ADVANTEST®

ADVANTEST CORPORATION

R3560

Receiver Test Set

Operation Manual

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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

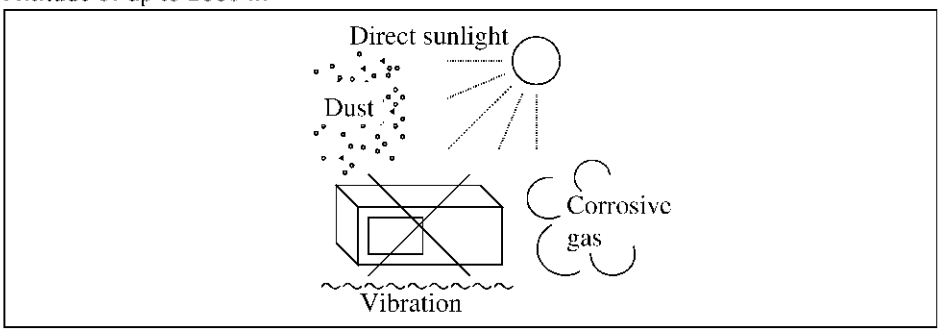


Figure-1 Environmental Conditions

- Operating position

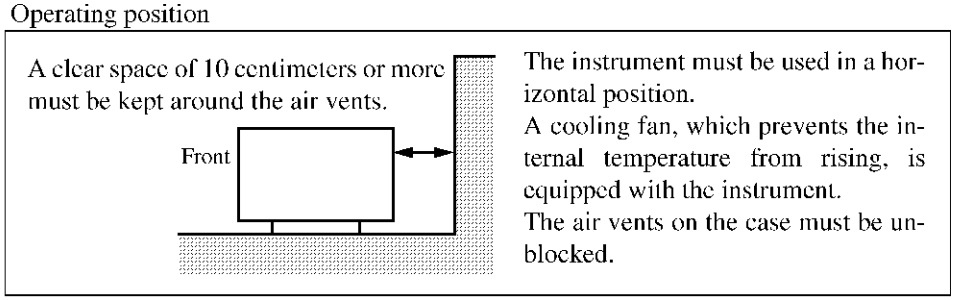


Figure-2 Operating Position

- Storage position

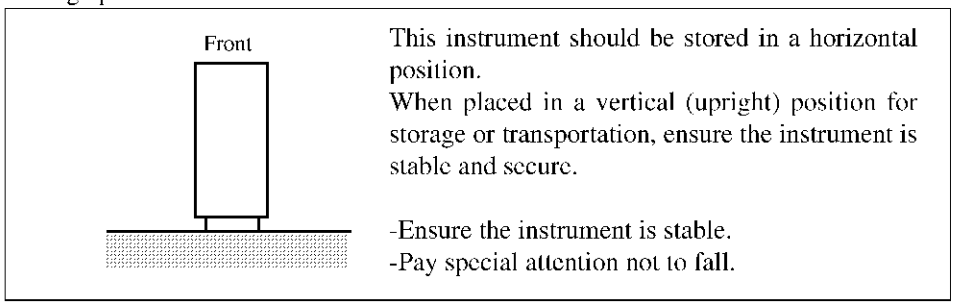


Figure-3 Storage Position

- 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.

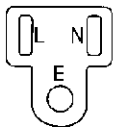
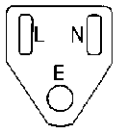
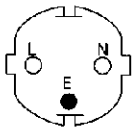
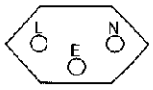
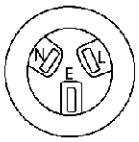
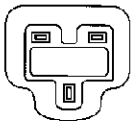
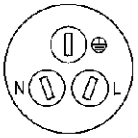
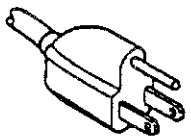
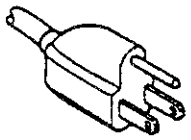
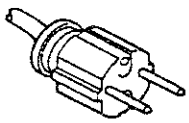
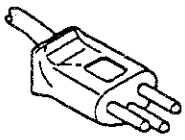
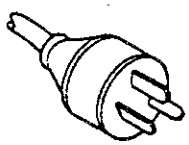
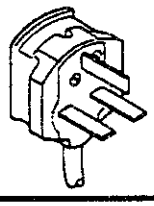
Plug configuration	Standards	Rating, color and length	Model number (Option number)
	PSE: Japan Electrical Appliance and Material Safety Law	125 V at 7 A Black 2 m (6 ft)	Straight: A01402 Angled: A01412
	UL: United States of America CSA: Canada	125 V at 7 A Black 2 m (6 ft)	Straight: A01403 (Option 95) 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

Table of Power Cable Options

There are six power cable options (refer to following table).

Order power cable options by Model number.

	Plug configuration	Standards	Rating, color and length	Model number (Option number)
1		JIS: Japan Law on Electrical Appliances	125 V at 7 A Black 2 m (6 ft)	Straight: A01402 Angled: A01412
2		UL: United States of America CSA: Canada	125 V at 7 A Black 2 m (6 ft)	Straight: A01403 (Option 95) Angled: A01413
3		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
4		SEV: Switzerland	250 V at 6 A Gray 2 m (6 ft)	Straight: A01405 (Option 97) Angled: A01415
5		SAA: Australia, New Zealand	250 V at 6 A Gray 2 m (6 ft)	Straight: A01406 (Option 98) Angled: ---------
6		BS: United Kingdom	250 V at 6 A Black 2 m (6 ft)	Straight: A01407 (Option 99) Angled: A01417

PREFACE

1. In the Beginning

This manual explains about the receiver test set from the purchase to the operation.
The contents of this manual can be changed without notice.

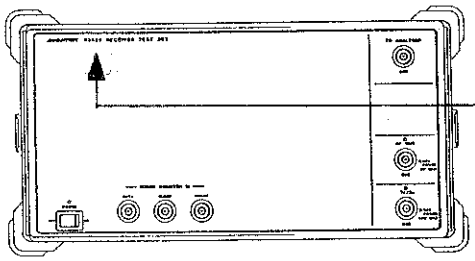
A part or all of this manual should not be reproduced or reprinted without ADVANTEST's permission.

Address and telephone number of ADVANTEST are mentioned at the end of this manual.
Refer to them for your inquiry.

2. Check of the Instrument and the Accessory

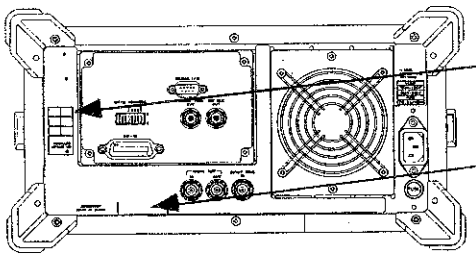
After opening the package, check the followings first. If you find something wrong in quantity, quality, and appearance, please contact ADVANTEST sales office or distributor nearest you.

•Main unit



Confirmation position of type and name of product.

Confirm the product the same as the order from the name plate in the front panel.



Place the built-in options are printed

Place the serial No. (product No.) is printed

Check the serial number marked on the rear panel, which shall be informed to us when you ask for repair.

●Standard accessory list

Request
Order the addition of the accessory etc. with type name.

Name	Type name	Quantity	Remarks
Power cable	*1	1	
Input cable	A01037-1500	1	50Ω BNC cable, 1.5 m
N-BNC conversion adaptor	JUG-201A/U	3	
N-SMA conversion adaptor	HRM-554S	1	
50Ω terminator	HRM-601A	1	
AC adaptor	A09034	1	
Power fuse	T6.3A/250V	1	
R3560 Operating manual	ER3560	1	English

*1 ADVANTEST provides the power cables for each country.

3. Calibration

The equipment requires the calibration of frequency reference source.
In order to satisfy the measurement accuracy, perform the calibration at least once a year.
Refer to "Guarantee" at the end of this manual for inquiry of the calibration.

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1. BEFORE STARTING THE MEASUREMENT

1.1 The Instrument Overview

R3560 is the receiver test set to cover all over frequency band of PHS/PDC by one set. The 10^3 to 10^6 bits BER counter and the DUT interface which is ready for diversity measurement are built in to it. With GPIB interface equipped, it can realize automatic test system on receiver test line at low cost. Furthermore, it can be developed to transmitter/receiver overall automatic test system by combining with modulation spectrum analyzer R3465.

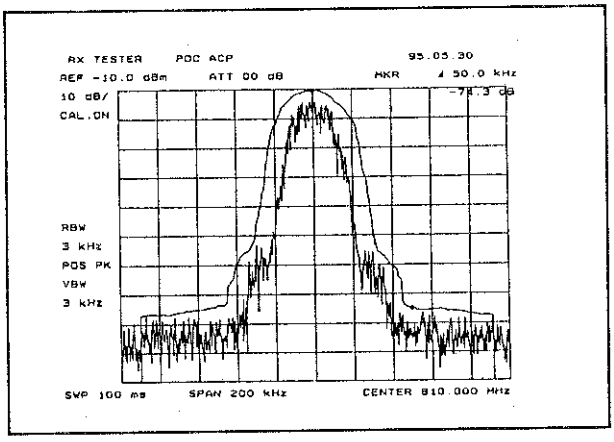
- Characteristics

  Covers all over frequency band of PHS/PDC by one set.

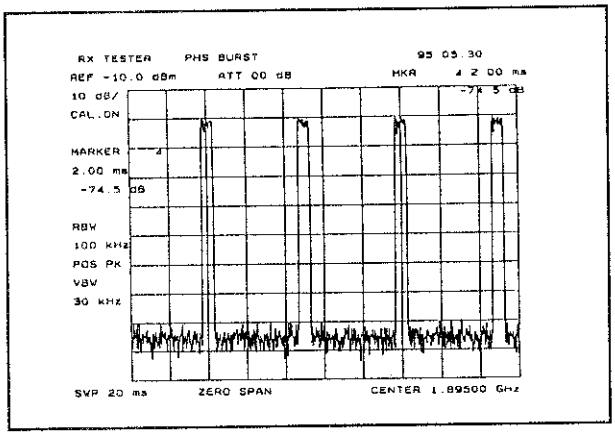
  BER counter built-in

  DUT interface built-in

  Tx/Rx automatic measurement system is realized by the combination with modulation spectrum analyzer R3465.



<Example of PDC signal output>



<Example of PHS burst signal output>

1.2 Operating Conditions

(1) Operating environmental conditions

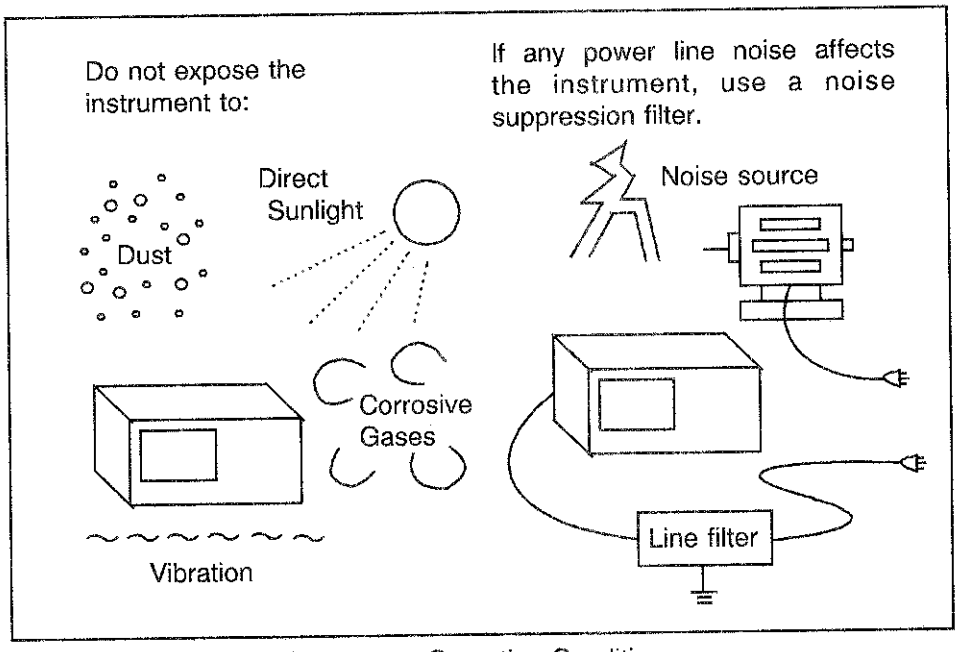


Figure 1-1 Operating Conditions

Place this instrument in the following conditions.

- Environmental temperature: 0°C to +50°C (Operating temperature range)
  -20°C to +60°C (Storage temperature range)
- Relative humidity: RH85% or less (Non- condensing)
- Place without corroded gas
- Place without exposed to direct sunshine
- Place without dust
- Place without vibration
- Place where there is minimum noise

The instrument is designed to resist noise from AC power lines. However, you should still take steps to minimize power line noise. If necessary, install a noise suppression filter.

For highly accurate measurement, turn the power ON after the instrument temperature has reached the room temperature level, and warm up the instrument for 60 minutes.

(2) Installation

Air cooling fan of the exhaust type is built into the rear panel. Do not close this outlet.

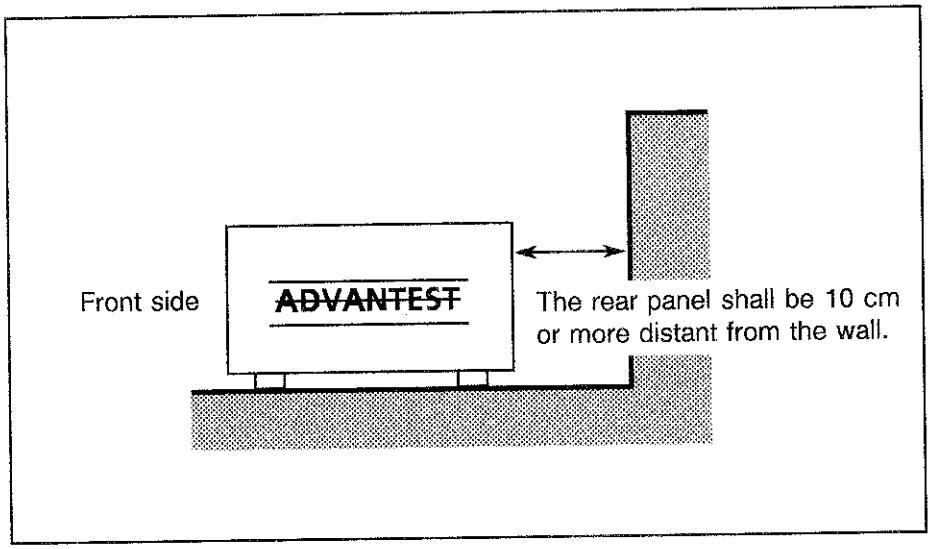


Figure 1-2 Installation

1.3 Power Source

1.3.1 Conditions of the Power Source

WARNING

Use this instrument safely following to the power source conditions. In case the power source conditions are not satisfied, this instrument might be damaged.

The power source conditions of this instrument is as follows.

	100 V_{AC} operation	220 V_{AC} operation
Input voltage range	90 V to 132 V	198 V to 250 V
Frequency range	48 Hz to 66 Hz	48 Hz to 66 Hz
Power Fuse	T6.3A/250V	
Power consumption	300 VA or below	

Use the power supplying path fitting to this instrument power source conditions.

1.3.2 Change of Power Source Voltage

The power source voltage (100 V - 240 V) of this instrument is switched automatically. Use power cable which fits to the power source voltage and the specification.

1.3.3 Power Fuse Replacement

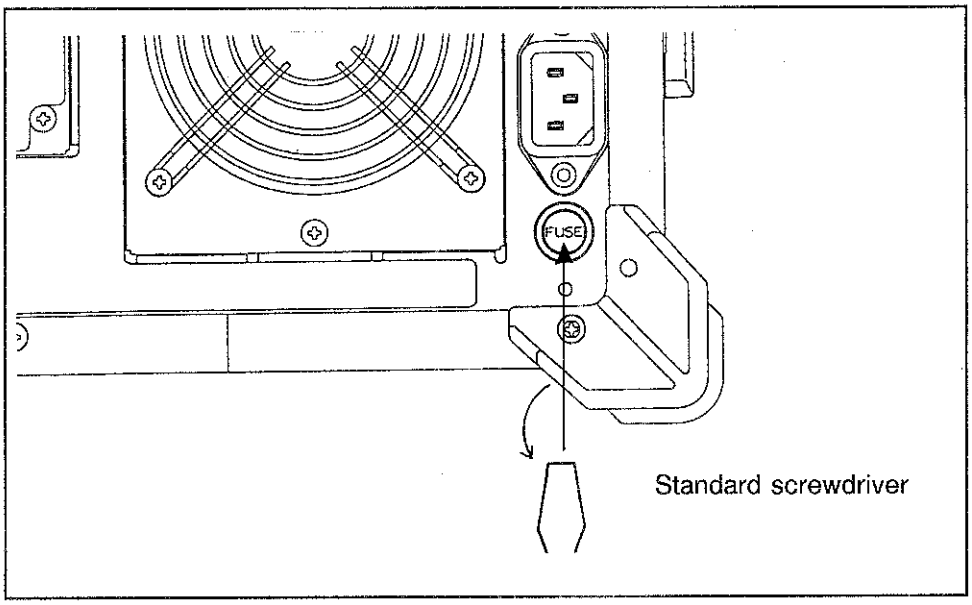
WARNING

1. The replacement of power fuse should be done after switching off the power source and removing the power cable from the receptacle.

2. To protect against fire, use the specified power fuse which fits to the power source voltage.

The power fuse is in the FUSE holder of the rear panel.
The power fuse is confirmed or replaced as follows.

① Turn the cap of the FUSE holder about 90° counterclockwise with a flat blade screwdriver.



Take the screwdriver off the cap, and the FUSE holder comes out by approximately 3 mm.

② Pull the FUSE holder out and replace the fuse.
Use a fuse fitting to the following specification.

Input voltage range	Fuse
AC 90 to 132 V	T6.3 A/250 V
AC 198 to 250 V	T6.3 A/250 V

③ After replacing the fuse, insert the FUSE holder and turn 90° clockwise pressing the screwdriver lightly to fix.

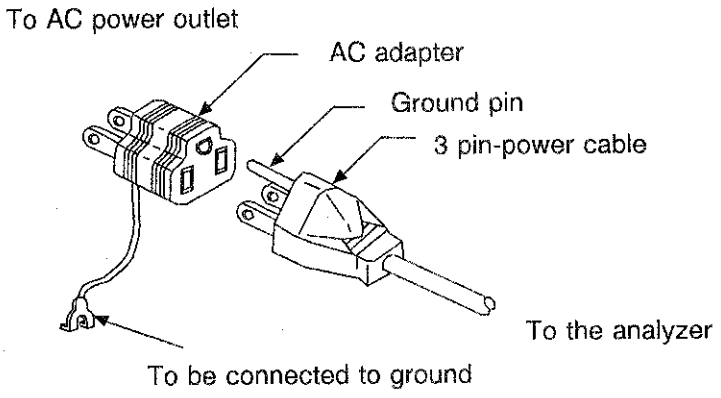
1.3.4 Connecting the Power Cable

WARNING

1. Power cable
   - Use the attached power cable to prevent an electric shock and a fire.
   - In foreign countries, use power cables which meet the safety specification in each country.
   - When you connect the power cable to the outlet, do it after switching off the power source.
   - When you remove the power cable from the outlet, do it holding the plug.

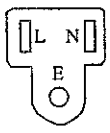
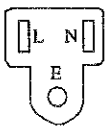
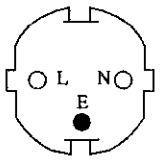
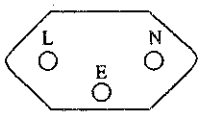
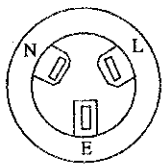
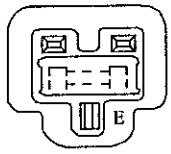
2. Protective grounding
   - Connect the power source plug cable to the outlet having a protective grounding terminal.
   - When an extension cord having no protective grounding terminal is used, the protective grounding is of no use.
   - Case in which use of AC adaptor (Three pins to two pins conversion adaptor), the earth pin of the adaptor is grounded to the earth of the outlet, or connect ground terminal of the rear panel with the earth of the outside, and ground it to the earth. Be careful of the adapter ground pin's short circuit.

(1) As 3 pin power connecter is rare in Japan, AC adapter is attached.
When you connect the adapter to the outlet, do it after confirming the directions of the plug and the outlet as the widths of the 2 electrodes are different.



(2) The power plug in various countries is as follows. For other plugs, please consult with ADVANTEST.

Table 1-1 Power Source Plugs in Each Country

Type name	Straight type	A01402 (Standard)	A01403 (Opt.95)	A01404 (Opt.96)
	Angle type	A01412	A01413	A01414
Applicable standard		JIS: Japan Law on Electrical Appliances	UL: USA CSA: Canada	*
Ratings and colors		125V/7A, Black, 2m	125V/7A, Black, 2m	250V/6A, Gray, 2m
Plug				
Type name	Straight type	A01405 (Opt.97)	A01406 (Opt.98)	A01407
	Angle type	A01415		A01417
Applicable standard		SEV: Switzerland	SAA: Australia New Zealand	BS: UK
Ratings and colors		250V/6A, Gray, 2m	250V/6A, Gray, 2m	250V/6A, Black, 2m
Plug				

* : CEE: Europe VDE: Germany OVE: Austria
DEMKO: Denmark KEMA: Netherlands FIMKO: Finland
NEMKO: Norway CEBEC: Belgium SEMKO: Sweden

1.4 Cleaning, Storage and Transportation

1.4.1 Cleaning

Remove dirt on this instrument with a soft cloth (or a wet cloth) properly.
Be careful of the followings, then.

- Be careful not to leave a cloth nap or not to get water soak into the instrument.

- Do not use organic solvents (for example, benzene, acetone, etc.) which change plastics.

1.4.2 Storage

Storage temperature of this instrument is from -20°C to +60°C. Do not store it out of this temperature range.
In case that this instrument 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 were prevented.

1.4.3 Transportation

When you transport this instrument, use the packing material which was used for the delivery of the instrument or better packing material (cardboard box of over 5 mm thickness) for packing.

Packing procedure

① Wrap this instrument itself with cushion material and put in the cardboard box.

② After putting attachment, put cushion again.

③ Shut the lid of the cardboard box. Fix the outside with string or tape.

- To carry the instrument by hand
  To carry the instrument by hand, put it in a transit case.
  The transit case is prepared as optional accessory.

1.5 Notes on Use

1.5.1 Case that Abnormality Occurs

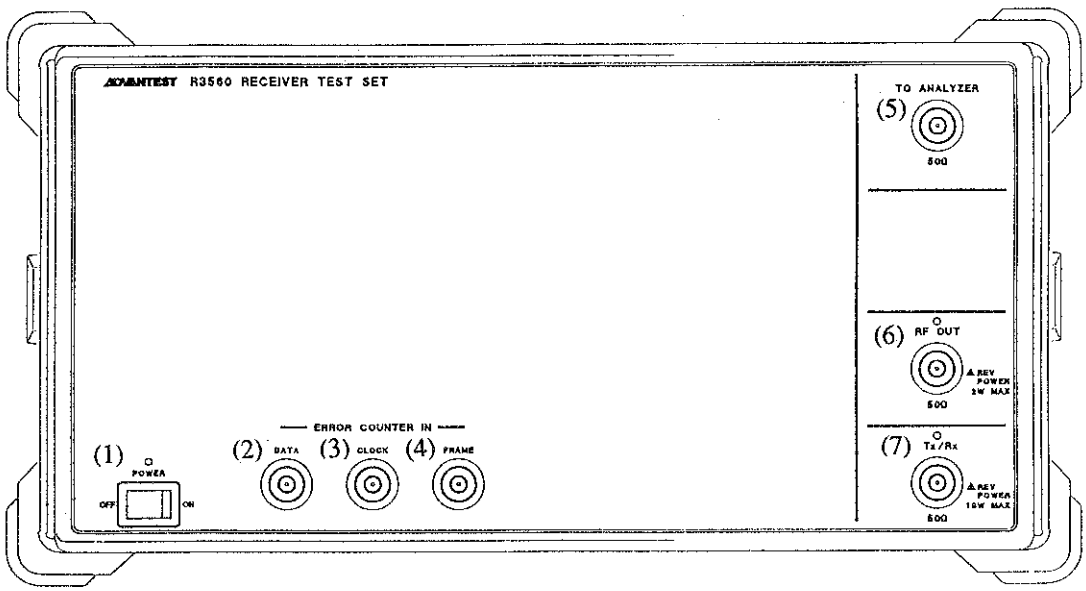
When smoke rises from the instrument or when you feel bad smell or abnormal sound, turn off the power switch. Pull out from the outlet. And contact to our company.

1.5.2 Warm up

After the instrument temperature has reached the room temperature level, turn the power switch ON and warm it up for 60 minutes.

2. DESCRIPTION OF PANELS

2.1 Description of Front Panel



(1) POWER switch — The switch to turn the power source on and off.
POWER lamp — It lights during power-on.

(2) DATA input connector — The connector to input DATA to the bit error rate measurement section. This is a TTL and BNC type connector.

(3) CLOCK input connector — The connector to input CLOCK to the bit error rate measurement section. This is a TTL and BNC type connector.

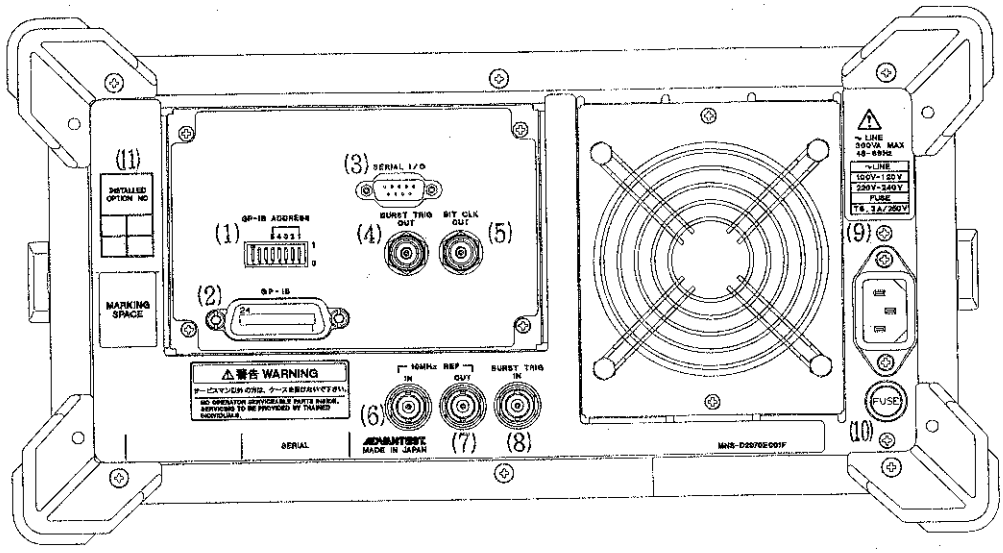
(4) FRAME input connector — The connector to input FRAME to the bit error rate measurement section. This is a TTL and BNC type connector.

(5) ANALYZER output connector
The connector to output the signal input from Tx/Rx connector to the outside analyzer.

(6) RF OUT connector — RF signal's output terminal
Output range: +6 dBm to -125 dBm
Maximum reverse input power: 2W
RF OUT lamp — It lights during RF signal output.

(7) Tx/Rx connector — The input and output terminal of RF signal
Output range: -7 dBm to -125 dBm
Maximum input power: 10 W
Tx/Rx lamp — It lights during RF signal output.

2.2 Description of Rear Panel



(1) GPIB address switch — The switch to set GPIB address. It is set with lower 5 bits.

(2) GPIB connector — The connector to connect the outside control with a GPIB cable.

(3) SERIAL I/O connector — It is the exclusive interface to control from ADVANTEST-made R3465 series.

(4) BURST TRIG output connector
It is a TTL output connector of the burst trigger.

(5) BIT CLK output connector
It is a TTL output connector of the bit clock.

(6) 10 MHz REF input connector
It is a reference frequency signal input connector from the outside.
Input impedance: 50Ω approx.
Input frequency: 5 MHz, 10 MHz
Input level: ≥0 dBm
*: When a specified signal is input in this connector, the selection of internal/external reference frequency signal is switched to the signal from outside automatically.

(7) 10 MHz REF output connector
It is 10 MHz reference frequency signal output connector.
Output level: ≥0 dBm

(8) BURST TRIG input connector
It is a TTL input connector of the burst trigger.

(9) Connector for AC power source
The center pin in 3 pin structure is the terminal for earth.

(10) FUSE holder — Power fuse is held.

(11) Print of the installed option

3. BASIC OPERATION

3.1 Power-on

3.1.1 Connection to AC Power Source

(1) Switch off the power source of this instrument and connect the attached power cable to the connector for AC power source on the rear panel.

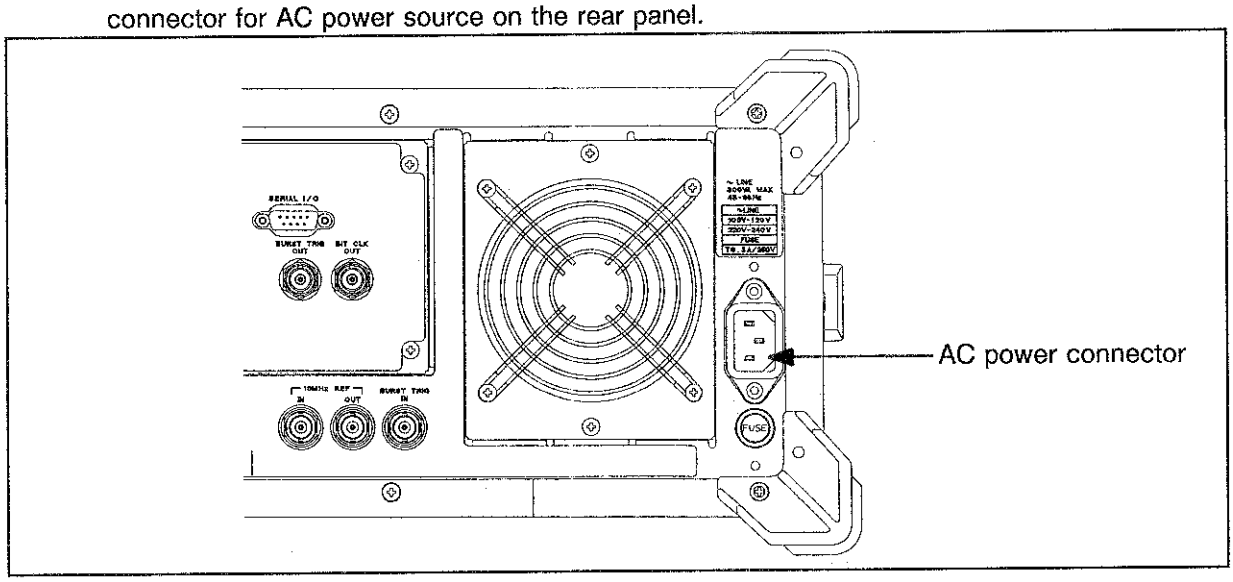


Figure 3-1 Connecting the Power Cable

(2) Connect the other end of the power cable to the outlet.

WARNING

Connecting to an out-of-spec power source may damage this instrument.
Power specification of this instrument is as follows:

	Operation under 100 V_{AC}	Operation under 220 V_{AC}
Input voltage	90 to 132 V	198 to 250 V
Frequency	48 to 66 Hz	48 to 66 Hz

3.1.2 Turning on the Power

After connecting the power cable, turn ON the power switch on the front panel.
Confirm that the fan is turning and the POWER lamp on the power switch is lightening.

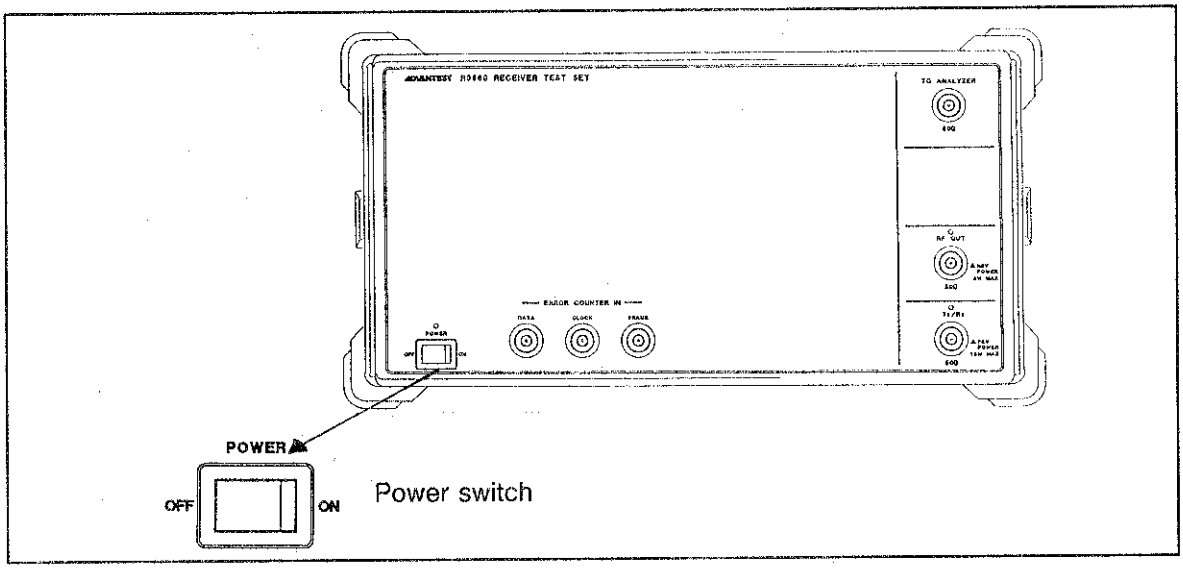


Figure 3-2 Power Switch

3.1.3 When the Power is Turned on

●Frequency reference
Warm-up time of the internal reference oscillator is shown in Table 3-1.

Table 3-1 Internal Reference Quartz Oscillator and the Warm-up Time

Starting characteristics (after power-on 10 minutes)	5×10^{-8} or less
Aging rate (after 24 hours of operation)	2×10^{-8}/day or less

●Setting conditions
At power-on, the setting conditions become the same as the last power-off conditions.
In order to make the initial setting of shipping from the factory, execute Instrument Preset of the GPIB command.

Related GPIB command
IP

3.2 GPIB Address Setting

GPIB address of this instrument is factory-set to 8. If you have to change the address for operation, change it with the GPIB address switch on the rear panel.

GPIB address of factory-shipped
8

CAUTION

Set address becomes effective after the change.

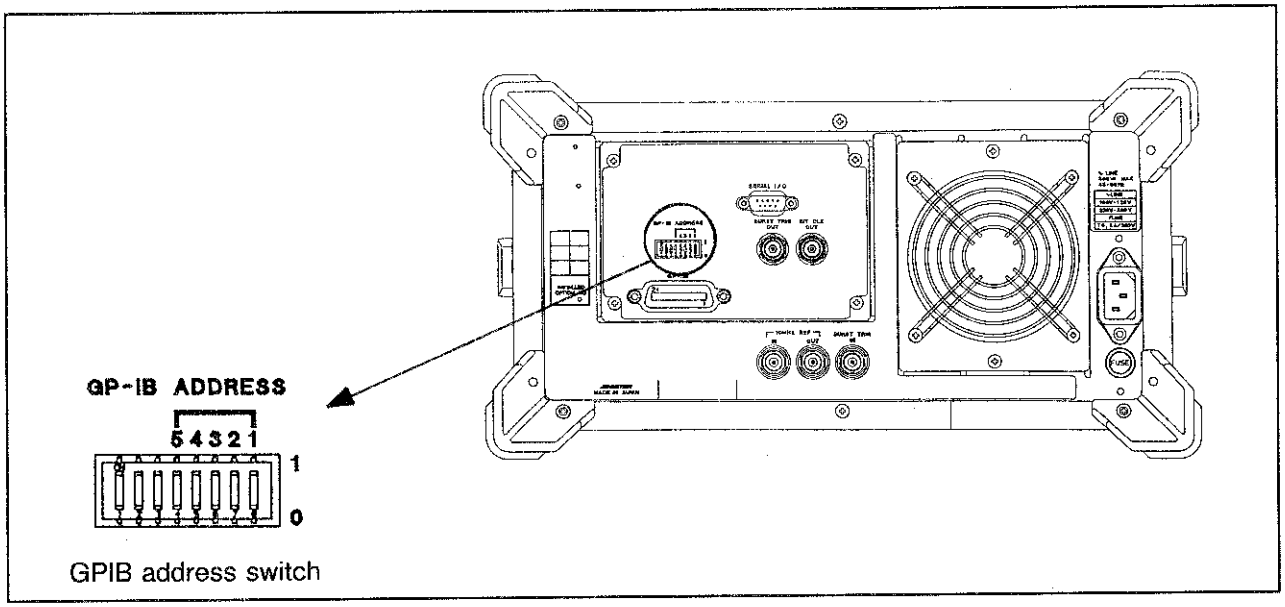


Figure 3-3 GPIB Address Switch

3.3 Communication System

Select a communication system, PDC or PHS.

3.3.1 PDC System Setting

In PDC system, you can select one from the two kinds shown in Table 3-2.

Table 3-2 PDC System Mode

Frequency band	Related GPIB command
800 MHz band	PDCL
1.5 GHz band	PDCH

When the PDC system mode is selected, this instrument is set as shown in Table 3-3 and Table 3-4.

●Initial setup state of 800 MHz band (PDCL) selected

Table 3-3 Initial Setup State (PDCL Selected)

Item				Setting	Related GPIB command
OUTPUT	Output frequency	Direct specification	Output frequency	810 MHz	FR
		Channel specification	Channel number	1 CH	CH
			Space between channels	25 kHz	CSP
			Channel start frequency	810 MHz	CSF
	Output level			-80 dBm	AP
	Output on/off			On	OUT
	Output connector			Tx/Rx connector	OSE
MODULATION	System mode			PDCL	PDCL PDCH PHS
	Modulation			On	MOD
	Baseband filter			Root Nyquist filter	NYQF
PATTERN	Slot configuration			Downlink traffic channel (* 1)	SCNF
	Rate			Full rate	RATE
MEASURE	SENS	Search upper limitation		-100 dBm	SEU
		Search lower limitation		-120 dBm	SEL
		Search step width		1 dB	SES
		Search point		1%	SEP
	BER measurement averaging count			One time	AVG
	BER measurement bit length			2556 bits	RBL
	BER clock polarity			Fall	BCLK
	BER data polarity			Data non-inverse	BDAT
	TCH frame timing signal			Off	TFRM
	BER measurement interval time			0 msec	INT

(* 1): Refer to '(4) DNT: Downlink traffic channel' in sub-section 3.7.2 "Slot configuration".

•Initial setup state of 1.5 GHz band (PDCH) selected

Table 3-4 Initial Setup State (PDCH Selected)

Item				Setting	Related GPIB command
OUTPUT	Output frequency	Direct specification	Output frequency	1477 MHz	FR
		Channel specification	Channel number	1 CH	CH
			Space between channels	25 kHz	CSP
			Channel start frequency	1477 MHz	CSF
	Output level			-80 dBm	AP
	Output on/off			On	OUT
	Output connector			Tx/Rx connector	OSE
MODULATION	System mode			PDCH	PDCL PDCH PHS
	Modulation			On	MOD
	Baseband filter			Root Nyquist filter	NYQF
PATTERN	Slot configuration			Downlink traffic channel (* 1)	SCNF
	Rate			Full rate	RATE
MEASURE	SENS	Search upper limitation		-100 dBm	SEU
		Search lower limitation		-120 dBm	SEL
		Search step width		1 dB	SES
		Search point		1%	SEP
	BER measurement averaging count			One time	AVG
	BER measurement bit length			2556 bit	RBL
	BER clock polarity			Fall	BCLK
	BER data polarity			Data non-inverse	BDAT
	TCH frame timing signal			Off	TFRM
	BER measurement interval time			0 msec	INT

(* 1): Refer to '(4) DNT: Downlink traffic channel' in sub-section 3.7.2 "Slot configuration".

3.3.2 PHS System Setting

Select PHS system.

Related GPIB command
PHS

When the PHS system mode is selected, this instrument is set as shown in Table 3-5.

●Initial setup state of PHS communication system selected

Table 3-5 Initial Setup State (PHS)

Item				Setting	Related GPIB command
OUTPUT	Output frequency	Direct specification	Output frequency	1895.15 MHz	FR
		Channel specification	Channel number	1 CH	CH
			Space between channels	300 kHz	CSP
			Channel start frequency	1895.15 MHz	CSF
	Output level			-80 dBm	AP
	Output on/off			On	OUT
	Output connector			Tx/Rx connector	OSE
MODULATION	System mode			PHS	PDCL PDCH PHS
	Modulation			On	MOD
	Baseband filter			Root Nyquist filter	NYQF
PATTERN	Slot configuration			Downlink traffic channel (* 1)	SCNF
	Rate			---	---
MEASURE	SENS	Search upper limitation		-100 dBm	SEU
		Search lower limitation		-120 dBm	SEL
		Search step width		1 dB	SES
		Search point		1%	SEP
	BER measurement averaging count			One time	AVG
	BER measurement bit length			2556 bit	RBL
	BER clock polarity			Fall	BCLK
	BER data polarity			Data non-inverse	BDAT
	TCH frame timing signal			Off	TFRM
	BER measurement interval time			0 msec	INT

(* 1): Refer to '(3) UPT/DNT Uplink/Downlink traffic channel' in sub-section 3.8.2 "Slot configuration".

3.4 OUTPUT Section

Output signal is set basically in the OUTPUT section.

3.4.1 Output Frequency Setting

Set the output frequency. For the setting, there are a direct specifying way and a channel specifying way.
Available frequency ranges are different depending on system modes. (Refer to Table 3-7.)

●Direct specifying way
Specify frequency value directly.

Related GPIB command
FR

●Channel specifying way
Specify frequency value by space between channels, channel start frequency and channel number. (Refer to Table 3-6.)

Item	Related GPIB command
Channel number	CH
Space between channels	CSP
Channel start frequency	CSF

Table 3-6 Calculation of Frequency

Output frequency is determined as follows.

Channel start frequency + Space between channels × (Channel number - 1)

Table 3-7 Available Frequency Range with Each System Mode

Communication system	PDCL		PDCH		PHS
	Up	Down	Up	Down	
Lower limit frequency	808 [MHz]	938 [MHz]	1429 [MHz]	1477 [MHz]	1885 [MHz]
Upper limit frequency	835 [MHz]	962 [MHz]	1453 [MHz]	1501 [MHz]	1930 [MHz]
Frequency step	1 [kHz]				
PDCL expanded frequency range by the option 06					
Lower limit frequency	835 [MHz]				
Upper limit frequency	938 [MHz]				

* Depending on the revision of R3560, the expansion of option 06 is not supported. Please contact us for any inquiry.

3.4.2 Output On/Off Setting

Set to output or not to output signal to output connector.

Related GPIB command
OUT

3.4.3 Setting of Output Connector Selection

Select to which connector the signal is output, RF connector or Tx/Rx connector.

Related GPIB command
OSE

3.4.4 Output Level Setting

Set the output level.
Maximum output levels are different between RF connector and Tx/Rx connector. (Refer to Table 3-8.)

Related GPIB command
AP

Table 3-8 Available Output Level Range

Connector	Maximum output	Minimum output	Output step
Tx/Rx	-7 dBm (106 dBμVemf)	-125 dBm (-12 dBμVemf)	0.1 dB
RF	+6 dBm (119 dBμVemf)	-125 dBm (-12 dBμVemf)	0.1 dB

References:

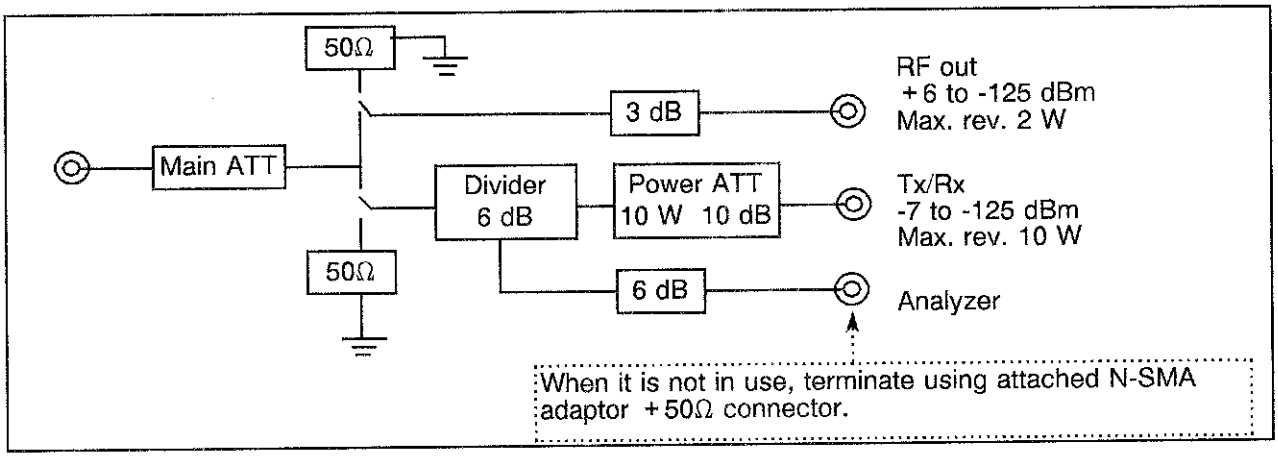


Figure 3-4 DUT Interface Block Chart

3.5 MODULATION Section

Basic setting of modulation is performed in the MODULATION section.

3.5.1 System Mode Setting

Set the system of this instrument to PDC (800 MHz band/1.5 GHz band) or PHS.
When the system mode is changed, the setting of all sections except GPIB related is initialized. (Refer to "Section 3.3 Setting of communication system".)

Table 3-9 System Mode

Item	Related GPIB command
PDC (800MHz band)	PDCL
PDC (1.5 GHz band)	PDCH
PHS	PHS
Read of system mode setting	SYS

3.5.2 Modulation On/Off

Set modulation (π/4DQPSK) or non-modulation (CW) signal of output.

Related GPIB command
MOD

3.5.3 Baseband Filter Switching

Set the baseband filter. The filter can be selected from Root Nyquist or Nyquist. The roll off rates of the both are $\alpha = 0.5$.

Related GPIB command
NYQF

3.6 PATTERN Section

Communication slots to be selected by system modes are edited in PATTERN section.

3.6.1 Slot Configuration

Set to one of the followings; downlink traffic channel, uplink traffic channel, frame for device evaluation, continuous pseudo random pattern, and synchronization burst frame (PHS system only).
By changing the slot configuration, the contents of PATTERN section are changed to the initial state which is decided by the setting.

References:
"Section 3.7 Slot configuration of PDC system", "Section 3.8 Slot configuration of PHS system".

Related GPIB command
SCNF

3.6.2 Rate Switching

Switch the communication rate. The setting can be performed only when the system mode is PDC (800 MHz band/1.5 GHz band). By changing the communication rate, the contents of PATTERN section is changed to down communication channel frame.

Related GPIB command
RATE

CAUTION

The setting can be performed only when the system mode is PDC (800 MHz band/1.5 GHz band).

3.6.3 Slot On/Off

The slot is on/off-controlled in slots. (Refer to CAUTION in page 3-12.)

Related GPIB command
SL

3.6.4 Color Code

This command is effective only when the system mode is PDC (800 MHz band/1.5 GHz band). (Refer to CAUTION below.)

Related GPIB command
CC

3.6.5 SACCH (Slow Associated Control Channel)

SACCH can be set with slot configuration of PDC (800 MHz band/1.5 GHz band) downlink traffic channel, uplink traffic channel, and PHS downlink traffic channel, uplink traffic channel. The available ranges are different depending on combinations of system modes and slot configurations. (Refer to Table 3-10.)
(Refer to CAUTION below.)

Related GPIB command
SA

Table 3-10 SACCH Available Range

System mode	Slot configuration	SACCH set value	
		Minimum value	Maximum value
PDC (800 MHz band/ 1.5 GHz band)	Downlink traffic channel	0 [HEX]	1FFFFF [HEX]
	Uplink traffic channel	0 [HEX]	7FFF [HEX]
PHS	Downlink traffic channel	0 [HEX]	FFFF [HEX]
	Uplink traffic channel		

CAUTION

Depending on the combinations of system modes and slot configurations, the command might be ineffective. Refer to "Section 3.7 Slot configuration of PDC system" and "Section 3.8 Slot configuration of PHS system".

3.6.6 Pattern

Select user information transmitting channel (TCH) of traffic channel for PDC (800 MHz band/1.5 GHz band), information channel I (TCH) of traffic channel for PHS, pseudo random pattern (PN) of the frame for device evaluation, or continuous pseudo random pattern (PN). (Refer to Table 3-11.)

(Refer to CAUTION in page 3-12.)

Related GPIB command
PAT

Table 3-11 Available Pattern

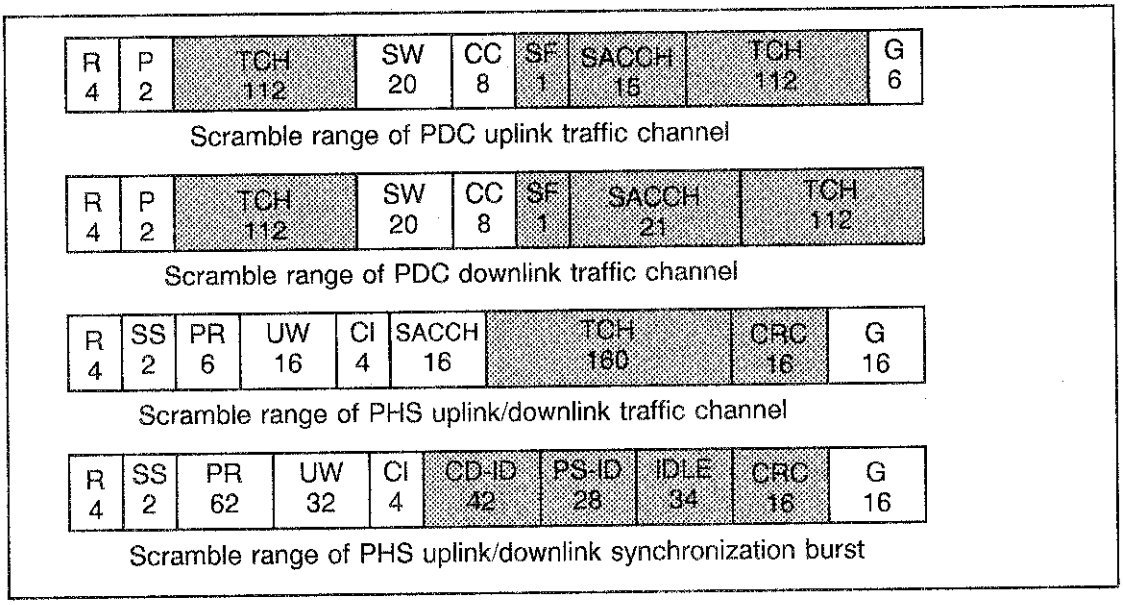
Item	Complying reference
PN 9 pseudo random pattern	CCITT V.52
PN 15 pseudo random pattern	CCITT O.151
ALL0 pattern	None
ALL1 pattern	None

3.6.7 Scramble On/Off

Select to scramble or not to scramble to traffic channel for PDC (800 MHz band/1.5 GHz band), traffic channel for PHS and synchronization burst. In scramble on, the value set by the scramble pattern becomes effective.
(Refer to CAUTION in page 3-12.)

Related GPIB command
SCR

References:



3.6.8 Scramble Pattern Setting

Set the scramble pattern.
The available ranges of the scramble pattern are different depending on system modes.
(Refer to Table 3-12.)
(Refer to CAUTION in page 3-12.)

Related GPIB command
SCRP

Table 3-12 Scramble Pattern Available Range

System mode	Scramble pattern setting value	
	Minimum value	Maximum value
PDC (800 MHz band/ 1.5 GHz band)	0 [HEX]	1FF [HEX]
PHS	0 [HEX]	3FF [HEX]

3.6.9 User-scramble On/Off

It is an effective function when the system mode is PHS.
Select to user-scramble or not to user-scramble for traffic channel. The value set by user-scramble code in user-scramble on becomes effective.
(Refer to CAUTION in page 3-12.)

Related GPIB command
ENC

References:

User-scramble range of PHS uplink/downlink traffic channel

3.6.10 User-scramble Code Setting

It is an effective function when the system mode is PHS.
Set user-scramble code for traffic channel.
(Refer to CAUTION in page 3-12.)

Related GPIB command
ENCP

3.7 PDC System Slot Configuration

3.7.1 PDC Frame Configuration

This instrument generates data with the cycle of frame shown in the following illustration. Pattern of each slot is independent and has continuity. (Except continuous pseudo random pattern)

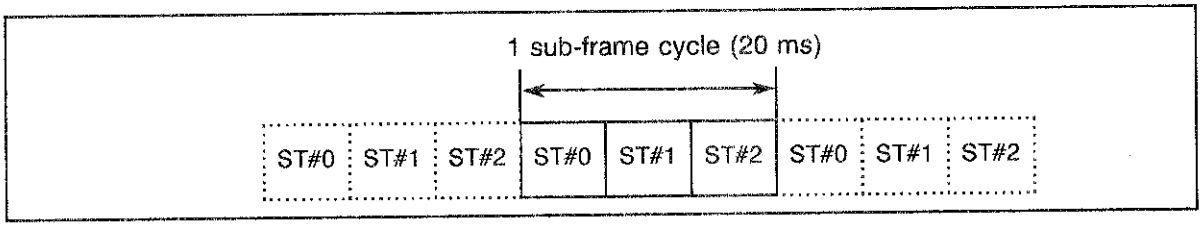


Figure 3-5 Frame in Full Rate Setting

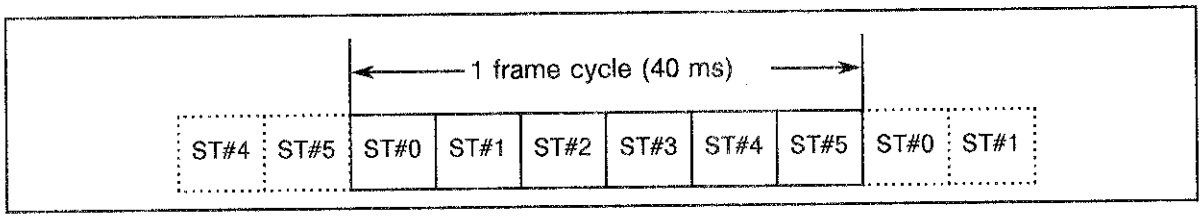


Figure 3-6 Frame in Half Rate Setting

3.7.2 Slot Configuration

Four kinds shown in Table 3-13 can be selected in the PDC system.

Table 3-13 Kinds of Slot Configuration (PDC)

Slot configuration	
FIL	Continuous pseudo random pattern
DEV	Frame for device evaluation
UPT	Uplink traffic channel
DNT	Downlink traffic channel

Related GPIB command
SCNF

(1) FIL : Continuous pseudo random pattern

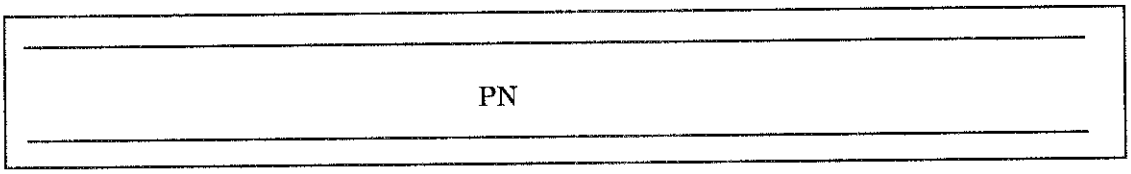


Figure 3-7 Slot Configuration (FIL)

Table 3-14 Continuous Pseudo Random Pattern Initial Setting State (PDC)

Item		Initial setting value
PN	Pattern	PN9 pseudo random pattern

Table 3-15 Continuous Pseudo Random Pattern Changeable Item (PDC)

Changeable item	Changeable parameter	Related GPIB command
PN	PN9 pseudo random pattern	PAT
	PN15 pseudo random pattern	
	ALL0 pattern	
	ALL1 pattern	

(2) DEV: Frame for device evaluation

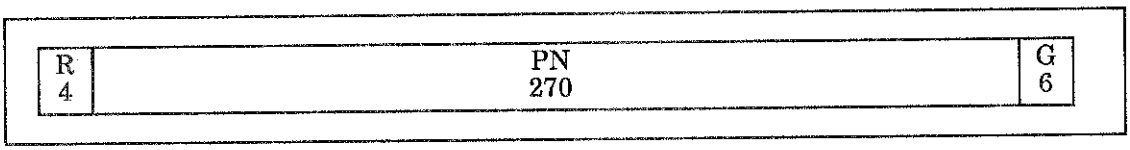


Figure 3-8 Slot Configuration (DEV)

Table 3-16 Frame Initial Setting State for Device Evaluation (PDC)

Item		Initial setting	
R	Guard time for burst over response	0 [HEX]	
PN	Pattern	SLOT0	PN9 pseudo random pattern
		SLOT1	PN15 pseudo random pattern
		SLOT2	PN15 pseudo random pattern
		SLOT3	PN15 pseudo random pattern
		SLOT4	PN15 pseudo random pattern
		SLOT5	PN15 pseudo random pattern
G	Guard time	0 [HEX]	
Slot on/off		SLOT0	On
		SLOT1	Off
		SLOT2	Off
		SLOT3	Off
		SLOT4	Off
		SLOT5	Off

▒▒ is in half rate setting.

Table 3-17 Changeable Item of Frame for Device Evaluation (PDC)

Changeable item	Changeable parameter	Related GPIB command
PN	PN9 pseudo random pattern	PAT
	PN15 pseudo random pattern	
	ALL0 pattern	
	ALL1 pattern	
Slot on/off	On/Off	SL

(3) UPT: Uplink traffic channel

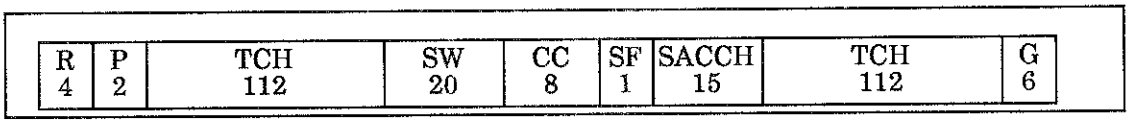


Figure 3-9 Slot Configuration (UPT)

Table 3-18 Initial Setting State of Uplink Traffic Channel

Item		Initial setting	
R	Guard time for burst over response	0 [HEX]	
P	Preamble	2 [HEX]	
TCH	Channel for user information transmission	SLOT0	PN9 pseudo random pattern
		SLOT1	PN15 pseudo random pattern
		SLOT2	PN15 pseudo random pattern
		SLOT3	PN15 pseudo random pattern
		SLOT4	PN15 pseudo random pattern
		SLOT5	PN15 pseudo random pattern
SW	Synchronization	SLOT0	785B4 [HEX]
		SLOT1	62DC9 [HEX]
		SLOT2	7E28A [HEX]
		SLOT3	56B15 [HEX]
		SLOT4	AE983 [HEX]
		SLOT5	B2621 [HEX]
CC	Color code	00 [HEX]	
SF	Steel flag	0 [HEX]	
SACCH	Slow associated control channel	0000 [HEX]	
G	Guard time	00 [HEX]	
Slot on/off		SLOT0	On
		SLOT1	Off
		SLOT2	Off
		SLOT3	Off
		SLOT4	Off
		SLOT5	Off
Scramble on/off		Off	
Scramble pattern		000 [HEX]	

is in half rate setting.

Table 3-19 Changeable Item of Uplink Traffic Channel

Changeable item	Changeable parameter	Related GPIB command
TCH	PN9 pseudo random pattern	PAT
	PN15 pseudo random pattern	
	ALL0 pattern	
	ALL1 pattern	
CC	00 [HEX] to FF [HEX]	CC
SACCH	000000 [HEX] to 7FFF [HEX]	SA
Slot on/off	On/Off	SL
Scramble on/off	On/Off	SCR
Scramble pattern	000 [HEX] to 1FF [HEX]	SCRP

(4) DNT: Downlink traffic channel

R	P	TCH	SW	CC	SF	SACCH	TCH
4	2	112	20	8	1	21	112

Figure 3-10 Slot Configuration (DNT)

Table 3-20 Initial Setting State of Downlink Traffic Channel

Item		Initial setting	
R	Guard time for burst over response	0 [HEX]	
P	Preamble	2 [HEX]	
TCH	Channel for user information transmission	SLOT0	PN9 pseudo random pattern
		SLOT1	PN15 pseudo random pattern
		SLOT2	PN15 pseudo random pattern
		SLOT3	PN15 pseudo random pattern
		SLOT4	PN15 pseudo random pattern
		SLOT5	PN15 pseudo random pattern
SW	Synchronization	SLOT0	87A4B [HEX]
		SLOT1	9D236 [HEX]
		SLOT2	81D75 [HEX]
		SLOT3	A94EA [HEX]
		SLOT4	5164C [HEX]
		SLOT5	4D9DE [HEX]
CC	Color code	00 [HEX]	
SF	Steel flag	0 [HEX]	
SACCH	Slow associated control channel	000000 [HEX]	
Scramble on/off		Off	
Scramble pattern		000 [HEX]	

▒▒ is in half rate setting.

Table 3-21 Changeable Item of Downlink Traffic Channel

Changeable item	Changeable parameter	Related GPIB command
TCH	PN9 pseudo random pattern	PAT
	PN15 pseudo random pattern	
	ALL0 pattern	
	ALL1 pattern	
CC	00 [HEX] to FF [HEX]	CC
SACCH	0000 [HEX] to 1FFFFF [HEX]	SA
Scramble on/off	On/Off	SCR
Scramble pattern	000 [HEX] to 1FF [HEX]	SCRP

3.8 PHS System Slot Configuration

3.8.1 PHS Frame Configuration

This instrument generates data with the cycle of frame shown in the following illustration. Pattern of each slot is independent and has continuity. (Except continuous pseudo random pattern)

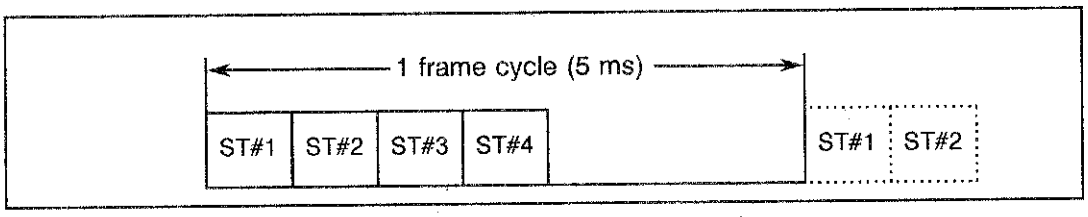


Figure 3-11 PHS Frame Configuration

3.8.2 Slot Configuration

Four kinds shown in Table 3-22 can be selected in the PHS system.

Table 3-22 Kinds of Slot Configuration (PHS)

Slot configuration	
FIL	Continuous pseudo random pattern
DEV	Frame for device evaluation
UPT	Physical slot frame for up communication
DNT	Physical slot frame for down communication
UPS	Up synchronization burst frame
DNS	Down synchronization burst frame

Related GPIB command
SCNF

(1) FIL : Continuous pseudo random pattern

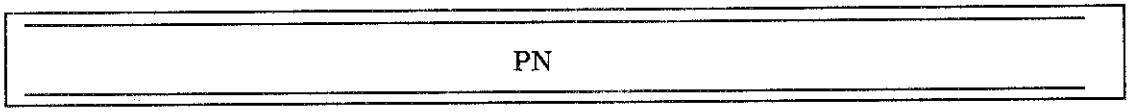


Figure 3-12 Slot configuration (FIL)

Table 3-23 Continuous Pseudo Random Pattern Initial Setting State (PHS)

Item		Initial setting value
PN	Pattern	PN9 pseudo random pattern

Table 3-24 Continuous Pseudo Random Pattern Changeable Item (PHS)

Changeable item	Changeable parameter	Related GPIB command
PN	PN9 pseudo random pattern	PAT
	PN15 pseudo random pattern	
	ALL0 pattern	
	ALL1 pattern	

(2) DEV: Frame for device evaluation

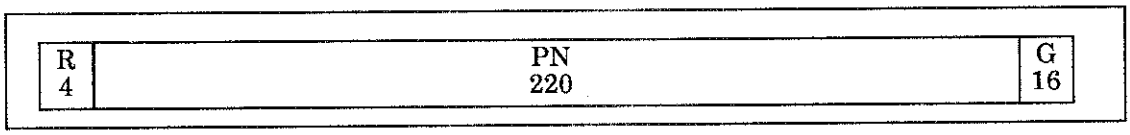


Figure 3-13 Slot Configuration (DEV)

Table 3-25 Frame Initial Setting State for Device Evaluation (PHS)

Item		Initial setting	
R	Ramp type for burst over response	0 [HEX]	
PN	Pattern	SLOT1	PN9 pseudo random pattern
		SLOT2	PN15 pseudo random pattern
		SLOT3	PN15 pseudo random pattern
		SLOT4	PN15 pseudo random pattern
G	Guard bit	0000 [HEX]	
Slot on/off		SLOT0	On
		SLOT1	Off
		SLOT2	Off
		SLOT3	Off

Table 3-26 Changeable Item of Frame for Device Evaluation (PHS)

Changeable item	Changeable parameter	Related GPIB command
PN	PN9 pseudo random pattern	PAT
	PN15 pseudo random pattern	
	ALL0 pattern	
	ALL1 pattern	
Slot on/off	On/Off	SL

(3) UPT/DNT: Uplink/downlink traffic channel

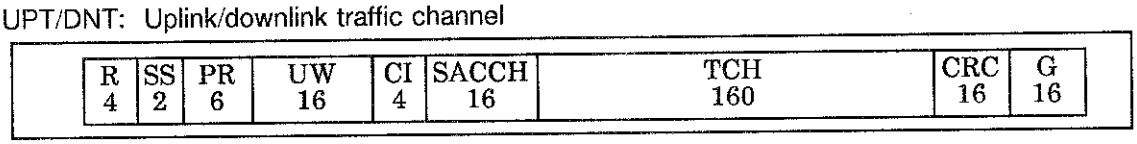


Figure 3-14 Slot Configuration (UPT/DNT)

Table 3-27 Initial Setting State of Uplink/Downlink Traffic Channel

Item		Initial setting	
R	Guard time for burst over response	0 [HEX]	
SS	Start symbol	2 [HEX]	
PR	Preamble	19 [HEX]	
UW	Synchronization word	Up	E149 [HEX]
		Down	3D4C [HEX]
CI	Channel group	0 [HEX]	
SACCH	Slow associated control channel	8000 [HEX]	
TCH	Information channel I (TCH)	SLOT1	PN9 pseudo random pattern
		SLOT2	PN15 pseudo random pattern
		SLOT3	PN15 pseudo random pattern
		SLOT4	PN15 pseudo random pattern
CRC	Cyclic code	CI : SACCH : CRC of TCH	
G	Guard bit	0000 [HEX]	
Slot on/off		SLOT1	On
		SLOT2	Off
		SLOT3	Off
		SLOT4	Off
Scramble on/off		Off	
Scramble pattern		000 [HEX]	
User-scramble on/off		Off	
User-scramble code		0000 [HEX]	

Table 3-28 Changeable Item of Uplink/Downlink Traffic Channel

Changeable item	Changeable parameter	Related GPIB command
SACCH	0000 [HEX] to FFFF [HEX]	SA
TCH	PN9 pseudo random pattern	PAT
	PN15 pseudo random pattern	
	ALL0 pattern	
	ALL1 pattern	
Slot on/off	On/Off	SL
Scramble on/off	On/Off	SCR
Scramble pattern	000 [HEX] to 7FF [HEX]	SCRP
User-scramble	On/Off	ENC
User-scramble code	0000 [HEX] to FFFF [HEX]	ENCP

(4) UPS/DNS: Uplink/downlink synchronization burst frame

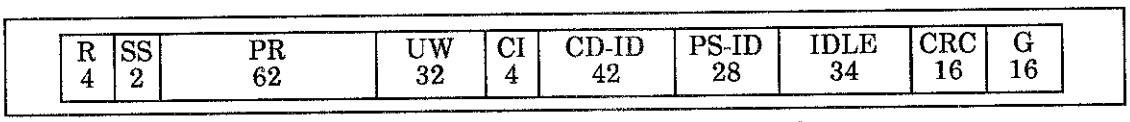


Figure 3-15 Slot Configuration (UPS/DNS)

Table 3-29 Initial Setting State of Uplink/Downlink Synchronization Burst Frame

Item		Initial setting	
R	Guard time for burst over response	0 [HEX]	
SS	Start symbol	2 [HEX]	
PR	Preamble	1999999999999999 [HEX]	
UW	Synchronization word	Up	6B899AF0 [HEX]
		Down	50EF2993 [HEX]
CI	Channel group	9 [HEX]	
CS-ID	Arrival identification code (up)/ Start identification code (down)	20200020001 [HEX]	
PS-ID	Start identification code (up)/ Arrival identification code (down)	0000001 [HEX]	
IDLE	Idle bit	000000000 [HEX]	
CRC	Cyclic code	CI : CS-ID : PS-ID : CRC of IDLE	
G	Guard bit	0000 [HEX]	
Slot on/off		SLOT1	On
		SLOT2	Off
		SLOT3	Off
		SLOT4	Off
Scramble on/off		Off	
Scramble pattern		000 [HEX]	

Table 3-30 Changeable Item of Uplink/Downlink Synchronization Burst Frame

Changeable item	Changeable parameter	Related GPIB command
CS-ID	00000000000 [HEX] to 3FFFFFFFFF [HEX]	CS
PS-ID	0000000 [HEX] to FFFFFFF [HEX]	PS
Slot on/off	On/Off	SL
Scramble on/off	On/Off	SCR
Scramble pattern	000 [HEX] to 7FF [HEX]	SCRP

3.9 MEASURE Section

The measure and the measuring conditions of bit error rate/sense measurement are set in the MEASURE section.

3.9.1 Bit Error Rate Counter

Bit error rate (BER) counter in this instrument can measure BER of PN9 pseudo random pattern (CCIT V.52 compliant).

CAUTION

The BER counter of this instrument cannot measure BER of PN15 random pattern, ALL0, and ALL1 pattern.

(1) BER measurement range

BER counter of this instrument changes maximum measurement range depending on measurement time (measurement bit length). If BER becomes over the measurement range, 9.9999×10^{-1} (measurement error) will result.

Table 3-31 BER Measurement Range

Measurement time [bits]	BER measurement range
1×10^3	0×10^{-3} to 7.29×10^{-1}
2556	0×10^{-3} to 8.93×10^{-1}
1×10^4	0×10^{-4} to 9.72×10^{-1}
1×10^5	0×10^{-5} to 1.63×10^{-1}
1×10^6	0×10^{-6} to 1.63×10^{-2}

(2) Calculating method of BER

Table 3-32 Calculating Method of BER

$$\text{Error rate} = \frac{\text{Count number of error counter [bits]}}{\text{Count number of clock counter [bits]}}$$

(3) Condition of Synchronization

From [(2) BER calculating method]

Table 3-33 BER Counter Synchronization Condition

$$0.1 = \frac{30\ [\text{bits}]}{300\ [\text{bits}]}$$

When the error rate = less than 0.1, synchronization results.

If the error rate = over 0.1, the synchronization can not be obtained.

BER counter synchronizes at the time of measurement start.

CAUTION

Once synchronizes, BER counter in this instrument does not resynchronizes during the measurement.

(4) Conditions that BER measurement results in error

The following shows the conditions that BER measurement results in error (returned value 9.9999×10^{-1}).

Table 3-34 Error Conditions

Condition
Some of CLK, DATA, FRAME (in use) or all of the signals are not input.
During the measurement, some of CLK, DATA, FRAME (in use) or all of the signals become not to be input.
Signals of CLK, DATA or FRAME (in use) are other than TTL level.
Synchronization cannot be obtained after a set time (about 2 seconds).
Measured value is outside the measurement range.
Measurement does not complete within expected time*1 of the measurement completion.

*1 : This instrument calculates expected time of the measurement completion based on the measurement time (measurement bit length) and monitors rough measurement time at BER measurement.

The calculating methods are different between PDC system and PHS system. The system mode selected at the time switches the calculating methods automatically.

Calculating expression of PDC measurement completion expected time

$$40\ [\text{msec}] = \frac{\text{Measurement time (measurement bit length)}}{224} + \alpha\ [\text{msec}]$$

Calculating expression of PHS measurement completion expected time

$$5\ [\text{msec}] = \frac{\text{Measurement time (measurement bit length)}}{160} + \alpha\ [\text{msec}]$$

3.9.2 BER Measurement

Measure BER. Returned value (measurement result) can be read by query (BER?).
If the returned value is 9.9999 $\times 10^{-1}$, it is BER measurement error.

Related GPIB command
BER

3.9.3 SENS (Receiver Sensitivity) Measurement

Measure the sensitivity. Measurement result can be read by query (SENS?) and the unit of the value is dBm.
If the returned value is 99.9, it is measurement error.
SENS measurement does BER measurement at each output level minimizing within the width specified by search step width from search upper limit to search lower limit. The output level 1 level before going beyond the BER specified by search point is the measurement result and the measurement ends.

Measurement error arises in the following cases.
- When [Section 3.9 (4) Conditions that BER measurement result becomes error] is satisfied.
- When the BER value at output level of search upper limit value is worse than BER value specified at search point .
- When the BER value at output level of search lower limit value is better than BER value specified at search point .

Related GPIB command
SENS

3.9.4 Search Upper Limit Value

Set output level to start the receiver sensitivity measurement.

Related GPIB command
SEU

CAUTION

The relationship between search upper limit value and search lower limit value must be 'search lower limit value < search upper limit value'.

3.9.5 Search Lower Limit Value

Set output level to end the receiver sensitivity measurement.

Related GPIB command
SEL

3.9.6 Search Step Width

Set the width of change of output level for the receiver sensitivity measurement. The width of change is minimum 1 dB step and maximum 115 dB step.

Related GPIB command
SES

3.9.7 Search Point

Specify BER point to search for the receiver sensitivity measurement. The search point can be set by 1 × 10^{-3} (0.1%) step between 0.0 and 5 × 10^{-2} (5%).

Related GPIB command
SEP

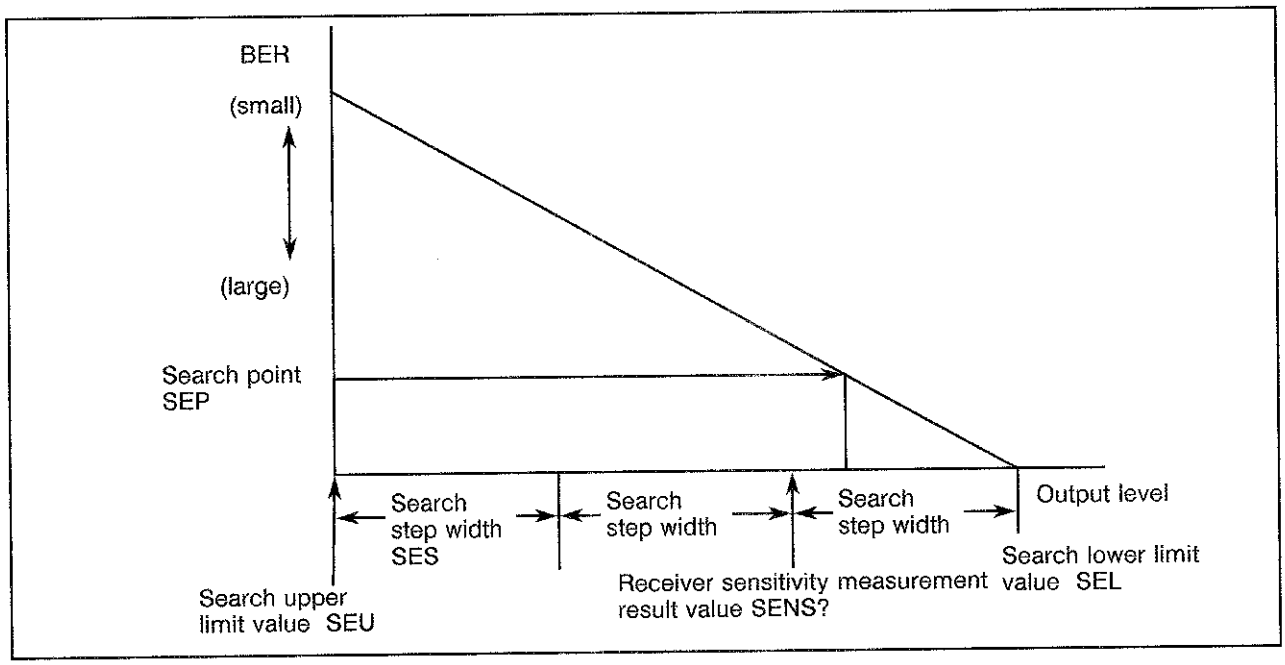


Figure 3-16 SENS (Receiver Sensitivity) Measurement

3.9.8 Averaging Count of BER Measurement

Specify averaging count of BER (SENS) measurement value. The averaging count can be set between 1 and 32.

Related GPIB command
AVG

3.9.9 Measurement Time (BER Measurement Bit Length)

Specify measurement time for BER (SENS) measurement with bit length.
The bit length can be set between 1000 and 1000000 (bits).

Related GPIB command
RBL

3.9.10 BER Clock Polarity

Select at which edge of BER clock signal the data signal will be sampled, rising or falling. The initial value is set to sample the data at the falling edge (NEG). (Refer to Figure 3-17.)

Related GPIB command
BCLK

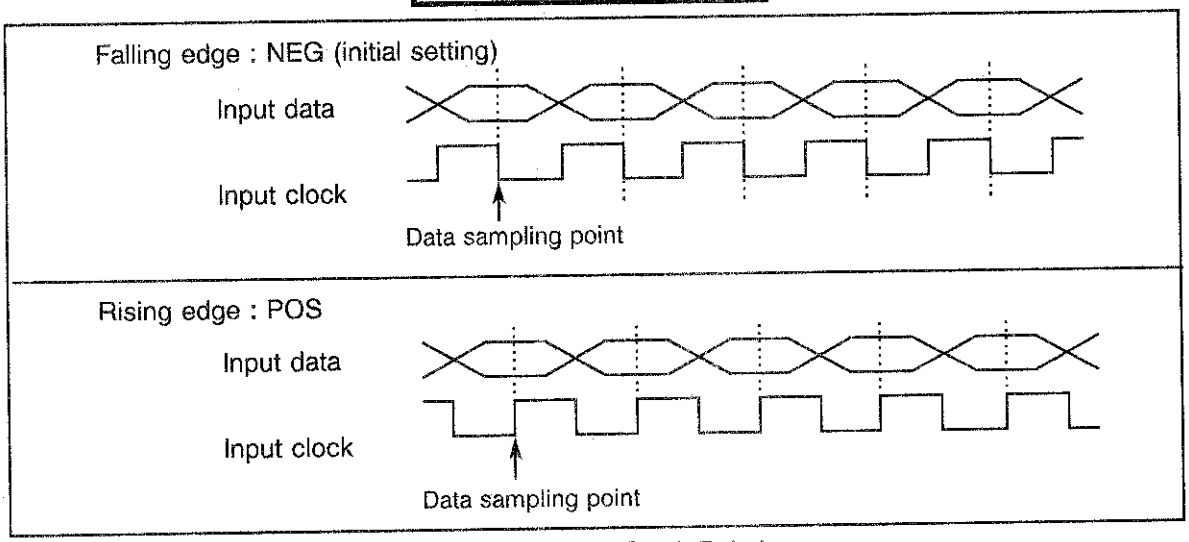


Figure 3-17 BER Clock Polarity

CAUTION

When jitter is produced a lot in the clock, use by making clock duty ratio 50%.

3.9.11 BER Data Polarity

Select to inverse or not to inverse the data of the DATA input connector.
The initial setting is set to data non-inverted (POS). (Refer to Figure 3-18.)

Related GPIB command
BDAT

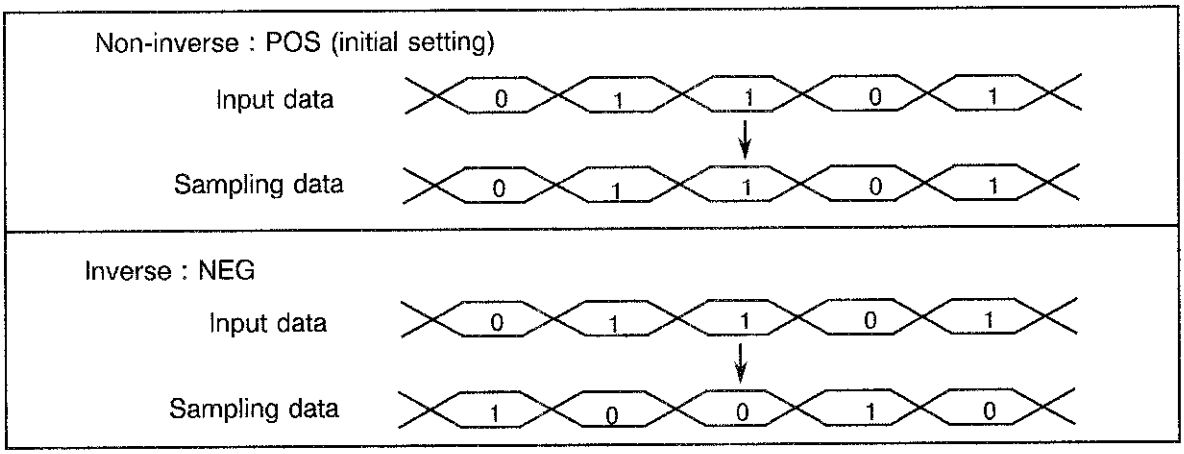


Figure 3-18 BER Data Polarity

3.9.12 TCH Frame Timing Signal

Control TCH frame timing signal for BER (SENS) measurement. Select to use or not to use TCH frame timing signal input from FRAME input connector for BER measurement and specify logic of TCH frame timing signal in case of use. The initial value is set not to use (OFF). (Refer to Figure 3-19 to Figure 3-21.)

Related GPIB command
TFRM

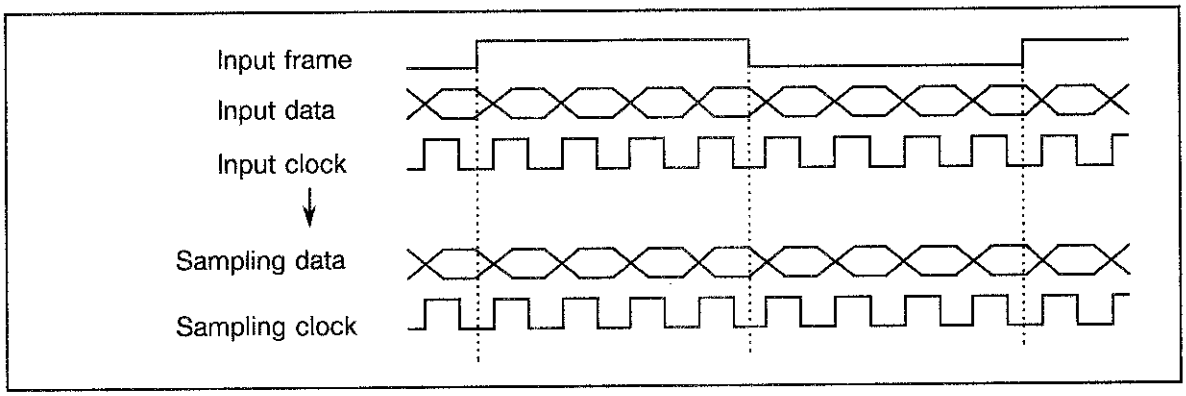


Figure 3-19 TCH Frame Timing OFF

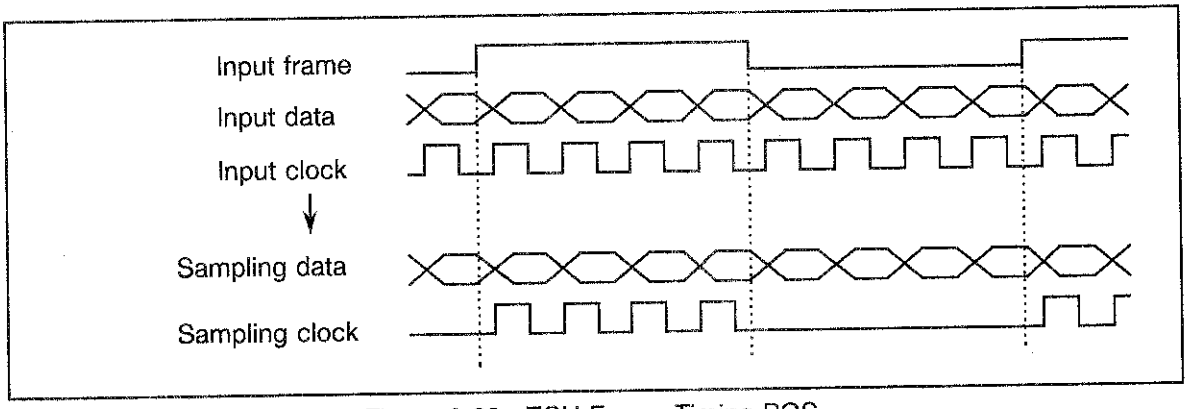


Figure 3-20 TCH Frame Timing POS

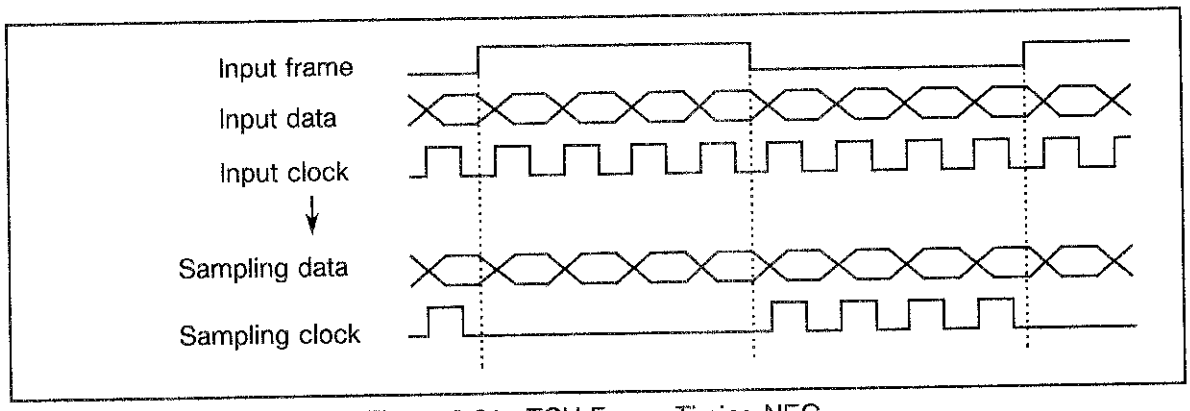


Figure 3-21 TCH Frame Timing NEG

3.9.13 BER Measurement Interval Time

Set the time from measurement start trigger to actual measurement start for BER (SENS) measurement. The BER measurement interval time can be set in 10 msec steps from 0 msec to 1000 msec. The initial value is 0 msec. (Refer to Figure 3-22.)

Related GPIB command
INT

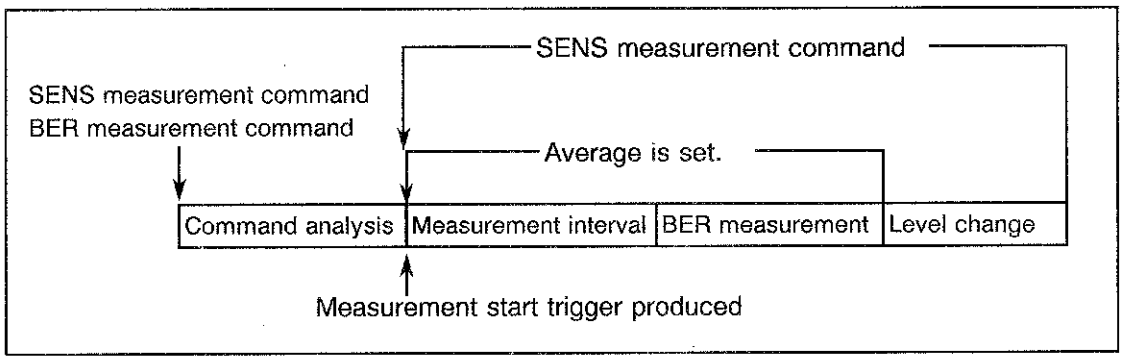


Figure 3-22 Interval Time

3.9.14 Measurement Stop

Stop BER measurement and SENS measurement forcefully. The measurement result is undefined.

Related GPIB command
STOP

3.9.15 In Occurrence of BER (SENS) Measurement Error

A measurement error can be known by the GPIB status byte.
Also, the factor of the measurement error can be known by referring to the measurement status register.
For details, refer to (7) Meaning of each bit of status byte and conditions of set/reset and (8) Meaning of each bit of measurement status register and conditions of set/reset in Section 4.4, "GPIB Code List".

Related GPIB command
MST?

: Measurement status register reading command

3.10 OTHER Section

3.10.1 Instrument Preset

Set this instrument to the initial state. When this command is executed, the system mode becomes PHS and all the setting becomes initial state. (Refer to Table 3-35.)

Related GPIB command
IP

Table 3-35 Initial Setting State

Item				Setting	Related GPIB command
OUTPUT	Output frequency	Direct specification	Output frequency	1895.15 MHz	FR
		Channel specification	Channel number	1 CH	CH
			Space between channels	300 kHz	CSP
			Channel start frequency	1895.15 MHz	CSF
	Output level			-80 dBm	AP
	Output on/off			On	OUT
	Output connector			Tx/Rx connector	OSE
MODULATION	System mode			PHS	PDCL PDCH PHS
	Modulation			On	MOD
	Baseband filter			Root Nyquist filter	NYQF
PATTERN	Slot configuration			Downlink traffic channel (* 1)	SCNF
	Rate			---	---
MEASURE	SENS	Search upper limitation		-100 dBm	SEU
		Search lower limitation		-120 dBm	SEL
		Search step width		1 dB	SES
		Search point		1%	SEP
	BER measurement averaging count			One time	AVG
	BER measurement bit length			2556 bit	RBL
	BER clock polarity			Fall	BCLK
	BER data polarity			Data non-inverse	BDAT
	TCH frame timing signal			Off	TFRM
	BER measurement interval time			0 msec	INT

(* 1): Refer to '(3) UPT/DNT Uplink/downlink traffic channel' in sub-section 3.8.2 "Slot configuration".

3.10.2 Save Condition

All the current setting (except the setting of GPIB related) is saved in back-up memory. Maximum 32 conditions can be saved.

Related GPIB command
SAVC

3.10.3 Recall Condition

Reset the setting saved with Save Condition.

Related GPIB command
RECC

3.10.4 System Revision

Display this instrument version and serial numbers. (Refer to Table 3-36.)

Table 3-36 Display Format

ADVANTEST R3560 serial number,
Soft-Revision_1,
Soft-Revision_2

Related GPIB command
IDN

3.11 Measurement Example

3.11.1 Receiver Bit Error Rate Measurement

The measurement is for the receiver which has a control mode to receive downlink traffic channel.

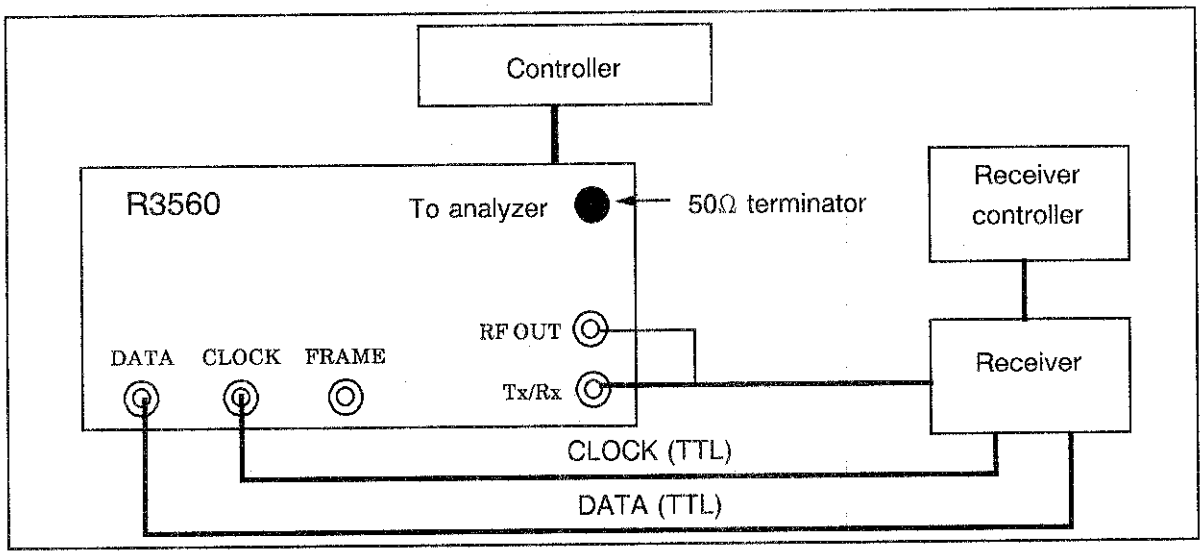


Figure 3-23 Connection Diagram of Rx Measurement

3.11.2 Measurement of Transmission/Reception Characteristics

Combining R3560 with the modulation spectrum analyzer R3465 allows expansion to the general test system for transmission/reception.

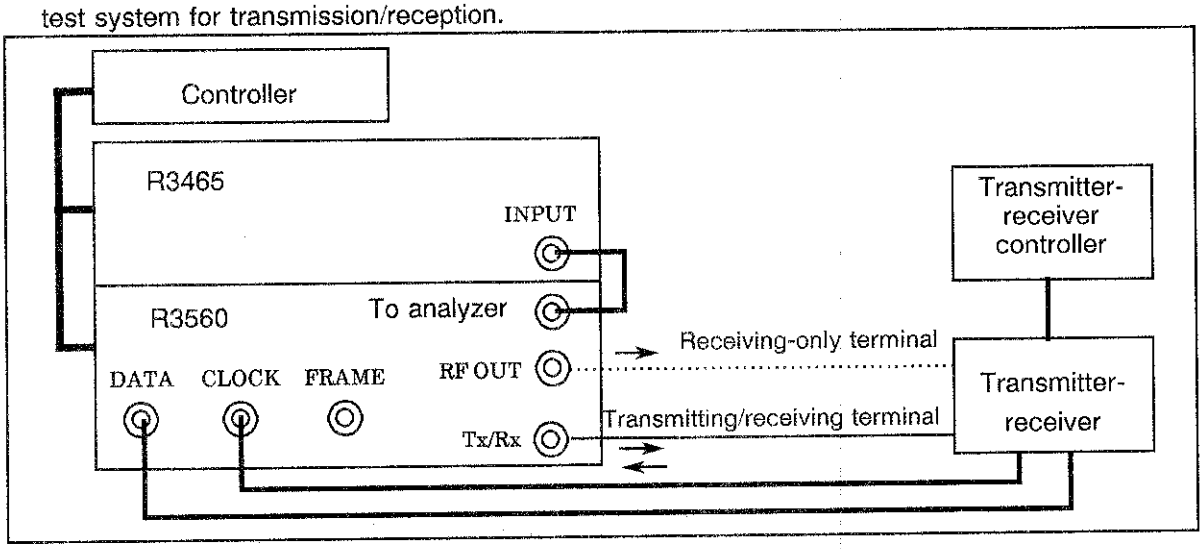


Figure 3-24 Connection Diagram of Tx/Rx Measurement

Table 3-37 Measurement Procedure of Bit Error Rate

Item	Contents	Related GPIB command
Measurement preparation	Connect as shown in Figure 3-23.	
Selection of system mode	Set R3560 system mode. (Refer to [Section 3.3 Communication system setting].)	PDCL PDCH PHS
Selection of slot configuration	Set R3560 slot configuration to downlink traffic channel (DNT). (Refer to [Section 3.7 Slot configuration of PDC system] and [Section 3.8 Slot configuration of PHS system].)	SCNF RATE
Setting in the slot	Select PN9 pseudo random pattern for TCH pattern of the slot which will be the object of the measurement. Set SACCH, scramble, etc. when necessary.	PAT SACCH SCR
Setting of frequency	Set R3560 frequency to the frequency you want to test.	FR
Selection of output terminal	Select R3560 output terminal.	OSE
Setting of output level	Set R3560 output level to the level which is suitable for the receiver.	AP
Receiver control	Set receiver to receivable mode with receiver controller.	
BER counter setting	Change the polarity of R3560 BER counter input by demodulation data and demodulation clock polarity. Set average, interval, etc. when necessary. (Refer to [Sub-section 3.9.10 BER clock polarity] and [Sub-section 3.9.11 BER data polarity].)	BCLK BDAT AVG INT
Code error rate measurement	Measure bit error rate.	BER

Table 3-38 Measurement Procedure of Transmission Characteristics

Item	Contents	Related GPIB command
Measurement preparation	Connect as shown in Figure 3-24.	
Setting of output level to off	Set R3560 output level to off.	OUT
Selection of output terminal	Select R3560 output terminal to RF OUT. (Set the internal output path to the Tx/Rx terminal as in 50Ω termination state. See Figure 3-4 in Section 3.4 OUTPUT section.)	OSE
Measurement of transmission characteristics	Refer to "R3465 Series Operation Manual".	

3.12 Special Function

Some functions explained in this section may not be supported depending on the version of the R3560 main unit. For detailed information, ask ADVANTEST service office.

3.12.1 Synchronization Word Setting (Sync Word)

Set the slot and change the synchronization word. This command can be set when the system mode is PDCL or PDCH and the slot configuration is UPT or DNT.

Related GPIB command
SSW

The setting values of the index number and the synchronization word are shown in Table 3-39.
To set the synchronization word with a GPIB command, specify a slot after the command. Then, enter a space and an index number (from 1 to 12) of Table 3-39.
For example, if you want to set S7 of Table 3-39 as the synchronization word of the slot 1, use GPIB command "SSW1 7".
When this command is executed, 31BAF (hexadecimal) or CE450 (hexadecimal) is set as the synchronization word if the slot configuration is DNT or UPT, respectively.

Table 3-39 Setting Values of Index No. and Synchronization Word Patten

Index number	Synchronization word number	20-bit synchronization word pattern (hexadecimal)	
		DNT	UPT
1	S1	87A4B	785B4
2	S2	9D236	62DC9
3	S3	81D75	7E28A
4	S4	A94EA	56B15
5	S5	5164C	AE9B3
6	S6	4D9DE	B2621
7	S7	31BAF	CE450
8	S8	1E56F	E1A90
9	S9	E712C	18ED3
10	S10	FBCIF	043E0
11	S11	8279E	7D861
12	S12	98908	676F7

Note: Synchronization words S1 to S12 in the table correspond to the 20-bit synchronization word pattern numbers of STD-27.

3.12.2 Burst Trigger Function

By inputting an external trigger signal (hereafter called burst trigger signal), the burst wave synchronized with a burst trigger signal can be output.

(1) Condition in inputting the burst trigger signal

Input the burst trigger under the following condition to the BURST TRIG IN terminal on the R3560 rear panel.

Table 3-40 Burst Trigger Input Condition

Communication system	Rate	T1	T2	T3
PDC	Full	100nsec or more	100nsec or more	20msec ± 1 symbol
	Half			40msec ± 1 symbol
PHS	–			5msec ± 1 symbol
Rising/Falling time: 100nsec or less				

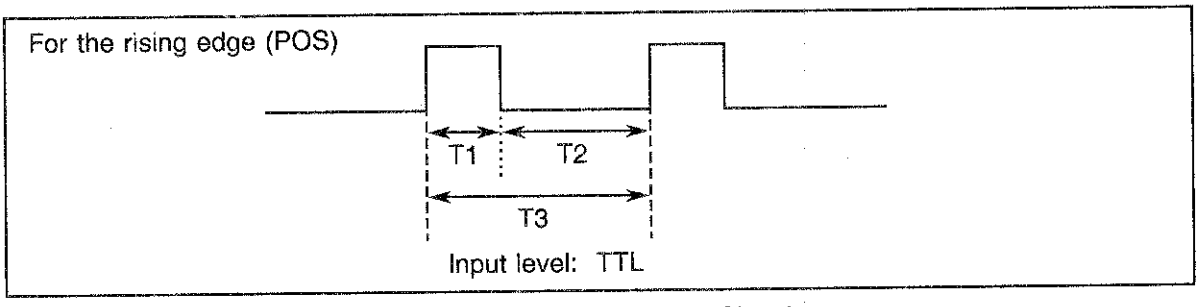


Figure 3-25 Burst Trigger Input Signal

(2) Relationship between burst trigger and burst wave

A burst wave is output after Tdt from inputting a burst trigger. (See Table 3-41.)

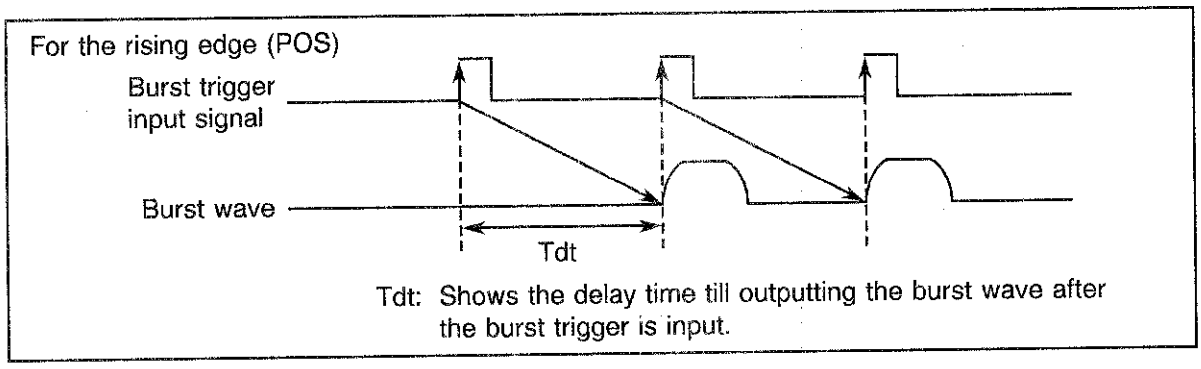


Figure 3-26 Relationship Between Burst Trigger and Burst Wave

(Note) When the burst trigger other than the T3-period burst trigger is input, the burst wave synchronized with the burst trigger is not output because the invalid trigger is developed as shown in Figure 3-27. (Refer to Table 3-41.)

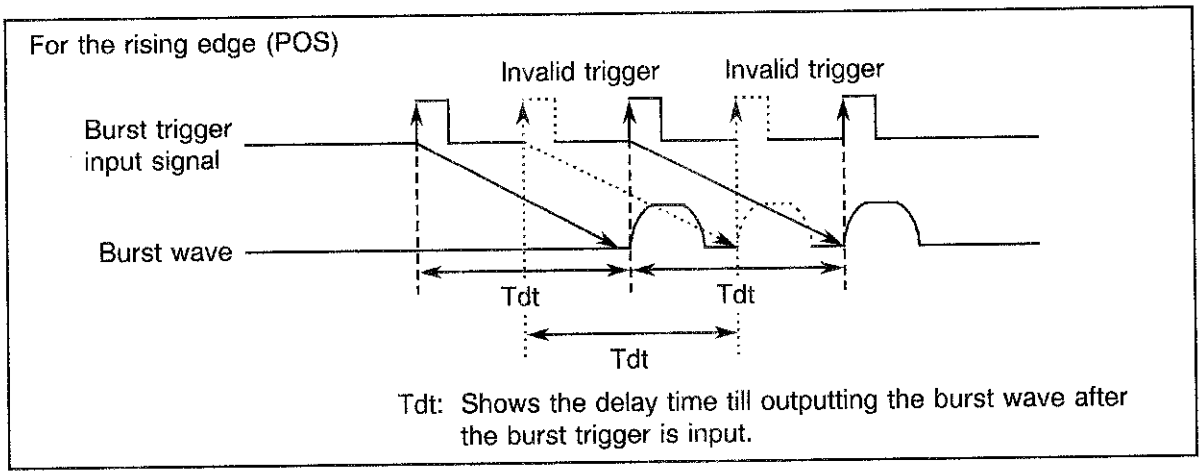


Figure 3-27 When the Burst Trigger Other than T3-period Burst Trigger is Input

(3) Timing of outputting the burst trigger and the burst wave

The delay time till outputting the burst wave after the burst trigger is input is shown.

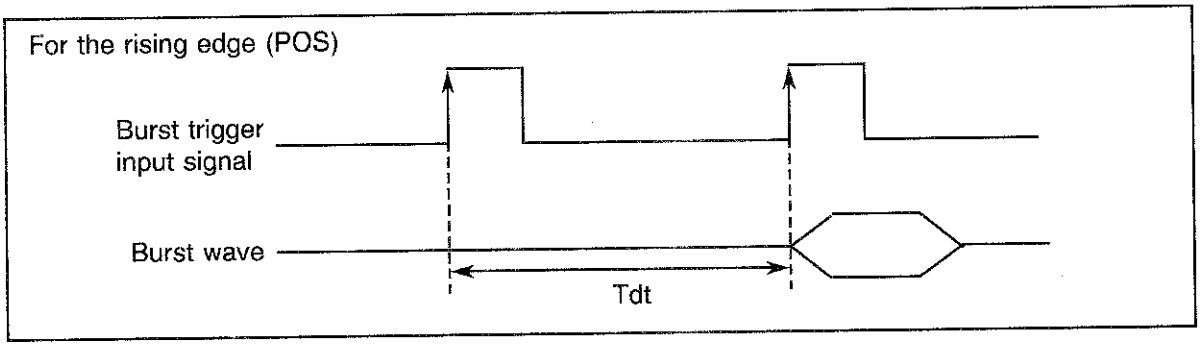


Figure 3-28 Timing of Outputting Burst Trigger and Burst Wave

Tdt: Shows the delay time till outputting the burst wave after the burst trigger is input.

Tdt = Frame period of the communication system (T3) + Tdi + Ts

Tdi: Delay time in the internal trigger operation (1/32 symbol)
Ts: Burst trigger sampling error (1/32 symbol)

Table 3-41 Delay Time of Tdt

Communication system	Rate	Delay time Tdt
PDC	Full	20msec + 2.98μsec
	Half	40msec + 2.98μsec
PHS	–	5msec + 0.33μsec

(4) Slot configuration to which the burst trigger function is effective

The burst trigger function is effective only when the modulation is in the ON state and the settings of the system mode and the slot configuration are as shown in Table 3-42.

Table 3-42 Condition of Burst Trigger Function

System mode	System mode					
	FIL	DEV	DNT	UPT	DSYNC	USYNC
PDCL	×	○	×	○	–	
PDCH						
PHS			○		○	○

○: Valid, ×: Invalid

3.12.3 Burst Trigger ON/OFF

Select to validate or to invalidate the burst trigger function.
In the initial condition, OFF is set to invalidate the burst trigger.

Related GPIB command
BTS

3.12.4 Burst Trigger Polarity

Select to validate the rising edge or the falling edge of the burst trigger signal.
In the initial condition, POS is set to validate the rising edge of the burst trigger signal.

Related GPIB command
BTP

3.12.5 Burst Trigger Delay

The delay time from the burst trigger signal is set by the symbol. When the signal effective to the BURST TRIG IN terminal is gotten, the delay time can be changed in the range of ±10 symbols based on the Tdi period (resolution 0.5 symbol).
In the initial condition, no delay (0 symbol) is set.

Related GPIB command
BTD

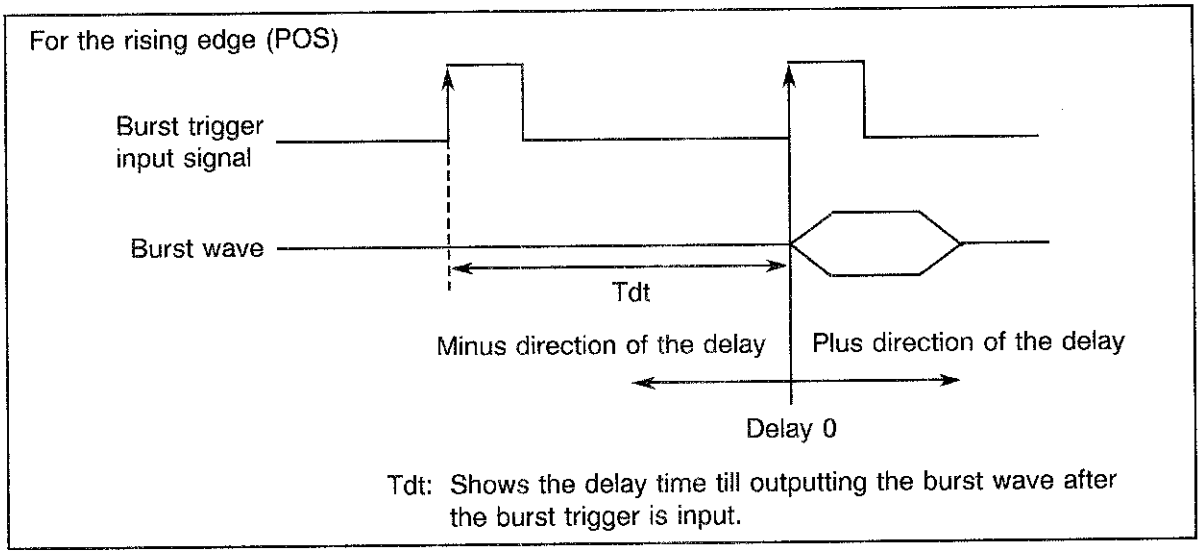


Figure 3-29 Burst Trigger Delay

4. GPIB INTERFACE

4.1 Introduction

This instrument is equipped with a GPIB (General-Purpose Interface Bus) as standard, which complies with IEEE standards 488-1978 and can be remotely controlled by means of an external controller.

4.1.1 GPIB

The GPIB is a high-performance interface bus used to connect the measuring instruments to the computer.
The operations of the GPIB are defined by IEEE standard 488-1978. Since the GPIB has a bus-configured interface, it can specify a device by assigning a specific address to each device. Up to 15 devices can be connected in parallel to a single bus. GPIB devices have one or more of the following functions:

- Talker
  The talker is a device which is specified to send data to the bus. Only one active talker can exist on the GPIB bus.

- Listener
  The listener is a device which is specified to receive data from the bus. Multiple active listeners can exist on the GPIB bus.

- Controller
  The controller is a device which specifies the talker and listener. Only one active controller can operate on the GPIB bus. Controllers which control IFC and REN messages are called "system controllers".

  The GPIB bus can have only one system controller on it. If there are multiple controllers on the bus, the system controller becomes the active controller, while other devices which have a control function operate as addressable devices when the system is started up.

  The TCT (Take Control) interface message is used to set a controller other than the system controller as the active controller. After setting, the system controller will become the non-active controller.

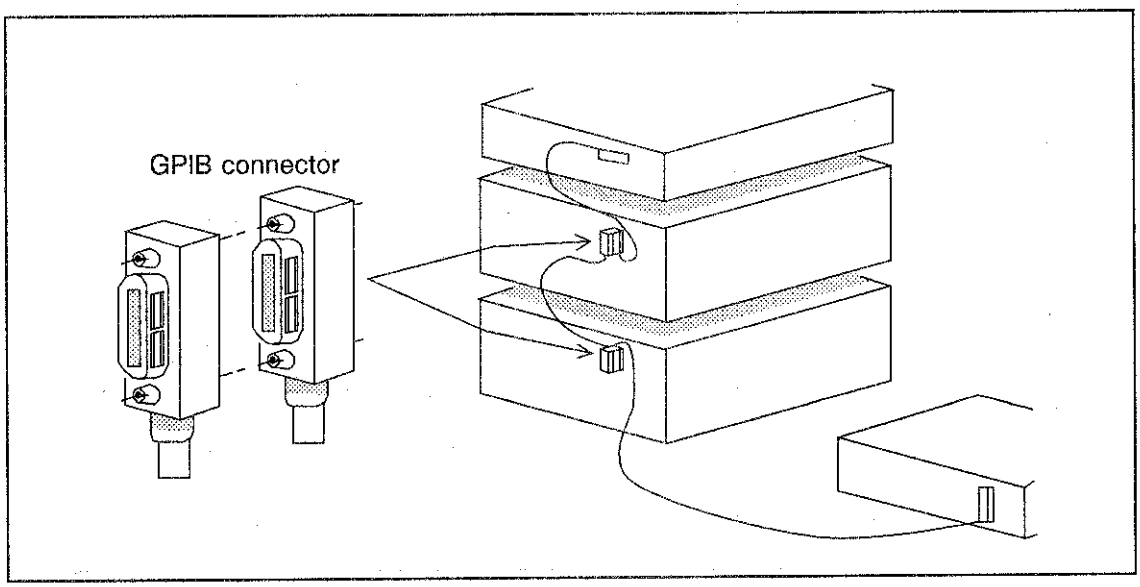
The controller controls the entire system by sending interface messages or device messages to each measuring instrument. The functions of the messages are:

- Interface message: Control of the GPIB bus
- Device message: Control of the measuring instrument

4.1.2 GPIB Setup

(1) Connecting GPIB

The following shows the standard GPIB connector. Secure the GPIB connector with the two screws to prevent it from coming loose during use.

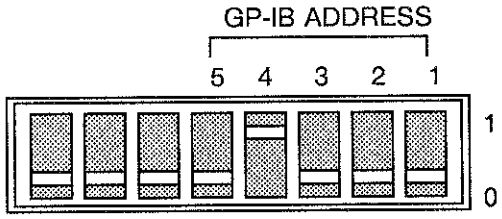


The following precautions should be observed when using the GPIB interface:

- The total GPIB cable length in a single bus system should not exceed n x 2 meters, where n = the number of devices to be connected, including the GPIB controller. In no case should the cable length exceed 20 meters.
- Up to 15 devices can be connected to a single bus system.
- There are no restrictions concerning the method of connection between cables. However, no more than three GPIB connectors should be connected to a single device, since the use of excessive force could damage the connector mounting.

For example, the total cable length in a system with five devices should be 10 meters or less (2 meters x 5 devices = 10 meters).The total cable length can be distributed freely within the range of the maximum allowed cable length. However, if more than ten devices are to be connected, some of them should be connected using cables of less than 2 meters so that the total cable length does not exceed 20 meters.

(2) GPIB address setting



The setting is performed with GPIB address switch on the rear panel.
The range of available GPIB address is from 0 to 30.
The above GPIB address is 8. This setting value is the one factory-shipped.

4.2 GPIB Bus Function

4.2.1 GPIB Interface Function

Code	Description
SH1	With source handshake function
AH1	With acceptor handshake function
T6	Basic talker function, serial polling function, listener-specified talker cancel function
TE0	Without extended talker function
L4	Basic listener function, talker-specified listener cancel function
LE0	Without extended listener function
SR1	With service request function
RL1	Remote function, local function, local lockout function
PP0	Without parallel polling function
DC1	Device clear function
DT0	Without device trigger function
C1	System controller function
C2	IFC transmission, controller in charge function
C3	REN transmission function
C4	SRQ response function
C12	Transmission of interface messages, control transfer function
E1	Using open-collector bus driver

4.2.2 Response to Interface Message

The responses of this instrument to interface messages are defined by IEEE standards 488-1978 and are described in this section.
For information on how to send interface messages to this instrument, refer to the instruction manual of the controller to be used.

(1) Interface clear (IFC)

The IFC message is transmitted directly to this instrument through a signal line. The message allows this instrument to stop the operation of the GPIB bus. Although all input/output operation is stopped, the input/output buffer is not cleared.

(2) Remote enable (REN)

The REN message is transmitted directly to this instrument through a signal line. If this instrument is specified as a listener when the message is true, this instrument is in the remote mode. This instrument remains in the remote mode until the GTL message is received.

4.2.3 Message Exchange Protocol

This instrument receives program message from controllers or other devices through the GPIB bus and generates response data. The program messages include commands, queries (commands used to query response data) and data. The procedure used to exchange these commands, queries and data is explained in this section.

(1) GPIB buffers

This instrument is equipped with the following two buffers.

① Input buffer
The input buffer is used to store data temporarily for command analysis.

② Output buffer
The output buffer is used to store data which are to be read from the controller.

(2) Message exchange

The following are the most important events when another controller or device receives messages from the analyzer:

<Response data are generated when a query is received.>

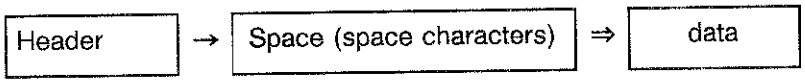
① Purser
The purser receives command messages in the order of reception from the input buffer, analyzes the syntax and determines what the received command is to execute.

② Generating response data
When the purser executes a query, the analyzer generates data in the output buffer in response to it (that is, to output data a query must be sent immediately before the data).

4.3 Command Syntax

4.3.1 Command Syntax

Command syntax is defined by the following format:



(1) Header

Two types of header are available: common command header explained below and simple header.

Common command header has an asterisk (*) at the top of mnemonic.

Simple header is a functionally independent command which has no hierarchical structure.

Attaching "?" in front and in the rear of a header makes a query command.

(2) Space (Space character)

One space or more is required in this field.

(3) Writing multiple commands

This instrument can describe multiple commands in 1 line by separating them with semicolon (;).

4.3.2 Data Format

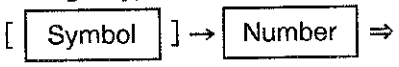
This instrument uses the data formats for data input/output shown in this section.

(1) Numeric data

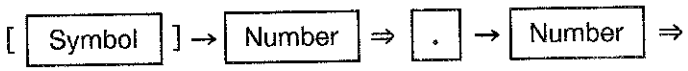
There are two numeric data formats, any of which can be used for numeric data input.

Some commands add the units to the data at data inputting.

- Integer type : NR1 format



- Fixed-point type: NR2 format



Note: "⇒" indicates repetition. Symbols at the beginning may be omitted.

4.4 GPIB Code List

(1) Function (1 of 5)

Item				Program code: Function header	Program code: Setting	Contents	Setting example	READ function
OUTPUT	Output frequency	Direct specification		FR	Numeric value + [Unit]	Unit HZ:Hz (by default) KZ:kHz MZ:MHz GZ:GHz	FR 1895.15MZ FR 0.81GZ	○ (*1)
		Channel specification	Channel number	CH	Numeric value		CH1	○
			Space between channels	CSP	Numeric value + [Unit]	Unit HZ:Hz (by default) KZ:kHz MZ:MHz GZ:GHz	CSP 0.2MZ	○ (*1)
			Channel start frequency (*3)	CSF	Numeric value + [Unit]		CSF 1895.15MZ	○ (*1)
	Output level			AP	Numeric value + [Unit]	Unit DM:dBm (by default) DU:dBμVemf	AP -80DM AP 33DU	○ (*2)
	Output on/off			OUT	ON OFF		OUT ON OUT OFF	○
	Output connector switch (TRX/RF)			OSE	TRX RF		OSE TRX OSE RF	○
MODULATION	System mode setting			PDCL PDCH PHS	---		PDCL PDCH PHS	×
	System mode setting read			SYS?	---	Return value:PDCL PDCH PHS	SYS?	○
	Modulation on/off			MOD	ON OFF		MOD ON MOD OFF	○
	Baseband filter switch (Root Nyquist/Nyquist)			NYQF	---	RNYQ:Root Nyquist filter NYQ:Nyquist filter	NYQF RNYQ NYQF NYQ	○

(*1): Unit of the value is MHz.

(*2): Unit of the value is dBm.

(*3): Even if the setting of channel start frequency is changed, the actual output is not changed. In order to change the actual output, reset the channel number or the space between channels after inputting channel start frequency setting.

(Note) ○: READ possible
×: READ impossible

Function (2 of 5)

	Item	Program code: Function header	Program code: Setting	Contents	Setting example	READ function
PATTERN	Slot configuration	SCNF	FIL	FILL pattern	SCNF DNT	○
			DEV	Except R and G		
			UPT	Up Tch		
			DNT	Down Tch		
			UPS	Up synchronization burst (only PHS)		
			DNS	Down synchronization burst (only PHS)		
	Rate switch (only PDC)	RATE	FULL HALF		RATE FULL	○
	Slot on/off	SL□ (*4)	ON OFF		SL1 ON SL4 OFF	○
	Color code	CC□ (*4)	$ numeric value (*5)		CC1 $0 CC4 $FF	○
	SACCH	SA□ (*4)	$ numeric value (*5)		SA1 $0 SA4 $FFFF	○
	Pattern	PAT□ (*4)	PN9	PN9	PAT1 PN9 PAT4 ALL1	○
			PN15	PN15		
			ALL0	0 pattern		
			ALL1	1 pattern		
	Scramble on/off	SCR	ON OFF		SCR ON SCR OFF	○
	Scramble pattern	SCRP	$ numeric value (*5)		SCRP $0 SCRP $1FF	○
	User-scramble on/off (only PHS)	ENC	ON OFF		ENC ON ENC OFF	○
	User-scramble pattern (only PHS)	ENCP	$ numeric value (*5)		ENCP $0 ENCP $FFFF	○

(*4): Specify slot number to perform the setting in □.
(*5): Set numerical value with hexadecimal digit.

(Note) ○: READ possible
×: READ impossible

Function (3 of 5)

	Item	Program code: Function header	Program code: Setting	Contents	Setting example	READ function
PATTERN	CS-ID pattern (*6)	CS	$ numeric value (*5)		CS $0 CS $FFFF	○
	PS-ID pattern (*6)	PS	$ numeric value (*5)		PS $0 PS $FFFF	○
	Synchronization word change (only PDC)	SSW□ (*4)	Numeric value		SSW1 7 SSW1 1	○
	Burst trigger on/off	BTS	ON OFF		BTS ON BTS OFF	○
	Burst trigger polarity	BTP	POS NEG	POS: Rising edge NEG: Falling edge	BTS POS	○
	Burst trigger delay	BTD	Numeric value	Set the value in the range from -10.0 to +10.0 [symbol]	BTD -10.0 BTD 10.0	○

(*6): When slot configuration is up synchronization burst or down synchronization burst, it can be set.

(Note) ○: READ possible
×: READ impossible

Function (4 of 5)

Item			Program code		Contents	Setting example	READ function
			Function header	Setting			
MEASURE	BER measurement		BER	---		BER BER?	○ (*7)
	SENS	SENS measurement	SENS	---		SENS SENS?	○ (*8) (*9)
		Search upper limit value	SEU	Numerical value + [Unit]	Unit DM:dBm (by defalt) DU:dBμVemf	SEU -80DM SEU 33DU	○
		Search lower limit value	SEL	Numerical value + [Unit]	Unit DM:dBm (by defalt) DU:dBμVemf	SEL -100DM SEL 23DU	○
		Search step width	SES	Numerical value + [Unit]	Unit DB:dB	SES 1DB	○
		Search point	SEP	Numerical value		SEP 0.01	○
	BER measurement average number of times		AVG	Numerical value		AVG 1 AVG 32	○
	BER measurement bit length		RBL	Numerical value		RBL 1000 RBL 65000	○
	BER clock polarity		BCLK	POS NEG	POS:Rising edge NEG:Falling edge	BCLK POS	○
	BER data polarity		BDAT	POS NEG	POS:Data non-inverse NEG:Data inverse	BDAT POS	○
	TCH frame timing signal		TFRM	OFF POS NEG	OFF:Unused POS:Effective in HI level NEG:Effective in LOW level	TFRM POS	○
	BER measurement interval time		INT	Numerical value + [Unit]	Unit S:SEC MS:mSEC (by defalt) US:μSEC	INT 0.1S INT 100MS	○ (*10)
	Measurement stop		STOP			STOP	×

(*7): When the READ value is 9.99999E-1, it is measurement error.

(*8): Unit of the value is dBm.

(*9): When the READ value is 9.990E + 1, it is measurement error.

(*10): Unit of the value is msec.

(Note) ○: READ possible
×: READ impossible

Function (5 of 5)

Item		Program code		Contents	Setting example	READ function
		Function header	Setting			
OTHER	Instrument preset	IP	---		IP	×
	Save condition	SAVC	Numerical value		SAVC 1 SAVC 32	×
	Recall condition	RECC	Numerical value		RECC 1 RECC 32	×
	System revision	IDN?	---		IDN?	○

(Note) ○: READ possible
×: READ impossible

(2) Data output and others

Item	Program code		Contents	Setting example	READ function
	Function header	Setting			
SRQ signal control (*11)	SRQ	0, 1	0: SRQ is not sent out. 1: SRQ is sent out.	SRQ 1	○
Mask of status byte (*11) (*12)	MSK	0 to 255	Bit of status mask is masked in bits. Initial value: 255	b0 and b1 are masked. MSK3	○
Status byte/Measurement status register clear	CSB	---		CSB	×
Header data output (*11)	HED	0, 1	0: HEADER OFF 1: HEADER ON	HED 1	○
Specification of terminator (*11)	DEL	0 to 3	0: NL<EOI> 1: NL 2: <EOI> 3: CR NL<EOI>	DEL 0	○
Measurement status register output (*13)	MST?	---	0: LF<EOI> 1: LF 2: <EOI> 3: CR LF<EOI>	MST?	○

(3) Common command

Item	Program code		Contents	Setting example	READ function
	Function header	Setting			
Status byte output (*14)	*STB?	---	---	*STB?	○
Status byte enable (*15)	*SRE	0 to 255	Bit of status byte is enabled in bits. Initial value: 0	b0 and b1 are enabled. *STE 3	○

(*11): There are no functions of Back-up and Save Condition.

(*12): The bit of 1 set becomes ineffective.

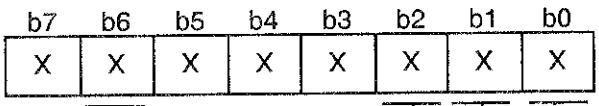
(*13): Value of the measurement status register is read out. After that, the measurement status register is cleared.

(*14): Value of the status byte is read out. After that, the status byte is cleared.

(*15): The bit of 1 set becomes effective.

(Note) ○: READ possible
×: READ impossible

(4) Meaning of each bit of status byte and conditions of set/reset



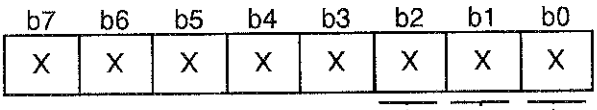
b0: Measure end
Set to 1 when the measurement (BER and SENS) ends.
Status byte clear
: CSB or status byte output
: * Set to 0 by STB command.

b1: Syntax error
When grammatical or setting error is in the received program code, set to 1.
Set to 0 in the next program code reception.

b2: Masurement error
b2 is set to 1 when an error occurred in the measurement (BER and SENS).
Clearing the status byte/measurement status register
: Outputting the CSB or the measurement status register
: Set to 0 with the MST? commande

b6: It is the bit which shows service request is sent out. When one of the bits, b0 or b1, is 1, 1 is set.
When both of b0 and b1 bits are 0, 0 is set.

(5) Meaning of each bit of measurement status register and conditions of set/reset



b0: Sync error
b0 is set to 1 when synchronization cannot be taken with the data of the DATA terminal for the BER measurement in the measurement (BER and SENS).
Clearing the status byte/measurement status register
: Outputting the CSB or the measurement status register
: Setting to 0 with the MST? command

b1: Clock error
b1 is set to 1 when the Clock signal cannot be found at the Clock terminal for the BER measurement in the measurement (BER and SENS).
Clearing the status byte/measurement status register
: Outputting the CSB or the measurement status register
: Setting to 0 with the MST? command

b2: Sens mesurement error
b2 is set to 1 when the search point is not found in the SENS measurement.
Clearing the status byte/measurement status register
: Outputting the CSB or the measurement status register
: Setting to 0 with the MST? command

4.5 Program Example

Here shows a program example to control this instrument by using NEC Co.-made PC-9801 series.

(Program example) After each setting performed, BER measurement results are read and displayed.
(1 of 2)

```
1000  '*************************************************************************
1010  '   RX tester BER measurement sample program  for PC-9801
1020  '   1995.8.8   ADVANTEST
1030  '   SAMPLE.BAS
1040  '*************************************************************************
1050  '
1060  ISET IFC                      'Sends out "IFC" signal.
1070  ISET REN                      'Sets "REN" signal to TRUE.
1080  RX = 8                        'Sets RX tester GPIB address (8) to variable.
1090  ON SRQ GOSUB *SSRQ            'Defines process routine in the case SRQ signal interruption occurs.
1100  '
1110  PRINT @RX;"HED 0"             'Header data output OFF
1120  PRINT @RX;"OSE TRX"           'Output connector switch      Outputs to TRX connector.
1130  PRINT @RX;"PDCL"              'Sets the system mode to PDCL.
1140  PRINT @RX;"SCNF DNT"          'Sets the slot configuration to down Tch.
1150  PRINT @RX;"FR 810MZ"          'Sets the frequency to 810 MHz.
1160  PRINT @RX;"AP -20DM"          'Sets the output level to -20 dBm.
1170  PRINT @RX;"RATE HALF"         'Sets the rate switch to half rate.
1180  PRINT @RX;"RBL 2556"          'Sets the BER measurement bit length to 2556 bits.
1190  PRINT @RX;"AVG 1"             'Sets the BER measurement average number of times to one time.
1200  '
1210  PRINT @RX;"MSK 254"           'Makes only the measure end bit in status byte effective.
1220  PRINT @RX;"SRQ 1"             'Sets the mode to send out SRQ signal.
1230  PRINT @RX;"CSB"               'Clears the status byte.
1240  PRINT @RX;"BER"               'Starts BER measurement.
1250  M.END = 0                     'Clears the flag showing the measurement end.
1260  SRQ ON                        'Permits the interruption by SRQ signal.
1270  IF M.END=0 THEN 1310          'Waits for the measurement end.
1280  PRINT @RX;"BER?               'Requests BER measurement result data output.
1290  INPUT @RX;A$                  'Reads BER measurement result into variable.
1300  PRINT A$                      'Displays BER measurement results.
1310  STOP                          'Ends the measurement.
```

(2 of 2)

```
1320  '
1330  *SSRQ: POLL RX,S          'Interruption process routine
1340  M.END = 1                 'Sets the measurement end flag.
1350  '
1360  RETURN                    'Return to the main routine.
1370  '
1380  END
```

5. PRINCIPLE OF OPERATION

5.1 Principle of R3560 Operation

R3560 measures generation of digital modulation signal for PDC/PHS and bit error rate.

5.1.1 Reference Oscillator Part

It supplies each part with the signal from 10 MHz reference crystal oscillator and 200 MHz signal synchronizing with the frequency.

5.1.2 Baseband Part

It consists of a circuit to generate I and Q pattern such as PN9/PN15, ALL0, and ALL1 for PDC/PHS and a circuit to measure bit error rate in demodulation signal from sample instrument.

5.1.3 Synthesizer Part

It produces local signal frequency-synchronizing with the signal from reference oscillation part and supplies it to modulator part.

5.1.4 Modulator Part

It does quadrature modulation by I and Q signal from baseband and internal local, and up-converts to PDC/PHS frequency band by the signal from synthesizer part.

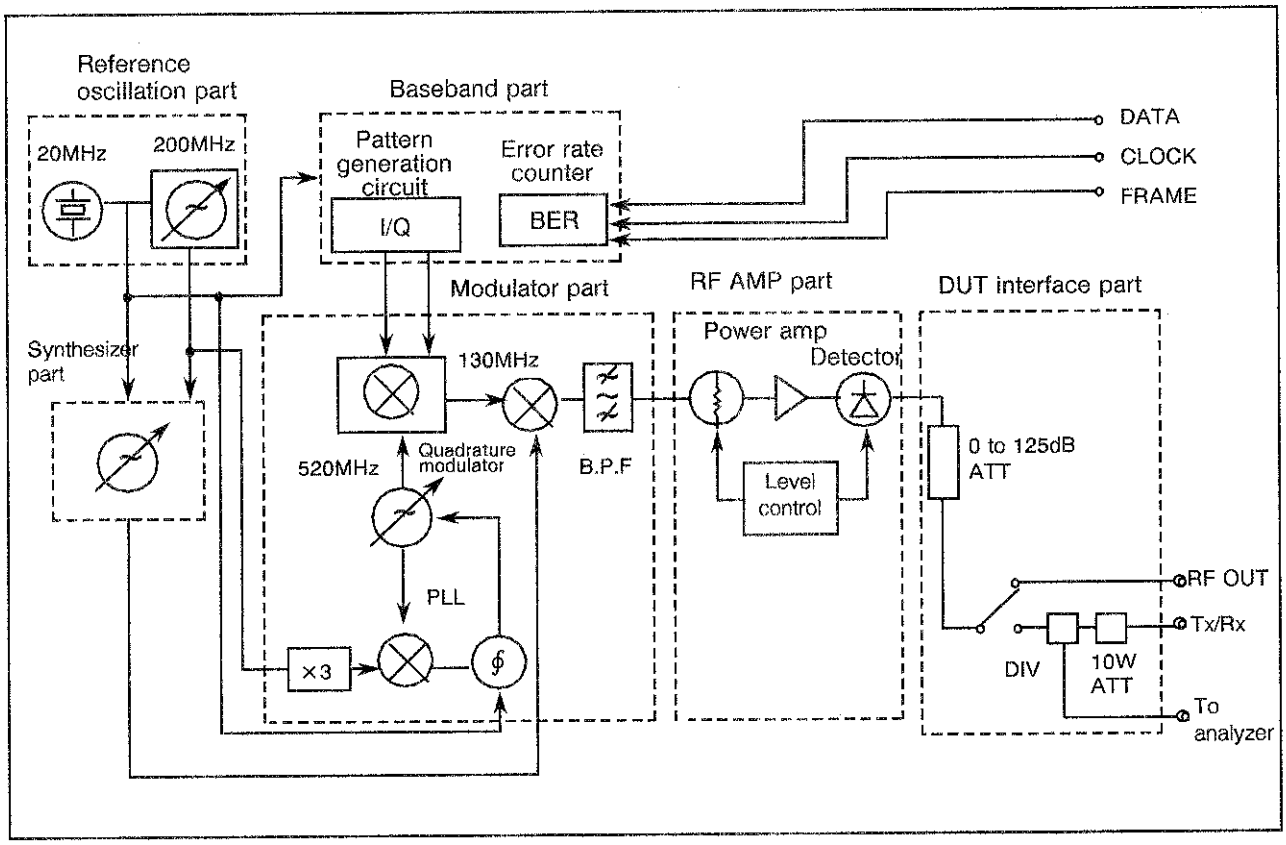
5.1.5 RF AMP Part

It amplifies the signal from modulator part and controls to have correct output level.

5.1.6 DUT Interface Part

It consists of 0 to 125 dB programmable step attenuator, sample instrument, splitter which takes the connection to external analyzer into consideration, high frequency switch, and high power attenuator.

5.2 Block Diagram



6. SPECIFICATIONS

6.1 Output Frequency

(1) Range
808 MHz to 835 MHz/ 938 MHz to 962 MHz (PDC)
1477 MHz to 1501 MHz/ 1429 MHz to 1453 MHz (PDC)
1885 MHz to 1930 MHz (PHS)
835 MHz to 938 MHz (When the option 06 is expanded.)

(2) Resolution
1 kHz

(3) Accuracy
Depends on the accuracy of standard source.

6.2 Output Level

(1) Range
RF OUT : -125 dBm to +6dBm
Tx/Rx : -125 dBm to -7dBm

(2) Resolution
0.1 dB

(3) Accuracy
≤ ±1.0 dB (Output level : -120 dBm to +6 dBm, Frequency : ≤1000 MHz)
≤ ±2.0 dB (Output level : -125 dBm to -120.1 dBm, Frequency : ≤1000 MHz)
≤ ±1.0 dB (Output level : -110 dBm to +6 dBm, Frequency : >1000 MHz)
≤ ±2.0 dB (Output level : -125 dBm to -110.1 dBm, Frequency : >1000 MHz)

Note: In the range of temperature 25 °C ±10 °C

(4) Frequency characteristics
≤1.0 dBp-p (Within PDC/PHS band, at 0 dBm output)

6.3 Signal Purity

(1) Harmonics spurious
≤-30 dBc

(2) Non-harmonics spurious
≤-70 dBc/ 10 kHz≤offset (Within PDC/PHS band)
≤-75 dBc/ 50 kHz≤offset (Within PDC/PHS band)
≤-50 dBc (Within PDC/PHS band)

(3) Adjacent channel leakage power
≤-60 dB/ ±50 kHz offset (PDC), ±600 kHz (PHS)

6.4 Modulation

(1) Scheme
$\pi/4$ DQPSK

(2) Transmission bit rate
42 Kbit/s (PDC)/ 384 Kbit/s (PHS)

(3) Transmission bit rate accuracy
Depends on the accuracy of standard source.

(4) Vector error
≤3%rms

(5) Baseband filter
Root Nyquist/ Nyquist $\alpha = 0.5$

(6) Internal modulation data

① No framing/ PDC framing/ PHS framing - possible

② PDC framing: Device/ Up/ Down, PN9/ PN15/ ALL0, ALL1
For FULL/HALF rate, Scramble function

③ PHS framing: Device/ Up/ Down, SYNC, PN9/ PN15/ ALL0, ALL1
Scramble function

(7) Burst function
The ratio of ON versus OFF: >70 dB (ON/OFF of optional slot - possible)
Rising/ falling time: <2 symbols

6.5 BER Measurement

(1) Bit length
10^3 to 10^6 bits

(2) Clock/data polarity
Polarities of clock/data can be switched.

(3) Tch frame
Selection of POSI/NEGA/OFF is possible.

(4) Average function
Average number of times : 1 to 32

(5) Receiving sensitivity measurement
Available (Specify the range of BER value/search level.)

6.6 Burst Trigger Function

(1) Burst trigger function
Selectable between ON and OFF

(2) Burst trigger polarity
Selectable between rising (POS) and falling (NEG)

(3) Burst trigger delay
Variable within ±10 symbols (Resolution: 0.5 symbols)

6.7 Reference Source

(1) Internal reference source
Accuracy: 2×10^{-8}/day
1×10^{-7}/year
Frequency: 10 MHz
Level: ≥0 dBm

(2) External reference source input
Frequency: 10 MHz/ 5MHz
Level: ≥0 dBm

6.8 Input/Output

(1) RF OUT output
50Ω N type connector, maximum reverse power: 2 W

(2) Tx/Rx input and output
50Ω N type connector, maximum input power: 10 W

(3) ANALYZER output
50Ω N type connector
•Level loss from Tx/Rx connectors: 22 dB (Typ)
•Frequency characteristics: ≤2.0 dB p-p (DC to 6 GHz)

(4) For BER measurement
DATA/CLOCK/FRAME input: BNC connector, TTL level

(5) External interface
GPIB, serial I/O

6.9 General Specification

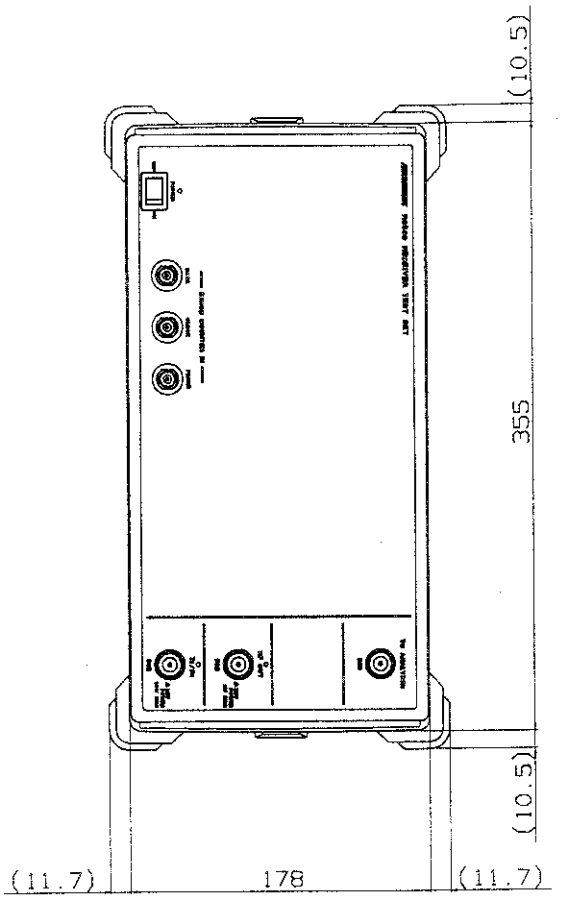
(1) Range of use temperature and humidity
0 °C to 50 °C, under RH85% (non-condensing)

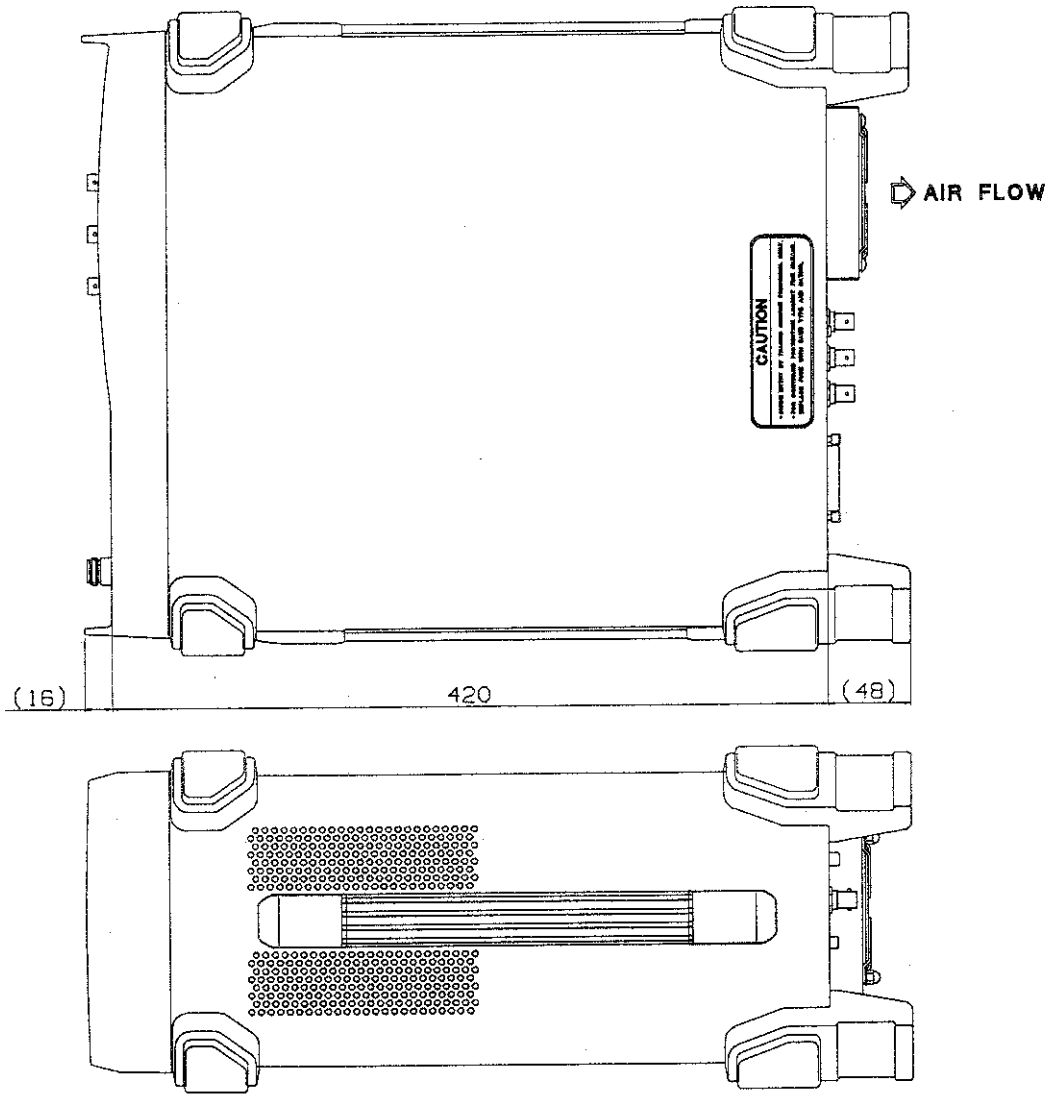
(2) Temperature for storage
-20 °C to 60 °C

(3) Power source
AC 100 V to 120 V/ AC 220 V to 240 V (automatic switching) , 50 Hz/ 60Hz,
300 VA or below

(4) Mass
17 kg or below

(5) Dimensions
Approx. 177 mm (Height) × 350 mm (Width) × 420 mm (Depth)





Unit : mm

CAUTION
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

IMPORTANT INFORMATION FOR ADVANTEST SOFTWARE

PLEASE READ CAREFULLY: This is an important notice for the software defined herein. Computer programs including any additions, modifications and updates thereof, operation manuals, and related materials provided by Advantest (hereafter referred to as "SOFTWARE"), included in or used with hardware produced by Advantest (hereafter referred to as "PRODUCTS").

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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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