
ADVANTEST®

ADVANTEST CORPORATION

R3541
Modulation Accuracy
Measurement Unit
Operation Manual

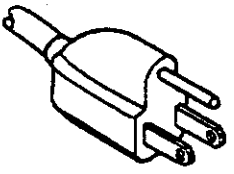
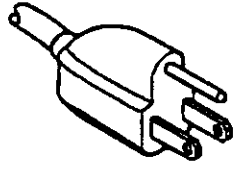
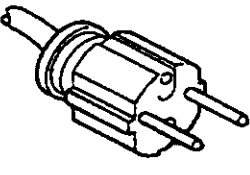
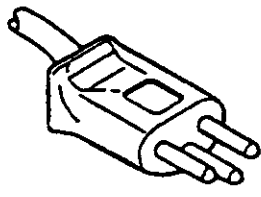
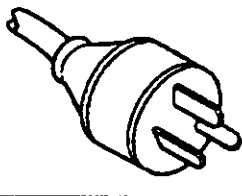
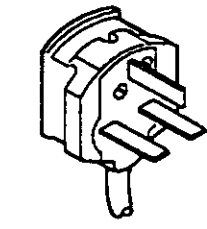
MANUAL NUMBER FOE-8311258E01

Applicable models

R3541A
R3541B
R3541C

Table of Power Cable options

There are six power cable options (refer to following table).
Order power cable options by Accessory Codes.

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

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1. GENERAL

1.1 Outline of Product

With a combination of the R3265/3271 Spectrum Analyzer, the R3541A/B Modulation Accuracy Measurement Unit measures the modulation accuracy in the $\pi/4$ DQPSK digital modulation. The R3541A is allowed to measure the modulation accuracy measurement of PDC (Personal Digital Cellular) and NADC (North American Dual-Mode Cellular) systems, and the R3541B for PHS (Personal Handy Phone System). The R3541C is allowed to measure the modulation accuracy measurement of PDC, NADC systems and PHS. The R3541A/B/C (hereinafter, the R3541A/B/C is generically described as the R3541) consists of the down converter, high-speed digitizer, DSP (Digital Signal Processor), and interface to the R3265/3271. Key operation on the R3265/3271 allows the R3541 to easily perform high-speed measurement. Also, the use of options allows to be displayed constellations, eye patterns, the waveforms of phases and amplitudes for each symbol. (Option 70)

Features of R3541

- ① Allows a measurement of modulation accuracy in a wide frequency range.

Table 1-1 Measurement Frequency Range

	R3265	R3271
R3541A/C	450kHz to 8GHz	450kHz to 26.5GHz
R3541B/C	10MHz to 8GHz	10MHz to 26.5GHz

- ② Allows a measurement in a wide dynamic range.
- ③ Realizes a high-speed measurement because of using DSP (Digital Signal Processor) for a signal processing.
- ④ Allows a modulation accuracy measurement while measuring the RF signals by the spectrum analyzer.
- ⑤ Allows an easy key operation measurement on the R3265/3271.

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1.2 Before Getting Started with R3541 Operation

1.2 Before Getting Started with R3541 Operation

1.2.1 Checking Accessories

- ① Check that there is no damage on the outside of R3541.
- ② Check the quantities and standards of standard accessories in accordance with the list shown in Table 1-2.

If there are damages or shortage of the standard accessories, contact ATCE or your nearest office. Note that the addresses and telephone numbers for ATCE and offices are listed at the end of this manual.

Note: When ordering the accessories, use the type names (or stock numbers).

Table 1-2 Standard Accessories

Name	Standard		Quantity	Remarks
	Type name	Stock No.		
Power supply cable	A01412	DCB-DD3130 × 01	1	
Input cable	—	DCB-FF3767 × 02	2	
	—	DCB-RR1156 × 01	1	
Power supply fuse	—	DFN-AA2A	2	
Instruction manual	—	JR3541	1	Japanese
	—	ER3541		English

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1.2 Before Getting Started with R3541 Operation

1.2.2 Ambient Conditions for Use

- (1) Avoid such places as receive direct sunlight or corrosive gas, or have much dirt or vibration.
- (2) Keep the ambient temperature of 0°C to +50°C and ambient humidity of 85% or less.
- (3) Keep the temperature of -20°C to +60°C for storage. If the R3541 is not used for a long time period, cover it with a vinyl sheet or put it in a corrugated board box, and store it at the dry place with no direct sunlight.
- (4) The R3541 is designed in due consideration of noise of the AC power supply line. However, use it at the place having as less noise as possible. If the noise is inevitable, use the noise filter.

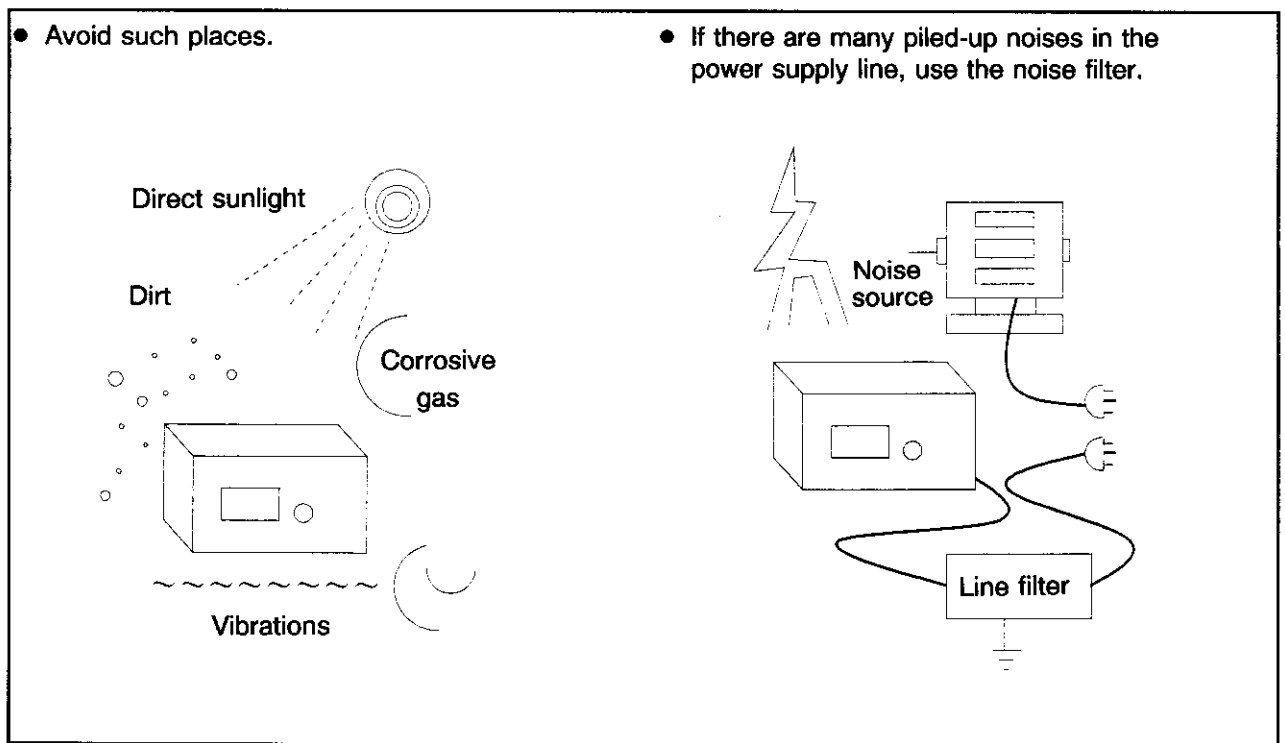


Figure 1-1 Ambient Conditions for Use

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1.2 Before Getting Started with R3541 Operation

1.2.3 Storage, Cleaning, and Transportation

(1) Storage

The temperature to store the R3541 is -20°C to $+60^{\circ}\text{C}$. If the R3541 is not used for a long time period, cover it with a vinyl sheet or put it in a corrugated board box, and store it at the dry place with no direct sunlight.

(2) Cleaning

CAUTION

Do not use organic solvents (benzene, acetone, etc.) which deteriorate plastic for maintenance or cleaning.

(3) Transportation

Use the original packing materials or its equivalents for transportation. If the original materials are lost, use the corrugated board box with a thickness of 5mm or more and put the R3541 with cushioning materials around it in the box.

After wrapping the R3541 with the cushioning materials, put the accessories in the box and then place cushioning materials on it again. After inserting all, close the box and wind/tighten the packing rope on the box.

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1.2 Before Getting Started with R3541 Operation

1.2.4 Before Power ON

WARNING

1. Use of power supply conditions other than those described in Table 1-3 may damage the R3541.
2. Use of fuses not complying with the standard may damage the R3541.

(1) Power supply conditions

Table 1-3 shows the power supply conditions to operate the R3541.

Table 1-3 Power Supply Conditions

Power supply	Conditions	
Input voltage	90V to 132Vrms	198V to 250Vrms
Frequency	48Hz to 66Hz	
Power consumption	110VA or less	

(2) Checking fuse

A 2.0A/250V fuse can be used for both input voltages of 90V to 132V and 198V to 250V of the AC power supply line.

Check that there is a fuse in the power supply connector on the rear panel.

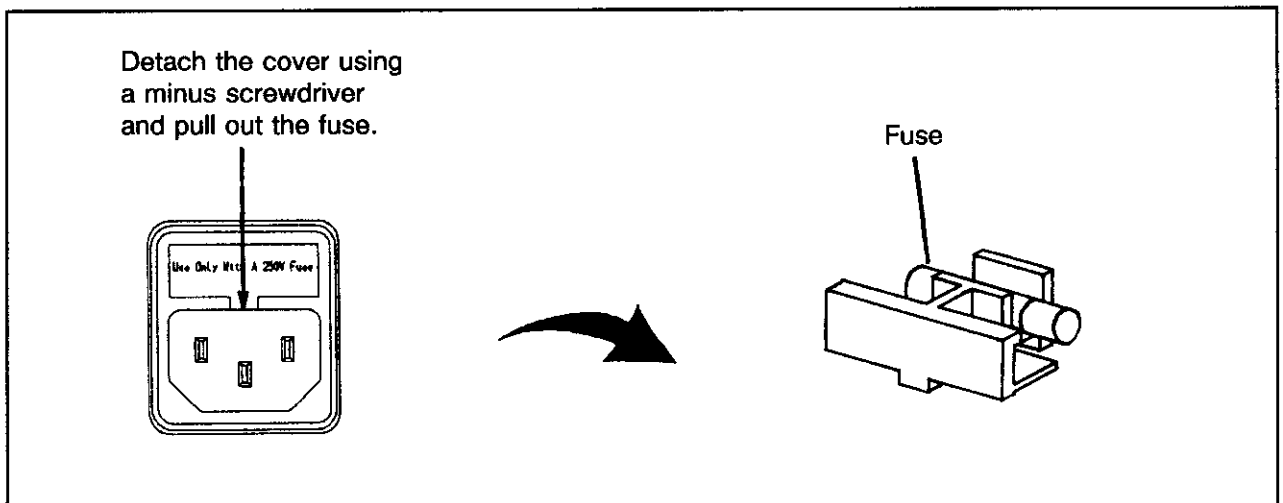


Figure 1-2 Checking Fuse

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1.2 Before Getting Started with R3541 Operation

(3) Checking the Power Cable

The standard power cable plug has three pins. For two-pin outlets, use a two-pin adapter and ground either the adapter's grounding lead or the grounding terminal on the analyzer's rear panel.

The two-pin adapter A09034 (KPR-18) conforms to industry standards. The adapter's pins have different widths as shown in Fig. 1-3 (b). When inserting the adapter in the receptacle, be sure to orient it properly. If the A09034 will not go into the receptacle, use the optional adapter KPR-13.

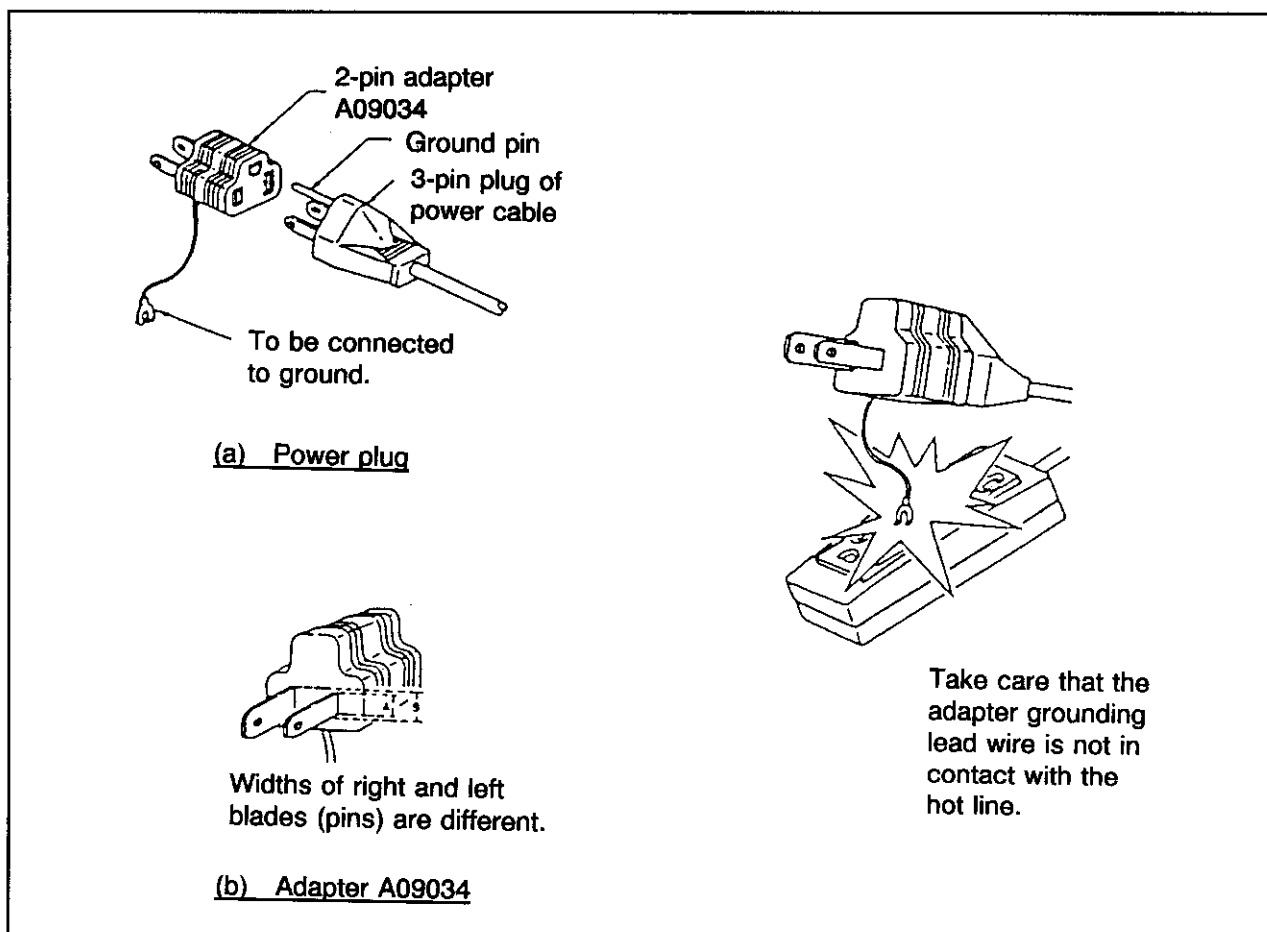
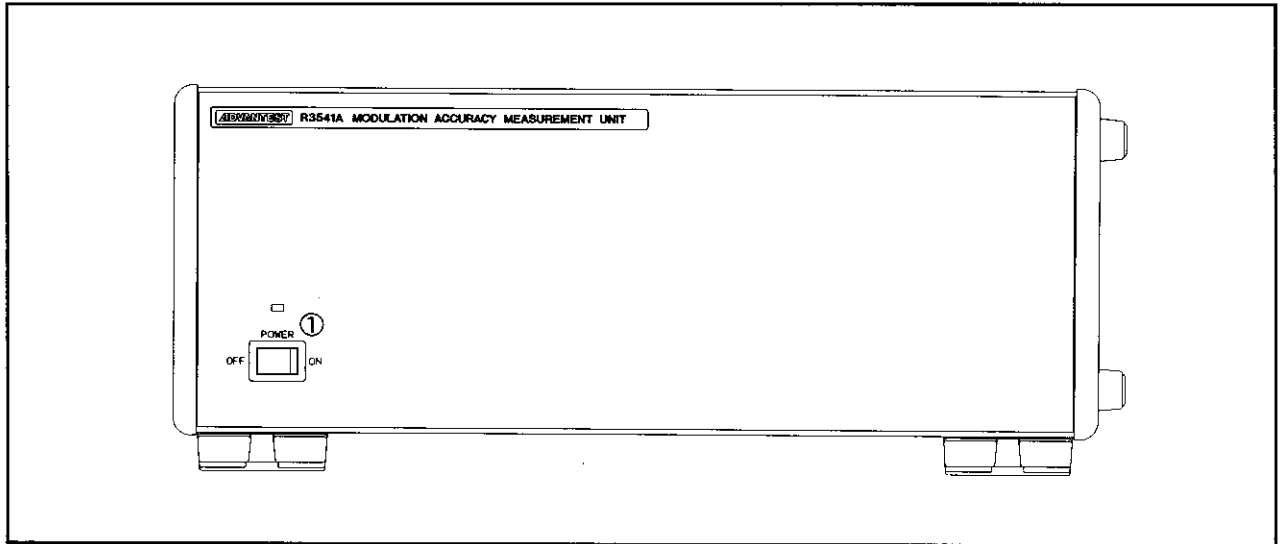


Figure 1-3 Power Cable Plug and Adapter

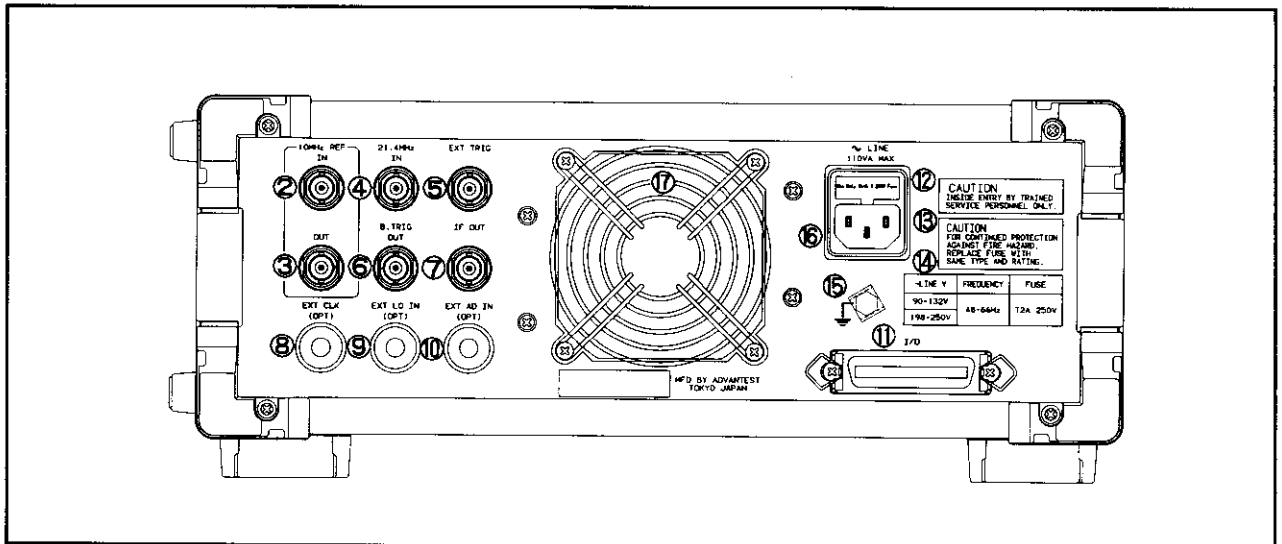
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2. Panel Description

2. PANEL DESCRIPTION



- ① POWER switch (front panel) : Switches the power to ON/OFF.



- ② Input terminal of reference frequency signal
- : Inputs the 10MHz REF OUT from the R3265/3271 or signals from the external reference source.
 - Input frequency range : 10MHz \pm 100Hz
 - Input level range : 0dBm to +10dBm
 - Input impedance : Approx. 50 Ω

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2. Panel Description

- ③ Output terminal of reference frequency signal : Outputs the signals received at the reference frequency signal input. When using the external reference signals, connect 10MHz REF INPUT/OUTPUT terminal of the R3265/3271 and select 10MHz REF EXT in the soft menu pressing CENTER key.
FREQ

- ④ 21.4MHz IN : Connects 21.4MHZ IF OUT of the R3265/3271.

- ⑤ External trigger input terminal : Starts the measurement by the external input signal of rising (+) or falling (-) edge (selectable). Press the MEAS, TRIG, EXT, SLOPE
CONDITION +/-
Input signal level: TTL level

- ⑥ Burst trigger output terminal : Outputs the burst trigger signals.
Output signal level: TTL level

- ⑦ IF OUT : Outputs the IF signals of the R3541 down converter.

- ⑧ EXT CLK : Sampling clock input terminal of the R3541 A/D CONVERTER (option)

- ⑨ EXT Lo. IN : Local oscillator input terminal of the R3541 down converter (option)

- ⑩ EXT. AD IN : External input terminal of R3541 A/D CONVERTER
Connects the Y output terminal of the R3265/3271.

- ⑪ I/O : Input/output terminal for data communication with being connected to PARALLEL I/O (OPT-06) of the R3265/3271

⑫ CAUTION

Only trained service personnel can open the panel for internal checking.

INSIDE ENTRY BY TRAINED SERVICE PERSONNEL ONLY.

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2. Panel Description

⑬

CAUTION

For fuse replacement, use one with the correct type and rating complying with power supply voltage.

**FOR CONTINUED PROTECTION AGAINST FIRE HAZARD.
REPLACE FUSE WITH SAME TYPE AND RATING.**

- ⑭ Power supply conditions and fuse rating : Displays the voltage frequencies of the power supply and fuse rating available.
- ⑮ Ground terminal : Is used for direct grounding from the body when 3-pin connector and 2-pin adapter of the power supply cable cannot be used.
- ⑯ AC power supply connector : The lower center pin of three pins is the grounding terminal. The power fuse is pulled out by opening the upper cover.
- ⑰ Cooling fan : Discharge-type cooling fan

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3.1 System Configurations and Measurement Items

3. MEASUREMENT METHOD

3.1 System Configurations and Measurement Items

The system configuration of the R3541 Modulation Accuracy Measurement Unit varies as shown in Table 3-1 depending on objects to be measured.

Table 3-1 Unit Configurations and Measurement Items

Configuration	Measurement object	Measurement item	Waveform analysis function (option 70)
R3265/3271 & R3541A/C	PDC/NADC	Modulation accuracy (rms value) Phase error (rms value) Amplitude error (rms value) Carrier frequency error Burst amplitude droop Carrier leak 10 burst measurement bit Rate (ppm, Hz) (only for 10 burst measurement) VOX measurement (PDC only)	Demodulation data display Synchronization word display I/Q eye pattern display I-Q constellation display Amplitude/phase display of each symbol Error vector amplitude display Phase error display IF signal spectrum display
R3265/3271 & R3541B/C	PHS	Modulation accuracy (rms value) Phase error (rms value) Amplitude error (rms value) Carrier frequency error Burst amplitude droop Carrier leak 10 burst measurement bit Rate (ppm, Hz) (only for 10 burst measurement)	Demodulation data display Unique word display I/Q eye pattern display I-Q constellation display Amplitude/phase display of each symbol Error vector amplitude display Phase error display IF signal spectrum display

CAUTION

When the following function can not be used, renew the software revision of R3265/3271.

- bit Rate measurement (PDC/NADC/PHS)
- VOX measurement
- 10 burst measurement (PDC/PHS)
- Display of Transmission Transient Response screen (Opt. 70 function)
- Display of Transmission Timing screen (Opt. 70 function)

For the detail, contact ADVANTEST or the local supplier.

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3.2 Connecting to R3265/3271

3.2 Connecting to R3265/3271

Figure 3-1 shows the connection between the R3265/3271 and R3541.

CAUTION

When connecting the R3265/3271 and the R3541, both power must be turned OFF.
 The power for the R3265/3271 and the R3541 should be turned ON/OFF simultaneously.

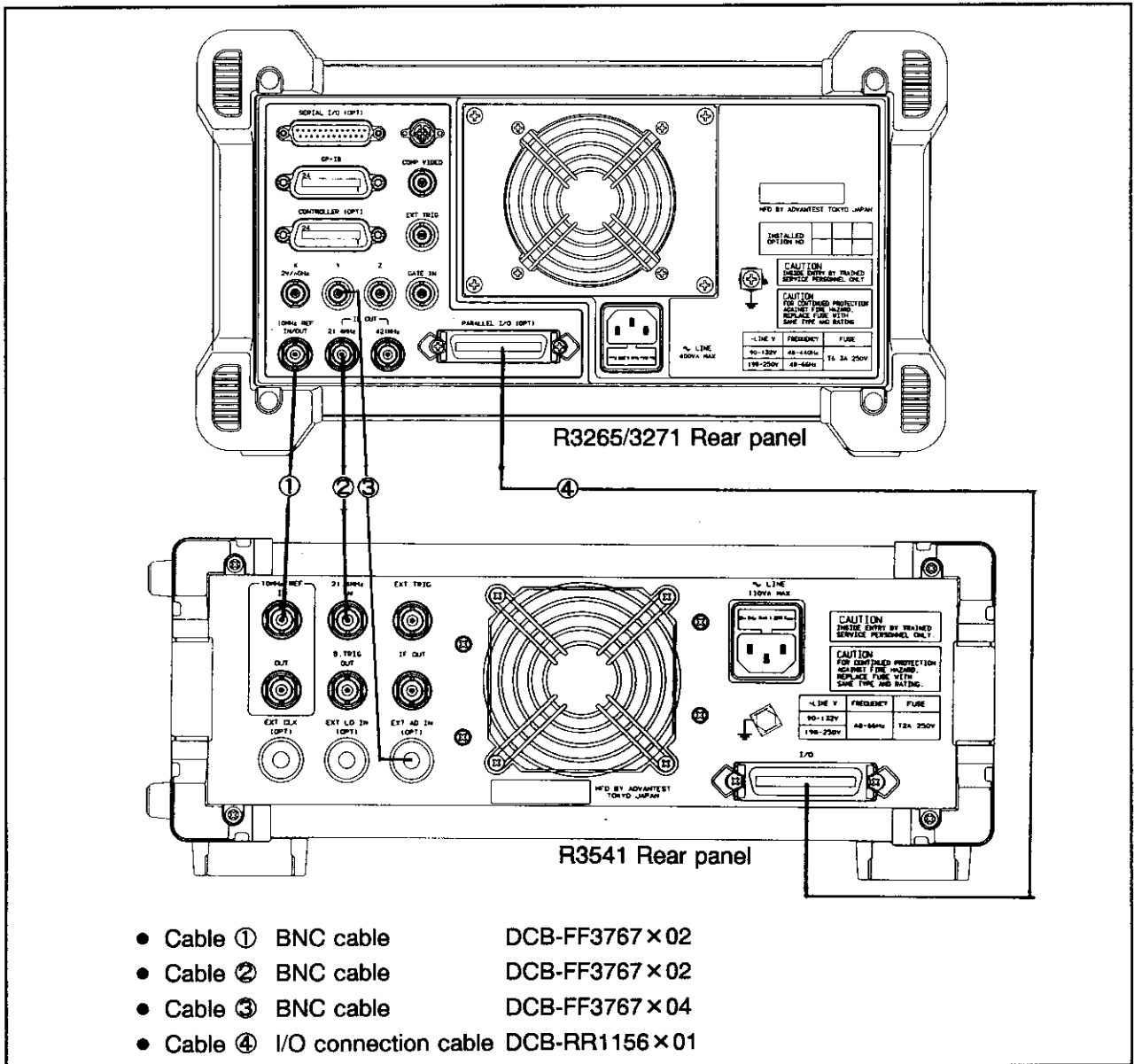


Figure 3-1 Connection to R3265/3271

3.3 Initial Settings

Table 3-2 shows the initial settings to which various settings corresponding to the modulation accuracy measurement unit are to be set.

Table 3-2 Initial Settings

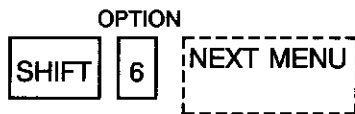
Setting item	Initial setting condition
PDC/NADC measurement	
Measurement type	PDC
Measurement link method	Uplink (mobile station to base station)
Trigger selection	SINGLE
Trigger slope	+ (rising edge)
Synchronization	SYNC (synchronization word)
Measurement mode	1 BU (1 burst)
√Nyquist filter	ON
Automatic level adjustment	ON (perform)
Measurement averaging operation	OFF
PHS measurement	
Unique word type	32 bit (control format)
Measurement link method	Uplink (mobile station to base station)
Trigger selection	SINGLE
Trigger slope	+ (rising edge)
Synchronization	UW (unique word)
Measurement mode	Burst waveform
√Nyquist filter	ON
Automatic level adjustment	ON (perform)
Measurement averaging operation	OFF

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3.4 Reading Out of Modulation Accuracy Measurement Setting Menu

3.4 Reading Out of Modulation Accuracy Measurement Setting Menu

Various keys for modulation accuracy measurement are defined as soft keys which are displayed on the R3265/3271 screen. To display the soft keys on the R3265/3271 screen, press keys in the order below on the R3265/3271.



By pressing the soft key MEAS MOD
ACCURACY on the screen, the menu for modulation accuracy measurement will be displayed as shown in Figure 3-2.

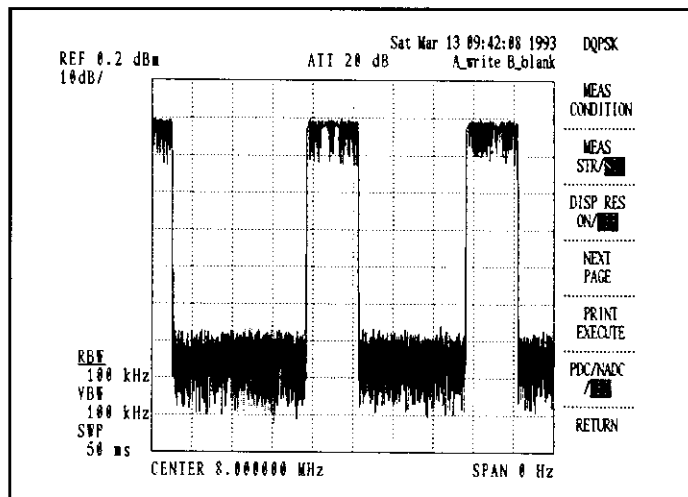
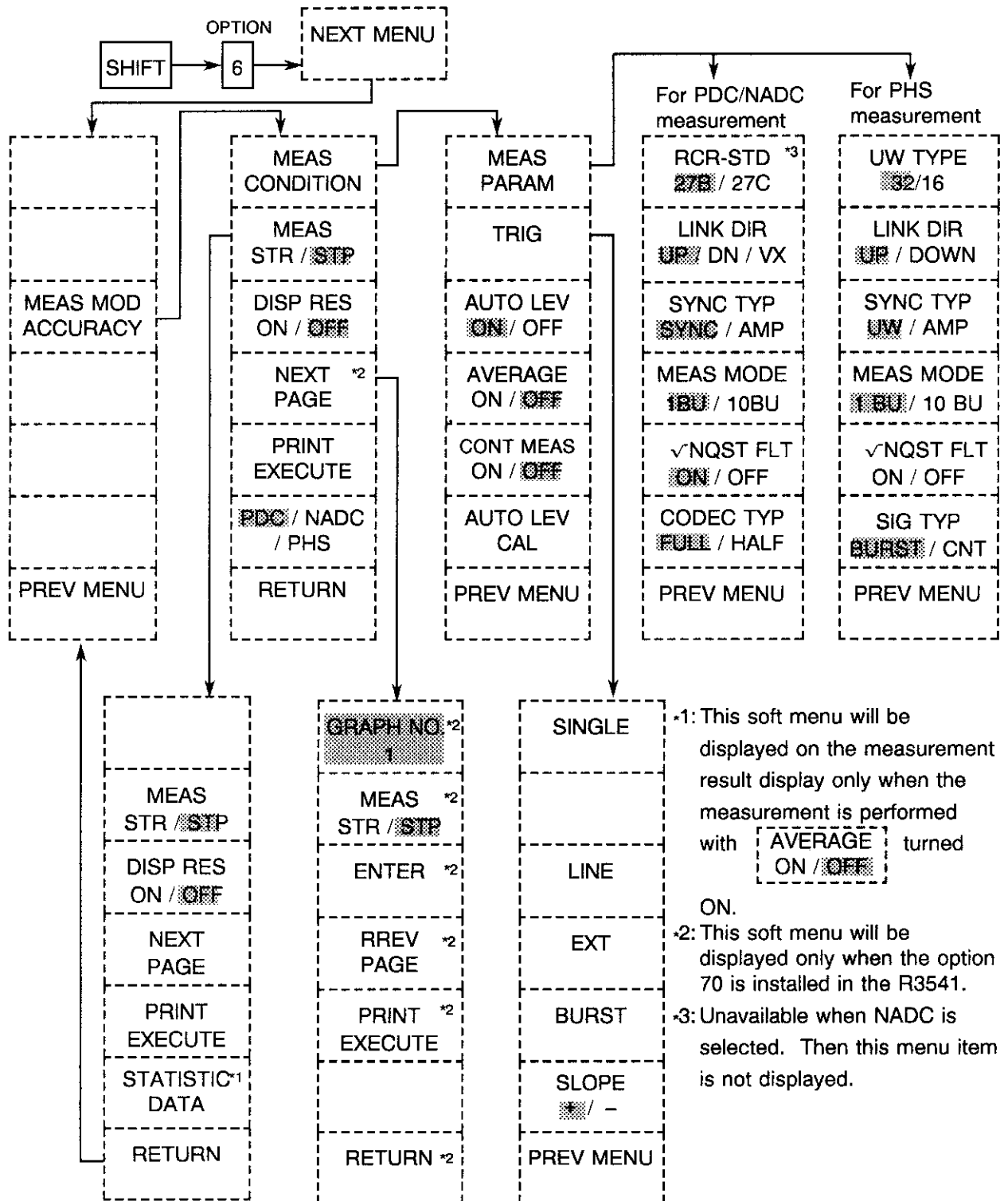


Figure 3-2 Modulation Accuracy Measurement Menu

3.5 Functions of Soft Keys



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3.5 Functions of Soft Keys

MEAS CONDITION : Display key for measurement condition setting menu
 Displays the menu to set various parameters and measurement condition used for modulation accuracy measurement.

MEAS STR/STP : Measurement start key and measurement status display key
 Indicates the start of the modulation accuracy measurement to the R3541 according to the current measurement settings. While the measurement is in progress on the R3541, the "STR" is displayed in reverse. When the measurement terminates or the R3541 is in an idle state, the "STP" is displayed in reverse.

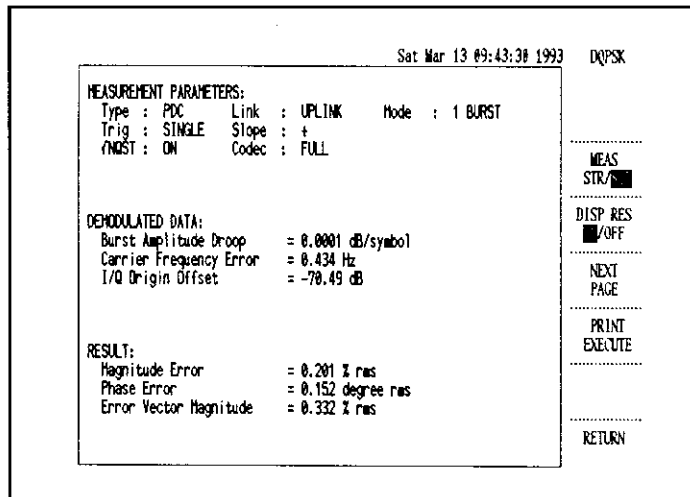


Figure 3-3 Modulation Accuracy Measurement Result

DISP RES ON/OFF : Display key for measurement result
 Selects whether the measurement result is displayed or not on the R3265/3271 screen on the completion of the R3541 measurement which were started by the

MEAS STR/STP

When this key is set to "OFF", the measurement result data returned from the R3541 is not displayed. On the completion of measurement of the R3541, the result will be displayed regardless of the status before the start of the measurement, as shown in Figure 3-3.

If this display is changed back to the normal display of the spectrum analyzer, set this key to "OFF" (see Figure 3-4). When the key is set to "ON", the result data which are finally measured will be displayed.

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3.5 Functions of Soft Keys

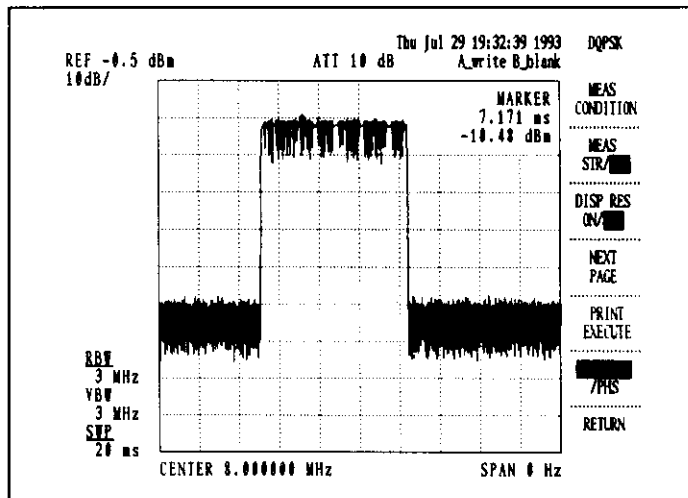


Figure 3-4 DISP RES "OFF" Screen

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: Display key for graph display selection menu
Displays the menu only when the option 70 is installed in the R3541. The key is used to display the graphic functions such as the constellation and the eye pattern of I/Q signal.

PRINT
EXECUTE

: Print out execute key
Executes to print the current information displayed on the screen by using the printer "Think Jet" manufactured by HP Co.

PDC/NADC
/PHS

: Measurement object system selection key
Selects a system to be measured from within PDC (Personal Digital Cellular) system, NADC (North American Dual-Mode Cellular) system and PHS (Personal Handy Phone System).
However, PDC and NADC only are available in R3541A, and PHS only is available in R3541B.

(1) Measurement condition selection menu

**MEAS
PARAM** : Measurement parameter selection key
Displays the menu for setting various parameters concerning the modulation accuracy according to the measurement objects ("PDC/NADC" or "PHS").

TRIG : Display key for trigger selection menu
Displays the trigger menu which condition is selected for the measurement. The following triggers can be selected.

- Burst waveform
- Power supply line
- External

**AUTO LEV
ON/OFF** : Selection key for automatic measurement signal level adjustment function
The key is used to automatically set REF. LEVEL. The signal level will be positioned at approx. -10dB from the upper edge of screen. Selects whether this function is used or not (ON/OFF).

**AVERAGE
ON/OFF** : Selection key for measurement result averaging function
Selects ON/OFF of the function which repeats measurement for the same DUT under the same condition. The result displayed is the average data of the sum of each data obtained from every measurements. In the "ON" state, the number of averages can be entered by numeric keys.

**CONT MEAS
ON/OFF** : Selection key for automatic continuous measurement mode
The measurement is started by setting the **MEAS
STR/STR** to STR and is executed repeatedly until the marker relation key **OFF** is pressed.

The mode that displays the result data is called the automatic continuous measurement mode.

This function is executed when the **CONT MEAS
ON/OFF** is turned on to start the measurement. When the measurement is started in the graph display state in the automatic continuous measurement mode, the corresponding graph is displayed after the measurement.

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3.5 Functions of Soft Keys

**CAL
AUTO LEV** : Level calibration execution key
At AUTO LEV ON, calibrates the 21.4 MHz IF OUT level of R3265/3271 to obtain the optimum level for R3541. Since the INPUT/OUTPUT level of 21.4 MHz IF for R3541 and R3265/3271 is adjusted to the optimum level, calibration is not required. However, if the "Over Range Error" occurs due to changes in the modulation accuracy measurement environment, execute the calibration.

The calibration data after calibration execution is written into the internal EEPROM of R3265/3271.

Since the reference signal for calibration uses the CAL OUT signal of R3265/3271, be sure to connect the INPUT terminal of R3265/3271 and the CAL OUT terminal before calibration execution.

CAUTION

In executing the CAL Auto LEV, the key operation for R3265/3271 is ineffective.

(2) Trigger selection menu

The trigger source for starting the measurement.

SINGLE : Trigger by "MEAS STR/STP" key
The trigger point is the time when pressing "MEAS STR/STP".

LINE : Trigger by power supply line

EXT : Trigger by the external trigger signal
The signal which is connected to the external trigger terminal of the R3541 is used as trigger signal.

BURST : Trigger by the burst signal
The input burst signal is used as trigger signal.

CAUTION

When 10BU is set in MEAS MODE, error occurs at the time of measurement. Don't set 10BU in MEAS MODE.

**SLOPE
+/-** : Selection of trigger signal rising/falling edge.
For all the triggers except for the "SINGLE", it is selectable the rising edge (+) or falling edge (-).

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3.5 Functions of Soft Keys

(3) Measurement parameter selection menu

(a) For PDC/NADC measurement only

- RCR-STD**
27B/27C : Standard signal selection key
Selects the standard of the modulation used in the signal to be measured, in the PDC measurement. In the NADC measurement, however, this menu item is not displayed.
27B : RCR-STD 27B
27C : RCR-STD 27C
- LINK DIR**
UP/DN/VX : Signal type selection key
Selects the signal type (up or down) to be measured. The selection is displayed in reverse.
Displays UP/DOWN when NADC is selected.
UP : Up (burst waveform) (mobile station to base station)
DN/DOWN : Down (continuous waveform) (base station to mobile station)
VX : Burst for VOX
- SYNC TYP**
SYNC/AMP : Symbol synchronization selection key
• If measurement signal have synchronization word, select "SYNC" and enter "SYNC No."
• If measurement signal have not synchronization word or unknown, select "AMP". The selection is displayed in reverse.
- MEAS MODE**
1BU/10BU : Measurement method selection key
Selects from two measurement methods: One method in which only a single burst waveform is measured; the other in which the first 10 symbols of 10 burst waveforms are measured and averaged. The selection is displayed in reverse.
1BU : Only 1 burst is measured.
10BU : 10 bursts are measured and the RMS averaged.
- √NQST FLT**
ON/OFF : Selection key for \sqrt{N} Nyquist filtering operation
The default setting is "ON". (modulation signal is after passing the \sqrt{N} Nyquist filter.) If modulation signal is before passing the \sqrt{N} Nyquist filter, "OFF" should be selected. The selection is displayed in reverse.
- CODEC TYP**
FULL/HALF : CODEC TYPE selection key
Selects the number of multiple for measurement signal. FULL (FULLRATE) should be selected for three multiple and HALF (HALFRATE) for six multiple. The selection is displayed in reverse.

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3.5 Functions of Soft Keys

(b) For PHS measurement only

- UW TYPE**
32/16 : Signal format selection key
Specifies the format in the slot by the type of unique word (number of bits). The selected unique word format is displayed in reverse.
32 : Format for control
16 : Format for communication
- LINK DIR**
UP/DOWN : Signal type selection key
Specifies the type of signal to be measured. The selection is displayed in reverse.
UP : Up (mobile station to base station)
DOWN : Down (base station to mobile station)
- SYNC TYP**
UW/AMP : Synchronization Selection key
If measurement signal have unique word, select "UW". If measurement signal have not unique word or unknown, select "AMP". The selection is displayed in reverse.
- MEAS MODE**
1BU/10BU : Measurement method selection key
Selects from two measurement methods: One method in which only a single burst waveform is measured; the other in which the first 10 symbols of 10 burst waveforms are measured and averaged. The selection is displayed in reverse.
1BU : Only 1 burst is measured.
10BU : 10 burst is measured and the RMS averaged.
- √NQST FLT**
ON/OFF : Selection key for \sqrt{N} Nyquist filtering operation
The default setting is "ON". (modulation signal is after passing the \sqrt{N} Nyquist filter.) If modulation signal is before passing the Nyquist filter, "OFF" should be selected. The selection is displayed in reverse.
- SIG TYP**
BURST/CNT : Measurement signal selection key
Selects if the signal is measured by the burst waveform or continuous waveform. The selection is displayed in reverse.
BURST: Burst waveform
CNT : Continuous waveform

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3.5 Functions of Soft Keys

(4) Measurement data analysis menu

- ENTER** : Analysis start key
Starts the analysis for the item selected by the knob. Pressing the key starts each analysis, and displays the result corresponding data or graph.
- PREV PAGE** : Level change key for measurement data analysis display
Returns the current page on the screen back to the previous page. By using this key, each analysis data screen can be returned back to the analysis item selection menu, or the analysis item selection menu to the modulation accuracy measurement result data screen.
- PRINT EXECUTE** : Execution key for printing the current screen
Executes to print the current information displayed on the screen by using the printer "Think Jet" manufactured by HP Co.

3.6 Procedures for Modulation Accuracy Measurement

This section describes the easy procedure for modulation accuracy measurement.

Procedure

- ① Power ON the R3541 and R3265/3271.

- ② Press the keys in order of **SHIFT**, **OPTION**, **6**, **NEXT MENU** and **MEAS MOD ACCURACY** to display the modulation accuracy measurement menu.

- ③ Press the **MEAS CONDITION** key to select the measurement condition of "TRIG", "AUTO LEVEL ON/OFF", and "AVERAGE". And then, press the **MEAS PARAM** key, set various measurement parameters.

- ④ Press the **PREV MENU** key to return to the modulation accuracy measurement menu (where the "MEAS STR/STP" is displayed) and then press the **MEAS STR/STP** to start the measurement. After starting the measurement, the screen below will be displayed on the R3265/3271.

NOTE
Modulation Accuracy Measuring, Now Wait a Moment, Please!!

- ⑤ On the termination of modulation accuracy measurement by the R3541, the measurement result will be displayed on the R3265/3271 screen. The soft keys for measurement parameter menu are not displayed on the measurement result screen. If the parameter setting is to be changed on this stage, press the **DISP RES ON/OFF** key to return to the normal screen, and reset the screen. Note that since the result data will be kept until the next measurement is executed. The data kept can be displayed any number of times by pressing the **DISP RES ON/OFF** to "ON".

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3.6 Procedures for Modulation Accuracy Measurement

CAUTION

The result data is kept. However, if the result data display is returned to "ON" after the setting is changed with the result data display set to "OFF", the parameter annexed to the result data is displayed indicating the setting changed.

The format of the result data display depends on whether the averaging operation is set to "ON" or "OFF".

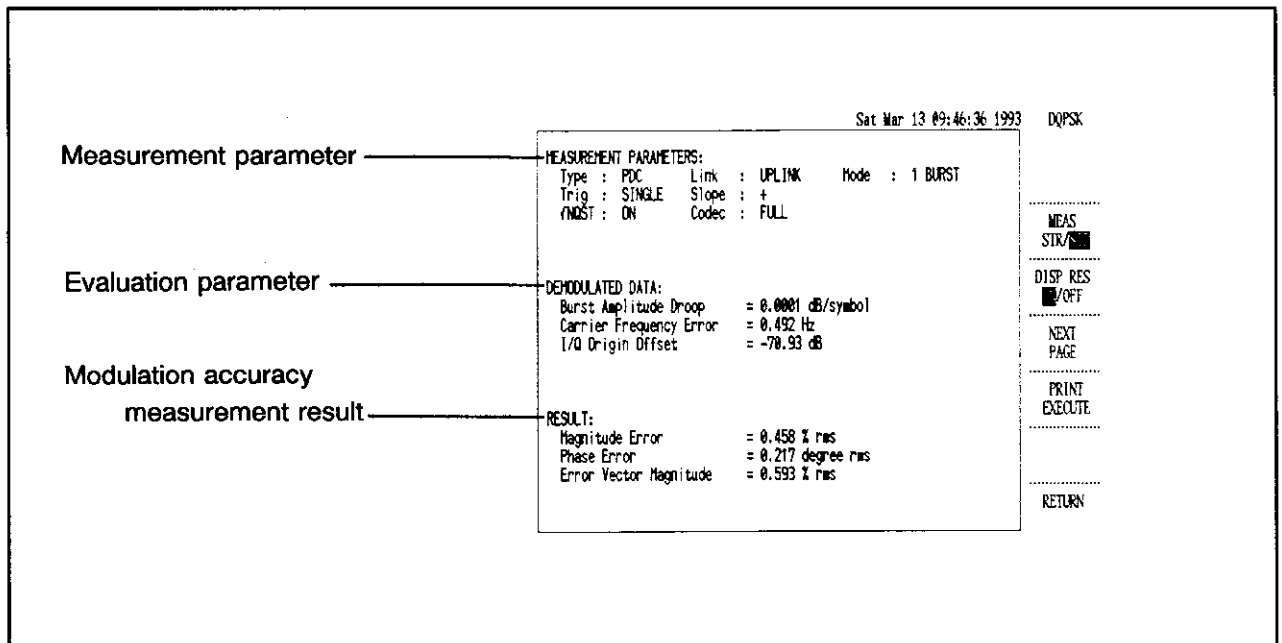


Figure 3-5 Measurement Result Screen (without Averaging, for 1 burst)

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3.6 Procedures for Modulation Accuracy Measurement

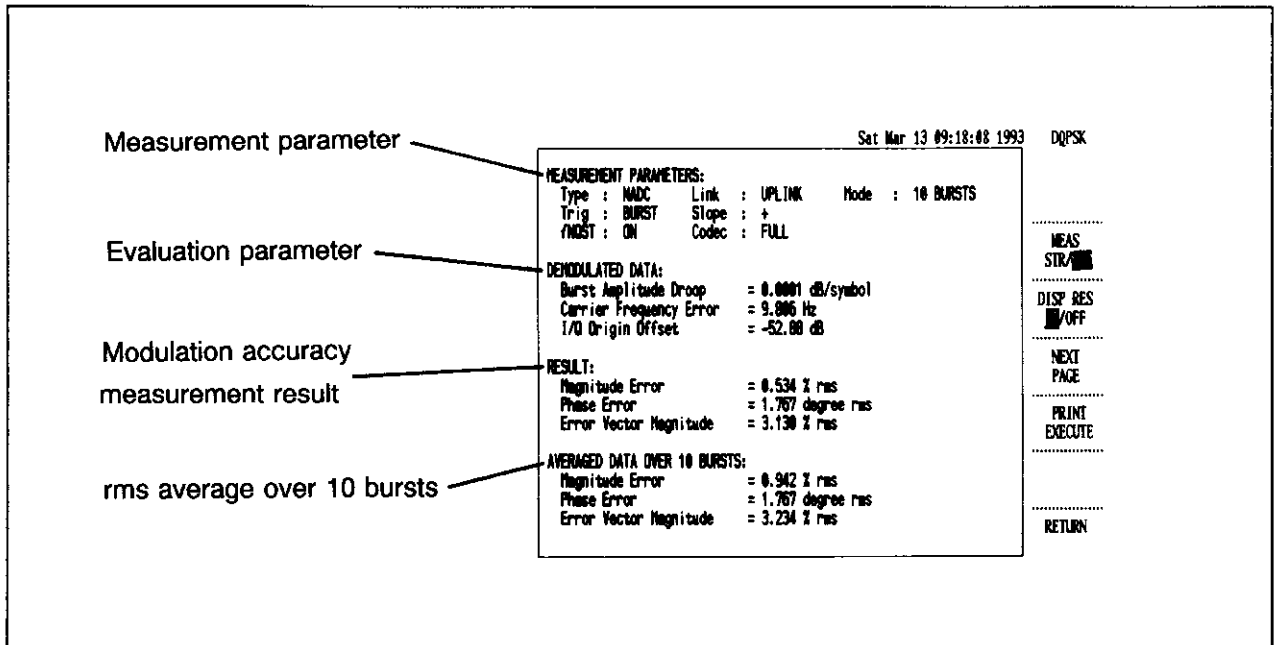


Figure 3-6 Measurement Result Screen (without Averaging, for 10 bursts)

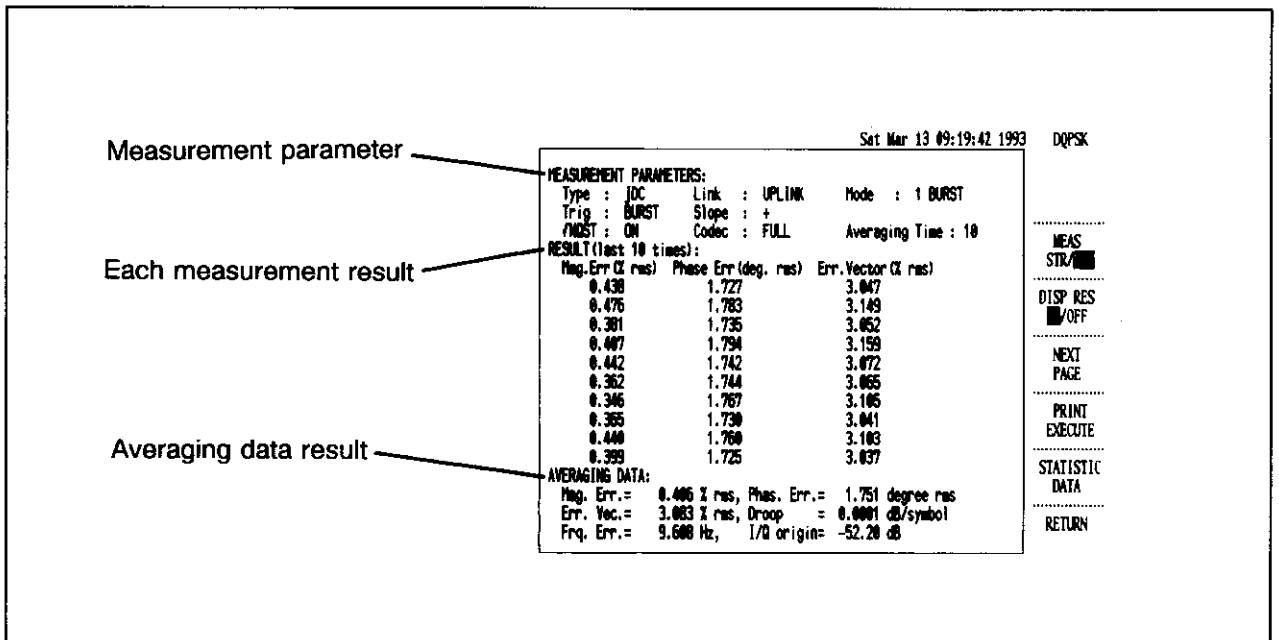


Figure 3-7 Measurement Result Screen (with Averaging, for both 1/10 bursts)

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3.6 Procedures for Modulation Accuracy Measurement

The **STATISTIC DATA** menu appears on the average result screen.

By pressing the menu, the statistic data will be displayed as shown in Figure 3-8.

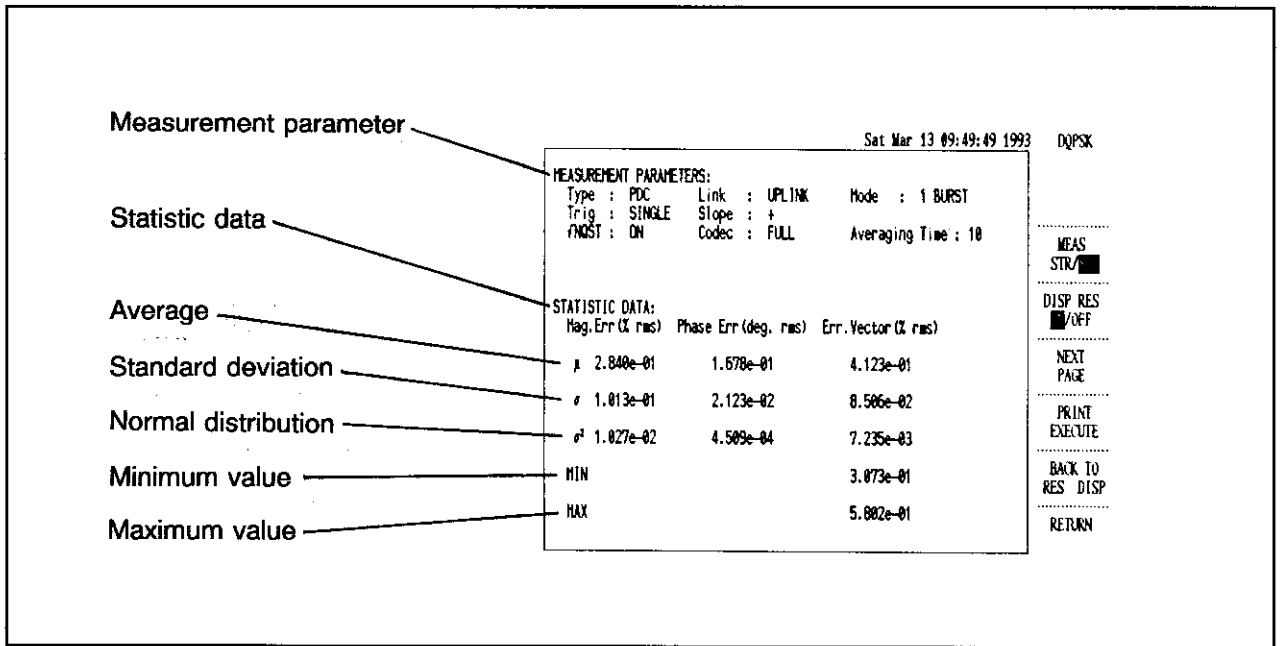
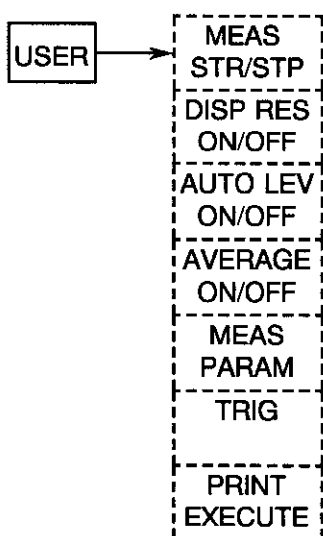


Figure 3-8 Statistic Data Measurement Result Screen (with Averaging, for both 1/10 bursts)

3.7 Use of User Key

When performing the modulation accuracy measurement, the following definitions for measurement menu can be given to the **USER** key for easier operation.



(1) How to define

- ① Press the **SHIFT** and **USER** to start the definition function.
- ② Press the software menu **GROUP ACTIVE** and then **USER** for definition.
- ③ If there is no definition on **USER**, the screen shown in Figure 3-9 will be displayed.

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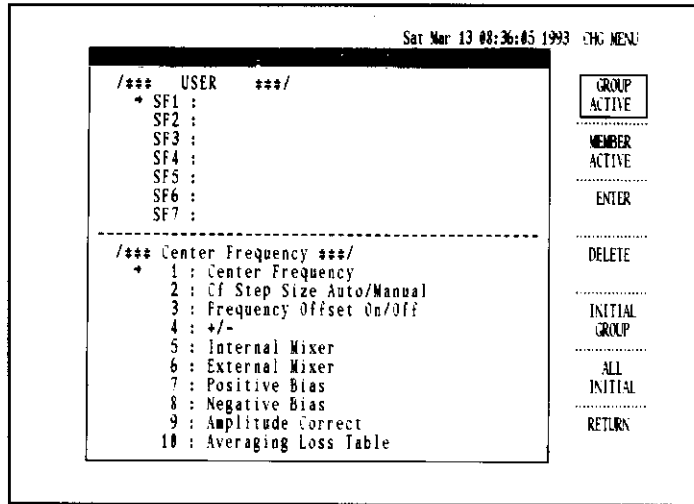


Figure 3-9 User Define Screen

- ④ Using the data knob, set "→" to the soft key No.1 of USER.

- ⑤ Press the MEMBER ACTIVE on the screen and then press the SHIFT and 6 to call the option function.

- ⑥ Using the data knob, set "→" to "MEASUREMENT START" and press the ENTER.

- ⑦ Press the GROUP ACTIVE and then press the MEMBER ACTIVE while setting "→" to SF2. Press the ENTER while setting "→" to "Display Results on/off".

- ⑧ Use the same procedure for definition of SF2 to SF7. (see Figure 3-10)

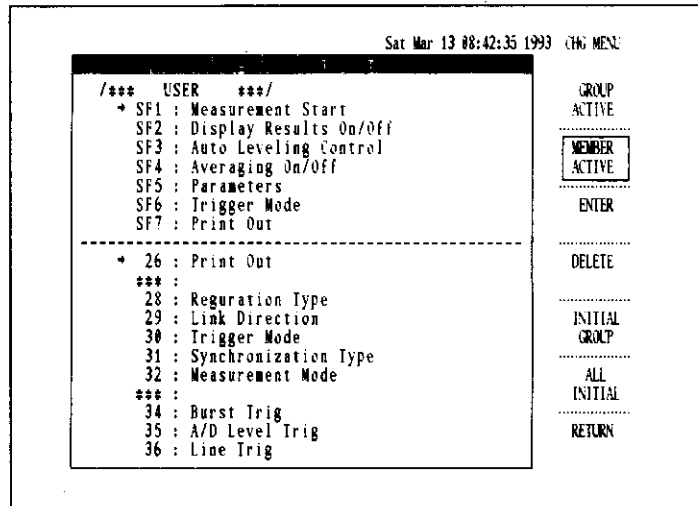


Figure 3-10 Definition Completion Screen

- ⑨ Press the RETURN key to exit the definition key operation.

Here, the definitions of the modulation accuracy measurement menu have been given to

the USER . When the USER key is pressed, the defined menu will be displayed on the screen.

(2) Store and Load by memory card

When the defined menu is stored in the memory card, perform the following procedures:

- ① Insert the memory card into the R3265/3271.

- ② Press the SHIFT , MEM CD 4 , and STORE
MENU to store the menu into the memory card.

- ③ Press the SHIFT , MEM CD 4 and LOAD
MENU to call the menu from the memory card.

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Table 3-3 Definition Menu List for Modulation Accuracy Measurement

DEFINE MEMBER menu	Soft key menu
21: Modulation Accuracy	MEAS MOD ACCURACY
22: Parameters	MEAS PARAM
23: Measurement Start	MEAS STR/STOP
24: Display Results	DISP RES ON/OFF
25: Display Next Page	NEXT PAGE
26: Print Out	PRINT EXECUTE
28: RCR-STD 27B/27C	RCR-STD 27B/27C
29: Link Direction	LINK DIR UP/DN/VX (PDC) LINK DIR UP/DOWN (NADC)
30: Trigger Mode	TRIG
31: Synchronization Type	SYNC TYP SYNC/AMP
32: Measurement Mode	MEAS MODE 1BU/10BU
34: Burst Trig	BURST
36: Line Trig	LINE
37: External Trig	EXT
38: Single Trig	SINGLE
39: Trigger Slope	SLOPE +/-
44: Measurement Condition	MEAS CONDITION
45: PDC/NADC/PHS	PDC/NADC/PHS
46: Auto Leveling Control	AUTO LEV ON/OFF
47: Averaging On/Off	AVERAGE ON/OFF
48: Root Nyquist Filter On/Off	✓ NQST FLT ON/OFF (R3541A/C)
51: Display Previous Page	PREV PAGE
52: Codec Type	CODEC TYP FULL/HALF (R3541A/C)
53: Unique Ward Type	UW TYPE 32/16 (R3541B/C)
54: Link Dir (PHS)	LINK DIR UP/DOWN (R3541B/C)
55: Sync Type (PHS)	SYNC TYPE UW/AMP (R3541B/C)
56: Meas Mode (PHS)	SIG TYP BURST/CNT (R3541B/C)
57: Nqst Filter (PHS)	✓ NQST FLT ON/OFF (R3541B/C)

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3.8 Example of Measurement

3.8 Example of Measurement

3.8.1 PDC/NADC Modulation Accuracy Measurement (only for R3541A/C)

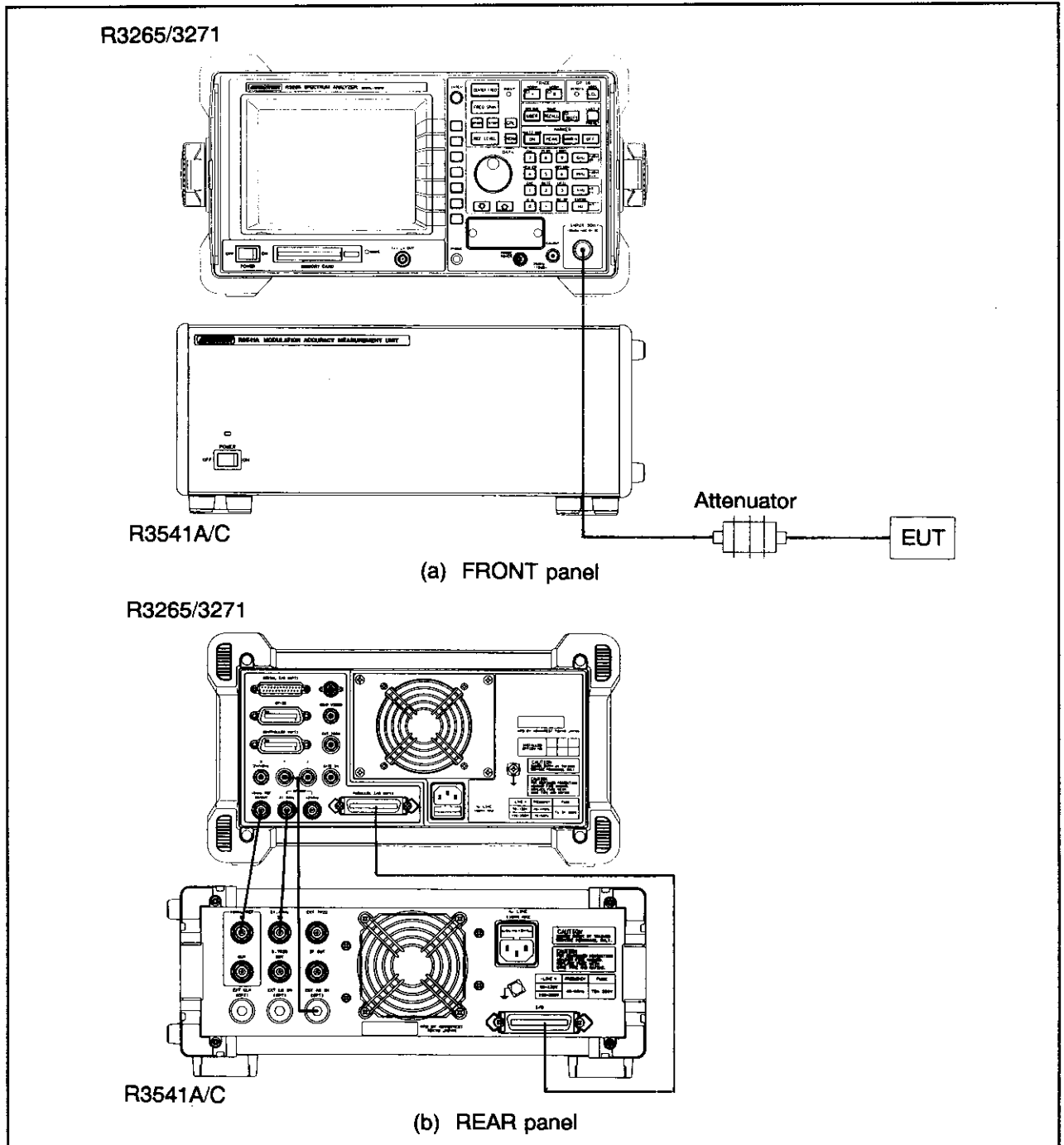


Figure 3-11 Connection of PDC/NADC Modulation Accuracy Measurement

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3.8 Example of Measurement

- ① Connect the unit referring to Figure 3-11.
- ② Set the center frequency of the R3265/3271 to the signal frequency (carrier frequency) and the frequency span to the ZERO SPAN.

Press the **CENTER FREQ** , enter frequency by numeric keys, and press the unit key.

Next, press the keys in order of the **FREQ SPAN** and the **ZERO SPAN**.

- ③ Set the resolution bandwidth (RBW) to 3MHz.

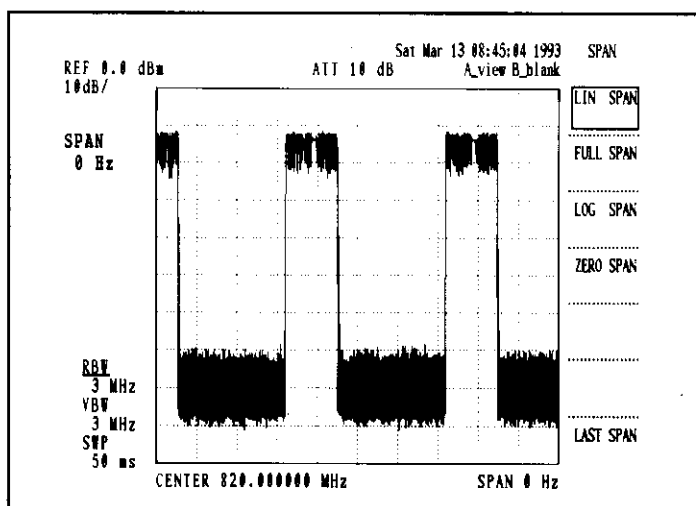


Figure 3-12 Resolution Bandwidth of 3MHz (JDC/NADC)

Press the keys in order of the **CPL** , **RBW** , **3** , and **MHz** .

CAUTION

When the frequency of 455kHz is used for evaluation, set the RBW to 100kHz. If the resolution bandwidth (RBW) is reduced, the value of the modulation accuracy deteriorates. In this case, the measurement error of the modulation accuracy is 1% (Typ). The unit cannot be used if the RBW is below 100kHz.

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3.8 Example of Measurement

- ④ Enter the modulation accuracy measurement mode.

Press the keys in order of SHIFT, 6, OPTION NEXT MENU and MEAS MOD ACCURACY.

- ⑤ Set the measurement parameters.

Set the PDC/NADC /PHS to "PDC" or "NADC".

- ⑥ Select the "UP or DN or VX" by pressing the MEAS CONDITION, MEAS PARAM, LINK DIR UP/DN/VX key.

UP : Mobile station

DN/DOWN : Base station

VX : BURST for VOX

Note : VX can be set only at selection of PDC.

- ⑦ Select the "SYNC or AMP" by pressing the SYNC TYP SYNC/AMP key.

SYNC : When measuring the slot modulation accuracy of the specified synchronization word.

AMP : Select the input signal have not synchronous word or unknown synchronous word.

For the synchronization word, set the SYNC TYP SYNC/AMP to "SYNC" and select any one of 1 to

12 (PDC) or 1 to 6 (NADC) using the numeric keys, data knob, or step key.

<PDC>	
1 : 87A4B	2 : 9D236
3 : 81D75	4 : A94EA
5 : 5164C	6 : 4D9DE
7 : 31BAF	8 : 1E56F
9 : E712C	10: FBC1F
11: 8279E	12: 98908

<NADC>	
1 : A91DE4A	2 : A9D127A
3 : C7E3COC	4 : 342C3F3
5 : 13E23D1	6 : DC2EC1D

REFERENCE→

- MEAS MODE 1BU/10BU** : 10 BU (10 bursts) mode is the measurement method defined by the NADC standard (IS-55).
- √ NQST FLT ON/OFF** : Normally sets to "ON" for measuring the transmission characteristics. If the IF signal is evaluated at the receive end after it passed through the √ Nyquist filter, the measurement is active when the key is set to "OFF" and allows the filter characteristics to be evaluated.
- CODEC TYPE FULL/HALF** : Selects the "FULL" if the measurement object is full rate (3CH), and select the "HALF" for half rate (6CH).

ⓑ Setting of TRIG

Press the **PREV MENU** and **TRIG** to set the trigger mode.

REFERENCE→

- SINGLE** : On pressing the **MEAS STR/STP** key, the measurement is started.
- LINE** : After pressing the **MEAS STR/STP** key, the power supply line is triggered and the measurement is started.
- EXT** : After pressing the **MEAS STR/STP** key, the measurement is started by the trigger signal which is entered in the external trigger terminal (on the rear panel).
- BURST** : The start of measurement is triggered by the level of the input signal. This mode is convenient for the measurement of mobile station (burst waveform) and modulation accuracy measurement immediately after transmission ON.

REFERENCE→

SLOPE +/- : Selects when triggering is performed at rising or falling edge of the signal in the trigger mode of **LINE** and **EXT**.

⑨ Press the **PREV MENU**.

REFERENCE→

AUTO LEV ON/OFF : When setting to "ON", the R3265/3271 detects the input level after triggering, and start the measurement while the "REF LEVEL" is set so that the "21.4MHz IF out" is automatically set to the optimum value.

Note: When the mode is set to "ON", set the **INPUT ATT** of **CPL** to "AUTO".

When the mode is set to "OFF", the measurement is started after triggering. The function is used immediately after transmission ON or power ON of the transmitter or input level varies a little.

Note: When the mode is set to "OFF", the **REF LEVEL** is set so that the peak of the signal level is positioned at the point approx. 10dB below the screen REF level (uppermost reading).

AVERAGE ON/OFF : "OFF"; Displays the result every time the **MEAS STR/STP** is pressed.

"ON" ; Performs the measurement specified number of times and displays the data of last 10 times and its average.

In the **STATISTIC DATA** menu which is displayed after the average

measurement, the statistic data of maximum value, minimum value, standard deviation, and normal distribution is displayed.

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3.8 Example of Measurement

- ⑩ Press the PREV MENU, and next the MEAS STR/STP to start the measurement.

The measurement result will be displayed on the R3265/3271 screen.

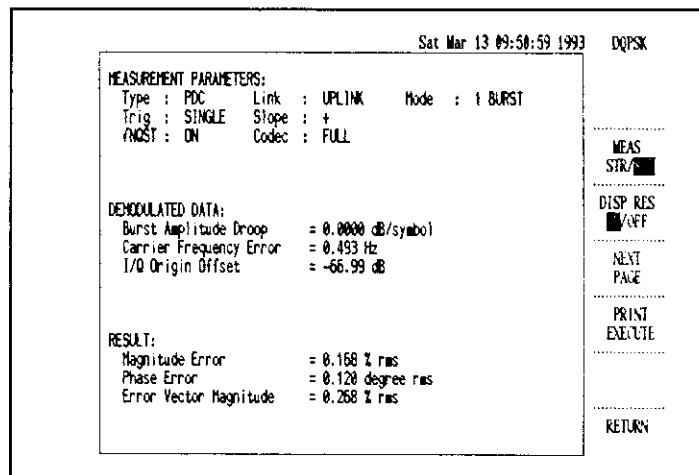


Figure 3-13 Measurement Result Screen for PDC

If the modulation accuracy cannot be measured because of great frequency deviation (more than $\pm 1.4\text{kHz}$), the R3265/3271 measures the carrier frequency (F_c) using the function of occupied bandwidth (OBW) of the R3265/3271. Since the occupied bandwidth is used as the center frequency, the function allows the modulation accuracy measurement. In this case, the value of the carrier frequency is:

$$F_c \text{ (measured value by OBW)} + \text{frequency error (measured value by R3541)}$$

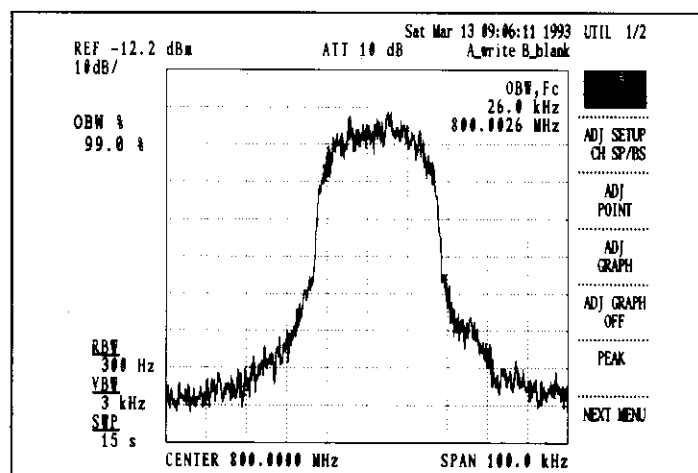


Figure 3-14 Carrier Frequency Measurement by OBW Function (PDC/NADC)

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3.8 Example of Measurement

3.8.2 PHS Modulation Accuracy Measurement (only for R3541B/C)

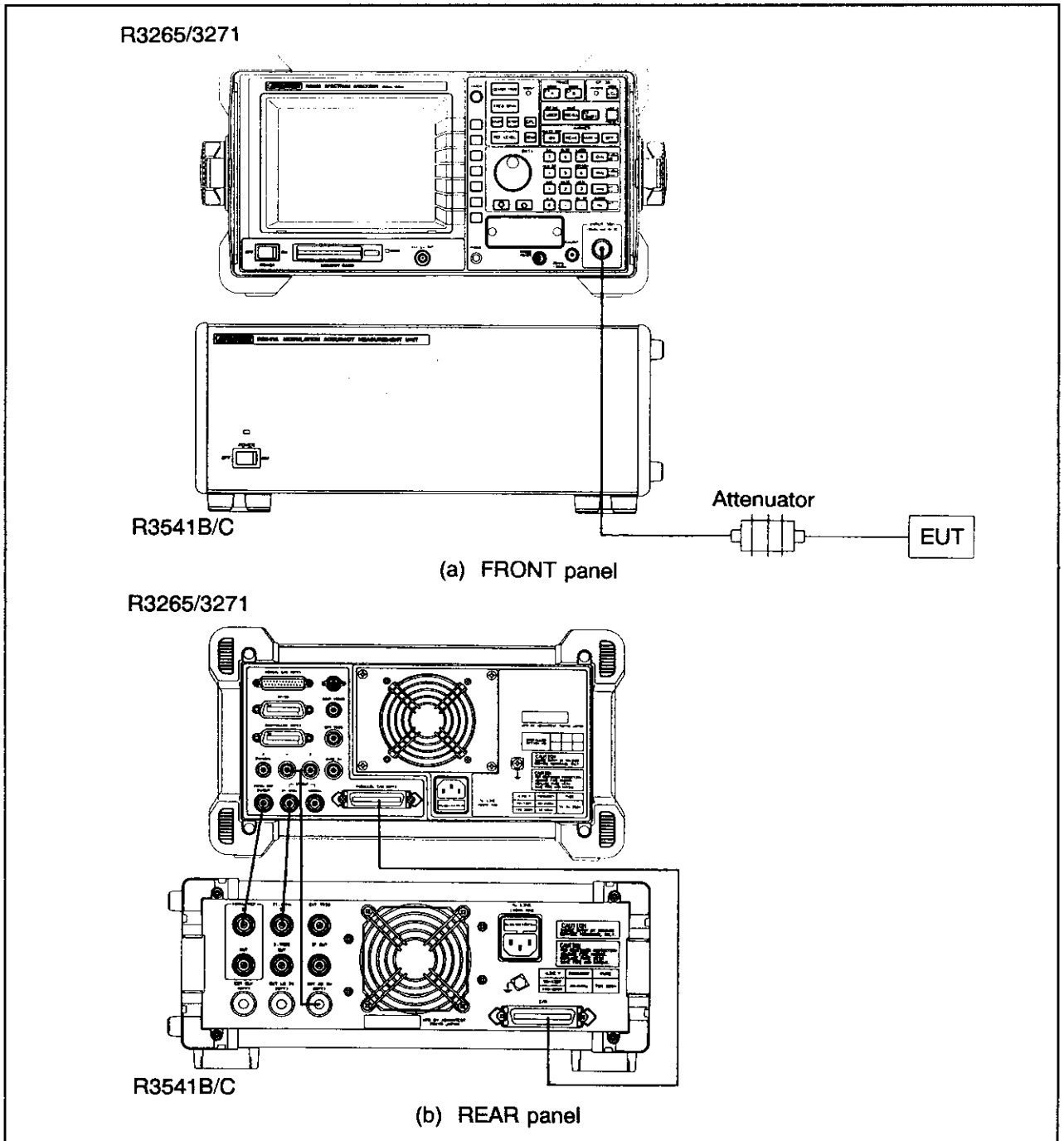


Figure 3-15 Connection of PHS Modulation Accuracy Measurement

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3.8 Example of Measurement

- ① Connect the unit referring to Figure 3-11.
- ② Set the center frequency of the R3265/3271 to the signal frequency (carrier frequency) and the frequency span to the ZERO SPAN.

Press the CENTER FREQ, enter frequency by numeric keys, and press the unit key.

Next, press the keys in order of FREQ SPAN and ZERO SPAN

- ③ Set the resolution bandwidth (RBW) to 3MHz.

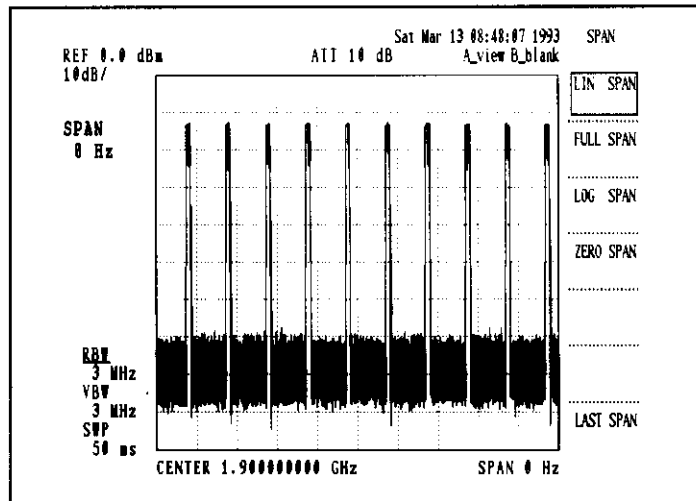


Figure 3-16 Resolution Bandwidth of 3MHz (PHS)

Press the keys in order of the CPL, RBW, 3, and MHz.

CAUTION

When the frequency of 10.7kHz is used for evaluation, set the RBW to 1MHz. If the resolution bandwidth (RBW) is reduced, the value of the modulation accuracy deteriorates. In this case, the measurement error of the modulation accuracy is 1.5% (Typ). The unit cannot be used if the RBW is below 100kHz.

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3.8 Example of Measurement

- ④ Enter the modulation accuracy measurement mode.

Press the keys in order of SHIFT, 6, OPTION
NEXT
MENU, and MEAS MOD
ACCURACY.

- ⑤ Set the measurement parameters.

Press the keys in order of MEAS
CONDITION and MEAS
PARAM.

- ⑥ Set the "UP or DOWN" by pressing the LINK DIR
UP/DOWN key.

UP : Mobile station

DOWN : Base station

- ⑦ Set the "UM or AMP" by pressing the SYSNC TYP
UW/AMP.

UW : When measuring the slot modulation accuracy of the specified unique word (UM).

AMP : Select the input signal have not unique word or unknown unique word.

For unique word, set the SYSNC TYP
UW/AMP to "UW" and select 32 bits or 16 bits using the

UW TYPE
32/16

REFERENCE →

- SIG TYP
BURST/CNT : Selects the "BURST" for measuring the normal burst measurement and the "CNT" for continuous transmission mode.
- √ NQST FLT
ON/OFF : Normally sets to "ON" for measuring the transmission characteristics. If the IF signal is evaluated at the receive end after it passed through the $\sqrt{}$ Nyquist filter, the measurement is active when the key is set to "OFF" and allows the filter characteristics to be evaluated.

④ Setting of TRIG

Press the **PREV MENU** and **TRIG** to set the trigger mode.

REFERENCE→

- SINGLE** : On pressing the **MEAS STR/STP**, the measurement is started.
- LINE** : After pressing the **MEAS STR/STP**, the power supply line is triggered and the measurement is started.
- EXT** : After pressing the **MEAS STR/STP**, the measurement is started by the trigger signal which is entered in the external trigger terminal on the back panel.
- BURST** : The start of measurement is triggered by the level of the input signal. This function is convenient for the measurement of mobile station (burst waveform) and modulation accuracy measurement immediately after transmission ON.
- SLOPE +/-** : Selects when triggering is performed at rising or falling edge of the signal in the trigger mode of **LINE** and **EXT**.

⑨ Press the **PREV MENU**

REFERENCE→

AUTO LEV ON/OFF

: When setting to "OFF", the R3265/3271 detects the input level after triggering, and start the measurement while the "REF LEVEL" is set so that the "21.4MHz IF out" is automatically set to the optimum value.

Note: When the mode is set to "ON", set the **INPUT ATT** of **CPL** to "AUTO".

When the mode is set "OFF", the measurement is started after triggering. The function is used immediately after transmission ON or power ON of the transmitter or input level varies a little.

Note: When the key is set to "OFF", the **REF LEVEL** is set so that the peak of the signal level is positioned at the point approx. 10dB below the screen REF level (uppermost reading).

AVERAGE ON/OFF

: "OFF"; Displays the result every time the **MEAS STR/STP** is pressed.

"ON" : Performs the measurement specified number of times and displays the data of last 10 times and its average.

In the **STATISTIC DATA** menu which is displayed after the average

measurement, statistic data of maximum value, minimum value, standard deviation, and normal distribution is displayed.

⑩ Press the **PREV MENU**, and next the **MEAS STR/STP** to start the measurement.

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3.8 Example of Measurement

The measurement result will be displayed on the R3265/3271 screen.

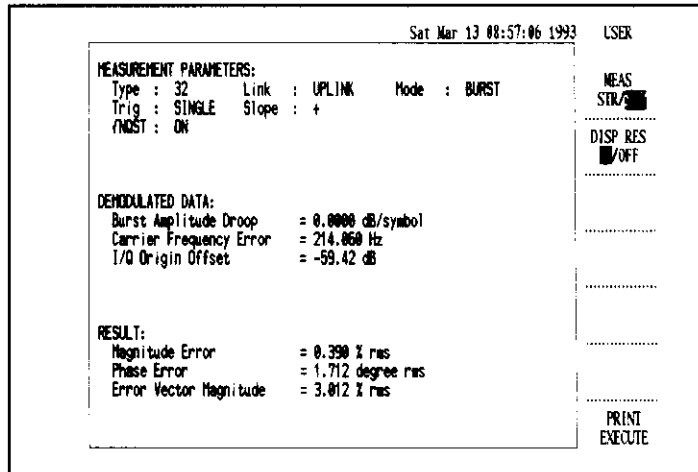


Figure 3-17 Measurement Result Screen for PHS

If the modulation accuracy cannot be measured because of great frequency deviation (more than ± 15 kHz), the R3265/3271 measures the carrier frequency (Fc) using the function of occupied bandwidth (OBW) of the R3265/3271. Since the occupied bandwidth is used as the center frequency, the function allows the modulation accuracy measurement.

In this case, the value of the carrier frequency is:

$$F_c \text{ (measured value by OBW) } + \text{ frequency error (measured value by R3541)}$$

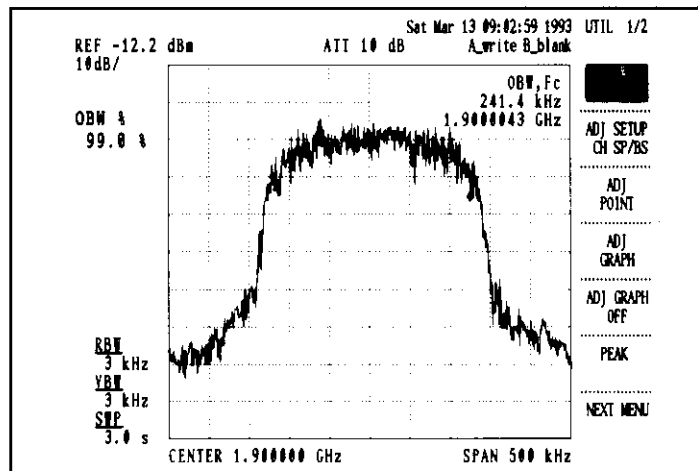


Figure 3-18 Carrier Frequency Measurement by OBW Function (PHS)

4. MEASUREMENT DATA ANALYSIS WITH GRAPH (OPTION 70 INSTALLED)

(1) Outline

The Option 70 is the function to display the demodulation data for the data measured after the termination of the modulation accuracy measurement, I/Q signal constellation, or "Error Vector Magnitude" or "Magnitude" value for each symbol on the R3265/3271 screen in the graph format. Since the detailed data can be examined for each symbol, this function allows easy analysis for the causes of errors. The following are the functions of the measurement data analysis options:

- | | | |
|---|---|---------|
| ① | Demodulation data display | |
| ② | Synchronization word display | |
| ③ | EYE diagram of I channel | (graph) |
| ④ | EYE diagram of Q channel | (graph) |
| ⑤ | Constellation using I/Q channel data | (graph) |
| ⑥ | Magnitude of each symbol | (graph) |
| ⑦ | Phase of each symbol | (graph) |
| ⑧ | Transition of Magnitude Error and Droop for each symbol | (graph) |
| ⑨ | Magnitude Error for each symbol | (graph) |
| ⑩ | Transition of Phase Error and Frequency Error for each symbol | (graph) |
| ⑪ | Phase Error for each symbol | (graph) |
| ⑫ | Error Vector Magnitude for each symbol | (graph) |
| ⑬ | Frequency analysis near to IF frequency (by FFT) | (graph) |
| ⑭ | Frequency analysis of Magnitude Error (by FFT) | (graph) |
| ⑮ | Frequency analysis of Phase Error (by FFT) | (graph) |
| ⑯ | Frequency analysis of Error Vector (by FFT) | (graph) |
| ⑰ | Burst transmission transient response characteristic analysis | (graph) |
| ⑱ | Burst transmission timing analysis | (graph) |

To perform these functions above, display specific (exclusive) menu in the following procedures to select the function.

Operating procedure:

- ① Press the keys in the order **SHIFT**, **6**, **NEXT MENU**, **MEAS MOD ACCURACY** and **NEXT PAGE** to display the specific (exclusive) menu as shown in Figure 4-1.

Note : The **NEXT PAGE** is displayed only when the option 70 is installed in the R3541.

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4. Measurement Data Analysis With Graph (Option 70 Installed)

- ② Use numeric keys and data knob to select the desired function.

Example: Graph display screen of 7 "Phase of signal"

- (1) When numeric keys are used for direct selection

ENTER

Press the 7 and Hz in order to display the graph display screen of "Phase of signal".

- (2) When data knob is used for selection

By rotating the data knob, move the arrow mark (→) to the item "7". Then, press the

ENTER

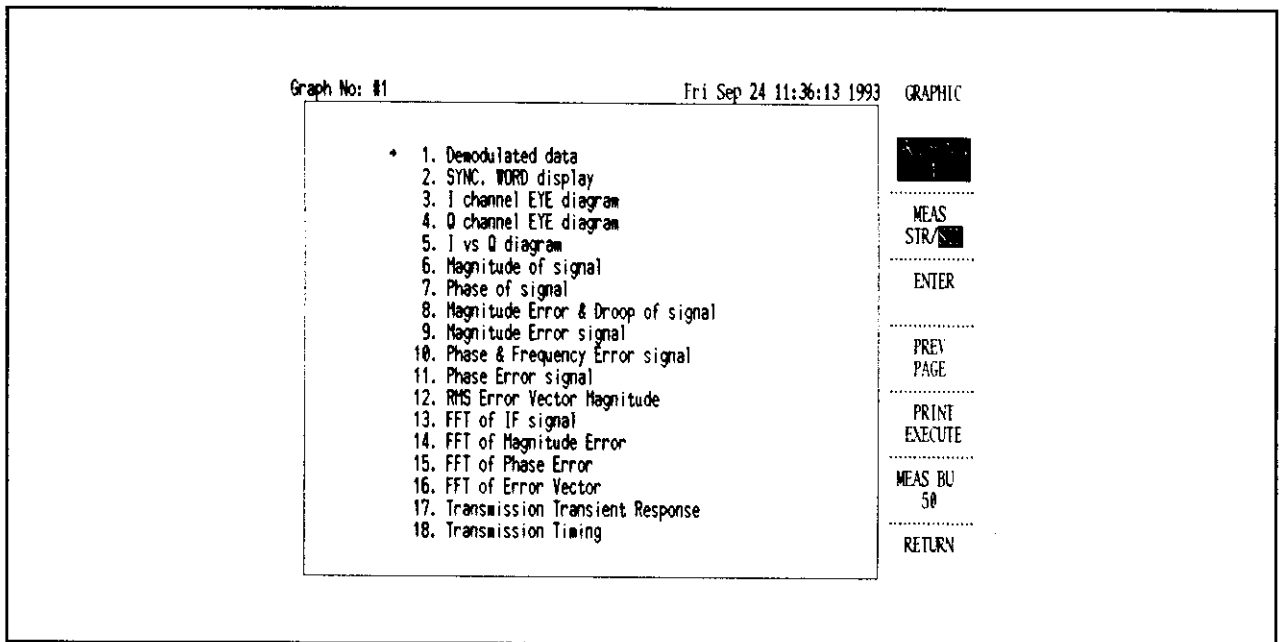


Figure 4-1 Measurement Data Analysis Menu

In the samples for each display described on the section 4.1 or later, all the data is graph-displayed data of the input modulation signals to which root Nyquist filter processing is made except for the frequency analysis of IF signal and burst transmission transient response characteristic analysis. If the root Nyquist filter setting menu is set to "OFF", data will be displayed as the input modulation signal.

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4. Measurement Data Analysis With Graph (Option 70 Installed)

(2) Graph-exclusive soft keys operation

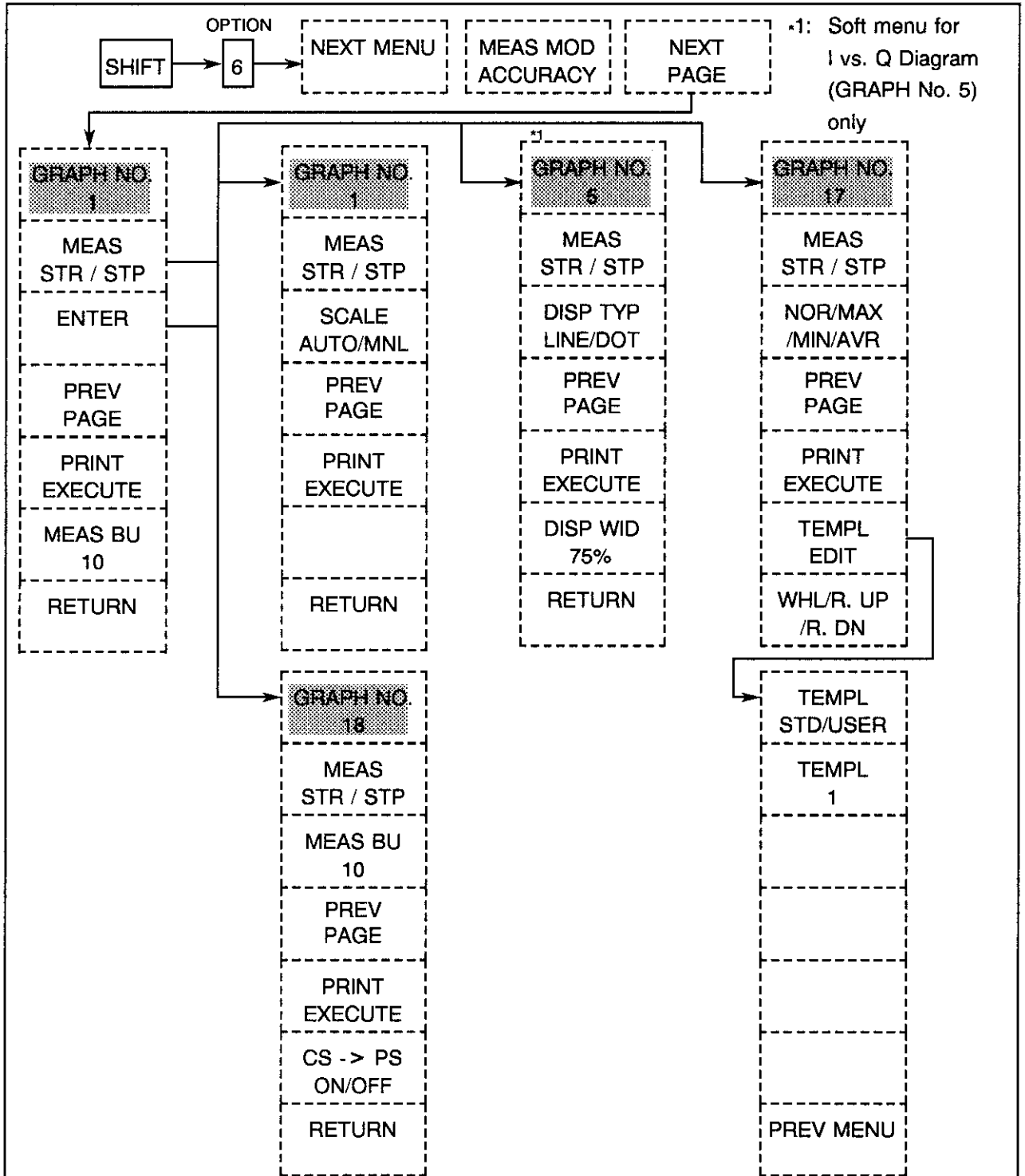


Figure 4-2 Graph-Exclusive Soft Menu

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4. Measurement Data Analysis With Graph (Option 70 Installed)

GRAPH NO.
1 : Graph display selection key

The desired graph is displayed by specifying the pertinent number on the selection menu. The selected graph is displayed by pressing the numeric keys and **ENTER** when the entire screen lighting is inverted. Also, the **Hz** operation can start from the state that the graph is displayed.

MEAS STR / STP : Measurement start and measurement state display key

This function is the same as that of the normal "Measurement start and measurement state display key". However, when the key is pressed in the graph display state, the modulation accuracy measurement and graph display are executed continuously. This enables changes in the measurement result from the graph to be monitored. Furthermore, the result can be expressed as a numeric value by returning from the graph screen to the numeric value data result screen.

CAUTION

On the burst transmission transient response characteristic analysis graph and burst transmission timing analysis graph, the modulation accuracy is not measured. Accordingly the numeric data displayed on the data result screen immediately after the burst transmission transient response characteristic analysis graph display is not updated. Also when displaying the burst transmission transient response characteristic analysis graph, the error message "Not Measured" to other graphs is not displayed only by pressing this key to measure again after specifying the graph number by using the "ENTRY" key or knob.

ENTER : Graph display execution key

Executes the graph display selected using the data knob ("→" position).

PREV PAGE : Level change key for measurement data analysis display

Changes the screen to the previous page.

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4. Measurement Data Analysis With Graph (Option 70 Installed)

PRINT
EXECUTE : Execution key for printing the current screen
Prints the current information displayed on the screen by using the printer "Think Jet" manufactured by HP Co.

SCALE
AUTO/MNL : Vertical axis scale control key for graph
For the calculation of the maximum or the minimum value of the vertical axis of the graph, selects either automatic (AUTO: auto) or user-specified value (MNL: manual).
If AUTO is selected, adjust the scale so that the data of the maximum and minimum values which are displayed as parts of the graph are inside the graph.
If MNL is selected, the current manually set default value is displayed on the upper left of the screen. Enter the maximum or minimum value for the
ENTER
Hz to display the scale again.

However, in some cases a scale different from the maximum and the minimum values set using the manual scale is displayed. Since the scale in the vertical axis is displayed with the appropriate unit, the entered value is adjusted before use.

This key is not shown in the following graphs.

1. Demodulated data
2. SYNC. WORD display
3. I channel EYE diagram
4. Q channel EYE diagram
5. I vs. Q diagram
17. Transmission Transient Response
18. Transmission Timing

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4. Measurement Data Analysis With Graph (Option 70 Installed)

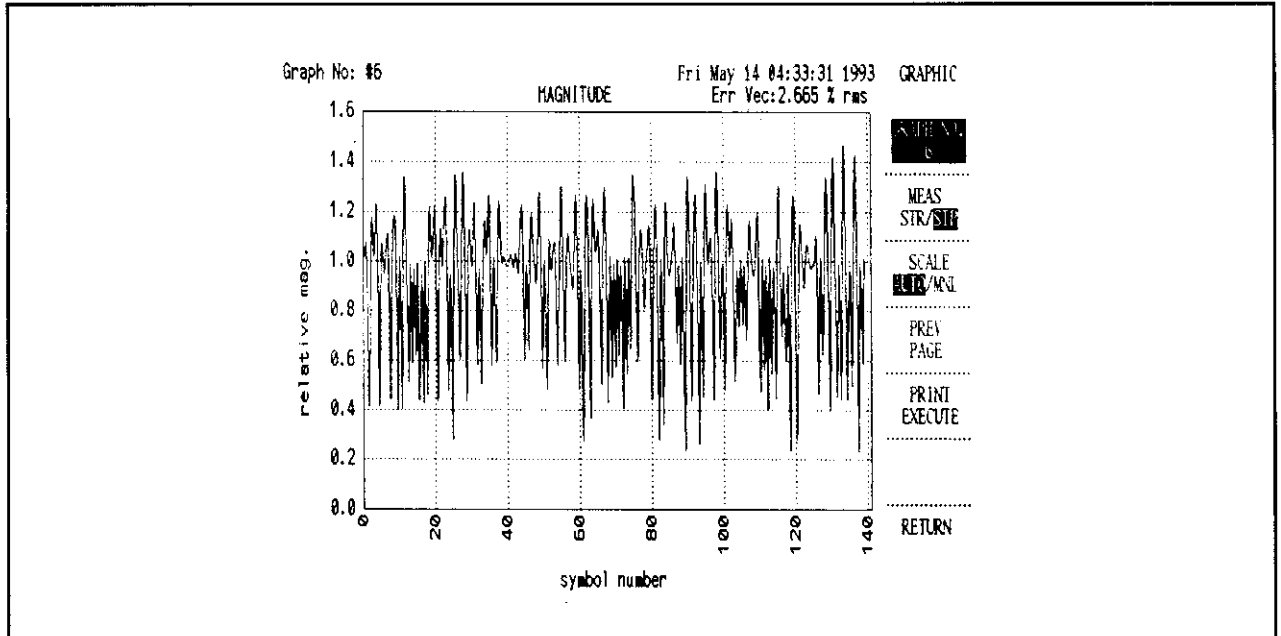


Figure 4-3 Display of Scale Selection (AUTO is selected)

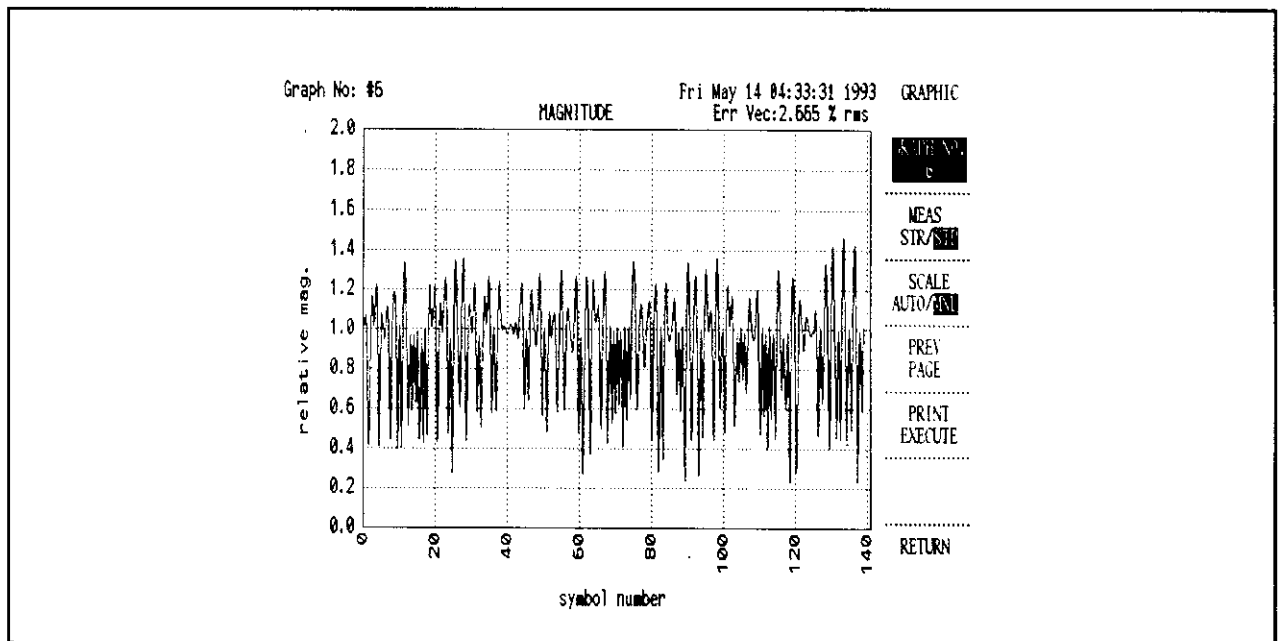


Figure 4-4 Display of Scale Selection (MNL is selected)

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4. Measurement Data Analysis With Graph (Option 70 Installed)

DISP TYP
LINE/DOT

: Graph display type selection key

The key is effective only in the "I vs. Q Diagram" display. This key function selects either the display connecting the transit between symbols (LINE) or the display of only symbols in dots without connecting the transit between symbol points (DOT).

If LINE is selected, the data between symbol points are interpolated 20 times. If DOT is selected, the symbol points only are displayed.

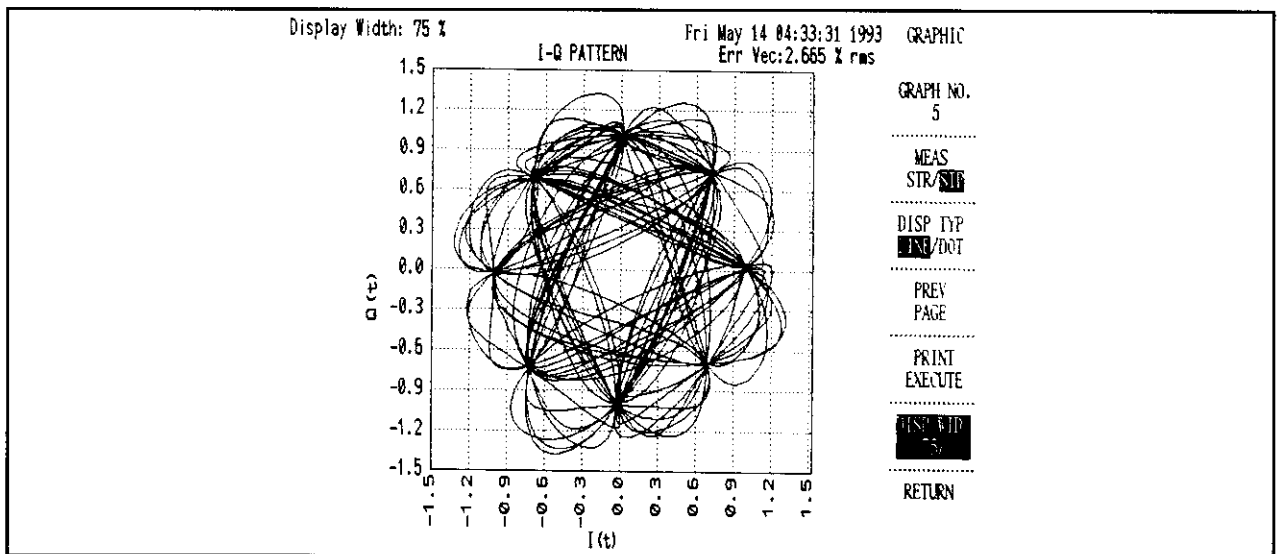


Figure 4-5 Display of Graph Display Type Selection (LINE is selected)

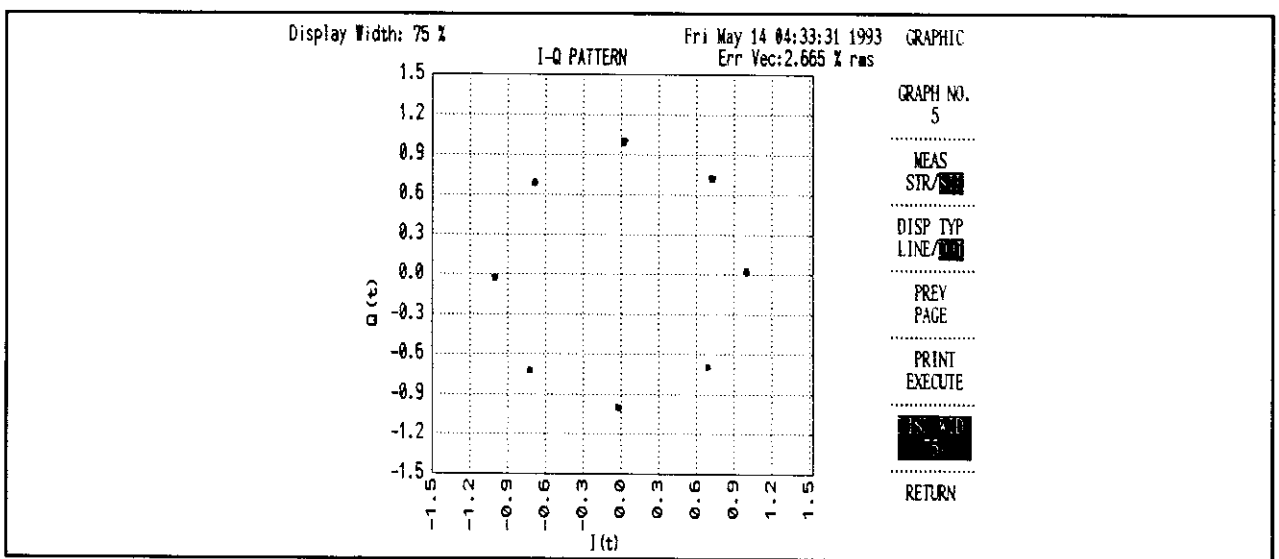


Figure 4-6 Display of Graph Display Type Selection (DOT is selected)

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4. Measurement Data Analysis With Graph (Option 70 Installed)

DISP WID
75 %

: Variable control key for graph horizontal axis display width

The key is effective only in the "I vs. Q Diagram" display. Since the aspect ratio of the CRT normally differs, the horizontal length of the displayed graph is longer than the vertical. This key allows the display width of the horizontal axis (proportion of the screen occupied by the graph) to change in the range of 50 % to 100 %. The setting value is displayed at the upper left of the screen.

When the setting is the 75 % (default value), the aspect ratio of the graph display is 1. If the setting is 100 %, the longest horizontal axis is displayed.

Example : Changing from 75 % to 100 %

Press the DISP WID
75 % to invert the display lighting.

Press the keys in the order 1 , 0 , 0 , and Hz ^{ENTER} to set the 100 % display.

When this graph is output to the printer, the aspect ratio is automatically adjusted.

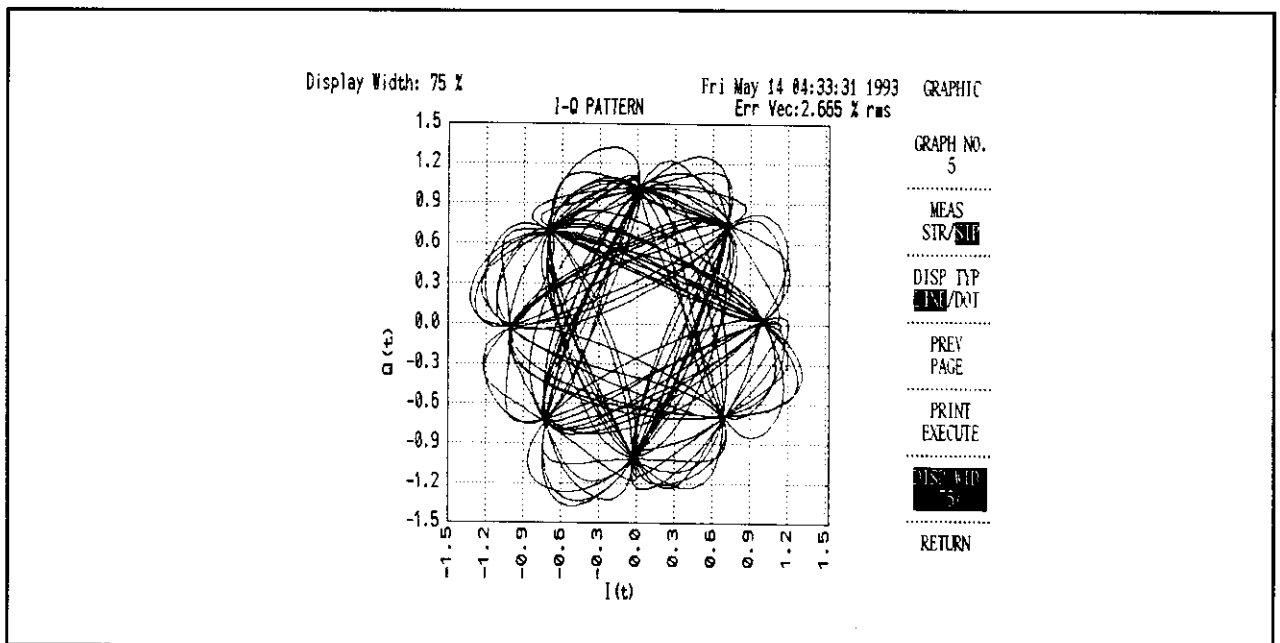


Figure 4-7 Display of Graph Display Width Control (75 % setting)

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4. Measurement Data Analysis With Graph (Option 70 Installed)

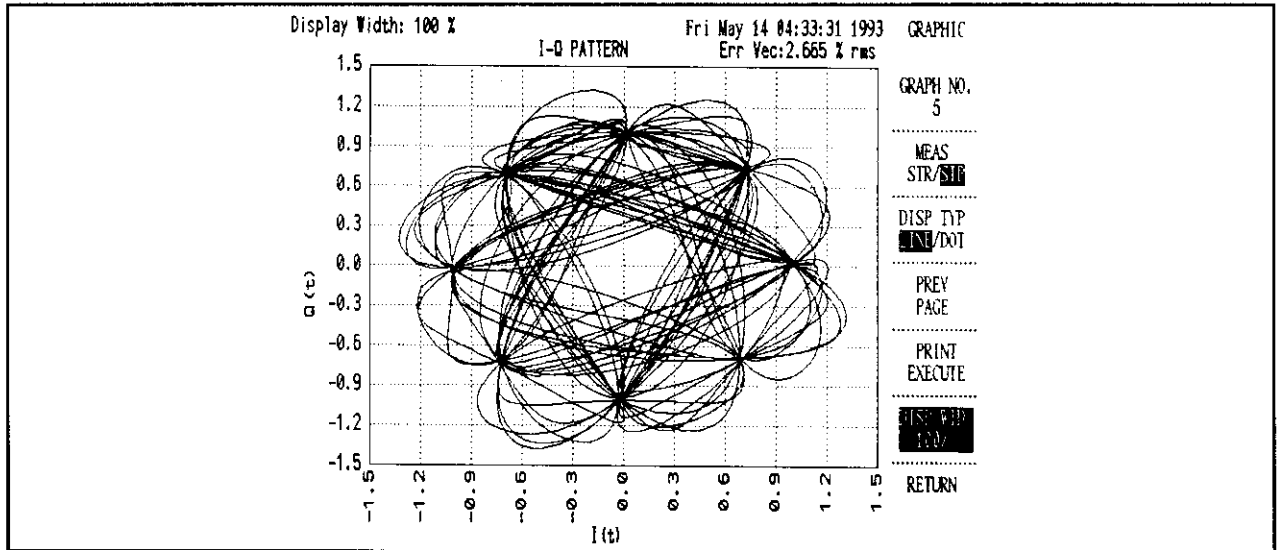


Figure 4-8 Display of Graph Display Width Control (100 % setting)

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4. Measurement Data Analysis With Graph (Option 70 Installed)

NOR /MAX
/MIN/AVG

: Transmission transient response characteristic graph evaluation mode selection key

The key is effective only when the "Transmission Transient Response" is displayed.

Pressing the key switches the evaluation mode and re-evaluates the measured burst signal.

The modes are switched as follows :

NOR (Normal Mode) : Evaluates one burst signal.

MAX (Maximum Mode) : Calculates the maximum value for continuous multiple burst signals in each sample to evaluate.

MIN (Minimum Mode) : Calculates the minimum value for continuous multiple burst signals in each sample to evaluate.

AVG (Average Mode) : Calculates the average value for continuous multiple burst signals in each sample to evaluate.

The number of the burst signals evaluated in MAX, MIN, or AVG is shown as follows:

	PDC/NADC	PHS
Full Rate	10	5
Half Rate	5	-

TEMPL
EDIT

: Transmission transient response characteristic graph template selection menu display key

The key is effective only when the "Transmission Transient Response" is displayed. It displays the menu which is used to select a template to judge whether the ON/OFF characteristic for the burst signal satisfies the standard value.

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4. Measurement Data Analysis With Graph (Option 70 Installed)

WHL/R. UP
/R. DN

: Transmission transient response characteristic graph display range selection key

This key is used to the WHL, R.UP, or R.DN mode. The transmission transient response graph of measured burst signal data is displayed in the selected mode. Pressing the key switches the evaluating mode and re-evaluates the measured burst signal.

The display ranges are switched as follows :

- WHL (Whole display) : Displays the whole data.
- R.UP (RAMP Up display) : Displays the data at RAMP UP.
- R.DN (RAMP Down display) : Displays the data at RAMP DOWN.

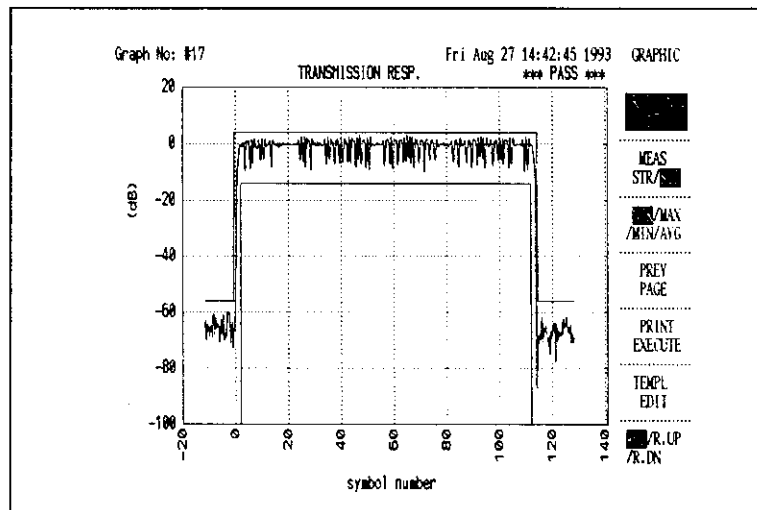


Figure 4-9 Burst Transmission Transient Response Characteristics Analysis (when WHL is specified)

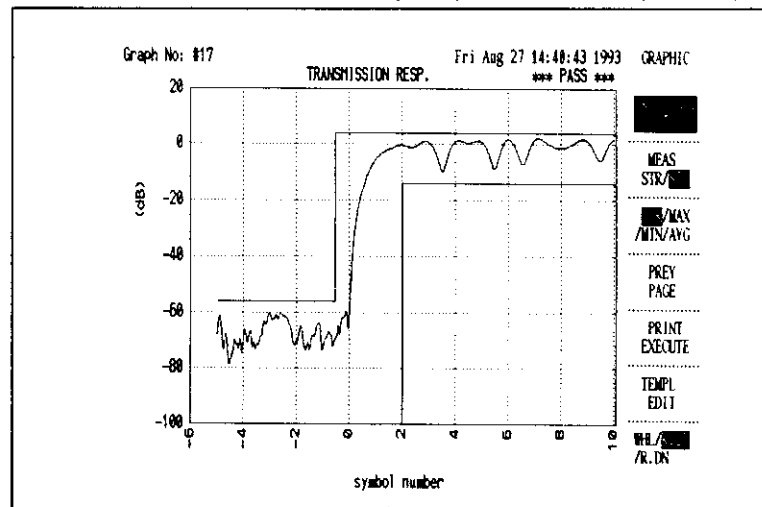


Figure 4-10 Burst Transmission Transient Response Characteristics Analysis (when R.UP is specified)

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4. Measurement Data Analysis With Graph (Option 70 Installed)

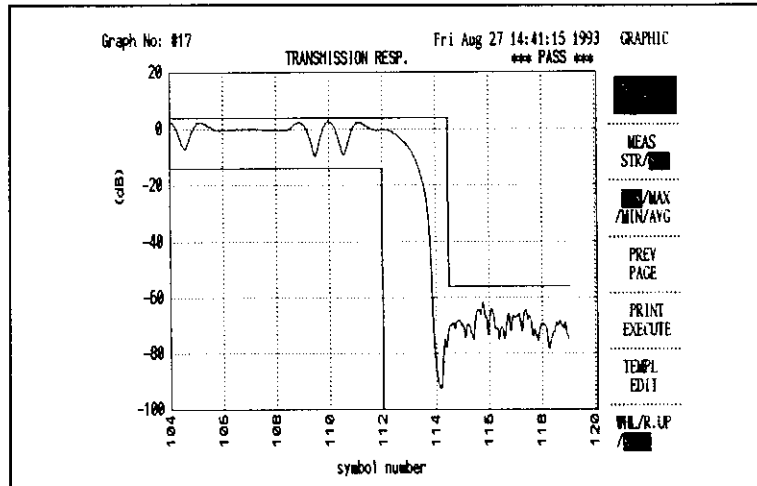


Figure 4-11 Burst Transmission Transient Response Characteristic Analysis (when R.DN is specified)

TEMPL
 STD/USER

: Template selection key
 Specifies the type of template to be used.
 "STD" defines the value gained from the time characteristic standard of the transmission transient response characteristic on the transmission output class in each standard as 1 through 4 and specifies any one of these values. "USER" divides the template into 5 blocks. The user sets the appropriate regulated value. It judges the GO/NOGO (PASS/FAIL) of the burst transmission transient response characteristic in the basis of the specified template value.

TEMPL
 1

: This key is used to set the class template used or the user-defined template value. It specifies the transmission output class when "STD" is selected by using the template selection key. The template value in each class is shown in Table 4-1.

On the other hand, when the "USER" is selected, the level value for each position of the template shown in Figure 4-12 can be set. Input the template value when the highlighting in the key is reversed. (Refer to the following example.) The setting value is displayed in the active area at the upper left of the screen.

Example: To input - 10dB

Press
 TEMPL
 1
 to display in reverse.

Press 1 0 MHz in order to set to - 10dB.

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4. Measurement Data Analysis With Graph (Option 70 Installed)

The numbers of 1 to 5 displayed at the "USER" selection shows the standard line in Figure 4-12.

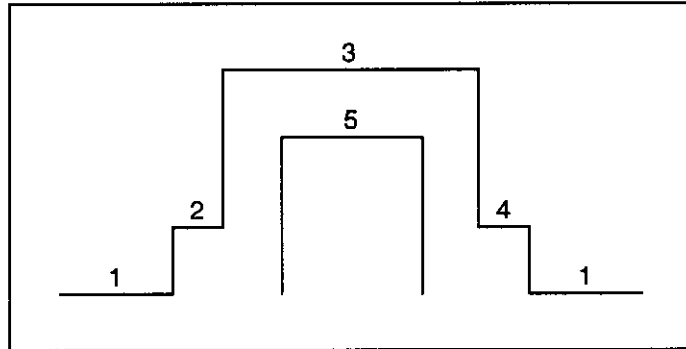


Figure 4-12 Template Position

Table 4-1 Template Value in "STD" Definition (Unit: dB)

For PDC		Position	1	2	3	4	5
Selection No.							
1	Class I :		- 90.77	- 60.0	4.0	- 60.0	- 14.0
2	Class II :		- 89.01	- 60.0	4.0	- 60.0	- 14.0
3	Class III :		- 85.03	- 60.0	4.0	- 60.0	- 14.0
4	Class IV :		- 80.77	- 60.0	4.0	- 60.0	- 14.0
For NADC		Position	1	2	3	4	5
Selection No.							
1	Class I :		- 96.02	- 96.02	3.0	- 96.02	- 20.0
2	Class II :		- 92.04	- 92.04	3.0	- 92.04	- 20.0
3	Class III :		- 87.78	- 87.78	3.0	- 87.78	- 20.0
4	(Class IV :		- 87.78	- 87.78	3.0	- 87.78	- 20.0)
For PHS		Position	1	2	3	4	5
Selection No.							
1	Class I :		- 56.0	- 56.0	4.0	- 56.0	- 14.0
2	(Class I :		- 56.0	- 56.0	4.0	- 56.0	- 14.0)
3	(Class I :		- 56.0	- 56.0	4.0	- 56.0	- 14.0)
4	(Class I :		- 56.0	- 56.0	4.0	- 56.0	- 14.0)

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4. Measurement Data Analysis With Graph (Option 70 Installed)

- MEAS BU**
40 : Setting key for number of bursts to be measured (Used for burst transmission timing)
- This key is used in the burst transmission timing analysis and specifies the number of bursts to be measured. The number of bursts that can be set is 2 to 50.
- CS -> PS**
ON/OFF : PS to CS transmission timing measurement setting key (PHS only)
- Select ON to analyze the burst transmission timing of the PS burst from the CS burst of the PHS signal. This function is effective only when both "PHS" and "Uplink" are specified.

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4. Measurement Data Analysis With Graph (Option 70 Installed)

(3) Modulation accuracy graph display

Unlike the waveform (spectrum) screen, the modulation accuracy graph is displayed in a specific format. The active data display area is on the upper left screen and is used for entering "GRAPH No.", the manual setting value in "SCALE AUTO/MNL", "DISP WIDTH" data value, etc.

The following three software menu configurations are provided in accordance with the displayed graphs :

① GRAPH No. setting soft menu

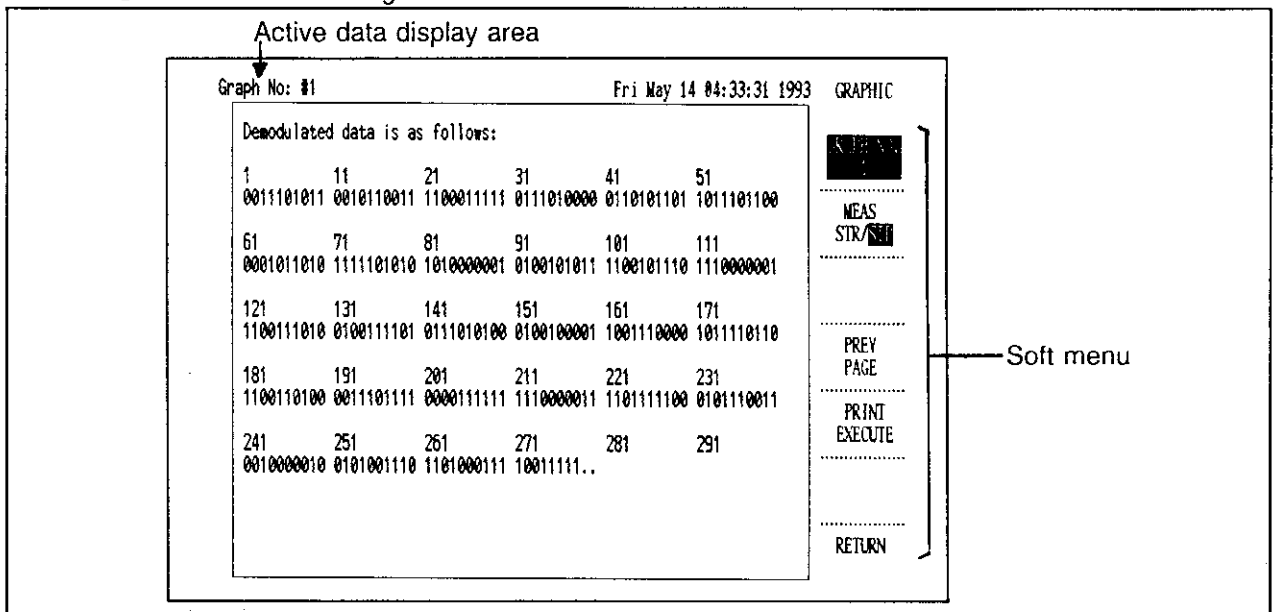


Figure 4-13 Modulation Accuracy Graph Display (GRAPH No. setting)

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4. Measurement Data Analysis With Graph (Option 70 Installed)

② MNL setting soft menu in SCALE AUTO/MNL

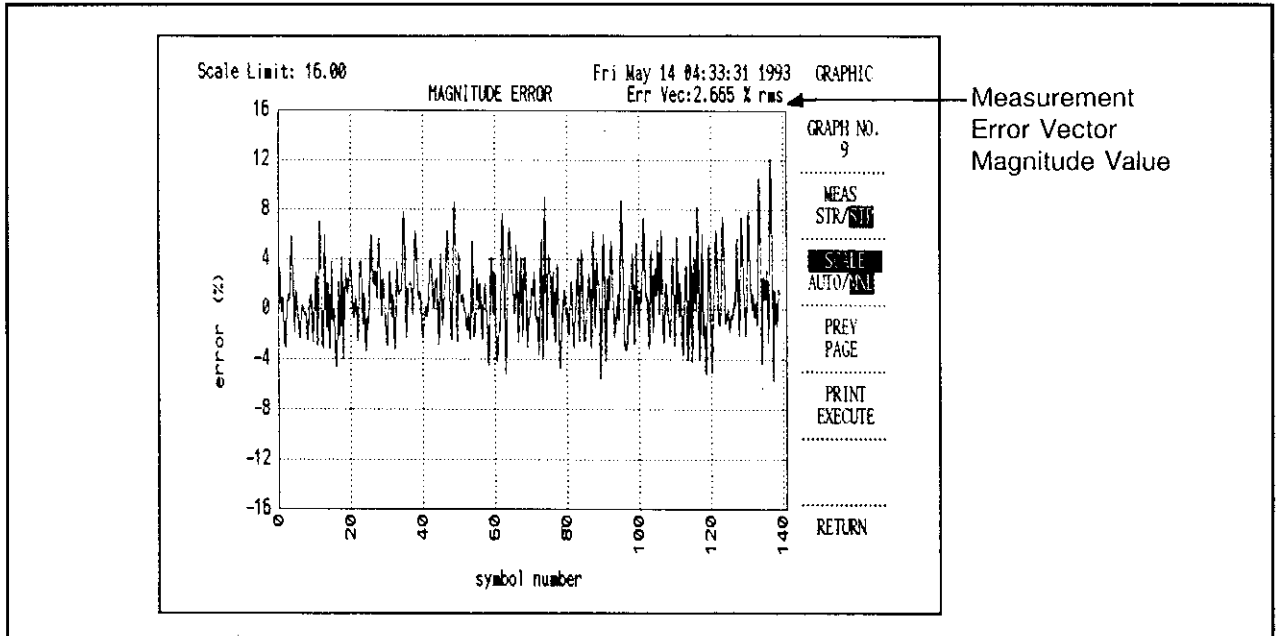


Figure 4-14 Modulation Accuracy Graph Display (MNL setting in SCALE AUTO /MNL)

③ DISP WID setting soft menu

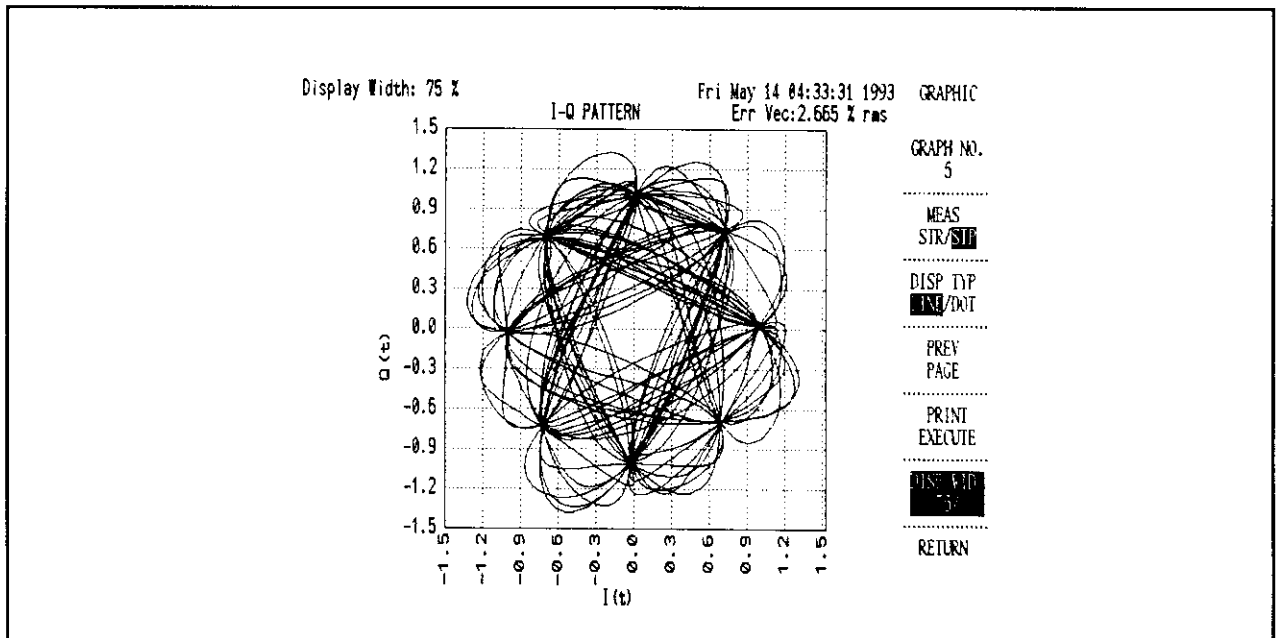


Figure 4-15 Modulation Accuracy Graph Display (DISP WID setting)

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4.1 "Demodulated data" Screen

4.1 "Demodulated data" Screen

The screen displays data finally demodulated in the modulation accuracy measurement. (The displayed data is of 10th burst if the 10th burst is specified, and data lastly taken in if AVERAGE is specified.)

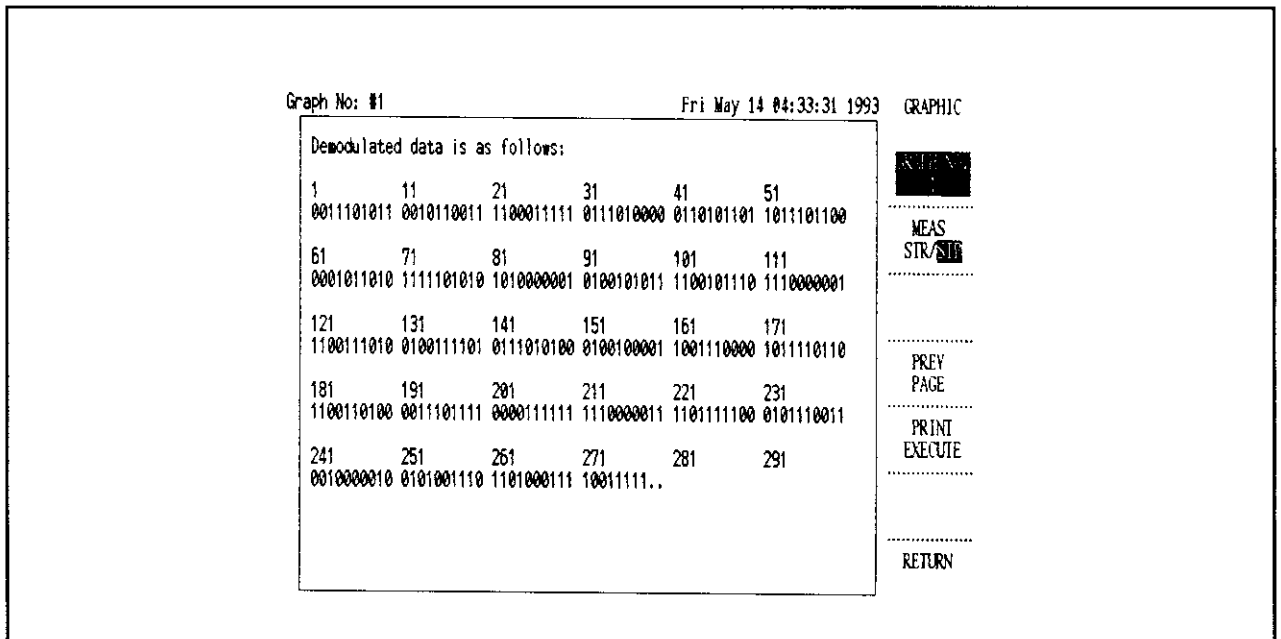


Figure 4-16 Demodulated Data Screen

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4.2 "SYNC WORD display" Screen

4.2 "SYNC WORD display" Screen

The screen displays all the synchronization word (unique word for PHS) corresponding to the current measurement object (PDC/NADC/PHS). As shown in the sample, the synchronization word (unique word) section that is used according to the current setting parameter is displayed while being separated from other sections.

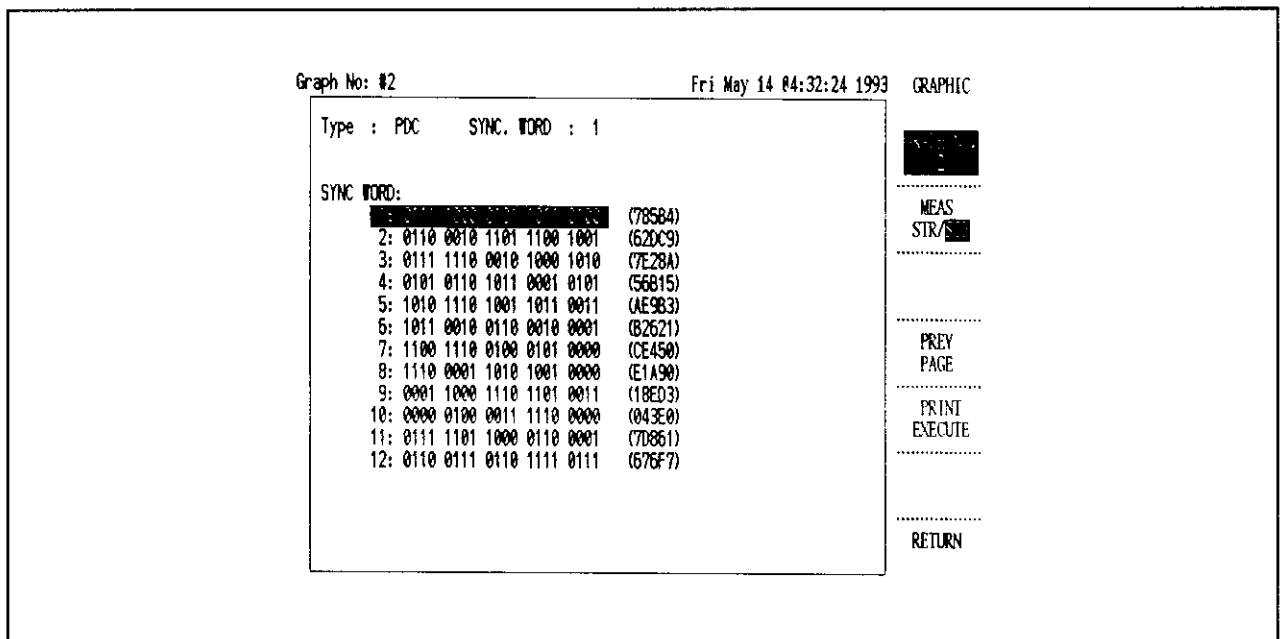


Figure 4-17 Synchronization Word (Unique Word) Screen

4.3 "I channel EYE diagram" Screen

On this screen, the transition of I (In-Phase) data against time is plotted. However, the time axis is displayed with repeating the transition between two symbols. The feature of the diagram is that greater "VECTOR ERROR", narrower the opening of "EYE" and the centered part of each symbol point is not clear.

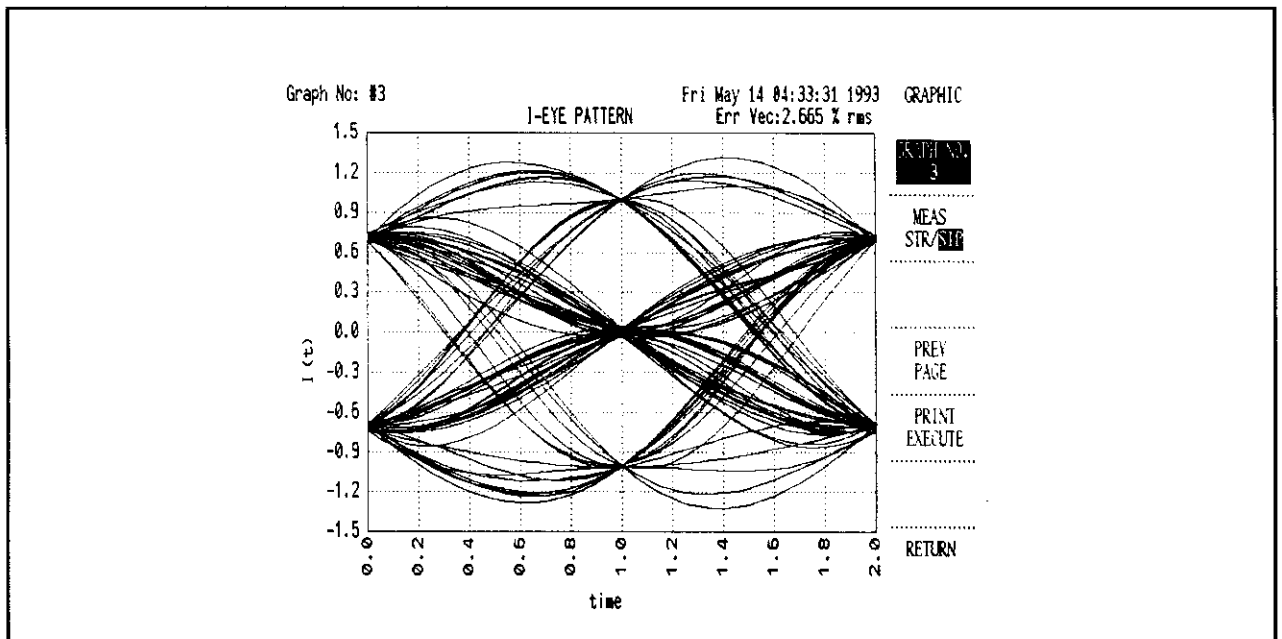


Figure 4-18 I channel EYE Diagram

4.4 "Q channel EYE diagram" Screen

On this screen, the transition of Q (Quadrature) data against time is plotted. However, the time axis is displayed with repeating the transition between two symbols. The feature of the diagram is that greater "VECTOR ERROR", narrower the opening of "EYE" and the centered part of each symbol point is not clear.

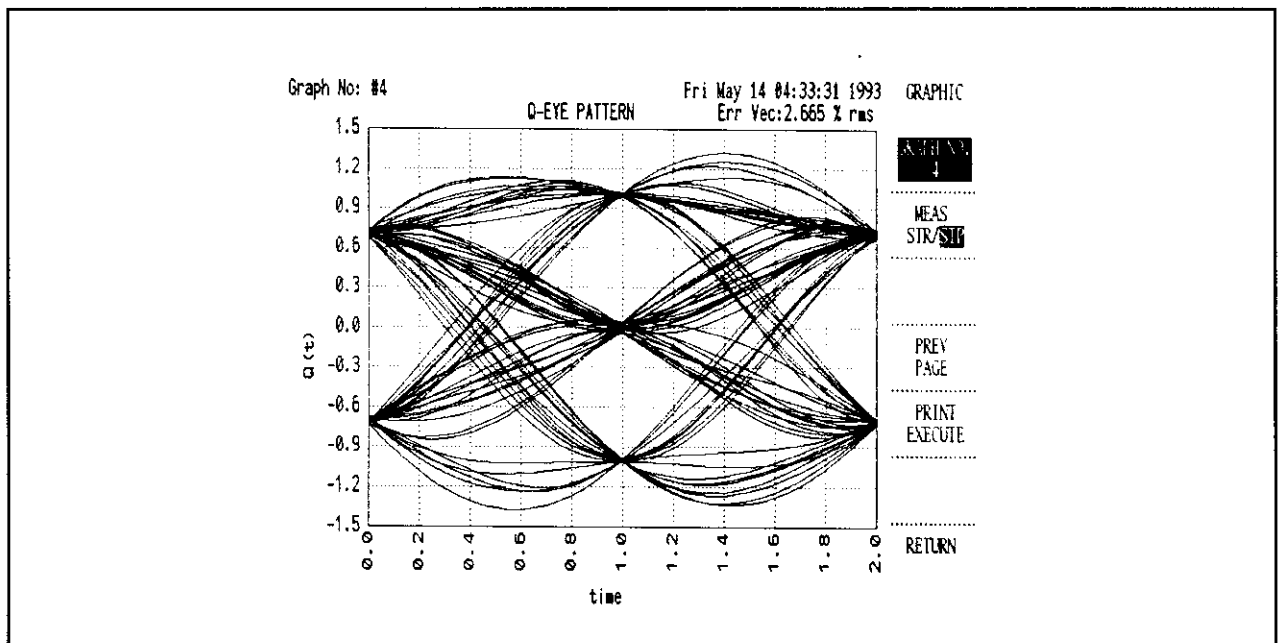


Figure 4-19 Q channel EYE Diagram

4.5 "I vs. Q diagram" Screen

The screen displays constellation using the I and Q data in the one slot.
The feature of the graph is that if the value of "ERROR Vector" is small, the intersecting point is centered on each symbol point. In this case, since data of 20 samples is displayed on the transition between two symbols, the transition is traced very smoothly.

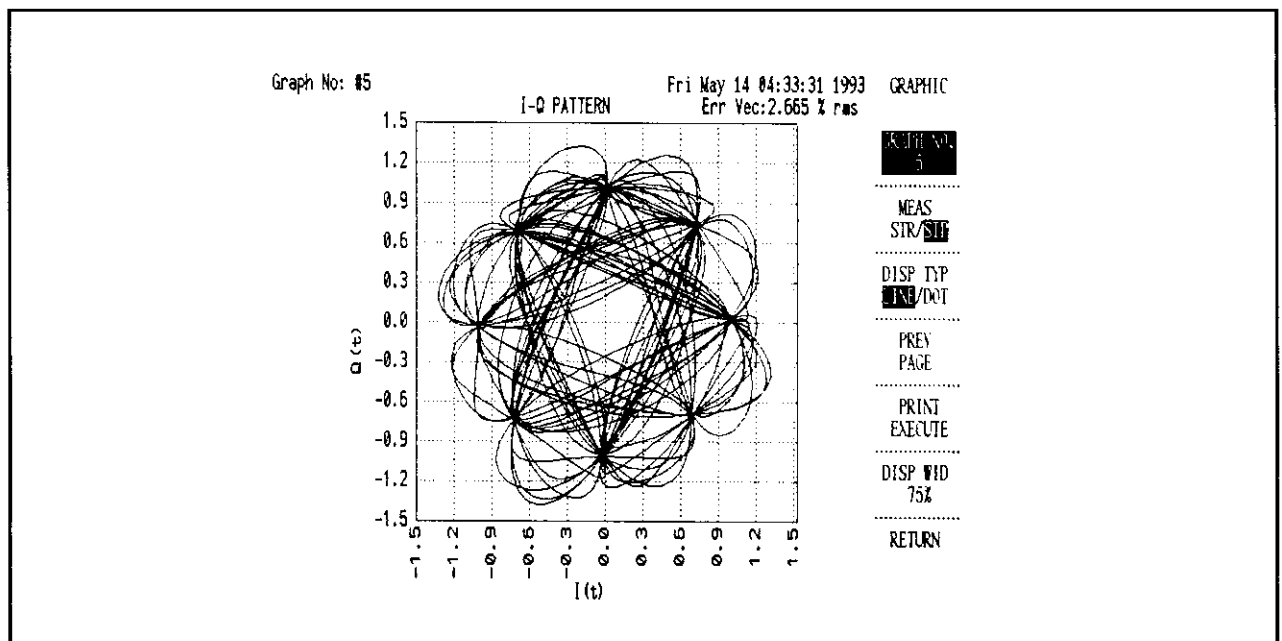


Figure 4-20 I vs. Q channel Diagram

4.6 "Magnitude of signal" Screen

The screen plots "Magnitude" of each symbol vector in one slot in the graph format. The value regularized on the basis of 1 is used for the data to be plotted on the diagram. The diagram plots the transition not only at each symbol point but also between symbols.

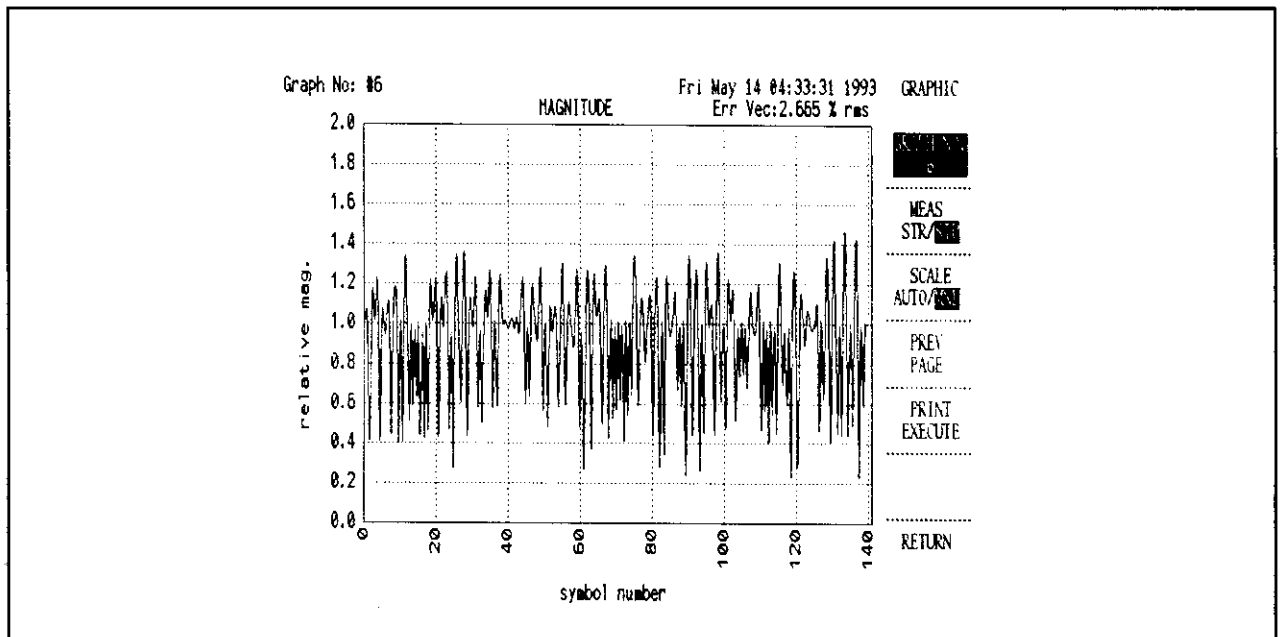


Figure 4-21 Magnitude of Each Symbol

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4.7 "Phase of signal" Screen

4.7 "Phase of signal" Screen

The screen plots "Phase" of each symbol in one slot in the graph format. The data plotted on the screen is the sum of variation at each symbol.

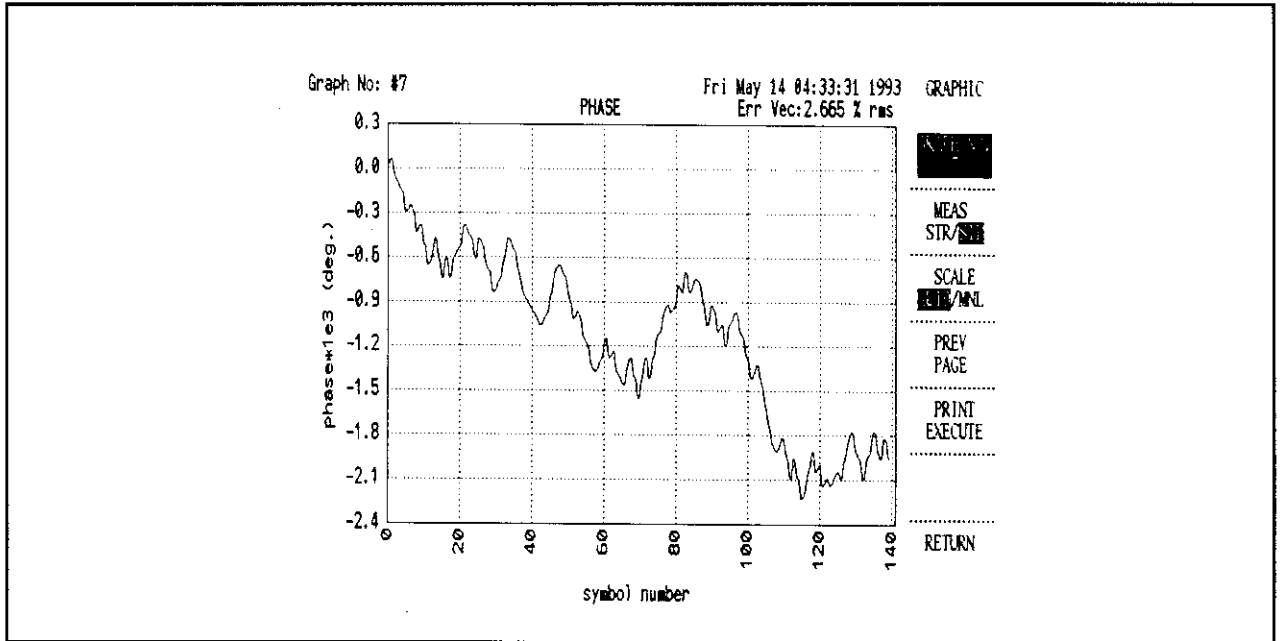


Figure 4-22 Phase Transition of Each Symbol

4.8 "Magnitude Error & Droop" Screen

The screen plots "Magnitude Error" for the reference signal of each symbol in one slot in a relative display. Also, Droop value is indicated by the straight line with inclination. The value of "Magnitude Error" displayed on the screen includes the Droop component.

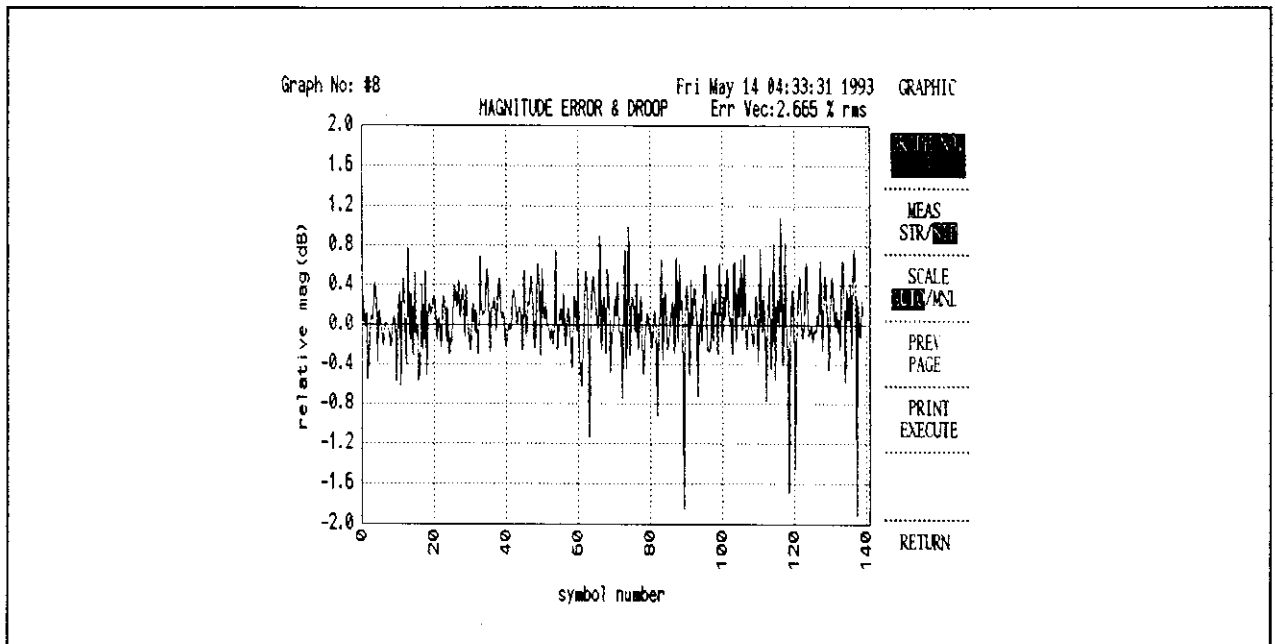


Figure 4-23 Magnitude Error and Droop of Each Symbol

4.9 "Magnitude Error" Screen

The screen plots "Magnitude Error" for the reference signal of each symbol in one slot in a % display. The data displayed on the screen excludes the Droop component.

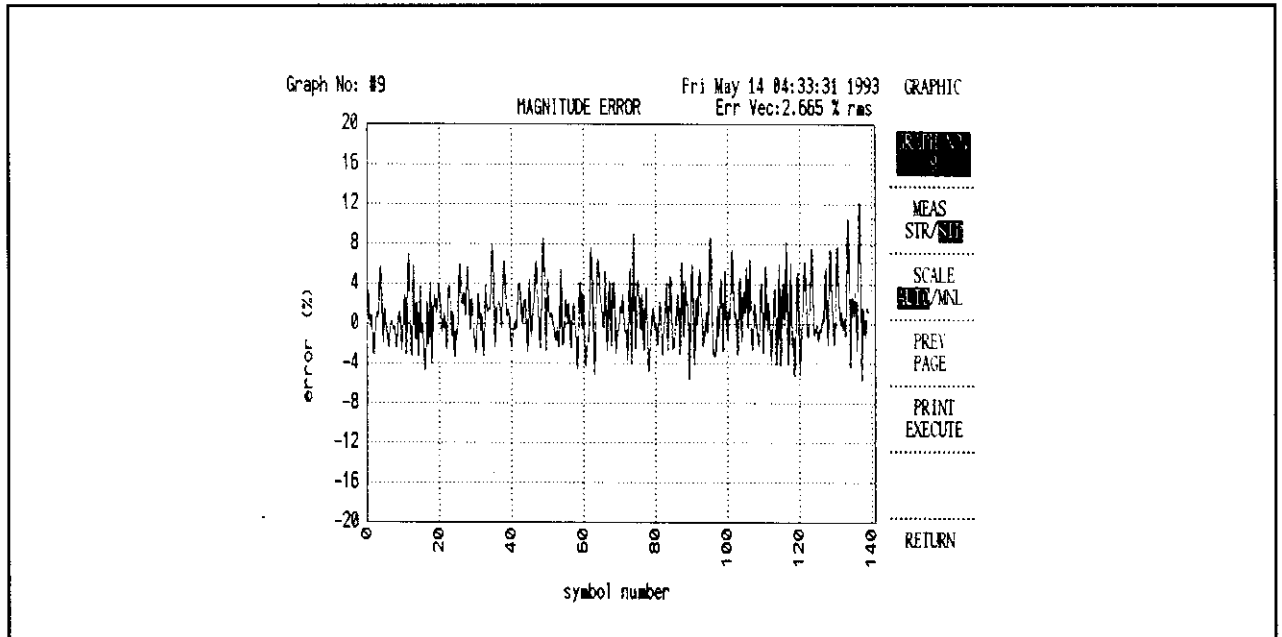


Figure 4-24 Magnitude Error of Each Symbol

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4.10 "Phase & Frequency Error" Screen

4.10 "Phase & Frequency Error" Screen

The screen plots "Phase Error" for the reference signal of each symbol in one burst in a degree display. Also, the screen plots the transition of "Frequency Error" against the time.

The value of "Phase Error" data displayed on the screen includes "Frequency Error" component.

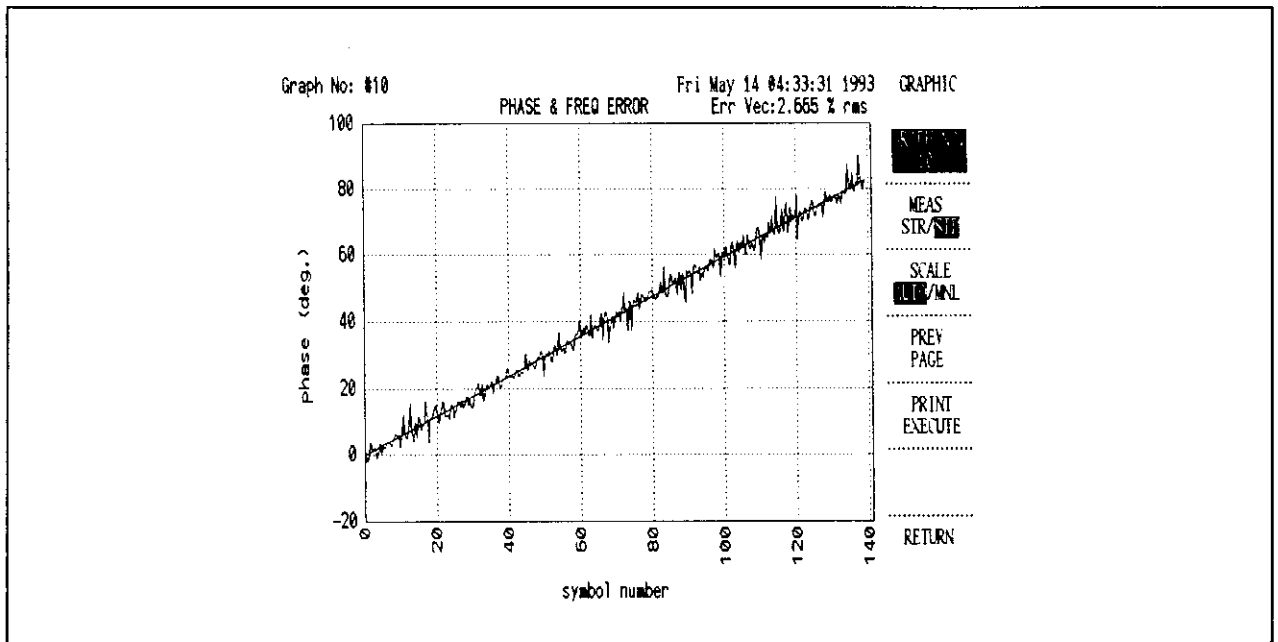


Figure 4-25 Phase Error and Frequency Error of Each Symbol

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4.11 "Phase Error" Screen

4.11 "Phase Error" Screen

The screen plots "Phase Error" for the reference signal of each symbol in one slot in a degree display. The "Phase Error" data displayed on the screen excludes the "Frequency Error" component.

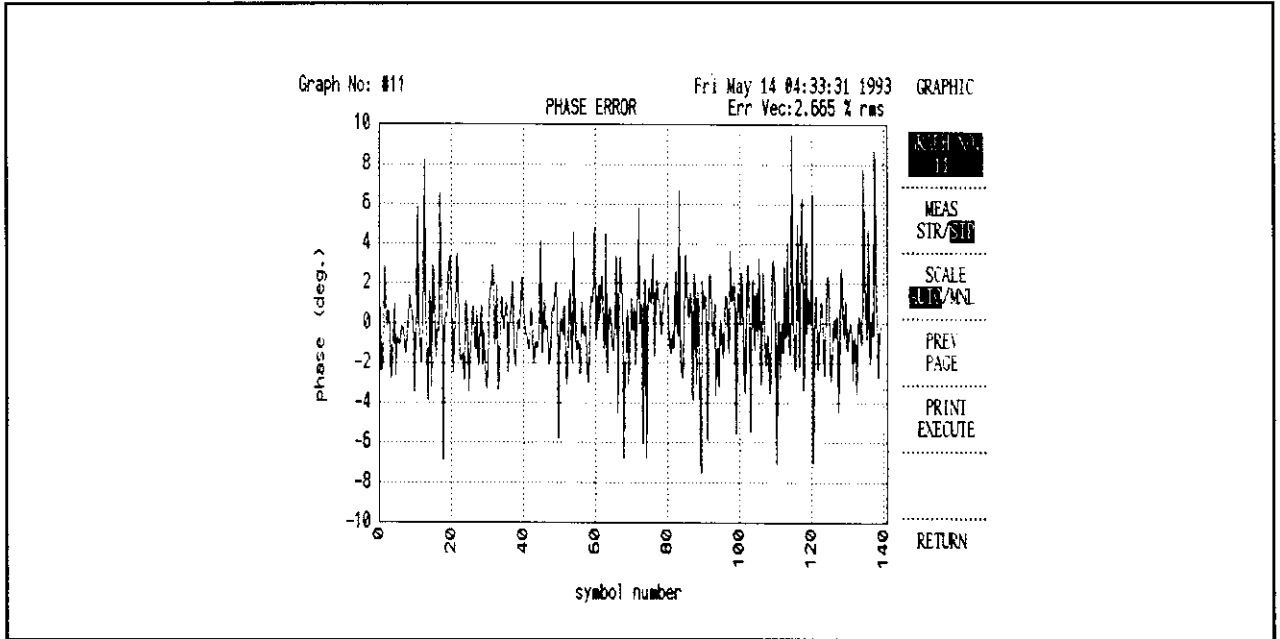


Figure 4-26 Phase Error of Each Symbol

4.12 "Error Vector Magnitude" Screen

The screen plots "Error Vector Magnitude" for the reference signal of each symbol in one slot. It plots not only the data at each symbol point but also "Magnitude" as each transition data between symbols.

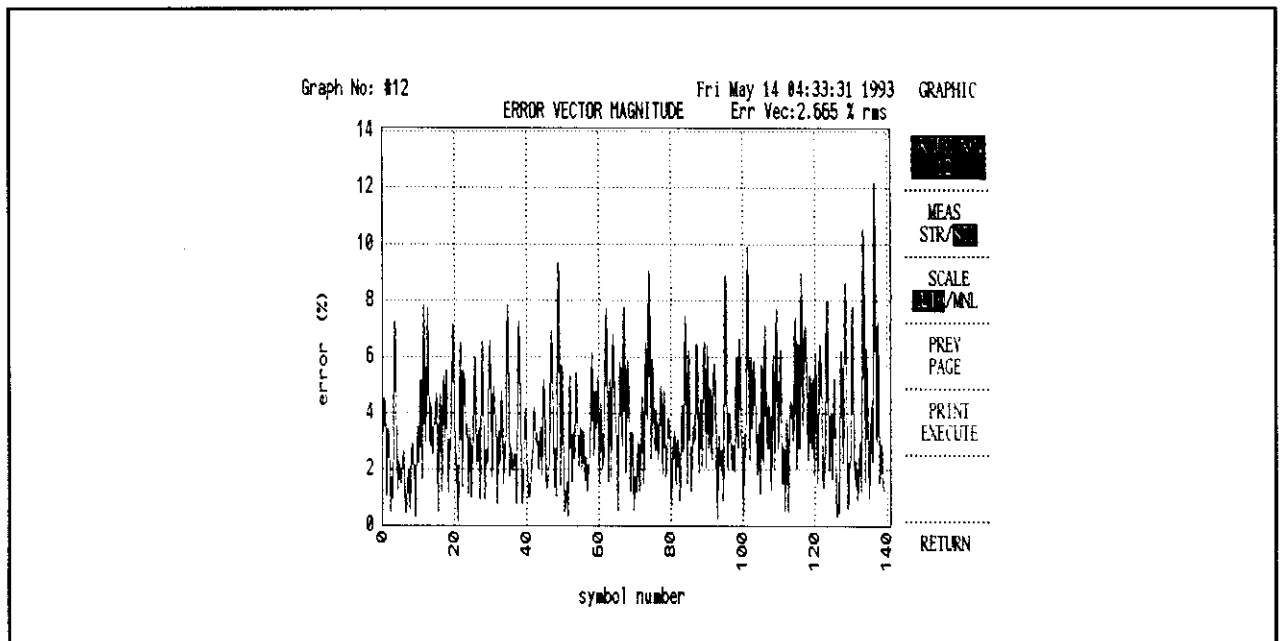


Figure 4-27 Error Vector Magnitude of Each Symbol

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4.13 "FFT Of IF signal" Screen

4.13 "FFT Of IF signal" Screen

The screen plots the time axis data (A/D converted data) in one time slot which has been frequency-analyzed using the FFT (Fast Fourier Transform). The frequency bandwidth displayed varies depending on the measurement object (PDC/NADC/PHS). Note that the data displayed on the screen is the relative level to the peak value (0dB).

Errors for graph display available:

- Data Detection Error
- Synchronization Error
- Reference Signal Generation Error
- Signal Detection Error
- Sync. Word Detection Error
- Invalid Trigger Timing
- Over Phase-Error Limit

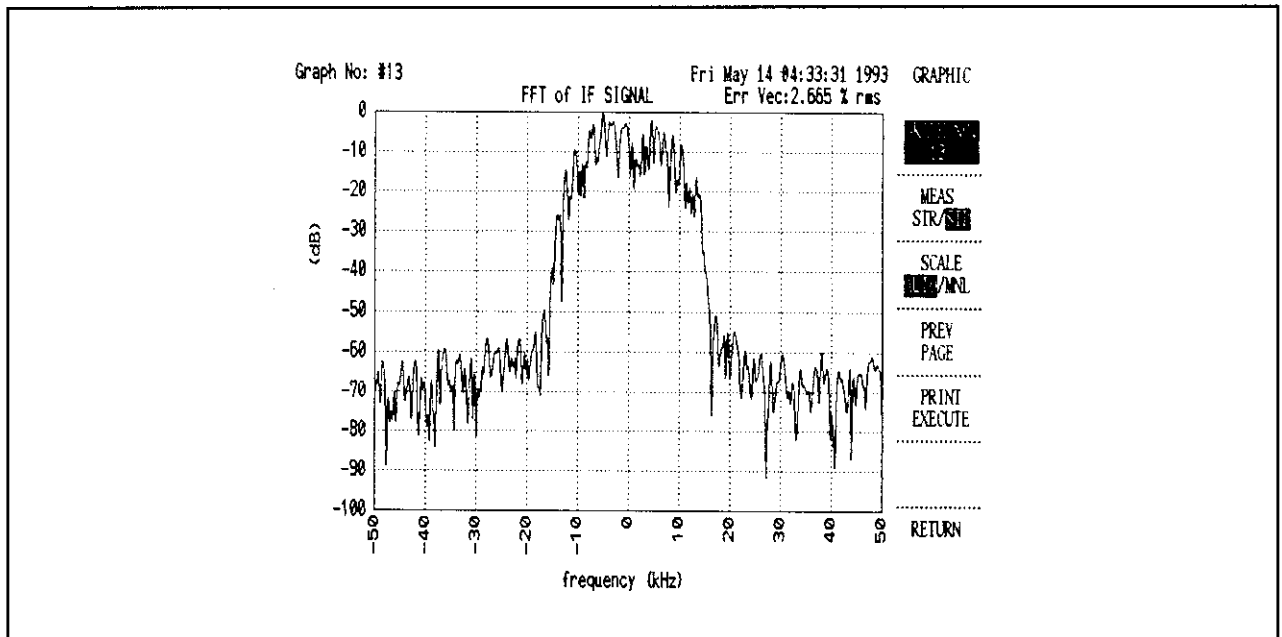


Figure 4-28 FFT of IF signal Screen

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4.1 4 "FFT of Magnitude Error" Screen

4.14 "FFT of Magnitude Error" Screen

This screen plots the "Magnitude Error" data which has been analyzed using the FFT (Fast Fourier Transform). This graph shows the AM modulation component by the analyzed signal. The 100 % data is (normalized) regulated as 1 (0dB).

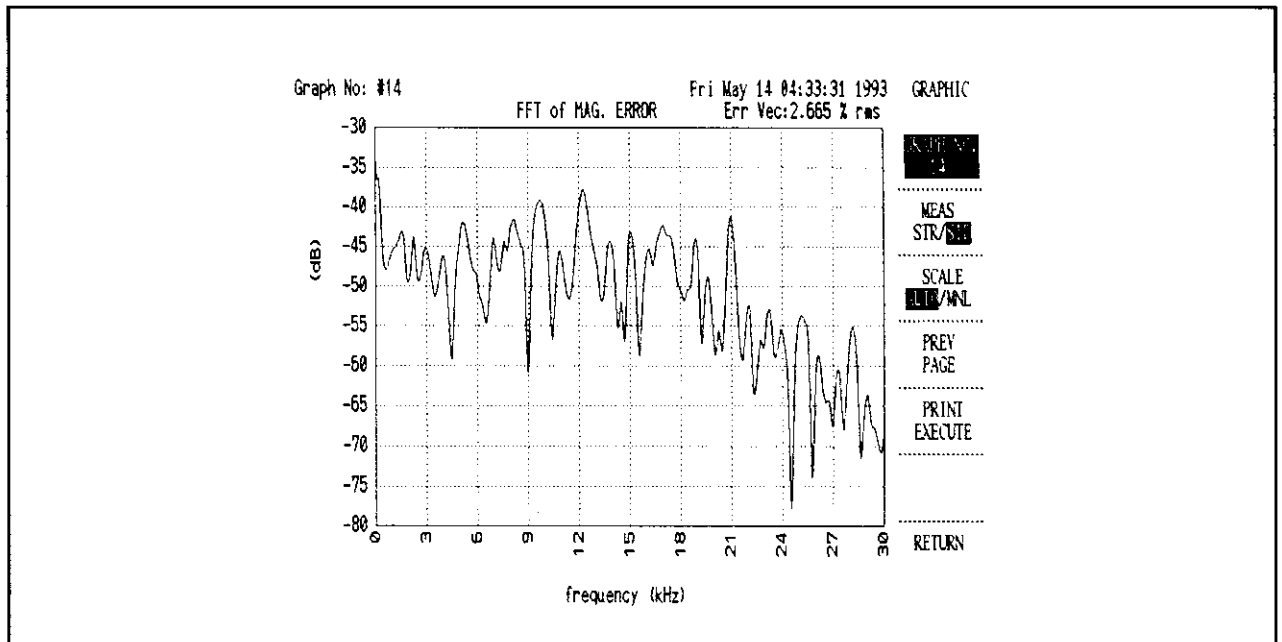


Figure 4-29 Frequency Analysis of "Magnitude Error"

4.15 "FFT of Phase Error" Screen

This screen plots the "Phase Error" data which has been analyzed using the FFT. This graph shows the \varnothing M modulation component by the analyzed signal. The 90 deg. data is normalized as 1 (0dB).

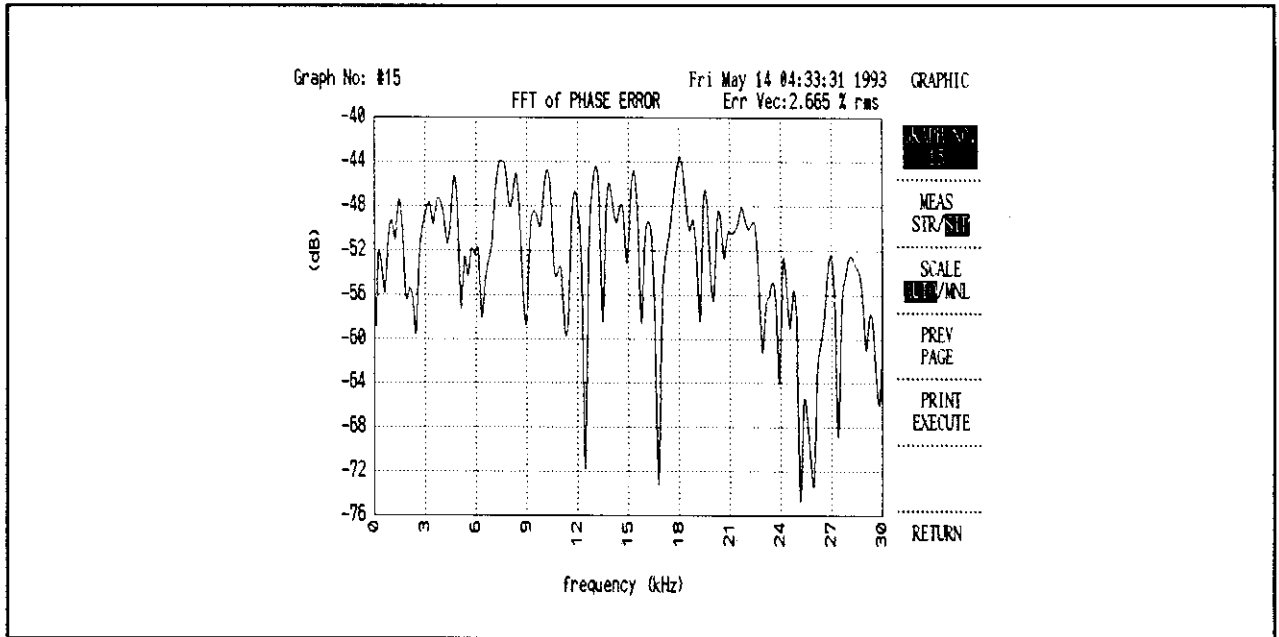


Figure 4-30 Frequency Analysis of "Phase Error"

4.16 "FFT of Error Vector" Screen

This screen plots the "Error Vector" data which has been analyzed using the FFT. This graph shows the noise component to baseband signal. The 100 % data is normalized as 1 (0dB).

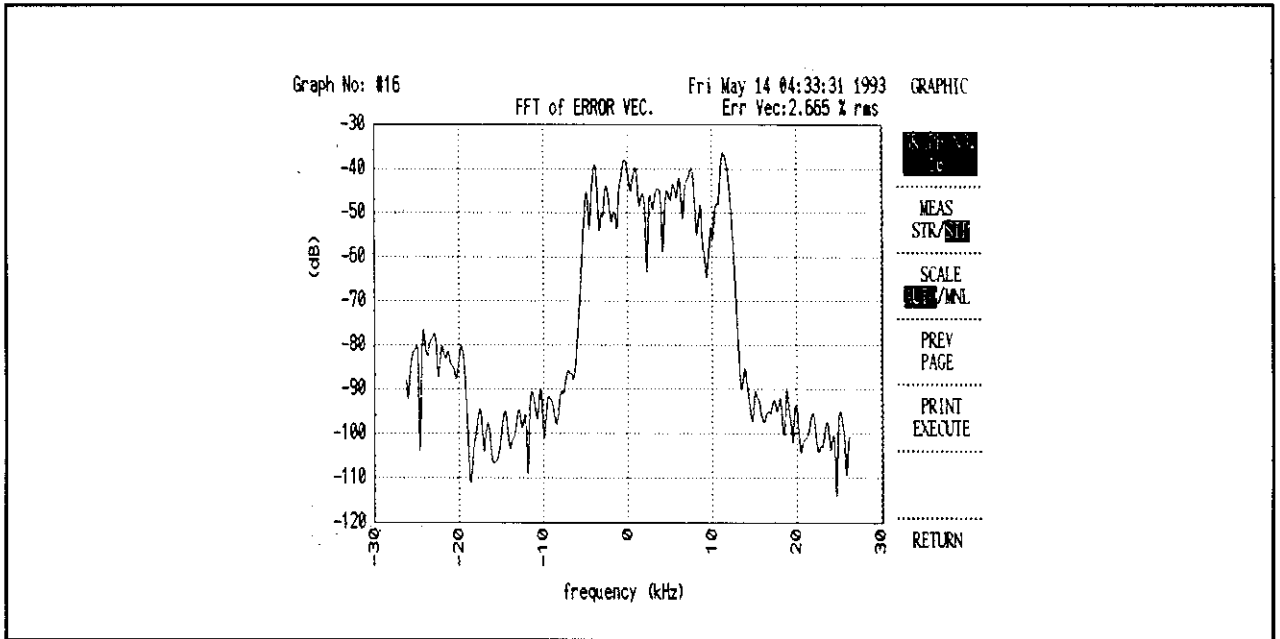


Figure 4-31 Frequency Analysis of "Error Vector"

4.17 "Transmission Transient Response" Display Screen

This screen is used to measure the amplitude of the burst signal and to display the measured amplitude and the selected template together. It judges whether the rising or falling characteristic of the burst signal conforms to the standard.

This judgment is executed continuously from the rising to the falling of the burst signal. The result is displayed at the upper right of the screen.

When "FAIL" is displayed, the template position number in which "FAIL" first occurred is also displayed.

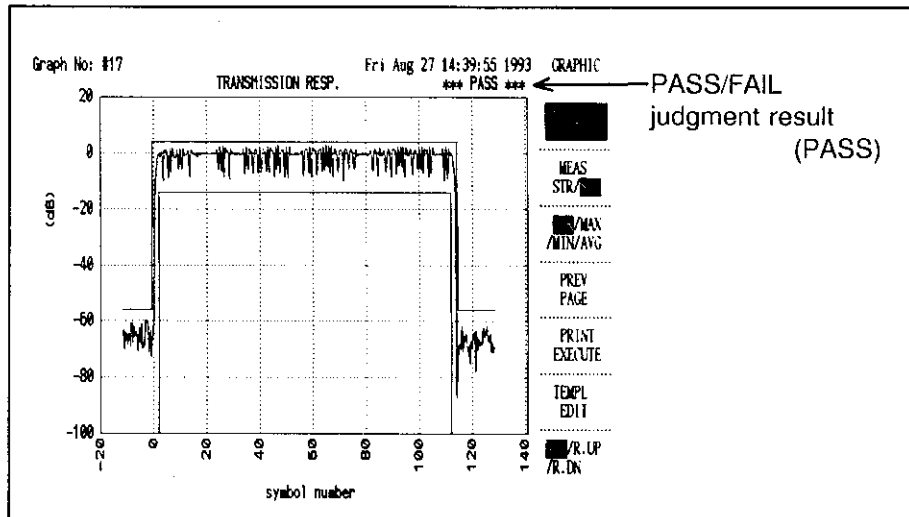


Figure 4-32 Burst Transmission Transient Response Characteristic Analysis (PASS)

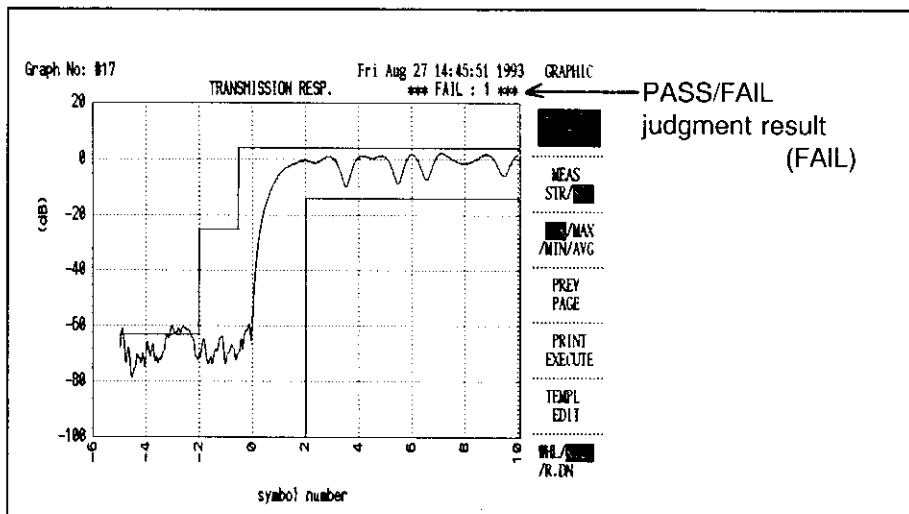


Figure 4-33 Burst Transmission Transient Response Characteristic Analysis (FAIL)

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4.17 "Transmission Transient Response" Display Screen

CAUTION

The burst transmission transient response characteristic analysis treats the data different from another analysis graph. Therefore the data to the burst signal which measured the normal modulation accuracy is not used but the analysis starts after the data is gained with the "MEAS STR/STP" key. Accordingly after this analysis is executed when another graph is displayed without pressing the "MEAS STR/STP" key, the error "Not Measured" occurs. Also immediately after another graph is displayed when this analysis is executed by using the "ENTER" key, the error "Not Measured" is displayed. In these cases, gain the data once by using the "MEAS STR/STP" key.

The applicable range for the GO/NOGO (pass/fail) judgment is the same as the WHL display range for the whole display range selection. Also when the evaluation mode is MAX, MIN or AVG, judge the GO/NOGO to the MAX, MIN or AVG processed data.

The bursts in the burst transmission transient characteristic analysis and the modulation accuracy measurement are gained at different timing and is not applicable for the analysis of the same burst data.

At selection of the synchronous word, unique word when the Magnitude Error for the burst signal is not good state, an error occurs in some cases. Then select the Amp to measure.

4.18 "Transmission Timing" Display Screen

This screen displays the burst transmission timing by using the maximum deviation from histogram, average value, or average.

When selecting "CS-> PS OFF", one frame later from the symbol judgment point of the burst synchronous word is the standard timing, the symbol judgment point of the next burst synchronous word is the transmission timing, the transmission timing when the standard timing is 0 is displayed at symbol unit.

When selecting "CS-> PS ON" and also the "Uplink" for PHS, the 1/2 frame later from the symbol judgment point of the CS burst unique word is the standard timing, the symbol judgment point of the PS burst unique word is the transmission timing.

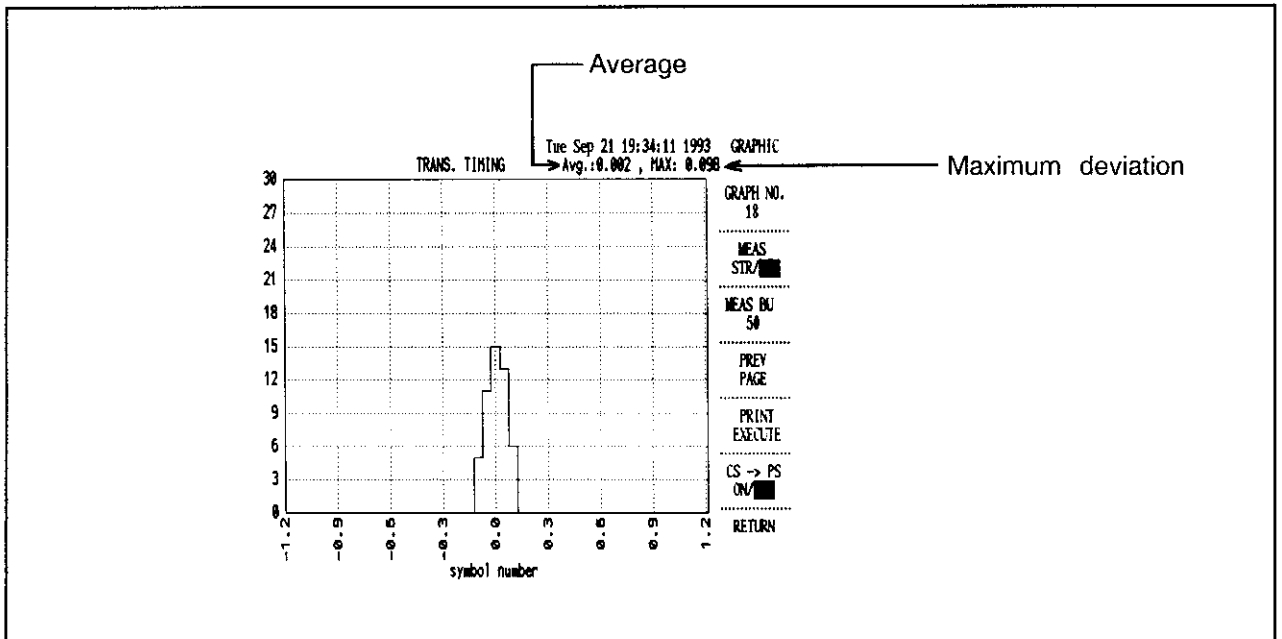


Figure 4-34 Burst Transmission Timing Analysis

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4.18 "Transmission Timing" Display Screen

CAUTION

The burst transmission timing analysis treats the data different from another analysis graph. Therefore the data to the burst signal which measured the normal modulation accuracy is not used but the analysis starts after the data is gained with the "MEAS STR/STP" key. Accordingly after this analysis is executed when another graph is displayed without pressing the "MEAS STR/STP" key, the error "Not Measured" occurs. Also immediately after another graph is displayed when this analysis is executed by using the "ENTER" key, the error "Not Measured" is displayed. In these cases, gain the data once by using the "MEAS STR/STP" key.

The bursts in the burst transmission timing analysis and the modulation accuracy measurement are gained at different timing and is not applicable for the analysis of the same burst data.

When the synchronous word or unique word is not set, the accurate evaluation can not be gained. The measurement is operated by selecting the synchronous word or unique word.

The "CS-> PS ON/OFF" key is effective only when the "Uplink" for PHS is selected.

At inputting the CS burst and PS burst signal, select the Amp to display the "Transmission Timing" display screen. After select the "CS-> PS ON" to decide the synchronous word or unique word.

4.19 Graph Marker Functions

In the display state of the modulation accuracy analysis graph, normal marker function is ineffective, however, the exclusive marker function for modulation accuracy analysis graph can be used. This modulation accuracy graph marker is equipped with the following functions.

- 1 Read the data value of X- and Y-axis in each symbol point.
- 2 Calculate and display ("I vs. Q Diagram" only) the phase information from the data value of X- and Y-axis.
- 3 Search the peak point on graph.
- 4 Read the data value of X-and Y-axis on sampling points between symbol points.
- 5 Move the marker to desired symbol point.
- 6 Control the marker by GPIB.

Since the marker uses the specific font, the specified point position can be clearly read if the graph such as "I vs. Q diagram" is complicated.

4.19.1 Marker Operation

The available keys for marker function are only the following keys and the data knob.

- Marker ON (Hard key) : Displays the marker on the graph screen.
- Marker OFF (Hard key) : Deletes the marker displayed on the graph screen.
- Marker PEAK (Hard key) : Moves the marker on the graph screen to the data of peak value on the graph.
- Numeric keys + ENTER (Hard key) : Moves the marker to the specified symbol No. data.
- Data knob : Moves the marker from the current position to the previous/next sampling point.
- STEP ↑ ↓ (Hard key) : Moves the marker from the current position to the previous/next symbol point.

Note : In the marker functions, the screen returns to the normal spectrum screen when the

hard key is pressed other than

MKR →

 key, numeric keys, and unit key.

4.19.2 Marker Display Screen

The marker display on the modulation accuracy graph is shown in Figure 4-35. On the marker data display window, the following information is displayed on the current marker point.

- X-axis data ("I vs. Q diagram", etc.)
- Y-axis data
- Degree (phase) data ("I vs. Q diagram" only)
- Symbol point No. and sample point No. in analysis slot

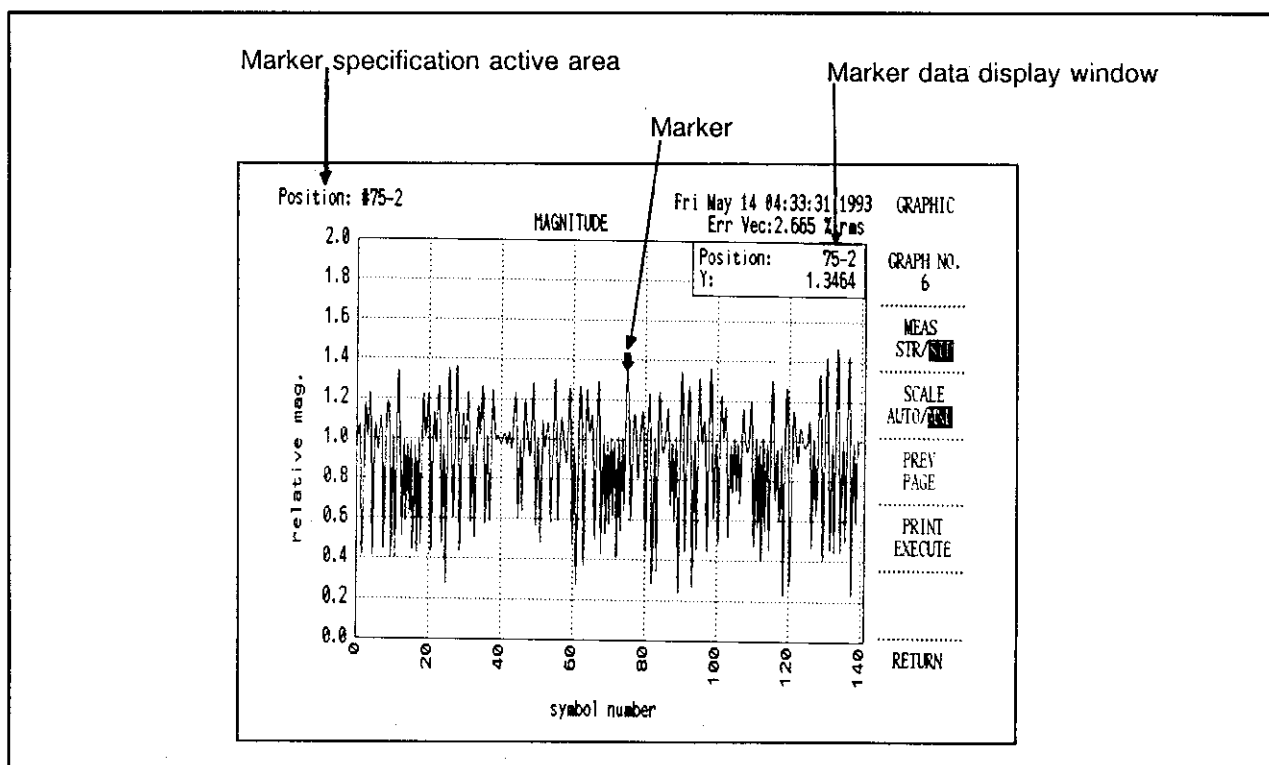


Figure 4-35 Marker Display on Modulation Accuracy Graph

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4.19 Graph Marker Functions

The marker data display window can move the display position by setting the
to UP or LOW in the normal marker soft menu.

DSP POSI
UP/LOW

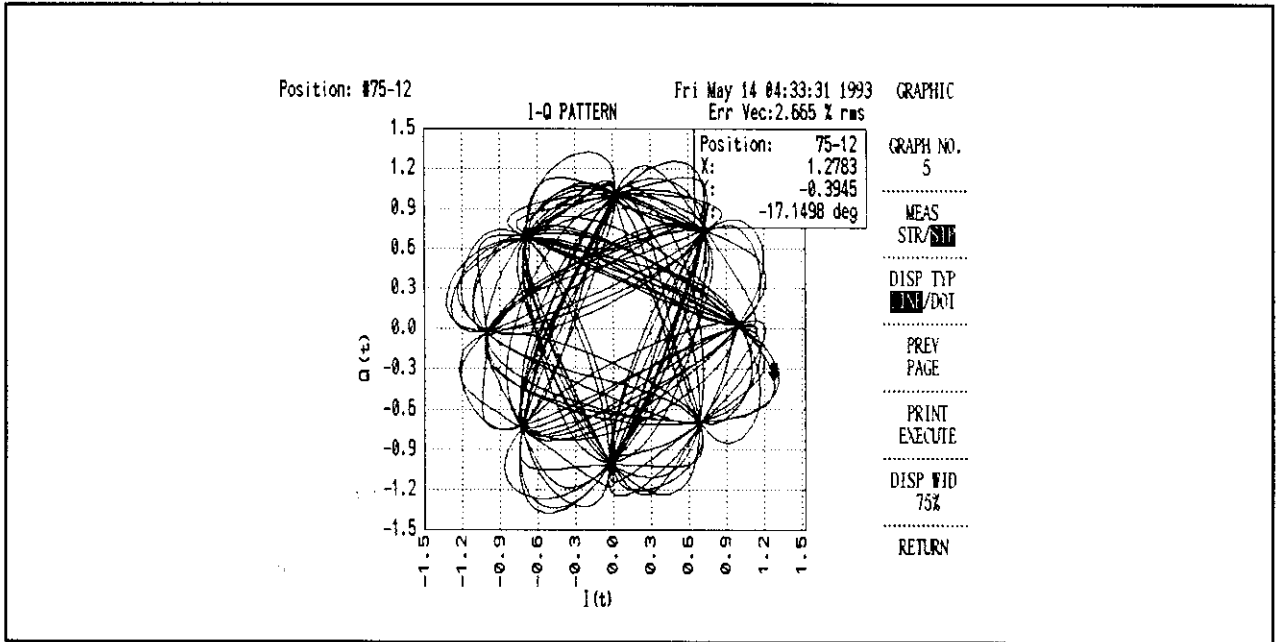


Figure 4-36 Display Position of Marker Data Display (UP is selected)

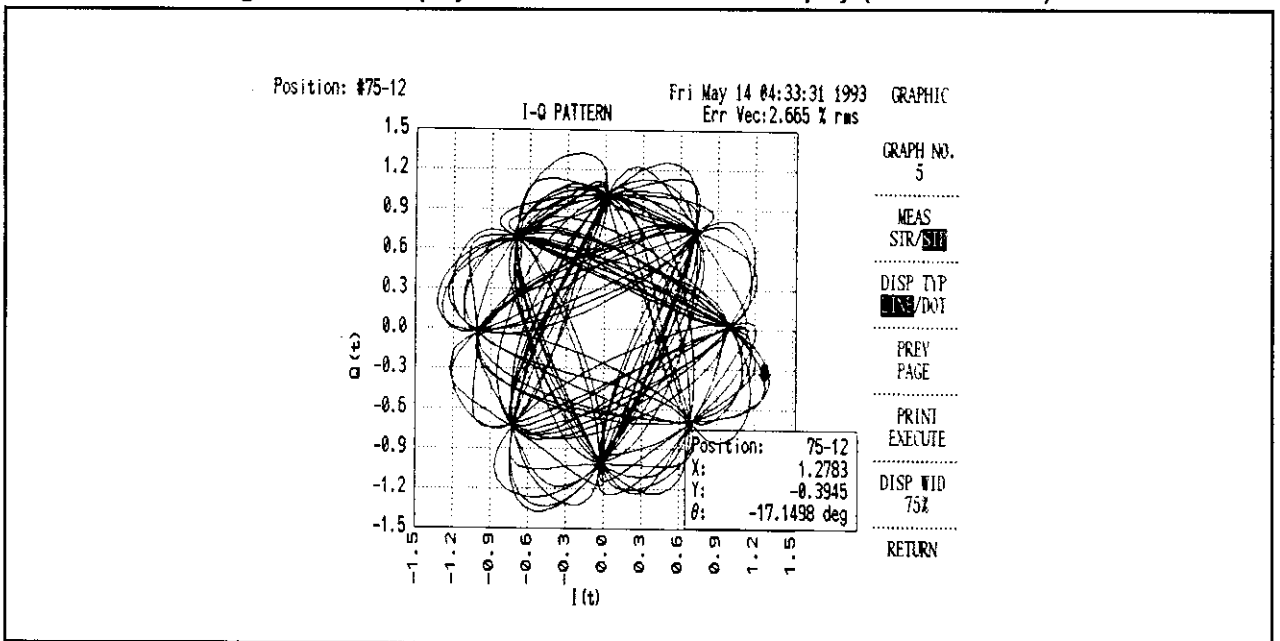


Figure 4-37 Display Position of Marker Data Display (LOW is selected)

Examples of marker data display window

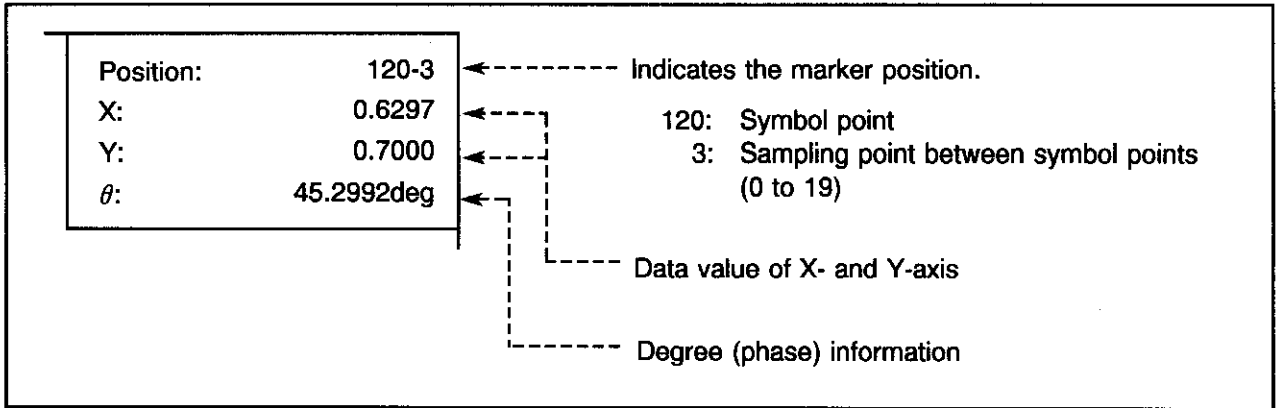


Figure 4-38 Marker Data Display Window (I vs. Q diagram display)

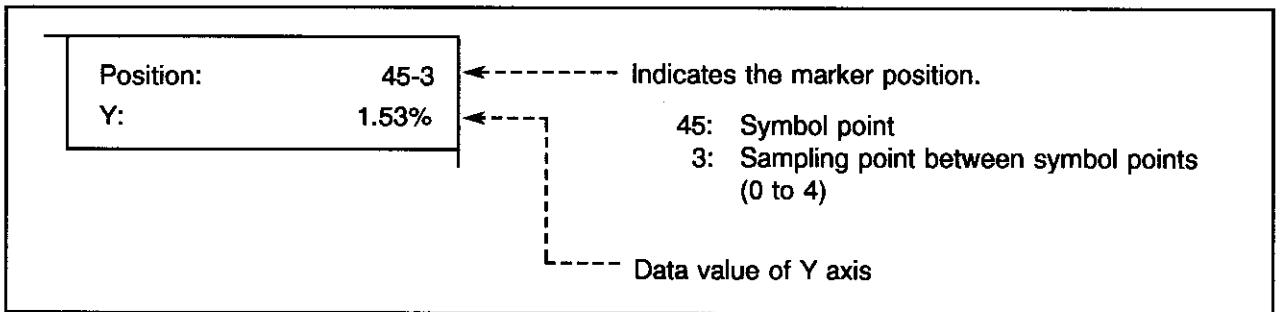


Figure 4-39 Marker Data Display Window (Magnitude Error display)

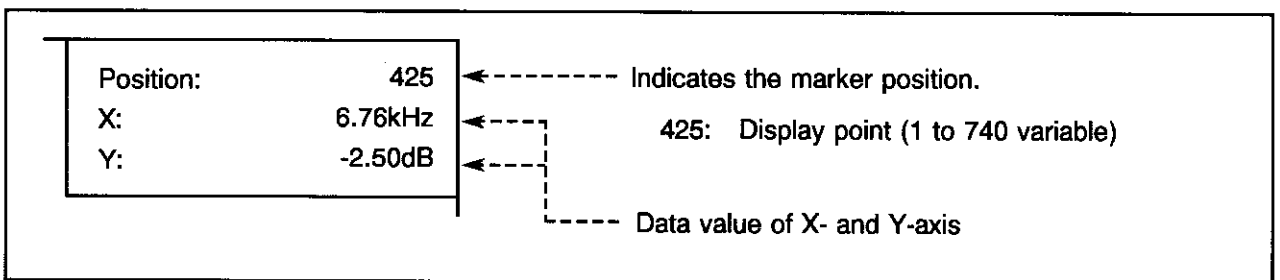


Figure 4-40 Marker Data Display Window (FFT of IF signal display)

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5.1 Error Messages

5. DISPLAYED MESSAGES LIST

5.1 Error Messages

The error messages below may be displayed on the R3265/3271 screen after measurement of modulation accuracy measurement is started because of such factor as the connection condition of the R3265/3271 or R3541, or input signal condition, etc. Measures should be taken for each error message.

Error Message	Description
R3541 is inactive	The R3541 is powered "OFF" or interface cable to the R3265/3271 is not connected.
	Measures: Check the connection of interface cable and start up the unit following the power up procedure.
R3541 timed out	Although the measurement is requested to the R3541 whose connection is checked, the response is not returned from it.
	Measures: Check the connection of interface cable and start up the unit following the power up procedure.
Invalid RBW	The "RBW" not suitable for modulation accuracy measurement is set.
	Measures: Set the "RBW" to 100kHz or more.
Invalid trace detection	The "TRACE DETECTION MODE" not suitable for modulation accuracy measurement is set.
	Measures: Set the "TRACE DETECTION MODE" to the "POSI-NEGA" or "POSI".
Input level over REF LEVEL	Input signal level is not suitable for modulation accuracy measurement because it exceeds REF. LEVEL.
	Measures: Adjust REF. LEVEL on the screen so that the input signal waveform does not exceed the "REF. LEVEL".

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5.1 Error Messages

(cont'd)

Error Message	Description
Can not recover from handshake error	Handshake with the R3541 which has been disconnected cannot be recovered.
	Measures: Check the connection of interface cable and start up the unit following the power up procedure.
Over Range	A/D converter detects over range.
	Measures: Adjust the "REF. LEVEL" so that the waveform is positioned at the point 10dB below the screen top. Execute the CAL AUTO LEV.
Burst Error	Burst signal cannot be detected or an error of the burst width is detected.
	Measures: Check for the burst signal when the R3265/3271 is at zero span.
Data Detection Error	Signal cannot be demodulated.
	Measures: The error of the carrier frequency should be within ± 1 kHz. Check that the modulation signal is prescribed signal ($\pi/4$ DQPSK signal).
Synchronization Error	SYNC. WORD cannot be detected.
	Measures: Check that the synchronization word setting for the measurement signal is consistent with that for the system. Check that the synchronization word is correctly positioned. Check that the setting such as PDC/NADC and UPLINK/DOWNLINK is correct.
Reference Signal Generation Error	Signals cannot be demodulated.
	Measures: The error of the carrier frequency should be within ± 1 kHz. Check that the modulation signal is prescribed signal ($\pi/4$ DQPSK signal).

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5.1 Error Messages

(cont'd)

Error Message	Description
Signal Detection Error	Modulation signal can not be detected.
	Measures: Check that the target modulation signal ($\pi/4$ DQPSK) is set. Check that the setting such as PDC/NADC, UPLINK/DOWNLINK is correctly executed. Check that the symbol rate of modulation signal is correct.
Sync. Word Detection Error	SYNC. WORD cannot be detected.
	Measures: Measure the signal to which the correct SYNC. WORD is set. When the external trigger is used, trigger the signal at the position where SYNC. WORD is detected.
Invalid Trigger Timing	The trigger timing is not correct (when the external trigger is used).
	Measures: Adjust the timing so that the signal is triggered outside slot.
Over Phase-Error Limit	Phase rotation is out of range.
	Measures: The error of the carrier frequency should be within 1kHz.
A/D Sampling Error	Although input operation to the A/D is started, the signal cannot be taken in within the specified time period.
	Measures: Input the signal which can be triggered. Check that the trigger signal is entered (when the external trigger is used).
Other Error	The condition where calculation cannot be performed is detected.
	Measures: Check that the system is correctly set. Check that the trigger signal is entered (when the external trigger is used).
Calibration signal not detected	The CAL signal cannot be detected while the CAL AUTO LEV is executing.
	Measures: Check that the INPUT of R3265/3271 and the CAL OUT are correctly connected.

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5.1 Error Messages

(cont'd)

Error Message	Description
IF LEVEL Error	The IF signal has an error while the CAL AUTO LEV is executing.
	Measures: Check that the 21.4 MHz IF OUT of R3265/3271 and the 21.4 MHz IN of R3541 are correctly connected.

The errors displayed at the execution of the burst transmission transient response characteristic graph are described as follows:

Error Message	Description
Link direction is incorrect	The setting of link direction is not correct.
	Measures: Set "UP" since the PDC/NADC has set "DOWN" link. Set "BURST" since the PHS has set "SIG TYP" to "CNT".
Trigger is incorrect	Trigger setting is not correct.
	Measures: The evaluation mode has been other than "NORMAL" and the trigger specification has been "BURST". Set the trigger to other than "BURST".
No. of bursts is shortage to estimate	The burst signal for the size required for the evaluation can not be found.
	Measures: When the evaluation mode is "MAX/MIN/AVG", this message occurs since the signal for 10 bursts is not detected within the regulated time. Also at the "NORMAL", this error occurs since the time for one burst is short. Input the signal applicable to evaluation.
A/D calibration data is incorrect	The calibration data required for evaluation is not correct.
	Measures: Execute the "AUTO LEV CAL" to gain the calibration data.

5.2 Warning Messages

The warning messages below may be displayed on the R3265/3271 screen after measurement of modulation accuracy measurement is started because of such factors as the connection condition of the R3265/3271 or R3541, or input signal condition, etc. The warning messages are mainly displayed when the external trigger is used. In this case, the measurement result is displayed but it may be supposed that the result is not correct because of the factors below. Check the input signal or others according to the message displayed.

Error Message	Description
No margin for filtering	There is not a sufficient space to filter at the trigger position (when the external trigger is used).
	Measures: Since a space corresponding to 10 symbols is required ahead of the start of the symbol to be measured, trigger the signal 10 symbols ahead of the point where the measurement is started.
Could not validate a sync. word	Since only one SYNC. WORD is detected when the external trigger, Down Link, and SYNC. WORD are specified, the slot cannot be checked.
	Measures: Check that the setting of FULL RATE or HALF RATE is consistent with the that of the signal to be measured.
Found a multiple sync. word	Multiple SYNC. WORDs are detected.
	Measures: Check that the signal which are to be measured for FULL RATE is measured for HALF RATE.
No margin for filtering & could not validate a sync. word	Two errors above "Could no validate a sync. word" and "Found a multiple sync. word" concurrently occur. (when the external trigger is used)
	Measures: Check the setting of FULL RATE and HALF RATE.

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5.2 Warning Messages

(cont'd)

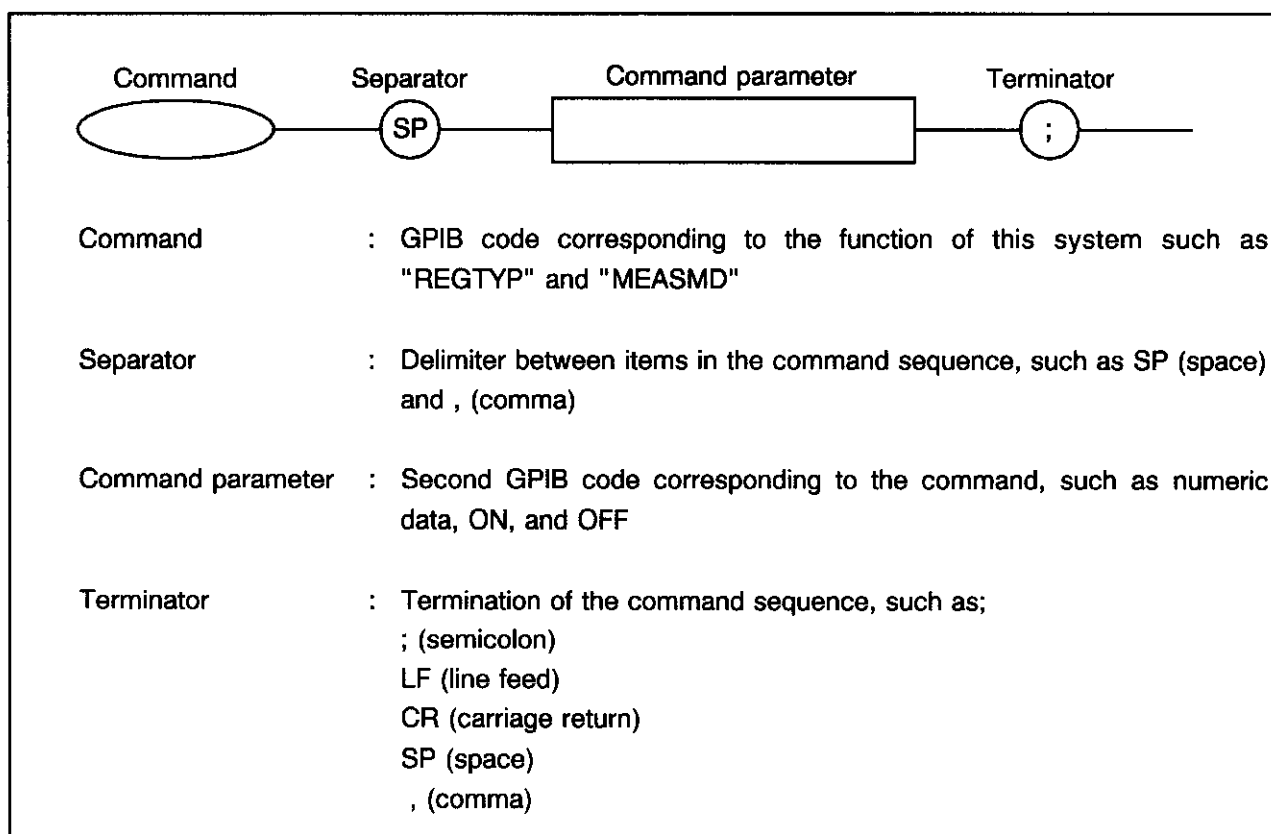
Error Message	Description
Trigger in a slot	Although the SYNC. WORD is confirmed, the trigger is performed within the slot (when the external trigger is used). For the external trigger, the slot is evaluated at the trigger point. In this case, since the trigger is performed within the slot, the evaluation is made for the next slot having the same SYNC. WORD.
	Measures: Trigger the signal outside the slot to be measured.
Invalid transmission error	Data transfer (transmission) has failed.
	Measures: Execute the graph display and the measurement again.

6. GPIB COMMAND SYNTAX DIAGRAM

This section describes the GPIB commands using the Syntax Diagram representation. For programming, follow the Syntax Diagram.

6.1 Syntax Diagram Description

The syntax diagram is a schematic representation of each command and its accompanied data following a specified rule. The figure below shows the command sequence on which the syntax diagram is based and the description. The command sequence is interpreted as the basic instruction set which controls this system.



The following are the terms used in the syntax diagram:

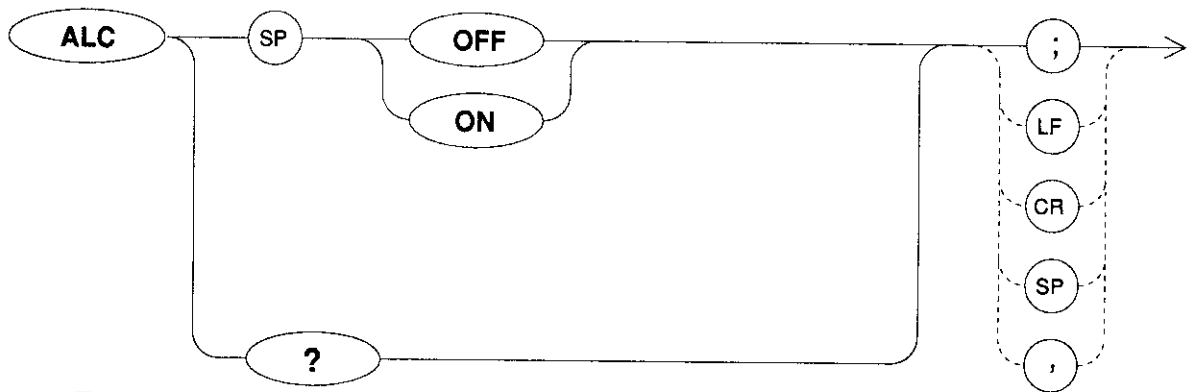
- data byte : Numeric data of one byte consisting of eight bits.
- data & EOI : Numeric data of one byte consisting of eight bits plus EOI signal.
- digit : 0123456789
- LF with EOI : Terminator. EOI signal is added at the same time of LF addition.
- number : Integer number, fixed point, and floating point data.

6.2 Command Syntax Diagram

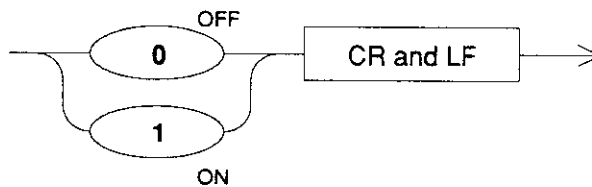
The Syntax Diagram is described below for each GPIB command code.

ALC Auto Leveling Control

Syntax



Query Response

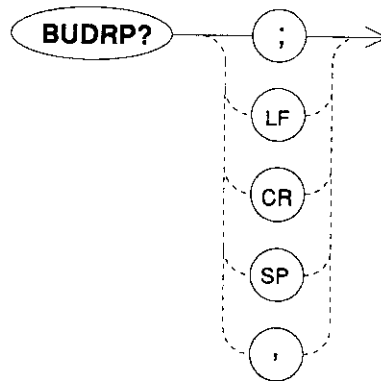


Parameters

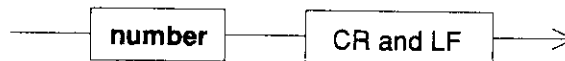
- OFF** : Turns off the auto-level control.
- ON** : Turns on the auto-level control.

BUDRP? Output Burst Amplitude Droop

Syntax



Query Response

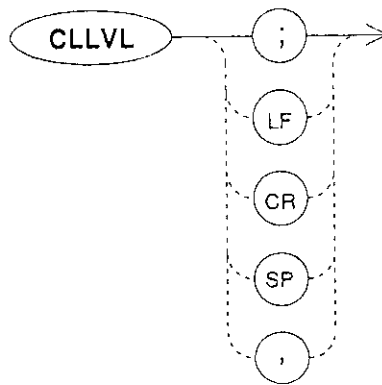


Comment

When the modulation accuracy measurement is terminated, BUDRP command returns the attenuation value of the burst amplitude.

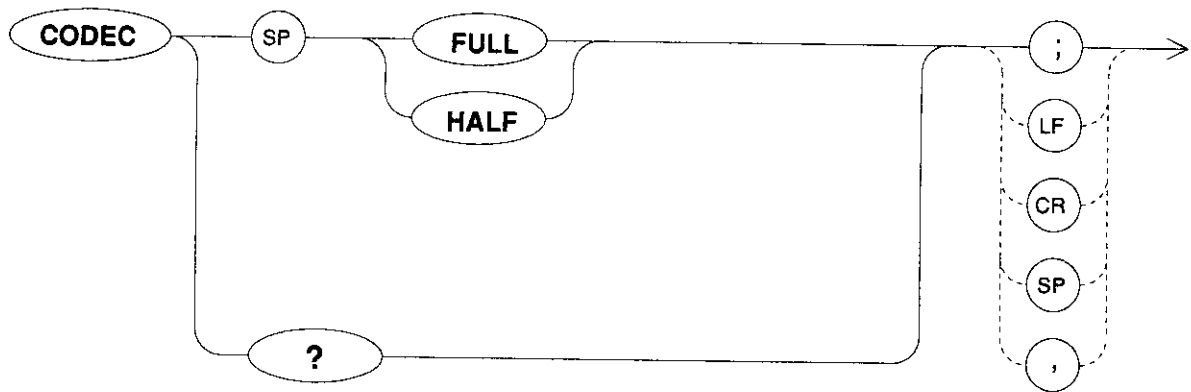
CLLVL
Auto Level Calibration

Syntax

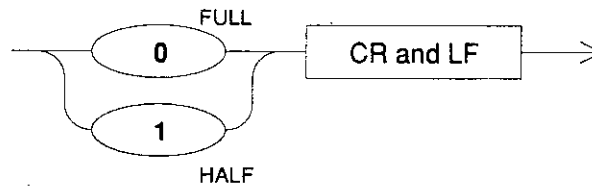


CODEC Codec Type

Syntax



Query Response

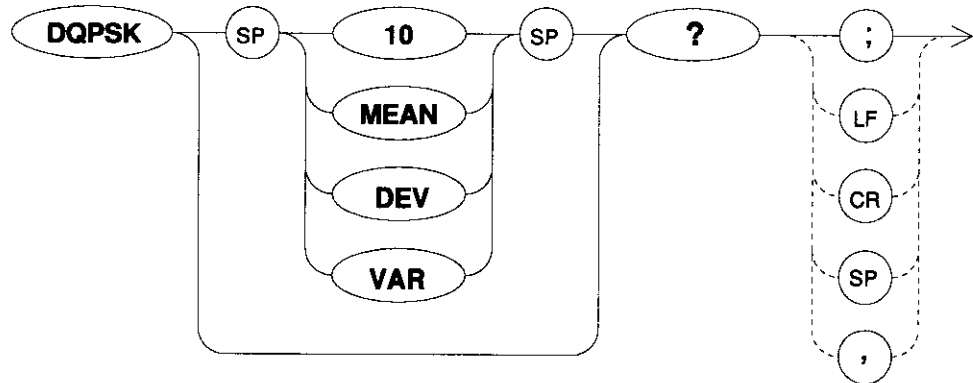


Parameters

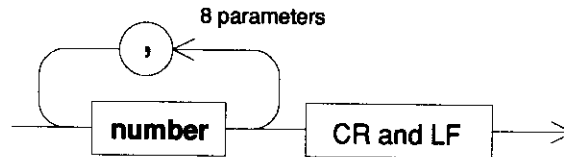
- FULL** : Selects FULL RATE.
- HALF** : Selects HALF RATE.

DQPSK Output All of the Measurement Result

Syntax



Query Response



Output Result Sequence

- 1: Measurement Status (1:finished/0:measuring now/2 to 13,99:Cf.STAT command)
- 2: Burst Amplitude Droop
- 3: Carrier Frequency Error
- 4: I/O Origin Offset
- 5: Magnitude Error (*1)
- 6: Phase error (*1)
- 7: Error Vector Magnitude (*1)
- 8: Bit Rate (*2)

*1: Returns the specified value from the average in the case of 10 bursts, the average, deviation, or variance in the case of averaging.

*2: Returns the bit rate in the case of 10 bursts.

Parameters

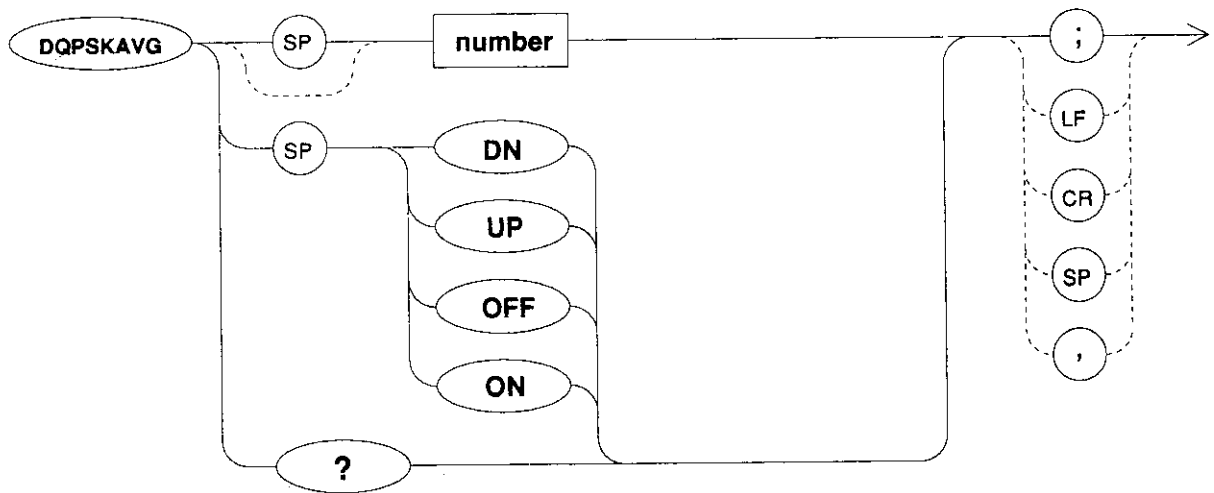
- 10** : When 10 bursts is specified, returns the RMS average of the last 10 measurement values.
- MEAN** : When the averaging measurement is specified, returns the average.
- DEV** : When the averaging measurement is specified, returns the deviation.
- VAR** : When the averaging measurement is specified, returns the variance.

Comment

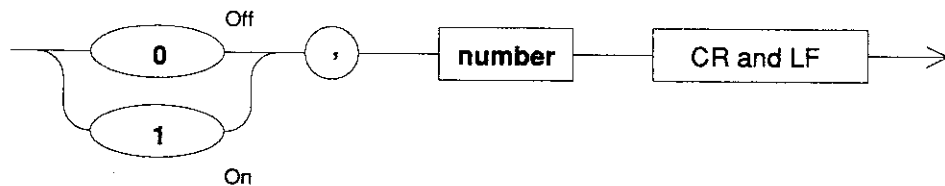
When the modulation accuracy measurement is terminated, the DQPSK command returns all of the modulation accuracy measurements. However, during measurement, returns an indeterminate value.

DQPSKAVG Averaging On and Off

Syntax



Query Response



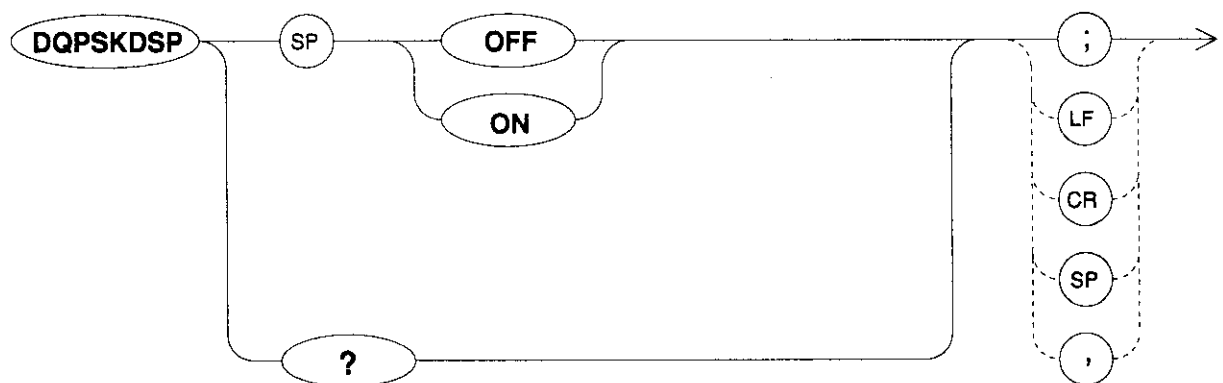
Parameters

- OFF** : Turns off the averaging.
- ON** : Turns on the averaging.
- number** : Sets the averaging number in a range of 2 to 50.

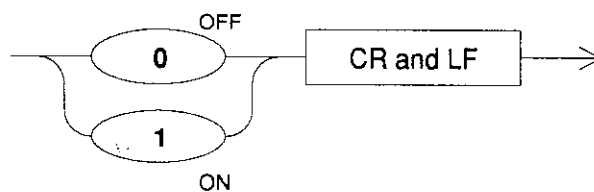
DQPSKDSP Display Results On and Off

(Measured result display)

Syntax



Query Response

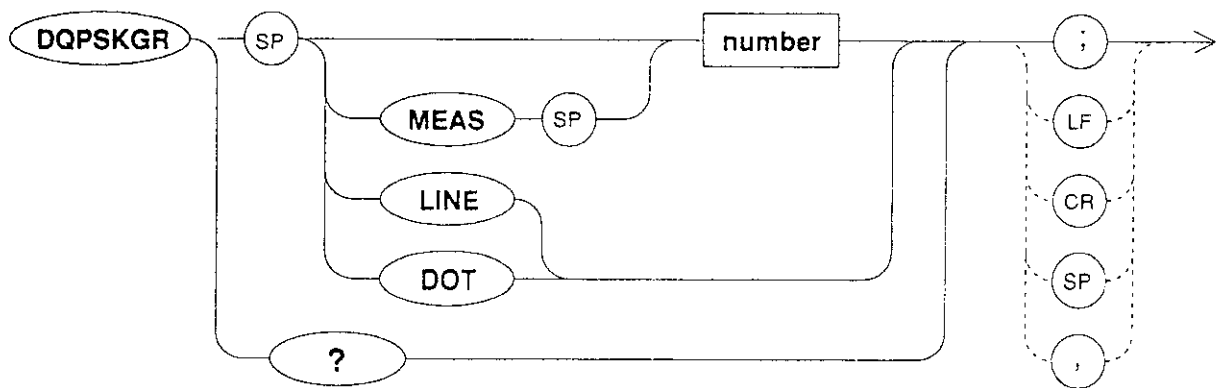


Parameters

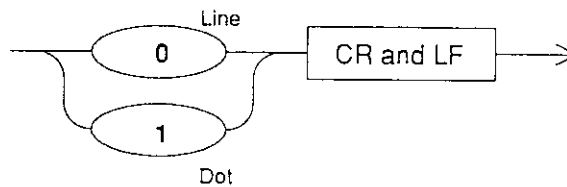
- OFF** : Displays the normal spectrum screen.
- ON** : Displays the modulation accuracy measurement result.

DQPSKGR Graphic Display Execute

Syntax



Query response

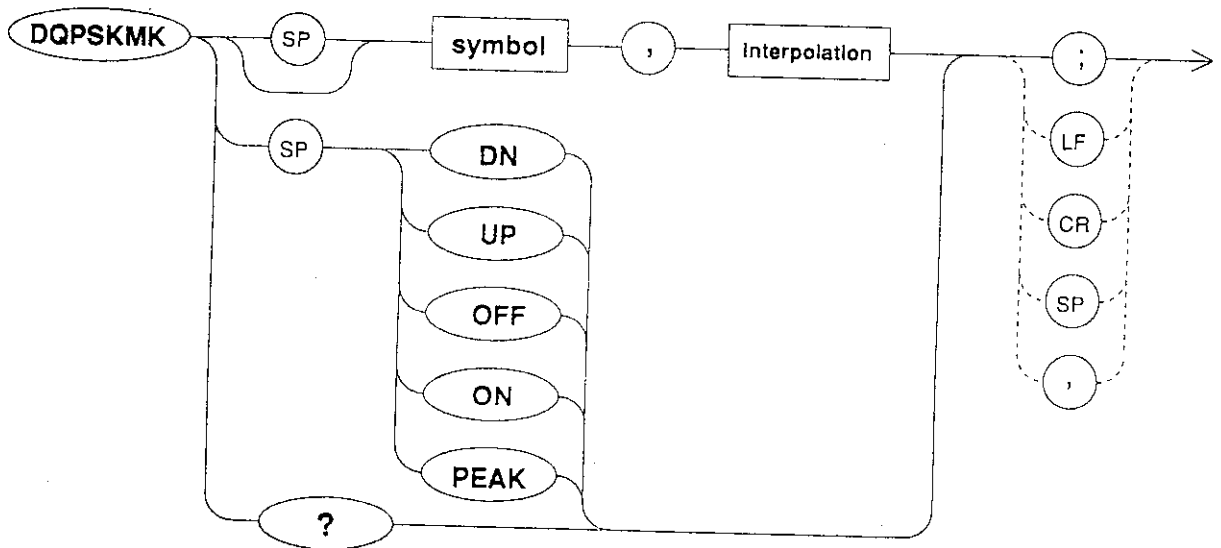


Parameters

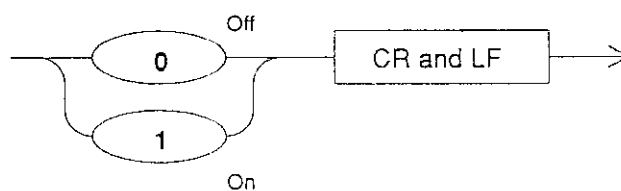
- MEAS** : Displays the graph of the specified number.
- number** : Displays the graph of the specified number after the modulation accuracy measurement is executed.
- LINE** : Displays the constellation graph with straight lines.
- DOT** : Displays the constellation graph with dots.

DQPSKMK Marker On and Off

Syntax



Query Response

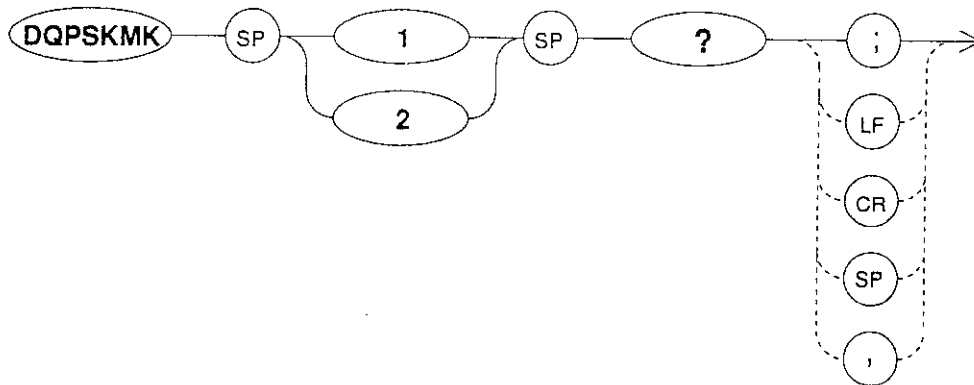


Parameters

- OFF** : Turns the marker for modulation accuracy graph off.
- ON** : Turns the marker for modulation accuracy graph on.
- PEAK** : Searches the peak level of the modulation accuracy graph and moves the marker to the peak position.
- symbol** : Sets the symbol number.
- interpolation** : Sets the interpolation (sampling) point number between symbols.

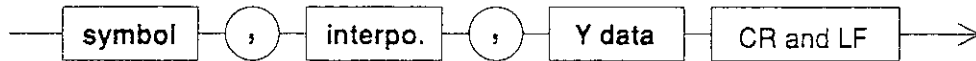
DQPSKMK?
 Returns the level data at marker point

Syntax

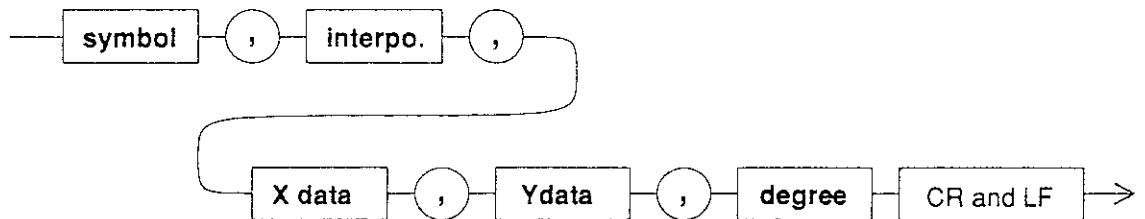


Query Response

case 1: *DQPSKMK 1 ?*



case 2: *DQPSKMK 2 ?*

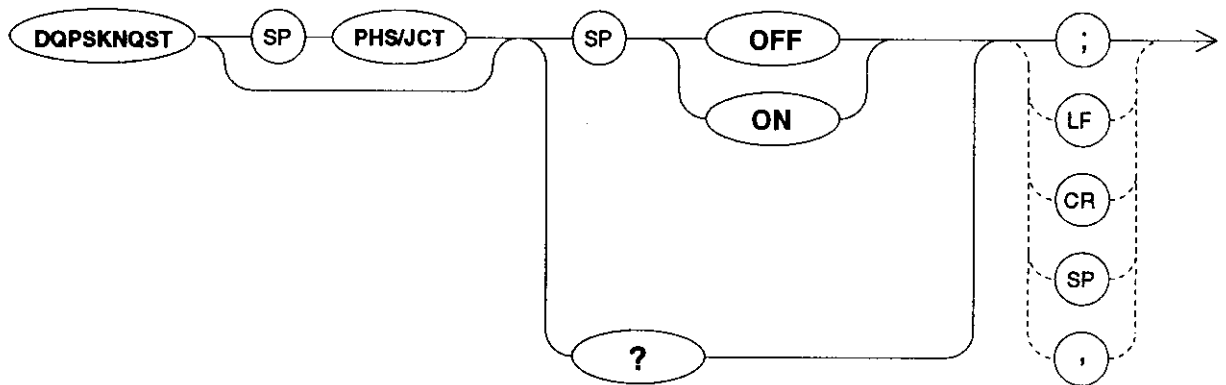


Parameters

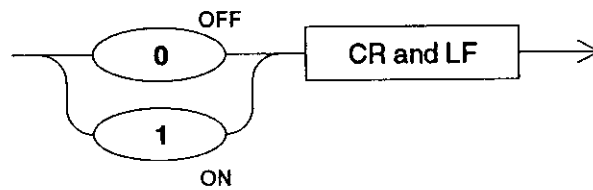
- 1 : Returns the symbol number, interpolation point number, and Y-axis data.
- 2 : Returns the symbol number, interpolation point number, X-axis data, Y-axis data, and degree data.
- symbol** : Represents the symbol number.
- interpo.** : Represents the interpolation point number.
- Y data** : Represents the Y-axis data.
- X data** : Represents the X-axis data.
- degree** : Represents the degree data.

DQPSKNQST Root Nyquist Filter

Syntax



Query Response



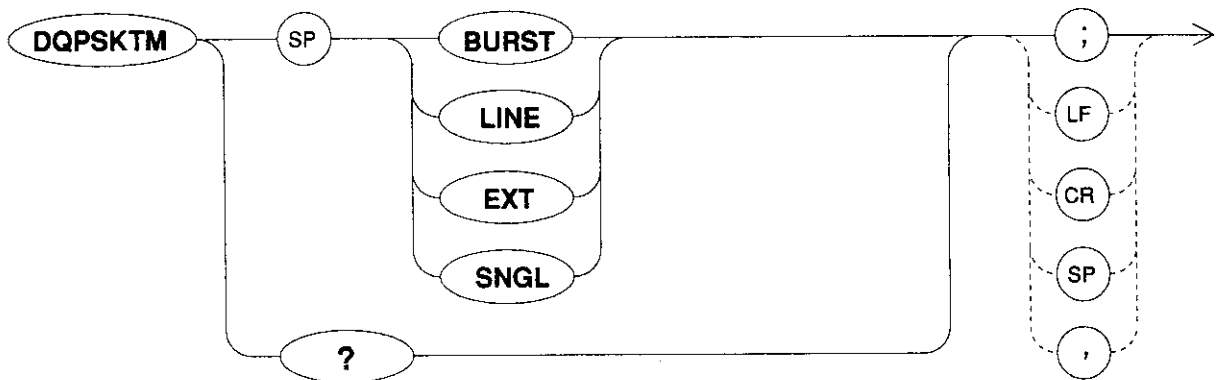
Parameters

- OFF** : Turns off the $\sqrt{\text{Nyquist}}$ filter.
- ON** : Turns on the $\sqrt{\text{Nyquist}}$ filter.
- PHS** : Specify this parameter when PHS is selected. (JCT is also available.)

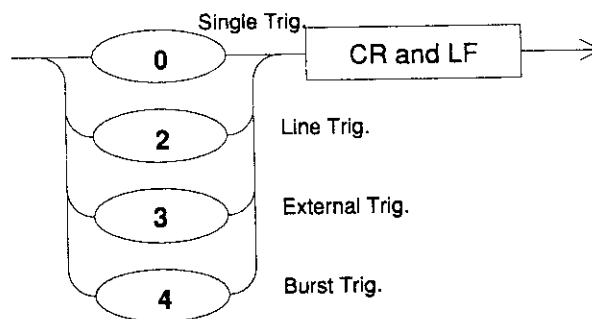
DQPSKTM Trigger Mode of Modulation Accuracy Measurement

(Trigger Selection)

Syntax



Query Response

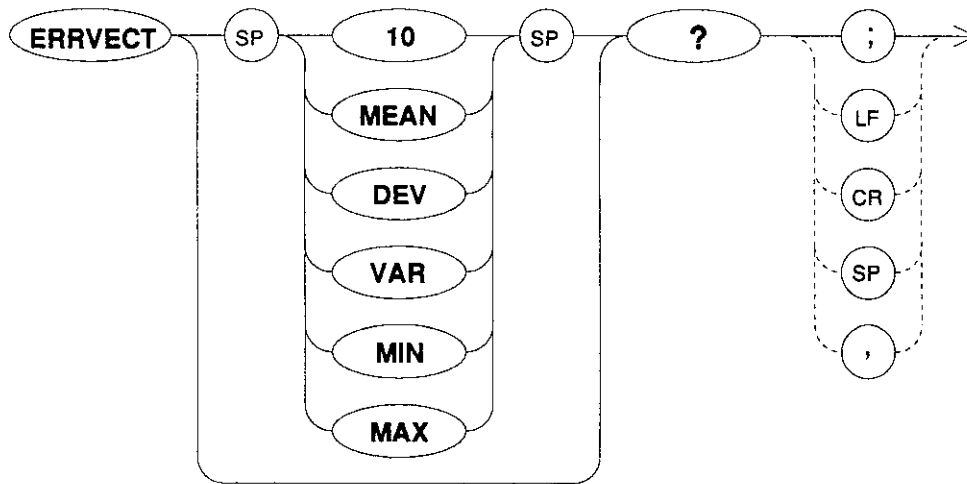


Parameters

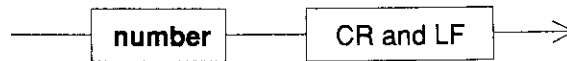
- BURST:** Triggers the measurement when the edge of one burst is detected.
- LINE :** Triggers the measurement using the power supply line.
- EXT :** Triggers the measurement using the external signal.
- SGNL :** Manually starts the measurement without the trigger function.

ERRVECT Output Error Vector Magnitude

Syntax



Query Response



Parameters

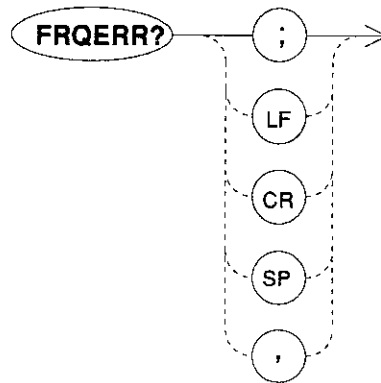
- 10** : When 10 burst is specified, returns the RMS average over the last 10 measurement values.
- MEAN** : When the averaging is specified, returns the average.
- DEV** : When the averaging is specified, returns the deviation.
- VAR** : When the averaging is specified, returns the variance.
- MIN** : When the averaging is specified, returns the minimum value.
- MAX** : When the averaging is specified, returns the maximum value.

Comment

When the modulation accuracy measurement is terminated, ERRVECT command returns the value of the error vector magnitude.

FRQERR? Output Carrier Frequency Error

Syntax



Query Response

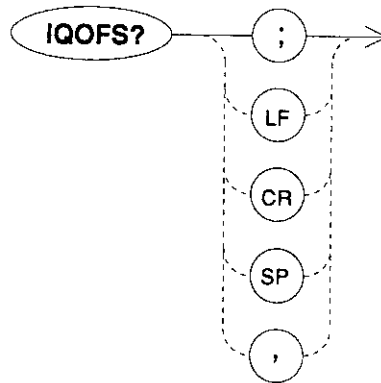


Comment

When the modulation accuracy measurement is terminated, FRQERR command returns the variable to the carrier frequency.

IQOFS? Output I/Q Origin Offset

Syntax



Query Response



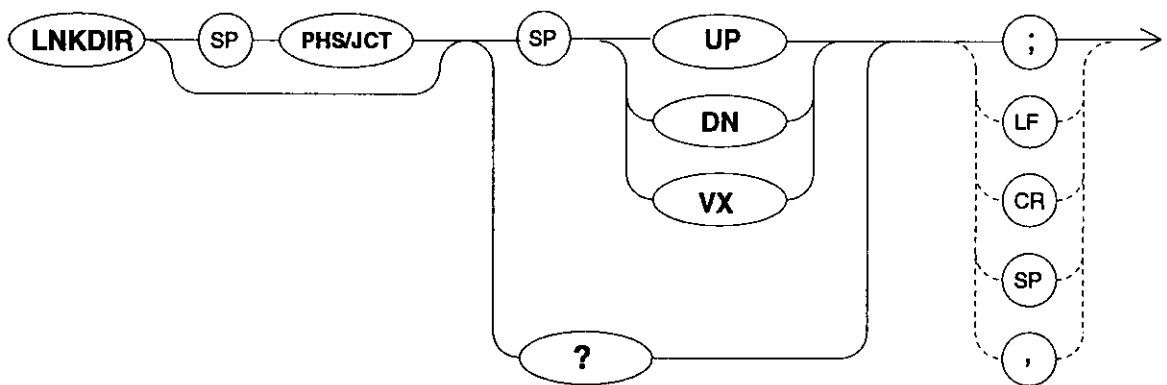
Comment

When the modulation accuracy measurement is terminated, IQOFS command returns I/Q offset.

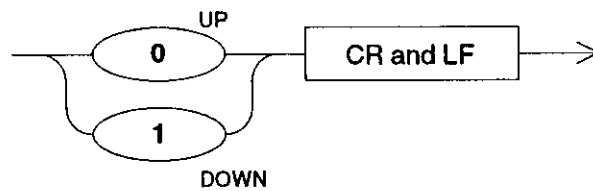
LNKDIR Link Direction

(Measured signal type selection)

Syntax



Query Response

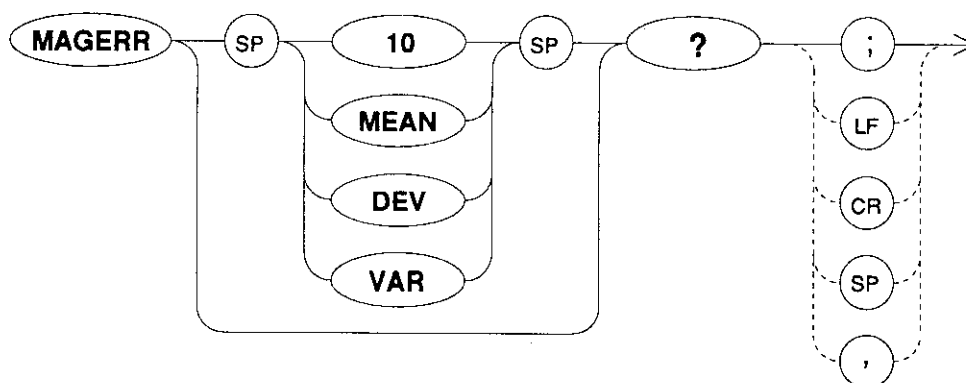


Parameters

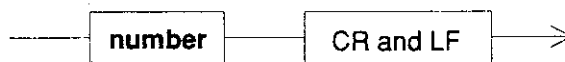
- UP** : Selects the link from the mobile station to base station.
- DN** : Selects the link from the base station to mobile station.
- VX** : Selects the burst measurement for VOX.
- PHS** : Specify this parameter when PHS is selected. (JCT is also available.)

MAGERR Output Magnitude Error

Syntax



Query Response



Parameters

- 10** : When 10 burst is specified, returns the RMS average over the last 10 measurement values.
- MEAN** : When the averaging is specified, returns the average.
- DEV** : When the averaging is specified, returns the deviation.
- VAR** : When the averaging is specified, returns the variance.

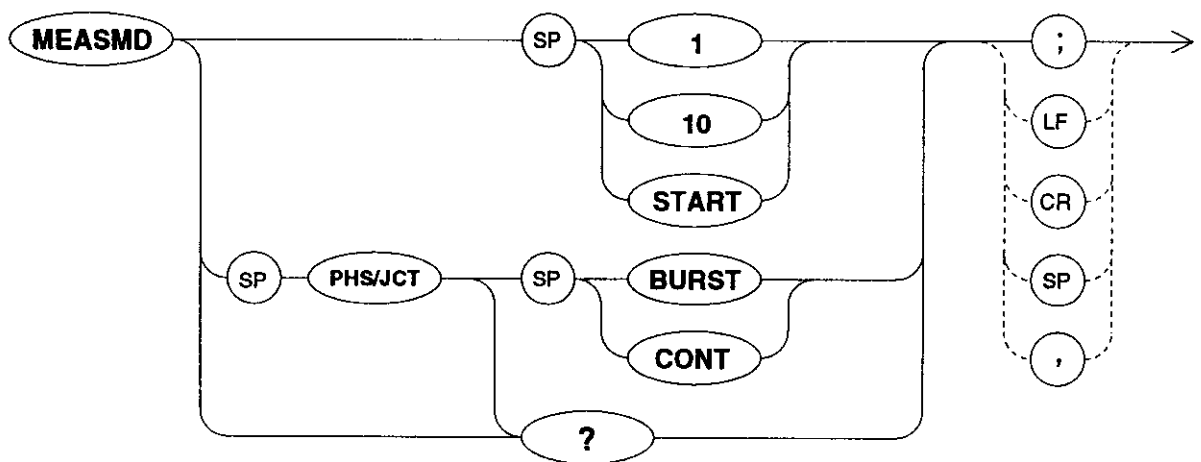
Comment

When the modulation accuracy measurement is terminated, MAGERR command returns the error vector magnitude.

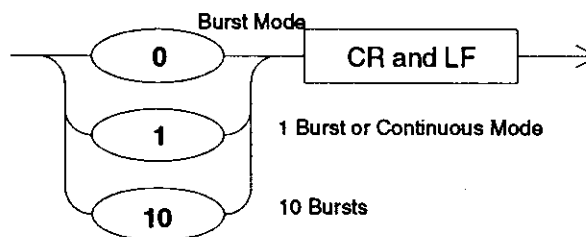
MEASMD Modulation Accuracy Measurement Mode and Measure Start

(Measuring method selection)

Syntax



Query Response

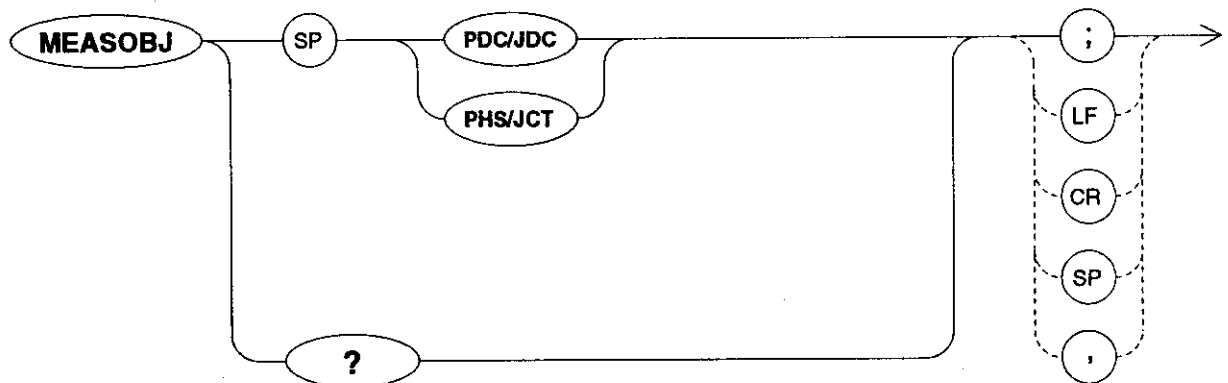


Parameters

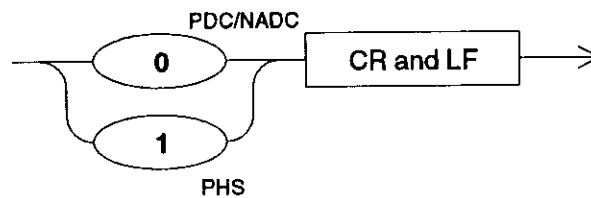
- 1** : Selects the 1-burst, error vector, detection mode.
- 10** : Selects the 10-burst, error vector, average measurement mode.
- START** : Starts the modulation accuracy measurement.
- BURST** : Selects the burst waveform analysis (for PHS).
- CONT** : Selects the continuous waveform analysis (for PHS).
- PHS** : Specify this parameter when PHS is selected. (JCT is also available.)

MEASOBJ Measurement Object (PDC/NADC or PHS Selection)

Syntax



Query Response



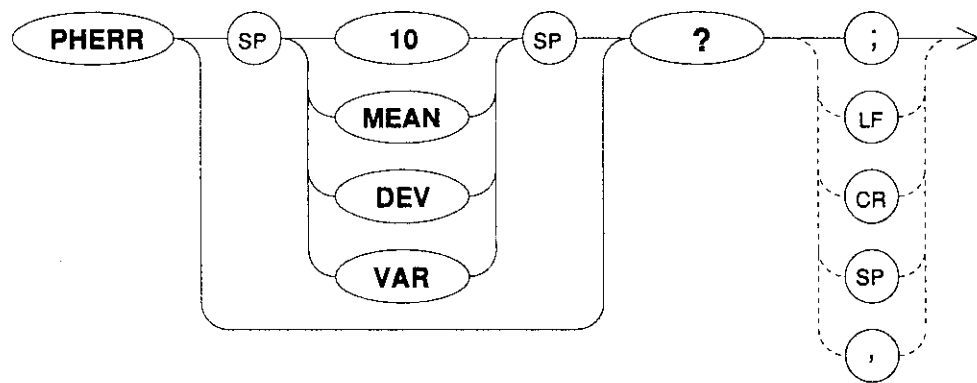
Parameters

PDC: Selects PDC/NADC mode. (JCT is also available.)

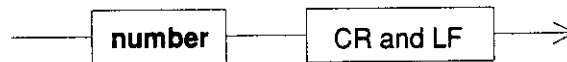
PHS: Selects PHS mode. (JCT is also available.)

PHERR Output Phase Error

Syntax



Query Response



Parameters

- 10** : When 10 burst is specified, returns the RMS average over the last 10 measurement values.
- MEAN** : When the averaging is specified, returns the average.
- DEV** : When the averaging is specified, returns the deviation.
- VAR** : When the averaging is specified, returns the variance.

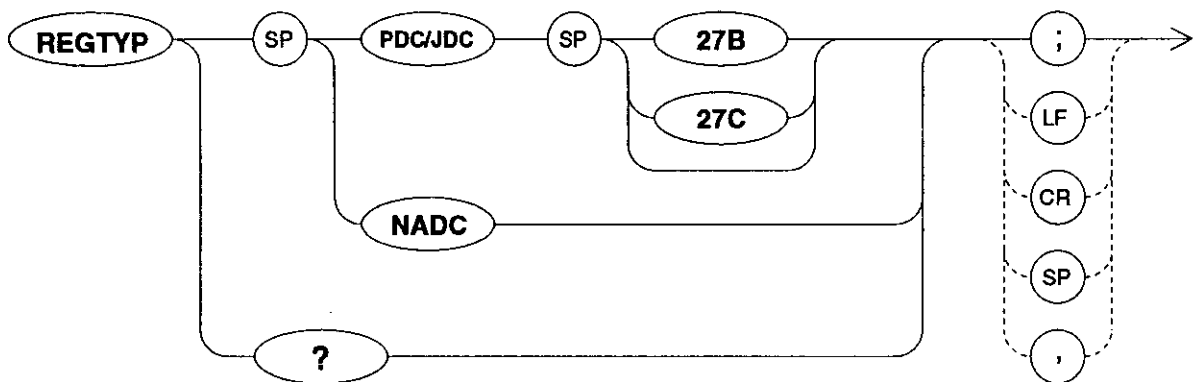
Comment

When the modulation accuracy measurement is terminated, PHERR command returns the phase to the error vector.

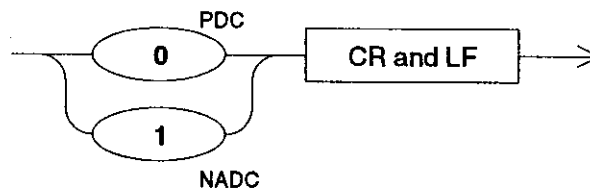
REGTYP Reguration Type

(Measurement signal standard selection)

Syntax



Query Response

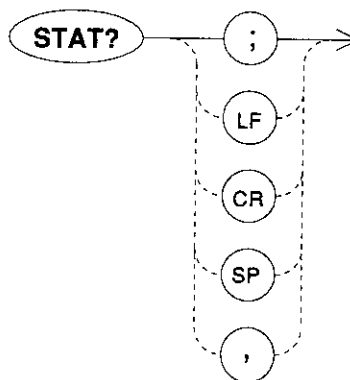


Parameters

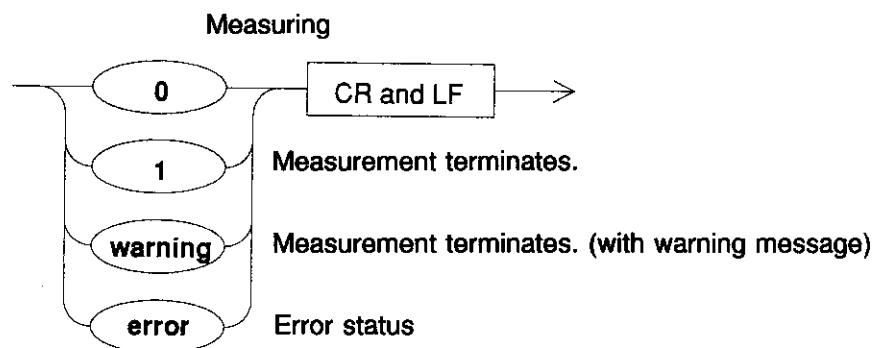
- PDC** : Selects PDC standard. (JCT is also available.)
- NADC** : Selects NADC standard.
- 27B** : When PDC is selected, this parameter selects RCR-STD27B.
- 27C** : When PDC is selected, this parameter selects RCR-STD27C.

STAT? Output Measurement Status

Syntax



Query Response



Error Codes

- 2 : A/D converter detects over range.
- 3 : An error is detected in the parameter set by the spectrum analyzer.
- 4 : Burst signal is not detected or there is burst width error.
- 5 : Demodulation failure.
- 6 : Synchronization word is not detected.
- 7 : Demodulation failure.
- 8 : Modulation signal is not detected.
- 9 : Modulation signal is not detected.
- 10 : Synchronization word is not detected.
- 11 : Trigger timing is not correct when the external trigger is specified.

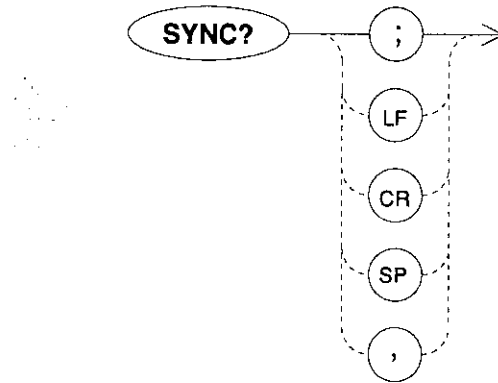
- 12 : Phase rotation is out of range.
- 13 : Although the input operation to the A/D is started, the signal cannot be taken in within a specified time period.
- 99 : Setting error or the condition where calculation cannot be performed is detected.

Warning Codes

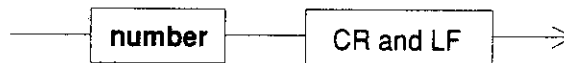
- 100 : There is not a sufficient space to filter at the trigger point when the external trigger is specified.
- 101 : Since only one word is detected when the external trigger, DOWN LINK, and SYNC WORD are specified, the slot cannot be checked.
- 102 : Multiple SYNC WORDs are detected.
- 103 : Warnings 101 and 102 concurrently occur when the external trigger is specified.
- 104 : Although SYNC WORD is confirmed, the trigger is performed within the slot (when the external trigger is specified).

SYNC?
Output SYNC word

Syntax



Query Response



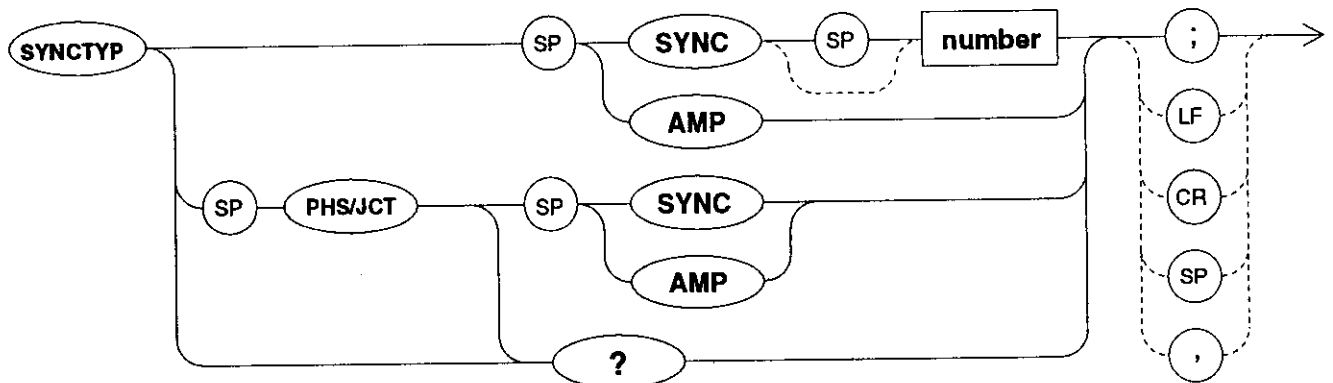
Comment

SYNC command returns the current synchronization word ID.

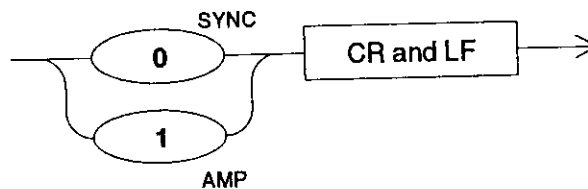
SYNCTYP Synchronization Type

(Symbol synchronizing method selection)

Syntax



Query Response



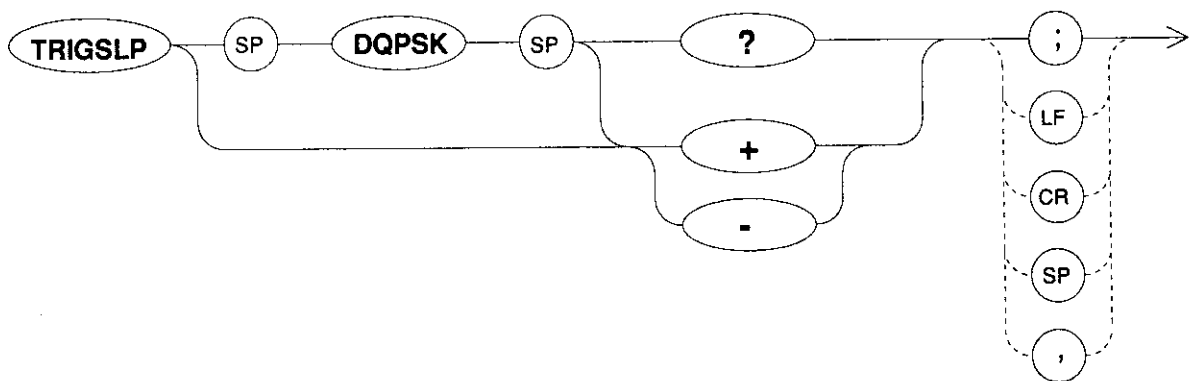
Parameters

- SYNC** : Synchronizes using the synchronization word 1 thru 12 for PDC and 1 thru 6 for NADC.
- AMP** : Synchronizes using amplitude.
- number** : Sets the synchronization word to 1 thru 12 for PDC and 1 thru 6 for NADC.
- PHS** : Specify this parameter when PHS is selected. (JCT is also available.)

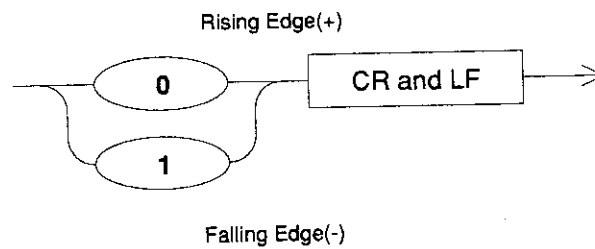
TRIGSLP Trigger Slope + / -

(Trigger signal rising/falling edge selection)

Syntax



Query Response

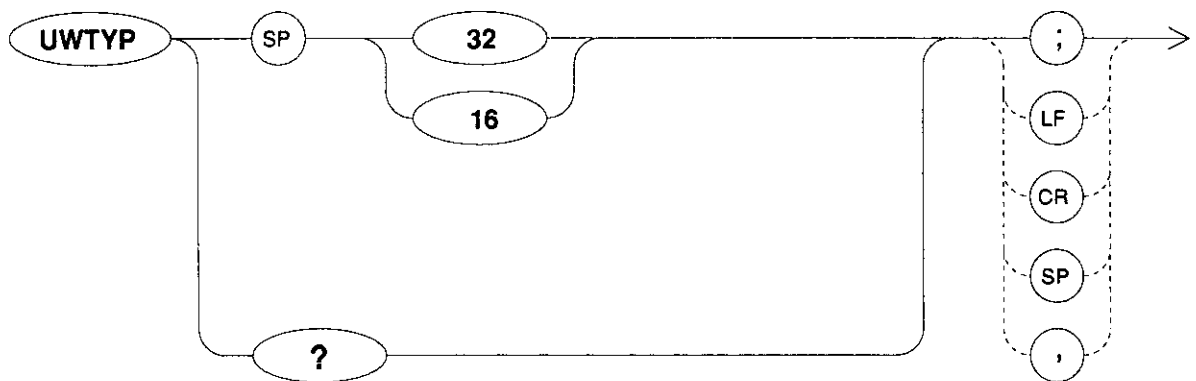


Parameters

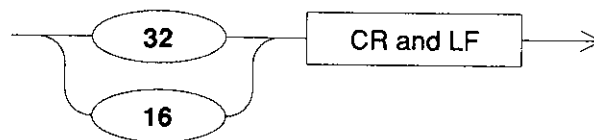
- DQPSK** : Sets the slope for modulation accuracy measurement.
- nothing** : Sets the slope for the normal measurement.

UWTYP Unique Word Type

Syntax



Query Response

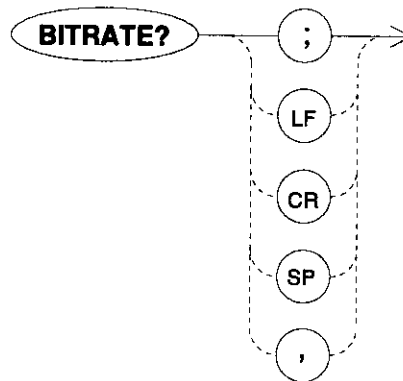


Parameters

- 32 : Selects the physical slot for control.
- 16 : Selects the physical slot for communication.

BITRATE? Output Bit Rate

Syntax



Query Response



Parameters

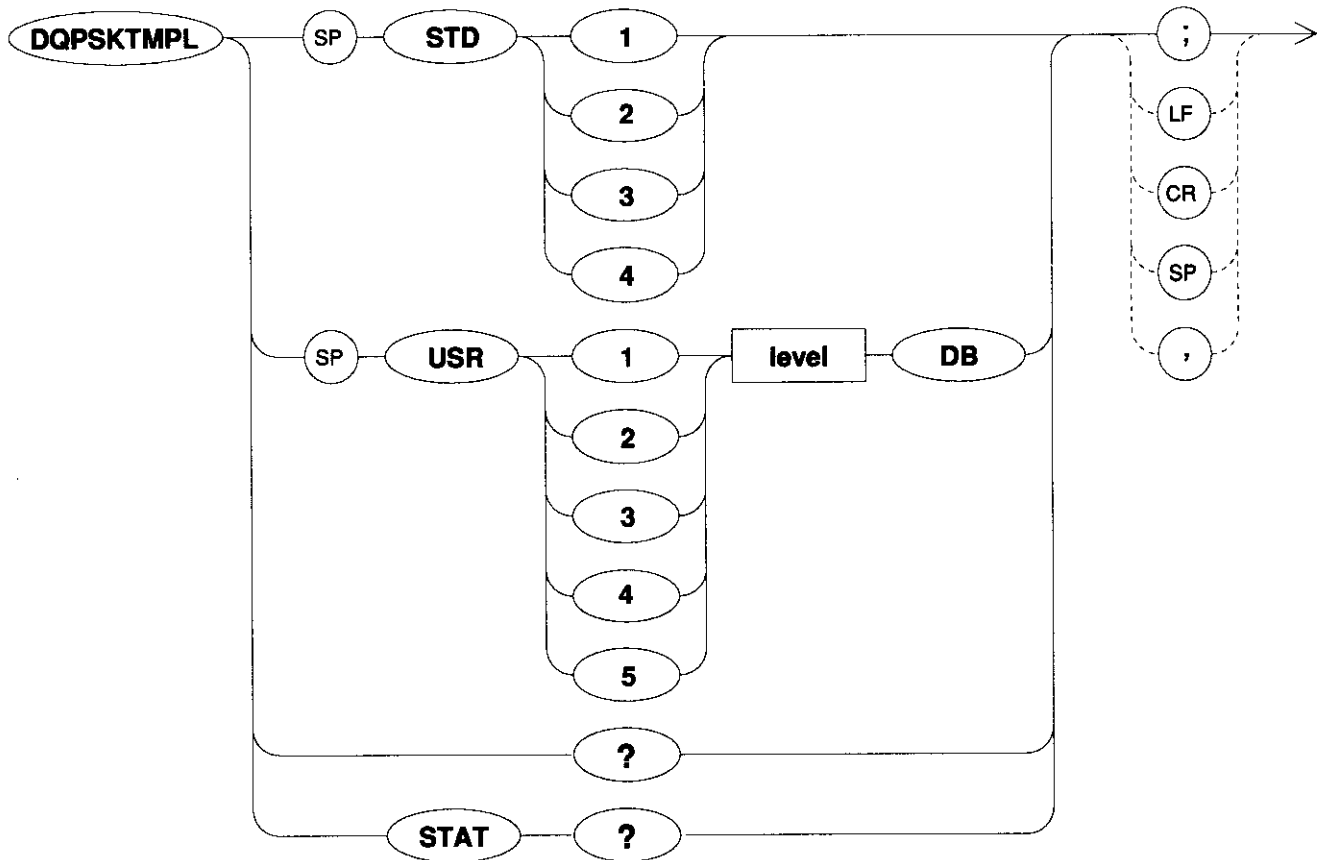
- number 1** : Returns the measured bit rate value (ppm).
- number 2** : Returns the measured bit rate value (Hz).

Comment

When the modulation accuracy measurement is terminated, BITRATE? command returns the measured bit rate value.

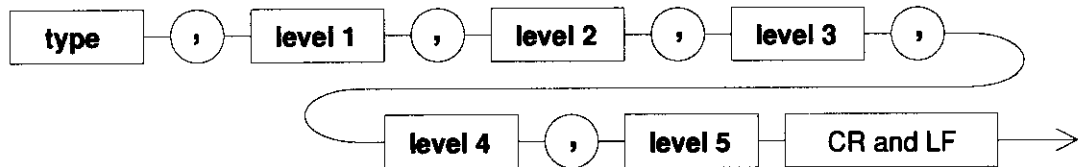
DQPSKT MPL Template Selection

Syntax



Query Response

(1) DQPSKT MPL?



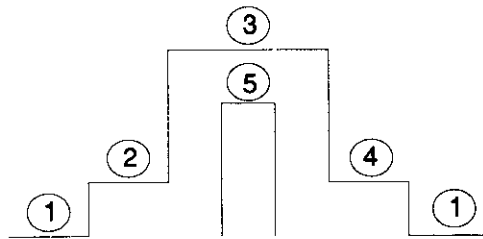
(2) DQPSKT MPL STAT?



Parameters

STD : Uses the standard definition value as template.

USR : Uses the user definition value as template.



type : Returns the type of the using template (STD:0/USR:1).

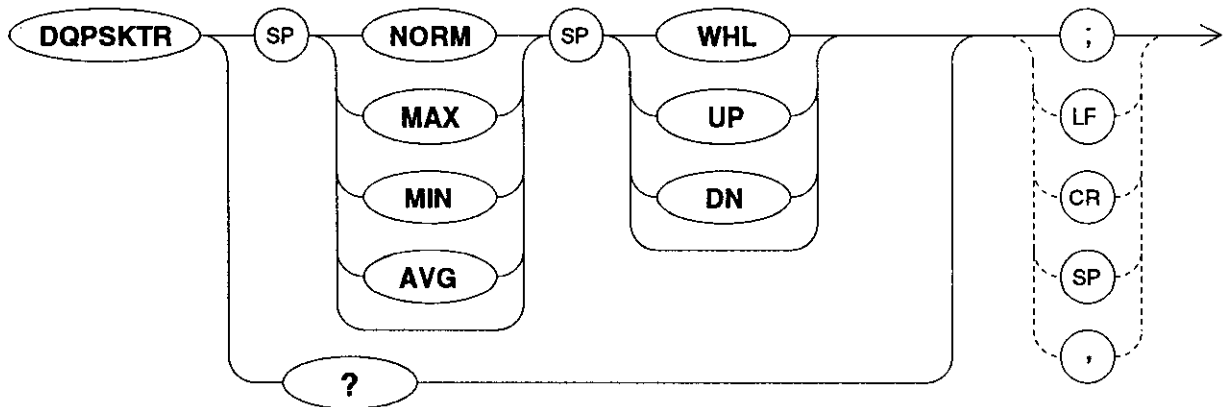
level 1 to 5 : Returns the user definition value.

go/nogo : Returns the judgment result by the template of transmission transient response characteristic (pass:0/fail:1).

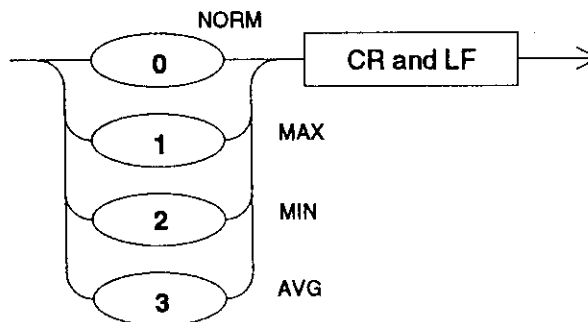
number : Returns the first range other than the template at fail by the template judgment.

DQPSKTR Transient Response Analysis Mode

Syntax



Query Response



1st Parameters

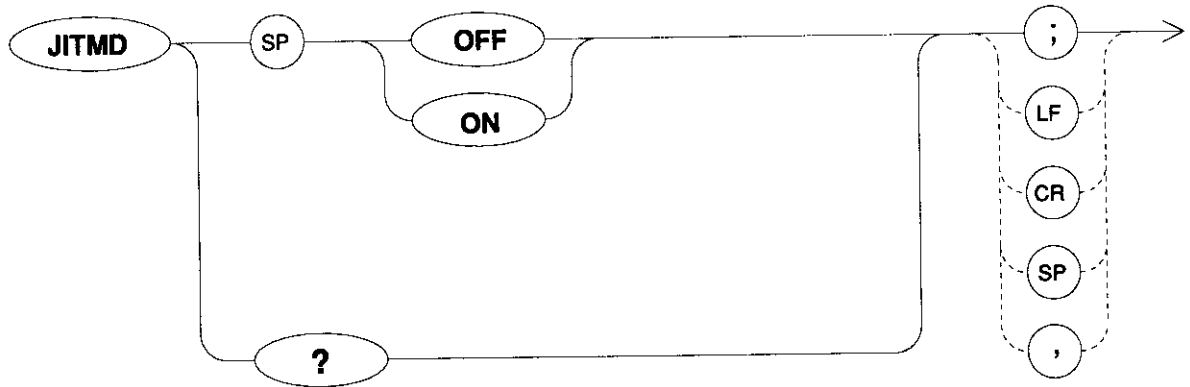
- NORM** : Evaluates 1 burst only.
- MAX** : Evaluates the MAX value of 10 bursts.
- MIN** : Evaluates the MIN value of 10 bursts.
- AVG** : Obtains the average of 10 bursts.

2nd Parameters

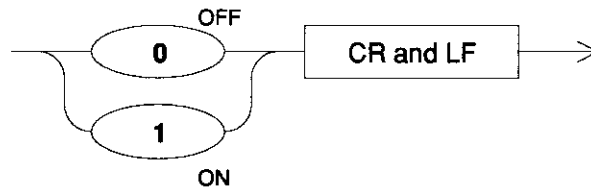
- WHL** : Displays the entire burst in graph.
- UP** : Displays the rising section of the burst in graph.
- DN** : Displays the falling section of the burst in graph.

JITMD Measuring of Jitter Mode

Syntax



Query Response



Parameters

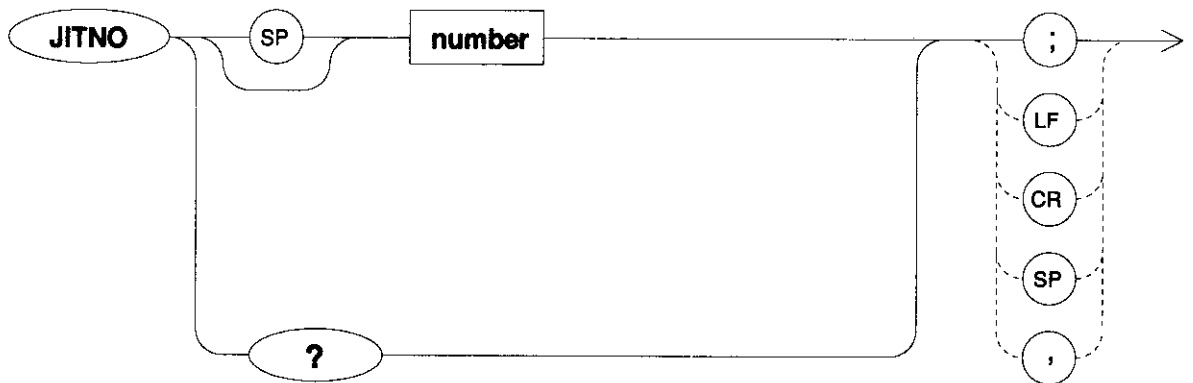
- OFF** : Sets the jitter measurement mode to CS or PS mode only.
- ON** : Sets the jitter measurement mode to CS -> PS mode.

Comment

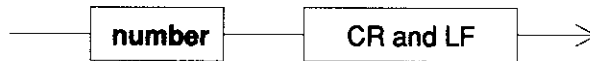
This function is effective only when PHS is specified.

JITNO Number of Bursts to be Measured at Jitter Measurement

Syntax



Query Response

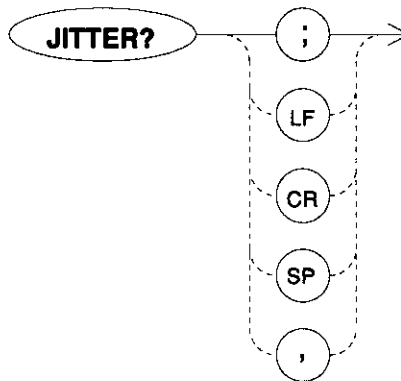


Parameters

number : Sets the number of burst to be measured at jitter measurement.

JITTER? Output Jitter Value

Syntax



Query Response



Parameters

- number 1** : Returns the average of measurement jitter value.
- number 2** : Returns the maximum value of deviation from the average of measurement jitter value.

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INSTRUCTION MANUAL

7. Specifications

7. SPECIFICATIONS

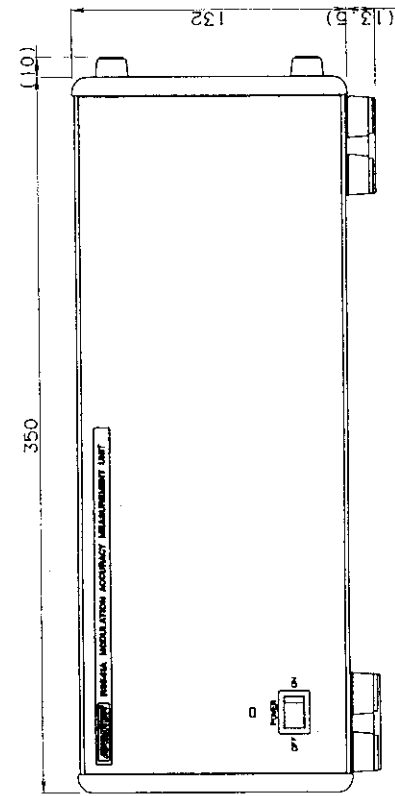
<ul style="list-style-type: none"> ● Measurement frequency range <p>PDC/NADC measurement (R3541A/C)</p> <p>PHS measurement (R3541B/C)</p>	<p>R3265 (combined use) : 450kHz to 8GHz R3271 (combined use) : 450kHz to 26.5GHz</p> <p>R3265 (combined use) : 10MHz to 8GHz R3271 (combined use) : 10MHz to 26.5GHz</p>
<ul style="list-style-type: none"> ● Adaptive modulation method 	<p>$\pi/4$ DQPSK, PDC, NADC, and PHS</p>
<ul style="list-style-type: none"> ● Measurement input level range 	<p>+ 30dBm to - 30dBm (R3265/3271 input)</p>
<ul style="list-style-type: none"> ● Measurement accuracy (rms) <p>Measurement range</p> <p>Measurement accuracy</p>	<p>to 30%</p> <p>R3541A/C : < 0.5% \pm 2% of measurement value (at RBW 3MHz) R3541B/C : < 1% \pm 2% of measurement value (at RBW 3MHz)</p>
<ul style="list-style-type: none"> ● Frequency error <p>Measurement range</p> <p>Accuracy</p> <ul style="list-style-type: none"> ● Carrier leak <p>Measurement range</p> <p>Measurement accuracy</p>	<p>R3541A/C : \pm 1.4kHz (PDC/NADC) R3541B/C : \pm 13kHz (PHS)</p> <p>Reference frequency source accuracy \pm 5Hz</p> <p>R3541A/C : - 15dBc or less (PDC) - 20dBc or less (NADC) R3541B/C : - 15dBc or less</p> <p>\pm 0.5dB (not more than - 35dB)</p>
<ul style="list-style-type: none"> ● Other measurement functions 	<p>Phase error (rms) Amplitude error (rms) Burst amplitude droop 10 burst measurement Average function (displays average up to 50 times, max., min., or standard deviation)</p>

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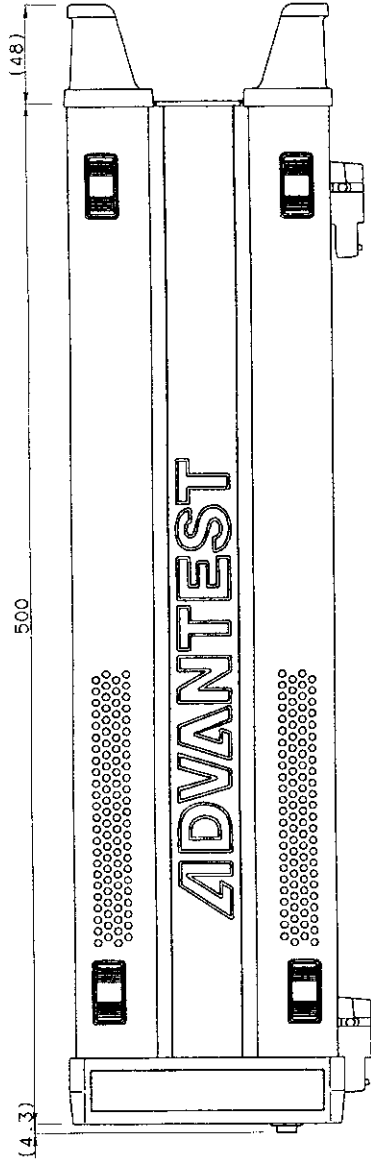
7. Specifications

(cont'd)

<ul style="list-style-type: none"> ● Waveform analysis functions (option 70) 	Demodulation data display Synchronization word display I/Q eye pattern display I/Q constellation display Amplitude (phase) display of each symbol Error vector amplitude display of each symbol Phase error display If signal spectrum (FFT) display
<ul style="list-style-type: none"> ● Input/output specifications <p>10MHz reference frequency input/output</p> <p>External trigger input</p> <p>Burst trigger output</p> <p>IF OUT</p>	<p>Connector : BNC (rear panel) Impedance : 50Ω (nominal) Input range : 0dBm to +10dBm Output : 0dBm ± 3dB (at 0dBm input)</p> <p>Connector : BNC (rear panel) Impedance : 10 kΩ (nominal) DC connection Trigger level : TTL level Rising or falling edge selectable</p> <p>Connector : BNC (rear panel) Output level : TTL level (positive pulse)</p> <p>Connector : BNC (rear panel) Impedance : 50Ω (nominal) Output level : approx. 1V_{p-p} (21.4MHz input at -10dBm)</p>
<ul style="list-style-type: none"> ● General specifications <p>Ambient conditions</p> <p>Power requirements</p> <p>Mass</p> <p>External dimensions</p>	<p>Temperature for use : 0°C to 50°C Temperature for storage : -20°C to +60°C Humidity : RH 85% or less</p> <p>Power supply voltage : 90V to 132V 198V to 250V Power consumption : Max. 110VA Frequency : 48Hz to 66Hz</p> <p>9kg or less</p> <p>Approx. 132mm (H) × 350mm (W) × 500mm (D) (excluding legs)</p>

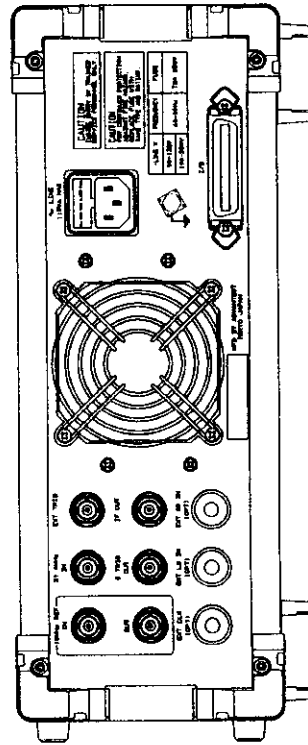


FRONT VIEW



SIDE VIEW

Unit: mm



REAR VIEW

R3541A EXTERNAL VIEW

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1. Unless otherwise specifically agreed by Seller and Purchaser in writing, Advantest will warrant to the Purchaser that during the Warranty Period this Product (other than consumables included in the Product) will be free from defects in material and workmanship and shall conform to the specifications set forth in this Operation Manual.
2. The warranty period for the Product (the "Warranty Period") will be a period of one year commencing on the delivery date of the Product.
3. If the Product is found to be defective during the Warranty Period, Advantest will, at its option and in its sole and absolute discretion, either (a) repair the defective Product or part or component thereof or (b) replace the defective Product or part or component thereof, in either case at Advantest's sole cost and expense.
4. This limited warranty will not apply to defects or damage to the Product or any part or component thereof resulting from any of the following:
 - (a) any modifications, maintenance or repairs other than modifications, maintenance or repairs (i) performed by Advantest or (ii) specifically recommended or authorized by Advantest and performed in accordance with Advantest's instructions;
 - (b) any improper or inadequate handling, carriage or storage of the Product by the Purchaser or any third party (other than Advantest or its agents);
 - (c) use of the Product under operating conditions or environments different than those specified in the Operation Manual or recommended by Advantest, including, without limitation, (i) instances where the Product has been subjected to physical stress or electrical voltage exceeding the permissible range and (ii) instances where the corrosion of electrical circuits or other deterioration was accelerated by exposure to corrosive gases or dusty environments;
 - (d) use of the Product in connection with software, interfaces, products or parts other than software, interfaces, products or parts supplied or recommended by Advantest;
 - (e) incorporation in the Product of any parts or components (i) provided by Purchaser or (ii) provided by a third party at the request or direction of Purchaser or due to specifications or designs supplied by Purchaser (including, without limitation, any degradation in performance of such parts or components);
 - (f) Advantest's incorporation or use of any specifications or designs supplied by Purchaser;
 - (g) the occurrence of an event of force majeure, including, without limitation, fire, explosion, geological change, storm, flood, earthquake, tidal wave, lightning or act of war; or
 - (h) any negligent act or omission of the Purchaser or any third party other than Advantest.
5. **EXCEPT TO THE EXTENT EXPRESSLY PROVIDED HEREIN, ADVANTEST HEREBY EXPRESSLY DISCLAIMS, AND THE PURCHASER HEREBY WAIVES, ALL WARRANTIES, WHETHER EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, (A) ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND (B) ANY WARRANTY OR REPRESENTATION AS TO THE VALIDITY, SCOPE, EFFECTIVENESS OR USEFULNESS OF ANY TECHNOLOGY OR ANY INVENTION.**
6. **THE REMEDY SET FORTH HEREIN SHALL BE THE SOLE AND EXCLUSIVE REMEDY OF THE PURCHASER FOR BREACH OF WARRANTY WITH RESPECT TO THE PRODUCT.**
7. **ADVANTEST WILL NOT HAVE ANY LIABILITY TO THE PURCHASER FOR ANY INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL OR PUNITIVE DAMAGES, INCLUDING, WITHOUT LIMITATION, LOSS OF ANTICIPATED PROFITS OR REVENUES, IN ANY AND ALL CIRCUMSTANCES, EVEN IF ADVANTEST HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES AND WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING, WITHOUT LIMITATION, NEGLIGENCE), STRICT LIABILITY, INDEMNITY, CONTRIBUTION OR OTHERWISE. TORT (INCLUDING, WITHOUT LIMITATION, NEGLIGENCE), STRICT LIABILITY, INDEMNITY, CONTRIBUTION OR OTHERWISE.**
8. **OTHER THAN THE REMEDY FOR THE BREACH OF WARRANTY SET FORTH HEREIN, ADVANTEST SHALL NOT BE LIABLE FOR, AND HEREBY DISCLAIMS TO THE FULLEST EXTENT PERMITTED BY LAW ANY LIABILITY FOR, DAMAGES FOR PRODUCT FAILURE OR DEFECT, WHETHER ARISING OUT OF BREACH OF CONTRACT, TORT (INCLUDING, WITHOUT LIMITATION, NEGLIGENCE), STRICT LIABILITY, INDEMNITY, CONTRIBUTION OR OTHERWISE.**

CUSTOMER SERVICE DESCRIPTION

In order to maintain safe and trouble-free operation of the Product and to prevent the incurrence of unnecessary costs and expenses, Advantest recommends a regular preventive maintenance program under its maintenance agreement.

Advantest's maintenance agreement provides the Purchaser on-site and off-site maintenance, parts, maintenance machinery, regular inspections, and telephone support and will last a maximum of ten years from the date the delivery of the Product. For specific details of the services provided under the maintenance agreement, please contact the nearest Advantest office listed at the end of this Operation Manual or Advantest's sales representatives.

Some of the components and parts of this Product have a limited operating life (such as, electrical and mechanical parts, fan motors, unit power supply, etc.). Accordingly, these components and parts will have to be replaced on a periodic basis. If the operating life of a component or part has expired and such component or part has not been replaced, there is a possibility that the Product will not perform properly. Additionally, if the operating life of a component or part has expired and continued use of such component or part damages the Product, the Product may not be repairable. Please contact the nearest Advantest office listed at the end of this Operation Manual or Advantest's sales representatives to determine the operating life of a specific component or part, as the operating life may vary depending on various factors such as operating condition and usage environment.

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