COSINUS®
MESSTECHNIK GMBH

WAVE FACTORY

MULTIFUNCTION GENERATOR
WF1973/WF1974

Effortless waveform generation via an intuitive graphical user interface

Upcoming general-purpose signal source that is a must for engineers

1CH / 30 MHz

WF1973

2CH / 30 MHz

WF1974

Wide Frequency Range
0.01 µHz to 30 MHz

Various Types of Output Waveforms
Equipped with standard, arbitrary and "parameter-variable" waveforms

Useful Programming Function
The sequence function enables you to easily program output patterns.

Wide Array of Oscillation Modes
Continuous, burst/trigger/gate, internal/external modulation, sweep, and sequence oscillation

2-channel Mode
Two independent channels, two phases, constant frequency difference, constant frequency ratio, and differential output

Functions
Synchronous operation of multiple units, usable as a pulse generator, external addition input, user-defined units and more

Pursuit of Usability
Flat and lightweight (88 mm high, 2.1 kg), each channel insulated from the housing, USB/GPIB interface, and more

Generate the waveforms you need–effortlessly!

Wide array of functions for a broad range of applications

While the WF1973 and WF1974 can generate standard waveforms such as sine and square waves, application-specific waveforms such as Gaussian pulse and chattering, and arbitrary waveforms, these generators also have a wide array of functions, including sequence, modulation, and sweep. These are up-and-coming general-purpose signal sources that are a must for engineers and should be kept on hand for a wide variety of applications.
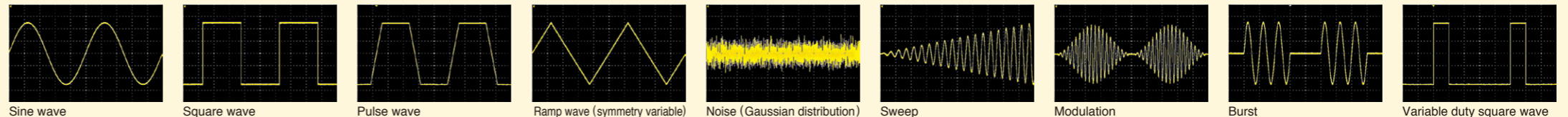
30MHz MULTIFUNCTION GENERATOR WF1973
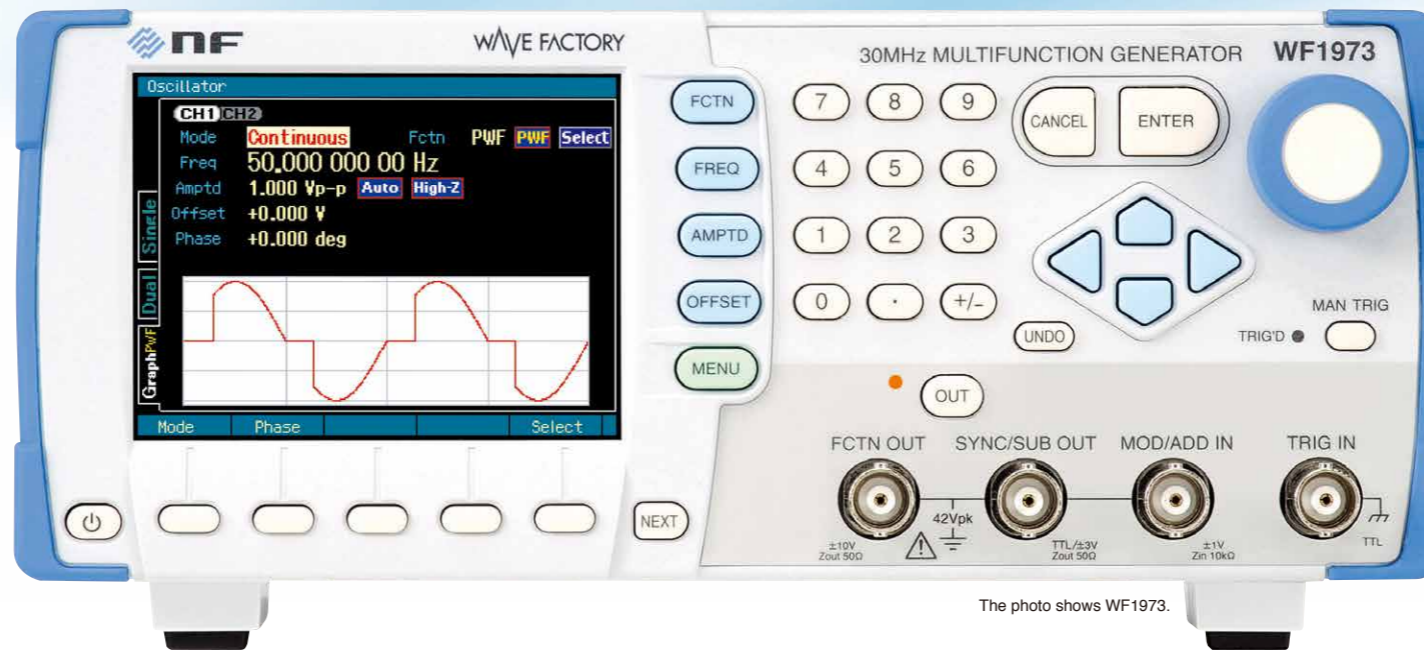
WAVE FACTORY

MULTIFUNCTION GENERATOR

WF1973 [1CH] **WF1974** [2CH]

0.01 μHz to 30 MHz

The photo shows WF1973.

Anytime, Anywhere

Handy signal source generates basic functions quickly and reliably

DDS method · Continuous · Sweep · Modulation · Burst · Trigger · Gate · DC offset · Duty variable · Rising/falling variable ·····etc.

The WF1973 and WF1974 are easy to use as general-purpose signal sources for routine tests. Both standard waveforms and various modifying functions, including sweep, modulation, burst and duty variable, can be operated intuitively. Use of direct digital synthesis (DDS) ensures superior stability and repeatability, and so supports reliable testing.

| Sine wave | Square wave | Pulse wave | Ramp wave (symmetry variable) | Noise (Gaussian distribution) | Sweep | Modulation | Burst | Variable duty square wave |

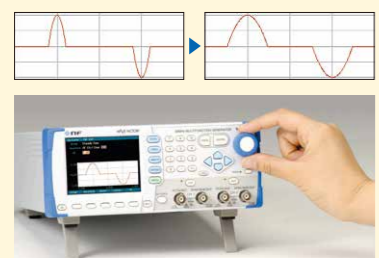## Three methods allow you to generate or program Any Waveform!

The desired waveform can be quickly found and generated.

Parameter-Variable Waveform

NF has incorporated an innovative waveform library called a parameter-variable waveform function.
The parameter-variable waveform offers an easy-order waveform system. The appropriate waveform for your purpose can be generated easily: just select a preprogrammed waveform and edit it using parameters specific to your requirements. The 25 types of available waveforms include circuit-related, communication-related, and machine-related waveforms.

For Example

The CF (crest factor) can be set within a range from 1.41 to 10.00 and varied easily using the modify knob.
Waveforms generated in this way can be treated as standard waveforms with respect to frequency, amplitude, oscillation mode and other parameters.

Names and Variable Parameters of Incorporated Waveforms

❶ Unbalanced sine
• 1st half amplitude
• 2nd half amplitude

❷ Clipped sine
• Clip rate

❸ CF controlled sine
• Crest Factor

❹ Conduction angle controlled sine
• Conduction angle

❺ Staircase sine
• Number of steps

❻ Multi-cycle sine
• Number of cycles
• Start phase

❼ On-phase controlled sine
• Complete-on phase
• On-slope time

❽ Off-phase controlled sine
• Off-phase
• Off-slope time

❾ Chattering-on sine
• On-phase
• Number of chattering
• On-state time
• Off-state time

❿ Chattering-on sine
• Off-phase
• Number of chattering
• On-state time
• Off-state time

⓫ Gaussian pulse
• Standard deviation

⓬ Lorentz pulse
• Half value of width

⓭ Haversine
• Width

⓮ Half-sine pulse
• Width

⓯ Trapezoid pulse
• Slope width
• Upper base width

⓰ Sin(x)/x
• Number of zero crossings

⓱ Exponential rise
• Time constant

⓲ Exponential fall
• Time constant

⓳ 2nd-order LPF step response
• LPF natural frequency
• LPF Q

⓴ Damped oscillation
• Oscillation frequency
• Damping time constant

㉑ Oscillation surge
• Oscillation frequency
• Damping time constant
• Trailing time constant

㉒ Pulse surge
• Rising time
• Duration time

㉓ Trapezoid wave with offset
• Leading delay
• Rising-slope width
• Upper base width
• Falling-slope width
• Offset

㉔ Half-sine edge pulse
• Leading edge time
• Trailing edge time
• Duty

㉕ Bottom-referenced ramp
• Symmetry

### Flexible Program Output Patterns

Sequence Function

The sequence function programs and sequentially outputs parameters such as waveform, frequency and amplitude. Repetition, jump and other such behavior can be programmed, so constantly changing signals—such as machine vibration and voltage fluctuation—and long complex output patterns can be generated easily. The sequence function allows sudden changes to parameters, and can be used with parameter-variable waveforms and sweep functions. The sequence function substantially expands the range of applications for which our function generators are suitable.

● Parameters: waveform, frequency, phase, amplitude, DC offset, square wave duty, step time, hold operation, jump destination, number of jumps, step stop phase, branch operation, step termination control, and more
● Number of steps: 1 to 255 per sequence ● Number of saved sequences: 10
● Maximum number of usable waveforms: 128

Main unit graph screen

Program Example Using the Sequence Function

The table on the right shows the program (sequence list) used to generate the signal on the left. The WF1973 and WF1974 can execute such simple programs automatically. The Sequence Editor facilitates generation, editing, and a number of other processes for more complicated programs.

Step	Wave-form	Frequency [Hz]	Amplitude [Vp-p]	Offset [V]	Step time [s]	Sweep
1	DC	—	0	0	0.15	—
2	DC	—	0	5	0.2	ON
3	Sine	20	2	5	0.15	—
4	DC	—	0	5	0.1	—
5	DC	—	0	3.75	0.1	—
6	DC	—	0	2.5	0.1	—
7	DC	—	0	1.25	0.1	—
8	DC	—	0	0	0.1	—

Sequence Editor
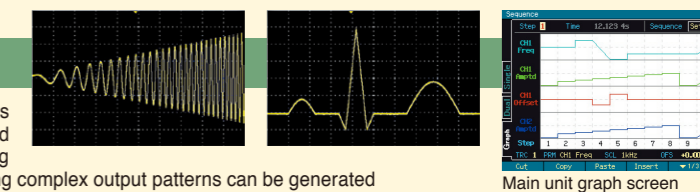
Up to 512 K words/Waveform, 4 M words

Arbitrary Waveforms

Arbitrary waveforms up to 512 K words can be output. Up to 128 waveforms can be stored in the large 4 M words memory. Highly precise waveforms are generated using high-resolution (14-bit), high-speed (120M samples/sec) sampling. Waveforms can be generated easily either via the control panel (linear interpolation of control points) or in software using the Arbitrary Waveform Editor, which also allows external data to be imported and mathematical expressions to be applied. Preprogrammed parameter-variable waveforms can be retrieved and edited as required.

Main unit editing screen

Arbitrary Waveform Editor
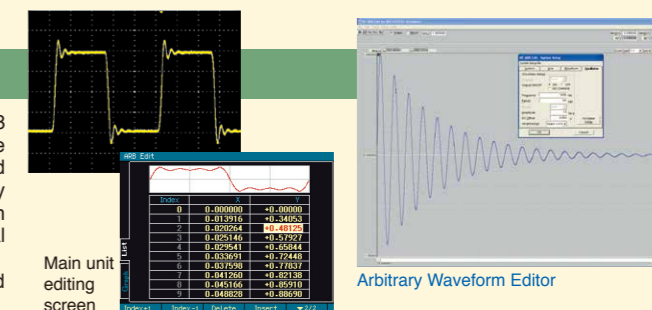
Fully equipped with the functions and performance that are required for function generators. The WF1973 and WF1974 are simple to operate and provide high-precision waveforms for a wide range of applications.

Multifunctional — A variety of oscillation modes and flexible scalability

### Sweep and modulation functions

Gated sweep   Offset modulation   PWM
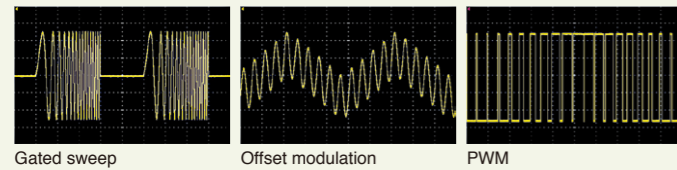
Frequency, phase, amplitude, DC offset and duty sweeps can be performed in one-way or shuttle, linear or logarithmic slope*, and continuous, single-shot or gated single-shot modes. Marker and X-drive outputs are available. DC offset modulation and PWM modes are supported as well as FM, FSK, PM, PSK, and AM—both internal and external modulation. These function generators can address a wide range of applications.

* Logarithmic mode is supported only for frequency sweeping.

Burst/trigger/gate

Triggered gate   3-value pulse (burst/trigger)   Full-wave rectification waveform (burst/trigger)
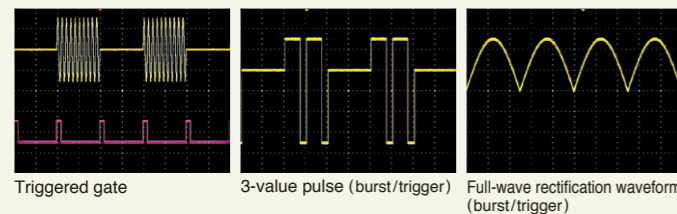
In the burst oscillation mode, oscillation can be started or stopped at any wave count.
WF1973 and WF1974 support four modes;
   **Auto burst**: No trigger is needed
   Trigger burst: Oscillation in sync with the trigger
   Gate: Oscillation in sync with the gate signal
   Triggered gate: Gate oscillation switched on/off by gate upon trigger
The phase where oscillation starts/stops and the level at which oscillation starts/stops can be set.

As pulse generator

Pulse width variable   Rising/falling time variable   Rising time (15 ns) X: 10 ns/DIV Y: 2 V/DIV
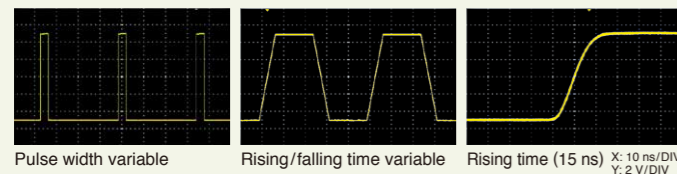
With great speed and operability, the WF1973 and WF1974 show excellent performance when used as a pulse generator or signal source for digital circuits. The duty/time, rising time, and falling time of pulse waves can be individually set, so these generators are best suited to operation testing of a wide variety of digital equipment and devices, data transmission equipment, and more.

External 10 MHz frequency reference input, synchronous operation of multiple generators

A high-accuracy frequency can be output when an external 10 MHz standard signal is input into the external 10 MHz frequency reference input (REF IN).
Synchronous operation of up to six units is possible in the form of master/slave connections*, using the frequency reference output (REF OUT) and frequency reference input (REF IN). A multi-channel (multi-phase) oscillator can be configured.

* A BNC cable is used for connection.

WF1973 rear panel

## 2 Channels — Ideal 2-channel generator

WF1974

WF1974 rear panel

The WF1974 is a dual-channel function generator. Each channel is insulated from the housing and has the same functions and performance as a single-channel WF1973. In addition, the WF1974 offers two phase, constant frequency difference, constant frequency ratio and differential output—all features that are unique to NF dual-channel function generators.

- Independent output (Indep) : Two channels programmed separately.
- Two phase (2-Phase) : Same frequency.
- Constant frequency difference (2-Tone) : Difference in frequencies is constant.
- Constant frequency ratio (Ratio) : Ratio of frequencies is constant.
- Differential output (Diff) : Reverse phase waveform with identical frequency, amplitude, and DC offset.
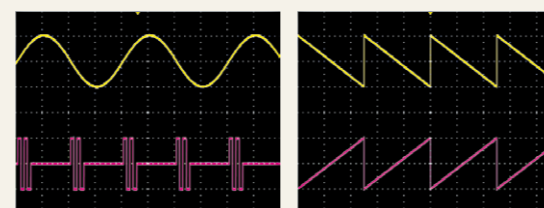

Two channels independent   Differential output

High Accuracy — High specifications to generate quality waveforms

Above all else, function generators must be very accurate. The WF1973 and WF1974 are high-specification instruments that deliver exceptional precision, stability and reliability in support of a wide variety of applications.

- Frequency accuracy : ±(3 ppm of setting + 2 pHz)
  (External frequency reference of 10 MHz usable.)
- Frequency resolution : 0.01 µHz
- Amplitude accuracy : ±(1% of amplitude setting [V_{p-p}] + 2 mV_{p-p})/open
- Phase setting resolution1: 0.001 (setting range: −1800.000 to +1800.000)
- Duty setting range : 0.0000% to 100.0000%; resolution: 0.0001%
- Pulse wave rising/falling time: 15.0 ns to 58.8 Ms; 3-digit resolution/0.1 ns
- Resolution of arbitrary waveform data amplitude: 16 bits

Operability — Thorough pursuit of usability
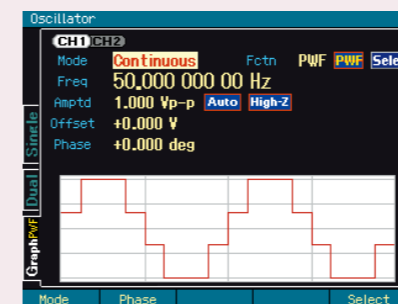
Waveform display
The TFT color LCD display with the QVGA high resolution has been adopted. A variety of setup parameters can be seen at a glance and the set waveform is also displayed. Setting errors can be avoided because the waveform to be output can be intuitively checked.

User-defined unit function
The frequency, period, phase, amplitude, DC offset and duty can be set and displayed in desired unit (up to four characters), using a specified conversion expression.

Other features
- Input/output signal ground independent of housing and signal ground between channels also insulated.
- Output voltage under specified load impedance can be set and displayed.
- External signals can be added and output.
- Up to ten settings can be saved.
- USB and GPIB interfaces.
- LabVIEW driver included.
- Power supply input for 90 V AC to 250 V AC enables worldwide use.
- Flat and light body (88 mm high, about 2.1 kg)

Applications — We can satisfy a variety of waveform-related needs.

● Electronic equipment and parts
Ultrasonic motor drive testing, differential/balanced input testing, LCD panel operation testing, copier drum (developing bias) testing, digital circuit evaluation testing, and evaluation of ICs

● Communication and audio equipment
Testing of echo cancellers which act as IQ signal generator/clock sources for mobile communication systems, amplifier and speaker tone burst testing and linearity measurement, and wireless communication equipment evaluation testing

● Automobiles
Gear rotation signal simulation, precision work for turbo chargers, inverter evaluation, ABS and power-steering device testing, ECU and sensor operation testing

● Machinery, controls, and construction
Industrial robot and servo system adjustment and testing, pulse motor driving, building vibration experiments (for incorporating vibration testers), water-tank-based wave generation tests, and material fatigue testing

● Other applications
Simulation of biosignals, electrolysis, electroplating, and battery charge/discharge testing, breaker testing, three-phase power source simulation, power source modulation testing, a frequency standard for measurement equipment management room, experiments and science projects in universities and technical colleges

Power amplifier that boosts output

High-Speed Bipolar Amplifier —BA4825/HSA Series

Example when combined with BA4825

NF recommends using our high-speed bipolar power amplifiers (BA4825/HSA Series) as power amplifiers for drive testing and other applications where a high voltage is applied to DUT, such as electronic parts or devices. These power amplifiers attain high-speed response and high voltage output, as well as wide frequency range. In addition, four-quadrant operation enables them to serve as the source (supply) and sink (absorption) for positive/negative voltage and current. They stably operate (output power) under capacitive or inductive loads such as a piezoelectric element or solenoid.

BA4825
- Wide band: DC, up to 2 MHz
- High voltage output: 300 V_{p-p}
- Output current: 0.5 Arms
- Slew rate: 500 V/µs
- Low output impedance
- Output polarity switching function and more

HSA Series
- Wide band: DC, up to 10 MHz
- High voltage output: up to 300 V_{p-p}
- Slew rate: 400 V/µs to 5,000 V/µs
- Low output impedance
- Output range shift function
- DC offset and more

■ 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 monitor 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 100.0 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

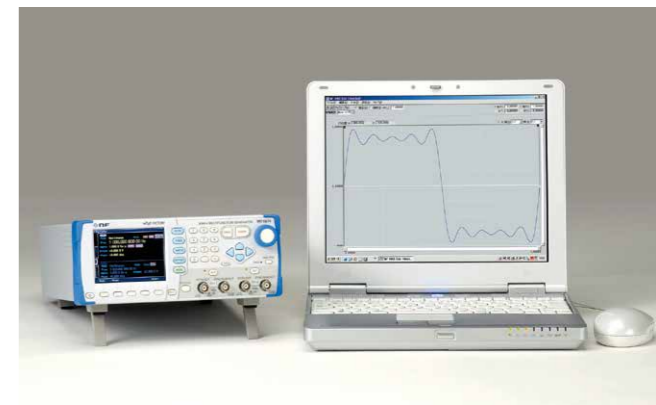| External 10 MHz frequency reference input	Input voltage: 0.5 Vp-p to 5 Vp-p, sine or square waves
Frequency reference output	For synchronization when more than one WF1973 and/or WF1974 are used. Output voltage: 1 Vp-p/50 Ω,square wave, 10 MHz
External addition input	Function	Function to add the external 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

▼ 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 Windows 7/8.1/10 (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)

■ Dimensions
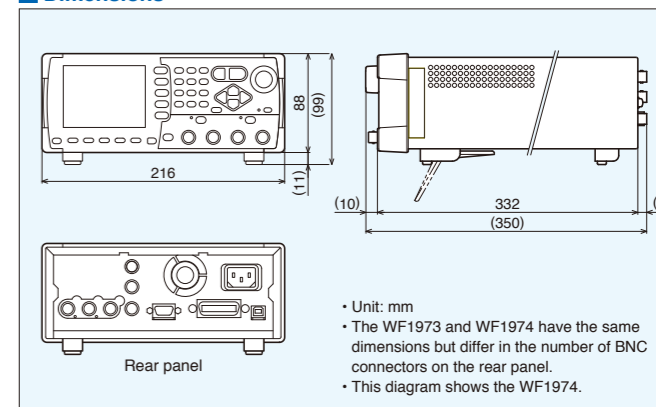
Rear panel

• Unit: mm
• The WF1973 and WF1974 have the same dimensions but differ in the number of BNC connectors on the rear panel.
• This diagram shows the WF1974.

• Unless otherwise specified, the value assumes the following conditions: continuous oscillation, load of 50Ω, 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

WAVE FACTORY

MULTIFUNCTION GENERATOR

WF1973	WF1974
[1CH / 30 MHz]	[2CH / 30 MHz]

■ WAVE FACTORY Lineup/Selection Guide

The following list summarizes the features of each model. For detailed specifications, refer to their respective catalogs, Web pages, or other documents.

		30 MHz				200 MHz	
Model name		WF1973	WF1974	WF1947	WF1948	WF1967	WF1968
Appearance		WF1974		WF1948		WF1968	
Oscillation frequency		0.01 µHz to 30 MHz		0.01 µHz to 30 MHz		0.01 µHz to 200 MHz	
Number of channels		1	2	1	2	1	2
Vertical resolution for waveform		14 bits		16 bits		16 bits	
Waveform and frequency range	$\sim$	0.01 µHz to 30 MHz		0.01 µHz to 30 MHz		0.01 µHz to 200 MHz	
	⊓⊔ (duty fixed)	0.01 µHz to 15 MHz		0.01 µHz to 20 MHz		0.01 µHz to 70 MHz	
	⊓⊔ (duty variable)						
	⊓⊔	0.01 µHz to 15 MHz		0.01 µHz to 20 MHz		0.01 µHz to 70 MHz	
	$\sim$ (symmetry variable)	0.01 µHz to 5 MHz		0.01 µHz to 5 MHz		0.01 µHz to 20 MHz	
	Parameter-variable waveforms (25 types)	0.01 µHz to 5 MHz		—		0.01 µHz to 20 MHz	
	Arbitrary waveform	0.01 µHz to 5 MHz		0.01 µHz to 5 MHz		0.01 µHz to 20 MHz	
	Noise	Bandwidth: 26 MHz		Bandwidth: 26 MHz		Equivalent bandwidth: Select from 100 M/30 M/10 M/3 M/1 M/300 k/100 kHz	
Frequency setting resolution		0.01 µHz				0.01 µHz (< 50MHz), 0.1 µHz (50MHz ≤)	
Rising/falling variable		Pulse: 15 ns to 58.8 Ms		Pulse: 15 ns to 62.5 Ms		Pulse: 4.21 ns to 58.8 Ms	
Arbitrary waveform data length/ number of waves		4K words to 512 K words/ 128 waves, 4 M words		4K words to 512 K words/ 128 waves, 4 M words		4 Ki words to 1 Mi words/ 128 waves, 4 Mi words[*1]	
Maximum output voltage/resolution		20 Vp-p/open, 10 Vp-p/50 Ω, Resolution: 0.1 mVp-p or 1 mVp-p (depending on conditions)					
Oscillation mode	Continuous oscillation	○	○	○	○	○	○
	Burst/trigger/gate/ triggered gate	○	○	○	○	○	○
	Sweep	Frequency, phase, amplitude, DC offset, duty ratio					
	Internal modulation	FM, FSK, PM, PSK, AM, DC offset and PWM					
	External modulation						
	Burst with modulation/ Sweep with modulation	—	—	—	—	○	○
	Sequence	○	○	—	—	○	○
	Two channel mode	—	○	—	○	—	○
Synchronous operation		○	○	○	○	○	○
Synclator function		—	—	—	—	○	○
Synchronization/sub-output		Sync signals/Internal modulation sync/Sweep X drive				Sync signals/Internal modulation sync/ Sweep X drive/Sub output[*3]	
Input/output floating		○	○	○	○	○	○
Isolation between channels		—	○	—	○	—	○
External addition		○	○	○	○	○	○
GPIB interface		○	○	○	○	○	○
USB interface		○	○	○	○	○	○
Arbitrary Waveform Editor		○	○	○	○	○	○
Sequence Editor		○	○	—	—	○	○
Power supply		90 to 250 V AC					
Power consumption		50 VA or less	75 VA or less	50 VA or less	75 VA or less	65 VA or less	85 VA or less
External dimensions (mm)[*2]		216 (W) × 88 (H) × 332 (D)		216 (W) × 132.5 (H) × 288 (D)		216 (W) × 132.5 (H) × 332 (D)	
Weight		approx. 2.1 kg		approx. 2.6 kg		approx. 3.0 kg	

*1 Ki and Mi represent $2^{10}=1024$ and $2^{20}=1048576$
*2 Not including projections
*3 Available waveform : sine, square (duty 50%), ramp (symmetry 50%), rising ramp, falling ramp, noise and arbitrary waveform.