MFG-2000 Specifications

The specifications apply when the MFG-2000 is powered on for at least 30 minutes under +20°C~+30°C.

MFG-2000 series specific functions						
	CH1 Function With ARB	CH2 Function With ARB	25MHz Pulse Generator	RF Generator (Function With ARB)	Power Amplifier	Modulation /Sweep/Burst/ Frequency Counter
MFG-2110	●10MHz		●			
MFG-2120	●20MHz		●			
MFG-2120MA	●20MHz		●		●	●
MFG-2130M	●30MHz		●			●
MFG-2160MF	●60MHz		●	●160MHz		●
MFG-2160MR	●60MHz		●	●320MHz		●
MFG-2230M	●30MHz	●30MHz	●			●
MFG-2260M	●60MHz	●60MHz	●			●
MFG-2260MFA	●60MHz	●60MHz	●	●160MHz	●	●
MFG-2260MRA	●60MHz	●60MHz	●	●320MHz	●	●
MFG-2220HM	●200MHz	●200MHz	●			●

CH1/ CH2

Arbitrary Functions

ARB function	Built-in
Sample Rate	200 MSa/s ;MFG-2220HM:250MSa/s
Repetition Rate	100MHz ; MFG-2220HM:125MHz
Waveform Length	16k points
Amplitude Resolution	14 bits
Non-Volatile Memory	10sets 16k points(1)
User-defined output section	From point 2~16384

Frequency Characteristics

Range	Sine	60MHz (max.) ;MFG-2220HM: 200MHz(max)
	Square	25MHz(max.) ;MFG-2220HM:60MHz(max.)
	Triangle, Ramp	1MHz ;MFG-2220HM:5MHz
Resolution		1μHz
Accuracy Stability		±20 ppm
Aging		±1 ppm, per 1 year
Tolerance		≤1μHz

Output Characteristics(2)

Amplitude Range (into 50Ω)	1mVpp to 10 Vpp ; MFG-2220HM: 1mVpp to 10Vpp ≦20MHz 1mVpp to 5Vpp ≦70MHz 1mVpp to 2Vpp ≦120MHz 1mVpp to 1Vpp ≦ 200MHz
Accuracy	±2% of setting ±1 mVpp (at 1 kHz/into 50Ω without DC offset))
Resolution	0.1mV or 4 digits

	Flatness	± 1% (0.1dB) ≦1MHz ± 3% (0.3dB) ≦50 MHz ± 16% (1.5dB) ≦60MHz MFG-2220HM: ± 1% (0.1dB) ≦10MHz ± 2% (0.2dB) ≦ 60 MHz ± 4% (0.4dB) ≦ 100MHz ± 8% (0.8dB) ≦ 160MHz ± 10% (1dB) ≦ 200MHz (sinewave relative to 1 kHz/into 50Ω)
	Units	Vpp, Vrms, dBm
Offset	Range	±5 Vpk AC +DC (into 50Ω) ±10Vpk AC +DC (Open circuit)
	Accuracy	1% of setting + 5mV+ 0.5% of amplitude
Waveform Output	Impedance	50Ω typical (fixed); > 10MΩ (output disabled)
	Protection	Short-circuit protected Overload relay automatically disables main output
	Ground Isolation	42Vpk max (MFG-2220HM excluded)
Sync Output	Range	TTL-compatible into>1kΩ
	Impedance	50Ω standard
	Ground Isolation	42Vpk max (MFG-2220HM excluded)
Sine wave Characteristics(3)		
	Harmonic distortion	–60 dBc DC ~ 200kHz, Ampl>0.1 Vpp –55 dBc 200kHz ~ 1 MHz, Ampl>0.1 Vpp –45 dBc 1MHz ~ 10 MHz, Ampl > 0.1Vpp –30 dBc 10MHz ~ 320MHz, Ampl > 0.1Vpp MFG-2220HM: <–60 dBc <200kHz, <–55 dBc 200kHz ~ 1 MHz, <–45 dBc 1MHz ~ 10 MHz, <–35 dBc 10MHz ~ 30MHz, <-30 dBc 30MHz~200MHz (at 1Vpp/into 50Ω without DC offset)
	Total harmonic distortion	< 0.1% (Ampl>1Vpp) DC~100 kHz
Square wave Characteristics		
	Rise/Fall Time	<15ns ;MFG-2220HM:<6ns
	Overshoot	<5%
	Asymmetry	1% of period +5 ns
	Variable duty Cycle	0.01% to 99.99%(limited by the current frequency setting)
	Jitter	20ppm+500ps(4)
Ramp Characteristics		
	Linearity	< 0.1% of peak output
	Variable Symmetry	0% to 100%
Pulse Characteristics		
	Frequency	1uHz~25MHz
	Pulse Width	≧20nS ;MFG-2220HM ≧ 10ns (limited by the current frequency setting)

	Variable duty Cycle	0.01%~99.99%(limited by the current frequency setting)
	Overshoot	<5%
	Jitter	20ppm +500ps(4)
Pulse Generator		
	Amplitude	1mVpp to 2.5 Vpp (into 50Ω) 2mVpp to 5 Vpp (open-circuit)
	Offset	±1 Vpk ac +dc (into 50Ω) ±2Vpk ac +dc (Open circuit)
	Frequency	1uHz~25MHz
	Pulse Width	20ns~999.7ks(limited by the current frequency setting)
	Variable duty Cycle	0.1%~99.9%(limited by the current frequency setting)
	Leading and Trailing Edge Time(5)	10ns~ 20s(1ns resolution) (limited by the current frequency and pulse width settings)
	Overshoot	<5%
	Jitter	100ppm +500ps(4)
RF Generator		
Arbitrary Functions	ARB function	Built-in
	Sample Rate	200 MSa/s
	Repetition Rate	100MHz
	Waveform Length	16k points
	Amplitude Resolution	14 bits
	User-defined output section	From point 2~16384
	Jitter	20ppm +5ns
Frequency Characteristics		
	Range	Sine 1uHz~160MHz(MFG-2XXXMF) 1uHz~320MHz(MFG-2XXXMR)
		Square 25MHz(max)
		Triangle, Ramp 1MHz
	Resolution	1µHz
	Accuracy Stability	±20 ppm
	Aging	±1 ppm, per 1 year
	Tolerance	≤1µHz
Output Characteristics(2)		
	Amplitude(into 50Ω)	1mVpp to 2 Vpp (MFG-2XXXMF) 1mVpp to 1 Vpp (MFG-2XXXMR)
	Accuracy	±2% of setting ±1 mVpp (at 1 kHz/into 50Ω without DC offset))
	Resolution	0.1mV or 4 digits
	Flatness	± 1% (0.1dB) ≦1MHz ± 3% (0.3dB) ≦50 MHz ± 10% (0.9dB) ≦160MHz ± 30% (3dB) ≦320MHz (sinewave relative to 1 kHz/into 50Ω)
Offset		±1 Vpk AC +DC (into 50Ω) ±2Vpk AC +DC (Open circuit)
Waveform Output	Impedance	50Ω typical (fixed) > 10MΩ (output disabled)
Sine wave Characteristics(3)		
	Harmonic distortion	–60 dBc DC ~ 200kHz, Ampl>0.1 Vpp –55 dBc 200kHz ~ 1 MHz, Ampl>0.1 Vpp –45 dBc 1MHz ~ 10 MHz, Ampl > 0.1Vpp –30 dBc 10MHz ~ 320MHz, Ampl > 0.1Vpp

	Total harmonic distortion	< 0.1% (Ampl>1Vpp) DC~100 kHz
Square wave Characteristics		
	Rise/Fall Time	<15ns
	Overshoot	<5%
	Asymmetry	1% of period +5 ns
	Variable duty Cycle	0.01% to 99.99%(limited by the current frequency setting)
	Jitter	20ppm+500ps(4)
Ramp Characteristics		
	Linearity	< 0.1% of peak output
	Variable Symmetry	0% to 100%
Modulation/Sweep		
	Modulation Type	AM,FM,PM,FSK,PWM (The detail same as CH1 modulation specification)
	Sweep type	Frequency
	Source	INT/EXT（INT only for AM,FM,PM, PWM)
PSK		(MFG-2220HM also provided)
	Carrier Waveforms	Sine, Square, Triangle, Ramp, Pulse
	Modulating Waveforms	50% duty cycle square
	Internal Frequency	2 mHz to 1 MHz
	Phase Range	0∘~360.0∘
	Source	Internal / External
ASK		(MFG-2220HM also provided)
	Carrier Waveforms	Sine, Square, Triangle, Ramp, Pulse
	Modulating Waveforms	50% duty cycle square
	Internal Frequency	2 mHz to 1 MHz
	Amplitude Range	1mVpp to 10Vpp
	Source	Internal / External
Power Amplifier		
	Input Impedance	10KΩ
	Input voltage	1.25Vpmax
	Working Mode	Constant Voltage
	Gain	20dB
	Output Power（RL=8Ω）	20W(Square）
	Output Voltage	12.5Vpmax
	Output Current	1.6Amax
	Rise/Fall Time	<2.5uS
	Full Power Bandwidth	DC-100KHz
	Overshoot	5%
	Total harmonic distortion	< 0.1% (Ampl>1Vpp) 20Hz~20 kHz
	Ground Isolation	42Vpk max
Advanced Functions		
AM Modulation		
	Carrier Waveforms	Sine, Square, Triangle, Ramp, Pulse, Arb
	Modulating Waveforms	Sine, Square, Triangle, Upramp, Dnramp
	Modulating Frequency	2mHz to 20kHz;MFG-2220HM: 2mHz to 50kHz(Int); DC to 20kHz;MFG-2220HM: DC to 50kHz (Ext)
	Depth	0% to 120.0%
	Source	Internal / External
FM Modulation		
	Carrier Waveforms	Sine, Square, Triangle, Ramp
	Modulating Waveforms	Sine, Square, Triangle, Upramp, Dnramp

	Modulating Frequency	2mHz to 20kHz;MFG-2220HM: 2mHz to 50kHz (Int) DC to 20kHz;MFG-2220HM: DC to 50kHz (Ext)
	Peak Deviation	DC to max frequency; MFG-2220HM: DC to 0.5*max frequency
	Source	Internal / External
PM		
	Carrier Waveforms	Sine, Square, Triangle, Ramp
	Modulating Waveforms	Sine, Square, Triangle, Upramp, Dnramp
	Modulation Frequency	2mHz to 20kHz;MFG-2220HM: 2mHz to 50kHz (Int) DC to 20kHz; MFG-2220HM: DC to 50kHz (Ext)
	Phase deviation	0∘~360.0∘
	Source	Internal / External
SUM		
	Carrier Waveforms	Sine, Square, Triangle, Ramp; MFG-2220HM: Sine, Square, Triangle, Pulse ,Ramp ,Noise
	Modulating Waveforms	Sine, Square, Triangle, Upramp, Dnramp
	Modulation Frequency	2mHz to 20kHz ;MFG-2220HM: 2mHz to 50kHz (Int) DC to 20kHz; MFG-2220HM: DC to 50kHz (Ext)
	SUM depth	0%~100.0%
	Source	Internal / External
PWM		
	Carrier Waveforms	Square
	Modulating Waveforms	Sine, Square, Triangle, Upramp, Dnramp
	Modulation Frequency	2mHz to 20kHz ;MFG-2220HM: 2mHz to 50kHz (Int) DC to 20kHz; MFG-2220HM: DC to 50kHz (Ext)
	Phase deviation	0%~100.0% pulse width
	Source	Internal / External
FSK		
	Carrier Waveforms	Sine, Square, Triangle, Ramp, Pulse
	Modulating Waveforms	50% duty cycle square
	Internal Frequency	2 mHz to 1 MHz
	Frequency Range	1μHz to max frequency
	Source	Internal / External
Sweep		
	Waveforms	Sine, Square, Triangle, Ramp
	Type	Linear or Logarithmic
	Sweep direction	Sweep up or sweep down
	Start/Stop Freq	1uHz to max frequency
	Sweep Time	1ms to 500s
	Source	Internal / External
	Trigger	Single, External, Internal.
	Marker	Marker signal on falling edge (programmable)
	Source	Internal / External
Burst		
	Waveforms	Sine, Square, Triangle, Ramp
	Frequency	1uHz~Max Frequency
	Pulse count	1~1000000 Cycles or infinite
	Start/ Stop Phase	-360.0∘~+360.0∘
	Internal Frequency	1 us~500 s
	Gate source	External Trigger
	Trigger Source	Single, External, Internal.
Trigger Delay	NCycle, Infinite	0s~100 s

External Trigger Input		
	Type	For FSK, Burst, Sweep

	Input Level	TTL Compatibility
	Slope	Rising or Falling(Selectable)
	Pulse Width	>100ns
	Input Impedance	10kΩ · DC coupled
	Input Rate	DC to 1MHz
External Modulation Input		
	Type	For AM, FM, PM,SUM,PWM
	Voltage Range	±5V full scale
	Input Impedance	10kΩ
	Frequency	DC to 20kHz (MFG-2220HM:DC to 50KHz)
	Ground Isolation	42Vpk max (MFG-2220HM excluded)
Trigger Output		
	Type	For Burst, Sweep
	Level	TTL Compatible into 50Ω
	Pulse Width	>450ns ;MFG-2220HM:>100ns
	Maximum Rate	1MHz
	Fan-out	≥4 TTL Load
	Impedance	50Ω Typical
Reference Input	(MFG-2220HM only)	
	Input Voltage	0.5Vpp to 5Vpp
	Output Impedance	1kΩ,unbalanced ,AC coupled
	Input Frequency	26.8436MHz±10Hz
	Waveform	Since or Square (50±5% duty)
Reference Output	(MFG-2220HM only)	
	Output Voltage	3.3Vpp square wave
	Output Impedance	50Ω ,AC coupled
	Output Frequency	26.8436MHz
Frequency Counter		
	Range	5Hz to 150MHz
	Accuracy	Time Base accuracy±1count
	Time Base	±20ppm (23˚C ±5˚C)
	Resolution	The maximum resolution is: 100nHz for 1Hz, 0.1Hz for 100MHz.
	Input Impedance	1kΩ/1pf
	Sensitivity	35mVrms ~ 30Vms (5Hz to 150MHz)
	Ground Isolation	42Vpk max (MFG-2220HM excluded)
Dual Channel Function(CH1/CH2)		
	Phase	-180◦ ~180◦
		Synchronize phase
	Track	CH2=CH1
	Coupling	Frequency(Ratio or Difference)
		Amplitude & DC Offset
	Dsolink	√
Save/Recall		10 Groups of Setting Memories
Interface		LAN(MFG-22XX only), USB
Display		4.3'' TFT LCD 480 × 3 (RGB) × 272
General Specifications		
	Power Source	AC100~240V, 50~60Hz or AC100~120V, AC220~240V, 50~60Hz; MFG-2220HM: AC100~240V, 50~60Hz
	Power Consumption	30W or 80W(With power amplifier) ;MFG-2220HM:35W

Operating Environment	Temperature to satisfy the specification : 18 ~ 28˚C Operating temperature : 0 ~ 40˚C Relative Humidity: ≤ 80%, 0 ~ 40˚C ≤ 70%, 35 ~ 40˚C Installation category： CAT II
Operating Altitude	2000 Meters
Pollution Degree	IEC 61010 degree 2, Indoor use
Storage Temperature	-10~70˚C, Humidity: ≤70%
Dimensions (WxHxD)	266(W) x 107(H) x 293(D) mm
Weight	Approx. 2.5kg
Safety designed to	EN61010-1
Accessories	GTL-101× 1(MFG-21XX) GTL-101× 2(MFG-22XX) GTL-110× 2(MFG-2220HM) Quick Start Guide ×1 CD (user manual + software) ×1 Power cord×1

(1). A total of ten waveforms can be stored. (Every waveform can be composed of a maximum of 16k points.)

(2). Add 1⁄10th of output amplitude and offset specification per ºC for operation outside of 0ºC to 28ºC range (1-year specification).

(3). DC offset set to zero,

(4). Jitter specification for RF Generator: 20ppm +5ns.

(5).Only Pulse channel support