■ Specifications

▼ Waveform and Oscillation Mode

Output waveforms	Sine, square, pulse, ramp, and parameter-variable waveforms (25 types), noise (Gaussian distribution), DC, and arbitrary waveform
Oscillation modes	Continuous, modulation, sweep, burst, and sequence

▼ Frequency and Phase

Frequency setting range

Oscillation mode / Waveform	Continuous, modulation, and sweep (continuous/single-shot)	Sweep (gated single-shot) and burst	Sequence
Sine	0.01 μHz to 30 MHz	0.01 μHz to 10 MHz	0.01 μHz to 10 MHz
Square	0.01 μHz to 15 MHz	0.01 μHz to 10 MHz	0.01 μHz to 10 MHz
Pulse	0.01 μHz to 15 MHz	0.01 μHz to 10 MHz	not avaiable
Ramp	0.01 μHz to 5 MHz		0.01 μHz to 5 MHz[2]
Parameter-variable	0.01 μHz to 5 MHz		0.01 μHz to 5 MHz[2]
Noise	The equivalent bandwidth is fixed to 26 MHz.		
DC	Frequency setting invalid		
Arbitrary	0.01 μHz to 5 MHz		

Frequency setting resolution	0.01 μHz
Frequency accuracy[1]	±(3 ppm of setting + 2 pHz), aging rate[1]: ±1 ppm/year
Phase setting range	−1800.000° to +1800.000°

▼ Output Characteristics

Amplitude	Setting range	0 Vp-p to 20 Vp-p/open, 0 Vp-p to 10 Vp-p/50 Ω AC+DC ≤ ±10 V/open
	Setting resolution	999.9 mVp-p or less: 4-digit/0.1 mVp-p 1 Vp-p or greater: 5-digit/1 mVp-p
	Accuracy[1][3]	±(1% of amplitude setting [Vp-p] + 2 mVp-p)/open
	Setting unit	Vp-p, Vpk, Vrms, dBV, and dBm
	Resolution of waveform amplitude	Approx. 14 bits (36 mVp-p/open or greater)
DC offset	Setting range	±10 V/open, ±5 V/50 Ω
	Setting resolution	499.9 mV or less: 4-digit/0.1 mV, ±0.5 V or greater: 5-digit/1 mV
	Accuracy[1]	±(|1% of DC offset setting [V]| + 5 mV + 0.5% of amplitude setting [Vp-p])/open (20°C to 30°C when outputting sine waves of 10 MHz or less)
Output impedance		50 Ω unbalanced
Synchronous/ sub output		Sync signals: TTL level Internal modulation signal: −3 V to +3 V/open Sweep X drive: 0 V to +3 V/open

▼ Signal Characteristics

Sine wave	Amplitude frequency characteristics[1]	Up to 100 kHz : 0.1 dB 100 kHz to 5 MHz : 0.15 dB 5 MHz to 20 MHz : 0.3 dB 20 MHz to 30 MHz : 0.5 dB (±0.8 dB at 2.8 Vp-p/50 Ω or greater) (50 mVp-p to 10 Vp-p/50 Ω ,1 kHz reference)	
	Total harmonic distortion[1]	10 Hz to 20 kHz : 0.2% or less (0.5 Vp-p to 10 Vp-p/50 Ω)	
	Harmonic spurious[1]		0.5 Vp-p to 2 Vp-p/50 Ω | 2 Vp-p to 10 Vp-p/50 Ω
		to 1 MHz	−60 dBc or less | −60 dBc or less
		1 MHz to 10 MHz	−50 dBc or less | −43 dBc or less
		10 MHz to 30 MHz	−40 dBc or less | −30 dBc or less
	Non-harmonic spurious[1]	to 1 MHz −60 dBc or less 1 MHz to 10 MHz −50 dBc or less 10 MHz to 30 MHz −45 dBc or less	(0.5 Vp-p to 10 Vp-p/ 50 Ω)
Square wave	Duty variable	Standard: Setting range: 0.0100% to 99.9900% Upper limit (%): 100 − frequency (kHz)/300 Lower limit (%): frequency (kHz)/300 Jitter: 300 ps rms or less typ. Extended: Setting range: 0.0000% to 100.0000% Jitter: 2.5 ns rms or less typ.	
	Rising/falling time[1]	17 ns or less	
	Overshoot	5% or less typ.	
Pulse wave	Pulse width	Duty setting range: 0.0170% to 99.9830% Time setting range: 25.50 ns to 99.9830 Ms	
	Rising/falling time	Setting range 15.0 ns to 58.8 Ms (3-digit/0.1 ns) Rising/falling time independently set The minimum setting value is 0.01% of period or 15 ns, whichever is larger.	
	Overshoot	5% or less typ.	
Ramp wave		Symmetry setting range: 0.00% to 100.00%	
Parameter-variable waveforms / Waveform types and names	Function	5% or less typ.	
	Steady sine wave group	Unbalanced sine, clipped sine, CF controlled sine, conduction angle controlled sine, staircase sine, and multi-cycle sine waves	
	Transient sine wave group	On-phase controlled sine, off-phase controlled sine, chattering-on sine, and chattering-off sine waves	
	Pulse waveform group	Gaussian pulse, Lorentz pulse, Haversine, half-sine pulse, trapezoid pulse, and Sin (x)/x	
	Transient response waveform group	Exponential rise, exponential fall, 2nd order LPF step response, and damped oscillation	
	Surge waveform group	Oscillation surge and pulse surge	
	Others group	Trapezoid with offset, half-sine edge pulse, and bottom referenced ramp waves	

▼ Arbitrary waveform

Waveform length	4 K to 512 K words (2^n, n=12 to 19) or the number of control points is 2 to 10,000 (Control points are linearly interpolated.)
Total of waveform saving capacity	Up to 128 waves or 4 M words (total of channels 1 and 2), saved in the nonvolatile memory.
Resolution	16 bits
Sampling rate	120 MS/s

▼ Modulation

Internal modulation	Modulation waveforms	Other than FSK and PSK: Sine, square (duty of 50%), triangle (symmetry of 50%), rising ramp, falling ramp, noise, arbitrary waveforms FSK and PSK: Square (duty of 50%)
	Modulation frequency	Other than FSK and PSK: 0.1 mHz to 100 kHz (5-digit/0.1 mHz) FSK and PSK: 0.1 mHz to 1 MHz (5-digit/0.1 mHz)
External modulation	Input voltage range	±1 V full scale (other than FSK and PSK)
	Input impedance	10 kΩ, unbalanced (other than FSK and PSK)
	Input frequency	DC to 25 kHz (other than FSK and PSK) DC to 1 MHz (FSK and PSK)
Modulation types and conditions	FM	Carrier waveform: Arbitrary waveform and standard waveform other than noise, pulse, and DC Peak deviation: 0.00 μHz to less than 15 MHz
	FSK	Carrier waveform: Arbitrary waveform and standard waveform other than noise, pulse, and DC Hop frequency: Within the frequency settable range for each carrier waveform
	PM	Carrier waveform: Arbitrary waveform and standard waveform other than noise and DC Peak deviation : 0.000° to 180.000°
	PSK	Carrier waveform: Arbitrary waveform and standard waveform other than noise and DC Deviation: −1800.000° to +1800.000°
	AM	Carrier waveform: Arbitrary waveform and standard waveform other than DC Modulation depth: 0.0% to 100.0% (DSB-SC and non-DSB-SC supported)
	DC offset modulation	Carrier waveform: Standard waveform and arbitrary waveform Peak deviation: 0 V to 10 V/open
	PWM	Carrier waveform: Square wave and pulse wave Peak deviation: Square wave of normal duty variable range: 0.0000% to 49.9900%, Square wave of extended duty variable range: 0.0000% to 50.0000%, Pulse: 0.0000% to 49.9000%

▼ Sweep

Sweep types	Frequency, phase, amplitude, DC offset, and duty
Sweep functions	One-way (ramp wave shape)/shuttle (triangle wave shape) selectable Linear/logarithmic selectable (only when sweeping the frequency)
Sweep range setting	The start and stop values or the center and span values are specified.
Sweep time setting range	0.1 ms to 10,000 s (4-digit/0.1 ms)
Sweep modes	Continuous/single-shot/gated single-shot selectable Oscillation only occurs during sweep execution in the gated single-shot mode.
Trigger source	Internal/external selectable
Internal trigger oscillator	Period setting range: 100.0 μs to 10,000 s (5-digit/0.1 s)
Stop level setting	The signal level while oscillation is stopped in the gated single-shot sweep mode is specified. Setting range: −100.00% to +100.00% (with reference to the full scale of amplitude) or off
Sweep input/output	Sweep sync/marker output, sweep X drive output, sweep external control input, and sweep external trigger input

▼ Burst/Trigger/Gate

Burst modes	Auto burst, trigger burst, gate, and triggered gate modes (The gate is turned on/off at each trigger in the triggered gate mode.)
Number of mark/space waves	0.5 to 999,999.5 cycles, in 0.5-cycle units
Number of oscillation waves in the gate mode	1 cycle/0.5 cycles selectable
Phase setting range	−1800.000° to +1800.000°
Stop level	The signal level while oscillation is stopped is specified. Setting range: −100.00% to +100.00% Oscillation stops at the set oscillation start/stop phase when the stop level is set to off.
Trigger source	Internal/external selectable, manual trigger allowed
Internal trigger oscillator	1.0 μs to 1,000 s (5-digit/0.1 μs)
Trigger delay	0.00 μs to 100.00 s (5-digit/0.01 μs) Except for latent delay. Valid in the trigger burst mode only.
External trigger input	TTL level Input impedance 10 kΩ (pulled up to +3.3 V) Unbalanced
Manual trigger	Panel key operation

▼ Sequence

Step control parameters	Step time, hold operation, jump destination, number of jumps, step stop phase, branch operation, step termination control, and step sync code output
Channel parameters in step	Waveform, frequency, phase, amplitude, DC offset, and square wave duty
Available waveforms	• Sine, square, noise, DC, and arbitrary waveforms • The ramp and parameter-variable waveforms can be used after being saved as arbitrary waveform.
Max. number of usable waveforms	128
Number of saved sequences	10 sequences (saved in the nonvolatile memory)
Number of steps	Up to 255 steps per sequence
Step time	0.1 ms to 1,000 s (4-digit/0.01 ms)
Operation in step	Constant, keep, and linear interpolation (except for waveform switching)
Number of jumps	1 to 999 or unlimited
Branch operation	Branched to the specified step when the branch signal is input.

▼ 2-channel Ganged Operation (WF1974 only)

Channel modes	Two channels independent, two phases (same frequency), constant frequency difference, constant frequency ratio, and differential output (same frequency, amplitude, DC offset, reversed waveform)
Equivalent setting, same operation	Set two channels at the same time.
Frequency difference setting range	0.00 μHz to less than 30 MHz (resolution: 0.01 μHz) CH2 frequency − CH1 frequency
Frequency ratio N:M setting range	1 to 9,999,999 (for N and M, respectively) N:M = CH2 frequency:CH1 frequency
Phase synchronization	Function to restart from the phase where the output waveforms for all the channels are set, automatic execution at channel mode switching

▼ Other Functions

External 10 MHz frequency reference input		Input voltage: 0.5 Vp-p to 5 Vp-p, sine or square waves
Frequency reference output		For synchronization when more than one WF1973 and/or WF1974 are used. Output voltage: 1 Vp-p/50 Ω,square wave, 10 MHz
External addition input	Function	Function to add the external signal to the waveform output signal
	Addition gain	×2/×10/off selectable The maximum output voltage range is fixed to 4 Vp-p (×2) or 20 Vp-p (×10).
	Input voltage/ input frequency	−1 V to +1 V DC to 10 MHz (−3 dB)
	Input impedance	10 kΩ, unbalanced
Multi input/output		Used for sweep and sequence control
Synchronization of multiple units		Sync operation is possible. Up to 6 units can be connected with BNC cables in the form of master/slave connections, using the frequency reference output and external 10 MHz frequency reference input.
User-defined unit	Function	Sets and displays the value in any unit, using a specified conversion expression.
	Setting target	Frequency, period, amplitude, DC offset, phase, and duty
	Conversion expression	[(setting target value)+n]×m or [$\log_{10}$ (setting target value)+n]×m The conversion expression, n and m are to be specified.
	Unit character string	Up to four characters
Memory to save setting		10 settings can be memorized (saved in the nonvolatile memory).
Interface		GPIB and USBTMC (SCPI-1999 and IEEE-488.2)

▼ General Characteristics

Display	3.5" TFT color LCD
Input/output ground	• The signal grounds for waveform output, sync/sub output and external modulation/addition input are insulated from the housing. (These signal grounds are common within the same channel.) • The signal ground for external 10 MHz frequency reference input is insulated from the housing. • Each signal ground for CH1, CH2 and external 10 MHz frequency reference input is independent.
Power supply	AC100 V to 230 V ±10% (250 V max.) 50 Hz/60 Hz ±2 Hz
Power consumption	WF1973: 50 VA max. WF1974: 75 VA max.
Operation temperature/ humidity range	0°C to +40°C, 5%RH to 85%RH (Absolute humidity: 1 g/m³ to 25 g/m³, no condensation)
Weight	Approx. 2.1 kg (main unit excluding accessories)
Safety and EMC	Safety: EN 61010-1: 2010 EMC: EN 61326-1: 2013

• Unless otherwise specified, the value assumes the following conditions: continuous oscillation, load of 50 Ω, oscillation setting of 10 Vp-p/50 , DC offset setting of 0 V, auto range, waveform amplitude range of FS, external addition turned off; the AC voltage is the rms value.
[1]: Guaranteed numerical value. Other numerical values are nominal or typical (typ.) values.
[2]: Used after converted into arbitrary waveform
[3]: Conditions: 1 kHz Sine, Amplitude 20 mVp-p or greater/open

▼ Sequence Editor

Editing functions	• Initializes, copies, pastes, inserts, and deletes steps • Saves and reads sequence data to/from a file • Sequence can be edited without connecting the device.
Display functions	• Editing screen: Lists parameters for each step. • Sequence view screen: Graphs changes of up to five parameters.
Transfer functions	• Transfers and reads sequence data to/from the device. • Transfers to the device the arbitrary waveform used in the sequence.
Device control functions	• Output on/off • Starts, stops, and holds the sequence. • Can monitor the execution status of sequence.
Operating environment	• PC that can display 1024 × 768 (pixels) × 256 colors • Microsoft Windows10 (32bit/64bit) • USB interface • NI-VISA from National Instruments • USB driver (required)

▼ Arbitrary Waveform Editor

Editing functions	• Generation (standard waveform and a mathematical expression) • Interpolation (straight line, spline, and continuous spline) • Math operation (addition, subtraction, multiplication, and division of waveform) • Contraction and extension (vertical and horizontal directions) • Cuts, copies, and pastes some part of waveform • Undo function • Saves and reads arbitrary waveform data to/from a file • Waveforms can be edited without connecting the device.
Display functions	• Zoom in/out • Scroll • Display unit (coordinates) selectable • Cursor (A, B)
Transfer function	• Transfers and reads arbitrary waveform data to/from the device.
Device control function	• Major parameter setting
Operating environment	*Same as the operating environment for the Sequence Editor.

Accessories	• Instruction Manual (Basic) • CD PDF manuals, Arbitrary Waveform Editor Sequence Editor, LabVIEW driver • Power cord set
Option	Multi input/output cable (model name: PA-001-1318)

Note: The contents of this catalog are current as of October 25th, 2024
*Products appearance and specifications are subject to change without notice.
*Before purchase contact us to confirm the latest specifications, price and delivery date.