ADVANTEST®
ADVANTEST CORPORATION

R3261/3361 Series

Spectrum Analyzer

INSTRUCTION MANUAL

MANUAL NUMBER OEM00 9701M

Applicable Instruments

R3261C/CN
R3261D/DN

R3361C/CN
R3361D/DN
R3361K/NK

MANUAL CHANGES

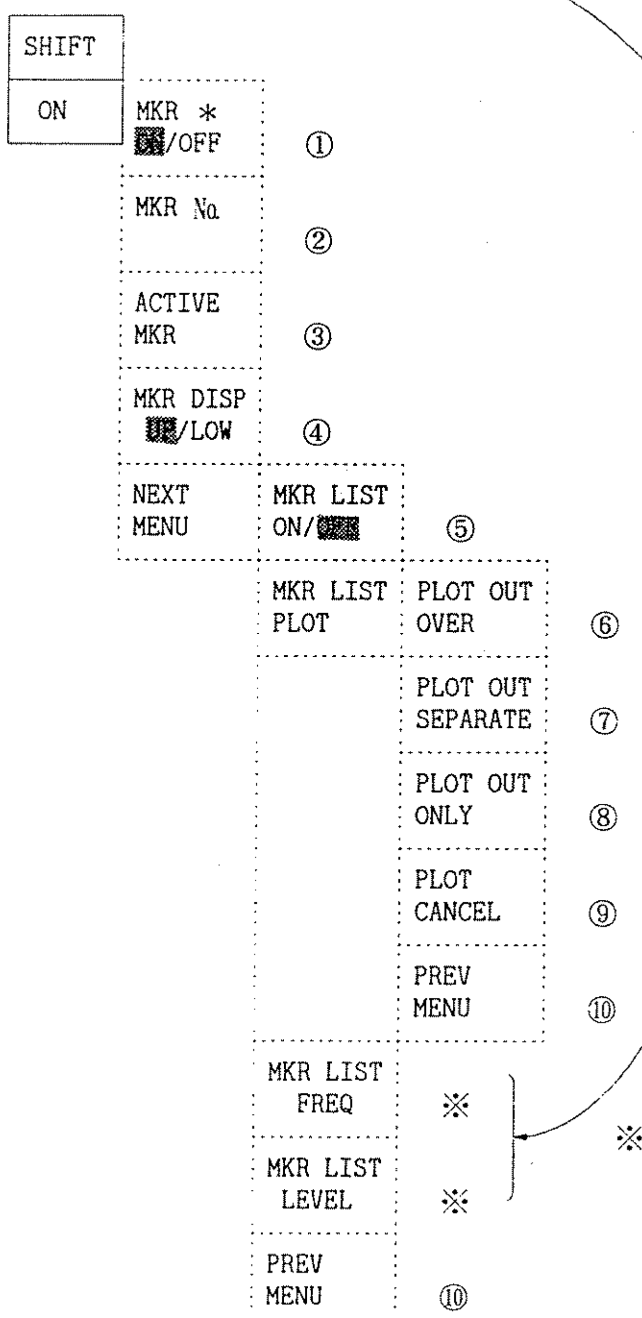
ADVANTEST

ADVANTEST CORPORATION

Manual Name	R3261/3361 SERIES	Date	August 20/1997
Manual No.	OEM00 9701	Manual Change No.	EMC-01

Parts of the Instruction Manual was changed as follows.

1. Page 4-55 Add two menus.



※ For explanation of the soft keys, see Section "4.3.5 Peak List".

2. Page 4-63 (7th line from the bottom) Change as follows.

In the normal marker mode, each frequency and level are displayed by absolute value. In the marker mode, they are displayed by relative value.

Note: The Δmarker is displayed by absolute value.

change

In the normal marker mode, each frequency and level are displayed in absolute notation.
In the Δmarker mode, the frequency and level are calculated relative to the Δmarker and displayed. Only the Δmarker data are displayed as absolute values of the frequency and level.

3. Page 4-76 Add Section "4.3.5 Peak List".

4.3.5 Peak List

[Function]

The Peak List function measures up to eight peaks of the waveform traced on the screen using the Multi-Marker function and lists the result in order of increasing frequency or in order of decreasing level.
This function is useful for differentiating among spurious signals.

The measurement data can be read by an external controller.

For details of the Multi-Marker operation, see Section "4.3.4 Multi-Marker".

(1) Soft keys

[Procedure and Explanation]

SHIFT			
ON	MKR * ON/OFF		※
	MKR No.		※
	ACTIVE MKR		①
	MKR DISP UP/LOW		②
	NEXT MENU	MKR LIST ON/OFF	③

(continues)

MKR LIST PLOT	PLOT OUT OVER	※
	PLOT OUT SEPARATE	※
	PLOT OUT ONLY	※
	PLOT CANCEL	※
	PREV MENU	※
MKR LIST FREQ	④	
MKR LIST LEVEL	⑤	
PREV MENU	※	

※ For explanation of soft keys, see Section "4.3.4 Multi-Marker".

① ACTIVE MKR

Sets the active marker in sequence.
When this key is pressed, a marker is set as the active marker in order of increasing marker number. In the absence of a large marker, the marker with the smallest number is set as the active marker.

② MKR DISP UP/LOW

Selects whether the marker data is displayed in the upper right or lower right portion of the screen.
The peak list is displayed in the position opposite the marker data.
For example, when UP is selected, the peak list is displayed at the lower right of the screen. When LOW is selected, the peak list is displayed in the upper right of the screen.

③ MKR LIST ON/OFF

Turns the peak list display on/off, including frequencies and levels.
Note : This key does not automatically search peaks.

④ MKR LIST FREQ

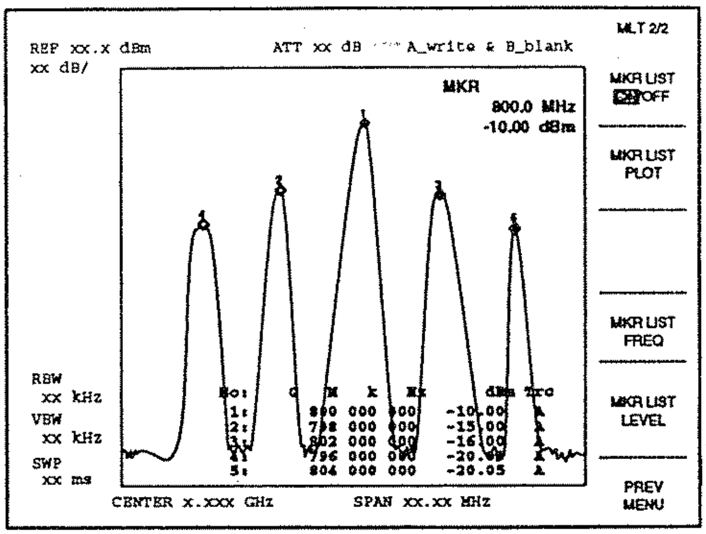
Automatically searches peaks of the waveform displayed, sets markers at up to eight peaks and lists the frequency and level of peaks on the screen in the order of increasing frequency.

⑤ MKR LIST LEVEL — Automatically searches peaks of the waveform displayed, sets markers at up to eight peaks and lists the frequency and level of peaks on the screen in the order of decreasing level.

(2) Peak List

Pressing the MKR LIST LEVEL key displays the peak list as shown below.

The xx denotes arbitrary screen data in the figure.



The frequency and level of the peaks and the related trace are listed. The listed data is not measured in the frequency counter mode or the noise level mode but computed on the basis of the marker position. Accordingly, the displayed values at upper right on the screen do not perfectly match the measured values.

In the normal marker mode, each frequency and level are displayed in absolute notation.
In the Δmarker mode, each frequency and level are calculated relative to the Δmarker and displayed.
Only the Δmarker data are displayed as absolute values of the frequency and level.

The characters listed in the right column indicate the trace where markers are set.
The listed level data is re-written whenever the frequency is swept. Peaks, however, are not automatically located. When the signal drifts, press the appropriate MKR LIST LEVEL (or MKR LIST FREQ) key to set markers at peaks.

(3) GPIB control program

(3-1) GPIB codes

GPIB codes are listed in table below.

FUNCTION	Listener code	Talker Request			Remarks
		Code	Output format	Header	
Peak list					
By frequency	PLS FREQ	—	—	—	
By level	PLS LEVEL	—	—	—	
Turns off the peak list display	PLS OFF	—	—	—	
Reading peak data					
Complete data	—	PKLST?	n,f1,l1,...f9,l9	—	Nine pairs
Frequency only	—	MLSF?	f1,f2,...f9	—	Δ included
Level only	—	MLSL?	l1,l2,...l9	—	Δ included
Turning the Peak list display on/off ※					
Display On	PKLST DSP	—	—	—	
Display Off	PKLST NODSP	—	—	—	

※ When the peak list display is turned off with the PKLST NODSP command, the GPIB response is improved.

For GPIB codes other than the peak list codes, see Chapter 7 "GPIB Control Program".

(3-2) GPIB commands

(a) Turning the peak list display on/off.

[Format]

```
OUTPUT 708;"PLS FREQ" ......... ①  '  Displays the peak list by frequency.
OUTPUT 708;"PLS LEVEL" ........ ②  '  Displays the peak list by level.
OUTPUT 708;"PLS OFF"  ......... ③  '  Turns off the peak list display.
```

[Function]

The PLS command automatically searches peaks in order of increasing frequency or in order of decreasing level according to the specified parameter and displays the results on the screen.
Commands ① and ② search up to eight peaks of the waveform, set markers at the peaks and list the marker data in order of increasing frequency or in order of decreasing level.
Carrying out command ③ will turn off the peak list display.

(b) List display control and readout data

[Format]

```
OUTPUT 708;"PKLST NODSP" ····· ①  '  Truns off the peak list display.
OUTPUT 708;"PKLST DSP"   ····· ②  '  Turns on the peak list display.

OUTPUT 708;"PKLST?"      ····· ③  '  Outputs the peak list to the external
                                     controller.
ENTER 708;Peak(*)
```

[Function]

The PKLST NODSP (①), DSP (②) commands turn the peak list display on/off and the PKLST?(③) command reads the peak list data (i.e. : frequency and level data).

We recommend turning off the peak list display with the PKLST NODSP command to enhance the response when an external controller controls the R3261/3361 remotely.

Once the PKLST NODSP command is carried out, the R3261/3361 saves the setting. Accordingly there is no need to set the same command in other programs.
This setting can be performed by the GPIB command but not by pressing a panel key. Take note that there is not a panel key to turn off the Peak List display.

The PKLST? command outputs the current peak list data to the external controller.
The peak list contains the number of displayed markers and the corresponding data. When the peak list is output to the external controller, the data is delimited by commas.
Accordingly, the total number of output values is nineteen (the Δmarker data is included).
(i.e. : cnt + (freq + level) × nine pairs).
Here, cnt is the number of displayed markers and freq + level are the frequency and level data.
In the Δmarker mode, only the Δmarker data are absolute values of the frequency and level.
Other marker data are calculated relative to the Δmarker.

[Sample program]

```
1000 ! Peak list acquisition (HP-BASIC 5.0)
1005 !
1010   DIM Peak(0:18)                        ! Number of displayed markers
                                               and frequency and level data
                                               of up to nine peaks.
1020   INTEGER Spa,S,I,Cnt
1030 !
1040   Spa=708
1050   OUTPUT Spa;"HDO S1"
1060   OUTPUT Spa;"PKLST NODSP"              ! Turns off the peak list
                                               display.
1070   OUTPUT Spa;"SI"
1080   OUTPUT Spa;"S2"
1090 !
1100   OUTPUT Spa;"FA10MZ FB110MZ VB10KZ DY10HZ"
1110 !
1120 ! Measurement starts.
1130 !
1140   OUTPUT Spa;"SI"                       ! Sweeps once.
1150   S=SPOLL(Spa)
1160   IF BINAND(S,4)=0 THEN GOTO 1150
1170   OUTPUT Spa;"S2"
1180   OUTPUT Spa;"PLS LEVEL"                ! Searches peaks in order of
                                               decreasing level.
1190   OUTPUT Spa;"PKLST?"                   ! Requests the list data.
1200   ENTER Spa;Peak(*)                     ! Reads the list data.
1210   FOR I=1 TO Peak(0)*2 STEP 2           ! Displays the list data on the
                                               controller screen.
1220       PRINT "NO.";(I+1)/2," FREQ: ";Peak(I)," LEVEL: ";Peak(I+1)
1230   NEXT I
1240 !
1250   END
```

4. Page 7-18 Add GPIB codes as (23).

No.	Function	Code	Talker request			Remarks
			Code	Output format	Header	
23	Annotation display ON/OFF OFF ON	 CHDF CHDN	—	—	—	Pressing the LOCAL key turns on the annotation display.

5. Page 3-2 (WARNING)

10dB
change

Maximum input level:R3261C/D, R3361C/D
+25dBm (Input attenuator : 30dB or more)
Maximum input level:R3261CN, R3361CN
+132dBμ (Input attenuator : 30dB or more)

No. ESC00

Safety Summary

To ensure thorough understanding of all functions and to ensure efficient use of this instrument, please read the manual carefully before using. Note that Advantest bears absolutely no responsibility for the result of operations caused due to incorrect or inappropriate use of this instrument.

If the equipment is used in a manner not specified by Advantest, the protection provided by the equipment may be impaired.

■Warning Labels

Warning labels are applied to Advantest products in locations where specific dangers exist. Pay careful attention to these labels during handling. Do not remove or tear these labels. If you have any questions regarding warning labels, please ask your nearest Advantest dealer. Our address and phone number are listed at the end of this manual.

Symbols of those warning labels are shown below together with their meaning.

DANGER: Indicates an imminently hazardous situation which will result in death or serious personal injury.

WARNING: Indicates a potentially hazardous situation which will result in death or serious personal injury.

CAUTION: Indicates a potentially hazardous situation which will result in personal injury or a damage to property including the product.

■Basic Precautions

Please observe the following precautions to prevent fire, burn, electric shock, and personal injury.

- Use a power cable rated for the voltage in question. Be sure however to use a power cable conforming to safety standards of your nation when using a product overseas. Do not place anything heavy on top of the power cable.

- When inserting the plug into the electrical outlet, first turn the power switch OFF and then insert the plug as far as it will go.

Certificate of Conformity

CE

This is to certify, that

Spectrum Analyzer

R3261/R3361 Series

instrument, type, designation

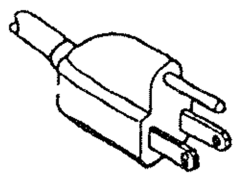
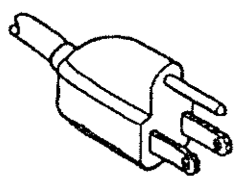
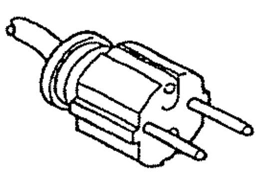
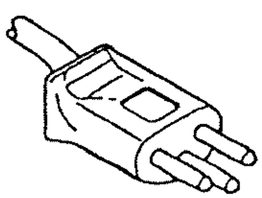
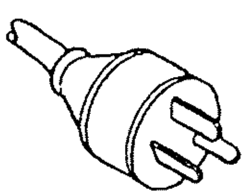
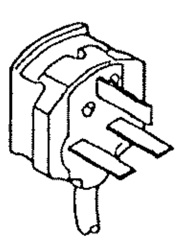
complies with the provisions of the EMC Directive 89/336/EEC in accordance with EN50081-1 and EN50082-1 and Low Voltage Directive 73/23/EEC in accordance with EN61010.

ADVANTEST Corp.
Tokyo, Japan

ROHDE&SCHWARZ
Engineering and Sales GmbH
Munich, Germany

Table of Power Cable options

There are six power cable options (refer to following table).
Order power cable options by Accessory Codes.

	Plug Configuration	Standards	Rationg, Color and Length	Accessory Codes (Option Number)
1		JIS: Japan Law on Electrical Appliances	125V at 7A Black 2m (6ft)	Straight: A01402 (Standard) Angled: A01412
2		UL: United States of America CSA: Canada	125V at 7A Black 2m (6ft)	Straight: A01403 (Option 95) Angled: A01413
3		CEE: Europe VDE: Germany OVE: Austria SEMKO: Sweden DEMKO: Denmark KEMA: Holland FIMKO: Finland NEMKO: Norway CEBEC: Belgium	250V at 6A Gray 2m (6ft)	Straight: A01404 (Option 96) Angled: A01414
4		SEV: Switzerland	250V at 6A Gray 2m (6ft)	Straight: A01405 (Option 97) Angled: A01415
5		SAA: Australia, New Zealand	250V at 6A Gray 2m (6ft)	Straight: A01406 (Option 98) Angled: ———
6		BS: United Kingdom	250V at 6A Black 2m (6ft)	Straight: A01407 (Option 99) Angled: A01417

PREFACE

This manual covers operations of the R3261C, R3261CN, R3261D, R3361C, R3361CN, R3361D, R3361NK and R3361K.

The text of this manual uses the R3261D/3361D data, but the panel diagrams and screen drawings use the R3361C data.

In the following explanations, a panel key is enclosed by a solid line (e.g., REF LEVEL) and a softkey menu is enclosed by a dotted line (e.g., XdB/DIV) as required to prevent confusion of them.

When a softkey menu enclosed by a dotted line is followed by [ ], this symbol indicates the softkey corresponding to this softkey menu.

This instruction manual consists of the following two parts.

- OPERATION
- PERFORMANCE TEST

TABLE OF CONTENTS

● How to Use This Manual

Information and notes necessary to use the R3261/3361 for Operating Manual safely are written. Read before the R3261/3361 is used.

1. General	This chapter explains features of the R3261/3361, and the procedure from set-up to power-on operation, and precautions.
2. Panels	This chapter provides brief information about every part of the front and rear panels.
3. Basic Operations	This chapter is edited for the beginners to explain the procedure from power-on operation to simple measurement using only basic keys.
4. Functions	This chapter explains basic functions and applications of the R3261/3361.
5. Tracking Generator Functions	This chapter explains the tracking generator functions which can control generation of highly stable wide-band frequencies continuously and are indispensable for analyzing the frequency characteristics of the DUT.
6. Measurement Examples	This chapter explains how to operate the R3261/3361 according to various examples.
7. GPIB: Remote Programming	The R3261/3361 is equipped with GPIB, enabling full remote control from an external controller.
8. Check	Read this chapter when the R3261/3361 does not operate normally.

9. R3361NK/3361K	This chapter explains the R3361NK/3361K.
10. Specifications	This chapter explains specifications and accessories of the R3261/3361.
11. Operations	This chapter explains basic operations of the R3261/3361.
APPENDIX	The appendix lists softkey menus corresponding to panel keys and glossary.
INDEX	
EXTERNAL VIEW	The outside dimensional drawing, front panel drawing, and rear panel drawing are listed.

TABLE OF CONTENTS

1. GENERAL

1.1 Overview

The R3261/3361 spectrum analyzer, which employs a synthesized local oscillator for assuring highly stable spectrum analyzer, features
wide frequency range from 9kHz to 2.6GHz (R3261C/CN, R3361C/CN R3361NK/K),
9kHz to 3.6GHz (R3261D, R3361D),
wide input range from -130dBm to +25dBm (R3261C/D, R3361C/D R3361NK/K),
-19dBμ to +132dBμ (R3261CN, R3361CN),
wide measurement display range of 115dB and high resolution of 30Hz, low residual FM of $20Hz_{p-p}$, less noise sideband of -105dBc/Hz (20kHz output from carrier) as well as full remote-control GPIB, and the memory card function for saving/recalling data and panel settings.
The R3361C/CN/D contains a tracking generator that facilitates frequency characteristic measurement.

Features

1. This analyzer permits sweeping over a wide frequency range from 9kHz to 3.6GHz (R3261D, R3361D).

2. A maximum frequency resolution of 30Hz enables analysis of adjacent signals and spurious response.

3. High-precision frequency measurement
A reference crystal oscillator with an aging rate of 2×10^{-8}/day is mounted to measure very weak signals (which cannot be measured by any counter) at a resolution of 1Hz in the counter mode.

4. Use of a memory card permits saving/recalling of panel settings.

5. The field strength can be viewed and read directly after compensating the antenna calibration coefficient and that the QP value based on the CISPR standard can be observed directly.

6. Various enhanced functions supported by digital indications
Whole information needed for spectrum analysis is displayed on the CRT together with signal traces. The digital memory screen realizes flickerless display. Various marker functions assures accurate and easy reading even in the manual mode.

7. Two channels of completely independent digital memories enable simultaneous display of two screens.

8. A full-remote-control GPIB is used as a powerful system component.

9. The built-in tracking generator of the R3361C/CN/D enables direct viewing of frequency attenuation of 115dB or more.

10. The R3261/3361 suits safety Class I of the IEC Publication 348 (safety Publication of the electronic measurement instrument).

11. R3361NK/3361K allows easy measurement concerning CATV.
(Refer to Chapter 9.)

1.2 Before Using This Spectrum Analyzer

1.2.1 Checking Accessories

Upon receipt of the R3261/3361, run checks thereon as shown below.

① Run visual checks against any and all damages or imperfections.

② Check the quantity and rating of standard accessories to assure their conformance with Table 1 - 1.

Should there be any flaw, or damage, or missing or insufficient part, contact dealer or the sales and support offices.

Table 1 - 1 Standard Accessories

Name	Type name	Quantity				Remarks
		R3261C/D	R3361C/D	R3261CN	R3361CN	
Power cable	*1	1	1	1	1	
Input cable	A01036-1500	1	2			50Ω BNC cable, 1.5m
	D3S015(Black)			1	2	75Ω BNC cable, 1.5m
N-BNC conversion adapter	JUG-201A/U	1	2			
	BA-A165			1	2	
Power fuse	218005	2	2	2	2	
Memory card	MAC1101BAB	1	1	1	1	
R3261/3361 Instruction manual	JR3261/3361	1	1	1	1	Japanese version
	ER3261/3361					English version

*1 ADVANTEST provides the power cables for each country.

Note: When ordering the addition of the accessory etc. with type code.

1.2.2 Environmental Conditions

(1) Do not use the R3261/3361 in a place exposed to direct sunlight or corrosive gas. Do not use this unit in a place exposed to dust or vibration.
The ambient temperature must be 0 to $50^{\circ}C$ and the relative humidity must be 85% or less.
The R3261/3361 is designed for indoor use. Safety can be kept for $-10^{\circ}C$ or more in the temperature.

(2) A cooling fan is provided on the back panel of this unit to prevent abnormal temperature rises in it. Since this fan blows air outside, give attention to the ventilation around the R3261/3361.
Place this unit within 10cm from the rear wall. Do not place any obstruction close to the rear panel of the R3261/3361.

(3) The R3261/3361 is designed with the effect of AC power supply line noise taken into consideration. However, it is recommended that it be used in a place where there is minimum noise. If the noise is unavoidable, use a noise suppresser or the equivalent.

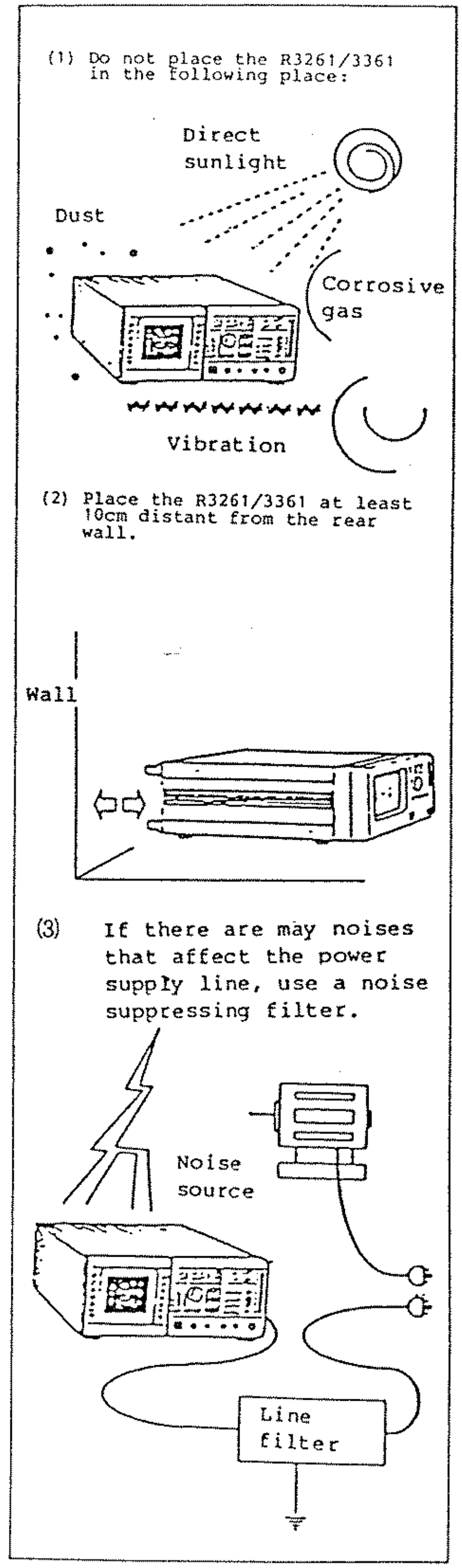


Figure 1 - 1 Environmental Conditions

1.2.3 Storage, Cleaning and Transport

(1) Storage

The R3261/3361 must be stored at temperatures from -20°C to +60°C. If the system will not be used for a long time, wrap it in a vinyl sheet or put it in a carton box, and store it in a dry place away from direct sunlight.

(2) Cleaning

The protect filter of the CRT display unit must be cleaned periodically with a soft cloth soaked with alcohol. Use alcohol only.

CAUTION

Do not use solvents such as benzene, toluene, acetone, and other organic solvents that can affect plastic.

(3) Transport

Pack the R3261/3361 in the original or similar packing materials for transport. If the original packing materials have been lost, wrap up the main unit in padding and put it in a carton box with sides at least 5mm thick. Put in the accessories, cover these with more cushioning materials, secure the box, and bind the package with a packaging strap.

1.2.4 Before Turning This Analyzer on

WARNING

1. Before any other connection is made, make sure the R3261/3361 has been properly grounded through the protective conductor of the AC power cable to a socket outlet provided with protective earth contact. Any interruption of the protective (grounding) conductor, inside or outside the R3261/3361, or disconnection of the protective earth terminal can result in personal injury.

2. Before turning R3261/3361 on, make sure that it is set to the voltage of the power supply (Refer to Table 1-2.).

3. If the fuse rating is not as specified, the R3261/3361 may be broken.

(1) Power Requirement

Table 1 - 2 lists power supply conditions.

Table 1 - 2 Power Supply Conditions

Power	Condition
Input voltage	90 to 132V or 198 to 250V rms
Frequency	48 to 66Hz
Power consumption	220VAC or less

(2) Checking a Fuse

The AC line fuse rating is T5A/250V whether the input voltage is 90 to 132V or 198 to 250V.

The T5A/250V fuse is contained in the power supply connector on the rear panel. Check it.

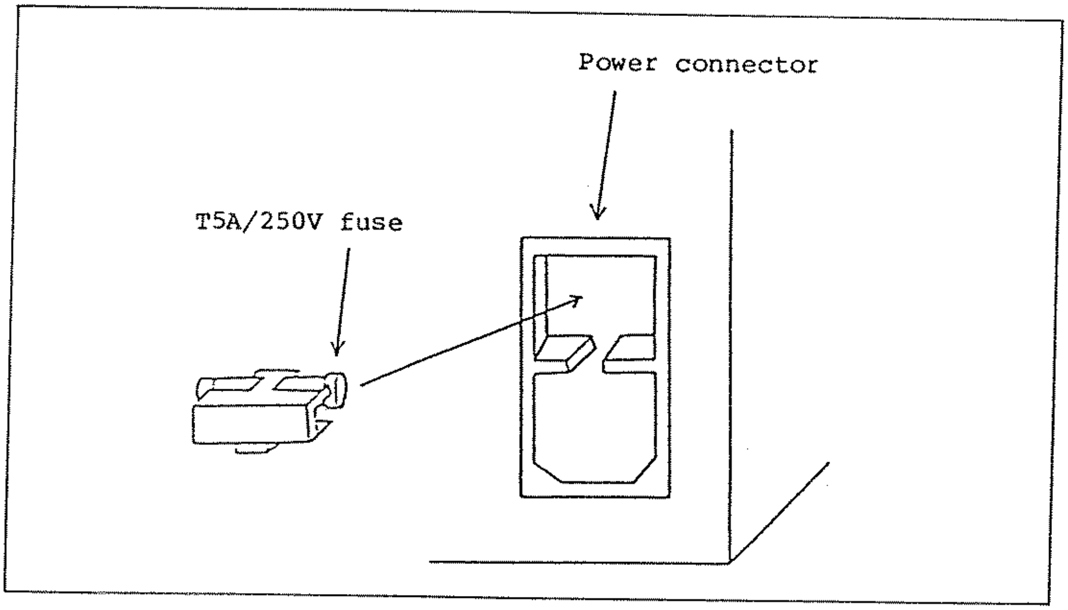


Figure 1 - 2 Checking a Fuse

(3) Checking the Power Cable

The power cable plug has three pins. The round pin is used for grounding.

When using the R3261/3361, defend the following.

- Connect power plug with the outlet prepared the protective earth terminal.
- Do not use the extension cable without a protective conductor.

WARNING

Any interruption of the protective conductor inside or outside the R3261/3361 or disconnection of the protective earth terminal is likely to make the instrument dangerous. Intentional interruption is prohibited.

CAUTION

Power is supplied to the R3261/3361 when the power cable is connected to the power connector; even if the power switch is turned off. Disconnect the power cable to shut off the power.

2. PANELS

2.1 Front Panel

This section explains the front panel components (1) to (38) in the ascending order. See Figure 2 - 1.

Explanation of Each Component:

(1) POWER switch : Supplies or cuts power.

(2) DRIVE lamp : Goes on when the memory card operates.

(3) Memory card insertion slot

(4) EJECT button : Ejects the memory card.

(5) TG key : Turns on/off the tracking generator.

(6) TG OUTPUT connector : An N-type output connector of the tracking generator.

(7) INTENSITY control : Controls intensity.

(8) PROBE POWER : A probe power connector. (Power supply to an accessory such as active probe.)

1 : NC
2 : GND
3 : -15V
4 : +15V

Note: Set the output current below ±80mA.

(9) PHONE jack : An 8Ω phone jack.

(10) INPUT connector : An N-type input connector.

(11) CRT display : Displays waveforms and measured data.

(12) Softkey menu display section : Displays up to six items.

(13) Softkeys : There are six softkeys which correspond to the left-hand softkey menu.

FUNCTION Section

(14)	CENTER FREQUENCY key	: Selects a center frequency input mode.
(15)	FREQUENCY SPAN key	: Selects a frequency span input mode.
(16)	START key	: Selects a sweep start frequency input mode.
(17)	STOP key	: Selects a sweep end frequency input mode.
(18)	COUPLE key	: Sets a resolution band width, video band width, sweep time, or input attenuator.
(19)	REFERENCE LEVEL key	: Selects a reference level input mode.
(20)	MENU key	: Selects a trigger, detector, sweep, display line, or tracing.
(21)	SWEEP lamp	: Goes on during sweeping.

TRACE Section

(22)	A-key	: Controls the trace memory.
(23)	B-key	: Controls the trace memory.

GPIB Section

(24)	LCL key	: Cancel external control.
(25)	REMOTE lamp	: Goes on only when this analyzer is controlled by an external unit.
(26)	USER key	: Assigned a function by the user.
	DEFINE key	: Used when the user defines a function.
(27)	RECALL key	: Used to call a saved setting condition.
	SAVE key	: Used to save the current set conditions.
(28)	SHIFT key	: Selects a shift mode (key expansion function). (The LED goes on when this mode is selected.)
(29)	PRESENT key	: Restores the initial state.

MARKER Section

(30)	ON key	: Displays a marker for direct reading of every part of the displayed waveform.
(31)	PEAK key	: Moves the marker to the highest level (peak) on the screen.
(32)	MKR → key	: Selects a marker point operation.
(33)	OFF key	: Clears the marker.

DATA Section

(34)	Data knob	: Adjusts data input finely.
(35)	Step key	: Inputs data step by step.
(36)	Ten key	: Consists of numeric keys (0 to 9) and decimal point key.
(37)	Back space key	: Used to correct a digit input by a numeric key.
(38)	Unit key	: Selects a unit and enters the set value.

2.2 Rear Panel

This section explains the rear panel components (1) to (20) in the ascending order. See Figure 2 - 2.

Explanation of Each Component:

(1) SERIAL I/O (Option)

(2) GPIB connector : Used to connect an external controller or connector with a GPIB cable.

(3) Controller output terminal (Option)

(4) Terminal for ouputting write waveform to X-Y recorder
: X.OUT : Approx. -5V to +5V
Output impedance : Approx. 10kΩ

(5) Terminal for ouputting write waveform to X-Y recorder
: Y.OUT : Approx. 0 to 4V
Output impedance : Approx. 220Ω

(6) Terminal to external CRT display, video plotter, etc.
: Includes output impedance of approx. 75 Ω, 1Vp-p, and composite signal.

(7) 2V/nGHz output terminal
: Outputs 2V per 1GHz tuning frequency.

(8) Gated sweep control terminal
: Stops sweeping and measurement at the low TTL level or performs sweeping and measurement at the high TTL level.

(9) External trigger : Triggers at the leading edge.

(10) Reference frequency signal input/output terminal
: Output : Approx. -5dBm
Input : Approx. 0dBm min.

(11) Input/output selector switch
: Selects input or output of a reference frequency signal.

(12) IF monitor output terminal (option)
: An IF output for supplying a 226MHz frequency.

(13) PARALLEL I/O (Option)

Note: Not provided for R3551.

(14) VIDEO Output (Option)

⑮ CAUTION

For continued protection against fire hazard, replace a fuse with the same type and rating.

⑯ Indication of installed options

⑰ CAUTION

Inside entry by trained service personnel only.

⑱ Cooling fan : A cooling fan that blows air out.

⑲ Connector for AC power
: An connector having three pins. The lower central pin is used for grounding. To remove the power fuse, remove the upper lid.

⑳ Japan Only

Ground terminal : Used to connect the unit frame to the ground when neither 3-pin nor 2-pin power cable connector cannot be used.

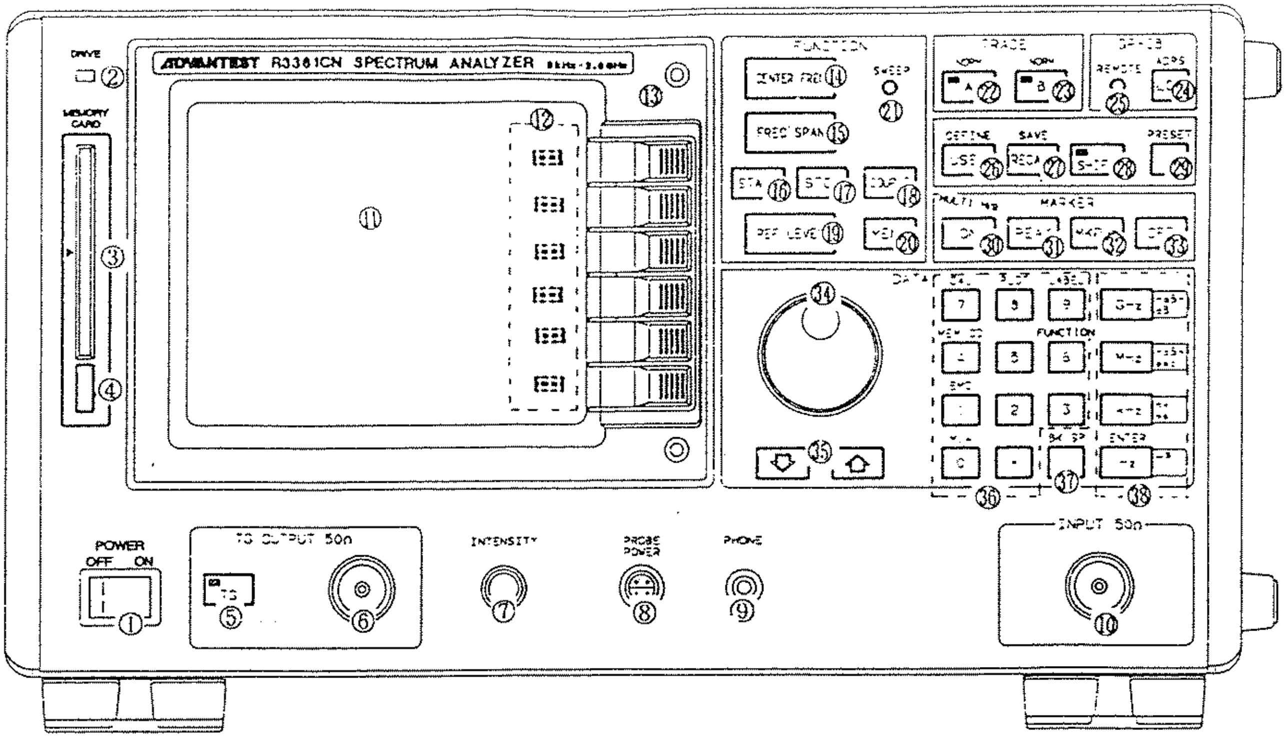


Figure 2 - 1 Front Panel

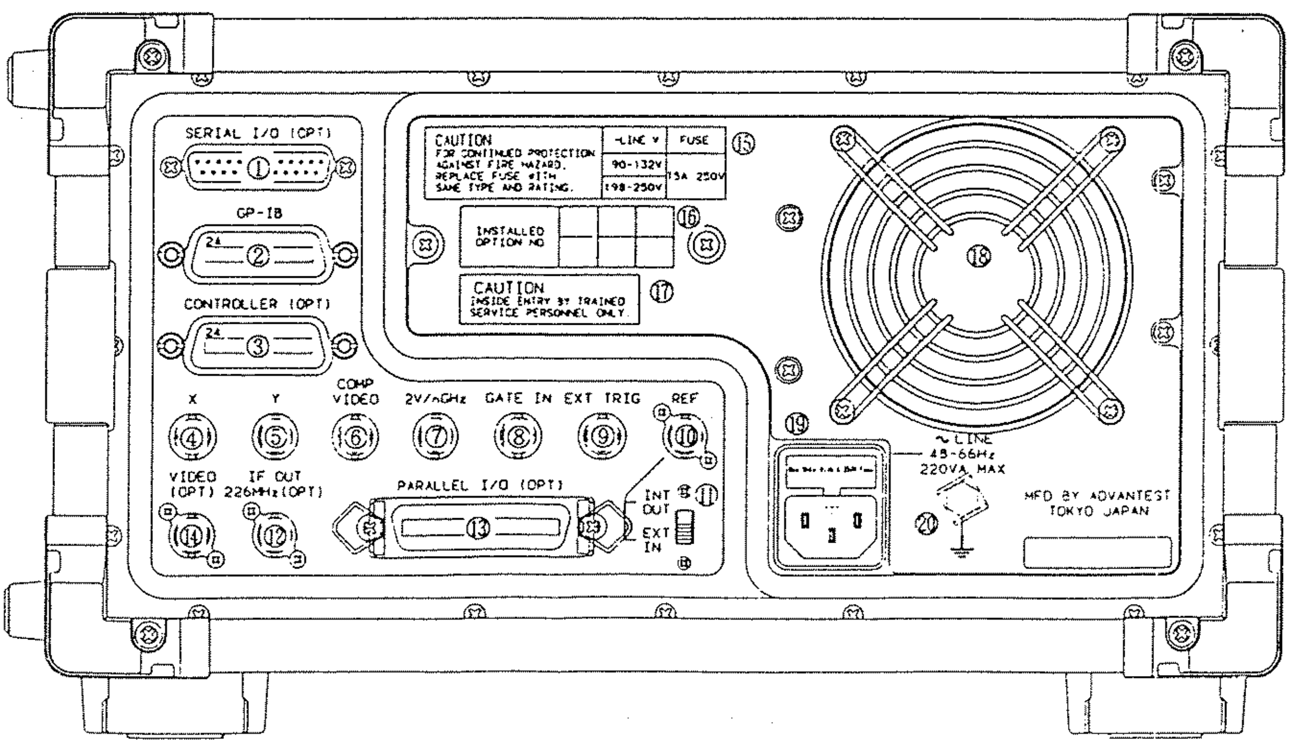


Figure 2 - 2 Rear Panel

3. BASIC OPERATIONS

3.1 Turning This Analyzer On and Inputting Signals

WARNING

1. The maximum allowable level of this input connector is given below. If voltage in excess of this level is applied, the input mixer will be broken and the cost of repairing it will be very high. If there is a possibility that the input signal level will exceed the maximum level of the R3261/3361, use an external attenuator to reduce the signal level sufficiently.

   Maximum input level: R3261C/D, R3361C/D
   +25dBm (Input attenuator : 10dB or more)
   : R3261CN, R3361CN
   +132dBμ (Input attenuator: 10dB or more)
   AC couple : Maximum ±50Vdc

2. Pay attention that 75Ω input/output connector of the R3261CN and R3361CN analyzers are fragile. Use the dedicated adopter, or the input/output connector will be damaged.

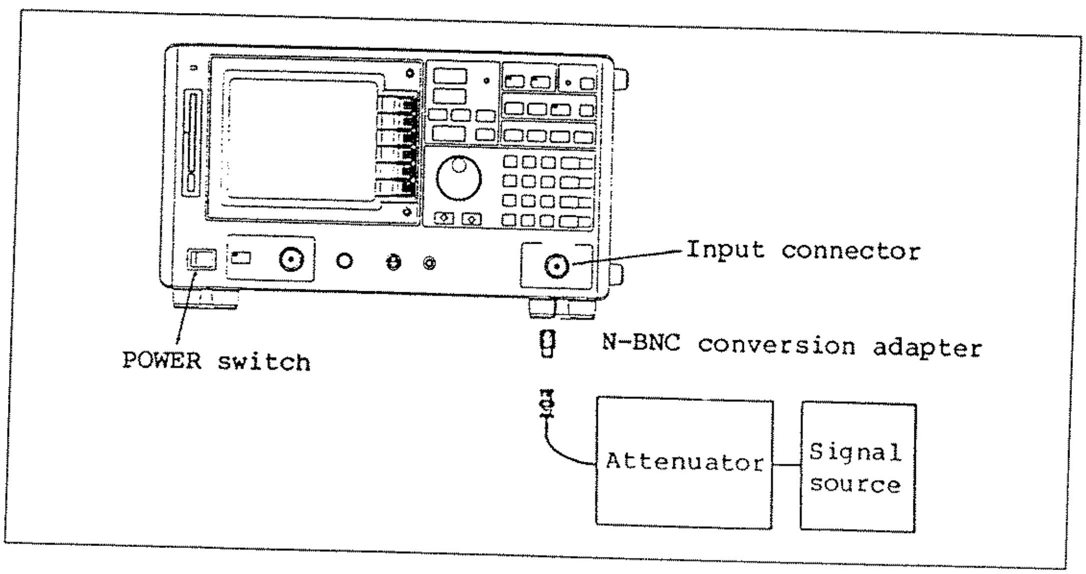


Figure 3 - 1 Turning Analyzer On and Inputting Signals

(1) Power-On Operation Warm-Up

Set the POWER switch to ON.

Warm the R3261/3361 up for about 30 minutes to attain the designed performance.

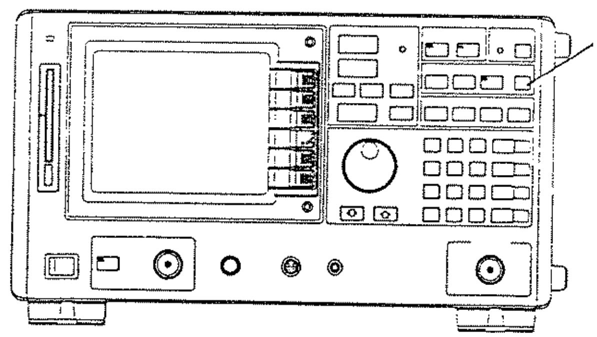
(2) Input

The N-type connector is used for signal input. When inputting signals through the BNC connector, use an attached N-BNC conversion adapter. Take care not to break fine connector pins. The maximum input level is +25dBm (R3261C/D, R3361C/D), +132dBμ(R3261CN, R3361CN) and the AC couple is ±50Vdc when the input attenuation level is 30dB or more.

The input impedance is about 50Ω(R3261C/D, R3361C/D), about +75Ω(R3261CN, R3361CN). When input impedance must be matched, insert a suitable matching circuit.

3.2 Initialization

(1) Initialization



The measuring parameters of the R3261/3361 have been set to the initial status as follows:

Table 3 - 1 Initial Settings (Parameters)

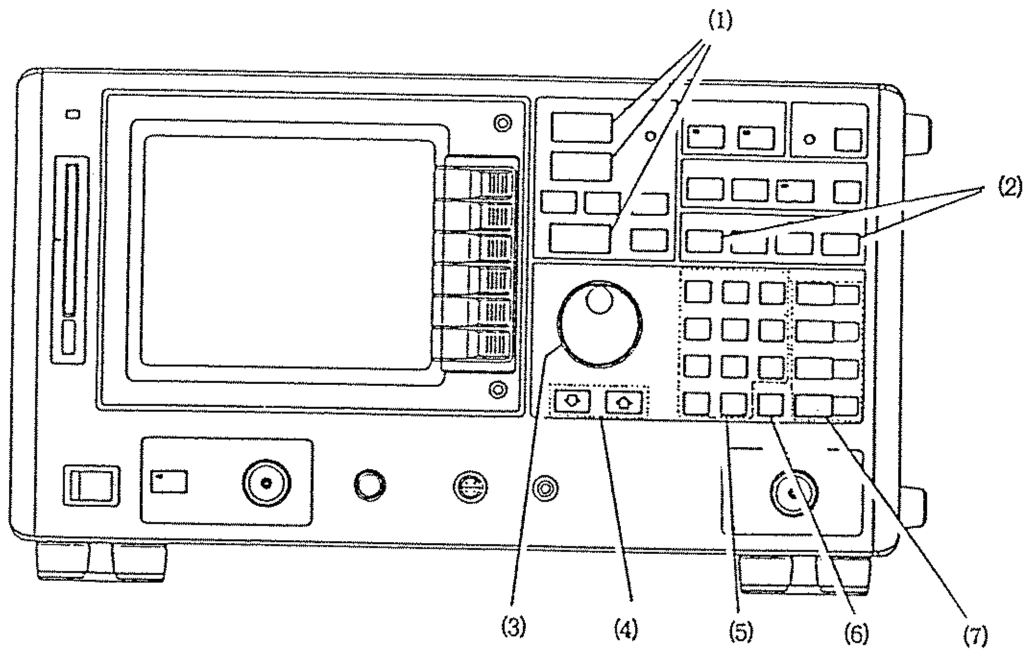
Measurement parameter	Initial value	
	R3261C/D, R3361C/D	R3261CN, R3361CN
Center frequency	1.8GHz (1.3GHz)	1.3GHz
Frequency span	3600MHz (2600MHz)	2600MHz
Reference level	0dBm	110dBμV
Sweep time	AUTO (50ms)	AUTO (50ms)
Resolution band width	AUTO (1MHz)	AUTO (1MHz)
Video band width	AUTO (1MHz)	AUTO (1MHz)
Step size	AUTO	AUTO
Input attenuator	AUTO (10dB)	AUTO (10dB)
Trigger mode	FREE RUN	FREE RUN
Trace mode	A WRITE	A WRITE
Detection mode	Normal mode	Normal mode
Marker	OFF	OFF
Display line	OFF	OFF
Label function	OFF	OFF
Vertical calibration	10dB/div.	10dB/div

3.2 Initialization

To initialize the measuring parameters, press the PRESET key.
When the R3261/3361 power switch is turned off, the last setting status of the instrument is kept in memory.
When the power switch is turned on again, the R3261/3361 is set to the same status.

3.3 Keys for Basic Operations

This section explains only basic keys for the users who have no experience in using this kind of analyzer. If you used to operate such an analyzer, you may skip this section.



(1) Keys for Basic Settings

CENTER FREQ key: Use this key to select a center frequency input mode.

FREQ SPAN key : Use this key to select a frequency span input mode.

REF LEVEL key : Use this to select a reference level input mode.

(2) Marker

ON key
OFF key } : Use this key to display or clear the marker for direct reading of every part of waveform data.

(3) Data knob : Use this key for fine adjustment of data input.

(4) Step key : Use this key to input data step by step.

(5) Numeric keys : Use these keys to input digits and decimal points.

(6) Back space key : Use this key to correct digits input with the numeric keys.

(7) Unit key : Use this key to set the unit and enter the setting.

3.4 Basic Operations

The R3261/3361 can measure both the signal frequency and level. The following gives an example to explain the basic procedure to measure the 200MHz signal frequency and level.

(1) Inputting a Signal to be Measured

Set the POWER switch to ON and input the signal to be measured. For example, input a 200MHz signal (10dBm) to the INPUT terminal of the R3261/3361 using connection cable MI-02 and conversion adapter N-BNC.

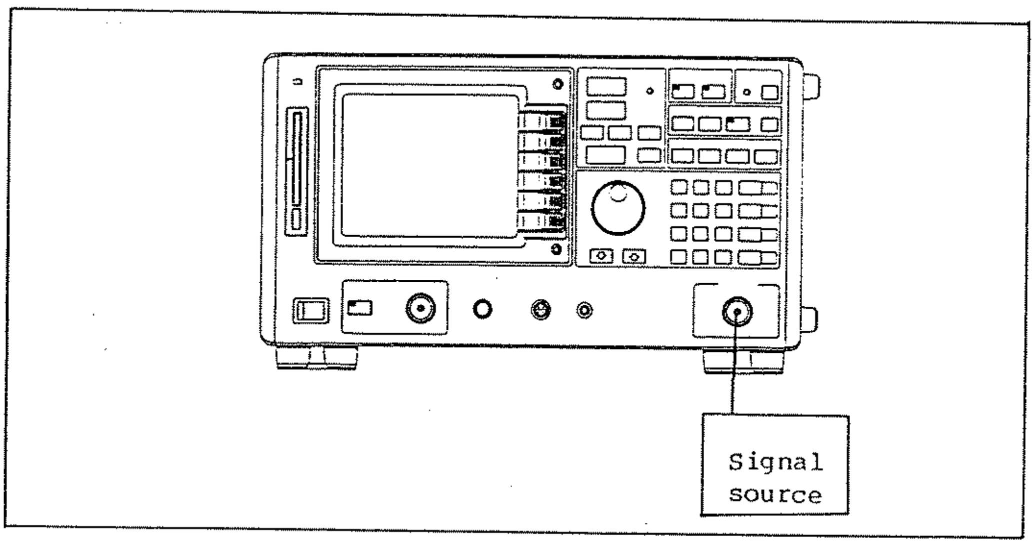


Figure 3 - 2 Inputting a Signal to be Measured

(2) Reading the Frequency and Level of the Signal to be Measured 1

(2-1) Set the center frequency to 200MHz.

① Press [CENTER FREQ]. "CENTER" is displayed at the upper left corner of the screen.

② Press [2] [0] [0] [MHz].
Thus, the center frequency is set to 200MHz and the signal subject to measurement moves to the center of the screen. (In this case, the frequency span becomes 800MHz.)

The center frequency may be set with the data knob or step key instead of the tem keys.

Data knob: Turning this knob clockwise will move the waveform to the left; that is, the center frequency is raised.

Step key : Pressing this key once will raise or lower the center frequency initially set on the horizontal axis.

(2-2) Change the very wide frequency span of 3600MHz (initial value) to 100MHz.

① Press [FREQ SPAN].
"SPAN ..Hz" is displayed at the upper left corner of the screen.

② Press [1] [0] [0] [MHz]. Thus, the horizontal scale will be 100MHz and 1 div. will be reduced by 1/10 (10MHz).

The frequency span is displayed at the lower right corner of the screen.

③ If the signal waveforms shift from the center of the screen, press [CENTER FREQ] and turn the data knob (for fine adjustment) to move the waveform to the center.

When a frequency span is changed, the 200MHz signal waveform displayed at the center of the screen may be shifted because the set resolution values differ between frequency spans.

If the frequency is known, just enter it by pressing the ten keys. In this case, the spectrum does not deviate from the center of the screen at the time of frequency span setting.

(2-3) Set the 200MHz signal to REFerence LEVEL (reference level: top level on the screen scale) to measure the level.

① The initial reference level is 0dBm. Change it to -10dBm and set the calibration signal to the reference level.

Press [REF LEVEL] . "REF LEVEL xx dBm" is displayed at the upper left corner of the screen.

Press [1] [0] [MHz] (-dBμ). Thus, the reference level change to -10dBm.

Step keys may be used instead of the above keys.

② If the calibration signal cannot be set to the reference level, the level indication must be changed, that is, calibration is required.

(3) Reading the Frequency and Level of the Signal to be Measured 2

If a marker (bright spot) is used, a center frequency and reference level can be displayed as marker frequency and marker level directly.

① To display a marker, press [ON] .

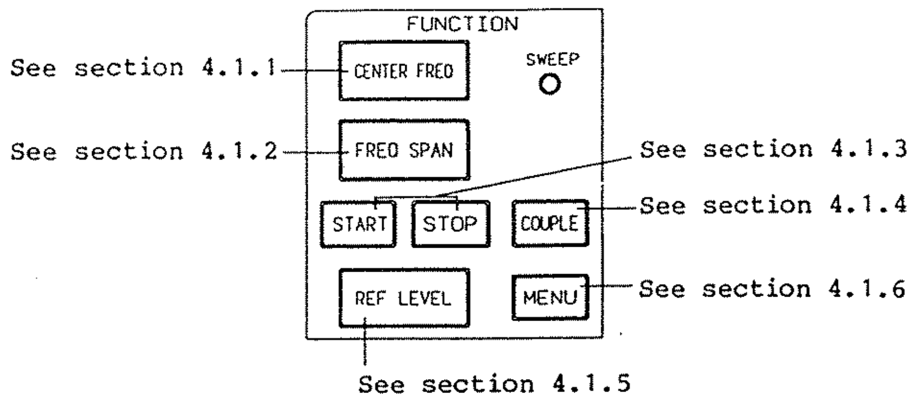
② Using the data knob and step keys, move the marker to the peak of the signal.

The marker frequency and its level are displayed in the upper right part of the screen, allowing direct reading of signal frequency and level.

③ To clear the marker, press [OFF].

4. FUNCTIONS

4.1 Functions of FUNCTION Section



4.1.1 Center Frequency

(1) Panel Keys and the Corresponding Softkey Menu

Refer to Section A.1 (1).

(2) Setting the Center Frequency

The center frequency may be set within the range from 0MHz to 3600MHz. The initial value is 1800MHz.

Center frequency display resolution
100kHz (Span ≥ 100MHz)
10kHz (100MHz > Span ≥ 10MHz)
1kHz (10MHz > Span ≥ 1MHz)
100Hz (1MHz Span ≥ 100kHz)
10Hz (100kHz > Span ≥ 10kHz)
1Hz (10kHz > Span ≥ 1kHz)
1Hz (Span = 0Hz)

Center frequency accuracy

The center frequency depends on the frequency span and reference oscillator accuracy.

If span > 2MHz;
±(2% of span + Center frequency x Reference oscillator + 100Hz)
If span ≤ 2MHz;
±(3% of span + Center frequency x Reference oscillator + 100Hz)
Reference oscillator accuracy: 2 x 10^{-7}/week, 1 x 10^{-6}/year

When an external reference signal source (10MHz) is used, this accuracy applies as the reference oscillator accuracy.

[Procedure and explanation]

Press [CENTER FREQ].

Center frequency set mode.
Data entry is enabled and the center frequency data is displayed on the screen.

[Data Adjustment Keys]

Data knob : Turning this knob clockwise will raise the center frequency. Turning it counterclockwise will lower the center frequency. The setting resolution is about 1/1000 of the frequency span.

Step key : Pressing this key once will raise or lower the center frequency step by step. When the step size is set to AUTO, the step width becomes 1/10 of the frequency span (one horizontal scale).

Ten key : The setting resolution is determined according to the frequency span.

CAUTION

The center frequency may be changed when the span mode is set to LINEAR or ZERO. It cannot be changed when the span mode is FULL or LOG SPAN.

(3) Setting the CF STEP SIZE

The center frequency step size may be set within the range from 0Hz to 3600MHz.

[Procedure and explanation]

Press [CENTER FREQ] [CF STEP SIZE].

Step-size set mode for the center frequency.
Data can be entered and the center frequency step-size data is displayed on the screen.

Press [CENTER FREQ] [CF STEP AUTO].

Step-size set mode for the center frequency.
The center frequency step-size data is set to AUTO mode, and the specified number of steps are deleted from the screen.

[Data Adjusting Keys]

Data knob : Turning this knob clockwise will increase the center frequency step size. Turning it counterclockwise will decrease the center frequency step size. The set resolution is the same as the display resolution.

Step key : The center frequency step size is increased or decreased by a value which is 10 times the display resolution value.

Ten key : The set resolution is the same as the set resolution.

(4) Setting the OFFSET FREQ

The offset frequency can be set within the range from 0MHz to ±9999MHz. If a value less than the display resolution is entered, it is automatically replaced by the display resolution value.

Center Frequency (Display) = Center Frequency (Setting) + OFFSET

[Procedure and explanation]

Press | CENTER FREQ |, and | FREQ OFS ON/OFF | is set to ON.

Offset frequency set mode.
Data can be entered and the offset frequency data is displayed on the screen. The center frequency and marker frequency are displayed after adding the offset value.

This key is set to ON and OFF alternately each time it is pressed.

Example: FREQ OFS ON/OFF : Data can be entered and the offset is operative.

Press | CENTER FREQ |, and | +/- | is set to + or -.

Select the sign for offset.

[Data Adjusting Keys]

Data knob : Turning this knob clockwise will increase the offset frequency. Turning it counterclockwise will decrease the offset frequency. The set resolution is the same as the display resolution.

Step key : The offset frequency is increased or decreased by 10 times the display resolution value.

Ten key : The set resolution is the same as the center frequency.

4.1.2 Frequency Span

(1) Panel Keys and the Corresponding Softkey Menu

Refer to Section A.1 (2).

(2) Setting the Frequency Span

Frequency span display resolution
1MHz ... (3600MHz ≥ Span ≥ 401MHz)
100kHz ... (400.0MHz ≥ Span ≥ 40.1MHz)
10kHz ... (40.00MHz ≥ Span ≥ 2.01MHz)
1kHz ... (2.000MHz ≥ Span ≥ 401kHz)
100Hz ... (400.0kHz ≥ Span ≥ 40.1kHz)
10Hz ... (40.00kHz ≥ Span ≥ 1.0Hz)
1Hz ... (Span = 0.0Hz)

Frequency span accuracy
LINEAR mode: ±3%
LOG mode : ±10%

[Procedure and explanation]

Press FREQ SPAN .

Frequency span set mode.
Data can be entered and the frequency span data is displayed on the screen.

[Data Adjusting Keys]

Data knob : Turning this knob clockwise will make the frequency span wider. Turning it cunterclockwise will make the frequency span narrower. The set resolution is 1/100 of the current frequency span.

Step key : Data is input in the 1-2-5 step in the following sequence:
3600MHz ↔ 2000MHz ↔ 1000MHz ↔ ... ↔ 5kHz ↔ 2kHz ↔ 1kHz

Ten key : The set resolution is determined according to the frequency span.

CAUTION

The frequency span can be changed only in the LINEAR mode but it cannot be changed in the FULL, LOG, or ZERO SPAN mode.

(3) Switching Span Modes

[Procedure and explanation]

Press FREQ SPAN LINEAR SPAN .

The frequency span scale is displayed in the linear mode (initial setting).

Press FREQ SPAN FULL SPAN .

The center frequency is 1800MHz and the frequency span is 3600MHz. The center frequency and frequency span cannot be changed.

Press FREQ SPAN LOG SPAN .

The frequency span scale is displayed in the log mode. Set start and stop frequencies according to the following combination table. To enter start and stop frequencies, use the START and STOP keys.

Start frequency	Stop frequency
10kHz	100kHz
	1MHz
	10MHz
100kHz	1MHz
	10MHz
	100MHz
1MHz	10MHz
	100MHz
	1000MHz
10MHz	100MHz
	1000MHz
100MHz	1000MHz

Press FREQ SPAN ZERO SPAN .

The frequency is fixed to the center frequency to operate this analyzer as a tuning receiver. In this case, the horizontal axis becomes a time axis and the center frequency size is calculated according to the previous frequency span.

4.1.3 Start and Stop Frequencies

(1) Panel Keys and the Corresponding Softkey Menu

Refer to Section A.1 (3) and A.1 (4).

(2) Setting the Start Frequency

The start frequency can be set between -200MHz and +3600MHz. The initial value is 0MHz.

[Procedure and explanation]

Press [START] .

Start frequency mode.
Data can be entered and the start/stop data is displayed on the screen.

[Data Adjusting Keys]

Data knob : Turning this knob clockwise will raise the start frequency. Turning it counterclockwise will lower the start frequency. The set resolution is about 1/1000 of the frequency span.

Step key : The start frequency is increased/decreased according to the step size setting. When the step size data is cleared (AUTO), the step width becomes 1/10 of the frequency span (i.e., one horizontal scale).

Ten key : The set resolution is determined according to the frequency span.

CAUTION

The start frequency can be changed in the LINEAR or ZERO mode but it cannot be changed in the FULL SPAN mode. When the LOG SPAN key is pressed, it is replaced with an approximate constant.

(3) Setting the Stop Frequency

The stop frequency can be set between 0Hz and 3800MHz. The initial value is 3600MHz.

[Procedure and explanation]

Press [STOP].

When the stop frequency mode is selected, data can be entered and the start/stop data is displayed on the screen.

[Data Adjusting Keys]

Data konb : Turning this knob clockwise will raise the stop frequency. Turning it counterclockwise will lower the start frequency. The set resolution is about 1/1000 of the frequency span.

Step key : The stop frequency is increased/reduced according to the step size setting. When the step size data is cleared (AUTO), the step width becomes 1/10 of the frequency span (i.e., one horizontal scale).

Ten key : The set resolution is determined according to the frequency span.

> **CAUTION**
>
> The stop frequency can be changed in the LINEAR or ZERO mode but it cannot be changed in the FULL SPAN mode. When the LOG SPAN key is pressed, it is replaced with an approximate constant.

(4) Setting of Frequency Offset (FREQ OFFSET)

The offset frequency can be set within the range of 0 to ±9999MHz. If data having the resolution less than the display resolution is entered, the display resolution is used automatically.

> Start or stop frequency (display)
> = Start or stop frequency (setting) + Offset

[Procedure and explanation]

Press START or STOP, and FREQ OFS ON/OFF is set to ON.

Offset frequency setting mode.
This key allows data entry and it displays the offset frequency data on the screen. The offset is added to the start (or stop) frequency and marker frequency, and the resulting frequency is displayed.

When this key is pressed, the ON and OFF states are switched. The selected status is displayed in reverse display on the software menu.

Example : FREQ OFS ON/OFF : Data can be entered and the offset ON mode has been selected.

Press START or STOP, and +/- is set to + or -.

Selects the positive (+) or negative (-) sign for offset frequency setup.

[Data Adjusting Keys]

Data knob : Turning this knob clockwise will increase the offset frequency. Turning it counterclockwise will decrease the offset frequency. The setting resolution is equal to the screen resolution.

Step key	:	The offset frequency can be increased or decreased for ten times of the screen resolution.
Ten key	:	The setting resolution is determined according to the center frequency.

4.1.4 Couple

(1) Panel Keys and the Corresponding Softkey Menu

Refer to Section A.1 (5)

(2) Setting the Resolution Band Width (RBW)

When a narrow RBW is set, the spectrum becomes thin and the resolution is improved. Accordingly, the spectrum can be separated from the neighboring noise and a spectrum can be separated from other spectrums. However, the sweep time lengthens as the resolution is enhanced. When the signal level narrows, the UNCAL message is displayed.

The RBW can be set within the range from 30Hz to 1MHz. AUTO is set initially and an optimum RBW is set according to the frequency span.

Relationships between frequency spans and RBW values (AUTO)

RBW		Frequency span
1MHz	↔	(Span ≥ 60MHz)
300kHz	↔	(60MHz > Span ≥ 20MHz)
100kHz	↔	(20MHz > Span ≥ 6MHz)
30kHz	↔	(6MHz > Span ≥ 2MHz)
10kHz	↔	(2MHz > Span ≥ 300kHz)
3kHz	↔	(300kHz > Span ≥ 100kHz)
1kHz	↔	(100kHz > Span ≥ 30kHz)
300Hz	↔	(30kHz > Span ≥ 10kHz)
100Hz	↔	(10kHz > Span ≥ 5kHz)
30Hz	↔	(5kHz > Span)

[Procedure and explanation]

Press [COUPLE] [RBW].

RBW set mode
Data can be entered and the RBW data is displayed on the screen. The softkey menu is displayed in the reverse mode.

[Data Adjusting Keys]

Data knob : Data is input by the 1-3 step in the following sequency:
1MHz ↔ 300kHz ↔ 100kHz ↔ ... ↔ 100Hz ↔ 30Hz

Step key : Data is input by the 1-3 step in the following sequency:
1MHz ↔ 300kHz ↔ 100kHz ↔ ... ↔ 100Hz ↔ 30Hz

Ten key : The frequency is replaced with an approximate constant assuming that the switching point is at 1.5 or 7.0.

(3) Setting a Video Band Width (VBW)

Noise contained in the signal waveform and bottom noise is averaged to find the hidden signal. Noise is averaged by filtering the detected signal waveform with a low pass filter, which improves the S/N ratio by about 10dB. To make the averaging process effective, the band width of this low pass filter must be changed according to RBW.

If VBW is narrowed, the measurement level may be lowered and the UNCAL message may be displayed because of the constant when a low pass filter is inserted. If this is the case, the sweep time must be prolonged.

The VBW may be set within the range from 1Hz to 1MHz. Initially, AUTO is set and the optimum VBW is set according to the RBW.

Relationships between RBWs and VBW values (AUTO)

VBW		RBW
1MHz	↔	1MHz
100kHz	↔	300kHz or 100MHz
10kHz	↔	30kHz or 10kHz
1kHz	↔	3kHz or 1kHz
100Hz	↔	300Hz or 100Hz
10Hz	↔	30Hz

[Procedure and explanation]

Press COUPLE VBW .

VBW set mode.
Data can be entered and the VBW data is displayed on the screen. The softkey menu is displayed in reverse.

[Data Adjusting Keys]

Data knob : Data is set in the following sequence:
1MHz ↔ 100kHz ↔ 10kHz ↔ 1kHz ↔ 100Hz ↔ 10Hz

Step key : Data setting steps are as follows:
1MHz ↔ 100kHz ↔ 10kHz ↔ 1kHz ↔ 100Hz ↔ 10Hz

Ten key : Data is replaced with the approximate constant after counting fractions over 6/10 as one and disregarding the rest. Moreover, 1Hz may be set.

(4) Setting the Sweep Time (SWP)

If the sweep speed is too fast to display the signal waveform, the displayed level is erroneous and the UNCAL message is displayed. If this is the case, the sweep time must be prolonged.

The SWP may be set within the range from 50ms to 1000s. Initially AUTO is set. The SWP is set according to the frequency span, RBW, and VBW, so that the displayed level is not correct.

Relationships between frequency span, RBW, VBW, and AUTO setting
Frequency span/{RBW * Min (RBW, VBW) * 0.5} = SWP

[Procedure and explanation]

Press COUPLE SWP .

SWP set mode.
Data can be entered and the SWP data is displayed on the screen. The softkey menu is displayed in the reverse mode.

[Data Adjusting Keys]

Data konb : Use the display resolution.

Step key : Data is set in the 1-2-5 step in the following sequence:
1000s ↔ 500s ↔ 200s ↔ ... ↔ 200ms ↔ 100ms ↔ 50ms

Ten key : Use the display resolution.

(5) Input Attenuator (ATT)

The ATT is used to prevent the input section from destruction, attenuate the input signal amplitude up to the easy-to-observe level, and prevent distortion during signal analysis.

The attenuation level may be set within the range from 0dB to 50dB. Initially, it is set to AUTO (10dB). The optimum attenuation level is set according to the reference level.

[Procedure and explanation]

Press [COUPLE] [ATT] .

ATT set mode.
Data can be entered and the ATT data is displayed on the screen. The softkey menu is displayed in the reverse mode.

[Data Adjusting Keys]

Data knob : 10, 20, 30, 40, or 50dB is set.

Step key : 10, 20, 30, 40, or 50dB is set.

Ten key : Data is replaced with the approximate constant after rounding off. 0dB may be set only with these keys.

(6) Selecting AUTO

[Procedure and explanation]

Press COUPLE AUTO .

Select the COUPLE function key to be set in the AUTO state from the softkey menu, then press this key. The softkey menu corresponding to the function in the data entry state is displayed in reverse, and other functions are framed.

Example:

RBW : Indicates that both data entry state and manual state are set.

RBW : Indicates that the manual state is set. RBW displayed in the lower left of the screen is underlined.

RBW : Indicates that the AUTO state is set.

Press COUPLE ALL AUTO .

All COUPLE functions are set in the AUTO state.

4.1.5 Reference Level

(1) Panel Keys and the Corresponding Softkey Menu

Refer to Section A.1 (6)

(2) Setting the Reference Level

The reference level can be set within the range from -109.9dBm to +40.0dBm(R3261C/D, R3361C/D), +0.1dBμ to +150dBμ(R3261CN, R3361CN). The initial value is 0.0dBm(R3261C/D, R3361C/D), 110dBμ(R3261CN, R3361CN) and the vertical axis is graduated to eight 10dB scales.

Reference level accuracy
±1dB or less when measured at 200MHz within the reference level from 0dBm to -109.9dBm (R3261C/D, R3361C/D), +110dBμ to +0.1dBμ (R3261CN, R3361CN) and calibrated by the 10dB input attenuator.

[Procedure and explanation]

Press REF LEVEL .

Reference level set mode.
Data can be entered and the reference level data is displayed on the screen.

[Data Adjusting Keys]

Data knob : Turning this knob clockwise will raise the reference level and turning it counterclockwise will lower the reference level. The set resolution is 0.1dB.

Step key : Data can be set in 10dB steps.

Ten key : The set resolution is 0.1dB.

CAUTION

When the input attenuator is in the manual mode, the reference level is affected by the manually set attenuation value, that is, its range may be narrower than -109.9dBm to +40.0dBm(R3261C/D, R3361C/D), +0.1dBμ to +150dBμ(R3261CN, R3361CN).

(3) Setting the dB/div

dB/div may be set to 10, 5, 2, 0.5, 0.2, or 0.1dB. If it is set to a value other than fixed values, the set value is replaced with the nearest fixed value. The LINEAR mode is automatically switched to the LOG mode.

[Caution when applying 120dB measuring function]

120dB measuring function has a measuring range of more than 110dB, by changing the measuring sensitivity near -60dB point. Therefore, change-over time is required when the measuring sensitivity is changed. This change-over time is variable according to the resolution bandwidth and video bandwidth.

When the operator measures a signal at a noise level near -60dB, the measuring time will be longer than the set value of the sweep time. In this case, select 8div display, and short time measurement is available.

In the 120dB measuring function, noise may occur near the change-over point when resolution bandwidth, video bandwidth and sweep time are combined. When noise occurs, change the sweep time and use the range under conditions where the noise does not occur.

When the operator selects 120dB measuring function during measurement of the line spectrum, the spectrum may not have been indicated. In this case, select 8div mode to measure the spectrum.

[Procedure and explanation]

Press REF LEVEL x dB/div .

dB/div set mode.
Data can be entered and the dB/div data is displayed on the screen.

Press REF LEVEL 8/12 div .

This menu is effective only when the 10dB/div is set.
In other cases, the softkey menu is cleared.

[Data Adjusting Keys]

Data knob : Data is set in the 1-2-5 step in the following sequence:
10dB ↔ 5dB ↔ 2dB ↔ 1dB ↔ 0.5dB ↔ 0.2dB ↔ 0.1dB

Step key : Data is set by the 1-2-5 step in the following sequence:
10dB ↔ 5dB ↔ 2dB ↔ 1dB ↔ 0.5dB ↔ 0.2dB ↔ 0.1dB

Ten key : When a numeric key is pressed, its value is replaced with the nearest prefixed value.

(4) Selecting a LINEAR Mode

Switch the LOG mode to the LINEAR mode. The vertical axis is calibrated to 10 scales; the highest level indicates the reference level and the lowest level depends on the scale factor.

[Procedure and explanation]

Press [REF LEVEL] [LINEAR] .

LINEAR set mode.
Data can be entered and the reference level data is displayed in voltage units.
Since the unit of voltage is converted from the unit of dBm, some error may be caused.

[Data Adjusting Key]

Data knob : Turning this knob clockwise will raise the reference level and turning it counterclockwise will lower the reference level. The set resolution is represented by a voltage value converted from 0.1dB.

Step key : Data can be set in 10dB steps.

Ten key : The set resolution is the fourth decimal place.

(5) Setting DISPLAY UNIT

The DISPLAY UNIT is the display units for the reference level, display line and marker level. The following are selectable:

Level display unit	
R3261C/D, R3361C/D	R3261CN, R3361CN
dBm dBmV (dBm + 47dB) dBµV (dBm + 107dB) dBµVemf (dBm + 113dB) dBpW (dBm + 90dB)	dBµV dBµVemf (dBµ + 6dB) dBmV (dBµ - 60dB) dBm (dBµ - 108.8dB) dBpW (dBµ - 18.8dB)

(6) Setting REF OFFSET

The REF OFFSET key toggles ON and OFF. The mode displayed in reverse is operative.

Example: REF OFS: Indicates that the OFF mode is operative.
ON/OFF

The offset level of the reference level can be set within the range from -99.9dB to +99.9dB. It is ineffective in the LINEAR mode.

Reference level (Display) = Reference level (Setting) + OFFSET

[Procedure and explanation]

Press REF LEVEL, and REF OFS ON/OFF is set to ON.

Reference level offset level set mode.
Data can be entered and the reference level offset level data is displayed on the screen. The reference level and marker level are displayed after adding an offset value.

[Data Adjusting Keys]

Data knob : Turning this knob clockwise will raise the reference level offset level and turning it counterclockwise will lower the reference level offset level.

Step key : Data can be set in 10dB steps.

Ten key : The set resolution is 0.1dB.

CAUTION

The REF OFFSET mode cannot be set even when REF OFS ON/OFF is set to ON, if the mode is LINEAR. Firstly select LOG mode, then REF OFS ON/OFF is set to ON. The LINEAR mode cannot be set while REF OFS is on.

4.1.6 Menu

(1) Panel Keys and the Corresponding Softkey Menu

Refer to Section A.1 (7).

(2) Setting Trigger

[Procedure and explanation]

Press MENU TRIGGER .

Trigger condition set mode.
The trigger mode softkey menu is displayed.

Press MENU TRIGGER FREE RUN .

Internal sweep operation is repeated automatically.
(Initial setting)

Press MENU TRIGGER TV-V .

Trigger is caused by the TV's vertical signal.

Press MENU TRIGGER LINE .

Sweep operation is repeated in synchronization with the AC power frequency.

Press MENU TRIGGER VIDEO .

Trigger is caused by the waveform displayed on the screen.

Press MENU TRIGGER EXT .

Sweep operation is controlled by external trigger.
Trigger occurs when TTL-level signal is applied to the EXT TRIG terminal on the rear panel to set the signal level from high to low.

Press | MENU | TRIGGER | SINGLE | .

Single sweep mode. Sweep operation can be controlled by pressing this key. If this key is pressed when the trigger mode is SINGLE, sweep operation is performed once. If this key is released during sweep operation, sweep operation is interrupted in any trigger mode and it is restarted from the beginning. Therefore, this key is used to retry sweep operation during rewriting of screen data when it takes a long time to complete the whole sweep operation.

(3) Setting a Detector

[Procedure and explanation]

Press | MENU | DETECTOR | .

Trace detection set mode.
The DET mode softkey menu is displayed.

Press | MENU | DETECTOR | NORMAL DET | .

Normal detection is set. (Initially, NORMAL is set.)

Press | MENU | DETECTOR | POSI DET | .

A POSI peak is set. Since the peak of a spectrum is seized without fail, this mode is effective for measuring the level of the thin spectrum or PULSED RF signal.

Press | MENU | DETECTOR | NEGA DET | .

A NEGA peak is set.

Press | MENU | DETECTOR | SAMPLE DET | .

Sample detection is set.

(4) Setting the Sweep Mode

[Procedure and explanation]

Press MENU SWEEP MODE .

Sweep mode.
The SWEEP mode softkey menu is displayed.

Press MENU SWEEP MODE NORMAL SWEEP .

Normal sweep mode.

Press MENU SWEEP MODE MANUAL SWEEP .

Manual sweep mode.
The frequency and level of the current sweep point are displayed.
To move the sweep point, turn the data knob clockwise or counterclockwise or press step keys.

Press MENU SWEEP MODE △ MKR SWEEP .

Sweeping between two markers. The Δ marker size may be changed like the ordinary Δ marker.

Press MENU SWEEP MODE WINDOW SWEEP .

Sweeping within the measurement window.
See section 4.10.

Press MENU SWEEP MODE , and MK PAUSE ON/OFF is set to ON.

Pause time setting mode.
If this key is pressed, data can be entered and the pause time is displayed on the screen.
Sweep operation stops at the marker for the period of pause time. The key is used for audio monitor at the marker. The pause time can be set within the range from 1ms to 1000s. The initial value is 1ms.

This key is set to the ON and OFF positions alternately each time it is pressed. The mode displayed in the reverse mode is active.

Example: MK PAUSE ON/OFF : Indicates that data was entered and the ON mode is active.

[Data Adjusting Key]

Data knob : Turning this knob clockwise will increase the pause time and turning it counterclockwise will reduce the pause time. The set resolution is 1ms.

Step key : The pause time is increased/decreased in 100ms units.

Ten key : The set resolution is 1ms.

(5) Setting a Display Line

The display line is a horizontal cursor line which is used for waveform level comparison. It can be set within the range from reference level to the lowest level. The initial level is -40dBm.

The lowest level is { REF + (dB/scale) * scale }.

X dB/div	Display resolution (dB)
10	0.1
5	0.01
2	0.01
1	0.01
0.5	0.001
0.2	0.001
0.1	0.001

[Procedure and explanation]

Press MENU , and DSP LINE ON/OFF is set to ON.

Display line set mode.
Data can be entered and the display line data is displayed on the screen.
If data has previously been entered, press the display line ON/OFF key for switching modes; otherwise, the data entry state is set then the display line ON mode is set.

Example: OFF state : DISPLINE ON/OFF

Data entry state and ON state: DISPLINE ON/OFF

[Data Adjusting Key]

Data konb : Turn this knob clockwise will raise the display line and turn it counterclockwise will lower the display line. The set resolution is 1/400 the dynamic range.

Step key : The display line is moved 1 scale up/down.

Ten key : The set resolution is 0.1dB.

(6) Selecting a Trace Mode

[Procedure and explanation]

Press MENU TRACE MENU .

Selection and setting are enabled only for the following functions. (A trace function is selected by the A-key or B-key.)

Press MENU TRACE MENU A XCH B .

Contents of memories A and B are exchanged. Contents of trace A are exchanged with those of trace B.

Press [MENU] [TRACE MENU] [A − B → A] .

The value obtained by subtracting the memory B value from the memory A value is indicated for each point.
The contents of memory B are subtracted from those of memory A or sweep result and the subtraction result is stored in memory A.
When VIEW A or BLANK B are selected, contents of memory B are subtracted from the contents of memory A and the result is stored in memory A.
When neither VIEW nor BLANK is selected for trace A, the contents of memory B are subtracted from the sweep result and the result is stored in memory A.
When neither VIEW nor BLANK is selected for trace B, VIEW B is selected automatically.

Press [MENU] [TRACE MENU] [B − A → A] .

The value obtained by subtracting the memory A value from the memory B value is indicated for each point.
The contents of memory A are subtracted from those of memory B or sweep result and the subtraction result is stored in memory A.
When VIEW A or BLANK B are selected, contents of memory A are subtracted from contents of memory B and the result is stored in contents A.
When neither VIEW nor BLANK is selected for trace A, the sweep result is subtracted from the contents of memory B and the result is stored in memory A.
When neither VIEW nor BLANK is selected for trace B, VIEW B is selected automatically.

Press [MENU] [TRACE MENU] [A − DL → A] .

The value obtained by subtracting the display line value the memory A value is displayed for each point.
The display line level is subtracted from the contents of memory A or sweep result, and the subtraction result is stored in memory A.
When VIEW A or BLANK A are selected, the display line level is subtracted from the contents of memory A, and the result is stored in memory A.
When neither VIEW nor BLANK is selected for trace B, the display line level is subtracted from the sweep result and the result is stored in memory A.

Press [MENU] [TRACE MENU] [B − DL → B].

The value obtained by subtracting the display line value the memory B value is displayed for each point. The display line level is subtracted from the contents of memory B or sweep result, and the subtraction result is stored in memory B.
When VIEW B or BLANK B are selected, the display line level is subtracted from the contents of memory B, and the result is stored in memory B.
When neither VIEW nor BLANK is selected for trace B, the display line level is subtracted from the sweep result and the result is stored in memory B.

(7) Setting a Sound (Audio Monitor)

[Procedure and explanation]

Press [MENU] [NEXT MENU] [SOUND] [AM].

AM wavelength signals are received.

Press [MENU] [NEXT MENU] [SOUND] [FM].

FM wavelength signals are received.

Press [MENU] [NEXT MENU] [SOUND] [VOLUME MAX].

The sound volume is set to the maximum level.

Press [MENU] [NEXT MENU] [SOUND] [VOLUME MID].

The sound volume is set to the medium level.

Press [MENU] [NEXT MENU] [SOUND] [VOLUME MIN].

The sound volume is set to the minimum level.

Press [MENU] [NEXT MENU] [SOUND], and [SOUND ON/OFF] is set to ON or OFF.

A sound monitor mode is turned on or off.

[Procedure to generate the sound]

(1) Place the marker to the spectrum to be monitored.

(2) PAUSE Time Setting

Press [MENU] [SWEEP MODE], and set the [MK PAUSE ON/OFF] to ON.

Then, set the PAUSE time.

For example, press [1] [0] [MHz] to set the PAUSE time to ten seconds.

(3) Sound Output

Press [MENU] [NEXT MENU] [SOUND], and set the [SOUND ON/OFF] to ON.

(4) Selection in Demodulating Format

Press [AM] or [FM].

(5) Volume Adjustment

Press [VOLUME MAX], [VOLUME MID], or [VOLUME MIN].

By the above operation, SOUND is generated for the specified PAUSE time at every sweeping.

(8) Changing the Graticule

[Procedure and explanation]

Press [MENU] [NEXT MENU], and [GRATIC. ON/OFF] is set to ON or OFF.

When this key is set to ON, the graticule is displayed on the screen (normal mode). When this key is set to OFF, only a waveform and character data are displayed.

(9) Selection of SSB PHASE NOISE characteristics

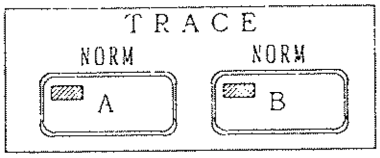
[Procedure and explanation]

Press MENU NEXT MENU , and SSB NOI CLOSE/BD is set to CLOSE or BD(Broad).

Note: This softkey menu appears only when a frequency span is set at 10kHz or less.

To measure spurious signals or noise, the Dynamic Range can be expanded when the Broad Mode is selected at a frequency span of 10kHz or less, whose frequency is separated from the carrier's frequency move than 5kHz. Usually, the CLOSE-IN Mode is selected. To measure the carrier frequency or near it, you do not have to select the Broad Mode.

4.2 TRACE Section Functions (Waveform display function)



The CRT display consists of 701 horizontal points and 401 vertical points. By displaying level data at horizontal points, trace data (signal waveform) can be displayed.

An input signal passes through the RF/IF section, its waveform is detected by the LOG/LIN amplifier, then A/D conversion is performed. This data is stored in the trace memory and displayed on the CRT display under the control of the CPU. Two trace memories, A and B, are provided and each memory can be rewritten after sweeping or it can store and display an arbitrary waveform.

CAUTION

1. Note that if the limit line is executed, the trace data stored is deleted, since the trace memory B is used.

2. Do not execute the AVERAGING measurement (SAMPLE mode) in the MAX HOLD measurement mode (POSI mode.) Also, do not execute the MAX HOLD measurement (POSI mode) in the AVERAGING measurement mode (SAMPLE mode.) They have different trace detection modes respectively.

(1) Panel Keys and the Corresponding Softkey Menu

Refer to Section A.1 (8).

(2) WRITE Mode

[Procedure and explanation]

Press [▭ A] [WRITE A] or press [▭ B] [WRITE B] .

New data is written in memory A or B after each sweep operation and it is displayed on the screen.

(3) VIEW Mode

[Procedure and explanation]

Press [▭ A] [VIEW A] or press [▭ B] [VIEW B] .

If a VIEW mode is selected in the BLANK mode (explained later), trace A or B is displayed again. If the VIEW mode is selected in a mode other than BLANK mode, rewriting of memory A or B and display of waveform stop.

(4) BLANK Mode

[Procedure and explanation]

Press [▭ A] [BLANK A] or press [▭ B] [BLANK B] .

Trace A or B disappears from the screen. Memory A or B holds the trace data stored at BLANK mode selection. When the VIEW mode is selected, contents of memory A or B are displayed.

(5) MAX HOLD Mode

[Procedure and explanation]

Press [▭ A] [MAX HOLD A] or press [▭ B] [MAX HOLD B].

Each point data on the frequency axis is compared with new data after each sweep operation, then the greater data is stored in the memory and displayed on the screen at the same time. That is, the waveform becomes the trace of the maximum values (time series). In this mode, the trace detection mode is automatically set to POSI.

(6) AVERAGING Mode

[Procedure and explanation]

Press [▭ A] [AVG A] or press [▭ B] [AVG B].

Averaging mode.
The S/N ratio can be improved easily as compared with the noise suppression in the VIDEO BW mode, thus enabling quantative estimation of random elements and measurement of signals contained in noises. When this mode is selected, the trace detection mode is automatically set to SAMPLE. The averaging count can be set between 2 and 1000 step by step.

Press [▭ A] [AVG A] [AVG A ST/SP] or press [▭ B] [AVG B] [AVG B ST/SP].

If this key is pressed during averaging, the average mode is canceled and the previous trace mode is set again. If this key is pressed again, averaging is restarted from the beginning.

Press [▭ A] [AVG A] [A PAUSE /CONT] or press [▭ B] [AVG B] [B PAUSE /CONT].

If this key is pressed during averaging, the averaging mode is canceled temporarily. If this key is pressed again, operation is restarted from the operation step in which the averaging mode was canceled temporarily.

Press [A] [AVG A] [A 1 TIME /CONT] or press [B] [AVG B] [B 1 TIME /CONT].

When CONTINUE is active, averaging is continued according to arithmetic operation method 2 if the averaging count reaches the specified limit.
When 1 TIME is active, the VIEW mode is selected automatically after the averaging count reaches the specified limit (the averaging mode is canceled).

Averaging Method

[When $N \geqq n$] ... Operation method 1
$\underline{Yn} = Sigma/n$

[When $N < n$] ... Operation method 2
$\underline{Yn} = ((N - 1) \times \overline{Yn-1})/N + Yn/N$

n	:	Present averaging count
Y	:	Specified averaging count
Yn	:	nth trace data
$\underline{Yn}$	:	nth averaged data
$\overline{Yn-1}$	:	(n-1)th averaged data
Sigma	:	Sum of data including the nth data

[Data Adjusting Key]

The averaging count can be set with ten keys, data knob or step key. After inputting a desired averaging count, press the unit key.

(7) NORMALIZE Mode

CAUTION

R3361C/CN/D only

When the tracking generator is used, it is recommended that the cable frequency characteristics be modified together with those of the R3361C/CN/D itself and filter. (See Section 5.2 for further details.)

[Procedure and explanation]

Press [▭ A] [NORM A] or press [▭ B] [NORM B].

The signal stored in the memory is subtracted from the input signal and the result is displayed, that is, the difference between the signal stored in the memory and the input signal is displayed. Actually, the DISP LINE value is added to the difference to be displayed.

Input signal - CORRECTION DATA + DISP LINE → Display

Press [▭ A] [NORM A] [NORM A ON/OFF] or press [▭ B] [NORM B] [NORM B ON/OFF].

[NORM A ON/OFF] or [NORM B ON/OFF] is set to ON and OFF alternately each time it is pressed. The mode displayed in the reverse mode is active. Before setting this key to ON, press the CORRECTION DATA SAVE key.

Press [▭ A] [NORM A] [CORRECT SAVE] or press [▭ B] [NORM B] [CORRECT SAVE].

The current trace A or B is stored in the memory as the correction data. This data is not cleared if the power is switched off.

Press [▭ A] [NORM A] [DSP LINE ON/OFF] or press [▭ B] [NORM B] [DSP LINE ON/OFF].

The display line is a horizontal line used for waveform level comparison. [DSP LINE ON/OFF] is set to ON and OFF alternately each time it is pressed.

Press [▭ A] [NORM A] [INSTANT NORM A] or press [▭ B] [NORM B] [INSTANT NORM B].

Normalize mode.
When this key is pressed, the following procedure is executed.

(1) The display line is displayed near the middle point between the maximum and minimum points of the signal.
(2) The current trace A or B is stored in the memory as the correction data. (Correction data saving)
(3) Normalize ON.

[Data Adjusting Keys]

Data knob : Turning this knob clockwise will raise the display line and turning it counterclockwise will lower the display line.
The set resolution is 1 point.

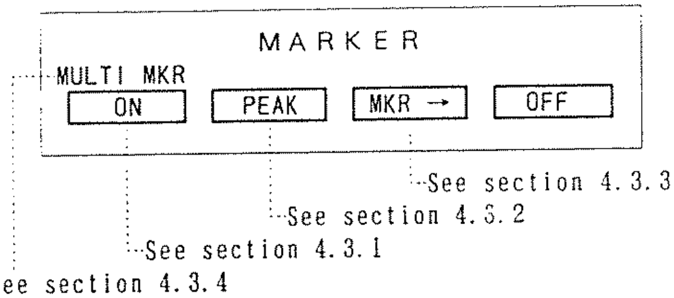
Step key : The display line is moved 1div up/down.

Ten key : The set resolution is 1 point.

(8) TRACE Mode

See Section 4.1.6-(6) for further details.

4.3 MARKER Section Functions



4.3.1 Marker

[Functions]

Displays the normal marker and Δ marker on the waveform, its frequency, and level data.

(1) Panel Keys and the Corresponding Softkey Menu

Refer to Section A.1 (13).

(2) Setting the Normal Marker Frequency

The normal marker frequency can be set within the range from 0 to 3600MHz. The initial value is 1800MHz.

[Procedure and explanation]

Press [ON] .

Normal marker frequency set mode. Data entry is enabled and the normal marker frequency level data are displayed on the screen if the marker is off. If the marker is on, either the normal marker or the Δ marker which is active is selected, and data entry is enabled.

Press [ON] [NORMAL MKR] .

Normal marker frequency set mode. Data entry is enabled, and the normal marker frequency and level data are displayed on the screen.

[Data Adjusting Keys]

Data knob : Turning this knob clockwise will move the marker to the right and turning it counterclockwise will move the Δ marker to the left. The set resolution is 1/700 point.

Step key : The marker is moved horizontally step by step according to the step size setting. If the step size is set to AUTO, it becomes 1/10 of the frequency span (horizontal 1 scale = step width).

Ten key : The set resolution is determined according to the frequency span.

(3) Setting the Δ Marker

The Δ marker can be set within the range from 0 to ±3600MHz. If the start/stop frequency is exceeded, it is replaced with the start/stop frequency.

[Procedure and explanation]

Press [ON] [Δ MKR] .

Δ marker set mode. This key allows data entry. Two markers are displayed at the normal marker positions, The normal marker can shift while the other marker is fixed. The frequency or signal level between these two markers is displayed on the screen.

Press [ON] [Δ MKR] [FIXED MK ON/OFF] .

The fixed marker is displayed at the normal marker position together with the Δ marker, then the Δ marker is fixed at this position as a reference marker. When an active marker is moved, the distance from the reference marker is displayed as the marker data. This key is set to ON and OFF each time it is pressed, The mode displayed in the reverse mode is active.

Example: FIXED MK ON/OFF : Indicates that ON is active.

[Data Adjusting Keys]

Data knob : Turning this knob clockwise will move the active marker to the right and turning it counterclockwise will move the marker to the left. The set resolution is 1/700 point.

Step key : The marker is moved horizontally step by step according to the step size setting. If the step size is set to AUTO, it becomes 1/10 of the frequency span (horizontal 1 scale = step width).

Ten key : The set resolution is the same as that of the normal marker.

(4) Selecting the Counter Mode

[Procedure and explanation]

Press [ON] [COUNTER] .

The frequency counter fucntion is selected. If the marker ponit is 15dB or more higher than the noise level, the frequency of the signal at the marker position is measured with high accuracy. Since the frequency of the marker is not measured but the frequency of the signal at the marker position is measured, the marker need not be set to the peak of the spectrum. However, the amplitude displayed is that at the marker point.

In the normal marker mode, the marker position on the frequency axis is calculated with reference to the center frequency to display the marker frequency. In the counter mode, however, it is directly measured according to the reference oscillator accuracy and

MKR COUNTER XXXX GHz or Δ MKR COUNTER XXXX GHz is displayed.

On the other hand, a maximum resolution of 1Hz may be set with the softkey menu. The gating time lengthens and the sweep speed is reduced as the counter resolution is enhanced. This mode must not be set together with the SIGNAL TRACK (signal track mode).

Press [ON] [COUNTER] , and [FORWARD / BACK] is set to FORWARD or BACK.

This device supports the following two counter modes.
Forward mode: Operates the counter at the marker point during sweep.
Back mode: Operates the counter for sweep blanking.

In forward mode, RBW or SPAN sometimes causes an error in waveforms while the counter is operating. In this case, change the mode to back mode. This allows the counter to stop. However, measuring time is longer than in forward mode.

CAUTION

Readouts may not be correct on the frequency counter mode if SPAN is set to 100MHz or more.

[Data Adjusting Keys]

Data knob : Turning this knob clockwise will move the marker to the right and turning it counterclockwise will move the marker to the left. The set resolution is 1/700 point.

Step key : The marker is moved horizontal step by step according to the step size setting. If the step size is set to AUTO, it becomes 1/10 of the frequency span (horizontal 1 scale = step width).

Ten key : The set resolution is determined according to the frequency span.

(5) Setting the Signal Track Mode

[Procedure and explanation]

Press [ON] , and [SIG TRK ON/OFF] is set to ON or OFF.

If a signal drifts, the marker follows it and the center frequency change at the same time, enabling constant display of the signal at the center of the screen. This does not apply if the signal once disappears from the screen. This key is set to ON and OFF each time it is pressed. The mode displayed in the reverse mode is active.

Example: SIG TRK **ON**/OFF : Indicates that ON is active.

(6) Selecting the Noise/Hz Mode

[Procedure and explanation]

Press | ON | NOISE/Hz | .

When the marker is in the noise, the noise level measurement mode is set and the rms value of the noise normalized according to the 1Hz to 27MHz noise power band width can be measured. The marker level on the screen becomes XX dBm/Hz or XX dBμV/$\sqrt{Hz}$ to indicate that the noise level measurement mode is now selected.
Data can be entered.

(7) Setting X dB Down

Differences between frequencies and levels of two markers at the level which is xx.x dB lower (higher) than the normal marker level are displayed, or these frequencies and levels themselves are displayed.

The down-width can be set within 0 to ± (the screen dynamic range). The initial value is 3dB.

Note: Be sure to turn the counter mode off before using the function of XdB down.

[Procedure and explanation]

Press | ON | NEXT MENU | X dB DOWN | .

Differences between frequencies and levels of two markers at the level which is xx.x dB lower than the normal marker level are displayed, or these frequencies and levels themselves are displayed.

Press | ON | NEXT MENU | X dB LEFT | .

Differences between frequencies and levels of two markers at the level which is xx.x dB lower than the normal marker level (only on the left side) are displayed, or these frequencies and levels themselves are displayed.

Press [ON] [NEXT MENU] [X dB RIGHT].

Differences between frequencies and levels of two markers at the level which is xx.x dB lower than the normal marker level (only on the right side) are displayed, or these frequencies and levels themselves are displayed.

Press [ON] [NEXT MENU], and [REL/ABS1 /ABS2] is set to REL or ABS1 or ABS2.

The following marker data to be displayed in the X dB DOWN mode is selected:
REL (relative display) : Δ marker
ABS1 (absolute display): Marker on the right
ABS2 (absolute display): Marker on the left

[Data Adjusting Keys]

Data knob : Turning this knob clockwise will increase the down-width and turning it counterclockwise will reduce the down-width. The set resolution is 0.1dB (10dB/, 5dB) or 0.01dB (2dB, 1dB). Negative values are X dB higher than positive value.

Step key : The down-width is increased/decreased in 1dB units.

Ten key : The set resolution is 0.1dB (10dB) or 0.01dB (5dB, 2dB, 1dB).

4.3.2 Peak Search

[Functions]

The maximum waveform level is searched, the marker is moved to that position, some peak levels are found in the waveform, and their frequencies and levels are displayed in a list format.

(1) Panel Keys and the Corresponding Softkey Menu

Refer to Section A.1 (14).

(2) Executing PEAK SEARCH

[Procedure and explanation]

Press PEAK .

The maximum level of the current waveform is searched, the marker (normal) is moved to this position, and the frequency and level are displayed on the screen. If the marker is not on, the peak level must be searched after the marker is displayed automatically.

If the measurement window is active, the peak is searched in this window first.

(3) Executing NEXT PEAK SEARCH

[Procedure]

Press PEAK NEXT PK .

Search the peak level in the current waveform from the higher level to 256 points (maximum) and display each frequency and level.

A VIEW waveform or a waveform after single sweep becomes valid. No valid result is obtained for NEXT PEAK during sweep.

Press NEXT PK . The marker is sequentially shifted from the point with higher amplitude.

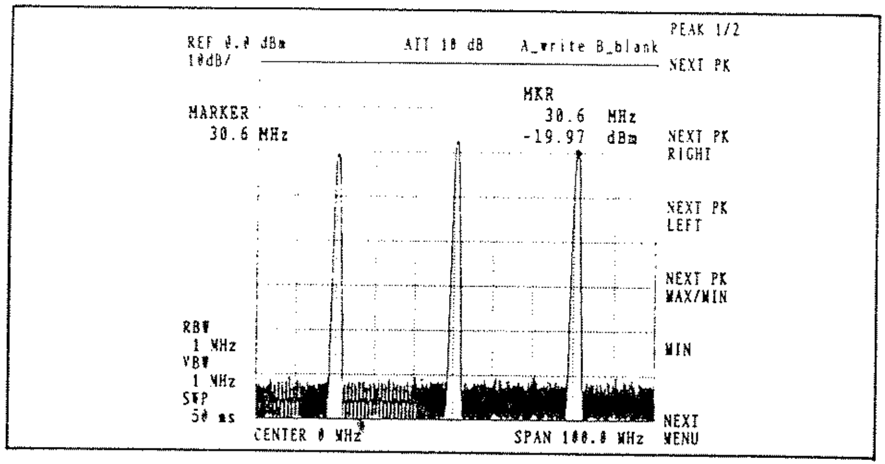


Figure 4 - 1 Execution of NEXT PK

(4) Executing NEXT PEAK RIGHT

[Procedure and explanation]

Press PEAK NEXT PK RIGHT .

Up to 256 peak level points are searched rightward from the current peak level point and their frequencies and levels are displayed. Others are the same as those of item (3) above.

(5) Executing NEXT PEAK LEFT

[Procedure and explanation]

Press PEAK NEXT PK LEFT .

Up to 256 peak level points are searched leftward from the current peak level point and their frequencies and levels are displayed. Others are the same as those of item (3) above.

(6) Executing NEXT PEAK MAX & MIN

[Procedure and explanation]

Press PEAK NEXT PK MAX/MIN .

Up to 256 maximum and minimum peak level points are alternately searched from the left of the current waveform and their frequencies and levels are displayed. Others are the same as those of item (3) above.

(7) Executing MIN SEARCH

[Procedure and explanation]

Press PEAK MIN .

The minimum level of the current waveform is searched, the marker (normal) is moves to this point, and its frequencies and level are displayed on the screen.

(8) Executing NEXT MIN

[Procedure and explanation]

Press PEAK NEXT MENU NEXT MIN .

Up to 256 lower level points are searched from the minimum point and their frequencies and levels are displayed. Others are the same as those of item (3) above.

CAUTION

The searched peak data becomes invalid when the PEAK search and MIN search keys are pressed or when the set data is changed. The subsequent NEXT PK (including other operations) is thus repeated from the beginning.
If no peak data exists or the next peak data does not exist, the error message below is displayed.

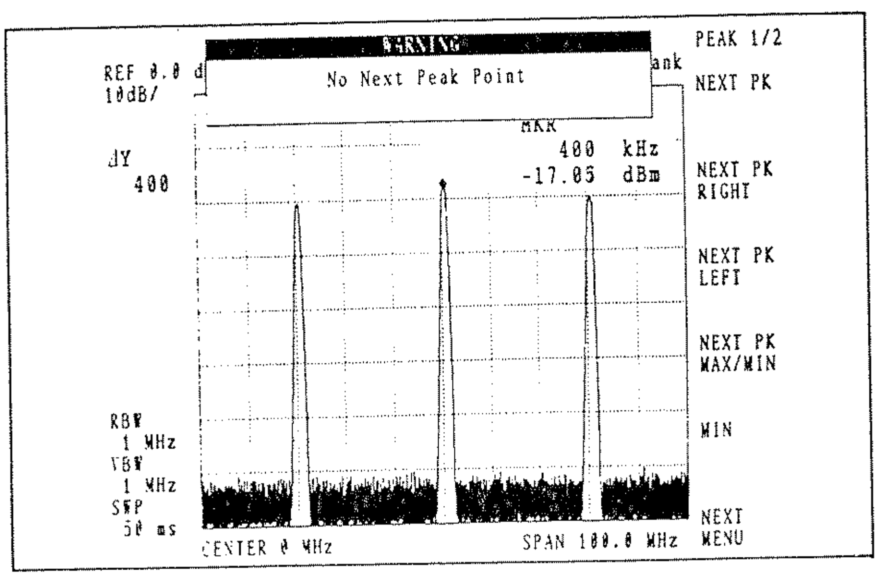


Figure 4 - 2 Error Message of Execution of NEXT PK

(9) Executing PK CONT

[Procedure and explanation]

Press PEAK, NEXT MENU, and PK CONT ON/OFF is set to ON..

Starts continuous peak search. The peak of the waveforms is calculated for each sweep, and the marker can shift.

(10) Setting ΔX and ΔY

To search the peaks (maximum and minimum) or a waveform, set the point value indicating the inclination in the X and Y directions.
Directions X and Y on the screen indicates the resolution shown in the figure below.

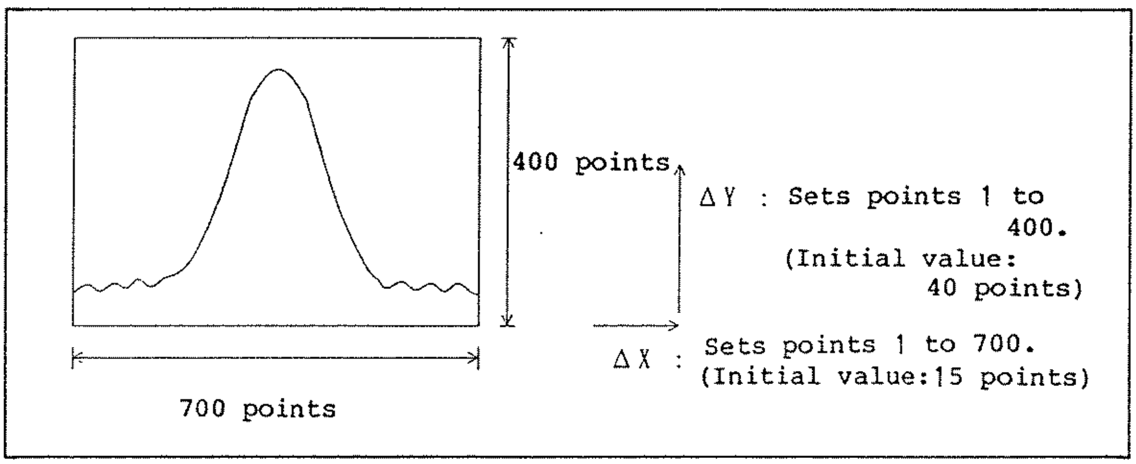


Figure 4 - 3 Resolution of ΔX and ΔY

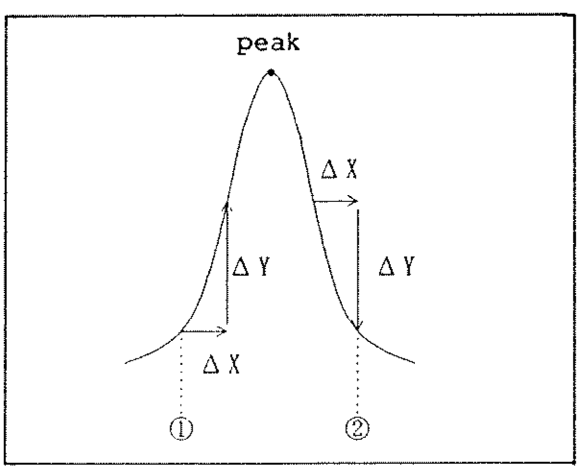


Figure 4 - 4 Setting of ΔX and ΔY

The point at which the waveform data at the tip of the ΔX point increases more than the ΔY point is defined as a rising edge (point ①).

The point at which the waveform data at the tip of the ΔX point decreases more than the ΔY point is defined as a falling edge (point ②).

The point where is a maximum value in the period of ① and ② is defined as peak.

(11) Alteration of peak search level

The reference level of the peak search can be altered using a display line.

[Procedure]

Press [PEAK] [NEXT MENU] and set the [PK RANGE UP/FULL] to UP.

The level exceeding the display line is searched when the [PK RANGE UP/FULL] is set to UP. (Initial setting)

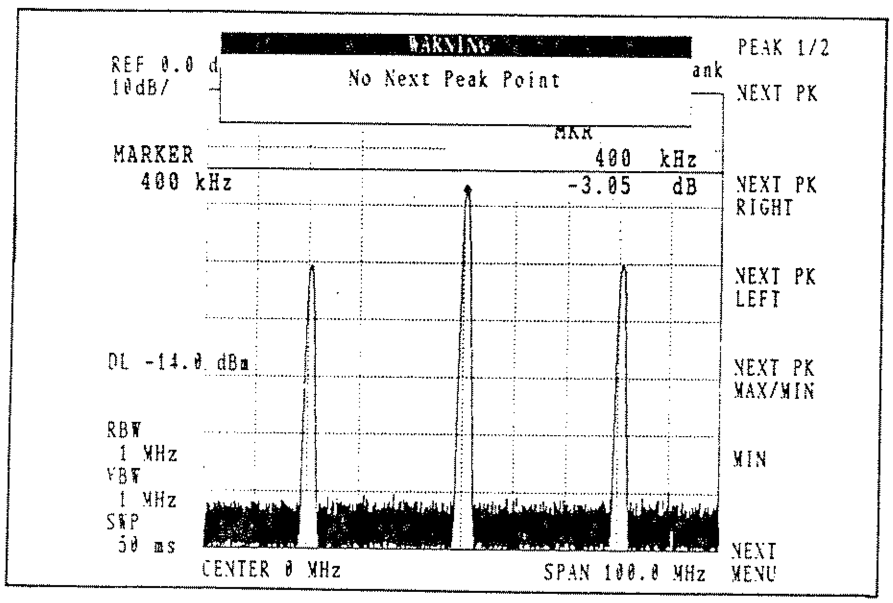


Figure 4 - 5 Execution of PK RANGE UP

Press PEAK NEXT MENU and set the PK RANGE UP/FULL to FULL.

All the waveforms are searched irrespective of the display line when PK RANGE UP/FULL is set to FULL.

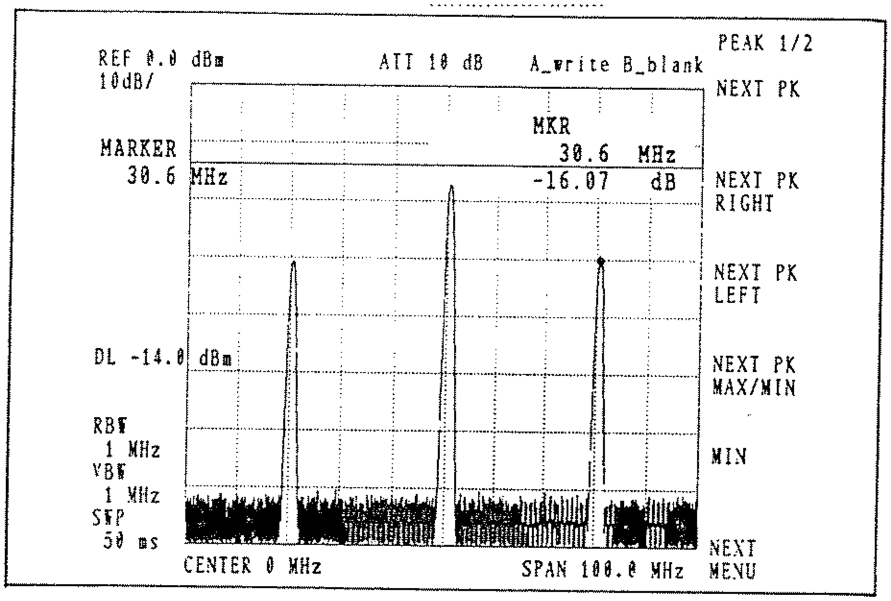


Figure 4 - 6 Execution of PK RANGE FULL

4.3.3 Marker →

[Functions]

The current marker data (frequency, level, Δ, etc.) is set as the data of another function.

(1) Panel Keys and the Corresponding Softkey Menu

Refer to Section A.1 (15).

(2) Execution of MKR →

[Procedure and explanation]

Press [MKR →] [MKR → CF].

The active marker frequency is set as the center frequency.

Press [MKR →] [MKR → REF].

The active marker level is set as the reference level.

Press [MKR →] [MKR Δ→ SPAN].

The Δ marker frequency is set as the frequency span.

Press [MKR →] [MKR → CF STEP].

The active marker frequency is set as the CF STEP frequency.

Press [MKR →] [MKR Δ→ CF STEP].

The Δ marker frequency is set as the CF STEP frequency.

Press [MKR →] [NEXT MENU] [MKR → MK STEP].

The active marker frequency is set as the marker step frequency.

Press [MKR →] [NEXT MENU] [MKR Δ→ MK STEP] .

The Δ marker frequency is set as the marker step frequency.

(3) Setting the Marker Step Size

The marker step can be set within the range from 1Hz to 3600MHz. Initially, it is about 1/10 of the frequency span.

[Procedure and explanation]

Press [MKR →] [NEXT MENU] [MK STEP SIZE] .

Marker step size set mode.
Data entry is enabled and data is displayed on the screen.

Press [MKR →] [NEXT MENU] [MK STEP AUTO] .

Marker frequency or marker frequency Δ set mode.
The marker step data is deleted from the screen.

[Data Adjusting Keys]

Data knob : Turning this knob clockwise will raise the marker step size. Turning it counterclockwise will lower the center frequency. The setting resolution is about 1/1000 of the frequency span.

Step key : Pressing this key once will raise or lower the center frequency step by step. When the step size is set to AUTO, the step width becomes 1/10 of the frequency span (one horizontal scale).

Ten key : The setting resolution is determined according to the frequency span.

4.3.4 Multi-marker

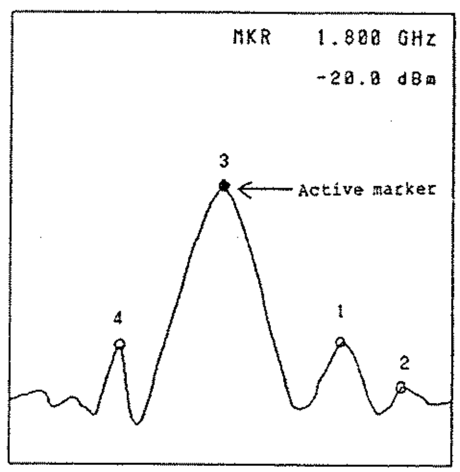
[Function]

The multi-marker of R3261/3361 can display up to eight markers to trace A and B. This makes it possible to measure the frequency or level at many points simultaneously. This marker can be turned on and off independently. You can select whether the marker is displayed to trace A or B.

One of eight markers must be the active marker (the normal marker is displayed with o, while the active marker is displayed with •).

The active marker can be moved optionally by numeric key, step key, and data knob.

When the multi-marker is on



The R3261/3361 has a Δ marker in addition to the above eight markers. The Δ marker detects the difference between the Δ marker and active marker or among the other markers (during marker list display only) to display.

Basically, the Δ marker is displayed at the same position as the active marker. If the active marker, for example, is moved from trance A to B, the Δ marker also moves similarly.

Note: If the active marker is changed to another marker, the Δ marker may not move to the same position as the active marker.

The setting of multi-marker can be saved or recalled, so resetting for the same measurement is not required.

(1) Marker

① Single marker

The state where the active marker and Δ marker can be used is called single marker. All of traditional markers is a single marker.

② Multi-marker

The state where up to eight markers including the active marker and the Δ marker can be used is called multi-marker. For each marker, marker No. is displayed on the marker pattern.

③ Active marker

The active marker can be moved optionally by single marker and multi-marker. Data for active marker is displayed on the upper right or lower right of the screen. When the active marker is moved by multi-marker, it is displayed with ● and the other markers are displayed with o.

④ Δ marker

The Δ marker is displayed when the difference between the Δ marker and active marker is measured. When the Δ marker is on, it displays the difference between the Δ marker and active marker. When it is off, it is displayed by absolute value (an exception such as a counter is excluded).

⑤ Normal marker

When the Δ marker is off, the marker is called normal marker.

⑥ Active trace

Either trace A or B changing the trace state finally is called active trace.

Note: When the state of trace is blank, active trace is disabled.

(2) Panel Key

[Function]

Press the [SHIFT] and [MULTI MKR ON] keys in order.

The multi-marker is turned on.

Press the [MULTI MKR ON] key.

When the marker is OFF:
The single marker is turned on.
When the single marker is used:
The active marker can move.
When the multi-marker is used:
One of multi-markers is changed to the multi-marker and can move.

Press the [OFF] key.

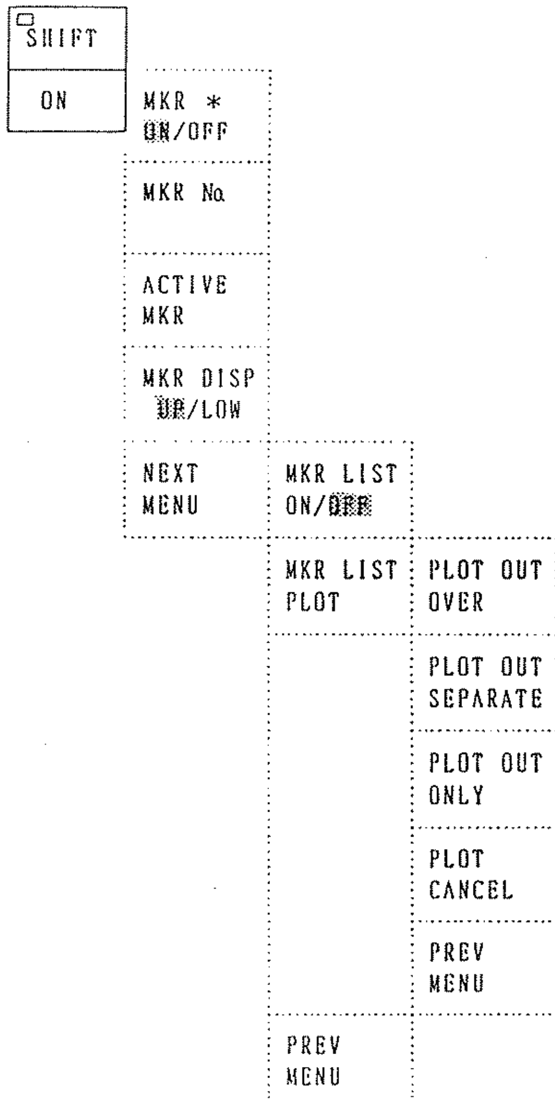
Turn all markers off. If the multi-marker list is being displayed, the list is also erased.

Press the [A] or [B] key.

The active marker and Δ marker move between trace A and B. The other markers remains.

(3) Soft Key

[Procedure and explanation]



(1) Press the SHIFT and MULTI MKR ON keys to turn the MKR * ON/OFF key on or off.

Turn each marker on or off to move.
An asterisk (*) indicates marker No.
For example, marker No. 1 is explained below.

. Active marker state

MKR 1 ON/OFF — This key indicates that marker No. 1 is an active marker and can be moved. The marker can be moved using the numeric key, step key, and data knob.
If the key is pressed in this state, the marker is turned off. But, the final marker (except the Δ marker) cannot be turned off by this key.

. ON state

MKR 1 ON/OFF — This key indicates that marker No. 1 is on. If the key is pressed in this state, the marker is changed to the active marker and can be moved.

. OFF state

MKR 1 ON/OFF — This key indicates that marker No. 1 is off. If the key is pressed in this state, marker No. 1 is turned on and is changed to the active marker. The marker can be moved. Marker No. 1 is displayed on the active trace waveform.

(2) Press the SHIFT MULTI MKR ON and MKR No. keys in order.

Select multi-marker No. in order. Use the numeric key, step key, and data knob to select an arbitrary marker. If a numeric key is used for output, the unit key need not be pressed.

MULTI MKR

(3) Press the [SHIFT] [ON] and [ACTIVE MKR] keys in order.

Select the active marker in order. Whenever this key is pressed, select the marker with a large number as an active marker. If there is no marker with a large number, select the marker with small number.
The frequency and level of active marker are displayed on the screen. When this key is pressed, data for marker points can be measured simply.

MULTI MKR

(4) Press the [SHIFT] and [ON] keys to set the [MKR DISP UP/LOW] key to UP or LOW.

Select the marker to be displayed on the upper right or lower right of the screen. The initial value is displayed on the upper right. When the waveform and the marker are overlapped, press the key and relocate the marker to the lower right.
Changed marker position is enabled when the plotter is output. It is not initialized for preset.

MULTI MKR

(5) Press the [SHIFT] [ON] and [NEXT MENU] keys to turn on or off the [MKR LIST ON/OFF] key.

Display all multi-marker lists. The window opens on the screen, and the frequencies and levels of up to eight markers are displayed in the window. Data for these markers is always an absolute value. The Δ marker mode displays the difference between the multi-marker and Δ marker.
While the list is displayed, sweep is stopped. Press the key other than the key related to list plot, the window is closed and displayed list is erased.

MULTI MKR

(6) Press the [SHIFT] [ON] [NEXT MENU] [MKR LIST PLOT] and [PLOT OUT OVER] keys.

Plot the current state and marker list in the overwrite mode.
After plotting the waveform and data, overlap the marker lists in ruled line to plot.

MULTI MKR

(7) Press the SHIFT ON NEXT MENU MKR LIST PLOT and PLOT OUT SEPARATE keys.

Plot the current state and marker list in the division mode.
After plotting the waveform and data, plot the marker list to the next plot position.

MULTI MKR

(8) Press the SHIFT ON NEXT MENU MKR LIST PLOT and PLOT OUT ONLY keys.

Plot the marker list only.

MULTI MKR

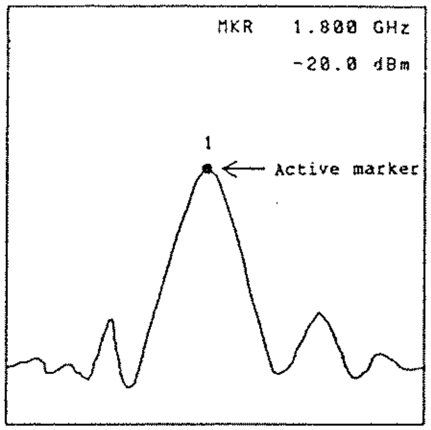
(9) Press the SHIFT ON NEXT MENU MKR LIST PLOT and PLOT CANCEL keys.

Interrupt plot.

(10) Press the PREV MENU key to return to the previous menu.

(4) Basic Operation

(4-1) Registering the Multi-marker

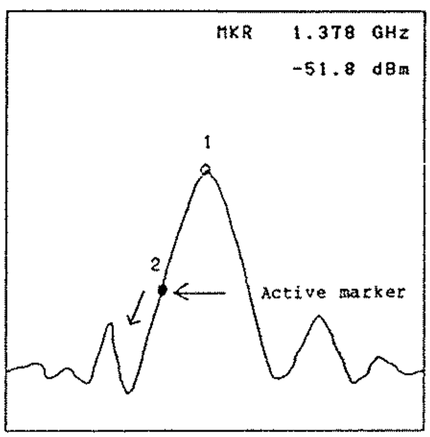


(1) MKR 2 ON/OFF

(2) MKR No.

At present, marker No. 1 is an active marker.
When marker No. 2 is turned on where the active marker is, select marker No. 2 with soft menu (2) to press soft menu (1).

⇩

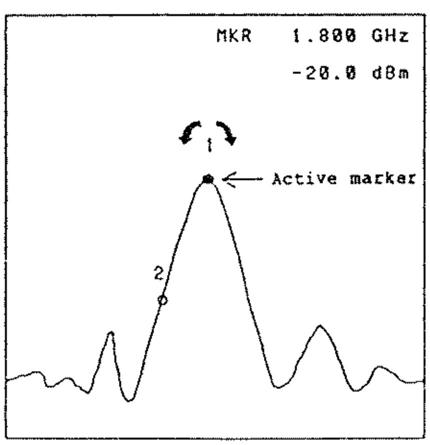


(1) MKR 2 ON/OFF

(2) MKR No.

Directly after the MKR 2 ON/OFF key is turned on, marker No. 2 is changed to the active marker. So, markers No. 1 and No. 2 are overlapped. The active marker can be moved as shown in figure.

⇩

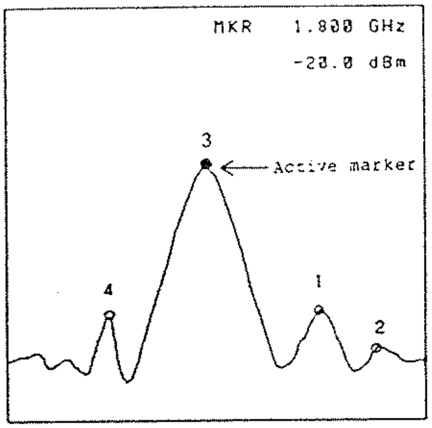


(1) MKR 1 ON/OFF

(2) MKR No.

When the active marker is returned from marker No. 2 to No. 1, press soft menu (2), select marker No. 1, press soft menu (1). As shown in figure, displayed data is changed.
So, up to eight markers can be registered.

(4-2) Erasing the Marker



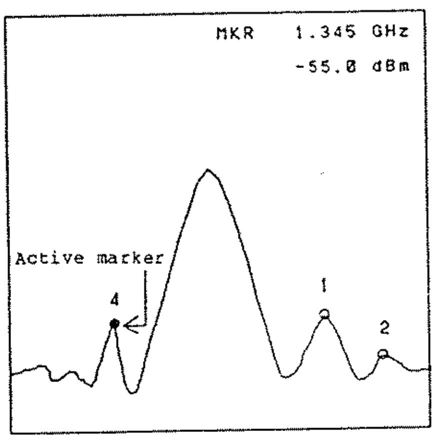
(1) MKR 3 ON/OFF

(2) MKR No

When the multi-markers are erased one by one, use soft menu (2) to select the marker to be erased. If the marker is an active marker, press soft menu (1) to erase. If not, change the marker to the active marker to press soft menu (1).
In figure, marker No. 3 is the active marker. If this marker is erased, marker No. 4 is automatically changed to the active marker.

Note: It is only the marker changed to the active marker that can erase the multi-marker.

⇩

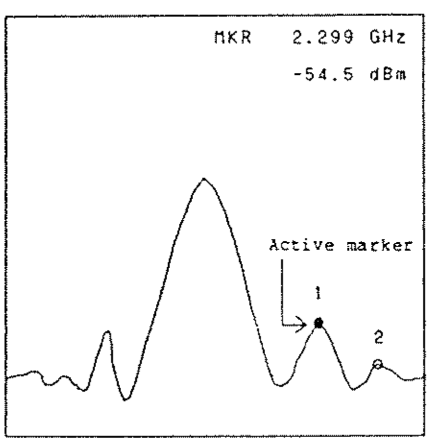


(1) MKR 4 ON/OFF

(2) MKR No

If marker No. 3 is erased, marker No. 4 is automatically changed to the active marker.
If marker No. 4 is erased, marker No. 1 is automatically changed to the active marker.

⇩

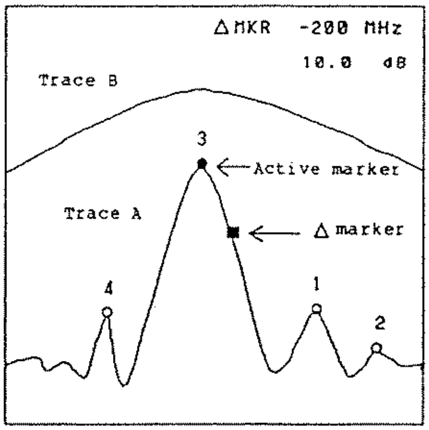


(1) MKR 1 ON/OFF

(2) MKR No

As described above, there must be the active marker. If the active marker is erased, the next marker with a large number is the active marker. If there is no marker with a large number, the marker with a small number is the active marker.
If there is only one marker, it cannot be erased.

(4-3) Moving the Multi-marker

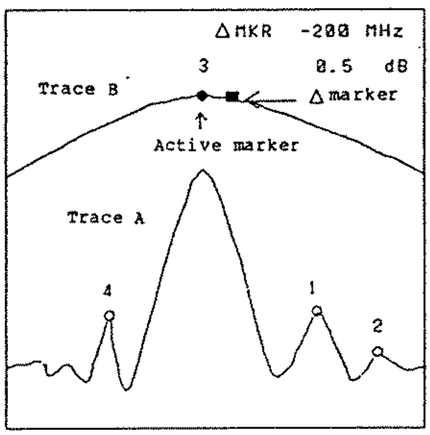


(1) MKR 3
ON/OFF

(2) MKR No.

The multi-marker can be displayed to traces A and B.
When the multi-marker is moved between waveforms, press key A or B.
In figure, all markers are installed on A at present. When the B key is pressed, the active marker and Δ marker move to trace B.
The marker is always installed on the active trace.

⇩

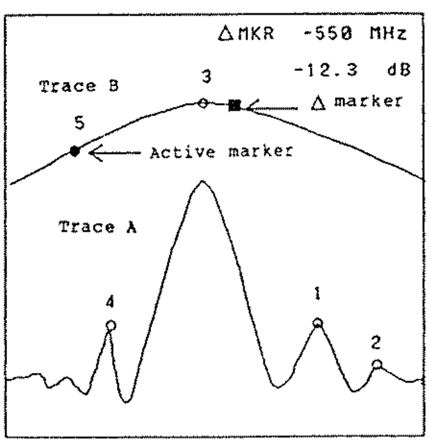


(1) MKR 5
ON/OFF

(2) MKR No.

After marker No. 3 (that is, active marker) and Δ marker are moved to trace B, select the marker by soft menu (2) and press soft menu (1) to install marker No. 5 on the active marker.

⇩



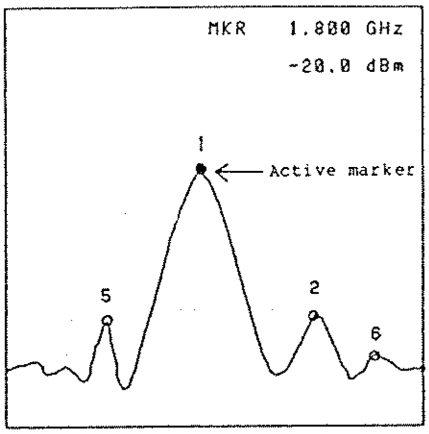
(1) MKR 5
ON/OFF

(2) MKR No.

(3) ACTIVE
MKR

When the active marker is changed by soft menu (3), the difference between different waveforms can be measured easily.

(4-4) Changing the Active Marker



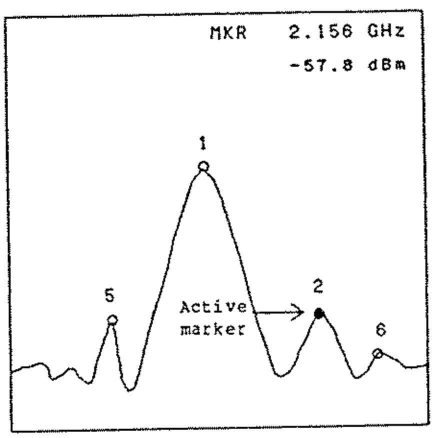
(1) MKR 1 ON/OFF

(2) MKR No

(3) ACTIVE MKR No

Whenever soft menu (3) is pressed, the active marker is changed in order.

⇩



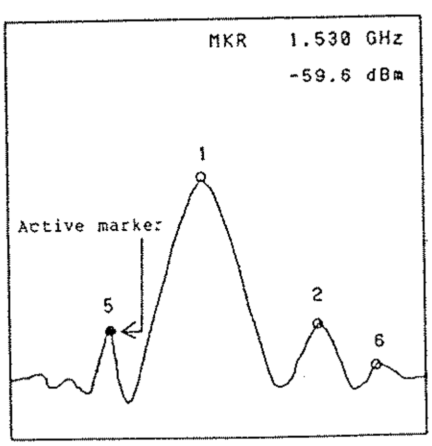
(1) MKR 2 ON/OFF

(2) MKR No

(3) ACTIVE MKR No

The frequency and level of the active marker are displayed on the CRT. This function can measure data for marker points easily.

⇩



(1) MKR 5 ON/OFF

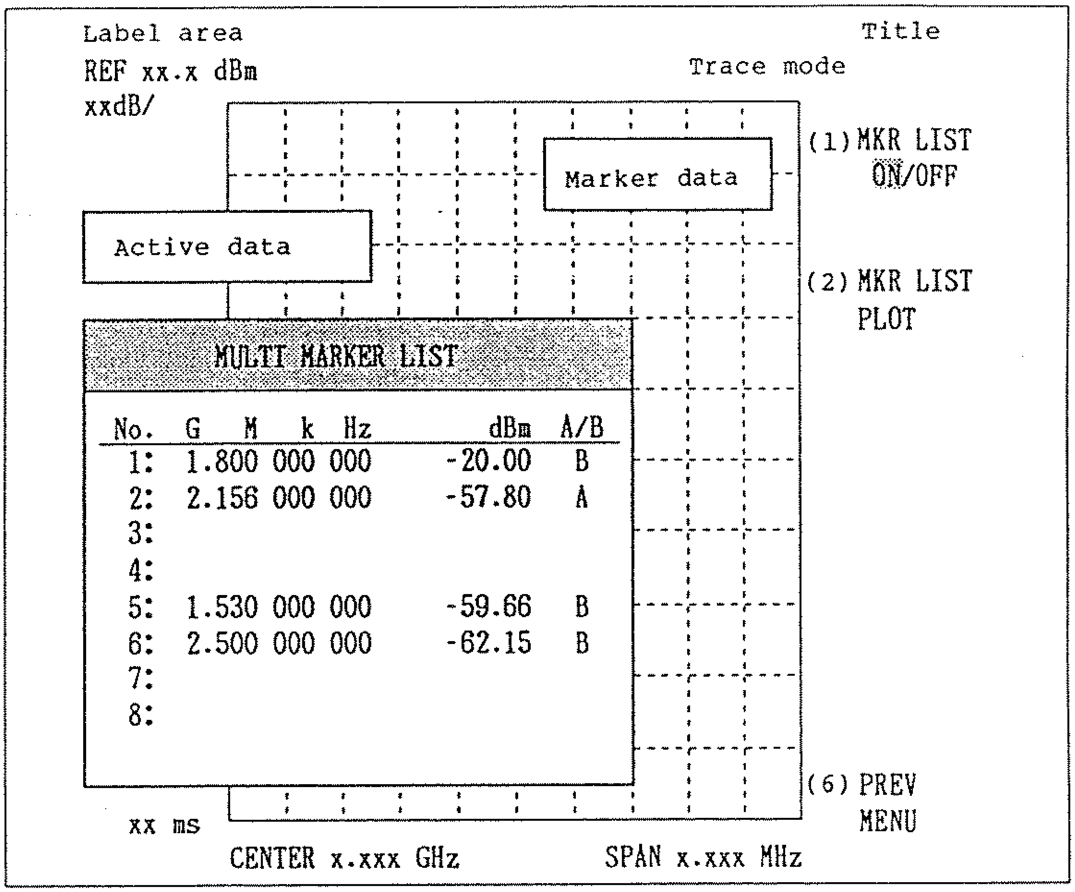
(2) MKR No

(3) ACTIVE MKR No

When the active marker is changed, turned-on marker is automatically selected. In figure, marker No. 5 is changed to the active marker after marker No. 2.

(4-5) Multi-marker List

When soft menu (1) is turned on, the frequencies and levels of all markers are listed as follows.



Data in list is converted from the marker position, and is not measured by frequency counter and in the noise level mode. So, the data is sometimes different from the marker data on the screen.

In the normal marker mode, each frequency and level are displayed by absolute value. In the marker mode, they are displayed by relative value.

Note: The Δ marker is displayed by absolute value.

The symbol of the last string in the list indicates the trace where each marker is installed. If the symbol is space, it is indicated that the state of trace is blank.

If other than the key for plot is pressed, displayed list is erased.

(4-6) Plotting the Marker List

When the multi-marker list is being displayed, it can be plotted. There are three types of output format. They can be selected optionally.

Output formats

(1) Overlapping the waveform and list: See plot plan (1).

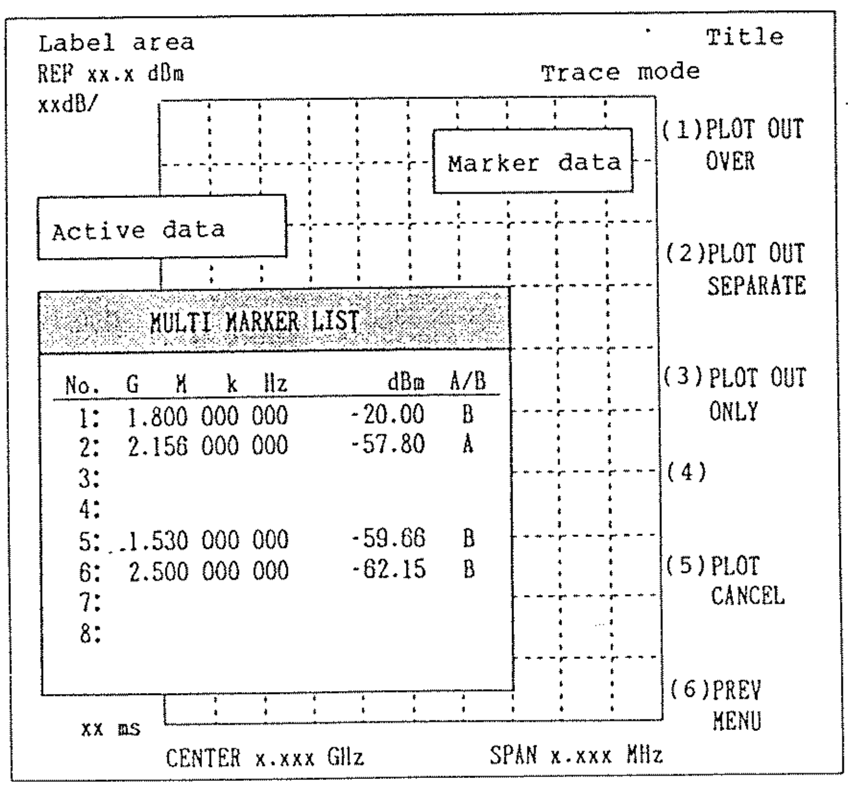
(2) Separating the list from waveform: See plot plan (2).

(3) Outputting the list only : See plot plan (3).

Unless the multi-marker list is displayed, the configuration of screen depends on the above output formats and list data is not plotted.

Press soft menu (2) in figure, the following soft menu appears. Select each output format.

Note: During plot, the key other than the cancel key is not acceptable.

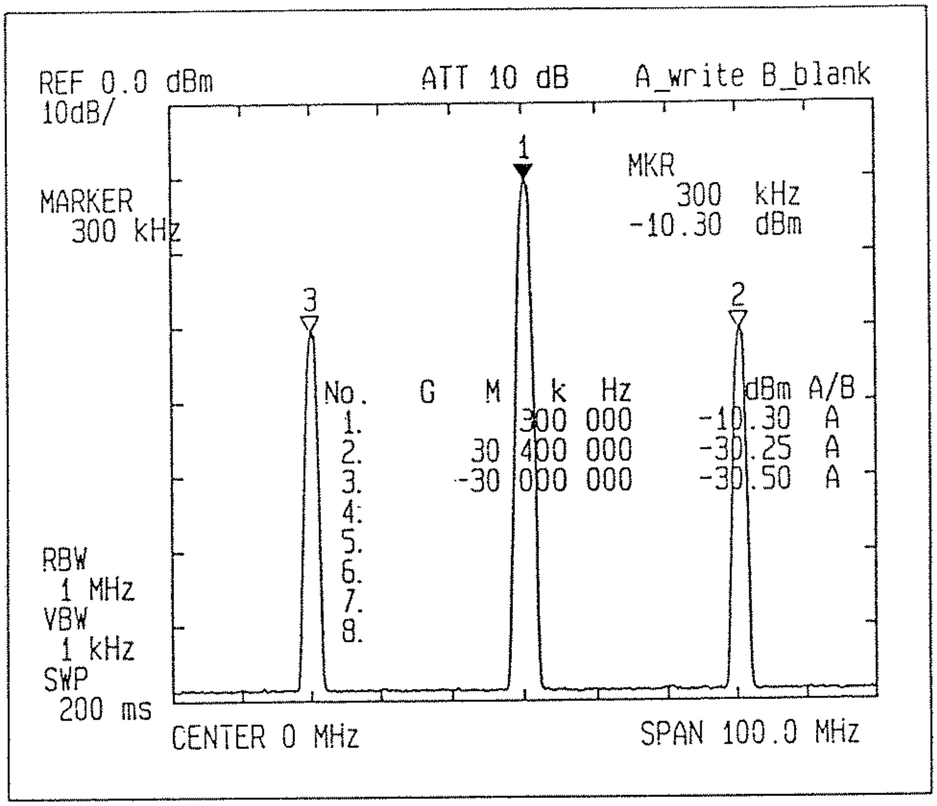


After plotting ends, the soft menu (previous page) is redisplayed and any key is acceptable.

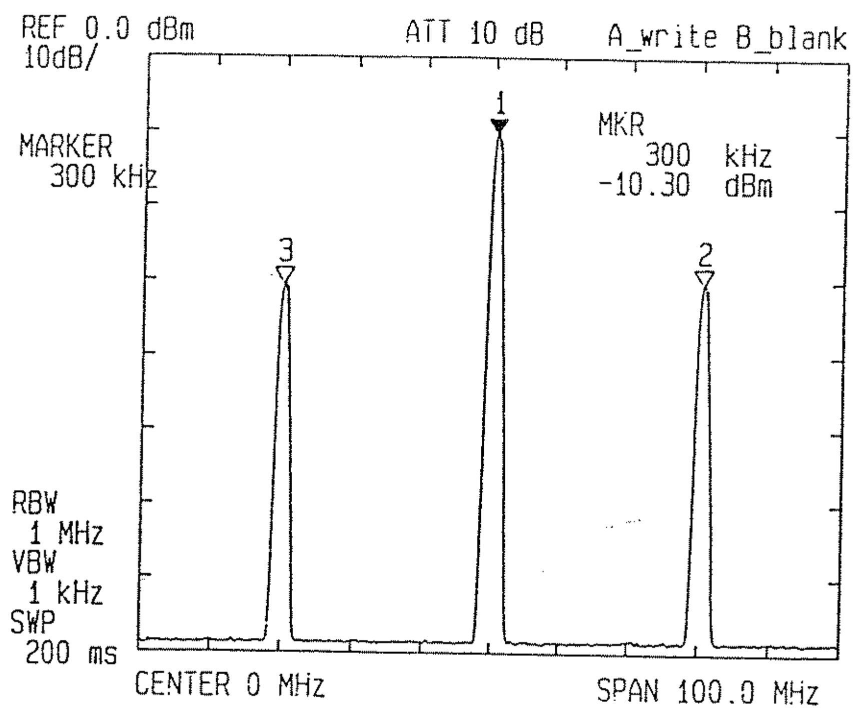
To interrupt plotting, press soft menu (5). Data transfer from the R3261/3361 to the plotter is interrupted. After plotting data that is already transferred to the plotter, end plotting and return to the soft menu (previous page). So, any key is acceptable.

For the setting of plotter, see Section 4.7 Plotting.

Plot plan (1): Plotting in the overwrite mode



Plot plan (2): Plotting to the R9833 plotter in the division mode under one division specification



*** MULTI MARKER LIST ***

No.	G M k Hz	dBm	A/B
1.	300 000	-10.30	A
2.	30 400 000	-30.25	A
3.	-30 000 000	-30.50	A
4.			
5.			
6.			
7.			
8.			

Plot plan (3): Plotting the list only

*** MULTI MARKER LIST ***

No.	G	M	k	Hz	dBm	A/B
1.			300	000	-10.30	A
2.		30	400	000	-30.25	A
3.		-30	000	000	-30.50	A
4.						
5.						
6.						
7.						
8.						

(5) GPIB Remote Programming

(5-1) GPIB Code

Table 4 - 1 GPIB Code

Function	Listener code	Talker request: Code	Talker request: Output format	Talker request: Header	Remarks
Multi-marker ON	MLT	MLT?	ON/OFF	-	
Multi-marker OFF	MF or MO	-	-	-	
Moving the Active-marker	MN or MK	-	-	-	Data input
Multi-marker No. 1 ON	MLN1	-	-	-	Data input
OFF	MLF1	-	-	-	
Multi-marker No. 2 ON	MLN2	-	-	-	Data input
OFF	MLF2	-	-	-	
Multi-marker No. 3 ON	MLN3	-	-	-	Data input
OFF	MLF3	-	-	-	
Multi-marker No. 4 ON	MLN4	-	-	-	Data input
OFF	MLF4	-	-	-	
Multi-marker No. 5 ON	MLN5	-	-	-	Data input
OFF	MLF5	-	-	-	
Multi-marker No. 6 ON	MLN6	-	-	-	Data input
OFF	MLF6	-	-	-	
Multi-marker No. 7 ON	MLN7	-	-	-	Data input
OFF	MLF7	-	-	-	
Multi-marker No. 8 ON	MLN8	-	-	-	Data input
OFF	MLF8	-	-	-	
Active marker frequency?	-	MF?	Frequency	MF	
Active marker level?	-	ML?	Level	Unit: Header dB : MLD dBm : MLB dBmV: MLM dBμV: MLU dBμVemf : MLE dBpW: MLW V : MLV dBm/Hz : MLH dBμV/$\sqrt{Hz}$: MLL	

Table 4 - 1 GPIB Code (Cont'd)

Function	Listener code	Talker request			Remarks
		Code	Output format	Header	
Frequency + level?	-	MFL?	Frequency + level	Similar to MF and ML	
All multi-marker frequencies?	-	MLSF?	Frequency	Similar to MF	8-marker output
All multi-marker levels?	-	MLSL?	Level	Similar to ML	8-marker output

For the code other than the multi-marker code, see Chapter 6 GPIB Remote Programming.

(5-2) GPIB Command

(a) Turning the multi-marker on or off

[Format]

```
PRINT @8;"MLT"          ..... (1)   ' Turns the multi-marker on.
PRINT @8;"MLT 1GZ"      ..... (2)   ' Turns the multi-marker on and
                                      move it to 1GHz.

PRINT @8;"MF"           ..... (3)   ' Turns the multi-marker off.
PRINT @8;"MO"           ..... (4)   ' Turns the multi-marker off.

PRINT @8;"MLT?"         ..... (5)   ' Outputs the state of multi-marker.
INPUT @8;ISMLT
```

[Function]

This command turns the multi-marker on or off. When the marker is off or the single marker is used, execute (1). The multi-marker is turned on, and one of up to eight markers is changed to the active marker, then it can move freely. The frequency and level of the active marker are displayed on the screen.

If (2) is executed similarly, the multi-marker is turned on and the active marker is moved to the position equivalent to specified frequency. If the output format is (2), the active marker is moved to the position equivalent to frequency of 1GHz.

If (3) and (4) are executed, the single marker and multi-marker erase all of displayed markers.

Note: The multi-marker can turn off the markers individually, but this command erases all markers. If (1) and (2) are re-executed, the marker is recovered.

To see the present state of the multi-marker, execute (5). When the multi-marker is on, 1 is output. If it is off, 0 is output. Judge these values.

(b) Turning the markers on or off individually

[Format]

```
PRINT @8;"MLN1"      ..... (1)   ' Turns multi-marker No. 1 on.
PRINT @8;"MLN1 1GZ"  ..... (2)   ' Turns multi-marker No. 1 on and
                                   move it to 1GHz.

PRINT @8;"MLF5"      ..... (3)   ' Turns multi-marker No. 5 off.
```

[Function]

The command turns the markers on or off individually. The number at the end of the command indicates marker No. If (1) is executed, marker No. 1 is turned on and is changed to the active marker. So, the marker can move freely.

If (2) is executed similarly, marker No. 1 is turned on and is moved to the position equivalent to specified frequency. If the output format is (2), frequency moves marker No. 1 to the position equivalent to 1GHz.

If (3) is executed, marker No. 5 is erased. The marker can be erased by the active marker only. After specified marker is changed to the active marker once, erase the marker. So, the active marker is automatically changed to the next marker with a large number. Even if marker No. 5 is not an active marker, execute (3) and erase the marker. The active marker is automatically changed.

(c) Outputting the frequencies and levels of markers individually

[Format]

[Format]

```
PRINT @8;"HDO MLN1 MF?" .. (1)    ' Turns marker No. 1 on to output
                                    the frequency.
INPUT @8;F;                       ' Reads the frequency to variable
                                    F1.

PRINT @8;"MLN5 1GZ"  ..... (2)    ' Turns on multi-marker No. 5 to
PRINT @8;"HDO ML?"                  frequency of 1GHz to output the
                                    level.
INPUT @8;L5                       ' Reads the level to variable L5.
```

[Function]

The command outputs the frequencies and levels of markers individually. To read data, be sure to change the marker to the active marker. As described above, change the marker to be read to the active marker, then read the value of the active marker.

If (1) is executed, marker No. 1 is changed to the active marker and the frequency is read to variable F1.

If (2) is executed similarly, marker No. 5 is moved to the position equivalent to specified frequency and the level is read to variable L5.

When the markers are read individually, the active marker is read actually and there is no difference between the single marker and multi-marker. When the multi-markers are read together, the values measured by counter and noise level cannot be read. Because the marker point is read by converted value.

(d) Outputting the frequencies and levels of all markers together

[Format]

```
PRINT @8;"MLSF?"              ..... (1)   ' Outputs the frequencies of
                                            all markers.
INPUT @8;F1,F2,F3,F4,F5,F6,F7,F8,F9     ' Reads the frequency to the
                                            variable.

PRINT @8;"MLN5 1GZ"           ..... (2)   ' Outputs all marker levels.
INPUT @8;L1,L2,L3,L4,L5,L6,L7,L8,L9     ' Reads the level to the
                                            variable.
```

[Function]

The command outputs the frequencies and levels of all markers together. A total of nine pieces of data containing eight multi-markers and marker can be output regardless of displayed list on the screen.

Turned off data outputs zero to the frequency and level. When the markers are read individually, the active marker is read actually. There is no difference between the single marker and multi-marker. When the multi-markers are read together, the value measured by counter or noise level cannot be read. Because the marker point is read by converted value.

[Sample program]

MLSF command

```
10      '******************************************
20      '*   R3261/3361  MULTI marker list check  *
30      '*      file: MLTLIST                     *
40      '******************************************
50       ISET IFC: ISET REN
60     *TEST
70      'GOSUB *SWEEP
80       GOSUB *STROUT          ' string output
90       GOSUB *VALOUT          ' value output
100     'GOTO *TEST
110      STOP
120       '
130    *STROUT
140      PRINT @8;"HD1 MLSF?"
150      INPUT @8;F1$,F2$,F3$,F4$,F5$,F6$,F7$,F8$,F9$
160      PRINT @8;"MLSL?"
170      INPUT @8;L1$,L2$,L3$,L4$,L5$,L6$,L7$,L8$,L9$
180      PRINT "***** STR out *****"
190      PRINT 1,F1$,L1$: PRINT 2,F2$,L2$: PRINT 3,F3$,L3$: PRINT 4,F4$,L4$
200      PRINT 5,F5$,L5$: PRINT 6,F6$,L6$: PRINT 7,F7$,L7$: PRINT 8,F8$,L8$
210      PRINT 9,F9$,L9$: PRINT ""
220      RETURN
230      '
240    *VALOUT
250      PRINT @8;"HD0 MLSF?"
260      INPUT @8;F1,F2,F3,F4,F5,F6,F7,F8,F9
270      PRINT @8;"MLSL?"
280      INPUT @8;L1,L2,L3,L4,L5,L6,L7,L8,L9
290      PRINT "***** VAL out *****"
300      PRINT 1,F1,L1: PRINT 2,F2,L2: PRINT 3,F3,L3: PRINT 4,F4,L4
310      PRINT 5,F5,L5: PRINT 6,F6,L6: PRINT 7,F7,L7: PRINT 8,F8,L8
320      PRINT 9,F9,L9: PRINT ""
330      RETURN
340      '
350    *SWEEP
360      PRINT @8;"S2"
370      PRINT @8;"SI"
380      POLL 8,S
390      IF (S AND 4)=0 THEN GOTO 380
400      RETURN
```

[Result of output]

When the Δ marker is off

```
***** STR out *****
 1          MF  0000000100.0E+6        MLB -00090.47E+0
 2          MF  0000000200.0E+6        MLB -00090.75E+0
 3          MF  0000000300.0E+6        MLB -00088.42E+0
 4          MF  0000000400.0E+6        MLB -00075.62E+0
 5          MF  0000000500.0E+6        MLB -00073.90E+0
 6          MF  0000000600.0E+6        MLB -00089.57E+0
 7          0             0
 8          0             0
 9          0             0

***** VAL out *****
 1           1E+08        -90.47
 2           2E+08        -90.75
 3           3E+08        -88.42
 4           4E+08        -75.62
 5           5E+08        -73.9
 6           6E+08        -89.57
 7           0             0
 8           0             0
 9           0             0

Ok

  load  auto  go to  list  run    save  key  print  edit  cont
```

When the Δ marker is on

```
***** STR out *****
 1          MF -0000000250.0E+6        MLD -00000.87E+0
 2          MF -0000000150.0E+6        MLD -00001.15E+0
 3          MF -0000000050.0E+6        MLD  00001.17E+0
 4          MF  0000000050.0E+6        MLD  00013.97E+0
 5          MF  0000000150.0E+6        MLD  00015.70E+0
 6          MF  0000000250.0E+6        MLD  00000.02E+0
 7          0             0
 8          0             0
 9          MF  0000000350.0E+6        MLD -00089.60E+0

***** VAL out *****
 1          -2.5E+08      -.87
 2          -1.5E+08      -1.15
 3          -5E+07         1.17
 4           5E+07         13.97
 5           1.5E+08       15.7
 6           2.5E+08       .02
 7           0             0
 8           0             0
 9           3.5E+08      -89.6

Ok

  load  auto  go to  list  run    save  key  print  edit  cont
```

(6) Cautions

① Difference between the single marker and multi-marker

There is several differences between the specification of processing for single marker and that of processing for multi-marker.

- Upper and lower limit for the next peak

  When the single marker turns on the display line or window, the upper display line or the upper/lower limit of window is executed as effective vertical axis data. The multi-marker enables every vertical axis data to execute.

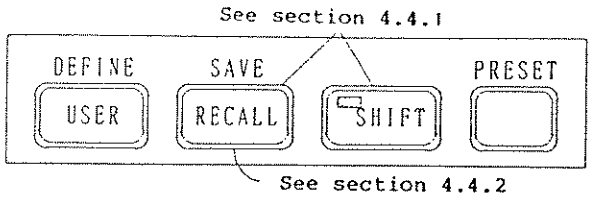
- List display for multi-marker and batch output by GPIB

  When the active marker is displayed for single marker and multi-marker and is output by GPIB, data operated for counter measurement or noise level measurement can be displayed and output. When the lists are displayed for multi-marker and are output together, the marker point can be displayed and output by converted value only. So, the value measured by counter or noise level cannot be displayed and output. When the display line is on, the value converted by the marker point is displayed and output.

② Supporting the user define function

The soft menu of multi-marker cannot be moved to the other menu by user define function. To the contrary, the other menu cannot be moved to the soft menu of the multi-marker.

4.4 Save and Recall Functions



4.4.1 Save Function

[Function]

The current set conditions are stored in the internal memory or memory card.

(1) Panel Keys and the Corresponding Softkey Menu

Refer to Section A.1 (10).

(2) Specifying a Channel

1 Internal Memory

A channel, 0 to 9, may be specified. Channel 0 is for recall-on-power, channels 1 and 2 are for set condition and waveform data, and channels 3 to 9 are for set condition.

Specify a channel directly with the numeric keys, or indirectly with the data knob or step key.

For the specified channel, → is displayed on the list.

2 Memory Card

Any channel from 10 onward may be specified. The number of channels depends on the relationship between the memory card capacity and how much data is saved.

Specify the channel directly with the numeric keys, or indirectly with the data knob or step key.

(3) Saving

After specifying a channel as mentioned above, the current set condition and waveform data are saved in the specified channel.

[Procedure and explanation]

Press [SHIFT] [RECALL] .

Displays the currently saved file status. The channel number, title (header), and write-protection are listed for each channel. The saved channel information is displayed in the reverse mode.

Press [SHIFT] [RECALL] [SAVE EXECUTE] .

If a numeric key has already been input, it is judged as a channel number and data is saved in this channel. If it has not been input, data is saved on the channel pointed by → on the list.

Press [SHIFT] [RECALL] [SAVE TITLE] .

When saving data, a title can be input with up to 30 characters. The input method is the same as that for the label function. (See Section 4.8.)

Press [SHIFT] [RECALL] [WRITE PROTECT] .

Data write into the specified is inhibited so that the previously saved information is not deleted or overwritten by mistake.
For the protected channel, ON is displayed at the end of the displayed list.
To cancel write protection, press this key again.
(This key is effective for the internal memory.)

Press [SHIFT] [RECALL] , and [TRACE A/B] is set to A or B.

Select the waveform data to be saved. Pressing this memory will select memories A and B alternately.
(This key is effective only when saving waveform data to internal memory, channel 1 or channel 2.)

(4) Saving into Memory Card

Setting conditions, waveform data, antenna correction coefficient or limit line data can be saved into the memory card.

Saving Method

(1) Saving Trace Data (The waveform data)

To save the trace data into the memory card, set the softkey mode of the TRACE section to VIEW mode.
If not saving the data, set to BLANK mode.

(2) Saving Normalize Data

To save the normalize data into the memory card, switch on the softkey NORMALIZE mode of the TRACE section.
If NORMALIZE mode is OFF, saving cannot be made.

(3) Saving Limit Line Data , Antenna Correction Coefficient or Marker

To save the limit line data, antenna correction coefficient, or marker, switch on the softkey mode of each section.
If softkey mode is OFF, saving cannot be made.

(4) Saving User Defined Key

To save the user defined key, press the softkey MENU STORE of memory card section. (Refer to subsection 4.9.7.)

CAUTION

If new datas are stored, the previous data such as set conditions in the channel will be erased.
To protect the stored datas, turn on the WRITE PROTECT switch of the memory card.

4.4.2 Recall Function

[Function]

The data (set condition and waveform) saved in the internal memory or memory card is called for restoration.

(1) Panel Keys and the Corresponding Softkey Menu

Refer to Section A.1 (11).

(2) Specifying a Channel

1 Internal Memory

A channel, 0 to 9, may be specified. Channel 0 is for call-on-power, channels 1 and 2 are for set condition and waveform data, and channels 3 to 9 are for set condition.

Specify a channel with a numeric key directly or with the data knob or step key indirectly.
For the specified channel, → is displayed on the list.

2 Memory Card

A channel, 10 and on, may be specified. The channel number depends on the relationship between the memory card capacity and data save state.

Specify a channel with a numeric key directly or with the data knob or step key indirectly.

CAUTION

If the waveform is recalled from internal memory, A memory is firstly recalled.

(3) Displaying the List

[Procedure and explanation]

Press RECALL .

The currently saved information such as channel number, title, data combination, and write enabled/inhibited state are displayed within the window for each channel.
The channel number corresponding to the channel in which data is saved is displayed in the reserve mode.
If no title has been input, the first 30 characters in the label line are displayed as a title.
Display the currently saved file status for each channel.

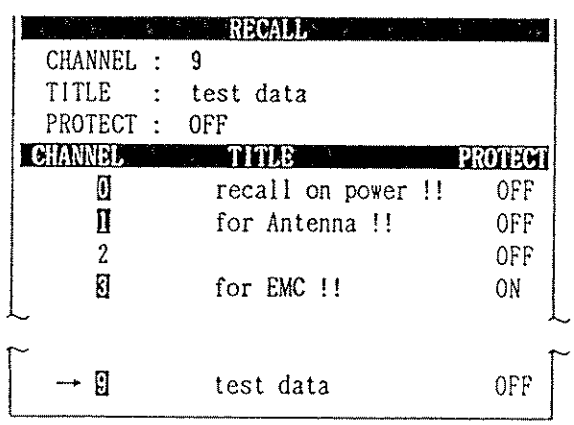
(4) Recalling

After specifying a channel as mentioned above, the data saved in this channel is called and restored.

[Procedure and explanation]

Press RECALL RECALL EXECUTE .

If a numeric key has already been input, it is judged as a channel number and data is restored in this channel. If it has not been input, the channel pointed by → on the list is recalled.

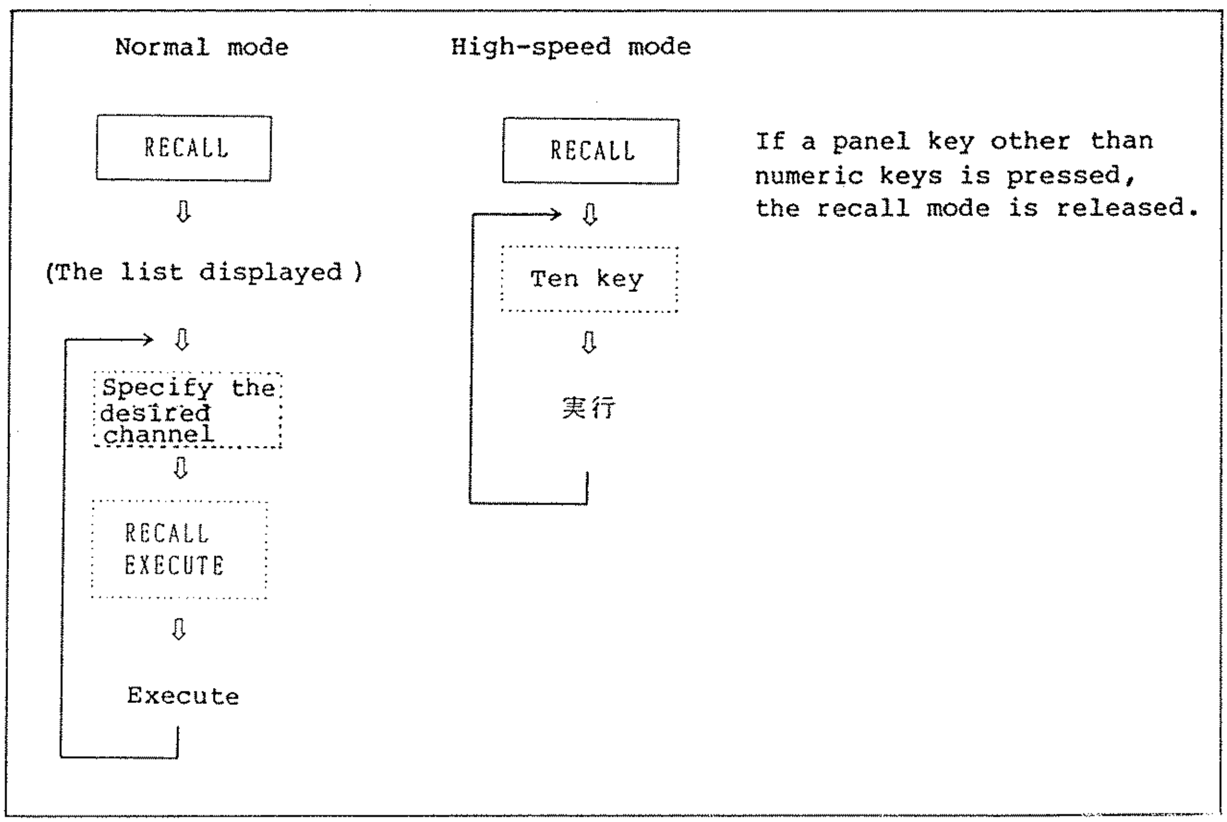


(5) High-speed/Normal RECALL Mode

In the normal mode, the user can check the list displayed in the window, specify the desired channel, and can recall data by pressing RECALL EXECUTE .

In the high-speed mode, no list is displayed in the window and the user need not press RECALL EXECUTE . When the numeric key is pressed, the data is recalled from memory.

Note: The high-speed mode is valid for internal memory only. Therefore, data cannot be recalled from the memory card even if the memory card is inserted.



4.5 User-Defined Function

[Function]

The order of the softkey menus corresponding to the function keys can be changed around so that the user can get to the most frequency used menu without pressing the same key many times.

(1) Panel Keys and the Corresponding Softkey Menu

Refer to Section A.1 (12).

(2) Changing Softkey Menus

Press [SHIFT] [USER] . The following display will appear:

On this screen, up to six soft menus (K1 through K6) can be selected as the user-defined function (Other soft menus can be modified.) If more than one pattern are required, save the data in the memory card.

(Only one set of data (soft menu (K1 through K6) and other soft menus) can be saved in one memory card.) (Refer to subsection 4.9.7.)

```
*** R3261/3361 Soft Menu Change Mode ***    MENU CHG

GROUP   USER                                 GROUP
     K1 :                                    ACTIVE
     K2 :
     K3 :                                             ①
     K4 :                                    MEMBER
     K5 :                                    ACTIVE
  →  K6 :

GROUP                                        ENTER
 /*** Center ***/
  →   1 : Step Size of Center
      2 : Step Size is auto
      3 : Offset of Center                   INITIAL
      4 : +/-(offset's sign)                 MEMBER   ②

 /*** Span ***/
      1 : Linear Span                        ALL
      2 : Full Span                          INITIAL
      3 : Log Span
      4 : Zero Span                          RETURN
```

[Explanation of the Above Screen]

1. The upper half of this screen displays the current assignment of softkey menus. This is called a softkey menu group.

2. The lower half of this screen displays the contents (functions) of each softkey menu group. This is called a softkey menu member.

[Procedure and explanation]

Find the softkey menu group to be changed and select its member.

Press SHIFT USER GROUP ACTIVE .

Press the panel key or the step key to select the desired softkey menu group. The member to be exchanged can be searched by turning the data knob. An arrow is displayed on the left of the member to be exchanged.

Press SHIFT USER MEMBER ACTIVE .

Select a softkey member to be incorporated. To select a softkey member, find the corersponding group by pressing the panel key or step key. Then turn the data knob to find the member to be incorporated. When the data knob is turned continuously, the screen is scrolled so that the desired member can be searched easily.

Press SHIFT USER ENTER .

After the member to be exchanged is selected, press this key. If the softkey menu number (K1, K2, ...) is displayed in the reverse mode, members cannot be exchanged.

Press SHIFT USER INITIAL MEMBER .

Initial members are displayed on the soft group display screen.

Press SHIFT USER ALL INITIAL .

All the changed members are replaced with the initial members.

Press SHIFT USER RETURN .

This mode is canceled and the previous soft groups are restored.

CAUTION

The new menu setting is held after the power is turned off. Save the new menu setting in the memory card, if necessary, and initialize before using the GPIB remote controller.

4.6 Calibration Function

[Function]

This device can improve measuring accuracy by running the calibration function and correcting the obtained calibration factor at the time of real measurement.

The following items can be measured with the calibration function:

- Absolute errors in 300kHz resolution bandwidth, -20dBm internal reference oscillator and 1dB/DIV
- IF filter switching level error in 30Hz to 1MHz resolution bandwidth
- Vertical axis linearity on the screen at LOG 10dB/DIV, 5dB/DIV, 2dB/DIV, and 1dB/DIV
- Switching error in IF STEP AMP
- Switching error in the input attenuator
- TG frequency errors in 30Hz to 1kHz RBW

(1) Panel Keys and the Corresponding Softkey Menu

Refer to Section A.1 (16).

[Procedure and explanation]

Press [SHIFT] [7] [CAL ALL].

Measure all calibration items. Becomes error correction mode after the calibration is completed.

Press [SHIFT] [7] [TOTAL GAIN].

Measure the absolute error in 300kHz resolution bandwidth, -20dBm internal reference oscillator, and 1dB/DIV.

Press [SHIFT] [7] [EACH ITEM].

EACH ITEM mode.

Press [SHIFT] [7] [EACH ITEM] [INPUT ATT].

Measure the switching error in input attenuator.

Press [SHIFT] [7] [EACH ITEM] [IF STEP AMPTD].

Measure the swithcing error in IF STEP AMP.

Press [SHIFT] [7] [EACH ITEM] [RBW SWITCH].

Measure the switching level error of IF filter of resolution bandwidth in 30Hz to 1MHz.

Press [SHIFT] [7] [EACH ITEM] [LOG LINEAR].

Measure vertical axis linearity on the screen at LOG 10dB/DIV, 5dB/DIV, 2dB/DIV and 1dB/DIV.

Press [SHIFT] [7] [EACH ITEM] [AMPTD MAG].

Measure the switching error in LOG 10dB/DIV, 5dB/DIV, 2dB/DIV and 1dB/DIV.

Press [SHIFT] [7] [EACH ITEM] [TG TRACKING].

Note: R3361C/D only
Measure level error caused from the difference between the output frequency of the tracking generator at PBW 30Hz to 1kHz and symchromized frequency of the spectrum analyzer.

Press [SHIFT] [7], and [CAL SIG ON/OFF] is set to ON or OFF.

Connect internally the internal basic transmitter (30MHz, -20dBm to -30dBm) with the input circuit. At this time, the signal level can be set at -20dBm to -30dBm (0.5dB steps) using either the ten-keys, data knob or step keys.

Press [SHIFT] [7], and [FRQ CORR ON/OFF] is set to ON or OFF.

The frequency characteristics measured at the factory are stored in the analyzer and it is shipped. When the analyzer is used in the field, its frequency characteristics are corrected if necessary for on. The frequency characteristics are turned on and off if [FRQ CORR ON/OFF] is pressed.

Press [SHIFT] [7], and [CAL CORR ON/OFF] is set to ON or OFF.

Uses (ON) or does not use (OFF) the calibration factor which has been obtained during calibration. The ON and OFF state are switched whenever [CAL CORR ON/OFF] is pressed.

CAUTION

Start the calibration function only after the specified time of warm-up.

4.7 Plot Output Function

[Function]

Set the necessary condition to output to the Plotter before being output.

(1) Panel Keys and the Corresponding Softkey Menu

Refer to Section A.1 (17).

(2) Setting the Plotter Output Conditions

Carry out effectively the operations to set various conditions for plotter output utilizing the window screen.

[Procedure and explanation]

Press [SHIFT] [8] .

The following instruction appears on the window screen; set the conditions according to this instruction.

```
        PLOT
TYPE   : R9833
MODE   : ALL
PAPER  : A4
DIV    : 2 PICTURE
PEN    : 6 PENS
LOCATE : LEFT
        PEN
    1 PEN
    2 PENS
    4 PENS
 →  6 PENS
```

Press [SHIFT] [8] [PLOTTER TYPE] .

Specifies plotter type. Types of plotters available are shown as follows:

(1) TR9832
(2) R9833
(3) HP7470
(4) HP7440
(5) HP7475
(6) HP7550

Press [SHIFT] [8] [PLOT MODE].

Specifies mode of plotter. Modes that can be selected are as follows:
(1) Waveform, grid, all character data
(2) Only waveform
(3) Only character data
(4) Only grid

Press [SHIFT] [8] [PLOT FORM] [PAPER SIZE].

Specifies the size of paper. Sizes of selectable paper are as follows:
(1) A4
(2) A3

Press [SHIFT] [8] [PLOT FORM] [PLOT DIVISION].

Specifies the size of the screen divisions. Sizes of the screen divisions are as follows:
(1) Single
(2) Divided into two sections, left and right
(3) Divided into four-left, right, upper and lower.

Press [SHIFT] [8] [PLOT FORM] [LOCATION].

Specifies the output screen. Selectable locations are as follows:

(1) Left side (2) Right side	When divided into two
(1) Upper left (2) Upper right (3) Lower left (4) Lower right	When divided into four

Press [SHIFT] [8] [PLOT FORM] [PEN].

Specifies the number of pens. The number of selectable pens are shown as follows:
(1) One
(2) Two
(3) Four
(4) Six

Press [SHIFT] [8] [PLOT FORM] , and [PLOT AUTO/MNL] is set to AUTO or MNL.

Specifies whether all the divided screens are to be plotted automatically.

Press [SHIFT] [8] [TALK/ ADRS 05] to set TALK.

This outputs TALK ONLY. Set the plotter to LISTEN ONLY.

Press [SHIFT] [8] [TALK/ ADRS 05] to set ADRS 05.

This outputs addressing. Specify the plotter address with the numeric, step keys and data knob. Also, set the plotter to the same address.

Press [SHIFT] [8] [PLOT CANCEL] .

Cancels the plot output.

Press [SHIFT] [8] [PLOT EXECUTE] .

Executes plot output according to the set conditions.

CAUTION

1. Refer to the separate plotter instruction manual for operating the plotter.
2. This equipment supports plotter types that comply with HP-GL standards only. Note that the screen of the HP7470 plotter cannot be divided into two sections.

(3) Assigning the Plotter Pens

1 pen specification :	Everything pen 1	frame, marker, character, D-line, waveform A, waveform B
2 pen specification :	pen 1	frame, marker
	pen 2	waveform A, waveform B, character, D-line
4 pen specification :	pen 1	frame, marker
	pen 2	character, D-line
	pen 3	waveform A
	pen 4	waveform B
6 pen specification :	pen 1	frame
	pen 2	character
	pen 3	waveform A
	pen 4	waveform B
	pen 5	D-line
	pen 6	marker

CAUTION

Output to the plotter is done in TALK ONLY mode, so the plotter must be set to LISTEN ONLY mode.
Do not connect the controller.

4.8 Label Function

[Function]

This function is used to input the title of waveform screen and the title at the time of save/recall, and the file name at the time of operating memory card, etc.

(1) Panel Keys and the Corresponding Softkey Menu

Refer to Section A.1 (18).

(2) Selection of Character

In general, the label function can be used to input the comment on the most significant line on the screen, but it also can be used to input such title characters as save/recall.

In label input, input is made by selecting characters one by one. Characters are selected from the operation window screen displaying upper and lower case letters and symbols. One character is selected and the ENTER key pressed. Numeric values can also be entered from the ten keys.

[Procedure and explanation]

Press [SHIFT] [9] .

The following operation window screen appears. Select any character from the screen.

LABEL
ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789

Press [SHIFT] [9] [CAPS LOCK ON] .

Select uppercase letters.

Press [SHIFT] [9] [CAPS LOCK OFF] .

Select lowercase letters.

Press [SHIFT] [9] [MARK] .

Select symbols.

Press [SHIFT] [9] [LABEL CLEAR] .

Deletes all labels.

Press [SHIFT] [9] [RETURN] .

Return to the softkey menu when the label function is started.

(3) Operation Procedure

1. Press [SHIFT] [9] .
2. Use the step keys to move the cursor to the right and left. Press [⇧] to move the cursor to the right, and press [⇩] to move the cursor to the left. Press [SHIFT] and then the up key to move the cursor to the beginning of the label, and press the shift key and then the down key to move the cursor to the end of the label.
3. Turn the data knob to find the desired character and press [ENTER] to input that character.
4. The backspace key deletes the input character. Press [SHIFT] and then [BK SP] to delete the character under the cursor and the subsequent characters.

4.9 Memory Card Function

4.9.1 Specification of Memory Card

Memory capacity	:	32K bytes, standard
Connector	:	20 poles and 2 pieces (connecting/disconnecting cycle: more than 5000 times)
Interface	:	I/O bus method (in accordance with JEIDA)
Power for memory back-up	:	CR 2016 (One unit, changeable)
Memory retention period	:	5 years (at room temperature)
Outline dimension	:	54(W) x 86(L) x 2.2(T) mm
Environmental condition	:	Dewing should be prohibited. Working temp. 0 to 40°C Memory storing temp. -20 to 60°C Relative humidity 10 to 90%
Write protection	:	The on or off status can be selected by the switch. When the write-protection switch is on, data cannot be written on the disk (that is, the disk is write-disabled).

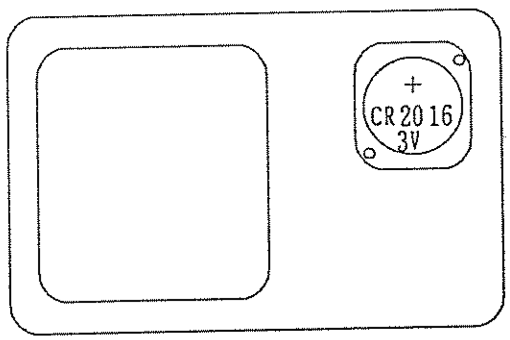
4.9.4 Replacing the Battery

Procedure for replacing

1. Remove two screws from the rear face of memory card using a Phillips driver, and remove the cover.

2. Remove the battery, and replace it with a new battery.

   Set the battery so that its ⊕ side is seen.



Battery type
CR2616

3. Install the cover.

CAUTION

When the battery is replaced, all data saved on the memory card are erased. Copy necessary data on another memory card, then the replace the battery.

Optional memory cards
A09505: 32K byte SRAM card ---- Set of five cards
A09506: 128K byte SRAM card --- Set of five cards

4.9.5 Cautions on Memory Card

(1) Do not insert dust in the connector hole as it may cause imperfect contact or connector damage.

(2) Do not attach the metallic needle to the connector. If it is attached, the static electricity may explored.

(3) Do not bend or apply strong shock.

(4) Keep this unit dry.

4.9.6 Method of Inserting and Removing Memory Card

Operation Procedure

1. Insert the memory card with the printed side kept to the left.
2. Normal READ/WRITE operation can be made while the protect switch is turned to "OFF". When the switch is turned to "ON", the write operation is prohibited.
3. Before taking out the card, push the eject button.

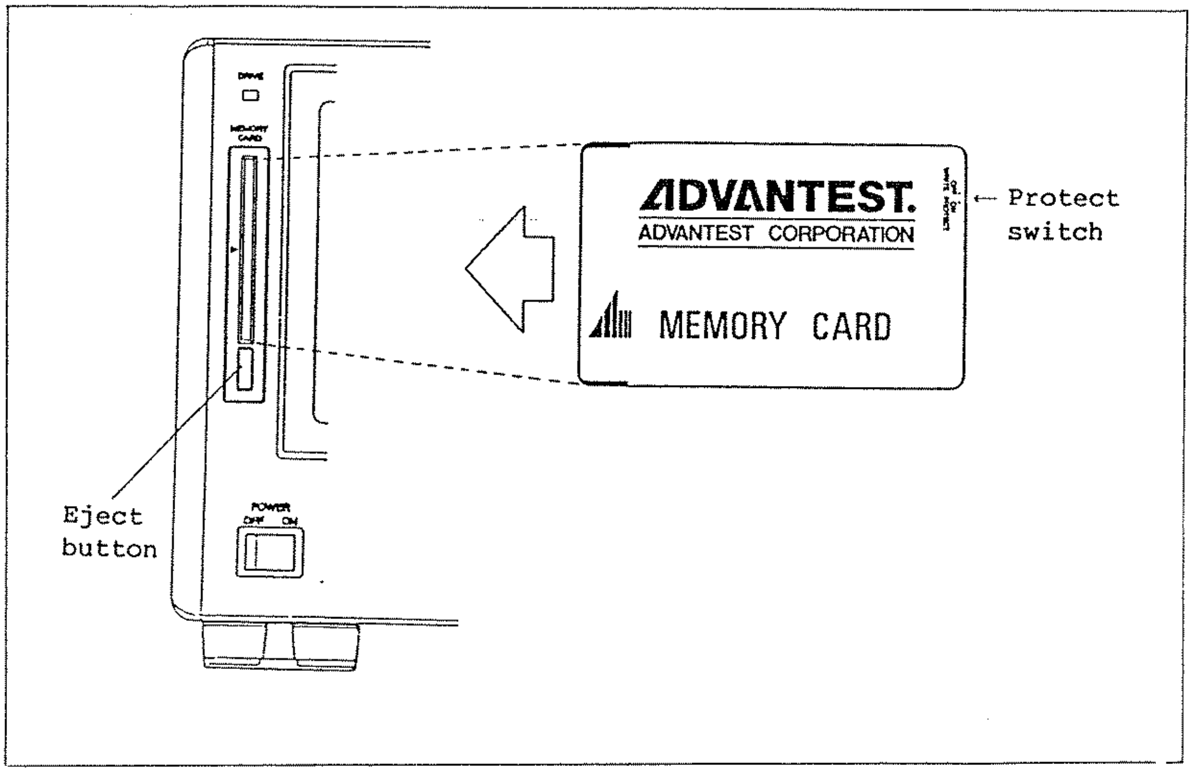


Figure 4 - 7 How to Insert Memory Card

CAUTION

The drive lamp should be lit during the card access. Do not push the ejection button to take out the memory card while the lamp is lit.

If the card is taken out while the lamp is lit, data in the card cannot be guaranteed.

4.9.7 Memory Card Function

[Function]

This function is for initializing the memory card and storing and recalling the softkey menu. For storing the setting conditions, restoration, etc. see the save and recall functions in Chapter 4.4.

(1) Panel Keys and the Corresponding Softkey Menu

Refer to Section A.1 (19).

(2) Initializing the Memory Card

Format the memory card.

Press [SHIFT] [4] [VOLUME INIT] to execute initialization.

CAUTION

The unused memory card won't function unless this initialization menu is run. Notice that all data in the card will be erased when the memory card storing the data is reinitialized.

(3) Storing Softkey Menu

One softkey menu programmed by the user-defined function Section 4.5 can be stored as data in the memory card.

Press [SHIFT] [4] [MENU STORE] to execute storing.

CAUTION

1. If the MENU STORE key is pressed again after storing the softkey menu, that softkey menu data will be deleted.

2. To protect the softkey menu data, turn on the WRITE PROTECT switch of the memory card.

(4) Recalling Softkey Menu

The softkey menu stored in the memory card can be recalled.

Press [SHIFT] [4] [MENU LOAD] to recall the softkey menu data.

CAUTION

When storing both the softkey menu and the setting conditions on a single memory card, store the softkey menu first.

The number of files to be stored depends on the memory card size and the execution conditions.

Example:

Softkey menu + setting conditions : up to 15 files

Setting conditions + trace data A : up to 12 files

Softkey menu + setting conditions + trace data A
: up to 11 files

Setting conditions + trace data A & B : up to 7 files

Softkey menu + setting conditions + trace data A & B
: up to 6 files

Setting conditions + trace data A + normalize data A & B + antenna correction data + limit line data A
: up to 4 files

4.10 Measuring Window

4.10.1 Window Setting

[Function]

This window for measuring is useful in the sweeping and marker peak search functions. The dynamic window sizes range from 0.2div (1/5 the grid size) to full scale.

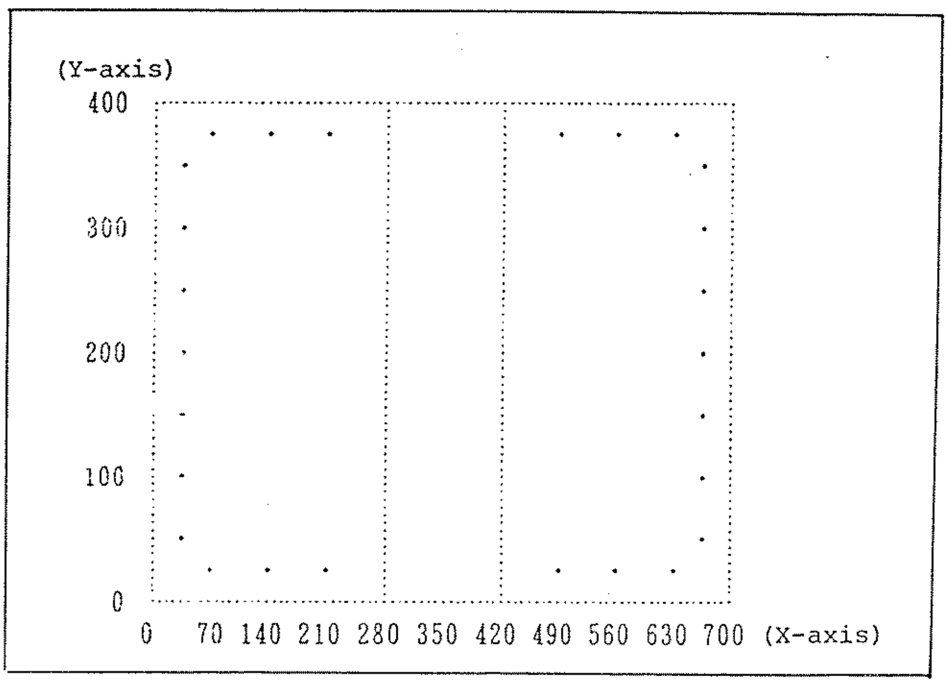
(1) Panel Keys and the Corresponding Softkey Menu

Refer to Section A.1 (22).

(2) Window Setting

① Window ON

Press [SHIFT] [0] (M. W), and display the window on the screen. (The figure below shows initial setting sizes.) The new sizes are retained until reset.



Window start frequency = X-axis 280th point
Window stop frequency = X-axis 420th point
Window high level = Y-axis highest level
Window low level = Y-axis lowest level

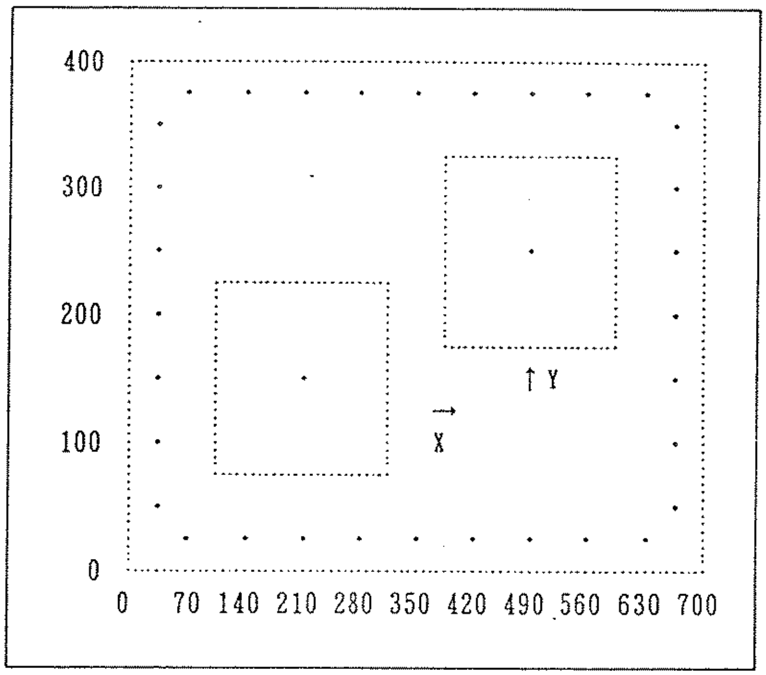
② Window OFF

Press [SHIFT] [0] (M. W) [WINDOW OFF], and clears the window display.

③ LOCATION

Press [SHIFT] [0] (M. W) [NEXT MENU] .

Moves the center of the window (X, Y) at [LOCATE X] or [LOCATE Y].



[keys for adjusting data]

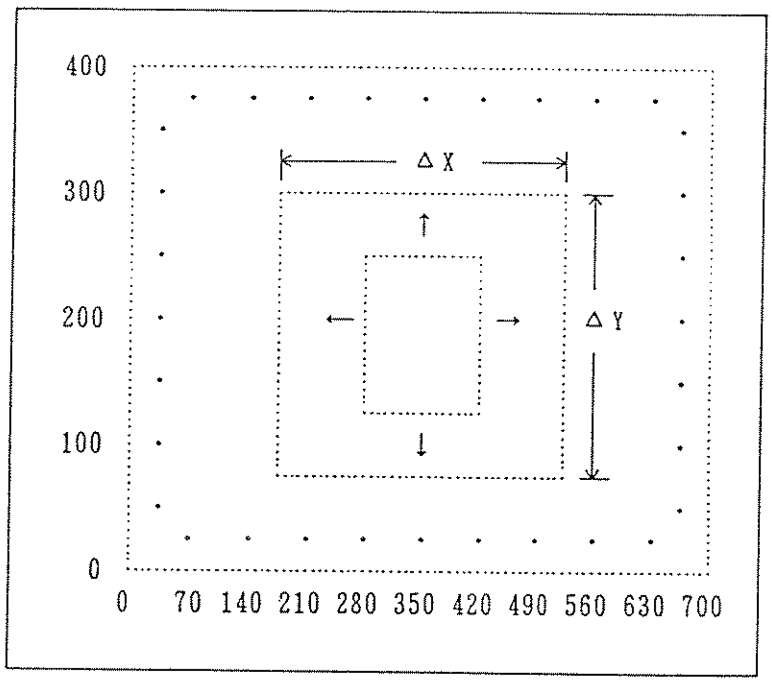
To increase the center frequency, turn the data knob clockwise or press the step up arrow key. (X or Y)

To decrease the center frequency, turn the data knob counterclockwise or press the step down arrow key. (X or Y)

(4) DELTA

Press [SHIFT] [0] (M. W) [NEXT MENU] .

Increases and decreases frequency width (ΔX), level difference (ΔY) at [ΔX] or [ΔY] .



[Keys for adjusting data]

To increase the delta value, turn the data knob clockwise or press the step up arrow key. (X or Y)

To decrease the delta value, turn the data knob counterclockwise or press the step down arrow key. (X or Y)

(5) ABSOLUTE

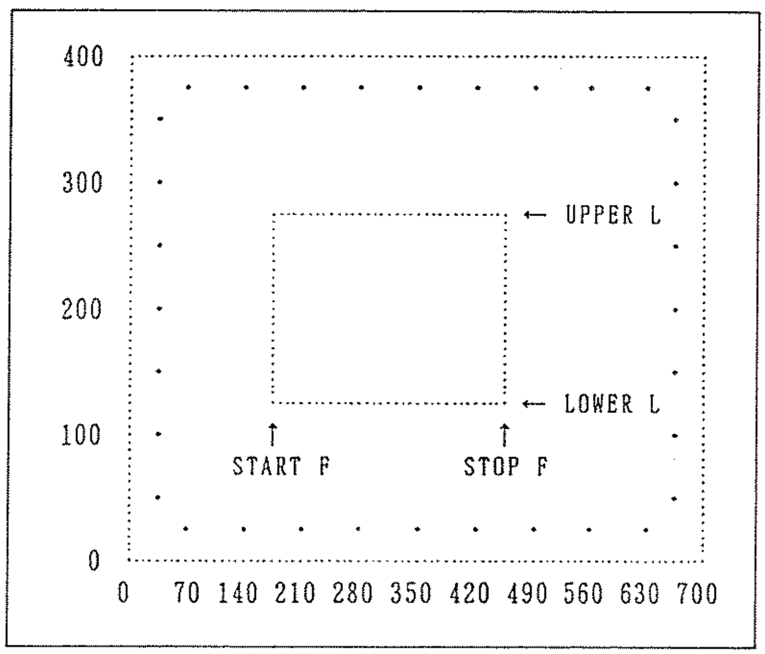
Press SHIFT 0 (M. W) NEXT MENU ABS DATA .

Pressing the WINDOW START key allows start frequency (START F) to be set with absolute value.

Pressing the WINDOW STOP key allows stop frequency (STOP F) to be set with absolute value.

Pressing the WINDOW UPPER key allows upper level (UPPER L) to be set with absolute value.

Pressing the WINDOW LOWER key allows lower level (LOWER L) to be set with absolute value.



[Keys for Adjusting Data]

To increase the most active of the above four data, turn the data knob clockwise or press the step up arrow key.

To decrease the most active of the above four data, turn the data knob counterclockwise or press the step down arrow key.

To specify the most active of the above four data with the absolute value, use the numeric keys.

4.10.2 WINDOW MEASUREMENT

(1) Measuring Function

When the window is on, the following measurement can be executed. The user can change the window setup or measuring conditions during measurement. When the window is turned off, the window measurement is released.

(1) Partial sweep

Signals are sweeped within the window (see Item (4) of Section 4.1.6).

[Operation procedure]

After window setup, press [MENU] [SWEEP MODE] [WINDOW SWEEP] in this order.

[NORMAL SWEEP] and [MANUAL SWEEP] mode can be switched.

Press [NORMAL SWEEP] continuously to release it.

(2) Peak search by marker

The peak can be searched in the window.

[Operation procedure]

After window setup, press [PEAK] .

(3) Continuous peak search by marker

The peak can be searched in the window.
The marker will remain in the window even after the window setting is changd.

[Operation procedure]

After window setup, press [PEAK] [NEXT MENU] [PK CONT ON/OFF] in this order.

(4) Next peak search by marker

The next peak can be searched in the window.

[Operation procedure]

After window setup, press [PEAK] [NEXT PK] in succession.

(5) x dB down of marker

The signal level can be reduced for "x dB" within the window.

[Operation procedure]

After window setup, press ON NEXT MENU X dB DOWN in this order.

(2) GO or NG Judgment Function

[Functions]

- This function is enabled only when the GPIB is controlled remotely.
- In properly-set MEAS and measuring data in the window, this function determines the upper or lower limit from the UPPER to the LOWER level of the window.
- The function outputs 0 for GO (all of measured data in the window range from UPPER to LOWER) and outputs the number of points for NG (up to 100 points from the left). It can also output not-good frequency.
- A resolution of Y-axis level in the window is up to 0.1 dB.

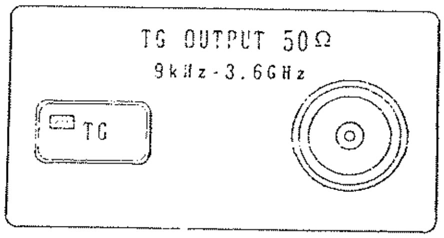
[GPIB command]

Command	Description
CMA	Determines GO or NG with trace A.
CMB	Determines GO or NG with trace B.
CM?	Specifies the output of GO or NG result (NG point number: GO=0, NG=1 to 100).
CMF?	Specifies the output of frequency data for NG (for NG point).

[Example of program] (PC9801)

```
 10  ISET IFC:ISET REN
 20  PRINT @8;"WTF1MZ WPF2MZ"       'Set window frequency.
 30  PRINT @8;"WUL-10DB WLL-20DB"   'Sets the upper and lower limits of window.
 40  PRINT @8;"CM?"                 'Specifies the output of GO or NG result.
 50  PRINT @8;"CMA"                 'Determine GO or NG in trace A.
 60  INPUT @8;P                     'Reads data.
 70  PRINT "NG = ";P;" point"       'Display
 80  IF P=0 THEN GOTO 140           'Terminates for GO.
 90  PRINT @8;"CMF?"                'Specifies the output of NG frequency data.
100  FOR N=1 TO P                   'Counts the NG point number.
110    INPUT @8;NGF$                'Reads data.
120    PRINT N,NGF$                 'Display
130  NEXT N
140  END
```

4.11 Tracking Generator Function (R3361C/CN/D only)



R3361D

For details, see Section 5.

[Function]

Tracking generator

(1) Panel Keys and the Corresponding Softkey Menu

Refer to Section A.1 (20).

(2) Setting TG Level

TG level can be set within the range of 0 to -50dBm. The initial setting value is -10dBm.

[Procedure and explanation]

Press [TG] [LEVEL].

Selects the TG level mode and displays the current TG level at the left upper end of the screen. This key input allows data entry.

[Data Adjusting Key]

Data knob : TG level rises when the knob is turned clockwise and lowers when the knob is turned counterclockwise. The set resolution is 1dB.

Step key : Increases or decreases the TG level by 5dB.

Ten key : The set resolution is 1dB.

(3) Setting FREQ CAL AUTO

[Procedure and explanation]

Press [TG] [FREQ CAL AUTO] .

Causes an automatic setup of appropriate TG FREQ D/A signal conversion level for the current RBW.

(4) Setting TG Frequency

The TG FREQ D/A value can be set within the range of 0 to 0xfff. The initial set value is 0x800.

[Procedure and explanation]

Press [TG] [FREQ CAL MANUAL] .

TG FREQ D/A value setting mode.
Data entry becomes possible, and the current TG FREQ D/A value is displayed at the upper left corner of the screen.

[Data Adjusting Key]

Data knob : The TG FREQ D/A value increases when the knob is turned clockwise and decreases when turned counterclockwise. The set resolution is one point.

Step key : Increases or decreases the TG FREQ D/A value by one point.

Ten key : The set resolution is one point.

(5) TG OFF

To turn off the TG, press OFF in the softkey menu or press the TG key in the front panel again. The TG mode is released and the instrumentation mode is enabled.

4.12 EMC Function

[Function]

This function is for measuring interfering waves.

4.12.1 Panel Keys and the Corresponding Softkey Menu

Refer to Section A.1 (21).

4.12.2 Antenna Correction Function

This function is for correcting antenna coefficients and measuring electric field strength.

[Procedure and explanation]

Press SHIFT 1 FIELD STR ANTENNA DIPOLE.

Sets electric field strength measuring conditions when using the Advantest half wavelength dipole antenna TR1722.

Press SHIFT 1 FIELD STR ANTENNA LOG PERD.

Sets electric field strength measuring conditions when using the Advantest logarithm cycle dipole antenna TR1711.

Press SHIFT 1 FIELD STR ANTENNA TR17203.

Sets electric field strength measuring conditions when using the Advantest active antenna TR17203.

Press SHIFT 1 FIELD STR ANTENNA ANTENNA OFF.

Cancels the electric field strength measuring conditions of the above three.

Press SHIFT 1 FIELD STR ANTENNA CORR.

Creates the user-defined antenna coefficients. The limit line section (4) contains further explanations.

Press SHIFT 1 FIELD STR ANTENNA CORR, and CORRECT ON/OFF is set to ON or OFF.

Either cancels or executes WRITE waveform adjustment of the user-defined antenna coefficients.

Press SHIFT 1 FIELD STR ANTENNA CORR NEXT MENU, and INPUT/ MODIFY is set to INPUT or MODIFY.

Selects new input or modification for the user-defined antenna coefficients.

Press SHIFT 1 FIELD STR ANTENNA CORR NEXT MENU, and FREQ/ LEVEL is set FREQ or LEVEL.

Selects frequency value or level value for the input of the user-defined antenna coefficients.

Press SHIFT 1 FIELD STR ANTENNA CORR NEXT MENU TABLE INIT.

Initializes the user-defined antenna coefficient input area, erasing all current values.
Note: Software menu TABLE INIT is displayed only when software menu INPUT/MODIFY is set to MODIFY.

Press SHIFT 1 FIELD STR ANTENNA CORR NEXT MENU TABLE DELETE.

Erases one set (frequency and level values) of user-defined antenna coefficient inputs. Section (4) Limit Line contains further explanation.
Note: Software menu TABLE DELETE is displayed only when software menu INPUT/MODIFY is set to MODIFY.

4.12.3 QP Measurement

① This function is for measuring pulse noises. Measuring constants are set as follows according to the CISPR standard.

Table 4 - 2 QP Measurement Basic Characteristics of CISPR Standard

	Measuring band	6 dB Banwidth	Waved time constant		
			Recharging constant	Discharging constant	Mechanical constant
A	10kHz to 150kHz	200Hz	45ms	500ms	160ms
B	150kHz to 30MHz	9kHz	1ms	160ms	160ms
C	30MHz to 300MHz	120kHz	1ms	550ms	100ms
D	300MHz to 1GHz	120kHz	1ms	550ms	100ms

② Since time constant with large number is counted on the measurement of QP value as shown in Table 4-2, set the sweep time for long enough. See Table 4-3 for the sweep time value.

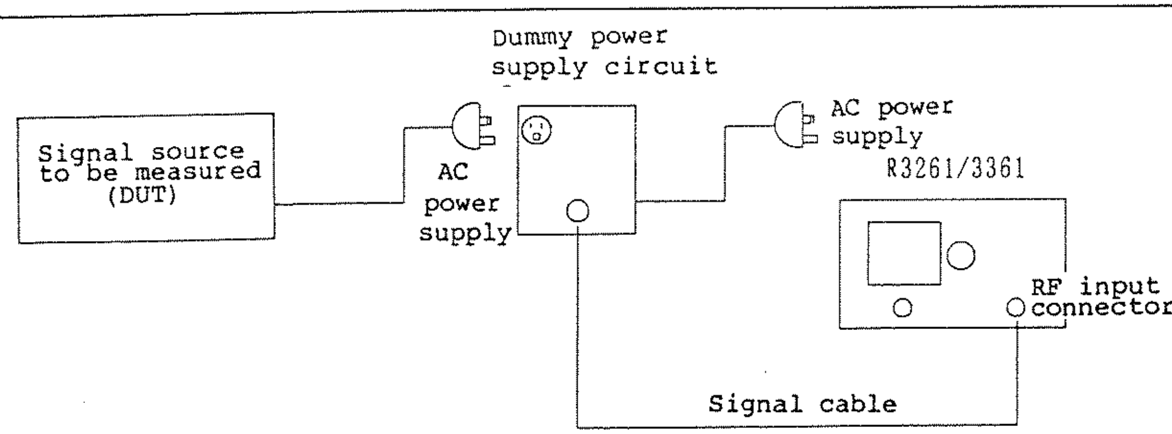
Table 4 - 3 Reference Value of the Sweep Time

Bandwidth to be measured		Target value of sweep time
A	10kHz to 150kHz	1 second per frequency span of 200Hz
B	150kHz to 30MHz	1 second per frequency span of 10kHz
C	30MHz to 300MHz	1 second per frequency span of 100kHz
D	300MHz to 1GHz	

③ Example of measurement of interfering terminal voltage in dummy power supply circuit.

Operating procedure

③-1 Connect this spectrum analyzer with signal (to be measured supplier (DUT) and dummy power supply circuit as shown in Figure 4-8.



Note: Remove the signal cable from the RF input connector of R3261/3361 when switching the DUT power source ON/OFF or connecting it to the circuit. (For spike noise is generated in the dummy power supply circuit and the RF input part (mix. diode) of R3261/3361 is broken.)

Figure 4 - 8 Measurement of Interfering Terminal Voltage

③-2 Set START and STOP frequencies which are to be measured.

Press [START] [1] [5] [0] [kHz] .

Press [STOP] [1] [0] [MHz].

③-3 Set QP resolution bandwidth.

Press [SHIFT] [1] [QP] , and [QP ON /OFF] is set to ON.

By this setting, this spectrum analyzer automatically selects the resolution bandwidth (9kHz) and charging/discharging time constant.

Note: If START and STOP frequencies exist in more than two frequency bands, the resolution bandwidth is automatically selected by the STOP frequency.

③-4 Set the sweep time in accordance with Table 4-3.

Press [COUPLE] [SWP] , and adjust a data with [⇩] or [⇧] .

Set the sweep time for long enough.

Note: In procedures ③-1 through ③-3, the sweep time is settled 1000 seconds.

3-5 Increase and decrease frequency by 10dB bandwidths on the operating attenator and ensure there is no waveform change. If the waveform changes, increase the attenator gain or attach a band pass filter in the input side, because the input capacity of this spectrum analyzer has been saturated.

Press [COUPLE] [ATT], and adjust a data with [⇩] or [⇧].

Check that the level does not change.

3-6 Switch on the marker lamp and read the data, then compensate for error by the correction factor, as according to the dummy power supply circuit.

Press [ON], and adjust a data with (knob).

3-7 Since QP dynamic range has two ranges, 40dB and 80dB, select the appropriate range as occasion calls.

Press [REF LEVEL] [XdB/div], and adjust a data with [⇩] or [⇧].

10dB/div=80dB D.Range
5dB/div=40dB D.Range

3-8 In releasing the QP value measuring mode, this spectrum analyzer sets the REF mode, where the QP value measuring mode is not set.

Press [SHIFT] [1] [QP], and [QP ON/OFF] is set to OFF.

[Procedure and explanation]

Press SHIFT 1 QP , and QP ON/OFF is set to ON or OFF.

Switches the QP measurement on or off.

QP BW AUTO is automatically selected when QP BW is not selected.

Press SHIFT 1 QP QP BW AUTO .

Automatically selects the appropriate QP bandwidth to match the measuring band in Table 4-2.

Press SHIFT 1 QP QP BW 200 Hz .

Manual selection of the QP bandwidth 200Hz.

Press SHIFT 1 QP QP BW 9 kHz .

Manual selection of the QP bandwidth 9kHz.

Press SHIFT 1 QP QP BW 120 kHz .

Manual selection of the QP bandwidth 120kHz.

4.12.4 Limit Line Function

The Limit Line function allows display of spectrum upper or lower limit on the screen. The measured data can easily be compared with the limit value on the screen.

(1) Data Table Input Procedure

Up to 51 points of frequencies and up to 51 points of levels can be input for the limit line data. The frequency data inputs range from 0GHz to 3.6GHz and the level data inputs range from -200dBm to +50dBm. The REF level unit may be used for the level data inputs. Ordinary data inputs are executed in the input mode. Use the modify mode to modify the data already input.

[Operating procedure]

(1) Press [SHIFT] [1] [LIMIT LINE A] to display the following data input window.

LIMIT LINE A

FREQ :
LEVEL :

No.	G M k Hz	dBm
1 :	1 000 000 000	-20.0
2 :	1 100 000 000	-30.0
3 :	1 200 000 000	-40.0
4 :	1 300 000 000	-50.0
5 :	1 400 000 000	-60.0
→ 6 :		
7 :		
8 :		
9 :		
10 :		

The above is the window with 5 points data input.

The window is divided into upper and lower parts and the upper is called the active area and the lower is called the list area. The active area displays the currently input data (input mode) or the data to be modified (modify mode).

(2) Selecting Input Mode

Press [NEXT MENU] [INPUT/ MODIFY] .

Press [INPUT/ MODIFY] to switch between the input and the modify mode.

The input mode accepts frequency data and level data alternately.

The frequency and level input together are considered one-point data. Input data is sorted in the ascending order of frequencies.

The modify mode accepts modification and sorting of data already input according to the frequency or level. Press [TABLE INIT] to delete all data. Press [TABLE DELETE] to delete the data to which the arrow points.

③ Selecting Data

Press FREQ/ LEVEL to select frequency data or level data.
Ordinarily, the two data inputs are accepted alternately. Press this key to modify the desired data.

④ Displaying List

Input data is displayed in the list area (lower part of the window). This data is not displayed in the active area (upper part of the window) while in input mode, but currently active data. Turn the data knob to scroll the data display up or down.

LIMIT LINE A

FREQ : 1 200 000 000 Hz
LEVEL : -40.0 dBm

	No.	G M k Hz	dBm
	1 :	1 000 000 000	-20.0
	2 :	1 100 000 000	-30.0
→	3 :	1 200 000 000	-40.0
	4 :	1 300 000 000	-50.0
	5 :	1 400 000 000	-60.0
	6 :		
	7 :		
	8 :		
	9 :		
	10 :		

(2) Executing Limit Line Function

ON closes the currently open window and displays the limit lines in the B memory. OFF erases the limit lines.

[Procedure and explanation]

Press SHIFT 1 LIMIT LINE A , and LIMIT A ON/OFF is set to ON or OFF.

Turns the user-defined limit line display in the VIEW B waveform area on or off.

Press [SHIFT] [1] [LIMIT LINE A] [NEXT MENU], and [INPUT/ MODIFY] is set to INPUT or MODIFY.

Selects new input or modification for the user-defined limit line.

Press [SHIFT] [1] [LIMIT LINE A] [NEXT MENU], and [FREQ/ LEVEL] is set to FREQ or LEVEL.

Selects the frequency value or level value for the user-defined limit line inputs.

Press [SHIFT] [1] [LIMIT LINE A] [NEXT MENU] [TABLE INIT].

Initializes the user-defined limit line input area, erasing all current values.

Note: Software menu TABLE INIT is displayed only when software menu INPUT/MODIFY is set to MODIFY.

Press [SHIFT] [1] [LIMIT LINE A] [NEXT MENU] [TABLE DELETE].

Erases one set (frequency and level values) of user-defined limit line to which the arrow points.

Note: Software menu TABLE DELETE is displayed only when software menu INPUT/MODIFY is set to MODIFY.

4.13 Occupied Bandwidth Measurement (OBW) and Adjacent Channel Leakage Power Measurement (ADJ)

4.13.1 Occupied Bandwidth Measurement (OBW)

[Function]

Calculates the occupied bandwidth by using the on-screen measured data that is stored in the trace A memory of the tester. In this calculation, the rate of the bandwidth to the total power can be specified within the range of 10% to 99.8%.

(1) Procedure and explanation

Refer to A.1 (23).

(2) Calculation

The tester screen shows 701 points of data on the frequency axis. If one of these points has the voltage of "Vn", the total power of P on the screen can be determined by the following equation:

$$P\,(W) = \sum_{n=1}^{701} \frac{Vn^2}{R}$$ (R is the input impedance.)

If the sum of the power is calculated as the amount from the left end of the screen. If the 0.5% position of the total power of P is point X from the left end of the frequency axis, the following equation is satisfied:

$$0.005P = \sum_{n=1}^{X} \frac{Vn^2}{R}$$ (If the rate is 99.0%)

If the some of the power is calculated as the amount from the left end of the screen. If the 99.5% position of the total power of P is point Y from the left end of the frequency axis, the following equation is satisfied.

$$0.995P = \sum_{n=1}^{Y} \frac{Vn^2}{R}$$ (If the rate is 99.0%)

Values X and Y can be determined, and the occupied bandwidth can be determined by the following equation:

$$OBW\,(Hz) = \frac{f_{SPAN}(Y-X)}{701}$$ (f_{SPAN} is the frequency span.)

(3) Operation Procedure

The following explains how to determined the occupied bandwidth.

CAUTION

1. If the amplitude of a signal is below 40dB, the calculation error may increase. Adjust the reference level of the signal to have 40dB or higher amplitude.

2. If the resolution bandwidth of the tester is set to approximately 1/200 or less than the frequency span, the measurement error can be minimized.

3. If a signal has excessive noise components (for example, the modulated waves of artificial voice signals), set the trace det. mode to SAMPLE to minimize the error.

Operating Procedure:

① Set the vertical axis scale to 10dB/div on the screen, select the "Normal" sweep mode, and set the frequency span to "Linear" as follows:

Press [REF LEVEL] [X dB/div] [1] [0] [GHz (dB)] ([8/12 div]).

Press [MENU] [SWP MODE], [NORMAL].

Press [FREQ SPAN] [LOG SPAN] (excluded).

② Adjust the center frequency so that the signal waveforms of trace A are displayed at the center of the screen, and specify the measurement frequency span and resolution bandwidth.

Press [A].

Press [CENTER FREQ], and adjust a data.

Press [FREQ SPAN], and adjust a data.

Press [COUPLE], and adjust a data.

Press [RBW].

③ Set the trace det. mode to "SAMPLE" as follows:

Press [MENU] [DETECTOR] [SAMPLE].

(4) Measure the occupied bandwidth by entering the following keys:

Press [SHIFT] [6] [OBW] .

The occupied bandwidth will be displayed at the left upper end of the screen. The marker points to the rate to the total power (indicated in a pair of parentheses).

If this rate is 99.0%, for example, the marker points to the 0.5% position of the total power from the both ends of the screen.

(5) To change the rate to the total power, change the occupied bandwidth displayed in Step (4) as follows:

Example:

If the [SHIFT] [6] [OBW] keys are pressed in succession, the occupied bandwidth is displayed.

Then, press the [8] [0] [GHz] keys in this order to set the rate to 80%.

4.13.2 Adjust Channel Leakage Power Measurement (ADJ)

[Function]

Calculates the integration of the power whose width is specified by the delta marker by using the on-screen measured data that is stored in the trace A memory of the tester. Then, ADJ determines the rate of this power to the total power.

(1) Procedure and explanation

Refer to A.1 (23).

(2) Explanation of Software Menu

Press [SHIFT] [6] [ADJ] .

Calculates the leakage power at the specified point.

Press [SHIFT] [6] [ADJ GRAPH] .

Calculates the leakage power of all points, stores the results in the trace B memory, and displays them on the screen.

(3) Calculation

The tester screen shows 701 points of the data on the frequency axis. If one of these points has the voltage of "Pn", the total power of P on the screen can be determined by the following equation:

$$P\,(W) = \sum_{n=1}^{701} Pn$$

If the integration width specified by the delta marker is "ΔX", the adjacent channel leakage powre at the n-th point from the left end of the screen can be calculated by the following equation:

$$P_{ADJ}\,(dB) = 10\log_{10}\frac{\sum_{n-\Delta X/2}^{n+\Delta X/2} Pn}{P}$$

where:
$n-\Delta X/2 \geqq$ Start frequency
$n+\Delta X/2 \leqq$ Stop frequency

(4) Operation Procedure

The following explains how to determine the adjacent channel leakage power.

CAUTION

1. As the dynamic range of the measured signal depends on the display amplitude of the signal, the reference level must be adjusted so that the signal amplitude reaches the highest scale on the screen.

2. If the resolution bandwidth of the tester is set to approximately 1/200 or less than the frequency span, the measurement error can be minimized.

3. If a signal has excessive noise components (for example, the modulated waves of artificial voice signals), set the trace det. mode to SAMPLE to minimize the error.

Operating Procedure:

1. Set the vertical axis scale to 10dB/div (8th or 12th scale position) on the screen, select the "Normal" sweep mode, and set the frequency span to "Linear" as follows:

   Press [REF LEVEL] [X dB/div] [1] [0] [GHz (dB)] ([8/12 div]) .

   Press [MENU] [SWP MODE] [NORMAL] .

   Press [FREQ SPAN] [LOG SPAN] .
   (excluded)

2. Adjust the center frequency so that the signal waveforms, of trace A are displayed at the center of the screen, and specify the measurement frequency span and resolution bandwidth.

   Press [A] .

   Press [CENTER FREQ] , and adjust a data.

   Press [FREQ SPAN] , and adjust a data.

   Press [COUPLE] , and adjust a data.

   Press [RBW] .

3. Set the trace det. mode to "SAMPLE" as follows:

   Press [MENU] [DETECTOR] [SAMPLE] .

4. Note: The further operation procedure differs between the ADJ and ADJ GRAPH modes.
   Go to (a) in the ADJ mode or (b) in the ADJ GRAPH mode.

(a) ADJ mode

(a-1) Set the normal marker to the leakage power measuring point.

Press [ON] , and adjust a data.

(a-2) Specify the measuring point by using the delta marker and specify the integration width.

Press [△MKR] , and adjust a data.

The point identified by the delta marker (X) is measured, and the difference from the normal marker position (◇) is the integration width (ΔX).
In the actual calculation, the sum of the power of both ends $\pm\Delta X/2$ from the center of delta marker is determined and the rate to the total power.

(a-3) Measure the adjacent channel leakage power

Press [SHIFT] [6] [ADJ].

The adjacent channel leakage power will be displayed at the left upper end of the screen.

(b) ADJ GRAPH Mode

(b-1) Specify the integration width by using the delta marker. (The marker can be set in any position.)

Press [ON] [ΔMKR], and adjust a data.

If the integration width is "ΔX", the value of [start frequency +Δx/2] is multiplied by the value of [stop frequency -ΔX/2] and the leakage power of each point is determined.

(b-2) The leakage power is calculated and the results are stored in trace B memory. Also, the calculation results are displayed on the screen.

Press [SHIFT] [6] [ADJ GRAPH].

When the calculation is complete, trace B is displayed in the dual screen mode. The graphs are displayed with the reference level of 0dB.

(b-3) To read the graphic data of trace B directly by using the marker, set the offset so that the reference level reaches 0dB.

Press [REF LEVEL] [REF OFST], and adjust a data.

Set the normal marker (◇) to the graphic data readout point and read the level value of the marker.

4.13.3 GPIB Remote Programming

The following gives a programming example where the Hewlett-Packard HP200 series computer is used. For the GPIB general information, see Section 7.

(1) GPIB Codes

GPIB code	Function
OBW OBW?	Executes OBW of the softkey menu. Requests OBW for data output.
ADJ ADJ?	Executes ADJ of the softkey menu. Requests ADJ for data output.
ADG	Executes the ADJ GRAPH of the softkey menu.

(2) Programming Examples (on HP200 series computer)

Example 4 - 1 OBW Measurement at Each End of Sweep

```
 10    DIM A$ [25]                          ! Declares the OBW data as
                                              character string variables.
 20    OUTPUT 701;"IP"                      ! Presets the tester.
 30    OUTPUT 701;"CLN"                     ! Turns on the (30MHz) CAL
                                              signal of the tester.
 40    OUTPUT 701;"CF30MZ SP500KZ RE-10DB DTS" ! Adjust the center frequency
                                              and other data.
 50    FOR I=1 TO 30                        ! Repeats measurement 30 times.
 60       OUTPUT 701;"SR"                   ! Sweeps the signals from the
                                              most beginning.
 70       GOSUB Swpend                      ! Waits for the end of sweep.
 80       OUTPUT 701;"OBW?"                 ! Specifies the output data to
                                              OBW.
 90       OUTPUT 701;"OBW"                  ! Starts OBW calculation.
100       ENTER 701;A$                      ! Reads the OBW data.
110       PRINT "I=";I,A$                   ! Displayes the data on the
                                              screen.
120    NEXT I
130    STOP
140    !
150 Swpend:!
160    OUTPUT 701;"S2"                      ! Clears the status byte.
170    S=SPOLL (701)                        ! Performs serial polling.
180    IF BIT(S,2)=1 THEN RETURN            ! Returns control after sweep.
190    GOTO 170
200    !
210    END
```

Example 4 - 2 ADJ Measurement at Each End of Sweep

```
 10    DIM A$ [25]                         ! Declares the ADJ data as
                                             character string vaiables.
 20    OUTPUT 701;"IP"                     ! Presets the tester.
 30    OUTPUT 701;"CLN"                    ! Turns on the (30MHz) CAL
                                             signal of the tester.
 40    OUTPUT 701;"CF30MZ SP200KZ RE-10DB DTS" ! Adjust the center frequency
                                             and other data.
 50    OUTPUT 701;"PS MT 15KZ MT"          ! Determines the ADJ measuring
                                             point that is 15kHz away from
                                             the maximum signal level.
 60    OUTPUT 701;"20KZ"                   ! Sets the delta frequency
                                             (integration width) to 20kHz.
 70    FOR I=1 TO 30                       ! Repeats measurement 30 times.
 80       OUTPUT 701;"SR"                  ! Sweeps the signals from the
                                             most beginning.
 90       GOSUB Swpend                     ! Waits for the end of sweep.
100       OUTPUT 701;"ADJ?"                ! Specifies the output data to
                                             ADJ.
110       OUTPUT 701;"ADJ"                 ! Starts ADJ calculation.
120       ENTER 701;A$                     ! Reads the ADJ data.
130       PRINT "I=";I,A$                  ! Displays the data on the
                                             screen.
140    NEXT I
150    STOP
160    !
170  Swpend:!
180    OUTPUT 701;"S2"                     ! Clears the status byte.
190    S=SPOLL (701)                       ! Performs serial polling.
200    IF BIT(S,2)=1 THEN RETURN           ! Returns control after sweep.
210    GOTO 190
220    !
230    END
```

4.14 Printer Interface

[Function]

The information on the R3261/3361 screen can be output to the printer, using the printer interface.

Printer which can be connected :

Maker	Printer
Hewlett Packard	HP2225AJ

(1) Connection with the Printer

Connect the printer with the R3261/3361, using the GPIB cable between the GPIB connectors.

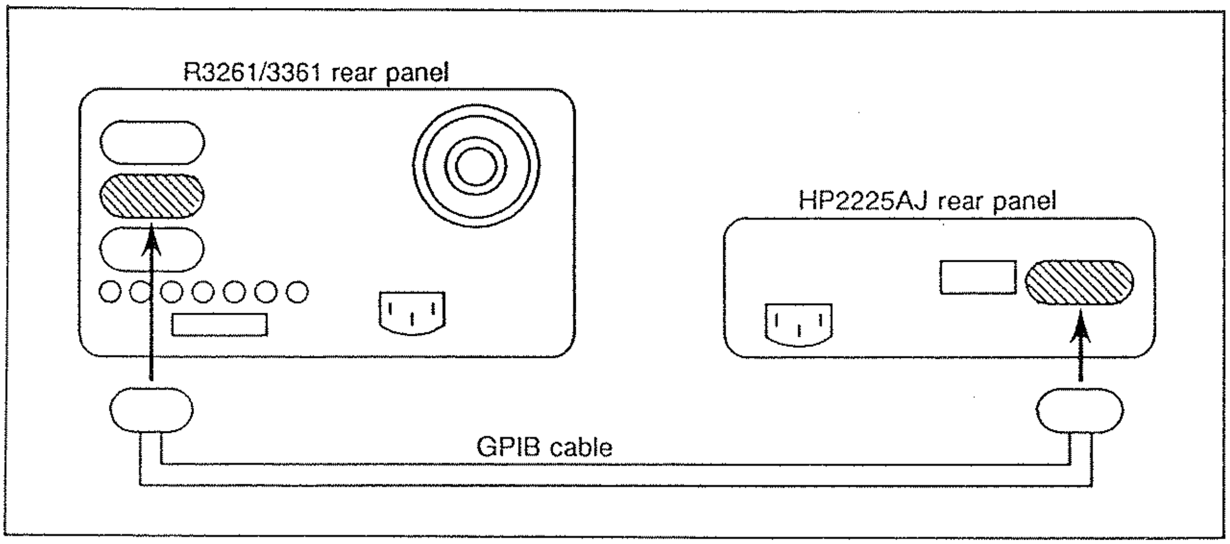


Figure 4 - 9 Connection between the R3261/3361 and the Printer

Example 4 - 3 ADJ Graphics Measurement and Direct Read by Marker

```
 10    OUTPUT 701;"IP"                          ! Presets the tester.
 20    OUTPUT 701;"CLN"                         ! Turns on the (30MHz) CAL
                                                  signal of the tester.
 30    OUTPUT 701;"CF30MZ SP200KZ RE-10DB DTS"  ! Adjust the center frequency
                                                  and other data.
 40    OUTPUT 701;"MT 20KZ"                     ! Sets the delta frequency
                                                  (integration width) to 20kHz.
 50    OUTPUT 701;"SR"                          ! Sweeps the signals from the
                                                  most beginning.
 60    GOSUB Swpend                             ! Waits for the end of sweep.
 70    OUTPUT 701;"ADG"                         ! Starts ADJ GRAPH calculation.
 80    OUTPUT 701;"MK 30.020MZ"                 ! Sets the marker (to determine
                                                  the measuring point) at the
                                                  point 20kHz away from the
                                                  maximum signal level.
 90    OUTPUT 701;"ML?"                         ! Specifies the output data at
                                                  the marker level.
100    ENTER 701;A                              ! Reads the data at the marker
                                                  level.
110    PRINT "ADJ=",A-(-10)                     ! Diaplays the data on the
                                                  screen.  (The value at the
                                                  marker level subtracted by
                                                  the reference level is the
                                                  ADJ value.)
120    GOTO 200
130    !
140  Swpend!
150    OUTPUT 701;"S2"                          ! Clears the status byte.
160    S=SPOLL (701)                            ! Performs serial polling.
170    IF BIT(S,2)=1 THEN RETURN                ! Returns control after sweep.
180    GOTO 160
190    !
200    END
```

(2) Printer Address Setting

Set the printer address with the dip switch. Figure 4-10 shows an example of address setting. (Address 1)

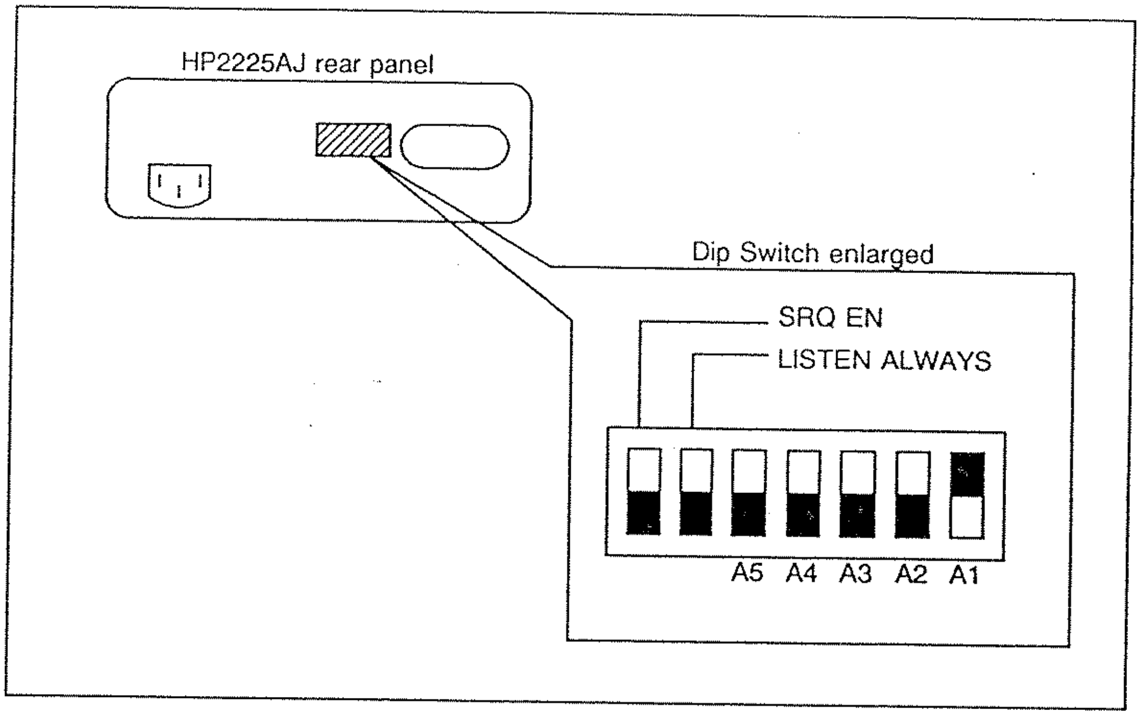


Figure 4 - 10 Dip Switch for Address Setting

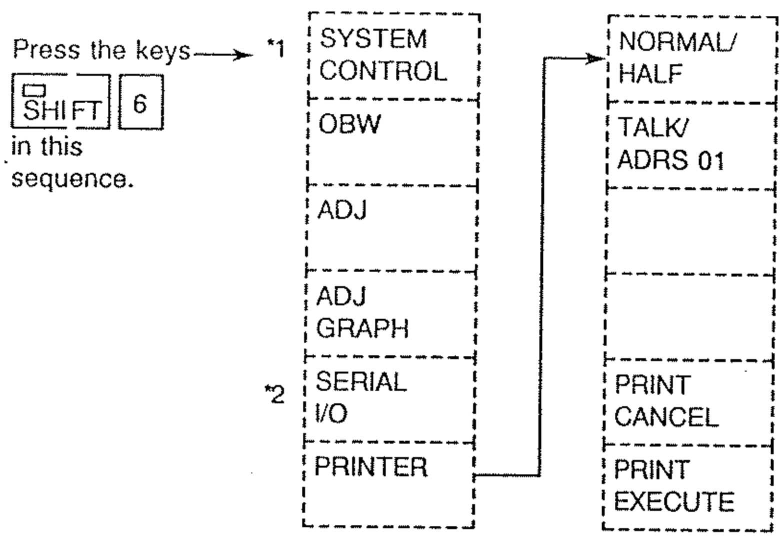
Note 1: For the GPIB details, see section 7.

Note 2: For the printer usage, see the Printer instruction Manual.

(3) Printer Output Setting

① Printer output setting menu

Specify the conditions necessary for printer output.



Explanation on the above menu is given in item (3) ②.

*1 : Indicated if option 81 is mounted.
*2 : Indicated if option 80 is mounted.

② Explanation on the printer output setting menu

Press [SHIFT] [6] [PRINTER] in this sequence.

The screen is set for printer output specification to set various conditions.

[NORMAL/ HALF]	*1 Select the print size. Default : Normal
[PRINT CANCEL]	Cancel the output during printer output.
[PRINT EXECUTE]	Output to the printer starts with the specified size.
[TALK/ ADRS 01]	*2 TALK : All the Listeners are subject to Printer output. ADRS XX: Any of the Listeners (address 0 to 30) are subject to printer output. Specify the listener address with the data knob or the step key. Default: TALK

CAUTION

*1: If the print size is set tot Half, more time is required for output, because the printer is set to HIGH DENSITY mode and the print head travels along the same line twice.

*2: When the print output is set to TALK (TALK ONLY mode), the printer should be set to LISTEN ONLY mode.
When the print output is set to ADRS XX (Address specified mode), the printer should specify the address.

(3) Printer output example

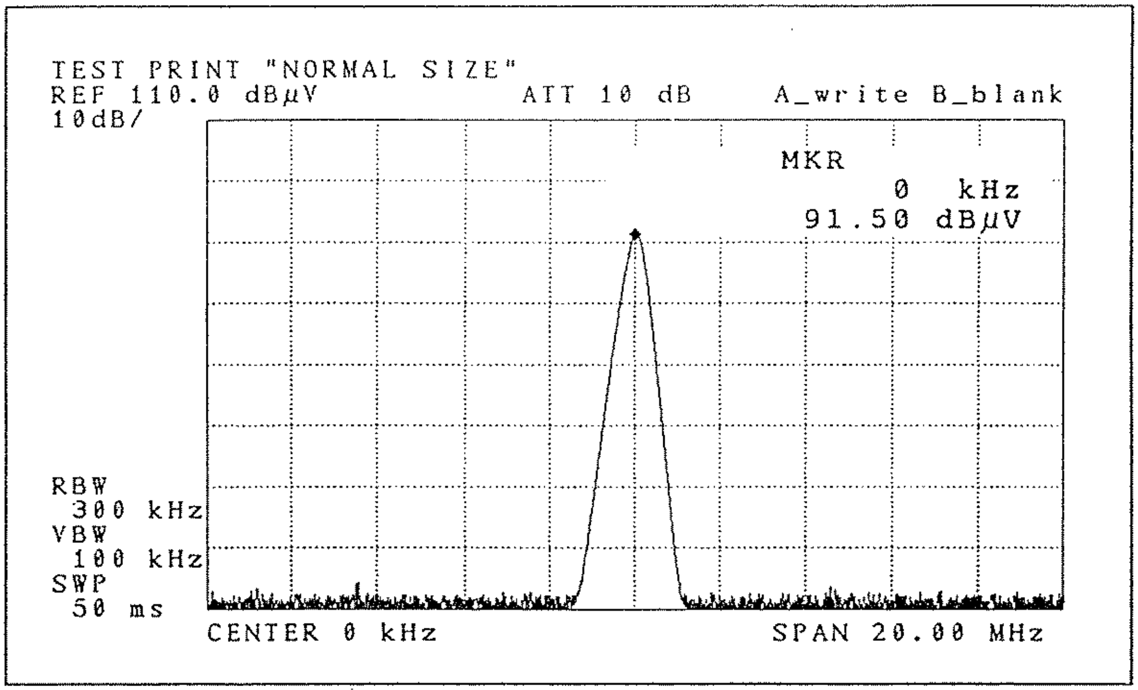


Figure 4 - 11 Print in Normal Size

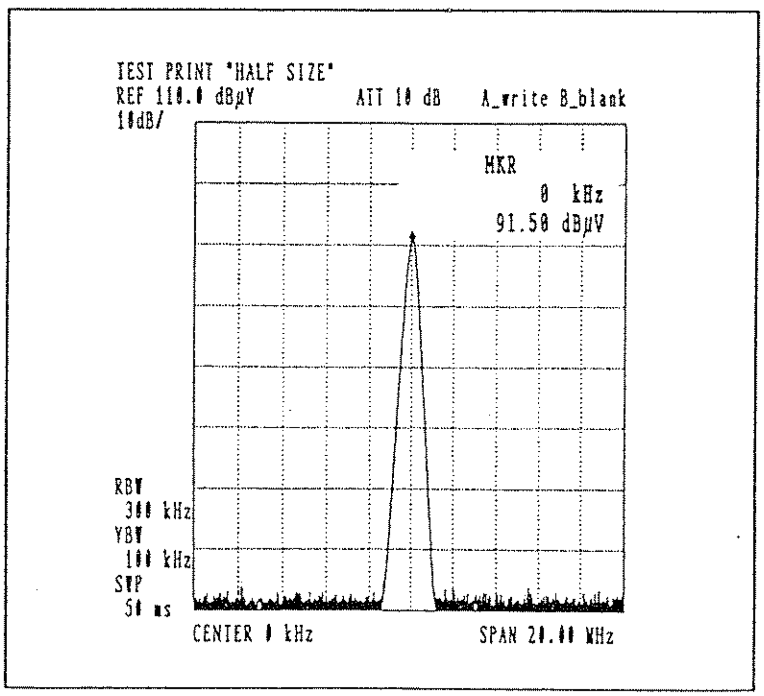


Figure 4 - 12 Print in Half Size

4.15 Option 80

Option 80 consists of two functions: a RS-232 interface and a gated sweep function.

4.15.1 RS-232 Interface

[Function]

A controller such as a personal computer having no GPIB interface can also offer a simple measurement system, using the RS-232 interface. Remote control which is normally carried out, using the GPIB interface, can also be obtained, using the RS-232 interface..

(1) Compatibility with the GPIB remote control codes:
The control codes which can be used by the RS-232 interface are identical to the GPIB codes of the R3261/3361, excluding some of the codes/functions inherent to the GPIB.

(2) Functions which can externally be controlled
The following functions can be controlled with the RS-232 interface:

1	Measurement condition setting:	Conditions entry through panel key operation
2	Set states output:	Set states and data call
3	I/O of measurement data:	Screen trace data write-in and read-out
4	Status output:	Data on the current instrument status can be read output in the same way as the GPIB status byte.

For the details, see an instruction manual attached to Option 80.

4.15.2 Gated Sweep Function

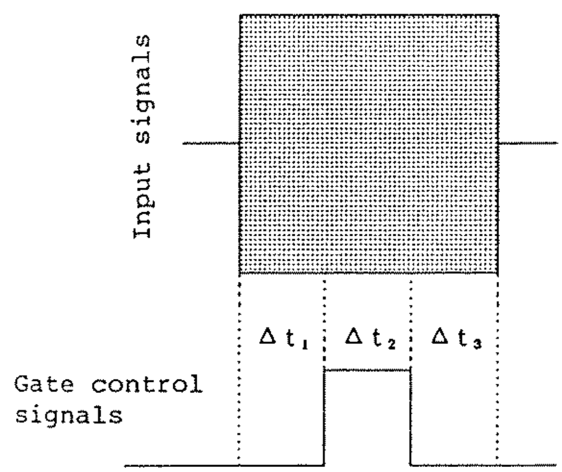
[Function]

When the Gated sweep function is applied, the spectrums of burst signals are analyzed and recorded on magnetic tapes used for VTRs, 8mm videos, and digital audio tapes (DAT).

(1) How to Meaure

Sweep the spectrum at TTL level "Hi" (or opened) by using the BNC connector at the gated sweep control terminal (Gate in terminal), and stop at "LO" level.

Input signals and gate control signals shall be specified as follows:



	RBW				
	1MHz	300kHz	100kHz	30kHz	10kHz
t_1	10µs or more	15µs or more	20µs or more	50µs or more	180µs or more
t_2	15µs or more				
t_3	1µs or more				

Note: Video BW 300kHz or more

Select "SAMPLE" mode for noise measurement.

4.16 Option 81

Option 81 consists of two functions: an internal controller function and a gated sweep function.

4.16.1 Internal controller

[Function]

An internal controller function of Option 81 has a serial I/O (RS-232) and a parallel I/O.
For the details of the controller function, see an instruction manual attached to R3261/3361 Option 81.

CAUTION

To prevent malfunction due to electromagnetic interference when a serial I/O (RS-232) terminal and a parallel I/O terminal are used, use shielded cables for connecting with an external terminal.
Do not bundle connection cables with AC lines.

(1) RS-232 Port Setting

Set the RS-232 port when the external terminal is connected to the unit.

① Procedure and explanation

Refer to A.1 (7).

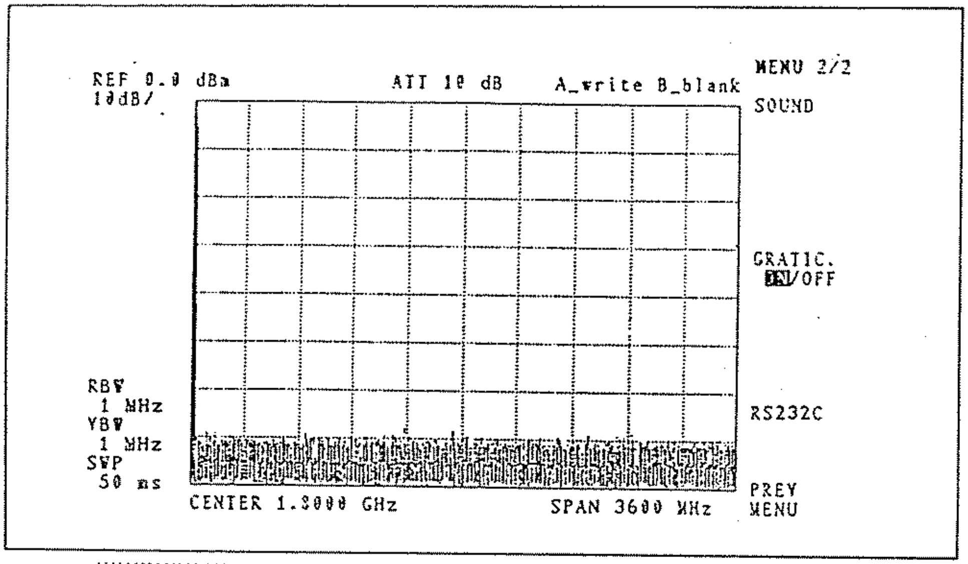
② RS-232 Port setting

Set the RS-232 port effectively using the window screen.

[Procedure and explanation]

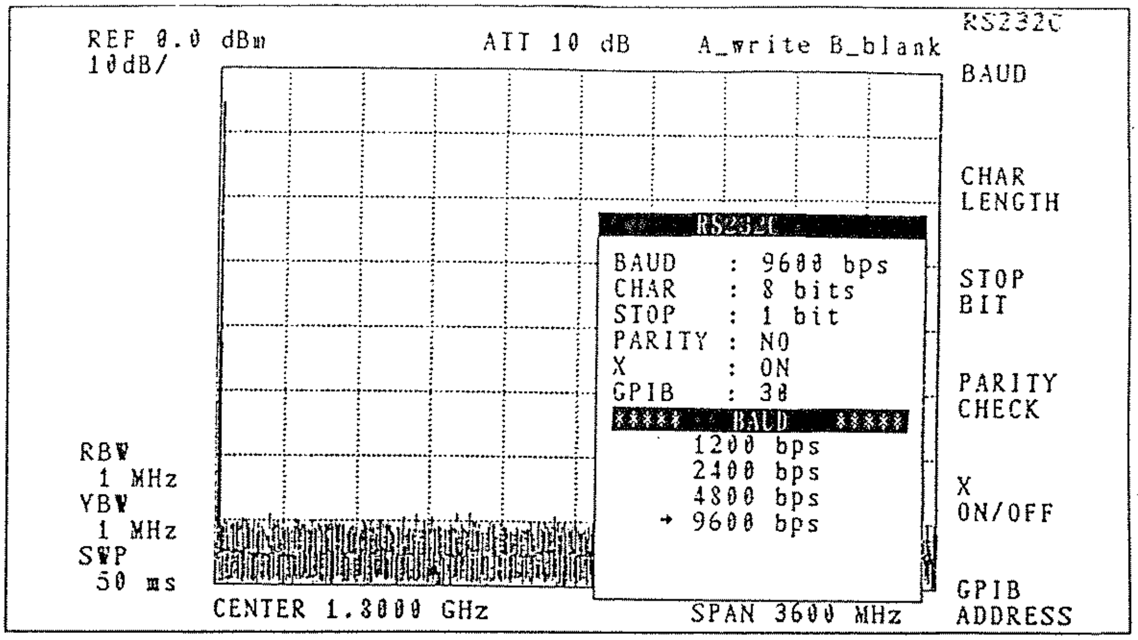
Press MENU NEXT MENU .

The following screen is displayed.



Press RS-232C .

The following operating window screen is displayed (See next page), then set the conditions.



BAUD

Specify the transfer rate (baud rate). The transferable rates are as follows:
(1) 1200bps
(2) 2400bps
(3) 4800bps
(4) 9600bps ⇦ Initial value

CHAR LENGTH

Specify the data length. The data lengths selective are as follows:
(1) 5bits
(2) 6bits
(3) 7bits
(4) 8bits ⇦ Initial value

STOP BIT

Specify the stop bit. The stop bits selective are as follows:
(1) Not approved
(2) 1bit ⇦ Initial value
(3) 1.5bits
(4) 2bits

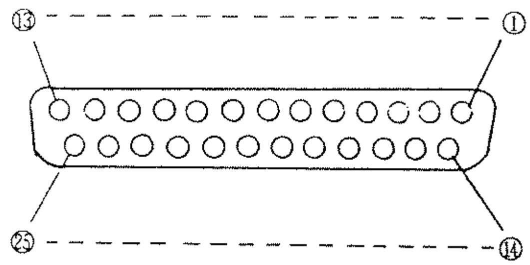
PARITY CHECK	Specify the parity bit. The parity bits selective are as follows: (1) No parity ⇦ Initial value (2) Odd number parity (3) Even number parity
X ON/OFF	Specify the data flow control. The conditions selective are as follows: (1) OFF (ignored) (2) ON
GPIB ADDRESS	Set the controller GPIB address.

(2) Arrangement of Pin Connector

① Arrangement of SIO 25 pin D-sub connector terminal

Table 4 - 4 Arrangement of SIO 25-pin D-sub connector terminal

Terminal name	Signal name		Signal direction
1	GND		○→
2	TxD	Transferring data	○←
3	RxD	Receiving data	○→
4	RTS	Request for transfer	
5	CTS	Enable transfer	○←
6	DSR	Data set ready	
7	GND		
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20	DTR	Data terminal ready	
21			
22			
23			
24			
25			

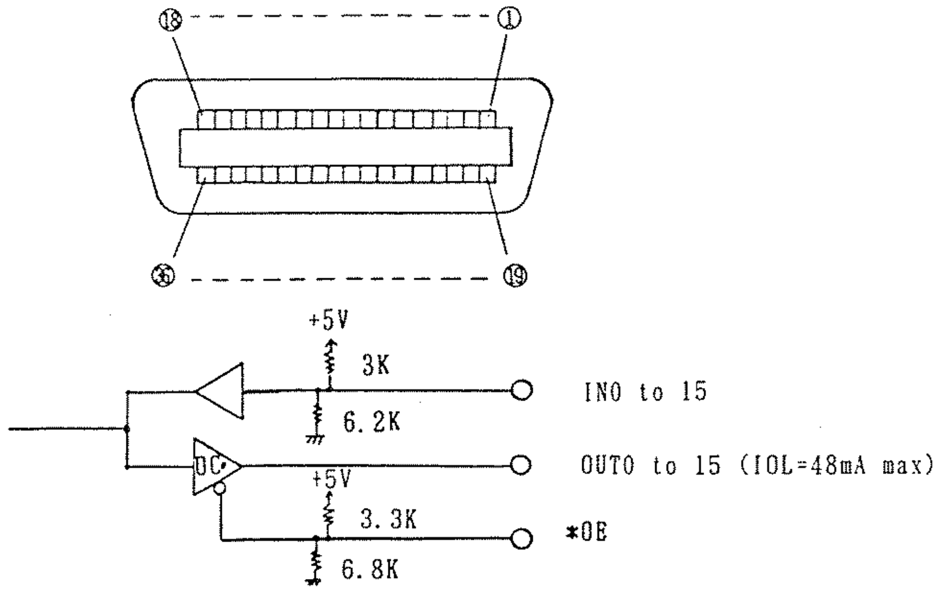


② Arrangement of PIO 36-pin connector terminal

Table 4 - 5 Arrangement of PIO 36-pin connector terminal

Terminal name	Signal name	Terminal name	Signal name
1	GND	19	*OE
2	IN0	20	OUT0
3	IN1	21	OUT1
4	IN2	22	OUT2
5	IN3	23	OUT3
6	IN4	24	OUT4
7	IN5	25	OUT5
8	IN6	26	OUT6
9	IN7	27	OUT7
10	IN8	28	OUT8
11	IN9	29	OUT9
12	IN10	30	OUT10
13	IN11	31	OUT11
14	IN12	32	OUT12
15	IN13	33	OUT13
16	IN14	34	OUT14
17	IN15	35	OUT15
18		36	

IN0 to IN15 : Input (TTL)
OUT0 to OUT15: Output (TTL open corrector output and external pull-up resistor are required)
*OE : Input output enable negative logic


18
1
36
19
+5V
3K
IN0 to 15
6.2K
OC
OUT0 to 15 (IOL=48mA max)
+5V
3.3K
*OE
6.8K

4.16.2 Gated Sweep Function

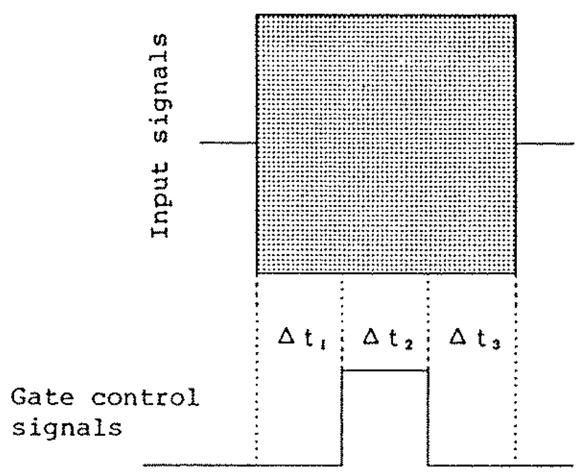
[Function]

When the Gated sweep function is applied, the spectrums of burst signals are analyzed and recorded on magnetic tapes used for VTRs, 8mm videos, and digital audio tapes (DAT).

(1) How to Meaure

Sweep the spectrum at TTL level "Hi" (or opened) by using the BNC connector at the gated sweep control terminal (Gate in terminal), and stop at "LO" level.

Input signals and gate control signals shall be specified as follows:



	RBW				
	1MHz	300kHz	100kHz	30kHz	10kHz
Δt_1	10µs or more	15µs or more	20µs or more	50µs or more	180µs or more
Δt_2	15µs or more				
Δt_3	1µs or more				

Note: Video BW 300kHz or more

Select "SAMPLE" mode for noise measurement.

5. TRACKING GENERATOR FUNCTION

5.1 How to Use Tracking Generator

Operating procedure:

① Turn the tracking generator on and set the output level.

Press [TG] [LEVEL] and set the output level using the ten keys, step key and data knob. (It can be set in 1 dB step.)

② Set the center frequency, frequency span and reference level.

Press [CENTER FREQ] and adjust using the ten key, step key or data knob.

Press [FREQ SPAN] and adjust using the ten key, step key or data knob.

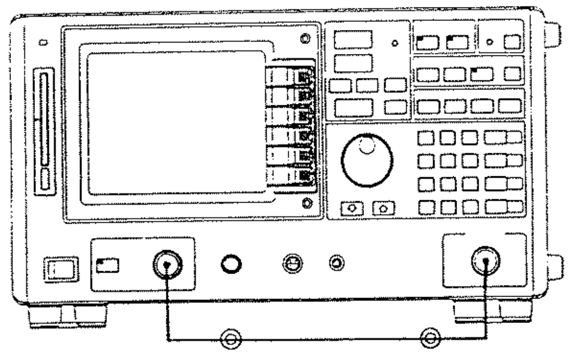
Press [REF LEVEL] and adjust either the ten key, step key or data knob.

CAUTION

If the tracking generator is used under the resolution bandwidth of 300Hz or less, the tracking error (a level error caused by a deviation between the output frequency of the tracking generator and the tuned frequency of the spectrum analyzer) may be occurred. Therefore, press [FREQ CAL AUTO] to make a tracking error minimum if the tracking generator is used under the resolution bandwidth of 300Hz or less. If the resolution bandwidth is 30Hz or 100Hz, the signal frequency is calibrated again approximately every 3 minutes. Therefore, the operation temporarily stop.

The signal frequency can be calibrated by pressing [FREQ CAL MANUAL] and by using the ten key, step key, or data knob.

③ Connect the TG OUTPUT connector with the INPUT connector with a cable. The frequency characteristics of the through current should appear on the display.



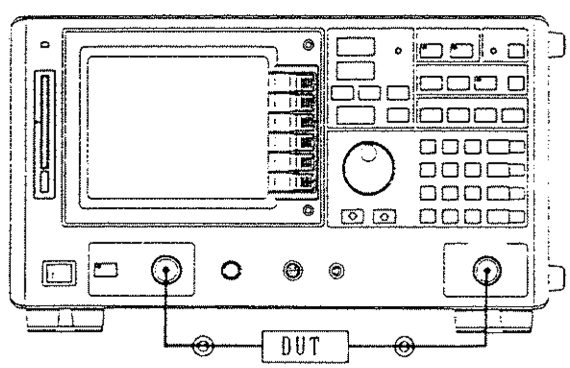
Through condition

④ Correct the error by the method described in Section 5.2 if the error due to the frequency characteristics of the output is large.

⑤ Connect the device to be measured (DUT).

CAUTION

If the input impedance and output impedance of the DUT are not 50Ω(R3261C/D, R3361C/D), 75Ω(R3261CN, R3361CN), match the impedances at the input and output side of the DUT.



⑥ Start measurement.

See Section 5.3.

5.2 How to Correct Frequency Characteristics Using Display Line

This section describes how to correct the cable's frequency characteristics when the frequency characteristics of the spectrum analyzer itself are corrected and the frequency characteristics of the filter utilizing the trace and display line are measured.

CAUTION

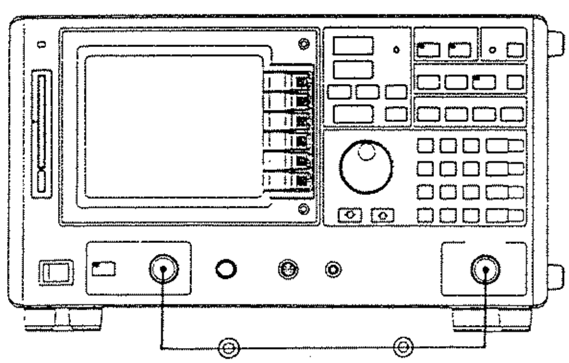
It the function data that changes the standard of normalization, such as center frequency, frequency span and reference level, is changed during operation of normalization, the proper normalization often cannot be made subsequently. Therefore, if the function data is changed, repeat the normalization sequence from the beginning.

Operating procedure:

1. Set trace A mode (or B mode).

   Press [A] (or).

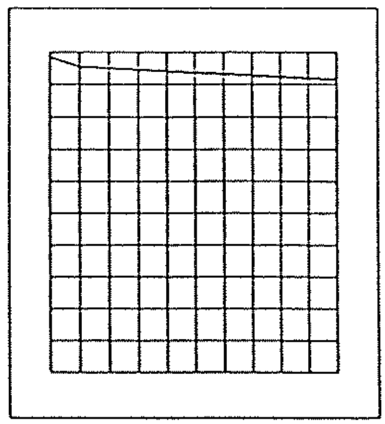
2. Connect the TG OUTPUT connector directly with the INPUT connector by a cable.



Through condition

(3) Change the reference level and lower the frequency characteristics of through current to the location where the waveform does not extend beyond the grid on the upper portion of the display.

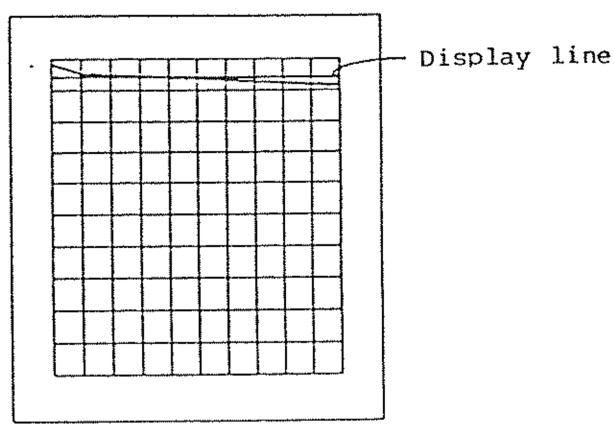
Press [REF LEVEL] and adjust, using either the step key or the data knob.



(Waveform Image)

(4) Have the display line appear on the screen and adjust so that the display line comes close to the waveform of the through current. The closer the display line is to the waveform of the through current, the wider the dynamic range can be gained when measuring.

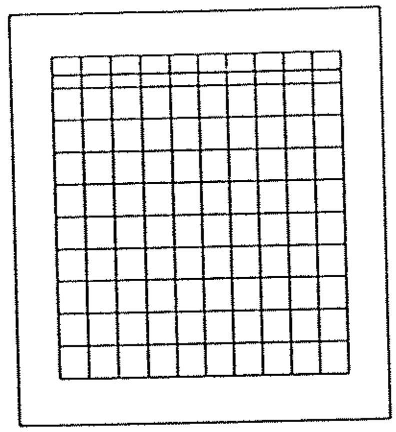
Press [A] (or [B]) [NORM A] (or [NORM B]) [DISP LINE ON/OFF], and adjust using either the step key or the data knob.



(Waveform Image)

(5) Correct the frequency characteristics.

Press [CORRECT SAVE] [NORM A ON/OFF] .



(Waveform Image)

(6) To release the correction mode, press [NORM A ON/OFF] .

5.3 Examples of Measurements

This section presents examples of methods of measuring the insertion loss of the crystal filter, ripple, normal bandwidth and the amount of attenuation using the tracking generator. Read Sections 5.1 and 5.2 if you have not done so already.

(1) Preliminary condition

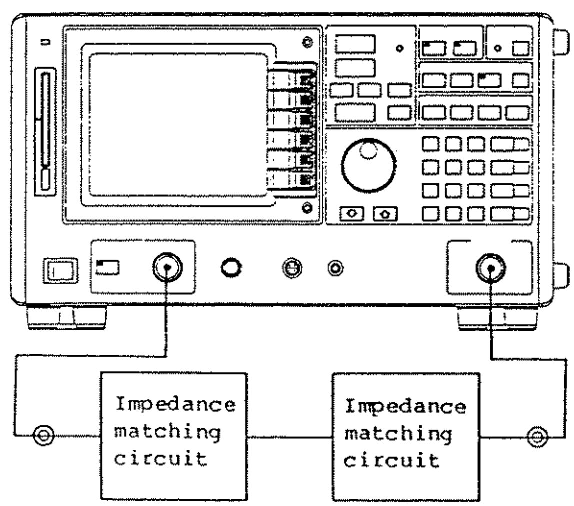
Condition of filter:	Center Frequency	:	10.7MHz
	Normal bandwidth (3dB)	:	15kHz
	Insertion loss (constant loss)	:	Less than 5dB
	Ripple	:	Less than ±1dB
	Attenuation	:	More than 60dB
Input impedance		:	50Ω

Measurement should be done in the above condition.

(2) Start of measurement

Operating procedure:

1. Connect the TG OUTPUT connector directly with the INPUT connector.



2. Turn the tracking generator "ON".

   Press [TG]. (The LED lamp on the key will light.)

3. Set the output level at -5dBm.

   Press [LEVEL] [5] [MHz].

4. Adjust the waveform peak value at the upper part of the display.

   Press [REF LEVEL] and adjust using the step key or the data knob.

(5) Lower the noise of the spectrum analyzer to a level where the measurement of the attenuation can be made adequately.

Press [RES BW] and adjust using the step key.

Press [VIDEO BW] and adjust using the step key.

(6) Set the frequency span at 50kHz, the center frequency at 10.7MHz and the vertical axis scale at 2dB/DIV.

Press [FREQ SPAN] [5] [0] [kHz].

Press [CENTER FREQ] [1] [0] [.] [7] [MHz].

Press [REF LEVEL] [xdB/DIV] [2] [GHz].

(7) Have the display line on the screen and match the display line to the reference level line.

Press [A] (or [B]) [NORMALIZE] [DISP LINE ON] and adjust using the step key or the data knob.

(8) If the normalize mode is set, the waveform of through current is normalized and matched to the reference level line.

This level is used as a reference for measuring the insertion loss.

Press [CORRECT SAVE] [NORM A ON/OFF]. (or [NORM B ON/OFF]).

CAUTION

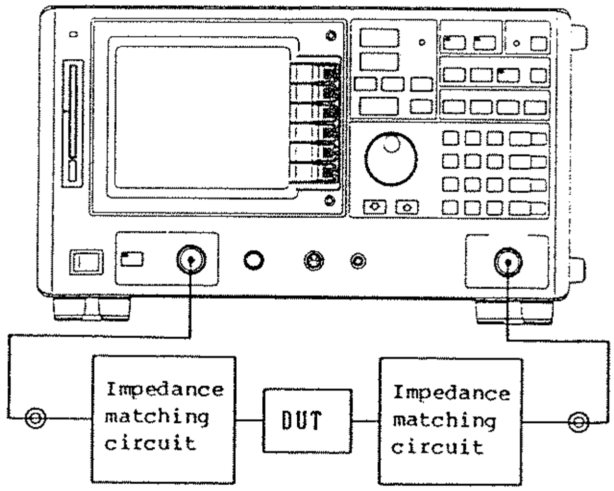
> If the function data regarding normalization is changed, such as center frequency, frequency span, and reference level, is changed during normalizing operation, the proper normalization often cannot be made subsequently. Therefore, if the function data is changed, repeat the normalization sequence from the beginning.

(9) Connect DUT and set the sweep time so that the waveform will not vary.

See Section 5.4.2.

CAUTION

> If the insertion loss of the filter is too great, sufficient dynamic range often cannot be obtained. When this happens, use the preamp for the input.



(10) Start each measurement.

Shown below are four examples of measurements.

a) Measurement of insertion loss (constant loss)
b) Measurement of pass bandwidth (3dB)
c) Measurement of ripple
d) Measurement of attenuation

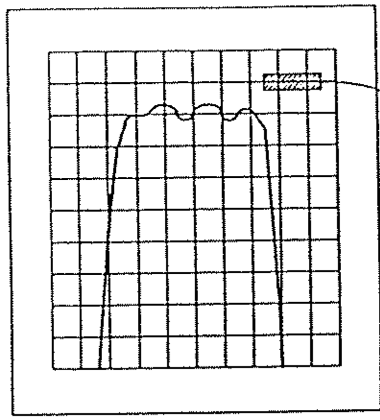
a) Measurement of insertion loss (constant loss)

Operating procedure:

(1) With the display line on the display, adjust the marker point to 10.7MHz.

Press [ON] [1] [0] [·] [7] [MHz].

(2) The difference of the level between the display line and the marker point is shown on the screen, and the insertion loss (constant loss) can be directly read.



Wave-form image

b) Measurement of pass bandwidth (3dB)

Operating procedure:

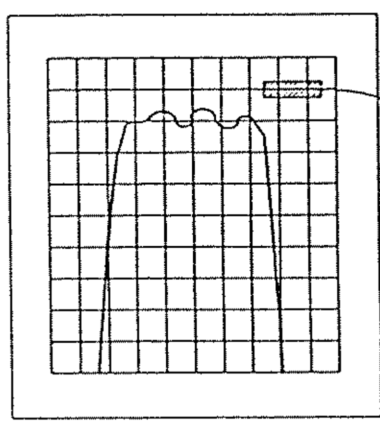
1. When measuring the insertion loss, set the xdB DOWN mode.

   Press NEXT NENU X dB DOWN.

2. Input the attenuation level.

   Press 3 GHz.

3. On the waveform, two marker frequencies are shown at points 3dB below and to the left and right of the marker point (10.7MHz), and 3dB of pass band can be read directly.



(Waveform Image)

c) Measurement of ripple

Operating procedure:

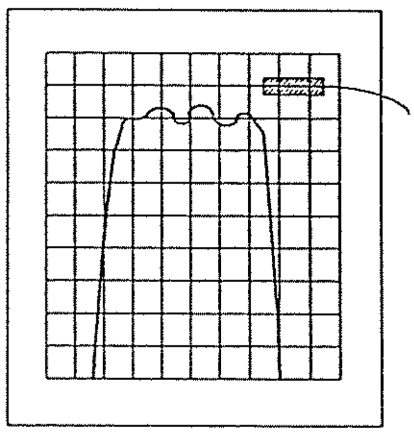
1) Move the marker point to the lowest loss point.

Press [PEAK].

2) Move the marker point to the lowest level of the ripple.

Press [Δ MKR]· and adjust using the data knob.

3) The level difference between the two marker points will appear on the screen, and this will become the ripple.



(Waveform Image)

d) Measurement of attenuation

Operating procedure:

1) Release the normalize mode.

Press [A] (or [B]·) [NORMALIZE] [DISP LINE ON] -- and adjust using either the step key or the data knob.

2) Set the vertical axis on the screen at 10dB/DIV.

Press [REF LEVEL] [XdB/DIV] [1] [0] [GHz] .

3) Set the optimum frequency span.

4) If the attenuation from the lowest loss is measured, press [PEAK] .

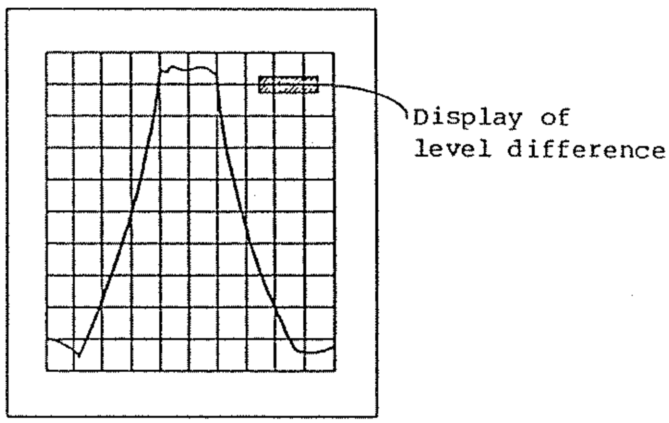
If the attenuation from the nominal frequency is measured,

press ---------------------------------.

(5) Move the marker point to the point where the measurement is required.

Press DELTA MKR and adjust using the data knob.

(6) The level difference between the two markers is shown on the screen, this is the attenuation.



(Waveform Image)

5.4 Notes on Handling

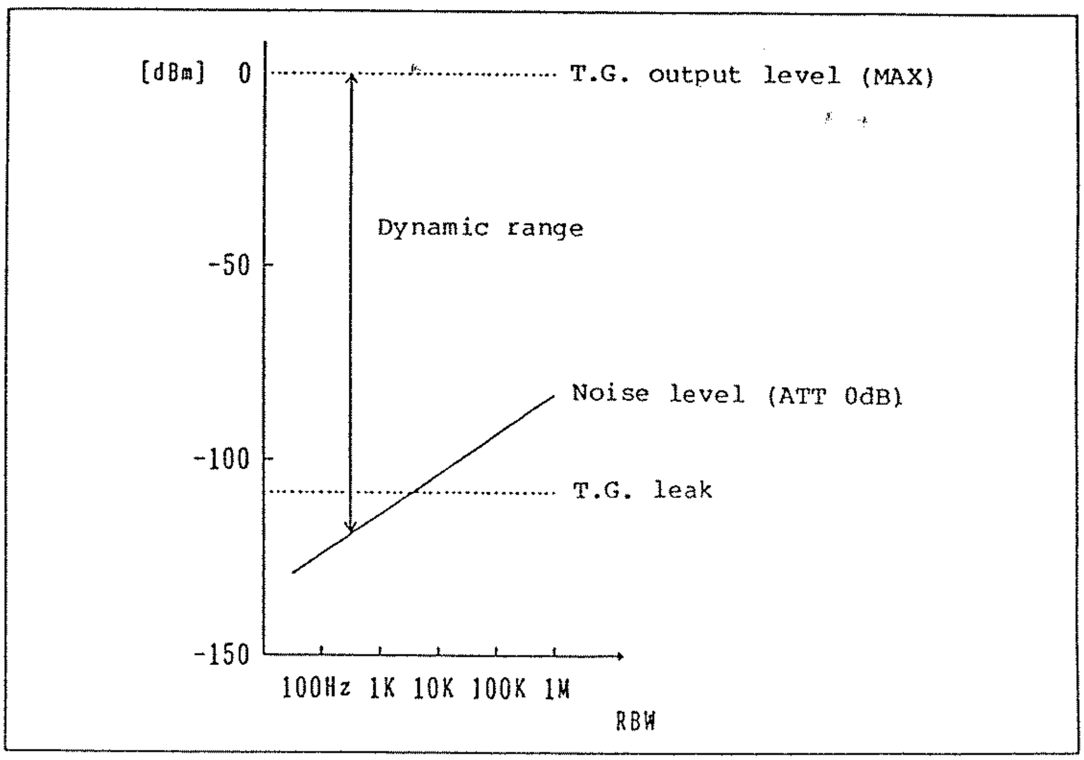
5.4.1 Dynamic Range

The measured dynamic range is restricted by the maximum output level of this device and white noise level of the analyzer. To widen the dyanamic range, it is necessary to narrow the resolution bandwidth (RBM) of the analyzer and to lower the noise level. (See the figure below.)

Because of the tracking signal into the analyzer (T.G. leak), the required noise level cannot be obtained from time to time even if the analyzer is set to the resolution bandwidth.

Since the T.G. leak is less than -110dBm, the measurement can be made using a filter having about 110dB of attenuation in the stop bank.

To prevent the T.G. leakage in the measurement system, the device under test (DUT) should be connected by using the well shielded cables.



CAUTION

1. The larger the insertion loss (including the loss of matching circuit) of DUT, the smaller the dynamic range measured. To avoid this, if the pre-amp is used for output, the measurement that does not impair the dynamic range measured can be made.

2. The selection of the output is determined depending on the DUT. At this time, the characteristics of the pre-amp must be identified also. When the output level of the tracking generator (such as amplification degree, frequency response, noise figure, maximum input, VSWR and input impedance) is too large, change the setting before using.
(A maximum attenuation of -50dBm can be achieved. (for R3361C/D))
(A maximum attenuation of +55dBμ can be achieved. (for R3361CN))

5.4.2 Time Response

Time response is shown on the CRT display and indicates if the level is correct. Sometimes the UNCAL message appears, but this has no effect on the operation when the frequency characteristics are measured using the analyzer.

This message indicates if the IF filter responds correctly to the time, and indicates the level correctly by the set combination of FREQ SPAN, SWP and RBW of the analyzer proper.

If the signal level change supplied from the output terminal of the measured device to the spectrum analyzer is small, if the UNCAL display appears, it is often correct.

When there are sharp fluctuations in the signal level supplied from the output terminal of the device to be measured to the spectrum analyzer, pay attention to the time response of the device to be measured, because the IF filter of the analyzer stops to respond.

When inspecting this time response, both the IF filter and the device to be measured respond sufficiently even if SWP is shifted, as long as the characteristics displayed on the screen remain unchanged. If the characteristics vary by shifting the SWEEP/DIV, delay the SWP or narrow the SPAN (sweep width of frequency) until the characteristics displayed on the screen stop changing.

5.4.3 Precautions on Using Low Output Level

If the output level is low (less than -49dBm or less than 56dBm), the TG frequency characteristic may be drastically varied according to the setting conditions of FREQ SPAN and SWP.
When this occurs, select the lower SWP condition (more than 100ms).

5.4.4 Limit Voltage Value Applying to the TG OUTPUT Connector

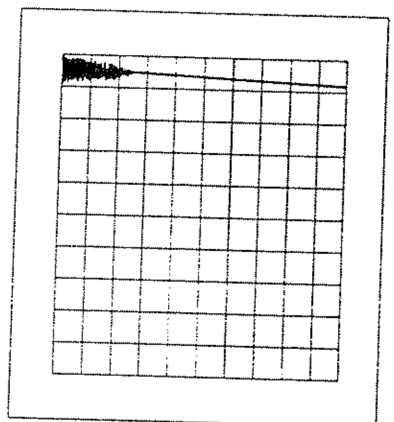
(1) Do not apply the voltage of ±10V or more or the power of +15dBm or more when the output level of the T.G is 0dBm.

When such voltage or power is applied, there is a fear that the output part may be damaged.

(2) To protect the output part against any damage, the output level of the T.G would be better to set to −10dBm or less. In this case, each limit value of the voltage and the power to be applied becomes ±29V and +24dBm.

5.4.5 Measurement of low frequency area.

The beet waveform will occur in the vicinity of local field through (ZERO waveform) when the low frequency area is measured.



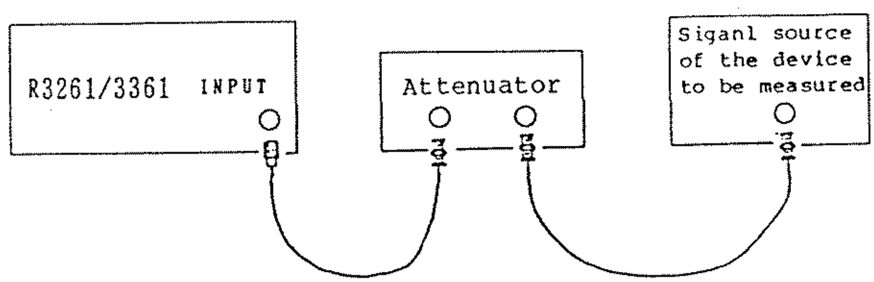
(Waveform Image)

Narrowly set RBW at this time.

6. EXAMPLES OF MEASUREMENTS

NOTE

The measurement examples are based on the initial settings of the analyzer. Input the signal to be measured through a device such as an attenuator when necessary so that the signal is low enough below the maximum allowable input of the analyzer.



6.1 Example of Measuring the Deviation:
Example of Deviation Analysis of the 200MHz Band Transmitter

Operating procedure:

1. Connect the transmitter with the analyzer after attenuating its output through RF coupler or the like. Since the maximum input level of the analyzer is +25dB when the attenuator is more than 10dB, select the coupler's value so that the RF coupler's output becomes less than +25dBm.

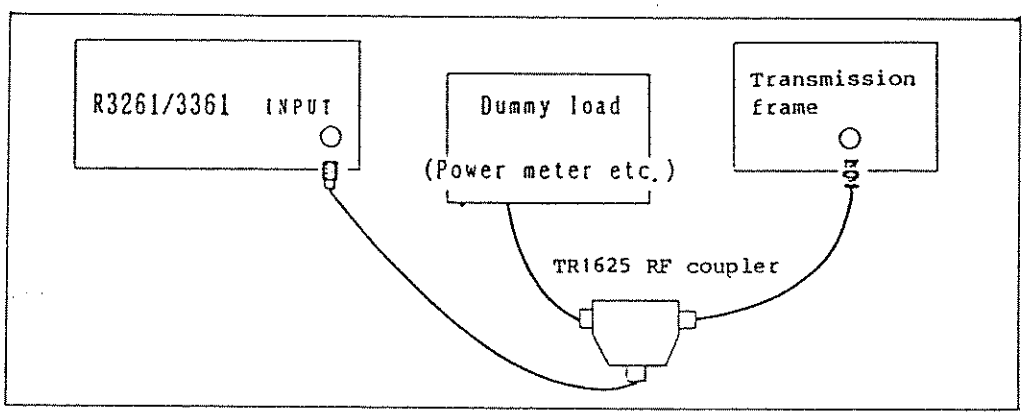


Figure 6 - 1 Measuring the Deviation of the Signal

2. Display the fundamental wave so that it can be observed well and adjust the peak to the reference level.

   Press [CENTER FREQ] [2] [0] [0] [MHz] .

   Press [FREQ SPAN] [2] [0] [0] [MHz] .

   Press [PEAK] [MKR →] [MKR → REF] .

3. Store the fundamental wave into the memory and display two screens including the new WRITE memory.

   Press [A] [VIEW] [B] [WRITE] .

4. Set the step size of the step key at the frequency of the fundamental wave.

   Press [PEAK] [MKR →] [MKR → CF STEP] .

5. Observation of secondary high frequency wave

   Press [CENTER FREQ] [⇧] [B] [VIEW B] .

(6) Display the marker at the peak of the secondary high frequency. The Marker's level display indicates the absolute level of the secondary high frequency wave.

Press [PEAK].

(7) Similarly, observe the tertiary high frequency wave.

Press [B] [WRITE] [CENTER FREQ] [⇧] [B] [VIEW] [PEAK].

[MEASUREMENT OF DEVIATION RATE OF HIGH HARMONIC WAVE]

In the low high-frequency area the deviation rate guage is well known for measuring exclusively the deviation of the high harmonic waves. The high harmonic wave and micro wave must be measured similarly. This is often expressed as spurious modulation. In the High band amplifier it is measured as the high harmonic wave's deviation, as in the case for low frequency wave measurement. In general, the degree of deviation of a certain waveform from the pure sinusoidal wave is called the deviation rate and expressed in the equation.

$$\text{Deviation rate K (\%)} = \frac{\text{RSM value of high harmonic wave}}{\text{RSM value of fundamental wave}} \times 100$$

$$= \frac{\sqrt{A_2{}^2 + A_3{}^2 + \ \ldots + A_n{}^2}}{A_1} \times 100$$

A_1: RSM value of fundamental wave component
A_n: RSM value of n-th high harmonic wave component

The high harmonic wave's deviation rate is expressed by the ratio between the signal's high harmonic wave and the fundamental wave's (A_1). In the spectrum analyzer, the fundamental wave (A_1), secondary high harmonic wave (A_2) and the n-th high harmonic wave (A_n) can be directly seen separately. Hence, the measurement of the deviation rate to the secondary high harmonic wave (A_2/A_1) and the deviation rate (A_n/A_1) to the n-th high harmonic wave can be separately measured. Therefore, the measurement to find the degree of deviation from the odd or even number high harmonic wave or can be made based on the more fundamental principal of the deviation rate measurement.

The spectrum analyzer expresses a wider dynamic range, and indication is made in log (dB). As the deviation rate of the n-th high harmonic wave is 20 log (A_n/a_1), if a_n is 40dB, it is found that (A_2/A_1) x 100 (%) is 1%.

Usually decibel indication is made reading the a_2 (20dB).

6.2 Measurement of Modulation Frequency AM Signal and Modulation Index AM Signal

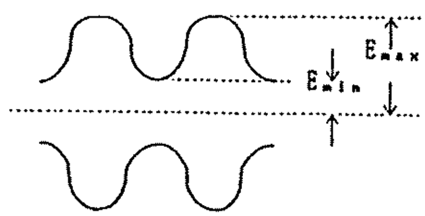
Performance of the spectrum analyzer is superior to that of the time domain oscilloscope for measuring low degrees of modulation as in residual AM or residual FM.

The modulation index "m" of the AM wave is obtained from the equation m = (Emax - Emin)/(Emax + Emin) in the time domain. (See Figure 6 - 2 (a).)

If the same value is calculated using the spectrum analyzer, the measurement can show how many decibels lower the side band is than the carrier wave. (See Figure 6 - 2 (b).)

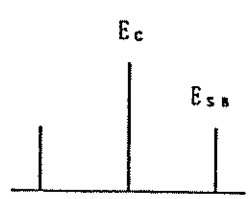
At the same time, the degree of modulation of the modulation wave compared to the high harmonic wave can be obtained. Especially, when the modulation is shallow, the spectrum analyzer can read degrees down to 0.02% while the time domain can read only down to 2%.

The measurement accuracy can be increased if the LINEAR mode is used when the modulation index is more than 10% and if the LOG mode is used when the index is less than 10%.



$$m(\%) = \frac{Emax - Emin}{Emax + Emin} \times 100$$

(a) AM signal seen by the time domain.



$$m(\%) = \frac{2E_{SB}}{EC} \times 100$$

(b) AM signal seen by the frequency domain.

Figure 6 - 2 AM Signal Wave

6.2.1 Example of Measuring when the Modulation Frequency of AM Wave is Low and the Modulation Index is Large

Operating procedure:

1. Display the signal to be measured and adjust its peak to the reference level. In this example the carrier wave is 903MHz.

   Press [CENTER FREQ] [9] [0] [3] [MHz].

   Press [FREQ SPAN] [2] [0] [MHz].

   Press [PEAK] [MKR →] [MKR → REF].

2. Set the resolution bandwidth three times wider than the modulation frequency value.

   Press [COUPLE] [RBW] [⇧].

3. Set the vertical scale as LINEAR.

   Press [REF LEVEL] [LIN].

4. Set in the ZERO SPAN mode.

   Press [FREQ SPAN] [ZERO SPN].

5. Make the trace detection mode SAMPLE.

   Press [MENU] [DETECTER] [SAMPLE].

6. Press [CENTER FREQ] and adjust using the data knob. Adjust so that the signal level is at a maximum.

7. Make the TRIGER mode VIDEO.

   Press [MENU] [TRIGGER] [VIDEO].

8. Set the sweep time to a value that is easy to observe.

   Press [COUPLE] [SWEEP TIME] and adjust using the step key.

9. Measure the intervals between the peaks of the modulation signals, namely frequency of the modulated waves T(S), using the marker. Set the Δ marker to the subsequent peak.

   Press [PEAK] [ON] [DELTA MKR], and adjust using the data knob.

The frequency of the modulation signal can be obtained from the following equation.

$$fm = \frac{1}{T(S)}$$

(10) Align the marker to the maximum value of the waves and read the level Emax.

Press [ON] [NORMAL MKR]

(11) Align the marker to the lowest value of the waves and read the level Emin. Align the marker to the lowest level line of the waves using the data knob.

(12) Assign appropriate values to the following equation and determine modulation index of "m".

$$m\ (\%) = \frac{Emax - Emin}{Emax + Emin} \times 100\ (\%)$$

6.2.2 Measuring Example of AM Wave when the Modulated Frequency is High and the Modulation Index is Small

Operating procedure:

(1) Set the frequency span at less than 10 times the modulated frequency.

Press [FREQ SPAN] and adjust using the step key.

(2) Set the central frequency at the frequency of the carrier waves.

Press [CENTER FREQ] and adjust using the data knob.

(3) Align the marker to the peak of the carrier waves.

Press [PEAK].

(4) Align the Δ marker to the peak of the modulated signal spectrum.

Press [ON] [DELTA MKR] and adjust using the data knob.

(5) From the Δ marker frequency and level display at this time, the modulated frequency fm and modulation index m can be obtained using the equation below.

$fm = \Delta$ marker frequency

$$m = \log^{-1} \frac{E_{SB} - E/_C + 6}{20}$$

Figure 6 - 3 shows the relationship between the value of <E_{SB}-E_C> and m (%).

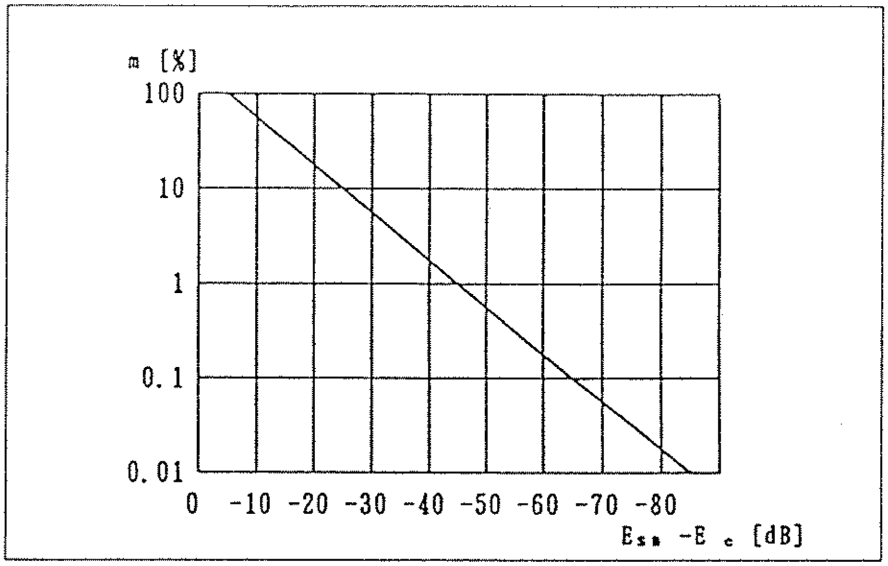


Figure 6 - 3 Relationship between the Value of Side Wave Band Level - Carrier Wave Level (E_{SB} - E_C) and Modulation Index m (%)

6.3 Measurement of FM Wave

Generally, when observing FM waves, frequency of the carrier wave fc, the frequency of modulated wave fm, the deviation of the frequency Δf_{peak}, modulation index m, occupied bandwidth, etc. are measured.

The modulation index m of FM waves is expressed as: $\Delta f_{peak}/f_m$.

By obtaining the relationship when the carrier wave becomes smallest and the modulation indexes are at 2.4, 5.5, 8.6 ....., the modulation index m or the frequency deviation Δf_{peak} can be obtained. (See Figures 6 - 4(a) and 6 - 4(b).)

Sometimes, the modulation cannot be read only through the FM wave spectrum. It can be easily read if the FM of the exterior signal is displayed after converting into the form of fluctuation of the amplitude. In this case the discriminator is additionally needed. However, in the spectrum analyzer, it can be detected utilizing the slope of IF, B.P.F. The detected modulated wave is displayed. (See Figure 6 - 4(c).)

When the modulated frequency is low, set the horizontal axis of the analyzer as ZERO SPAN, operate as a fixed tuning receiver, and set in the time axis. When the modulated frequency is high, measure on the frequency axis and obtain the modulated frequency from the frequency of the side wave band. When the modulation index is small (less than about 0.8), m can be obtained from the relationship between the carrier wave and the first side wave band level.

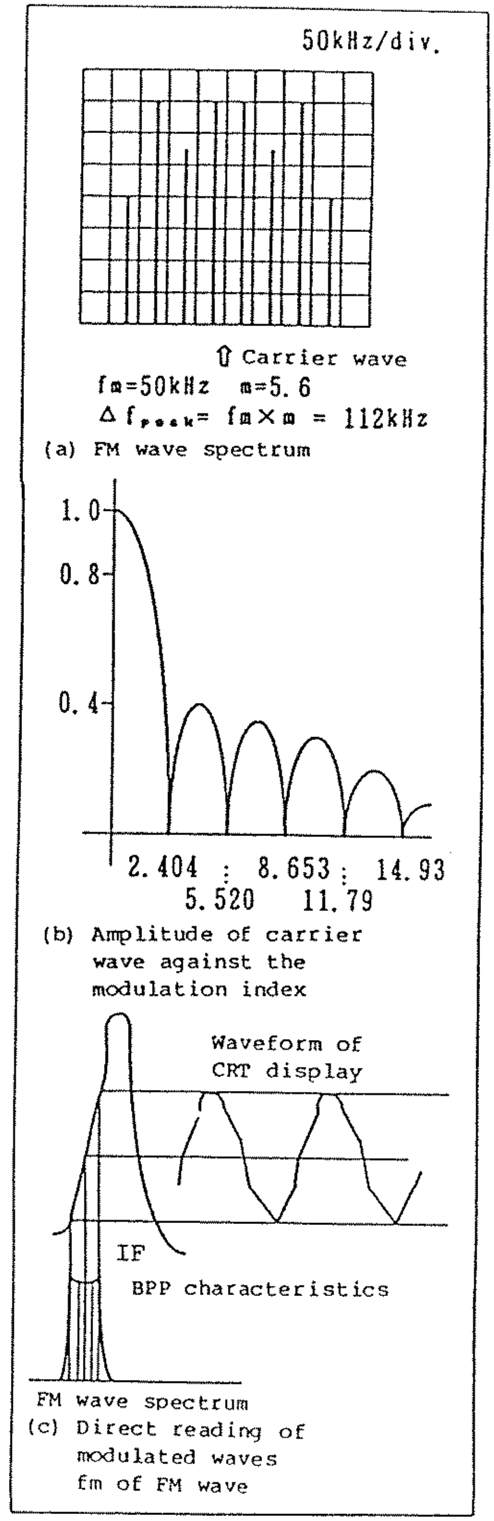


Figure 6 - 4 FM Signal

6.3.1 Example of Measuring FM Wave with Low Modulated Frequency

Operating procedure:

1. Set so that the carrier wave of the signal becomes the center frequency.

   Press [CENTER FREQ] and adjust using either the step key or the data knob.

2. Take the signal's peak as the reference level.

   Press [PEAK] [MKR →] [MKR → REF] .

3. Select the ZERO SPAN mode.

   Press [FREQ SPAN] [ZERO SPAN] .

4. Change the central frequency so that the demodulation wave appears at the center of the screen.

   Press [CENTER FREQ] and adjust using either the step key or the data knob.

5. Make the resolution bandwidth more than three times the modulated frequency so that the demodulation wave can be readily seen.

   Press [COUPLE] [RBW] and adjust using the step key.

6. Set the trigger mode at VIDEO.

   Press [MENU] [TRIGGER] [VIDEO] .

7. Select the sweep time so that the demodulation wave can be readily seen.

   Press [COUPLE] [SWEEP TIME] and adjust using the step key.

8. Set the marker at the peak of the demodulation wave.

   Press [PEAK] .

9. Align the marker to the adjacent peak.

   Press [ON] [DELTA MKR] and adjust using the data knob.

(10) If the time interval of the demodulation wave's peak is taken as T(S) from the Δ marker, fm can be obtained using the equation:

$$fm = \frac{1}{T(S)}.$$

6.3.2 Example of Measuring the FM Wave with a High Modulated Frequency and a Small "m"

Operating procedure:

(1) Set the frequency span at the value lower than ten times the modulated frequency.

Press [FREQ SPAN] and adjust using the step key.

(2) Set the carrier wave at the center frequency.

Press [CENTER FREQ] and adjust using the data knob.

(3) Set the marker at the peak of the carrier wave.

Press [PEAK].

(4) Place the Δ marker at the peak of the adjacent side wave band.

Press [ON] [DELTA MKR] and adjust using the data knob.

Display of the Δ marker's frequency becomes the modulated frequency fm.

6.3.3 Measurement Example of FM Wave Frequency Deviation (Δf peak)

Operating procedure:

(1) Set the resolution bandwidth to the value that includes the main side wave band, or five times greater than the modulated frequency.

Press [COUPLE] [RBW] and adjust using the step key.

(2) Set the center frequency at the carrier wave frequency.

Press [CENTER FREQ] and adjust using the data knob.

(3) Set the frequency span, in accordance with peak deviation, at the value easiest to measure.

Press [FREQ SPAN] and adjust using the step key.

(4) Measure $\Delta f_{peak\ peak}$. Use the equations below to obtain the Δf_{peak} and modulation exponent.

$\Delta f_{peak} = \frac{1}{2} \Delta f_{peak\ peak}$

$m = \frac{\Delta f_{peak}}{fm}$

- When Δf_{peak} is small: See Figure 6 - 5
  In this example, $\Delta f_{peak\ peak}$
  $= (\Delta f \text{ marker frequency})/2$
  $= 2.31\text{kHz}$
  $\Delta f_{peak} = \frac{1}{2} \Delta f_{peak\ peak}$
  $= 1.155\text{kHz}$

- When Δf_{peak} is large: See Figure 6 - 6
  In this example, $\Delta f_{peak\ peak}$
  $= (\Delta f \text{ marker frequency})/2$
  $= 580\text{kHz}$
  $\Delta f_{peak} = \frac{1}{2} \Delta f_{peak\ peak}$
  $= 290\text{kHz}$

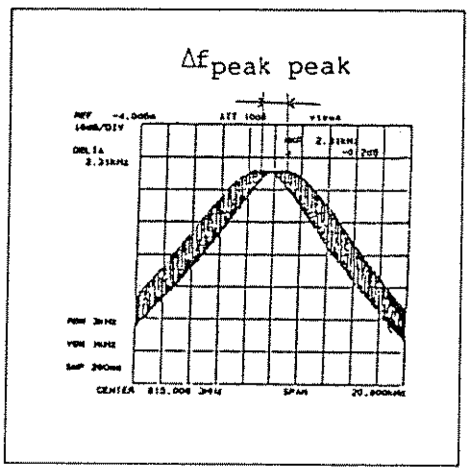


Figure 6 - 5 When Δf_{peak} is small

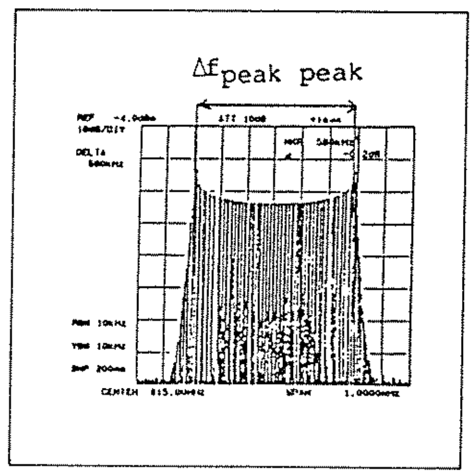


Figure 6 - 6 When Δf_{peak} is large

6.3.4 Obtaining Small FM Modulation Exponent m

When m, the FM modulation exponent of FM waves, is lower than 0.8, using the following equation.

$$m = \frac{2E_{SB}}{E_C}$$

E_{SB}: first side band wave level
E_C : carrier wave level

Operating procedure:

1. Set the center frequency and frequency span where the carrier wave is easiest to measure, then adjust the carrier wave level to the reference level.

   Press [CENTER FREQ] and adjust using the data knob.

   Press [FREQ SPAN] and adjust using the step key.

   Press [REF LEVEL] and adjust using the data knob.

2. Find carrier wave frequency (f_C) in the center frequency display and carrier wave level (E_C) in the reference level frequency. (See Figure 6 - 7.)

3. Place the Δ marker on the first side band wave and find the frequency (f_{SB}) and level (E_{SB}) in the Δ marker display.

   Press [PEAK] [ON] [Δ MKR] and adjust using the data knob.

4. Obtain FM modulation exonent (m) using the equation:

$$m = 2 \times \frac{E_{SB}}{E_C} = \log^{-1} \frac{E_{SB} - E_C + 6}{20}$$

5. Obtain modulation frequency (f_m) using the equation:

$$f_m = |f_{SB} - f_C|$$

6. Obtain frequency deviation (Δf_{peak}) using the equation:

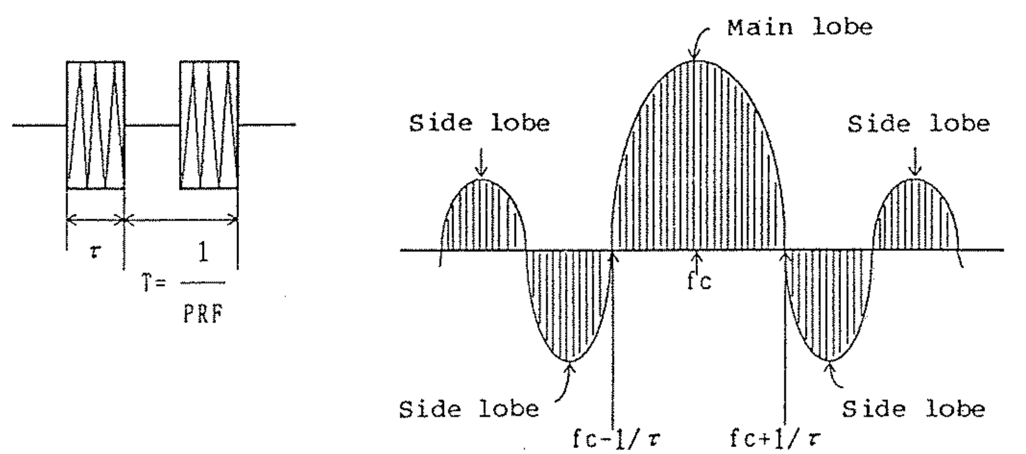
$$\Delta f_{peak} = m \times f_m$$

6.4 Measurement of Pulse Modulation Wave

The spectrum analyzer equivalently analyzes waveforms and displays high frequency basic waves. Spectrum distribution (See Figure 6 - 7(b).) with its envelope centered around the carrier wave frequency can be obtained by converting the time axis waveform of pulse modulation wave to frequency axis as illustrated in Figure 6 - 7(a).

The following can be easily obtained if such pulse modulation waves as rader are measured through the spectrum analyzer.

- Pulse repetition frequency (PRF)
- Pulse width (τ)*
- Carrier frequency (fc)**
- Peak power (P peak)
- Average power (Pave)



(a) Time axis display (b) Frequency axis display

Figure 6 - 7 Pulse Modulation Wave

CAUTION

1. The maximum input level of the main unit is +25dBm, +50VDC, with the input attenuator set at 10dB or higher. Radar and other pulse modulation waves having a very high peak power must be attenuated through a coupler before inputting to the main unit connector.

2. The input level of the main unit mixer is -10dBm. The input attenuator must be set at $P_{peak} \leq$ -10dBm. To prevent mixer saturation, find the lowest possible attenuator value, where the signal level does not decline, by starting with 50dB and lowering in 10dB steps.

(1) Pulse Width (τ)

Pulse width (τ) is obtained from the reciprocal of half the lobe width or the reciprocal of the side lobe width. In order to get the envelope having sufficient resolution, set the resolution bandwidth in the following range.

Pulse repetition frequency (PRF) x 1.7 $\leq$ resolution bandwidth $\leq 0.1/\tau$

(2) Carrier Frequency (τ)

Measurement accuracy of the carrier frequency (fc) is determined by the pulse width (τ). A small r broadens the main lobe and makes recognition of the center difficult. So set the SPAN/DIV broader than 1/r to easily recognize the center. The measurement frequency accuracy will be the center frequency accuracy of the specified SPAN/DIV.

(3) Peak Power (P_{peak})

Only when the spectrum analyzer bandwidth satisfies the following condition, amplitude display becomes proportional to resolution bandwidth.

Pulse Repetition Frequency (PRF) x 1.7 $\leq$ resolution bandwidth $\leq 0.2/\tau$

When the amplitude display is proportional to the resolution bandwidth, the relationship between the peak power (P_{peak}) (dBm) and the amplitude display (P'_{peak}) (dBm) is shown in the following equations.

$P_{peak} = P'_{peak} + \alpha$ (dB)
α(dB) = 20 log (r x 1.5 x RBW) α : pulse attenuation factor

(4) Average Power (Pave) (dBm)

Pave (dBm) is obtained using the following equation.

Pave = P_{peak} x PRF x τ PRF: pulse repetition frequency (Hz)
τ : pulse width (s)

6.5 Noise Level Measurement

6.5.1 Measurement Example of Noise Level Absolute Value (dBm/Hz, dBμV/$\sqrt{Hz}$)

When measuring the noise by regulating in the noise power 1Hz bandwidth, first average the noise using the video bandwidth or the averaging function, then measure the noise level, and obtain the noise level absolute value with the following equation.

$$N \text{ dBm/Hz} = P + 10\log\left(\frac{1}{RBW \times 1.2}\right) + Kn$$

N : 1Hz bandwidth conversion noise level
P : Measured noise level
RBW: Resolution bandwidth (Hz) set in the main unit
Kn : Value adjusted in log mode (dB) = 2.5dB

These calculations can be internally carried out in the main unit.

Operating procedure:

(1) Place the marker on the noise signal (145MHz) to be measured.

Press [ON] [1] [4] [5] [MHz] .

(2) Set the video bandwidth (VID BW) to 1/30 the specified resolution bandwidth. Press [COUPLE] [VIDEO BW] [1] [0] [MHz] .

(3) Marker

When [ON] [NOISE/Hz] is set, [dBm/Hz] [dBμV/$\sqrt{Hz}$] [OFF] appear on the screen.

Press [dBm/Hz] for the level display unit dBm, and press for the dBμ.

When [dBm/Hz] is set, the marker level display appears on the upper right-hand corner of the screen, showing 1Hz band conversion noise level in "XX dBm/Hz".

(4) Press [OFF] to cancel the noise measuring mode. To convert the noise power bandwidth to another one, add the following to the value displayed.

$$K_B = 10\log_{10}\left(\frac{\text{Band width to be converted}}{1\text{Hz}}\right)$$

7. GPIB : REMOTE PROGRAMMING

7.1 Outline

CAUTION

> To prevent malfunction due to electromagnetic interference when a GPIB is used, use shielded cables for connecting with an external terminal.
> Do not bundle connection cables with AC lines.

The main unit, loaded with the IEEE 489-1978 general purpose interface bus (GPIB), enables full remote control from the external controller.

(1) GPIB Extensibility and Compatibility

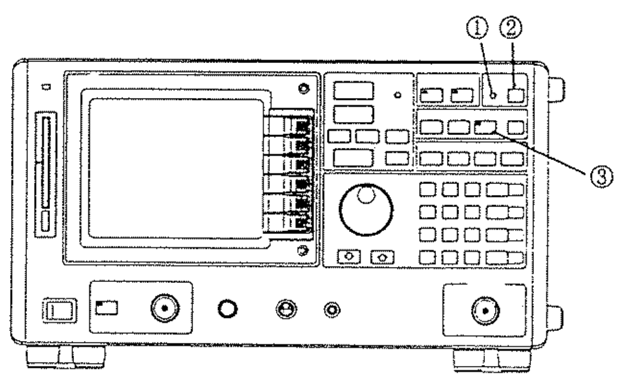
The GPIB is an interface system connected via cables (sub lines) to a measuring apparatus, controller, and peripheral devices. This system is far more extensible than the conventional systems and is electrically, mechanically, and functionally compatible with other manufacturers' devices. System configuration may be as simple as a single bus line or a high-grade automatic measuring system.

(2) Talker, Listener, Controller

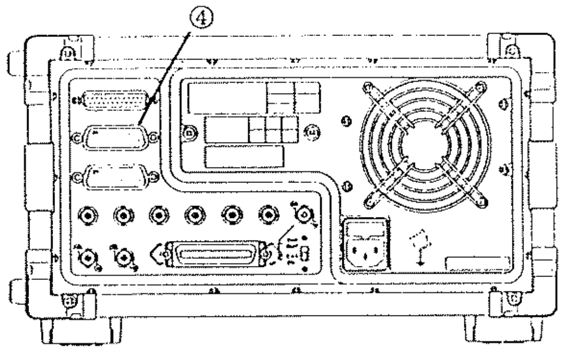
In GPIB systems, devices on the other end of the bus lines are assigned with addresses. Each device can take one or more of the following roles: talker, listener, controller. During system operation, only one talker can transmit data on the bus line, but two or more listeners receive the data. A controller specifies the talker and listener addresses to transfer data from the talker to the listener, and lets the talker assign listener measuring conditions.

(3) GPIB Panels

Front panel



Rear panel



① REMOTE lamp:
Lights while the main unit is in external control mode

② LCL key:
Remote/local switch. Interrupts external control and enables on-panel input.

③ SHIFT key:
Press this key and ② LCL key to start GPIB address setting.

④ GPIB connector:
Insert the GPIB cable here to connect to the external controller or plotter.

(4) Externally Controlled Functions

① Measuring condition setting:
Inputs measuring condition is the same manner as key entries on the panel.

② Measuring set condition output:
Calls data and set conditions from the main unit.

③ Measurement input/output:
Writes and reads screen trace data.

④ Service request to controller:
Requests the controller to interrupt processing and to output status bytes.

(5) Option 81 (system control with internal BASIC)

If the Option 81 is equipped to the spectrum analyzer, the unit is remote-controlled with the external controller or carries out the following operations:

- Control the analyzer using the internal BASIC.
- Control the external devices connected to the analyzer using the internal BASIC.

(For the details, see an instruction manual attached to Option 81.)

7.2 GPIB Standards & Main Unit GPIB Specifications

(1) Bus Line

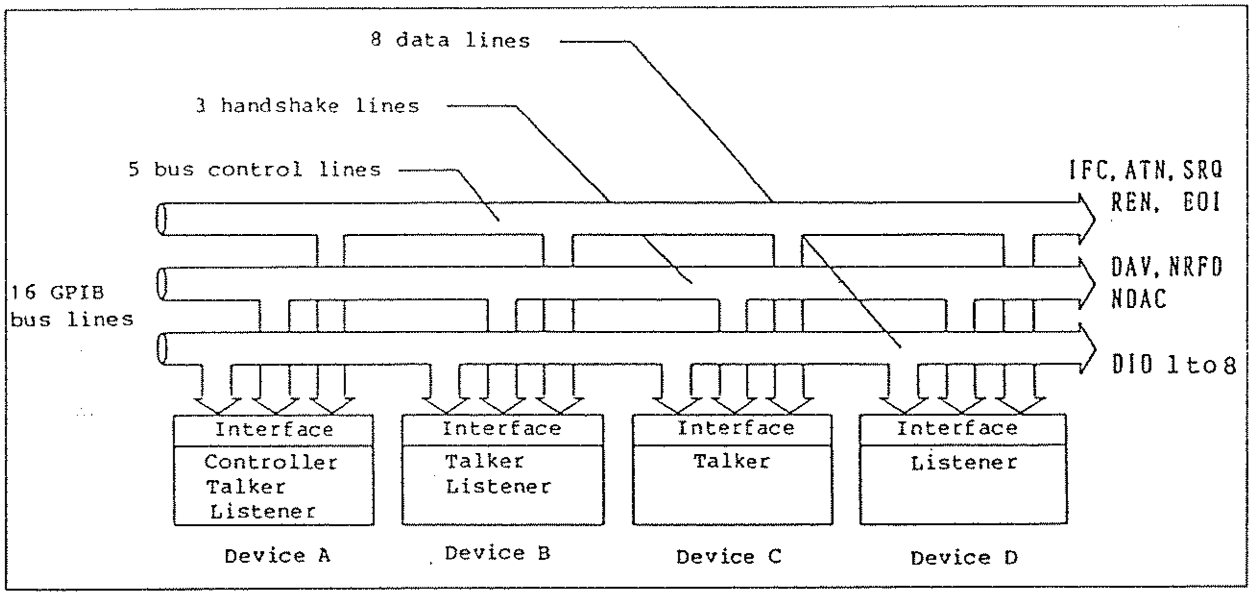


Figure 7 - 1 GPIB Bus Line Configuration

GPIB bus lines include eight data lines, three handshake lines for controlling asynchronous data transmission between devices, and five control lines.

- Data lines:
  Eight bit-parallel-byte-serial data lines are used for bi-directional data transmissions between devices. The asynchronous feature permits simultaneous connection of both high and low speed devices. Data (message) transmitted between devices includes measurements, measuring conditions (programs), and commands in ASCII code.

- Handshake lines:
  The following signals are used.
  DAV (Data Valid) : Indicates that the data is valid.
  NRFD (Not Ready For Data) : Indicates that it is ready to receive data.
  NDAC (Not Data Accepted) : Indicates the end of data reception.

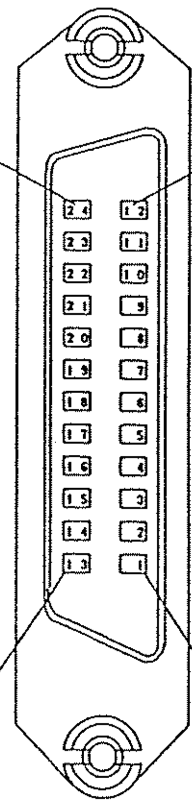
- Control lines:
  The following signals are used.
  ATN (Attention) : Discriminates addresses and commands on the data line from other information.
  IFC (Interface Clear) : Clears interface.
  EOI (End of Identify) : Used at the end of data transmission.

SRQ (Service Request) : Requests controller service to a certain device.

REN (Remote Enable) : Used to remote control remote programmable devices.

(2) Connector: 24 pin GPIB connector, 57-20240-D35A (an Amphenor or its equivalent)

Signal name	Pin No.
GND LOGIC	24
GND (ATN)	23
GND (SRQ)	22
GND (IFC)	21
GND (NDAC)	20
GND (NRFD)	19
GND (DAV)	18
REN	17
DIO 8	16
DIO 7	15
DIO 6	14
DIO 5	13



Pin No.	Signal name
12	SHIELD
11	ATN
10	SRQ
9	IFC
8	NDAC
7	NRFD
6	DAV
5	EOI
4	DIO 4
3	DIO 3
2	DIO 2
1	DIO 1

Figure 7 - 2 GPIB Connector Pin Configuration

(3) Specifications

Code : ASCII code, except at packed formatting when binary codes are used.

Logical level : Logic 0 "high" +2.4V or greater
Logic 1 "low" +0.4V or less

Signal line end : 16 bus lines terminate as illustrated in Figure 7 - 3.

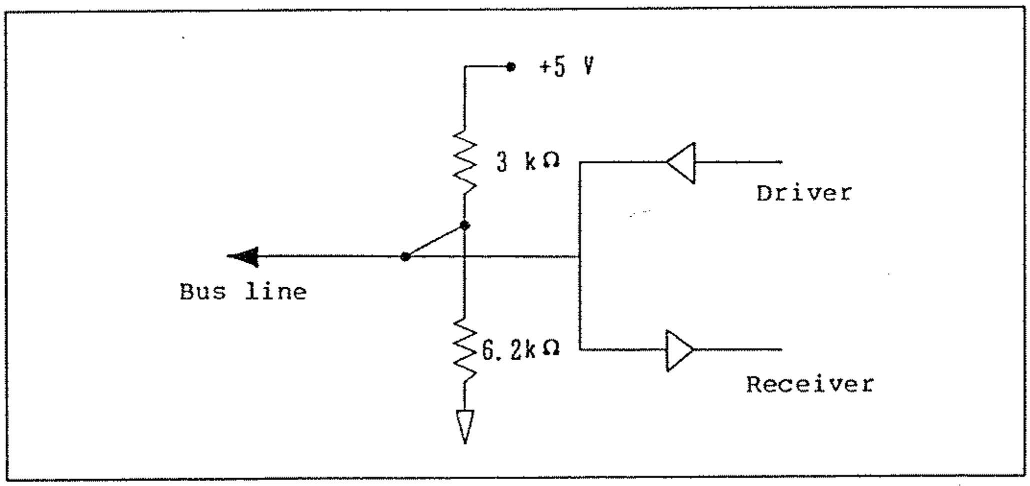


Figure 7 - 3 End of Signal Line

Driver specifications : Open collector type
Voltage output at "low" : +0.4V or less, 48mA
Voltage output at "high" : +2.4V or greater, -6.2mA
Receiver specifications : "low" if less than +0.6V
"high" if greater than +2.0V
Bus cable length : Individual cable should be less than four meters long, and the sum of all cables, i.e., twice the number of devices connected to buses, should not exceed twenty meters.
Address setting : Up to 31 talk/listen addresses are entered through keys on the front panel.

(4) Interface Function: See Table 7-1.

Table 7 - 1 GPIB Interface Functions

Code	Function & description
SH1	Source handshake function
AH1	Acceptor handshake function
T6	Basic talker function, serial poll function, talker cancel function by listener specification
L4	Basic listener function, listener cancel function by talker specification
SR1	Service request function
RL1	Remote function
PR0	Parallel function
DC1	Device clear function provided
DT1	Device trigger function provided
C0	Controller function not provided, except when the plotter comes into use.
E1	Open collector bus driver is in use. EOI, DAV means E2 (three state bus driver) is in use.

7.3 List of GPIB Codes

The following list is commonly applicable to the R3261C, R3261CN, R3261D, R3361C, R3361CN, and R3361D spectrum analyzers. Also, it is applicable to the Option 81.

[Note regarding Table 7 - 2]

- * : Function used to input data (such as ten-key, step key, data knob) Examples for use is listed in Table 7 - 3.
- F : Frequency
- L : Level
- T : Time
- N : Data output in the constant-specified format
- \+ : Indicates that multiple data is output.
- AU : Denotes AUTO
- MA : Denotes MANUAL
- ☆ : Denotes initial values set when the power is turned on.
- Δ : Subsequent codes will be ignored due to processing convenience.
- \- : Inapplicable

Table 7 - 2 List of GPIB Codes

No.	Function	Code	Talker request			Remarks
			Code	Output format	Header	
1.	CENTER FREQ	* CF	CF?	F	CF	
	CF step size	* CS	CS?	F	CS	
	CF step AUTO	CA	CA?	1=AU/0=MA	-	
	freq offset (ON/OFF)	*FON/FOF	FO?	1=ON/0=OFF + F	FO	
	sign (+/-)	Δ, +/-	-	-	-	
2.	FREQ SPAN	* SP	SP?	F	SP	
	linear	* LS	-	-	-	
	full	FS	-	-	-	
	log	LG	-	-	-	
	-- start	* LGA	LGA?	F	LGA	
	-- stop	* LGB	LGB?	F	LGB	
	zero	ZS	-	-	-	
	Span mode	-	SPM?	0=lin / 1=full 2=log / 3=zero	-	

Table 7 - 2 List of GPIB Codes (Cont'd)

No.	Function	Code	Talker request			Remarks
			Code	Output format	Header	
3.	START FREQ	*FA, *FT	FA?, FT?	F	FA	
	freq offset (ON/OFF)	*FON/FOF	FO?	1=ON/0=OFF + F	FO	
	sign (+/-)	Δ, +/-	-	-	-	
	STOP FREQ	*FB, *FP	FB?, FP?	F	FB	
	freq offset (ON/OFF)	*FON/FOF	FO?	1=ON/0=OFF + F	FO	
	sign (+/-)	Δ, +/-	-	-	-	
4.	REF LEVEL	*RE, *RL	RE?, RL?	L	(UNIT) dBm =REB dBmV=REM dBuV=REU EMF =REE dBpW=REW V =REV	
	dB/div	* DD	DD?	0=10dB/, 1=5dB/ 2= 2dB/, 3=1dB/ 4=0.5dB/ 5=0.2dB/ 6=0.1dB/	-	
	8/12 div (at 10dB/)	DV0/DV1	DV?	0=8div/1=12div 2=Others	-	
	linear -- x 1	LL1	-	-	-	
	-- x 1.6	LL2	-	-	-	
	-- x 4	LL4	-	-	-	
	-- x 8	LL8	-	-	-	
	Linear magnification	-	LL?	0=x1, 1=x1.6 2=x4, 3=x8	-	
	disp unit					
	-- dBm	UB	-	-	-	
	-- dBmV	UM	-	-	-	
	-- dBuV	UU	-	-	-	
	-- dBuV (EMF)	UE	-	-	-	
	-- dBpW	UW	-	-	-	
	REF. offset (ON/OFF)	*RON/ROF	RO?	1=ON/0=OFF + L	RO	
	Vertical axis unit	-	UN?	0=dBm / 1=dBmV 2=dBuV / 3=EMF 4=dBpW / 5=dB 6=V	-	

Table 7 - 2 List of GPIB Codes (Cont'd)

No.	Function	Code	Talker request			Remarks
			Code	Output format	Header	
5.	COUPLE	CO	–	–	–	
		auto	auto			
	RBW	*RB (BA)	RB?(BA?)	F (1=AU/0=MA)	RB	
	VBW	*VB (VA)	VB?(VA?)	F (1=AU/0=MA)	VB	
	SWP	*SW (AS)	SW?(AS?)	T (1=AU/0=MA)	SW	
	ATT	*AT (AA)	AT?(AA?)	L (1=AU/0=MA)	AT	
	AUTO	AC	–	–	–	
	all AUTO	AL	AL?	1=YES/0=NO	–	
6.	MENU	ME	–	–	–	
	trigger -- free run	FR	–	–	–	
	-- line	LI	–	–	–	
	-- video	VI	–	–	–	
	-- TV_V	TV	–	–	–	
	-- EXT	EX	–	–	–	
	-- single (ST/RST)	SI	–	–	–	
	Trigger mode	–	TM?	0=free / 1=line 2=video/ 3=TV 4=EXT / 5=singl	–	
	SWEEP start	SR	–	–	–	free, single only
	detector -- normal	DTN	–	–	–	
	-- posi	DTP	–	–	–	
	-- nega	DTG	–	–	–	
	-- sample	DTS	–	–	–	
	Detector mode	–	DM?	0=norm/ 1=posi 2=nega/ 3=sampl	–	
	SWEEP -- normal	SN	–	–	–	
	-- manual	SM	–	–	–	
	-- Δ marker	SDM	–	–	–	
	-- window	SDW	–	–	–	
	-- mkr PAUSE (ON/OFF)	*PUN/PUF	PU?	1=ON/0=OFF + T	PU	
	Sweep mode	–	SWM?	0=norm./1=manual 2= Δ mkr/ 3=window	–	
	display line (ON/OFF)	*DLN/DLF	DL?	1=ON/0=OFF + L	(unit) dBm =DLB dBmV=DLM dBuV=DLU EMF =DLE dBpW=DLW V =DLV	

Table 7 - 2 List of GPIB Codes (Cont'd)

No.	Function	Code	Talker request			Remarks
			Code	Output format	Header	
(6)	display line point	-	G2?	Y (Y axis= 0 to 400 point)	-	
	TRACE -- A <-> B	CH	-	-	-	
	-- A - B → A	TR0	-	-	-	
	-- B - A → A	TR1	-	-	-	
	-- A - DL → A	TR2	-	-	-	
	-- B - DL → B	TR3	-	-	-	
	(next) -- sound		-	-	-	
	-- AM	SAM	-	-	-	
	-- FM	SFM	-	-	-	
	-- vol.MAX	VX	-	-	-	
	-- vol.MID	VD	-	-	-	
	-- vol.MIN	VN	-	-	-	
	-- ON/OFF	SON/SOF	-	-	-	
	-- gratical (ON/OFF)	GN/GF	-	-	-	
7.	MARKER ON	* MN	MN?	0=OFF / 1=norm 2=Δ	-	
	Marker frequency	-	MF?	F	MF	
	Marker level	-	ML?	L	(unit) dB =MLD dBm =MLB dBmV=MLM dBμV=MLU EMF =MLE dBpW=MLW V =MLV dBm/Hz =MLH dBμV/√Hz =MLL	
	Maker frequency, level	-	MFL?	F + L	MF (unit) dB =MLD dBm =MLB dBmV=MLM dBμV=MLU EMF =MLE dBpW=MLW V =MLV dBm/Hz =MLH dBμV/√Hz =MLL	

Table 7 - 2 List of GPIB Codes (Cont'd)

No.	Function	Code	Talker request			Remarks
			Code	Output format	Header	
(7)	normal mkr point	-	G0?	X + Y	-	
	Δ mkr point	-	G1?	X + Y (X axis= 0 to 700 point) (Y axis= 0 to 400 point)	-	
	normal mkr	* MK	-	-	-	
	Δ mkr	* MT	-	-	-	
	-- normal mkr	* MK	-	-	-	
	-- Δ mkr	* MT	-	-	-	
	-- counter	-	CN?	1=ON / 0=OFF	-	
	- 1kHz	CN0	-	-	-	
	- 100Hz	CN1	-	-	-	
	- 10Hz	CN2	-	-	-	
	- 1Hz	CN3	-	-	-	
	- FORWARD/BACK	FW/BK	-	-	-	
	- OFF	CNF	-	-	-	
	-- fixed (ON/OFF)	FXN/FXF	FX?	1=ON / 0=OFF	-	
	-- sign (+/-)	Δ, +/-	-	-	-	
	counter	-	CN?	1=ON / 0=OFF	-	
	-- 1kHz	CN0	-	-	-	
	-- 100Hz	CN1	-	-	-	
	-- 10Hz	CN2	-	-	-	
	-- 1Hz	CN3	-	-	-	
	-- FORWARD/BACK	FW/BK	-	-	-	
	-- OFF	CNF	-	-	-	
	sig.track (ON/OFF)	SGN/SGF	SG?	1=ON / 0=OFF	-	
	noise/Hz	-	NI?	1=ON / 0=OFF + F (xHz)	NI	
	-- dBm/Hz	* NIM	-	-	-	
	-- dBμV/$\sqrt{Hz}$	* NIU	-	-	-	
	-- OFF	NIF	-	-	-	
	(next)					
	X dB down	* XDB	-	-	-	
	X dB left	* XDL	-	-	-	
	X dB right	* XDR	-	-	-	
	X dB REL/	DC0	-	-	-	
	ABS1/	DC1	-	-	-	
	ABS2	DC2	-	-	-	
		-	DC?	0=REL/ 1=ABS1/2=ABS2	-	
8.	MARKER OFF	MO, MF	-	-	-	

Table 7 - 2 List of GPIB Codes (Cont'd)

No.	Function	Code	Talker request: Code	Talker request: Output format	Talker request: Header	Remarks
9.	PEAK	PS	-	-	-	
	next pk	NXP	-	-	-	
	next pk right	NXR	-	-	-	
	next pk left	NXL	-	-	-	
	next pk max/min	NMM	-	-	-	
	min.	MIS	-	-	-	
	(next)					
	next min.	NXM	-	-	-	
	pk cont. ON/OFF	CPN/CPF	CP?	1=ON/0=OFF	-	
	ΔX/ΔY	*DX/*DY	-	-	-	
10.	MARKER ->	MG	-	-	-	
	mkr →CF	MC	-	-	-	
	mkr →REF	MR	-	-	-	
	mkrΔ→SPAN	DS	-	-	-	
	mkr →CF step size	M0	-	-	-	
	mkrΔ→CF step size	M1	-	-	-	
	(next)					
	mkr → mkr step size	M2	-	-	-	
	mkrΔ → mkr step size	M3	-	-	-	
	mkr step size	* MPM	MPM?	F	MPM	
	mkr step AUTO	MPA	MPA?	1=AU/0=MA	-	
11.	TRACE A, B	TA, TB	TA?, TB?	(A #1) 0=write 1=view 2=blank 3=norm. 4= A-DL->A 5=A-B->A 6=B-A->A (A #2) 0= nothing 1=+max 2=+avg. (B #1) 0=write 1=view 2=blank 3=norm. 4= B-DL->B (B #2) 0= nothing 1=+max 2=+avg.	-	
	write	AW, BW	-	-	-	
	view	AV, BV	-	-	-	
	blank	AB, BB	-	-	-	
	max hold	AM, BM	-	-	-	

Table 7 - 2 List of GPIB Codes (Cont'd)

No.	Function	Code	Talker request			Remarks
			Code	Output format	Header	
(11)	avg.	*AG, *BG	AG?, BG?	N (Number of times set)	-	
	-- start/	AGR, BGR	-	-	-	
	stop	AGS, BGS	-	-	-	
	-- pause/	AGP, BGP	-	-	-	
	cont	AGC, BGC	-	-	-	
	-- 1 time	AG1, BG1	-	-	-	
	cont/	AG0, BG0	-	-	-	
	normalize					
	-- ON/	ANN, BNN	-	-	-	
	OFF	ANF, BNF	-	-	-	
	-- corr. data save	AR, BR	-	-	-	
	-- disp L (ON/OFF)	*DLN/DLF	DL?	1=ON / 0=OFF + L	(unit) dBm=DLB dBmV=DLM dBuV=DLU EMF =DLE dBpW=DLW V =DLV	
	-- instant norm.	AI, BI	-	-	-	
	clear the data by 0	CWA,CWB	-	-	-	
12.	DATA					
	0 to 9	0 to 9	-	-	-	
	. (point)	.				
	back space	BS	-	-	-	
	step UP	UP	-	-	-	
	step DOWN	DN	-	-	-	
		(co/fin)				
	nob UP	CU/FU	-	-	-	
	nob DOWN	CD/FD	-	-	-	
	GHz	GZ	-	-	-	
	MHz	MZ	-	-	-	
	kHz	KZ	-	-	-	
	Hz	HZ	-	-	-	
	mV	MV	-	-	-	
	+/-dBm, dB (Add polarity)	DB	-	-	-	
	sec	SC	-	-	-	
	msec	MS	-	-	-	
	usec	US	-	-	-	

Table 7 - 2 List of GPIB Codes (Cont'd)

No.	Function	Code	Talker request			Remarks
			Code	Output format	Header	
13.	RECALL	*RC	-	-	-	
	NORMAL/FAST mode	RN/RF	-	-	-	
14.	SOFTKEY	-	-	-	-	
	softkey 1	SF1	-	-	-	
	softkey 2	SF2	-	-	-	
	softkey 3	SF3	-	-	-	
	softkey 4	SF4	-	-	-	
	softkey 5	SF5	-	-	-	
	softkey 6	SF6	-	-	-	
15.	LOCAL	LC	-	-	-	
16.	MASTER RESET	IP	-	-	-	
17.	USER	UR	-	-	-	
	user key 1	UR1	-	-	-	
	user key 2	UR2	-	-	-	
	user key 3	UR3	-	-	-	
	user key 4	UR4	-	-	-	
	user key 5	UR5	-	-	-	
	user key 6	UR6	-	-	-	
18.	SHIFT	SH	SH?	1=ON / 0=OFF	-	
	GPIB address(+LOCAL)	* AD (SHLC)	AD?	N (Address)	-	
	NORMALIZE A (+A)	SHTA (AI)	-	-	-	
	NORMALIZE B (+B)	SHTB (BI)	-	-	-	
	EMC (+1)	SH1				
	-- field str.					
	- antenna					
	- dipole	AN0	-	-	-	
	- log perd	AN1	-	-	-	
	- TR17203	AN2	-	-	-	
	- OFF	AF	-	-	-	
	- correct ON/OFF	CRN/CRF	CR?	1=ON / 0=OFF	-	

Table 7 - 2 List of GPIB Codes (Cont'd)

No.	Function	Code	Talker request			Remarks
			Code	Output format	Header	
(18)	-- QP					
	- ON/OFF	QN/QF	QP?	1=ON / 0=OFF	-	
	- BW AUTO	QA	-	-	-	
	- BW 200Hz	QP0	-	-	-	
	- BW 9kHz	QP1	-	-	-	
	- BW 120kHz	QP2	-	-	-	
	-- limit A					
	- ON/OFF	LAN/LAF	-	-	-	
	MEMORY CARD (+4)	SH4				
	-- volume init.	MMI	-	-	-	
	-- menu load	MML	-	-	-	
	-- menu store	MMS	-	-	-	
	meas. WINDOW (+5)	WN(SH5)	WN?	1=ON / 0=OFF	-	
	-- OFF	WF	-	-	-	
	(next)					
	-- location (X)	* WLX	WLX?	F (center)	WLX	
	-- location (Y)	* WLY	WLY?	L (center)	WLY	
	-- delta (X)	* WDX	WDX?	F (Δ)	WDX	
	-- delta (Y)	* WDY	WDY?	L (Δ)	WDY	
	-- ABS data					
	-- start freq.	* WTF	WTF?	F (start)	WTF	
	-- stop freq.	* WPF	WPF?	F (stop)	WPF	
	-- upper level	* WUL	WUL?	L (upper)	WUL	
	-- lower level	* WLL	WLL?	L (lower)	WLL	
	Executing judgment A of GO or NG	CMA	-	-	-	See 4.10.2
	Executing judgment B of GO or NG	CMB	-	-	-	
	Result output (NG point)	-	CM?	GO=0/NG=1 to 100	-	
	NG frequency output	-	CMF?	F	CMF	
	CALIBRATION (+7)	SH7				
	-- call all	CLA	-	-	-	
	-- total gain	CLG	-	-	-	
	-- itmes					
	- input ATT	IT0	-	-	-	
	- IF step AMPTD	IT1	-	-	-	
	- RBW switch	IT2	-	-	-	
	- LOG linearity	IT3	-	-	-	
	- AMPTD MAG	IT4	-	-	-	
	- TG tracking	IT5	-	-	-	

Table 7 - 2 List of GPIB Codes (Cont'd)

No.	Function	Code	Talker request			Remarks
			Code	Output format	Header	
(18)	-- cal. sig. ON/OFF	*CLN/CLF	CL?	1=ON / 0=OFF	-	
	-- frq corr. ON/OFF	FCN/FCF	FC?	1=ON / 0=OFF	-	
	-- cal. corr. ON/OFF	CCN/CCF	CC?	1=ON / 0=OFF	-	
	SAVE (+RECALL)	*SHRC				
	PLOT (+8)	SH8				
	LABEL (+9)					
	--ON (write)	LON/	-	-	-	up to 49 letters in LABEL
	--OFF (clear)	LABEL/ LOF	-	-	-	
	FUNCTION (+6)	SH6				
	-- OBW	OBW	OBW?	F (Hz)	OBW	
	-- ADJ	ADJ	ADJ?	L (dB)	ADJ	
	-- ADJ graph	ADG	-	-	-	
19.	Trace data					
	A memory					
	ASCII output	-	TAA?	ASCII format	-	Option 81 only
	Binary output	-	TBA?	Binary format	-	Option 81 only
	B memory					
	ASCII output	-	TAB?	ASCII format	-	Option 81 only
	Binary output	-	TBA?	Binary format	-	Option 81 only
	A memory					
	ASCII input	TAA	-		-	Δ Option 81 only
	Binary input	TBA	-		-	Δ Option 81 only
	B memory					
	ASCII input	TAB	-		-	Δ Option 81 only
	Binary input	TBB	-		-	Δ Option 81 only
20.	Others					
	Header OFF	HD0	-	-	-	
	ON	HD1	-	-	-	☆
	Delimiter					
	CR LF EOI	DL0	-	-	-	Option 81 only
	LF	DL1	-	-	-	Option 81 only
	EOI	DL2	-	-	-	Option 81 only
	CR LF	DL3	-	-	-	☆ Option 81 only
	LF EOI	DL4	-	-	-	Option 81 only

Table 7 - 2 List of GPIB Codes (Cont'd)

No.	Function	Code	Talker request			Remarks
			Code	Output format	Header	
(20)	SRQ interrupt ON interrupt OFF status clear	S0 S1 S2	- - -	- - -	- - -	☆
	Output of product type (numeral)	-	VER?	1=B3261C 2=R3261D 3=R3361C 4=R3361D 5=R3261CN 6=R3361CN	- - - -	
	Output of unit type (character string)	-	TYP?	Output the unit name by charac-ter string	-	
	Output of displayed character (64x24)	-	GPL?	DDDD..03=1 line 24 set continue (D=1 character/ 03=CR)	- - -	Option 81 only
21.	TG	TG	TG?	1=ON / 0=OFF	-	R3361 only
	TG level	*TGL	TGL?	L	(unit) dBm=TGB dBmV=TGM dBuV=TGU EMF =TGE dBpW=TGW V =TGV	
	freq. cal AUTO freq. cal MANUAL OFF	TGA *TGM TGF	- - -	- - -	- - -	
22.	Preselector		PR?	1=ON / 0=OFF	-	Option
	ATT 0dB ATT 10dB ATT 20dB ATT 30dB ATT 40dB ATT 50dB	A0 A1 A2 A3 A4 A5	- - - - - -	- - - - - -	- - - - - -	- - - - - -
	pre amp ON/OFF bypass ON/OFF linearity check ON/OFF	PO/PF BO/BF LO/LF	- - -	- - -	- - -	
	REF. offset	-	PRO?	L	PRO	

Table 7 - 3 Example of Data Input Function to be Used (Asterisk of GPIB Codes)

Command name	Description
CF100MZ	Sets center frequency to 100MHz.
CS100KZ	Sets frequency step size to 100kHz.
FON10MZ	Turns on the frequency offset, and sets it to 10MHz.
SP500MZ or LS500MZ	Sets frequency span to 500MHz.
LGA100MZ	Sets log start frequency to 100MHz.
LGB1000MZ	Sets log stop frequency to 1GHz.
FA100KZ or FT100KZ	Sets start frequency to 100kHz.
FB400KZ or FP400KZ	Sets stop frequency to 400kHz.
RE-25DB or RL-25DB	Sets reference level to -25dBm (when dBm is set).
DD5DB	Sets 5dB/div.
RON30DB	Turns on level offset, and set it to 30dB.
RB300KZ	Sets RBW to 300kHz.
VB100KZ	Sets VBW to 100kHz.
SW200MS	Sets sweep time to 200msec.
AT20DB	Sets attenuator to 20dB.
PUN100MS	Turns on the marker pause, and sets time to 100msec.
DLN87DB	Turns on Disp. line, and sets it to 87dBμV (when dBμV is set).
MK1.8GZ	Turns on the normal marker, and sets it to 1.8GHz.
MT2MZ	Turns on the delta marker, and display the normal marker at 2MHz.
MN100KZ	Sets 100kHz to the active marker.
NIM50HZ	Sets to dBm/50Hz.
NIU70HZ	Sets to dBμV/√70Hz.
XDB6DB	Sets XdB-down width to 6dB (this is enabled with the XDL and XDR commands).
DX10GZ	Sets increased X points to 10 when retrieving the Next peak (GZ is ENTRY).
DY50GZ	Sets increased Y points to 50 when retrieving the Next peak (GZ is ENTRY).
MPM100KZ	Sets the marker step size to 100 for execution (GZ is ENTRY).

Table 7 - 3 Example of Data Input Function to be Used (Asterisk of GPIB Codes) (Cont'd)

Command name	Description
AG 200GZ	Sets average A number to 200 for execution (GZ is ENTRY).
BG 300GZ	Sets average B number to 300 for execution (GZ is ENTRY).
AD8GZ	Sets the GPIB address of this device to 8 (GZ is ENTRY).
WTF1MZ	Sets window start frequency to 1MHz.
WPF2MZ	Sets window stop frequency to 2MHz.
WUL-20DB	Sets window high-order level to -20dBm (when dBm is set).
WLL-40DB	Sets window low-order level to -40dBm (when dBm is set).
CLN-25DB	Turns on the CAL signal, and sets level to -25dBm (when dBm is set).
SHRC5SF1	Saves channel No. 5 (SF1 is the first softkey).
RC5SF1/RC5	Recall channel No. 5 (normal/high-speed mode).
TGL-25DB	Sets TG output level to -25dBm (when dBm is set).

7.4 Introduction

This chapter gives programming examples using the Hewlett-Packard manufactured HP 200, 300 series.

7.4.1 GPIB Address Setting

Addresses are set with keys on the panel.

Example: Setting address 01

Press [SHIFT] [LCL] [1] [GHz].

Address 00 to 30 are acceptable.

7.4.2 Delimiters

When sending data from the GPIB controller to the main unit (listener), the main unit GPIB does not work normally unless the controller delimiters are one of the following. This rule also applies when the main unit is acting as a talker.

GPIB code	Function
DL0	Simultaneously outputs CR and LF. LF is accompanied by EOI signals.
DL1	Outputs LF.
DL2	Outputs EOI signals with the data final byte.
DL3	Outputs CR and LF (initial value).
DL4	Outputs LF accompanied by EOI signals.

7.4.3 Input/Output Format

Such input/output commands as GPIB code transmission to connected devices, data reception, bus command execution, and serial polling are programmable in GPIB. Other operational calculations are defined by the active controller.

[Statement format]

```
--------------------------------------------------
 Input/output statement     device address; data
--------------------------------------------------
```

7.5 Input Format (Listener)

Measurement parameters and setting conditions can be entered by remote control, similarly to operating the panel keys.

To set the center frequency to 300MHz, enter as follows:

```
OUTPUT   7 01 ; "CF 300MZ"      *1  Specifies the controller as the talker.
  |      |  |     |    |        *2  GPIB interface selector
  |      |  |     |    |        *3  Specifies the spectrum analyzer (GPIB
  |      |  |     |    |            address 01) to the listener.
 *1     *2 *3    *4   *5        *4  Activates the center frequency.
                                *5  Set value
```

'CF', '3', '0', and 'MZ' in the program are the GPIB codes used to remote control the spectrum analyzer. (See Section 7.3 GPIB Codes List.)

The following are the restrictions on entry data:

- Lowercase is converted internally into uppercase, and assumed as having been uppercase from the outset.
- Spaces and commas are ignored.
- A minus sign is ignored except when used as the sign of a negative value.
- No exponent can be entered.
- No binary digits can be entered. (Excluding trace binary input)
- Carriage returns (CR) and line feeds (LF) are recognized as data delimiters only.
- Nothing can be entered unless it is defined as a GPIB code.

Programming examples (GPIB address = 1)

Example 7-1 : Reset the analyzer master key and turn on the CAL signal (30 MHz).

```
10 OUTPUT 701;"IP"
20 OUTPUT 701;"CLN"
30 END
```

Example 7-2 : Setting start and stop frequencies to 300kHz and 800kHz respectively, and adding 50kHz to the frequency offset

```
10 OUTPUT 701;"FA300KZ"
20 OUTPUT 701;"FB800KZ"
30 OUTPUT 701;"FON50KZ"
40 END
```

Example 7-3 : Setting the reference level to -20dBm (5dB/div), resolution bandwidth to 100kHz, and detector mode to positive

```
10 OUTPUT 701;"RE-20DB"
20 OUTPUT 701;"DD5DB"
30 OUTPUT 701;"RB100KZ"
40 OUTPUT 701;"DTP"
50 END
```

Example 7-4 : Setting the trigger mode to single, sweep time to 2 seconds, and putting on a marker on the maximum level during repeated sweeping

```
10 OUTPUT 701;"SI"
20 OUTPUT 701;"SW2SC"
30 OUTPUT 701;"SR"                    ! Start of sweeping
40 WAIT 2.5                           ! Wait for the end of sweeping (or
                                        use the service request)
50 OUTPUT 701;"PS"                    ! Marker peak search
60 GOTO 30
70 STOP
80 END
```

Example 7-5 : Setting to MAX HOLD (A)

```
OUTPUT 701;"AM"                       ! Direct setting
or
OUTPUT 701;"TA SF4"                   ! Setting by softkey operation
```

Porgramming examples (GPIB address = 1)

Example 7-6 : Execute of Recall (for channel 5)

```
OUTPUT 701;"RN"                    ! (Normal mode)
OUTPUT 701;"RC 5 SF1"              ! RC is the RECALL key.
                                   ! 5 is channel 5 plus unit key.
                                   ! SF1 is the EXECUTE software key.
or

OUTPUT 701;"RF"                    ! (FAST mode)
OUTPUT 701;"RC 5"                  ! RC is the EXECUTE software key.
                                   ! SF1 is the EXECUTE software key.
```

Note : The main unit recognizes GPIB codes by the length. Because the longer codes have the priority, use a space " " to avoid misunderstanding of the codes beginning with the same letter.

For example, the main unit mistakes the marker frequency level output ("MFL") for OUTPUT 701; "MFLC", the program that turns off the marker ("MF") and sets to local ("LC"), and flags an error claiming that "?" is missing.

It correctly should be input OUTPUT 701; "MF LC".

7.6 Output Format (Talker)

To internal data on such as measuring data or set state, specify data to be output with xx? command. When this device is a talker, specified data is read. The output format is explained below. The header listing kinds of output data is attached to the beginning of characters (can be abbreviated), and five kinds of delimiters to be final data can be used (see GPIB code No. 20). Once the xx? command is set, it is enabled until it is changed.

	Description
Frequency format	HHHΔ±DDDDDDDDDDDDE±D CR LF *1*2*3 *4 *5 *6 *1 = Header (2 or 3 characters when set to on) *2 = Separate (space) *3 = Sign (space for positive, - for negative) *4 = Mantissa data *5 = Exponential data *6 = Delimiter (Initialization) Data length is 20 bytes. The unit is Hz. Example: Specify "CF?" and output the center frequency of 123.456MHz (at header ON) CF 00000123.456E+6
Level format	HHHΔ±DDDDDDDDE±D CR LF *1*2*3 *4 *5 *6 *1 = Header (2 or 3 characters when set to on) *2 = Separate (space) *3 = Sign (space for positive, - for negative) *4 = Mantissa data *5 = Exponential data *6 = Delimiter (Initialization) Data length is 16 bytes. The unit varies for each item. Example: Specify "ML?" and output the marker level of -56.23dBm (at header ON) MLB -00056.23E+0
Time format format	HHΔ±DDDDE±D CR LF *1*2*3*4*5 *6 *1 = Header (2 characters when set to on) *2 = Separate (space) *3 = Sign (space for positive, - for negative) *4 = Mantissa data *5 = Exponential data *6 = Delimiter (Initialization) Data length is 11 bytes. The unit is second. Example: Specify "SW?" and output the sweep time of 500msec (at header ON) SW 0500E-3

	Description
Constant format	DDDD CR LF *1 *2 (Variable length) *1 = Mantissa data *2 = Delimiter (Initialization) Example: On/off : 1/0 Average number of switching: 128
Header	When set to on, a header is put on the beginning of data. To output the header with data, modify the strings constant. GPIB code / Meanings HD0 — OFF HD1 — ON
Delimiter	Delimiters are added to the final data during the process of data output. A choice of 5 types described in Section 7.4.2 is available.

Porgramming examples (GPIB address = 1)

Example 7-7 : Outputting the marker frequency (integer)

```
10 OUTPUT 701;"MF?"
20 ENTER 701:A
30 END                    Result (example):  A=1.8E+9
```

Example 7-8 : Outputting the center frequency (strings)

```
10 DIM A$[30]
20 OUTPUT 701;"HD1"
30 OUTPUT 701;"CF?"
40 ENTER 701;A$
50 END                    Result (example);  A&=CF 00001.234567E+9
```

Porgramming examples (GPIB address = 1)

Example 7-9 : Outputting the status of the unit

```
10 OUTPUT 701;"UN?"
20 ENTER 701;A
30 END                        Result (example):  A=2 (dBuV)
```

Example 7-10: Outputting the marker frequency and the level (multiple output items)

```
10 OUTPUT 701;"MFL?"
20 ENTER 701;Mf, Ml
30 END                        Result (example):  Mf=1.8E+9  Ml=-65.15
```

Example 7-11: Outputting the frequency offset (multiple output items)

```
10 OUTPUT 701;"FO?"
20 ENTER 701;On,Frq
30 END                        Result (example):  On=1  Frq=1.23E+6
```

Example 7-12: Reading out the levels of ten subsequent peaks after the first peak of the signal by using the next peak function

```
10 DIM Ml(9)
20 OUTPUT 701;"PS"
30 FOR I=0 TO 9
40 OUTPUT 701;"NXP"
50 OUTPUT 701;"ML?"
60 ENTER 701;Ml(I)
70 NEXT I
80 END                        Result (example):
                              Ml(0)=-55.01 Ml(1)=-58.22
                              ..... Ml(9)=-70.26
```

7.7 Input and Output of Trace Data

Trace data displayed on the screen comprises 701 points of data, each representing the trace data at the corresponding frequency value at one of the 701 points. To input or output this trace data, transfer data of 701 points sequentially from the left (start frequency). The level on each point is represented by an integer from 0 to 400.

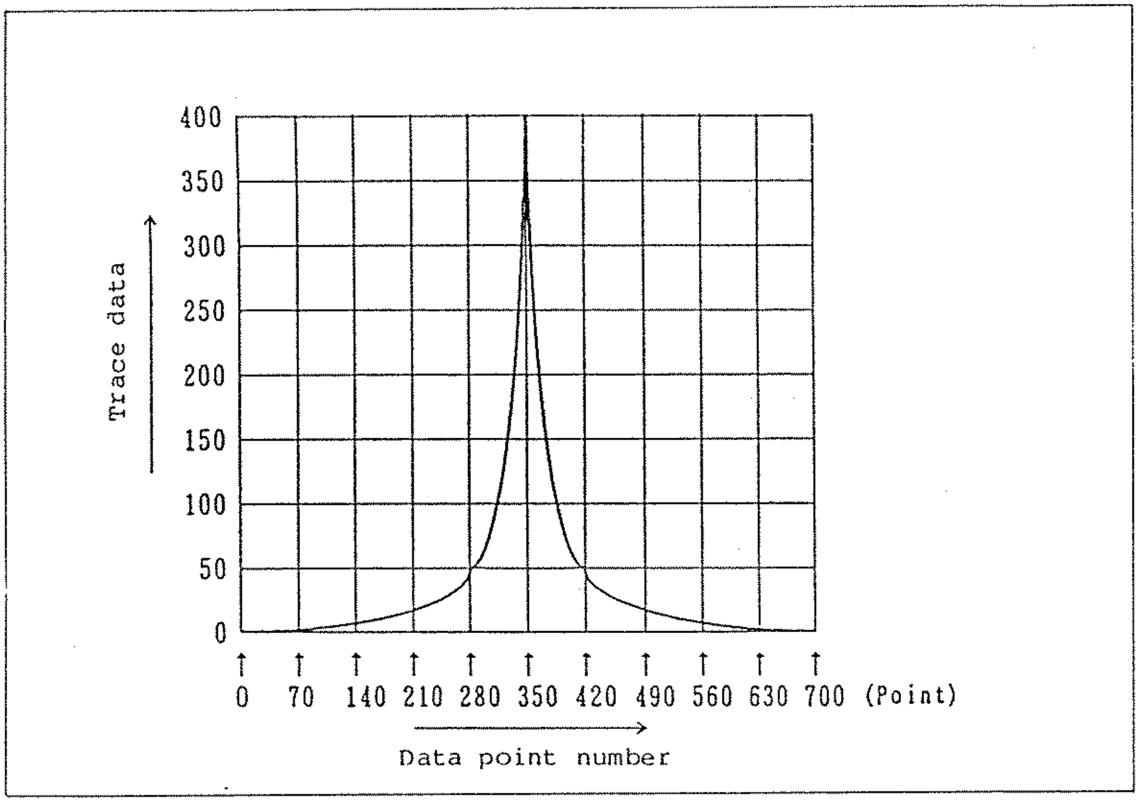


Figure 7 - 4 Relation Between the Screen Grid and Trace Data

Trace data can be input or output in the form of ASCII data or binary data.

<table>
<tr><th>Input/output format</th><th>Details</th></tr>
<tr><td>ASCII format</td><td>
DDDD CR LF
Delimiter
Data for a point

Four-byte data without a header

<table>
<tr><th></th><th>Input GPIB code</th><th>Output GPIB code</th></tr>
<tr><td>Memory A</td><td>TAA</td><td>TAA?</td></tr>
<tr><td>Memory B</td><td>TAB</td><td>TAB?</td></tr>
</table>
</td></tr>
<tr><td>Binary format</td><td>
DD DD .... DD DD + EOI
Delimiter
Low order byte of the first point data
Low order byte of the 701st point data
High order byte of the first point data
High order byte of the 701st point data

The binary digits of the first point data is divided into two bytes, the upper and the lowe. The consecutive data for 701 points is followed by an EOI signal code.

<table>
<tr><th></th><th>Input GPIB code</th><th>Output GPIB code</th></tr>
<tr><td>Memory A</td><td>TBA</td><td>TBA?</td></tr>
<tr><td>Memory B</td><td>TBB</td><td>TBB?</td></tr>
</table>
</td></tr>
</table>

Programming examples (GPIB address = 1)

Example 7-13: Outputting data in Memory A in ASCII code

```
10 DIM Tr(700)                    ! Reserves 701 variables.
20 OUTPUT 701;"DL3"               ! Designates the delimiter as CR
30 OUTPUT 701;"TAA?"              ! LF.
40 FOR I=0 TO 700                 ! Specifies ASCII code in Memory A
50 ENTER 701;Tr(I)                ! Repeats data fetching for 701
60 NEXT I                         ! times.
70 END
```

Result (example): Tr(0)=208 Tr(1)=210 ... Tr(699)=311 Tr(700)=298

Example 7-14: Outputting data in Memory B in binary code

```
10 DIM Tr(700)                    ! Reserves 701 variables.
20 OUTPUT 701;"DL2"               ! Designates the delimitor as EOI.
30 OUTPUT 701;"TBB?"              ! Specifies binary code in Memory B
40 ENTER 701 USING "%,W";Tr(*)    ! Fetches data through word
50 END                            ! conversion until detecting EOI
```

Result (example): Tr(0)=312 Tr(1)=319 ... Tr(699)=208 Tr(700)=211

Example 7-15: Inputting data in Memory A in ASCII code

```
10 OUTPUT 701;"TAA"               ! Specifies ASCII code in Memory A
20 FOR I=0 TO 700                 ! Repeats inputting the 701
30 OUTPUT 701;Tr(I)               ! reserved variables Tr.
40 NEXT I
50 END
```

Note: The system must be in the view mode before running this program. After executing the program, press the view key again to check the result of the entry.

Example 7-16: Inputting data in Memory B in binary code

```
10 OUTPUT 701;"TBB"                    ! Specifies binary code in Memory B
20 OUTPUT 701 USING "#,B";Tr(*),END    ! Inputs data of 1402 bytes in
30 END                                 ! units of byte, and puts EOI at
                                         the last.
```

Note: The system must be in the view mode before running this program. After executing the program, press the view key again to check the result of the entry.

Note: To input or output data in the form of ASCII code, specify 701 times of inputting or outputting. Even for data in binary format, secure 701 data values and specify EOI by a delimiter.

7.8 Service Request (SRQ)

The GPIB service request function enables the external devices to detect main unit conditions. When one of the following event occurs, 1 is set to all the bits of the main unit status bytes enabling the controller to read status bytes by serial polling. Status bytes are cleared as soon as they are read by the controller.

Table 7 - 4 SRQ ON/OFF Specification Codes

GPIB code	Function
S0	Transmits SRQ (interrupt) signals to the controller.
S1	Does not transmit SRQ (interrupt) signals to the controller. (initial setting)
S2	Clears the status byte.

Table 7 - 5 Status Bytes

Bit	Hexa-decimal	Meaning
0	1	Set to 1 when UNCAL error occurs.
1	2	Set to 1 when calibration is completed.
2	4	Set to 1 when sweeping is completed.
3	8	Set to 1 when averaging is completed within the number of times set.
4	16	
5	32	Set to 1 when a GPIB code error occurs. (SYNTAX ERR)
6	64	Set to 1 when bit 0, 1, 2, 3, 4, 5, or 7 has been set to 1 at service request transmission (S0).
7	128	

Programming examples (GPIB address = 1)

Example 7-17: Reading end of averaging (interrupts are not transmitted)

```
10 OUTPUT 701;"S2"               ! Clear the status byte
20 OUTPUT 701;"AG 30GZ"          ! Start averaging (A)
30 S=SPOLL(701)                  ! Output status byte to S
40 IF BIT(S,3) <> 1 THEN 30      ! Wait until the third bit
                                   becomes 1
50 DISP "AVG.END"                ! Indicates completed
60 END
```

Example 7-18: Continuously reading single sweep termination (interrupts are not transmitted)

```
10 OUTPUT 701;"SI"               ! Set to single
20 OUTPUT 701;"S2"               ! Clear the status byte
30 OUTPUT 701;"SR"               ! Start sweeping
40 S=SPOLL(701)                  ! Output status byte to S
50 IF BIT(S,2)<>1 THEN 40        ! Wait until the second bit
                                   becomes 1
60 PRINT "SWEEP END"             ! Indicates completed
70 GOTO 20                       ! Start next sweeping
80 END
```

Example 7-19: Reading end of averaging (interrupts are transmitted)

```
 10 OUTPUT 701;"S0"              ! Transmit
 20 OUTPUT 701;"S2"              ! Clear the status byte
 30 OUTPUT 701;"AG"              ! Start averaging (A)
 40 ON INTR 7 GOTO 70            ! Jump to line 70 if interrupted
 50 ENABLE INTR 7;2              ! Set the mode that accepts
                                   interrupt
 60 GOTO 50                      ! Wait until an interrupt occurs
 70 S=SPOLL(701)                 ! Output status byte to S
 80 IF BIT(S,3)=1 THEN 110       ! Jump to line 110 if the third
                                   bit is 1
 90 OUTPUT 701;"S2"              ! Clear the status byte
100 GOTO 40                      ! Repeat
110 DISP "AVG. END"              ! Indicates completed
120 END
```

Note 1: To start sweep, SR and SI commands can be used.

Command	Function
"SR"	Resets sweep, and starts it forcibly (always).
"SI"	Sets trigger to single, and stops sweep (during non-single). Resets sweep (on the way of single sweep). Starts sweep (when single sweep stops).

8.1 Check and Brief Diagnosis

Should a problem occur, check the following items before requesting repair. If the problem persists in spite of the prescribed procedures below, contact the nearest dealer or the sales and support offices. The addresses and telephone numbers are listed at the end of the manual. The user will be charged for any repairing done by our engineers, even for the procedures prescribed below.

Condition	Cause	Prescription
The system cannot be powered up.	The power cable is not properly inserted in the connector.	Turn off the power and connect the power cable properly.
	The power fuse is blown.	Replace the power fuse. (See 1.2.4 (2).)
The sweep lamp is lit but no waveform is displayed on the screen.	The intensity volume is kept too low.	Adjust the intensity by turning the volume knob.
	The input cable and the connector are not connected properly.	Connect the input cable and the connector properly.
Sweeping cannot be carried out.	The trigger is set to 'Single'	Press the menu key and select 'FREE-RUN'.
	The lamp corresponding to key A or key B is not lit.	Press the A or B key of 'Trace', and select 'Write'.
The signal level is inaccurate.	The AMPTD CAL is not adjusted.	Perform calibration.
The keys do not function.	The system is in the GPIB remote control mode.	If a program is being executed, halt it and press the LCL key.

WARNING

To remove the main unit case is allowed only for the trained service personnel because there is danger of the electric shock.

8. CHECK

8.2 Defects and Abnormal Stresses

When the R3261/3361 is impaired as undermentioned, it is thought that the protective function is damaged.

Before the R3261/3361 is used, make sure to find the damage and ensure the safety of this equipment at your nearest support office.

The instruments:
- shows visible damage,
- fails to perform the intended measurments,
- has been subjected to prolonged storage under unfavourable conditions,
- has been subjected to severe transport stresses.

9. R3361NK/3361K

9.1 Overview

R3361NK/3361K is the analyzer which allows easy measurement concerning CATV.

9.1.1 Features of R3361NK/3361K

(1) Frequency can be set by specifying the channel number of the television.
(2) Programs in the memory card can be executed easily.
(3) Audio can be monitored through the built-in speaker.
(4) Good visual recognition in the outdoors is provided by adopting the high brightness green CRT.

9.1.2 Checking Accessories

Upon receipt of the R3261/3361, run checks thereon as shown below.

① Run visual checks against any and all damages or imperfections.

② Check the quantity and rating of standard accessories to assure their conformance with Table 9 - 1.

Should there be any flaw, or damage, or missing or insufficient part, contact dealer or the sales and support offices.

Table 9 - 1 Standard Accessories (R3361NK/3361K)

Accessory name	Standard		Quantity		Remaeks
	Model name	Stock No.	R3361NK	R3361K	
Power cable	A01412	DCB-DD3130×01	1	1	
Input cable	MI-02	DCB-FF0386		2	
	D3S015 (Black)	DCB-FF2987×01	2		
N-BNC conversion adapter	JUG-201A/V	JCF-AF001E×03		2	
	BA-A165	JCF-AF001E×04	2		
C15 conversion adapter	NCP-NFJ	JCF-AF001E×06	2		
Power fuse	218005	DFT-AA5A	2	2	
Memory card	–	SEE-MAC1101BAB	1	1	
Instruction menual *	–	JR3261/3361	1	1	Japanese Version
	–	ER3261/3361			English Version

* :One of the Japanese and the English instruction manuals.

Note:When ordering an accessory, let us know its type (or stock No.).

9.2 Front Panel

① AUTO switch : Executes programs automatically.

② CH switch : Changes the unit of the frequency. CH/xHz

③ AUDIO VOLUME knob : Adjusts volume of the speaker.

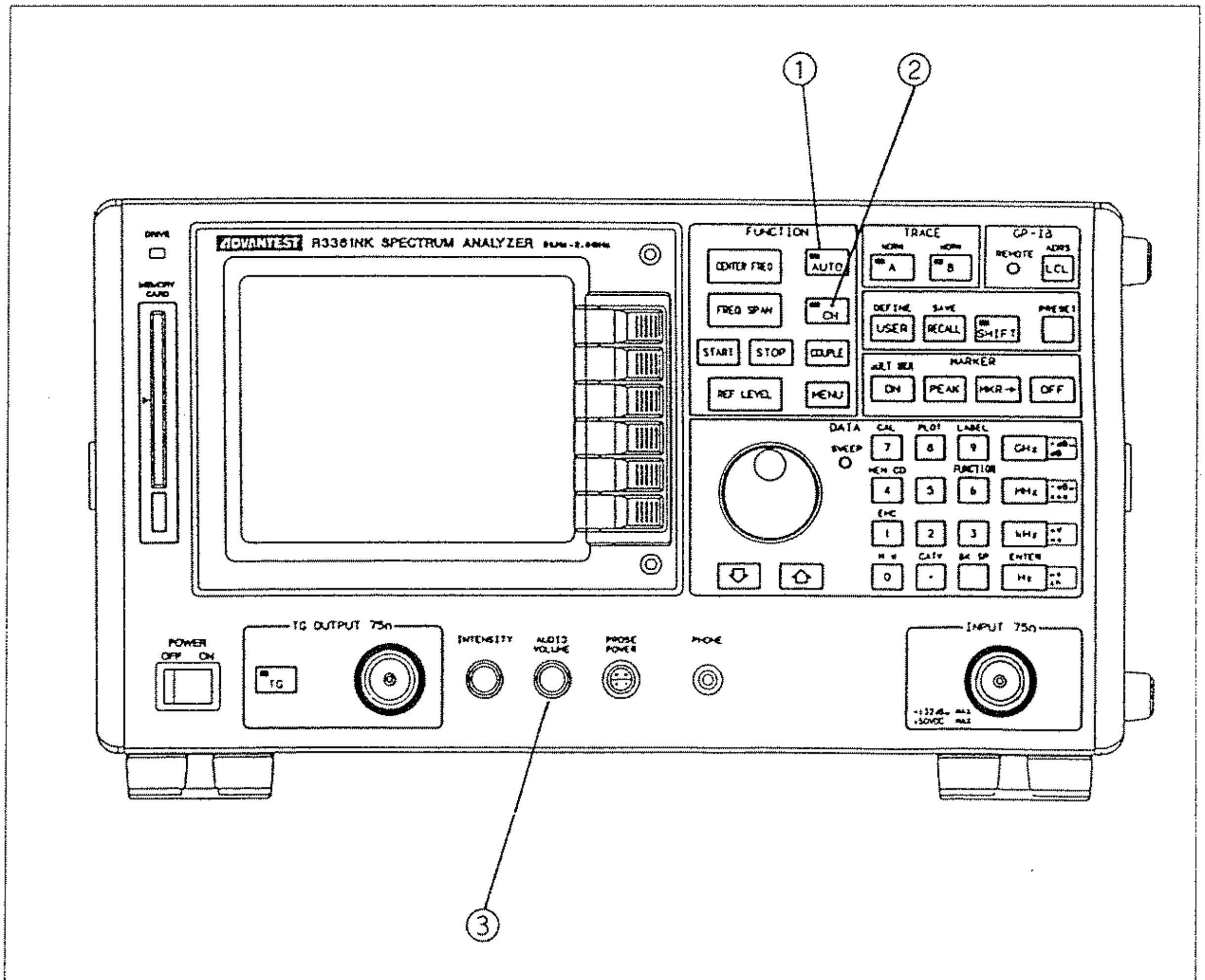


Figure 9 - 1 Front Panel (R3361NK/3361K)

9.3 Audio Monitor Function

In R3361NK/3361K, audio can be monitored by the built-in speaker. The volume is increased by turning the AUDIO VOLUME knob on the front panel clockwise and is decreased by turning it counterclockwise.

Audio output is available only when softkey menu SOUND ON/OFF is ON .

Refer to "(7) SOUND (audio monitor) Setting" in Subsection 4.1.6 "Menu" for the details on SOUND setting.

9.3.1 Using Audio Monitor Function

Operating Procedure:

(1) Set "SOUND" of the sift key menu to ON.
Select the volume or the demodulation mode as necessary.

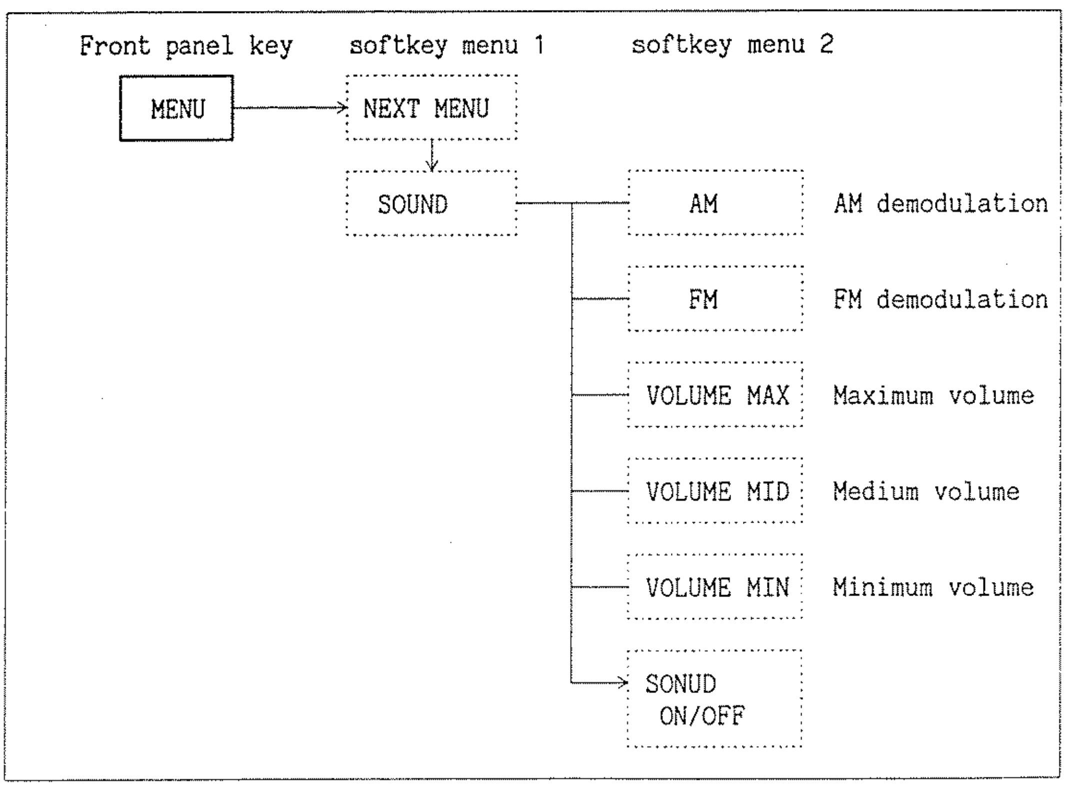


Figure 9 - 2 Menu Items of SOUND

(2) When one of marker on, manual sweep and zero span is selected in the state of SOUND ON, audio output becomes available.

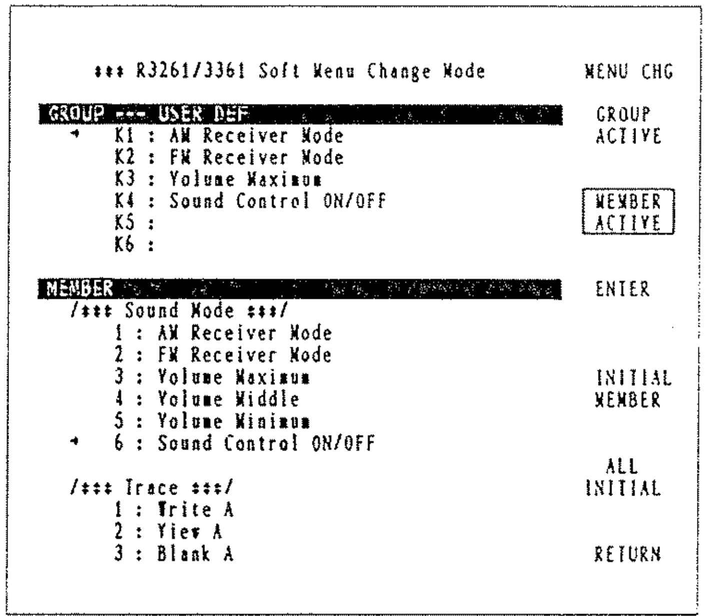
(3) Adjust the volume by turning the AUDIO VOLUME knob on the front panel.

9.3.2 Using User Define Function

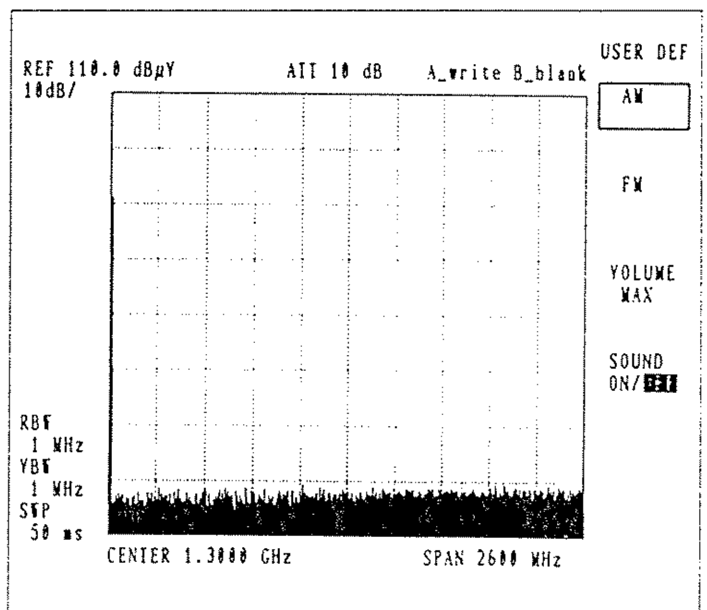
User Define function is useful for executing the audio monitor easily. Refer to "4.5 User Define Function" for the explanation of User Define function.

Operating Procedure:

① Press SHIFT and USER, then assign the sound menu to the user key by using the user define function.



② Pressing USER immediately calls the sound menu.



9.4 Channel Setup Function

9.4.1 Description of the Function

The channel of TV and CATV can be specified with this function.
The vision carrier of the each channel can be measured at the center in dispatch.
The measurement of the vision carrier and the sound carrier or also the measurements of the multi-channel are possible simultaneously.
The channels are available three type which are for Japan, USA and Europe.
The channels for other countries and the channels for the radio and ect can be defined arbitrary to the user table.
These channels can be selected by the softkey menu and can be easily specified.

9.4.2 Feature of the Channel of Each Country

(1) Japan : Frequency band width······6MHz
Vision carrier···········Start frequency 1.25MHz
Sound carrier ···········Vision carrier+4.5MHz

(2) USA : Frequency band width······6MHz
Vision carrier···········Start frequency 1.25MHz
Start frequency 1.00MHz
Sound carrier ···········Vision carrier+4.5MHz

(3) Europe: Frequency band width······6, 7 and 8MHz
Vision carrier···········Start frequency 1.25MHz
Sound carrier ···········Vision carrier+4.5MHz, 5.5MHz, 6.5MHz

In case of Europe, frequency band width is different in compliance with the cannel. Therefore, the positions of the each sound carrier are different.

9.4.3 Operation

(1) Setup for the input mode of the channel number.

[Operation]

Press the $\boxed{\text{CH}}$ button then LED in the key lights and R3361K becomes to the input mode of the channel number.

Press the $\boxed{\text{CH}}$ button again, then LED in the key lights off and the input mode of the channel number is released.

(2) Setup of the vision carrier

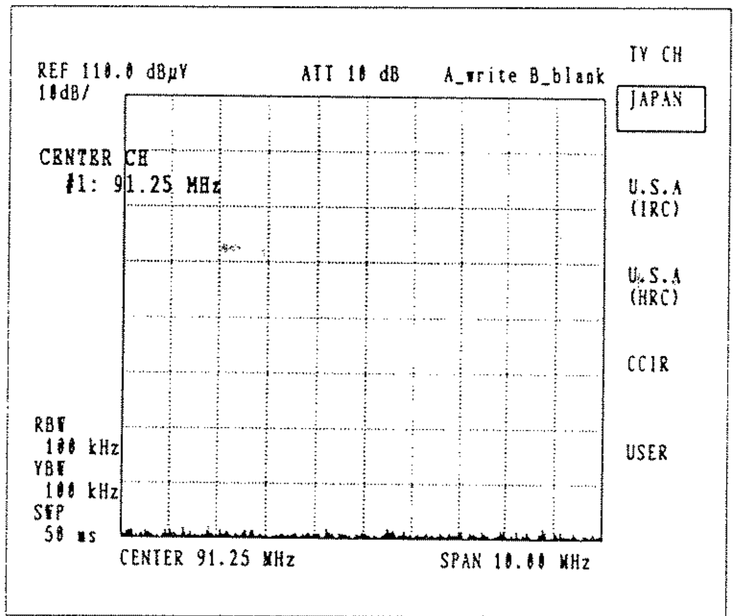
The center frequency is made the input vision carrier frequency of the channel number. The frequency span is not changed.

[Setup example] (Set the channel input mode beforehand.)

CRT display (in the active display area)

① Press CENTER FREQ .

```
CENTER CH
  #1: 91.25 MHz
   |      └──── Vision carrier
   └─────────── Channel
```

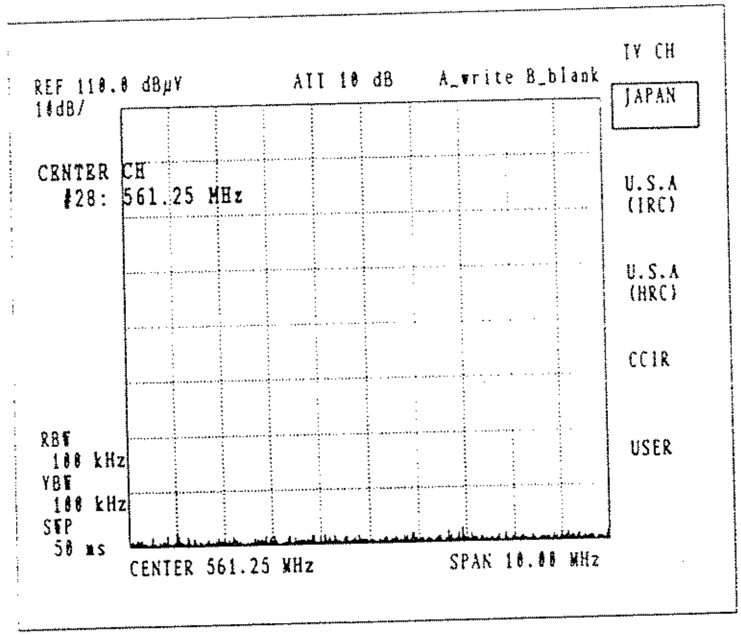


② Input the channel number by TEN KEY .

```
CENTER CH
  28
  └──────── Input of the channel
            number.
```

③ Press ENTER [Hz].

CENTER CH
#28: 561.25 MHz



The selection of CATV channel and UHF channel can be set by CATV [.].

Press CATV [.] before input of the channel number when CATV channel is specified.

In this case, "C" is displayed in the top of the channel number.

(3) Setup of the start frequency and the stop frequency

The start frequency is set lower limit value of frequency band of the input channel number and the stop is set upper limit value of frequency band of the input channel number.

[Setup example] (Set the channel input mode beforehand.)

CRT display (in the active display area)

① Press START .

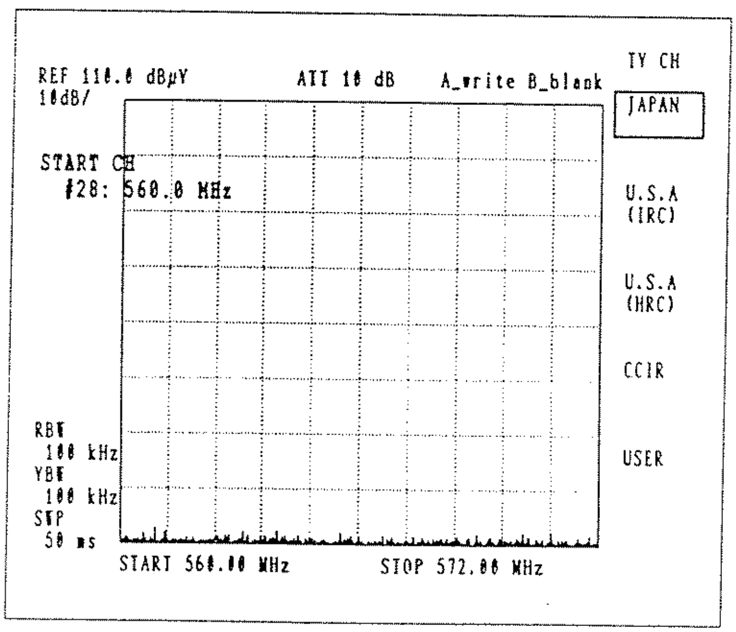
START CH
#1: 90.00 MHz
Lower limit of frequency band
Channel

② Input the channel number by TEN KEY .

START CH
28
Input of the channel number

③ Press ENTER Hz .

START CH
#28: 560.00 MHz



The selection of CATV channel can be set by CATV · , same as setup of the center channel.

(4) Setup for the corresponding frequency to the specified channel in a case it differs to the current specified value.

When the vision frequency (start and stop frequency) of the specified channel and the specified current center frequencys are different, indicate a message in the active area as fillows then it shows different specified value.

[Setup example]

CRT display (in the active display area)

① Press CENTER FREQ .

```
CENTER CH
  #1: Last Setup
   |        └── Message
   └─────────── Last channel
```

② Input the channel number by TEN KEY .

```
CENTER CH
  28
   └─────────── Input of the channel
                number
```

③ Press ENTER Hz .

```
CENTER CH
  #28: 561.25 MHz
```

(5) Setup for the channel by [↑], [↓] and data knob.

Setup for the channel by [↑], [↓] and data knob are made by increment and decrement of the one channel each.

For example, in case of Japan, following channel is specified as follows.

VHF 1ch → VHF 2ch → VHF 3ch → CATV 13ch → CATV 14ch → ··· → 62ch

In case of setup for the start and stop frequency, the channel can be changed automatically keeping on a relationship between start and stop frequency.

[Setup example] (Set the channel input mode beforehand.)

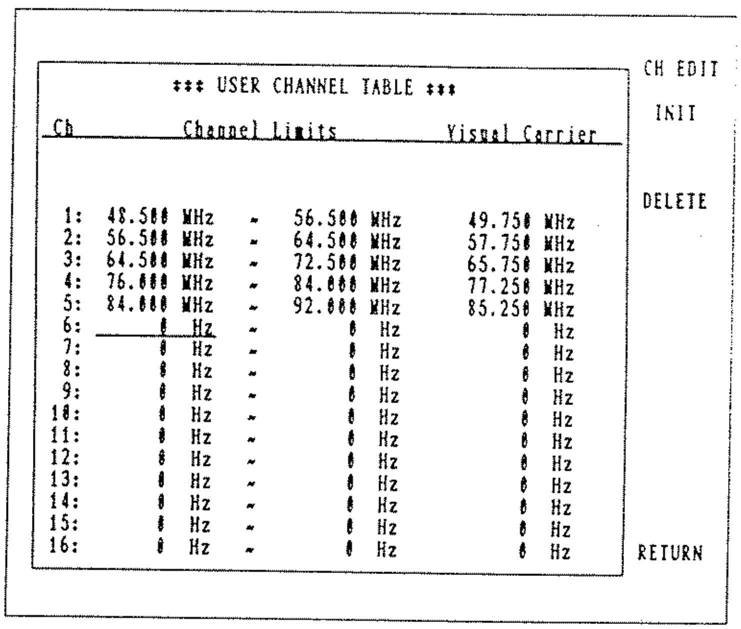
	Key operation	START CH	STOP CH
①	[START] [4] [Hz] (ENTER)	#4: 170.00 MHz Setup to 4 ch	#8: 198.00 MHz
②	[STOP] [5] [Hz] (ENTER)	#4: 170.00 MHz	#5: 182.00 MHz Setup to 5 ch
③	Press [START] and change the channel by [↑].	#5: 176.00 MHz Change to 5 ch	#5: 182.00 MHz No change
	START, STOP CH is change at only [↑].	#6: 182.00 MHz Change to 6 ch	#6: 188.00 MHz Change to 6 ch automatically

(6) Setup for user channel

User can arbitrarily define the maximum 99 channel numbers for the countries expect Japan, USA and Europe or FM and AM radio broadcast.
Editor is used for input data and the start and stop frequency and the vision carrier frequency can be input to each channel.
The input data is saved in the memory which is backed up by battery.

[Setup example]

① CH USER EDIT is pressed then following screen display appears and data of the maximum 99 channel number can be specified.


*** USER CHANNEL TABLE ***

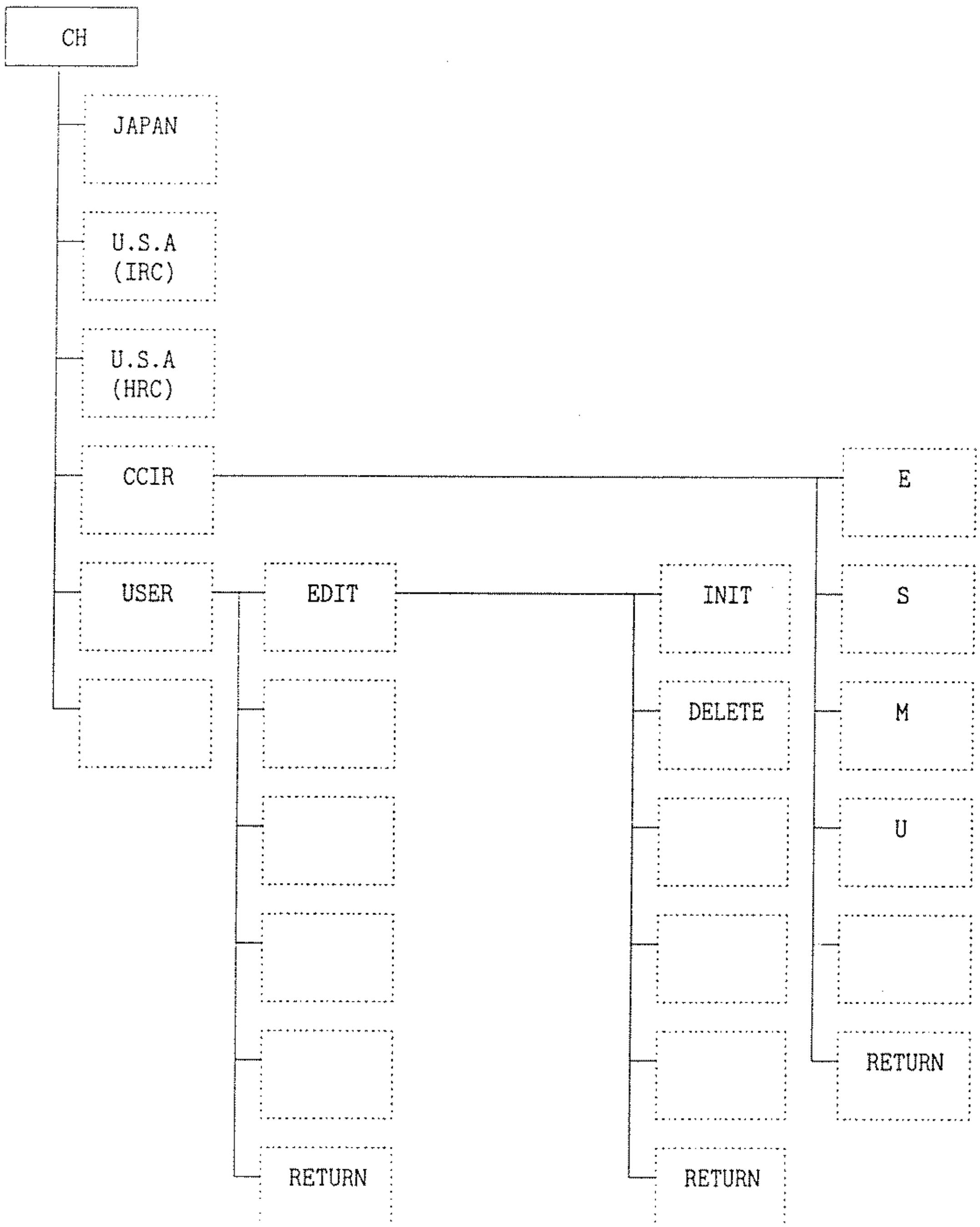
Ch	Channel Limits			Visual Carrier
1:	48.500 MHz	~	56.500 MHz	49.750 MHz
2:	56.500 MHz	~	64.500 MHz	57.750 MHz
3:	64.500 MHz	~	72.500 MHz	65.750 MHz
4:	76.000 MHz	~	84.000 MHz	77.250 MHz
5:	84.000 MHz	~	92.000 MHz	85.250 MHz
6:	0 Hz	~	0 Hz	0 Hz
7:	0 Hz	~	0 Hz	0 Hz
8:	0 Hz	~	0 Hz	0 Hz
9:	0 Hz	~	0 Hz	0 Hz
10:	0 Hz	~	0 Hz	0 Hz
11:	0 Hz	~	0 Hz	0 Hz
12:	0 Hz	~	0 Hz	0 Hz
13:	0 Hz	~	0 Hz	0 Hz
14:	0 Hz	~	0 Hz	0 Hz
15:	0 Hz	~	0 Hz	0 Hz
16:	0 Hz	~	0 Hz	0 Hz

② Input the data lower limit and upper limit value of the frequency range and the vision carrier frequency in sequence from the left.

Turn the knob when the channel is skipped.

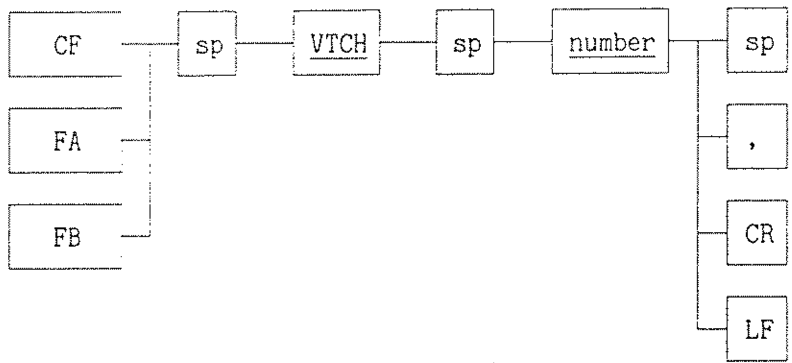
Press ↑ and ↓ key when cursor is moved.

9.4.4 List of Softkey Menu of the CH Key



9.4.5 GPIB Command

(1) Channel setup command(TVCH)



CF/FA/FB : Center/start/stop frequency
TVCH : Channel setup command
number : Channel number

1 ～99 → VHF, UHF channel
C1～C99 → CATV channel(Japan, USA)
E2～E12 → CATV channel(Europe)
S1～S3 → CATV channel(Europe)
M1～M10 → CATV channel(Europe)
U1～U31 → CATV channel(Europe)
0 → Channel input mode off

(a) Specify 8 channel to the center channel. (In case of internal controller)

```
OUTPUT 31;"CF TVCH 8"
```

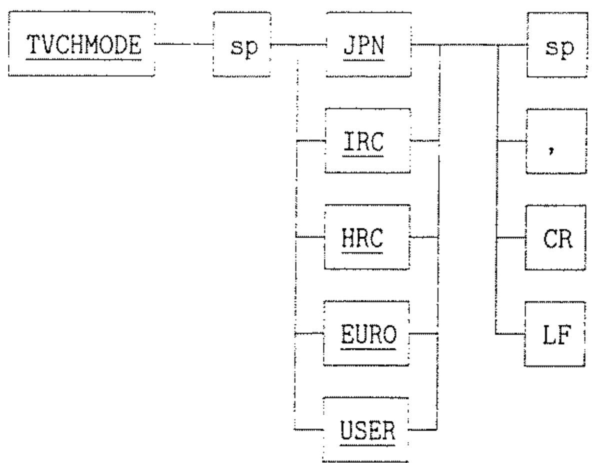
(b) Specify the center frequency to Europe CATV"U31" channel.

```
OUTPUT 31;"FA TVCH U31"
```

(c) Turn off channel input mode.

```
OUTPUT 31;"TVCH0"
```

(2) Channel selection command(TVCHMODE)



TVCHMODE: Channel selection command
JPN : Japan channel
IRC : USA channel(IRC)
HRC : USA channel(HRC)
EURO : Europe channel
USER : User channel

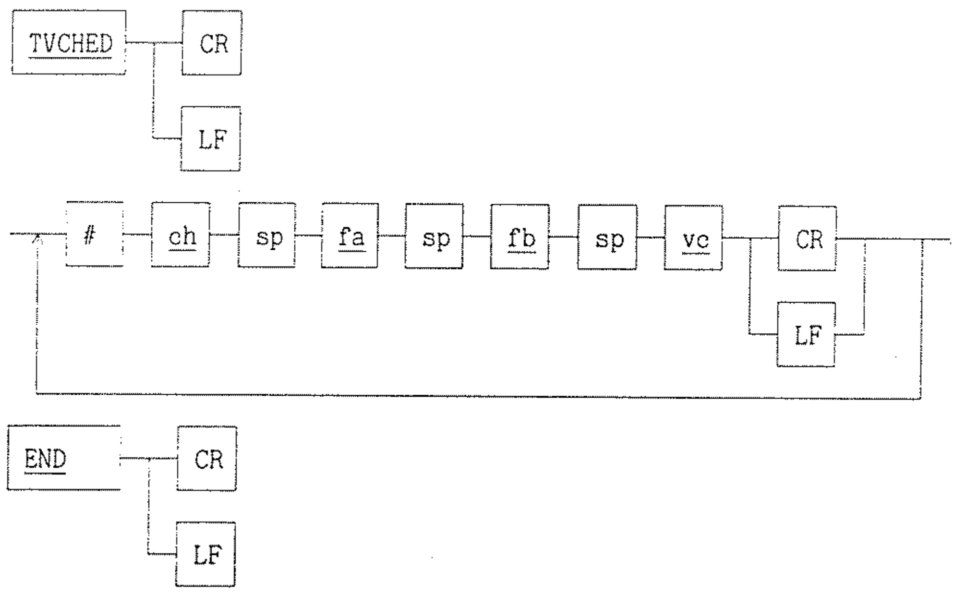
(a) Select Japan channel and specify 3 channel.

```
OUTPUT 31;"TVCHMODE JPN CF TVCH 3"
```

(b) Select Europe channel and specify M2 channel.

```
OUTPUT 31;"TVCHMODE EURO,FA TVCH M2"
```

(3) User channel setup command(TVCHED)



TVCHED: User channel setup command
ch : Channel number
fa : Lower limit value of the channel frequency range
fb : Upper limit value of the channel frequency range
vc : Vision carrier frequency
END : Data input end command

(a) Onput China channel

```
OUTPUT 31;"TVCHED"
OUTPUT 31;"#1 48.5MZ 56.5MZ 49.75MZ"      ! 1 channel
OUTPUT 31;"#2 56.5MZ 64.5MZ 57.75MZ"      ! 2 channel
OUTPUT 31;"#3 64.5MZ 72.5MZ 65.75MZ"      ! 3 channel
OUTPUT 31;"#4 76MZ 84MZ 77.25MZ"          ! 4 channel
OUTPUT 31;"#5 84MZ 92MZ 85.25MZ"          ! 5 channel
OUTPUT 31;"END"
```

(b) Input only vision carrier frequency of italy channel

```
OUTPUT 31;"TVCHED"
OUTPUT 31;"#10 OMZ OMZ 53.75MZ"           ! A channel
OUTPUT 31;"#11 OMZ OMZ 62.25MZ"           ! B channel
OUTPUT 31;"#12 OMZ OMZ 82.25MZ"           ! C channel
OUTPUT 31;"#13 OMZ OMZ 175.25MZ"          ! D channel
OUTPUT 31;"#14 OMZ OMZ 183.75MZ"          ! E channel
OUTPUT 31;"#15 OMZ OMZ 192.25MZ"          ! F channel
OUTPUT 31;"#16 OMZ OMZ 201.25MZ"          ! G channel
OUTPUT 31;"#17 OMZ OMZ 210.25MZ"          ! H channel
OUTPUT 31;"#18 OMZ OMZ 217.25MZ"          ! H1 channel
OUTPUT 31;"#19 OMZ OMZ 224.25MZ"          ! H2 channel
OUTPUT 31;"END"
```

9.5 AUTO Function

AUTO key was added so that the program in the memory card can be run easily.

When AUTO is pressed after turning on the spectrum analyzer, the program which has the file name "AUTOSTART" in the memory card is loaded and executed automatically.

Operating Procedure:

① Insert the memory card containing programs to the memory card insertion part correctly.

② Pressing AUTO changes the mode from the measurement mode to the controller mode, loads the program from the memory card and executes it. If the program has already existed in the internal memory of the analyzer, the program loading from the memory card is omitted.

If you want to load a program from another card after a program is executed from a card, once turn off the power.

Note: When the memory card is not inserted or the program to be loaded does not exist in the card, the process is stopped in the same state when the mode was changed to the controller mode.

③ Press LCL to stop the program in the midst of the execution.

④ After a program is executed, if you want to execute the program again, then press RUN .

⑤ After the program execution, if you want to return the mode from the controller mode to the measurement mode, then press EXIT .

10. SPECIFICATIONS

10.1 R3261C Specifications

(1) Frequency Specifications

Measurable bandwidth : 9kHz to 2.6GHz

Center frequency setting increment
: 1Hz

Center frequency indication accuracy
: ±(3% of the span + center frequency x reference oscillator accuracy + 20Hz)
(span _ 2MHz)
±(2% of the span + center frequency x reference oscillator accuracy + 50kHz)
(span 2MHz)

Reference oscillator : Internal or external input (10MHz)

Internal reference oscillator accuracy
Aging : $\pm 2 \times 10^{-8}$ per day
$\pm 1 \times 10^{-7}$ per year
Temperature stability : $\pm 5 \times 10^{-8}$ (from 0 to +50°C, +25°C as a reference)

Frequency span
LIN mode : 1kHz to 2.6GHz, and 0
LOG mode : 1, 2, or 3 decades of span can be selected within the range from 10kHz to 1000MHz.

Frequency span accuracy
LIN mode : ±3% of the span (span 2MHz)
±5% of the span (span _ 2MHz)

Frequency stability
Residual FM : 50kHz p-p or less (span 10MHz)
2kHz p-p or less (10MHz _ span 2MHz)
20Hz p-p or less (span _ 2MHz)
Frequency drift : 300Hz/min. or less (span _ 2MHz, at a constant temperature after an hour of warming up)

Side band noise : -105dBc/Hz (20kHz offset)

Resolution
3dB bandwidth : 30Hz to 1MHz, switched at 1 to 3 steps

6dB bandwidth : 200Hz, 9kHz, 120kHz
Selectivity : 15:1 (60dB : 3dB)
Bandwidth accuracy : ±20%

Marker accuracy
Normal mode : Center frequency indication accuracy + span accuracy
Counter mode : Indicated frequency x reference oscillator accuracy ±1 count (SPAN 100MHz)

(2) Amplitude Specifications

Amplitude measurement range
: −130dBm to +25dBm

Screen display range
LOG mode : 120dB (10dB/div)
: 80dB (10dB/div)
: 50dB (5dB/div)
: 20dB (2dB/div)
: 10dB (1dB/div)
LIN mode : 10div
QP mode : 80dB (10dB/div)
Provided the measurement range is 70dB

Linearity display
LOG mode : ±2.0dB/110dB, ±1.5dB/70dB, ±1.0dB/10dB, ±0.2dB/1dB
LIN mode : ±5% of the fullscale
QP mode : ±2.0dB/70dB, ±1.0dB/40dB

Reference level indication range
: −109.9dBm to +40.0dBm
0.715μV to 22.4V

Reference level accuracy : ±0.3dB 0 to −50dBm (after automatic calibration)
±0.7dB +20 to −70dBm (after automatic calibration)

Dynamic range
Average noise level : −121dBm + 1.55f(GHz)dB
(Resolution bandwidth 300Hz, video bandwidth 1Hz, input attenuator 0dB, frequency 1MHz or more)
Secondary, tertiary distortion
: _ −70dB −30dBm input
(Input attenuator 0dB, frequency 10MHz or more)

Frequency response : ±0.5dB 100kHz to 2GHz
±1.0dB 9kHz to 2.6GHz
(LOG mode, input attenuator 10dB, 20 to 30°C)

Residual response : ≤ -100dBm (Input attenuator 0dB, 50Ω terminator, frequency 500kHz or more)

Resolution bandwidth switching accuracy:
: ±0.3dB (after automatic calibration)

Video filter : 1Hz to 1MHz (switched 1 to 10 steps)

(3) Sweep Specifications

Sweep time : 30msec to 1000sec and Manual sweeping

Sweep time accuracy : ≤ 3%

Trigger mode : FREE RUN, LINE, VIDEO, EXT, TV-V, SINGLE

(4) Input Specifications

Input impedance : Approx. 50Ω
VSWR ≤ 1.5 (100kHz ≤ f ≤ 2GHz)
VSWR ≤ 2.0 (9kHz ≤ f ≤ 2.6GHz)
(Input attenuator ≥ 10dB)

Input connector : N connector

Maximum input level : +25dBm (input attenuator ≥ 30dB)
±50VDC max

Input attenuator : 0 to 50dB (10dB steps)

Input attenuator switching accuracy
: ±1.0dB (≤ 2.0GHz)
±1.5dB (≤ 2.6GHz)
(Input attenuator 10dB standard)

Detection mode : NORMAL, POSI, NEGA, SAMPLE

(5) Output Specifications

External memory function : IC memory card

Video output : Approx. 1Vp-p, approx 75Ω, composite

Sound monitor output : The AM and FM sound can be monitored with an approximately 8Ω earphone.

Power supply for probes : ±15V, 4-pin connector

Recorder output	: X axis approx. -5 to +5V, output impedance approx. 10kΩ Y axis approx. 0 to +4V, output impedance approx. 220Ω
GPIB data output/ Remote control	: The built-in GPIB interface allows data output and remote control.
Direct plot	: Also, the built-in GPIB interface allows an output of on-screen data to the R9833 plotter to have a hardcopy.
Printer output	: The built-in GPIB interface allows HP2225AJ to output a hard copy of on-screen data.

(6) Indication Specifications

Indicated items	: Waveforms, setting conditions, grid, label
CRT display unit	: 5.5 inch
Trace	: Two screens of A and B
WRITE	: Signal response from the analyzer is indicated at every sweeping.
VIEW	: The WRITE waveform contained in the memory, or other contents in the memory are displayed.
MAX HOLD	: Indication of the maximum signal level of repeat sweeping
AVG	: Indication of the average of repeat sweeping

(7) Other functions

Occupied bandwidth measurement/ Adjacent channel leakage power measurement

Multi-marker measurement

(8) General Specifications

Using ambient condition	: 0 to 50°C 85%RH or less
Storage temperature range	: -20 to +60°C
Power supply	: Line voltage range 90 to 132VAC or 198 to 250VAC is automatically selected internally. 48 to 66Hz
Power consumption	: 220VA or less
Dimensions	: Approx. 330(W) x 177(H) x 450(D) mm
Mass	: Approx. 15kg

10.2 R3261CN Specifications

(1) Frequency Specifications

Measurable bandwidth : 9kHz to 2.6GHz

Center frequency setting increment
: 1Hz

Center frequency indication accuracy
: ±(3% of the span + center frequency x reference oscillator accuracy + 20Hz)
(span _ 2MHz)
±(2% of the span + center frequency x reference oscillator accuracy + 50kHz)
(span 2MHz)

Reference oscillator : Internal or external input (10MHz)

Internal reference oscillator accuracy
Aging : $\pm 2 \times 10^{-8}$ per day
$\pm 1 \times 10^{-7}$ per year
Temperature stability : $\pm 5 \times 10^{-8}$ (from 0 to $+50^{\circ}C$, $+25^{\circ}C$ as a reference)

Frequency span
LIN mode : 1kHz to 2.6GHz, and 0
LOG mode : 1, 2, or 3 decades of span can be selected within the range from 10kHz to 1000MHz.

Frequency span accuracy
LIN mode : ±3% of the span (span 2MHz)
±5% of the span (span _ 2MHz)

Frequency stability
Residual FM : 50kHz p-p or less (span 10MHz)
2kHz p-p or less (10MHz _ span 2MHz)
20Hz p-p or less (span _ 2MHz)
Frequency drift : 300Hz/min. or less (span _ 2MHz, at a constant temperature after an hour of warming up)

Side band noise : -105dBc/Hz (20kHz offset)

Resolution
3dB bandwidth : 30Hz to 1MHz, switched at 1 to 3 steps

6dB bandwidth : 200Hz, 9kHz, 120kHz
Selectivity : 15: 1 (60dB : 3dB)
Bandwidth accuracy : ±20%

Marker accuracy	
Normal mode	: Center frequency indication accuracy + span accuracy
Counter mode	: Indicated frequency x reference oscillator accuracy ±1 count (SPAN 100MHz)

(2) Amplitude Specifications

Amplitude measurement range	
	: -19dBμ to +132dBμ
Screen display range	
LOG mode	: 120dB (10dB/div)
	: 80dB (10dB/div)
	: 50dB (5dB/div)
	: 20dB (2dB/div)
	: 10dB (1dB/div)
LIN mode	: 10div
QP mode	: 80dB (10dB/div) Provided the measurement range is 70dB
Linearity display	
LOG mode	: ±2.0dB/110dB, ±1.5dB/70dB, ±1.0dB/10dB, ±0.2dB/1dB
LIN mode	: ±5% of the fullscale
QP mode	: ±2.0dB/70dB, ±1.0dB/40dB
Reference level indication range	
	: +0.1dBμ to +150dBμ 1.01μV to 31.6V
Reference level accuracy	: ±0.3dB +110 to +60dBμ (after automatic calibration) ±0.7dB +130 to +40dBμ (after automatic calibration)
Dynamic range	
Average noise level	: -10dBμ + 1.55f(GHz)dB (Resolution bandwidth 300Hz, video bandwidth 1Hz, input attenuator 0dB, frequency 1MHz or more)
Secondary, tertiary distortion	
	: _ -70dB -30dBm input (Input attenuator 0dB, frequency 10MHz or more)
Frequency response	: ±0.5dB 100kHz to 2GHz ±1.5dB 9kHz to 2.6GHz (LOG mode, input attenuator 10dB, 20 to 30^{o}C)
Residual response	: _ +11dBμ (Input attenuator 0dB, 75Ω terminator, frequency 500kHz or more)

Resolution bandwidth switching accuracy:
: ±0.3dB (after automatic calibration)

Video filter : 1Hz to 1MHz (switched 1 to 10 steps)

(3) Sweep Specifications

Sweep time : 30msec to 1000sec and Manual sweeping

Sweep time accuracy : _ 3%

Trigger mode : FREE RUN, LINE, VIDEO, EXT, TV-V, SINGLE

(4) Input Specifications

Input impedance : Approx. 75Ω
VSWR _ 1.5 (100kHz _ f _ 2GHz)
VSWR _ 2.0 (9kHz _ f _ 2.6GHz)
(Input attenuator _ 10dB)

Input connector : N connector

Maximum input level : +132dBμ (input attenuator _ 30dB)
±50VDC max

Input attenuator : 0 to 50dB (10dB steps)

Input attenuator switching accuracy
: ±1.0dB (_2.0GHz)
±1.5dB (_2.6GHz)
(Input attenuator 10dB standard)

Detection mode : NORMAL, POSI, NEGA, SAMPLE

(5) Output Specifications

External memory function : IC memory card

Video output : Approx. 1Vp-p, approx 75Ω, composite

Sound monitor output : The AM and FM sound can be monitored with an approximately 8Ω earphone.

Power supply for probes : ±15V, 4-pin connector

Recorder output : X axis approx. -5 to +5V, output impedance approx. 10kΩ
Y axis approx. 0 to +4V, output impedance approx. 220Ω

GPIB data output/ Remote control	: The built-in GPIB interface allows data output and remote control.
Direct plot	: Also, the built-in GPIB interface allows an output of on-screen data to the R9833 plotter to have a hardcopy.
Printer output	: The built-in GPIB interface allows HP2225AJ to output a hard copy of on-screen data.

(6) Indication Specifications

Indicated items	: Waveforms, setting conditions, grid, label
CRT display unit	: 5.5 inch
Trace	: Two screens of A and B
WRITE	: Signal response from the analyzer is indicated at every sweeping.
VIEW	: The WRITE waveform contained in the memory, or other contents in the memory are displayed.
MAX HOLD	: Indication of the maximum signal level of repeat sweeping
AVG	: Indication of the average of repeat sweeping

(7) Other functions

Occupied bandwidth measurement/ Adjacent channel leakage power measurement

Multi-marker measurement

(8) General Specifications

Using ambient condition	: 0 to 50°C 85%RH or less
Storage temperature range	: -20 to +60°C
Power supply	: Line voltage range 90 to 132VAC or 198 to 250VAC is automatically selected internally. 48 to 66Hz
Power consumption	: 220VA or less
Dimensions	: Approx. 330(W) x 177(H) x 450(D) mm
Mass	: Approx. 15kg

10.3 R3261D Specifications

(1) Frequency Specifications

Measurable bandwidth : 9kHz to 3.6GHz

Center frequency setting increment
: 1Hz

Center frequency indication accuracy
: ±(3% of the span + center frequency x reference oscillator accuracy + 20Hz) (span _ 2MHz)
±(2% of the span + center frequency x reference oscillator accuracy + 50kHz) (span 2MHz)

Reference oscillator : Internal or external input (10Hz)

Internal reference oscillator accuracy
Aging : $\pm 2 \times 10^{-8}$ per day
$\pm 1 \times 10^{-7}$ per year
Temperature stability : $\pm 5 \times 10^{-8}$ (from 0 to +50°C, +25°C as a reference)

Frequency span
LIN mode : 1kHz to 3.6GHz and 0
LOG mode : 1, 2, or 3 decades of span can be selected within the range from 10kHz to 1000MHz.

Frequency span accuracy
LIN mode : ±3% of the span (span 2MHz)
±5% of the span (span _ 2MHz)

Frequency stability
Residual FM : 50kHz p-p or less (span 10MHz)
2kHz p-p or less (10MHz _ span 2MHz)
20Hz p-p or less (span _ 2MHz)
Frequency drift : 300Hz/min. or less (span _ 2MHz, at a constant temperature after an hour of warming up)

Side band noise : _ -105dBc/Hz f _ 3.0GHz
_ -101dBc/Hz f _ 3.6GHz
(20kHz offset)

Resolution
3dB bandwidth : 30Hz to 1MHz, switched 1 to 3 steps
6dB bandwidth : 200Hz, 9kHz, 120kHz
Selectivity : 15:1 (60dB : 3dB)
Bandwidth accuracy : ±20%

Marker accuracy
- Normal mode : Center frequency indication accuracy + span accuracy
- Counter mode : Indicated frequency x reference oscillator accuracy ±1 count (SPAN 100MHz)

(2) Amplitude Specifications

Amplitude measurement range
: -130dBm to +25dBm

Screen display range
- LOG mode : 120dB (10dB/div)
  : 80dB (10dB/div)
  : 50dB (5dB/div)
  : 20dB (2dB/div)
  : 10dB (1dB/div)
- LIN mode : 10div
- QP mode : 80dB (10dB/div)
  Provided the measurement range is 70dB

Linearity display
- LOG mode : ±2.0dB/110dB, ±1.5dB/70dB, ±1.0dB/10dB, ±0.2dB/1dB
- LIN mode : ±5% of the fullscale
- QP mode : ±2.0dB/70dB, ±1.0dB/40dB

Reference level indication range
: -109.9dBm to +40.0dBm
0.715μV to 22.4V

Reference level accuracy : ±0.3dB 0 to -50dBm (after automatic calibration)
±0.7dB +20 to -70dBm (after automatic calibration)

Dynamic range
- Average noise level : -121dBm + 1.55f(GHz)dB
  (Resolution bandwidth 300Hz, video bandwidth 1Hz, input attenuator 0dB, frequency 1MHz or more)
- Secondary, tertiary distortion
  : ≤ -70dB -30dBm input
  (Input attenuator 0dB, frequency 10MHz or more)
- Frequency response : ±0.5dB 100kHz to 2GHz
  ±1.0dB 9kHz to 3.6GHz
  (LOG mode, input attenuator 10dB, 20 to 30°C)
- Residual response : ≤ -100dBm (Input attenuator 0dB, 50Ω terminator, frequency 500kHz or more)

Resolution bandwidth switching accuracy
: ±0.3dB (after automatic calibration)

Video filter : 1Hz to 1MHz (switched 1 to 10 steps)

(3) Sweep Specifications

Sweep time : 30msec to 1000sec and Manual sweeping

Sweep time accuracy : _ 3%

Trigger mode : FREE RUN, LINE, VIDEO, EXT, TV-V, SINGLE

(4) Input Specifications

Input impedance : Approx. 50Ω
VSWR _ 1.5 (100kHz _ f _ 2GHz)
VSWR _ 2.0 (9kHz _ f _ 3.6GHz)
(Input attenuator _ 10dB)

Input connector : N connector

Maximum input level : +25dBm (input attenuator _ 30dB)
±50VDC max

Input attenuator : 0 to 50dB (10dB steps)

Input attenuator switching accuracy
: ±1.0dB (_ 2.0GHz)
±1.5dB (_ 3.6GHz)
(Input attenuator 10dB standard)

Detection mode : NORMAL, POSI, NEGA, SAMPLE

(5) Output Specifications

External memory function : IC memory card

Video output : Approx. 1Vp-p, approx 75Ω, composite

Sound monitor output : The AM and FM sound can be monitored with an approximately 8Ω earphone.

Power supply for probes : ±15V, 4-pin connector

Recorder output : X axis approx. -5 to +5V, output impedance approx. 10kΩ
Y axis approx. 0 to +4V, output impedance approx. 220Ω

GPIB data output/ Remote control	: The built-in GPIB interface allows data output and remote control.
Direct plot	: Also, the built-in GPIB interface allows an output of on-screen data to the R9833 plotter to have a hardcopy.
Printer output	: The built-in GPIB interface allows HP2225AJ to output a hard copy of on-screen data.

(6) Indication Specifications

Indicated items	: Waveforms, setting conditions, grid, label
CRT display unit	: 5.5 inch
Trace	: Two screens of A and B
WRITE	: Signal response from the analyzer is indicated at every sweeping.
VIEW	: The WRITE waveform contained in the memory, or other contents in the memory are displayed.
MAX HOLD	: Indication of the maximum signal level of repeat sweeping
AVG	: Indication of the average of repeat sweeping

(7) Other functions

Occupied bandwidth measurement/ Adjacent channel leakage power measurement

Multi-marker measurement

(8) General Specifications

Using ambient condition	: 0 to 50°C 85%RH or less
Storage temperature range	: -20 to +60°C
Power supply	: Line voltage range 90 to 132VAC or 198 to 250VAC is automatically selected internally. 48 to 66Hz
Power consumption	: 220VA or less
Dimensions	: Approx. 330(W) x 177(H) x 450(D) mm
Mass	: Approx. 15kg

10.4 R3361C Specifications

(1) Frequency Specifications

Measurable bandwidth : 9kHz to 2.6GHz

Center frequency setting increment
: 1Hz

Center frequency indication accuracy
: ±(3% of the span + center frequency x reference oscillator accuracy + 20Hz)
(span _ 2MHz)
±(2% of the span + center frequency x reference oscillator accuracy + 50kHz)
(span 2MHz)

Reference oscillator : Internal or external input (10MHz)

Internal reference oscillator accuracy
Aging : $\pm 2 \times 10^{-8}$ per day
$\pm 1 \times 10^{-7}$ per year
Temperature stability : $\pm 5 \times 10^{-8}$ (from 0 to +50°C, +25°C as a reference)

Frequency span
LIN mode : 1kHz to 2.6GHz and 0
LOG mode : 1, 2, or 3 decades of span can be selected within the range from 10kHz to 1000MHz.

Frequency span accuracy
LIN mode : ±3% of the span (span 2MHz)
±5% of the span (span _ 2MHz)

Frequency stability
Residual FM : 50kHz p-p or less (span 10MHz)
2kHz p-p or less (10MHz _ span 2MHz)
20Hz p-p or less (span _ 2MHz)
Frequency drift : 300Hz/min. or less (span _ 2MHz, at a constant temperature after an hour of warming up)

Side band noise : -105dBc/Hz (20kHz offset)

Resolution
3dB bandwidth : 30Hz to 1MHz, switched 1 to 3 steps
6dB bandwidth : 200Hz, 9kHz, 120kHz
Selectivity : 15: 1 (60dB : 3dB)
Bandwidth accuracy : ±20%

Marker accuracy
Normal mode : Center frequency indication accuracy + span accuracy
Counter mode : Indicated frequency x reference oscillator accuracy ±1 count (SPAN   100MHz)
(Excepting TG mode)

(2) Amplitude Specifications

Amplitude measurement range
: -130dBm to +25dBm

Screen display range
LOG mode : 120dB (10dB/div)
: 80dB (10dB/div)
: 50dB (5dB/div)
: 20dB (2dB/div)
: 10dB (1dB/div)
LIN mode : 10div
QP mode : 80dB (10dB/div)
Provided the measurement range is 70dB

Linearity display
LOG mode : ±2.0dB/110dB, ±1.5dB/70dB, ±1.0dB/10dB, ±0.2dB/1dB
LIN mode : ±5% of the fullscale
QP mode : ±2.0dB/70dB, ±1.0dB/40dB

Reference level indication range
: -109.9dBm to +40.0dBm
0.715μV to 22.4V

Reference level accuracy : ±0.3dB   0 to -50dBm (after automatic calibration)
±0.7dB   +20 to -70dBm (after automatic calibration)

Dynamic range
Average noise level : -121dBm + 1.55f(GHz)dB
(Resolution bandwidth 300Hz, video bandwidth 1Hz, input attenuator 0dB, frequency 1MHz or more)
Secondary, tertiary distortion
: ≤ -70dB   -30dBm input
(Input attenuator 0dB, frequency 10MHz or more)
Frequency response : ±0.5dB   100kHz to 2GHz
±1.0dB   9kHz to 2.6GHz
(LOG mode, input attenuator 10dB, 20 to 30°C)
Residual response : ≤ -100dBm (Input attenuator 0dB, 50Ω terminator, frequency 500kHz or more)

Resolution bandwidth switching accuracy
: ±0.3dB (after automatic calibration)

Video filter : 1Hz to 1MHz (switched 1 to 10 steps)

(3) Sweep Specifications

Sweep time : 30msec to 1000sec and Manual sweeping

Sweep time accuracy : _ 3%

Trigger mode : FREE RUN, LINE, VIDEO, EXT, TV-V, SINGLE

(4) Input Specifications

Input impedance : Approx. 50Ω
VSWR _ 1.5 (100kHz _ f _ 2GHz)
VSWR _ 2.0 (9kHz _ f _ 2.6GHz)
(Input attenuator _ 10dB)

Input connector : N connector

Maximum input level : +25dBm (input attenuator _ 30dB)
±50VDC max

Input attenuator : 0 to 50dB (10dB steps)

Input attenuator switching accuracy
: ±1.0dB (_ 2.0GHz)
±1.5dB (_ 2.6GHz)
(Input attenuator 10dB standard)

Detection mode : NORMAL, POSI, NEGA, SAMPLE

(5) Tracking generator specifications

Frequency range : 9kHz to 2.6GHz

Output level range : 0dBm to -50dBm Setting can be done in steps of 1dB.

Output level accuracy : ±0.5dB (30MHz, -10dBm, +20 to +30°C)

Output level flatness : ±0.7dB (100kHz to 1.0GHz)
±1.5dB (9kHz to 2.6GHz)
(-10dBm output)

Output level switching accuracy
: ±1.0dB (100kHz to 1.0GHz)
±2.0dB (9kHz to 2.6GHz)
(-10dBm reference)

Output spuriousness : Harmonics spurious level ≤ -20dB
Non-harmonics spurious level ≤ -30dB
(Output level 0dBm)

TG leakage : ≤ -110dBm

Output impedance : Approx. 50Ω

Output VSWR : ≤ 1.5 (100kHz to 2.0GHz)
≤ 2.0 (9kHz to 2.6GHz)
(At -10dBm output)

Minimum resolution bandwidth
: 300Hz

Output connector : N-connector

(6) Output Specifications

External memory function: IC memory card

Video output : Approx. 1Vp-p, approx. 75Ω, composite

Sound monitor output : The AM and FM sound can be monitored with an approximately 8Ω earphone.

Power supply for probes : ±15V, 4-pin connector

Recorder output : X axis approx. -5 to +5V, output impedance approx. 10kΩ
Y axis approx. 0 to +4V, output impedance approx. 220Ω

GPIB data output/ Remote control : The built-in GPIB interface allows data output and remote control.

Direct plot : Also, the built-in GPIB interface allows an output of on-screen data to the R9833 plotter to have a hardcopy.

Printer output : The built-in GPIB interface allows HP2225AJ to output a hard copy of on-screen data.

(7) Indication Specifications

Indicated items	: Waveforms, setting conditions, grid, label
CRT display unit	: 5.5 inch
Trace	: Two screens of A and B
WRITE	: Signal response from the analyzer is indicated at every sweeping.
VIEW	: The WRITE waveform contained in the memory, or other contents in the memory are displayed.
MAX HOLD	: Indication of maximum signal level during repeated sweeping
AVG	: Indication of average signal level during repeated sweeping

(8) Other functions

Occupied bandwidth measurement/ Adjacent channel leakage power measurement

Multi-marker measurement

(9) General Specifications

Using ambient condition	: 0 to 50°C 85%RH or less
Storage temperature range	: -20 to +60°C
Power supply	: Line voltage range 90 to 132VAC or 198 to 250VAC is automatically selected internally. 48 to 66Hz
Power consumption	: 220VA or less
Dimensions	: Approx. 330(W) x 177(H) x 450(D) mm
Mass	: Approx. 17kg

10.5 R3361CN Specifications

(1) Frequency Specifications

Measurable bandwidth	: 9kHz to 2.6GHz
Center frequency setting increment	: 1Hz
Center frequency indication accuracy	: ±(3% of the span + center frequency x reference oscillator accuracy + 20Hz) (span _ 2MHz) ±(2% of the span + center frequency x reference oscillator accuracy + 50kHz) (span 2MHz)
Reference oscillator	: Internal or external input (10MHz)
Internal reference oscillator accuracy	
Aging	: $\pm 2 \times 10^{-8}$ per day $\pm 1 \times 10^{-7}$ per year
Temperature stability	: $\pm 5 \times 10^{-8}$ (from 0 to +50°C, +25°C as a reference)
Frequency span	
LIN mode	: 1kHz to 2.6GHz and 0
LOG mode	: 1, 2, or 3 decades of span can be selected within the range from 10kHz to 1000MHz.
Frequency span accuracy	
LIN mode	: ±3% of the span (span 2MHz) ±5% of the span (span _ 2MHz)
Frequency stability	
Residual FM	: 50kHz p-p or less (span 10MHz) 2kHz p-p or less (10MHz _ span 2MHz) 20Hz p-p or less (span _ 2MHz)
Frequency drift	: 300Hz/min. or less (span _ 2MHz, at a constant temperature after an hour of warming up)
Side band noise	: -105dBc/Hz (20kHz offset)
Resolution	
3dB bandwidth	: 30Hz to 1MHz, switched 1 to 3 steps
6dB bandwidth	: 200Hz, 9kHz, 120kHz
Selectivity	: 15: 1 (60dB : 3dB)
Bandwidth accuracy	: ±20%

Marker accuracy

Normal mode : Center frequency indication accuracy + span accuracy

Counter mode : Indicated frequency x reference oscillator accuracy ±1 count (SPAN 100MHz) (Excepting TG mode)

(2) Amplitude Specifications

Amplitude measurement range
: -19dBμ to +132dBμ

Screen display range

LOG mode
: 120dB (10dB/div)
: 80dB (10dB/div)
: 50dB (5dB/div)
: 20dB (2dB/div)
: 10dB (1dB/div)

LIN mode : 10div

QP mode : 80dB (10dB/div)
Provided the measurement range is 70dB

Linearity display

LOG mode : ±2.0dB/110dB, ±1.5dB/70dB, ±1.0dB/10dB, ±0.2dB/1dB

LIN mode : ±5% of the fullscale

QP mode : ±2.0dB/70dB, ±1.0dB/40dB

Reference level indication range
: +0.1dBμ to +150dBμ
1.01μV to 31.6V

Reference level accuracy : ±0.3dB +110 to +60dBμ (after automatic calibration)
±0.7dB +130 to +40dBμ (after automatic calibration)

Dynamic range

Average noise level : -10dBμ + 1.55f(GHz)dB
(Resolution bandwidth 300Hz, video bandwidth 1Hz, input attenuator 0dB, frequency 1MHz or more)

Secondary, tertiary distortion
: _ -70dB -30dBm input
(Input attenuator 0dB, frequency 10MHz or more)

Frequency response : ±0.5dB 100kHz to 2GHz
±1.5dB 9kHz to 2.6GHz
(LOG mode, input attenuator 10dB, 20 to 30°C)

Residual response : _ +11dBμ (Input attenuator 0dB, 75Ω terminator, frequency 500kHz or more)

Resolution bandwidth switching accuracy
: ±0.3dB (after automatic calibration)

Video filter : 1Hz to 1MHz (switched 1 to 10 steps)

(3) Sweep Specifications

Sweep time : 30msec to 1000sec and Manual sweeping

Sweep time accuracy : _ 3%

Trigger mode : FREE RUN, LINE, VIDEO, EXT, TV-V, SINGLE

(4) Input Specifications

Input impedance : Approx. 75Ω
VSWR _ 1.5 (100kHz _ f _ 2GHz)
VSWR _ 2.0 (9kHz _ f _ 2.6GHz)
(Input attenuator _ 10dB)

Input connector : N connector

Maximum input level : +132dBμ (input attenuator _ 30dB)
±50VDC max

Input attenuator : 0 to 50dB (10dB steps)

Input attenuator switching accuracy
: ±1.0dB (_ 2.0GHz)
±1.5dB (_ 2.6GHz)
(Input attenuator 10dB standard)

Detection mode : NORMAL, POSI, NEGA, SAMPLE

(5) Tracking generator specifications

Frequency range : 9kHz to 2.6GHz

Output level range : 105dBμ to +55dBμ Setting can be done in steps of 1dB.

Output level accuracy : ±0.5dB (30MHz, +95dBμ, +20 to +30°C)

Output level flatness : ±0.7dB (100kHz to 1.0GHz)
±1.5dB (100kHz to 2.0GHz)
±2.0dB (9kHz to 2.6GHz)
(+95dBμ output)

Output level switching accuracy
: ±1.0dB (100kHz to 1.0GHz)
±2.0dB (9kHz to 2.6GHz)
(+95dBμ reference)

Output spuriousness : Harmonics spurious level ≤ -20dB
Non-harmonics spurious level ≤ -30dB
(Output level +105dBμ)

TG leakage : ≤ +1dBμ

Output impedance : Approx. 75Ω

Output VSWR : ≤ 1.5 (100kHz to 2.0GHz)
≤ 2.0 (9kHz to 2.6GHz)
(At +95dBμ output)

Minimum resolution bandwidth
: 300Hz

Output connector : N-connector

(6) Output Specifications

External memory function: IC memory card

Video output : Approx. 1Vp-p, approx. 75Ω, composite

Sound monitor output : The AM and FM sound can be monitored with an approximately 8Ω earphone.

Power supply for probes : ±15V, 4-pin connector

Recorder output : X axis approx. -5 to +5V, output impedance approx. 10kΩ
Y axis approx. 0 to +4V, output impedance approx. 220Ω

GPIB data output/ Remote control : The built-in GPIB interface allows data output and remote control.

Direct plot : Also, the built-in GPIB interface allows an output of on-screen data to the R9833 plotter to have a hardcopy.

Printer output : The built-in GPIB interface allows HP2225AJ to output a hard copy of on-screen data.

(7) Indication Specifications

Indicated items	: Waveforms, setting conditions, grid, label
CRT display unit	: 5.5 inch
Trace	: Two screens of A and B
WRITE	: Signal response from the analyzer is indicated at every sweeping.
VIEW	: The WRITE waveform contained in the memory, or other contents in the memory are displayed.
MAX HOLD	: Indication of maximum signal level during repeated sweeping
AVG	: Indication of average signal level during repeated sweeping

(8) Other functions

Occupied bandwidth measurement/ Adjacent channel leakage power measurement

Multi-marker measurement

(9) General Specifications

Using ambient condition	: 0 to 50^{o}C 85%RH or less
Storage temperature range	: -20 to +60^{o}C
Power supply	: Line voltage range 90 to 132VAC or 198 to 250VAC is automatically selected internally. 48 to 66Hz
Power consumption	: 220VA or less
Dimensions	: Approx. 330(W) x 177(H) x 450(D) mm
Mass	: Approx. 17kg

10.6 R3361D Specifications

(1) Frequency Specifications

Measurable bandwidth : 9kHz to 3.6GHz

Center frequency setting increment
: 1Hz

Center frequency indication accuracy:
±(3% of the span + center frequency x reference oscillator accuracy + 20Hz)
(span _ 2MHz)
±(2% of the span + center frequency x reference oscillator accuracy + 50kHz)
(span 2MHz)

Reference oscillator : Internal or external input (10Hz)

Internal reference oscillator accuracy
- Aging : $\pm 2 \times 10^{-8}$ per day
  $\pm 1 \times 10^{-7}$ per year
- Temperature stability : $\pm 5 \times 10^{-8}$ (from 0 to +50°C, +25°C as a reference)

Frequency span
- LIN mode : 1kHz to 3.6GHz and 0
- LOG mode : 1, 2, or 3 decades of span can be selected within the range from 10kHz to 1000MHz.

Frequency span accuracy
- LIN mode : ±3% of the span (span 2MHz)
  ±5% of the span (span _ 2MHz)

Frequency stability
- Residual FM : 50kHz p-p or less (span 10MHz)
  2kHz p-p or less (10MHz _ span 2MHz)
  20Hz p-p or less (span _ 2MHz)
- Frequency drift : 300Hz/min. or less (span _ 2MHz, at a constant temperature after an hour of warming up)

Side band noise : _ -105dBc/Hz f _ 3.0GHz
_ -101dBc/Hz f _ 3.6GHz
(20kHz offset)

Resolution
- 3dB bandwidth : 30Hz to 1MHz, switched 1 to 3 steps
- 6dB bandwidth : 200Hz, 9kHz, 120kHz
- Selectivity : _ 15 : 1 (60dB : 3dB)
- Bandwidth accuracy : ±20%

Marker accuracy

- Normal mode : Center frequency indication accuracy + span accuracy
- Counter mode : Indicated frequency x reference oscillator accuracy ±1 count (SPAN   100MHz) (Excepting TG mode)

(2) Amplitude Specifications

Amplitude measurement range
: -130dBm to +25dBm

Screen display range

- LOG mode : 120dB (10dB/div)
  : 80dB (10dB/div)
  : 50dB (5dB/div)
  : 20dB (2dB/div)
  : 10dB (1dB/div)
- LIN mode : 10div
- QP mode : 80dB (10dB/div)
  Provided the measurement range is 70dB

Linearity display

- LOG mode : ±2.0dB/110dB, ±1.5dB/70dB, ±1.0dB/10dB, ±0.2dB/1dB
- LIN mode : ±5% of the fullscale
- QP mode : ±2.0dB/70dB, ±1.0dB/40dB

Reference level indication range
: -109.9dBm to +40.0dBm
0.715μV to 22.4V

Reference level accuracy : ±0.3dB   0 to -50dBm (after automatic calibration)
±0.7dB +20 to -70dBm (after automatic calibration)

Dynamic range

- Average noise level : -121dBm + 1.55f(GHz)dB
  (Resolution bandwidth 300Hz, video bandwidth 1Hz, input attenuator 0dB, frequency 1MHz or more)
- Secondary, tertiary distortion
  : ≤ -70dB -30dBm input
  (Input attenuator 0dB, frequency 10MHz or more)
- Frequency response : ±0.5dB (100kHz to 2GHz)
  ±1.0dB (9kHz to 3.6GHz)
  (LOG mode, input attenuator 10dB, 20 to 30°C)
- Residual response : ≤ -100dBm (Input attenuator 0dB, 50Ω terminator, frequency 500kHz or more)

Resolution bandwidth switching accuracy
: ±0.3dB (after automatic calibration)

Video filter : 1Hz to 1MHz (switched 1 to 10 steps)

(3) Sweep Specifications

Sweep time : 30msec to 1000sec and Manual sweeping

Sweep time accuracy : _ 3%

Trigger mode : FREE RUN, LINE, VIDEO, EXT, TV-V, SINGLE

(4) Input Specifications

Input impedance : Approx. 50Ω
: VSWR _ 1.5 100kHz _ f _ 2GHz
: VSWR _ 2.0 9kHz _ f _ 3.6GHz
: Input attenuator _ 10dB reference

Input connector : N connector

Maximum input level : +25dBm (input attenuator _ 30dB)
±50VDC max

Input attenuator : 0 to 50dB (10dB steps)

Input attenuator switching accuracy
: ±1.0dB (_ 2.0GHz)
±1.5dB (_ 3.6GHz)
Input attenuator 10dB standard

Detection mode : NORMAL, POSI, NEGA, SAMPLE

(5) Tracking generator specifications

Frequency range : 9kHz to 3.6GHz

Output level range : 0dBm to -50dBm Setting can be done in steps of 1dB.

Output level accuracy : ±0.5dB (30MHz, -10dBm, +20 to +30°C)

Output level flatness : ±0.7dB (100kHz to 1.0GHz)
±1.5dB (9kHz to 2.6GHz)
±2.0dB (9kHz to 3.6GHz)
(-10dBm output)

Output level switching accuracy	
	: ±1.0dB (100kHz to 1.0GHz) ±2.0dB (9kHz to 2.6GHz) ±3.0dB (9kHz to 3.6GHz) (-10dBm reference)
Output spuriousness	: Harmonics spurious level _ -20dB Non-harmonics spurious level _ -30dB (Output level 0dBm)
TG leakage	: _ -110dBm (frequency _ 3.0GHz) : _ -100dBm (frequency _ 3.6GHz)
Output impedance	: Approx. 50Ω
Output VSWR	: _ ±1.5 (100kHz to 2.0GHz) _ ±2.0 (9kHz to 3.6GHz) (At _ -10dBm output)
Minimum resolution bandwidth	
	: 300Hz
Output connector	: N-connector

(6) Output Specifications

External memory function:	IC memory card
Video output	: Approx. 1Vp-p, approx. 75Ω, composite
Sound monitor output	: The AM and FM sound can be monitored with an approximately 8Ω earphone.
Power supply for probes	: ±15V, 4-pin connector
Recorder output	: X axis approx. -5 to +5V, output impedance approx. 10kΩ Y axis approx. 0 to +4V, output impedance approx. 220Ω
GPIB data output/ Remote control	: The built-in GPIB interface allows data output and remote control.
Direct plot	: Also, the built-in GPIB interface allows an output of on-screen data to the R9833 plotter to have a hardcopy.
Printer output	: The built-in GPIB interface allows HP2225AJ to output a hard copy of on-screen data.

(7) Indication Specifications

Indicated items	: Waveforms, setting conditions, grid, label
CRT display unit	: 5.5 inch
Trace	: Two screens of A and B
WRITE	: Signal response from the analyzer is indicated at every sweeping.
VIEW	: The WRITE waveform contained in the memory, or other contents in the memory are displayed.
MAX HOLD	: Indication of maximum signal level during repeated sweeping
AVG	: Indication of average signal level during repeated sweeping

(8) Other functions

Occupied bandwidth measurement/ Adjacent channel leakage power measurement

Multi-marker measurement

(9) General Specifications

Using ambient conditions	: 0 to 50°C 85%RH or less
Storage temperature range	: -20 to +60°C
Power supply	: Line voltage range 90 to 132VAC or 198 to 250VAC is automatically selected internally. 48 to 66Hz
Power consumption	: 220VA or less
Dimensions	: Approx. 330(W) x 177(H) x 450(D) mm
Mass	: Approx. 17kg

10.7 R3361NK Specification

(1) Frequency specifications

Measurable bandwidth	: 9kHz to 2.6GHz
Center frequency setting increment	: 1Hz
Center frequency indication accuracy	: ±(3% of the span + center frequency x reference oscillator accuracy + 20Hz) (span ≦ 2MHz) ±(2% of the span + center frequency x reference oscillator accuracy + 50Hz) (span > 2MHz)
Reference oscillator	: Internal or external input (10MHz)
Internal reference oscillator accuracy	
Aging	: $\pm 2 \times 10^{-8}$ per day $\pm 1 \times 10^{-7}$ per year
Temperature stability	: $\pm 5 \times 10^{-8}$ (from 0 to +50℃, +25℃ as a reference)
Frequency span	
LIN mode	: 1kHz to 2.6GHz, and 0
LOG mode	: 1, 2, or 3 decades of span can be selected within the range from 10kHz to 1000MHz.
Frequency span accuracy	
LIN mode	: ±3% of the span (span > 2MHz) ±5% of the span (span ≦ 2MHz)
Frequency stability	
Residual FM	: 50kHz p-p or less (span > 10MHz) 2kHz p-p or less (10MHz ≧ span > 2MHz) 20Hz p-p or less (span ≦ 2MHz)
Frequency drift	: 300Hz/min. or less (span ≦ 2MHz, at a constant temperature after an hour of warming up)
Side band noise	: ≦-105dBc/Hz (20kHz offset)
Resolution	
3dB bandwidth	: 30Hz to 1MHz, switched at 1 to 3 steps
6dB bandwidth	: 200Hz, 9kHz, 120kHz
Selectivity	: ≦ 15: 1 (60dB : 3dB)
Bandwidth accuracy	: ±20%

Marker accuracy
- Normal mode : Center frequency indication accuracy + span accuracy
- Counter mode : Indicated frequency x reference oscillator accuracy ±1 count (span ≦ 100MHz) (Expect TG mode)

(2) Amplitude specifications

Amplitude measurement range
: -19dBμ to +132dBμ

Screen display range
- LOG mode : 120dB (10dB/div)
  : 80dB (10dB/div)
  : 50dB (5dB/div)
  : 20dB (2dB/div)
  : 10dB (1dB/div)
- LIN mode : 10div
- QP mode : 80dB (10dB/div)
  Provided the measurement range is 70dB.

Linearity display
- LOG mode : ±2.0dB/110dB, ±1.5dB/70dB, ±1.0dB/10dB, ±0.2dB/1dB
- LIN mode : ±5% of the fullscale
- QP mode : ±2.0dB/70dB, ±1.0dB/40dB

Reference level indication range
: +1.0dBμ to +150dBμ
1.01μV to 31.6V

Reference level accuracy : ±0.3dB +110dBμ to +60dBμ (after automatic calibration)
±0.7dB +130dBμ to +40dBμ (after automatic calibration)

Dynamic range
- Average noise level : -10dBμ + 1.55f(GHz)dB
  (Resolution bandwidth 300Hz, video bandwidth 1Hz, input attenuator 0dB, frequency 1MHz or more)

Secondary, tertiary distortion
: ≦ -70dB -30dBm input
(Input attenuator 0dB, frequency 10MHz or more)

Frequency response : ±0.5dB 100kHz to 2GHz
±1.5dB 9kHz to 2.6GHz
(LOG mode, input attenuator 10dB, 20 to 30℃)

Residual response : ≦ +11dBμ (Input attenuator 0dB, 75Ω terminator, frequency 500kHz or more)

Resolution bandwidth switching accuracy
: ±0.3dB (after automatic calibration)

Video filter : 1Hz to 1MHz (switched 1 to 10 steps)

(3) Sweep specifications

Sweep time : 30msec to 1000sec and manual sweeping

Sweep time accuracy : ≦ 3%

Trigger mode : FREE RUN, LINE, VIDEO, EXT, TV-V, SINGLE

(4) Input specifications

Input impedance : Approx. 75Ω
VSWR ≦ 1.5 (100kHz ≦ f ≦ 2GHz)
VSWR ≦ 2.0 (9kHz ≦ f ≦ 2.6GHz)
(Input attenuator ≧ 10dB)

Input connector : N connector

Maximum input level : +132dBμ (input attenuator ≧ 30dB)
±50VDC max

Input attenuator : 0 to 50dB (10dB steps)

Input attenuator switching accuracy
: ±1.0dB (≦2.0GHz)
±1.5dB (≦2.6GHz)
(Input attenuator 10dB reference)

Detection mode : NORMAL, POSI, NEGA, SAMPLE

(5) Tracking generator specifications

Frequency range : 9kHz to 2.6GHz

Output level range : 105dBμ to +55dBμ Setting can be done in steps of 1dB.

Output level accuracy : ±0.5dB (30MHz, +95dBμ +20 to +30℃)

Output level flatness : ±0.7dB (100kHz to 1.0GHz)
±1.5dB (100kHz to 2.0GHz)
±2.0dB (9kHz to 2.6GHz)
(+95dBμ output)

Output level switching accuracy
: ±1.0dB (100kHz to 1.0GHz)
±2.0dB (9kHz to 2.6GHz)
(+95dBμ reference)

Output spuriousness : Harmonics spurious level ≦ -20dB
Non-harmonics suprious level ≦ -30dB
(Output level +105dBμ)

TG leakage : ≦ +1dBμ

Output impedance : Approx. 75Ω

Output VSWR : ≦ 1.5 (100kHz to 2.0GHz)
≦ 2.0 (9kHz to 2.6GHz)
(At ≦ +95dBμ output)

Minimum resolution bandwidth
: 300Hz

Output connector : N-connector

(6) Output specifications

External memory function : IC memory card

Video ourput : Approx. 1Vp-p, approx 75Ω, composite

Sound monitor output : The AM and FM sound can be monitored with an approximately 8Ω earphone.

Power supply for probes : ±15V, 4-pin connector

Recorder output : X axis approx. -5 to +5V, output impedance approx. 10kΩ
Y axis approx. 0 to +4V, output impedance approx. 220Ω

GPIB data output/ Remote control : The built-in GPIB interface allows data output and remote control.

Direct plot : Also, the built-in GPIB interface allows an output of on-screen data to the R9833 plotter to have a hardcopy.

Printer output : The built-in GPIB interface allows HP2225AJ to output a hardcopy of on-screen data.

(7) Indication specifications

Indicated items	:	Waveforms, setting conditions, grid, label
CRT display unit	:	5.5 inch
Trace	:	Two screens of A and B
WRITE	:	Signal response from the analyzer is indicated at every sweeping.
VIEW	:	The WRITE waveform contained in the memory, or other contents in the memory are displayed.
MAX HOLD	:	Indication of maximum signal level of during repeated sweeping.
AVG	:	Indication of average signal level during repeated sweeping.

(8) Other functions

Occupied bandwidth measurement/Adjacent channel leakage power measurement

Multi-marker measurement

(9) General specifications

Using ambient condition	:	0 to 50℃ 85%RH or less
Storage temperature range	:	-20 to 60℃
Power supply	:	Line voltage range 90 to 132VAC or 198 to 250VAC is automatically selected internally. 48 to 66Hz
Power consumption	:	220VA or less
Dimensions	:	Approx. 330(W) x 177(H) x 450(D) mm
Mass	:	Approx. 17kg

10.8 R3361K Specification

(1) Frequency Specifications

Measurable bandwidth : 9kHz to 2.6GHz

Center frequency setting increment
: 1Hz

Center frequency indication accuracy
: ±(3% of the span + center frequency x reference oscillator accuracy + 20Hz)
(span ≦ 2MHz)
±(2% of the span + center frequency x reference oscillator accuracy + 50Hz)
(span > 2MHz)

Reference oscillator : Internal or external input (10MHz)

Internal reference oscillator accuracy
- Aging : $\pm 2 \times 10^{-8}$ per day
  $\pm 1 \times 10^{-7}$ per year
- Temperature stability : $\pm 5 \times 10^{-8}$ (from 0 to +50℃, +25℃ as a reference)

Frequency span
- LIN mode : 1kHz to 2.6GHz, and 0
- LOG mode : 1, 2, or 3 decades of span can be selected within the range from 10kHz to 1000MHz.

Frequency span accuracy
- LIN mode : ±3% of the span (span > 2MHz)
  ±5% of the span (span ≦ 2MHz)

Frequency stability
- Residual FM : 50kHz p-p or less (span > 10MHz)
  2kHz p-p or less (10MHz ≧ span > 2MHz)
  20Hz p-p or less (span ≦ 2MHz)
- Frequency drift : 300Hz/min. or less (span ≦ 2MHz, at a constant temperature after an hour of warming up)

- Side band noise : ≦-105dBc/Hz (20kHz offset)

- Resolution
  - 3dB bandwidth : 30Hz to 1MHz, switched at 1 to 3 steps

  - 6dB bandwidth : 200Hz, 9kHz, 120kHz
  - Selectivity : ≦ 15: 1 (60dB : 3dB)
  - Bandwidth accuracy : ±20%

Marker accuracy
  Normal mode : Center frequency indication accuracy + span accuracy
  Counter mode : Indicated frequency x reference oscillator accuracy ±1 count (span ≦ 100MHz) (Expect TG mode)

(2) Amplitude Specifications

Amplitude measurement range
: -130dBm to +25dBm

Screen display range
  LOG mode : 120dB (10dB/div)
  : 80dB (10dB/div)
  : 50dB (5dB/div)
  : 20dB (2dB/div)
  : 10dB (1dB/div)
  LIN mode : 10div
  QP mode : 80dB (10dB/div)
  Provided the measurement range is 70dB.

Linearity display
  LOG mode : ±2.0dB/110dB, ±1.5dB/70dB, ±1.0dB/10dB, ±0.2dB/1dB
  LIN mode : ±5% of the fullscale
  QP mode : ±0.2dB/70dB, ±1.0dB/40dB

Reference level indication range
: -109.9dBm to +40.0dBm
0.715μV to 22.4V

Reference level accuracy : ±0.3dB 0dBm to -50dBm (after automatic calibration)
±0.7dB +20dBm to -70dBm (after automatic calibration)

Dynamic range
  Average noise level : -121dBm + 1.55f(GHz)dB
  (Resolution bandwidth 300Hz, video bandwidth 1Hz, input attenuator 0dB, frequency 1MHz or more)

  Secondary, tertiary distortion
  : ≦ -70dB -30dBm input
  (Input attenuator 0dB, frequency 10MHz or more)

  Frequency response : ±0.5dB 100kHz to 2GHz
  ±1.5dB 9kHz to 2.6GHz
  (LOG mode, input attenuator 10dB, 20 to 30℃)

Residual response	: ≦ -100dBm (Input attenuator 0dB, 75Ω terminator, frequency 500kHz or more)
Resolution bandwidth switching accuracy	: ±0.3dB (after automatic calibration)
Video filter	: 1Hz to 1MHz (switched 1 to 10 steps)

(3) Sweep Specifications

Sweep time	: 30msec to 1000sec and manual sweeping
Sweep time accuracy	: ≦ 3%
Trigger mode	: FREE RUN, LINE, VIDEO, EXT, TV-V, SINGLE

(4) Input Specifications

Input impedance	: Approx. 50Ω VSWR ≦ 1.5 (100kHz ≦ f ≦ 2GHz) VSWR ≦ 2.0 (9kHz ≦ f ≦ 2.6GHz) (Input attenuator ≧ 10dB)
Input connector	: N connector
Maximum input level	: +25dBm (input attenuator ≧ 30dB) ±50VDC max
Input attenuator	: 0 to 50dB (10dB steps)
Input attenuator switching accuracy	: ±1.0dB (≦2.0GHz) ±1.5dB (≦2.6GHz) (Input attenuator 10dB reference)
Detection mode	: NORMAL, POSI, NEGA, SAMPLE

(5) Tracking generator specifications

Frequency range	: 9kHz to 2.6GHz
Output level range	: 0dBm to -50dBm Setting can be done in steps of 1dB.
Output level accuracy	: ±0.5dB (30MHz, -10dBm, +20 to +30℃)
Output level flatness	: ±0.7dB (100kHz to 1.0GHz) ±1.5dB (9kHz to 2.6GHz) (-10dBm output)

Output level switching accuracy	: ±1.0dB (100kHz to 1.0GHz) ±2.0dB (9kHz to 2.6GHz) (-10dBm reference)
Output spuriousness	: Harmonics spurious level ≦ -20dB Non-harmonics suprious level ≦ -30dB (Output level 0dBm)
TG leakage	: ≦ -110dBm
Output impedance	: Approx. 50Ω
Output VSWR	: ≦ 1.5 (100kHz to 2.0GHz) ≦ 2.0 (9kHz to 2.6GHz) (At ≦ -10dBm output)
Minimum resolution bandwidth	: 300Hz
Output connector	: N-connector

(6) Output specifications

External memory function	: IC memory card
Video ourput	: Approx. 1Vp-p, approx 75Ω, composite
Sound monitor output	: The AM and FM sound can be monitored with an approximately 8Ω earphone.
Power supply for probes	: ±15V, 4-pin connector
Recorder output	: X axis approx. -5 to +5V, output impedance approx. 10kΩ Y axis approx. 0 to +4V, output impedance approx. 220Ω
GPIB data output/ Remote control	: The built-in GPIB interface allows data output and remote control.
Direct plot	: Also, the built-in GPIB interface allows an output of on-screen data to the R9833 plotter to have a hardcopy.
Printer output	: The built-in GPIB interface allows HP2225AJ to output a hardcopy of on-screen data.

(7) Indication specifications

Indicated items	: Waveforms, setting conditions, grid, label
CRT display unit	: 5.5 inch
Trace	: Two screens of A and B
WRITE	: Signal response from the analyzer is indicated at every sweeping.
VIEW	: The WRITE waveform contained in the memory, or other contents in the memory are displayed.
MAX HOLD	: Indication of the maximum signal level of repeat sweeping.
AVG	: Indication of the average of repeat sweeping

(8) Other functions

Occupied bandwidth measurement/Adjacent channel leakage power measurement

Multi-marker measurement

(9) General specifications

Using ambient condition	: 0 to 50℃ 85%RH or less
Storage temperature range	: -20 to 60℃
Power supply	: Line voltage range 90 to 132VAC or 198 to 250VAC is automatically selected internally. 48 to 66Hz
Power consumption	: 220VA or less
Dimensions	: Approx. 330(W) x 177(H) x 450(D) mm
Mass	: Approx. 17kg

10.9 Options and Accessories

Option

Option 80	• RS-232 interface • Gated sweep function
Option 81	• Controller function (including an editor function of a parallel I/O and a serial I/O, Standard function for R3361NK/R3361K) • Gated sweep function

Separate accessory

R3551	EMI preselector
R16056A	Transit case
R16211A	Carring case
A02804	Front cover
A09505	Memory card (32k byte, 5 pieces)
A09506	Memory card (128k byte, 5 pieces)
A02034	Panel mount kits
A02255	Rack mount kits (JIS)
A02455	Rack mount kits (EIA)

11. OPERATION DESCRIPTION

11.1 Description of Operations

See the block diagram in Figure 11 - 1.

R3261D/3361D consists of the following blocks: 'RF', which converts signals of a frequency from 9kHz to 3.6GHz (9kHz to 2.6GHz in R3261C/3361C) into IF signals with a frequency of 3.58MHz; 'IF-A/D', which determines the resolution bandwidth and converts amplitude signals from analog to digital; and the controller that controls the former two.

Adding to the above, R3361C/CN/D has 'TG', which outputs frequency synchronized to the input frequency.

(1) RF

The input signal is input to the first mixer via the input attenuator (0dB to 50dB, 10dB steps) in the RF.

The signal input in the first mixer is mixed with the synthesized signal generated by the YIG synchronized oscillator of 4GHz to 7.6GHz, and is converted to the IF signal of 4.06642GHz. The converted signal goes through the 4GHz bandpass filter to remove the undesirable signal added in the first mixer, before going to the second mixer.

The 4GHz signal input in the second mixer is then mixed with phase locked oscillator signal of 3.84GHz, converted into the secondary IF signal of 226.42MHz, and then input to the third mixer.

In the third mixer the signal is mixed with the 200MHz signal by the frequency reference source to be converted into tertiary IF signal.

Then the signal is input to the fourth mixer, mixed with the 30MHz signal from the frequency reference source, and the 3.58MHz final IF signals are output. The final IF signal of 3.58MHz is input to the IF, the next stage, where the resolution bandwidth will be determined.

(2) IF•A/D

The IF comprises the L/C filter that determines the resolution bandwidth in the range from 1MHz to 10kHz, the crystal filter for the range from 3kHz to 30Hz, and the step amplifier that determines the reference level.

Resolution bandwidth and reference level of the IF signal are determined as it passes through the IF. The signal is then input in the LOG amplifier in the display block.

The signal input in the LOG amplifier is compressed, detected and input to the A/D converter. The digital signal converted from analog is transferred to the controller.

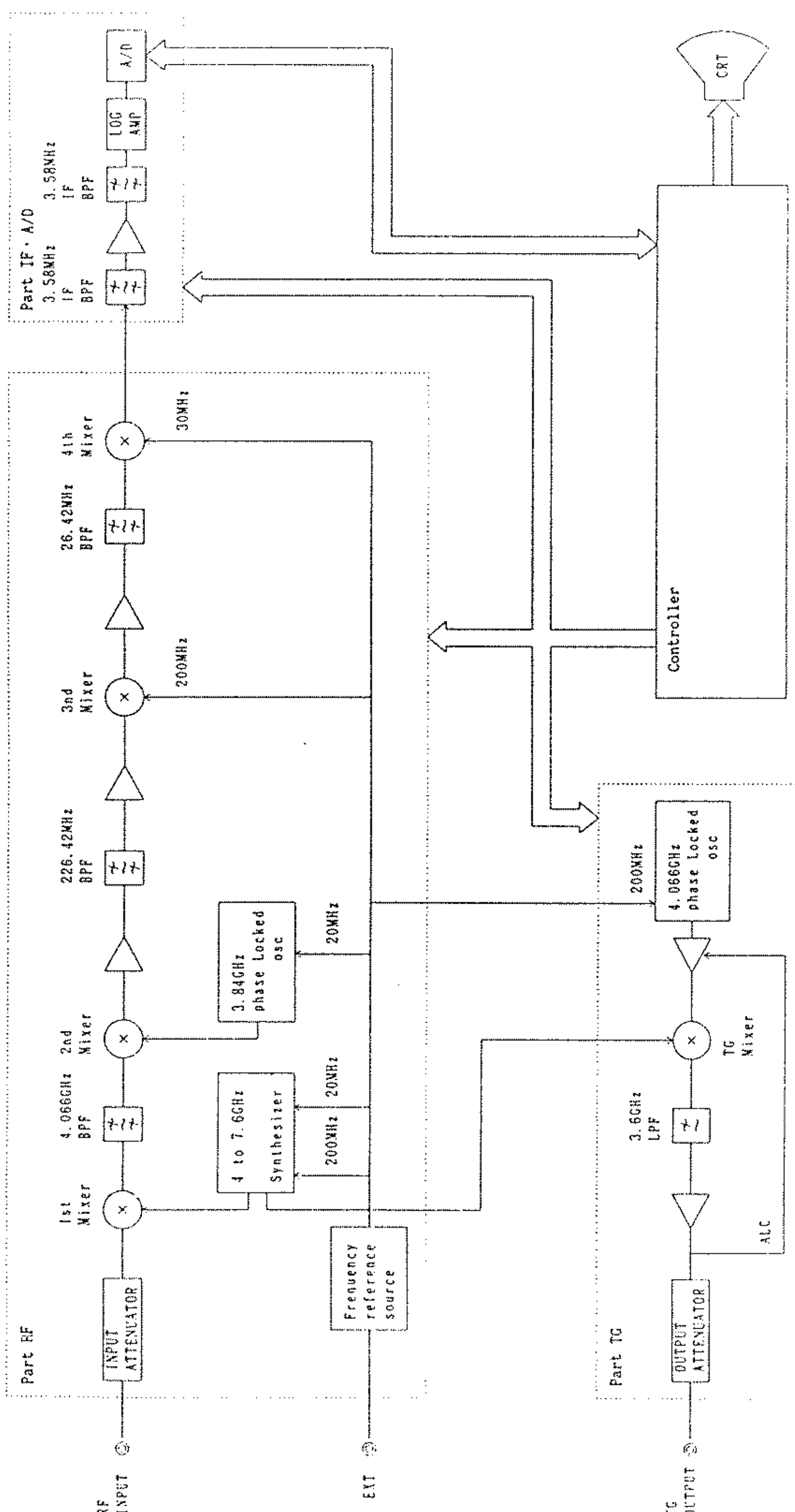
(3) Controller

The controller sends necessary data from the microprocessor to RF, IF-A/D, and TG (for R3361C/CN/D only).

(4) TG (For R3361C/CN/D only)

TG in R3361C/CN/D mixes the first IF frequency of 4.066GHz and synthesized signal of 4GHz to 7.6GHz to output the signal tracing the input frequency.

11.2 Block Diagram



Note : The R3261 series does not contain TG.

Figure 11 - 1 R3261/3361 Block Diagram

APPENDIX

A.1 List of Softkey Menus for Panel Keys

Softkey menus to be consecutively displayed by the corresponding panel key are shown in the diagrams on the following pages, in the order below:

Item number	Panel key	Remarks
(1)	CENTER FREQ key	FUNCTION section
(2)	FREQ SPAN key	
(3)	START key	
(4)	STOP key	
(5)	COUPLE key	
(6)	REF LEVEL key	
(7)	MENU key	
(8)	Key A or key B	TRACE section
(9)	GPIB ADRS (SHIFT + LCL) key	GPIB section
(10)	SAVE (SHIFT + RECALL) key	
(11)	RECALL key	
(12)	DEFINE key (SHIFT + USER) key	
(13)	ON key	MARKER section
(14)	PEAK key	
(15)	MKR key	
(16)	MULTI MKR (SHIFT + ON) key	
(17)	CAL (SHIFT + 7) key	DATA section
(18)	PLOT (SHIFT + 8) key	
(19)	LABEL (SHIFT + 9) key	
(20)	MEM CD (SHIFT + 4) key	
(21)	TG key	
(22)	EMC (SHIFT + 1) key	
(23)	M.W (SHIFT + 0) key	
(24)	FUNCTION (SHIFT + 6) key	

(1) Center Frequency

Panel key	Softkeys
CENTER FREQ	CF STEP SIZE
	CF STEP AUTO
	FREQ OFS ON/OFF
	+/-

(2) Frequency Span

Panel key	Softkeys
FREQ SPAN	LINEAR SPAN
	FULL SPAN
	LOG SPAN
	ZERO SPAN

(3) Start Frequency

Panel key	Softkeys
START	FREQ OFS ON/OFF
	+/-

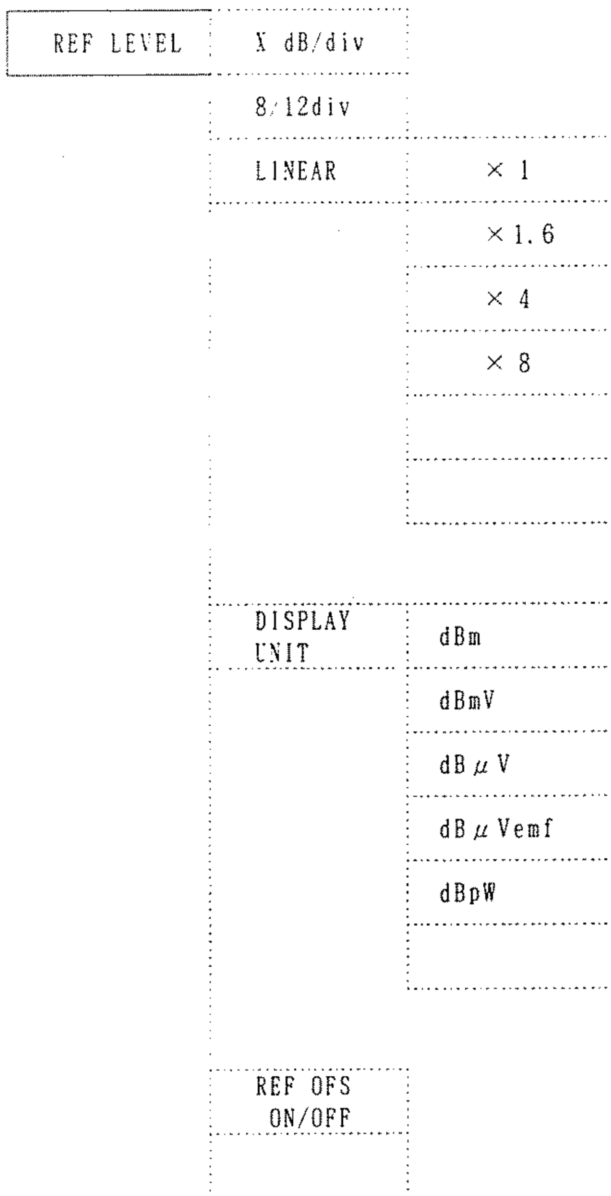
(4) Stop Frequency

STOP	FREQ OFS ON/OFF
	+/-

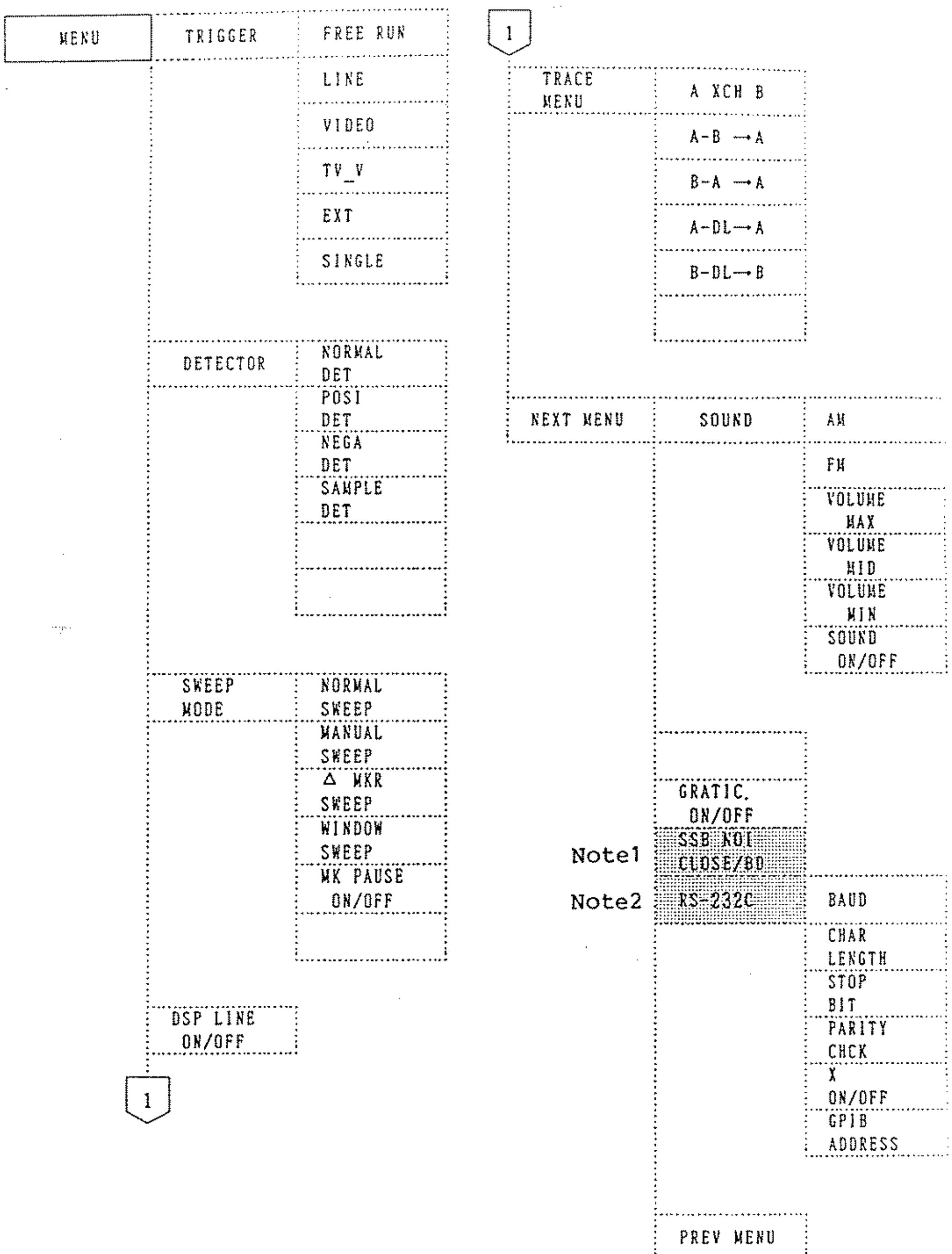
(5) Couple

COUPLE	RBW
	VBM
	SWP
	ATT
	AUTO
	ALL AUTO

(6) Reference Level

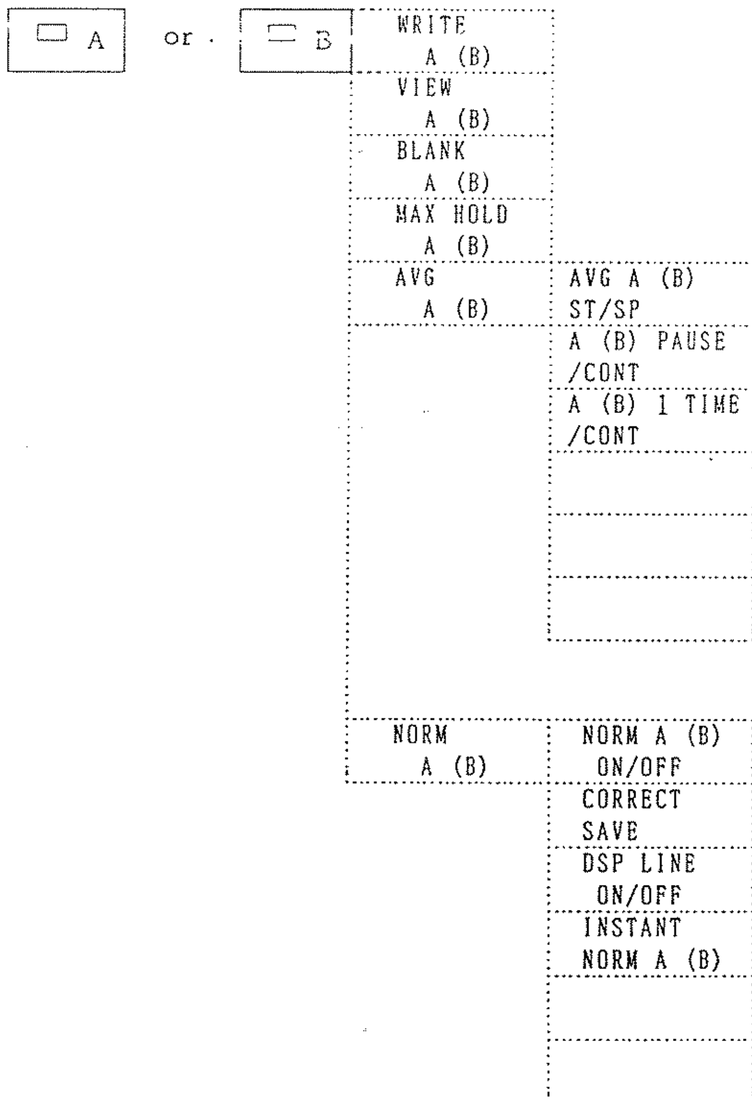


(7) Menu

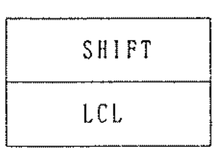


Note1: The menu is displayed only when the span length is less than 10k.
Note2: Display the devices equipped with Option 81.

(8) A or B



(9) GPIB Address



No softkey menu provided.

(10) Save

Panel key	Softkey
SHIFT	
RECALL	SAVE EXECUTE
	SAVE TITLE
	WRITE PROTECT
	TRACE A/B

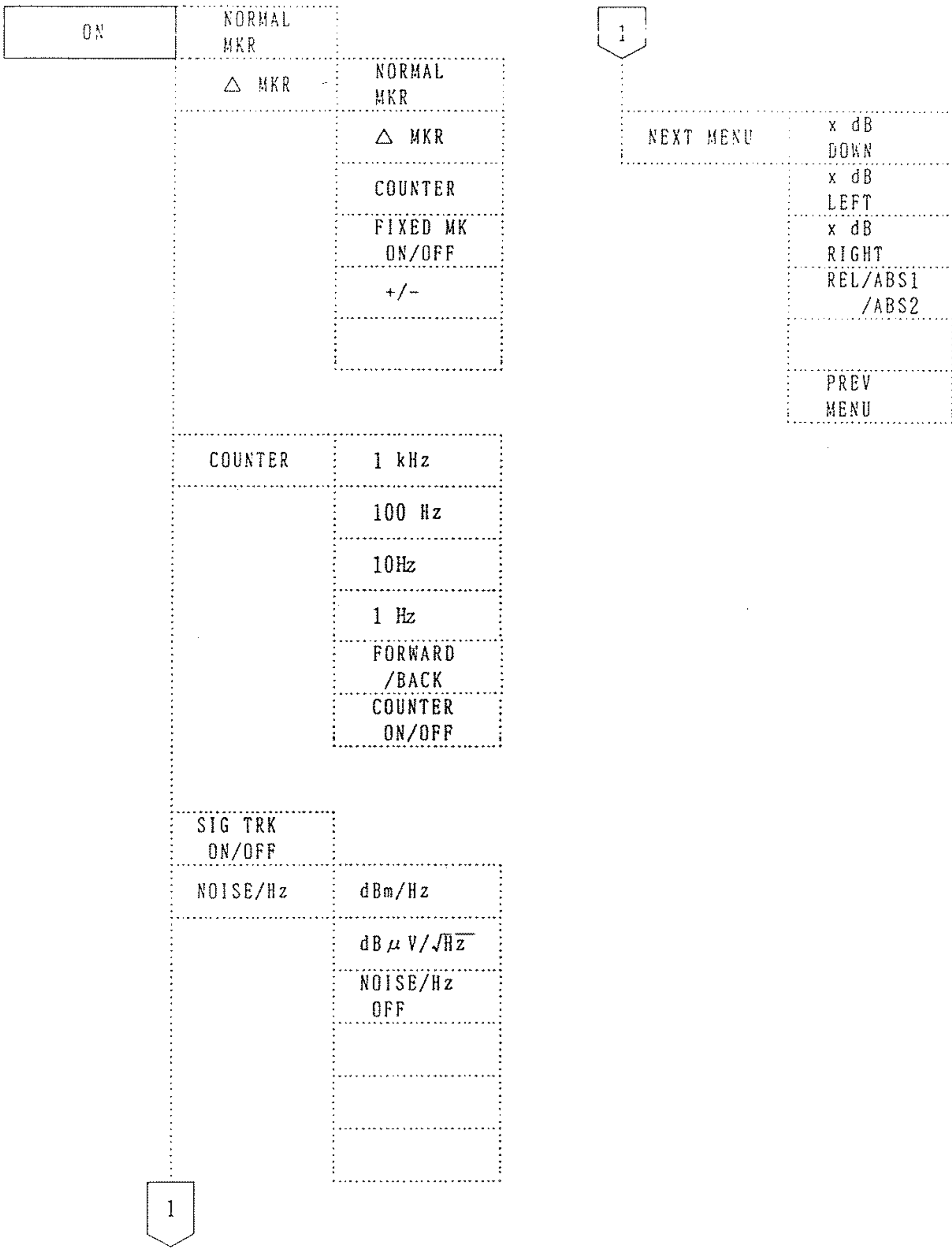
(11) Recall

Panel key	Softkey
RECALL	RECALL EXECUTE
	FAST/ NORMAL

(12) User Define

Panel key	Softkey
SHIFT	
USER	GROUP ACTIVE
	MEMBER ACTIVE
	ENTER
	INTIAL MEMBER
	ALL INITIAL
	RETURN

(13) Marker on


ON
NORMAL MKR
△ MKR
NORMAL MKR
△ MKR
COUNTER
FIXED MK ON/OFF
+/-
COUNTER
1 kHz
100 Hz
10Hz
1 Hz
FORWARD /BACK
COUNTER ON/OFF
SIG TRK ON/OFF
NOISE/Hz
dBm/Hz
dBμV/√Hz
NOISE/Hz OFF
1
1
NEXT MENU
x dB DOWN
x dB LEFT
x dB RIGHT
REL/ABS1 /ABS2
PREV MENU

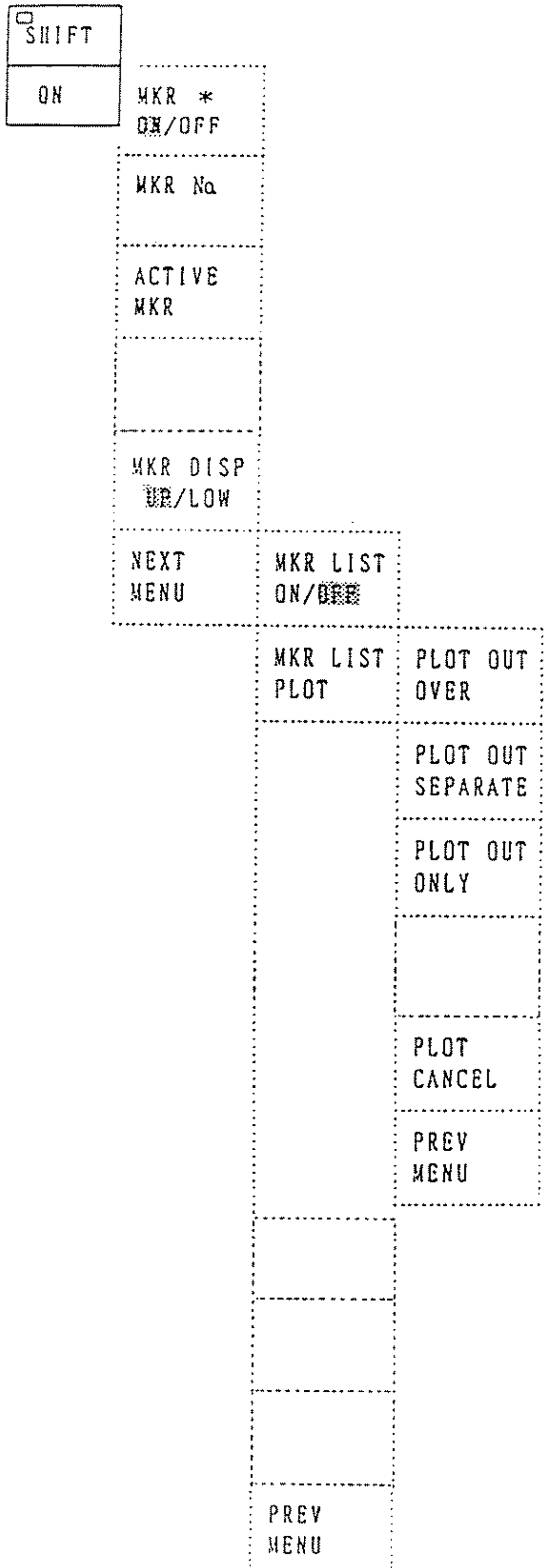
(14) Peak Search

PEAK	NEXT PK	
	NEXT PK RIGHT	
	NEXT PK LEFT	
	NEXT PK MAX/MIN	
	MIN	
	NEXT MENU	NEXT MIN
		PK CONT ON/OFF
		PK RANGE UP/FULL
		△ X/△ Y
		PREV MENU

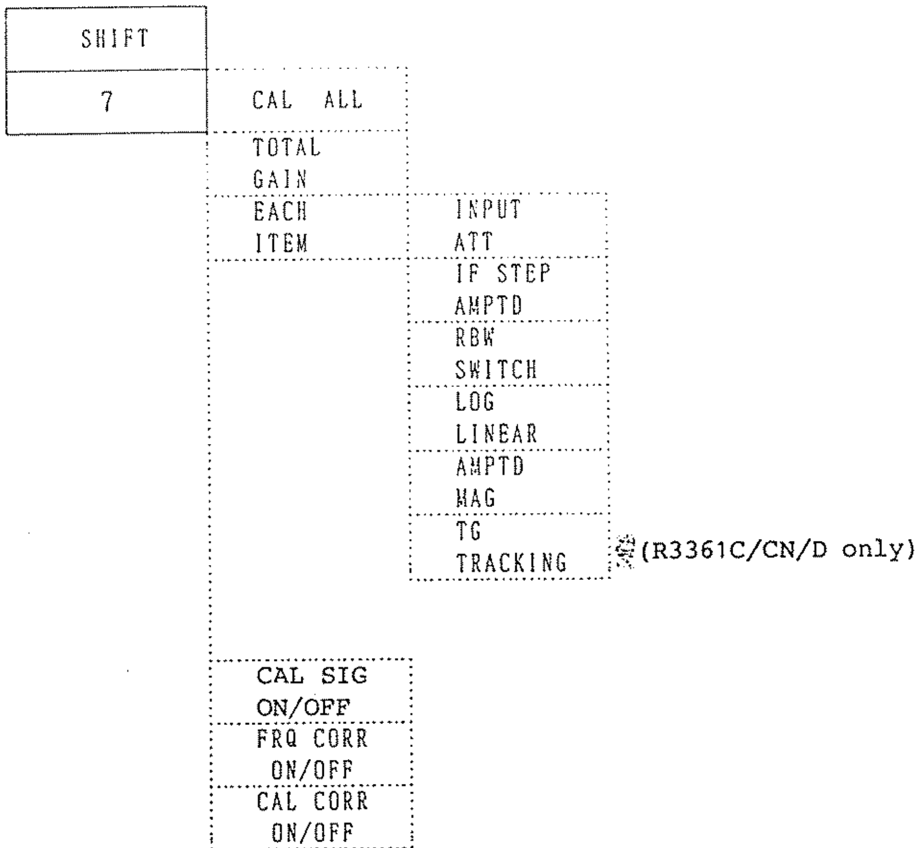
(15) Marker→

MKR→	MKR → CF	
	MKR → REF	
	MKR △ SPAN	
	MKR → CF STEP	
	MKR △ CF STEP	
	NEXT MENU	MKR→ MK STEP
		MKR △→ MK STEP
		MK STEP SIZE
		MK STEP AUTO
		PREV MENU

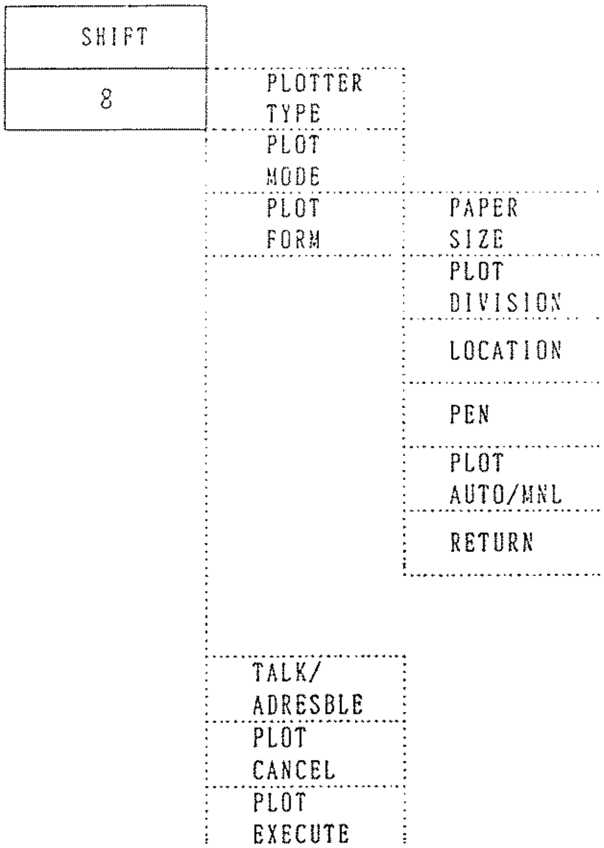
(16) Multi-marker



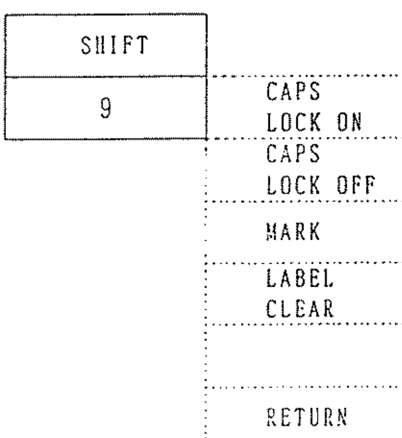
(17) Calibration



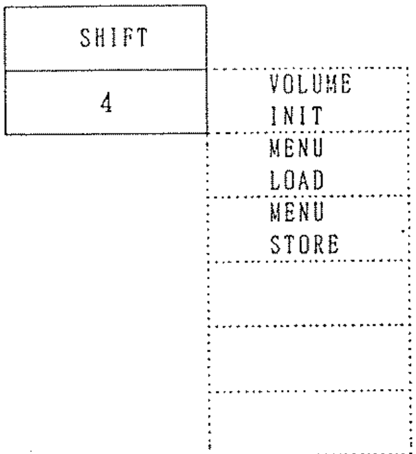
(18) Plot



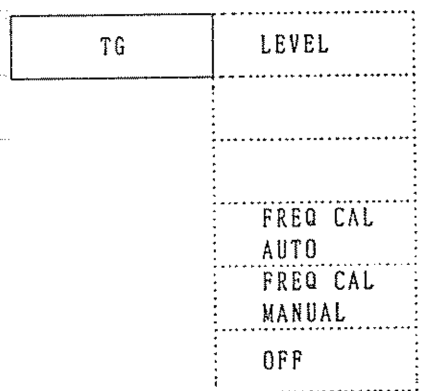
(19) Label



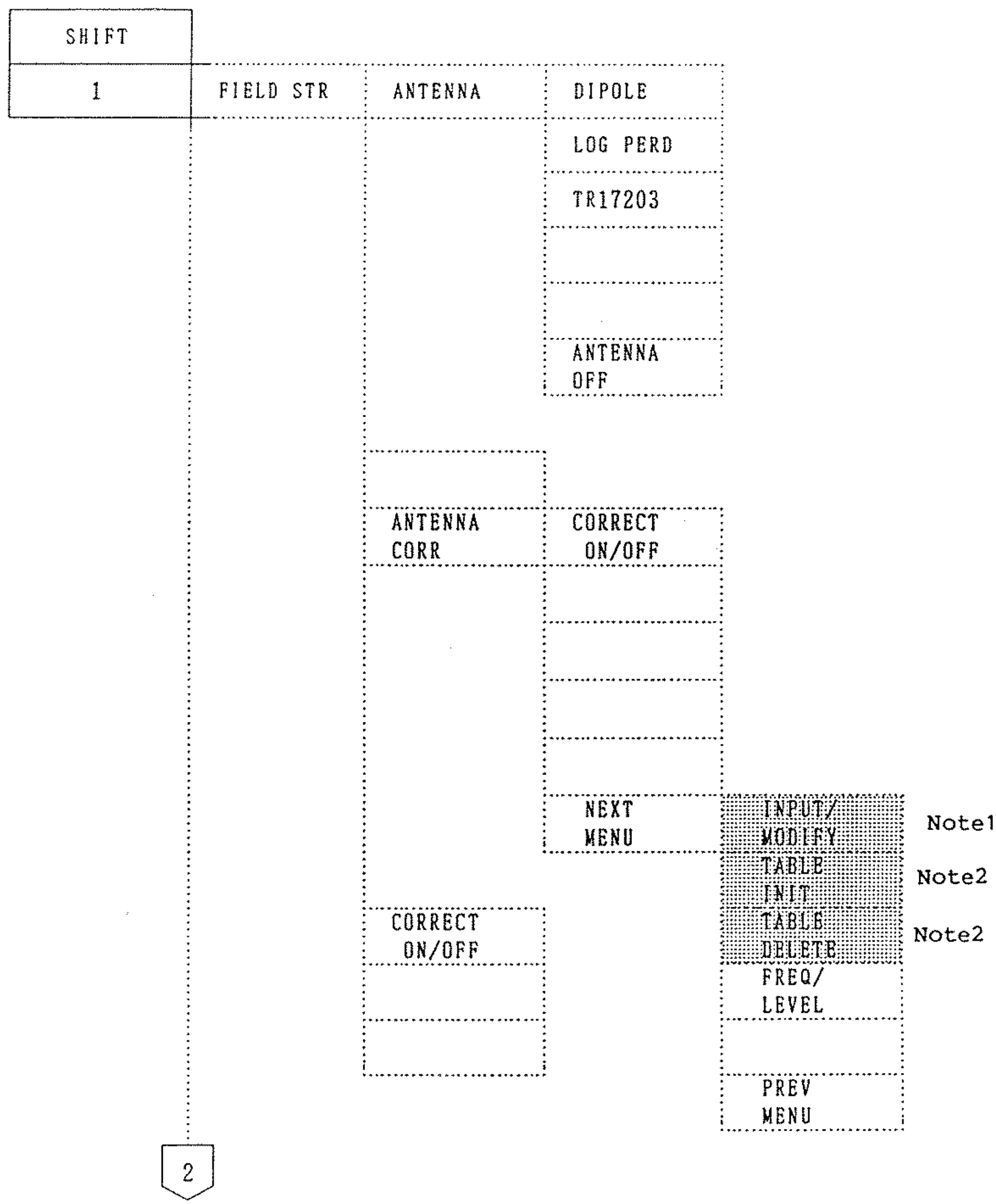
(20) Memory Card



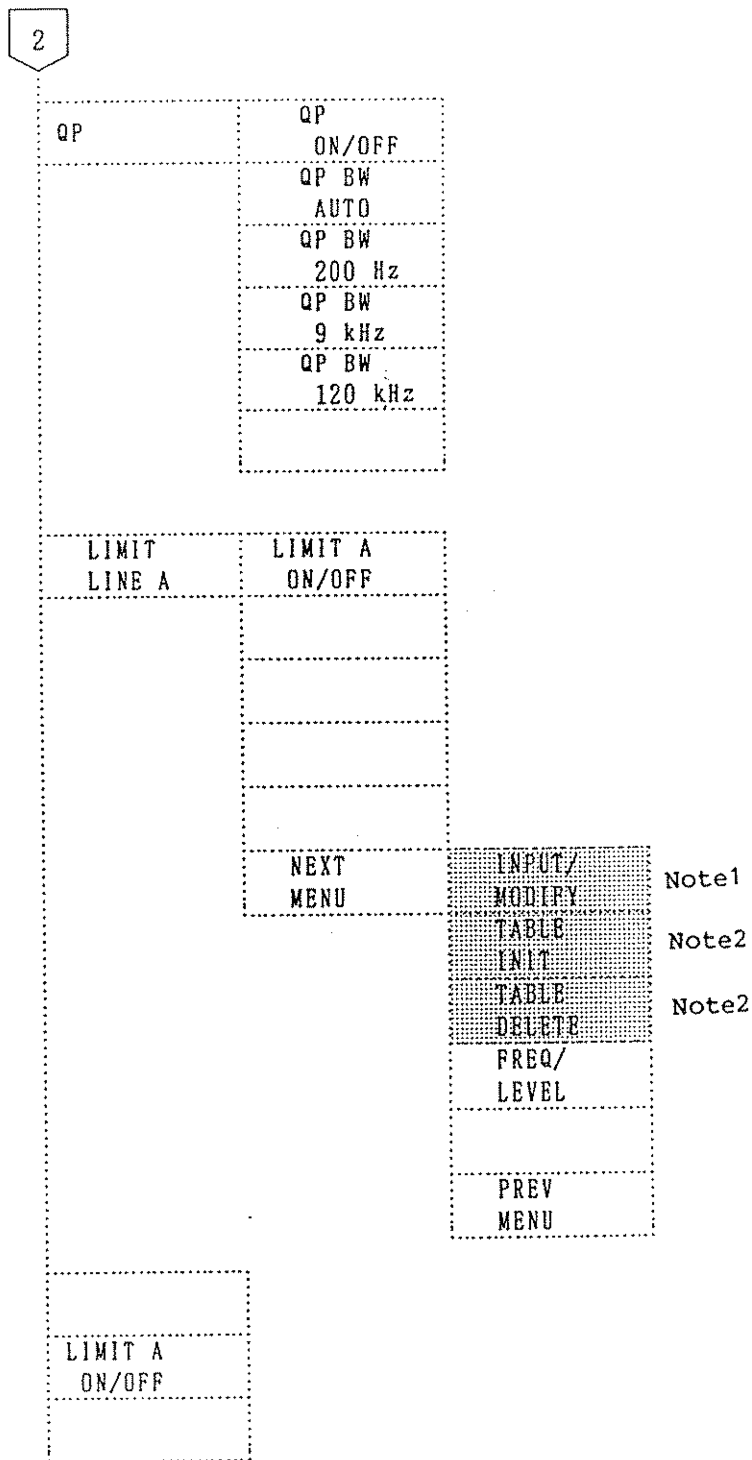
(21) Tracking Generator



(22) EMC

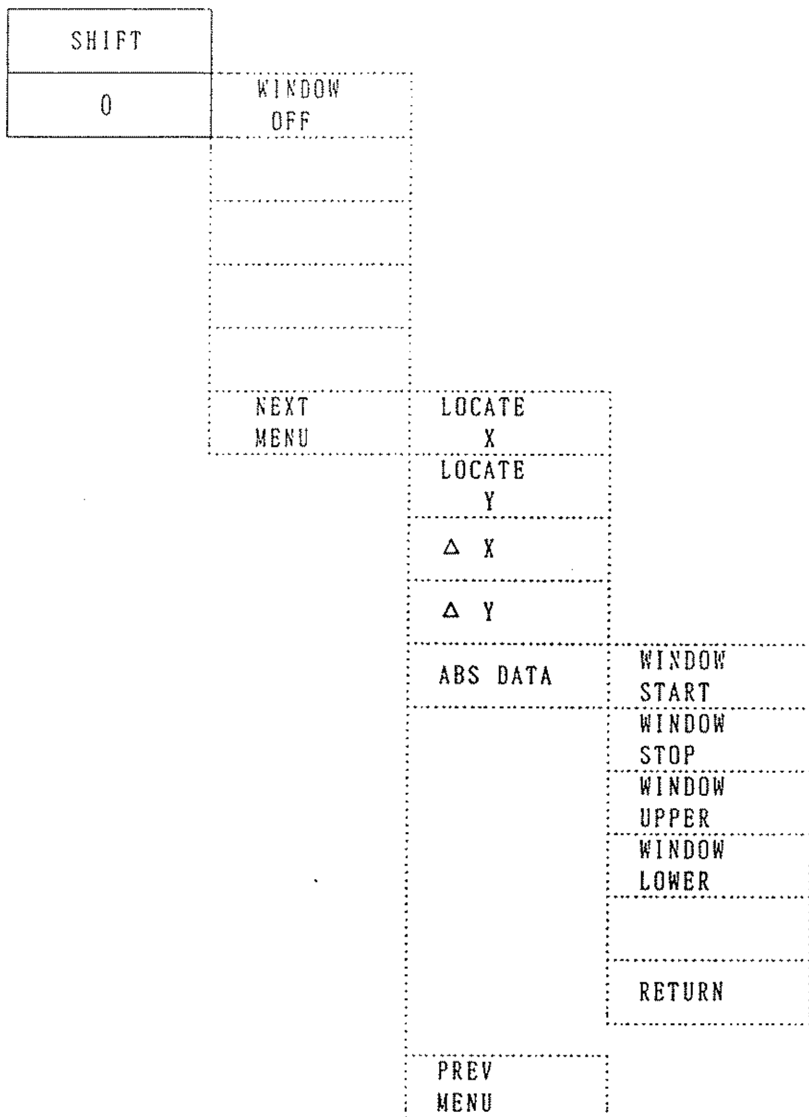


Note: "Note2" is displayed only when "Note1" is set in the MODIFY.

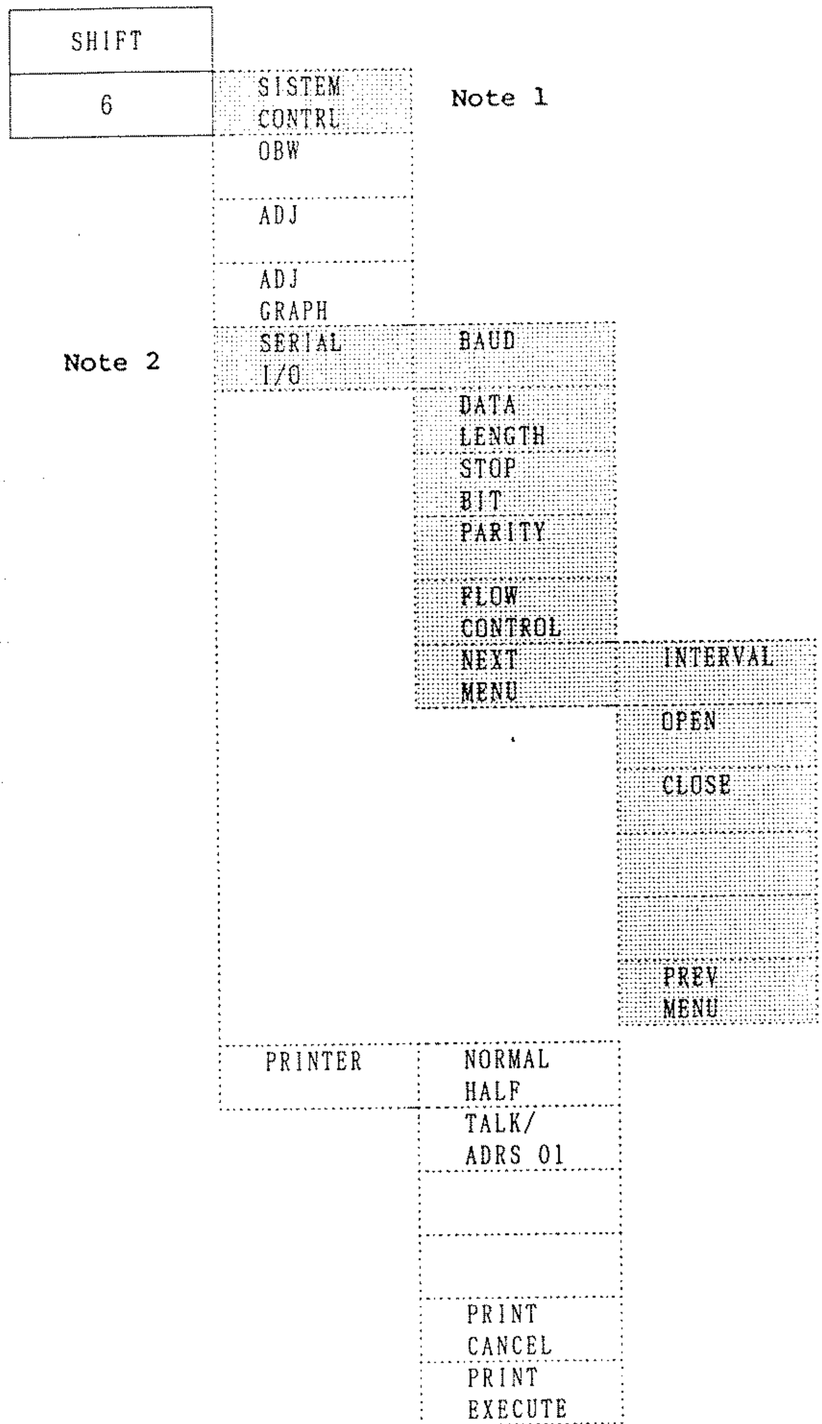


Note: "Note2" is displayed only when "Note1" is set in the MODIFY.

(23) MEAS WINDOW



(24) FUNCTION



Note1: Display for only devices equipped with Option 81.
Note2: Display for only devices equipped with Option 80.

A.2 Glossary

IF Bandwidth

A spectrum analyzer employs bandpass filters (BPF) to differentiate various frequency components of the input signal. IF bandwidth is the range of frequencies centered about the intermediate frequency limited by the -3dB amplitude points. (See Figure A-1 (a).) An optimum BPF characteristics must be selected according to the sweep width and sweep speed. The R3261/3361 spectrum analyzers optimize the BPF characteristics based on the sweep width. In general, the narrower the IF bandwidth is set, the finer is the selectivity (resolution) of the spectrum. Hence, sometimes the most narrow IF bandwidth possible is used as a measure of the resolution of the spectrum analyzer. (Figure A-1 (b).)

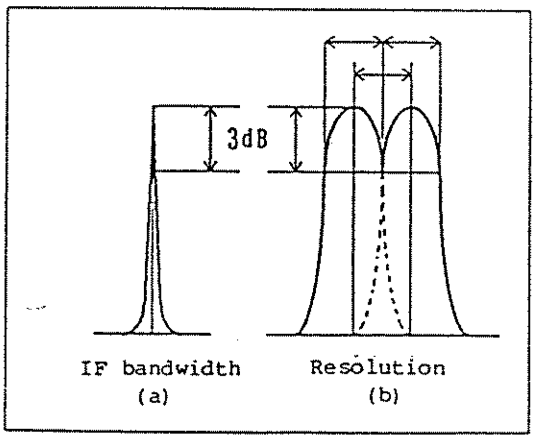


Figure A - 1 IF Bandwidth

Gain Compression

If an input signal is greater than a certain value, the CRT display cannot indicate the correct value. This causes compression of the effective indication as the input signal is increased. This process is termed the gain compression. Generally, the value of the level range within which one decibel of gain compression takes place is used to indicate the input signal range linearity.

Input Sensitivity

Input sensitivity is the minimum input signal that the spectrum analyzer is required to detect. Sensitivity is related to the noise generated by the spectrum analyzer itself, and depends on the IF bandwidth to be used. Generally, input sensitivity is taken as the average noise level at a minimum IF bandwidth of the spectrum analyzer.

Maximum Input Level

Maximum input level is the maximum level allowed in the input circuit of the spectrum analyzer. The level can be varied by an input attenuator.

Residual FM

Residual FM is the short-term jitter or undesired FM deviation of local oscillators. Residual FM in a spectrum analyzer is expressed as spectrum space of the jitter per unit time, and its symbol is p-p. This limits measurement resolution of residual FM contained in a signal to be tested.

Residual Response

Residual response is the level of spurious signal generated in the spectrum analyzer, referenced to the input level. Residual response is caused by a certain signal leakage, for instance, the output of local oscillators in the spectrum analyzer. It may disturb analysis of an input signal of very low level.

Quasi Peak Value Measurement

Interference noise in receiving radio waves often appears as an impulse. Such interference noise can be objectively represented as a function of the peak value of the pulse. The quasi peak value is measured under some specified conditions, including the measurement bandwidth and detection time constant. The Japanese JRTC and international CISPR are the two prevailing standards of this quasi peak value measurement.

Frequency Response

Generally, the term frequency response is used as a characteristic showing relative amplitudes at different frequencies (that is, the frequency characteristic). The frequency response of the spectrum analyzer is taken as the frequency characteristics (flatness) at different input frequencies in input attenuator, mixer and other units. It is expressed as ± dB.

Zero Span

Zero span is one of the modes of operation of the R3261/3361 spectrum analyzer, where sweep over a certain frequency span is not carried out. Instead, sweep is performed on an arbitrary specified frequency, and the y coordinate represents the time parameter.

Spurious Signals

Spurious signals are undesired signals. They may be classified into the following three categories by their nature:

Harmonics: Harmonics are generated by a part of the spectrum analyzer (generally by the mixer) when an ideal non-distortion signal is applied to the analyzer. The level of the harmonics represents the harmonics distortion measurement capacity of the analyzer.

Neighborhood signals:
Small spurious signals generated at near frequencies to a single pure signal applied to the spectrum analyzer.

Non-harmonic spurious signals:
Spurious signals of a specified frequency generated by the spectrum analyzer itself. Also termed residual response.

Noise Sidebands

The noise sidebands are usually regarded as a measure of oscillation purity generated by oscillating equipment. In the spectrum analyzer, local oscillators and phase lock loop generate noise near the spectrum displayed on the CRT screen, reducing the analysis precision of the analyzer. The noise sidebands means the range of analyzable bandwidth of external signal noise, apart from the specified intrinsic side bands. Noise side band characteristic of a spectrum analyzer is defined as follows:

[Example]

In 1 kHz of IF bandwidth, -70dB apart from the carrier frequency by 20kHz. Otherwise, the noise side band characteristic may be expressed indirectly by the noise level, generally represented by the energy present within 1Hz of the bandwidth. (See Figure A-2 (b).)

In the latter form, a signal of -70dB within 1kHz of the bandwidth must have lower energy in 1Hz of bandwidth, by 10 log 1Hz/1kHz [dB] = approx. 30dB. Hence, in 1kHz of IF bandwidth, -100dB/Hz apart from the carrier frequency.

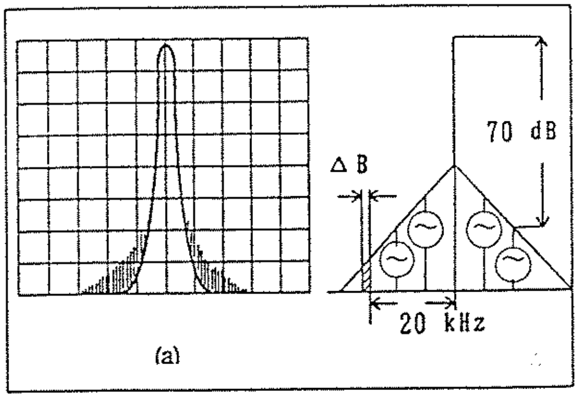
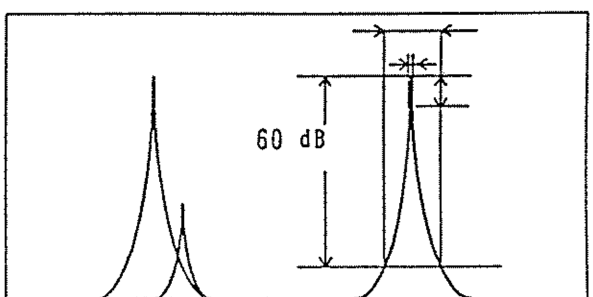


Figure A - 2 Noise Side Bands

Bandwidth Selectivity

Graphically, bandpass filter shows the attenuation characteristic of normal Gaussian distribution, instead of the rectangular shape. Therefore, a small signal may be concealed under the skirt of a nearby large signal. (See Figure A-3.) Because of this, bandwidth at the specified attenuation point needs to be specified. The ratio of 15:1 (60dB to 3dB) is used as the bandwidth selectivity for the R3261/3361 spectrum analyzer.



(a) Differentiation of two signals of different levels
(b) IF filter selectivity

Figure A - 3 Bandwidth Selectivity

Bandwidth Accuracy

Bandwidth accuracy is the factor representing the IF filter bandwidth accuracy, expressed as the deviation from the nominal value of the -3dB amplitude points. This factor little affects level measurement of normal continuous signals, but must be taken into consideration in noise signal level measurement.

Bandwidth Switching Accuracy

For spectrum analysis of signals, a choice of multiple IF filters instead of a single one is provided for optimum resolution of a given scan width. Bandwidth switching accuracy is the maximum error in measurement that may result from analysis of an identical signal, caused by switching the IF filters and thus varying the loss.

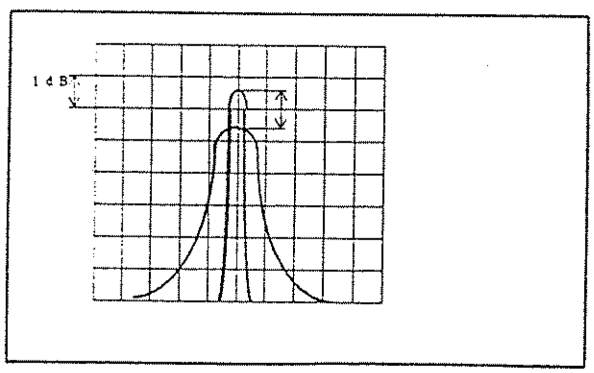


Figure A - 4 Bandwidth Switching Error

Reference Level Display Accuracy

Reference level display accuracy is the absolute accuracy of the indication expressed in dBm, or dBμ, of the reference level, which is set at the uppermost scale on the CRT screen. The reference level is used to measure the absolute level of an input signal in decibels. The reference level setting can be done by using the IF GAIN key and the input attenuator.

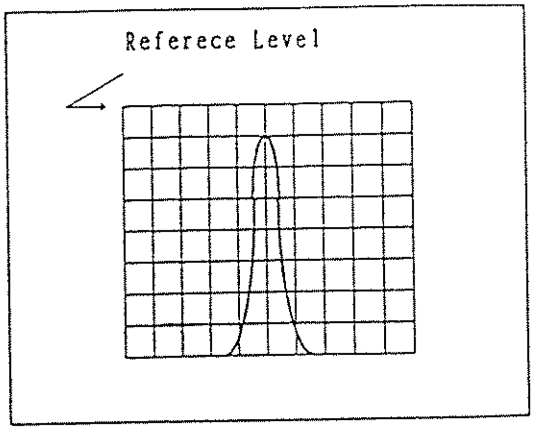


Figure A - 5 Reference Level

Voltage Standing Wave Ratio (VSWR)

Voltage standing wave ratio is the ratio of voltage at a loop (maximum) to the value at a (minimum) node in a stationary wave system, which is formed by progressive and reflected waves generated by the spectrum analyzer connected to an ideal nominal impedance source. This factor can otherwise be expressed as reflection coefficient or reflection loss.

See Figure A-6. If signal E_0 sent from the transmitting party should have been transferred to the receiving party (spectrum analyzer inlet) without any loss caused by mismatching of impedance, etc., the received signal E_1 would be equal to E_0. Otherwise, if part of the signal is reflected and returned to the receiving party because of mismatching, the ratio of the reflected wave to the progressive wave is given by the formula

$$m = E_R/E_0$$

where m is the reflection coefficient and E_R and E_0 are the voltage levels of reflected and progressive waves, respectively. The ratio (in decibels) of the reflected wave E_R to the progressive wave E_0 is the reflection loss.

$$\text{Reflection loss} = 20 \log E_R/E_0 \text{ [dB] VSWR}$$
$$= (E_0 + E_R)/(E_0 - E_R)$$

VSWR can be expressed related to reflection coefficient;

$$\text{VSWR} = (1 + |m|)/(1 - |m|)$$

where VSWR vary from 1 to infinite. VSWR approaches 1 as the impedance is equalized.

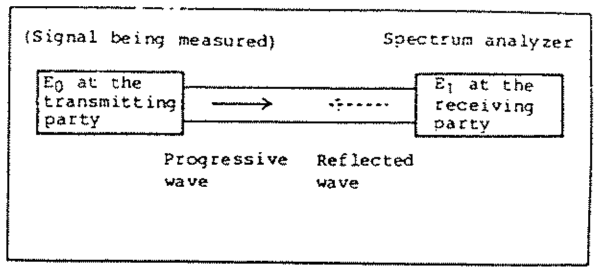


Figure A - 6 VSWR

Spurious Response

Spurious response is the harmonic distortion generated in the input mixer as the signal level is increased. The range free from spurious response varies depending on the fundamental wave input level. In the example shown in Figure A-7, -70dB display level corresponds to the input level of -30dBm. If a signal of excess level is input, the input attenuator decreases the signal to be applied to the mixer to an adequate level.

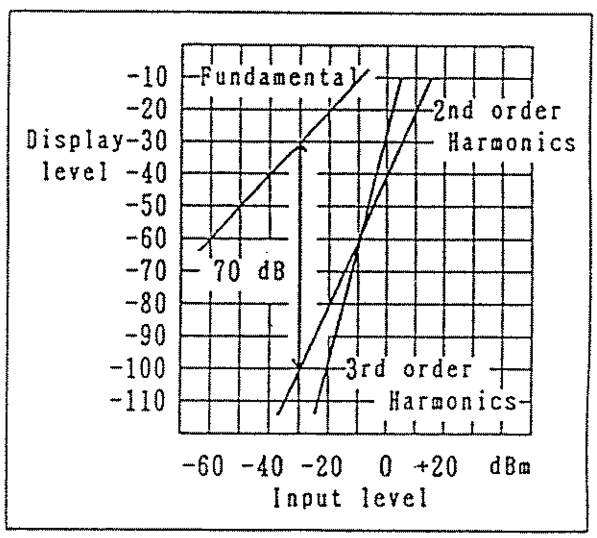


Figure A - 7 Spurious Response

YIG-tuned Oscillator

As first reported by Griffiths in 1946, ferrites of garnet group represented by Yttrium Iron Garnet (YIG) mono crystal show electron spin resonance at microwave frequencies. The resonance frequencies are linearly proportional to the direct magnetic field applied. This characteristic holds through a wide frequency band. With these properties, precise tuning in wide frequency band is accomplished by varying the exciting current of the electromagnet producing the magnetic field. This type of oscillator is widely employed as the local sweep generator in spectrum analyzers or automatic microwave frequency counters made by ADVANTEST.

A.3 Level Conversion Table

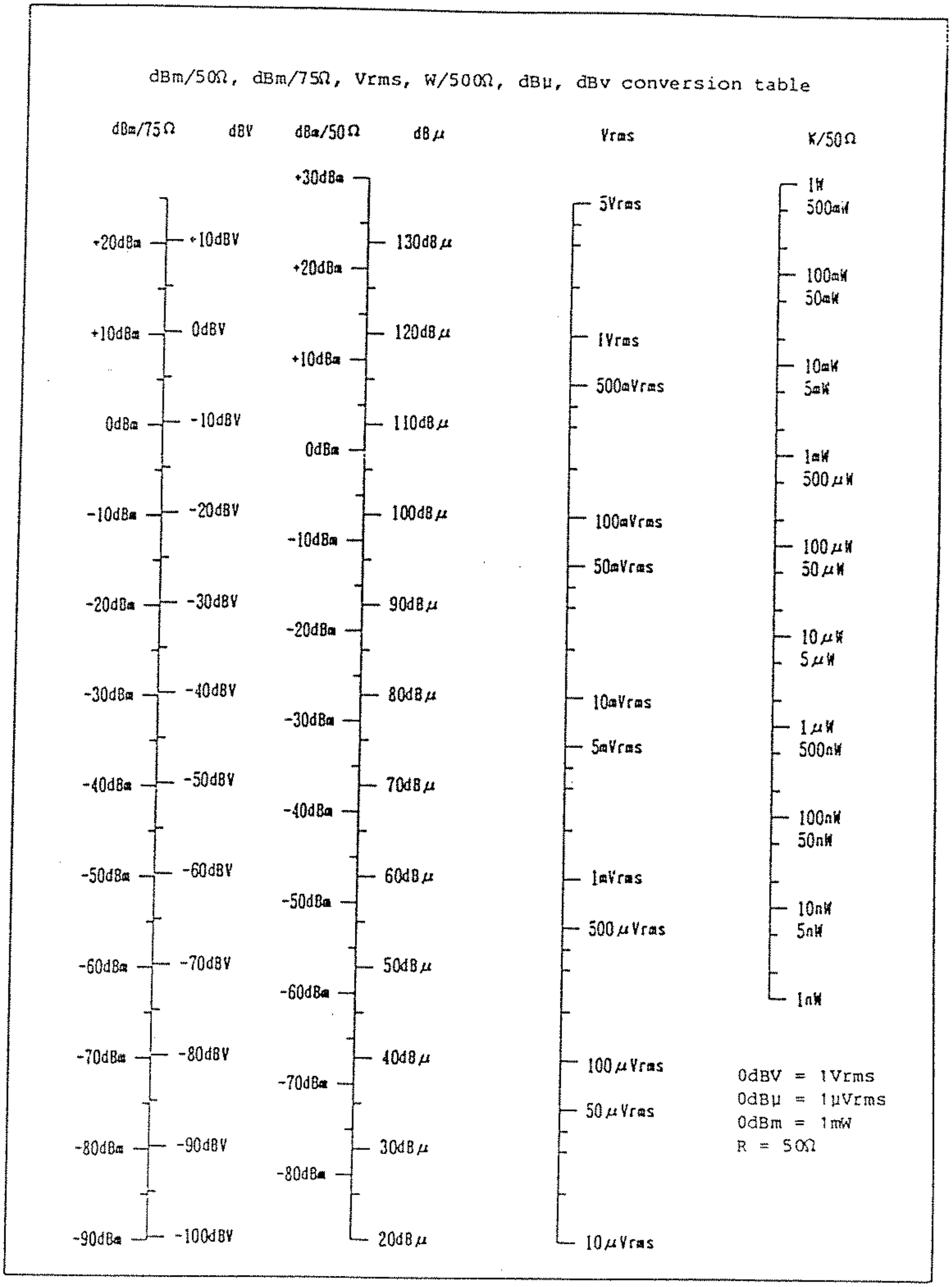


Figure A - 8 Level Conversion Table

ALPHABETICAL INDEX

[E]

[F]

[G]

[H]

[I]

[L]

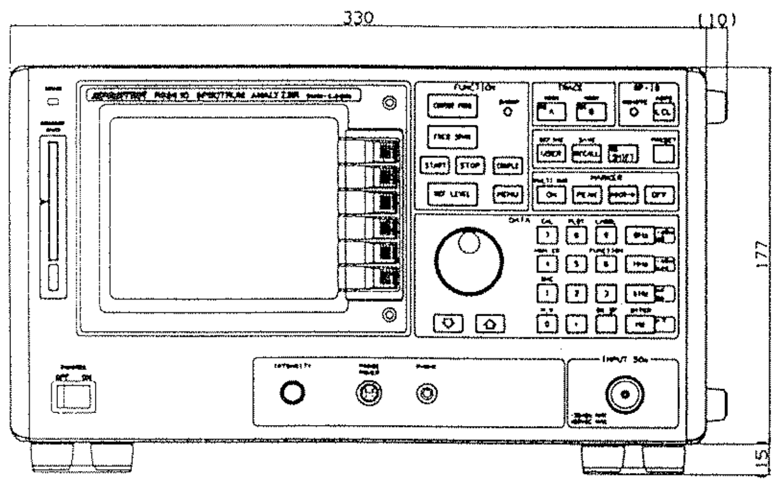
[P]

[Q]

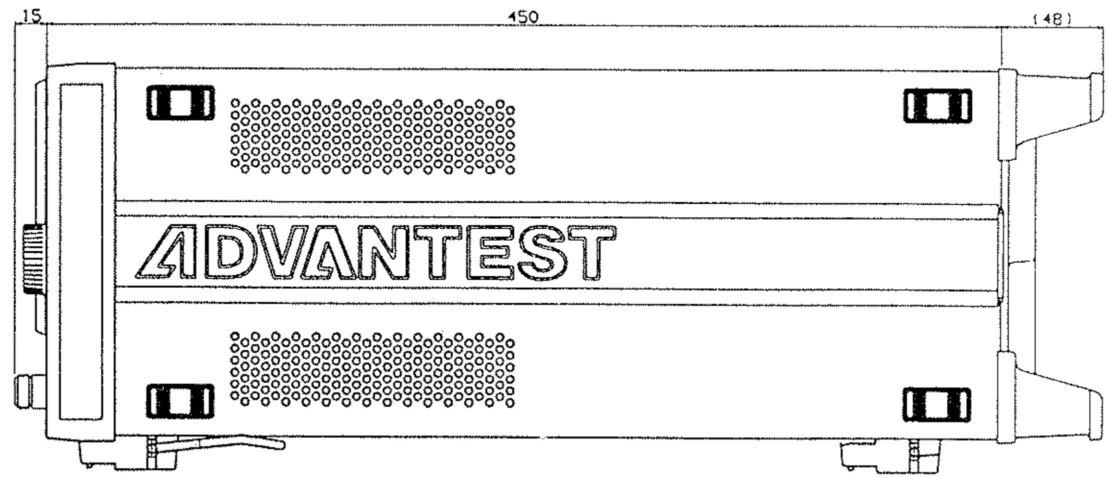
[R]

[S]

EXTERNAL VIEW

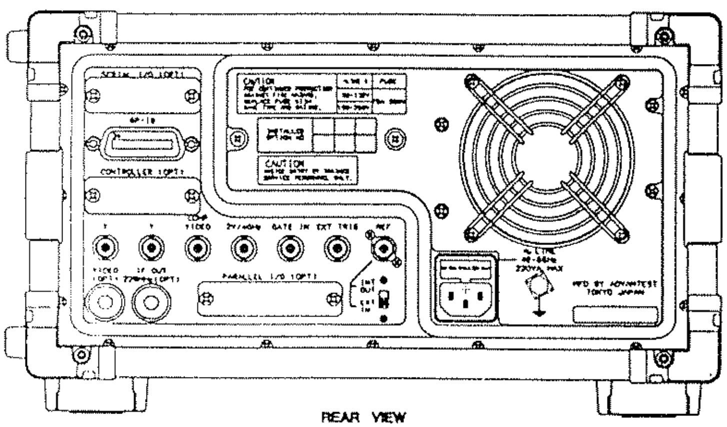


FRONT VIEW



SIDE VIEW

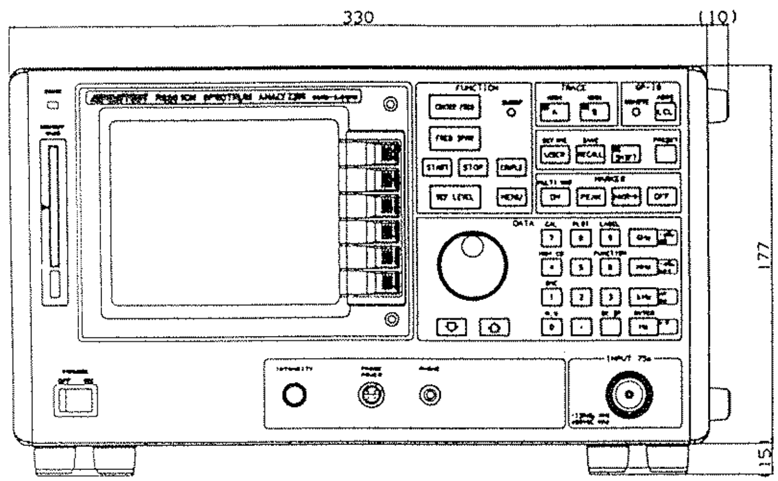
Unit : mm



REAR VIEW

R3261C
EXTERNAL VIEW

EXT1-9406-A



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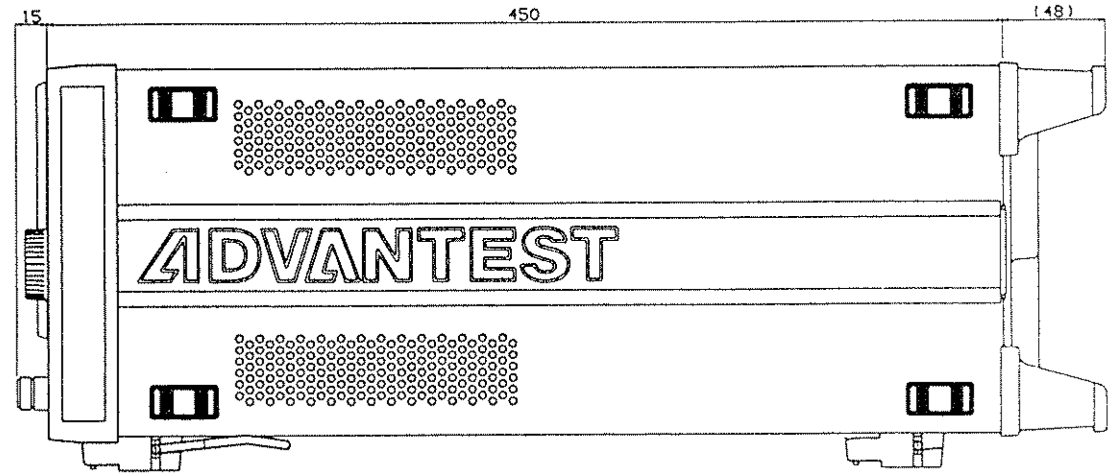
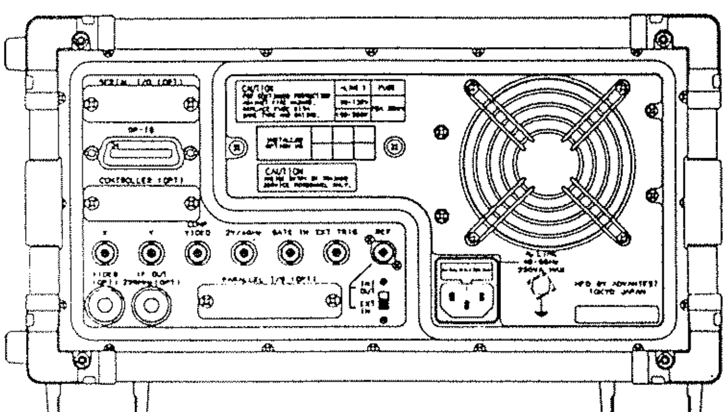


SIDE VIEW

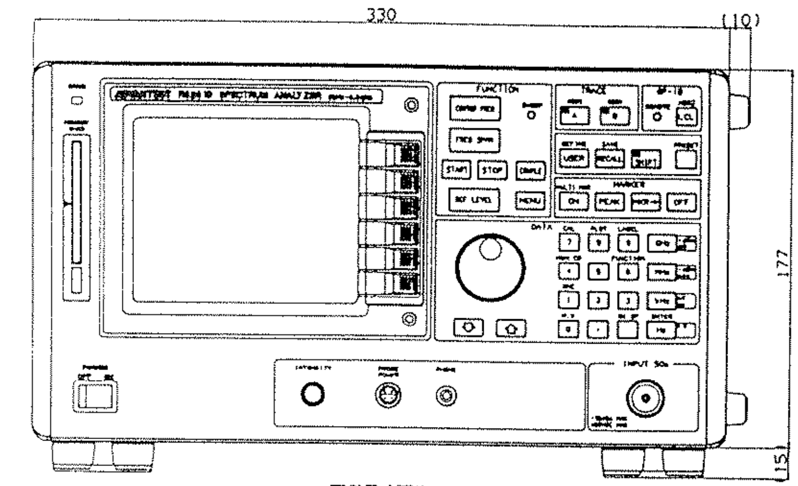
Unit : mm



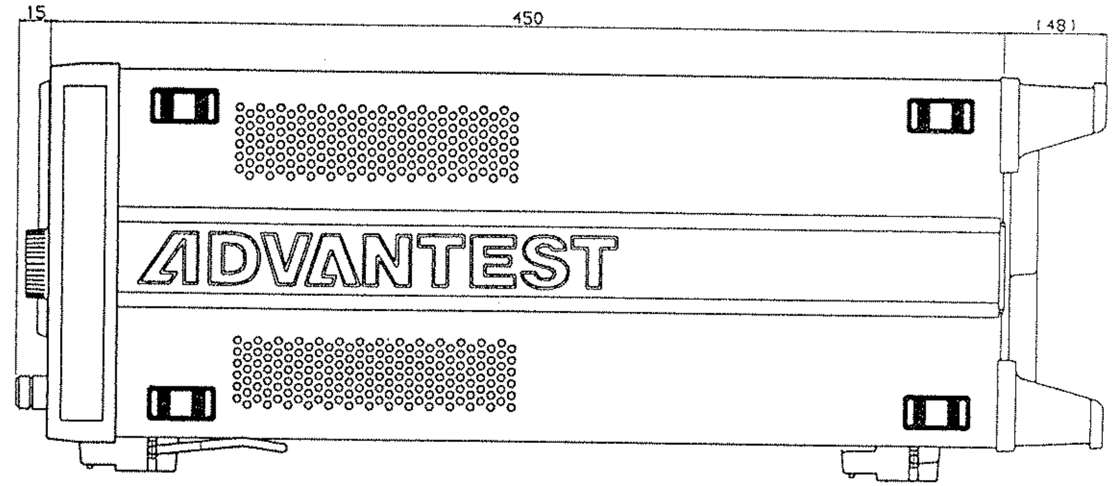
REAR VIEW

R3261CN
EXTERNAL VIEW

EXT2-9406-A

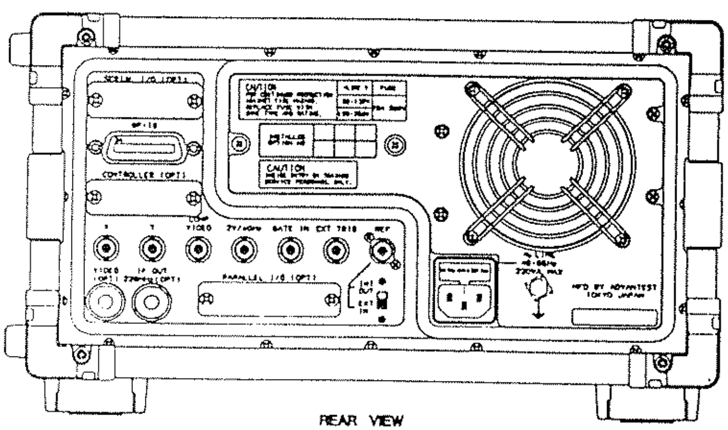


FRONT VIEW



SIDE VIEW

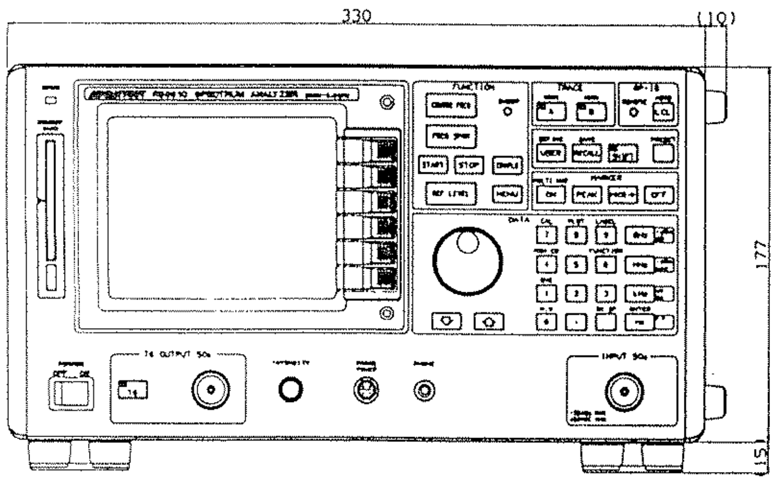
Unit : mm



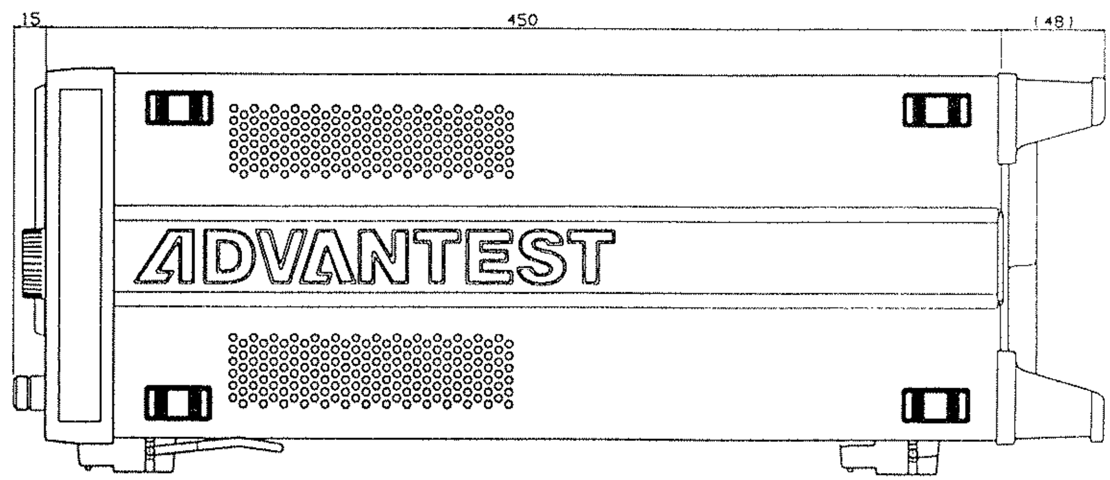
REAR VIEW

R3261D
EXTERNAL VIEW

EXT3-9406-A

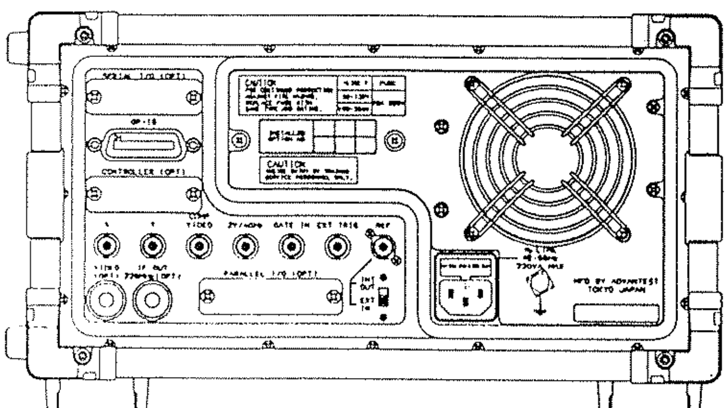


FRONT VIEW



SIDE VIEW

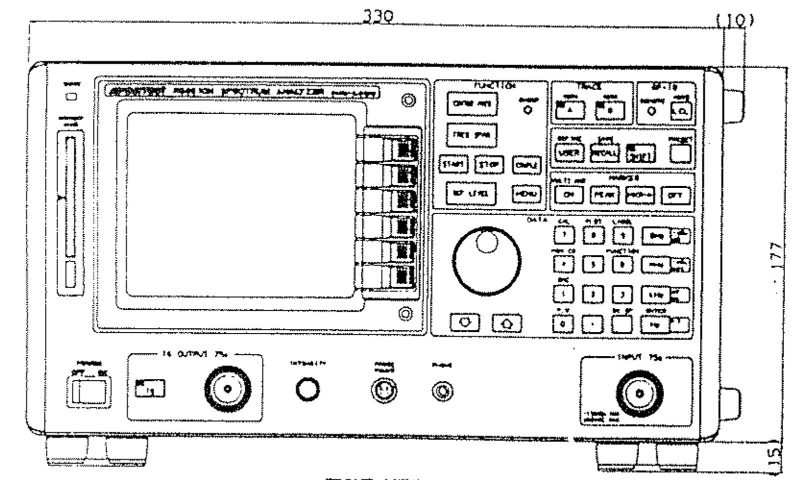
Unit : mm



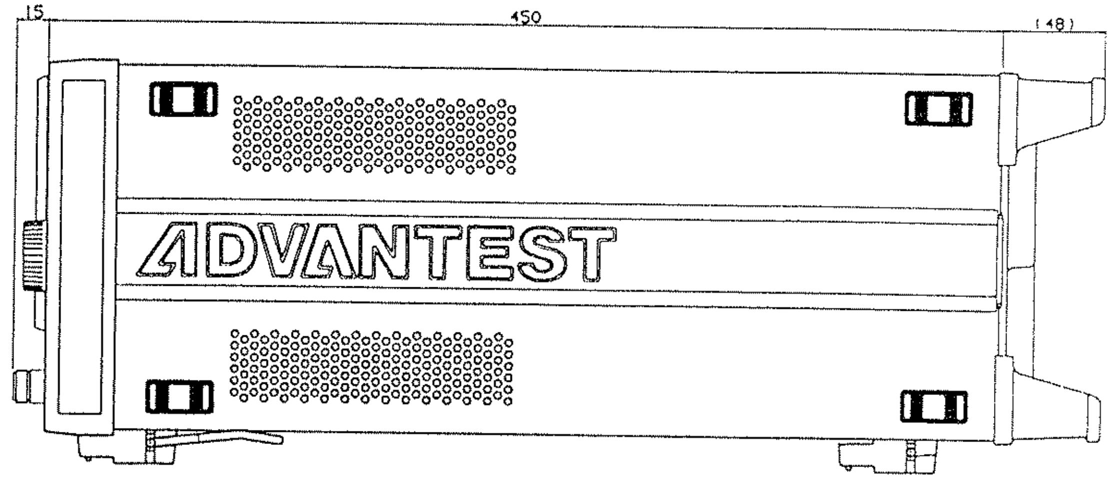
REAR VIEW

R3361C
EXTERNAL VIEW

EXT4-9406-A

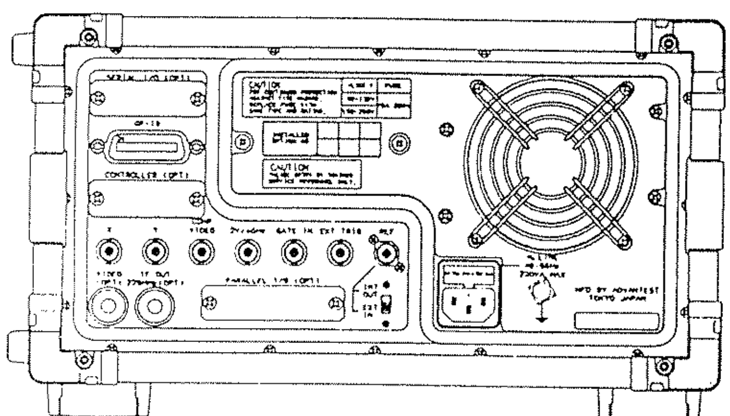


FRONT VIEW



SIDE VIEW

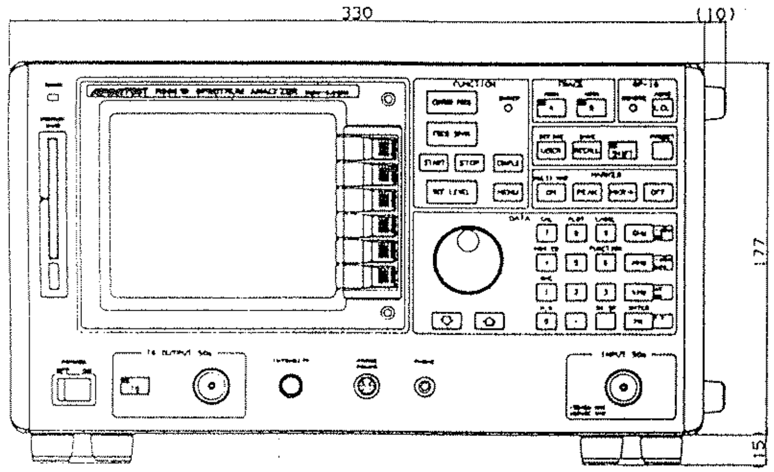
Unit : mm



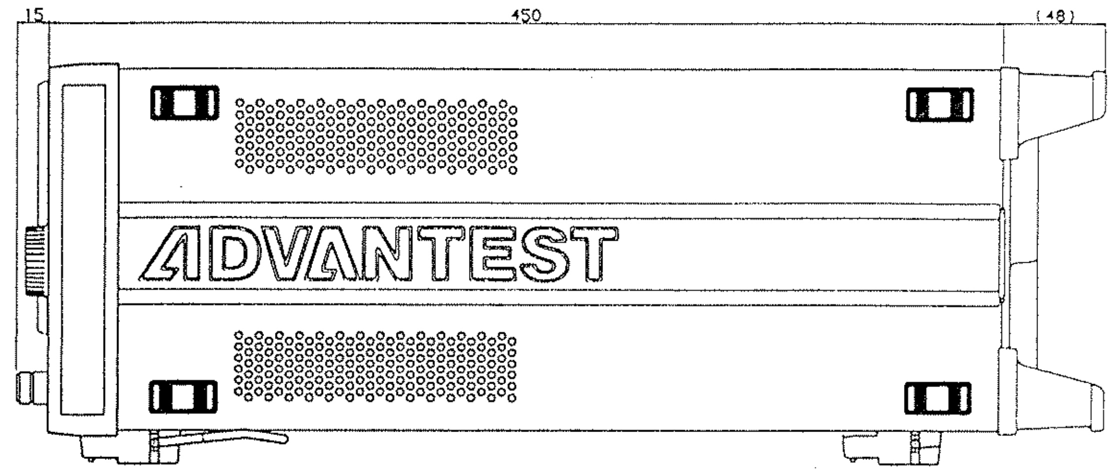
REAR VIEW

R3361CN
EXTERNAL VIEW

EXT5-9406-A

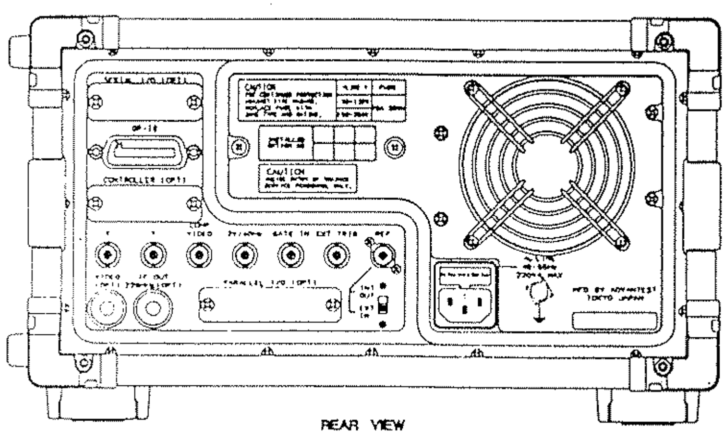


FRONT VIEW



SIDE VIEW

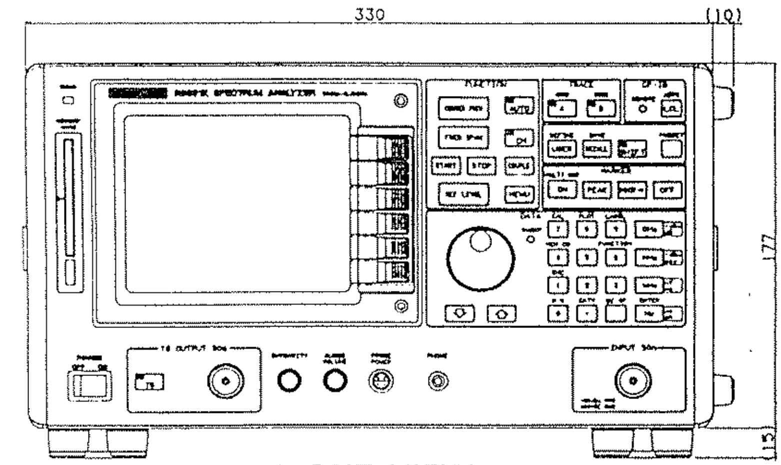
Unit : mm



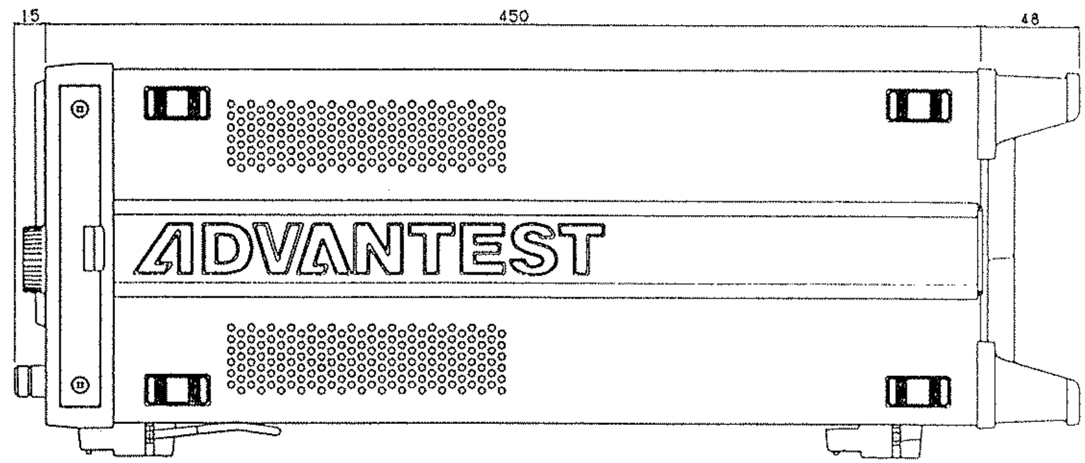
REAR VIEW

R3361D
EXTERNAL VIEW

EXT6-9406-A

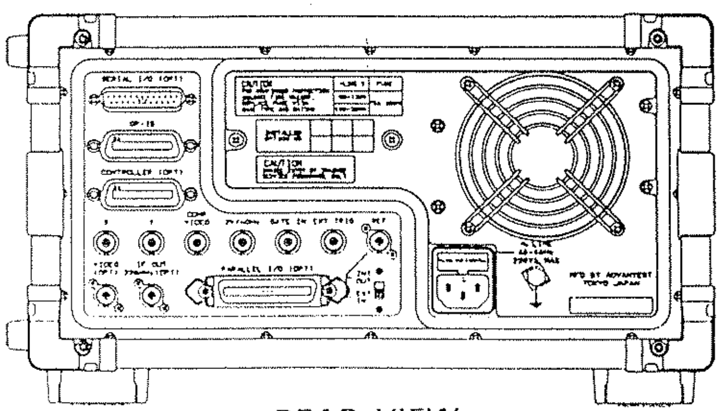


FRONT VIEW



SIDE VIEW

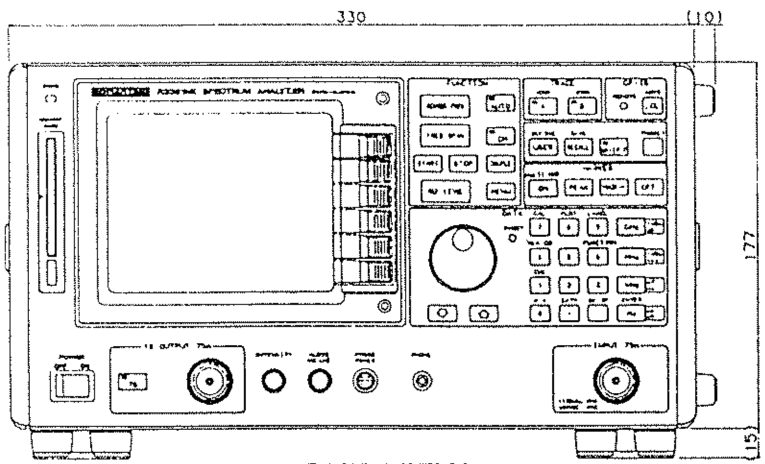
Unit : mm



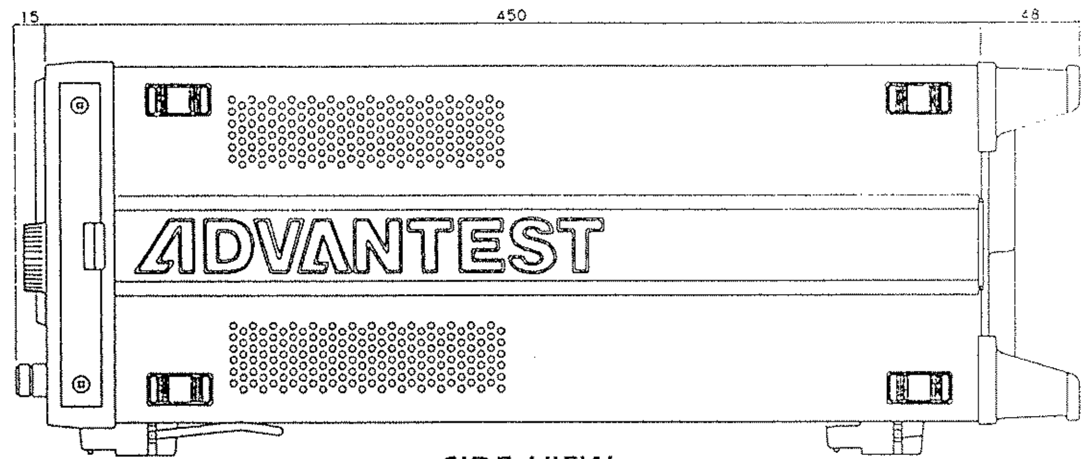
REAR VIEW

R3361K
EXTERNAL VIEW

EXT7-9505-A

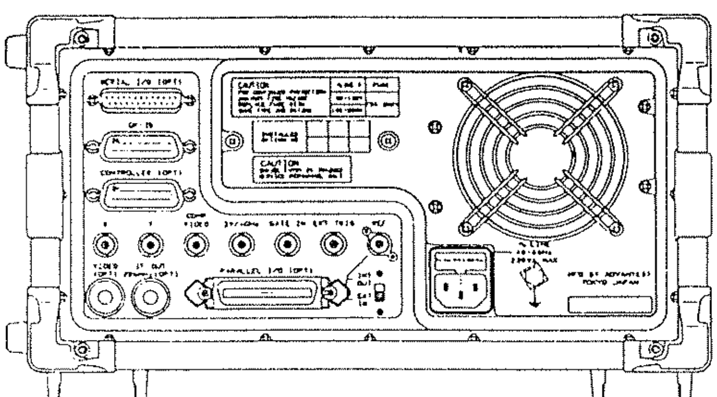


FRONT VIEW



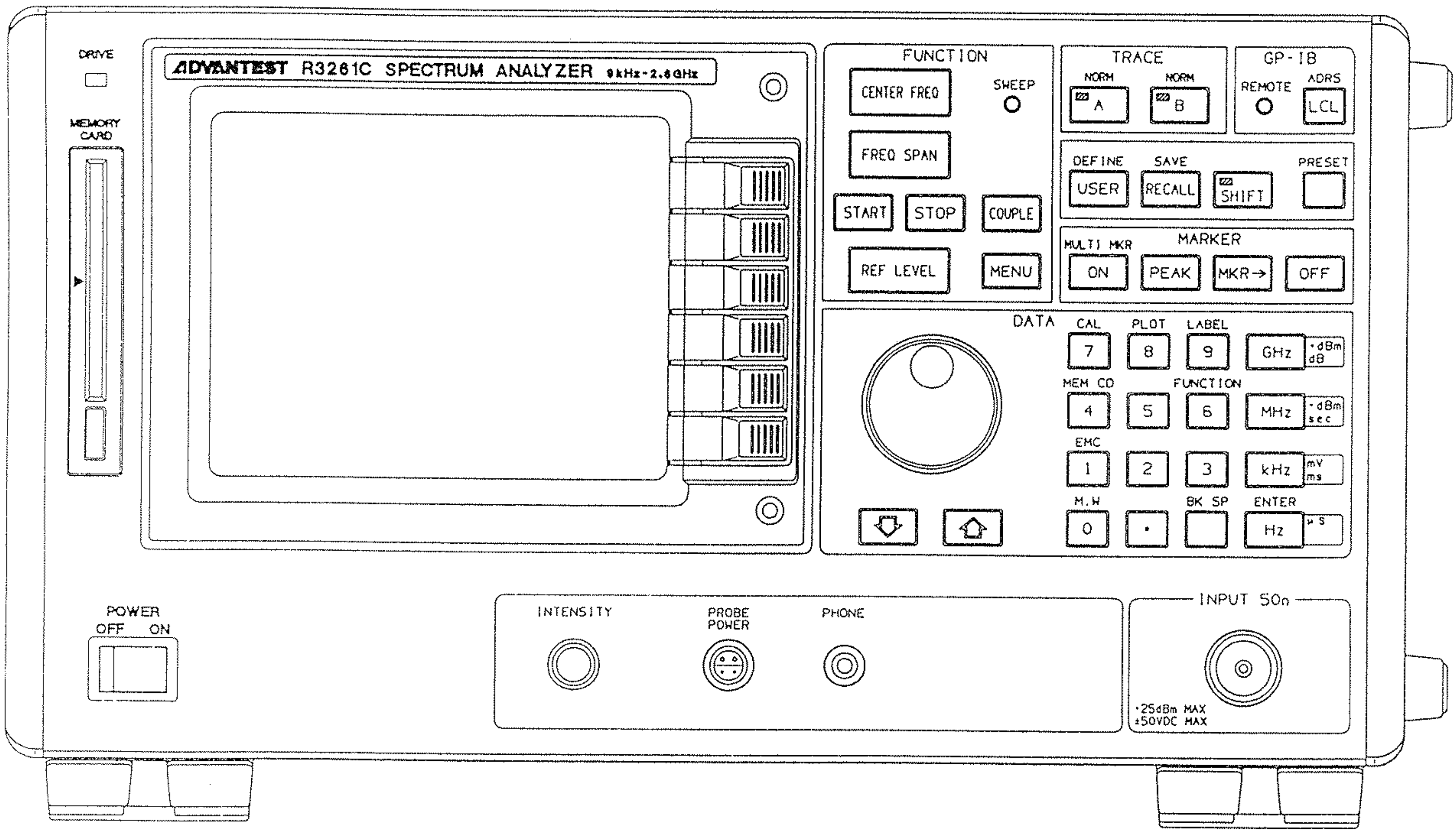
SIDE VIEW

Unit : mm



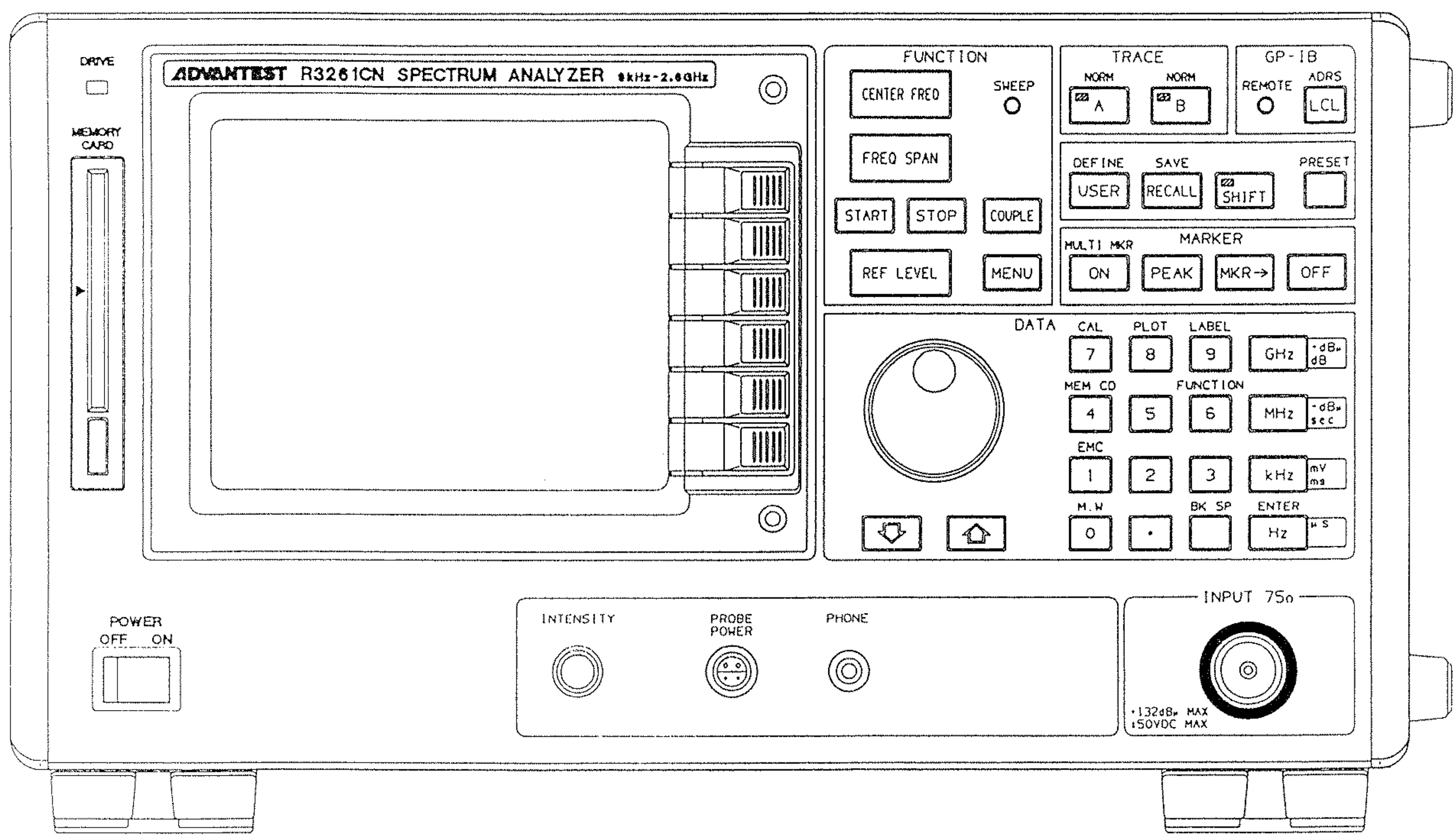
REAR VIEW

R3361NK
EXTERNAL VIEW



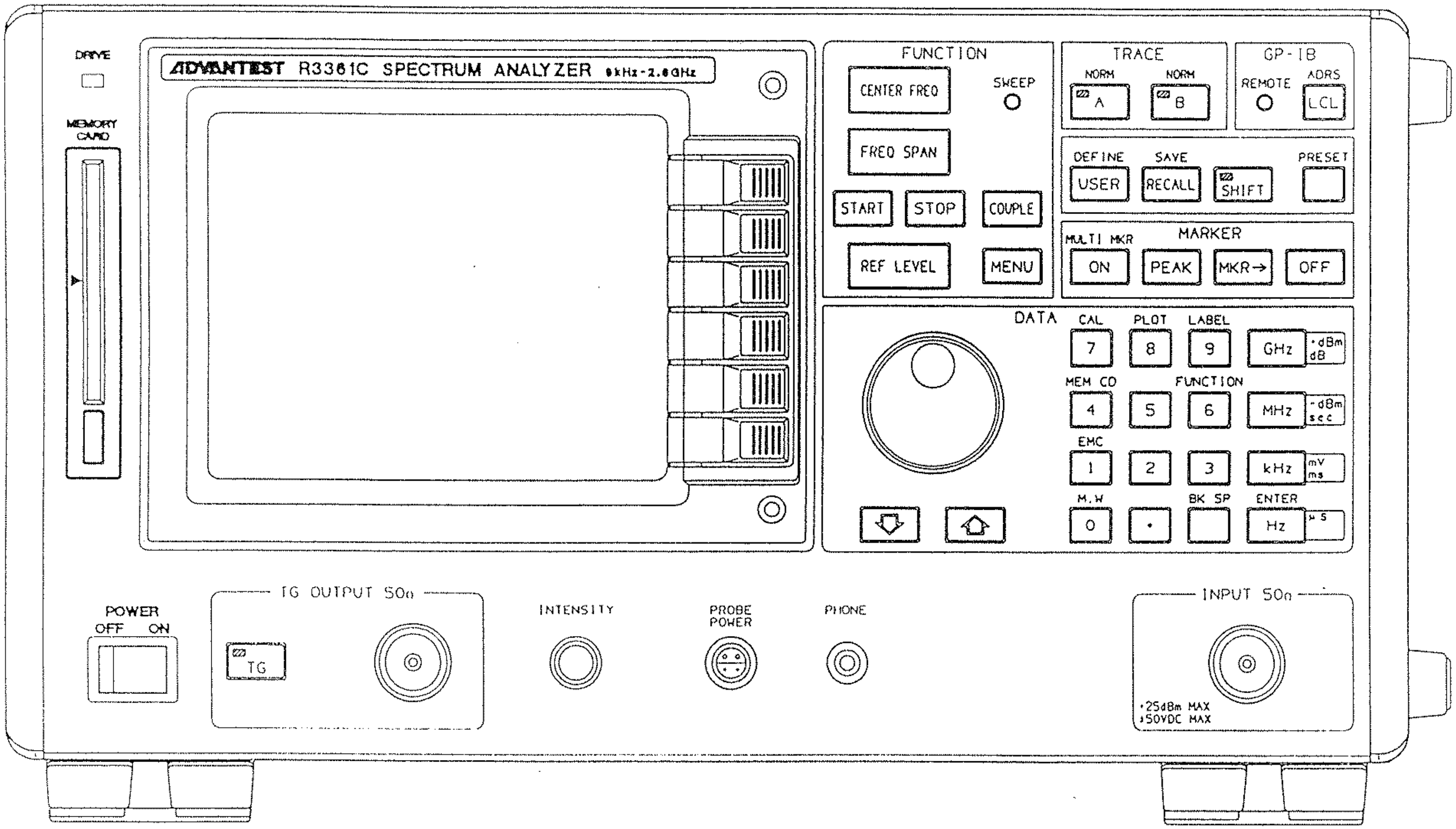
R3261C
FRONT VIEW

EXT9-9505-A



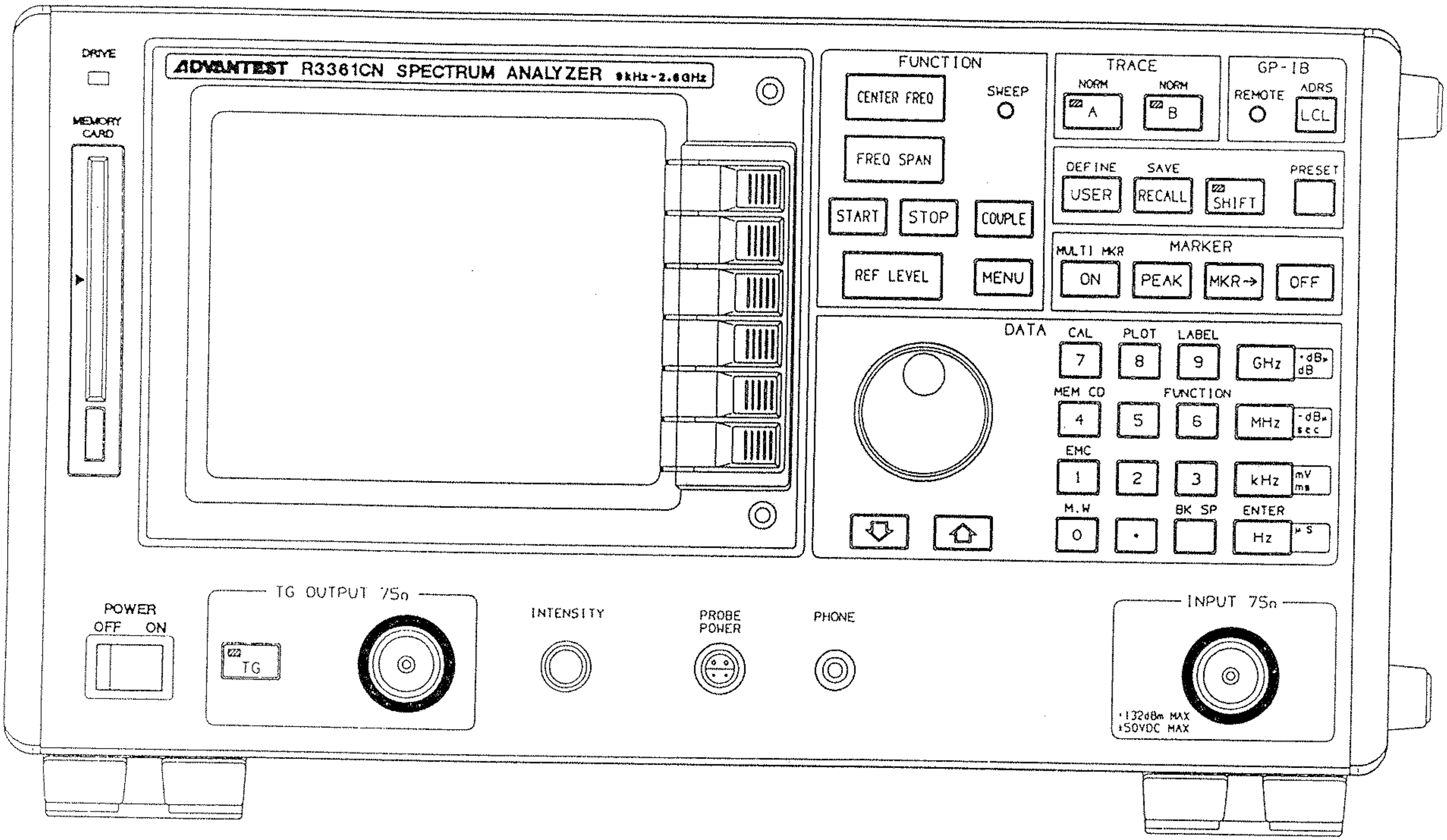
R3261CN
FRONT VIEW

EXT10-9505-A



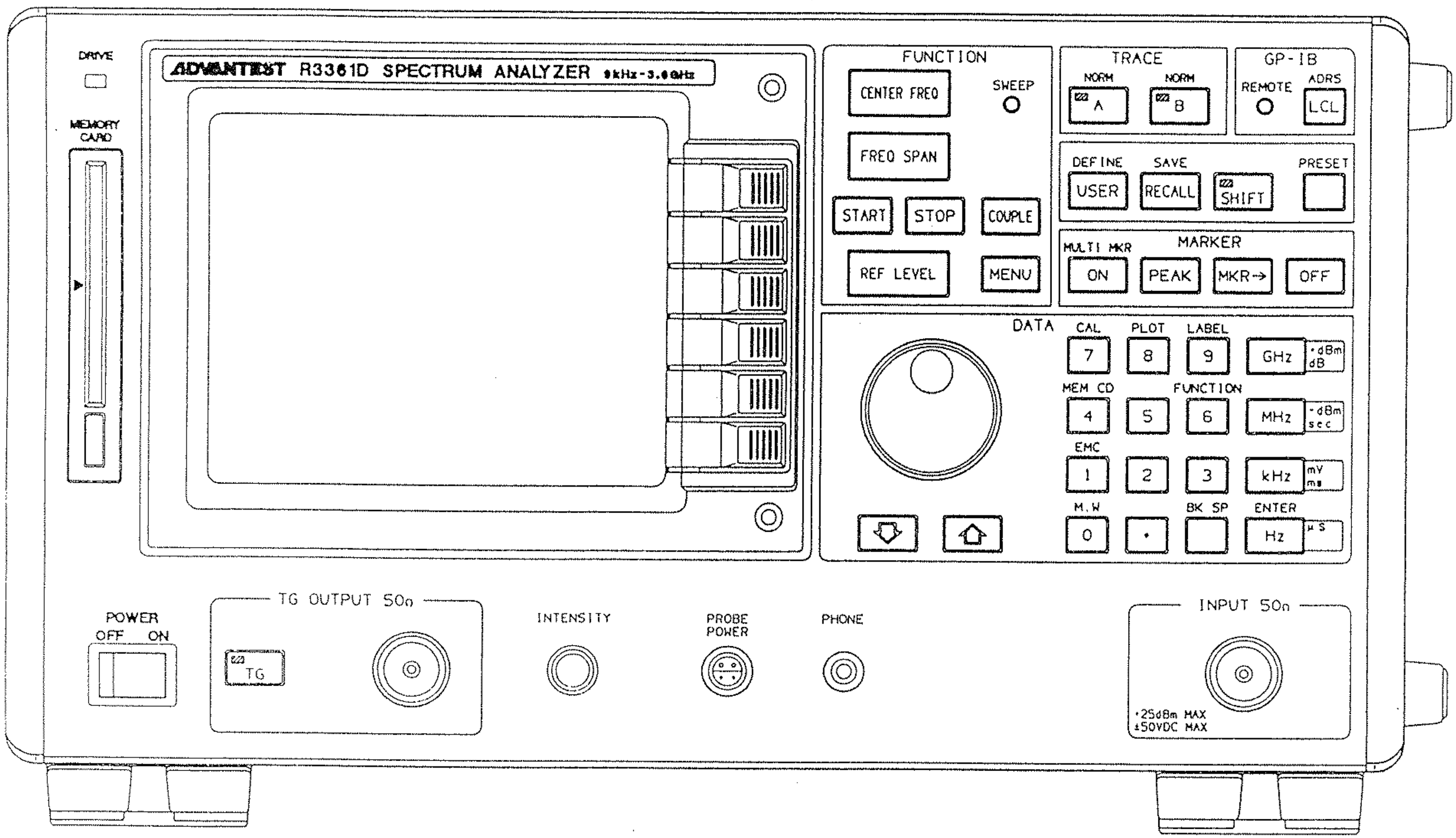
R3361C
FRONT VIEW

EXT.2-9505-A



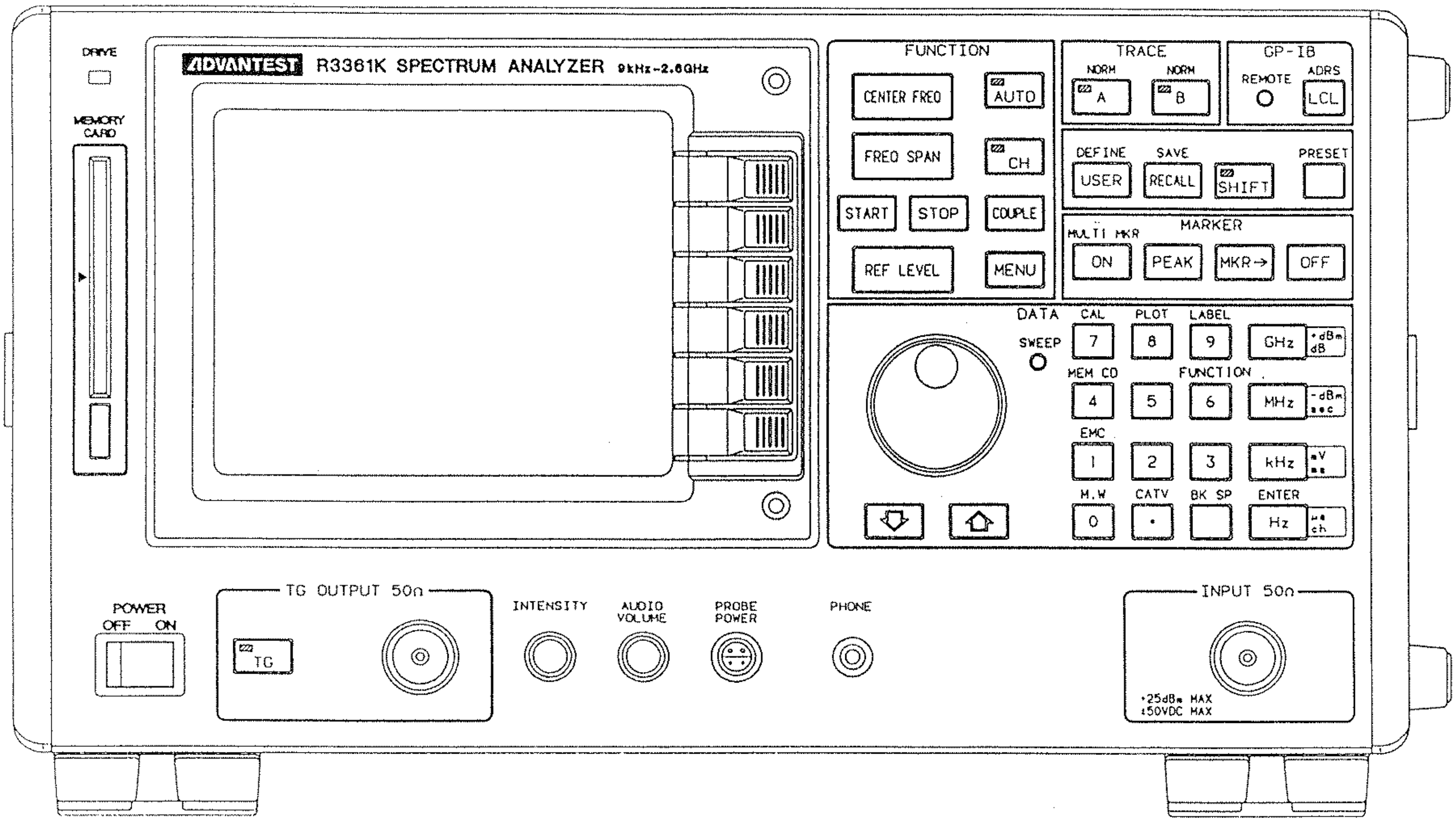
R3361CN
FRONT VIEW

EXT13-9505-A



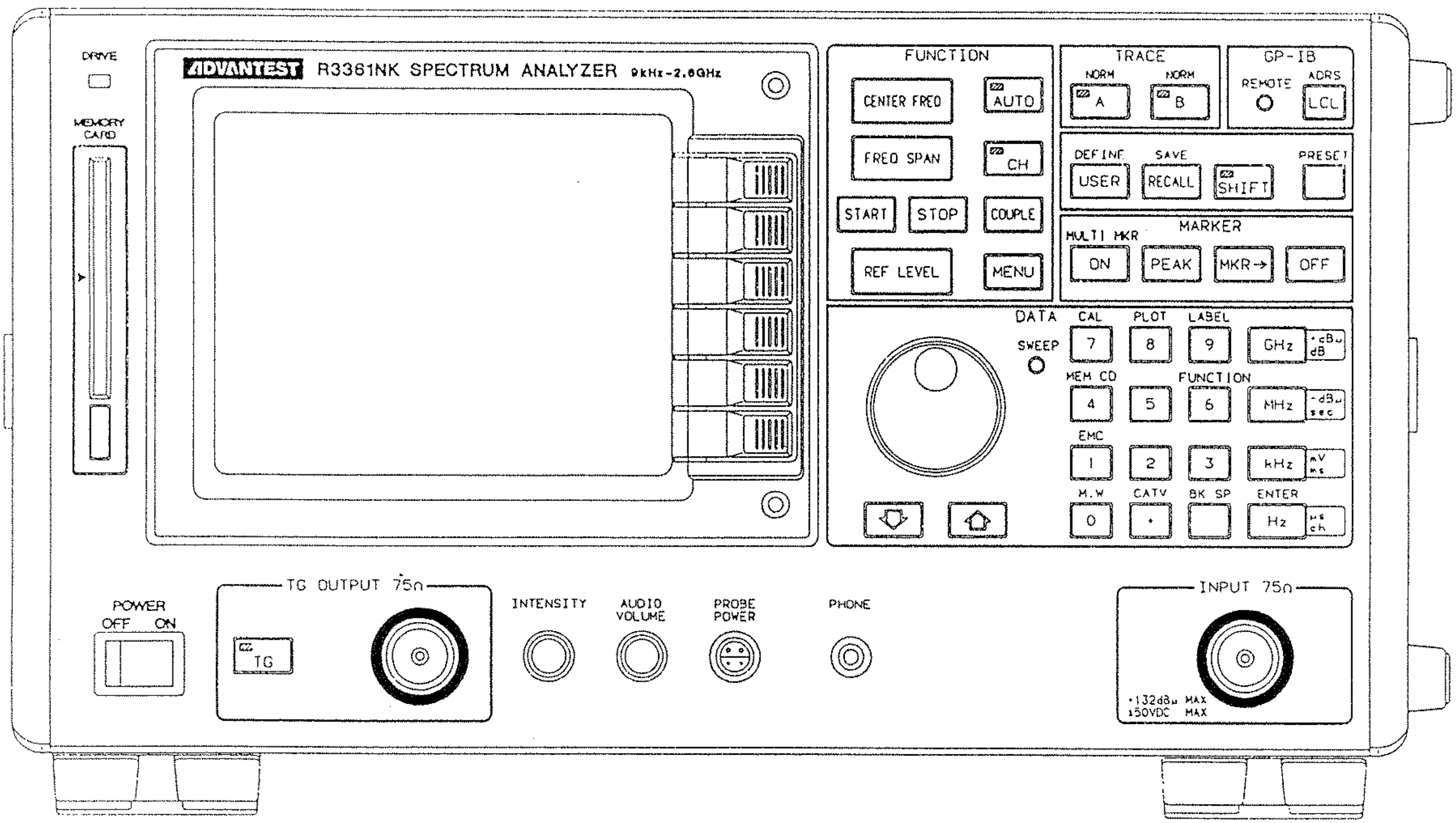
R3361D
FRONT VIEW

EXT14-9505-A



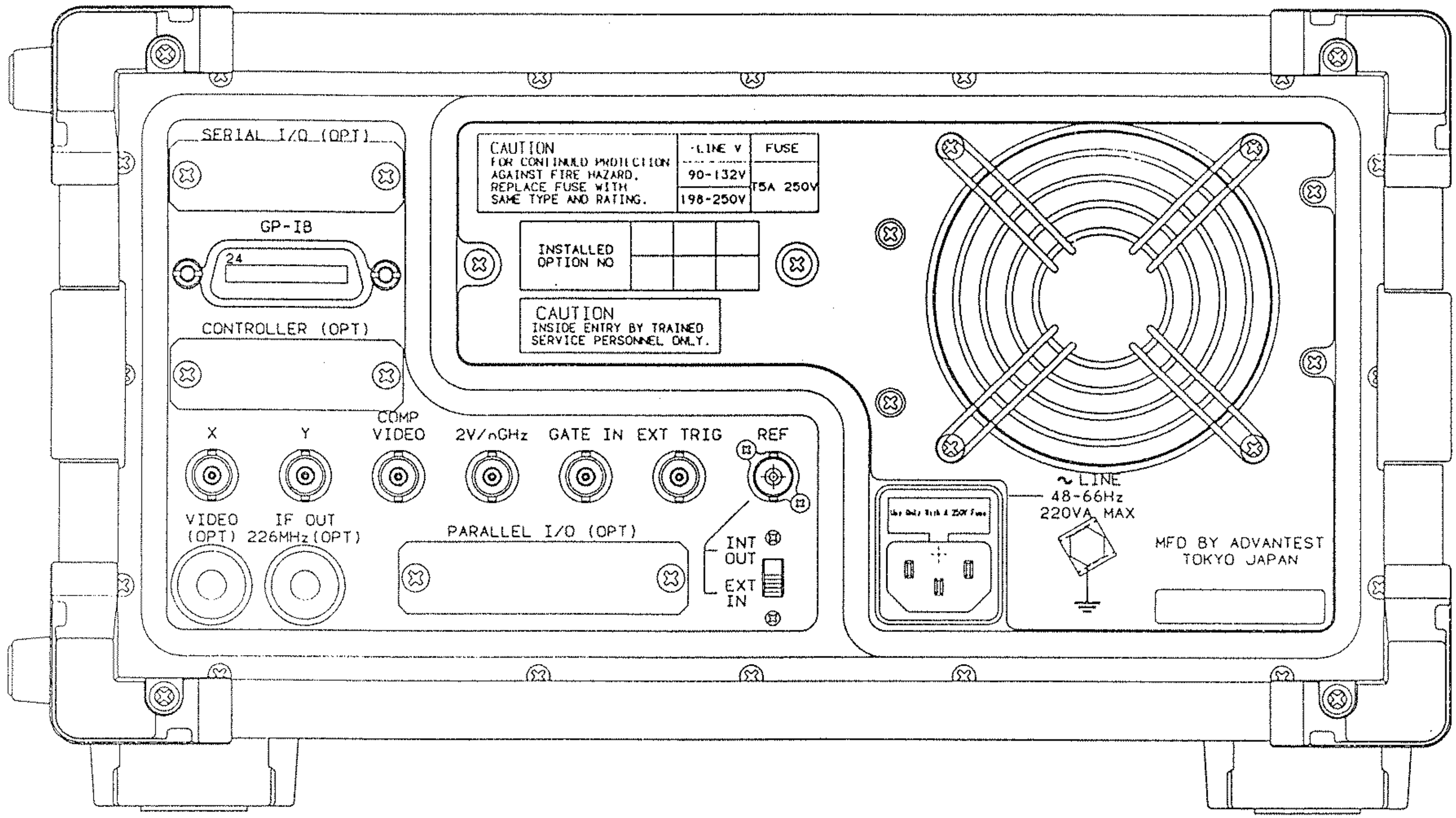
R3361K
FRONT VIEW

EXT15-9505-A



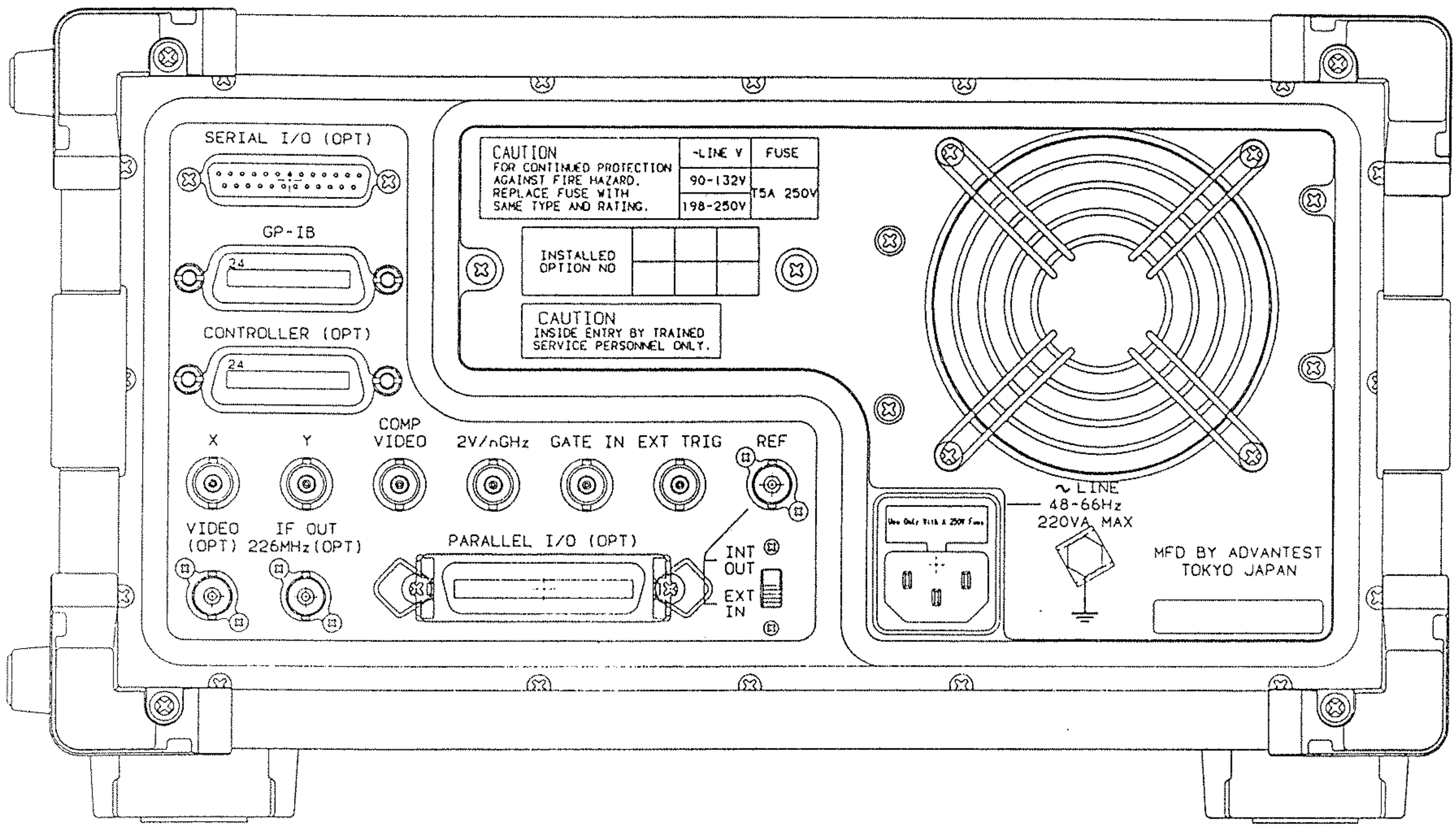
R3361NK
FRONT VIEW

-9505-A



R3261/3361 SERIES
REAR VIEW (Standard)

EXT17-9505-A



R3261/3361 SERIES
REAR VIEW (When option is inst

EXT18-9505-A

PERFORMANCE TEST

TABLE OF CONTENTS

1 General

1.1 Testing Equipment

Equipment to be used for the performance test is listed in Table 1. The cables needed are listed in Table 2.

Table 1 Test Equipment

Test Equipment	Required Performance		Recommended Equipment
Synthesized Signal Generator	Frequency Output Level Output Impedance AM Modulation	: to 3.6 GHz : +10 dBm to -30 dBm : 50Ω : 100 Hz with 30% Modulation (or external modulation)	Advantest R4262
Low Distortion Signal Generation (or synthesized signal generator with low pass filter)	Frequency Output Level Output Impedance Second Harmonic Frequency	: to 1.8 GHz : -10 dBm : 50Ω : 60dB or less for -10dBm output	Advantest R4262 +L.P.F.
RF Power Meter	Frequency Sensitivity	: to 3.6 GHz : +20 dBm to -50 dBm : ±0.2 dB	Generic
Attenuator	Frequency Attenuation Stability	: to 500 MHz : 10 dB step : 0 to 110 dB : 1 dB step : 0 to 11 dB : 10dB : ±0.2 dB : 1dB : ±0.02 dB	Generic
Low-Frequency Generator	Frequency Output Level	: 100 Hz : 1 Vp-p	Generic
Frequency Comparator			Generic
Frequency Standard	Stability	: 2 X 10^{-9}	Advantest TR3110

Table 2 Cables & Adapters Required

Product Name	Model	Stock No.	Remarks
Connecting Cable (BNC-BNC)	MI-02	DCB-FF0386	
Connecting Cable (SMA-SMA)	A01002	-	
N-BNC Conversion Adapter	JUG-201A/U	JCF-AF001Ex03	
N-SMA Conversion Adapter			

1.2 Calibration

Self-calibration is an important factor for the high performance spectrum analyzer.
Let the system warm up for 30 minutes and then start the self-calibration performance test.
Self- calibration is started by the following keystrokes.

[SHIFT] [7] [CAL ALL]
(SOFT KEY 1)

The calibration should be made on the following items :

(1) INPUT ATTENUATOR
(2) IF STEP AMP
(3) RBW SWITCHING
(4) LOG LINEARITY
(5) AMPLITUDE MAG
(6) TG TRACKING

2 Testing CAL Signals

The CAL signal frequency accuracy is same as that of the reference oscillator because the CAL signal is phase-locked to the reference oscillator.

$\pm 2 \times 10^{-8}$/day
$\pm 1 \times 10^{-7}$/year

Procedure

① Preset and then set spectrum analyzer to the following settings.

CENTER FREQ	:	30MHz
FREQ SPAN	:	2MHz
RBW	:	300kHz
dB/div	:	1dB
REF LEVEL	:	-15dBm

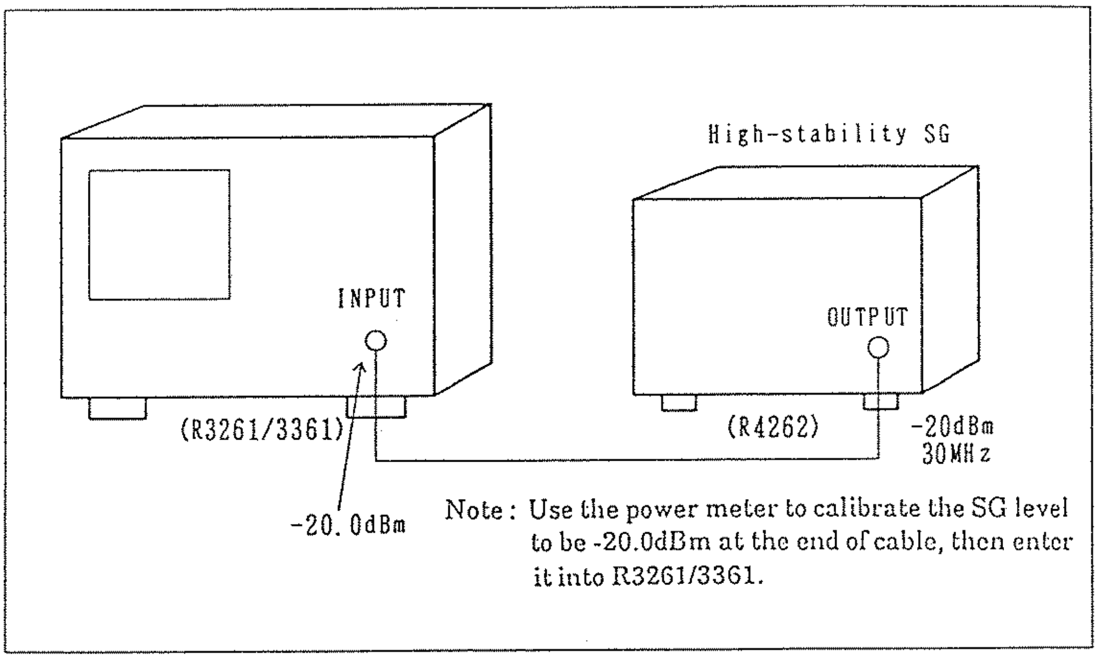
② Enter a 30MHz, -20.0dBm signal from an external signal generator to the system.

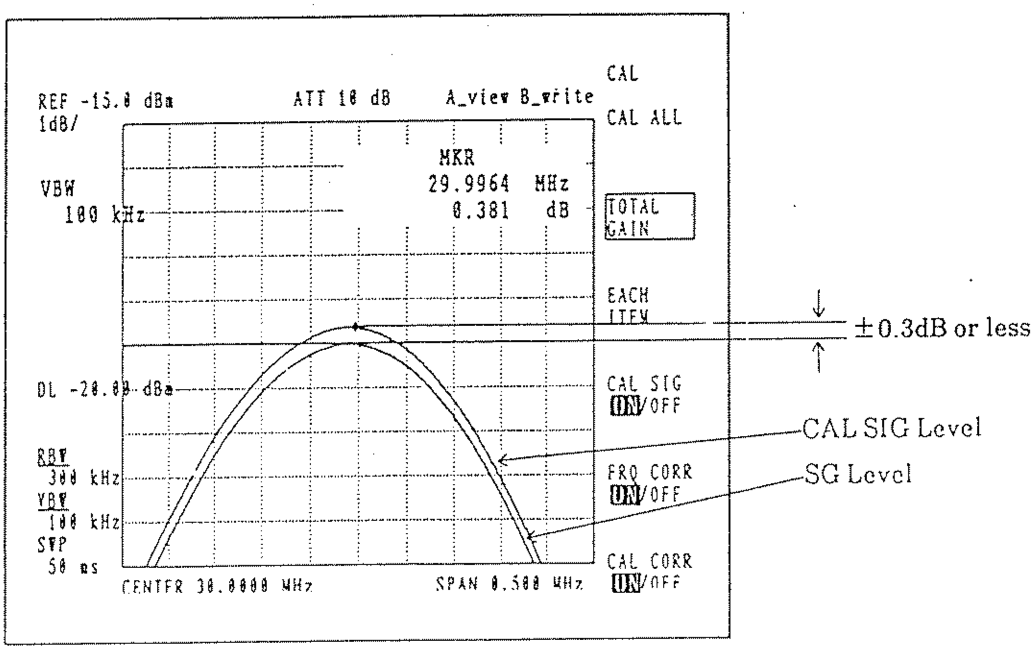
③ Adjust the REF LEVEL so that the spectrum of the signal appears at the center of the screen.

④ Remove the cable that is connected to the external signal generator. Make the CAL SIG (at -20.0dBm) appear on the screen.

SHIFT 7 CAL SIG ON/OFF
(SOFT KEY 4)

⑤ Check that the difference is within ±0.3dB between the levels of the signal at the input from SG and the CAL SIG. If not, make adjustments according to the chapter 5. "ADJUSTMENTS" in maintenance manual.





3 Test Using Internal Signal

3.1 Testing Noise Sideband

Procedure

① From the preset condition, set the spectrum analyzer as follows:

CENTER FREQ	:	0MHz
FREQ SPAN	:	40kHz
ATT	:	0dB
VBW	:	10Hz
RBW	:	300Hz

② Read the peak level of the zero spectrum using the marker.

③ Set the spectrum analyzer as follows:

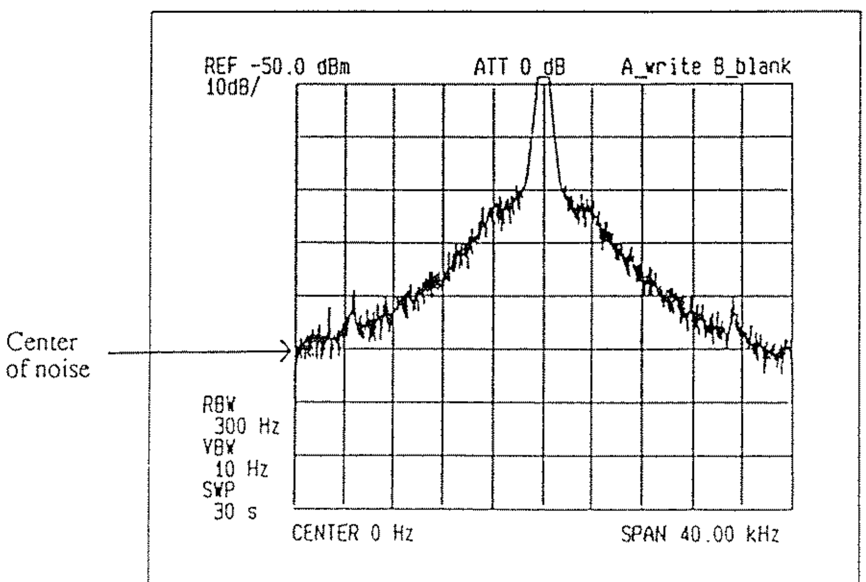
REF LEVEL	:	-50dBm

④ Read the average left end level of the noise waveform as it appears on the screen.

⑤ Obtain the noise sideband (with 20kHz offset) from the levels determined in steps ② and ④ above.

The formula used is:

result of ② put into XdB
result of ④ put into YdB
$|Y| - |X| - 23\text{dBc/Hz} \leqq -105\text{dBc/Hz}$



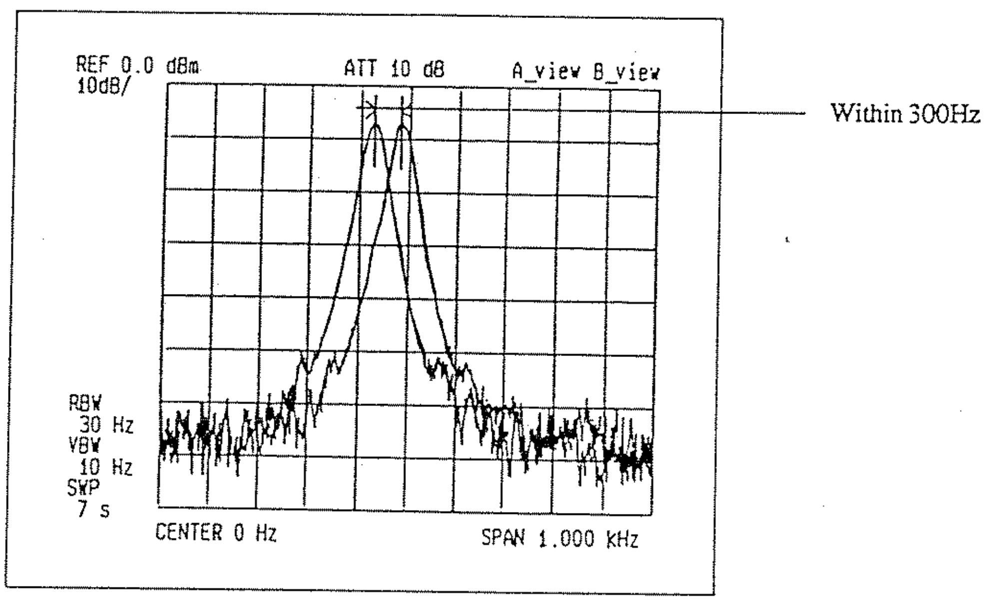
3.2 Testing Frequency Drift

Procedure

① Preset and then set the spectrum analyzer to the following settings :

CENTER FREQ	:	0MHz
FREQ SPAN	:	1kHz

② Confirm that the drift of the zero spectrum as measured for one minute is within 300Hz.



3.3 Testing Resolution Bandwidth (3dB bandwidth)

Procedure

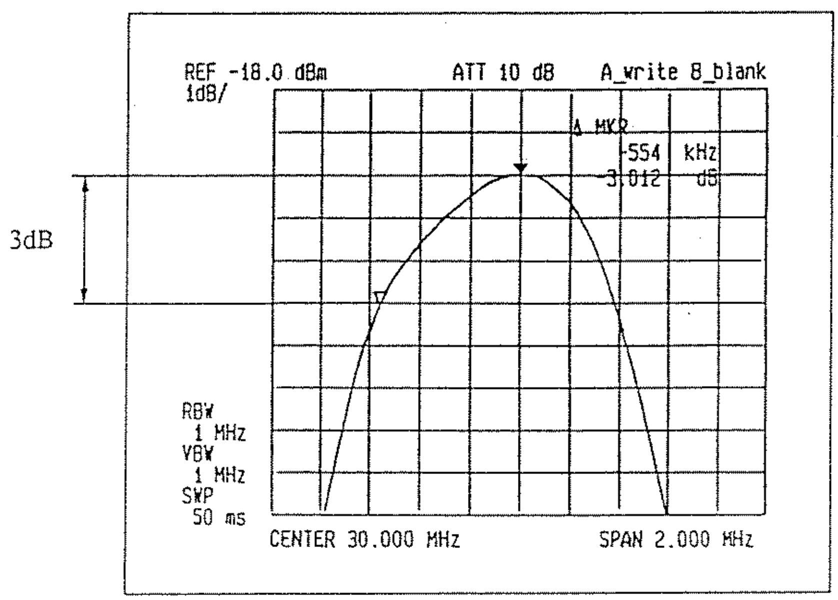
① Preset and then set the spectrum analyzer to the following settings:

CENTER FREQ	:	30MHz
FREQ SPAN	:	2MHz
RBW	:	1MHz
REF LEVEL	:	-18dBm
dB/div	:	1dB
CAL SIG	:	ON

② Set the spectrum analyzer as follows:

PEAK
ΔMKR

③ By turning the data knob counterclockwise, move the marker to such a position as to give a 3dB difference between the two points indicated by the marker.

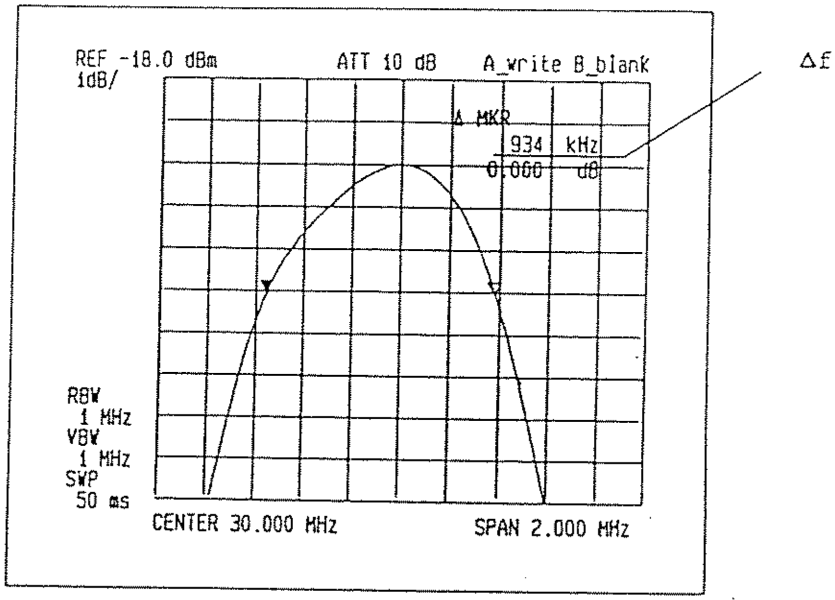


④ Set the spectrum analyzer as follows:

ΔMKR

⑤ By turning the data knob counterclockwise, move the marker to such a position as to give a 0.0dB difference between the two points indicated by the marker.

Cont'd



⑥ Confirm that the frequency difference, Δf, is within ±20% of the set value.

⑦ Check for 300kHz and 3kHz resolution bandwidths by performing steps ② through ⑥ above. Table 3 lists the span values most suitable to each resolution bandwidth. If the test result falls out of the specification, make adjustments in accordance with the chapter 5. "ADJUSTMENTS" in maintenance manual.

Table 3 Relationship Between Resolution Bandwidth and Span

RBW [Hz]	1M	300k	3k
FREQ SPAN [Hz]	2M	500k	5k

3.4 Testing Selectivity of Resolution Bandwidth

Procedure

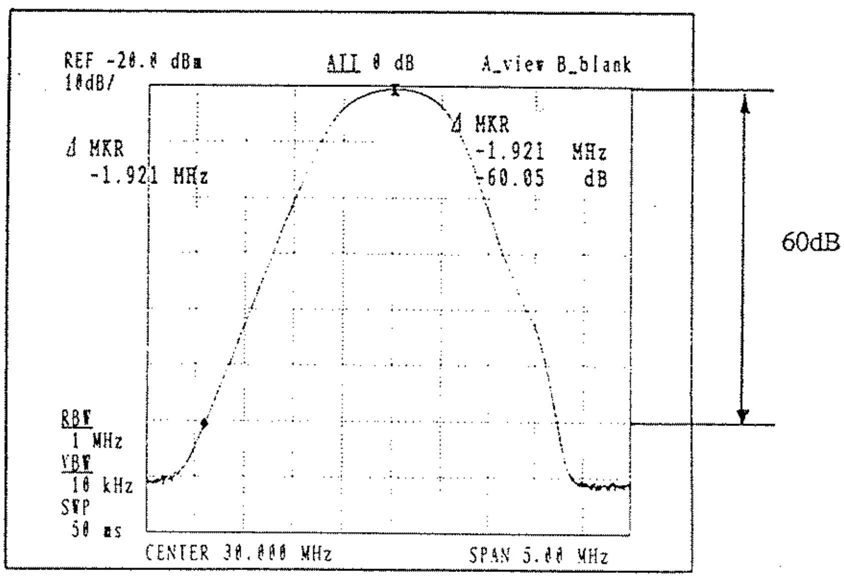
① From the preset condition, set the spectrum analyzer as follows:

CENTER FREQ	:	30MHz
FREQ SPAN	:	5MHz
RBW	:	1MHz
VBW	:	10kHz
ATT	:	0dB
REF LEVEL	:	-20dBm
CAL SIG	:	ON

② Set the spectrum analyzer as follows:

PEAK
ΔMKR

③ By turning the data knob counterclockwise, move the marker to such a position as to give a 60dB difference between the two points indicated by the marker.

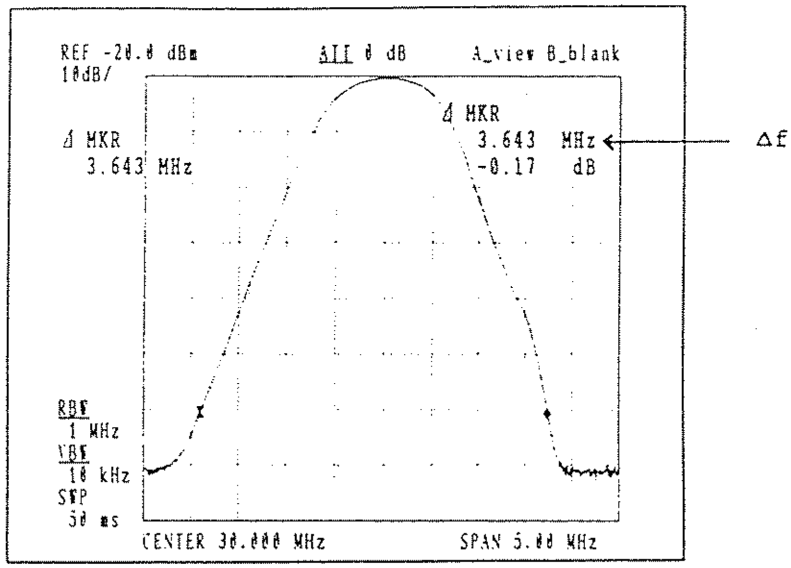


④ Set the spectrum analyzer as follows:

ΔMKR

Cont'd

⑤ By turning the data knob counterclockwise, move the marker to such a position as to give a 0.0dB difference between the two points indicated by the marker.



⑥ The 60dB bandwidth of the IF filter is given as the frequency difference, Δf, between the two points. Confirm that the ratio of this value to the value obtained in the resolution bandwidth test is 15:1 or less.

⑦ Check for 300kHz and 3kHz resolution bandwidths by performing steps ② through ⑥ above. Table 4 shows the relationship between resolution bandwidth and FREQ SPAN. If the test result falls out of the specification, make adjustments according to the chapter 5. "ADJUSTMENTS" in maintenance manual.

Table 4 Settings for Resolution Bandwidth Selectivity Test

RBW [Hz]	1M	300k	3k
FREQ SPAN [Hz]	5M	5M	50k
VBW [Hz]	10k	10k	1k

3.5 Testing Stability of QP Bandwidth

The QP value measurement is for measuring the pulse characteristic noise. Various constants in this measurement are defined values in the CISPR Standards as shown in Table 5.

Table 5 CISPR Standards for QP Value Measurement Basic Characteristic

Measuring band	6dB bandwidth	Charging time constant	Discharging time constant	Mechanical time constant
10kHz to 150kHz	200Hz	45ms	500ms	160ms
150kHz to 30MHz	9kHz	1ms	160ms	160ms
30MHz to 1GHz	120kHz	1ms	550ms	100ms

Procedure

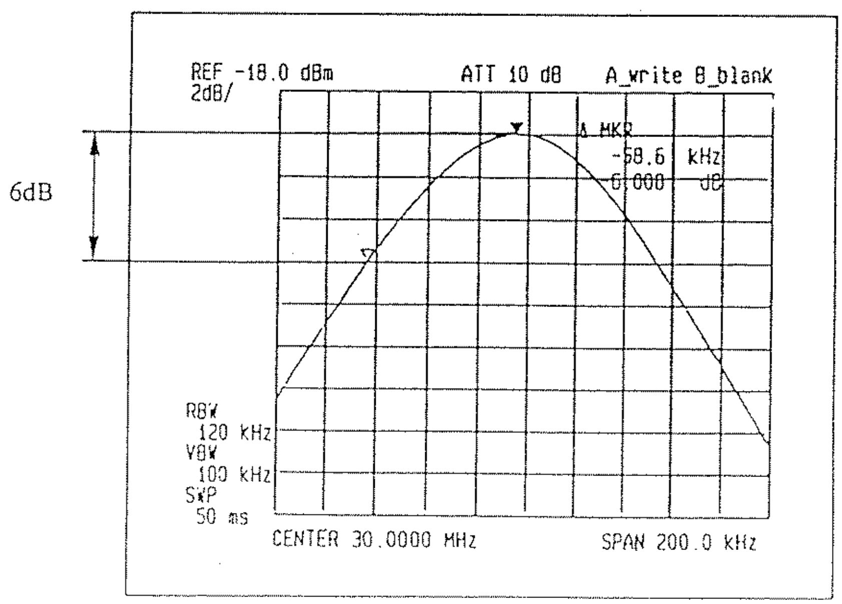
① From the preset condition, set the spectrum analyzer as follows:

CENTER FREQ	:	30MHz
FREQ SPAN	:	200kHz
REF LEVEL	:	-18dBm
dB/div	:	2dB/
QP BW	:	120kHz (6dB)
CAL SIG	:	ON

② Set the spectrum analyzer as follows:

PEAK
ΔMKR

③ By turning the data knob counterclockwise, move the marker to such a position as to give a 6dB difference between the two points indicated by the marker.

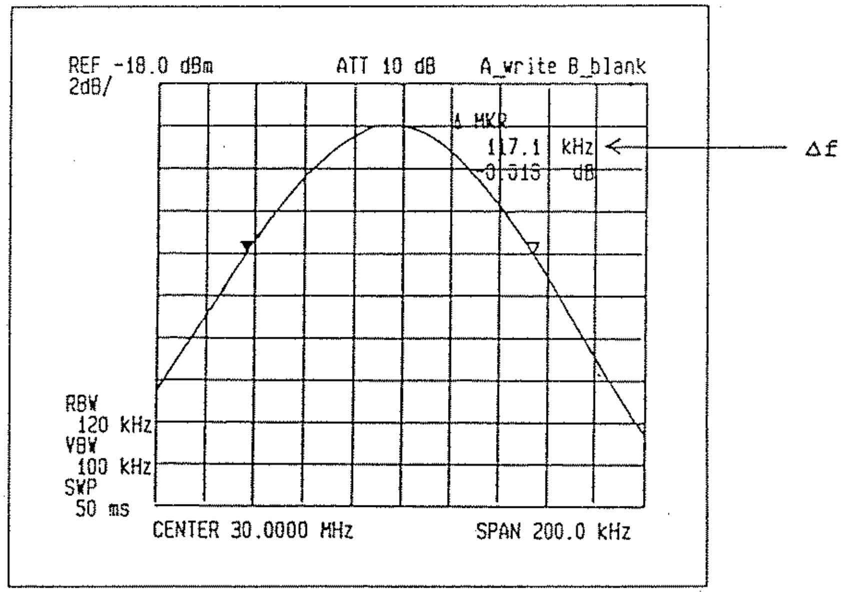


Cont'd

④ Set the spectrum analyzer as follows:

ΔMKR

⑤ By turning the data knob counterclockwise, move the marker to such a position as to give a 0.0dB difference between the two points indicated by the marker.



⑥ Confirm that the frequency difference, Δf, between the points is within 110kHz to 130kHz.

⑦ Check for 9kHz and 200Hz QP bandwidths by performing steps ② to ⑥ above. Table 6 shows the relationships between QP bandwidth, FREQ SPAN and sweep time.

Table 6 Setting for the QP Bandwidth Stability Test

QP bandwidth	120kHz	9kHz	200Hz
FREQ SPAN	200kHz	20kHz	2kHz
Sweep time	50ms	100ms	2sec

3.6 Testing Stability of Marker Indication (In normal mode)

Procedure

① From the preset condition, set the spectrum analyzer as follows:

CENTER FREQ	:	30MHz
FREQ SPAN	:	20MHz
CAL SIG	:	ON
MARKER	:	PEAK

② Confirm that the marker indication is within 30MHz ±1.05MHz.

③ Set the spectrum analyzer as follows:

FREQ SPAN	:	10MHz
MARKER	:	PEAK

④ Confirm that the marker indication is within 30MHz ±0.55MHz

⑤ Set the spectrum analyzer as follows:

FREQ SPAN	:	2MHz
MARKER	:	PEAK

⑥ Confirm that the marker indicator is within 30MHz ±0. 16MHz.

3.7 Testing Stability of Marker Indication (In counter mode)

Procedure

① From the preset condition, set the spectrum analyzer as follows:

CENTER FREQ	:	30MHz
FREQ SPAN	:	1kHz
CAL SIG	:	ON
MARKER	:	PEAK
		COUNTER
RESOLUTION	:	1Hz

② Confirm that the marker indication is within 30MHz ± 1Hz.

3.8 Testing Average Noise Level

Procedure

① From the preset condition, set the spectrum analyzer as follows:

ATT	:	0dB
REFLEVEL	:	-70dBm
RBW	:	1MHz
VBW	:	1kHz
START FREQ	:	50MHz
STOP FREQ	:	3600MHz (2600MHz for R3261C/R3361C)

② At completion of the sweep, set the spectrum analyzer as follows:

Press the PEAK, MKR→ and MKR→ CF keys.

SPAN	:	1kHz
RBW	:	300Hz
VBW	:	1kHz

③ Confirm that the noise level at the frequency, in GHz, determined in step ② above is -121dBm + 1.55f [GHz] or less.

3.9 Testing Residual Response

Procedure

① From the preset condition, set the spectrum analyzer as follows:

CENTER FREQ	:	250MHz
SPAN	:	500MHz
RBW	:	30kHz
VBW	:	1kHz
ATT	:	0dB
REF LEVEL	:	-60dBm

② Confirm that there is no residual spurious when no connection is made to the input terminal of the spectrum analyzer.

③ Confirm that there is no residual spurious when the frequency is changed up to 3.6GHz (2.6GHz for R3261C/R3361C) with the CENTER FREQ set to 500MHz.

3.10 Testing Switchover Stability of Resolution Bandwidth

Procedure

① From the preset condition, set the spectrum analyzer as follows:

CENTER FREQ	:	30MHz
FREQ SPAN	:	500kHz
RBW	:	300kHz
REF LEVEL	:	-15dBm
dB/div	:	1dB/
CAL SIG	:	ON

② While changing the resolution bandwidth from 1MHz to 30Hz, confirm that the peak level of each spectrum is within ±0.3dB of the level at 300kHz resolution bandwidth. Table 7 shows that relationship between bandwidth and FREQ SPAN. If the test result falls out of the specification, make adjustments according to the chapter 5. "ADJUSTMENTS" in maintenance manual.

Table 7 Relationship Between Resolution Bandwidth and FREQ SPAN

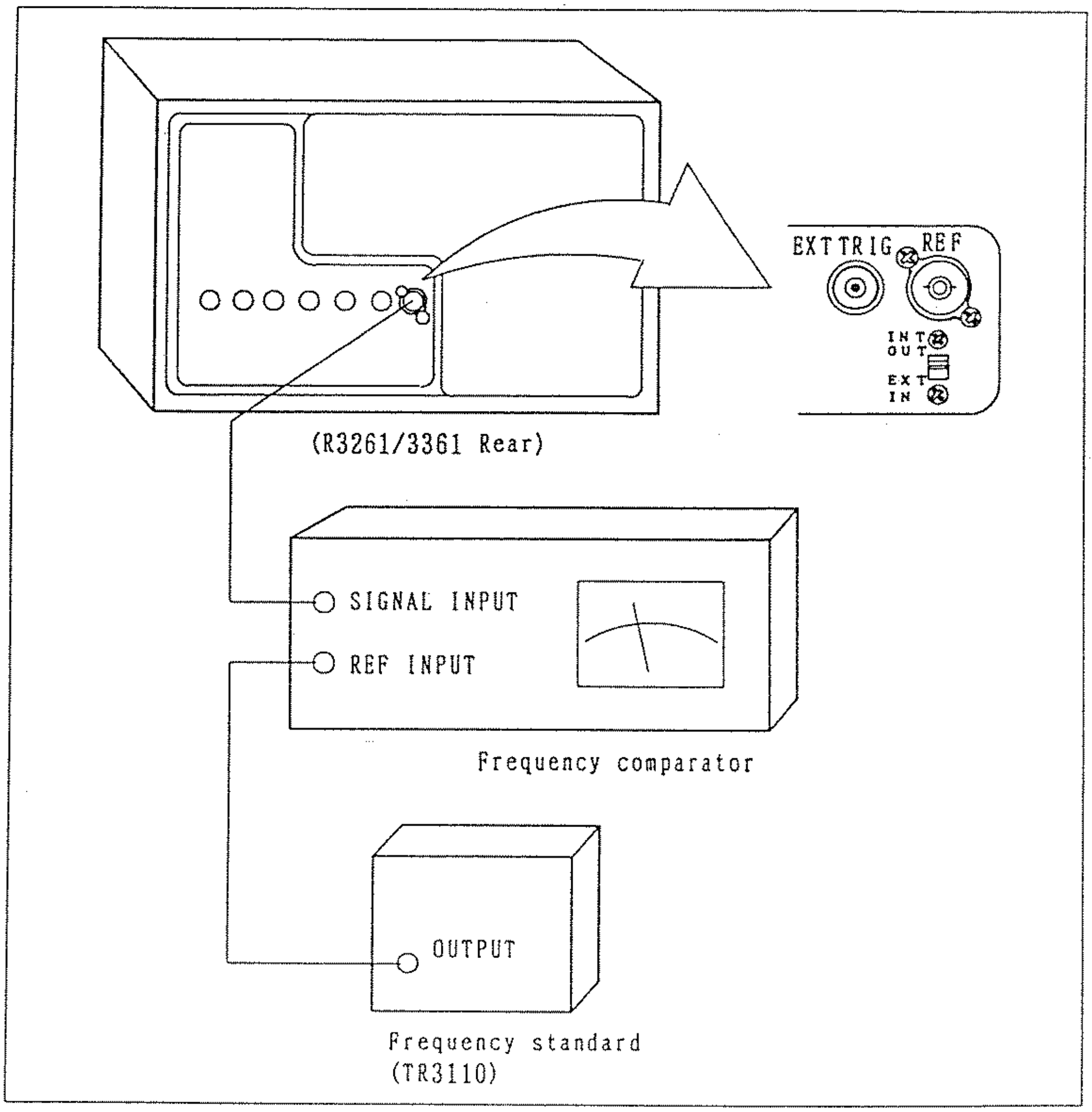
RBW [Hz]	1M	300k	100k	30k	10k	3k	1k	300	100	30
FREQ SPAN [Hz]	2M	500k	200k	50k	20k	5k	2k	1k	1k	1k

4 Testing Using Measuring Equipment

4.1 Testing Stability of Reference Oscillator

Procedure

① Set the REF INT OUT/EXT IN switch on the rear panel of the spectrum analyzer to INT OUT. Connect frequency standard to REF socket on spectrum analyzer through a frequency comparator.



② Confirm that the reading on the frequency comparator is 2×10^{-8} or less.

Cont'd

4.2 Testing Stability of Center Frequency

Procedure

① From the preset condition, set the spectrum analyzer as follows:

CENTER FREQ	:	30MHz
FREQ SPAN	:	20MHz

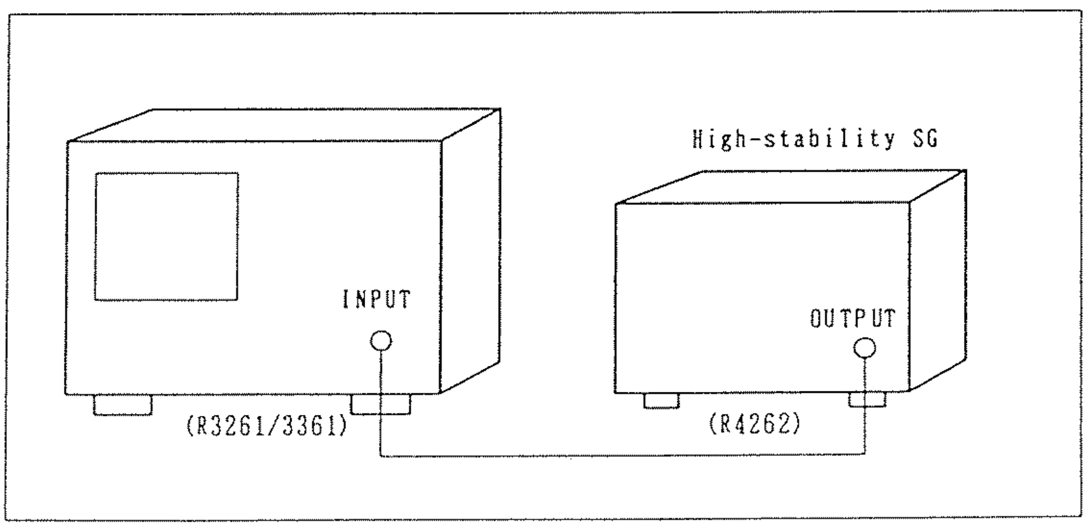
② Input a 30MHz, -10dBm signal-generated signal to the spectrum analyzer. The signal generator must have stability of 2×10^{-8} or better.

③ Confirm that the peak of the spectrum is within ±450kHz (±0.2 div). of the screen center.

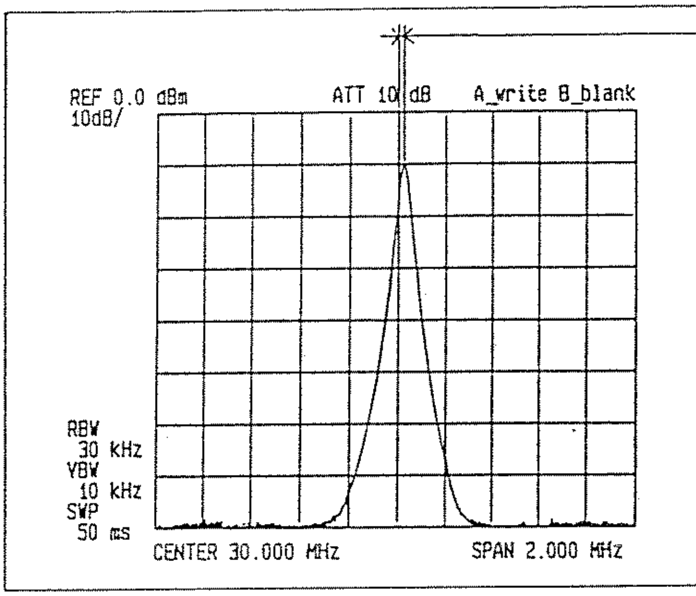
④ Set the spectrum analyzer to the following settings, and confirm that the position of the spectrum peak is still within the specification.

Table 8 FREQ SPAN and Center Frequency Stability

FREQ SPAN	20MHz	10MHz	2MHz	1 kHz
Specification	±450kHz (±0.2div)	±250kHz (±0.2div)	±60kHz (±0.3div)	±50Hz (±0.5div)



Cont'd



Confirm that the position of the spectrum peak is within the specification

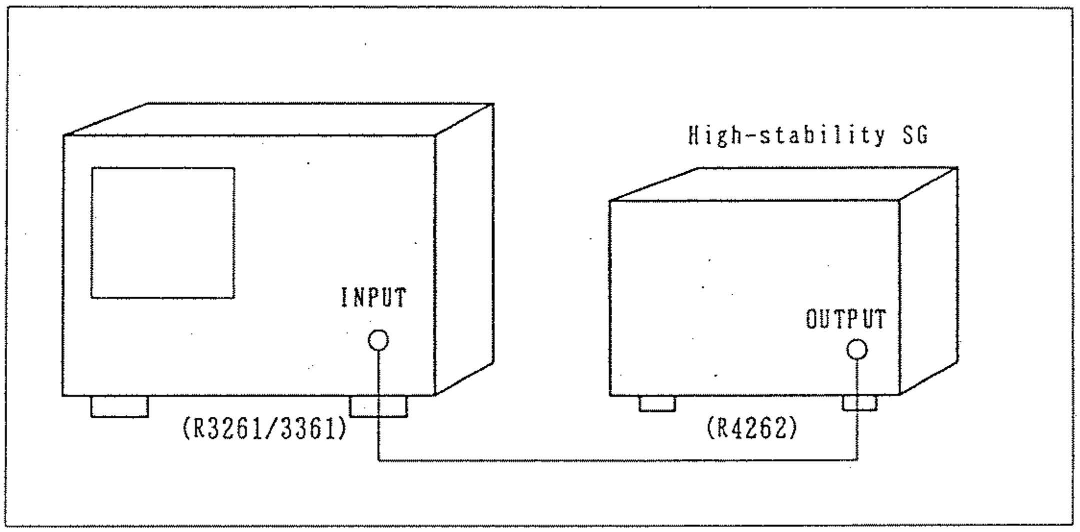
4.3 Testing Stability of Frequency Span

Procedure

① From the preset condition, set the spectrum analyzer as follows:

CENTER FREQ	:	1GHz
FREQ SPAN	:	2GHz

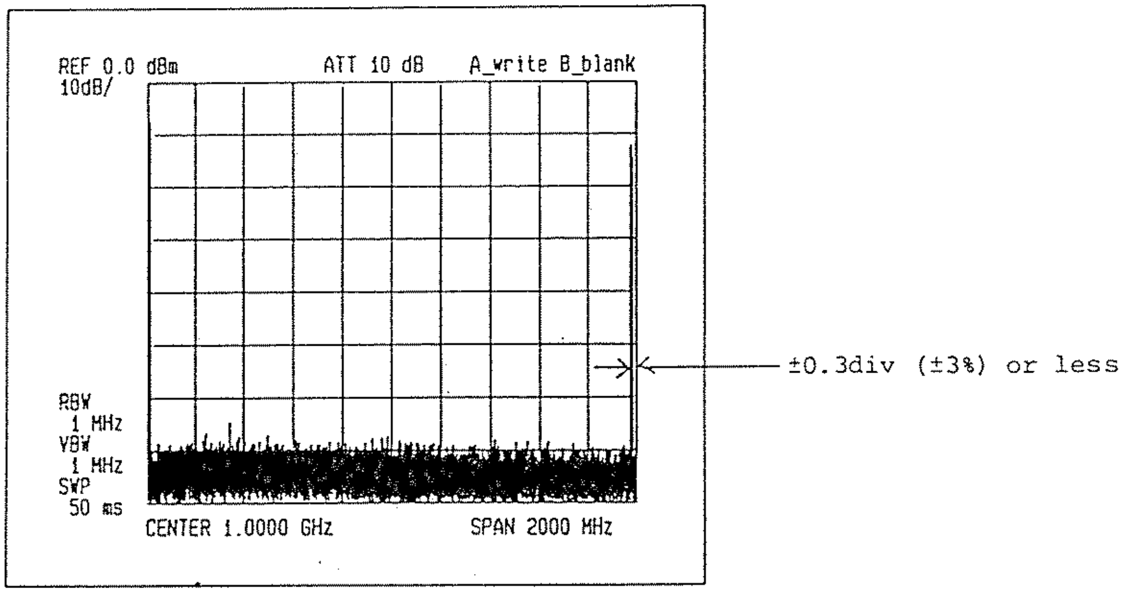
② Input to the spectrum analyzer a 2GHz, -10dBm signal from an external signal generator.



③ Adjust the CENTER FREQ so that the zero spectrum is at the left end of the scale.

④ Confirm that the difference between the 2GHz spectrum and the right scale end is within ±0.3 div. (within ±3%). If not, make adjustments according to the chapter 5. "ADJUSTMENTS" in maintenance manual.

Cont'd



⑤ Set the spectrum analyzer as follows:

CENTER FREQ	:	5MHz
FREQ SPAN	:	10MHz

⑥ Adjust the CENTER FREQ so that the peak of the zero spectrum is at the left end of the scale.

⑦ Input a 10MHz, -10dBm signal from an external signal generator to the spectrum analyzer. Confirm that the difference between the 10MHz spectrum and the right end of the scale is within ±0.3 div. (±3%). If not, make adjustments according to the chapter 5. "ADJUSTMENTS" in maintenance manual.

⑧ Set the spectrum analyzer to the following settings:

CENTER FREQ	:	1MHz
FREQ SPAN	:	2MHz

Then input a 2MHz, -10dBm signal from an external signal generator to the spectrum analyzer. Confirm that the difference between the 2MHz spectrum and the right end of the scale is within ±0.5 div. (±5%). If not, make adjustments according to the chapter 5. "ADJUSTMENTS" in maintenance manual.

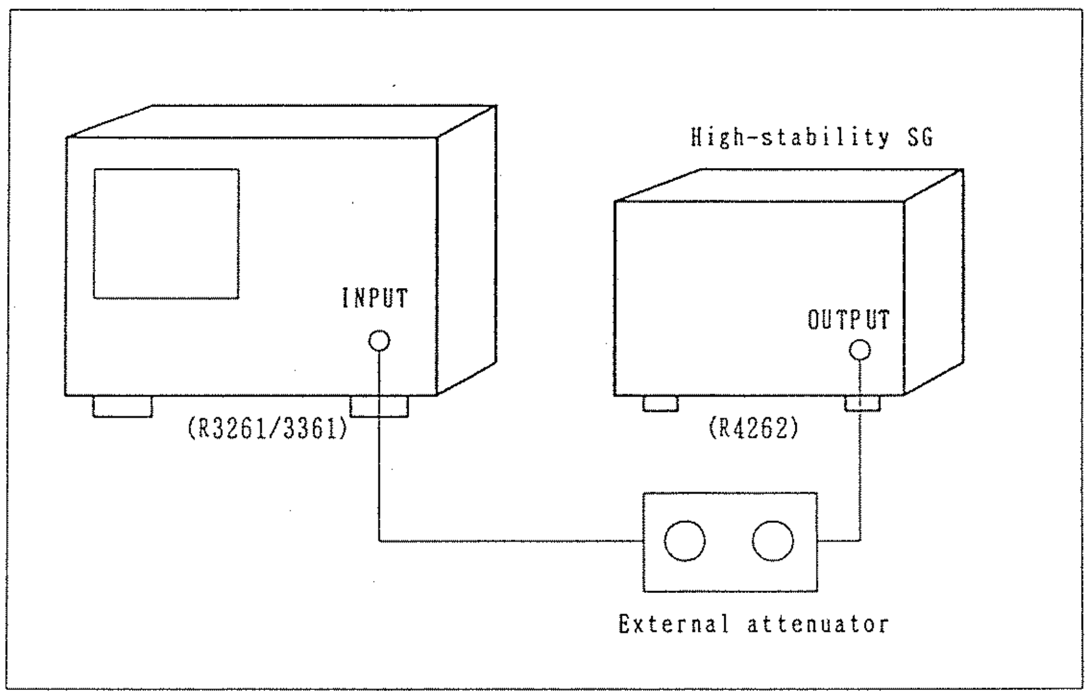
4.4 Testing LOG Linearity

Procedure

① From the preset condition, set the spectrum analyzer as follows:

CENTER FREQ	:	30MHz
SPAN	:	2MHz
RBW	:	300kHz
REF LEVEL	:	-10dBm
dB/div	:	1dB/div

② Connect a signal generator to the spectrum analyzer through an external attenuator.

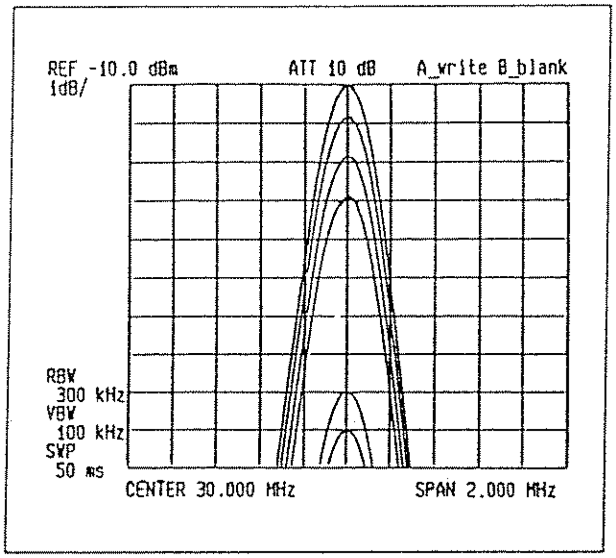


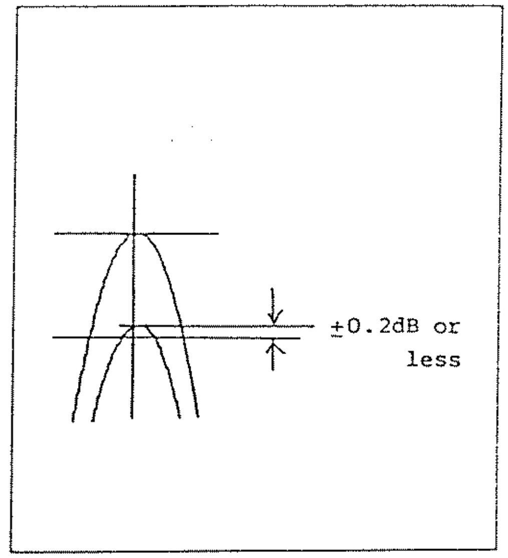
③ Input a 30MHz, - 10dBm signal from the signal generator to the spectrum analyzer.

④ Adjust the output level of the signal generator so that the spectrum peaks at -10dBm when the attenuator is set to 0dB.

⑤ Confirm that the deviation in peak level as read on the screen is within ±0.2dB (±0.2div) while the attenuator setting is incremented by 1dB.

Cont'd





⑥ Set the spectrum analyzer to the following settings:

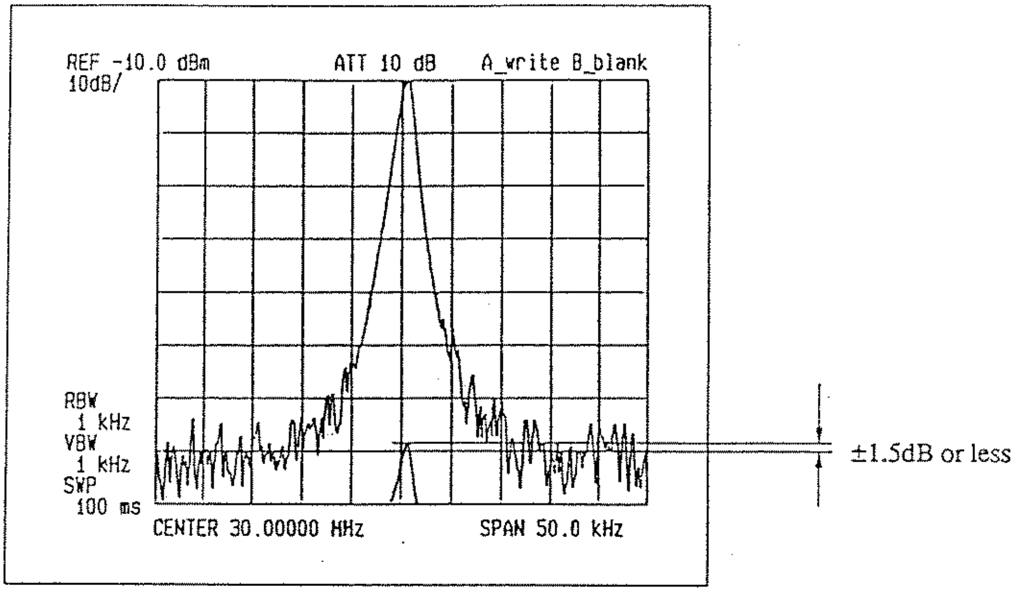
dB/div	:	10dB/
SPAN	:	50kHz
RBW	:	1kHz

⑦ Adjust the output level of the signal generator so that the spectrum peaks at -10dBm when the attenuator is set to 0dB.

⑧ Confirm that the deviation in peak level as read on the screen is within ±1dB (±0. 1 div) while the attenuator setting is incremented by 10dB.

⑨ Confirm that the spectrum peaks at -80dBm ±1. 5dB when the attenuator is set to 70dB. If not, make adjustments according to the chapter 5. "ADJUSTMENTS" in maintenance manual.

Cont'd



⑩ Set the spectrum analyzer to the following settings:

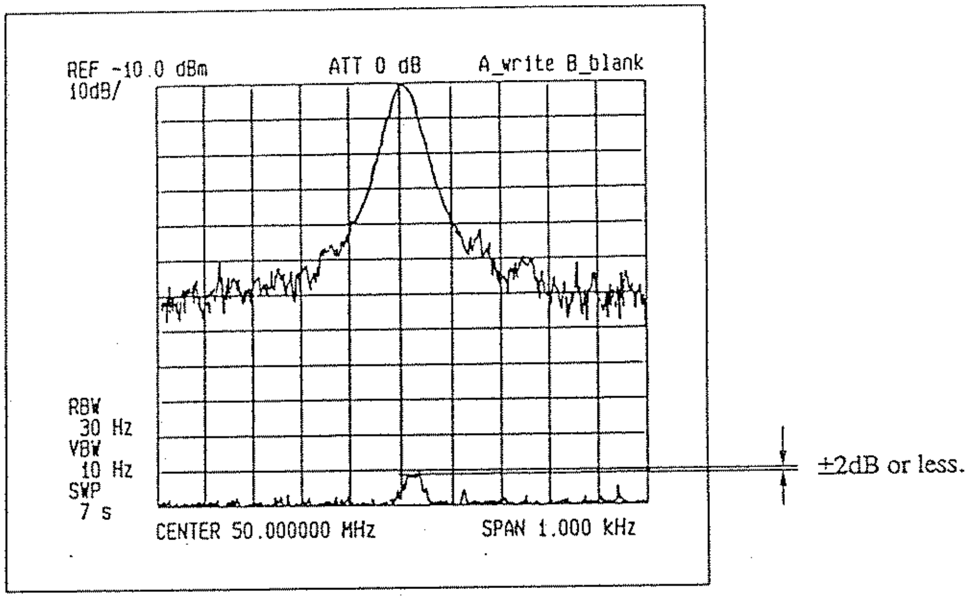
CENTER FREQ	:	50MHz
FREQ SPAN	:	1kHz
RBW	:	30Hz
ATT	:	-10dBm
12div display		

⑪ Input a 50MHz, -10dBm signal from the signal generator to the spectrum analyzer.

⑫ Adjust the output level of the signal generator so that the spectrum peaks at -10dBm when the attenuator is set to 0dB.

⑬ Confirm that the spectrum peaks at -120dBm ±2dB when the attenuator is set to 110dB.

Cont'd


REF -10.0 dBm
10dB/
ATT 0 dB
A_write B_blank
RBW
30 Hz
VBW
10 Hz
SWP
7 s
CENTER 50.000000 MHz
SPAN 1.000 kHz
±2dB or less.

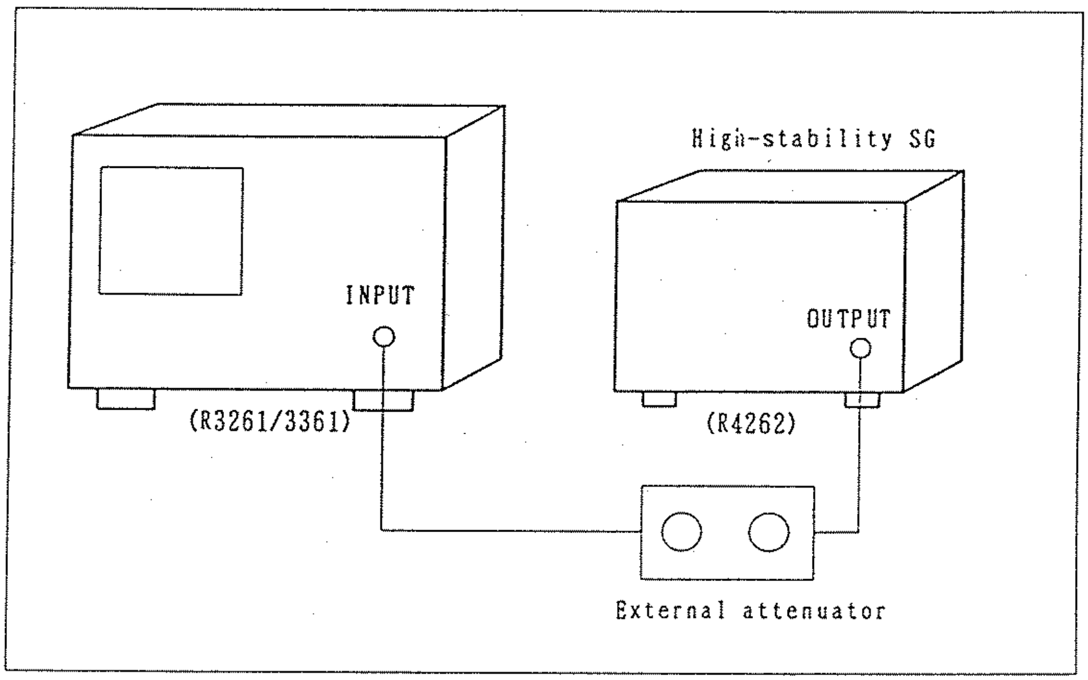
4.5 Testing LIN Linearity

Procedure

① Set the spectrum analyzer as follows from the preset condition.

CENTER FREQ	:	30MHz
SPAN	:	2MHz
RBW	:	100kHz
REF LEVEL	:	-10dBm
LINEAR DISPLAY MODE		

② Connect a signal generator to the spectrum analyzer through an external attenuator.



③ Set the signal generator so that it puts out a 30MHz, -10dBm signal.

④ Adjust the output level of the signal generator so that the spectrum peaks at the uppermost scale on the screen.

⑤ Using the marker, read the peak level of the spectrum.

⑥ Set the attenuator to 6dB, and read the peak level of the spectrum using the marker.

⑦ Obtain the LIN linearity from the values determined in steps ⑤ and ⑥ above. Confirm that the LIN linearity thus obtained is 100±5%.

LIN linearity (%) = [(value in step ⑥ - value in step ⑤/2)/value in step ⑤] × 100

If the linearity is out of specification, make adjustments according to the chapter 5. "ADJUSTMENTS" in maintenance manual.

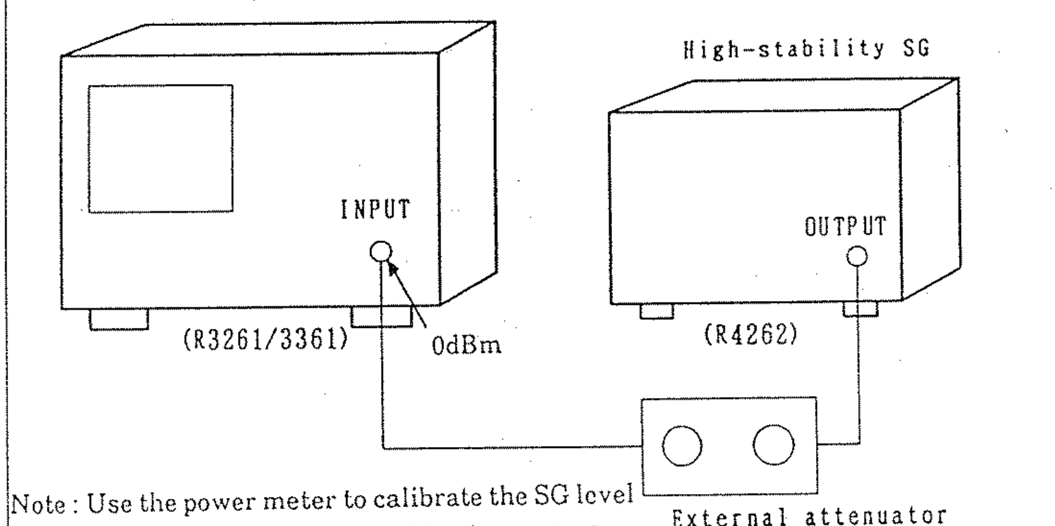
4.6 Testing Stability of Reference Level

Procedure

① From the preset condition, set the spectrum analyzer as follows:

CENTER FREQ	:	30MHz
FREQ SPAN	:	5kHz
ATT	:	10dB
REF LEVEL	:	0dBm

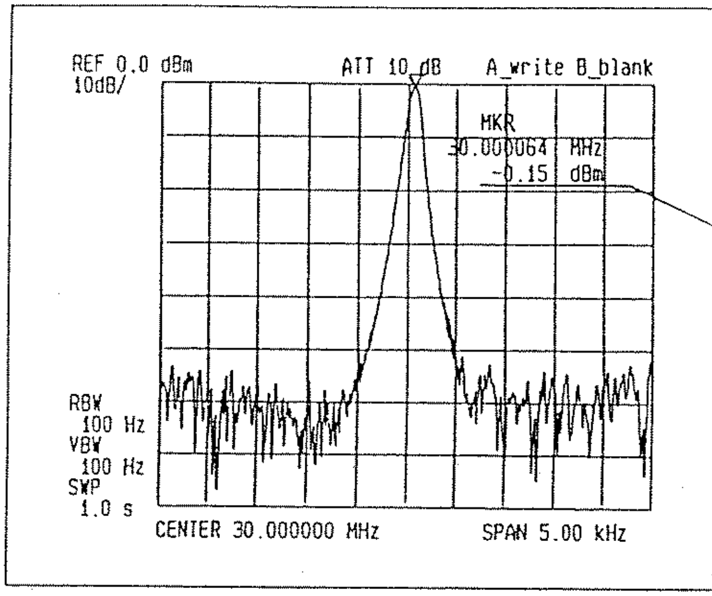
② Input a 30MHz, 0dBm signal from a signal generator through an external attenuator to the spectrum analyzer.



Note : Use the power meter to calibrate the SG level to be 0dBm at the end of cable, then enter it into R3261/3361.

③ Set the attenuator to 0dB, and read the peak level of the input waveform using the marker. Confirm that this level is within ±0.3dB of the REF LEVEL setting.

Cont'd



±0.3 dB or less to the setting value.

④ Change the REF LEVEL and attenuator settings as shown in Table 9 and confirm that the deviation from each setting is within ±0.3dB. If not, make adjustments according to the chapter 5. "ADJUSTMENTS" in maintenance manual.

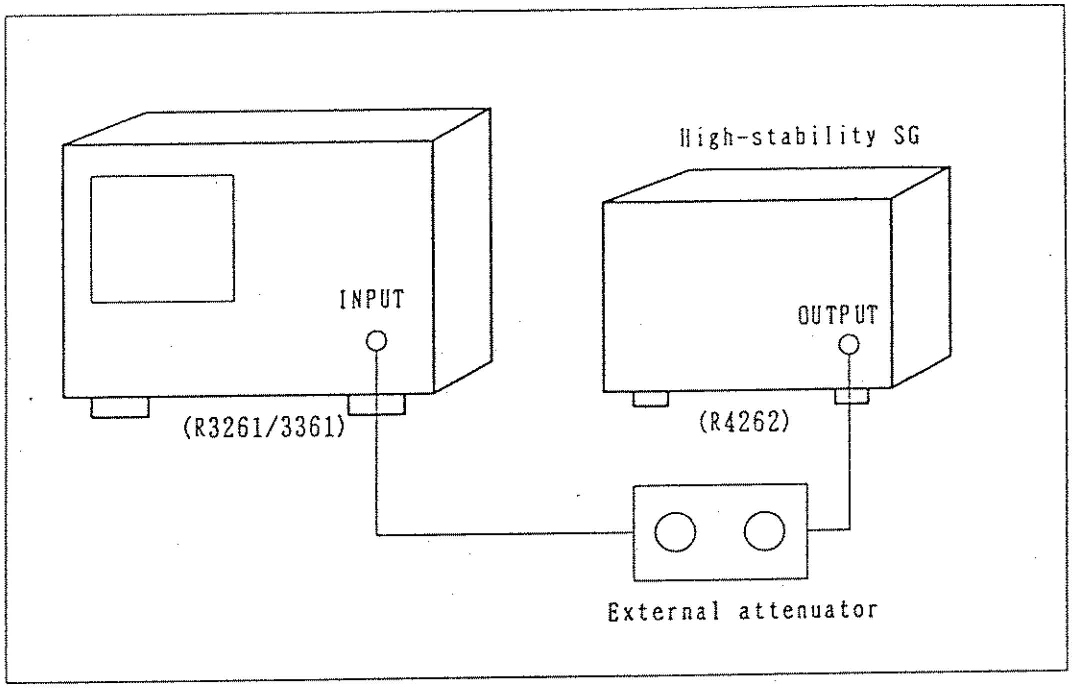
Table 9 REF LEVEL and External Attenuator Settings

REF LEVEL [dBm]	0	-10	-20	-30	-40	-50	-60	-70
External attenuator [dB]	0	10	20	30	40	50	60	70
Specifications [dB]	±0.3	±0.3	±0.3	±0.3	±0.3	±0.3	±0.7	±0.7

4.7 Testing Stability of Input Attenuator Changeover

Procedure

① Input a 50MHz, -10dBm signal from a signal generator to the spectrum analyzer through an external attenuator set to 40dB.



② From the preset condition, set the spectrum analyzer as follows:

CENTER FREQ	:	50MHz
FREQ SPAN	:	10kHz
RBW	:	3kHz
ATT	:	10dB
dB/div	:	1dB/
REF LEVEL	:	-45dBm

③ Adjust the output level of the signal generator so that the spectrum peaks at the center of the screen.

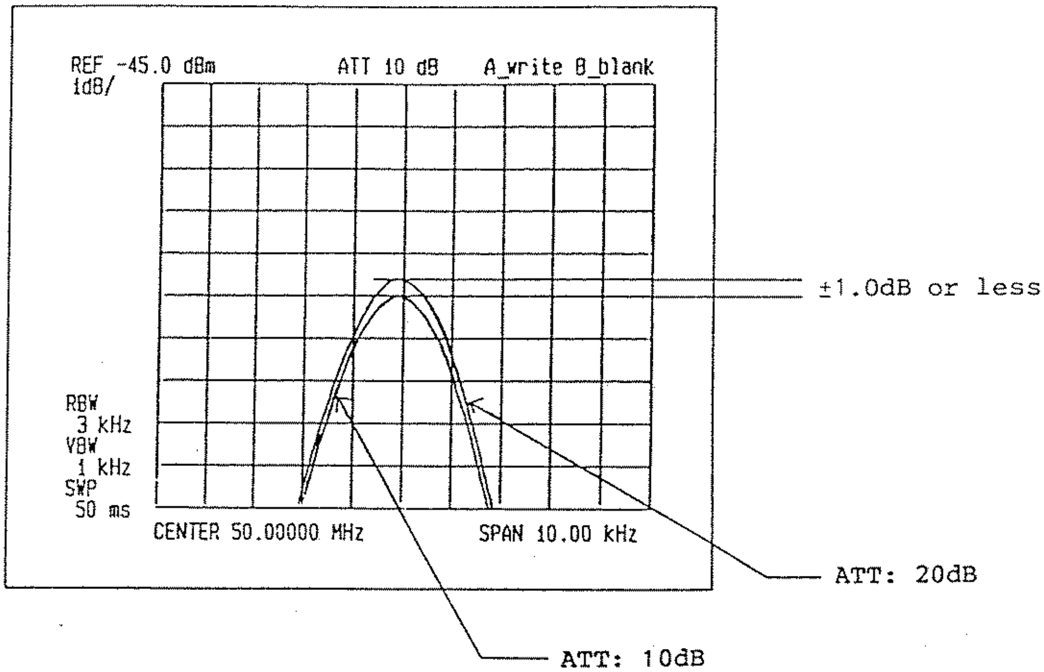
④ Set the external attenuator to 30dB, and set the spectrum analyzer to the following settings:

ATT : 20dB

REF LEVEL : -35dBm

Then confirm that the difference between the current indication and the indication for the 10dB attenuation is with ±1.0dB.

Cont'd



⑤ Change the ATT, external attenuator and REF LEVEL settings as shown in Table 10. Confirm that the stability of the input attenuator changeover is within ±1.0dB of the 10dB ATT setting.

Table 10 Testing Stability of Input Attenuator Changeover

ATT [dB]	10	20	30	40	50
External attenuator [dB]	40	30	20	10	0
REF LEVEL [dBm]	-45	-35	-25	-15	-5

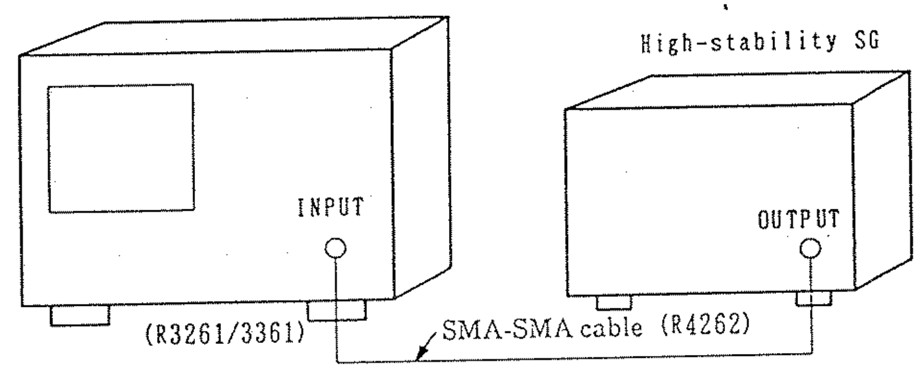
4.8 Testing Frequency Response

Procedure

① Set the spectrum analyzer as follows from the preset condition:

ATT	:	10dB
dB/div	:	1dB/
CENTER FREQ	:	1GHz
SPAN	:	2GHz
REF LEVEL	:	-15dBm

② Input a signal of -20dBm at a frequency of between 100kHz and 2GHz to the R3261/3361 and confirm that the deviation as read on the screen for each frequency is within ±0.5dB.



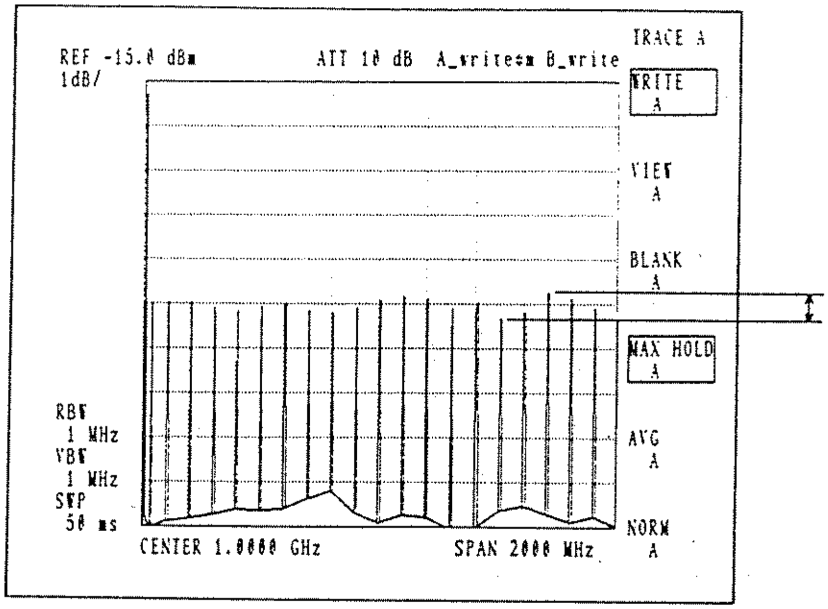
Note : Use the power meter to calibrate the SG level at the end of cable, then enter it into R3261/3361.

③ Set the spectrum analyzer to the following settings:

START FREQ	:	0MHz
STOP FREQ	:	3.6GHz (2.6GHz for R3261C/R3361C)

④ Input to the R3261/3361 a signal of -20dBm at a frequency between 9kHz and 3.6GHz (2.6GHz for R3261C/R3361C), and confirm that the deviation as read on the screen for each frequency is within ±1dB.

Cont'd



Confirm that the deviation for each frequency is within ±0.5dB

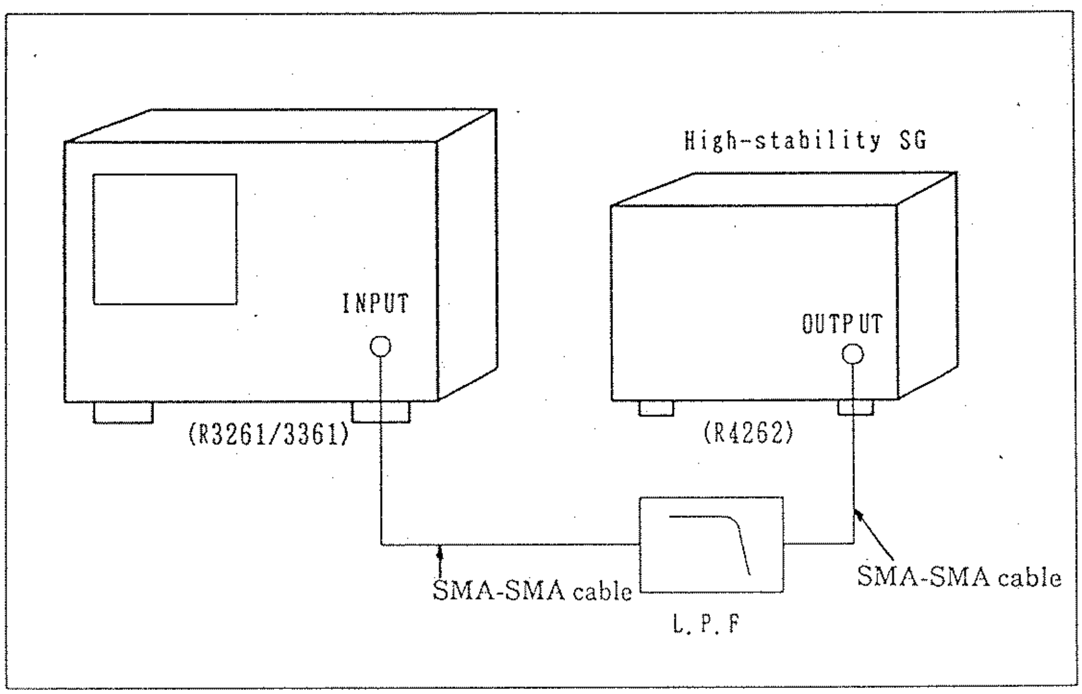
4.9 Testing Spurious Response

Procedure

① From the preset condition, set the spectrum analyzer as follows:

CENTER FREQ	:	500MHz
FREQ SPAN	:	1000MHz
REF LEVEL	:	-10dBm
RBW	:	1MHz
VBW	:	10kHz
ATT	:	0dB

② Input a signal of -10dBm from a low-distortion signal generator to the spectrum analyzer. A signal from a signal generator with a low-pass filter capable of reducing the level of the second harmonics by a least 60dB will also work.



③ Change the output frequency of the low-distortion signal generator from 10MHz to 500MHz and confirm that the signal level of the second harmonics is lower than that of the reference waveform by at least 50dB(equivalent to 70dB for -30dBm input).

Cont'd

④ For low-distortion signal generator frequencies of 500MHz or over, change the setting of the spectrum analyzer as shown in Table 11.

Table 11 CENTER FREQ AND SPAN for Dynamic Range Test

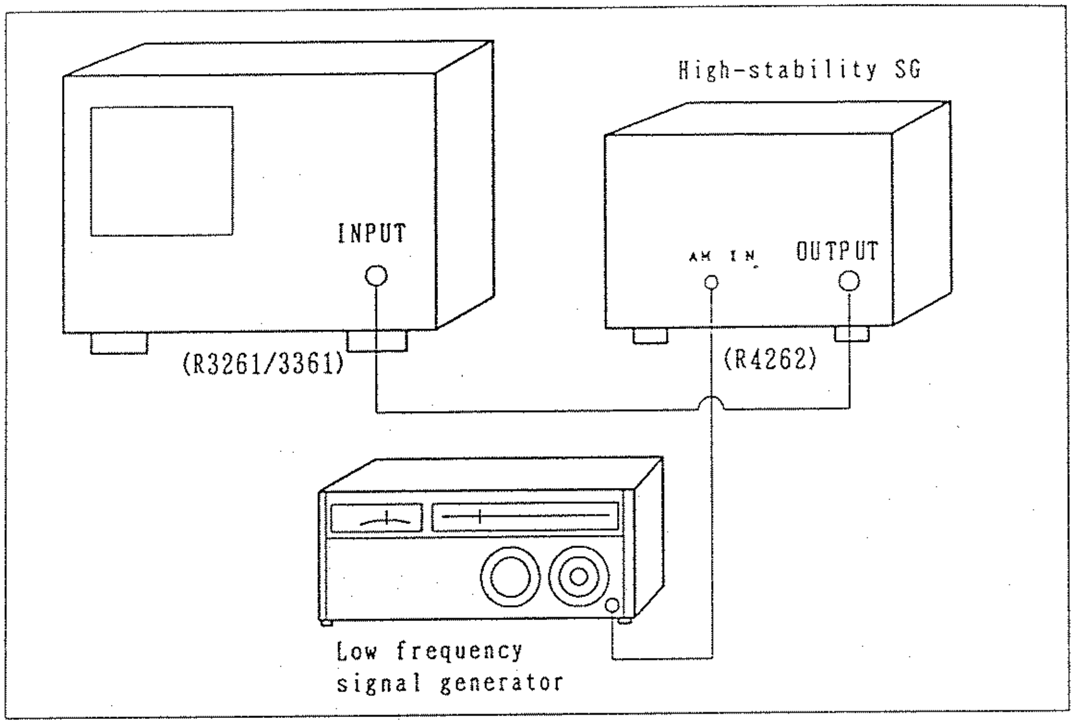
Frequency [MHz] SG	R3261C/D R3361C/D Set	
	CENTER FREQ [GHz]	SPAN [GHz]
10 to 500	0.5	1
500 to 1000	1.5	1
1000 to 1500 (1300)	2.5	1
1500 to 1800	3.3	0.6

( ): R3261C/R3361C

4.10 Testing Stability of Sweep Time

Procedure

① Input a 30MHz, -5dBm, amplitude-modulated signal (100Hz, 30% modulation) from the signal generator to the spectrum analyzer.

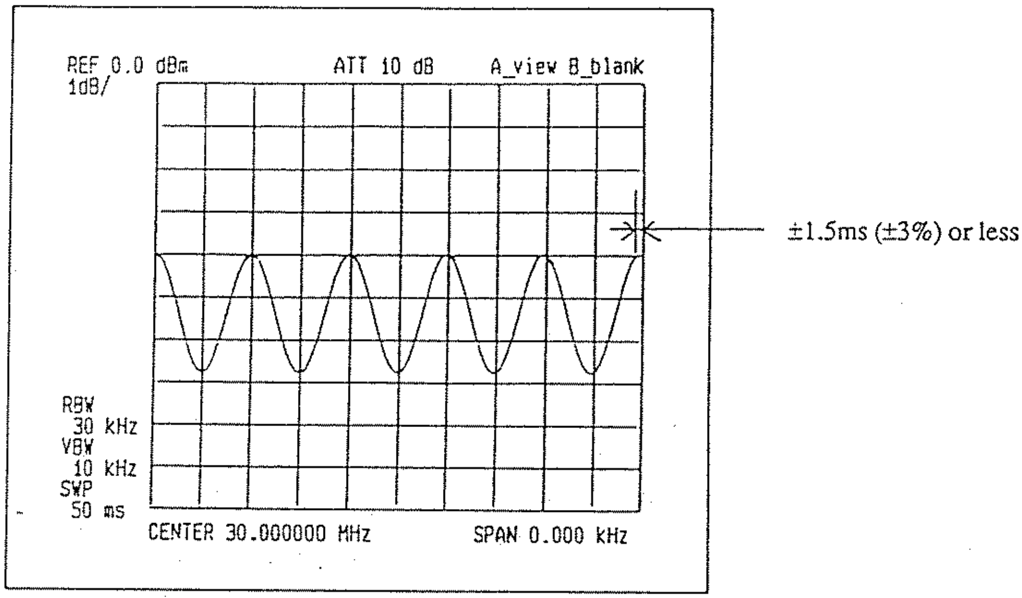


② From the preset condition, set the spectrum analyzer as follows:

CENTER FREQ	:	30MHz
SPAN	:	0kHz
RBW	:	30kHz
dB/div	:	1dB
TRIGGER	:	VIDEO
SWEEP TIME	:	50ms

③ Confirm that there are 5 cycles ±3/20 cycles (±1. 5ms, ±0.3div.) of the amplitude-modulated waveform on the screen.

Cont'd


REF 0.0 dBm
1dB/
ATT 10 dB
A_view B_blank
RBW
30 kHz
VBW
10 kHz
SWP
50 ms
CENTER 30.000000 MHz
SPAN 0.000 kHz
±1.5ms (±3%) or less

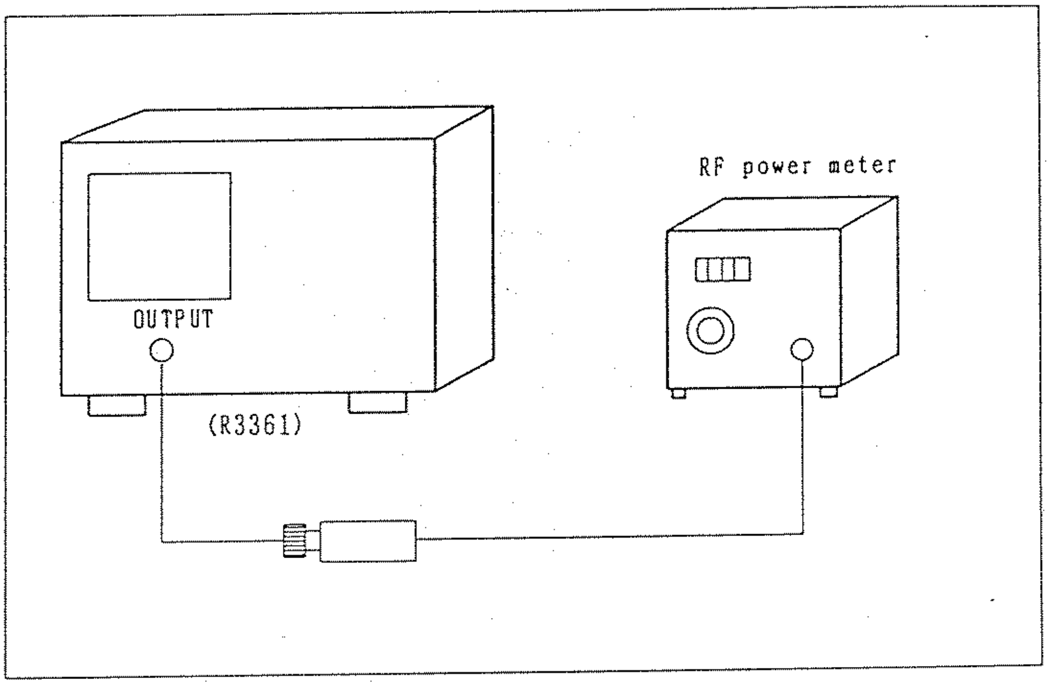
4.11 Testing Stability of TG Output Level (For R3361C/D only)

Procedure

① Reset and then set the spectrum analyzer (R3361C/D only) to the following settings:

CENTER FREQ	:	30MHz
FREQ SPAN	:	0Hz
TG	:	ON
TG LEVEL	:	-10dBm

② Connect an RF power meter to the spectrum analyzer at the TG OUTPUT to measure the TG output level. Confirm that the TG output level is -10dBm ±0.5dB. If not, make adjustments according to the chapter 5. "ADJUSTMENTS" in maintenance manual.



4.12 Testing TG Frequency Response (for R3361C/D only)

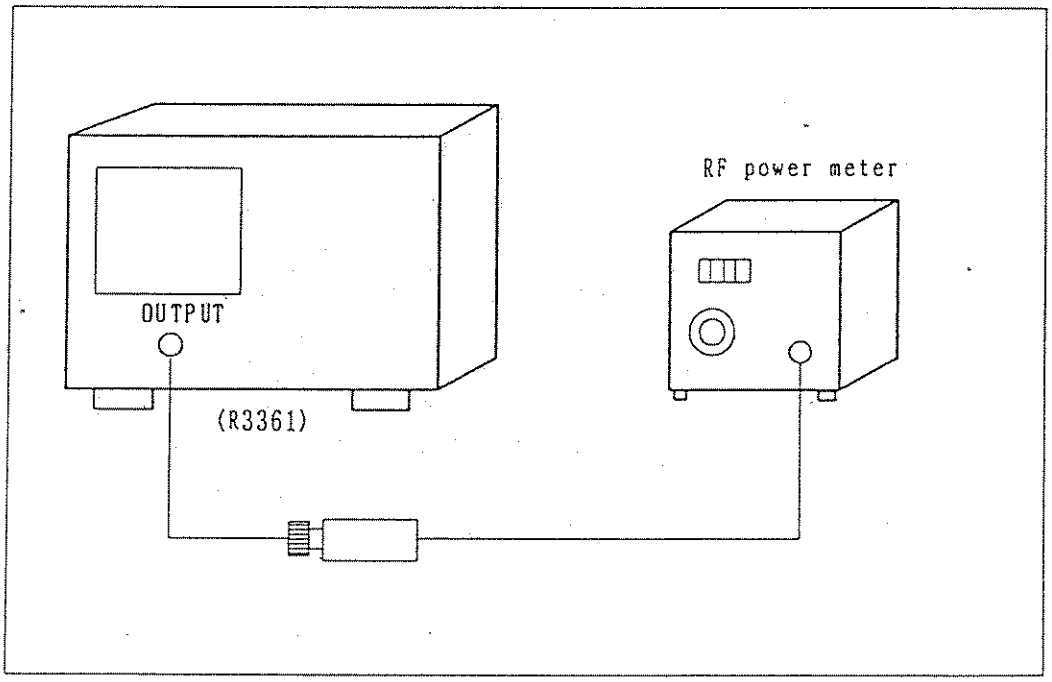
Procedure

① Reset and then set the spectrum analyzer (R3361C/D only) to the following settings:

CENTER FREQ	:	30MHz
FREQ SPAN	:	0Hz
TG	:	ON
TG LEVEL	:	-10dBm

② Connect an RF power meter with the spectrum analyzer at the TG output.

③ Confirm that the TG output level is ±0.7dB for the output level in CENTER FREQ of 30MHz when the CENTER FREQ of the R3361C/D is changed in a range of 100kHz to 1.0GHz.



④ Confirm that the TG output level is ±1.5dB for the output level in CENTER FREQ of 30MHz when the CENTER FREQ of the R3361C/D is changed in a range of 9kHz to 2.6GHz.

⑤ Confirm that the TG output level is ±2.0dB for the output level in CENTER FREQ of 30MHz when the CENTER FREQ of the R3361C/D is changed in a range of 9kHz to 3.6GHz.

4.13 Testing Stability of TG Output Level Changeover (For R3361C/D only)

Procedure

① Reset and then set the spectrum analyzer (R3361C/D only) to the following settings:

CENTER FREQ	:	30MHz
FREQ SPAN	:	0Hz
TG	:	ON
TG LEVEL	:	-10dBm

② Connect an RF power meter to the spectrum analyzer to measure the TG output level.

③ Set the TG LEVEL to -15dBm, and take reading on power meter.

④ Confirm that the difference between the readings of steps③ and④above is 5dB±1dB.

⑤ For a range from 0dBm to -50dBm of the TG output level, test according to Table 12.

Table 12 Stability of TG output Level Changeover

TG LEVEL [dBm]	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50
Output level difference at -10dBm setting	+10 ±1	+5 ±1	0	-5 ±1	-10 ±1	-15 ±1	-20 ±1	-25 ±1	-30 ±1	-35 ±1	-40 ±1

⑥ Perform steps ② to ④ for 1. 5GHz and 3.0GHz center frequencies. The deviations for 1.5GHz and 3.0GHz must be within ±2dB and ±3dB respectively.

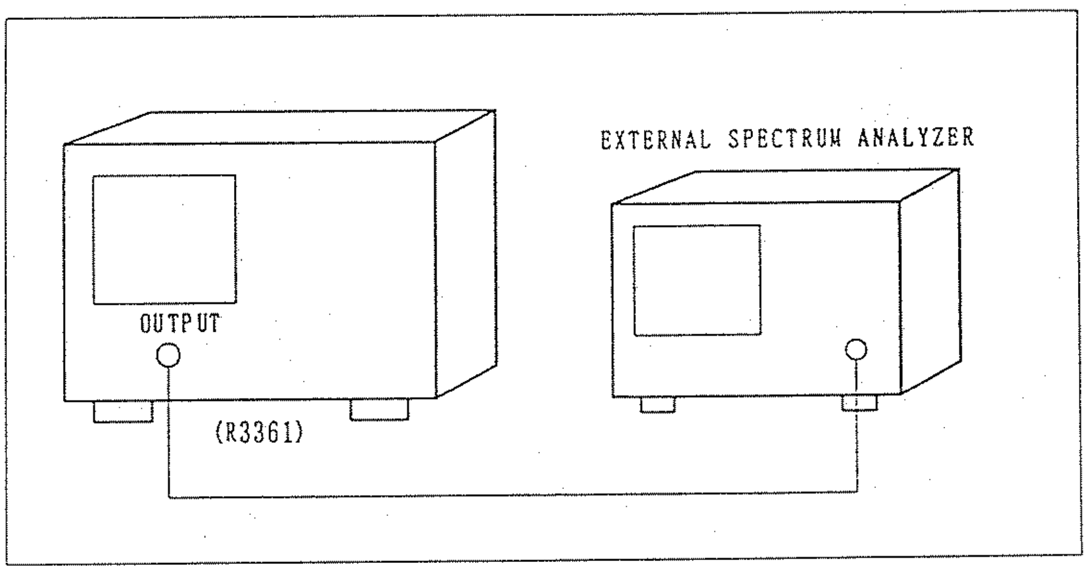
4.14 Testing Output Spurious (For R3361C/D only)

Procedure

① Reset and then set the spectrum analyzer (R3361C/D only) to the following settings:

CENTER FREQ	:	30MHz
FREQ SPAN	:	0Hz
TG	:	ON
TG LEVEL	:	0dBm

② Connect an external spectrum analyzer to the R3361C/D at the TG OUTPUT.



③ Change the center frequency to up to 3.6GHz for the R3361D, or 2.6GHz for the R3361C, and confirm that the harmonics spurious is lower than the basic waveform by at least -20dBc and that the non-harmonics spurious is lower by at least -30dBc.

4.15 Testing TG Leak (For R3361C/D only)

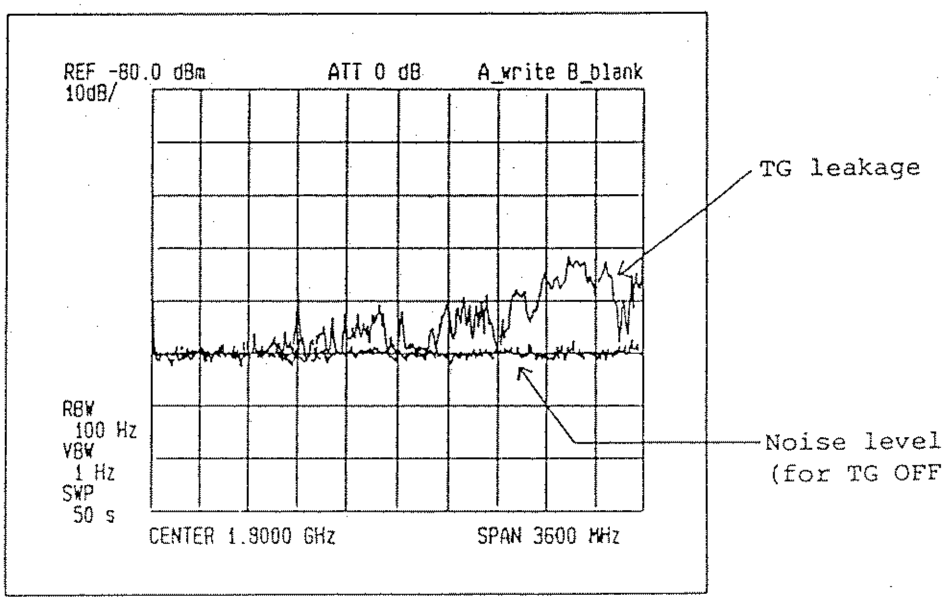
Procedure

① Reset and then set the spectrum analyzer (R3361C/D only) to the following settings:

REF LEVEL	:	-80dBm
SWP TIME	:	50sec
RBW	:	100Hz
VBW	:	1Hz
ATT	:	0dB
TG	:	ON
TG LEVEL	:	0dBm

② Execute the TG FREQ CAL (AUTO) to compensate for any tracking error. Make no connection to the INPUT or TG OUTPUT connector.

③ Confirm that TG leak is not more than -110dBm for up to 3GHz, and not more than -100dBm for up to 3.6GHz.



5 Test Report

The test report form for the spectrum analyzer is given below.

R3261C/D R3361C/D Test Report

Item		Specification	Measurement
1. CAL signal test			
1. CAL signal level		-20dBm ± 0.3dB	dBm
2. Test using CAL signals			
1. Noise side band	20kHz offset	-105dBc/Hz	dBc/Hz
2. Frequency drift		300Hz/min	
3. Stability of resolution bandwidth (3dB bandwidth)	RBW 1MHz	±20%	%
	RBW 300kHz		%
	RBW 3kHz		%
4. Resolution bandwidth selectivity (60dB : 3dB)	RBW 1MHz	15 : 1	:
	RBW 300kHz		:
	RBW 3kHz		:
5. QP bandwidth stability (6dB bandwidth)	QP 120kHz	110kHz to 130kHz	kHz
	QP 9kHz	8kHz to 10kHz	kHz
	QP 200Hz	170Hz to 220Hz	Hz
6. Marker indication stability (normal mode)	SPAN 20MHz	±1.05MHz	MHz
	SPAN 10MHz	±550kHz	kHz
	SPAN 2MHz	±160kHz	kHz
7. Marker indication stability (counter mode)	SPAN 20Hz	±1Hz	Hz
8. Average noise level		-121dBm + 1.55f	dBm
9. Residual response		-100dBm	dBm
10. Switchover stability of resolution bandwidth		±0.3dB	dB

R3261C/D R3361C/D Test Report (Cont'd)

Item		Specification	Measurement
3. Test Using measuring equipment			
1. Reference oscillator stability		$\pm 2 \times 10^{-8}$	x10
2. Center frequency stability	SPAN 20MHz	±450kHz	kHz
	SPAN 10MHz	±250kHz	kHz
	SPAN 2MHz	±60kHz	kHz
	SPAN 1kHz	±50Hz	Hz
3. Frequency span stability	SPAN 2GHz	±3%	%
	SPAN 10MHz	±3%	%
	SPAN 2MHz	±5%	%
4. LOG linearity		±0.2dB/1dB	dB
		±1.0dB/10dB	dB
		±1.5dB/70dB	dB
		±2.0dB/110dB	dB
5. LIN linearity		±5% of Full Scale	%
6. Reference level stability	REF 0dBm to -50dBm	±0.3dB	dB
	REF -60dBm to -70dBm	±0.7dB	dB
7. Input attenuator changeover stability		±1.0dB	dB
8. Frequency response	100kHz to 2GHz	±0.5dB	dB
	9kHz to 3.6GHz	±1dB	dB
9. Spurious response	-10dBm INPUT	-50dBc	dBc
10. Sweep time stability		±3%	%
11. TG output level stability		±0.5dB	dB

R3261C/D R3361C/D Test Report (Cont'd)

Item		Specification	Measurement
12. TG output frequency response	100kHz to 1GHz	±0.7dB	dB
	9kHz to 2.6GHz	±1.5dB	dB
	9kHz to 3.6GHz	±2.0dB	dB
13. Stability of TG output level changeover	100kHz to 1GHz	±1.0dB	dB
	9kHz to 2.6GHz	±2.0dB	dB
	9kHz to 3.6GHz	±3.0dB	dB
14. Output spurious	Harmonics spurious	-20dB	dB
	Non-harmonic spurious	-30dB	dB
15. TG leakage	to 3.0GHz	-110dBm	dBm
	to 3.6GHz	-100dBm	dBm

ADVANTEST product is warranted against defects in material and workmanship for a period of one year from the date of delivery to original buyer.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by buyer, unauthorized modification or misuse, accident or abnormal conditions of operations.

No other warranty is expressed or implied. ADVANTEST specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

ADVANTEST shall not be liable for any special incidental or consequential damages, whether in contract, tort or otherwise.

Any and all warranties are revoked if the product is removed from the country in which it was originally purchased.

SERVICE

During the warranty period, ADVANTEST will, at its option, either repair or replace products which prove to be defective.

When trouble occurs, buyer should contact his local supplier or ADVANTEST giving full details of the problem and the model name and serial number.

For the products returned to ADVANTEST for warranty service, buyer shall prepay shipping and transportation charges to ADVANTEST and ADVANTEST shall pay shipping and transportation charges to return the product to buyer. However, buyer shall pay all charges, duties, and taxes incurred in his country for products returned from ADVANTEST.

CLAIM FOR DAMAGE IN SHIPMENT TO ORIGINAL BUYER

The product should be thoroughly inspected immediately upon original delivery to buyer. All material in the container should be checked against the enclosed packing list or the instruction manual alternatively. ADVANTEST will not be responsible for shortage unless notified immediately.

If the product is damaged in any way, a claim should be filed by the buyer with carrier immediately. (To obtain a quotation to repair shipment damage, contact ADVANTEST or the local supplier.) Final claim and negotiations with the carrier must be completed by buyer.

SALES & SUPPORT OFFICES

Advantest(Singapore)Pte.Ltd.
438A Alexandra Road
#08-03/06 Alexandra Technopark Singapore 119967
Phone : 65-274-3100 Facsimile : 65-274-4055

ROHDE & SCHWARZ Engineering and Sales GmbH
Mühldorfstr. 15 (P.O.B. 80 1429, D-81614 Munich)
D-81671 Munich, Germany
Phone : 49-89-4129-3711 Facsimile : 49-89-4129-3723

TEKTRONIX INC.
P.O. Box 500, M/S 39-520, Beaverton, Oregon 97077-0001
or
Howard Vollum Industrial Park, M/S 58-743, Beaverton, OR, 97077, U.S.A.
Inside the U.S. 1-800-426-2200
Outside the U.S. 1-503-627-1933

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ADVANTEST CORPORATION

Shinjuku-NS Building, 4-1, Nishi-Shinjuku 2-chome, Shinjuku-ku, Tokyo 163-0880, JAPAN
Phone:(03)3342-7500 Facsimile:(03)3342-7410 Telex:232-4914 ADVAN J