

# WW5064/1074/2074

## 50MS/s, 100MS/s or 200MS/s Four Channel Arbitrary Waveform Generators

### Specification

#### CONFIGURATION

Output Channels 4, semi-independent

#### STANDARD WAVEFORMS

Waveforms: Sine, Triangle, Square, Pulse, Ramp, Sine(x)/x, Gaussian, Exponential, Repetitive Noise and DC

#### Frequency Range:

Sine	100µHz to 25MHz (WW5064) 100µHz to 50MHz (WW1074) 100µHz to 80MHz (WW2074)
Square, Pulse	100µHz to 12.5MHz (WW5064) 100µHz to 25MHz (WW1074) 100µHz to 50MHz (WW2074)
All others	100µHz to 6.25MHz (WW5064) 100µHz to 12.5MHz (WW1074) 100µHz to 25MHz (WW2074)

#### SINE

Start Phase: 0-360°  
Phase Resolution: 0.01°  
Harmonics Distortion, 3Vp-p (typ.):  
DC to 2.5MHz <-55dBc  
2.5MHz to 25MHz <-50dBc  
25MHz to 40MHz <-40dBc  
40MHz to 80MHz <-35dBc

Non-Harmonic Distortion:  
DC to 50MHz <-70dBc  
50MHz to 80MHz <-65dBc

Total Harmonic Distortion:  
DC to 100kHz 0.1%

Flatness (1kHz)(typical):  
DC to 1MHz 1%  
1MHz to 10MHz 3%  
10MHz to 25MHz 5%  
25MHz to 80MHz 10%

Phase Noise (8 points Sine, Max. SCLK)  
100Hz Offset -80dBc/Hz  
1kHz Offset -89dBc/Hz  
10kHz Offset -92dBc/Hz  
100kHz Offset -112dBc/Hz  
1MHz Offset -140dBc/Hz

#### TRIANGLE

Start Phase Range: 0-360°  
Phase Resolution: 0.01°  
Timing Ranges: 0%-99.9% of period

#### SQUARE

Duty Cycle Range: 0% to 99.9%  
Timing Ranges: 0%-99.9% of period  
Rise/Fall Time: <4ns (typ.)  
Aberration: <5%+10mV

#### SINC (Sine(x)/x)

"0 Crossings": 4-100

#### GAUSSIAN

Time Constant: 10-200

#### EXPONENTIAL PULSE

Time Constant: -100 to 100

#### DC

Range: -5V to 5V

#### PULSE

Pulse Mode: Single or double, programmable  
Polarity: Normal, inverted or complement  
Period:  
WW5064 80ns to 1000s  
WW1074 40ns to 1000s  
WW2074 20ns to 1000s

Resolution:  
WW5064 20ns  
WW1074 10ns  
WW2074 5ns

Pulse Width:  
WW5064 40ns to 1000s  
WW1074 20ns to 1000s  
WW2074 10ns to 1000s

Rise/Fall Time:  
Fast  
<4ns, typ. (WW5064)  
<6ns, typ. (WW1074)  
<8ns, typ. (WW2074)  
Linear  
20ns to 1000s (WW5064)  
10ns to 1000s (WW1074)  
5ns to 1000s (WW2074)

High Time, Delay & Double Pulse Delay:  
20ns to 1000s (WW5064)  
10ns to 1000s (WW1074)  
5ns to 1000s (WW2074)

Impedance: 50Ω  
Amplitude Window: 10mVp-p to 10Vp-p<sup>(1)</sup>  
Low Level -5V to +4.995V<sup>(1)</sup>  
High Level -4.995V to +5V<sup>(1)</sup>  
(1) Double into high impedance

#### NOTES:

- All pulse parameters, except rise and fall times, may be freely programmed within the selected pulse period provided that the ratio between the period and the smallest incremental unit does not exceed the ratio of 1,000,000 to 1. With the 2M/4M option, the ratio is extended to 2,000,000 (4,000,000) to 1, hence the specifications below do not show maximum limit as each must be computed from the above relationship.
- Rise and fall times, may be freely programmed provided that the ratio between the rise/fall time and the smallest incremental unit does not exceed the ratio of 100,000 to 1.
- The sum of all pulse parameters must not exceed the pulse period setting

#### HALF-CYCLE WAVEFORMS

Function Shape: Sine, Triangle, Square  
Frequency Range: 0.01Hz to 1MHz  
Phase (Sine/triangle): 0 to 360°  
Phase Resolution: 0.01°  
Duty Cycle Range: 0% to 99.9%  
Run Modes: Continuous, Triggered  
Delay Between Half Cycles (Continuous only): 200ns to 20s  
Delay Resolution 20ns

#### ARBITRARY WAVEFORMS

Sample Rate:  
WW5064 1.5S/s to 50MS/s  
WW1074 1.5S/s to 100MS/s  
WW2074 1.5S/s to 200MS/s  
Vertical Resolution: 16 Bits  
Waveform Memory:  
WW5064 512k points (1M optional)  
WW1074/WW2074 1M points (2M/4M optional)  
Min. Segment Size: 16 points  
Resolution: 4 points  
No. of Segments: 1 to 10k

#### SEQUENCED WAVEFORMS

Operation: Segments may be linked and repeated in a user-selectable order to generate extremely long waveforms. Segments are advanced using either a command or a trigger  
Multi Sequence: 1 to 10, Selectable  
Sequencer Steps: 1 to 4k  
Segment Duration: 600ns min.  
Segment Loops: 1 to 1M

#### ADVANCE MODES

Automatic: No triggers required to step from one segment to the next. Sequence is repeated continuously through a pre-programmed sequence table  
Stepped: Current segment is sampled continuously, external trigger advances to next programmed segment.  
Single: Current segment is sampled to the end of the segment including repeats and idles there. Next trigger advances to next segment  
Mixed: Each step of a sequence can be programmed to advance either: a) automatic (Automatic mode), or b) with a trigger (Stepped mode)  
Advance Source: External (TRIG IN), Internal or software

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#### COMMON CHARACTERISTICS

##### FREQUENCY

<b>Resolution:</b>	
Display	11 digits (limited by 1μHz)
Remote	14 digits (limited by 1μHz)
<b>Accuracy/Stability:</b>	Same as reference

##### ACCURACY REFERENCE CLOCK

<b>Internal</b>	0.0001% (1 ppm TCXO) initial tolerance over a 19°C to 29°C temperature range; 1ppm/°C below 19°C and above 29°C; 1ppm/year aging rate
<b>External</b>	10MHz TTL, 50% ±2%, or 50Ω ±5% 0dBm (jumper)

##### AMPLITUDE

<b>Range:</b>	10mV to 10Vp-p into 50Ω; Double into open circuit
<b>Resolution:</b>	4 digits
<b>Accuracy (1kHz):</b>	
16mV to 160mVp-p	±(1% + 5mV)
160mV to 1.6Vp-p	±(1% + 10mV)
1.6V to 10Vp-p	±(1% + 70mV)

##### OFFSET

<b>Range:</b>	0 to ±4.995V, into 50Ω
<b>Resolution:</b>	1mV
<b>Accuracy:</b>	±(1%+1% of Amplitude +5mV)

##### FILTERS

<b>Type:</b>	
Bessel	25MHz or 50MHz
Elliptic	60MHz or 120MHz

##### OUTPUTS

###### MAIN OUTPUT

<b>Coupling:</b>	DC coupled
<b>Connector:</b>	Front panel BNC
<b>Impedance:</b>	50Ω ±1%
<b>Protection:</b>	Short Circuit to Case Ground, 10s max

###### SYNC OUTPUT

<b>Connector:</b>	Rear panel BNC
<b>Level:</b>	TTL
<b>Sync Type:</b>	
Pulse	Arbitrary and Standard waves
LCOM	Sequence and Burst modes
<b>Position:</b>	
WW5064	0 to 512k (1M optional)
WW1074/2074	0 to 1M (2M or 4M optional)
<b>Resolution:</b>	4 points

#### SAMPLE CLOCK OUTPUT

<b>Connector:</b>	Rear panel SMB
<b>Level:</b>	400mVp-p
<b>Impedance:</b>	50Ω

#### COUPLE OUTPUT

<b>Connector:</b>	Rear panel SMB
<b>Level:</b>	LVPECL
<b>Impedance:</b>	50Ω, terminated to +1.3V

#### INPUTS

##### TRIGGER INPUT

<b>Connector:</b>	Rear panel BNC
<b>Input Impedance:</b>	10kΩ
<b>Polarity:</b>	Positive or negative, selectable
<b>Level:</b>	±5V
<b>Sensitivity:</b>	100mV
<b>Damage Level:</b>	±12V
<b>Min. Pulse Width:</b>	10ns

##### EXTERNAL REFERENCE INPUT

<b>Connector:</b>	Rear panel SMB
<b>Frequency:</b>	10MHz
<b>Impedance &amp; Level:</b>	
Default	10kΩ ±5%, TTL, 50% ±2%
Option	50Ω ±5%, 0dBm Sinewave

#### SAMPLE CLOCK INPUT

<b>Connector:</b>	Rear panel SMB
<b>Range:</b>	
WW5064	1.5Hz to 50MHz
WW1074	1.5Hz to 100MHz
WW2074	1.5Hz to 200MHz
<b>Input Level:</b>	300mVp-p to 1Vp-p
<b>Impedance:</b>	50kΩ
<b>Min. Pulse Width:</b>	4 ns

#### COUPLE INPUT

<b>Connector:</b>	Rear panel SMB
<b>Input Level:</b>	LVPECL
<b>Impedance:</b>	50Ω, terminated to +1.3V
<b>Min. Pulse Width:</b>	4 ns

#### RUN MODES

<b>Continuous:</b>	Free-run output of a waveform.
<b>Triggered:</b>	Upon trigger, outputs one waveform cycle. Last cycle always completed.
<b>Gated:</b>	External signal transition enables or disables generator output. Last cycle always completed
<b>Burst:</b>	Upon trigger, outputs a Dual or multiple pre-programmed number of waveform cycles from 1 through 1M.

<b>Mixed:</b>	First output cycle is initiated by a software trigger. Consequent output requires external triggers through the rear panel TRIG IN
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#### TRIGGER CHARACTERISTICS

<b>System Delay:</b>	6 SCLK + 150ns
<b>Trigger Delay:</b>	[[0; 200ns to 20s]+system delay]
<b>Trigger Resolution:</b>	20ns
<b>Trigger Delay Error:</b>	6 SCLK + 150ns

#### EXTERNAL

<b>Source:</b>	Rear panel BNC
<b>Trigger Level:</b>	±5V
<b>Resolution:</b>	1mV
<b>Input Frequency:</b>	DC to 2.5MHz
<b>Min. Pulse Width:</b>	10ns
<b>Slope:</b>	Positive/Negative, selectable
<b>Trigger Jitter:</b>	±1 sample clock period

#### INTERNAL / TIMER

<b>Range:</b>	200ns to 20s
<b>Resolution:</b>	20ns
<b>Error:</b>	3 sample clock cycles+20ns

#### MANUAL

<b>Source:</b>	Soft trigger command from the front panel or remote
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#### FREQUENCY COUNTER / TIMER

<b>Measurements:</b>	Frequency, Period, Averaged Period, Pulse Width & Totalize
<b>Source:</b>	Trigger Input
<b>Range:</b>	10Hz to 100MHz (typ.120MHz)
<b>Sensitivity:</b>	500mVpp
<b>Accuracy:</b>	1ppm
<b>Slope:</b>	Positive/Negative transitions
<b>Gate Time:</b>	100μSec to 1 Sec
<b>Input Range:</b>	±5V
<b>Trigger Modes:</b>	Continuous, Hold and Gated
<b>Period Averaged:</b>	
Range	10ns to 50ms
Resolution	7 digits / Sec
<b>Period and Pulse Width:</b>	
Range	500ns to 50ms
Resolution	100ns
<b>Totalize:</b>	
Range	10 <sup>12</sup> -1
Overflow	Led indication

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### Specification

#### INTER-CHANNEL DEPENDENCY

<b>Separate controls:</b>	Output on/off, amplitude, offset, standard waveforms, user waveforms, user waveform size, sequence table
<b>Common Controls:</b>	Sample clock (Arb), frequency (Std), period (Pulse) reference source, trigger modes, trigger advance source, SYNC OUT.

#### PHASE OFFSET (LEADING EDGE)

<b>DESCRIPTION:</b>	Channel 1 used as start reference channel 2, 3 and 4 can be offset by a programmable number of points. Channels 3&4 must have the same duration in one of the following run modes: Triggered, Burst, or gated.
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<b>Jitter Between Channels:</b>	Ops
<b>Offset Range:</b>	
WW5064	0 to ±512k points (1M opt.)
WW1074/WW2074	0 to ±1M points (2M/4M opt.)
<b>Reference:</b>	Each CH. in reference to CH 1
<b>Resolution and Accuracy:</b>	
Channels 1/2	1 point
Channels 3/4	4 points
<b>Initial Skew:</b>	<1ns
<b>Error</b>	1 SCLK

#### MULTI-INSTRUMENT SYNCHRONIZATION

<b>Initial Skew:</b>	<25 ns + 1 SCLK
<b>Waveform Types:</b>	Standard, Arbitrary and Sequenced using the automatic sequence advance mode only
<b>Run Modes:</b>	Continuous, Triggered, Gated and Counted Burst

#### LEADING EDGE OFFSET

<b>Run Mode:</b>	Continuous run mode only
<b>Offset Range:</b>	200ns to 20s
<b>Resolution:</b>	20ns

#### GENERAL

<b>Voltage Range:</b>	85 to 265V
<b>Frequency Range:</b>	48 to 63Hz
<b>Power Consumption:</b>	60W
<b>Display Type:</b>	Color LCD, back-lit
<b>Size</b>	3.8" reflective
<b>Resolution</b>	320 x 240 pixels,
<b>Interfaces:</b>	
USB Device	1 x rear, USB device, (A type)
LAN	100/10 BASE-T
GPIO	IEEE 488.2 standard interface
<b>Dimensions:</b>	
With Feet	212 x 102 x 415mm (WxHxD)
Without Feet	212 x 88 x 415mm (WxHxD)
<b>Weight:</b>	
Without Package	3.5Kg
Shipping Weight	4Kg
<b>Temperature:</b>	
Operating	0°C - 50°C
Storage	-40°C to + 70°C.
<b>Humidity:</b>	
11°C - 30°C	85%
31°C - 40°C	75%
41°C - 50°C	45%
<b>Safety:</b>	EN61010-1, 2nd revision
<b>Calibration:</b>	1 year
<b>Warranty <sup>(1)</sup>:</b>	5 years standard

#### ORDERING INFORMATION

MODEL	DESCRIPTION
WW5064	50MS/s Four Channel Arbitrary Waveform Generator
WW1074	100MS/s Four Channel Arbitrary Waveform Generator
WW2074	200MS/s Four Channel Arbitrary Waveform Generator

#### OPTIONS

<b>WW5064:</b>	
<b>Option 1:</b>	1M Memory (per channel)
<b>WW1074/WW2074:</b>	
<b>Option 1:</b>	2M Memory (per channel)
<b>Option 2:</b>	4M Memory (per channel)

#### ACCESSORIES

<b>Sync Cable:</b>	Multi-instrument synchronization
<b>S-Rack Mount:</b>	19" Single Rack Mounting Kit
<b>D-Rack Mount:</b>	19" Dual Rack Mounting Kit
<b>Case Kit:</b>	Professional Carrying Bag

<b>Note:</b>	Options and Accessories must be specified at the time of your purchase.
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<sup>(1)</sup> Standard warranty in India is 1 year.