ADVANTEST

ADVANTEST CORPORATION

R3968 OPT11

9 Port Test Adapter

Operation Manual

MANUAL NUMBER FOE-8440039A01

First printing May 20, 2002
Printed in Japan

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.
  - Connect the power cable to a power outlet that is connected to a protected ground terminal. Grounding will be defeated if you use an extension cord which does not include a protected ground terminal.
  - Be sure to use fuses rated for the voltage in question.
  - Do not use this instrument with the case open.
  - Do not place anything on the product and do not apply excessive pressure to the 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 before their expected lifespan has expired to maintain the performance and function of the instrument.
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.
The parts inside are not user-replaceable. For a part replacement, please contact the Advantest sales office for servicing.

Each product may use parts with limited life.
For more information, refer to the section in this document where the parts with limited life are described.

Main Parts with Limited Life

Part name	Life
Unit power supply	5 years
Fan motor	5 years
Electrolytic capacitor	5 years
LCD display	6 years
LCD backlight	2.5 years
Floppy disk drive	5 years
Memory backup battery	5 years

- **Hard Disk Mounted Products**

The operational warnings are listed below.

- Do not move, shock and vibrate the product while the power is turned on.
  Reading or writing data in the hard disk unit is performed with the memory disk turning at a high speed. It is a very delicate process.

- Store and operate the products under the following environmental conditions.
  An area with no sudden temperature changes.
  An area away from shock or vibrations.
  An area free from moisture, dirt, or dust.
  An area away from magnets or an instrument which generates a magnetic field.

- Make back-ups of important data.
  The data stored in the disk may become damaged if the product is mishandled. The hard disc has a limited life span which depends on the operational conditions. Note that there is no guarantee for any loss of data.

- **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
- Altitude of up to 2000 m

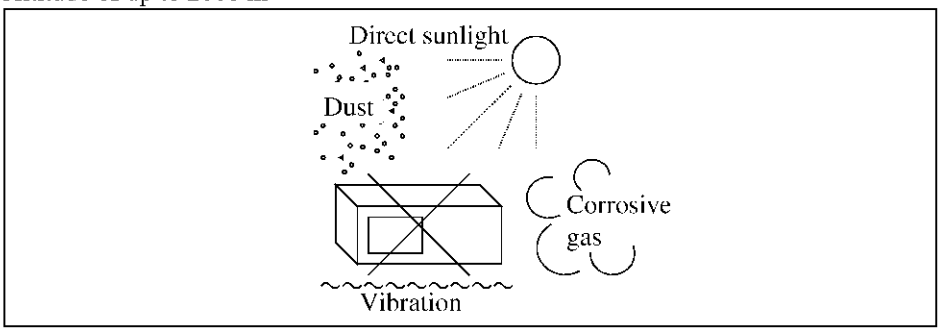


Figure-1 Environmental Conditions

- Operating position

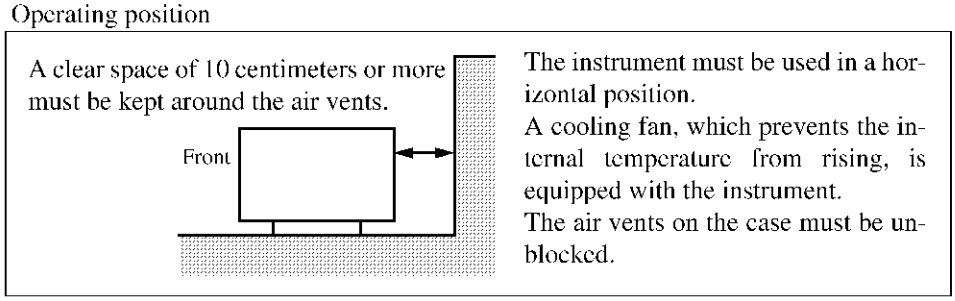


Figure-2 Operating Position

- Storage position

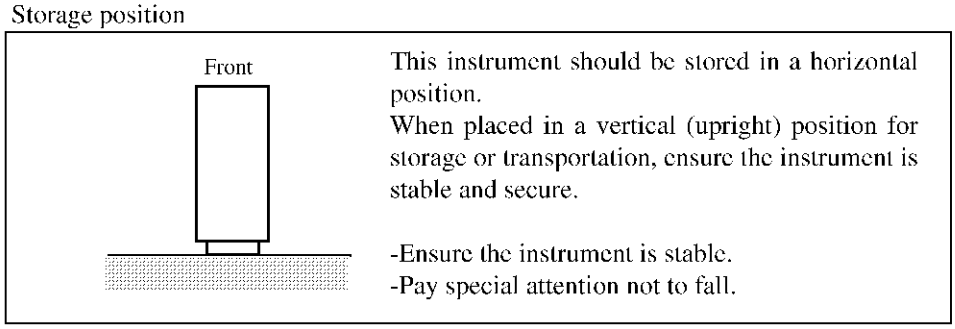


Figure-3 Storage Position

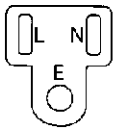
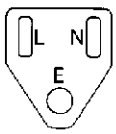
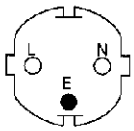
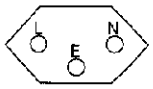
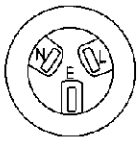
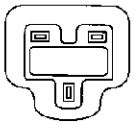
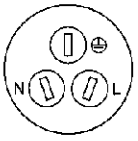
- The classification of the transient over-voltage, which exists typically in the main power supply, and the pollution degree is defined by IEC61010-1 and described below.

  Impulse withstand voltage (over-voltage) category II defined by IEC60364-4-443

  Pollution Degree 2

Types of Power Cable

Replace any references to the power cable type, according to the following table, with the appropriate power cable type for your country.

Plug configuration	Standards	Rating, color and length	Model number (Option number)
	PSE: Japan Electrical Appliance and Material Safety Law	125 V at 7 A Black 2 m (6 ft)	Straight: A01402 Angled: A01412
	UL: United States of America CSA: Canada	125 V at 7 A Black 2 m (6 ft)	Straight: A01403 (Option 95) Angled: A01413
	CEE: Europe DEMKO: Denmark NEMKO: Norway VDE: Germany KEMA: The Netherlands CEBEC: Belgium OVE: Austria FIMKO: Finland SEMKO: Sweden	250 V at 6 A Gray 2 m (6 ft)	Straight: A01404 (Option 96) Angled: A01414
	SEV: Switzerland	250 V at 6 A Gray 2 m (6 ft)	Straight: A01405 (Option 97) Angled: A01415
	SAA: Australia, New Zealand	250 V at 6 A Gray 2 m (6 ft)	Straight: A01406 (Option 98) Angled: ---------
	BS: United Kingdom	250 V at 6 A Black 2 m (6 ft)	Straight: A01407 (Option 99) Angled: A01417
	CCC:China	250 V at 10 A Black 2 m (6 ft)	Straight: A114009 (Option 94) Angled: A114109

Certificate of Conformity

CE

This is to certify, that

9 Port Test Adapter

R3968 OPT11

instrument, type, designation

complies with the provisions of the EMC Directive 89/336/EEC in accordance with EN61326 and Low Voltage Directive 73/23/EEC in accordance with EN61010.

ADVANTEST Corp.

Tokyo, Japan

ROHDE&SCHWARZ

Engineering and Sales GmbH
Munich, Germany

3968.00

PREFACE

- This manual describes the following test adapter.

  9 port test adapter R3968 OPT11

- Instruments which can be used with the R3968 OPT11 are shown below:

  RF component analyzer R3860 OPT14
  (Firmware version: SYS A00)

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LIST OF TABLES

1. INTRODUCTION

Includes the accessories along with information on the R3968 OPT11s' operating environment, and information on how to perform a system checkout for users who operate the R3968 OPT11 for the first time.

1.1 Products Overview

The R3968 OPT11, when connected to the R3860 OPT14 can easily measure transmission and reflection characteristics without reconnecting any 9 port devices.

1.2 Accessories

Table 1-1 list the standard accessories that come with the instrument. If any of the accessories are damaged or missing, contact a sales representative. Order new accessories by type name.

Table 1-1 List of R3968 OPT11 Standard Accessories

Part name	Type name	Remarks
Semi-rigid cable (Port 1)	A112004	1
Semi-rigid cable (Port 2)	A112005	1
Semi-rigid cable (Port 3)	A112006	1
Semi-rigid cable (Port 4)	A112007	1
N-SMA conversion connector	HRM-554S	4
Control cable	A01293	1
Operation manual	ER3968	1

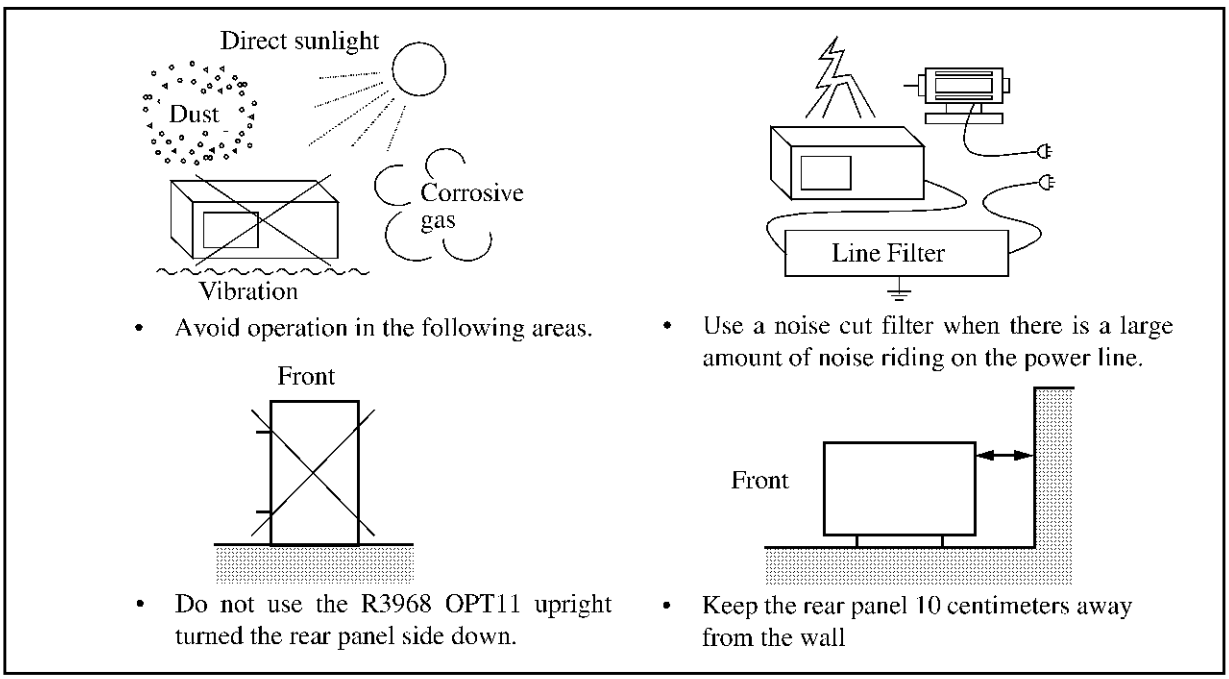
1.3 Operating Environment

This section describes the environmental conditions and power requirements necessary to use the R3968 OPT11.

1.3.1 Environmental Conditions

The R3968 OPT11 should be only be used in an area which satisfies the following conditions:

- Ambient temperature: +5°C to +40°C (Operating temperature range: When the floppy disk drive is used)
  0°C to +50°C (Operating temperature range: When the floppy disk drive is used)
  -20°C to +60°C (Storage temperature range)
- Relative humidity: 80% or less (without condensation)
- An area free from corrosive gas
- An area away from direct sunlight
- A dust-free area
- An area free from vibrations
- A low noise area
  Although the R3968 OPT11 has been designed to withstand a certain amount of noise riding on the AC power line, it should be used in an area of low noise. Use a noise cut filter when ambient noise is unavoidable.



- Avoid operation in the following areas.
- Use a noise cut filter when there is a large amount of noise riding on the power line.
- Do not use the R3968 OPT11 upright turned the rear panel side down.
- Keep the rear panel 10 centimeters away from the wall

Figure 1-1 Operating Environment

The R3968 OPT11 can be used safely under the following conditions:

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

1.4 Notes on Use

1. Before starting the measurement

   Before turning the R3860 OPT14 on, connect the R3968 OPT11 to the R3860 OPT14 using the control cable. (For more information, refer to Chapter 3, "CONNECTING THE R3968 OPT11 TO THE R3860 OPT14.")

2. Removing of case

   Do not open the case to one except service engineer of our company. The R3968 OPT11 has a high temperature part and a high pressure part.

3. When abnormality occurs

   When smoke rises from the R3968 OPT11, smell nastily, or rear unusual sound feel, turn off the **POWER** switch. Pull out power cable from the outlet. And contact to our company.

   The address and the telephone number of our company are in the end of this manual.

4. Electromagnetic interference.

   Electromagnetic interference may be caused to the television or the radio.

   If the R3968 OPT11 power is turned off and the electromagnetic interference is reduced, then the R3968 OPT11 has caused the problem.

   Prevent electromagnetic interference by the following procedure.

   - Change the direction of antenna of the television or the radio.
   - Place the R3968 OPT11 the other side of the television or the radio.
   - Place the R3968 OPT11 away from the television or the radio.
   - Use another line of power source for the television or the radio than the R3968 OPT11.

5. Prevention of Electrostatic Buildup

   To prevent damages to semiconductor parts from electrostatic discharge (ESD), the precautions shown below should be taken. We recommend that two or more measures be combined to provide adequate protection from ESD. (Static electricity can easily be built up when a person moves or an insulator is rubbed.)

   Countermeasure example

Human body:	Use of a wrist strap (see Figure 1-2).
Floor in the work area:	Installation of a conductive mat, the use of conductive shoes, and grounding (see Figure 1-3).
Benchboard:	Installation of a conductive mat and grounding (see Figure 1-4).

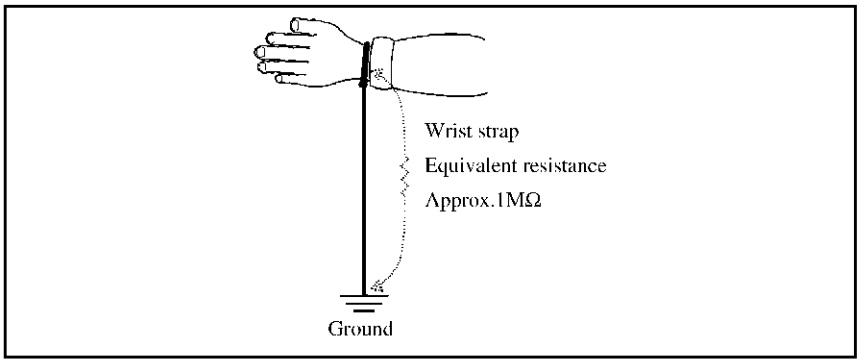


Figure 1-2 Countermeasures for Static Electricity of Human Bodies

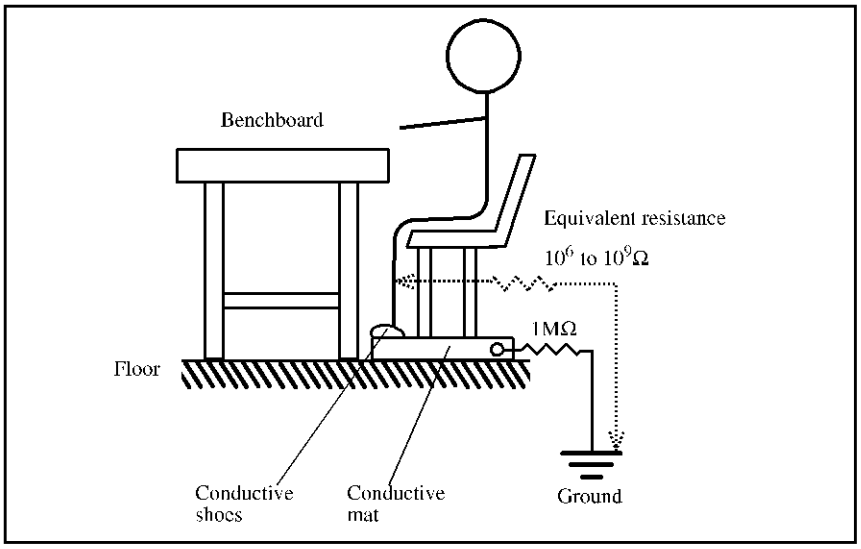


Figure 1-3 Countermeasures for Electrostatic on Work Floor

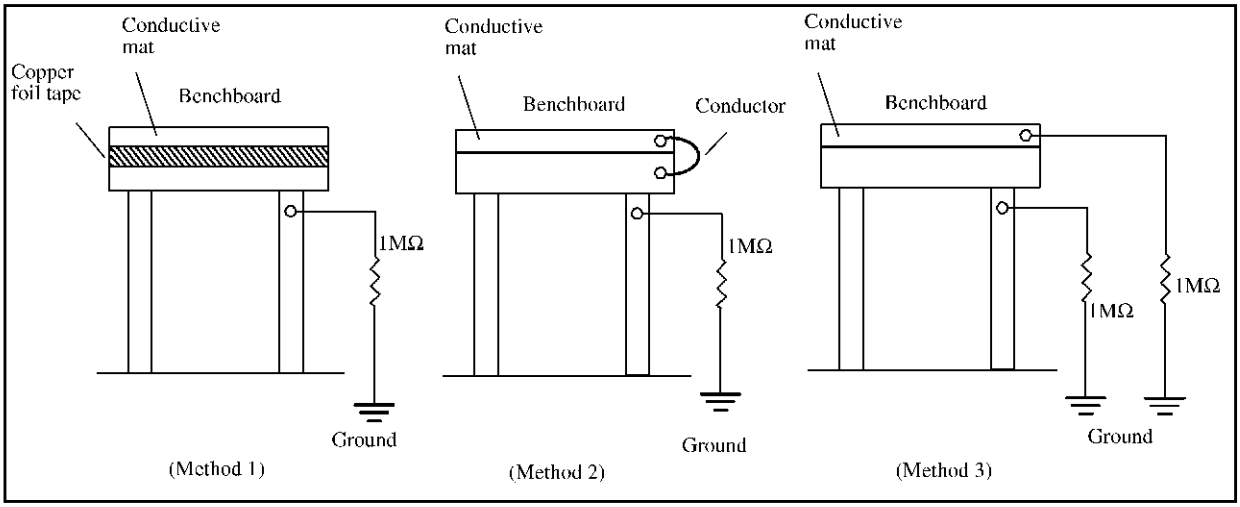


Figure 1-4 Countermeasures for Electrostatic on Work Bench

1.5 Cleaning, Storage and Transportation

1.5.1 Cleaning

Wipe the dirt of the R3968 OPT11 off with a soft cloth (or wet cloth). At this time, attend to the following points.

- Do not remain the fluff of the cloth and do not soak water into the internal of the R3968 OPT11.
- Do not use an organic solvent (for example, benzene and acetone, etc.) which changes plastics in quality.

1.5.2 Storage

Storage temperature of the R3968 OPT11 is from -20°C to +60°C. Do not store it out of this temperature range.

The cases in which the R3968 OPT11 is not used for a long time, cover with the vinyl cover or put in the cardboard box and prevent dust. Keep it in a dry place where dust and direct sunshine are prevented.

1.5.3 Transportation

When you ship the R3968 OPT11, use the original container and packing material. If the original packaging is not available, use the following repackaging guidelines:

1. To allow for cushioning, use a corrugated cardboard container that is at least 15 centimeters larger than those of the R3968 OPT11.
2. Surround the R3968 OPT11 with protective sheeting.
3. Cushion the R3968 OPT11 on all sides with packing material.
4. Seal the corrugated cardboard container with shipping tape or an industrial stapler.

If you are shipping the R3968 OPT11 to a sales representative for service or repair, attach a tag to the R3968 OPT11 that shows the following information:

- Owner and address
- Name of a contact person at your location
- Serial number of the R3968 OPT11 (located on the rear panel)
- Description of the service requested

1.6 Warm-up

After the R3968 OPT11 temperature has reached the room temperature level, turn the **POWER** switch ON and warm it up for 30 minutes.

1.7 Calibration

Calibration work should be performed at an ADVANTEST CORPORATION site.
When you want to calibrate the R3968 OPT11, please contact a sales representative.

Desirable Period	One year

2. PANEL DESCRIPTION

2.1 Front Panel Description

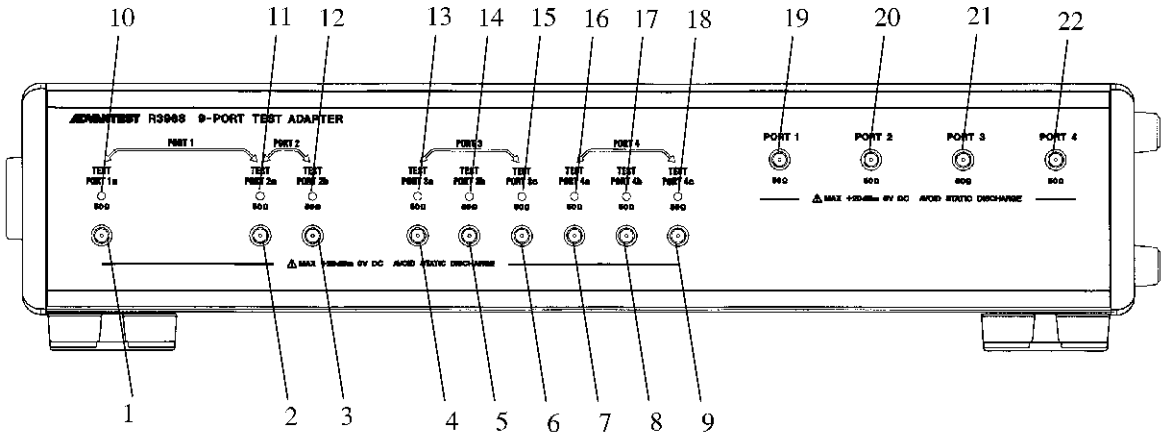


Figure 2-1 R3968 OPT11 Front Panel

Table 2-1 R3968 OPT11 Front Panel Description (1 of 2)

No.	Name of accessory	Description
1	TEST PORT 1a Connector	Used to measure transmission and reflection characteristics.
2	TEST PORT 2a Connector	Used to measure transmission and reflection characteristics.
3	TEST PORT 2b Connector	Used to measure transmission and reflection characteristics.
4	TEST PORT 3a Connector	Used to measure transmission and reflection characteristics.
5	TEST PORT 3b Connector	Used to measure transmission and reflection characteristics.
6	TEST PORT 3c Connector	Used to measure transmission and reflection characteristics.
7	TEST PORT 4a Connector	Used to measure transmission and reflection characteristics.
8	TEST PORT 4b Connector	Used to measure transmission and reflection characteristics.
9	TEST PORT 4c Connector	Used to measure transmission and reflection characteristics.

Table 2-1 R3968 OPT11 Front Panel Description (2 of 2)

No.	Name of accessory	Description
10	TEST PORT 1a LED	Lights when Test Port 1a is connected to the R3860 OPT14 signal source.
11	TEST PORT 2a LED	Lights when Test Port 2a is connected to the R3860 OPT14 signal source.
12	TEST PORT 2b LED	Lights when Test Port 2b is connected to the R3860 OPT14 signal source.
13	TEST PORT 3a LED	Lights when Test Port 3a is connected to the R3860 OPT14 signal source.
14	TEST PORT 3b LED	Lights when Test Port 3b is connected to the R3860 OPT14 signal source.
15	TEST PORT 3c LED	Lights when Test Port 3c is connected to the R3860 OPT14 signal source.
16	TEST PORT 4a LED	Lights when Test Port 4a is connected to the R3860 OPT14 signal source.
17	TEST PORT 4b LED	Lights when Test Port 4b is connected to the R3860 OPT14 signal source.
18	TEST PORT 4c LED	Lights when Test Port 4c is connected to the R3860 OPT14 signal source.
19	PORT 1 Connector	Used to connect to R3860 OPT14 Test Port 1.
20	PORT 2 Connector	Used to connect to R3860 OPT14 Test Port 2.
21	PORT 3 Connector	Used to connect to R3860 OPT14 Test Port 3.
22	PORT 4 Connector	Used to connect to R3860 OPT14 Test Port 4.

2.2 Rear Panel Description

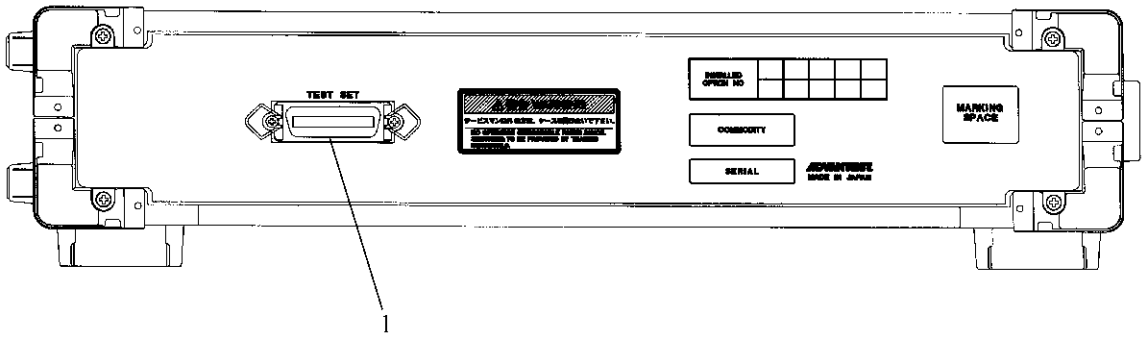


Figure 2-2 R3968 OPT11 Rear Panel

Table 2-2 Rear Panel Description

No.	Name of accessory	Description
1	TEST SET Connector	Used to connect to the R3860 OPT14 test set.

3. CONNECTING THE R3968 OPT11 TO THE R3860 OPT14

This chapter describes how to connect the R3968 OPT11 to the R3860 OPT14.

3.1 Connecting the Front Panels

Connect, as shown below, using the N-SMA cables provided.

R3968 OPT11	R3860 OPT14	Cable used	Conversion connector
PORT 1	TEST PORT 1	A112004	HRM-554S
PORT 2	TEST PORT 2	A112005	
PORT 3	TEST PORT 3	A112006	
PORT 4	TEST PORT 4	A112007	

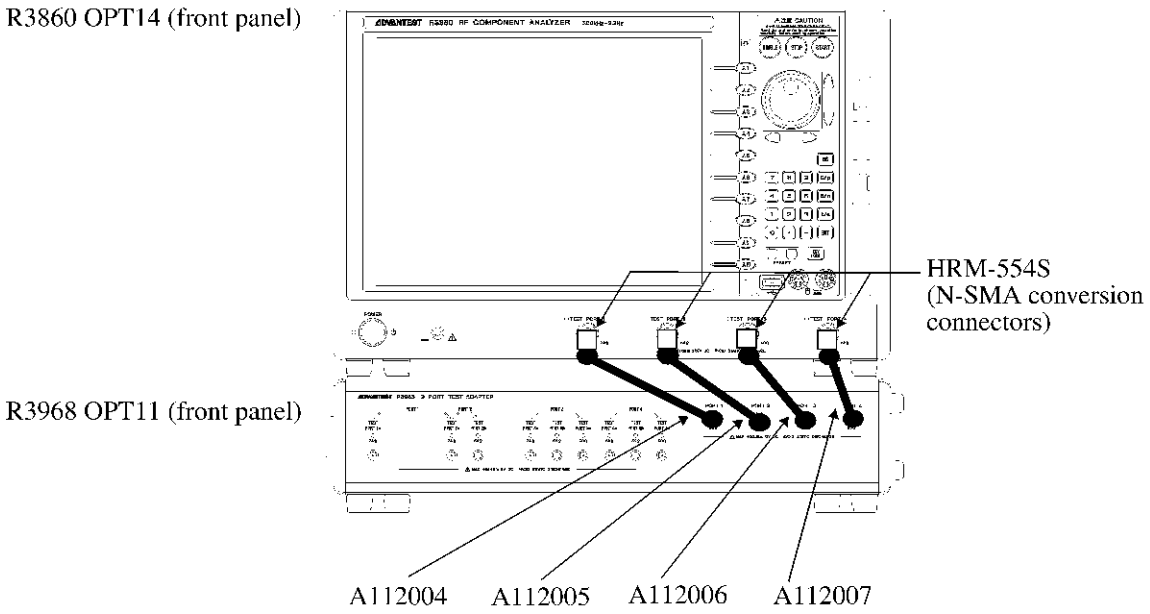


Figure 3-1 Connecting the Front Panels

3.2 Connections the Rear Panels

Connect, as shown below, using the control cables provided.

R3968 OPT11	R3860 OPT14	Cable used
TEST SET	TEST SET	A01293

R3860 OPT14 (rear panel)

R3986 OPT11 (rear panel)

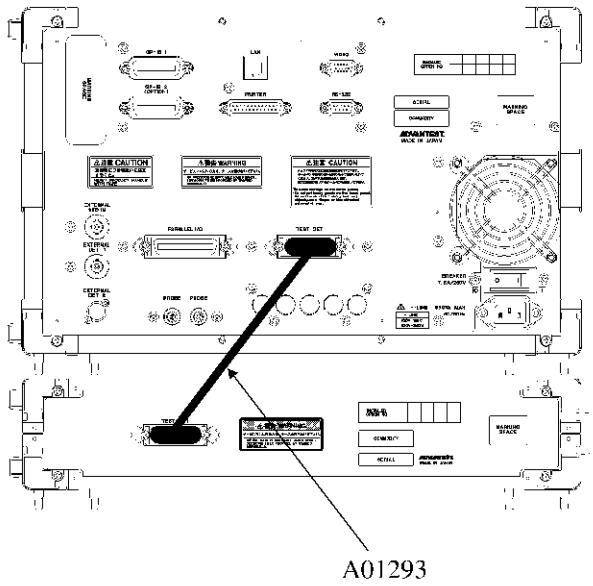


Figure 3-2 Connecting the Rear Panels

4. BASIC MEASUREMENTS

4.1 Measurement Overview

CAUTION: ***Use the 50Ω-system Calibration kit and cables appropriate for the instrument being used. When calibrating the instrument, set the Calibration kit type and FEMAL/MAL (polarity) according to the connector terminals used before making measurements.***

Select using the MEAS keys, the S parameters to be measured, Select using a Multi-port menu key, a measurement path. Table 4-1 displays combinations between S parameters and measurement paths.

Table 4-1 Combinations of Measurement Paths (1 of 9)

Path selection / Meas	1a-2a-3a-4a	1a-2a-3a-4b	1a-2a-3a-4c
S11	Reflection characteristics of TEST PORT 1a	Reflection characteristics of TEST PORT 1a	Reflection characteristics of TEST PORT 1a
S12	Transmission characteristics of TEST PORT 2a to 1a	Transmission characteristics of TEST PORT 2a to 1a	Transmission characteristics of TEST PORT 2a to 1a
S13	Transmission characteristics of TEST PORT 3a to 1a	Transmission characteristics of TEST PORT 3a to 1a	Transmission characteristics of TEST PORT 3a to 1a
S14	Transmission characteristics of TEST PORT 4a to 1a	Transmission characteristics of TEST PORT 4b to 1a	Transmission characteristics of TEST PORT 4c to 1a
S21	Transmission characteristics of TEST PORT 1a to 2a	Transmission characteristics of TEST PORT 1a to 2a	Transmission characteristics of TEST PORT 1a to 2a
S22	Reflection characteristics of TEST PORT 2a	Reflection characteristics of TEST PORT 2a	Reflection characteristics of TEST PORT 2a
S23	Transmission characteristics of TEST PORT 3a to 2a	Transmission characteristics of TEST PORT 3a to 2a	Transmission characteristics of TEST PORT 3a to 2a
S24	Transmission characteristics of TEST PORT 4a to 2a	Transmission characteristics of TEST PORT 4b to 2a	Transmission characteristics of TEST PORT 4c to 2a
S31	Transmission characteristics of TEST PORT 1a to 3a	Transmission characteristics of TEST PORT 1a to 3a	Transmission characteristics of TEST PORT 1a to 3a
S32	Transmission characteristics of TEST PORT 2a to 3a	Transmission characteristics of TEST PORT 2a to 3a	Transmission characteristics of TEST PORT 2a to 3a
S33	Reflection characteristics of TEST PORT 3a	Reflection characteristics of TEST PORT 3a	Reflection characteristics of TEST PORT 3a
S34	Transmission characteristics of TEST PORT 4a to 3a	Transmission characteristics of TEST PORT 4b to 3a	Transmission characteristics of TEST PORT 4c to 3a
S41	Transmission characteristics of TEST PORT 1a to 4a	Transmission characteristics of TEST PORT 1a to 4b	Transmission characteristics of TEST PORT 1a to 4c
S42	Transmission characteristics of TEST PORT 2a to 4a	Transmission characteristics of TEST PORT 2a to 4b	Transmission characteristics of TEST PORT 2a to 4c
S43	Transmission characteristics of TEST PORT 3a to 4a	Transmission characteristics of TEST PORT 3a to 4b	Transmission characteristics of TEST PORT 3a to 4c
S44	Reflection characteristics of TEST PORT 4a	Reflection characteristics of TEST PORT 4b	Reflection characteristics of TEST PORT 4c

Table 4-1 Combinations of Measurement Paths (2 of 9)

Path selection / Meas	1a-2a-3b-4a	1a-2a-3b-4b	1a-2a-3b-4c
S11	Reflection characteristics of TEST PORT 1a	Reflection characteristics of TEST PORT 1a	Reflection characteristics of TEST PORT 1a
S12	Transmission characteristics of TEST PORT 2a to 1a	Transmission characteristics of TEST PORT 2a to 1a	Transmission characteristics of TEST PORT 2a to 1a
S13	Transmission characteristics of TEST PORT 3b to 1a	Transmission characteristics of TEST PORT 3b to 1a	Transmission characteristics of TEST PORT 3b to 1a
S14	Transmission characteristics of TEST PORT 4a to 1a	Transmission characteristics of TEST PORT 4b to 1a	Transmission characteristics of TEST PORT 4c to 1a
S21	Transmission characteristics of TEST PORT 1a to 2a	Transmission characteristics of TEST PORT 1a to 2a	Transmission characteristics of TEST PORT 1a to 2a
S22	Reflection characteristics of TEST PORT 2a	Reflection characteristics of TEST PORT 2a	Reflection characteristics of TEST PORT 2a
S23	Transmission characteristics of TEST PORT 3b to 2a	Transmission characteristics of TEST PORT 3b to 2a	Transmission characteristics of TEST PORT 3b to 2a
S24	Transmission characteristics of TEST PORT 4a to 2a	Transmission characteristics of TEST PORT 4b to 2a	Transmission characteristics of TEST PORT 4c to 2a
S31	Transmission characteristics of TEST PORT 1a to 3b	Transmission characteristics of TEST PORT 1a to 3b	Transmission characteristics of TEST PORT 1a to 3b
S32	Transmission characteristics of TEST PORT 2a to 3b	Transmission characteristics of TEST PORT 2a to 3b	Transmission characteristics of TEST PORT 2a to 3b
S33	Reflection characteristics of TEST PORT 3b	Reflection characteristics of TEST PORT 3b	Reflection characteristics of TEST PORT 3b
S34	Transmission characteristics of TEST PORT 4a to 3b	Transmission characteristics of TEST PORT 4b to 3b	Transmission characteristics of TEST PORT 4c to 3b
S41	Transmission characteristics of TEST PORT 1a to 4a	Transmission characteristics of TEST PORT 1a to 4b	Transmission characteristics of TEST PORT 1a to 4c
S42	Transmission characteristics of TEST PORT 2a to 4a	Transmission characteristics of TEST PORT 2a to 4b	Transmission characteristics of TEST PORT 2a to 4c
S43	Transmission characteristics of TEST PORT 3b to 4a	Transmission characteristics of TEST PORT 3b to 4b	Transmission characteristics of TEST PORT 3b to 4c
S44	Reflection characteristics of TEST PORT 4a	Reflection characteristics of TEST PORT 4b	Reflection characteristics of TEST PORT 4c

Table 4-1 Combinations of Measurement Paths (3 of 9)

Path selection / Meas	1a-2a-3c-4a	1a-2a-3c-4b	1a-2a-3c-4c
S11	Reflection characteristics of TEST PORT 1a	Reflection characteristics of TEST PORT 1a	Reflection characteristics of TEST PORT 1a
S12	Transmission characteristics of TEST PORT 2a to 1a	Transmission characteristics of TEST PORT 2a to 1a	Transmission characteristics of TEST PORT 2a to 1a
S13	Transmission characteristics of TEST PORT 3c to 1a	Transmission characteristics of TEST PORT 3c to 1a	Transmission characteristics of TEST PORT 3c to 1a
S14	Transmission characteristics of TEST PORT 4a to 1a	Transmission characteristics of TEST PORT 4b to 1a	Transmission characteristics of TEST PORT 4c to 1a
S21	Transmission characteristics of TEST PORT 1a to 2a	Transmission characteristics of TEST PORT 1a to 2a	Transmission characteristics of TEST PORT 1a to 2a
S22	Reflection characteristics of TEST PORT 2a	Reflection characteristics of TEST PORT 2a	Reflection characteristics of TEST PORT 2a
S23	Transmission characteristics of TEST PORT 3c to 2a	Transmission characteristics of TEST PORT 3c to 2a	Transmission characteristics of TEST PORT 3c to 2a
S24	Transmission characteristics of TEST PORT 4a to 2a	Transmission characteristics of TEST PORT 4b to 2a	Transmission characteristics of TEST PORT 4c to 2a
S31	Transmission characteristics of TEST PORT 1a to 3c	Transmission characteristics of TEST PORT 1a to 3c	Transmission characteristics of TEST PORT 1a to 3c
S32	Transmission characteristics of TEST PORT 2a to 3c	Transmission characteristics of TEST PORT 2a to 3c	Transmission characteristics of TEST PORT 2a to 3c
S33	Reflection characteristics of TEST PORT 3c	Reflection characteristics of TEST PORT 3c	Reflection characteristics of TEST PORT 3c
S34	Transmission characteristics of TEST PORT 4a to 3c	Transmission characteristics of TEST PORT 4b to 3c	Transmission characteristics of TEST PORT 4c to 3c
S41	Transmission characteristics of TEST PORT 1a to 4a	Transmission characteristics of TEST PORT 1a to 4b	Transmission characteristics of TEST PORT 1a to 4c
S42	Transmission characteristics of TEST PORT 2a to 4a	Transmission characteristics of TEST PORT 2a to 4b	Transmission characteristics of TEST PORT 2a to 4c
S43	Transmission characteristics of TEST PORT 3c to 4a	Transmission characteristics of TEST PORT 3c to 4b	Transmission characteristics of TEST PORT 3c to 4c
S44	Reflection characteristics of TEST PORT 4a	Reflection characteristics of TEST PORT 4b	Reflection characteristics of TEST PORT 4c

Table 4-1 Combinations of Measurement Paths (4 of 9)

Path selection / Meas	1a-2b-3a-4a	1a-2b-3a-4b	1a-2b-3a-4c
S11	Reflection characteristics of TEST PORT 1a	Reflection characteristics of TEST PORT 1a	Reflection characteristics of TEST PORT 1a
S12	Transmission characteristics of TEST PORT 2b to 1a	Transmission characteristics of TEST PORT 2b to 1a	Transmission characteristics of TEST PORT 2b to 1a
S13	Transmission characteristics of TEST PORT 3a to 1a	Transmission characteristics of TEST PORT 3a to 1a	Transmission characteristics of TEST PORT 3a to 1a
S14	Transmission characteristics of TEST PORT 4a to 1a	Transmission characteristics of TEST PORT 4b to 1a	Transmission characteristics of TEST PORT 4c to 1a
S21	Transmission characteristics of TEST PORT 1a to 2b	Transmission characteristics of TEST PORT 1a to 2b	Transmission characteristics of TEST PORT 1a to 2b
S22	Reflection characteristics of TEST PORT 2b	Reflection characteristics of TEST PORT 2b	Reflection characteristics of TEST PORT 2b
S23	Transmission characteristics of TEST PORT 3a to 2b	Transmission characteristics of TEST PORT 3a to 2b	Transmission characteristics of TEST PORT 3a to 2b
S24	Transmission characteristics of TEST PORT 4a to 2b	Transmission characteristics of TEST PORT 4b to 2b	Transmission characteristics of TEST PORT 4c to 2b
S31	Transmission characteristics of TEST PORT 1a to 3a	Transmission characteristics of TEST PORT 1a to 3b	Transmission characteristics of TEST PORT 1a to 3a
S32	Transmission characteristics of TEST PORT 2b to 3a	Transmission characteristics of TEST PORT 2b to 3a	Transmission characteristics of TEST PORT 2b to 3a
S33	Reflection characteristics of TEST PORT 3a	Reflection characteristics of TEST PORT 3a	Reflection characteristics of TEST PORT 3a
S34	Transmission characteristics of TEST PORT 4a to 3a	Transmission characteristics of TEST PORT 4b to 3a	Transmission characteristics of TEST PORT 4c to 3a
S41	Transmission characteristics of TEST PORT 1a to 4a	Transmission characteristics of TEST PORT 1a to 4b	Transmission characteristics of TEST PORT 1a to 4c
S42	Transmission characteristics of TEST PORT 2b to 4a	Transmission characteristics of TEST PORT 2b to 4b	Transmission characteristics of TEST PORT 2b to 4c
S43	Transmission characteristics of TEST PORT 3a to 4a	Transmission characteristics of TEST PORT 3a to 4b	Transmission characteristics of TEST PORT 3a to 4c
S44	Reflection characteristics of TEST PORT 4a	Reflection characteristics of TEST PORT 4b	Reflection characteristics of TEST PORT 4c

Table 4-1 Combinations of Measurement Paths (5 of 9)

Path selection / Meas	1a-2b-3b-4a	1a-2b-3b-4b	1a-2b-3b-4c
S11	Reflection characteristics of TEST PORT 1a	Reflection characteristics of TEST PORT 1a	Reflection characteristics of TEST PORT 1a
S12	Transmission characteristics of TEST PORT 2b to 1a	Transmission characteristics of TEST PORT 2b to 1a	Transmission characteristics of TEST PORT 2b to 1a
S13	Transmission characteristics of TEST PORT 3b to 1a	Transmission characteristics of TEST PORT 3b to 1a	Transmission characteristics of TEST PORT 3b to 1a
S14	Transmission characteristics of TEST PORT 4a to 1a	Transmission characteristics of TEST PORT 4b to 1a	Transmission characteristics of TEST PORT 4c to 1a
S21	Transmission characteristics of TEST PORT 1a to 2b	Transmission characteristics of TEST PORT 1a to 2b	Transmission characteristics of TEST PORT 1a to 2b
S22	Reflection characteristics of TEST PORT 2b	Reflection characteristics of TEST PORT 2b	Reflection characteristics of TEST PORT 2b
S23	Transmission characteristics of TEST PORT 3b to 2b	Transmission characteristics of TEST PORT 3b to 2b	Transmission characteristics of TEST PORT 3b to 2b
S24	Transmission characteristics of TEST PORT 4a to 2b	Transmission characteristics of TEST PORT 4b to 2b	Transmission characteristics of TEST PORT 4c to 2b
S31	Transmission characteristics of TEST PORT 1a to 3b	Transmission characteristics of TEST PORT 1a to 3b	Transmission characteristics of TEST PORT 1a to 3b
S32	Transmission characteristics of TEST PORT 2b to 3b	Transmission characteristics of TEST PORT 2b to 3b	Transmission characteristics of TEST PORT 2b to 3b
S33	Reflection characteristics of TEST PORT 3b	Reflection characteristics of TEST PORT 3b	Reflection characteristics of TEST PORT 3b
S34	Transmission characteristics of TEST PORT 4a to 3b	Transmission characteristics of TEST PORT 4b to 3b	Transmission characteristics of TEST PORT 4c to 3b
S41	Transmission characteristics of TEST PORT 1a to 4a	Transmission characteristics of TEST PORT 1a to 4b	Transmission characteristics of TEST PORT 1a to 4c
S42	Transmission characteristics of TEST PORT 2b to 4a	Transmission characteristics of TEST PORT 2b to 4b	Transmission characteristics of TEST PORT 2b to 4c
S43	Transmission characteristics of TEST PORT 3b to 4a	Transmission characteristics of TEST PORT 3b to 4b	Transmission characteristics of TEST PORT 3b to 4c
S44	Reflection characteristics of TEST PORT 4a	Reflection characteristics of TEST PORT 4b	Reflection characteristics of TEST PORT 4c

Table 4-1 Combinations of Measurement Paths (6 of 9)

Path selection / Meas	1a-2b-3c-4a	1a-2b-3c-4b	1a-2b-3c-4c
S11	Reflection characteristics of TEST PORT 1a	Reflection characteristics of TEST PORT 1a	Reflection characteristics of TEST PORT 1a
S12	Transmission characteristics of TEST PORT 2b to 1a	Transmission characteristics of TEST PORT 2b to 1a	Transmission characteristics of TEST PORT 2b to 1a
S13	Transmission characteristics of TEST PORT 3c to 1a	Transmission characteristics of TEST PORT 3c to 1a	Transmission characteristics of TEST PORT 3c to 1a
S14	Transmission characteristics of TEST PORT 4a to 1a	Transmission characteristics of TEST PORT 4b to 1a	Transmission characteristics of TEST PORT 4c to 1a
S21	Transmission characteristics of TEST PORT 1a to 2b	Transmission characteristics of TEST PORT 1a to 2b	Transmission characteristics of TEST PORT 1a to 2b
S22	Reflection characteristics of TEST PORT 2b	Reflection characteristics of TEST PORT 2b	Reflection characteristics of TEST PORT 2b
S23	Transmission characteristics of TEST PORT 3c to 2b	Transmission characteristics of TEST PORT 3c to 2b	Transmission characteristics of TEST PORT 3c to 2b
S24	Transmission characteristics of TEST PORT 4a to 2b	Transmission characteristics of TEST PORT 4b to 2b	Transmission characteristics of TEST PORT 4c to 2b
S31	Transmission characteristics of TEST PORT 1a to 3c	Transmission characteristics of TEST PORT 1a to 3c	Transmission characteristics of TEST PORT 1a to 3c
S32	Transmission characteristics of TEST PORT 2b to 3c	Transmission characteristics of TEST PORT 2b to 3c	Transmission characteristics of TEST PORT 2b to 3c
S33	Reflection characteristics of TEST PORT 3c	Reflection characteristics of TEST PORT 3c	Reflection characteristics of TEST PORT 3c
S34	Transmission characteristics of TEST PORT 4a to 3c	Transmission characteristics of TEST PORT 4b to 3c	Transmission characteristics of TEST PORT 4c to 3c
S41	Transmission characteristics of TEST PORT 1a to 4a	Transmission characteristics of TEST PORT 1a to 4b	Transmission characteristics of TEST PORT 1a to 4c
S42	Transmission characteristics of TEST PORT 2b to 4a	Transmission characteristics of TEST PORT 2b to 4b	Transmission characteristics of TEST PORT 2b to 4c
S43	Transmission characteristics of TEST PORT 3c to 4a	Transmission characteristics of TEST PORT 3c to 4b	Transmission characteristics of TEST PORT 3c to 4c
S44	Reflection characteristics of TEST PORT 4a	Reflection characteristics of TEST PORT 4b	Reflection characteristics of TEST PORT 4c

Table 4-1 Combinations of Measurement Paths (7 of 9)

Path selection / Meas	2a-2b-3a-4a	2a-2b-3a-4b	2a-2b-3a-4c
S11	Reflection characteristics of TEST PORT 2a	Reflection characteristics of TEST PORT 2a	Reflection characteristics of TEST PORT 2a
S12	Transmission characteristics of TEST PORT 2b to 2a	Transmission characteristics of TEST PORT 2b to 2a	Transmission characteristics of TEST PORT 2b to 2a
S13	Transmission characteristics of TEST PORT 3a to 2a	Transmission characteristics of TEST PORT 3a to 2a	Transmission characteristics of TEST PORT 3a to 2a
S14	Transmission characteristics of TEST PORT 4a to 2a	Transmission characteristics of TEST PORT 4b to 2a	Transmission characteristics of TEST PORT 4c to 2a
S21	Transmission characteristics of TEST PORT 2a to 2b	Transmission characteristics of TEST PORT 2a to 2b	Transmission characteristics of TEST PORT 2a to 2b
S22	Reflection characteristics of TEST PORT 2b	Reflection characteristics of TEST PORT 2b	Reflection characteristics of TEST PORT 2b
S23	Transmission characteristics of TEST PORT 3a to 2b	Transmission characteristics of TEST PORT 3a to 2b	Transmission characteristics of TEST PORT 3ato 2b
S24	Transmission characteristics of TEST PORT 4a to 2b	Transmission characteristics of TEST PORT 4b to 2b	Transmission characteristics of TEST PORT 4c to 2b
S31	Transmission characteristics of TEST PORT 2a to 3a	Transmission characteristics of TEST PORT 2a to 3a	Transmission characteristics of TEST PORT 2a to 3a
S32	Transmission characteristics of TEST PORT 2b to 3a	Transmission characteristics of TEST PORT 2b to 3a	Transmission characteristics of TEST PORT 2b to 3a
S33	Reflection characteristics of TEST PORT 3a	Reflection characteristics of TEST PORT 3a	Reflection characteristics of TEST PORT 3a
S34	Transmission characteristics of TEST PORT 4a to 3a	Transmission characteristics of TEST PORT 4b to 3a	Transmission characteristics of TEST PORT 4c to 3a
S41	Transmission characteristics of TEST PORT 2a to 4a	Transmission characteristics of TEST PORT 2a to 4b	Transmission characteristics of TEST PORT 2a to 4c
S42	Transmission characteristics of TEST PORT 2b to 4a	Transmission characteristics of TEST PORT 2b to 4b	Transmission characteristics of TEST PORT 2b to 4c
S43	Transmission characteristics of TEST PORT 3a to 4a	Transmission characteristics of TEST PORT 3a to 4b	Transmission characteristics of TEST PORT 3a to 4c
S44	Reflection characteristics of TEST PORT 4a	Reflection characteristics of TEST PORT 4b	Reflection characteristics of TEST PORT 4c

Table 4-1 Combinations of Measurement Paths (8 of 9)

Path selection / Meas	2a-2b-3b-4a	2a-2b-3b-4b	2a-2b-3b-4c
S11	Reflection characteristics of TEST PORT 2a	Reflection characteristics of TEST PORT 2a	Reflection characteristics of TEST PORT 2a
S12	Transmission characteristics of TEST PORT 2b to 2a	Transmission characteristics of TEST PORT 2b to 2a	Transmission characteristics of TEST PORT 2b to 2a
S13	Transmission characteristics of TEST PORT 3b to 2a	Transmission characteristics of TEST PORT 3b to 2a	Transmission characteristics of TEST PORT 3b to 2a
S14	Transmission characteristics of TEST PORT 4a to 2a	Transmission characteristics of TEST PORT 4b to 2a	Transmission characteristics of TEST PORT 4c to 2a
S21	Transmission characteristics of TEST PORT 2a to 2b	Transmission characteristics of TEST PORT 2a to 2b	Transmission characteristics of TEST PORT 2a to 2b
S22	Reflection characteristics of TEST PORT 2b	Reflection characteristics of TEST PORT 2b	Reflection characteristics of TEST PORT 2b
S23	Transmission characteristics of TEST PORT 3b to 2b	Transmission characteristics of TEST PORT 3b to 2b	Transmission characteristics of TEST PORT 3b to 2b
S24	Transmission characteristics of TEST PORT 4a to 2b	Transmission characteristics of TEST PORT 4b to 2b	Transmission characteristics of TEST PORT 4c to 2b
S31	Transmission characteristics of TEST PORT 2a to 3b	Transmission characteristics of TEST PORT 2a to 3b	Transmission characteristics of TEST PORT 2a to 3b
S32	Transmission characteristics of TEST PORT 2b to 3b	Transmission characteristics of TEST PORT 2b to 3b	Transmission characteristics of TEST PORT 2b to 3b
S33	Reflection characteristics of TEST PORT 3b	Reflection characteristics of TEST PORT 3b	Reflection characteristics of TEST PORT 3b
S34	Transmission characteristics of TEST PORT 4a to 3b	Transmission characteristics of TEST PORT 4b to 3b	Transmission characteristics of TEST PORT 4c to 3b
S41	Transmission characteristics of TEST PORT 2a to 4a	Transmission characteristics of TEST PORT 2a to 4b	Transmission characteristics of TEST PORT 2a to 4c
S42	Transmission characteristics of TEST PORT 2b to 4a	Transmission characteristics of TEST PORT 2b to 4b	Transmission characteristics of TEST PORT 2b to 4c
S43	Transmission characteristics of TEST PORT 3b to 4a	Transmission characteristics of TEST PORT 3b to 4b	Transmission characteristics of TEST PORT 3b to 4c
S44	Reflection characteristics of TEST PORT 4a	Reflection characteristics of TEST PORT 4b	Reflection characteristics of TEST PORT 4c

Table 4-1 Combinations of Measurement Paths (9 of 9)

Path selection / Meas	2a-2b-3c-4a	2a-2b-3c-4b	2a-2b-3c-4c
S11	Reflection characteristics of TEST PORT 2a	Reflection characteristics of TEST PORT 2a	Reflection characteristics of TEST PORT 2a
S12	Transmission characteristics of TEST PORT 2b to 2a	Transmission characteristics of TEST PORT 2b to 2a	Transmission characteristics of TEST PORT 2b to 2a
S13	Transmission characteristics of TEST PORT 3c to 2a	Transmission characteristics of TEST PORT 3c to 2a	Transmission characteristics of TEST PORT 3c to 2a
S14	Transmission characteristics of TEST PORT 4a to 2a	Transmission characteristics of TEST PORT 4b to 2a	Transmission characteristics of TEST PORT 4c to 2a
S21	Transmission characteristics of TEST PORT 2a to 2b	Transmission characteristics of TEST PORT 2a to 2b	Transmission characteristics of TEST PORT 2a to 2b
S22	Reflection characteristics of TEST PORT 2b	Reflection characteristics of TEST PORT 2b	Reflection characteristics of TEST PORT 2b
S23	Transmission characteristics of TEST PORT 3c to 2b	Transmission characteristics of TEST PORT 3c to 2b	Transmission characteristics of TEST PORT 3c to 2b
S24	Transmission characteristics of TEST PORT 4a to 2b	Transmission characteristics of TEST PORT 4b to 2b	Transmission characteristics of TEST PORT 4c to 2b
S31	Transmission characteristics of TEST PORT 2a to 3c	Transmission characteristics of TEST PORT 2a to 3c	Transmission characteristics of TEST PORT 2a to 3c
S32	Transmission characteristics of TEST PORT 2b to 3c	Transmission characteristics of TEST PORT 2b to 3c	Transmission characteristics of TEST PORT 2b to 3c
S33	Reflection characteristics of TEST PORT 3c	Reflection characteristics of TEST PORT 3c	Reflection characteristics of TEST PORT 3c
S34	Transmission characteristics of TEST PORT 4a to 3c	Transmission characteristics of TEST PORT 4b to 3c	Transmission characteristics of TEST PORT 4c to 3c
S41	Transmission characteristics of TEST PORT 2a to 4a	Transmission characteristics of TEST PORT 2a to 4b	Transmission characteristics of TEST PORT 2a to 4c
S42	Transmission characteristics of TEST PORT 2b to 4a	Transmission characteristics of TEST PORT 2b to 4b	Transmission characteristics of TEST PORT 2b to 4c
S43	Transmission characteristics of TEST PORT 3c to 4a	Transmission characteristics of TEST PORT 3c to 4b	Transmission characteristics of TEST PORT 3c to 4c
S44	Reflection characteristics of TEST PORT 4a	Reflection characteristics of TEST PORT 4b	Reflection characteristics of TEST PORT 4c

4.2 Measurement Examples

This section describes how to measure pass characteristics by using a (six-port) Triple band ANT SW module (800 MHz for GSM, 1.85 GHz for DCS and 1.9 GHz for PCS) as an example.

Measure ANT-GSM-Tx1 pass characteristics by using Testport 1a-2a-3a (CH1)
Measure ANT-GSM-Rx1 pass characteristics by using Testport 1a-2a-3a (CH2)
Measure ANT-DCS&PCS-Tx2 pass characteristics by using Testport 1a-2b-3b (CH3)
Measure ANT-DCS-Rx2 pass characteristics by using Testport 1a-2b-3b (CH4)
Measure ANT-DCS&PCS-Tx2 pass characteristics by using Testport 1a-2b-3c (CH5)
Measure ANT-PCS-Rx3 pass characteristics by using Testport 1a-2b-3c (CH6)

Measurement conditions:

The R17050 is used as the calibration kit.
The settings in Table 4-2 are assumed to control SW1 and SW2 provided within the device.
The R3968 OPT11 PIO automatically controls switches within the device.

NOTE:

1. ***If control specifications differ from Table 4-2, modify PIO settings in the table.***
2. ***Connect the device to the voltage used for driving device switches by using the circuit which is used to convert the PIO (TTL: negative logic) level.***
3. ***Pins 5 and 6 are assigned to A0 and A1 of the R3860 OPT14 respectively.***

Table 4-2 SW1 and SW2 Device Controls

PIO \ SW status			SW1		SW2	
Setting	A0	A1	ANT - GSM Tx1	ANT - GSM Rx2	ANT - DCS&PCN Tx2	ANT - DCS Rx2/ ANT - PCN Rx3
255	H	H	ON	OFF	ON	OFF
254	L	H	ON	OFF	OFF	ON
253	H	L	OFF	ON	ON	OFF
252	L	L	OFF	ON	OFF	ON

Setting-up

Set up the units as shown in Figure 4-1.

1. Connect the R3968 OPT11 and R3860 OPT14 front panels. (Refer to Section 3.1)
2. Connect the R3968 OPT11 and R3860 OPT14 rear panels. (Refer to Section 3.2)
3. Connect the R17050 to the R3860.
4. Connect the level conversion circuit A0 input and A1 input to the R3860 PIO.
5. Connect the level conversion circuit outputs A0 and A1 to SW1 and SW2 of the device respectively.
6. Connect the R3968 OPT11 to the DUT's ANT, GSM Tx1, GSM Rx1, DCS Rx2, PCS Rx3 and DCS&PCS Tx2.

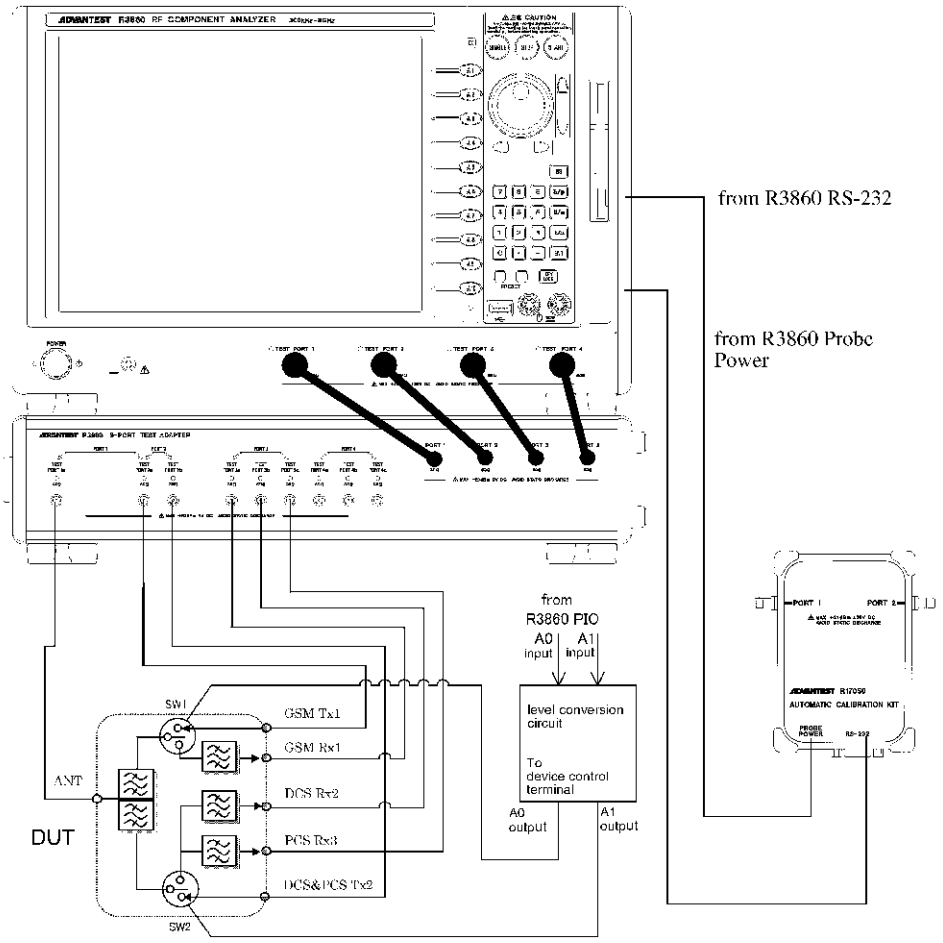


Figure 4-1 Measurement-set-up Diagram

Setting CH 1 measurement conditions

7. Initializing the R3860.
   Select ***System*** from the main menu → ***Preset***
8. Set the R3860 OPT14 to measure ANT-GSM-Tx1 pass characteristics using Testport 1a-2a-3a (CH1).
   Select ***Sweep*** from the tool menu →
   Select ***Measurement Port*** from the side menu →
   Select ***P123*** from the pull-down menu →
   Select ***Start Frequency*** → **8** → **0** → **0** → **M/n** →
   Select ***Stop Frequency*** → **1** → **0** → **0** → **0** → **M/n** →
   Select ***Measure Point*** → **4** → **0** → **1** → **Enter** →
   Select ***IF RBW*** → Select ***20 kHz*** from the pull-down menu →
   Select ***Trace*** from the tool menu →
   Select ***Trace Parameter*** from the side menu →
   Select ***S21*** from the pull-down menu →
   Select ***Config*** from the main menu →
   Select ***PIO Setting*** from the pull-down menu →
   Set the check box for ***CII-sync*** to ***ON*** in the dialog box →
   Select ***Port A (8bit)*** → **2** → **5** → **5** → **Enter** → ***Close***

Calibrating CH 1

9. Calibrate (three-port full calibration) by using Testport 1a-2a-3a.
   Select ***Cal*** from the tool menu →
   Select ***Auto Cal*** from the side menu → ***3-port Auto Cal*** → ***P1-P2-P3*** →
   Connect the R17050 to R3968 OPT11 Testports 1a and 2a→
   Select ***Acquire P1-P2*** from the side menu →
   Connect the R17050 to the R3968 OPT11 Testports 1a and 3a after confirming that the "Auto Cal: Completed" message appears →
   Select ***Acquire P1-P3*** from the side menu →
   Connect the R17050 to R3968 OPT11 Testports 2a and 3a after confirming that the "Auto Cal: Completed" message appears →
   Select ***Acquire P2-P3*** from the side menu → ***Done***

Setting CH 2 measurement conditions

10. Set the R3860 OPT14 to measure ANT-GSM-Rx1 pass characteristics by using Testport 1a-2a-3a (CH2).
    Select ***Window*** from the tool menu → Select ***Add Window*** from the side menu →
    Select ***Channel*** from the tool menu → Select ***CH2*** from the side menu →
    Select ***Sweep*** from the tool menu →

Select ***Measurement Port*** from the side menu →
Select ***P123*** from the pull-down menu →
Select ***Start Frequency*** → **8** → **0** → **0** → **M/n** →
Select ***Stop Frequency*** → **1** → **0** → **0** → **0** → **M/n** →
Select ***Measure Point*** → **4** → **0** → **1** → **Enter** →
Select ***IF RBM*** → Select ***20 kHz*** from the pull-down menu →
Select ***Trace*** from the tool menu →
Select ***Trace Parameter*** from the side menu →
Select ***S31*** from the pull-down menu →
Select ***Config*** from the main menu →
Select ***PIO Setting*** from the pull-down menu →
Select ***Port A (8 bit)*** from the dialog box → **2** → **5** → **3** → **Enter** → ***Close***

Calibrating CH 2

11. Calibrate (three-port full calibration) by using Testport 1a-2a-3a.
    Follow the procedure used to calibrate CH1 above.

Setting CH 3 measurement conditions

12. Set the R3860 OPT14 to measure ANT-DCS&PCS-Tx2 pass characteristics by using Testport 1a-2b-3b (CH3).
    Select ***Window*** from the tool menu → Select ***Add Window*** from the side menu →
    Select ***Channel*** from the tool menu →
    Select ***CH3*** from the side menu → ***Channel Setup*** → ***Multiport Testset*** →
    Select ***1a-2b-3b-4b*** → ***Channel-sync [off]*** → ***Channel-sync [on]*** →
    Select ***Sweep*** from the tool menu →
    Select ***Measurement Port*** from the side menu →
    Select ***P123*** from the pull-down menu →
    Select ***Start Frequency*** → **1** → **7** → **0** → **0** → **M/n** →
    Select ***Stop Frequency*** → **2** → **0** → **0** → **0** → **M/n** →
    Select ***Measure Point*** → **4** → **0** → **1** → **Enter** →
    Select ***IF RBW*** → Select ***20 kHz*** from the pull-down menu →
    Select ***Trace*** from the tool menu →
    Select ***Trace Parameter*** from the side menu →
    Select ***S21*** from the pull-down menu →
    Select ***Config*** from the main menu →
    Select ***PIO Setting*** from the pull-down menu →
    Select ***Port A (8 bit)*** from the dialog box → **2** → **5** → **5** → **Enter** → ***Close***

Calibrating CH 3

13. Calibrate (three-port full calibration) by using Testport 1a-2b-3b.
Select ***Cal*** from the tool menu → Select ***Auto Cal*** from the side menu →
Select ***3-port Auto Cal*** → ***P1-P2-P3*** →
Connect the R17050 to R3968 OPT11 Testports 1a and 2b →
Select ***Acquire P1-P2*** from the side menu →
Connect the R17050 to R3968 OPT11 Testports 1a and 3b after confirming that the "Auto Cal: Completed" message appears →
Select ***Acquire P1-P3*** from the side menu →
Connect the R17050 with Testport2b and Testport3b of this unit after confirming that the "Auto Cal: Completed" message appears →
Select ***Acquire P2-P3*** from the side menu → ***Done***

Setting CH 4 measurement conditions

14. Set the R3860 OPT14 to measure ANT-DCS-Rx2 pass characteristics by using Testport 1a-2b-3b (CH4).
Select ***Window*** from the tool menu → Select ***Add Window*** from the side menu →
Select ***Channel*** from the tool menu →
Select ***CH4*** from the side menu → Select ***Channel Setup*** →
Select ***Multiport Testset*** →
Select ***1a-2b-3b-4b*** →
Select ***Sweep*** from the tool menu →
Select ***Measurement Port*** from the side menu →
Select ***P123*** from the pull-down menu →
Select ***Start Frequency*** → **1** → **7** → **0** → **0** → **M/n** →
Select ***Stop Frequency*** → **2** → **0** → **0** → **0** → **M/n** →
Select ***Measure Point*** → **4** → **0** → **1** → **Enter** →
Select ***IF RBW*** → Select ***20 kHz*** from the pull-down menu →
Select ***Trace*** from the tool menu →
Select ***Trace Parameter*** from the side menu →
Select ***S31*** from the pull-down menu →
Select ***Config*** from the main menu →
Select ***PIO Setting*** from the pull-down menu →
Select ***Port A (8 bit)*** from the dialog box → **2** → **5** → **4** → **Enter** → ***Close***

Calibration of CH 4

15. Calibrate (three-port full calibration) by using Testport 1a-2b-3b.
Follow the procedure used to calibrate CH3 above.

Setting CH 5 measurement conditions

16. Set the R3860 OPT14 to measure ANT-DCS&PCS-Tx2 pass characteristics by using Testport 1a-2b-3c (CH5).
    Select ***Window*** from the tool menu → Select ***Add Window*** from the side menu →
    Select ***Channel*** from the tool menu →
    Select ***CH5*** from the side menu → ***Channel Setup*** → ***Multiport Testset*** →
    Select ***1a-2b-3c-4c*** →
    Select ***Sweep*** from the tool menu →
    Select ***Measurement Port*** from the side menu →
    Select ***P123*** from the pull-down menu →
    Select ***Start Frequency*** → **1** → **7** → **0** → **0** → **M/n** →
    Select ***Stop Frequency*** → **2** → **0** → **0** → **0** → **M/n** →
    Select ***Measure Point*** → **4** → **0** → **1** → **Enter** →
    Select ***IF RBW*** → Select ***20 kHz*** from the pull-down menu →
    Select ***Trace*** from the tool menu →
    Select ***Trace Parameter*** from the side menu →
    Select ***S21*** from the pull-down menu →
    Select ***Config*** from the main menu →
    Select ***PIO Setting*** from the pull-down menu →
    Select ***Port A (8 bit)*** from the dialog box → **2** → **5** → **5** → **Enter** → ***Close***

Calibrating CH 5

17. Calibrate (three-port full calibration) by using Testport 1a-2b-3c.
    Select ***Cal*** from the tool menu → Select ***Auto Cal*** from the side menu →
    Select ***3-port Auto Cal*** → ***P1-P2-P3*** →
    Connect the R17050 to R3968 OPT11 Testports 1a and 2b→
    Select ***Acquire P1-P2*** from the side menu →
    Connect the R17050 to R3968 OPT11 Testports 1a and 3c after confirming that the "Auto Cal: Completed" message appears →
    Select ***Acquire P1-P3*** from the side menu →
    Connect the R17050 with Testport 2b and Testport 3b of this unit after confirming that the "Auto Cal: Completed" messageappears →
    Select ***Acquire P2-P3*** from the side menu → ***Done***

Setting CH 6 measurement conditions

18. Set the R3860 OPT14 to measure ANT-PCS-Rx3 pass characteristics by using Testport 1a-2b-3c (CH6).
    Select ***Window*** from the tool menu → Select ***Add Window*** from the side menu →
    Select ***Channel*** from the tool menu →

Select ***CH6*** from the side menu → ***Channel Setup*** → ***Multiport Testset*** →
Select ***1a-2b-3c-4c*** →
Select ***Sweep*** from the tool menu →
Select ***Measurement Port*** from the side menu →
Select ***P123*** from the pull-down menu →
Select ***Start Frequency*** → **1** → **7** → **0** → **0** → **M/n** →
Select ***Stop Frequency*** → **2** → **0** → **0** → **0** → **M/n** →
Select ***Measure Point*** → **4** → **0** → **1** → **Enter** →
Select ***IF RBW*** → Select ***20 kHz*** from the pull-down menu →
Select ***Trace*** from the tool menu →
Select ***Trace Parameter*** from the side menu →
Select ***S31*** from the pull-down menu →
Select ***Config*** from the main menu →
Select ***PIO Setting*** from the pull-down menu →
Select ***Port A (8 bit)*** from the dialog box → **2** → **5** → **4** → **Enter** → ***Close***

Calibrating CH 6

19. Calibrate (three-port full calibration) by using Testport 1a-2b-3c.
    Follow the procedure used to calibrate CH5 above.

Checking results

20. After calibrating all paths, reconnect the R3968 OPT11 to the device as shown in Figure 4-1.
    The test results will be displayed on the screen.
    Measured values can be checked by using the R3860 marker function. (For more information, refer to the R3860 operation manual.)

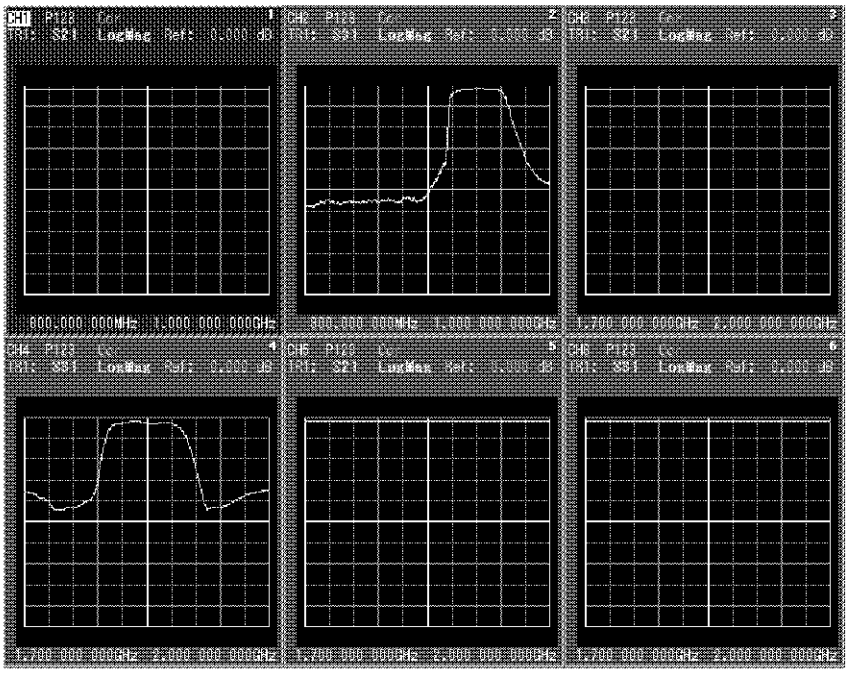


Figure 4-2 Measurement Result Display Examples

5. OPERATION DESCRIPTION

5.1 Block Diagram

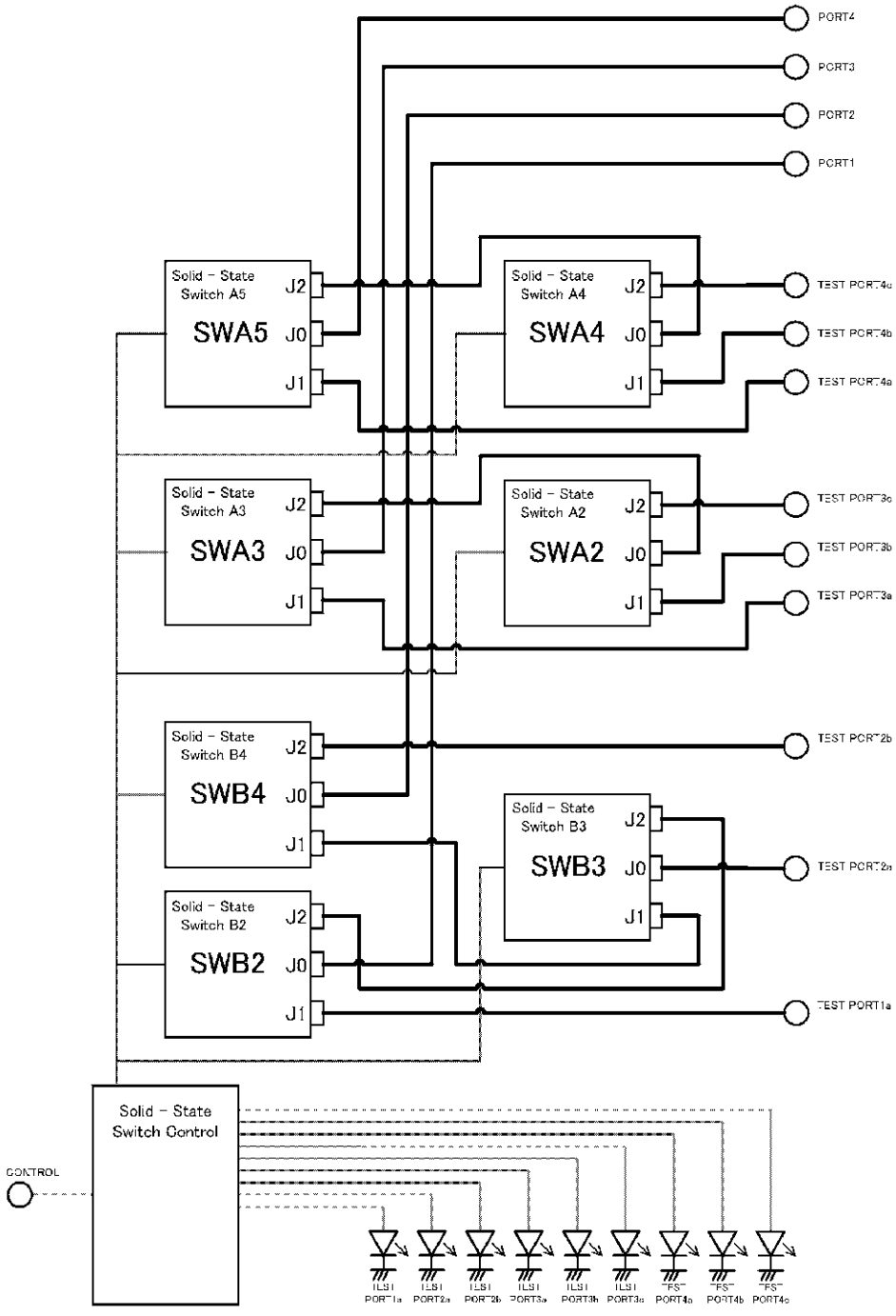


Figure 5-1 R3968 OPT11 Block Diagram

5.2 Reflection Characteristics

1. S11 (TEST PORT 1a/2a)

   <TEST PORT 1a>
   The R3860 OPT14 signal is input to R3968 OPT11 PORT 1 and is then output to TEST PORT 1a via SWB2 J0-J1.
   DUT reflected components are input to R3968 OPT11 TEST PORT 1a, output to PORT 1 via the path opposite to the one above, and are then analyzed in the R3860 OPT14.

   <TEST PORT 2a>
   The R3860 OPT14 signal is input to R3968 OPT11 PORT 1 and is then output to TEST PORT 2a via SWB2 J0-J2 and SWB3 J2-J0.
   DUT reflected components are input to R3968 OPT11 TEST PORT 2a, output to PORT 1 via the path opposite to the one above, and are then analyzed in the R3860 OPT14.

2. S22 (TEST PORT 2a/2b)

   <TEST PORT 2a>
   The R3860 OPT14 signal is input to R3968 OPT11 PORT 2 and is then output to TEST PORT 2a via SWB4 J0-J2 and SWB3 J1-J0.
   DUT reflected components are input to R3968 OPT11 TEST PORT 2a, output to PORT 2 via the path opposite to the one above, and are then analyzed in the R3860 OPT14.

   <TEST PORT 2b>
   The R3860 OPT14 signal is input to R3968 OPT11 PORT 2 and is then output to TEST PORT 2b via SWB2 J0-J2.
   DUT reflected components are input to R3968 OPT11 TEST PORT 2b, output to PORT 2 via the path opposite to the one above, and are then analyzed in the R3860 OPT14.

3. S33 (TEST PORT 3a/3b/3c)

   <TEST PORT 3a>
   The R3860 OPT14 signal is input to R3968 OPT11 PORT 3 and is then output to TEST PORT 3a via SWA3 J0-J1.
   DUT reflected components are input to R3968 OPT11 TEST PORT 3a, output to PORT 3 via the path opposite to the one above, and are then analyzed in the R3860 OPT14.

   <TEST PORT 3b>
   The R3860 OPT14 signal is input to R3968 OPT11 PORT 3 and is then output to TEST PORT 3b via SWA3 J0-J2 and SWA2 J0-J1.
   DUT reflected components are input to R3968 OPT11 TEST PORT 3b, output to PORT 3 via the path opposite to the one above, and are then analyzed in the R3860 OPT14.

   <TEST PORT 3c>
   The R3860 OPT14 signal is input to R3968 OPT11 PORT 3 and is then output to TEST PORT 3c via SWA3 J0-J2 and SWA2 J0-J2.
   DUT reflected components are input to R3968 OPT11 TEST PORT 3c, output to PORT 3 via the path opposite to the one above, and are then analyzed in the R3860 OPT14.

4. S44 (TEST PORT 4a/4b/4c)

<TEST PORT 4a>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4 and is then output to TEST PORT 4a via SWA5 J0-J1.
DUT reflected components are input to R3968 OPT11 TEST PORT 4a, output to PORT 4 via the path opposite to the one above, and are then analyzed in the R3860 OPT14.

<TEST PORT 4b>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4 and is then output to TEST PORT 4b via SWA5 J0-J2 and SWA4 J0-J1.
DUT reflected components are input to R3968 OPT11 TEST PORT 4b, output to PORT 4 via the path opposite to the one above, and are then analyzed in the R3860 OPT14.

<TEST PORT 4c>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4 and is then output to TEST PORT 4c via SWA5 J0-J2 and SWA4 J0-J2.
DUT reflected components are input to R3968 OPT11 TEST PORT 4c, output to PORT 4 via the path opposite to the one above, and are then analyzed in the R3860 OPT14.

5.3 Transmission Characteristics

1. S21

   <PORT 1 - TEST PORT 1a - DUT - TEST PORT 2a - PORT 2>
   The R3860 OPT14 signal is input to R3968 OPT11 PORT 1, output to TEST PORT 1a via SWB2 J0-J1, and is then input to the DUT.
   DUT transmission components are input to R3968 OPT11 TEST PORT 2a, output to PORT 2 via SWB3 J0-J1 and SWB4 J1-J0, and are then analyzed in the R3860 OPT14.

   <PORT 1 - TEST PORT 1a - DUT - TEST PORT 2b - PORT 2>
   The R3860 OPT14 signal is input to R3968 OPT11 PORT 1, output to TEST PORT 1a via SWB2 J0-J1, and is then input to the DUT.
   DUT transmission components are input to R3968 OPT11 TEST PORT 2b, output to PORT 2 via SWB4 J2-J0, and are then analyzed in the R3860 OPT14.

   <PORT 1 - TEST PORT 2a - DUT - TEST PORT 2b - PORT 2>
   The R3860 OPT14 signal is input to R3968 OPT11 PORT 1, output to TEST PORT 2a via SWB2 J0-J2 and SWB3 J2-J0, and is then input to the DUT.
   DUT transmission components are input to R3968 OPT11 TEST PORT 2b, output to PORT 2 via SWB4 J2-J0, and are then analyzed in the R3860 OPT14.

2. S12

   <PORT 2 - TEST PORT 2a - DUT - TEST PORT 1a - PORT 1>
   The R3860 OPT14 signal is input to R3968 OPT11 PORT 2, output to TEST PORT 2a via SWB4 J0-J1 and SWB3 J1-J0, and is then input to the DUT.
   DUT transmission components are input to R3968 OPT11 TEST PORT 1a, output to PORT 1 via SWB2 J1-J0, and are then analyzed in the R3860 OPT14.

   <PORT 2 - TEST PORT 2b - DUT - TEST PORT 1a - PORT 1>
   The R3860 OPT14 signal is input to R3968 OPT11 PORT 2, output to TEST PORT 2b via SWB4 J0-J2, and is then input to the DUT.
   DUT transmission components are input to R3968 OPT11 TEST PORT 1a, output to PORT 1 via SWB2 J1-J0, and are then analyzed in the R3860 OPT14.

   <PORT 2 - TEST PORT 2b - DUT - TEST PORT 2a - PORT 1>
   The R3860 OPT14 signal is input to R3968 OPT11 PORT 2, output to TEST PORT 2b via SWB4 J0-J2, and is then input to the DUT.
   DUT transmission components are input to R3968 OPT11 TEST PORT 2a, output to PORT 1 via SWB3 J0-J1 and SWB2 J2-J0, and are then analyzed in the R3860 OPT14.

3. S31

<PORT 1 - TEST PORT 1a - DUT - TEST PORT 3a - PORT 3>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 1, output to TEST PORT 1a via SWB2 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 3a, output to PORT 3 via SWA3 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 1 - TEST PORT 1a - DUT - TEST PORT 3b - PORT 3>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 1, output to TEST PORT 1a via SWB2 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 3b, output to PORT 3 via SWA2 J1-J0 and SWA3 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 1 - TEST PORT 1a - DUT - TEST PORT 3c - PORT 3>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 1, output to TEST PORT 1a via SWB2 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 3c, output to PORT 3 via SWA2 J2-J0 and SWA3 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 1 - TEST PORT 2a - DUT - TEST PORT 3a - PORT 3>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 1, output to TEST PORT 2a via SWB2 J0-J2 and SWB3 J2-J0, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 3a, output to PORT 3 via SWA3 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 1 - TEST PORT 2a - DUT - TEST PORT 3b - PORT 3>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 1, output to TEST PORT 2a via SWB2 J0-J2 and SWB3 J2-J0, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 3b, output to PORT 3 via SWA2 J1-J0 and SWA3 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 1 - TEST PORT 2a - DUT - TEST PORT 3c - PORT 3>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 1, output to TEST PORT 2a via SWB2 J0-J2 and SWB3 J2-J0, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 3c, output to PORT 3 via SWA2 J2-J0 and SWA3 J2-J0, and are then analyzed in the R3860 OPT14.

4. S13

<PORT 3 - TEST PORT 3a - DUT - TEST PORT 1a - PORT 1>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 3, output to TEST PORT 3a via SWA3 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 1a, output to PORT 1 via SWB2 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 3 - TEST PORT 3b - DUT - TEST PORT 1a - PORT 1>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 3, output to TEST PORT 3b via SWA3 J0-J2 and SWA2 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 1a, output to PORT 1 via SWB2 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 3 - TEST PORT 3c - DUT - TEST PORT 1a - PORT 1>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 3, output to TEST PORT 3c via SWA3 J0-J2 and SWA2 J0-J2, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 1a, output to PORT 1 via SWB2 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 3- TEST PORT 3a - DUT - TEST PORT 2a - PORT 1>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 3, output to TEST PORT 3a via SWA3 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 2a, output to PORT 1 via SWB3 J0-J1 and SWB2 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 3 - TEST PORT 3b - DUT - TEST PORT 2a - PORT 1>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 3, output to TEST PORT 2a via SWA3 J0-J2 and SWA2 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 2a, output to PORT 1 via SWB3 J0-J1 and SWB J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 3 - TEST PORT 3c - DUT - TEST PORT 2a - PORT 1>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 3, output to TEST PORT 3c via SWA3 J0-J2 and SWA2 J0-J2, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 2a, output to PORT 1 via SWB3 J0-J1 and SWB2 J2-J0, and are then analyzed in the R3860 OPT14.

5. S41

<PORT 1 - TEST PORT 1a - DUT - TEST PORT 4a - PORT 4>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 1, output to TEST PORT 1a via SWB2 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 4a, output to PORT 4 via SWA5 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 1 - TEST PORT 1a - DUT - TEST PORT 4b - PORT 4>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 1, output to TEST PORT 1a via SWB2 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 4b, output to PORT 1 via SWA4 J1-J0 and SWA5 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 1 - TEST PORT 1a - DUT - TEST PORT 4c - PORT 4>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 1, output to TEST PORT 1a via SWB2 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 4c, output to PORT 4 via SWA4 J2-J0 and SWA5 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 1 - TEST PORT 2a - DUT - TEST PORT 4a - PORT 4>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 1, output to TEST PORT 2a via SWB2 J0-J2 and SWB3 J2-J0, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 4a, output to PORT 4 via SWA5 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 1 - TEST PORT 2a - DUT - TEST PORT 4b - PORT 4>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 1, output to TEST PORT 2a via SWB2 J0-J2 and SWB3 J2-J0, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 4b, output to PORT 4 via SWA4 J1-J0 and SWA5 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 1 - TEST PORT 2a - DUT - TEST PORT 4c - PORT 4>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 1, output to TEST PORT 2a via SWB2 J0-J2 and SWB3 J2-J0, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 4c, output to PORT 4 via SWA4 J2-J0 and SWA5 J2-J0, and are then analyzed in the R3860 OPT14.

6. S14

<PORT 4 - TEST PORT 4a - DUT - TEST PORT 1a - PORT 1>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4, output to TEST PORT 4a via SWA5 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 1a, output to PORT 1 via SWB2 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 4 - TEST PORT 4b - DUT - TEST PORT 1a - PORT 1>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4, output to TEST PORT 4b via SWA5 J0-J2 and SWA4 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 1a, output to PORT 1 via SWB2 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 4 - TEST PORT 4c - DUT - TEST PORT 1a - PORT 1>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4, output to TEST PORT 4c via SWA5 J0-J2 and SWA4 J0-J2, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 1a, output to PORT 1 via SWB2 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 4 - TEST PORT 4a - DUT - TEST PORT 2a - PORT 1>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4, output to TEST PORT 4a via SWA5 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 2a, output to PORT 1 via SWB3 J0-J1 and SWB2 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 4 - TEST PORT 4b - DUT - TEST PORT 2a - PORT 1>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4, output to TEST PORT 4b via SWA5 J0-J2 and SWA4 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 2a, output to PORT 1 via SWB3 J0-J1 and SWB2 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 4 - TEST PORT 4c - DUT - TEST PORT 2a - PORT 1>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4, output to TEST PORT 4c via SWA5 J0-J2 and SWA4 J0-J2, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 2a, output to PORT 1 via SWB3 J0-J1 and SWB2 J2-J0, and are then analyzed in the R3860 OPT14.

7. S32

<PORT 2 - TEST PORT 2a - DUT - TEST PORT 3a - PORT 3>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 2, output to TEST PORT 2a via SWB4 J0-J1 and SWB3 J1-J0, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 3a, output to PORT 3 via SWA3 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 2 - TEST PORT 2a - DUT - TEST PORT 3b - PORT 3>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 2, output to TEST PORT 2a via SWB4 J0-J1 and SWB3 J1-J0, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 3b, output to PORT 3 via SWA2 J1-J0 and SWA3 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 2 - TEST PORT 2a - DUT - TEST PORT 3c - PORT 3>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 2, output to TEST PORT 2a via SWB4 J0-J1 and SWB3 J1-J0, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 3c, output to PORT 3 via SWA2 J2-J0 and SWA3 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 2 - TEST PORT 2b - DUT - TEST PORT 3a - PORT 3>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 2, output to TEST PORT 2b via SWB4 J0-J2, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 3a, output to PORT 3 via SWA3 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 2 - TEST PORT 2b - DUT - TEST PORT 3b - PORT 3>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 2, output to TEST PORT 2b via SWB4 J0-J2, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 3b, output to PORT 3 via SWA2 J1-J0 and SWA3 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 2 - TEST PORT 2b - DUT - TEST PORT 3c - PORT 3>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 2, output to TEST PORT 2b via SWB4 J0-J2, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 3c, output to PORT 2 via SWA3 J2-J0 and SWA3 J2-J0, and are then analyzed in the R3860 OPT14.

8. S23

<PORT 3 - TEST PORT 3a - DUT - TEST PORT 2a - PORT 2>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 3, output to TEST PORT 3a via SWA3 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 2a, output to PORT 2 via SWB3 J0-J1 and SWB4 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 3 - TEST PORT 3b - DUT - TEST PORT 2a - PORT 2>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 3, output to TEST PORT 3b via SWA3 J0-J2 and SWA2 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 2a, output to PORT 2 via SWB3 J0-J1 and SWB4 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 3 - TEST PORT 3c - DUT - TEST PORT 2a - PORT 2>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 3, output to TEST PORT 3c via SWA3 J0-J2 and SWA2 J0-J2, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 2a, output to PORT 2 via SWB3 J0-J1 and SWB4 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 3 - TEST PORT 3a - DUT - TEST PORT 2b - PORT 2>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 3, output to TEST PORT 3a via SWA3 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 2b, output to PORT 2 via SWB4 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 3 - TEST PORT 3b - DUT - TEST PORT 2b - PORT 2>
The R3860 OPT14 signal is input to the R3968 OPT11 PORT 3, output to TEST PORT 3b via SWA3 J0-J2 and SWA2 J2-J0, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 2b, output to PORT 2 via SWB4 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 3 - TEST PORT 3c - DUT - TEST PORT 2b - PORT 2>
The R3860 OPT14 signal is input to the R3968 OPT11 PORT 3, output to TEST PORT 3c via SWA3 J0-J2 and SWA2 J0-J2, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 2b, output to PORT 2 via SWB4 J2-J0, and are then analyzed in the R3860 OPT14.

9. S42

<PORT 2 - TEST PORT 2a - DUT - TEST PORT 4a - PORT 4>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 2, output to TEST PORT 2a via SWB4 J0-J1 and SWB3 J1-J0, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 4a, output to PORT 4 via SWA5 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 2 - TEST PORT 2a - DUT - TEST PORT 4b - PORT 4>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 2, output to TEST PORT 2a via SWB4 J0-J1 and SWB3 J1-J0, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 4b, output to PORT 4 via SWA4 J1-J0 and SWA5 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 2 - TEST PORT 2a - DUT - TEST PORT 4c - PORT 4>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 2, output to TEST PORT 2a via SWB4 J0-J1 and SWB3 J1-J0, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 4c, output to PORT 4 via SWA4 J2-J0 and SWA5 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 2 - TEST PORT 2b - DUT - TEST PORT 4a - PORT 4>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 2, output to TEST PORT 2b via SWB4 J0-J2, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 4a, output to PORT 4 via SWA5 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 2 - TEST PORT 2b - DUT - TEST PORT 4b - PORT 4>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 2, output to TEST PORT 2b via SWB4 J0-J2, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 4b, output to PORT 4 via SWA4 J1-J0 and SWA5 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 2 - TEST PORT 2b - DUT - TEST PORT 4c - PORT 4>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 2, output to TEST PORT 2b via SWB4 J0-J2, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 4c, output to PORT 4 via SWA4 J2-J0 and SWA5 J2-J0, and are then analyzed in the R3860 OPT14.

10. S24

<PORT 4 - TEST PORT 4a - DUT - TEST PORT 2a - PORT 2>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4, output to TEST PORT 4a via SWA5 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 2a, output to PORT 2 via SWB3 J0-J1 and SWB4 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 4 - TEST PORT 4b - DUT - TEST PORT 2a - PORT 2>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4, output to TEST PORT 4b via SWA5 J0-J2 and SWA4 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 2a, output to PORT 2 via SWB3 J0-J1 and SWB4 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 4 - TEST PORT 4c - DUT - TEST PORT 2a - PORT 2>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4, output to TEST PORT 4c via SWA5 J0-J2 and SWA4 J0-J2, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 2a, output to PORT 2 via SWB3 J0-J1 and SWB4 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 4 - TEST PORT 4a - DUT - TEST PORT 2b - PORT 2>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4, output to TEST PORT 4a via SWA5 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 2b, output to PORT 2 via SWB4 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 4 - TEST PORT 4b - DUT - TEST PORT 2b - PORT 2>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4, output to TEST PORT 4b via SWA5 J0-J2 and SWA4 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 2b, output to PORT 2 via SWB4 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 4 - TEST PORT 4c - DUT - TEST PORT 2b - PORT 2>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4, output to TEST PORT 4c via SWA5 J0-J2 and SWA4 J0-J2, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 2b, output to PORT 2 via SWB4 J2-J0, and are then analyzed in the R3860 OPT14.

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<PORT 3 - TEST PORT 3a - DUT - TEST PORT 4a - PORT 4>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 3, output to TEST PORT 3a via SWA3 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 4a, output to PORT 4 via SWA5 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 3 - TEST PORT 3b - DUT - TEST PORT 4a - PORT 4>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 3, output to TEST PORT 3b via SWA3 J0-J2 and SWA2 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 4a, output to PORT 4 via SWA5 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 3 - TEST PORT 3c - DUT - TEST PORT 4a - PORT 4>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 3, output to TEST PORT 3c via SWA3 J0-J2 and SWA2 J0-J2, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 4a, output to PORT 4 via SWA5 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 3 - TEST PORT 3a - DUT - TEST PORT 4b - PORT 4>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 3, output to TEST PORT 3a via SWA3 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 4b, output to PORT 4 via SWA4 J1-J0 and SWA5 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 3 - TEST PORT 3b - DUT - TEST PORT 4b - PORT 4>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 3, output to TEST PORT 3b via SWA3 J0-J2 and SWA2 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 4b, output to PORT 4 via SWA4 J1-J0 and SWA5 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 3 - TEST PORT 3c - DUT - TEST PORT 4b - PORT 4>
The R3860 OPT14 signal is input to the R3968 OPT11 PORT 3, output to TEST PORT 3c via SWA3 J0-J2 and SWA2 J0-J2, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 4b, output to PORT 4 via SWA4 J1-J0 and SWA5 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 3 - TEST PORT 3a - DUT - TEST PORT 4c - PORT 4>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 3, output to TEST PORT 3a via SWA3 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 4c, output to PORT 4 via SWA4 J2-J0 and SWA5 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 3 - TEST PORT 3b - DUT - TEST PORT 4c - PORT 4>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 3, output to TEST PORT 3b via SWA3 J0-J2 and SWA2 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 4c, output to PORT 4 via SWA4 J2-J0 and SWA5 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 3 - TEST PORT 3c - DUT - TEST PORT 4c - PORT 4>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 3, output to TEST PORT 3c via SWA3 J0-J2 and SWA2 J0-J2, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 4c, output to PORT 4 via SWA4 J2-J0 and SWA5 J2-J0, and are then analyzed in the R3860 OPT14.

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<PORT 4 - TEST PORT 4a - DUT - TEST PORT 3a - PORT 3>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4, output to TEST PORT 4a via SWA5 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 3a, output to PORT 3 via SWA3 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 4 - TEST PORT 4b - DUT - TEST PORT 3a - PORT 3>
The R3860 OPT14 signal is input to the R3968 OPT11 PORT 4, output to TEST PORT 4b via SWA5 J0-J2 and SWA4 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 3a, output to PORT 3 via SWA3 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 4 - TEST PORT 4c - DUT - TEST PORT 3a - PORT 3>
The R3860 OPT14 signal is input to the R3968 OPT11 PORT 4, output to TEST PORT 4c via SWA5 J0-J2 and SWA4 J0-J2, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 3a, output to PORT 3 via SWA3 J1-J0, and are then analyzed in the R3860 OPT14.

<PORT 4 - TEST PORT 4a - DUT - TEST PORT 3b - PORT 3>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4, output to TEST PORT 4a via SWA5 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 3b, output to PORT 3 via SWA2 J1-J0 and SWA3 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 4 - TEST PORT 4b - DUT - TEST PORT 3b - PORT 3>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4, output to TEST PORT 4b via SWA5 J0-J2 and SWA4 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 3b, output to PORT 3 via SWA2 J1-J0 and SWA3 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 4 - TEST PORT 4c - DUT - TEST PORT 3b - PORT 3>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4, output to TEST PORT 4c via SWA5 J0-J2 and SWA4 J0-J2, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 3b, output to PORT 3 via SWA2 J1-J0 and SWA3 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 4 - TEST PORT 4a - DUT - TEST PORT 3c - PORT 3>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4, output to TEST PORT 4a via SWA5 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 3c, output to PORT 3 via SWA2 J2-J0 and SWA3 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 4 - TEST PORT 4b - DUT - TEST PORT 3c - PORT 3>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4, output to TEST PORT 4b via SWA5 J0-J2 and SWA4 J0-J1, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 3c, output to PORT 3 via SWA2 J2-J0 and SWA3 J2-J0, and are then analyzed in the R3860 OPT14.

<PORT 4 - TEST PORT 4c - DUT - TEST PORT 3c - PORT 3>
The R3860 OPT14 signal is input to R3968 OPT11 PORT 4, output to TEST PORT 4c via SWA5 J0-J2 and SWA4 J0-J2, and is then input to the DUT.
DUT transmission components are input to R3968 OPT11 TEST PORT 3c, output to PORT 3 via SWA2 J2-J0 and SWA3 J2-J0, and are then analyzed in the R3860 OPT14.

6. PERFORMANCE TESTS

This chapter describes the test method to keep the performance of the R3968 OPT11.
Contact ADVANTEST for other test methods than the items described in this chapter.

6.1 Preparations for the Tests

6.1.1 Warm-up

Warm up the instrument at least 60 minutes before starting the performance tests.
Initialize the system by clicking ***System*** and then ***Preset*** on the main menu before starting each test.

6.1.2 Instrument Preparation

Make certain you have all necessary instrument and materials on hand for the tests listed in Table 6-1.

Table 6-1 Required Measurement Instrument for Performance Test

Test	Instrument used	Remarks
Test port load match	R3860 OPT14 RF Component Analyzer	Refer to Section 6.2
	Calibration kit *1	
	RF cable (TEST CABLE) *2	
Insertion loss	R3860 OPT14 RF Component Analyzer	Refer to Section 6.3
	Calibration kit *1	
	RF cable (TEST CABLE) *2	

*1: Calibration kit: Model 9617F3 (18 GHz, 3.5 mm connector)
*2: RF cable: Use cables with SMA connectors and good frequency characteristics (approx. 0.25dB/GHz).

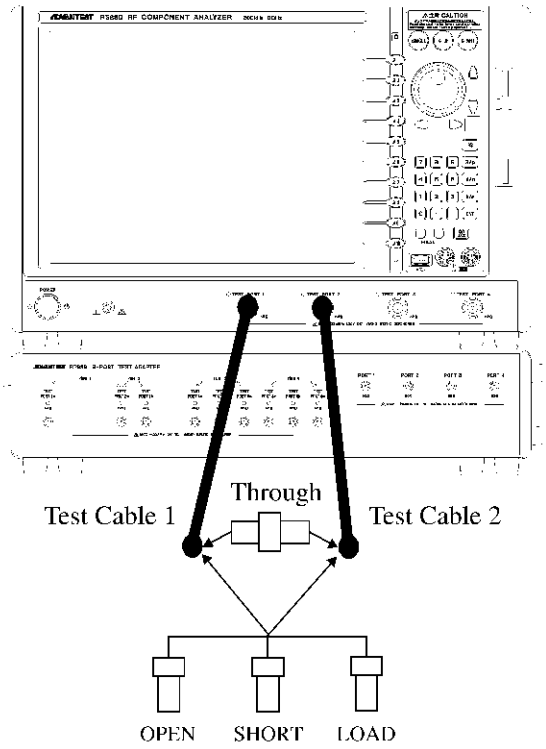
6.1.3 General Note

- Use an AC power source having a voltage of 90V to 250V and a frequency of 48Hz to 66Hz.
- Turn the R3860 OPT14 **POWER** switch off before connecting power cable.
- The R3968 OPT11 must be tested under the following conditions:
  Temperature: +25°C to ±5°C
  Relative humidity: 80% or less (without condensation)
  Free from dust, vibration and noise.

6.2 Test PORT Load Matching

Testing procedures

1. Connect the R3968 OPT11 to the R3860 OPT14 by using the control cable.
2. Connect Test Cable 1 to R3860 OPT14 TEST PORT 1, Test Cable 2 to R3860 OPT14 TEST PORT 2, and then conduct two-port full calibration.



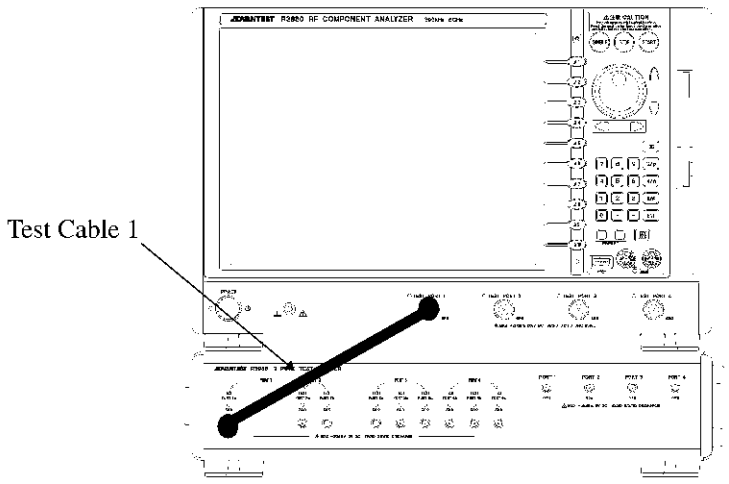
Calibration kit

3. Connect a standard open-circuit to Test Cable 1.
   Acquire open-circuit calibration data by using the following procedure.
   Select ***Cal*** from the tool menu → Select ***Standard Cal*** from the side menu → Select ***Full 2-Port Cal*** → Select ***P1-P2*** → Select ***Port 1 Open***
4. Connect a standard short-circuit to Test Cable 1.
   Acquire short-circuit calibration data by using the following procedure.
   Port 1 Short
5. Connect a standard load to Test Cable 1.
   Acquire standard load calibration data by using the following procedure.
   Port 1 Load

6. Connect a standard open-circuit to Test Cable 2.
   Acquire open-circuit calibration data by using the following procedure.
   Port 2 Open
7. Connect a standard short-circuit to Test Cable 2.
   Acquire short-circuit calibration data by using the following procedure.
   Port 2 Short
8. Connect a standard load to Test Cable 2.
   Acquire standard load calibration data by using the following procedure.
   Port 2 Load
9. Connect Test Cable 1 to Test Cable 2 by using a through connector.
   Acquire through-connection calibration data by using the following procedure.
   P1-P2 Thru
10. Remove the through connector connecting Test Cables 1 and 2.
    Acquire isolation calibration data by using the following procedure.
    Omit Isolation
11. Complete a two-port full calibration operation by using the following procedure.
    Done

TEST PORT 1a test port load matching

12. Set the R3860 OPT14 to measure S11.
    Select ***Trace*** from the tool menu →
    Select ***Trace Parameter*** from the side menu → ***S11***
13. Terminate TEST PORT 1a by using the following procedure.
    Select ***Channel*** from the tool menu →
    Select ***Channel Setup*** from the side menu →
    Select ***Multiport Test Set*** → Select ***2a-2b-3a-4a*** →
    Select ***Trace*** from the tool menu → Select ***/Div*** from the side menu →
    Select **1** → **0** → **Enter**
14. Connect Test Cable 1 to R3968 OPT11 TEST PORT 1a and then read test port load matching values from waveform data by using the markers. (Test Cable 2 is not used.)



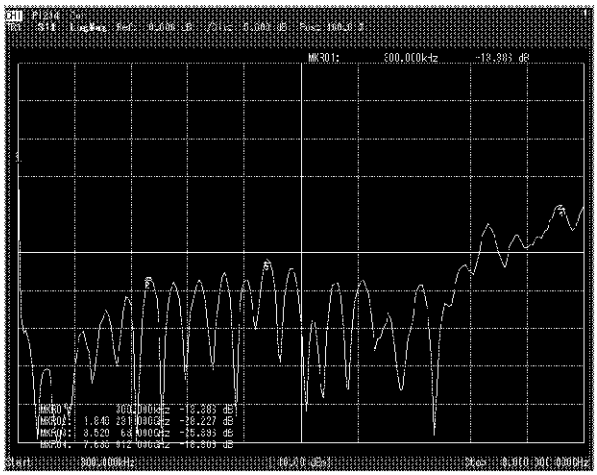
15. Check test port load matching for TEST PORT 1a.

    Measure the maximum response in the range 300 kHz to 40 MHz by using marker 1: The value must be 7 dB or more.

    Measure the maximum response in the range 40 MHz to 2.6 GHz by using marker 2: The value must be 21 dB or more.

    Measure the maximum response in the range 2.6 GHz to 3.8 GHz by using marker 3: The value must be 17 dB or more.

    Measure the maximum response in the range 3.8 GHz to 8 GHz by using marker 4: The value must be 12 dB or more.



TEST PORT 2a test port load matching

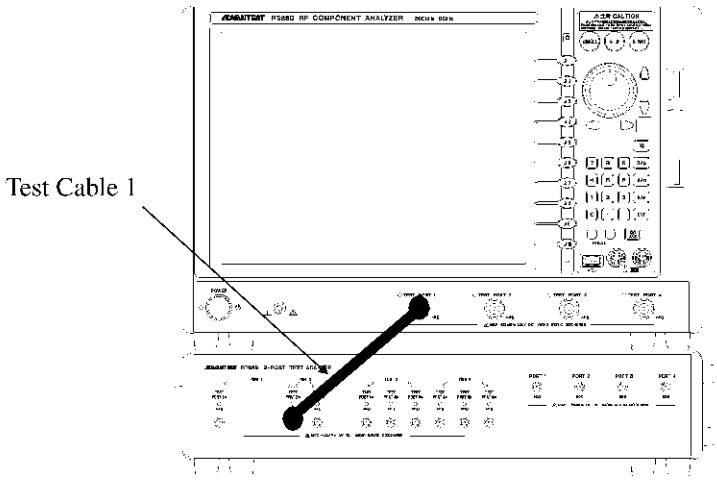
16. Terminate TEST PORT 2a by using the following procedure.

    Select ***Channel*** from the tool menu →

    Select ***Channel Setup*** from the side menu →

    Select ***Multiport Test Set*** → ***1a-2b-3a-4a***

17. Connect Test Cable 1 to R3968 OPT11 TEST PORT 2a and then read test port load matching values from waveform data by using the markers. (Test Cable 2 is not used.)



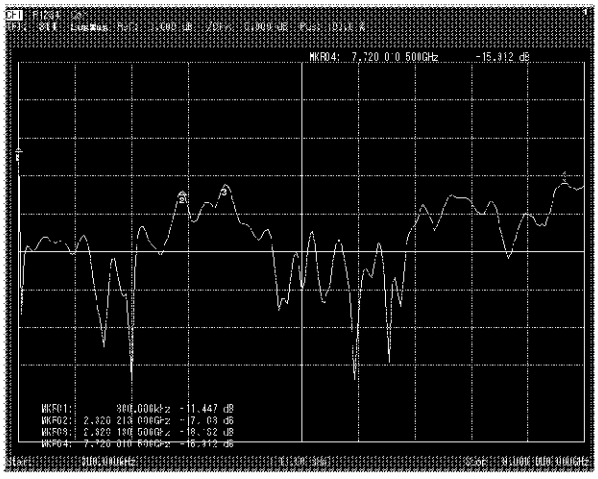
18. Check test port load matching for TEST PORT 2a.

    Measure the maximum response in the range 300 kHz to 40 MHz by using marker 1: The value must be 7 dB or more.

    Measure the maximum response in the range 40 MHz to 2.6 GHz by using marker 2: The value must be 13 dB or more.

    Measure the maximum response in the range 2.6 GHz to 3.8 GHz by using marker 3: The value must be 12 dB or more.

    Measure the maximum response in the range 3.8 GHz to 8 GHz by using marker 4: The value must be 10 dB or more.



TEST PORT 2b test port load matching

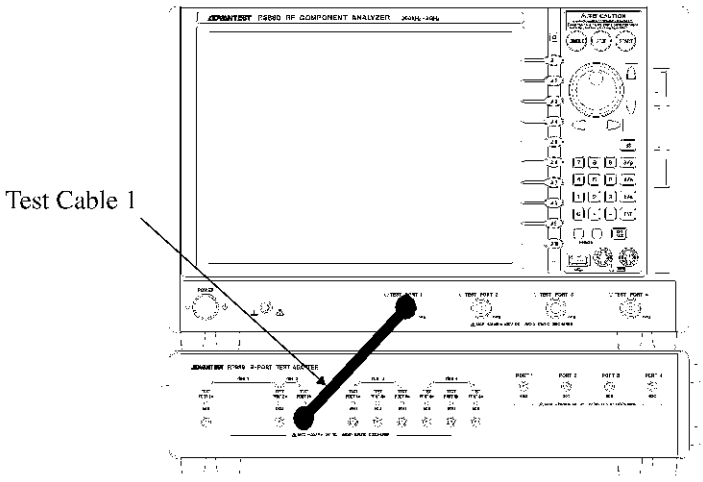
19. Terminate TEST PORT 2b by using the following procedure.

    Select ***Channel*** from the tool menu →

    Select ***Channel Setup*** from the side menu →

    Select ***Multiport Test Set → 1a-2a-3a-4a***

20. Connect Test Cable 1 to R3968 OPT11 TEST PORT 2b and then read test port load matching values from waveform data by using the markers. (Test Cable 2 is not used.)



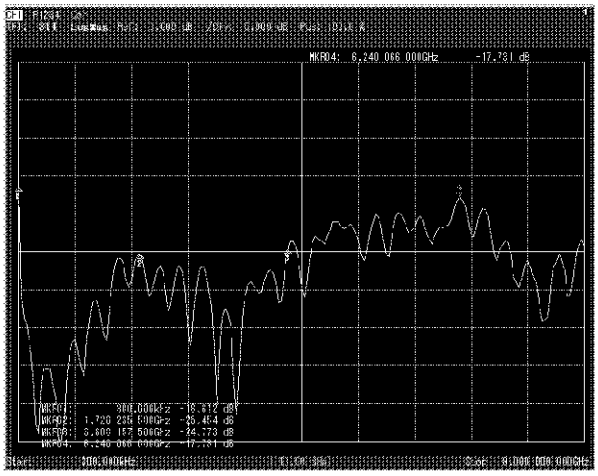
21. Check test port load matching for TEST PORT 2b.

    Measure the maximum response in the range 300 kHz to 40 MHz by using marker 1: The value must be 7 dB or more.

    Measure the maximum response in the range 40 MHz to 2.6 GHz by using marker 2: The value must be 21 dB or more.

    Measure the maximum response in the range 2.6 GHz to 3.8 GHz by using marker 3: The value must be 17 dB or more.

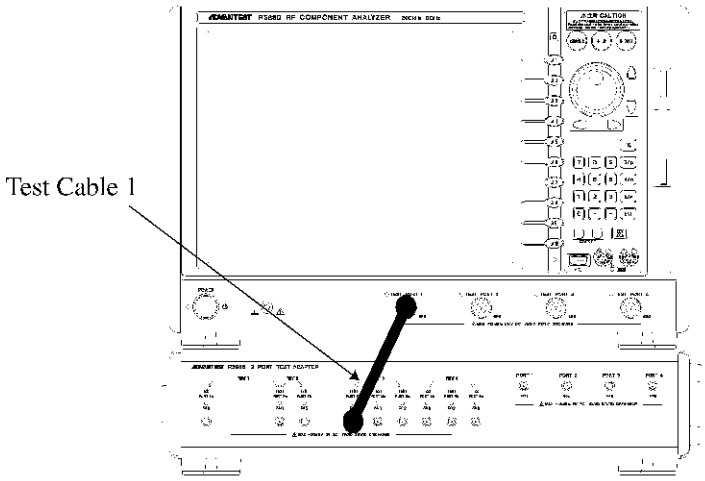
    Measure the maximum response in the range 3.8 GHz to 8 GHz by using marker 4: The value must be 12 dB or more.



TEST PORT 3a test port load matching

22. Terminate TEST PORT 3a by using the following procedure.
    Select ***Channel*** from the tool menu →
    Select ***Channel Setup*** from the side menu →
    Select ***Multiport Test Set → 1a-2a-3b-4b***

23. Connect Test Cable 1 to R3968 OPT11 TEST PORT 3a and then read test port load matching values from waveform data by using the markers. (Test Cable 2 is not used.)



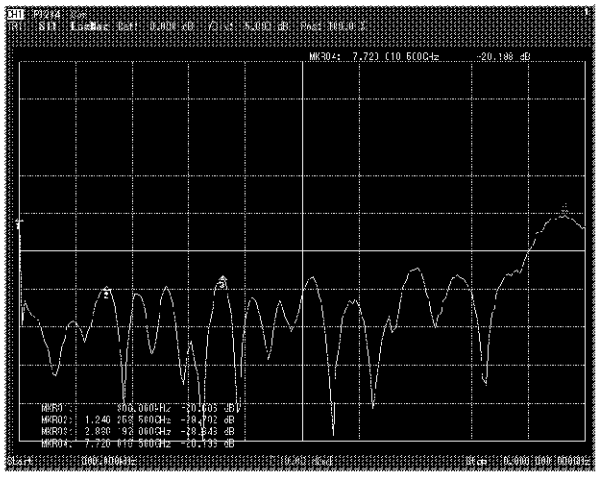
24. Check test port load matching for TEST PORT 3a.

    Measure the maximum response in the range 300 kHz to 40 MHz by using marker 1: The value must be 7 dB or more.

    Measure the maximum response in the range 40 MHz to 2.6 GHz by using marker 2: The value must be 21 dB or more.

    Measure the maximum response in the range 2.6 GHz to 3.8 GHz by using marker 3: The value must be 17 dB or more.

    Measure the maximum response in the range 3.8 GHz to 8 GHz by using marker 4: The value must be 12 dB or more.



TEST PORT 3b test port load matching

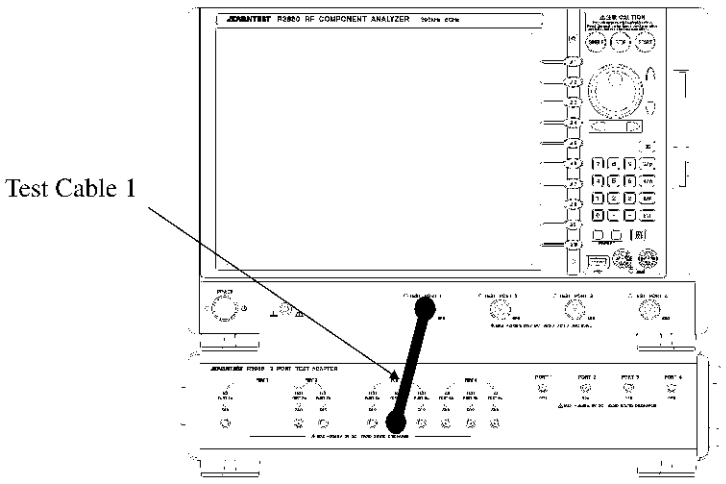
25. Terminate TEST PORT 3b by using the following procedure.

    Select ***Channel*** from the tool menu →

    Select ***Channel Setup*** from the side menu →

    Select ***Multiport Test Set → 1a-2a-3a-4a***

26. Connect Test Cable 1 to R3968 OPT11 TEST PORT 3b and then read test port load matching values from waveform data by using the markers. (Test Cable 2 is not used.)



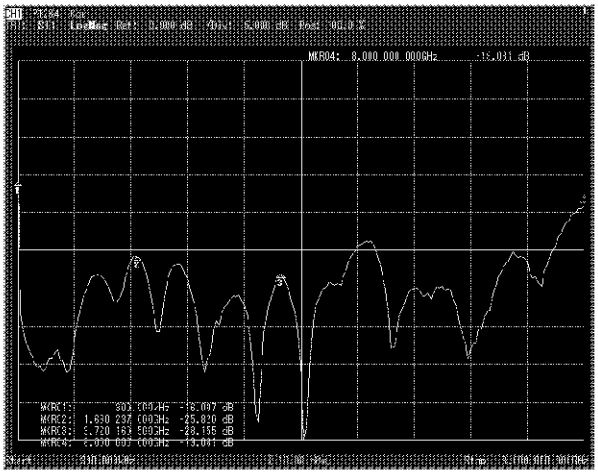
27. Check test port load matching for TEST PORT 3b.

    Measure the maximum response in the range 300 kHz to 40 MHz by using marker 1: The value must be 7 dB or more.

    Measure the maximum response in the range 40 MHz to 2.6 GHz by using marker 2: The value must be 21 dB or more.

    Measure the maximum response in the range 2.6 GHz to 3.8 GHz by using marker 3: The value must be 17 dB or more.

    Measure the maximum response in the range 3.8 GHz to 8 GHz by using marker 4: The value must be 12 dB or more.



TEST PORT 3c test port load matching

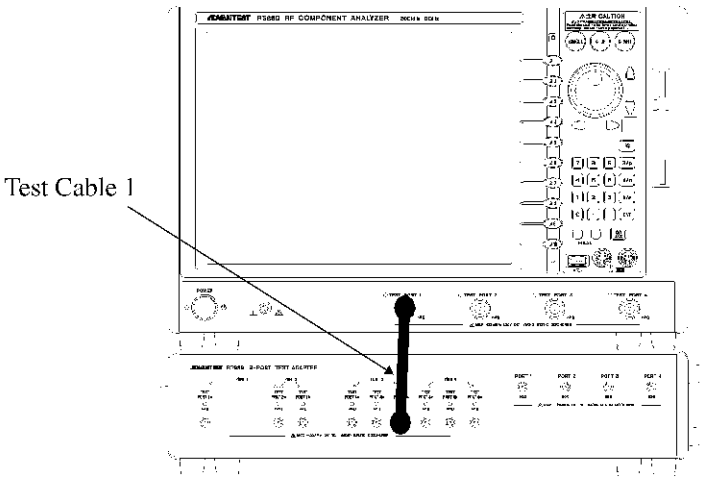
28. Terminate TEST PORT 3c by using the following procedure.

    Select ***Channel*** from the tool menu →

    Select ***Channel Setup*** from the side menu →

    Select ***Multiport Test Set*** → ***1a-2a-3a-4a***

29. Connect Test Cable 1 to R3968 OPT11 TEST PORT 3c and then read test port load matching values from waveform data by using the markers. (Test Cable 2 is not used.)



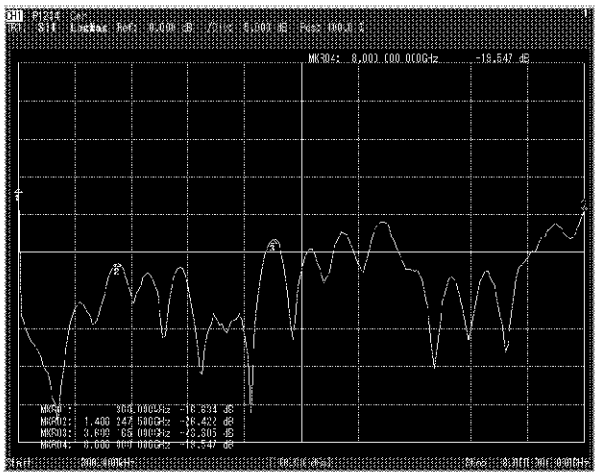
30. Check test port load matching for TEST PORT 3c.

    Measure the maximum response in the range 300 kHz to 40 MHz by using marker 1: The value must be 7 dB or more.

    Measure the maximum response in the range 40 MHz to 2.6 GHz by using marker 2: The value must be 21 dB or more.

    Measure the maximum response in the range 2.6 GHz to 3.8 GHz by using marker 3: The value must be 17 dB or more.

    Measure the maximum response in the range 3.8 GHz to 8 GHz by using marker 4: The value must be 12 dB or more.



TEST PORT 4a test port load matching

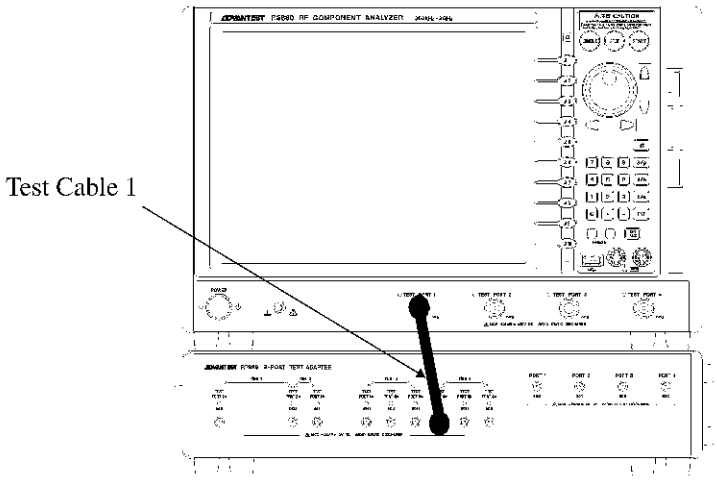
31. Terminate TEST PORT 4a by using the following procedure.

    Select ***Channel*** from the tool menu →

    Select ***Channel Setup*** from the side menu →

    Select ***Multiport Test Set → 1a-2a-3b-4b***

32. Connect Test Cable 1 to R3968 OPT11 TEST PORT 4a and then read test port load matching values from waveform data by using the markers. (Test Cable 2 is not used.)



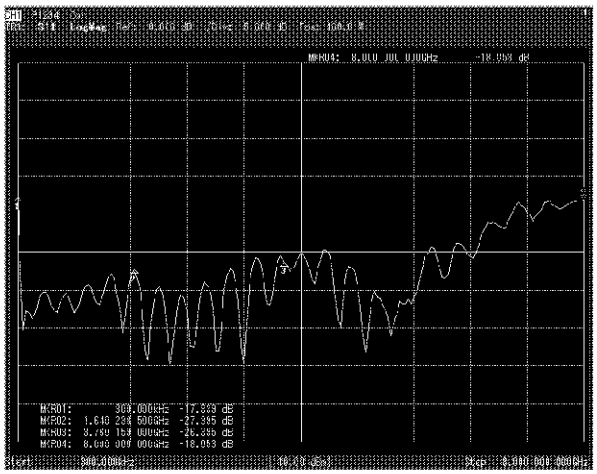
33. Check test port load matching for TEST PORT 4a.

    Measure the maximum response in the range 300 kHz to 40 MHz by using marker 1: The value must be 7 dB or more.

    Measure the maximum response in the range 40 MHz to 2.6 GHz by using marker 2: The value must be 21 dB or more.

    Measure the maximum response in the range 2.6 GHz to 3.8 GHz by using marker 3: The value must be 17 dB or more.

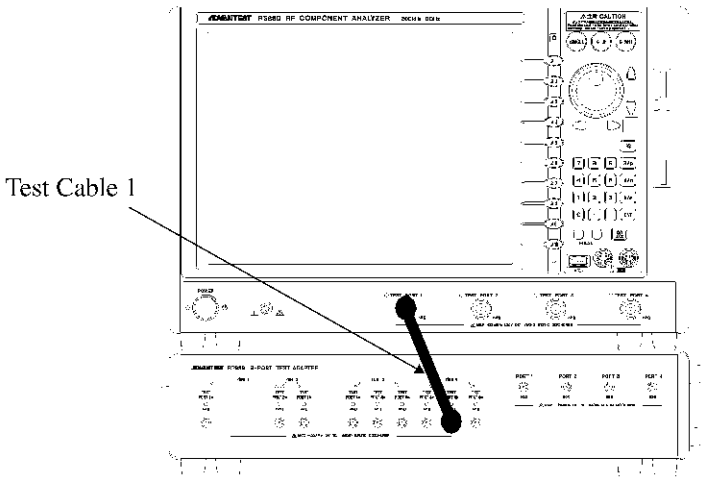
    Measure the maximum response in the range 3.8 GHz to 8 GHz by using marker 4: The value must be 12 dB or more.



TEST PORT 4b test port load matching

34. Terminate TEST PORT 4b by using the following procedure.
    Select ***Channel*** from the tool menu →
    Select ***Channel Setup*** from the side menu →
    Select ***Multiport Test Set*** → ***1a-2a-3a-4a***

35. Connect Test Cable 1 to R3968 OPT11 TEST PORT 4b and then read test port load matching values from waveform data by using the markers. (Test Cable 2 is not used.)



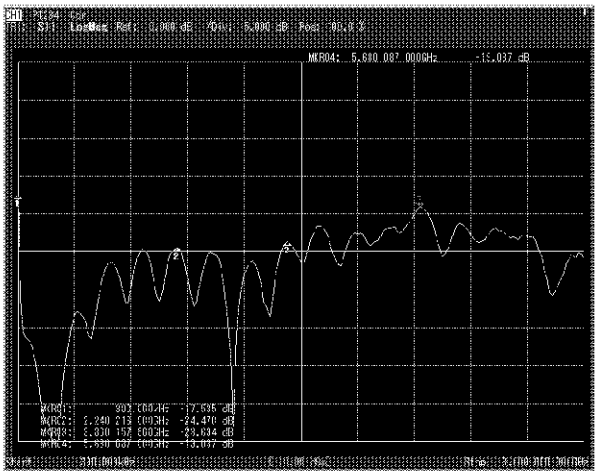
36. Check test port load matching for TEST PORT 4b.

    Measure the maximum response in the range 300 kHz to 40 MHz by using marker 1: The value must be 7 dB or more.

    Measure the maximum response in the range 40 MHz to 2.6 GHz by using marker 2: The value must be 21 dB or more.

    Measure the maximum response in the range 2.6 GHz to 3.8 GHz by using marker 3: The value must be 17 dB or more.

    Measure the maximum response in the range 3.8 GHz to 8 GHz by using marker 4: The value must be 12 dB or more.



TEST PORT 4c test port load matching

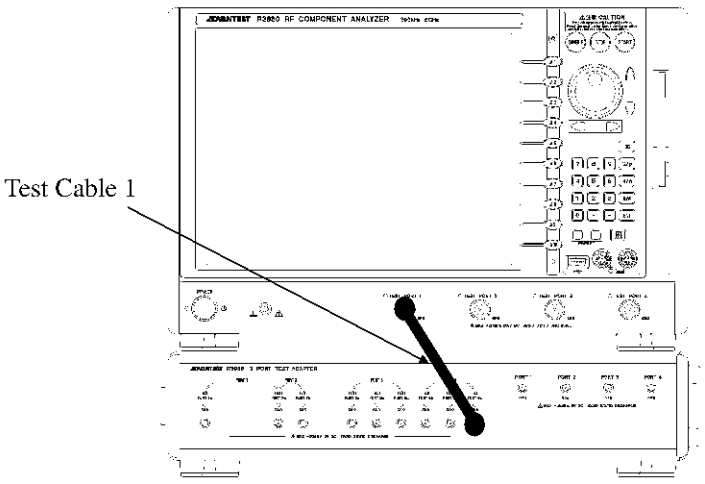
37. Terminate TEST PORT 4c by using the following procedure.

    Select ***Channel*** from the tool menu →

    Select ***Channel Setup*** from the side menu →

    Select ***Multiport Test Set*** → ***1a-2a-3a-4a***

38. Connect Test Cable 1 to R3968 OPT11 TEST PORT 4c and then read test port load matching values from waveform data by using the markers. (Test Cable 2 is not used.)



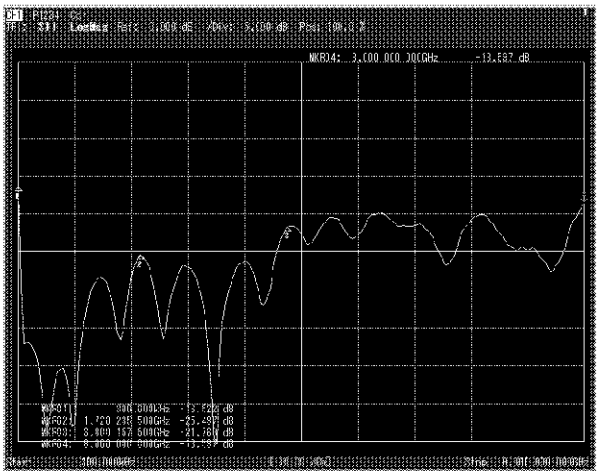
39. Check test port load matching for TEST PORT 4c.

    Measure the maximum response in the range 300 kHz to 40 MHz by using marker 1: The value must be 7 dB or more.

    Measure the maximum response in the range 40 MHz to 2.6 GHz by using marker 2: The value must be 21 dB or more.

    Measure the maximum response in the range 2.6 GHz to 3.8 GHz by using marker 3: The value must be 17 dB or more.

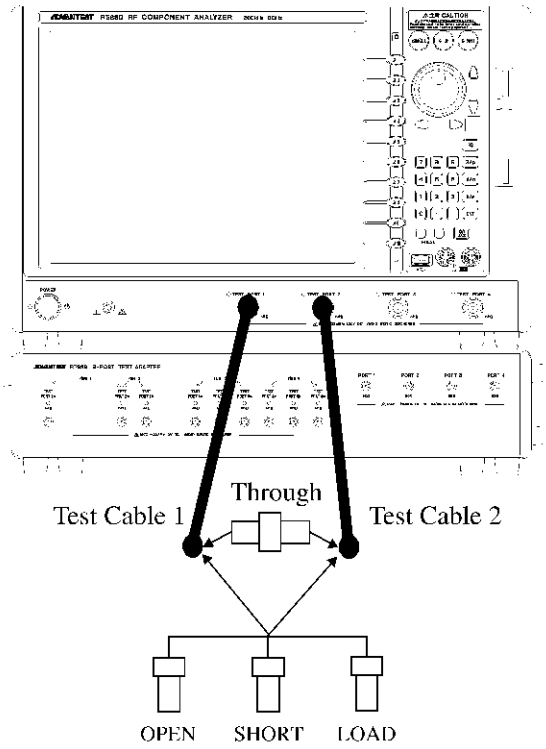
    Measure the maximum response in the range 3.8 GHz to 8 GHz by using marker 4: The value must be 12 dB or more.



6.3 Insertion Loss

Testing procedures

1. Connect the R3968 OPT11 to the R3860 OPT14 by using the control cable.
2. Connect Test Cable 1 to R3860 OPT14 TEST PORT 1, Test Cable 2 to R3860 OPT14 TEST PORT 2, and then conduct two-port full calibration.



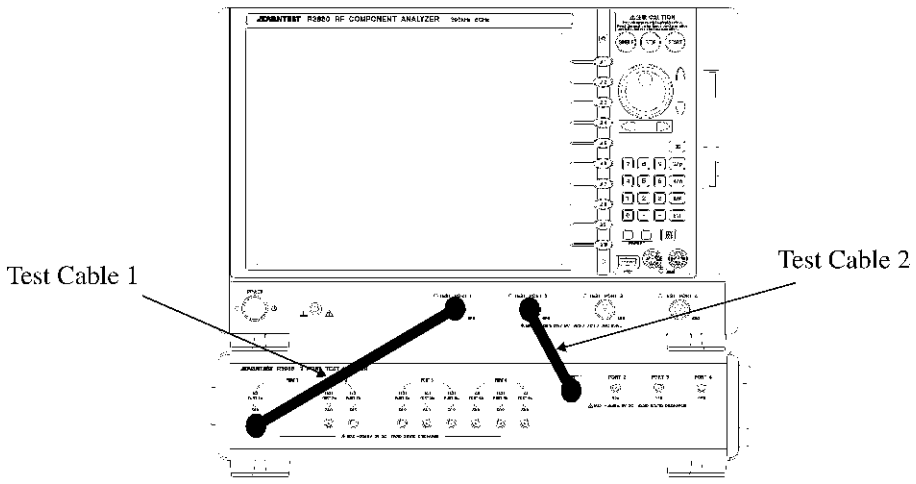
Calibration kit

3. Connect a standard open-circuit to Test Cable 1.
   Acquire open-circuit calibration data by using the following procedure.
   Select ***Cal*** from the tool menu → Select ***Standard Cal*** from the side menu
   Select ***Full 2-Port Cal*** → ***P1-P2*** → ***Port 1 Open***
4. Connect a standard short-circuit to Test Cable 1.
   Acquire short-circuit calibration data by using the following procedure.
   Port 1 Short
5. Connect a standard load to Test Cable 1.
   Acquire standard load calibration data by using the following procedure.
   Port 1 Load

6. Connect a standard open-circuit to Test Cable 2.
   Acquire open-circuit calibration data by using the following procedure.
   Port 2 Open
7. Connect a standard short-circuit to Test Cable 2.
   Acquire short-circuit calibration data by using the following procedure.
   Port 2 Short
8. Connect a standard load to Test Cable 2.
   Acquire standard load calibration data by using the following procedure.
   Port 2 Load
9. Connect Test Cable 1 to Test Cable 2 by using a through connector.
   Acquire through-connection calibration data by using the following procedure.
   P1-P2 Thru
10. Remove the through connector connecting Test Cables 1 and 2.
    Acquire isolation calibration data by using the following procedure.
    Omit Isolation
11. Complete a two-port full calibration operation by using the following procedure.
    Done

Insertion loss provided by the path from PORT 1 to TEST PORT 1a

12. Set the R3860 PT14 to measure S21.
    Select ***Trace*** from the tool menu →
    Select ***Trace Parameter*** from the side menu → ***S21***
13. Set a path from PORT 1 to TEST PORT 1a by using the following procedure.
    Select ***Channel*** from the tool menu →
    Select ***Channel Setup*** from the side menu →
    Select ***Multiport Test Set*** → ***1a-2a-3a-4a*** →
    Select ***Trace*** from the tool menu → Select ***/Div*** from the side menu →
    Select **1** → **ENTER**
14. Connect Test Cable 1 and Test Cable 2 by using PORT 1 and R3968 OPT11 TEST PORT 1a, respectively, and then read the waveform data insertion loss values by using the markers.

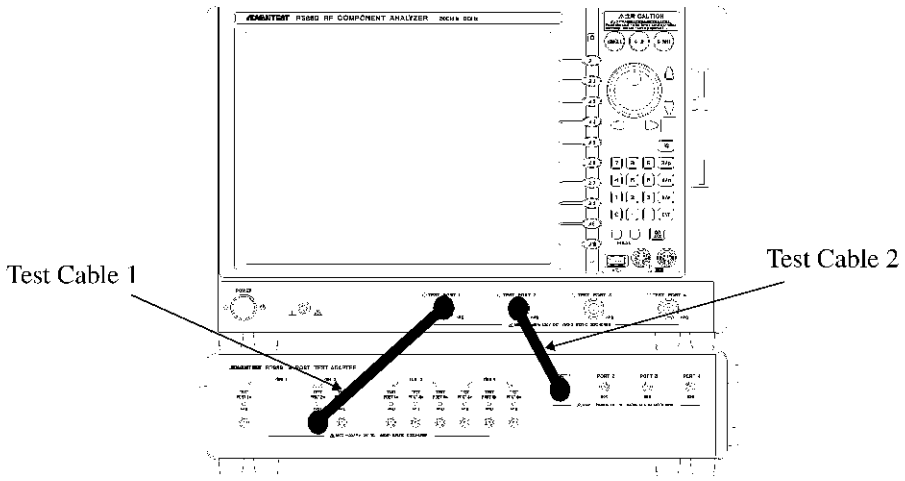


15. Check the amount of insertion loss from PORT 1 to TEST PORT 1a.
    Measure the minimum response in the range of 300 kHz to 8 GHz by using marker 1: the value must be 10 dB or less.

Insertion loss provided by the path from PORT 1 to TEST PORT 2a

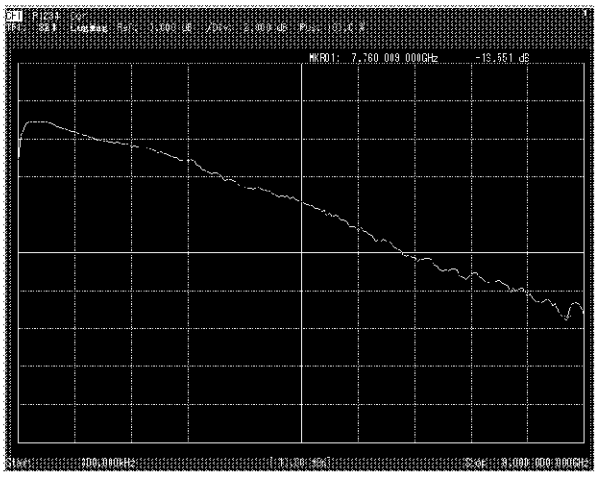
16. Set a path from PORT 1 to TEST PORT 2a by using the following procedure.
    Select ***Channel*** from the tool menu →
    Select ***Channel Setup*** from the side menu →
    Select ***Multiport Test Set*** → ***2a-2b-3a-4a*** →
    Select ***Trace*** from the tool menu → Select ***/Div*** from the side menu →
    Select **2** → **ENTER**

17. Connect Test Cable 1 and Test Cable 2 by using PORT 1 and R3968 OPT11 TEST PORT 2a, respectively, and then read the waveform data insertion loss values by using the markers.



18. Check the amount of insertion loss from PORT 1 to TEST PORT 2a.

    Measure the minimum response in the range of 300 kHz to 8 GHz by using marker 1: the value must be 16 dB or less.



Insertion loss provided by the path from PORT 2 to TEST PORT 2a

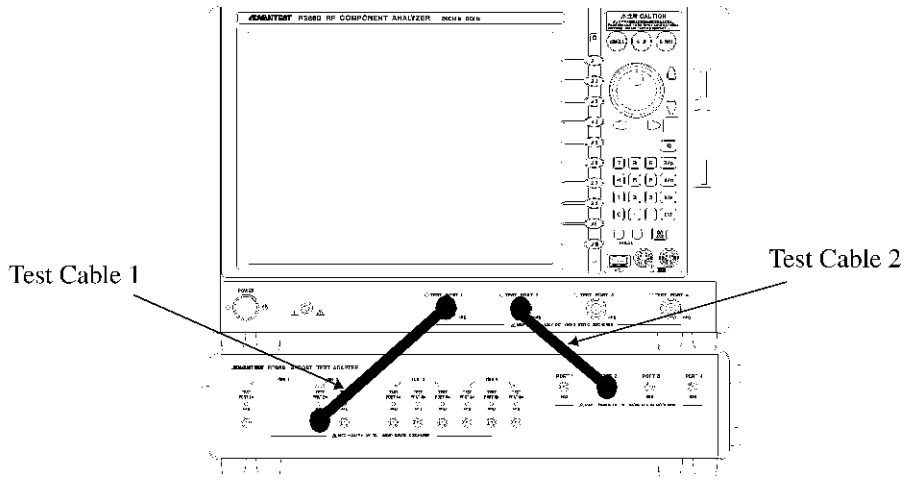
19. Set a path from PORT 2 to TEST PORT 2a by using the following procedure.

    Select ***Channel*** from the tool menu →

    Select ***Channel Setup*** from the side menu →

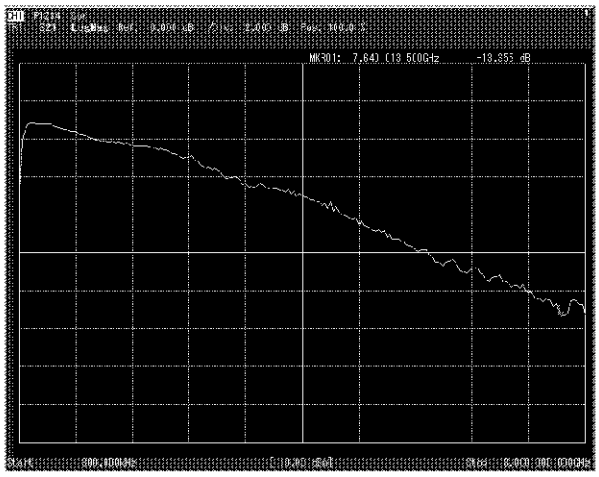
    Select ***Multiport Test Set*** → ***1a-2a-3a-4a***

20. Connect Test Cable 1 and Test Cable 2 by using PORT 2 and R3968 OPT11 TEST PORT 2a, respectively, and then read the waveform data insertion loss values by using the markers.



21. Check the amount of insertion loss from PORT 2 to TEST PORT 2a.

    Measure the minimum response in the range of 300 kHz to 8 GHz by using marker 1: the value must be 16 dB or less.



Insertion loss provided by the path from PORT 2 to TEST PORT 2b

22. Set a path from PORT 2 to TEST PORT 2b by using the following procedure.

    Select ***Channel*** from the tool menu →

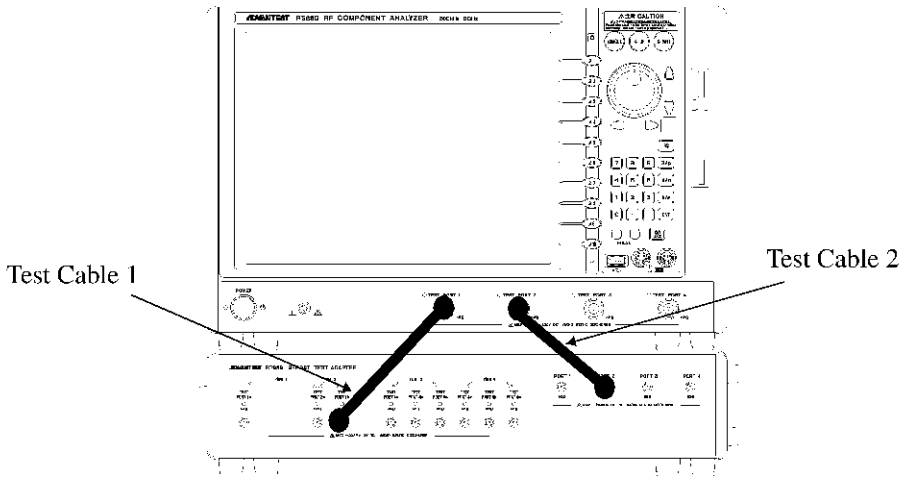
    Select ***Channel Setup*** from the side menu →

    Select ***Multiport Test Set*** → ***2a-2b-3a-4a*** →

    Select ***Trace*** from the tool menu → Select ***/Div*** from the side menu →

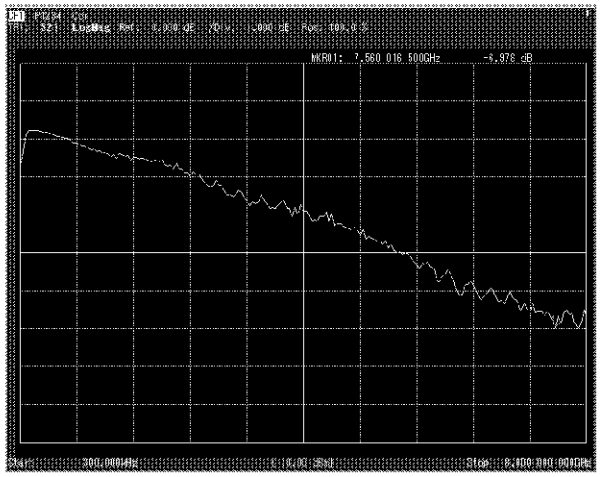
    Select **1** → **ENTER**

23. Connect Test Cable 1 and Test Cable 2 by using PORT 2 and R3968 OPT11 TEST PORT 2b, respectively, and then read the waveform data insertion loss values by using the markers.



24. Check the amount of insertion loss from PORT 2 to TEST PORT 2b.

    Measure the minimum response in the range of 300 kHz to 8 GHz by using marker 1: the value must be 10 dB or less.



Insertion loss provided by the path from PORT 3 to TEST PORT 3a

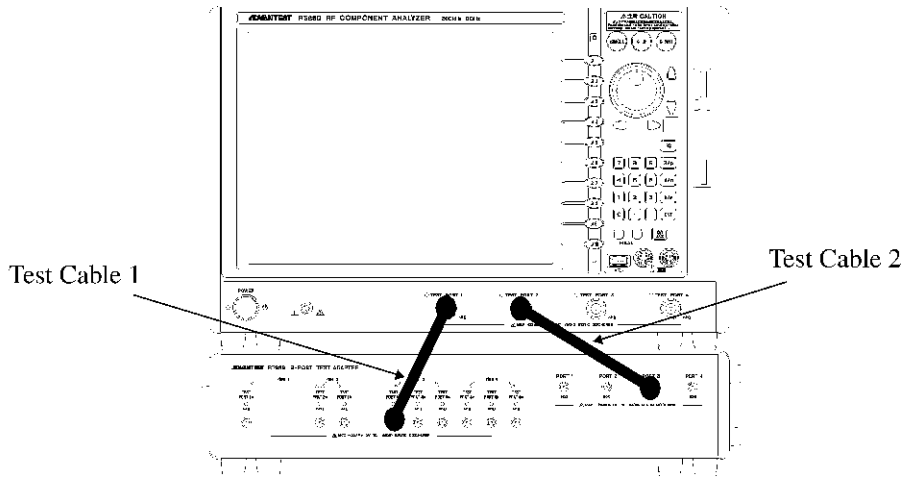
25. Set a path from PORT 3 to TEST PORT 3a by using the following procedure.

    Select ***Channel*** from the tool menu →

    Select ***Channel Setup*** from the side menu →

    Select ***Multiport Test Set*** → ***1a-2a-3a-4a***

26. Connect Test Cable 1 and Test Cable 2 by using PORT 3 and R3968 OPT11 TEST PORT 3a, respectively, and then read the waveform data insertion loss values by using the markers.



27. Check the amount of insertion loss from PORT 3 to TEST PORT 3a.

    Measure the minimum response in the range of 300 kHz to 8 GHz by using marker 1: the value must be 10 dB or less.

Insertion loss provided by the path from PORT 3 to TEST PORT 3b

28. Set a path from PORT 3 to TEST PORT 3b by using the following procedure.

    Select ***Channel*** from the tool menu →

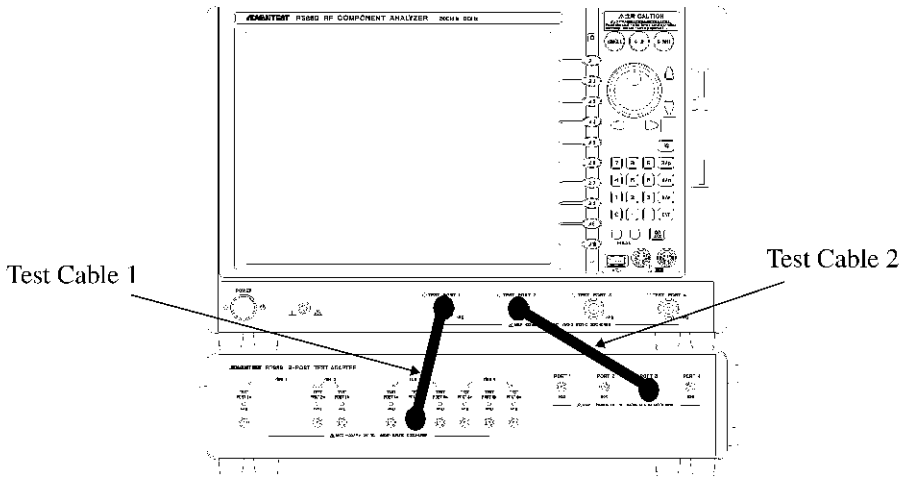
    Select ***Channel Setup*** from the side menu →

    Select ***Multiport Test Set*** → ***1a-2a-3b-4b*** →

    Select ***Trace*** from the tool menu → Select ***/Div*** from the side menu →

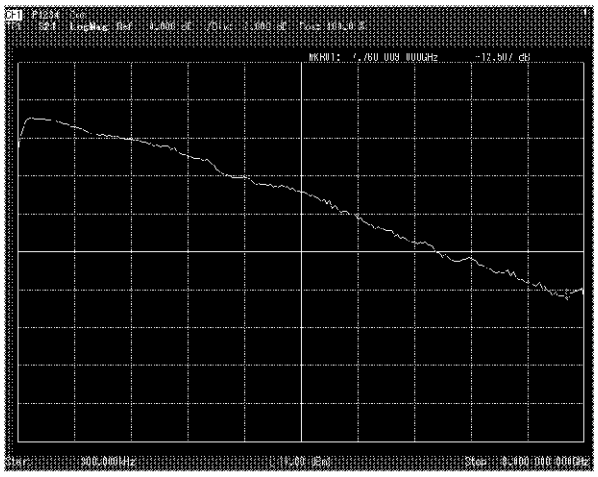
    Select **2** → **ENTER**

29. Connect Test Cable 1 and Test Cable 2 by using PORT 3 and R3968 OPT11 TEST PORT 3b, respectively, and then read the waveform data insertion loss values by using the markers.



30. Check the amount of insertion loss from PORT 3 to TEST PORT 3b.

    Measure the minimum response in the range of 300 kHz to 8 GHz by using marker 1: the value must be 16 dB or less.



Insertion loss provided by the path from PORT 3 to TEST PORT 3c

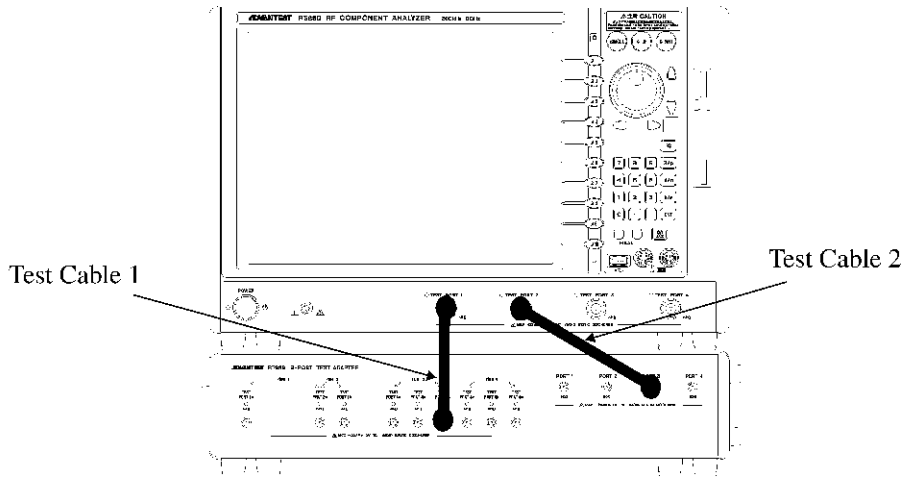
31. Set a path from PORT 3 to TEST PORT 3c by using the following procedure.

    Select ***Channel*** from the tool menu →

    Select ***Channel Setup*** from the side menu →

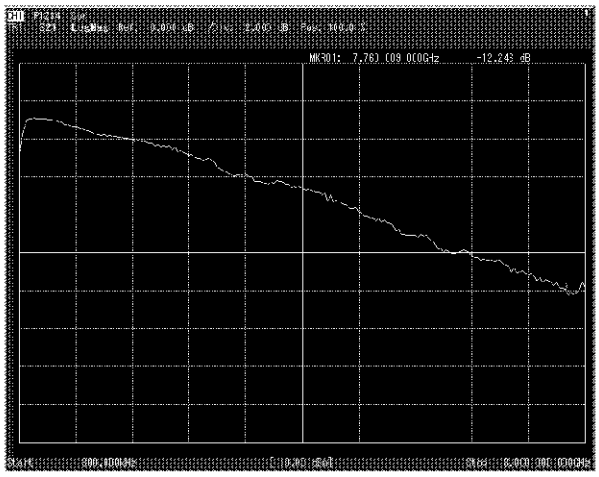
    Select ***Multiport Test Set*** → ***1a-2a-3c-4c***

32. Connect Test Cable 1 and Test Cable 2 by using PORT 3 and R3968 OPT11 TEST PORT 3c, respectively, and then read the waveform data insertion loss values by using the markers.



33. Check the amount of insertion loss from PORT 3 to TEST PORT 3c.

    Measure the minimum response in the range of 300 kHz to 8 GHz by using marker 1: the value must be 16 dB or less.



Insertion loss provided by the path from PORT 4 to TEST PORT 4a

34. Set a path from PORT 1 to TEST PORT 4a by using the following procedure.

    Select ***Channel*** from the tool menu →

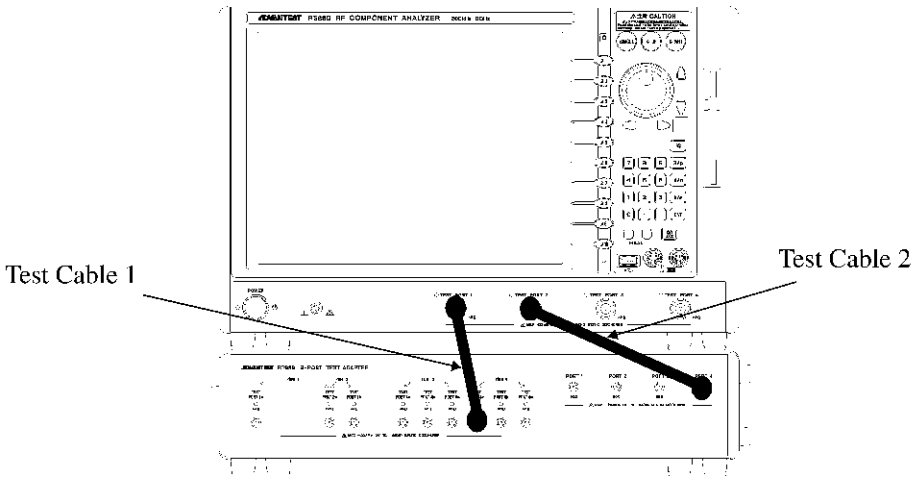
    Select ***Channel Setup*** from the side menu →

    Select ***Multiport Test Set*** → ***1a-2a-3a-4a*** →

    Select ***Trace*** from the tool menu → Select ***/Div*** from the side menu →

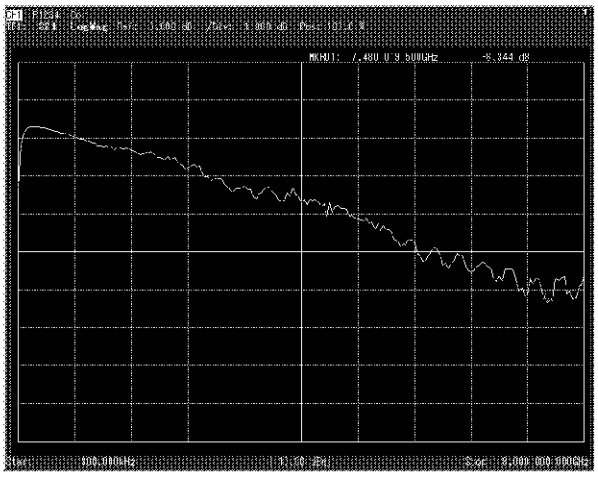
    Select **1** → **ENTER**

35. Connect Test Cable 1 and Test Cable 2 by using PORT 4 and R3968 OPT11 TEST PORT 4a, respectively, and then read the waveform data insertion loss values by using the markers.



36. Check the amount of insertion loss from PORT 4 to TEST PORT 4a.

    Measure the minimum response in the range of 300 kHz to 8 GHz by using marker 1: the value must be 10 dB or less.



Insertion loss provided by the path from PORT 4 to TEST PORT 4b

37. Set a path from PORT 4 to TEST PORT 4b by using the following procedure.

    Select ***Channel*** from the tool menu →

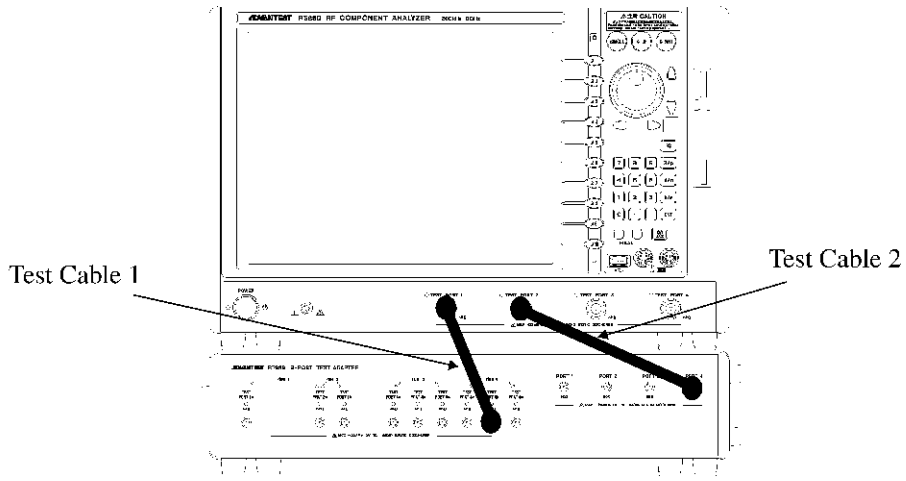
    Select ***Channel Setup*** from the side menu →

    Select ***Multiport Test Set*** → ***1a-2a-3b-4b*** →

    Select ***Trace*** from the tool menu → Select ***/Div*** from the side menu →

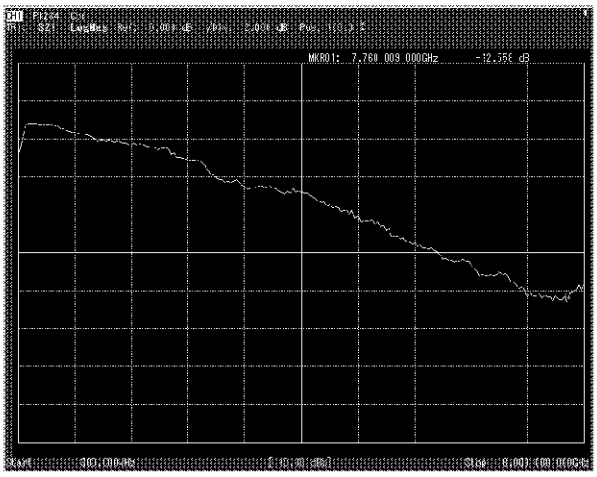
    Select **2** → **ENTER**

38. Connect Test Cable 1 and Test Cable 2 by using PORT 4 and R3968 OPT11 TEST PORT 4b, respectively, and then read the waveform data insertion loss values by using the markers.



39. Check the amount of insertion loss from PORT 4 to TEST PORT 4b.

    Measure the minimum response in the range of 300 kHz to 8 GHz by using marker 1: the value must be 16 dB or less.



Insertion loss provided by the path from PORT 4 to TEST PORT 4c

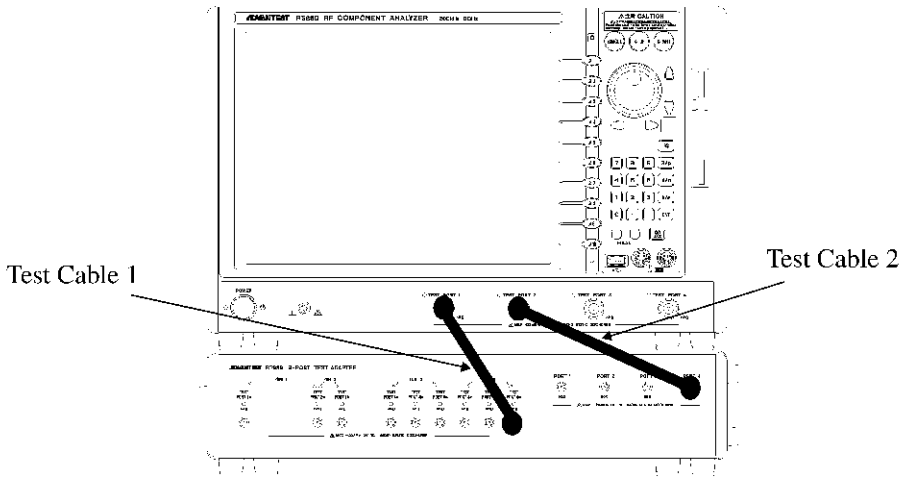
40. Set a path from PORT 4 to TEST PORT 4c by using the following procedure.

    Select ***Channel*** from the tool menu →

    Select ***Channel Setup*** from the side menu →

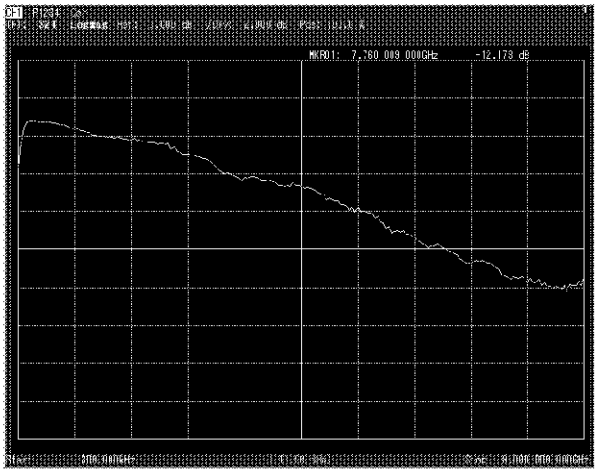
    Select ***Multiport Test Set*** → ***1a-2a-3c-4c***

41. Connect Test Cable 1 and Test Cable 2 by using PORT 4 and R3968 OPT11 TEST PORT 4c, respectively, and then read the waveform data insertion loss values by using the markers.



42. Check the amount of insertion loss from PORT 4 to TEST PORT 4c.

    Measure the minimum response in the range of 300 kHz to 8 GHz by using marker 1: the value must be 16 dB or less.

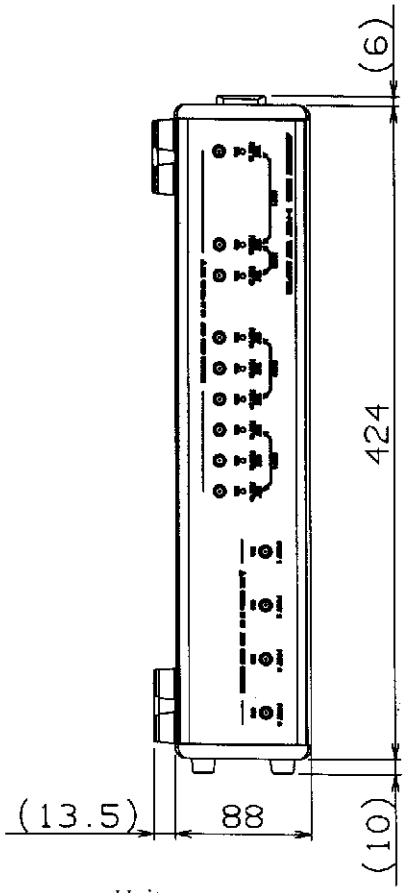


7. SPECIFICATIONS

7.1 Specifications for the R3968 OPT11

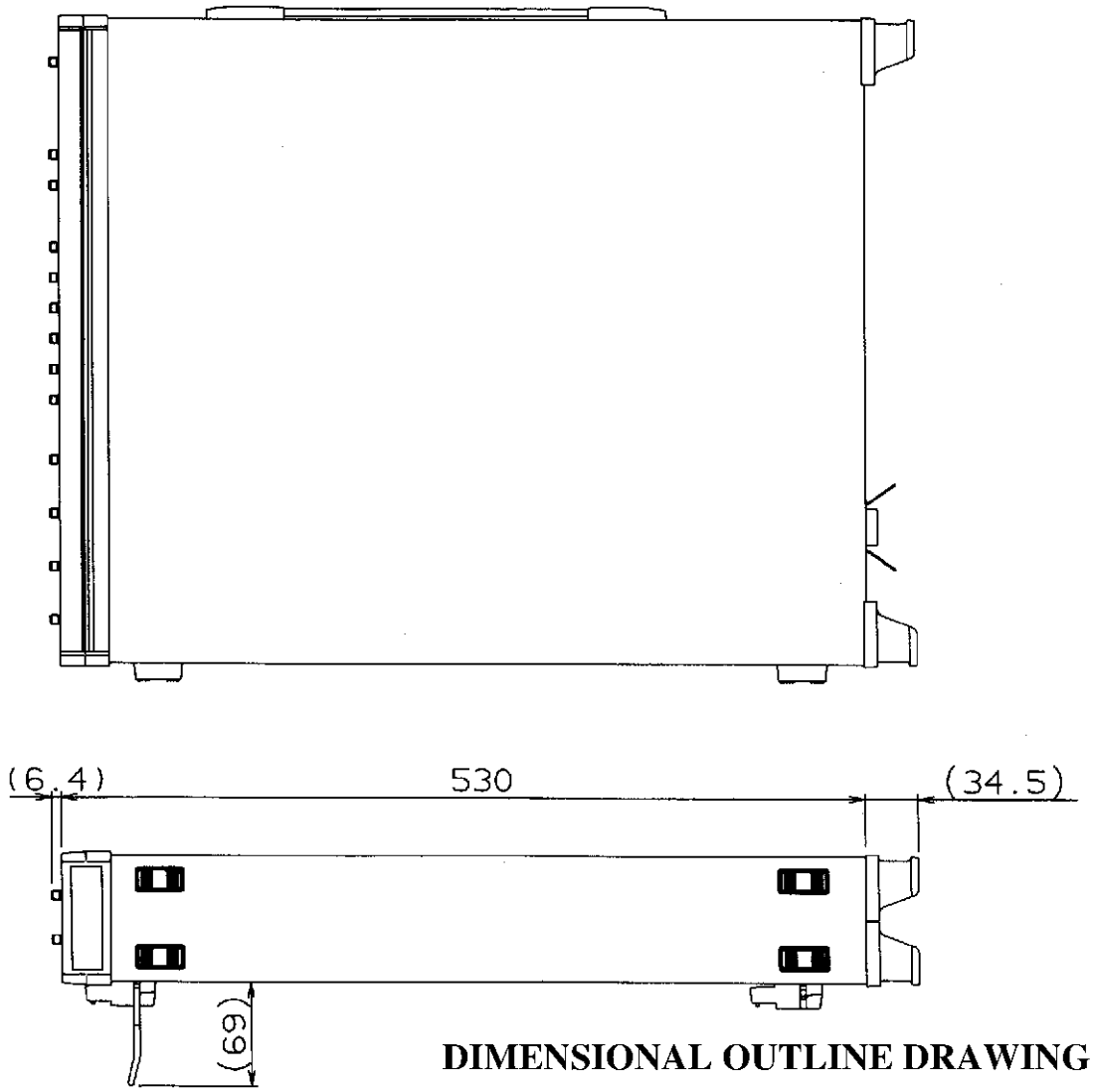
Characteristics		Specification
1. Characteristic impedance		50 Ω
2. Frequency range		300 kHz to 8 GHz
3. Insertion Loss		
	port1 to testport1a	10 dB or less
	port1 to testport2a	16 dB or less
	port2 to testport2a	16 dB or less
	port2 to testport2b	10 dB or less
	port3 to testport3a	10 dB or less
	port3 to testport3b	16 dB or less
	port3 to testport3c	16 dB or less
	port4 to testport4a	10 dB or less
	port4 to testport4b	16 dB or less
	port4 to testport4c	16 dB or less
4. Test port load match		
TEST PORT1a	300 kHz to 40 MHz	7 dB or higher (23°C ±5°C)
	40 MHz to 2.6 GHz	21 dB or higher (23°C ±5°C)
	2.6 GHz to 3.8 GHz	17 dB or higher (23°C ±5°C)
	3.8 GHz to 8 GHz	12 dB or higher (23°C ±5°C)
TEST PORT2a	300 kHz to 40 MHz	7 dB or higher (23°C ±5°C)
	40 MHz to 2.6 GHz	13 dB or higher (23°C ±5°C)
	2.6GHz to 3.8 GHz	12 dB or higher (23°C ±5°C)
	3.8 GHz to 8 GHz	10 dB or higher (23°C ±5°C)
TEST PORT2b	300 kHz to 40 MHz	7 dB or higher (23°C ±5°C)
	40 MHz to 2.6 GHz	21 dB or higher (23°C ±5°C)
	2.6 GHz to 3.8 GHz	17 dB or higher (23°C ±5°C)
	3.8 GHz to 8 GHz	12 dB or higher (23°C ±5°C)
TEST PORT3a	300 kHz to 40 MHz	7 dB or higher (23°C ±5°C)
	40 MHz to 2.6 GHz	21 dB or higher (23°C ±5°C)
	2.6 GHz to 3.8 GHz	17 dB or higher (23°C ±5°C)
	3.8 GHz to 8 GHz	12 dB or higher (23°C ±5°C)

Characteristics		Specification
TEST PORT3b	300 kHz to 40 MHz	7 dB or higher (23°C ±5°C)
	40 MHz to 2.6 GHz	21 dB or higher (23°C ±5°C)
	2.6 GHz to 3.8 GHz	17 dB or higher (23°C ±5°C)
	3.8GHz to 8 GHz	12 dB or higher (23°C ±5°C)
TEST PORT3c	300 kHz to 40 MHz	7 dB or higher (23°C ±5°C)
	40 MHz to 2.6 GHz	21 dB or higher (23°C ±5°C)
	2.6 GHz to 3.8 GHz	17 dB or higher (23°C ±5°C)
	3.8 GHz to 8 GHz	12 dB or higher (23°C ±5°C)
TEST PORT4a	300 kHz to 40 MHz	7 dB or higher (23°C ±5°C)
	40 MHz to 2.6 GHz	21 dB or higher (23°C ±5°C)
	2.6 GHz to 3.8 GHz	17 dB or higher (23°C ±5°C)
	3.8 GHz to 8 GHz	12 dB or higher (23°C ±5°C)
TEST PORT4b	300 kHz to 40 MHz	7 dB or higher (23°C ±5°C)
	40 MHz to 2.6 GHz	21 dB or higher (23°C ±5°C)
	2.6 GHz to 3.8 GHz	17 dB or higher (23°C ±5°C)
	3.8 GHz to 8 GHz	12 dB or higher (23°C ±5°C)
TEST PORT4c	300 kHz to 40 MHz	7 dB or higher (23°C ±5°C)
	40 MHz to 2.6 GHz	21 dB or higher (23°C ±5°C)
	2.6 GHz to 3.8 GHz	17 dB or higher (23°C ±5°C)
	3.8 GHz to 8 GHz	12 dB or higher (23°C ±5°C)
5. Operating environment		Temperature range: ±0°C to +50°C Relative humidity: 80% or lower
6. Programming		All functions can be controlled from the R3860 OPT14. The GPIB interface installed in the R3860 OPT14 is also used when using remote control.
7. Storage temperature range		Temperature range: -20°C to +60°C Relative humidity: 80% or lower
8. External dimensions		Approximately 424 (W) × 88 (H) × 530 (D) mm
9. Mass		7 kg or less
10. RF destruction level		+20 dBm max



Unit : mm

NOTE
This drawing shows external dimensions of this instrument.
The difference in products and options used can cause a change in the appearance of the instrument.



DIMENSIONAL OUTLINE DRAWING

ALPHABETICAL INDEX

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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) incorporation in the Product of any parts or components (i) provided by Purchaser or (ii) provided by a third party at the request or direction of Purchaser or due to specifications or designs supplied by Purchaser (including, without limitation, any degradation in performance of such parts or components);

   (f) Advantest's incorporation or use of any specifications or designs supplied by Purchaser;

   (g) 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

   (h) 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. TORT (INCLUDING, WITHOUT LIMITATION, NEGLIGENCE), STRICT LIABILITY, INDEMNITY, CONTRIBUTION OR OTHERWISE.**

8. **OTHER THAN THE REMEDY FOR THE BREACH OF WARRANTY SET FORTH HEREIN, ADVANTEST SHALL NOT BE LIABLE FOR, AND HEREBY DISCLAIMS TO THE FULLEST EXTENT PERMITTED BY LAW ANY LIABILITY FOR, DAMAGES FOR PRODUCT FAILURE OR DEFECT, WHETHER ARISING OUT OF BREACH OF CONTRACT, TORT (INCLUDING, WITHOUT LIMITATION, NEGLEGENCE), 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.

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