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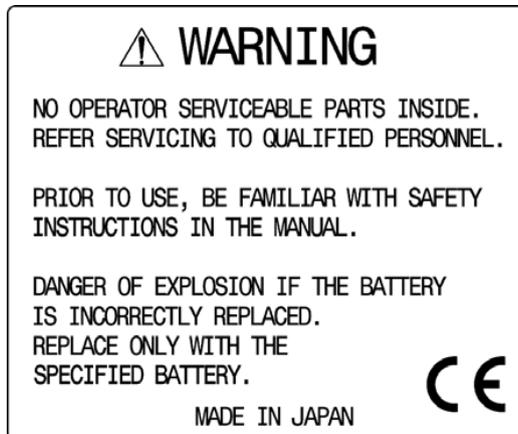
Model 2650A/2651 Series 3.3 GHz/8.5 GHz Spectrum Analyzer

USER MANUAL



Before Using the Product

- Please note the following described on the back panel.



- **For safe use:**

- 1) When abnormal sound, abnormal smell or smoke is found, stop using the product and remove the battery and AC adapter.
- 2) Never handle this product with wet hands to prevent risks of electric shock, fire, or damage.
- 3) Never use this product under lightning conditions to prevent risks of damage.
- 4) Never use any AC adapter other than specified, or it will cause damage. Connect the power cable only to three-terminal outlet for protection from static electricity, otherwise this product or a device under test may be damaged.
- 5) Never use any battery other than specified, or it may damage this product. Turn off the power and disconnect the AC adapter before removing the battery out of the battery compartment.
- 6) Be sure to charge the battery as specified in the instructions in this manual. Moreover, an explosion, fire or smoke may occur if battery is handled improperly.

Please read the notes for handling the battery.

• **Set clock function**

The time information is set at Japan standard time. Set the year, month, day and time when the 2650A series is used for the first time. (Refer to “24.4 Setting the clock” for the details.)

• **Quality assurance**

Warranty

If the defect by our responsibility occurs within one year after delivered, it shall be repaired free of charge. However, this warranty does not cover such defect that :

- 1) is caused by a fire or natural disasters.
- 2) is caused by inappropriate handling such as dropping while moving the unit delivered.
- 3) is caused by handling in contradiction to usage or precautions described in the operating manual.
- 4) is caused by modification or misuse.

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

Refer to the end of this manual for details.

Warm-up time

Warm up the product for at least ten minutes after turning on the power in order to stabilize the internal circuit.

Precautions for storage

- 1) Avoid direct sunlight or dust.
- 2) Store this unit in a place where temperature is between -20 °C to 60 °C, humidity less than 60 °C/70 %RH and variations in temperature and humidity are small.

After service

Please contact us without hesitation if you have any questions about this product:

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1. Outline

1.1 Product outlines

The 2650A series are authentic spectrum analyzers in a compact and lightweight form factor providing performance and functions comparable to large-size bench type instruments.

The features are as follows.

- 1) Compact and lightweight 1.8 kg.
The dimensions are 162(W)×71(H)×265(D) mm, and the weight is only 1.8 kg including the battery, making the instrument very convenient for field use.
- 2) Large color TFT display
5.7 inches, 640×480 color LCD
- 3) Four hours battery operation
The included Lithium-ion battery, when fully charged, can provide power for up to four hours of operation with the backlight turned off. And about 3 ½ hours with the backlight set to the minimum level.
- 4) USB host adapter
USB host port can be used with removable storage USB flash drives. The screen image is stored as BMP format, and the spectrum and the setting parameters are stored as CSV format. The port conforms to USB 1.1 standards and is backwards compatible with USB 2.0 devices.
- 5) USB device for PC connectivity
USB interface with transfer rates up to 12 Mbps maximum (conform to USB 1.1 standards).
- 6) Accurate frequency measurement by PLL synthesizer
The center frequency is accurately set by PLL (Phase Locked Loop) synthesizer. Moreover, the frequency counter (factory option) enables more accurate measurements of the frequency of a signal.
- 7) Average noise level -127 dBm
The low average noise level of -127 dBm @ 1 GHz provides a wide dynamic range.
- 8) 100 dB display dynamic range
Wide dynamic range display with a display scale of 100 dB/10div (at 10 dB/div) in the amplitude axis.
- 9) Easy operation with AUTO mode
 - Auto range operation: RBW, VBW and sweep time are automatically selected based on the frequency span.
 - Auto tuning operation: The center frequency is adjusted to the maximum level within full span, and the optimum RBW, VBW and sweep time are chosen.

10) Abundant functions

- Measuring functions : Channel power, Adjacent channel power, Occupied bandwidth, Electric field strength, Magnetic field strength and Frequency measurement.
- Calculation functions : Max hold, Min hold, Averaging, Over write
- Marker measurement and peak search function
- Save/Load function
- Hard copy with printer

11) PC Software

The included PC software controls all four models of the 2650A/2651 series via PC. The software emulates the front panel keys and supports transfer of 1001 point trace data from the analyzer to the PC. Screen images can be stored in BMP format and the spectrum data in CSV format (stores frequency and level).

12) Options

There are many options available, such as dipole antennas, magnetic field probes and USB printer

1.2 Standard accessories

1. AC adaptor MA400
2. Carrying case LC2650A
3. Accessory pouch
4. User manual
5. PC software and USB cable
6. Lithium Ion battery MB400

1.3 Optional accessories

1. Dipole antennas M401, M402, M403, M404, M405, M406
2. Magnetic field probe PR 26M with a dedicated double shielded coaxial cable
3. Printer PT2650A with AC adaptor, 4pcs of AA batteries, one roll paper
4. Roll paper PX2650A for PT2650A printer (with 10 rolls)

1.4 Overview of all four models

Model	Contents
2650A	50 kHz to 3.3 GHz Applications: Cellular phone, 2.4 GHz wireless LAN, 2.5 GHz WiMAX, RF-ID, Broadcasting
2658A	50 kHz to 8.5 GHz Covering most of the wireless communication frequency spectrum Applications: 5 GHz wireless LAN, 3.5/5.8 GHz WiMAX, Maintenance of wireless base station
2652A	50 kHz to 3.3 GHz With 5 MHz to 3.3 GHz tracking generator Applications: Frequency characteristics measurement of electronic component/circuit and return loss measurement
2651	50 kHz to 3.3 GHz For EMI test Applications: Radiated and conducted emission measurement

2. Specifications

2.1 Performance

▪ Frequency section

	2650A, 2652A, 2651	2658A												
Frequency range	50 kHz to 3.3 GHz	50 kHz to 8.5 GHz												
		<table border="1"> <thead> <tr> <th>Frequency range</th> <th>Frequency band</th> <th>Harmonic order</th> </tr> </thead> <tbody> <tr> <td>50 k to 3.5 GHz</td> <td>Base band</td> <td>1</td> </tr> <tr> <td>3.3 G to 6.3 GHz</td> <td>Band 1-</td> <td>1</td> </tr> <tr> <td>6.1 G to 8.5 GHz</td> <td>Band 1+</td> <td>1</td> </tr> </tbody> </table>	Frequency range	Frequency band	Harmonic order	50 k to 3.5 GHz	Base band	1	3.3 G to 6.3 GHz	Band 1-	1	6.1 G to 8.5 GHz	Band 1+	1
Frequency range	Frequency band	Harmonic order												
50 k to 3.5 GHz	Base band	1												
3.3 G to 6.3 GHz	Band 1-	1												
6.1 G to 8.5 GHz	Band 1+	1												
Center frequency														
Setting resolution	20 kHz Allows rotary encoder, numeric key and function key													
Accuracy	within $\pm(30+20T)$ kHz ± 1 dot @frequency span: 200 kHz to 10 MHz, RBW 3 kHz, 23 \pm 5 $^{\circ}$ C within $\pm(60+300T)$ kHz ± 1 dot @frequency span: 20 MHz to 3.3 GHz, RBW 100 kHz, 23 \pm 5 $^{\circ}$ C T: sweep time (s)	within $\pm(30+20T)$ kHz ± 1 dot @frequency span: 200 kHz to 10 MHz, RBW 3 kHz, 23 \pm 5 $^{\circ}$ C within $\pm(60+300T)$ kHz ± 1 dot @frequency span: 20 MHz to 8.5 GHz, RBW 100 kHz, 23 \pm 5 $^{\circ}$ C T: sweep time (s)												
RBW frequency error	within ± 4 kHz @ 3 kHz, 10 kHz, 30 kHz within 20% of RBW @ RBW: 100 kHz, 300 kHz within 10% of RBW @ RBW: 1 MHz, 3 MHz													
Frequency span														
Setting range	0 Hz (zero span), 200 kHz to 2 GHz (1-2-5 step) and 3.3 GHz (full span)	0 Hz (zero span), 200 kHz to 5 GHz (1-2-5 step) and 8.5 GHz (full span)												
Accuracy	within $\pm 3\% \pm 1$ dot @ sweep time of 0.3s, 23 \pm 5 $^{\circ}$ C													
Display resolution # of points per trace	501 dots on LCD screen, 1001 dots readout via PC (501 dots are visible on the display, 1001 dots of trace data are captured internally and can be transferred to a PC via USB device interface.)													
Resolution bandwidth	3 dB bandwidth (6 dB for 2651 @ 9 kHz, 120 kHz)													
Setting range	3 kHz to 3 MHz (1-3 step) and AUTO (2651: 3 kHz, 9 kHz, 30 kHz, 120 kHz, 300 kHz, 1 MHz, 3 MHz)													
Accuracy	$\pm 20\%$													
Selectivity	1:12 (typical, 3 dB : 60 dB)													
Video bandwidth	100 Hz to 1 MHz (1-3 step) and AUTO													
SSB phase noise	-90 dBc/Hz (typical) @100 kHz offset, RBW : 3 kHz, VBW : 100 Hz, sweep time: 1 s													
Spurious response	less than -60 dBc													
Harmonics	less than -40 dBc @ ≥ 100 MHz													

▪ **Amplitude section**

		2650A, 2652A, 2651	2658A
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, REF : -15 dBm, 23 \pm 5 °C	
	Unit	dBm, dBV, dBmV, dB μ V, dB μ V/m, dB μ A/m (dB μ V/m and dB μ A/m are used for measurement functions)	
Average noise level		-127 dBm (typical) @ CF : 1 GHz, RBW : 3 kHz, VBW : 100 Hz, Ref. level < -40dBm (preamp automatically ON)	
Frequency characteristics		within ± 2.0 dB ± 1 dot @ 50 kHz to 100 MHz within ± 1.0 dB ± 1 dot @ 100 MHz to 3.3 GHz	within ± 2.0 dB ± 1 dot @ 50 kHz to 100 MHz within ± 1.0 dB ± 1 dot @ 100 MHz to 8.5 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	± 0.6 dB @ 100 MHz	
RBW switching error		± 0.6 dB	
Display resolution (vertical)		381 dots/10div	
Display scale	Scale	10 dB/div, 5 dB/div, 2 dB/div	
	Accuracy	$\pm(0.2$ dB+1 dot)/2 dB $\pm(0.4$ dB+1 dot)/5 dB $\pm(0.8$ dB+1 dot)/10 dB $\pm(1.8$ dB+1 dot)/83 dB	
Input damage level		+27 dBm (CW average power), 25 VDC	

▪ **Sweep section**

		2650A, 2652A, 2651	2658A
Sweep time			
	Setting range	10 ms to 30 s and AUTO @frequency span : 0 to 2 GHz 30 ms to 30 s and AUTO @frequency span : full span 1-3 step	10 ms to 30 s and AUTO @frequency span : 0 to 2 GHz 30 ms to 30 s and AUTO @frequency span : 5 GHz, full span 1-3 step
	Accuracy	Within ± 0.1 % ± 1 dot @frequency span : 0 to 2GHz within ± 1.5 % ± 1 dot @ full span	Within ± 0.1 % ± 1 dot @frequency span : 0 to 5GHz within ± 2.5 % ± 1 dot @ full span
Trigger			
	Trigger mode	AUTO (Available only for zero span)	
	Trigger source	Internal and External	

External trigger	1 to 10 Vp-p
Input voltage range	DC to 5 MHz
Frequency range	DC coupling
Input coupling	approx. 0.56 V(fix)
Trigger level	approx. 10 k Ω /less than 15 pF
Input RC	± 50 V(DC+AC peak)
Input damage level	SMA(J)
Input connector	
Detection mode	Positive peak, Negative peak, Sample (QP and AV for model 2651 only.)

▪ Function

		2650A, 2652A, 2658A, 2651 common
Marker measurement		NORM : displays frequency (8digits max) and level (4digits max) at marker point. DELTA : displays frequency difference and level difference between two markers.
Peak search function		Searches for peak level with all of 10 div (NORM mode) or within ZONE specified (ZONE mode) and displays frequency and level at peak level, and moreover NEXT peak at NORM mode.
Calculation function		NORM, MAX HOLD, MIN HOLD, AVERAGE, OVER WRITE Number of sweeps is 2 to 1024 (power of 2) and infinite.
Measuring function		Channel power, Adjacent channel power, Occupied bandwidth, Electric field strength (needs optional dipole antenna), Magnetic field strength (needs optional magnetic field probe) and Frequency counter
Auto tuning		When pressing AUTO TUNE key, the spectrum of maximum level within full span is adjusted to center, and reference level, RBW, VBW and sweep time are set to optimum parameters.
Save/ Load	Save	Saves 200 spectrums and 200 setting parameters
	Load	Loads one spectrum and one setting parameter

▪ General

		2650A, 2652A, 2658A, 2651 common
Input connector		N(J) connector
USB Communication		
	Protocol	USB version 1.1 (will also work with USB 2.0 devices)
	Device Connector	B plug
	Transfer rate	12 Mbps
Hard copy		USB printer (option) connected to A plug (host) enables hard copy of screen.
host connector		A plug
Display		
	Display	5.7 inches and color LCD
	Backlight	LED backlight
	Number of dots	640(H) x 480(V) dots
Power supply		
	Dedicated AC adaptor	Input : 100 to 240 VAC Output : 9 VDC/2.6 A
	Lithium-ion battery Charge function	MB400 : 7.4 V/5000 mAh Li-Ion battery Capable of charging during power-off. Indicates 4 conditions with two colors LED (red and green).
	Remainder indication	5 level indicator

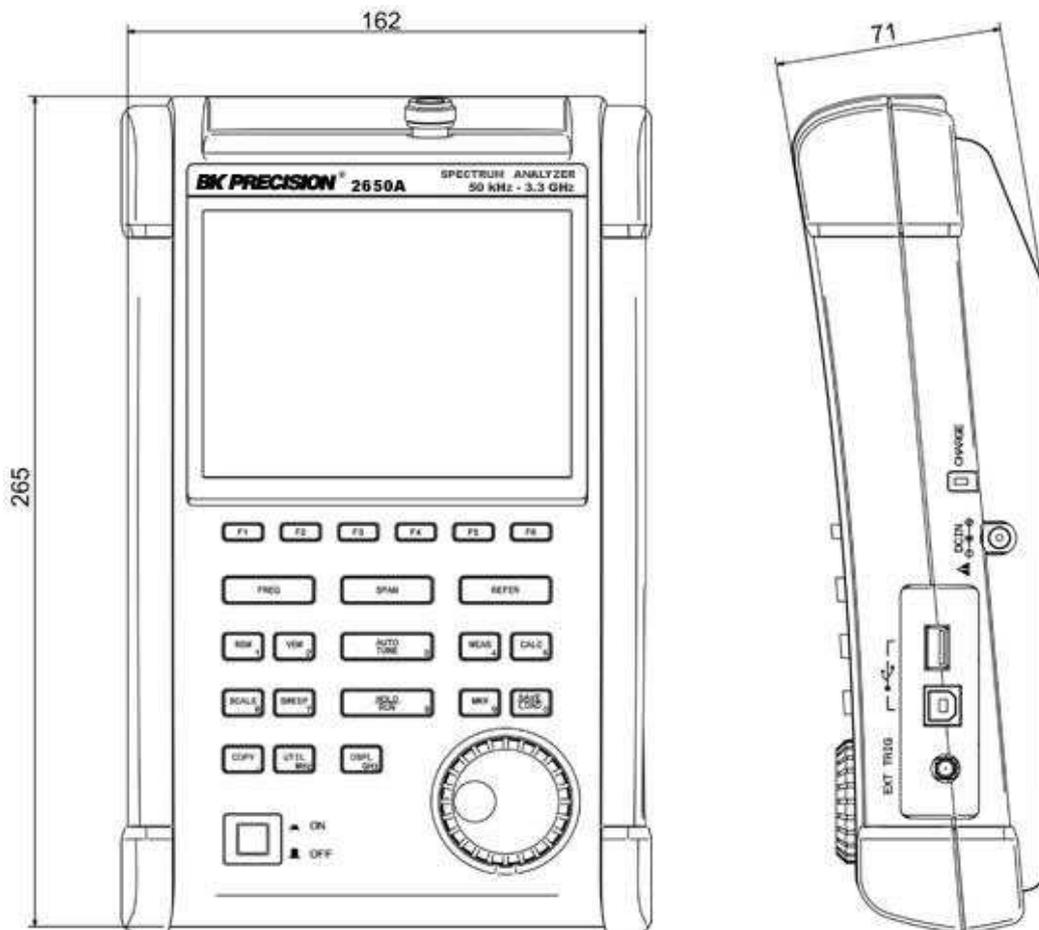
- Other

	2650A, 2652A, 2658A, 2651 common
Operating temperature	0 to 50° C (guaranteed at 23±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 to 60 °C, less than 60 °C/70 %RH
Dimensions	162(W) x 71(H) x 265(D) mm , 6.38 (W) x 2.80 (H) x 10.43 (D) inch (excluding projections, protection bumper and stand)
Weight	approx. 1.8 kg or 4 lbs (including battery)

* Refer to section 22) Tracking Generator Mode for the specifications of the tracking generator, model 2652A.

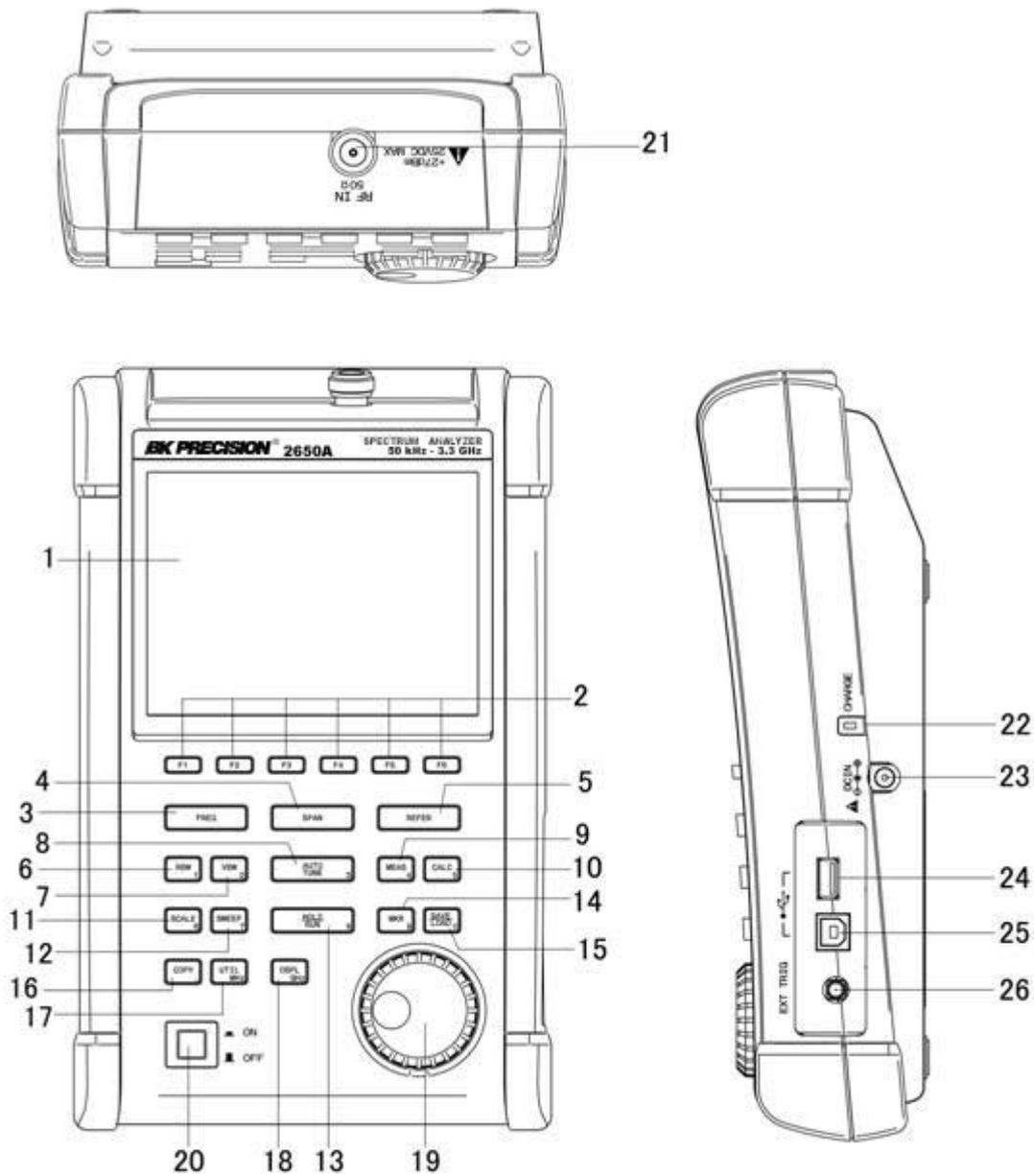
2.2 External view

[Unit : mm]



* B&K Precision reserves the right to make changes in design, specification and other information without prior notice.

3. Explanation of Panel



1) TFT display

This is a large liquid crystal display with 640 (H) x 480 (V) dots. It simultaneously displays spectrum (10div x 10 div), various setting parameters and measured values.

2) Function key (F1 to F6)

The function can change according to the operation key.

3) Center frequency key

The center frequency is set with this key. The setting range is 0 to 3.3 GHz (for 2650A, 2652A, and 2651), and 0 to 8.5 GHz (for 2658A). The setting resolution is 20 kHz.

4) Frequency span key

The frequency span is set with this key.

For 2650A, 2652A, and 2651, it is set in the range from 200 kHz to 2 GHz, ZERO SPAN or FULL SPAN (3.3 GHz). For 2658A, it is set in the range from 200 kHz to 5 GHz, ZERO SPAN or FULL SPAN (8.5 GHz).

5) Reference level key

The reference level is set with this key. It can be set in the range from +10 dBm to –60 dBm by 1 dB step.

6) Resolution bandwidth key

The resolution bandwidth is set with this key. It can be set in the range from 3 kHz to 3 MHz and to AUTO.

7) Video bandwidth key

The video bandwidth is set with this key. It can be set in the range from 100 Hz to 1 MHz and to AUTO.

8) AUTO tuning key

When pushing this key, the spectrum with the maximum level is searched within full span (3.3 GHz @ 2650A/2652A/2651 and 8.5 GHz @ 2658A), and then it is adjusted to the center of the screen, and the optimum setting parameters are set. In the case when in zero span, full span, input signal level lower than –40 dBm and input frequency lower than 50 MHz, this function will not work correctly.

9) Measuring function key

Available for Channel power, Adjacent channel leakage power, Occupied frequency bandwidth, Electric field strength, and Magnetic field strength measurement.

10) Calculation function key

Available for Max hold, Min hold, Average and Over write.

11) Display scale key

The display scale of amplitude axis can be selected as 2 dB/div, 5 dB/div or 10 dB/div with this key.

12) Sweep key

The sweep time can be set in the range from 10 ms to 30 s or AUTO. This key can also select the detection mode.

13) Hold/Run key

Used to hold or run measurements.

14) Marker & Peak search key

This key is used for setting marker or peak search.

15) Save/Load key

Used for saving or loading a spectrum or settings parameters.

16) Copy key

This key allows the screen image to be printed on USB printer (option) or stored in USB memory.

17) UTIL key

Used for setting label entry, clock, and buzzer.

18) Display control key

Used for setting color, backlight ON/OFF or brightness of backlight.

19) Rotary encoder

This is used for adjusting settings and parameters.

20) Power switch

This is for power ON or OFF.

21) Input connector

N(J) connector

22) Indicator for charging condition

Two color LED indicates the charging conditions of battery.

23) Input connector for DC power source

Connect AC adaptor MA400.

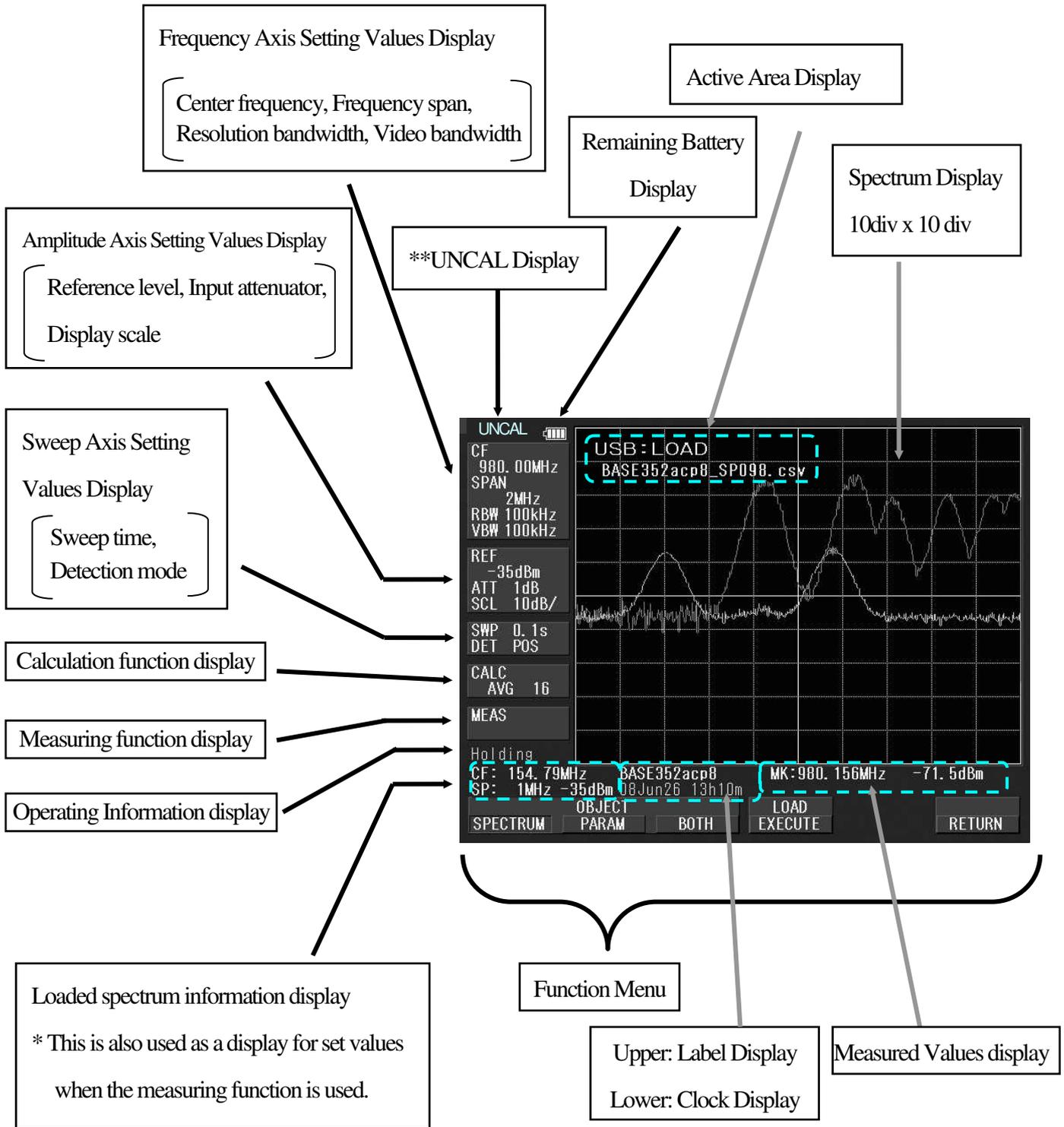
24) USB A plug

For connecting USB printer (option) or USB memory.

25) USB B plug

For interfacing with a PC

4. Explanation of Screen



**UNCAL is displayed when a normal measurement cannot be done due to sweep rate being too fast. In such cases, slowing down the sweep rate will change this indicator.

5. Function Menu

5.1 List of Function Menu

The function menu is shown in the table below. For descriptions of each function, see their respective page. For the sequence of selection for the function menu, refer to “5.2 Menu tree”.

	Function menu	Key Sequence	Page	
A	ACP OFFSET	MEAS → (F2) → F2	42	
	ACP	MEAS → F2	41	
	ACP WIDTH	MEAS → (F2) → F3	42	
	ANT	MEAS → (F4) → F1	44	
	AVG	CALC → F4	32	
B	BACK LT	DSPL → F2	53	
	BACK SPACE	FREQ → F6 → F5	21	
	BAND CNTR	MEAS → (F1) → (F1) → F2	41	
	BAND WIDTH	MEAS → (F1) → (F1) → F3	41	
	BRIGHT	DSPL → F3	53	
	BUZZER	UTIL → F3	59	
	C	CENTER FREQ ←	FREQ → F1	20
CENTER FREQ →		FREQ → F2	20	
CH POWER		MEAS → F1	41	
CLEAR		FREQ → F6 → F4	21	
CLOCK CONFIG		UTIL → F4	59	
COLOR		DSPL → F1	53	
CONV		MKR → F6	33	
D		DELETE	SAVE/LOAD → F3	36
		DEVICE MEM	SAVE/LOAD → F4	36
	DET	SWEEP → F4	29	
	DISP CLEAR	SAVE/LOAD → F2 → F5	38	
E	E/F ANT	MEAS → F4	43	
	EncST	FREQ → F4	20	
	EMI-C **1	SAVE/LOAD → F6 → F2	50	
	EMI-R **1	SAVE/LOAD → F6 → F3	50	
F	FREQ COUNT	MEAS → F6	49	
I	IMP	REFER → F6	25	
K	KeyST	FREQ → F3	20	
L	LABEL	UTIL → F1	58	
	LOAD	SAVE/LOAD → F2	38	
M	M/F PROBE	MEAS → F5	47	
	MAX HLD	CALC → F2	31	
	MEAS OFF	MEAS → (F1~5) → F6	41	
	MIN HLD	CALC → F3	31	
	MARKER DELTA	MKR → F2	33	
	MARKER NORMAL	MKR → F1	33	

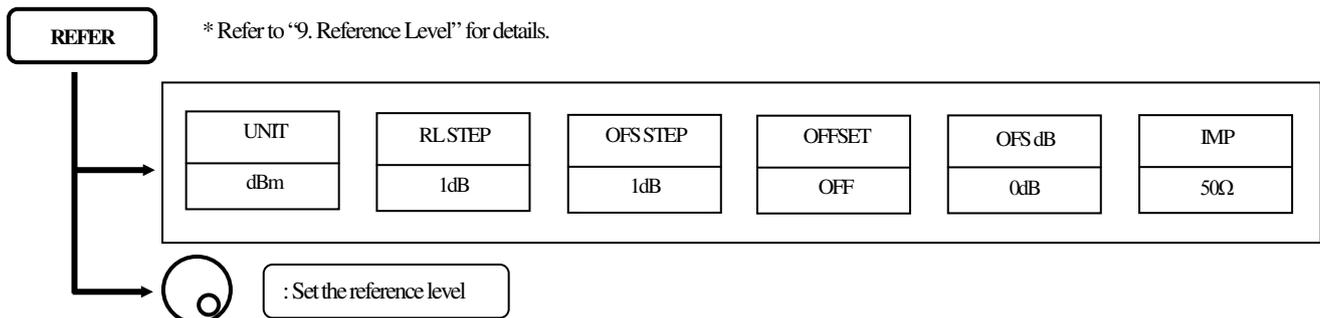
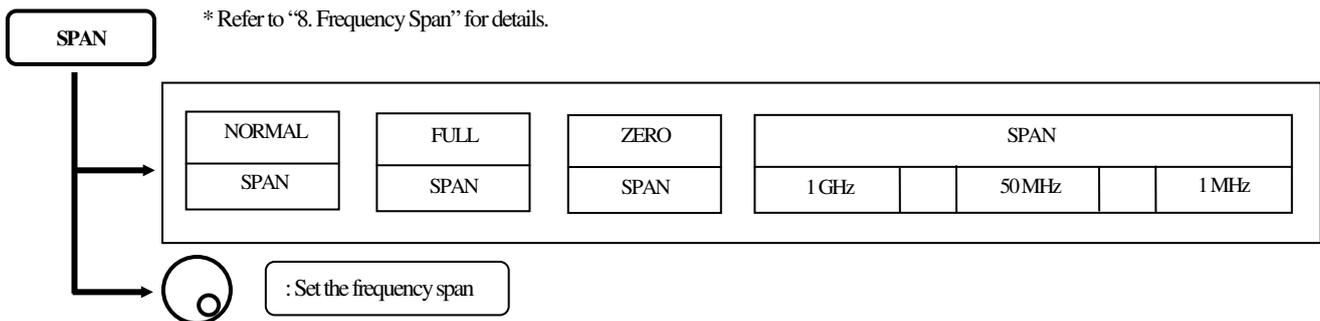
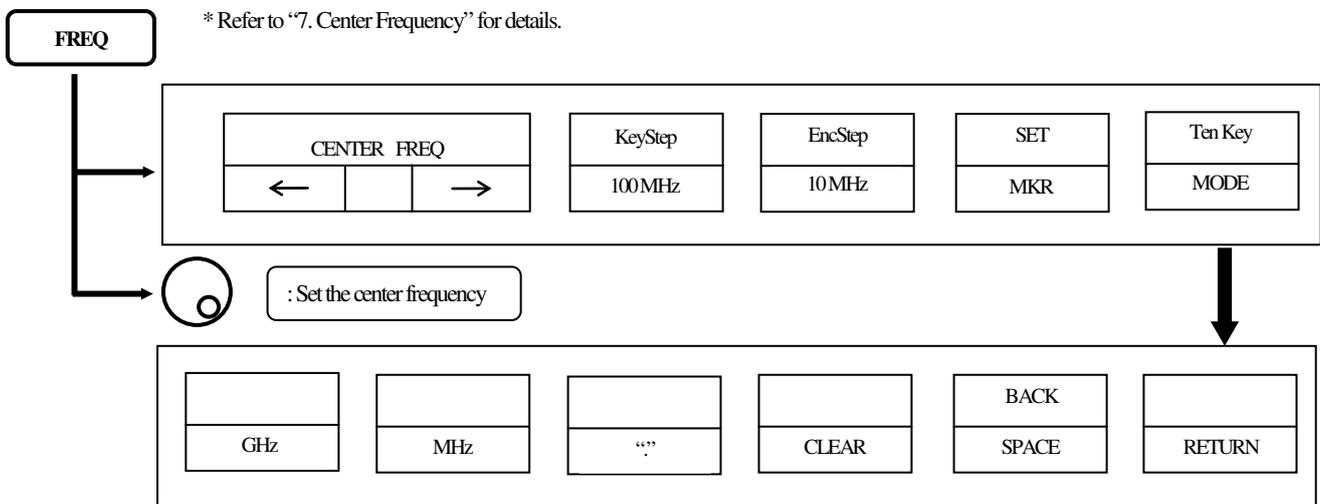
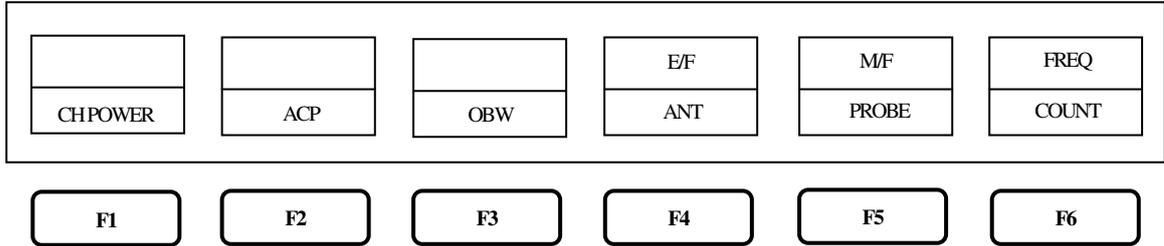
	Function menu	Key Sequence	Page	
M	MODE	MEAS → (F1 → F3) → F1	41 to 43	
	N	NEXT PEAK	MKR → (F4) → F2	34
NORMAL		CALC → F1	31	
NORMAL **1		SAVE/LOAD → F6 → F1	50	
O	OBW	MEAS → F3	42	
	OFSdB	REFER → F5	24	
	OFS STEP	REFER → F3	24	
	OVR WR	CALC → F5	32	
P	PEAK SEACH	MKR → (F5) → F1	34	
	PEAK SERCH NORM	MKR → F4	34	
	PEAK SERCH ZONE	MKR → F5	34	
	PRE SET	SAVE/LOAD → F6	36	
	PROBE	MEAS → (F5) → F1	48	
	R	RATIO	MEAS → (F3) → F2	43
RBW ALL AUTO		RBW → F3	28	
RBW AUTO		RBW → F2	28	
RBW MANUAL		RBW → F1	27	
REFERENCE CENTER		MEAS → (F2) → F4	42	
REFERENCE WIDTH		MEAS → (F2) → F1 → F5	42	
S		SAVE	SAVE/LOAD → F1	36
		SCALE 5dB	SCALE → F3	27
	SET MKR	FREQ → F5	20	
	SPR. FR **2	CALC → F6	32	
	SWEEP AUTO	SWEEP → F2	29	
	SWEEP MANUAL	SWEEP → F1	29	
	T	T.G. MODE **3	SWEEP → F6	55
TRIG		SWEEP → F5	30	
Ten Key MODE		FREQ → F6	20	
U	UNIT	REFER → F1 → 4	24	
V	VBW ALL AUTO	VBW → F3	29	
	VBW AUTO	VBW → F2	28	
	VBW MANUAL	VBW → F1	28	
Z	ZONE CENTER	MKR → (F5) → F1	35	
	ZONE WIDTH	MKR → (F5) → F2	35	

**1 2651 only **2 2658A only **3 2652A only

5.2 Menu Tree

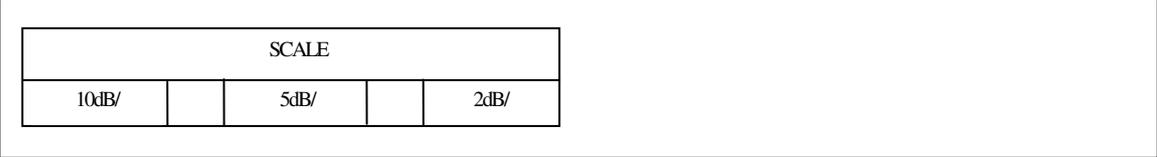
The following is the sequence of selection for the function menu. The function menu corresponds to the function key of F1 to F6.

“Function menu”



SCALE

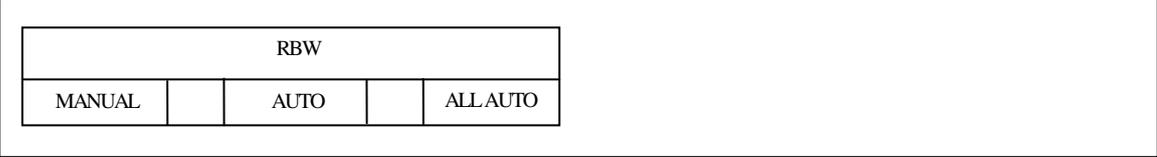
* Refer to "10. Display scale" for details.



: Set the display scale

RBW

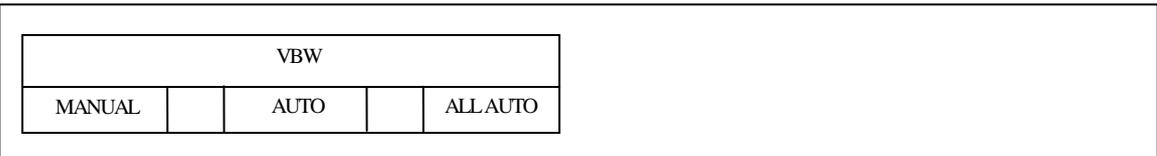
* Refer to "11. Resolution Bandwidth" for details.



: Set the RBW

VBW

* Refer to "12. Video Bandwidth" for details.

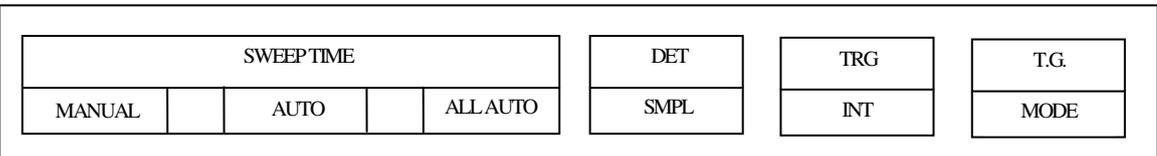


: Set the VBW

SWEEP

* Refer to "13. Sweep Axis / Detection Mode" for details.

* T.G. MODE is only for 2658A.



: Set the sweep time



CALC

* Refer to "16. Calculation Function" for details.

* "SPR. FR" is only for 2658A.

NORMAL	MAX HLD	MIN HLD	AVG	OVR WR	SPR. FR
	256	256	256	256	OFF

: Set the number

MKR

* Refer to "17. Marker & Peak Search" for details.

MARKER			PEAK SEARCH		CONV
NORMAL	DELTA	OFF	NORMAL	ZONE	dBm → W

: Move the marker (NORM mode)

F4: Peak Search

PEAK SEARCH	NEXT PEAK	RETURN
-------------	-----------	--------

: Move the marker (NORM mode)

F5: Zone marker

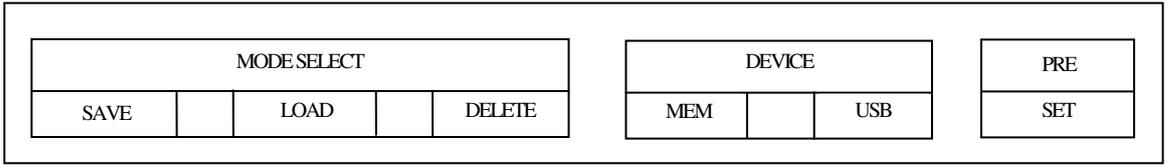
ZONE		RETURN
CENTER	WIDTH	

: Set the zone center frequency (ZONE mode)

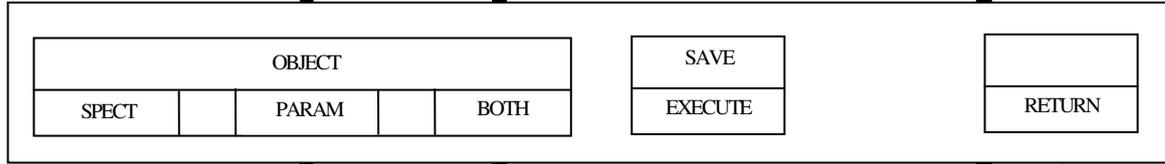
SAVE/LOAD

* Refer to "18. Save / Load" for details.

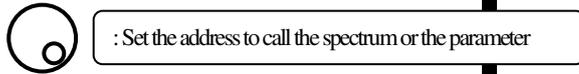
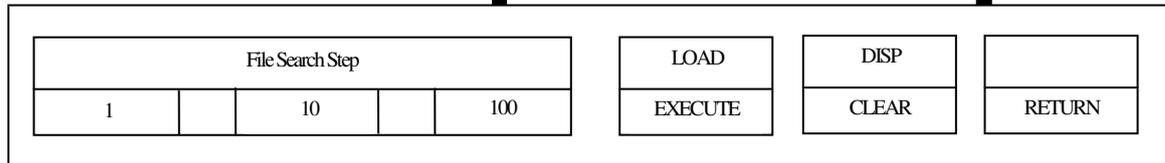
Main menu



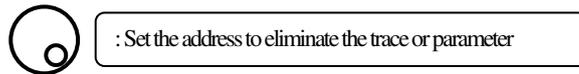
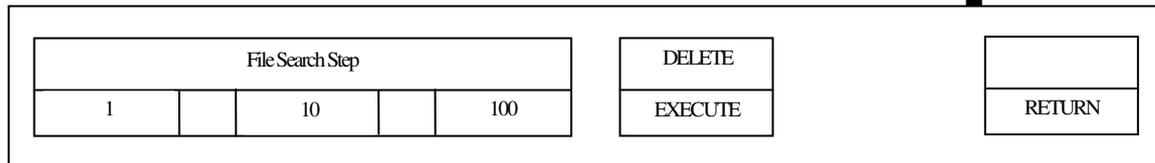
Save menu



Load menu

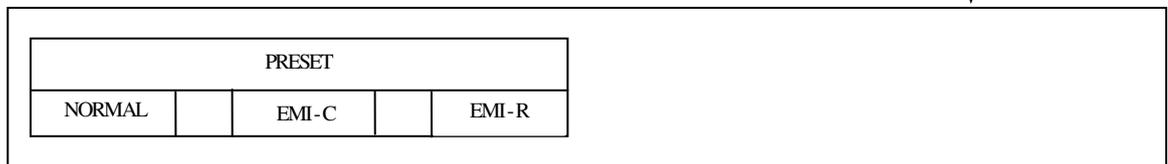


Delete menu



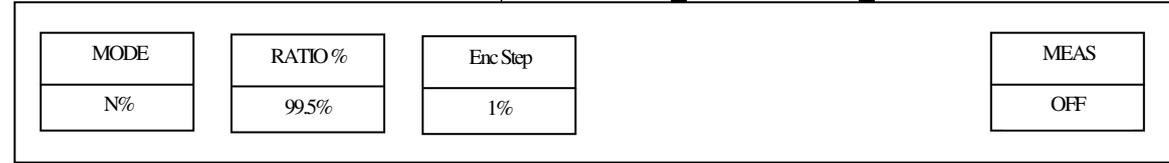
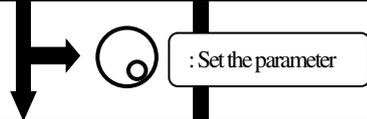
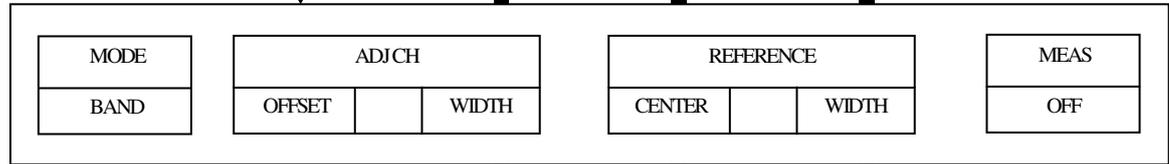
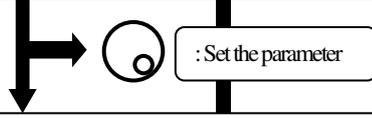
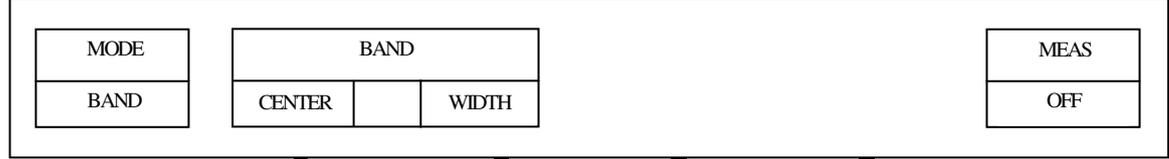
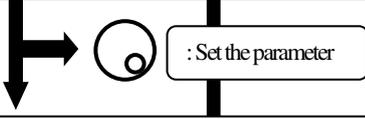
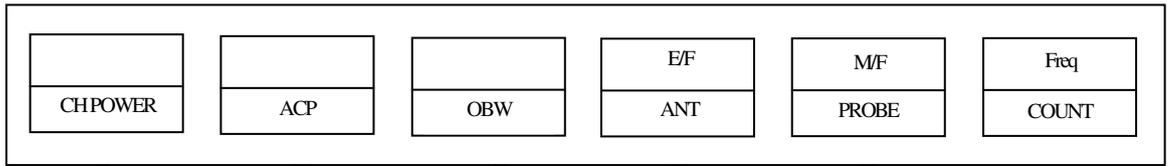
For 2651

Preset menu for 2651



MEAS

* Refer to "19. Measuring Function" for details

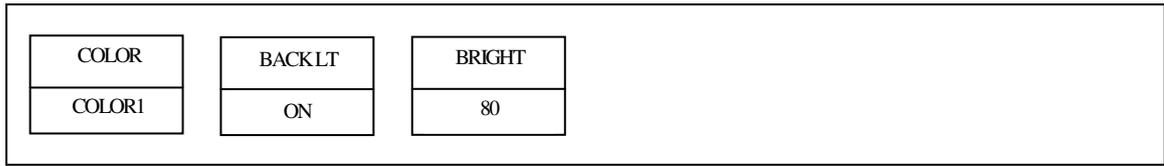


Input the probe ID (first time only) *Refer to "19.5 Magnetic field strength measurement" for details.



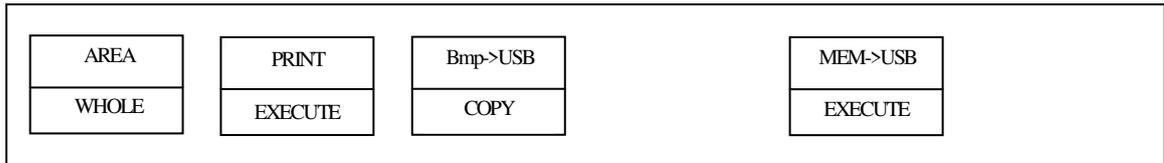
DSPL

* Refer to "21. Screen Control" for details



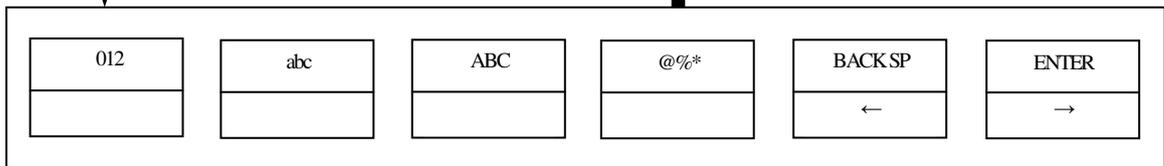
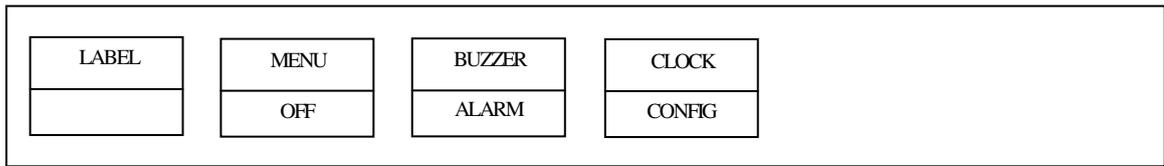
COPY

* Refer to "23. Storage/Print Screen Image" for details

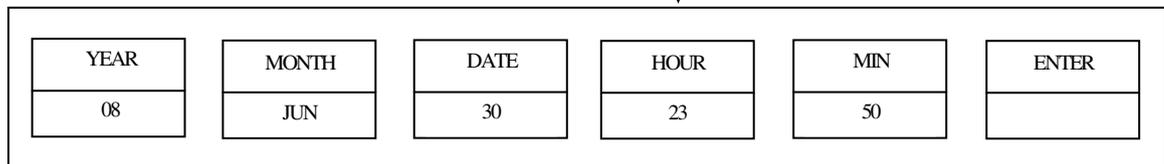


UTIL

* Refer to "24. Utility Function" for details



 : Select the character

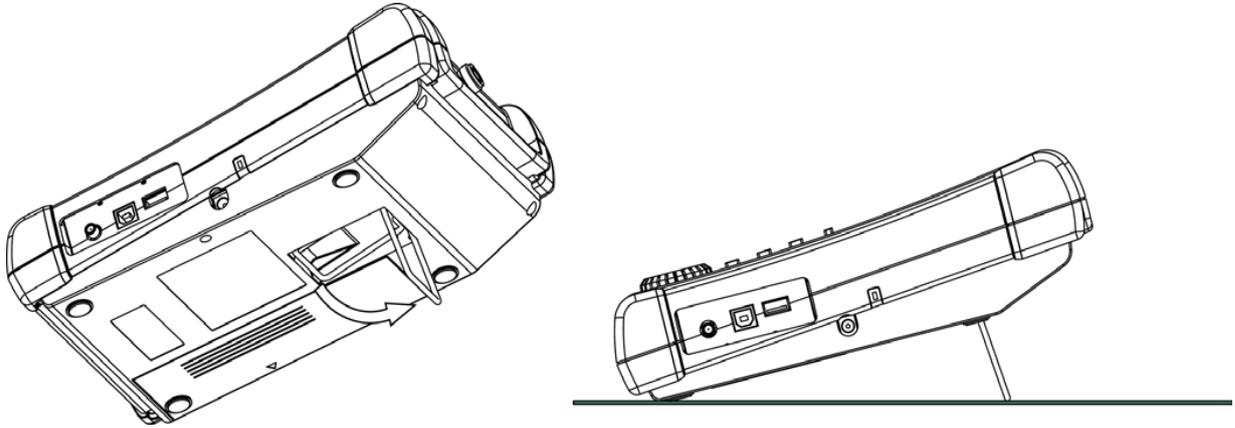


 : Select the numeric value

6. Preparing for Operation

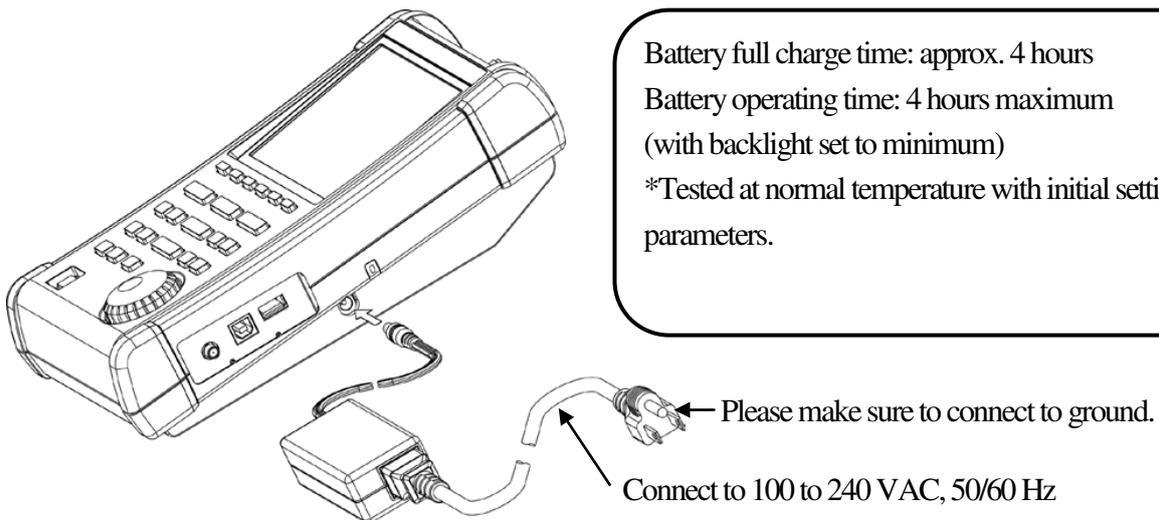
6.1 Stand

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 AC adapter MA400 is used to power the instrument and for charging the MB400 battery. (Charging starts automatically if the AC adapter is connected and unit is power-off.) Connect the adapter as in the figure below and connect the AC plug to the power line (100-240 VAC, 50/60 Hz). For static electricity protection, ground the unit by connecting the three cores if possible. Not grounding the unit can damage the unit and/or device being measured. Do not use an AC adapter other than the MA400 supplied with the unit. Using an AC adapter other than the MA400 may cause damage to the unit.



The battery indicator is divided into five levels and is displayed on the screen. When the mark of the battery remainder displays \square , the buzzer will sound even if buzzer is OFF under settings, and the power will turn off within a few minutes. Ensure to protect any data or measurements promptly by saving into memory to prevent data lost if the unit shuts down.