
ADVANTEST®
ADVANTEST CORPORATION

U4941TG/NTG
RF FIELD ANALYZER
OPERATION MANUAL

MANUAL NUMBER OEA00 9506

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**U4941TG/NTG
RF FIELD ANALYZER
OPERATION MANUAL**

Preface

PREFACE

(1) Applicable type to U4941TG/NTG

U4941TG (Input impedance of 50Ω system)

U4941NTG (Input impedance of 75Ω system)

(2) How to use Operation Manual

This document describes about tracking generator. For the explanation of functions other than tracking generator, see the separate volume "U4941 series Operation Manual" with replacing as follows.

U4941 series →U4941TG/NTG

U4941 →U4941TG

U4941N →U4941NTG

U4941TG/NTG Operation Manual	
Configuration	Contents
1. Outline	
2. Standard accessories	
3. Panels Front panel Rear panel	Use the separate volume "U4941 series Operation Manual" Chapter 3 together.
4. Operation method	
5. Function descriptions	Use the separate volume "U4941 series Operation Manual" Chapter 7 together.
6. GPIB command codes	Use the separate volume "U4941 series Operation Manual" Chapter 8 together.
7. Specifications	
8. Softkey menu	Use the separate volume "U4941 series Operation Manual" Section A.3 together.
A.1 Error message list	
External view (Front panel)	

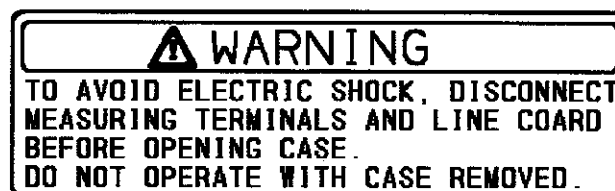
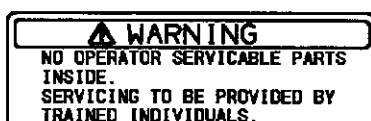
Safety Summary

To ensure thorough understanding of all functions and to ensure efficient use of this equipment, please read the Instruction 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 equipment.

Careful attention to personal safety should be paid when operating and servicing this equipment. Please be sure to always use this equipment correctly and safely.

■ Warning Labels

Warning labels such as shown below 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.



■ 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.
- When removing the plug from the electrical outlet, first turn the power switch OFF and then pull it out by gripping the plug. Do not pull on the power cable itself. Make sure your hands are dry at this time.
- Before turning on the power, be sure to check that the supply voltage matches the voltage requirements of the equipment.
- Be sure to plug the power cable into an electrical outlet which has a safety ground terminal. Grounding will be defeated if you use an extension cord which does not include a safety ground terminal.
- Be sure to use fuses rated for the voltage in question.
- Do not use this equipment with the case open.
- Do not place any heavy objects on top of this equipment. Also, do not place flower pots or other containers containing liquid such as chemicals on top of or near this equipment.
- Do not stick or drop metal or easily flammable objects into the ventilation outlets of this equipment.
- In the case of products which emit laser light, do not look directly at the output connector edge or the connected fiber output edge.

■ Caution Symbols Used Within the Instruction Manual

Symbols indicating items requiring caution which are used in this instruction manual are shown below together with their meaning.

DANGER : Indicates an item where there is a danger of serious personal injury (death or serious injury)

WARNING : Indicates an item relating to personal safety or health

CAUTION : Indicates an item relating to possible damage to the product or equipment or relating to a restriction on operation

■ Safety Marks on the Product

The following safety marks can be found on Advantest products.



:

Indicates that care in handling is required. A reference to the appropriate pages in the instruction manual is given to protect yourself and the product.



:

Represents a ground symbol. This indicates field wiring terminals which must be grounded before using the equipment to prevent electric shock.



:

Indicates dangerous high voltage. This is placed at locations where 1000 volts or more is input or output.



:

Indicates a frame (or case) terminal. This is placed on terminals connected to the outside frame (or case) of the product.



:

Indicates alternating current (current or voltage).



:

Indicates direct current (current or voltage).



:

Indicates alternating current (current or voltage) and direct current (current or voltage).

■ Precautions when Disposing of this Equipment

Be aware of the following harmful substances when disposing of this product and be sure they are disposed of properly. If you have questions on how to dispose of this product, please contact your nearest Advantest dealer. Our address and phone number are listed at the end of this manual.

Harmful substances:

- (1) PCB (polycarbon biphenyl)
- (2) Mercury
- (3) Ni-Cd (nickel cadmium)
- (4) Other

Items possessing cyan, organic phosphorous and hexadic chromium and items which may leak cadmium or arsenic (excluding lead in solder).

■ Replacement Parts

Some parts used in this equipment are expected to wear out over time due to friction or other causes. Please replace these parts periodically to ensure a set level of performance. If you have questions about replacement parts, please ask your nearest Advantest dealer. Our address and phone number are listed at the end of this manual.

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EXTERNAL VIEW (Front view)

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1. OUTLINE

1. OUTLINE

U4941TG/NTG is U4941 with a tracking generator. A tracking generator is a device that generates signals of the same frequency as the sweep frequency of a spectrum analyzer.

A tracking generator allows the measurement of filters or amplifiers.

This tracking generator outputs frequencies in the range of 100kHz to 2.2GHz.

The level of an output frequency varies from 0dBm to -31dBm in 1dB steps.

The output impedance of U4941TG is 50 Ω .

The output impedance of U4941NTG is 75 Ω .

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2. STANDARD ACCESSORIES


2. STANDARD ACCESSORIES

If something is missing, please contact the dealer or the sales and support offices. Address and telephone numbers are listed at the end of this manual.

Table 2-1 Standard Accessories

Part Name	Specification		Quantity		Remarks
	Type Code	Stock No.	U4941TG	U4941NTG	
AC/DC Adapter	A08180	—	1	1	
AC Power supply cable	A01402	DCB-DD2428X01	1	1	
Power fuse	326010	DFT-AF10A	1	1	
N-BNC conversion adapter	JUG-201A/V	JCF-AF001EX03	1	—	U4941TG only
C15 type conversion adapter	NCP-NFJ	JCF-AF001EX06	—	1	U4941NTG only
NC-BNC conversion adapter	BA-A165	JCF-AF001EX04	—	1	
Carrying belt	—	—	1	1	
U4941 series	—	JU4941 SERIES	1	1	Japanese version
Operation manual	—	EU4941 SERIES			English version
U4941TG/NTG	—	JU4941TG/NTG	1	1	Japanese version
Operation manual	—	EU4941TG/NTG			English version
Quick guide	—	JU4941 SERIES(Q)	1	1	Japanese version
	—	EU4941 SERIES(Q)			English version

Note: When ordering additional accessories, please be sure to specify the Model (or Stock number).

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3. PANELS

This chapter briefly describes the analyzer's front, rear and top panels.

3.1 Front Panel

- ① to ㉔ : Refer to the separate volume "U4941 series Operation Manual" 3.1 Front Panel ① to ㉔.
- ㉕ TG key : If it is pressed, LED lights up on it and TG starts.
- ㉖ N-Type connector : This is an output connector of a tracking generator.

3.2 Rear Panel

For the rear panel of U4941TG/NTG, refer to the separate volume "U4941 series Operation Manual" 3.2 Rear Panel .

3.3 Top Panel

For the top panel of U4941TG/NTG, refer to the separate volume "U4941 series Operation Manual" 3.3 Top Panel .

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3. PANELS

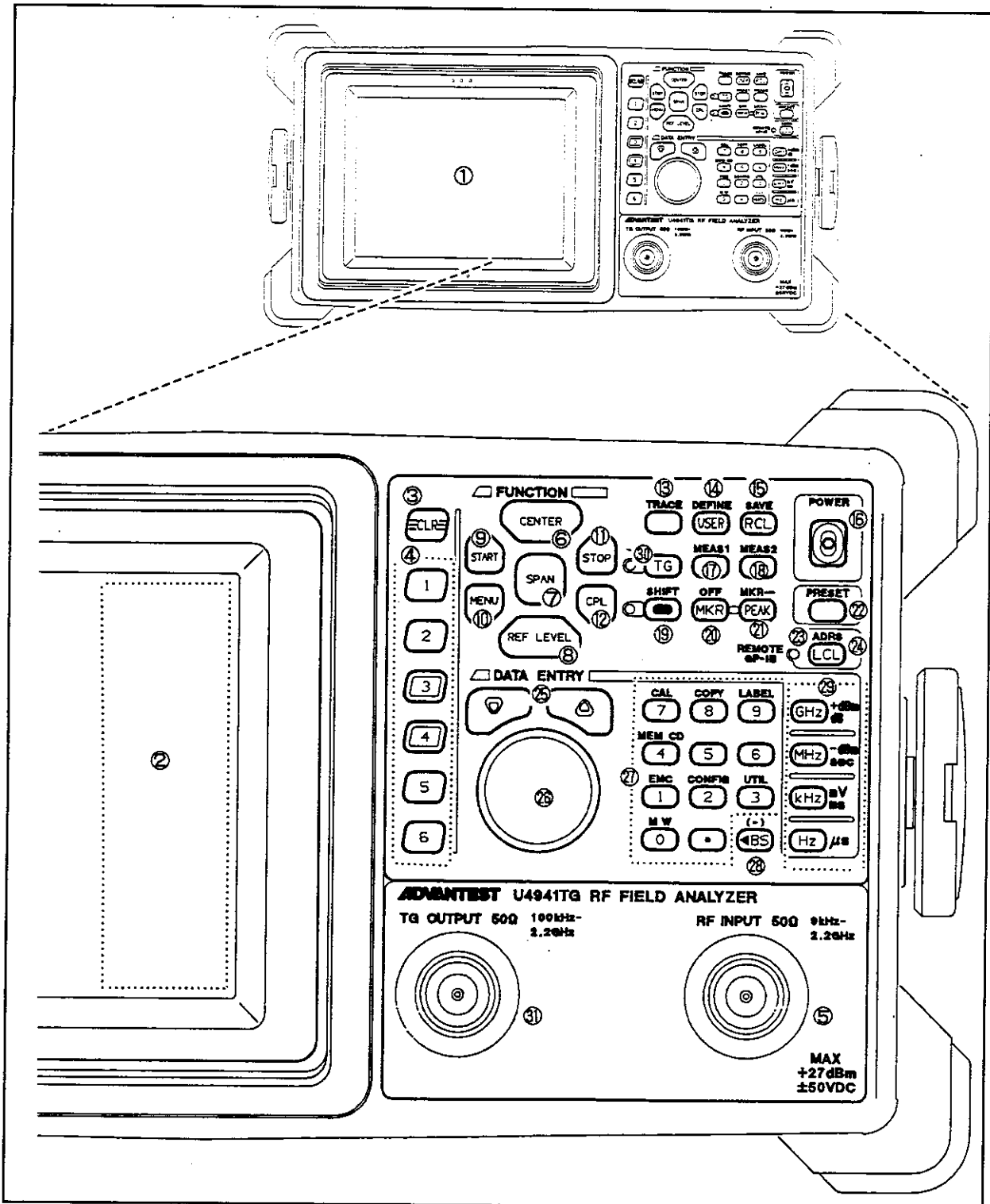



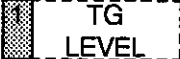
Figure 3-1 Front Panel (U4941TG)

4. OPERATION METHOD


4.1 Usage of Tracking Generator

[Operation method]


- ① Turn the tracking generator on to set its output level. (LED lights up upward on the left side of keys)

Then press   and set the output level with ten keys, step keys, or the data knob.
(It is possible to set the output level of 0dBm to -31dBm in 1dB steps.)

- ② Set a center frequency, a frequency span, and a reference level as follows.


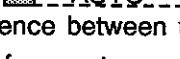
Press  and then adjust a center frequency with the ten keys, the step keys, or the data knob.

Press  and then adjust a frequency span with the ten keys, the step keys, or the data knob.

Press  and then adjust a reference level with the ten keys, the step keys, or the data knob.

CAUTION

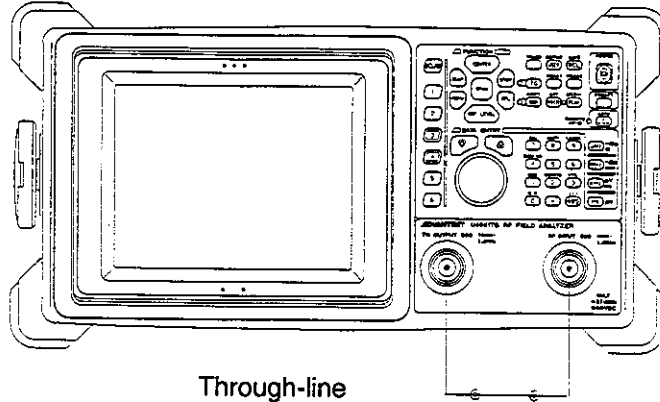
If resolution bandwidth is 120kHz or less, connect a cable between TG output

connector and RF input connector and press   to correct a tracking error (that is a level error caused by the difference between the output frequency of a tracking generator and the tuned frequency of a spectrum analyzer).

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4.1 Usage of Tracking Generator

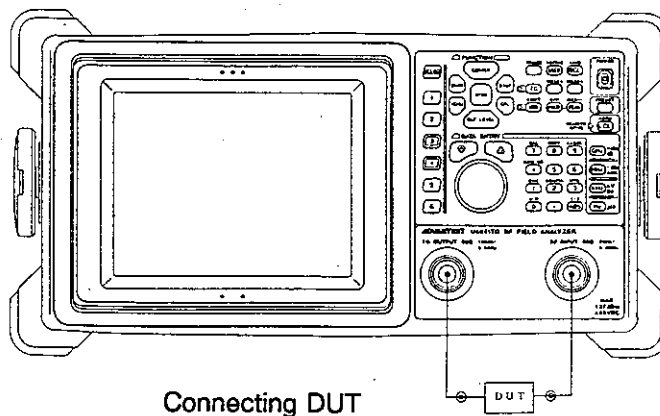
- ③ Connect a cable between TG OUTPUT connector and INPUT connector. A through-line frequency characteristic appears on the screen.



- ④ If the transmission loss is not ignored, calibrate the loss according to Section 4.2.
- ⑤ Connect a device under test (DUT).

CAUTION

If the input and output impedance of DUT is not 50Ω (for U4941TG) or 75Ω (for U4941NTG), match the input and output impedance of DUT to that of TG INPUT and OUTPUT.



- ⑥ Opening of measurement
See Section 4.3.

4.2 How to Normalize a Frequency Characteristic with Reference to a Display Line

4.2 How to Normalize a Frequency Characteristic with Reference to a Display Line

This section explain how to normalize the frequency characteristic of a cable with reference to a trace and a display line.

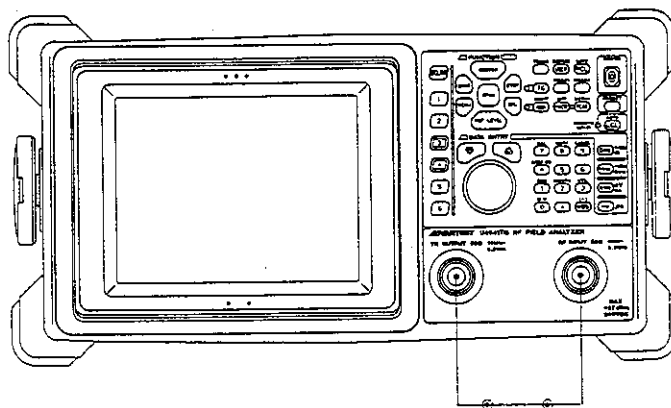
This operation normalizes the frequency characteristic of the spectrum analyzer itself and allows the correct measurement of the frequency characteristic of DUT such as a filter.

CAUTION

When changing the center frequency, frequency span, reference level and so on, are changed after having normalized the analyzer, the normalization has to be made again.

[Operation method]

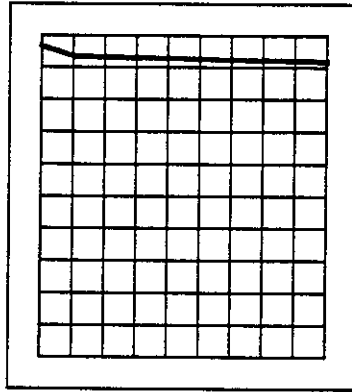
- ① Connect a cable directly between the TG OUTPUT connector and the INPUT connector.



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4.2 How to Normalize a Frequency Characteristic with Reference to a Display Line

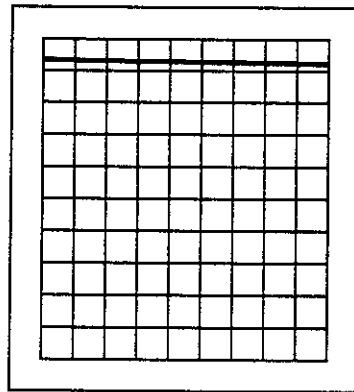
- ② Press **REF LEVEL** to adjust the reference level with the step keys or the data knob.



(Waveform image)

- ③ The frequency characteristic is normalized.

Press keys in order of **TRACE**, **TRACE MATH**, **NORMALIZE**, and **INSTANT NORMALIZE**.



(Waveform image)

- ④ To release the normalization mode, press **NORMALIZE ON/OFF**.

4.3 Measurement Example

The measurement of a filter and an amplifier is introduced as an example.

4.3.1 Measurement of a Filter's Damping Property

A band-pass filter with a passing band of around 900MHz is measured here.
 Its characteristics are as follows.

Center frequency	: 200MHz
Passing bandwidth (3dB)	: Approx. 4.5MHz
Insertion loss	: Approx. 5dB
Input/output impedance	: 50Ω

(1) Normalizing the Measurement System

It is necessary to adjust the tracking generator (TG). See section 4.2.

- ① Connect a through line between the TG OUTPUT connector and the INPUT connector by using measuring cables.

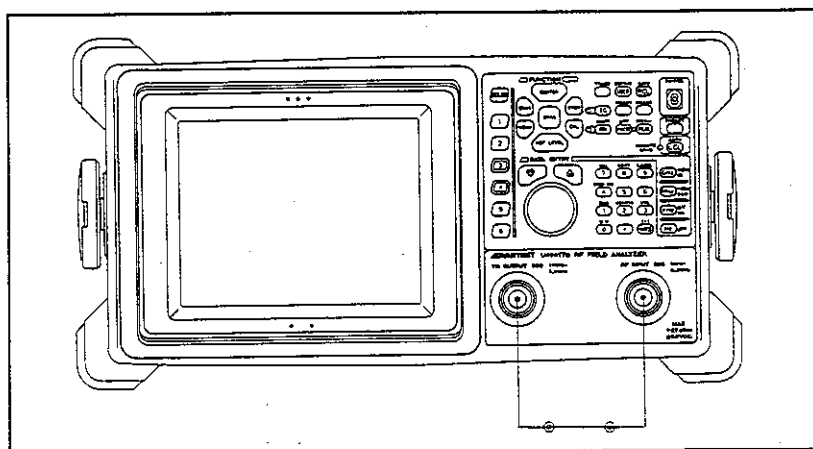


Figure 4-1 Through-line

- ② Press the **PRESET** key to preset the analyzer.
- ③ Press the **TG** key to turn on TG.
- ④ Press **TG LEVEL** **0** **MHz** $\frac{-dBm}{sec}$ to set the TG output level to 0dBm.
- ⑤ Press **CENTER** **2** **0** **0** **MHz** $\frac{-dBm}{sec}$ to set the center frequency to 200MHz.

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4.3 Measurement Example

- ⑥ Press **SPAN** **2** **0** **MHz** $\frac{-dBm}{sec}$ to set the span to 20MHz.
- ⑦ Press **CPL** **RBW** **AUTO/MNL** **1** **0** **0** **kHz** $\frac{mV}{ms}$ to set RBW to 100kHz.
- ⑧ Press **VBW** **AUTO/MNL** **1** **kHz** $\frac{mV}{ms}$ to set VBW to 1kHz.

Note : The setting of RBW and VBW decreases the noise and make the waveform of the band-pass filter sharp.

- ⑨ Press **REF LEVEL** **dB/DIV** **2** **GHz** $\frac{+dBm}{dB}$ to set the vertical axis to 2dB/div.
- ⑩ Press **REF LEVEL** and then move the waveform to the upper part of the screen by turning the data knob so that the waveform does not lie offscreen.

Press **CLRF** to watch the full screen without the softkeys.

Then the screen changes as shown in Figure 4-2.

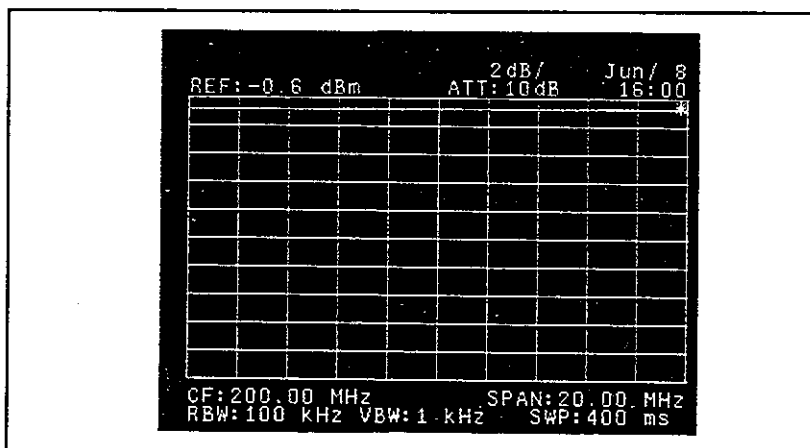


Figure 4-2 Clear Screen

Press **CLRF** to recall the softkeys.

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4.3 Measurement Example

- ① Press     to normalize the system of measurement.

Then the screen changes as shown in Figure 4-3.

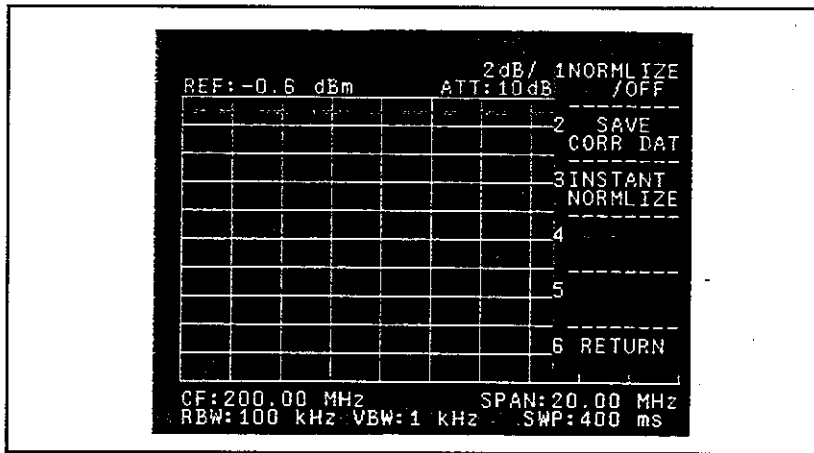


Figure 4-3 Normalize Screen

Now, the frequency characteristic became flat without DUT.

CAUTION

If functional values that have reference to normalization; for example, a center frequency, a frequency span, and a reference level, and so on, are changed under normalizing the analyzer, there is a possibility of not performing the normalization correctly. In such a case, normalize the analyzer again from the beginning.

(2) Starting Measurement

- ① Connect BPF between the TG OUTPUT connector and the INPUT connector by using measuring cables as shown in Figure 4-4.

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4.3 Measurement Example

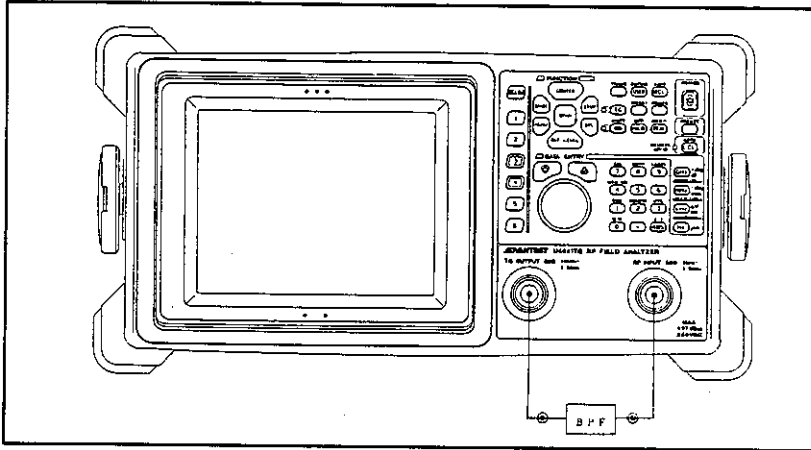


Figure 4-4 Connecting BPF

- ② Press **CPL** **3** **SWP** **AUTO/MNL** **2** **MHz** **-dBm** **sec** to set the sweep time to 2 seconds.

Note : This setting allows the sweep time not to influence the waveform.

Then the screen changes as shown in Figure 4-5.

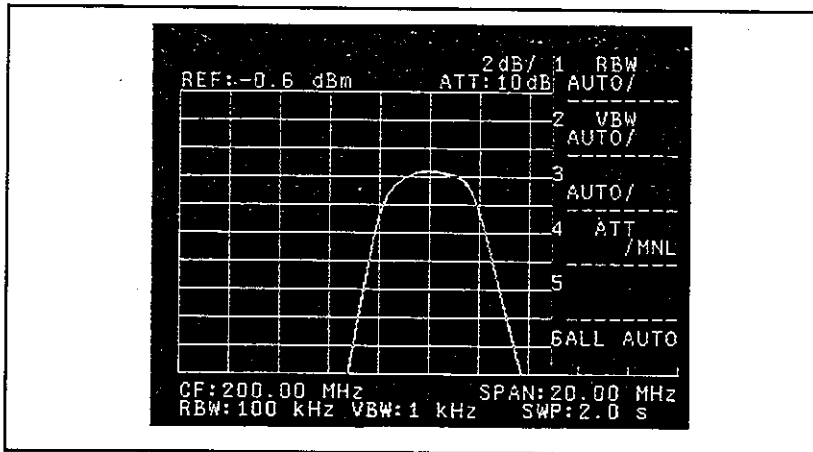


Figure 4-5 Sweep Time for 2 Seconds

Measuring the following three items.

- (a) Insertion loss
- (b) Passing bandwidth
- (c) Attenuation

(a) Measurement of an insertion loss

- ① Press **MKR** **2** **0** **0** **MHz** $\frac{-\text{dBm}}{\text{sec}}$ to locate a marker at 200MHz on the screen.

The insertion loss of 200MHz is displayed as the readout of the marker.

Note : When the display line is shown, a marker level indicates a value based on the display line.

Then the screen changes as shown in Figure 4-6.

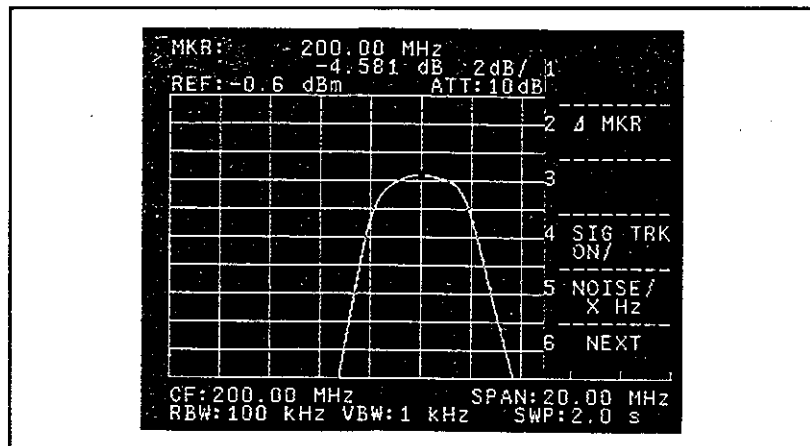


Figure 4-6 Measurement of an Insertion Loss

In this measurement, the insertion loss is 4.581dB.

(b) Measurement of a passing bandwidth (3dB)

- ① Press **MEAS2** **dB DOWN** to set from the condition of measurement insertion loss to X dB DOWN mode.
- ② Press **3** **GHz** $\frac{+\text{dBm}}{\text{dB}}$ to make an attention 3dB.
- ③ Press **XdB DOWN** to measure 3dB DOWN.

Then, two marker moves to points of 3dB below the level of 200MHz, respectively and then the markers indicate 3-dB passing bandwidth.

The screen becomes Figure 4-7.

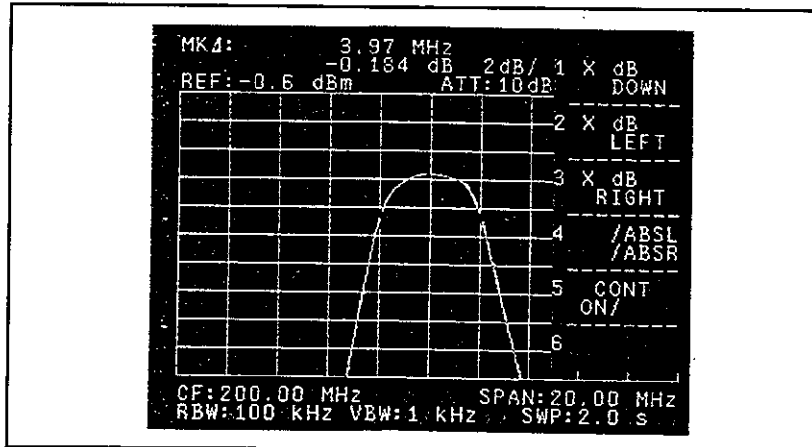


Figure 4-7 Measurement of a Passing Bandwidth

In this measurement, the 3-dB passing bandwidth is 3.97MHz.

(c) Measurement of an attenuation

Measurement of an attenuation at 14MHz, referred to the level of 200MHz.

① Press to release normalization because the attenuation should be measured on a scale of 10dB/DIV not to be influenced by the through-line frequency characteristic.

② Press $\frac{+dBm}{dB}$ to set 10dB/DIV.

③ Press $\frac{-dBm}{sec}$ to set the span to 50MHz.

④ Press twice to turn the display line off.

⑤ Press $\frac{-dBm}{sec}$ to set a marker to 200MHz.

⑥ Press to switch from the marker to Δ MKR, and then move the Δ MKR by 14MHz high monitoring the frequency of Δ MKR.

Press to erase the soft menu.

Then the screen changes as shown in Figure 4-8.

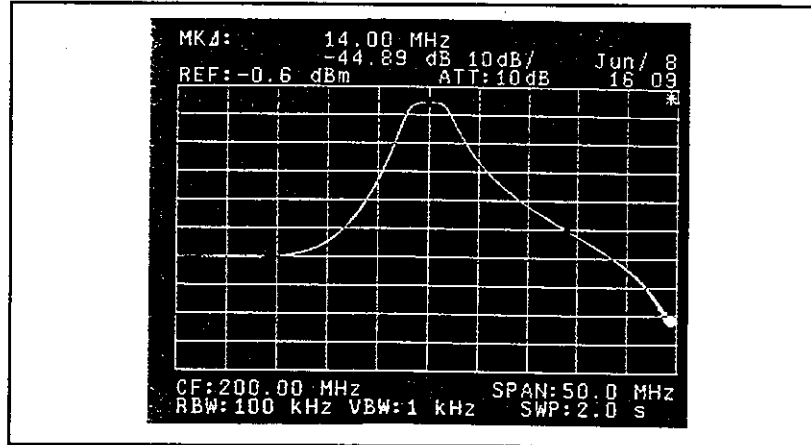


Figure 4-8 Measurement of an Attenuation

In this measurement, the attenuation is 44.89dB at the frequency of 14MHz.

4.4 Handling Precautions of Tracking Generator

(1) Dynamic Range

- ① The dynamic range of measurement is limited by the maximum output level of the TG part and the noise floor of the analyzer.
Making a resolution bandwidth RBW narrow expands the dynamic range.
If the local oscillation signal leaks from the TG part to the receiving part, there is possibilities that the noise level doesn't decrease at the maximum available resolution and that the dynamic range doesn't expand.
- ② If the loss of DUT (including its matching circuit) is big, the dynamic range also gets wrong. In such a case, the dynamic range can be improved by inserting an amplifier into the input or output port of DUT.
- ③ The location of an amplifier to be inserted is determined by conditions of DUT. Accordingly, it is necessary to study the characteristic of an amplifier to be inserted (for example, gain, flatness, noise figure, output level, 1-dB compression point, input/output VSWR, and so on).
- ④ If the tracking generator outputs an extreme large signal, decrease its output level.

(2) Time Response

- ① LCD displays a **UNCAL** message to indicate whether the level is correct or not. In the case of measuring the frequency characteristic with TG, however, ignore the **UNCAL** message.
This message indicates whether the IF filter responds sufficiently under conditions of **FREQ SPAN**, **SWP**, and **RBW** in the analyzer and whether a correct level is displayed.
- ② If the level change of a signal to be supplied from the output end of DUT to the spectrum analyzer is small, even if the **UNCAL** message is displayed, there are cases of displaying a correct level.
- ③ If the level of a signal to be supplied from the output end of DUT to the spectrum analyzer changes violently, the IF filter cannot respond.
Be careful to the time response of DUT.

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4.4 Handling Precautions of Tracking Generator

- ④ If the characteristic displayed on the screen does not change even after switching SWP, the IF filter of the analyzer and DUT is responding sufficiently. If not, slow SWP down or make SPAN narrow, until the characteristic on the screen does not change.

(3) Overvoltage Protection of TG OUTPUT Connector


Don't apply a voltage of $\pm 50V$ or more or a power of $+13dBm$ or more to TG OUTPUT connector. (It will be broken with such a voltage or a power.)

(4) Output Level Overshooting at TG Turns on

When TG turns on, approx. 2dBm output level overshoot occurs for a short time.

CAUTION

If DUT is weak in large level input, be careful to this output overshoot.

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5. FUNCTION DESCRIPTIONS

- TG (Function key)

Pressing this key powers the tracking generator. LED lights up to show the tracking generator is on.

- TG LEVEL (Softkey)

Pressing this key makes it possible to set the output level of the tracking generator with the ten




keys plus the unit keys, the   keys, or the knob .

- TG ADJ AUTO (Softkey)

Press this key corrects a tracking error (an error to generate from the difference between the output frequency of the tracking generator and the tuning frequency of the spectrum analyzer part) automatically on condition that RBW is 120kHz or less.

- TG ADJ MANUAL (Softkey)

Pressing this key makes it possible to correct a tracking error with the ten keys plus the unit keys,

the   keys, or the knob .

LCD displays DA data of TG frequency adjustment.

- TG OFF (Softkey)

Press this key powers the tracking generator off.

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6. GPIB COMMAND CODES


6.1 List of GPIB Command Codes

(Note) The following list describes GPIB codes for tracking generator. Refer to "8. LIST OF GPIB COMMAND CODES" in the separate volume "U4941 series Operation Manual".

Note on Table

- An asterisk (*) in the Listener Codes column indicates that you can send numeric data following that code by using a knob, numeric key or step key.
- AUTO/MANUAL or ON/OFF in the Output Formats column indicates that the code outputs 1 or 0, respectively.
- ON/OFF in the Output Formats column indicates that they output 1 or 0, respectively.
- All frequencies are in Hertz (Hz), and all times are in seconds or fractions of a second.
- Refer to an optionally available "GPIB Handbook" for information about the use of GPIB.

Function	Listener code	Talker request			Remarks
		Code	Output format	Header	
Tracking generator :ON :OFF	TG TGF	TG? —	ON/OFF —	— —	
Tracking generator output level	TGL*	TGL?	Level	Unit :Header dBm :TGB dBmV :TGM dBuV :TGU dBuVemf :TGE dBpW :TGP V :TGV W :TGW	
Tracking Generator ADJ :AUTO :MANUAL	TGADJA TGADJM*	TGADJ? — —	AUTO/MANUAL — —	— — —	

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7.1 U4941TG Specifications

7. SPECIFICATIONS

7.1 U4941TG Specifications

(1) Frequency

● Frequency range	9kHz to 2.2GHz
● Frequency readout accuracy (Start, Stop, CF, Marker frequency)	$\pm (\text{span} \times \text{span accuracy} + 0.15 \times \text{RBW} + 50\text{kHz})$
● Count frequency marker Resolution Count accuracy	1Hz to 1kHz $\pm (\text{marker frequency} \times \text{frequency reference accuracy} + 1\text{LSD} + 5\text{Hz})$ (S/N $\geq 25\text{dB}$, $50\text{kHz} \leq \text{SPAN} \leq 10\text{MHz}$, $\text{RBW} \geq 100\text{kHz}$)
● Frequency reference accuracy	$\pm 2 \times 10^{-6}/\text{Year}$ $\pm 1 \times 10^{-5}$ (0°C to 50°C)
● Frequency span Range Accuracy	50kHz to 2.4GHz, ZERO $\leq \pm 5\%$ (SPAN $\geq 100\text{kHz}$)
● Frequency stability Residual FM Drift	$\leq 3\text{kHz p-p}/100\text{ms}$ $\leq 10\text{kHz}$ (Frequency is fixed. 30 minutes after power ON. Sweep time: 50ms to 5s, temperature is fixed.)
● Sideband noise	$\leq -100\text{dBc}/\text{Hz}$ (20kHz offset)
● Resolution bandwidth (3dB) Range Bandwidth range accuracy Selectivity Bandwidth (6dB)	1kHz to 3MHz, 1-3 sequence $\leq \pm 20\%$ (1kHz to 1MHz) $\leq \pm 25\%$ (3MHz) $\leq 15 : 1$ (60dB : 3dB) 9kHz, 120kHz
● Video bandwidth	10Hz to 3MHz

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7.1 U4941TG Specifications

(2) Amplitude Range

• Measurement range	+ 20dBm to Average indicated noise level
• Maximum input level Preamplifier OFF	+ 27dBm (Input ATT \geq 10dB)
Preamplifier ON	\pm 50V DC max + 13dBm \pm 50V DC max
• Display range Log	10 \times 10div 10, 5, 2, 1dB/div
Linear	10% /div of reference level
QP Log	40dB (5dB/div)
• Reference level range Preamplifier OFF Log	- 64dBm to + 40dBm (0.1dB step)
Linear	141.1 μ V to 22.36V
Preamplifier ON Log	- 84dBm to + 5dBm (0.1dB step)
Linear	14.11 μ V to 707.1mV
• Input attenuator range	0 to 50dB (10dB step)

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7.1 U4941TG Specifications

(3) Dynamic Range

<ul style="list-style-type: none"> • Display average noise level <p style="padding-left: 20px;">Preamplifier OFF</p> <p style="padding-left: 20px;">Preamplifier ON</p>	<p style="padding-left: 20px;">- 117dBm + 2.7f (GHz)dB (RBW 1kHz, VBW 10Hz, INPUT ATT 0dB, frequency 1MHz or more)</p> <p style="padding-left: 20px;">- 132dBm + 3.3f (GHz)dB (RBW 1kHz, VBW 10Hz, INPUT ATT 0dB, frequency 1MHz or more)</p>
<ul style="list-style-type: none"> • 1dB gain compression <p style="padding-left: 20px;">Preamplifier OFF</p> <p style="padding-left: 20px;">Preamplifier ON</p>	<p style="padding-left: 20px;">- 10dBm (mixer input level) Frequency 10MHz or more</p> <p style="padding-left: 20px;">- 40dBm (RF input level) Frequency 10MHz or more</p>
<ul style="list-style-type: none"> • Spurious response <p style="padding-left: 20px;">Preamplifier OFF</p> <p style="padding-left: 40px;">2nd harmonic distortion</p> <p style="padding-left: 40px;">3rd-order inter modulation distortion</p>	<p style="padding-left: 20px;">≤ - 70dB - 30dBm input (INPUT ATT 0 dB, frequency > 10MHz)</p> <p style="padding-left: 20px;">≤ - 70dB - 30dBm input (INPUT ATT 0dB, frequency > 10MHz)</p>
<ul style="list-style-type: none"> • Residual response <p style="padding-left: 20px;">Preamplifier OFF</p> <p style="padding-left: 20px;">Preamplifier ON</p>	<p style="padding-left: 20px;">≤ - 100dBm (INPUT ATT 0dB, INPUT 50Ω terminated, frequency > 1MHz)</p> <p style="padding-left: 20px;">≤ - 115dBm (INPUT ATT 0dB, INPUT 50Ω terminated, frequency > 1MHz)</p>

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7.1 U4941TG Specifications

(4) Amplitude Accuracy

<ul style="list-style-type: none"> ● Frequency response <p style="padding-left: 20px;">Preamplifier OFF</p> <p style="padding-left: 20px;">Preamplifier ON</p>	$\leq \pm 1.0\text{dB}$ (100kHz to 2GHz) $\leq \pm 2.0\text{dB}$ (9kHz to 2.2GHz) (INPUT ATT 10dB, 20°C to 30°C, referenced to 30MHz after automatic calibration) $\leq \pm 1.0\text{dB}$ (100kHz to 2GHz) $\leq \pm 2.0\text{dB}$ (9kHz to 2.2GHz) (INPUT ATT 0dB, 20°C to 30°C, referenced to 30MHz after self calibration)
<ul style="list-style-type: none"> ● Calibration signal accuracy 	- 20dBm \pm 0.3dB
<ul style="list-style-type: none"> ● IF gain error (after self calibration) 	< $\pm 0.5\text{dB}$
<ul style="list-style-type: none"> ● Scale fidelity accuracy (after self calibration) <p style="padding-left: 20px;">LOG</p> <p style="padding-left: 20px;">LIN</p>	$\leq \pm 1.5\text{dB}/90\text{dB}$ $\leq \pm 1.0\text{dB}/10\text{dB}$ $\leq \pm 0.2\text{dB}/1\text{dB}$ $\leq \pm 5\%$ of reference level
<ul style="list-style-type: none"> ● Input attenuator (20 to 50dB settings referenced to 10dB) 	$\leq \pm 1.0\text{dB}$ (100kHz to 2GHz) $\leq \pm 1.5\text{dB}$ (9kHz to 2.2GHz)
<ul style="list-style-type: none"> ● Resolution bandwidth switching error (after self calibration) 	$\leq \pm 1.0\text{dB}$ (at reference bandwidth: 3MHz)

(5) Sweep

<ul style="list-style-type: none"> ● Sweep time <p style="padding-left: 20px;">Accuracy</p>	50ms to 1000s and manual sweep $\leq \pm 5\%$
<ul style="list-style-type: none"> ● Trigger mode 	FREE RUN, SINGLE, VIDEO, EXT, TV

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7.1 U4941TG Specifications

(6) Demodulation

<ul style="list-style-type: none"> ● Spectrum demodulation 	
Modulation type	AM, FM
Audio output	speaker and phone jack with volume control adjustable

(7) Input/Output

<ul style="list-style-type: none"> ● RF input 	
Connector	N-type female
Impedance	50 Ω (nominal)
Preamp OFF	VSWR \leq 1.5 (100kHz to 2GHz) VSWR \leq 2.0 (9kHz to 2.2GHz) INPUT ATT \geq 10dB
Preamp ON	VSWR \leq 2.1 (10MHz to 2GHz) INPUT ATT \geq 0dB
<ul style="list-style-type: none"> ● 10MHz reference input 	
Connector	BNC female, rear panel
Impedance	50 Ω (nominal)
Input range	+8dBm to +16dBm
<ul style="list-style-type: none"> ● Video output 	
Connector	BNC female, rear panel
Impedance	75 Ω (nominal), AC coupled
Amplitude (75 Ω terminator)	Approx. 1Vp-p, 75 Ω terminator (composite video signal)
<ul style="list-style-type: none"> ● External trigger input 	
Connector	BNC female, rear panel
Impedance	10k Ω (nominal), DC coupled
Trigger level	TTL level
<ul style="list-style-type: none"> ● Gate input 	
Connector	BNC female, rear panel
Impedance	10k Ω (nominal)
Sweep stop	during TTL level low level
Sweep continue	during TTL level high level
<ul style="list-style-type: none"> ● Phone output 	
Connector	Subminiature monophonic jack, front panel
Power output	0.2 watt max. 8 Ω (nominal)

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7.1 U4941TG Specifications

(cont'd)

<ul style="list-style-type: none"> ● GPIB Plotter Printer 	IEEE-488, bus connector Supports R9833, HP7470A, HP7475A, HP7440A, HP7550A, HP2225AJ
<ul style="list-style-type: none"> ● RS-232 	D-SUB 9 pin, rear panel
<ul style="list-style-type: none"> ● Power input Battery mounter adapted 	Advantest AC/DC adapter Model: A08180 Automatically selections between 100VAC and 200VAC Antonbauer Inc: Magnum 14 battery (nominal 70WH)

(8) Tracking Generator

<ul style="list-style-type: none"> ● Frequency range 	100kHz to 2.2GHz
<ul style="list-style-type: none"> ● Output level 	0 to -31dBm (in 1dB steps)
<ul style="list-style-type: none"> ● Accuracy output level 	± 0.5dB at 30MHz, at -10dBm (20°C to 30°C)
<ul style="list-style-type: none"> ● Frequency characteristic 	± 0.7dB up to 1GHz ± 1.5dB 100kHz to 2.2GHz
<ul style="list-style-type: none"> ● Attenuation accuracy 	± 1dB 100kHz to 1GHz ± 2dB 100kHz to 2.2GHz
<ul style="list-style-type: none"> ● Harmonics 	-20dBc or less
<ul style="list-style-type: none"> ● Non harmonics 	-30dBc or less
<ul style="list-style-type: none"> ● TG leakage 	-95dBm or less
<ul style="list-style-type: none"> ● Output impedance 	50Ω VSWR 1.5 or less from 100kHz to 2GHz 2.0 or less from 100kHz to 2.2GHz

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7.1 U4941TG Specifications

(9) General Specifications

<ul style="list-style-type: none"> ● Environment temperature <ul style="list-style-type: none"> Operating temperature Non-operating temperature Relative humidity 	<p>0°C to +50°C - 20°C to +60°C RH 85% or less</p>
<ul style="list-style-type: none"> ● Power supply <ul style="list-style-type: none"> External DC input Power consumption during DC operation During AC adapter is used During 100 VAC operation During 220 VAC operation 	<p>Connector: XLR 4 pin Input range: +10V to +16V</p> <p>50W max. Automatically selections between 100VAC and 220VAC Voltage: 90V to 132V Power consumption: 110VA max Frequency: 48Hz to 66Hz</p> <p>Voltage: 198V to 250V Power consumption: 110VA max. Frequency: 48Hz to 66Hz</p>
<ul style="list-style-type: none"> ● Mass 	<p>Approx. 7kg (Without option, accessory, carrying belt and battery)</p>
<ul style="list-style-type: none"> ● Dimensions 	<p>Approx. 148mm (height) × 291mm (wide) × 330mm (depth) Excluding the projecting (legs, connector, etc.).</p>
<ul style="list-style-type: none"> ● External memory <ul style="list-style-type: none"> Memory card 	<p>2 slot, upper panel Connector: JEIDA-Ver4.1, PCMCIA Rel 2.0</p>

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7.2 U4941NTG Specifications

7.2 U4941NTG Specifications

(1) Frequency

• Frequency range	9kHz to 2.2GHz
• Frequency readout accuracy (Start, Stop, CF, Marker frequency)	$\pm (\text{span} \times \text{span accuracy} + 0.15 \times \text{RBW} + 50\text{kHz})$
• Count frequency marker Resolution Count accuracy	1Hz to 1kHz $\pm (\text{marker frequency} \times \text{frequency reference accuracy} + 1\text{LSD} + 5\text{Hz})$ (S/N \geq 25dB, 50kHz \leq SPAN \leq 10MHz, RBW \geq 100kHz)
• Frequency reference accuracy	$\pm 2 \times 10^{-6}/\text{Year}$ $\pm 1 \times 10^{-5}$ (0°C to 50°C)
• Frequency span Range Accuracy	50kHz to 2.4GHz, ZERO $\leq \pm 5\%$ (SPAN \geq 100kHz)
• Frequency stability Residual FM Drift	$\leq 3\text{kHz p-p}/100\text{ms}$ $\leq 10\text{kHz}$ (Frequency is fixed. 30 minutes after power ON. Sweep time: 50ms to 5s, temperature is fixed.)
• Sideband noise	$\leq -100\text{dBc}/\text{Hz}$ (20kHz offset)
• Resolution bandwidth (3dB) Range Bandwidth range accuracy Selectivity Bandwidth (6dB)	1kHz to 3MHz, 1-3 sequence $\leq \pm 20\%$ (1kHz to 1MHz) $\leq \pm 25\%$ (3MHz) $\leq 15 : 1$ (60dB : 3dB) 9kHz, 120kHz
• Video bandwidth	10Hz to 3MHz

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7.2 U4941NTG Specifications

(2) Amplitude Range

• Measurement range	+ 130dB μ V to Average indicated noise level
• Maximum input level Preamplifier OFF Preamplifier ON	+ 134dB μ V (Input ATT \geq 10dB) \pm 50V DC max + 120dB μ V \pm 50V DC max
• Display range Log Linear QP Log	10 \times 10div 10, 5, 2, 1 dB/div 10% div of reference level 40dB (5dB/div)
• Reference level range Preamplifier OFF Log Linear Preamplifier ON Log Linear	+ 46dB μ V to + 150dB μ V (0.1dB step) 199.5 μ V to 31.62V + 26dB μ V to + 115dB μ V (0.1dB step) 19.95 μ V to 1V
• Input attenuator range	0 to 50dB (10dB step)

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7.2 U4941NTG Specifications

(3) Dynamic Range

<ul style="list-style-type: none"> • Display average noise level <p style="padding-left: 20px;">Preamplifier OFF</p> <p style="padding-left: 20px;">Preamplifier ON</p>	<p style="padding-left: 20px;">$- 8\text{dB}\mu\text{V} + 2.7f \text{ (GHz)}\text{dB}$ (RBW 1kHz, VBW 10Hz, INPUT ATT 0dB, frequency 1MHz or more)</p> <p style="padding-left: 20px;">$- 23\text{dB}\mu\text{V} + 3.3f \text{ (GHz)}\text{dB}$ (RBW 1kHz, VBW 10Hz, INPUT ATT 0dB, frequency 1MHz or more)</p>
<ul style="list-style-type: none"> • 1dB gain compression <p style="padding-left: 20px;">Preamplifier OFF</p> <p style="padding-left: 20px;">Preamplifier ON</p>	<p style="padding-left: 20px;">$> + 100\text{dB}\mu\text{V}$ (mixer input level) Frequency 10MHz or more</p> <p style="padding-left: 20px;">$> + 70\text{dB}\mu\text{V}$ (RF input level) Frequency 10MHz or more</p>
<ul style="list-style-type: none"> • Spurious response <p style="padding-left: 20px;">Preamplifier OFF</p> <p style="padding-left: 40px;">2nd harmonic distortion</p> <p style="padding-left: 40px;">3rd-order inter modulation distortion</p>	<p style="padding-left: 20px;">$\leq - 70\text{dB} + 78\text{dB}\mu\text{V}$ input (INPUT ATT 0dB, frequency $> 10\text{MHz}$)</p> <p style="padding-left: 20px;">$\leq - 70\text{dB} + 78\text{dB}\mu\text{V}$ input (INPUT ATT 0dB, frequency $> 10\text{MHz}$)</p>
<ul style="list-style-type: none"> • Residual response <p style="padding-left: 20px;">Preamplifier OFF</p> <p style="padding-left: 20px;">Preamplifier ON</p>	<p style="padding-left: 20px;">$\leq + 10\text{dB}\mu\text{V}$ (INPUT ATT 0dB, INPUT 75Ω terminated, frequency $> 1\text{MHz}$)</p> <p style="padding-left: 20px;">$\leq - 5\text{dB}\mu\text{V}$ (INPUT ATT 0dB, INPUT 75Ω terminated, frequency $> 1\text{MHz}$)</p>

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7.2 U4941NTG Specifications

(4) Amplitude Accuracy

<ul style="list-style-type: none"> ● Frequency response Preamplifier OFF Preamplifier ON 	$\leq \pm 1.0\text{dB}$ (100kHz to 2GHz) $\leq \pm 2.0\text{dB}$ (9kHz to 2.2GHz) (INPUT ATT 10dB, 20°C to 30°C, referenced to 30MHz after automatic calibration) $\leq \pm 1.0\text{dB}$ (100kHz to 2GHz) $\leq \pm 2.0\text{dB}$ (9kHz to 2.2GHz) (INPUT ATT 0dB, 20°C to 30°C, referenced to 30MHz after self calibration)
<ul style="list-style-type: none"> ● Calibration signal accuracy 	+ 90.5dB μ V \pm 0.3dB
<ul style="list-style-type: none"> ● IF gain error (after self calibration) 	< $\pm 0.5\text{dB}$
<ul style="list-style-type: none"> ● Scale fidelity accuracy (after self calibration) LOG LIN 	$\leq \pm 1.5\text{dB}/90\text{dB}$ $\leq \pm 1.0\text{dB}/10\text{dB}$ $\leq \pm 0.2\text{dB}/1\text{dB}$ $\leq \pm 5\%$ of reference level
<ul style="list-style-type: none"> ● Input attenuator (20 to 50dB settings referenced to 10dB) 	$\leq \pm 1.0\text{dB}$ (100kHz to 2GHz) $\leq \pm 1.5\text{dB}$ (9kHz to 2.2GHz)
<ul style="list-style-type: none"> ● Resolution bandwidth switching error (after self calibration) 	$\leq \pm 1.0\text{dB}$ (at reference bandwidth: 3MHz)

(5) Sweep

<ul style="list-style-type: none"> ● Sweep time Accuracy 	50ms to 1000s and manual sweep $\leq \pm 5\%$
<ul style="list-style-type: none"> ● Trigger mode 	FREE RUN, SINGLE, VIDEO, EXT, TV

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7.2 U4941NTG Specifications

(6) Demodulation

<ul style="list-style-type: none"> ● Spectrum demodulation 	
Modulation type	AM, FM
Audio output	speaker and phone jack with volume control adjustable

(7) Input/Output

<ul style="list-style-type: none"> ● RF input 	
Connector	N-type female
Impedance	75Ω (nominal)
Preamplifier OFF	VSWR ≤ 1.5 (100kHz to 2GHz) VSWR ≤ 2.0 (9kHz to 2.2GHz) INPUT ATT ≥ 10dB
Preamplifier ON	VSWR ≤ 2.1 (10MHz to 2GHz) INPUT ATT ≥ 0dB
<ul style="list-style-type: none"> ● 10MHz reference input 	
Connector	BNC female, rear panel
Impedance	50Ω (nominal)
Input range	+ 8dBm to + 16dBm
<ul style="list-style-type: none"> ● Video output 	
Connector	BNC female, rear panel
Impedance	75Ω (nominal), AC coupled
Amplitude (75Ω terminator)	Approx. 1Vp-p, 75Ω terminator (composite video signal)
<ul style="list-style-type: none"> ● External trigger input 	
Connector	BNC female, rear panel
Impedance	10kΩ (nominal), DC coupled
Trigger level	TTL level
<ul style="list-style-type: none"> ● Gate input 	
Connector	BNC female, rear panel
Impedance	10kΩ (nominal)
Sweep stop	during TTL level low level
Sweep continue	during TTL level high level
<ul style="list-style-type: none"> ● Phone output 	
Connector	Subminiature monophonic jack, front panel
Power output	0.2 watt, 8Ω (nominal)

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7.2 U4941NTG Specifications

(cont'd)

<ul style="list-style-type: none"> ● GPIB Plotter Printer 	IEEE-488, bus connector Supports R9833, HP7470A, HP7475A, HP7440A, HP7550A, HP2225AJ
<ul style="list-style-type: none"> ● RS-232 	D-SUB 9 pin, rear panel
<ul style="list-style-type: none"> ● Power input Battery mounter adapted 	Advantest AC/DC adapter Model: A08180 Automatically selections between 100VAC and 200VAC Antonbauer Inc: Magnum 14 battery (nominal 70WH)

(8) Tracking Generator

<ul style="list-style-type: none"> ● Frequency range 	100kHz to 2.2GHz
<ul style="list-style-type: none"> ● Output level 	105dB μ to 74dB μ
<ul style="list-style-type: none"> ● Accuracy output level 	± 0.5 dB at 30MHz, at 95dB μ (20°C to 30°C)
<ul style="list-style-type: none"> ● Frequency characteristic 	Based on 30MHz, 95dB μ
<ul style="list-style-type: none"> ● Attenuation accuracy 	± 1 dB 100kHz to 1GHz ± 2 dB 100kHz to 2.2GHz
<ul style="list-style-type: none"> ● Harmonics 	-20dBc or less
<ul style="list-style-type: none"> ● Non harmonics 	-30dBc or less
<ul style="list-style-type: none"> ● TG leakage 	16dB μ or less
<ul style="list-style-type: none"> ● Output impedance 	75 Ω VSWR 1.5 or less from 100kHz to 2GHz 2.0 or less from 100kHz to 2.2GHz

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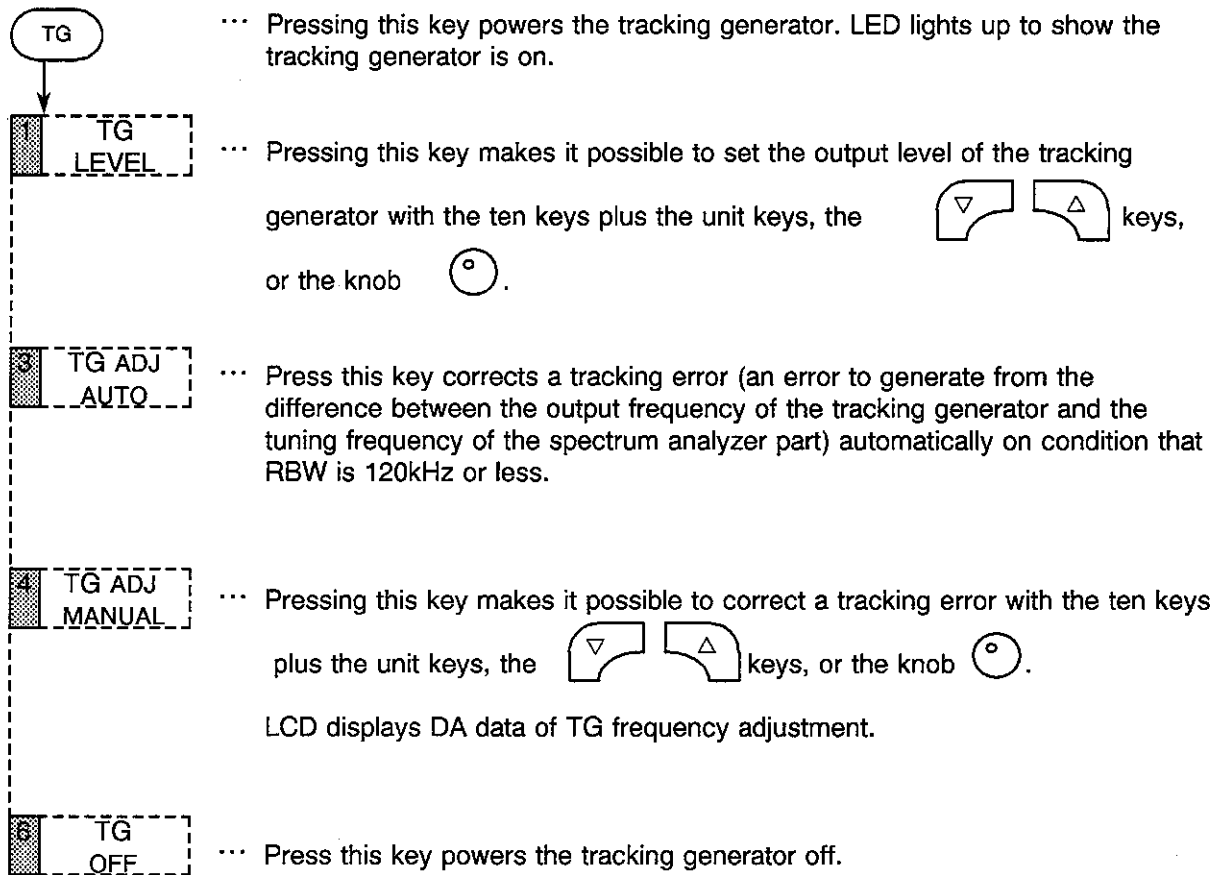
7.2 U4941NTG Specifications

(9) General Specifications

<ul style="list-style-type: none"> ● Environment temperature <ul style="list-style-type: none"> Operating temperature Non-operating temperature Relative humidity 	<p>0°C to +50°C -20°C to +60°C RH 85% or less</p>
<ul style="list-style-type: none"> ● Power supply <ul style="list-style-type: none"> External DC input Power consumption during DC operation During AC adapter is used During 100 VAC operation During 220 VAC operation 	<p>Connector: XLR 4 pin Input range: +10V to +16V</p> <p>50W max. Automatically selections between 100VAC and 200VAC Voltage: 90V to 132V Power consumption: 110VA max Frequency: 48Hz to 66Hz</p> <p>Voltage: 198V to 250V Power consumption: 110VA max. Frequency: 48Hz to 66Hz</p>
<ul style="list-style-type: none"> ● Mass 	<p>Approx. 7kg (Without option, accessory, carrying belt and battery)</p>
<ul style="list-style-type: none"> ● Dimensions 	<p>Approx. 148mm (height) × 291mm (wide) × 330mm (depth) Excluding the projecting (legs, connector, etc.).</p>
<ul style="list-style-type: none"> ● External memory <ul style="list-style-type: none"> Memory card 	<p>2 slot, upper panel Connector: JEIDA-Ver4.1, PCMCIA Rel 2.0</p>

8. SOFTKEY MENU

(Note) For the softkey menus except for the followings, refer to the separate volume "U4941 series Operation manual" A.3 Menu Lists.



MEMO 


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A.1 Error Message List

APPENDIX

A.1 Error Message List

Error code	Message	Description
ERR 120:	TG OUTPUT?	The automatic adjustment of TG ADJ cannot be executed because TG output signal is not detected.
ERR 121:	?? TG ADJ	An error occurs in the automatic adjustment of TG ADJ.

MEMO 

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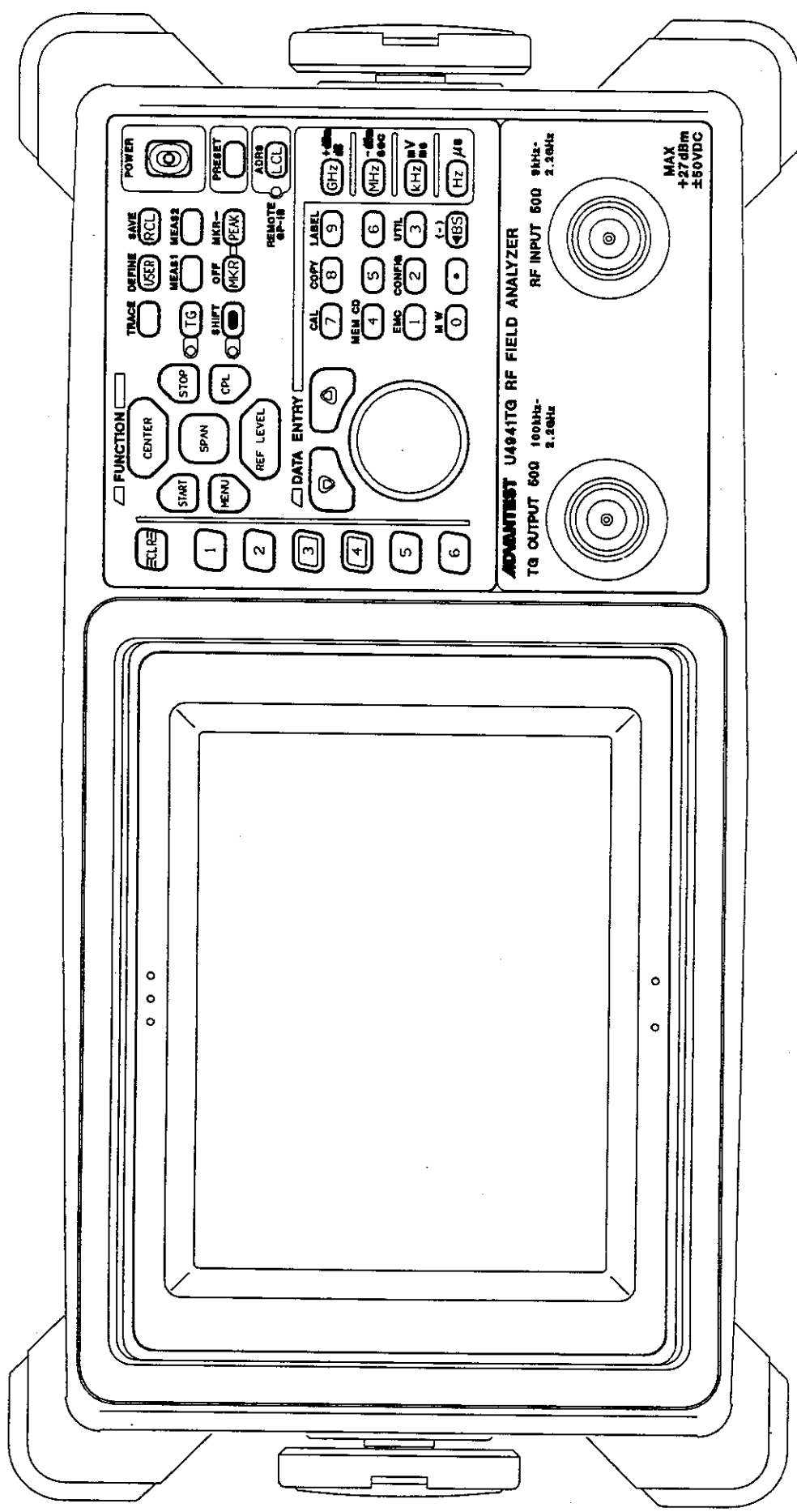
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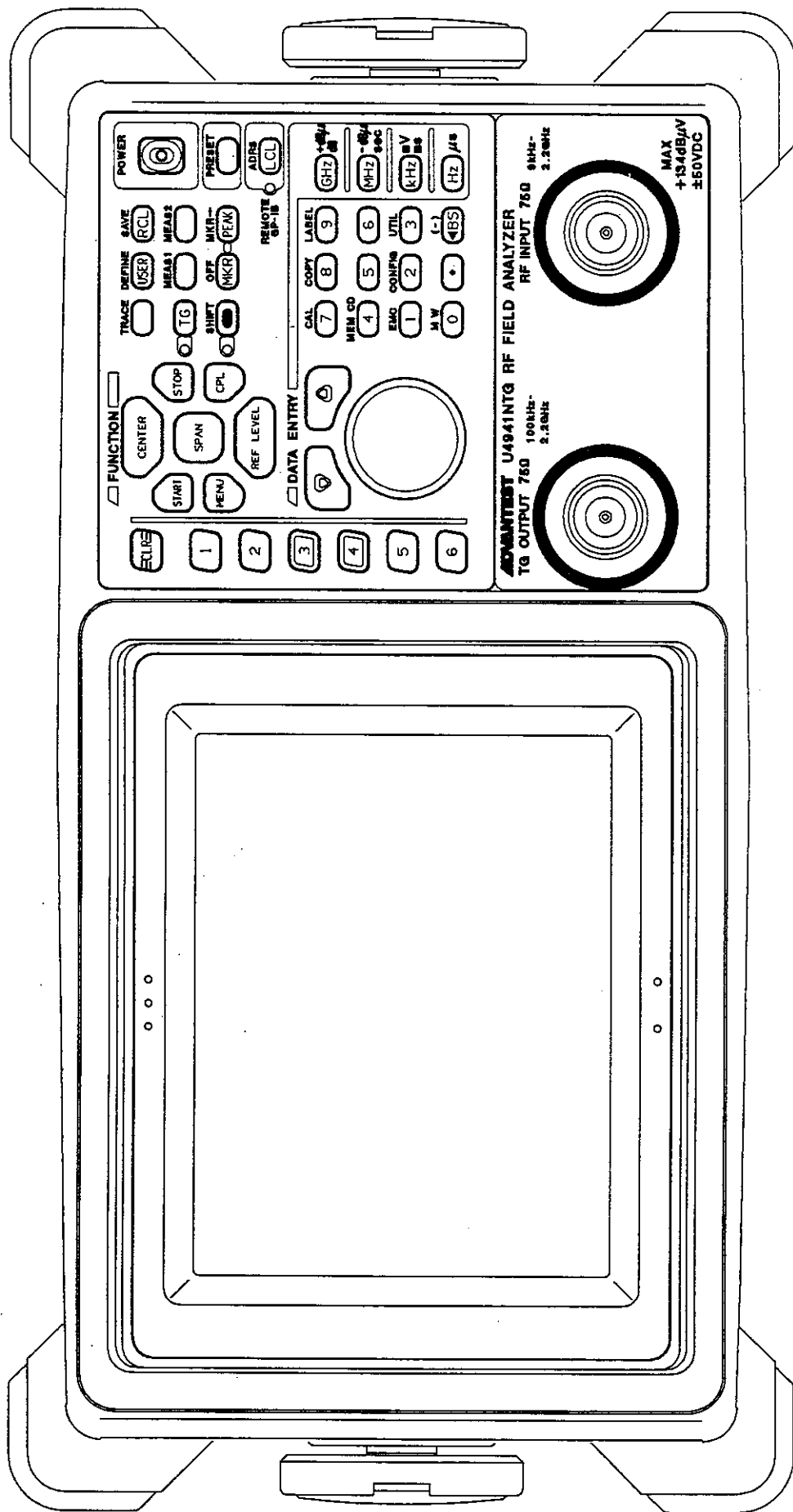
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**U4941TG
FRONT VIEW**



U4941NTG FRONT VIEW

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