MX880213A
IS-136A Measurement Software
(for MT8802A)
Operation Manual

Second Edition

Read this manual before using the equipment.
Keep this manual with the equipment.

Measuring Instruments Division
Measurement Group
ANRITSU CORPORATION

SEP.
2000

Document No.: M-W1500AE-2.0

Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Corporation uses the following safety symbols to indicate safety-related information. Insure that you clearly understand the meanings of the symbols BEFORE using the equipment.
(Some or all of the following symbols may not used on all Anritsu equipment. In addition, there may be other labels attached to products which are not shown in the diagrams in this manual.)

Symbols used in manual

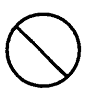
DANGER This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.

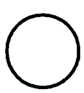
WARNING This indicates a hazardous procedure that could result in serious injury or death if not performed properly.

CAUTION This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

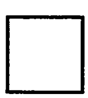
Safety Symbols Used on Equipment and in Manual

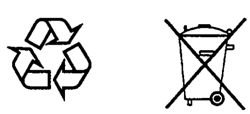
The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Insure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.


This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.


This indicates an obligatory safety precaution. The obligatory operation is indicated symbolically in or near the circle.


This indicates warning or caution. The contents are indicated symbolically in or near the triangle.


This indicates a note. The contents are described in the box.


These indicate that the marked part should be recycled.

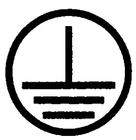
MT8802A Radio Communication Analyzer
MX880213A IS-136A Measurement Software
Operation Manual

10 August 1998 (First Edition)
1 December 1999 (Second Edition)

For Safety

WARNING ⚠

1. ALWAYS refer to the operation manual when working near locations at which the alert mark shown on the left is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced.
   Moreover, this alert mark is sometimes used with other marks and descriptions indicating other dangers.



2. When supplying power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. If a grounded 3-pin outlet is not available, before supplying power to the equipment, use a conversion adapter and ground the green wire, or connect the frame ground on the rear panel of the equipment to ground. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock.

Repair

WARNING ⚠

3. This equipment cannot be repaired by the user. DO NOT attempt to open the cabinet or to disassemble internal parts. Only Anritsu-trained service personnel or staff from your sales representative with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision parts.

Falling Over

4. This equipment should be used in the correct position. If the cabinet is turned on its side, etc., it will be unstable and may be damaged if it falls over as a result of receiving a slight mechanical shock.

For Safety

WARNING ⚠

Battery fluid

5. DO NOT short the battery terminals and never attempt to disassemble it or dispose of it in a fire. If the battery is damaged by any of these actions, the battery fluid may leak.

   This fluid is poisonous.

   DO NOT touch it, ingest it, or get in your eyes. If it is accidentally ingested, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, irrigate them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.

LCD

6. This instrument uses a Liquid Crystal Display (LCD);
   DO NOT subject the instrument to excessive force or drop it. If the LCD is subjected to strong mechanical shock, it may break and liquid may leak.
   This liquid is very caustic and poisonous.
   DO NOT touch it, ingest it, or get in your eyes. If it is ingested accidentally, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, irrigate them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.

For Safety

CAUTION ⚠

Changing Fuse

CAUTION ⚠

1. Before changing the fuses, ALWAYS remove the power cord from the poweroutlet and replace the blown fuses. ALWAYS use new fuses of the type and rating specified on the fuse marking on the rear panel of the cabinet.

   T□□□A indicates a time-lag fuse.
   □□□A or F□□□A indicates a ordinary melt type fuse.
   There is risk of receiving a fatal electric shock if the fuses are replaced with the power cord connected.

Cleaning

2. Keep the power supply and cooling fan free of dust.
   - Clean the power inlet regularly. If dust accumulates around the power pins, there is a risk of fire.
   - Keep the cooling fan clean so that the ventilation holes are not obstructed. If the ventilation is obstructed, the cabinet may overheat and catch fire.

Heavy weight

⚠ CAUTION
>18 kg
Heavy weight

3. Use two or more people to lift and move this equipment, or use a trolley. There is a risk of back injury, if this equipment is lifted by one person.

Check Terminal

⚠

4. Never input a signal of more than the specified voltage between the measured terminal and ground. Input of an excessive signal may damage the equipment.

5. Do not take out the floppy disk if LED lamp of the floppy disk drive is on. If it is taken out, the contents of the storage medium will be damaged, resulting in floppy disk drive failure.

CAUTION ⚠

Memory Back-up Battery

6. The power for memory back-up of the MT8802A is supplied by a poly-carbomonofluoride lithium battery. this battery should only be replaced by a battery of the same type; since replacement can only be made by Anritsu, contact the nearest Anritsu representative when replacement is required.
At the end of it's life, the battery should be recycled or disposed properly.
Note: The Battery life is about 7 years. Early battery replacement is recommended.

Storage Medium

7. The MT8802A stores data and programs using a floppy disk (FD), memory card (MC), and backed-up memories.
Data and programs may be lost due to improper use or failure.
Anritsu therefore recommends that you back up the memory.
ANRITSU CANNOT COMPENSATE FOR ANY MEMORY LOSS.

Please pay careful attention to the following points. Do not remove the floppy disk from the equipment being accessed.

(FD)
- Do not touch the FD directly or by using any object.
- Do not place the equipment where dirty and dusty.
- Isolate the FD and memory card from static electricity.
- Avoid to placing the FD in direct sunlight or near heating sources.
- Store under temperature of 40° to 54°C, humidity of 8 to 90% (No condensation).

(Memory card)
- Isolate the memory card from static electricity.

(Backed-up memory)
- Isolate the memory from ststic electricity.

Disposing of the Product

8. The MT8802A uses chemical compound semiconductor including arsenic.
At the end of its life, the MT8802A should be recycled or disposed properly according to the local disposal regulations.

Equipment Certificate

Anritsu Corporation certifies that this equipment was tested before shipment using calibrated measuring instruments with direct traceability to public testing organizations recognized by national research laboratories including the Electrotechnical Laboratory, the National Research Laboratory and the Communication Research laboratory, and was found to meet the published specifications.

Anritsu Warranty

Anritsu Corporation will repair this equipment free-of-charge if a malfunction occurs within 1 year after shipment due to a manufacturing fault.
When this software alone is purchased, Anritsu will repair or exchange this software free-of-charge at the company's own discretion if it provides defective within 1 year after purchase when used as described in the operation manual.
This warranty is rendered void under any or all of the following conditions.

- The fault is outside the scope of the warranty conditions described in the operation manual.
- The fault is due to misoperation, misuse, or unauthorized modification or repair of the equipment by the customer.
- The fault is due to severe usage clearly exceeding normal usage.
- The fault is due to improper or insufficient maintenance by the customer.
- The fault is due to natural disaster including fire, flooding and earthquake, etc.
- The fault is due to use of non-specified peripheral equipment, peripheral parts, consumables, etc.
- The fault is due to use of a non-specified power supply or in a non-specified installation location.

In addition, this warranty is valid only for the original equipment purchaser. It is not transferable if the equipment is resold.

Anritsu Corporation will not accept liability for equipment faults due to unforeseen and unusual circumstances, nor for faults due to mishandling by the customer.

Anritsu Corporation Contact

If this equipment develops a fault, contact Anritsu Corporation or its representatives at the address in this manual.

Software License Agreement

Please read this Software License Agreement before using the accompanying software program (hereafter this software).

You are authorized to use this software only if you agree to all the terms of this License.

By opening the sealed package containing this software, you are agreeing to be bound by the terms of this License.

If you do not agree to these terms, return the unopened software package to Anritsu Corporation (hereafter Anritsu).

1. License

(1) This License gives you the right to use this software on one MT8802A Radio Communication Analyzer, MX880213A IS-136A Measurement Software (hereafter computer system).

(2) To use this software on one computer system, this License allows you to make one copy of this software on the storage device of your computer system.

(3) You must obtain a site license to use this software on more than one computer system even if such computer systems are not operating simultaneously.

2. Copyright

(1) Although you are licensed to use this software, Anritsu retains the copyright.

(2) Although you have purchased this software, rights other than those specified in this License are not transferred to you.

(3) You may not print, copy, modify, create derivative works, incorporate in other software programs, decompile or disassemble this software in whole or in part, without obtaining prior written permission from Anritsu.

3. Copying

Notwithstanding item (3) of section 2 above, you may make one copy of this software for backup purposes only. In this case, you may only use either the backup copy or the original copy of this software.

4. Termination

(1) Anritsu will deem this License to be automatically terminated if you fail to comply with any provision of this License. Upon termination, you will lose all rights to this software.

(2) Either party (Anritsu or yourself) to this Software License Agreement may terminate this Agreement by giving 1 months notice in writing to the other party.

(3) Upon termination of this License for any reason, you must either immediately destroy this software and related documentation, or return it to Anritsu.

Front Panel Power Switch

To prevent malfunction caused by accidental touching, the front power switch of this equipment turns on the power if it is pressed continuously for about one second in the standby state. If the switch is pressed continuously for one second in the power-on state, the equipment enters the standby state.

In the power-on state, if the power plug is removed from the outlet, then reinserted into it, the power will not be turned on. Also, if the lines is disconnected due to momentary power supply interruption or power failure, the power will not be turned on (enters the standby state) even if the line is recovered.

This is because this equipment enters the standby state and prevents incorrect data from being acquired when the line has to be disconnected and reconnected.

For example, if the data acquisition requires a long time at the BER measurement, momentary power supply interruption (power failure) might occur during measurement and the line could be recovered automatically to power-on. In such a case, the equipment may mistake incorrect data for correct data without recognizing the momentary power supply interruption.

If this equipment enters the standby state due to momentary power supply interruption or power failure, check the state of the measuring system and press the front power switch to restore power to this equipment.

Further, if this equipment is built into a system and the system power has to be disconnected then reconnected, the power for this equipment must also be restored by pressing the front power switch.

Consequently, if this equipment is built into remote monitoring systems that use MODEMs, the standby function of this equipment must be modified.

Trade Mark

[IBM] is a registered trademark of the IBM Corporation.
[HP] is a registered trademark of the Hewlett-Packard Company.
[MS-DOS] is a registered trademark of the Microsoft Corporation.
[NEC] is a registered trademark of the NEC Corporation.

CE Marking

Anritsu affix the CE Conformity Marking on the following product (s) accordance with the Council Directive 93/68/EEC to indicate that they conform with the EMC directive of the European Union (EU).

CE Conformity Marking

1. Product Name/Model Name

Product Name: IS-136A Measurement Software for MT8802A
Model Name: MX880213A

2. Applied Directive

EMC : Council Directive 89/336/EEC

Safety: Council Directive 73/23/EEC

3. Applied Standards

EMC:

Electromagnetic radiation:

EN55011(ISM, Group 1, Class A equipment)

Immunity:

EN50082-1

		Performance Criteria*
IEC801-2 (ESD)	4 kVCD, 8 kVAD	B
IEC801-3 (Rad.)	3 V/m	A
IEC801-4 (EFT)	1 kV	B

*: Performance Criteria

A: No performance degradation or function loss

B: Self-recovered temporary degradation of performance or temporary loss of function

Harmonic current emissions:

EN61000-3-2 (Class A equipment)

Safety: EN61010-1 (Installation Category II, Pollution Degree 2)

Anritsu affix the C-tick marking on the following product(s) accordance with the regulation to indicate that they conform with the EMC framework of Australia/New Zealand

C-tick marking

N274

1. Product Name/Model Name

Product Name: IS-136A Measurement Software for MT8802A

Model Name: MX880213A

2. Applied Standards

EMC:

Emission:

AS/NZS 2064.1/2 (ISM, Group 1, Class A equipment)

Immunity:

AS/NZS 4252.1

		*Performance Criteria
IEC801-2 (ESD)	8 kVAD	B
IEC801-3 (Rad.)	3 V/m	A
IEC801-4 (EFT)	1 kV(peak)	B

* Performance Criteria

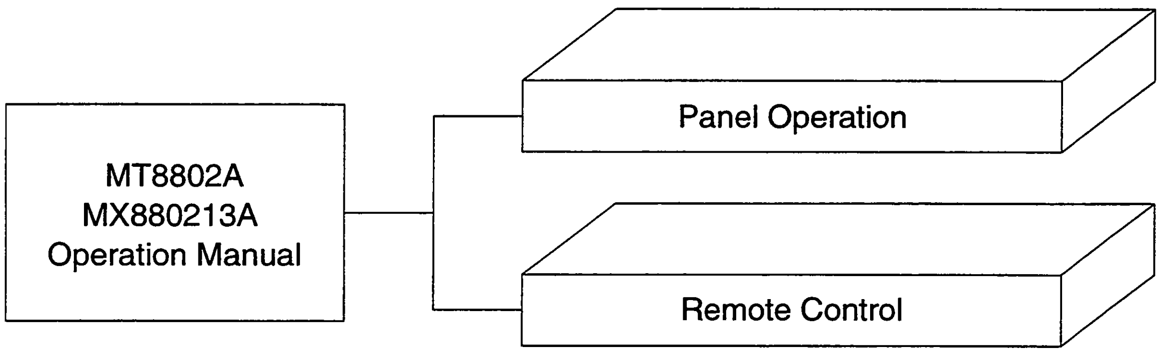
A: No performance degradation or function loss

B: Self-recovered temporary degradation of performance or temporary loss of function

ABOUT THIS MANUAL

(1) This manual describes the operation of the MT8802A Radio Communication Analyzer using the measurement software installed.

(2) MX880213A Operation Manual
The MT8802A Radio Communication Analyzer and MX880213A IS-136A Measurement Software operation manuals consist of the following two manuals. Use the manuals matching the usage objective.



Panel Operation: Outlines the MT8802A and describes its preparations, panel explanations, operations, performance text, calibrations, storage and transportation.

Remote Control: Describes RS-232C/GPIB remote control and the sample programs etc..

MX880213A
IS-136A Measurement Software (for MT8802A)
Operation Manual

Panel Operation

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SECTION 1
GENERAL

TABLE OF CONTENTS

1.1 General

The MT8802A Radio Communication Analyzer is a measuring-instrument platform that consists of the hardware components necessary for testing mobile telecommunication terminals. Using the MT8802A along with the optionally available measurement software allows you to evaluate the performance of mobile telecommunication equipment with efficiency.

By using measurement software MX880213A, you can use the MT8802A as an integrated measuring instrument (hereafter called this analyzer) that can evaluate the functions and performance of the mobile telecommunication equipment conforming to IS-136 (North American standard for digital/analog automobile telephones).

This analyzer is provided with such measurement functions as digital and analog mobile-station (MS) control, transmission measurement, reception measurement, and sequence monitoring. This analyzer alone can test the IS-136 dual-mode mobile station for transmission and reception.

Measurement functions offered by this analyzer are as follows:

- Mobile station control: A mobile station can be set for analog or digital measurement by performing call processing.
- Digital transmission measurement: IS-136-specified digital modulated signals (e.g., carrier frequency, RF level, modulation accuracy) can be measured.
- Analog transmission measurement: IS-136-specified analog modulated signals (e.g., carrier frequency, RF level, modulation factor, distortion rate) can be measured.
- Digital reception measurement: The bit error rate can be measured by outputting a digital modulated signal and checking the demodulated data from a mobile station. This enables the reception sensitivity of the mobile station to be measured based on the measured bit error rate.
- Analog reception measurement: The AF signal level, SINAD, and other conditions of a mobile station can be measured by outputting an analog modulated signal. This enables the reception sensitivity, and other conditions of the mobile station to be measured based on the measurement data.
- AF signal measurement: The AF signal level, frequency, distortion rate, and other conditions can be measured.
- Sequence monitoring: A performance test can be conducted for Call Processing of origination, termination, release, and hand-over.

This analyzer is equipped with a high-speed digital signal processing technology, allowing you to carry out transmission and reception measurements quickly and with high accuracy.

1.2 Manual Composition

This manual is made up of the following sections.

Section 1 General

Describes the introduction, composition, function specifications and performance of this instrument.

Section 2 Preparations before Use

Explains various work to be performed before using this instrument.

Section 3 Panel Layout and Overview of Operation

Explains the basic items for operating this equipment.

Section 4 Operation

Explains basic operation and how to operate for each measurement item.

Section 5 Performance Test

Explains the performance test method for this instrument.

Section 6 Calibration

Describes calibration items and methods for the periodical calibration of this equipment.

Section 7 Storage and Transportation

Describes how to store and transport this equipment.

Appendix A Screens and Function Key Transition Diagrams

Appendix B Initial Values

Appendix C Index

1.3 Equipment Configuration

This paragraph describes the configuration of the MX880213A standard accessories.

1.3.1 Standard configuration

The table below shows the configuration of the MX880213A with the standard accessories.

Table 1-1 MX880213A standard accessories

Item	Order No.	Name	Qty	Remarks
Software	MX880213A	IS-136A Measurement Software	1	
Accessories	W1500AE	Operation manual	1	For IS-136A system

The table below shows the configuration of the MT8802A with the standard accessories.

Table 1-2 MT8802A standard accessories

Item	Order No.	Name	Qty	Remarks
Main instrument	MT8802A	Radio communication analyzer	1	
Accessories	J0576B	Coaxial cord	1	N-P·5D-2W·N-P, 1m
	J0768	Coaxial adapter	2	N-J·TNC-P
	J0017F	Power cord	1	2.6m
	J0266	Adapter	1	3 poles to 2 poles plug conversion adapter
	F0014	Fuse	2	6.3A for 100V/200V system

1.3.2 Option

The table below shows the MT8802A options.

These are sold separately.

Table 1-3 Options

Option No.	Name
07	Spectrum analyzer

1.3.3 Software

The table below shows the MT8802A Softwares.

Table 1-4 Softwares

Model/Order No.	Name	Remarks
MX880201A	CDMA measurement software	Sequence Monitor provided.
MX880213A	IS-136A measurement software	Sequence Monitor provided.

1.4 Optional Accessories and Peripherals

The following table shows the optional accessories and peripherals for the MT8802A which are all sold separately.

Table 1-5 Optional Accessories and Peripherals

<Optional accessories>

Model*/Order No.	Name*	Remarks
J0127C	Coaxial cord	BNC-P•RG-58A/U•BNC-P, 0.5m
J0769	Coaxial adapter	BNC-J•TNC-P
J0040	Coaxial adapter	N-P•BNC-J
J0007	GPIB connection cable	408JE-101, 1m
J0008	GPIB connection cable	408JE-102, 2m
J0742A	RS-232C cable	1m, D-sub 25pins, for PC-9800 Series personal computer of NEC Corp.
J0743A	RS-232C cable	1m, D-sub 9pins, for IBM PC/AT personal computer
MN1607A	Coaxial switch	DC to 3GHz, 50Ω, externally controllable
MA1612A	4-Port junction pad	5 to 3000MHz
J0395	Attenuator for high power	30dB, 30W, DC to 9GHz
B0329D	Protective cover	
B0331D	Front handle kit	2 pcs/set
B0332	Coupling plate	4 pcs/set
B0333D	Rack mounting kit	
B0334D	Carrying case	With casters and protective cover

* Please specify the model/order number, name, and quantity when ordering.

<Peripherals and applicable units>

Model*/Order No.*	Name*
MS8606A	Digital mobile radio transmitter tester
MS2602A	Spectrum analyzer
MG3670B	Digital modulation signal generator

* Please specify the model/order number, name, and quantity when ordering.

1.5 Specifications

The MT8802A specifications are listed in Tables 1-6 to 1-7 below.

Table 1-6 MT8802A Specifications

General	Frequency range		300 kHz to 3 GHz
	Maximum input level		+40 dBm(10 W) (MAIN connector) +20 dBm (100 mW) (auxiliary input connector)
	Input/output connector	MAIN I/O connector	N-type connector Impedance 50 Ω, VSWR≤1.2 (Frequency≤2.2 GHz) VSWR≤1.3 (Frequency>2.2 GHz)
		Auxiliary input connector, Auxiliary output connector	TNC connector
	Reference oscillator	Frequency	10 MHz
		Starting characteristic	≤5 x 10^{-8}/day After 10 minutes of warm-up, refered to frequency after 24 hours of warm-up
		Aging rate	≤2 x 10^{-8}/day ≤1 x 10^{-7}/year Refered to frequency after 24 hours of warm-up
		Temperature characteristic	5 x 10^{-8} (0 to 50°C) Refered to frequency at 25°C
		External standard input	10 MHz or 13 MHz(within ±1 ppm), Input level : 2 to 5 Vp-p
Others	Display		Color TFT LCD display Size: 7.8 inches Number of dots: 640 x 480
	Hard copy		Enables data hard copy on the display through a parallel interface. (Only for the EPSON VP Series and other close kind models)
	External control	GPIB	Function: This equipment is specified as a device, can be controlled from external controller. (excluding power switch and FD ejection key) No controller function Interface function: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, and E2
		Parallel	Function: Conforms to the Centronics. Outputs printing data to a printer. Data line exclusive for output: 8 Control line: 4 (BUSY, $\overline{\text{DTSB}}$, $\overline{\text{ERROR}}$, PE) Connectors: D-sub 25 pins, Female (Equivalent to the connector of IBM-PC/AT built-in printer)
		RS-232C	Controlled from an external controller (except for the power switch) Baud rate: 1200, 2400, 4800, or 9600 bps
Dimensions Mass Power supply	Dimensions		221.5 mm (H) X 426 mm (W) X 451 mm (D)
	Mass		≤27 kg (When the optional accessories are not equiped)
	Power supply		100 to 120 V, 200 to 240 V 47.5 to 63 Hz, ≤300 VA Automatic voltage switch system
	Operating temperature range		0 to 50°C

Table 1-7 MX880213A IS-136A Measurement Software Specifications

Transmission measurement	Modulation/ frequency measurement	Frequency range		10 MHz to 2.2 GHz
		Input level range		–10 to +40 dBm (Average power within burst) : MAIN connector –30 to +15 dBm (Average power within burst) : AUX Input connector
		Carrier frequency		Accuracy: ±(accuracy of the reference frequency +1 Hz)
		Modulation accuracy		Accuracy: ±(2% of indicated value +0.5%)
		Origin offset		Accuracy: ±0.5 dB (to a signal level of –30 dBc)
		Waveform display		Constellation display
	Amplitude measurement	Frequency range		10 MHz to 2.2 GHz
		Input level range		+10 to +40 dBm (Average power within burst): MAIN connector
		Transmission power		Accuracy: ±10% (MAIN connector) (after calibration by using built-in power meter)
		Carrier-off power	Normal mode	Measurement range: ≥65 dB (compared with burst average power)
			Wide dynamic range mode	Measurement range: ≥96 dB (compared with 4 W of burst average power) Measurment limit is decided by average noise level (≤-60 dBm, 100 MHz to 2.1 GHz).
		Rise/fall characteristic		Displays rising/falling edges while synchronizing to modulation data of signal to be measured. Standard line display possible. Raising/falling time measurement (measured by 100 kHz bandwidth)
	Occupied bandwidth measurement	Frequency range		10 MHz to 2.2 GHz
		Input level range		+10 to +40 dBm (Average power within burst): MAIN connector
		Measurement	High-speed mode	Measurement: Displays results of occupied bandwidth calculation after FFT transform of a signal (1 burst) under measurement.
	Adjacent channel leakage power measurement	Frequency range		100 MHz to 2.2 GHz
		Input level range		+10 to +40 dBm (average power within burst): MAIN connector
		Measurement	High-speed mode	Measurement: Displays results of adjacent channel leakage power calculation after passing through built-in reception filter(Root Nyquist characteristics)
		Measurement range	High-speed mode	30 kHz offset: ≥30 dB 60 kHz offset: ≥60 dB 90 kHz offset: ≥65 dB Ratio of adjacent channel leakage power during burst-on to burst-signal average power
	All measurement items	Frequency range		Same as each the measurement item.
		Input level range		Same as each the measurement item.
		Measurement item		Transmission frequency Modulation accuracy Origin offset Transmission power Carrier off power Pass/Fail judgement of specification for transmission-output-power time response Adjacent channel leakage power
		Measurement time		≤1.5 seconds Note that amplitude measurement is done in normal mode; adjacent channel leakage power measurement is done in high-speed mode.
				≤2 seconds Note that amplitude measurement is done in wide dynamic range mode; adjacent channel leakage power measurement is done in high-speed mode. (The time from the start to completion (SRQ signal generation) of measurement by GPIB control)

Table 1-7 MX880213A IS-136A Measurement Software Specifications

(Cont.)

Reception measurement	Signal generator	Frequency range	10 MHz to 3 GHz
		Level range	−133 to −13 dBm (MAIN connector) −133 to +7 dBm (Auxiliary Output connector)
		Modulation system	$\pi/4$ DQPSK, α=0.35 (Root Nyquist filter)
		Modulation accuracy	≤3% rms
		Burst repeat period	20 ms(Normal) Note that one burst is outputted in one frame.
		Modulation data	Continuous waveform output: • PN9 pseudo-random patterns and arbitrary 4-bit data repetitive patterns Burst waveform output: • Downlink communication channel patterns • Data editing in slots possible.
	Error rate measurement	Function	Error rate measurement is done by synchronizing to modulated data of signal generator.
		Input connector	• RF input connector (Front panel, only for burst signal measurement) • BER input connector: BNC (Rear panel), DUT interface (Front panel)
		Measurement pattern	PN9 (Measurement of TCH data in uplink communication burst when RF input)
		Input signal	• RF input connector Frequency: 10 MHz to 2.2 GHz Level: −10 to +40 dBm (Average power within burst), MAIN connector • BER input connector: BNC (Rear panel), DUT interface (Front panel) Level: TTL (NRZ)
		Number of measurement bits	1 to 99 999 999
Call processing	Executes call processing of location registration, origination, termination, conversation, handoff, mobile-station release, and network release (in analog and digital dual modes).		
Analog measurement functions	The following analog functions are provided: Performance conforms to MT8802A (Analog Measurement). Signal generator Frequency modulation (FM) function AF oscillator Tone generation function Noise generation function RF analyzer Power meter (wide band) function Power meter (narrow band) function Frequency counter function FM/øM measurement function FM demodulation output Audio analyzer AF level measurement function Distortion measurement function AF frequency measurement function		

SECTION 2
PREPARATIONS BEFORE USE

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2.1 Installation Site and Environmental Conditions

The MT8802A Radio Communication Analyzer operates normally at temperatures from 0° to 50°C. However, for the best performance, the following locations should be avoided.

- Where there is severe vibration
- Where the humidity is high
- Where the equipment will be exposed to direct sunlight
- Where the equipment will be exposed to active gases

To insure long-term trouble-free operation, the equipment should be used at room temperature and in a location where the power supply voltage does not fluctuate greatly.

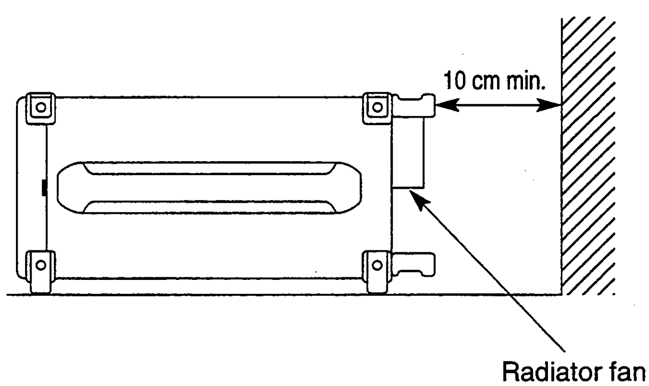
CAUTION ⚠

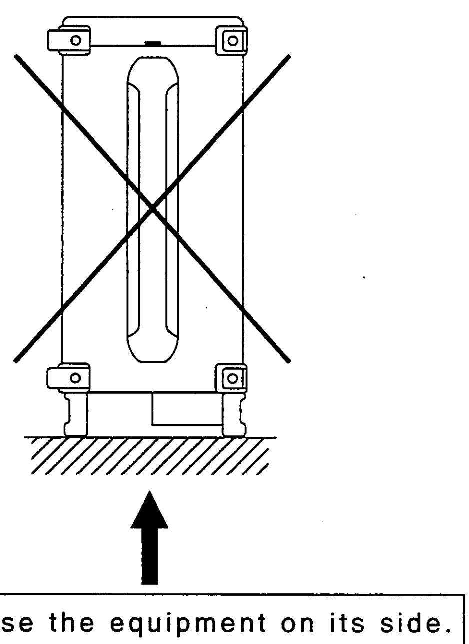
- Prevention of failure due to condensation

If the MT8802A is used at normal temperatures after it has been used or stored for a long time at low temperature, there is a risk of short-circuiting caused by condensation.
To prevent this risk, do not turn the power on until the MT8802A has been allowed to dry out sufficiently.

Fan clearance:

To suppress any internal temperature increase, the MT8802A has a fan on the rear panel as shown in the diagram below. Leave a gap of at least 10 cm between the rear panel and the wall, nearby equipment or obstructions so that fan ventilation is not blocked.





2.2 Safety Measures

This paragraph explains the safety procedures which should be followed under all circumstances to counter the risk of an accidental electric shock, damage to the equipment or a major operation interruption.

2.2.1 Safety measures for power supply

WARNING ⚠

Before power-on:
- Protective grounding
  The MT8802A must be connected to ground. If the power is turned on without taking this countermeasure, there is a risk of receiving an accidental electric shock.
- Power supply voltage
  In addition, it is essential to check the power supply voltage. If an abnormal voltage that exceeds the specified value is input, there is an accidental risk of damage to the MT8802A and fire.

During power on:
- To maintain the MT8802A, sometimes it is necessary to make internal checks and adjustments with the top, bottom or side covers removed while power is supplied. Very-high, dangerous voltages are used in the MT8802A; if insufficient care is taken, there is a risk of an accidental electric shock being received or of damage to the equipment. To maintain the MT8802A, request service by service personnel who has received the required training.

In the following, special notes on safety procedures are explained for sections other than Section 2. To prevent accidents, read this section together with the related sections before beginning operation.

2.2.2 Maximum power to connector

The allowable maximum power to the MT8802A connectors are as follows.

Connector	Allowable maximum power
Main Input/Output	10 W (40 dBm)
AUX Input	100 mW (20 dBm)
AUX Output	Exclusive output connector, 0.5 mW (-3 dBm)
AF Input	30 Vrms
AF Output	Dedicated output connector, 5 Vrms (output impedance : 600 Ω), 0.5 Vrms (output impedance : 50 Ω)
DUT Interface	TTL level
Reference Input	2 to 5 Vp-p
10MHz Buffered Output	Dedicated output connector, TTL level
Detector Output	Dedicated output connector, TTL level
BER Input connectors	TTL level
Ext Trig Input	TTL level
Ext Trig Output	Dedicated output connector, TTL level
Ext FM Input	±10 Vp-p
Demod Output	Dedicated output connector, ±8 Vp-p
CDMA Timing	Dedicated output connector, TTL level

CAUTION ⚠

- Excessive power protection
  Never apply power more than the allowable maximum power. Also, do not input external signal to the output connector.

2.3 Preparations before Power-on

The MT8802A operates normally when connected to 100 to 120 Vac, 47.5 to 63 Hz, or 200 to 240 Vac, 47.5 to 63 Hz AC power supply via the power inlet.

To prevent the following problems, take the necessary procedures described on the following pages before power is supplied.

- Accidental electric shock
- Damage caused by abnormal voltage
- Ground current problems

To protect the operator, the following WARNING and CAUTION notices are attached to the rear panel of the MT8802A.

WARNING ⚠

NO OPERATOR SERVICE-
ABLE PARTS INSIDE.
REFER SERVICING TO
QUALIFIED PERSONNEL.

WARNING
Disassembly, adjustment, maintenance, or other access inside this instrument by unqualified personnel should be avoided. Maintenance of this instrument should be performed only by Anritsu trained service personnel who are familiar with the risks involved of fire and electric shock.

CAUTION ⚠

FOR CONTINUED FIRE
PROTECTION REPLACE
ONLY WITH SPECIFIED
TYPE AND RATED FUSE.

CAUTION
Replace only with fuses of the specified type and rating. The use of improper fuses may cause fire.

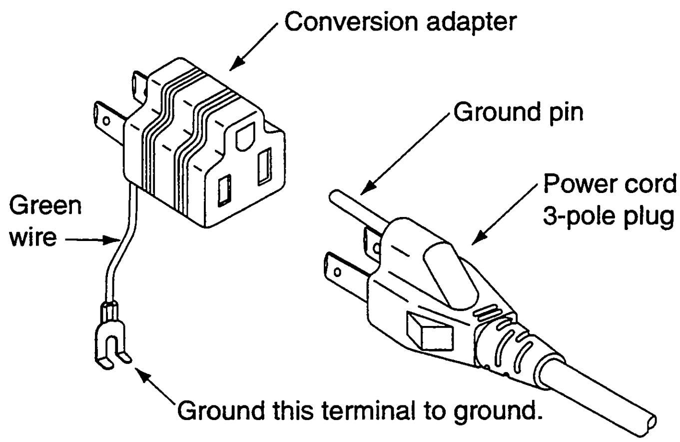
2.3.1 Protective grounding

(1) Grounding with 3-pole power outlet

The power supply polarity of the 3-pole (grounded, 2-pole type) matches that of the 3-core power cord plug. Therefore, the MT8802A is connected to ground potential when the power cord is connected to the plug. As a result, it is not necessary to connect the FG terminal to ground.

(2) Grounding with conversion adapter

If a 3-pole power socket is not provided, use the 3-pole to 2-pole conversion adapter as shown in the figure below. Connect the green wire protruding from the 3 to 2 conversion adapter to ground.

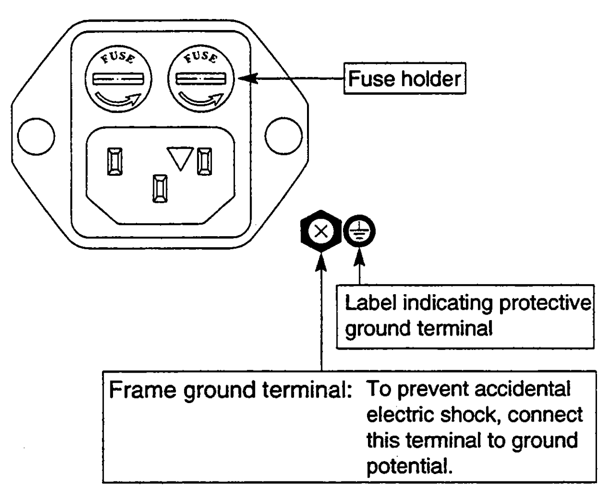


(3) Grounding with frame ground (FG) terminal

If a 3-pole ac power supply outlet is not available and the green wire cannot be grounded, the protective frame ground (FG) terminal on the rear panel must be connected directly to ground potential.

WARNING ⚠

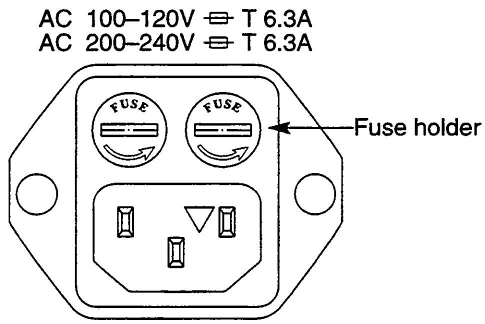
• Prevention of danger using protective ground terminal
If power is supplied without protective grounding, there is a risk of accidental electric shock. If a 3-pole power supply outlet is not available and the green wire cannot be grounded, the protective frame-ground (FG) terminal on the rear panel must be connected to ground potential before power is supplied to the MT8802A.



2.3.2 Replacing fuse

The MT8802A with standard accessories has two spare fuses (T6.3A250V). Use these fuses to replace the blown fuses. If the fuses must be replaced, locate and remedy the cause before replacing the blown fuses.

Power supply system	Voltage range	Fuse rating plate	Fuse rating	Fuse name	Model/Order No.
100 Vac	100 – 120V	T6.3A	6.3A, 250V	T6.3A 250V	F0014
200 Vac	200– 240V	T6.3A			



WARNING ⚠

- Prevention of electric shock

Before replacing the fuses, turn the power switch off and remove the power cord from the power outlet. If the fuses are replaced while power is being supplied,there is a serious risk of electric shock.

- Confirmation before turning the power on

After replacing fuses, the protective grounding mentioned above must be provided before turning the power on again, and the proper AC power supply voltage must be confirmed.
If the AC power supply voltage is improper, there is a risk of the internal circuits of the MT8802A being damaged.

CAUTION ⚠

- Check on replacing fuses

If the replacement fuses are not provided, obtain replacement fuses of the same rated voltage and current as the fuses in the fuse holders.
If the replacement fuses are not of the same type, they may not fit correctly, and failure will occur due to melting of the fuse.
When the rated voltage and current are over-sufficient, the fuses may not blow even if there is a risk of damage to the equipment by fire.

After performing the safety procedures, replace the fuses according to the following procedure.

Step	Procedure
1	Turn off the power switches on the front and rear panels, then remove the power cord from the power supply outlet.
2	Use a screwdriver to turn the fuse holder cap shown in the figure counterclockwise. The cap and fuse are removed together as a unit from the AC inlet.
3	Remove the fuse from the fuse cap and replace it with a spare fuse.
4	Return the fuse cap with the fuse to the fuse holder, then fasten it by turning it clockwise with the screwdriver.

* Contact the Anritsu service department for fuses by specifying the model name, order number, name, and quantity.

2.4 Installation

2.4.1 Rack mounting

The B0333D Rack Mounting Kit (sold separately, Table 1-3) is required to mount the MT8802A in a rack.
The installation method is included in the rack mount kit diagram.

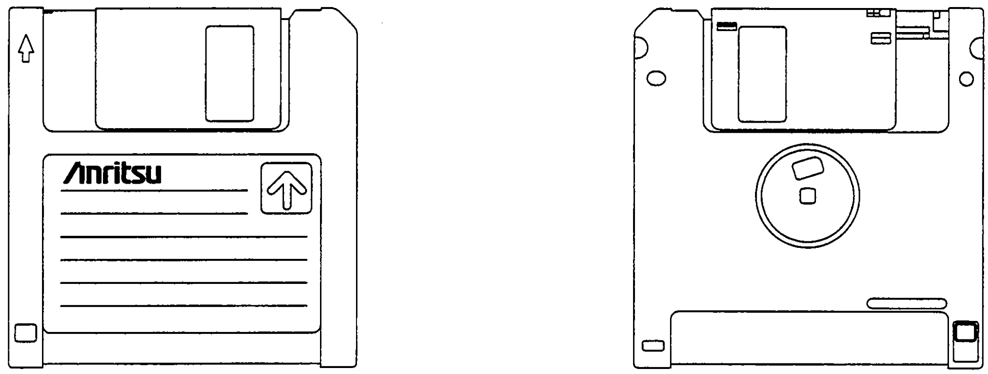
2.4.2 Stacking

When stacking several MT8802As or stacking the MT8802A with equipment of the same width as the MT8802A, the B0332 Coupling Plate (sold separately, Table 1-3) are required.

2.5 Precautions for Handling Storage Media

2.5.1 Floppy disk

The following explains how to handle the floppy disk media of this instrument.



Front Rear

Fig. 2-1 3.5-inch Floppy Disk

(1) Precautions

The plastic case of the 3.5-inch floppy disk has a shutter to protect the disk inside. When the disk is inserted into the disk drive, the shutter opens to expose part of the disk. Do not touch the shutter.

The following care must be taken for handling the disk.

(a) When a floppy disk is inserted, and LED lamp on the disk drive lights, do not eject the disk. Otherwise, the memory contents may be damaged, resulting in disk drive failure.

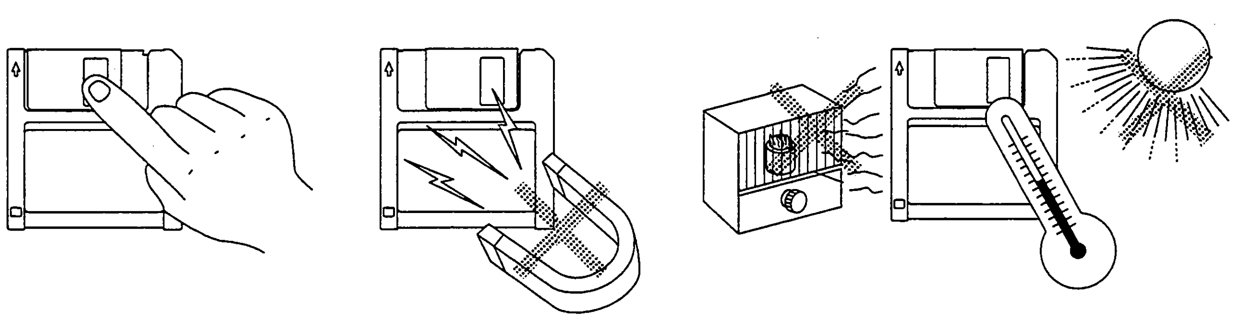
(b) Do not directly touch the magnetic surface with your hand or any object.

(c) Do not expose the disk to dust.

(d) Do not place the disk near any magnetic objects.

(e) Do not place the disk in direct sunlight or near heater.

(f) Store the disk under a temperature range of 4° to 53°C, and humidity of 8 to 90% (no condensation).



(2) Write-protection tab

A write-protection tab is provided on the 3.5-inch floppy disk.

Sliding this tab downward in the arrow direction beforehand prevents accidental writing and deletion. (A write operation is disabled in this state.)

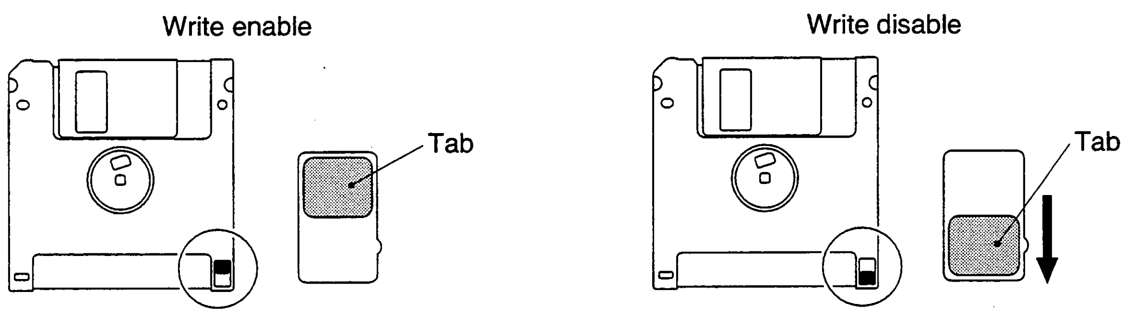


Fig. 2-2 Write-protection Tab for 3.5-inch Floppy Disk

(3) Inserting and ejecting the floppy disk

With the front surface of the floppy disk facing ups, fully insert the disk in the arrow direction until a clicking sound is heard.

To eject, press the eject button on the right side of the disk drive. Remove the disk after confirming that the LED lamp is off.

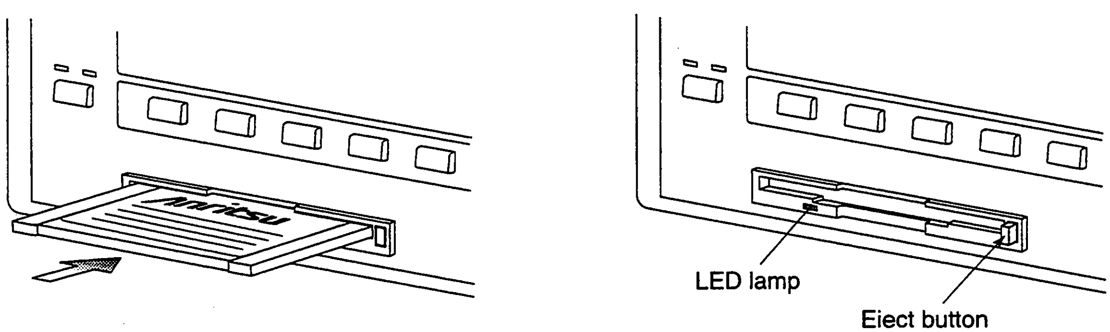


Fig. 2-3 Inserting and Ejecting the 3.5-inch Floppy Disk

SECTION 3
PANEL LAYOUT AND OVERVIEW OF OPERATION

TABLE OF CONTENTS

3.1 Panel Layout

This paragraph describes the keys, switches, LEDs, and connectors on the front and rear panels of the MT8802A Radio Communication Analyzer.

3.1.1 Front panel layout

This paragraph describes the keys, switches, LED, connectors, and the rotary knob on the front panel.

No.	Display	Function
1	F1,F2,F3,F4,F5,F6	
		Main function keys Group of keys that select and execute the corresponding menus displayed on the LCD screen. When the [Main Func] F6 key is on, the menus for F1 to F5 are placed in MT8802A measurement mode. When the [Main Func] F6 key is off, the menus of F1 to F5 are displayed for the currently used screen function.
2	F7,F8,F9,F10,F11,F12	
		Function keys Group of keys that select and execute the corresponding menus displayed on the LCD screen. These screen functions are related to the current operation.
3	Next Menu	
	▲	Displays the next page of the function key menu.
	◀	Displays the next page of the main function key menu.

No.	Display	Function outline
4		Key group for entering data.
	Shift	Switches the function of keys with a shift function. When the shift key is pressed, the key's LED goes on. Subsequent operation must be started with this LED on.
	BS	Back space key used to correct input data.
	0,.,-/+,1,2,3, A/4,B/5,C/6,D/7,E/8,F/9	Numeric keys (ten-keypad) used for data input. These keys become alphanumeric keys at shift function activation.
	(Definition key group)	The data input using the numeric keys is defined with these keys.
	W/GHz/dBm/dB	Validates data when W/GHz/dBm/dB unit system data is input.
	mW/MHz/dBμ/V/sec	Validates data when mW/MHz/dBμ/V/sec unit system data is input.
	μW/kHz/mV/ms	Validates data when μW/kHz/mV/ms unit system data is input.
	nW/Hz/μV/μs/Enter	Validates data when nW/Hz/μV/μs unit system data or non-unit system data is input.
5	Measure	Key group used to start measurement.
	Single	Key used to execute measurement once.
	Continuous	Key used to execute measurement continuously .
6	Copy	Outputs display screen to the specified printer.(Hard copy function)
7	Cursor	Key group used to control the cursor on the LCD screen.
	Set	Opens the input window for data in the item pointed to by the cursor. After the completion of data entry, the window is closed.
	Cancel	Closes the window. The input data becomes invalid.
	︿ < > ﹀	Moves the cursor.
8	Step	Key group increment or decrement numeric data.
	︿	Increments numeric data by the specified step value.
	﹀	Decrements numeric data by the specified step value.
9	(Rotary knob)	Knob used for data input. When this knob is turned clockwise, the value increases and when it is turned counterclockwise, the value decreases. For input by the rotary knob, data is validated each time it is incremented/decremented.

No.	Display	Function outline
10	Main Input/Output	Input/output connector for RF signal.(N type connector)
11	AUX	Auxiliary input/output connectors for RF signal.(TNC connector)
	Input	Auxiliary input connector for RF signal. This is used when the output level of DUT is too low.
	Output	Auxiliary output connector for RF signal. This is used when the sensitivity of DUT is too low.
12	AF Input	AF signal input connector for Analog, (BNC connector)
	AF Output	AF signal output connector for Analog, (BNC connector)
13	DUT Interface	Multi-pole connector used to output AF signal and measure the BER (D-SUB connector, 25-pin, female).
14	(Floppy disk drive)	Slot in which the floppy disk is loaded for saving and recalling data, and loading system program.
15	Stby On	Change-over switch to turn the standby power supply on when the Line Input on/off switch on the rear of this instrument is turned on. In Standby mode, power is only supplied to the reference crystal oscillator.
16	Panel Lock	Invalidates all key operations except the Panel Lock key and the Stby On power supply switch on the front panel. In lock mode, the LED on this key goes on.
17	Remote Local	Resets GPIB remote mode and returns to local mode. In GPIB remote mode, the LED (Remote) goes on.
18	Preset	Initializes measurement parameters.

3.1.2 Rear panel layout

This paragraph describes the switch and connectors on the rear panel.

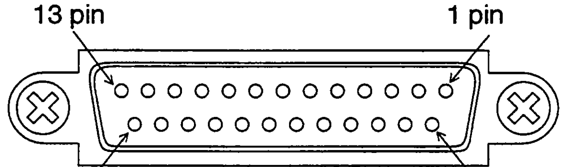
No.	Display	Function
19	O I	Input switch for AC power supply. If this switch is turned off, the Power switch on the front panel cannot be turned on.
20	(Fuses)	Power supply fuses. For safety, always use fuses of the specified rating.
21		Frame grounding terminal. For safety, always ground this terminal.
22	(Memory card cover)	The memory card is built-in. Close the cover for card use.
23	(Power supply inlet)	For safety, always use a power supply of the rated voltage.
24	GPIB	GPIB interface connector.
25	Parallel	Parallel interface connector (conforms to Centronics type). Used to connect printer (D-SUB connector, 25-pin, female).
26	Serial	RS232C interface connector (D-SUB connector, 9-pin, female).
27	10MHz Buffered Output	10 MHz reference signal (TTL level) for internal use is output (BNC connector).
28	10MHz/13MHz Reference Input	10 MHz or 13 MHz reference signal (2 to 5 Vp-p) is input (BNC connector).
29	Detector Output	RF burst signal detection output connector (BNC connector).
30	BER Input	Signal input connectors for measuring bit error rate (BNC connector).
	Data	Input connector for measurement data of bit error rate (BNC connector). TTL level signal is input.
	Clock	Input connector for clock of bit error rate (BNC connector). TTL level signal is input.
31	Ext FM Input	External FM modulation signal input connector for Analog measurement, (BNC connector)
32	Demod Output	FM demodulated signal monitor connector for Analog measurement, (BNC connector)
33	Ext Trig Input	Input connector for external trigger signal (BNC connector). TTL level signal is input.
34	Ext Trig Output	Output connector for external trigger signal (BNC connector). TTL level signal is output.
35	(Fan)	Instrument internal air cooling fan.
36	CDMA Reference Input	Not used
37	CDMA Reference Output	Output connector for CDMA clock signal (BNC connector). TTL level signal is output.
38	CDMA Timing	Connector for CDMA Timing (D-SUB 25 connector, 25-pin, female).

Specification of CDMA Timing connector

CDMA Timing connector is a 25-pin female D-SUB connector.

Pin Number	Signal name	Remark	Specification
1	GND	Signal ground	
2	1.25MSEC_OUT	Reference signal output in the cycle of 1.25 msec	5 V TTL level
3	26.7MSEC_OUT	Reference signal output in the cycle of 26.7 msec	5 V TTL level
4	PP2S_OUT	Reference signal output in the cycle of 2 seconds	5 V TTL level
5	RESER VED	Not used	
6	NC	Not connected pins	
7	NC	Not connected pins	
8	NC	Not connected pins	
9	NC	Not connected pins	
10	NC	Not connected pins	
11	NC	Not connected pins	
12	NC	Not connected pins	
13	NC	Not connected pins	
14	GND	Signal ground	
15	20MSEC_OUT	Reference signal output in the cycle of 20 msec Note*1	5 V TTL level
16	80MSEC_OUT	Reference signal output in the cycle of 80 msec Note*1	5 V TTL level
17	RESER VED	Not connected pins	
18	RESER VED	Not connected pins	
19	NC	Not connected pins	
20	NC	Not connected pins	
21	NC	Not connected pins	
22	NC	Not connected pins	
23	NC	Not connected pins	
24	NC	Not connected pins	
25	NC	Not connected pins	

Note*1: The pulse width is 813 nsec (1/1.2288 MHz).



Positioning of the 25 pins of CDMA Timing connector

3.1.3 Panel layout

The front panel and rear panel layouts are shown in Figs. 3-1 and 3-2, respectively.

The numbers in the diagram correspond to those in paragraphs 3.1.1 and 3.1.2.

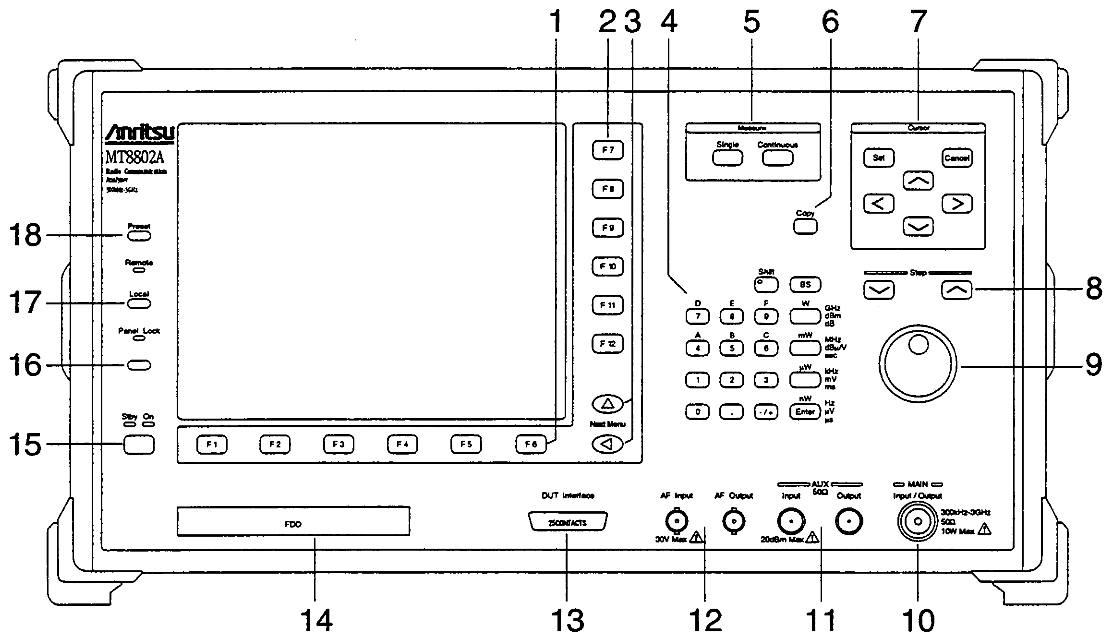


Fig. 3-1 Front Panel

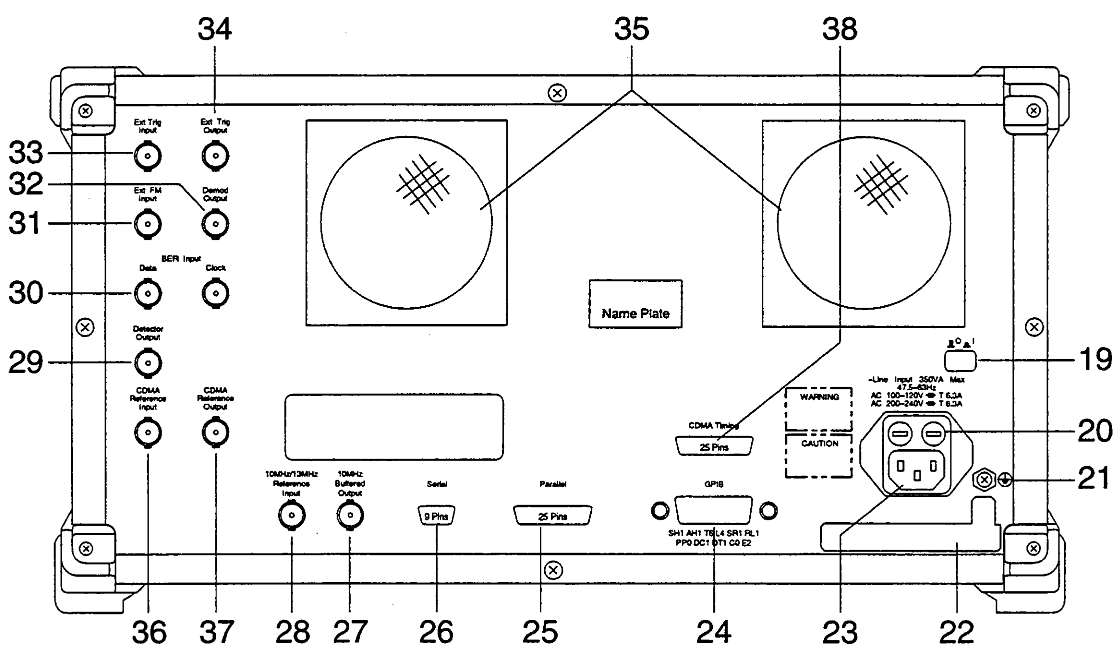


Fig. 3-2 Rear Panel

3.2 Overview of Operation

3.2.1 Overview of functions

The MT8802A with MX880213A IS-136A Measurement Software can perform IS-136A TX/RX measurement.

• IS-136 TX/RX measurement --- TX/RX Measure mode

The following measurement can be performed by using the function menus displayed on the screen.

1 Digital transmitter measurement

The MT8802A can measure the items below by receiving digital modulated signals from a transmitter.

- Modulation analysis

  Carrier frequency, carrier frequency error, vector error: RMS/10-symbols/maximum-value, amplitude error, phase error, origin offset, droop factor, bit rate, bit rate error, constellation, Eye-diagram

- RF power (with burst amplitude, standard line template): Slot, frame, rising edge, falling edge
- Occupied frequency bandwidth
- Adjacent channel leakage power
- Power meter (Note: Measures the average power with a power sensor.)

An automatic measurement function that performs all the selected measurements at a time by selecting some of the above items is also provided.

2 Analog transmitter measurement

The MT8802A can measure the items below by outputting an AF signal to the microphone terminal of a transmitter and receiving the analog modulated signal from the transmitter.

- RF frequency
- RF power
- FM/ϕM deviation
- Modulation signal (AF) level
- Modulation (AF) distortion
- Modulation (AF) frequency

3 Digital receiver measurement

The MT8802A sends a digital modulated test signal to the receiver (DUT), and the demodulation data from the receiver is input to the MT8802A. Then the MT8802A measures the bit error rate of the receiver.

4 Analog receiver measurement

The MT8802A sends an analog modulated test signal to the receiver (DUT). The demodulated signal (AF signal) from the receiver is input to the MT8802A. Then the MT8802A measures the items below.

- Demodulation signal (AF) level
- Demodulation signal (AF) SINAD value
- Demodulation signal (AF) distortion
- Demodulation signal (AF) frequency

5 AF signal measurement

The MT8802A outputs AF signals to the DUT from the AF Output connector.

The MT8802A also inputs AF signals from the DUT to the AF Input connector to measure the items below.

- AF Input signal level
- AF Input signal distortion
- AF Input signal frequency

6 Call processing test

The MT8802A monitors the call-processing (location registration, origination, termination, conversation, handoff, mobile-station release, network release, and others) sequence between the MT8802A and the DUT (mobile station) to judge the pass/fail of the sequence operation.

The following functions are provided to these functions.

- Save/recall

  In TX Measure mode, the measurement conditions (Parameters) and RF power measurement templates (amplitude standard lines) can be saved or recalled up to 100 types to/from an FD (3.5-inch floppy disk).

  Also in RX Measure mode, set output patterns up to 100 types can be saved and recalled through the FD.

- Copy

  Outputs the image on LCD screen to an external printer using a parallel interface (conforming to Centronics type).

- GPIB

  The MT8802A can be controlled by an external controller using the GPIB interface.

- RS232C

  The MT8802A can be controlled by an external controller using a serial interface (RS232C).

3.2.2 Overview of operation

At power-on operation begins in "TX&RX Tester" (Transmitter and Receiver test) status (Setup Common Parameter screen).

(1) Main menu selection

If measurement is to be started from another mode, or from other than a measurement mode, first select one of the main menu items, as shown below.

TX&RX Tester (Transmitter and Receiver test)
Recall (Parameter file recall)
Save (Parameter file save)
File Operation (File retrieval/deletion/protect, FD initialization)
Change System (Measurement system change)
Instrument Set (MT8802A main-frame setting)
Change Color (Selection of screen color)

First press the [Main Func On/Off] F6 key to ON, then select the desired function by using main function keys F1 to F5 and the Next Menu key [◀].

(2) Selection of measurement items

Items are set by using cursor keys ([︿],[﹀],[<], [>]), and other function keys while observing the screen menu.

Press the [Set] key to open the input window.

(3) Item input

For selection items displayed: Select the required value using the cursor keys and validate it by using the [Set] or [Enter] key. The window closes.

For numeric values: Input data using the numeric keys or change data using the rotary knob and [Step] keys. Validate by pressing a unit key, [Enter] key, or [Set] key. The window closes.

(4) Outline of screen configuration

The screen configuration is shown below. A tree-shaped Hierarchical configuration of items below each the main menu is indicated. (Details of operation are explained in Section 4. The screens, setup items and function key flowchart for each screen are summarized in Appendix A, "Screen and Function Key Transition Diagrams.")

[Overview of screens]

```
• TX&RX Tester mode
  └ Setup Common Parameter screen
    (TX/RX common measurement conditions setup screen)
    ├ TX Measure mode
    │  ├ Setup Digital TX Measure parameters screen
    │  │ (Screen for setting items of Digital TX measurement conditions)
    │  ├ Select All Measure Items screen
    │  │ (Screen for setting items of all TX measurement conditions)
    │  ├ All Measure screen
    │  │ (Screen for measuring all TX measurement items)
    │  ├ Modulation Analysis screen
    │  │ (TX modulation analysis screen-- numeric display)
    │  │   └ Waveform Display screen
    │  │     (TX modulation analysis screen - 5 waveforms:  Constellation, Eye Diagram, Vector Error,
    │  │                                                    Phase Error, Magnitude Error)
    │  ├ RF Power screen
    │  │ (TX RF power (burst amplitude) measurement screen
    │  │   ├ Recall Template screen
    │  │   └ Setup Template screen
    │  │       └ Save Template screen
    │  ├ Occupied Bandwidth screen
    │  │ (Screen for measuring occupied bandwidth)
    │  ├ Adjacent Channel Power screen
    │  │ (Screen for measuring adjacent channel leakage power)
    │  ├ Power Meter screen
    │  │ (Screen for measuring TX RF power (average value))
    │  ├ Setup Analog TX Measure Parameter screen
    │  │ (Screen for setting items of analog TX measurement conditions)
    │  ├ Analog TX Measure screen
    │  │ (Screen for analog TX measurement)
    │  └ Analog TX Meas with SG screen
    │    (Screen for signal generator and analog TX measurement)
    ├ RX Measure mode
    │  ├ Setup Digital RX Measure Parameters screen
    │  │ (Screen for setting items of Digital RX measurement conditions)
    │  │   ├ Recall Pattern screen
    │  │   │ (Screen for saving MT8801B output pattern)
    │  │   └ Save Pattern screen
    │  │     (Screen for saving MT8801B output pattern)
    │  ├ Bit Error Rate screen
    │  │ (Screen for measuring RX bit error rate (BER))
    │  ├ Setup Analog RX Measure Parameter screen
    │  │ (Screen for setting items of analog RX measurement conditions)
    │  └ Analog RX Measure screen
    │    (Screen for analog RX measurement)
    ├ AF Measure mode
    │  ├ Setup AF Measure Parameter screen
    │  │ (Screen for setting items of AF measurement conditions)
    │  └ AF Measure screen
    │    (Screen for AF measurement)
    └ Call Processing mode
       ├ Setup Call Proc Parameter screen (Call Processing Test Condition Set screen)
       └ Sequence Monitor screen (Call Processing Operation Sequence Display screen)
```

• Recall mode
  └ Recall Parameter screen
  (Screen for recalling parameter-file)

• Save mode
  └ Save Parameter screen
  (Screen for saving parameter-file)

• File Operation mode
  └ File Operation screen
  (Screen for file retrieval/deletion/protection-setup in FD, and FD initialization)

• Change System mode
  └ Change System screen
  (Screen for changing TX&RX Tester mode measurement system)

• Instrument Setup mode
  └ Instrument Setup screen
  (Screen for setting up RS232C/GPIB, etc. for MT8802A main frame)

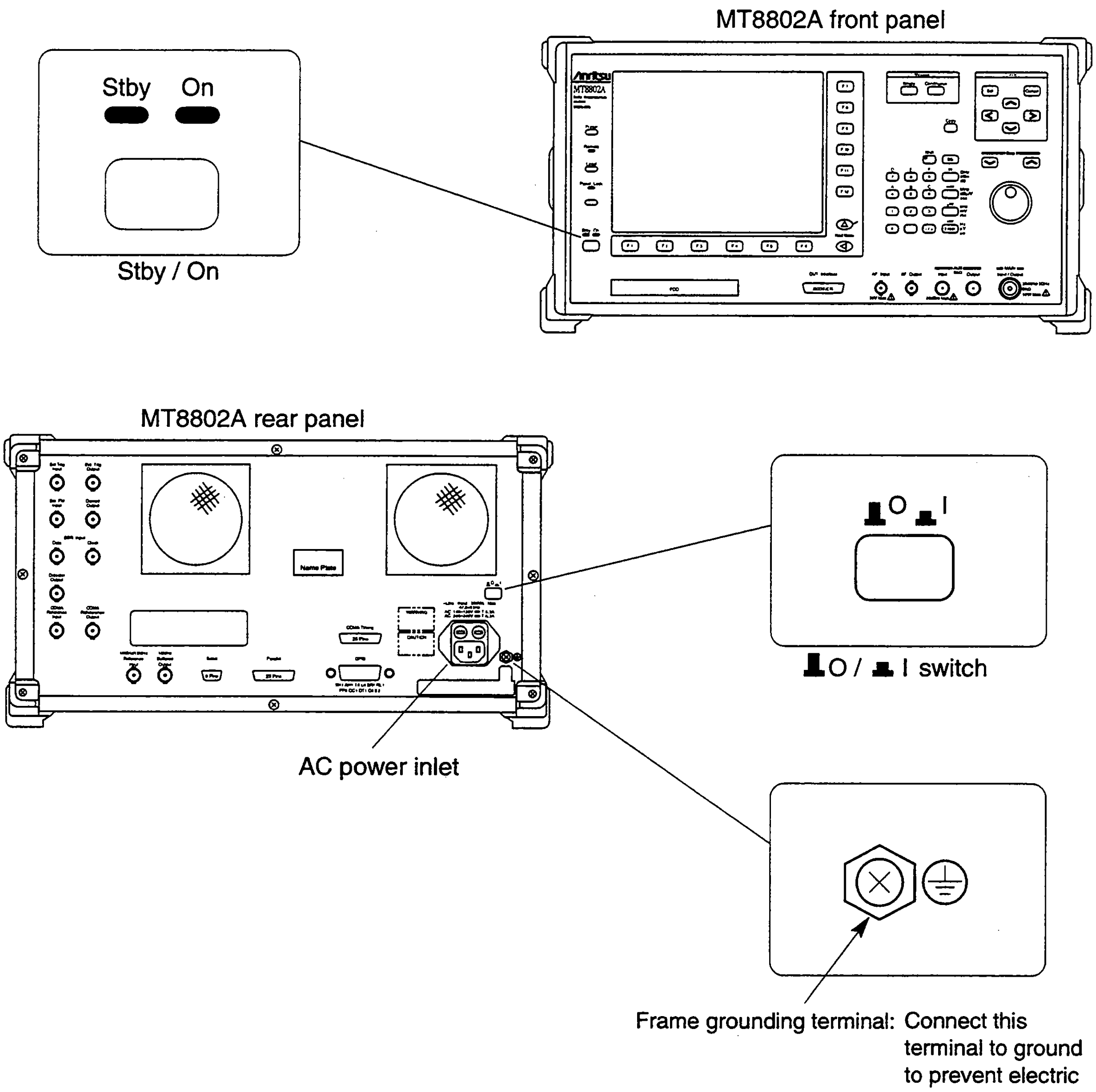
Note: Change Color mode (Selection for screen display color) is setup using the function key menu. There is no screen in Change Color mode.

SECTION 4
OPERATION

TABLE OF CONTENTS

4.1 Turning on and off the Power

The MT8802A has two power switches: The Stby/On switch on the front panel and O I (main power) switch on the rear panel.



WARNING ⚠

• Protective grounding

If the power is turned on without protective grounding, operator runs the risk of electric shock. If the MT8802A does not have a three-pole (grounding type two-pole) power outlet, be sure to connect the frame grounding (FG) terminal on the rear panel or ground terminal of the accessory power cable to ground before turning on the MT8802A power.

CAUTION ⚠

• Checking the power supply voltage

If the AC power supply voltage is improper, abnormal voltage may damage the mechanism inside the equipment. Confirm that the AC power supply voltage is within the specified rating before turning on the MT8802A power.

The following shows the specified power supply voltage and frequency:

Voltage: 100 to 120 Vac or 200 to 240 Vac (Because an automatic input voltage rating switching system is used, the rating need not be switched.)

Frequency: 47 to 63 Hz

For normal MT8802A operation, leave the power switch on the rear panel set to on when the AC power inlet is connected to the power outlet, and only use the Stby/On switch on the front panel to turn the power on and off.

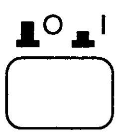
Check the power display lamps at the lower-left part of the front panel as listed in the table below to confirm the power supply state.

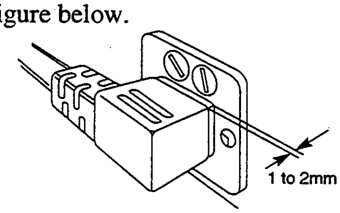
Table 4.1 Power Display Lamp Indications and Power Supply States

Display lamp / State	Power standby display lamp (green) (Stby)	Power on display lamp (orange) (On)
Main power off	Off	Off
Only main power on	On	Off
All power supplies on	Off	On

4.1.1 Turning on the Power

Perform the power-on procedure through warming up the internal reference oscillator to normal MT8802A operation in order of the following steps:

Step	Operation	Description
1.	Connect the frame grounding terminal on the rear panel to ground.	• When using a three-pole power cable with a grounding terminal, the MT8802A need not be grounded.
2.	 Set the O I switch on the rear panel to O (Off).	• When the button is pressed down and set, it is I (On). Press the button again to release it. When the button is set Off, the AC power is turned off even if the power switch on the front panel is set On.
3.	Connect the power cable jack to the AC power inlet on the rear panel.	• Fully insert the power cable jack so that there is a gap of 1 to 2 mm as shown in the figure below.
4.	Connect the power cable plug to the AC power outlet.	



Step	Operation	Description
5.	Set the O I switch on the rear panel to I (On)	• The Stby lamp on the front panel power switch lights. Stby On • The reference crystal oscillator circuit built in the MT8802A starts to warmed up. Before operating the MT8802A under low temperatures, warm up the crystal oscillator for 24 hours. The table below lists the stability of the crystal oscillator based on the warm-up time.

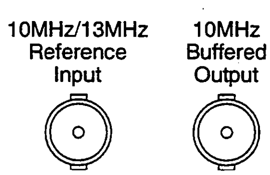
Crystal oscillator stability

Item		Stability
Starting characteristics	After 30-minute operation	5×10^{-8}/day or less
Aging rate (after 24-hour operation)		2×10^{-8}/day or less
Stability at ambient temperature change of crystal oscillator (25˚C ±25˚C)		±5×10^{-8} or less

Step	Operation	Description
6.	Stby On Hold down the Stby/On switch on the front panel for a few seconds to set it On.	• The On lamp on the front panel power switch lights and the Stby lamp goes off. Stby On • Power is supplied to all circuits in the MT8802A, then the MT8802A becomes operable.

Notes: If neither power display lamp lights, check the following:

1. Are the power cables properly connected to the power inlet and power plug?
2. Are the specified fuses set in the fuse holders?
3. Is the power supply voltage correct?



Notes: The left figure shows the reference signal input/output connectors on the MT8802A rear panel. The internal 10 MHz reference signal is output from the 10 MHz OUTPUT connector at TTL level. When the internal reference signal is not used, input an external reference signal satisfying the following conditions to the 10 MHz/13 MHz Reference Input connector:

i) Frequency: 10 MHz ±1 ppm, signal level: 2 to 5 Vp-p

ii) Frequency: 13 MHz ±1 ppm, signal level: 2 to 5 Vp-p

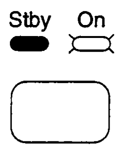
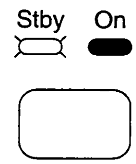
Set the reference frequency on the Instrument Setup screen (see paragraph 4.3.1) according to the external reference signal used as described in i) and ii) above.

Warm up the external reference signal equipment separately from warming up the MT8802A.

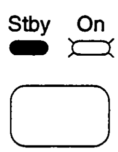
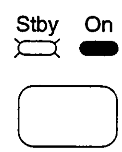
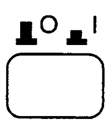
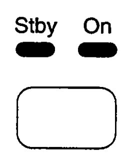
4.1.2 Turning off the Power

Turn off the power as described below.

(1) Normal power-off procedures

Step	Operation	Result check	
1.	 Press the Stby/On switch on the front panel for a few seconds to set it to Stby state.	• The On lamp of the Power switch on the front panel goes off, and the Stby lamp lights. • Only the internal reference crystal oscillator is turned on.	

(2) Power-off procedures for storage or long stop

Step	Operation	Result check	
1.	 Press the Stby/On switch on the front panel for a few seconds to set it to Stby state.	• The On lamp of the power switch on the front panel goes off and the Stby lamp lights. • Only the internal reference crystal oscillator is turned on.	
2.	 Set the O I switch on the rear panel to the O (off) position.	• The AC power is turned off. Both the Stby and On lamps of the Power switch on the front panel go off.	

4.1.3 Setup state after power-on

- The Setup Common Parameter screen is displayed shortly after power-on. At this time, parameters can be set by specifying Power-On Initial on the Instrument Setup screen.(See paragraph 4.3.3.)
- If a short power failure occurs, the power switch on the front panel goes Off. In this case, press the power switch On again.

4.2 Screen Descriptions

This paragraph describes the common items displayed on the screen.

(1) Screen layout

The composition of the measurement screen is described below.

- Title display area
  The type MT8802A, and date (**_**_**) time (**:**:**), or user-defined character string (title) are displayed on the top left line. These are set on the Instrument Setup Screen.
- Screen name display area
  The screen name (paragraph 3.2.2 (4)) and measurement system name IS-136 are displayed on the second line from the top left.
- Measurement error messages display area
  Messages for errors generated during measurement are reverse displayed on the third line from the top left. There are 9 measurement error messages as follows. TX messages are shown in high priority order.

[Digital TX measurement]

Priority

High	Input Level Over	RF input level exceeded the hardware limit.
	Level Over	Level too high
	Level Under	Level too low
	Signal Abnormal	Measurements cannot be carried out.
Low	Unique Word Not Found	Sync word cannot be detected

[Digital RX measurement]

Pattern Sync Being Established	
Pattern Sync Loss	
Over Flow	Measured data is over flowed.

[Analog RF measurement]

Priority

High	Input Level Over	RF input level exceeded the hardware limit.
	Level Over	RF input Level too high
	Level Under	RF input Level too low
Low	Diviation under	Deviation measured data is too low.

[Analog AF measurement]

Priority

High	Input Level Over	AF input level exceeded the hardware limit.
	Level Over	AF input Level too high
Low	Level Under	AF input Level too low

- RF input/output display
  "M" or "A" displayed on the first line from the top center indicates the RF connector used.
  M: Main Input/Output
  A: AUX Input/Output
- Calibrated display
  If the MT8802A is already calibrated, "C" is displayed on the second line from the top center.
  This is appeared after executing calibration on the Modulation Analysis screen etc..
  C: Calibrated
- User calibration factor setting display
  If a user calibration coefficient is being set, "U" is displayed on the third line from the top center.
  This is appeared when the user Cal. factor is set to any value other than 0.00 dB at the set up TX Measure Parameter screen.
  U: User Cal. Factor
- Measurement mode display area
  The measurement mode is displayed on the first line from the top center.
  This is appeared depending on the Measure key (Continuous/Single).
  Measure: Continuous: Continuous measurement
  Measure: Single: Single (one time) measurement
  In average storage mode, nothing is displayed in this area.
- Storage mode display area
  The displayed value or waveform storage mode is displayed on the second line from the top right.
  This is the setting value of the storage mode on the current measurement screen.
  Storage:

Normal:	Normal display
Overwrite:	Trace data overwriting
Average :	Averaging
(order of storage operations performed and total number of operations)	
Wide:	Wide dynamic range
Max Hold:	Maximum value held
Min Hold:	Minimum value held
Cumulative:	Dot data accumulation display

- Measurement method display area
  The Call Processing state(Call Proc) and waveform format (Trace) are displayed on the third line from the top right.
  Call Processing state:When the DUT Control is set to Call Proc to make Call Processing mode, the current Call Processing state is displayed.

Stop:	Call Processing function stops.
Standby:	Standby state on DCCH or ACCH. The MT8802A generates the DCCH or ACCH signal, then wait for the uplink DCCH or ACCH signal from the DUT.
Registration:	Sequence execution state for location registration
Origination:	Sequence execution state for origination This is the transition state from Standby to Conversation, and is triggered from DUT.
Termination:	Sequence execution state for termination This is the transition state from Standby to Conversation, and is triggered by pressing [Termination]F2 key on MT8802A.
Conversation:	Communication state on DTCH or AVC
MS Release:	Sequence execution state for disconnection from MS This is the transition state from Conversation to Standby, and is triggered from DUT.

NW Release: Sequence execution state for disconnection from Network(i.e.MT8802A)
This is the transition state from Conversation to Standby, and is triggered by pressing [N W Release]F2 key on MT8802A.

Handoff: This is the transition state between DTCHs, AVCs, or DTCH and AVC of different frequency or slot.

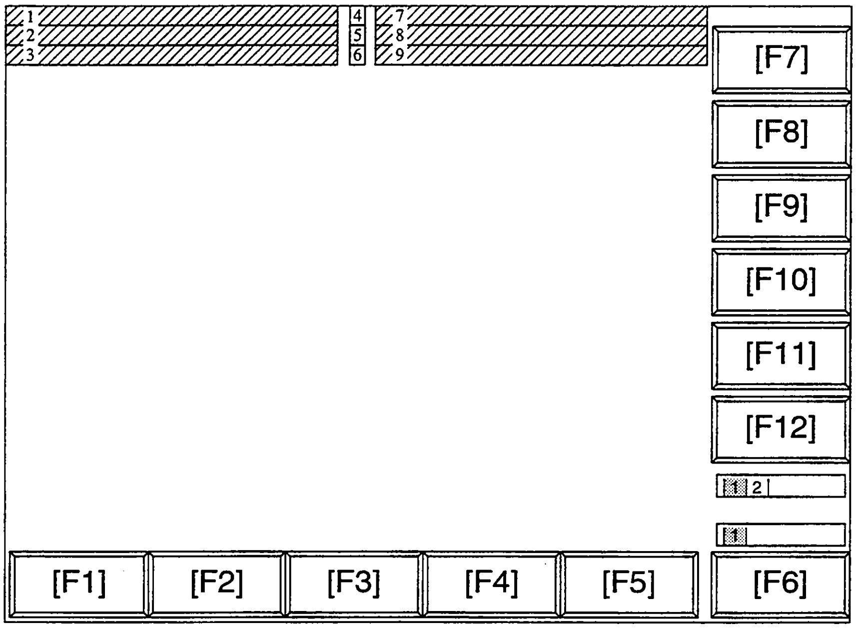
Others: Sequence execution state for DUT control
This occurs in the Conversation state on DTCH or AVC, when changing the MS power level, Time Alignment, or other events.

Trace: This is set when the waveform display mode of the Modulation Analysis screen is set.
Constellation
Eye Diagram
Vector Error
Phase Error
Magnitude Error

• Menu display area

The titles of up to six main function keys (F1 to F6) are displayed horizontally along the bottom.
When the [Main Func on off] (F6) key on the right is set On, the main function menu is displayed.
When the [Main Func on off] (F6) key is set Off, the menu is displayed according to the screen contents.
Use the Next Menu [◀] key to display the next page.
The display of 1 (first page), 2 (second page), or later above the F6 menu indicates the current page.

The titles of up to six function keys (F7 to F12) are displayed vertically along the right side.
The display of 1 (first page), 2 (second page), or later under function key F12 indicates the menu page number.
The current page is reverse displayed. If there are multiple pages, use the Next Menu [▲] key to display the next page under the F12 key.



1. Title/date and time
2. Screen name
3. Measurement error or measurement being performed
4. RF input switching
5. Calibrated display
6. User Cal display
7. Measurement mode
8. Storage mode
9. Call Proc and trace format

Fig. 4-1 Screen Layout

(2) Function keys

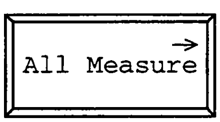
The symbols displayed on the top right of the function keys indicate the following functions:

*: Indicates a lower level function key is displayed when this function key is pressed.

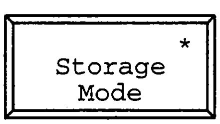
->: Indicates the screen is changed by pressing this function key.

#: Indicates a window is opened to set a value using the ten-keypad, Step key, or rotary knob when this function key is pressed.

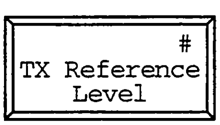
(a) Menu for transition to lower hierarchy screen
(The Back screen key switches the current screen to the higher hierarchy screen.)



(b) Menu for transition to lower hierarchy menu



(c) Menu for opening the value setting window



- Function key menu that select setting item:

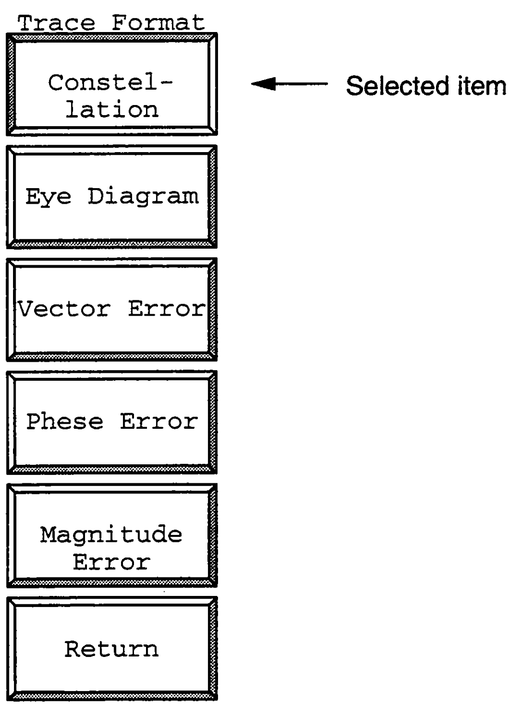
  One of the multiple selection keys (displayed in the same menu hierarchy) can be selected. The top and right frames of the selected key are reverse displayed. (See para. (e) below.)

  The setting values displayed in a key are changed alternately. When such a key is selected, the set value is reverse displayed. (See para. (d) below.)

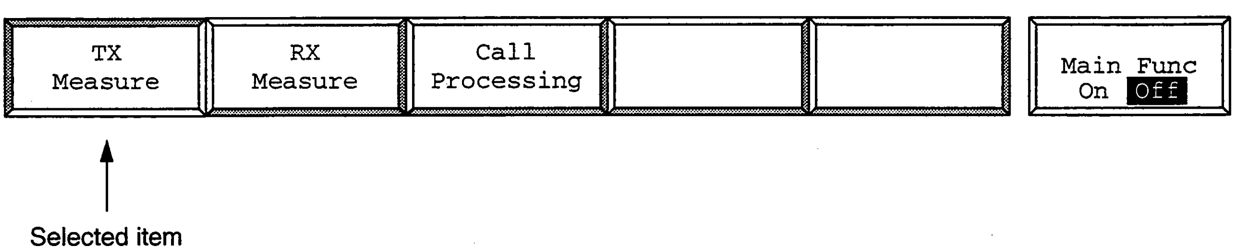
(d) Menu on which set items are switched alternately (alternate key menu)

(e) Menu on which a set item is selected

[Example of the function key menu]



[Example of the main function key menu]



(3) Entering the data

(a) Entering numeric data by opening/closing the window

(i) Entering numeric data by moving the cursor and opening/closing the window

Move the cursor to the brackets enclosing the item to be set, then press the Set key. The value setting window shown below is opened and numeric data can be set.

Set value of selected item

```
TX Measure Ref Level: [ 30.0dBm ]
```

Set window

```
Entry [ 30.0dBm ]
Min -5dBm Max 42dBm
```

When a value is entered using the ten-keypad, Step key, or encoder, then press the unit or Set key, the numeric data is defined and the window is closed.

If the Cancel key, a function key or main function key is pressed while the window is open, the window is closed and the previously set value is displayed.

(ii) Entering numeric data by pressing a function key or main function key

When the key marked # on the top right of the menu is pressed, the value setting window shown below is opened and numeric data can be set.

```
             #
TX Reference
    Level
```

press

Set window

```
Entry [ 30.0dBm ]
Min -5dBm Max 42dBm
```

When a value is entered using the ten-key pad, Step key, or encoder, then press the unit or Set key, the numeric data is defined and the window is closed.

If the Cancel key, a function key or main function key is pressed while the window is open, the window is closed and the previously set value is displayed.

(b) Entering selection item by opening/closing the window

Move the cursor to the brackets enclosing the item to be set, then press the Set key. The selected item setting window shown below is opened and the selected item can be set.

```
RF Input      : [ Main ]
                  Main
                  AUX
```

When an item in the window is selected using the cursor keys and the Set key is pressed, the set value is defined and the window is closed.

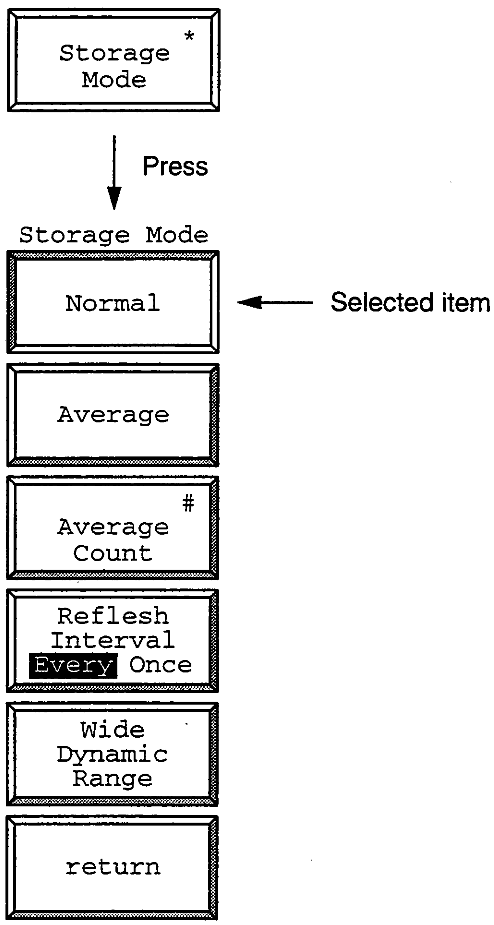
(c) Entering selected items using alternate keys

Selection items are displayed on the function key menu. Each time one of these keys is pressed, set values are switched alternately. The currently selected item is reverse displayed.

(d) Entering selected items using function keys with lower hierarchy

When the key marked * on the top right of the menu is pressed, the menu set of the lower hierarchy shown below is displayed.

Select an item from the menu set and press the corresponding function key. The menu display of the selected item is changed. When the return function key is pressed, display returns to the menu set of the higher hierarchy.



(c) Entering the title

See paragraph 4.3.3, "Instrument Setup screen."

4.3 IS-136 Transmitter and Receiver Test --- TX and RX Tester Mode

This paragraph describes operation when using the MT8802A in which MX880213A IS-136A Measurement Software is installed to measure the IS-136 transmitter and receiver.

4.3.1 Preparations

This paragraph describes the setup, zero-point calibration of the power meter, and RF cable loss correction when measuring the DUT.

(1) Setup

This paragraph explains how to set the MT8802A and device under test (DUT) when conducting tests.

[DUT Interface connector]

The DUT Interface connector is equipped on the bottom of the MT8802A front panel to transmit and receive signals for control and measurement.

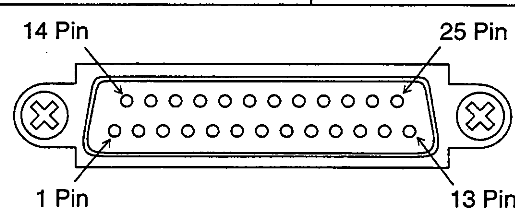
The following lists the specifications and functions of the DUT connector and gives and notes on its use.

1) Specifications of the DUT Interface connector

The DUT Interface connector is a 25-pin female D-SUB connector.

Signal assignment

Pin number	Signal name	Signal type	Specification	Direction
1	GND	Signal ground		---
2	DUT_TXD12	Spare output	12 V level	MT8802A -> DUT
3	DUT_RXD	Spare input	5V TTL / 3V C-MOS / 12V	MT8802A <- DUT
4	DUT_RTS12	Spare output	12 V level	MT8802A -> DUT
5	DUT_CTS	Spare input	5V TTL / 3V C-MOS / 12V	MT8802A <- DUT
6	AF_SHELL	AF signal output (floating output –)		MT8802A -> DUT
7	GND	Signal ground		---
8	DUT_RTS5	Spare output	5 V TTL level	MT8802A -> DUT
9	DUT_IN0	Spare input	5 V TTL/3 V C-MOS level	MT8802A <- DUT
10	DUT_IN1	Spare input	5 V TTL/3 V C-MOS level	MT8802A <- DUT
11	DUT_IN2	Spare input	5 V TTL/3 V C-MOS level	MT8802A <- DUT
12	DUT_IN3	Spare input	5 V TTL/3 V C-MOS level	MT8802A <- DUT
13	PRSS_TLK0	Press talk switch 0	Current capacity: 0.5 A or less	MT8802A -> DUT
14	DUT_OUT0	Spare output	5 V TTL/3 V C-MOS level	MT8802A -> DUT
15	DUT_OUT1	Spare output	5 V TTL/3 V C-MOS level	MT8802A -> DUT
16	DUT_OUT2	Spare output	5 V TTL/3 V C-MOS level	MT8802A -> DUT
17	DUT_OUT3	Spare output	5 V TTL/3 V C-MOS level	MT8802A -> DUT
18	AF_SIGNAL	AF signal output (floating output +)		MT8802A -> DUT
19	DUT_TXD5	Spare output	5 V TTL level	MT8802A -> DUT
20	12VOUT	+12 V power output	12 V, 50 mA or less	MT8802A -> DUT
21	BCLK_IN	BER measurement clock	5 V TTL/3 V C-MOS level	MT8802A <- DUT
22	BDAT_IN	BER measurement data	5 V TTL/3 V C-MOS level	MT8802A <- DUT
23	DUT_TXD3	Spare output	3 V C-MOS level	MT8802A -> DUT
24	DUT_RTS3	Spare output	3 V C-MOS level	MT8802A -> DUT
25	PRSS_TLK1	Press talk switch 1	Current capacity: 0.5 A or less	MT8802A -> DUT



2) Pin descriptions

2.1) Signal ground (GND)

This signal ground is the common grounding terminal of all signals using this connector.

2.2) 12 V power output

The 12 V power output can be used for the DUT or external interface for the DUT.

The maximum current capacity of this output is 50 mA.

2.3) BER measurement signal

The BER measurement signal is applied to this terminal to receive the data output from the DUT when measuring receiving sensitivity.

A serial signal is assumed to be output from the DUT. Input both serial data and the transmission clock for serial data.

The level of the input signal is 5V TTL or 3V C-MOS level.

2.4) Press talk switch

The press talk switch is a control terminal for the transmission On/Off switch used mainly for simplex communication.

Because IS-136 does not use this terminal, leave it unconnected.

2.5) AF signal output

AF signal output (floating output) for analog transmitter measurement.

Output is made from AF Output (BNC connector) at the same time. The output impedance is fixed to 600Ω.

Connect the GND of the MT8802A to the GND of the DUT. Connect the floating output – side to the low impedance side of DUT microphone input.

Use a shielded cable for microphone input and connect the sheath to GND.

2.6) Spare input and output

Spare input and output are terminals provided for future expansion. IS-136 does not support these terminals. Leave these terminals unconnected.

Note: Do not input BER measurement signals of BER Input (Data/Clock) and the DUT Interface at the same time.
In the MT8802A, these signals are logically producted to generate the BER measurement signal. Therefore, if a Low level signal is applied to a terminal which is not input for BER measurement, the BER measurement signal is set to All 0 in the MT8802A and measurement is disabled.

(a) Setup for digital transmitter measurement and call processing test

In digital transmitter measurement, the MT8802A receives the modulated signal (RF signal) from the DUT to measure modulation accuracy and other conditions.

In the call processing test, the DUT receives the downlink signal (RF signal) from the MT8802A; the MT8802A receives the uplink signal (RF signal) from the DUT.

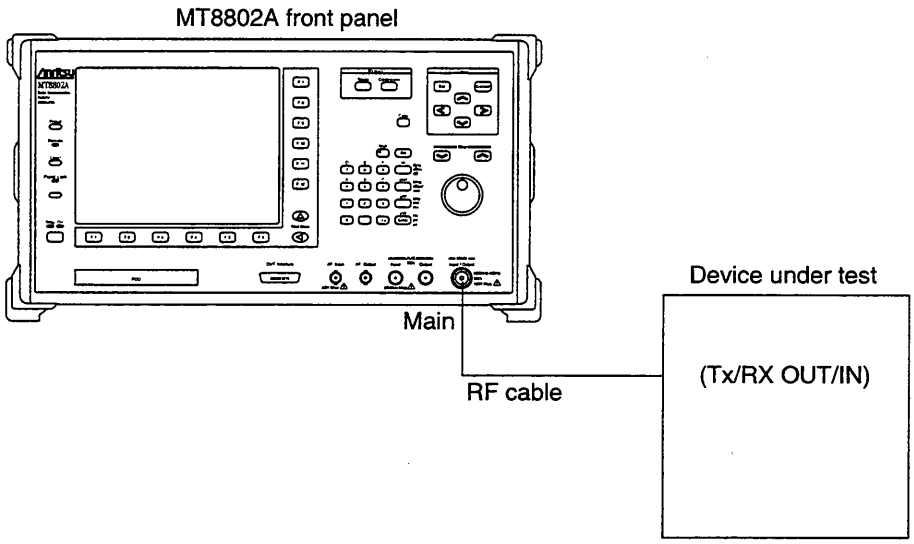


Fig. 4-2 Setup

Note: The RF measurement connectors of the MT8802A are composed of the Main Input/Output, and AUX Input and Output. The IS-136 system uses only the Main Input/Output connector.

CAUTION ⚠

- The maximum input level of the AUX Input connector

The maximum input level of the AUX Input connector is +20 dBm. If a signal whose level exceeds the specified value is input, the internal circuit of the MT8802A may be damaged.

- AUX Output connector

The AUX Output connector is the dedicated output connector of the signal generator in the MT8802A. If a transmitter signal is input in the AUX Output connector, the internal circuit may be damaged.

(b) Setup for analog transmitter measurement (Analog TX Measure, Analog TX Meas with SG)

In analog transmitter measurement, the AF signal from the MT8802A is input to the DUT. The MT8802A receives the modulated signal (RF signal) from the DUT to measure the modulation factor and other conditions.

The AF signal can be input to the DUT in one of the following two ways:

(i) Use the AF Output connector (BNC connector on the front panel).

(ii) Use the DUT Interface connector (D-SUB connector on the front panel).

(i) Using the AF Output connector (BNC connector)

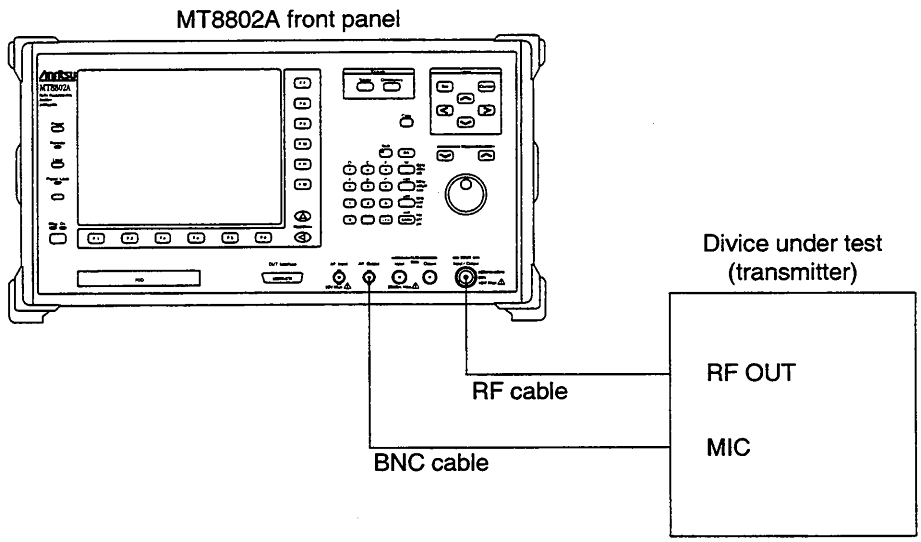


Fig. 4-3

(ii) Using the DUT Interface connector (D-SUB connector)

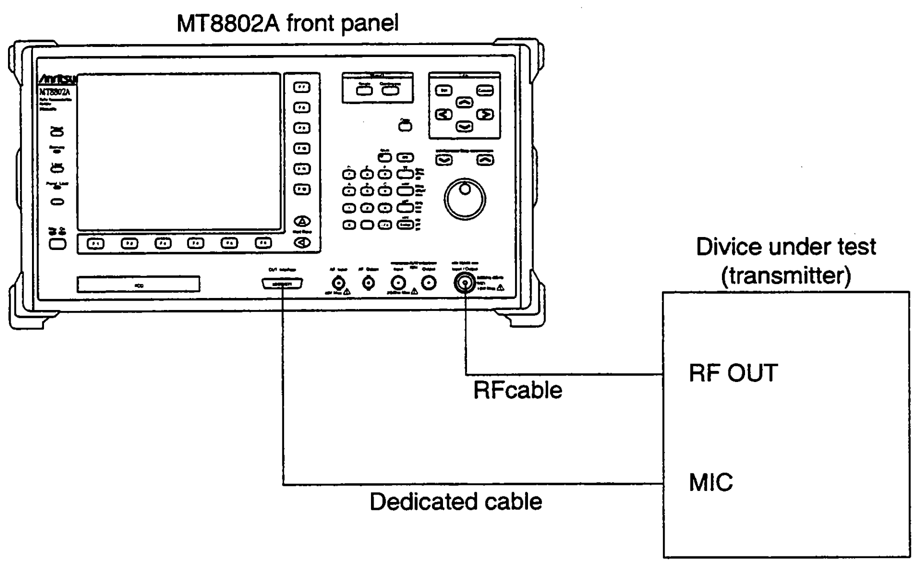


Fig. 4-4

Note: The RF measurement connectors of the MT8802A are composed of the Main Input/Output, and AUX Input and Output. The IS-136 system uses only the Main Input/Output connector.

CAUTION ⚠

- The maximum input level of the AUX Input connector

The maximum input level of the AUX Input connector is +20 dBm. If a signal whose level exceeds the specified value is input, the internal circuit of the MT8802A may be damaged.

- AUX Output connector

The AUX Output connector is the dedicated output connector of the signal generator in the MT8802A. If a transmitter signal is input in the AUX Output connector, the internal circuit may be damaged.

(c) Setup for digital receiver measurement (bit error rate)

In digital receiver measurement, the DUT receives the RF signal from the MT8802A. The receiver result is input to the MT8802A to measure the bit error rate (BER).

The receiver result can be input to the MT8802A in any of the following three ways:

(i) Input the demodulation data of the DUT to the RF input connector (front panel) as an RF signal by using the loop-back method.

(ii) Input the demodulation data of the DUT to the DUT Interface connector (front panel) as a digital signal (serial data).

(iii) Input the demodulation data of the DUT to the BER Input connectors (Data/Clock on the rear panel) as a digital signal (serial data).

(i) Inputting the demodulation data of the DUT to the RF input connector (front panel) as an RF signal by using the loop-back method

Same as the setup for the call processing test (Fig. 4-2).

(ii) Inputting demodulation data of the DUT to the DUT Interface connector (front panel) as a digital signal

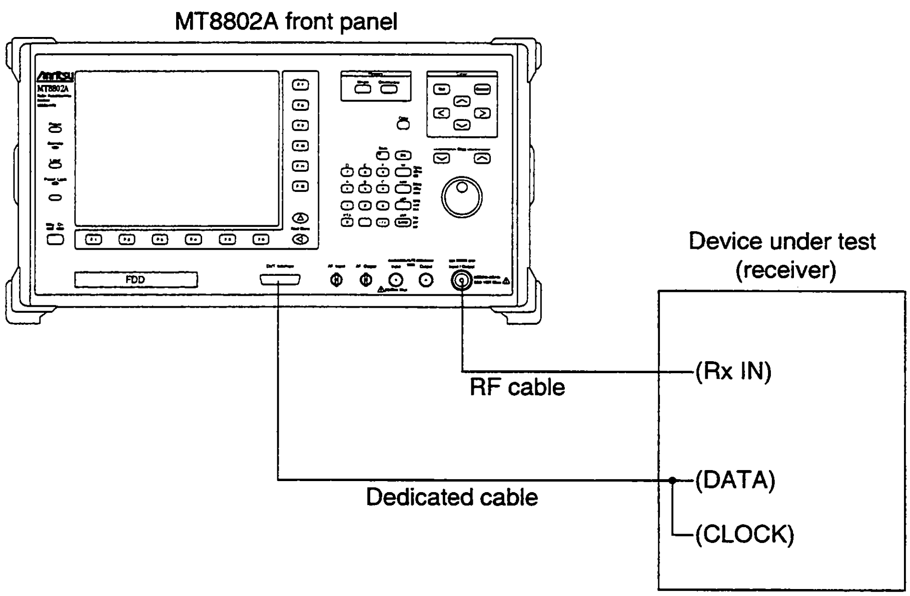


Fig. 4-5 (1/2)

(iii) Inputting the demodulation data of the DUT to the BER Input connectors (Data/Clock on the rear panel) as a digital signal (serial data)

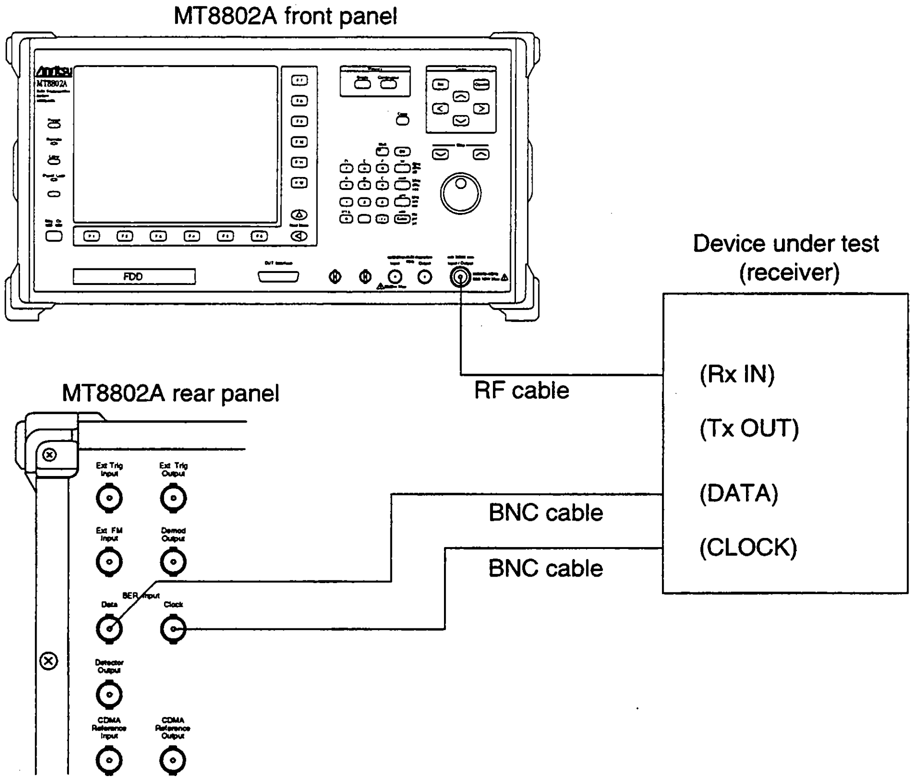


Fig. 4-5 (2/2)

(d) Setup for analog receiver measurement (Analog RX Measure)

In analog receiver measurement, the DUT receives the RF signal from the MT8802A. The demodulated signal (AF signal) is input to the MT8802A to measure the distortion rate and other conditions.

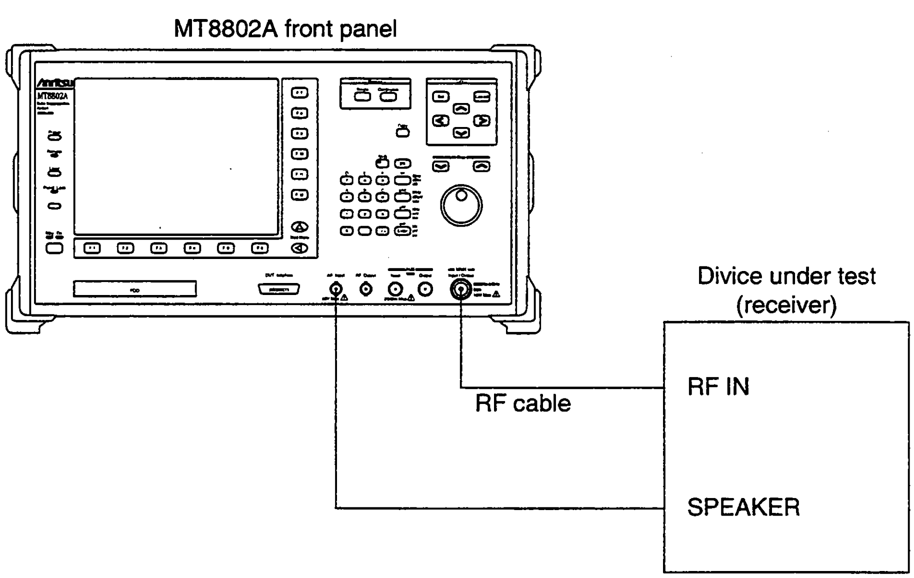


Fig. 4-6

(d) Setup for AF signal measurement (AF Measure)

In AF signal measurement, the DUT receives the RF signal from the MT8802A. The demodulated signal (AF signal) is input to the MT8802A to measure the distortion rate and other conditions.

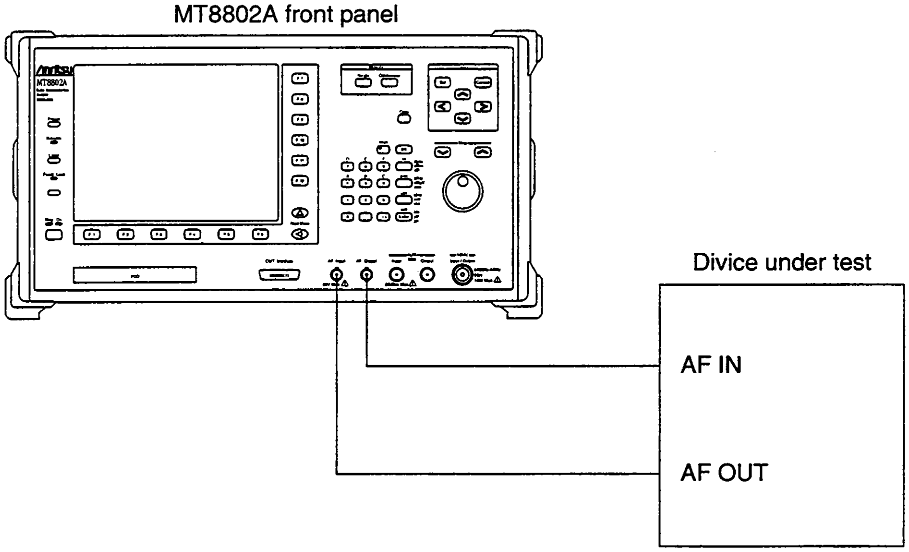


Fig. 4-7

(2) Calibration before measurement

The MT8802A has two types of power measurement functions.
For high precision measurements, calibrate the MT8802A as shown below.

(a) Power meter function

The power meter function uses a thermo-couple for high-precision wide-band measurement of average power. In digital transmitter measurement, press the [Power Meter] F12 key in TX Measure mode to set the power meter function.

In analog transmitter measurement, set the power measure method to Power Meter on the Setup Analog TX Measure Parameter screen, then press the [Analog TX Measure] F7 or [Analog TX Meas with SG] F10 key in TX Measure mode to set the power meter function.

Calibrate the MT8802A at the zero power point for high-precision measurements.

Zero-point calibration: Disconnect anything from the Main Input/Output connector to set no input power, and press the [Zero Set] F11 key to automatically calibrate the power meter at the zero power point.

For details on operation, see Paragraph 4.3.6, (7) "Power Meter."

Note: The power meter function is effective only when the Main connector is used.

(b) Burst-power measurement/IF level meter function

This function performs high-linearity narrow-band measurement of the IF signal level of the MT8802A.
In digital transmitter measurement, press the [RF Power] F9 key in TX Measure mode to set this function.
This function can measure the on/off power, rise/fall times and other conditions of burst signals.
In analog transmitter measurement, set the power measure method to IF Level Meter on the Setup Analog TX Measure Parameter screen, then press the [Analog TX Measure] F7 or [Analog TX Meas with SG] F10 key in TX Measure mode to set this function.
For high precision measurement, internal calibration is required.
There are two types of internal calibrations of the Adjust Range and Manual Calibration, as described below.

Adjust Range: Optimizes the internal RF ATT, A/D input level, and power meter range of the MT8802A for the signal to be measured. This function can increase the measurement range for the on/off ratio and adjacent channel leak power.

Manual Calibration: Calibrates the measured power value on the RF Power or Analog TX Measure/Analog TX Meas with SG screen using the MT8802A built-in power meter.
Pressing the Calibration Cancel key clears the calibration factor to 0 dB.
The calibration factor may become incorrect when the internal temperature rises, the ambient temperature changes, the measurement frequency changes etc.. For precise measurement of the TX power, perform Manual Calibration at that time.

For details on operation, see Paragraph 4.3.6 "Digital transmitter measurement."

Notes:

1. Manual Calibration is effective only when the Main connector is used.
2. The Adjust Range and Manual Calibration run a common internal process in all TX measurement screens.
   Once calibration is performed in any TX measurement screen, no more calibration is required in any other screen.
3. If the MT8802A input level is small or the input frequency does not match the setup frequency, the Adjust Range and Manual Calibration may not be performed properly.
4. Execute Adjust Range and Manual Calibration while the measurement signals are input stationary.
5. When performing Manual Calibration results in an error (corrected data cannot be generated), calibration factor of the Manual Calibration (held before the execution) is lost.

(3) Correcting RF cable loss when conducting the transmitter measurement: Setting User Cal Factor

When conducting digital transmitter measurement, set the loss of the RF cable connecting the MT8802A and transmitter under test as a correction value (User Cal Factor) to measure RF power in the transmitter under test.

Step	Key operation	Description
1.	[Main Func on off]F6	Sets Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [∧][∨][<][>] [Set][∧][∨][Set]	Move the cursor to Band of Traffic Channel. Select D800 MHz or D1.9 GHz and press the [Set] key to validate it.
4.	[TX Measure]F1 Next Menu [▲] [Setup Digital TX Parameter]F9	Displays the first page of the TX Measure menu. Displays the second page of the TX Measure menu. Displays the Setup Digital TX Measure Parameter screen.
5.	Cursor [∧][∨]	Moves the cursor to User Cal Factor.
6.	[Set][-/+] [0] [1] to [F/9] [BS]	Enter the RF cable loss. Example: For 5dB loss, enter 5.00 dB.
7.	[Enter]	Defines the entered value.
8.	[Back Screen]F12	Returns to the Setup Common Parameter screen.

In analog transmitter measurement, perform the same operation to set the User Cal Factor.

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets the TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [∧][∨][<][>] [Set][∧][∨][Set]	Move the cursor to Band of Traffic Channel. Select A800 MHz and press the [Set] key to validate it.
4.	[TX Measure]F1 Next Menu [▲] [Setup Analog TX Parameter]F9	Displays the first page of the TX Measure menu. Displays the second page of the TX Measure menu. Displays the Setup Analog TX Measure Parameter screen.
5.	Cursor [∧][∨]	Move the cursor to User Cal Factor.
6.	[Set] [-/+] [0] [1] to[F/9] [BS]	Enter the RF cable loss. Example: For 5 dB loss, enter -5.00 dB.
7.	[Enter]	Defines the entered value.
8.	[Back Screen]F12	Returns to the Setup Common Parameter screen.

4.3.2 Selecting and changing the measurement system: Change System screen

Change the measurement system according to the following steps.
For measurement after change, refer to the manual of the selected measurement system.

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on. The Main Menu appears at the bottom of the screen.
	Next Menu [◀]	Displays the second page of the Main Menu.
2.	[Change System]F1	Sets Change System mode. The Change System screen and System menu appear.

This screen is used to select anyone of measuring systems and to upgrade the system software.

Note: Changing any measuring system in this screen initializes the corresponding measurement parameters. Save the parameters before changing if necessary.

(1) Changing the built-in measuring system

This paragraph describes how to exchange the measuring system used when more than one measuring systems are built in the MT8802A.

Step	Key operation	Description
1.		Make sure that "Current System" shows the system currently selected and that "Application Memory" contains a new measuring system to select.
2.	Cursor [︿] [﹀]	Select one of the measuring system softwares in the "Application Memory". Displays one of the measuring system softwares in the "Application Memory" in reverse display.
3.	[Change System]F7 Cursor [<] [>] Set	Sets Change System mode. Select "Yes" and Press the [Set] to confirm the measuring system software.

(2) Loading measuring systems from an external floppy disk

This paragrsph describes how to load measuring systems from an external floppy disk.
(This function is effective only when the measuring software floppy disk is used.)

Step	Key operation	Description
1.		Set the floppy disk containing measuring system files in the floppy disk driver of the MT8802A.
2.	[Floppy Disk Dir]F8	Displays measuring system files on the floppy disk. Here, confirm the "Unused area" under "Application Memory", and also the size of the measuring systems on the floppy disk. The measuring systems can be loaded when the value in "Unused area" is greater than size of measuring systems to be loaded.
3.	[Install system form FD]F10	Loads measuring system from the floppy disk to "Application Memory."
4.	Set	Make sure that the measuring systems are displayed(saved) in "Application Memory."

4.3.3 Setting the measurement system conditions: Instrument Setup screen

Set the standard frequency of the measurement system (10 MHz or 13 MHz), RF connector (Main or AUX), screen title/date/time display, interface (GPIB or RS232C), printer (ESC/P), and alarm (on or off) on this screen.

Procedure for transition to the Instrument Setup screen

Step	Key operation	Description
1.	[Main Func on off]F6	Set Main Func on. The Main Menu appears at the bottom of the screen.
	Next Menu [◀]	Displays the second page of the Main Menu.
2.	[Instrument Setup]F2	Sets Instrument Setup mode. The Instrument Setup screen appears. The Instrument Setup function key menu appears on F7 to F12.

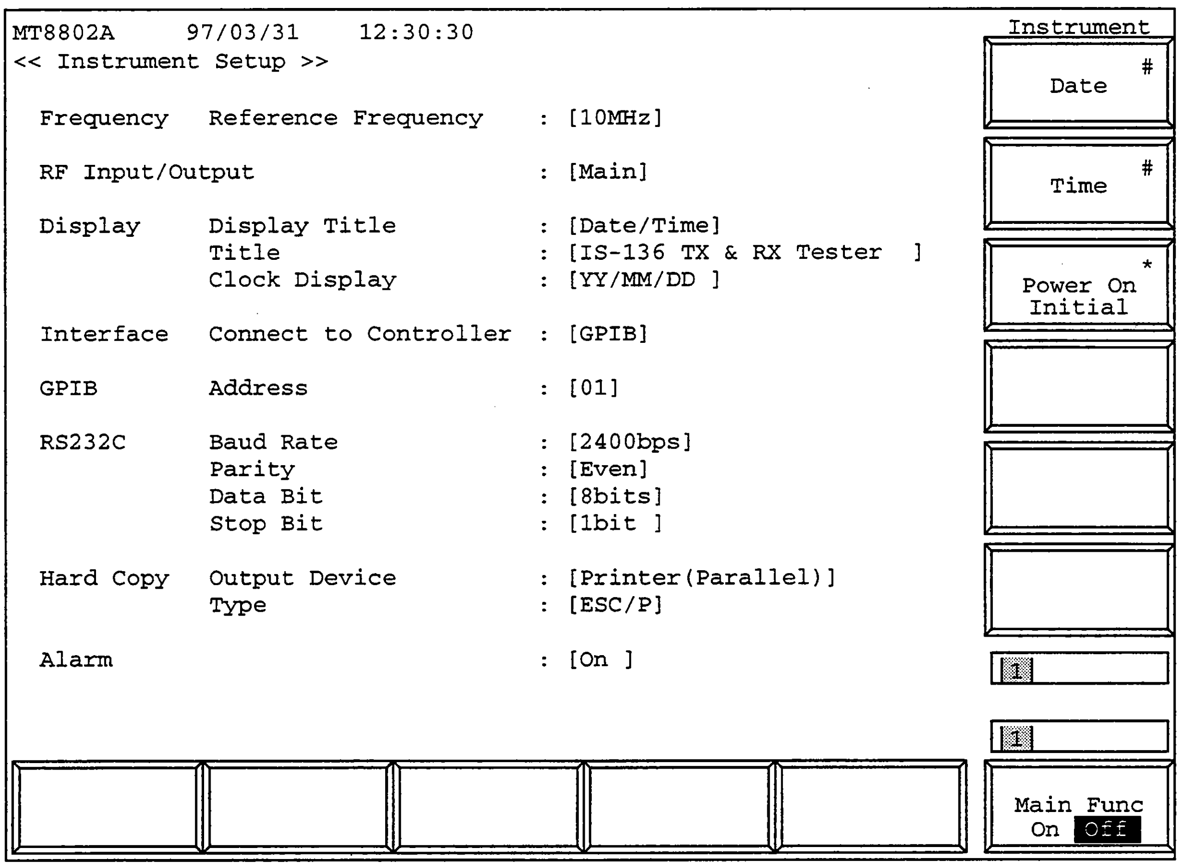


Fig. 4-8 Instrument Setup Screen

• Set the following items:

Item	Range	Initial value
Frequency		
Reference Frequency		
	10MHz, 13MHz	10MHz
RF Input/Output	Main, AUX	Main
Display		
Display Title		
	User Define, Date/Time, Off	User Define
Title	User Define, Date/Time, Off	
	(32 alphanumeric characters) (*1)	
Clock Display		
	YY/MM/DD (year, month, day)	
	MM-DD-YY (month, day, year)	
	DD-MM-YY (day, month, year)	YY/MM/DD (year, month, day)
Interface		
Connect to Controller		
	GPIB, RS232C	GPIB
GPIB		
Address	00 to 30	01
RS232C		
Baud Rate	1200, 2400, 4800, 9600(bps)	2400
Parity	Even, Odd, Off	Even
Data Bit	7 bits, 8 bits	8 bits
Stop Bit	1 bit, 2 bits	1 bit
Hard Copy		
Output device	Printer (Parallel), File	Printer (Parallel)
Type	ESC/P, HP2225… for Printer (Parallel)	ESC/P
	BMP (B&W)… for File	
Alarm	On, Off	On

*1 Entering the title:
A title up to 32 characters can be entered in the title display area. (User Define)
MT8802A**_**_**(date)**:**:**(time) is displayed as an initial value. (Date/Time)
Enter a title according to the following steps. (User Define)

Step	Key operation	Description
1.	Cursor [︿] [﹀]	Moves the cursor to the Title entry area.
2.	[Set]	Opens the Tile entry window.
3.	Step [︿] [﹀]	Moves the cursor into position in the Title entry area to enter character.
4.	Cursor [<] [>]	Select a character.
5.	[Enter]	Defines the character.
6.	[BS]	Correct any incorrect character.
7.		Repeat steps 3 to 6 to enter all characters in the Title entry area.
8.	[Set]	Defines the entered character string.

• Function keys

Main function key: None

Function keys:

[Date]F7: Opens the date entry window.

[Time]F8: Opens the time entry window.

[Power On Initial]F9: Displays the Power On menu to select Initialization modes, which are classified into Previous Status and Recall File.

Initial value: Previous Status

When Previous Status mode is selected, the parameters after power-on retain the status held before the previous power-off.

When Recall File mode is selected, the parameters after power-on are set by reading the specified file.

[Previous Status]F7 Sets the parameters after power-on to the status held before the previous power-off.

[Recall File]F8 Sets the mode in that the parameters after power-on are read from floppy disk.

[File No.]F9 Opens the parameter-file setting-location (number) entry window.

File No.: 0 to 99, Initial value: 0

[return]F12 Returns to the previous menu.

• Selecting Power On Initial mode

The following describes how to select parameter initialization mode after power-on.

1. Selecting Previous Status mode

Step	Operation
1.	Press the [Power On Initial] F9 key.
2.	Press the [Previous Status] F7 key.
3.	Press the [return] F12 key to define the parameters then return to the previous menu.

2. Selecting Recall File mode (being developed)

Step	Operation
1.	Press the [Power On Initial] F9 key.
2.	Press the [Recall File] F8 key. (Access the floppy disk to call the parameter list file.)
3.	Press the [File No.] F9 key. (Open the parameter-file setting-location [number] window.)
4.	Enter the number of the parameter file to be set.
5.	Press the [Set] key to define the parameters, then press the [return] F12 key to return to the previous menu.
6.	Set the floppy disk (on which parameters to be read before power-on are written) in the floppy disk drive. When the next power on, the parameters in floppy disk is set.

Notes:
- If no floppy disk is set before power-on or a floppy disk other than that used at setting is used, parameters may be set in Previous Status mode or different parameters may be set.
- The ambient temperature range of the floppy disk is specified as 5 to 45 °C. If a set temperature is outside the specified range, operation is not guaranteed.

• Changing the time and date of the built-in clock

1. Changing the date

Step	Key operation	Description
1.	[Date]F7	Opens the date setting window.
		Displays the current date and time of the built-in clock.
2.	Cursor [︿] [﹀]	Moves the cursor to the part to be changed.
3.	0 to 9, [BS]	Sets the data.
4.	Cursor [︿] [﹀]	Moves the cursor to the next part to be changed.
5.	0 to 9, [BS]	Sets the data.
6.	[Set]	Closes the setting window and establishes the set value.

2. Changing the time

Step	Key operation	Description
1.	[Time]F8	Opens the time setting window.
		Displays the current time of the built-in clock.
2.	Cursor [︿] [﹀]	Moves the cursor to the part to be changed.
3.	0 to 9, [BS]	Sets the data.
4.	Cursor [︿] [﹀]	Moves the cursor to the next part to be changed.
5.	0 to 9, [BS]	Sets the data.
6.	[Set]	Closes the setting window and establishes the set value.

Note: To stop changing the date or time of the built-in clock

To stop changing the date or time after opening the setting window of the built-in clock, press the [Cancel] key in the above Step 4 or 5 (do not use the [Set] key). If the [Set] key is pressed again after the date and time window is opened, the value on the setting window is set again. The date and time window remains in the state when the window was opened. Therefore, if the [Set] key is pressed without changing the display on the window, the date and time of the built-in clock are delayed.

4.3.4 Setting the screen display color: Change Color menu

To set a screen color, display the Change Color menu as follows.

(The F7 to F12 function keys menu changes to the Change Color menu, but the screen does not change.)

Step	Key operation	Description
1.	[Main Func on off]F6	Sets Main Func on. The Main Menu appears at the bottom of the screen.
	Next Menu [◀]	Displays the second page of the Main Menu.
2.	[Change Color]F3	Sets Change Color mode. The Change Clr. function key menu appears on F7 to F12.
3.		Use the function key on the next page to set a color.
4.	[return]F12	Returns to the previous menu.

• Function keys

Main function key:	None
Function keys:	
Change Color menu:	Initial value: Color Pattern 1
[Color Pattern 1] F7:	Selects Anritsu-specified color 1.
[Color Pattern 2] F8:	Selects Anritsu-specified color 2.
[Color Pattern 3] F9:	Selects Anritsu-specified color 3.
[Color Pattern 4] F10:	Selects Anritsu-specified color 4.
[Define User Color] F11:	Displays the Define Clr. menu to set a user-specified color.
[Copy Color Ptn from] F7	Displays the [Copy from] menu to select an Anritsu-specified color as an original color to set a user-specified color.
[Color Pattern 1] F7:	Selects Anritsu-specified color 1 as an original color.
[Color Pattern 2] F8:	Selects Anritsu-specified color 2 as an original color.
[Color Pattern 3] F9:	Selects Anritsu-specified color 3 as an original color.
[Color Pattern 4] F10:	Selects Anritsu-specified color 4 as an original color.
[return] F12:	Returns to the previous menu.
[Select Item frame **] F8:	Selects the screen configuration field to set a display color. Use a number ** from 0 to 16 for this setting. The number increases in step of one by pressing this key.
[Red *] F9:	Set red intensity of the item frame selected by F8.
[Green *] F10:	Set green intensity of the item frame selected by F8.
[Blue *] F11:	Set blue intensity of the item frame selected by F8.
[return] F12:	Returns to the previous menu.
[return] F12:	Returns to the previous menu.

• Relation between screen assignment and number ** in [Select Item Frame **] F8 key

[Select Item Frame 0]	Back-screen of function keys
[Select Item Frame 1]	Back-screen of the main function keys
[Select Item Frame 2]	Display frame of function and main function keys
[Select Item Frame 3]	Characters and display frame of function and main function keys
[Select Item Frame 4]	Back-screen of waveform display
[Select Item Frame 5]	Scale line and frame of waveform display
[Select Item Frame 6]	Waveform display (1)
[Select Item Frame 7]	Waveform display (2)
[Select Item Frame 8]	Display other than function and main function keys
[Select Item Frame 9]	Characters right over the main function keys
[Select Item Frame 10]	Measurement execution error display
[Select Item Frame 11]	Template and zone frames
[Select Item Frame 12]	Marker
[Select Item Frame 13]	Window back-screen
[Select Item Frame 14]	Window shade and characters
[Select Item Frame 15]	(Not used)
[Select Item Frame 16]	Back-screen

4.3.5 Setting the common measurement parameters: Setup Common Parameter screen

• Switch to the Setup Common Parameter screen according to the following steps.
Set common measurement conditions on this screen.

Step	Key operation	Description
1.	[Main Menu on off]F6	Sets the Main Menu on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode The Setup Common Parameter screen appears.
3.	Cursor [︿] [﹀][<][>] [Set][︿] [﹀][Set]	Move the cursaor to Band of Traffic Channel. Select Digital/Analog, Frequency Band and press the [Set] key to validate it. A800 MHz is Analog Measure mode in 800 MHz band. D800 MHz is Digital Measure mode in 800 MHz band. D1.9 GHz is Digital Measure mode in 1.9 GHz band.
4.	[TX Measure]F1	The TX Measure (for transmitter test) function keys appear on F7 to F12. The Analog/Digital Measure mode function keys(selected in step 3) are different.
	[RX Measure]F2	The RX Measure (for receiver test) function keys appear on F7 to F12. The Analog/Digital Measure mode function keys(selected in step 3) are different.
	[AF Measure]F3	The AF Measure (for AF signal test) function keys appear on F7 to F12.
	[Call Processing]F4	The Call Processing (sequence monitor) function keys appear on F7 to F12.

Measurement depends on the settings of the Band of Traffic Channel and DUT Control, as shown below.

Table 4-1 Relations between Measurement
and settings of the Band of Traffic Channel and DUT Control

Traffic Channel Band	D800MHz, D1.9GHz (for Digital Measure mode)		A800MHz (for Analog Measure mode)	
DUT Control	None	Call Proc	None	Call Proc
[TX Measure] F1	Digital transmitter Measure	Digital transmitter Measure*	Analog transmitter Measure	Analog transmitter Measure *
[RX Measure] F2	Digital receiver Measure	————	Analog receiver Measure	Analog receiver Measure *
[AF Measure] F3	————	————	AF Signal Measure	————
[Call Processing] F4	————	Call Processing test	————	Call Processing test

* : Measuable at Call Processing status of Conversation.

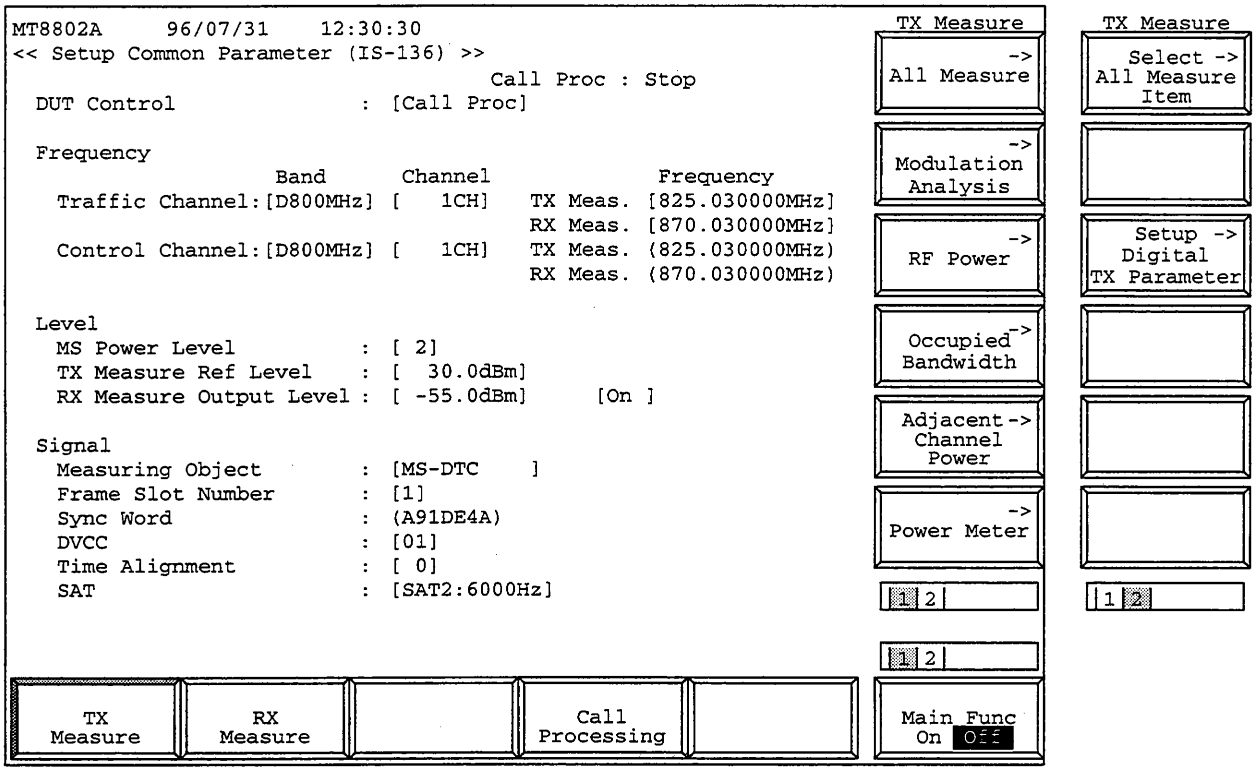


Fig. 4-9 (1/6) Setup Common Parameter Screen(TX Measure, Digital Measure mode)

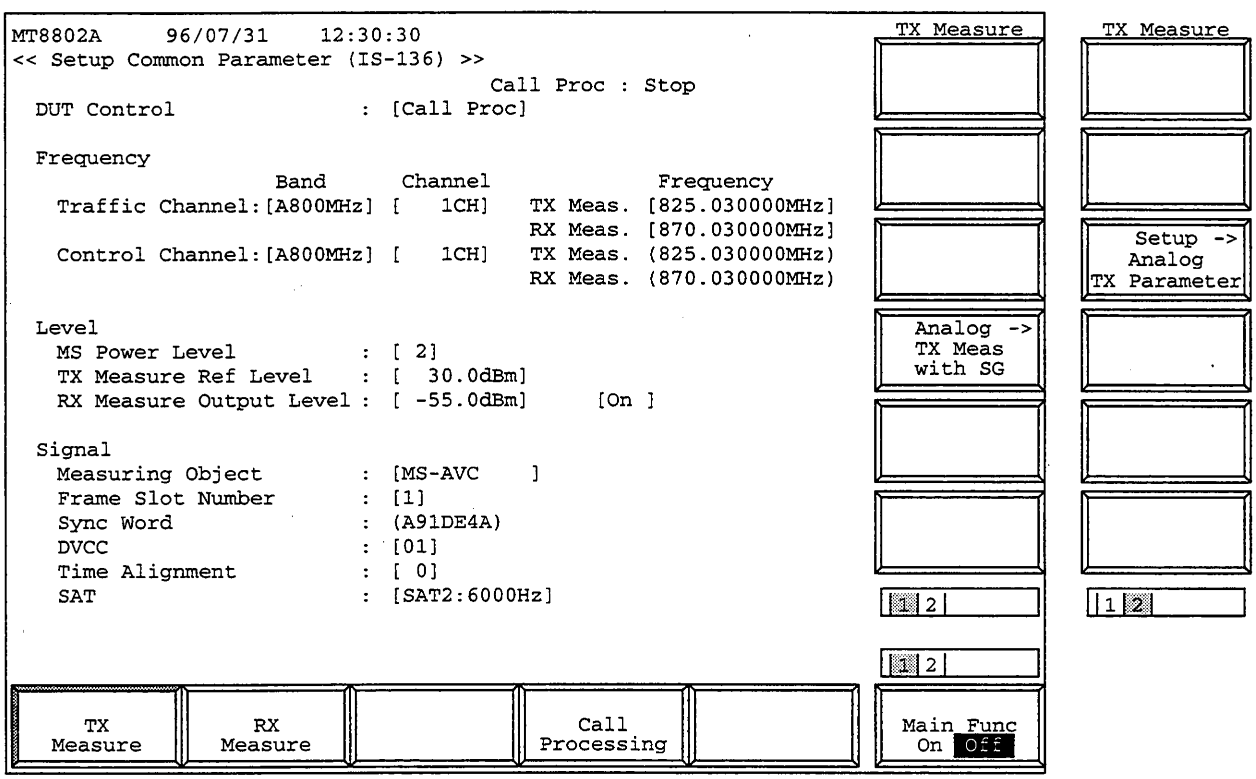


Fig. 4-9 (2/6) Setup Common Parameter Screen(TX Measure, Analog Measure mode)

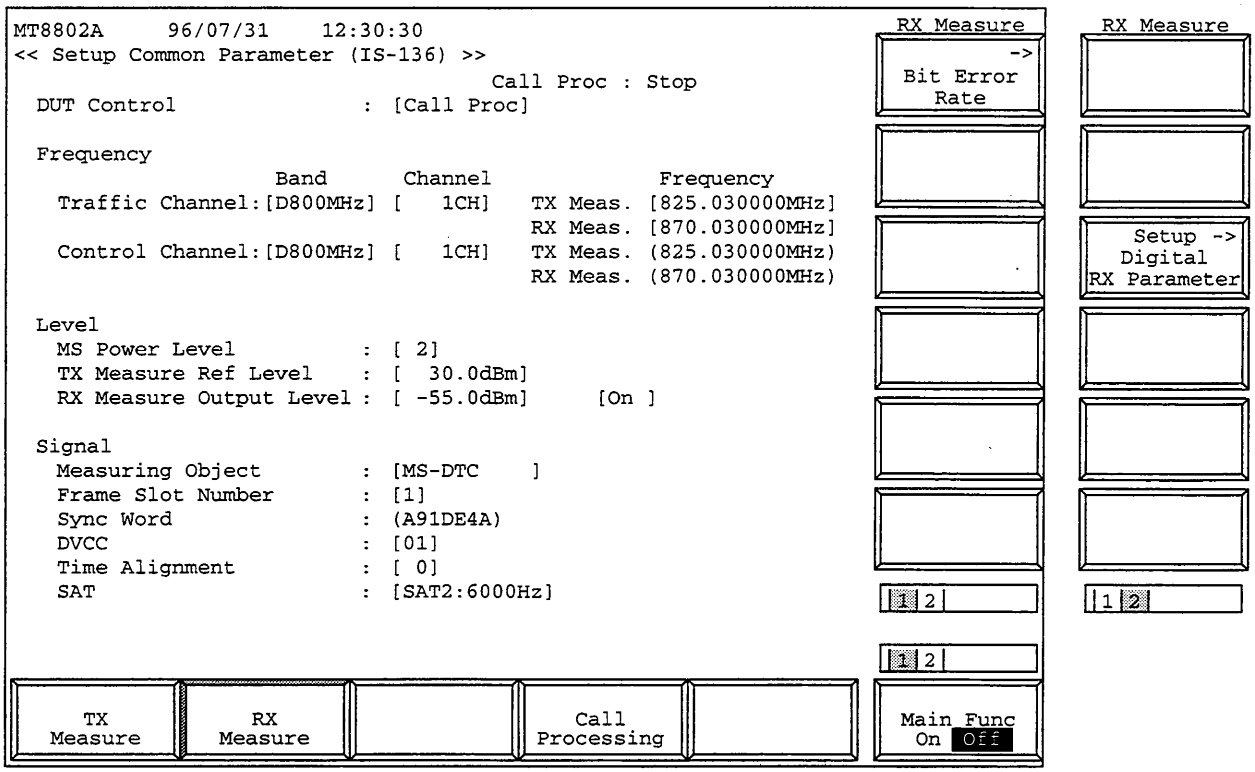


Fig. 4-9 (3/6) Setup Common Parameter Screen(RX Measure, Digital Measure mode)

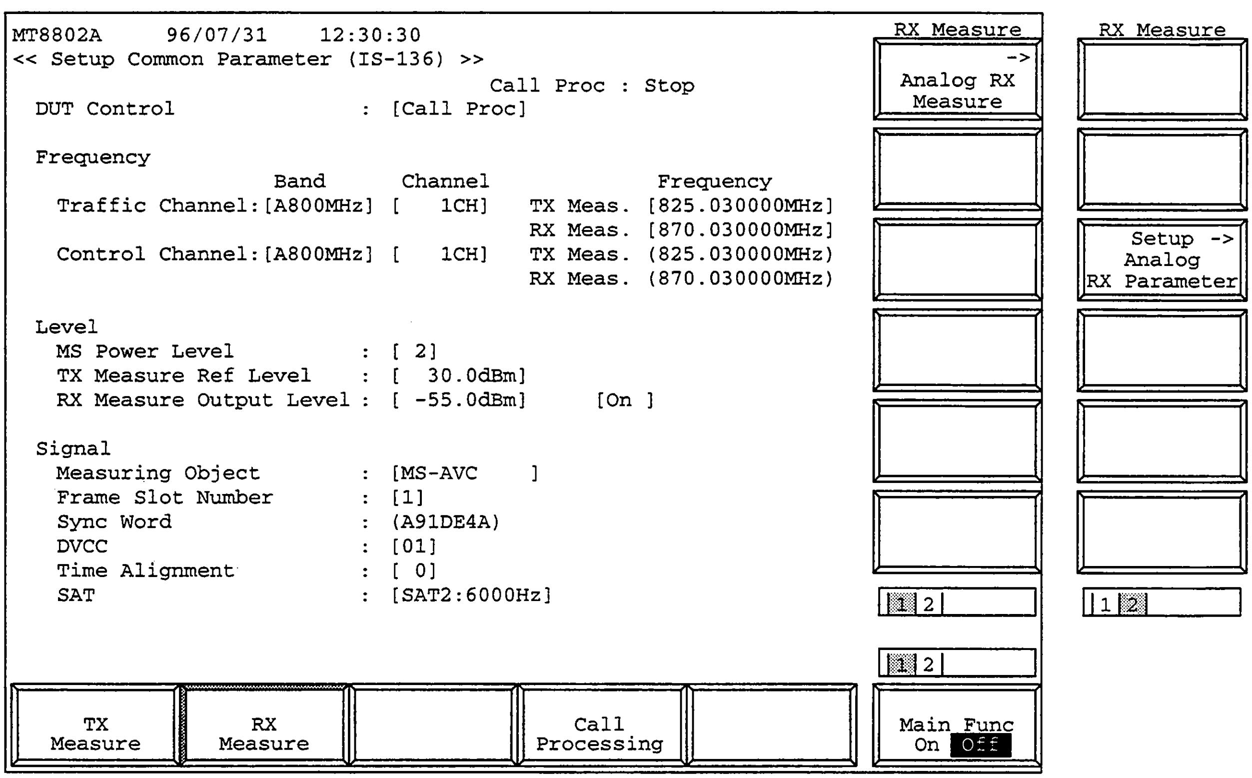


Fig. 4-9 (4/6) Setup Common Parameter Screen(RX Measure, Analog Measure mode)

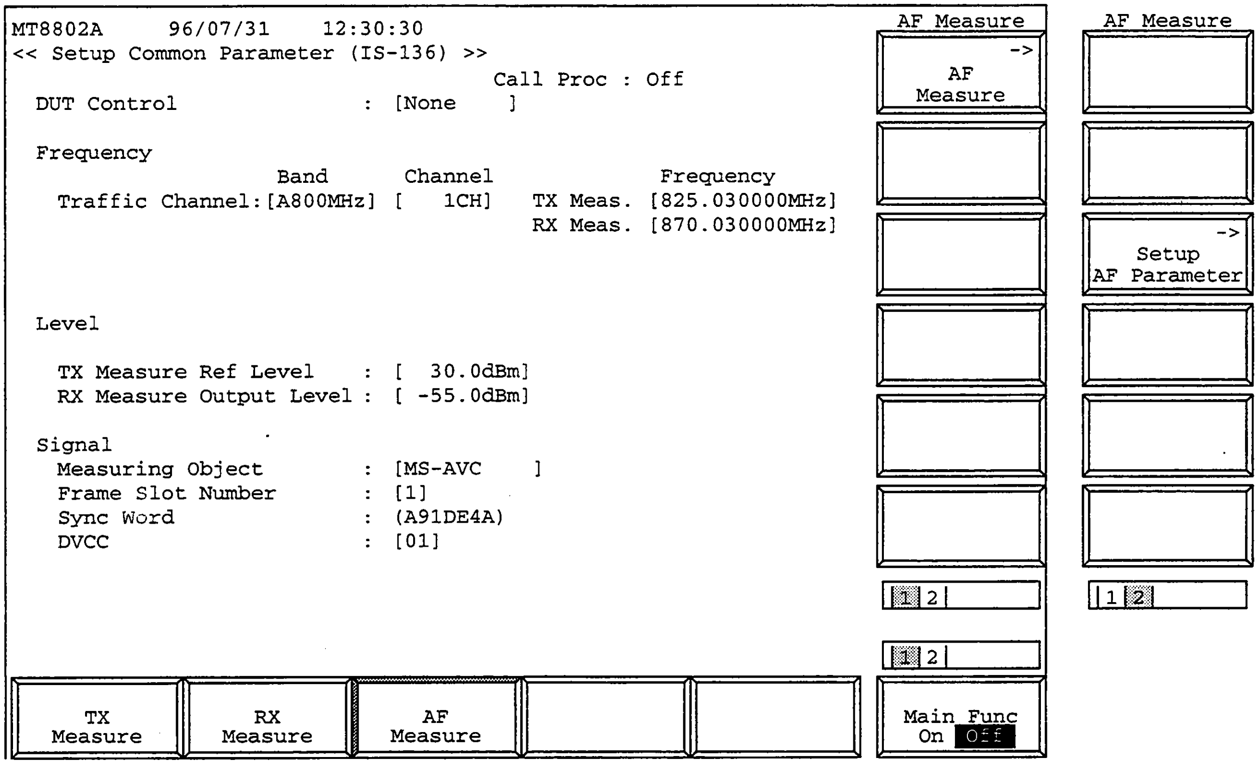


Fig. 4-9 (5/6) Setup Common Parameter Screen(AF Measure, Analog Measure Mode)

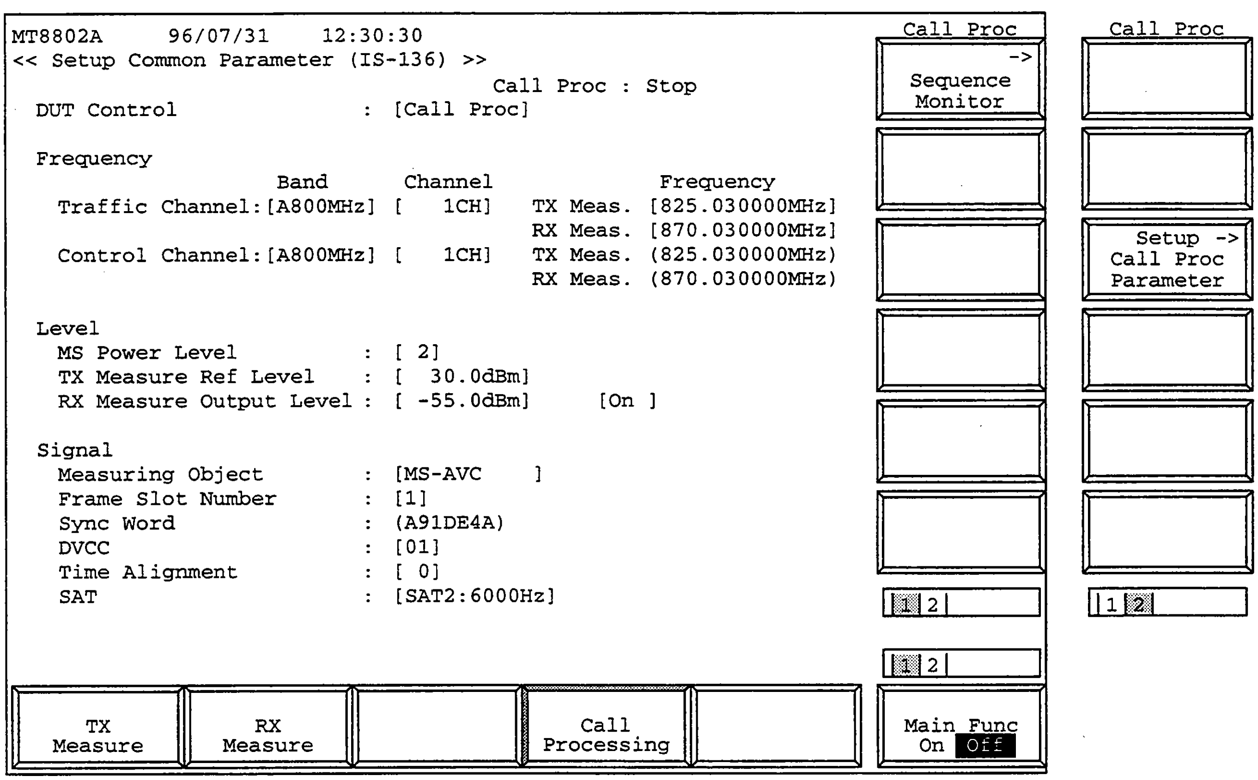


Fig. 4-9 (6/6) Setup Common Parameter Screen(Call Precessing)

• The 2nd page of the main function keys on the Setup Common Parameter screen

(1) When the MT8802A is at the Call Processing status of Stop:

1 2

				Start	Main Func On Off

(2) When the MT8802A is at the Call Processing status of Standby:

1 2

	Termination			Stop	Main Func On Off

(3) When the MT8802A is at the Call Processing status of Conversation:

1 2

	NW Release			Stop	Main Func On Off

(4) When the MT8802A is at the Call Processing status of the sequence execution:

1 2

				Stop	Main Func On Off

• Set the following items:

Item	Range	Initial value	
DUT Control	None, Call Proc	None	Note 1
Frequency			Note 2
Traffic Channel:			
Band	D800 MHz, D1.9 GHz, A800 MHz	D800 MHz	Note 3
Channel	1 to 799, 990 to 1023 (Band: D800 MHz, A800 MHz)	1	
	1 to 1999 (Band: D1.9 GHz)	1	
As switching Band and Channel simultaneously			
	10001 to 10799, 10990 to 11023	(10000 stands for D800 MHz)	
	20001 to 21999	(20000 stands for D1.9 GHz)	
	30001 to 30799, 30999 to 31023	(30000 stands for A8000 MHz)	
TX Measure Frequency			Note 4
	825.000+0.030N [MHz] (Band: D800 MHz, A800 MHz, Channel(N): 1 to 700)		
	825.000+0.030(N-1023) [MHz] (Band: D800 MHz, A800 MHz, Channel(N): 990 to 1023)		
	1849.980+0.030N [MHz] (Band: D1.9 GHz)		
		825.030 MHz (Band: D800 MHz, Channel:1)	
RX Measure Frequency			Note 4
	870.000+0.030N [MHz] (Band: D800 MHz, A800 MHz, Channel(N): 1 to 700)		
	870.000+0.030(N-1023) [MHz] (Band: D800 MHz, A800 MHz, Channel(N): 990 to 1023)		
	1930.020+0.030N [MHz] (Band: D1.9 GHz)		
		870.030 MHz (Band: D800 MHz, Channel:1)	
Control Channel:			
Band	D800 MHz, D1.9 GHz, A800 MHz	D800 MHz	Note 3
Channel	1 to 799, 990 to 1023 (Band: D800 MHz, A800 MHz)	1	
	1 to 1999 (Band: D1.9 GHz)	1	
TX Measure Frequency			Note 5
	825.000+0.030N [MHz] (Band: D800 MHz, A800 MHz, Channel(N): 1 to 700)		
	825.000+0.030(N-1023) [MHz] (Band: D800 MHz, A800 MHz, Channel(N): 990 to 1023)		
	1849.980+0.030N [MHz] (Band: D1.9 GHz)		
		825.030 MHz (Band: D800 MHz, Channel:1)	

Item	Range	Initial value	
RX Measure Frequency		Note 5	
	870.000+0.030N [MHz] (Band: D800 MHz, A800 MHz, Channel(N): 1 to 700)		
	870.000+0.030(N-1023) [MHz] (Band: D800 MHz, A800 MHz, Channel(N): 990 to 1023)		
	1930.020+0.030N [MHz] (Band: D1.9 GHz)		
		870.030 MHz (Band: D800 MHz, Channel:1)	
Level			
MS Power Level	0(max. level) to 10(min. level) (Band: D800 MHz, D1.9 GHz)	2	Note 6
	0(max. level) to 7(min. level) (Band: A800 MHz)	2	
TX Measure Ref Level			
(MAIN)	–5 to 42 dBm	30 dBm	
(AUX)	–30 to 20 dBm		
RX Measure Output Level			
(MAIN)	–133 to –13 dBm	–55.0 dBm	
(AUX)	–133 to +7 dBm		
	On, Off	Off	Note11
Signal			
Measuring Object	MS-DTC(Traffic Channel Band: D800 MHz, D1.9 GHz)	MS-DTC	Note 7
	Continuous (DUT Control: None, Traffic channel Band: D800 MHz, D1.9 GHz)		
	MS-AVC(Traffic Channel Band: A800 MHz)		
Frame Slot Number	1 to 3	1	Note 8
Sync Word			Notes 8,9
	Sync1(Slot 1): A91DE4A		
	Sync2(Slot 2): A9D127A		
	Sync3(Slot 3): C7E3C0C		
DVCC	00 to FF	01h	Note 8
Time Alignment	0 to 30	0	Note 10
SAT	SAT1: 5970Hz	SAT2: 6000Hz	Note 10
	SAT2: 6000Hz		
	SAT3: 6030Hz		

Note 1: When DUT Control is None, the MT8802A can't control DUT.So user should control DUT to measure.
When DUT Control is Call proc, call processing function on the MT8802A is available.

Note 2: Traffic Channel is used for TX/RX measurement using the frequency with the measuring objects of Continuous and MS-TCH.
Control Channel is used in the Call Processing mode.

Note 3: The Traffic Channel Band setting switches between digital measurement (D800MHz,D1.9GHz) and analog measurement (A800MHz).
When Measuring Object is Continuous, this parameter is not available.

Note 4: When being at Conversation state in Call Processing mode, the BAND and Channel can be changed with Handoff sequence.

Note 5: When DUT Control is None, this parameter is available.

Note 6: When DUT Control is Call Processing, this parameter is available.
MS Power Level data is send through the Other sequence of the call-processing to control MS output level.

Value of MS Power Level and the corresponding output level from MS

MS Power Level	Output level from MS (dBm)									
	Band=D800 MHz				Band=D1.9 GHz		Band=A800 MHz			
	Class of MS output level									
	I	II	III	IV	II	IV	I	II	III	IV
0	36	32	28	28	30	28	36	32	28	28
1	32	32	28	28	30	28	32	32	28	28
2 (Initial value)	28	28	28	28	28	28	28	28	28	28
3	24	24	24	24	24	24	24	24	24	24
4	20	20	20	20	20	20	20	20	20	20
5	16	16	16	16	16	16	16	16	16	16
6	12	12	12	12	12	12	12	12	12	12
7	8	8	8	8	8	8	8	8	8	8
8	8	8	8	3	2	2	—	—	—	—
9	8	8	8	−2	−3	−3	—	—	—	—
10	8	8	8	−7	−8	−8	—	—	—	—

Note 7 : When DUT Control is Call Processing, Measuring Object becomes MS-DTC or MS-AVC.

Note 8 : When Measuring Object is Continuous, Frame Slot Number does not appear.

Note 9 : Sync Word is a fixed value depending on Frame Slot Number.

Frame Slot Number	Sync Word
1	A91DE4AH
2	A9D127AH
3	C7E3C0CH

Note 10 : When DUT Control is Call Processing, Time Alignment becomes valid.

Note 11 : The RX Measure Output Level On/Off setting is available when DUT Control is None and Traffic Channel Band is D800MHz or D1.9GHz.
When DUT Control is Call Proc, Call Processing Start and Stop automatically switches Output Level On and Off.
When DUT Control is None and Traffic Channel Band is A800MHz, Output Level Off is always set on the Setup Common Parameter screen.

- Notes on setup items

(1) Relationship between measurement frequencies and channels

The IS-136 system uses different transmit and receive frequencies for the same frequency channel. If a frequency channel is selected, the relationship between the channel and the transmit/receive frequencies depend on the unit to be measured (that is, signals to be measured).

When Measuring Object is set to Continuous, the relationship between the frequency channel and the transmit/receive frequencies that is set immediately before is used.

RF Signal Frequency of the IS-136 System

BAND	Channel	TX Measure Freq.(MHz)	RX Measure Freq.(MHz)
800 MHz	1	825.030	870.030
	2	825.060	870.060
	3	825.090	870.090
	797	848.910	893.910
	798	848.940	893.940
	799	848.970	893.970
	990	824.010	869.010
	991	824.040	869.040
	992	824.070	869.070
	1023	824.940	869.940
	1022	824.970	869.970
	1023	825.000	870.000
1.9 GHz	1	1850.010	1930.050
	2	1850.040	1930.080
	3	1850.070	1930.110
	1997	1909.890	1989.930
	1998	1909.920	1989.960
	1999	1909.950	1989.990

- Main function keys:

1st page

[TX Measure] F1	Displays the TX Measure (transmitter measurement) function keys appear on F7 to F12.
[RX Measure] F2	Displays the RX Measure (receiver measurement) function keys on F7 to F12.
[AF Measure] F3	Displays the AF Measure (AF signal measurement) function keys on F7 to F12. These keys are displayed when Traffic Channel Band is A800MHz and DUT Control is None.
[Call Processing]F4	Displays the Call Processing (sequence monitor) function keys on F7 to F12. When DUT Control is Call Proc, this is appeared.

2nd page

Call Processing (for sequence monitor) main function keys:

The following main function is displayed depending on the Call-Processing execution state.

[Termination]F2	Executes Termination sequence for the MT8802A to call MS.
[NW Release]F2	Executes Network Release sequence.
[Start]F5	Executes the Call-Processing function for the MT8802A to enter Standby state.
[Stop]F5	Stops the Call-Processing function of the MT8802A.

- Function keys for digital transmitter measurement:

1st page

[All Measure] (F7):	Displays the All Measure screen.
[Modulation Analysis] (F8):	Displays the Modulation Analysis screen.
[RF Power] (F9):	Displays the RF Power screen.
[Occupied Bandwidth] (F10):	Displays the Occupied Bandwidth screen.
[Adjacent Channel Power] (F11):	Displays the Adjacent Channel Power screen.
[Power Meter] (F12):	Displays the Power Meter screen.

2nd page

[Select All Measure Item] (F7):	Displays the Select All Measure Item screen.
[Setup Digital TX Parameter] (F9):	Displays the Setup Digital TX Measure Parameter screen.

- Function keys for analog transmitter measurement:

1st page

[Analog TX Measure] (F7):	Displays the Analog TX Measure screen.
[Analog TX Meas with SG] (F10):	Displays the Analog TX Meas with SG screen.

2nd page

[Setup Analog TX Parameter] (F9):	Displays the Setup Analog TX Measure Parameter screen.

- Function keys for digital receiver measurement:

1st page

[Bit Error Rate] (F7):	Displays the Bit Error Rate screen.

2nd page

[Setup Digital RX Parameter] (F9):	Displays the Setup Digital RX Measure Parameter screen.

- Function keys for analog receiver measurement:

  1st page

  [Analog RX Measure] (F7): Displays the Analog RX Measure screen.

  2nd page

  [Setup Analog RX Parameter] (F9): Displays the Setup Analog RX Measure Parameter screen.

- Function keys for AF signal measurement:

  1st page

  [AF Measure] (F7): Displays the AF Measure screen.

  2nd page

  [Setup AF Parameter] (F9): Displays the Setup AF Measure Parameter screen.

- Function keys for Call Processing test:

  1st page

  [Sequence Monitor]F7: Displays the Sequence Monitor screen.

  2nd page

  [Setup Call Proc Parameter]F9: Displays the Setup Call Proc. Parameter screen.

- Comment on the Call-Processing main function keys:

When DUT Control is set to Call Processing, the 2nd page is appeared.
The 2nd page indicates the call-processing trigger keys.
These 2nd-page main-function keys are displayed depending on the call processing status, as described below:

State 1 :	Stop state Main function key --- [Start]F5
State 2 :	Standby state Main function keys --- [Termination]F2, [Stop]F5
State 3 :	Conversation (communication) state Possible to perform TX measurement in this state. Main function keys --- [NW Release]F2, [Stop]F5
State 4 :	Transition state between DCCH and DTCH Execution states of the sequences --- Origination, Termination, MS Release and NW Release Main function key---[Stop]F5
State 5 :	Transition state between DTCHs Execution states of the sequences --- Handoff and Others (DUT control sequence) Main function key---[Stop]F5

4.3.6 Digital Transmitter Measurement

Set Traffic Channel Band to D800MHz or D1.9GHz on the Setup Common Parameter screen, then press the [TX Measure] F1 main function key to set digital transmitter measurement mode.

This paragraph describes the following digital transmitter measurement items:

1. Setting parameters (Setup Digital TX Measure Parameter screen) and all item measurement items (Select All Measure Item screen)
2. All item measurement (All Measure screen)
3. Modulation analysis [1] (Modulation Analysis screen: Value display)
   Modulation analysis [2] (Waveform Display screen: Waveform display of 5 screens)
4. Power measurement (RF Power screen, Setup Template screen)
5. Occupied frequency bandwidth measurement (Occupied Bandwidth screen)
6. Adjacent channel leakage power measurement (Adjacent Channel Power screen)
7. Power meter (Power Meter screen)

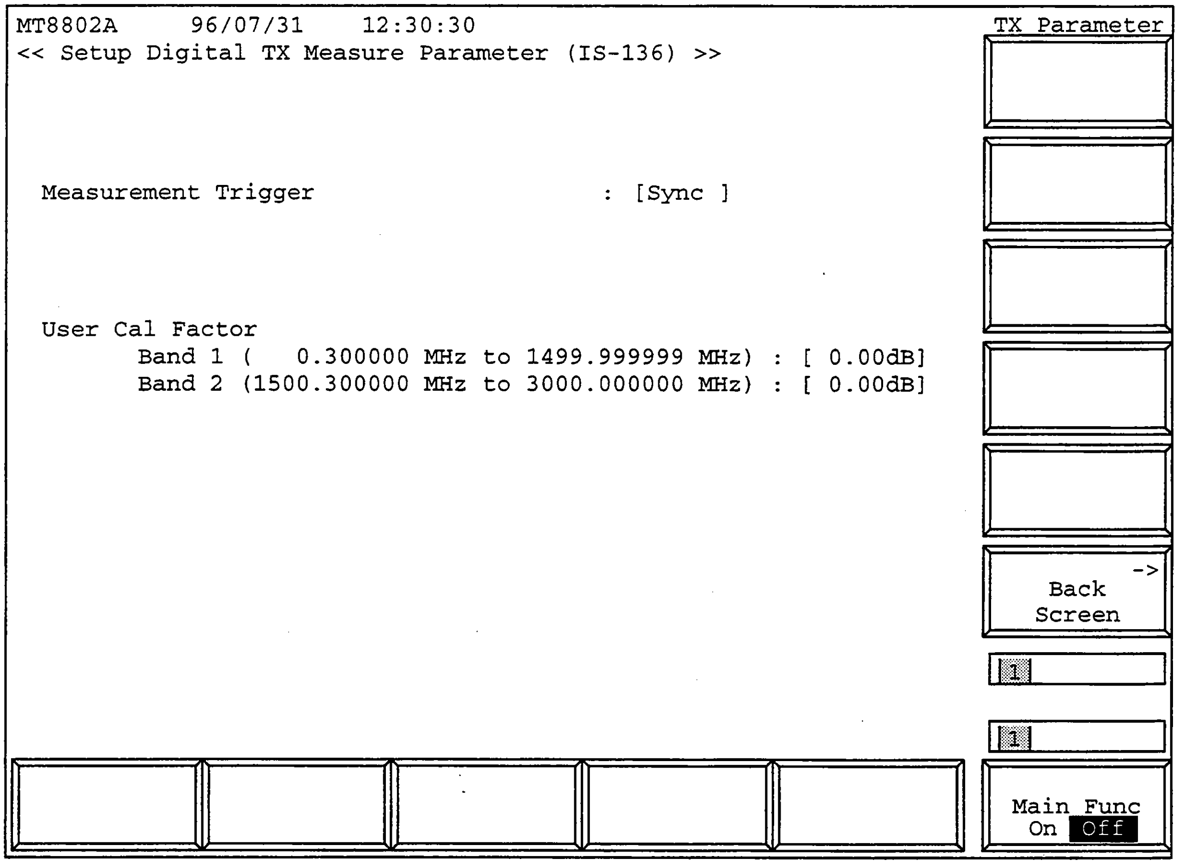
(1) Setting the parameters and measure items

This paragraph describes how to set parameters (on the Setup Digital TX Measure Parameter screen), and how to set measurement items (on the Select All Measure Item screen) of all-item measurement (All Measure) for digital transmitter measurement.

(a) Setting the parameters: Setup Digital TX Measure Parameter screen

• Switch to the Setup Digital TX Measure Parameter screen according to the following steps:

Step	Key operation	Description
1.	[Main Func on off]F6	Sets Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets the TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [︿] [﹀][<][>] [Set][︿] [﹀][Set]	Move the cursor to Traffic Channel Band. Select D800 MHz or D1.9 GHz and press the [Set] key to validate it.
4.	[TX Measure]F1	Displays the first page of the TX Measure menu.
5.	Next Menu [▲]	Displays the second page of the TX Measure menu.
6.	[Setup Digital TX Parameter]F9	Displays the Setup Digital TX Measure Parameter screen.



4-10 Setup Digital TX Measure Parameter Screen

Note: When DUT Control is Call Proc, the setting item of Measurement Trigger does not appear, and is forcibly set to Sync.

- Set the following items:

Item	Range	Resolution	Initial value	
Measurement Trigger	Video, Sync		Sync	Note 1
User Cal Factor (User-level calibration value)	-30.00 to 30.00 dB	0.01 dB	0.00 dB	(*1)

Note 1: When the Measuring Object is MS-DTC, Measurement Trigger appears.
When the Measurement Trigger is Sync, the signal is detected using the Sync Word (fixed value related to the Frame Slot Number, para.4.3.5).
When the measurement Trigger is Video, the signal is detected for that level.

Note 2: User Cal Factor (User level calibration value)
This parameter is used to compensate the increase or decrease of the signal level caused in the signal route from the DUT to the RF input connector of the MT8802A.
For setup example, see Paragraph 4.3.1, (3) "Correcting RF cable loss when conducting the transmitter test".

Note 3: The value obtained from the following equation is displayed as an RF level measurement result:
Displayed measurement result value = Measured value + User Cal Factor
For User Cal Factor, the loss in the RF cable connecting the MT8802A and device under test is set as a correction value.(See paragraph 4.3.1, (2))

- Function keys

Main function key: None

Function key: TX Parameter

[Back Screen] (F12): Displays the previous screen.

(b) Setting items for all item measurement of the transmitter: Select All Measure Item screen

- Switch to the Select All Measure Item screen according the following steps:

  Set all item measurement (All Measure screen) items on this screen.

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [︿] [﹀][<][>] [Set][︿] [﹀][Set]	Move the cursor to Band of Traffic Channel. Select D800 MHz or D1.9 GHz and press the [Set] key to validate it.
4.	[TX Measure]F1	Displays the first page of the TX Measure menu.
5.	Next Menu [▲]	Displays the second page of the TX Measure menu.
6.	[Select All Measure Item]F7	Displays the first page of the Select All Measure Item screen.
7.	[Next Page]F8	Displays the second page of the Select All Measure Item screen.

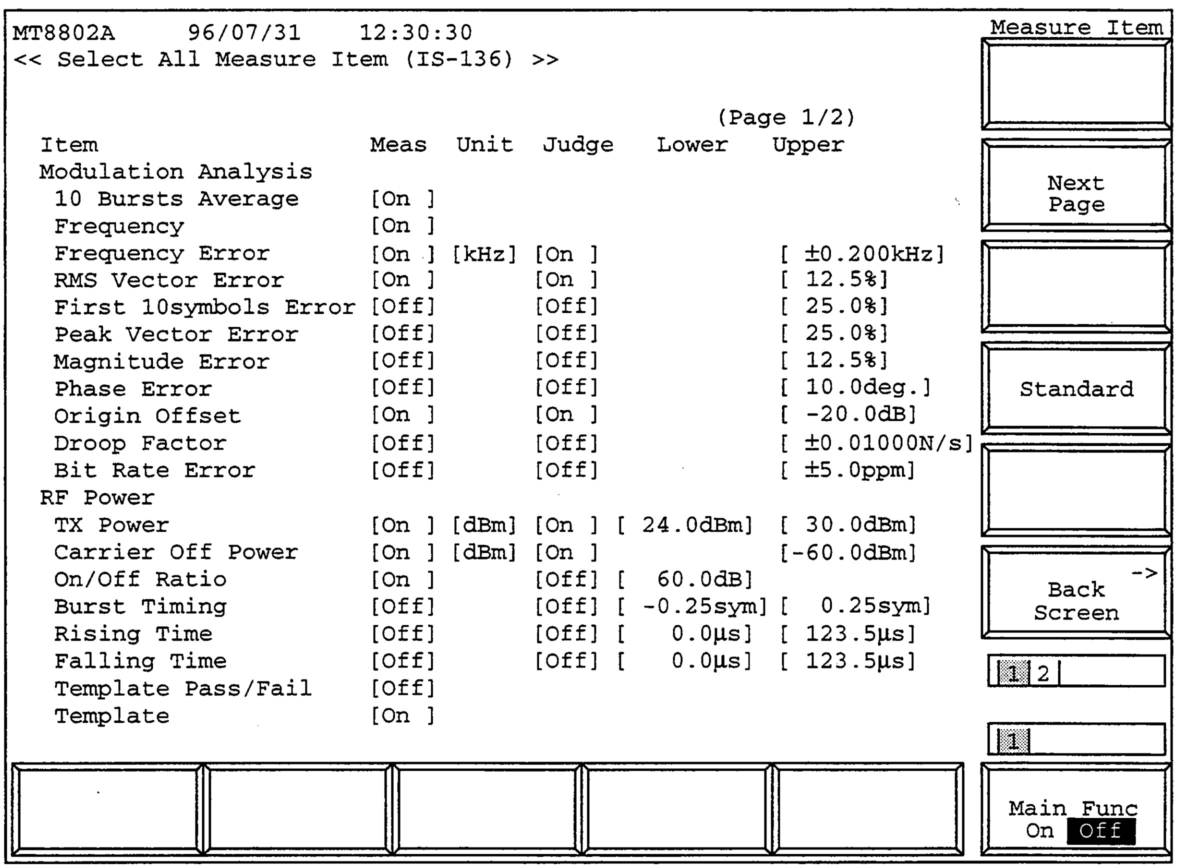


Fig. 4-11 Select All Measure Item Screen (First Page)

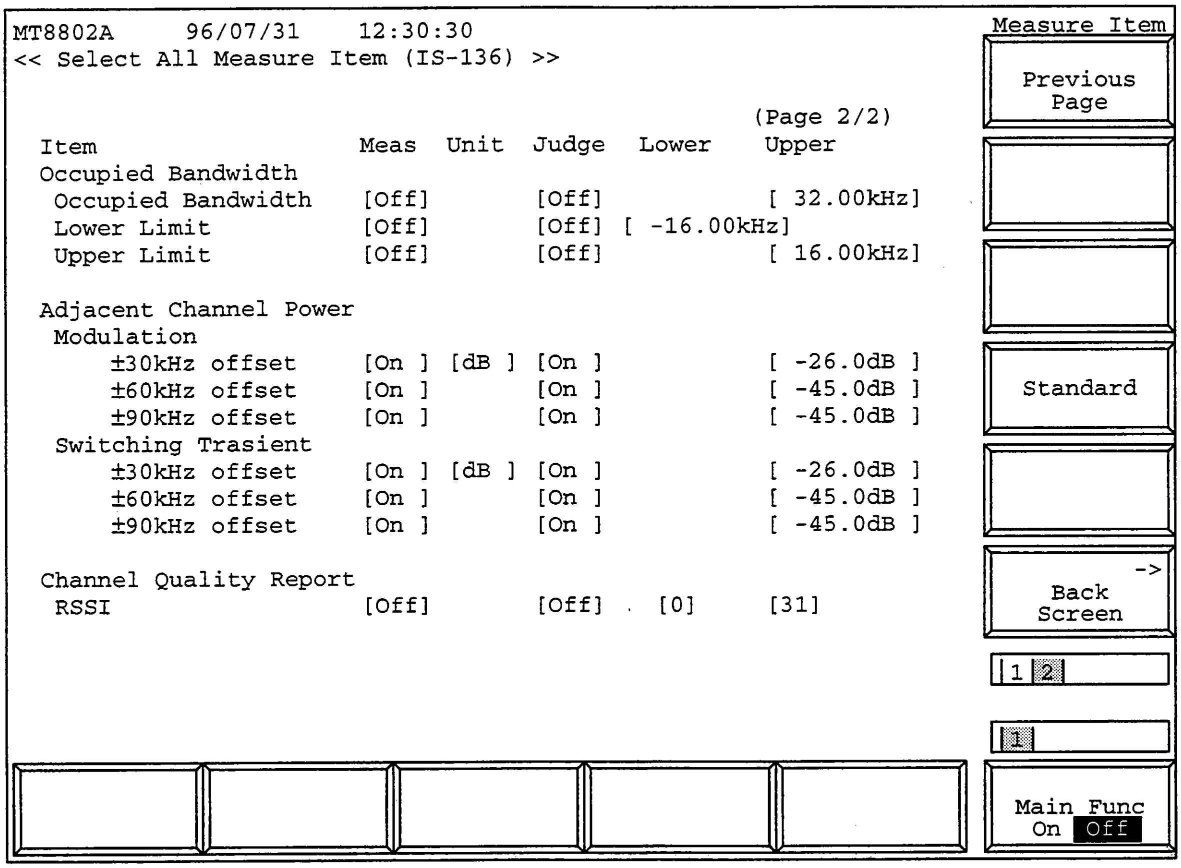


Fig. 4-12 Select All Measure Item Screen (Second Page)

Note : When Call Processing is None, the setting items (Received BER, RSSI) of Channel Quality Report does not appear.

- Set items in the following ranges: * indicates the initial value.

Item	Measurement On/Off	Unit (*1)	Judgment On/Off	Judgment lower limit value	Judgment upper limit value
1st page					
Modulation analysis					
10 Burst Average	On*, Off				
Frequency	On, Off*	(MHz)			
Frequency Error	On*, Off	kHz*, ppm	On*, Off		0.000 to 100.000 kHz(unit: kHz), ±0.200 kHz* Note2: 0.0 to 100.0 ppm(unit: ppm)
RMS Vector Error	On*, Off	kHz*, ppm	On*, Off		0.0 to 100.0%, 12.5%*
First 10symbols Error	On, Off*	(%)	On, Off*		0.0 to 100.0%, 25.0%*
Peak Vector Error	On, Off*	(%)	On, Off*		0.0 to 100.0%, 12.5%*
Magnitude Error	On, Off*	(%)	On, Off*		0.0 to 100.0%, 12.5%*
Phase Error	On, Off*	(%)	On, Off*		0.0 to 100.0 degrees, 10.0 degrees*
Origin Offset	On*, Off	(dB)	On*, Off		-100.0 to 0.0 dB, -20.0 dB*
Droop Factor	On, Off*	(Neper/Symbol)	On, Off*		0.00000 to ±0.10000 Neper/Symbol, ±0.01000 Neper/Symbol*
Bit Rate Error	On, Off*	(ppm)	On, Off*		0.0 to ±100.0 ppm, ±5.0 ppm*

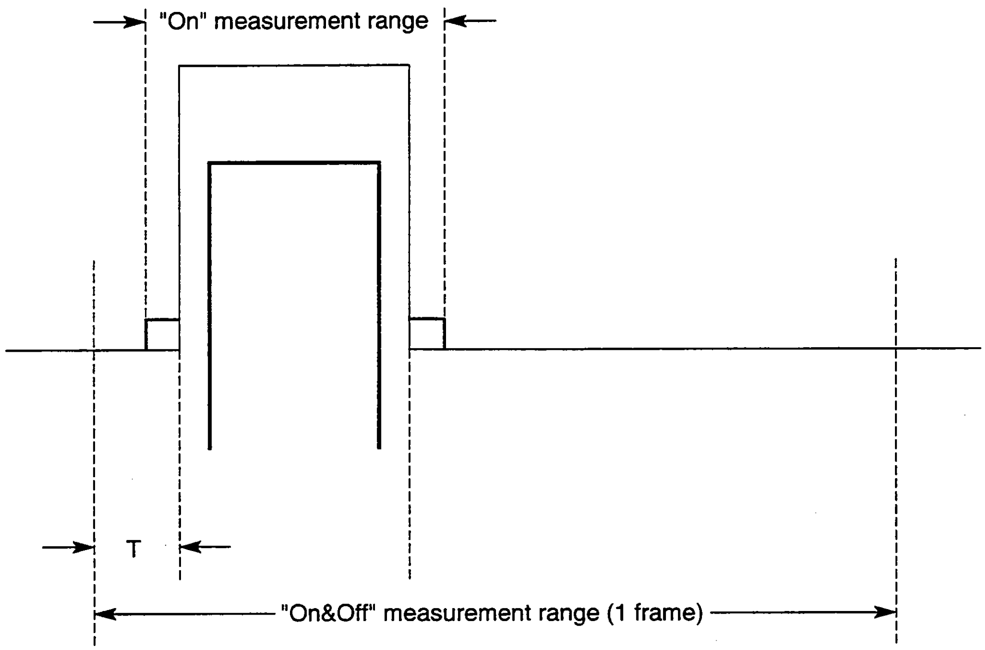
Item	Measurement On/Off	Unit (*1)	Judgment On/Off	Judgment lower limit value	Judgment upper limit value
RF Power					
TX Power	On*, Off	W, dBm*	On*, Off	0 nW to 20 W(unit:W)24dBm* -80.0 to 43.0 dBm(unit:dBm),	0 nW to 20 W(unit:W), 30dBm* -80.0 to 43.0 dBm(unit: dBm)
Carrier Off Power	On*, Off	W, dBm*	On*, Off		0 nW to 20 W(unit:W) , -60 dBm* -80.0 to 43.0 dBm(unit:dBm)
On/Off Ratio	On*, Off	(dB)	On*, Off		0.0 to 100.0 dB, 60.0 dB*
Burst Timing	On, Off*	(symbol)	On, Off*	-10.00 to 10.00 symbol, -0.25 symbol*	-10.00 to 10.00 symbol,0.25 symbol*
Rising Time	On, Off*	(µs)	On, Off*	0.0 to 200.0 µs, 0.0 µs*	0.0 to 200.0 µs, 123.5 µs*
Falling Time	On, Off*	(µs)	On, Off*	0.0 to 200.0 µs, 0.0 µs*	0.0 to 200.0 µs, 123.5 µs*
Template Pass/Fail	On, Off*				
Template	On, On&Off*				Note3:
2nd page					
Occupied Bandwidth					
Occupied Bandwidth	On, Off*	(kHz)	On, Off*		0.000 to 200.000 kHz, 32.000 kHz*
Lower Limit	On, Off*	(kHz)	On, Off*		-100.000 to 0.000 kHz, -16.000 kHz*
Upper Limit	On, Off*	(kHz)	On, Off*		0.000 to 100.000 kHz, 16.000 kHz*
Adjacent Channel Power					
Modulation	On*, Off	dB*/dBm/nW/uW/mW	On*, Off		On ±30 kHz frequency offset -100. to 0.0 dB (unit: dB) -80.0 to +43.0 dBm (unit: dBm) 0 nW to 20 W (unit: W) -26.0 dB* On ±60 kHz frequency offset -100. to 0.0 dB (unit: dB) -80.0 to +43.0 dBm (unit: dBm) 0 nW to 20 W (unit: W) -45.0 dB* On ±90 kHz frequency offset -100. to 0.0 dB (unit: dB) -80.0 to +43.0 dBm (unit: dBm) 0 nW to 20 W (unit: W) -45.0 dB*
Switching Transient	On*, Off	dB*/dBm/nW/uW/mW	On*, Off		On ±30 kHz frequency offset -100. to 0.0 dB (unit: dB) -80.0 to +43.0 dBm (unit: dBm) 0 nW to 20 W (unit: W) -26.0 dB* On ±60 kHz frequency offset -100. to 0.0 dB (unit: dB) -80.0 to +43.0 dBm (unit: dBm) 0 nW to 20 W (unit: W) -45.0 dB* On ±90 kHz frequency offset -100. to 0.0 dB (unit: dB) -80.0 to +43.0 dBm (unit: dBm) 0 nW to 20 W (unit: W) -45.0 dB*

*1 Values in parentheses are fixed units.

*2 The set judgment upper limit value is considered both the upper and lower limit values. (Judgment is made using the absolute value of an error from the reference value.)

*3 Template On: A signal waveform is applied to measurement only in a section with a burst.

Template On&Off: A signal waveform is applied to measurement in both sections with and without a burst. (See the figure below.)



T: 100 symbols

- When the [Standard] F10 function key is pressed, items in the all measurement value list (All Measure screen) are set to the initial value (Standard value):

- Function keys

Main function key:	None
Function key:	Measure Item

1st page

[Next Page] (F8):	Displays the second page.
[Standard] (F10):	Sets the standard value.
[Back Screen] (F12):	Displays the previous screen.

2nd page

[Previous Page] (F7):	Displays the first page.
[Standard] (F10):	Sets the standard value.
[Back Screen] (F12):	Displays the previous screen.

(2) Transmitter all item measurement: All Measure screen

Use the parameters set on the Setup Common Parameter screen (see paragraph 4.3.5) and Setup Digital TX Measure Parameter screen (see paragraph 4.3.6, (1), (a)) to measure and display the items (see paragraph 4.3.6, (1), (b)) set on the Select All Measure Item screen.

- Display the All Measure screen according to the following steps:

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [︿] [﹀][<][>] [Set][︿] [﹀][Set]	Move the cursor to Band of Traffic Channel. Select D800 MHz or D1.9 GHz and press the [Set] key to validate it.
4.	[TX Measure]F1	Displays the first page of the TX Measure menu.
5.	[All Measure]F7	Displays the first page of the All Measure screen.
6.	[Next Page]F8	Displays the second page of the All Measure screen.

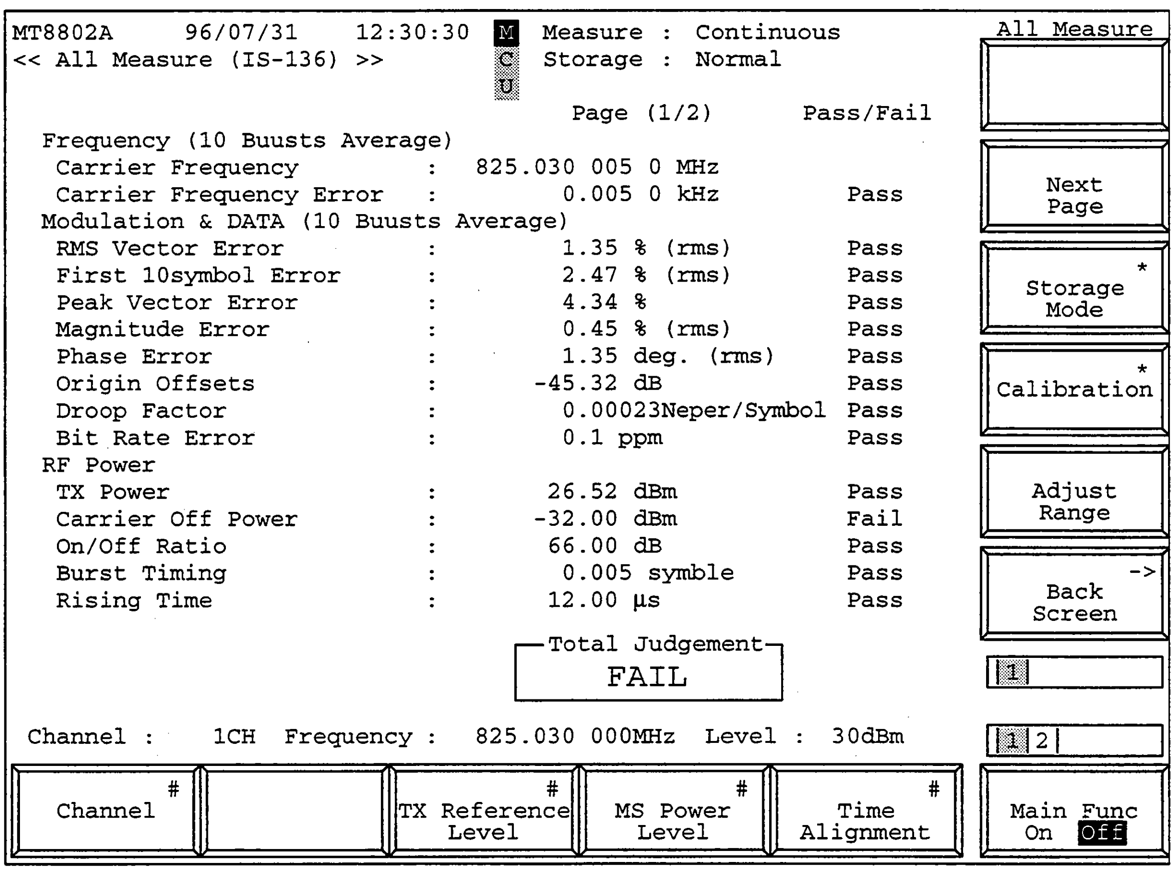


Fig. 4-13 Example of All Measure Screen (First Page)

Note: When all measurement items are Pass, Total Judgment becomes "PASS." If any one item is Fail, Total Judgement becomes "FAIL."

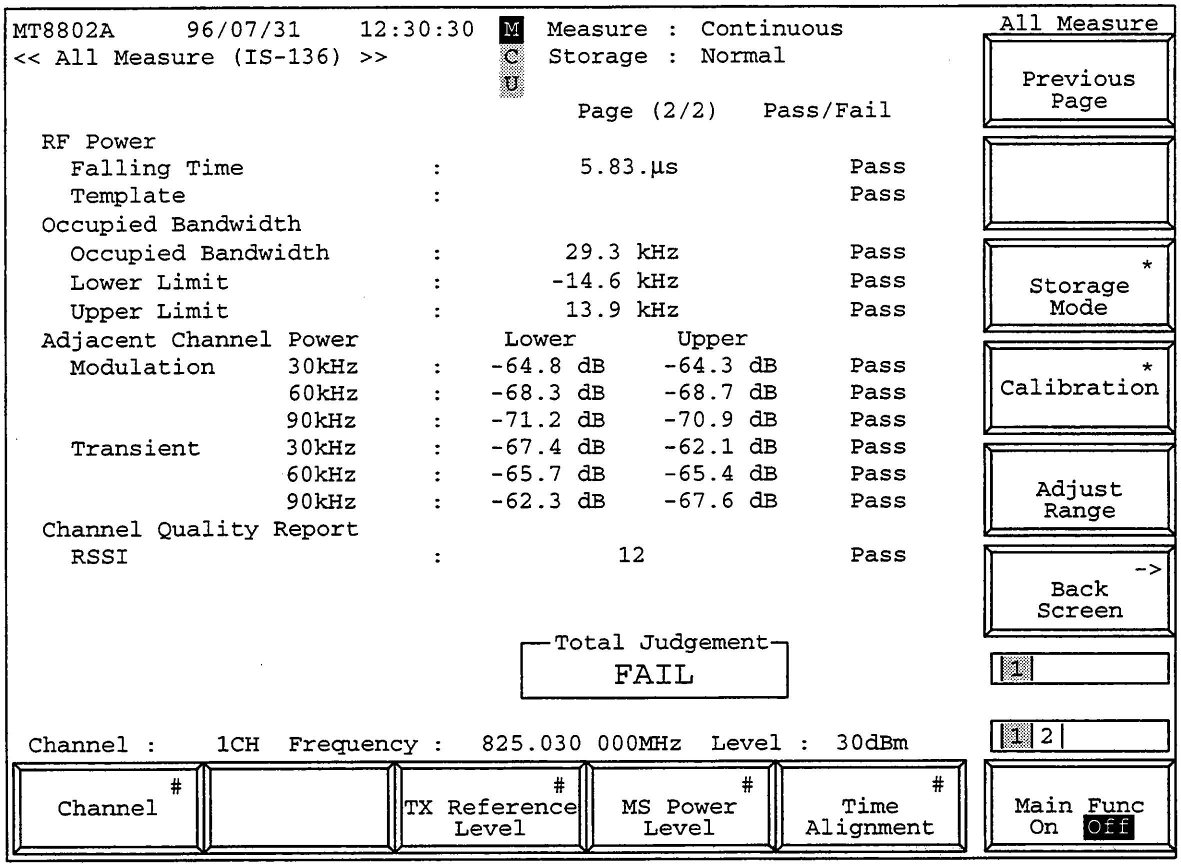
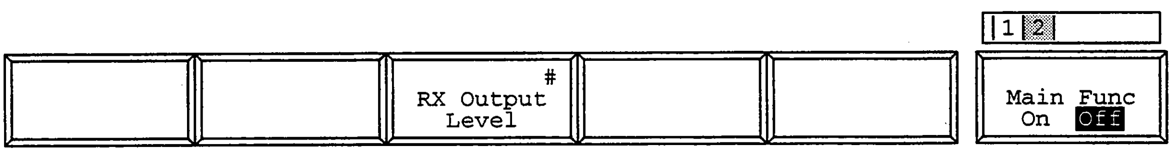
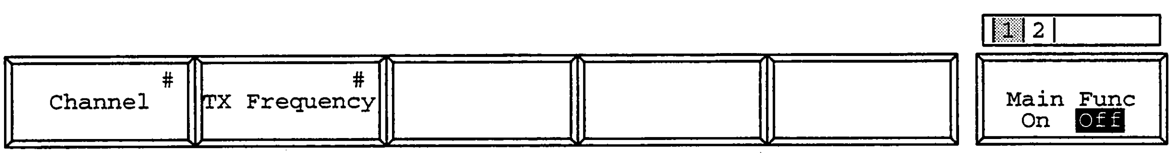


Fig. 4-14 Example of All Measure Screen (Second Page)

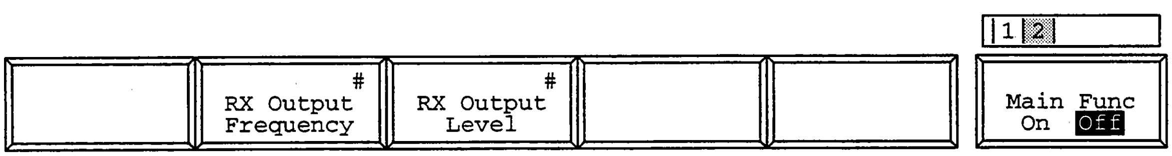
The 2nd page of the main function keys on the All measure screen (DUT Control: Call Proc)



The 1st page of the main function keys on the All measure screen (DUT Control:None)



The 2nd page of the main function keys on the All measure screen (DUT Control:None)



Note: When DUT Control is None, setting items (Received BER, RSSI) of Channel Quality Report do not appear.

- Main function keys

1st page

[Channel]F1	Changes channel number. When DUT Control is Call Proc, TX Frequency and RX Output Frequency become the values corresponding to the channel number.
[TX Frequency]F2	Changes the transmission frequency of MS(mobile station to be measured) (reception frequency of the MT8802A). Disappears when DUT Control is Call Proc, and becomes the value corresponding to the channel number.
[TX Reference Level]F3	Changes the MT8802A reference level to measure the transmission level from MS.
[MS Power Level]F4	Changes the transmission level from MS. Disappears when DUT Control is None.(Para.4.3.5)
[Time Alignment]F5	Changes Time Alignment of MS. Disappears when DUT Control is None.(Para.4.3.5)

2nd page

[RX Output Frequency]F2	Changes the reception frequency of MS (output frequency from the MT8802A). Disappears when DUT Control is Call Proc, and becomes the value corresponding to the channel number.
[RX Output Level]F3	Changes the reception level of MS (output level from the MT8802A).

- Function keys: All Measure

[Previous Page]F7	Displays the previous page.
[Next Page]F8	Displays the next page.
[Storage Mode]F9:	Displays the storage mode setup menu.
[Normal]F7:	Sets normal mode.(Initial value)
[Average]F8:	Sets averaging mode. Measure mode is set to Single. (No screen is displayed.)
[Average Count]F9:	Sets an averaging count. 2 to 9999 Initial value:10
[Refresh Interval]F10:	Sets the update time of the averaged-measurement data display. Every: after every single measurement Once: after the specified-count-measurement averaging processing
[return]F12:	Returns to the previous menu.
[Calibration]F10:	Displays the level calibration menu.
[Manual Calibration]F7:	Performs level calibration. During calibration, the window indicating calibration in progress is displayed on the screen.
[Calibration Cancel]F8:	Deletes level calibration data.
[return]F12:	Returns to the previous menu.
[Adjust Range]F11:	Sets the measurement level ranges (RF power meter range and reference level) to the status appropriate for measurement signal.(See paragraph 4.3.1(2))
[Back Screen]F12:	Displays the previous screen.

(3) Modulation analysis: Modulation Analysis screen (value display)
Waveform Display screens (waveform display: 5 screens)

Use the parameters set on the Setup Common Parameter screen (see paragraph 4.3.5) and Setup Digital TX Measure Parameter screen (see paragraph 4.3.6, (1), (a)) to analyze a modulated signal from the transmitter, and display a measured value or waveform.

There is one value-display screen. A waveform display screen can be used to select and display one of five measured waveforms (Constellation, Eye Diagram, Vector Error, Phase Error, or Magnitude Error).

(a) Modulation analysis (value display): Modulation Analysis screen

- Display the Modulation Analysis screen according to the following steps:

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&TR Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [︿] [﹀][<][>] [Set][︿] [﹀][Set]	Move the cursor to Band of Traffic Channel. Select D800 MHz or D1.9 GHz and press the [Set] key to validate it.
4.	[TX Measure]F1	Displays the first page of the TX Measure menu.
5.	[Modulation Analysis]F8	Displays the Modulation Analysis screen.

```
MT8802A      96-07-31    12:30:30   M  Measure  :  Continuous          Mod. Anal.
<< Modulation Analysis (IS-136) >>  C  Storage  :  Normal                     ->
                                    U                                   Waveform
                                                                        Display
  Frequency
   Carrier Frequency                    :     825.030 001 0 MHz        10 Bursts
   Carrier Frequency Error              :           0.001 0 kHz         Average
                                                                         On  Off
  Modulation
   RMS Vector Error                     :       1.35 % (rms)                   *
   First 10 symbols RMS Vector Error    :       2.55 % (rms)            Storage
   Peak Vector Error                    :       4.23 %                    Mode
   Magnitude Error                      :       0.45 % (rms)
   Phase Error                          :       1.35 deg. (rms)                *
   Origin Offsets                       :     -45.32 dB               Calibration
   Droop Factor                         :   -0.00002 Neper/Symbol

  DATA (10 Bursts Average "On" Only)                                    Adjust
   Bit Rate                             :    48.600 001 2 kbps          Range
   Bit Rate Error                       :      0.0 ppm
                                                                              ->
                                                                         Back
                                                                        Screen

                                                                        |1|

 Channel :    1CH   Frequency :   825.030 000MHz   Level :  30dBm       |1|2|

 Channel  # |        | TX Reference # | MS Power # |   Time   # |  Main Func
            |        |    Level       |   Level    | Alignment  |  On  Off
```

Fig. 4-15 Modulation Analysis Screen

The 2nd page of the main function keys on the Modulation Analysis screen (DUT Control:Call Proc)

```
                                                                |1|2|
          |          | RX Output # |          |          |  Main Func
          |          |   Level     |          |          |  On  Off
```

The 1st page of the main function keys on the Modulation Analysis screen (DUT Control:None)

```
                                                                |1|2|
 Channel #| TX Frequency # |          |          |          |  Main Func
          |                |          |          |          |  On  Off
```

The 2nd page of the main function keys on the Modulation Analysis screen (DUT Control:None)

```
                                                                |1|2|
          | RX Output #  | RX Output # |          |          |  Main Func
          |  Frequency   |   Level     |          |          |  On  Off
```

Note: When the 10 Burst Average is set to on, the items of Frequency and Modulation display the averaged values of the continuous 10 bursts (or maximum value for peak value display). When the 10 Burst Average is set to on and also the Storage Mode is set to Average, the measurement is performed for the ten times of the bursts of the Average-Count set value.

- Main function keys

1st page:

[Channel]F1 — Changes channel number.
When DUT Control is Call Proc, TX Frequency and RX Output Frequency become the values corresponding to the channel number.

[TX Frequency]F2 — Changes the transmission frequency of MS(mobile station to be measured) (reception frequency of the MT8802A).
Disappears when DUT Control is Call Proc, and becomes the value corresponding to the channel number.

[TX Reference Level]F3 — Changes the MT8802A reference level to measure the transmission level from MS.

[MS Power Level]F4 — Changes the transmission level from MS.
Disappears when DUT Control is None.(Para.4.3.5)

[Time Alignment]F5 — Changes Time Alignment of MS.
Disappears when DUT Control is None.(Para.4.3.5)

2nd page

[RX Output Frequency]F2 — Changes the reception frequency of MS (output frequency from the MT8802A).
Disappears when DUT Control is Call Proc, and becomes the value corresponding to the channel number.

[RX Output Level]F3 — Changes the reception level of MS (output level from the MT8802A).

- Function keys: Mod.Anal.

[Waveform Display]F7: — Displays the Waveform Display screen.
(See paragraph 4.3.6, (3), (b).)

[10 Bursts Average On/Off]F8 — Used for measurement of 10 bursts at one time.
When 10 Bursts average is On, the MT8802A measures below.
1. "Bit Rate" and "Bit Rate Error" items
2. 10 bursts average of other measurement Items except for "Peak Vector Error".
3. Peak hold of 10 Bursts for Peak Vector Error.
If Storage mode is "Average" and 10 Bursts average is "On", the MT8802A measures 10 times "Average Count" bursts at one time.
Initial value:On

[Storage Mode]F9: — Displays the storage mode setup menu.

- [Normal]F7: — Sets normal mode (initial value).
- [Average]F8: — Sets averaging mode.
Measure mode is set to Single.
- [Average Count]F9: — Sets an averaging count.
2 to 9999   Initial value:10
- [Refresh Interval]F10: — Sets the update time of the averaged-measurement data display.
Every:after every single measurement
Once:after the specified-count-measurement averaging processing
- [return]F12: — Returns to the previous menu.

[Calibration]F10: — Displays the level calibration menu.

- [Manual Calibration]F7: — Performs level calibration.
During calibration, the window indicating calibration in progress is displayed on the screen.
- [Calibration Cancel]F8: — Deletes level calibration data.
- [return]F12: — Returns to the previous menu.

[Adjust Range]F11: — Sets the measurement level ranges (RF power meter range and reference level) to the status appropriate for measurement signal. (See paragraph 4.3.1(2))

[Back Screen]F12: — Displays the previous screen.

(b) Modulation analysis (waveform display): Waveform Display screens

- Display the following five Waveform Display screens according to the steps described below:

Constellation:	I to Q constellation
Eye Diagram:	Symbol to I and Symbol to Q eye patterns
Vector Error:	Symbol to vector error
Phase Error:	Symbol to phase error
Magnitude Error:	Symbol to magnitude error

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup common Parameter screen appears.
3.	Cursor [︿] [﹀][<][>] [Set][︿] [﹀][Set]	Move the cursor to Band of Traffic Channel. Select D800 MHz or D1.9 GHz and press the [Set] key to validate it.
4.	[TX Measure]F1	Displays the first page of the TX Measure menu.
5.	[Modulation Analysis]F8	Displays the Modulation Analysis screen.
6.	[Waveform Display]F7	Displays the Waveform Display screen (initial value: Constellation).
7.	[Trace Format]F7	Displays the Trace Format menu.
8.	[Constellation] F7 [Eye Diagram] F8 [Vector Error]F9 [Phase Error] F10 [Magnitude Error]F11	Displays the Waveform Display screen (Constellation). Displays the Waveform Display screen (Eye Diagram). Displays the Waveform Display screen (Vector Error). Displays the Waveform Display screen (Phase Error). Displays the Waveform Display screen (Magnitude Error).

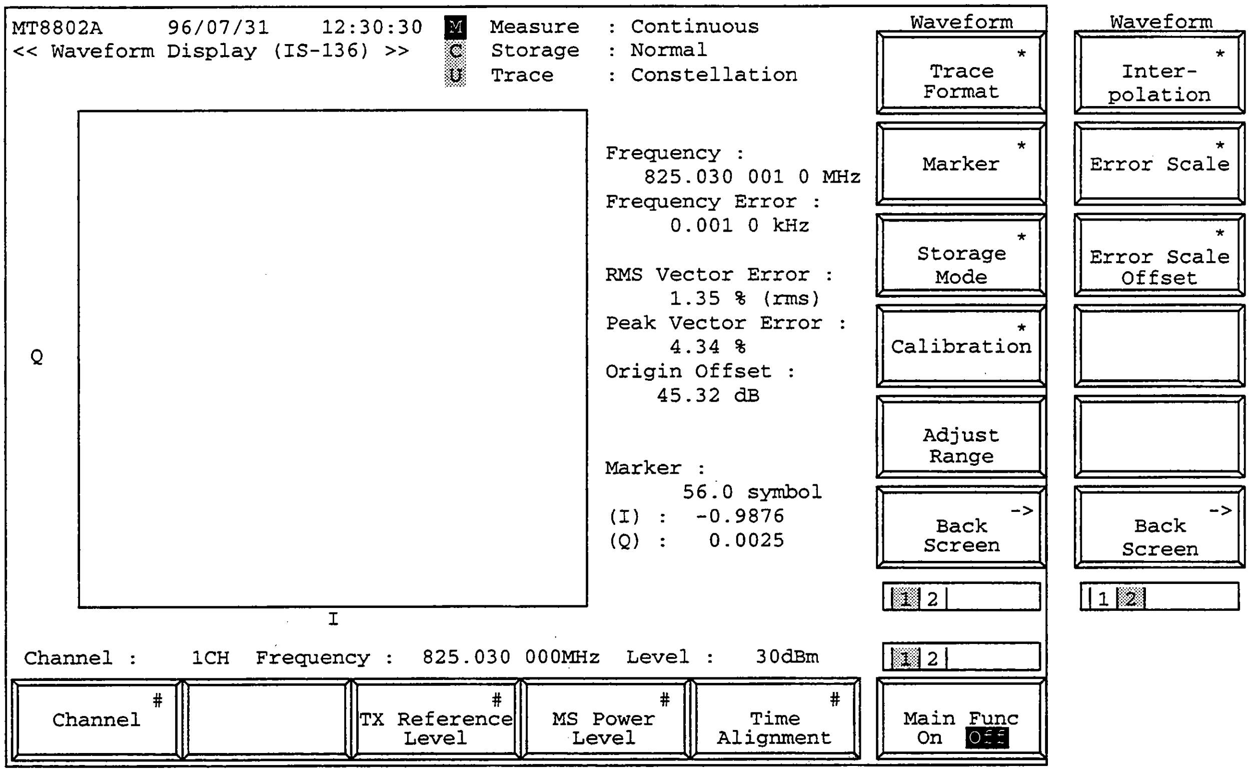
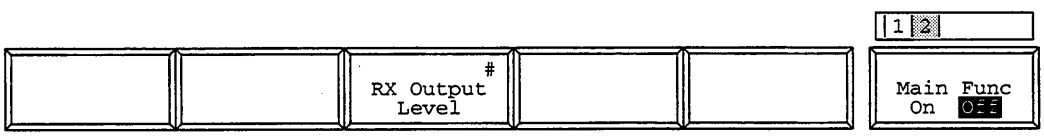
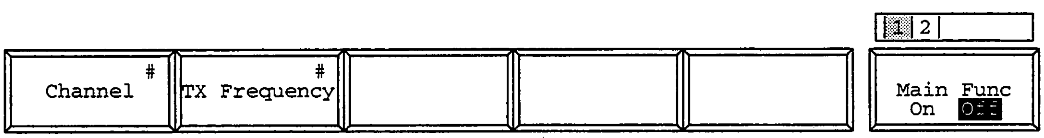


Fig. 4-16 Waveform Display Screen (Constellation)

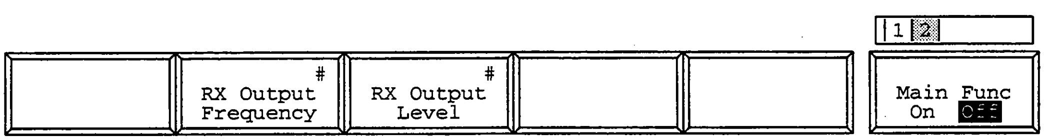
The 2nd page of the main function keys on the Waveform Display screen (DUT Control: Call Proc)



The 1st page of the main function keys on the Waveform Display screen (DUT Control:None)



The 2nd page of the main function keys on the Waveform Display screen (DUT Control:None)



- Main function keys

1st page:

[Channel]F1	Changes channel number. When DUT Control is Call Proc, TX Frequency and RX Output Frequency become the values corresponding to the channel number.
[TX Frequency]F2	Changes the transmission frequency of MS(mobile station to be measured) (reception frequency of the MT8802A). Disappears when DUT Control is Call Proc, and becomes the value corresponding to the channel number.
[TX Reference Level]F3	Changes the MT8802A reference level to measure the transmission level from MS.
[MS Power Level]F4	Changes the transmission level from MS. Disappears when DUT Control is None.(Para.4.3.5)
[Time Alignment]F5	Changes Time Alignment of MS. Disappears when DUT Control is None.(Para.4.3.5)

2nd page

[RX Output Frequency]F2	Changes the reception frequency of MS (output frequency from the MT8802A). Disappears when DUT Control is Call Proc, and becomes the value corresponding to the channel number.
[RX Output Level]F3	Changes the reception level of MS (output level from the MT8802A).

- Function keys:

1st page (common for all waveforms)

[Trace Format]F7:	Displays the Trace Format menu.	
	[Constellation]F7:	Displays the Waveform Display screen (Constellation) (initial value).
	[Eye Diagram]F8:	Displays the Waveform Display screen (Eye Diagram).
	[Vector Error]F9:	Displays the Waveform Display screen (Vector Error).
	[Phase Error]F10:	Displays the Waveform Display screen (Phase Error).
	[Magnitude Error]F11:	Displays the Waveform Display screen (Magnitude Error).
	[return]F12:	Returns to the previous menu.
[Marker]F8:	Displays the Marker menu.	
	[Normal]F7:	Sets the normal marker mode. The screen enters the marker-position input wait state. Resolution: 0.1 symbols (when Interpolation on Constellation display is 10 Points) 1 symbol (under other than the condition above)
	[Off]F8:	Sets marker mode off and clears a marker display (initial value).
	[return]F12:	Returns to the previous menu.
[Storage Mode]F9:	Displays the storage mode setup menu.	
	[Normal]F7:	Sets normal mode (initial value).
	[Over Write]F8:	Sets overwriting mode.
	[return]F12:	Returns to the previous menu.

[Calibration]F10: Displays the level calibration menu.

- [Manual Calibration]F7: Performs level calibration.
  During calibration, the window indicating calibration in progress is displayed on the screen.
- [Calibration Cancel]F8: Deletes level calibration data.
- [return]F12: Returns to the previous menu.

[Adjust Range]F11: Sets the measurement level range (RF power meter range and reference level) to the status appropriate for measurement signal. (See paragraph 4.3.1 (2))

- [Back Screen]F12: Displays the previous screen.

2nd page (when a Constellation waveform is displayed)

[Interpolation]F7: Displays the interpolation mode menu.

- [Non]F7: Sets interpolation mode to no (initial value).
  (Symbol points are displayed with dots.)
- [Linear]F8: Sets interpolation mode to linear interpolation.
  (Symbol points are connected by a straight line.)
- [10 Points]F9: Sets interpolation mode to 10-point interpolation.
  (Symbol points are connected with interpolation of ten divisions.)
- [return]F12: Returns to the previous menu.

[Error Scale]F8: Displays the error circle display menu to select the size of the error circles that displays error ranges relating to origins indicating the ideal symbol points and ideal carrier elements of constellation display.

- [5%]F7: Displays 5% error circles.
- [10%]F8: Displays 10% error circles.
- [20%]F9: Displays 20% error circles.
- [Off]F10: Clears all the error circles (initial value).
- [return]F12: Returns to the previous menu.

[Error Scale Offset]F9: Displays the offset menu to rotate the constellation display and the error circles to the I and Q axes.

- [0°]F7: Sets the display angle to 0° (initial value).
- [22.5°]F8: Rotates the display by 22.5°.
- [return]F12: Returns to the previous menu.

[Back Screen]F12: Displays the previous screen.

2nd page (when a Vector Error, Phase Error, or Magnitude Error waveform is displayed)

[Vertical Scale]F7: Displays the vertical scale menu.

(Vector Error, Magnitude Error)

[5%]F7:	Displays the 5% scale.
[10%]F8:	Displays the 10% scale.
[20%]F9:	Displays the 20% scale.
[50%]F10:	Displays the 50% scale.
[100%]F11:	Displays the 100% scale.
[return]F12:	Returns to the previous menu.

(Phase Error)

[5deg.]F7:	Displays the 5-degree scale.
[10deg.]F8:	Displays the 10-degree scale.
[20deg.]F9:	Displays the 20-degree scale.
[50deg.]F10:	Displays the 50-degree scale.
[100deg.]F11:	Displays the 100-degree scale.
[return]F12:	Returns to the previous menu.

[Back Screen]F12: Displays the previous screen.

2nd page (when an Eye Diagram waveform is displayed): No function key is displayed.

(4) Power measurement: RF Power screen, Setup Template screen

Use the parameters set on the Setup Common Parameter screen (see paragraph 4.3.5) and Setup Digital TX Measure Parameter screen (see paragraph 4.3.6, (1), (a)) to measure the RF power of the send signal from the transmitter.

For the burst signal measurement, the template (magnitude standard line) of the RF power waveform can be set (on Setup Template screen). One hundred types of templates can be saved on floppy disk (3.5-inch) (on Save Template screen) and recalled (on Recall Template screen).

Note that a template can be displayed only when a relative level mode is set at burst signal measurement.

> Note: On the RF Power screen, the power sensor is not used; the internal IF level is used to measure the power.

(a) Measuring power: RF Power screen

- Display the RF Power screens according to the following steps:

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [︿] [﹀][<][>] [Set][︿] [﹀][Set]	Move the cursor to Band of Traffic Channel. Select D800 MHz or D1.9 GHz and press the [Set] key to validate it.
4.	[TX Measure]F1	Displays the first page of the TX Measure menu.
5.	[RF Power]F9	Displays the RF Power screen. The first page of the RF Power menu appears.

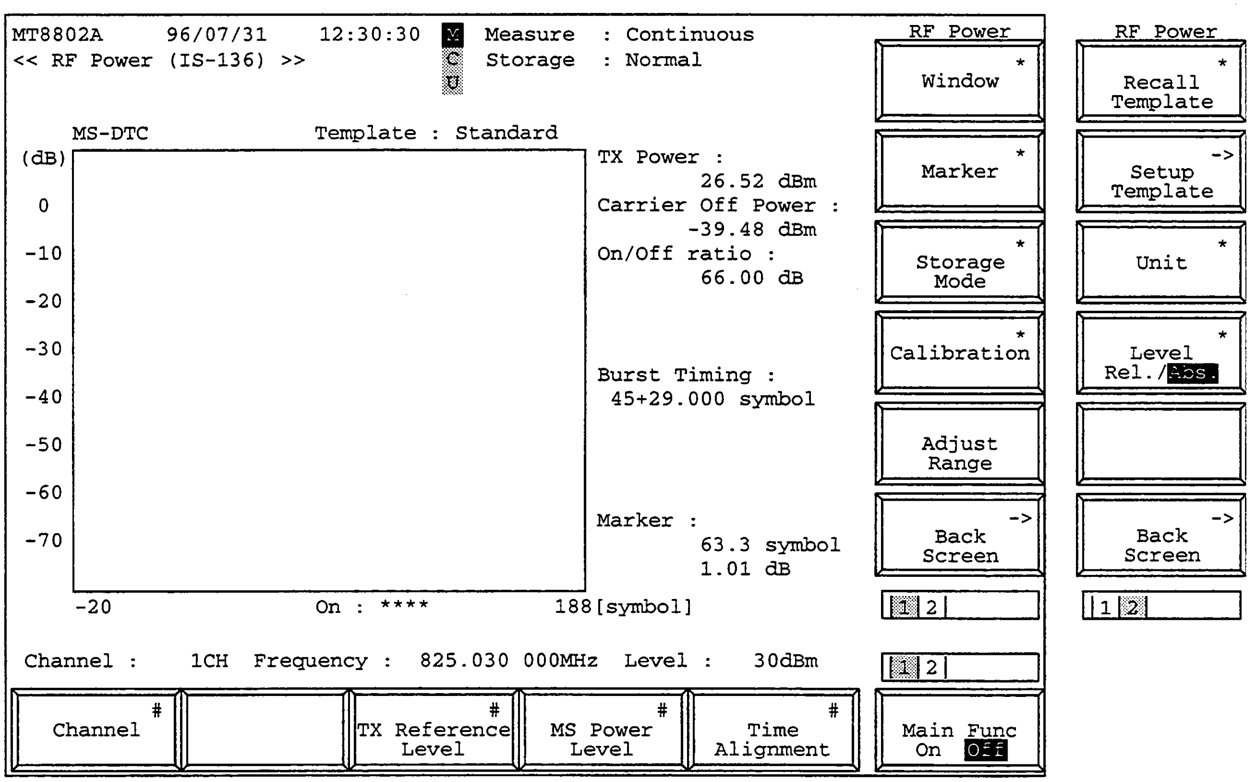


Fig. 4-17 RF Power Screen

The 2nd page of the main function keys on the RF Power screen (DUT Control: Call Proc)

					1 2
		# RX Output Level			Main Func On Off

The 1st page of the main function keys on the RF Power screen (DUT Control: None)

					1 2
# Channel	# TX Frequency				Main Func On Off

The 2nd page of the main function keys on the RF Power screen (DUT Control: None)

					1 2
	# RX Output Frequency	# RX Output Level			Main Func On Off

Notes:
- When measuring the burst signal while the relative level of the magnitude measurement waveform is displayed, a template (magnitude standard line) can also be displayed.
- TX Power: Displays the average power in the burst.

  Carrier Off Power: Displays an average power when transmission is not performed. Carrier Off Power is displayed when the burst signal is measured.

  Burst Timing: The Burst Timing is available when Measuring Object (on Setup Common Parameter screen) is MS-DTC and RX MeasureOutput Level is "On".
  The Burst Timing is the time from the receiving timing of transmission burst signal of MS to RF output timing of the MT8802A.
  According to the IS-136 specification, the standard burst timing difference between Uplink Slot and Downlink Slot is 45 symbols.Therefore, the MT8802A measures the timing with the 45 symbols as the reference.

- Main function keys

1st page

[Channel]F1	Changes channel number. When DUT Control is Call Proc, TX Frequency and RX Output Frequency become the values corresponding to the channel number.
[TX Frequency]F2	Changes the transmission frequency of MS(mobile station to be measured) (reception frequency of the MT8802A). Disappears when DUT Control is Call Proc, and becomes the value corresponding to the channel number.
[TX Reference Level]F3	Changes the MT8802A reference level to measure the transmission level from MS.
[MS Power Level]F4	Changes the transmission level from MS. Disappears when DUT Control is None.(Para.4.3.5)
[Time Alignment]F5	Changes Time Alignment of MS. Disappears when DUT Control is None.(Para.4.3.5)

2nd page

[RX Output Frequency]F2	Changes the reception frequency of MS (output frequency from the MT8802A). Disappears when DUT Control is Call Proc, and becomes the value corresponding to the channel number.
[RX Output Level]F3	Changes the reception level of MS (output level from the MT8802A).

- Function keys:

1st page

[Window]F7: Displays a waveform-window setup menu.

- [Slot]F7: Displays a waveform corresponding to one slot.
- [Frame]F8: Displays a waveform corresponding to one frame.
- [Leading]F9: Displays a waveform at the leading edge of the burst signal.
- [Trailing]F10: Displays a waveform at the trailing edge of the burst signal.
- [return]F12: Returns to the previous menu.

[Marker]F8: Displays the Marker menu.
If this key is pressed when Off is selected, Normal is selected.

- [Normal]F7: Sets normal marker mode. Enters the marker-position input wait status.
  Range: Lower limit to upper limit of horizontal display scale (unit: symbol)
  Resolution: 0.1 symbol
  Initial value: Center of the screen
- [Off]F8: Sets marker mode to off and clear the marker (initial value).
- [return]F12: Returns to the previous menu.

[Storage Mode]F9: Displays the storage mode setup menu.
Either of the following items can be selected:

1st page

[Normal]F7: Displays the normal waveform storage mode setup menu.

[Average]F8: Sets averaging mode.
Measure mode is set to Single.

[Average Count]F9: Sets the averaging count.
2 to 9,999, Resolution: 1, Initial value: 10

[Refresh Interval]F10: Sets the update time of the averaged-measurement data display.
Every:after every single measurement
Once:after the specified-count-measurement averaging processing

[Wide Dynamic Range]F11: Increases the vertical axis display range by 20 dB to make it 120 dB.
Measure mode is set to Single.
This item can be selected when RF Input is set to MAIN on the Instrument Setup screen and the measurement signal is a burst signal with a synchronous word.

[return]F12: Returns to the previous menu.

2nd page

[Max Hold]F7: Compares new and old waveform data items each time a measurement is performed, and displays the larger data item. (Maximum value holding)

[Min Hold]F8: Compares new and old data items each time a measurement is performed, and displays the smaller data item. (Minimum value holding)

[Cumulative]F9: Sets waveform dot data accumulation display mode.

[Over Write]F10: Sets the waveform overwriting mode.

[return]F12: Returns to the previous menu.

[Calibration]F10: Displays the level calibration menu.

[Manual Calibration]F7: Performs level calibration.
During calibration, the window indicating calibration in progress is displayed on the screen.

[Calibration Cancel]F8: Deletes level calibration data.

[return]F12: Returns to the previous menu.

[Adjust Range]F11: Sets the measurement level ranges (RF power meter range and reference level) to the status appropriate for measurement signals.
(See paragraph 4.3.1 (2))

[Back Screen] (F12): Displays the previous screen.

2nd page

[Recall Template]F7: Displays the template calling menu. (Para. 4.3.9)
This function key is only valid when the burst signal is measured and a relative level is displayed.

[Setup Template]F8: Displays the template setup (Setup Template) screen.
(See paragraph 4.3.6, (4), (b).)

[Unit]F9: Displays the power measurement unit menu.

- [dBm]F7: Sets the power measurement value unit to dBm (initial value)
- [nW/μW/mW/W]F8: Switches the power measurement value unit to the watt system.
- [return]F12: Returns to the previous menu.

[Level Rel./Abs.]F10: Displays the menu for selecting absolute or relative display of the waveform vertical axis scale.

- [Relative]F7: Sets the waveform vertical axis scale to relative display (dB).
  This function key displays a relative value from the average power at burst-on (initial value).
- [Absolute]F8: Sets the waveform vertical scale to absolute display (dBm).
  No template is displayed.
- [return]F12: Returns to the previous menu.

[Back Screen]F12: Displays the previous screen.

(b) Setting the template: Setup Template screen

- Display the Setup Template according to the following steps:

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [∧] [∨][<][>] [Set][∧] [∨][Set]	Move the cursor to Band of Traffic Channel. Select D800 MHz or D1.9 GHz and press the [Set] key to validate it.
4.	[TX Measure]F1	Displays the first page of the TX Measure menu.
5.	[RF Power]F9	Displays the RF Power screen. The first page of the RF Power menu appears.
6.	Next Menu [▲]	Displays the second page of the RF Power menu.
7.	[Setup Template]F8	Displays the Setup Template screen.

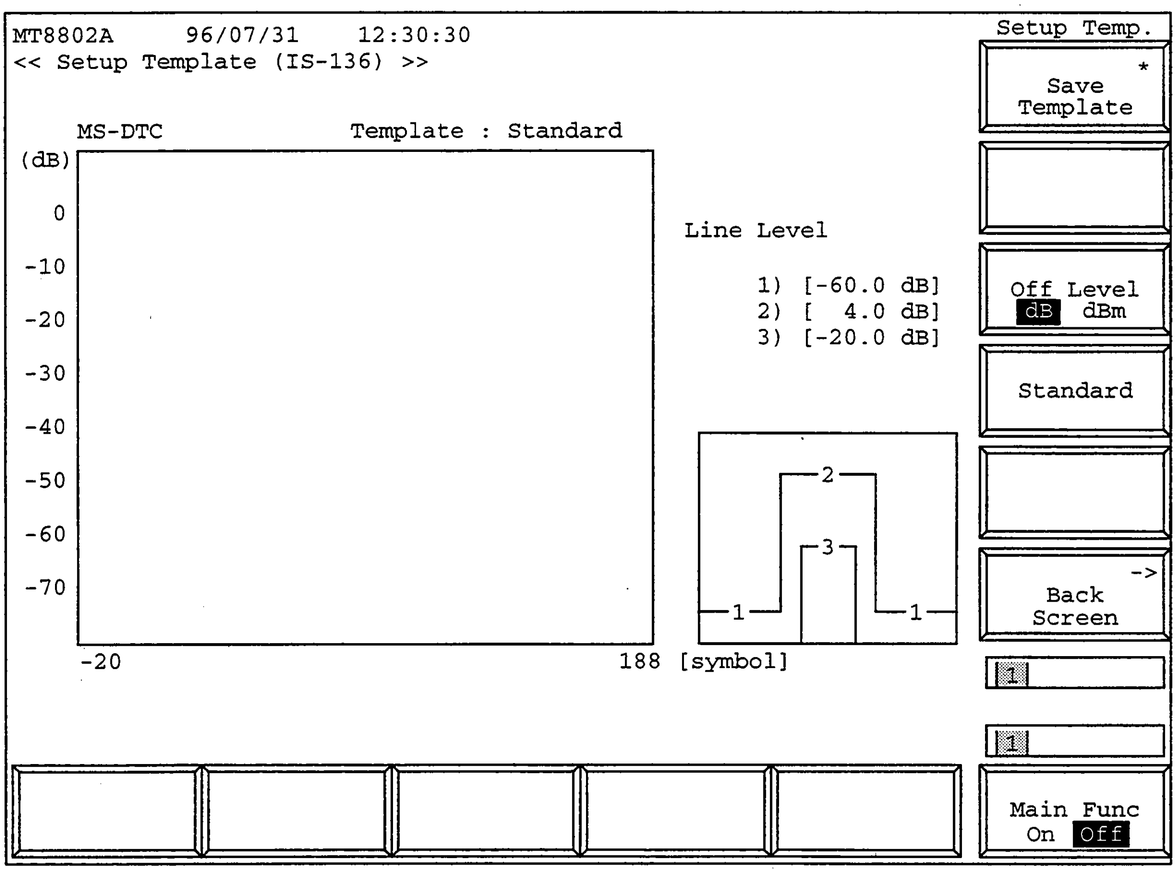


Fig. 4-18 Setup Template Screen (Standard)

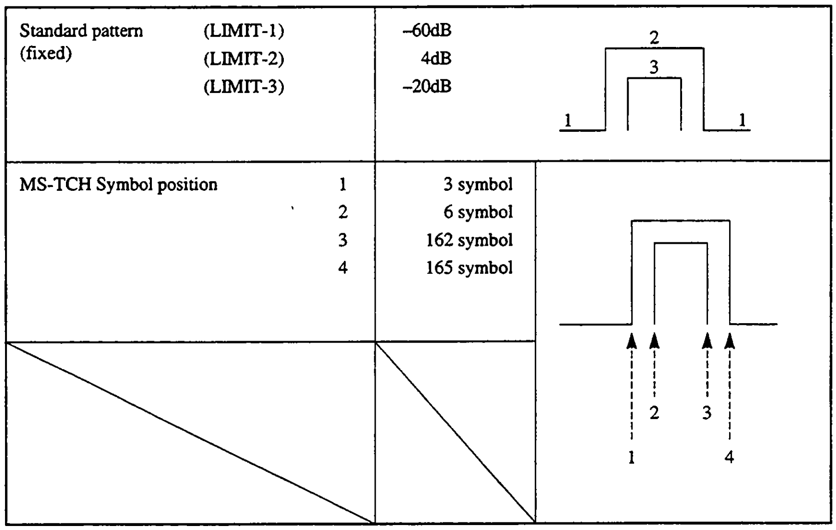
Note: When the template to be called is modified, the template name becomes "Not Selected" indicating that the template is not saved in internal memory.

- Standard template

  Limit 1 (off level): -60.0dB

  Limit 2 (on level, upper): + 4.0dB

  Limit 3 (on level, lower): -20.0dB



- Set the following items on the Setup Template screen.

Item	Range	Resolution	Initial value
Line Level			
1	-110.0 to 10.0 dB/dBm	0.1 dB	standard value
2	-110.0 to 10.0 dB	0.1 dB	standard value
3	-110.0 to 10.0 dB	0.1 dB	standard value

- Function keys

  Main function key: None

  Function keys:

  [Save Template]F7: Display the template save menu. (Para. 4.3.9)

  [Off Level dB dBm]F9: Selects a template level-1 unit (dB or dBm). (Initial value: dB)

  [Standard]F10: Sets the standard template.

  [Back Screen]F12: Displays the previous screen.

(5) Measuring the occupied frequency bandwidth: Occupied Bandwidth screen

Use the parameters set on the Setup Common Parameter screen (see paragraph 4.3.5) and Setup Digital TX Measure Parameter screen (see paragraph 4.3.4, (1), (a)) to measure an occupied frequency bandwidth of a send signal from the transmitter.

- Display the Occupied Bandwidth screen according to the following steps:

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [∧] [∨][<][>] [Set][∧] [∨][Set]	Move the cursor to Band of Traffic Channel. Select D800 MHz or D1.9 GHz and press the [Set] key to validate it.
4.	[TX Measure]F1	Displays the first page of the TX Measure menu.
5.	[Occupied Bandwidth]F10	Displays the Occupied Bandwidth screen.

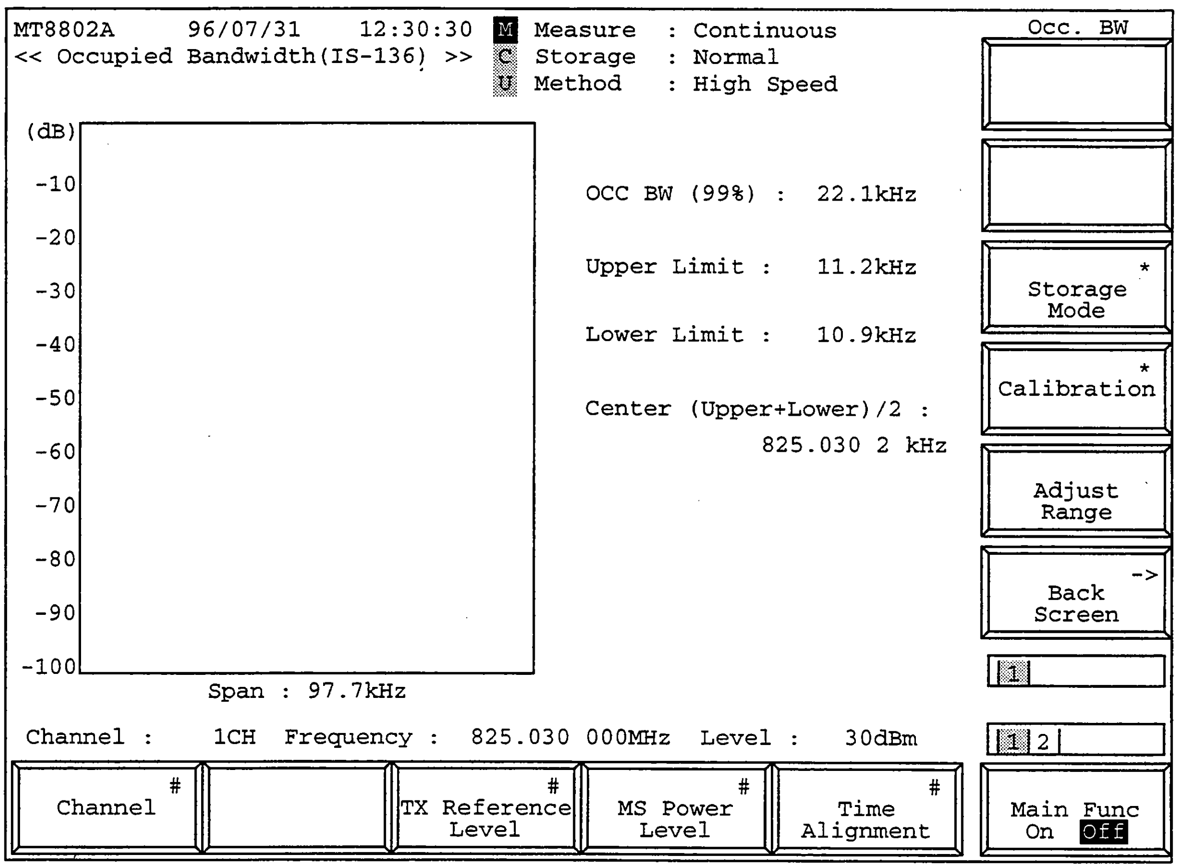


Fig. 4-19 Occupied Bandwidth Screen

The 2nd page of the main function keys on the Occupied Bandwidth screen (DUT Control: Call Proc)

						1 2
		# RX Output Level				Main Func On Off

The 1st page of the main function keys on the Occupied Bandwidth screen (DUT Control: None)

						1 2
# Channel	# TX Frequency					Main Func On Off

The 2nd page of the main function keys on the Occupied Bandwidth screen (DUT Control: None)

						1 2
	# RX Output Frequency	# RX Output Level				Main Func On Off

Notes:
- A spectrum measurement waveform is displayed in the window.
- The vertical axis scale is fixed to 0 to -100 dB.
- The reference level is that set on the Setup Common Parameter screen. If the set level is significantly different from the input signal level, use the [Adjust Range] (F11) key to make it appropriate, then measure the occupied frequency bandwidth.

- Main function keys

1st page

[Channel]F1 — Changes channel number.
When DUT Control is Call Proc, TX Frequency and RX Output Frequency become the values corresponding to the channel number.

[TX Frequency]F2 — Changes the transmission frequency of MS(mobile station to be measured) (reception frequency of the MT8802A).
Disappears when DUT Control is Call Proc, and becomes the value corresponding to the channel number.

[TX Reference Level]F3 — Changes the MT8802A reference level to measure the transmission level from MS.

[MS Power Level]F4 — Changes the transmission level from MS.
Disappears when DUT Control is None.(Para.4.3.5)

[Time Alignment]F5 — Changes Time Alignment of MS.
Disappears when DUT Control is None.(Para.4.3.5)

2nd page

[RX Output Frequency]F2 — Changes the reception frequency of MS (output frequency from the MT8802A).
Disappears when DUT Control is Call Proc, and becomes the value corresponding to the channel number.

[RX Output Level]F3 — Changes the reception level of MS (output level from the MT8802A).

- Function keys:

[Storage Mode]F9: — Displays the storage mode setup menu.

    [Normal]F7: — Sets normal mode (initial value).

    [Average]F8: — Sets averaging mode.
    The Measure mode is set to Single.

    [Average Count]F9: — Sets the averaging count.
    2 to 9999, Resolution: 1, Initial value: 10

    [Refresh Interval]F10: — Sets the update time of the averaged-measurement data display.
    Every:after every single measurement
    Once:after the specified-count-measurement averaging processing

    [return]F12: — Returns to the previous menu.

[Calibration]F10: — Displays the level calibration menu.

    [Manual Calibration]F7: — Performs level calibration.
    During calibration, the window indicating that calibration in progress is displayed on the screen.

    [Calibration Cancel]F8: — Deletes the level calibration data.

    [return]F12: — Returns to the previous menu.

[Adjust Range]F11: — Sets the measurement level range (RF power meter range and reference level) to the status appropriate for measurement signals. (See paragraph 4.3.1 (2))

[Back Screen]F12: — Displays the previous screen.

(6) Measuring the adjacent channel leakage power: Adjacent Channel Power screen

Use the parameters set on the Setup Common Parameter screen (see paragraph 4.3.5) and Setup Digital TX Measure Parameter screen (see paragraph 4.3.6, (1), (a)) to measure the adjacent channel leakage power of a send signal from the transmitter.

- Display the Adjacent Channel Power screen according to the following steps:

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [∧] [∨][<][>] [Set][∧] [∨][Set]	Move the cursor to Band of Traffic Channel. Select D800 MHz or D1.9 GHz and press the [Set] key to validate it.
4.	[TX Measure]F1	Displays the first page of the TX Measure menu.
5.	[Adjacent Channel Power]F11	Displays the Adjacent Channel Power screen.

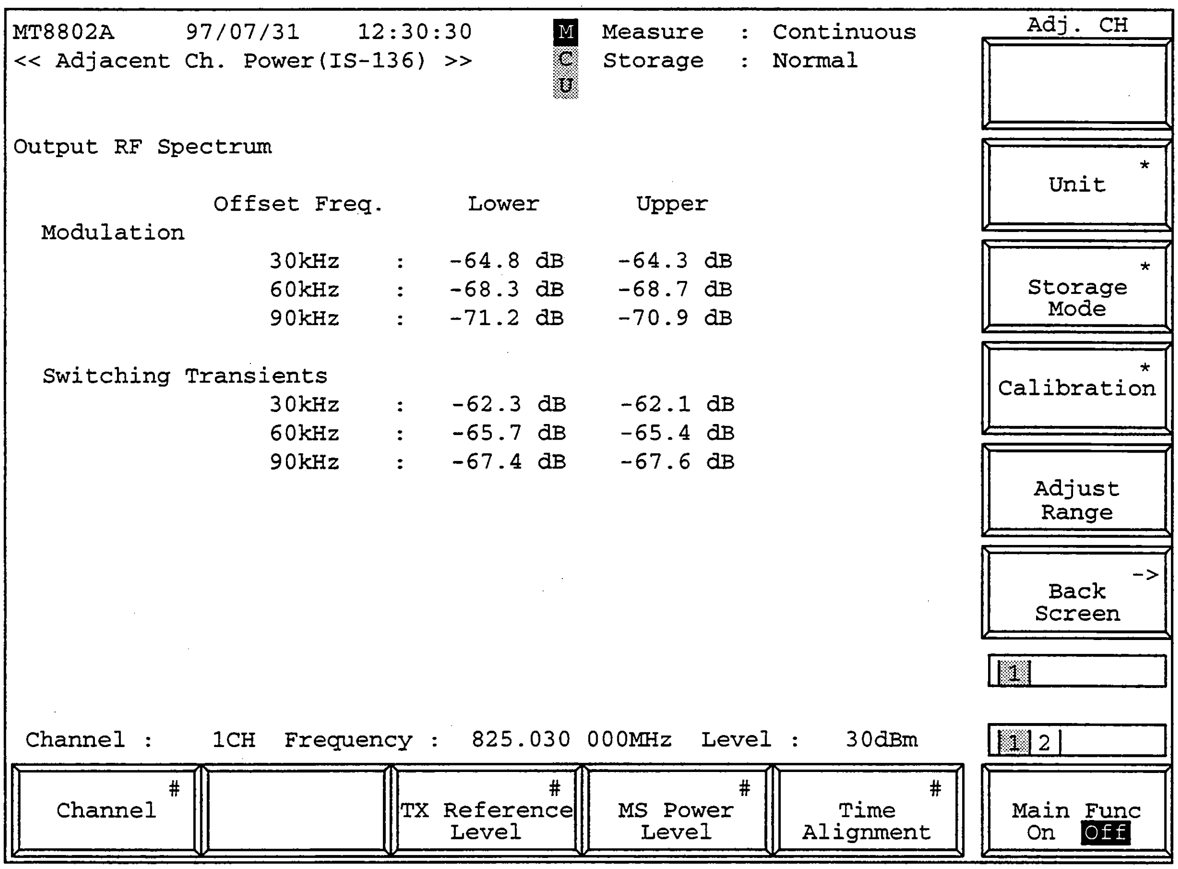


Fig. 4-20 Adjacent Channel Power Screen

The 2nd page of the main function keys on the Adjust Ch. Power screen (DUT Control: Call Proc)

					1 2
		# RX Output Level			Main Func On Off

The 1st page of the main function keys on the Adjust Ch. Power screen (DUT Control: None)

					1 2
# Channel	# TX Frequency				Main Func On Off

The 2nd page of the main function keys on the Adjust Ch. Power screen (DUT Control: None)

					1 2
	# RX Output Frequency	# RX Output Level			Main Func On Off

Note :

- Modulation:

  Modulation is the RMS level of Adjacent Channel Power in each measuring offset frequency. When Burst inputs, burst time excepts rising time, falling time, and burst-off time.

- Switching Transients:

  Switching Transients are the peak levels of Adjacent Channel Power in each measuring offset frequency on rising time and falling time.

- Main function keys

1st page

[Channel]F1	Changes channel number. When DUT Control is Call Proc, TX Frequency and RX Output Frequency become the values corresponding to the channel number.
[TX Frequency]F2	Changes the transmission frequency of MS(mobile station to be measured) (reception frequency of the MT8802A). Disappears when DUT Control is Call Proc, and becomes the value corresponding to the channel number.
[TX Reference Level]F3	Changes the MT8802A reference level to measure the transmission level from MS.
[MS Power Level]F4	Changes the transmission level from MS. Disappears when DUT Control is None.(Para.4.3.5)
[Time Alignment]F5	Changes Time Alignment of MS. Disappears when DUT Control is None.(Para.4.3.5)

2nd page

[RX Output Frequency]F2	Changes the reception frequency of MS (output frequency from the MT8802A). Disappears when DUT Control is Call Proc, and becomes the value corresponding to the channel number.
[RX Output Level]F3	Changes the reception level of MS (output level from the MT8802A).

- Function keys:

[Unit]F8: Displays the power measurement value unit menu.

[dBm]F7:	Sets the power measurement value unit to dBm (initial value).
[mW]F8:	Sets the power measurement value unit to mW.
[μW]F9:	Sets the power measurement value unit to μW.
[nW]F10:	Sets the power measurement value unit to nW.
[dB]F11:	Sets the power measurement value unit to dB. The power is displayed with a relative value from the carrier signal level in the burst signal.
[return] (F12):	Returns to the previous menu.

[Storage Mode]F9: Displays the storage mode setting menu.

[Normal]F7:	Sets normal mode.
[Average]F8:	Sets averaging mode. Measure mode is set to Single.
[Average Count]F9:	Sets the averaging count. 2 to 9999, Resolution: 1, Initial value: 10 This item can be set even if averaging mode is set to Off.
[Refresh Interval]F10:	Sets the update time of the averaged-measurement data display. Every:after every single measurement Once:after the specified-count-measurement averaging processing
[return]F12:	Returns to the previous menu.

[Calibration]F10: Displays the level calibration menu.

[Manual Calibration]F7:	Performs level calibration. During calibration, the window indicating calibration in progress is displayed on the screen.
[Calibration Cancel]F8:	Deletes the level calibration data.
[return]F12:	Returns to the previous menu.

[Adjust Range]F11: Sets the measurement level ranges (RF power meter range and reference level) to the status appropriate for measurement signals. (See paragraph 4.3.1 (2))

[Back Screen]F12: Displays the previous screen.

(7) Power meter: Power Meter screen

Use the power sensor to measure the average power on the Power Meter screen.

- Display the Power Meter screen according to the following steps:

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Test mode. The Setup Common Parameter screen appears.
3.	Cursor [∧] [∨][<][>] [Set][∧] [∨][Set]	Move the cursor to Band of Traffic Channel. Select D800 MHz or D1.9 GHz and press the [Set] key to validate it.
4.	[TX Measure]F1	Displays the first page of the TX Measure menu.
5.	[Power Meter]F12	Displays the Power Meter screen.

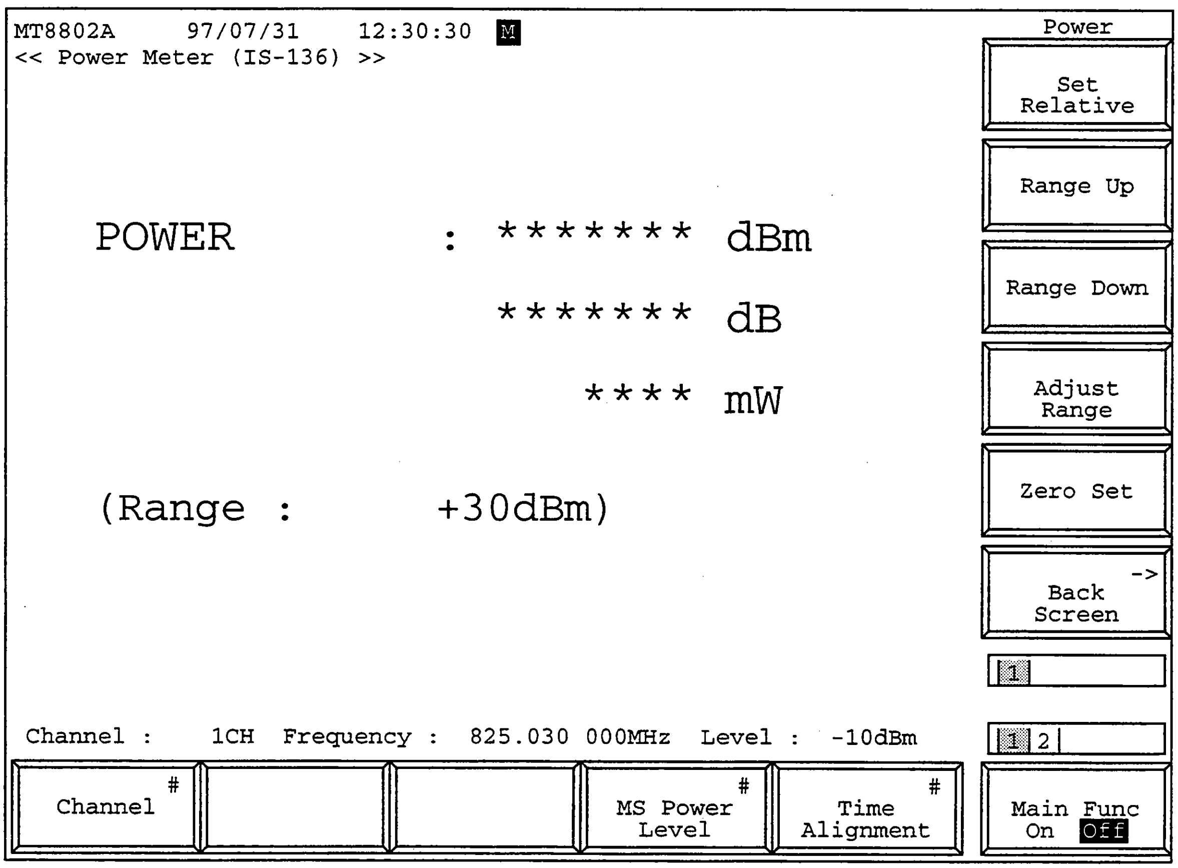


Fig. 4-21 Power Meter Screen

The 2nd page of the main function keys on the Power Meter screen (DUT Control: Call Proc)

					1 2
		# RX Output Level			Main Func On Off

The 1st page of the main function keys on the Power Meter screen (DUT Control: None)

					1 2
# Channel	# TX Frequency				Main Func On Off

The 2nd page of the main function keys on the Power Meter screen (DUT Control: None)

					1 2
	# RX Output Frequency	# RX Output Level			Main Func On Off

Note: The measured resultes are displayed in units of dBm/dB (relative display)/W in this order.

- Main function keys

1st page

[Channel]F1 — Changes channel number.
When DUT Control is Call Proc, TX Frequency and RX Output Frequency become the values corresponding to the channel number.

[TX Frequency]F2 — Changes the transmission frequency of MS(mobile station to be measured) (reception frequency of the MT8802A).
Disappears when DUT Control is Call Proc, and becomes the value corresponding to the channel number.

[MS Power Level]F4 — Changes the transmission level from MS.
Disappears when DUT Control is None.(Para.4.3.5)

[Time Alignment]F5 — Changes Time Alignment of MS.
Disappears when DUT Control is None.(Para.4.3.5)

2nd page

[RX Output Frequency]F2 — Changes the reception frequency of MS (output frequency from the MT8802A).
Disappears when DUT Control is Call Proc, and becomes the value corresponding to the channel number.

[RX Output Level]F3 — Changes the reception level of MS (output level from the MT8802A).

- Function keys:

[Set Relative]F7:	Enables to display the power measurement result using a relative value. The reference value is the power measurement value immediately before setting the relative value display. If the Power Meter screen is switched to another screen or the power is turned off, the screen enters absolute value display mode and the set reference value is invalid.
[Range Up]F8:	Increases the measurement range.
[Adjust Range]F10:	Sets the measurement level ranges (RF power meter range and reference level) to the status appropriate for measurement signal. (See paragraph 4.3.1, (2))
[Zero Set]F11:	Adjusts zero-point of the power meter, as described below.
[Back Screen]F12:	Displays the previous screen.

- Power meter zero calibration

To make accurate RF power measurement in transmitter measurement (TX Measure mode), calibrate the zero position of the power meter as described below.

Step	Key operation	Description
1.		Remove any signal input to the RF input connector (Main).
2.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
3.	[TX&RX Tester]F1	Sets the TX&RX Tester mode. The Setup Common Parameter screen appears.
4.	Cursor [︿] [﹀][<][>] [Set][︿] [﹀][Set]	Move the cursor to Band of Traffic Channel. Select D800 MHz or D1.9 GHz, and press the [Set] key to validate it.
5.	Cursor [︿] [﹀][<][>] [Set][︿] [﹀][Set]	Move the cursor to RX Measure Output Level On/Off. Select Off and press the [Set] key to validate it.
6.	[TX Measure]F1	Displays the first page of the TX Measure menu.
7.	[Power Meter]F12	Displays the Power Meter screen.
8.	[Zero Set]F11	Zero-calibrates the power meter. During zero calibration, the window indicating that calibration is being performed is displayed on the screen.
9.	[Back Screen]F12	Returns to the Setup Common Parameter screen.

(8) Transmitter measurement example

An example of digital transmitter measurement (modulation analysis) using the mobile station of IS-136 as the measured equipment is given below.
The mobile station is assumed to be controlled by an external controller.

1. Setup

As described in paragraph 4.3.1 (1) (a), connect the MT8802A to the measured equipment (mobile station).

2. Setting and measurement procedures

Perform transmission measurement (modulation analysis) as described below.

Step	Operation
	(Checking and setting the measurement interface)
1.	Press function key F6 (Main Func) to the Main Func "On".
2.	Press the Next Menu key [◀] and function key F2 (Instrument Setup) in this order to switch to the Instrument Setup screen.
3.	Check that the RF Input/Output item is set to Main. If necessary, change the set value (Note 1).
4.	Press function key F6 (Main Func) to the Main Func "On".
5.	Press function key F1 (TX/RX Measure) to enter TX/RX Measure mode (Setup Common Parameter screen).
	(Setting the Setup Common Parameter screen)
6.	Set DUT Control to None. (Note 2)
7.	Set Traffic Channel Band to D800MHz or D1.9GHz and set the measurement frequency or channel. (Example: Set Band to D800MHz and Channel to 1CH.)
8.	Set a measurement level (TX Measure Ref Level).
9.	Set Signal items for the type of measurement object signal. • Measuring Object: Set MS-DTC (up-link communication channel). (Note 4) • Frame Slot Number:Specify the slot number to be measured. • DVCC: Corresponds to downlink signal ID from base station. Set any number (01H for an example).
	(Setting the Setup TX Parameter screen)
10.	Press function key F1 (TX Measure) to enter TX measurement mode. (Note 5)
11.	Press the Next Menu key [▲] and function key F9 (Setup Digital TX Parameter) in this order to switch to the Setup Digital TX Measure Parameter screen.
12.	Set Measurement Trigger item. If necessary, change this value (Note 6).
13.	If necessary, set User Cal Factor. For details of the contents and steps, see paragraph 4.3.1 (3).
	(Setting the Modulation Analysis screen and measurement)
14.	Press function key F12 (Back Screen) to return to the Setup Common Parameter screen temporarily.
15.	Press function key F2 (RX Measure) and F7 (Bit Error Rate) in this order to switch to the Bit Error Rate measurement screen.
16.	Press both the function keys F4 (RF Output) and F5 (Modulation) to on, for outputing the down-link signal.
17.	Press function key F12 (Back Screen) to return to the Setup Common Parameter screen.

18. Press function key F1 (TX Measure), then press function key F8 (Modulation Analysis) in this order to switch to the Modulation Analysis screen.
19. Operate the measured equipment to output up-link stationary burst signals.
20. Press function key F11 (Adjust Range) to optimize the measurement range.
21. If the Single or Continuous key is pressed after terminating the optimization, the modulation precision is measured and the result is displayed.
22. If function key F9 (Storage Mode) is pressed, the function keys for measurement mode selection are displayed. The Normal measurement mode (Normal) or average measurement mode (Average) can be selected. If the Single or Continuous key is pressed after the setting, the modulation precision is measured again.

Notes 1: Use the Main RF signal connector to the measured equipment unless the level range is OK.

2: When using the call-processing function to control the state of the measured equipment, set DUT Control to Call Proc.In this case, set Measuring Object to MS-DTC. Set the call-processing parameters on the Setup Call Proc Parameters screen.

3: Measurement frequency depends on the Measurering Object, as shown in the table below:

Measuring Object	Measurement frequency
MS-DTC Continuous	Traffic Channel

4: Set this value to the same value as that of the measured equipment. The MT8802A measures up-link signals output by the mobile station (MS) (correspond to signals output by the measured equipment).

5: When using the Call-Processing function to control the state of the measured equipment, move to the Conversation state using the Call-Processing function, and then press the [TX Measure] key.

6: When Measurement Trigger is Sync, the fixed Sync Word (determined by the Frame Slot Number on the Setup Common Parameter screen) is used.If the sync word of the output signal of the measured equipment, the Measurement Trigger is reset to the Video (triggering by the signal level).

3. Notes on transmission measurement

Note the followings when measuring the transmission:

3.1 Output Signal period of the Measured Equipment

Output transmission output signals from the measured equipment periodically as close with the frame (subframe) timings as possible. Fix the transmission level and synchronous word of the modulation data. The following measurements and operations are performed assuming that the transmission output signals are output periodically and are stationary:

- Adjust Range operation
- Manual Calibration operation
- Average mode measurement

4.3.7 Analog transmitter measurement

Set Traffic Channel Band to A800MHz on the Setup Common Parameter screen, then press the [TX Measure] F1 main function key to set analog transmitter measurement mode.
This paragraph describes the following analog transmitter measurement items:

1. Setting parameters (Setup Analog TX Measure Parameter screen)
2. Analog transmitter measurement (Ananlog TX Measure screen)
3. Signal generator + analog transmitter measurement (Analog TX Meas with SG screen)

(1) Setting the parameters: Setup Analog TX Measure parameter screen

Set the Analog transmitter measurement parameters on Setup Analog TX Measure Parameter screen.
measurements.
Switch to the Setup Analog TX Measure Parameter screen according to the following steps:

Step	Key operation	Description
1.	[Main Func on off]F6	Sets Main Func on to display the first page of the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets the TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [∧] [∨][<][>] [Set][∧] [∨][Set]	Move the cursor to Band of Traffic Channel. Select A800 MHz and press the [Set] key to validate it.
4.	[TX Measure]F1	Displays the first page of the TX Measure menu.
5.	Next Menu [▲]	Displays the second page of the TX Measure menu.
6.	[Setup Analog TX Parameter]F9	Displays the Setup Analog TX Measure Parameter screen.

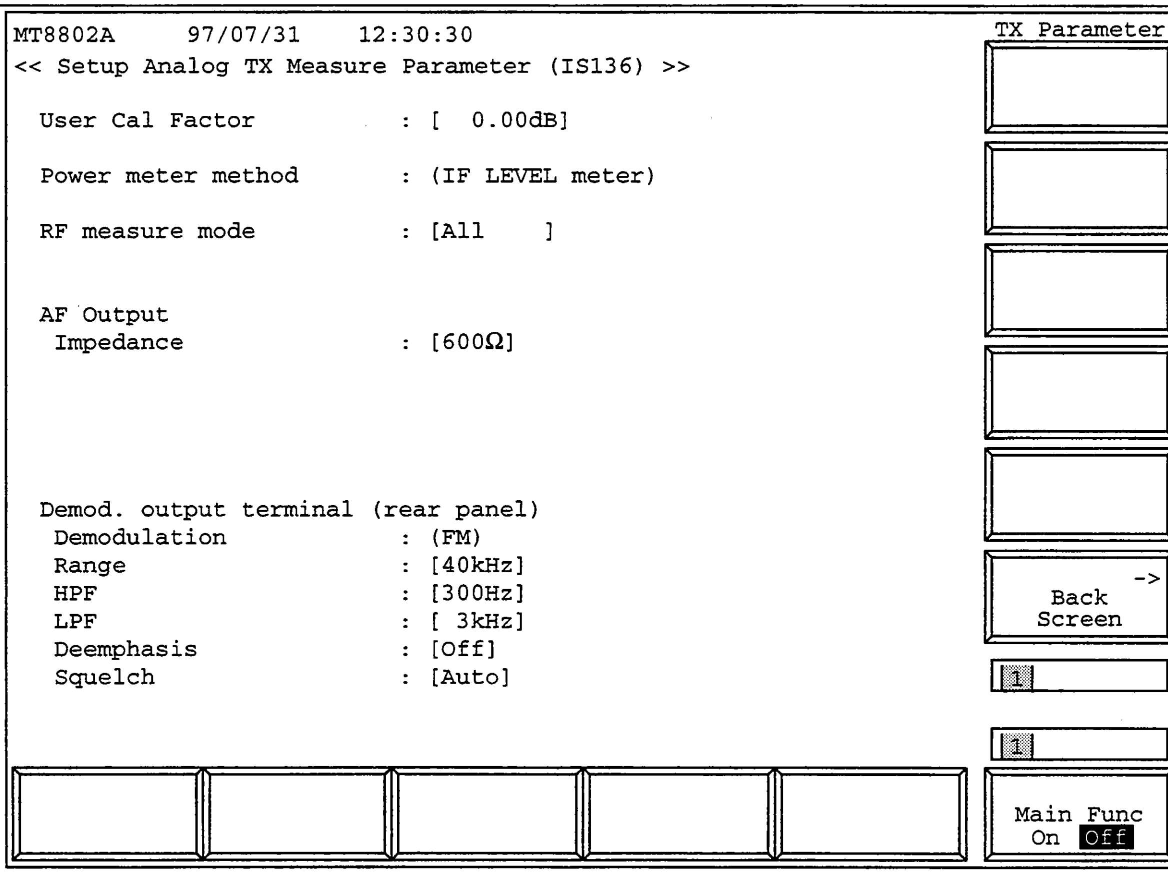


Fig. 4-22 Setup Analog TX Measure Parameter screen

• Set the following items.

Item	Range	Initial value	
User Cal Factor	-30.00 to 30.00 dB, 0.01 dB step	0.00 dB	
RF measure mode	All, RF only	All	Note 1
AF Output Impedance	50 Ω, 600 Ω	600 Ω	
Demod. output terminal			
Range	40 kHz, 4 kHz	40 kHz	
HPF	300 Hz, off	300 Hz	
LPF	3 kHz, off	3 kHz	
De-emphasis	on, off	off	
Squelch	Auto, off	Auto	

Note 1 : In the RF Only mode, only both the RF Freq. and RF Power are measured for transmitter measurement.
AF values (Deviation, AF Level, AF Freq., and Distortion) are not measured. These not-measured AF items are indicated by - mark.

• Main-function key: None

• Function key:
[Back Screen]F12 Returns to the Setup Common Parameter screen.

(2) Analog transmitter measurement: Analog TX Measure screen

On the Analog TX Measure screen, output an AF signal from the MT8802A and measure the RF signal from the DUT. When DUT Control is Call Proc, Analog TX Measure screen cannot be used.

Switch to the Analog TX Measure screen according to the following steps:

Step	Key operation	Description
1.	[Main Func on off]F6	Sets Main Func on to display the first page of the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets the TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [∧] [∨][<][>] [Set][∧] [∨][Set]	Move the cursor to Band of Traffic Channel. Select A800 MHz and press the [Set] key to validate it.
4.	[TX Measure]F1	Displays the first page of the TX Measure menu.
5.	[Analog TX Measure]F7	Displays the Analog TX Measure screen.

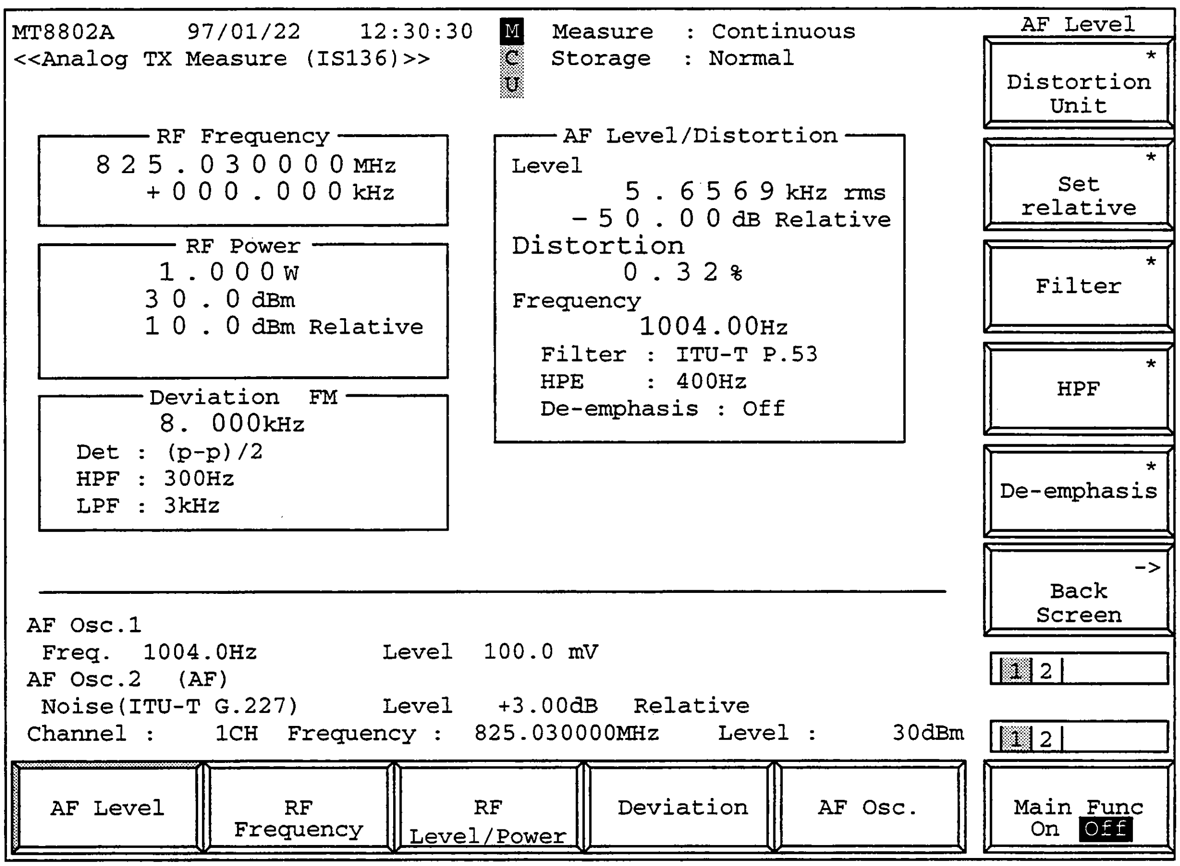


Fig. 4-23 Analog TX Measure screen

Note 1: Relative values (RF Power and AF Level, which are always displayed) are displayed with —.- dB until the [Set Relative]F8 key is pressed.

Note 2: Display value of RF Power Meter range [dBm] = TX Power Meter set value[dBm] + User Cal Factor[dB]
(User Cal Factor[dB] is set on the Setup TX Measure Parameter(Analog) screen.)
IF Level Meter is fixed to be used for AUX Input. Then, Power Meter is not used and the Range is not displayed.

Note 3: When RF measure mode is RF only mode on the Setup Analog TX Measure Parameter screen, only RF Frequency and RF Power are measured.
Note that - is displayed for the measured values of Deviation and AF Level/Distortion.

• Main-function keys:

1st page

[AF Level]F1	Displays the AF Level function keys on F7 to F12. (Settings for demodulating RF signal from transmitter)
[RF Frequency]F2	Displays the RF Frequency function keys on F7 to F12. (Settings for changing the frequency of the RF signal from transmitter)
[RF Level/Power]F3	Displays the RF Level/Power function keys on F7 to F12. (Settings for measuring the level and power of the RF signal from transmitter)
[Deviation]F4	Displays the Deviationfunction keys on F7 to F12. (Settings for measuring the FM/øM of the RF signal from transmitter)
[AF Osc.]F5	Displays the AF Osc.function keys on F7 to F12. (Settings modulation signal to transmitter)
2nd page	None

- AF Level function keys:

1st page

[Distortion Unit]F7	Selects the distortion measurement unit of dB or %. Initial value: %
[Set Relative]F8	Displays the relative value with the reference value that is the measured level when this key is pressed.
[Filter]F9	Selects the estimation filter of ITU-T P.53, C-MESSAGE, 6kHz BPF, or Off. Initial value: Off Note : The HPF of 400 Hz is the filter for tone signal rejection.
[HPF]F10	Selects the HPF of 400Hz or Off. Initial value: Off
[De-emphasis]F11	Selects the De-emphasis of 750μs or Off. Initial value: Off
[Back Screen]F12	Returns to the Setup Common Parameter screen.

2nd page

[Storage Mode]F9	Displays the Storage Mode menu for all the measured results on the screen.
[Normal]F7	Sets normal mode. (Initial value)
[Average]F8	Sets average mode.
[Average Count]F9	Sets number of Averaging processings. $2 \leq$ Set value ≤ 9999 Initial value: 10 (In the average mode, the measurement is of single mode, which displays the averaged results in each measurement, and stops measurement when the Average Count reached.) Note that the Power Meter has not the average mode.
[return]F12	Returns to the AF Level menu.
[Back Screen]F12	Returns to the Setup Common Parameter screen.

- RF Frequency function keys:

[Frequency]F7	Changes the RF frequency. (See para. 4.4 for the changing method.)
[Channel]F8	Changes the channel number. (See para. 4.4 for the changing method.)
[Back Screen]F12	Returns to the Setup Common Parameter screen.

• RF Level/Power function keys:

1st page

[Ref Level]F7	Changes the reference level. (See para. 4.4 for the changing method.)
[Set Relative]F8	Displays the relative value with the reference value of 0 dB that is the level when the key is pressed.
[Storage Mode]F9	Displays the Storage Mode menu for all the measured results on the screen.
[Normal]F7	Sets normal mode. (Initial value)
[Average]F8	Sets average mode.
[Average Count]F9	Sets number of Averaging processings. 2 ≤ Set value ≤ 9999 Initial value: 10 (In the average mode, the measurement is of single mode, which displays the averaged results in each measurement, and stops measurement when the Average Count reached.) Note that the Power Meter has not the average mode.
[return]F12	Returns to the RF Level/Power menu.
[Calibration]F10	Displays the level calibration menu.
[Manual Calibration]F7	Performs the level calibration. Calibrates the absolute value of the measured results of the IF Level Meter with the built-in Power Meter. During calibration, the window indicating calibration in progress is displayed on the screen. Disappears when AUX connector used.
[Calibration Cancel]F8	Deletes level calibration data.
[return]F12	Returns to the RF Level/Power menu.
[Adjust Range]F11	Sets the measurement level ranges (RF power meter range and reference level) to the status appropriate for measurement signals.
[Back Screen]F12	Returns to the Setup Common Parameter screen.

2nd page

[Power Meter Zero Set]F11	Calibrates the Power-Meter zero point. (Sets the input level of the Main Input/Output connector to 0, and press this key to calibrate zero point of the power meter, automatically.)
[Back Screen]F12	Returns to the Setup Common Parameter screen.

Note : When the unit key [dBμ/V] pressed, it is assumed as "dBμ" for RF level setting, and as "V" for AF level setting.

• Deviation function keys:

1st page

[Demod.]F7	Selects the demodulation function of FM (measurement unit: kHz) or øM (measurement unit: rad).Initial value: FM
[Relative On Off]F8	Displays the relative value with the reference value that is the measured level when the key is pressed. Initial value: Off
[Det Mode]F9	Selects the detection mode of: 1st page: (P-P)/2, +P, -P, RMS 2nd page: (P-P)/2 Hold, +P Hold, -P Hold Initial value:(P-P)/2
[HPF]F10	Selects the HPF of 300 Hz, 50 Hz, or Off. Initial value: Off
[LPF]F11	Selects the LPF of 3 kHz, 15 kHz, or Off. Initial value: Off
[Back Screen]F12	Returns to the Setup Common Parameter screen.

2nd page

[Storage Mode]F9	Displays the Storage Mode menu for all the measured results on the screen.
[Normal]F7	Sets normal mode. (Initial value)
[Average]F8	Sets average mode.
[Average Count]F9	Sets number of Averaging processings. $2 \leq$ Set value ≤ 9999 Initial value: 10 (In the average mode, the measurement is of single mode, which displays the averaged results in each measurement, and stops measurement when the Average Count reached.) Note that the Power Meter has not the average mode.
[return]F12	Returns to the Deviation menu.
[Back Screen]F12	Returns to the Setup Common Parameter screen.

• AF Osc. function keys:

1st page —— Sets AF Osc. 1, independently from AF Osc. 2.

[AF Osc.1 Signal]F7 Selects AF-Osc.1 signal type of Tone, Noise(ITU-T G.227), or Noise(White).
When Noise is set, displays "Noise(Noise type)" at the frequency display area.
Initial value: Tone

[AF Osc.1 Lvl Relative On Off]F8
Displays the relative value with the reference value that is the value when this key is pressed.
Initial value: Off

[AF Osc.1 Frequency]F9 Sets AF-Osc.1 frequency.
20.0 Hz ≤ Set value ≤ 20 000.0 Hz, 0.1 Hz step
Initial value: 1 004.0 Hz
(When setting the same frequency as AF Osc.2, the AF Osc. output level becomes the sum of the set values.)

[AF Osc.1 Level]F10 Sets the AF-Osc. 1 level.
Initial value: 100.0 mV

When 600 Ω is set for Impedance of AF Output on the Setup Analog TX Measure Parameter screen:

• For Tone of signal type
  0.400 V< Set value ≤ 3.000 V, 0.001 V step
  40.0 mV< Set value ≤ 400.0 mV, 0.1 mV step
  4.00 mV< Set value ≤ 40.00 mV, 0.01 mV step
  0.010 mV< Set value ≤ 4.000 mV, 0.001 mV step

• For Noise of signal type
  0.150 V< Set value ≤ 1.500 V, 0.001 V step
  15.0 mV< Set value ≤ 150.0 mV, 0.1 mV step
  1.50 mV< Set value ≤ 15.00 mV, 0.01 mV step
  0.010 mV< Set value ≤ 1.500 mV, 0.001 mV step

When 50 Ω is set for Impedance of AF Output on the Setup Analog TX Measure Parameter screen:

• For Tone of signal type
  40.0 mV< Set value ≤ 400.0 mV, 0.1 mV step
  4.00 mV< Set value ≤ 40.00 mV, 0.01 mV step
  0.010 mV< Set value ≤ 4.000 mV, 0.001 mV step

• For Noise of signal type
  15.0 mV< Set value ≤ 150.0 mV, 0.1 mV step
  1.50 mV< Set value ≤ 15.00 mV, 0.01 mV step
  0.010 mV< Set value ≤ 1.500 mV, 0.001 mV step

[AF Osc.1 On Off]F11 Turns on/off the AF-Osc. 1 output level.
When off, displays off at the level display area.
Initial value:On
(When off, the [AF Osc.1 Level]F10 key is not displayed, so level cannot be set.)

[Back Screen]F12 Returns to the Setup Common Parameter screen.

2nd page —— Sets AF Osc. 2, independently from AF Osc. 1.

[AF Osc.2 Signal]F7
Selects AF-Osc. 2 signal type of Tone, Noise(ITU-T G.227), or Noise(White).
Initial value: Tone
When Noise is set, displays "Noise(Noise type)" at the frequency display area.

[AF Osc.2 Lvl Relative On Off]F8
Displays the relative value with the reference value that is the value when this key is pressed.
Initial value: Off

[AF Osc.2 Frequency]F9
Sets AF-Osc. 2 frequency.
20.0 Hz ≤ Set value ≤ 20 000.0 Hz, 0.1 Hz step
Initial value: 1 004.0 Hz
(When setting the same frequency as AF Osc. 1, the AF Osc. output level becomes the sum of the set values.)

[AF Osc.2 Level]F10
Sets the AF-Osc. 2 level.
Initial value: 100.0 mV

When 600 Ω is set for Impedance of AF Output on the Setup Analog TX Measure Parameter screen:

- For Tone of signal type
  - 0.400 V< Set value ≤ 3.000 V, 0.001 V step
  - 40.0 mV< Set value ≤ 400.0 mV, 0.1 mV step
  - 4.00 mV< Set value ≤ 40.00 mV, 0.01 mV step
  - 0.010 mV< Set value ≤ 4.000 mV, 0.001 mV step
- For Noise of signal type
  - 0.150 V< Set value ≤ 1.500 V, 0.001 V step
  - 15.0 mV< Set value ≤ 150.0 mV, 0.1 mV step
  - 1.50 mV< Set value ≤ 15.00 mV, 0.01 mV step
  - 0.010 mV< Set value ≤ 1.500 mV, 0.001 mV step

When 50 Ω is set for Impedance of AF Output on the Setup Analog TX Measure Parameter screen:

- For Tone of signal type
  - 40.0 mV< Set value ≤ 400.0 mV, 0.1 mV step
  - 4.00 mV< Set value ≤ 40.00 mV, 0.01 mV step
  - 0.010 mV< Set value ≤ 4.000 mV, 0.001 mV step
- For Noise of signal type
  - 15.0 mV< Set value ≤ 150.0 mV, 0.1 mV step
  - 1.50 mV< Set value ≤ 15.00 mV, 0.01 mV step
  - 0.010 mV< Set value ≤ 1.500 mV, 0.001 mV step

[AF Osc.2 On Off]F11
Turns on/off the AF-Osc. 2 output level.
When off, displays off at the level display area.
Initial value:Off
(When off, the [AF Osc.2 Level]F10 key is not displayed, so level cannot be set.)

[Back Screen]F12
Returns to the Setup Common Parameter screen.

(3) Signal generator + analog transmitter measurement: Analog TX Meas with SG screen

On the Analog TX Meas with SG screen, output an RF signal from the MT8802A and measure the RF signal from the DUT.

AF Osc.2 signal can also be output to the AF output terminal as required.

Switch to the Analog TX Meas with SG screen according to the following steps:

Step	Key operation	Description
1.	[Main Func on off]F6	Sets Main Func on to display the first page of the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets the TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [︿] [﹀][<][>] [Set][︿] [﹀][Set]	Move the cursor to Band of Traffic Channel. Select A800 MHz and press the [Set] key to validate it.
4.	[TX Measure]F1	Displays the first page of the TX Measure menu.
5.	[Analog TX Meas with SG]F10	Displays the Analog TX Meas with SG screen.

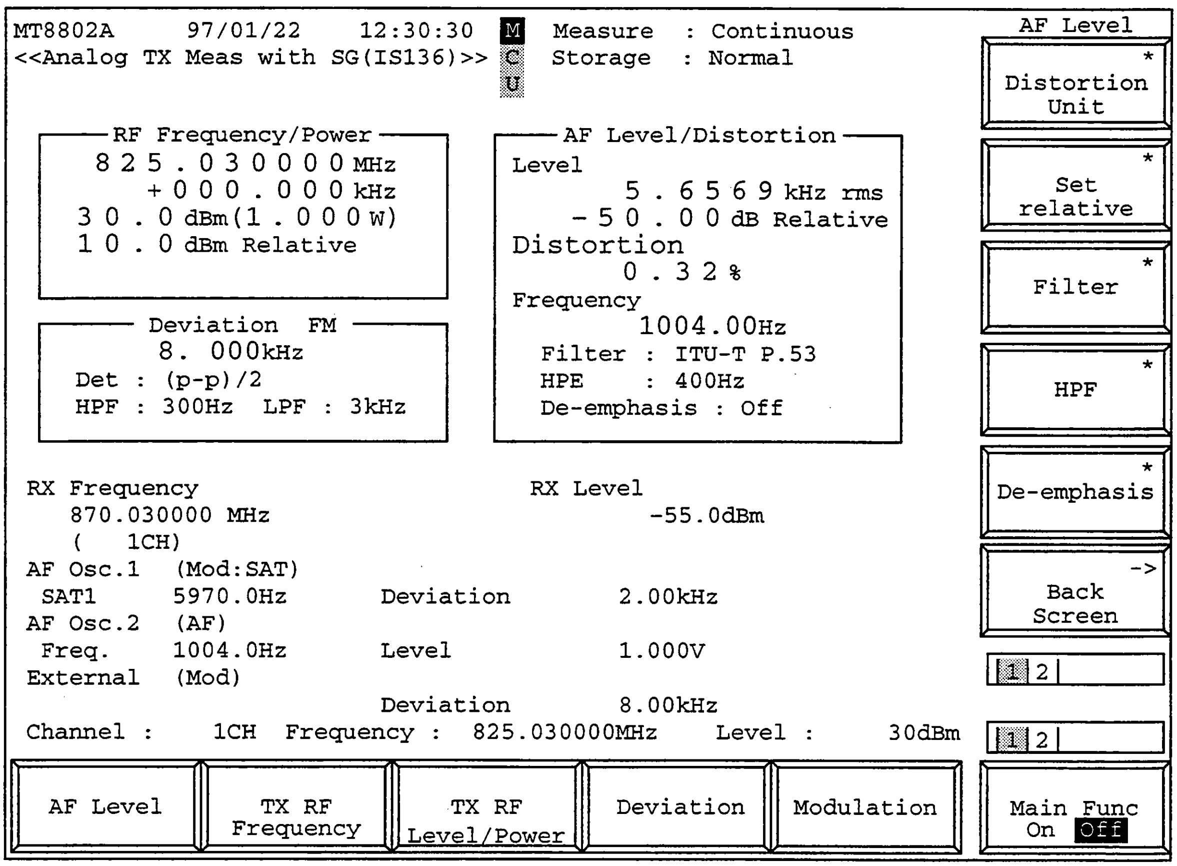


Fig. 4-24 Analog TX Meas with SG screen

The 2nd page of the main function keys on the Analog TX Meas with SG screen (DUT Control: Call Proc)

					1 2
AF Level	RX RF Frequency	RX RF Level	# MS Power Level	Modulation	Main Func On Off

The 1st page of the main function keys on the Analog TX Meas with SG screen (DUT Control:None)

					1 2
AF Level	RX RF Frequency	RX RF Level/Power	# Deviation	Modulation	Main Func On Off

The 2nd page of the main function keys on the Analog TX Meas with SG screen (DUT Control:None)

					1 2
AF Level	RX RF Frequency	RX RF Level	# RX RF Level On Off	Modulation	Main Func On Off

Note 1: Relative values (RF Power and AF Level, which are always displayed) are displayed with --.- dB untill the [Set Relative]F8 key is pressed.

Note 2: Display value of RF Power Meter range [dBm] = TX Power Meter set value[dBm] + User Cal Factor[dB] (User Cal Factor[dB] is set on the Setup TX Measure Parameter(Analog) screen.) IF Level Meter is fixed to be used for AUX Input. Then, Power Meter is not used and the Range is not displayed.

Note 3: When RF measure mode is RF only mode on the Setup Analog TX Measure Parameter screen, only RF Frequency and RF Power are measured.
Note that - is displayed for the measured values of Deviation and AF Level/Distortion.

Note 4: When DUT Control is Call Proc, AF Osc.1 is used for SAT modulation and cannot be changed.

- Main-function keys:

1st page

[AF Level]F1	Displays the RX AF Level function keys on F7 to F12. (Settings for demodulating the RF signal from the transmitter, the same as the 2nd-page F1 key)
[TX RF Frequency]F2	Displays the TX RF Frequency function keys on F7 to F12. (When DUT Control is Call Proc, only the frequency channel for transmission and reception can be changed.)
[TX RF Level/Power]F3	Displays the TX RF Level/Power function keys on F7 to F12. (Settings for measuring the RF-signal level/power from the transmitter)
[Deviation]F4	Displays the Deviation function keys on F7 to F12. (Settings for measuring the FM/øM modulation degree of the RF-signal from the transmitter)
[Modulation]F5	Displays the Modulation function keys on F7 to F12. (Settings of the modulation degree of the RF signal from the built-in signal generator of the MT8802A, the same as the 2nd-page F5 key)

2nd page

[AF Level]F1	Displays the AF Level function keys on F7 to F12. (Settings for demodulating the RF signal from the transmitter, the same as the 1st-page F1 key)
[RX RF Frequency]F2	Displays the RX RF Frequency function keys on F7 to F12. (When DUT Control is Call Proc, only the frequency channel for transmission and reception can be changed.)
[RX RF Level]F3	Displays the RX RF Level function keys on F7 to F12. (Sets the RF signal level from the built-in signal generator of the MT8802A.)
[MS Power Level] F4	(when DUT Control is Cal Proc) Changes the MS (mobile station under test) transmission level.
[RX RF Level On Off] F4	(when DUT Control is None) Turns on and off the RF signal output from the signal generator in the MT8802A. Function keys F7 to F12 are not changed.
[Modulation]F5	Displays the Modulation function keys on F7 to F12. (Settings of the modulation degree of the RF signal from the built-in signal generator of the MT8802A, the same as the 1st-page F5 key)

Function key:

Function keys for 1st page of the main function key— Settings used for TX measurement

- AF Level function keys:

1st page

[Distortion Unit]F7 — Selects the distortion measurement unit of dB or %.
Initial value: %

[Set Relative]F8 — Displays the relative value with the reference value that is the measured level when this key is pressed.

[Filter]F9 — Selects the estimation filter of ITU-T P.53, C-MESSAGE, 6kHz BPF, or Off.
Initial value: Off

[HPF]F10 — Selects the HPF of 400Hz or Off.
Initial value: Off

Note : The HPF of 400 Hz is the filter for tone signal rejection.

[De-emphasis]F11 — Selects the De-emphasis of 750μs or Off.
Initial value: Off

[Back Screen]F12 — Returns to the Setup Common Parameter screen.

2nd page

[Storage Mode]F9 — Displays the Storage Mode menu for all the measured results on the screen.

- [Normal]F7 — Sets normal mode. (Initial value)
- [Average]F8 — Sets average mode.
- [Average Count]F9 — Sets number of Averaging processings.
  $2 \leq$ Set value ≤ 9999
  Initial value: 10
  (In the average mode, the measurement is of single mode, which displays the averaged results in each measurement, and stops measurement when the Average Count reached.)
  Note that the Power Meter has not the average mode.
- [return]F12 — Returns to the AF Level menu.

[Back Screen]F12 — Returns to the Setup Common Parameter screen.

- TX RF Frequency function keys:

[Frequency]F7 — Changes the RF frequency for transmitter measurement.
The RF frequency cannot be set when DUT control is Call Proc.

[Channel]F8 — Changes the channel number. (See para. 4.4 for the changing method.)

[Back Screen]F12 — Returns to the Setup Common Parameter screen.

• TX RF Level/Power function keys:

1st page

[Ref Level]F7 — Changes the reference level. (See para. 4.4 for the changing method.)

[Set Relative]F8 — Displays the relative value with the reference value that is the measured level when this key is pressed.

[Storage Mode]F9 — Displays the Storage Mode menu for all the measured results on the screen.

- [Normal]F7 — Sets normal mode. (Initial value)
- [Average]F8 — Sets average mode.
- [Average Count]F9 — Sets number of Averaging processings.
  $2 \leq$ Set value ≤ 9999
  Initial value: 10
  (In the average mode, the measurement is of single mode, which displays the averaged results in each measurement, and stops measurement when the Average Count reached.)
  Note that the Power Meter has not the average mode.
- [return]F12 — Returns to the TX RF Level/Power menu.

[Calibration]F10 — Displays the level calibration menu.

- [Manual Calibration]F7 — Performs the absolute level calibration, which calibrates the measured results of IF Level Meter using the built-in Power Meter.
  During calibration, the window indicating calibration in progress is displayed on the screen.
  Disappears when AUX connector used.
- [Calibration Cancel]F8 — Deletes level calibration data.
- [return]F12 — Returns to the TX RF Level/Power menu.

[Adjust Range]F11 — Sets the measurement level ranges (RF power meter range and reference level) to the status appropriate for measurement signals.

[Back Screen]F12 — Returns to the Setup Common Parameter screen.

2nd page

[Power Meter Zero Set]F11 — Calibrates the Power-Meter zero point.
(Set the input level of the Main Input/Output connector to 0, then press this key to perform zero-point calibration of the Power Meter, automatically.)

[Back Screen]F12 — Returns to the Setup Common Parameter screen.

Note : When the unit key [dBμ/V] pressed, it is assumed as "dBμ" for RF level setting, and as "V" for AF level setting.

• Deviation function keys:

1st page

[Demod.]F7	Selects the demodulation function of FM (measurement unit: kHz) or øM (measurement unit: rad). Initial value: FM
[Relative On Off]F8	Displays the relative value with the reference value that is the measured level when this key is pressed. Initial value: Off
[Det Mode]F9	Selects the detection mode of: 1st page: (P-P)/2, +P, -P, RMS 2nd page: (P-P)/2 Hold, +P Hold, -P Hold Initial value: (P-P)/2
[HPF]F10	Selects the HPF of 300 Hz, 50 Hz, or Off. Initial value: Off
[LPF]F11	Selects the LPF of 3 kHz, 15 kHz, or Off. Initial value: Off
[Back Screen]F12	Returns to the Setup Common Parameter screen.

2nd page

[Storage Mode]F9 — Displays the Storage Mode menu for all the measured results on the screen.

[Normal]F7	Sets normal mode. (Initial value)
[Average]F8	Sets average mode.
[Average Count]F9	Sets number of Averaging processings. $2 \leq$ Set value ≤ 9999 Initial value: 10 (In the average mode, the measurement is of single mode, which displays the averaged results in each measurement, and stops measurement when the Average Count reached.) Note that the Power Meter has not the average mode.
[return]F12	Returns to the Deviation menu.

[Back Screen]F12 — Returns to the Setup Common Parameter screen.

• Modulation function keys:

1st page ----- Sets AF Osc. 1 only for modulating (Mod) the built-in signal generator (SG) of the MT8802A. When DUT Control is Call Proc, AF Osc.1 is used for SAT modulation. The frequency, deviation, and On/Off state cannot be changed.

[AF Osc.1 Frequency]F8 — Sets AF-Osc.1 frequency (modulation frequency of the SG).
20.0 Hz ≤ Set value ≤ 20 000.0 Hz, 0.1 Hz step
Initial value: 1 004.0 Hz
(When setting the same frequency as AF Osc.2 in Mod mode, the deviation becomes the sum of the set values.)

[AF Osc.1 Deviation]F9 — Sets the FM deviation of the SG using the AF Osc. 1 signal.
0.00 kHz ≤ Set value ≤ 40.00 kHz, 0.01 kHz step
Initial value: 8.00 kHz

[AF Osc.1 On Off]F11 — Turns on/off the AF-Osc. 1 output level so that turns on/off the SG modulation.
(When off, the [AF Osc. 1 Deviation]F9 key disappears, and Deviation cannot be set.)
Initial value:Off

[Back Screen]F12 — Returns to the Setup Common Parameter screen.

2nd page ----- Sets AF Osc. 1 for modulating (Mod) the built-in signal generator (SG) of the MT8802A, or for AF signal output (AF) from the AF Output connector on the front panel.

[AF Osc.2 Signal]F7 — Displays the AF Osc.2 Signal menu.

[AF Signal]F7 — Selects AF-Osc. 2 signal type of Tone, Noise(ITU-T G.227), or Noise(White).
When Noise is set, displays "Noise(Noise type)" at the frequency display area.
Initial value: Tone

[Output for Mod AF]F8 — Selects the AF Osc.2 signal usage for Mod (SG modulation signal) or AF (AF signal output from AF Output connector).
Initial value: Mod

[return]F12 — Returns to the Modulation menu.

[AF Osc.2 Frequency]F8 — In Mod mode, sets the modulation frequency of SG.
(When setting the same frequency as AF Osc. 1 in the Mod mode, the deviation becomes the sum of the set values.)
In AF mode, sets the frequency of the AF signal output from the AF Output connector.
When the AF Osc. 2 Signal type is Noise, this item disappears.
20.0 Hz ≤ Set value ≤ 20 000.0 Hz, 0.1 Hz step
Initial value: 1 004.0 Hz

[AF Osc.2 Deviation]F9 — In Mod mode, sets the FM deviation of SG.
In AF mode, this item disappears.
0.00 kHz ≤ Set value≤ 40.00 kHz, 0.01 kHz step
Initial value: 8.00 kHz

[AF Osc.2 Level]F10 — In AF mode, sets the AF signal output level as shown below.
Initial value: 100.0 mV

When 600 Ω is set for Impedance of AF Output on the Setup Analog TX Measure Parameter screen:

- For Tone of signal type
  - 0.400 V< Set value ≤ 3.000 V, 0.001 V step
  - 40.0 mV< Set value ≤ 400.0 mV, 0.1 mV step
  - 4.00 mV< Set value ≤ 40.00 mV, 0.01 mV step
  - 0.010 mV< Set value ≤ 4.000 mV, 0.001 mV step
- For Noise of signal type
  - 0.150 V< Set value ≤ 1.500 V, 0.001 V step
  - 15.0 mV< Set value ≤ 150.0 mV, 0.1 mV step
  - 1.50 mV< Set value ≤ 15.00 mV, 0.01 mV step
  - 0.010 mV< Set value ≤ 1.500 mV, 0.001 mV step

When 50 Ω is set for Impedance of AF Output on the Setup Analog TX Measure Parameter screen:

- For Tone of signal type
  - 40.0 mV< Set value ≤ 400.0 mV, 0.1 mV step
  - 4.00 mV< Set value ≤ 40.00 mV, 0.01 mV step
  - 0.010 mV< Set value ≤ 4.000 mV, 0.001 mV step
- For Noise of signal type
  - 15.0 mV< Set value ≤ 150.0 mV, 0.1 mV step
  - 1.50 mV< Set value ≤ 15.00 mV, 0.01 mV step
  - 0.010 mV< Set value ≤ 1.500 mV, 0.001 mV step

In Mod mode, this item disappears.

[AF Osc.2 On Off]F11 — In Mod mode, turns on/off the FM deviation of SG by AF Osc. 2.
In AF mode, turns on/off the AF output.
(When off, the [AF Osc. 2 Deviation]F9 key and [AF Osc. 2 Level]F10 key disappear, and deviation or level cannot be set.)
Initial value: Off

[Back Screen]F12 — Returns to the Setup Common Parameter screen.

Note : When the unit key [dBμ/V] pressed, it is assumed as "dBμ" for RF level setting, and as "V" for AF level setting.

3rd page — External input signal (from the Ext FM Input connector on rear panel) is used for FM modulation of SG.

[External Deviation]F9 — Sets FM deviation of SG using the External FM Input signal.
0.00 kHz ≤ Set value≤ 40.00 kHz, 0.01 kHz step
Initial value: 8.00 kHz

[External On Off]F11 — Turns on/off the External FM Input signal to turn on/off the FM deviation of SG.
(When off, the [External Deviation]F9 key disappears, and deviation cannot be set.)
Initial value: Off

[Back Screen]F12 — Returns to the Setup Common Parameter screen.

Function key:
Function keys for 2nd page of the main function key

• AF Level function key — The same as the AF Level function keys at the 1st page of the main function key

• RX RF Frequency function key:

[Incremental Step Value]F7	Sets the step value to up/down the RF frequency of the built-in signal generator (SG) of the MT8802A with [Step] keys. 1 Hz ≤ Set value ≤ 3 GHz, 1 Hz step Initial value: 1 MHz
[Relative On Off]F8	Displays the relative value with the reference value that is the set value when this key is pressed. Initial value: Off When the frequency is set with numeric keys in Relative On mode, it becomes the actual output frequency (not relative value). Relative displayed value = Set value by numeric keys - value when this key is pressed
[Channel]F9	Changes the channel number. (See para. 4.4 for changing method.)
[Back Screen]F12	Returns to the Setup Common Parameter screen.

• RX RF Level function key:

[Incremental Step Value]F7	Sets the step value to up/down the RF level of signal generator with [Step] keys. Range: 0.1 dB ≤ Set value ≤ 80.0 dB, 0.1 dB step Initial value: 1.0 dB
[Relative On Off]F8	Displays the relative value with the reference value of 0 dB that is the level when this key is pressed. Initial value: Off When the level is set with numeric keys in Relative On mode, it becomes the actual output level (not relative value). Relative displayed value = Set value by numeric keys - value when this key is pressed
[Unit EMF TERM]F10	Selects the RF level unit of the open voltage (EMF, dBμ), terminated voltage (TERM, dBμ). Level can be set at dBμ display. 30 dBμ EMF = 24 dBμ TERM Initial value: EMF
[Back Screen]F12	Returns to Setup Common Parameter screen.

Note : When the unit key [dBμ/V] pressed, it is assumed as “dBμ” for RF level setting, and as “V” for AF level setting.

2nd page

[Offset Value]F7: Sets an offset value in output level offset display mode.

Range: -55.0 to 55.0 dB
Resolution: 0.1 dB
Initial value: 0 dB

[Offset On Off]F8: Increases or decreases the real output level to display.
Displayed value = Real output level value + Offset value

Range: On, Off
Initial value: Off

Note: If a level is set using a numeric key when this item is On, the value becomes the displayed value.

Real output level value = Displayed value - Offset value

[Back Screen]F12: Displays the previous screen.

• Modulation function key— The same as the Modulation function keys at the 1st page of the main function key

4.3.8 Digital receiver measurement

Set Traffic Channel Band to D800MHz or D1.9GHz on the Setup Common Parameter screen, then press the [RX Measure] F2 main function key to set digital receiver measurement mode.

This paragraph describes how to set parameters (on the Setup Digital RX Measure Parameter screen) and how to measure the bit error rate (on the Bit Error Rate screen) for digital receiver measurement.

(1) Setting the parameters: Setup Digital RX Measure Parameter screen

The following describes how to set parameters (on the Setup Digital RX Measure Parameter screen) for digital receiver measurement.

Display the Setup Digital RX Measure Parameter screen according to the following steps, then set the RX parameters.

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [︿] [﹀][<][>]	Move the cursor to Band of Traffic Channel.
	[Set][︿] [﹀][Set]	Select D800 MHz or D1.9 GHz and press the [Set] key to validate it.
4.	[RX Measure]F2	Displays the RX Measure menu.
5.	Next Menu[▲]	Displays the second page of the RX Measure menu.
6.	[Setup Digital RX Parameter]F8	Displays the Setup Digital RX Measure Parameter screen.

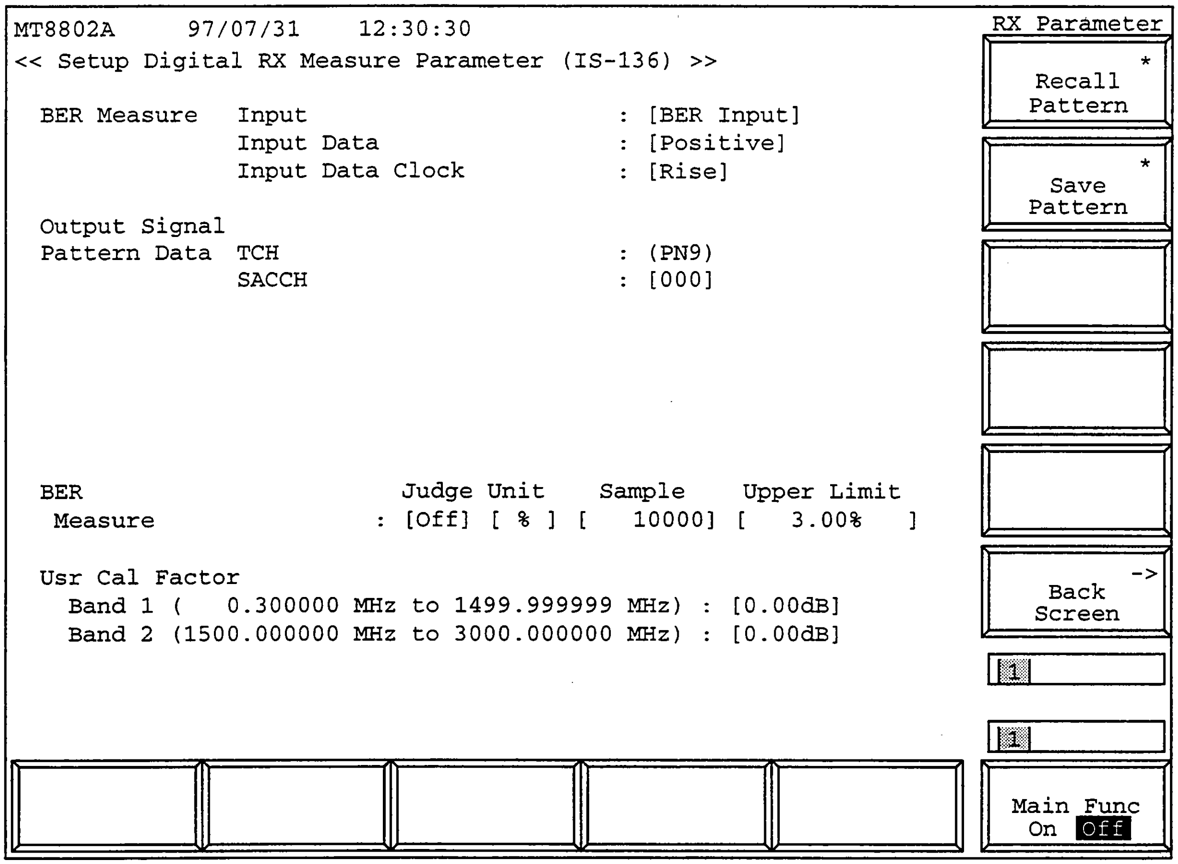


Fig. 4-25 Setup Digital RX Measure Parameter Screen

Note : When DUT Control is Call Proc, setting items of BER Measure (Input Data and Input Data Clock) and Pattern Data (SACCH) disappear.

- Set the following items:

Item		Range	Initial value	
BER Measure				
Input				Note 1
		RF Loopback	RF Loopback	
		BER Input		
Input Data				
(When Input:BER Input)				
		Positive, Negative	Positive	
Input Data Clock				
(When Input:BER Input)				
		Rise, Fall	Rise	
Output Signal Pattern Data				
(When Measuring Object:MS-DTC)				
	TCH	PN9	PN9	
	SACCH	000 to FFF	000	Note 2
(When Measuring Object:Continuous)		PN9, PN15, 0000 to 1111 (4 Bits)	PN9	
BER Measure	Judge	On, Off	Off	
	Unit	%, Bit	%	
	Sample	0 to 99 999 999	10000	
	Upper Limit	0 to (set value of Sample)	300	
	User Cal Factor	–30 dB to 30 dB	0.0 dB	
(User level calibration value)				

Note 1: Setting items of BER Measure (Input Data and Input Data Clock) become valid when the setting item of BER Measure (Input) is BER Input.

Note 2: When DUT Control is Call Proc, this can not be set.

- Function keys

Main function key: None

Function keys:

[Recall Pattern]F7: Displays the output pattern calling menu. (Para. 4.3.9)

[File No.]F9: Opens the window for entering the calling position (number) of the pattern data file.
0 to 99, Resolution: 1, Initial value: 0

[return]F12: Returns to the previous menu.

[Save Pattern]F8: Displays the output pattern saving menu. (Para. 4.3.9)

[Back Screen]F12: Displays the previous screen

- Modulation Data

The Digital modulation of IS-136 System uses the TDMA frame consisting of three slots at full rate. The MT8802A uses the frame as the period to generate data (modulation signal).

The PN9 (pseudo-random pattern) in a selected TCH burst data has continuity.

← 20 ms (Full rate period) →

Slot 1	Slot 2	Slot 3

Slot signal configuration :

(1) Up-link communication channel

This signal uses for TX measurement when Measuring Object is set to MS-DTC.

Up-link communication channel

G	R	DATA	SYNC	DATA	SACCH	CDVCC	DATA
6	6	16	28	122	12	12	122

G	:	Guard time	
R	:	Ramp time	00_H (6 bits)
DATA	:	User imformation transmission:	PN9 pseudo-random pattern independent in each slot
SYNC	:	Sync word	Slot 1 = $A91DE4A_H$ (28 bits)
			Slot 2 = $A9D127A_H$ (28 bits)
			Slot 3 = $C7E3C0C_H$ (28 bits)
SACCH	:	Slow Associated control channel	
CDVCC	:	Coded DVCC (Digital Verification Color Cord)	

(2) Down-link communication channel

This signal uses for RX measurement when Measuring Object is set to MS-DTC.

SYNC	SACCH	DATA	CDVCC	DATA	RSVD+CDL
28	12	130	12	130	12

SYNC	:	Sync word	Slot 1 = $A91DE4A_H$ (28 bits)
			Slot 2 = $A9D127A_H$ (28 bits)
			Slot 3 = $C7E3C0C_H$ (28 bits)
SACCH	:	Slow Associated control channel	000_H (12 bits)
DATA	:	User imformation transmission:	PN9 pseudo-random pattern independent in each slot
CDVCC	:	Coded DVCC (Digital Verification Color Cord)	
		→ DVCC	01_H (8 bits)
RSVD+CDL	:	Reserved data + Coded DCCH Locator	
			$80F_H$ (12 bits)

[Setup parameters]

- SW : 0000000_H to $FFFFFFF_H$ (28 bits)
- SACCH : 000_H to FFF_H (12 bits)
- DVCC : 00_H to FF_H (8 bits)

(2) Measuring the bit error rate: Bit Error Rate screen

The following describes how to measure the bit error rate (on the Bit Error Rate screen) of the receiver by using the parameters set on the Setup Common Parameter and Setup Digital RX Measure Parameter screens.

Some set items can be changed by using the function keys.

Display the Bit Error Rate screen according to the following steps to measure the bit error rate.

Step	Key operation	Description
1.	[Main Menu on off]F6	Sets the Main Menu on to display the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [∧] [∨][<][>] [Set][∧] [∨][Set]	Move the cursor to Band of Traffic Channel. Select D800 MHz or D1.9 GHz and press the [Set] key to validate it.
4.	Cursor [∧] [∨][<][>] [Set][∧] [∨][Set]	Move the cursor to DUT Control. Select None and press the [Set] key to validate it.
5.	[RX Measure]F2	Displays the RX Measure menu.
6.	[Bit Error Rate]F7	Displays the Bit Error Rate screen.

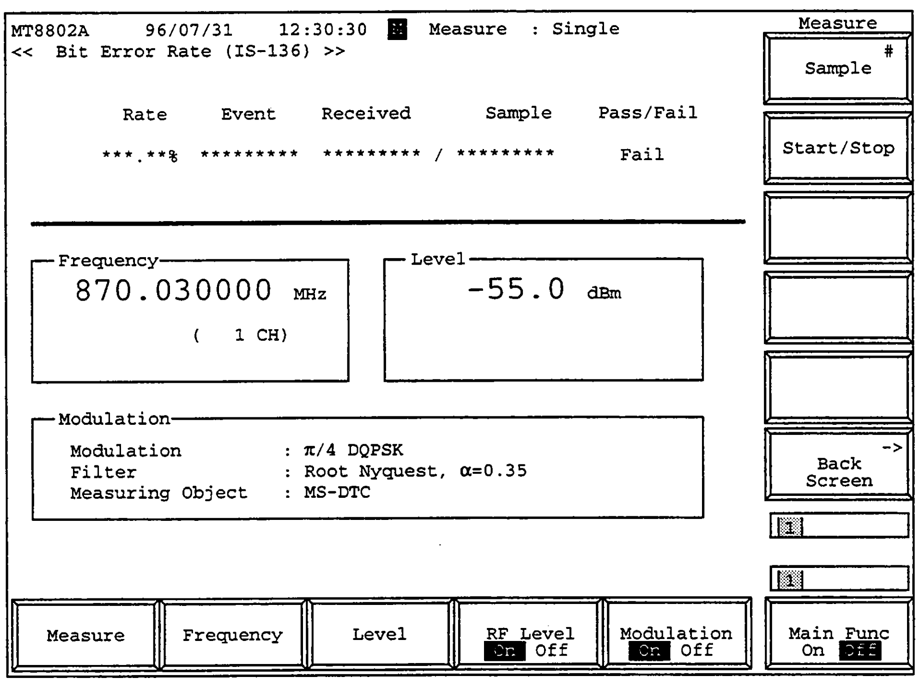


Fig. 4-26 Bit Error Rate screen (1/3)

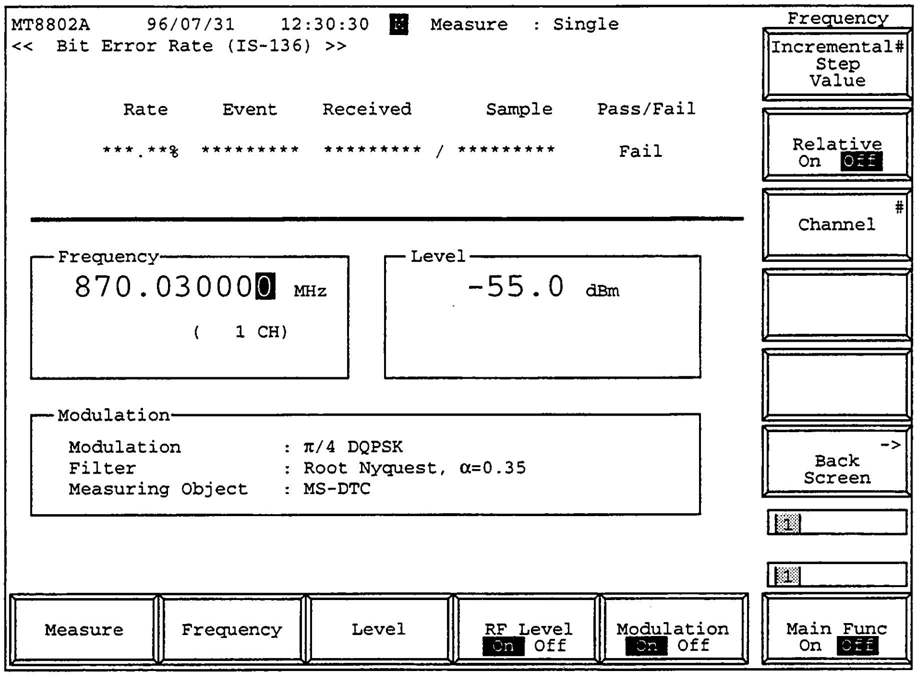


Fig. 4-26 Bit Error Rate screen (2/3)

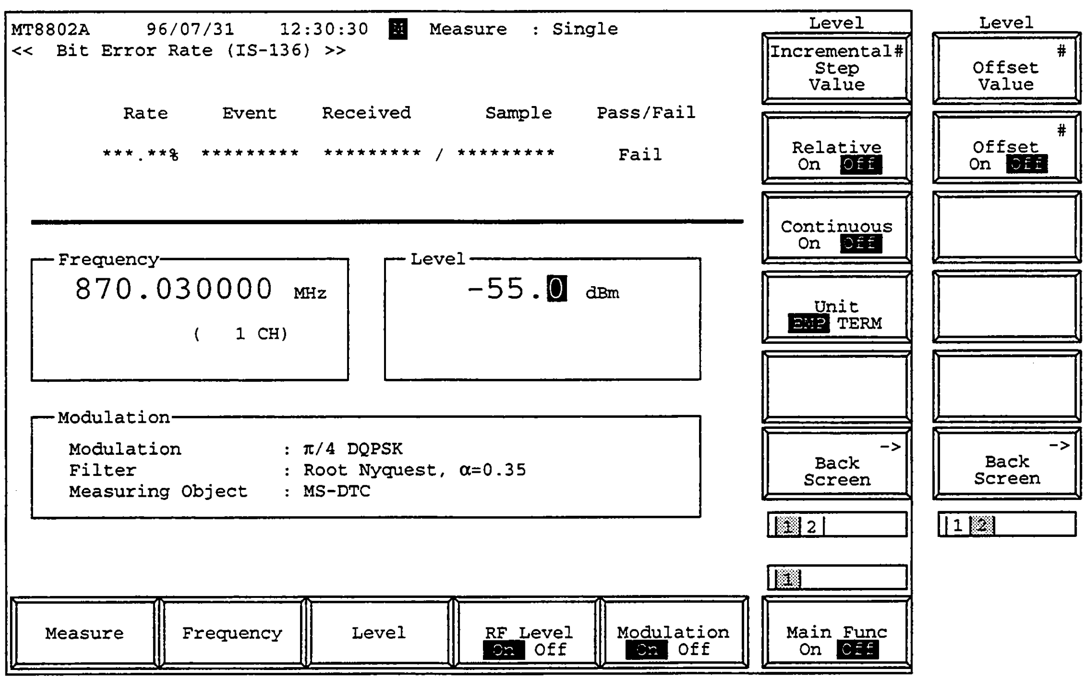


Fig. 4-26 Bit Error Rate screen (3/3)

Notes: 1. This screen is valid when the DUT Control is set to None.

2. If synchronization failure occurs at start of or during measurement, Pattern Sync Loss is displayed. In this case, measurement stops until synchronization is established. When synchronization is established, measurement starts.

3. When the Measure mode is set to Single:
The intermediate measurement result is updated and displayed. When the number of data items reaches the specified number, measurement terminates.

When Measure mode is set to Continuous:
The measurement result is updated when measurement of the specified number of data items terminates. Measurement is then restarted.

- Main function keys:

[Measure]F1: Displays the Measure function keys for measuring bit error rate on F7 to F12.

[Frequency]F2: Displays the Frequency function keys for setting RF frequency on F7 to F12.

[Level]F3: Displays the Level function keys for setting RF output level on F7 to F12.

[RF Level On Off]F4: Sets the output level On or Off. Initial value: Off

[Modulation On Off]F5: Sets Modulation On or Off. Initial value: Off

- Function keys:

--- Measure Function keys ---

[Sample]F7: Changes the number of BER-measurement samples.

[Start/Stop]F8: Starts or stops measurement.

[Back Screen]F12: Displays the previous screen.

-- Frequency Function keys ---

When DUT Control is None, the Frequency menu does not appear, but the channel-number changing window appears.

[Incremental Step Value]F7: Sets a step value when incrementing or decrementing an output frequency value by using the Step keys.

Range: 1 Hz to 3 GHz
Resolution: 1 Hz
Initial value: 1 MHz

[Relative On Off]F8: Displays the relative output frequency based on the reference value immediately before setting Relative On.

Range: On, Off
Initial value: Off

Note: If a frequency is set using a numeric key when this item is On, the value becomes the real output frequency.

Relative display value = Value set by numeric key - Value before setting On

[Channel]F9: Sets the channel number. When set, the corresponding TX/RX frequencies are set.

[Back Screen]F12: Displays the previous screen.

--- Level Function Keys ---

1st page

[Incremental Step Value]F7: Sets a step value when incrementing or decrementing an output level by using the Step keys.

Range: 0.1 to 80 dB
Resolution: 0.1 dB
Initial value: 1 dB

[Relative On Off]F8: Displays a relative output level based on the reference value (dB unit) immediately before setting Relative On.

Range: On, Off
Initial value: Off

Note: If a level is set using a numeric key when this item is set On, the value becomes the real output level.

Relative display value = Value set using a numeric key - Value before setting On

[Continuous On Off]F9: Sets a mode in which an output level can be changed without an interrupt in the range of 20 dB. If a value immediately before setting Continuous On is assumed to be L_0 dBm, the level can be changed by using the rotary knob without an interrupt in the range of 20 dB. (The Step and numeric keys are invalid.)

$(L_0 - 20)$ dBm $\leq$ Output level $\leq L_0$ dBm

[Back Screen]F12: Displays the previous screen.

2nd page

[Offset Value]F7: Sets an offset value in output level offset display mode.

Range: -55.0 to 55.0 dB
Resolution: 0.1 dB
Initial value: 0 dB

[Offset On Off]F8: Increases or decreases the real output level to display.

Displayed value = Real output level value + Offset value

Range: On, Off
Initial value: Off

Note: If a level is set using a numeric key when this item is On, the value becomes the displayed value.

Real output level value = Displayed value - Offset value

[Back Screen]F12: Displays the previous screen.

• Input signals for BER Measurement

This paragraph describes the input signals used to measure BER(Bit Error Rate, receive sensitivity) of the receiver using RX Measure function.

The MT8802A has the BER input connectors in 3 locations.

1. RF Input connector on the front panel(See para.(a).)
2. BER connectors on the rear panel (See para. (b).)
3. DUT Interface connector on the front panel (See para. (c).)

Note: Do not input signals to both of the BER connectors and BER measurement terminals in the DUT Interface connector at a time. (Leave either of them disconnected or not wired.)

(a) RF Input connector on front panel

The MT8802A has the RF Input connector on the front panel.
Looped-back RF output signal of the receiver is input to this connector.

(b) BER measurement connectors on rear panel

The MT8802A has the BER connectors on the upper left of the rear panel.

i) BER Input Data

BER-measurement data input connector.
BER-measurement serial data is input from the receiver.
Input level: TTL level
Input waveform: See para. (d).

ii) BER Input Data Clock

BER-measurement data-clock input connector.
BER-measurement serial-data timing clock is input from the receiver.
Input level: TTL level
Input waveform: See para. (d).

(c) BER-measurement DUT Interface connector on front panel

The MT8802A has the DUT Interface connector on the front panel.

Note: When entering a signal from this connector, be sure to connect the GND terminals (1-pin or 7-pin) to ground.

i) BDAT_IN terminal (pin 22)

BER-measurement data input terminal. Similar to the BER Input Data connector on the rear panel, BER-measurement serial data is input from the receiver..
Input level: TTL level
Input waveform: See para. (d).

ii) BCLK_IN terminal (pin 21)

BER-measurement data clock input terminal. Similar to the BER Input Data Clock on the rear panel, BER-measurement serial-data timing clock is input from the receiver.
Input level: TTL level
Input waveform: See para. (d).

(d) Input signals for BER measurement

This paragraph describes the BER measurement signals which are input to the BER connectors or DUT Interface connector described in paragraphs (b) and (c).

a) BER Input Data, BDAT_IN

- Measurement signal

  This input signal is PN data (PN9/PN15-stage pseudo random pattern) demodulated by the receiver. When communication burst (MS-DTC) is used for BER measurement, extract the PN data in the TCH area, then output it to the MT8802A.

- Signal polarity

  The polarity of input signal may be positive or negative logic. However, match the interface of the MT8802A to the polarity of input signal used, as described below.

  Setup item: BER Measure Input Data in the Setup RX Parameter screen

  Set [Positive] for the positive logic (same logic as the modulation signal).

  Set [Negative] for the negative logic (inverted logic to the modulation signal) .

b) BER Input Data Clock, BCLK_IN

- Measurement signal

  This input signal is the data-transmission timing clock of the BER Input Data or BDAT_IN. The clock is synchronized to the data signal in para. a). Set the data fetching timing of the MT8802A.

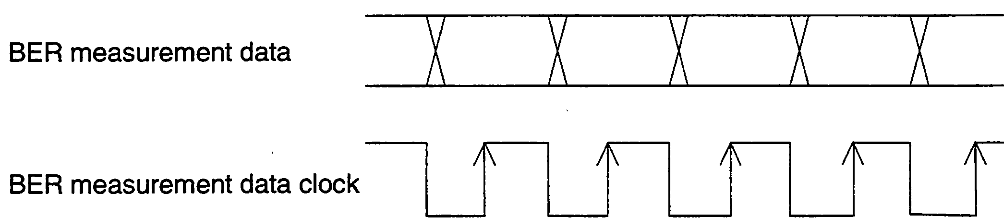
- Signal polarity

  The polarity of input signals may be rising or falling edge. However, match the interface of the MT8802A to the polarity of input signal used, as described below. (Set the data fetching timing of the MT8802A.)

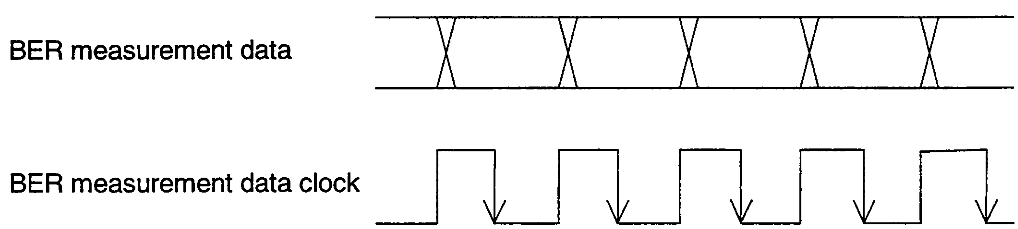
  Setup item: BER Measure Input Data Clock in the Setup RX Parameter screen

  Set [Rise] for the rising edge, and [Fall] for the falling edge, as shown below.

  i) When the input signal polarity is the rising edge, set [Rise].



  ii) when the input signal polarity is the falling edge, set [Fall].



(3) Example of receiving sensitivity measurement

An example of digital receiving sensitivity measurement on the IS-136 mobile station is given below.

1. Setup

As described in paragraph 4.3.1(1), connect the MT8802A to the measured equipment (mobile station).

2. Measurement Setting Procedure

Set the receiving sensitivity measurement of the MT8802A in the following steps:

Step	Operation
(Checking and setting the measurement interface)	
1.	Press function key F6 (Main Func) to turn on the Main Func.
2.	Press the Next Menu key [◀] and function key F2 (Instrument Setup) in this order to switch to the Instrument Setup screen.
3.	Check that the RF Input/Output item is set to "Main."
4.	Press function key F6 (Main Func) to turn on the Main Func.
5.	Press function key F1 (TX/RX Measure) to enter TX/RX Measure mode (Setup Common Parameter screen).
(Setting the Setup Common Parameter screen)	
6.	Set DUT Control to None.
7.	Set Traffic Channel Band to D800MHz or D1.9GHz and set the measurement frequency or channel. (Example: Set Band to D800MHz and Channel to 1CH.)
8.	Set a measurement level (RX Measure Output Level).
9.	Set Measuring Object of Signal to MS-DTC (Note 1)
(Setting the Setup Digital RX Measure Parameter screen)	
10.	Press function key F2 (RX Measure) to enter RX measurement mode. Press the Next Menu key [▲] and function key F9 (Setup Digital RX Measure Parameter) to switch to the Setup Digital RX Measure Parameter screen.
11.	Set the BER Measure item on the top of the screen. Set the polarity of the digital signal interface for BER measurement , and select the measurement signal entered from the measured equipment as a BER Measure item. (Note 2)
12.	Set the Pattern Data item on the center of the screen. This setting item is a modulation signal parameter of the signal generator.
13.	Set the BER Measure item on the bottom of the screen.Especially, set and confirm the the Sample (number of the measurement data).
(Setting the Bit Error Rate screen)	
14.	Press function key F12 (Back Screen) to switch to the Setup Common Parameter screen.
15.	Press the Next Menu key [▲] and function key F7 (Bit Error Rate) to switch to the Bit Error Rate screen.
16.	Set both function keys F4 (RF Output On/Off) and F5 (Modulation On/Off) to On to output a modulation signal.

(Measuring the receiving sensitivity)

17. Check that the measured equipment receives signals output from the signal generator and outputs data. (If the BER measurement signal is output from the measured equipment, the BER measuring instrument starts counting data items.)
18. Press function key F1 (Measure) to display the function keys used to set the parameters of the BER measuring instrument.
19. Press the Single key or function key [Start/Stop] to start the BER measurement.
20. When counting of the specified number of BER measurement data items terminates, the measured value is read.

Note 1: Set this value to the same value as that of the measured equipment. Signals output from the MT8802A correspond to down-link signals output from the base station (BS) (correspond to signals received by the measured object).

Note 2: When the Input of BER Measure is set to RF Input, the signal from the measured equipment to the MT8802A becomes RF signal.So, correctly set the TX measurement parameters on the Setup Common Parameter screen and Setup TX Measure Parameter screen for the MT8802A to receive the signal.

Note 3: Synchronization is established autonomously in the measured equipment (mobile station). The MT8802A operates using the internal timing.

3. Notes on receiving sensitivity measurement

Note the followings when measuring the receiving sensitivity:

3.1 Synchronization of the Measured Equipment

1) Control for the synchronization time of the measured equipment

Execute the BER Measure on the Bit Error Rate screen. Output signals of the signal generator can be output while this screen is displayed. The BER measuring instrument starts measurement immediately after the screen is switched to the BER Measure screen. If abnormal data is output while the carrier frequency or symbol lock is gaining synchronization during demodulation of the measured equipment, the output data items may be counted as error data items. In this case, the first data during gaining synchronization is ignored and the measurement is started after data is output correctly.

3.2 Signal Loss While Changing Output Level

When the output level of the signal generator is changed, the output level is lost at the instant. So, if the output level of the signal generator is changed at the BER measurement, the measured results become erroneous because of the signal loss. Instantaneous signal-loss while changing the output level can be prevented by setting Continuous of the output level control of the MT8802A to "On."

3.3 Controlling the BER Measuring Instrument

The following keys are used to control (start, stop) the BER measuring instrument on the front panel:

1) Single and Continuous keys

The Single or Continuous key is used to start usual measurement. When the Single or Continuous key is pressed, the BER measurement starts. When the number of data reaches the number of BER measurement data items set in [Counting time], the Single key stops the measurement automatically, or the Continuous key updates the measurement result, then restarts the measurement from the beginning. If the MT8802A enters a BER measurement state before the key is pressed, it discards measurements up to this time and starts new measurements.

2) Start/Stop key

This is the [F7] key in the Measure menu (appears when main function key Measure [F1] is pressed).

a) If the Start/Stop key is pressed while the BER measuring instrument is operating, it stops the BER measuring instrument.

b) If the Start/Stop key is pressed when the BER measuring instrument is not operating, it starts the BER measurement from the beginning.

3.4 RF signal interference at loop back

When the Input of BER Measure is set to RF Input (RF loop back), take care of the intereference between the measurment RF input/output signals. If the input/output frequencies are set to the same value, the measurement cannot be performed.

3.5 BER Measurement Interface with the Measured Equipment

When the Input of BER Measure is set to BER Input, BER measurement signals fetched from the measured equipment are the data signal for measurement described above and the clock signal. The measurement data entered to the MT8802A at this time is assumed to be PN9 (also PN15 when Measuring Object is Continuous) set on the Setup Digital RX Measure Parameter screen.

If a signal other than Continuous is set as the output signal of the signal generator, note the followings:

1) For the measurement data, fetch the signal of the TCH part.

The output signal of the signal generator has a fixed data pattern (such as synchronous words) and the TCH data (used for the BER measurement) connected. Therefore, a signal simply modulated does not become PN9 or PN15 data correctly, and so the measurement is disabled.

If only the TCH area part is fetched as the BER measurement data, match the changing part of the data transmission clock to it. The MT8802A fetches data when the data transmission clock changes (rises or falls). If the data transmission clock changes when there is no BER measurement data, continuity of the PN data is considered to be lost. In this case, the MT8802A assumes that an error occurred.

2) Note the followings with regard to the BER measurement data and data transmission clock signals:

a) Type and length of the BER measurement signal transmission cable
A coaxial cable may be used to transmit the BER measurement data signal. Coaxial cable offers sufficient protection from external noise. However, when transmitting digital signals used for BER measurement, reflection of the signal may degrade the waveform. To solve this problem, take either of the following countermeasures:

a-1) When using coaxial cable, make the cable length short.
If a long cable is used, the waveform deteriorates (ringing, etc.) greatly at a rise or fall of the signal. If a long transmission line is required, use twisted paired cables or build an exclusive interface.

a-2) Make the lengths of the data signal transmission and data clock signal transmission cables the same.
If the time difference between the data and data transmission clock signals is large, the data location is different from the clock location, and so the correct data cannot be fetched.

b) Transmission signal level of BER measurement data signal
Input signal level to the MT8802A must be within the specified level.
The BER measurement data signal level of the MT8802A is the TTL level (+5 V C-MOS level). If the input signal level is less than this level, error or trouble may be occurred.

3) Match the clock (for data transmission) to the BER measurement data:

When the TCH part is fetched for BER measurement data, match it to the transition point of the data transmission clock.

The MT8802A fetches the data at the transition point (rising edge or falling edge) of the data transmission clock. If the clock changes at the time of no data, the continuity of the PN data is lost, and then error occurs.

4.3.9 Analog receiver measurement

Set Traffic Channel Band to A800MHz on the Setup Common Parameter screen, then press the [RX Measure] F2 main function key to set analog receiver measurement mode.

This paragraph describes how to set parameters (on the Setup Analog RX Measure Parameter screen) and how to measure the analog receiver (on the Analog RX Measure screen) for analog receiver measurement.

(1) Setting the parameters: Setup Analog RX Measure Parameter screen

The following describes how to set parameters (on the Setup Analog RX Measure Parameter screen) for analog receiver measurement.

Display the Setup Analog RX Measure Parameter screen according to the following steps, then set the RX parameters.

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the first page of the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [∧] [∨][<][>] [Set][∧] [∨][Set]	Move the cursor to Band of Traffic Channel. Select A800 MHz and press the [Set] key to validate it.
4.	[RX Measure]F2	Displays the first page of the RX Measure menu.
5.	Next Menu[▲]	Displays the second page of the RX Measure menu.
6.	[Setup Analog RX Parameter]F9	Displays the Setup Analog RX Measure Parameter screen.

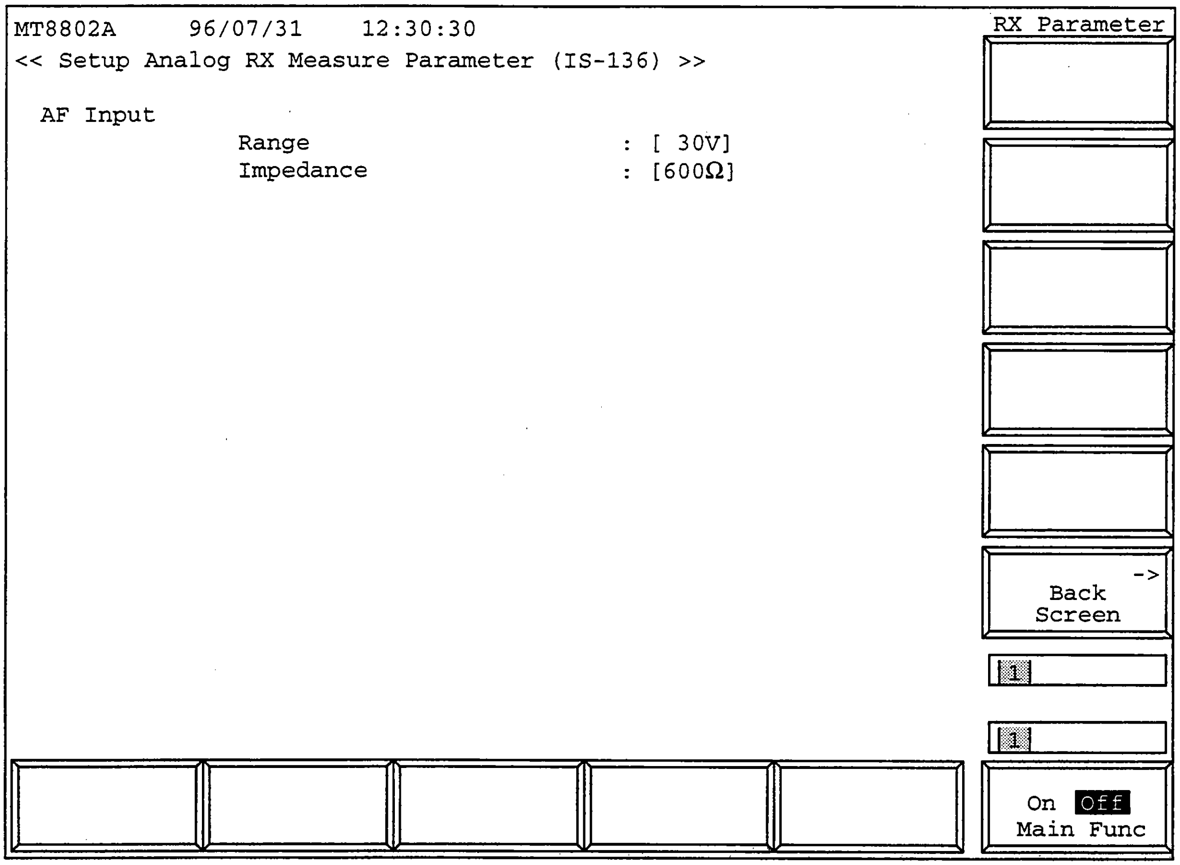


Fig. 4-27 Setup Analog RX Measure Parameter Screen

- Set the following items:

Item	Range	Initial value
AF Input		
Range	30 V, 4 V, 400 mV, 40 mV	30 V
Impedance	100 kΩ, 600 Ω	100 kΩ

- Main function key: None
- Function keys:

[Back Screen]F12: Displays the previous screen

(2) Analog receiver measurement: Analog RX Measure screen

On the Analog RX Measure screen, output an RF signal from the MT8802A and measure the AF signal from the DUT.

Switch to the Analog RX Measure screen according to the following steps:

Step	Key operation	Description
1.	[Main Func on off]F6	Sets Main Func on to display the first page of the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets the TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [︿] [﹀][<][>] [Set][︿] [﹀][Set]	Move the cursor to Band of Traffic Channel. Select A800 MHz and press the [Set] key to validate it.
4.	[RX Measure]F2	Displays the first page of the RX Measure menu.
5.	[Analog RX Measure]F7	Displays the Analog RX Measure screen.

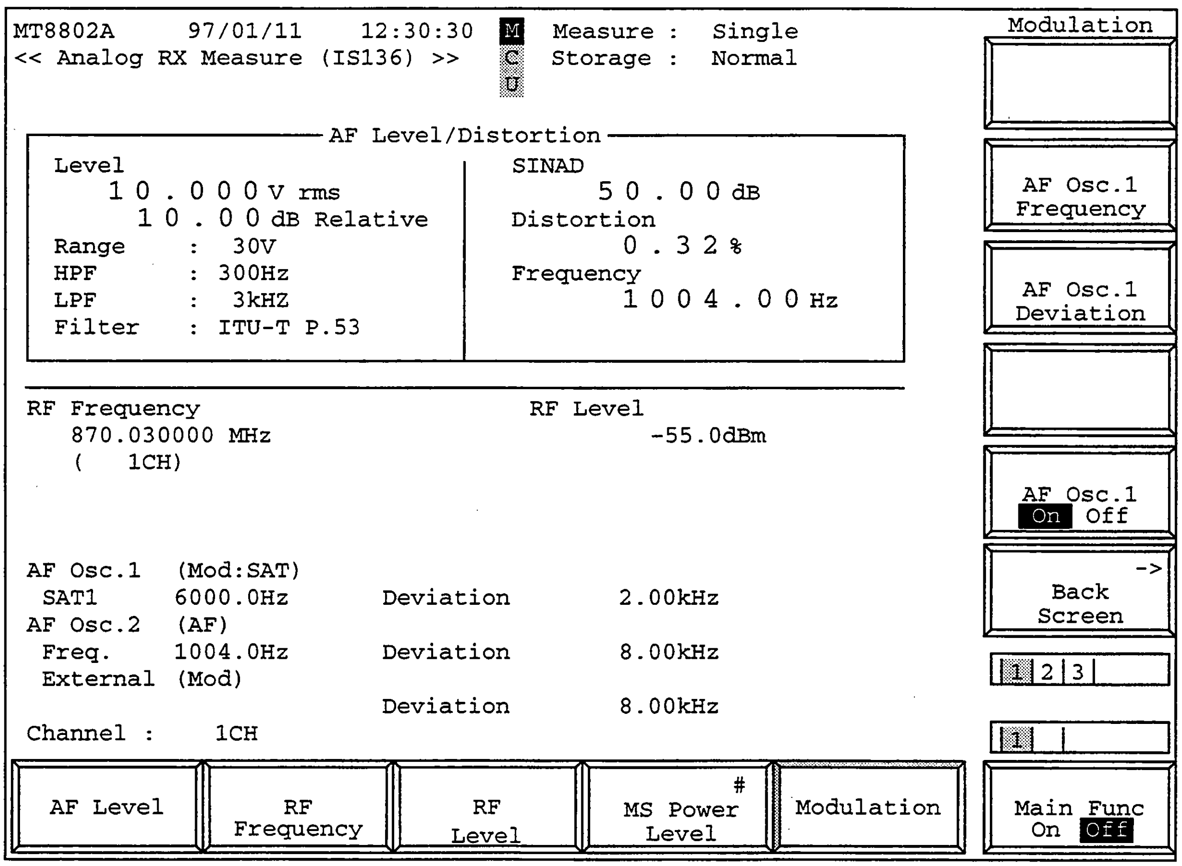
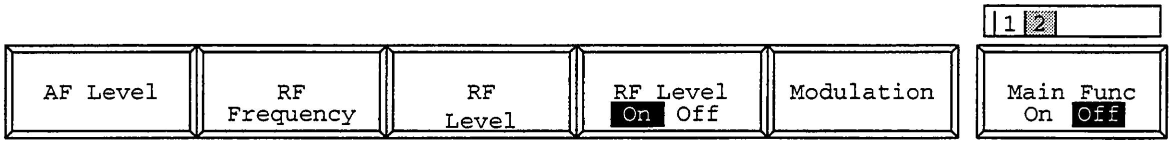


Fig. 4-28 Analog RX Measure screen

The 2nd page of the main function keys on the Analog RX Measure screen (DUT Control: None)



Note 1: Relative value (of AF Level, which is always displayed) is displayed with --.- dB until the [Set Relative]F8 key is pressed.

Note 2: When DUT Control is Call Proc, AF Osc.1 is used for SAT modulation and cannot be changed.

• Main function keys:

[AF Level]F1	Displays the AF Level function keys on F7 to F12. (Settings for measuring AF signal from receiver)
[RX Frequency]F2	Displays the RF Frequency function keys on F7 to F12. (When DUT Control is Call Proc, only the frequency channel for transmission and reception can be changed.)
[RF Level]F3	Displays the RF Level function keys on F7 to F12. (Setting RF signal level to receiver)
[MS Power Level] F4	(when DUT Control is Cal Proc) Changes the MS (mobile station under test) transmission level.
[RX RF Level On Off] F4	(when DUT Control is None) Turns on and off the RF signal output from the signal generator in the MT8802A. Function keys F7 to F12 are not changed.
[Modulation]F5	Displays the Modulation function keys on F7 to F12. (Setting RF signal modulation degree to receiver)

• AF Level function keys:

1st page

[Adjust Range]F7	Sets the AF-measurement level range to the status appropriate for AF-measurement signals.
[Set Relative]F8	Displays the relative value with the reference value of 0 dB that is the level when this key is pressed.
[HPF]F9	Selects the HPF of 400Hz, 300Hz, 50Hz, or Off. Initial value: Off Note : The HPF of 400 Hz is the filter for tone signal rejection.
[LPF]F10	Selects the LPF of 3kHz, 15kHz, or Off. Initial value: Off
[Filter]F11	Selects the estimation filter of ITU-T P.53, C-MESSAGE, 6kHz BPF, or Off. Initial value: Off
[Back Screen]F12	Returns to the Setup Common Parameter screen.

2nd page

[Range Up]F7	Up the measurement range of the AF level meter.
[Range Down]F8	Down the measurement range of the AF level meter.
[Storage Mode]F9	Displays the Storage Mode menu for all the measured results on the screen.
[Normal]F7	Sets normal mode. (Initial value)
[Average]F8	Sets average mode.
[Average Count]F9	Sets number of Averaging processings. $2 \leq$ Set value ≤ 9999 Initial value: 10 (In the average mode, the measurement is of single mode, which displays the averaged results in each measurement, and stops measurement when the Average Count reached.) Note that the Power Meter has not the average mode.
[return]F12	Returns to the AF Level menu.
[AF Level Unit]F10	Selects the unit of the AF Level measurement value of dBm (valid for 600 Ω of input impedance) or V. Initial value: V When the 100 kΩ of Impedance of AF Level Input is set on the Setup Common Parameter (Analog) screen, this menu is not displayed.
[Distortion Unit]F11	Selects the unit of the distortion measurement value of dB or %. Initial value: %
[Back Screen]F12	Returns to the Setup Common Parameter screen.

• RF Frequency function keys:

[Incremental Step Value]F7 Sets the step value for up/down the RF frequency by the [Step] keys.
1 Hz ≤ Set value≤ 3 GHz, 1 Hz step
Initial value: 1 MHz

[Relative On Off]F8 Displays the relative value with the reference value that is the set value when this key is pressed.

Initial value: Off
When the frequency is set with numeric keys in Relative On mode, it becomesthe actual output frequency (not relative value).
Relative displayed value = Set value by numeric keys - value when this key is pressed

[Channel]F9 Changes the channel number. (See para. 4.4 for the changing method.)

[Back Screen]F12 Returns to the Setup Common Parameter screen.

• RF Level function keys:

[Incremental Step Value]F7 Sets the step value for up/down the RF level by the [Step] keys.

Range: 0.1 dB ≤ Set value ≤ 80.0 dB, 0.1 dB step
Initial value: 1.0 dB

[Relative On Off]F8 Displays the relative value with the reference value that is the set value when this key is pressed.
Initial value: Off
When the level is set with numeric keys in Relative On mode, it becomes the actual output level (not relative value).
Relative displayed value = Set value by numeric keys - value when this key is pressed

[Unit EMF TERM]F10 Selects the RF level unit of open voltage (EMF, dBμ) or termination voltage (TERM, dBμ).

Selectable only when in dBμ display mode. 30 dBμ EMF = 24 dBμ TERM
Initial value: EMF

[Back Screen]F12 Returns to the Setup Common Parameter screen.

2nd page

[Offset Value]F7: Sets an offset value in output level offset display mode.
Range: -55.0 to 55.0 dB
Resolution: 0.1 dB
Initial value: 0 dB

[Offset On Off]F8: Increases or decreases the real output level to display.
Displayed value = Real output level value + Offset value
Range: On, Off
Initial value: Off
Note: If a level is set using a numeric key when this item is On, the value becomes the displayed value.
Real output level value = Displayed value - Offset value

[Back Screen]F12: Displays the previous screen.

• Modulation function keys:

1st page — AF Osc.1 is used only for the modulation (Mod mode) of the built-in signal generator (SG) in the MT8802A. When DUT Control is Call Proc, AF Osc.1 is used for SAT modulation. The frequency, deviation, and On/Off state cannot be changed.

[AF Osc.1 Frequency]F8 Sets AF Osc.1 frequency to set modulation frequency of the SG.

20.0 Hz ≤ Set value≤ 20 000.0 Hz, 0.1 Hz step
Initial value: 1 004.0 Hz
(When setting the same frequency as AF Osc.2 in Mod mode, the deviation of the RF output becomes the sum of each the set value.)

[AF Osc.1 Deviation]F9 Sets the FM deviation of the SG using AF Osc.1 output.
0.00 kHz ≤ Set value≤ 40.00 kHz, 0.01 kHz step
Initial value: 8.00 kHz

[AF Osc.1 On Off]F11 Turns on/off the AF Osc.1 output level to turn on/off the FM deviation of the SG by the AF Osc.1 output.
(When off, the [AF Osc.1 Deviation]F9 key disappears, and deviation cannot be set.)

Initial value: On

[Back Screen]F12 Returns to the Setup Common Parameter screen.

2nd page — AF Osc.2 is used for the modulation (Mod mode) of the built-in signal generator (SG) in the MT8802A, or AF output signal (AF mode) from the AF Output connector on the front panel.

[AF Osc.2 Signal]F7 Displays the AF Osc.2 Signal menu.

[AF Signal]F7 Selects AF-Osc.2 signal type of Tone, Noise(ITU-T G.227), or Noise(White).

When Noise is set, displays "Noise(Noise type)" at the frequency display area.
Initial value: Tone

[Output for Mod AF]F8 Selects the AF Osc.2 signal usage for Mod (SG modulation signal) or AF (AF signal output from AF Output connector).
Initial value: Mod

[return]F12 Returns to the Modulation menu.

[AF Osc.2 Frequency]F8 In Mod mode, sets the modulation frequency of the signal generator.

(When setting the same frequency as AF Osc. 1 in the Mod mode, the deviation becomes the sum of the set values.)
In AF mode, sets the frequency of the AF signal output from the AF Output connector.
When the AF Osc. 2 Signal type is Noise, this item disappears.

20.0 Hz ≤ Set value ≤ 20 000.0 Hz, 0.1 Hz step
Initial value: 1 004.0 Hz

[AF Osc.2 Deviation]F9 In Mod mode, sets the FM deviation of the SG.
In AF mode, this item disappears.
0.00 kHz ≤FM Set value≤ 40.00 kHz, 0.01 kHz step
Initial value: 8.00 kHz

[AF Osc.2 Level]F10 — In AF mode, sets the AF signal output level as shown below.
Initial value: 100.0 mV

When 600 Ω is set for Impedance of AF Output on the Setup Analog TX Measure Parameter screen:

- For Tone of signal type
  - 0.400 V< Set value ≤ 3.000 V, 0.001 V step
  - 40.0 mV< Set value ≤ 400.0 mV, 0.1 mV step
  - 4.00 mV< Set value ≤ 40.00 mV, 0.01 mV step
  - 0.010 mV< Set value ≤ 4.000 mV, 0.001 mV step
- For Noise of signal type
  - 0.150 V< Set value ≤ 1.500 V, 0.001 V step
  - 15.0 mV< Set value ≤ 150.0 mV, 0.1 mV step
  - 1.50 mV< Set value ≤ 15.00 mV, 0.01 mV step
  - 0.010 mV< Set value ≤ 1.500 mV, 0.001 mV step

When 50 Ω is set for Impedance of AF Output on the Setup Analog TX Measure Parameter screen:

- For Tone of signal type
  - 40.0 mV< Set value ≤ 300.0 mV, 0.1 mV step
  - 4.00 mV< Set value ≤ 40.00 mV, 0.01 mV step
  - 0.010 mV< Set value ≤ 4.000 mV, 0.001 mV step
- For Noise of signal type
  - 15.0 mV< Set value ≤ 150.0 mV, 0.1 mV step
  - 1.50 mV< Set value ≤ 15.00 mV, 0.01 mV step
  - 0.010 mV< Set value ≤ 1.500 mV, 0.001 mV step

In Mod mode, this item disappears.

[AF Osc.2 On Off]F11 — In Mod mode, turns on/off the FM deviation of SG by AF Osc. 2.

In AF mode, turns on/off the AF output.
(When off, the [AF Osc.2 Deviation]F9 key disappears, and deviation cannot be set.)

Initial value: Off

[Back Screen]F12 — Returns to the Setup Common Parameter screen.

Note : When the unit key [dBμ/V] pressed, it is assumed as "dBμ" for RF level setting, and as "V" for AF level setting.

3rd page — External input signal (from the Ext FM Input connector on the rear panel) is used for FM modulation of the built-in signal generator(SG).

[External Deviation]F9 — Sets FM deviation of signal generator using the External FM Input signal.

0.00 kHz ≤ FM Set value ≤ 40.00 kHz, 0.01 kHz step
Initial value: 8.00 kHz

[External On Off]F11 — Turns on/off the External FM Input signal to turn on/off the FM deviation of signal generator.
(When off, the [External Deviation]F9 key disappears, and deviation cannot be set.)
Initial value: Off

[Back Screen]F12 — Returns to the Setup Common Parameter screen.

4.3.10 AF Signal Measurement

Set Traffic Channel Band to A800MHz and DUT Control to None on the Setup Common Parameter screen, then press the [AF Measure] F3 main function key to set AF signal measurement mode.

This paragraph describes how to set parameters (on the Setup AF Measure Parameter screen) and how to measure the AF signal (on the AF Measure screen) for AF signal measurement.

(1) Setting the parameters: Setup AF Measure Parameter screen

The following describes how to set parameters (on the Setup AF Measure Parameter screen) for AF signal measurement.

Display the Setup AF Measure Parameter screen according to the following steps, then set the AF parameters.

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the first page of the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [︿] [﹀][<][>] [Set][︿] [﹀][Set]	Move the cursor to Band of Traffic Channel. Select A800 MHz and press the [Set] key to validate it.
4.	Cursor [︿] [﹀][<][>] [Set][︿] [﹀][Set]	Move the cursor to DUT Control. Select None and press the [Set] key to validate it.
5.	[AF Measure]F3	Displays the first page of the AF Measure menu.
6.	Next Menu[▲]	Displays the second page of the AF Measure menu.
7.	[Setup AF Parameter]F9	Displays the Setup AF Measure Parameter screen.

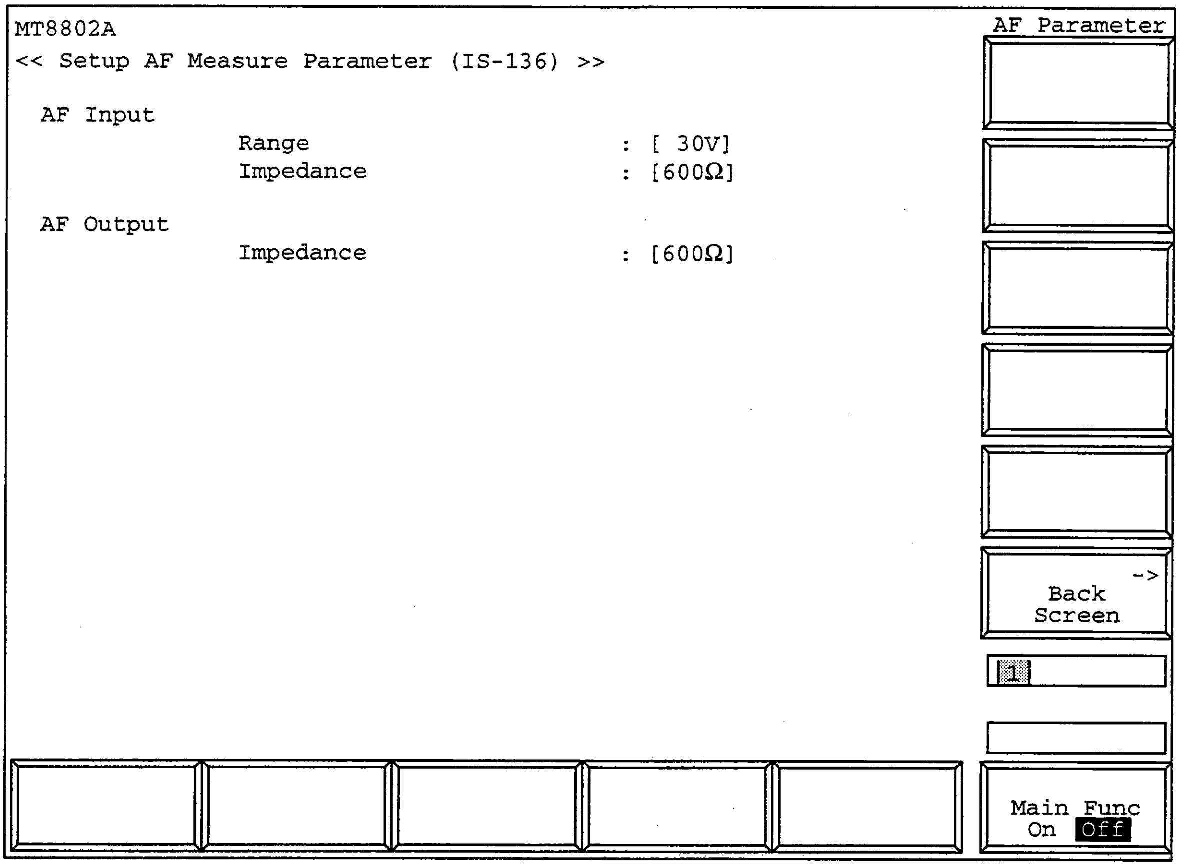


Fig. 4-29 Setup AF Measure Parameter screen

- Set the following items:

Item	Range	Initial value
AF Input		
Range	30 V, 4 V, 400 mV, 40 mV	30 V
Impedance	100 kΩ, 600 Ω	100 kΩ
AF Output		
Impedance	50 Ω, 600 Ω	600 Ω

- Main function key: None
- Function keys:

[Back Screen]F12: Displays the previous screen

(2) AF signal measurement: AF Measure screen

On the AF Measure screen, output an AF signal from the MT8802A and measure the AF signal from the DUT.

Switch to the AF Measure screen according to the following steps:

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on to display the first page of the Main Menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [︿] [﹀][<][>] [Set][︿] [﹀][Set]	Move the cursor to Band of Traffic Channel. Select A800 MHz and press the [Set] key to validate it.
4.	Cursor [︿] [﹀][<][>] [Set][︿] [﹀][Set]	Move the cursor to DUT Control. Select None and press the [Set] key to validate it.
5.	[AF Measure]F3	Displays the first page of the AF Measure menu.
6.	[AF Measure]F7	Displays the AF Measure screen.

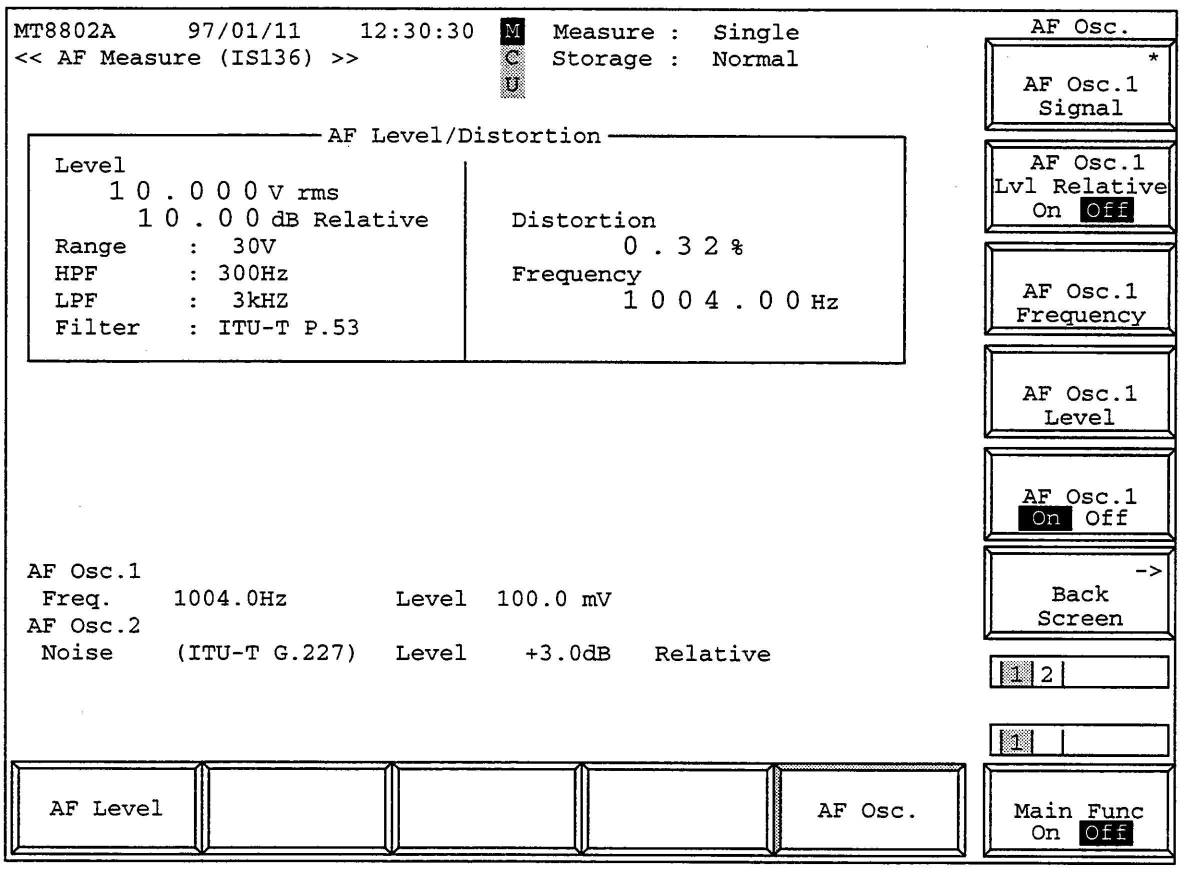


Fig. 4-30 AF Measure screen

• Main-function keys:

[AF Level]F1 — Displays the AF Level function keys on F7 to F12.
(The same as the AF Level menu of the Analog RX Measure screen.)

[AF Osc.]F5 — Displays the AF Osc. function keys on F7 to F12.
(The same as the AF Osc. menu of the Analog TX Measure screen.)

• AF Level function keys:

1st page

[Adjust Range]F7 — Sets the measurement AF level ranges to the status appropriate for the measurement signals.

[Set Relative]F8 — Displays the relative value with the reference value that is the set value when this key is pressed.

[HPF]F9 — Selects the HPF of 400 Hz, 300 Hz, 50 Hz, or Off.
Initial value: Off

Note : The HPF of 400 Hz is the filter for tone signal rejection.

[LPF]F10 — Selects the LPF of 3 kHz, 15 kHz, or Off.
Initial value: Off

[Filter]F11 — Selects the estimation filter of ITU-T P.53, C-MESSAGE, 6kHz BPF, or Off.
Initial value: Off

[Back Screen]F12 — Returns to the Setup Common Parameter screen.

2nd page

[Range Up]F7 — Up the measurement range of the AF level meter.

[Range Down]F8 — Down the measurement range of the AF level meter.

[Storage Mode]F9 — Displays the Storage Mode menu for all the measured results on the screen.

- [Normal]F7 — Sets normal mode. (Initial value)
- [Average]F8 — Sets average mode.
- [Average Count]F9 — Sets number of Averaging processings.
  $2 \leq$ Set value ≤ 9999
  Initial value: 10
  (In the average mode, the measurement is of single mode, which displays the averaged results in each measurement, and stops measurement when the Average Count reached.)
- [return]F12 — Returns to the AF Level menu.

[AF Level Unit]F10 — Selects the unit of the AF Level measurement value of dBm (valid for 600 Ω of input impedance) or V.
Initial value: V
When the 100 kΩ of Impedance of AF Input is set on the Setup AF Measure Parameter screen, this menu is not displayed.

[Distortion Unit]F11 — Selects the unit of the distortion measurement value of dB or %.
Initial value: %

[Back Screen]F12 — Returns to the Setup Common Parameter screen.

• AF Osc. function key:

1st page —— Sets AF Osc. 1, independently from AF Osc. 2.

[AF Osc.1 Signal]F7 — Selects AF-Osc.1 signal type of Tone, Noise(ITU-T G.227), or Noise(White).
When Noise is set, displays "Noise(Noise type)" at the frequency display area.
Initial value: Tone

[AF Osc.1 Lvl Relative On Off]F8 — Displays the relative value with the reference value that is the set value when this key is pressed.
Initial value: Off

[AF Osc.1 Frequency]F9 — Sets AF Osc.1 frequency.
Range: 20.0 Hz ≤ Set value ≤ 20 000.0 Hz, 0.1 Hz step
Initial value: 1 004.0 Hz
(When setting the same frequency as AF Osc.2, the AF Osc. output level becomes the sum of the set values.)

[AF Osc.1 Level]F10 — Sets AF Osc.1 output level.
Initial value: 100.0 mV

When 600 Ω is set for Impedance of AF Output on the Setup AF Measure Parameter screen:

• For Tone of signal type
  0.400 V< Set value ≤ 3.000 V, 0.001 V Step
  40.0 mV< Set value ≤ 400.0 mV, 0.1 mV Step
  4.00 mV< Set value ≤ 40.00 mV, 0.01 mV Step
  0.010 mV< Set value ≤ 4.000 mV, 0.001 mV Step

• For Noise of signal type
  0.150 V< Set value ≤ 1.500 V, 0.001 V Step
  15.0 mV< Set value ≤ 150.0 mV, 0.1 mV Step
  1.50 mV< Set value ≤ 15.00 mV, 0.01 mV Step
  0.010 mV< Set value ≤ 1.500 mV, 0.001 mV Step

When 50 Ω is set for Impedance of AF Output on the Setup AF Measure Parameter screen:

• For Tone of signal type
  40.0 mV< Set value ≤ 300.0 mV, 0.1 mV Step
  4.00 mV< Set value ≤ 40.00 mV, 0.01 mV Step
  0.010 mV< Set value ≤ 4.000 mV, 0.001 mV Step

• For Noise of signal type
  15.0 mV< Set value ≤ 150.0 mV, 0.1 mV Step
  1.50 mV< Set value ≤ 15.00 mV, 0.01 mV Step
  0.010 mV< Set value ≤ 1.500 mV, 0.001 mV Step

[AF Osc.1 On Off]F11 — Turns on/off the AF-Osc. 1 output level.
When off, displays "Off" at the level display area.
(When off, the [AF Osc.1 Level]F10 key disappears, and level cannot be set.)

Initial value: On

[Back Screen]F12 — Returns to the Setup Common Parameter screen.

2nd page —— Sets AF Osc. 2, independently from AF Osc. 1.

[AF Osc.2 Signal]F7 Selects AF-Osc. 2 signal type of Tone, Noise(ITU-T G.227), or Noise(White).
When Noise is set, displays "Noise(Noise type)" at the frequency display area.
Initial value: Tone

[AF Osc.2 Lvl Relative On Off]F8
Displays the relative value with the reference value that is the set value when this key is pressed.
Initial value: Off

[AF Osc.2 Frequency]F9 Sets AF Osc.2 frequency.
Range: 20.0 Hz ≤ Set value ≤ 20 000.0 Hz, 0.1 Hz step
Initial value: 1 004.0 Hz
(When setting the same frequency as AF Osc.1, the AF Osc. output level becomes the sum of the set values.)

[AF Osc.2 Level]F10 Sets AF Osc.2 output level.
Initial value: 100.0 mV

When 600 Ω is set for Impedance of AF Output on the Setup AF Measure Parameter screen:

• For Tone of signal type
  0.400 V< Set value ≤ 3.000 V, 0.001 V Step
  40.0 mV< Set value ≤ 400.0 mV, 0.1 mV Step
  4.00 mV< Set value ≤ 40.00 mV, 0.01 mV Step
  0.010 mV< Set value ≤ 4.000 mV, 0.001 mV Step

• For Noise of signal type
  0.150 V< Set value ≤ 1.500 V, 0.001 V Step
  15.0 mV< Set value ≤ 150.0 mV, 0.1 mV Step
  1.50 mV< Set value ≤ 15.00 mV, 0.01 mV Step
  0.010 mV< Set value ≤ 1.500 mV, 0.001 mV Step

When 50 Ω is set for Impedance of AF Output on the Setup AF Measure Parameter screen:

• For Tone of signal type
  40.0 mV< Set value ≤ 300.0 mV, 0.1 mV Step
  4.00 mV< Set value ≤ 40.00 mV, 0.01 mV Step
  0.010 mV< Set value ≤ 4.000 mV, 0.001 mV Step

• For Tone of signal type
  15.0 mV< Set value ≤ 150.0 mV, 0.1 mV Step
  1.50 mV< Set value ≤ 15.00 mV, 0.01 mV Step
  0.010 mV< Set value ≤ 1.500 mV, 0.001 mV Step

[AF Osc.2 On Off]F11 Turns on/off the AF-Osc. 2 output level.
When off, displays "off" at the level display area.
(When off, the [AF Osc.2 Level]F10 key disappears, and level cannot be set.)

[Back Screen]F12 Returns to the Setup Common Parameter screen.

4.3.11 Call processing test

Set DUT Control to Call Proc on the Setup Common Parameter screen, then press the [Call Processing] F4 main function key to set call processing test mode.

This paragraph describes how to set parameters (on the Setup Call Proc. Parameters screen) to conduct the call processing test, and how to conduct the test (on the Sequence Monitor screen).

(1) Setting the parameters: Setup Call Proc. Parameters screen

The following describes how to set parameters (on the Setup Call Proc. Parameters screen) to conduct the call processing test.

Display the Setup Call Proc. Parameters screen according to the following steps, then set the parameters.

Step	Key operation	Description
1.	[Main Func On Off]F6	Sets Main Func to ON to display the main menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [︿] and [﹀]	Move the cursor at DUT Control.
4.	[Set]	Opens DUT Control window.
5.	Cursor [︿] and [﹀]	Move the cursor at Call Proc.
6.	[Set]	Closes DUT Control window.
7.	[Call Processing]F4	Displays the Call Processing menu.
8.	Next Menu[▲]	Displays the second page of the Call Processing menu.
9.	[Setup Call Proc Parameter]F9	Displays the Setup Call Processing Parameter screen.

Note: Execute the Steps 3 to 6 when the DUT Control is set to None.

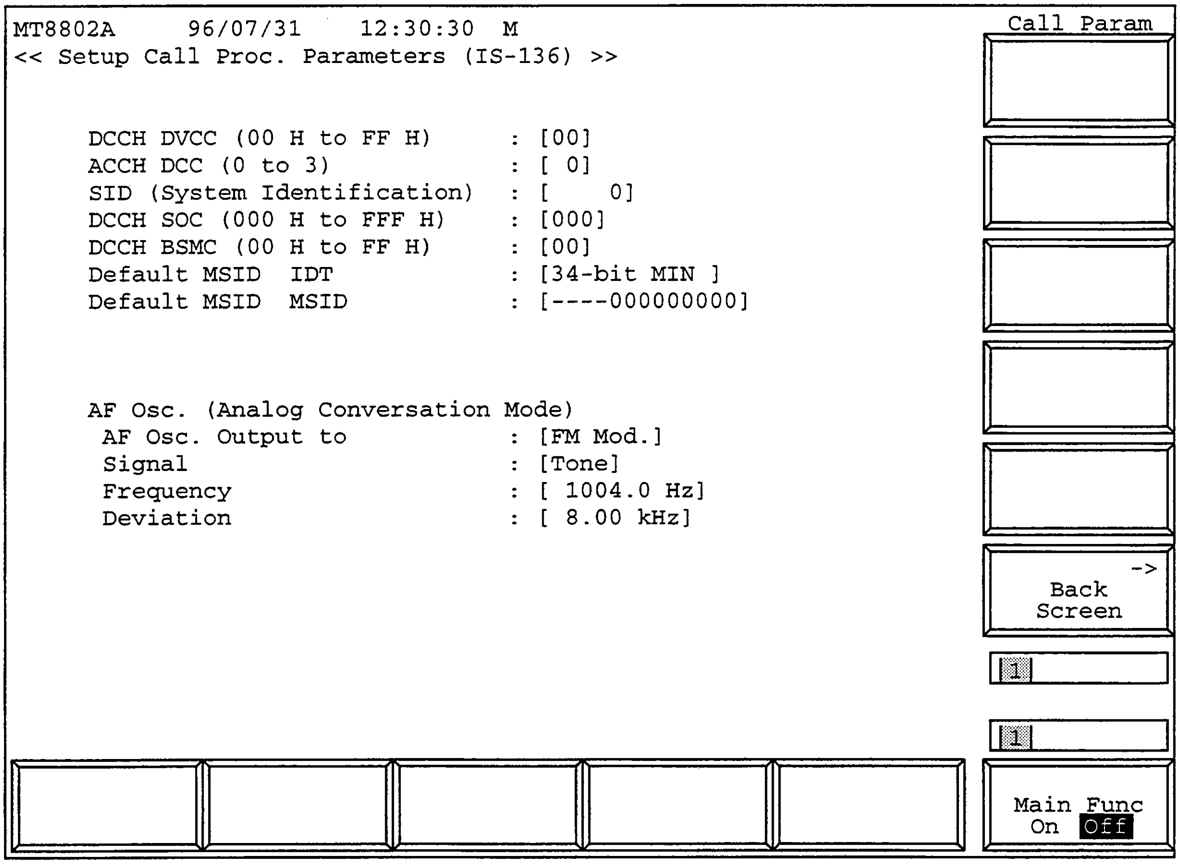


Fig. 4-31 Setup Call Processing Parameter Screen

- Set the following items:

Item	Range	Initial value	
DCCH DVCC	00 to FF	00	
ACCH DCC	0 to 3	0	
SID	0 to 32767	0	
DCCH SOC	000 to FFF	000	
DCCH BSMC	00 to FF	00	
Default MSID - IDT	34-bit MIN 50-bit IMSI	34-bit MIN	
Default MSID - MSID	0 00 00 00 00 to 3 FF FF FF FF (34-bit) 0 00 00 00 00 00 00 to 3 FF FF FF FF FF FF (50-bit)	- -- -0 00 00 00 00	
AF Osc. (Analog conversation mode)			
AF Osc. Output to	FM Mod., Off	FM Mod.	
Frequency	20 Hz to 20 kHz	1004 Hz	
Deviation	0 to 40 kHz	8 kHz	Note 1
Signal	Tone, Noise (ITU-T G.227), Noise (White)	Tone	

Note1: Displayed when AF Osc. Output to FM mod. is set.
Note2: Displayed when AF Osc. Output to AF out. is set.
Note3: These parameter items can be set only when the Call Processing state is Stop.
Default MSID becomes the initial value to be used when the Termination is performed without using Registration.
After detecting the MSID from the burst signal of the DUT(MS), the MSID is used for Termination.

- Main function keys: None
- Function keys
  [Back Screen]F12 Displays the previous screen (Setup Common Parameter screen).

(2) Call processing test: Sequence Monitor screen

The following describes the call processing test conducted on the Sequence Monitor screen according to the parameters set on the Setup Call Proc. Parameters and Setup Common Parameter screens.

Display the Sequence Monitor screen according to the following steps to conduct the call processing test.

Step	Key operation	Description
1.	[Main Func On Off]F6	Sets Main Func to ON to display the main menu at the bottom of the screen.
2.	[TX&RX Tester]F1	Sets TX&RX Tester mode. The Setup Common Parameter screen appears.
3.	Cursor [∧] and [∨]	Move the cursor at DUT Control.
4.	[Set]	Opens DUT Control window.
5.	Cursor [∧] and [∨]	Move the cursor at Call Proc.
6.	[Set]	Closes DUT Control window.
7.	[Call Processing]F4	Displays the Call Processing menu.
8.	[Sequence Monitor]F7	Displays the Sequence Monitor screen.

Note: Execute the Steps 3 to 6 when the DUT Control is set to None.

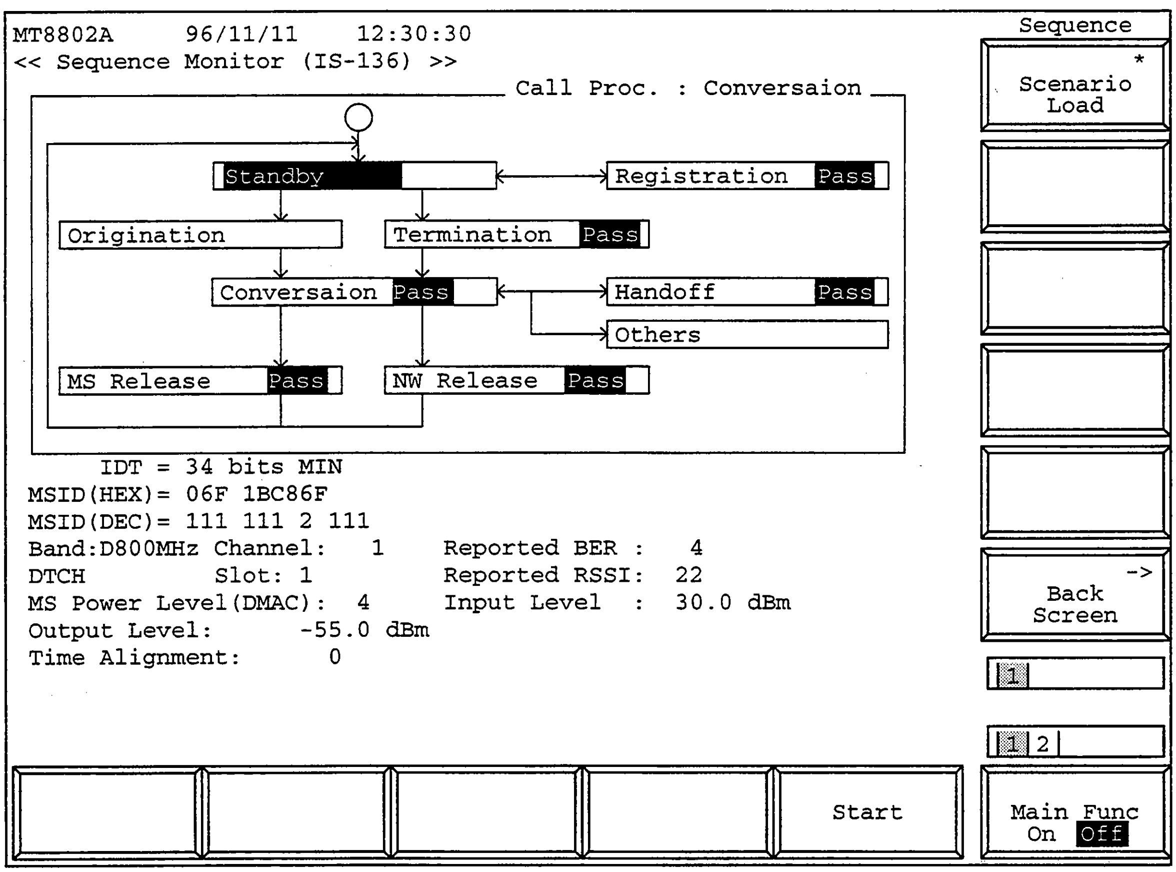


Fig. 4-32 Sequence Monitor screen

- 1st page of the main function keys on the Sequence Monitor screen

(1) When the MT8802A is at the Call Processing status of Stop.

					1 2
				Start	Main Func On Off

(2) When the MT8802A is at the Call Processing status of Standby.

					1 2
	Termination			Stop	Main Func On Off

(3) When the MT8802A is at the Call Processing status of Conversation.

					1 2
# Channel	NW Release	# Band		Stop	Main Func On Off

(4) When the MT8802A is at the Call Processing status of the Execute Sequence.

					1 2
				Stop	Main Func On Off

- 2nd page of the main function keys on the Sequence Monitor screen

(1) When the MT8802A is at the Call Processing status of Stop.

					1 2
	# RX Output Level	# TX Reference Level	# MS Power Level	# Time Alignment	Main Func On Off

(2) When the MT8802A is at the Call Processing status of Standby.

The setting of the MS Power Level is executed by re-starting FDCCH of BCCH message(When Control Channel Band sets D800 MHz, D1.9 GHz) or ACCH of Overhead message (When Control Channel Band sets A800 MHz).

					1 2
	# RX Output Level	# TX Reference Level	# MS Power Level	# Time Alignment	Main Func On Off

(3) When the MT8802A is at the Call Processing status of Conversation.

					1 2
	# RX Output Level	# TX Reference Level	# MS Power Level	# Time Alignment	Main Func On Off

(4) When the MT8802A is at the Call Processing status of the Execute Sequence.

					1 2
					Main Func On Off

Note: Time Alignment is not displayed at A800 MHz of Traffic Channel Band.

- Displayed items are described, below: (MS: Mobile Station to be tested)

Item	Contents
Sequence Monitor transition diagram	Displays the current Call-Processing state (black & white reversed display) and the executed results (Pass/Fail).
Setup and measured results	Displays the current set value, occupied channel , and the measured results.
(MSID)	Displays the MSID obtained from the RACH burst of MS.
IDT	Displays IDT of MSID. (34 bits MIN, 50 bits IMSI, 20 bits TMSI, 24 bits TMSI)
MSID(HEX)	Displays the received MSID in hexa-decimal notation.
MSID(DEC)	When IDT is 34 bits MIN or 50 bits IMSI, displays the received MSID in decimal notation of IS-136 specified format.
(Occupied channel)	Displays the parameters of the current using channel for communication with MS.
Band	Displays the current using band (D800MHz, D1.9GHz, A800 MHz).
Channel	Displays the current using channel number (1 to 1999).
DCCH	Displayed when DCCH is used for communication with MS.
DTCH	Displayed when DTCH is used for communication with MS.
ACCH	Displayed when using ACCH for communication with MS.
AVCH	Displayed when using AVCH for communication with MS.
Slot	Displays the current using slot number (1, 2, or 3).
(Set value)	Displays the current set values of parameters.
MS Power Level (DMAC)	Displays the specified value (0 to 10) of the MS transmission level (DMAC *1).
Output Level	Displays the MS reception level (MT8802A transmission level).
Time Alignment	Displays the specified value (0 to 30) of the MS transmission timing (Time Alignment).
(Reported value from MS)	Displays the measured results by MS reported from MS. *2
Reported BER	Displays the specified value (0 to 7) of the MS Bit-Error-Rate (BER) on the current channel.
Reported RSSI	Displays the specified value (0 to 31) of the MS reception level (RSSI) on the current channel.
(Measured result by MT8802A)	Displays the measured results by MT8802A.
Input Level	Displays the reception level of MT8802A. If any burst signal is not recognized (Sync Pattern is not detected), this item becomes blank.

*1 DMAC: Digital Mobile Attenuation Code

*2 Report from MS is included in Channel Quality Message 1 on SACCH.

- Main function keys

1st page

[Channel]F1	Opens the channel-number changing window to change the channel of DTCH or AVCH. *1 Appears when the MT8802A is at the Call Processing status of Conversation.
[Termination]F2	Starts the Termination sequence to page the MS. Appears when the MT8802A is at the Call Processing status of Standby.
[NW Release]F2	Starts the Network Release sequence to disconnect the MS from the network. Appears when the MT8802A is at the Call Processing status of Conversation.
[Band]F3	Opens the band changing window to change the band of DTCH or DTCH/AVCH. *2 Appears when the MT8802A is at the Call Processing status of Conversation.
[Start]F5	Sets the MT8802A from the Stop state to Standby state.. Appears when the MT8802A is at the Call Processing status of Stop.
[Stop]F5	Sets the MT8802A to Stop state. Appears when the MT8802A is at the Call Processing status of the other (Standby, Registration, Origination, Termination, Conversation, Handoff, NW Release, MS Release, and Others) than Stop.

*1 Executes the Handoff sequence to change channel.

*2 Executes the Handoff sequence of Hyperband or Dual mode to change band.
Uses the same channel number after changing band.
Since the channel number auto-correction of 800 MHz band for 800-to-989 and 1024-to-1999 channel numbers of 1.5 GHz band is not performed, change the channel number of 1.5 GHz band to the number that is available in the 800 MHz band, beforehand. Then, change the 800 MHz band to 1.5 GHz band.

2nd page .... Appears when the MT8802A is at the Call Processing status of Stop, Standby, or Conversation.

[RX Output Level]F2	Changes the reception level of the MS (i.e. the output level of the MT8802A).
[TX Reference Level]F3	Changes the reference level of the MT8802A to measure the transmission level of the MS (i.e. the reception level of the MT8802A).
[MS Power Level]F4	Changes the transmission level of the MS. (Informs MS of DMAC.)
[Time Alignment]F5	Changes the burst transmission timing of the MS. (Informs MS of Time Alignment.) Displayed when Traffic Channel Band is D800MHz or D1.9GHz.

- Function keys

[Scenario Load]F7 — Loads a new scenario file from a floppy disk.
Changes the Call Processing operation set at shipment by loading a new scenario file.

[File No.]F9 — Opens the sub-window to display the scenario file numbers.
A new file is loaded from a floppy disk by selecting the desired file number in the sub-window.
When the power is turned on, the original scenario files in internal memory set at shipment are loaded. To use the different scenario, load the desired scenario file once again using this function after turning the power on
0 to 99, Resolution: 1, Initial value: 0

[Default]F10 — Loads the original scenario files set at shipment to return to the standard Call Processing operation.

[Return]F12 — Returns to the previous menu.

[Back Screen]F12 — Displays the previous screen.

4.3.12 Saving and recalling parameter data: Save Parameter screen, Recall Parameter screen

Display the Save Parameter and Recall Parameter screens according to the following steps to save or recall parameters set for the transmitter and receiver test.

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on. The first page of the Main Menu appears at the bottom of the screen.
2.	[Recall]F4 [Display Dir.]F8	Sets Recall Parameter mode. The Recall Parameter screen appears. The Recall function key menu appears on F7 to F12.
2'	[Save]F5 [Display Dir.]F8	Sets Save Parameter mode. The Save Parameter screen appears. The Save function key menu appears on F7 to F12.

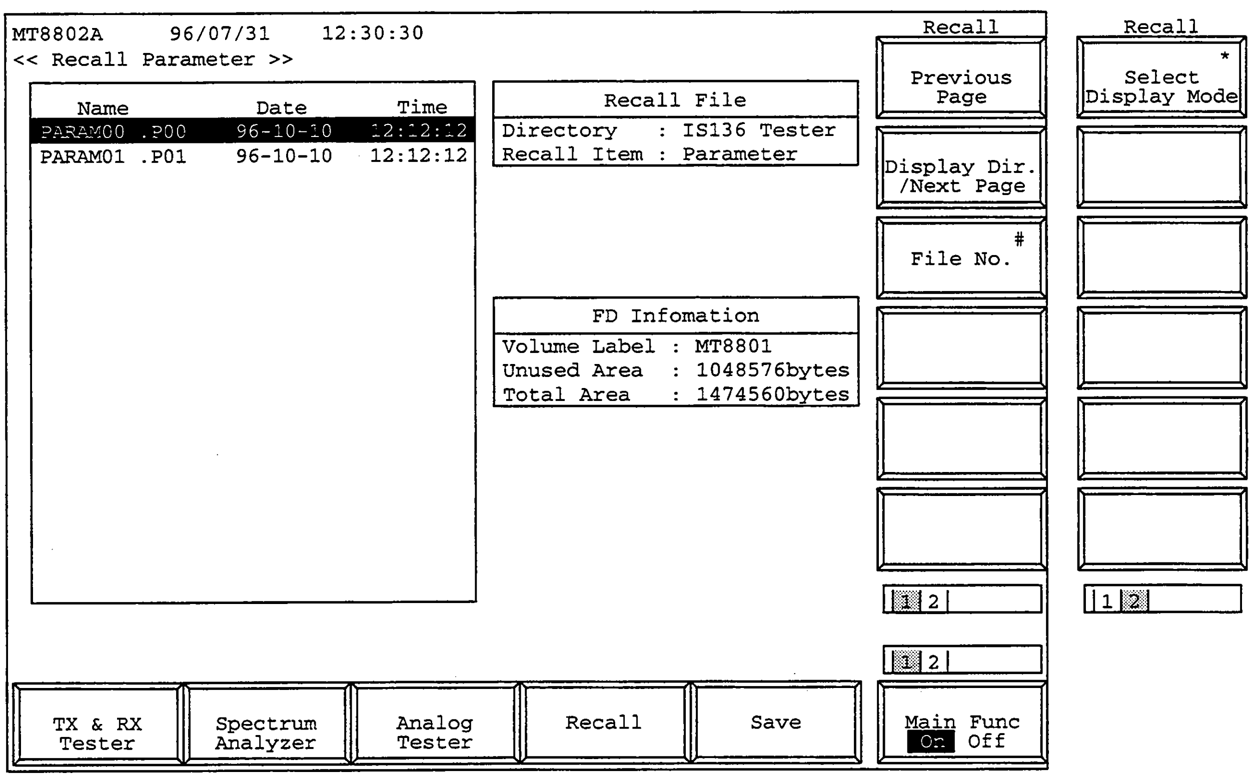


Fig. 4-33 Recall Parameter Screen

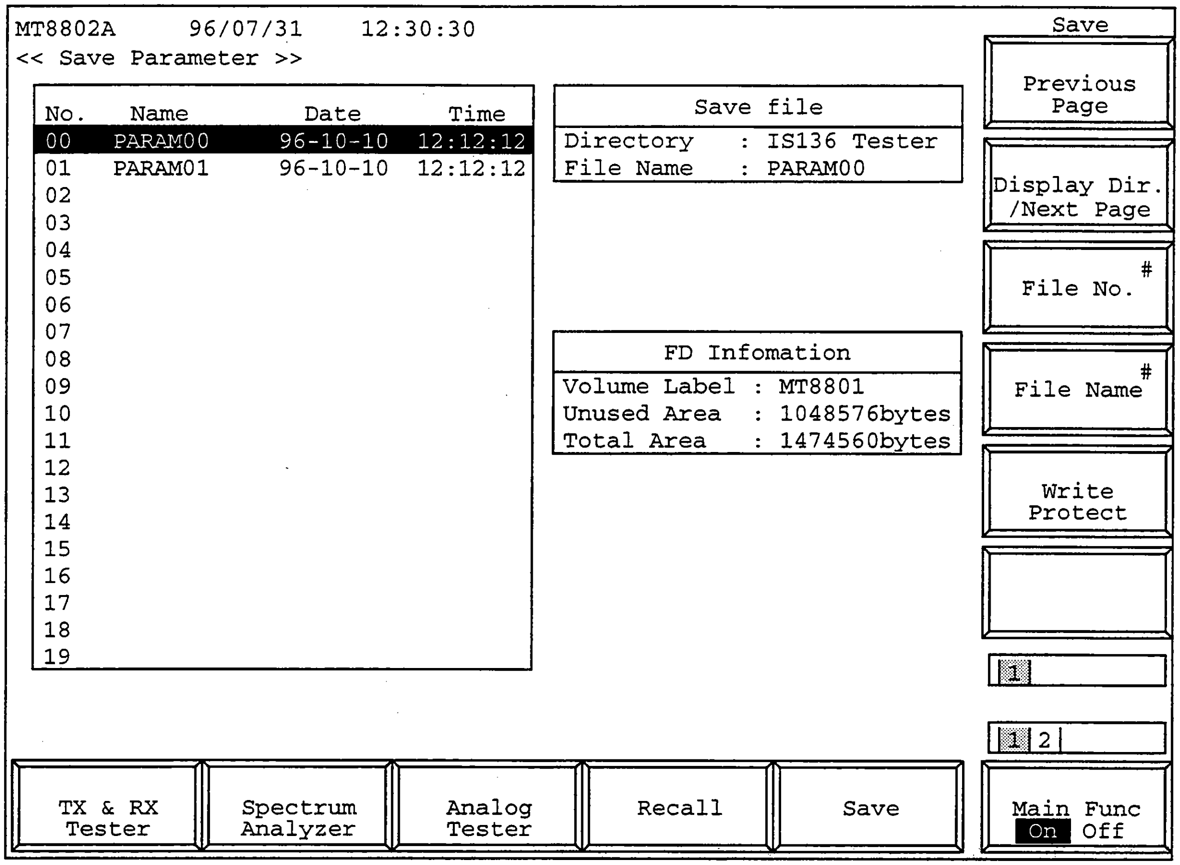


Fig. 4-34 Save Parameter Screen

- Floppy disk to be used:

  For saving and loading parameters and data, use the floppy disk described in Section 3. When the floppy disk is required to be formatted, use the File Operation screen in Paragraph 4.3.10.

- Notes when displaying the Save Parameter screen and Recall Parameter screen:

  Before pressing the [Save]F5 or [Recall]F4 function key, insert a floppy disk(FD) in the FD driver of the MT8802A. Then press the key. The MT8802A automatically starts the FD-driver operation.

- Screen display and function key display:

  Pressing the [Save]F5 or [Recall]F4 function key changes only the display of the F7 to F12 function keys.

  The screens (Figs. 4-22, 4-23) appear when the [Display Dir./Next Page] F8 key is pressed to display the contents of the FD. These screens also display the function keys used to select any directory and any file.

- Information to be saved and recalled:

  1) The [Save] and [Recall] keys on the main function keys saves and recalls the measurement parameters except those in paragraphs 2) and 3) below, respectively.

  2) The Save Template and Recall Template screens under the RF Power screen saves and recalls only the template level information, respectively.

  3) The Save Pattern and Recall Pattern screens under the Setup Digital RX Measure screen saves and recalls only the pattern information of the measurement test signals, respectively.

- Function keys on the Recall Parameter screen

Main function key: None

Recall function keys:

[Display Dir.]F8: Accesses the floppy disk and displays the directory of the parameter data file. The lower-order Recall menu appears.

** 1st page** (Use the Next Menu [▲] key to scroll the page.)

[Previous Page]F7: Displays the previous page of the directory.

[Display Dir./Next Page]F8: Accesses the floppy disk and displays the next page of the directory.

[File No.]F9: Opens the window for entering the recall position (number) of the setup parameter data file.

0 to 99, Resolution: 1, Initial value: 0

[Back Screen]F12: Displays the previous screen.

** 2nd page ** (Use the Next Menu [▲] key to scroll the page.)

[Select Display Mode]F7: Displays the Display Mode menu to select a display mode.

[Wide]F7: Displays file numbers in ascending order from 0 regardless of whether all files are saved.

[Narrow]F8: Skips the numbers of files not saved and displays only the numbers of saved files in ascending order.

[return]F12: Returns to the previous menu.

[Back Screen]F12: Displays the previous screen.

[File No.]F9: Opens the window for entering the recall position (number) of the setup parameter file.

0 to 99, Resolution: 1, Initial value: 0

[return]F12: Returns to the previous menu.

- Function keys on the Save Parameter screen

Main function key: None

Save function keys:

[Display Dir.]F8: Accesses the floppy disk and displays the directory of the parameter data file. The low-order Save menu appears.

[Previous Page]F7: Displays the previous page of the directory.

[Display Dir./Next Page]F8: Accesses the floppy disk and displays the next page of the directory.

[File No.]F9: Opens the window for entering the save position (number) of the setup parameter data file.
0 to 99, Resolution: 1, Initial value: 0

[File Name]F10: Opens the window for entering the name of the parameter data file to be saved.
The data file name consists of up to eight characters.

[Write Protect]F11: Write-protects the specified parameter data file.
An asterisk (*) is displayed at the end of the name of the write-protected file.
If the specified parameter data file is already write-protected, this key cancels write protect.

Note: This function can only be executed through panel operation.

Displays the previous screen.

[File No.]F9: Opens the window for entering the save position (number) of the setup parameter data file.
0 to 99, Resolution: 1, initial value: 0

[return]F12: Returns to the previous menu.

• Saving parameters and data

This paragraph describes how to save the measurement parameters of the MT8802A to a floppy disk.

Step	Key operation	Description
A When the [Save]F5 main function key is used		
1.		Insert a saving floppy disk(FD) into the FD driver on the bottom left of the MT8802A.
2.	[Main Func on off]F6	Sets Main Func to on. The Main Menu is displayed on the main function keys.
3.	[Save] F5	Changes to Save parameter mode. Displays the Save function keys in F7 to F12, and then moves to the Save screen for parameter and data. Searches the FD for parameter and data files, and displays them on the screen.
4.		Proceed to Step 5 below.
B When using Save Template of the Setup Template screen for RF Power measurement		
1.		Insert a saving floppy disk(FD) into the FD driver on the bottom left of the MT8802A.
2.	[Save Template]F7	Displays the Save Template screen. Displays the Save function keys in F7 to F12, then moves to the Save screen for parameter and data.
3.		Searches the FD for parameter and data files, and displays them on the screen.
4.		Proceed to Step 5 below.
C When using Save Pattern of the Setup Digital RX Measure Parameter screen		
1.		Insert a saving floppy disk(FD) into the FD driver on the bottom left of the MT8802A.
2.	[Save Pattern]F8	Changes to the Save Pattern screen. Displays the Save function keys in F7 to F12, then moves to the Save screen for parameter and data.
3.		Searches the FD for parameter and data files, and displays them on the screen.
4.		Proceed to Step 5 below.
(Under state where the Save menu is displayed)		
5.	[Display Dir.]F8	Displays existing files to check the number of the file to be saved.
6.	[File Name]F10	Sets the file name used for save within 8 alphanumeric characters if necessary.
7.		Check the number of the file to be saved and the file status (whether the file exists and whether the file is write-enabled). To write-enable the file, proceed to Steps 8a and later. Otherwise, proceed to Step 9.
8a.	Cursor [$\wedge$] and [$\vee$]	Select the file to be write-enabled.
8b.	[Write Protect] F11	Write-enables the file for over-writing.
9.	[File No.] F9	Specify the number of the file to be saved.
10.	[Set]	Saves the file.

• Write-protecting or write-enabling the file to be saved

This paragraph describes how to write-protect or write-enable the file containing data in the Save screen.

Step	Key operation	Description
1.		Execute the Steps 1 to 4 of the saving procedure in the previous paragraph to display the Save menu.
2.	[Display Dir./Next Page]F8	Displays the existing files. Check the number of the file to be saved.
3.	Cursor [⌃], [⌄]	Select the file to be write-enabled.
4.	[Write Protect]F11	Write-protects or write-enables the file to be saved.

• Recalling parameters and data

This paragraph describes how to recall measurement parameters from the floppy disk.

Step	Key operation	Description
A When the [Recall]F5 main function key is used:		
1.		Insert a recall floppy disk(FD) into the FD driver at the bottom left of the MT8802A.
2.	[Main Func on off]F6	Sets Main Func to on. Displays Main Menu on the main function keys.
3.	[Recall]F4	Changes to Recall Parameter mode. Displays the Recall function keys in F7 to F12, and moves to the Recall screen for parameter and data. Searches the FD for parameter and data files, and displays them on the screen.
4.		Proceed to Step 5 below.
B When [Recall Template]F7 function key of RF Power Measure screen is used		
1.		Insert a recall FD into the FD driver at the bottom left of the MT8802A.
2.	[Recall Template] F7	Changes to the Recall Template screen. Displays the Recall function keys in F7 to F12, then moves to the Recall screen for parameter and data.
3.		Searches the FD for parameter and data files, and displays them on the screen.
4.		Proceed to Step 5 below.
C When the [Recall Pattern]F7 function key of Setup Digital RX Measure Parameter screen is used		
1.		Insert a recall floppy disk(FD) into the FD driver at the bottom left of the MT8802A.
2.	[Recall Pattern]F7	Changes to the Recall Pattern screen. Displays the recall function keys in F7 to F12, then moves to the Recall screen for parameter and data.
3.		Searches the FD for parameter and data files, and displays them on the screen.
4.		Proceed to Step 5 below.
(Under state where the Recall menu is displayed)		
5.	[Display Dir./Next Page]F8	Displays the directory containing the file to be recalled. Check the file to be recalled.
6.	Cursor[⌃][⌄]	Select the file to be recalled.
7.	[File No.]F9	Sets the number of any file to be recalled.
	(The file to be recalled can be specified by the file number, too.)	
8.	[Set]	Confirms the file to be recalled. The MT8802A reads the specified file. Then, returns to the previous screen automatically.

• Changing the recall-file display format(WIDE/NARROW)

This paragraph describes how to change the recall-file display format(WIDE/NARROW).

Step	Key operation	Description
1.		Execute the Steps 1 to 5 of the recalling procedure in the previous paragraph to display the recalled file.
2.	Next Menu [︿]	Displays the second page of the function keys.
3.	[Select Display Mode]F7	Displays the file display format selection menu.
4.	[Wide]F7 or [Narrow]F8	Specify the display format.
5.	[return]F12	Returns to the previous menu.

4.3.13 Operating the file: File Operation screen

To access the floppy disk and display the parameter file directory, delete or write-protect the parameter file, and initialize the floppy disk; display the File Operation screen according to the following steps.

Note: This function can only be executed through panel operation.

Step	Key operation	Description
1.	[Main Func on off]F6	Sets the Main Func on. The Main Menu appears at the bottom of the screen
	Next Menu [◀]	Displays the second page of the Main Menu.
2.	[File Operation]F4	Sets File Operation mode. The File Operation screen appears. The File function key menu appears on F7 to F12.

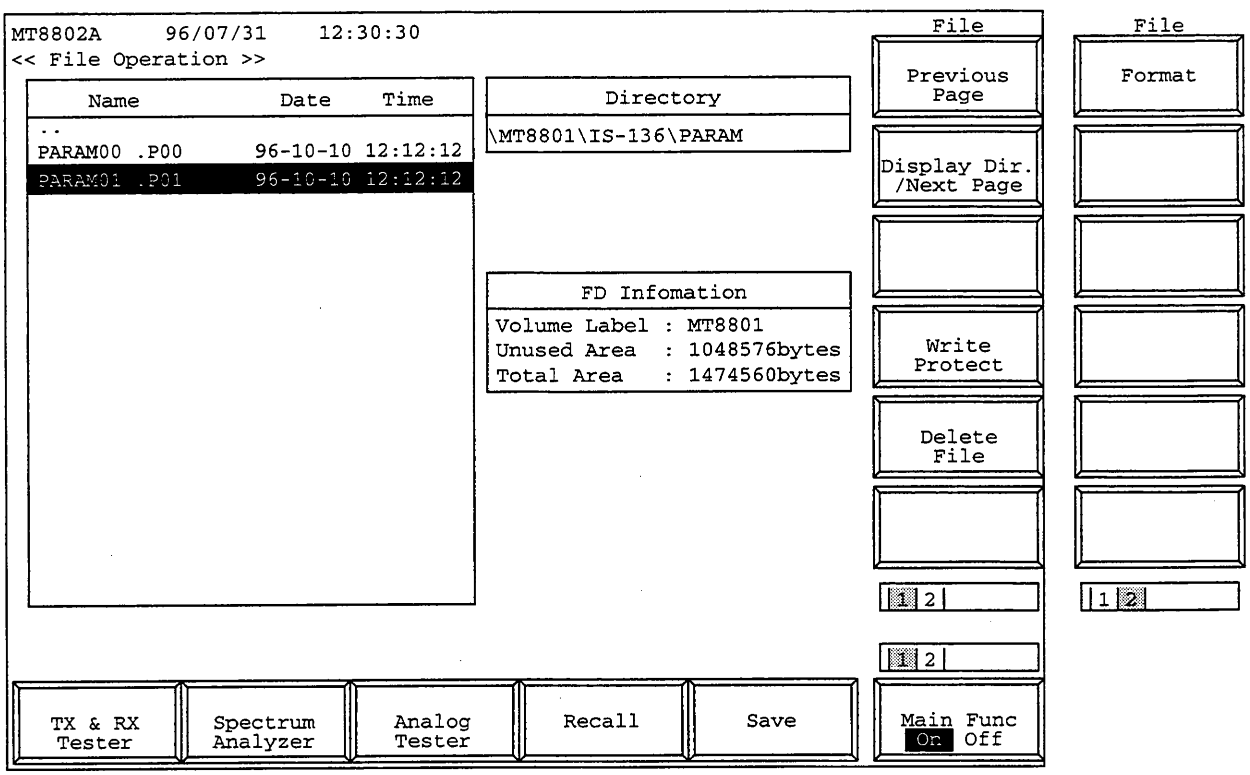


Fig. 4-35 File Operation Screen

Note: Use the floppy disk described in Section 3.

- Functions keys on the File Operation screen

Main function key: None

Function keys: 2 pages. Use the Next Menu [▲] key to scroll to the next page.

** 1st page **

[Previous Page]F7: Displays the previous page of the directory.

[Display Dir./Next Page]F8: Accesses the floppy disk and displays the next page of the directory.

[Write Protect]F10: Write-protects the specified parameter data file.
An asterisk (*) is displayed at the end of the name of the write-protected file.
If the specified parameter data file is already protected, write protect can be canceled by pressing this key.

Note: This function can only be executed through panel operation.

[Delete File]F11: Opens the window for entering the position (number) of the parameter data file to be deleted.
Setup range: 0 to 99 (integer)
Initial value: 0

** 2nd page **

[Format]F7: Initializes the floppy disk to the specified type. The initialization format is MS-DOS 1.44 MB or 720 kB.

Note: The format is MS-DOS 1.44 MB or 720 kB. Use the 2HD or 2DD type of 3.5-inch floppy disk.

- Displaying files

This paragraph describes how to display the files in FD.

Step	Key operation	Description
1.		Insert a floppy disk(FD) into the FD driver at the bottom left of the MT8802A.
2.	[Main Func on off]F6	Turn the Main Func on to display the main function keys.
3.	Next Menu [◀]	Displays the second page of the main function keys.
4.	[File Operation]F4	Moves to the File Operation screen. Accesses the FD to display the root directory.
5.	Cursor [︿][﹀]	Specify the directory to be required.
6.	[Set] or [Enter]	Moves to the specified directory to display its contents.
7.		Repeat the Steps 5 and 6 above to display the required directory.

Note: The sub-directories and file name under the selected directory are displayed in the frame on the left of the screen.
For directories, only their names are displayed in the "Name" field.
For files, Name/Date/Time are displayed.
The Directory field at the upper right of the screen displays the layer and location of the selected directory.

• Write-enabling/write-protecting files

This paragraph describes how to change the file write mode between the write-protected and write-enabled modes.

Step	Key operation	Description
1.		Select the directory of the desired file by the displaying-file procedure above.
2.	Cursor [∧][∨]	Specify the file.
3.	[Write Protect]F10	Changes the file write mode.

• Deleting files

This paragraph describes how to delete the parameter/data files.

Step	Key operation	Description
1.		Select the directory of the desired file by the displaying-file procedure above.
2.	Cursor [∧][∨]	Specify the file.
3.	[Delete File]F11	Opens the confirmation window.
4.	Cursor [∧][∨]	Select Yes or No. "Yes" deletes the specified file.

Note: Once a file is deleted, it cannot be restored.

• Initializing(formatting) floppy disk

This paragraph describes how to initialize a floppy disk.

Step	Key operation	Description
1.		Insert a floppy disk(FD) into the FD driver at the lower left of the MT8802A. The acceptable FD is the 2HD(1.44 M-bytes) or 2DD(720 k-bytes) type.
2.	Next Menu [∧]	Displays the second page of the function keys.
3.	[Format]F7	Initializes the floppy disk. During initialization, a window indicating initialization appears on the screen.
4.	Next Menu [∧]	Returns to the first page of the function keys.

Note: Once a floppy disk is initialized, the data recorded on the disk is all lost.

4.3.14 Screen hard copy ... Copy

The copy function transfers a screen display to the printer or floppy disk. Specify a transfer destination and mode on the Instrument Setup screen. Press the Copy key on the front panel to activate the Copy function. While the Copy function is operating, operations (including remote control) such as measurement or internal setting are disabled.

(1) Transfer to the printer

If Copy is set to the printer on the Instrument Setup screen, screen display can be printed via the Parallel interface on the rear panel. Printers using the ESC/P command system can be used.

(2) Transfer to the floppy disk

If Copy is set to BMP on the Instrument Setup screen, the floppy disk driver on the front panel can be used to store data displayed on the screen in the floppy disk. Paragraph 4.3.10 describes the floppy disks that can be used. Data created on the floppy disk is the image file of the monochrome BMP data format. While the Copy is being executed, the name of the created file "RCA_***.BMP" is displayed on the bottom of the screen (*** is a number beginning with 000).

(Reference) Number of storable BMP files

2DD (720K bytes): Up to 18

2HD (1.44M bytes): Up to 37

4.3.15 Settings relating to remote control and panel key control

1. Remote control interfaces

The remote control interfaces of the MT8802A are classified into the GPIB interface and serial interface (RS-232C interface). Select an interface used on the Instrument Setup screen (see paragraph 4.3.3).

2. Remote control and panel control keys

The keys and lamps described in this section are assigned on the front panel as exclusive keys and lamps.

1) REMOTE lamp and LOCAL key

The REMOTE lamp indicates that the MT8802A is controlled remotely using the GPIB interface or RS-232C interface. When the MT8802A is controlled remotely from an external controller via the GPIB interface or RS-232C interface, the REMOTE lamp lights. While the REMOTE lamp is on, key entry and rotary knob entry from the front panel are disabled. The LOCAL key is used to cancel the remote control status of the GPIB interface or RS-232C interface. When the LOCAL key is pressed, the REMOTE lamp goes off and key entry and rotary knob entry from the front panel are enabled.

2) PANEL LOCK key

The PANEL LOCK key is used to enable and disable key entry and rotary knob entry from the front panel. Use the PANEL LOCK key to prevent an incorrect operation on the front panel for automatic measurement or status holding. When the panel is locked, the green lamp on the PANEL LOCK key lights.

3. Remote control status

If MT8802A is used for remote control, the REMOTE lamp on the left of the front panel lights. While the REMOTE lamp is on, key entry and rotary knob entry from the front panel are disabled. To change the remote control status to the front panel entry status, execute the following steps:

1) Halt the remote control.

2) If the REMOTE lamp is on, press the LOCAL key to cancel the REMOTE status.

SECTION 5
PERFORMANCE TESTS

This section lists the equipment used in performing the MT8802A performance tests, and explains the setup and the performance test items.

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5.1 Requirements for Performance Tests

The performance tests are carried out as a part of preventive maintenance to prevent deterioration of the MT8802A performance.

Use the performance test procedure during acceptance inspection, periodic inspection, and after repair to check the MT8802A performance. The items which is regarded important should be tested periodically as preventive maintenance. This section explains the following test procedures:

- Frequency/modulation accuracy
- Origin offset measurement
- Carrier OFF power measurement
- Adjacent-channel leak power measurement
- Modulation accuracy of signal generator
- Transmission power accuracy

For the analog measurement performance test, see SECTION 5 "PERFORMANCE TEST" of the operation manual of the MT8802A main unit.

The performance is recommended to inspect regularly once or twice a year.
If the specifications are not met in the performance tests, contact the Service Department of Anritsu Corporation.

5.2 Instruments Required for Performance Test

The instruments required for performance test are shown below.

Instruments Required for Performance Test

Recommended instrument name (model name)	Required performance†	Test item
Synthesized signal generator (MG3633A)	• Frequency range: 100 MHz to 1 GHz 1-Hz resolution available • Output level range: –20 to +10 dBm 0.1-dB resolution available • SSB phase noise: Maximum –130 dBc/Hz (at 10 kHz offset) • Second harmonics: Maximum –30 dBc • External reference input: (10 MHz available)	Frequency/modulation measurement accuracy Origin offset measurement
Digital modulation signal generator (MG3670B)	• Frequency range: 300 kHz to 2250 MHz 1-Hz resolution available • Output level range: –143 to +13 dBm 0.1-dB resolution available • SSB phase noise: Maximum –120 dBc/Hz (at 100 kHz offset) • Second harmonics: Maximum –30 dBc • External reference input: 10 MHz or 13 MHz	Frequency/modulation measurement accuracy Origin offset measurement Carrier OFF power measurement Adjacent-channel leak power measurement
Intelligent RF signal generator (HP8665B)	• Frequency range: 100 MHz to 3000 MHz 0.01-Hz resolution available • Output level range: –139.9 to +13 dBm 0.1-dB resolution available • SSB phase noise: Maximum –117 dBc/Hz (at 20 kHz offset) • Second harmonics: Maximum –30 dBc	Transmission power measurement accuracy
Power meter (ML4803A) Power sensor (MA4601A)	• Main unit accuracy: ± 0.02 dB • Frequency range: 100 MHz to 8.5 GHz (depending on the power sensor in use) • Frequency range: 10 MHz to 3 GHz • Measurement power range: –30 to +20 dBm • Input connector: N type	Frequency/modulation measurement accuracy Frequency/modulation measurement accuracy
Resistive terminator (MP752A)	• Frequency range: DC to 8.5 GHz • VSWR: Maximum 1.2	Frequency/modulation measurement accuracy Origin offset measurement
Resistive terminator (MP721A)	• Attenuation amount: 3 dB • VSWR: Maximum 1.25	Transmission power measurement accuracy
Digital mobile radio transmitter tester (MS8604A)	• Vector error: Maximum 1.8% rms	Modulation accuracy of signal generator
Receiver for calibration (ML2530A)	• Frequency range: 0.1 to 3000 MHz • Level range: +20 to –140 dBm	Origin offset measurement
Three-signal characteristics measurement pad (MA1612A)	• Frequency range: 10 MHz to 2 GHz	Frequency/modulation measurement accuracy Origin offset measurement

† Performances are partially extracted that can cover the measurement range of test items.

5.3 Performance Tests

Make sure to have the equipment to be tested and the measuring instruments have warmed up and completely stabilized for at least 30 minutes before starting the test unless otherwise specified. To perform the most accurate measurement, it is also necessary to test under the room temperature, obtain minimum fluctuation of AC supply voltage, and have no problem such as noise, vibration, dust and humidity.

5.3.1 Frequency/modulation measurement accuracy

Unmodulated signal that deviated from the frequency is inputted from the Signal Generator 1, and it is used as a pseudo modulated signal by 00 data. It is piled up on the disturbing wave generated from the Signal Generator 2 and generates the signal with desired modulated accuracy to use.

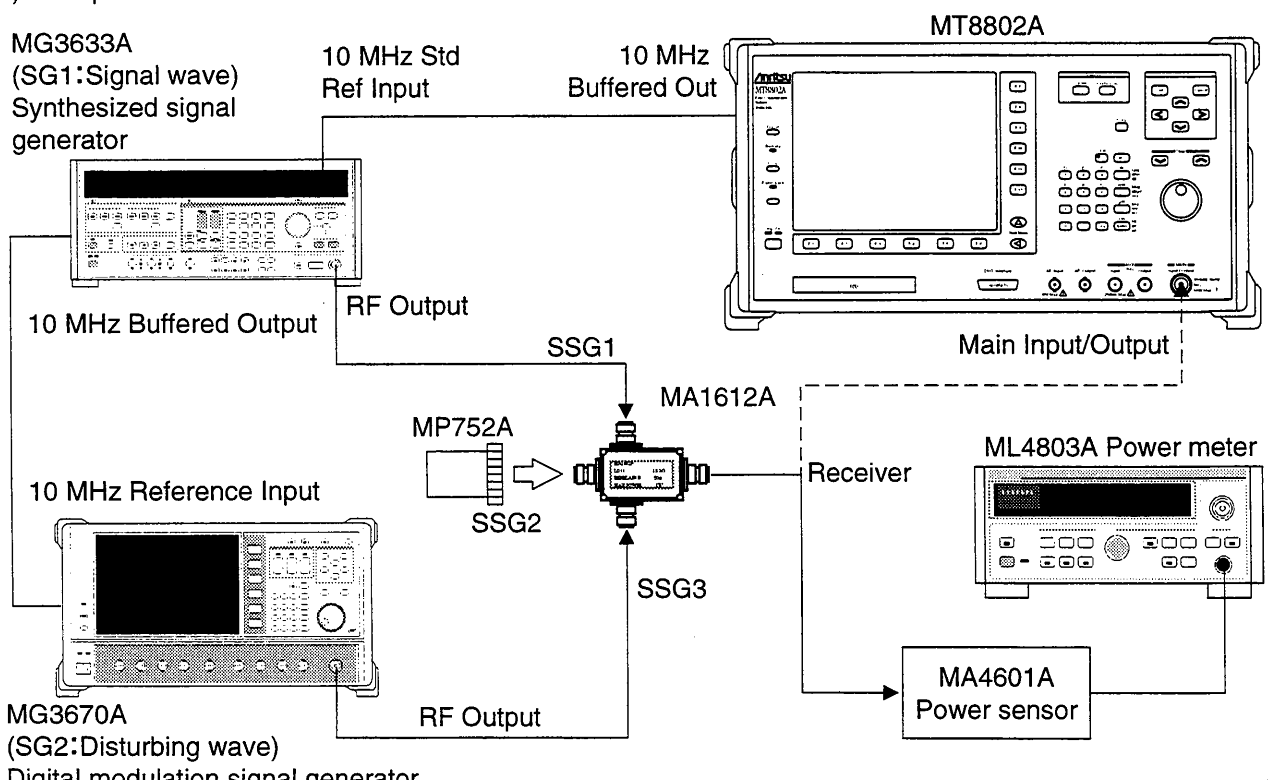
(1) Specifications

- Carrier frequency accuracy: ± (Accuracy of reference crystal oscillator +1 Hz)
- Range: 0 to 12.5 %
- Accuracy: ± (2% of indication value +0.5%)

(2) Test instruments

- Synthesized signal generator: MG3633A or the equivalent
- Digital modulation signal generator: MG3670B or the equivalent
- Power meter: ML4803A or the equivalent
- Power sensor: MA4601A or the equivalent
- Three-signal characteristics measurement pad: MA1612A or the equivalent
- Resistive terminator: MP752A or the equivalent

(3) Setup



(4) Test procedures: Frequency/modulation measurement accuracy

Step	Procedure
1.	Initialize the MT8802A and the signal generator (press the Preset key).
2.	Set the signal generator as follows: SG1 (signal wave) : Frequency (no modulation) Frequency in the table +3.0375 kHz *1 SG2 (disturbing wave) : Frequency (no modulation) Frequency in the table +1.5188 kHz *2
3.	Turn on the SG1 output and turn off the SG2 output. Adjust the SG1 output level so that the read value of power meter becomes 0 dBm. Then press the dB (REL) key of power meter.
4.	Turn off the SG1 output and turn on the SG2 output. Adjust the SG2 output level so that the read value of power meter becomes –18.06 ± 0.05 dB. *3
5.	Set the MT8802A as follows: RF Input/Output : Main — Set it on the Instrument Setup screen. DUT Control : None — Set it on the Setup Common Parameter screen. Traffic Channel Band : D800 MHz — Set it on the Setup Common Parameter screen. Measuring Object : Continuous — Set it on the Setup Common Parameter screen. Traffic Channel Frequency : Frequencies in the table. — Set it on the Setup Common Parameter screen. TX Measure Ref Level : 0 dBm — Set it on the Setup Common Parameter screen. RX Measure Output Level : Off — Set it on the Setup Common Parameter screen.
6.	Turn on the SG1 output and turn off the SG2 output.
7.	Display the Modulation Analysis screen of MT8802A.
8.	Read "RMS Vector Error" after executing the "Measure Single" sweep by MT8802A to check whether it is within the table range (0%: Minimum value to Maximum value). Also check whether the "Carrier Frequency Error" display value is within the specification value.
9.	Turn on the SG1 and the SG2 outputs. Read "RMS Vector Error" after executing the "Measure Single" sweep by MT8802A to check whether it is within the table range (12.5% Minimum value to Maximum value).
10.	Perform the steps 2 to 9 for each of frequencies in the table.

Frequency/modulation measurement accuracy

			10 MHz	800 MHz	1.9 GHz	2.2 GHz
RMS Vector Error (modulation accuracy)	0 %	Minimum value	0 %	0 %	0 %	0 %
		Actual measurement value	______ %	______ %	______ %	______ %
		Maximum value	0.5 %	0.5 %	0.5 %	0.5 %
	12.5 %	Minimum value	11.87 %	11.87 %	11.87 %	11.87 %
		Actual measurement value	______ %	______ %	______ %	______ %
		Maximum value	13.14 %	13.14 %	13.14 %	13.14 %
	Measurement uncertainty		+0.12 % –0.11 %			
Carrier frequency	0 %	Minimum value	–0.9 Hz	–0.9 Hz	–0.9 Hz	–0.9 Hz
		Frequency accuracy	______ Hz	______ Hz	______ Hz	______ Hz
		Maximum value	+0.9 Hz	+0.9 Hz	+0.9 Hz	+0.9 Hz
	Measurement uncertainty		±0.1 Hz			

Notes) *1: Frequency deviation is as large as the symbol rate/8 = 3.0375 kHz when the phase changes (corresponds to the modulation of all 0) at + 45 ° /symbol.

*2: 1.5188 kHz = Symbol rate/16 = 24.3 kHz/16

*3: Modulation accuracy is $10^{-18.06/20} = 0.125 = 12.5\%$.

5.3.2 Origin offset measurement

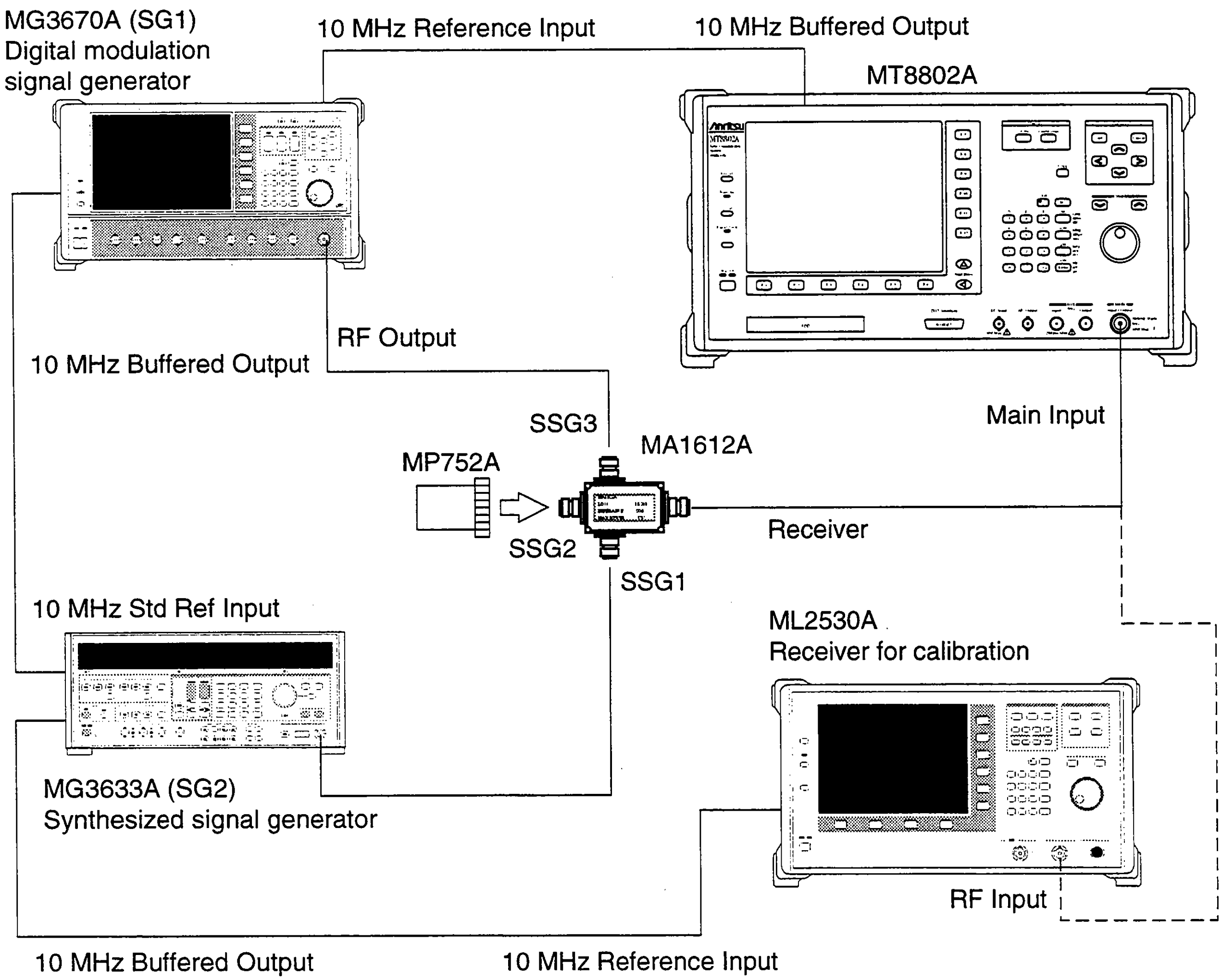
(1) Specifications

- 0.5 dB (for the 30-dBc signal)

(2) Test instruments

- Synthesized signal generator: MG3633A or the equivalent
- Digital modulation signal generator: MG3670B or the equivalent
- Receiver for calibration: ML2530A or the equivalent
- Three-signal characteristics measurement pad: MA1612A or the equivalent
- Resistive terminator: MP752A or the equivalent

(3) Setup



(4) Test procedures: Origin offset measurement

Step	Procedure
1.	Initialize the measurement system.
2.	Set the MT8802A as follows: RF Input/Output : Main — Set it on the Instrument Setup screen. TX Measure Ref Level : –5.0 dBm — Set it on the Setup Common Parameter screen. Measuring Object : Continuous — Set it on the Setup Common Parameter screen. Storage Mode : Average — Set it on the Modulation Analysis screen. Average Count : 10 — Set it on the Modulation Analysis screen.
3.	Set the output level (+13 dBm) of signal generator (SG2) and turn on the output. In addition, set the frequency at the measurement frequency +2.625 KHz (*1).
4.	Set the receiver for calibration at the frequency of signal generator (SG2) and perform "Meas to Ref."
5.	Change the frequency of receiver for calibration at the measurement frequency after turning off the output of signal generator (SG2).
6.	Turn on the output of signal generator (SG2) and set the frequency at the measurement frequency. In addition, set the output level to -30 dB displayed on the receiver for calibration.
7.	Connect the output of three-signal characteristics measurement pad to the MT8802A.
8.	Execute the "Measure Single" of MT8802A, read the "Origin OFFSET" display value, and check whether the result is within the specification value.
9.	Change the measurement frequency and perform the above measurement steps 3 to 8.

Origin offset measurement

	10 MHz	800 MHz	1.9 GHz	2.2 GHz
–30 dBc	________ dB	________ dB	________ dB	________ dB
Measurement uncertainty	±0.03 dB			
Effective lower limit	–0.47 dB			
Effective upper limit	+0.47 dB			

*1: Frequency deviation is as large as the symbol rate/8 = 3.0375 kHz when the phase changes (corresponds to the modulation of all 0) at + 45˚ /symbol.

5.3.3 Carrier OFF power measurement

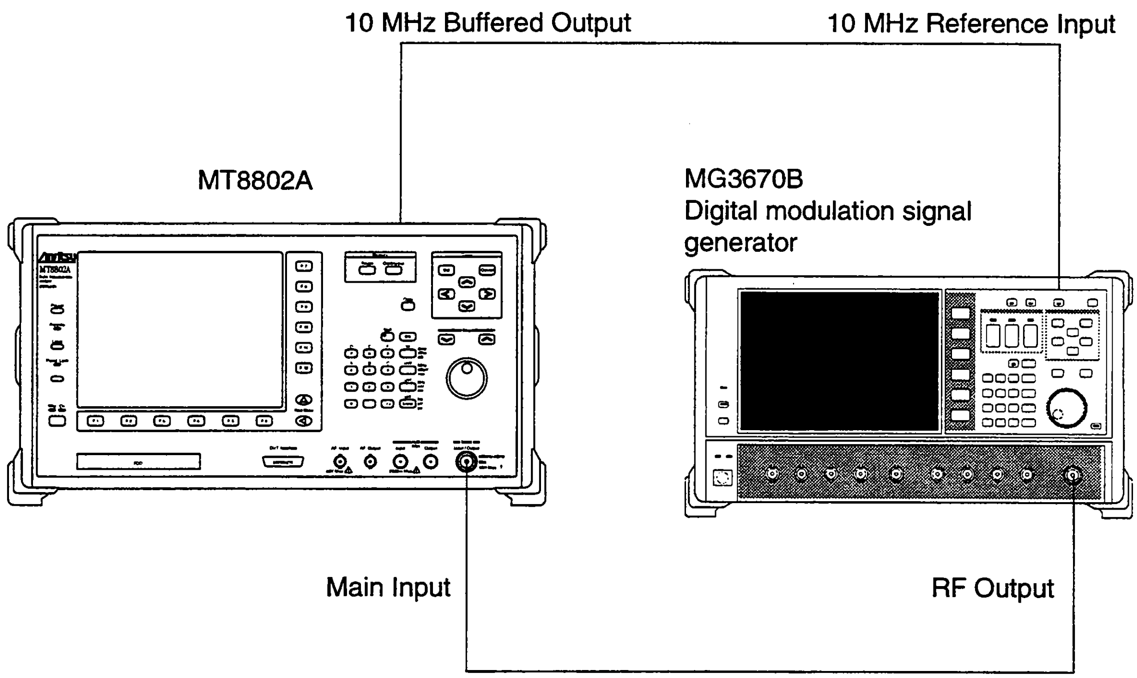
(1) Specifications

- Normal mode: Measurement range: ≥ 65 dB (in comparison with the average power in the burst)
- Wide dynamic range mode: Measurement range: ≥ 96 dB (in comparison with the average 4W power in the burst)
  (Average noise level (≤ –60 dBm at 100 MHz to 2.1 GHz) determines the measurement limit.)

(2) Test instrument

- Digital modulation signal generator: MG3670B or the equivalent

(3) Setup



(4) Test procedures: Carrier OFF power measurement

Step	Procedure
1.	Obtain the calibration data of signal generator.
2.	Initialize the MT8802A and signal generator (press the Preset key).
3.	Set the MT8802A as follows: RF Input/Output : Main — Set it on the Instrument Setup screen. Measuring Object : MS-DTC — Set it on the Setup Common Parameter screen.
4.	Display the RF Power screen of MT8802A.
5.	Set the signal generator as follows: Modulation : On System : NADC Burst Trigger : Int Burst : On Pattern : UP TCH
6.	Set "Storage Mode" of MT8802A to "Normal".
7.	Set the measurement frequency and the calibrated output level (+5 dBm) for each instrument and signal generator, respectively.
8.	Execute "Adjust Range" and "Manual Calibration" of MT8802A. Read the measurement status after executing the "Measure Single" sweep. If it is other than the normal end, force to quit the measurement.
9.	Read the "On/Off ratio" value displayed on the MT8802A to check whether it is larger than or equal to the specification value.
10.	Change the measurement frequency and perform the above measurement steps 7 to 9.
11.	Change "Storage Mode" of MT8802A to "Wide Dynamic Range."
12.	Set the measurement frequency and the calibrated output level (+10 dBm) for each instrument and signal generator, respectively.
13.	Execute "Adjust Range" and "Manual Calibration" of MT8802A. Read the measurement status after executing the "Measure Single" sweep. If it is other than the normal end, force to quit the measurement.
14.	Read the "Carrier OFF Power" value displayed on the MT8802A to check whether it is larger than or equal to the specification value.
15.	Change the measurement frequency and perform the above measurement steps 12 to 14.

Carrier OFF power measurement

	10 MHz	100 MHz	800 MHz	1.9 GHz	2.1 GHz	2.2 GHz	Measurement uncertainty	Effective lower limit	Effective upper limit
Normal mode measurement range in dB	______	----	______	______	----	______	±1.25 dB	66.25 dB	----
Wide-dynamic average-noise level in dBm	----	______	______	______	______	----		----	–61.25 dBm

5.3.4 Adjacent-channel leak power measurement

(1) Specifications

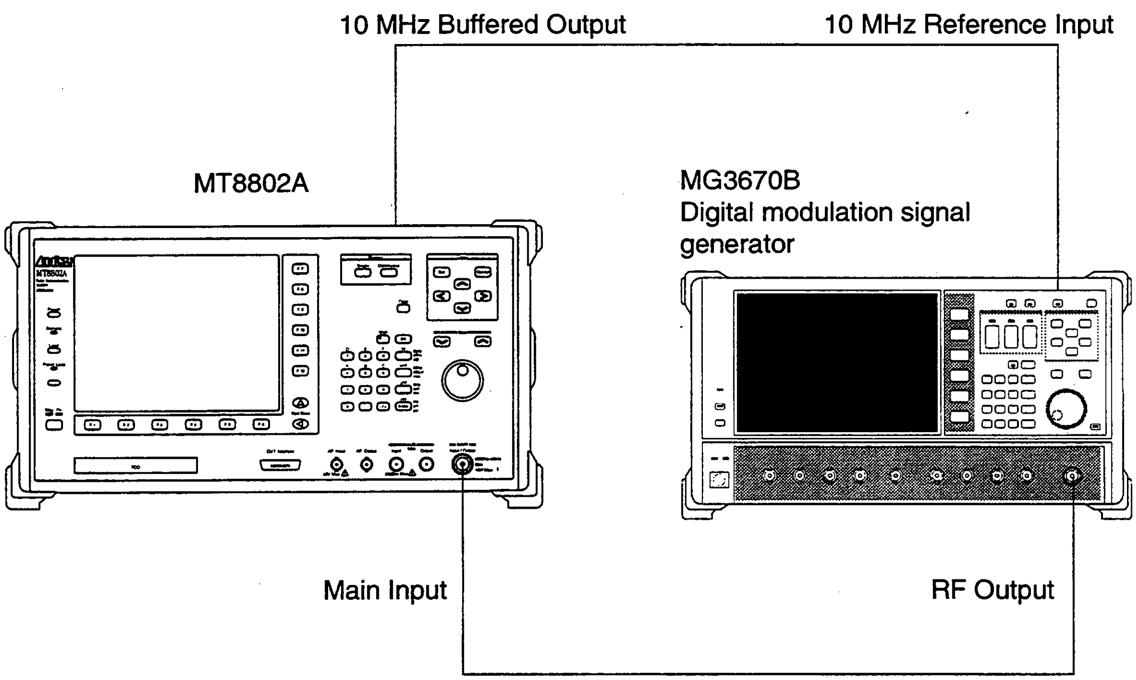
- High-speed mode: 30 KHz detuning: ≥ 30 dB
  60 KHz detuning: ≥ 60 dB
  90 KHz detuning: ≥ 65 dB

It is the ratio of the average power of the burst signal to the adjacent-channel leak power during On period.

(2) Test instrument

- Digital modulation signal generator: MG3670B or the equivalent

(3) Setup



(4) Test procedures: Adjacent-channel leak power measurement

Step	Procedure
1.	Obtain the calibration data of signal generator.
2.	Initialize the MT8802A and the signal generator (press the Preset key).
3.	Set the MT8802A as follows: RF Input/Output : Main — Set it on the Instrument Setup screen. Measuring Object : MS-DTC — Set it on the Setup Common Parameter screen.
4.	Display the Adjust Channel Power screen of MT8802A and select "Unit: dB."
5.	Set the signal generator as follows: Modulation : On System : NADC Burst Trigger : Int Burst : On Pattern : UP TCH
6.	Set "Measure Method: Spectrum (All)" of MT8802A.
7.	Set the measurement frequency and the calibrated output level (+5 dBm) for each instrument and signal generator, respectively.
8.	Execute "Adjust Range" and "Manual Calibration" of MT8802A. Read the measurement status after executing "Measure Single." If it is other than the normal end, force to quit the measurement.
9.	Read each offset frequency value of "Modulation Power" and "Switching Transients" (the worse value, Upper or Lower) displayed on MT8802A to check whether each result is larger than corresponding specification value.
10.	Change the measurement frequency and repeat the above measurement steps 7 to 9.

Adjacent-channel leak power measurement

	100 MHz	800 MHz	1.9 GHz	2.2 GHz	Measurement uncertainty	Effective lower limit
–90 kHz	_______ dB	_______ dB	_______ dB	_______ dB	±1 dB	66 dB
–60 kHz	_______ dB	_______ dB	_______ dB	_______ dB		61 dB
–30 kHz	_______ dB	_______ dB	_______ dB	_______ dB		31 dB
+30 kHz	_______ dB	_______ dB	_______ dB	_______ dB		31 dB
+60 kHz	_______ dB	_______ dB	_______ dB	_______ dB		61 dB
+90 kHz	_______ dB	_______ dB	_______ dB	_______ dB		66 dB

5.3.5 Transmission power measurement accuracy

Power measurement is tested by using the unmodulated continuous wave of signal generator.

(1) Specifications

- Transmission power: Accuracy: ± 10% (at the Main connector after the calibration using the built-in power meter)

Succeeding "Test instruments," "Setup," and "Test procedures" are same as the section 5.3.4.1 of PERFROMANCE TEST of the MT8802A main unit.

5.3.6 Modulation accuracy of signal generator

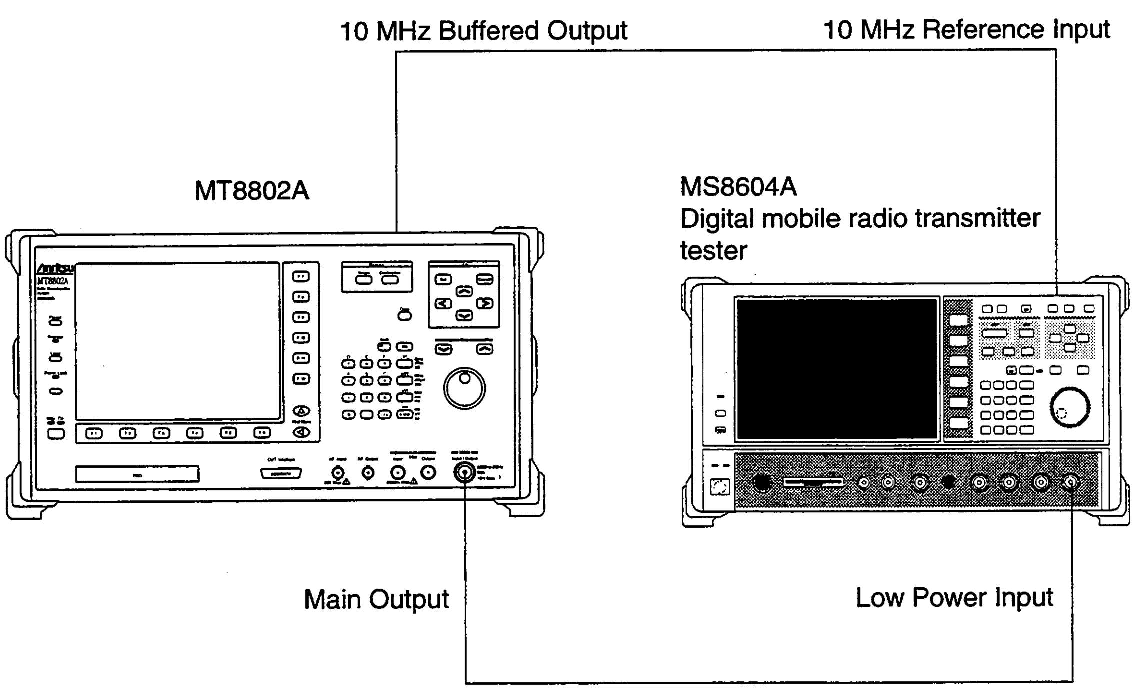
(1) Specifications

- Modulation accuracy: Vector error: ≤ 3% rms

(2) Test instrument

- Digital mobile radio transmitter tester: MS8604A or the equivalent

(3) Setup



(4) Test procedures: Modulation accuracy of signal generator

Step	Procedure
1.	Initialize the MT8802A and the transmitter tester (press the Preset key).
2.	Set the MT8802A as follows: RF Input/Output : Main — Set it on the Instrument Setup screen. RX Measure Output Level : −18 dBm — Set it on the Setup Common Parameter screen.
3.	Display the Bit Error Rate screen of MT8802A.
4.	Turn on the Modulation and Level of MT8802A.
5.	Set "RF Input: Low" on "System" screen of the transmitter tester, and return to "Setup Parameter" screen.
6.	Select the measurement system: NADC using the transmitter tester, and set as follows. RF Level : −18 dBm
	Measurement during Burst Off
7.	Set MT8802A as follows: Measuring Object : Continuous — Set it on the Setup Common Parameter screen. Pattern Data : PN9 — Set it on the Setup Digital RX Measure Parameter screen.
8.	Set the transmitter tester as follows: Measuring Object : Base Pattern : NO
9.	Display the Bit Error Rate screen of Mt8802A, and set the measurement frequency.
10.	Display the Modulation Analysis screen of the transmitter tester, and set the measurement frequency and "Burst Average: On".
11.	Read the instruction value of "Vector Error" after executing "measure Single" using the transmitter tester to check whether the result is within the specification value.
12.	Repeat the above measurement steps 9 to 11 for each measurement frequency.
	Measurement during Burst On
13.	Set MT8802A as follows: Measuring Object: MS-DTC — Set it on the Setup Common Parameter screen.
14.	Set the transmitter tester as follows: Measuring Object: Base Pattern: Sync1
15.	Repeat the above measurement steps 9 to 12 for each measurement frequency.
16.	Turn Off the Level of MT8802A and Modulation.

Modulation accuracy of signal generator

	10 MHz	800 MHz	1.9 GHz	3 GHz	Measurement uncertainty	Effective lower limit
Burst Off	______ %	______ %	______ %	______ %	±0.56 %	3 %
Burst On	______ %	______ %	______ %	______ %		

5.3.7 Example of performance test result entry sheet

This paragraph gives an example of sheets used to summarize the test results before conducting the performance test of the MT8802A radio communication analyzer.
Use a copy of this sheet for the performance test.

Test location ______________________ Report No. ______________________
______________________ Date ______________________
______________________ Person in charge of the test ______________________

Device name: MT8802A Radio Communication Analyzer
MX880213A IS-136A Measurement Software

Manufacturing No. ______________________ Ambient temperature ______________ °C
Power frequency ______________ Hz Relative humidity ______________ %
Remarks ____
____
____

1. Frequency/modulation measurement accuracy

			10 MHz	800 MHz	1.9 GHz	2.2 GHz
RMS Vector Error (modulation accuracy)	0 %	Minimum value	0 %	0 %	0 %	0 %
		Actual measurement value	_____ %	_____ %	_____ %	_____ %
		Maximum value	0.5 %	0.5 %	0.5 %	0.5 %
	12.5 %	Minimum value	11.87 %	11.87 %	11.87 %	11.87 %
		Actual measurement value	_____ %	_____ %	_____ %	_____ %
		Maximum value	13.14 %	13.14 %	13.14 %	13.14 %
	Measurement uncertainty		+0.12 % –0.11 %			
Carrier frequency	0 %	Minimum value	–0.9 Hz	–0.9 Hz	–0.9 Hz	–0.9 Hz
		Frequency accuracy	_____ Hz	_____ Hz	_____ Hz	_____ Hz
		Maximum value	+0.9 Hz	+0.9 Hz	+0.9 Hz	+0.9 Hz
	Measurement uncertainty		±0.1 Hz			

2. Originm offset measurement

	10 MHz	800 MHz	1.9 GHz	2.2 GHz
–30 dBc	________ dB	________ dB	________ dB	________ dB
Measurement uncertainty	±0.03 dB			
Effective lower limit	–0.47 dB			
Effective upper limit	+0.47 dB			

3. Carrier OFF power measurement

	10 MHz	100 MHz	800 MHz	1.9 GHz	2.1 GHz	2.2 GHz	Measurement uncertainty	Effective lower limit	Effective upper limit
Normal mode measurement range in dB	______	- - - -	______	______	- - - -	______	±1.25 dB	66.25 dB	- - - -
Wide-dynamic average-noise level in dBm	- - - -	______	______	______	______	- - - -		- - - -	–61.25 dBm

4. Adjacent-channel leak power measurement

	100 MHz	800 MHz	1.9 GHz	2.2 GHz	Measurement uncertainty	Effective lower limit
–90 kHz	________ dB	________ dB	________ dB	________ dB	±1 dB	66 dB
–60 kHz	________ dB	________ dB	________ dB	________ dB		61 dB
–30 kHz	________ dB	________ dB	________ dB	________ dB		31 dB
+30 kHz	________ dB	________ dB	________ dB	________ dB		31 dB
+60 kHz	________ dB	________ dB	________ dB	________ dB		61 dB
+90 kHz	________ dB	________ dB	________ dB	________ dB		66 dB

5. Transmission power measurement

This is same as the section 5.3.4.1 of PERFORMANCE TEST of the MT8802A main unit.

6. Modulation accuracy of signal generator

	10 MHz	800 MHz	1.9 GHz	3 GHz	Measurement uncertainty	Effective lower limit
Burst Off	________ %	________ %	________ %	________ %	±0.56 %	3 %
Burst On	________ %	________ %	________ %	________ %		

5.4 About Service

If the machine is fractured or does not operate as specified, contact the head office, a branch office, a sales office, a local office, or Customer Service Department of Anritsu Corporation to ask the repair. Addresses and telephone numbers are described on the back cover.

Provide the following information when asking the repair:

(a) Machine name and number described on the back panel.

(b) Malfunction status

(c) Contact person to check the malfunction contents or to inform the repair completion.

SECTION 6
CALIBRATION

This section describes the measuring instruments required to calibrate the MT8802A, and the setup and calibration method for these instruments.

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6.1 Calibration Requirements

Calibration is done to help maintain the MT8802A's performance.

Calibration should be performed periodically even if the MT8802A is operating normally.

We recommend that the MT8802A be calibrated once or twice a year.

Contact the Service Department of Anritsu Corporation if the MT8802A fails to meet the specifications during calibration.

6.2 Equipment Required for Calibration

The table below shows the equipment required to calibrate each item.

Table 6.1 Equipment Required for Calibration

Recommended equipment	Required performance†	Calibration item
Frequency counter (MF1603A)	• 100 kHz to 3 GHz • Resolution: 1 Hz • External reference input: 10 MHz	Frequency accuracy of reference crystal oscillator
Frequency standard	Standard radio-wave receiver or equipment having equivalent function (accuracy better than 1×10^{-9})	Frequency accuracy of reference crystal oscillator

† Extracts part of performance which can cover the measurement range of the test item.

6.3 Calibration

Do not start the performance tests until the MT8802A and measuring instruments have warmed up for at least 24 hours and they have stabilized completely. To obtain the best measurement accuracy, do the calibration at room temperature. Keep AC power voltage fluctuations, noise, vibration, dust, humidity, and any other factors which can affect results to a minimum.

6.3.1 Calibrating the reference crystal oscillator

The stability of the MT8802A reference crystal oscillator is $\pm 2 \times 10^{-8}$/day. Calibrate the frequency of the reference crystal oscillator by using a reference signal generator generating a reference signal that is either locked to a standard wave or to the sub-carrier of a TV broadcast on a color TV (the sub-carrier will be locked to a rubidium atomic standard).

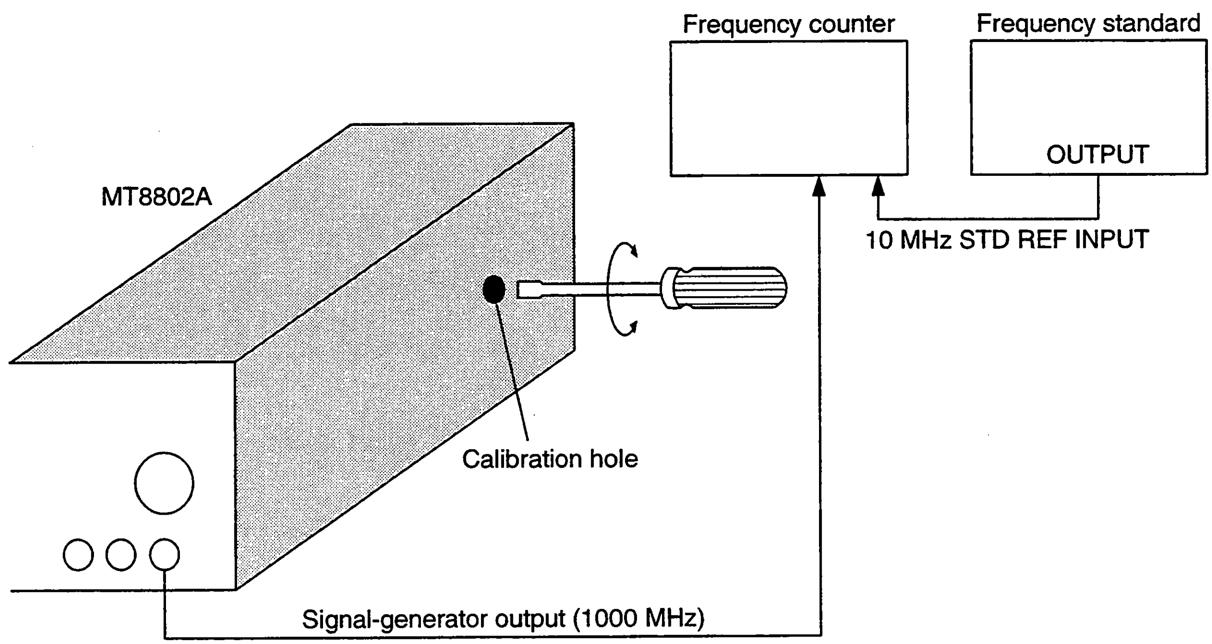
(1) Specifications

Reference oscillator	Frequency	Aging rate	Temperature characteristics
Standard type (after 24-hour operation)	10MHz	2×10^{-8}/day	$\pm 5 \times 10^{-8}$ (0°C to 50°C)

(2) Instruments required for calibration

- Frequency counter: 10 MHz external reference input, resolution: 1 Hz
- Frequency standard: Standard radio-wave receiver or equipment having equivalent function (accuracy better than 1×10^{-9})

(3) Setup



(4) Calibration procedure

Step	Procedure
1.	Setup the equipment as shown in the figure above. The ambient temperature must be 23°C ± 5°C.
2.	Set the Power switch on the rear panel to On and the Power switch on the front panel to the Standby position. Then, allow the MT8802A reference crystal oscillator to warm-up for 24 hours.
3.	Set the Power switch on the MT8802A front panel to On.
4.	Apply the standard frequency signal to the external reference input of the frequency counter.
5.	Set the frequency of the signal generator of the MT8802A to 1 000.000 000 MHz, the level to –28 dBm, and the modulation to off.
6.	Adjust the calibration trimmer of the crystal oscillator so that the frequency-counter reading is 1 000.000 000 MHz ±10 Hz.

SECTION 7
STORAGE AND TRANSPORTATION

This section describes the long-term storage, repacking, and transportation of the MT8802A and the regular maintenance procedures.

TABLE OF CONTENTS

7.1 Cleaning the Cabinet

Always turn the MT8802A power switch OFF and disconnect the power plug from the AC power inlet before cleaning the cabinet. To clean the external cabinet:

- Use a soft, dry cloth.
- Use a cloth moistened with diluted neutral cleaning liquid if the instrument is very dirty or before long-term storage. Then, use a soft, dry cloth to wipe the instrument dry.
- If loose screws are found, tighten them with the appropriate tools.

CAUTION ⚠

Never use benzine, thinner, or alcohol to clean the cabinet; these chemicals may damage the coating or cause deformation or discoloration.

7.2 Storage Precautions

This paragraph describes the procedures for long-term storage of the MT8802A.

7.2.1 Precautions before storage

(1) Before storage, wipe dust, finger-marks, and other contaminants off the MT8802A.

(2) Avoid storing the MT8802A where it may be exposed to:

1) Direct sunlight or high dust levels.

2) High humidity.

3) Active gasses or acid.

4) The following temperatures or humidity:

- Temperature: .... > 60 °C, < -20 °C
- Humidity: .... ≥ 90%

7.2.2 Recommended storage conditions

The recommended storage conditions are as follows:

- Temperature: .... 0 to 30 °C
- Humidity: .... 40% to 80%
- Stable temperature and humidity over a 24-hour period.

7.3 Repacking and Transportation

Take the following precautions if the MT8802A must be returned to Anritsu Corporation for servicing.

7.3.1 Repacking

Use the original packing materials. If the MT8802A is packed in other materials, observe the following packing procedure:

(1) Wrap the MT8802A in a plastic sheet or similar material.

(2) Use a cardboard box, wooden box, or aluminum case which allows shock-absorbing material to be inserted on all sides of the MT8802A.

(3) Use enough shock-absorbing material to protect the MT8802A during transportation and to prevent it from moving in the container.

(4) Secure the container with packing straps, adhesive tape,or bands.

7.3.2 Transportation

Do not subject the MT8802A to severe vibration during transport. Also, transport under the storage conditions recommended in paragraph 7.2.

APPENDIXES

TABLE OF CONTENTS

APPENDIX A SCREEN AND FUNCTION KEY TRANSITION DIAGRAMS

This appendix gives the screen and function-keys transition diagrams.

[Screen transitions] .... See Paragraph 3.2.

- On any type of screen, the main menu shown below can be displayed by turning the [Main Func On Off] (F6) key to On. When main function keys F1 to F5 and Next Menu key [◀] are used to select a main menu item, the screen transits to the corresponding screen or key menu.

Note: Change Color is a function key menu, so there is no corresponding screen.

<F1>TX&RX Tester ──────────→ Setup Common Parameter screen
<F4>Recall ──────────→ Recall Parameter screen *1
<F5>Save ──────────→ Save Parameter screen *2
↑(The screen can be scrolled vertically
using the Next Menu key [◀].)
<F1>Change System ──────────→ Change System screen
<F2>Instrument Setup ──────────→ Instrument Setup screen
<F3>Change Color ──────────→ Change Color menu
<F4>File Operation ──────────→ File Operation screen

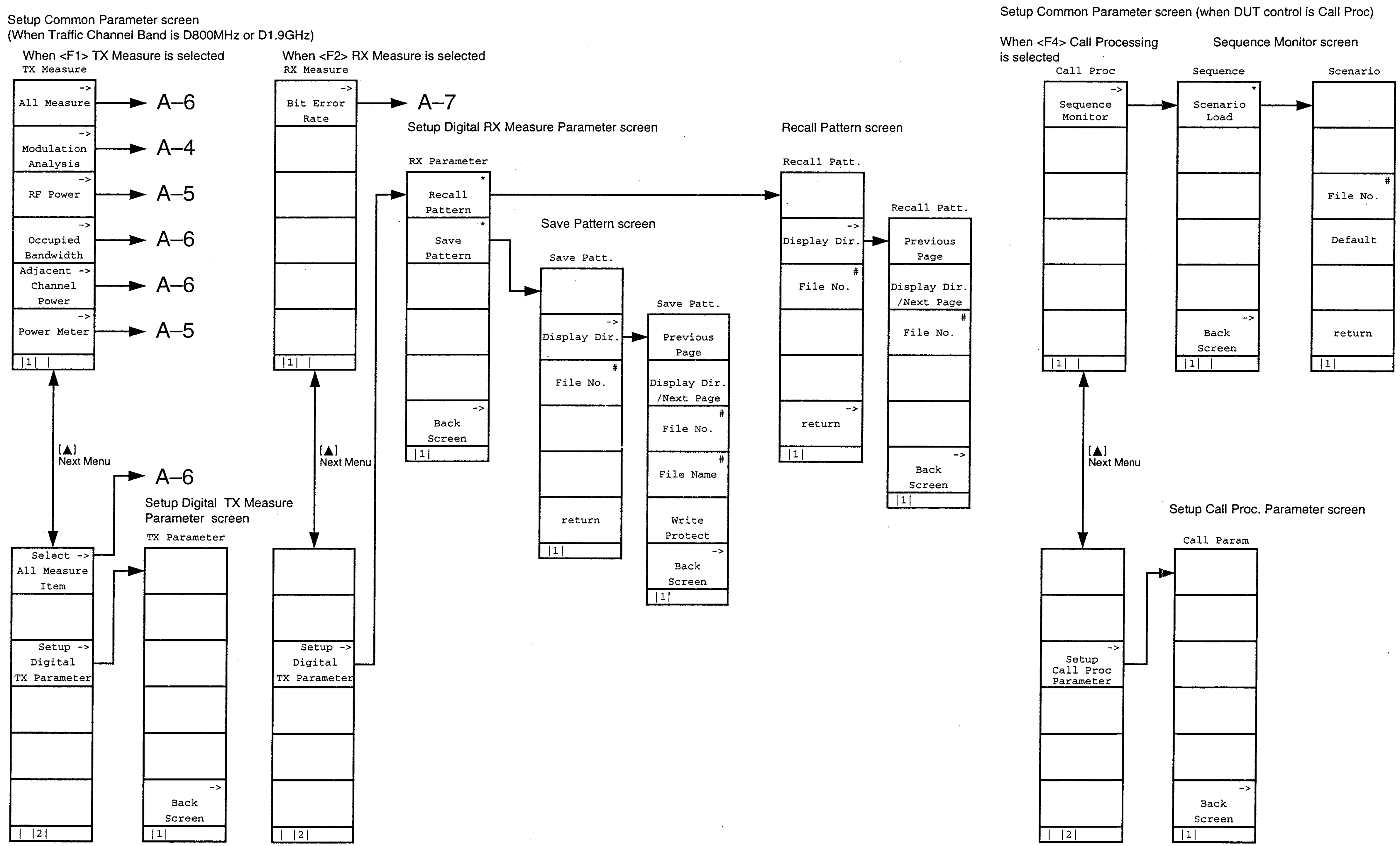
*1 Press the [Recall] F4 key and the [Display Dir.] F8 key to move to "Recall Parameter Screen".

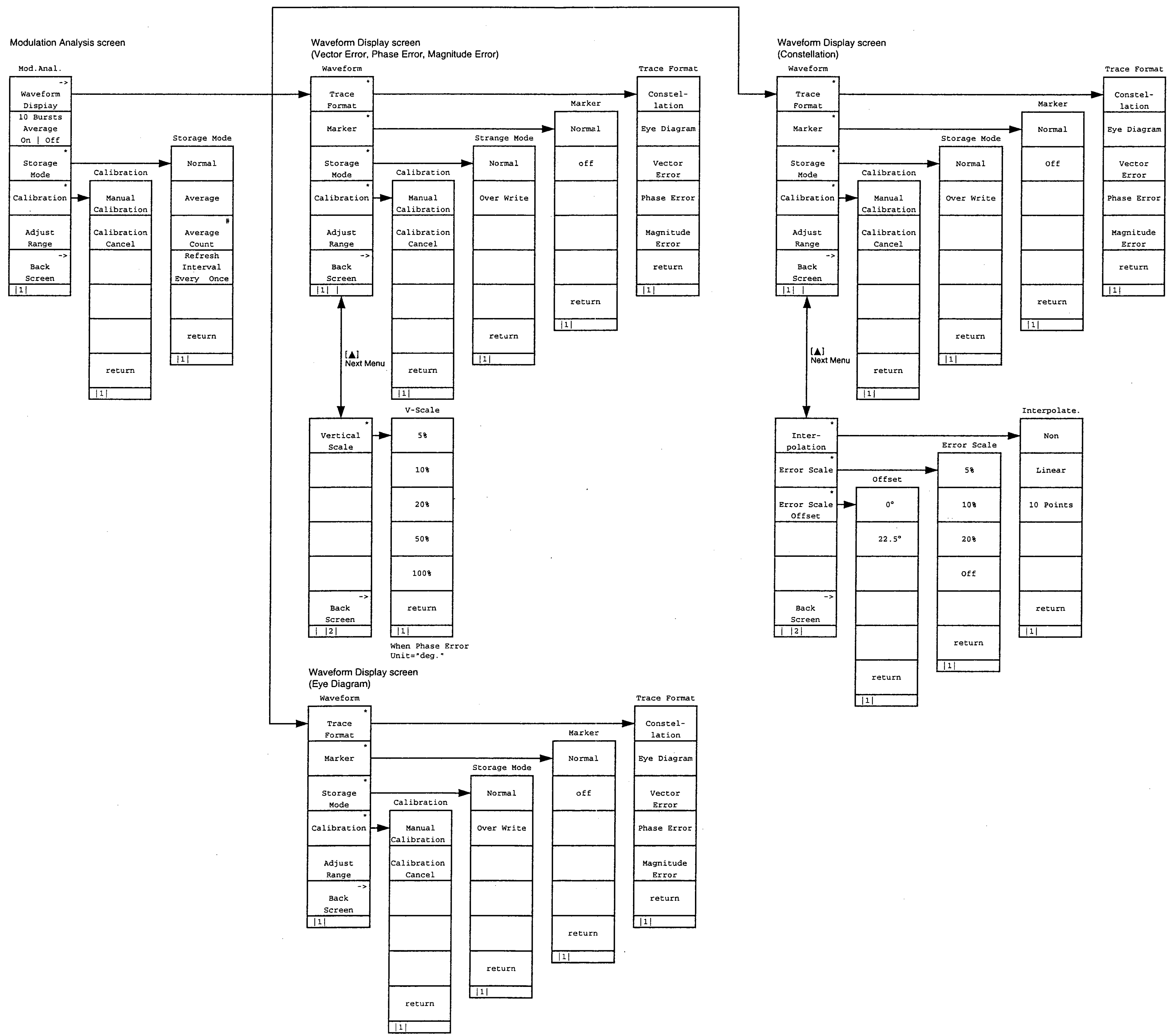
*2 Press the [Save] F5 key and the [Display Dir.] F8 key to move to "Save Parameter Screen".

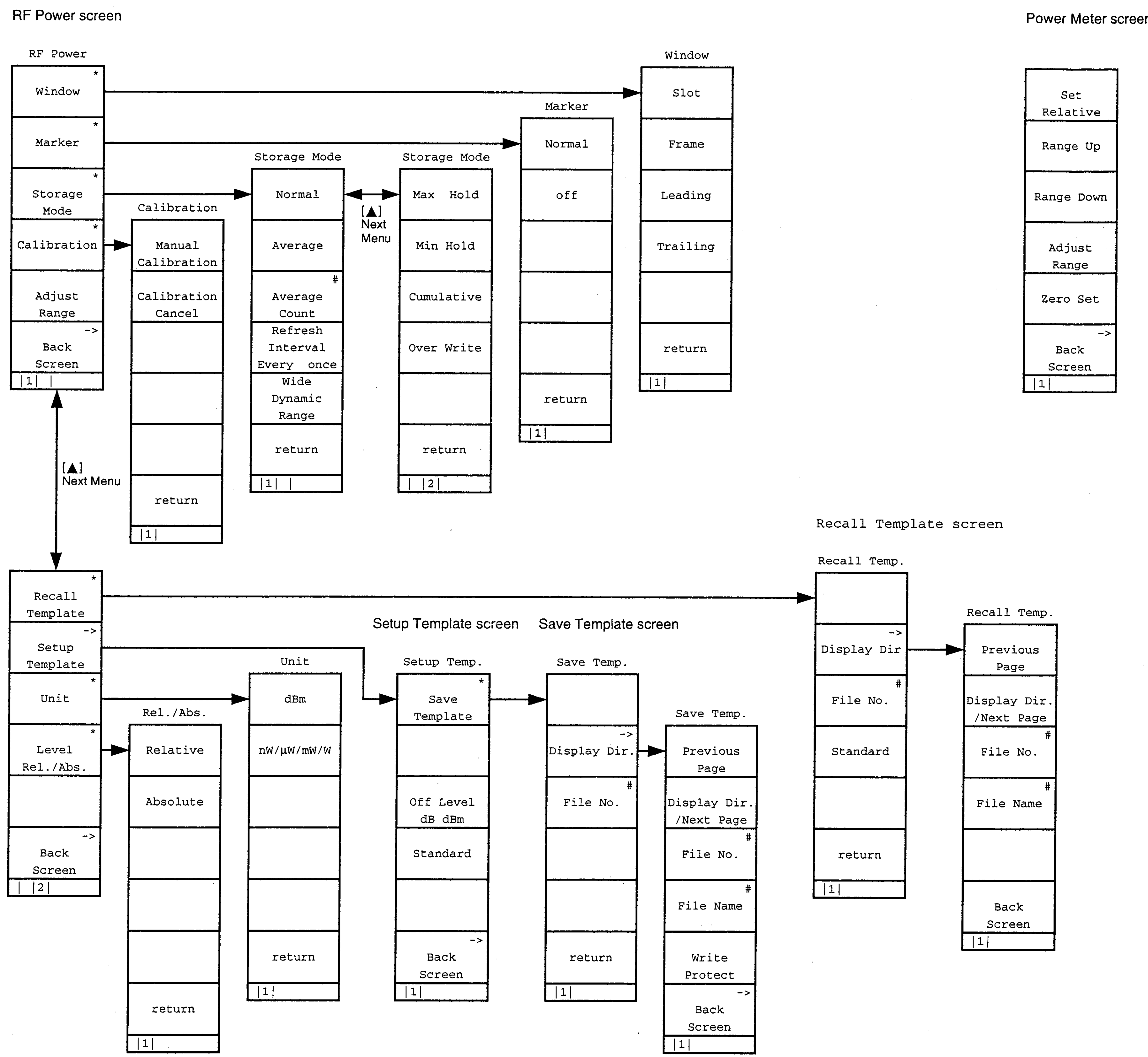
- TX & RX Tester (Setup Common Parameter screen)
  - <F1>TX Measure
    - TX Measure (Digital)
      - <F7>All Measure → All Measure screen (TX all-measured value list measurement screen)
      - <F8>Modulation Analysis → Modulation Analysis screen (TX modulation analysis screen: Value display)
        - <F7>Waveform Display → Waveform Display screen (TX modulation and analysis screen: Waveform display)
          - <F7>Trace Format5 → waveforms: Constellation, Eye Diagram, Vector Error, Phase Error, Magnitude Error
      - <F9>RF Power → RF Power screen (TX RF power [burst amplitude] measurement screen)
        - <F7>Recall Template → Recall Template screen
        - <F8>Setup Template → Setup Template screen
          - <F7>Save Template → Save Template screen
      - <F10>Occupied Bandwidth → Occupied Bandwidth screen (occupied frequency band measurement screen)
      - <F11>Adjacent Channel Power → Adjacent Channel Power screen (adjacent channel leakage power measurement screen)
      - <F12>Power Meter → Power Meter screen (power measurement screen)
        ↑ The Next Menu key [▲] can be
        ↓ used to scroll the screen vertically.
      - <F7>Select All Measure Item → Select All Measure Items screen (TX all-measured value item setting screen)
      - <F9>Setup Digital TX Parameter → Setup Digital TX Measure Parameter screen (Digital TX measurement condition setup screen)
    - TX Measure (Analog)
      - <F7>Analog TX Measure → Analog TX Measure screen (Screen for analog TX measurement)
      - <F10>Analog TX Meas with SG → Analog TX Meas with SG screen (Screen for signal generator and analog TX measurement)
        ↑ The Next Menu key [▲] can be
        ↓ used to scroll the screen vertically.
      - <F9>Setup Analog TX Parameter → Setup Analog TX Measure Parameter screen (Analog TX measurement condition setup screen)
  - <F2>RX Measure
    - RX Measure (Digital)
      - <F7>Bit Error Rate → Bit Error Rate screen (TX bit error rate [BER] measurement screen)
        ↑ The Next Menu key [▲] can be
        ↓ used to scroll the screen vertically.
      - <F9>Setup Digital RX Parameter → Setup Digital RX Measure Parameters screen (Digital RX measurement condition setup screen)
    - RX Measure (Digital)
      - <F7>Analog RX Measure → Analog RX Measure screen (Screen for analog RX measurement)
        ↑ The Next Menu key [▲] can be
        ↓ used to scroll the screen vertically.
      - <F9>Setup Analog RX Parameter → Setup Analog RX Measure Parameter screen (Analog RX measurement condition setup screen)
  - <F3>AF Measure (When DUT Control is set to None.) → AF Measure
    - <F7>AF Measure → AF Measure screen (Screen for AF measurement)
      ↑ The Next Menu key [▲] can be
      ↓ used to scroll the screen vertically.
    - <F9>Setup AF Parameter → Setup AF Measure Parameter screen (AF measurement condition setup screen)
  - <F4>Call Processing (When DUT Control is set to call Proc.) → Call Processing
    - <F7>Sequence Monitor → Sequence Monitor screen (Call processing operation state display screen)
      ↑ The Next Menu key [▲] can be
      ↓ used to scroll the screen vertically.
    - <F9>Setup Call Proc Parameter → Setup Call Processing Parameter screen (Call processing test condition setup screen)

[Function key transitions on various screens]

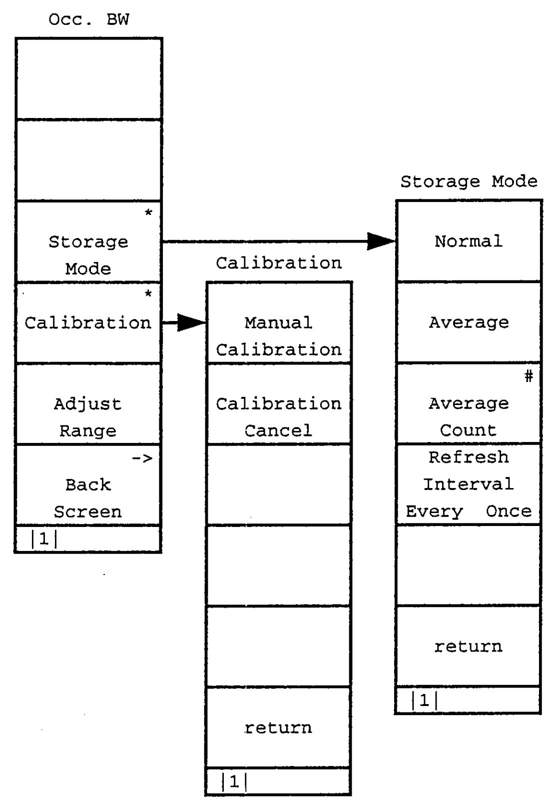
Note: If [F12], [Back Screen], or [return] displayed at the bottom of the function key is selected, the screen returns to the upper hierarchy.



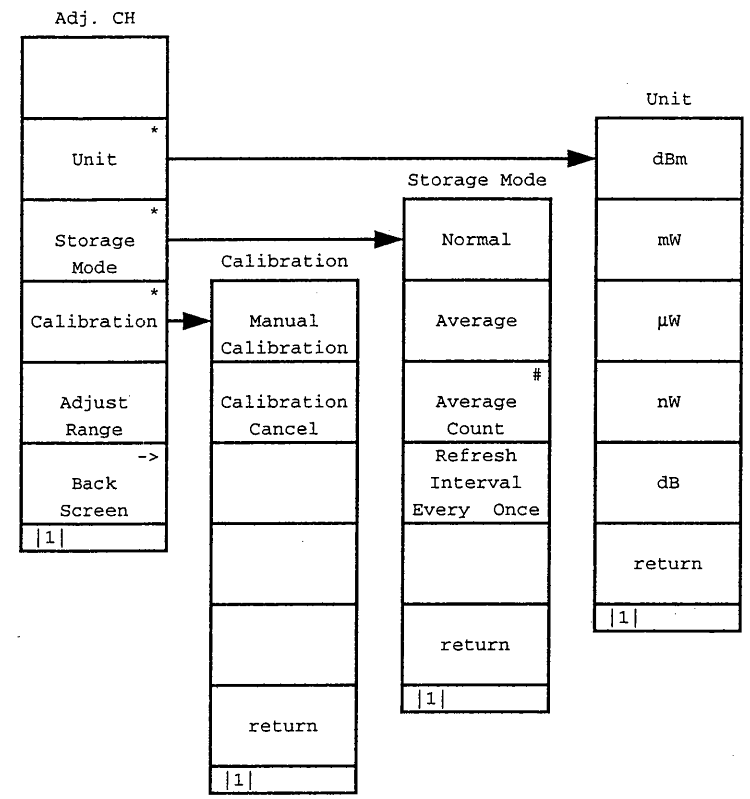

Modulation Analysis screen
Mod.Anal.
Waveform Display
10 Bursts Average On | Off
Storage Mode
Calibration
Adjust Range
Back Screen
Calibration
Manual Calibration
Calibration Cancel
return
Storage Mode
Normal
Average
Average Count
Refresh Interval Every Once
return
Waveform Display screen
(Vector Error, Phase Error, Magnitude Error)
Waveform
Trace Format
Marker
Storage Mode
Calibration
Adjust Range
Back Screen
[▲] Next Menu
Calibration
Manual Calibration
Calibration Cancel
return
Strange Mode
Normal
Over Write
return
Marker
Normal
off
return
Trace Format
Constel-lation
Eye Diagram
Vector Error
Phase Error
Magnitude Error
return
Vertical Scale
Back Screen
V-Scale
5%
10%
20%
50%
100%
return
When Phase Error Unit="deg."
Waveform Display screen
(Constellation)
Waveform
Trace Format
Marker
Storage Mode
Calibration
Adjust Range
Back Screen
[▲] Next Menu
Calibration
Manual Calibration
Calibration Cancel
return
Storage Mode
Normal
Over Write
return
Marker
Normal
Off
return
Trace Format
Constel-lation
Eye Diagram
Vector Error
Phase Error
Magnitude Error
return
Inter-polation
Error Scale
Error Scale Offset
Back Screen
Offset
0°
22.5°
return
Error Scale
5%
10%
20%
Off
return
Interpolate.
Non
Linear
10 Points
return
Waveform Display screen
(Eye Diagram)
Waveform
Trace Format
Marker
Storage Mode
Calibration
Adjust Range
Back Screen
Calibration
Manual Calibration
Calibration Cancel
return
Storage Mode
Normal
Over Write
return
Marker
Normal
off
return
Trace Format
Constel-lation
Eye Diagram
Vector Error
Phase Error
Magnitude Error
return


RF Power screen
RF Power
Window *
Marker *
Storage Mode *
Calibration *
Adjust Range
Back Screen ->
|1| |
Calibration
Manual Calibration
Calibration Cancel
return
|1|
Storage Mode
Normal
Average
Average Count #
Refresh Interval Every once
Wide Dynamic Range
return
|1| |
[▲] Next Menu
Storage Mode
Max Hold
Min Hold
Cumulative
Over Write
return
| |2|
Marker
Normal
off
return
|1|
Window
Slot
Frame
Leading
Trailing
return
|1|
Power Meter screen
Set Relative
Range Up
Range Down
Adjust Range
Zero Set
Back Screen ->
|1|
[▲] Next Menu
Recall Template *
Setup Template ->
Unit *
Level Rel./Abs. *
Back Screen ->
| |2|
Rel./Abs.
Relative
Absolute
return
|1|
Unit
dBm
nW/μW/mW/W
return
|1|
Setup Template screen
Setup Temp.
Save Template *
Off Level dB dBm
Standard
Back Screen ->
|1|
Save Template screen
Save Temp.
Display Dir. ->
File No. #
return
|1|
Save Temp.
Previous Page
Display Dir. /Next Page
File No. #
File Name #
Write Protect
Back Screen ->
|1|
Recall Template screen
Recall Temp.
Display Dir ->
File No. #
Standard
return
|1|
Recall Temp.
Previous Page
Display Dir. /Next Page
File No. #
File Name #
Back Screen
|1|

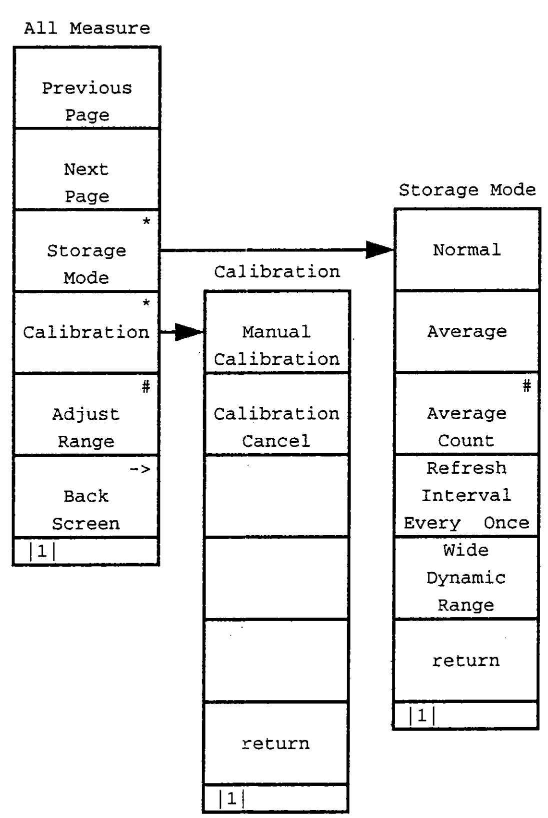
Occupied Bandwidth screen



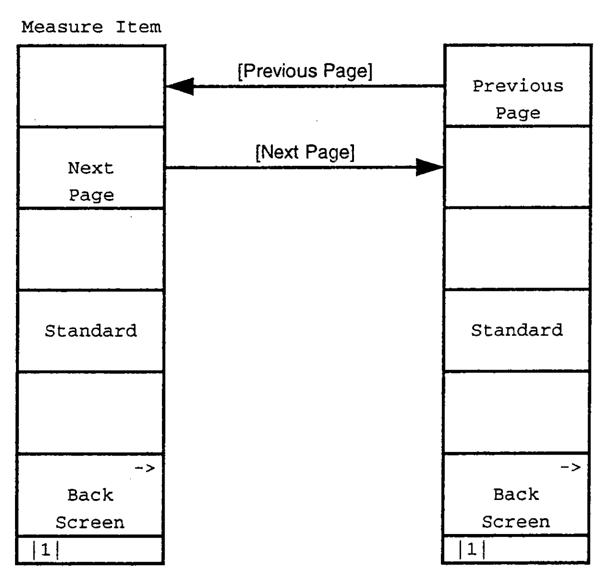
Adjacent Channel Power screen

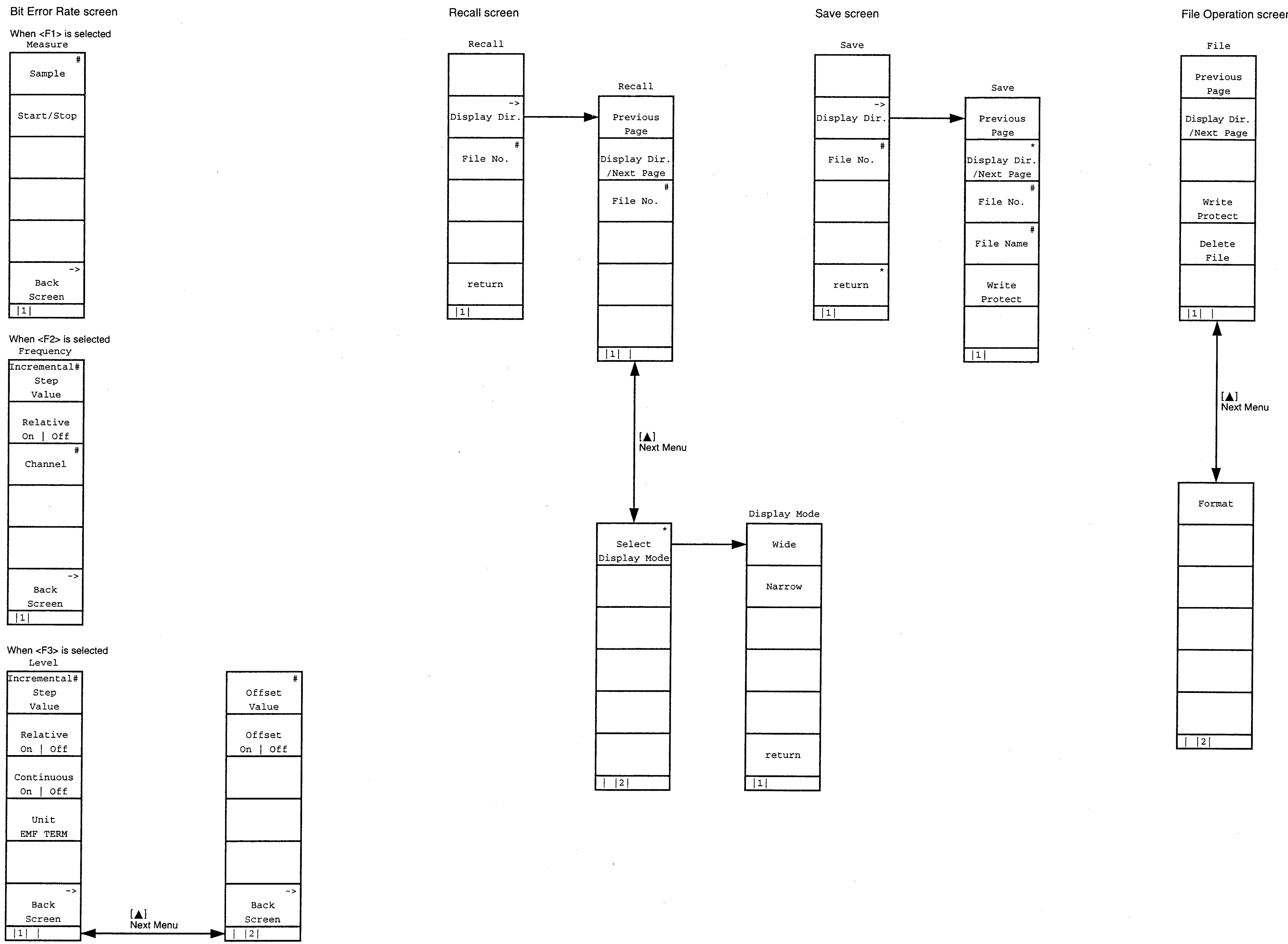


TX All Measure screen

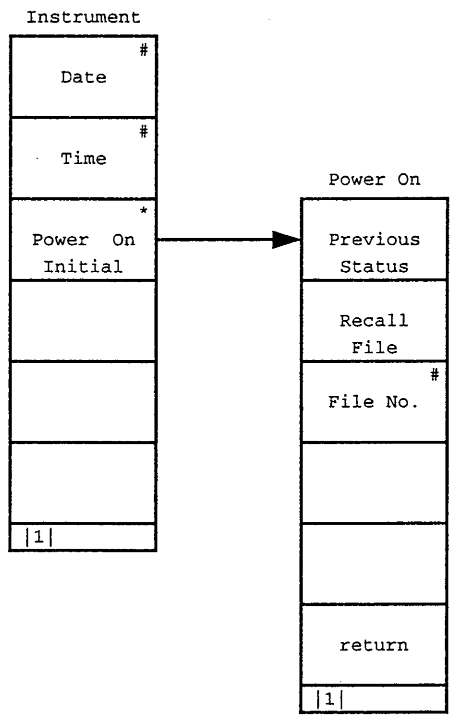


Select All Measure Item screen

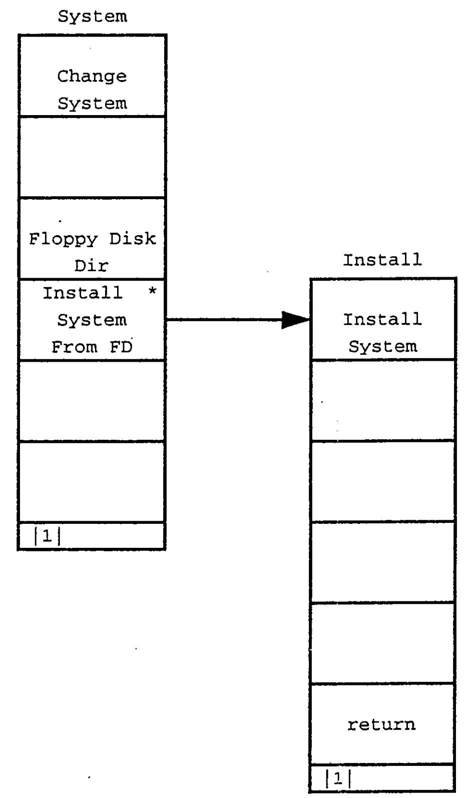



Bit Error Rate screen
When <F1> is selected
Measure
Sample #
Start/Stop
Back Screen ->
|1|
When <F2> is selected
Frequency
Incremental Step Value #
Relative On | Off
Channel #
Back Screen ->
|1|
When <F3> is selected
Level
Incremental Step Value #
Relative On | Off
Continuous On | Off
Unit EMF TERM
Back Screen ->
|1| |
[▲] Next Menu
Offset Value #
Offset On | Off
Back Screen ->
| |2|
Recall screen
Recall
Display Dir. ->
File No. #
return
|1|
Recall
Previous Page
Display Dir. /Next Page
File No. #
|1| |
[▲] Next Menu
Select Display Mode *
| |2|
Display Mode
Wide
Narrow
return
|1|
Save screen
Save
Display Dir. ->
File No. #
return *
|1|
Save
Previous Page
Display Dir. /Next Page *
File No. #
File Name #
Write Protect
|1|
File Operation screen
File
Previous Page
Display Dir. /Next Page
Write Protect
Delete File
|1| |
[▲] Next Menu
Format
| |2|

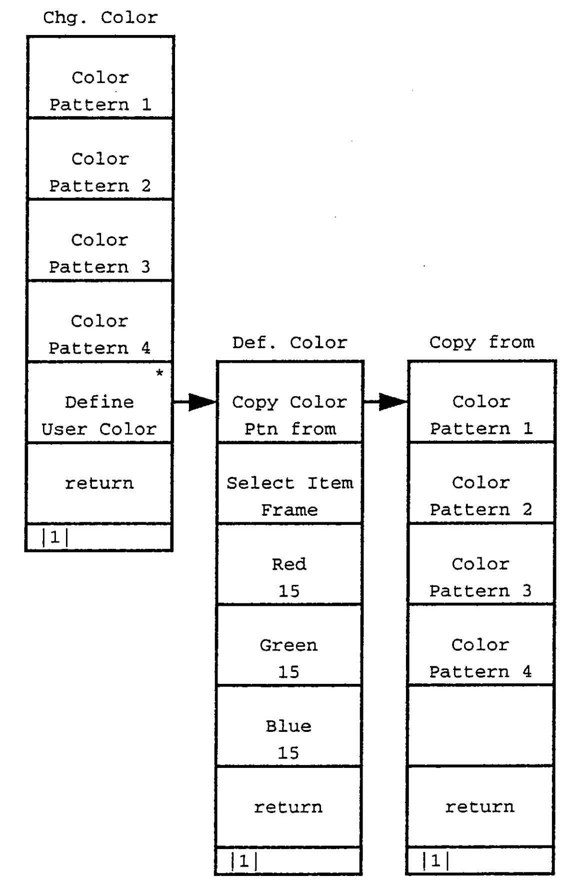
Instrument Setup screen



Change System screen



Change Color menu

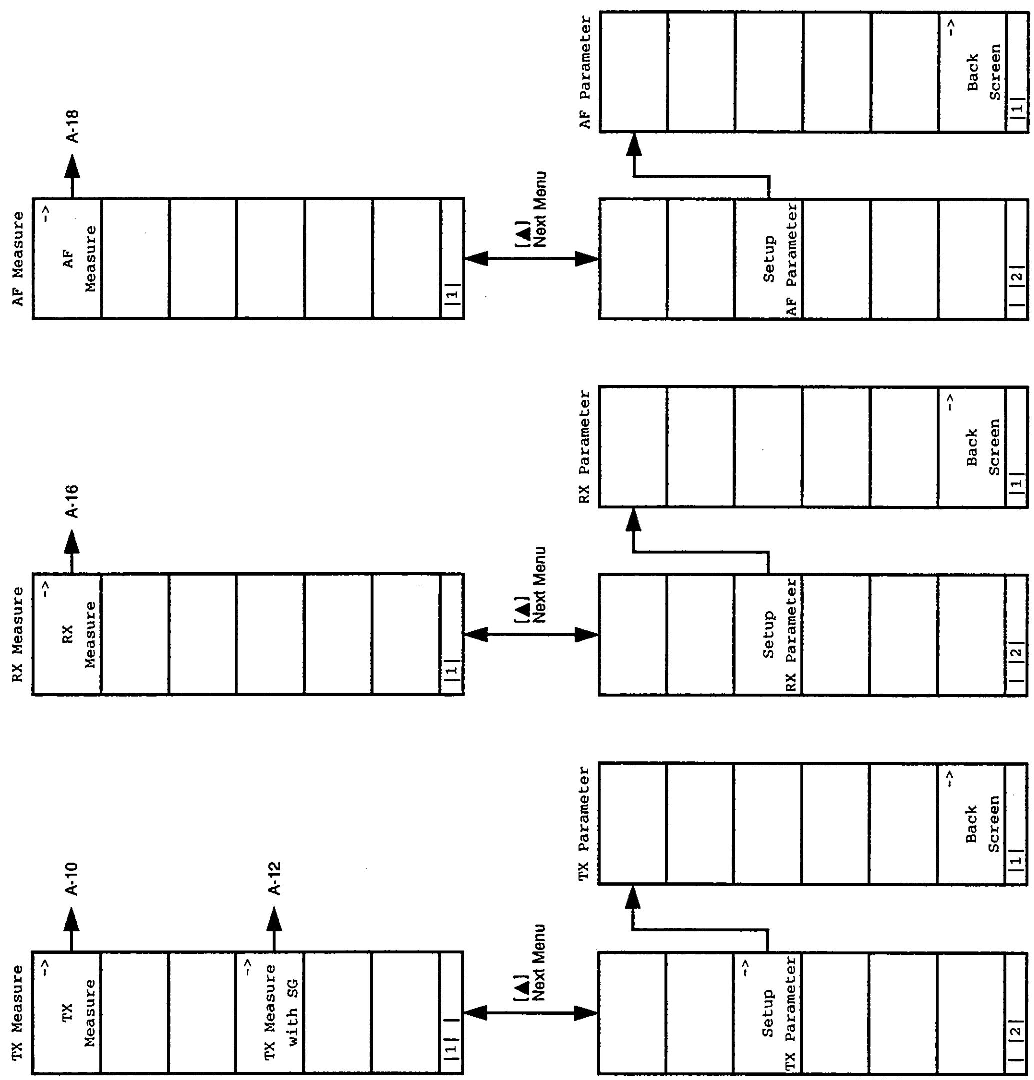


Setup common Parameter screen (When Traffic Channel Band is A800MHz)

If (F1) TX Measure is selected

If (F2) RX Measure is selected

If (F3) AF Measure is selected

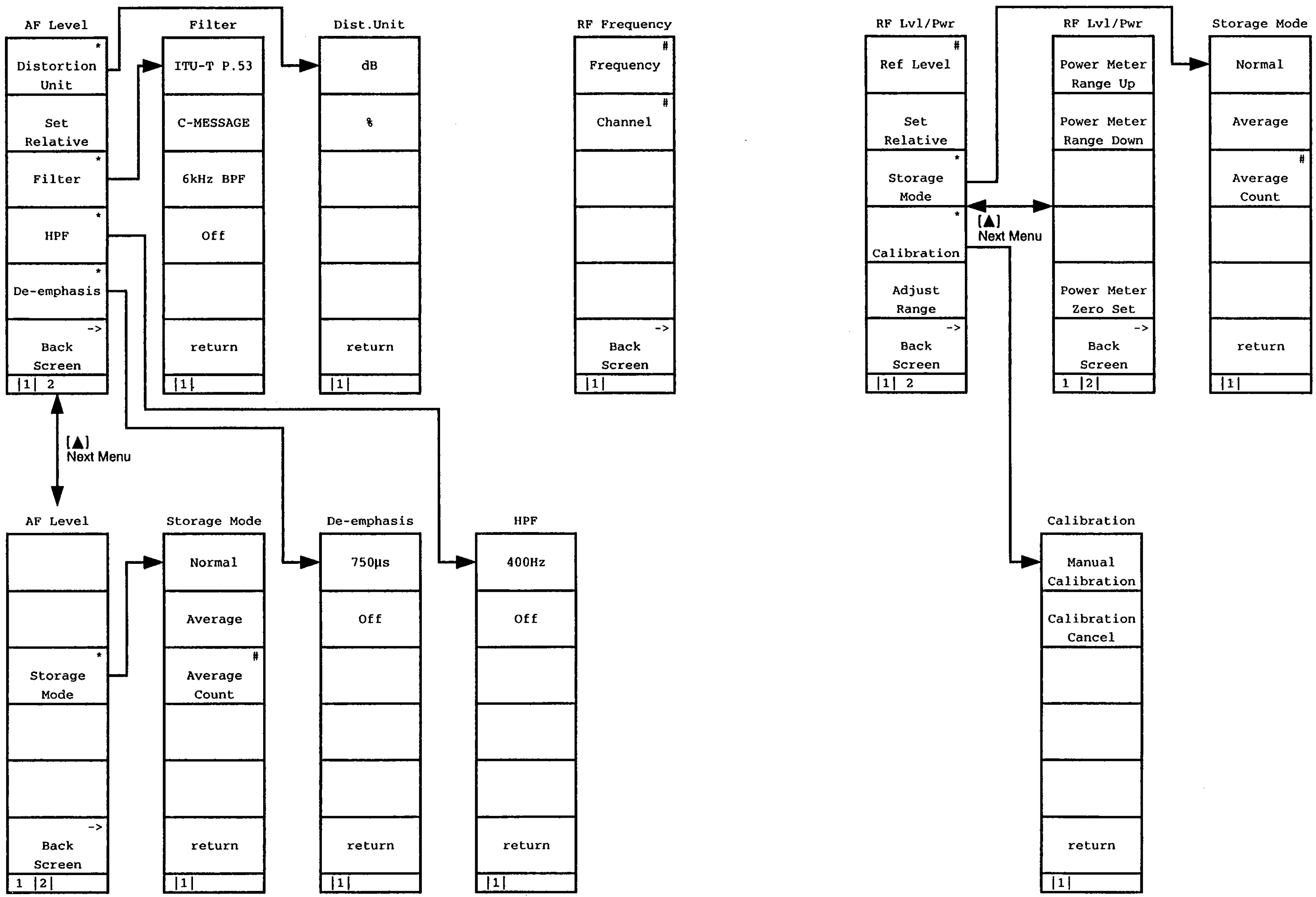


Analog TX Measure screen

If (F1) AF Level is selected

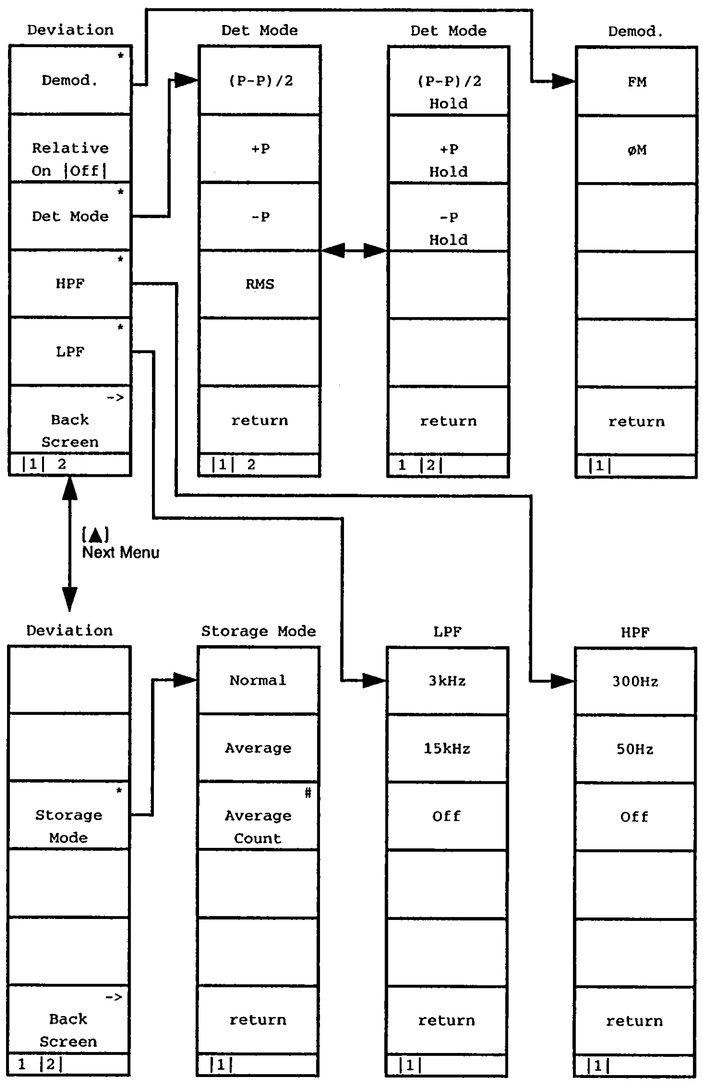
If (F2) RF Frequency is selected

If (F3) RF Level/Power is selected

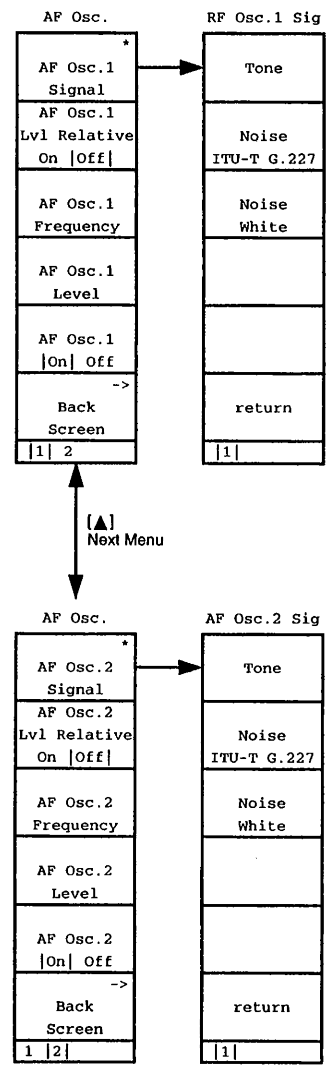


Analog TX Measurement screen

If (F4) Deviation is selected

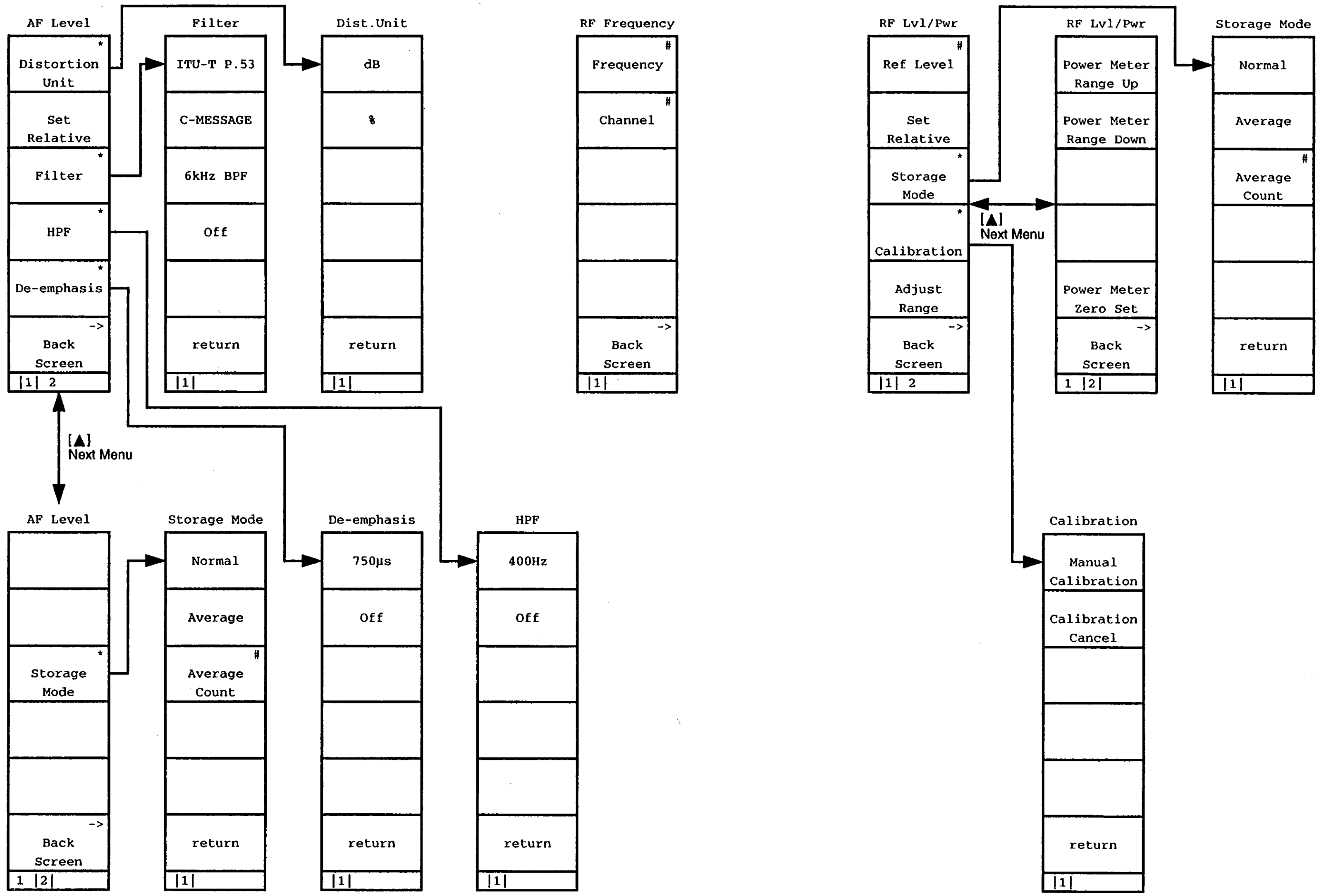


If (F5) AF Osc. is selected



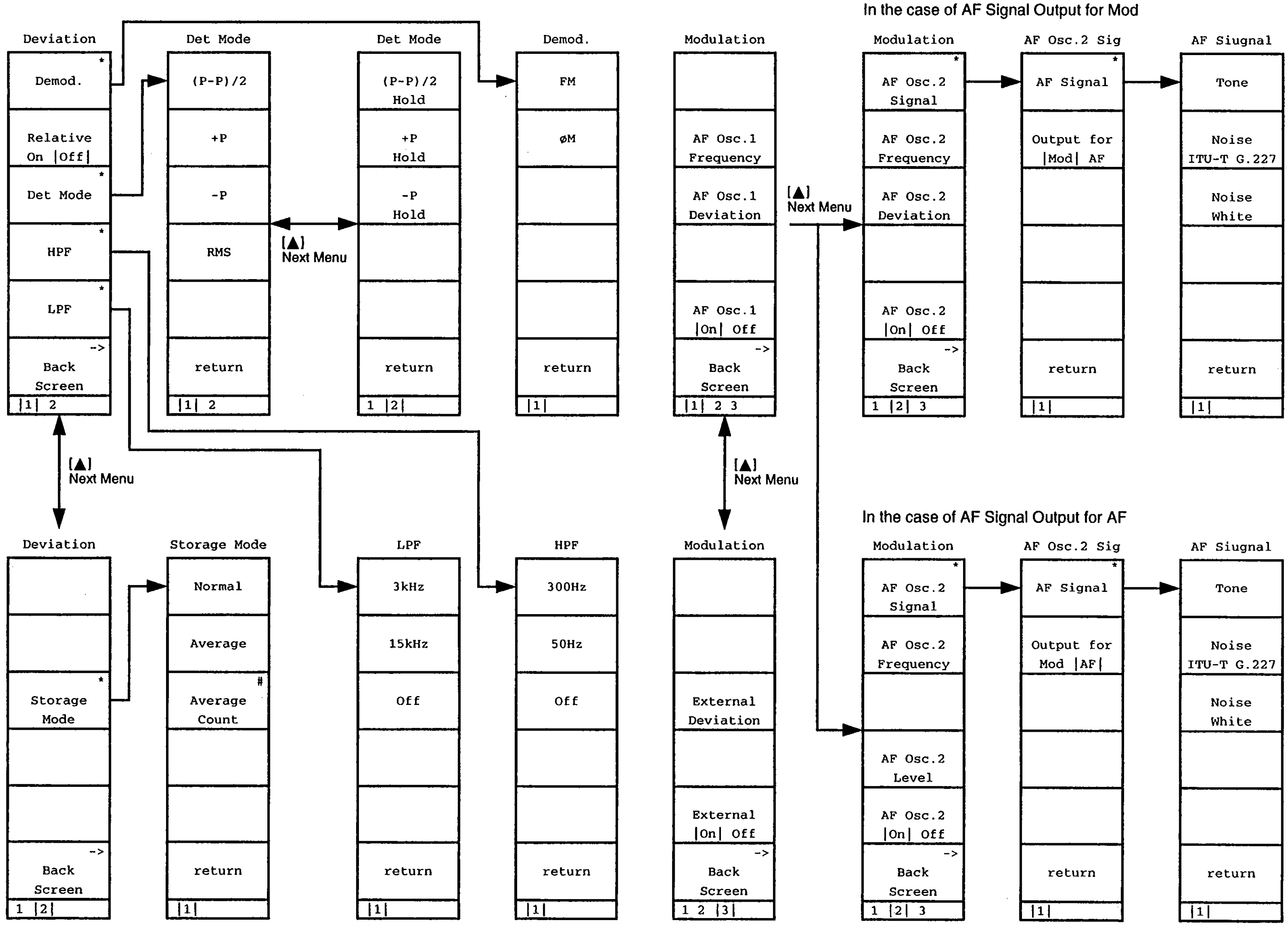
Analog TX Mesurement with SG screen
First page or second page
If (F1) AF Level is selected

First page (Press the Next Menu key [▲] to change to the second page.)
If (F2) TX RF Frequency is selected
If (F3) TX RF Level/Power is selected

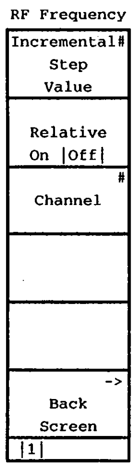


Analog TX Mesurement with SG screen
First page (Press the Next Menu key [▲] to change to the second page.)
If (F4) Deviation is selected

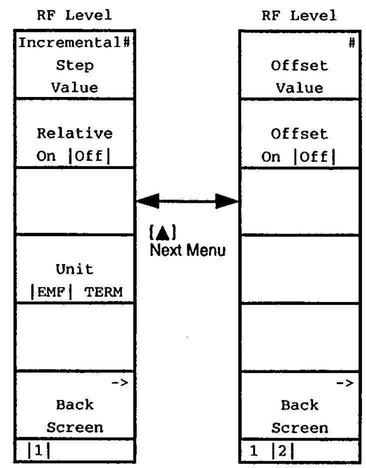
First page or second page
If (F5) Modulation is selected



Analog TX Mesurement with SG screen
Second page (Press the Next Menu key [▲] to change to the first page.)
If (F2) RX RF Frequency is selected



If (F3) RX RF Level is selected

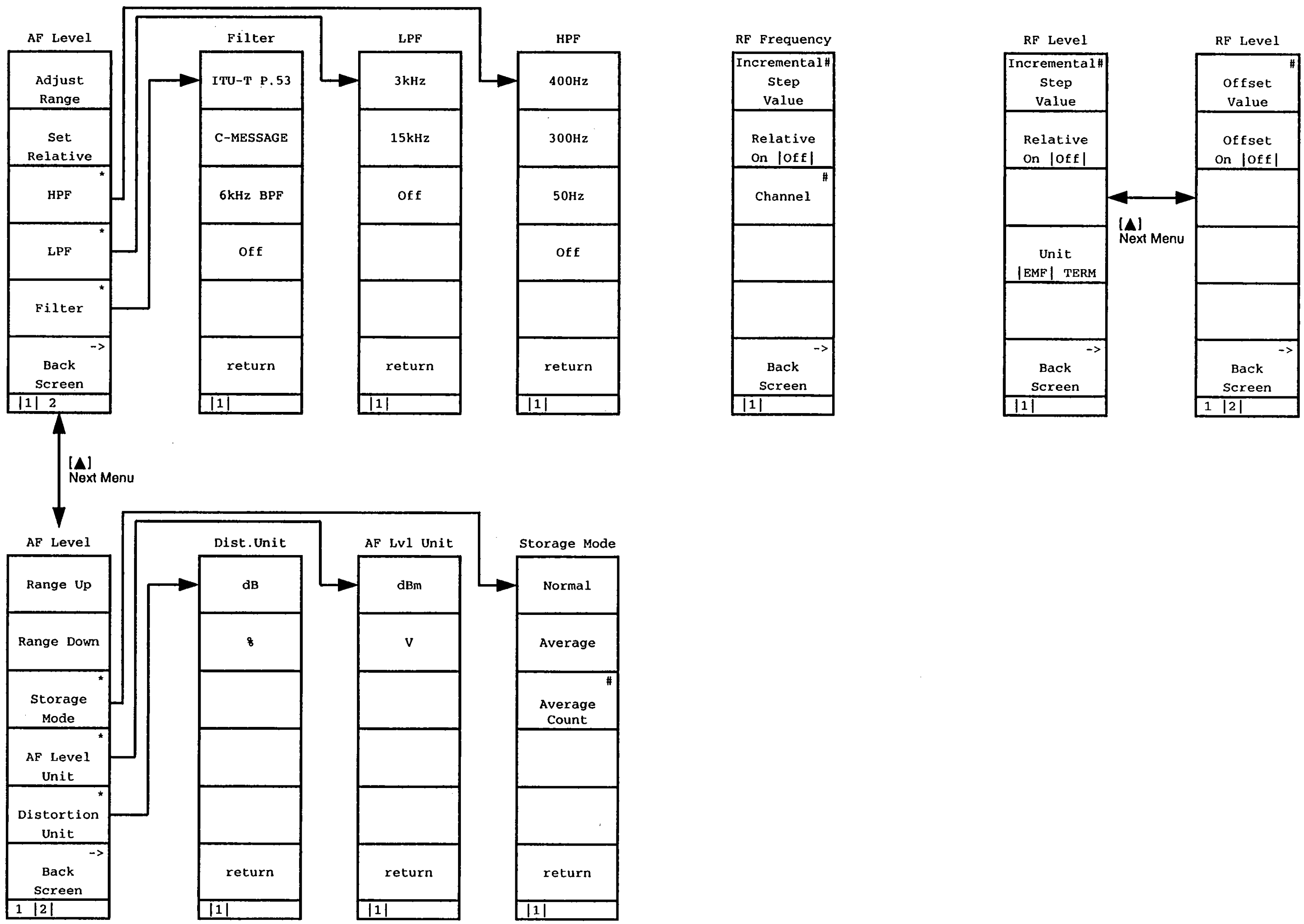


Analog RX Mesurement screen

If (F1) AF Level is selected

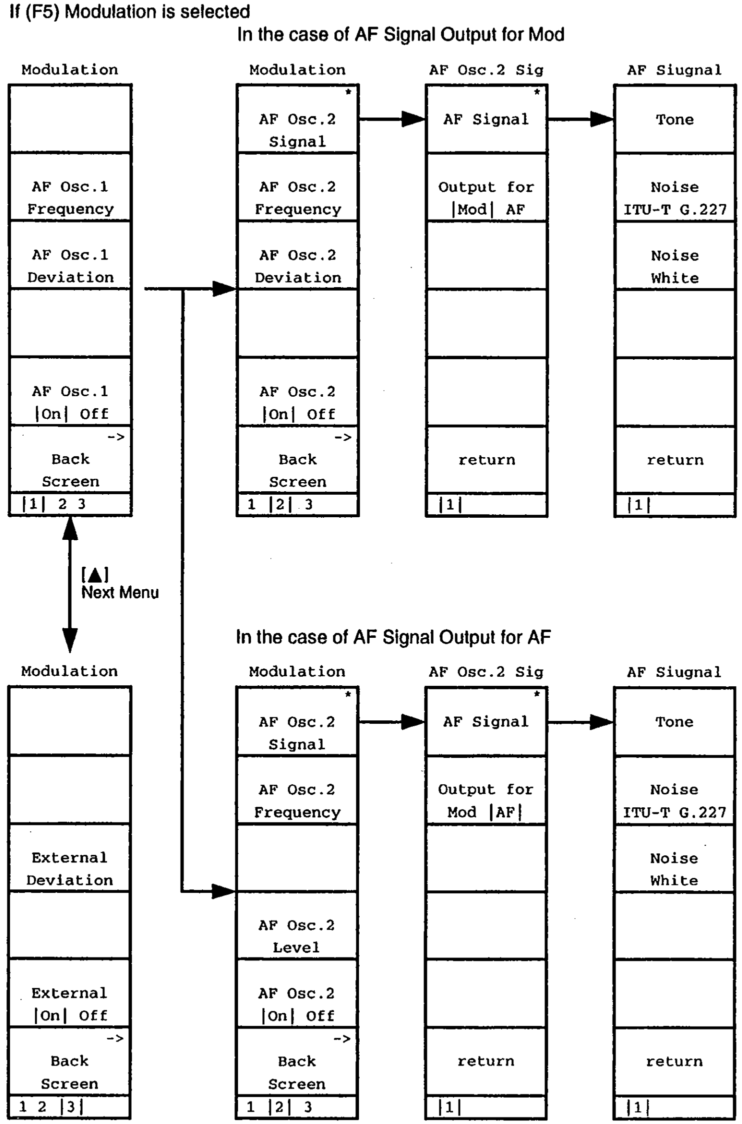
If (F2) RF Frequency is selected

If (F3) RF Level is selected



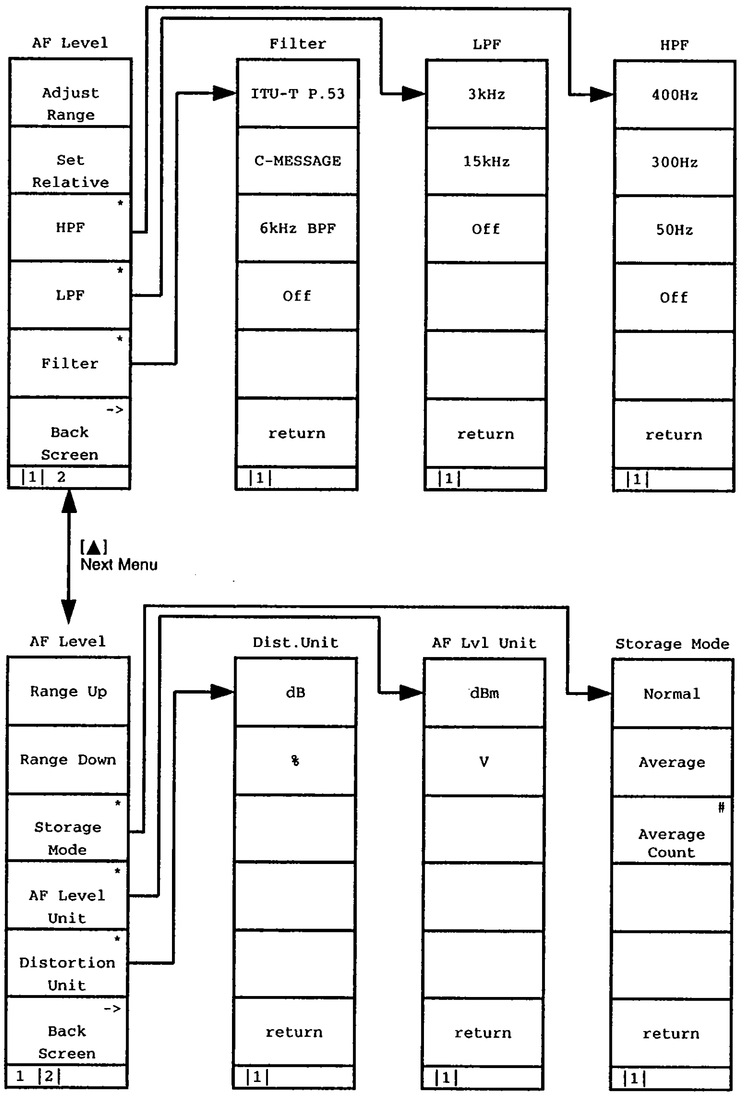
Analog RX Measurement screen

If (F5) Modulation is selected

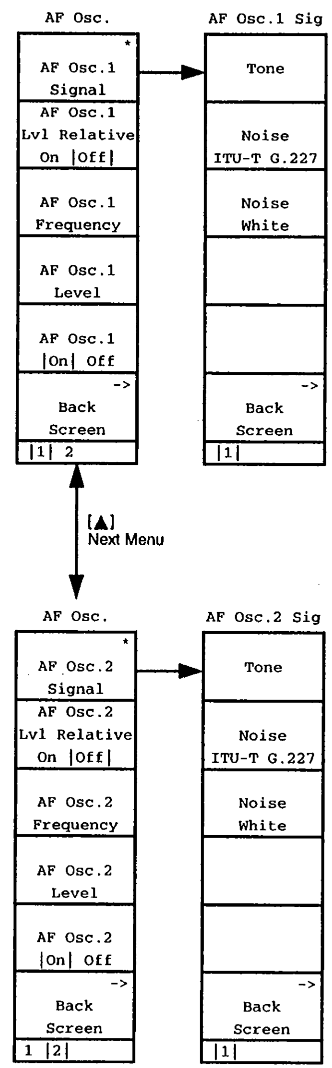


Analog AF Mesurement screen

If (F1) AF Level is selected



If (F5) AF Osc. is selected



APPENDIX B INITIAL VALUES

- The initial value is the value set at factory shipping.
- Items marked with an asterisk (*) is not displayed or selected by default.
- "PS" in the "Initialization" column on the rightmost on the table indicates the item that is initialized with the [Preset] key on the front panal or PRE/INI of the remote control commands.
  "PW" indicates the item initialized with the *RST of the remote control command.
  Items initialized with the PRE/INI commands can also be initialized with the *RST command.
- Items not initialized with those commands above are indicated as "NO."

- Change System screen
  No initial values

- Instrument Setup screen

Item	Initial value	Initialization
Frequency		
Reference Frequency	10 MHz	PW
RF Input/Output	Main	PW
Display		PW
Display Title	User Define	PW
Clock Display	YY/MM/DD (Year, Month, Day)	PW
Interface		
Connect to Controller	GPIB	No
GPIB		
Address	01	No
RS232C		
Baud Rate	2400 bps	No
Parity	Even	No
Data Bit	8 bits	No
Stop Bit	1 bit	No
Hard Copy		
Output Davice	Printer (Parallel)	PW
Type	ESC/P	PW
Alarm	On	PW
[Power On Initial] F9:	Previous Status	No
[File No.] F9	0	No

• Change Color menu

Item	Initial value	Initialization
Change Clr. menu	Color Pattern 1	No
[Define User Color] F11		No

• Setup Common Parameter screen

Item	Initial value	Initialization
DUT Control	None	PW
Frequency (Traffic channel)		
Band	D800 MHz	PW
Channel	1 CH	PW
TX Measure Frequency	825.03 MHz	PW
RX Measure Frequency	870.03 MHz	PW
Frequency (Control channel)		
Band	D800 MHz	PW
Channel	1 CH	PW
Level		
MS Power Lever	2	PW
TX Measure Reference Level		
	30 dBm	PW
RX Measure Output Level		
	–55 dBm	PW
	Off	PW
Signal		
Measuring Object	MS-DTC	PW
Frame Slot Number	1	PW
DVCC	01	PW
Time Alignment	0	PW
SAT	SAT2:6000Hz	PW

• Setup Digital TX Measure Parameter screen

Item	Initial value	Initialization
Measurement Trigger	Sync	PW
User Cal Factor	0.00 dB	PW

• Select All Measure Item screen

Item	Initial value					Initialization
	Measurement	Unit	Judge	Lower	Upper	
1st page						
Modulation Analysis						
10 Bursts Average	On					PW
Frequency	On	(MHz)				PW
Frequency Error	On	kHz	On		±0.200 kHz	PW
RMS Vector Error	On	(%)	On		12.5 %	PW
First 10 Symbols Error	Off	(%)	Off		25.0 %	PW
Peak Vector Error	Off	(%)	Off		25.0 %	PW
Magnitude Error	Off	(%)	Off		12.5 %	PW
Phase Error	Off	(deg)	Off		10.0 deg.	PW
Origin Offset	On	(dB)	On		–20.0 dB	PW
Droop Factor	Off	(N/S)	Off		±0.010000 N/S	PW
Bit rate Error	Off	(ppm)	Off		±5.0 ppm	PW
RF Power						
TX Power	On	dBm	On	24 dBm	30 dBm	PW
Carrier Off Power	On	dBm	On		–60.0 dBm	PW
On/Off Ratio	On	(dB)	On	60.0 dB		PW
Burst Timing	Off	(sym)	Off	–0.25 sym	0.25 sym	PW
Rising Time	Off	(μs)	Off	0.0 μs	123.5 μs	PW
Falling Time	Off	(μs)	Off	0.0 μs	123.5 μs	PW
Template Pass/Fail	Off					
Template	On					
2nd page						
Occupied Bandwidth						
Occupied Bandwidth	Off	(kHz)	Off		32.000 kHz	PW
Lower Limit	Off	(kHz)	Off	–16.000 kHz		PW
Upper Limit	Off	(kHz)	Off		16.000 kHz	PW
Adjacent Channel Power						
Modulation						
±30 kHz Offset	On	dB	On		–26.0 dB	PW
±60 kHz Offset	On		On		–45.0 dB	PW
±90 kHz Offset	On		On		–45.0 dB	PW
Switching Transient						
±30 kHz Offset	On	dB	On		–26.0 dB	PW
±60 kHz Offset	On		On		–45.0 dB	PW
±90 kHz Offset	On		On		–45.0 dB	PW

• All Measure screen

Item	Initial value	Initialization
[Storage Mode] F9:	Normal mode	PS
[Average Count] F9:	10	PS
[Refresh Interval] F10:	Every	PS

• Modulation Analysis screen

Item	Initial value	Initialization
[10 Burst Average] F8:	Off	PS
[Storage Mode] F9:	Normal mode	PS
[Average Count] F9	10	PS
[Refresh Interval] F10:	Every	PS

• Waveform Display screen

Item	Initial value	Initialization
[Marker] F8	Off mode	
[Normal] F7	84 symbol	PS
[Storage Mode] F9	Normal mode	PS
(For Constellation waveform display)		
[Interpolation] F7	Non mode	PS
[Error Scale] F8	Off mode	PS
[Error Scale Offset] F9	0° mode	PS
(For Vector-Error/Phase-Error/Magnitude-Error waveform displays)		
[Vertical Scale] F8		
(Vector Error, Magnitude Error)	20 %	PS
(Phase Error)	20 deg.	PS

• RF Power screen, Recall Template screen

Item	Initial value	Initialization
1st pager		
[Window] F7	Slot	PS
[Marker] F8	Off mode	PS
[Normal] F7	The screen center: 84.00 symbol	PS
[Storage Mode] F9	Normal mode	PS
[Average Count] F9	10	PS
[Refresh Interval] F10	Every	PS
2nd page		
[Setup Template] F7	Standard mode	PW
[Unit] F9	dB	PS
[Level Rel./Abs.] F10	Relative	PS

• Setup Template screen

Item	Initial value	Initialization
Line Level		
1	–60.0 dB	PW
2	4.0 dB	PW
3	–20.0 dB	PW
[Off Level dB dBm] F9	dB	PW

• Save Template screen

Item	Initial value	Initialization
[Save Template] F7		
[File No.] F9	0	–

• Occupied Bandwidth screen

Item	Initial value	Initialization
[Storage Mode] F9	Normal mode	PS
[Average Count] F9	10	PS
[Refresh Interval] F10	Every	PS

• Adjacent Channel Power screen

Item	Initial value	Initialization
Function key:		
[Unit] F8	dBm	PS
[Storage Mode] F9	Normal mode	PS
[Average Count] F9	10	PS
[Refresh Interval] F10	Every	PS

• Power Meter screen

Item	Initial value	Initialization
Range	+40 dBm	PS

• Setup RX Measure Parameter sereen, Recall Pattern screen, Save Pattern screen

Item	Initial value	Initialization
BER Measure		
Input	RF Loopback	PW
Input Data	Positive	PW
Input Data Clock	Rise	PW
–When Measuring Object is Continuous.–		
Pattern	PN9	PW
BER		
Judge	Off	PW
Unit	%	PW
Sample	10000	PW
Upper Limit	3.00 %	PW
–When Measuring Object is MS-DTC.–		
Pattern Data		
SACCH	000	PW
BER		
Judge	Off	PW
Unit	%	PW
Sample	10000	PW
Upper Limit	3.00 %	PW

[Recall Pattern] F7		
[Display Dir] F8		
[File No.] F9	0	–
[File No.] F9	0	–
[Save Pattern] F8		
[Display Dir] F8		
[File No.] F9	0	–
[File No.] F9	0	–

• Bit Error Rate screen

Item	Initial value	Initialization
[RF Level On Off] F4	Off	PS
[Modulation On Off] F5	Off	PS
–Measure menu–		
[Sample] F7	10000	PS
[Start/Stop] F8	Stop	PS
–Frequency menu–		
[Incremental Step Value] F7	1 MHz	PS
[Relative On Off] F8	Off	PS
–Level menu–		
1st page		
[Incremental Step Value] F7	1 dB	PS
[Relative On Off] F8	Off	PS
[Continuous On Off] F9	Off	PS
[Unit EMF TERM] F10:	EMF	PS
2nd page		
[Offset Value] F7	0 dB	PS
[Offset On Off] F8	Off	PS

• File Operation screen

Item	Initial value	Initialization

• Setup Call Proc Parameter screen

Item	Initial value	Initialization
DCCH DVCC	00	PW
ACCH DCC	0	PW
SID	0	PW
DCCH SOC	000	PW
DCCH BSMC	00	PW
Default MSID-IDT	34-bit MIN	PW
Default MSID-MSID	000000000	
AF Osc. (Analog Conversation Mode)		
AF Osc. Output to	FM Mod.	PW
Frequency	1004.0 Hz	PW
Deviation	8.00 kHz	PW

• Sequence Monitor screen

No initial values

- Setup AF Measure Parameter screen

Item	Initial value	Initialization
AF Level input		
Range	30V	PW
Impedance	100kΩ	PW
AF Level output		
Impedance	600Ω	PW

- Setup Analog TX Measure Parameter screen

Item	Initial value	Initialization
User Cal Factor	0.00 dB	PW
RF measure mode	All	PW
Demod output terminal (real panel)		
Range	40 kHz	PW
HPF	300 Hz	PW
LPF	3 kHz	PW
De-emphasis	Off	PW
Squelch	Auto	PW

• Analog TX Measure screen

Item		Initial value	Initialization
• AF Level function key :			
First page			
[Distortion Unit]F7		%	PS
[Filter]F9		Off	PW
[HPF]F10		Off	PW
[De-emphasis]F11		Off	PW
Second page			
[Strage Mode]F9		Normal	PS
[Average Count]F9		10	PS
• RF Frequency function key :			
[Frequency]F7		825.030000 MHz	PW
[Channel]F8		1 CH	PW
• RF Level/Power function key :			
[Ref level]F7	(MAIN)	30.0 dBm	PW
	(AUX)	22.0 dBm	PW
[Strage Mode]F9		Normal	PS
[Average Count]F9		10	PS
• Deviation function key :			
First page			
[Demod.]F7		FM	PW
[Relative On Off]F8		Off	PS
[Det Mode]F9		(P-P)/2	PW
[HPF]F10		Off	PW
[LPF]F11		Off	PW
Second page			
[Strage Mode]F9		Normal	PS
[Average Count]F9		10	PS
• AF Osc. function key :			
First page			
[AF Osc.1 Signal]F7		Tone	PW
[AF Osc.1 Lvl Relative On Off]F8		Off	PS
[AF Osc.1 Frequency]F9		1004.0 Hz	PW
[AF Osc.1 Level]F10		100.0 mV	PW
[AF Osc.1 On Off]F11		On	PS
Second page			
[AF Osc.2 Signal]F7		Tone	PW
[AF Osc.2 Lvl Relative On Off]F8		Off	PS
[AF Osc.2 Frequency]F9		1004.0 Hz	PW
[AF Osc.2 Level]F10		100.0 mV	PW
[AF Osc.2 On Off]F11		Off	PS

• Analog TX Measure with SG screen

Item		Initial value	Initialization
• Main function key :			
Second page			
[RX RF Level On Off]F4		Off	PS
• AF Level function key :			
First page			
[Distortion Unit]F7		%	PS
[Filter]F9		Off	PW
[HPF]F10		Off	PW
[De-emphasis]F11		Off	PW
Second page			
[Strage Mode]F9		Normal	PS
[Average Count]F9		10	PS
• TX RF Frequency function key :			
[Frequency]F7		825.030000 MHz	PW
[Channel]F8		1 CH	PW
• TX RF Level/Power function key :			
First page			
[Ref level]F7	(MAIN)	30.0 dBm	PW
	(AUX)	22.0 dBm	PW
[Strage Mode]F9		Normal	PS
[Average Count]F9		10	PS
• Deviation function key :			
First page			
[Demod.]F7		FM	PW
[Relative On Off]F8		Off	PS
[Det Mode]F9		(P-P)/2	PW
[HPF]F10		Off	PW
[LPF]F11		Off	PW
Second page			
[Strage Mode]F9		Normal	PS
[Average Count]F9		10	PS
• Modulation function key :			
[AF Osc.1 Frequency]F8		1.0040 kHz	PW
[AF Osc.1 Deviation]F9		8.00 kHz	PW
[AF Osc.1 On Off]F11		On	PS
Second page			
[AF Osc.2 Signal]F7			
[AF Signal]F7		Tone	PW
[Output for Mod AF]F8		Mod	PW
[AF Osc.2 Frequency]F8		1.0040 kHz	PW
[AF Osc.2 Deviation]F9		8.00 kHz (only for AF Osc.2 Signal=Mod)	PW
[AF Osc.2 Level]F10		100.0 mV (only for AF Osc.2 Signal=AF)	PW
[AF Osc.2 On Off]F11		Off	PS
Second page			
[External Deviation]F9		8.00 kHz	PW
[External On Off]F11		Off	PS

Item	Initial value	Initialization
• RX RF Frequency function key :		
[Incremental Step Value]F7	1.000 000 MHz	PS
[Relative On Off]F8	Off	PS
[Channel]F9	1 CH	PW
• RX RF Level function key :		
[Incremental Step Value]F7	1.0 dB	PS
[Relative On Off]F8	Off	PS
[Unit EMF TERM]F10	EMF	PS

- Analog RX Measure screen

Item	Initial value	Initialization
• Main function key :		
First page		
[RF Level On Off]F4	Off	PS
• AF Level function key :		
First page		
[HPF]F9	Off	PW
[LPF]F10	Off	PW
[Filter]F11	Off	PW
Second page		
[Strage Mode]F9	Normal	PS
[Average Count]F9	10	PS
[AF Level Unit]F10	V	PS
[Distortion Unit]F11	%	PS
• RF Frequency function key :		
[Incremental Step Value]F7	1.000 000 MHz	PS
[Relative On Off]F8	Off	PS
[Channel]F9	1 CH	PW
• RF Level function key :		
[Incremental Step Value]F7	1.0 dB	PS
[Relative On Off]F8	Off	PS
[Unit EMF TERM]F10	EMF	PS
• Modulation function key :		
First page		
[AF Osc.1 Frequency]F8	1.0040 kHz	PW
[AF Osc.1 Deviation]F9	8.00 kHz	PW
[AF Osc.1 On Off]F11	On	PS
Second page		
[AF Osc.2 Signal]F7		
[AF Signal]F7	Tone	PW
[Output for Mod AF]F8	Mod	PW
[AF Osc.2 Frequency]F8	1.0040 kHz	PW
[AF Osc.2 Deviation]F9	8.00 kHz (only for AF Osc.2 Signal=Mod)	PW
[AF Osc.2 Level]F10	100.0 mV (only for AF Osc.2 Signal=AF)	PW
[AF Osc.2 On Off]F11	Off	PS
Third page		
[External Deviation]F9	8.00 kHz	PW
[External On Off]F11	Off	PS

- AF Measure(Analog) screen

Item	Initial value	Initialization
• AF Level function key :		
First page		
[HPF]F9	Off	PW
[LPF]F10	Off	PW
[Filter]F11	Off	PW
Second page		
[Strage Mode]F9	Normal	PS
[Average Count]F9	10	PS
[AF Level Unit]F10	V	PS
[Distortion Unit]F11	%	PS
• AF Osc. function key :		
First page		
[AF Osc.1 Signal]F7	Tone	PW
[AF Osc.1 Lvl Relative On Off]F8	Off	PS
[AF Osc.1 Frequency]F9	1004.0 Hz	PW
[AF Osc.1 Level]F10	100.0 mV	PW
[AF Osc.1 On Off]F11	On	PS
Second page		
[AF Osc.2 Signal]F7	Tone	PW
[AF Osc.2 Lvl Relative On Off]F8	Off	PS
[AF Osc.2 Frequency]F9	1004.0 Hz	PW
[AF Osc.2 Level]F10	100.0 mV	PW
[AF Osc.2 On Off]F11	Off	PS

APPENDIX C INDEX

• Numbers on the right indicate section and paragraph numbers in this operation manual.

MX880213A
IS-136A Measurement Software
(for MT8802A)
Operation Manual

Remote Control

TABLE OF CONTENTS

SECTION 1
GENERAL

This section outlines the Remote Control functions of the MT8802A Radio Communication Analyzer.

TABLE OF CONTENTS

1.1 General Description

The MT8802A Radio Communication Analyzer, when combined with an external controller, can automate your measurement system. For this purpose, the MT8802A is equipped with an RS-232C interface port and a GPIB interface bus (IEEE Std 488.2-1987) as a standard feature.

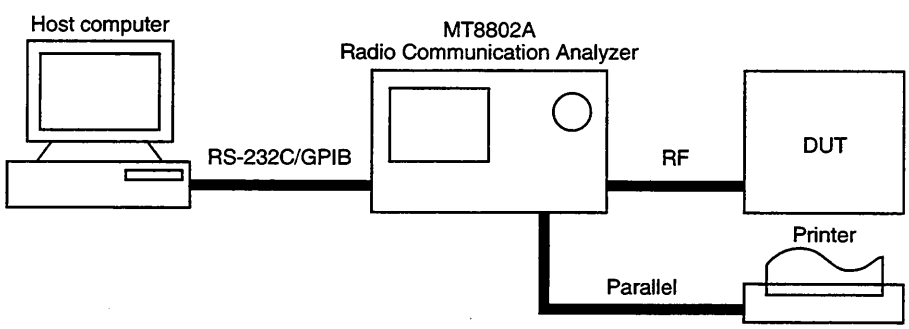
1.2 Remote Control Functions

The Remote Control functions of the MT8802A are as follows:

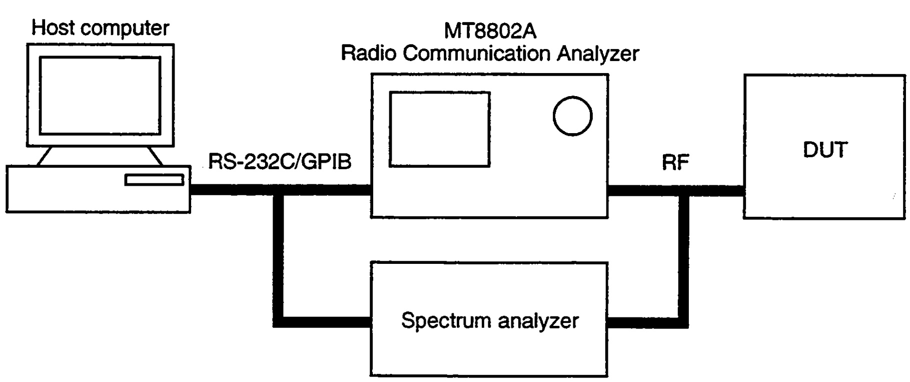
(1) Controls all functions except the power switch, floppy disk unloading , and some keys including the [Local] key
(2) Reads out all setting conditions
(3) Sets the RS-232C interface conditions and GPIB address from the panel
(4) Executes interrupts and serial polling
These functions enable to configure the automatic measurement system when the MT8802A is combined with a personal computer and other measuring instruments

1.3 Example of System Configuration Using RS-232C/GPIB

(1) Control by the host computer (1)



(2) Control by the host computer (2)



1.4 RS-232C Specifications

The RS-232C specifications of the MT8802A are shown in the table below.

Item	Specification
Function	Control from an external controller (except power switch)
Communication system	Asynchronous (start-stop method), half-duplex
Communication control	X-ON/OFF control
Baud rate	1200, 2400, 4800, 9600 bps
Data bits	7 bits, 8 bits
Parity	Odd, Even, None
Start bit	1 bit
Stop bit	1 bit, 2 bits
Connector	D-sub 9 pins, female

1.5 GPIB Specifications

The GPIB of the MT8802A provides the IEEE488.1 interface function subsets listed in the table below.

GPIB Interface Functions

Code	Interface function
SH1	All source handshake functions are provided. Synchronizes the timing of data transmission.
AH1	All acceptor handshake functions are provided. Synchronizes the timing for receiving data.
T6	Synchronizes the timing for receiving data. The serial poll function is provided. The talk-only function is not provided. The talker can be canceled by MLA.
L4	Basic listener functions are provided. The listen-only function is not provided. The listener can be canceled by MTA.
SR1	All service request and status byte functions are provided.
RL1	All remote/local functions are provided. The local lockout function is provided.
PP0	Parallel poll functions are not provided.
DC1	All device clear functions are provided.
DT1	The device trigger function is provided.
C0	Controller functions are not provided.

SECTION 2
DEVICE MESSAGES

This section outlines and lists the device messages of the MT8802A.

TABLE OF CONTENTS

2.1 General Description

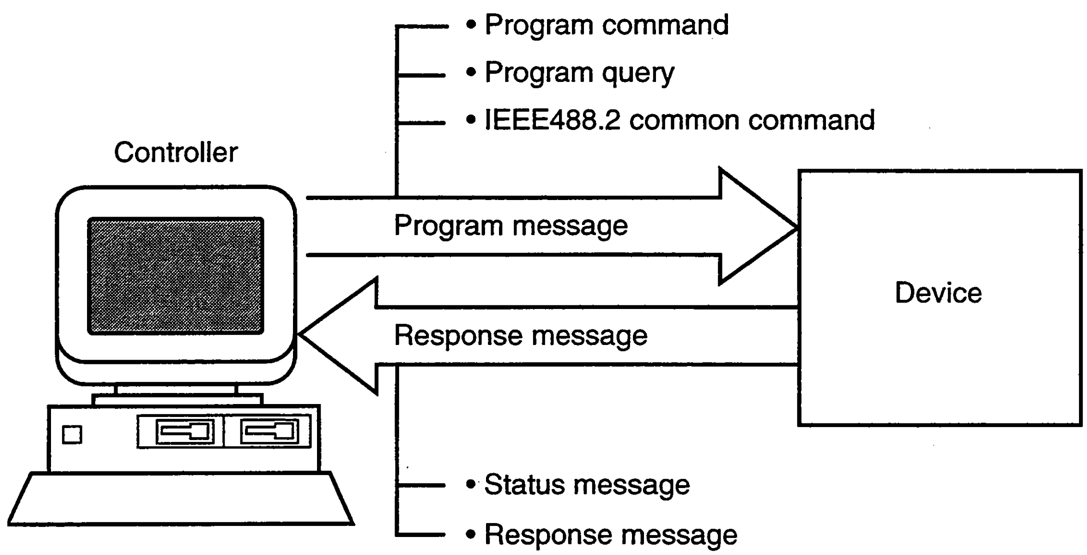
A device message is a data message transmitted between the controller and device via the system interface. Device messages are classified into program messages and response messages.

A program message is an ASCII data message transferred from the controller to the device. Program messages are classified into program commands and program queries.

Program commands are classified into device-specific commands used exclusively to control the MT8802A, and IEEE488.2 common commands. IEEE488.2 common commands are also used for other measuring instruments conforming to IEEE488.2 connected to the bus.

A program query is a command used to obtain a response message from the device. It is transferred from the controller to the device in advance, then the controller receives the response message from the device.

A response message is an ASCII data message transferred from the device to the controller.



Program messages and response messages may have a suffix (units) at the end of the numeric data.

2.2 Suffix Code

The table below shows the suffixes used for the MT8802A.

MT8802A Suffix Codes

Type	Unit	Suffix code
Frequency	GHz	GHZ, GZ
	MHz	MHZ, MZ
	kHz	KHZ, KZ
	Hz	HZ
	Default	HZ
Time	second	S
	m second	MS
	μsecond	US
	Default	MS
Level (dB)	dB	DB
	dBm	DBM, DM
	dBμ	DBU
	Default	Determined in conformance with the set scale unit
Level (W)	W	W
	mW	MW
	μW	UW
	nW	NW
	Default	UW
Level (V)	V	V
	mV	MV
	μV	UV
	Default	V

2.3 IEEE488.2 Common Commands and Supported Commands

The table below lists 39 common commands specified in the IEEE488.2 standard. IEEE488.2 common commands which are supported by the MT8802A are indicated with the ◎ symbol in the table.

Mnemonic	Command name	IEEE488.2 standard	MT8802A supported commands
*ADD	Accept Address Command	Optional	
*CAL	Calibration Query	Optional	
*CLS	Clear Status Command	Mandatory	◎
*DDT	Define Device Trigger Command	Optional	
*DDT?	Define Device Trigger Query	Optional	
*DLF	Disable Listenner Function Command	Optional	
*DMC	Define Macro Command	Optional	
*EMC	Enable Macro Command	Optional	
*EMC?	Enable Macro Query	Optional	
*ESE	Standard Event Status Enable Command	Mandatory	◎
*ESE?	Standard Event Status Enable Query	Mandatory	◎
*ESR?	Standard Event Status Register Query	Mandatory	◎
*GMC?	Get Macor contents Query	Optional	
*IDN?	Identification Query	Mandatory	◎
*IST?	Individual Status Query	Optional	
*LMC?	Learn Macro Query	Optional	
*LRN?	Learn Device Setup Query	Optional	
*OPC	Operation Complete Command	Mandatory	◎
*OPC?	Operation Complete Query	Mandatory	◎
*OPT?	Option Identification Query	Optional	
*PCB	Pass Control Back Command	Mandatory if other than C0	
*PMC	Purge Macro Command	Optional	
*PRE	Parallel Poll Register Enable Command	Optional	
*PRE?	Parallel Poll Register Enable Query	Optional	
*PSC	Power On Status Clear Command	Optional	
*PSC?	Power On Status Clear Query	Optional	
*PUD	Protected User Data Command	Optional	
*PUD?	Protected User Data Query	Optional	
*RCL	Recall Command	Optional	
*RDT	Resource Description Transfer Command	Optional	
*RDT?	Resource Description Transfer Query	Optional	
*RST	Reset Command	Mandatory	◎
*SAV	Save Command	Optional	
*SRE	Service Request Enable Command	Mandatory	◎
*SRE?	Service Request Enable Query	Mandatory	◎
*STB?	Read Status Byte Query	Mandatory	◎
*TRG	Trigger Command	Mandatory if DT1	◎
*TST?	Self Test Query	Mandatory	◎
*WAI	Wait to Continue Command	Mandatory	◎

Note:The first character of IEEE488.2 common commands is always *.

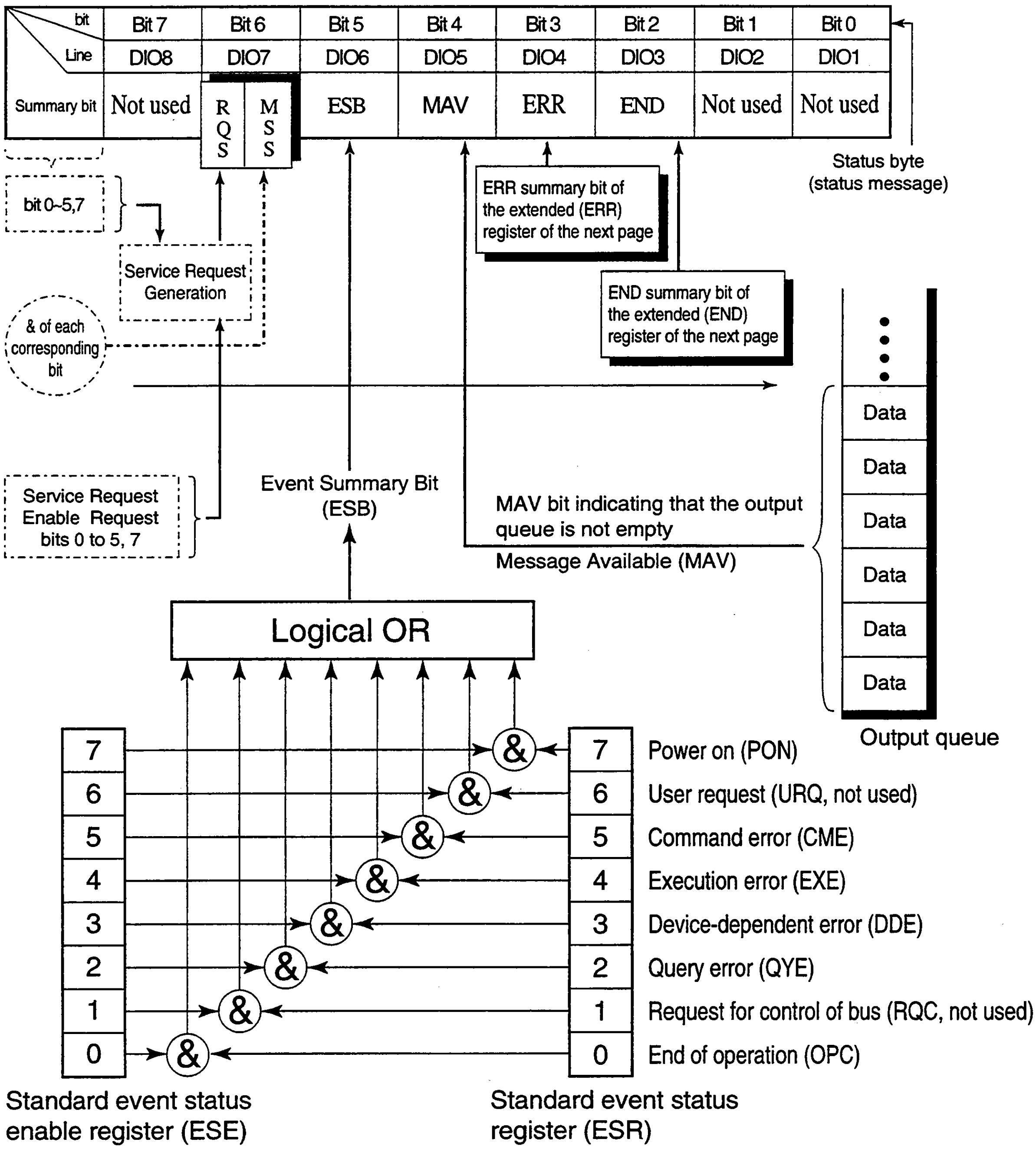
Table below lists the IEEE488.2 common commands used in the MT8802A.

IEEE488.2 common command

Command name	Program Msg.	Query Msg.	Response Msg.	Remarks
Clear status	*CLS	---	---	
Standard event status enable	*ESE n	*ESE?	n	n:0 to 255
Standard event status register	---	*ESR?	n	n:0 to 255
Identification query	---	*IDN?	id	ID:Manufacturer name, model name, etc.
Operation complete	*OPC	*OPC?	1	
Reset	*RST	---	---	
Service request enable	*SRE	*SRE?	n	"n:0 to 63,128 to 191"
Read status byte	---	*STB?	n	
Trigger	*TRG	---	---	
Self test	---	*TST?	n	
Wait to continue	*WAI	---	---	

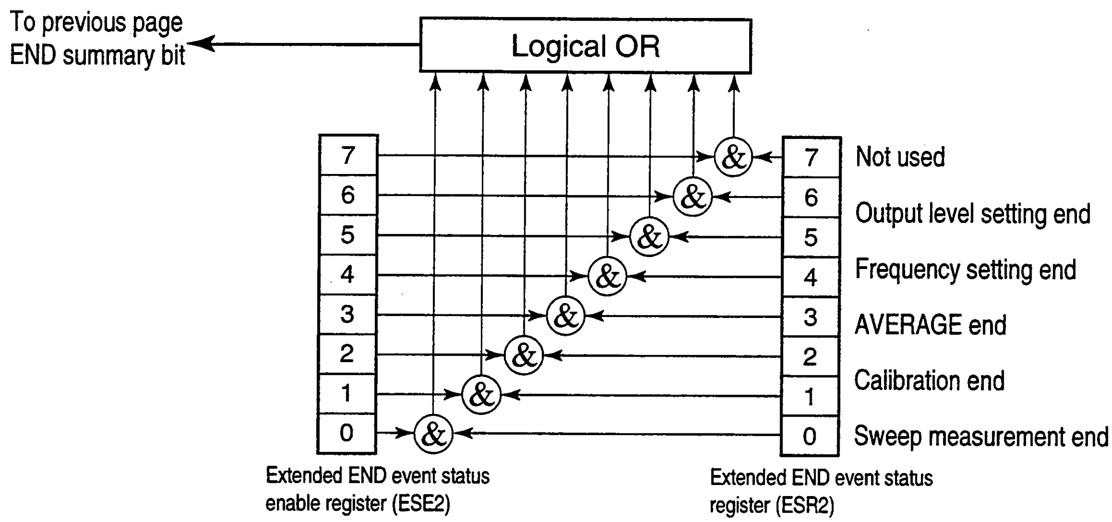
2.4 Status Messages

The diagram below shows the structure of service-request summary messages for the status byte register (STB) used with the MT8802A.

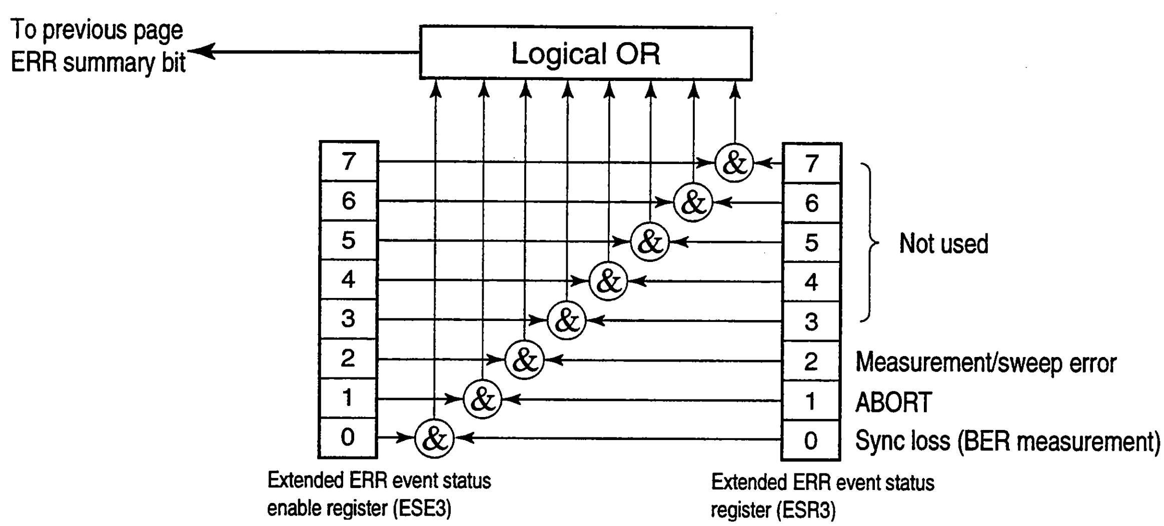


Standard Event Status (STB) Register

Note: & indicates a logical product (AND).



Extended Event Status (END) Register



Extended Event Status (ERR) Register

2.5 Device Message List

MT8802A-specific program commands, query messages, and response messages are listed from paragraph 2.5.1.

• Device message table

(a) Program messages (Program Msg)/query message (Query Msg)

(i)	Uppercase characters	:	Reserved words
(ii)	Numeric	:	Reserved words (numeric code)
(iii)	Lowercase characters in argument		
	f (frequency)	:	Real number or integer with decimal point
		Units :	GHZ, MHZ, KHZ, HZ, GZ, MZ, KZ, no units = HZ
	t(time)	:	Real number or integer with decimal point
		Units :	S, SC, MS, US, no unit = US
	ℓ (level)	:	Real number or integer with decimal point
		Units :	DB, DBM, DM, DBU, W, MW, UW, NW, no units = set SCALE units
	n (no units integer)	:	Integer
	r (no units real number)	:	Real number
	h (no units hexadecimal number)	:	Hexadecimal number
	Others	:	Listed in remarks columns of the table

(b) Response messages (Response Msg)

(i)	Uppercase characters	:	Reserved words
(ii)	Numeric	:	Reserved words (numeric code)
(iii)	Lowercase characters in argument		
	f (frequency)	:	12-character fixed integerunits = HZ
	t (time)	:	Real number or integer with decimal point
	ℓ (level)	:	Real number or integer with decimal point
	u (ratio)	:	Real number or integer with decimal point
	s (symbol)	:	Real number or integer with decimal point
	n (no units integer)	:	Integer, variable number of digits (Significant digits are output.)
	r (no units real number)	:	Real number with decimal point, variable number of digits (Significant digits are output.)
	h (no units hexadecimal number)	:	Hexadecimal number
	Others	:	Written in remarks columns of the table

Notes:
- Integer:NR1 format, real number:NR2 format
- Ø /:Zero

Device messages are classified into ten types according to valid ranges:

1. MT8802A common commands	:	Valid in all MT8802A modes
2. Instrument Setup command	:	Valid in Instrument Setup panel mode
3. TX/RX tester commands	:	Valid in TX/RX tester panel mode (on all TX/RX test screens)
4. Setup Common Parameter screen commands	:	Valid on the Setup Common Parameter screen
5. Digital TX measure command	:	Valid in a range defined on each Digital TX measure screen
6. Analog TX measure command	:	Valid in a range defined on each analog TX measure screen
7. Digital RX measure command	:	Valid in a range defined on each digital RX measure screen
8. Analog RX measure command	:	Valid in a range defined on each analog RX measure screen
9. AF measure command	:	Valid in a range defined on each AF measure screen
10. Call Processing command	:	Valid in a range defined on each Call Processing screen

These device messages are listed below.

• Relationship between screen hierarchies and commands

[MT8802A common commands]:Valid in all MT8802A modes regardless of screen hierarchies

Save/Recall command
FD command (Verify)
Copy command
Single/Continuous switching command
Preset command
Panel mode switching command
Switch to upper screen command (BS: Back Screen)
Extended event status command (END, ERR)

[Screen hierarchies and commands]

Panel mode switching command (PNLMD)

- Instrument Setup panel mode
  Instrument Setup screen: Instrument Setup command
- TX/RX tester panel mode
  TX/RX tester command
  Measure screen switching command (MEAS)
  - Setup Common Parameter screen switching commands
    - Setup Common Parameter screen
      Setup Common Parameter screen commands
      Traffic Channel Band switching command (FERQBAND)
      - Digital measure mode (D800MHz, D1900MHz)
      - Analog measure mode (A800MHz)
  - Digital TX measure screen switching commands
    Digital TX measure common commands
    Waveform memory read command
    - Setup Digital TX Measure Parameter screen
      Setup Digital TX Measure Parameter screen command
    - Modulation Analysis screen
      Modulation Analysis screen command
    - Waveform Display screen
      Waveform Display screen command
    - RF Power screen
      RF Power screen command
    - Setup Template screen
      Setup Template screen command
    - Occupied Bandwidth screen
      Occupied Bandwidth screen command
    - Adjacent Ch. Power screen
      Adjacent Ch. Power screen command
    - Power Meter screen
      Power Meter screen command
    - Select All Measure Item screen
      Select All Measure Item screen command
    - All Measure screen
      All Measure screen command
  - Analog TX measure screen switching commands
    - Setup Analog TX Measure Parameter screen
      Setup Analog TX Measure Parameter screen command
    - Analog TX Measure screen
      Analog TX Measure screen command
    - Analog TX Meas with SG screen
      Analog TX Meas with SG screen command
  - Digital RX measure screen switching commands
    - Setup Digital RX Measure Parameter screen
      Setup Digital RX Measure Parameter screen command
    - Bit Error Rate screen
      Bit Error Rate screen command
  - Analog RX measure screen switching commands
    - Setup Analog RX Measure Parameter screen
      Setup Analog RX Measure Parameter screen command
    - Analog RX Measure screen
      Analog RX Measure screen command
  - AF signal measure screen switching commands
    - Setup AF Measure screen
      Setup AF Measure screen command
    - AF Measure screen
      AF Measure screen command
  - Call Processing screen switching commands
    - Setup Call Proc. Parameter screen
      Setup Call Proc. parameter screen command
    - Sequence Monitor screen
      Sequence Monitor screen command

2.5.1 MT8802A common commands

MT8802A common commands are valid in all MT8802A modes.

(1) Save/Recall commands (parameter saving and recalling)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Recall	Recall file		RCM n	---	---	
Save	Save file		SVM n	---	---	

(2) FD commands (verify)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Verify	On	VERIFY ON	VERIFY?	ON	
		Off	VERIFY OFF	VERIFY?	OFF	

(3) Copy commands (copy)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Copy		PRINT	---	---	
			PLS Ø	---	---	

(4) Single/Continuous switching commands

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Single sweep	Measurement/	SNGLS	---	---	
		Sweep start	S2	---	---	
		Measurement/	SWP	---	---	
		Sweep synchronization	TS	---	---	
	Continuous		CONTS	---	---	
			S1	---	---	
	Measurement/	Sweep end	---	SWP?	SWP Ø	
	Sweep status	Sweep	---	SWP?	SWP 1	

(5) Preset commands (initialization, power-on setting)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Preset		PRE	---	---	
			INI	---	---	
			IP	---	---	
	Preset value	Previous state	POWERON LAST	POWERON?	LAST	
		Recall memory No.	POWERON n	POWERON?	n	

(6) Panel-mode switching commands (TX/RX tester panel mode, Instrument Setup panel mode)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	TX/RX tester		PNLMD TESTER	PNLMD?	TESTER	
	Analog		PNLMD ANALOG	PNLMD?	ANALOG	
	Instrument setup		PNLMD SYSTEM	PNLMD?	SYSTEM	

(7) Switch to upper screen command (BS)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Back screen		BS	---	---	

(8) Extended event status commands (END)

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Event status	END event status	Enable register	ESE2 n	ESE2?	n	
		Status register	---	ESR2?	n	
	ERR event status	Enable register	ESE3 n	ESE3?	n	
		Status register	---	---	n	

2.5.2 Instrument Setup commands

The Instrument Setup command is valid in Instrument Panel mode.

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Hardware	Reference frequency	10MHz	REF 10MHZ	REF?	10MHZ	
		13MHz	REF 13MHZ	REF?	13MHZ	
		Main	RFINOUT MAIN	RFINOUT?	MAIN	
		AUX	RFINOUT AUX	RFINOUT?	AUX	
Display	Display	On	DSPL ON	---		
		Off	DSPL OFF	---		
	Title display	DATE/TIME	TTL DATE	TTL?	DATE	
		USER define	TTL USER	TTL?	USER	
		OFF	TTL OFF	TTL?	OFF	
	Title input	User title	TITLE a	TITLE?	a	
			KSE a	---	---	
	Select date display mode	Japan (yy/mm/dd)	DATEMODE YMD	DATEMODE?	YMD	
		USA (mm-dd-yy)	DATEMODE MDY	DATEMODE?	MDY	
		Europe (dd-mm-yy)	DATEMODE DMY	DATEMODE?	DMY	
	Set and read date	Japan (yy/mm/dd)	DATE yy,mm,dd	DATE?	yy,mm,dd	
	Set and read time		TIME hh,mm,ss	TIME?	hh,mm,ss	
Buzzer	Buzzer switch	On	ALARM ON	ALARM?	ON	
			BEP 1	---	---	
			BEP ON	---	---	
		Off	ALARM OFF	ALARM?	OFF	
			BEP Ø	---	---	
			BEP OFF	---	---	
	Sounds buzzer		BZR	---	---	
GPIB	Terminater	LF	TRM Ø	---	---	
		CR/LF	TRM 1	---	---	
RS232C	Baud rate	9600	BAUD 96ØØ	BAUD?	96ØØ	
		4800	BAUD 48ØØ	BAUD?	48ØØ	
		2400	BAUD 24ØØ	BAUD?	24ØØ	
		1200	BAUD 12ØØ	BAUD?	12ØØ	
	Parity	Even	PRTY EVEN	PRTY?	EVEN	
		Odd	PRTY ODD	PRTY?	ODD	
		Off	PRTY OFF	PRTY?	OFF	
	Date bit	7bits	DTAB 7	DTAB?	7	
		8bits	DTAB 8	DTAB?	8	
	Stop bit	1bit	STPB 1	STPB?	1	
		2bits	STPB 2	STPB?	2	

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Time out		TOUT t	TOUT?	t	
	Delimiter	LF	DELM Ø	---	---	
		CR/LF	DELM 1	---	---	
Print	Type	ESC/P (24DOT)	PMOD 6	PMOD?	6	
		HP	PMOD 3	PMOD?	3	
		BMP(B&W)	PMOD11	PMOD?	11	
Color	Select pattern	Pattern1	COLORPTN COLOR1	COLORPTN?	COLOR1	
		Pattern2	COLORPTN COLOR2	COLORPTN?	COLOR2	
		Pattern3	COLORPTN COLOR3	COLORPTN?	COLOR3	
		Pattern4	COLORPTN COLOR4	COLORPTN?	COLOR4	
		User pattern	COLORPTN USERCOLOR	COLORPTN?	USERCOLOR	
	Copy from	Pattern1	COPYCOLOR COLOR1	---	---	
		Pattern2	COPYCOLOR COLOR2	---	---	
		Pattern3	COPYCOLOR COLOR3	---	---	
		Pattern4	COPYCOLOR COLOR4	---	---	
	User define	Red, green, blue	COLORDEF n,r,g,b,	COLORDEF? n	r,g,b	n:Frame number

2.5.3 TX/RX/Call-Processinng screen switching commands

- The TX/RX tester commands are valid in TX/RX tester panel mode (on all TX/RX test screens).
  Note that, the TX/RX tester command depends on the analog measure mode/digital measure mode as shown below.(The analog measure mode/digital measure mode is set by Traffic Channel Band switching command "FREQBAND.")
- Query messages for the Setup Common Parameter screen command are also valid on the Setup Common Parameter and lower screens (all TX/RX test screens). (See paragraph 2.5.4.)

(1) System-mode switching commands (IS-136)

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
IS136		SYS IS136	SYS?	IS136	

(2) Setup Common Parameter screen switching command

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Setup common parameter		MEAS SETCOM	MEAS?	SETCOM	

(3) Digital TX Measure screen switching command

The digital TX measure screen switching command is valid in digital measure mode.

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Setup Digital TX parameter		MEAS SETDTX	MEAS?	SETDTX	
		MEAS SETTX	MEAS?	SETDTX	
Select TX all measure item		MEAS TXITEM	MEAS?	TXITEM	
TX all measure		MEAS TXALL	MEAS?	TXALL	
Modulation analysis		MEAS MODANAL	MEAS?	MODANAL	
Waveform display		MEAS WAVEFORM	MEAS?	WAVEFORM	
RF power		MEAS RFPWR	MEAS?	RFPWR	
Setup template		MEAS SETTEMP	MEAS?	SETTEMP	
Occupied bandwidth	High speed	MEAS OBW,HIGH	MEAS?	OBW,HIGH	
Adjust channel power	High speed	MEAS ADJ,HIGH	MEAS?	ADJ,HIGH	
Power meter		MEAS PWRMTR	MEAS?	PWRMTR	

(4) Analog TX Measure screen switching command

The analog TX measure screen switching command is valid in analog measure mode.

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Setup Analog TX Parameter		MEAS SETATX	MEAS?	SETATX	
		MEAS SETTX	MEAS?	SETATX	
Analog TX Measure		MEAS ATX	MEAS?	ATX	
		MEAS TX	MEAS?	ATX	
Analog TX Meas with SG		MEAS ATXSG	MEAS?	ATXSG	
		MEAS TXSG	MEAS?	ATXSG	

(5) Digital RX Measure screen switching command

The digital RX measure screen switching command is valid in digital measure mode.

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Setup Digital RX parameter		MEAS SETDRX	MEAS?	SETDRX	
		MEAS SETRX	MEAS?	SETDRX	
Bit error rate		MEAS BER	MEAS?	BER	

(6) Analog RX Measure screen switching command

The analog RX measure screen switching command is valid in analog measure mode.

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Setup Analog RX Parameter		MEAS SETARX	MEAS?	SETARX	
		MEAS SETRX	MEAS?	SETARX	
Analog RX Measure		MEAS ARX	MEAS?	ARX	
		MEAS RX	MEAS?	ARX	

(7) AF Measure screen switching command

The AF measure screen switching commands is valid in analog measure mode.

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Setup AF Parameter		MEAS SETAF	MEAS?	SETAF	
AF Measure		MEAS AF	MEAS?	AF	

(8) Call Processing screen switching command

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Setup Call Processing		MEAS SETCALL	MEAS?	SETCALL	
Sequence monitor		MEAS SEQMON	MEAS?	SEQMON	

(9) Measure result status command

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Measure result status		---	MSTAT?	n	

- Response value n of MSTAT?

  The response value n of MSTAT? (measure result status command) depends on the analog/digital measure mode.

  For digital measure mode

Value of n	Explanation
0	Normal termination
1	RF input limit
2	Level over
3	Level under
4	Unmeasurable
5	Synchronous word undetectable
6	Synchronization being established (BER Measure)
7	Synchronization loss (BER Measure)
8	Overflow (BER Measure)
9	Unmeasured
10	Parity Error (Call Processing)
11	SACCH Invalid (Call Processing)

For analog measure mode

Value of n	Explanation
0	Normal termination
1	RF input limit
2	Level over
3	Level under
4	Unmeasurable
5	Deviation under
9	Unmeasured

(10) Trigger timeout command

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Trigger timeout		TRGWAIT s	TRGWAIT?	s	

(11) RF Input/output connector switching command

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
RF in/out	Main	RF INOUT MAIN	RFINOUT?	MAIN	
	Aux	RF INOUT AUX	RFINOUT?	AUX	

(12) 10 MHz/13 MHz reference input testing command

Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Reference Input		---	EXTREF?	a	a: VALID, INVALID

2.5.4 Setup Common Parameter screen commands

- Program messages for the Setup Common Parameter screen commands are valid on the Setup Common Parameter screen.
- Query messages for the Setup Common Parameter screen commands are valid on the Setup Common Parameter and lower screens (all TX/RX test screens).

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
DUT control	DUT control	Call Proc	DUTCTRL CALLP	DUTCTRL?	CALLP	
		None	DUTCTRL NONE	DUTCTRL?	NONE	
Frequency Traffic channel	Band	D800MHz	FREQBAND D8ØØMHZ	FREQBAND?	D8ØØMHZ	
			FREQBAND 8ØØMHZ	FREQBAND?	D8ØØMHZ	
		D1900MHz	FREQBAND D19ØØMHZ	FREQBAND?	D19ØØMHZ	
			FREQBAND 19ØØMHZ	FREQBAND?	D19ØØMHZ	
		A800MHz	FREQBAND A8ØØMHZ	FREQBAND?	A8ØØMHZ	
	Channel		CHAN n	CHAN?	n	
	Band & Channel	D800MHz	TBANDCH D8ØØMHZ,n	TBANDCH?	D8ØØMHZ,n	n: channel
			TBANDCH 8ØØMHZ,n	TBANDCH?	D8ØØMHZ,n	n: channel
		D1900MHz	TBANDCH D19ØØMHZ,n	TBANDCH?	D19ØØMHZ,n	n: channel
			TBANDCH 19ØØMHZ,n	TBANDCH?	D19ØØMHZ,n	n: channel
		A800MHz	TBANDCH A8ØØMHZ,n	TBANDCH?	A8ØØMHZ,n	n: channel
	TX frequency		TFREQ f	TFREQ?	f	
	RX frequency		RFREQ f	RFREQ?	f	
Frequency Control channel	Band	D800MHz	CTRLBA D8ØØMHZ	CTRLBA?	D8ØØMHZ	
			CTRLBA 8ØØMHZ	CTRLBA?	D8ØØMHZ	
		D1900MHz	CTRLBA D19ØØMHZ	CTRLBA?	D19ØØMHZ	
			CTRLBA 19ØØMHZ	CTRLBA?	D19ØØMHZ	
		A800MHz	CTRLBA A8ØØMHZ	CTRLBA?	A8ØØMHZ	
	Channel		CTRLCH n	CTRLCH?	n	
Level	Reference level		RFLVL ℓ	RFLVL?	ℓ	
	Output level		OLVL ℓ	OLVL?	ℓ	
	Output Level	On	LVL ON	LVL?	ON	
		Off	LVL OFF	LVL?	OFF	
Signal	Measuring object	MS-DTC	MEASOBJ MSDTC	MEASOBJ?	MSDTC	Digital measurement mode
		MS-DTC	MEASOBJ MSTCH	MEASOBJ?	MSDTC	Digital measurement mode
		Continuous	MEASOBJ CONT	MEASOBJ?	CONT	Digital measurement mode
		MS-AVC	MEASOBJ MSAVC	MEASOBJ?	MSAVC	Analog measurement mode
	Slot number		SLTNUM n	SLTNUM?	n	
	DVCC		DVCC h	DVCC?	h	
	MS power level		MSPWR n	MSPWR?	n	
	Time alignment		TMALIGN n	TMALIGN?	n	
	AVC SAT CC		SATCC n	SATCC?	n	n: 0 to 2

2.5.5 Digital TX Measure commands

- Program messages for the digital TX measure command are valid in ranges defined on each digital TX measure screen.
- Query messages for the digital TX measure command are valid on all digital TX measure screens.

(1) Digital TX Measure common commands

Digital TX measure common commands are valid on all digital TX measure screens.

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Frequency	Channel		CHAN n	CHAN?	n	
	TX frequency		TFREQ f	TFREQ?	f	
	RX frequency		RFREQ f	RFREQ?	f	
Level	Reference level		RFLVL ℓ	RFLVL?	ℓ	
	Output level		OLVL ℓ	OLVL?	ℓ	
Calibration	Adjust range		ADJRNG			f=0: No calibration
	Calibration		PWRCAL	PWRCAL?	ℓ	f=1: Calibrated in inside
			CALVAL ℓ	CALVAL?	f, ℓ	f=2: Written from outside ℓ : −10.00 to 10.00
	Calibration cancel		CALCANCEL			
MS control (Call proc. only)	MS power level		MSPWR n	MSPWR?	n	
	Time alignment		TMALIGN n	TMALIGN?	n	

(2) Setup Digital TX Measure parameter screen command

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Measurement Trigger	Measurement Trigger	Sync.	MEASTRG SYNC	MEASTRG?	SYNC	
		Video	MEASTRG VIDEO	MEASTRG?	VIDEO	
TX Calibration	User cal factor		UCAL ℓ	UCAL?	ℓ	
	User Cal factor Band1		TXUCALBA1 ℓ	TXUCALBA1?	ℓ	
	User Cal factor Band2		TXUCALBA2 ℓ	TXUCALBA2?	ℓ	

(3) Modulation Analysis screen commands

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	10 Bursts Average	On	BSTAVG ON	BSTAVG?	ON	
		Off	BSTAVG OFF	BSTAVG?	OFF	
Storage mode	Normal		STORAGE NRM	STORAGE?	NRM	
	Average		STORAGE AVG	STORAGE?	AVG	
	Average on		VAVG ON	---	---	
			VAVG 1	---	---	
			KSG	---	---	
	Average off		VAVG OFF	---	---	
			VAVG 0	---	---	
			KSH	---	---	
	Average count	2 to 9999	AVR n	AVR?	n	
			VAVG n	VAVG?	n	
	Refresh interval	Every	INTVAL EVERY	INTVAL?	EVERY	
		Once	INTVAL ONCE	INTVAL?	ONCE	
Measure result	Carrier frequency		---	CARRF?	f	
	Carrier frequency error		---	CARRFERR?	f	
			---	CARRFERR? un	u	un:HZ,PPM
	RMS vector error		---	VECTERR?	u	
	First 10 symbols RMS vector error		---	FVECTERR?	u	
	Peak vector error		---	PVECTERR?	u	
	Magnitude error		---	MAGTDERR?	u	
	Phase error		---	PHASEERR?	u	
	Origin offset		---	ORGNOFS?	u	
	Droop factor		---	DRPFACT?	u	
	Bit rate		---	BITR?	u	
	Bit rate error		---	BITRERR?	u	
Measure result (remote control only)	Peak vector error symbol		---	PVECTSYM?	s	
	+Peak magnitude error		---	PMAGTDERR? +	u	
	+Peak magnitude error symbol		---	PMAGTDSYM? +	s	
	-Peak magnitude error		---	PMAGTDERR? -	u	
	-Peak magnitude error symbol		---	PMAGTDSYM? -	s	
	+Peak phase error		---	PPHASEERR? +	u	
	+Peak phase error symbol		---	PPHASESYM? +	s	
	-Peak phase error		---	PPHASEERR? -	u	
	-Peak phase error symbol		---	PPHASESYM? -	s	

(4) Waveform Display screen commands

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Trace format	Trace format	Constellation	TRFORM CONSTEL	TRFORM?	CONSTEL	
			TRFORM IQ	---	---	
		Eye diagram	TRFORM EYE	TRFORM?	EYE	
		Vector error	TRFORM VECT	TRFORM?	VECT	
		Phase error	TRFORM PHASE	TRFORM?	PHASE	
		Magnitude error	TRFORM MAGTD	TRFORM?	MAGTD	
Scale mode	Interpolation (Constellation)	Non	INTPOL NON	INTPOL?	NON	
		Linear	INTPOL LIN	INTPOL?	LIN	
		10points	INTPOL POINT10	INTPOL?	POINT10	
	Error scale (Constellation)	5%	ERRSC 5	ERRSC?	5	
		10%	ERRSC 10	ERRSC?	10	
		20%	ERRSC 20	ERRSC?	20	
		OFF	ERRSC OFF	ERRSC?	OFF	
	Error scale offset (Constellation)	0	SCOFS 0	SCOFS?	0	
		22.5	SCOFS 22.5	SCOFS?	22.5	
	Vertical scale (Vector,Phase, Magnitude)	5 [deg,%]	VSCALE 5	VSCALE?	5	
		10 [deg,%]	VSCALE 10	VSCALE?	10	
		20 [deg,%]	VSCALE 20	VSCALE?	20	
		50 [deg,%]	VSCALE 50	VSCALE?	50	
		100 [deg,%]	VSCALE 100	VSCALE?	100	
Storage mode	Storage mode	Normal	STORAGE NRM	STORAGE?	NRM	
		Over write	STORAGE OVER	STORAGE?	OVER	
Marker	Marker mode	Normal	MKR NRM	MKR?	NRM	
		Off	MKR OFF	MKR?	OFF	
	Marker position (Symbol)	Symbol	MKRS r	MKRS?	r	
			MKN r	MKN?	r	
	Marker level		---	MKL?	r	
		I	---	MKL? I	r	
		Q	---	MKL? Q	r	
Measure result	Refer to Modulation analysis					

(5) RF Power screen commands

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Window		Slot	WINDOW SLOT	WINDOW?	SLOT	
		Frame	WINDOW FRAME	WINDOW?	FRAME	
		Leading	WINDOW LEAD	WINDOW?	LEAD	
			WINDOW RISE	---	---	
		Trailing	WINDOW TRAIL	WINDOW?	TRAIL	
			WINDOW FALL	---	---	
Marker	Merker mode	Normal	MKR NRM	MKR?	NRM	
		Off	MKR OFF	MKR?	OFF	
	Marker position	Symbol	MKRS r	MKRS?	r	
			MKN r	MKN?	r	
	Marker level		---	MKL?	ℓ	
Level	Unit	dBm	UNIT DBM	UNIT?	DBM	
		nW/uW/mW/W	UNIT WATT	UNIT?	WATT	
	Level	Relative	LVLREL ON	LVLREL?	ON	
			MTEMPREL ON	MTEMPREL?	ON	
		Absolute	LVLREL OFF	LVLREL?	OFF	
			MTEMPREL OFF	MTEMPREL?	OFF	
Storage mode	Normal		STORAGE NRM	STORAGE?	NRM	
	Max hold		STORAGE MAX	STORAGE?	MAX	
	Min hold		STORAGE MIN	STORAGE?	MIN	
	Average		STORAGE AVG	STORAGE?	AVG	
	Average on		VAVG ON	---	---	
			VAVG 1	---	---	
			KSG	---	---	
	Average off		VAVG OFF	---	---	
			VAVG Ø	---	---	
			KSH	---	---	
	Cumulative		STORAGE CUM	STORAGE?	CUM	
	Over write		STORAGE OVER	STORAGE?	OVER	
	Wide dynamic range		STORAGE WIDE	STORAGE?	WIDE	
	Average count	2 to 9999	AVR n	AVR?	n	
			VAVG n	VAVG?	n	
	Refresh interval	Every	INTVAL EVERY	INTVAL?	EVERY	
		Once	INTVAL ONCE	INTVAL?	ONCE	
Select template		Standard	SLCTTEMP STD	SLCTTEMP?	STD	
		Off	SLCTTEMP OFF	SLCTTEMP?	OFF	
		Not selected	---	SLCTTEMP?	NOT	

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Measure result	TX power		---	TXPWR?	ℓ	un:WATT, DBM
			---	TXPWR? un	ℓ	
	Carrirer off power		---	OFFPWR?	ℓ	
			---	OFFPWR?	ℓ	
	On/Off ratio		---	RATIO?	ℓ	
	Burst Timing		---	BSTTIMING?	r	
	Template PASS/FAIL (On section)	PASS	---	TEMPPASS? ON	PASS	
		FAIL	---	TEMPPASS? ON	FAIL	
	Template PASS/FAIL (Off section)	PASS	---	TEMPPASS? OFF	PASS	
		FAIL	---	TEMPPASS? OFF	FAIL	
	Rising time		---	RISETM?	r	
	Falling time		---	FALLTM?	r	
(Remote control Only)	Frame mean power		---	FMEANPWR?	ℓ	un:WATT, DBM
			---	FMEANPWR? un	ℓ	
	Slot mean power		---	SMEANPWR?	ℓ	un:WATT, DBM
			---	SMEANPWR? un	ℓ	
	Slot power		---	SLOTPWR? n	ℓ	
	Reference power for template		---	TEMPRPWR?	ℓ	

(6) Setup Template screen commands

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Setup template	Off level	dBm	OFFLVL DBM	OFFLVL?	DBM	
		dB	OFFLVL DB	OFFLVL?	DB	
	Level modify	Limit-1	TEMPLVL 1, ℓ	TEMPLVL? 1	ℓ	
		Limit-2	TEMPLVL 2, ℓ	TEMPLVL? 2	ℓ	
		Limit-3	TEMPLVL 3, ℓ	TEMPLVL? 3	ℓ	

(7) Occupied Bandwidth screen commands

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Measure method	Method	High speed	MEAS OBW,HIGH	MEAS?	OBW,HIGH	
Storage mode	Normal		STORAGE NRM	STORAGE?	NRM	
	Average		STORAGE AVG	STORAGE?	AVG	
	Average on		VAVG ON	---	---	
			VAVG 1	---	---	
			KSG	---	---	
	Average off		VAVG OFF	---	---	
			VAVG Ø	---	---	
			KSH	---	---	
	Average count	2 to 9999	AVR n	AVR?	n	
			VAVG n	VAVG?	n	
	Refresh interval	Every	INTVAL EVERY	INTVAL?	EVERY	
		Once	INTVAL ONCE	INTVAL?	ONCE	
Measure result	Occupied Bandwidth		---	OCCBW?	f	
			---	OBW?	f	
	Center Frequency		---	OBWFREQ? CENTER	f	
	Lower		---	OBWFREQ? LOWER	f	
			---	OBWFREQ? –	f	
	Upper		---	OBWFREQ? UPPER	f	
			---	OBWFREQ? +	f	
	Span width		---	FSPAN?	f	

(8) Adjacent Channel Power screen commands

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Measure method	Method	High speed	MEAS ADJ,HIGH	MEAS?	ADJ,HIGH	
Level	Unit	dBm	UNIT DBM	UNIT?	DBM	
		mW	UNIT MW	UNIT?	MW	
		uW	UNIT UW	UNIT?	UW	
		nW	UNIT NW	UNIT?	NW	
		dB	UNIT DB	UNIT?	DB	
Storage mode	Normal		STORAGE NRM	STORAGE?	NRM	
	Average		STORAGE AVG	STORAGE?	AVG	
	Average on		VAVG ON	---	---	
			VAVG 1	---	---	
			KSG	---	---	
	Average off		VAVG OFF	---	---	
			VAVG Ø	---	---	
			KSH	---	---	
	Average count		AVR n	AVR?	n	
			VAVG n	VAVG?	n	
	Refresh interval	Every	INTVAL EVERY	INTVAL?	EVERY	
		Once	INTVAL ONCE	INTVAL?	ONCE	
Measure result	Adjacent channel power	Lower-3 to Upper-3	---	MODPWR? ps	ℓ	ps:LOW90,LOW60, LOW30,UP30, UP60,UP90 un:DBM,WATT,DB
			---	SWPWR? ps	ℓ	
			---	MODPWR? ps,un	ℓ	
			---	SWPWR? ps,un	ℓ	
	Span width		---	FSPAN?	f	
	Signal power		---	SPWR?		

(9) Power Meter screen commands

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Calibration	Zero set		ZEROSET	---	---	
			ZAJ	---	---	
Range	Range up		RNG UP	---	---	
	Range down		RNG DN	---	---	
	Adjust range		ADJRNG	---	---	
	Hold (0.1mW)		RNG2	---	---	
	Hold (1mW)		RNG3	---	---	
	Hold (10mW)		RNG4	---	---	
	Hold (100mW)		RNG5	---	---	
Measure result	Power		---	POWER? un	ℓ	un:DBM,WATT,DB

(10) Select All Measure Item screen commands

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Frequency	10 bursts average	On	MBSTAVG ON	MBSTAVG?	ON	
		Off	MBSTAVG OFF	MBSTAVG?	OFF	
	Frequency	On	MCARRF ON	MCARRF?	ON	
		Off	MCARRF OFF	MCARRF?	OFF	
	Frequency error Measurement	On	MCARRFERR ON	MCARRFERR?	ON	
		Off	MCARRFERR OFF	MCARRFERR?	OFF	
	Frequency error Unit	kHz	UCARRFERR KHZ	UCARRFERR?	KHZ	
		ppm	UCARRFERR PPM	UCARRFERR?	PPM	
	Frequency error Judge	On	JCARRFERR ON	JCARRFERR?	ON	
		Off	JCARRFERR OFF	JCARRFERR?	OFF	
	Frequency error Limit	Upper limit	ULCARRFERR f	ULCARRFERR?	f	
				ULCARRFERR? un	f	un:HZ,PPM
Modulation analysis	RMS vector error Measurement	On	MVECTERR ON	MVECTERR?	ON	
		Off	MVECTERR OFF	MVECTERR?	OFF	
	RMS vector error Judge	On	JVECTERR ON	JVECTERR?	ON	
		Off	JVECTERR OFF	JVECTERR?	OFF	
	RMS vector error Limit	Upper Limit	ULVECTERR r	ULVECTERR?	r	
	10 Burst Average	On	MBSTAVG ON	MBSTAVG?	ON	
		Off	MBSTAVG OFF	MBSTAVG?	OFF	
	First 10symbol vector error Measurement	On	MFVECTERR ON	MFVECTERR?	ON	
		Off	MFVECTERR OFF	MFVECTERR?	OFF	
	First 10symbol vector error Judge	On	JFVECTERR ON	JFVECTERR?	ON	
		Off	JFVECTERR OFF	JFVECTERR?	OFF	
	First 10symbol vector error Limit	Upper Limit	ULFVECTERR r	ULFVECTERR?	r	
	Peak vector error Measurement	On	MPVECTERR ON	MPVECTERR?	ON	
		Off	MPVECTERR OFF	MPVECTERR?	OFF	

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Peak vector error Judge	On	JPVECTERR ON	JPVECTERR?	ON	
		Off	JPVECTERR OFF	JPVECTERR?	OFF	
	Peak vector error Limit	Upper limit	ULPVECTERR r	ULPVECTERR?	r	
	Magnitude error Measurement	On	MMAGTDERR ON	MMAGTDERR?	ON	
		Off	MMAGTDERR OFF	MMAGTDERR?	OFF	
	Magnitude error Judge	On	JMAGTDERR ON	JMAGTDERR?	ON	
		Off	JMAGTDERR OFF	JMAGTDERR?	OFF	
	Magnitude error Limit	Upper Limit	ULMAGTDERR r	ULMAGTDERR?	r	
	Phase error Measurement	On	MPHASEERR ON	MPHASEERR?	ON	
		Off	MPHASEERR OFF	MPHASEERR?	OFF	
	Phase error Judge	On	JPHASEERR ON	JPHASEERR?	ON	
		Off	JPHASEERR OFF	JPHASEERR?	OFF	
	Phase error Limit	Upper Limit	ULPHASEERR r	ULPHASEERR?	r	
	Origin offset Measurement	On	MORGNOFS ON	MORGNOFS?	ON	
		Off	MORGNOFS OFF	MORGNOFS?	OFF	
	Origin offset Judge	On	JORGNOFS ON	JORGNOFS?	ON	
		Off	JORGNOFS OFF	JORGNOFS?	OFF	
	Origin offset Limit	Upper Limit	ULORGNOFS r	ULORGNOFS?	r	
	Droop Factor Measurement	On	MDRPFACT ON	MDRPFACT?	ON	
		Off	MDRPFACT OFF	MDRPFACT?	OFF	
	Droop Factor Judge	On	JDRPFACT ON	JDRPFACT?	ON	
		Off	JDRPFACT OFF	JDRPFACT?	OFF	
	Droop Factor Limit	Upper Limit	ULDRPFACT r	ULDRPFACT?	r	
	Bit rate error Measurement	On	MBITRERR ON	MBITRERR?	ON	
		Off	MBITRERR OFF	MBITRERR?	OFF	
	Bit rate error Judge	On	JBITRERR ON	JBITRERR?	ON	
		Off	JBITRERR OFF	JBITRERR?	OFF	
	Bit rate error Limit	Upper Limit	ULBITRERR r	ULBITRERR?	r	
RF power	TX power Measurement	On	MTXPWR ON	MTXPWR?	ON	
		Off	MTXPWR OFF	MTXPWR?	OFF	
	TX power Unit	dBm	UTXPWR DBM	UTXPWR?	DBM	
		W	UTXPWR WATT	UTXPWR?	WATT	
	TX power Judge	On	JTXPWR ON	JTXPWR?	ON	
		Off	JTXPWR OFF	JTXPWR?	OFF	
	TX power Limit	Lower limit	LLTXPWR ℓ	LLTXPWR?	ℓ	
				LLTXPWR? un	ℓ	un:DBM,WATT
		Upper limit	ULTXPWR ℓ	ULTXPWR?	ℓ	
				ULTXPWR? un	ℓ	un:DBM,WATT
	Carrier off power Measurement	On	MOFFPWR ON	MOFFPWR?	ON	
		Off	MOFFPWR OFF	MORRPWR?	OFF	

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Carrier off power Unit	dBm	UOFFPWR DBM	UOFFPWR?	DBM	
		W	UOFFPWR WATT	UOFFPWR?	WATT	
	Carrier off power Judge	On	JOFFPWR ON	JOFFPWR?	ON	
		Off	JOFFPWR OFF	JOFFPWR?	OFF	
	Carrier off power Limit	Upper limit	ULOFFPWR ℓ	ULOFFPWR?	ℓ	
				ULOFFPWR? un	ℓ	un: DBM,WATT
	On/Off ratio Measurement	On	MRATIO ON	MRATIO?	ON	
		Off	MRATIO OFF	MRATIO?	OFF	
	On/Off ratio Judge	On	JRATIO ON	JRATIO?	ON	
		Off	JRATIO OFF	JRATIO?	OFF	
	On/Off ratio Limit	Lower limit	LLRATIO r	LLRATIO? r	r	
	Burst Timing Measurement	On	MBSTTIMING ON	MBSTTIMING?	ON	
		Off	MBSTTIMING OFF	MBSTTIMING?	OFF	
	Burst Timing Judge	On	JBSTTIMING ON	JBSTTIMING?	ON	
		Off	JBSTTIMING OFF	BBSTTIMING?	OFF	
	Burst Timing Limit	Upper Limit	ULBSTTIMING r	ULBSTTIMING?	r	
		Lower Limit	LLBSTTIMING r	LLBSTTIMING?	r	
	Rising time Measurement	On	MRISETM ON	MRISETM?	ON	
		Off	MRISETM OFF	MRISETM?	OFF	
	Rising time Judge	On	JRISETM ON	JRISETM?	ON	
		Off	JRISETM OFF	JRISETM?	OFF	
	Rising time Limit	Lower limit	LLRISETM r	LLRISETM?	r	
		Upper limit	ULRISETM r	ULRISETM?	r	
	Falling time Measurement	On	MFALLTM ON	MFALLTM?	ON	
		Off	MFALLTM OFF	MFALLTM?	OFF	
	Falling time Judge	On	JFALLTM ON	JFALLTM?	ON	
		Off	JFALLTM OFF	JFALLTM?	OFF	
	Falling time Limit	Lower limit	LLFALLTM r	LLFALLTM?	r	
		Upper limit	ULFALLTM r	ULFALLTM?	r	
	Template Pass/Fail	On	MTEMPPASS ON	MTEMPPASS?	ON	
		Off	MTEMPPASS OFF	MTEMPPASS?	OFF	
	Template Pass/Fail zone	On Only	LTEMPPASS ON	LTEMPPASS?	ON	
		On & Off	LTEMPPASS BOTH	LTEMPPASS?	BOTH	
Occupied bandwidth	Occupied Bandwidth Measurement	On	MOCCBW ON	MOCCBW?	ON	
		Off	MOCCBW OFF	MOCCBW?	OFF	
	Occupied Bandwidth Judge	On	JOCCBW ON	JOCCBW?	ON	
		Off	JOCCBW OFF	JOCCBW?	OFF	
	Occupied Bandwidth Limit	Upper limit	ULOCCBW f	ULOCCBW?	f	
	Lower Measurement	On	MOBWFREQ LOW,ON	MOBWFREQ? LOW	ON	
		Off	MOBWFREQ LOW,OFF	MOBWFREQ? LOW	OFF	

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Lower Judge	On	JOBWFREQ LOW,ON	JOBWFREQ? LOW	ON	
		Off	JOBWFREQ LOW,OFF	JOBWFREQ? LOW	OFF	
	Lower Limit	Lower limit	LLOBWFREQ LOW,f	LLOBWFREQ? LOW	f	
	Upper Measurement	On	MOBWFREQ UP,ON	MOBWFREQ? UP	ON	
		Off	MOBWFREQ UP,OFF	MOBWFREQ? UP	OFF	
	Upper Judge	On	JOBWFREQ UP,ON	JOBWFREQ? UP	ON	
		Off	JOBWFREQ UP,OFF	JOBWFREQ? UP	OFF	
	Upper Limit	Upper limit	ULOBWFREQ UP,f	ULOBWFREQ? UP	f	
Adjacent channel power	Lower-3 to Upper-3 Measurement	On	MMODPWR po,ON	MMODPWR? po	ON	po: OF30, OF60, OF90
			MSWPWR po,ON	MSWPWR? po	ON	
		Off	MMODPWR po,OFF	MMODPWR? po	OFF	
			MSWPWR po,OFF	MSWPWR? po	OFF	
	Lower-3 to Upper-3 Unit	dBm	UMODPWR,DBM	UMODPWR?	DBM	
			USWPWR,DBM	USWPWR?	DBM	
		dB	UMODPWR,DB	UMODPWR?	DB	
			USWPWR,DB	USWPWR?	DB	
		mW	UMODPWR,MW	UMODPWR?	MW	
			USWPWR,MW	USWPWR?	MW	
		uW	UMODPWR,UW	UMODPWR?	UW	
			USWPWR,UW	USWPWR?	UW	
		nW	UMODPWR,NW	UMODPWR?	NW	
			USWPWR,NW	USWPWR?	NW	
	Lower-3 to Upper-3 Judge	On	JMODPWR po,ON	JMODPWR? po	ON	
			JSWPWR po,ON	JSWPWR? po	ON	
		Off	JMODPWR po,OFF	JMODPWR? po	OFF	
			JSWPWR po,OFF	JSWPWR? po	OFF	
	Lower-3 to Upper-3 Limit	Upper limit	ULMODPWR po, ℓ	ULMODPWR? po	ℓ	
			ULSWPWR po, ℓ	ULSWPWR? po	ℓ	
			ULMODPWR po, ℓ	ULMODPWR? po,un	ℓ	un:DBM,DB,MW UW,NW
			ULSWPWR po, ℓ	ULSWPWR? po,un	ℓ	
Call Processing	RSSI Measurement	On	MRSSI ON	MRSSI?	ON	
		Off	MRSSI OFF	MRSSI?	OFF	
	RSSI Judge	On	JRSSI ON	JRSSI?	ON	
		Off	JRSSI OFF	JRSSI?	OFF	
	RSSI Lower Limit	Lower Limit	LLRSSI n	LLRSSI?	n	
	RSSI Upper Limit	Upper Limit	ULRSSI n	ULRSSI?	n	
Standard setup	Standard		AITEM STD	---	---	

(11) All Measure screen commands

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Storage mode	Normal		STORAGE NRM	STORAGE?	NRM	
	Average		STORAGE AVG	STORAGE?	AVG	
	Wide dynamic range		STORAGE WIDE	STORAGE?	WIDE	
	Average on		VAVG ON	---	---	
			VAVG 1	---	---	
			KSG	---	---	
	Average off		VAVG OFF	---	---	
			VAVG 0	---	---	
			KSH	---	---	
	Average count	2 to 9999	AVR n	AVR?	n	
			VAVG n	VAVG?	n	
	Refresh interval	Every	INTVAL EVERY	INTVAL?	EVERY	
		Once	INTVAL ONCE	INTVAL?	ONCE	
Measure judgement	Carrier frequency error		---	JCARRFERR?	b	b:PASS,FAIL
	RMS vector error		---	JVECTERR?	b	
	Peak vector error		---	JPVECTERR?	b	
	Magnitude error		---	JMAGTDERR?	b	
	Phase error		---	JPHASEERR?	b	
	Origin offset		---	JORGNOFS?	b	
	Bit rate error		---	JBITRERR?	b	
	TX power		---	JTXPWR?	b	
	Carrier off power		---	JOFFPWR?	b	
	On/Off ratio		---	JRATIO?	b	
	First 10symbol vector error		---	JFVECTERR?	b	
	Burst Timing		---	JBSTTIMING?	b	
	Rising time		---	JRISETM?	b	
	Falling time		---	JFALLTM?	b	
	Template		---	TEMPPASS?	b	
	Occupied bandwidth		---	JOCCBW?	b	
	Lower		---	JOBWFREQ? L	b	
	Upper		---	JOBWFREQ? U	b	
	Adjacent channel power	Lower3 to Upper3	---	JMODPWR? po	b	
			---	JSWPWR? po	b	
	RSSI		---	JRSSI?	b	
Total judgement	Total judgement	PASS	---	JTOTAL?	PASS	
		FAIL	---	JTOTAL?	FAIL	
Measurement result	All Measurement		---	ALL MEAS? a	n,r...	a:MODANAL RFPWR, OBW, ADJ, CALLP
	RSSI		---	RSSI?	n	
	See each Measure screen for other result					

- Comment on the measurement results

  The range and combination of the parameters used in the measurement results of the TX All measure, is described below.

[Value of a]

MODANAL	: Modulation analysis measurement
RFPOWER	: RF power measurement
OBW	: Occupied bandwidth measurement
ADJ	: Adjacent channel power measurement
CALLP	: Call Processing

[Value of n]

0 : Pass

4 : Fail

9 : Off is set to Measure or Judge on the Setup TX All Measure Item screen.

[Value of r]

When n = 0, 4, the measurement results are output with the set unit.

When n = 9, 0 is output.

[Combination of n, r]

When a = MODANAL:	n, CARRF, n, CARRFERR, n, VECTERR, n, FVECTERR, n, PVECTERR, n, MAGTDERR n, PHASEERR, n, ORGNOFS, n, DRPFACT, n, BITRERR
When a = RFPWR:	n, TXPWR, n, OFFPWR, n, RATIO, n, BSTTIMING, n, RISETM, n, FALLTM, n, TEMPPASS
When a = OBW:	n, OBW, n, LOWER, n, UPPER
When a = ADJ:	n, LOWER90, n, LOWER60, n, LOWER30, n, UPPER30, n, UPPER60, n, UPPER90
When a = CALLP:	n, RSSI

Note: that when a = RFPWR, data of TEMPPASS is below.

Value of n	TEMPPASS
0	PASS
4	FAIL
9	0

(12) Waveform memory read command

The waveform memory read command is valid on all digital TX measurement screens.

See Section 8 for such details as data format.

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Modulation analysis	I-Q	Mem C	XMC p0,pl,b	XMC? p0,pl,d	b,b,b,...	
		Origin offset	OXMC p0,b	OXMC? p0	b	
	Magnitude error	Mem N	XMN p,b	XMN? p,d	b,b,b,...	
	Phase error	Mem P	XMP p,b	XMP? p,d	b,b,b,...	
	Vector error	Mem V	XMV p,b	XMV? p,d	b,b,b,...	
RF Power	RF power	Mem D	XMD p,b	XMD? p,d	b,b,b,...	
Occupied bandwidth	Occ.bw(High speed)	Mem E	XME p,b	XME? p,d	b,b,b,...	
Demodulation	Demodulation	Mem M	XMM p,b	XMM? p,d	b,b,b,...	
Output format	Output format	ASCII	BIN 0	---	---	
			BIN OFF	---	---	
		Binary	BIN 1	---	---	
			BIN ON	---	---	

2.5.6 Analog TX measure commands

- Program messages for the analog TX measure command are valid in ranges defined on each analog TX measure screen.

(1) Setup Analog TX Measure Parameter screen commands

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
TX Calibration	User Cal Factor		UCAL ℓ	UCAL?	ℓ [dB / 0.01dB]	
RF measure mode	RF measure mode	All	RFMM ALL	RFMM?	ALL	
		RF Only	RFMM RF	RFMM?	RF	
AF Output	Impedance	600Ω	AOIMP 6ØØ	AOIMP?	6ØØ	
		50Ω	AOIMP 5Ø	AOIMP?	5Ø	
Demod. output terminal (rear panel)	Range	40kHz	RRNG 4ØK	RRNG?	4ØK	
		4kHz	RRNG 4K	RRNG?	4K	
	High Pass Filter	300Hz	RHPF 3ØØ	RHPF?	3ØØ	
		Off	RHPF OFF	RHPF?	OFF	
	Low Pass Filter	3kHz	RLPF 3K	RLPF?	3K	
		Off	RLPF OFF	RLPF?	OFF	
	De-emphasis	On	RDEMP ON	RDEMP?	ON	
		Off	RDEMP OFF	RDEMP?	OFF	
	Squelch	Auto	RSQL AUTO	RSQL?	AUTO	
		Off	RSQL OFF	RSQL?	OFF	

(2) Analog TX Measure screen commands

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Storage Mode	Storage Mode	Normal	STRG NRM	STRG?	NRM	
		Average	STRG AVG	STRG?	AVG	
	Average On		VAVG ON	---	---	
			VAVG 1	---	---	
			KSG	---	---	
	Average Off		VAVG OFF	---	---	
			VAVG Ø	---	---	
			KSH	---	---	
	Average Count		AVR n	AVR?	n	
			VAVG n	VAVG?	n	
RF Power	Adjust Range		ADJRNG	---	---	
	Manual Calibration		PWRCAL	---	---	
	Calibration Cancel		CALCANCEL	---	---	
	Power Meter Zero Set		ZEROSET	---	---	
	Set Relative		RFPWRSRL	---	---	
Deviation	Demod.	FM	DDMOD FM	DDMOD?	FM	
		øM	DDMOD PM	DDMOD?	PM	
	Detect Mode	(P-P)/2	DETMD PP	DETMD?	PP	
		+P	DETMD +P	DETMD?	-P	
		-P	DETMD -P	DETMD?	+P	
		RMS	DETMD RMS	DETMD?	RMS	
		(P-P)/2 Hold	DETMD PPH	DETMD?	PPH	
		+P Hold	DETMD +PH	DETMD?	+PH	
		-P Hold	DETMD -PH	DETMD?	-PH	
	High Pass Filter	300Hz	DHPF 300	DHPF?	3ØØ	
		50Hz	DHPF 50	DHPF?	5Ø	
		Off	DHPF OFF	DHPF?	OFF	
	Low Pass Filter	3kHz	DLPF 3	DLPF?	3	
		15kHz	DLPF 15	DLPF?	15	
		Off	DLPF OFF	DLPF?	OFF	
	Relative On/Off	On	RDEVRL ON	RDEVRL?	ON	
		Off	RDEVRL OFF	RDEVRL?	OFF	

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
AF Level/Distortion	Filter	ITU-T P.53	AFLT P53	AFLT?	P53	
		C-MESSAGE	AFLT CMESS	AFLT?	CMESS	
		6kHz BPF	AFLT BPF	AFLT?	BPF	
		Off	AFLT OFF	AFLT?	OFF	
	High Pass Filter	400Hz	AHPF 400	AHPF?	4ØØ	
		Off	AHPF OFF	AHPF?	OFF	
	De-emphasis	750µs	ADEMP 750	ADEMP?	75Ø	
		Off	ADEMP OFF	ADEMP?	OFF	
	Distortion Unit	dB	ADSTU DB	ADSTU?	DB	
		%	ADSTU PER	ADSTU?	PER	
	AF Level Set Relative		TALVLSRL	---	---	
RF Frequency	Channel		CHAN n	CHAN?	n[ch / 1ch]	
	TX Measure Frequency		TXFREQ f	TXFREQ?	f[Hz / 1Hz]	
RF Level	TX Measure Ref Level		RFLVL ℓ	RFLVL?	ℓ [dBm / 1dB]	
AF Oscillator 1	Frequency		AFREQ1 f	AFREQ1?	f[Hz / 0.1Hz]	
	Level	Specifies the input/output level with V unit.	ALVL1 vV(V,MV,UV)	ALVL1? V	v[V / 1µV]	
		Specifies the input/output level with dBm unit.	ALVL1 ℓ DBM	ALVL1? DBM	ℓ [dBm / 0.1dB]	
		Specifies the input/output level with current selected unit.	ALVL1 ℓ (or ALVL1 v)	ALVL1?	ℓ (or v)	
	Signal	Tone	ASIG1 TONE	ASIG1?	TONE	
		Noise(ITU-T G.227)	ASIG1 G227	ASIG1?	G227	
		Noise(White)	ASIG1 WHITE	ASIG1?	WHITE	
	Level Relative	On	ALVL1RL ON	ALVL1RL?	ON	
		Off	ALVL1RL OFF	ALVL1RL?	OFF	
	Relative Value		---	ALVL1RLV?	ℓ [dB / 0.1dB]	
	Oscillator Switch	On	AOUT1 ON	AOUT1?	ON	
		Off	AOUT1 OFF	AOUT1?	OFF	
AF Oscillator 2	Frequency		AFREQ2 f	AFREQ2?	f[Hz / 0.1Hz]	
	Level	Specifies the input/output level with V unit.	ALVL2 vV(V,MV,UV)	ALVL2? V	v[V / 1µV]	
		Specifies the input/output level with dBm unit.	ALVL2 ℓ DBM	ALVL2? DBM	ℓ [dBm / 0.1dB]	
		Specifies the input/output level with current selected unit.	ALVL2 ℓ (or ALVL2 v)	ALVL2?	ℓ (or v)	
	Signal	Tone	ASIG2 TONE	ASIG2?	TONE	
		Noise(ITU-T G.227)	ASIG2 G227	ASIG2?	G227	
		Noise(White)	ASIG2 WHITE	ASIG2?	WHITE	
	Level Relative	On	ALVL2RL ON	ALVL2RL?	ON	
		Off	ALVL2RL OFF	ALVL2RL?	OFF	
	Relative Value		---	ALVL2RLV?	ℓ [dB / 0.1dB]	
	Oscillator Switch	On	AOUT2 ON	AOUT2?	ON	
		Off	AOUT2 OFF	AOUT2?	OFF	

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Measure Result	RF Frequency		---	RFFREQ?	f[Hz / 0.01Hz]	
	RF Frequency Error		---	RFFREQERR?	f[Hz / 0.01Hz]	
	RF Freq. Error ppm		---	RFFREQERRPPM?	m[ppm / 0.0001ppm]	
	RF Power		---	RFPWR? W	w[W / 1pW]	
			---	RFPWR? DBM	ℓ[dBm / 0.01dB]	
		Relative Value	---	RFPWRRLV?	ℓ[dB / 0.01dB]	
	Deviation	Demod. FM	---	RDEV?	f[Hz / 0.1Hz]	
		Demod. øM	---	RDEV?	r[rad / 0.0001rad]	
		Relative Value	---	RDEVRLV?	ℓ[dB / 0.01dB]	
	Deviation	Demod. FM	---	RDEVALL?	f[Hz / 0.1Hz]	*1
		Demod. øM	---	RDEVALL?	r[rad / 0.0001rad]	
	AF Level Readouts all the measurexd results.	Demod. FM	---	TALVL?	f[Hz / 0.1Hz]	
		Demod. øM	---	TALVL?	r[rad / 0.1rad]	
		Relative Value	---	TALVLRLV?	ℓ[dB / 0.01dB]	
	AF Level	Demod. FM	---	TALVLALL?	f[Hz / 0.1Hz]	*2
		Demod. øM	---	TALVLALL?	r[rad / 0.0001rad]	
	Distortion Readouts all the measured results.		---	DSTN? DB	ℓ[dB / 0.01dB]	
			---	DSTN? PER	p[% / 0.01%]	
			---	DSTN?	Output with current selected unit.	
	AF Frequency		---	AFFREQ?	f[Hz / 0.001Hz]	
	Freq. Characteristics		---	FREQCHAR? n	ℓ[dB / 0.01dB]	*3

*1 RDEVALL? command (which readouts all the measured results of the Deviation) outputs the measured results of the (P-P)/2, +P, -P, RMS, (P-P)/2 Hold, +P Hold, and -P Hold, in this order with commas for these data separation.
Output format is shown below, where one data is indicated with 7 characters.

Example 1: Outputs with kHz unit. (One digit under decimal point)
"10000.0, 1000.0, 100.0, 10.0, 1.0, 12.3, 123.4, 1234.5"

Example 2: Outputs with rad unit. (Four digits under decimal point)
"10.0000, 1.0000, 0.1000, 0.0100, 0.0001, 0.0003, 0.1234, 1.2345"

*2 TALVLALL? command (which readouts all the measured results of the AF Level) outputs the 8 types of the measured results, depending on the combination of the Filter and De-emphasis.
This command outputs the measured results of the ITU-T/750μs, C-MESSAGE/750μs, 6kHz BPF/750μs, Off/750μs, ITU-T/Off, C-MESSAGE/Off, 6kHz BPF/Off, and Off/Off,in this order with commas for these data separation.
Output format is shown below, where one data is indicated with 8 characters.

Example 1: Outputs with kHz unit. (Four digits under decimal point)
"100.0000, 10.0000, 1.0000, 0.0100, 0.0010, 0.0123, 0.1234, 1.2345"

Example 2: Outputs with rad unit. (Four digits under decimal point)
"100.0000, 10.0000, 1.0000, 0.1000, 0.0100, 0.0003, 0.1234, 1.2345"

*3 FREQCHAR? command (which readouts the measured results of the frequency characteristics) performs FFT of the demodulated AF signal, and outputs the frequency characteristics (from 50 Hz to 10 kHz, in 50 Hz steps, with the reference of the data at 1 kHz).
When inputing this command, specify multiple integer values of n (range: 1 to 200) which are integer-type parameters to determine the measurement frequencies.
The relation between n and the measurement frequency (f) is as follows:

$f = 50n$ (n: 1 to 200)

(3) Analog TX Meas with SG screen commands

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Storage Mode	Storage Mode	Normal	STRG NRM	STRG?	NRM	
		Average	STRG AVG	STRG?	AVG	
	Average On		VAVG ON	---	---	
			VAVG 1	---	---	
			KSG	---	---	
	Average Off		VAVG OFF	---	---	
			VAVG 0	---	---	
			KSH	---	---	
	Average Count		AVR n	AVR?	n	
			VAVG n	VAVG?	n	
RF Power	Adjust Range		ADJRNG	---	---	
	Manual Calibration		PWRCAL	---	---	
	Calibration Cancel		CALCANCEL	---	---	
	Power Meter Zero Set		ZEROSET	---	---	
	Set Relative		RFPWRSRL	---	---	
Deviation	Demod.	FM	DDMOD FM	DDMOD?	FM	
		øM	DDMOD PM	DDMOD?	PM	
	Detect Mode	(P-P)/2	DETMD PP	DETMD?	PP	
		+P	DETMD +P	DETMD?	+P	
		-P	DETMD -P	DETMD?	-P	
		RMS	DETMD RMS	DETMD?	RMS	
		(P-P)/2 Hold	DETMD PPH	DETMD?	PPH	
		+P Hold	DETMD +PH	DETMD?	+PH	
		-P Hold	DETMD -PH	DETMD?	-PH	
	High Pass Filter	300Hz	DHPF 3ØØ	DHPF?	3ØØ	
		50Hz	DHPF 5Ø	DHPF?	5Ø	
		Off	DHPF OFF	DHPF?	OFF	
	Low Pass Filter	3kHz	DLPF 3	DLPF?	3	
		15kHz	DLPF 15	DLPF?	15	
		Off	DLPF OFF	DLPF?	OFF	
	Relative On/Off	On	RDEVRL ON	RDEVRL?	ON	
		Off	RDEVRL OFF	RDEVRL?	OFF	

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
AF Level/ Distortion	Filter	ITU-T P.53	AFLT P53	AFLT?	P53	
		C-MESSAGE	AFLT CMESS	AFLT?	CMESS	
		6kHz BPF	AFLT BPF	AFLT?	BPF	
		Off	AFLT OFF	AFLT?	OFF	
	High Pass Filter	400Hz	AHPF 4ØØ	AHPF?	4ØØ	
		Off	AHPF OFF	AHPF?	OFF	
	De-emphasis	750µs	ADEMP 75Ø	ADEMP?	75Ø	
		Off	ADEMP OFF	ADEMP?	OFF	
	Distortion Unit	dB	ADSTU DB	ADSTU?	DB	
		%	ADSTU PER	ADSTU?	PER	
	AF Level Set Relative		TALVLSRL	---	---	
RF Frequency	Channel		CHAN n	CHAN?	n[ch / 1ch]	
	TX Measure Frequency		TXFREQ f	TXFREQ?	f[Hz / 1Hz]	
	RX Measure Frequency		RXFREQ f	RXFREQ?	f[Hz / 1Hz]	
	Incremental Step Value		FINC f	FINC?	f[Hz / 1Hz]	
	RX Freq. Step Up		FRS UP	---	---	
			UFR	---	---	
	RX Freq. Step Down		FRS DN	---	---	
			DFR	---	---	
	Relative On/Off	On	RXFREQRL ON	RXFREQRL?	ON	
		Off	RXFREQRL OFF	RXFREQRL?	OFF	
	Relative Value		---	RXFREQRLV?	f[Hz / 1Hz]	
RF Level TX	TX Measure Ref Level		RFLVL ℓ	RFLVL?	ℓ [dBm / 1dB]	
RX	RX Measure Output Level	Specifies the input level with dBm unit.	OLVL ℓ DBM	OLVL?	ℓ [dBm/1dB]	Unit can be changed by inputing the set value with a character string of unit.
		Specifies the input level with dBu unit.	OLVL ℓ DBU	OLVL?	ℓ [dBµ/0.1dBµ]	
		Specifies the input level with current selected unit.	OLVL ℓ	OLVL?	ℓ	
	Incremental Step Value		LINC ℓ	LINC?	ℓ [dB / 0.1dB]	
	RF Level Step Up		OLS UP	---	---	
			UOL	---	---	
	RF Level Step Down		OLS DN	---	---	
			DOL	---	---	
	Unit EMF/TERM	EMF	RFUT EMF	RFUT?	EMF	
		TERM	RFUT TERM	RFUT?	TERM	
	RF Level Rel. On/Off	On	OLVLRL ON	OLVLRL?	ON	
		Off	OLVLRL OFF	OLVLRL?	OFF	
	Relative Value		---	OLVLRLV?	ℓ [dB / 0.1dB]	
	RF Level On/Off	On	RRLVL ON	RRLVL?	ON	
		Off	RRLVL OFF	RRLVL?	OFF	

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
AF Oscillator 1 (Mod.)	Frequency		AFREQ1 f	AFREQ1?	f[Hz / 0.1Hz]	
	Deviation		ADEV1 f	ADEV1?	f[Hz / 0.1Hz]	
	Oscillator Switch	On	AOUT1 ON	AOUT1?	ON	
		Off	AOUT1 OFF	AOUT1?	OFF	
AF Oscillator 2 (Mod./AF)	Frequency		AFREQ2 f	AFREQ2?	f[Hz / 0.1Hz]	
	Deviation		ADEV2 f	ADEV2?	f[Hz / 0.1Hz]	
	Level	Specifies the input level with dBm unit.	ALVL2 vV(V,MV,UV)	ALVL2? V	v[V / 1μV]	
		Specifies the input level with dBu unit.	ALVL2 ℓ DBM	ALVL2? DBM	ℓ [dBm / 0.1dB]	
		Specifies the input level with current selected unit.	ALVL2 ℓ (or ALVL2 v)	ALVL2?	ℓ (or v)	
	Signal	Tone	ASIG2 TONE	ASIG2?	TONE	
		Noise(ITU-T G.227)	ASIG2 G227	ASIG2?	G227	
		Noise(White)	ASIG2 WHITE	ASIG2?	WHITE	
	Output For Mod/AF	Mod.	AOPF2 MOD	AOPF2?	MOD	
		AF	AOPF2 AF	AOPF2?	AF	
	Oscillator Switch	On	AOUT2 ON	AOUT2?	ON	
		Off	AOUT2 OFF	AOUT2?	OFF	
External Oscillator (Mod.)	Deviation		ADEVX f	ADEVX?	f[Hz / 0.1Hz]	
	Oscillator Switch	On	AOUTX ON	AOUTX?	ON	
		Off	AOUTX OFF	AOUTX?	OFF	
Measure Result	RF Frequency		---	RFFREQ?	f[Hz / 0.01Hz]	
	RF Frequency Error		---	RFFREQERR?	f[Hz / 0.01Hz]	
	RF Freq. Error ppm		---	RFFREQERRPPM?	m[ppm / 0.0001ppm]	
	RF Power		---	RFPWR? W	w[W / 1pW]	
			---	RFPWR? DBM	ℓ [dBm / 0.01dB]	
		Relative Value	---	RFPWRRLV?	ℓ [dB / 0.01dB]	
	Deviation	Demod. FM	---	RDEV?	f[Hz / 0.1Hz]	
		Demod. øM	---	RDEV?	r[rad / 0.0001rad]	
		Relative Value	---	RDEVRLV?	ℓ [dB / 0.01dB]	
	Deviation	Demod. FM	---	RDEVALL?	f[Hz / 0.1Hz]	*1
		Demod. øM	---	RDEVALL?	r[rad / 0.0001rad]	
	AF Level Readouts all the measured results.	Demod. FM	---	TALVL?	f[Hz / 0.1Hz]	
		Demod. øM	---	TALVL?	r[rad / 0.1rad]	
		Relative Value	---	TALVLRLV?	ℓ [dB / 0.01dB]	
	AF Level Readouts all the measured results.	Demod. FM	---	TALVLALL?	f[Hz / 0.1Hz]	*2
		Demod. øM	---	TALVLALL?	r[rad / 0.0001rad]	
	Distortion		---	DSTN? DB	ℓ [dB / 0.01dB]	
			---	DSTN? PER	p[% / 0.01%]	
			---	DSTN?	Output with current selected unit.	
	AF Frequency		---	AFFREQ?	f[Hz / 0.001Hz]	
	Freq. Characteristics		---	FREQCHAR? n	ℓ [dB / 0.01dB]	*3

*1 RDEVALL? command (which readouts all the measured results of the Deviation) outputs the measured results of the (P-P)/2, +P, -P, RMS, (P-P)/2 Hold, +P Hold, and -P Hold, in this order with commas for these data separation.

Output format is shown below, where one data is indicated with 7 characters.

Example 1: Outputs with kHz unit. (One digit under decimal point)

"10000.0, 1000.0, 100.0, 10.0, 1.0, 12.3, 123.4, 1234.5"

Example 2: Outputs with rad unit. (Four digits under decimal point)

"10.0000, 1.0000, 0.1000, 0.0100, 0.0001, 0.0003, 0.1234, 1.2345"

*2 TALVLALL? command (which readouts all the measured results of the AF Level) outputs the 8 types of the measured results, depending on the combination of the Filter and De-emphasis.

This command outputs the measured results of the ITU-T/750µs, C-MESSAGE/750µs, 6kHz BPF/750µs, Off/750µs, ITU-T/Off, C-MESSAGE/Off, 6kHz BPF/Off, and Off/Off,in this order with commas for these data separation.

Output format is shown below, where one data is indicated with 8 characters.

Example 1: Outputs with kHz unit. (Four digits under decimal point)

"100.0000, 10.0000, 1.0000, 0.0100, 0.0010, 0.0123, 0.1234, 1.2345"

Example 2: Outputs with rad unit. (Four digits under decimal point)

"100.0000, 10.0000, 1.0000, 0.1000, 0.0100, 0.0003, 0.1234, 1.2345"

*3 FREQCHAR? command (which readouts the measured results of the frequency characteristics) performs FFT of the demodulated AF signal, and outputs the frequency characteristics (from 50 Hz to 10 kHz, in 50 Hz steps, with the reference of the data at 1 kHz).

When inputing this command, specify multiple integer values of n (range: 1 to 200) which are integer-type parameters to determine the measurement frequencies.

The relation between n and the measurement frequency (f) is as follows:

$f = 50n$ (n: 1 to 200)

2.5.7 Digital RX measure commands

- Program messages for the digital RX measure command are valid in ranges defined on each digital RX measure screen.
- Query messages for the digital RX measure command are valid on all digital RX measure screens.

(1) Setup Digital RX Measure Parameter screen commands

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
BER Measure	Input	RF Loopback	BERMEASIN RFLOOP	BERMEASIN?	RFLOOP	
		BER Input	BERMEASIN BERINPUT	BERMEASIN?	BERINPUT	
	Input data	Positive	EIBD POS	EIBD?	POS	
		Negative	EIBD NEG	EIBD?	NEG	
	Input data clock	Rise	EIBC RISE	EIBC?	RISE	
		Fall	EIBC FALL	EIBC?	FALL	
Output signal data pattern	Pattern(Continuous)	PN9	PAT PN9	PAT?	PN9	
		PN15	PAT PN15	PAT?	PN15	
		bit	PAT bit	PAT?	bit	bit:0000 to 1111
	MS-DTC:SACCH		SACCH h	SACCH?	h	
BER Measure judgment	Judge	On	JBERMEAS ON	JBERMEAS?	ON	
		Off	JBERMEAS OFF	JBERMEAS?	OFF	
	Unit	%	UBERMEAS PERCENT	JBERMEAS?	PERCENT	
		Bit	UBERMEAS BIT	JBERMEAS?	BIT	
	Sample		BERSAMPLE n	BERSAMPLE?	n	
	Upper Limit		ULBERMEAS r	ULBERMEAS?	r	
				ULBERMEAS? un		un:PERCENT,BIT
Recall pattern	Recall data pattern		RCLPATT n	---	---	
Save pattern	Save data pattern		SAVEPATT n	---	---	
RX Caribration	User cal factor Band 1		RXUCAL1 ℓ	RXUCAL1?	ℓ	
	User cal factor Band 2		RXUCAL2 ℓ	RXUCAL2?	ℓ	

(2) Bit Error Rate screen commands

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Frequency	Frequency		RFREQ f	RFREQ?	f	
			FR f	---	---	
			FC f	---	---	
	Channel		CHAN n	CHAN?	n	
	Incremental step	Value	FIS f	FIS?	f	
		Up	FRS UP	---	---	
			UFR	---	---	
		Down	FRS DN	---	---	
			DFR	---	---	
	Relative	Reference value	---	FRLR?	f	
		Value	---	FRLV?	f	
		On	FRL ON	FRL?	ON	
			FO	---	---	
		Off	FRL OFF	FRL?	OFF	
			FF	---	---	
Level	Output level		OLVL ℓ	OLVL?	ℓ	
			OL ℓ	---	---	
			AP ℓ	---	---	
	Incremental step	Value	OIS ℓ	OIS?	ℓ	
		Up	OLS UP	---	---	
			UOL	---	---	
		Down	OLS DN	---	---	
			DOL	---	---	
	Knob	Step up	OLK UP	---	---	
			TOL	---	---	
		Step down	OLK DN	---	---	
			EOL	---	---	
	Output level resolution	0.1,1,10dB	OLR ℓ	OLR?	ℓ	
	Relative	Reference value	---	ORLR?	ℓ	
		Value	---	ORLV?	ℓ	
		On	ORL ON	ORL?	ON	
			LO	---	---	
		Off	ORL OFF	ORL?	OFF	
			LF	---	---	
	Output level offset	Value	OOS ℓ	OOS?	ℓ	
		On	OOF ON	OOF?	ON	
		Off	OOF OFF	OOF?	OFF	
	Output level ON/OFF	On	LVL ON	LVL?	ON	
			RO	---	---	
		Off	LVL OFF	LVL?	OFF	
			RF	---	---	

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
	Voltage display	EMF	VDSPL EMF	VDSPL?	EMF	
			SPØ3	---	---	
		TERM	VDSPL TERM	VDSPL?	TERM	
			SPØ4	---	---	
	Level continuous mode	On	OCNT ON	OCNT?	ON	
		Off	OCNT OFF	OCNT?	OFF	
	Unit	dBm	OLDBM	---	---	
			OLDM	---	---	
			APDBM	---	---	
			APDM	---	---	
		dBu	OLDBU	---	---	
			OLDU	---	---	
			APDBU	---	---	
			APDU	---	---	
	Calibration		CAL	---	---	
Modulation	Modulation	On	MOD ON	MOD?	ON	
		Off	MOD OFF	MOD?	OFF	
Bit error rate measure	Counting time		BERSAMPLE n	BERSAMPLE?	n	
Measurement	Start		BERSA	---	---	
	Stop		BERSO	---	---	
Measurement result	Error rate		---	BERRATE?	u	
	Error count		---	BERCNT?	n	
			---	BEREVENT?	n	

2.5.8 Analog RX measure commands

- Program messages for the analog RX measure commands are valid in ranges defined on each analog RX measure screen.

(1) Setup Analog RX Measure Parameter screen commands

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
AF Input	Range	30V	ARNG 30	ARNG?	30	
		4V	ARNG 4	ARNG?	4	
		400mV	ARNG 4ØØM	ARNG?	4ØØM	
		40mV	ARNG 4ØM	ARNG?	4ØM	
	Impedance	600Ω	AIMP 6ØØ	AIMP?	6ØØ	
		100kΩ	AIMP 1ØØK	AIMP?	1ØØK	

(2) Analog RX Measure screen commands

- Program messages of the analog RX Measure command are valid on the analog RX Measure screen.

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Storage Mode	Storage Mode	Normal	STRG NRM	STRG?	NRM	
		Average	STRG AVG	STRG?	AVG	
	Average On		VAVG ON	---	---	
			VAVG 1	---	---	
			KSG	---	---	
	Average Off		VAVG OFF	---	---	
			VAVG 0	---	---	
			KSH	---	---	
	Average Count		AVR n	AVR?	n	
			VAVG n	VAVG?	n	
AF Level	Adjust Range		ADJRNG	---	---	
	Set Relative		AFLVLSRL	---	---	
	Level Range	Up	ALRNG UP	---	---	
		Down	ALRNG DN	---	---	
	High Pass Filter	400Hz	AHPF 4ØØ	AHPF?	4ØØ	
		300Hz	AHPF 3ØØ	AHPF?	3ØØ	
		50Hz	AHPF 5Ø	AHPF?	5Ø	
		Off	AHPF OFF	AHPF?	OFF	
	Low Pass Filter	3kHz	ALPF 3	ALPF?	3	
		15kHz	ALPF 15	ALPF?	15	
		Off	ALPF OFF	ALPF?	OFF	
	Filter	ITU-T P.53	AFLT P53	AFLT?	P53	
		C-MESSAGE	AFLT CMESS	AFLT?	CMESS	
		6kHz BPF	AFLT BPF	AFLT?	BPF	
		OFF	AFLT OFF	AFLT?	OFF	
	AF Level Unit	dBm	ALUT DBM	ALUT?	DBM	
		V	ALUT V	ALUT?	V	
	Distortion Unit	dB	ADUT DB	ADUT?	DB	
		%	ADUT PER	ADUT?	PER	
RF Frequency	Channel		CHAN n	CHAN?	n[ch / 1ch]	
	RX Measure Frequency		RXFREQ f	RXFREQ?	f[Hz / 1Hz]	
	Incremental Step Value		FINC f	FINC?	f[Hz / 1Hz]	
	RX Freq. Step Up		FRS UP	---	---	
			UFR	---	---	
	RX Freq. Step Down		FRS DN	---	---	
			DFR	---	---	
	Relative On/Off	On	RXFREQRL ON	RXFREQRL?	ON	
		Off	RXFREQRL OFF	RXFREQRL?	OFF	
	Relative Value	---	---	RXFREQRLV?	f[Hz / 1Hz]	

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
RF Level	RX Measure Output Level	Specifies the input level with dBm unit.	OLVL ℓ DBM	OLVL?	ℓ [dBm/0.1dB]	Unit can be changed by inputing the set value with a character string of unit.
		Specifies the input level with dBu unit.	OLVL ℓ DBU	OLVL?	ℓ [dBμ/0.1dB]	
		Specifies the input level with current selected unit.	OLVL ℓ	OLVL?	ℓ	
	Incremental Step Value		LINC ℓ	LINC?	ℓ [dB / 0.1dB]	
	RF Level Step Up		OLS UP	---	---	
			UOL	---	---	
	RF Level Step Down		OLS DN	---	---	
			DOL	---	---	
	Unit EMF/TERM	EMF	RFUT EMF	RFUT?	EMF	
		TERM	RFUT TERM	RFUT?	TERM	
	RF Level Rel. On/Off	On	OLVLRL ON	OLVLRL?	ON	
		Off	OLVLRL OFF	OLVLRL?	OFF	
	Relative Value		---	OLVLRLV?	ℓ [dB / 0.1dB]	
	RF Level On/Off	On	RRLVL ON	RRLVL?	ON	
		Off	RRLVL OFF	RRLVL?	OFF	
AF Oscillator 1 (Mod.)	Frequency		AFREQ1 f	AFREQ1?	f[Hz / 0.1Hz]	
	Deviation		ADEV1 f	ADEV1?	f[Hz / 0.1Hz]	
	Oscillator Switch	On	AOUT1 ON	AOUT1?	ON	
		Off	AOUT1 OFF	AOUT1?	OFF	
AF Oscillator 2 (Mod./AF)	Frequency		AFREQ2 f	AFREQ2?	f[Hz / 0.1Hz]	
	Deviation		ADEV2 f	ADEV2?	f[Hz / 0.1Hz]	
	Level	Specifies the input/output level with V unit.	ALVL2 vV(V,MV,UV)	ALVL2? V	v[V / 1μV]	
		Specifies the input/output level with dBm unit.	ALVL2 ℓ DBM	ALVL2? DBM	ℓ [dBm / 0.1dB]	
		Specifies the input/output level with current selected unit.	ALVL2 ℓ (or ALVL2 v)	ALVL2?	ℓ (or v)	
	Signal	Tone	ASIG2 TONE	ASIG2?	TONE	
		Noise(ITU-T G.227)	ASIG2 G227	ASIG2?	G227	
		Noise(White)	ASIG2 WHITE	ASIG2?	WHITE	
	Output For Mod/AF	Mod.	AOPF2 MOD	AOPF2?	MOD	
		AF	AOPF2 AF	AOPF2?	AF	
	Oscillator Switch	On	AOUT2 ON	AOUT2?	ON	
		Off	AOUT2 OFF	AOUT2?	OFF	
External Oscillator (Mod.)	Deviation		ADEVX f	ADEVX?	f[Hz / 0.1Hz]	
	Oscillator Switch	On	AOUTX ON	AOUTX?	ON	
		Off	AOUTX OFF	AOUTX?	OFF	

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Measure Result	AF Level	dBm	---	AFLVL? DBM	ℓ[dBm / 0.01dBm]	*The input level with 100kΩ is invalid.
		V	---	AFLVL? V	v[V / #.####E+##V]	
			---	AFLVL?	Output with current selected unit.	
		Relative Value	---	AFLVLRLV?	ℓ[dB / 0.01dB]	
	AF Level Readouts all the measured results.		---	AFLVLALL? DBM	ℓ[dBm / 0.01dB]	*1
			---	AFLVLALL? V	v[V / 0.1μV]	
			---	AFLVLALL?	Output with current selected unit.	
	AF SINAD		---	SINAD?	ℓ[dB / 0.01dB]	
	AF Distortion	dB	---	DSTN? DB	ℓ[dB / 0.01dB]	
		%	---	DSTN? PER	p[% / 0.01%]	
			---	DSTN?	Output with current selected unit.	
	AF Frequency		---	AFFREQ?	f[Hz / 0.001Hz]	
	Freq. Characteristics		---	FREQCHAR? n	ℓ[dB / 0.01dB]	*2

*1 AFLVLALL? command (which readouts all the measured results of the AF Level) outputs the 8 types of the measured results, depending on the combination of the Filter and De-emphasis.
This command outputs the measured results of the ITU-T/750μs, C-MESSAGE/750μs, 6kHz BPF/750μs, Off/750μs, ITU-T/Off, C-MESSAGE/Off, 6kHz BPF/Off, and Off/Off,in this order with commas for these data separation.
Output format is shown below, where one data is indicated with 9 characters.

Example 1: Outputs with dBm unit. (Two digits under decimal point)

"100000.00, _10000.00, _1000.00, __0.01, _1234.56, _123.45, _-12.34, __-0.10"

Example 2: Outputs with Volt unit. (Exponent form)

"1.234E+01,2.324E-03,5.325E-05,4.448E-06,1.568E+01,3.525E-04,4.256E-03,1.825E-02"

*2 FREQCHAR? command (which readouts the measured results of the frequency characteristics) performs FFT of the demodulated AF signal, and outputs the frequency characteristics (from 50 Hz to 10 kHz, in 50 Hz steps, with the reference of the data at 1 kHz).
When inputing this command, specify multiple integer values of n (range: 1 to 200) which are integer-type parameters to determine the measurement frequencies.
The relation between n and the measurement frequency (f) is as follows:

f = 50n (n: 1 to 200)

2.5.9 AF measure commands

- Program messages for the AF measure command are valid in ranges defined on each AF measure screen.

(1) Setup AF Measure Parameter screen commands

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
AF Input	Range	30V	ARNG 3Ø	ARNG?	3Ø	
		4V	ARNG 4	ARNG?	4	
		400mV	ARNG 4ØØM	ARNG?	4ØØM	
		40mV	ARNG 4ØM	ARNG?	4ØM	
	Impedance	600Ω	AIMP 6ØØ	AIMP?	6ØØ	
		100kΩ	AIMP 1ØØK	AIMP?	1ØØK	
AF Output	Impedance	600Ω	AOIMP 6ØØ	AOIMP?	6ØØ	
		50Ω	AOIMP 5Ø	AOIMP?	5Ø	

(2) AF Measure screen commands

- Program messages of the AF Measure command are valid on the AF Measure screen.

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Storage Mode	Storage Mode	Normal	STRG NRM	STRG?	NRM	
		Average	STRG AVG	STRG?	AVG	
	Average On		VAVG ON	---	---	
			VAVG 1	---	---	
			KSG	---	---	
	Average Off		VAVG OFF	---	---	
			VAVG 0	---	---	
			KSH	---	---	
	Average Count		AVR n	AVR?	n	
			VAVG n	VAVG?	n	
AF Level	Adjust Range		ADJRNG	---	---	
	Set Relative		AFLVLSRL	---	---	
	Level Range	Up	ALRNG UP	---	---	
		Down	ALRNG DN	---	---	
	High Pass Filter	400Hz	AHPF 4ØØ	AHPF?	4ØØ	
		300Hz	AHPF 3ØØ	AHPF?	3ØØ	
		50Hz	AHPF 5Ø	AHPF?	5Ø	
		Off	AHPF OFF	AHPF?	OFF	
	Low Pass Filter	3kHz	ALPF 3	ALPF?	3	
		15kHz	ALPF 15	ALPF?	15	
		Off	ALPF OFF	ALPF?	OFF	
	Filter	ITU-T P.53	AFLT P53	AFLT?	P53	
		C-MESSAGE	AFLT CMESS	AFLT?	CMESS	
		6kHz BPF	AFLT BPF	AFLT?	BPF	
		OFF	AFLT OFF	AFLT?	OFF	
	AF Level Unit	dBm	ALUT DBM	ALUT?	DBM	
		V	ALUT V	ALUT?	V	
	Distortion Unit	dB	ADUT DB	ADUT?	DB	
		%	ADUT PER	ADUT?	PER	

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
AF Oscillator 1	Frequency		AFREQ1 f	AFREQ1?	f[Hz / 0.1Hz]	
	Level	Specifies the input/output level with V unit.	ALVL1 vV(V,MV,UV)	ALVL1? V	v[V / 1μV]	
		Specifies the input/output level with dBm unit.	ALVL1 ℓ DBM	ALVL1? DBM	ℓ [dBm / 0.1dB]	
		Specifies the input/output level with current selected unit.	ALVL1 ℓ (or ALVL1 v)	ALVL1?	ℓ (or v)	
	Signal	Tone	ASIG1 TONE	ASIG1?	TONE	
		Noise(ITU-T G.227)	ASIG1 G227	ASIG1?	G227	
		Noise(White)	ASIG1 WHITE	ASIG1?	WHITE	
	Level Relative	On	ALVL1RL ON	ALVL1RL?	ON	
		Off	ALVL1RL OFF	ALVL1RL?	OFF	
	Relative Value		---	ALVL1RLV?	ℓ [dB / 0.1dB]	
	Oscillator Switch	On	AOUT1 ON	AOUT1?	ON	
		Off	AOUT1 OFF	AOUT1?	OFF	
AF Oscillator 2	Frequency		AFREQ2 f	AFREQ2?	f[Hz / 0.1Hz]	
	Level	Specifies the input/output level with V unit.	ALVL2 vV(V,MV,UV)	ALVL2? V	v[V / 1μV]	
		Specifies the input/output level with dBm unit.	ALVL2 ℓ DBM	ALVL2? DBM	ℓ [dBm / 0.1dB]	
		Specifies the input/output level with current selected unit.	ALVL2 ℓ (or ALVL2 v)	ALVL2?	ℓ (or v)	
	Signal	Tone	ASIG2 TONE	ASIG2?	TONE	
		Noise(ITU-T G.227)	ASIG2 G227	ASIG2?	G227	
		Noise(White)	ASIG2 WHITE	ASIG2?	WHITE	
	Level Relative	On	ALVL2RL ON	ALVL2RL?	ON	
		Off	ALVL2RL OFF	ALVL2RL?	OFF	
	Relative Value		---	ALVL2RLV?	ℓ [dB / 0.1dB]	
	Oscillator Switch	On	AOUT2 ON	AOUT2?	ON	
		Off	AOUT2 OFF	AOUT2?	OFF	
Measure Result	AF Level	dBm	---	AFLVL? DBM	ℓ [dBm / 0.01dB]	
		V	---	AFLVL? V	v[V / 0.1μV]	*The input level with 100kΩ is invalid.
			---	AFLVL?	Output with current selected unit.	
		Relative Value	---	AFLVLRLV?	ℓ [dB / 0.01dB]	
	AF Level Readouts all the measured results.		---	AFLVLALL? DBM	ℓ [dBm / 0.01dB]	*1
			---	AFLVLALL? V	v[V / 0.1μV]	
			---	AFLVLALL?	Output with current selected unit.	
	AF Distortion	dB	---	DSTN? DB	ℓ [dB / 0.01dB]	
		%	---	DSTN? PER	p[% / 0.01%]	
			---	DSTN?	Output with current selected unit.	
	AF Frequency		---	AFFREQ?	f[Hz / 0.001Hz]	
	Freq. Characteristics		---	FREQCHAR? n	ℓ [dB / 0.01dB]	*2

*1 AFLVLALL? command (which readouts all the measured results of the AF Level) outputs the 8 types of the measured results, depending on the combination of the Filter and De-emphasis.
This command outputs the measured results of the ITU-T/750μs, C-MESSAGE/750μs, 6kHz BPF/750μs, Off/750μs, ITU-T/Off, C-MESSAGE/Off, 6kHz BPF/Off, and Off/Off,in this order with commas for these data separation.
Output format is shown below, where one data is indicated with 9 characters.

Example 1: Outputs with dBm unit. (Two digits under decimal point)

"100000.00, _10000.00, __1000.00, _____0.01, __1234.56, ___123.45, ___-12.34, ____-0.10"

Example 2: Outputs with Volt unit. (Exponent form)

"1.234E+01,2.324E-03,5.325E-05,4.448E-06,1.568E+01,3.525E-04,4.256E-03,1.825E-02"

*2 FREQCHAR? command (which readouts the measured results of the frequency characteristics) performs FFT of the demodulated AF signal, and outputs the frequency characteristics (from 50 Hz to 10 kHz, in 50 Hz steps, with the reference of the data at 1 kHz).
When inputing this command, specify multiple integer values of n (range: 1 to 200) which are integer-type parameters to determine the measurement frequencies.
The relation between n and the measurement frequency (f) is as follows:

$f = 50n$ (n: 1 to 200)

2.5.10 Call Processing commands

- Program messages for the Call Processing command are valid in ranges defined on each screen of the Call Processing test.

(1) Setup Call Proc. Parameters screen commands

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Call Processing parameter	DVCC (DCCH)		CTRLDVCC n	CTRLDVCC?	n	
	DCC (ACCH)		CTRLDCC n	CTRLDCC?	n	n: 0 to 3
	SID (System Identification)		CTRLSID n	CTRLSID?	n	
	SOC (System Operater Code)		CTRLSOC h	CTRLSOC?	h	h: 0 to FFF
	BSMC (MS Manufacturer)		CTRLBSMC h	CTRLBSMC?	h	h: 0 to FF
	Default MSID		DEFMSID d1,d2	DEFMSID?	d1,d2	
AF Osc (Analog Conversation Mode)	AF Osc. Output for	FM mod.	AOPF MOD	AOPF?	MOD	
		Off	AOPF OFF	AOPF?	OFF	
	AF Osc. Signal	Tone	ASIG TONE	ASIG?	TONE	
		Noise(ITU-T G.227)	ASIG G227	ASIG?	G227	
		Noise(White)	ASIG WHITE	ASIG?	WHITE	
	Frequency		AFREQ f	AFREQ?	f	
	Deviation		ADEV ℓ	ADEV?	ℓ	

(2) Sequence Monitor screen commands

Intermediate class	Function	Function details	Program Msg	Query Msg	Response Msg	Remarks
Call processing status	Start test		CALLSA			
	Stop test		CALLSO			
	Paging		CALLPG			
	NW release		CALLNWR			
	Refresh status		CALLRFR			
Scenario Load	File No.		SLOAD n	SLOAD?	n	
	Default		SLOAD DEFAULT	SLOAD?	DEFAULT	
Call processing result	C/P status			CALLSTAT?	ss	
	C/P error			CALLERR?	ss,ec	
	C/P result			CALLRSLT? ss	flg,ec	
MS parameter	MSID			CALLMSID?	flg,nI,h	
	Channel quality report			CALLREP?	flg,nR,nB	
	Input level			CALLILVL?	flg, ℓ	
	Current channel			CALLCH?	flg,n1,n2,n3	n1:Band n2:Channel n3:Slot

⋆ Meaning of Response data

ss (Sequence)	0:Stop, 1:Stanby, 4:Registration, 5:Origination, 6:Termination, 7:Conversation, 8:Handoff, 9:NW Release, 10:MS Release, 12:Other (2,3,11 are not supported by IS-136)
flg (Received flag)	0:Not received, 1:Received (When Received flag is 0, then other data are set to 0.)
ec (Error code)	0:No error, 1 to 255:Error code
nI (IDT: ID type)	2:34-bit MIN, 3:50-bit IMSI, 0:20-bit TMSI, 1:24-bit TMSI
nR (RSSI)	0 to 31
nB (BER)	0 to 7
n1 (Band)	0:800 MHz, 1:1.9 GHz

SECTION 3
SETUP

This section describes the RS-232C/GPIB connections to external devices and setting the remote-control interface of the MT8802A.

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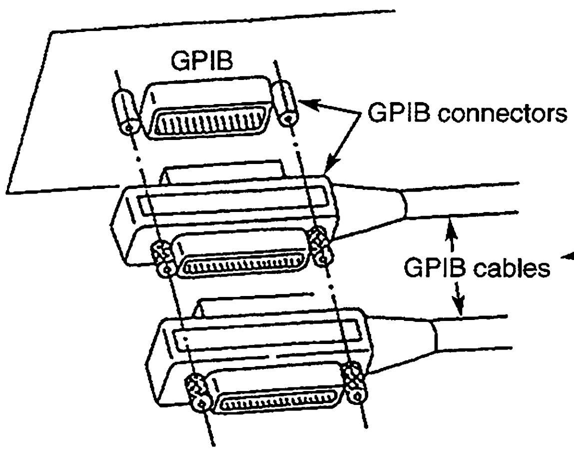
3.1 Connecting Devices with GPIB Cables

The rear panel has connectors for connecting GPIB cables.

Up to 15 devices, including the controller, can be connected to one system. Connect devices under the conditions described to the right of the diagram below.



Total cable length ≤20 m
Cable length between devices ≤4 m
Number of devices which can be connected ≤15

Mounting and dismounting of the GP-IB cable must be done after turning off the power switch and pulling out the power cord from the socket. If the power remains on, only signal common line may disconnected before the other lines, then AC leak voltages are applied to the ICs, and there is a possibility that components such as ICs in the interface unit will be damaged.

⚠ CAUTION

The GPIB cables must be connected before the power is turned on.

3.2 Setting GPIB Interface Conditions

Set the GPIB interface on the Instrument Setup screen at the front panel.

Set the following items:

1) Interface: Connect to Controller (Initial value: GPIB)

2) GPIB: Address (Initial value: 01)

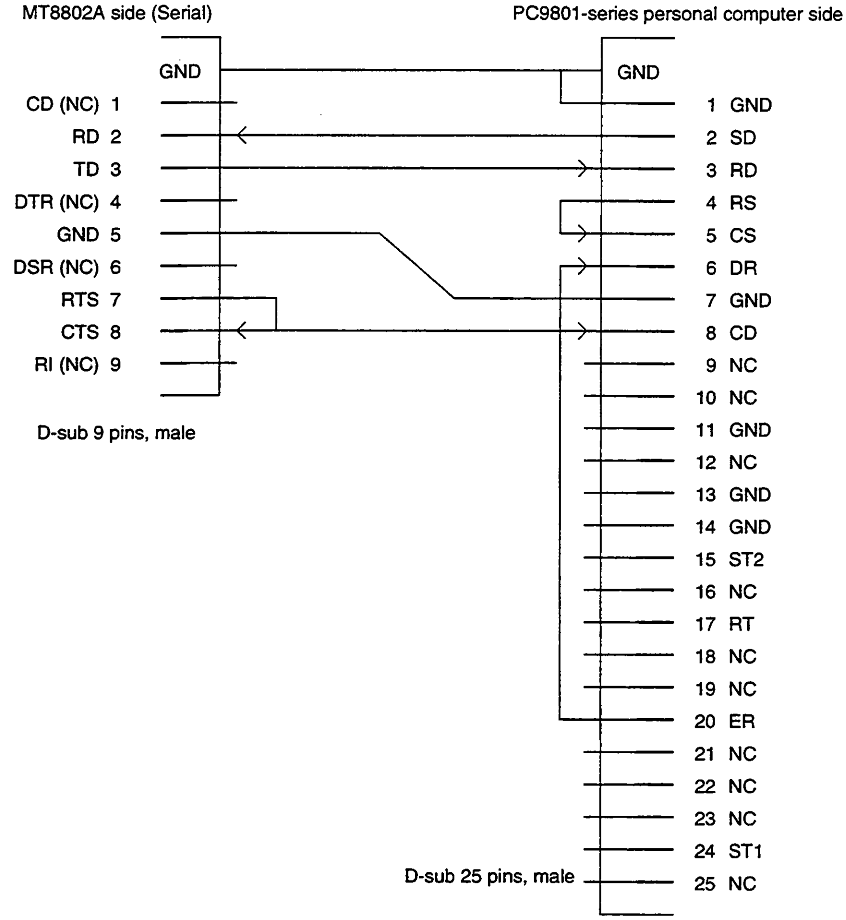
An example of the setting when the GPIB interface is set with the GPIB address03 is given below.

Step	Key operation	Explanation
(Switching to the Instrument Setup screen)		
1.	[Main Func on off] F6	Sets the Main Func on to display the main menu.
2.	Next Menu[◀]	Sets the Instrument Setup mode.
	[Instrument Setup] F2	Displays the Instrument Setup screen.
(Selecting the remote control interface)		
3.	Cursor [︿] [﹀]	Uses these cursor keys to select "Interface Connect to Controller.".
4.	[Set]	Opens the setup window.
5.	Cursor [︿] [﹀]	Selects GPIB on the setting window.
6.	[Set]	Closes the setting window and determines the set value.
(Setting the GPIB address)		
7.	Cursor [︿] [﹀]	Use these cursor keys to select a GPIB address.
8.	[Set]	Opens the setup window.
9.	[0] [3] [Set]	Set the GPIB address to 03.

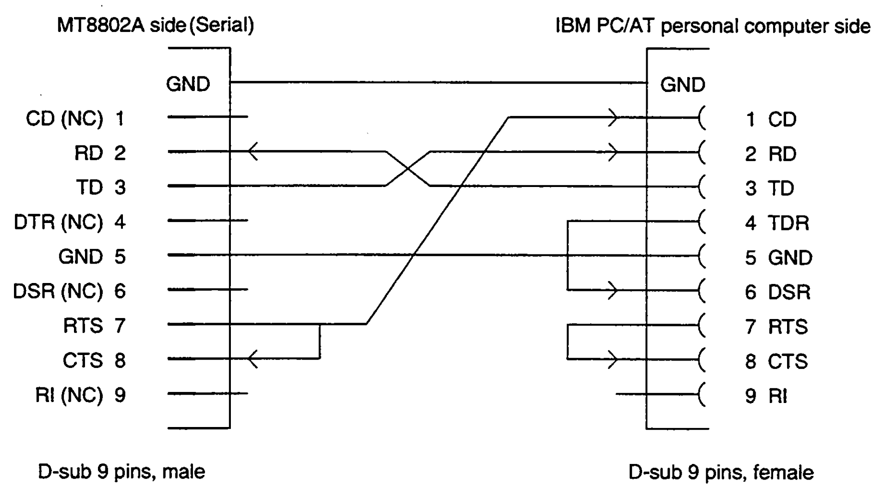
3.3 Connection of RS-232C Interface Signal

Connection of RS-232C interface signal between the MT8802A and a personal computer is shown below.

• Connection to PC98-series personal computer(NEC)



• Connection to IBM PC/AT personal computer



3.4 Setting RS-232C Interface Conditions

Set the RS-232C interface on the Instrument Setup screen at the front panel.

Set the following items:

1) Interface: Connect to Controller (Initial value: GPIB)

2) RS-232C: Baud Rate (Initial value: 2400)

Parity (Initial value: Even)

Data Bit (Initial value: 8 bits)

Stop Bit (Initial value: 1 bit)

Set the RS-232C interface conditions, as desribed below.

Step	Key operation	Explanation
(Switching to the Instrument Setup screen)		
1.	[Main Func On/Off] F6	Sets the Main Func on to display the main menu.
2.	Next Menu [◀]	Sets the Instrument Setup mode.
	[Instrument Setup] F2	Displays the Instrument Setup screen.
(Selecting the remote control interface)		
3.	Cursor [︿] [﹀]	These cursor keys are used to select "Interface Connect to Controller."
4.	[Set]	Opens the setup window.
5.	Cursor [︿] [﹀]	Selects RS-232C on the setting window.
6.	[Set]	Closes the setting window and establishes the set value.
(Setting the RS-232C interface)		
7.	Cursor [︿] [﹀]	Uses these cursor keys to select the setting item Baud rate.
8.	[Set]	Opens the setup window.
9.	[︿] [﹀] [Set]	Uses these cursor keys to select a Baud rate value (9600 [bps] etc.).
10.	[︿] [﹀]	Sets other interface conditions in the same way.

3.5 Setting the Items Relating to Remote Control and Panel Key Control

3.5.1 Remote control and panel control keys

The keys and lamps described in this paragraph are assigned on the front panel as exclusive keys and lamps.

1) REMOTE lamp and LOCAL key

The REMOTE lamp indicates that the MT8802A is controlled remotely via the GPIB interface. When the MT8802A is controlled remotely from an external controller via the GPIB interface on the rear panel, the REMOTE lamp lights. While the REMOTE lamp is on, key entry and rotary encoder entry from the front panel are disabled.The LOCAL key is used to cancel the remote control status of the GPIB interface. When the LOCAL key is pressed, the REMOTE lamp goes off and key entry and rotary encoder entry from the front panel are enabled.

2) PANEL LOCK key

The PANEL LOCK key is used to enable and disable key entry and rotary encoder entry from the front panel. Use the PANEL LOCK key to prevent an operation error on the front panel for automatic measurement or status holding. When the panel is locked, the green lamp on the PANEL LOCK key lights.

3.5.2 Remote control status

If the MT8802A is controlled remotely, the REMOTE lamp on the left of the front panel lights. While the REMOTE lamp is on, key entry and rotary encoder entry from the front panel are disabled. To change from the remote control to front panel entry status, execute the following steps:

1) Halt the remote control.

2) If the REMOTE lamp is on, press the LOCAL key to cancel the REMOTE status.

SECTION 4
DEVICE MESSAGE FORMAT

This section describes the format of the device messages transmitted between a controller and the MT8802A via the GPIB system.

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4.1 General Description

The device messages are data messages that are transmitted between the controller and devices. There are two types of data messages:program messages output from the controller to the MT8802A, and response messages input from the MT8802A by the controller. There are also two types of program commands and program queries in the program message. The program command is used to set this instrument's parameters and to instruct it to execute processing. The program query is used to query the values of parameters and measured results.

4.2 Program Message Format

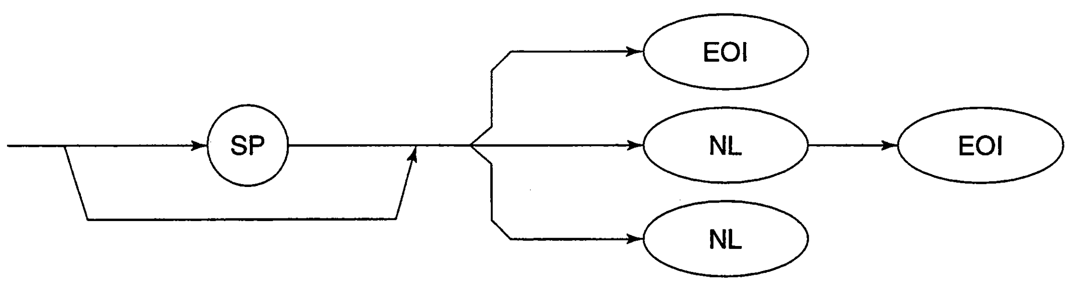
To transfer program messages from the controller to the MT8802A using the PRINT statement, the program message formats are defined as follows:


```
PRINT△@1,"TFREQ△3GHZ"
```

Program message

When the program message is transmitted from the controller to the MT8802A, the specified terminator is attached.

(1) PROGRAM MESSAGE TERMINATOR

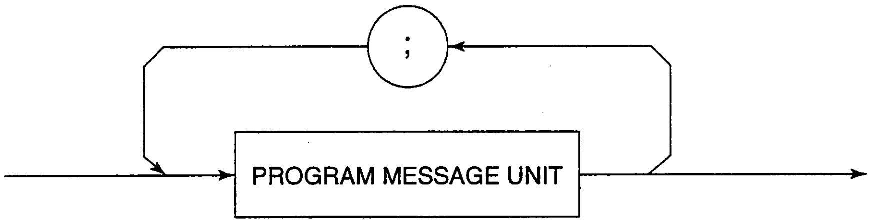


NL : New line or LF (Line Feed)

EOI : The EOI signal of the GPIB interface is used to indicate message termination.

Cartridge Return (CR) is ignored, and is not processed as a terminator.

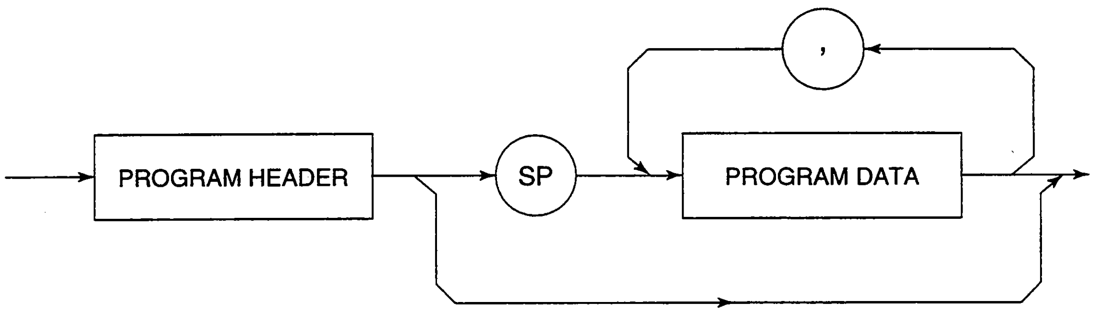
(2) PROGRAM MESSAGE



Multiple commands can be output sequentially by concatenating each of them with a semicolon.

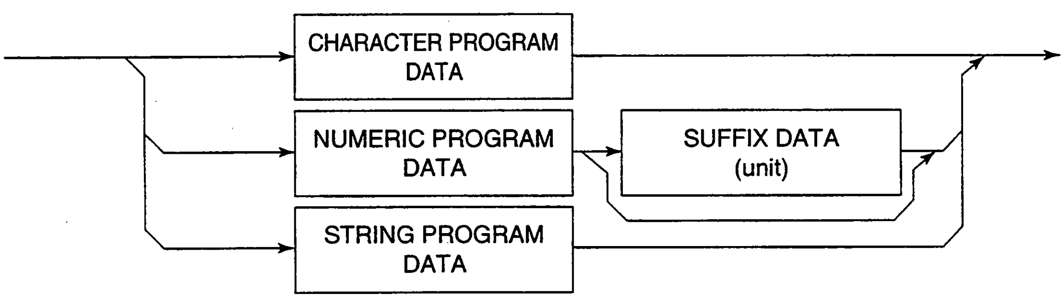
<Example> `PRINT△@1,"TFREQ△1GHZ;RFLVL△UP"`

(3) PROGRAM MESSAGE UNIT



- Each IEEE488.2 common command has a leading asterisk "*" that is always placed before the program header.
- The program query has a trailing question mark "?" that is always added at the end of the program header.

(4) PROGRAM DATA



(5) CHARACTER PROGRAM DATA

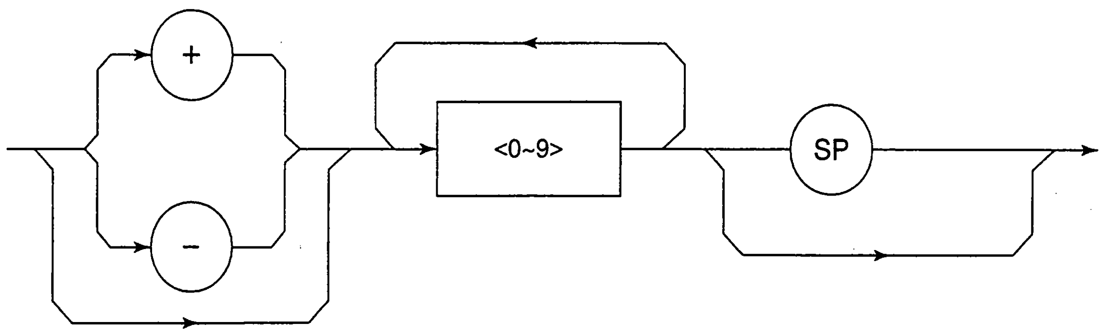
Character program data consists of uppercase alphabetic characters from A to Z, lowercase alphabetic characters from a to z, the underline "_", and the numbers 0 to 9. These characters can be used in specified combinations.

<Example> `PRINT△@1,△"MKR△NRM"` .... Sets Marker to Normal.

(6) NUMERIC PROGRAM DATA

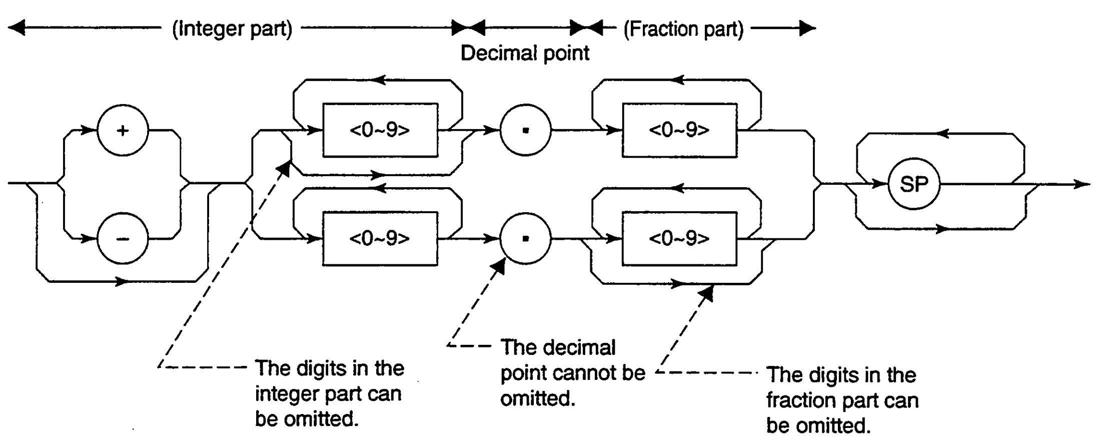
Numeric program data has two types of formats:integer format (NR1) and fixed-point real number format (NR2).

<Integer Format (NR1)>



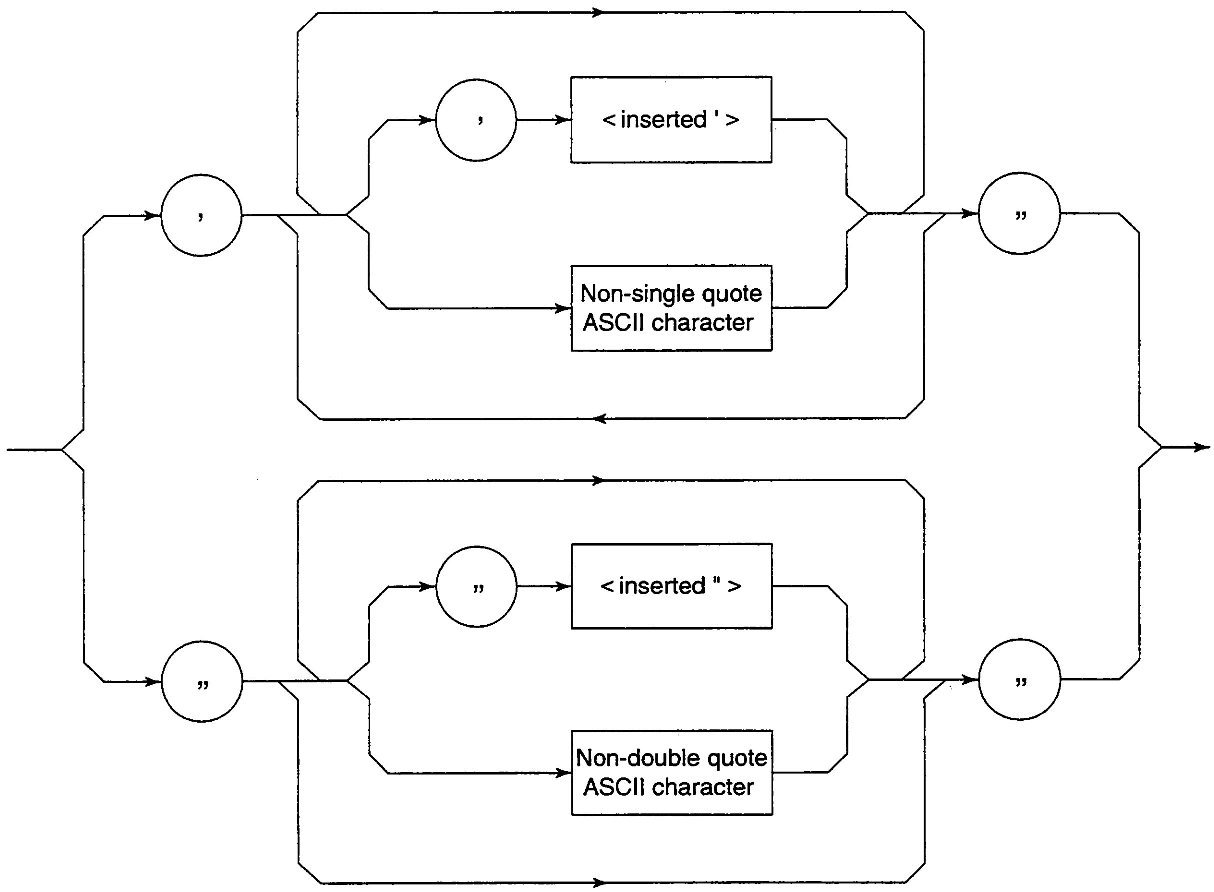
- Zeros can be inserted at the beginning. → 005, +000045
- No spaces can be inserted between a + or - sign and a number. → 5, +△5 (×)
- Spaces can be inserted after a number. → +5△△△
- The + sign is optional. → +5,5
- Commas cannot be used to separate digits. → 1,234,567 (×)

<Fixed-Point (real number) Format (NR2)>



- The numeric expression of the integer format is applied to the integer part.
- No spaces can be inserted between numbers and the decimal point. → +753△.123 (×)
- Spaces can be inserted between numbers and the decimal point. → +753.123△△△△
- A number may not always be placed before the decimal point. → .05
- A + or - sign can be placed before the decimal point. → +. 05, –.05
- A number can end with a decimal point. → 12.

(7) STRING PROGRAM DATA



•Both ends of string program data must have a pair of double quotation marks "___".

```
PRINT @1,"TITLE 'MT8802A'"
```

A single quotation mark used within the character string must be repeated as shown in ' or ''.

```
PRINT @1,"TITLE 'MT8802A''NOISE MEAS''' "
```

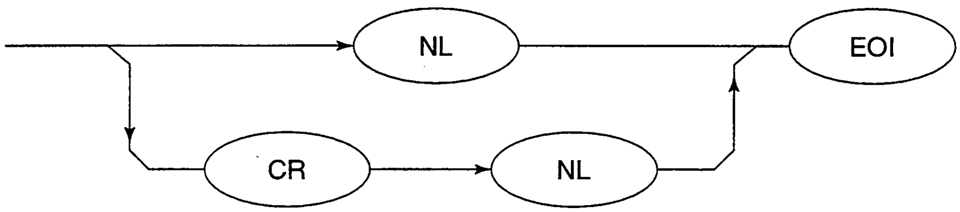
Executing TITLE results in MT8802A 'NOISE MEAS'.

Note:To use the double quotation mark " in the PRINT statement, specify CHR$ (&H22).

4.3 Response Message Format

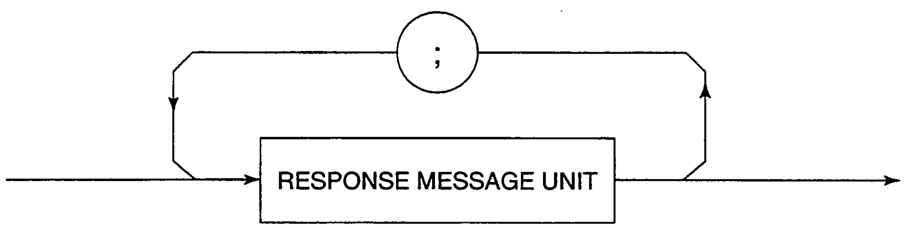
To transfer responses messages from the MT8802A to the controller by using the INPUT statement, the response message formats are defined as follows:

(1) RESPONSE MESSAGE TERMINATOR



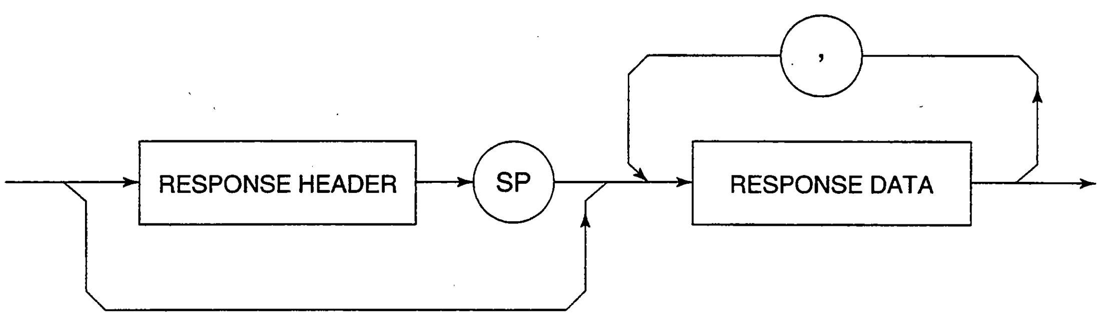
The response message terminator to be used depends on the TRM command.

(2) RESPONSE MESSAGE

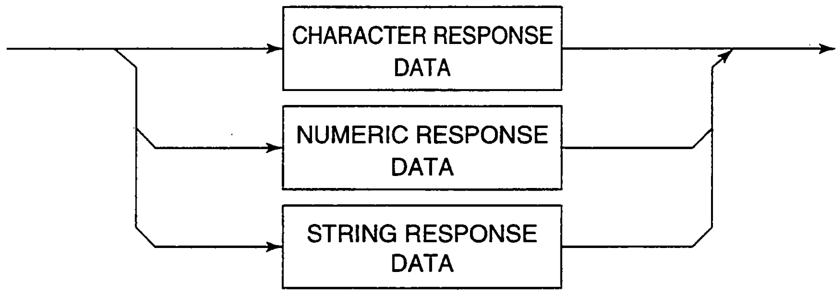


When a query is sent by the PRINT statement with one or more program queries, the response message also consists of one or more response message units.

(3) Normal RESPONSE MESSAGE UNIT



(4) RESPONSE DATA

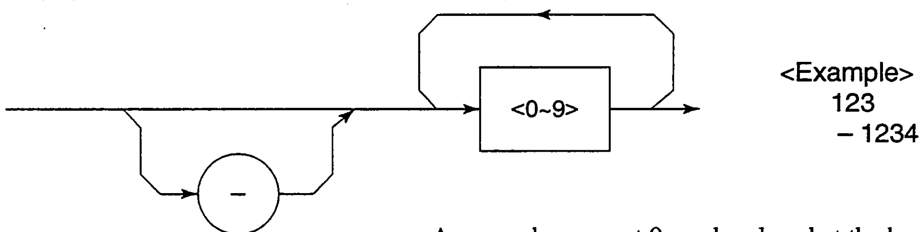


(5) CHARACTER RESPONSE DATA

Character response data consists of uppercase alphabetic characters from A to Z, lowercase alphabetic characters from a to z, the underline "_", and the numbers 0 to 9.These characters can be used in specified combinations.

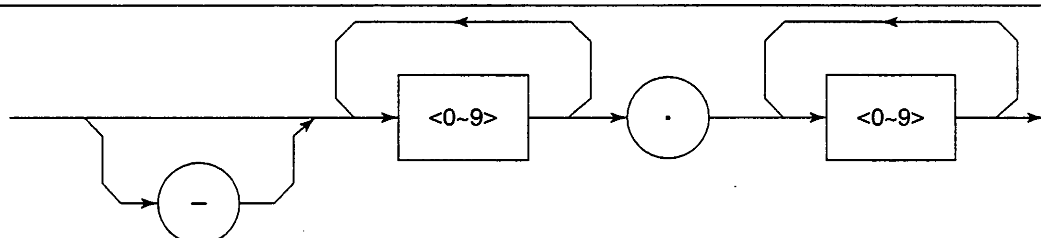
(6) NUMERIC RESPONSE DATA

<Integer Format (NR1)>



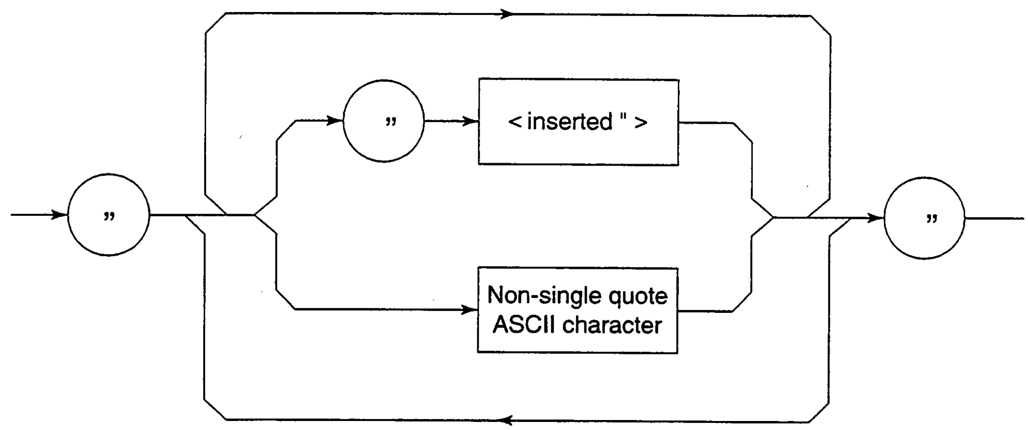
- Any number except 0 can be placed at the beginning digit.
- There is no need for a + sign before a positive number.

<Integer Format (NR1)>



- Any number except 0 can be placed at the beginning digit.
- There is no need for a + sign before a positive number
- If there are zeros after the decimal point, the numeric data is output in integer format.

(7) STRING RESPONSE DATA



String response data is output as an ASCII character string, which is enclosed with double quotation marks.

(8) Response message to input the waveform data using binary data

For details on reading binary format, see paragraph 7.2 in Section 7, "SAMPLE PROGRAMS."

SECTION 5
STATUS MESSAGES

This section describes MT8802A status messages, their data structure and models, and explains the techniques for synchronizing the controller and the MT8802A.

To obtain more detailed status information, the IEEE488.2 standard has more common commands and common queries than the IEEE488.1 standard.

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The Status Byte (STB) sent to the controller is based on the IEEE488.1 standard. The bits comprising it are called a status summary message because they represent a summary of the current data contained in registers and queues.

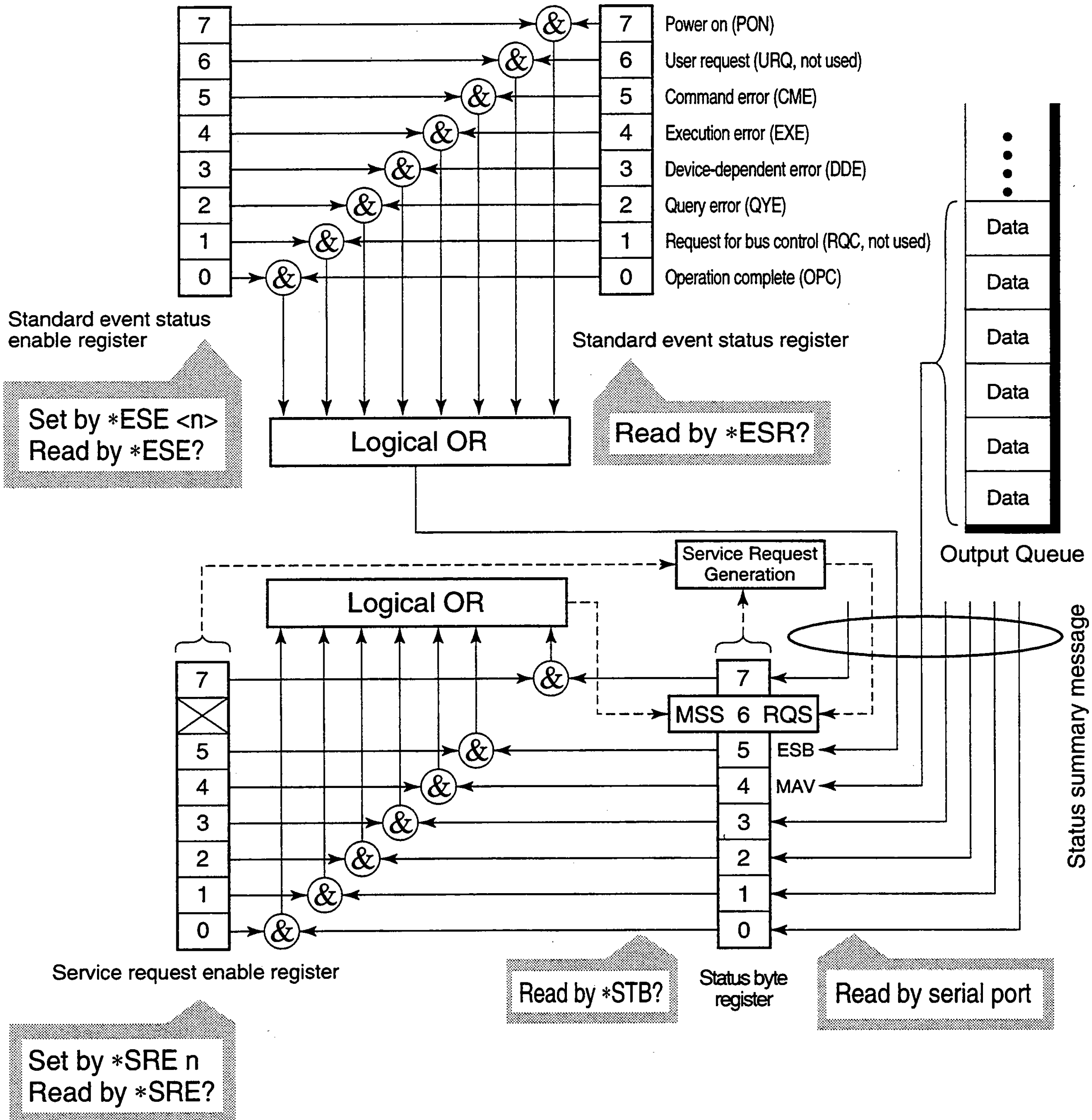
The following pages explain the status summary message and structure of status data that constitutes the status summary message bits, as well as techniques for synchronizing the MT8802A and controller, which use these status messages.

These functions are used by an external controller with the GPIB interface bus.

Almost functions can be used by an external controller with the RS-232C interface.

5.1 IEEE488.2 Standard Status Model

The diagram below shows the standard model for the status data structure stipulated in the IEEE488.2 standard.



Standard Status Model Diagram

The IEEE488.1 status byte is used in the status model. This status byte is composed of seven summary message bits given from the status data structure. To create the summary message bits, there are two models for the data structure:the register model and the queue model.

Register model	Queue model
The register model consists of the two registers used for recording events and conditions encountered by a device. These two registers are the Event Status Register and Event Status Enable Register. When the result of the AND operation of both register contents is not 0, the corresponding bit of the status bit becomes 1.In other cases, it becomes 0.And, when the result of their Logical OR is 1, the summary message bit also becomes 1.If the logical OR result is 0, the summary message bit also becomes 0.	The queue in the queue model is for sequentially recording the waiting status values and data. The queue structure is such that the relevant bit is set to 1 when there is data in it and 0 when it is empty.

In IEEE488.2, there are three standard models for status data structure, two register models and one queue model, based on the register model and queue model explained above. They are:

(1) Standard Event Status Register and Standard Event Status Enable Register
(2) Status Byte Register and Service Request Enable Register
(3) Output Queue

Standard Event Status Register	Status Byte Register	Output Queue
The Standard Event Status Register has the structure of the previously described register model. In this register, bits are set for eight types of standard events encountered by a device. (1) Power on, (2) User request, (3) Command error, (4) Execution error, (5) Device-dependent error, (6) Query error, (7) Request for bus control and 8 Operation complete. The logical OR output bit is represented by Status Byte Register bit 5 (DIO6) as a summary message for the Event Status Bit (ESB).	The Status Byte Register is a register in which the RQS bit and the seven summary message bits from the status data structure can be set. It is used together with the Service Request Enable Register. When the result of the OR operation of both register contents is not 0, SRQ goes ON. To indicate this, bit 6 of the Status Byte Register (DIO7) is reserved by the system as the RQS bit, which indicates a service request for the external controller. The mechanism of SRQ conforms to the IEEE488.1 standard.	The Output Queue has the structure of the queue model mentioned above. Status Byte Register bit 4 (DIO5) is set as a summary message for Message Available (MAV) to indicate that there is data in the output buffer.

5.2 Status Byte (STB) Register

The STB register consists of device STB and RQS (or MSS) messages. The IEEE488.1 standard defines the method of reporting STB and RQS messages, but not the setting and clearing of protocols or the meaning of STB. The IEEE488.2 standard defines the device status summary message and the Master Summary Status (MSS) which is sent to bit 6 together with STB in response to an *STB? common query.

5.2.1 ESB and MAV summary messages

The following describes the ESB and MAV summary messages.

(1) ESB summary messages

The ESB (Event Summary Bit) summary message is a message defined by IEEE488.2, and is represented by bit 5 of the STB register. This bit indicates whether at least one of the events defined in IEEE488.2 has occurred when the service request enable register is set to enable events after the final reading or clearing of the standard event register.

The ESB summary message bit becomes 1 when the setting permits events to occur if any of the events recorded in the standard event status register becomes 1.The ESB summary bit becomes true when the setting permits events to occur if any of the events registered in the standard event status register is true. Conversely, it is false if none of the recorded events occurs even if events are set to occur.

This bit becomes FALSE (0) when the ESR register is read by the *ESR? query and the ESR register is cleared by the *CLS command.

(2) MAV summary messages

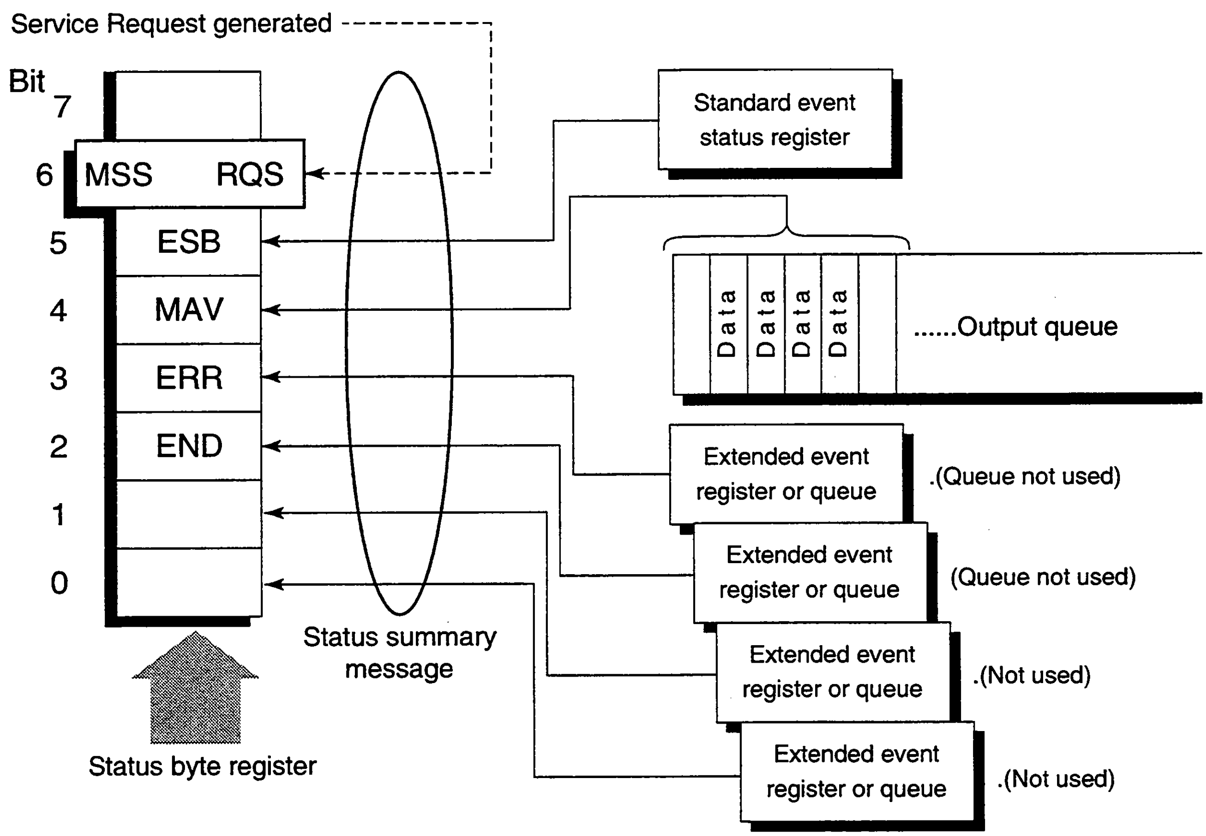
The MAV summary message is a message defined in IEEE488.2 and represented by bit 4 in the STB register. This bit indicates whether the output queue is empty. The MAV summary message bit is set to 1 (true) when a device is ready to receive a request for a response message from the controller and to 0 (false) when the output queue is empty. This message is used to synchronize the exchange of information with the controller. For example, this message can be used to make the controller wait until MAV is true after it sends a query command to the device. While the controller is waiting for a response from thedevice, it can process other jobs. Reading the output queue without first checking MAV delay all system bus operations until the device responds.

5.2.2 Device-dependent summary messages

The IEEE488.2 standard specifies that bits 7 (DIO8) and 3 (DIO4) to 0 (DIO1) of the status byte register can be used as status register summary bits, or to indicate that there is data in a queue.

Device-dependent summary messages have the respective status data structures of the register model or the queue model. Thus, the status data structure may be either the register to report events and status in parallel or the queue to report conditions and status in sequence. The summary bit represents a summary of the current status of the corresponding status data structure. For the register model, the summary message is true when there is an event set to permit the occurrence of more than one true event; while for the queue model, it is true if the queue is not empty.

As shown below, the MT8802A does not use bits 0, 1 and 7. As it uses bits 2 and 3 as the summary bit of the status register, it has 3 register model types (where 2 types are extended) and one queue model type(with no extension).



5.2.3 Reading and clearing the STB register

Serial poll or the *STB? common query are used to read the contents of the STB register. STB messages conforming to IEEE488.1 can be read by either method, but the value sent to bit 6 (position) is different for each message.
The STB register can be cleared by using the *CLS command.

(1) Reading by serial poll (only when using the GPIB interface)

When using serial poll conforming to IEEE488.1, the device must return a 7-bit status byte and an RQS message bit which conforms to IEEE488.1.According to IEEE488.1, the RQS message indicates whether the device sent SRQ as true or not. The value of the status byte is not changed by serial poll. The device must set the RQS message to false immediately after being polled. As a result, if the device is again polled before there is a new cause for a service request, the RQS message is false.

(2) Reading by the *STB common query

The *STB? common query requires the device to send the contents of the STB register and an integer format response message from the MSS (Master Summary Status) summary message. The response represents the total binary weighted value of the STB register and the MSS summary message. STB register bits 0 to 5 and 7 are weighted to 1, 2, 4, 8, 16, 32, and 128; and the MSS to 64, respectively. Thus, excepting the fact that bit 6 represents the MSS summary message instead of the RQS message, the response to *STB? is identical to that for serial poll.

(3) Definition of MSS (Master Summary Status)

MSS indicates that there is at least one cause for a service request. The MSS message is represented by bit 6 in a device response to the *STB? query, but it is not generated response to serial poll. In addition, it is not part of the status byte specified by IEEE488.1.MSS is generated by the logical OR operation of the STB register with SRQ enable (SRE) register. In concrete terms, MSS is defined as follows:

(STB Register bit0 AND SRE Register bit0)

OR

(STB Register bit1 AND SRE Register bit1)

OR

:

:

(STB Register bit5 AND SRE Register bit5)

OR

(STB Register bit7 AND SRE Register bit7)

Since bit-6 status of the STB and SR enable registers is ignored in the definition of MSS, it can be considered that bit-6 status is always being 0 when calculating the value of MSS.

(4) Clearing the STB register by the *CLS common command

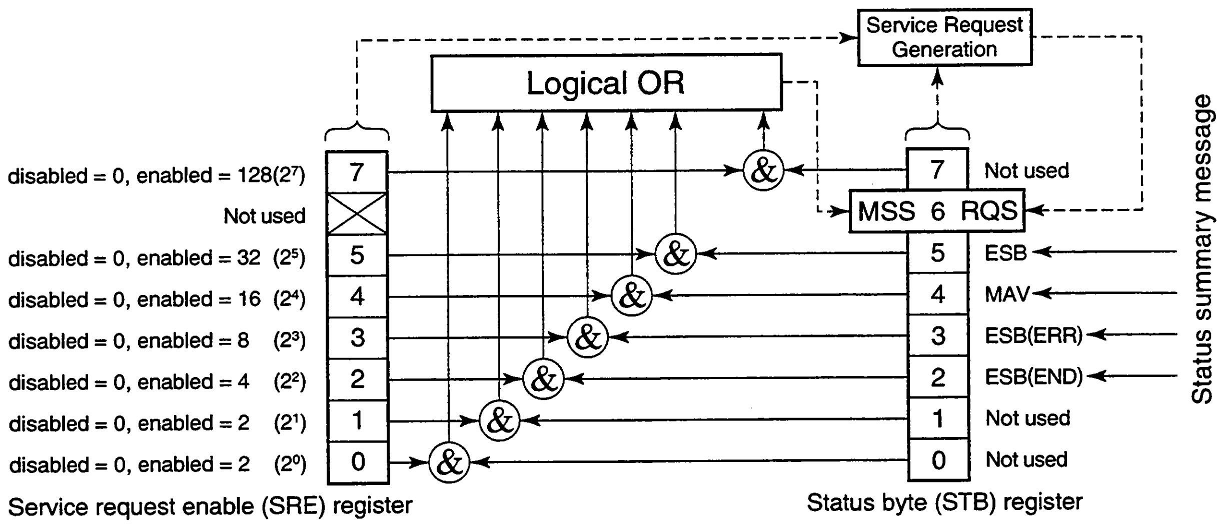
With the exception of the output queue and its MAV summary message, the *CLS common command clears all status data structures (status event registers and queues) as well as the corresponding summary messages.

The *CLS command does not affect settings in the enable registers.

5.3 Enabling the Service Request (SRQ)

All types of summary messages in the STB register can be enabled or disabled for service requests (SRE) by using the program-controlling service request (SRQ) enable operation. The service request enable (SRE) register controls the generation of SRQ in bits 0 to 7 as shown in the diagram below.

Bits in the service request enable register correspond to bits in the status byte register. If a bit in the status byte corresponding to an enabled bit in the service request enable register is set to 1, the device makes a service request to the controller with the RQS bit set to 1.For example, if bit 4 in the service request enable register is enabled, the device makes a request for service to the controller each time the MAV bit is set to 1 when there is data in the output queue.



(1) Reading the SRE register

The contents of the SRE register are read using the *SRE? common query. The response message to this query is an integer from 0 to 255, which is the sum of the bit digit weighted values in the SRE register. SRE register bits 0 to 5 and 7 are respectively weighted to 1, 2, 4, 8, 16, 32, and 128.The unused bit 6 must always be set to 0.

(2) Updating the SRE register

The *SRE common instruction is used to write data to the SRE register. An integer from 0 to 255 is added after the *SRE. fm3common instruction.

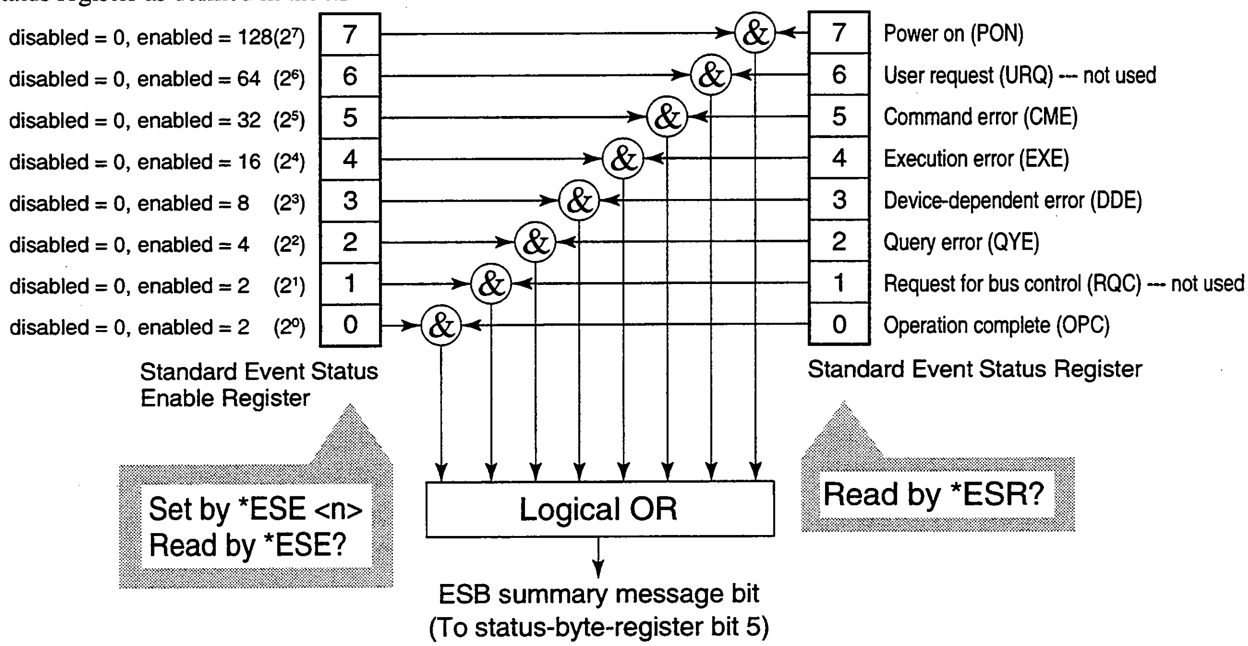
This integer indicates the total number of bits in the SRE register (weighted values:1, 2, 4, 8, 16, 32, and 128), and sets the corresponding SRE register bit to 0 or 1.

A bit value of 1 indicates an enabled state; 0 indicates a disabled state. Always ignore the value of bit 6.

5.4 Standard Event Status Register

5.4.1 Bit definition of standard event status register

The standard event status register must be available on all devices conforming to the IEEE488.2 standard. The diagram below shows the operation of the standard event status register model. Because the operation of the model is the same as that for the other models already described, the following only explains the meaning of each bit in the standard event status register as defined in the IEEE488.2 standard.



Standard event status enable (ESE) register selects whether the register makes the summary message true when the corresponding bit of the event status register is set.

Bit	Event name	Description
7	Power on (PON)	The power is turned on.
6	User Request (URQ)	Request for local control (rtl). This bit is produced regardless of whether a device is in remote or local mode. It is not used for the MT8802A so, it is always set to 0.
5	Command Error (CME)	An illegal program message, a misspelt command or a GET command within a program is received.
4	Execution error (EXE)	A legal program message, which cannot be executed, is received.
3	Device-dependent Error (DDE)	An error caused by other than CME, EXE or QYE (e.g., parameter error) occurred.
2	Query Error (QYE)	An attempt is made to read data in the output queue though there is none there, or data is lost from the output queue due to some reason (e.g., overflow).
1	Request Control (RQC)	A device is requesting an active controller.This bit is not used for the MT8801B so, it is always set to 0.
0	Operation Complete (OPC)	A device has completed specified operations and is ready to receive new commands. This bit is only set in response to the *OPC command.

5.4.2 Query error details

No.	Item	Description
1	Incomplete program message	If a device receives an MTA from the controller before it receives the terminator of the program message it is receiving, it aborts the incomplete program message and waits for the next one. To abort the incomplete message, the device clears its input-output buffer, reports a query error to the status report section and sets bit 2 in the standard status register to indicate the query error.
2	Interruption of response message output	If a device receives an MLA from the controller before it has sent the terminator of the response message it is sending, it automatically interrupts response message output and waits for the next program. To interrupt the response message output, the device clears its output buffer, reports a query error to the status report section, and sets bit 2 in the standard status register to indicate the query error.
3	Sending the next program message without reading the previous response message	When a device becomes unable to send a response message because the controller has sent another program message immediately following a program or query message, the device aborts the response message and waits for the next program message. It then reports a query error to the status report section as in No.2 above.
4	Output queue overflow	When several program and query messages are executed in succession, too many response messages for the output queue (256 bytes) may be generated. If further query messages are received when the output queue is full, the output queue cannot send corresponding responses due to the overflow situation. If there is overflow in the output queue, the device clears it and resets the section where response messages are created. Then it sets bit 2 in the standard event status register to indicate a query error.

5.4.3 Reading, writing to and clearing the standard event status register

Reading	The register is read by the *ESR? common query. The register is cleared after being read. The response message is an integer format data value obtained by binary weighting the event bit and converting it to a decimal number.
Writing	With the exception of clearing, writing operations cannot be performed externally.
Clearing	The register is only cleared in the following cases: (1) A *CLS command received. (2) The power is turned on. Devices first clear their standard event status registers but later record events that occurred during the sequence in the registers (e.g., setting of the PON event bit). (3) An event is read for the *ESR? command.

5.4.4 Reading, writing to and clearing the standard event status enable register

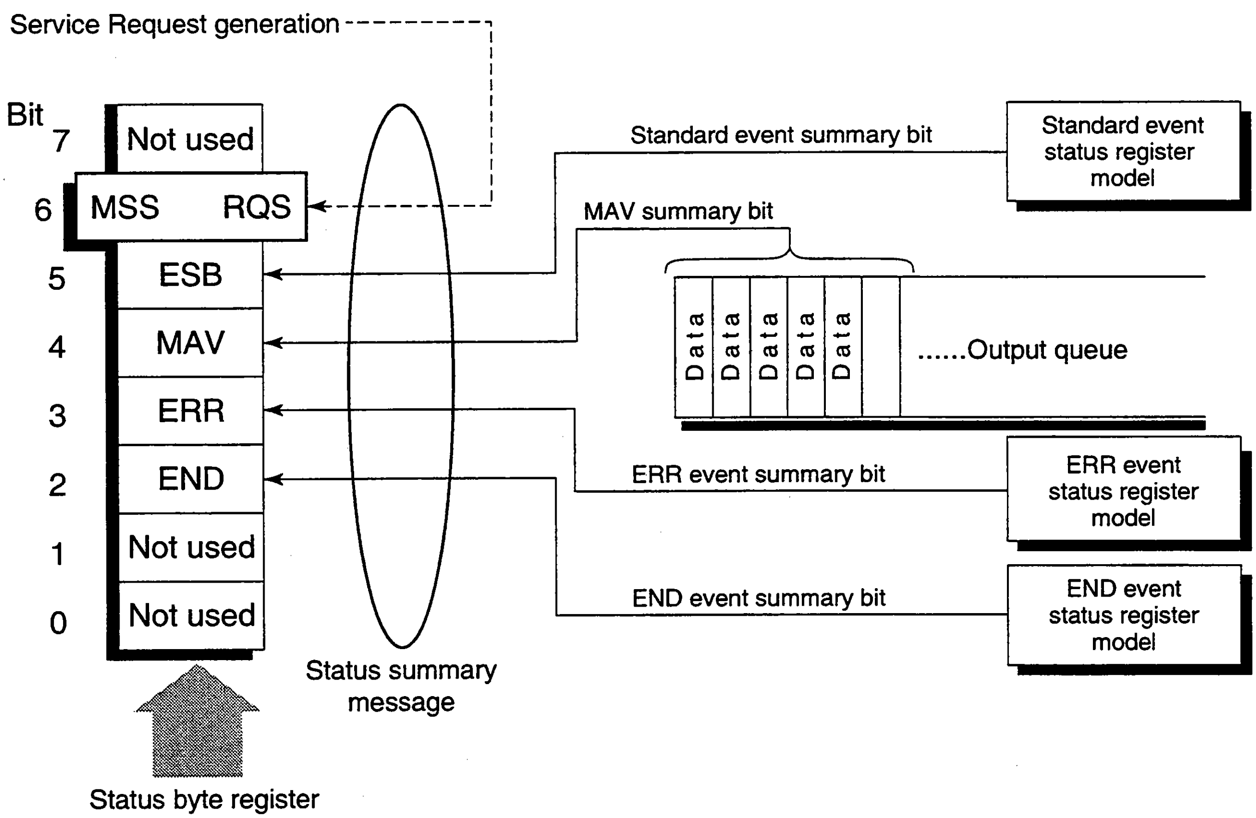
Reading	The register is read by the *ESE? common query. The response message is an integer format data value obtained by binary weighting the event bit and converting to a decimal number.
Writing	The register is written to by the *ESE common command. As bits 0 to 7 of the register are respectively weighted to 1, 2, 4, 8, 16, 32, 64, and 128, data to be written is sent by <DECIMAL NUMERIC PROGRAM DATA> which is the digit total of the bits selected from these bits.
Clearing	The register is cleared in the following cases: (1) An *ESE command with a data value of 0 is received. (2) The power is turned on. The standard event status enable register is not affected by the following: (1) Changes of the status of the IEEE488.1 device clear function (2) An *RST common command is received. (3) A *CLS common command is received.

5.5 Extended Event Status Register

The register models of the status byte register, standard event status register and enable registers are mandatory for equipment conforming to the IEEE488.2 standard.

In IEEE488.2, status-byte-register bits 7 (DIO8), 3 (DIO4) to 0 (DIO1) are assigned to status summary bits supplied by the extended-register and extended-queue models.

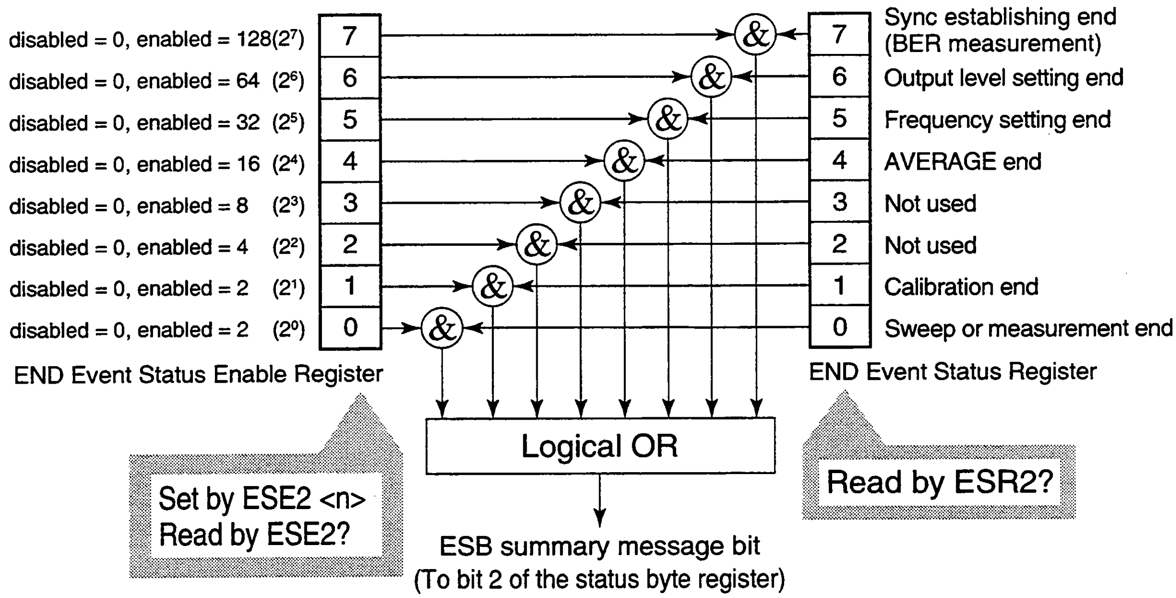
For the MT8802A, as shown in the diagram below, bits 7, 1 and 0 are unused; bits 2 and 3 are assigned to the END and ERR summary bits as the status-summary bits supplied by the extended-register model. As the queue model is not extended, there is only one type of queue: the output queue.



The following pages describe bit definition, the reading, writing to and clearing of bits for the END extended event register model.

5.5.1 Bit definition of END event status register

The following describes the operation of the END event status register model, the naming of its event bits, and what they mean.

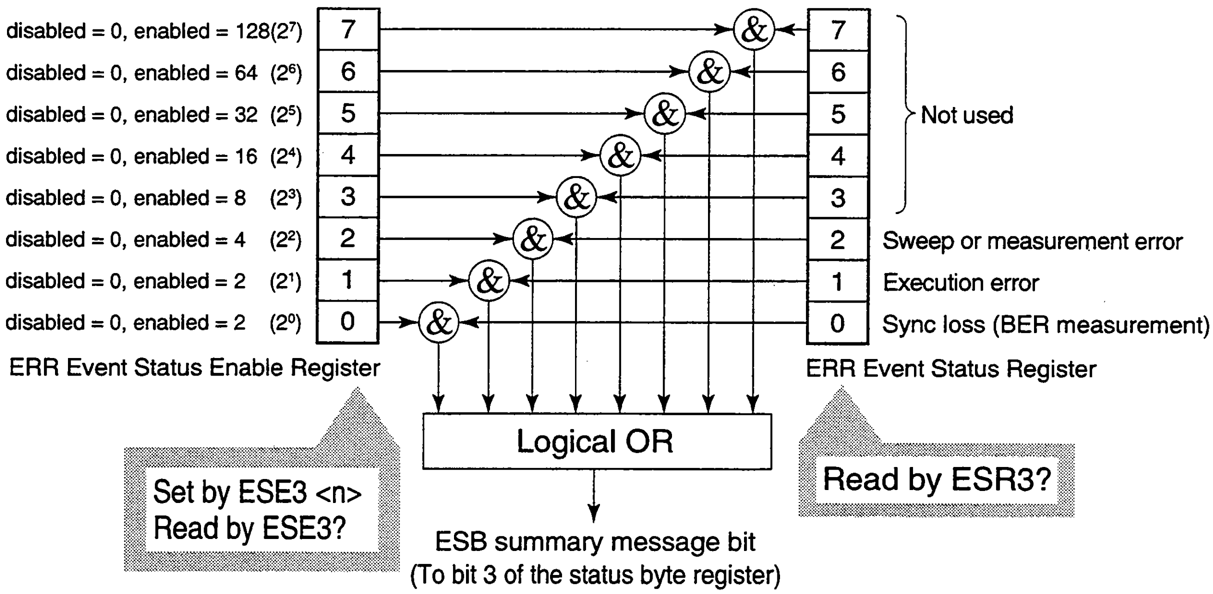


The END event status register selects whether the register makes the summary message true when the corresponding bit of the status register is set.

Bit	Event name	Description
7	Sync establishing end	This bit is set to 1 when synchronization is established after BER measurement starts.
6	Output level setting end	This bit is set to 1 when output level setting ends.
5	Frequency setting end	This bit is set to 1 when frequency setting ends.
4	AVERAGE end	This bit is set to 1 when averaging ends.
3	(Not used)	(Not used)
2	(Not used)	(Not used)
1	CAL end	This bit is set to 1 when calibration ends.
0	Sweep or measurement end	This bit is set to 1 when sweep or measurement ends.

5.5.2 Bit definition of ERR event status register

The following describes the operation of the ERR event status register model, the naming of its event bits, and what they mean.



The ERR event status register selects whether the register makes the summary message true when the corresponding bit of the status register is set.

Bit	Event name	Description
7	(Not used)	(Not used)
6	(Not used)	(Not used)
5	(Not used)	(Not used)
4	(Not used)	(Not used)
3	(Not used)	(Not used)
2	Sweep or measurement error	This bit is set to 1 when sweep or measurement error is occurred.
1	Execution error	This bit is set to 1 when execution error is occurred at Zero Set, Adjust Range, or Manual Calibration.
0	Sync loss	This bit is set to 1 when synchronization loss is occurred.

Note: Sweep or measurement error means other than the three states of normal end, sync established, and not measured.

5.5.3 Reading, writing to and clearing the extended event status register

Reading	The register is destructively read by a query (e.g., it cleared after being read). The END/ERR event status register is read by ESR2?/ESR3? query. The read value, an integer format data (NR1), is obtained by binary weighting the event bit and converting it to decimal.
Writing	With the exception of clearing, writing operations cannot be performed externally.
Clearing	The register is cleared in the following cases: (1) A *CLS command is received. (2) The power is turned on. (3) An event is read by the ESR2?/ESR3? query command.

5.5.4 Reading, writing to and clearing the extended event status enable register

Reading	The register is non-destructively read by a query (i.e., not cleared after being read). The END/ERR event status register is read by the ESE2?/ESE3? query. The read value, an integer format data (NR2), is obtained by binary total weighting the event bit and converting it to decimal.
Writing	The END/ERR event status register is written to by the ESE2/ESE3 program command. As bits 0 to 7 of the registers are respectively binary weighted to 1, 2, 4, 8, 16, 32, 64, and 128, write data is sent as the integer format data obtained by total weighting the digit value of bits selected from among them.
Clearing	The register is cleared in the following cases: (1) The ESE2/ESE3 program command with a data value of 0 is received for the END/ERR event status register. (2) The power is turned on the power-on-status-clear flag is true. The extended event status enable register is not affected by the following: (3) Changes of the status of the IEEE488.1 device clear function (4) An *RST common command is received. (5) A *CLS common command is received.

5.6 Techniques for Synchronizing the MT8802A with a Controller

The MT8802A usually treats program messages as sequential commands that do not execute the processing of newly received commands until the previous command has been processed. Thus, special consideration need not be taken for pair-synchronization between the MT8802A and the controller.

If the controller controls one or more devices and synchronizes with them, after all the commands specified for the MT8802A have been processed, the next commands must be sent to other devices.

There are five ways of synchronizing the MT8802A with the controller:

(1) Wait for SWP or TS command termination.
(2) Wait for a response after the *OPC? query is sent.
(3) Wait for SRQ after *OPC is sent.
(4) Wait for status generation of the status register.
(5) Wait for SRQ by the status register.

5.6.1 Wait for SWP or TS command termination

When the MT8802A starts measurement using the SWP or TS command, it stops accepting the next measurement command until it terminates the measurement. Use this feature to set a synchronization.

Note: A response may not be returned if there is no measurement termination condition (permanent measurement of BER, etc.). In Average measurement mode, a response may be returned before averaging.

<Controller program>

1. Sends one or more commands sequentially.

⇩

2. Sends the SWP or TS command.

⇩

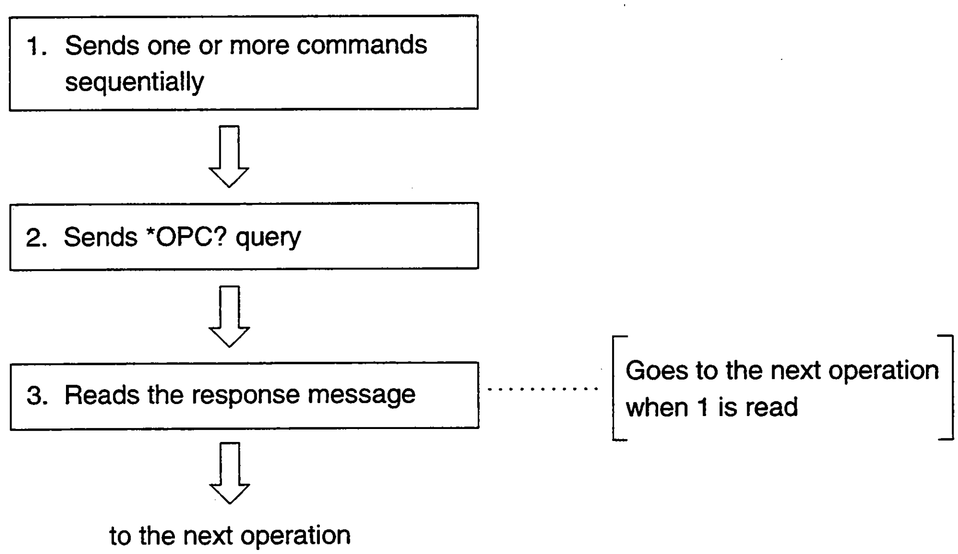
to the next operation

5.6.2 Wait for response after *OPC? query is sent

When executing the *OPC? query command, the MT8802A outputs "1" as the response message at the end of the previous command. The controller is synchronized with the MT8802A by waiting for the request message to be entered.

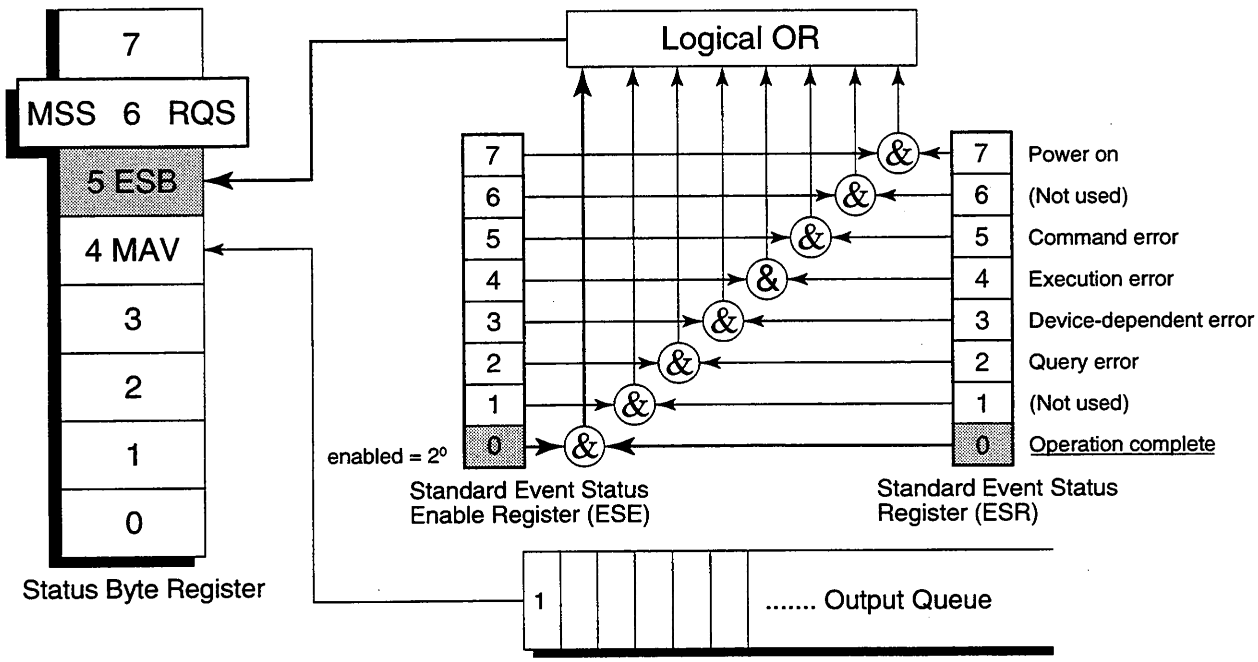
Note: When the read response message is "Q" (command is being executed), wait for about 50 ms until the controller moves to the next operation.

<Controller program>



5.6.3 Wait for service request after *OPC is sent

The MT8802A sets the operation-complete bit (bit 0) to 1 when executing the *OPC command. The controller is synchronized with the MT8802A by waiting for SRQ when the operation-complete bit is set for SRQ.



■ <Controller program>

1. Enables the 2^0 bit (1) of the Standard Event Status Enable Register — `PRINTΔ@1;"*ESEΔ1"`

⇩

2. Enables the 2^5 bit (32) of the Service Request Enable Register — `PRINTΔ@1;"*SREΔ32"`

⇩

3. Makes the device execute the specified operation

⇩

4. Sends the *OPC command — `PRINTΔ@1;"*OPC"`

⇩

5. Wait for an SRQ interrupt (ESB summary message) ....Value of status byte: $2^6 + 2^5 = 96$

5.6.4 Wait for status generation of the status register

An event status register bit of the MT8802A is set to 1 when the corresponding event occurs.When the *ESR?, ESR2?, or ESR3? query is executed, the MT8802A outputs the value of the corresponding status register as a response message. The controller reads this response message and waits until the response becomes the specified value for synchronization.Reset the event status register immediately before making a desired event occur.

Note: Wait for 50 ms for the controller to go to the next operation after reading a response message.

• <Controller program : Synchronization by operation termination bit>

1. Clear the status register. `PRINT @1:"*CLS"`

⇩

2. Sends one or more commands sequentially.

⇩

3. *ESR? query `PRINT @1:"*ESR?"`

⇩

4. Reads the response message. ....Goes to the next operation when the read value becomes the desired value (bit 2^0 to "1").

⇩

to the next operation

5.6.5 Wait for service request issuance from the status register

An event status register bit of the MT8802A is set to 1 when the corresponding event occurs. After setting these bits to set the RQS, the controller waits the SRQ for synchronization. Reset the event status register immediately before making a desired event occur.

• <Controller program 1: Synchronization by operation termination bit>

1. Clears the status register.	PRINT @1:"*CLS"
⇩	
2. Sets bit 2^0 of the standard event status enable register to 1.	PRINT @1:"*ESE 1"
⇩	
3. Sets bit 2^5 (32) of the service request enable register to 1.	PRINT @1:"*SRE 32"
⇩	
4. Makes the device execute the specified operation.	
⇩	
5. Waits for SRQ interrupt (ESB summary message).	....Status byte value: $2^6 + 2^5 = 96$
⇩	
to the next operation	

• <Controller program 2: Synchronization by the sweep/measurement termination bit>

1. Clears the status register	`PRINT @1:"*CLS"`
⇩	
2. Sets bit 2^0 (1) of the extended END event status enable register to 1	`PRINT @1:"ESE2 1"`
⇩	
3. Sets bit 2^2 (4) of the service request enable register to 1	`PRINT @1:"*SRE 4"`
⇩	
4. Make the device execute the specified operation (measurement)	
⇩	
5. Waits for SRQ interrupt (ESB summary message)	....Status byte value: $2^6 + 2^2 = 68$
⇩	
to the next operation	

SECTION 6
INITIAL SETTINGS

This section outlines initialization for the system and describes how to initialize the system.
An example of initial settings are written for IBM-PC commands.

TABLE OF CONTENTS

6.1 General Description

There are three levels of initialization for the GPIB system.

The first level is bus initialization using the IFC statement with the system bus in the idle state.

The second level is initialization for message exchange using the DCL command to enable devices to receive program messages.

The third level is device initialization using the PRE or *RST command to initialize device functions. These levels of initialization prepare a device for operation.

A device must be set to a known state when the power is switched on.

Level	Initialization type	Description	Level combination and sequence
1	Bus initialization	The IFC message from the controller initializes all interface functions connected to the bus.	Can be combined with other levels, level 1 must be executed before level 2.
2	Initialization for message exchange	The message exchanges of all devices and specified devices on the GPIB are initialized respectively by the DCL (Device Clear) and SDC (Select Device Clear) GPIB bus commands, which also nullify the function that reports to the controller that operation has completed.	Can be combined with other levels, level 2 must be executed before level 3.
3	Device initialization	The *RST or PRE/INI/IP command returns the specified device to the device-dependent known state, regardless of the conditions of previous device use.	Can be combined with other levels; level 3 must be executed after levels 1 and 2.

The following paragraph describes the commands for executing levels 1, 2, and 3, and the items initialized by execution. It also describes the known state which is set when the power is switched on.

When controlling with an external controller through the GPIB interface bus, all the initialization functions of the first/second/third levels can be used.

When controlling with an external controller through the RS-232C interface port, the initialization function of the third level (device initialization) can be used. The initialization functions of the first/second levels cannot be used.

6.2 Bus Initialization by the IFC Statement

■ Example

```
Call ibsic (ud%)
```

■ Explanation

The IFC statement initializes the interface functions of all devices connected to the GPIB bus line.

The initialization of interface functions involves erasing the settings (e.g. talker, listener) made by the controller and resetting to the initial states. In the table below, O indicates the initialized functions; Δ indicates partially initialized functions.

No	Function	Symbol	Initialization by IFC
1	Source handshake	SH	O
2	Acceptor handshake	AH	O
3	Talker or extended talker	T or TE	O
4	Listener or extended listener	L or LT	O
5	Service request	SR	Δ
6	Remote/local	RL	
7	Parallel poll	PP	
8	Device clear	DC	
9	Device trigger	DT	
10	Controller	C	O

Bus initialization by the IFC statement does not affect the device-operating state (e.g. frequency settings, lamp on/off).

6.3 Initialization for Message Exchange by DCL and SDC Bus Commands

■ Example

`Call△ibclr△(ud%)` `WBYTE△&H3F,△&H04,△&H23`	Initializes only the device which is specified by ud% for message exchange (sending SDC)

■ Explanation

This statement executes initialization for message exchange by all devices or only the specified device on the GPIB of the specified select code.

■ Items to be initialized for message exchange

The MT8802A by which the DCL or SDC bus command is accepted executes the following:

(1) Input buffer and Output Queue: Cleared; the MAV bit is also cleared at the same time.

(2) Parser, Execution Controller, and Response Formatter: Reset

(3) Device commands including *RST: Clears all commands that prevent these commands from executing.

(4) Processing the *OPC command: Puts a device in OCIS (Operation Complete Command Idle State). As a result, the operation complete bit cannot be set in the Standard Event Status Register.

(5) Processing the *OPC query: Puts a device in OQIS (Operation Complete Query Idle State). As a result, the operation complete bit 1 cannot be set in the Output Queue.

(6) Device function: Puts sections relating to message exchange in an idle state. The device keeps waiting for a message from a controller.

Note: The items listed below are not affected even if DCL and SDC bus command processing is executed:

(1) The current data set or stored in the device

(2) Front panel settings

(3) Other status byte state except MAV bit

(4) Device operation in progress

6.4 Device Initialization by the *RST Command

■ Syntax

```
*RST
```

■ Example

`PCall△ibwrt(ud%,"*RST"):` Initializes the device (MT8802A) whose address is 1 with level 3.

■ Explanation

The *RST (Reset) command is an IEEE488.2 common command which resets a device with level 3.

The *RST (Reset) command is used to reset a device (MT8802A) to a specific initial state. Refer to the separate Operation Manual Vol. 1 Appendix B for details of initialization items and initial values.

Note: The *RST command does not affect the items listed below.

(1) IEEE488.1 interface state
(2) Device address
(3) Output Queue
(4) Service Request Enable register
(5) Standard Event Status Enable register
(6) Power-on-status-clear flag setting
(7) Calibration data affecting device specifications
(8) Parameters preset for controlling external devices, etc.

6.5 Device Initialization by the PRE/INI/IP Command

■ Syntax

```
PRE

INI

IP
```

■ Example (program message)

`Call△ibwrt(ud%,"PRE"):` Initializes the device (MT8802A) whose address is 1 with level 3.

■ Explanation

The PRE, INI and IP commands are MT8802A device-dependent messages which initialize a device with level 3.

Refer to the separate Operation Manual Vol. 1 Appendix B for details of items initialized by the PRE, INI, and IP commands and initial values.

6.6 Device Status at Power-on

When the power is switched on:

(1) Preset value: When a power-off time (POWERON LAST) is selected, the device is set to the status before the last power off.

Preset value: When Recall memory No. (POWERON n) is selected, the device is set to file (number [n]) status.

(2) The Input Buffer and Output Queue are cleared.

(3) The Parser, Execution Controller, and Response Formatter are initialized.

(4) The device is put into OCIS (Operation Complete Command Idle State).

(5) The device is put into OQIS (Operation Complete Query Idle State).

(6) The Standard Event Status and Standard Event Status Enable Registers are cleared. Events can be recorded after the registers have been cleared.

For the special case of 1 , when the power supply is first turned on after the device is shipped, the initial values are set to those in the initial setting table (refer to separate Operation Manual Vol. 1 Appendix B).

SECTION 7
SAMPLE PROGRAMS

This section gives some examples of the Visual BASIC programs that control the MT8802A from the IBM-PC personal computer used as a controller.

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7.1 Notes on Creating the Program

Note the items listed in the table below when creating the remote control program.

No.	Note	Explanation
1	Be sure to initialize each device.	The state of each device in actual use such as operating the operator panel of the device itself or executing another program may not be appropriate. Be sure to initialize each device to unify conditions at the start of use. Do the following: (1) Initialize the interface function (Call ibsic(ud%)) (2) Initialize the message exchange function of the device (Call ibclr(ud%)) (3) Initialize the device-specific function (PRE.INI or *RST)
2	Set the remote state of the device to remote with lockout state (RWLS).	Execute Call ibcnd (ud%) to set the device to the local lockout state to prevent the device from returning to the local state. In the simple remote state, the device enters the local state when the [Local] key is pressed. At this time, when the panel key is pressed, automatic measurement of the device is not done correctly and measurement data may be unreliable. Execute Call ibcnd (ud%, chr$(<listener>), [+chr$(secondary-address)]+chr$(&H01)) to set all devices to the local control state.
3	Except for Call ibrd(ud%), do not send a command related to a device immediately after a query is sent.	Write Call ibrd(ud%) after the query command. If MLA is received when a command other than Call ibrd(ud%) is sent to the controller before a query result is read, the output buffer is cleared. Therefore, the response message is erased.
4	Program that avoids exceptional processing of protocol	No.3 above is also a type of exceptional processing of the protocol. Avoid exceptional processing if necessary. For a predicted exception, create the exceptional processing part in the program to prevent execution from being halted due to an error.
5	Check the interface function (subset) of each device.	Be sure to check the subset of each device. Even if the program is executed on a device that does not provide the required subset, processing does not proceed. Also, check that the device type conforms to IEEE488.2.

7.2 Sample Program (Example of Program Using Visual Basic)

7.2.1 Common items for sample program

(1) Notes on use

Note 1: The sample programs are used in any personal computer for control with the following environmental conditions:

- Microsoft Visual Basic version 2.0 or later
- OS such as MS Windows (version 3.1 or later) or Windows 95 in which above Visual Basic can operate.
- The GPIB board manufactured by the National Instruments corporation is mounted.
- BASIC library (NI-488 or NI-488.2) for the above GPIB board: Used as a library for Visual Basic.

Note 2: The number on the left of the program list is the line number used for the program explanation. Do not write the number in the program.

Note 3: Because the sample programs are given mainly to explain the GPIB control procedures, the user interface related to screen display is simplified. For details on creating a practical user interface, refer to the handbook of Visual Basic. (See paragraph (3).)

Note 4: The description of the sample programs in this section is arranged as follows because of restrictions on structured programming in Visual Basic and the number of pages:

- In each item, the project file "***.mak" is used to manage required files.
- If routines described in previous paragraphs are required in each paragraph, only the part that calls these routines and reference paragraphs are described. When operating a routine, write the required routine in the code module file, and call this file (multiple files can also be specified) from the project file.

Note 5: Be sure to write subroutine Form1_click() of the program to the form file (with extension of. FRM).

(2) Common module

This paragraph describes the program module used commonly when writing the sample programs:

1) Response message read module

To simplify the program, create the following routines based on the functions provided by the BASIC library for the GPIB board to read response messages.

Code module file: RESP01.BAS

```
Function ReceiveResp() As String '   Response message processing routine
 Dim read_data$, read_term$
 Dim i%
 '
 read_data$ = Space$(257)'           Clears receiving buffer.
 read_term$ = Chr$(10)'              Reads the terminator as LF.
 '
```

```
Do
Call ibrd(Ans%, read_data$)'          Receives a response message.
If ibsta% < 0 Then '                  Displays an error if it occurs in reception process.
ReceiveResp$ = ""
MsgBox "Data Read  Address = " & Str$(RCA%), MB_IconStop, "Data Error !"
End
Else
i% = InStr(read_data$, read_term$)
ReceiveResp$ = Mid$(read_data$, 1, i% - 1)' Accepts the terminator for the response message.
Exit Do
End If
Loop
End Function
```

2) SG output control module

IS-136 uses downlink and uplink RF signals together for measurement. Therefore, the transmission measurement program also requires SG output control.

Code module file: SGOUT. BAS

```
 1 Sub SG_out (Control%) '              Processing routine for output control.
 2 Dim Stat As String * 40'             Variable for securing information for current measurement screen.
 3 '
 4 Call ibwrt(Ans%, "MEAS?")'           Reads current measurement screen information.
 5 Stat = ReceiveResp()
 6 If Control% <> 0 Then
 7 Call ibwrt(Ans%, "MEAS BER")'        Moves to BER measurement screen.
 8 Call ibwrt(Ans%, "LVL ON")'          Outputs RX measurement signal.
 9 Call ibwrt(Ans%, "MOD ON")'          Modulates RX measurement signal.
10 Else
11 If Stat <> "SETCOM" And Stat <> "BER" Then
12 Call ibwrt(Ans%, "MEAS SETCOM")'          Moves to common parameter setting screen.
13 End If
14 Call ibwrt(Ans%, "LVL OFF")'              Stops outputting RX measurement signal.
15 End If
16 Call ibwrt(Ans%, "MEAS " & Stat$)'        Returns to the original screen.
17 End Sub
```

Execute lines 4 and 5 to read the current measurement screen. Check argument Control% that controls SG output by executing line 6. If Control% is a value other than 0, execute lines 7 to 9 to turn on the SG output. If Control% is 0, execute lines 11 to 14 to turn off the SG output. Because the SG output can be set on the BER Measurement or Common Parameter screen, if another screen is displayed, execute line 7 or lines 11 to 13 to change the screen.

Execute line 16 to return to the original measurement screen.

3) Form file

As described in Note 3 above, the display window data of the form file (file name FORM***.FRM) is simplified. Write the contents indicating the display window data described below into the description of frame files in paragraph 7.2.2 and later.

Note: The asterisks after "FORM" below indicate the form file name. (For example, set FORM*** to FORM201 for file FORM201.FRM.)

```
VERSION 2.00
Begin Form Form***
Caption        =    "Form***"
Height         =    8235
Left           =    1035
LinkTopic      =    "Form***"
ScaleHeight    =    7830
ScaleWidth     =    7965
Top            =    1230
Width          =    8085
End
```

For file name FORM201.FRM

```
VERSION 2.00
Begin Form Form201
Caption        =    "Form202"
Height         =    8235
Left           =    1035
LinkTopic      =    "Form202"
ScaleHeight    =    7830
ScaleWidth     =    7965
Top            =    1230
Width          =    8085
End

Sub Form_click ()
Call initial_gpib
Call Set_TX_parameter
End Sub
```

7.2.2 Initializing the MT8802A

<Example 1.1> Initializing the MT8802A

1) Project file: SMPL101.MAK

`1 FORM101.FRM`	Specifies the form file.
`2 INIT001.BAS`	Indicates the code file of the initialization module.
`3 VBIB.BAS`	Specifies the GPIB library file.
`4 NIGLOBAL.BAS`	Specifies the GPIB library file.
`5 ProjWinSize=87,394,243,136`	
`6 ProjWinShow=2`	

Lines 1 and 2 indicate that the files described below are used. Lines 3 and 4 specify the GPIB control library to be used. If the directory containing these files is not located where project file SMPL001.MAK is located, also specify the directory.

2) Form file: FORM101.FRM

Write the following additional procedures:

`Sub Form_click ()`	Executed when the form file is clicked.
`  Call initial_gpib'`	Calls the GPIB initialization routine.
`End Sub`	

These procedures become main routines to call the initialization routine of the GPIB interface. When the mouse button is clicked on the Form101 window, initial_gpib is executed.

3) Code module file: INIT001.BAS

`'----------------------------`	
`' MT8802A GPIB Sample Program`	
`' Initialize`	
`'----------------------------`	
`'`	
`Global Const RCA% = 1'`	Defines the MT8802A addrress in variable RCS.
`Global Ans%'`	Variable for GPIB board
`'`	
`Sub initial_gpib ()'`	GPIB initialization routine
`  Call ibdev(0, RCA%, 0, 0, 1, 0, Ans%)'`	Initializes the GPIB board in the controller.
`  Call ibsic(Ans%)'`	Initializes the interface function.
`  Call ibclr(Ans%)'`	Clears the MT8802A device.
`  Call ibwrt(Ans%, "TRM 0")'`	Sets the GPIB send terminator of the MT8802A to LF.
`  Call ibwrt(Ans%, "INI")'`	Initializes the MT8802A.
`End Sub`	

Appendix B of the volume "Panel Operations" describes the parameters to be initialized by the above programs.

Use the GPIB address value defined on the Instrument Setup screen of the MT8802A as the address value on line 6 (see paragraph 3.2).

Lines 9 to 15 are initialization routines of the GPIB interface.

Line 10 initializes the GPIB board on the controller and sets the variable Ans%. No time-out is set here, but an appropriate time-out value can be set if necessary.

Line 11 initializes the GPIB interface function (it does not initialize any other function).

Line 12 performs initialization related to GPIB message exchange of the MT8802A.

Line 14 initializes the MT8802A device (initialization related to measurement).

The GPIB commands for device initialization are classified into IP, PRE, INI, and *RST. Use IP, PRE, and INI as the same function. The initialization range of the *RST command is wider than that of other initialization commands.

For the initialization range, see Section 5.

Generally, execute INI and *RST as follows:

1) Use INI and *RST to set the device to be controlled (MT8802A) to the initial state.

2) Use the program command to set the required functions.

By using this method, the device can be prevented from being controlled with unnecessary functions set.

7.2.3 Transmission (TX) measurement

(1) Setting the TX measurement parameters

<Example 2.1> Setting the TX measurement parameters (carrier frequency, reference level, and burst type) in the MT8802A.

1) Project file: SMPL201.MAK

```
1  FORM201.FRM                 Specifies the form file.
2  INIT001.BAS                 Use the code file of the initialization module described in paragraph 7.2.2.
3  SETTX.BAS                   Code file of modules for setting the TX measurement parameters
4  VBIB.BAS
5  NIGLOBAL.BAS
6  ProjWinSize=87,394,243,136
7  ProjWinShow=2
```

Specify the code module file of the initialization routine described in the previous paragraph as the code file on line 2.

2) Form file: FORM201.FRM

Write the following additional procedures:

```
Sub Form_click ()
 Call initial_gpib'            Calls the GPIB initialization routine.
 Call Set_TX_parameter'        Calls the TX parameter setting routine.
End Sub
```

3) Code module file: SETTXBAS

```
'----------------------------
' MT8802A GPIB Sample Program
' Set TX Parameters
'----------------------------
'
'
'
Sub Set_TX_parameter ()
 '
 Call ibwrt(Ans%, "SYS IS136")'              Selects IS-136 measuring system.
 Call ibwrt(Ans%, "PNLMD SYSTEM")'           Moves to system setting screen.
 Call ibwrt(Ans%, "RFINOUT MAIN")'           Uses Main Input/Output connector.
 Call ibwrt(Ans%, "PNLMD TESTER")'           Sets measurement mode to "TX/RX tester."
 '
 Call ibwrt(Ans%, "MEAS SETCOM")'            Moves to common parameter setting screen.
 Call ibwrt(Ans%, "DUTCTRL NONE")'           Sets DUT Control to One.
 Call ibwrt(Ans%, "FREQBAND D800MHZ")'       Sets frequency band to digital 800 MHz band.
 Call ibwrt(Ans%, "CHAN 1")'                 Sets measurement frequency channel to CH1.
 Call ibwrt(Ans%, "RFLVL 10DBM")'            Sets TX reference level to 10 dBm.
```

`20 Call ibwrt(Ans%, "OLVL -60DBM")'`	Sets output level to –60 dBm.
`21 Call ibwrt(Ans%, "MEASOBJ MSDTC")'`	Sets measurement object signal to "MS-DTC."
`22 Call ibwrt(Ans%, "SLTNUM 1")'`	Sets measurement slot number to 1.
`23 Call ibwrt(Ans%, "DVCC 01")'`	Sets DVCC to 01H.
`24 '`	
`25 Call ibwrt(Ans%, "MEAS SETDTX")'`	Moves to setting screen for digital TX parameter.
`26 Call ibwrt(Ans%, "MEASTRG SYNC")'`	Sets burst catch trigger to Sync word.
`27 End Sub`	

Lines 8 to 27 are the routines for setting parameters for digital TX measurement.

Select the IS-136 measurement system in line 10.

Select the RF signal input-output connectors to be used in lines 11 and 12.

Set the parameters for the digital TX measurement on the Setup Common Parameter and Setup Digital TX Measure Parameter screens.

Lines 15 to 23 show the settings on the Setup Common Parameter screen. Set the center measurement frequency, reference measurement level, downlink signal output level, and signals to be measured here.

Lines 25 and 26 show the settings on the Setup digital TX Measure Parameter screen. Set the parameters (burst catch trigger) of the RF signals to be measured.

Note: Handling the measurement-system select command

Execution of measurement system selection by line 10 may take a long time. All measurement parameters are initialized. If the system does not need to be selected, use the REM statement to make line 10 into the following comment line.

```
10 Rem Call ibwrt(Ans%, "SYS IS136")
```

(2) Executing modulation analysis and reading the result of analysis

<Example 2.2> Executing modulation analysis and reading the result of measuring the vector error.

1) Project file: SMPL202.MAK

```
FORM202.FRM
INIT001.BAS          Use the code file of the initialization module described in paragraph 7.2.2.
RESP01.BAS           Use the code file of the response reading module described in paragraph 7.2.1.(2).
SETTX.BAS            Indicates the code file of the parameter setup module for TX measurement described in
                     paragraph 7.2.3(1).
SGOUT.BAS            Indicates the code file of the SG output control module described in paragraph 7.2.1(2).
MODANA01.BAS         Indicates the code file of the modulation analysis module.
VBIB.BAS
NIGLOBAL.BAS
ProjWinSize=87,394,243,136
ProjWinShow=2
```

2) Form file: FORM202.FRM

Write the following additional procedures:

```
Sub Form_click ()
  Call initial_gpib'              Calls the GPIB initialization routine.
  Call Set_TX_parameter'          Calls the TX parameter setup routine.
  Call SG_out(1)'                 Calls the test signal output routine.
  Call mod_analysis1'             Calls the modulation analysis routine.
  Call SG_out(0)'                 Calls the test signal output routine.
End Sub
```

3) Code module file: MODANA01.BAS

```
'-----------------------------
' MT8802A GPIB Sample Program
' Modulation analysis(1)
'-----------------------------
'
'
'
Sub mod_analysis1 ()
 Dim Verr$, PVerr$
 '
 Call ibwrt(Ans%, "MEAS MODANAL")'  Transits to the Modulation Analysis screen.
 Call ibwrt(Ans%, "STORAGE NRM")'   Sets the normal mode.
 Call ibwrt(Ans%, "SWP")'           Starts measurement.
 '
 Call ibwrt(Ans%, "VECTERR?")'      Inquires about the measured value of an rms vector error.
 Verr$ = ReceiveResp()
 Call ibwrt(Ans%, "PVECTERR?")'     Inquires about the measured value of a peak vector error.
 PVerr$ = ReceiveResp()
```

```
19  '
20  Form202.Print "RMS  vector error = "; Val(Verr$);  "% (rms)"
21  Form202.Print "Peak vector error = "; Val(PVerr$);  "%"
22 End Sub
```

Lines 11 to 13 execute modulation analysis. Set the parameter (measurement mode) of the Modulation Analysis screen on line 12.

Execute line 13 to start modulation analysis measurement. If a SWP command is set, the next command acceptance enters the wait state until the measurement ends.

Execute lines 15 to 18 to read a vector error (the RMS and maximum values), which is the result of the measurement.

(3) Executing modulation analysis and reading the result of analysis (reading analytical data row in ASCII format)

<Example 2.3> Executing modulation analysis and reading the data row of the vector error at each symbol.

1) Project file: SMPL203.MAK

```
FORM203.FRM
INIT001.BAS           Use the code file of the initialization module described in paragraph 7.2.2.
RESP01.BAS            Use the code file of the response reading module described in paragraph 7.21.(2).
SETTX.BAS             Indicates the code file of the parameter setup module for TX measurement described in
                      paragraph 7.2.3(1).
SGOUT.BAS             Indicates the code file of the SG output control module described in paragraph 7.2.1(2).
MODANA02.BAS          Indicates the code file of the modulation analysis module.
VBIB.BAS
NIGLOBAL.BAS
ProjWinSize=87,394,243,136
ProjWinShow=2
```

2) Form file: FORM203.FRM

Write the following additional procedures:

```
Sub Form_click ()
  Call initial_gpib'          Calls the GPIB initialization routine.
  Call Set_TX_parameter'      Calls the TX parameter setup routine.
  Call SG_out(1)'             Calls the test signal output routine.
  Call mod_analysis2'         Calls the modulation analysis routine.
  Call SG_out(0)'             Calls the test signal output routine.
End Sub
```

3) Code module file: MODANA02.BAS

```
'-------------------------------------
' MT8802A GPIB Sample Program
' Modulation analysis(2: ASCII Read)
'-------------------------------------
'
'
'
Sub mod_analysis2 ()
 Const NUM% = 156'                     Specifies the number of data items to be read.
 Dim TRACE%(NUM%)'                     Declares the data storage array.
 Dim Verr$
 Dim I%
 '
 Call ibwrt(Ans%, "MEAS WAVEFORM")'    Transits to the Vector Error Waveform Display screen.
 Call ibwrt(Ans%, "TRFORM VECT")'      Transits to the Vector Error Waveform Display screen.
 Call ibwrt(Ans%, "STORAGE NRM")'      Sets the normal mode.
 Call ibwrt(Ans%, "BIN 0")'            Sets the read data format to ASCII.
```

```
18  Call ibwrt(Ans%, "SWP")'                   Starts measurement.
19  '
20  For I% = 0 To NUM% - 1
21  Call ibwrt(Ans%, "XMV? " & Str$(I%) & ",1")' Inquires about the measured value of the vector error.
22  Verr$ = ReceiveResp()
23  TRACE%(I%) = Val(Verr$)'                    Converts ASCII format to a numeric value.
24  Next I%
25  '
26  For I% = 0 To NUM% - 1
27  Form203.Print "Vector Error at "; I% + 6; "symbol = "; TRACE%(I%) / 100; "%"
28  Next I%
29 End Sub
```

Line 14 sets the modulation analysis measurement mode (waveform display mode). Line 16 sets the measurement mode (normal mode).

Line 17 sets the format of the measurement result to ASCII.

Start the measurement in line 18. The SWP command stops accepting the next command until the measurement terminates.

Execute lines 20 to 24 to read the measurement data and store it in array Trace. The data read here is in ASCII format. Use function `Val()` to convert the data to a real number.

(4) Executing modulation analysis and reading the result of analysis (reading analytical data in binary format)

<Example 2.4> Executing modulation analysis and reading the data row of a vector error at each symbol in binary format.

1) Project file: SMPL204.MAK

`FORM204.FRM`	
`INIT001.BAS`	Use the code file of the initialization module described in paragraph 7.2.2.
`RESP01.BAS`	Use the code file of the response reading module described in paragraph 7.2.1(2).
`SETTX.BAS`	Indicates the code file of the parameter setup module for TX measurement described in paragraph 7.2.3(1).
`SGOUT.BAS`	Indicates the code file of the SG output control module described in paragraph 7.2.1(2).
`MODANA03.BAS`	Indicates the code file of the modulation analysis module.
`VBIB.BAS`	
`NIGLOBAL.BAS`	
`ProjWinSize=87,394,243,136`	
`ProjWinShow=2`	

2) Form file: FORM204.FRM

Write the following additional procedures:

`Sub Form_click ()`	
`  Call initial_gpib'`	Calls the GPIB initialization routine.
`  Call Set_TX_parameter'`	Calls the TX parameter setup routine.
`  Call SG_out(1)'`	Calls the test signal output routine.
`  Call mod_analysis3'`	Calls the modulation analysis routine.
`  Call SG_out(0)'`	Calls the test signal output routine.
`End Sub`	

3) Code module file: MODANA03.BAS

`'-------------------------------------`	
`' MT8802A GPIB Sample Program`	
`' Modulation analysis(3: Binary Read)`	
`'-------------------------------------`	
`'`	
`'`	
`'`	
`Sub mod_analysis3 ()`	
`Const NUM% = 156'`	Specifies the number of data items to be read.
`Dim TRACE%(NUM%)'`	Declares the data storage array.
`Dim dbuf%(NUM%)'`	Declares the receive data buffer.
`Dim UPRBYTE%, LWRBYTE%`	
`Dim I%`	
`'`	
`'`	
`Call ibwrt(Ans%, "MEAS WAVEFORM")'`	Transits to the Vector Error Waveform Display screen.
`Call ibwrt(Ans%, "TRFORM VECT")'`	Transits to the Vector Error Waveform Display screen.

```
18  Call ibwrt(Ans%, "STORAGE NRM")'        Sets the normal mode.
19  Call ibwrt(Ans%, "BIN 1")'              Sets the read data format to binary.
20  Call ibwrt(Ans%, "SWP")'                Starts measurement.
21  '.
22  Call ibwrt(Ans%, "XMV? 0," + Str$(NUM%))' Inquiries about the measured value of a vector error.
23  Call ibrdi(Ans%, dbuf%(), NUM% * 2)'      Receives the binary data.
24  For I% = 0 To NUM% - 1
25  UPRBYTE% = dbuf%(I%) And &HFF'            Fetches the upper byte data.
26  LWRBYTE% = (dbuf%(I%) / &H100) And &HFF'  Fetches the lower byte data.
27  If UPRBYTE% >= 128 Then UPRBYTE% = UPRBYTE% - &H100 '    Corrects a minus value.
28  TRACE%(I%) = UPRBYTE% * &H100 + LWRBYTE%' Converts data to a 2-byte decimal number.
29  Next I%
30  '
31  For I% = 0 To NUM% - 1
32  form204.Print "Vector Error at "; I% + 6; "symbol = "; TRACE%(I%) / 100; "%"
33  Next I%
34 End Sub
```

Line 19 “BIN 1” sets the data format to binary. Line 22 inquires about data after one measurement is executed by line 20. Line 23 receives the data of the NUM%*2 bytes at controller.

Each element of array dbuf%() in the receive data is 2- byte unit. Each element of dbuf%() with its upper and lower bytes exchanged is the correct value because of the data format in the controller and the storage sequence of arrays in the receive data.

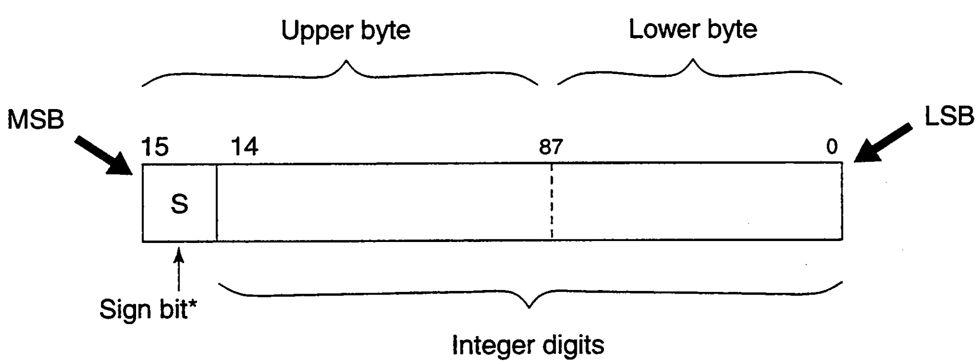
Lines 24 to 29 convert the 2-byte binary data to a decimal number and store it in variable TRACE(1). If the data is a minus value, line 27 converts it to a correct value.

[Transferring 2-byte binary data]

The 2-byte binary data can represent the 65,536 integers from -32,768 to 32,767 as shown in the figure below. The lower bytes of the data are sent after the upper byte.

16-Bit Binary	With Sign	No Sign
1000000000000000	-32768	32768
1000000000000001	-32767	32769
1000000000000010	-2766	32770
1111111111111101	-3	65533
1111111111111110	-2	65534
1111111111111111	-1	65535
0000000000000000	0	0
0000000000000001	1	1
0000000000000010	2	2
0000000000000011	3	3
0111111111111101	32765	32765
0111111111111110	32766	32766
0111111111111111	32767	32767

The 16-bit (2-byte) binary data consists of the sign bit and integer digits.
Sign bit : Bit 15 (MSB) is used.
Integer digits : Bits 0 to 14 are used.

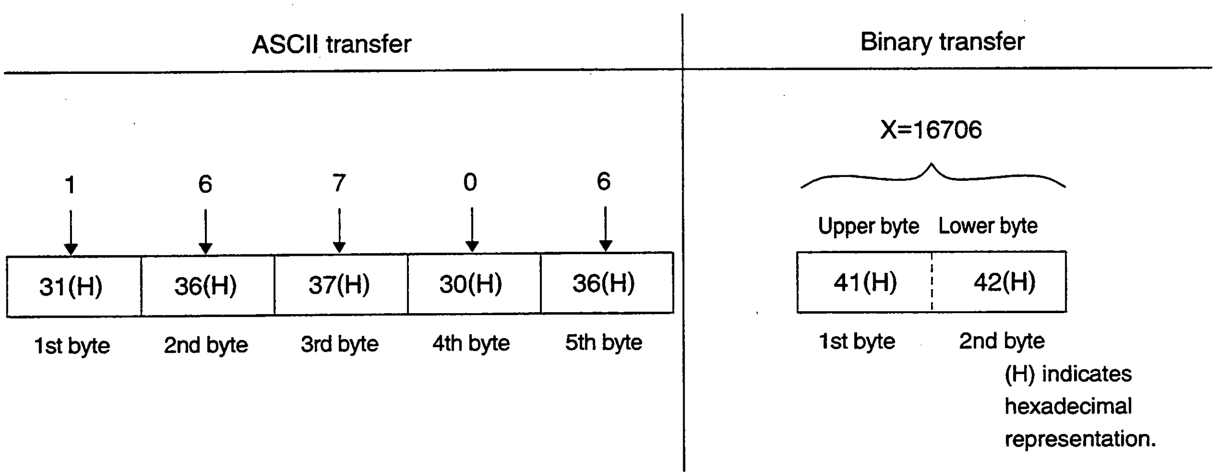


Internal representation of 2-byte binary data

* : When a minus value is stored in a numeric variable, sign bit 1 is set in the MSB to indicate that the stored value is a minus value. The minus value is stored in the numeric variable as a twos complement.

For example, when integer value 16,706 is transferred in ASCII and binary formats are compared.

As shown in the figure below, five bytes are required to transfer the data in ASCII format. In this case, the ASCII code must be converted to binary code. On the other hand, only two bytes are required to transfer the data in binary format. In this case, the data format does not need to be converted. Therefore, binary transfer is usually used for high-speed data transfer.



$$16706\ (D) = 4 \times 16^3 + 1 \times 16^2 + 4 \times 16^1 + 2 \times 16^0$$

Binary representation

Upper byte (bits 15–8) / Lower byte (bits 7–0)

bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
X=16706	0	1	0	0	0	0	0	1	0	1	0	0	0	0	1	0

(Transmission sequence): 1st byte to 2nd byte

bit	7	6	5	4	3	2	1	0	
1st byte	0	1	0	0	0	0	0	1	(Upper byte) = 41 (H)
2nd byte	0	1	0	0	0	0	1	0	(Lower byte) = 42 (H)

(5) RF power measurement (average power measurement)

<Example 2.5> Measuring RF power and reading average power.

1) Project file: SMPL205.MAK

`FORM205.FRM`	
`INIT001.BAS`	Uses file of the initialization module in paragraph 7.2.2.
`RESP01.BAS`	Uses code file of the response read module in paragraph 7.2.1(2).
`SETTX.BAS`	This is the code file of the parameter setting module for TX measurement in paragraph 7.2.3(1).
`SGOUT.BAS`	This is the code file of the SG output control module in paragraph 7.2.1(2).
`RFPWR01.BAS`	This is the code file of the RF power measurement module.
`VBIB.BAS`	
`NIGLOBAL.BAS`	
`ProjWinSize=87,394,243,136`	
`ProjWinShow=2`	

2) Form file: FORM205.FRM

The following procedures are added and described.

`Sub Form_click ()`	
`  Call initial_gpib'`	Calls GPIB initialization routine.
`  Call Set_TX_parameter'`	Calls TX parameter setting routine.
`  Call SG_out(1)'`	Calls test signal output routine.
`  Call RF_power1'`	Calls RF power measurement routine.
`  Call SG_out(0)'`	Calls test signal output routine.
`End Sub`	

3) Code module file: RFPWR01.BAS

`'----------------------------`	
`' MT8802A GPIB Sample Program`	
`' RF power measurement(1)`	
`'----------------------------`	
`'`	
`'`	
`'`	
`Sub RF_power1 ()`	
` Dim sbuf As String * 40`	
` '`	
` Call ibwrt(Ans%, "MEAS RFPWR")'`	Moves to RF power measurement screen.
` Call ibwrt(Ans%, "WINDOW SLOT")'`	Sets waveform display to Slot.
` Call ibwrt(Ans%, "UNIT DBM")'`	Sets measurement unit to dBm.
` Call ibwrt(Ans%, "ADJRNG")'`	Optimizes power measurement range.
` '`	
` Call ibwrt(Ans%, "STORAGE NRM")'`	Sets the mode to normal mode.
` Call ibwrt(Ans%, "SWP")'`	Starts measurement.
` '`	

```
19  Call ibwrt(Ans%, "TXPWR?")'          Inquires the RF power measurement value.
20  sbuf = ReceiveResp()
21  Form205.Print "TX RF Power = "; Val(sbuf); "dBm"
22 End Sub
```

Set the RF power measurement mode in line 11.

Line 12 sets the MT8802A screen to slot display.

Set the measurement unit to dBm in line 13.

Line 14 optimizes the range to improve the precision of the RF power measurement. The ADJRNG command stops accepting the next command until range optimization terminates.

Start the measurement in line 17. The SWP command stops accepting the next command until the measurement terminates.

Read the measurement results in lines 19 and 20.

(6) RF power measurement (power measurement at marker point)

<Example 2.6> Measuring RF power and reading power at specified marker point.

1) Project file: SMPL206.MAK

```
FORM2Ø6.FRM
INITØØ1.BAS              Uses the code file of the initialization module in paragraph 7.2.2.
RESPØ1.BAS               Uses the code file of the response read module in paragraph 7.2.1(2).
SETTX.BAS                This is the code file of the parameter setting module for TX measurement in
                         paragraph 7.2.3 (1).
SGOUT.BAS                This is the code file of the SG output control module in paragraph 7.2.1(2).
RFPWRØ2.BAS              This is the code file of the RF power measurement module.
VBIB.BAS
NIGLOBAL.BAS
ProjWinSize=87,394,243,136
ProjWinShow=2
```

2) Form file: FORM206.FRM

The following procedures are added and described.

```
Sub Form_click ()
  Call initial_gpib'              Calls GPIB initialization routine.
  Call Set_TX_parameter'          Calls TX parameter setting routine.
  Call SG_out(1)'                 Calls test signal output routine.
  Call RF_power2'                 Calls RF power measurement routine.
  Call SG_out(Ø)'                 Calls test signal output routine.
End Sub
```

3) Code module file: PFPWR02.BAS

```
'-----------------------------
' MT88Ø2A GPIB Sample Program
' RF power measurement(2)
'-----------------------------
'
'
'
Sub RF_power2 ()
 Const Pmak! = 1Ø# '                      Specified position of marker point (10.0 th symbol).
 Dim sbuf As String * 4Ø
 '
 Call ibwrt(Ans%, "MEAS RFPWR")'          Moves to RF power measurement screen.
 Call ibwrt(Ans%, "WINDOW SLOT")'         Sets waveform display to Slot.
 Call ibwrt(Ans%, "MKR NRM")'             Displays the normal marker.
 Call ibwrt(Ans%, "UNIT DBM")'            Sets measurement unit to dBm.
 Call ibwrt(Ans%, "ADJRNG")'              Optimizes power measurement range.
 '
```

```
18  Call ibwrt(Ans%, "STORAGE NRM")'     Sets the mode to normal mode.
19  Call ibwrt(Ans%, "SWP")'             Starts measurement.
2Ø  '
21  Call ibwrt(Ans%, "MKRS " + Str$(Pmak!))'   Specifies marker point.
22  Call ibwrt(Ans%, "MKL?")'            Inquires about measurement level of marker point.
23  sbuf = ReceiveResp()
24  Form2Ø6.Print "RF power at marker "; Pmak!; "symbol = "; Val(sbuf); "dB"
25 End Sub
```

The marker is displayed in line 14.

Start the measurement in line 19. The SWP command stops accepting the next command until the measurement terminates.

Specify the marker point in line 21. The marker point is the value specified in Pmak in line 9 (10.0th symbol).

Read the data on the marker point in lines 22 and 23.

(7) RF power measurement (reading of measured data string)

<Example 2.7> Measuring RF power, reading and displaying data string

1) Project file: SMPL207.MAK

`FORM206.FRM`	
`INIT001.BAS`	Uses code file of the initialization module in paragraph 7.2.2.
`RESP01.BAS`	Uses code file of the response read module in paragraph 7.2.1(2).
`SETTX.BAS`	This is the code file of the parameter setting module for TX measurement in paragraph 7.2.3 (1).
`SGOUT.BAS`	This is the code file of the SG output control module in paragraph 7.2.1(2).
`RFPWR03.BAS`	This is the code file of the RF power measurement module.
`VBIB.BAS`	
`NIGLOBAL.BAS`	
`ProjWinSize=87,394,243,136`	
`ProjWinShow=2`	

2) Form file: FORM207.FRM

The following procedures are added and described.

`Sub Form_click ()`	
`  Call initial_gpib'`	Calls GPIB initialization routine.
`  Call Set_TX_parameter'`	Calls TX parameter setting routine.
`  Call SG_out(1)'`	Calls test signal output routine.
`  Call RF_power3'`	Calls RF power measurement routine.
`  Call SG_out(0)'`	Calls test signal output routine.
`End Sub`	

3) Code module file: RFPWR03.BAS

`'----------------------------`	
`' MT8802A GPIB Sample Program`	
`' RF power measurement(3)`	
`'----------------------------`	
`'`	
`'`	
`'`	
`Sub RF_power3 ()`	
`  Const NUM% = 687'`	Specifies the number of data items to be read.
`  Dim Trace%(NUM%)'`	Declares array for storing data.
`  Dim sbuf As String * 40`	
`  Dim I%`	
`  '`	
`  Call ibwrt(Ans%, "MEAS RFPWR")'`	Moves to RF power measurement screen.
`  Call ibwrt(Ans%, "WINDOW SLOT")'`	Sets waveform display to Slot.
`  Call ibwrt(Ans%, "UNIT DBM")'`	Sets measurement unit to dBm.
`  Call ibwrt(Ans%, "BIN 0")'`	Outputs measurement results in ASCII format.

```
18  Call ibwrt(Ans%, "ADJRNG")'          Optimizes power measurement range.
19  '
20  Call ibwrt(Ans%, "STORAGE NRM")'     Sets the mode to normal mode.
21  Call ibwrt(Ans%, "SWP")'             Starts measurement.
22  '
23  For I% = 0 To NUM% - 1
24  Call ibwrt(Ans%, "XMD? " + Str$(I% * 10) + ",1")'  Inquires about result of RF power measurement.
25  sbuf = ReceiveResp()
26  Trace%(I%) = Val(sbuf)'              Converts read data to numerical value.
27  Next I%
28  '
29  For I% = 0 To NUM% - 1
30  Form207.Print "RF Power at "; I% - 100; "symbol = "; Trace%(I%) / 100; "dB"
31  Next I%
32 End Sub
```

Set the reading format of measurement results to ASCII format in line 17.

Start the measurement in line 21. The SWP command stops accepting the next command until the measurement terminates.

Read the measurement results in lines 23 to 27. The RF power measurement waveform can be read in units of 0.1 symbol as described in paragraph 8.2 (2), but it is read in units of one symbol here.

(8) RF power measurement (setting of template)

<Example 2.8> Setting the template for RF power measurement

1) Project file: SMPL208.MAK

`FORM208.FRM`	
`INIT001.BAS`	Uses the code file of the initialization module in paragraph 7.2.2.
`SETTX.BAS`	This is the code file of the parameter setting module for TX measurement in paragraph 7.2.3 (1).
`RFTMP01.BAS`	This is the code file for the RF power template setting module.
`VBIB.BAS`	
`NIGLOBAL.BAS`	
`ProjWinSize=87,394,243,136`	
`ProjWinShow=2`	

2) Form file: FORM208.FRM

The following procedures are added and described.

`Sub Form_click ()`	
`  Call initial_gpib'`	Calls GPIB initialization routine.
`  Call Set_TX_parameter'`	Calls TX parameter setting routine.
`  Call Set_template'`	Calls RF power template setting routine.
`End Sub`	

3) Code module file: RFTMP01.BAS

`1 '----------------------------`	
`2 ' MT8802A GPIB Sample Program`	
`3 ' RF power (4) Set Template`	
`4 '----------------------------`	
`5 '`	
`6 '`	
`7 '`	
`8  Sub Set_template ()`	
`9  Call ibwrt(Ans%, "MEAS SETTEMP")'`	Moves to template setting screen of RF power.
`10 Call ibwrt(Ans%, "OFFLVL DBM")'`	Sets the unit of standard level of Burst OFF to dBm.
`11 Call ibwrt(Ans%, "TEMPLVL 1, -56")'`	Sets the value of standard level 1 to –56 dBm.
`12 Call ibwrt(Ans%, "TEMPLVL 2, 4")'`	Sets the value of standard level 2 to +4 dB.
`13 Call ibwrt(Ans%, "TEMPLVL 3, -14")'`	Sets the value of standard level 3 to –14 dB.
`14 End Sub`	

By line 9, the RF power template setting screen is set.

By lines 10 to 13, the setting of template (level setting) is made.

(9) Power meter (Average power measurement)

<Example 2.9> Measuring RF average power using a power meter.

1) Project file: SMPL209.MAK

`FORM209.FRM`	
`INIT001.BAS`	Uses the code file of the initialization module in paragraph 7.2.2.
`RESP01.BAS`	Uses the code file of the response read module in paragraph 7.2.1(2).
`SETTX.BAS`	This is the code file of the parameter setting module for TX measurement in paragraph 7.2.3(1).
`SGOUT.BAS`	This is the code file of the SG output control module in paragraph 7.2.1(2).
`PWMTR.BAS`	This is the code file of the power meter measurement module.
`VBIB.BAS`	
`NIGLOBAL.BAS`	
`ProjWinSize=87,394,243,136`	
`ProjWinShow=2.`	

2) Form file: FORM209.FRM

The following procedures are added and described.

```
Sub Form209_click ()
 Call initial_gpib'                 Calls GPIB initialization routine.
 Call Set_TX_parameter'             Calls TX parameter setting routine.
 Call SG_out(1)'                    Calls test signal output routine.
 Call power_meter'                  Calls power meter routine.
 Call SG_out(0)'                    Calls test signal output routine.
End Sub
```

3) Code module file: PWMTR.BAS

```
'----------------------------
' MT8802A GPIB Sample Program
' Power meter
'----------------------------
'
'
'
Sub power_meter ()
 Dim sbuf As String * 40
 '
 Call ibwrt(Ans%, "MEAS PWRMTR")'      Moves to power meter measurement screen.
 Call ibwrt(Ans%, "ADJRNG")'           Optimizes power measurement range.
 '
 Call ibwrt(Ans%, "SWP")'              Starts measurement.
 '
 Call ibwrt(Ans%, "POWER? DBM")'       Inquires about result of power measurement.
 sbuf = ReceiveResp()
```

```
18  Form209.Print "Average RF Power = "; Val(sbuf); "dBm"
19 End Sub
```

Set the power meter measurement mode in line 11.

Set the optimum range in line 12. The ADJRNG command stops accepting the next command until the measurement terminates.

Start the measurement in line 14. The SWP command stops accepting the next command until the measurement terminates.

Read the measurement results in lines 16 and 17.

(10) Power meter (zero point calibration)

<Example 2.10> Zero point calibration of power meter

1) Project file: SMPL210.MAK

`FORM210.FRM`	
`INIT001.BAS`	Uses the code file of the initialization module in paragraph 7.2.2.
`RESP01.BAS`	Uses the code file of the response reading module described in paragraph 7.2.1. (2).
`SETTX.BAS`	This is the code file of the parameter setting module for TX measurement in paragraph 7.2.3(1).
`SGOUT.BAS`	Uses the code file of the SG output control module described in paragraph 7.2.1. (2).
`ZEROSET.BAS`	This is the code file for the zero point calibration module.
`VBIB.BAS`	
`NIGLOBAL.BAS`	
`ProjWinSize=87,394,243,136`	
`ProjWinShow=2`	

2) Form file: FORM210.FRM

The following procedures are added and described.

`Sub Form_click ()`	
`  Call initial_gpib'`	Calls GPIB initialization routine.
`  Call Set_TX_parameter'`	Calls TX parameter setting routine.
`  Call zero_set'`	Calls zero point calibration routine.
`End Sub`	

3) Code module file: ZEROSET.BAS

`'----------------------------`	
`' MT8802A GPIB Sample Program`	
`' Power meter (zero set)`	
`'----------------------------`	
`'`	
`'`	
`'`	
`Sub zero_set ()`	
`  Dim sbuf As String * 40`	
`  Dim Stat%, I%`	
`  '`	
`  Call SG_out(0)'`	Sets the SG output to off.
`  Call ibwrt(Ans%, "MEAS PWRMTR")'`	Moves to power meter measurement screen.
`  Call ibwrt(Ans%, "*CLS")'`	Clears GPIB status register.
`  '`	
`  Call ibwrt(Ans%, "ZEROSET")'`	Starts adjustment of zero point.
`  Do`	
`  For I% = 0 To 10000: Next I%`	
`  Call ibwrt(Ans%, "ESR2?")'`	
`  sbuf = ReceiveResp()`	
`  Stat% = Val(sbuf)`	

```
22  Loop While (Stat% And 2) <> 2
23  '
24  Form21Ø.Print "End of zero set for RF Power."
25 End Sub
```

Turn off the RF input to this device before executing this program. Set the SG output to off in line 12 to set the RF input-output terminal to a no signal state.

Start the zero point calibration of the power meter in line 16.

Monitor completion of the zero point calibration (calibration termination bit of the END event status register) in lines 17 to 22.

(11) Measurement of occupied frequency bandwidth

<Example 2.11> Measuring occupied frequency bandwidth

1) Project file: SMPL211.MAK

`FORM211.FRM`	
`INIT001.BAS`	Uses the code file of the initialization module in paragraph 7.2.2.
`RESP01.BAS`	Uses the code file of the response read module in paragraph 7.2.1(2).
`SETTX.BAS`	This is the code file of the parameter setting module for TX measurement in paragraph 7.2.3(1).
`SGOUT.BAS`	This is the code file of the SG output control module in paragraph 7.2.1(2).
`OCCBW.BAS`	This is the code file of the occupied frequency bandwidth measurement module.
`VBIB.BAS`	
`NIGLOBAL.BAS`	
`ProjWinSize=87,394,243,136`	
`ProjWinShow=2`	

2) Form file: FORM211.FRM

The following procedures are added and described.

`Sub Form_click ()`	
`  Call initial_gpib'`	Calls GPIB initialization routine.
`  Call Set_TX_parameter'`	Calls TX parameter setting routine.
`  Call SG_out(1)'`	Calls test signal output routine.
`  Call occ_bw'`	Calls occupied frequency bandwidth measurement routine.
`  Call SG_out(0)'`	Calls test signal output routine.
`End Sub`	

3) Code module file: OCCBW.BAS

`'----------------------------`	
`' MT8802A GPIB Sample Program`	
`' OCC. BW`	
`'----------------------------`	
`'`	
`'`	
`'`	
`Sub occ_bw ()`	
` Dim sbuf as string * 40`	
` Dim Endsts%, I%`	
` '`	
` Call ibwrt(Ans%, "MEAS OBW,HIGH")'`	Moves to occupied frequency bandwidth measurement (High Speed) screen.
` Call ibwrt(Ans%, "STORAGE AVG")'`	Sets the mode to average mode.
` Call ibwrt(Ans%, "AVR 3")'`	Sets average number to 3.
` Call ibwrt(Ans%, "ADJRNG")'`	Optimizes measurement range.
` '`	
` Call ibwrt(Ans%, "*CLS")'`	Clears GPIB status register.

```
18  Call ibwrt(Ans%, "SNGLS")'            Starts measurement.
19  '
20  Do
21  For I% = 0 To 10000: Next I%
22  Call ibwrt(Ans%, "ESR2?")'            Confirms state of ending measurement.
23  sbuf = ReceiveResp()
24  Endsts% = Val(sbuf)
25  Loop While (Endsts% And 16) <> 16
26  '
27  Call ibwrt(Ans%, "OCCBW?")'     Inquires about results of occupied frequency bandwidth measurement.
28  sbuf = ReceiveResp()
29  Form211.Print "Occupied Bandwidth = "; Val(sbuf) / 1000; "kHz"
30 End Sub
```

Set the occupied frequency bandwidth measurement (high-speed measurement) mode in line 12.

Specify averaging of the measurement value in lines 13 and 14.

Start the measurement in line 18. In this example, the SNGLS command is used to start the measurement. Unlike the SWP command, the SNGLS command accepts the next command regardless of measurement termination.

For this processing, monitor measurement termination (the sweep measurement termination bit of the END event status register) in lines 20 to 25.

Specify the number of repetitions of the For-to-Next loop in line 21 so that the wait time for the GPIB control of the controller becomes about 50 ms.

Read the measurement results in lines 27 and 28 after checking that the measurement terminates.

(12) Measurement of adjacent channel leakage power

<Example 2.12> Measuring adjacent channel leakage power

1) Project file: SMPL212.MAK

```
FORM212.FRM
INIT001.BAS          Uses the code file of the initialization module in paragraph 7.2.2.
RESP01.BAS           Uses the code file of the response read module in paragraph 7.2.1(2).
SETTX.BAS            This is the code file of the parameter setting module for TX measurement in paragraph
                     7.2.3(1).
SGOUT.BAS            This is the code file of the SG output control module in paragraph 7.2.1(2).
ADJCH.BAS            This is the code file of the adjacent channel leakage power measurement module.
VBIB.BAS
NIGLOBAL.BAS
ProjWinSize=87,394,243,136
ProjWinShow=2
```

2) Form file: FORM212.FRM

The following procedures are added and described.

```
Sub Form_click ()
  Call initial_gpib'          Calls GPIB initialization routine.
  Call Set_TX_parameter'      Calls TX parameter setting routine.
  Call SG_out(1)'             Calls test signal output routine.
  Call Adj_ch'                Calls adjacent channel leakage power measurement routine.
  Call SG_out(0)'             Calls test signal output routine.
End Sub
```

3) Code module file: ADJCH.BAS

```
'----------------------------
' MT8802A GPIB Sample Program
' ADJ. CH
'----------------------------
'
'
'
Sub Adj_ch ()
 Dim Low90$, Low60$, Low30$, Up30$, Up60$, Up90$
 '
 Call ibwrt(Ans%, "MEAS ADJ,HIGH")'  Moves to adjacent channel leakage power measurement (High
                                     Speed method) screen.
 Call ibwrt(Ans%, "STORAGE NRM")'    Sets the normal mode.
 Call ibwrt(Ans%, "ADJRNG")'         Optimizes measurement range.
 '
 Call ibwrt(Ans%, "SWP")'            Starts measurement.
 '
```

```
17  Call ibwrt(Ans%, "MODPWR? LOW90,DBM")'    Inquires about measurement rsults of lowerside
                                              next-to-next adjacent channel leakage power.
18  Low90$ = ReceiveResp()
19  Call ibwrt(Ans%, "MODPWR? LOW60,DBM")'    Inquiries about measurement results of lowerside
                                              next adjacent channel leakage power.
20  Low60$ = ReceiveResp()
21  Call ibwrt(Ans%, "MODPWR? LOW30,DBM")'    Inquiries about measurement results of lowerside
                                              adjacent channel leakage power.
22  Low30$ = ReceiveResp()
23  Call ibwrt(Ans%, "MODPWR? UP30,DBM")'     Inquires about measurement results of upperside
                                              adjacent channel leakage power.
24  Up30$ = ReceiveResp()
25  Call ibwrt(Ans%, "MODPWR? UP60,DBM")'     Inquires about measurement results of upperside
                                              next adjacent channel leakage power.
26  Up60$ = ReceiveResp()
27  Call ibwrt(Ans%, "MODPWR? UP90,DBM")'     Inquires about measurement results of upperside
                                              next-to-next adjacent channel leakage power.
28  Up90$ = ReceiveResp()
29 '
30  Form212.Print "Adjacent channel power"
31  Form212.Print "  Modulation   (-900kHz) = "; Val(Low90$); "dBm"
32  Form212.Print "               (-600kHz) = "; Val(Low60$); "dBm"
33  Form212.Print "               (-300kHz) = "; Val(Low30$); "dBm"
34  Form212.Print "               ( 300kHz) = "; Val(Up30$); "dBm"
35  Form212.Print "               ( 600kHz) = "; Val(Up60$); "dBm"
36  Form212.Print "               ( 900kHz) = "; Val(Up90$); "dBm"
37  End Sub
```

Set the adjacent channel leakage power measurement (high-speed measurement) mode in line 11.

Optimize the range in line 13.

Start the measurement in line 15. The SWP command stops accepting the next command until the measurement terminates.

Read the measurement result in lines 17 to 28.

(13) Analog transmitter measurement

<Example 2.13> Measuring the analog modulation signal

1) Project file: SMPL213.MAK

```
FORM213.FRM
INIT001.BAS          Uses the code file of the initialization module described in paragraph 7.2.2.
RESP01.BAS           Uses the code file of the response reading module described in paragraph 7.2.1 (2).
SETATX.BAS           Code file of the parameter setting module for analog TX measurement
ATXMEAS.BAS          Code file of the analog TX measurement module
VBIB.BAS
NIGLOBAL.BAS
ProjWinSize = 87, 394, 243, 136
ProjWinShow = 2
```

2) Form file: FORM213.FRM

The following procedures are added and described.

```
Sub Form_click ()
 Call initial_gpib'            Calls the GPIB initialization routine.
 Call Set_ATX_parameter'       Calls the analog TX parameter setting routine.
 Call ATX_Measure'             Calls the analog TX measurement routine.
End Sub
```

3) Code module file: SETATX.BAS

```
'-----------------------------
' MT8802A GPIB Sample Program
' Set Analog TX Parameters
'-----------------------------
'
'
'
Sub Set_ATX_parameter ()
 '
 Call ibwrt(Ans%, "SYS IS136")'          Selects IS-136 system.
 Call ibwrt(Ans%, "PNLMD SYSTEM")'       Moves to system setting screen.
 Call ibwrt(Ans%, "RFINOUT MAIN")'       Uses Main Input/Output connector.
 Call ibwrt(Ans%, "PNLMD TESTER")'       Sets measurement mode to "TX/RX tester."
 '
 Call ibwrt(Ans%, "MEAS SETCOM")'        Moves to common parameter setting screen.
 Call ibwrt(Ans%, "DUTCTRL NONE")'       Sets DUT Control to None.
 Call ibwrt(Ans%, "FREQBAND A800MHZ")'   Sets frequency band to analog 800 MHz band.
 Call ibwrt(Ans%, "CHAN 1")'             Sets measurement frequency channel to CH 1.
 Call ibwrt(Ans%, "RFLVL 10DBM")'        Sets TX reference level to 10 dBm.
 Call ibwrt(Ans%, "MEASOBJ MSAVC")'      Sets measurement object signal to "MS-AVC."
 Call ibwrt(Ans%, "SATCC 1")'            Sets SAT CC to 1.
 '
```

`23 Call ibwrt(Ans%, "MEAS SETATX")'`	Moves to Setup screen for analog TX parameter.
`24 Call ibwrt(Ans%, "PMTH POW")'`	Sets power measurement method to Power Meter.
`25 Call ibwrt(Ans%, "RFMM ALL")'`	Sets RF measurement mode to All Item Measurement.
`26 Call ibwrt(Ans%, "AOIMP 600")'`	Set output impedance to 600 Ω.
`27 End Sub`	

Lines 8 to 27 are the routines for setting parameters for the analog TX measurement.

Set the IS-136 measurement system in line 10.

Set the RF signal input connector in lines 11 and 12. Set the parameters for the analog TX measurement on the Setup Common Parameter and Setup Analog TX Measure Parameter screens.

Lines 15 to 21 show the settings on the Setup Common Parameter screen. Set the center measurement frequency, reference measurement level, and signals to be measured here.

Lines 23 to 26 show the settings on the Setup Analog TX Measure Parameter screen. Set the power measurement method, RF measurement mode, and AF output impedance.

4) Code module file: ATXMEAS.BAS

```
'---------------------------
' MT8802A GPIB Sample Program
' Analog TX Measure
'---------------------------
'
'
'
Sub ATX_Measure ()
 Dim RFFreq$, RFPwr$, RFDev$, AFLvl$, AFDstn$, AFFreq$
 '
```

`Call ibwrt(Ans%, "MEAS ATXSG")'`	Moves to the screen of analog TX measurement with signal generator.
`Call ibwrt(Ans%, "AFREQ1 6000HZ")'`	Sets frequency of AF oscillator for SAT modulation to 6 kHz.
`Call ibwrt(Ans%, "AOUT1 ON")'`	Sets AF oscillator for SAT modulation to On.
`Call ibwrt(Ans%, "ADEV1 2KHZ")'`	Sets SAT modulation to 2 kHz.
`Call ibwrt(Ans%, "RRLVL ON")'`	Sets RF output to On.
`Call ibwrt(Ans%, "OLVL -50DBM")'`	Set RF output level to -50 dBm.
`'`	
`Call ibwrt(Ans%, "AOPF2 AF")'`	Sets AF oscillator 2 to AF output (for microphone input use).
`Call ibwrt(Ans%, "ASIG2 TONE")'`	Assigns AF oscillator (for microphone input use) to Tone.
`Call ibwrt(Ans%, "AFREQ2 1004HZ")'`	Sets frequency of AF oscillator (for microphone input use) to 1004 Hz.
`Call ibwrt(Ans%, "AOUT2 ON")'`	Sets AF oscillator (for microphone input use) to On.
`Call ibwrt(Ans%, "ALVL2 200MV")'`	Sets level of AF oscillator (for microphone input use) to 200 mV.
`'`	
`Call ibwrt(Ans%, "ADEMP 750")'`	Sets Deimphasis to 750 µs
`Call ibwrt(Ans%, "AFLT CMESS")'`	Sets the evaluation fileter to C-MESSAGE.
`'`	
`Call ibwrt(Ans%, "STRG NRM")'`	Sets the normal mode.
`Call ibwrt(Ans%, "ADJRNG")'`	Optimizes measurement range.

```
29  '
30  Call ibwrt(Ans%, "SWP")'               Starts measurement.
31  '
32  Call ibwrt(Ans%, "RFFREQ?")'           Requests for the measured results of RF frequency.
33  RFFreq$ = ReceiveResp()
34  Call ibwrt(Ans%, "RFPWR? DBM")'        Requests measured results of RF levels.
35  RFPwr$ = ReceiveResp()
36  Call ibwrt(Ans%, "RDEV?")'             Requests measured results of modulation.
37  RFDev$ = ReceiveResp()
38  Call ibwrt(Ans%, "TALVL?")'            Requests measured results of AF levels.
39  AFLvl$ = ReceiveResp()
40  Call ibwrt(Ans%, "DSTN? DB")'          Requests measured results of AF distoriton.
41  AFDstn$ = ReceiveResp()
42  Call ibwrt(Ans%, "AFFREQ?")'           Requests measured results of AF frequency.
43  AFFreq$ = ReceiveResp()
44  '
45  Form213.Print "RF Frequency = "; Val(RFFreq$); "Hz"
46  Form213.Print "RF Power = "; Val(RFPwr$); "dBm"
47  Form213.Print "Deviation = "; Val(RFDev$); "Hz"
48  Form213.Print "AF Level = "; Val(AFLvl$); "Hz"
49  Form213.Print "AF Distortion = "; Val(AFDstn$); "dB"
50  Form213.Print "AF Frequency"; Val(AFFreq$); "Hz"
51  '
52  Call ibwrt(Ans%, "AOUT2 OFF")'         Sets AF oscillator (for microphone input use) to Off.
53  Call ibwrt(Ans%, "RRLVL OFF")'         Sets RF output to Off.
54 End Sub
```

Set the analog TX measurement with signal generator screen in line 11.

Set the SAT modulation signals of 6 kHz in lines 12 to 16.

Set the AF oscillators for microphone input in lines 18 to 22.

Set the measurement conditions in lines 24 and 25.

Optimize the range in line 28.

Start the measurement in line 29. The SWP command stops accepting the next command until the measurement terminates.

Read the measurement results in lines 32 to 43.

Set the AF output and RF output to off in lines 52 and 53.

7.2.4 Reception (RX) measurement

(1) Setting of parameter for RX measurement

<Example 3.1> Setting parameters for RX measurement (measurement signal, BER input interface, etc.) for MT8802A.

1) Project file: SMPL301.MAK

```
FORM301.FRM
INIT001.BAS                      Uses the code file of the initialization module in paragraph 7.2.2.
SETRX.BAS                        This is the code file of parameter setting module for RX measurement.
VBIB.BAS
NIGLOBAL.BAS
ProjWinSize=87,394,243,136
ProjWinShow=2
```

2) Form file: FORM301.FRM

The following procedures are added and described.

```
Sub Form301_click ()
  Call initial_gpib'              Calls GPIB initialization routine.
  Call Set_RX_parameter'          Calls RX parameter setting routine.
End Sub
```

3) Code module file: SETRX.BAS

```
'--------------------------------------
' MT8802A GPIB Sample Program
' Setup Digital RX Measure Parameters
'--------------------------------------
'
'
'
Sub Set_RX_parameter ()
'
 Call ibwrt(Ans%, "SYS IS136")'        Selects IS-136 measuring system.
 Call ibwrt(Ans%, "PNLMD SYSTEM")'     Moves to system setting screen.
 Call ibwrt(Ans%, "RFINOUT MAIN")'     Uses Main Input/Output connector.
 Call ibwrt(Ans%, "PNLMD TESTER")'     Sets measurement mode to "TX/RX tester."
 '
 Call ibwrt(Ans%, "MEAS SETCOM")'      Moves to common parameter setting screen.
 Call ibwrt(Ans%, "DUTCTRL NONE")'     Sets DUT Control to None.
 Call ibwrt(Ans%, "FREQBAND D800MHZ")' Sets frequency band to digital 800 MHz band.
 Call ibwrt(Ans%, "CHAN 1")'           Sets measurement frequency channel to CH1.
 Call ibwrt(Ans%, "RFLVL 10DBM")'      Sets TX reference level to 10 dBm.
 Call ibwrt(Ans%, "MEASOBJ MSDTC")'    Sets measurement object signal to "MS-DTC."
 Call ibwrt(Ans%, "SLTNUM 1")'         Sets measurement slot number to 1.
 Call ibwrt(Ans%, "DVCC 01")'          Sets DVCC data to 01H.
 '
```

```
24  Call ibwrt(Ans%, "MEAS SETDRX")'          Moves to Setup Digital RX parameter screen.
25  Call ibwrt(Ans%, "BERMEASIN RFLOOP")'     Sets BER signal input to RF connector.
26  Call ibwrt(Ans%, "SACCH 000")'            Sets SACCH data to 000H.
27  '
28 End Sub
```

By lines 11 and 12, RF signal input terminal is set.

Setting of parameter for RX measurement is made on the Setup Common parameter screen and the Setup Digital RX Measure Parameter screen.

Lines 15 to 22 are setting of Setup Common parameter screen. Here, test signal center frequency, TX reference level (for loopback), and measurement signal classification are set.

Line 24 and subsequent lines are settings at the Setup Digital RX Measure Parameter screen. The RF signal parameter is set as the measurement object (measurement signal parameter, BER input interface, etc.).

(2) Setting of transmission signal for RX tests

<Example 3.2> Setting transmission signal parameter of RX measurement for MT8802A to output test signal.

1) Project file: SMPL302.MAK

`FORM3Ø2.FRM`	
`INITØØ1.BAS`	Uses the code file of the initialization module in paragraph 7.2.2.
`RESPØ1.BAS`	Uses the code file of the response reading module described in paragraph 7.2.1 (2).
`SETRX.BAS`	This is the code file of the parameter setting module for RX measurement in paragraph 7.2.4(1).
`SGOUT.BAS`	This is the code file of the SG output control module.
`VBIB.BAS`	
`NIGLOBAL.BAS`	
`ProjWinSize=87,394,243,136`	
`ProjWinShow=2`	

2) Form file: FORM302,FRM

The following procedures are added and described.

```
Sub Form3Ø2_click ()
  Call initial_gpib'          Calls GPIB initialization routine.
  Call Set_RX_parameter'      Calls RX parameter setting routine.
  Call SG_out(1)'             Calls test signal output routine.
End Sub
```

3) Code module file:

Uses SGOUT.BAS file in paragraph 7.2.1 (2).

(3) BER measurement (1) BER measurement at stipulated level

<Example 3.3> Performing the BER measurement using the test signal of the specified level.

1) Project file: SMPL303.MAK

```
FORM303.FRM
INIT001.BAS              Uses the code file of the initialization module in paragraph 7.2.2.
RESP01.BAS               Uses the code file of the response read module in paragraph 7.2.1(2).
SETRX.BAS                This is the code file of the parameter setting module for RX measurement in
                         paragraph 7.2.4(1).
SGOUT.BAS                This is the code file of the SG output control module in paragraph 7.2.1(2).
BER01.BAS                This is the code file of the BER measurement module.
VBIB.BAS
NIGLOBAL.BAS
ProjWinSize=87,394,243,136
ProjWinShow=2
```

2) Form file: FORM303.FRM

The following procedures are added and described.

```
Sub Form303_click ()
  Call initial_gpib'             Calls GPIB initialization routine.
  Call Set_RX_parameter'         Calls RX parameter setting routine.
  Call BER_measure1'             Calls BER measurement routine.
  Call SG_out(0)'                Calls test signal output routine.
End Sub
```

3) Code module file: BER01.BAS

```
'-------------------------------------
' MT8802A GPIB Sample Program
' Bit Error Rate Measurement (1)
'-------------------------------------
'
'
'
Sub BER_measure1 ()
 Const SGLVL! = -50!'            Sets RX measurement signal output level to -50 dBm.
 Dim sbuf As String * 40
 Dim Endsts%, I%
  '
 Call ibwrt(Ans%, "MEAS BER")
 Call ibwrt(Ans%, "CHAN 1")
 Call ibwrt(Ans%, "OLVL " + Str$(SGLVL!) + "DBM")'     Sets RX test signal level.
 Call ibwrt(Ans%, "LVL ON")
 Call ibwrt(Ans%, "MOD ON")
  '
```

```
19  Call ibwrt(Ans%, "*CLS")'                 Clears GPIB status register.
20  Call ibwrt(Ans%, "BERSAMPLE 100000")'     Sets number of BER measurement data to 100000 bits.

21  Call ibwrt(Ans%, "SNGLS")'                Starts BER measurement.
22  '
23  Do
24  For I% = 0 To 10000: Next I%
25  Call ibwrt(Ans%, "ESR2?")
26  '
27  sbuf = ReceiveResp()
28  Endsts% = Val(sbuf)
29  Loop While (Endsts% And 1) <> 1
30  '
31  Call ibwrt(Ans%, "BERRATE?")'             Reads BER measurement value.

32  sbuf = ReceiveResp()
33  Form303.Print "RX level "; SGLVL!; "dBm : Bit Error Rate = "; sbuf
34  '
35 End Sub
```

Output test signals in lines 14 to 17.

Set the measurement unit of the BER measurement data to 100000 bits in line 20.

In this example, the SNGLS command is used to start the measurement as in line 21. Unlike the SWP command, the SNGLS command accepts the next command regardless of measurement termination.

For this processing, monitor measurement termination (sweep or measurement termination bit of the END event status register) in lines 23 to 29.

Read the measurement results in lines 31 and 32 after checking that the measurement terminates.

(4) BER measurement (2) BER measurement to test the receiving level that produces the specified error rate

<Example 3.4> BER measurement to look for test signal level of specified error ratio

1) Project file: SMPL304.MAK

```
FORM304.FRM
INIT001.BAS                  Uses the code file of the initialization module in paragraph 7.2.2.
RESP01.BAS                   Uses the code file of the response read module in paragraph 7.2.1(2).
SETRX.BAS                    This is the code file of the parameter setting module for TX measurement in
                             paragraph 7.2.4(1).
SGOUT.BAS                    This is the code file of the SG output control module in paragraph 7.2.1(2).
BER02.BAS                    This is the code file of the BER measurement module.
VBIB.BAS
NIGLOBAL.BAS
ProjWinSize=87,394,243,136
ProjWinShow=2
```

2) Form file: FORM304.FRM

The following procedures are added and described.

```
Sub Form304_click ()
  Call initial_gpib'              Calls GPIB initialization routine.
  Call Set_RX_parameter'          Calls RX parameter setting routine.
  Call BER_measure2'              Calls BER measurement routine.
  Call SG_out(0)'                 Calls test signal output routine.
End Sub
```

3) Code module file: BER02.BAS

```
'-------------------------------------
' MT8802A GPIB Sample Program
' Bit Error Rate Measurement (2)
'-------------------------------------
'
'
'
Sub BER_measure2 ()
 Const BERLIMIT = .01'            Designates specified error ratio.
 Const SGLVL1! = -50!'            Sets RX measurement starting level to -50 dBm.

 Const SGLVL2! = -70!'            Sets RX measurement ending level to -70 dBm.
 Const LVLSTEP! = 1!'             Sets level step to 1 dB.
 Dim sbuf As String * 40
 Dim Endsts%, I%
 Dim SGLVL!
 '
 Call ibwrt(Ans%, "MEAS BER")
 Call ibwrt(Ans%, "CHAN 1")
```

```
19  SGLVL! = SGLVL1!
20  Call ibwrt(Ans%, "OLVL " + Str$(SGLVL!) + "DBM")'    Sets RX test level.
21  Call ibwrt(Ans%, "OIS " + Str$(LVLSTEP!))'           Sets level step.
22  Call ibwrt(Ans%, "LVL ON")
23  Call ibwrt(Ans%, "MOD ON")
24  '
25  Call ibwrt(Ans%, "BERSAMPLE 10000")'    Sets number of BER measurement data to 1000 bits.
26  Do
27  Call ibwrt(Ans%, "*CLS")'               Clears ESR status.
28  Call ibwrt(Ans%, "SNGLS")'              Starts BER measurement.
29  '
30  Do'                                     Waits until the end of BER measurement.
31  For I% = 0 To 10000: Next I%
32  Call ibwrt(Ans%, "ESR2?")
33  '
34  sbuf = ReceiveResp()
35  Endsts% = Val(sbuf)
36  Loop While (Endsts% And 1) <> 1
37  '
38  Call ibwrt(Ans%, "BERRATE?")'           Reads BER measurement value.
39  sbuf = ReceiveResp()
40  Form304.Print "RX level "; SGLVL!; "dBm : Bit Error Rate = "; sbuf
41  '
42  If BERLIMIT <= Val(sbuf) Then Exit Do
43  Call ibwrt(Ans%, "OLS DN")'             Reduces test signal level.
44  Call ibwrt(Ans%, "OLVL?")'              Reads test signal level.
45  sbuf = ReceiveResp()
46  SGLVL! = Val(sbuf)
47  Loop While SGLVL! >= SGLVL2!
48  '
49 End Sub
```

Output test signal in lines 18 to 23.

Set the measurement unit of the BER measurement data to 10000 bits in line 25.

Measure BER while lowering the test signal level in lines 26 to 47. When BER exceeds the specified value in line 42, the measurement stops.

"OLS DN" in line 43 lowers the test signal level by the level steps set in line 21.

Read test signal level in lines 44 to 46.

(5) Analog receiver measurement

<Example 3.5> Measuring the analog receiver

1) Project file: SMPL305.MAK

```
FORM305.FRM
INIT001.BAS          Uses the code file of the initialization module described in paragraph 7.2.2.
RESP01.BAS           Uses the code file of the response reading module described in paragraph 7.2.1 (2).
SETARX.BAS           Code file of the parameter setting module for analog RX measurement.
ARXMEAS.BAS          Code file of the analog RX measurement module.
VBIB.BAS
NIGLOBAL.BAS
ProjWinSize = 87, 394, 243, 136
ProjWinShow = 2
```

2) Form file: FORM305.FRM

The following procedures are added and described.

```
Sub Form_click()
  Call initial_Gpib'           Calls the GPIB initialization routine.
  Call Set_ARX_parameter'      Calls the analog RX parameter setting routine.
  Call ARX_Measure'            Calls the analog RX measurement routine.
End Sub
```

3) Code module file: SETARX.BAS

```
'----------------------------
' MT8802A GPIB Sample Program
' Set Analog RX Parameters
'----------------------------
'
'
'
Sub Set_ARX_parameter ()
 '
 Call ibwrt(Ans%, "SYS IS136")'        Selects IS-136 measuring system.
 Call ibwrt(Ans%, "PNLMD SYSTEM")'     Moves to system setting screen.
 Call ibwrt(Ans%, "RFINOUT MAIN")'     Uses Main Input/Output connector.
 Call ibwrt(Ans%, "PNLMD TESTER")'     Sets measurement mode to "TX/RX tester."
 '
 Call ibwrt(Ans%, "MEAS SETCOM")'      Moves to common parameter setting screen.
 Call ibwrt(Ans%, "DUTCTRL NONE")'     Sets DUT Control to None.
 Call ibwrt(Ans%, "FREQBAND A800MHZ")' Sets frequency band to analog 800 MHz band.
 Call ibwrt(Ans%, "CHAN 1")'           Sets measurement frequency channel to CH 1.
 Call ibwrt(Ans%, "RFLVL 10DBM")'      Sets TX reference level to 10 dBm.
 Call ibwrt(Ans%, "MEASOBJ MSAVC")'    Sets measurement object signal to "MS-AVC."
 Call ibwrt(Ans%, "SATCC 1")'          Sets SATCC to 1.
 '
```

```
23  Call ibwrt(Ans%, "MEAS SETARX")'      Moves to Analog TX parameter setting screen.
24  Call ibwrt(Ans%, "AIMP 100K")'        Sets AF input impedance to 100 kΩ.
25 End Sub
```

Lines 8 to 25 are the routines for setting parameters for the analog RX measurement.

Set the IS-136 measurement system in line 10.

Set the RF signal input connectors in lines 11 and 12. Set the parameters for the analog TX measurement on the Setup Common Parameter and Setup Analog RX Measure Parameter screens.

Lines 15 to 21 show the settings on the Setup Common Parameter screen. Set the center measurement frequency, reference measurement level, and signals to be measured here.

Lines 23 and 24 show the settings on the Setup Analog RX Measure Parameter screen. Set the AF input impedance.

4) Code module file: ARXMEAS.BAS

```
'----------------------------
' MT8802A GPIB Sample Program
' Analog RX Measure
'----------------------------
'
'
'
Sub ARX_Measure ()
 Dim AFLvl$, AFDstn$, AFFreq$
 '
 Call ibwrt(Ans%, "MEAS ARX")'          Moves to the analog RX measure screen.
 Call ibwrt(Ans%, "AFREQ1 1004HZ")'     Sets AF oscillator frequency for modulation to 1004 Hz.
 Call ibwrt(Ans%, "AOUT1 ON")'          Sets AF oscillator for modulation to On.
 Call ibwrt(Ans%, "ADEV1 8KHZ")'        Sets modulation rate to 8 kHz.
 Call ibwrt(Ans%, "RRLVL ON")'          Sets RF output to On.
 Call ibwrt(Ans%, "OLVL -50DBM")'       Sets RF output level to -50 dBm.
 '
 Call ibwrt(Ans%, "AOPF2 AF")'          Sets AF oscillator 2 to AF output (for microphone input use)
 Call ibwrt(Ans%, "ASIG2 TONE")'        Sets AF oscillator for microphone input use to Tone.
 Call ibwrt(Ans%, "AFREQ2 1100HZ")'     Sets AF oscillator frequency for microphone input use to
                                        1004 Hz.
 Call ibwrt(Ans%, "AOUT2 ON")'          Sets AF oscillator for microphone input use to On.
 Call ibwrt(Ans%, "ALVL2 200MV")'       Sets AF oscillator level for microphone input use to 200
                                        mV.
 '
 Call ibwrt(Ans%, "AFLT CMESS")'        Sets the evaluation filter to C-MESSAGE.
 '
 Call ibwrt(Ans%, "STRG NRM")'          Sets the mode to normal mode.
 Call ibwrt(Ans%, "ADJRNG")'            Optimizes measurement range.
 '
 Call ibwrt(Ans%, "SWP")'               Starts measurement.
```

```
30  '
31  Call ibwrt(Ans%, "AFLVL? V")'        Inquires about results of AF level measurement.
32  AFLvl$ = ReceiveResp()
33  Call ibwrt(Ans%, "DSTN? DB")'        Inquires about result of AF distortion measurement.
34  AFDstn$ = ReceiveResp()
35  Call ibwrt(Ans%, "AFFREQ?")'         Inquires about result of AF frequency measurement.
36  AFFreq$ = ReceiveResp()
37  '
38  Form305.Print "AF Level = "; Val(AFLvl$); "V"
39  Form305.Print "AF Distortion = "; Val(AFDstn$); "dB"
40  Form305.Print "AF Frequency"; Val(AFFreq$); "Hz"
41
42  Call ibwrt(Ans%, "AOUT2 OFF")'       Sets AF oscillator for microphone input use to On.
43  Call ibwrt(Ans%, "RRLVL OFF")'       Set the RF output to On.
44 End Sub
```

Set the analog RX measurement screen in line 11.

Set the RF modulation signal in lines 12 to 16.

Set the AF oscillators for microphone input use in lines 18 to 22.

Set the measurement conditions in line 24.

Optimize the range in line 27.

Start the measurement in line 29. The SWP command stops accepting the next command until the measurement terminates.

Read the measurement results in lines 31 to 36.

Set the AF output and RF output to off in lines 42 and 43.

7.2.5 Digital TX all measure item measurement, AF measurement

This paragraph describes examples of the programs for digital TX all measure item measurement and AF signal measurement.

(1) Setting the measurement items

<Example 4.1> Set the measurement items of the digital TX all measure item measurement.

1) Project file: SMPL401.MAK

```
FORM4Ø1.FRM
INITØØ1.BAS      Uses the code file of the initialization module in paragraph 7.2.2.
RESP01.BAS       Uses the code file of the response reading module described in paragraph 7.2.1 (2).
SETTX.BAS        This is the code file of the parameter setting module for TX measurement in paragraph 7.2.3(1).
SETALL.BAS       This is the code file of the measurement item setting module.
VBIB.BAS
NIGLOBAL.BAS
ProjWinSize=87,394,243,136
ProjWinShow=2
```

2) Form File: FORM401.FRM

The following procedures are added and described.

```
Sub Form4Ø1_click ()
  Call initial_gpib'            Calls GPIB initialization routine.
  Call Set_TX_parameter'        Calls TX parameter setting routine.
  Call Sel_TX_all'              Calls measurement items setting routine.
End Sub
```

3) Code module file: SETALL.BAS

```
 1 '-------------------------------------
 2 ' MT8802A GPIB Sample Program
 3 ' Select TX All Measure Item
 4 '-------------------------------------
 5 '
 6 '
 7 '
 8 Sub Sel_TX_all ()
 9 '
10  Call ibwrt(Ans%, "MEAS TXITEM")'        Moves to Select All Measure Item screen.
11  Call ibwrt(Ans%, "AITEM STD")'          Sets the mode to Standard mode.
12  Call ibwrt(Ans%, "MTEMPPASS ON")'       Judges Template.
13  Call ibwrt(Ans%, "LTEMPPASS BOTH")'     Selects Template On & Off.
14 End Sub
```

Shift to the Select All Measure Item screen in line 10. First, set the default parameter "Standard" of the MT8802A in line 11. Next, add or change required items in lines 12 and 13.

(2) Digital TX all measure item measurement

<Example 4.2> Set the measurement items and perform Digital TX all measure item measurement based on the set items.

1) Project file: SMPL402.MAK

```
FORM402.FRM
INIT001.BAS          Uses the code file of the initialization module in paragraph 7.2.2.
RESP01.BAS           Uses the code file of the response read module in paragraph 7.2.1(2).
SETTX.BAS            This is the code file of the parameter setting module for TX measurement in
                     paragraph 7.2.3(1).
SETALL.BAS           This is the code file of the measurement item setting module.
SGOUT.BAS            This is the code file of the SG output control module in paragraph 7.2.1(2).
TXALL01.BAS          This is the code file of the digital TX all item measurement module.
VBIB.BAS
NIGLOBAL.BAS
ProjWinSize=87,394,243,136
ProjWinShow=2
```

2) Form file: FORM402.FRM

The following procedures are added and described.

```
Sub Form402_click ()
  Call initial_gpib'          Calls GPIB initialization routine.
  Call Set_TX_parameter'      Calls TX parameter setting routine.
  Call Sel_TX_all'            Calls setting routine for measurement item.
  Call SG_out(1)'             Calls test signal output routine.
  Call TX_all_measure'        Calls digital TX all item measurement routine.
  Call SG_out(0)'             Calls test signal output routine.
End Sub
```

3) Code module file: TXALL01.BAS

```
'-------------------------------------
' MT8802A GPIB Sample Program
' TX All Measurement
'-------------------------------------
'
'
'
Sub TX_all_measure ()
 Const NUM% = 7'                      Specifies the number of groups of read data.
 Dim JDGE%(NUM%), MDAT$(NUM%)'        Declares the array for storing read data.
 Dim P%
 Dim JUDGE$, RCVDAT$
 Dim JMODPWR$, JTMPLAT$
 Dim sbuf As String * 40
 '
 Call ibwrt(Ans%, "MEAS TXALL")'         Moves to TX All-Measure screen.
```

```
17  Call ibwrt(Ans%, "STORAGE NRM")'        Sets the mode to normal mode.
18  Call ibwrt(Ans%, "ADJRNG")'             Optimizes measurement range.
19  '
2Ø  Call ibwrt(Ans%, "SWP")'                Starts measurement.
21  '
22  Call ibwrt(Ans%, "JTOTAL?")'            Inquires the result of total judgment.
23  JUDGE$ = ReceiveResp()
24  Call ibwrt(Ans%, "ALLMEAS? RFPWR")'     Inquires the result of judgment of RF Power and the
                                            measurement value.
25  RCVDAT$ = ReceiveResp()
26  For I% = Ø To NUM% - 1'                 Classifies the batched read results of measurement by
                                            items.
27  P% = InStr(RCVDAT$, ",")
28  JDGE%(I%) = Val(Mid$(RCVDAT$, 1, P% - 1))
29  RCVDAT$ = Right$(RCVDAT$, Len(RCVDAT$) - P%)
3Ø  P% = InStr(RCVDAT$, ",")
31  If P% = Ø Then P% = Len(RCVDAT$)
32  MDAT$(I%) = Mid$(RCVDAT$, 1, P% - 1)
33  RCVDAT$ = Right$(RCVDAT$, Len(RCVDAT$) - P%)
34  Next I%
35  '
36  Form4Ø2.Print "Total judgment is "; JUDGE$
37  If JDGE%(Ø) = Ø Then JMODPWR$ = "PASS" Else JMODPWR$ = "FAIL"
38  Form4Ø2.Print " TX Power: "; JMODPWR$; " ("; Val(MDAT$(Ø)); "dBm)"
39  If JDGE%(6) = Ø Then JTMPLAT$ = "PASS" Else JTMPLAT$ = "FAIL"
4Ø  Form4Ø2.Print " Template: "; JTMPLAT$
41 End Sub
```

Shift to the digital TX all item measurement screen in line 16.

Optimize the measurement range in line 18.

Start the measurement in line 20. The SWP command stops accepting the next command until the measurement terminates.

Read the measurement results in lines 22 to 25.

Divide the batched reading results (character strings delimited by commas) into character strings of individual items in lines 26 to 34.

(3) AF signal measurement

<Example 4.3> Measure the AF signal.

1) Project file: SMPL403.MAK

```
FORM403.FRM
INIT001.BAS           Uses the code file of the initialization module described in paragraph 7.2.2.
RESP01.BAS            Uses the code file of the response reading module described in paragraph 7.2.1 (2).
SETAF.BAS             Code file of the setting module of AF measurement parameters
AFMEAS.BAS            Code file of the AF measurement module
VBIB.BAS
NIGLOBAL.BAS
ProjWinSize = 87, 394, 243, 136
ProjWinShow = 2
```

2) Form file: FORM403.FRM

The following procedures are added and described.

```
Sub Form_click()
 Call Initial_gpib'           Calls the GPIB initialization routine.
 Call Set_AF_parameter'       Calls the AF parameter setting routine.
 Call AF_Measure'             Calls the AF measurement routine.
End Sub
```

3) Code module file: SETAF.BAS

```
'----------------------------
' MT8802A GPIB Sample Program
' Set AF Parameters
'----------------------------
'
'
'
Sub Set_AF_parameter ()
 '
 Call ibwrt(Ans%, "SYS IS136")'              Selects IS-136 measuring system.
 Call ibwrt(Ans%, "PNLMD TESTER")'           Sets measurement mode to "TX/RX" tester.
 '
 Call ibwrt(Ans%, "MEAS SETCOM")'            Moves to common parameter setting screen.
 Call ibwrt(Ans%, "DUTCTRL NONE")'           Sets DUT Control to None.
 Call ibwrt(Ans%, "FREQBAND A800MHZ")'       Sets frequency band to analog 800 MHz band.
 '
 Call ibwrt(Ans%, "MEAS SETAF")'             Moves to analog TX parameter setting screen.
 Call ibwrt(Ans%, "AIMP 100K")'              Sets AF input impedance to 100 KΩ.
 Call ibwrt(Ans%, "AOIMP 600")'              Sets AF output impedance to 600Ω.
End Sub
```

Lines 8 to 20 are the routines for setting the AF measurement parameters.

Set the IS-136 measurement system in line 10. Set the AF measurement parameters on the Setup Common Parameter and Setup AF Measure Parameter screens.

Lines 13 to 15 show the settings on the Setup Common Parameter screen. The AF measurement can be made available by setting DUT Control to None and the frequency band to the analog 800 MHz band.

Lines 17 to 19 show the settings on the Setup AF Measure Parameter screen. Set the AF input-output impedances.

4) Code module file: AFMEAS.BAS

```
 1 '----------------------------
 2 ' MT8802A GPIB Sample Program
 3 ' AF Measure
 4 '----------------------------
 5 '
 6 '
 7 '
 8 Sub AF_Measure()
 9  Const NUM% = 200 '          Specifies the number of data items for reading frequency characteristics.
10  Dim AFLvlAll$, AFLvl$(8), AFDstn$, AFFreq$
11  Dim AFFreqCharN$, AFFreqChar(NUM%)
12  Dim i%, f%, t%
13  '
14  Call ibwrt(Ans%, "MEAS AF") '          Moves to the AF measurement screen.
15  Call ibwrt(Ans%, "ASIG1 TONE") '       Sets AF oscillator as tone.
16  Call ibwrt(Ans%, "AFREQ1 1000HZ") '    Sets the AF oscillator frequency to 1000 Hz.
17  Call ibwrt(Ans%, "AOUT1 ON") '         Sets AF oscillator for modulation to On.

18  Call ibwrt(Ans%, "ALVL1 1V") '         Sets AF oscillator level to 1V.
19  Call ibwrt(Ans%, "AOUT2 OFF") '        Sets AF oscillator 2 to Off.
20  '
21  Call ibwrt(Ans%, "AFLT CMESS") '       Sets evaluation filter as C-MESSAGE.
22  '
23  Call ibwrt(Ans%, "STRG NRM") '         Sets the normal mode.
24  Call ibwrt(Ans%, "ADJRNG") '           Optimizes measurement range.
25  '
26  Call ibwrt(Ans%, "SWP") '              Starts measurement.
27  '
28  Call ibwrt(Ans%, "AFLVLALL? V") '      Inquiries about all measured results of AF levels.
29  AFLvlAll$ = ReceiveResp()
30  Call ibwrt(Ans%, "DSTN? DB") '         Inquiries about measurement results of AF distortion rate.
31  AFDstn$ = ReceiveResp()
32  Call ibwrt(Ans%, "AFFREQ?") '          Inquiries about results of AF frequency measurement.
33  AFFreq$ = ReceiveResp()
34  '
35  f% = 1
```

```
36  For i% = 0 To 6
37  t% = InStr(f%, AFLvlAll$, ",")
38  AFLvl$(i%) = Mid$(AFLvlAll$, f%, t% - f%)
39  f% = t% + 1
40  Next i%
41  AFLvl$(7) = Mid$(AFLvlAll$, f%)
42
43  Form403.Print "AF Level (ITU-T P.53) = "; Val(AFLvl$(4)); "V"
44  Form403.Print "AF Level (C-MESSAGE)  = "; Val(AFLvl$(5)); "V"
45  Form403.Print "AF Level (6kHz BPF) = "; Val(AFLvl$(6)); "V"
46  Form403.Print "AF Level (Filter Off) = "; Val(AFLvl$(7)); "V"
47  Form403.Print "AF Distortion = "; Val(AFDstn$); "dB"
48  Form403.Print "AF Frequency"; Val(AFFreq$); "Hz"
49
50  Call ibwrt(Ans%, "ALVL1 0.5V") '    Sets AF oscillator level to 0.5V.
51  Call ibwrt(Ans%, "ASIG1 WHITE") '   Sets AF oscillator as white noise.
52  Call ibwrt(Ans%, "AFLT OFF") '      Sets evaluation filter to Off.
53  Call ibwrt(Ans%, "ADJRNG") '        Optimizes measurement range.
54  '
55  Call ibwrt(Ans%, "SWP") '           Starts measurement.
56  '
57  For i% = 0 To NUM% - 1
58  Call ibwrt(Ans%, "FREQCHAR? " & Str$(i% + 1)) '  Inquiries about results of frequency
                                                     characteristics measurement.
59  AFFreqCharN$ = ReceiveResp()
60  AFFreqChar(i%) = Val(AFFreqCharN$)
61  Next i%
62  '
63  For i% = 0 To NUM% - 1
64   Form403.Print "AF Freq. Characteristics ("; 50 * (i% + 1); "Hz) = ";
AFFreqChar(i%); "dB"
65  Next i%
66  '
67  Call ibwrt(Ans%, "AOUT1 OFF") '    Sets AF oscillator to Off.
68 End Sub
```

Set the AF measurement screen in line 14.

Set the AF oscillator to 1 kHz tone in lines 15 to 19.

Set the measurement conditions in line 21.

Optimize the range in line 24.

Start the measurement in line 26. The SWP command stops accepting the next command until the measurement terminates.

Read the measurement results in lines 28 to 33.

Divide the batched read results (character strings delimited by commas) into character strings of individual items in lines 35 to 41.

Lines 50 to 65 are an examples of batched frequency characteristic measurement using the white noise.

Lines 50 and 51 set the AF oscillator to the white noise.

Optimize the range in line 53.

Start the measurement in line 55.

Read the measurement results in lines 57 to 61.

Set the AF output to off in line 67.

SECTION 8
WAVEFORM DATA STORAGE FORMAT

This section describes the storage format of waveform data fetched by an external computer. The use examples are described in the IBM-PC instructions.

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8.1 Notes on Fetching the Waveform Data

(1) Fetching screen

- The waveform data to be fetched must be displayed on the MT8802A screen.
- Check that the measurement terminates before fetching the waveform data. If Continuous measurement mode is set or measurement does not terminate, the correct data cannot be fetched.

Examples of checking measurement termination:

a) In Continuous measurement mode

1. Switch to Single measurement mode.
2. Read the End Event Status Register (ESR2) and check that the measurement terminates.

b) In Average measurement mode

- Read the End Event Status Register (ESR2) and check that both averaging and measurement terminate.

c) In Single measurement mode

- Read the End Event Status Register (ESR2) and check that the measurement terminates.

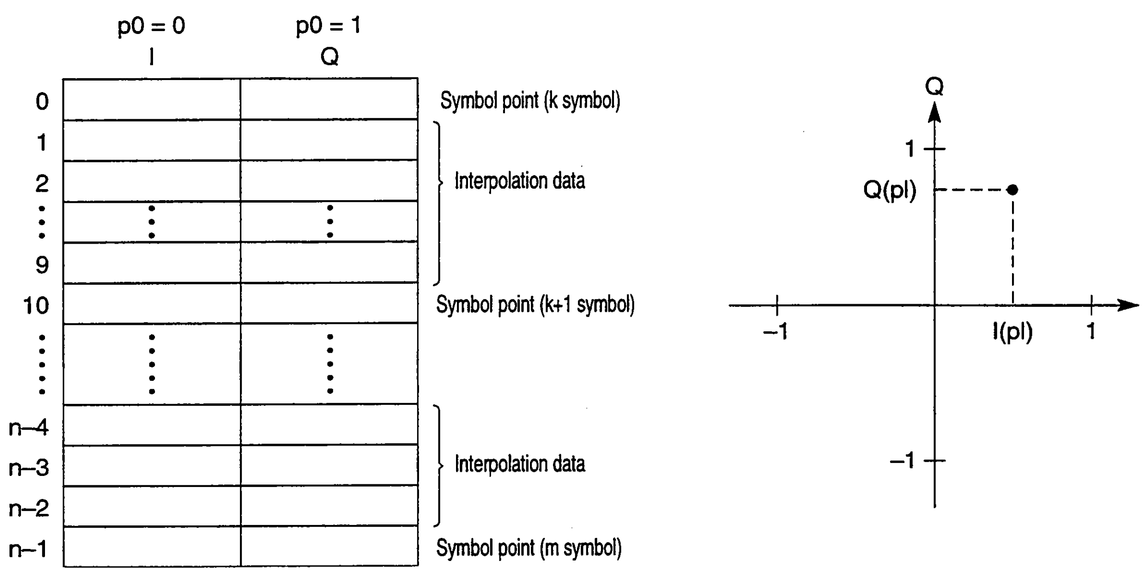
(2) Response data

- When fetching two or more data items together, commas (,) are output as data separators.
- The query command format is designed so that it can fetch all data items together. However, the number of data items actually fetched depends on restrictions placed on the external controller.

8.2 Waveform Data Storage Format

(1) XMC (constellation measurement waveform of modulation analysis)

a) Format



- Stored with the two-dimensional I-Q data.
- Note that n, k, and m depend on the measurement signal.
  For IS-136 MS-DTC: n = 1561, k = 6, m = 162
  For IS-136 Continuous: n = 1621, k = 0, m = 162
- Correspondence to screen display is as follows (Interpolation mode)
  Non: Dots represent symbol points (0, 10, 20, ... , n-1).
  Linear: Each symbol point is connected in linear lines (0-10-20- ...-n-1)
  10point: Liner lines connect a symbol point and interpolation data (0-1-2-...-n-1)

b) Scaling

- Displays an 16-bit signed integer value (-32768 to 32767) in 0.0001 units (ideal signal of 1 = 10000).

c) Read commands

```
XMC? p0,pl,d
```

p0: I data for 0, Q data for 1
pl: Read starting point (0 to n-1)
d: Number of reads

Use examples

```
Call△ibwrt(ud%,"XMC?△ Ø,Ø,1")
Call△ibrd(ud%,rdbuf$)
I6!=Val(rdbuf$)/1ØØØØ.Ø
Call△idwrt(ud%, "XMC?△ 1,Ø,1")
Call△ibrd(ud%,rdbuf$)
Q6!=Val(rdbuf$)/11ØØØØ.Ø
```

(2) XMD (RF power measurement waveform)

a) Format

p		
0		–100.0 symbol
1		–99.9 symbol
2	⋮	–99.8 symbol
⋮		⋮
1000		0.0 symbol
1001		0.1 symbol
⋮	⋮	⋮
n–3		m–0.2 symbol
n–2		m–0.1 symbol
n–1		m symbol

- Note that n and m depend on the measuring system.
  For IS-136: n = 6861, m = 586
  The number of data are numbers to which 100 symbols are added to both the front and the rear of one frame.

b) Scaling

- Displays a 16-bit signed integer value (-32768 to 32767) in 0.01 dB units (1 dB = 100).

c) Read commands

```
XMD? p,d
```

p: Read starting point (0 to n-1)

d: Number of reads

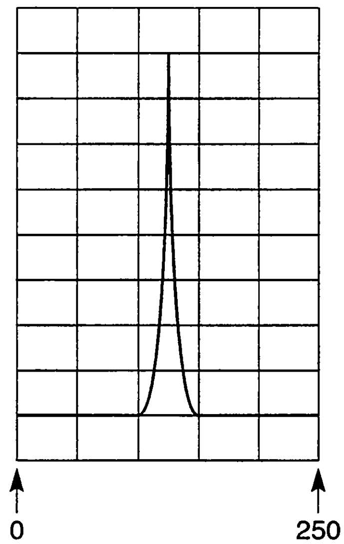
Use examples

```
Call△ibwrt(ud%, "XMD?△1ØØØ,1")
Call△ibrd(ud%, rdbuf$)
pØ!=Val(rdbuf$)/1.ØØ.Ø
```

(3) XME (High Speed measurement waveform of occupied frequency bandwidth measurement)

a) Format

p		
0		center frequency–125× Δf
1		center frequency–124× Δf
2		center frequency–123× Δf
⋮	⋮	⋮
124		center frequency– Δf
125		center frequency
126		center frequency+Δf
⋮	⋮	⋮
248		center frequency+123× Δf
249		center frequency+124× Δf
250		center frequency+125× Δf



- The number of data items is fixed to 251 points.
- Δf depends on the measuring system.
  For IS-136: Δf = 390.625Hz
- Correspondence to the horizontal axis scale of screen display (occupied frequency bandwidth measurement screen) is on a one-to-one basis.

b) Scaling

- Displays a 16-bit signed integer value in 0.01 dB units (1 dB = 100).

c) Read command

```
XME? p,d
```

p: Read starting point (0 to 250)

d: Number of reads

Use examples

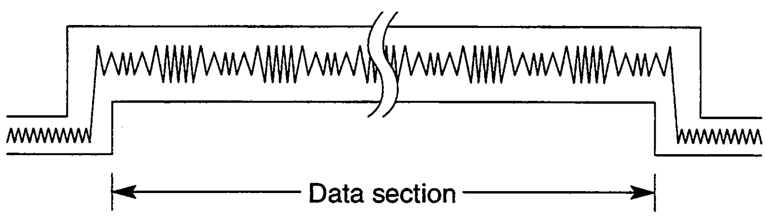
```
Call△ibwrt(ud%, "XME?△125,1")
Call△ibrd(ud%, rdbuf$)
sØ!=Val(rdbuf$)/1ØØ.Ø
```

(4) XMM (Demodulation data)

a) Format

p		
0		k to k+15 bits
1		k+16 to k+31 bits
2		k+32 to k+47 bits
⋮	⋮	⋮
n–2		m–32 to m–17 bits
n–1		m–16 to m–1 bits

- The demodulation bit depends on the measurement signal.
  For IS-136 MS-DTC: 20 to 323 bits
  For IS-136 Continuous: 0 to 323 bits
- Note that n, k, and m depend on the measurement signal.
  For IS-136 MS-DTC: n = 20, k = 12, m = 332
  For IS-136 Continuous: n = 21, k = 0, m = 336



b) Scaling

- Data in the demodulation section (delimited in units of 16 bits from the first symbol) is represented by a 16-bit unsigned integer value from 0 to 65535.
- If the demodulation section cannot be divided by 16, the last data is treated as left-justified data with the remaining part padded with 0s.

c) Read command

```
XMM? p,d
```

p: read starting point (0 to n-1)

d: number of reads

Use examples

```
Call△ibwrt(ud%, "XMM?△Ø,1")
Call△ibrd(ud%, rdbuf$)
bØ&=Val(rdbuf$)
```

(5) XMN (magnitude error measurement waveform of modulation analysis)

a) Format

p		
0		k symbol
1		k+1 symbol
2		k+2 symbol
⋮	⋮	⋮
n–2		m–1 symbol
n–1		m symbol

- Note that n, k, and m depend on the measurement signal.
  For IS-136 MS-DTC: n = 157, k = 6, m = 162
  For IS-136 Continuous: n = 163, k = 0, m = 162
- Correspondence to the horizontal axis scale of screen display (magnitude error screen) is on a one-to-one basis.

b) Scaling

- Displays a 16-bit signed integer value (-32768 to 32767) in 0.01% units (magnitude error of 1% = 100).

c) Read command

```
XMN? p,d
```

p: read starting point (0 to n-1)

d: number of reads

Use examples

```
Call△ibwrt(ud%, "XMN?△Ø,1")
Call△ibrd(ud%, rdbuf$)
em6!=Val(rdbuf$)/1ØØ.Ø
```

(6) XMP (phase error measurement waveform of modulation analysis)

a) Format

p		
0		k symbol
1		k+1 symbol
2		k+2 symbol
⋮	⋮	⋮
n–2		m–1 symbol
n–1		m symbol

- Note that n, k, and m depend on the measurement signal.
  For IS-136 MS-DTC: n = 157, k = 6, m = 162
  For IS-136 Continuous: n = 163, k = 0, m = 162
- Correspondence to the horizontal axis scale of screen display (phase error screen) is on a one-to-one basis.

b) Scaling

- Displays a 16-bit signed integer value (-32768 to 32767) in a 0.01 degree unit (phase error of 1 degree = 100).

c) Read command

```
XMP? p,d
```

p: Read starting point (0 to n-1)

d: number of reads

Use examples

```
Call△ibwrt(ud%, "XMP?△Ø,1")
Call△ibrd(ud%, rdbuf$)
ev6!=Val(rdbuf$)/1ØØ.Ø
```

(7) XMV (vector error measurement waveform of modulation analysis)

a) Format

p		
0		k symbol
1		k+1 symbol
2		k+2 symbol
⋮	⋮	⋮
n–2		m–1 symbol
n–1		m symbol

- Note that n, k, and m depend on the measurement signal.
  For IS-136 MS-DTC: n = 157, k = 6, m = 162
  For IS-136 Continuous: n = 163, k = 0, m = 162
- Correspondence to the horizontal axis scale of screen display (vector error screen) is on a one-to-one basis.

b) Scaling

- Displays a 16-bit signed integer value (-32768 to 32767) in 0.01% units (vector error of 1% = 100).

c) Read command

```
XMV? p,d
```

p: Read starting point (0 to n-1)

d: number of reads

Use examples

```
Call△ibwrt(ud%, "XMV?△Ø,1")
Call△ibrd(ud%, rdbuf$)
ev6!=Val(rdbuf$)/1ØØ.Ø
```

APPENDIXES

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APPENDIX A ASCII* CODE TABLE

B7 B6 B5	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
BITS B4 B3 B2 B1	CONTROL		NUMBERS SYMBOLS		UPPER CASE		LOWER CASE	
0 0 0 0	0 NUL 0 0	20 DLE 10 16	40 SP 20 32	60 0 30 48	100 @ 40 64	120 P 50 80	140 ` 60 96	160 p 70 112
0 0 0 1	1 GTL SOH 1 1	21 LLO DC1 11 17	41 ! 21 33	61 1 31 49	101 A 41 65	121 Q 51 81	141 a 61 97	161 q 71 113
0 0 1 0	2 NUL 2 2	22 DC2 12 18	42 " 22 34	62 2 32 50	102 B 42 66	122 R 52 82	142 b 62 98	162 r 72 114
0 0 1 1	3 ETX 3 3	23 DC3 13 19	43 # 23 35	63 3 33 51	103 C 43 67	123 S 53 83	143 c 63 99	163 s 73 115
0 1 0 0	4 SDC EOT 4 4	24 DCL DC4 14 20	44 S 24 36	64 4 34 52	104 D 44 68	124 T 54 84	144 d 64 100	164 t 74 116
0 1 0 1	5 PPC ENO 5 5	25 PPU NAK 15 21	45 % 25 37	65 5 35 53	105 E 45 69	125 U 55 85	145 e 65 101	165 u 75 117
0 1 1 0	6 ACK 6 6	26 SYN 16 22	46 & 26 38	66 6 36 54	106 F 46 70	126 V 56 86	146 f 66 102	166 v 76 118
0 1 1 1	7 BEL 7 7	27 ETB 17 23	47 ' 27 39	67 7 37 55	107 G 47 71	127 W 57 87	147 g 67 103	167 w 77 119
1 0 0 0	10 GET BS 8 8	30 SPE CAN 18 24	50 (28 40	70 8 38 56	110 H 48 72	130 X 58 88	150 h 68 104	170 x 78 120
1 0 0 1	11 TCT HT 9 9	31 SPD EM 19 25	51) 29 41	71 9 39 57	111 I 49 73	131 Y 59 89	151 i 69 105	171 y 79 121
1 0 1 0	12 LF A 10	32 SUB 1A 26	52 * 2A 42	72 : 3A 58	112 J 4A 74	132 Z 5A 90	152 j 6A 106	172 z 7A 122
1 0 1 1	13 VT B 11	33 ESC 1B 27	53 ÷ 2B 43	73 ; 3B 59	113 K 4B 75	133 [5B 91	153 k 6B 107	173 { 7B 123
1 1 0 0	14 FF C 12	34 FS 1C 28	54 , 2C 44	74 < 3C 60	114 L 4C 76	134 \ 5C 92	154 l 6C 108	174 | 7C 124
1 1 0 1	15 CR D 13	35 GS 1D 29	55 – 2D 45	75 = 3D 61	115 M 4D 77	135] 5D 93	155 m 6D 109	175 } 7D 125
1 1 1 0	16 SO E 14	36 RS 1E 30	56 . 2E 46	76 > 3E 62	116 N 4E 78	136 Λ 5E 94	156 n 6E 110	176 ~ 7E 126
1 1 1 1	17 SI F 15	37 US 1F 31	57 / 2F 47	77 ? 3F 63	117 O 4F 79	137 UNT _ 5F 95	157 o 6F 111	177 RUBOUT (DEL) 7F 127
	Address command	Universal command	Listen address		Talk address		Secondary address or command	

KEY

octal	25 PPU	GPIB code
	NAK	ASCII character
hex	15 21	decimal

*American Standard Code for Information Interchange

Table A-1 GPIB Interface Messages (Extended)

b7 → b6 → b5 →					0 0 0	① MSG	0 0 1	MSG	0 1 0	MSG	0 1 1	MSG	1 0 0	MSG	1 0 1	MSG	1 1 0	MSG	1 1 1	MSG
Bits ↓	b3 ↓	b2 ↓	b1 ↓	COLUMN → ROW ↓	0		1		2		3		4		5		6		7	
0	0	0	0	0	NUL		DLE		SP	Listener address (MLA) assigned to equipment	0	Listener address (MLA) assigned to equipment	@	Listener address (MLA) assigned to equipment	P	Listener address (MLA) assigned to equipment	`	Meaning defined by PCG	p	Meaning defined by PCG
0	0	0	1	1	SOH	GTL	DC1	LLO	!		1		A		Q		a		q	
0	0	1	0	2	STX		DC2		"		2		B		R		b		r	
0	0	1	1	3	ETX		DC3		#		3		C		S		c		s	
0	1	0	0	4	EOT	SDC	DC4	DCL	$		4		D		T		d		t	
0	1	0	1	5	ENQ	PPC	NAK	PPU	%		5		E		U		e		u	
0	1	1	0	6	ACK		SYN		&		6		F		V		f		v	
0	1	1	1	7	BEL		ETB		'		7		G		W		g		w	
1	0	0	0	8	BS	GET	CAN	SPE	(		8		H		X		h		x	
1	0	0	1	9	HT	TCT	EM	SPD	)		9		I		Y		i		y	
1	0	1	0	A	LF		SUB		*		:		J		Z		j		z	
1	0	1	1	B	VT		ESC		+		;		K		[		k		{	
1	1	0	0	C	FF		FS		,		<		L		\		l		¦	
1	1	0	1	D	CR		GS		–		=		M		]		m		}	
1	1	1	0	E	SO		RS		.		>		N		^		n		~	
1	1	1	1	F	SI		US		/		?	UNL	O		—	UNT	o		DEL	

2

Address Command Group (ACG)

Universal Command Group (UCG)

Listen Address Group (LAG)

Talk Address Group (TAG)

Primary Command Group (PCG)

Secondary Command Group (SCG)

Notes:
1 MSG=INTERFACE MESSAGE (Sent by ATN of True, Low level)
2 b1=DI01...b7=DI07 (b1 through b7 correspond to DI01 to DI07 sequence.)GTL

SDC	Go to Local
PPC	Select Device Clear
GET	Parallel Poll Configure
TCT	Group Execute Trigger
LLO	Take Control
DCL	Local Lockout
PPU	Device Clear
SPE	Parallel Poll Unconfigure
SPD	Serial Poll Enable
UNL	Serial Poll Disable
UNT	Unlisten
(ACG)	Untalk
(UCG)	Addressed Command Group
(LAG)	Universal Command Group
(TAG)	Listen Address Group
(PCG)	Talk Address Group
(SCG)	Primary Command Group
	Secondary Command Group

Table A-2 Interface Message Groups

DI08	DI07	DI06	DI05	DI04	DI03	DI02	DI01	Interface message group (G)
×	0	0	0	b4	b3	b2	b1	Addressed command G
×	0	0	1	b4	b3	b2	b1	Universal command G
×	0	1	b5	b4	b3	b2	b1	Listen address G
×	0	1	1	1	1	1	1	Unlisten (UNL)
×	1	0	b5	b4	b3	b2	b1	Talker Address G
×	1	0	1	1	1	1	1	Untalk (UNT)
×	1	1	b5	b4	b3	b2	b1	Secondary command G

Table A-3 Address Assignments

Address character		Address swich setting					Primary address	Factory address set device
Talk	Listen	5	4	3	2	1		
b_7 b_6	b_7 b_6	b_5	b_4	b_3	b_2	b_1		
1 0	0 1	↓	↓	↓	↓	↓	Decimal	
@	SP	0	0	0	0	0	0	
A	!	0	1	0	0	1	1	
B	"	0	0	0	1	0	2	
C	#	0	0	0	1	1	3	
D	$	0	0	1	0	0	4	
E	%	0	0	1	0	1	5	
F	&	0	0	1	1	0	6	
G	'	0	0	1	1	1	7	
H	(	0	1	0	0	0	8	
I	)	0	1	0	0	1	9	
J	*	0	1	0	1	0	10	
K	+	0	1	0	1	1	11	
L	,	0	1	1	0	0	12	
M	-	0	1	1	0	1	13	Printer
N	.	0	1	1	1	0	14	Plotter
O	/	0	1	1	1	1	15	
P	0	1	0	0	0	0	16	
Q	1	1	0	0	0	1	17	
R	2	1	0	0	1	0	18	
S	3	1	0	0	1	1	19	
T	4	1	0	1	0	0	20	
U	5	1	0	1	0	1	21	
V	6	1	0	1	1	0	22	
W	7	1	0	1	1	1	23	
X	8	1	1	0	0	0	24	
Y	9	1	1	0	0	1	25	
Z	:	1	1	0	1	0	26	
[	;	1	1	0	1	1	27	
\	<	1	1	1	0	0	28	
]	=	1	1	1	0	1	29	
^	>	1	1	1	1	0	30	
?	—	1	1	1	1	1	31	UNL,UNT

APPENDIX B COMPARISON TABLE OF CONTROLLERS' GPIB INSTRUCTIONS

Function	Controller			
	PACKET V (Anritsu)	PC-9800 series (NEC)	IBM-PC	HP9000 series
Outputs data to a device	WRITE @ device number; data	PRINT @ listener address; data	CALL IBWRT( )	OUTPUT device selector;data
Outputs binary data to a device	BIN WRITE @ device number; data	WBYTE command;data		
Assigns data entered from a device to a variable	READ @ device number:variable	INPUT @ talker address, listener address;variable LINE INPUT @ talker address, listener address;variable	CALL IBRD( )	ENTER device selector;variable
Assigns binary data entered from a device to a variable	BIN READ @ device number; variable	RBYTE command;variable		
Initializes an interface function	IFC @ select code	ISET IFC	CALL IBSIC( )	ABORT select code
Turns REN line on	REN @ select code	ISET REN	CALL IBSRE( )	REMOTE device selector (select code)
Turns REN line off	LCL @ select code (sets all devices local) LCL @ device number (sets only specified devices to listeners, and sends out GTL command)	IRESET REN WBYTE &H3F,listener address,secondary address,&H01;	CALL IBSRE( ) CALL IBLOC( )	LOCAL device selector (select code) LOCAL device selector (select code + primary address)
Outputs interface messages (messages) and data	COMMAND @ select code : character string for message [;data]		CALL IBCMD() CALL IBCMDA() (asynchronous)	SEND select code ;message string
Triggers a specified device	TRG @ device number	WBYTE &H3F,listener address,secondary address,&H08;	CALL IBTRG( )	TRIGGER device selector

Function	Controller			
	PACKET V (Anritsu)	PC-9800 series (NEC)	IBM-PC	HP9000 series
Initializes devices	DCL @ select code (all devices bearing a specified select code) DCL @ device number (specified devices only)	WBYTE &H3F,&H14; WBYTE &H3F, listener address, secondary address,&H04;	CALL IBCLR( )	CLEAR device selector (selector code) CLEAR device selector (selector code + primary address)
Disables a device from being switched over from remote to local	LLO @ select code	WBYTE &H3F, &H11;		LOCAL LOCKOUT
Transfers control to a specified device	RCT @ device number	WBYTE talker address, &H09;	CALL IBPCT( )	PASS CONTROL
Sends out a service request	SRQ @ select code	ISET SRQ	CALL IBRSV( )	REQUEST select code
Performs serial polling	STATUS @ device number	POLL	CALL IBRSP( )	SPOLL (device selector) (function)
Sets a terminator code	TERM IS	CMD DELIM	CALL IBEOS( ) CALL IBEOT( )	
Sets a limit value for checking a timeout		CMD TIMEOUT	CALL IBTOM( )	

APPENDIX C INDEX

• The numbers on the right indicate section and paragraph numbers in this operation manual.