
ADVANTEST[®]
ADVANTEST CORPORATION

R3263 OPT55
GSM Tx Plus Option
Operation Manual

MANUAL NUMBER FOE-8311282D01

Safety Summary

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

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

- **Warning Labels**

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

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

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

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

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

- **Basic Precautions**

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

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

Safety Summary

product.

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

- **Caution Symbols Used Within this Manual**

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

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

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

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

- **Safety Marks on the Product**

The following safety marks can be found on Advantest products.



: ATTENTION - Refer to manual.



: Protective ground (earth) terminal.



: DANGER - High voltage.



: CAUTION - Risk of electric shock.

- **Replacing Parts with Limited Life**

The following parts used in the instrument are main parts with limited life.

Replace the parts listed below before their expected lifespan has expired to maintain the performance and function of the instrument.

Note that the estimated lifespan for the parts listed below may be shortened by factors such as the environment where the instrument is stored or used, and how often the instrument is used. The parts inside are not user-replaceable. For a part replacement, please contact the Advantest sales office for servicing.

Each product may use parts with limited life.

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

Main Parts with Limited Life

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

- **Hard Disk Mounted Products**

The operational warnings are listed below.

- Do not move, shock and vibrate the product while the power is turned on.
Reading or writing data in the hard disk unit is performed with the memory disk turning at a high speed. It is a very delicate process.
- Store and operate the products under the following environmental conditions.
An area with no sudden temperature changes.
An area away from shock or vibrations.
An area free from moisture, dirt, or dust.
An area away from magnets or an instrument which generates a magnetic field.
- Make back-ups of important data.
The data stored in the disk may become damaged if the product is mishandled. The hard disc has a limited life span which depends on the operational conditions. Note that there is no guarantee for any loss of data.

- **Precautions when Disposing of this Instrument**

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

Harmful substances: (1) PCB (polycarbon biphenyl)
(2) Mercury
(3) Ni-Cd (nickel cadmium)
(4) Other

Items possessing cyan, organic phosphorous and hexadic chromium and items which may leak cadmium or arsenic (excluding lead in solder).

Example: fluorescent tubes, batteries

Environmental Conditions

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

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

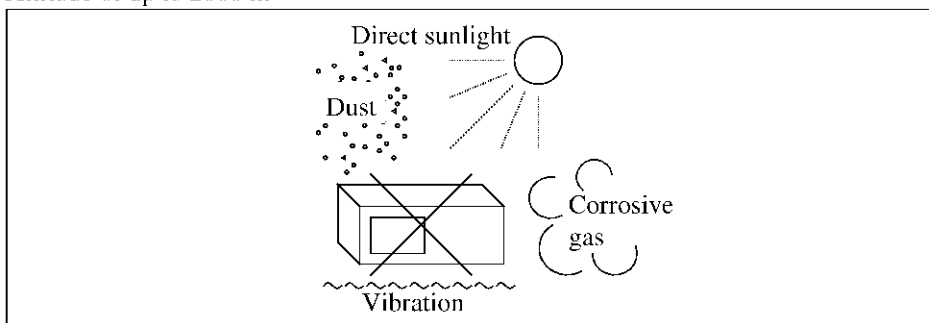


Figure-1 Environmental Conditions

- Operating position

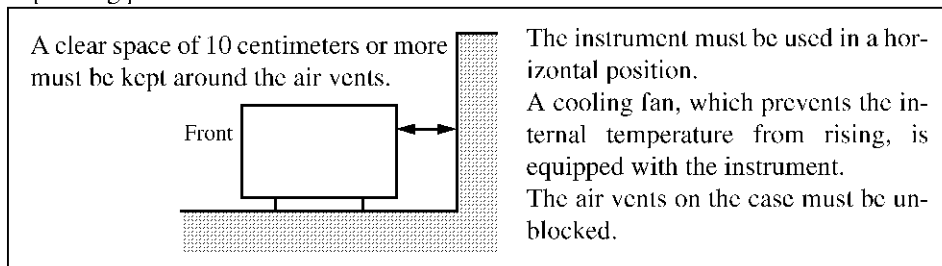


Figure-2 Operating Position

- Storage position

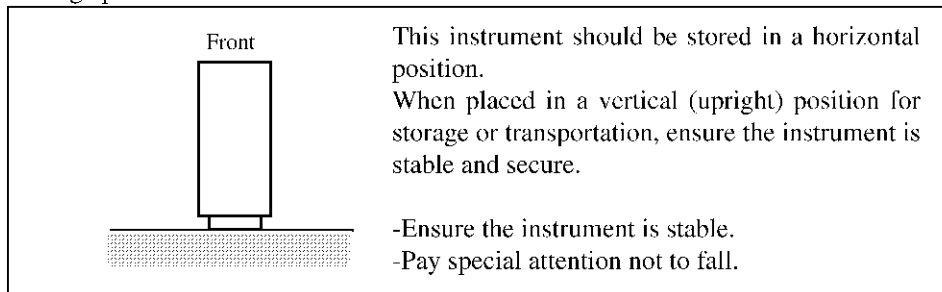


Figure-3 Storage Position

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

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

Pollution Degree 2

Types of Power Cable

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

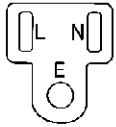
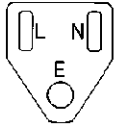
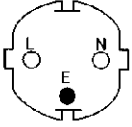
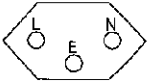
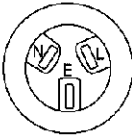

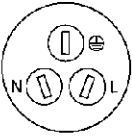
Plug configuration	Standards	Rating, color and length	Model number (Option number)
	PSE: Japan Electrical Appliance and Material Safety Law	125 V at 7 A Black 2 m (6 ft)	Straight: A01402 Angled: A01412
	UL: United States of America CSA: Canada	125 V at 7 A Black 2 m (6 ft)	Straight: A01403 (Option 95)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

Table of Power Cable Options

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

Order power cable options by Model number.

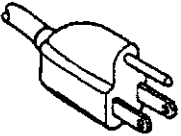
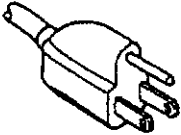
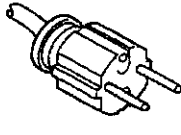
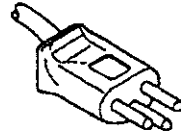
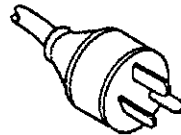
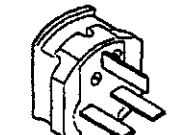
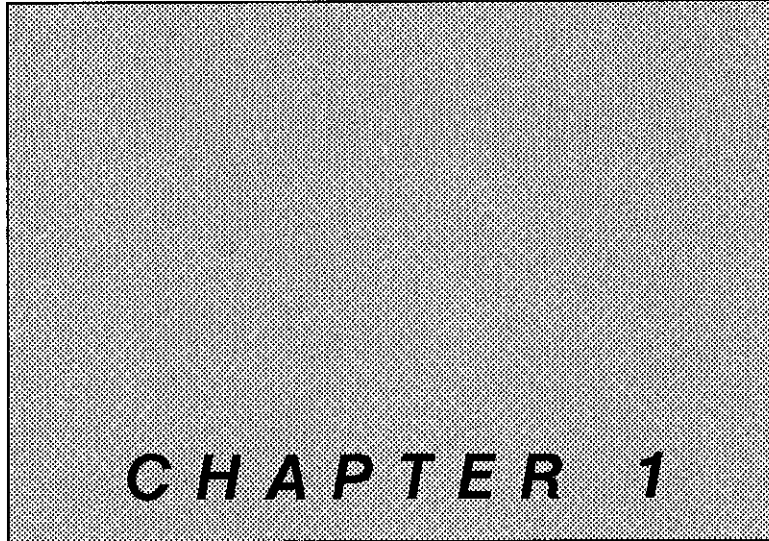
	Plug configuration	Standards	Rating, color and length	Model number (Option number)
1		JIS: Japan Law on Electrical Appliances	125 V at 7 A Black 2 m (6 ft)	Straight: A01402 Angled: A01412
2		UL: United States of America CSA: Canada	125 V at 7 A Black 2 m (6 ft)	Straight: A01403 (Option 95) Angled: A01413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

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CHAPTER 1

GSM Tx Plus FUNCTION

This chapter describes about GSM Tx Plus Option.

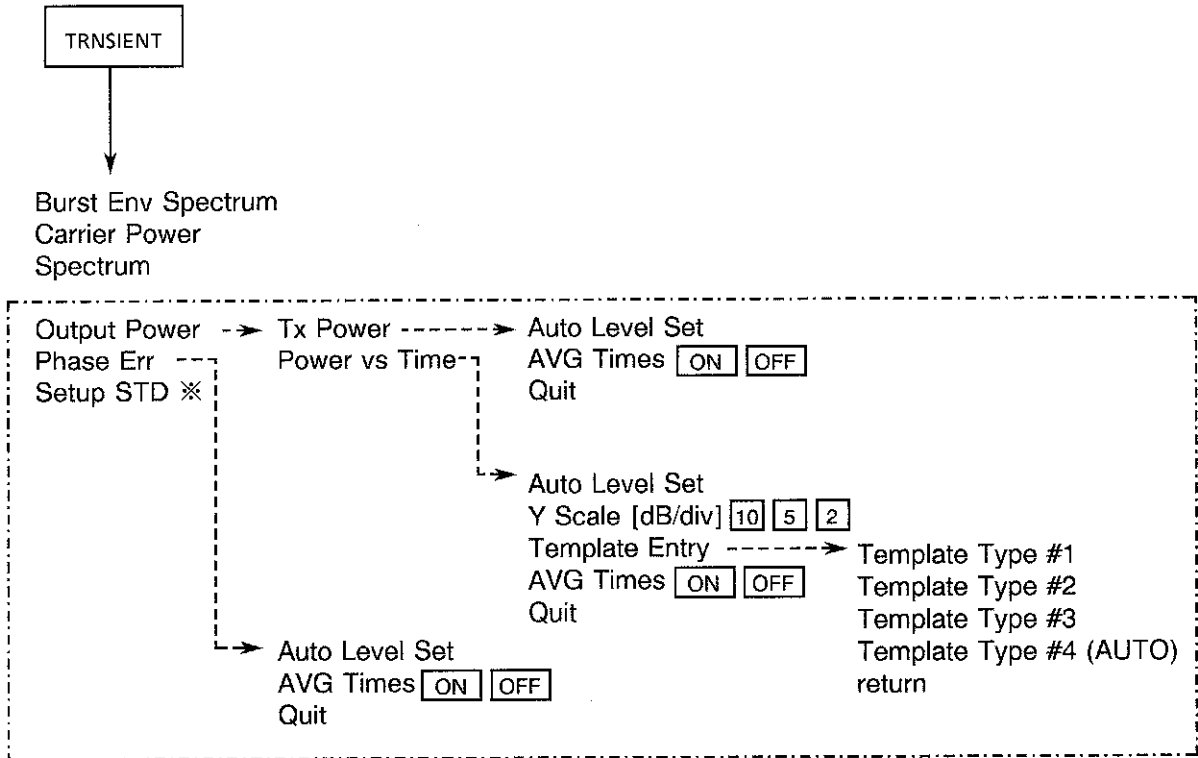
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- 1. GSM Tx Plus Measurement Function 1-2
-

1. GSM Tx Plus Measurement Function

The function of GSM Tx Plus option is to measure the average power, frequency error, and phase error.

● **Softkey menu of the TRNSIENT key**



The part enclosed with [] is the menus added by this option.

* The setup STD menu is occasionally added by this option.

■ Measurement Function Menu for GSM Tx Plus

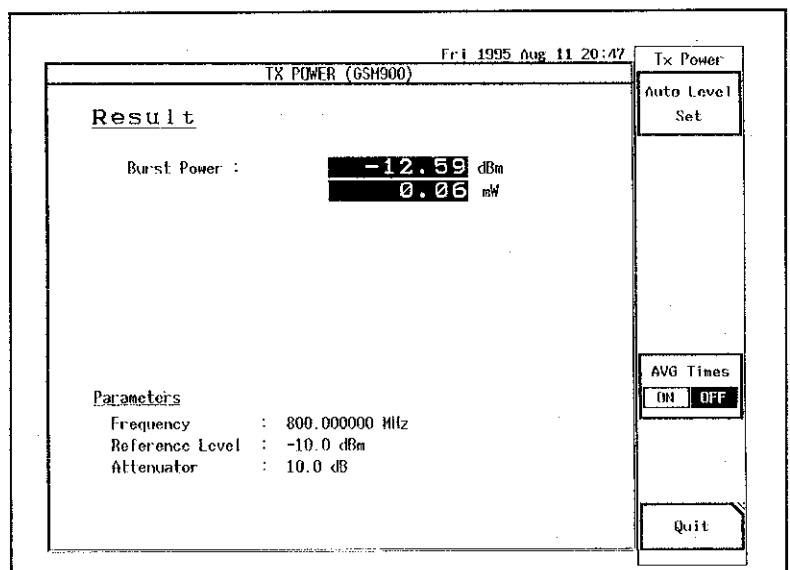
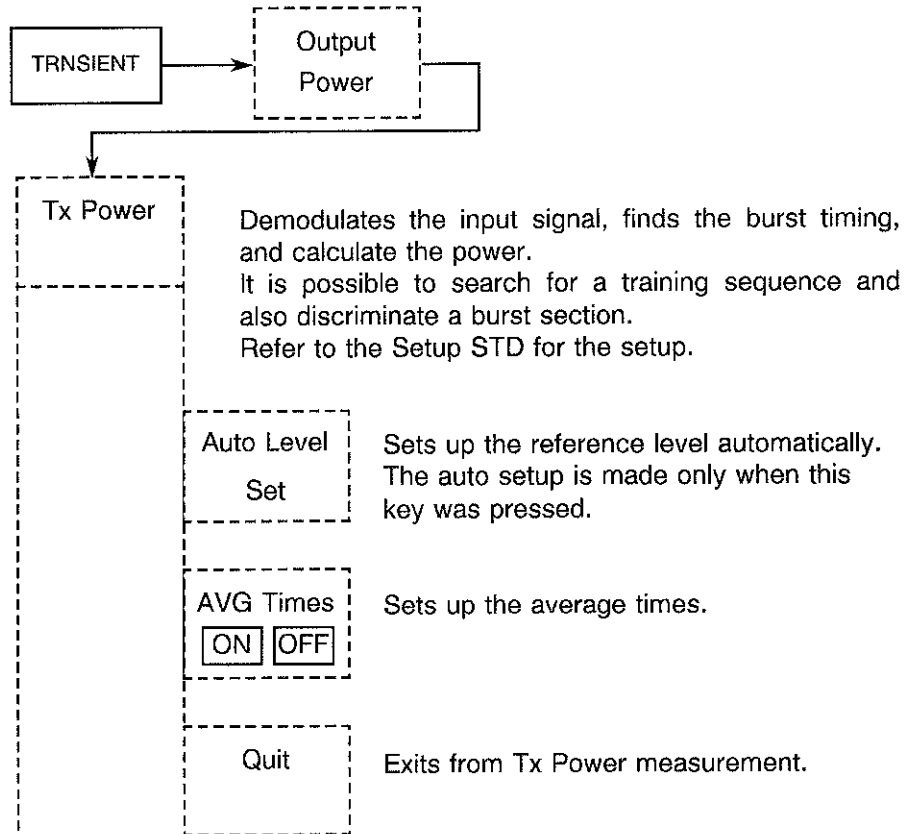
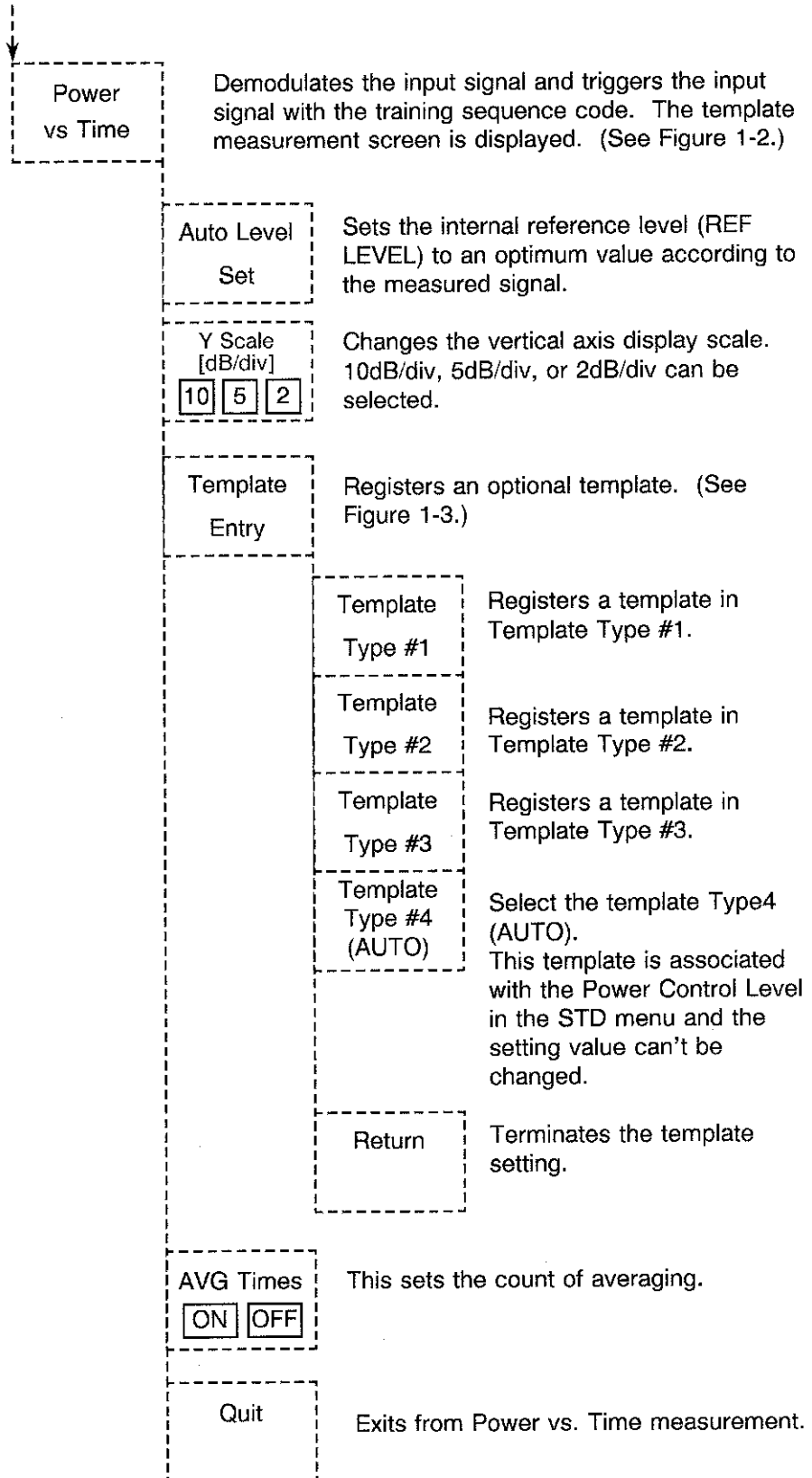


Figure 1-1 Display of Tx Power Measurement Result

1. GSM Tx Plus Measurement Function



1. GSM Tx Plus Measurement Function

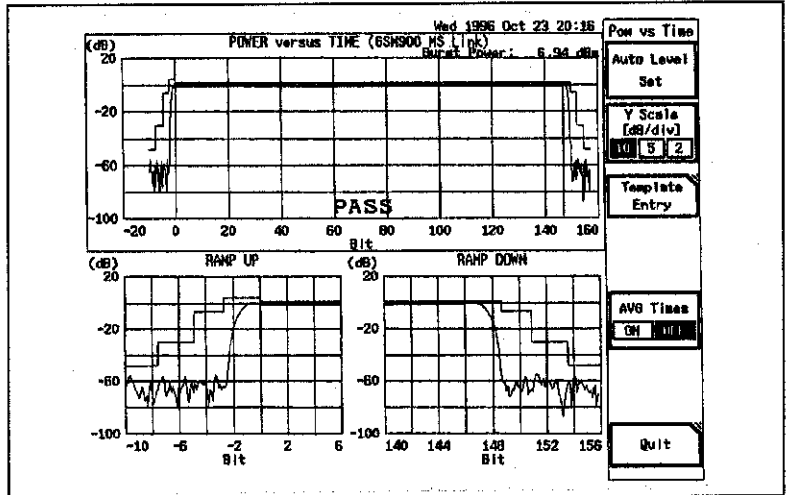


Figure 1-2 Sample of Power vs. Time Measurement

Note

Burst power is calculated for the burst-on sections.

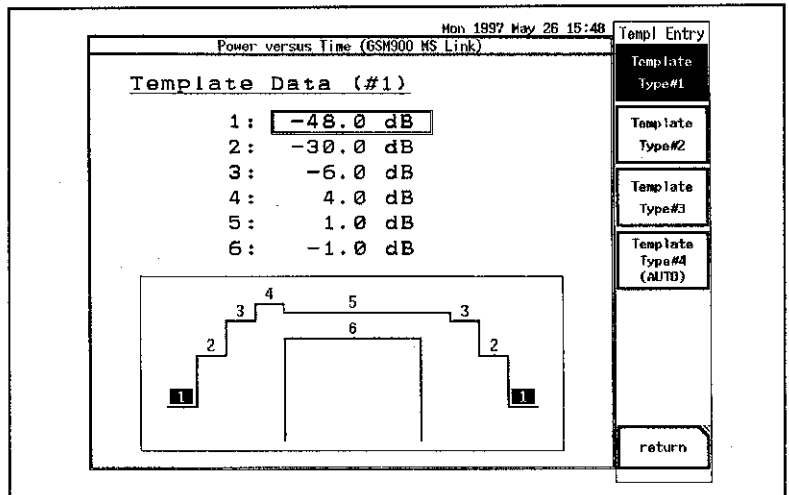


Figure 1-3 Template Registration Screen

Note

The default template is shown in Figure 1-3 due to an insufficient dynamic range. Since the dynamic range specified by the standards is not satisfied, use with "Burst Env" measurement.

When the marker is displayed by the MARKER
ON key, data can be read for each symbol point. Press this key again to set Marker OFF.

1. GSM Tx Plus Measurement Function

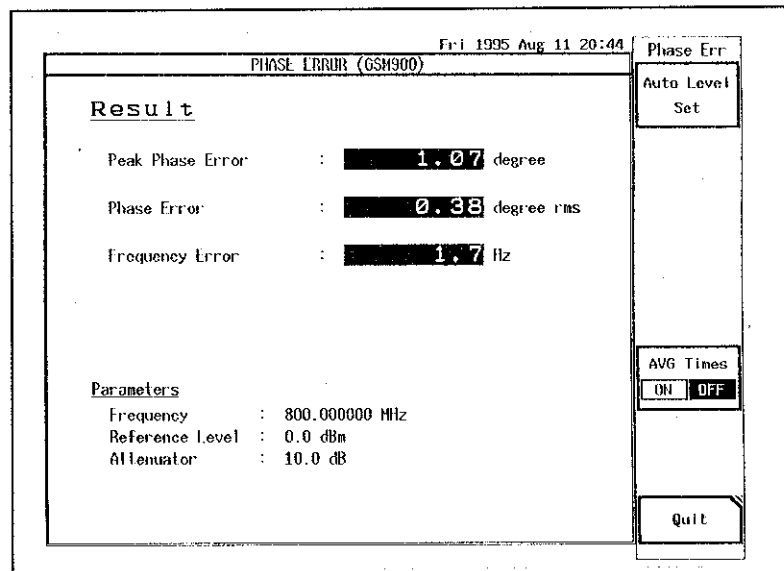
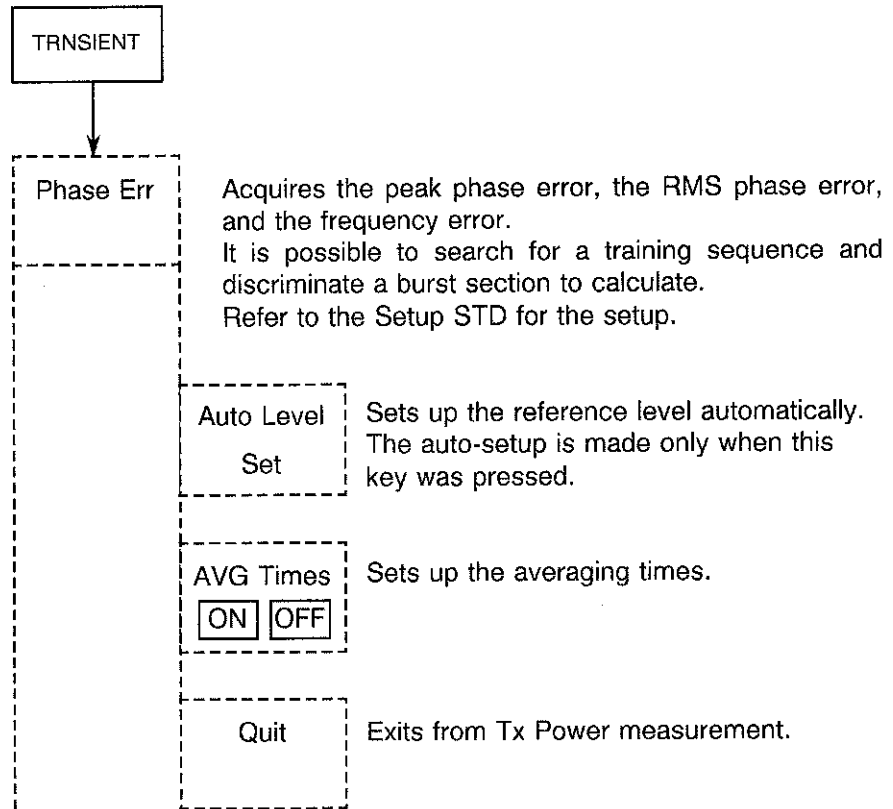
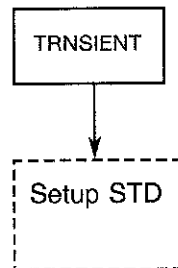


Figure 1-4 Display of Phase Error Measurement Results



Tue 1996 Mar 5

Setup STD

Measurement parameter set

Type : GSM900 DCS1800 DCS1900

Link : MS BTS

Power Control Level :

0: -----	1: -----	2: 39dBm	3: 37dBm
4: 35dBm	5: 33dBm	6: 31dBm	7: 29dBm
8: 27dBm	9: 25dBm	10: 23dBm	11: 21dBm
12: 19dBm	13: 17dBm	14: 15dBm	15: 13dBm
16: 11dBm	17: 9dBm	18: 7dBm	19: 5dBm

Offset Level :

Freq Input :

Channel Offset :

Signal Type : 140bit BURST 80bit BURST CONTINUOUS

Sync Trigger : TSC HD

Training Seq. Code : 0 1 2 3 4 5 6 7

Data Capture Trigger : AUTO SOFTWARE EXT

EXT Trigger Slope : ON OFF

Cont. Auto Level Set : ON OFF

return

Figure 1-5 Display of Setup STD

Type : Selects a type of signal to be measured from GSM900, DCS1800, or DCS1900.

Template of the measurement is changed according to this selection.

Link: Selects the mobile station (MS) or the base station (BTS).

Power Control Level:

Selects a power control level of the communication system set up above.

Power Class (at BTS selected):

Sets the output power level or class of the station to be measured. Depending on this setting, the template value used in Due To Modulation/Switching is decided.

Offset Level:

Sets up the offset to put on the measurement result. Set up 0 when the offset is not put on.

1. GSM Tx Plus Measurement Function

Channel Offset:

Sets up the offset value when the channel number, which is decided by the specification when CHANNEL NO. was selected at the above "Freq Input", is input with the offset put on.

The following items are the parameters which are used for Phase Error and Tx Power measurement.

Signal Type:

Sets the burst length to be measured.

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

88 bit BURST: Effective for the Access Burst measurement.

CONTINUOUS: Effective for the measurement of the continuous signals.

Sync Trigger:

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

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

NO: Judges the burst section from the magnitude.

Training seq. Code (TSC):

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

Data Capture Trigger:

Selects the trigger to take in the signal for measurement.

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

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

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

Ext Trigger Slope:

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

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

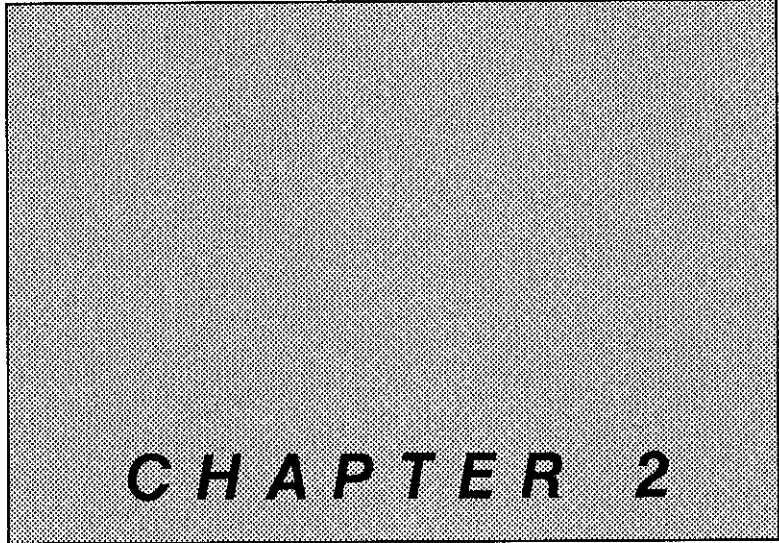
-: The data is taken in at the falling signal of the external trigger.

Cont. Auto Level Set:

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

ON: Measures while setting up the reference level automatically.

OFF: The reference level is not set up.



GPIB CODE

This chapter lists GP-IB code of GSM Tx Plus Option.

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| 1. List of GPIB Codes | 2-2 |
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1. List of GPIB Codes

[Note on Table]

- An asterisk (*) in the Listener Code column indicates that it is the function that needs the input of the numeric data following the code.
- A plus sign (+) in the Output Formats column indicates that multiple data items are output.
- AUTO/MANUAL or ON/OFF in the Output Formats column indicates that the code outputs 1 or 0, respectively.
- "-" means impropriety.
- All frequencies are in Hertz (Hz), and all times are in seconds or fractions of a second. And the levels are output in the setting display unit.

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

(cont'd)

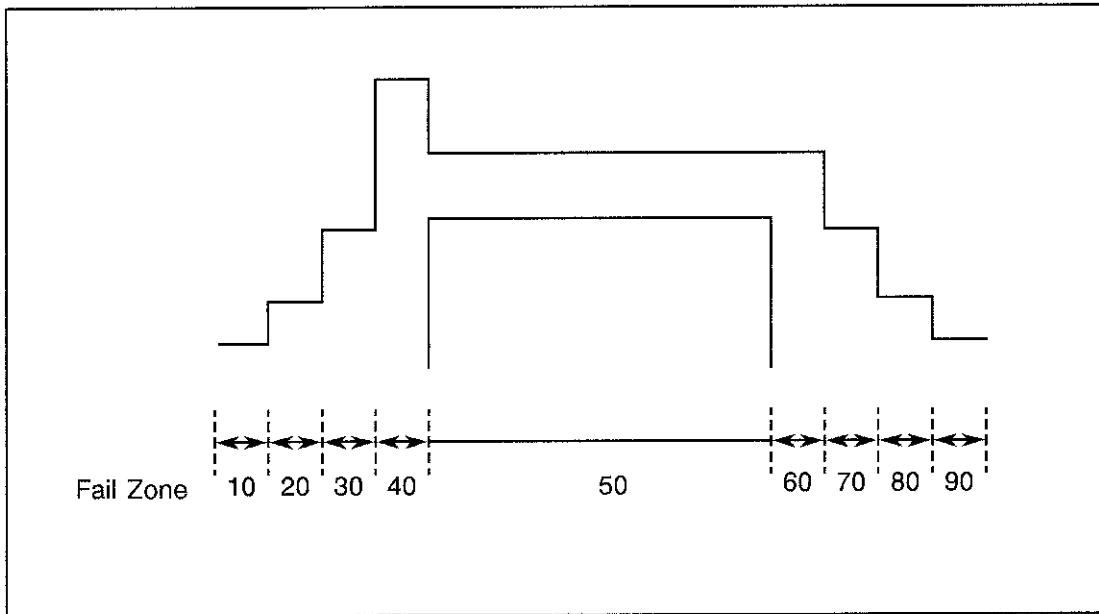
Function	Listener code	Talker request		Remarks
		Code	Output format	
Power control level	GSM900	PWCTL n (n: 2 to 19)	PWCTL?	2: 39dBm / 3: 37dBm 4: 35dBm / 5: 33dBm 6: 31dBm / 7: 29dBm 8: 27dBm / 9: 25dBm 10: 23dBm/ 11: 21dBm 12: 19dBm/ 13: 17dBm 14: 15dBm/ 15: 13dBm 16: 11dBm/ 17: 9dBm 18: 7dBm / 19: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

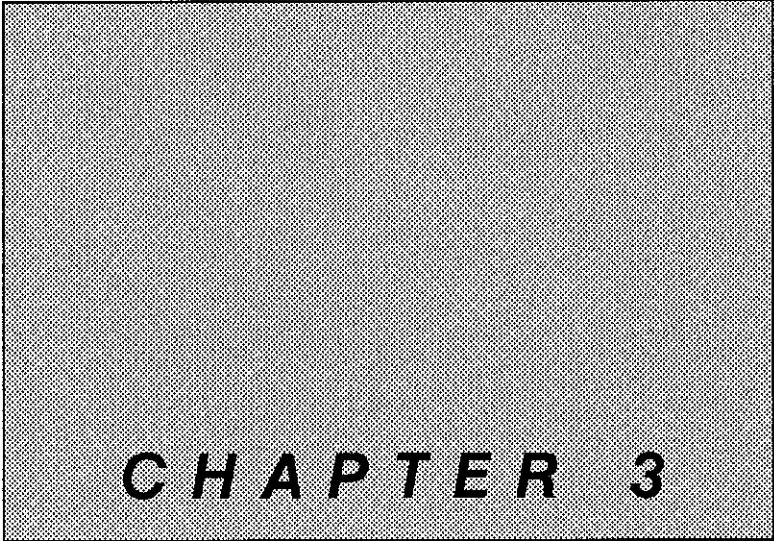
1. List of GPIB Codes

(cont'd)

	Function	Listener code	Talker request		Remarks
			Code	Output format	
Measuring condition	Power vs Time				
	YScale selection				
	10dB/div	GPTDIV P10DB	GPTDIV?	0 : 10dB/div	
	5dB/div	GPTDIV P5DB		1 : 5dB/div	
	2dB/div	GPTDIV P2DB		2 : 2dB/div	
	Template selection	GPTTYP *	GPTTYP?	Integer	
	* : 1/2/3/4			(Template Number : 1/2/3/4)	
Template edit	GPTENT	-	-	Level unit dB is required.	
	d1, d2, d3, d4, d5, d6				
	d1 to d6 :				
	Relative level (dB)				
	Average				
	TX Power	TAVGTX *	TAVGTX?	Integer (1 to 32)	1: OFF
	Power vs Time	GPTAVG *	GPTAVG?	Integer (1 to 32)	
	Phase error	TAVGPH *	TAVGPH?	Integer (1 to 32)	
Measurement start	Tx power	TXPWR	-	-	
	Power vs Time	GPWRM	-	-	
	Phase error	PHACC	-	-	
	Execute measurement of same item	SI	-	-	
Measurement result	Tx power	-	TXPWR?	< Pw1, Pw2 >	*1 See the following page for the
	Power vs Time	-	GPWRM?	Level (unit : W)	correspondence
	Power Level	-	GPTJDG?	0 : FAIL	of the returned
	Pass/Fail determination	-		1 : PASS	values and the
	Fail zone	-	GPTFAIL?	Real number *1	fail zone.
		-		(10/20/30/40/50/60/70/80/90)	
Phase Accuracy	-	PHACC?	< Pk, Ph, Fr > *2	*2	
			Pk: Phase (degree)	Pk:Peak	
			Ph: Phase (degree rms)	Phase Err	
			F1: Frequency [Hz]	Ph:Phase Err	
				Fr: Frequency Err	

Reference
Correspondence of Returned Values and Fail Zone.





CHAPTER 3

SPECIFICATIONS

This chapter describes about the specifications of GSM Tx Plus.

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1. Specifications of GSM Tx Plus option 3-2
-

1. Specifications of GSM Tx Plus Option

■ Modulation type

GMSK (GSM, DSC1800, DCS1900)

■ Analysis input range

10 MHz to 3 GHz, -30 dBm to +30 dBm

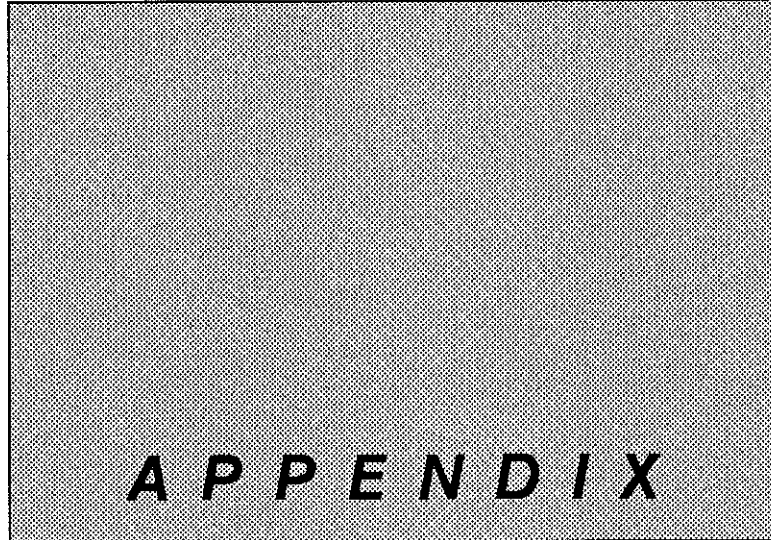
■ Average power measurement

(After auto-calibration, in the band of GSM, DCS1800 and DCS1900, AUTO set up state)

- **Measurement accuracy** ± 0.8 dB (15°C to 35°C)
 ± 1.0 dB (0°C to 50°C)

■ Frequency and Phase error measurement

- **Frequency error**
 - Range ± 10 kHz
 - Accuracy Reference accuracy \times Carrier frequency ± 5 Hz
- **Phase error**
 - Range 0 to 30° (peak)
 - Accuracy $\leq \pm 5^\circ$ (peak)
 $\leq \pm 1^\circ$ (rms)



In this appendix, you will find a glossary.

CONTENTS

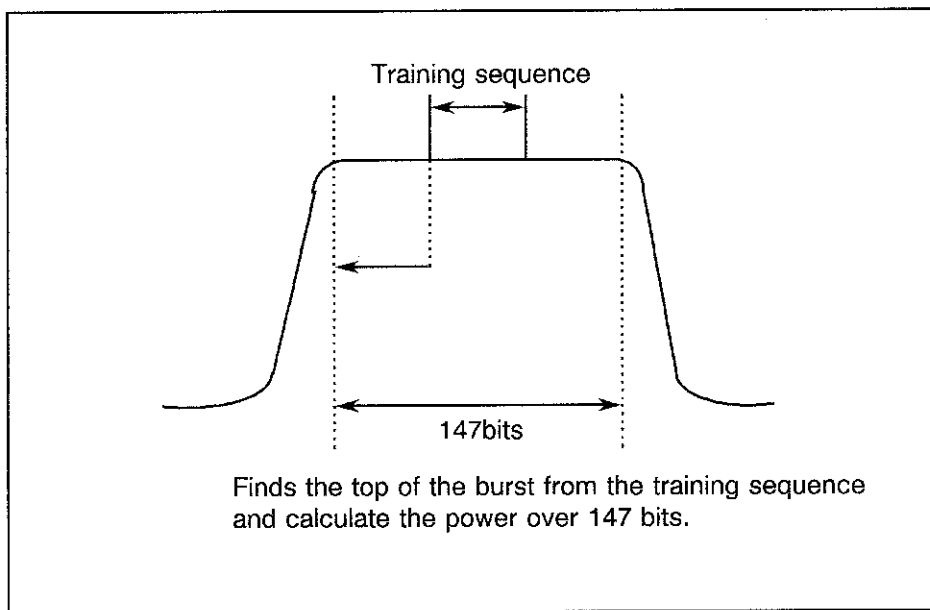
1. Glossary A-2

1. Glossary

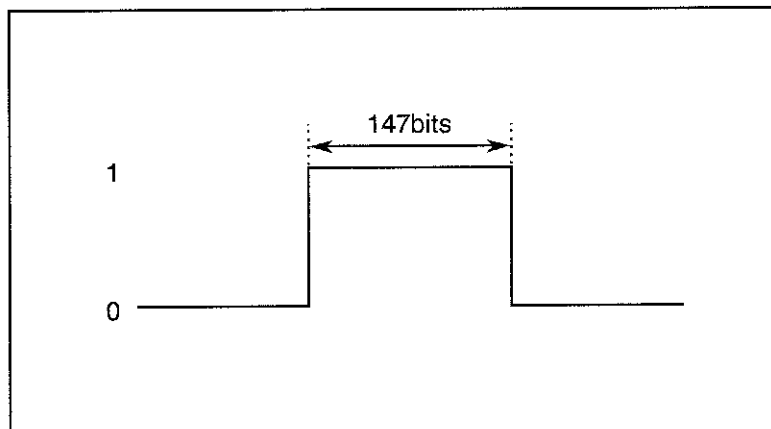
Tx Power

According to GSM 11.10 V4.80 page 121, "The transmitter out power is calculated as the average of the samples over the 147 useful bits."

In Tx Power, the input signal is demodulated and the setup training sequence is searched. Based on the position of the searched training sequence, decide the 147 useful bits and calculate the power.



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



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