MF2400B Series

Microwave Frequency Counter

10 Hz to 20/27/40 GHz

The Most up to Date Comprehensive Frequency Measurement Available

Latest Burst Wave Measurement

The line up of MF2400B series is composed of three frequency counters: the MF2412B (20 GHz), the MF2413B (27 GHz), and the MF2414B (40 GHz).
They are ideal for evaluating mobile radio communications devices and circuits, and are also able to measure the carrier frequency and pulse width of burst signals.
In addition to displaying measurements results on a 12-digits LCD, the frequency values can be read using the analog display function, which can be used for monitoring

evaluation and especially for frequency adjustment, etc., of various types of oscillators.
Furthermore, the template function is useful for assessing whether or not the measurement results fall within the upper and lower frequency limit specifications; the evaluation result is output from the AUX connector on the rear panel as Go/No-go signal. An easy-to-use automatic measurement system can be configured using the GPIB function.
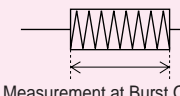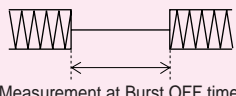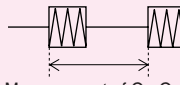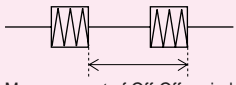
Wide Band Measurement

The line up of three counters upper frequency limits of 20, 27, and 40 GHz meet every type of usage requirement. In addition, a high-frequency fuse holder and fuse element protect the input circuit from excessively powerful signals, and a variety of adapters are available for coupling each connector.

High-Accuracy Burst Measurement

The carrier frequency, burst width and burst repetition rate of a 100 ns to 0.1 s burst signal input from INPUT 1 can be measured quickly at high accuracy.

Measurement	Positive selected	Negative selected
Burst width	Measurement at Burst ON time	Measurement at Burst OFF time
Burst repetition	Measurement of On-On period	Measurement of Off-Off period

Analog Display Function

Using this function, the entire LCD becomes an analog meter and the measured values are indicated by the position of the meter needle. In addition to grasping changes in the measured frequency, this permits faster frequency adjustment and Go/No-go judgement of oscillators which had to be read many digits of measured data before. This analog meter also solves problems of misreading of frequency value.
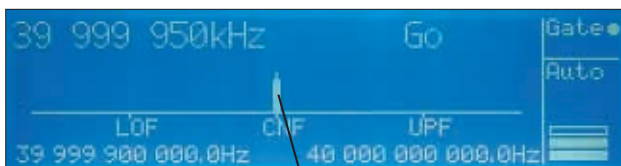
Moves left/right and indicates frequency value

Template Function

When the upper and lower frequency limits have been preset, if the measured frequency is within the preset range, Go is displayed; if it is out of range, No-go is displayed. In addition, the Go/No-go signal can be output from the AUX connector on the back panel as a TTL signal.

This is very useful for configuring an automatic device Pass/Fail evaluation system (using analog display).

High-Speed Transient Measurement

Frequency counters have an interval when measurement is not performed (sample rate), so that sudden frequency changes during this period can not be measured.
However, the MF2400B series overcomes this problem by capturing frequency changes at speeds of up to 10 µs and saving a maximum of 2000 sampling points. When it is combined with a host computer, frequency changes can be displayed graphically. This is very effective for measuring VCO start-up characteristics and PLL lock times.
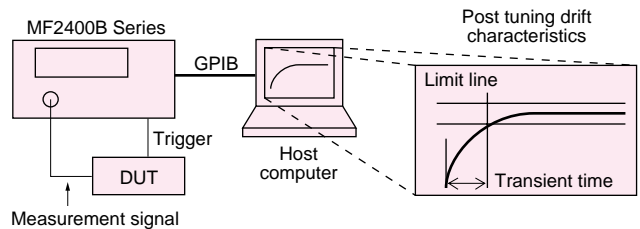
Gating Function

At burst signal measurement, the carrier frequency may be different at the start, middle, and end of the burst.
In the MF2400B series, the carrier signal frequency at any position of the signal (delay time from trigger signal leading edge) and at any specified time (gate time) can be measured using a combination of the gating and trigger delay functions.
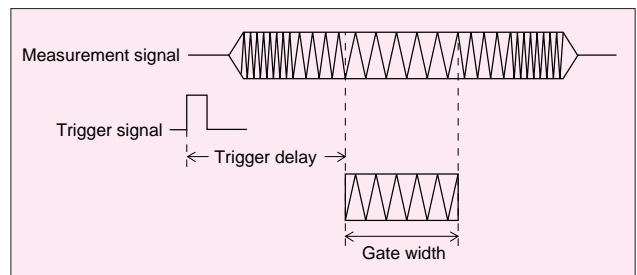
Save and recall functions added

Up to maximum of 10 setups can be stored in the internal memory, and these can be freely recalled. Storing complex setups in advance, such as burst triggers and gate settings, makes it possible to recall them immediately when needed for measurement, which makes it possible to reduce the measurement setup time and to prevent malfunctions from setup mistakes.

Anritsu

MF2414B
Microwave Frequency
Counter
10Hz-40GHz

40 000 000 000.0

GHz   MHz   kHz   Hz

Gate●
Auto

Preset

Local   Remote

Stby   On

Input1
600MHz-40GHz
+10dBm Max

Input2
10Hz-1GHz
10Vrms Max(1MΩ)
2Vrms Max(50Ω)

Hold

Restart

Frequency
Acquisition

Auto
Manual

Meas
Mode

Burst
CW

Setup

Return
to Meas

Sample Rate

Reso

Menu

Freq   Level   Burst
7   8   9

Trig   TD   CW
4   5   6

Temp   Ofs   Stat
1   2   3

Input   Sys
0   .   +/−

Ext
Trig
Input

AUX
Output

─ Reference ─

1,2,5,10MHz
Input

Output
GPIB

~Line Input ─
47.5-63Hz,90VA M
100-230V,⊟ T 3,1

SH1 AH1 T5 L4 SR1 DC1
RL1 PP0 DT1 C0 E2
Refer to manual for addres

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1 248 x 60 dot LCD displaying measurement results and parameter settings.

2 Sample Rate
Sets measurement off time

3 Resolution
At normal measurement, the $\boxed{<}$ and $\boxed{>}$ keys switch the frequency measurement resolution. However, when setting parameters, the $\boxed{<}$ and $\boxed{>}$ keys are used to select the setting item; the selected item is confirmed by pressing the Enter key.

4 Menu
This key sets measurement functions such as frequency, level and burst, etc.
It automatically changes to the parameter setting condition, and changes numerics and units.

5 Preset
Pressing this key returns each parameter to the initial setting.

6 Hold, Restart
The Hold key is used to hold to measured valued. When Hold is ON, the key lamp is lit. The Restart key starts measurement over. When the Restart key is pressed when Hold is ON, the latest data is measured and hold.

7 Frequency Acquisition
This is used at frequency measurement of Input 1. At Auto, the full frequency band is swept and the frequency of signals exceeding the specified level is measured. At Manual, the preset frequency and the frequency in input allowable frequency range can be measured.

8 Meas Mode
At Burst, the burst signal width, period and carrier frequency can be measured (not related to Acquisition key setting, and change in to the manual measurement condition). Continuous wave measurement is performed at CW mode.

9 Return to Meas
Pressing this key after setting parameters, returning the counter to the normal measurement status.

10 Ext Trig Input
Measures frequency by using external timing signal

11 AUX Output
Outputs control signal of the measurement function and parameters which are set.

Specifications

● MF2400B Series

Input	Frequency range	INPUT 1 　MF2412B: 600 MHz to 20 GHz 　MF2413B: 600 MHz to 27 GHz 　MF2414B: 600 MHz to 40 GHz INPUT 2 　10 MHz to 1 GHz (50 Ω), 10 Hz to 10 MHz (1 MΩ)
	Input level range (sine wave input)	INPUT 1 　−33 to +10 dBm (<12.4 GHz), −28 to +10 dBm (<20 GHz), 　−25 to +10 dBm (<27 GHz), [−44.6 + 0.741 x frequency (GHz)] to +10 dBm (≤40 GHz) INPUT 2 　25 mVrms to 2 Vrms (50 Ω), 25 mVrms to 10 Vrms (1 MΩ)
	Impedance, coupling	INPUT 1: 50 Ω, AC couple INPUT 2: 50 Ω or ≥1 MΩ (≤35 pF), AC couple
	Connector	INPUT 1 　MF2412B: N-type, MF2413B: SMA-type, MF2414B: K-type INPUT 2: BNC-type
Gating function	Trigger mode	INT: Triggered by measurement signal EXT: Triggered by external signal 　∗Trigger level: 1.5 V ± (2 to 10 Vp-p), Trigger pulse width: ≥1 μs, Impedance: ≥100 Ω, Coupling: DC LINE: Triggered by AC line signal
	Trigger delay	20 ns to 0.1 s∗[1], off (≤320 ns in 20 ns steps, and <1 μs in 40 ns steps variable; ≥1 μs in continuously variable as effective two digits)
	Gate width	100 ns to 0.1 s (<1 μs in 20 ns steps variable; ≥1 μs in continuously variable as effective two digits
Pulse modulation wave measurement	Frequency range	MF2412B: 600 MHz to 20 GHz MF2413B: 600 MHz to 27 GHz MF2414B: 600 MHz to 40 GHz
	Pulse width	100 ns to 0.1 s (NARROW), 1 μs to 0.1 s (WIDE)
	Pulse repetition frequency	10 Hz to 4 MHz (pulse off time: ≥240 ns)
	Carrier frequency measurement∗[2]	Max. resolution: 10 kHz (pulse width: 100 ns to 1 μs), 1 kHz (pulse width: 1 to 10 μs), 　　　　　　　　100 Hz (pulse width: 10 to 100 μs), 10 Hz (pulse width: 0.1 to 1 ms), 　　　　　　　　1 Hz (pulse width: 1 to 10 ms), 0.1 Hz (pulse width: 10 to 100 ms) Measurement time: (T or T_S whichever is greater) x $\{1/(f_R \times TGW)\}^2$ ∗[3] 表: Resolution / Measurement time ∗Measurement carrier frequency: 1 GHz (TGW∗[3] = 0.1/f_R) Accuracy: ±1 count ±time base accuracy x measurement frequency ±trigger accuracy ±residual error∗[5] 　±1/TGW∗[3]
	Pulse width measurement	Resolution: 1 ns Accuracy: ±20 ns ±time base accuracy x measurement pulse width ±trigger accuracy Unit indication: μs (fixed)
	Pulse period measurement	Resolution: 1 ns Accuracy: ±20 ns ±time base accuracy x measurement period ±trigger accuracy Unit indication: μs (fixed)
Carrier wave frequency measurement	Resolution, gate time	INPUT 1 　NORMAL: 1 MHz/1 μs to 0.1 Hz/10 s 　FAST: 1 MHz/0.18 μs to 0.1 Hz/1.8 s (typical) INPUT 2 　10 MHz to 1 GHz (50 Ω): 1 MHz/1 μs to 0.1 Hz/10 s 　10 Hz to 10 MHz (1 MΩ): Shown below
	Measurement accuracy	INPUT 1 　NORMAL: ±1 count ±time base accuracy x measurement frequency ±residual error∗[4] 　FAST: ±1 count ±time base accuracy x measurement frequency ±trigger accuracy ±residual error∗[5] INPUT 2 　10 MHz to 1 GHz: ±1 count ±time base accuracy x measurement frequency 　10 Hz to 10 MHz: ±1 count ±time base accuracy x measurement frequency ±trigger accuracy

Carrier frequency measurement table:

Resolution	1 Hz	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz
Measurement time	200 s	20 s	2 s	200 ms	20 ms	5 ms	5 ms

Auto/manual measurement	Auto
	  FM tolerance: 35 MHzp-p, Acquisition time: ≤50 ms
	Manual (CW measurement)
	  Input allowable frequency range: ±30 MHz (600 MHz to 1 GHz), ±40 MHz (≥1 GHz)
	  Acquisition time: ≤15 ms
	Manual (Burst measurement)
	  Input allowable frequency range:
	    ±30 MHz (600 MHz to 1 GHz, pulse width mode: WIDE)
	    ±20 MHz (≥1 GHz, pulse width mode: NARROW)
	    ±40 MHz (≥1 GHz, pulse width mode: WIDE)
	  Acquisition time: ≤15 ms

Functions	Template: Inputs in upper/lower limit of frequency, judged on GO/NO-GO Frequency offset: +offset, −offset, ppm Statistical processing: mean, maximum, minimum, p-p Save/recall: 10 panel settings (max)
AUX output	Output for GO/NO-GO, count end, input level detection, internal gating, restart, and acquisition signal
Sample rate	1 ms to 10 s (1-2-5 steps), hold
High-speed sample period/frequency resolution	INPUT 1: 10 μs/10 kHz, 100 μs/1 kHz, 1 ms/100 Hz INPUT 2: 10 μs/100 kHz, 100 μs/10 kHz, 1 ms/1 kHz *Measurement frequency : 100 MHz
Memory back up	Store in non-volatile memory at instrument power-down
Display	Display digits: 12 digits and 1 digit (− mark) LCD: 248 x 60 dots (with back light)
Reference crystal oscillator	Frequency: 10 MHz Warm-up: ≤±5 x 10^{-8}/day (after 30 min. warm-up) Aging rate: ≤±2 x 10^{-8}/day (after 24 h warm-up) Temperature characteristics: ±5 x 10^{-8} (0˚ to 50 ˚C)
External reference input	1/2/5/10 MHz, Input voltage: 1 to 5 Vp-p (AC coupling), Input impedance: ≥1 kΩ
External reference output	1/2/5/10 MHz*6, Output voltage: ≥2 Vp-p (open end, AC coupling), Output impedance: ≤400 Ω
External control	GPIB (conforms to IEEE488.2 standards): SH1, AH1, T5, L4, SR1, RL1, PP0, DC1, DT1, C0, E2
Power	85 to 132/170 to 250 V (auto switch), 47.5 to 63 Hz, ≤80 VA
Operating temperature	0˚ to 50 ˚C
Dimensions and mass	213 (W) x 88 (H) x 350 (D) mm, ≤5 kg
EMC	EN55011: 1191, Group 1, Class A EN50082-1: 1992
Safety	EN61010-1: 1993 (Installation Category II, Pollution Degree II)

*1 Delay time until counter started by trigger detection
*2 MANUAL measurement mode
*3 f_R: frequency resolution, TGW: gate width, Ts: processing time (50 μs), T: period (2/f_R)
*4 Measurement frequency (GHz)/10 count (rms)
*5 Measurement frequency (GHz)/2 count (rms)
*6 10 MHz when using internal reference signal; outputs signal based on this signal (1/2/5/10 MHz) when using external reference signal

● Options 01/02/03: Crystal oscillator

Option number	01	02	03
Frequency	10 MHz		

Aging rate	5 x 10^{-9}/day,
	5 x 10^{-8}/month,
	7.5 x 10^{-8}/year
	*After power on, with reference to
	  frequency after 24 h
		2 x 10^{-9}/day,
		3 x 10^{-8}/month,
		4.5 x 10^{-8}/year
		*After power on, with reference to
		  frequency after 24 h
			5 x 10^{-10}/day,
			1 x 10^{-8}/month,
			1.5 x 10^{-8}/year
			*After power on, with reference to
			  frequency after 48 h

Temperature characteristics	±5 x 10^{-8}	±1.5 x 10^{-8}	±5 x 10^{-9}
	−10˚ to 60 ˚C (with reference to 25 ˚C)		

Ordering information

Please specify model/order number, name and quantity when ordering.

Model/order No.	Name	Remarks
	– Main frame –	
MF2412B	Microwave Frequency Counter	10 Hz to 20 GHz, N-J connector
MF2413B	Microwave Frequency Counter	10 Hz to 27 GHz, SMA-J connector
MF2414B	Microwave Frequency Counter	10 Hz to 40 GHz, K-J connector
	– Standard accessories –	
	Power cord, 2.5 m: 1 pc	
F0012	Fuse, 3.15 A: 2 pcs	
W1520AE	MF2412B/2413B/2414B operation manual: 1 copy	
	– Options –	
MF2412B-01	Crystal oscillator (5×10^{-9}/day)	
MF2413B-01	Crystal oscillator (5×10^{-9}/day)	
MF2414B-01	Crystal oscillator (5×10^{-9}/day)	
MF2412B-02	Crystal oscillator (2×10^{-9}/day)	
MF2413B-02	Crystal oscillator (2×10^{-9}/day)	
MF2414B-02	Crystal oscillator (2×10^{-9}/day)	
MF2412B-03	Crystal oscillator (5×10^{-10}/day)	
MF2413B-03	Crystal oscillator (5×10^{-10}/day)	
MF2414B-03	Crystal oscillator (5×10^{-10}/day)	
	– Optional accessories –	
K224[1]	Coaxial adapter (K-P•K-J, SMA compatible)	DC to 40 GHz, SWR: 1.2
34RKNF50	Coaxial adapter (ruggedized K-P•N-J)	DC to 20 GHz, SWR: 1.25
J0526	Coaxial adapter (N-J•SMA-J)	
J0527	Coaxial cord (K-P•K-P), 2 ft	
J0127A	Coaxial cord (BNC-P•RG-58A/U•BNC-P), 1 m	
J0853	Coaxial cord (N-P•SF104P•N-P), 2 m	
J0854	Coaxial cord (APC3.5-P•SF104P•APC3.5-P), 2 m	
MP612A[2]	Fuse Holder (N-P•N-J)	DC to 1 GHz
MP613A[2]	Fuse Element	DC to 1 GHz, Power rating: +17 dBm, Blow rating: ≥+35 dBm
J0007	GPIB cable, 1 m	
J0008	GPIB cable, 2 m	
B0426A	Carrying bag	Soft type
B0409	Carrying case	With B0329L protection cover
B0329L	Protection cover	
J0060	Coaxial adapter (N-J•SMA-P)	
B0390G	Rack mount kit	19 inch type, one unit
B0411A	Rack mount kit	19 inch type, two units, side by side
ERV713-H	Portable power supply	Matsushita product
J0997	Adapter	For portable power supply

∗1: The K224 adapter is used to prevent damage to the input connector.
∗2: The MF2400B series has the MP612A Fuse Holder (with MP613A Fuse Element) to prevent input of excessive power.
In addition, the MP612A Fuse Holder has an N-type connector, so an adapter is required according to the coupled connector type.

Specifications are subject to change without notice.

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