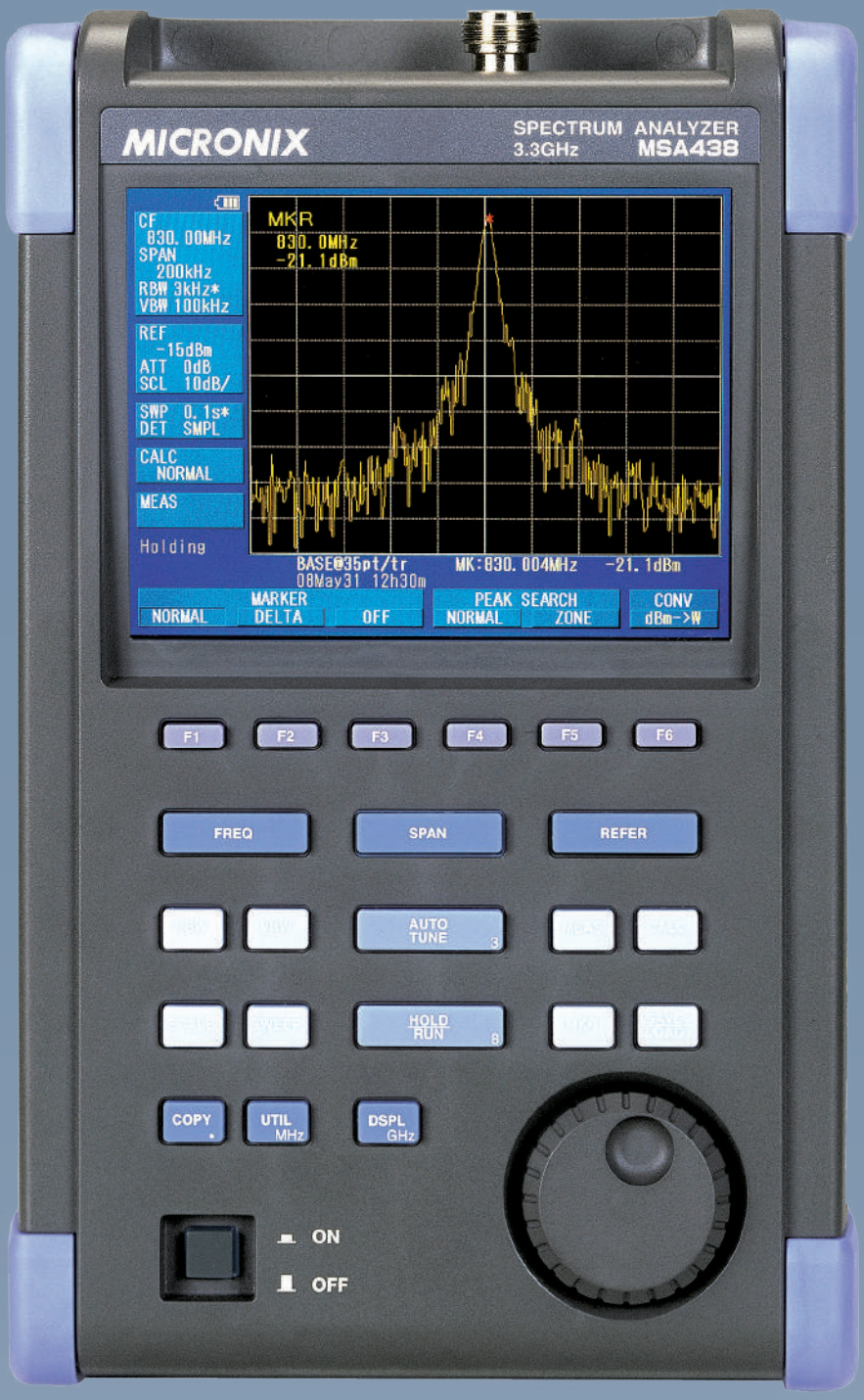
C & U
CREATIVE
& UNIQUE

MICROWAVE

Handheld spectrum analyzer

MSA400 series



MSA438
MSA458
MSA438TG
MSA438E

MICRONIX

Further Upgrade of the handheld spectrum analyzer

MSA300 series was upgraded further.
MSA400 series is a definitive handheld spectrum analyzer
we can recommend to you with confidence.

Lineup of four models

Model	Contents
MSA438	50kHz to 3.3GHz The most popular model ■Applications Cellular phone, 2.4GHz wireless, LAN, 2.5GHz Wi-MAX, RF-ID, Broadcasting
MSA458	50kHz to 8.5GHz Covering most of the wireless communication ■Applications 5GHz wireless LAN, 3.5/5.8GHz WiMAX, ETC/DSRC, Maintenance of wireless base station
MSA438TG	50kHz to 3.3GHz With 5MHz to 3.3GHz tracking generator ■Applications Frequency characteristics measurement of electronic component/circuit and return loss measurement
MSA438E	50kHz to 3.3GHz For EMI test ■Applications Radiated emission measurement and conducted emission measurement

Features of MSA400 series

1 Compact and lightweight 1.8kg

The dimensions are as small as 162(W)×71(H)×265(D)mm, and the weight is only 1.8kg including the battery. It is very convenient for outdoor use and on business trip.

2 Large and color TFT display

5.7 inches, 640×480 dots and color LCD

3 Four hours battery operation

Lithium-ion battery MB400 (option) fully charged enables about four-hour battery operation at minimum backlight brightness.

4 USB memory

USB memory can be used as a removable storage. The screen image is stored by BMP format, and the spectrum and the setting parameters are stored by CSV format.

5 USB communication

Such fast transfer rate as 12Mbps maximum was achieved by adoption of USB interface.

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 to measure the frequency of the signal more accurately.

7 Average noise level -127dBm

The low average noise level of -127dBm @ 1GHz provides a wide dynamic range.

8 100dB display dynamic range

As the display scale in the amplitude axis is 100dB/10div (at 10dB/div), the signal is observed in a wide dynamic range.

9 Easy operation by AUTO mode

- By auto range operation, RBW, VBW and sweep time are automatically selected based on the frequency span.
- By 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 Competitive 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, AVERAGE, OVER WRITE
- Marker measurement and peak search function
- Save/Load function
- Hard copy with printer

11 Abundant options

A lot of options such as PC software, Logging software, VSWR bridge, Dipole antenna, Magnetic field probe, USB printer, Frequency counter, Lithium-ion battery and Test accessories are available.

Large and color TFT display
(5.7inches, 640×480dots)

RF input (N(J) connector)
+27dBm/25VDC MAX

Setting of accurate center
frequency by PLL synthesizer

Setting of reference level
from +10 to -60dBm
by 1dB step

Tuning to maximum level
within full span.

Measuring functions
·Channel power
·Adjacent channel power
·Occupied bandwidth
·Electric field strength
·Magnetic field strength
·Frequency counter

Setting of sweep time
and detection mode

Calculation functions
·Max hold
·Min hold
·Averaging
·Over write

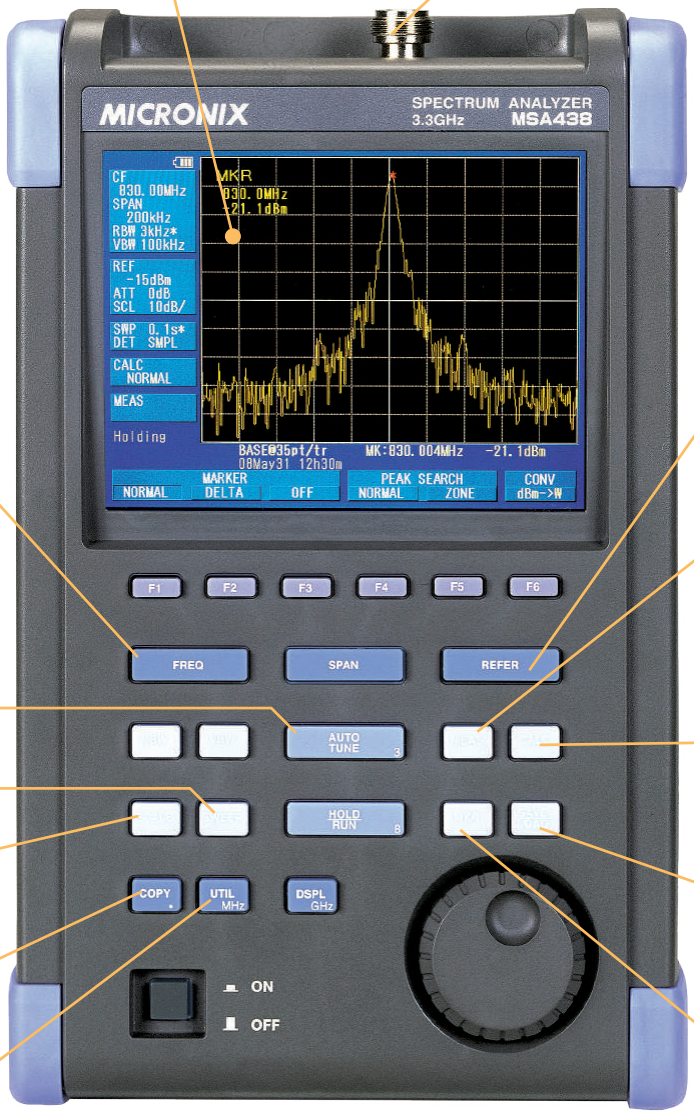
2, 5, 10dB/div

Spectrum and setting parameters are saved/loaded in/from internal memory or USB memory.

Printing on USB printer and
storing image in USB memory.

Marker measurement
and peak search

Label entry and others



USB B plug

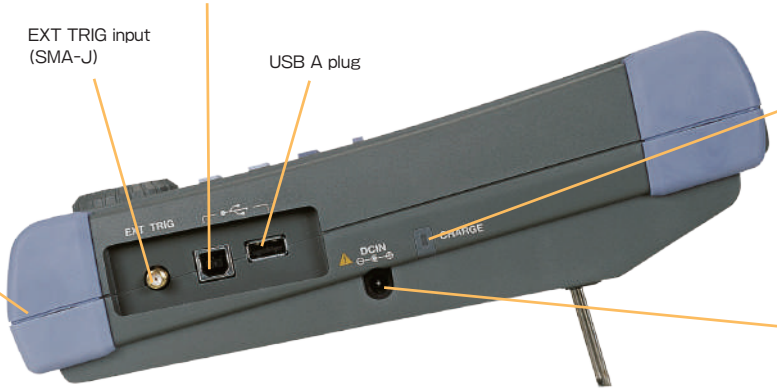
EXT TRIG input
(SMA-J)

USB A plug

LED indicator for
charging conditions

Protection bumper

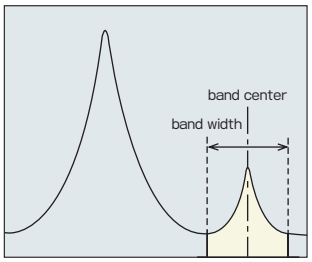
DC power input



Measuring functions

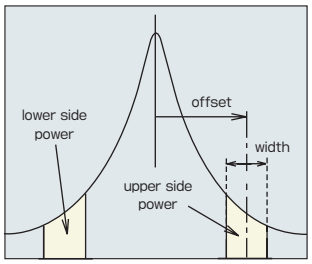
Channel power measurement

The sum of power in the band specified by band center and band width (colored area) is measured.
In short, it is possible to measure the total power in the specified frequency band. Of course, this function enables to measure a noise power.



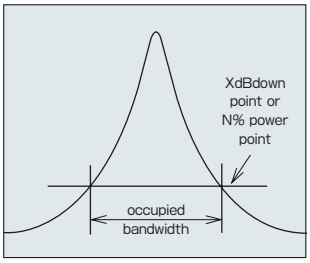
Adjacent channel power measurement

The adjacent channel leakage power is measured as the ratio of power in the range specified by offset frequency and bandwidth (colored area) to carrier power.
Both of leakage power at the upper and lower side are measured. Furthermore, the method for measurement is selected out of three methods based on the classification of definition of carrier power ; total power method, reference level method and in-band method.



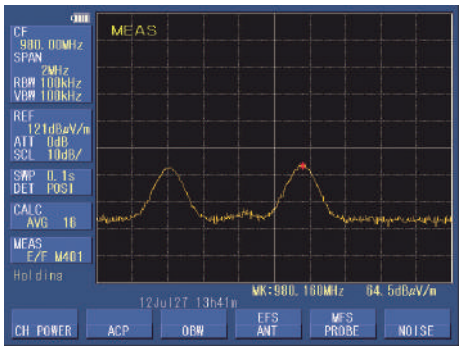
Occupied bandwidth measurement

It is possible to measure the occupied frequency bandwidth defined as the width of points that are X (dB) lower than the peak level, or as the width of points at N(%) of the total power.

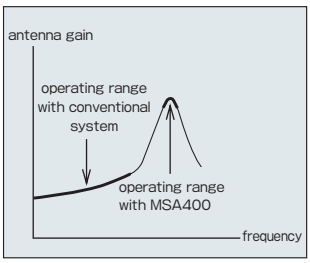


Electric field strength measurement

A dipole antenna (option) connected to the RF input enables the measurement of the electric field strength. According to the measuring frequency band, one antenna can be chosen from six kinds of antennas. M401 is mainly for PDC 800MHz and GSM 900MHz band, M402 is mainly for PDC 1500MHz band, M403 is mainly for PHS, W-CDMA and GSM 1800/1900MHz band, M404 is mainly for 2.4GHz wireless LAN and Bluetooth, M405 is mainly for 400MHz wireless, and M406 is mainly for 5GHz wireless LAN and 5.8GHz DSRC (ETC). M404 is capable of measuring direct sequence spread spectrum, frequency hopping and Bluetooth system because of 10ms sweep time and MAX HOLD function.

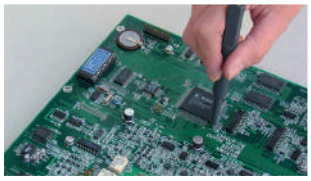


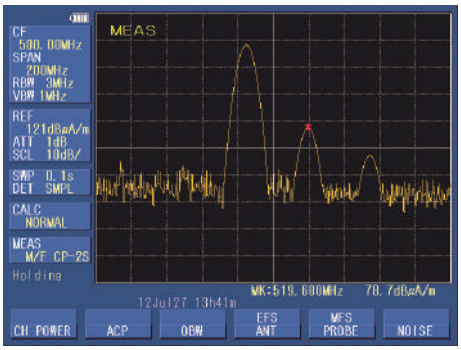
The conventional method covering the wide band with a single antenna results in low antenna gain because of using the range away from an antenna resonance point, and the dynamic range extremely worsens as a result. To use a resonance point where the antenna gain is high, six kinds of antennas are provided according to the frequency bands. Therefore, each antenna secures a wide dynamic range. Antennas of other bands will be also provided if requested.
Since the electric field strength is calibrated for each antenna in MSA400 series, it is possible to directly read the measured value. Moreover, the electric field strength is also measured with an user's antenna besides antennas from M401 to M406 if "USER" antenna is selected.



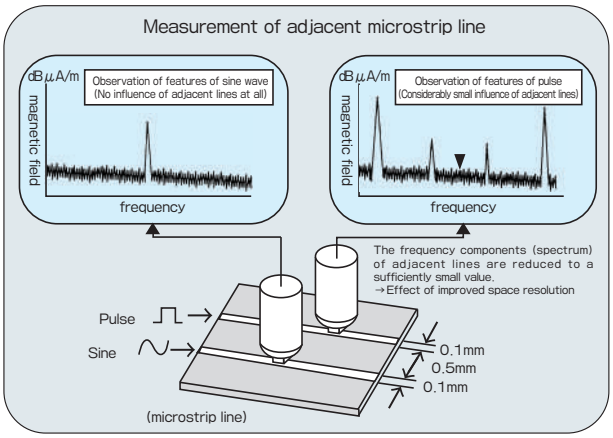
Magnetic field strength measurement

MSA400 series measures precisely the magnetic field distribution on LSI or PCB using the magnetic field probe CP-2SA. As the magnetic field detection portion of CP-2SA is of a shielded loop structure using a glass ceramic multi-layer board technology with excellent high frequency characteristics, it enables the measurement with high reproducibility by detecting magnetic field components only. The measuring frequency range is as broad as 10MHz to 3GHz, and the measured value is calibrated in the instrument.





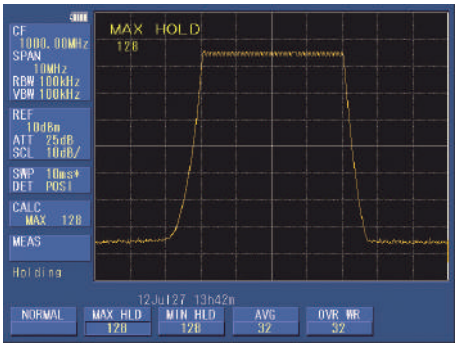
The typical applications of CP-2SA are the evaluation of effectiveness of a bypass capacitor located at a power supply terminal of LSI and the evaluation of wiring rule of PCB. CP-2SA is not affected by adjacent patterns because of high space resolution.



Calculation functions

MAX HOLD

The update spectrum data is compared with the data left last time at each point on X axis, and the larger one is retained and displayed. The number of times of the sweep can be set in the range from 2 to 1024 times by a power of 2, or by infinite. It is possible to observe a burst signal generated intermittently like a cellular phone and a frequency drift. In addition, this function is effective when the maximum level such as EMI test should be measured.

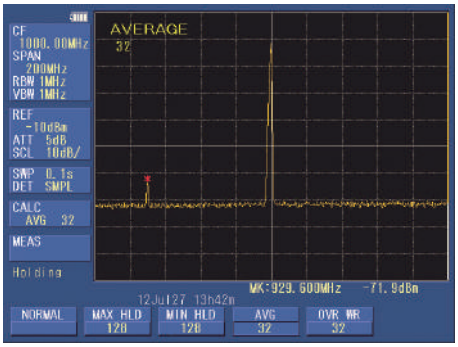


MIN HOLD

The update spectrum data is compared with the data left last time at each point on X axis, and the smaller one is retained and displayed. The number of times of the sweep can be set in the range from 2 to 1024 times by a power of 2, or by infinite.

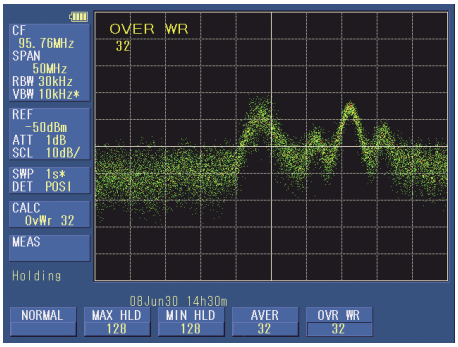
AVERAGING

The simple averaging processing is executed at each sweep. The number of times of the averaging can be set in the range from 2 to 1024 times by a power of 2. Even the spectrum buried in noise is observed.



OVER WRITE

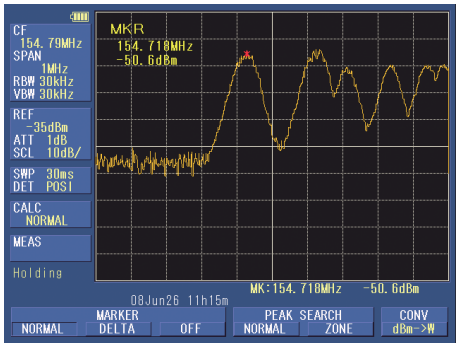
The image on the screen is not cleared at each sweep, and the overwriting display is executed. The number of times of overwriting can be set in the range from 2 to 1024 times by a power of 2, or by infinite. This function is, therefore, convenient for observing a process of changes of the signal. Moreover, it is effective for observing a signal occasionally generated.



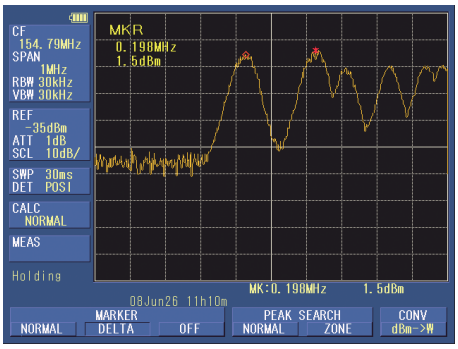
Marker and peak search

Marker measurement

Two different modes are available for the marker measurement. One is the normal marker mode to calculate and display the frequency (maximum effective digits: 7) and the level (maximum effective digits: 4) at marker point.
And another is the delta marker mode to calculate and display the frequency difference and the level difference between two markers (one of which is the reference marker).



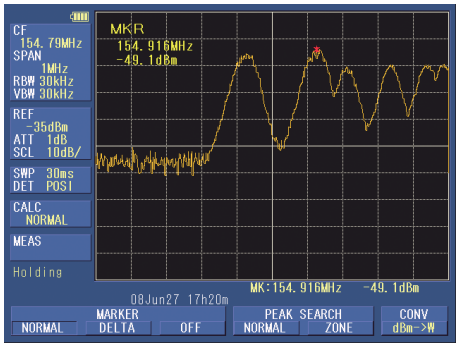
Normal marker measurement



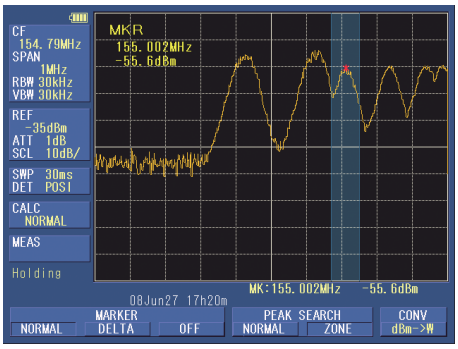
Delta marker measurement

Peak search

Two different modes are available for the peak search. One is the normal peak search mode to search for a peak level within all of 10div of the frequency axis as the search range. And another is the zone peak search mode to search for a peak level in the range specified by the center value and width. At the normal mode, the marker moves to a peak level only when the search key is pushed, but at the zone mode, it follows to a peak level at each sweep. In addition, the NEXT search to search for the next smaller level is permitted in the normal peak search mode.



Normal peak search



Zone peak search

Storage of measurement data

The following four methods allow you to store the spectrum and the setting parameters. The storage data is easily managed because the label or the file name is attached to the collected data.

●Label function
The named label is displayed in the label area on the screen. As for the characters, four kinds of numerals (0 to 9), small letter alphabet (a to z), capital letter alphabet (A to Z) and marks(@,#, ! and etc.) are available. The number of characters is 16 or less.

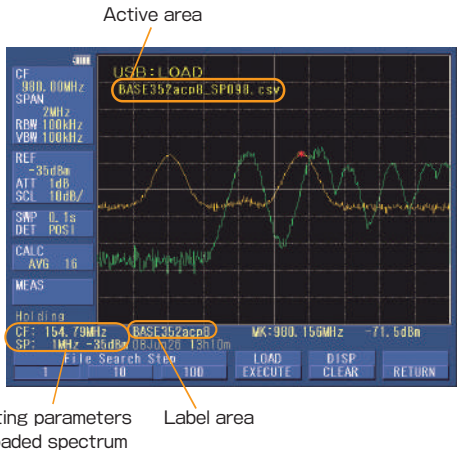
Label example : BASE352acp8 (refer to screen in next item)

This label is useful as a comment sentence in case of storing the screen image by BMP format in USB memory, or printing on the printer. Furthermore, it is used as a part of the file name at SAVE/LOAD function.

Storage into USB memory

The storage into USB memory is executed with SAVE/LOAD key or COPY key

●Storage with SAVE/LOAD key
I 000 data or less are stored in USB memory by CSV format. The storage data is managed by the file name as shown below, and the file name is displayed in the active area on the screen when pushing SAVE/LOAD key.



File name : BASE352acp8 _ SP 098
① ② ③

① The named label is pasted.
② The kind of storage data chosen is attached.
S : spectrum
P : setting parameters
SP : spectrum + setting parameters
③ The consecutive number is automatically attached only to the same label name.

Only one spectrum is loaded on the screen, and at the same time the setting parameters attached to the spectrum are displayed on the screen.

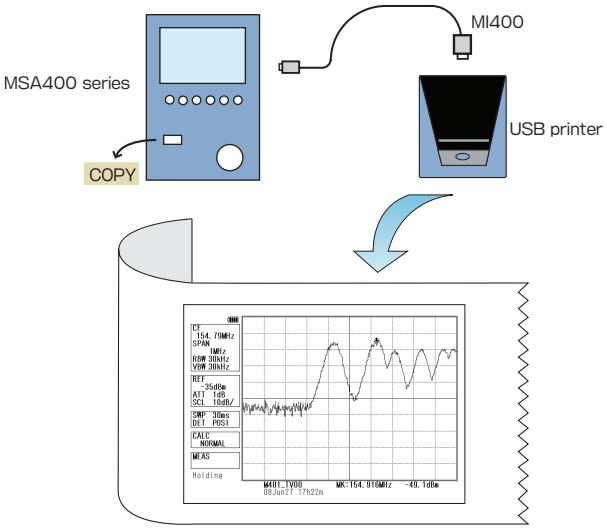
●Storage with COPY key
The number of storage data is not limited and depends only on the capacity of USB memory. The whole screen image (excluding function menu) or the spectrum can be selected, and it is stored by BMP format. This storage data cannot be loaded on the screen of MSA400 series. Besides, it is possible to transfer the storage data in the internal memory to USB memory in a lump sum.

Storageintointer nalmemory

The operation of SAVE, LOAD or DELETE is achieved in the same way as "Storage with SAVE/LOAD key" in the item of USB memory.
However, the number of storage date is limited to 200 data or less

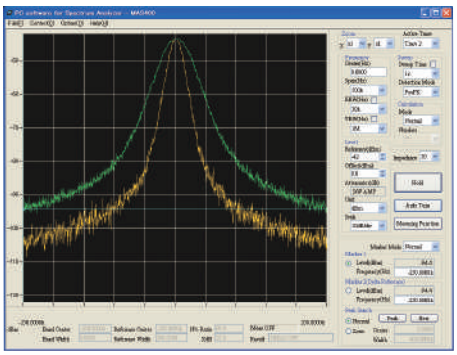
Print on printer

The MSA400 series enables a hard copy of the screen by connecting USB printer(option) to USB A plug with USB cable MI400(option)
Comes into the print mode when pushing COPY key. Since the printer corresponds to two kinds of power supplies of dedicated AC adapter and dry battery, the hard copy of the screen image is easily accomplished even in the open where there is no AC power supply. The dry battery allows the hard copy if almost 140 images.



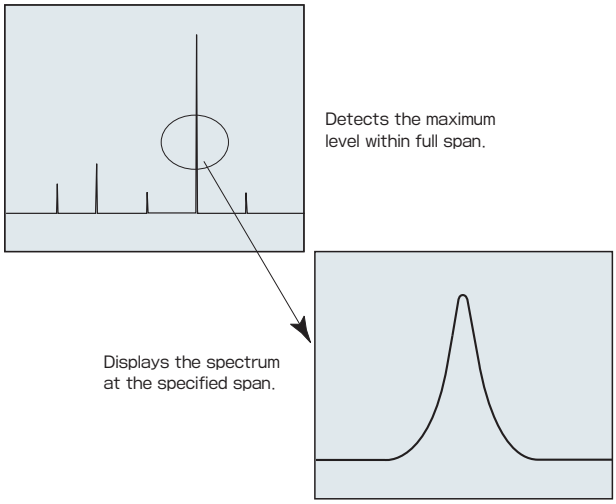
Save in PC Software

It is possible to store the data in the PC by using PC software MAS400 (option), which enables to set the setting parameters with the PC and display the spectrum on the PC screen.
In addition, Logging software MAS410(option) makes it possible to collect the data by uninhabited for a long time and store them.



Auto tuning

When pushing AUTO TUNE key the spectrum with the maximum level is searched within full spam(3.3GHz@ MSA438/438TG/438E and 8.5GHz@ MSA458), and then it is adjusted to the center of the screen. That spectrum is displayed on the screen at the specified frequency span, and at reference level, resolution bandwidth, video bandwidth and sweep time that are automatically set to the optimum parameters based on the span.

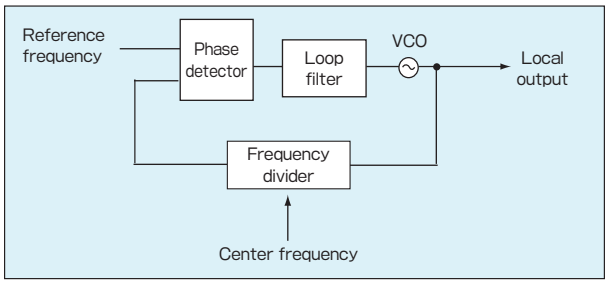


Easy operation AUTO mode

Resolution bandwidth, video bandwidth and sweep time are set automatically based on the specified frequency span. Furthermore, it is also possible to automatically set one or two parameters of either resolution bandwidth, video bandwidth or sweep time.
The operator is released from troublesome operation because these three parameters accompanying the frequency span are set automatically.
Moreover, the input attenuator and the IF amplifier are automatically set to the optimum values based on the reference level.

Precise frequency measurement

The center frequency is precisely set by PLL (Phase Locked Loop) synthesizer. The setting resolution is 20kHz.



The frequency counter (factory option) enables you to measure the frequency of input signal more accurately. The frequency is measured by 100Hz resolution and 8 digits or less. The frequency accuracy of the reference crystal oscillator is ±2ppm@23℃ and the measuring frequency range is from 1MHz to the maximum measuring frequency of each model.

Battery operation

Almost four hours battery operation has been achieved without enlarging the main body by adopting a lithium-ion battery (MB400, option) as a built-in battery. The battery is easily installed or removed because the cover is removed by hand without any tool.
In addition, the battery remainder is divided into five levels and displayed on the screen.

●Battery charge
The time from empty state to full charge is only almost four hours because each model is equipped with the rapid charging circuit.
Under the conditions of power-off and connecting the AC adapter MA400 of a standard accessory, the battery is charged. The charging conditions are indicated by two colors LED on the right side as shown in the table below.

Charging condition	Color of LED
On charge	red
Completion of charge	green
No battery	green
Abnormal	blinking in red

※LED is turned off at power-on.

The abnormal condition means that the charging time is more than the time decided beforehand, or that the battery voltage becomes too high.

With Tracking generator

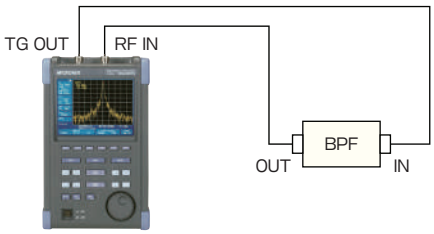
MSA438TG

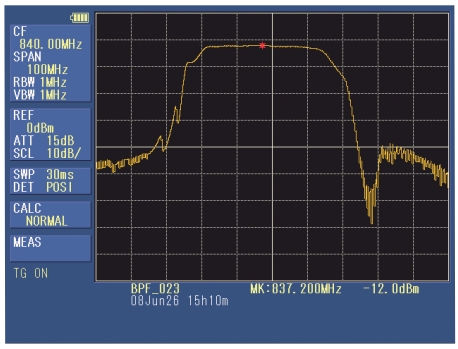
MA430

The tracking generator is a signal source which generates the sine wave synchronized with the sweep of the spectrum analyzer.
For example, the tracking generator outputs 1MHz sine wave when the spectrum analyzer is at 1MHz sweep point. The 1GHz is output at 1GHz sweep point as well. Therefore, the amplitude frequency characteristics of various electronic components and circuits can be observed on the screen without any troublesome operation. Moreover, the VSWR bridge MVS300 (option) enables to measure the return loss.

Frequency response of filter

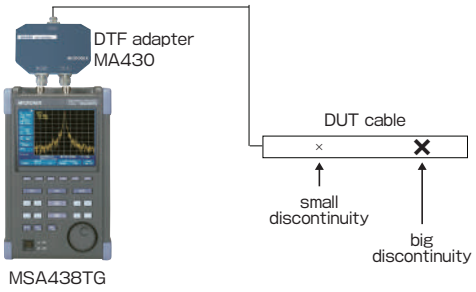
The input and the output of a filter are connected to TG OUT and RF IN respectively. The frequency response of a filter is observed in the range of 5MHz to 3.3GHz.
The frequency response of the coaxial cable and MSA438TG is made flat by using the NORMALIZING function.

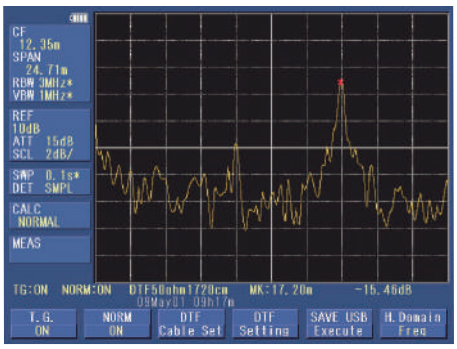




Gain characteristics of amplifier

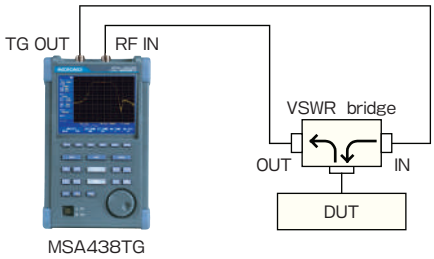
The frequency response of an active circuit such as an amplifier besides a passive circuit such as LC filter is measured. A measurement example of the gain-frequency characteristics of an amplifier is shown in the figure below.
The level of TG OUT is -10dBm.

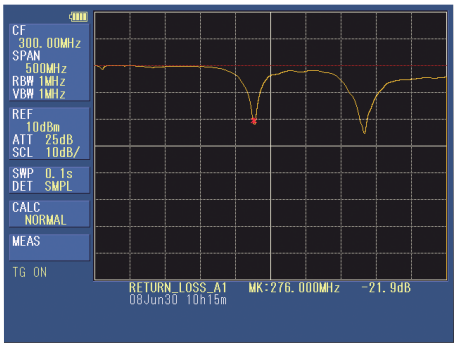




Return loss measurement

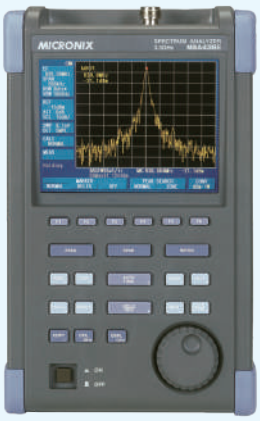
VSWR bridge MVS300 (option) connected to TG OUT and RF IN of MSA438TG enables the return loss measurement. The measured frequency range is from 5MHz to 3GHz.
Additionally, the calibration of the return loss 0dB is done by using the NORMALIZING function.





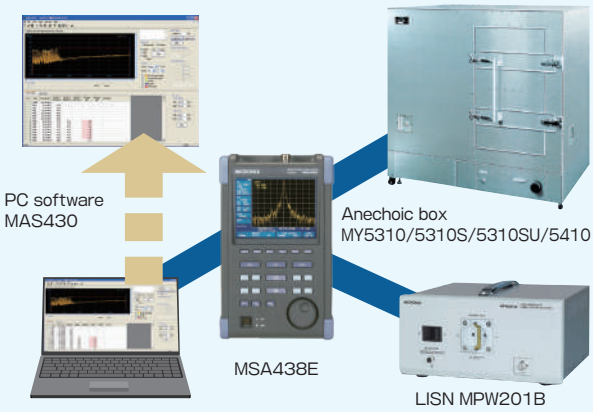
For EMI test

MSA438E



MSA438E is a key instrument of EMI measurement. Since it has functions such as PK detection, QP detection, AV detection and RBW 9kHz/120kHz (6dB), it enables the radiated emission measurement and the conducted emission measurement for precompliance.
Furthermore, the magnetic field probe CP-2S (option) finds out the source of disturbance noise.

EMI total test system MR2300



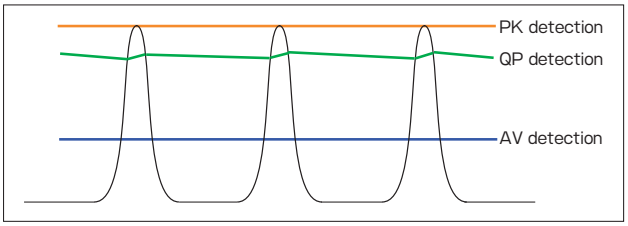
Measurement mode and Preset

Three measurement modes shown below are available. The troublesome setting for EMI test is unnecessary because the parameters corresponding to the measurement mode are automatically preset.

Measurement mode	Function key	Preset
Normal measurement	NORM(F1)	Presets initial parameters of normal mode
Conducted emission measurement	EMI-C(F2)	Presets initial paramenters of conducted emission mode
Radiated emission measurement	EMI-R(F3)	Presets initial paramenters of radiated emission mode

Detection mode

Three detection modes are available: PK (peak value) detection, QP (quasi-peak value) detection, and AV (average value) detection. Only the sweep mode is valid. As shown in the figure below, the measured level depends on the detection mode, and PK≥QP≥AV is valid. For narrow bandwidth signals such as CW waves, PK=QP=AV.



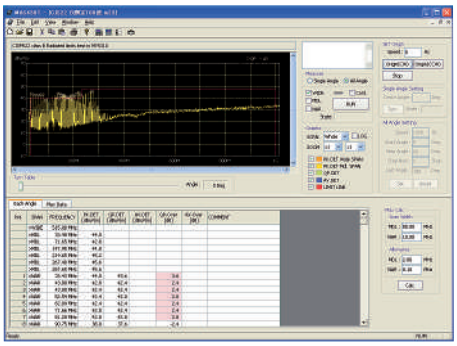
The PK detection is achieved by setting the measurement mode to normal measurement, the detection mode to positive peak and the calculation function to MaxHold. By the way, a signal of time width 200ns or more is detected by positive peak detector because the sampling speed of A/D converter is 5MS/s.
When observing a disturbance noise, the PK detection enables the fast sweep because its time constant is much smaller than QP or AV.
Therefore, it is convenient to use the PK detection when narrowing the disturbance noise spectrums out of specification down to small number.
The QP detection is usually used in both of the radiated and conducted emission measurements, and the AV detection is usually used in the conducted emission measurement. The measurement time is shortened if they are finally used only for the measurement of the spectrums narrowed down by the PK detection.

Resolution bandwidth (RBW)

CISPR standard specifies that conducted disturbance should be measured at 9kHz, radiated disturbance from 30 to 1000 MHz at 120kHz, and radiated disturbance above 1GHz at 1MHz RBW. The bandwidth is at 6dB.
In addition to these three RBWs, the MSA438E has RBW filters with bandwidths of 3kHz, 30kHz, 300kHz, and 3 MHz at 3dB.

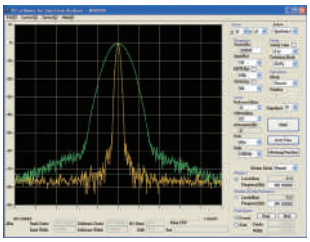
Horizontal axis data of 1001 points

Although the spectrum is displayed by 501 points on the horizontal axis of the screen of MSA438E, it is captured by 1001 points per sweep in the instrument. All of these 1001 point s are transferred to a personal computer and displayed on the PC screen after processed by PC software MAS430. The image, therefore, becomes clearer.



Software

PC software MAS400

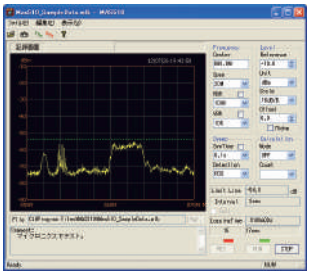


MAS400 is a software that controls the spectrum analyzers of four models by the PC. 1001 points are captured in the spectrum analyzer. Although 501 points are displayed on its screen, the number of points transferred to the PC is all of 1001 points. The screen image is stored by BMP format and the spectrum is stored by CSV format each point (frequency and level).

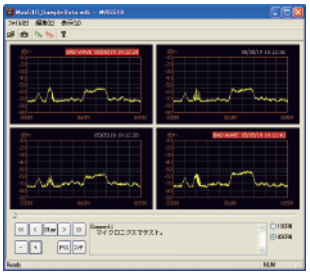
Logging software MAS410

MAS410 is a logging software that collects the measurement data by uninhabited. It is optimum for watching an abnormal signal at night and recording the data by uninhabited for a long time.

- Logging at specified frequency band, sampling interval and measurement time.
- Makes it possible to fast-forward and fast-rewind the images in the file like a video recorder, and moreover, to jump to the image with spectrum exceeding the limit line.
- ERROR is automatically displayed when the signal exceeding the limit line is input.

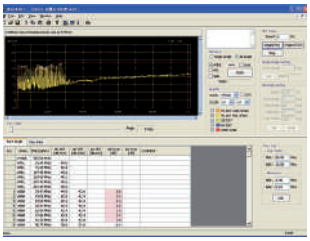


Recording



Playback

EMI measurement PC software MAS430



This software presets spectrum analyzer settings and typical EMI standard values so that users unfamiliar with spectrum analyzer operation and EMI standards can easily use the software. In addition, an automatic measurement mode is provided to simplify the process of finding out-of-spec spectrum and measuring its QP or AV detection value.
※For MSA438E only

DTF Adapter MA430

■Measuring distance range
0.3 to 1,000 meters @50Ω cable
1 to 400 meters @75Ω cable

■Cable characteristics list
111 kinds @50Ω cable
11 kinds @75Ω cable

Antenna

Portable antenna M400 series, M300 series

Model	Frequency range	Antenna gain(typ)	VSWR	Dimensions	Weight
M401	0.8 to 1GHz	≧+1dBi	<1.5	7.5φ×280mm	65g
M402	1.25 to 1.65GHz	≧+1dBi	<1.5	7.5φ×280mm	65g
M403	1.7 to 2.2GHz	≧+1dBi	<1.8	7.5φ×210mm	65g
M404	2.25 to 2.65GHz	≧+1dBi	<1.8	7.5φ×210mm	65g
M405	300 to 500MHz	≧+1dBi	<1.5	8.0φ×212mm	62g
M407	470 to 770MHz	≧+1dBi	<1.5	8.0φ×138mm	56g
M306	4.8 to 6.2GHz	≧+1dBi	<1.8	16φ×100mm	22g
M308	3.6 to 4.2GHz	≧+1dBi	<2.0	16φ×100mm	22g
M309	4.4 to 4.9GHz	≧+1dBi	<2.0	16φ×100mm	22g
M310	5.9 to 7.2GHz	0.7dBi(typ)	<2.0	16φ×100mm	22g

1)The antenna gain and VSWR are the values for the center frequency of the frequency range.
2)Connectors: N(P)@M401-405/M407, SMA(P)@M306/M308-M310.
※Conversion adapter MA306 is required to install M306, M308, M309, and M310.

Loop antenna MAN120

Antenna suitable for detection of low frequency signal and noise.

Frequency range	50kHz to 33MHz
Dimensions	420(φ)×13(T)mm
Weight	1.2kg

Biconical antenna MAN150/MAN150B

Suitable for simplified measurement of radiated emissions.

Model	MAN150	MAN150B
Frequency range	20MHz to 3GHz	30MHz to 1GHz
Gain(nominal)	-45dBi to +1dBi	-31dBi to +1dBi
Antenna factor	20 to 51dB/m	17 to 31dB/m
Connector	SMA(J)	
Dimensions(L×W×D)	350×160×140mm	540×225×225mm
Weight	approx.350g	approx.1150g

Log-Periodic antenna MAN160A/160B

■Components
- Antenna body
- Grip
- Antenna data
- Hard case

Model	MAN160A	MAN160B
Frequency range	700MHz to 4GHz	700MHz to 6GHz
Maximum power	100W(At CW and 400MHz)	
Impedance	50Ω (nominal)	
VSWR	< 2.0(Typical)	
Gain	4dBi(Typical)	5dBi(Typical)
Antenna factor	23 to 38dB/m	26 to 41dB/m
Connector	SMA(J)	
Dimensions	340(L)×200(W)×25(D)mm	
Weight	270g	250g

Low noise amplifier MAP301/302

Can be used as a preamplifier for signal analyzers.

Items	MAP301	MAP302
Frequency range	100kHz to 500MHz	20MHz to 3GHz
Gain	50dB	20dB
Noise figure	3.5dB	3.5dB

USB printer

Printing method	Thermal line dot method
Paper	80mm width thermal paper
Power source	·Internal : AA-sized alkaline battery (4pcs) ·External : 7.5VDC/3A (dedicated AC adapter)
Dimensions	134(W)×60(H)×180(D)mm
Weight	Approx. 450g (main unit only)
Data entry	USB 2.0

Lithium-ion battery MB400

7.4V/5000mAh

USB cable MI400

Connector	A plug/B plug
Length	1.5m

Frequency Counter(factory option)

Items	Specifications
Frequency range	1MHz to 3.3GHz@MSA438/438TG/438E 1MHz to 8.5GHz@MSA458
Measured level	+10 to -70dBm@1MHz to 2GHz, RBW100kHz +10 to -60dBm@2GHz to 8.5GHz, RBW100kHz
Measurement resolution	100Hz
Display digits	8digits max
Reference x'tal	Accuracy: ±2ppm@23℃ Temp. characteristics: ±5ppm@0 to 40℃

Coaxial parts

Coaxial attenuator MG-XXdB

Model	Coaxial Attenuator MG-XXdB		VSWR	Rated power
	DC to 12.4GHz	12.4GHz to 18GHz		
MG-1dB, 2dB, 3dB, 4dB	<±0.5dB	<±1dB	<1.15@DC to 4GHz <1.2@4 to 12.4GHz <1.3@12.4 to 18GHz	1W
MG-5dB, 6dB, 7dB, 8dB	<±0.7dB	<±1.2dB		
MG-9dB, 10dB, 12dB, 13dB	<±1.0dB	<±1.25dB		
MG-14dB, 15dB, 20dB	<±1.2dB	<±1.3dB		
MG-30dB	<±1.2dB@DC to 8GHz		<1.2@DC to 8GHz	

※Connectors, Impedance:SMA(P)/SMA(J), 50Ω

Terminator

Model	Frequency range	VSWR				Rated power	Connector
		DC to 4GHz	4 to 8GHz	8 to 12.4GHz	12.4 to 18GHz		
MG-50S	DC to 18GHz	<1.08	<1.10	<1.15	<1.20	0.25W	SMA(P)
MG-50N	DC to 8GHz	<1.2@DC to 8GHz				2W	N(P)

※Impedance:50Ω

Coaxial cable

Model	Connector	Length	Frequency range
MC102	SMA(P)/BNC(P)	1.5m	DC to 2GHz
MC201	SMA(P)/SMA(P)	0.5m	DC to 18.5GHz
MC202	SMA(P)/SMA(P)	3m	DC to 18.5GHz
MC203	SMA(P)/SMA(P)	4m	DC to 18.5GHz
MC204	SMA(P)/SMA(P)	1.5m	DC to 18.5GHz
MC301	SMA(P)/SMA(P)	0.5m	DC to 10GHz
MC302	SMA(P)/SMA(P)	1m	DC to 10GHz
MC303	SMA(P)/SMA(P)	1.5m	DC to 10GHz
MC304	SMA(P)/N(J)	0.2m	DC to 4GHz
MC305	SMA(P)/N(P)	0.2m	DC to 4GHz
MC306	SMA(P)/BNC(J)	0.2m	DC to 2GHz
MC307	SMA(P)/BNC(P)	0.2m	DC to 2GHz
MC308	N(P)/N(P)	0.5m	DC to 10GHz
MC309	N(P)/N(P)	1m	DC to 10GHz
MC310	N(P)/N(P)	1.5m	DC to 10GHz
MC311	N(P)/SMA(J)	0.2m	DC to 10GHz
MC312	N(P)/BNC(J)	0.2m	DC to 2GHz
MC313	N(P)/BNC(P)	0.2m	DC to 2GHz
MC314	BNC(P)/BNC(P)	1.5m	DC to 2GHz

Adapter

Model	Connector	Impedance	Frequency range
MA301	BNC(P)/BNC(J)	50Ω/75Ω	DC to 2GHz
MA302	BNC(P)/N(J)	75Ω/75Ω	DC to 1.8GHz
MA303	BNC(P)/N(P)	75Ω/75Ω	DC to 1.8GHz
MA304	BNC(P)/F(J)	75Ω/75Ω	DC to 1.8GHz
MA305	BNC(P)/F(P)	75Ω/75Ω	DC to 1.8GHz
MA306	N(P)/SMA(J)	50Ω/50Ω	DC to 12.4GHz
MA307	N(P)/BNC(J)	50Ω/50Ω	DC to 2GHz
MA308	N(P)/BNC(J)	50Ω/75Ω	DC to 2GHz
MA309	N(J)/BNC(P)	50Ω/50Ω	DC to 2GHz

Specifications

Frequency section

Frequency range	50kHz to 3.3GHz(MSA438/438TG/438E) 50kHz to 8.5GHz(MSA458)
Center frequency	
Setting resolution	20kHz Allows rotary encoder, numeric key and function key.
Accuracy	±(30+20T)kHz±1dot@span≦10MHz, RBW3kHz, ※1 ±(60+300T)kHz±1dot@span≧20MHz, RBW100kHz, ※1
RBW freq. error	±4kHz@3kHz, 10kHz, 30kHz RBW±20%@100kHz, 300kHz RBW±10%@1MHz, 3MHz
Frequency span	
Setting range	·〈MSA438/438TG/438E〉 0Hz(zero span), 200kHz to 2GHz(1-2-5step)and 3.3GHz(full span) ·〈MSA458〉 0Hz(zero span), 200kHz to 5GHz(1-2-5step)and 8.5GHz(full span)
Accuracy	±3%±1dot@one step slower sweep time than AUTO, ※1
Display dots	501dots @ LCD screen, 1001dots @ USB communication ※1001 dots are captured in the unit.
Resolution bandwidth	3dB bandwidth
Setting range	·〈MSA438/458/438TG〉 3kHz to 3MHz(1-3step)and AUTO ·〈MSA438E〉 3k, 9k(6dB), 30k, 120k(6dB), 300k, 1M(6dB), 3MHz and AUTO
Accuracy	±20%
Selectivity	1：12(typ)@3dB：60dB
Video bandwidth	100Hz to 1MHz(1-3step)and AUTO
SSSB phase noise	-90dBc/Hz(typ)@100kHz offset, RBW3kHz, VBW100Hz, sweep time 1s
Spurious response	Less than-60dBc
Harmonics	Less than -40dBc@≧100MHz

Amplitude section

Reference level	
Setting range	+10 to -60dBm, 1dB step
Accuracy	±0.8dB±1dot@CF100MHz, RBW3MHz, VBW1MHz, REF-15dBm, ※1
Unit	dBm, dBV, dBmV, dBμV, dBμV/m, dBμA/m
Average noise level	-127dBm(typ)@1GHz MSA458は-123dBm(typ)
Frequency response	±2.0dB±1dot@≧100MHz ±1.0dB±1dot@≧100MHz
Input impedance	50Ω
Input VSWR	Less than 2.0
Input attenuator	
Attenuation range	0 to 25dB(1dB step), coupled with reference level
Switching error	±0.6dB@100MHz
RBW switching error	±0.6dB
Display scale	
Display dots	381dots/10div
Scale	2dB/div, 5dB/div, 10dB/div,
Accuracy	±(0.2dB+1dot)/2dB ±(0.4dB+1dot)/5dB ±(0.8dB+1dot)/10dB ±(1.8dB+1dot)/83dB
Input damage level	+27dBm(CW average power), 25VDC
RF input connector	N(J)connector

Sweep section

Sweep time	
Setting range	10ms to 30s(1-3step, span：0 to 2GHz)and AUTO 30ms to 30s(1-3step, span：5GHz/only MSA458, full span)and AUTO
Accuracy	±0.1%±1dot(span：0 to 5GHz) ±2.5%±1dot(span：full span)
Trigger	Available only for zero span
Trigger mode	AUTO
Trigger source	Internal and External
External trigger	
Voltage range	1 to 10Vp-p
Frequency range	DC to 5MHz
Input RC	approx.10kΩ// less than15pF
Input coupling	DC coupling
Trigger level	approx.0.56V(fixed)
Input damage level	50V(DC+AC peak)
Input connector	SMA(J)
Detection mode	Positive peak, Negative peak, Sample ※As for MSA438E, QP and AV are added further.

Functions

Marker measurement	NORM：displays frequency (7digits 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 within 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 (factory option)
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 spectrum waveforms and 200 setting parameters.
Load	Loads one spectrum waveform and one setting parameter.

Tracking generator (only MSA438TG)

Frequency range	5MHz to 3.3GHz
Output level	-10dBm±1dB@1GHz
Output level flatness	±1.5dB
Normalizing function	Compensates input frequency response flat on screen.
Output impedance	50Ω
Output VSWR	Less than 2.0
Output connector	N(J) connector

EMI measurement function (only MSA438E)

Detection mode	PosPK(positive peak)、QP(quasi peak)、AV(average)detections
Resolution bandwidth	3kHz、9kHz(6dB)、30kHz、120kHz(6dB)、300kHz、1MHz(6dB)、3MHz ※3dB bandwidth excluding 9kHz and 120kHz.
Time constant of QP	

Time constant \ RBW	9kHz	120kHz	1MHz
Charge	1ms	1ms	1ms
Discharge	160ms	550ms	550ms

General

Communication	
Interface	Corresponds to USB2.0
Connector	B plug (device)
Transfer rate	Full speed (12Mbps)
Hard copy	USB printer (option) connected to A plug (host) eanbles hard copy of screen.
USB memory	Uses A plug (host), and stores spectrum data, setting parameters and spectrum data + setting parameters.
Display	
Display	5.7inches and color LCD
Backlight	LED backlight
Number of dots	640(H)×480(V) dots
Power supply	
Source of power supply	External DC source (dedicated AC adapter MA400) and Lithium-ion battery (MB400/option)
Dedicated AC adapter	Input：100 to 240VAC Output：9VDC/2.6A
Lithium-ion battery	7.4V/5000mAh
Charge function	Capable of charging only during power-off. Indicates 4 conditions with two colors LED (red and green).
Remainder indication	5 levels indication

Other

Operating temperature	0 to 50℃ (Guaranteed at 23±10℃ but at 23 ±5℃ as to items with ※1, without carrying case)
Operating humidity	Less than 40℃/80%RH (Guaranteed at less than 33 ℃ /70%RH but at less than 28 ℃ /70%RH as to items with※1, without carrying case)
Storage temperature	-20 to 60℃,less than 60℃/70%RH
Dimensions	162(W)×71(H)×265(D)mm (Excluding projections, protection bumper and stand)
Weight	Approx.1.8kg(including battery)
Standard accessories	AC adapter MA400, Carrying case, Accessory pouch, Operation manual

T：sweep time (s), ※1：23±5℃、less than 28℃/70%RH

※MICRONIX Corporation reserves the right to make changes in design, specifications and other information without prior notice.

MICRONIX

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