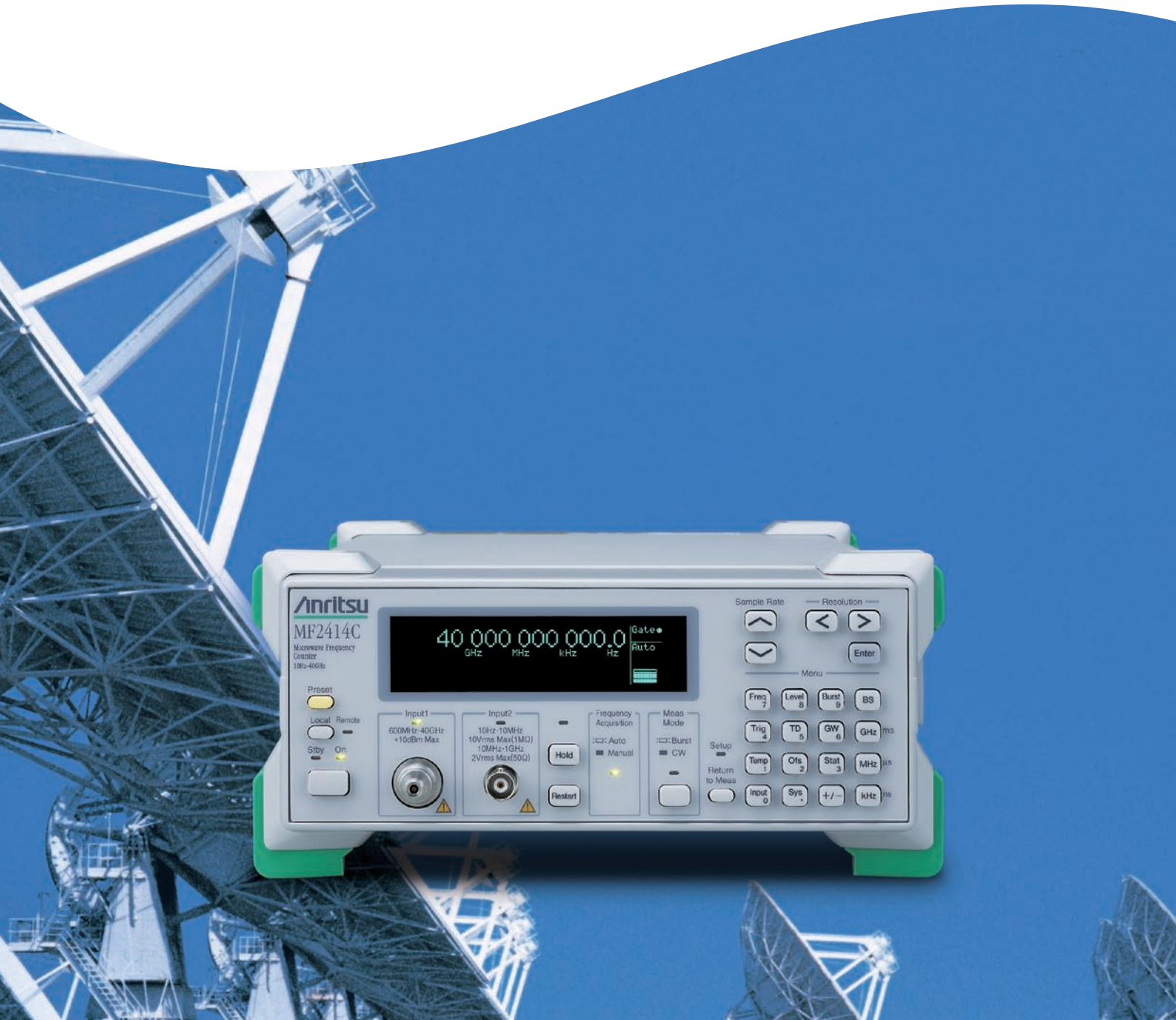
Product Brochure

Anritsu

MF2400C Series

Microwave Frequency Counter

10 Hz to 20, 27, 40 GHz



Newest Burst Wave Measurements

The MF2400C series lineup is composed of three frequency counters:
the MF2412C (20 GHz), the MF2413C (27 GHz), and the MF2414C (40 GHz).
This series is ideal for evaluating mobile radio communications devices and circuits, and can also measure the carrier frequency and pulse width of burst signals.
In addition to displaying measurement results on the 12-digit vacuum fluorescent display (VFD), frequency values can be read using the analog display function, which can be used for monitoring and is especially useful for adjusting the frequency of oscillators.
Furthermore, the template function is perfect for assessing whether or not results fall within upper and lower frequency limit specification. Because the evaluation result is output from the AUX connector on the back panel as a Go/No-go signal, an easy-to-use, automatic measurement system can be configured using the GPIB function.

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Wide Band Measurement

The lineup of three counters with upper frequency limits of 20, 27, and 40 GHz, satisfies every usage requirement. In addition, a high-frequency fuse protects the input circuit from over-power signals, and a variety of adapters is available for coupling each connector.

High-Accuracy Burst Measurement

The carrier frequency, burst width, and burst repetition rate of burst signals from 100 ns to 0.1 s input to Input 1 can be measured quickly and accurately.

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

Analog Display Function

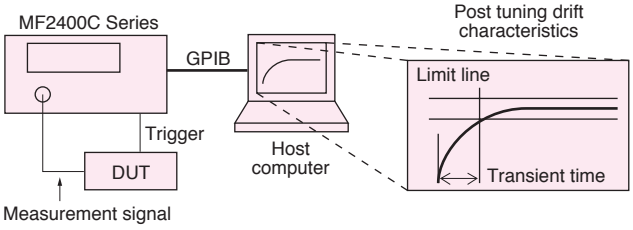
Using this function, the entire VFD becomes an analog meter and values are indicated by the meter needle. In addition to quickly grasping changes in measured frequency, this permits faster frequency adjustment and Go/No-Go evaluation of oscillators, which previously required reading of many digits. This analog meter also solves problems of misreading frequency values.

Template Function

When the upper and lower frequency limits have been preset, Go is displayed when the measured frequency is within the preset range; 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 Pass/Fail evaluation system (using analog display).

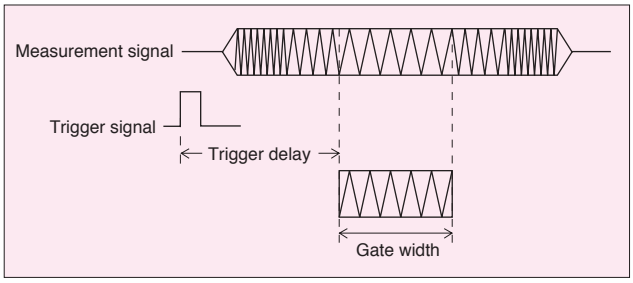
High-Speed Transient Measurement

Frequency counters have an interval (sample rate) when measurement is not performed, so sudden frequency changes during this period cannot be measured.
However, the MF2400C series overcomes problems of measuring fast transients by capturing frequency variations at speeds of up to 10 µs and saving a maximum of 2000 sampling points. Saved data can be read by a PC host using GPIB. 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 burst start, middle, and end.
In the MF2400C 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.



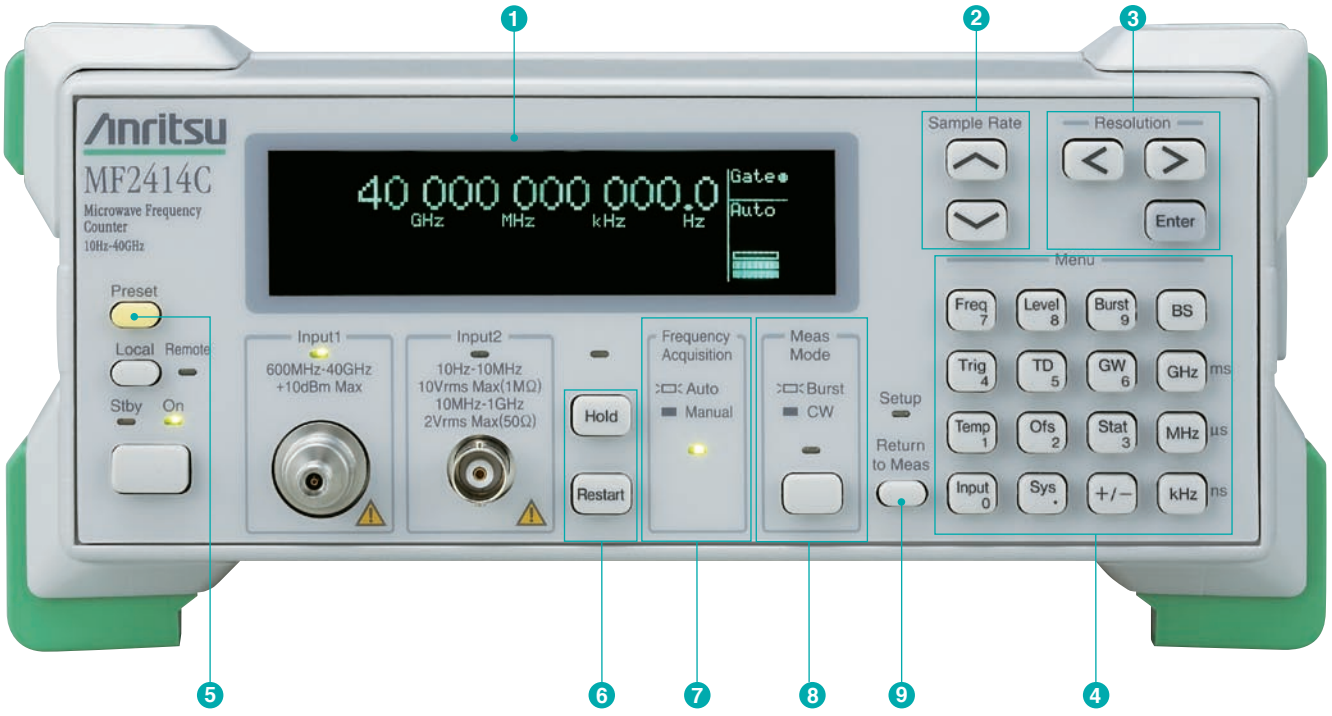
High-stability Reference Crystal Oscillator

A high-stability reference crystal oscillator is installed as standard in this counter instead of being available as an option in the previous MF2400B series.
It supports an order-of-magnitude better measurement stability than previous instruments without additional investment.

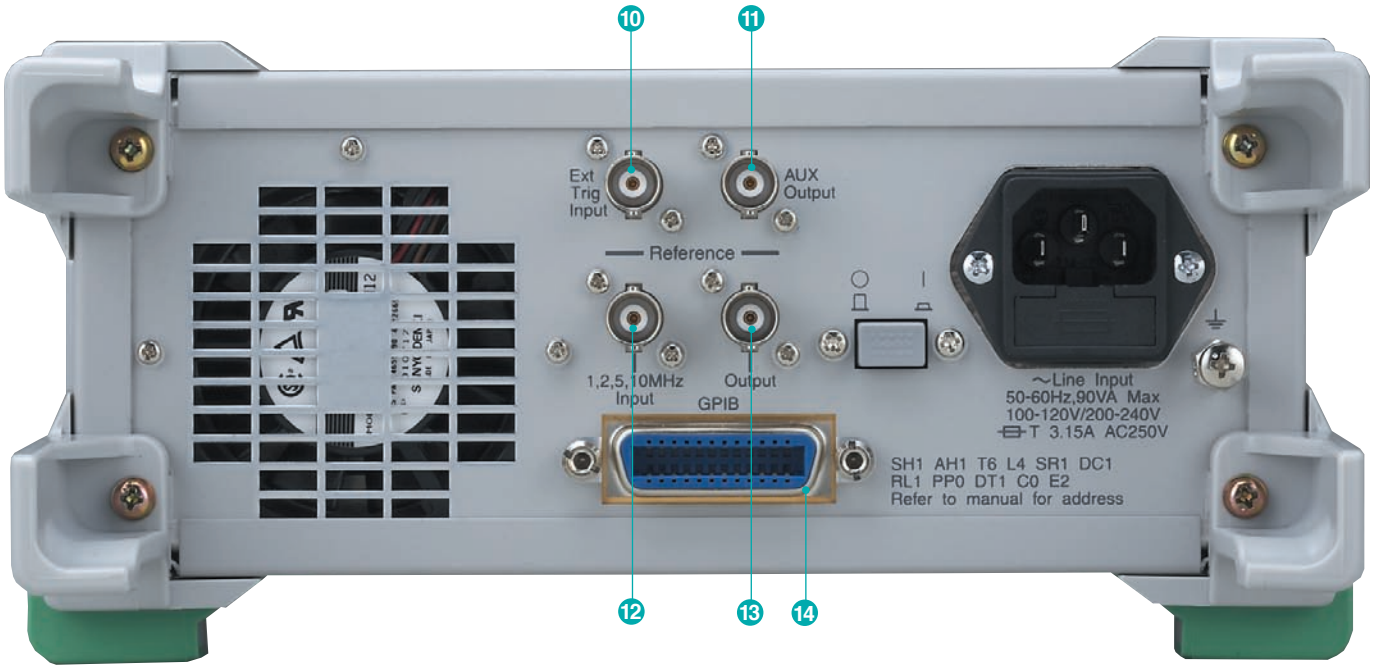
Added Save and Recall Functions

Up to 10 setups can be saved in the internal memory and freely recalled. Saving complex setups in advance, such as burst triggers and gate settings, supports immediate recall for measurement, reducing both measurement setup time and malfunctions due to setup mistakes.

Panel Layout



1. VFD display (256 x 64 dot):
   Measurement results and parameter settings displayed. Excellent visibility compared to LCD due to self-luminescent display method
2. Sample Rate:
   Sets measurement off time
3. Resolution:
   At normal measurement, the ⊲ and ⊳ keys switch the frequency measurement resolution. However, when setting parameters, the ⊲ and ⊳ keys select the setting item, which is confirmed by pressing the Enter key.
4. Menu:
   Sets measurement functions, such as frequency, level, burst, etc.
   This menu changes automatically to the parameter setting condition, and changes numeric values and units.
5. Preset:
   Returns each parameter to default setting
6. Hold, Restart:
   The Hold key holds the 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 data is measured and held.
7. Frequency Acquisition:
   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 frequency in the allowable input frequency range centered on the preset frequency is measured.
8. Meas Mode:
   At Burst, the burst signal width, period, and carrier frequency are measured (unrelated to Acquisition key setting, and change to manual measurement condition). Continuous wave measurement is performed in the CW mode.
9. Return to Meas:
   Pressing this key after setting parameters returns to the normal measurement status (measurement screen).



10 Ext Trig Input:
Measures frequency using external timing signal

11 AUX Output:
Outputs control signal for measurement function and set parameters

12 Reference Input:
Inputs external reference clock (1, 2, 5, 10 MHz)

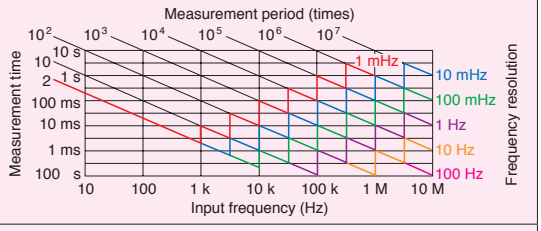
13 Reference Output:
Outputs reference clock

14 GPIB Connector:
Connects GPIB cable

Specifications

• **MF2400C Series Microwave Frequency Counter**

Input	Frequency Range	Input 1 MF2412C: 600 MHz to 20 GHz MF2413C: 600 MHz to 27 GHz MF2414C: 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 coupled Input 2: 50 Ω or ≥1 MΩ (≤35 pF), AC coupled
	Connector	Input 1 MF2412C: N-type, MF2413C: SMA-type, MF2414C: 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	MF2412C: 600 MHz to 20 GHz MF2413C: 600 MHz to 27 GHz MF2414C: 600 MHz to 40 GHz
	Pulse Width	100 ns to 0.1 s (NARROW), 1 µs to 0.1 s (WIDE)
	Pulse Repetition Cycle	340 ns to 0.1 s (pulse off time: ≥240 ns)
	Carrier Frequency Measurement*2	Max resolution: 1 kHz (pulse width: 100 ns to 1 µs), 100 Hz (pulse width: 1 to 10 µs), 10 Hz (pulse width: 10 to 100 µs), 1 Hz (pulse width: 100 µs to 1 ms), 0.1 Hz (pulse width: 1 to 100 ms) Measurement time: (T or T_S whichever is greater) x $\{1/(f_R \times T_{GW})\}^2$ *3 *Example of measurement time when measurement carrier frequency = 1 GHz, T = $2/f_R$, and $T_{GW} = 0.1f_R$ Accuracy: ±2 count ± time base accuracy x measurement frequency ± trigger accuracy ± residual error*5
	Pulse Width Measurement	Resolution: 1 ns Accuracy: ±20 ns ± time base accuracy x measurement pulse width ± trigger accuracy (time) Unit: µs (fixed)
	Pulse Period Measurement	Resolution: 1 ns Accuracy: ±20 ns ± time base accuracy x measurement period ± trigger accuracy (time) Unit: µs (fixed)
Carrier Wave Frequency Measurement	Resolution, Measurement 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 (typ.) 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): 1 MHz to 0.001 Hz Measurement time shown on right
	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



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 frequency range: ±30 MHz (600 MHz to 1 GHz), ±40 MHz (≥1 GHz) Acquisition time: ≤15 ms Manual (Burst measurement) Input 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 at upper/lower limit of frequency, judged 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 Backup	Saved in backup memory at power off
Display	Display digits: 12 digits and 1 digit (– mark) VFD: 256 x 64 dots
Reference Crystal Oscillator	Frequency: 10 MHz Warm-up: ±5 x 10^{-8}/10 minutes Aging rate: ±5 x 10^{-9}/day, ±8 x 10^{-8}/year (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 coupled), Input impedance: ≥1 kΩ
External Reference Output	1, 2, 5, 10 MHz∗6, Output voltage: ≥2 Vp-p (open end, AC coupled), Output impedance: ≤400 Ω
External Control	GPIB (conforms to IEEE488.2 standards): SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, E2
Power	100 to 120 V/200 to 240 V (auto-switching), 50 to 60 Hz, ≤90 VA≤, ≤80 VA
Operating Temperature	0° to 50°C
Dimensions and Mass	213 (W) x 88 (H) x 350 (D) mm, ≤5 kg
EMC	EN61326 EN61000-3-2
LVD	EN61010-1

∗1 Delay time until counter started by trigger detection
∗2 MANUAL measurement mode
∗3 f_R: frequency resolution, T_{GW}: gate width, Ts: processing time (50 µs), T: Pulse repetition cycle
∗4 Measurement frequency (GHz)/10 count (rms), 5 GHz Measurement example: 5/10 = 0.5 count (rms)
∗5 Measurement frequency (GHz)/2 count (rms), 5 GHz Measurement example: 5/10 = 0.5 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: Crystal Oscillator

Option Number	MF2412C-003	MF2413C-003	MF2414C-003
Frequency	10 MHz		
Aging Rate	±5 x 10^{-10}/day, ±2 x 10^{-8}/year ∗After power-on, with reference to frequency after 72 h		
Temperature Characteristics	±5 x 10^{-9} –10° to 60°C (with reference to 25°C)		

Ordering Information

Please specify the model/order number, name and quantity when ordering.
The following name of articles is an order name. The actual name may differ name from the product.

Model/Order No.	Name
	– Main frame –
MF2412C	Microwave Frequency Counter (10 Hz to 20 GHz, N-J connector)
MF2413C	Microwave Frequency Counter (10 Hz to 27 GHz, SMA-J connector)
MF2414C	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
W2897AE	MF2412C/2413C/2414C Operation Manual: 1 copy
	– Options –
MF2412C-003	Crystal Oscillator (5 x 10^{-10}/day)
MF2413C-003	Crystal Oscillator (5 x 10^{-10}/day)
MF2414C-003	Crystal Oscillator (5 x 10^{-10}/day)

∗1: The K224B Coaxial Adapter prevents damage to the input connector.
∗2: The MF2400C series has the MP612A Fuse Holder (with MP613A Fuse Element) to prevent over-power input.
In addition, the MP612A Fuse Holder has an N-type connector, so an adapter matching the coupled connector type is required.

Model/Order No.	Name
	– Optional accessories –
K224B∗1,∗3	Coaxial Adapter (K-P • K-J, SMA compatible, DC to 40 GHz, SWR: 1.2)
34RKNF50∗3	Coaxial Adapter (ruggedized K-P • N-J, DC to 20 GHz, SWR: 1.25)
J0527∗3	Coaxial Cord (K-P • K-P), 2 ft
J0127A	Coaxial Cord (BNC-P • RG-58A/U • BNC-P), 1 m
J0853∗4	Coaxial Cord (N-P • SF104P • N-P), 2 m
J0854∗5	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, Failsafe rating: ≥+35 dBm)
J0007	GPIB Cable, 1 m
J0008	GPIB Cable, 2 m
B0409	Carrying Case (With B0329L Protection Cover)
B0598A	Carrying Bag (soft type, with B0329L Protection Cover)
B0390G	Rack Mount Kit (19" type, one unit)
B0411A	Rack Mount Kit (19" type, two units, side-by-side)
B0329L	Protection Cover

∗3: MF2414C Parts
∗4: MF2412C Parts
∗5: MF2413C and MF2414C Parts

Anritsu

Specifications are subject to change without notice.

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