ADVANTEST

ADVANTEST CORPORATION

R3561

CDMA Test Source

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

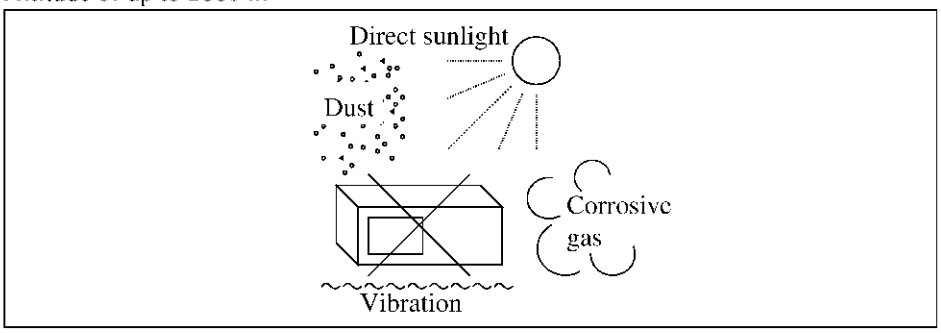


Figure-1 Environmental Conditions

- Operating position

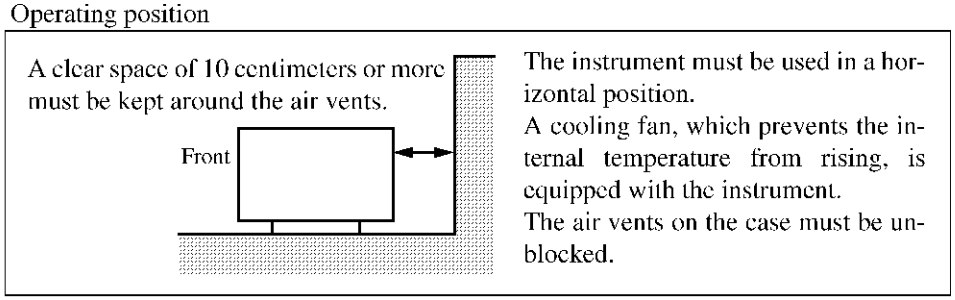


Figure-2 Operating Position

- Storage position

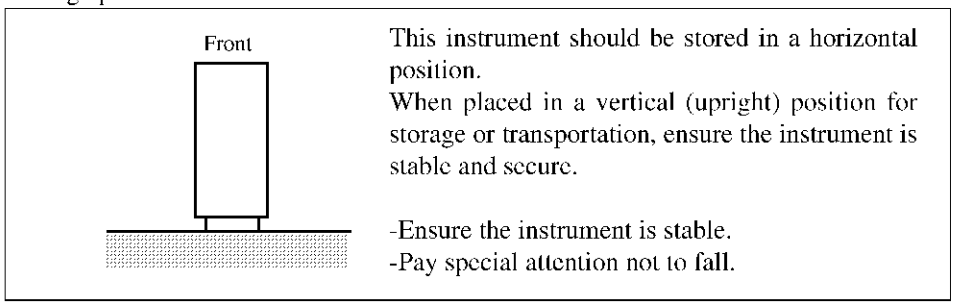


Figure-3 Storage Position

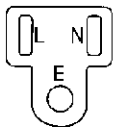
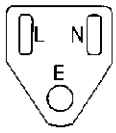
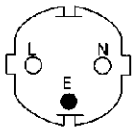
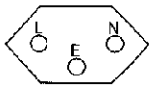
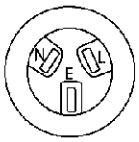
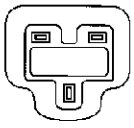
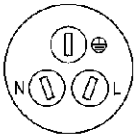
- The classification of the transient over-voltage, which exists typically in the main power supply, and the pollution degree is defined by IEC61010-1 and described below.

  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

Certificate of Conformity

CE

This is to certify, that

CDMA Test Source/Receiver Test Source

R3561/R3562

instrument, type, designation

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

ADVANTEST Corp.

Tokyo, Japan

ROHDE&SCHWARZ

Engineering and Sales GmbH
Munich, Germany

3561.3562.00

PREFACE

This manual provides the information on the R3561 CDMA Test Source necessary to operate, check functionality and take measurements.

1.Organization of this manual

1. Introduction · Product Description · A list of standard accessories and power cable options · Operating Environment · Cleaning, Storing and Transporting	Be sure to read this manual carefully in order to use the instrument safely.
2. Panel descriptions · Front panel · Rear panel	Shows the name and function of each part on the panels.
3. Basic operation · Switching the power on · Setting the GPIB address	Details the operation basics of this instrument.
4. List of Functions	Gives an explanation of the functions of this instrument.
5. GPIB	Details the GPIB command syntax (description) and explains some GPIB sample programs.
6. Operation Principles	Explains the operation of this instrument using block diagrams.

2.Calibration
The frequency reference source of this instrument needs to regularly calibrated to maintain its' measurement accuracy of this instrument. Calibrate this instrument at least once a year.

3.For your convenience, ADVANTEST contact addresses and phone numbers are listed at the end of this manual.

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LIST OF ILLUSTRATIONS

LIST OF TABLES

1 INTRODUCTION

This chapter provides the following information:

- Product description
- A list of standard accessories and power cable options
- Operating environment
- How to clean, store and transport the instrument

1.1 Product Description

The R3561 provides a modulation signal generation function compliant with the CDMA system (TIA/EIA/IS-95), and can be used as an extremely reliable signal source for testing receivers.
Using the GPIB interface allows you to reduce the costs of production line product tests. In addition, the user can assemble an integrated transmission/reception automatic test system by using this instrument in combination with the R3465 series Modulation spectrum analyzer (with Option 61 installed).

The key features of this instrument are listed below:

(1) Multiplexing base band signals (Pilot/Sync/Traffic)

(2) Supports both forward and reverse links

(3) Equipped with AWGN

(4) Supports both cellular and PCS frequency bands

(5) High waveform quality

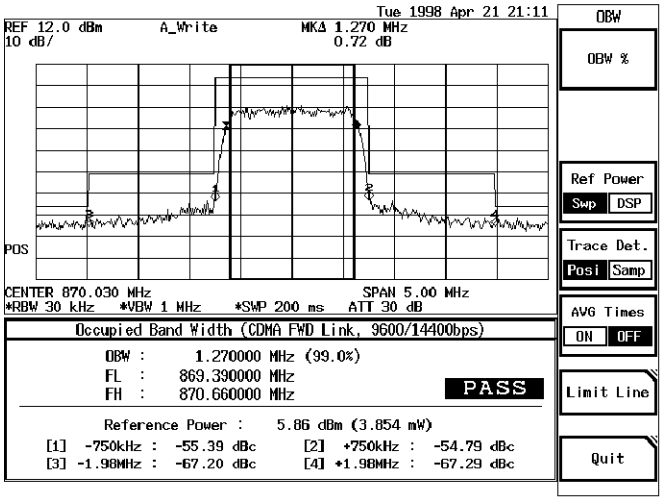


Figure 1-1 Output Example (OBW/ACP)

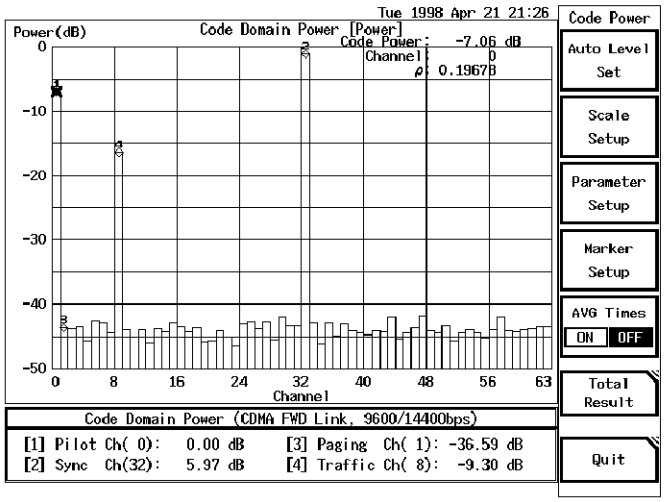


Figure 1-2 Output Example (Code Domain Power)

1.2 Accessories

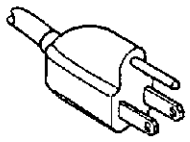
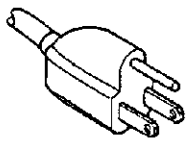
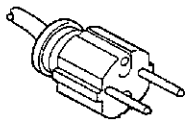
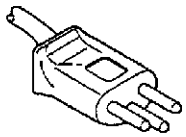
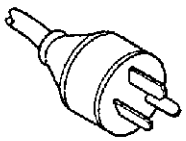
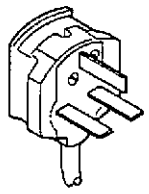
Table 1-1 lists the standard accessories shipped with the instrument. If any of the accessories are damaged or missing or, to order additional accessories, contact the nearest ADVANTEST Field Office or representative.

Table 1-1 Standard Accessories List

Accessory Name	Model Number	Quantity	Remarks
Power cable	A01412	1	* 1
Input cable	A01037-1500	1	50Ω BNC type (1.5m)
N-BNC through connector	JUG-201A/U	1	
Power fuse	T6.3A/250V	1	
R3561 CDMA Test Source Opertion Manual	ER3561	1	English

* 1: Can be changed according to option specifications when purchasing.
There are 11 types of power cable available (see Table 1-2).
Order power cable by type name or option number.

Table 1-2 Power Cable Options

Plug	Standards	Rating, Color	Model Number
	JIS: Japan Law on Electrical Appliances	125V at 7A Black 2m (6ft)	Straight: A01402 Angled: A01412
	UL: United States of America CSA: Canada	125V at 7A Black 2m (6ft)	Straight: A01403 (Option 95) Angled: A01413
	*1	250V at 6A Gray 2m (6ft)	Straight: A01404 (Option 96) Angled: A01414
	SEV: Switzerland	250V at 6A Gray 2m (6ft)	Straight: A01405 (Option 97) Angled: A01415
	SAA: Australia, New Zealand	250V at 6A Gray 2m (6ft)	Straight: A01406 (Option 98) Angled: ---------
	BS: United Kingdom	250V at 6A Black 2m (6ft)	Straight: A01407 (Option 99) Angled: A01417

*1: CEE: Europe, DEMKO: Denmark, NEMKO: Norway, VED: Germany, KEMA: The Netherlands, CBEC: Belgium, OVE: Austria, FIMKO: Finland, SEMKO: Sweden

1.3 Operating Environment

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

1.3.1 Environmental Conditions

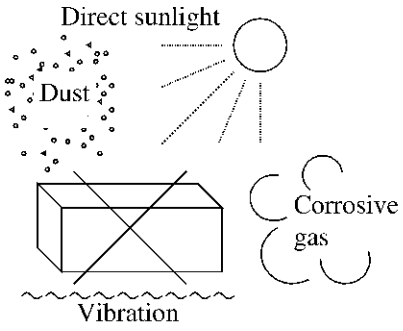
The instrument should be installed in an area which satisfies the following conditions:

- Ambient temperature: 0 °C to +50 °C (operating temperature)
- Relative humidity: 85% or less (without condensation)
- An area free from corrosive gas
- An area away from direct sunlight
- A dust-free area
- An area free from vibrations
- A low noise area

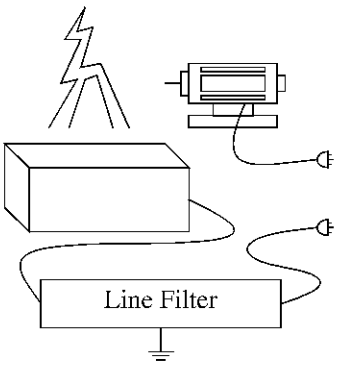
  Although the instrument has been designed to withstand a certain amount of noise riding on the AC power line, it should be used in an area of low noise. Use a noise cut filter when ambient noise is unavoidable.
- An area allowing unobstructed air flow

  The instrument has an exhaust cooling fan on the rear panel and an exhaust vent on the bottom side toward the front. Never block these areas as the resulting internal temperature rise will affect measurement accuracy.

- Avoid operation in the following areas.



- Use a noise cut filter when there is a large amount of noise riding on the power line.



- Keep the rear panel 10cm away from the wall

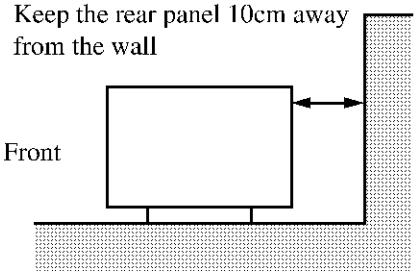


Figure 1-3 Operating Environment

The R3561 can be used safely under the following conditions:

- Altitude: 2000m maximum above the sea level
- Installation category II
- Pollution degree 2

1.3.2 Power Requirements

The power supply specifications of the instrument are listed in Table 1-3.

Table 1-3 Power Supply Specifications

	100VAC Operation	200VAC Operation
Input voltage range	90V to 132V	198V to 250V
Frequency range	48Hz to 66Hz	
Power fuse	T6.3A/250V	
Power consumption	300VA or below	

CAUTION: ***Use this instrument safely within the power supply specifications. Using a power supply outside of the specified range could damage this instrument. Make sure any attached power supply meets the specifications listed in the table above.***

During operation, the power supply automatically switches between input voltage levels of 100VAC and 200VAC. Be sure, however, to use a power cable that matches the input voltage and meets the related standard (see Table 1-2).

1.3.3 Power Fuse

CAUTION: ***When a fuse blows, there may be some problem with the analyzer so contact a qualified ADVANTEST service representative before replacing the fuse.***

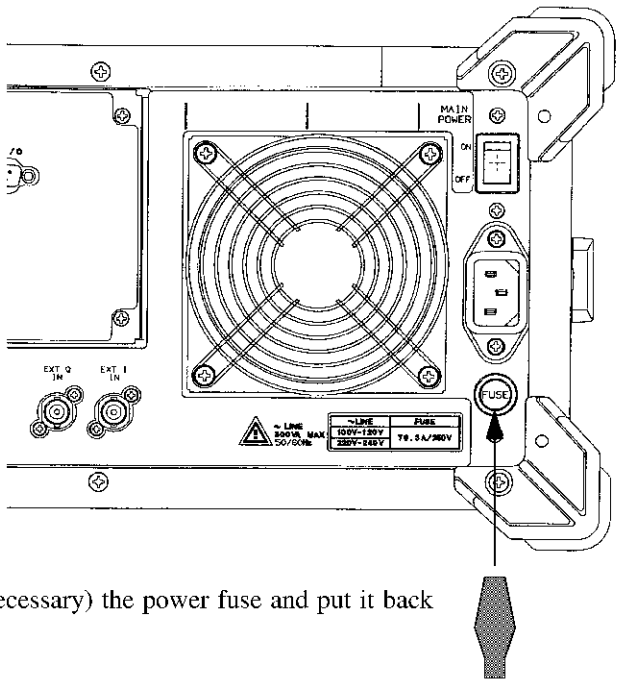
The power fuse is placed in the fuse holder which is mounted on the rear panel.
To check or replace the power fuse, use the following procedure:

1. Press the POWER switch to the OFF position.
2. Disconnect the power cable from the AC power supply.
3. Remove the fuse holder on the rear panel.
4. Check (and replace if necessary) the power fuse and put it back in the fuse holder.

CAUTION:

1. ***Before you replace the power fuse with a new one, make sure to turn the POWER switch off and disconnect the power cord.***
2. ***To avoid a potential fire hazard, make sure to use a power fuse with the appropriate specifications for this instrument (see Table 1-3).***

Turn the fuse holder cap counterclockwise approximately 90 (using a slotted head screwdriver).



Check (and replace if necessary) the power fuse and put it back into the fuse holder.

Figure 1-4 Replacing the Power Fuse

1.3.4 Power Cable

A detachable power cable with a three-contact plug is included with the instrument. The protective earth ground contact on the plug connects (through the power cable) to the accessible metal parts of the instrument. For protection against electrical shock, insert the plug into a power-source outlet that has a properly grounded, protective-ground contact.

The manufacturer ships a power cable, as ordered, with the instrument. A list of other available power cables is shown in Table 1-2. Contact your ADVANTEST representative or the local ADVANTEST Field Office for information on how to order these.

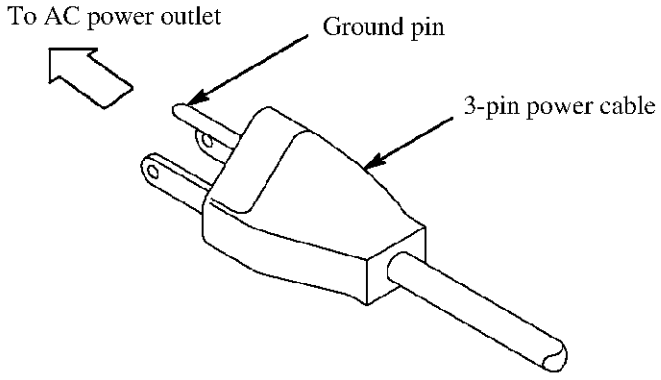


Figure 1-5 Power Cable

1.4 Cleaning, Storing and Transporting

1.4.1 Cleaning

Remove dust from the outside of the instrument by wiping or brushing the surface with a soft cloth or small brush. Use a brush to remove dust from around the panel keys. Hardened dirt can be removed by using a cloth which has been dampened in water containing a mild detergent.

CAUTION:

1. ***Do not allow water to get inside the instrument.***
2. ***Do not use organic cleaning solvents, such as benzene, toluene, xylene, acetone or similar compounds, since these solvents may damage the plastic parts.***
3. ***Do not use abrasive cleaners.***

1.4.2 Storing

Store the instrument in an area which has a temperature from -20°C to +60°C. If you plan to store the instrument for a long period (more than 90 days), package the instrument in a vapor-barrier bag with a drying agent and store the instrument in a dust-free location out of direct sunlight.

1.4.3 Transporting

When you ship the instrument, use the original container and packing material. If the original packaging is not available, pack the instrument using the following guidelines:

1. To allow for cushioning, use a corrugated cardboard container with inner dimensions that are at least 15 centimeters more than those of the instrument.
2. Surround the instrument with plastic sheeting to protect the finish.
3. Cushion the instrument on all sides with packing material or plastic foam.
4. Seal the container with shipping tape or a heavy-duty, industrial stapler.

If you are shipping the instrument to a service center for service or repair, attach a tag to the instrument that shows the following information:

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

1.5 Precautions when Using This Instrument

1.5.1 When Something Unusual Occurs

When you notice smoke, a bad smell or a strange noise, turn the power supply switch off, disconnect the power cable at the outlet and contact ADVANTEST.

The address and phone numbers of ADVANTEST are listed at the end of this manual.

1.5.2 On Warm-up

Allow sufficient time at a place where this instrument is used before turning the power of this instrument on.

After turning the power on, allow the instrument at least one hour to warm up before using it.

2 Panel Description

This chapter describes the front and rear panels.

2.1 Front Panel

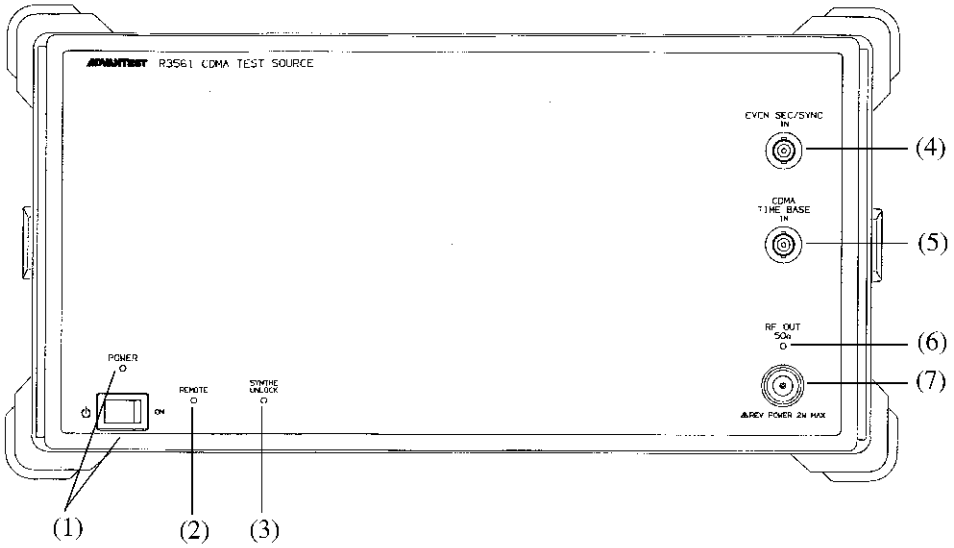


Figure 2-1 Front Panel

Control		Description
1	Power (secondary) switch POWER lamp	Turns the power on or lets the power on standby. Lights up when the power is turned on.
2	REMOTE lamp	Lit when a GPIB command is received.
3	SYNTHE UNLOCK lamp	Lit when the internal frequency synthesizer is out of sync.
4	EVEN SEC/SYNC IN terminal	EVEN SECOND CLOCK input terminal from the base station. Input level : TTL level
5	CDMA TIME BASE IN terminal	Time base input terminal for CDMA reference synchronization. Impedance : 50Ω Level : ≥ 0dBm Frequency selection : Refer to 4.7 (5) (Default : Internal)
6	RF OUT lamp	Lit when outputting the RF signal.
7	RF OUT terminal	Output terminal for the RF signal. Output impedance : 50Ω Maximum inverse input power : 2W

2.2 Rear Panel

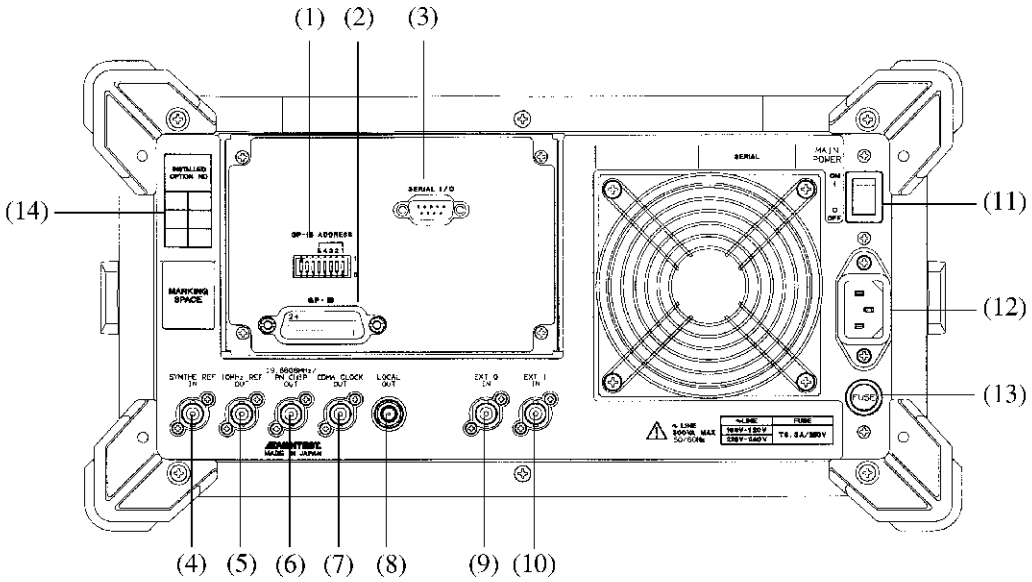


Figure 2-2 Rear Panel

Control		Description
1	GPIB address switch	Used to set the GPIB address. The lower five bits can be set.
2	GPIB connector	Used to connect the R3561 to an external controller using a GPIB cable.
3	Serial I/O connector	Special interface which the ADVANTEST R346x series uses to control this instrument.
4	SYNTHE REF IN terminal	Reference signal input terminal to RF synthesizer Impedance : 50Ω Level : ≥ 0dBm Frequency selection : Refer to Section 4.7 (4) (Default : Internal)
5	10 MHz REF OUT terminal	10 MHz signal output terminal in synchronism with the input to SYNTHE REF. Impedance : 50Ω Level : ≥ 0dBm
6	19.6608 MHz/PN CHIP OUT terminal	TTL output terminal from either 19.6608 MHz (16 x CDMA chip rate) signals or 1.2288 MHz (CDMA chip rate) signals. Method of selection : Refer to Section 4.7 (3) (Default : OFF)
7	CDMA CLOCK OUT terminal	TTL output connector used to output various CDMA frame clocks. Method of selection : Refer to Section 4.7 (2) (Default : EVEN SECOND IN)

Control		Description
8	LOCAL OUT terminal	Output terminal for internal local signals.
9	EXT I IN terminal	External I/Q signal input terminal. (Switching between Internal and External is required.) Method of selection : Refer to Section 4.4 (11) (Default : Internal)
10	EXT Q IN terminal	
11	Main power switch	Switch used to turn the primary power on or off.
12	AC power supply connector	Three pin connector (the center pin is for the ground).
13	Fuse holder	Contains the power fuse.
14	Installed options	Options already installed for this instrument are listed.

3 BASIC OPERATION

This chapter describes the basic operation of this instrument.

3.1 Turning the Power On

3.1.1 Connecting the Power Cable to the AC Power Supply

(1) Turn the MAIN POWER and POWER switches off and connect the power cable provided to the AC power supply connector on the rear panel.

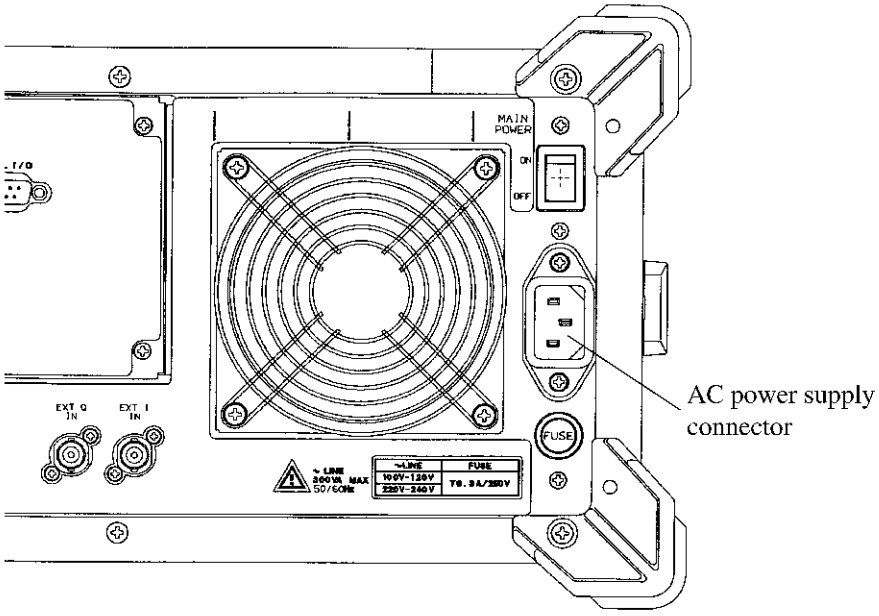


Figure 3-1 Connecting the Power Supply Cable to the Instrument

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

CAUTION: ***To avoid damage to this instrument, operate the instrument within the specified input voltage conditions. Refer to Section 1.3.2 Power Requirements.***

3.1.2 Turning the AC Power On

After connecting the power cable, turn on the main power switch (on the rear panel) and turn the power supply switch on.

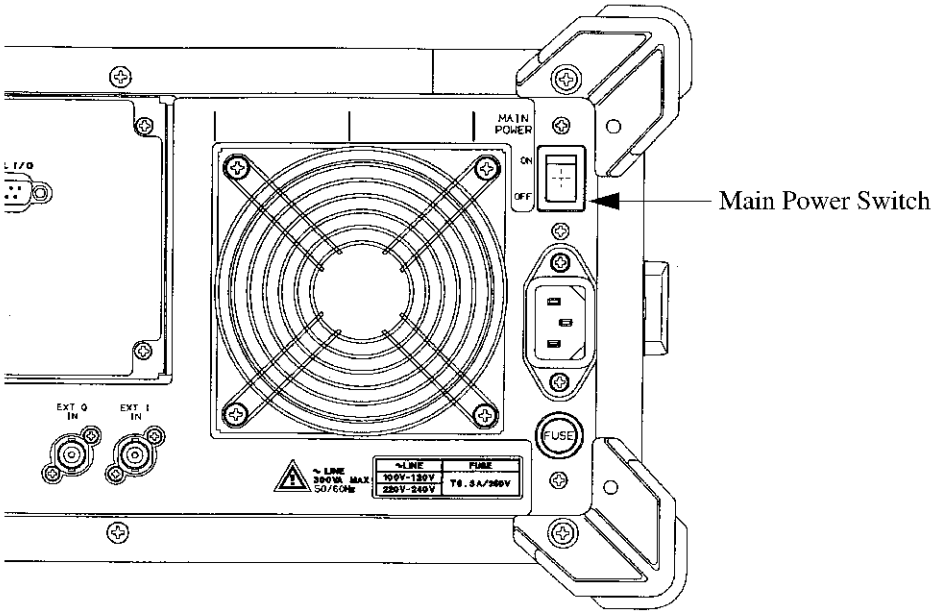


Figure 3-2 Main Power Switch

NOTE: The main power switch of this instrument is used to turn the primary power of this instrument on or off, but not make the crystal oscillator on standby.

3.1.3 Switching the power supply on

Turn the power supply switch on after checking that the main power switch is turned on. Check that the fan is rotating and the power indicator (located above the power switch) is lit.

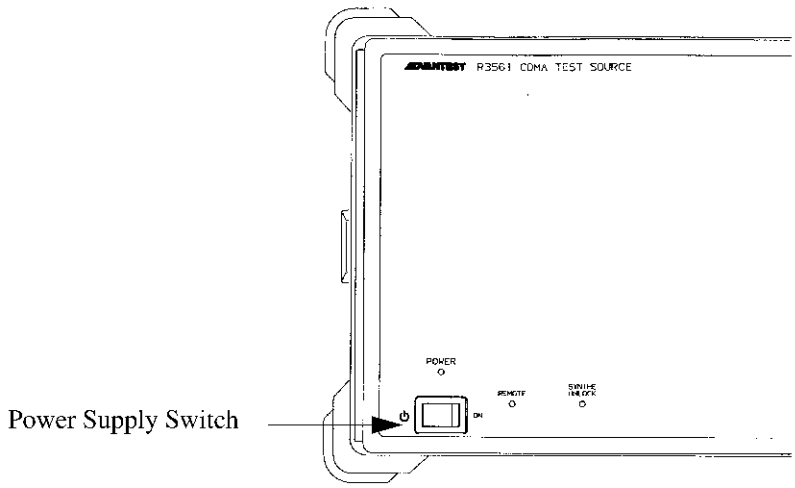


Figure 3-3 Power Supply Switch

NOTE: ***The power cannot be turned on even if the power switch (on the front panel) is turned on unless the main power switch (on this instrument) is also turned on.***

CAUTION: ***If the fan stops while the instrument is in operation, an alarm will sound informing the user of the problem. If this happens, turn the main power switch off and disconnect the power cable from the outlet. This instrument may not operate properly if the fan stops.***

3.1.4 Turning the Power On

(1) Self diagnostic test

This instrument performs a self diagnostic test after turning the power on. During the execution of the diagnostic test,the following lamps are lit: POWER, REMOTE, SYNTHE UNLOCK and RF OUT lamps.

The instrument switches to normal operating mode after the diagnostic test is complete. An alarm will sound once and the REMOTE and SYNTHE UNLOCK lamps will turn off. If an error is detected during the diagnostic test, an alarm will sound but the POWER, REMOTE, SYNTHE UNLOCK and RF OUT lamps will remain lit. If this occurs, refer to Section 4.6, "(5) Self Test".

---

*NOTE: **SYNTHE and UNLOCK lamps occasionally blink or remain lit even though the diagnostic test terminates normally. If this occurs, check the settings in the instrument (refer to Section 4.7,"(4) Synthe Reference IN" and "(5) CDMA TIMEBASE IN").***

---

(2) Frequency Reference

Warm-up times required by the internal reference oscillator are listed in Table 3-1.

Table 3-1 Internal Reference Crystal Oscillator and Warm-up Time

Start-up characteristics (warm-up for 15 minutes)	1×10^{-7} or less
Start-up characteristics (warm-up for 60 minutes)	5×10^{-8} or less
Aging rate (after 24 hours of operation)	2×10^{-8}/day or less

(3) Settings when turning the power on

When the power is turned on, the previous settings (at the time of the last power-off) are restored.

3.2 Setting the GPIB Address

The GPIB default address is 8. You can reset this address by changing the GPIB address switches on the rear panel.

GPIB factory default : 8

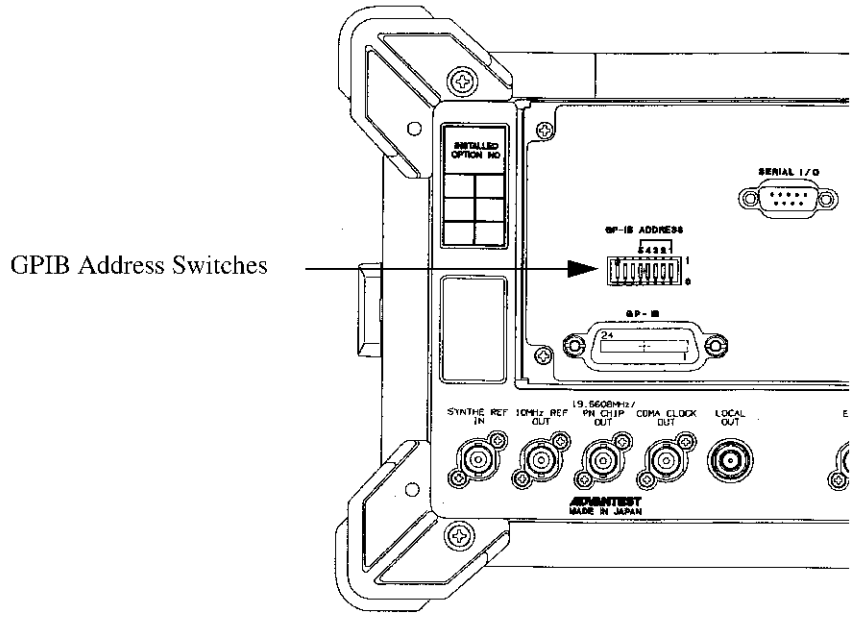


Figure 3-4 GPIB Address Switches

NOTE: The address set when the power is turned on is effective.

4 LIST OF FUNCTIONS

The functions listed in Table 4-1 are used with this instrument. These functions are grouped into eight sections. For details, refer to Section 4.1 System Selection through Section 4.8 Save/Recall Section.

Table 4-1 List of Settings (1 of 3)

Section	Item to Be Set	GPIB Command
System	Preset	IP
	SRQ signal control	SRQ
	Status byte clear	CSB
	Status byte output	*STB
	Status byte enabling	*SRE
	Terminator specification	DEL
	Internal reference adjustment	SRAD
	External IQ phase adjustment	PHA
	External I gain adjustment	LBAI
	External Q gain adjustment	LBAQ
Output frequency	Output frequency	FR
	Output channel	CH
	Channel offset	CSN
	Channel start number	CSP
	Start frequency	CSF
RF level	Output level	AP
	Output level upper limit value	OLM
	Output level offset ON/OFF	OOF
	Output level offset value	OOS
	Output ON/OFF	OUT
	ALC mode	ALCM

Table 4-1 List of Settings (2 of 3)

Section	Item to Be Set	GPIB Command
Modulation	Modulation ON/OFF	MOD
	LINK	LINK
	Channel mode	CST
	Generator mode	GEN
	Equalizing Filter ON/OFF	EQFLT
	Data burst ON/OFF	BUR
	Eb/No (Eb/Nt) value	EPN
	Channel ON/OFF	CSW
	Channel level	CLV
	PN Offset value	PNOF
	IQ source selection	IQS
Frame	Channel assignment	CAS
	Code channel	CCH
	Traffic PRBS	CTP
	Data rate	RATE
	Frame number specification	IBL
	Frame data	IBD
	Start frame number specification	STF
	Repetitive frame number specification	NOF
Frequency shift	Frequency shift mode ON/OFF	FSS
	Frequency shift value	FSV
Calibration/Self test	AWGN calibration	CWGN
	AWGN calibration correction ON/OFF	CAC
	Modular calibration	CMOD
	Modular calibration correction ON/OFF	CMC
	Self test	*TST

Table 4-1 List of Settings (3 of 3)

Section	Item to Be Set	GPIB Command
Input/Output	EVEN SEC/SYNC IN	EVEN
	CDMA CLOCK OUT	CCK
	CDMA TIMEBASE OUT	CTB
	Synthe Reference IN	RSYN
	CDMA TIMEBASE IN	DIG
Save/Recall	Save	SAVC
	Recall	RECC

4.1 System Selection

This section describes how to set or select each of the system functions.

(1) Pre-setting

This function is used to initialize the RF, modulation, frame and input/output sections. The other functions cannot be initialized. The values to be set or selected after the presettings are listed in Table 4-2.

GPIB command: IP

Table 4-2 Preset values (1 of 2)

Section	Item to be set	Channel	Set value
Output frequency	Output frequency		870.03MHz
	Output channel		1
	Channel start number		1
	Channel spacing		30kHz
	Start frequency		870.03MHz
RF level	Output level		-80.0dBm
	Output level upper limit value		0.0dBm
	Output level offset ON/OFF		OFF
	Output level offset value		0.0dB
	Output ON/OFF		ON
	ALC mode		SAMPLE&HOLD
Modulation	Modulation ON/OFF		ON
	LINK		FORWARD
	Channel mode		MULTI
	Generator mode		SIGNAL ONLY
	Equalizing Filter ON/OFF		ON
	Data burst ON/OFF		OFF
	Eb/No (Eb/Nt) value		10.0dB
	Channel ON/OFF	A	ON
		B	AUTO
		C	ON
	Channel level	A	-16.3dB
		B	-1.1dB
		C	-7.0dB
	PN Offset value		0.00
	IQ source value		INTERNAL

Table 4-2 Preset values (2 of 2)

Section	Item to be set	Channel	Set value
Frame	Channel assignment	A	TRAFFIC PRIMARY
		B	SYNC
		C	PILOT
	Code channel	A	8
		B	32
		C	0
	Traffic PRBS	A	PN15
		B	PN15
	Data rate	A	9600bps
		B	1200bps
	Start frame number specification (Note 1)	A	1
	Repetitive frame number specification (Note 1)	A	600
	Frame number specification		*** (Note 2)
	Frame data		*** (Note 2)
Frequency shift	Frequency shift mode ON/OFF		OFF
	Frequency shift value		0.06MHz
Input/Output	EVEN SEC/SYNC IN		DISABLE
	CDMA CLOCK OUT		EVEN SECOND IN
	CDMA TIMEBASE OUT		OFF
	Synthe Reference IN		INTERNAL
	CDMA TIMEBASE IN		INTERNAL

Note 1 : This is factory-shipped setting. This value cannot be returned to the value set at preset time.
Note 2 : "***" : This indicates that this item cannot be set or is pending at present.

(2) SRQ signal control

Controls the SRQ signal. For more detailed information, refer to Chapter 5 GPIB.

GPIB command: SRQ

(3) Status byte clearing

Clears the status byte. For more detailed information, refer to Chapter 5 GPIB.

GPIB command: CSB

(4) Status byte output

Outputs the status byte. For more detailed information, refer to Chapter 5 GPIB.

GPIB command: *STB

(5) Status byte enabling

Enables an arbitrary bit in the status byte. A set value is represented by a decimal value corresponding to the enabled bits in the status byte.
For example, if bits 3 and 4 must be enabled, specify 24 as the set value. The factory default is 64 which means that 64 (only bit 6 is enabled) is automatically set when the power is turned on.

GPIB command: *SRE

NOTE: ***Bit 6 in the status byte is always enabled (set to 1).***
This bit cannot be disabled. For more information, refer to Section 5.3 Status Byte.

---

(6) Terminator specification

Selects the delimiter. The delimiter is set to "LF+EOI" when the power is turned on. For more information, refer to Chapter 5 GPIB.

GPIB command: DEL

4.2 Output Frequency Section

This section describes how to set or select each of this instruments' output frequency functions. Each function is described as follows.

(1) Output frequency

Sets an output frequency.

Value after the preset: 870.03 MHz

GPIB command: FR

(2) Output channel

Output frequency is specified using channel numbers. The channel start number, channel spacing and start frequency determine the output frequency for a given channel number. Table 4-3 shows the conversion formula.

Table 4-3 Formula Used to Convert Channel number into Frequency

Output frequency **= Start frequency + Channel spacing x (Channel number - Channel start number)** The channel number must be greater than the channel start number. Otherwise, the settings are invalid.

(3) Channel start number

Sets the channel start number. The channel start number previously set is the start frequency.

Value after the preset: 1

GPIB command: CSN

(4) Channel spacing

Sets the channel spacing

Value after the preset: 30 kHz

GPIB command: CSP

(5) Start frequency

Sets the start frequency

Value after the preset: 870.03 MHz

GPIB command: CSF

4.3 RF Level Section

This section describes how to set or select each RF level function of this instrument. Each function is described as follows.

(1) Output level

When the output level offset is turned off, the level set by the output level is obtained at the RF OUT terminal. When this is turned on, the output at the RF OUT terminal is the sum of the output level previously obtained (when this is turned off) and the output level offset.

Value after the preset: -80.0 dBm

GPIB command: AP

NOTE: ***An output level setting whose value exceeds output level upper limit at the RF OUT terminal is invalid.***

---

(2) Output level upper limit value

Limits the output level at the RF OUT terminal.

Value after the preset: 0.0 dBm

GPIB command: OLM

(3) Output level offset ON/OFF

When the output level offset value must be added to the RF OUT terminal level, turn on this function. Otherwise, turn it off.

Value after the preset: OFF

GPIB command: OOF

(4) Output level offset value

The offset level is set for an output level you desire. Actual output level obtained at the RF OUT terminal is calculated using the formula below.

Level output from the RF OUT terminal = Output level + Out level Offset value

The output offset value can set if the following a satisfied.

-125.0 dBm ≤ Output level + Output level offset value ≤ 0.0 dBm

Value after the preset: 0.0 dBm

GPIB command: OOS

(5) Output ON/OFF

Selects whether or not to output the signal to the RF terminal.

When turned off, the output terminal is set so as to obtain the maximum attenuation.

GPIB command: OUT

(6) ALC mode

Selects the ALC mode. The optimum operating mode is automatically set in accordance with the settings of this instrument. A criterion for mode selection in relation to the settings is shown in Table 4-5. Change the operating mode if necessary. The summary of the operating modes is listed in Table 4-4.

Value after the preset: SAMPLE&HOLD

GPIB command: ALCM

Table 4-4 Summary of the Operating Modes

Operation Mode	Operation Summary
AUTO	Operates under normal ALC.
SAMPLE & HOLD	Samples the ALC voltage used with the reference pattern signal and calibrates the ALC reference voltage used with modulation.
ALC Hold	Holds the ALC voltage when the reference pattern signal is activated.

Table 4-5 Criteria for Selecting Operating Modes

Operation Mode	Operation Summary
AUTO	1. Modulation ON/OFF is turned off 2. LINK is set to REVERSE 3. LINK is set to FORWORD and the channel mode is set to SINGLE
SAMPLE & HOLD	1. LINK is set to FORWARD 2. Channel mode is set to MULTE and Channel B is set to AUTO for Channel ON/OFF.
ALC Hold	LINK is set to FORWARD and SAMPLE&HOLD is not set to "Selection Reference."

NOTE: If the ALC is not set to the optimum mode, the output level at the RF OUT terminal may be deviated.
In SAMPLE&HOLD operating mode, the reference signal pattern may be output momentarily when changing output level or frequency.

4.4 Modulation Section

This section describes how to set or select each of the modulation functions of this instrument. Each function is described below.

(1) Modulation ON/OFF

Selects the modulation signal or carrier wave.

Value after the preset: ON

GPIB command: MOD

(2) LINK

Selects the Link-Direction of the instrument. When this setting is changed, the set values are changed accordingly as shown in Table 4-6.

Value after the preset: FORWARD

GPIB command: LINK

Table 4-6 Setting LINK

LINK	Description
FORWARD	Signal direction is from the base station to the mobile station. The modulation system is QPSK.
REVERSE	Signal direction is from the mobile station to the base station The modulation system is OQPSK.

Table 4-7 Set Value/Selection Value vs. LINK Settings (1 of 2)

Section	Item to Be Set	Channel	Set value/Selected value	
			FORWARD	REVERSE
Output frequency	Output frequency		--	
	Output channel		--	
	Channel start number		--	
	Channel spacing		--	
	Start frequency		--	
RF level	Output level		--	
	Output level upper limit value		--	
	Output level offset ON/OFF		--	
	Output level offset value		--	
	Output ON/OFF		--	
	ALC mode		SAMPLE& HOLD	AUTO
Modulation	Modulation ON/OFF		ON	
	LINK		FORWARD	REVERSE
	Channel mode		MULTI	SINGLE
	Generator mode		SIGNAL ONLY	
	Equalizing Filter ON/OFF		ON	OFF
	Data burst ON/OFF		OFF	
	Eb/No (Eb/Nt) value		10.0dB	
	Channel ON/OFF	A	ON	
		B	AUTO	
		C	ON	
	Channel level	A	-16.3dB	ON
		B	-1.1dB	
		C	-7.0dB	
	PN Offset value		0.00	
	IQ source value		INTERNAL	

Table 4-7 Set Value/Selection Value vs. LINK Settings (2 of 2)

Section	Item to Be Set	Channel	Set value/Selected value	
			FORWARD	REVERSE
Frame	Channel assignment	A	TRAFFIC PRIMARY	
		B	SYNC	
		C	PILOT	
	Code channel	A	8	
		B	32	
		C	0	
	Traffic PRBS	A	PN15	
		B	PN15	
	Data rate	A	9600bps	
		B	1200bps	
	Start frame number specification *1	A	--	
	Repetitive frame number specification *1	A	--	
	Frame number specification		--	
	Frame data		--	
Input/Output	EVEN SEC/SYNC IN		DISABLE	
	CDMA CLOCK OUT		EVEN SECOND IN	
	CDMA TIMEBASE OUT		OFF	
	Synthe Reference IN		--	
	CDMA TIMEBASE IN		--	

*1: The values in this item are not affected even if the LINK settings are changed.

(3) Channel mode

Selects channel multiplexing in the base band.

Value after the preset: MULTI

GPIB command: CST

Table 4-8 Channel Mode

Channel mode	Description
SINGLE	Only channel A is output.
MULTI	Channels A, B and C are output as triplex system.

NOTE: ***When LINK is set to REVERSE, only SINGLE mode is available.***

(4) Generator mode

Selects the signal to be input to IQ-Modulator.

Value after the preset: SIGNAL

GPIB command: GEN

Table 4-9 Generator mode

Generator mode	Description
SINGLE	Selects the CDMA signal.
NOISE	Selects AWGN which has a bandwidth of 2 MHz.
Eb/No(Eb/Nt) *	Selects the CDMA signal to which AWGN output is added. A ratio of the channel A signal level to AWGN output level can be set.

* : This is Eb/No(Eb/Nt) to channel A.

NOTE: ***Before switching the generator mode to Eb/No(Eb/Nt), perform a AWGN calibration first.***
If IQ Source is set to EXTERNAL, only SIGNAL is available.

(5) Equalizing Filter ON/OFF

Toggles the Equalizing Filter on or off. This is automatically performed when LINK settings are changed, and the Equalizing Filter is turned on when FORWARD LINK is selected.

Value after the preset: ON

GPIB command: EQFLT

Table 4-10 Equalizing Filter

Equalizing Filter	Description
ON	Equalizing Filter circuit is enabled.
OFF	Equalizing Filter circuit is bypassed.

(6) Data Burst

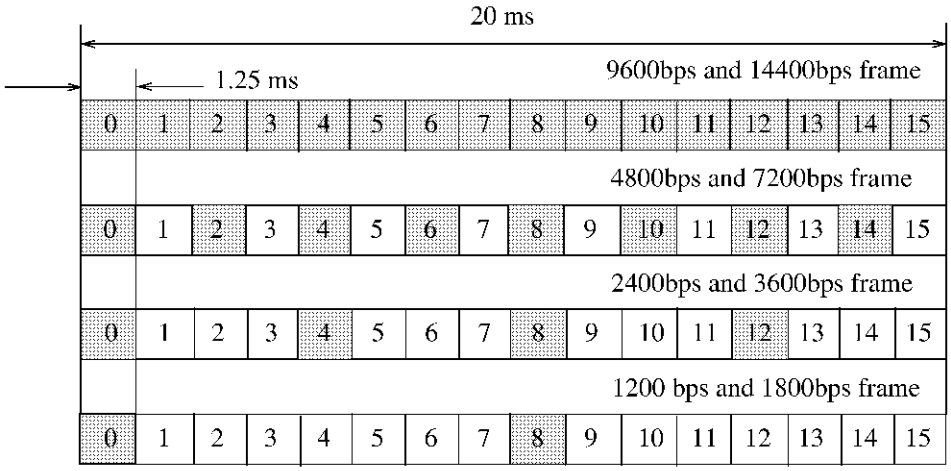
Selects the data burst (Figure 4-1).
This setting is enabled when LINK is set to REVERSE and when the assigned channel is either TRAFFIC PRIMARY, TRAFFIC PN or USER.

Value after the preset: OFF

GPIB command: BUR

Table 4-11 Data Burst

Data Burst	Description
ON	Burst data
OFF	non-burst dat



The data burst positions are stipulated in TIA/EIA IS95 standards.

Figure 4-1 Positions of Data Burst

(7) Eb/No(Eb/Nt) Value

Eb/No(Eb/Nt) value to channel A can be set. This setting is valid only when the generator mode is set to Eb/Nt(Eb/No) (Figure 4-2).

Value after the preset: 10.0 dB

GPIB command: EPN

Eb/No(Eb/Nt) can be calculated using the formula shown below.

$$\text{Eb/No(Eb/Nt)} = \frac{\text{Energy} \times v}{\text{Noise}} \times \frac{1.23\ \text{MHz}}{\text{Data rate}}$$

Energy:A channel energy
Noise:BW=1.23 MHz
Data Burst OFF:
Data rate=9600bps, 14400bps v=1
Data rate=4800bps, 7200bps v=2
Data rate=2400bps, 3600bps v=4
Data rate=1200bps, 1800bps v=8
Data Burst ON:
v=1

Figure 4-2 Calculating Eb/No(Eb/Nt)

(8) Channel ON/OFF

This mode is enabled when the channel mode is set to MULTI. Channels A and C can be set to ON or OFF; Channel B can be set to either AUTO, MANUAL or OFF.

Å@Value after the preset : Channel A : ON
Channel B : AUTO
Channel C : ON

Å@GPIB command:CSW

Table 4-12 Channels A and C ON/OFF

Data Burst	Description
ON	Outputs the selected channel signal.
OFF	Does not output the selected channel signal.

Table 4-13 Channel B AUTO/MANUAL/OFF

Data Burst	Description
AUTO	The level of channel B is controlled so that the combined level of channels A, B and C is 0 dB.
MANUAL	Sets the level of channel B manually.
OFF	Does not output the signal from channel B.

(9) Channel level

This function is enabled when the channel mode is set to MULTI. Levels for channels A, B and C are variable.

Value after the preset : Channel A : -16.3 dB
Channel B : -1.1 dB
Channel C : -7.0 dB

GPIB command:CLV

NOTE: ***When channel B is set to AUTO, the level of channel B cannot be set.***

---

(10) PN OFFSET value

This function sets the PN OFFSET to the EVEN SECOND signal when EVEN SEC/SYNC IN is enabled and when this instrument is operating in sync with the EVEN SECOND signal. 1 PN OFFSET is 64 chips. The amount of chips (to be set for the PN OFFSET value) is calculated as follows:

OFFSET[chip] = Roundoff(64 x PN OFFSET)

Where, OFFSET : Amount of chip to be set for this instrument

PN OFFSET : PN OFFSET value

RoundOff : Rounds off a number to the integer

Value after the preset:0.00

GPIB command:PNOF

NOTE: ***Due to the hardware construction of this instrument, the PN OFFSET value has a delay of 1.5 chips in relation to the EVEN SECOND signal when operating in sync with the EVEN SECOND signal. Therefore, the actual PN OFFSET value is the sum of OFFSET[chips] and 1.5[chips].***

---

(11) IQ Source selection

This function selects the input signal for this instrument (see Table 4-14). All paths in the IQ Source are shown in Figure 4-3. (Note1)

Value after the preset: INTERNAL

GPIB command: IQS

Table 4-14 IQ Source Description

IQ Source Items	Description
INTERNAL	Inputs the IQ signal from the base band block to the IQ-Modulator.
EXTERNAL(AC)	Inputs the IQ signal received from the outside to the IQ-Modulator through an AC coupling. When using this mode, the IQ signal is input to the IQ-Modulator after it has been adjusted with the phase and gain values (used by the external IQ).
EXTERNAL(DC)	Inputs the IQ signal received from the outside to the IQ-modulator through a DC coupling. When using this mode, the IQ signal is input directly to the IQ-Modulator.

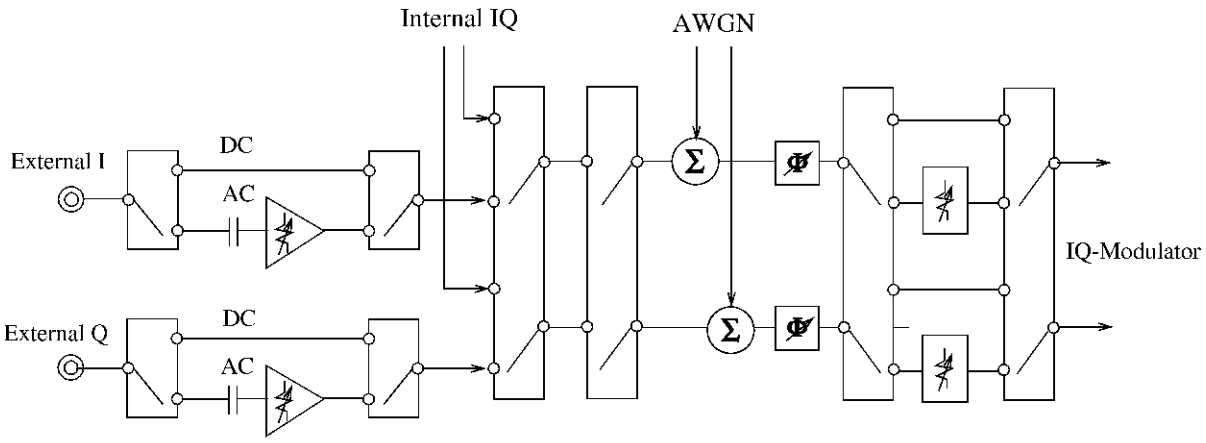


Figure 4-3 Q Source Signal Paths

NOTE: When the input level exceeds its upper limit with the IQ Source set to EXTERNAL(DC), an alarm will sound. If it this happens, adjust the input level until it is to fall within the limit.

CAUTION: Never apply an input signal whose level is beyond the upper limit to at the EXTERNAL IQ input terminal.

(12) External IQ phase adjustment

When the IQ Source is switched to EXTERNAL(AC), the external IQ signal phase can be adjusted. Q signal phase is adjusted in relation to the I signal. Its variable range is 0 to 4000. This value represents the variable range, but not the range of phase angles. (Note1)

GPIB command: PHA

(13) External IQ gain adjustment

When the IQ Source is switched to EXTERNAL(AC), the external IQ signal gain can be adjusted. Its variable range is 0 to 4000. This value represents the variable range, but not the range of phase angles. (Note1)

GPIB command: LBAI, LBAQ

---

*Note 1: **For external IQ Sources, calibrations performed under Item (3), "Modulator calibration" in Section 4.6 will have no effect and this will affect the accuracy of the instrument. As a result, you should optimize the IQ signal (which is output to the modulator) when using this instrument.***

EXTERNAL (AC): Adjust the phase and gain using GPIB commands.

EXTERNAL (DC): Adjust the phase, the gain (1 Vp-p or less) and the DC bias (typically, 2.3 V) at the IQ signal source (which is connected from the outside).

4.5 Frame Section

This section describes how to set or select each frame function of this instrument. Each function is described below.

(1) Channel assignment

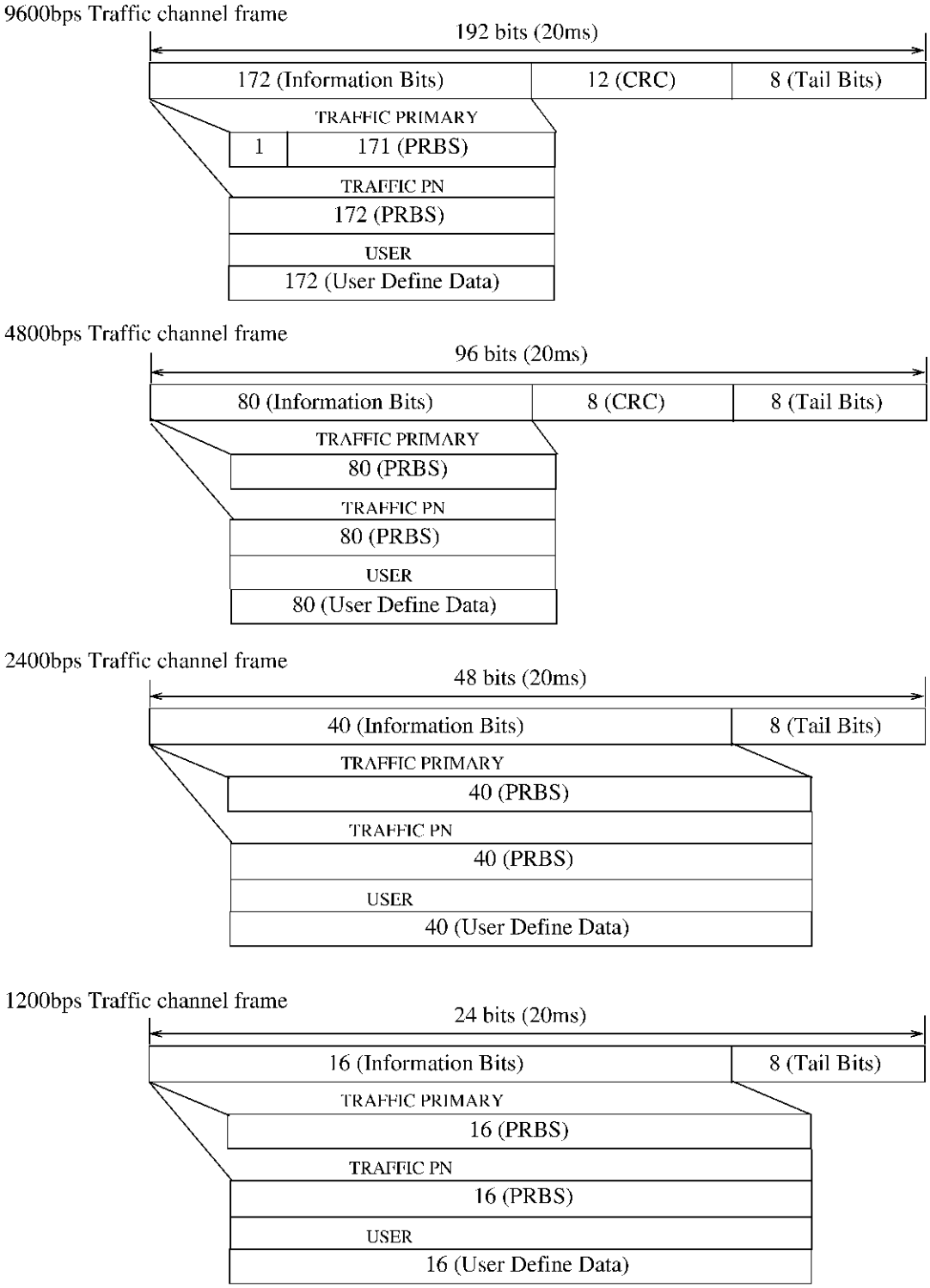
An appropriate channel type must be selected for channels A and B (see Table 4-15). Channel C uses the PILOT type only.

Value after the preset: Channel A : TRAFFIC PRIMARY
Channel B : SYNC
Channel C : PILOT

GPIB command: CAS

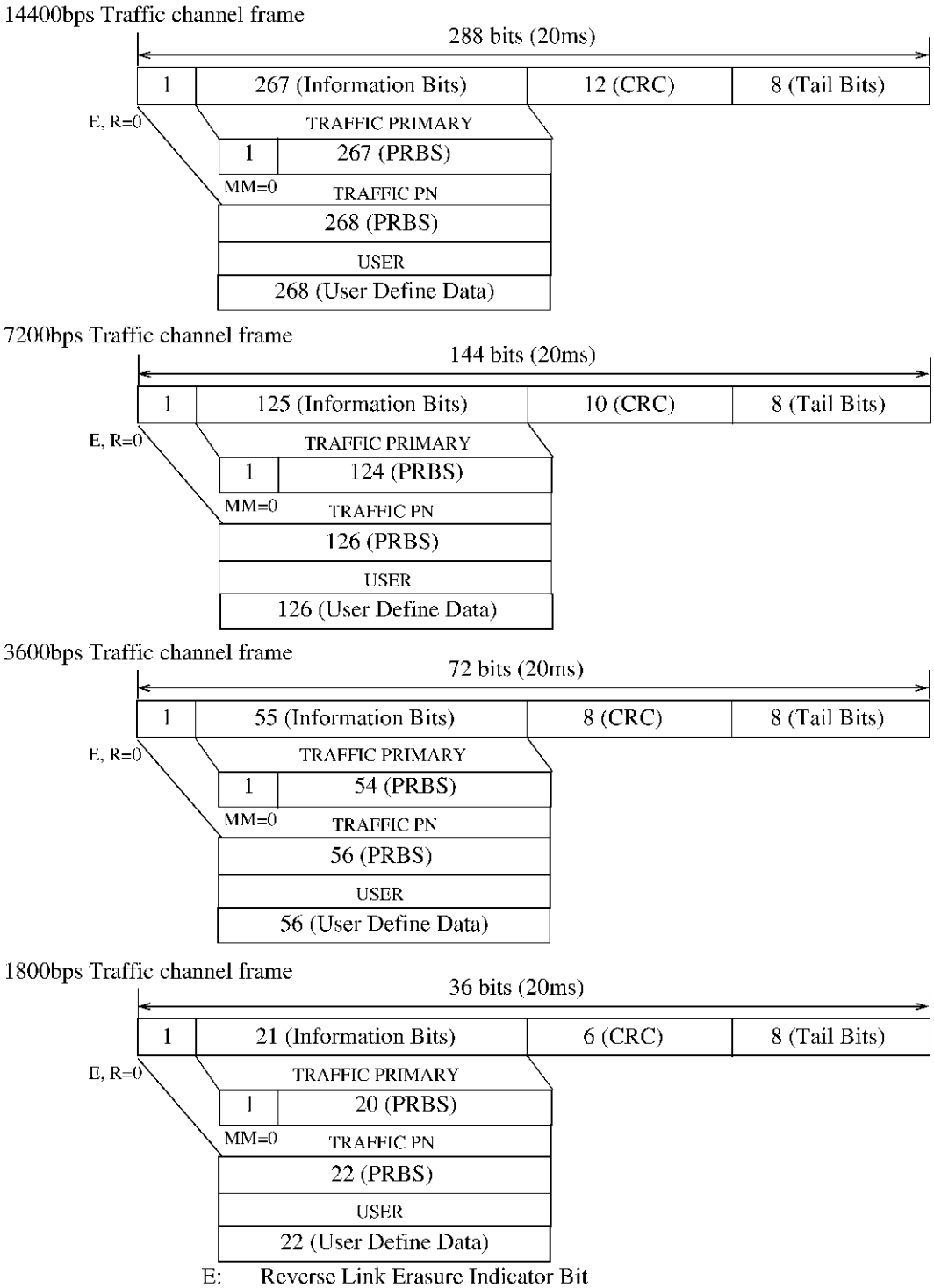
Table 4-15 Channel Signal Types

Channel Signal Type	Description
PILOT	This is the PILOT channel based on the TIA/EAI IS95 standard and used when the LINK is set to FORWARD.
ZEROS(ZEROES)	When the LINK is set to REVERSE, the data pattern is DATA ALL0.
SYNC	This is enabled only when the LINK is set to FORWARD. This is the SYNC channel based on the TIA/EAI IS95 standard.
TRAFFIC PRIMARY	Selects the frame which inserted PRBS into the Primary Traffic section within Information Bits in the Traffic channel frame. Refer to the details of the frame construction in Figure 4-5 and Figure 4-4.
TRAFFIC PN	Selects the frame which inserted PRBS into all of the Information Bits Buffer in the Traffic channel frame. Refer to the details of the frame construction in Figure 4-5 and Figure 4-4.
USER	Downloads data from the outside to the USER Define Buffer in this instrument, and outputs this data. Refer to the details of the frame construction in Figure 4-5 and Figure 4-4. For detailed information on how to use User, refer to section 4.9 User Define Buffer Function.



MM:Mixed Mode Bist

Figure 4-4 Details on the Frame Construction (Rate set1)



E: Reverse Link Erasure Indicator Bit
R: Forward Link Reserved Bit
MM: Mixed Mode Bist

Figure 4-5 Details on the Frame Construction (Rate set2)

(2) Code Channel

This function selects a type of code channel for channels A and B. Orthogonal code spreading is performed for each channel using the Walsh function corresponding to the selected code channel type. The code channels between 8 and 31 or between 33 and 63 can be selected when LINK is set to FORWARD and when the channel assignment is either TRAFFIC PRIMARY, TRAFFIC PN or USER.

The code channel is set to 0 (zero) when the channel assignment is set to PILOT. When set to SYNC, the code channel is set to 32.

Value after the preset: Channel A : 8
Channel B : 32
Channel C : 0

GPIB command: CCH

(3) Traffic PRBS

This function selects the PRBS stored to Information-Bits in the Traffic-channel-frame under TRAFFIC PRIMARY or TRAFFIC PN. See Figure 4-5 and Figure 4-4 for the frame construction in TRAFFIC PRIMARY or TRAFFIC PN.

Table 4-16 Traffic PRBS

PRBS	Description
PN9	This pattern is based on ITU-T V.52.
PN15	This pattern is based on ITU-T O.151.

Value after the preset: Channel A : PN15
Channel B : PN15

GPIB command: CTP

(4) Data rate

The data rate for channel A or B can be set when the channel assignment is either TRAFFIC PRIMARY, TRAFFIC PN or USER.

The data rate cannot be set when the channel assignment is set to PILOT. In addition, the data rate is set to 1200 bps when the channel assignment is set to SYNC.

Value after the preset: Channel A : 9600 bps
Channel B : 1200 bps

GPIB command: RATE

(5) Frame number specification

Refer to Section 4.9 User Define Buffer Function.

GPIB command: IBL

(6) Frame data

Refer to Section 4.9 User Define Buffer Function.

GPIB command: IBD

(7) Start frame number specification

Refer to Section 4.9 User Define Buffer Function.

GPIB command: STF

(8) Repetition frame number specification

Refer to Section 4.9 User Define Buffer Function.

GPIB command: NOF

4.6 Calibration and Self Test Sections

This section describes how to set or select each calibration and self test function. Each function is described as follows.

(1) AWGN calibration

This function is used to calibrate AWGN and CDMA signals. A calibration must be performed when you set the generator mode to Eb/Nt(Eb/No).

GPIB command: CWGN

NOTE: ***It takes 10 to 30 seconds to perform the calibration.***

---

(2) Correction ON/OFF for the AWGN calibration

Specifies whether or not to reflect the correction data.

GPIB command: CAC

Table 4-17 Correction ON/OFF for the AWGN calibration

Item	Description
ON	Reflects the correction data obtained from an AWGN calibration.
OFF	Does not reflect the correction data obtained from an AWGN calibration.

NOTE: ***Turn on the correction mode after checking that the calibration has completed normally. The calibration result can be checked by reading the status byte.***

---

(3) Modulator calibration

The balance of IQ-Modulator is calibrated.

GPIB command: CMOD

NOTE: ***It takes 10 to 30 seconds to perform the calibration.***

---

(4) Correction ON/OFF for the modulator calibration

Specifies whether or not to reflect the correction data.

GPIB command: CMC

Table 4-18 Correction ON/OFF for the modulator calibration

Item	Description
ON	Reflects the correction data obtained from a modulator calibration.
OFF	Does not reflect the correction data obtained from a modulator calibration.

*NOTE: **Turn on the correction mode after checking that the calibration has completed normally. The calibration result can be checked by reading the status byte.***

(5) Self-tests

This function performs self-test(s) for each section of this instrument. The POWER, REMOTE, SYNTHE UNLOCK and RF OUT lamps are turned on during the tests.
An alarm will sound each time one of the self-tests completes.
The self-test results are read into a 16-bit register using GPIB. This instrument sends the result out by outputting the contents of the register. When an error occurs, the corresponding bit is turned on ("1"). When no errors have been detected, the corresponding bit is turned off ("0"). The higher-order four bits (d15 to d12) are always set to "0" (see Figure 4-6).

GPIB command: *TST

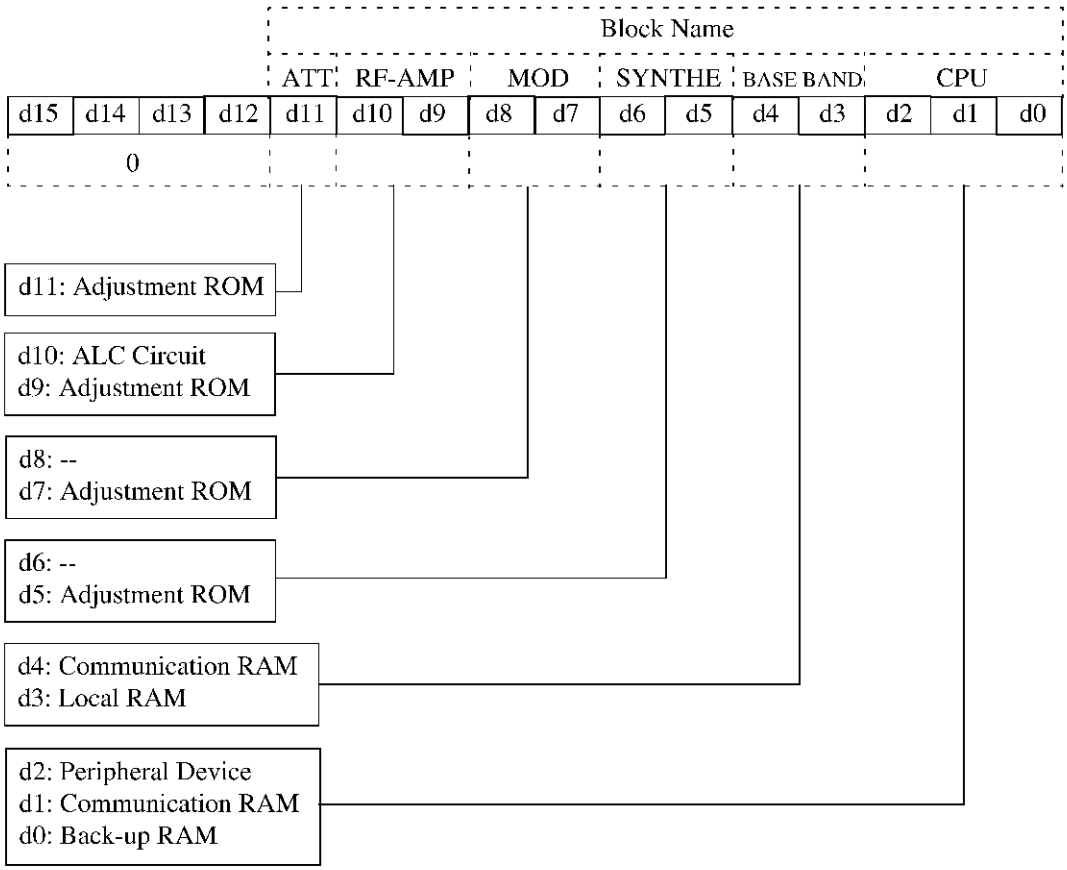


Figure 4-6 Self-test Result Register's Bit Assignment

4.7 Input/Output Section

This section describes how to set or select each of the input/output functions. Each function is described as follows.

(1) EVEN SEC/SYNC IN

This function specifies whether or not to synchronize the base band block of this instrument with the signal input from the EVEN SEC/SYNC IN terminal.

Value after the preset: DISABLE

GPIB command: EVEN

Table 4-19 EVEN SEC/SYNC IN

EVIN SEC/SYNC IN	Description
ENABLE	Synchronizes the base band block with the signal input from the EVEN SEC/SYNC IN terminal.
DISABLE	Does not synchronize the base band block with the signal input from the EVEN SEC/SYNC IN terminal.

(2) CDMA CLOCK OUT

This function selects the CDMA frame clock output signal from the CDMA CLOCK OUT terminal. For the types of CDMA frame clock signal, see Table 4-20.

Value after the preset: EVEN SECOND IN

GPIB command: CCK

Table 4-20 Types of CDMA Frame Clock

CDMA Frame Clock	Description
EVEN SECOND IN	Outputs the signal from the EVEN SEC/SYNC IN terminal. When no signal is input from the EVEN SEC/SYNC IN terminal, no signal is output.
2s	Outputs the Even-Second-Mark period in the base band block of this instrument.
80ms	Outputs the Sync-Channel-Superframe period in the base band block of this instrument.
26.6ms	Outputs the Sync-Channel-Frame period in the base band block of this instrument.
20ms	Outputs the Traffic-Channel-Frame period in the base band block of this instrument.

(3) CDMA TIMEBASE OUT

This function selects the signals which are output from the 19.6608 MHz/PN CHIP OUT terminal.

Value after the preset: OFF

GPIB command: CTB

Table 4-21 CDMA TIMEBASE OUT

CDMA TIMEBASE OUT	Description
OFF	No signals are output.
1.2288MHz	Outputs a frequency of 1.2288 MHz (PN Chip Rate).
19.6608MHz	Outputs a frequency of 19.6608 MHz (PN Chip Rate x 16).

(4) Synthe Reference IN

This function selects the reference frequency signals which are input to RF synthesizer reference circuit (from the SYNTHE REF IN terminal). When set to INTERNAL, the internal reference oscillator signal is input to the RF synthesizer reference circuit. Table 4-22 shows selectable frequencies.

Value after the preset: INTERNAL

GPIB command: RSYN

Table 4-22 Selectable Frequencies (Synthe Reference)

Reference Frequencies
INTERNAL
1MHz
1.2288MHz
2MHz
2.4576MHz
4.9152MHz
5MHz
9.8304MHz
10MHz
15MHz
19.6608MHz

(5) Internal reference adjustment

This function corrects the frequency deviation using the time set for the frequency (in the internal reference oscillator). Its factory-shipped setting is 0, but the range is from -2000 to +2000. Note this is the variable range, not the frequency range.

GPIB command: SRAD

(6) CDMA TIMEBASE IN

This function selects the reference frequency signals which are input to RF synthesizer reference circuit (from the CDMA TIMEBASE IN terminal). When set to INTERNAL, the internal reference oscillator signal is input to the CDMA TIMEBASE reference circuit. Table 4-23 shows selectable frequencies.

Value after the preset: INTERNAL

GPIB command: DIG

Table 4-23 Selectable Frequencies (CDMA TIMEBASE)

Reference Frequencies
INTERNAL
1MHz
1.2288MHz
2MHz
2.4576MHz
4.9152MHz
5MHz
9.8304MHz
10MHz
15MHz
19.6608MHz

4.8 Save/Recall Section

This section describes how to set or select each save or recall function of this instrument. Each function is described below.

(1) Save function

This function saves the current set status to the backup memory of this instrument. A maximum of 10 settings can be saved.

GPIB command: SAVC

(2) Recall function

This function reads the settings saved in the backup memory of this instrument.

GPIB command: RECC

4.9 User Define Buffer Function

This section describes how to set or select each of the User Define Buffer functions. Each function is described as follows.

(1) This function outputs coded frame data (which is first written as arbitrary frame data called the User Define Data in the Information Bits under the Traffic Channel Frame, and then coded) (see Figure 4-5 and Figure 4-4). A maximum of 600 frames can be saved in the User Define Buffer. Note that this function can only be used with channel A.

The User Define Buffer is written one frame at a time through the Transfer buffer (see Figure 4-7).

To write one frame of data in the User Define Buffer, a User Define Buffer frame (which comprises an 8-bit Control Bits Block to control the base band clock, a User Define Data Block and a Tail Bits Block) is first converted into a string of hexadecimal characters, and transferred to this instrument through GPIB. The last two (, or the User Define Data Block and the Tail Bits Block) are blocks whose bit lengths vary with its data rate.

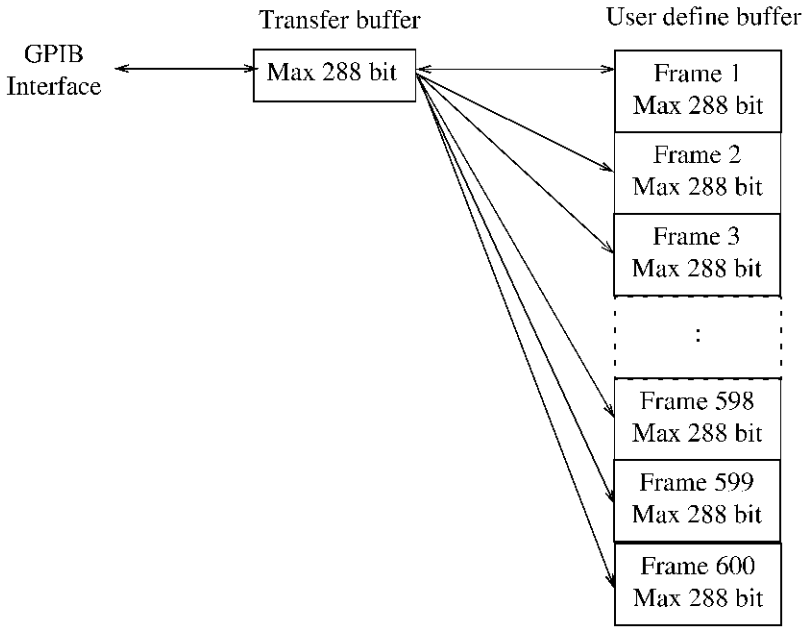


Figure 4-7 Relationship between the Transfer and User Define Buffers

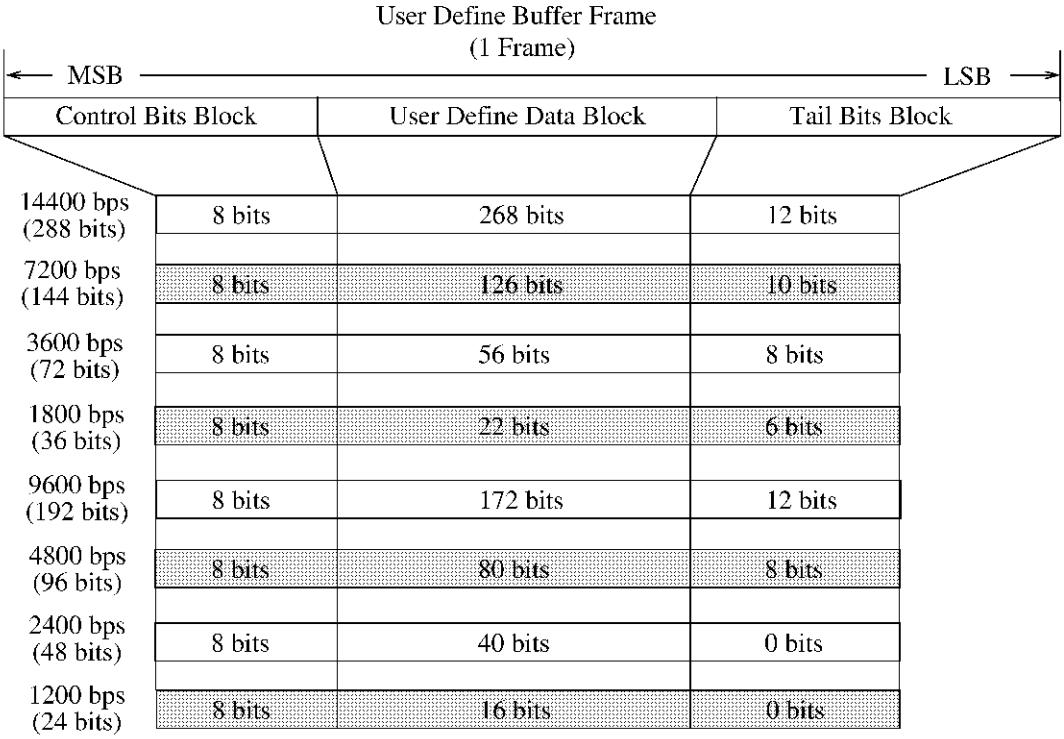


Figure 4-8 Construction of the User Frame Buffer

- Control Bits Block

  This data is used with the base band block control of this instrument. This is reserved for future expansion. Set all bits in the Control Bits Block to 0 (zero) (see Figure 4-9).

Bit7(MSB)	Bit6	Bit6	Bit6	Bit6	Bit6	Bit6	Bit0(LSB)
0	0	0	0	0	0	0	0

Figure 4-9 Bit Assignment for the Control Bits Block

- User Define Data Block

  This data is written in the Information Bits (see Figure 4-5 and Figure 4-4).

- Tail Bits Block

  This additional data is used to adjust the data length of the Use Define Buffer Frame to the one used with the base band block. This data can be omitted when in write mode.

(2) How to write data in (or read data from) the User Define Buffer

Writing data in (or reading data from) the User Define Buffer is instructed from GPIB. The GPIB commands related to this objective are explained here.

- Frame number specification

  Sets which frame in the User Define Buffer is used to write or read. A frame number specified can be used to write or read. Be sure to specify the frame number to be used.
  GPIB command: IBL

- Frame data

  The frame number specified by the frame number specification is used to write or read.
  To write data in the User Define Buffer, you must create a frame as shown in Figure 4-8 User Define Buffer Frame. You transfer the frame converted into hexadecimal characters (from MSB to LSB) using GPIB. When the data is read into the User Define Buffer, the User Define Buffer Frame is output as shown in Figure 4-8.
  GPIB command: IBD

(3) Output from the User Define Buffer

The data written into the User Define Buffer is output after being coded.

The output from the User Define Buffer is enabled when the channel assignment is set to USER. The functions used with the User Define Buffer are described as follows:

- specifying the start frame number

  Specifies which frame in the User Define Buffer is output first. See the example shown in Figure 4-10.
  GPIB command: STF

- Specifying the number of repetitive frames

  Specifies which frames (from the frame specified by the start frame number) must be used repeatedly. See the example shown in Figure 4-10.
  GPIB command: NOF

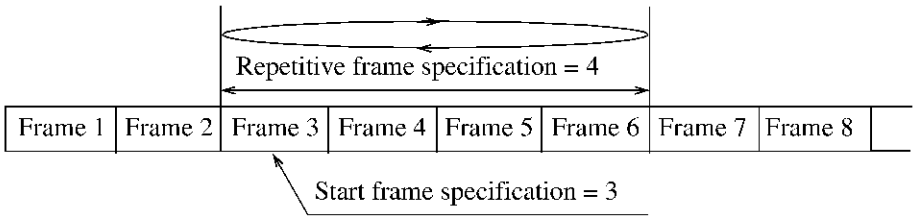


Figure 4-10 Relationship between the Start Frame Number and the Repetitive Frames

---

NOTE: The relationship between the start frame number and the repetitive frame must meet the conditions shown below:

$1 \leq$ Start frame number + the number of repetitive frames - $1 \leq 600$

---

5 GPIB

This chapter describes the GPIB command syntax and shows GPIB sample programs.

5.1 GPIB Command Syntax

There are two formats depending on the command type as shown below.

(1) Format using a header, data and a space (which is the delimiter between the header and the data) (Figure 5-1).

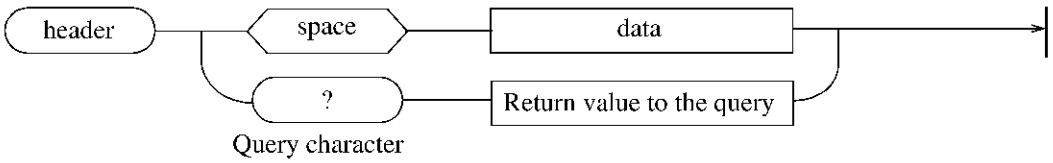


Figure 5-1 COMMAND SYNTAX 1

(2) Format using a header, channel specification data, data, a colon (:) (which is used as the delimiter between the header and the channel specification data) and a space (which is the delimiter between the channel specification data and the data) (Figure 5-2).

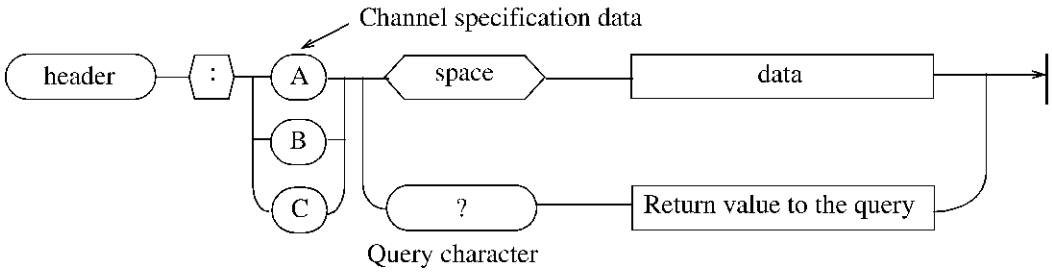
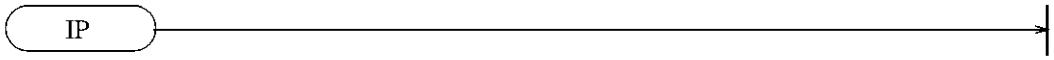


Figure 5-2 COMMAND SYNTAX 2

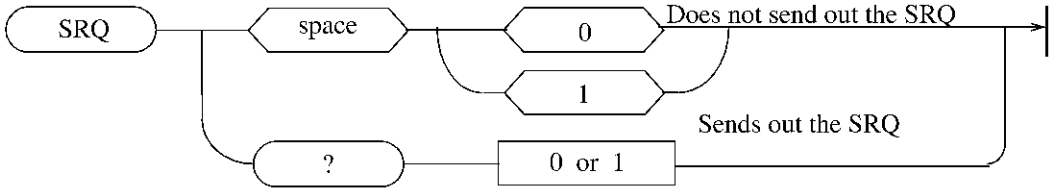
5.2 GPIB Command Description

5.2.1 System Related Commands

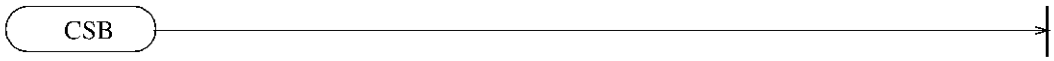
(1) Preset (Initialization) command



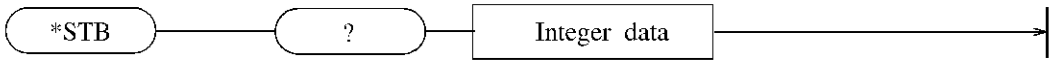
(2) SRQ signal control command



(3) Clears the status byte



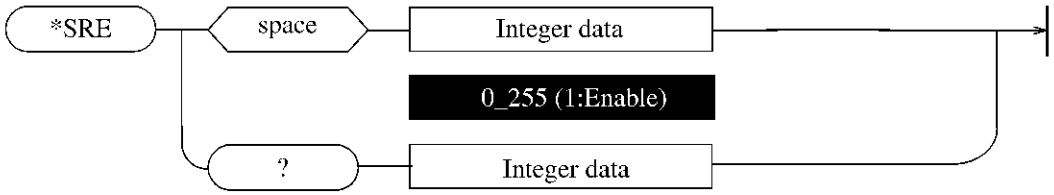
(4) Outputs the status byte



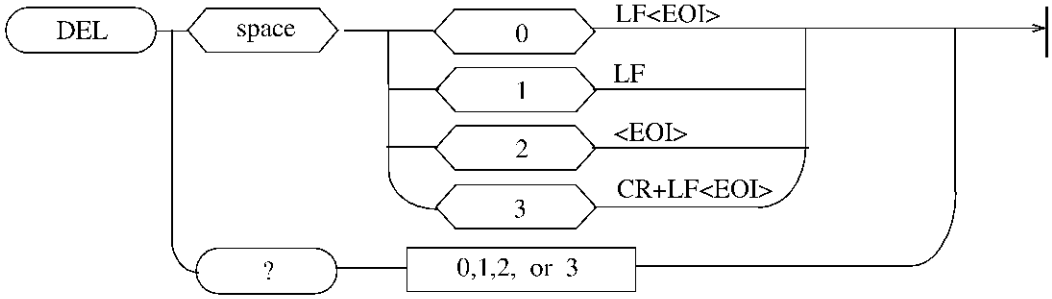
NOTE: ***Reads the status byte and clears it later.***

---

(5) Enables the status byte



(6) Specifies the terminator



(7) Reads the system revision

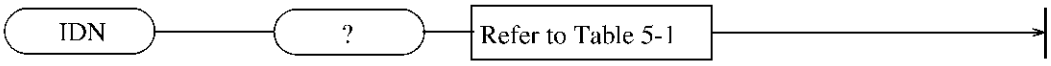


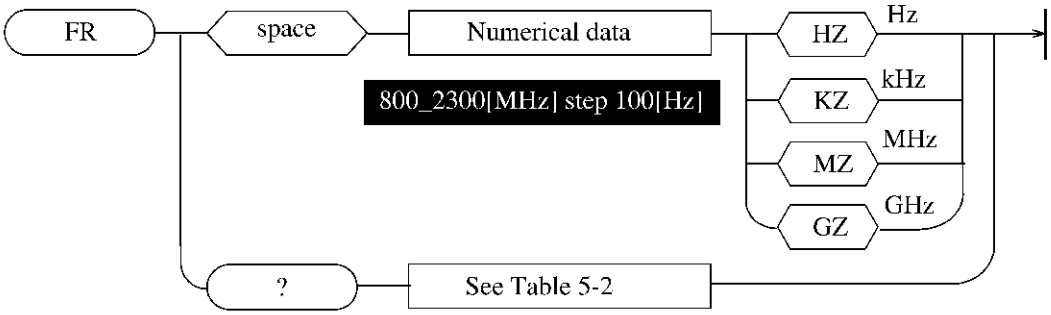
Table 5-1 Format for the System Revision

Manufacturer and Product name	MS	Product Serial Number	MS	System Revision	MS	BaseBand Revision
ADVANTEST R3561	,	8-digit integer	,	A00	,	A00

5.2.2 Output Frequency Related Commands

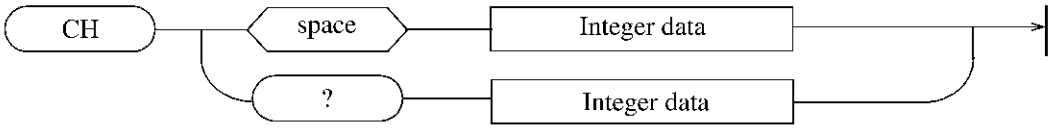
(1) Sets the output frequency

(a) Direct entry

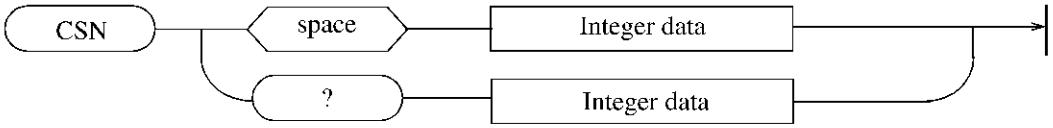


(b) Channel number entry

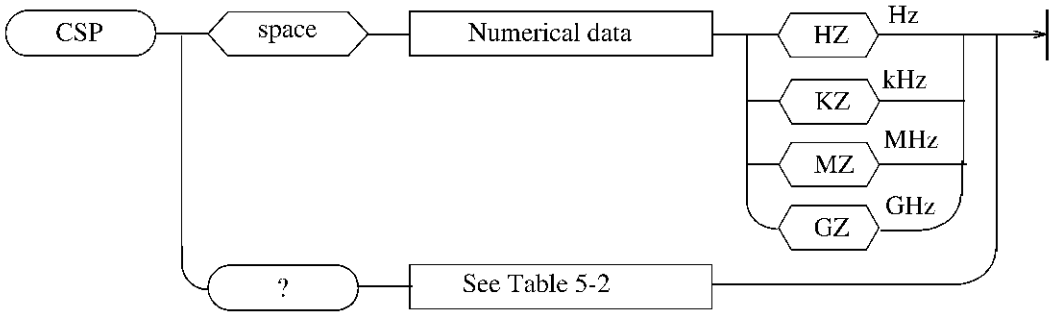
- Sets channel number



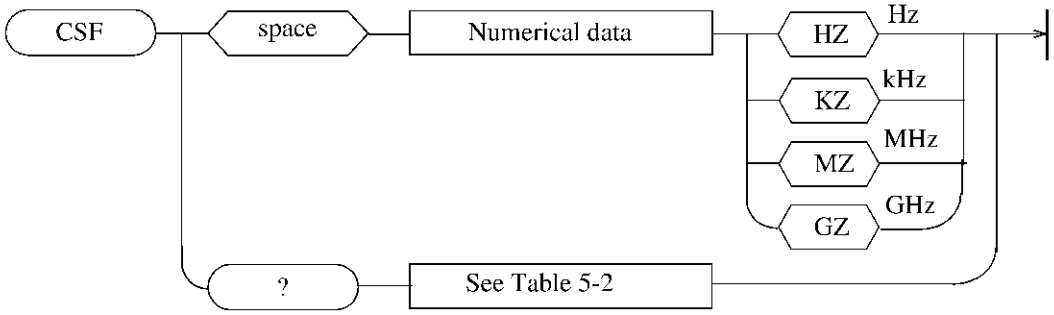
- Sets channel number offset



- Sets channel spacing

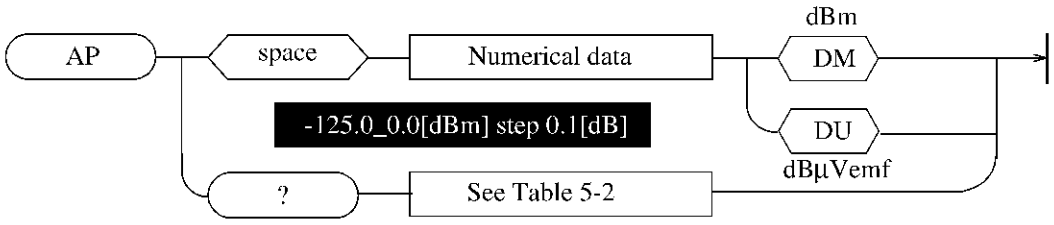


- Sets start frequency

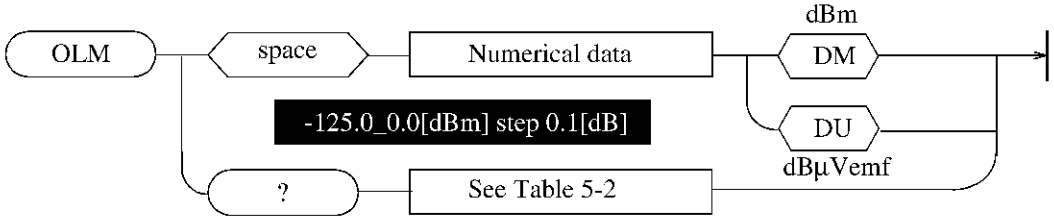


5.2.3 RF Level Related Commands

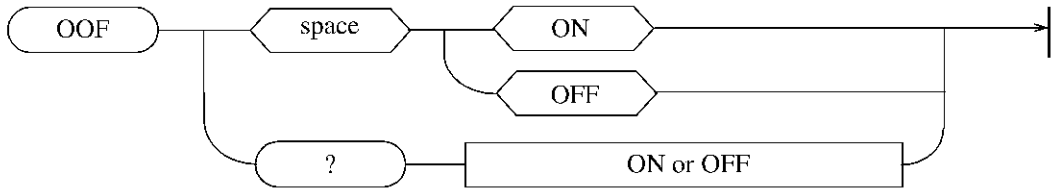
(1) Sets the output level



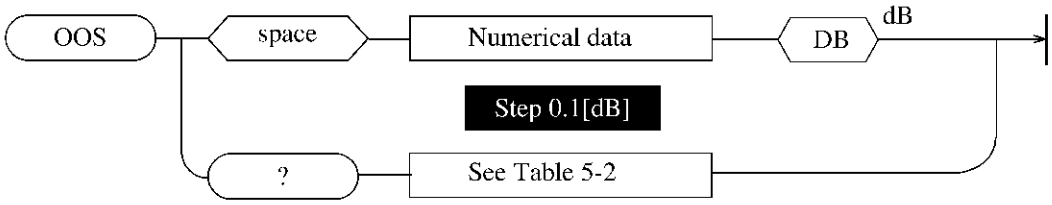
(2) Sets the output level upper limit value



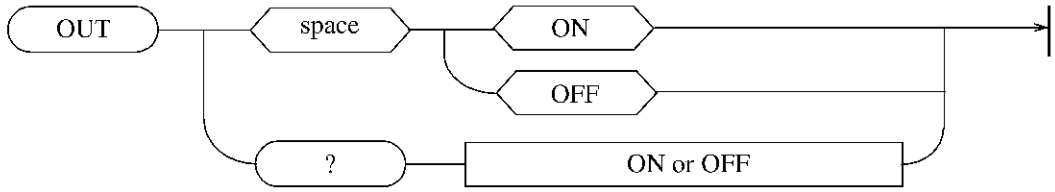
(3) Turns the output level offset ON/OFF



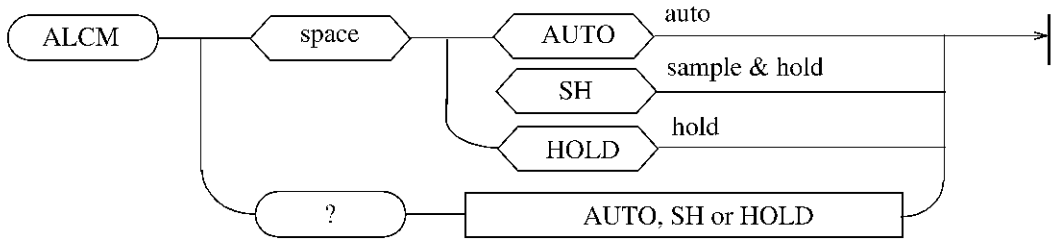
(4) Sets the output level offset value



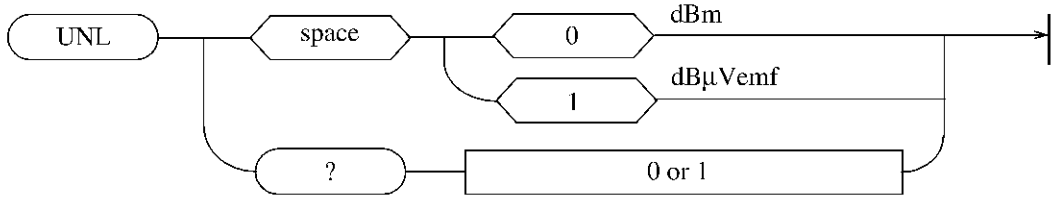
(5) Turns the output ON/OFF



(6) Sets the ALC mode



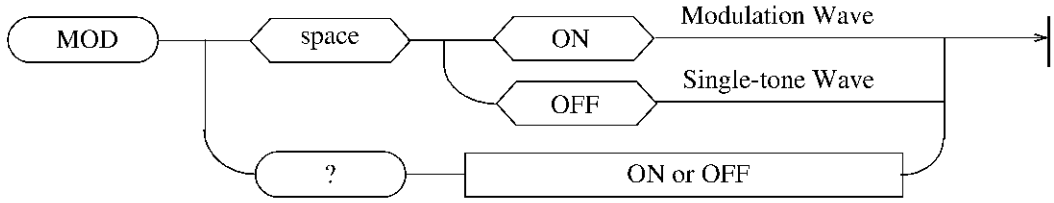
(7) Specifies a query data unit



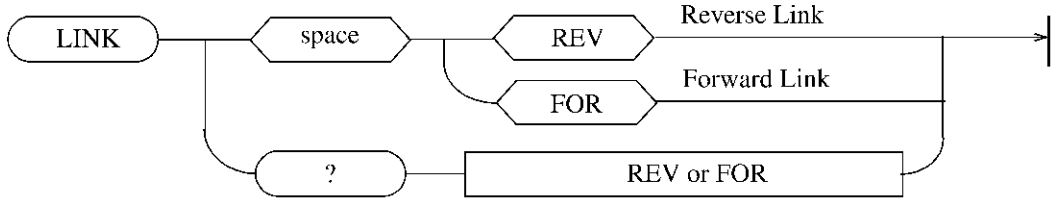
NOTE: ***Reads the output level or output level limit value and switches the unit of query data.***

5.2.4 Modulation Related Commands

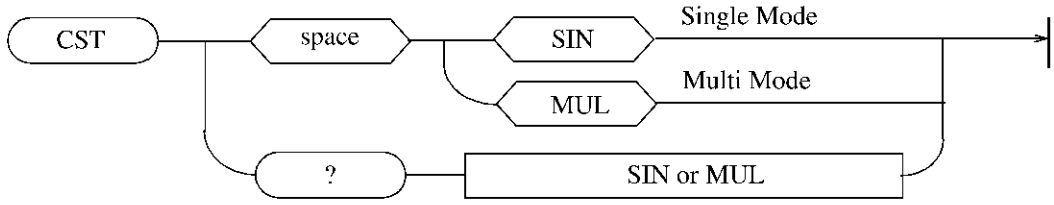
(1) Turns the modulation ON/OFF



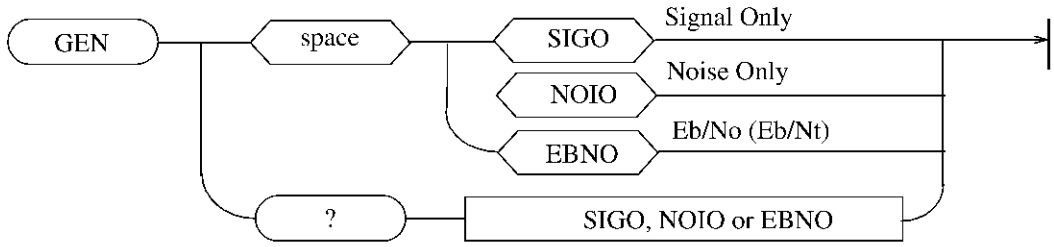
(2) Sets the link



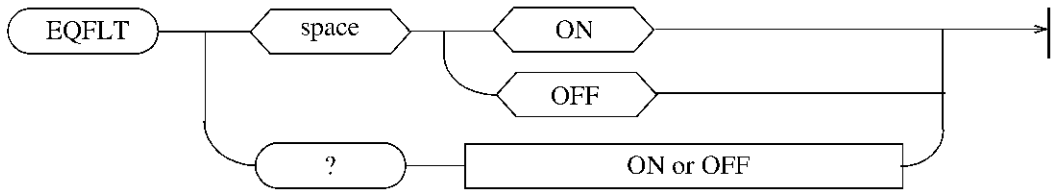
(3) Selects the channel mode



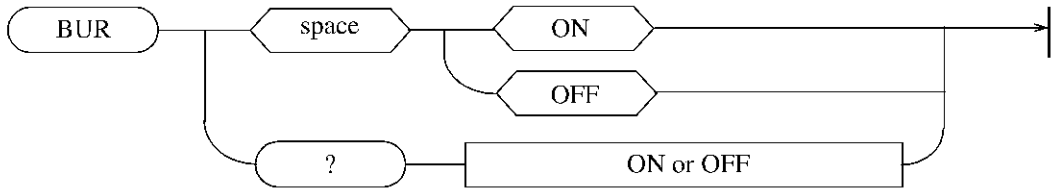
(4) Selects the generator mode



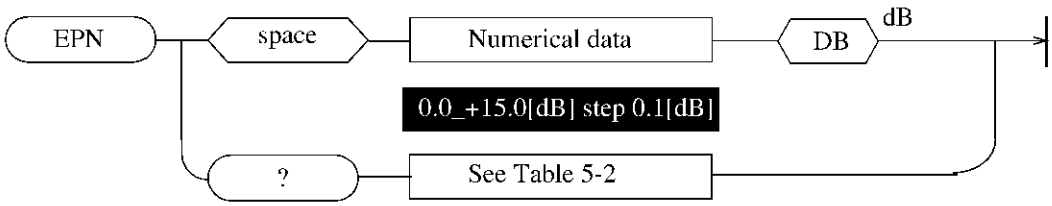
(5) Turns the equalizing filter ON/OFF



(6) Turns the data burst ON/OFF

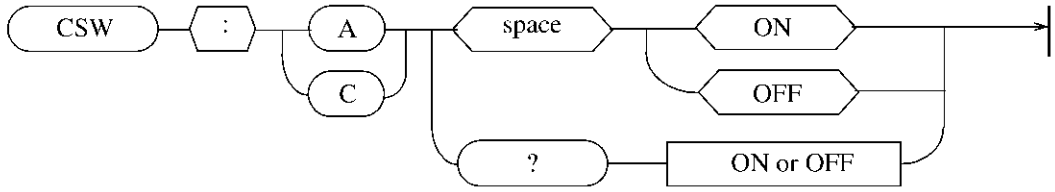


(7) Sets Eb/No (Eb/Nt)

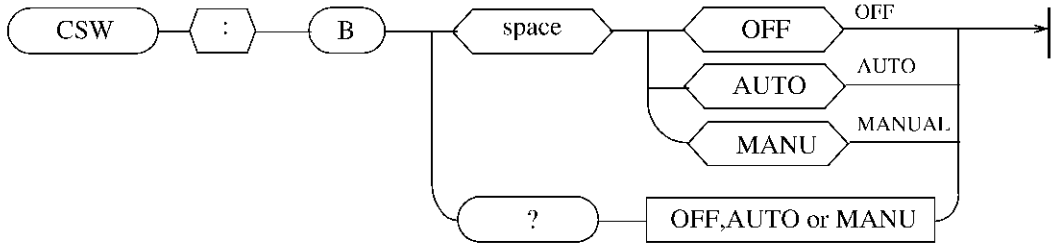


(8) Turns channel ON/OFF

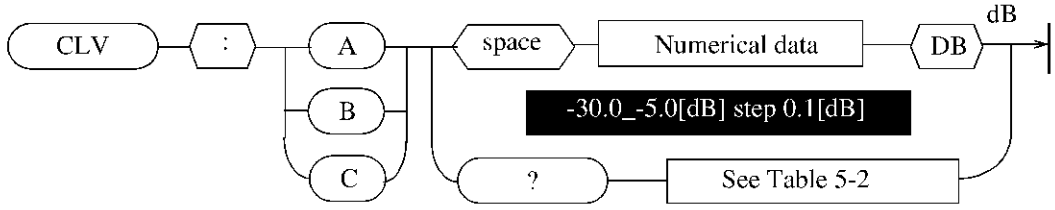
(a) Channels A and C



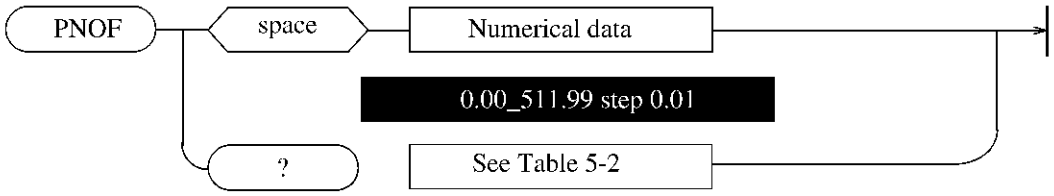
(b) Channel B



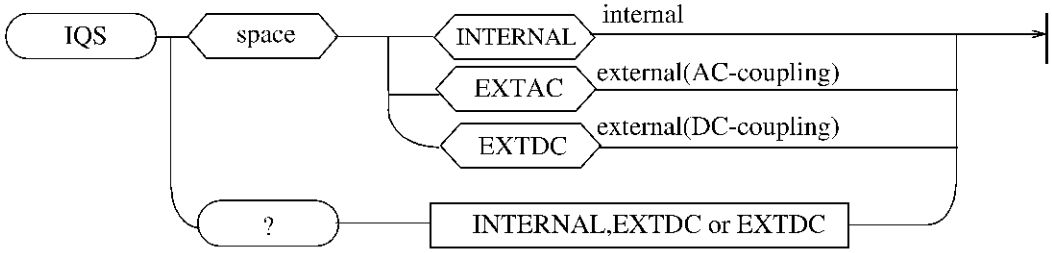
(9) Sets the channel level



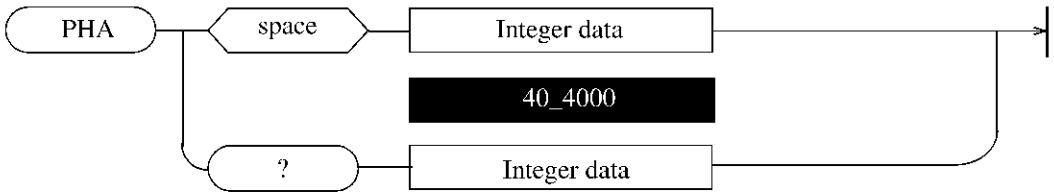
(10) Sets the PN offset value



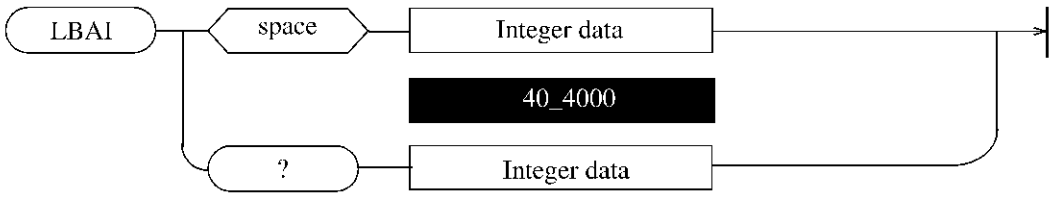
(11) Selects the I/Q source



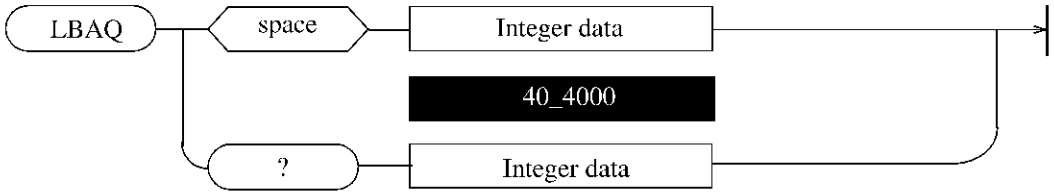
(12) Adjusts external IQ phase



(13) Adjusts external I gain

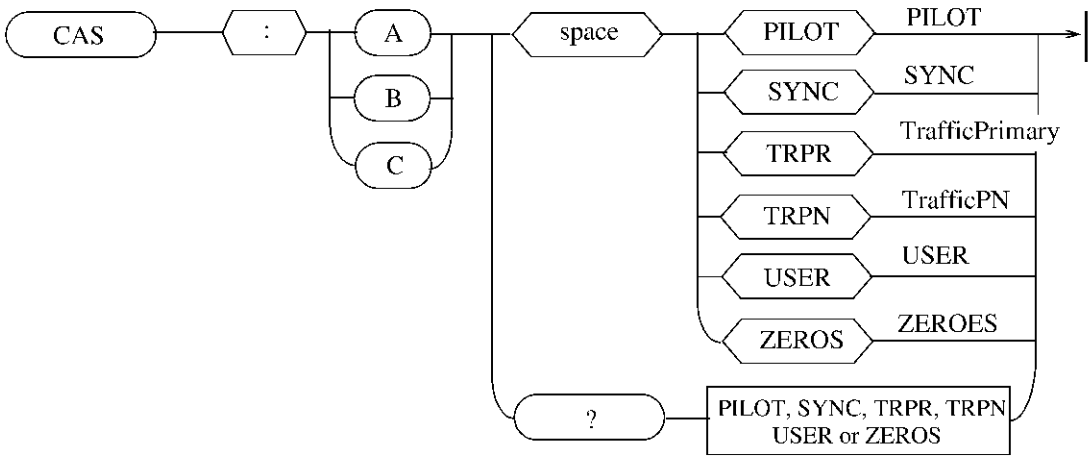


(14) Adjusts external Q gain

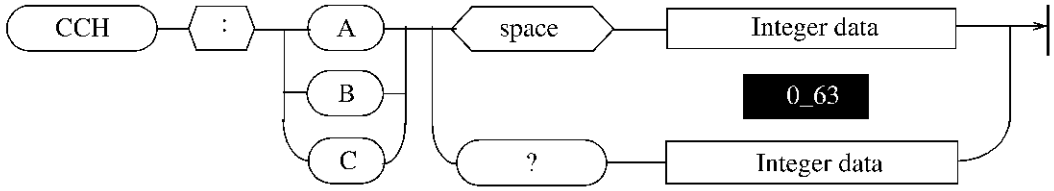


5.2.5 Frame Related Commands

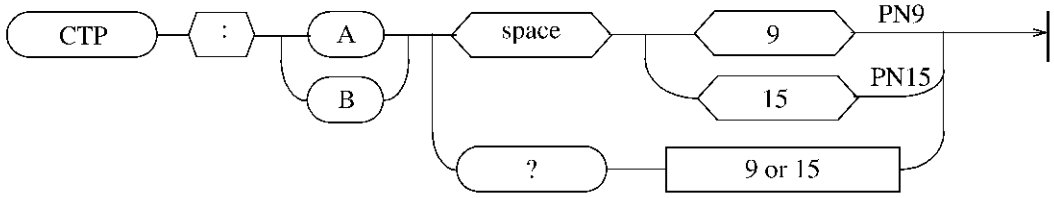
(1) Assigns channels



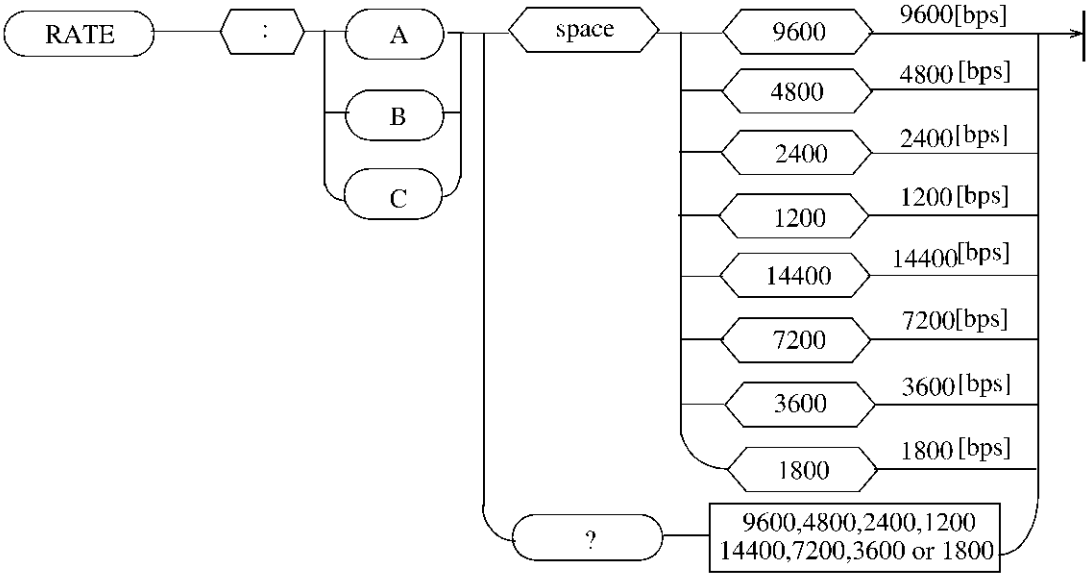
(2) Sets code channels



(3) Sets the traffic PRBS (traffic data source)

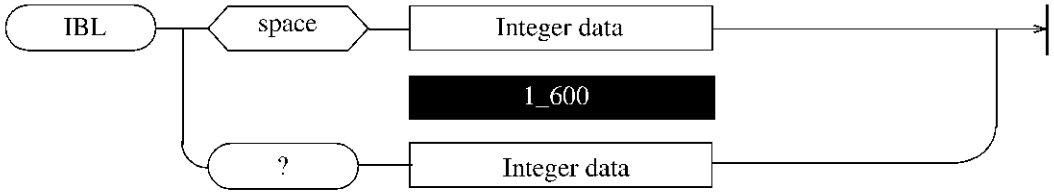


(4) Sets data rate

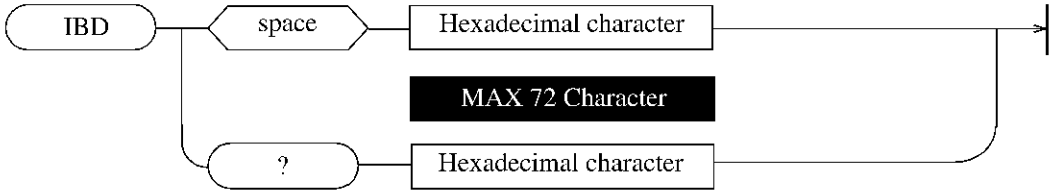


(5) User defined buffer

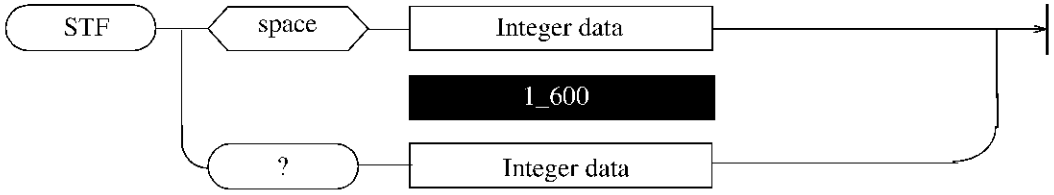
- Specifies the frame number



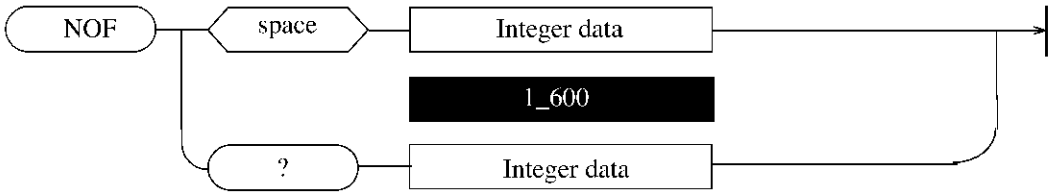
- Sets the frame data



- Specifies the start frame number

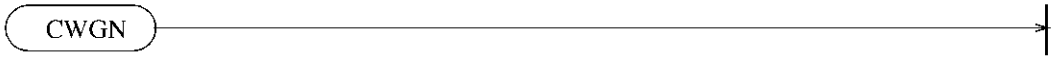


- Specifies the number of repetitive frames

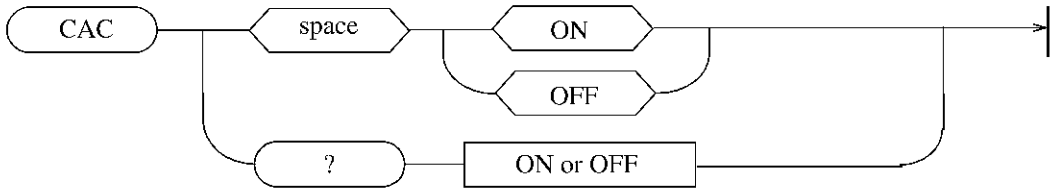


5.2.6 Calibration or Self Test Related Commands

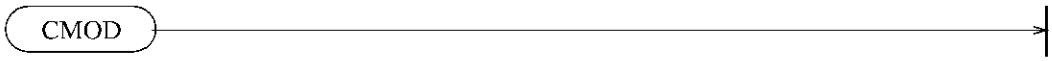
(1) Executing the AWGN calibration



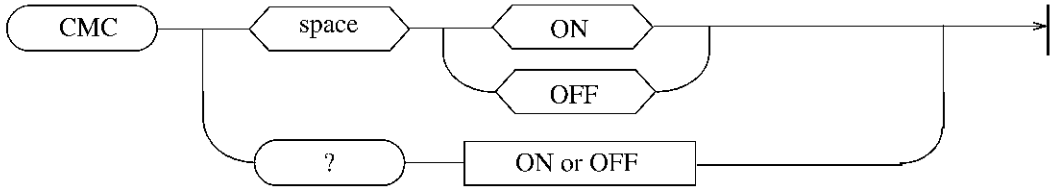
(2) Turns the AWGN CAL correction data ON/OFF



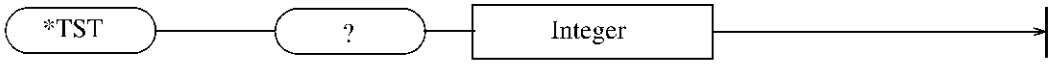
(3) Executes the Modulator calibration



(4) Sets the Modulator CAL correction data ON/OFF



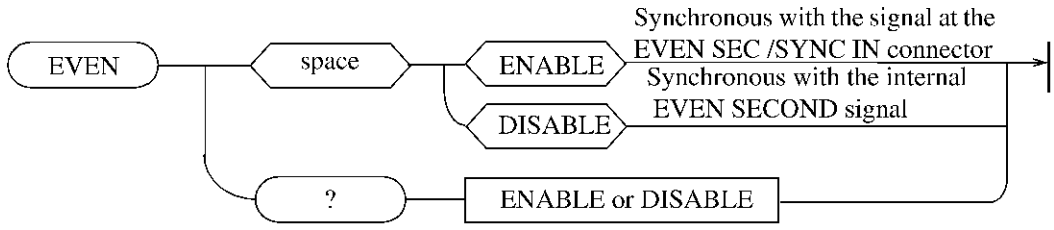
(5) Performs self test or outputs the test results



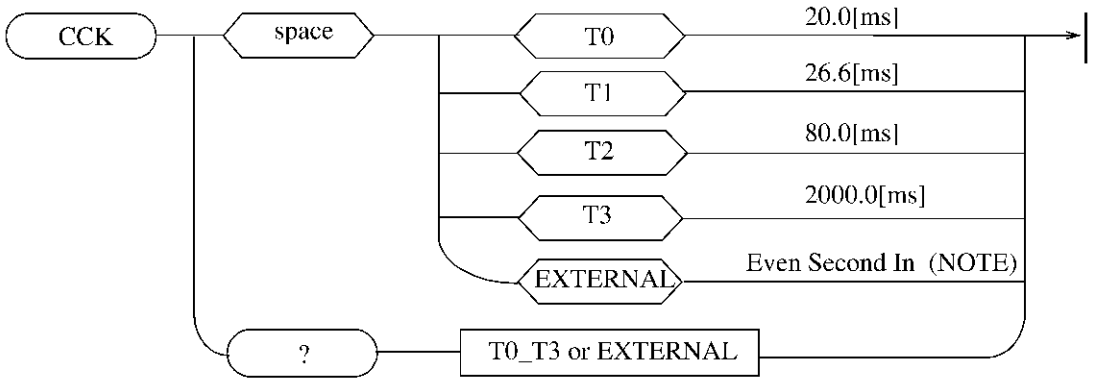
NOTE: ***For the test contents and results, refer to Section 4.6 (5) Self Tests.***

5.2.7 Commands to Set the Input and Output Clocks

(1) Sets EVEN SEC or SYNC IN

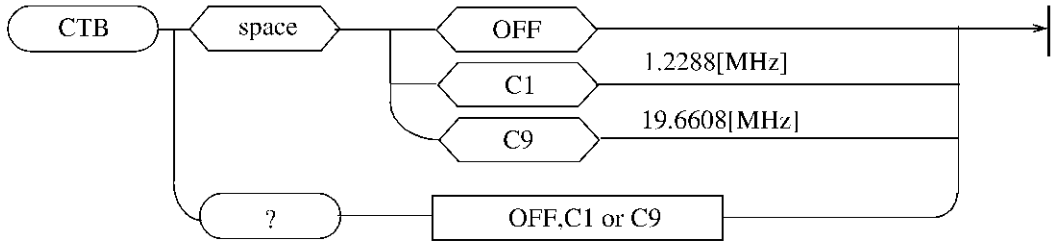


(2) Sets the CDMA clock

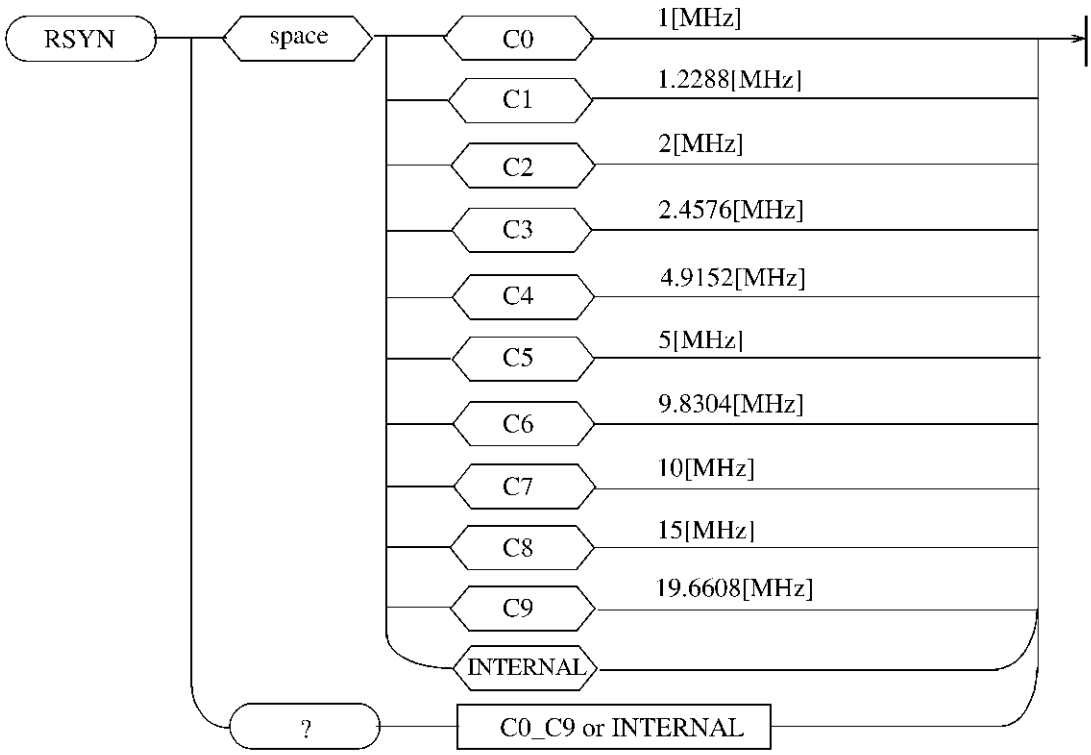


NOTE: ***The signal entering at EVEN SEC/SYNC IN is output.***

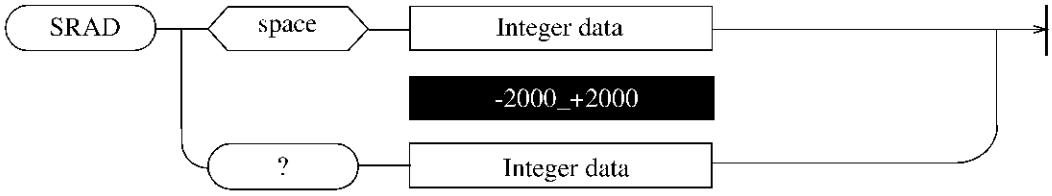
(3) Sets the CDMA TB (CDMA TIME BASE clock) output



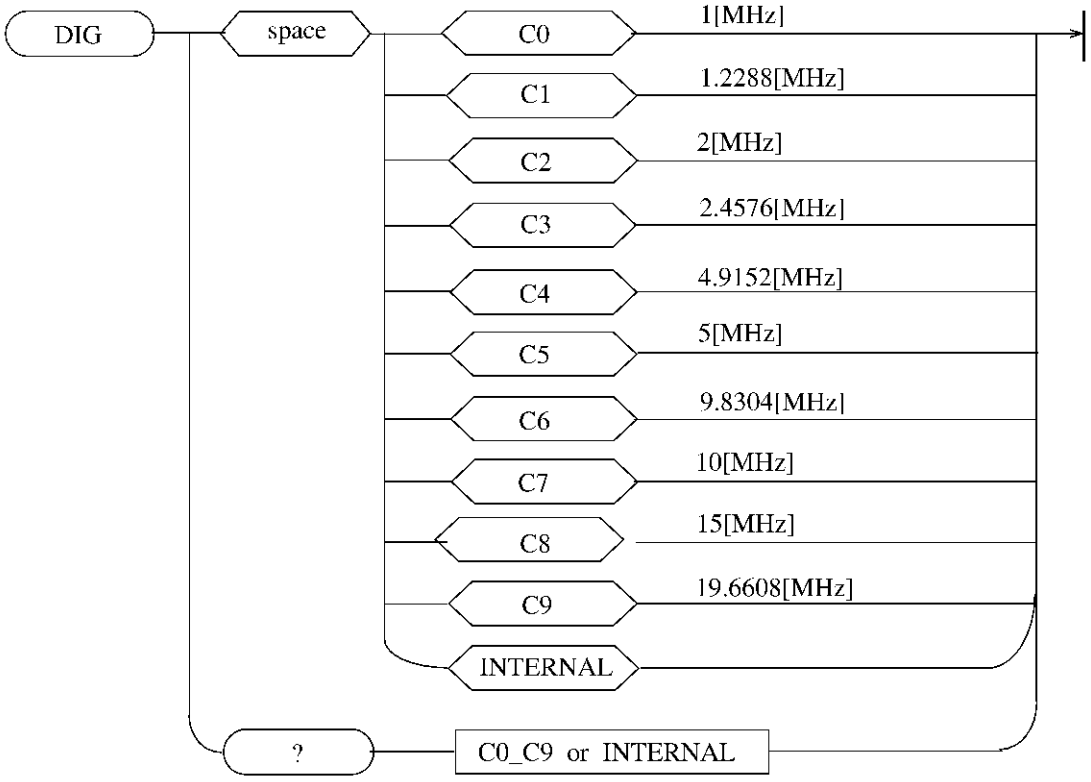
(4) Sets the Synthe Reference



(5) Adjusts the Internal Reference Clock (10 MHz)

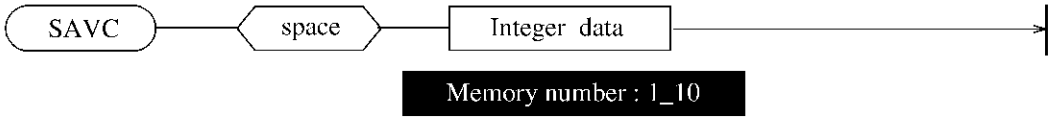


(6) Sets input data for CDMA TB (CDMA TIME BASE clock)



5.2.8 Commands Related to Saving or Recalling Conditions

(1) Saves the present settings to the back-up memory using the memory number



(2) Recalls the present settings to the back-up memory using the memory number

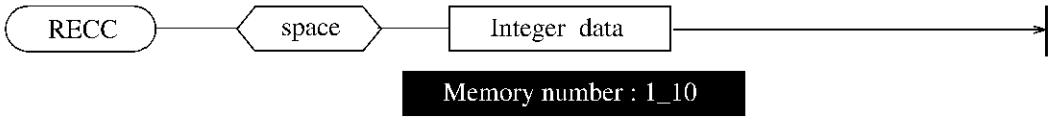


Table 5-2 Numeric Data Output Format

Items			Output format	Unit
Output frequency related	Direct entry		D.DDDDDDDDDeD	Hz
	Channel number entry	Sets the channel spacing		
		Sets the start frequency		
RF level related	Sets the output level		D.DDDeD	(Note)
	Sets the output level limit value		D.DDDe-D	
	Sets the output level offset value		-D.DDDeD	dB
Modulation related	Sets Eb/No (Eb/Nt) value			dB
	Sets the channel level			
	Sets the PN offset value		D.DDDDeD	~

Note : The unit can be specified using the same manner that you specify a query data unit.

5.3 Status Byte

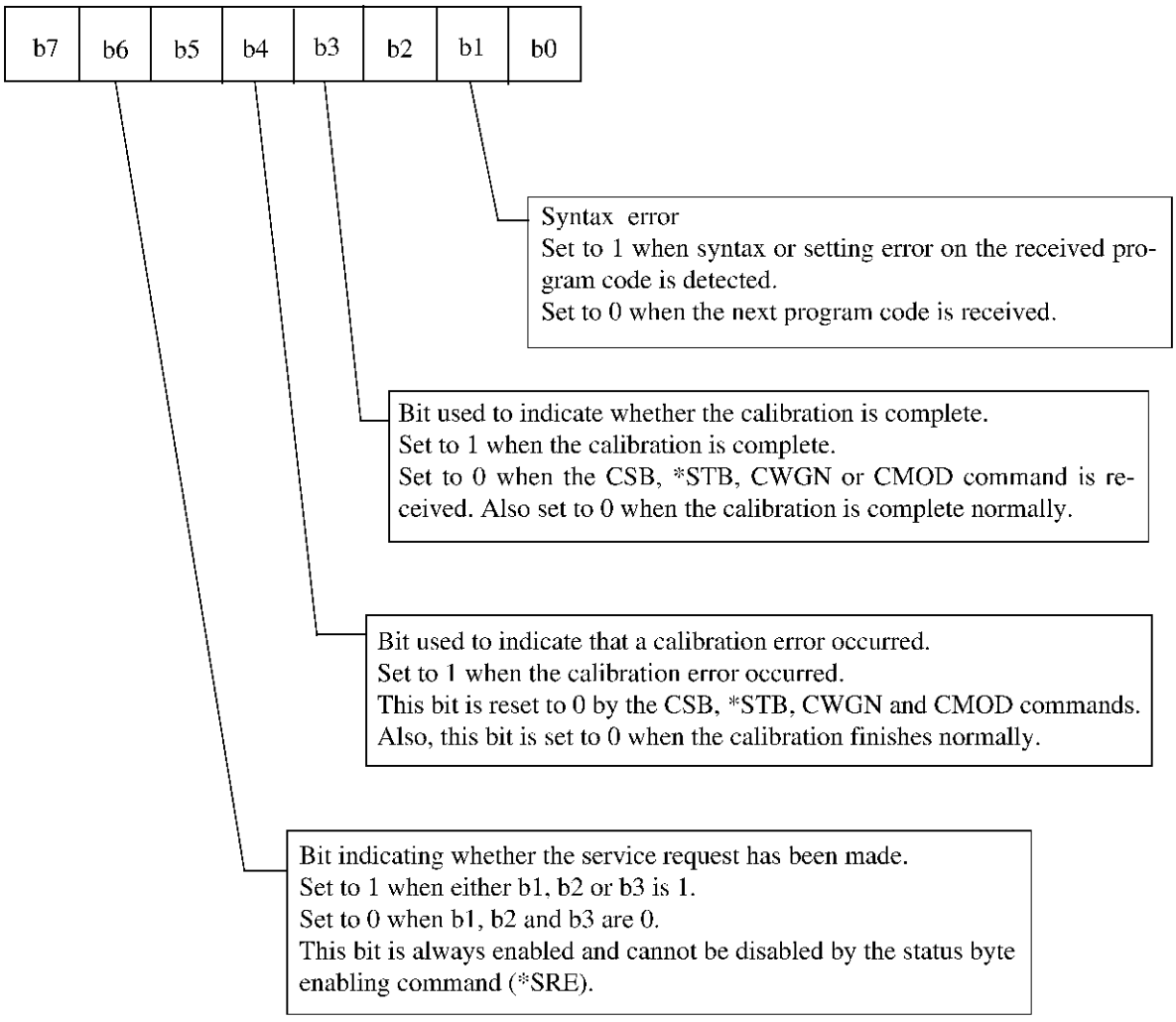


Figure 5-3 Meaning of Each of the Status Byte Bits and Set/Reset Conditions

5.4 GPIB Sample Programs

NOTE:

1. ***The sample programs shown here are written in HP-BASIC.***
2. ***A GPIB address of 8 is used in these programs.***

Example 1: Basic settings

```
10  !*********************************************************************
20  !  ===sample program1 ===
30  !  OUTPUT CONDITION >>> FREQUENCY      :825.03MHz
40  !                       OUTPUT LEVEL   :-85dBm
50  !                       LINK           :Forward
60  !                       GENERATOR MODE:SIGNAL ONLY
70  !                       CHANNEL MODE   :MULTI
80  !*********************************************************************
90  !
100 INTEGER Cdma
110 Cdma=708                              !GPIB Address Setting
120 CLEAR Cdma                            !GPIB Interface initialize
130 !
140 OUTPUT Cdma;"IP"                      !Initialize R3561
150 OUTPUT Cdma;"FR 870.03MZ"             !Sets Output Frequency to 870.03MHz
160 OUTPUT Cdma;"AP -85.0DM"              !Sets Output Level to -85dBm
170 OUTPUT Cdma;"LINK FOR"                !Sets Link to Forward
180 OUTPUT Cdma;"CST MUL"                 !Sets Channel-Mode to Multi
190 OUTPUT Cdma;"GEN SIGO"                !Sets Generator-Mode to Signal-only
200 OUTPUT Cdma;"MOD ON"                  !Sets Modulation to ON
210 OUTPUT Cdma;"CAS:A TRPR"              !Sets Channel-Assign
220 OUTPUT Cdma;"CAS:B SYNC"              !  Channel A :Traffic Primary
230                                       !          B :Sync
240 OUTPUT Cdma;"RATE:A 9600"             !Sets Channel_A Date to 9600bps
250 OUTPUT Cdma;"EVEN DISABLE"            !Sets EvenSecond_In to Disable
260 OUTPUT Cdma;"PNOF 0.0"                !Sets PN-offset to 0.00
270 OUTPUT Cdma;"EQFLT ON"                !Sets Equalizing-Filter to ON
280 OUTPUT Cdma;"RSYN C7"                 !Sets Reference Clock to 10MHz
290 OUTPUT Cdma;"DIG INTERNAL"            !Sets CDMA-TB to Internal
300 END
```

Example 2: Changing the channel levels

Continuation from line 290 under Example 1 (Basic settings)

```
300 OUTPUT Cdma;"CLV:A -25.0DB"           !Sets Channel_A-Level to -25.0dB
310 OUTPUT Cdma;"CLV:B -5.0DB"            !Sets Channel_B-Level to -5.0dB
320 END
```

6 PRINCIPLES OF OPERATION

This chapter describes the operation of the R3561 using block diagrams.

6.1 Operation principles for the R3561

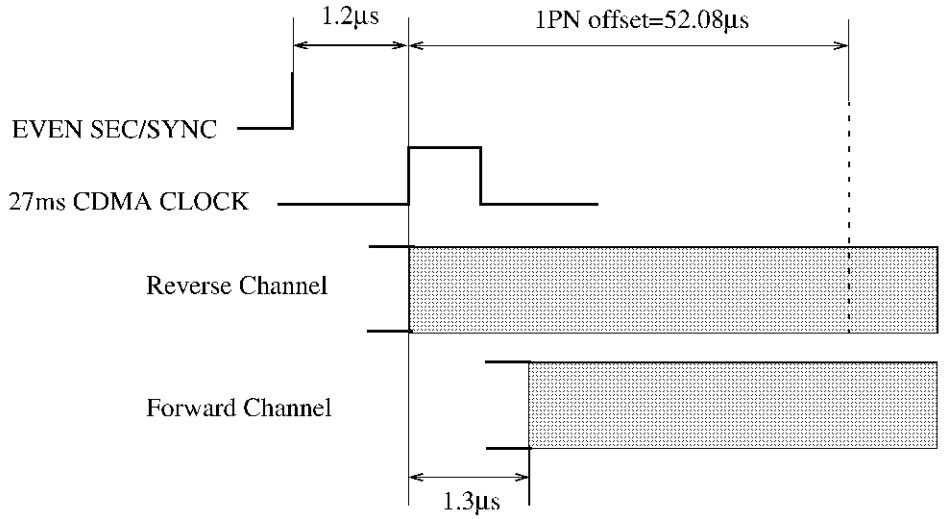
The R3561 provide a digital modulation signal compliant with the CDMA(TIA/EIA/IS-95).

(1) REFERENCE section

This section consists of the RF-SYNSETHIZER REFERENCE which supplies the reference signal (which is phase-synchronous with the input signal to SYNTHE REF IN terminal on the rear panel or in the internal reference source) to the RF circuit system and the CDMA-TIMEBASE which supplies the reference signal for modulation to the base band section. The CDMA-TIMEBASE uses the INTERNAL mode to synchronize with the RF circuit and the mode to synchronize with the front panel CDMA TIME BASE IN terminal signal.

(2) Base band section

This section executes modulation pattern coding conforming to TIA/EIA/IS-95 based on the internal data source. Channels A and B can set to either Pilot, Sync or Traffic. Channel C can use Pilot only. Internal signals I and Q are supplied after selecting or multiplexing signals in these three channels and passing them through filters. These I and Q signals can be output at the following timing which is synchronous with the signal from the front panel when EVEN SEC/SYNC mode is set to ENABLE.



(3) AWGN section

The AWGN generator switches the modulation mode (of the I and Q signals) to Eb or Nt.

NOTE: Noise is not added when external I and Q signals are selected.

---

(4) Synthesizer and YTO sections

A highly purity YTO local is attained in 100 Hz steps using several PLL circuits synchronous with the reference source frequency.

(5) Modulator and UP Converter sections

First, performs direct modulation using the 421 MHz band local signal and the I and Q signals.

Next, obtains an IF signal of 4.23 GHz (which is higher than RF OUT frequency) using a local signal of 3.81 GHz. The final RF output frequency is obtained after performing IF signal down conversion and then filtering the spurious signals.

(6) RF AMP section

This section consists of the RF signal amplifier and the high-precision control circuit. The 0.1 dB output level resolution is attained in this section.

The ALC mode includes the AUTO mode which is known as a common way, and S/H (sample and hold) mode to comply with a wide base band multiplexing.

(7) ATT section

This section provides an output range of -125 dBm to 0 dBm using a durable and programmable attenuator.

An accurately calibrated signal is output from RF OUT terminal on the front panel. The accuracy and RF AMP characteristics are written on each control board.

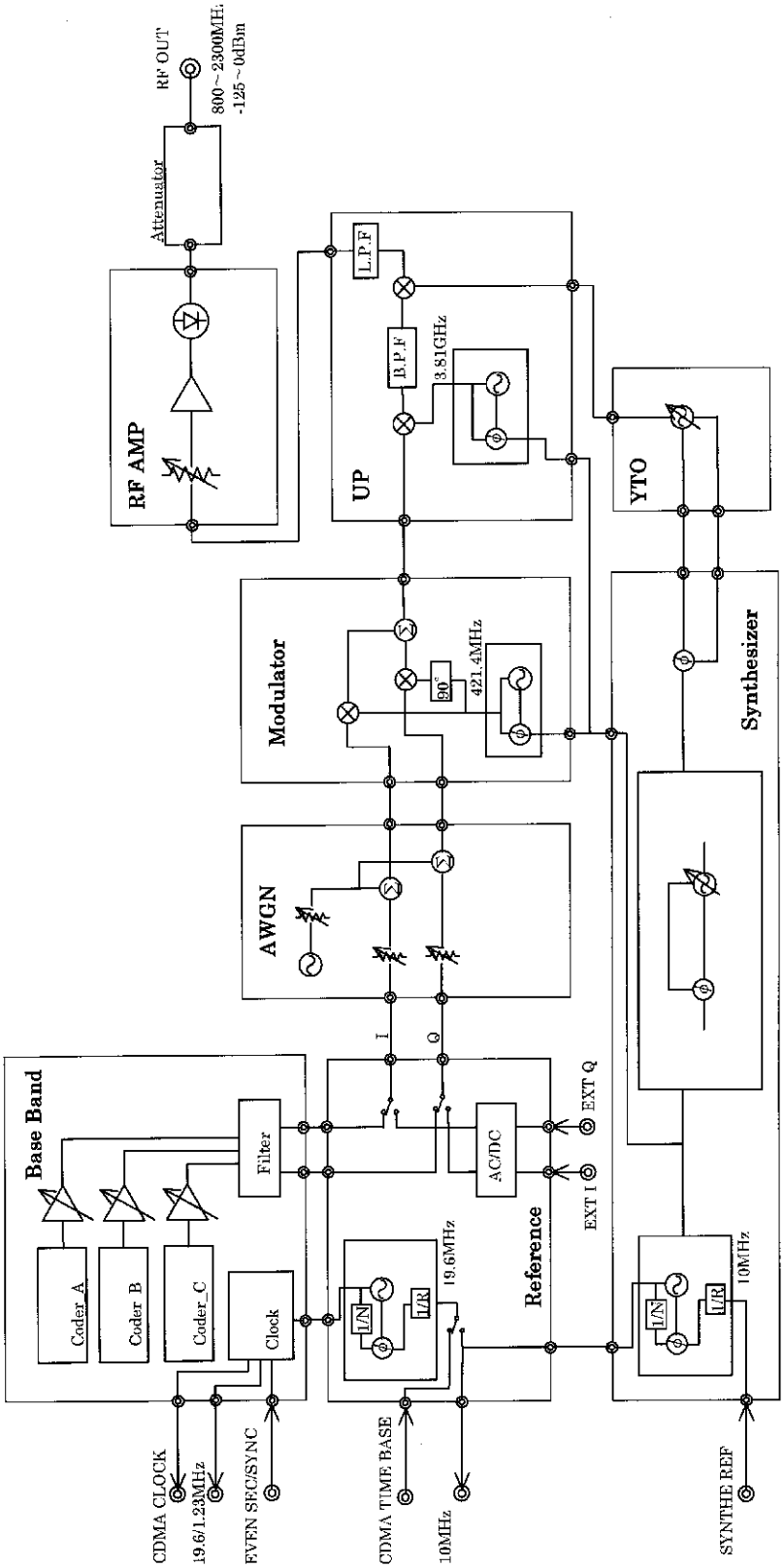


Figure 6-1 R3561 Block Diagram

7 SPECIFICATIONS

(1) Frequency

Characteristics	Specification
Range	800MHz to 2300MHz
Resolution	100Hz
Accuracy	Depending on the reference source accuracy

(2) Level

Characteristics	Specification
Range	-125dBm to 0dBm
Resolution	0.1dB
Accuracy (25 ± 10 °C)	Frequency : ≤ 1000MHz < ±1.5dB (-120.0dBm to 0dBm) < ±2.5dB (-125.0dBm to -120.1dBm) Frequency : > 1000MHz < ±1.5dB (-110.0dBm to 0dBm) < ±2.5dB (-125.0dBm to -110.1dBm)
Output impedance	50 Ω
SWR	< 1.3 : 1 (Typical)

(3) Signal Purity

Characteristics	Specification
Harmonics	< -30dBc
Non-harmonics	< -60dBc (offset >10kHz)
SSB phase noise	< -107dBc/Hz (offset : 50kHz, @1000MHz)

(4) Modulationl

Characteristics	Specification
Modulation method	OQPSK/QPSK (TIA IS-95)
Waveform quality	> 0.99 (Aftter Calibration)
ACP	< -45dBc (BW : 30kHz, offset : 750kHz) < -60dBc (BW : 30kHz, offset : 1.98MHz)
Channel types	Forward Link : Channel(A) : Pilot/Sync/Traffic Channel(B) : Pilot/Sync/Traffic Channel(C) : Pilot Reverse Link Pilot(ZEROS)/Traffic
Variable level between channels	Range : -5dB to -30dB (against the total level) Resolution : 0.1dB Accuracy : < ±0.5dB
Data transfer rat	9600bps/4800bps/2400bps/1200bps 14400bps/7200bps/3600bps/1800bps
Data source	PN9/PN15 600 fremes (User)
PN Offset	0 to 511(*64chips)
Long Code Mask	42 ZEROS
External I/Q input	DC to 2.5MHz, Frequency response < 2dBp-p $\sqrt{(I^2 + Q^2)}$ = 0.5Vrms, 50Ω Max input : AC 1.4Vp-p, DC 4V

(5) AWGN

Characteristics	Specification
Bandwidth	> 2MHz (Typical)
Eb/No(Eb/Nt)Range	0 to 15dB
Eb/No(Eb/Nt)Resolution	0.1dB
Eb/No(Eb/Nt)Accuracy	< ±1.0dB (Aftter Calibration)

(6) Reference Source

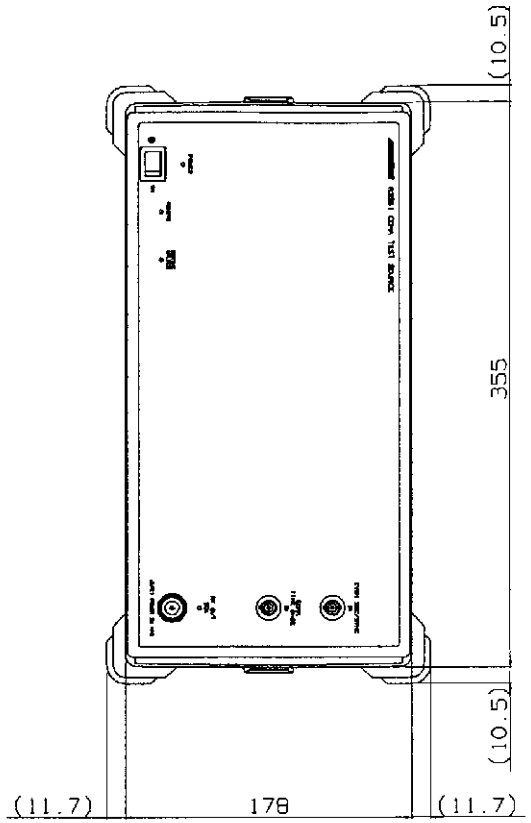
Characteristics	Specification
Internal reference source	10MHz, > 0dBm Aging rate : < 2×10^{-8}/day, < 5×10^{-7}/year
Synthe Reference CDMA TB input	Frequency : 19.6608/15/10/9.8304/5MHz 4.9152/2.4576/2/1.2288/1MHz Level : > 0dBm
EVEN Second input	2s ± 300ns (TTL)
CDMA Clock output	1.2288MHz/19.6608MHz (TTL) 20ms/26.67ms/80ms/2s/EVEN SEC (TTL)

(7) Local Output

Characteristics	Specification
Frequency	5.0314GHz to 6.5314GHz
Level	> 0dBm

(8) General Specifications

Characteristics	Specification
Operating temperature/humidity	0°C to 50°C, RH85% or less (No condensation)
Storage temperature	-20°C to 60°C, RH85% or less
Power supply	Voltage : AC100V-120V/220V-240V (Automatic change) Power consumption : 300 VA or less Frequency : 50Hz/60Hz
Mass	16 kg or less
External dimensions	Approximately 177(H) × 350(W) × 420(D) mm

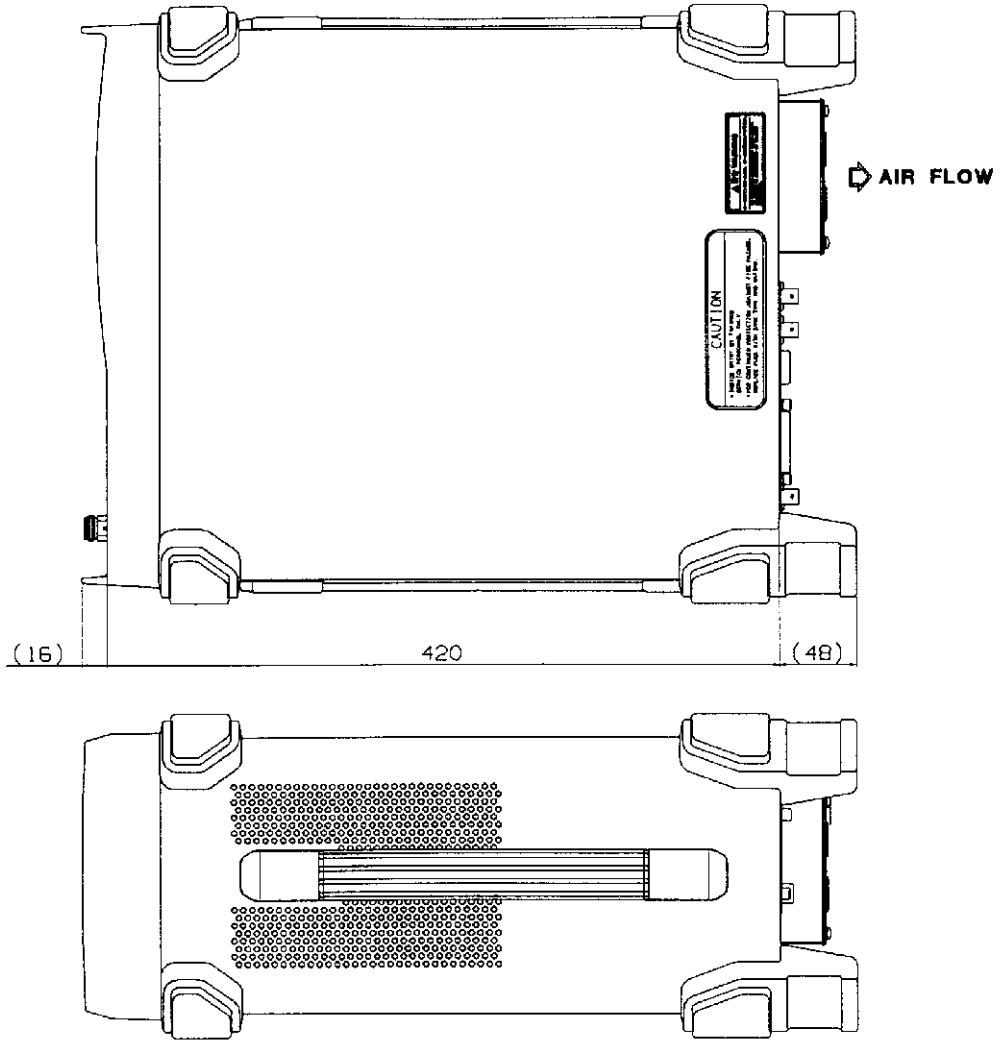


Unit : mm

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

[P]

[R]

[S]

[T]

[U]

[W]

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   (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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