ENGLISH

HAMEG®
Instruments

3.3 GHz Portable Spectrum Analyzer
HM5033

MANUAL • HANDBUCH • MANUEL

Before Starting to Use the Unit

When you use the unit, please observe the following notes listed on the rear of the body.

⚠ WARNING

NO OPERATOR SERVICEABLE PARTS INSIDE . REFER SERVICING TO QUALIFIED PERSONNEL . PRIOR TO USE , BE FAMILIAR WITH SAFETY INSTRUCTIONS IN THE MANUAL .

⚠ CAUTION

FOR CONTINUED FIRE PROTECT , REPLACE ONLY WITH SPECIFIED TYPE'S AND RATED FUSE .

For you to use it safely

1) When abnormal sounds, abnormal smell and smoke were confirmed, remove the battery and AC adapter and stop the use.

2) Never use with hands that got wet, because doing so may cause damage, fire and electric shock to the unit.

3) Never use it under the thunder. There is a possibility of receiving a thunderbolt.

4) Never use an AC adapter other than the one specified, because doing so may cause damage to the unit. For static electricity protection, ground the unit by connecting the three cores if possible. Not grounding the unit can damage it and the object measured.

5) Never use a battery other than the one specified, because doing so may cause damage to the unit. When removing or installing the battery, be sure to do it after you turn off the unit and disconnect the AC adapter.

6) When replacing the fuse, disconnect the AC adapter, open the battery cover on the back and remove battery, and then take sufficient care to perform the replacement. Use 5 A / 250 V fuse (IEC127-2 sheet 3, slow-blow type).

Never use a fuse not specified because doing so may cause damage to the unit.

Guarantee of quality

Guarantee period

Guarantees that it will repair any failure free of charge if it occurs because of our responsibility within one year after delivery. However, the above guarantee does not apply to such a failure that:

1) is caused by a fire, natural disasters, etc.

2) is caused by inappropriate handling of the unit, such as dropping it while moving it after purchasing.

3) is caused by handling counter to the instructions or precautions listed in the operating manual.

4) is caused by modifying the unit or by being considered to be your responsibility because of inappropriate use.

We will not be responsible for direct or indirect damage caused by use of this product or by a failure of this product.

Warm-up time

In order to stabilize the electric performance at the time of turning on the unit, please perform warming-up for at least 10 minutes.

Precautions for storage

1) Strictly observe the storage conditions specified for this unit, such as avoiding direct sunlight and dust.

2) Store this unit in a place where –20 °C to 60 °C, less than 60 °C / 70 %RH, variations in temperature and humidity are small.

After service

If you have any question about the contents of this product or how to operate it, please contact us at:

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KONFORMITÄTSERKLÄRUNG
DECLARATION OF CONFORMITY
DECLARATION DE CONFORMITE

HAMEG® Instruments

Die HAMEG GmbH bescheinigt die Konformität für das Produkt
The HAMEG GmbH herewith declares conformity of the product
HAMEG GmbH déclare la conformite du produit

Bezeichnung / Product name / Designation:
Spektrum-Analysator/Spectrum Analyzer/Analyseur de spectre

Typ / Type / Type: **HM5033**

mit / with / avec: -

Optionen / Options / Options: -

mit den folgenden Bestimmungen / with applicable regulations / avec les directives suivantes

EMV Richtlinie 89/336/EWG ergänzt durch 91/263/EWG, 92/31/EWG
EMC Directive 89/336/EEC amended by 91/263/EWG, 92/31/EEC
Directive EMC 89/336/CEE amendée par 91/263/EWG, 92/31/CEE

Niederspannungsrichtlinie 73/23/EWG ergänzt durch 93/68/EWG
Low-Voltage Equipment Directive 73/23/EEC amended by 93/68/EEC
Directive des equipements basse tension 73/23/CEE amendée par 93/68/CEE

Angewendete harmonisierte Normen / Harmonized standards applied / Normes harmonisées utilisées

Sicherheit / Safety / Sécurité
EN 61010-1: 2001 / IEC (CEI) 1010-1: 2001

Messkategorie / Measuring category / Catégorie de mesure: I
Verschmutzungsgrad / Degree of pollution / Degré de pollution: 2

Elektromagnetische Verträglichkeit / Electromagnetic compatibility / Compatibilité électromagnétique

EN 61326-1/A1 :1997 + A1:1998 + A2 :2001/IEC 61326 :1997 + A1 :1998 + A2 :2001
Störaussendung / Radiation / Emission: Tabelle / table / tableau 4; Klasse / Class /Classe B.
Störfestigkeit / Immunity / Imunitee: Tabelle / table / tableau A1.

EN 61000-3-2/A14
Oberschwingungsströme / Harmonic current emissions / Émissions de courant harmonique: Klasse / Class / Classe D.

EN 61000-3-3
Spannungsschwankungen u. Flicker / Voltage fluctuations and flicker / Fluctuations de tension et du flicker.

Datum / Date / Date
25.6.2003

Unterschrift / Signature / Signatur
G. Hübenett
Product Manager

General information regarding the CE marking

HAMEG instruments comply with the regulations of the EMC directive. The conformity test made by HAMEG is based on the actual generic- and product standards. In cases where different limit values are applicable, HAMEG applies the severer standard. For emission the limits for residential, commercial and light industry are applied. Regarding the immunity (susceptibility) the limits for industrial environment have been used.

The measuring- and data lines of the instrument have much influence on emmission and immunity and therefore on meeting the acceptance limits. For different applications the lines and/or cables used may be different. For measurement operation the following hints and conditions regarding emission and immunity should be observed:

1. Data cables

For the connection between instruments resp. their interfaces and external devices, (computer, printer etc.) sufficiently screened cables must be used. Without a special instruction in the manual for a reduced cable length, the maximum cable length of a dataline must be less than 3 meters and not be used outside buildings. If an interface has several connectors only one connector must have a connection to a cable.

Basically interconnections must have a double screening. For IEEE-bus purposes the double screened cables HZ72S and HZ72L from HAMEG are suitable.

2. Signal cables

Basically test leads for signal interconnection between test point and instrument should be as short as possible. Without instruction in the manual for a shorter length, signal lines must be less than 3 meters and not be used outside buildings.

Signal lines must screened (coaxial cable - RG58/U). A proper ground connection is required. In combination with signal generators double screened cables (RG223/U, RG214/U) must be used.

3. Influence on measuring instruments.

Under the presence of strong high frequency electric or magnetic fields, even with careful setup of the measuring equipment an influence of such signals is unavoidable.

This will not cause damage or put the instrument out of operation. Small deviations of the measuring value (reading) exceeding the instruments specifications may result from such conditions in individual cases.

4. RF immunity of Spectrum Analyser

4.1 Electromagnetic RF field

Although the interior of the spectrum analyser is screened by the cabinet, the influence of electromagnetic RF fields may become visible, if the field intensity under the present environmental condition is high. The device under test as well as the measuring cable may also receive such signals.

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1. Outlines

1.1 Product outlines

HM5033 is an authentic spectrum analyzer providing performance and functions that are comparable to those of large-size bench type equipment, in a compact, lightweight and inexpensive model.

1) Compact and lightweight, 1.7 kg

The external dimensions are as small as 162 (W) × 70 (H) × 260 (D) (mm), and the weight is only 1.7 kg including the battery. It is very convenient for outdoor use and while on business trips.

2) Measuring frequency bandwidth 50 kHz to 3.3 GHz

This bandwidth covers those of W-CDMA, CDMA, PDC, PHS, GSM, 2.4 GHz band wireless LAN, Bluetooth, etc.

3) Operation with battery for 120 minutes

When battery MB300 is fully charged, HM5033 works for about 120 minutes (with the backlight turned off). It is extremely convenient for outdoor use and for use in the survey of wireless LAN installation environment.

4) Performance that is comparable to that of large-size bench type equipment

HM5033 guarantees a highly stable frequency axis by PLL synthesizer system. The center frequency setup resolution is 100 kHz. Furthermore, the mean noise level is -110 dBm or less. Thus, a broad dynamic range is secured and the reference level can be set in 1 dB steps.

5) Abundant functions

Measuring functions: Channel power measurement, Adjacent channel leakage power measurement, Occupied frequency bandwidth measurement, Electric field strength measurement.

Electric field strength measurement: Optimum for measurement of cellular phone and wireless LAN working environment.

Magnetic field strength measurement: Optimum for EMI design of printed circuit boards and for evaluation of signal quality.

Calculation functions: MAX HOLD, MIN HOLD, AVERAGE, OVER WRITE

Marker & peak search

Save/Load

6) Auto tuning

The center frequency is set at the spectrum of the maximum level in the 3.3 GHz band, and in addition, optimum reference level, resolution bandwidth, video bandwidth and sweep time are set when the AUTO TUNE key is pressed. This function is very convenient for measurement of an unknown signal.

7) Auto range motion

The resolution bandwidth, video bandwidth and sweep time are set automatically based on the set frequency span. It is also possible to set auto range motion only one out of resolution bandwidth, video bandwidth and sweep time.

8) Hard copy of the image

Connect a printer (optional) and press the [PRINT] key on HM5033. The image on the screen is printed as it is.

9) High resolution display on the PC screen

The trace is displayed at high resolution, 1001 points in the horizontal axis, on the PC screen when „PC Software MAS300" (optional) is used.

1.2 Standard accessories

1. AC adaptor MA300
2. Soft carrying case
3. Accessory pouch
4. Operating manual
5. Ni-MH battery MB300 (Refer to „6.4 Installing the battery" for details.)

1.3 Optional accessories

1. PC software MAS300 (Refer to „24. PC Software" for details).
2. Electric field antenna M301, M302, M303, M304, M305 (Please note „19.4 Electric field strength measurement").
3. Magnetic field probe CP-2S with a dedicated double shielded coaxial cable (Please note „19.5 Magnetic field strength measurement").
4. Ni-MH battery MB300 (Refer to „6.4 Installing teh battery" for details).
5. Battery charger MBC300
6. Printer with AC adaptor, 4 pcs. of AA batteries and one paper roll (Please note „21. Printing")
7. Paper pack (10 rolls)

2. Specifications

2.1 Performance

Frequency section

Frequency range:	50 kHz to 3.3 GHz
Center frequency	
Setting resolution:	100 kHz, allows Rotary encoder, numeric key and function key
Accuracy (kHz):	**within** ±(30 + 100 x t) ±1 dot t: Sweep time (s) (frequency span: 200 kHz to 10 MHz, RBW: 30 kHz, 23 °C ±5 °C)
	within ±(100 +700 x t) ±1 dot t: Sweep time (s) (frequency span: 20 MHz to 3.3 GHz, RBW: 100 kHz, 23 °C ±5 °C)
RBW frequency error:	**within** ±6 % of RBW (RBW: 3 kHz, 30 kHz) **within** ±30 % of RBW (RBW: 100 kHz to 3 MHz)

Frequency span
Setting range: 0 Hz (zero span), 200 kHz to 2 GHz (1-2-5step), 3.3 GHz (full span)

Accuracy (kHz): **within** [±3 % (20 x t)] ±1 dot (frequency span: 200 kHz to 10 MHz, 23 °C ±5 °C)

within [±3 % ±(200 x t)] ±1 dot (frequency span: 20 MHz to 3.3 GHz, 23 °C ±5 °C) t: Sweep time (s)

Display resolution:
LCD: Frequency span/250
PC Monitor (max.): Frequency span/1000 (via RS-232C)

Display dot number:
LCD: 251 dots,
PC Monitor (max.): 1001 dots **(via RS-232C)**
(The unit displays data as 251 horizontal dots, but it internally captures the signal as in 1001 dots)

Resolution bandwidth: 3 dB bandwidth

Setting range: 3 kHz to 3 MHz (1-3step) and AUTO
Accuracy: within ±20 %
Selectivity: 1 : 12 (typical, 3 dB : 60 dB)

Video bandwidth: 100 Hz to 300 kHz (1-3step), OFF and AUTO

SSB phase noise: -90 dBc/Hz (typical, 100 kHz offset, RBW: 3 kHz, VBW: 100 Hz, Sweep time: 0.3 s)

Spurious response: less than -60 dBc

Harmonics: less than -40 dBc (50 kHz to 100 MHz)
less than -45 dBc (100 Mhz to 3.3 GHz)

Amplitude section

Reference level
Setting range: +10 to -60 dBm (1dB step)

Accuracy: within ±0.8 dB ±1 dot (center frequency: 100 MHz, RBW: 3 MHz, VBW: 1 MHz, ATT: 0 dB, 23 °C ±5 °C)

Unit: dBm, dBV, dBmV, dBµV, dBµV/m, dBµA/m (dBµV/m and dBµA/m is used the measuring function)

Average noise level: -110 dBm
(typical, center frequency: 100 MHz, RBW: 3 kHz, VBW: 100 Hz)

Frequency Characteristic:
within ±2.0 dB ±1 dot (50 kHz to 100 MHz)
within ±1.0 dB ±1 dot (100 Mhz to 3.3 GHz)

Input impedance: 50 Ω

Input VSWR: less than 2.0

Input attenuator:
Operating range: 0 to 25 dB (1 dB step), coupled with reference level

Switching error: **within** ±0.6 dB

RBW switching error: **within** ±0.6 dB

Display resolution: 0.4 dB (10 dB/div)
0.08 dB (2 dB/div)

Display dot number: 200 dots

Display Scale:
Scale: 10 dB / div, 2 dB/div

Accuracy: **within** ±0.2 dB / 2 dB ±1 dot

within ±0.8 dB / 10 dB ±1 dot

within ±1.6 dB / 70 dB ±1 dot

Input damage level: +20 dBm (CW average power), 25 VDC

Sweep section

Sweep time 10 ms to 30 s
(1-3step, frequency span: 0 to 2 GHz) and AUTO

Setting range: 30 ms to 30 s
(1-3step, frequency span: full span) and AUTO

Accuracy: **within** ±0.1 % ±1 dot (frequency span: 0 to 2 GHz)

within ±1.5 % ±1 dot (frequency span: full span)

Trigger mode: AUTO (frequency span: zero span)

Detection mode: Positive peak, Negative peak, Sample
(When sweep time is 10 ms or 30 ms, only Sample can be set)

Functions

Marker:
NORM: displays frequency (7 digits max) and level (4 digits max) at marker point
.
DELTA: displays differential frequency and level between 2 markers.

Peak search:
NORM: searches a peak point within 10 div. Available NEXT peak (10 max).

ZONE: searches a peak point within a zone designated by center and width. Marker moves to a peak point each sweep.

Calculation: NORM, MAX HOLD, MIN HOLD, AVERAGE, OVER WRITE

MAX/MIN HOLD: 2 to 1024 times

AVERAGE: 2 to 256

Measuring:
Channel power, Adjacent channel leakage power, Occupied frequency bandwidth, Electric field strength (optional antenna),Magnetic field strength (needs optional magnetic field probe) measurement, Frequency counter.

AUTO tuning:
When pushing AUTO TUNE key, the maximum level spectrum within 3.3 GHz bandwidth is adjusted to center, and reference level, RBW, VBW and sweep time are adjusted to optimum values.

Save/Load

Save:	Saves 100 traces and 100 setups
Load:	Loads 1 trace and 1 setup

General

Input connector: SMA(J)

Communication:

Interface:	RS-232C
Baud rate:	2400 to 38400 bps

Hard copy: Allows direct hard copy with an optional printer.

Display: LCD

Backlight:	CFL backlight
Resolution:	320 (H) × 240 (V) dots

Power source:

Battery:	Ni-MH battery
External DC source:	Pin jack, DC 5 V / 4 A

Other

Operating temperature: 0 °C to 40 °C
(Guaranteed at 23 °C ±10 °C, without soft carrying case)

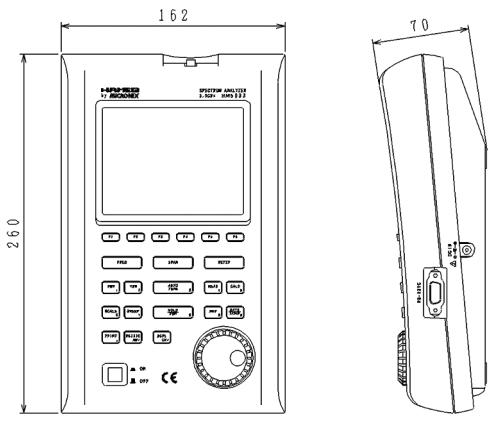
Operating humidity: less than 40 °C / 80 % RH
(Guaranteed at less than 33 °C / 70 % RH, without soft carrying case)

Storage temperature: -20 °C to 60 °C, less than 60 °C / 70 % RH

Dimensions (W x H x D)**:** 162 × 70 × 260 mm

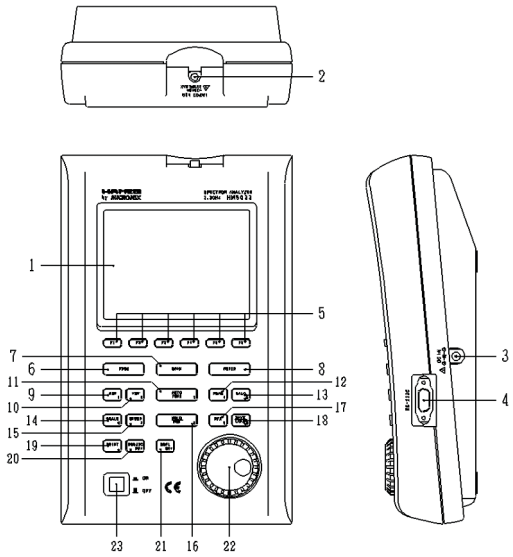
Weight: approx. 1.5 kg (without battery)

2.2 Outline



HAMEG & MICRONIX reserves the right to make changes in design, specification and other information without prior notice.

3. Description of Panel



1) LCD screen
This is a large liquid crystal display with 240 (V) × 320 (H) dots. It simultaneously displays traces (8 ×10 div), various setting values, measured values, etc.

2) Input connector
SMA (J) connector.

3) Input connector for DC power source
Connects AC adaptor MA300.

4) RS-232C connector
Connects PC and printer, by using RS-232C cable MI180.

5) Function keys (F1 to F6)
Functions change according to operation. Have functions corresponding to the on-screen displays.

6) Center frequency key
Use this key to set the center frequency. It can set between 0 to 3.3 GHz (100 kHz step).

7) Frequency span key
Use this key to set the frequency span. It can set between 200 kHz to 2 GHz, ZERO SPAN and FULL SPAN (3.3 GHz).

8) Reference level key
Set the reference level, etc. Reference level can set between +10dBm and -60dBm (1dB step).

9) Resolution bandwidth key
Use this key to set the resolution bandwidth. It can set between 3 kHz and 3 MHz.

10) Video bandwidth key
Use this key to set the video bandwidth. It can set between 100 Hz and 1 MHz .

11) AUTO tuning key
Tune up to the maximum level in 3.3 GHz zones, and display by the optimal setup. This does not operate normally when the signal level is lower than -40 dBm , or when the input frequency is below 50 MHz, or when the frequency span is ZERO SPAN or FULL SPAN.

12) Measuring function key
Available for Channel power, Adjacent channel leakage power, Occupied frequency bandwidth, Electric field strength and Magnetic field strength measurement (optional), Frequency counter (factory option).

13) Calculation function key
Available for Max hold, Min hold, Average and Over write.

14) Display scale key
Use this key to select the display scale of amplitude axis from 2 dB/div or 10 dB/div.

15) Sweep key
Use this key to set the sweep time between 10 ms to 30 s or set the detection mode.

16) Hold/Run key
Stops or restarts the measurement.

17) Marker & Peak search key
Use this key to set and move a marker.

18) Save/Load key
Saves 100 traces and 100 setups, and loads 1trace and 1setup.

19) Print key
When pressing this key, the image is printed with a printer (optional) as it is.

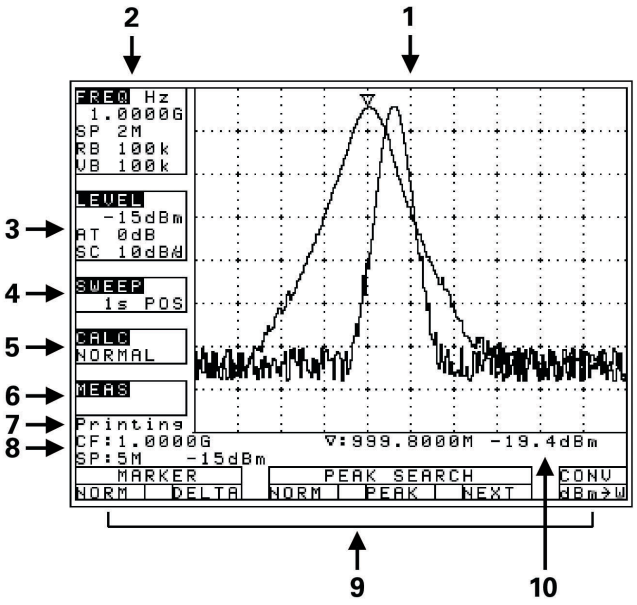
20) RS-232C key
Sets baud rate and transfers a current or saved trace.

21) Display control key
Sets contrast, backlight ON/OFF, brightness of backlight, invert display and buzzer ON/OFF.

22) Rotary encoder
Use this to make various settings.

23) Power switch
Use this to turn the power ON or OFF.

4. Description of Screen



1) Trace display
8 div × 10 div.

2) Frequency axis setting values display
Center frequency, Frequency span,Resolution bandwidth, Video bandwidth.

3) Amplitude axis setting values display
Reference level, Input attenuator, Display scale.

4) Sweep axis setting values display
Sweep time, Detection mode.

5) Calculation function display

6) Measuring function display

7) Operating information display

8) Loaded trace information display
This is also used as a setting values display when the measuring function is used.

9) Display for function keys

10) Measured values display

5. Function Key Menu

5.1 List of the Function key menus

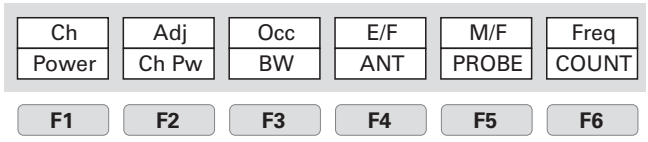
The types of function keys are shown in the table below. For description of each function, see the detailed pages. For the flow of change in the function key display, refer to „5.2 Menu tree".

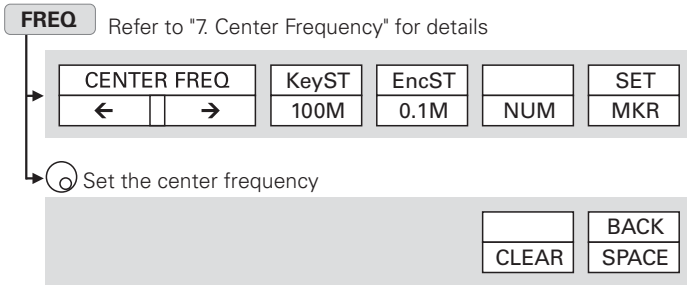
	Function key menu	Key flow	Page
A)	Adj Ch OFS	MEAS→(F6)→(F2)→F2	21
	Adj Ch Pw	MEAS→(F6)→F2	21
	Adj Ch WIDTH	MEAS→(F6)→(F2)→F3	21
	ANT	MEAS→(F6)→(F5)→F1	22
	AVER	CALC→F4	19
B)	B.L.	DSPL→F2	26
	BACK SPACE	FREQ→F5→F6	15
	BAND CNTR	MEAS→(F6)→(F1)→(F1)→F2	21
	BAND WIDTH	MEAS→(F6)→(F1)→(F1)→F3	21
	BAUD	RS232C→F2	26
	BLCTR	DSPL→F3	26
	BUZZR	DSPL→F5	26
C)	CENTER FREQ	FREQ→F1	15
	CENTER FREQ	FREQ→F2	15
	Ch Power	MEAS→(F6)→F1	20
	CLEAR	FREQ→F5→F5	15
	CONV	MKR→F6	19
	CTRS	DSPL→F1	26
D)	DET	SWEEP→F4	18
E)	E/F ANT	MEAS→(F6)→(F3)→F4	22
	EncST	FREQ→F4	15
	EXEC	RS232C→F3	26
	EXECUTE DEL	SAVE/LOAD→F5	20
	EXECUTE LOAD	SAVE/LOAD→F4	20
	EXECUTE SAVE	SAVE/LOAD→F3	20
F)	Freq COUNT	MEAS→F6	20
I)	IMP	REFER→F6	17
	INVT	DSPL→F4	26
K)	KEYST	FREQ→F3	15
M)	M/F PROBE	MEAS→(F6)→F5	25
	MAXHD	CALC→F2	18
	MEAS OFF	MEAS→(F1 to 5)→F6	25
	MINHD	CALC→F3	19
	MKR DELTA	MKR→F2	19
	MKR NORM	MKR→F1	19
	MODE	MEAS→(F6)→(F1 to 3)→F1	21/22
N)	NORM	CALC→F1	18
	NUM	FREQ→F5	15
O)	Occ BW	MEAS→(F6)→F3	22
	OFSdB	REFER→F5	16
	OVRWR	CALC→F5	19
P)	PARAM	SAVE/LOAD→F2	20
	PEAK SEARCH CNTR	MKR→(F3)→F4	19
	PEAK SEARCH NEXT	MKR→(F3)→F5	19
	PEAK SEARCH NORM	MKR→(F3)→F3	19
	PEAK SEARCH PEAK	MKR→(F3)→F4	19
	PEAK SEARCH WIDTH	MKR→(F3)→F5	19
	PEAK SEARCH ZONE	MKR→(F3)→F3	19
	PRE SET	SAVE/LOAD→F6	20
	PROBE	MEAS→(F6)→(F5)→F1	25
R)	RATIO	MEAS→(F6)→(F3)→F2	22
	RBW ALL	RBW→F3	17
	RBW AUTO	RBW→F2	17
	RBW MANU	RBW→F1	17
	REFERENCE CNTR	MEAS→(F6)→(F2)→F4	21
	REFERENCE WIDTH	MEAS→(F6)→(F2)→F5	21
S)	SCALE 10dB	SCALE→F1	17
	SCALE 2dB	SCALE→F2	17
	SET MKR	FREQ→F6	15
	SWEEP ALL	SWEEP→F3	18
	SWEEP AUTO	SWEEP→F2	18
	SWEEP MANU	SWEEP→F1	18
T)	TRACE	SAVE/LOAD→F1	19
		RS232C→F1	26
U)	UNIT	REFER→F1 to 4	16
V)	VBW ALL	VBW→F3	18
	VBW AUTO	VBW→F2	17
	VBW MANU	VBW→F1	17

5.2 Menu tree

The displayed items on the bottom of the screen correspond to the function keys under them, as shown in the figure below:

„Displayed items on the bottom of the screen"





REFER Refer to "9. Reference Level" for details

UNIT				OFSdB	IMP
dBm	dBµV	dBmV	dBV	0.0	50 Ω

Set the reference level

CALC Refer to "16. Calculation functions" for details

NORM	MAXHD	MINHD	AVER	OVRWR
	**	**	256	

Set the number

RBW Refer to "11. Resolution Bandwidth" for details

RBW		
MANU	AUTO	ALL

Set the RBW

SCALE Refer to "10. Display Scale" for details

SCALE	
10 dB	2 dB

Set the display scale

VBW Refer to "12. Video Bandwidth" for details

VBW		
MANU	AUTO	ALL

Set the VBW

SWEEP Refer to "13. Sweep Axis" for details

SWEEP		
MANU	AUTO	ALL

Set the sweep time

MEAS 1st Refer to "19. Measuring Function" for details

Ch	Adj	Occ	E/F	M/F	Freq
Power	Ch Pw	BW	ANT	PROBE	COUNT

Set the parameter

MODE	BAND		MEAS
BAND	CNTR	WIDTH	OFF

Set the parameter

MODE	Adj Ch Pw		REFERENCE		MEAS
TOTAL	OFS	WIDTH	CNTR	WIDTH	OFF

Set the parameter

MODE	RATIO	MEAS
N%	99.5%	OFF

ANT	MEAS
M301	OFF

MEAS 2nd

Ch	Adj	Occ	E/F	M/F	Freq
Power	Ch Pw	BW	ANT	PROBE	COUNT

Input the probe ID (first time only) –
Refer to "19.5 Magnetic field strength measurement" for details

PROBE	MEAS
CP-2S	OFF

MKR Refer to "17. Marker / Peak Search" for details

MKR		PEAK SEARCH			CONV
NORM	DELTA	NORM	PEAK	NEXT	dBm→W

Move the marker position (NORM mode)
F3: Changing the marker mode

MKR		PEAK SEARCH			CONV
NORM	DELTA	ZONE	CNTR	WIDTH	dBm→W

Set the zone center frequency (ZONE mode)

SAVE/LOAD Refer to "18. SAVE/LOAD" for details

TRACE	PARAM	EXECUTE			PRE
00	00	SAVE	LOAD	DEL	SET

Set the adress to store the trace

RS 232 C Refer to "22. Data Output" for details

TRACE	BAUD	
CURR	38400	EXEC

Set the trace to transfer

DSPL Refer to "20. Screen Control" for details

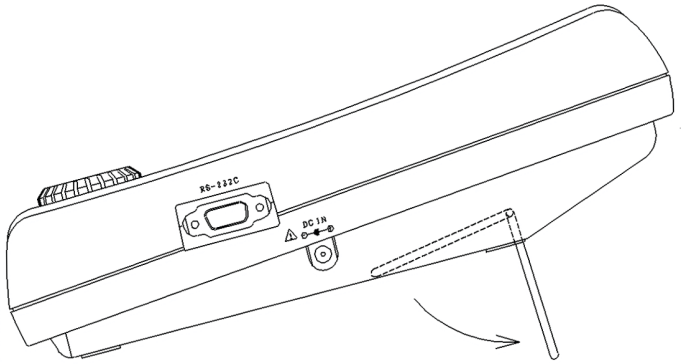
CTRS	B.L.	BLCTR	INVT	BUZZR
140	ON	200	OFF	ON

Set the contrast

6. Preparing for Operation

6.1 Stand

Utilize the stand on the back to use the screen in an easier-to-see angle on the desk.



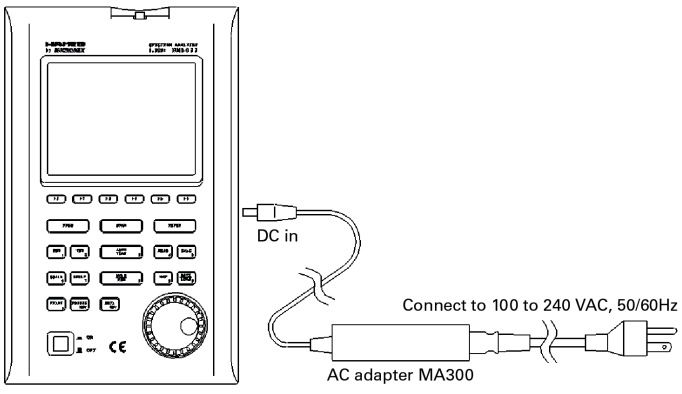
6.2 Connection to power supply

The MA300 AC adapter is both for the use with AC power supply and for charging the MB300 built-in battery (charge is started automatically if AC adapter is connected).

Connect the adapter as in the figure below and connect the AC plug to the power line (100 to 240 VAC, 50/60 Hz). For static electricity protection, ground the unit by connecting the three cores if possible. Not grounding the unit can damage it and the object measured. Do not use an AC adapter other than the MA300 supplied with the unit. Using an AC adapter other than the MA300 may cause damage to the unit.

Battery full charge time: approx. 8 hours
Battery operate time: the longest 120 min (back light OFF)
Battery full charge time with MBC300: approx.120 to 150 min

When it is not operated at normal temperature and setting parameters is the initialization.



If the voltage of a battery becomes low at the time of battery operation, it will be displayed on a screen as „Low Batt", and a buzzer will sound (it sounds, even if it is set up so that a buzzer may not sound), and a power supply will be shut off within several minutes. At that time, since the switch is the position of „ON", please push once and return to the position of „OFF". If it is with the position of „ON" after a power supply is shut off, it discharges inside, will be in electric overdischarge state, and becomes the cause of contracting the life of a battery. Please take care.

Moreover, under low temperature (near 0 °C), since a battery performance falls and voltage becomes low, even when capacity remains enough, it may display on a screen as „Low Batt".

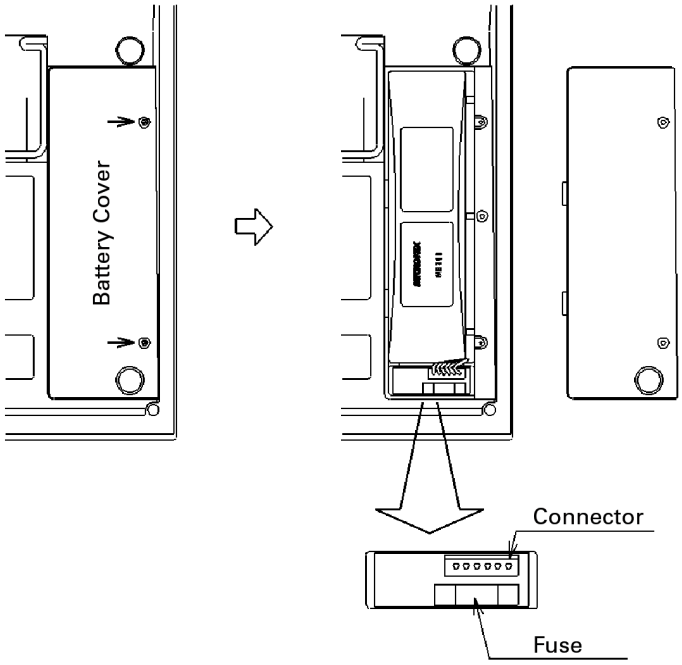
When a battery repeats charge and electric discharge, the fall (the fall of capacity and increase in internal resistance) of a battery performance begins from about 200 times, and capacity falls to the original half by about 500 times also under good conditions. On bad conditions (high temperature, etc.), the life of battery will be shorter than this.

6.3 Replacing the fuse

5 A / 250 V fuse (IEC127-2 sheet3, slow-blow type) is used for the battery power supply. When replacing it, turn the power off first, disconnect the AC adapter, remove the battery cover and on the back as shown in the figure below, remove the battery, and then take sufficient care to perform the replacement.
Be sure to use the fuse supplied with the unit, or specified one.

6.4 Installing the battery

When installing the battery, turn the power off first, disconnect the AC adapter, open the battery cover on the back of the unit after removing the two screws as shown in the figure below, and then take sufficient care to perform the installation. Be sure to use the specified battery, MB300.



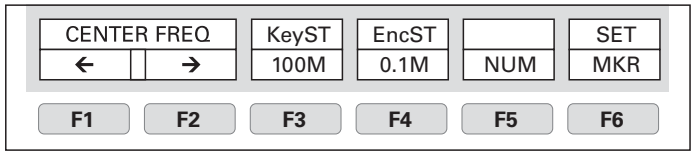
6.5 Soft carrying case

When carrying the unit or using it outdoors, the soft carrying case is convenient. You can also carry the AC adapter and printer with it, putting them in the accessory pouch.

Avoid using the unit in the soft carrying case in places where temperature is high because, with the soft carrying case, the temperature inside becomes higher than the ambient temperature.

7. Center Frequency <FREQ>

Press **FREQ**
to switch over to the function screen shown below:



Center frequency can be set between 0 to 3.3 GHz.Center frequency may shift for the time being (1 to 10 sec.), after changing a setting.

7.1 Setting with the step keys ([F1], [F2])

1. Each time **F1** is pressed, the center frequency decreases in the set step size.

2. Each time **F2** is pressed, the center frequency increases in the set step size.

3. Setting the step size:
Each time **F3** is pressed, it is set in the following order:

→ 0,1MHz → 1MHz → 10MHz → 100MHz →

7.2 Setting with the encoder

1. When ◯ is turned, the center frequency changes in the set step size.

2. Setting the step size:
Each time **F4** is pressed, it is set in the following order:

→ 0,1MHz → 1MHz → 10MHz → 100MHz →

7.3 Setting with the numeric keys

1. Press **F5** to enter into the numeric key input mode.

[F5] functions as the <CLEAR> key. [F6] functions as the <BACK SPACE> key.

In this mode, setting with [F1], [F2] or the encoder is not accepted.

2. The center frequency can be directly input according to the „Numeric Key Mapping Diagram".

3. The value is entered by pressing a unit key, [MHz (RS232C)] or [GHz (DSPL)].

Any figures below the resolution (100 kHz) will be discarded.

4. Changing the setting:

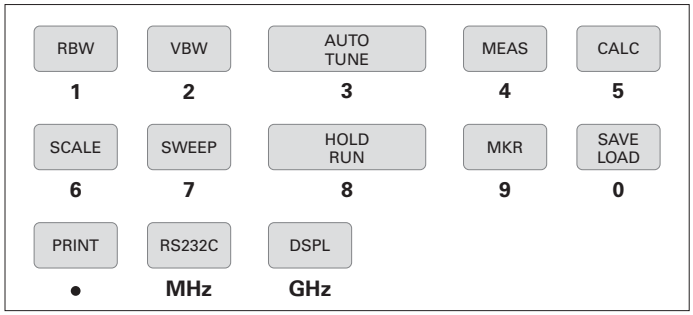
F5 : Deletes the entire value and allows you to input one from the beginning.

F6 : Deletes the last input figure.

5. Canceling the numeric key mode:

FREQ : Enables setting with step keys ([F1], [F2]) or the encoder again.

„Numeric Key Mapping Diagram"



7.4 According to the Marker position

1. When **F6** is pressed, the center frequency is set according to the frequency of current marker position.

Any figures below the resolution (100 kHz) will be discarded. This does not operate when the marker is not displayed (and the function display disappears).

8. Frequency Span <SPAN>

Press **SPAN** and use ◯ to set the frequency span.

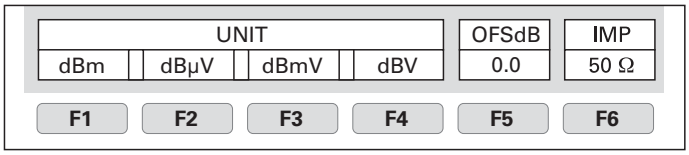
The frequency span can be set only with the encoder. Function keys are not available.

1. When ◯ is turned, the frequency span changes in the specified step.

[Hz] ZERO ↔ 200k ↔ 500k ↔ 1M ↔ 2M ↔ 5M ↔ 10M ←
→ 20M ↔ 50M ↔ 100M ↔ 500M ↔ 1G ↔ 2G ↔ FULL (3.3G)

9. Reference Level <REFER>

Press **REFER**
to switch over to the function screen shown below:



9.1 Setting the Reference level

1. When ◎ is turned, the reference level changes.
(Refer to „9.3 Reference level setting range for each unit" for details.)

9.2 Switching units of amplitude axis

(dBµV/m and dBµA/m are optional. Refer to „19.4 Electric field strength measurement" and „19.5 Magnetic field strength measurement" for details.)

1. Press **F1** to switching units to dBm.

Press **F2** to switching units to dBµV

Press **F3** to switching units to dBmV

Press **F4** to switching units to dBV

9.3 Reference level setting range for each unit

UNIT	dBm	dBµV	dBmV	dBV
MAXIMUM	10	117	57	-3
MINIMUM	-40	67	7	-53
MINIMUM*	-60	47	-13	-33

*(*shifted trace data)*

„Unit that is able to use it with the measuring function"

UNIT	dBµV/m**					dBµA/m***
Setting	**M301**	**M302**	**M303**	**M304**	**M305**	**CP2S**
MAXIMUM	143	146	148	150	137	160 to 203
MINIMUM	93	96	98	100	87	110 to 153
MINIMUM*	73	76	78	80	67	90 to 133

*(*shifted trace data*
*(**Electric filed strength measurement)*
*(***Magnetic field strength measurement)*

When the reference level is set between the „MINIMUN" and „MINIMUN (shifted trace data)", the trace in „MINIMUM" is shifted and displayed on a screen. When the reference level is set below to the „MINIMUM", the ATT display area is displayed as „S/W AMP".

Calculation expression (conversion formula to and from dBm)**:**

A [dBµV] = 107+X [dBm]
B [dBmV] = 47+X [dBm]
C [dBV] = -13+X [dBm]
D [dBµV/m] = 68.8/λ×√(X/Gar) [dBm]
λ: Wavelength[m]
Gar: Antenna absolute gain [times]
E [dBµA/m] = 180+X+F [dBm]
F: probe calibration coefficient
changes by frequency

9.4 Relation between the reference level and ATT · AMP (in dBm indication)

The programmable attenuator (ATT) and the input amplifier (AMP) inside HM5033 are automatically set according to the setting value of the reference level (REFER). ATT cannot be set independently.

REFER (dBm)	ATT (dB)	AMP (dB)
10	25	0
9	24	0
8	23	0
7	22	0
6	21	0
5	20	0
4	19	0
3	18	0
2	17	0
1	16	0
0	15	0
-1	14	0
-2	13	0
-3	12	0
-4	11	0
-5	10	0
-6	9	0
-7	8	0
-8	7	0
-9	6	0
-10	5	0
-11	4	0
-12	3	0
-13	2	0
-14	1	0
-15	0	0

REFER (dBm)	ATT (dB)	AMP (dB)
-16	20	21
-17	19	21
-18	18	21
-19	17	21
-20	16	21
-21	15	21
-22	14	21
-23	13	21
-24	12	21
-25	11	21
-26	10	21
-27	9	21
-28	8	21
-29	7	21
-30	6	21
-31	5	21
-32	4	21
-33	3	21
-34	2	21
-35	1	21
-36	5	26
-37	4	26
-38	3	26
-39	2	26
-40	1	26

When the input signal level is higher than the suitable level for 1st mixer's terminal, it generates harmonics distortion and spurious. HM5033 is designed so the input signal level of 1st mixer is determined between -20 and -25 dBm by the reference level. An input level to 1st mixer is calculated for by the following formula.

Input level of 1st mixer [dBm] = Input level [dBm] - (Fixed ATT + Insertion loss [dB]) – ATT [dB] + Input AMP [dB]

„(Fixed ATT + Insertion loss [dB])" is always 5 dB.

9.5 Setting the offset level

1. Press **F5** and use ◎ to set the offset of reference level.
When amplifier and attenuator are used externally, display level can be matched by offset.
The setting range is from -50.0 to 50.0 dB (0.1 dB step).
Offset is calculated to the reference level, and it is displayed.

When offset is set, it is displayed on LEVEL display area as „OFS".

Furthermore, the value of a marker point is displayed reflecting the calculated offset.

Offset of dBµV, dBmV, dBV, W, etc. are changed automatically.

9.6 Setting the input impedance

1. Press F6 and use ◎ to select the input impedance compensation.

50Ω ↔ 75Ω

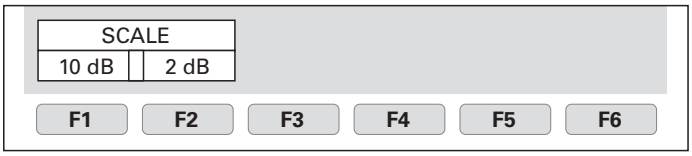
When coaxial adaptor MA301 (50 Ω/75 Ω impedance converter) is attached, and choose „75 Ω", then offset is calculated to the reference level, and it changes for the measured value as 75 Ω system, and display it.

When „75 Ω" is selected, „75 Ω" is displayed in the LEVEL area on the screen. When „75 Ω" is selected, the offset is set to 5.7 dB (insertion loss of MA301). Moreover, can set offset. Moreover, while setting the unit of the marker point to [W, V, V/m] etc, it changes from dBm correctly.

When you set it as „75 Ω", please be sure to attach coaxial adapter MA301 (50 Ω/75 Ω impedance converter).

10. Display Scale <SCALE>

Press SCALE
to switch over to the function screen shown below:



10.1 Setting with the keys ([F1], [F2])

1. Press F1 to set the 10 dB/div display scale.

2. Press F2 to set the 2 dB/div display scale.

10.2 Setting with the encoder

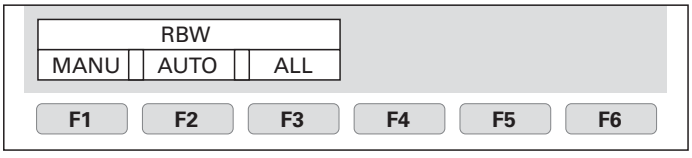
1. Turn ◎ to switch between the 10 dB/div and 2 dB/div display scale.

10dB ↔ 2dB

In 2 dB/div, display level may not become smaller than fixed level, by frequency compensation.

11. Resolution Bandwidth <RBW>

Press RBW
to switch over to the function screen shown below:



Any selected parts of MANU, AUTO and ALL become inverted display.

11.1 MANUAL mode

1. Press F1 or turn the ◎ to enter MANUAL mode.

Use ◎ to set the RBW.

3kHz ↔ 10kHz ↔ 30kHz ↔ 100kHz ↔ 300kHz ↔ 1MHz ↔ 3MHz

11.2 AUTO mode

1. When F2 is pressed, optimum RBW is set according to the settings of SPAN and SWEEP.

Since „" is displayed on the right end of RBW setting value display portion of a screen when set as AUTO mode, it can check being set as AUTO mode.*

11.3 ALL AUTO mode

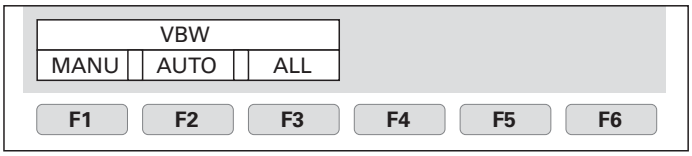
1. When F3 is pressed, optimum RBW, VBW and SWEEP are set according to the setting of SPAN.

Since „" will be displayed on the right end of each setting value display portion of RBW, VBW, and SWEEP if ALL AUTO mode is set up, it can check being set as ALL AUTO mode.*

When RBW is set as 3 kHz or 10 kHz, selectivity (60 dBc) becomes larger than an actual value, by influence of SSB phase noise.

12. Video Bandwidth <VBW>

Press VBW
to switch over to the function screen shown below:



Any selected parts of MANU, AUTO and ALL become inverted display.

12.1 MANUAL mode

1. Press or turn the ◎ to enter MANUAL mode.

Use ◎ to set the VBW.

100Hz ↔ 300Hz ↔ 1kHz ↔ 3kHz ↔ 10kHz ↔ 30kHz
100kHz ↔ 300kHz ↔ 1MHz

12.2 AUTO mode

1. When F2 is pressed, VBW is set according to the settings of SPAN and SWEEP.

Since „" is displayed on the right end of VBW setting value display portion of a screen when set as AUTO mode, it can check being set as AUTO mode.*

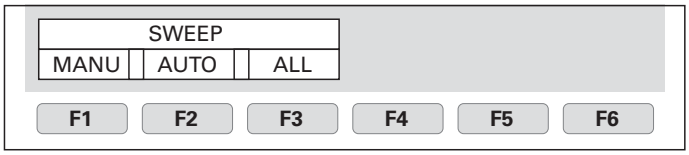
12.3 ALL AUTO mode

1. When F3 is pressed, RBW, VBW and SWEEP are set according to the setting of SPAN.

Since „" will be displayed on the right end of each setting value display portion of RBW, VBW, and SWEEP if ALL AUTO mode is set up, it can check being set as ALL AUTO mode.*

13. Sweep Axis · Detection Mode <SWEEP>

Press SWEEP
to switch over to the function screen shown below:



Any selected parts of MANU, AUTO and ALL become inverted display. When [F4] is pressed, the part of DET become inverted display.

13.1 MANUAL mode

1. Press F1 or turn the ◯ to enter MANUAL mode.
Use ◯ to set the SWEEP.

10ms ↔ 30ms ↔ 0.1s ↔ 0.3s ↔ 1s ↔ 3s ↔ 10s ↔ 30s

Can't set 10ms at the FULLSPAN.

13.2 AUTO mode

1. When F2 is pressed, SWEEP is set according to the settings of SPAN and RBW.

Since „" is displayed on the right end of SWEEP setting value display portion of a screen when set as AUTO mode, it can check being set as AUTO mode.*

13.3 ALL AUTO mode

1. When F3 is pressed, RBW, VBW and SWEEP are set according to the setting of SPAN.

Since „" will be displayed on the right end of each setting value display portion of RBW, VBW, and SWEEP if ALL AUTO mode is set up, it can check being set as ALL AUTO mode.*

13.4 Setting the Detection mode

1. Pressing F4 allows you to change the method to capture the trace.

PosPK (Positive Peak): Traces the maximum value of the sample points.
SMPL (Sample): Traces the momentary value of the sample points.
NegPK (Negative Peak): Traces the minimum value of the sample points.

When sweep time is 10ms or 30ms, detection mode is set to SMPL.

14. AUTO Tuning <AUTO TUNE>

1. When AUTO TUNE is pressed, center frequency is set at the spectrum of the maximum level in the 3.3 GHz band, and in addition, optimum reference level, RBW, VBW and SWEEP are set according to the setting of SPAN.

The AUTO tuning does not operate normally, at the time of the following 4 conditions.

1) ZERO SPAN
2) FULL SPAN
3) Signal level is –40 dBm or lower
4) Signal frequency is 50 MHz or lower

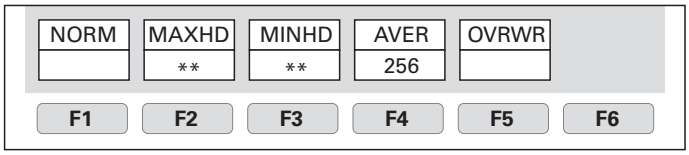
15. Hold/Run <HOLD/RUN>

1. Press HOLD/RUN to switch to between sweep halt and continuous sweep.

This operates only with the key press, with no function indication.

16. Calculation Function <CALC>

Press CALC
to switch over to the function screen shown below:



After sweeps stops, press HOLD/RUN to restart sweep.
Press [F1] to [F5] to set the CALC mode.
Use ◯ to set the number of sweeps.

16.1 NORM mode

1. Press F1 Calculation is not performed in this mode. The number of sweeps is always unlimited.

Usually, please choose this mode.
„NORMAL" is displayed in the CALC area on the LCD screen. (Refer to „4. Description of Display" for details)

16.2 MAX HOLD mode

1. Press F2 ans use ◯ to set the number of sweeps.

2. Sweeps are performed the set number of times, the maximum value of each point of trace data is displayed as a trace, and then sweep is halted.

„MAX --- (number of sweeps)" is displayed in the CALC area on the LCD screen. (Refer to „4. Description of Display" for details)

16.3 MIN HOLD mode

1. Press F3 and use ◎ to set the number of sweeps.

2. Sweeps are performed the set number of times, the minimum value of each point of trace data is displayed as a trace, and then sweep is halted.

2 ↔ 4 ↔ 8 ↔ 16 ↔ 32 ↔ 64 ↔ 128
256 ↔ 512 ↔ 1024 ↔ ∗∗ (unlimited)

„MIN — (number of sweeps)" is displayed in the CALC area on the LCD screen. (Refer to „4. Description of Display" for details)

16.4 AVERAGE mode

1. Press F4 Use ◎ to set the number of sweeps.

2. Sweeps are performed the set number of times, average value of each point of trace data is displayed as a trace, and then sweep is halted.

2 ↔ 4 ↔ 8 ↔ 16 ↔ 32 ↔ 64 ↔ 128 ↔ 256

„AVG — (number of sweeps)" is displayed in the CALC area on the LCD screen. (Refer to „4. Description of Display" for details)

16.5 OVER WRITE mode

1. Press F5 to enter into the OVER WRITE mode, where traces are written one over another. The number of sweeps is unlimited.

„OVER WR" is displayed in the CALC area on the LCD screen. (Refer to „4. Description of Display" for details) Only the last one trace is saved.

17. Marker · Peak Search <MKR>

Press MKR
to switch over to the function screen shown below:

MARKER		PEAK SEARCH			CONV
NORM	DELTA	NORM	PEAK	NEXT	dBm→W
F1	F2	F3	F4	F5	F6

The display when an NORM marker is selected.
The marker is manually moved at NORM mode. Peak search function, NEXT peak function is available.

MARKER		PEAK SEARCH			CONV
NORM	DELTA	ZONE	CNTR	WIDTH	dBm→W
F1	F2	F3	F4	F5	F6

The display when an ZONE marker is selected.
The marker moves to the highest paek position automatically at ZONE mode, inside specified zone.

17.1 Moving the marker

Use F1 and ◎ to move the marker.

Use F2 to put DELTA REF at the current marker position.

17.2 Setting the peak search <PEAK SEARCH>

NORM mode (Use F3 to select NORM.)

Use F4 to move the marker to the maximum peak position.

Use F5 to move the marker successively from higher to lower peak positions other than the maximum peak. (The marker moves to 10 peaks.)

When you move the marker to the 10th peak or moving the marker, the NEXT peak search function stops and the function display disappears.

ZONE mode (Use F3 to select ZONE.)

Use F4 and ◎ to move the center position.

Use F5 and ◎ to change the width.

17.3 Changing the unit of marker point

Press F6 to change the unit of marker point.

When unit of reference level is dBm, the unit is changed from [dBm] to [W].

When unit of reference level is dBµV, the unit is changed from [dBµV, dBmV, dBV] to [V].

When unit of reference level is dBµV/m, the unit is changed from [dBµV/m] to [V/m].

When unit of reference level is dBiA/m, the unit is changed from [dBµA/m] to [A/m].

Moreover, according to each unit, it is displayed as follows.

[W] ↔ [W, mW, µW, nW, pW, fW]
[V] ↔ [V, mV, µV, nV]
[V/m] ↔ [V/m, mV/m, µV/m, nV/m]
[A/m] ↔ [A/m, mA/m, µA/m, nA/m]

18. Save/Load <SAVE/LOAD>

Press SAVE/LOAD
to switch over to the function screen shown below:

TRACE	PARAM	EXECUTE			PRE
00	00	SAVE	LOAD	DEL	SET
F1	F2	F3	F4	F5	F6

18.1 Setting the location to store the trace

1. Pressing F1 allows you to set the number of location to store the trace.

2. Use ◎ to set the number of location.

00 ↔ 01 ↔ 02 ↔ 03 ↔ 04 ↔ ··· ↔ 98 ↔ 99

The part of TRACE become inverted display after it is selected.

18.2 Setting the location to store the parameter

1. Pressing F2 allows you to set the number of location to store the parameter.

2. Use ◎ to set the number of location.

00 ↔ 01 ↔ 02 ↔ 03 ↔ 04 ↔ ··· ↔ 98 ↔ 99

The part of PARAM become inverted display after it is selected.

18.3 Saving the data

1. Press F3 to save the data at the set number.

This saves the trace when TRACE is selected, or the setting parameters when PARAM is selected.
*„***** " is displayed on the right end of the number of location place at which data is saved.*
It can be overwritten, too.

18.4 Loading the data

1. Press F4 to read out the data at the set number.

This reads out the trace when TRACE is selected. The setting parameter of the loaded trace is displayed in the loaded trace information display area. (Refer to „4. Description of Display" for details)

This reads out the setting parameters when PARAM is selected.

When you load a trace, the current trace disappears, the HOLD state is set, and the loaded trace is displayed. For the loaded trace, you can use the marker, but cannot use a measuring function. When you press the HOLD/RUN key, the loaded and the current traces are displayed overlapping each other.

„" is displayed on the right end of the number of location place at which data is saved.*

When you search the trace or setting parameters to be read out, repeat F4 ↔ ◎ ↔ F4 *···, and load the trace or setting parameters in turn.*

18.5 Clearing the loaded trace

1. Press F5 to clear the loaded trace that has been displayed.

18.6 Presetting (Initialization)

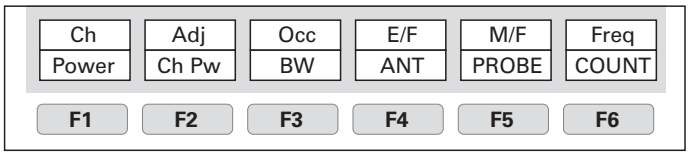
1. Press F6 to preset the setting parameters as the Initialization shown below:

„Initialization"

Items	Parameter	Items	Parameter
Center frequency	1 GHz	Sweep time	0.3 s
Frequency span	20 MHz	Detection mode	Positive peak mode
Reference level	10 dBm	RBW	100 kHz
Offset	0.0 dB	VBW	10 kHz
Impedance	50 Ω	Display scale	10 dB/div

19. Measuring Function<MEAS>

Press MEAS
to switch over to the function screen shown below:



Select the measuring function:

F1 **Ch Power:** Channel power measurement

F2 **Adj Ch Pw:** Adjacent channel leakage power measurement

F3 **Occ BW:** Occupied frequency bandwidth measurement

F4 **E/F ANT:** Electric field strength measurement

F5 **M/F PROBE:** Magnetic field strength measurement (optional)

F6 **Invalid**

Once you select the measuring function, pressing MEAS *next time will directly bring up the function screen for the function you selected the last time. If you want to stop the measuring function, or if you want to select another measuring function, press [F6] (MEAS OFF). This stops the measuring function and switches to the above screen, which allows you to select the measuring function.*

The measuring function is stops, when push MKR *while these 4 functions (Channel power ,Adjacent channel leakage power, Occupied frequency bandwidth, Frequency counter) are selected. Because each 4 functions and marker operation cannot be used simultaneously. Similarly, the function of the marker stops, when the functions of these 4 measurements are selected while using the marker.*

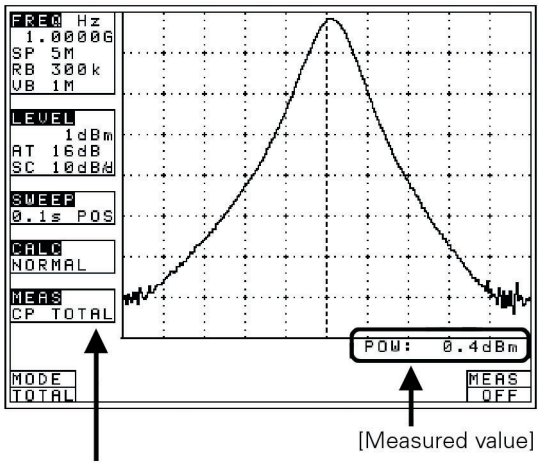
The unit displays data in 251 horizontal dots, but it internally captures the trace and calculates the measured value (Channel power measurement, Adjacent channel leakage power measurement and Occupied frequency bandwidth measurement) in 1001 dots.

19.1 Channel power measurement <Ch Power> F1

Measures the sum of the power in the zone specified. Two modes, TOTAL and BAND, are available.

TOTAL mode [Use F1 (MODE) to select TOTAL.]
Measure the sum of the power in the zone specified by the center frequency and frequency span (whole range of the screen).

It is shown on MEAS area of LCD as „CP TOTAL"
The measured value is displayed at the right lower corner on the screen.

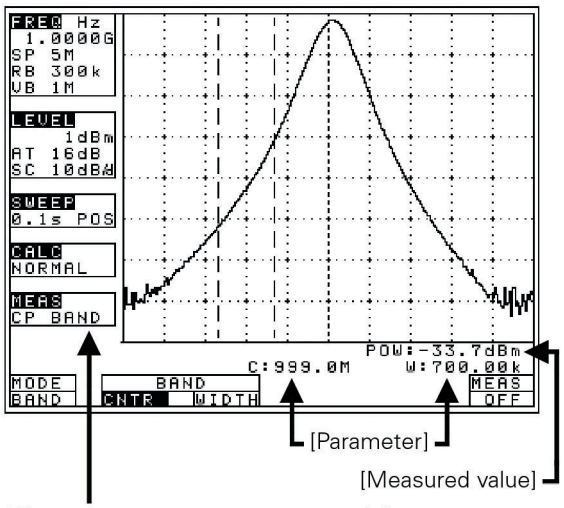


[Channel power measurement mode]

BAND mode [Use F1 (MODE) to select BAND.]

Measure the sum of the power in the zone specified by the zone center frequency and zone width.

It is shown on MEAS area of LCD as „CP BAND".
The measured value and setting parameter are displayed at the right lower corner on the screen.



[Channel power measurement mode]

1. Use F2 (CNTR) and ◎ to set the zone center frequency.

2. Use F3 (WIDTH) and ◎ to set the zone width.

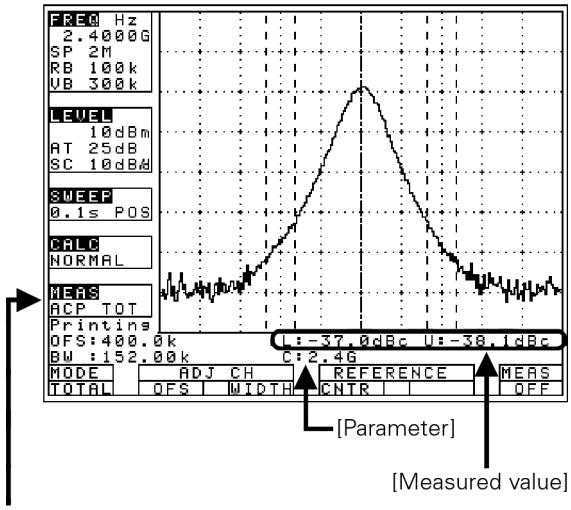
19.2 Adjacent channel leakage power measurement <Adj Ch Pw> F2

Measures the adjacent channel leakage power as the ratio of the power in the range specified by the offset frequency against the reference frequency (reference carrier frequency) and the bandwidth, to the carrier wave power.

Two channels of adjacent waves on the upper and lower sides of the same offset frequency are measured. In addition, you can select from three modes, TOTAL (total power method), REF BAND (in-band method) and PEAK (reference level method), according to the classification of definitions of carrier wave.

Mode selection and measurement
[Use F1 (MODE) to select a mode: TOTAL, BAND or PEAK.]

It is each shown on MEAS area of LCD as „ACP TOT", „ACP BAND" or „ACP PK".
The measured value and setting parameter are displayed at the right lower corner on the screen.



[Adjacent channel Leakage power measurement mode]

1. Use F2 (Adj Ch OFS) and ◎ to set the offset frequency of adjacent channel.

The offset is from the center frequency of the reference carrier wave.

2. Use F3 (Adj Ch WIDTH) and ◎ to set the band width of adjacent channel.

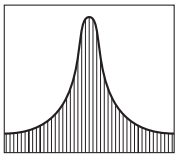
3. Use F4 (REFERENCE CNTR) and ◎ to setthe center frequency of reference carrier.

[F4] is only for the TOTAL and BAND mode.

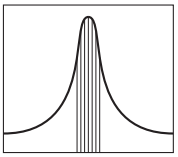
4. Use F5 (REFERENCE WIDTH) and ◎ to set the band width of reference carrier.

[F5] is only for the BAND mode.

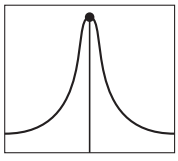
Definition of the reference carrier for each mode



TOTAL (total power method)
This is based on the sum total of the power of whole range on the screen. Use [F4] to set center frequency of the reference carrier wave.



BAND (in-band method)
This is based on the sum total of the power within the set bandwidth. Use [F4] to set center frequency of the reference carrier wave.



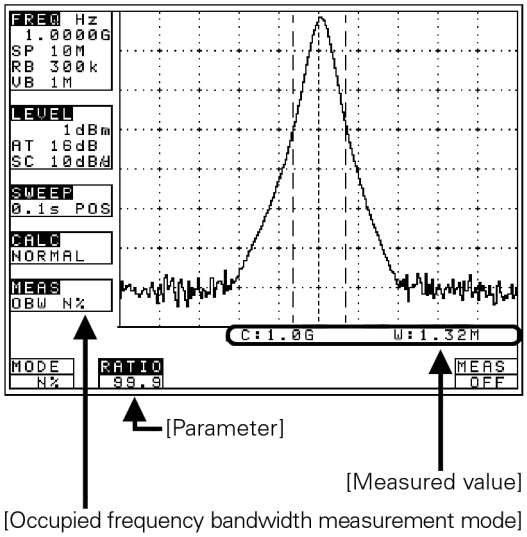
PEAK (reference level method)
This is based on the power of the peak on the screen. Center frequency of the reference carrier wave is set up to the peak inside the screen automatically.

19.3 Occupied frequency bandwidth measurement <Occ BW> F3

Measures the bandwidth at the point of N [%] of total power (N% POWER) or the bandwidth at the point X [dB] down from the peak level (XdB DOWN). Two modes are available.

N% POWER mode [Use F1 (MODE) to select N%.] Measures the bandwidth at the point of N [%] of total power displayed on the screen.

It is shown on MEAS area of LCD as „OBW N%"
The measured value is displayed at the right lower corner on the screen.

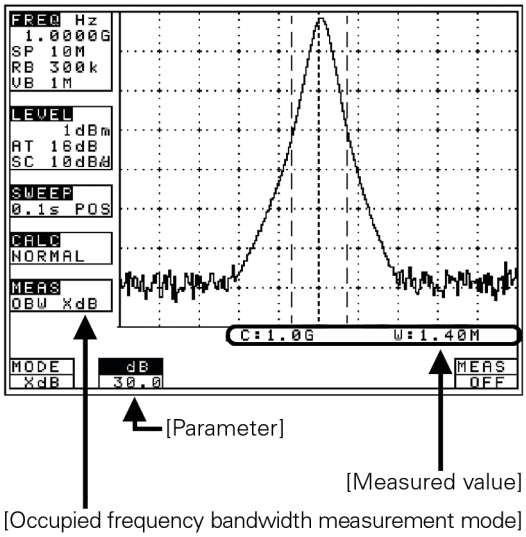


1. Use F2 (RATIO) and ◎ to set the percentage to total power.

Setting range: 80.0 to 99.9 %.

XdB DOWN mode [Use F1 (MODE) to select XdB.] Measures the bandwidth at the point X [dB] down from the peak level.

It is shown on MEAS area of LCD as „OBW XdB".
The measured value is displayed at the right lower corner on the screen.

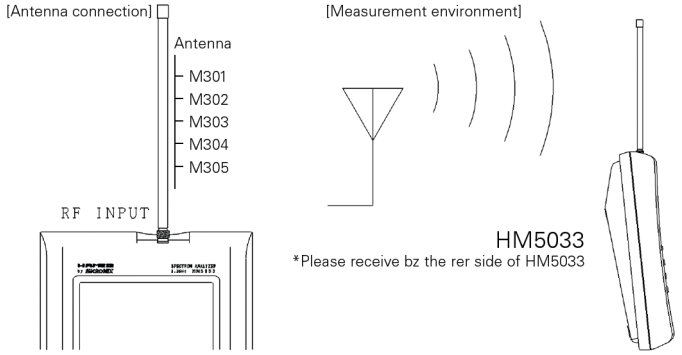


1. Use F2 (dB) and ◎ to set the down level from peak level.

Setting range: 0.1 to 80.0 dB.

19.4 Electric field strength measurement <E/F ANT> F4

Measures electric field strength by connecting an optional antenna. Allows using an antenna other than options by creating and inputting the original compensation table (Refer to „23.6 Writing of original compensation data" for how to create and write).



„Specifications of the antenna (antenna gain and VSWR are specified at a center of frequency range)."

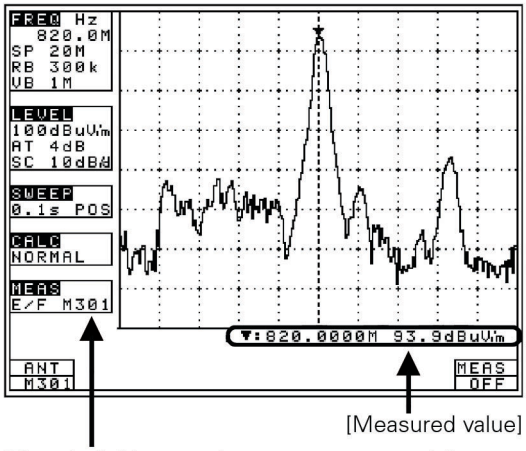
Items	M301	M302	M303
Type	Sleeve	Sleeve	Sleeve
Frequency range	0.8 to 1.0 GHz	1.25 to 1.65 GHz	1.7 to 2.20 GHz
Antenna gain	+1 dBi or higher	+1 dBi or higher	+1 dBi or higher
VSWR	1.5 or lower	1.5 or lower	1.5 or lower
Dimensions	7.5 Ø×250 mm	7.5 Ø×250 mm	7.5 Ø×180 mm
Weight	approx.20 g	approx.20 g	approx. 20 g
Reference level setting range	93 to 143 dBµV/m	96 to 146 dBµV/m	98 to 148 dBµV/m
(except for the minimum value in screen shift)			

Items	M304	M305
Type	Sleeve	1/4 λ whip
Frequency range	2.25 to 2.65 GHz	300 to 500 MHz
Antenna gain	+1 dBi or higher	+1 dBi or higher
VSWR	1.5 or lower	1.5 or lower
Dimensions	7.5 Ø×180 mm	8.0 Ø×195 mm
Weight	approx. 20g	approx.30 g
Reference level setting range	100 to 150 dBµV/m	87 to 137 dBµV/m
(except for the minimum value in screen shift)		

Measured value varies depending on how to have HM5033 main unit. Moreover, if the person who has is different, measured value will vary. Because M305 is 1/4 λ whip antenna. Therefore, in the measurement used an antenna M305, measurement errors occurs. The error value is several dB or 10 dB or more. In order to lessen the error value, use it, separating from the body as much as possible so that there is no influence of human body.

Mode selection and measurement
Use F1 (ANT) to select an antenna, M301, M302, M303, M304, M305 or USER. As soon as the antenna is entered, the measurement is taken.

It is each shown on MEAS area of LCD as „M/F M301", „M/F M302", „M/F M303", „M/F M304", „E/F M305" or „M/F USER" (Refer to „23.1 Command description" for details.)
USER" is an original compensation table the user creates. Trace may exceed from a screen by antenna gain compensation.



Unit of amplitude axis changes to [dBµV/m]

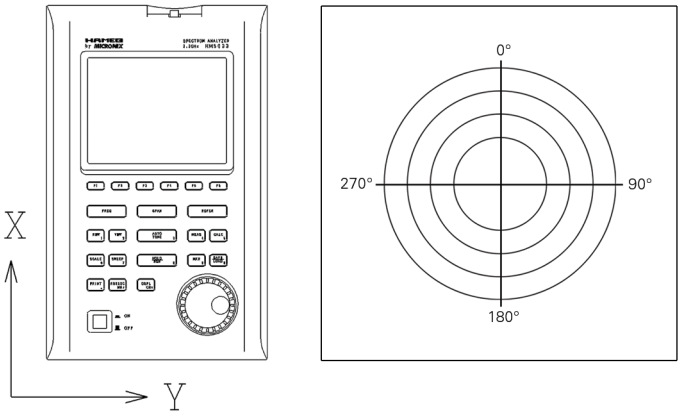
Optimum center frequency and frequency span are set according to the antenna. In addition, a trace is not displayed for frequencies outside those supported by the antenna.

Example (case of M301)

Center frequency:	900 MHz
Frequency span:	200 MHz

Antenna directivity (reference data)

E plane: X-Y axis (X direction= 0 °)

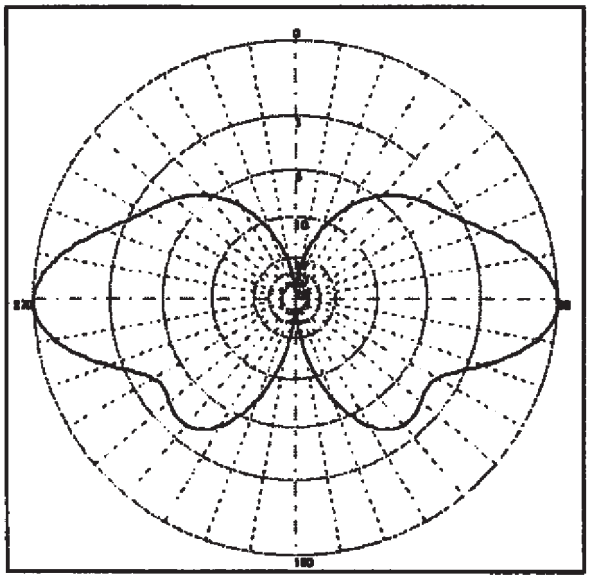


All the data are those when the antenna is connected to the RF input with no obstacles around.

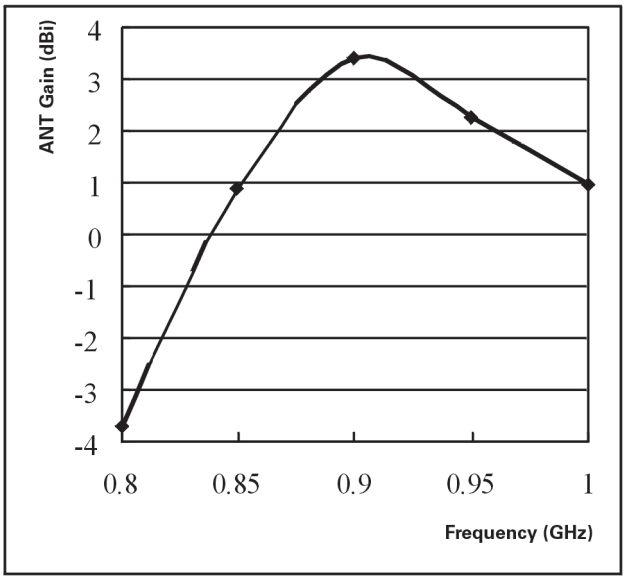
However, data of M305 is reference data of the conditions in which people have HM5033 attached M305. So, the directivity changes in practice, because, for example, the unit is carried by people.

Antenna diagrams

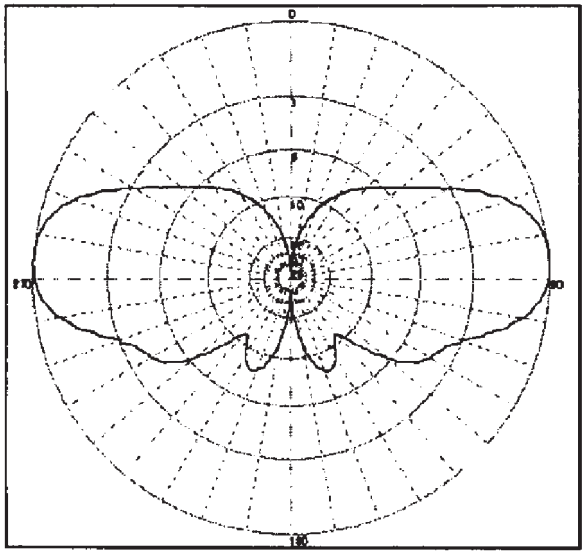
M301 (900 MHz, E plane)



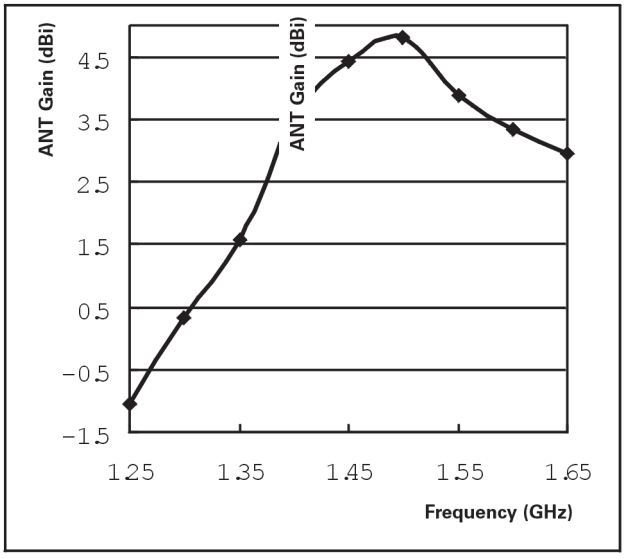
Antenna gain vs Frequency



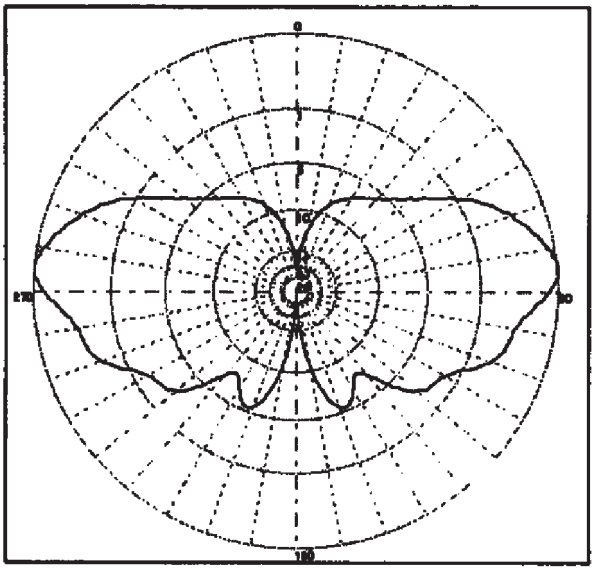
M302 (1.5 GHz, E plane)



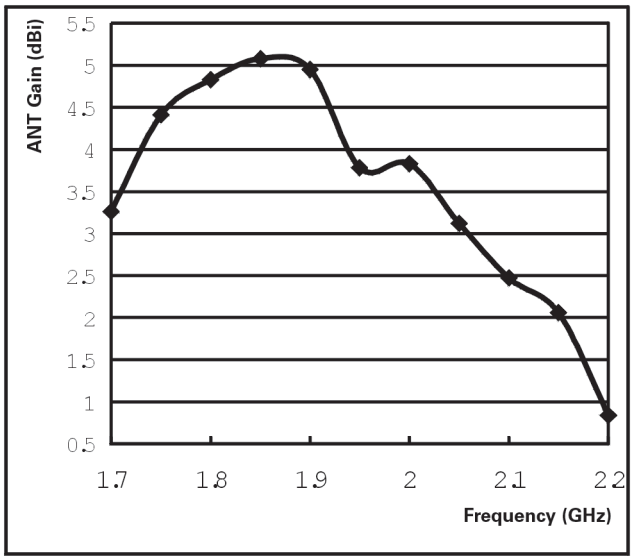
Antenna gain vs Frequency



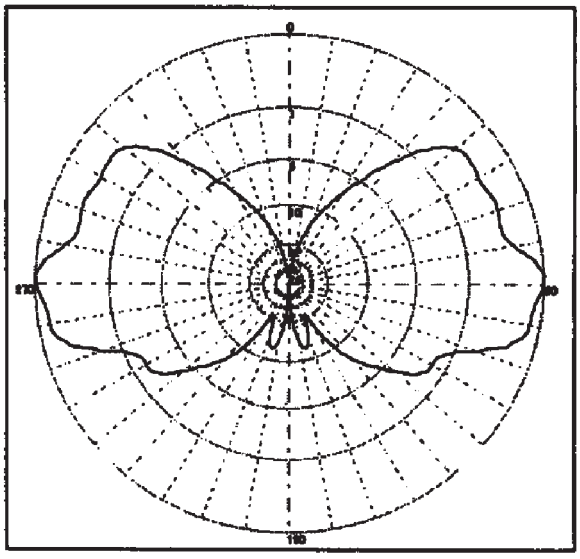
M303 (2.0 GHz, E plane)



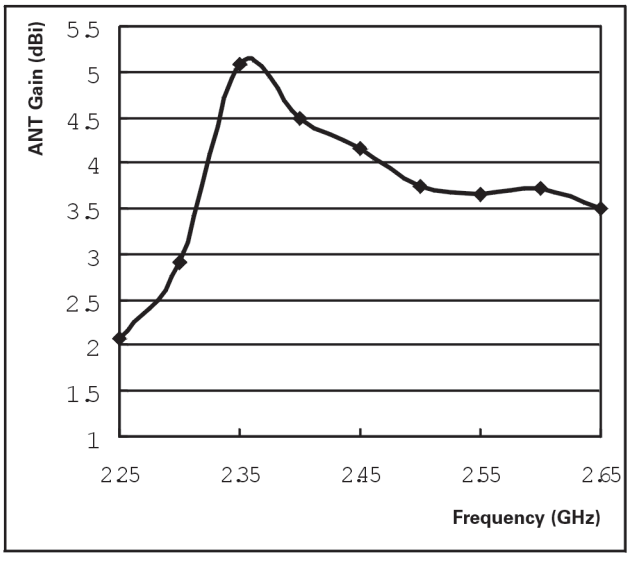
Antenna gain vs Frequency



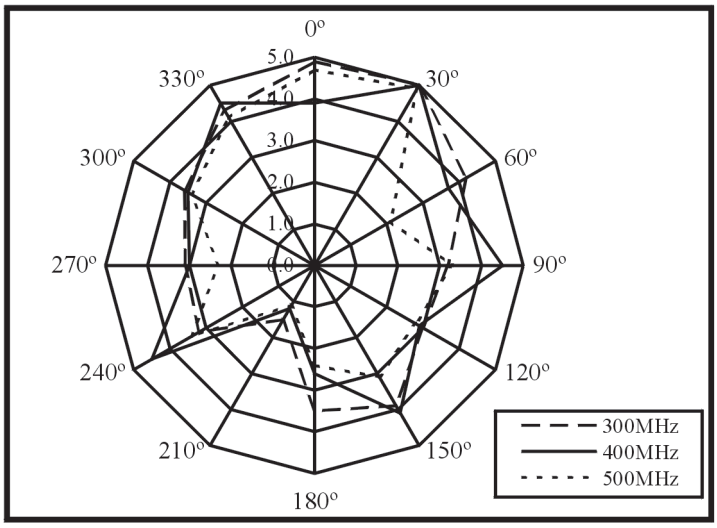
M304 (2.4 GHz, E plane)



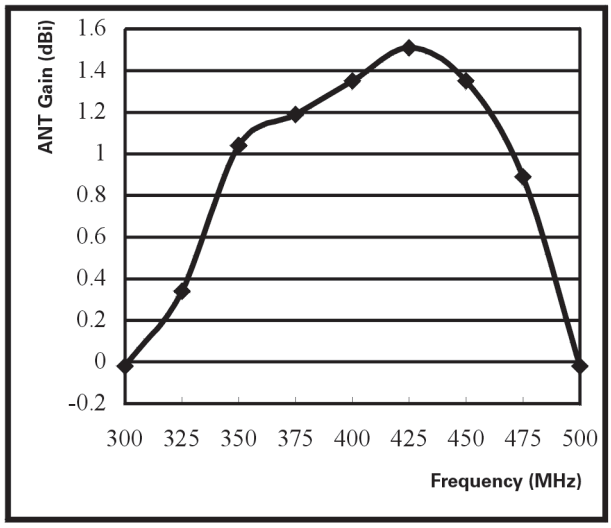
Antenna gain vs Frequency



M305 (horizontal plane)

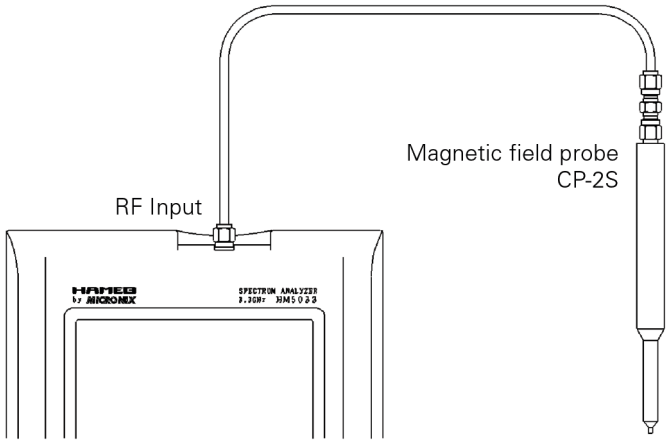


Antenna gain vs Frequency



19.5 Magnetic field strength measurement <M/F PROBE> (optional) F6

Measures the magnetic field strength using the optional magnetic field probe CP-2S.



„Specifications of magnetic field probe CP-2S"

Items	Specifications
Frequency range	10 MHz to 3 GHz
Space resolution (-6dB) (Depending on objects)	approx. 0.25 mm
Dimensions	Outside: 12 mm ∅ × 135mm probe tip: 2 mm (W) × 1mm (T)
Connector	SMA (P)
Reference level setting range (maximum)	160 to 203 dBµA/m
Reference level setting range (except for the minimum value in screen shift)	110 to 153 dBµA/m
Measurement error	approx. ± 1 dB (Probe simple substance)

(Refer to the operating manual for CP-2S for details)

The tip of the optional magnetic field probe CP-2S is made of glass-ceramic board. Take care when handling the probe even though the strength of the glass-ceramic board is sufficiently ensured under normal operation.

Registration of the probe ID

Magnetic field strength measurement cannot be used without entering the „Probe ID" attached to the optional magnetic field probe, CP-2S. Once you have entered it, you don't need to enter it again.

When you press MEAS and F6 in that order, „Input PROBE ID" will appear in the measured value display area on the screen. Then, input the 14-digit „Probe ID" with the numeric keypads.

Press F4 (ENTER) to confirm it.

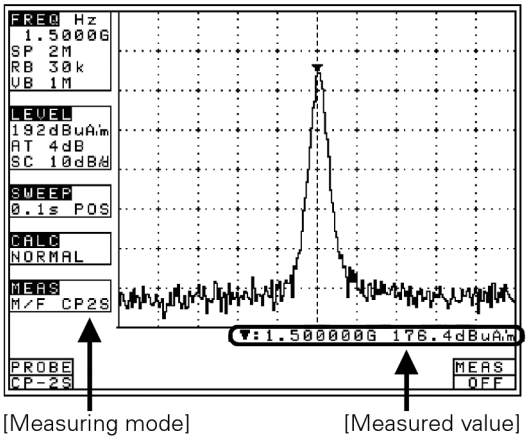
Press F5 (CLEAR) to delete the entire value and allow you to input one from the beginning.

Press F6 (BACK SPACE) to delete the last input figure.

Press F3 to cancel the probe ID input display.

Mode selection and measurement

Use F1 (PROBE) to select a probe, CP-2S or USER. As soon as the probe is entered, the measurement is taken.



It is each shown on MEAS area of LCD as „M/F CP2S" or „M/F USER". „USER" is an original calibration table the user creates. (Refer to „23.1 Command description" for details)

Unit of amplitude axis are changing to [dBµA/m]

A trace is not displayed for frequencies outside those supported by the probe.

20. Screen Control <DSPL>

Press DSPL
to switch over to the function screen shown below:

CTRS	B.L.	BLCTR	INVT	BUZZR	
140	ON	200	OFF	ON	
F1	F2	F3	F4	F5	F6

20.1 Adjusting the contrast

Use F1 and ◎ to adjust the contrast.

20.2 Switching ON and OFF the LCD backlight

Each time F2 is pressed, the LCD backlight is alternately switched to ON or OFF.

20.3 Adjusting the brightness of the LCD backlight

Use F3 and ◎ to set the brightness.

20.4 Inverting the display

Press F4 to invert the screen display. Press F4 again to return it to the previous state.

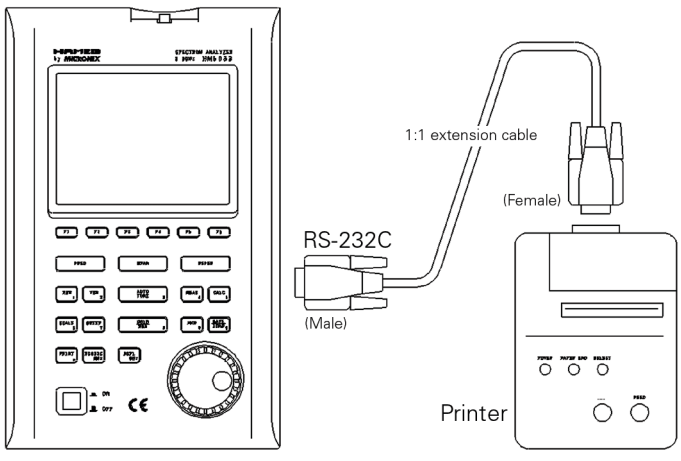
20.5 Enabling or disabling the beep

Pressing F6 allows you to disable the beep that sounds when you operate a key or the encoder. Press F6 again to return it to the previous state.

If the voltage of a battery becomes low at the time of battery operation, it will be displayed on a screen as „Low Batt", and a buzzer will sound (it sounds, even if it is set up so that a buzzer may not sound), and a power supply will be shut off within several minutes.

21. Printing <PRINT> (option)

When using the optional printer, connect the RS-232C cable MI180 (optional) as shown in the figure below.



21.1 Hard copy of the screen

When you press the PRINT with the printer (optional) connected to the unit, it is set to the HOLD state and starts printing. It remains in the HOLD state after the printing is finished. It stops printing if you press the PRINT again during printing.

Since the printer operates with power supply from either the AC adapter or dry batteries, you can easily produce a hard copy of measured data even when outdoors where no AC power supply is available. When battery-powered, the printer operates for approximately 30 minutes (continuous use), allowing you to produce about 80 hard copies of the screen image.

22. Data Output <RS-232C>

Press RS 232 C
to switch over to the function screen shown below:

TRACE	BAUD				
CURR	38400	EXEC			
F1	F2	F3	F4	F5	F6

Refer to „23. RS-232C" for „How to connect" and „RS-232C specifications". The trace currently displayed on the screen is transmitted when „CURR" is selected.

22.1 Selecting the trace to transfer

Use F1 and ◎ to select a trace.

CURR ↔ 00 ↔ 01 ↔ 02 ↔ 03 ↔ ··· ↔ 98 ↔ 99

An asterisk (*) appears when there is a saved trace at the selected number as well as „SAVE/LOAD".

22.2 Selecting the communication speed (baud rate)

Use F2 and ◎ to select a baud rate.

2400 ↔ 4800 ↔ 9600 ↔ 19200 ↔ 38400

22.3 Transfer the data

Press F3 to start the transfer. The data are transmitted as ASCII cord character strings.

Contents of data

1) Center frequency
CF ** [**=0.0M, 0.1M to 999.9M (0.1 step), 0.0001G to 3.3G (0.0001 step)]

2) Frequency span
SP ** [**=ZERO, 200k, 500k, 1M, 2M, 5M, 10M, 20M, 50M, 100M, 200M, 500M, 1G, 2G, FULL]

3) Reference level
RF ** [**=-60 to 10dBm, 47 to 117dBµV, -13 to 57dBmV, -33 to –3dBV, 72 to 149dBµV/m, 89 to 203dBµA/m (all 1 step)]

4) Sweep time and Detection mode
ST ** ## [**=10ms, 30ms, 0.1s, 0.3s, 1s, 3s, 10s, 30s]
[##=POS, NEG, SMP]

5) Resolution bandwidth
RB ** [**=3k, 10k, 30k, 100k, 300k, 1M, 3M]

6) Video bandwidth
VB ** [**=100, 300, 1k, 3k, 10k, 30k, 100k, 300k, 1M]

"CR(0D[HEX])+LF(0A[HEX])" is added to the tail of every data.

Character strings	Description		Example
PARAM	This means that the data from the next line are „setting parameters".		RARAM
CF **	Center frequency	Refer to 1)	CF 2.5140G
SP **	Frequency span	Refer to 2)	SP 20M
RF **	Reference level	Refer to 3)	RF 10 dBm
ST ** ##	Sweep time and detection mode	Refer to 4)	ST 30 ms SMP
RB **	Resolution bandwidth	Refer to 5)	RB 300k
VB **	Video bandwidth	Refer to 6)	VB 1M
SC **	Display scale	(** = 10 dB/div or 2 dB/div)	SC 10 dB/div
TRACE	This means that the data from the next line are „trace data".		TRACE
**, **, ...	These are trace data. Ten two-digit hexadecimal characters separated by		24, 20, 1f, 1f, 1e, ...
	commas make a line, and there are 26 lines (251 data) of data in total.		...
	For Trace 1001 data transfer, there are 101 lines (1001 data) of data in total.		23

23. RS-232C Interface

23.1 RS-232C specifications

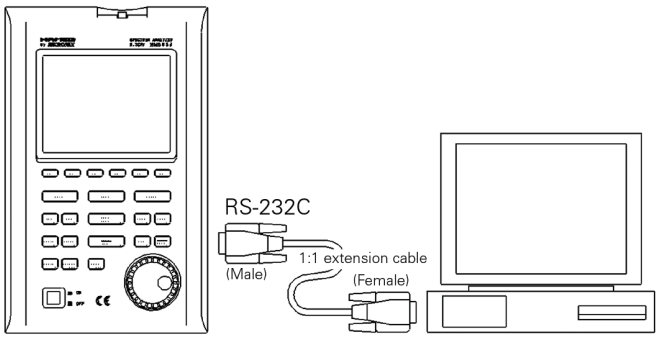
Transfer rate:	2400 / 4800 / 9600 / 19200 / 38400 bps
Date bit length:	8 bit
Stop bit:	1 bit
Parity check:	none

23.2 How to connect

When using the RS-232C interface, connect a 1:1 Sub-D extension cable as shown in the figure below.

Cable length:	approx. 1.5m
Connector:	D-sub 9 pin male / D-sub 9 pin female
Wiring:	straight

Refer to „22. Data Output" about changing baud rate.
COM PORT (D-sub 9pin, male)



Use the conversion connector, in the case that is D-sub 25pin (male)

23.3 Command description

„CR(0D[HEX])+ LF(0A[HEX])" is added to the tail of every command. When you send a command from your PC, HM5033 returns a response. Responses include „OK" + CR + LF, „ERR" + CR + LF and „(response to command)" + CR + LF.

*By inputting „?" instead of „**" for each command, the current setting parameters are returned. Except for „····Request" command and command for inputting corrected data.*

1) Set the center frequency
Command: FREQ*******
(*******= Refer to [23.4 Input the frequency])

2) Request the set marker
Command: FREQSETMKR

The center frequency is set according to the frequency of current marker position.

3) Set the span
Command: SPAN****
(****= ZERO, 200K, 500K, 1M, 2M, 5M, 10M, 20M, 50M, 100M, 500M, 1G, 2G, FULL [unit: Hz])

4) Set the reference level
Command: REF***
(***= -60 to 10 [1step, unit: dBm])

For units other than dBm, use the conversion formulas in „9.3 Refference level setting range for each unit" to convert them into dBm before inputting the value.

5) Set the reference unit
Command: UNIT****
(****= DBM, DBUV, DBMV, DBV)

Command	Unit
DBM	dBm
DBUV	dBμV
DBMV	dBmV
DBV	dBV

6) Set the RBW
Command: RBW****
(****= 3K, 10K, 30K, 100K, 300K, 1M, 3M, AUTO, ALL [unit: Hz])

7) Set the VBW
Command: VBW****
(****= 100, 1K, 3K, 10K, 30K, 100K, 300K, 1M, AUTO, ALL [unit: Hz])

8) Start/Stop the measuring function
Command: MEAS***
(***= CP, ACP, OBW, EF, MF, OFF)

Command	Measuring function
CP	Channel power measurement
ACP	Adjacent channel leakage power measurement
OBW	Occupied frequency bandwidth measurement
EF	Electric field strength measurement
MF	Magnetic field strength measurement
OFF	OFF

9) Request the result of measuring function
Command: MEASRES

Example of the return data

Case of channel power measurement···
POW: -25.5dBm

Case of adjacent channel power measurement···
L: -44.7dBc
U: -48.3dBc

Case of occupied bandwidth measurement···
C: 1.45G
W: 20.00k

Case of frequency counter···
FC: 2400.0000M

When the level of spectrum is small and cannot measure, it is returned as „Non signal".

If frequency counter (factory option) is not mounting, it is returned as „Invalid for F/C".

10) Set the mode of channel power measurement
Command: CPMODE*****
(*****= TOTAL. BAND)

Command	Mode
TOTAL	Measure the power of whole range on the screen
BAND	Measure the power within zone set

11) Set the zone center frequency of channel power measurement
Command: CPCNTR*******
(*******=Refer to [23.4 Input the frequency])

12) Set the zone width of channel power measurement
Command: CPWIDTH*******
(******=Refer to [23.4 Input the frequency])

13) Set the mode of adjacent channel power mesurement
Command: ACPMODE*****
(*****=TOTAL, REF, PEAK)

Command	Mode
TOTAL	TOTAL (total power method)
BAND	BAND (in-band method)
PEAK	PEAK (reference level method)

14) Set the band offset of adjacent channel power mesurement
Command: ACPOFS*******
(*******=Refer to [23.4 Input the frequency])

15) Set the bandwidth of adjacent channel power mesurement
Command: ACPCHBW*******
(*******=Refer to [23.4 Input the frequency])

16) Set the reference band center frequency of adjacent channel power mesurement
Command: ACPREF*******
(*******=Refer to [23.4 Input the frequency])

17) Set the reference bandwidth of adjacent channel power measurement
Command: ACPREFBW*******
(*******=Refer to [23.4 Input the frequency])

18) Set the mode of occupied bandwidth measurement
Command: OBWMODE**
(**=N%, DB)

Command	Mode
N%	N% POWER mode
DB	XdB DOWN mode

19) Set the N% ratio of occupied bandwidth mesurement
Command: OBWRATIO****
(****=80.0 to 99.9 [0.1 step, unit: %])

20) Set the XdB down of occupied bandwidth mesurement
Command: OBWDB****
(****=0.1 to 40.0 [0.1 step, unit: dB])

21) Set the antenna of electric field strength measurement
Command: EFANT****
(****=M301, M302, M303, M304, M305, USER)

Command	Antenna
M301	Setting date for M301
M302	Setting date for M302
M303	Setting date for M303
M304	Setting date for M304
M305	Setting data for M305
USER	Setting date for user's original antenna

22) Transfer the user-compensation data of electric field strength measurement
Command: EFUSER*******
Example of the compensation data:
*******=2.25G:2.08DBI,···2.65G:3.5DBI

If the compensation coefficient is -0.3 dBi at 2.5 GHz, the compensation data is „2.5G:-0.3DBI"

Set apart by „," between data and input from lower frequency. 10data are available.

Command	Probe
CP2S	Setting data for CP-2S
USER	Setting data for user's original probe

23) Set the probe of magnetic field strength measurement
Command: MFPROBE****
(****=CP2S, USER)

24) Transfer the user-compensation date for magnetic field strength measurement
Command: MFUSER*******
Example of the compensation data:
*******=10M:86.7DB, 100M:69.2DB,···3G:40dB

If the compensation coefficient is 86.7 dB at 10 MHz, the compensation data is „10M:86.7DB". Set apart by „," between data and input from lower frequency. 10data are available.

25) Start/Stop Calculation
Command: CALC***
(***=OFF, MAX, MIN, AVE, OVR)

Command	Calculation
OFF	OFF
MAX	MAX HOLD
MIN	MIN HOLD
AVE	AVERAGE
OVR	OVER WRITE

26) Set the number of MAX HOLD
Command: MAXNO****
(****=2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 0)
Command: 0 = unlimited

27) Set the number of MIN HOLD
Command: MINNO****
(****=2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 0)
Command: 0 = unlimited

28) Set the number of AVERAGE
Command: AVENO***
(***= 2, 4, 8, 16, 32, 64, 128, 256)

29) Set the display scale of amplitude axis
Command: SCALE**
(**= 2, 10)

Command	Display scale
2	2 dB/div
10	10 dB/div

30) Set the sweep time
Command: SWEEP****
(****= 10M, 30M, 0.1S, 0.3S, 1S, 3S, 10S, 30S, AUTO, ALL)

Command	Sweep time
10M	10 ms
30M	30 ms
0.1S	0.1 s
0.3S	0.3 s
1S	1 s
3S	3 s
10S	10 s
30S	30s
AUTO	AUTO
ALL	ALL AUTO

31) Set the detection mode
Command: DET***
(***= POS, NEG, SMP)

Command	Detection mode
POS	Positive peak mode
NEG	Negative peak mode
SMP	Sample mode

32) Request the AUTOTUNE
Command: AUTO

Returns the response after tuning.

33) Request the action
Command: HOLD/RUN

34) Request the marker information
Command: MKRRES

Example of returned data: 1.42G -15dBm

35) Set the marker mode
Command: MKR*****
(*****= NORM, DELTA)

Command	Marker mode
NORM	Normal marker
DELTA	Delta marker

36) Set the marker position
Command: NORMMKR*******
(*******= Refer to [23.4 Input the frequency])

37) Set the peak search mode
Command: PEAK****
(****= NORM, ZONE)

Command	Peak search mode
NORM	Normal peak search
ZONE	Zone peak search

38) Request the peak search
Command: PKSEARCH**
(**= 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11)

Command	Position to where the marker moves
01	Position of the maximum peak on the screen
02	Position of the 2nd highest peak on the screen
...	...
11	Position of the 11th highest peak on the screen

39) Set the zone center frequency of peak search
Command: PKCNTR*******
(*******= Refer to [23.4 Input the frequency])

40) Set the zone width of peak search
Command: PKWIDTH*******
(*******= Refer to [23.4 Input the frequency])

41) Set the unit of marker
Command: CONV***
(***=DBM, M, DBV, V, DBUVM, VM)

Command	Unit of marker
DBM	dBm
W	W
DBV	dBV
V	V
DBUVM	dBìV/m
VM	V/m

42) Request the transfer of hard copy
Command: PRT

When transfering the returned data to optional printer, hard copy is performed.

43) Request to transfer trace
Command: SRS****
(****= CURR, 00 to 99)

Command	Trace that is transferred
CURR	Trace of Current
00	Trace of save data 1
...	...
99	Trace of save data 100

44) Request to transfer 1001 date of trace
Command: SRSF
(Refer to „22.3 Transfer the data“ about returned data.)

45) Request the preset
Command: PRESET

46) Set the remote control
Command: REMOTE***
(***=ON, OFF)

When remote control is ON, „REMOTE" is displayed in the operating information display area on the LCD screen. (Refer to „4. Description Of Screen" for details)

Command	Remote control
ON	Any operation from the keys or the encoder of the main body will not be accepted. Control the unit withRS-232C commands.
OFF	The operation from the keys or theencoder of the main body andRS-232C commands will be accepted.

47) Single sweep
Command: CAPT

It sweeps only once and will be in a HOLD state.

48) Setting of the offset level
Command: OFFSET****
(****=-50.0 to 50.0 [0.1step, unit:dB])

49) Setting the input impedance
Command: IMP**
(**=50, 75)

When selecting of „75Ù", please attach the coaxial connector (impedance converter) MA301 (optional) to an input connector.

Command	Offset level
50	Offset level is set to 0 dB.
75	Offset level is set to 5.7 dB.

50) Clearing of saved trace-data and parameter
Command: MCLR****
(****=WALL, SALL, W00 to W99, S00 to S99)

It is not clearable with HM5033 main unit.

Command	Clearing data
WALL	All of saved trace-data
SALL	All of saved-parameter
W00	Trace-data of save-No. 00
...	...
W99	Trace-data of save-No. 99
S00	Parameter of save-No. 00
...	...
S99	Parameter of save-No. 99

23.4 Input the frequency

For the items written (*******=Refer to [23.4 Input the frequency]) in [23.3 Command description] above, enter a frequency as follows.

******* = 0.0k to 999.9k [0.1 step, unit: Hz]
0.0M to 999.9M [0.1 step, unit: Hz]
0.0001G to 3.3G [0.0001 step, unit: Hz]

However, the offset frequency and zone width can be input only in the range decided by the center frequency and frequency span. The value out of the range becomes error. Values of the offset frequency and the zone width will change as you alter the frequency span.

23.5 Writing of original compensation data

On the case of electric field strength measurement used the antenna prepared by the visitor, or, on the case of magnetic field strength measurement used the magnetic field probe prepared by the visitor, it is necessary to write the data of the antenna gain or the magnetic probe field compensation coefficient to HM5033 main unit. Please write the antenna gain or the magnetic probe field compensation coefficient according to the following description. There are two kinds of methods, „method 1: use PC software MAS300 (optional)" and „method 2: use communication program which is prepared by user".

1) Preparation things
- RS-232C interface cable (9 pole 1:1 Sub-D extension cable)
- Windows® PC (with RS-232C interface)
  It is not writable with HM5033 main unit only.
- PC software MAS300 (case of „Method 1 of writing data")

2) Write-in data
As example, the compensation data (antenna gain) of antenna M305 and the compensation data (compensation coefficient) of magnetic field probe CP-2S are shown below.

Compensation data (antenna gain) of antenna M305.

Frequency	300 MHz	350 MHz	400 MHz	450 MHz	500 MHz
Antenna gain	0.0 dBi	1.0 dBi	1.4 dBi	1.4 dBi	0.0 dBi

Compensation data (compensation coefficient) of magnetic field probe CP-2S.

Frequency	10 MHz	100 MHz	1 GHz	2 GHz	3 GHz
Compensation coefficient	86.7 dB	69.2 dB	50.7 dB	44.9 dB	40.1 dB

Here, although the number of data is 5 points, it is possible to write even the data of maximum of 10 points. Data cannot be written at 0 Hz.

3) Method 1 of writing data
The method which used the optional PC software MAS300.

Please use MAS300 of the version more than 1.03b. The software can be updated. Please contact to our company for details.

1. Write the antenna gain to text file.
Please create a new text file by new creation of a personal computer, and open by the text editor.

Format
„Frequency":"Antenna gain",
„Frequency":"Antenna gain",
„Frequency":"Antenna gain", ···

Example: case of M305
300M:0.0DB,350M:1.0DB,400M:1.4DB,450M:1.4DB,
500M:0.0DB

Please write unit with a capital letter. Moreover, Frequency can also use G (GHz).

2. It writes in by PC software MAS300.
Connect the personal computer to HM5033 by MI180. Turn on the power of HM5033. Start the PC software MAS300. Please set the same baud rate of HM5033 and MAS300. (Refer to „HM5033 operating manual" for details)

On the case of electric field strength measurement, please choose [File] ! [Write E/F User Data],

on the case of magnetic field strength measurement, please choose [File] ! [Write M/F User Data],

from the upper menu of software, and select the text file which made some time ago.

Then, data is written.

4) Method 2 of writing data
It is method of writing in which does not use MAS300. A user needs to prepare communication program.

1. Prepare the RS-232C communication software.
Connect the personal computer to HM5033.
Turn on the power of HM5033.
Start the RS-232C communication software.

Please set the same baud rate of HM5033 and software, and unite the setting of communication. (Refer to „22. Data Output" for details.)

2. Write the data
Please transmit data of the following format to HM5033 from RS-232C communication software.

Format
Case of compensation data of electric field strength measurement.
EFUSER"Frequency":"Antenna gain",
"Frequency":"Antenna gain", ···

Case of compensation data of magnetic field strength measurement.
MFUSER"Frequency":"Compensation coefficient",
"Frequency":"Compensation coefficient", ···

Example: case of CP-2S
MFUSER10M:86.7DB,100M:69.2DB,1G:50.7DB,
2G:44.9DB,3G:40.1DB

Please write unit with a capital letter.

3. After writing is completed correctly
„OK" is returned from HM5033.

5) How to use

1. Please set the measuring function of HM5033 to electric field strength measurement mode or magnetic field strength measurement mode.

On the case of electric field strength measurement, please select [MEAS] ! [E/F ANT],

on the case of magnetic field strength measurement, please select [MEAS] ! [M/F PROBE],

Please push [F1] and display [USER] on the upper of [F1]. Now, electric field strength measurement or magnetic field strength measurement can be performed by using compensation data written.

Even if a power supply is shut off, the written compensation data does not disappear.

If a power supply is shuts off at once, it will return to the usual measurement.

6) About the antenna gain
In this items, the antenna gain is meaning absolute gain [dBi]. When antenna gain is relative gain, it can change into absolute gain by adding +2.15dB.

Absolute gain [dBi] = Relative gain [dBd] + 2.15dB

As reference, the conversion formula to electric field strength is using the following:

$\mathbf{E}=\sqrt{(480\pi^2 \times Pa \div (Ga \times \lambda^2)}$

E: Electric field strength [V/m]
Pa: Received electric power [W]
Ga: Antenna gain [times] = $10^{(\text{antenna gain [dBi]} \div 10)}$
λ: Wavelength [m] = $(3 \times 10^8) \div$ frequency [Hz]

23.6 Sample program

An example program to send following setting with RS-232C is shown below.

Setting: Center frequency 1GHz

```
10                                  'FREQ SETTING
20    OPEN „COM1:N81N" AS #1
30    PRINT #1 „FREQ1G";            „FREQ1G" OUTPUT
40    INPUT #1 A$                   „OK" READ
50    CLOSE #1
```

24. PC Software (optional)

This is the software MAS300 that controls HM5033 by RS-232C. All setting can be performed from PC. Although the 251 points of trace data is displayed on horizontal axis in the screen of the HM5033, 1001 points of trace data are taken per sweep. When this software is used, all of these 1001 points data are transformed to a PC and trace is displayed at high resolution.

Corresponding OS

Hardware Requirements
Computer that is able to act normally Windows®, and able to use the COM port and CD-ROM drive.
Screen size 1024x768 or more computers.

Operating system
Windows® 95/98/2000/Me/NT

XP: Only the check of operation is performed.

Communication method
Bidirectional communication by RS-232C.

Installation procedure

1. Start windows®.
2. Insert the MAS300 software CD into the CD-ROM drive.The setup will start automatically and the initial screen will appear.
3. Follow the instructions on the screen.

If the setup does not start,
1. Double-click on the My Computer icon.
2. Double-click on the CD-ROM icon.
3. Double-click on „setup.exe".
4. Follow the instructions on the screen.

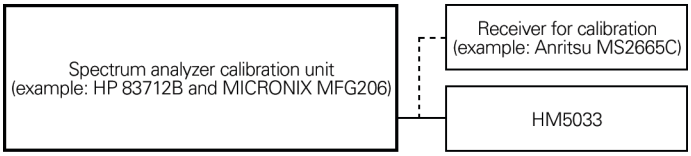
Refer to the „REEDME" in the HM5033 for details.

The software can be updated. Please contact to our company for details.

25. Basis Performance Test

To keep the quality of the unit, regular performance testing is recommended. This section describes a method and specification of basic performance testing. If a problem is found in the results of basic performance testing, or formal testing is needed, please contact the dealership where you purchased the product, or contact us.

[Connection diagram]



25.1 Frequency characteristics

Adjust the output level of the spectrum analyzer calibration unit (thereafter, „calibration unit") so that the displayed power value is -15dBm at each frequency for this unit, and measure the absolute value with a receiver for calibration (microwave power meter, etc.).

Setting of HM5033					
Centerfrequency	Frequency span	RBW	Specifications	Measurement value	Judgement
50 kHz	200 kHz	10 kHz	within Reference ± 2.6 dB ± 1dot		
100 kHz	200 kHz	30 kHz	within Reference ± 2.6 dB ± 1dot		
1 MHz	2 MHz	100 kHz	within Reference ± 1.6d B ± 1dot		
10 MHz	10 MHz	3 MHz	within Reference ± 1.0 dB ± 1dot		
100 MHz	10 MHz	3 MHz	Reference		
1 GHz	10 MHz	3 MHz	within Reference ± 1.0 dB ± 1dot		
2 GHz	10 MHz	3 MHz	within Reference ± 1.0 dB ± 1dot		
3.3 GHz	10 MHz	3 MHz	within Reference ± 1.0 dB ± 1dot		

RBW switching error is included at RBW other than 3MHz.

Setting of HM5033

Reference level: -15 dBm
VBW: 1 MHz
Sweep time: 1 s
Detection mode: SMPL
Display scale: 2 dB/div

Setting of calibration unit

Frequency: Same as a center frequency of HM5033
Output power: Adjust the power indication of HM5033 to –15 dBm.

25.2 Accuracy of reference level

Adjust the output level of the calibration unit so that the displayed value of this unit is the 0th div from the top, and calibrate the absolute value with the receiver for calibration (microwave power meter, etc.).

Setting of HM5033 Reference level	Specifications	Measurement value	Judgement
+10 dBm	within ±1.4 dB ±1 dot		
0 dBm	within ±1.4 dB ±1 dot		
-10 dBm	within ±1.4 dB ±1 dot		
-15 dBm	within ±0.8 dB ±,Pdot		
-20 dBm	within ±1.4 dB ±1 dot		
-30 dBm	within ±1.4 dB ±1 dot		
-40 dBm	within ±1.4 dB ±1 dot		

Input attenuator switching error is included at the reference level other than -15 dBm.

Setting of HM5033

Center frequency: 100 MHz
Frequency span: 10 MHz
RBW: 3 MHz
VBW: 1 MHz
Sweep time: 1 s
Detection mode: SMPL
Display scale: 2 dB/div

Setting of calibration unit

Frequency: 100 MHz
Output power: Adjust it so that the indicated value of HM5033 is at the 0th div from the top.

25.3 The display accuracy of the center frequency

Measure the frequency with the peak search function of HM5033.

Setting of HM5033					
Center frequency	Frequency span	RBW	Specifications	Measurement value	Judgement
100 MHz	200 kHz	3 kHz	within ± 130 kHz ± 1dot		
100 MHz	10 MHz	30 kHz	within ± 130 kHz ± 1dot		
100 MHz	20 MHz	100 kHz	within ± 800 kHz ± 1dot		
100 MHz	200 MHz	100 kHz	within ± 800 kHz ± 1dot		
1 GHz	500 MHz	100 kHz	within ± 800 kHz ± 1dot		
1 GHz	2 GHz	3 MHz	within ± 800 kHz ± 1dot		
1.65 GHz	FULL (3.3 GHz)	3 MHz	within ± 800 kHz ± 1dot		

Setting of HM5033

Reference level: -15 dBm
VBW: AUTO
Sweep time: 1 s
Detection mode: SMPL
Display scale: 10 dB/div

Setting of calibration unit

Frequency: Same as a center frequency of HM5033.
Output power: -15 dBm

However, calibrate the signal generatorin advance.

25.4 The display accuracy of the frequency span

Adjust the frequency of the calibration equipment so that the peaks are at the positions of f_1 and f_9, and measure the frequencies of f_1 and f_9. Calculate from f_1 and f_9 the display accuracy of the frequency span.

Setting of HM5033							
Frequency span	Center Frequency	RBW	Specifications	f_1 Measurement value	f_9 Measurement value	$(f_9 - f_1)$ X 1.25	Judgement
200 kHz	100 MHz	3 kHz	within ± 26 kHz ± 1 dot				
10 MHz	100 MHz	100 kHz	within ± 320 kHz ± 1 dot				
20 MHz	100 MHz	300 kHz	within ± 0.8 MHz ± 1 dot				
200 MHz	100 MHz	3 MHz	within ± 6.2 MHz ± 1 dot				
500 MHz	1 GHz	3 MHz	within ± 15.2 MHz ± 1 dot				
2 GHz	1 GHz	3 MHz	within ± 60.2 MHz ± 1 dot				
FULL (3.3 GHz)	1.65 GHz	3 MHz	within ± 99.2 MHz ± 1 dot				

f_1: 1st div from the left on the trace screen / f_9: 9th div from the left on the trace screen

Setting of HM5033
Reference level: -15 dBm
VBW: AUTO
Sweep time: 1 s
Detection mode: SMPL
Display scale: 2 dB/div

Setting of calibration unit
Frequency: Adjust it to the positions of f_1 and f_9.
Output power: -15 dBm

25.5 Linearity of the amplitude axis

Adjust the level of the calibration unit so that the peak is at the top of the amplitude axis (0th div), and regard the point set at that time as the reference. Gradually lower the output, starting from the reference, and measure the amplitude value of HM5033.

Setting of HM5033 Display scales	Output of calibration unit	Specifications	Measurement value	Judgement
10 dB/div	**X**dBm (adjust it to the 0th div)	Reference (-15 dBm)	(-15 dBm)	
	X-10 dBm	within –25 dBm ± 0.8dB ± 1 dot		
	X-70 dBm	within -85dBm±1.6dB±1dot		
2 dB/div	**X**dBm (adjust it to the 0th div)	Reference (-15 dBm)	(-15 dBm)	
	X-2 dB	within –17 dBm ± 0.2 dB ± 1dot		
	X-10 dB	within –25 dBm ± 0.8 dB ± 1dot		

Setting of HM5033
Center frequency: 100 MHz
Reference level: -15 dBm
Frequency span: 10 MHZ
RBW: 3 MHz
VBW: 1 MHz
Sweep time: 1 s
Detection mode: SMPL

Setting of calibration unit
Frequency: 100 MHz

HAMEG®
Instruments

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Multimeters

Counters

Frequency Synthesizers

Generators

R- and LC-Meters

Spectrum Analyzers

Power Supplies

Curve Tracers

Time Standards

42-5033-00E0

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