
ADVANTEST®
ADVANTEST CORPORATION

R3131 Series
Spectrum Analyzer
Maintenance Manual

MANUAL NUMBER FME-8335142B00

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.
- 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 instrument.
- 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 instrument with the case open.

Safety Summary

- Do not place objects on top of this product. Also, do not place flower pots or other containers containing liquid such as chemicals near this product.
- When the product has ventilation outlets, do not stick or drop metal or easily flammable objects into the ventilation outlets.
- When using the product on a cart, fix it with belts to avoid its drop.
- When connecting the product to peripheral equipment, turn the power off.

- **Caution Symbols Used Within this Manual**

Symbols indicating items requiring caution which are used in this 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 instrument or relating to a restriction on operation.

- **Safety Marks on the Product**

The following safety marks can be found on Advantest products.

 : ATTENTION - Refer to manual.

 : Protective ground (earth) terminal.

 : DANGER - High voltage.

 : CAUTION - Risk of electric shock.

- **Replacing Parts with Limited Life**

The following parts used in the instrument are main parts with limited life.

Replace the parts listed below after their expected lifespan has expired.

Note that the estimated lifespan for the parts listed below may be shortened by factors such as the environment where the instrument is stored or used, and how often the instrument is used.

There is a possibility that each product uses different parts with limited life. For more information, refer to Chapter 1.

Main Parts with Limited Life

Part name	Life
Unit power supply	5 years
Fan motor	5 years
Electrolytic capacitor	5 years
LCD panel	6 years
LCD backlight	2.5 years
Floppy disk drive	5 years

- **Precautions when Disposing of this Instrument**

When disposing of harmful substances, be sure dispose of them properly with abiding by the state-provided law.

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).

Example: fluorescent tubes, batteries

Environmental Conditions

This instrument should be only be used in an area which satisfies the following conditions:

- An area free from corrosive gas
- An area away from direct sunlight
- A dust-free area
- An area free from vibrations

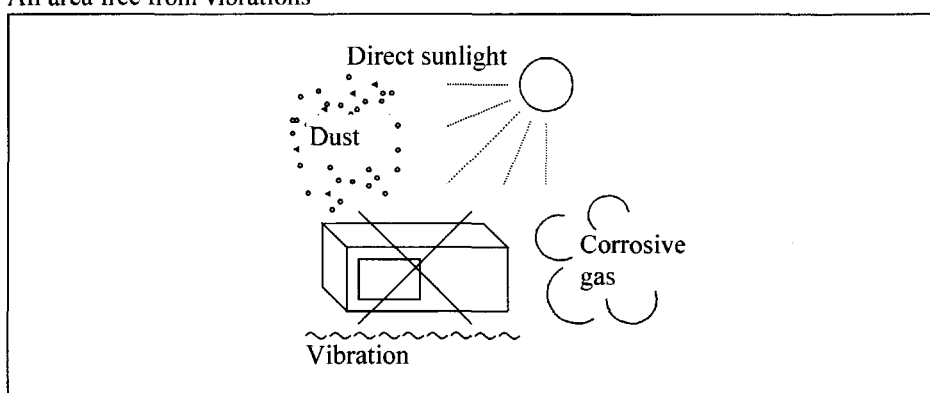


Figure-1 Environmental Conditions

- Instrument Placement

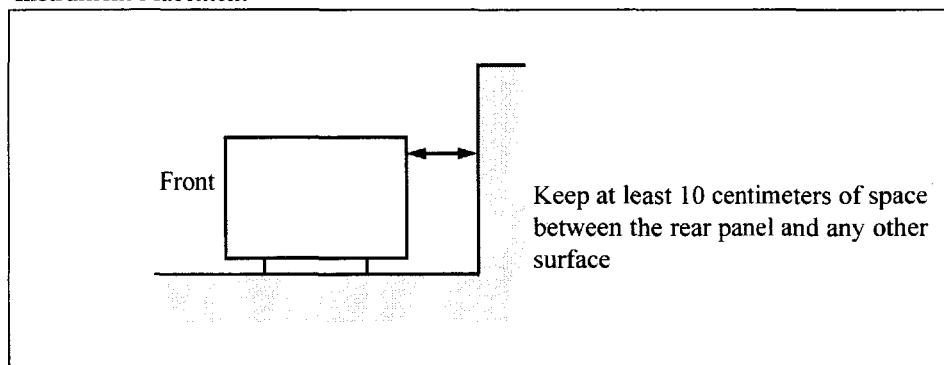


Figure-2 Instrument Placement

This instrument can be used safely under the following conditions:

- Altitude of up to 2000 m
- Installation Categories II
- Pollution Degree 2

TABLE OF CONTENTS

1. GENERAL INFORMATION		1-1 of 7
1.1. Introduction		1-1 of 7
1.2. Outline of Product		1-3 of 7
1.3. Specification		1-4 of 7
1.4. Service Concept		1-6 of 7
1.5. Test Equipment Required for Performance Verification		1-6 of 7
2. THEORY OF OPERATION		2-1 of 4
2.1. Introduction		2-1 of 4
2.2. RF Unit		2-2 of 4
2.2.1. Outline of RF Unit		2-2 of 4
2.2.2. Sweep Function		2-2 of 4
2.2.3. Signal Analysis Flow		2-2 of 4
2.3. IF/LOG Block		2-3 of 4
2.4. CPU/AD Block		2-4 of 4
2.5. KEY Board		2-4 of 4
2.6. DISPLAY Unit		2-4 of 4
2.7. POWER SUPPLY Unit		2-4 of 4
2.8. MOTHER Board		2-4 of 4
2.9. Tracking Generator		2-4 of 4
3. PERFORMANCE VERIFICATION		3-1 of 72
3.1. General		3-1 of 72
3.2. Performance Verification Procedure		3-4 of 72
3.2.1. Calibration Signal Level Accuracy		3-4 of 72
3.2.2. Accuracy of Frequency Readout and Frequency Counter Marker		3-6 of 72
3.2.3. Frequency Reference Source Accuracy		3-8 of 72
3.2.4. Noise Sidebands		3-10 of 72
3.2.5. Frequency Span Accuracy		3-12 of 72
3.2.6. Resolution Bandwidth Accuracy and Selectivity		3-14 of 72
3.2.7. Resolution Bandwidth Switching Uncertainty		3-17 of 72
3.2.8. QP Bandwidth Accuracy		3-19 of 72
3.2.9. Residual FM		3-21 of 72
3.2.10. Displayed Average Noise Level		3-24 of 72
3.2.11. Gain Compression		3-26 of 72
3.2.12. Residual Response		3-29 of 72
3.2.13. Second Harmonic Distortion		3-31 of 72
3.2.14. Third Order Inter Modulation Distortion		3-33 of 72
3.2.15. Frequency Response		3-35 of 72
3.2.16. IF Gain Uncertainty		3-39 of 72
3.2.17. Scale Fidelity		3-43 of 72
3.2.18. Input Attenuator Switching Accuracy		3-48 of 72
3.3. Tracking Generator Performance Verification Procedure		3-51 of 72
3.3.1. Absolute Output Level Accuracy		3-51 of 72
3.3.2. Output Level Flatness		3-52 of 72
3.3.3. Output Level Switching Accuracy		3-54 of 72
3.3.4. Harmonic Distortion		3-57 of 72
3.3.5. Non harmonic Distortion		3-59 of 72

3.3.6. TG Leakage	3-61 of 72
3.4. Performance Verification Test Record	3-63 of 72
4. ADJUSTMENT	4-1 of 1
4.1. Frequency Reference Adjustment	4-1 of 1
5. TROUBLESHOOTING	5-1 of 23
5.1. Preventive Maintenance	5-1 of 23
5.2. Preparation	5-2 of 23
5.2.1. Introduction	5-2 of 23
5.2.2. General Caution for Handling Replaceable Assemblies	5-3 of 23
5.3. Isolation of Failure Block	5-4 of 23
5.3.1. Introduction	5-4 of 23
5.3.2. Isolation of Failure Block	5-4 of 23
5.3.3. Power on Self Test	5-5 of 23
5.3.4. Self-Test Function	5-5 of 23
5.3.4.1. How to use it ?	5-6 of 23
5.3.4.2. Explanation of Each Test Item	5-7 of 23
5.3.5. Tracking Generator (Option)	5-8 of 23
5.4. Error Code List	5-8 of 23
5.5. Removal and Installation	5-11 of 23
5.5.1. Tool required	5-11 of 23
5.5.2. CPU/AD, IF/LOG Removal and Installation	5-11 of 23
5.5.3. RF Unit Removal and Installation	5-14 of 23
5.5.4. Power Supply Unit Removal/ Installation	5-16 of 23
5.5.5. FRONT Block Removal and Installation	5-17 of 23
5.5.6. Display Block Removal and Installation	5-20 of 23
5.5.7. TG Block Removal and Installation	5-21 of 23
6. REPLACEABLE PARTS	6-1 of 1
6.1. Introduction	6-1 of 1
6.2. Ordering Information	6-1 of 1
6.3. Replaceable Parts List	6-1 of 1
Appendix	A-1
A.1. Firmware Upgrading Procedure	A-1

LIST OF ILLUSTRATION

Figure 2-1	R3131/R3131A Simplified Block Diagram	-----	2-1 of 4
Figure 3-1	Setup Cal. Signal Level Accuracy Test	-----	3-4 of 72
Figure 3-2	Setup Frequency Readout and Frequency Counter Marker Accuracy Test	-----	3-6 of 72
Figure 3-3	Setup of Internal Frequency Source Accuracy Test	-----	3-9 of 72
Figure 3-4	Setup of Noise Sidebands Test	-----	3-10 of 72
Figure 3-5	Setup of Frequency Span Accuracy	-----	3-12 of 72
Figure 3-6	Setup of Resolution Bandwidth Accuracy and Selectivity Test	-----	3-14 of 72
Figure 3-7	Setup of Resolution BW Switching Uncertainty Test	-----	3-17 of 72
Figure 3-8	Setup of QP Bandwidth Accuracy Test	-----	3-19 of 72
Figure 3-9	Setup of Residual FM Test	-----	3-22 of 72
Figure 3-10	Displayed Average Noise Level Test Setup	-----	3-24 of 72
Figure 3-11	Setup of Gain Compression Test	-----	3-27 of 72
Figure 3-12	Setup of Residual Response Test	-----	3-29 of 72
Figure 3-13	Setup Second Harmonic Distortion Test	-----	3-31 of 72
Figure 3-14	Setup of Third Order Intermodulation Test	-----	3-33 of 72
Figure 3-15	Setup of Frequency Response Test	-----	3-36 of 72
Figure 3-16	Setup of IF Gain Uncertainty Test	-----	3-39 of 72
Figure 3-17	Setup of Scale Fidelity Test	-----	3-43 of 72
Figure 3-18	Setup of Input Attenuator Switching Accuracy Test	-----	3-48 of 72
Figure 3-19	Setup of Absolute Output Level Accuracy Test	-----	3-51 of 72
Figure 3-20	Setup of Output Level Flatness Test	-----	3-53 of 72
Figure 3-21	Setup of Output Switching Accuracy Test	-----	3-55 of 72
Figure 3-22	Setup of Harmonic Distortion Test	-----	3-58 of 72
Figure 3-23	Setup of Non-Harmonic Distortion Test	-----	3-60 of 72
Figure 3-24	Setup of TG Leakage Test	-----	3-61 of 72
Figure 4-1	Setup of Frequency Reference Adjustment	-----	4-1 of 2
Figure 4-2	Location of Adjustment Potentiometer	-----	4-2 of 2
Figure 5-1	Location of Screws fixed Bezel Display	-----	5-1 of 23
Figure 5-2	Removal of Bezel Display	-----	5-2 of 23
Figure 5-3	Self-Test Mode Display	-----	5-6 of 23
Figure 5-4	Self-Test Result Display	-----	5-6 of 23
Figure 5-5	Locations of Screws	-----	5-11 of 23
Figure 5-6	Removal of Screws	-----	5-11 of 23
Figure 5-7	Locations of Screws (Rear Panel)	-----	5-12 of 23
Figure 5-8	Board Locations View from Rear Side	-----	5-12 of 23
Figure 5-9	Removal of CPU/AD (BLL-023465)	-----	5-13 of 23
Figure 5-10	External View of CPU/AD(BLL-023465)	-----	5-13 of 23
Figure 5-11	External View of IF/LOG(BLL-023454)	-----	5-14 of 23
Figure 5-12	Locations of Screws (Bottom Case)	-----	5-14 of 23
Figure 5-13	Location of Connector	-----	5-15 of 23
Figure 5-14	External View of RF Unit	-----	5-15 of 23
Figure 5-15	Rear View after Removal	-----	5-16 of 23
Figure 5-16	Locations of Screws (Bottom Case)	-----	5-16 of 23
Figure 5-17	Removal Power Supply Unit	-----	5-17 of 23
Figure 5-18	External View of Power Supply Unit	-----	5-17 of 23
Figure 5-19	Locations of Screws (TFT Bezel)	-----	5-18 of 23
Figure 5-20	Removal of TFT Bezel	-----	5-18 of 23
Figure 5-21	Locations of Screws (Front Frame)	-----	5-19 of 23
Figure 5-22	Locations of Screws (Front Panel)	-----	5-19 of 23
Figure 5-23	Removal of Front Block	-----	5-19 of 23
Figure 5-24	Locations of Screws (Display Block)	-----	5-20 of 23
Figure 5-25	Removal of Display Block	-----	5-20 of 23
Figure 5-26	Location of TG Block	-----	5-21 of 23

Figure 5-27 Locations of Screws(RF Unit)

----- 5-22 of 23

Figure 5-28 Location of RF Cable(TG Block)

----- 5-22 of 23

Figure 5-29 External View of TG Block

----- 5-23 of 23

LIST OF TABLES

Table 1-1	Equipment List for Performance Verification	-----	1-7 of 7
Table 3-1	Performance Verification Items	-----	3-1 of 72
Table 3-2	Additional Performance Verification Items for Tracking Generator	-----	3-2 of 72
Table 3-3	Setting for Frequency Readout Accuracy Test	-----	3-7 of 72
Table 3-4	Setting for Counter Marker Accuracy	-----	3-8 of 72
Table 3-5	Noise Sidebands	-----	3-11 of 72
Table 3-6	Setting for Frequency Span Accuracy Test	-----	3-13 of 72
Table 3-7	Setting for RBW Accuracy Test	-----	3-15 of 72
Table 3-8	Setting for RBW Selectivity Test	-----	3-16 of 72
Table 3-9	Setting for RBW Switching Uncertainty Test	-----	3-19 of 72
Table 3-10	Setting for QP Bandwidth Accuracy test	-----	3-21 of 72
Table 3-11	Setting for Displayed Average Noise Level Test	-----	3-25 of 72
Table 3-12	Setting for Gain Compression Test	-----	3-28 of 72
Table 3-13	Setting for Third Order Intermodulation Distortion Test	-----	3-35 of 72
Table 3-14	Setting for Frequency Response Test	-----	3-38 of 72
Table 3-15	Setting for IF Gain Uncertainty Test (RBW=1 MHz)	-----	3-41 of 72
Table 3-16	Setting for IF Gain Uncertainty Test (RBW=3 kHz)	-----	3-42 of 72
Table 3-17	Log Scale Fidelity (1 dB/div ,RBW= 1 MHz)	-----	3-45 of 72
Table 3-18	Log Scale Fidelity (10 dB/div, RBW= 3 kHz)	-----	3-46 of 72
Table 3-19	Linear Scale Fidelity (x1)	-----	3-47 of 72
Table 3-20	Input Attenuator Switching Accuracy	-----	3-50 of 72
Table 3-21	Setting for Output Flatness Test	-----	3-54 of 72
Table 3-22	Setting for TG output Level Switching Accuracy Test	-----	3-56 of 72
Table 3-23	Setting for Output Level Switching Accuracy Test	-----	3-57 of 72
Table 3-24	Setting for Harmonic Distortion Test	-----	3-59 of 72
Table 5-1	Summary of Power on Self-Test	-----	5-5 of 23
Table 5-2	Each Test item Explanation	-----	5-7 of 23
Table 5-3	Summary of Self-Test and Failure Board	-----	5-7 of 23
Table 5-4	Error Code List (1/2)	-----	5-9 of 72
Table 5-4	Error Code List (2/2)	-----	5-10 of 23
Table 6-1	Replaceable Parts List	-----	6-1 of 1

1. GENERAL INFORMATION

This chapter contains following information,

- 1.1 Introduction
- 1.2 Outline of Product
- 1.3 Specifications;
- 1.4 Service Concept
- 1.5 Test Equipment Required for Performance Verification

1.1 Introduction

This manual provides information to perform unit or assembly level troubleshooting included removal/Installation procedures of instrument's module assemblies and a parts list.

This manual is intended for use by trained service personnel only.

Detailed operation and programming information is excluded from this manual. Including only sufficient information for service purpose. For more detailed operation information, refer to the R3131/R3131A spectrum analyzer operation manual.

WARNING!

*The information in this manual is for use of Service Trained Personnel only.
To avoid electrical shock, to do not perform any procedures in this manual or do any servicing to the R3131/R3131A, unless you are qualified to do so.*

This manual has information the following five chapters.

1. GENERAL INFORMATION

This chapter provides description of this manual and brief product information, specification and Test equipment required for performance verification.

2. THEORY OF OPERATION

This chapter provides the theory of operation based on replaceable assemblies.

1. GENERAL INFORMATION

3. PERFORMANCE VERIFICATION PROCEDURE

This chapter provides the procedures for performance verification and performance verification test record sheet.

4. ADJUSTMENT

This chapter provides adjustment procedures for a periodical maintenance.

5. TROUBLESHOOTING

This chapter provides the diagnostic procedure including the removal of defective module and installation procedures.

6. PARTS LIST

This chapter provides the replaceable parts list.

1.2 Outline of Product

The R3131/R3131A are spectrum analyzers that provide highly stable spectrum analysis using the synthesized local method to the user.

The key features of the R313/R3131A spectrum analyzer are listed below,

Items	R3131	R3131A
Frequency Range	9 kHz to 3 GHz	
Frequency Span	ZERO, 50 kHz to 3 GHz	ZERO, 10 kHz to 3 GHz
Maximum Input Level	+20 dBm, ± 50 VDC	+30 dBm, ± 50 VDC
Averaged Noise Level	-113 dBm + 2f (GHz)	
Noise Sideband	≤ 100 dBc/Hz (20 kHz offset)	
Tracking Generator as Option	Frequency Range: 100 kHz to 3.0 GHz Output Level range: 0 dBm to -59.9 dBm	

The analyzer provides the following additional features;

- 1) Frequency counter function with a resolution of 1 Hz.
- 2) A power measurement function useful for evaluating radio instruments using measurements such as occupied bandwidth(OBW), adjacent channel power(ACP), etc.
- 3) An auto tuning function that searches for a signal with the maximum input level.
- 4) Save and recall functions, which you can use to store measurement condition and data inTEXT format.
- 5) A 3.5-inch floppy disk drive, which you can use to save screen, images in BMP format.
- 6) Support for ESC/P, ESC/P-R and PCL compatible printers.
- 7) Remote control capabilities, which allow you to set up an automatic measurement system. The remote control function complies with GPIB and RS-232 specifications.
- 8) Tracking Generator function is available as an option when you order R3131/R3131A.

R3131 Series Spectrum Analyzer Maintenance Manual

1. GENERAL INFORMATION

1.3. Specification

This section provides R3131/R3131A specifications including Tracking generator function.

Frequency

Items	R3131	R3131A
Frequency range	9 kHz to 3 GHz	
Frequency readout accuracy	$\pm(\text{Frequency reading} \times \text{Frequency reference accuracy} + \text{Span} \times \text{Span accuracy} + 0.15 \times \text{Resolution bandwidth} + 1 \text{ kHz})$	
Marker counter accuracy	$\pm(\text{Marker frequency} \times \text{Frequency reference accuracy} + 1\text{LSD})$ (S/N \geq 25 dB, SPAN \leq 200 MHz)	
Marker frequency counter resolution	1 Hz to 1 kHz	
Frequency reference source accuracy	$\pm 2 \text{ ppm}$ $\pm 5 \text{ ppm/ Temperature: } 0 \text{ }^\circ\text{C to } 50 \text{ }^\circ\text{C}$	
Frequency span	ZERO, 50 kHz to 3 GHz	ZERO, 10 kHz to 3 GHz
Frequency span accuracy	$\leq \pm 3\%$	$\leq \pm 3\%$ (50 kHz to 3 GHz)
Frequency stability	$\leq 100 \text{ Hz p-p/100 msec}$ (Zero span)	
Residual FM		
Noise sideband	$\leq 100 \text{ dBc/Hz}$ (20 kHz offset)	
Resolution bandwidth (3 dB)	1 kHz to 1 MHz, 1,3 sequence	
Bandwidth accuracy	$\leq \pm 20\%$	
Selectivity (60 dB: 3 dB)	$\leq 15:1$	
6 dB bandwidth	9 kHz, 120 kHz	
Video bandwidth	10 Hz to 1 MHz, 1, 10 sequence	

Amplitude

Items	R3131	R3131A
Amplitude measurement range	+20 dBm to Averaged noise level	+30 dBm to Averaged noise level
Maximum input level	+20 dBm, $\pm 50 \text{ VDC}$	+30 dBm, $\pm 50 \text{ VDC}$
Display range		
Logarithmic	10 dB/div, 8 div 1, 2, 5 dB/div	
Linear	(10% of the reference level)/div	
Reference level range		
Logarithmic	-64 dBm to +40 dBm	
Linear	+141.1 μV to 22.36 V	
Input attenuator range	0 to 50 dB, 10 dB step	

Sweep

Items	R3131	R3131A
Sweep time	50 msec to 500 msec	
Sweep time accuracy	$\leq \pm 3\%$	
Trigger mode	FREE RUN, VIDEO, EXT, LINE	
Sweep mode	REPEAT, SINGLE	

R3131 Series Spectrum Analyzer Maintenance Manual

1. GENERAL INFORMATION

Dynamic range

Items	R3131	R3131A
Averaged noise level	-113 dBm + 2f (GHz) dB (RBW 1 kHz, VBW 10 Hz, Attenuator: 0 dB, f ≥ 1 MHz)	
1 dB gain compression	> -5 dBm (Mixer input level, -30 dBm)	
Secondary harmonic distortion	≤ -70 dB (f > 10 MHz, Mixer input level -30 dBm)	
Two signal thirdorder intermodulation	≤ -70 dB (f ≥ 10 MHz, Mixer input level -30 dBm, Δf > 50 kHz)	
Other spurious factor related to the input signal	≤ -60 dB (Offset ≥ 20 kHz, Mixer input level -30 dBm)	
Residual response	≤ -100 dB (f ≥ 10 MHz, Attenuator: 0 dB, Input terminated in 50Ω)	

Amplitude Accuracy

Items	R3131	R3131A
Calibration signal	30 MHz, -20 dBm ± 0.3 dB	
Frequency response	≤ ± 0.5 dB (100kHz to 3 GHz, Attenuator: 10 dB) ≤ ± 1.0 dB (100 kHz to 2 GHz) ≤ ± 2 dB (9 kHz to 3 GHz) (after the calibration, and in referenced to 30 MHz)	
Scale indication accuracy	≤ ± 0.5 dB (0 to -20 dB), After auto calibration ≤ ± 1.5 dB/70 dB, After auto calibration ≤ ± 1.0 dB/10 dB, After auto calibration ≤ ± 0.2 dB/1 dB, After auto calibration	
Logarithmic		
Linear	Within ± 5% of the reference level	
Input attenuator switching accuracy	≤ ± 0.3 dB (0 to 50 dB) With reference to an attenuation of 10 dB at 30 MHz	
IF gain error	≤ ± 0.5 dB, After auto calibration	
Overall level accuracy	1.5 dB (REF=-50 to 0 dBm, Attenuator=10 dB, 2 dB/div, RBW=300 kHz, f > 100 kHz, after auto calibration)	

Input/Output

Items	R3131	R3131A
RF input	N-type (female), 50Ω (nominal)	
Connector/Impedance	≤ 1.5 (100 kHz to 2 GHz, Attenuator ≥ 10 dB)	
VSWR	≤ 1.5 (9 kHz to 3 GHz, Attenuator ≥ 10 dB)	
10 MHz reference input	BNC (female), 50Ω	
Input range	-10 dBm to +10 dBm	
External trigger input	BNC (female), 10 kΩ (nominal), DC connection -10 dBm to +10 dBm	
Phone output	Mini monophonic jack, 8Ω	
GPIB interface	IEEE-488 bus connector	
Serial interface	D-SUB 9 pins	
Printer interface	D-SUB 25 pins, ESC/P, ESC/P-R, PCL	
Floppy disk drive	3.5 inch, MS-DOS format	

1. GENERAL INFORMATION

General Specification

Items	R3131	R3131A
Operation environment range	0 °C to 50 °C, RH:85 % or less (no condensation)	
Storage environment range	-20 °C to +60 °C	
AC input power source	100 VAC/200 VAC (auto switching) 100 VAC: 100 VAC to 120 VAC, 50 Hz/60 Hz 200 VAC: 220 VAC to 240 VAC, 50 Hz/60 Hz	
Power consumption	200 VA or less	
Mass	12 kg or less	
Dimension	Approx. 424 (W) x 177 (H) x 300 (D) mm (excluding projection such as rubber feet and connectors)	

Tracking Generator (Option)

Items	R3131	R3131A
Frequency range	100 kHz to 3.0 GHz	
Output level range	0 dBm to -59.9 dBm, 0.1 dB step	
Output level accuracy	≤ ± 0.5 dB at 30 MHz, -10 dBm; Temperature range: 20 °C to 30 °C)	
Output level flatness	≤ ± 1.0 dB (100 kHz to 1 GHz) ≤ ± 1.5 dB (100 kHz to 3 GHz) at -10 dBm, referenced to 30 MHz	
Output level switching accuracy	Output level ≥ -30 dBm, referenced to -10 dBm ≤ ± 1.0 dB (100 kHz to 1 GHz) ≤ ± 2.0 dB (100 kHz to 2.6 GHz) ≤ ± 3.0 dB (9 kHz to 3.0 GHz)	
Output spurious Harmonic Non-harmonics	Output level = -10 dBm ≤ -20 dBc ≤ -30 dBc	
Dynamic range (TG leakage)	≤ -100 dBm, at input attenuator: 0 dB	
Output VSWR	≤ 2 (nominal) (output level ≤ -10 dBm)	
Maximum input signal level	±15 dBm ±10VDC	
Mass	1 kg or less	

1.4. Service Concept.

The troubleshooting concept of this manual is based on self-test result approach.

Replaceable assemblies listed in chapter 6 are no required adjustment after replace.

1.5. Test Equipment Required for Performance Verification

Table 1-1 lists the recommended equipment for performance verification and adjustment.

In the usage column, P.V and Adj are abbreviation of Performance Verification and Adjustment.

The equipment needed to perform all of the performance test.

1. GENERAL INFORMATION

Equipment lists for individual tests are provided in each performance verification.
Any equipment that meets the critical specifications given in the table can be substituted for the recommended models.

Table 1-1 Equipment List for Performance Verification

No.	Description	Minimum-Use Specifications	Recommended Model	Manufacturer	Notes	Usage
1	Frequency Standard	Output Frequency: 10 MHz Stability: 5 x 10 exp-10/day Output Impedance: 50Ω Output Voltage: 1 Vp-p or more	Generic	Generic	-	PV, Adj
2	Signal Generator	Frequency Range: 9 kHz to 3 GHz Residual SSB Phase Noise: 1 kHz offset <-115 dBc/Hz 10 kHz offset <-125 dBc/Hz 100 kHz offset <-130 dBc/Hz Output Power Level Range: to +13 dBm	SME03 or Equivalent	Rohde&Schwarz	SG1	PV, Adj
3	Signal Generator	Frequency Range: 9 kHz to 320 MHz Frequency Accuracy: 5x 10 exp-6/year Output Power Level Range: -70 dBm to +13 dBm	HP3325B or Equivalent	Agilent Technology	SG2	PV
4	RF Power Meter	Accuracy: ± 0.02 dB (dB Relative mode)	NRVS or Equivalent	Rohde&Schwarz	PM	PV
5	RF Power Sensor	Frequency Range: 100 kHz to 6 GHz	NRV-Z51 or Equivalent	Rohde&Schwarz	PS	PV
6	RF 1 dB Step Attenuator	Frequency Range: DC to 18 GHz Attenuation Range: 12 dB	HP8494H or Equivalent	Agilent Technology	ATT1	PV
7	RF 10 dB Step Attenuator	Frequency Range: DC to 18 GHz Attenuation Range: 70 dB	HP8495H or Equivalent	Agilent Technology	ATT2	PV
8	Attenuator Driver	Compatible with HP 8494H and 8496H Programmable step attenuators	HP11713A	Agilent Technology	Driver	PV
9	RF Coaxial Attenuator, 3 dB	SMA(m)-SMA(f)	Generic	Generic	-	PV
10	RF Coaxial Attenuator, 20 dB	SMA(m)-SMA(f)	Generic	Generic	-	PV
11	Power Splitter	Frequency Range: 10 MHz to 26.5 GHz Insertion Loss: 6 dB (nominal)	Generic	Generic	-	PV
12	Low Pass Filter	Cutoff Frequency: 2.2 GHz Rejection at 3 GHz: >40 dB Rejection at 3.8 GHz: >80 dB	Generic	Generic	-	PV
13	Power Divider	Frequency Range: 2 MHz to 2 GHz Isolation: >20 dB	Generic	Generic	-	PV
14	50Ω Terminator	SMA	Generic	Generic	-	PV
15	Spectrum Analyzer	Frequency Range: 100 kHz to 6 GHz	R3265A or Equivalent	Advantest	SPA	PV for Tracking Generator
16	Adapter	Type N (m)-BNC(f)	Generic	Generic	-	PV, Adj
17	Adapter	Type N (m)-SMA(f)	Generic	Generic	-	PV, Adj
18	Adapter	Type SMA(m)-SMA(f)	Generic	Generic	-	PV, Adj
19	RF Cable	Connector: SMA(m) both ends Frequency Range: DC to 26.5 GHz Maximum VSWR: <1.45 at 26.5 GHz Length: 70 cm	Generic	Generic	-	PV, Adj
20	RF Cable	Connector: BNC(m) both ends Length: 70 cm	Generic	Generic	-	PV, Adj

2. THEORY OF OPERATION

2.1. Introduction

R3131/R3131A Spectrum Analyzer are consists of RF unit, IF/LOG block, CPU/AD board, Front block, Display block, Power supply block, Mother board and Tracking generator block as option.

This section describes each block's theory of operation based on board, module level, which is replaceable.

The simplified block diagram is shown Figure 2-1.

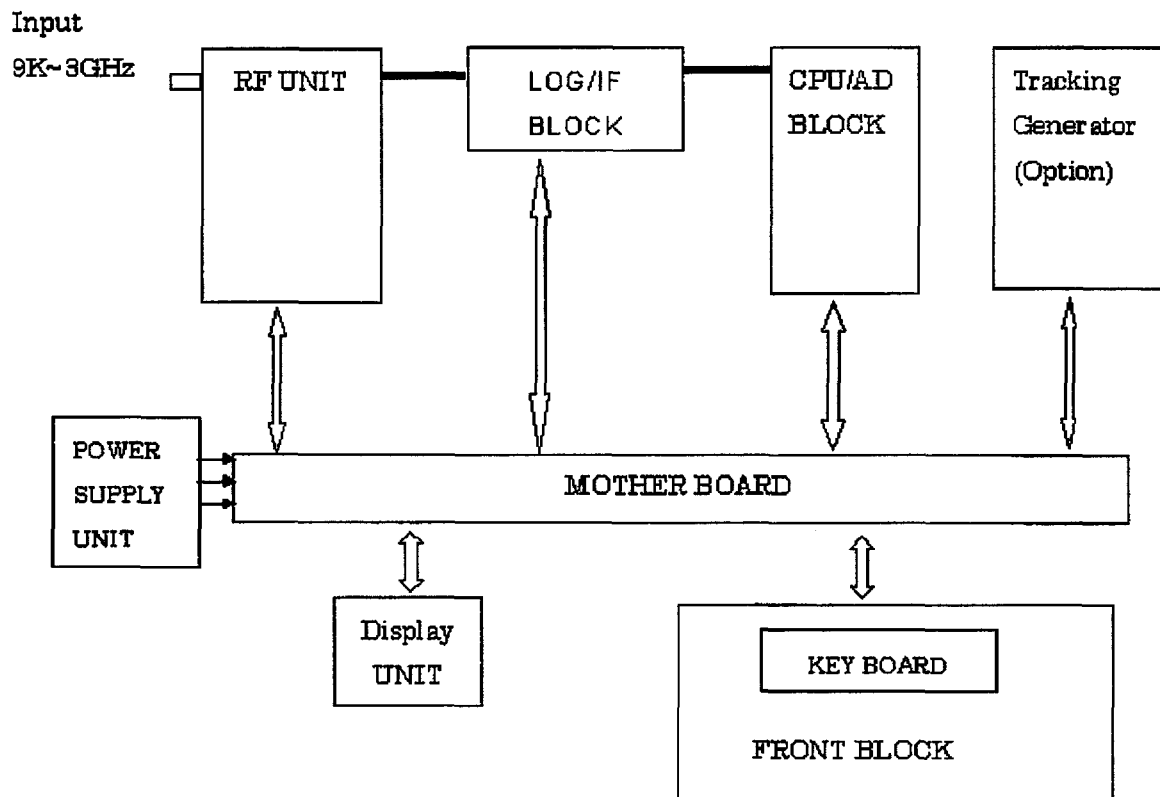


Figure 2-1 R3131/R3131A Simplified Block Diagram

2. THEORY OF OPERATION

2.2. RF Unit

RF unit is a frequency converter, which down converts input signal from 9 kHz to 3 GHz to IF signal 3.58 MHz.

2.2.1. Outline of RF Unit

The RF unit consists of RF I/O board and RF block.

RF block consist of RF-1 (RF input to 2nd mixer), RF3RD4TH (3rd mixer to 4th mixer), 3R8GOSC(2nd OSC.) and SYNTHE block.

Data of frequency characteristic compensation, frequency span control and RF gain are stored in EEROM on the RF I/O board.

10 MHz reference signal outputs to CPU/AD board via Mother board from RF unit.

2.2.2. Sweep Function

Ramp signal for sweeping function is supplied from CPU/AD via Mother board.

2.2.3. Signal Analysis Flow

An input signal applies through INPUT Attenuator, which consist of 10 dB, 20 dB, and 20 dB attenuator.

1st Local oscillator sweep from 4113.58 MHz to 7113.58 MHz for Input signal from 0 MHz to 3 GHz.

The 1st Local oscillator is YTO (Yig Tuned Oscillator), which is controlled by RF-I/O and SYNTHESIZER circuit board.

The input signal is down converted to 1st IF signal by 1st Mixer and 1st Local signal. The IF signal frequency is 4113.58 MHz.

The 2nd Local oscillator generates signal of frequency 3840 MHz, which phase locked by SYNTHESIZER circuit board with 10 MHz reference signal.

The 1st IF signal is down converted to 2nd IF signal of frequency 273.58 MHz by 2nd Mixer and 2nd Local oscillator.

The 2nd IF signal is down converted to 3rd IF signal of frequency 33.58 MHz by 3rd Mixer and 3rd Local oscillator.

The 3rd IF signal is down converted to 4th IF signal of frequency 3.58 MHz by 4th Mixer and 4th Local oscillator.

The 3rd and 4th Local oscillator frequency are 240 MHz and 30 MHz.

Both of them are generated from 2nd Local oscillator using 1/16 and 1/8 dividers.

4th IF signal (3.58 MHz) go through coaxial cable to IF/LOG circuit board.

The 4th IF signal level (IF/LOG circuit input level) is calculated by following formula,

IF/LOG input level = (RF input signal level) - (Input Attenuator value) + 8 (dBm)

e.g.

When it is applied its level 0 dBm signal with 10 dB Input Attenuator

IF/LOG input level = (0) -(10) + 8 = -2 dBm.

2.3. IF/LOG Block

IF/LOG consists of IF filter which specify RBW, IF GAIN AMP which is specified by REFERENCE LEVEL setting, LOG AMP, DETECTOR to convert to DC voltage signal, FM DEMODULATOR circuit and control circuit for them.

"DETECTOR" output signal, "FM DEMODULATOR" signal and IF signal for "FREQUENCY COUNTER" function are output to CPU/AD block through by Mother board.

IF signal for Frequency counter function is 3.58 MHz frequency.

2.4. CPU/AD Block

It consist of CPU main processor and its peripheral circuit, GPIB interface, RS232 Interface,

Printer Interface, FDD Interface, LCD display control, VBW(Video Bandwidth) setting circuit, 1/2/5/10dB/div. display scale setting circuit, QP (Quasi Peak) detector circuit, Posi/Nega/Sample detector circuit, A/D converter, Sweep signal generator circuit, Trigger Gate control circuit, AM demodulator circuit, audible sound output circuit, frequency counter circuit.

This block controls Keyboard, IF/LOG board, and RF unit.

It uses Lithium Battery for measurement parameter backed up.

2. THEORY OF OPERATION

2.5. KEY Board

It has key matrix control circuit for front panel key operation.

Clock signal which use in this circuit is 8MHz supplied by CPU/AD board through Mother board.

2.6. DISPLAY Unit

It consists of LCD and inverter.

Driving voltage for LCD is -24 V supplied by CPU/AD board.

2.7. POWER SUPPLY Unit

It consists of switching power supply unit, cooling fan, AC inlet and power switch.

It can be connected 90 VAC to 240 VAC directly.

The output DC voltage are +5.2V, +12.6V, -12.6V and supply to each block through Mother board.

2.8. MOTHER Board

It consist of Logic bus, display control signal, analog signals, power supply voltage lines.

Each slot connector is connected by common bus.

2.9. Tracking Generator

Tracking generator generates frequency from 100 kHz to 3 GHz signal and output level from 0 dBm to -59.9 dBm.

The output signal tracks setting of Spectrum analyzer such as Center frequency and frequency span.

3. PERFORMANCE VERIFICATION

3.1. General

1. Introduction

This chapter provides R3131/R3131A performance verification procedures, item by item as listed on Table 3-1.

Additional performance verification items are listed on Table 3-2 for Tracking Generator Option 74.

Performance verification will be carried out under following condition.

Temperature range: 20 °C to 30 °C

Relative Humidity: 85 % or less

Table 3-1 Performance Verification Items

No.	Items	Applicable Model	
		R3131	R3131A
3.2.1.	Calibration Signal Level Accuracy		
3.2.2.	Accuracy of Frequency readout and Frequency Counter Marker	○	○
3.2.3.	Frequency Reference Source Accuracy	○	○
3.2.4.	Noise Sidebands	○	○
3.2.5.	Frequency Span Accuracy	○	○
3.2.6.	Resolution bandwidth Accuracy and Selectivity	○	○
3.2.7.	Resolution Bandwidth Switching Uncertainty	○	○
3.2.8.	QP Bandwidth Accuracy	○	○
3.2.9.	Residual FM	○	○
3.2.10.	Displayed Average Noise Level	○	○
3.2.11.	Gain Compression	○	○
3.2.12.	Residual Response	○	○
3.2.13.	Second Harmonic Distortion	○	○
3.2.14.	Third Order Intermodulation Distortion	○	○
3.2.15.	Frequency Response	○	○
3.2.16.	IF Gain Uncertainty	○	○
3.2.17.	Scale Fidelity	○	○
3.2.18.	Input Attenuator Switching Accuracy	○	○

3. PERFORMANCE VERIFICATION

Table 3-2 Additional Performance Verification Items for Tracking Generator

No.	Items	Applicable Model	
		R3131	R3131A
3.3.1.	Absolute Output Level Accuracy	O	O
3.3.2.	Output Flatness	O	O
3.3.3.	Output Level Switching Accuracy	O	O
3.3.4.	Harmonic Distortion	O	O
3.3.5.	Non-harmonic Distortion	O	O
3.3.6.	TG Leakage	O	O

O Apply

X Not Apply

2. Test Equipment

The table of recommended test equipment in General information lists the equipment needed to perform all of the performance test.

Equipment lists for individual tests are provided in each performance verification.

NOTE

1. The R3131/R3131A to be tested should be warmed up for at least 60 minutes before starting tests. Any additional equipment used for this performance verification tests should be warmed up as appropriate.
2. Make sure that the test equipment used meets its own published specifications and that all connectors are clean, before starting test.
3. Any equipment that meets critical specifications given in the Table can be substituted for recommended models.

3. Calibration Cycle

The performance verifications should be used to check the spectrum analyzer against its specifications every once a year recommended.

4. Performance Verification Test Record Sheets

The performance verification test record sheets at the end of this chapter is provided the value measured in each performance verification.

The test record lists test specification and acceptable limits.

Recommend that make a copy of this table, record the complete test results on the copy, and keep the copy for calibration test record.

This record could prove invaluable in tracking gradual changes in test result over long periods of the time.

5. Performance Verification Procedures

1) Use UUT for R3131/R3131A as Unit Under Test.

2) Typeface conventions used in this manual.

*Panel keys and soft keys are printed in a contrasting typestyle to make them stand out from the text as follows:

Panel keys: Boldface type Example: **FREQ, FORMAT**

Soft keys: Boldface and Italic Example: ***Center, Trace Detector***

*When a series of key operations are described using a comma between two keys.

*There are various soft menus used to switch between two states such as ON/OFF and AUTO/MNL.

For example, when turning off the ***Display ON/OFF*** function, the annotation "***Display ON/OFF (OFF)***" is used.

When switching the RBW AUTO/MNL function to MNL, the annotation "***RBW AUTO/MNL (MNL)***" is used.

3. PERFORMANCE VERIFICATION

3.2. PERFORMANCE VERIFICATION PROCEDURE

3.2.1. Calibration Signal Level Accuracy

[Description]

Verify internal calibration signal level accuracy.

Compare with calibrated external signal generator signal, and then measure level difference between external signal and internal calibration signal on R3131 display.

[Specification]

30 MHz, -20 dBm \pm 0.3 dB

[Equipment used]

- RF Power Meter :PM
- RF Power Sensor :PS
- Signal Generator :SG1
- RF Cable :BNC(m)-BNC(m)
- Adapter :Type N(m) to BNC(f)

[Setup]

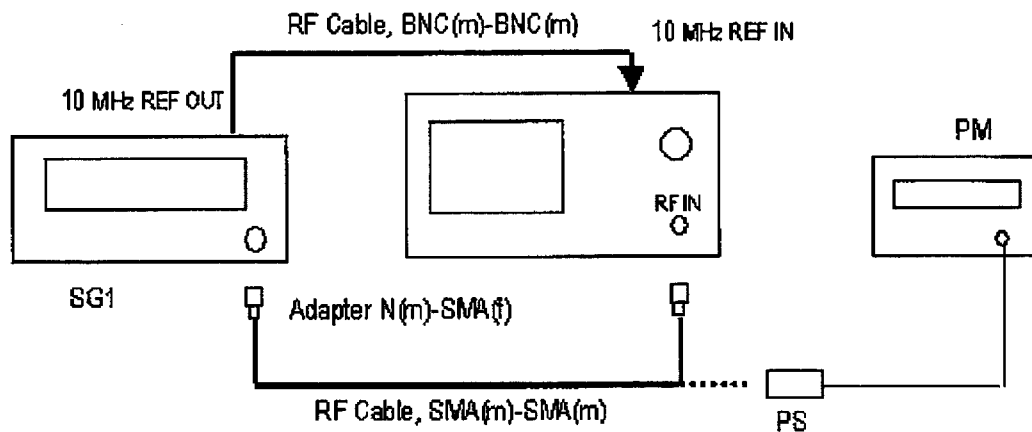


Figure 3-1 Setup Cal. Signal Level Accuracy Test

[Procedure]

1. Perform PM calibration follows PM calibration procedure.
2. Connect equipment as shown dashed line in Figure 3-1.
3. On the SG1, set controls as follows;

Frequency :30 MHz
Output Level :-20 dBm

4. While monitoring PM reading, adjust the output level of SG1 to be -20.0 dBm.
5. Change to apply the SG1 output to UUT input as shown in Figure 3-1.
6. On the UUT, press keys as follows to preset.

SHIFT, CONFIG

7. On the UUT, set controls as follows;

Center Frequency :30 MHz
Span :100 kHz
Reference Level :-15 dBm
dB/div :1 dB/div
RBW :100 kHz
VBW :1 kHz

8. On the UUT, press **PKSRCH** to capture the signal peak.
9. Memorize signal peak level as reference.
10. Disconnect SG1 output from RF IN of UUT.
11. On the UUT, press keys as follows to set internal calibration signal to on.

SHIFT, 7(CAL), Cal Sig Level ON/OFF (ON)

12. On the UUT, press **PKSRCH** to capture the signal peak.
13. Calculate level difference between step in 9 and 12.

Difference = Measured level in step 9 – Measured level in step 12.
It should be within ± 0.3 dB.

3. PERFORMANCE VERIFICATION

3.2.2. Accuracy of Frequency Readout and Frequency Counter Marker

[Description]

The Accuracy of the R3131/R3131A frequency readout and frequency counter marker is verified with an input signal of known frequency.

[Specification]

Frequency Readout Accuracy : $\leq \pm [(\text{Frequency reading} \times \text{Frequency Reference Accuracy}) + (\text{Span} \times \text{Span Accuracy}) + (0.15 \times \text{Resolution Bandwidth}) + 1 \text{ kHz}]$

Span Accuracy: $\leq \pm 3\%$

Marker Frequency Counter Accuracy $\leq \pm [(\text{Marker Frequency} \times \text{Frequency Reference Accuracy}) + 1 \text{ LSD}]$

[Equipment used]

- Frequency Standard :Generic
- Signal Generator :SG1
- RF Cable :SMA(m)-SMA(m)
- RF Cable :BNC(m)-BNC(m)
- Adapter :Type N (m)-SMA(f)

[Setup]

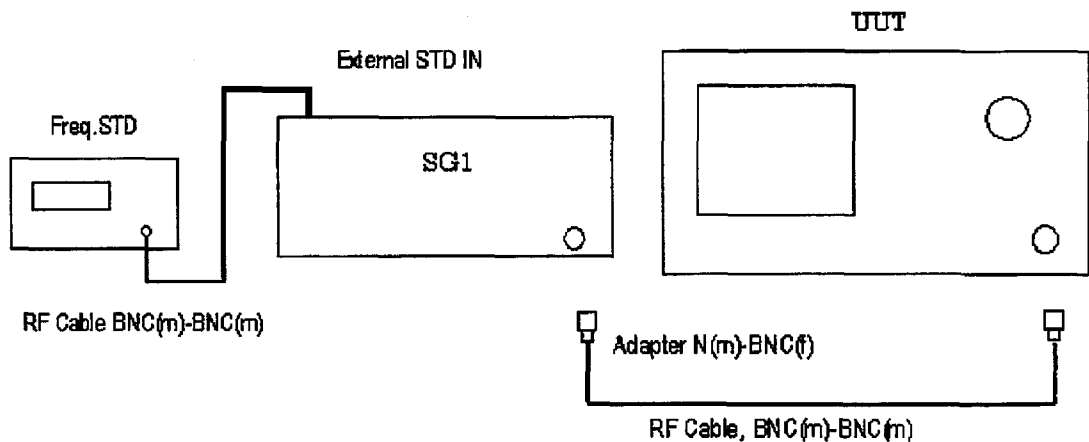


Figure 3-2 Setup Frequency Readout and Frequency Counter Marker Accuracy Test

[Procedure]

1. Connect the equipment, as shown in Figure 3-2.
2. On the UUT, press keys as follows to preset.

SHIFT, CONFIG

Frequency Readout Accuracy

3. On the SG1, set controls as follows;

Frequency :1.5 GHz
 Output Level :-10 dBm
 Frequency Reference :EXT

4. On the UUT, press keys as follows;

Center Frequency :1.5 GHz
 Span :5 MHz

5. On the UUT, press **PKSRCH** to capture the signal peak.
6. Record the marker frequency on the performance verification data sheet.
7. Repeat steps 3 through 6 for each setting on Table 3-3.

Table 3-3 Setting for Frequency Readout Accuracy Test

SG1	UUT		Δ Marker Reading		
	Frequency (GHz)	Center Frequency (GHz)	Span (Hz)	Min. (GHz)	Actual (GHz)
1.5	1.5	1 M	1.499960		1.500040
1.5	1.5	10 M	1.49968		1.50032
1.5	1.5	50 M	1.4985		1.50155
1.5	1.5	100 M	1.4986		1.5032
1.5	1.5	2 G	1.440		1.560

Frequency Counter Marker Accuracy

8. On the UUT, set control as follow;

Span :5 MHz

3. PERFORMANCE VERIFICATION

9. Set the Span of the R3131 to 5 MHz.
10. Set SG1 frequencies and the R3131 center as indicated on Table 3-4.
11. On the UUT, press **PKSRCH** to capture the signal peak.
12. Record the frequency of marker reading on the performance verification data sheet.
The marker readings should be within the limits shown.

Table 3-4 Setting for Counter Marker Accuracy

SG1 Frequency (GHz)	UUT Center Frequency (GHz)	Marker Frequency		
		Min. (GHz)	Actual (GHz)	Max. (GHz)
1.5	1.5	1.499992		1.500008

3.2.3. Frequency Reference Source Accuracy

[Description]

Apply 1 GHz output of signal generator referenced external signal standard.
Then measure 1 GHz signal using R3131/R3131A frequency counter function
R3131/3131A's frequency counter measurement accuracy is referenced to 10 MHz
reference oscillator.

[Specification]

Frequency : ± 2 ppm/year
 ± 5 ppm at operating temperature range

[Related adjustment]

Frequency Reference Adjustment

[Equipment used]

Signal Generator :SG1
Frequency Standard :Generic
RF Cable: :BNC(m)-BNC(m)
Adapter :Type N(m) to BNC(f)

[Setup]

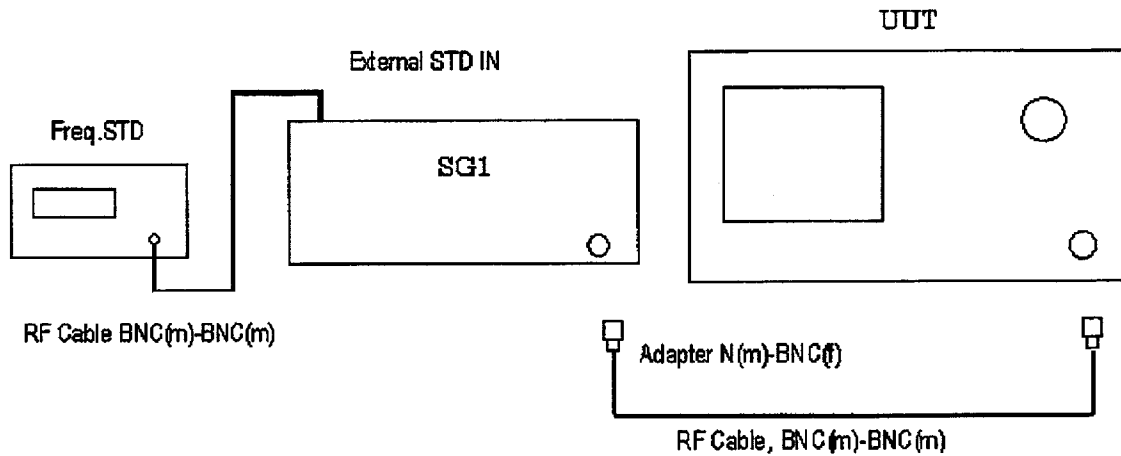


Figure 3-3 Setup of Internal Frequency Source Accuracy Test

[Procedure]

1. Connect the equipment as shown in Figure 3-3.
2. On the SG1, set controls as follows;

FREQUENCY REFERENCE	:EXT
Frequency	:1 GHz
Output Level	:-10 dBm

3. On the UUT, press keys as follows to preset.

SHIFT, CONFIG**CAUTION:**

Before starting this measurement, perform warm-up operation of the UUT for more than 30 minutes.

If the frequency of the UUT is set to EXT, set it to INT or perform 15-minutes warm-up operation after instrument preset.

4. On the UUT, set controls as follows;

Center Frequency	:1 GHz
Span	:5 MHz
Counter	:ON
Counter Resolution	:1 Hz

3. PERFORMANCE VERIFICATION

5. Read the frequency counter display. The frequency should be within the following limits:

999.998000 MHz<

<1000.002000 MHz

3.2.4 Noise Sidebands

[Description]

The noise side bands of a 20 MHz, -10 dBm signal are measured at an offset of 20 kHz from the carrier.

[Specification]

Noise sidebands:

≤ -100 dBc/Hz (20 kHz offset)

[Equipment used]

Signal Generator :SG1

Adapter :Type N(m) to BNC(f)

RF Cable :BNC(m)-BNC(m)

[Setup]

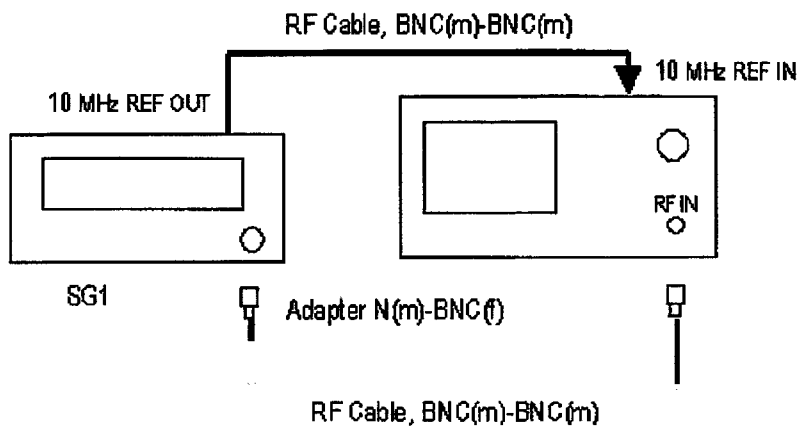


Figure 3-4 Setup of Noise Sidebands Test

[Procedure]

1. Connect the equipment, as shown in Figure 3-4.
2. On the SG1, set controls as follows;

Frequency :30 MHz
Output Level :-5 dBm

3. On the UUT, press keys as follows to preset.

SHIFT, CONFIG

4. On the UUT, set controls as follows;

Center Frequency :30 MHz
Span :50 kHz

5. On the UUT, press **PKSRCH** to capture the signal peak.
6. On the UUT, press keys as follows to set the signal peak to be the reference level.

MKR →, Ref

7. On the UUT, press keys as follows to set noise measurement mode in dBc/Hz.

MEAS, Noise/Hz, dBc/Hz

8. On the UUT, press keys as follows to set average mode with average times 20.

TRACE, 1/2,more, AVG A ON/OFF (ON), 2, 0, Hz

9. On the UUT, after average has completed, put the marker at 20 kHz away from the signal peak.
10. Record the level of marker reading in dBc/Hz on the performance verification data sheets.

Table 3-5 Noise Sidebands

UUT Setting	Noise Sideband		
Center Frequency (GHz)	Min. (dBc/Hz)	Actual (dBc/Hz)	Max. (dBc/Hz)
1.5	NA		-100

3. PERFORMANCE VERIFICATION

3.2.5. Frequency Span Accuracy

[Description]

Set the signal frequency twice with the signal generator and measure the difference between signal frequencies with the analyzer. Check the span accuracy using the signal frequency difference measured with the delta marker function.

[Specification]

$\leq \pm 3\%$ of actual frequency separation

[Equipment used]

- Signal Generator :SG1
- RF Cable :SMA (m)-SMA (m)
- RF Cable :BNC(m)-BNC(m)
- Adapter :Type N(m) to SMA (f)

[Setup]

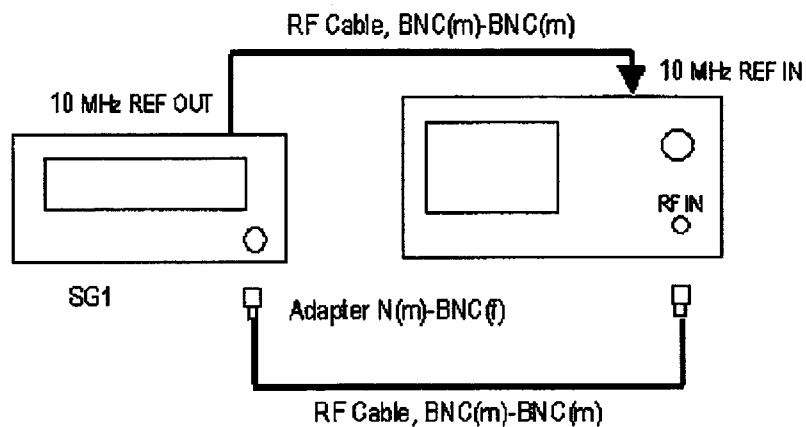


Figure 3-5 Setup of Frequency Span Accuracy

[Procedure]

1. Connect the equipment as shown in Figure 3-5.
2. On the UUT, press keys as follows to preset.

SHIFT, CONFIG

3. On the SG1, set controls for 1st frequency as follows;

Frequency :1.498 GHz
Output Level :-5 dBm

4. On the UUT, set controls as follows;

Center Frequency :1.5 GHz
Span :5 MHz

5. On the UUT, press **SINGLE** for a single sweep.

6. On the UUT, press **PKSRCH** to capture the signal peak.

7. On the UUT, press keys as follows to set delta marker mode;

MKR, Delta Marker

8. On the SG1, set control for 2nd frequency as follow;

Frequency :1.502 GHz

9. On the UUT, press **SINGLE** for a single sweep.

10. On the UUT, press **PKSRCH** to capture the signal peak.

11. Record the frequency of the delta marker reading on the performance verification data sheet as Actual.

12. Repeat steps 3 through 11 for each setting listed on Table 3-6.

Table 3-6 Setting for Frequency Span Accuracy Test

SG1		UUT		Δ Marker Reading		
1st Frequency (Hz)	2nd Frequency (Hz)	Center Frequency (Hz)	Span (Hz)	Min. (Hz)	Actual (Hz)	Max. (Hz)
1.498 G	1.502 G	1.5 G	5 M	3.88 M		4.12 M
1.484 G	1.516 G	1.5 G	40 M	31.04 M		32.96 M
1.34 G	1.66 G	1.5 G	400 M	310.4 M		329.6 M

3. PERFORMANCE VERIFICATION

3.2.6. Resolution Bandwidth Accuracy and Selectivity

[Description]

This test measures the 3 dB down of resolution bandwidth (RBW) accuracy and selectivity.

Selectivity is specified the 3 dB and the 60 dB down bandwidth of RBW.

[Specification]

Range : 1 kHz to 1 MHz ,1,3 sequence

Accuracy : $\leq \pm 20\%$

Selectivity : $\leq 15:1(60\text{ dB}:3\text{ dB})$

[Equipment used]

Nil

[Setup]

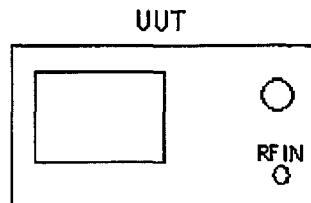


Figure 3-6 Setup of Resolution Bandwidth Accuracy and Selectivity Test

[Procedure]

Resolution Bandwidth Accuracy

1. On the UUT, press keys as follows to preset.

SHIFT, CONFIG

2. On the UUT, press keys as follows to the internal calibration signal to on.

SHIFT, 7(CAL), Cal Sig Level ON/OFF (ON)

3. On the UUT, set controls as follows;

Center Frequency :30 MHz
 Span :2 MHz
 RBW :1 MHz
 VBW :100 Hz
 dB/div :1 dB/div
 Reference Level :-5 dBm
 Trace detector :Sample

4. On the UUT, press keys as follows to set X dB Down function to measure 3 dB down bandwidth.

MEAS, XdB Down, 3, dB

5. On the UUT, press **Cont Down ON/OFF** (ON) to set continuous X dB down measurement.

6. On the UUT, press **SINGLE** for a single sweep.

7. After sweep completed, record the marker frequency in Table 3-7 and 3-8.

8. Change RBW and span frequency setting as shown in Table 3-7, and repeat for remaining RBWs.

Table 3-7 Setting for RBW Accuracy Test

UUT Setting		3 dB Bandwidth		
RBW (Hz)	Frequency Span (Hz)	Min. (Hz)	Actual (Hz)	Max. (Hz)
1 M	2 M	800 k		1.2 M
300 k	500 k	240 k		360 k
100 k	200 k	80 k		120 k
30 k	50 k	24 k		30.0 k
10 k	50 k	8.0 k		12.0 k
3 k	50 k	2.4 k		3.6 k
1 k	50 k	800		1200

3. PERFORMANCE VERIFICATION

Table 3-8 Setting for RBW Selectivity Test

RBW (Hz)	Frequency Span Setting (Hz)	60 dB Bandwidth (Hz)	3 dB Bandwidth (Hz)	Selectivity	
				Actual	Max.
1 M	20 M				15
300 k	5 M				15
100 k	100 k				15
30 k	30 k				15
10 k	10 k				15
3 k	3 k				15
1 k	1 k				15

Resolution Bandwidth Selectivity

9. On the UUT, press keys as follows to preset.

SHIFT, CONFIG

10. On the UUT, press keys as follows to the internal calibration signal to on.

SHIFT, 7(CAL), Cal Sig Level ON/OFF (ON)

11. On the UUT, set controls as follows;

Center Frequency :30 MHz
 Span :20 MHz
 RBW :1 MHz
 VBW :100 Hz
 dB/div :10 dB/div
 Reference Level :-10 dBm
 Trace Detector :Sample

12. On the UUT, press keys as follows to set X dB Down function to measure 60 dB down bandwidth.

MEAS, XdB Down, 6, 0, dB

13. On the UUT, press **Cont Down ON/OFF (ON)** to set continuous X dB down measurement.

14. On the UUT, press **SINGLE** for a single sweep.

15. After the single sweep has completed, record the marker frequency in the 60 dB bandwidth column on Table 3-8.
16. Divide 60 dB down bandwidth by 3 dB down bandwidth and record the result in the Actual column on Table 3-8.
17. Change RBW and span frequency setting as shown in Table 3-8, and repeat for remaining RBWs.

3.2.7. Resolution Bandwidth Switching Uncertainty

[Description]

This set utilizes the internal Cal. Signal for measuring the switching uncertainty between resolution bandwidth. At each resolution bandwidth setting, the displayed amplitude variation of the signal is measured. All measurements are reference to the 300 kHz bandwidth.

[Specification]

1 kHz to 1 MHz RES BW:

$\leq \pm 0.5$ dB (referred to 300 kHz RBW)

[Equipment used]

Nil

[Setup]

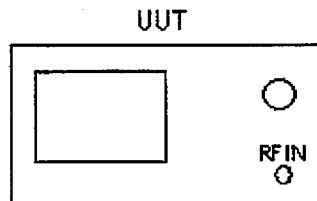


Figure 3-7 Setup of Resolution BW Switching Uncertainty Test

3. PERFORMANCE VERIFICATION

[Procedure]

1. On the UUT, press keys as follows to preset;

SHIFT, CONFIG

2. On the UUT, press keys as follows to perform RBW switch calibration.

SHIFT, 7(CAL), Each Item, RBW Switch

Wait for the "Calibrating" message to disappear.

3. On the UUT, press keys as follows to set internal calibration signal to on.

SHIFT, 7(CAL), Cal Sig Level ON/OFF(ON)

4. On the UUT, set controls as follows;

Center Frequency	:30 MHz
Span	:500 kHz
Reference Level	:-5 dBm
RBW	:300 kHz
dB/div	:1 dB/div
Trace Detector	:Posi

5. On the UUT, press **SINGLE** for a single sweep.
6. On the UUT, after the single sweep has completed, press **PKSRCH** to capture the signal peak.
7. On the UUT, press keys as follows to set fixed marker to on.

MKR, 1/2, more, Fixed MKR ON/OFF(ON)

8. On the UUT, set controls as follows;

RBW	:1 MHz
Span	:2 MHz

9. On the UUT, press **SINGLE** for a single sweep.
10. On the UUT, after single sweep has completed, press **PKSRCH** to capture the signal peak.

11. Record the level of delta marker reading on Table 3-9.

Table 3-9 Setting for RBW Switching Uncertainty Test

UUT		Δ Marker reading		
RBW (Hz)	Span (Hz)	Min. (dB)	Actual (dB)	Max. (dB)
300 k	500 k	-	(Reference)	-
1 M	2 M	-0.5		+0.5
100 k	200 k	-0.5		+0.5
30 k	50 k	-0.5		+0.5
10 k	50 k	-0.5		+0.5
3 k	50 k	-0.5		+0.5
1 k	50 k	-0.5		+0.5

12. Repeat steps 9 through 11 for remaining RBW.

3.2.8. QP Bandwidth Accuracy

[Description]

This test measures the 6 dB down RBW accuracy under EMC measurement function.

[Specification]

RBW: 9 kHz and 120 kHz

Accuracy : ± 20%

[Equipment used]

Nil.

[Setup]

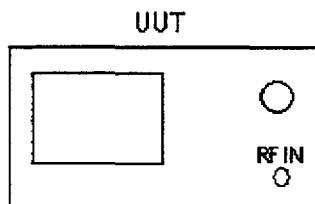


Figure 3-8 Setup of QP Bandwidth Accuracy Test

3. PERFORMANCE VERIFICATION

[Procedure]

1. On the UUT, press keys as follows to preset.

SHIFT, CONFIG

2. On the UUT, press keys as follows to set internal calibration signal to on.

SHIFT, 7(CAL), Cal Sig Level ON/OFF(ON)

3. On the UUT, set controls as follows;

Center Frequency	:30 MHz
Span	:200 kHz
VBW	:100 Hz
dB/div	:5 dB/div
Reference Level	:-5 dBm
Trace Detector	:Sample

4. On the UUT, press keys as follows to set X dB Down function to measure 6 dB down bandwidth.

MEAS, XdB Down, 6, dB

5. On the UUT, press **Cont Down ON/OFF (ON)** to set continuous X dB down measurement.
6. On the UUT, press keys as follows to set QP bandwidth to 120 kHz.

SHIFT, 1(EMC), Detector Mode, RBW 120 kHz

7. On the UUT, press SINGLE for a single sweep.
8. Record the marker frequency on the Table 3-10.
9. Change RBW and span frequency setting as shown in Table 3-10, and repeat for 9 kHz.

Table 3-10 Setting for QP Bandwidth Accuracy test

UUT Setting		6 dB down Bandwidth		
Resolution Bandwidth (Hz)	Frequency Span (Hz)	Min. (Hz)	Actual (Hz)	Max. (Hz)
120 k	200 k	96 k		144 k
9 k	50 k	7.2 k		10.8 k

3.2.9. Residual FM

[Description]

The residual FM Test measures the short-term stability of the spectrum analyzer's LO system. A stable signal is applied to the input, in zero span, the signal is slope detected on the IF bandwidth filter skirt.

Any instability in the LO system transfer to the IF signal in the mixing process.

The test determines the slope of the IF filter in Hz /dB and then measure the signal amplitude variation caused by the residual FM.

Multiplying these two values gives the residual FM in Hz.

[Specification]

Residual FM: < 100 Hzp-p / 100 msec.

[Equipment used]

Signal Generator :SG2
 Adapter :Type N(m) to BNC(f)
 RF Cable :BNC(m)-BNC(m)

3. PERFORMANCE VERIFICATION

[Setup]

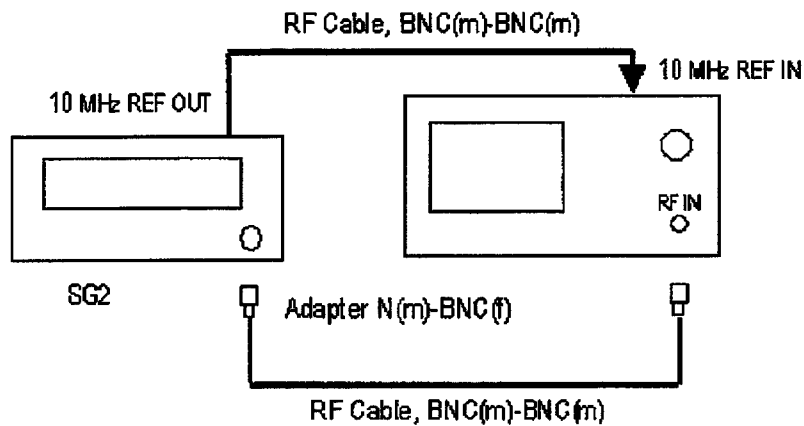


Figure 3-9 Setup of Residual FM Test

[Procedure]

Determine the IF filter slope

1. Connect the equipment as shown in Figure 3-9.
2. On the SG2, set controls as follows;

Frequency :10 MHz
Output Level :-10 dBm

3. On the UUT, press keys as follows to preset.

SHIFT, CONFIG

4. On the UUT, set controls as follows;

Center Frequency :10.3 MHz
Span :50 kHz
Reference Level :-15 dBm
RBW :30 kHz
dB/div :1 dB/div

5. On the UUT, press **SINGLE** for a single sweep.
6. On the UUT, after sweep has completed, press **MKR** to put marker then rotate data knob to counterclockwise until marker reads $-16 \text{ dBm} \pm 0.1 \text{ dB}$.
7. Set delta marker, then rotate the data knob to clockwise until marker reads $-8 \text{ dBm} \pm 0.1 \text{ dB}$.

8. Divide the delta marker frequency by the delta marker amplitude to obtain the slope of the RBW filter.

For example,

if the delta marker frequency is 14.6 kHz and the delta marker amplitude is 8 dB, the slope is 1.825 kHz/dB.

Record the result below:

Slope: _____ Hz / dB

Measuring the Residual FM

9. On the UUT, press **MKR** and **REPEAT** to set marker and repeat sweep mode.
10. On the UUT, set controls as follows;

Span : 0 Hz
Sweep Time : 100 msec.

11. On the SG2, adjust an output frequency 1 kHz step to place the displayed trace about 5 division below the reference level.
12. On the UUT, press **SINGLE** for a single sweep.
13. On the UUT, after the single sweep has completed, press **PKSRCH** to capture the signal peak.
14. On the UUT, press keys as follows to set delta marker mode to on.

MKR, Delta Marker

15. On the UUT, press keys as follow to set minimum peak search mode to capture the minimum peak of signal.

MKR, Peak Menu, Min. Peak

16. Read the delta marker amplitude, take its absolute value, and record the result as the deviation.

Deviation : _____ dB

3. PERFORMANCE VERIFICATION

17. Calculate the residual FM by multiplying the slope recorded before by the deviation. Record the result below.

The residual FM should be less the 100 Hz.

Residual FM : _____ Hz

3.2.10. Displayed Average Noise Level

[Description]

This test measures the displayed average noise level in all frequency range. The analyzer's input is terminated in 50Ω. In the frequency range from 9 kHz to 3.0 GHz, the test first measures the average noise at 1 MHz, then at any frequency point in zero span.

[Specification]

Displayed Average Noise level:

at RBW:1 kHz, Input attenuator: 0 dB, VBW: 10 Hz and Frequency \geq 1 MHz.

Frequency Range : 1 MHz to 3 GHz
Specification : $\leq -113 \text{ dBm} + 2 f(\text{GHz}) \text{ dB}$

[Equipment used]

50Ω Terminator :Generic

[Setup]

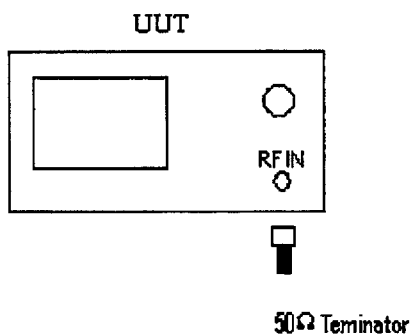


Figure 3-10 Displayed Average Noise Level Test Setup

[Procedure]

1. Connect equipment as shown in Figure 3-10.
2. On the UUT, press keys as follows to preset.

SHIFT, CONFIG

3. On the UUT, set controls as follows;

Center Frequency : 1 MHz
 Span : 0 Hz
 Reference Level : -60 dBm
 RBW : 1 kHz
 VBW : 10 Hz
 Input Attenuator : 0 dB

4. On the UUT, press **SINGLE** for a single sweep.
5. On the UUT, after the single sweep has completed, press **PKSRCH** to capture the maximum noise level.
6. Read the marker level and record it on Table 3-11 as the Displayed Noise Level at 1 MHz.

Table 3-11 Setting for Displayed Average Noise Level Test

Center Frequency (Hz)	Min. (dBm)	Displaed Average Noise Level (dBm)	Max. (dBm)
1 M	NA		-112.99
100 M	NA		-112.80
500 M	NA		-112.00
1000 M	NA		-111.00
1500 M	NA		-110.00
2000 M	NA		-109.00
2500 M	NA		-108.00
3000 M	NA		-107.00

7. Repeat steps 3 through 6 for each center frequency listed on Table 3-11.

3. PERFORMANCE VERIFICATION

3.2.11. Gain Compression

[Description]

This test measures the gain compression using two signals that are 1 MHz apart. Two signals, separated by 1 MHz, are used. First a -30 dBm signal is placed at the input of the R3131/R3131A. After that, input a signal at -5 dBm or above and increase its signal level. The initial level at -30 dBm is lowered. Measure the input level when the signal is lowered by 1 dB.

[Specification]

>-5 dBm (mixer input level, $f \geq 20$ MHz)

[Equipment]

Signal Generator	:SG1
Signal Generator	:SG2
Power Meter	:PM
Power Sensor	:PS
Power Splitter	:Generic
20 dB Fixed Attenuator	:Generic
3 dB Fixed Attenuator	:Generic
Adapter	:Type N(m) to BNC(f)
RF Cable	:BNC(m)-BNC(m)

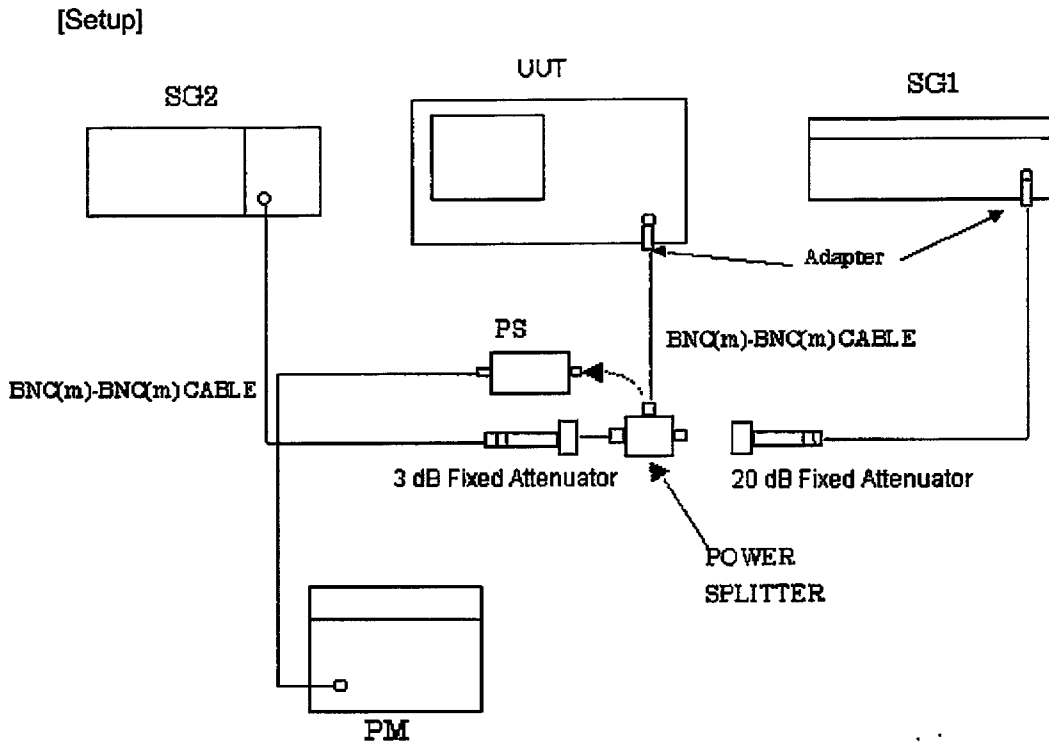


Figure 3-11 Setup of Gain Compression Test

[Procedure]

1. On the PM, perform calibration.
2. Connect the equipment as shown in Figure 3-11.
3. Preset both of SG1 and SG2.
4. On the SG2, set controls as follows;

Frequency	:20 MHz
Output Level	:-2 dBm

5. On the SG1, set controls as follows;

Frequency	:21 MHz
Output Level	:-4 dBm

6. On the UUT, press keys as follows to preset.

SHIFT, CONFIG

3. PERFORMANCE VERIFICATION

7. On the UUT, set controls as follows;

Center Frequency :20.5 MHz
 Span :2 MHz
 Input Attenuator : 0 dB
 dB/div :1 dB/div

8. On the UUT, set controls as follows;

Reference Level :-30 dBm

9. On the SG2, set output signal to off.

10. On the SG1, adjust output signal level for a displayed signal of -30 dBm ± 0.1 dB on the UUT screen.

11. On the SG2, set output signal to on.

12. On the SG2, adjust output signal level until the signal level at 2.5 divisions in the left hand part on the UUT screen is lowered by 1 dB from -30 dBm.

If the output level cannot be adjusted any more, stop it there.

13. Remove the BNC cable from the input terminal of the UUT and connect the power sensor there.

14. Record the amplitude reading on the power meter.

It should be greater than -5 dBm _____ dBm

Table 3-12 Setting for Gain Compression Test

UUT Center Frequency (MHz)	SG1 Frequency (MHz)	SG2 Frequency (MHz)	1 dB Gain Compression Level		
			Min. (dBm)	Actual (dBm)	Max. (dBm)
20.5	21	20	-5		NA

3.2.12. Residual Response

[Description]

This test checks residual responses.

Any response located above the display line is measured in a narrow frequency span and resolution bandwidth.

The RF input is terminated in 50Ω .

[Specification]

1 MHz to 3.0 GHz : ≤ -100 dBm

(With no signal at input and 0 dB input attenuator. RF INPUT is terminated in 50Ω .)

[Equipment used]

50Ω Terminator :Generic

[Setup]

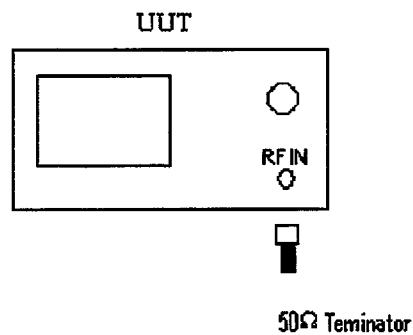


Figure 3-12 Setup of Residual Response Test

[Procedure]

1. Install the 50Ω Terminator at the RF INPUT terminal as shown in Figure 3-12.
2. On the UUT, press keys as follows to preset.

SHIFT, CONFIG

3. PERFORMANCE VERIFICATION

3. On the UUT, set controls as follows;

Center Frequency	:1.3 MHz
Span	:2 MHz
CF Step	:1.9 MHz
Reference Level	:-50 dBm
Input Attenuator	:0 dB
RBW	:10 kHz
VBW	:300 Hz
Display Line	:-100 dBm

4. On the UUT, press **SINGLE** for a single sweep.

5. On the UUT, after the single sweep has completed, check the noise level measured.

The noise level should be 3 dB below the display line at least.

If it is not it will be necessary to reduce the span and RBW to reduce the noise level.

If the span is reduced, reduce the CF Step to no more than 95% of the Span.

6. If the residual is suspected, execute single sweep again.

A residual response will persist, but a noise peak will not. Record the frequency and amplitude of any responses above the display line.

7. If a response is marginal, verify the response amplitude as follows:

- 1) Change sweep mode to continuous sweep.
- 2) Capture marginal response frequency by peak search marker.
- 3) Set center frequency to marginal response frequency.
- 4) Set RBW to AUTO.
- 5) Continue to reduce the Span until a RBW 1 kHz is reached.
- 6) Record the frequency and amplitude of any residual response above the display line.

8. Check for residual up to 3 GHz using procedure of step 3 through 7.

3.2.13. Second Harmonic Distortion

[Description]

The SG1 and low pass filter provide the signal for measuring second harmonic distortion. The low pass filter eliminates any harmonic distortion originating at the signal source. This measurement will be done using delta marker mode.

[Specification]

≤ -70 dBc (10 MHz to 3.0 GHz, -30 dBm mixer level.)

[Equipment used]

Signal Generator	:SG1
Power Meter	:PM
Power Splitter	:Generic
2 GHz Low Pass Filter	:Generic
Adapter	:Type N (m) to SMA(f)
RF Cable	:BNC(m)-BNC(m)
RF Cable	:SMA(m)-SMA(m)

[Setup]

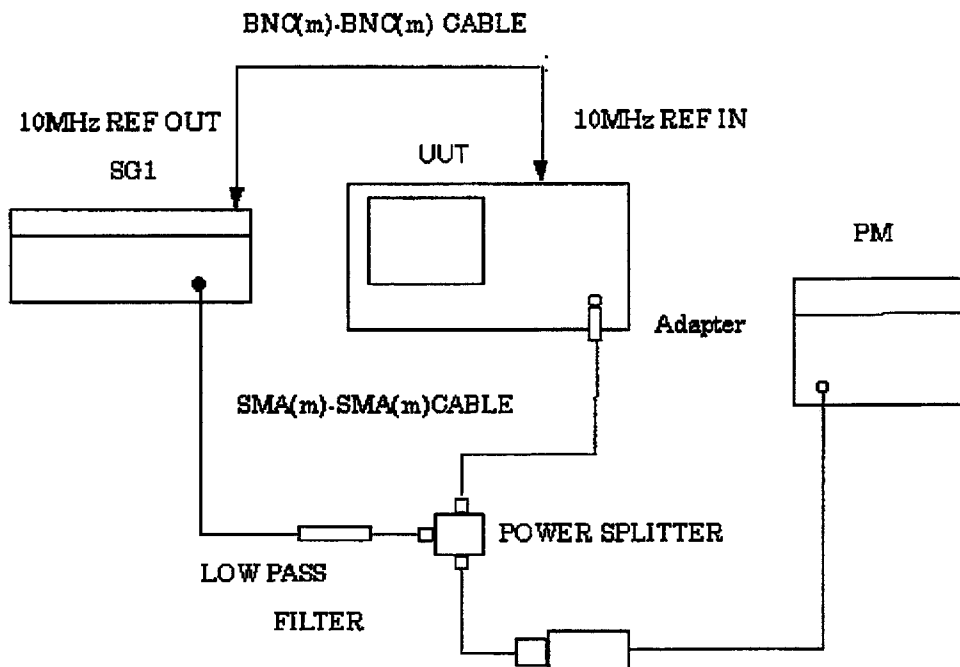


Figure 3-13 Setup Second Harmonic Distortion Test

3. PERFORMANCE VERIFICATION

[Procedure]

1. On the PM, perform calibration.
2. Connect equipment as shown in Figure 3-13.
3. On the SG1, after preset, set controls as follows;

Frequency :1.4 GHz
Output level :0 dBm
Frequency Standard Switch (rear panel) :EXT 10 MHz

4. On the UUT, press keys as follows to preset.

SHIFT, CONFIG

5. On the UUT, set controls as follows;

Center Frequency :1.4 GHz
Span :50 kHz
VBW :30 Hz
Input Attenuator :20 dB
Reference Level :-10 dBm

6. On the SG1, adjust output level so that PM reading to be $-10.0 \text{ dBm} \pm 0.1 \text{ dB}$.
7. On the UUT, press **SINGLE** for a single sweep.
8. On the UUT, after sweep has completed, press **PKSRCH** to capture the signal peak.
9. On the UUT, press keys as follows to set fixed marker to on.

MKR, 1/2,more, Fixed MKR ON/OFF(ON)

10. On the UUT, set controls as follow;

Center Frequency :2.8 GHz

11. On the UUT, press **SINGLE** for a single sweep.
12. On the UUT, after the single sweep has completed, press **PKSRCH** to measure level difference between 1.4 GHz and 2.8 GHz by delta marker mode.

It should be less than -70 dBc.

Second Harmonic Distortion _____dBc

3.2.14. Third Order Inter Modulation Distortion

[Description]

Two Signal generators provide the signals required for measuring third order inter modulation.

It is difficult when the input level is low because of being buried to the noise, to measure the spectrum generated by the distortion. Third ordered inter-modulation is raised by 20 dB if the input level is raised by 10 dB.

Then, examine with mixer input level set in -20 dBm after the specification is converted into a value, which is 20 dB larger.

[Specification]

1. For a total mixer input level of -30 dBm

: ≤ -70 dBc (10 MHz to 3 GHz, mixer input level -30 dBm, $\Delta f > 50$ KHz)

2. Converted specification for total mixer input level of -20 dBm

: ≤ -50 dBc (10 MHz to 3 GHz, mixer input level -20 dBm, $\Delta f > 50$ kHz)

[Equipment used]

Signal Generator	:SG1
Signal Generator	:SG2
Power Divider	:Divider
Adapter	:Type N(m) to BNC(f)
RF Cable	:BNC(m)-BNC(m)

[Setup]

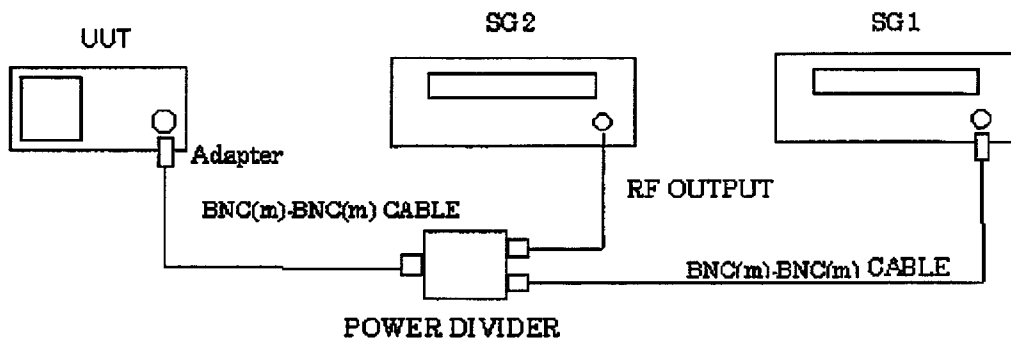


Figure 3-14 Setup of Third Order Intermodulation Test

3. PERFORMANCE VERIFICATION

[Procedure]

The following procedure carries out at -20 dBm for a total mixer input level.
It is applied specification 2.

1. Connect equipment as shown in Figure 3-14.
2. On the SG1 and SG2, preset.
3. On the SG1, set controls as follows;

Frequency :20.050 MHz
Output Level : -10 dBm
RF Output Control :OFF

4. On the SG2, set controls as follow;

Frequency :20.000 MHz
Output Level :-10 dBm
RF Output Control :OFF

5. On the UUT, press keys as follows to preset.

SHIFT, CONFIG

6. On the UUT, set controls as follows;

Center Frequency :20.025 MHz
Span :200 kHz
Reference Level :-8 dBm
RBW :1 kHz
VBW :300 Hz
Input Attenuator :10 dB

7. On the SG1, set RF output control to on.
8. On the UUT, press keys as follows to set continuous peak search mode to on.

MKR, Peak Menu, Cont Peak ON/OFF(ON)

9. On the SG1, adjust the output level for a -10 dBm \pm 0.1 dB reading on the UUT display.
10. On the SG1, set RF output control to off.
11. On the SG2, set RF output control to on.
12. On the SG2, adjust the output level for a -10 dBm \pm 0.1 dB reading on the UUT display.

13. On the SG1, set RF output control to on.

14. On the UUT, press keys as follows to set continuous peak search mode to off.

MKR, Peak Menu, Cont Peak ON/OFF(OFF)

15. On the UUT, press **SINGLE** for a single sweep.

16. On the UUT, after the single sweep has completed, press **PKSRCH** to capture the signal peak.

17. On the UUT, press keys as follows to set delta marker mode to on.

MKR, Delta Marker

18. Third order inter modulation distortions appear symmetrically 50 kHz apart from the two carriers.

Move the marker to each distorted position with the knob or upper arrow key to read the level in dBc and record the greater reading.

Table 3-13 Setting for Third Order Intermodulation Distortion Test

UUT	SG1	SG2	Third Order Intermodulation Distortion		
Center Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Min. (dBc)	Actual (dBc)	Max. (dBc)
20.050	20.050	20.000	NA		-50

3.2.15. Frequency Response

[Description]

The SG1 signal is fed through a power splitter to a power sensor and the R3131/R3131A. The frequency the SG1 output level is adjusted at 30 MHz to place the displayed signal at the R3131/R3131A center horizontal scale line.

The power meter is placed in RATIO mode. At each new the SG1 frequency, the SG1's power level is adjusted to the center horizontal scale line.

The power meter displays the inverse of the frequency response.

[Specification]

$\leq \pm 0.5$ dB (100 kHz to 3 GHz, Input attenuator=10 dB)

$\leq \pm 1.0$ dB (100 kHz to 2 GHz)

$\leq \pm 2.0$ dB (9 kHz to 3 GHz)

After calibration at 30 MHz reference.

3. PERFORMANCE VERIFICATION

[Equipment used]

Signal Generator :SG1
 Power Meter :PM
 Power Sensor :PS
 Power Splitter :Generic
 Adapter: :Type N(m) to SMA(f)
 Adapter :Type SMA(f)-SMA(f)
 RF Cable :SMA(m)-SMA(m)

[Setup]

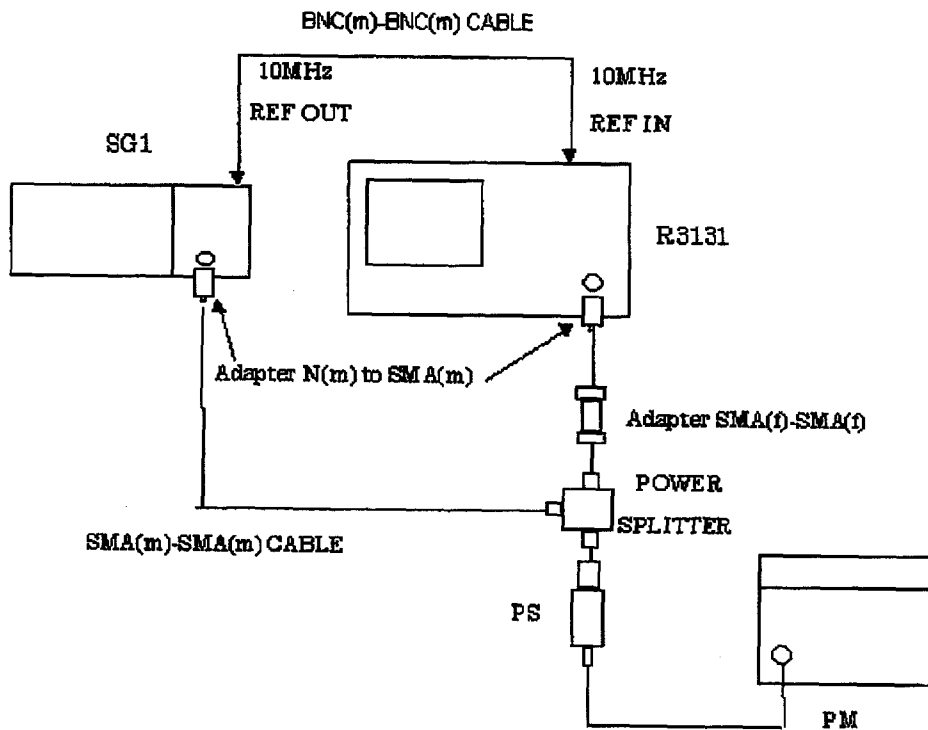


Figure 3-15 Setup of Frequency Response Test

[Procedure]

1. On the PM, perform calibration.
2. Connect equipment as shown in Figure 3-15.
3. On the SG1, after preset, sent controls as follows;

Frequency :30 MHz
 Frequency Step :100 MHz
 Output Level :-4 dBm

4. On the UUT, press keys as follows to preset.

SHIFT, CONFIG

5. On the UUT, set controls as follows;

Center Frequency	:30 MHz
Span	:5 MHz
Center Frequency Step	:100 MHz
Reference Level	:-5 dBm
dB/div	:1 dB/div
VBW	:100 Hz
Trace Detector	:Posi

6. On the UUT, press keys as follows to set continuous peak search mode to on.

MKR, Peak Menu, Cont Peak ON/OFF(ON)

7. On the SG1, adjust output level so that UUT marker reading is $-10 \text{ dBm} \pm 0.01 \text{ dB}$.

8. On the PM, set relative measurement mode.

9. On the SG1, set control as follow;

Frequency	:100 MHz
-----------	----------

10. On the PM, set a correction data for 100 MHz.

11. On the UUT, set control as follow;

Center Frequency	:100 MHz
------------------	----------

12. On the SG1, adjust the output level so that UUT marker reading is $-10 \text{ dBm} \pm 0.01 \text{ dB}$.

13. Record the reverse sign value of the power ratio displayed on the power meter on Table 3-14.

14. Repeat steps 9 through 13 for each frequency listed on Table 3-14.

3. PERFORMANCE VERIFICATION

Table 3-14 Setting for Frequency Response Test

Frequency (MHz)	Power Meter Reading (dB)
100	
200	
300	
400	
500	
600	
700	
800	
900	
1000	
1100	
1200	
1300	
1400	
1500	
1600	
1700	
1800	
1900	
2000	
2100	
2200	
2300	
2400	
2500	
2600	
2700	
2800	
2900	
3000	

[Test Results]

15.Frequency Response

Enter the most positive number from Table 3-14,

1) Power Meter Reading: ____dB

Enter the most negative number from Table 3-14,

2) Power Meter Reading: ____dB

Subtract 1) from 2) :

The result should be less than 0.98 dB.

3.2.16. IF Gain Uncertainty

[Description]

This test measures IF Gain error in RBW 1 MHz and 3 kHz.

The input signal decreased as the spectrum analyzer's reference level is decreased (If gain increased). Since the signal level is decreased in precise steps, any error between the reference level and the signal level is caused by the analyzer's IF gain.

[Specification]

IF Gain Uncertainty:

$\leq \pm 0.5$ dB,

Reference levels 0 dBm to -50 dBm with 10 dB input attenuation
(After auto calibration)

[Equipment used]

Signal Generator	:SG2
1 dB Step Attenuator	:ATT1
10 dB Step Attenuator	:ATT2
Attenuator/Switch driver	:Driver
Adapter	:Type N(m) to BNC(f)
RF Cable	:BNC(m)-BNC(m)

[Setup]

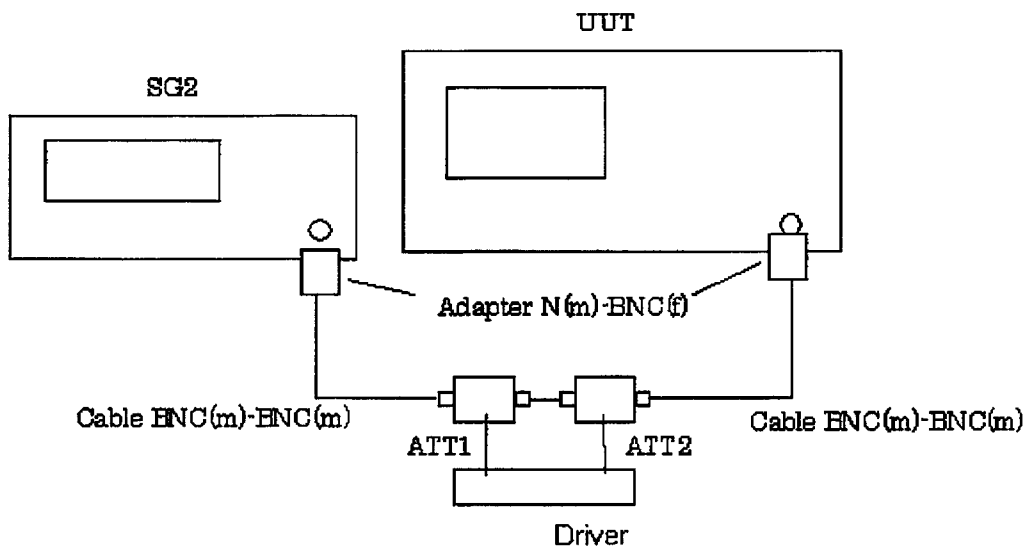


Figure 3-16 Setup of IF Gain Uncertainty Test

3. PERFORMANCE VERIFICATION

[Procedure]

1. On the UUT, press keys as follows to preset.

SHIFT, CONFIG

2. ON the UUT, press keys as follows to perform auto calibration function.

SHIFT, 7(CAL), Call All

Wait until auto calibration has completed

3. Connect equipment as shown in Figure 3-16.
4. On the SG2, set controls as follows;

Frequency :11 MHz

Output Level :-5 dBm

5. On the UUT, set controls as follows;

Center Frequency :11 MHz

Span :1 MHz

Reference Level :0 dBm

dB/div :1 dB/div

VBW :100 Hz

RBW :1 MHz

Trace Detector :Posi

6. On the Driver, set ATT1 and ATT2 to 0 dB.
7. While monitoring UUT display, adjust SG2 output level to be 5 dB lower than UUT's reference level.
8. On the UUT, after several sweeps, press keys as follow to capture the signal peak.

SINGLE, PKSRCH

9. Read the level of marker, and the record it as reference value.
10. On the UUT, press keys as follows to set fixed marker to on for reading difference between reference value and reference level which is set.

MKR, 1/2,more, Fixed Marker ON/OFF(ON)

3. PERFORMANCE VERIFICATION

11. On the Driver, increase 1 dB by the ATT1 and decrease 1 dB by reference level of UUT.
12. On the UUT, press **SINGLE** for a single sweep.
13. On the UUT, press **PKSRCH** to capture the signal peak.
14. Record the level of marker reading on table 3-15.

Table 3-15 Setting for IF Gain Uncertainty Test (RBW=1 MHz)

UUT Reference Level (dBm)	Setp Attenuator Setting		Min. (dB)	Δ Marker Level (dB)	Max. (dB)
	1 dB Step	10 dB Step			
0	0	0	-	Reference	-
-1	1	0	-0.5		+0.5
-2	2	0	-0.5		+0.5
-3	3	0	-0.5		+0.5
-4	4	0	-0.5		+0.5
-5	5	0	-0.5		+0.5
-6	6	0	-0.5		+0.5
-7	7	0	-0.5		+0.5
-8	8	0	-0.5		+0.5
-9	9	0	-0.5		+0.5
-10	10	0	-0.5		+0.5
-20	10	10	-0.5		+0.5
-30	10	20	-0.5		+0.5
-40	10	30	-0.5		+0.5
-50	10	40	-0.5		+0.5

15. Repeat steps 11 through 14 until ATT1 is lowered 10 dB.
16. On the Driver, increase 10 dB by the ATT2 and decrease 10 dB by reference level of UUT.
17. On the UUT, press **SINGLE** for a single sweep.
18. Record the level of marker reading on table 3-15.
19. Repeat steps 16 through 18 until ATT2 is lowered 50 dB.

RBW:3 kHz

20. On the UUT, press keys as follows to preset.

SHIFT, CONFIG

3. PERFORMANCE VERIFICATION

21. On the UUT, set controls as follows;

Center Frequency :11 MHz
 Span :50 kHz
 Reference Level :0 dBm
 dB/div :1 dB/div
 RBW :3 kHz
 VBW :10 Hz
 Trace Detector :Posi

22. Repeat steps 6 through 19 for RBW 3 kHz, and record the result on Table 3-16.

Table 3-16 Setting for IF Gain Uncertainty Test (RBW=3 kHz)

UUT Reference Level (dBm)	Setp Attenuator Setting		Min. (dB)	Δ Marker Level (dB)	Max. (dB)
	1 dB Step	10 dB Step			
0	0	0	-	Reference	-
-1	1	0	-0.5		+0.5
-2	2	0	-0.5		+0.5
-3	3	0	-0.5		+0.5
-4	4	0	-0.5		+0.5
-5	5	0	-0.5		+0.5
-6	6	0	-0.5		+0.5
-7	7	0	-0.5		+0.5
-8	8	0	-0.5		+0.5
-9	9	0	-0.5		+0.5
-10	10	0	-0.5		+0.5
-20	10	10	-0.5		+0.5
-30	10	20	-0.5		+0.5
-40	10	30	-0.5		+0.5
-50	10	40	-0.5		+0.5

3.2.17. Scale Fidelity**[Description]**

This test measures display accuracy for 1 dB, 10 dB log scales, X1 linear scales.
All scales are measured with 0 dBm reference signal.

[Specification]

Log Scale Fidelity: $\leq \pm 0.2$ dB/1 dB(after auto calibration)
 $\leq \pm 1$ dB/10 dB (after auto calibration)
 $\leq \pm 1.5$ dB/70 dB(after auto calibration)

Linear Scale Fidelity: $\pm 5\%$ of reference level

[Equipment used]

Signal Generator :SG2
 1 dB Step Attenuator :ATT1
 10 dB Step Attenuator :ATT2
 Attenuator/Switch driver :Driver
 Adapter :Type N(m) to BNC(f)
 RF Cable :BNC(m)-BNC(m)

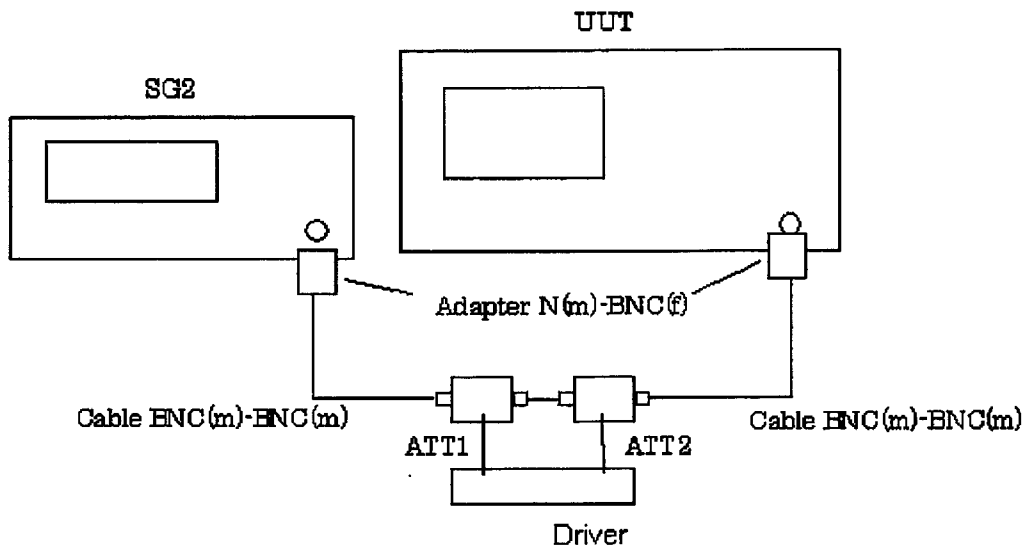
[Setup]

Figure 3-17 Setup of Scale Fidelity Test

3. PERFORMANCE VERIFICATION

[Procedure]

1. Connect equipment up as shown in Figure 3-17.
2. On the SG2, set controls as follows;

Frequency	:11 MHz
Output level	:0 dBm

3. On the UUT, press keys as follows to preset.

SHIFT, CONFIG

4. On the UUT, set controls as follows;

Center Frequency	:11 MHz
Span	:1 MHz
Reference Level	:0 dBm
RBW	:3 kHz
VBW	:100 Hz
dB/div	:1 dB/div
Trace Detector	:Posi

5. On the Driver, set ATT1 and ATT2 to 0 dB.
6. On the UUT, press keys as follows to set continuous peak search marker mode to on.

MKR, Peak Menu, Cont Peak ON/OFF(ON)

1 dB/div Log Scale

7. While monitoring UUT marker reading, adjust SG2 output level so that the UUT marker reads $0.00 \text{ dBm} \pm 0.01 \text{ dB}$.
8. On the UUT, press **SINGLE** for a single sweep.
9. On the SG2, lower the output level by 1 dB.
10. On the UUT, press **SINGLE** for a single sweep.
11. After single sweep completed, record the marker level on Table 3-17.

12. Calculate the incremental error using the following equation and record the result in the Incremental Error column on Table 3-17.

$$\text{Incremental Error} = (\text{Current marker level}) - (\text{Previous marker level}) + 1 \text{ dB}$$

13. Repeat steps 10 through 12 until the SG2 level set to the value 10 dB lower than initial set level.

Table 3-17 Log Scale Fidelity (1 dB/div ,RBW= 1 MHz)

Input Signal Level (dBm, nominal)	dB from Reference Level (dBm, nominal)	Min. (dB)	Actual (dB)	Max. (dB)
0	0	-	Reference	-
-1	-1	-1.2		-0.8
-2	-2	-2.2		-1.8
-3	-3	-3.2		-2.8
-4	-4	-4.2		-3.8
-5	-5	-5.2		-4.8
-6	-6	-6.2		-5.8
-7	-7	-7.2		-6.8
-8	-8	-8.2		-7.8
-9	-9	-9.2		-8.8
-10	-10	-10.2		-9.8

10dB/div Log Scale

14. On the UUT, press **REPEAT** for a repeat sweep.

15. On the UUT, set controls as follows;

Span :50 kHz
 dB/div :10 dB
 RBW :3 kHz

16. While monitoring UUT marker reading, adjust SG2 output level so that the UUT marker reads 0.00 dBm \pm 0.01 dB.

17. On the SG2, lower the output level by 10 dB.

If the level cannot be lowered by 10 dB, use the ATT2 to lower it 10 dB.

18. On the UUT, press **SINGLE** for a single sweep.

19. After single sweep completed, record the marker level on Table 3-18.

3. PERFORMANCE VERIFICATION

20. Calculate the incremental error using the following equation and record the result in the Incremental Error column on Table 3-18.

$$\text{Incremental Error} = (\text{Current marker level}) - (\text{Previous marker level}) + 10 \text{ dB}$$

21. Repeat steps 17 through 20 until the SG2 level is set to the value 70 dB lower than the initial set level.

Table 3-18 Log Scale Fidelity (10 dB/div, RBW= 3 kHz)

Input Signal Level (dBm, nominal)	dB from Reference Level (dBm, nominal)	Min. (dB)	Actual (dB)	Max. (dB)
0	0	-	Reference	-
-10	-10	-11		-9
-20	-20	-21		-19
-30	-30	-31		-29
-40	-40	-41		-39
-50	-50	-51		-49
-60	-60	-61		-59
-70	-70	-71		-69

Linear Scale

22. On the SG2, set controls as follows;

Frequency :11 MHz
 Output Level :0 dBm

23. On the UUT, press keys as follows to preset;

SHIFT, CONFIG

24. On the UUT, set controls as follows;

Center Frequency :11 MHz
 Span :50 kHz
 Reference Level :0 dBm
 RBW :10 kHz
 VBW :1 kHz
 Trace Detector :Posi

25. On the UUT, press keys as follows to set linear mode.

LEVEL, Linear

26. On the UUT, press keys as follows to set continuous peak search marker mode to on.

MKR, Peak Menu, Cont Peak ON/OFF(ON)

27. On the SG2, precisely adjust output level to meet reference level by monitoring marker reading on the screen.

28. After single sweep completed, read the level value displayed on the SG2 and set the value as the reference value (Ref).

29. On the SG2, set output level 0.9 dB lower than the reference value.

30. On the UUT, press **SINGLE** for a single sweep.

31. Record the level of marker reading on Table 3-19.

32. Repeat steps 30 through 31 for each input signal level as shown in the input signal column on Table 3-19.

Table 3-19 Linear Scale Fidelity (x1)

Input Signal Level		Div. from Reference Level	Δ Marker Level		
dB (nominal)	mV (nominal)		Min. (mV)	Actual (mV)	Max. (mV)
0 (Reference)	223.6	0	223.6		223.6
-0.92	201.24	1	190.1		212.4
-1.94	178.88	2	167.7		190.1
-3.10	156.52	3	145.3		167.7
-4.44	134.16	4	123.0		145.3
-6.02	111.8	5	100.6		123.0
-7.96	89.44	6	78.3		100.6
-10.46	67.08	7	55.9		78.3
-13.98	44.72	8	33.5		55.9

3. PERFORMANCE VERIFICATION

3.2.18. Input Attenuator Switching Accuracy

[Description]

This test measures the input attenuator's switching accuracy over the full 50 dB.

The measurement is done at 30 MHz.

The input attenuator switching accuracy is referenced to the 10 dB attenuator setting.

[Specification]

Input attenuator accuracy: $\leq \pm 0.3$ dB

(Referenced to 10 dB input attenuation, for 0 to 50 dB setting, at 30 MHz)

[Equipment used]

- Signal Generator :SG1
- Adapter :Type N(m) to BNC(f)
- RF Cable :BNC(m)-BNC(m)

[Setup]

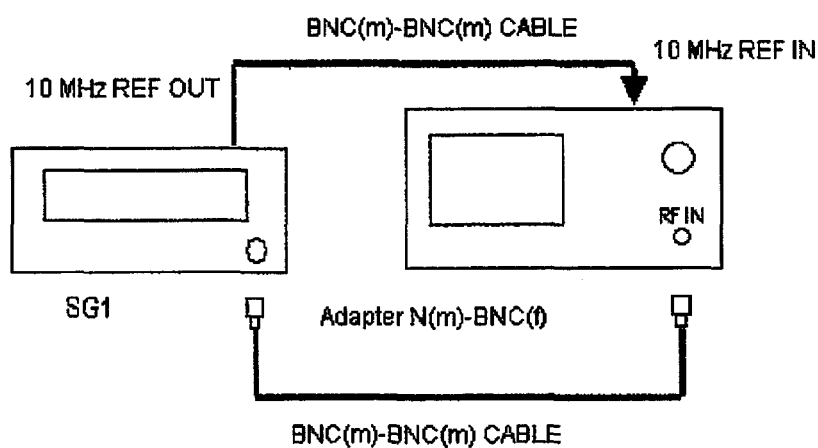


Figure 3-18 Setup of Input Attenuator Switching Accuracy Test

[Procedure]

IF gain uncertainty is measured when RBW is set to 3 kHz and the result is filled in on the IF Gain uncertainty of Table 3-18.

CAUTION

Measure IF gain uncertainty when the RBW is set to 3 kHz before doing this test. IF gain uncertainty is included in the measurement result because of IF gain's changing and measuring in this test.

1. Connect the equipment as shown in Figure 3-18.
2. On the SG1, set controls as follows;

Frequency :30 MHz
Output Level :-5 dBm

3. On the UUT, press keys as follows to preset.

SHIFT, CONFIG

4. On the UUT, set controls as follows;

Center Frequency :30 MHz
Span :50 kHz
Reference Level :0 dBm
dB/div :1 dB/div
RBW :3 kHz
Trace Detector :Posi

5. On the UUT, press keys as follows to set continuous peak search mode to on.

MKR, Peak Menu, Cont Peak ON/OFF(ON)

6. While monitoring reading of peak search marker level, adjust SG1 output level so that 5 dB lower than UUT's reference level.

3. PERFORMANCE VERIFICATION

7. On the UUT, press **SINGLE** for a single sweep.
8. Record the level of marker reading on Table 3-20 as reference value.

Table 3-20 Input Attenuator Switching Accuracy

Attenuator (dB)	IF Gain (dB)	IF Gain Uncertainty	Switching Accuracy		
			Min. (dB)	Actual (dB)	Max. (dB)
10	0	-	-		-
20	10		-0.3		+0.3
30	20		-0.3		+0.3
40	30		-0.3		+0.3
50	40		-0.3		+0.3

9. Change Input Attenuator value to 20 dB and Ref level to -10 dBm.
10. On the UUT, press **SINGLE** for a single sweep.
11. Read the level of marker reading.

The marker level measured here is subtracted from the reference value measure in the step 6.

IF gain uncertainty measured in the step 1 is subtracted from the reference value.

Records it in Table 3-19 as Actual.

$$\text{Actual} = \text{Reference value measured in step 6} - \text{Marker level measured in step 11} - \text{IF gain uncertainty measured in step 1}$$

12. Repeat steps 9 through 11 for the remaining UUT's ATT setting listed on Table 3-20.

3.3. Tracking Generator Performance Verification Procedure

This section provides tracking generator performance verification procedure.

3.3.1 Absolute Output Level Accuracy

[Description]

A calibrated power sensor is connected to the tracking generator output directly to measure the power level at 30 MHz and output level -10 dBm.

[Specification]

$\leq \pm 0.5$ dB at Frequency 30 MHz, output level -10 dBm.

[Equipment used]

RF Power Meter :PM

RF Power Sensor :PS

[Setup]

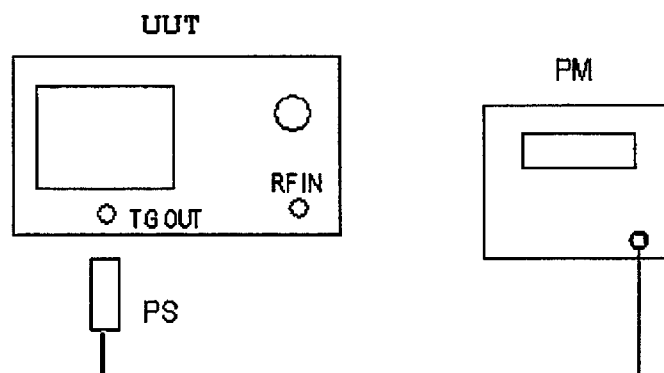


Figure 3-19 Setup of Absolute Output Level Accuracy Test

[Procedure]

1. On the PM, perform calibration with PS.
2. Connect the equipment as shown Figure 3-19.

3. PERFORMANCE VERIFICATION

3. On the UUT, after preset, set controls as follows:

Center Frequency :30 MHz
Span :0 Hz
TG Output Level :-10 dBm
TG :ON

4. On the PM, set a correction data for 30 MHz.

5. Record the measurement value of the PM on the performance verification test record sheets.

3.3.2. Output Level Flatness

[Description]

Output level flatness is measured by using RF power meter in relative mode referenced to center frequency at 30 MHz and output level -10 dBm.

TG is stepped to several frequencies throughout its range.

[Specification]

Reference to 30 MHz and -10.0 dBm

$\leq \pm 1.0$ dB, Frequency Range: 100 kHz to 1 GHz

$\leq \pm 1.5$ dB, Frequency Range: 100 kHz to 3 GHz

[Equipment used]

Power Meter :PM

Power Sensor :PS

[Setup]

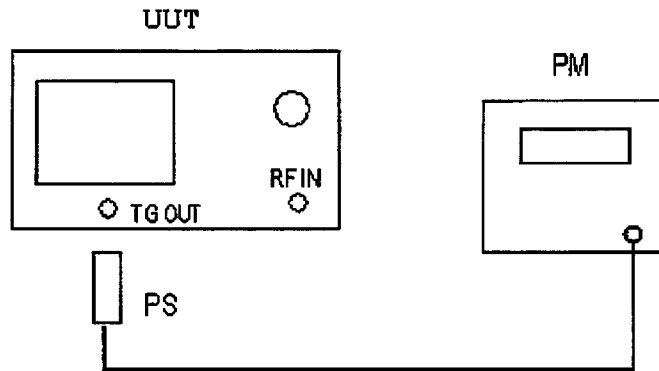


Figure 3-20 Setup of Output Level Flatness Test.

[Procedure]

1. On the PM, perform calibration with PS.
2. Connect equipment as shown in Figure 3-20.
3. On the UUT, set controls as follows:

Center Frequency	:30 MHz
Span	:0 Hz
TG level	:-10 dBm
TG	:ON

4. On the PM, set a correction data for 30 MHz.
5. On the PM, set relative measurement mode.
6. On the UUT, set center frequency to 100 kHz.
7. On the PM, set correction data for 100 kHz.
8. Record PM reading on the performance verification test record sheets.
9. Repeat steps 6 through 8 for each center frequency listed on Table 3-21.

3. PERFORMANCE VERIFICATION

Table 3-21 Setting for Output Flatness Test

Test Data for UUT
Center Frequency(Hz)
30 M
100 k
300 k
1 M
3 M
10 M
100 M
200 M
400 M
600 M
800 M
1 G
1.2 G
1.4 G
1.6 G
1.8 G
2 G
2.2 G
2.4 G
2.6 G
2.8 G
3.0 G

3.3.3. Output Level Switching Accuracy

[Description]

Measure switching accuracy of TG output attenuator, after CAL ALL performed.
Measure level of several frequencies against output level -10.0 dBm as reference.
The measurement of deviation from -10 dBm point using normalize function.
When change TG output level, reference level setting also change for trace data
to stay center of vertical on the screen.

[Specification]

Reference to -10 dBm at 30 MHz

± 1.0 dB, Frequency Range: 100 kHz to 1 GHz, TG output level ≥ -30 dBm

± 2.0 dB, Frequency Range: 100 kHz to 2.6 GHz

± 3.0 dB, Frequency range: 100 kHz to 3 GHz

[Equipment used]

RF Cable :SMA (m)-SMA (m)

Adapter :Type N (m)-SMA (f)

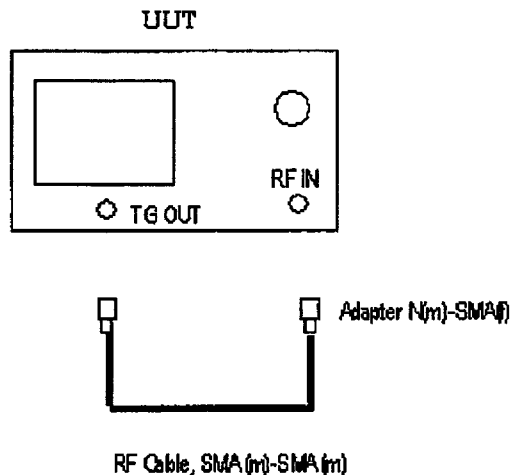
[Setup]

Figure 3-21 Setup of Output Switching Accuracy Test

[Procedure]

1. Connect equipment as shown in Figure 3-21.
2. On the UUT, press as follows to perform TG frequency cal auto.

TG, Freq Adj Auto

3. PERFORMANCE VERIFICATION

3. On the UUT, after calibration done, set controls as follows:

Center Frequency :30 MHz
 Span :50 kHz
 Reference Level :-5 dBm
 dB/div :1 dB/div
 RBW :1 MHz
 VBW :10 kHz
 TG Level :-10 dBm

4. On the UUT, press as follows to set normalized mode to on.

TG, Execute Normalize

5. On the UUT, set TG output level to 0 dBm and reference level to 5 dBm.

6. On the UUT, press **MKR** to activate marker.

7. On the UUT, press **SINGLE** for a single sweep.

8. On the UUT, after the single sweep has completed,

record the level of marker on the performance verification test record sheets.

9. Repeat 5 through 8 each TG output level and reference level listed on Table 3-22.

Table 3-22 Setting for TG output Level Switching Accuracy Test

Setting of UUT		
Center Frequency(Hz)	Output Level(dBm)	Reference Level(dBm)
30 M	-10.0	-5.0
	0	5.0
	-14.9	-9.9
	-15.0	-10.0
	-19.9	-14.9
	-20.0	-15.0
	-30.0	-25.0
	-40.0	-35.0
	-50.0	-45.0

10. Repeat steps 3 through 9 for each frequency listed on Table 3-23.

Table 3-23 Setting for Output Level Switching Accuracy Test

Setting of UUT
Center Frequency(Hz)
100 k
1 M
10 M
100 M
200 M
400 M
600 M
800 M
1 G
1.5 G
2.0 G
2.5 G
3.0 G

3.3.4. Harmonic Distortion

[Description]

The measurement for tracking generator harmonic spurious outputs.

The tracking generator output is connected to the input of a spectrum analyzer, and then set to several different frequencies as the amplitude of the second harmonics relative to the fundamental is measured at each frequency.

[Specification]

≤ -20 dBc, Output Level: 0 dBm

[Equipment used]

Spectrum Analyzer :SPA
 Adapter :Type N (m) to SMA (f)
 RF Cable :SNA (m)-SMA (m)

3. PERFORMANCE VERIFICATION

[Setup]

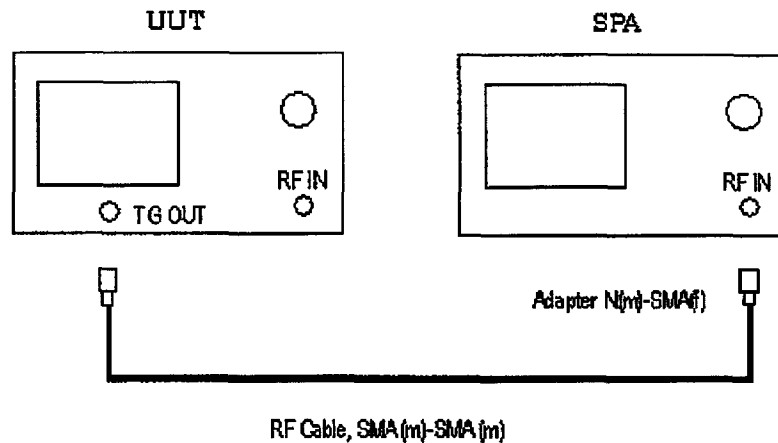


Figure 3-22 Setup of Harmonic Distortion Test

[Procedure]

1. Connect equipment as shown in Figure 3-22
2. On the UUT, after preset, set controls as follows:

Center Frequency	:100 kHz
Span	:0 Hz
RBW	:1 kHz
TG	:ON
TG Level	:-10 dBm

3. On the SPA, after preset, set controls as follows:

Center Frequency	:350 kHz
Span	:600 kHz
Reference level	:0 dBm

4. On the SPA, press **SINGLE** for a single sweep.
5. On the SPA, after the single sweep has completed, measure the level difference of signal between fundamental and second harmonic signal.
6. Record measured level difference on the performance verification test record sheets.
7. Repeat steps 2 through 6 for each setting listed on Table 3-24.

8. Record maximum data on the performance verification test record sheets as result.

Table 3-24 Setting for Harmonic Distortion Test

UUT Setting	SPA Setting	
Center Frequency	Center Frequency	Span
100 kHz	350 kHz	600 kHz
200 kHz	350 kHz	600 kHz
500 kHz	750 kHz	600 kHz
1 MHz	3.5 MHz	6 MHz
2 MHz	3.5 MHz	6 MHz
5 MHz	7.5 MHz	6 MHz
10 MHz	35 MHz	60 MHz
20 MHz	35 MHz	60 MHz
50 MHz	75 MHz	60 MHz
100 MHz	350 MHz	600 MHz
200 MHz	350 MHz	600 MHz
500 MHz	750 MHz	600 MHz
1 GHz	3.5 GHz	6 GHz
1.5 GHz	3.5 GHz	6 GHz
2 GHz	3.5 GHz	6 GHz
2.5 GHz	3.5 GHz	6 GHz
3 GHz	3.5 GHz	6 GHz

3.3.5. Non harmonic Distortion

[Description]

Measure the level difference between fundamental and signal, except for second harmonic using SPA.

[Specification]

≤ -30 dBc, Output level: -10 dBm

[Equipment used]

Spectrum Analyzer :SPA
 Adapter :Type N (m) to SMA (f)
 RF Cable :SMA (m)-SMA (m)

3. PERFORMANCE VERIFICATION

[Setup]

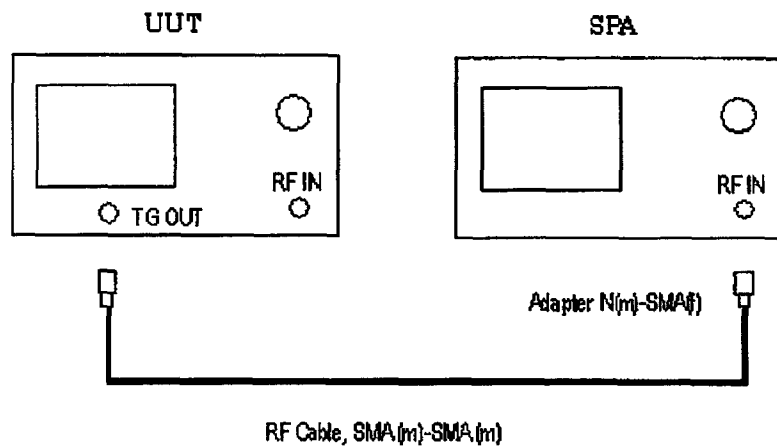


Figure 3-23 Setup of Non-Harmonic Distortion Test

[Procedure]

1. Connect equipment as shown in Figure 3-23.
2. On the UUT, after preset, set controls as follows:

Center Frequency	:0 Hz
Span	:0 Hz
Center Frequency step	:10 MHz
TG	:ON
TG level	:-10 dBm

3. On the SPA, after preset, set control as follow:

Stop Frequency	:6 GHz
----------------	--------

4. On the UUT, press Δ key, to set center frequency by 10 MHz step up to 3 GHz.
5. Capture the biggest harmonic signal except second harmonic signal.
6. Record the level difference between fundamental and biggest harmonic signal on the performance verification test record sheets.

3.3.6. TG Leakage

[Description]

Measure the leakage of TG signal by measuring UUT noise level.
TG output and RF input are terminated in 50 Ω

[Specification]

≤ -100 dBm, Input ATT: 0 dB

[Equipment used]

50 Ω Terminator :Generic

[Setup]

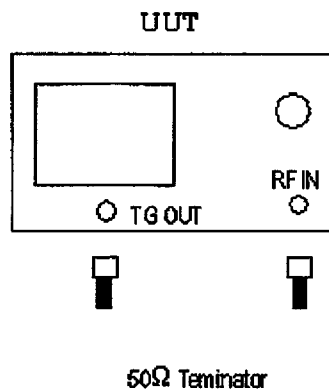


Figure 3-24 Setup of TG Leakage Test

3. PERFORMANCE VERIFICATION

[Procedure]

1. Connect equipment as shown in Figure 3-24.
2. On the UUT, after preset, set controls as follows:

Start Frequency	:30 MHz
Stop Frequency	:3.0 GHz
Sweep Time	:20 sec
RBW	:1 kHz
VBW	:10 Hz
Reference Level	:-60 dBm
Input Attenuator	:0 dB
TG Output Level	:0 dBm
TG	:ON

(Ignore UNCAL message under above setting condition)

3. On the UUT, press SINGLE for a single sweep.
4. On the UUT, after the single sweep has completed, press **PKSRCH** to capture the signal peak.
5. Record the measurement data on the performance verification test record sheets.

3.4. Performance Verification Test Record Sheet

Performance Verification Test Record

Report Number :

Customer Name :

Address :

Description :

Model Number :

Serial Number:

Asset Number :

Testing Environment : °C± °C / % ± % RH

Verification Date:

Due Date:

Equipment Used:

Model No.	Description	Trace No.	Cal Due Date
-----------	-------------	-----------	--------------

Test Officer
Date:

Head of Laboratory
Date:

3. PERFORMANCE VERIFICATION

1. Calibration Signal Amplitude Accuracy

Test Data	Specification			Result
	Min. (dBm)	Measured Value (dBm)	Max. (dBm)	
-20.0 dBm	-20.3		-19.7	Pass/Fail

2. Frequency Readout Accuracy and Frequency Marker Accuracy

2.1. Frequency Readout Accuracy

Test Data		Specification			Result
Center Frequency (Hz)	Span (Hz)	Min. (Hz)	Measured Value (Hz)	Max. (Hz)	
1.5 G	1 M	1.499960 G		1.500040 G	
	10 M	1.499968 G		1.50032 G	
	50 M	1.49845 G		1.50155 G	
	100 M	1.4968 G		1.5032 G	
	2 G	1.4940 G		1.560 G	

2.2. Frequency Marker Accuracy

Test Data		Specification			Result
Center Frequency (Hz)	Span (Hz)	Min. (Hz)	Measured Value (Hz)	Max. (Hz)	
1.5 G		1.499992 G		1.500008 G	

3. Frequency Reference Source Accuracy

Test Data		Specification			Result
Frequency (Hz)		Min. (Hz)	Measured Value (Hz)	Max. (Hz)	
10 M		9.99998 M		10.00002 M	

4. Noise Sideband

Test Data		Specification			Result
Center Frequency (Hz)	Offset Frequency (Hz)	Min. (dBc/Hz)	Measured Value (dBc/Hz)	Max. (dBc/Hz)	
1.5 G	20 k	NA		-100	

5. Frequency Span Accuracy

Test Data		Specification			Result
Center Frequency (Hz)	Span (Hz)	Min. (Hz)	Measured Value (Hz)	Max. (Hz)	
1.5 G	5 M	3.88 M		4.12 M	
	40 M	31.04 M		32.96 M	
	400 M	310.4 M		329.6 M	

6. Resolution Bandwidth Accuracy and Selectivity

6.1. Resolution Bandwidth Accuracy

Test Data		Specification			Result
RBW (Hz)		Min. (Hz)	Measured Value (Hz)	Max. (Hz)	
1 M		800 k		1.2 M	
300 k		240 k		360 k	
100 k		80 k		120 k	
30 k		24 k		36 k	
10 k		8.0 k		12.0 k	
3 k		2.4 k		3.6 k	
1 k		800		1200	

6.2. Resolution Bandwidth Selectivity

Test Data	Specification			Result
	Min.	Measured Value	Max.	
RBW (Hz)				Pass/Fail
1 M	NA		15	
300 k	NA		15	
100 k	NA		15	
30 k	NA		15	
10 k	NA		15	
3 k	NA		15	
1 k	NA		15	

7. Resolution Bandwidth Switching Uncertainty

Test Data	Specification			Result
	Min. (dB)	Measured Value (dB)	Max. (dB)	
RBW (Hz)				Pass/Fail
1 M	-0.5		0.5	
300 k	-	Reference	-	
100 k	-0.5		0.5	
30 k	-0.5		0.5	
10 k	-0.5		0.5	
3 k	-0.5		0.5	
1 k	-0.5		0.5	

8.QP(6dB) Bandwidth

Test Data	Specification			Result
	Min. (Hz)	Measured Value (Hz)	Max. (Hz)	
RBW (Hz)				Pass/Fail
120 k	96 k		144 k	
9 k	7.2 k		10.8 k	

9. Residual FM

Test Data	Specification			Result
	Min. (Hz p-p/100 msec)	Measured Value (Hzp-p/100 msec)	Max. (Hz p-p/100 msec)	
RBW(Hz)				Pass/Fail
30 k	NA		100	

10. Displayed Average Noise Level

Test Data	Specification			Result
	Min. (dBm)	Measured Value (dBm)	Max. (dBm)	
Center Frequency (Hz)				Pass/Fail
1 M	NA		-112.99	
100 M	NA		-112.80	
500 M	NA		-112.00	
1.0 G	NA		-111.00	
1.5 G	NA		-110.00	
2.0 G	NA		-109.00	
2.5 G	NA		-108.00	
3.0 G	NA		-107.00	

3. PERFORMANCE VERIFICATION

11. Gain Compression

Test Data		Specification			Result
Center Frequency (Hz)		Min. (dBm)	Measured Value (dBm)	Max. (dBm)	Pass/Fail
20.5 M		-5		NA	

12. Residual Response

Test Data		Specification			Result
Frequency range		Min. (dBm)	Measured Value (dBm)	Max. (dBm)	Pass/Fail
1 MHz to 3.0 GHz		NA		-100	

13. Second Harmonic Distortion

Test Data		Specification			Result
Fundamental Frequency(Hz)		Min. (dBc)	Measured Value (dBc)	Max. (dBc)	Pass/Fail
1.4 G		NA		-70	

14. Third Order Inter Modulation

Test Data		Specification			Result
Center Frequency (Hz)	Mixer Input Level (dBm)	Min. (dBc)	Measured Value (dBc)	Max. (dBc)	Pass/Fail
20.050 M	-20	NA		-50	

15. Frequency Response

Test Data		Specification			Result
Frequency Range (Hz)	Input Attenuator(dB)	Min. (dB)	Measured Value (dB)	Max. (dB)	Pass/Fail
100 k to 3.0 G	10	-0.5		0.5	

16. IF Gain Uncertainty

Test Data		Specification			Result
RBW (Hz)	Reference Level (dBm)	Min. (dB)	Measured Value (dB)	Max. (dB)	Pass/Fail
1 M	0	-	Reference	-	
	-1	-0.5		+0.5	
	-2	-0.5		+0.5	
	-3	-0.5		+0.5	
	-4	-0.5		+0.5	
	-5	-0.5		+0.5	
	-6	-0.5		+0.5	
	-7	-0.5		+0.5	
	-8	-0.5		+0.5	
	-9	-0.5		+0.5	
	-10	-0.5		+0.5	
	-20	-0.5		+0.5	
	-30	-0.5		+0.5	
	-40	-0.5		+0.5	
-50	-0.5		+0.5		
3 k	0	-	Reference	-	
	-1	-0.5		+0.5	
	-2	-0.5		+0.5	
	-3	-0.5		+0.5	
	-4	-0.5		+0.5	
	-5	-0.5		+0.5	
	-6	-0.5		+0.5	
	-7	-0.5		+0.5	
	-8	-0.5		+0.5	
	-9	-0.5		+0.5	
	-10	-0.5		+0.5	
	-20	-0.5		+0.5	
	-30	-0.5		+0.5	
	-40	-0.5		+0.5	
-50	-0.5		+0.5		

17. Scale Fidelity**17.1. Log Scale Fidelity (1 dB/div)**

Test Data		Specification			Result
RBW (Hz)	Reference Level (dBm)	Min. (dB)	Measured Value (dB)	Max. (dB)	Pass/Fail
1M	-1	-0.2		+0.2	
	-2	-0.2		+0.2	
	-3	-0.2		+0.2	
	-4	-0.2		+0.2	
	-5	-0.2		+0.2	
	-6	-0.2		+0.2	
	-7	-0.2		+0.2	
	-8	-0.2		+0.2	
	-9	-0.2		+0.2	
	-10	-0.2		+0.2	

3. PERFORMANCE VERIFICATION

17.2. Log Scale Fidelity (10 dB/div)

Test Data		Specification			Result
RBW (Hz)	Reference Level (dBm)	Min. (dB)	Measured Value (dB)	Max. (dB)	Pass/Fail
3 k	-10	-1.0		+1.0	
	-20	-1.0		+1.0	
	-30	-1.0		+1.0	
	-40	-1.0		+1.0	
	-50	-1.0		+1.0	
	-60	-1.0		+1.0	
	-70	-1.0		+1.0	

17.3. Linear Scale Fidelity

Test Data		Specification			Result
div from Reference Level		Min. (mV)	Measured Value (mV)	Max. (mV)	Pass/Fail
0 (Reference)		223.6		223.6	
1		190.1		212.4	
2		167.7		190.1	
3		145.3		167.7	
4		123.0		145.3	
5		100.6		123.0	
6		78.3		100.6	
7		55.9		78.3	
8		33.5		55.9	

18. Input Attenuator Accuracy

Test Data		Specification			Result
Center Frequency (Hz)	Attenuator (dB)	Min. (dB)	Measured Value (dB)	Max. (dB)	Pass/Fail
30 M	20	-0.3		+0.3	
	30	-0.3		+0.3	
	40	-0.3		+0.3	
	50	-0.3		+0.3	

Tracking Generator (Option)

19. Absolute Output Level Accuracy

Test Data	Specification			Result
	Min (dBm)	Measured Value (dBm)	Max (dBm)	Pass/Fail
-10 dBm	-10.5		-9.5	

20. Output Level Flatness

Test Data		Specification			Result
Output Level (dBm)	Center Frequency (Hz)	Min. (dB)	Measured Value (dB)	Max. (dB)	Pass/Fail
-10	30 M	-	0(Ref.)	-	
	100 k	-1.0		+1.0	
	300 k	-1.0		+1.0	
	1 M	-1.0		+1.0	
	3 M	-1.0		+1.0	
	10 M	-1.0		+1.0	
	100 M	-1.0		+1.0	
	200 M	-1.0		+1.0	
	400 M	-1.0		+1.0	
	600 M	-1.0		+1.0	
	800 M	-1.0		+1.0	
	1 G	-1.0		+1.0	
	1.2 G	-1.5		+1.5	
	1.4 G	-1.5		+1.5	
	1.6 G	-1.5		+1.5	
	1.8 G	-1.5		+1.5	
	2 G	-1.5		+1.5	
	2.2 G	-1.5		+1.5	
	2.4 G	-1.5		+1.5	
2.6 G	-1.5		+1.5		
2.8 G	-1.5		+1.5		
3.0 G	-1.5		+1.5		

3. PERFORMANCE VERIFICATION

21. Output Level Switching Accuracy

Test Data			Specification			Result
Center Frequency (Hz)	Output Level (dBm)	Reference Level (dBm)	Min. (dB)	Measured Value (dB)	Max. (dB)	Pass/Fail
100 k	-10.0	-5.0	NA	Reference	NA	
	0	5.0	-1.0		+1.0	
	-14.9	-9.9	-1.0		+1.0	
	-15.0	-10.0	-1.0		+1.0	
	-19.9	-14.9	-1.0		+1.0	
	-20.0	-15.0	-1.0		+1.0	
	-30.0	-25.0	-1.0		+1.0	
	-40.0	-35.0	-2.0		+2.0	
1 M	-50.0	-45.0	-2.0		+2.0	
	-10.0	-5.0	NA	Reference	NA	
	0	5.0	-1.0		+1.0	
	-14.9	-9.9	-1.0		+1.0	
	-15.0	-10.0	-1.0		+1.0	
	-19.9	-14.9	-1.0		+1.0	
	-20.0	-15.0	-1.0		+1.0	
	-30.0	-25.0	-1.0		+1.0	
10 M	-40.0	-35.0	-2.0		+2.0	
	-50.0	-45.0	-2.0		+2.0	
	-10.0	-5.0	NA	Reference	NA	
	0	5.0	-1.0		+1.0	
	-14.9	-9.9	-1.0		+1.0	
	-15.0	-10.0	-1.0		+1.0	
	-19.9	-14.9	-1.0		+1.0	
	-20.0	-15.0	-1.0		+1.0	
100 M	-30.0	-25.0	-1.0		+1.0	
	-40.0	-35.0	-2.0		+2.0	
	-50.0	-45.0	-2.0		+2.0	
	-10.0	-5.0	NA	Reference	NA	
	0	5.0	-1.0		+1.0	
	-14.9	-9.9	-1.0		+1.0	
	-15.0	-10.0	-1.0		+1.0	
	-19.9	-14.9	-1.0		+1.0	
200 M	-20.0	-15.0	-1.0		+1.0	
	-30.0	-25.0	-1.0		+1.0	
	-40.0	-35.0	-2.0		+2.0	
	-50.0	-45.0	-2.0		+2.0	
	-10.0	-5.0	NA	Reference	NA	
	0	5.0	-1.0		+1.0	
	-14.9	-9.9	-1.0		+1.0	
	-15.0	-10.0	-1.0		+1.0	

21. Output Level Switching Accuracy (Con'd)

Test Data			Specification			Result
Center Frequency (Hz)	Output Level (dBm)	Reference Level (dBm)	Min. (dB)	Measured Value (dB)	Max. (dB)	Pass/Fail
400 M	-10.0	-5.0	NA	Reference	NA	
	0	5.0	-1.0		+1.0	
	-14.9	-9.9	-1.0		+1.0	
	-15.0	-10.0	-1.0		+1.0	
	-19.9	-14.9	-1.0		+1.0	
	-20.0	-15.0	-1.0		+1.0	
	-30.0	-25.0	-1.0		+1.0	
	-40.0	-35.0	-2.0		+2.0	
	-50.0	-45.0	-2.0		+2.0	
600 M	-10.0	-5.0	NA	Reference	NA	
	0	5.0	-1.0		+1.0	
	-14.9	-9.9	-1.0		+1.0	
	-15.0	-10.0	-1.0		+1.0	
	-19.9	-14.9	-1.0		+1.0	
	-20.0	-15.0	-1.0		+1.0	
	-30.0	-25.0	-1.0		+1.0	
	-40.0	-35.0	-2.0		+2.0	
	-50.0	-45.0	-2.0		+2.0	
800 M	-10.0	-5.0	NA	Reference	NA	
	0	5.0	-1.0		+1.0	
	-14.9	-9.9	-1.0		+1.0	
	-15.0	-10.0	-1.0		+1.0	
	-19.9	-14.9	-1.0		+1.0	
	-20.0	-15.0	-1.0		+1.0	
	-30.0	-25.0	-1.0		+1.0	
	-40.0	-35.0	-2.0		+2.0	
	-50.0	-45.0	-2.0		+2.0	
1 G	-10.0	-5.0	NA	Reference	NA	
	0	5.0	-1.0		+1.0	
	-14.9	-9.9	-1.0		+1.0	
	-15.0	-10.0	-1.0		+1.0	
	-19.9	-14.9	-1.0		+1.0	
	-20.0	-15.0	-1.0		+1.0	
	-30.0	-25.0	-1.0		+1.0	
	-40.0	-35.0	-2.0		+2.0	
	-50.0	-45.0	-2.0		+2.0	
1.5 G	-10.0	-5.0	NA	Reference	NA	
	0	5.0	-2.0		+2.0	
	-14.9	-9.9	-2.0		+2.0	
	-15.0	-10.0	-2.0		+2.0	
	-19.9	-14.9	-2.0		+2.0	
	-20.0	-15.0	-2.0		+2.0	
	-30.0	-25.0	-2.0		+2.0	
	-40.0	-35.0	-2.0		+2.0	
	-50.0	-45.0	-2.0		+2.0	

3. PERFORMANCE VERIFICATION

21. Output Level Switching Accuracy (Con'd)

Test Data			Specification			Result
Center Frequency (Hz)	Output Level (dBm)	Reference Level (dBm)	Min. (dB)	Measured Value (dB)	Max. (dB)	Pass/Fail
2.0 G	-10.0	-5.0	NA	Reference	NA	
	0	5.0	-2.0		+2.0	
	-14.9	-9.9	-2.0		+2.0	
	-15.0	-10.0	-2.0		+2.0	
	-19.9	-14.9	-2.0		+2.0	
	-20.0	-15.0	-2.0		+2.0	
	-30.0	-25.0	-2.0		+2.0	
	-40.0	-35.0	-2.0		+2.0	
	-50.0	-45.0	-2.0		+2.0	
2.5 G	-10.0	-5.0	NA	Reference	NA	
	0	5.0	-2.0		+2.0	
	-14.9	-9.9	-2.0		+2.0	
	-15.0	-10.0	-2.0		+2.0	
	-19.9	-14.9	-2.0		+2.0	
	-20.0	-15.0	-2.0		+2.0	
	-30.0	-25.0	-2.0		+2.0	
	-40.0	-35.0	-2.0		+2.0	
	-50.0	-45.0	-2.0		+2.0	
3.0 G	-10.0	-5.0	NA	Reference	NA	
	0	5.0	-3.0		+3.0	
	-14.9	-9.9	-3.0		+3.0	
	-15.0	-10.0	-3.0		+3.0	
	-19.9	-14.9	-3.0		+3.0	
	-20.0	-15.0	-3.0		+3.0	
	-30.0	-25.0	-3.0		+3.0	
	-40.0	-35.0	-3.0		+3.0	
	-50.0	-45.0	-3.0		+3.0	

22. Harmonic Distortion

Test Data		Specification			Result
Frequency Range (Hz)	Output Level (dBm)	Min. (dBc)	Measured Value (dBc)	Max. (dBc)	Pass/Fail
100 k to 3 G	0	NA		-20	

23. Non harmonic Distortion

Test Data		Specification			Result
Frequency Range (Hz)	Output Level (dBm)	Min. (dBc)	Measured Value (dBc)	Max. (dBc)	Pass/Fail
100 k to 3 G	0	NA		-30	

24. TG Leakage

Test Data		Specification			Result
Frequency Range (Hz)		Min. (dBmm)	Measured Value (dBm)	Max. (dBm)	Pass/Fail
100 k to 3 G		NA		-100	

4. ADJUSTMENT

4.1. Frequency Reference Adjustment

This section provides the internal frequency reference adjustment procedure.

[Description]

Tune frequency reference source oscillator to meet the specification.

This parameter specifies frequency measurement accuracy.

[Specification]

± 2 ppm*

*ppm is an abbreviation of parts per million

[Equipment used]

Signal Generator :SG1

Frequency Standard :Generic

[Setup]

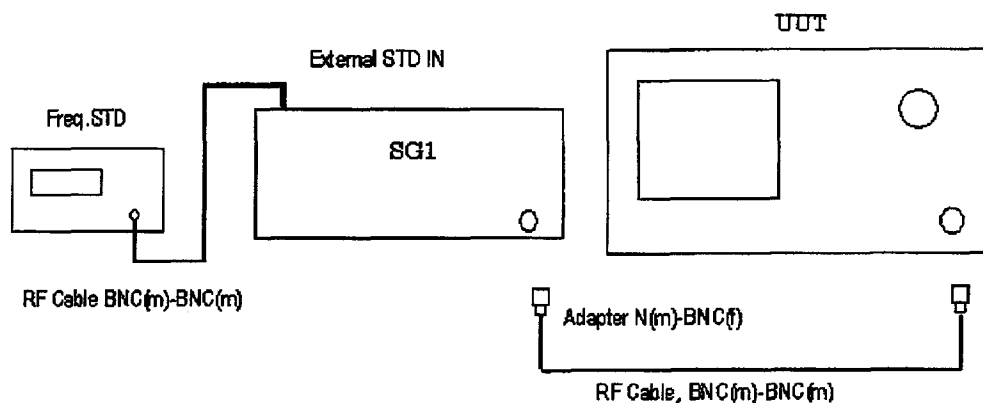


Figure 4-1 Setup of Frequency Reference Adjustment

4. ADJUSTMENT

[Procedure]

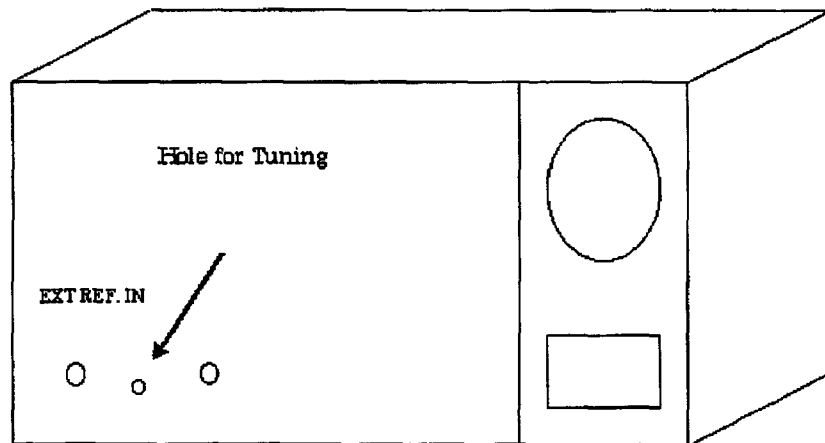
1. Connect the equipment shown Figure 4-1.
2. On the SG1, set controls as follows;

Frequency :1 GHz
Output Level :-10 dBm

3. On the UUT, set controls as follows;

Center Frequency :1 GHz
Span :1 MHz
Peak Search Marker :ON
Counter :ON
Counter Resolution :1 Hz

4. Tune internal oscillator so that counter reading on the display is $1 \text{ GHz} \pm 200 \text{ Hz}$.
Tuning potentiometer location is shown Figure 4-2.



Rear View of UUT

Figure 4-2 Location of Adjustment Potentiometer

5. TROUBLESHOOTING

This chapter provides information of troubleshooting as followings:

- 5.1 Preventive Maintenance
- 5.2 Preparation
- 5.3 Isolation of Failure Block
- 5.4. Error Code List
- 5.5. Removal and Installation

5.1. Preventive Maintenance

This section provides cleaning procedure of display (TFT) filter.

Cleaning the outer surface of the filter is sufficient.

If after cleaning the outer surface of the filter, the display appears dark or dirty or unfocused, clean the inner surface of display filter following procedures.

CAUTION!

Do not touch the TFT display with your finger when the filter removed.

Do not use any chemical solvent such as benzene, toluene, xylene, acetone for cleaning

1. Remove the 2 pieces of screws, referring Figure 5 -1.

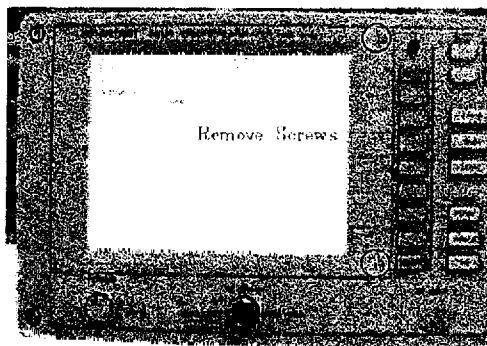


Figure 5-1 Location of Screws fixed Bezel Display

5. TROUBLESHOOTING

2. Remove the display bezel assembly, refer to Figure 5 -2.

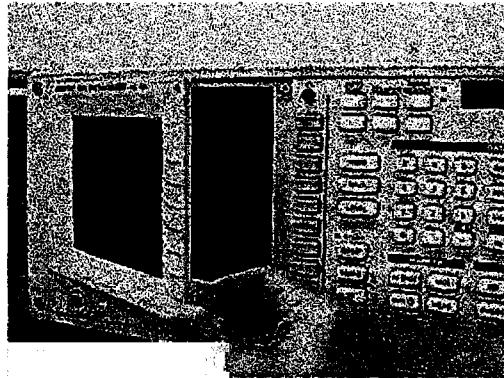


Figure 5-2 Removal of Bezel Display

3. Clean the inner surface of display filter and the surface of TFT with a soft cloth dampened water with mild soap.
Do not use any chemical solvent such as benzene, toluene, xylene, acetone for cleaning.
Allow the surface to dry and then reassemble the display bezel.

5.2. Preparation

5.2.1. Introduction

This section provides general information for handling replaceable assemblies.

WARNING!

Only personnel with knowledge of electronic circuitry and awareness with hazards involved should remove and install any printed circuit board assemblies.

CAUTION!

To prevent equipment circuit damage, always remove the ac line power cord before removing or replacing any assembly.

To prevent static zap of ICs, always observe anti-static techniques when assemblies are handled or serviced.

5.2.2. General Caution for Handling Replaceable Assemblies

STATIC HANDLING

Static electricity is a familiar phenomenon which, except for an occasional shock, does not seem very serious. However, it has been proven that in the electronics industry electrostatic discharge (ESD) is a major cause of component failure.

In many cases, the component damaged may not immediately fail, causing low instrument reliability and future repair.

ESD damage can occur at a static level below human perception. It has also been shown that ESD can affect both passive and active devices.

The following guidelines are the minimum requirements for a static safe service environment.

- ◆ The workbench should be equipped with a conductive table mat. The mat should be grounded to the earth ground through a 1M-ohm resistor. The mat should be equipped with at least one swivel connector for connecting a wrist strap.
- ◆ All service and handling personnel should wear a conductive wrist strap in contact with bare skin. This strap should be connected to the swivel connector on the conductive table mat through a 1M-ohm resistor.
- ◆ All the metal equipment at the workstation must be grounded. This includes soldering irons, soldering removers, and equipment stands.
- ◆ Only one common ground should be provided at the workstation.
- ◆ The workstation should be kept free of nonconductors. No common plastics, polybags, cardboard, cigarette or candy wrappers should be allowed. There should not be rugs or carpet on the floor, shelving, or bench top.
- ◆ Only proper containers should be used for shipping, storing or transporting assemblies. This is required on any assembly shipped to ADVANTEST for repair.

5. TROUBLESHOOTING

CLEAN HANDLING

Due to the high performance of the U3661, use the following clean handling techniques when removing and installing assemblies.

- ◆ Handle the assemblies only by their edges.
- ◆ Be sure to place them on clean workbench away from dirty or dusty conditions.

5.3. Isolation of Failure Block

5.3.1. Introduction

This section provides information for isolating failure block.

To isolate failure block uses information of the self-test function.

5.3.2. Isolation of Failure Block

The R3131/R3131A equipped self-diagnostic function, which can be isolated failure block.

This section describes how to use this function.

It has 2 modes diagnostic function.

1. Power on Self Test
2. "Self Test" function

Repair will be done as assembly after determines failure block or module by these functions.

This section describe those function and summarized correspondence between test result and failure board or module for assembly level repair.

5.3.3. Power on Self Test

It is executed automatically by every power on to test logic circuit mainly.

Its result display on the display "PASS/FAIL", or Error codes.

It is summarized as Table 5-1

Once failure block or module is determined, take replacement procedure following Section 5-4.

***Replacement of board or module does not required any of adjustment.**

Table 5-1 Summary of Power on Self-Test

No.	Test Item	Board or Module tested	Result display	Possibility of failure cause on Board or Module
1	Pre memory	CPU/AD	SWEEP LED blinking	CPU/AD BLOCK
2	Display memory	CPU/AD	SHIFT LED blinking	CPU/AD BLOCK
3	LCD & LED	CPU/AD	-	
4	Memory	CPU/AD	PASS or FAIL	CPU/AD BLOCK
5	RTC	CPU/AD	PASS or FAIL	CPU/AD BLOCK
6	Panel	Key board	PASS or FAIL	FRONT BLOCK
7	Super I/O	CPU/AD	PASS or FAIL	CPU/AD BLOCK
8	AD logic I/F	CPU/AD	Error 150 with audible sound	CPU/AD BLOCK
9	AD SRAM	CPU/AD	Error 151 with audible sound	CPU/AD BLOCK
10	IF/LOG logic I/F	IF/LOG	Error 152 with audible sound	IF/LOG BLOCK
11	RF logic I/F	RF	Error 153 with audible sound	RF UNIT
12	RF EEPROM	RF	Error 154 with audible sound	RF UNIT

5.3.4. Self-Test Function

This function executes more functional test of each board or module, even analog circuit. Result of test is displayed "PASS or "FAIL on the display.

This section describes how to use it, what each test item is and summarized correspondence between test result and failure board or module.

During operate this mode, all the key are not function except soft menu key on the display.

5. TROUBLESHOOTING

5.3.4.1. How to use it ?

On the UUT, press keys as follows to enter the self-test mode.

SHIFT, 0

Then you can go in "Self Test" mode as shown Figure 5-3.

To execute this function select "Execute Self Test" and to return to normal operation mode, select "Exit".

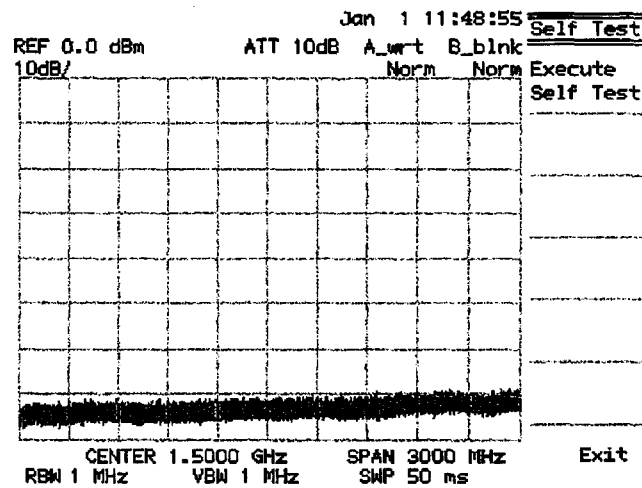


Figure 5-3 Self-Test Mode Display

Once select it ,self test is executing functional test sequentially as follows, then result is displayed "PASS or FAIL" on the display as shown Figure 5-4.

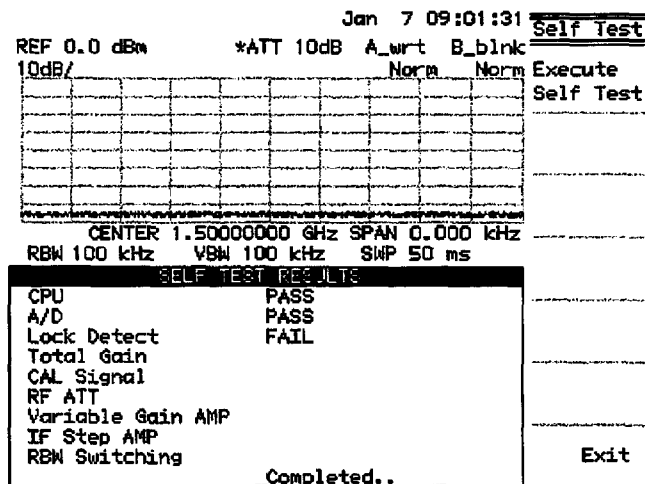


Figure 5-4 Self-Test Result Display

5.3.4.2. Explanation of Each Test Item

Each test item explanation summarize on Table 5-2.

Table 5-2 Each Test item Explanation

No.	Test Items	Explanations
1	CPU	Check CPU basic function such as arithmetic function and display
2	A/D	Check A/D function by automatic adjustment function of Detector, Magnifier amp, Ramp circuit.
3	Lock Detector	Check Phase Lock Loop output voltage of RF unit
4	Total Gain	Check the total gain through RF unit and IF
5	CAL. Signal	Check CAL. Signal level by switching its level from -10 dBm to -70 dBm.
6	RF ATT.	Check Attenuation level by switching attenuator from 0 dB to 50 dB
7	Variable Gain Amp	Check Variable Gain Amp's gain by changing control voltage of its circuit
8	IF Step Amp.	Check Error of 10dB step amplifier and 1dB step attenuator by switching its driving signal
9	RBW switching	Check Error of RBW switching between

Summary between test result and failure board or module is shown on Table 5-3.

Once failure block or module is determined, take replacement procedure following Section 5-6.

***Replacement of board or module is not required any of adjustment.**

Table 5-3 Summary of Self-Test and Failure Board

No.	Test Item	Object functional circuit	Result Display	Possibility of failure cause on Board or Module
1.	CPU	CPU basic function	PASS/FAIL	CPU(BLL-023465)
2.	A/D	A/D converter	PASS/FAIL	CPU(BLL-023465)
3.	Lock Detector	Phase lock Loop	PASS/FAIL	RF unit(WUN0R3131*RF)
4.	TotalGain	Total gain	PASS/FAIL	RF unit(WUN0R3131*RF) & IF/LOG(BLL-023464)
5.	CAL. Signal	CAL. signal circuit	PASS/FAIL	RF unit(WUN0R3131*RF)
6.	RF ATT.	RF attenuator	PASS/FAIL	RF unit(WUN0R3131*RF)
7.	Variable Gain Amp	Variable amplifier	PASS/FAIL	RF unit(WUN0R3131*RF)
8.	IF Step Amp.	10dB step amplifier/1dB step attenuator	PASS/FAIL	IF/LOG(BLL-023464)
9.	RBW switching	RBW switching between	PASS/FAIL	IF/LOG(BLL-023464)

5. TROUBLESHOOTING

5.3.5. Tracking Generator (Option)

Tracking generator is checking functional circuit in-side itself.

At every sweep end, It check output level control circuit such as a ALC circuit.

Once detect error, it displays error code on the display such 801 and 802.

When error code display, please take TG module replacement procedure following Section 5-5.

5.4. Error Code List

Error code list is shown Table 5-4.

Once find error code No.106,150,151,152,153,154,155, go to Self Test function which describes in Section 5.3.4. to confirm what problem is.

Then take a replacement procedure, which describes in Section 5-5 to change defective block.

Table 5-4 Error Code List (1/2)

Error No.	Error Message	Description
001	Span is set 0 Hz Pls change span	Zero Span is selected Please set the correct span.
002	Scale is Linear Mode. Pls select dB/div scale	Vertical scale is set to Linear mode Please select dB/div scale
003	QP detector is activate Pls change to Normal.	QP detection mode is selected. Please change to Normal mode.
004	Antenna correction is ON Pls turn correction off.	Antenna correction is active. Please turn Antenna correction to off.
005	Scale is not 10 dB/div. Pls select dB/div scale	The vertical scale is not set to 10 dB/div. Please select 10 dB/div scale
006	Δ Marker is not activate. Pls activate Δ Marker.	The delta marker is not active. Please activate the delta marker.
007	Blank mode is selected. Pls change to Write mode.	Cannot execute because the blank mode is selected. Please change to Write mode.
008	Calculated power is out of range.	The display line cannot be displayed because the measurement result is out of range.
009	No peak is detected.	No corresponding peak has been detected
010	Parameter is set over the scale.	The set parameter is incorrect.
011	Ant Corr data is not save to RAM. Pls select device FD.	Antenna correction data cannot be saved to RAM. Please select floppy disk as destination.
100	IF STEP AMP: Calibration failure.	A calibration failure occurred
101	LOG LINEARITY: Calibration failure.	A calibration failure occurred
102	TOTAL GAIN: Calibration failure.	A calibration failure occurred
103	RBW SWITCHING: Calibration failure.	A calibration failure occurred
104	AMPTD MAG: Calibration failure.	A calibration failure occurred
105	Cal data is not enough. Pls execute Cal All.	A calibration failure occurred
106	Calibration signal is not detected.	No calibration signal has been detected
150	Self Test failure. Pls report to qualified service person.	Self Test selected an error. Please contact qualified service representative
151	Self Test failure. Pls report to qualified service person.	Self Test selected an error. Please contact qualified service representative
152	Self Test failure. Pls report to qualified service person.	Self Test selected an error. Please contact qualified service representative
153	Self Test failure. Pls report to qualified service person.	Self Test selected an error. Please contact qualified service representative
154	Self Test failure. Pls report to qualified service person.	Self Test selected an error. Please contact qualified service representative
155	Broken Freq-Corr data. Pls report to qualified service person.	Freq-Corr data has been destroyed. Please contact qualified service representative

5. TROUBLESHOOTING

Table 5-4 Error Code List (2/2)

Error No.	Error Message	Description
200	Illegal parameters.	The specified parameter is wrong.
201	Software version unmatched	The software version is incompatible.
202	Can't format a device	The disk cannot be formatted properly
203	File or register empty	The recall command could not be executed successfully because the file or register is empty
204	Trace buffer full.	The area reserved for trace data is full.
205	Device not ready	The device is not communicable
206	Read error	The file cannot be read out
207	File not found	No file has been found
208	Invalid BPB. Pls format disk.	The BPB has been erased. Please format disk.
209	Can't delete a file. (read-only file)	This is a read-only file and cannot be deleted
210	Media changed.	The disk was replaced with another while it was being accessed
211	No disk space	There is no space on the disk
212	Read-only file.	This is a read-only file.
213	Read-only media	This is a read-only media
214	Root directory full	The Root directory is full
215	Invalid boot sector signature	The boot sector signature cannot be recognized
216	CRC error	A CRC error occurred
217	invalid disk geometry	An invalid disk geometry
218	File number is over 999. Pls reset file counter.	The file number exceeded 999. Please reset the file counter.
300	Printer is not ready. Pls check a printer setting.	Cannot print. Please check the printer setting.
301	Printer cable problem. Pls check a cable or connection.	There is a problem with the printer cable. Please check the cable connection
302	Printer is not active.	the printer is not enable.
303	Printer is busy.	The printer is currently being used.
800	TG output signal is not detected.	TG output signals cannot be detected.
801	TG Freq Adjust failure. Pls report to qualified service person.	Automatic TG frequency adjustments cannot be performed. Please contact qualified service personnel for repair information.
802	TG Unleveled. Pls report to qualified service person.	An abnormal TG level is detected. Please contact qualified service personnel for repair information.
803	Normalize buffer full.	There is not enough memory to store the normalization data

5.5. Removal and Installation

Once determined failure board or module, please take following procedure to replace defective board or module with new one.

5.5.1. Tool required

Following tools are required for board or module removal and installation.

- 1) 4 mm Phillips screw driver x1 pc
- 2) 3 mm Hexagonal screw driver x1 pc
- 3) 14 mm Hexagonal box spanner x1 pc

5.5.2. CPU/AD, IF/LOG Removal and Installation.

1. Remove 4 pieces hexagonal screws.

Locations of screws are referred to Figure 5-5.

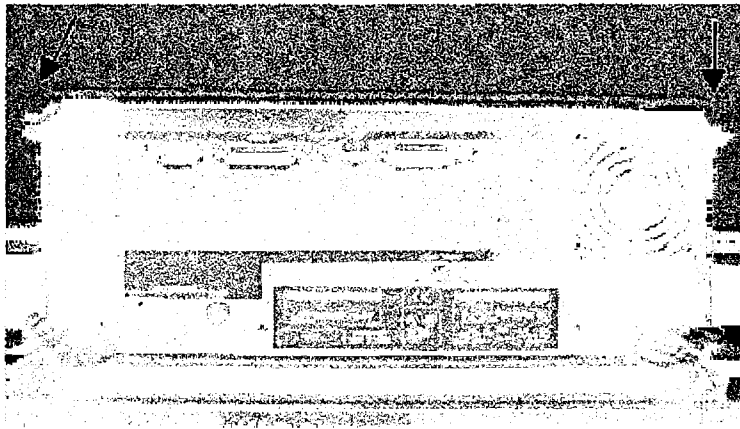


Figure 5-5 Locations of Screws

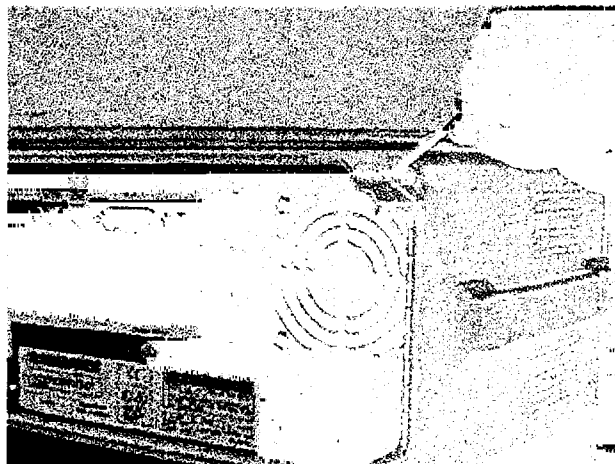


Figure 5-6 Removal of Screws

5. TROUBLESHOOTING

- 2. Remove rear shield cover

Remove screws and nut, refer to Figure 5-7.

Then pull rear shield cover off.

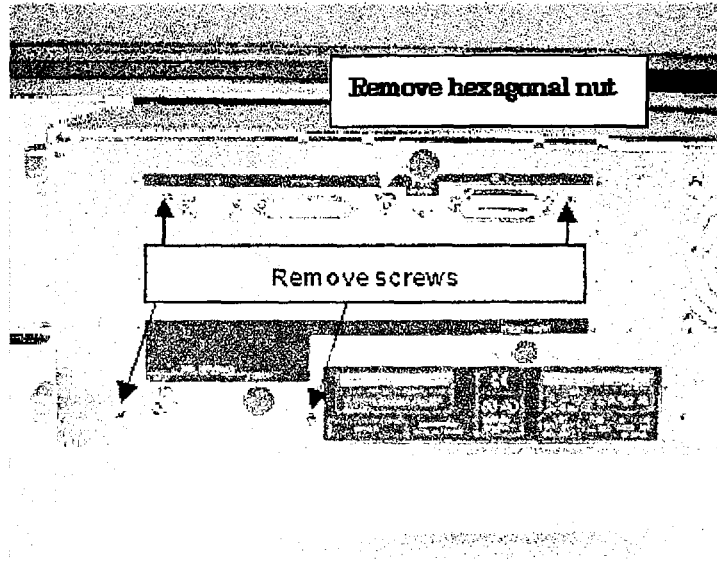


Figure 5-7 Locations of Screws (Rear Panel)

Figure 5-8 shows locations of each block.

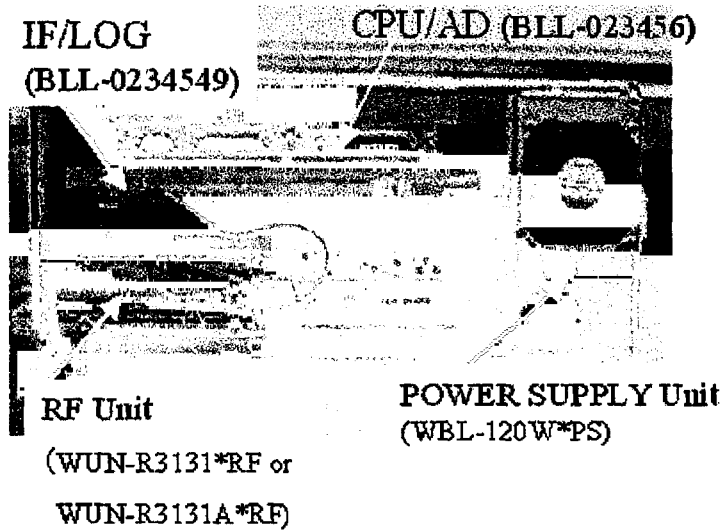


Figure 5-8 Board Locations View from Rear Side

3. Pull defective board off by ejector, refer to Figure 5-9

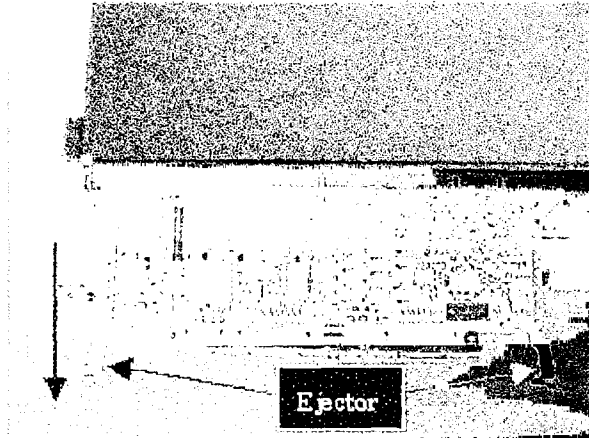


Figure 5-9 Removal of CPU/AD (BLL-023465)

4. Replace defective board with new one.
5. Use reverse procedure for fixing back.

External views of CPU/AD (BLL-023465) and IF/LOG (BLL-023454) are shown in Figure 5-10 and Figure 5-11.

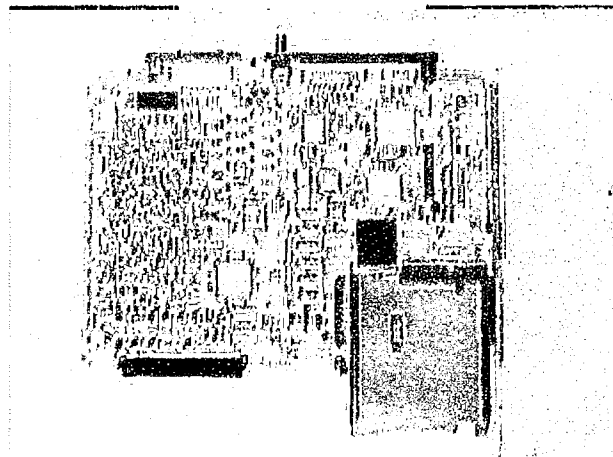


Figure 5-10 External View of CPU/AD(BLL-023465)

5. TROUBLESHOOTING



Figure 5-11 External View of IF/LOG(BLL-023454)

5.5.3. RF Unit Removal and Installation

1. Use procedure 1 through 2 described in section 5.5.2.
2. Remove screws on the bottom case, refer to Figure 5-12.

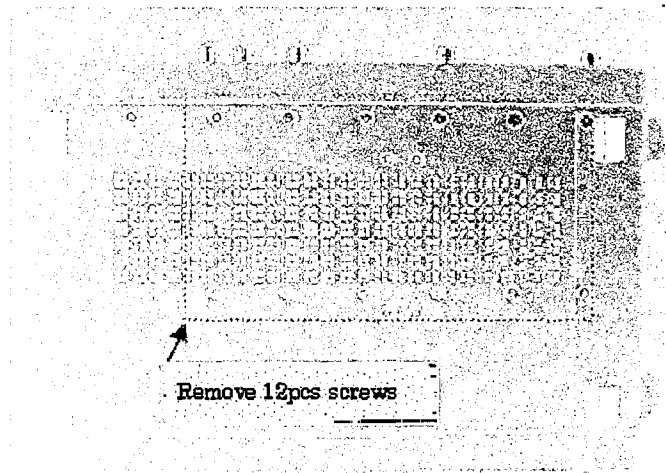


Figure 5-12 Locations of Screws (Bottom Case)

3. Remove connector refer to Figure 5-13, and then pull RF unit off by using ejector.

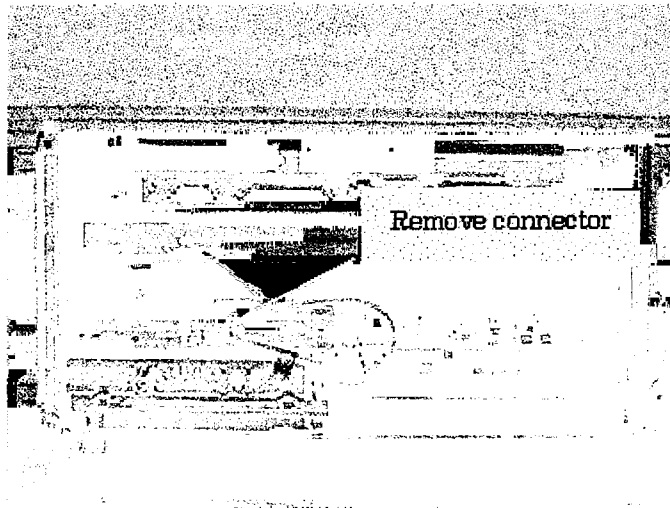


Figure 5-13 Location of Connector

4. Replace defective RF unit with new unit.
5. Use reverse procedure for fixing back.

External view of RF unit is shown in Figure 5-14.

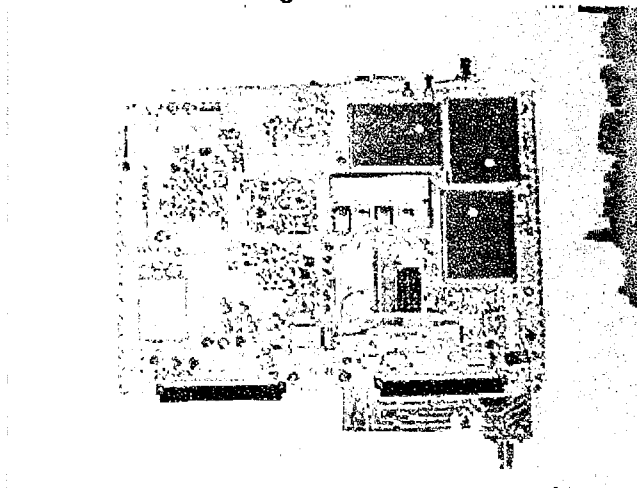


Figure 5-14 External View of RF Unit

5. TROUBLESHOOTING

5.5.4. Power Supply Unit Removal/ Installation

1. Remove CPU/AD board (BLL-023465), IF/LOG board (BLL-023454) and RF unit(WUN-3131*RF), by using procedures described in section 5.5.2 and 5.5.3.

Figure 5-15 shows rear view after remove CPU/AD board(BLL-023465), IF/LOG board (BLL-023454) and RF unit

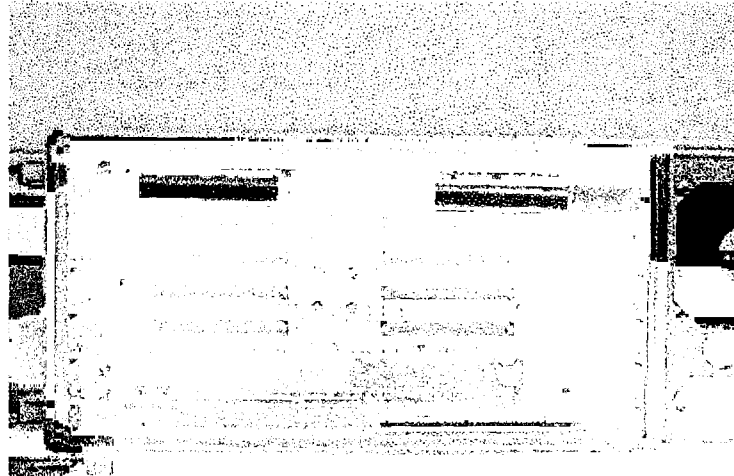


Figure 5-15 Rear View after Removal

2. Remove 2 pieces screws of bottom of chases referring Figure 5-16.

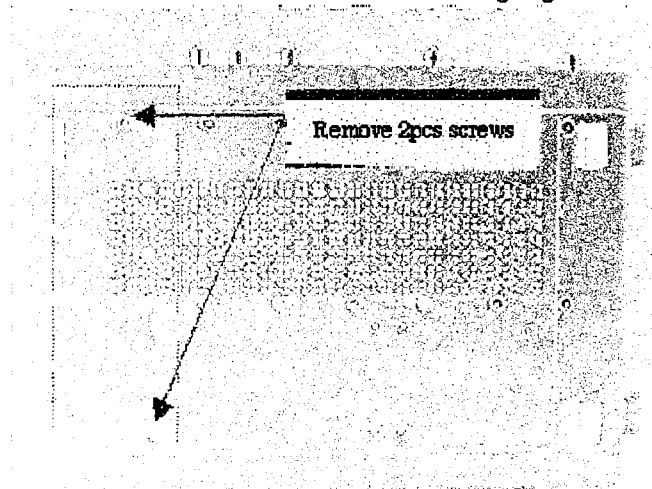


Figure 5-16 Locations of Screws (Bottom Case)

3. Pull power supply unit out, refer to Figure 5-17.



Figure 5-17 Removal Power Supply Unit

4. Replace defective power supply unit with new unit, then use reverse procedure for fixing back.

Power supply unit is shown Figure 5-18.

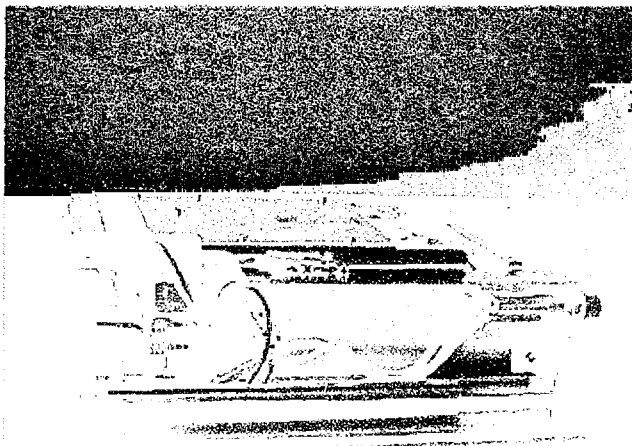


Figure 5-18 External View of Power Supply Unit

5. TROUBLESHOOTING

5.5.5. FRONT Block Removal and Installation

1. Remove TFT bezel, refer to Figure 5-19 and Figure 5-20.

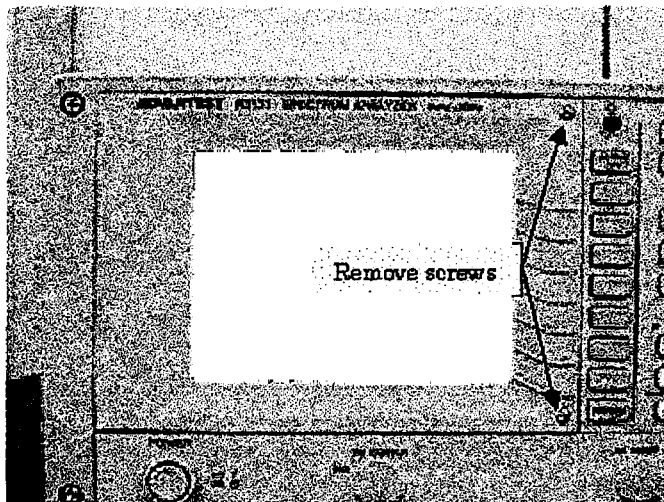


Figure 5-19 Locations of Screws (TFT Bezel)

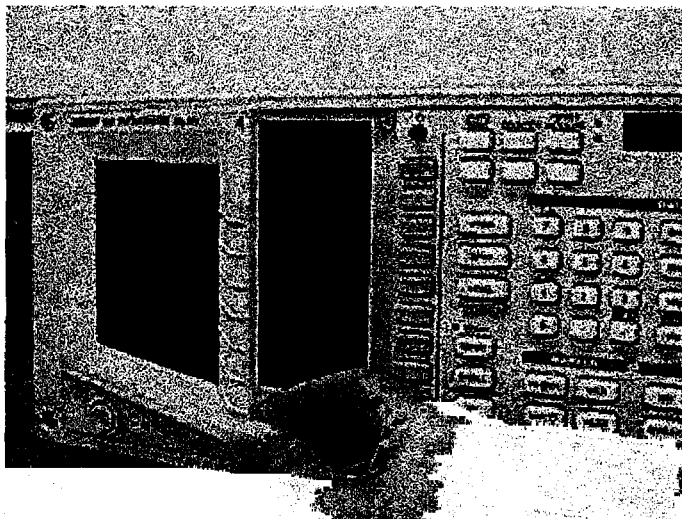


Figure 5-20 Removal of TFT Bezel

2. Remove 4 pieces hexagonal screws, refer to Figure 5-21.

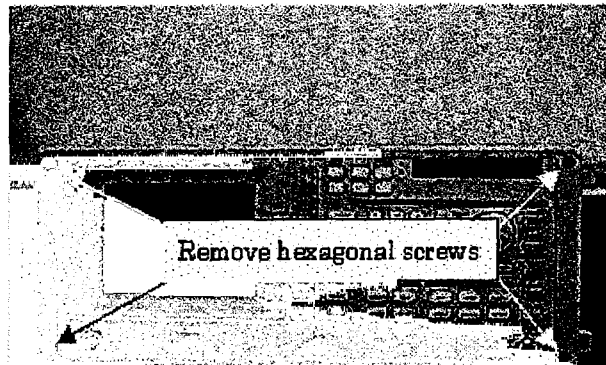


Figure 5-21 Locations of Screws (Front Frame)

3. Remove frame front by pulling out, and then remove 2 pieces screws refer to Figure 5-22.

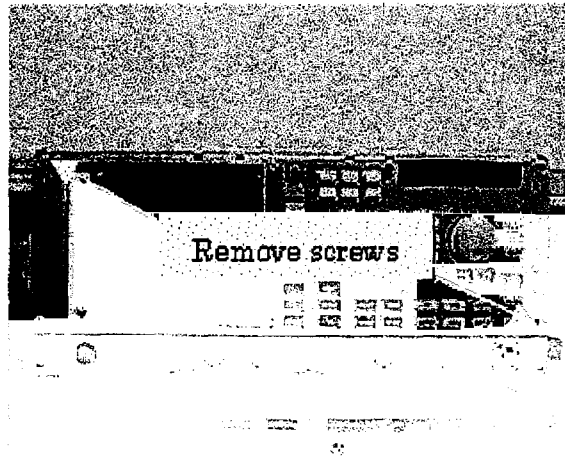


Figure 5-22 Locations of Screws (Front Panel)

4. Remove FRONT block, refer to Figure 5-23.

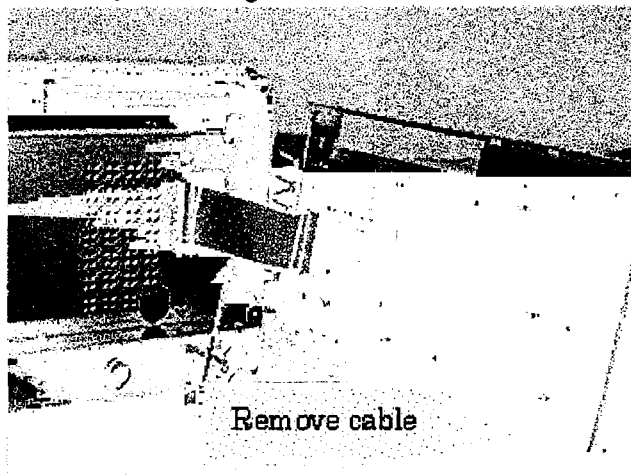


Figure 5-23 Removal of Front Block

5. TROUBLESHOOTING

5. Replace defective block with new one, then use reverse procedure for fixing back.

5.5.6. Display Block Removal and Installation

1. Remove FRONT block by using procedures described in section 5.5.5.
2. Remove 4 pieces screws refer to Figure 5-24.

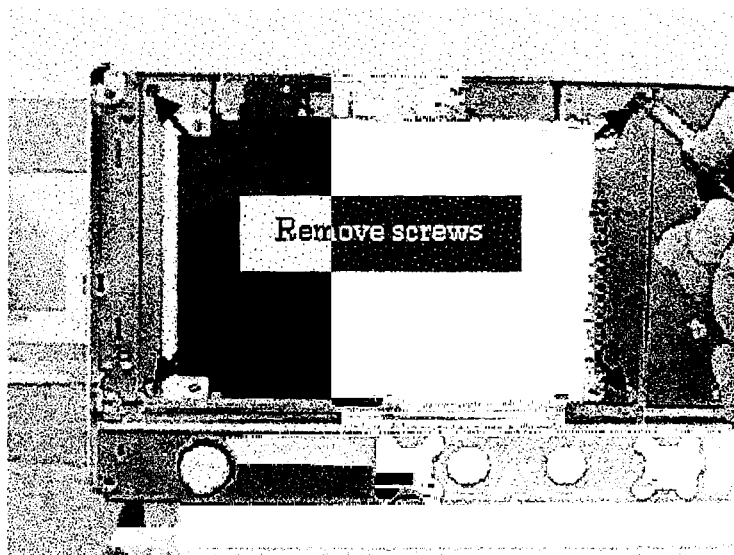


Figure 5-24 Locations of Screws (Display Block)

3. Remove display block, refer to Figure 5-25.

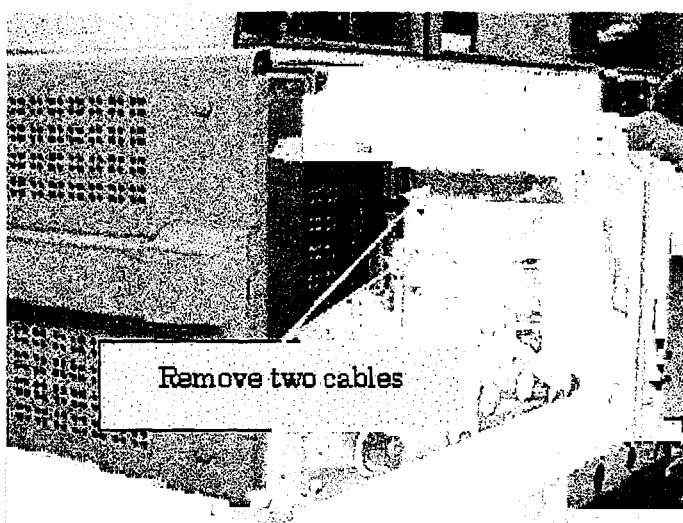


Figure 5-25 Removal of Display Block

4. Replace defective block to new one, then take reverse procedure for fixing back.

5.5.7. TG Block Removal and Installation

1. Remove rear panel and rear shield cover by using steps 1 through 3 described in section 5.5.3.

TG block is assembled with RF unit. Figure 5-26 is shown location view from rear.

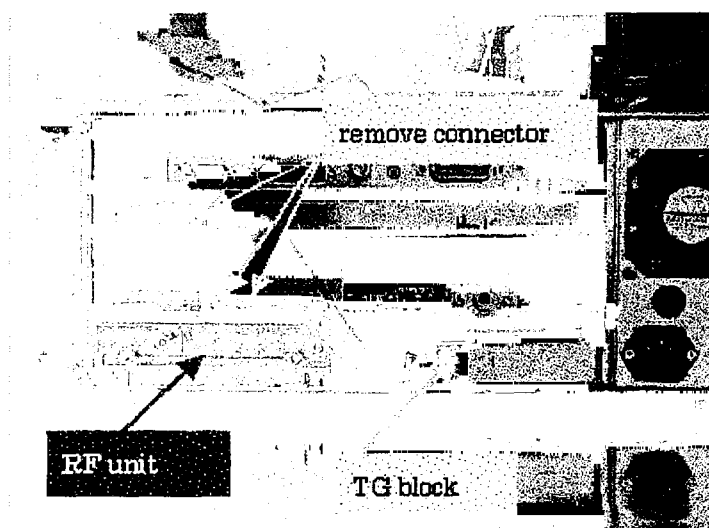


Figure 5-26 Location of TG Block

2. Remove three connectors as shown Figure 5-26.
3. Pull RF unit with TG block out.

TG block is assembled by 4 pieces screws with RF unit.

Both unit connect with flat cable and RF cable(semi-rigid).

4. Remove 4 pieces screws, refer to Figure 5-27

5. TROUBLESHOOTING



Figure 5-27 Locations of Screws(RF Unit)

5. Remove RF cable connector from TG block, referring Figure 5-28.

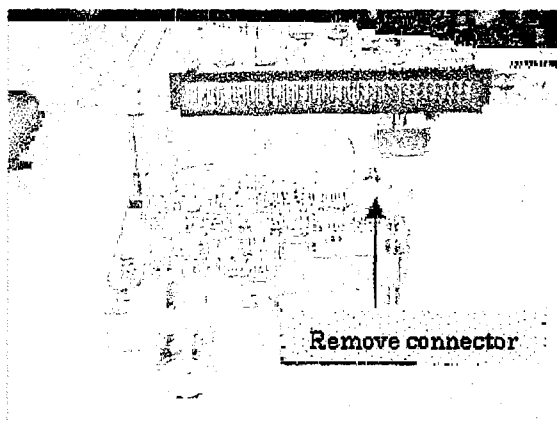


Figure 5-28 Location of RF Cable(TG Block)

6. Disassemble TG block from RF unit by removing flat cable.

Figure 5-29 shows external view of TG block.

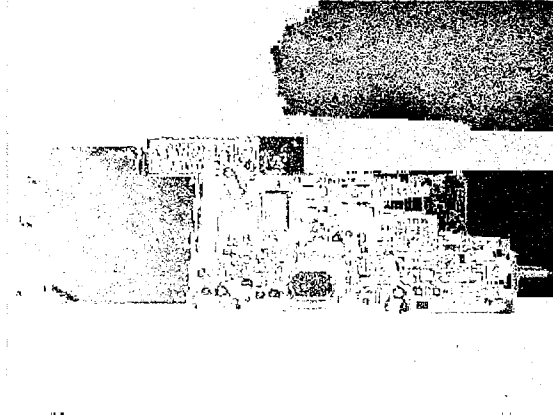


Figure 5-29 External View of TG Block

7. Replace defective block with new one, and then use reverse procedure for fixing back.

6. REPLACEABLE PARTS

6.1. Introduction

This chapter provides information for ordering replaceable parts.

6.2. Ordering Information

To order a part listed in the replaceable parts list, quote Advantest part number, indicate the description, quantity required, including your Model Number and serial number.

Then address the order to the nearest Advantest office or representatives of Advantest in your region.

The offices are listed at the back of this manual.

6.3. Replaceable Parts List

The replaceable parts are listed on the Table 6-1.

All the parts are replaceable with no adjustment.

Table 6-1 Replaceable Parts List

No.	Description	Parts Codes	
		R3131	R3131A
1	CPU/AD	BLL-023465	BLL-023465
2	IF/LOG	BLL-023464	BLL-023464
3	RF unit	WUN-R3131*RF	WUN-R3131A*RF
4	Display block	WBL-R3131*DISP	WBL-R3131*DISP
5	Power supply block	WBL-120W*PS	WBL-120W*PS
6	Tracking generator block	WBL-R3131*TG	WBL-R3131*TG
7	Front block	WBL-R3131*FRONT	WBL-R3131A*FRONT
8	Floppy disk drive	AAA-05HG5661-1	AAA-05HG5661-1
9	Chasis	MBT-E0181A-1	MBT-E0181A-1
10	Handle	MME-F6700A001A-2	MME-F6700A001A-2
11	Handle cover	MME-F6697A001A-2	MME-F6697A001A-2
12	Foot	MME-F6695A001A-2	MME-F6695A001A-2
13	Frame Rear	MME-E0197A001A-2	MME-E0197A001A-2
14	Frame Rear	MME-E0198A001A-2	MME-E0198A001A-2
15	Bezel Display	MME-E0202A001A-2	MME-E0202A002A-2
16	Cover Guard (rear,front)	MME-F6773A001B-2	MME-F6773A001B-2

Appendix

A.1. Firmware Upgrading Procedure

If UUT needs to up date its firmware, follow the installation procedure.

In this chapter italic "xxx" means soft key on the panel.

[Procedure]

1. Power UUT switch on.
2. After self-test completed, press keys as follows to preset.

SHIFT, CONFIG

3. Power UUT switch off.
4. Insert floppy disk for installation to floppy disk drive.
5. Power UUT switch on again.
6. Firmware loading starts automatically.
7. Wait until "EJECT MEDIA & REBOOT" message displays on the display.
8. Eject floppy disk from floppy disk drive.
9. Power UUT switch off.
10. Power UUT switch on, and then confirm no error messages appear.
11. Confirmation firmware revision number.

Press keys as follows to check the revision number;

CONFIG, 1/2 MORE, REVISION

12. Confirm revision number is same as installed firmware revision.

LIMITED WARRANTY

1. Unless otherwise specifically agreed by Seller and Purchaser in writing, ADVANTEST will warrant to the Purchaser that during the Warranty Period this Product (other than consumables included in the Product) will be free from defects in material and workmanship and shall conform to the specifications set forth in this Operation Manual.
2. The warranty period for the Product (the "Warranty Period") will be a period of one year commencing on the delivery date of the Product.
3. If the Product is found to be defective during the Warranty Period, ADVANTEST will, at its option and in its sole and absolute discretion, either (a) repair the defective Product or part or component thereof or (b) replace the defective Product or part or component thereof, in either case at ADVANTEST's sole cost and expense.
4. This limited warranty will not apply to defects or damage to the Product or any part or component thereof resulting from any of the following:
 - (a) any modifications, maintenance or repairs other than modifications, maintenance or repairs (i) performed by ADVANTEST or (ii) specifically recommended or authorized by ADVANTEST and performed in accordance with ADVANTEST's instructions;
 - (b) any improper or inadequate handling, carriage or storage of the Product by the Purchaser or any third party (other than ADVANTEST or its agents);
 - (c) use of the Product under operating conditions or environments different than those specified in the Operation Manual or recommended by ADVANTEST, including, without limitation, (i) instances where the Product has been subjected to physical stress or electrical voltage exceeding the permissible range and (ii) instances where the corrosion of electrical circuits or other deterioration was accelerated by exposure to corrosive gases or dusty environments;
 - (d) use of the Product in connection with software, interfaces, products or parts other than software, interfaces, products or parts supplied or recommended by ADVANTEST;
 - (e) the occurrence of an event of force majeure, including, without limitation, fire, explosion, geological change, storm, flood, earthquake, tidal wave, lightning or act of war; or
 - (f) any negligent act or omission of the Purchaser or any third party other than ADVANTEST.
5. **EXCEPT TO THE EXTENT EXPRESSLY PROVIDED HEREIN, ADVANTEST HEREBY EXPRESSLY DISCLAIMS, AND THE PURCHASER HEREBY WAIVES, ALL WARRANTIES, WHETHER EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, (A) ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND (B) ANY WARRANTY OR REPRESENTATION AS TO THE VALIDITY, SCOPE, EFFECTIVENESS OR USEFULNESS OF ANY TECHNOLOGY OR ANY INVENTION.**
6. **THE REMEDY SET FORTH HEREIN SHALL BE THE SOLE AND EXCLUSIVE REMEDY OF THE PURCHASER FOR BREACH OF WARRANTY WITH RESPECT TO THE PRODUCT.**
7. **ADVANTEST WILL NOT HAVE ANY LIABILITY TO THE PURCHASER FOR ANY INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL OR PUNITIVE DAMAGES, INCLUDING, WITHOUT LIMITATION, LOSS OF ANTICIPATED PROFITS OR REVENUES, IN ANY AND ALL CIRCUMSTANCES, EVEN IF ADVANTEST HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES AND WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING, WITHOUT LIMITATION, NEGLIGENCE), STRICT LIABILITY, INDEMNITY, CONTRIBUTION OR OTHERWISE.**

CUSTOMER SERVICE DESCRIPTION

In order to maintain safe and trouble-free operation of the Product and to prevent the incurrence of unnecessary costs and expenses, ADVANTEST recommends a regular preventive maintenance program under its maintenance agreement.

ADVANTEST's maintenance agreement provides the Purchaser on-site and off-site maintenance, parts, maintenance machinery, regular inspections, and telephone support and will last a maximum of ten years from the date the delivery of the Product. For specific details of the services provided under the maintenance agreement, please contact the nearest ADVANTEST office listed at the end of this Operation Manual or ADVANTEST's sales representatives.

Some of the components and parts of this Product have a limited operating life (such as, electrical and mechanical parts, fan motors, unit power supply, etc.). Accordingly, these components and parts will have to be replaced on a periodic basis. If the operating life of a component or part has expired and such component or part has not been replaced, there is a possibility that the Product will not perform properly. Additionally, if the operating life of a component or part has expired and continued use of such component or part damages the Product, the Product may not be repairable. Please contact the nearest ADVANTEST office listed at the end of this Operation Manual or ADVANTEST's sales representatives to determine the operating life of a specific component or part, as the operating life may vary depending on various factors such as operating condition and usage environment.

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

Mühlendorfstr. 15 (P.O.B. 80 1429, D-81614 München)

D-81671 München, Germany

Phone : 49-89-4129-13711 Facsimile : 49-89-4129-13723

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