHz	
10 kHz	50 kHz	
30 kHz	500 kHz	
100 kHz	500 kHz	
120 kHz	500 kHz	
300 kHz	5 MHz	
1 MHz	10 MHz	
3 MHz	10 MHz	

6-8. Display Scale linearity

■ **Test Standard**

Standard Amplitude Scale (dB)	Minimum (dB)	Maximum (dB)
10 dB / div total 80 dB	-1.5	1.5
5 dB / div total 40 dB	-1.5	1.5
1 or 2 dB / div total 10 or 20dB	-0.5	0.5

■ **Explanation on the Test**

Input 80 MHz CW signal to the analyzer from the signal generator. The source will be adjusted to the response of reference level. Set the signal to the reference level by adjusting the amplitude of the signal generator. Seek out the display scale linearity error by comparing the amplitude marker of the analyzer, and actual source change with the delta marker.

■ **Requirements for the Device**

Signal generator

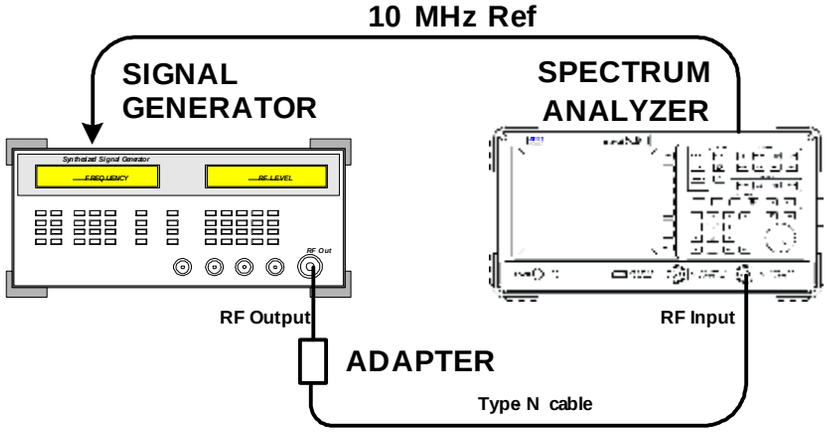
Adaptor : Type-N(m) ~ BNC(f)

Cable : Type-N, 152 cm

BNC, 122 cm

■ **Test Procedures**

Please connect the device as figure 6-5.



[Figure 6-5]

1. Please set the signal generator as follows.

   FREQUENCY >> 80 MHz

   AMPLITUDE >> - 30 dBm

2. After pressing the Preset of the analyzer, please wait until the Preset procedure is over.

   Press SYSTEM >> Alignments >> Align Now.

   FREQUENCY >> 80 MHz

   SPAN >> 10 kHz

   AMPLITUDE >> Attenuation >> 30 dB

   BW/AVG >> Res BW >> 1 kHz

   Video BW >> 10 Hz

   PEAK SEARCH

3. Please adjust the amplitude of the signal generator until the marker amplitude of the analyzer moves between 0 dBm +/- 0.10 dB.

4. Please press the following keys on the analyzer.

   MARKER >> Delta

5. Please record the marker delta reading value on table 6-4.

   Please record the delta marker value by power level of each signal generator.

[Table 6-4] Screen Scale Royalty

Signal Generator Level	Minimum (dB)	Marker Level (dB)	Maximum (dB)
Standard = ____	0 (standard)		0 (standard)
Standard - 10 dB			
Standard - 20 dB			
Standard - 30 dB			
Standard - 40 dB			
Standard - 50 dB			
Standard - 60 dB			
Standard - 70 dB	Total - 1.5 dB		Total 1.5 dB

6-9. Second Harmonic Distortion

■ **Test Standard**

≤ - 60 dBc, - 40 dBm input

■ **Explanation on the Test**

In order to test the distortion of the second harmonic, filter the source output with 50 MHz low pass filter so that the harmonic deciphered on the analyzer is not created on the source, but be created internally. After passing this filtering process, input a signal with nearly no harmonics, and measure the harmonics occurring within the analyzer.

■ **Requirements for the Device**

Signal generator

50 MHz Low pass filter

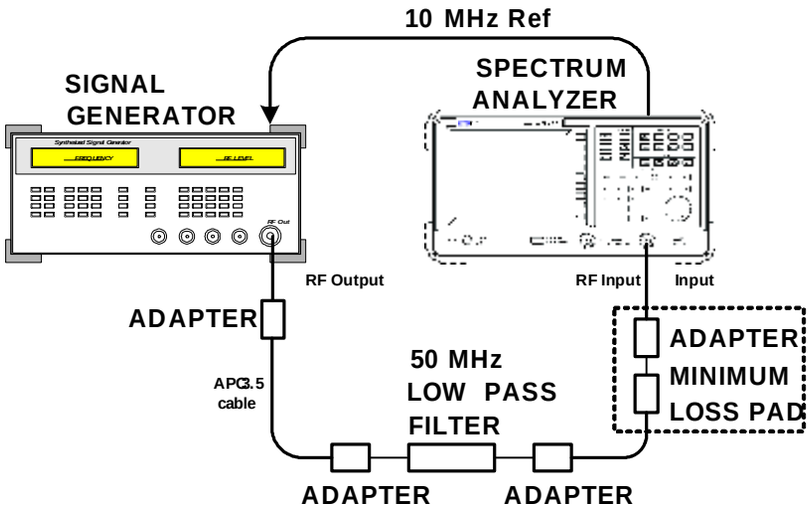
Adaptor : Type-N(m) ~ BNC(f)

BNC(f) ~ BNC(f)

Cable : BNC, 150 cm

■ **Test Procedures**

Please connect the device as figure 6-6.



[Figure 6-6]

1. Please set the signal generator as follows.

   FREQUENCY >> 50 MHz

   AMPLITUDE >> - 40 dBm

2. Press the Preset of the analyzer, Wait until the Preset procedure is over.

   Set the analyzer by pressing the following keys.

   FREQUENCY >> 50 MHz

   SPAN >> 1 MHz

   AMPLITUDE >> - 40 dBm >> Attenuation >> 0 dB

   BW/AVG >> 30 kHz

3. Adjust the amplitude of the signal generator so that the signal peak gets to reference level.

4. Please set the analyzer by pressing the following keys.

   SPAN >> 50 kHz

   BW/AVG >> 1 kHz

   Video BW >> 100 Hz

5. Wait until two times of sweep are over, and press the keys on the analyzer as follows.

   MARKER SEARCH

   MARKER >> Delta

6. Please move the center frequency of the analyzer to the second harmonics (100 MHz).

   Press **Peak Search**. The marker delta amplitude value should be below the test standard.

AT6030D

7

3.0 GHz Spectrum Analyzer

Measurement Guide

In this chapter, the basic operating methods and measurement methods will be explained.

Chapter 7. Measurement Guide

7-1. Composition

The following examples of use explain the functions of the analyzer by taking a simple example of measurement generally used. When an inexperienced user performs experiment, he/she can promptly learn how to use.

Utilization of delta marker ; Comparison of signals

Utilization of RBW ; Distinction of a small signal

Measurement of a small signal

Measurement of CDMA channel power

Measurement of CDMA ACPR

Use of a Printer

Use of USB memory

Use of the trace function

7-2. Utilization of Delta Marker ; Comparison of Signals

You can easily compare the difference of frequency and amplitude between spectrum signals of radio, wireless device, mobile communication phone, and CATV by using the analyzer. If you use the delta marker function of the analyzer, you can compare the difference of power between two signals.

■ **Examples of Use (Delta Marker Function)**

It compares the difference of power between two signals.

1. Connect 10 MHz REF OUT on the back panel of the analyzer to RF INPUT on the front panel of the analyzer.

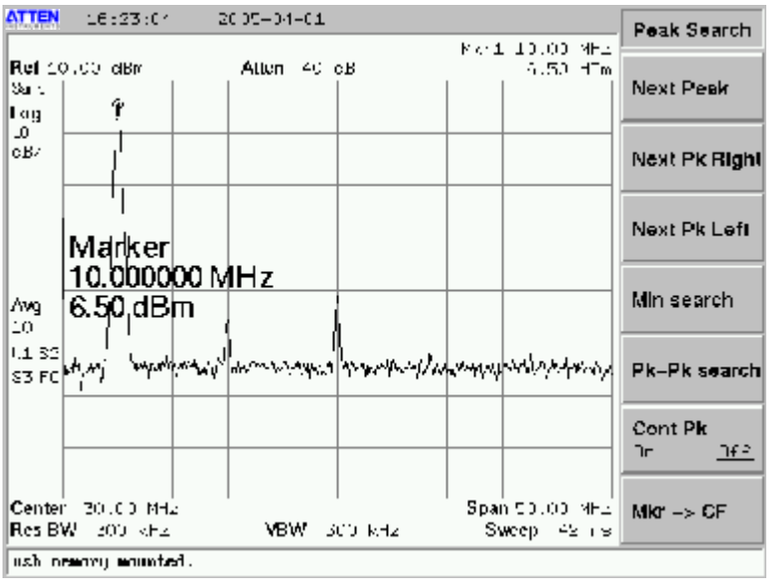
2. By pressing **FREQUENCY >> 30 MHz >> SPAN >> 50 MHz**, set the center frequency to 30 MHz, and set the span to 50 MHz.

3. By pressing **AMPLITUDE >> 10 dBm**, set reference level to 10 dBm.
   The 10 MHz standard signal and its harmonics are displayed on the screen.

WARNING ! **If you lower reference level instead of adjusting it to 10 dBm , 10 MHz standard signal harmonics will be displayed very high since the mixer input level becomes elevated. In this case, the higher level may enter the mixer input than the stipulated level, thus, take heed to it. Please keep the level of the input signal not to be higher than reference level all the time.**

4. By pressing **BW/AVG >> Average**, perform ten times of trace average.

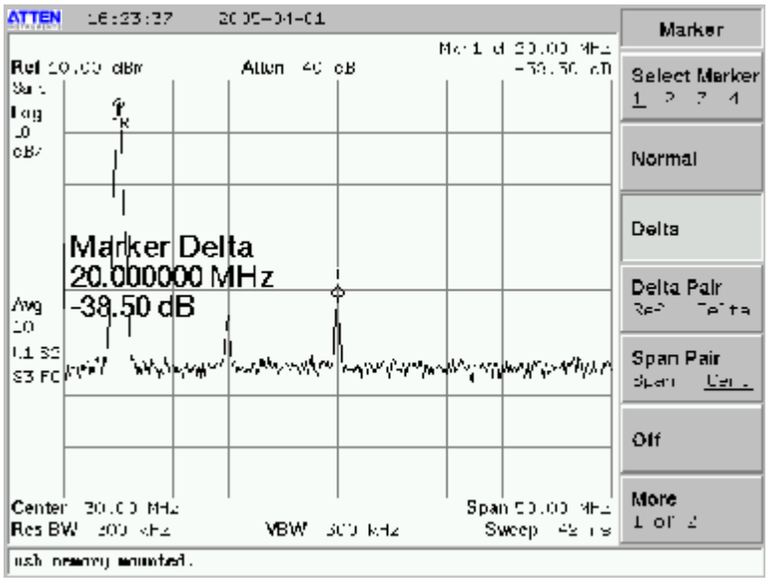
5. By pressing **PEAK SEARCH**, locate the marker on the peak point.



[Figure 7-1] Reading 10 MHz signal by using marker

6. Turn on the delta marker by pressing **MARKER >> Delta**, Move the delta marker to the next peak by using a scroll knob or **PEAK SEARCH >> Next Peak**.

7. The differences of amplitude and frequency between markers appear on the right of the upper part of display LCD.



[[Figure 7-2] Delta Marker Function

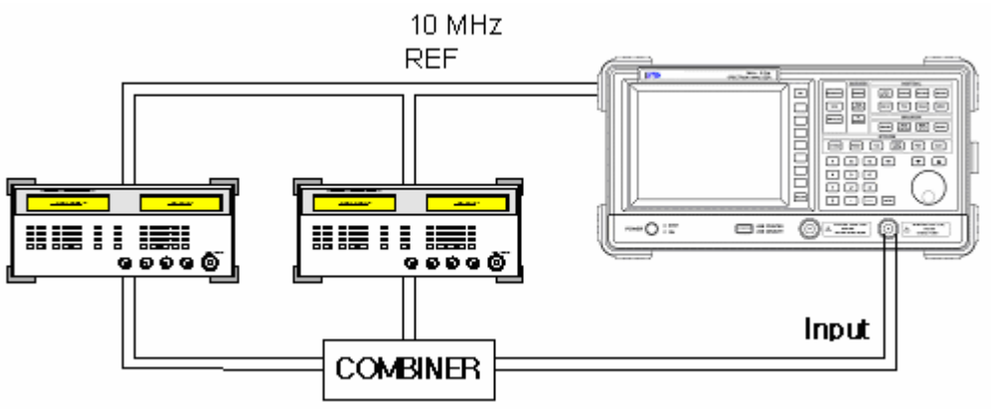
7-3. Utilization of RBW ; Distinction of a Small Signal

In order to distinguish two signals with similar signal, you need to consider the feature of the form of the analyzer IF(RBW) filter and 3 dB bandwidth. The feature of the form of a filter is defined by selectivity which is a ratio of 3 dB bandwidth and 60 dB bandwidth. If a small signal is too near a big signal, the small signal might be hidden by the IF(RBW) filter selection.

■ **Examples of Use (IF(RBW) Selection)**

If the value of frequency difference is 200 kHz, you can gain feature of IF(RBW) and measuring methods by measuring two input signals with amplitude difference.

1. In order to gain a signal with 200kHz of frequency difference, connect the analyzer as figure 7-3. Set the first signal generator to be 100 MHz, -30 dBm.



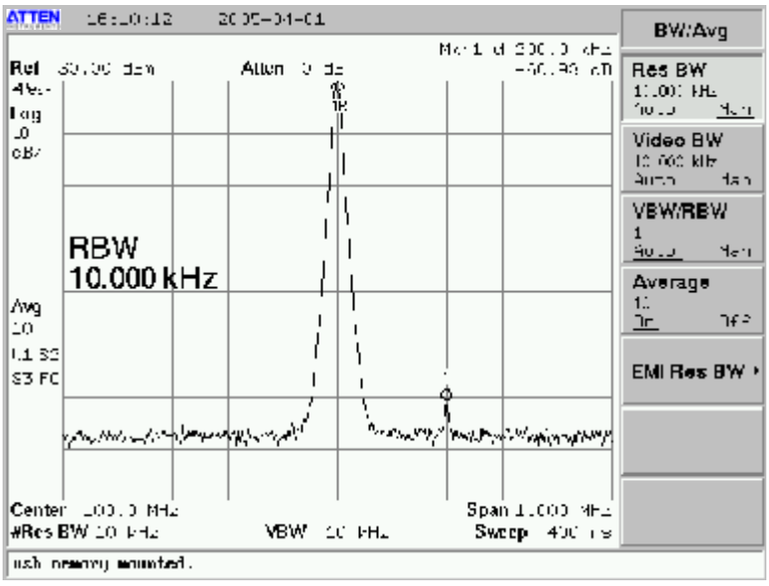
[Figure 7-3] Set-up for Input of Two Signals

2. By pressing **FREQUENCY >> 100 MHz >> SPAN >> 1 MHz**, set the center frequency of the analyzer to 100 MHz and set the span to 1MHz.

3. By pressing **I/O DETECT >> Detect >> Peak**, set detect mode as peak.

4. By pressing **BW/AVG >> Average**, perform ten times of trace average.

5. Set the second signal generator to 100.2 MHz, set the signal 200 kHz higher than the first signal. Set the signal amplitude to -90 dBm. (it is lower than the first signal by 60 dB.)

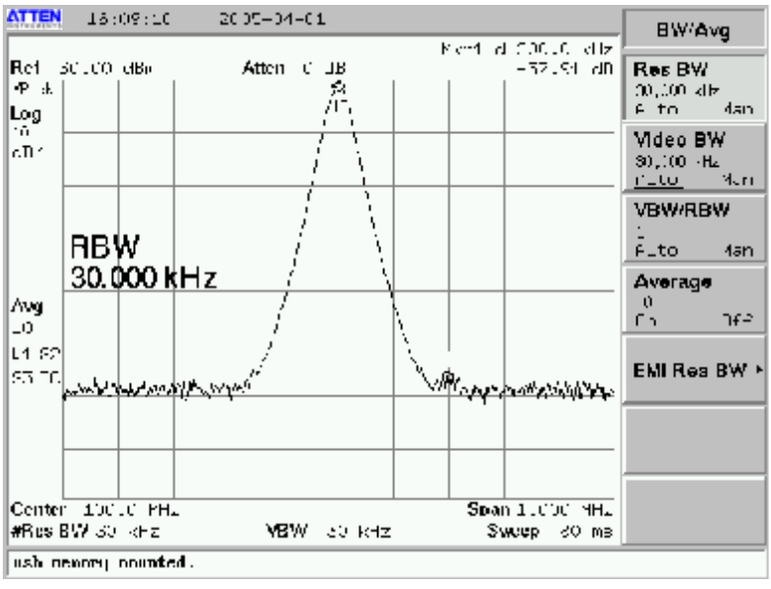


[Figure 7-4] Signal Resolution with 10 kHz of RBW

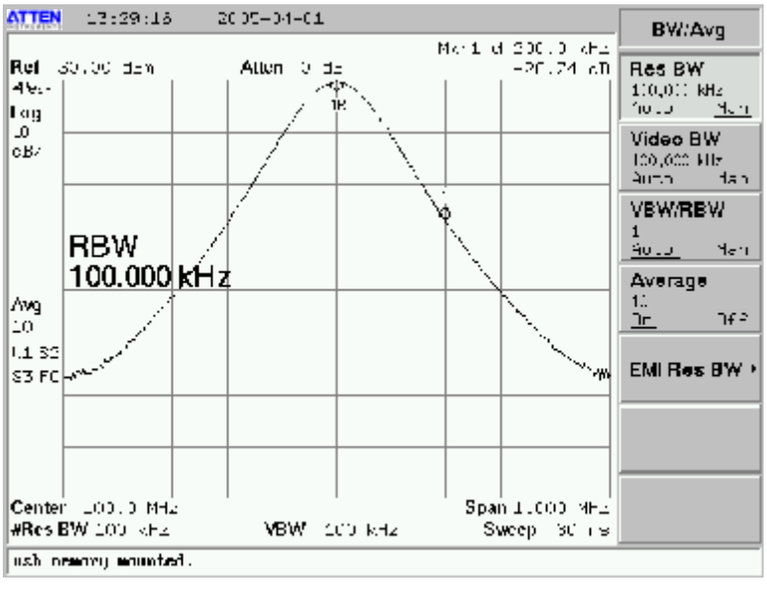
6. By pressing **PEAK SEARCH >> MARKER → >> Mkr → Ref Lvl**, set the 100 MHz signal as reference level. When a 10 kHz filter with less than 15 : 1 of selectivity is used, the bandwidth of the filter will be less than 150 kHz on the point of 60 dB, and the half of the disintegration capacity bandwidth becomes smaller than the difference of frequency (less than 75 kHz), you can distinguish an input signal.

7. By pressing **MARKER >> Delta >> PEAK SEARCH >> Next Pk Right**, move the marker on a small signal. When a filter with RBW 30 kHz is used, the area of 60 dB bandwidth will be less than 450 kHz.

   Since the half of bandwidth (less than 225 kHz) is larger than the difference of frequency (200 kHz), you cannot nearly distinguish a signal.



[Figure 7-5] Signal Resolution with RBW 30 kHz



[Figure 7-6] Signal Resolution with RBW 100 kHz

8. Figure 7-6 is an example of using an RBW 100 kHz filter. It shows that a signal with 200 kHz distance, enters the inside of RBW 100 kHz bandwidth, thus, any signal cannot be distinguished at all. As such, you can distinguish a delicate signal by adjusting RBW.

7-4. Measurement of a Small Signal

The capacity of the analyzer for measuring a small signal is limited by noise level occurred inside of the analyzer itself. A small signal with poor power level may not be seen while hidden by noise level of the analyzer. As for sensitivity on the measurement of a small signal, the set-up of the device is the most important when measuring, thus, noise level within the analyzer get affected by the set-up state.

RBW set-up affects noise level within the analyzer the most, and the attenuator of input part of the analyzer affects the level of a signal measured. Ultimately, you can accurately measure a small signal if you set the analyzer with high S/N ratio (Signal - to - noise ratio). (RBW, Atten è set it relatively smaller) The following example shows several examples for measuring a small signal. When it is difficult to distinguish a small signal from noise even after setting RBW, attenuator, you can enhance the visuality by reducing video bandwidth and using the video average function. The reduction of video bandwidth and average function averages irregularly occurring noise.

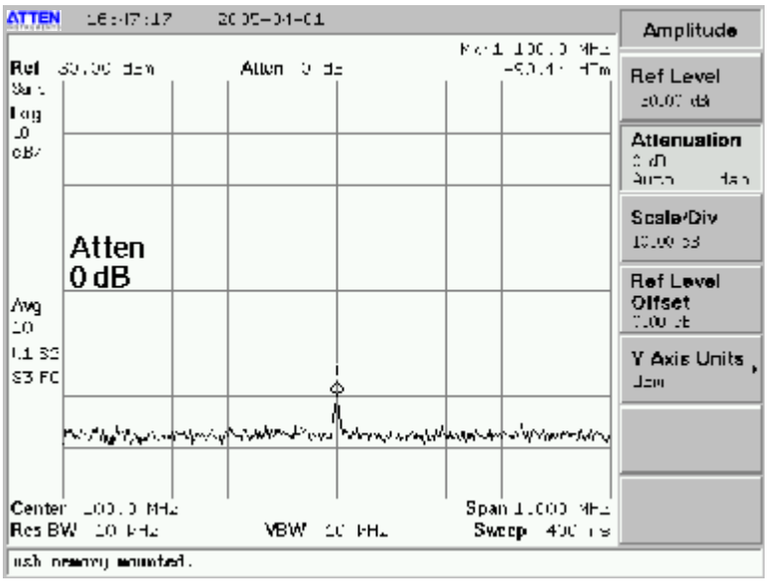
■ **Examples of Use (Set-up of Input Part Attenuator)**

When a signal approaches mostly closely the noise level, if you decrease the input part attenuator to 0 dB, and adjust reference level to lower part, you can measure maximized signal output of the analyzer.

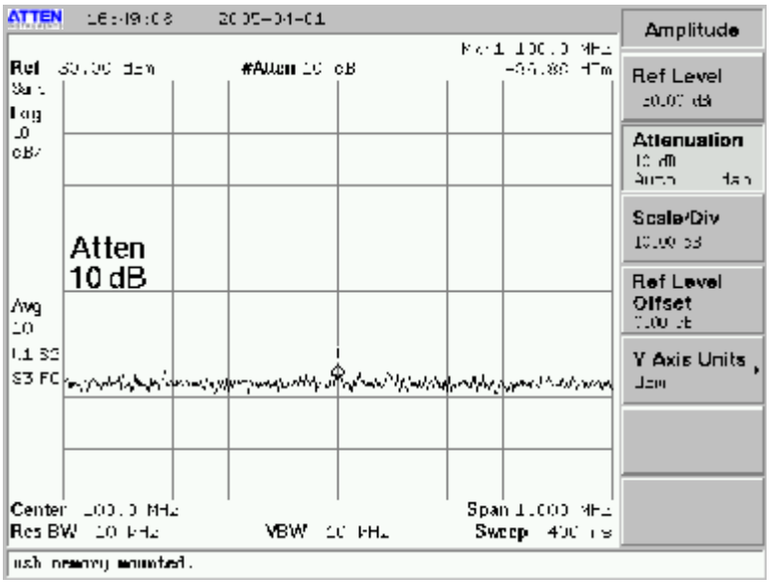
1. Connect the signal generator to RF INPUT of the analyzer.
2. Set the frequency of the signal generator to 100 MHz, and set the amplitude to -90 dBm.
3. Set the center frequency of the analyzer to 100 MHz.
4. Set the span to 1 MHz.
5. Set reference level to -30 dBm.
6. Perform ten times of trace average.

7. Press **AMPLITUDE >> Attenuation (Man)**. By pressing a step key, select 10 dB attenuation rate, If you increase the attenuation rate, noise will move closer to a signal.

8. In order to clearly measure a signal, set the attenuator to 0 dB or Atten(Auto).
   The attenuator 0 dB shows the signal more clearly.



[Figure 7-7] Set-up of 0 dB Attenuation



[Figure 7-8] Set-up of 10 dB Attenuation

■ Examples of Use (RBW Selection)

By reducing RBW and lowering noise level of the analyzer, you can measure a small signal.

1. Set the frequency of the signal generator to 100 MHz, and set the amplitude to -90 dBm.

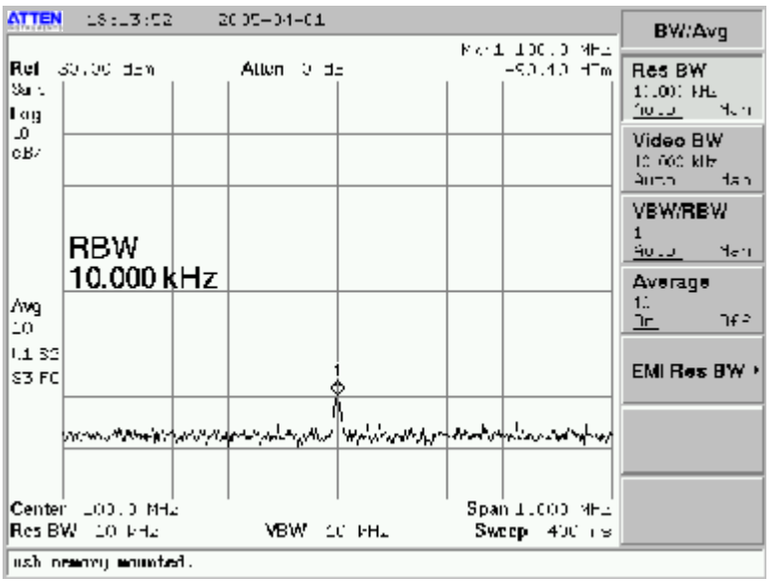
2. Set the center frequency of the analyzer to 100 MHz.

3. Set the span to 1 MHz.

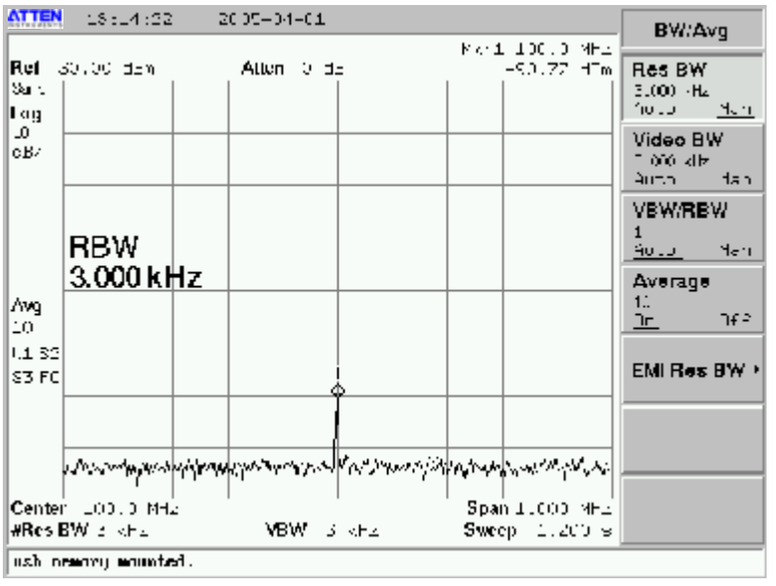
4. Set reference level to -30 dBm.

5. Perform ten times of trace average.

6. After pressing **BW/AVG >> RBW (Man)**, decrease the disintegration capacity bandwidth by pressing a step key. Since noise level of the analyzer decreases, a small signal will appear more clearly.



[Figure 7-9] Signal with RBW 10 kHz



[Figure 7-10] Signal with RBW 3 kHz

There is # mark in front of RBW mark on the lower left of the screen, which means it is not RBW Auto. As RBW decreases, the sweep time will increase.

■ Examples of Use (Video Bandwidth Reduction)

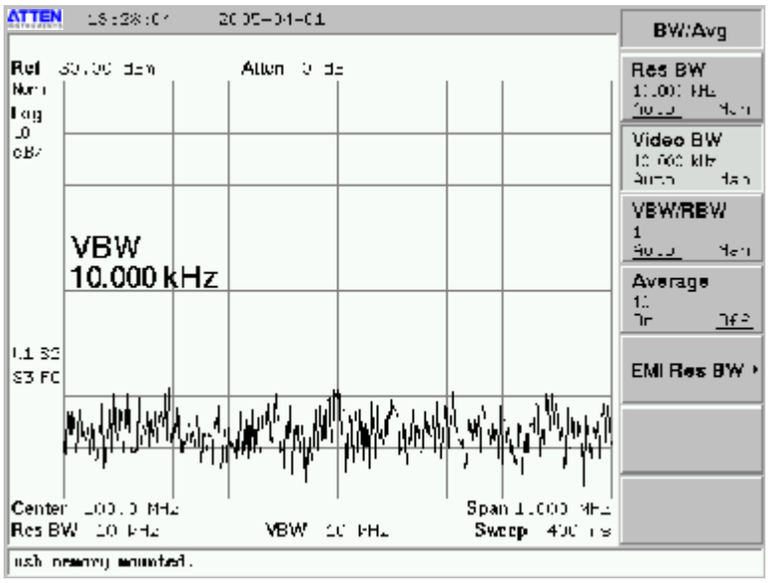
If you set a video filter with a smaller value, it is useful for measuring a small signal or noise around noise level. A video filter is a sort of low band penetrating filter, Thus, if you decrease the video filter, reduce irregular random noise, and make a signal look better, when it is difficult to distinguish signal adjacent to noise level of the analyzer from noise, If you decrease video bandwidth, the sweep time will increase.

Measure the level of a small signal by using the video bandwidth function.

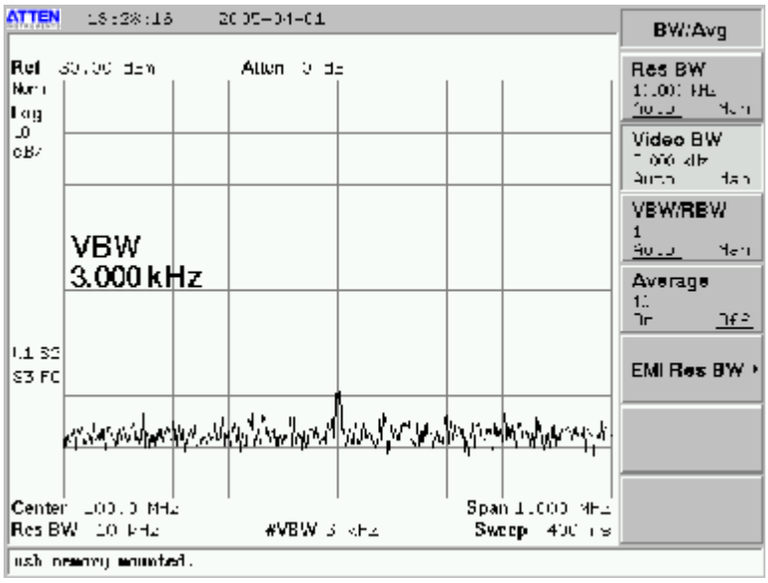
1. Set the frequency of the signal generator to 100 MHz, and set the amplitude to -90 dBm.
2. Set the center frequency of the analyzer to 100 MHz.
3. Set the span to 1 MHz.
4. Set reference level to -30 dBm.

5. Perform ten times of trace average.

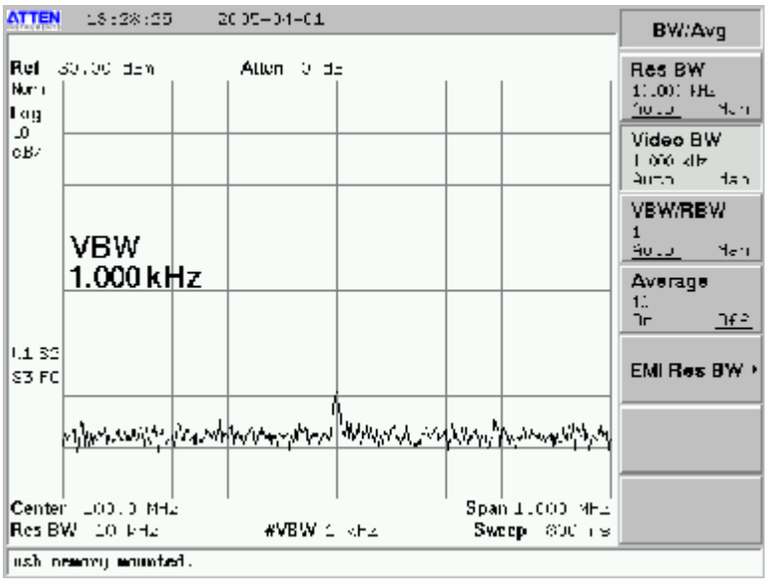
6. After pressing **BW/AVG >> VBW (Man)**, decrease the disintegration capacity bandwidth by pressing a step key. Since noise level of the analyzer decreases, a small signal will appear more clearly and the measurement of signal level will improve.



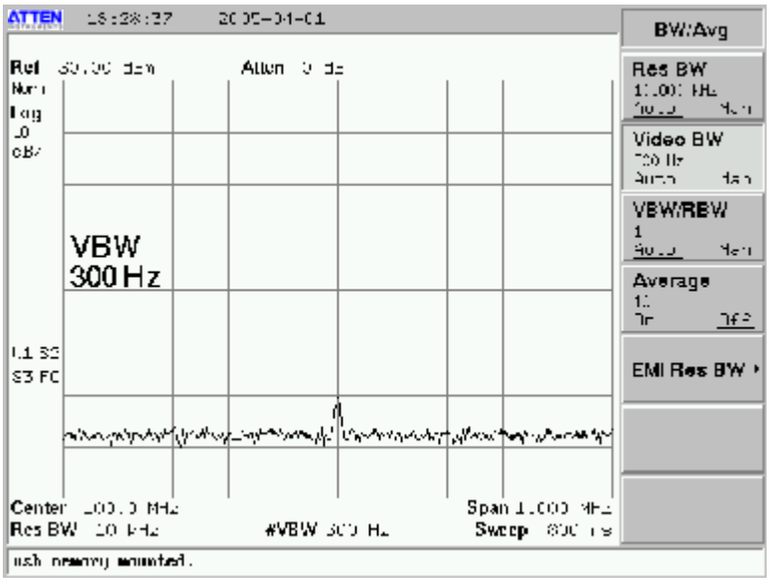
[Figure 7-11] Signal with VBW 10 kHz



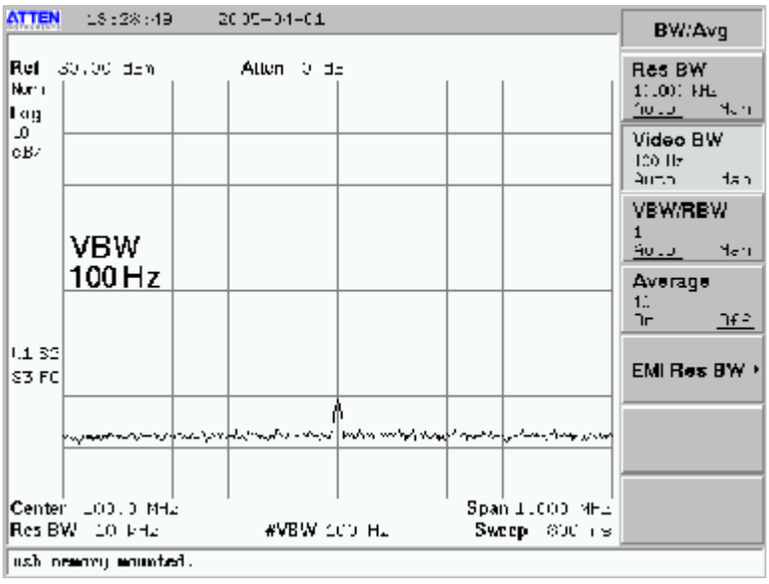
[Figure 7-12] Signal with VBW 3 kHz



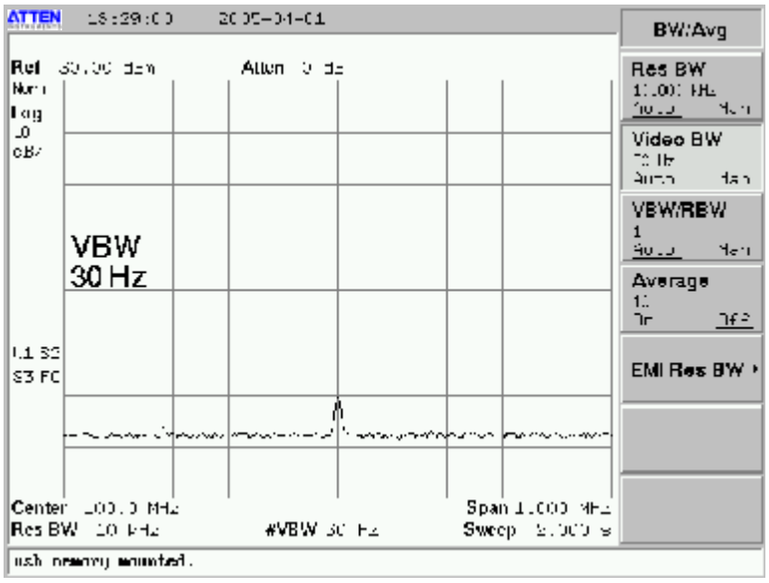
[Figure 7-13] Signal with VBW 1 kHz



[Figure 7-14] Signal with VBW 300 Hz



[Figure 7-15] Signal with VBW 100 Hz



[Figure 7-16] Signal with VBW 30 Hz

■ **Examples of Use (Trace Average)**

When signal level is very close to noise level, the trace average will enhance the visibility of a measuring signal via normalization of irregular random noise.

The final result of trace average is similar to the reduction of video bandwidth. As video

bandwidth reduces, the sweep time increases, and the trace average will use the averaging of many sweep data.

1. Set the frequency of the signal generator to 100 MHz, and set the amplitude to -90 dBm.

2. Set the center frequency of the analyzer to 100 MHz.

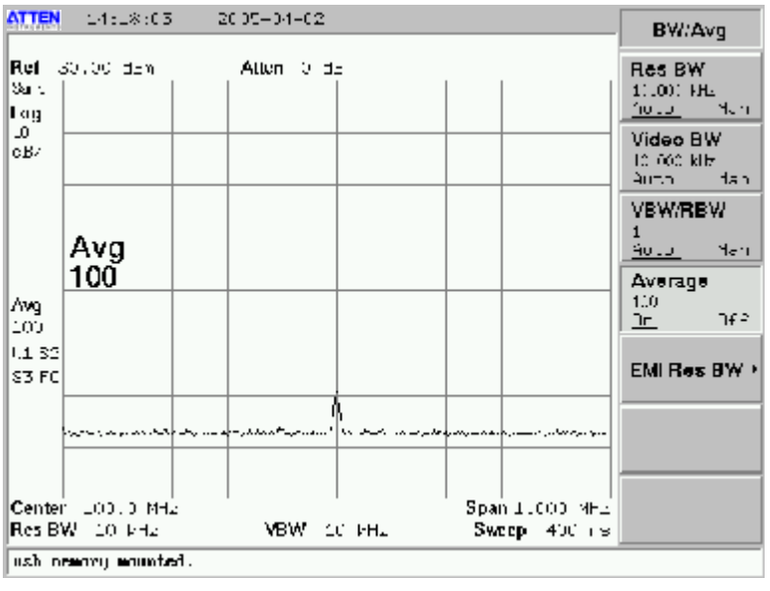
3. Set the span to 1 MHz.

4. Set reference level to -30 dBm.

5. By pressing **BW/AVG >> Average (On)**, operate the trace average. If the trace average function softens trace, the visibility of a small signal will be enhanced.

6. In order to set the number of sweep, input the number by using a number key while the average button is pressed. After inputting the number, if you press the next unit key, the averaging of trace will be initialized, and resumed.

   While the trace average function is performed, the current sweep counter will appear on the center of the left of the screen. When the sweep with established time is completed, the analyzer will keep trace averaging based on the established number.



[Figure 7-17] Trace Average Function

7-5. Measurement of CDMA Channel Power

Channel power measures the power of the area equivalent to the channel bandwidth designated on the base of the current center frequency.

1. Set the frequency of CDMA signal generator to 850 MHz, and set the amplitude to -30 dBm.

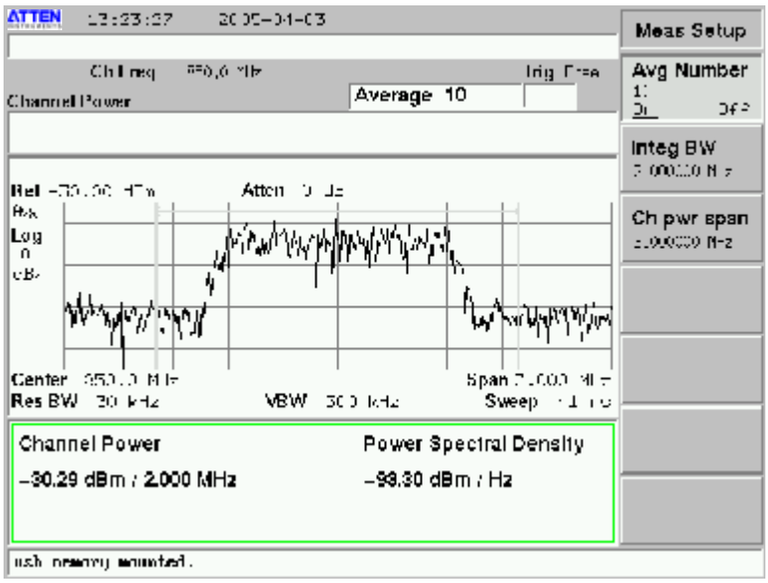
2. By pressing **MEASURE >> Channel Pwr**, change the analyzer to the power measurement mode.

3. Set the center frequency of the analyzer to 850 MHz.

4. Set reference level to -30 dBm.

5. Set Integration BW to 2 MHz. Then, the entire span will be automatically established as 1.5 times of Integration BW.

6. By pressing **MEAS SETUP >> Avg Number >> 10 >> ENTER**, perform ten times of average.

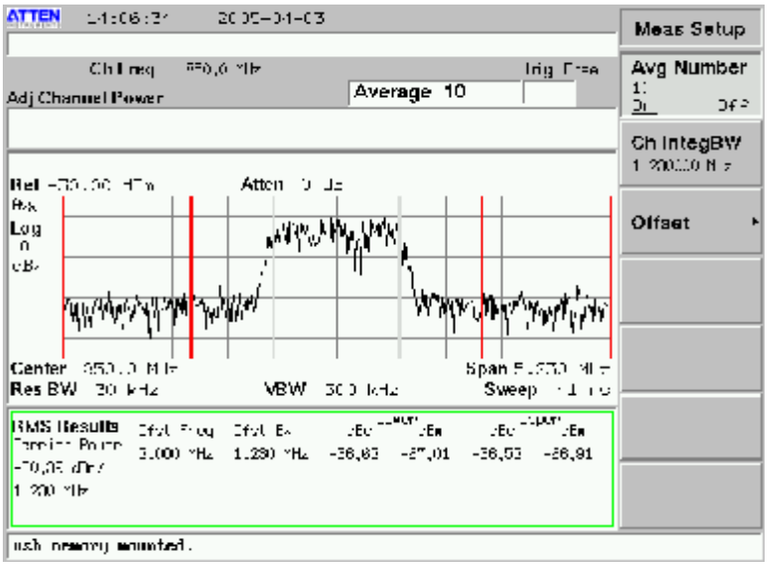


[Figure 7-18] Channel Power Measurement Function

7-6. CDMA ACP Measurement

On the transmission using multi-channels, it measures the effect of transmitted power amount of a channel on the adjacent channels. (lower band channel, upper band channel) ACP performs measurement after setting Channel Integration BW, Offset Frequency, Offset BW based on the current center frequency.

1. Set the frequency of CDMA signal generator to 850 MHz, and set the amplitude to -30 dBm.
2. By pressing MEASURE >> ACP, change the analyzer to ACP measurement mode.
3. Set the center frequency of the analyzer to 850 MHz.
4. Set reference level to -30 dBm.
5. Set Channel Integration BW to 1.23 MHz.
6. By pressing Offset, set Offset Freq to 2 MHz.
7. By pressing Offset, set Offset BW to 1.23 MHz.
8. By pressing **MEAS SETUP >> Avg Number >> 10 >> ENTER**, perform ten times of average.



[Figure 7-19] ACP Measurement Function

7-7. Printer Use

On AT6030D, it offers USB port apart from a parallel port for the connection to a printer. Set a port to transmit print data on a printer of PRINT SETUP menu. As for USB port on the front, you can save data by using USB memory apart from a print port.

■ Examples of Use

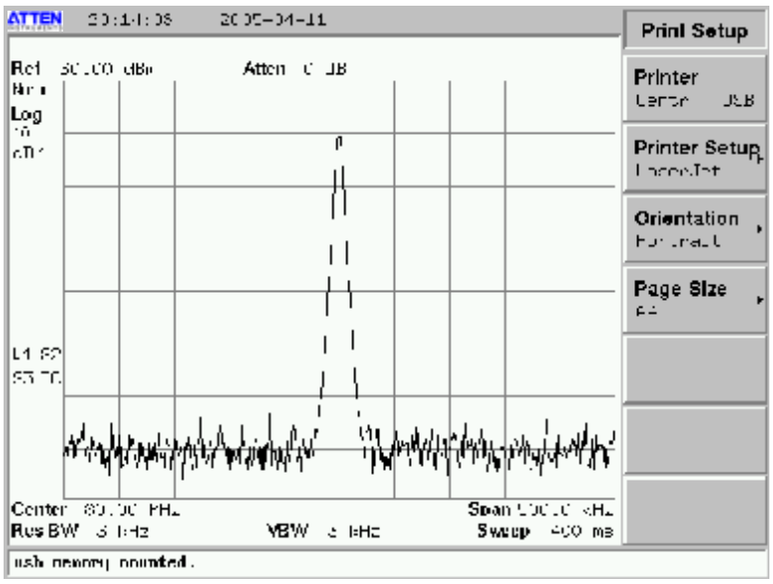
1. **On PRINT SETUP >> Printer**, select a parallel port or USB port.

2. **On PRINT SETUP >> Printer Setup**, select a driver of a print to use.

3. **On PRINT SETUP >> Orientation**, select printing direction.

4. **On PRINT SETUP >> Page Size**, select the size of printing paper.

5. Press **PRINT** key.



[Figure 7-20] PRINT SETUP Menu

7-8. USB Memory Use

On AT6030D, in order to bring picture data saved outside of the analyzer, USB flash memory is used instead of 3.5″ floppy disk. As for locations to save data of AT6030D, there are “screen” which is an internal memory of the analyzer, and “usbfs” indicating USB flash memory. If you set a path to usbfs on the file list screen, while USB flash memory is attached to USB port on the front of the analyzer, operations including Save, Load, Delete, Rename, and Create Dir will perform not as a screen, which is an internal memory of the analyzer, but as USB flash memory on File menu. Also, if you get out of the file menu after setting a path to usbfs on the file list screen of the file menu, the saving of a file by the operation of Save key on the front board will be directly performed not as an internal memory of the analyzer, but as USB flash memory.

■ Examples of Use

1. Equip USB flash memory to USB port on the front.
2. By pressing **FILE** >> **Save** >> **Type** >> **Screen** keys, set a file type to a picture file.
3. By pressing **FILE** >> **Save** >> **Format** >> **GIF** keys, set a picture format file.
4. By pressing **FILE** >> **Save** >> **Dir Select** keys, set a path to usbfs.
5. By pressing RETURN key, comes out to the analyzer wave sweep screen.
6. Press SAVE key. Then, the current display screen will be saved as a picture file on USB flash memory.

7-9. Trace Use

It offers three trace memories on AT6030D. The movement between trance memories will be used by the first menu key.

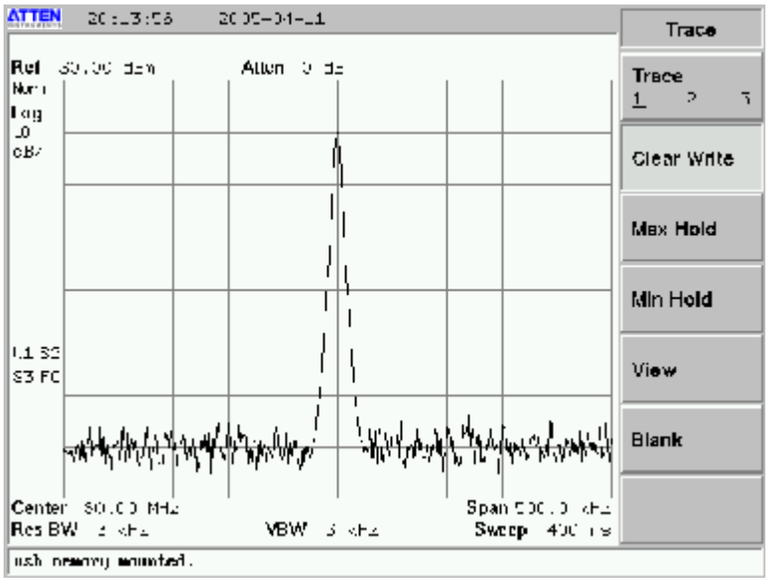
Clear Write deletes the current data in trace memory, and rewrite data newly acquired after sweep, on the memory, This operation is successively performed after every sweep is over. Clear Write is the basic trace mode of the analyzer.

Max Hold saves the biggest value by comparing data in the current trace memory and data newly acquired after sweep, and display them.

Min Hold saves the smallest value in trace memory by comparing data in the current trace memory and data newly acquired after sweep, and display them.

View indicates the contents of the current trace memory while suspending the writing on the display screen.

Blank deletes trace on the display screen. However, the contents of the trace memory do not get deleted, and they will show up on the display screen, when View menu key is pressed.



[Figure 7-21] Trace Menu

8

Options

In this chapter, the Options of AT6030D Spectrum Analyzer will be explained.

Chapter 8. Options

8-1. Specifications

► **Opt-1** : TRACKING GENERATOR

Scope of Frequency : 100 kHz ~ 3 GHz

Scope of the Amplitude : 0 dBm ~ -50 dBm

Accuracy of the Amplitude : ±3 dB, Typically ±1.5 dB

Flatness of the Amplitude : ±2 dB, Typically ±1.5 dB

Distortion of Harmonics : < -20 dBc (10 MHz ~ 2.8 GHz), Typically < -30 dBc

Reverse Power : +30 dBm

Impedance : 50Ω nominal

Connector : N-type Female

RF Input VSWR : <1.5 : 1

► **Opt-2** : CDMA(CDMA2000 ; Pilot Channel, WCDMA ; 1 CPICH) Signal Generator

► **Opt-3** : AC/DC/BATTERY OPERATION PACK

► **Opt-4** : GPIB interface

IEEE 488 Bus

► **Opt-5** : ETHERNET interface ; for Internet Remote Control

► **Opt-6** : SOFT CARRYING CASE

► **Opt-7** : General KIT SET

SMA-N adapter × 2

10 dB attenuator × 1, 20dB attenuator × 1

RF cable (SMA-SMA, RD316, 300 mm) × 2

Kit box × 1

► **Opt-8** : CATV KIT SET

N-BNC adapter × 2

50Ω ~ 75Ω adapter × 2

RF cable (N-N, RD223, 1000 mm) × 2

Kit box × 1

► **Opt-9**：RETURN LOSS BRIDGE KIT SET

Termination 50Ω × 1

Cap with chain × 1

RF cable (N-N, RD223, 1000 mm) × 2

Kit box × 1

ATTEN is guaranteeing the quality of this product.

■ Notice on the Guarantee

Items Subject to Guarantee

The period of the quality guarantee of this product is two years from the date that you purchase this product, and you can take service from ATTEN customer support center free of charge for the breakdown or abnormality of the product, free of charge.

Costs of Customers

You can take service for the following at the minimum expenses.

1) When the guarantee period is expired,
   ※ However, it will be five years after the expiration of the guarantee period.
2) When there should be a breakdown due to carelessness of customers or natural disasters,
   ※ Even if those breakdowns occur during the guarantee period, you will be charged for their fixation.

Item Out of Guarantee

When you voluntarily dismantle this product, and changed its functions, we will not guarantee the product.

Introduction of Service

Please contact a customer support center for the receipt and consultation of services.

TEL. of a customer support center : 0755-86021372, 86021373 FAX : 0755-86021337

※ In order to safely and accurately use this product, please be sure to read manuals of this product before use, and use this product in accordance with the methods of handling and use.

■ Notice on the Change of Devices

This product is subject to changes without prior notice for improving the surface, specification, and function.

■ Notice for Safety

Thank you for selecting ATTEN's product.

In order to safely and correctly use this product, please make sure to read explanations.

!

This sign means that you should be especially careful for items and operation that might cause danger under specific conditions.

The part with this sign should be carefully read and observed in order to prevent the danger of fire.

DANGER !

: When there occurs severe injury death, immediately after the indicated part was violated,

WARNING !

: When there is a possibility of the occurrence of sever injury or death after the indicated part was violated,

NOTE !

: When there is a possibility of the occurrence of light injury or damage to a product after the indicated part was violated,

After reading the explanations, please make sure to keep them in a place where a product user can find them out any time

WARNING !

◈ Please do not input abnormal electric pressure exceeding the standard value of electric pressure.
There can be danger of unexpected damage to or fire on the device.

◈ Please do not allow power without protective ground connection.
There can be danger of unexpected electric shock, and you should use power cable with grounded three cables.

◈ Please do not change a fuse while power is supplied.
There can be danger of electric shock. Before changing a fuse, please turn off a power switch, and pull out power code from a outlet Check whether a protective ground connection is connected before turning it on again after changing a fuse, and check whether AC electric pressure is appropriate. After then, turn on the power switch.

◈ Please do not integrate, adjust, repair, or touch the inside of the device.
Only trained ATTEN service staff can perform he repair and maintenance of this device against the danger of fire or electric shock. In the event that you touch high electric pressure of the inside of the device, you can be injured or die or precision parts can be damaged.

◈ Please do not allow AC, DC electric power to an output circuit.
It can cause sever damage to the device.

NOTICE !

◈ Please do not establish it where there is sever vibration.
It can be one of the reasons that the device may malfunction.

◈ Please do not establish it in a place exposed to moisture or rain, or wet place.
There is danger of electric shock, fire, and breakdown.

◈ Please do not put it on a place exposed to direct ray, or place it near a heater, etc. which might occur fire.
There is danger of the transformation of the device and fire.

◈ Please avoid excessive impact when delivering and establishing.
It can cause damage to the device by impact.

◈ Please do not spray cleaning liquid directly to a product.
It can be a cause of fire and electric shock.

◈ Please do not put heavy material on the device.
It can be a cause of damage or injury to the device if it falls on the device.

◈ Please pull out electric cord when you do not use the device for a long time.
It can be a cause of fire and electric shock since it hurts the covering of a cord.

◈ This devices needs about 15 minutes' heating.
In order to make the device operate stably, please try not to use it before it is heated.

◈ Please make sure if the selected power and the electric pressure of the power is the same before connecting it to power.
It can be a cause of damage to and fire on the device.

◈ Please use a socket with grounding terminal for power.
If it is not grounded, it can be a cause of electric shock.

◈ Please make sure to use a power socket with sound standard.
It can be a cause of electric shock and fire.

◈ Please use a fuse with right electric pressure and electric current rating.
It can be a cause of fire, and cause damage to the device.

◈ Please do not input abnormal input signal exceeding the standard value to the external input terminal. It can cause damage to the device.