ADVANTEST®

ADVANTEST CORPORATION

R3465 OPT51/56

GSM Measurement Option

Operation Manual

MANUAL NUMBER FOE-8311289D01

Applicable model

R3465

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Printed in Japan

Safety Summary

To ensure thorough understanding of all functions and to ensure efficient use of this instrument, please read the manual carefully before using. Note that Advantest bears absolutely no responsibility for the result of operations caused due to incorrect or inappropriate use of this instrument.

If the equipment is used in a manner not specified by Advantest, the protection provided by the equipment may be impaired.

- **Warning Labels**

  Warning labels are applied to Advantest products in locations where specific dangers exist. Pay careful attention to these labels during handling. Do not remove or tear these labels. If you have any questions regarding warning labels, please ask your nearest Advantest dealer. Our address and phone number are listed at the end of this manual.

  Symbols of those warning labels are shown below together with their meaning.

  DANGER: Indicates an imminently hazardous situation which will result in death or serious personal injury.

  WARNING: Indicates a potentially hazardous situation which will result in death or serious personal injury.

  CAUTION: Indicates a potentially hazardous situation which will result in personal injury or a damage to property including the product.

- **Basic Precautions**

  Please observe the following precautions to prevent fire, burn, electric shock, and personal injury.

  - Use a power cable rated for the voltage in question. Be sure however to use a power cable conforming to safety standards of your nation when using a product overseas.
  - When inserting the plug into the electrical outlet, first turn the power switch OFF and then insert the plug as far as it will go.
  - When removing the plug from the electrical outlet, first turn the power switch OFF and then pull it out by gripping the plug. Do not pull on the power cable itself. Make sure your hands are dry at this time.
  - Before turning on the power, be sure to check that the supply voltage matches the voltage requirements of the instrument.
  - Connect the power cable to a power outlet that is connected to a protected ground terminal. Grounding will be defeated if you use an extension cord which does not include a protected ground terminal.
  - Be sure to use fuses rated for the voltage in question.
  - Do not use this instrument with the case open.
  - Do not place anything on the product and do not apply excessive pressure to the product. Also, do not place flower pots or other containers containing liquid such as chemicals near this

product.

- When the product has ventilation outlets, do not stick or drop metal or easily flammable objects into the ventilation outlets.
- When using the product on a cart, fix it with belts to avoid its drop.
- When connecting the product to peripheral equipment, turn the power off.

- **Caution Symbols Used Within this Manual**

Symbols indicating items requiring caution which are used in this manual are shown below together with their meaning.

DANGER: Indicates an item where there is a danger of serious personal injury (death or serious injury).

WARNING: Indicates an item relating to personal safety or health.

CAUTION: Indicates an item relating to possible damage to the product or instrument or relating to a restriction on operation.

- **Safety Marks on the Product**

The following safety marks can be found on Advantest products.

 : ATTENTION - Refer to manual.

 : Protective ground (earth) terminal.

 : DANGER - High voltage.

 : CAUTION - Risk of electric shock.

- **Replacing Parts with Limited Life**

The following parts used in the instrument are main parts with limited life.
Replace the parts listed below before their expected lifespan has expired to maintain the performance and function of the instrument.
Note that the estimated lifespan for the parts listed below may be shortened by factors such as the environment where the instrument is stored or used, and how often the instrument is used.
The parts inside are not user-replaceable. For a part replacement, please contact the Advantest sales office for servicing.

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

Main Parts with Limited Life

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

- **Hard Disk Mounted Products**

The operational warnings are listed below.

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

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

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

- **Precautions when Disposing of this Instrument**

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

Harmful substances: (1) PCB (polycarbon biphenyl)
(2) Mercury
(3) Ni-Cd (nickel cadmium)
(4) Other
Items possessing cyan, organic phosphorous and hexadic chromium and items which may leak cadmium or arsenic (excluding lead in solder).

Example: fluorescent tubes, batteries

Environmental Conditions

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

- An area free from corrosive gas
- An area away from direct sunlight
- A dust-free area
- An area free from vibrations
- Altitude of up to 2000 m

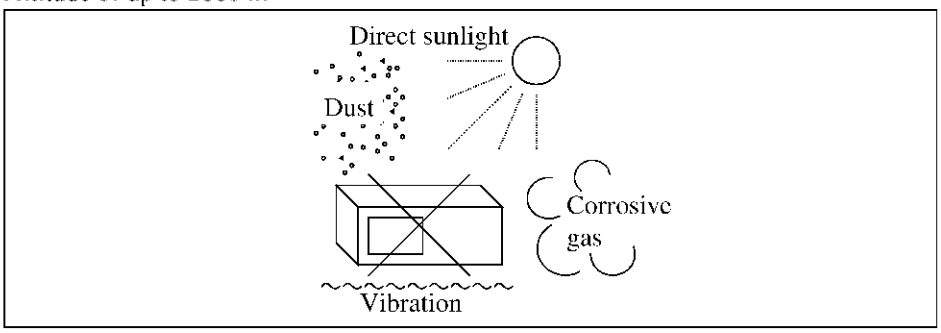


Figure-1 Environmental Conditions

- Operating position

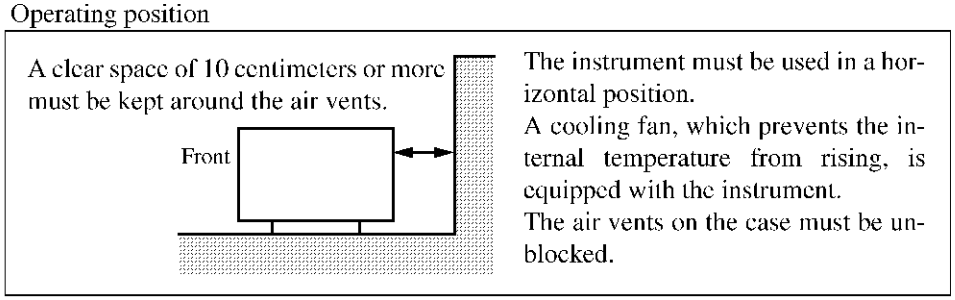


Figure-2 Operating Position

- Storage position

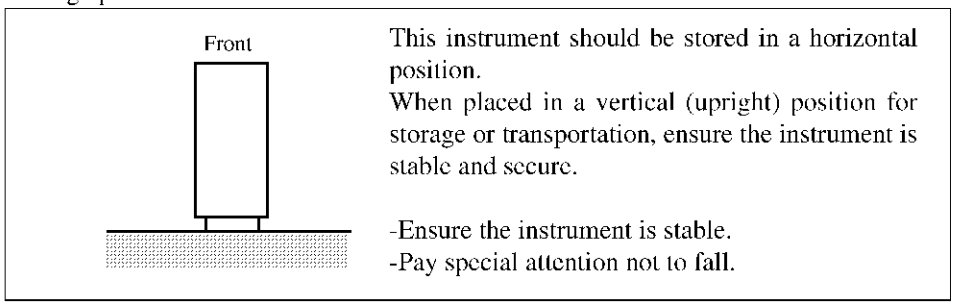


Figure-3 Storage Position

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

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

  Pollution Degree 2

Types of Power Cable

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

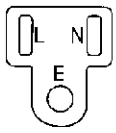
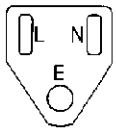
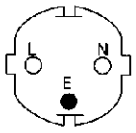
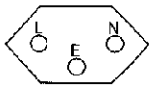
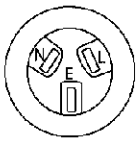
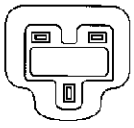
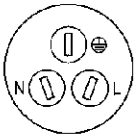
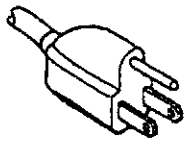
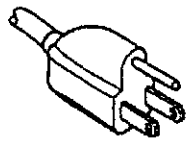
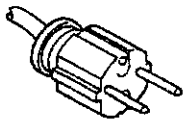
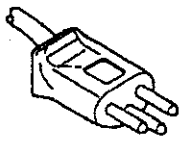
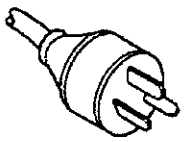
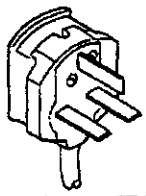
Plug configuration	Standards	Rating, color and length	Model number (Option number)
	PSE: Japan Electrical Appliance and Material Safety Law	125 V at 7 A Black 2 m (6 ft)	Straight: A01402 Angled: A01412
	UL: United States of America CSA: Canada	125 V at 7 A Black 2 m (6 ft)	Straight: A01403 (Option 95)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

Table of Power Cable Options

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

Order power cable options by Model number.

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

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APPENDIX

LIST OF ILLUSTRATIONS

CHAPTER 1

Measurement Function

This chapter explains the GSM measurement option.

CONTENTS

1. Outline of GSM Measurement Option

Two kinds of GSM measurement options are provided. One is OPT51 which offers the GSM measurement function besides the PDC/PHS/NADC measurement function. The other is OPT56 which offers GSM measurement function only.
This manual covers explanations of these two kinds of options.

■ OPT 51

OPT51 allows the GSM standard (GSM900/DCS1800/DCS1900) measurement besides the PDC/PHS/NADC standard measurement. Installing this option to an instrument, the instrument can support all the above standard measurement. However, the PDC/PHS/NADC standard measurement function and the GSM standard measurement function each act exclusively. So, to use the equipment as a system applicable to each standard measurement, it is necessary to switch the standard according to the explanation on page 1-3.

■ OPT 56

OPT56 supports the GSM standard measurement only. This option does not offer the PDC/PHS/NADC standard measurement.

2. Switching Standard Measurement Function (Only OPT51)

In OPT51, it is necessary to switch the system between PDC/PHS/NADC standard measurement and GSM standard measurement.
The switching operation is made as a system function operation.

1 **Press** [LCL] **then** [Comm. System] **keys to display the dialog box in Figure 1-1.**

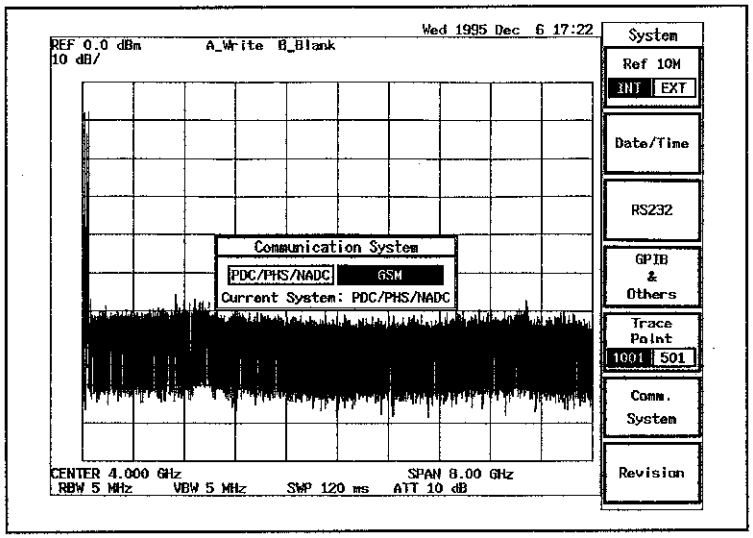


Figure 1-1 Dialog Box

2 **Select a communication system (PDC/PHS/NADC or GSM) with the data knob.**

3 **Press the** [Hz] **key or turn the data knob to determine the setting.**

Then a box for a confirmation appears. If you want to make the setting effective, select "Confirm". If making it ineffective, select "Cancel" and press the [Hz] key.

4 **If the power is turned off once then turned on, the communication system to be measured and the menu for measurement are switched. Then either PDC/PHS/NADC standard measurement or GSM standard measurement becomes executable according to your selection.**

NOTE
After the system is switched by using Comm. System, always execute a calibration.

3. Function under CW Mode

When the GSM measurement function is set by OPT51 or OPT56, the specifications of the FREQ key of the basic key and the OBW/ACP/HARM/STD key in the MEASUREMENT section differ from the case that PDC/PHS/NADC measurement function is set.

● **Explanation of Center Frequency Menu**

Center

Sets the center frequency setting mode.

Start

Sets the start frequency setting mode.

Stop

Sets the stop frequency setting mode.

CF Step Size [AUTO] [MNL]

When MANUAL is selected, step size of the center frequency can be set. In MANUAL, data can be entered and the step size data of the center frequency is displayed on the screen.
In AUTO, the step size is set to 1/10 of the frequency span.

Freq Offset [ON] [OFF]

When ON is selected, an offset frequency can be set in the range of 0 to ±100,000 MHz. If a value less than the display resolution is entered, it will be replaced with the value of the display resolution.

Center frequency (displayed) = Center frequency (set) + Offset

When OFF is selected, the offset is canceled.

Freq Input

Sets the method of inputting the center frequency with the FREQ key.

FREQ: Frequency input method
CHANNEL No.: Channel input method

The correspondence between input channel and center frequency depends on the setting of the communication type and link.

4. Functions of MEASUREMENT Section

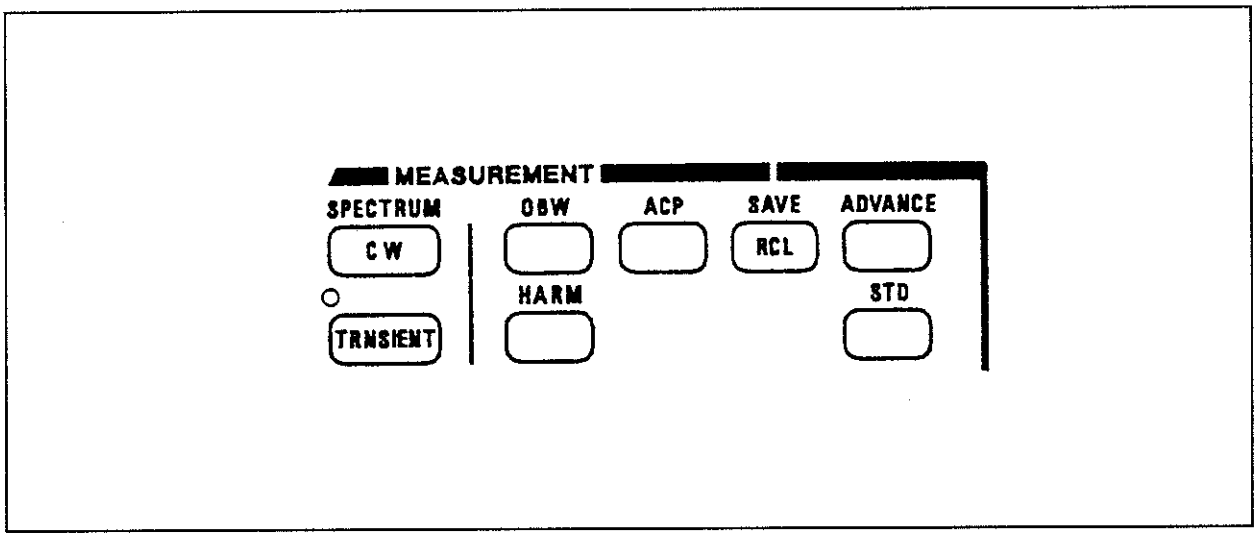


Figure 1-2 Panel Keys in MEASUREMENT Section

■ Explanation of OBW (Occupied Bandwidth) Key

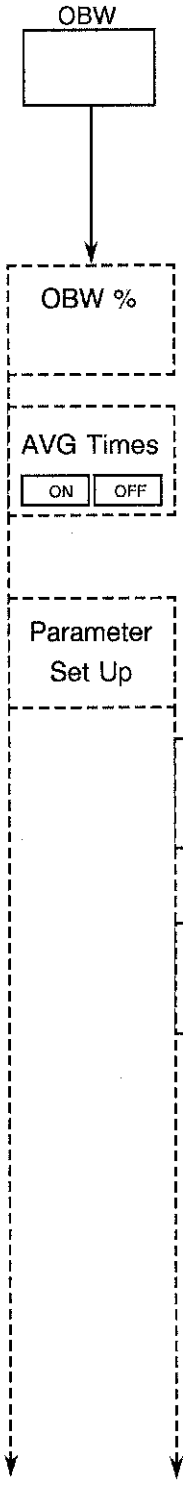
Pressing [OBW] key enters OBW measurement mode, halting sweep.

This is the condition waiting for OBW measurement related parameters being input or measurement start command being input.

When currently set parameters need not be changed, press [REPEAT] or [SINGLE] key to start measurement.

When measurement has been started with [REPEAT] key, measurement is continued after the end of a measurement.

When measurement has been started with [SINGLE] key, operation stops after the end of a measurement.



Calculates the occupied bandwidth of the waveform displayed on the screen.
For the result, occupied bandwidth and carrier frequency (Fc) which is equal to the central frequency in the occupied bandwidth are displayed in the result display area on the screen.

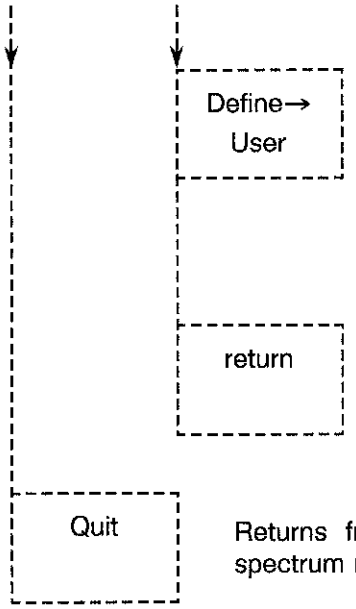
Sets the ratio to the total power in the occupied bandwidth.
Setting range is 10% to 99.8%, and initial value is 99%.

Sets average times.
When turned ON, executes operation for measuring occupied bandwidth after executing trace averaging the set times.

Displays the parameter select menu for the measurement of occupied bandwidth.

Specify to measure under the conditions set with Define→ User key.

Specify to measure with parameter setting other than the measurement parameters which are already specified or set with Define→ User key.
When this measurement is selected, set necessary parameters before executing measurement.



Stores the current set condition and makes it the condition on selecting the [User] key.

Returns to the preceding menu.

Returns from OBW measurement mode to normal spectrum measurement mode.

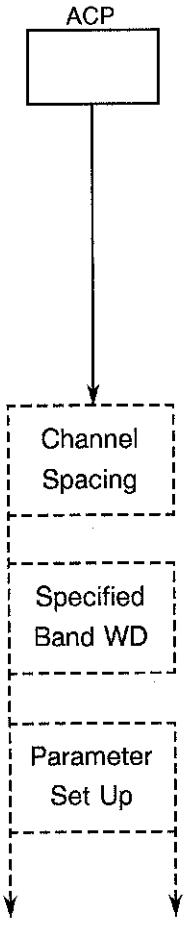
■ Explanation of ACP (Adjacent Channels Leakage Power) Key

Pressing [ACP] key enters ACP measuring mode, halting sweep.

When currently set parameters need not be changed, press [REPEAT] or [SINGLE] key to start measurement.

When measurement has been started with [REPEAT] key, measurement is continued after the end of a measurement.

When measurement has been started with [SINGLE] key, operation stops after the end of a measurement.

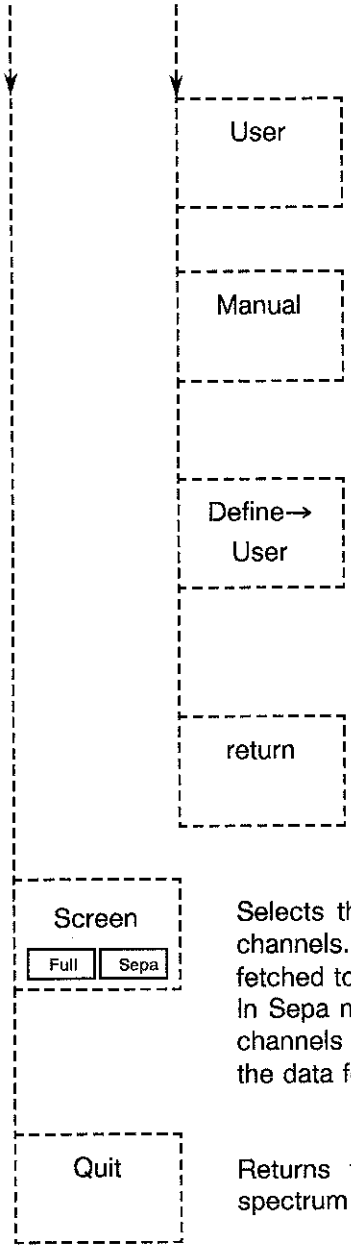


Calculates the total power from measured data displayed on the screen, and integrates power in specified bandwidth to obtain the ratio to the total power.
For out-of-spec measurement, 2 measuring methods are available: "Full mode" to measure based on the measured data which is displayed on a single screen and "Sepa mode" to measure based on the data obtained by dividing screen for specified channel and upper and lower channels.

Sets the distance between channels.

Sets specified bandwidth.

Displays the parameters select menu for measuring the leak power from adjacent channels.



User

Specifies to measure under the conditions set with Define→ User key.

Manual

Specifies to measure under the condition set at present.
When this mode is selected, set necessary parameters before starting measurement.

Define→ User

Stores the current set condition and makes it the condition on selecting the User key.

return

Returns to the preceding menu.

Screen

Full | Sepa

Selects the measuring mode for carrier and adjacent channels. In Full mode, the data in a single screen is fetched to execute calculation.
In Sepa mode, specified channel and upper and lower channels are independently swept and thus fetches the data for 3 screens to execute calculation.

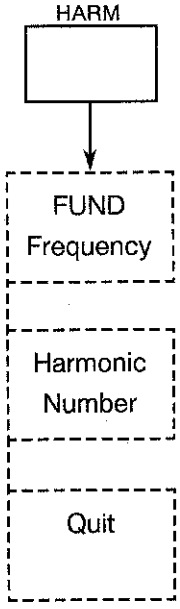
Quit

Returns from ACP measurement mode to normal spectrum measurement mode.

■ HARMONICS (higher harmonics) measuring function

Pressing HARM key enters higher harmonics measuring mode, halting sweep.
Entering higher harmonics measuring mode automatically sets start/stop frequency according to the parameters preset at selecting the mode.
When currently set parameters need not be changed, press REPEAT or SINGLE key to start measurement.

When measurement has been started with REPEAT key, measurement is continued after the end of a measurement.
When measurement has been started with SINGLE key, operation stops after the end of a measurement.

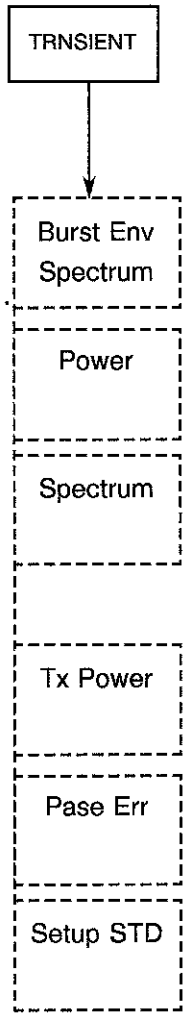


Sets the frequency of fundamental wave.

Sets which order higher harmonic to measure.
The initial value is 3 and it is possible to be set from 2 to 10 with the ten keys.

Returns from HARM measurement mode to normal spectrum measurement mode.

Function of TRNSIENT key



Select TRANSIENT mode to perform burst and modulation waveform analysis in the time domain and envelope analysis in the frequency domain of a burst signal. This is used exclusively from the conventional spectrum analysis mode (CW mode).

This is used when performing waveform analysis of burst signals.

This is used when performing average electric power measurements of the burst pulse in the time domain.

This is used when performing measurements in the frequency domain (spectrum due to modulation and due to transients) and when performing spurious measurements.

Demodulates the input signal then finds out the timing of a burst signal to calculate the power.

Calculates the peak phase error, the RMS phase error and the frequency error.

This is used when setting parameters such as specifications for the measurement signal and transmission direction.

CAUTION !

In general, operations in TRANSIENT mode are performed using soft keys. The following keys which can be used when performing conventional spectrum measurements (in CW mode) cannot be used in this mode.

SWEEP, INPUT, FORMAT, WINDOW, →CF, →RF

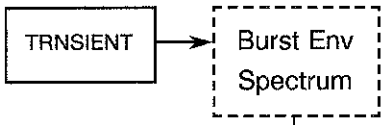
Also, only settings made using numeric values, knobs, and arrow keys can be made for the following keys (the corresponding soft key menu will not be displayed).

FREQ, LEVEL, SPAN(*1), ATT(*2)
(*1) : SPAN can only be used during frequency domain measurements.
(*2) : ATT can only be used when the setting is MNL.

All measurements are started and stopped using the SINGLE/ REPEAT keys. Be sure that the system is in stop mode when changing measurement parameters.
When using the external trigger, input a trigger signal with the TTL level into the external trigger input terminal on the rear panel.

■ TDMA waveform analysis and burst envelope waveform display

- **TDMA waveform analysis Function**



Select the TDMA waveform analysis function.
It is possible to measure temporal waveforms anywhere in the range 50μs to 2s using the SWP T key.

A template (limit line) conforming to all ETSI specifications is automatically displayed, and the burst pulse is judged for Pass/Fail.

NOTE: No template will be displayed if the limit line mode is OFF or if a limit line defined by the user is selected but no user definition table data exists. The rising edge position and wave level of the temporal waveform displayed does not necessarily match standard template (limit line) values.
In order to use this function efficiently, it is necessary to adjust the horizontal (time axis) positions and vertical (level) positions of the burst pulse and template.
This is used to adjust Shift X of the Trigger Position and limit line in the horizontal direction and Shift Y of the limit line in the vertical direction. Once these settings have been made, subsequent measurements can be made without having to make the adjustments again. If specifications (GSM, DCS1800, DCS1900) have changed, however, it will be necessary to make re-adjustments.

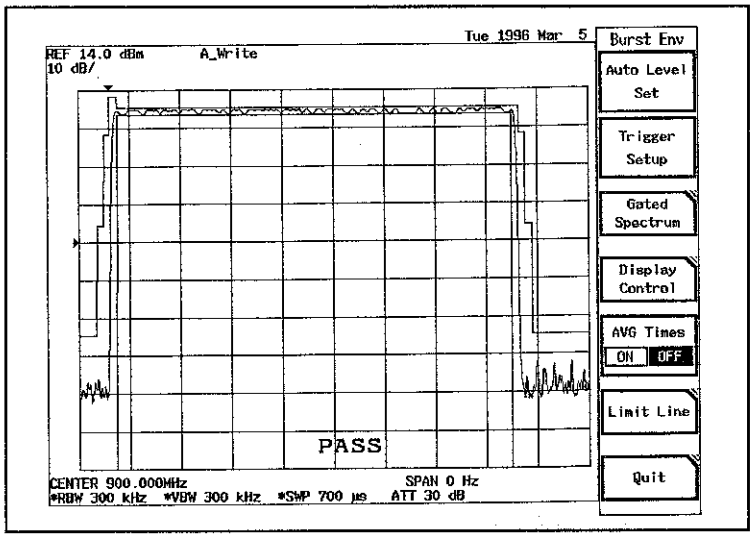


Figure 1-3 Power Template Measurement Screen

Auto Level Set

This is used to set the internal reference level (REF LEVEL), which is used in the time waveform analysis and the frequency waveform analysis, to the optimum value according to the measurement signal.

Trigger Setup

A Dialog Box for trigger settings will appear. It can be used to set trigger source, trigger level, trigger position, and delay time settings. When making settings, select the parameter to be set using the step key and select the parameter value to be set using the data knob. After parameters have been selected, you can set them by pressing the data knob or pressing the ENTER Hz key. The Dialog Box will disappear either of these keys is pressed.

Trigger: Selects the trigger source (signal from which synchronization is taken) for controlling the measurement timing for the burst signal or other.

- Free Run: Selects asynchronous measurement mode. (Measure using internal measurement timing.)
- Video: Selects a measurement mode synchronized with the internal Video signal.

IF Signal: Selects a measurement mode synchronized with the internal IF signal (21.4 MHz).

Ext: Selects a measurement mode synchronized with a signal input from an external source (EXT TRIG connector on the rear panel).

Slope: Select whether to match the sync position with the rising edge (+) of the signal (Video, IF Signal or EXT) or with the falling edge (-) of the signal.

Trigger Level: Specifies the level position of the trigger source signal (Video, IF Signal or EXT) at which to take synchronization. A trigger level position mark (▶) will be displayed at the left of the display scale.
The data can be set by using the data knob or ten-key and pressing the

ENTER
Hz key.

Source Monitor: Select whether or not to display the temporal waveform for the trigger source. This is automatically set to OFF whenever the trigger source is changed. (This selection is only available when the trigger source is the IF signal.)

Trigger Posi: Sets the X axis position (time) of the trigger source signal (Video, IF Signal or EXT) at which to synchronize. A trigger position mark ([▼]) will be displayed above the display scale.
The data can be set by using the data knob or ten-key and pressing the

ENTER
Hz key.

TDMA Structure:

This is the parameter to decide the delay time from the trigger. Select the type of slot width inside the frame. One is the 156.25-bit fixed-width type and the other is 156/157-bit variable-width type. The delay time from the trigger is calculated depending on the slot wide type. The obtained delay time is automatically set to Delay Time shown below. (This parameter is effective only when the trigger source is Ext.)
The delay time from the trigger point is calculated according to this parameter and the value of the following Slot Number. The calculation is made as follows.

- If 156.25-bit is selected:
  Delay Time = Slot Number × 0.577 msec

- If 156/157-bit is selected:
  - If Slot Number = 0,
    Delay Time = 0
  - If 0 < Slot Number < 5,
    Delay Time

$$= \left(\frac{120}{26}\right) \times \left(\frac{157}{156.25 \times 8}\right) + (\text{Slot Number} - 1)$$

$$\times \left(\frac{120}{26}\right) \times \left(\frac{156}{156.25 \times 8}\right) \text{msec}$$

  - If 4 < Slot Number < 8,
    Delay Time =

$$2 \times \left(\frac{120}{26}\right) \times \left(\frac{157}{156.25 \times 8}\right) + (\text{Slot Number} - 2)$$

$$\times \left(\frac{120}{26}\right) \times \left(\frac{156}{156.25 \times 8}\right) \text{msec}$$

Slot Number:

This is the parameter to decide the delay time from the trigger. Specify the slot number (position) inside the frame. The available values' range is from 0 to 7. (This parameter is effective only when the trigger source is Ext.)
The Delay Time value is automatically set according to the values of the above TDMA Structure and this parameter.

Delay Time: Sets the delay time to be added to the trigger source signal.

Note: ***If the trigger source is Ext, Delay Time is changed by changing values of TDMA Structure and Slot Number.***

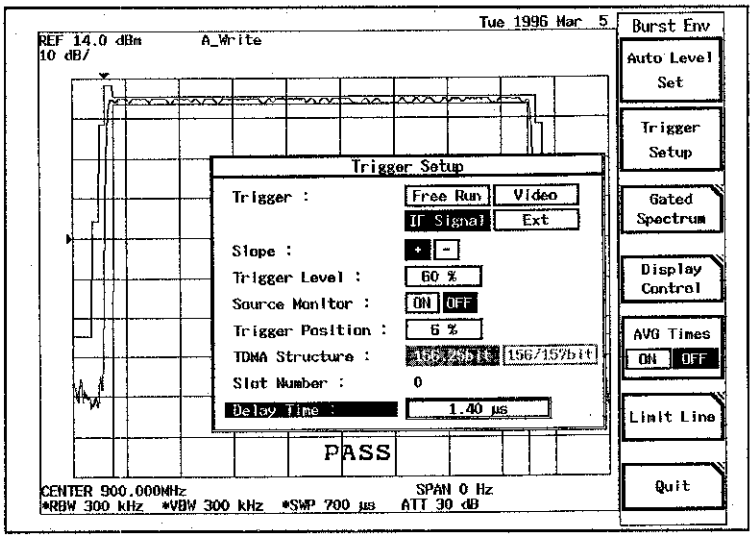


Figure 1-4 Trigger Setup Dialog Box

Gated Spectrum

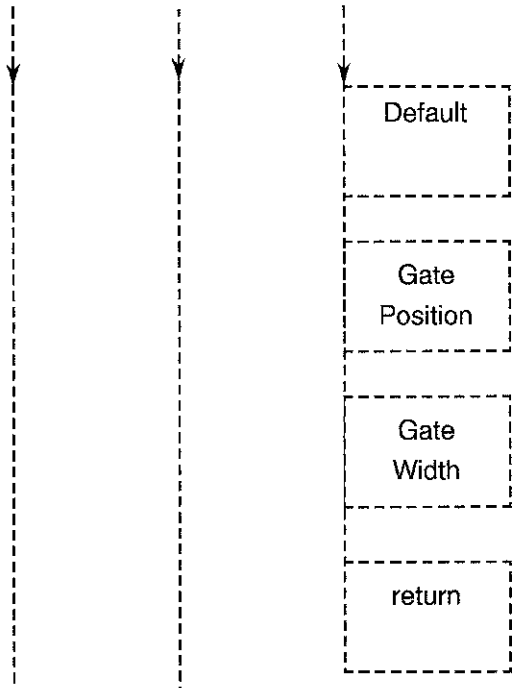
Parameter settings for gated sweep can be made while monitoring the waveform in the time domain or in the frequency domain. In this mode, a split screen display results with the frequency waveform in the upper screen and the temporal waveform in the lower screen.

Save Parameter

This records all gated sweep parameters. Parameters recorded here are used as the gated sweep parameters for the Spectrum Due To Modulation measurement. The following parameters are inherited by the Due To Modulation measurement: Gate Position/Gate Width, Gate Source, Slope, Gate Threshold.

Gate Setup

This is used to set the gate position/width to be used for gated sweep.



Default — This sets the gate position/width to the default value.

Gate Position — This sets the gate position.

Gate Width — This sets the gate width.

return — This returns to the previous menu.

Note: ***The default value of the gate position/width is set as follows depending on Burst Length (148-bit/88-bit).***

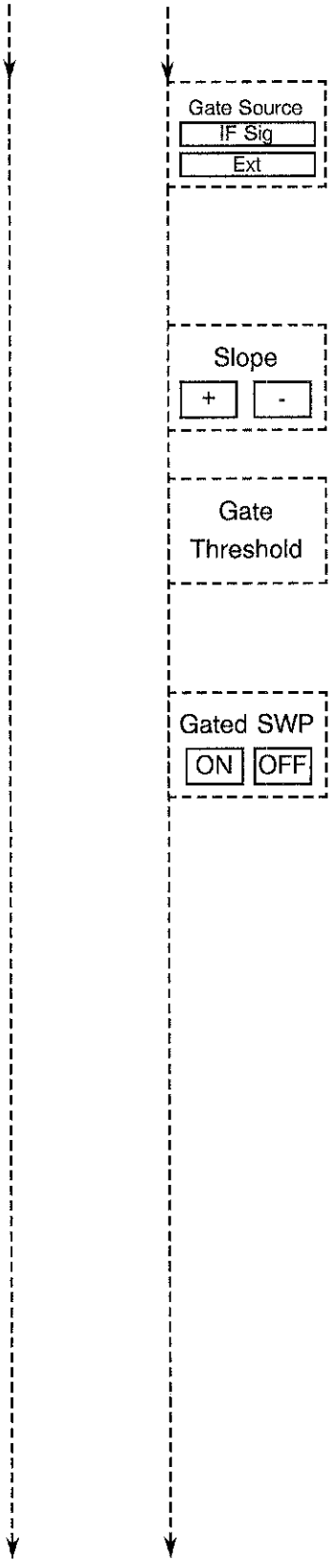
•Gate position =

$$0.6 \times \left(\frac{B}{156.25}\right) \times \left(\frac{15}{26}\right) + 0.014 \text{ msec}$$

•Gate width =

$$0.3 \times \left(\frac{B}{156.25}\right) \times \left(\frac{15}{26}\right) \text{ msec}$$

Assign 148 to B, if Burst Length is 148-bit.
Assign 88 to B, if Burst Length is 88-bit.
The gate position is the value from the trigger position.



This selects the gate signal source. The source is set to the internal IF signal when IF Sig is selected. The source is set to the external signal input to the "EXT TRIG" connector on the rear panel when Ext is selected.

This selects the polarity of the gate signal source.

This is used to set the IF signal level anywhere between 0% and 100% when IF Sig is selected as the gate signal source. This setting changes the timing of gate signal generation.

This alternately sets the sweep mode to gated sweep ON/OFF. Gated sweep results when ON is selected.

Note: ***When gated sweep is selected, sweep for both the frequency waveform and the temporal waveform will appear as if stopped if the parameters set for gated sweep are inappropriate, but sweep can be started when changing to appropriate settings.***

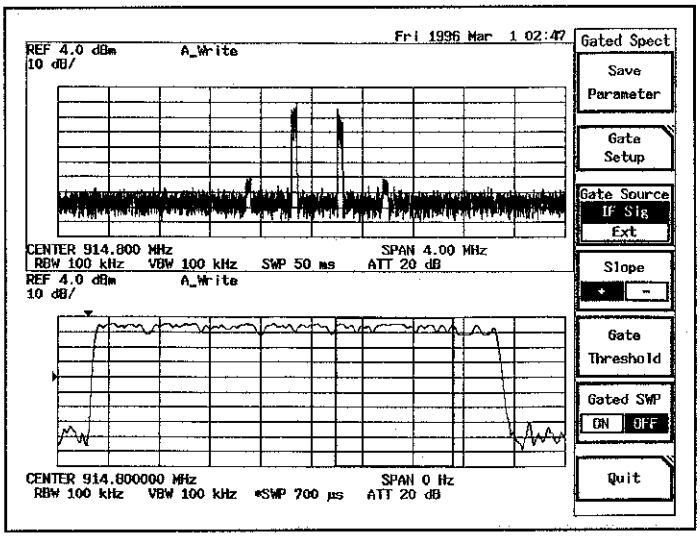


Figure 1-5 Waveform at Gate Sweep OFF

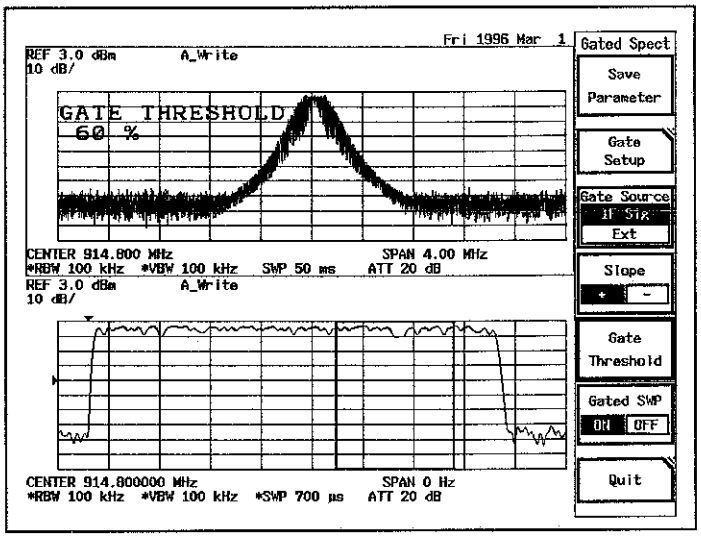


Figure 1-6 Waveform at Gate Sweep ON

Quit

This escapes from gated sweep mode and returns to the menu of the previous level. The split screen display will automatically return to a single screen display once Quit is selected.

Display Control

This is used for an enlarged split-screen display (T-Zoom) of the level using windows, to switch the waveform display of the level where the window is open, and to switch vertical axis scales.

T-Zoom

This results in a split-screen display with the waveform in the upper screen and width of current window displayed in the lower screen.

Zoom on Window

This automatically sets the trigger delay time and sweep time in accordance with the width of the current window and enlarges the waveform in the window using a single screen display.

Zoom Off

This cancels the enlarged display mode set by Zoom on Window. The Dialog Box will appear when this key is pressed, and you can select one of the following three cancellation methods using the knobs. Once the method is selected it can be activated by pressing a knob or pressing the ENTER Hz key.

Last state: Returns to using the trigger delay time, sweep time, and trigger position used before with the Zoom on Window function.

Burst: Makes the following settings according to single slot burst waveform monitoring, and cancels Zoom mode.

Trigger delay time: Delay time before executing Zoom on Window

Sweep time: 700 μsec

Trigger position: 6%

Frame: Makes the following settings according to frame burst waveform monitoring, and cancels Zoom mode.
Trigger delay time: 0 sec
Sweep time: 5 msec
Trigger position: 0%

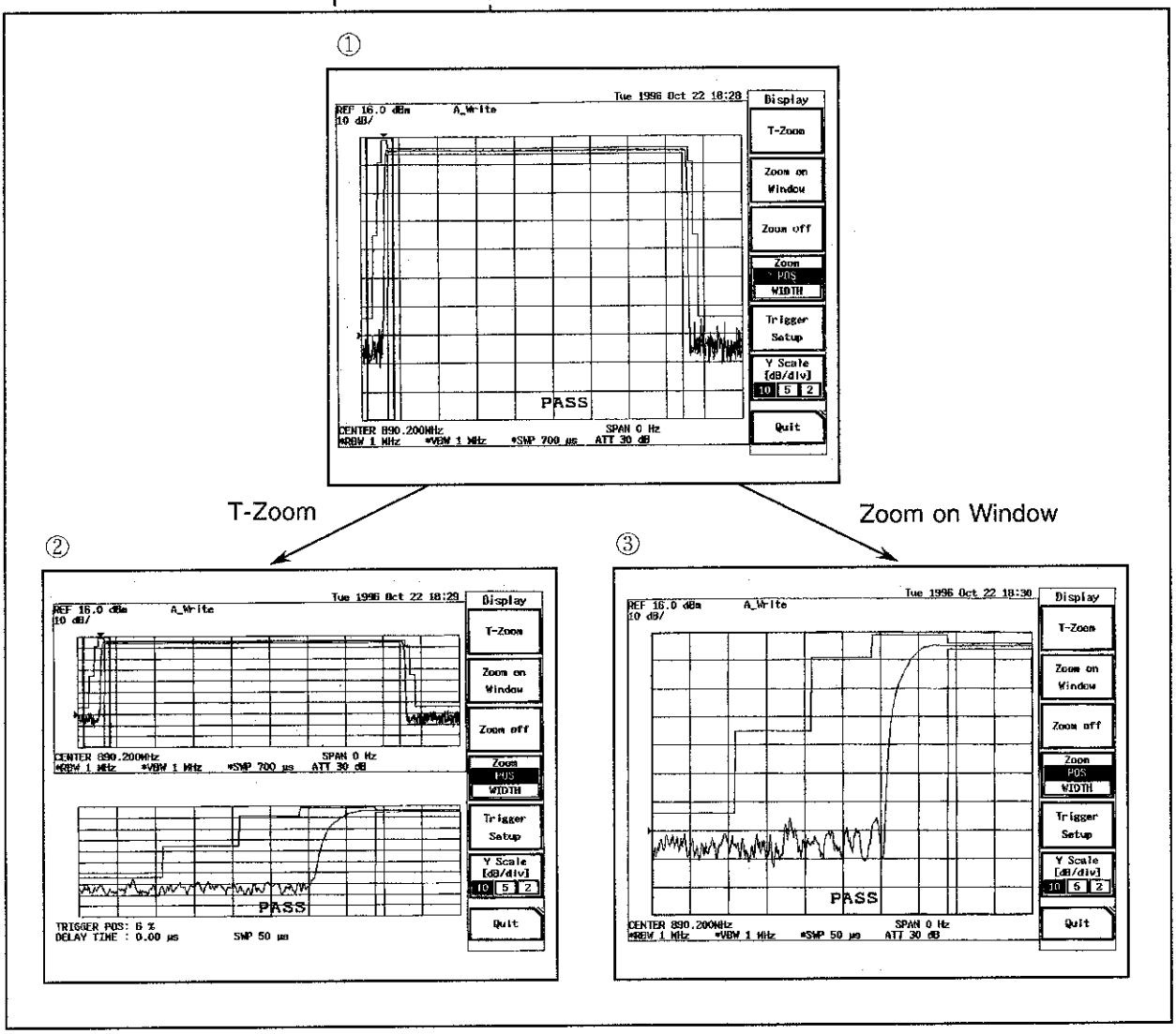
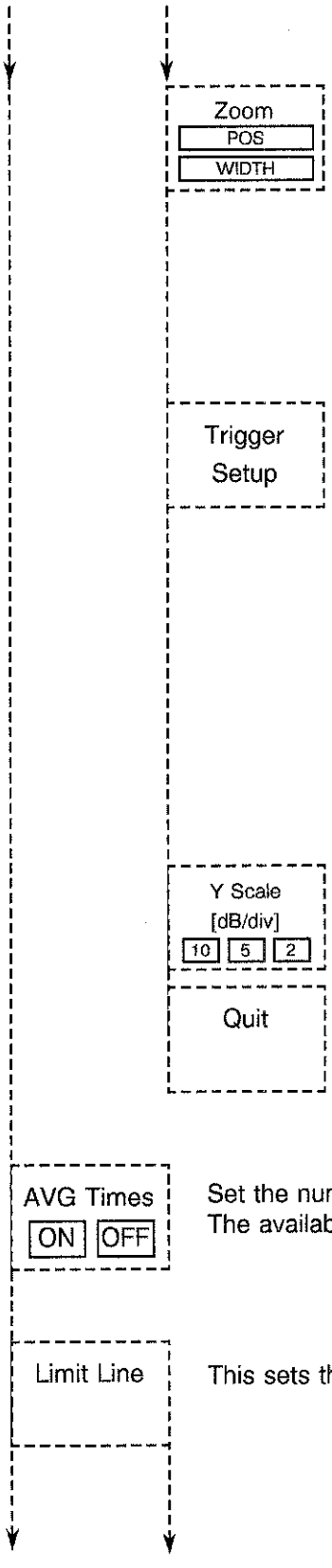


Figure 1-7 Expansion of Display Using Window



This allows the window position to be changed when POS is selected, and allows window width to be changed when WIDTH is selected. Delay time and sweep time for the lower screen when in T-Zoom mode, and the delay time and sweep time when enlarged under Window to Span mode are set at that time. Window width can be set between 50μsec and 2 sec.

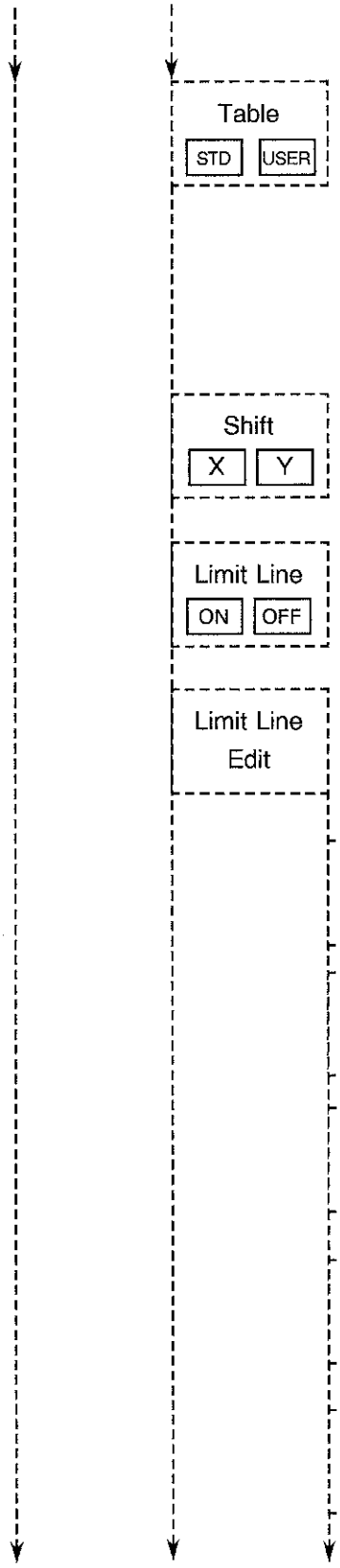
A Dialog Box for making trigger settings will appear. It can be used to make trigger source, trigger level, trigger position, and delay time settings. When making settings, select the parameter to be set using the step key and select the parameter value to be set using the data knob. After parameters have been selected, you can set them by pressing the data knob or pressing the ENTER Hz key. The Dialog Box will disappear once either of these keys is pressed.

Changes the vertical axis display scale. 10dB/div, 5dB/div, or 2dB/div can be selected.

This cancels T-Zoom mode.

Set the number of averaging.
The available number is 2 to 32.

This sets the limit line in the time domain.



STD: This uses the specification values for any of the communications protocols GSM900, DCS1800 or DCS1900 as selected on the communications protocol setting menu.

USER: This uses the table input using the Limit Line Edit key.

This shifts time data (X) or level data (Y) which has already been input.

Switches between limit line ON and OFF.

This displays a menu for copying and/or editing the limit line data table.

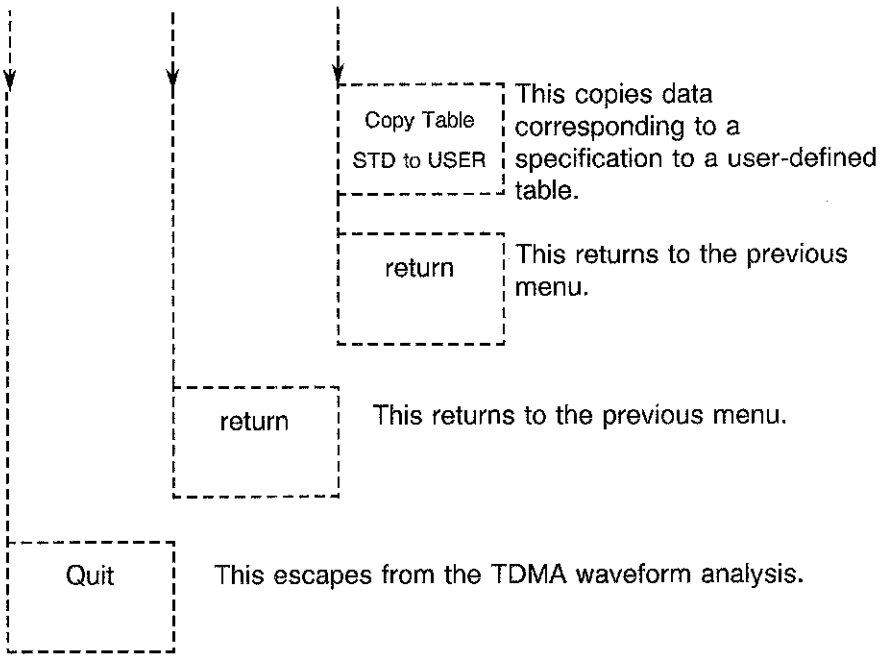
Switches between limit line UP and LOW.

This selects insert mode (INSERT) or overwrite mode (OVERWRT) when editing.

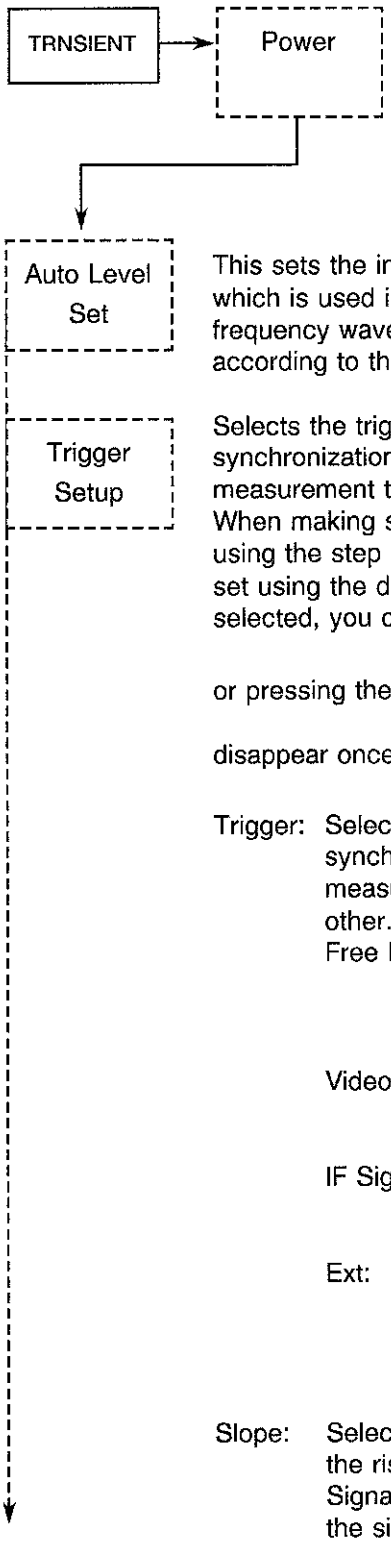
This switches input (frequency and/or time and level).

This delete the line the cursor is on.

This initializes the limit line table data.


Copy Table
STD to USER
This copies data corresponding to a specification to a user-defined table.
return
This returns to the previous menu.
return
This returns to the previous menu.
Quit
This escapes from the TDMA waveform analysis.

- **Average Power Measurement in the Time Domain**



This selects average power measurement in the time domain. It is possible to measure the average power of the entire signal being displayed or the average power within the window.

This sets the internal reference level (REF LEVEL), which is used in the time waveform analysis and the frequency waveform analysis, to the optimum value according to the measurement signal.

Selects the trigger source (signal from which synchronization is taken) for controlling the measurement timing for the burst signal or other. When making settings, select the parameter to be set using the step key and select the parameter value to be set using the data knob. After parameters have been selected, you can set them by pressing the data knob or pressing the ENTER Hz key. The Dialog Box will disappear once either of these keys is pressed.

Trigger: Selects the trigger source (signal from which synchronization is taken) for controlling the measurement timing for the burst signal or other.

- Free Run: Selects asynchronous measurement mode. (Measure using internal measurement timing.)
- Video: Selects a measurement mode synchronized with the internal Video signal.
- IF Signal: Selects a measurement mode synchronized with the internal IF signal (21.4 MHz).
- Ext: Selects a measurement mode synchronized with a signal input from an external source (EXT TRIG connector on the rear panel).

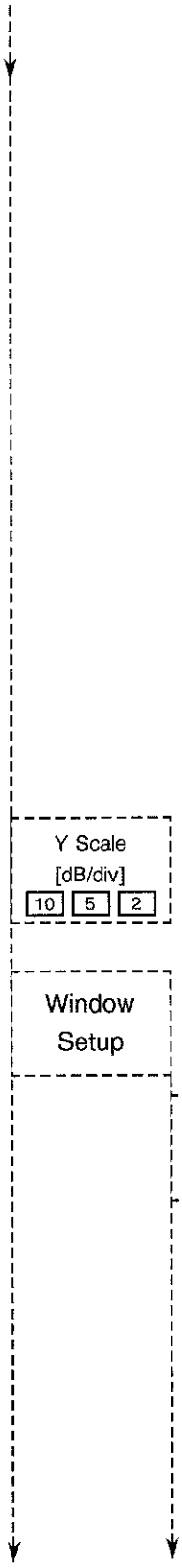
Slope: Select whether to match the sync position with the rising edge (+) of the signal (Video, IF Signal or EXT) or with the falling edge (-) of the signal.

Trigger Level: Specifies the level position of the trigger source signal (Video, IF Signal or EXT) at which to synchronize. A trigger level position mark (▸) will be displayed to the left of the display scale.
The data can be set by using the data knob or ten-key and pressing the ENTER Hz key.

Source Monitor: Select whether or not to display the waveform for the trigger source. This is automatically set to OFF whenever the trigger source is changed. (This selection is only available when the trigger source is the IF signal.)

Trigger Posi: Sets the X axis position (time) of the trigger source signal (Video, IF Signal or EXT) at which to synchronize. A trigger position mark ([▼]) will be displayed above the display scale.
The data can be set by using the data knob or ten-key and pressing the ENTER Hz key.

TDMA Structure:
This is the parameter to decide the delay time from the trigger. Select the type of slot width inside the frame. One is the 156.25-bit fixed-width type and the other is 156/157-bit variable-width type. The delay time from the trigger is calculated depending on the slot wide type. The obtained delay time is automatically set to Delay Time shown below. (This parameter is effective only when the trigger source is Ext.)
The delay time from the trigger point is calculated according to this parameter and the value of the following Slot Number.
The calculation is made as follows.
•If 156.25-bit is selected:
Delay Time = Slot Number × 0.577 msec
•If 156/157-bit is selected:
•If Slot Number = 0,
Delay Time = 0



•If Slot Number = 1 to 4,
Delay Time

$$= \left(\frac{120}{26}\right) \times \left(\frac{157}{156.25 \times 8}\right) + (\text{Slot Number-1})$$

$$\times \left(\frac{120}{26}\right) \times \left(\frac{156}{156.25 \times 8}\right) \text{msec}$$

•If Slot Number = 5 to 7,
Delay Time

$$2 \times \left(\frac{120}{26}\right) \times \left(\frac{157}{156.25 \times 8}\right) + (\text{Slot Number-2})$$

$$\times \left(\frac{120}{26}\right) \times \left(\frac{156}{156.25 \times 8}\right) \text{ msec}$$

Delay Time: Sets the delay time to be added to the trigger source signal.

Note: ***If the trigger source is Ext, Delay Time is changed by changing values of TDMA Structure and Slot Number.***

Y Scale
[dB/div]
10 5 2

Changes the vertical axis display scale.
10dB/div, 5dB/div, or 2dB/div can be selected.

Window Setup

This sets the position/width of the window displayed.

Window
ON OFF

This displays a window which limits the measurement range. When the window is displayed, all points within the window are used to calculate electric power. When the window is not displayed, all points within the screen are used.

Default

This sets the position/width of the window to the following value.
Position:
Start time of the STD limit line LOW side
Width:

$$\left(\frac{B}{156.25}\right) \times \left(\frac{15}{26}\right) \text{ msec}$$

B: Assign 148 to B when Burst Length is 148-bit.
Assign 88 to B when Burst Length is 88-bit.

Window Position

This sets the position of the window.

Window Width

This sets the width of the window.

return

AVG Times
ON OFF

This sets the average processing count for making the average power measurement. The count can be set from 2 to 999.

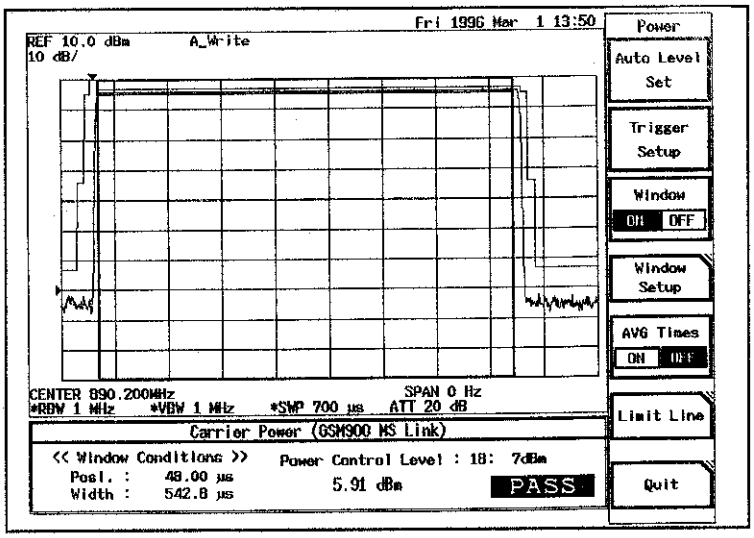
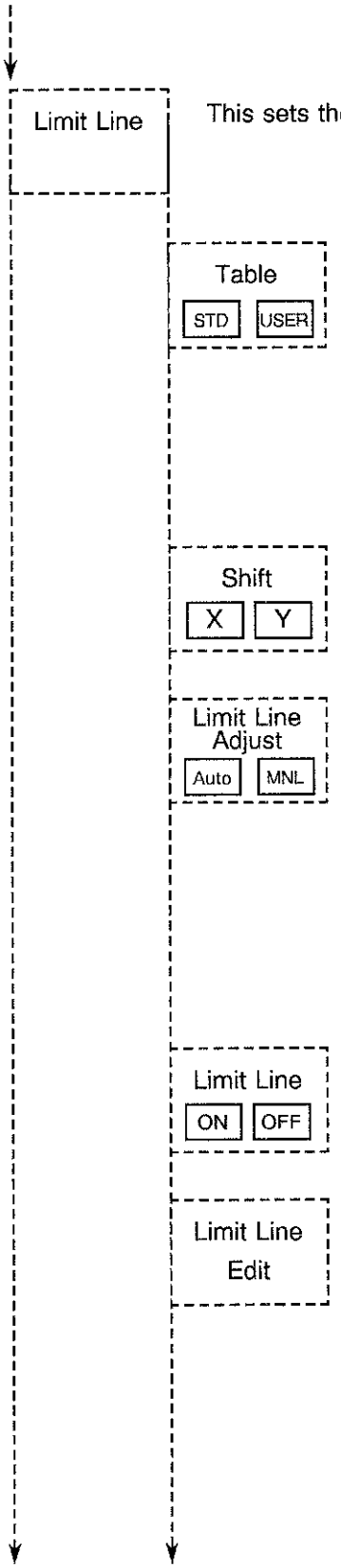


Figure 1-8 Sample Power Spectrum Measurement



This sets the limit line in the time domain.

STD: This uses the specification values for any of the communications protocols GSM900, DCS1800 or DCS1900 as selected on the communications protocol setting menu.

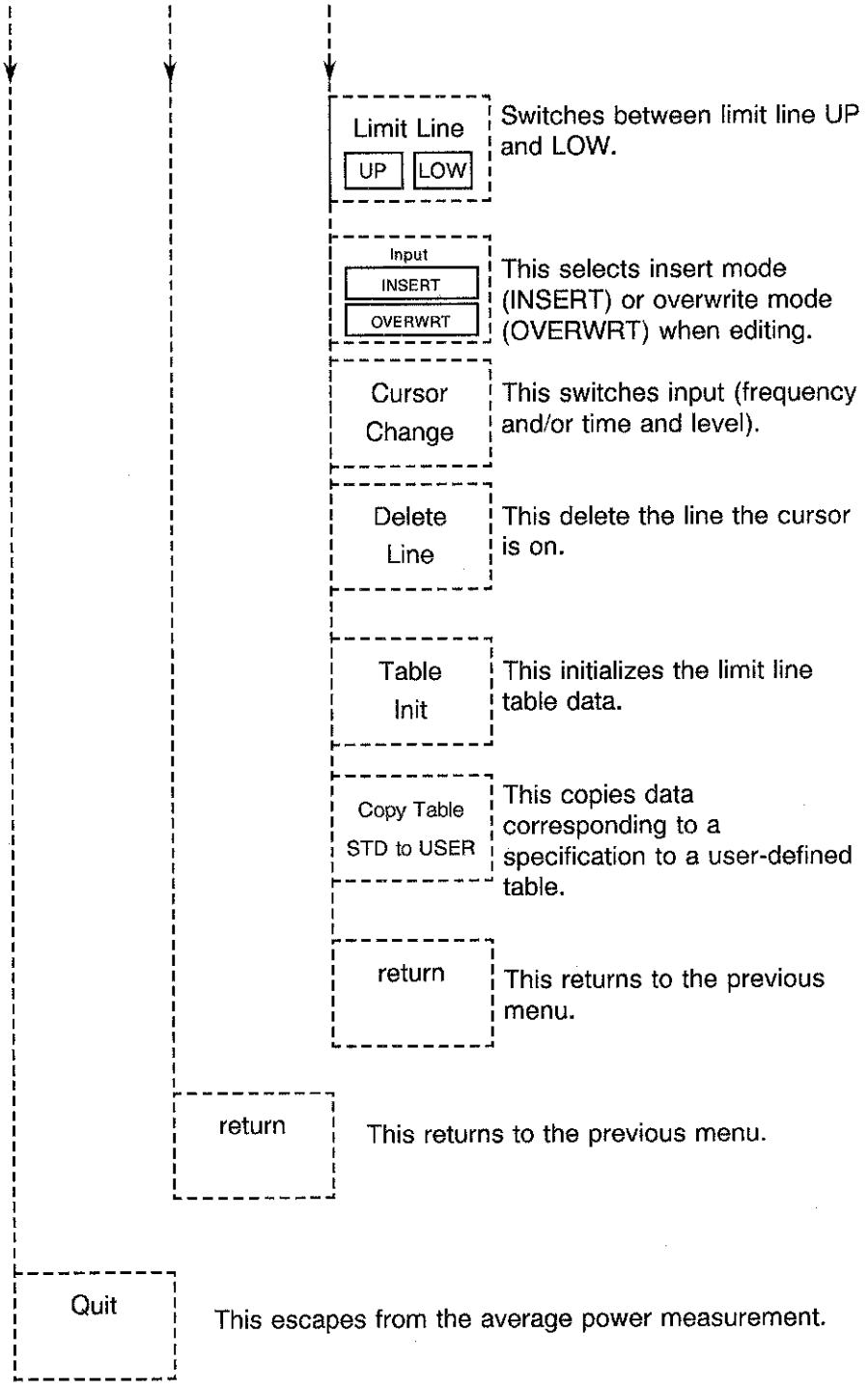
USER: This uses the table input using the Limit Line Edit key.

This shifts time data (X) or level data (Y) which has already been input.

This selects the mode to automatically adjust the level reference position of the limit line according to the measurement waveform.
If Auto is set, the limit line is provided with regarding the measured average-voltage as the reference value of the template.
If MNL is set, the level value of Power Control Level and Power Class is regarded as the reference value.

Switches between limit line ON and OFF.

This displays a menu for copying and/or editing the limit line data table.


Limit Line
UP
LOW
Switches between limit line UP and LOW.
Input
INSERT
OVERWRT
This selects insert mode (INSERT) or overwrite mode (OVERWRT) when editing.
Cursor Change
This switches input (frequency and/or time and level).
Delete Line
This delete the line the cursor is on.
Table Init
This initializes the limit line table data.
Copy Table STD to USER
This copies data corresponding to a specification to a user-defined table.
return
This returns to the previous menu.
return
This returns to the previous menu.
Quit
This escapes from the average power measurement.

- **Frequency Domain Analysis**

TRNSIENT → Spectrum

This displays a menu for performing frequency domain analysis. Output power spectrum measurement for the modulated interval, output power spectrum measurement for the entire burst interval including the rising and falling edge intervals, and spurious measurement can be selected.

Due to Modulation

This measures the output power spectrum of the modulated interval of a modulated signal. In this mode, a specification template conforming to specifications for measuring the output power spectrum is displayed, and a Pass/Fail judgment regarding whether or not display waveform levels exceed template values is made.

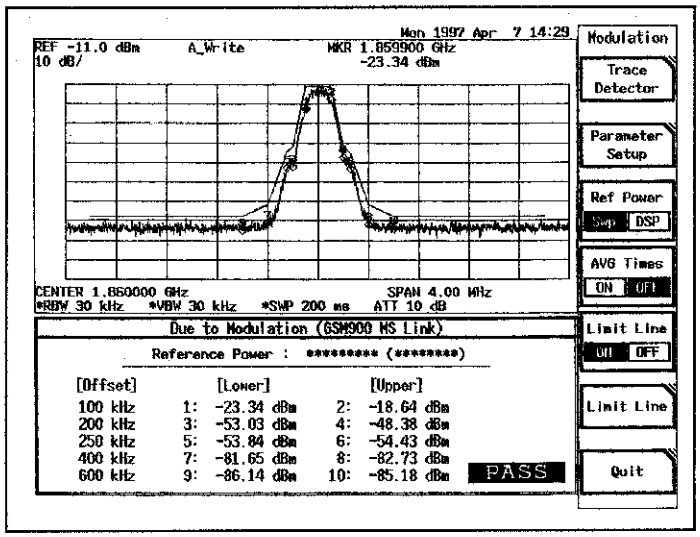
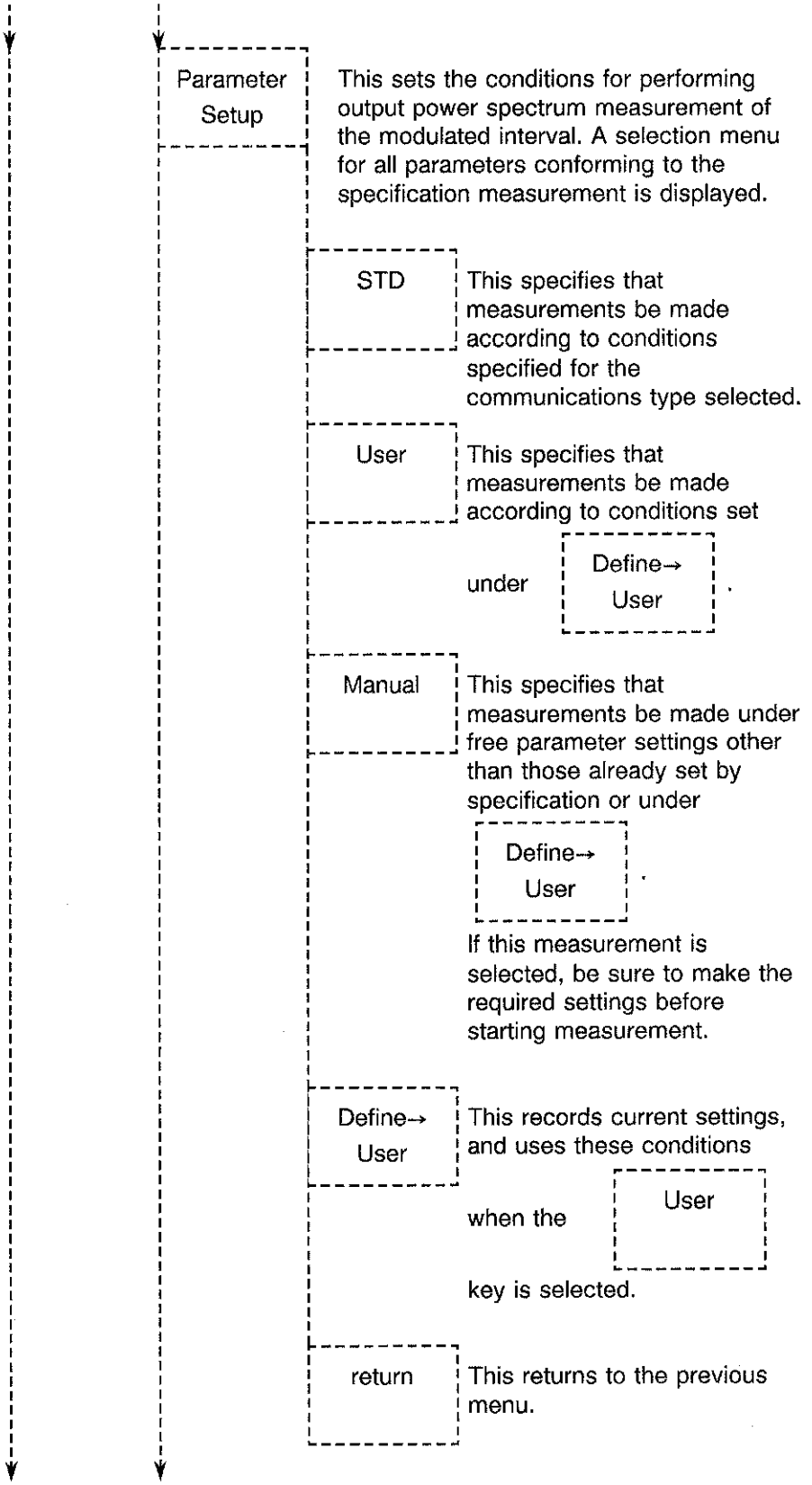


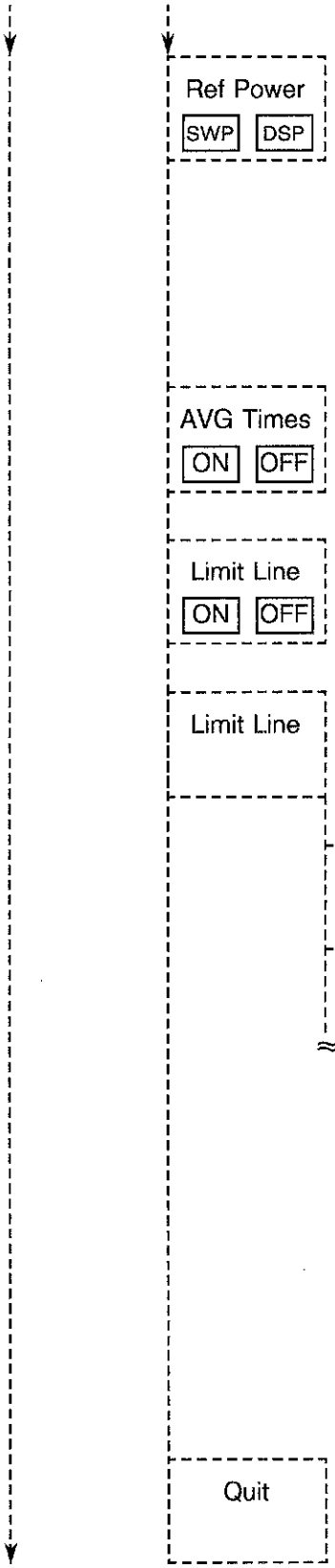
Figure 1-9 Output Power Spectrum in Modulation Period

Trace Detector

This displays a menu for making detector settings.
The following menu is the same as the Trace Detector on the soft menu of the FORMAT key.

≈ For details, refer to the instruction manual of the main unit.


Parameter Setup
This sets the conditions for performing output power spectrum measurement of the modulated interval. A selection menu for all parameters conforming to the specification measurement is displayed.
STD
This specifies that measurements be made according to conditions specified for the communications type selected.
User
This specifies that measurements be made according to conditions set under
Define→ User
.
Manual
This specifies that measurements be made under free parameter settings other than those already set by specification or under
Define→ User
.
If this measurement is selected, be sure to make the required settings before starting measurement.
Define→ User
This records current settings, and uses these conditions when the
User
key is selected.
return
This returns to the previous menu.



Ref Power [SWP] [DSP]

Specifies the reference power of the template.

SWP : Makes the reference power the peak value of the trace.

DSP : Makes the reference power the average power with respect to time.

Note: When DSP is selected, the offset frequency power depends on the average power.

AVG Times [ON] [OFF]

This sets the average processing count for the displayed waveform. The count can be set from 2 to 999.

Limit Line [ON] [OFF]

This sets the limit line used as the template ON/OFF.

Limit Line

This displays a menu for making parameter settings related to the limit line used as the template.

Margin ΔX [ON] [OFF]

This extends the left-to-right width with the center of the template as the reference. The object delta frequency can be set in the range of 0 to 1 MHz.

≈

For this menu, refer to the Limit Line menu (on page 1-22) of Power (Average power measurement).

Note: •The function to switch between Limit Line ON and OFF is not provided.
•In the Auto mode of Limit Line Adjust Auto/MNL, the peak level of the measurement waveform is regarded as the reference level.

Quit

This escapes from output power level measurement mode in the modulated interval.

Due to Switching

This measures the output power spectrum including the rising and falling edges of the burst signal. In this mode, a specification template for measuring the output power spectrum conforming to specifications is displayed, and a Pass/Fail Judgment regarding whether or not display waveform levels exceed template values is made.

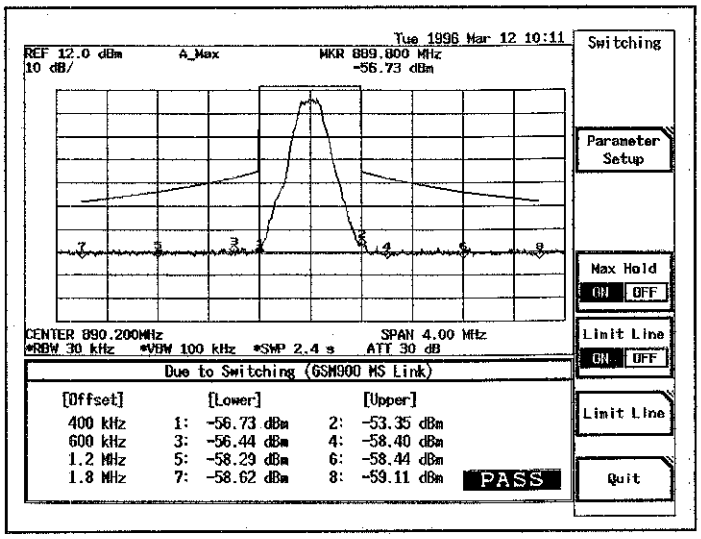


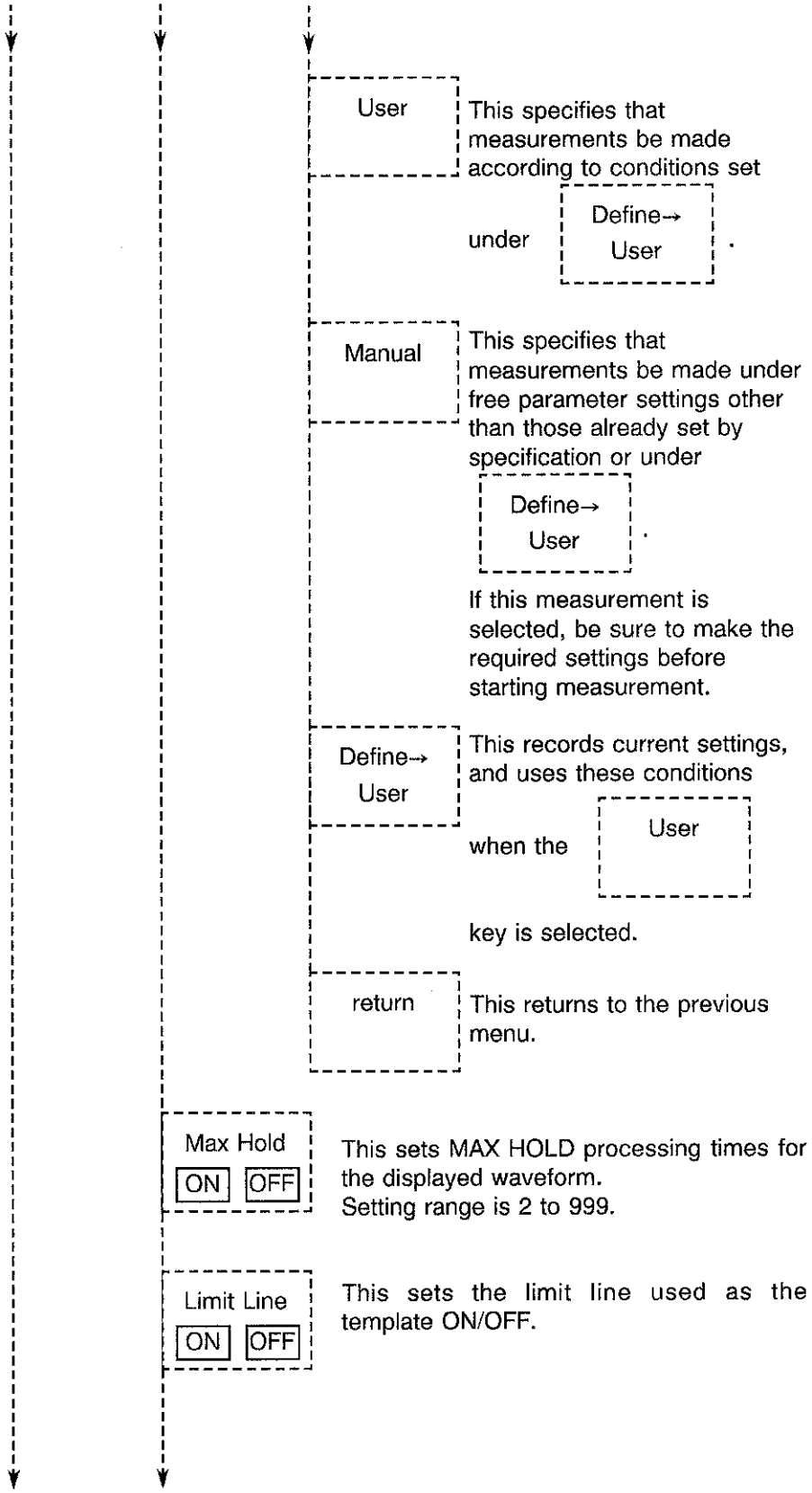
Figure 1-10 Pass/Fail Judgment

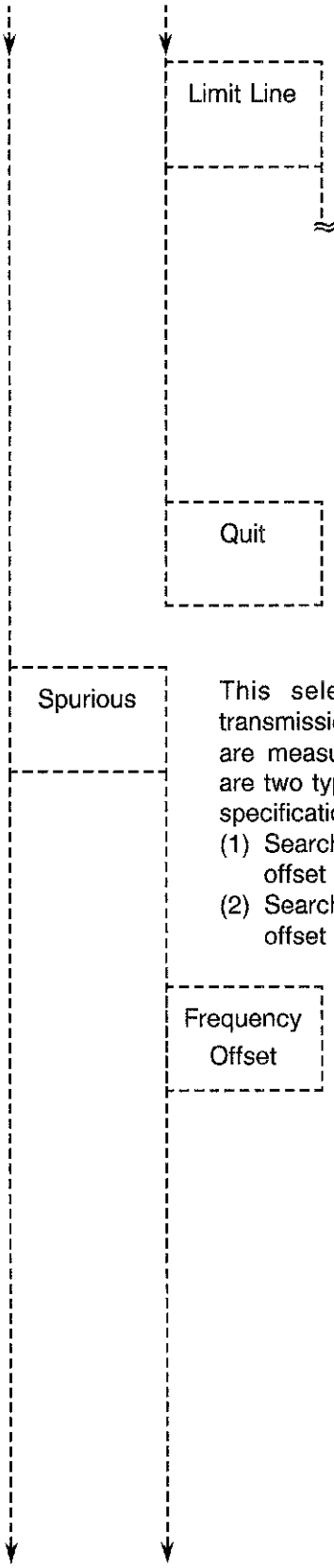
Parameter Setup

This sets the conditions for performing output power spectrum measurement of the modulated interval. A selection menu for all parameters conforming to the specification measurement is displayed.

STD

This specifies that measurements be made according to conditions specified for the communications type selected.


User
This specifies that measurements be made according to conditions set under Define→ User.
Manual
This specifies that measurements be made under free parameter settings other than those already set by specification or under Define→ User.
If this measurement is selected, be sure to make the required settings before starting measurement.
Define→ User
This records current settings, and uses these conditions when the User key is selected.
return
This returns to the previous menu.
Max Hold
ON OFF
This sets MAX HOLD processing times for the displayed waveform.
Setting range is 2 to 999.
Limit Line
ON OFF
This sets the limit line used as the template ON/OFF.



This displays a menu for making parameter settings related to the limit line used as the template.

For this menu, refer to the Limit Line menu (on page 1-22) of Power (Average power measurement).

Note: The functions to switch between Limit Line Adjust Auto and MNL and to switch between Limit Line ON and OFF are not provided.

This escapes from output power level measurement mode in the modulated interval.

This selects spurious measurement within the transmission band. The peak value of up to 10 points are measured and displayed in order of level. There are two types of measurement methods conforming to specifications:

(1) Searches the frequency range within a ± 6 MHz offset from the carrier.
(2) Searches the frequency range outside a ± 6 MHz offset from the carrier.

Selects the frequency range to be measured.

± 1.8 MHz to 6 MHz:
Measures spurious existing between a 1.8 MHz offset from the center frequency up to 6 MHz. Measurement conditions at this time are set as follows.

Sweep time:	2.4 sec
RBW:	30 kHz
VBW:	100 kHz
DETECTOR:	POSI
Span:	12 MHz

±6 MHz to 12.5 MHz/ to 37.5MHz/ to 29.8MHz:

The start frequency and the stop frequency of the standardized transmission band are set and the spurious search of IN-Band is measured. Measurement conditions at this time are set as follows.

Sweep time: 2.4 sec
RBW: 100 kHz
VBW: 300 kHz
DETECTOR: POSI

	Start f	Stop f
GSM900(MS)	880MHz	915MHz
GSM900(BS)	925MHz	960MHz
DCS1800(MS)	1710MHz	1785MHz
DCS1800(BS)	1805MHz	1880MHz
DCS1900(MS)	1850.2MHz	1909.8MHz
DCS1900(BS)	1930.2MHz	1989.8MHz

Span: AUTO: Sets the span or the start and stop frequency to the parameter shown above.
FULL: Sets to full span mode.

Notes:
The various measurement conditions selected using this key only apply when STD is selected on the Parameter Setup menu.
Only signals having an amplitude difference of 5 dB or more are recognized as spurious. (This corresponds to a 0.5 div ΔY for the MARKER peak search.)

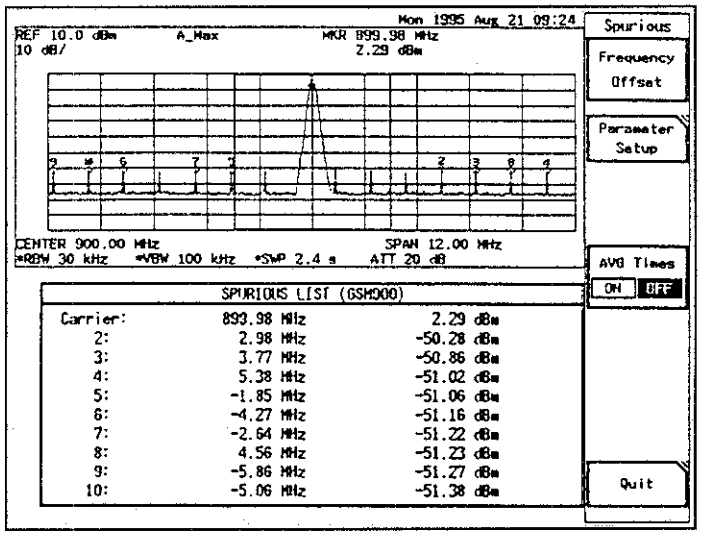


Figure 1-11 Selection of Frequency Range

Parameter Setup

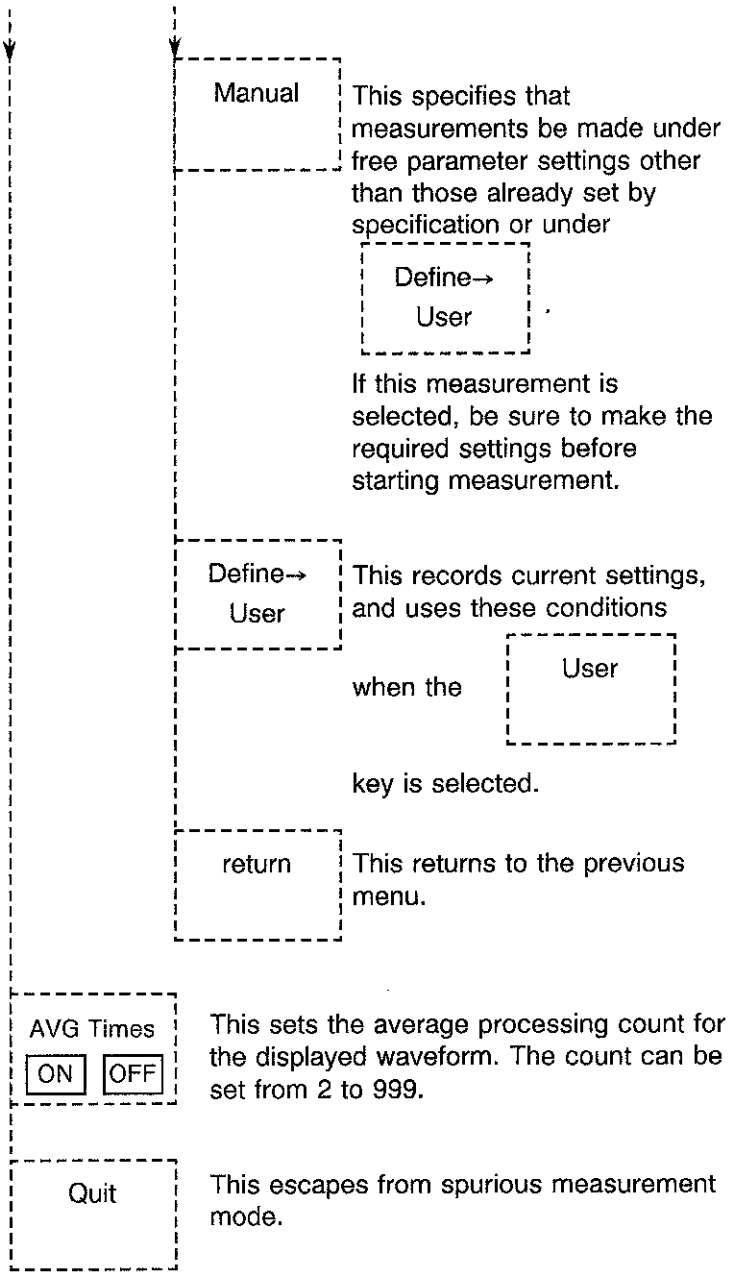
This sets the conditions for spurious measurement. A selection menu for all parameters conforming to the specification measurement is displayed.

STD

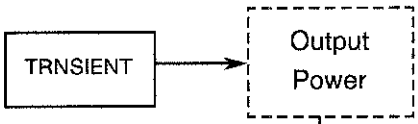
This specifies that measurements be made according to conditions specified for the communications type selected.

User

This specifies that measurements be made according to conditions set under **Define→ User**.


Manual
This specifies that measurements be made under free parameter settings other than those already set by specification or under
Define→ User
.
If this measurement is selected, be sure to make the required settings before starting measurement.
Define→ User
This records current settings, and uses these conditions
when the
User
key is selected.
return
This returns to the previous menu.
AVG Times
ON
OFF
This sets the average processing count for the displayed waveform. The count can be set from 2 to 999.
Quit
This escapes from spurious measurement mode.

■ Explanation of Menu on Transmission-Power



Tx Power

Demodulates the input signal, finds the burst timing, and calculate the power.
It is possible to search for a training sequence and also discriminate a burst section.
Refer to the Setup STD for the setup.

Auto Level Set

Sets up the reference level automatically. The auto setup is made only when this key was pressed.

AVG Times
ON OFF

Sets up the average times.

Quit

Exits from Tx Power measurement.

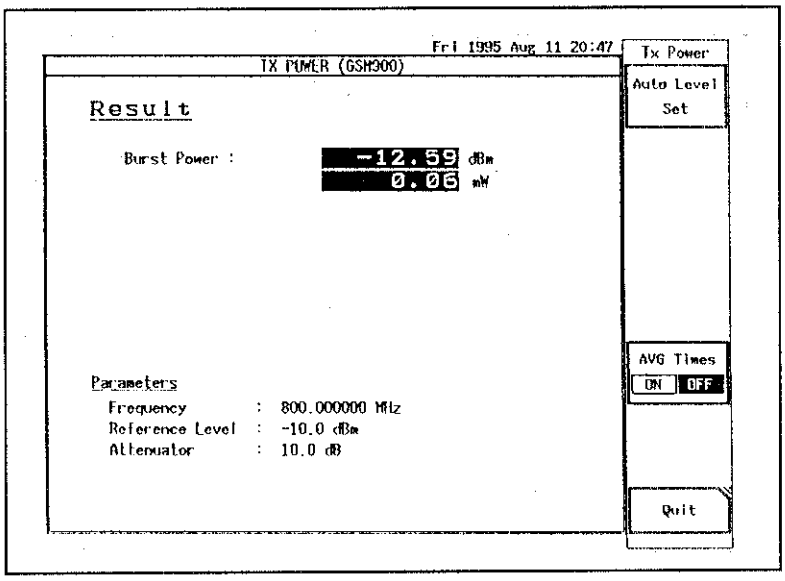
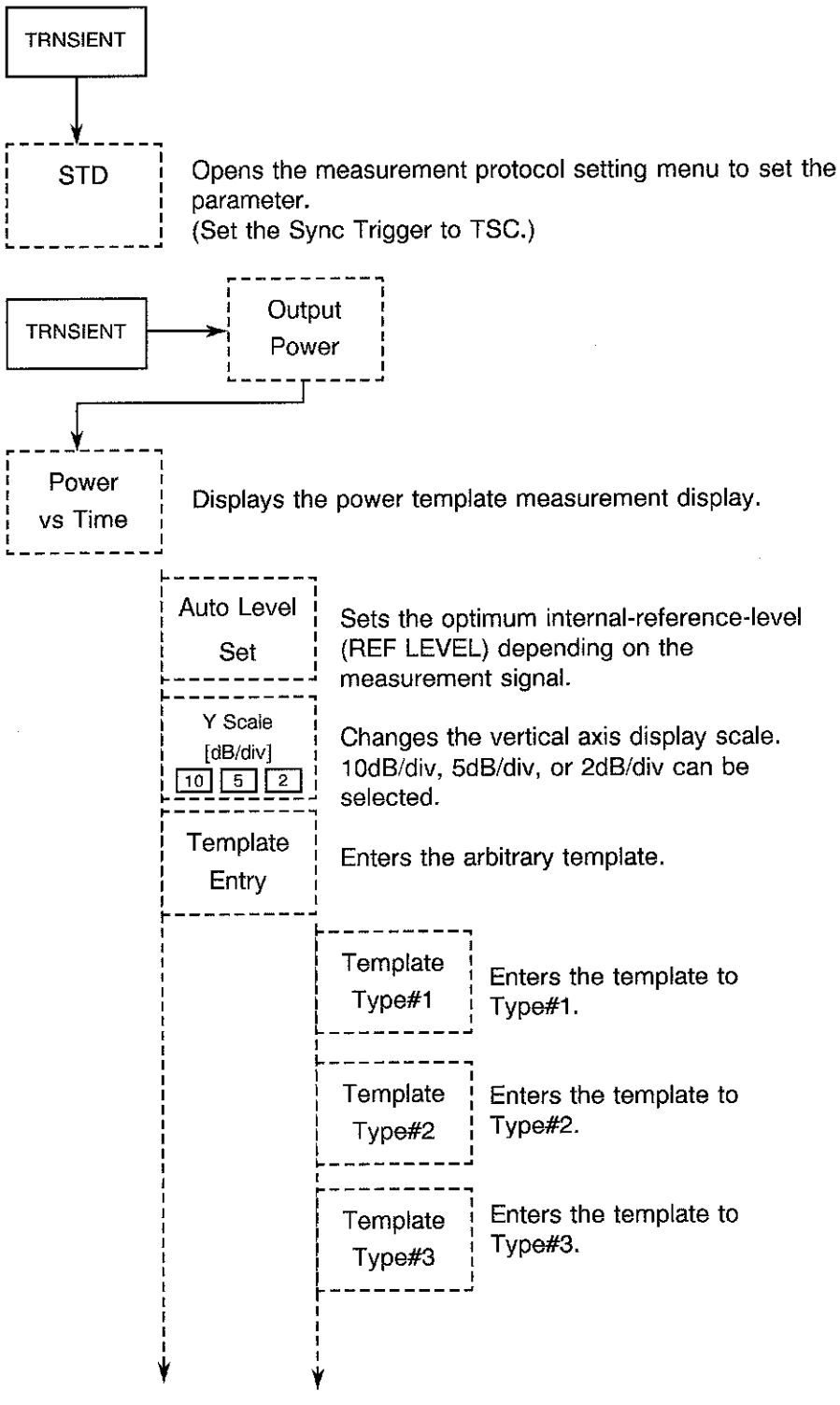
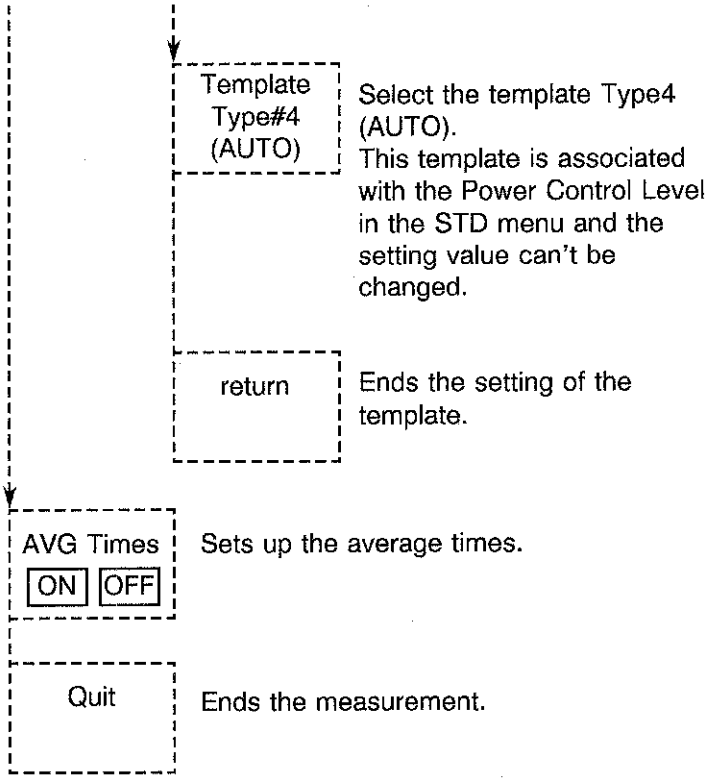


Figure 1-12 Display of Tx Power Measurement Result

Power vs Time Measurement

The input signal is demodulated and then is triggered with training sequence code to suit with the template.





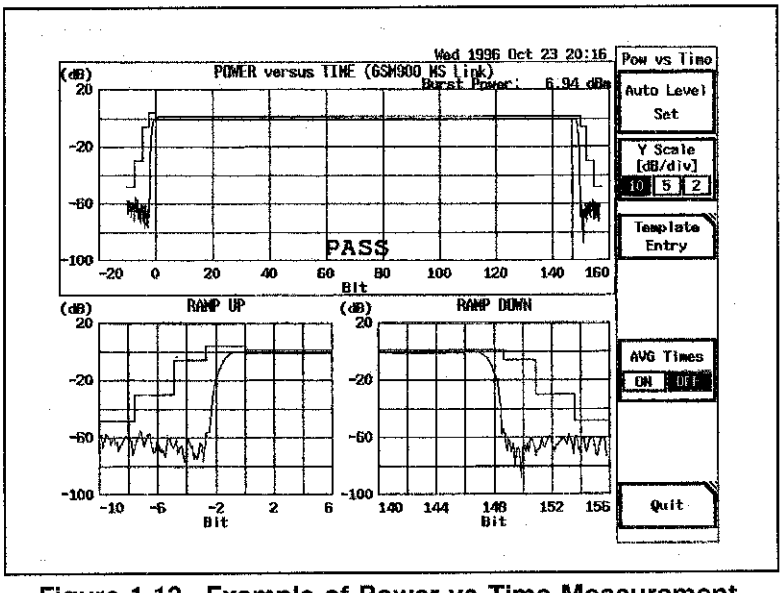


Figure 1-13 Example of Power vs Time Measurement

NOTE: ***Burst Power calculates the power of the burst-ON period.***

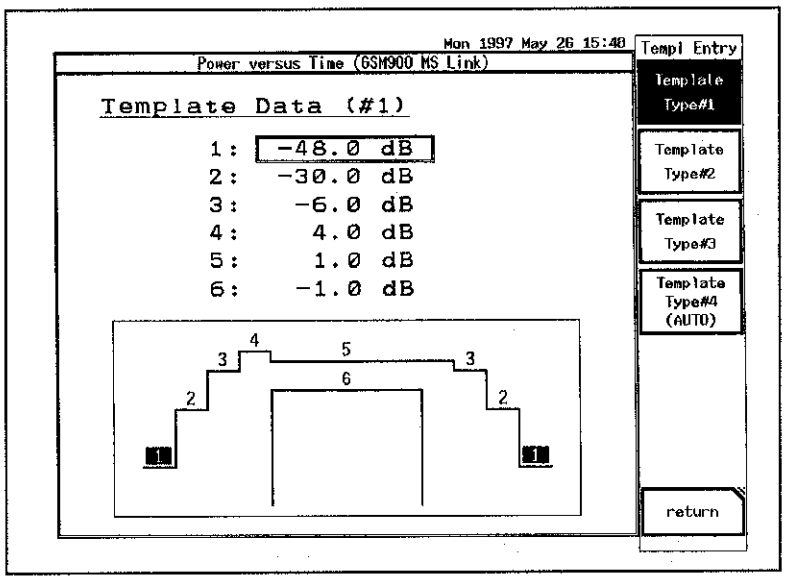


Figure 1-14 Display of Template Entry

NOTE: ***The default template is as shown in Figure 1-14 due to shortage of the dynamic range. Because the specified dynamic range is not satisfied, use the template in combination with "Burst Env" measurement.***

Pressing MARKER [ON] to display the marker, the data at each symbol point can be read out.

To set the marker to OFF, press MARKER [ON] again.

■ Explanation of Menu on Frequency-Error Measurement

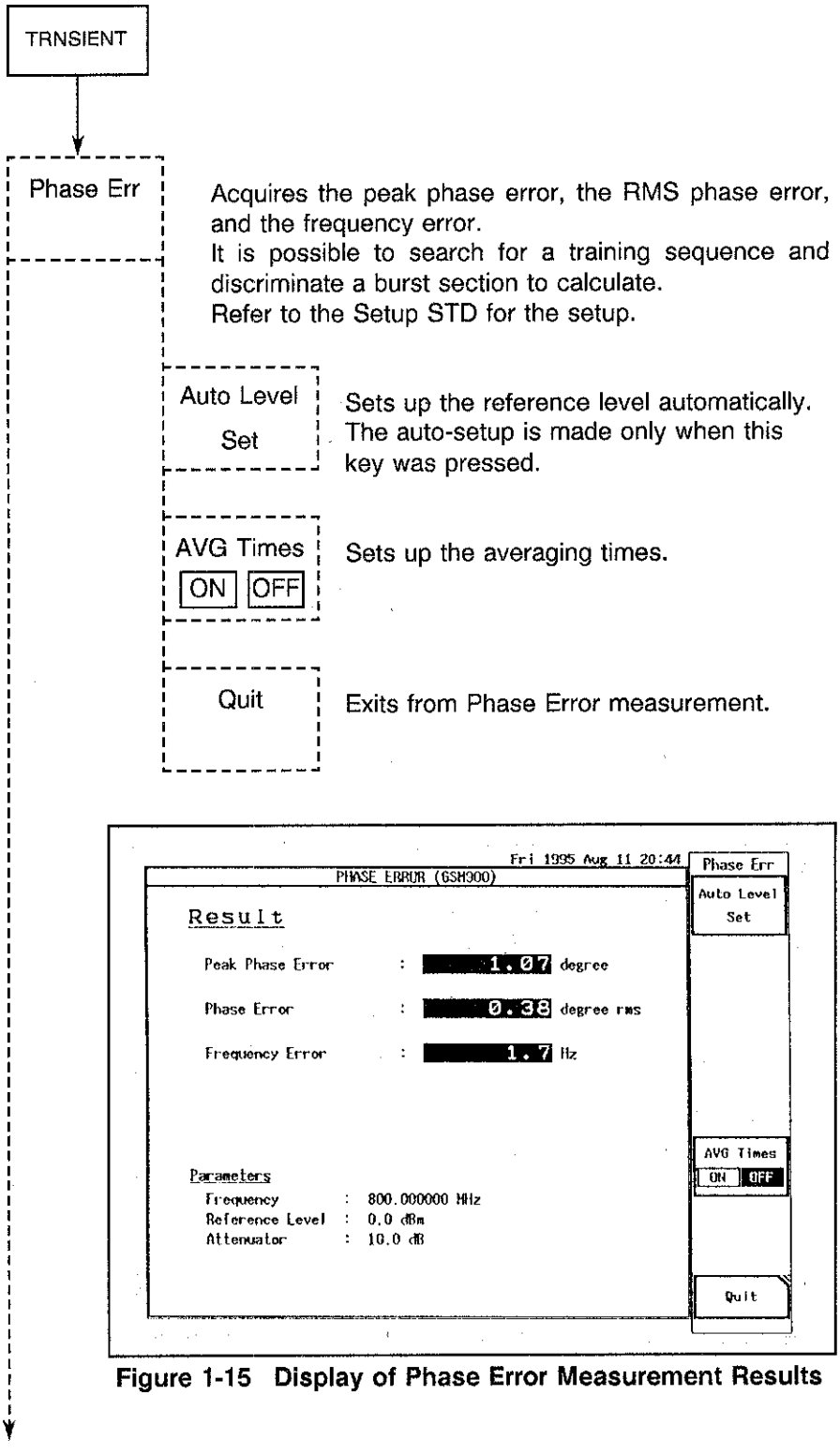


Figure 1-15 Display of Phase Error Measurement Results

Description of Communication Protocol Setting Menu

Pressing TRNSIENT and Setup STD in this order or pressing STD displays the communication protocol setting menu.

With this menu, the communication type, link, power control level and so on of the object signal can be set.

In this menu, the step keys can be used to go to each item, the data knob can be used to select/determine the parameter in each item, and the ten keys can be used to enter data.

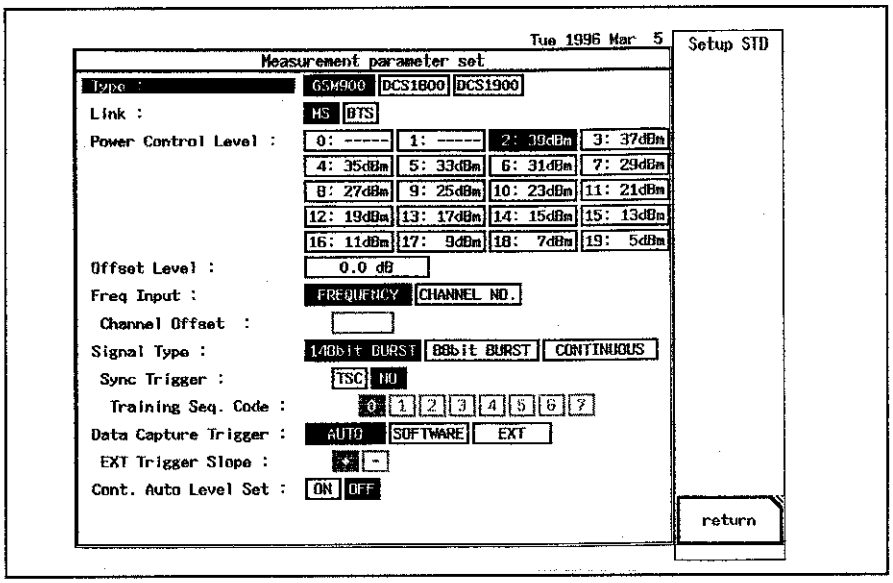


Figure 1-16 Communication Protocol Setting Menu

Type: Sets the communication type.
GSM900
DCS1800
DCS1900

Link: Sets the base station and the mobile station.
MS: Mobile station
BTS: Base station

Power Control Level (on MS selection):
Power Class (on BTS selection):
Sets the output power level or class of the station to be measured.
Depending on this setting, the template value used in Due To Modulation/Switching is decided.

Offset Level:

The offset of the reference level can be set within the range of 0 to ±100 dB.
To set the value, the ten keys and the data knob can be used.

Freq Input:

Sets the input method of the center frequency using the FREQ key.
FREQUENCY: Frequency input mode
CHANNEL NO.:Channel input mode
Correspondence between input channel and center frequency depends on the settings of the communication type and the link.

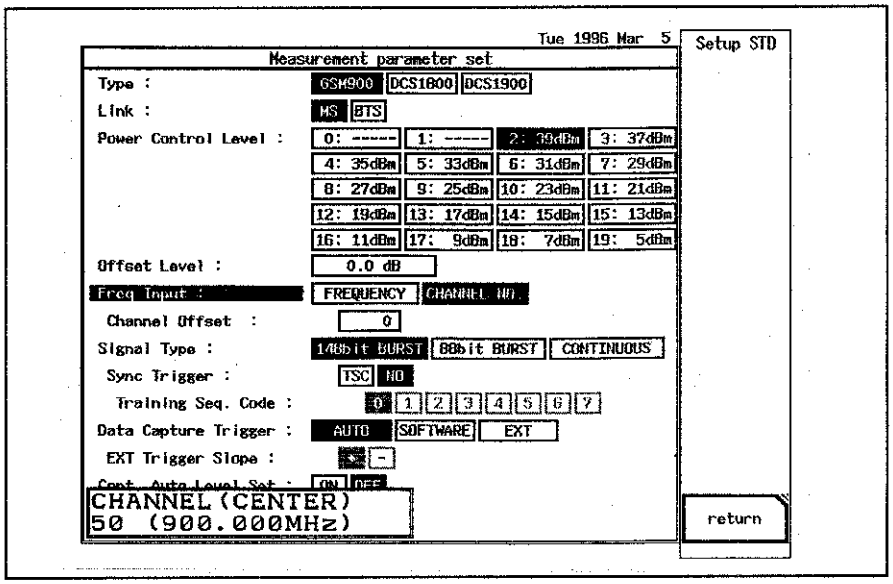


Figure 1-17 Display Example at Center Frequency Channel Input

Channel Offset:

Becomes active when CHANNEL NO in Frequency Input is selected.
This gives,

Offset Frequency = (channel offset N × channel spacing)

Ex. channel spacing 200kHz in GSM

allows to define own channel assignment.

Signal Type:

Sets the burst length to be measured. Depending on this parameter, the template value used in time waveform analysis is decided.

148 bit Burst: Effective for the Normal Burst/Synchronization Burst/Dummy Burst measurement.

88 bit Burst: Effective for the Access Burst measurement.

Sync Trigger:

Searches for the training sequence and sets up whether the burst is judged or not.

TSC: Searches for the training sequence code and judges the burst section.

NO: Judges the burst section from the magnitude.

Training Seq. Code (TSC):

Selects the training sequence code when the training sequence code was selected at the above Sync Trigger.

Data Capture Trigger:

Selects the trigger to take in the signal for measurement.

AUTO: When Signal Type is CONTINUOUS, the data is taken in by the internal timing.
The data is taken in by the timing in the measuring apparatus.

SOFTWARE: When Signal Type is BURST, the burst is searched with the software.

EXT: The data is taken in by the external trigger signal.

Ext Trigger Slope:

Selects EXT trigger slope when EXT is selected at the above Data Capture Trigger.

+: The data is taken in at the rising signal of the external trigger.

-: The data is taken in at the falling signal of the external trigger.

Cont. Auto Level Set:

While setting up the reference level automatically, sets up whether the measurement is performed or not.

ON: Measures while setting up the reference level automatically.

OFF: The reference level is not set up.

5. Caution on the RECALL Function

When R3465 is turned on just after the communication system is changed with using "Comm. System", R3465 is started at the factory-shipped initial setting screen.
The file or the register under the communication system (PDC/PHS/NADC versus GSM) cannot be recalled. (If recalled, an error message "Communication system unmatched." is displayed on the screen.)

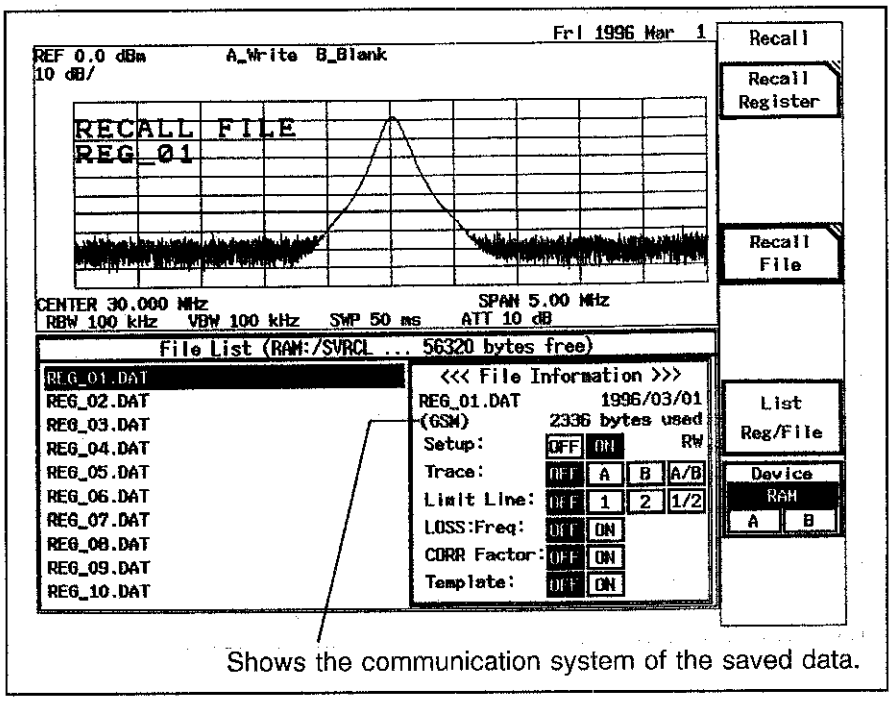


Figure 1-18 Recall Screen

CHAPTER 2

GPIB REMOTE PROGRAMMING

This chapter describes GPIB code of TRANSIENT mode and Program example of TRANSIENT mode.

CONTENTS

1. GPIB Code of TRANSIENT Mode

	Function		Listener code	Talker request		Remarks
				Code	Output format	
Standard	Operation mode	CW	SETFUNC CW	SETFUNC?	0 : CW	
		Transient	SETFUNC TRAN		1 : TRANSIENT	
	Communication system	GSM900	MODTYP GSM	MODTYP?	3 : GSM900	
		DCS1800	MODTYP DCS1800		4 : DCS1800	
		DCS1900	MODTYP DCS1900		5 : DCS1900	
	Communication direction	MS	LINK MS	LINK?	0 : MS	
		BTS	LINK BTS		1 : BTS	
	Signal type					
	Continuous wave		MEASMD CONT	MEASMD?	0 : 148 bit burst	
	Burst wave				1 : 88 bit burst	
	148 bit		MEASMD BURST		2 : Continuous wave	
	88 bit		MEASMD BURST1			
	CH setting	CF setting	CH n	CH?	Integer (Channel number)	
			(n: Channel number)			
		Offset	CHOFS n	CHOFS?	Integer (Offset channel)	
			(n: Offset CH)			
	Sync trigger	TSC	SYNC TSCn	SYNC?	0 : TSC0	
			(n: 0 to 7)		to	
		Sync Bit	SYNC BIT		7 : TSC7	
		None	SYNC NO			
	TSC: Training Sequence Code					
	Auto level					
	Execution (Other than Burst Env)		AUTOLVL	-	-	
	Execution (Burst Env)		AUTOWFL	-	-	
	Auto Level ON		ALS ON	-	-	
	Auto Level OFF		ALS OFF	-	-	
	Power class	GSM900	PWCLS n	PWCLS?	1: 55dBm / 2: 52dBm	
			(n: 1 to 8)		3: 49dBm / 4: 46dBm	
					5: 43dBm / 6: 40dBm	
					7: 37dBm / 8: 34dBm	
		DCS1800/ DCS1900	PWCLS n	PWCLS?	1: 43dBm / 2: 40dBm	
			(n: 1 to 4)		3: 37dBm / 4: 34dBm	

(cont'd)

	Function		Listener code	Talker request		Remarks
				Code	Output format	
Standard	Power control level					
		GSM900	PWCTL n (n: 2 to 19)	PWCTL?	2: 39dBm / 3: 37dBm 4: 35dBm / 5: 33dBm 6: 31dBm / 7: 29dBm 8: 27dBm / 9: 25dBm 10: 23dBm/ 11: 21dBm 12: 19dBm/ 13: 17dBm 14: 15dBm/ 15: 13dBm 16: 11dBm/ 17: 9dBm 18: 7dBm / 19: 5dBm	
		DCS1800	PWCTL n (n: 0 to 15)	PWCTL?	0: 30dBm / 1: 28dBm 2: 26dBm / 3: 24dBm 4: 22dBm / 5: 20dBm 6: 18dBm / 7: 16dBm 8: 14dBm / 9: 12dBm 10: 10dBm/ 11: 8dBm 12: 6dBm / 13: 4dBm 14: 2dBm / 15: 0dBm	
		DCS1900	PWCTL n (n: 0 to 15, 30, 31)	PWCTL?	0: 30dBm / 1: 28dBm 2: 26dBm / 3: 24dBm 4: 22dBm / 5: 20dBm 6: 18dBm / 7: 16dBm 8: 14dBm / 9: 12dBm 10: 10dBm/ 11: 8dBm 12: 6dBm / 13: 4dBm 14: 2dBm / 15: 0dBm 30: 33dBm/ 31: 32dBm	
	Level offset		RO *	RO?	Level	
	Trigger					
	Mode	AUTO	TRGMODE AUTO	-	-	
		SOFTWARE	TRGMODE SOFT	-	-	
		EXT	TRGMODE EXT	-	-	
	EXT Slope	+	TRGMSLP RISE	-	-	
		-	TRGMSLP FALL	-	-	
Measurement conditions	Source	FREE	TRGSRC FREE	-	-	
		VIDEO	TRGSRC VIDEO	-	-	
		IF	TRGSRC IF	-	-	
		EXT	TRGSRC EXT	-	-	
	SLOPE	+	TRGSLP RISE	-	-	
		-	TRGSLP FALL	-	-	

1. GPIB Code of TRANSIENT Mode

(cont'd)

	Function		Listener code	Talker request		Remarks
				Code	Output format	
Measurement conditions	Level		TRGLVL *	-	Integer (Level : 0 to 100)	
	Position		TRGPOS *	-	Integer (Time : 0 to 100)	
	Source monitor	ON	TRGMON ON	TRGMON?	0 : OFF	
		OFF	TRGMON OFF		1 : ON	
	Delay time		TRGDT *	TRGDT?	Time	
	TDMA Structure					
	156.25 bit		TRGSTR TYP1	TRGSTR?	0 : 156.25 bit	
	156/157 bit		TRGSTR TYP2	-	1 : 156/157 bit	
	Slot number		TRGSLOT *	TRGSLOT?	Integer (Slot number : 0 to 7)	
	Gated spectrum					
	Gate	Position	TGTPOS *	TGTPOS?	Time	
		Width	TGTWID *	TGTWID?	Time	
		Default	TGTDEF	-	-	
	Source	IF signal	TGTSRC IF	TGTSRC?	0 : IF signal	
		EXT Trigger	TGTSRC EXT		2 : EXT Trigger	
	Slope	+	TGTSLP RISE	-	-	
		-	TGTSLP FALL	-	-	
	Threshold		TGTTHD *	TGTTHD	Integer (0 to 100)	0: OFF
	Save parameters		TGTSV	-	-	
	Gated sweep	ON	TGTSWP ON	TGTSWP?	0 : OFF	
		OFF	TGTSWP OFF		1 : ON	

(cont'd)

	Function		Listener code	Talker request		Remarks
				Code	Output format	
Measurement conditions	Display control					
	Window position		DCPOS *	DCPOS?	Time	
	Window width		DCWID *	DCWID?	Time	
	T-Zoom	ON	DCZOM	-	-	
		Reset	DCRST	-	-	
	Zoom on window		DCHZOM ON	-	-	
	Return to last span		DCHZOM OFF	-	-	
	Span to 1 burst		DCHZOM BURST	-	-	
	Span to 1 frame		DCHZOM FRAME	-	-	
	Vertical Zoom	ON	DCVZOM ON	-	-	ON: 2dB/div
		OFF	DCVZOM OFF	-	-	OFF: 10dB/div
	Y Scale selection					
		10dB/div	DCVDIV P10DB	DCVDIV?	0: 10dB/div	Valid only when measurement mode is going on.
		5dB/div	DCVDIV P5DB		1: 5dB/div	
		2dB/div	DCVDIV P2DB		2: 2dB/div	
	Average					
	Carrier Power		TPWTM *	TPWTM?	Integer (1 to 999)	
	Tx Power		TAVGTX *	TAVGTX?	Integer (1 to 32)	1: OFF
	Power vs Time		GPTAVG *	GPTAVG?	Integer (1 to 32)	
	Phase Error		TAVGPH *	TAVGPH?	Integer (1 to 32)	
	Burst Envelope		TAVGBST *	TAVGBST?	Integer (1 to 32)	
	Due to Modulation		TAVGDTM *	TAVGDTM?	Integer (1 to 999)	
	Spurious Emissions		TAVGSPR *	TAVGSPR?	Integer (1 to 999)	
	Max Hold					
	Due to Switching		TMAXDTS *	TMAXDTS?	Integer (1 to 999)	
	Limit line					
	Type selection	*1				
	Burst Envelope		TLMTYP TM1	-	-	Table :
	Carrier Power		TLMTYP TM2	-	-	TM1 = UP
						TM2 = LOW
	Due to Modulation		TLMTYP FR1	-	-	
	Due to Switching		TLMTYP FR2	-	-	
	STD		LMCPSL STD	-	-	
	USER		LMCPSL USR	-	-	

*1:Be sure to make a Type selection before setting STD/USER, Level Adjust, X/Y-axis shift and so on.

1. GPIB Code of TRANSIENT Mode

(cont'd)

	Function		Listener code	Talker request		Remarks
				Code	Output format	
Measurement conditions	Level Adjust	AUTO	LMSFAT	-	-	
		MANUAL	LMSFMNL	-	-	
	X-axis shift		TLMSFT *	TLMSFT?	Frequency or time	
	Y-axis shift		TLMASFT *	TLMASFT?	Level	
	Limit line	ON	TLMT ON	TLMT?	0 : OFF	
		OFF	TLMT OFF		1 : ON	
	Table data	*2				
	Table insertion		TLMIN *			*=F, L
	Table deletion		TLMDEL			
	PASS/FAIL					
	Judgment	ON	PFC ON	PFC?	0: OFF	
		OFF	PFC OFF		1: In continuous measurement	
	Judgment results ?		-	PFJ?	0 : FAIL	
					1 : PASS	
	Judgment results ? (details)		-	OPF?	0 : PASS	
					1 : UPPER	
					2 : LOWER	
					3 : UPPER and LOWER	
					4 : ERROR	
	Fail point reading					
		Upper side	-	FPU?	Fail point number <CR+LF> + Frequency, Level <CR/LF> (Repeated for the number of point)	256 sets max.
		Lower side	-	FPL?	Ditto to Upper	
	Carrier power					
	Window	ON	TWDO ON	TWDO?	0 : OFF	Carrier power
		OFF	TWDO OFF		1 : ON	only
		Position	TWLX *	TWLX?	Time	
		Width	TWDX *	TWDX?	Time	
		Default	TWDEF	-	-	

*2: In the type selection for inserting or deleting the table data, TM1 corresponds to UP and TM2 corresponds to LOW in the template specification.

(cont'd)

	Function		Listener code	Talker request		Remarks
				Code	Output format	
Measurement conditions	Y Scale selection					Valid only when measurement mode is going on.
		10dB/div	DCPDIV P10DB	DCPDIV?	0 : 10dB/div	
		5dB/div	DCPDIV P5DB		1 : 5dB/div	
		2dB/div	DCPDIV P2DB		2 : 2dB/div	
	Due to Modulation					
	Trace detection					
		Posi-Nega	TDET NRM	TDET?	0 : Posi-Nega	
		Posi	TDET POS		1 : Posi	
		Nega	TDET NEG		2 : Nega	
		Sample	TDET SMP		3 : Sample	
	Reference power selection					
		Sweep	REFPWR SWP	REFPWR?	0 : SWP	
		DSP	REFPWR DSP		1 : DSP	
	Limit line	Margin ΔX	LIMMRG *	LIMMRG?	Frequency	0Hz : OFF
	Spurious Emissions					
	Offset frequency from carrier		CRFO * *: 1.8MHz (1.8MHz ≥) 6.0MHz (6.0MHz ≥)	CRFO?	Frequency	
	Span mode	Auto	SPRSP AUTO	-	-	
		Full span	SPRSP FULL	-	-	
	Power vs Time					
	Y Scale selection					Valid only when measurement mode is going on.
		10dB/div	GPTDIV P10DB	GPTDIV?	0 : 10dB/div	
		5dB/div	GPTDIV P5DB		1 : 5dB/div	
		2dB/div	GPTDIV P2DB		2 : 2dB/div	
	Template selection		GPTTYP * *: 1/2/3/4	GPTTYP?	Integer (Template number: 1/2/3/4)	
	Template edit		GPTENT d1, d2, d3, d4, d5, d6 d1 to d6: Relative level (dB)	-		Level unit dB is required.
Measurement start	Burst Envelope		PWRTIME	-	-	
	Carrier Power		TPWAVG	-	-	
	Due to Modulation		DUEMOD	-	-	
	Due to Switching		DUESWT	-	-	
	Spurious Emissions		SPREMI	-	-	
	Tx Power		TXPWR	-	-	
	Power vs Time		GPWRTM	-	-	
	Phase Error		PHACC	-	-	
	Execute measurement of same item		SI	-	-	

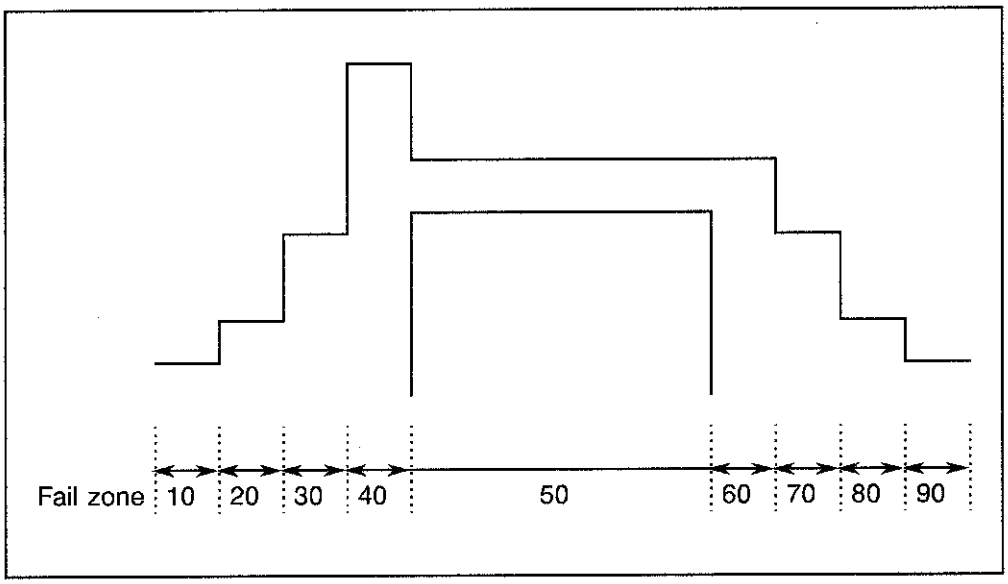
1. GPIB Code of TRANSIENT Mode

(cont'd)

	Function	Listener code	Talker request		Remarks
			Code	Output format	
Measurement start	dB down				
	XdB down width	MKBW *	MKBW?	Level	
	XdB down	XDB	-	-	
	XdB down left	XDL	-	-	
	XdB down right	XDR	-	-	
	XdB relative	DC0	-	-	
	XdB abs. left	DC1	-	-	
	XdB abs. right	DC2	-	-	
	XdB executing status	-	DC?	0 : Relative 1 : Absolute (left side) 2 : Absolute (right side)	
Measured result	Burst Envelope	-	-	Judged as PASS/FAIL	
	Carrier Power	-	TPWAVG?	Level	
	Due to Modulation	-	-	Judged as PASS/FAIL	
	Level list data?		DUEMOD?	<I1, I2, ... I10>	
	Due to Switching	-	-	Judged as PASS/FAIL	
	Level list data?		DUESWT?	<I1, I2, ... I8>	
	Spurious Emissions	-	SPREMI?	<n, f1, I1, ... fn, In>	
	Tx Power	-	TXPWR?	<Pw1, Pw2>	
	Power vs Time				
	Power level	-	GPWRTM?	Level (unit : W)	
	PASS/FAIL judgment	-	GPTJDG?	0 : FAIL 1 : PASS	
	Fail zone	-	GPTFAIL?	Real number (10/20/30/40/50/60/70/80/90)	See the following page for the correspondence of the returned values and the fail zone.
	Phase Accuracy	-	PHACC?	<Pk, Ph, Fr> Pk: Phase (degree) Ph: Phase (degree rms) Fr: Frequency (Hz)	Pk:Peak Phase Err Ph:Phase Err Fr: Frequency Err
	X dB down	-	MF? MT?	Frequency or time	

■REFERENCE■

Correspondence of Returned values and Fail Zone



2. Program Example of TRANSIENT Mode

Program example of PC9801 series (GPIB Address = 8)

Example 1 To measure the spurious near the carrier in the Transient mode. (When SRQ signal is not used.)

```
 10 ISET IFC :ISET REN
 20 SPA = 8
 30 DIM DAT(20)
 40 STAT = 0
 50 GSMTYP = 0
 60 LINKTYP = 0
 70 AVG = 0
 80 OFST = 0
 90 AUTOSP = 0
100 '
110 PRINT @SPA;"SETFUNC TRAN"              ' Enters the Transient mode
120 PRINT @SPA;"CF 903MZ"                  ' Sets the center frequency to 903MHz
130 '
140 '                                      ' Selects the communication system
150 INPUT "GSM TYPE? (0:GSM900/1:DCS1800/2:DCS1900)  > > > ",GSMTYP
160 IF GSMTYP = 0 THEN PRINT @SPA;"MODTYP GSM"
170 IF GSMTYP = 1 THEN PRINT @SPA;"MODTYP DCS1800"
180 IF GSMTYP = 2 THEN PRINT @SPA;"MODTYP DCS1900"
190 '
200 PRINT @SPA;"S1"                        ' Sets the service request interruption to OFF
210 PRINT @SPA;"SPREMI"                    ' Displays the Spurious Emissions
                                             measurement display
220 *MEAS.START
230 '
240 '                                      ' Selects the communication direction
250 INPUT "LINK?    (0:Mobil/1:Base Station)      > > > ",LINKTYP
260 IF LINKTYP = 0 THEN PRINT @SPA;"LINK MS"
270 IF LINKTYP = 1 THEN PRINT @SPA;"LINK BTS"
280 '
290 '                                      ' Selects the span mode
300 INPUT "AUTO SPAN?     (0:Full Span/1:Auto Span)  > > > ",AUTOSP
310 IF AUTOSP = 0 THEN PRINT @SPA;"SPRSP FULL"
320 IF AUTOSP = 1 THEN GOSUB *SPAUTO.SET
330 '
340 '                                      ' Sets the number of averaging times
350 INPUT "AVG Times? (1:OFF/2< >999:AVG Times)      > > > ",AVG
360 PRINT @SPA;"TAVGSPR",AVG
370 PRINT @SPA;"*CLS"
380 *RESTART
390 PRINT @SPA;"SI"
400 GOSUB *MEAS.END
410 GOTO *RESTART
```

(ctd. from example 1)

```
420 '
430 *SPAUTO.SET
440 PRINT @SPA;"SPRSP AUTO"
450 '                                          ' Selects the offset frequency from the carrier
460 INPUT "FREQ. OFFSET? (0:1.8< >6MHz/1:6< >12MHz) > > > ",OFST
470 IF OFST=0 THEN PRINT @SPA;"CRFO 1.8MZ"
480 IF OFST=1 THEN PRINT @SPA;"CRFO 6MZ"
490 RETURN
500 '
510 *MEAS.END
520 PRINT @SPA;"*CLS"                          ' Clears the status byte
530 *WLOOP
540 PRINT @SPA;"OPREVT?":INPUT @SPA;S          ' Reads out the status byte
550 IF (S AND 272)=0 THEN GOTO *WLOOP          ' Waits until the measurement end or the
                                                 averaging end
560 PRINT @SPA;"SPREMI?"
570 INPUT @SPA;DAT(0),DAT(1),DAT(2),DAT(3),DAT(4),DAT(5),DAT(6),DAT(7),DAT(8),DAT(9),
    DAT(10),DAT(11),DAT(12),DAT(13),DAT(14),DAT(15),DAT(16),DAT(17),DAT(18),DAT(19),
    DAT(20)
580 PRINT "Spurious List (";DAT(0);")"
590 FOR I=1 TO DAT(0)
600   PRINT I;":  ";DAT(I*2-1);"Hz",DAT(I*2);"dBm"    '   Displays measurement results
610 NEXT I
620 PRINT @SPA;"ERRNO?":INPUT @SPA;ERR.NUM'   Reads the error number
630 IF ERR.NUM< >0 THEN GOTO *MEAS.ERROR      '   Outputs a measurement error if
                                                  other than 0
640 RETURN
650 '
660 *MEAS.ERROR
670 PRINT "Measuring Error. Error Number:";ERR.NUM  '  Displays the error number
680 STOP
690 '
700 END
```

Program examples of HP200, 300 series (GPIB Address = 8)

Example 2 To measure the spurious near the carrier in the Transient mode. (When SRQ signal is used.)

```
1000 !! Spurious Emissions Measurement
1010 !
1020 OPTION BASE 0
1030 DIM Result(20)
1040 INTEGER Spa,Stat,Gsmtyp,Linktyp,Avg,Ofst,Autosp
1050 ON INTR 7 GOSUB Measend_intr
1060 Spa = 708
1070 Stat = 0
1080 Gsmtyp = 0                          !0:GSM900/1:DCS1800/2:DCS1900
1090 Linktyp = 0                         !0:MS/1:BTS
1100 Avg = 0                             !1:OFF/2< >999:ON
1110 Ofst = 0                            !0:1.8MHz/1:6MHz
1120 Autpsp = 0                          !0:FULL/1:AUTO
1130 !
1140 OUTPUT Spa;"SETFUNC TRAN"           ! Enters the Transient mode
1150 OUTPUT Spa;"CF903MZ"                ! Sets the center frequency to 903MHz
1155 !                                   ! Selects the communication system
1160 INPUT "GSM TYPE? (0:GSM900/1:DCS1800/2:DCS1900) > > > ",Gsmtyp
1170 IF Gsmtyp = 0 THEN
1180    OUTPUT Spa;"MODTYP GSM"
1190 ELSE
1200    IF Gsmtyp = 1 THEN
1210        OUTPUT Spa;"MODTYP DCS1800"
1220    ELSE
1230        OUTPUT Spa;"MODTYP DCS1900"
1240    END IF
1250 END IF
1255 !  Sets the SRQ interruption to measurement end or average end
1260 OUTPUT Spa;"S0;OPR272;*SRE128"      ! Sets the service request interruption to ON
1270 OUTPUT Spa;"SPREMI"                 ! Displays the Spurious Emissions measurement
                                           display
1280 Meas_start:!
1285 !                                   ! Selects the communication direction
1290 INPUT "LINK?    (0:Mobile/1:Base Station)     > > > ",Linktyp
1300 IF Linktyp = 0 THEN
1310    OUTPUT Spa;"LINK MS"
1320 ELSE
1330    OUTPUT Spa;"LINK BTS"
1340 END IF
1345 !                                   ! Sets the span mode
1350 INPUT "AUTO SPAN? (0:Full Span/1:Auto Span)    > > > ",Autosp
1360 IF Autosp = 0 THEN
```

(ctd. from example 2)

```
1370    OUTPUT Spa;"SPRSP FULL"
1380  ELSE
1390    OUTPUT Spa;"SPRSP AUTO"
1395  !                                    ! Selects the offset frequency from the carrier
1400    INPUT "FREQ. OFFSET? (0:1.8< >6MHz/1:6< >12MHz)   > > >  ",Ofst
1410    IF Ofst=0 THEN
1420        OUTPUT Spa;"CRFO 1.8MZ"
1430    ELSE
1440        OUTPUT Spa;"CRFO 6MZ"
1450    END IF
1460  END IF
1465  !                                    ! Sets the number of averaging times
1470  INPUT "AVG Times? (1:OFF/2< >999:AVG Times)      > > >  ",Avg
1480  OUTPUT Spa;"TAVGSPR";Avg
1490  OUTPUT Spa;"*CLS"                    ! Clears the status byte
1500  ENABLE INTR 7;2
1510  Restart:  !
1520  OUTPUT Spa;"SI"                      ! Executes measurement in the same mode
1530  Stat=0
1540  Measend:  !
1550  IF Stat=0 THEN GOTO Measend
1560  OUTPUT Spa;"SPREMI?"                 ! Reads out measurement results
1570  ENTER Spa;Result(*)
1580  PRINT "Spurious List (";Result(0);")"
1590  FOR I=1 TO Result(0)
1600  PRINT I;":  ";Result(I*2-1);"Hz",Result(I*2);"dBm"       ! Displays measurement results
1610  NEXT I
1620 ! GOTO Meas_start
1630  GOTO Restart
1640  STOP
1650  !
1660  Measend_intr:  !
1670  OUTPUT Spa;"*CLS"
1680  BEEP
1690  Stat=1
1700  ENABLE INTR 7;2
1710  RETURN
1720  END
```

CHAPTER 3

SPECIFICATIONS

This chapter contains specifications of the GSM measurement function.

CONTENTS

1. GSM Measurement Option Specifications

■ Transient RF Analysis

● **Burst Envelope measurement**

Amplitude resolution	12 bits
Sweep time/Resolution	50 μs to 2s/100ns
Trigger	Free-run, Single, Video, IF detection, External Delay trigger/Time 200ns to 650 ms

● **Burst spectrum measurement (With Gated Sweep)**

Gate Position/Resolution	1 μs to 65 ms/1 μs
Gate Width/Resolution	2 μs to 65 ms/1 μs
Trigger	Internal IF detection, External

■ Anti-modulation System

GMSK (GSM, DCS1800, DCS1900)

■ Analysis Input Range

-30 dBm to +30 dBm

■ Average Power Measurement

(After an auto-calibration, in the band of GSM, DCS1800 and DCS1900)

● **Measurement accuracy**

±0.8 dB (15°C to 35°C)
±1 dB (0°C to 50°C)

■ Frequency/Phase Error

● **Frequency error**

Tolerance	±10kHz
Accuracy	Reference accuracy × Carrier frequency ± 5 Hz

● **Phase error**

Tolerance	0° to 30° (Peak)
Accuracy	≤ ±5° (Peak) ≤ ±1° (rms)

APPENDIX

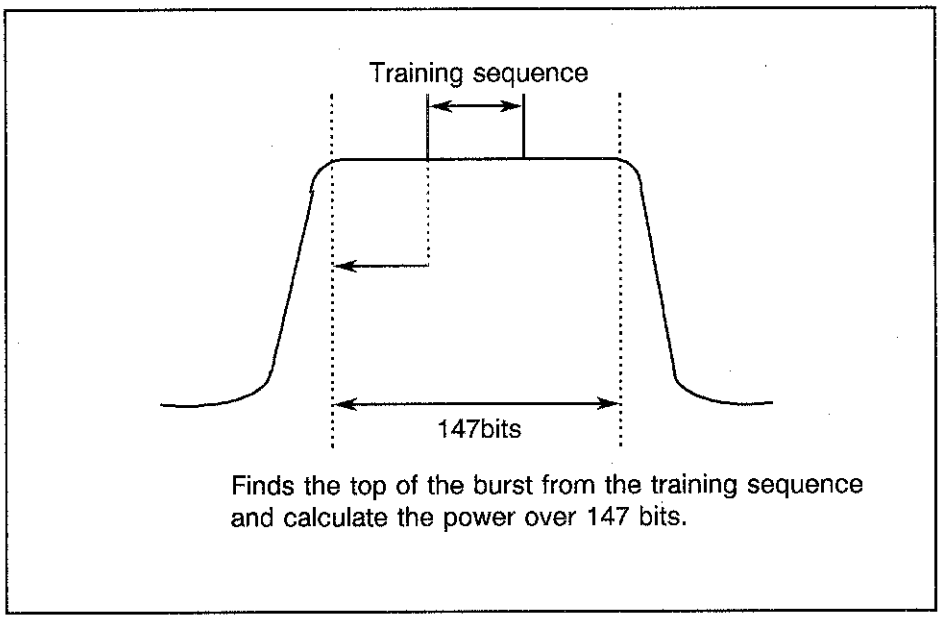
In this appendix, you will find a glossary, a menu lists and list of messages.

CONTENTS

1. Glossary

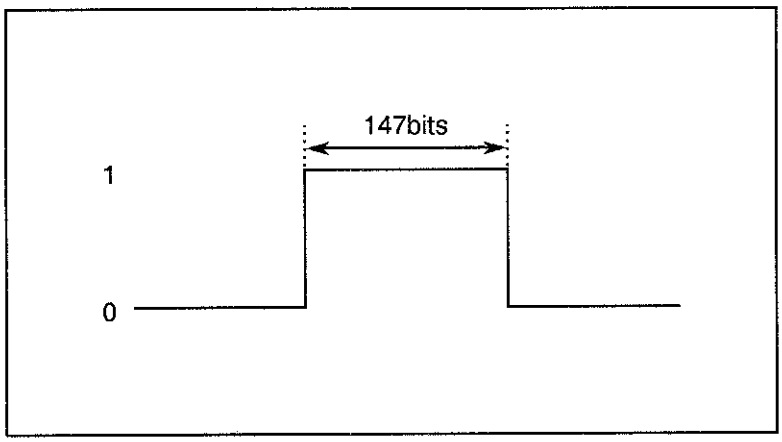
Tx Power

According to GSM 11.10 V4.80 page 121, "The transmitter out power is calculated as the average of the samples over the 147 useful bits."
In Tx Power, the input signal is demodulated and the setup training sequence is searched.
Based on the position of the searched training sequence, decide the 147 useful bits and calculate the power.

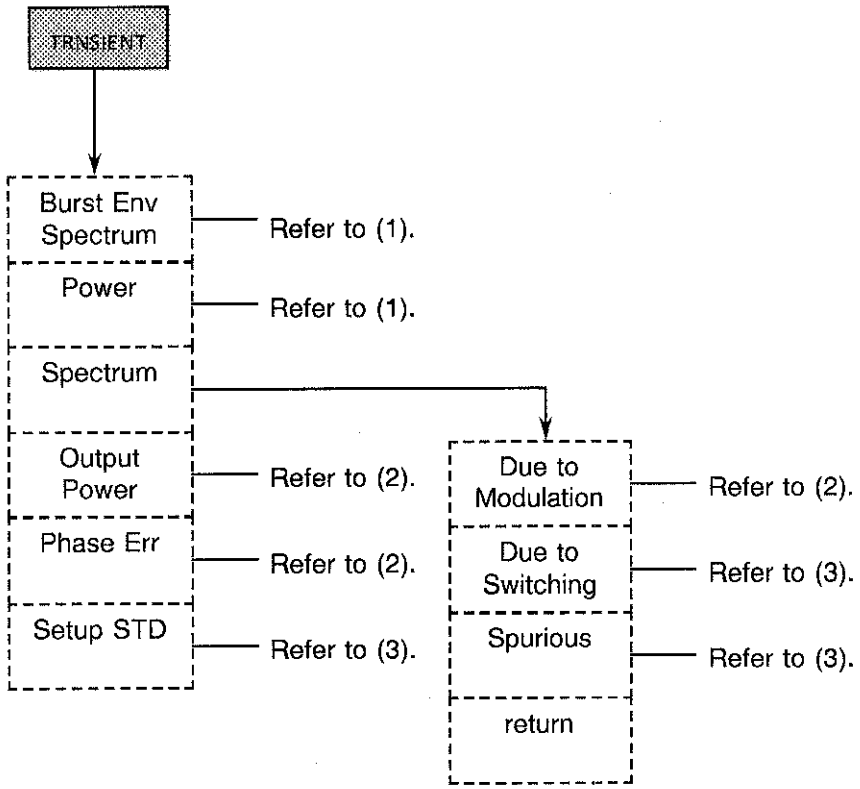


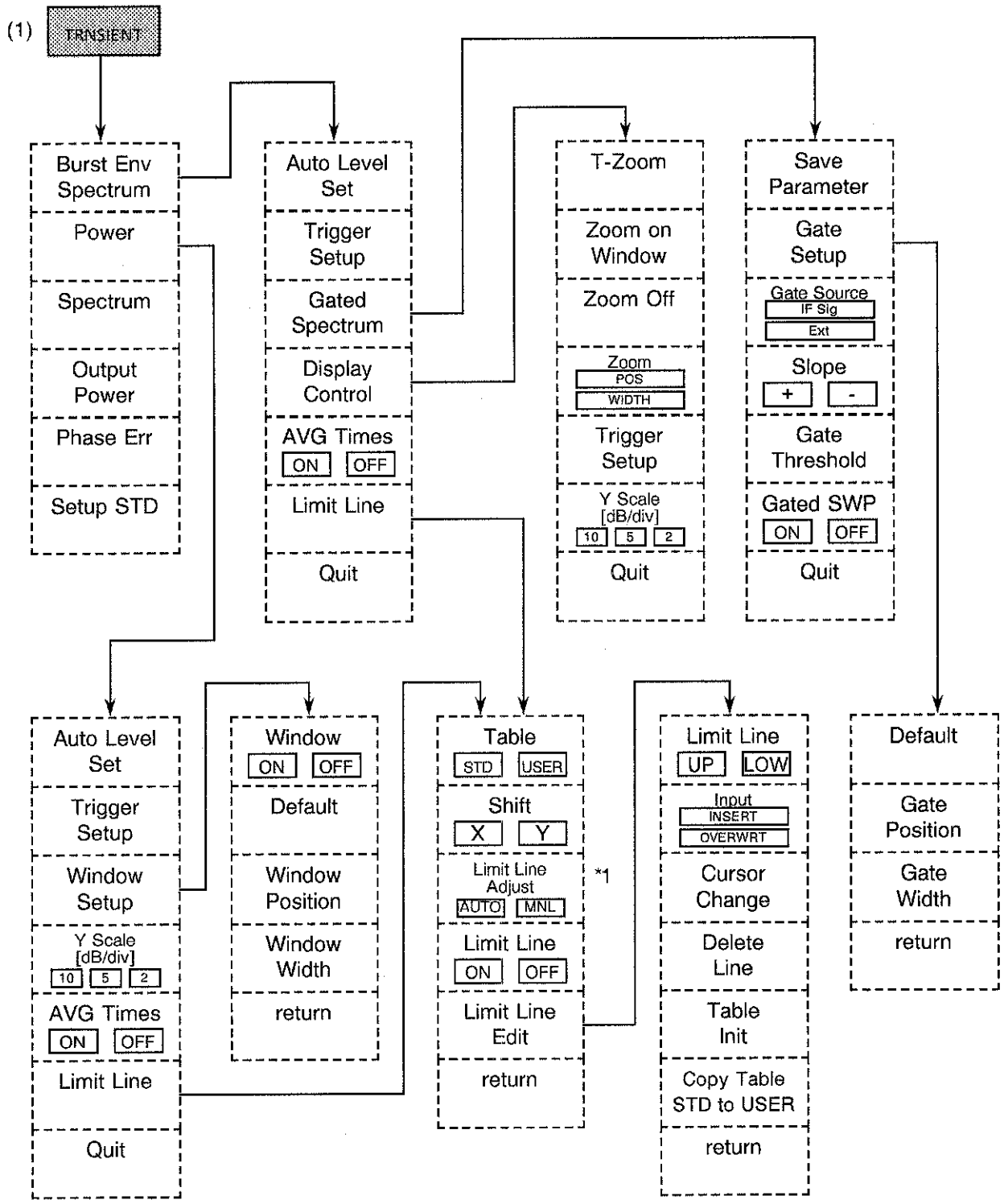
Finds the top of the burst from the training sequence and calculate the power over 147 bits.

When the trigger is not set in the training sequence, take a correlation between template shown in the down figure and the input burst to be 1 for the time of the 147 bits to find out the burst part.

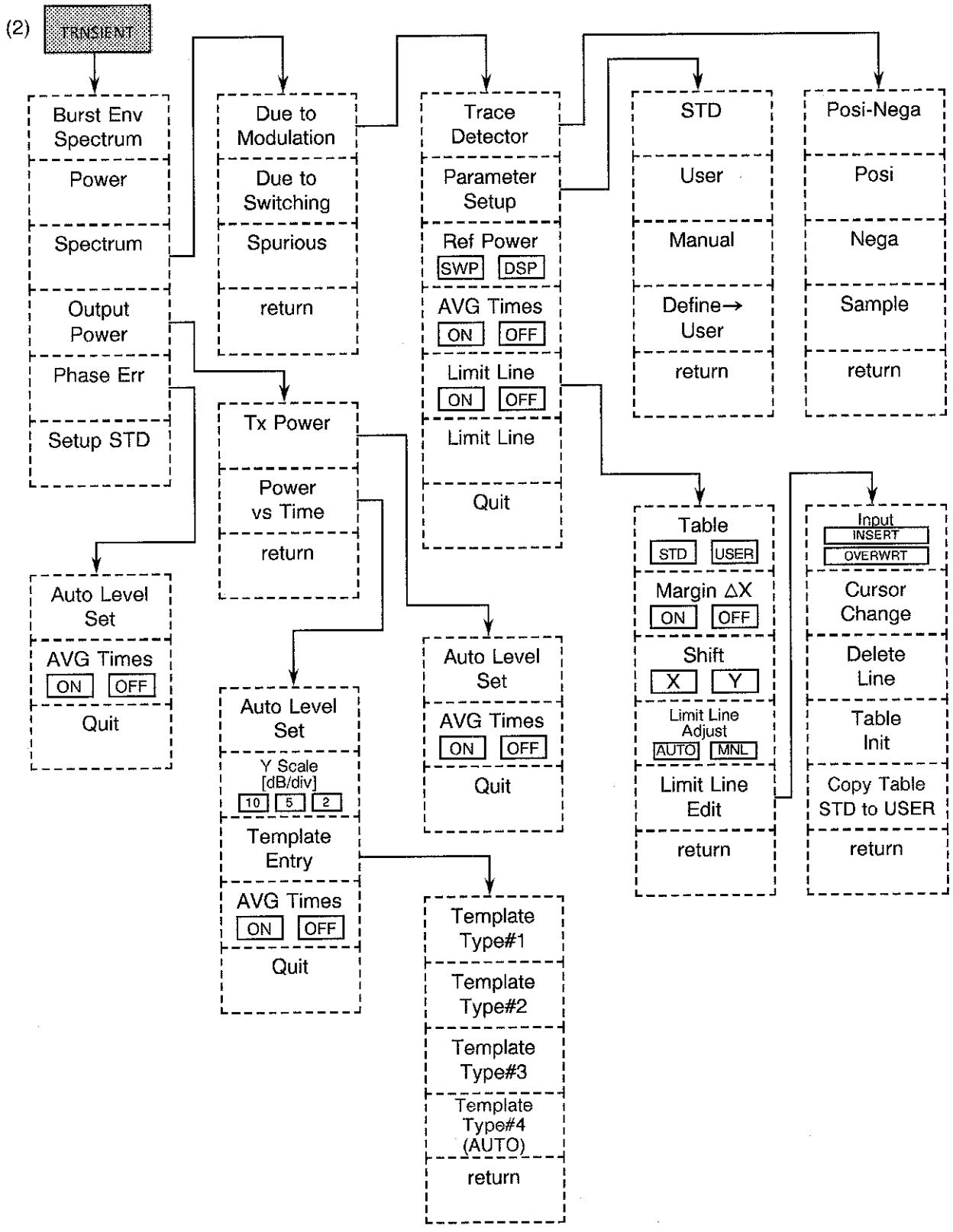


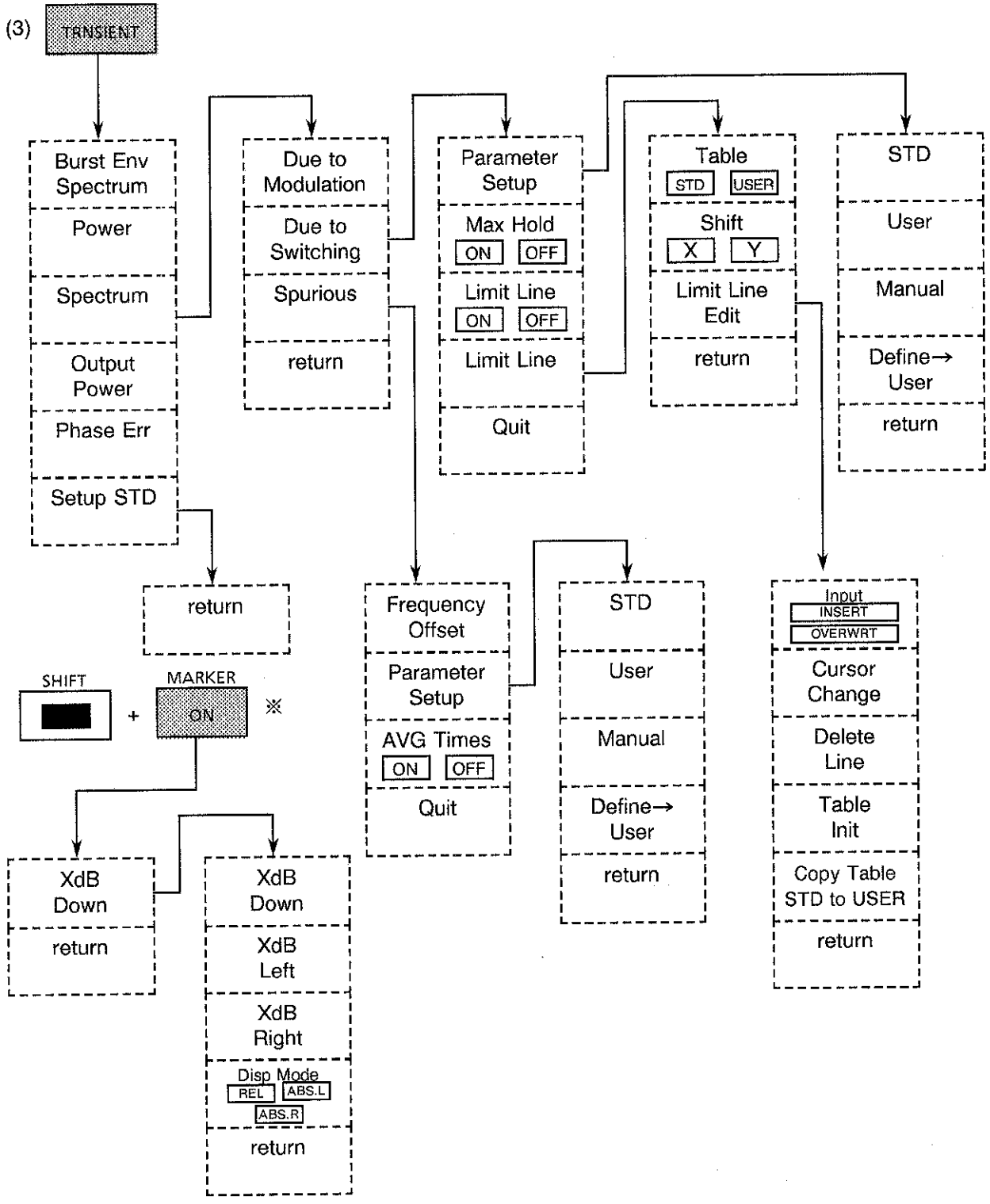
2. Menu Lists


TRNSIENT
Burst Env Spectrum
Refer to (1).
Power
Refer to (1).
Spectrum
Output Power
Refer to (2).
Phase Err
Refer to (2).
Setup STD
Refer to (3).
Due to Modulation
Refer to (2).
Due to Switching
Refer to (3).
Spurious
Refer to (3).
return



*1: This soft key is displayed in the Power measurement.


(2)
TRNSIENT
Burst Env Spectrum
Power
Spectrum
Output Power
Phase Err
Setup STD
Due to Modulation
Due to Switching
Spurious
return
Trace Detector
Parameter Setup
Ref Power
SWP
DSP
AVG Times
ON
OFF
Limit Line
ON
OFF
Limit Line
Quit
STD
User
Manual
Define→ User
return
Posi-Nega
Posi
Nega
Sample
return
Tx Power
Power vs Time
return
Auto Level Set
AVG Times
ON
OFF
Quit
Auto Level Set
Y Scale [dB/div]
10
5
2
Template Entry
AVG Times
ON
OFF
Quit
Auto Level Set
AVG Times
ON
OFF
Quit
Template Type#1
Template Type#2
Template Type#3
Template Type#4 (AUTO)
return
Table
STD
USER
Margin ΔX
ON
OFF
Shift
X
Y
Limit Line Adjust
AUTO
MNL
Limit Line Edit
return
Input
INSERT
OVERWRT
Cursor Change
Delete Line
Table Init
Copy Table STD to USER
return



※ This menu is displayed by operating when entering to the measurement state of Transient Mode.

3. List of Messages

Massage	Explanation	Error No.
Sound demodulation is working. Please turn off the Sound mode. [CW 1/2]	Sound demodulation is working.	1
Span is set 0 Hz. Please change a span.	It is set in Zero span.	5
Power Measure is working. Please turn off each item. [CW->Power Meas]	Power Measure is working.	9
Signal Track is working. Please turn off Signal Track. [Marker 1/3]	Signal Track is working.	10
Noise/Hz is working. Please quit the Noise/Hz. [CW 2/2]	Noise/Hz is working.	11
Only dBm and dBuV is useful while Noise/Hz is been working.	It is not possible to select because Noise/Hz is been working.	12
Counter is working. Please turn off the Counter. [CW 1/2]	Counter is working.	13
ΔMKR is not active. Please activate the ΔMKR. [Marker 1/3]	The delta marker is not active.	14
Not available in Multi Screen. Please reset Multi Screen mode. [Window 1/1]	It is not possible to execute in Multi Screen mode.	17
View or Blank trace is selected. Please select Write mode. [Format->Trace A]	It is not possible to execute in View/Blank.	18
Trigger source is not Video. Please select Video trigger. [Sweep->Trigger Source]	Trigger source is not Video.	19

Massage	Explanation	Error No.
MKR is not on Trace A. Please execute Trace MKR Move. [Marker 3/3]	The marker is not on Trace A.	20
Calculated power is out of range.	The calculated power is out of range.	25
Edit table is opened. Please return to execute menu.	It is not possible to execute in the Edit mode.	26
Frequency table is empty. Please edit a table and execute.	There are no table data.	27
Calibration signal was not detected. Please check CAL OUT signal.	There is no CAL signal connected.	28
Trace Average is working. Please turn Average off. [Format->Trace A]	Trace average is working.	39
Trace Point is set to 501. Please change mode to 1001. [SYS 1/1]	Trace 501 Point mode is set.	41
Not available while Zooming.	It is not possible to execute while Zooming.	42
No trace data. Please start a measure.	Trace data is not displayed. Start the measurement.	43
Attenuator is MANUAL mode. Please select AUTO mode.	Attenuator is set to the MANUAL mode. Change the mode to Auto, then execute the measurement.	44
No margin for filtering.	There's no margin for filtering in trigger position.	200
Trigger occurs in a slot.	Trigger is in a slot.	204
Multiple TSC was detected.	Plural Training sequence code were detected.	220
Printer is not ready. Please check a printer setting.	It is not possible to print. Please check the printer setting.	300*
Printer cable problem. Please check a cable or connection.	The printer cable is defective. Please check the cable or connection.	301*
Printer is not active.	The printer is not active.	302*

Massage	Explanation	Error No.
Plotter cable problem or plotter is not active.	The plotter cable is defective or the plotter does not operate.	303*
INPUT ATT: Calibration failure.	It is a failure of the Calibration.	400
IF STEP AMP: Calibration failure.	It is a failure of the Calibration.	401
LOG LINEARITY: Calibration failure.	It is a failure of the Calibration.	402
TOTAL GAIN: Calibration failure.	It is a failure of the Calibration.	403
RBW SWITCHING: Calibration failure.	It is a failure of the Calibration.	404
AMPTD MAG: Calibration failure.	It is a failure of the Calibration.	405
Calibration data is not enough. Please execute CAL ALL.	It is not possible to execute because source calibration data is missing.	406
HS ADC: Calibration failure.	It is a failure of the Calibration.	407
MOD DSP: Calibration failure.	It is a failure of the Calibration.	408
NORMAL ADC: Calibration failure.	It is a failure of the Calibration.	409
Illegal parameters.	The specified parameters are illegal.	600
Illegal file or device name.	The file or device name is illegal.	601
Software version unmatched.	Software version is unmatched.	602
Cannot format a device.	The memory card cannot be initialized.	603
Cannot rename a file in RAM disk.	The file name in RAM disk cannot be changed.	604
Broken saved block data.	The saved data is lost.	605
Device already exists.	The device already has been selected.	606
Device not found.	There are no devices.	607

Massage	Explanation	Error No.
Device not ready.	The device cannot be referred.	608
Directory not found.	There are no directories.	609
File already exists.	The file already exists.	610
File not found.	There are no files.	611
Invalid BPB. Please format a card.	BPB is invalid. The card needs to be initialized.	612
Cannot delete a file. (read-only file)	It is not possible to delete because it is a read-only file.	613
No disk space.	Card/Disk capacity is full.	614
Read-only file.	It is the read-only file.	615
Read-only media.	It is the read-only media.	616
Read-only volume.	The card is in the write protection.	617
Invalid boot sector signature.	The boot sector signature cannot be recognized.	618
CRC error.	CRC error occurred.	619
Any trouble in DSP or AD module.	DSP or AD module has some trouble.	620
Broken Freq-Correction data. Please report to qualified service person.	An error of the frequency characteristic correction data occurred.	621*
Handshake error occurred to TBC. Please report to qualified service person.	A handshake error occurred.	622*
Handshake error occurred to DSP. Please report to qualified service person.	A handshake error occurred.	623*
Cannot detect Mod. DSP board. Please report to qualified service person.	Connection error has occurred.	624*
File or register empty.	It is impossible to recall a file or a register that is empty.	634
Communication system unmatched.	The communication system is improper.	635

Massage	Explanation	Error No.
Time Out ! No Trigger detected.	Trigger is not detected.	700
System Error. Cannot allocate memory.	Cannot allocate memory space.	701
Input level is out of range. Please check Reference level.	Input level is out of allowable range.	702
Burst signal is not detected. Please check Burst length.	Burst signal cannot be detected.	703
Cannot demodulate.	Cannot demodulate.	704
Trigger timing is not proper.	Trigger timing is not proper.	707
Signal Type is set to CONTINUOUS. Please set BURST in STD menu.	Continuous wave was detected.	709
TSC is not detected. please check STD menu.	Training sequence code cannot be detected.	720
TSC detection failure.	Failed in Training sequence code detection.	721
Auto Level completed !	Auto level completed.	801
Auto Level failed !	Auto level failed.	802

TSC : Training Sequence Code

NOTE

It is possible to read error numbers by using the GPIB query, "ERRNO?", but impossible to read codes marked by (*).

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