



WAVE FACTORY  
WAVE FACTORY

# MULTIFUNCTION SYNTHESIZER

GPIB USB



15 MHz Synthesizer	WF 1943A
15 MHz Pro-Synthesizer	WF 1945A
2CH 15 MHz Synthesizer	WF 1944A
2CH 15 MHz Pro-Synthesizer	WF 1946A
50 MHz Super Synthesizer	WF 1965
2CH 50 MHz Super Synthesizer	WF 1966
100 MHz Super Synthesizer	WF 1956

NF Corporation

# Rainbow Variation

Only NF Provides 7 Types of Function Synthesizers.

## WAVE FACTORY

We wanted to prepare a lineup from which you can choose functions that really fit your works. The results are these 7 types of synthesizers. The 7 types of Wave Factory are unequaled anywhere in the world. Which one is your color?

15MHz  
Synthesizer  
WF 1943A  
CE



15MHz  
Pro-Synthesizer  
WF 1945A  
CE



2CH 15MHz  
Synthesizer  
WF 1944A  
CE



2CH 15MHz  
Pro-Synthesizer  
WF 1946A  
CE



50MHz  
Super Synthesizer  
WF 1965  
CE



2CH 50MHz  
Super Synthesizer  
WF 1966  
CE



100MHz  
Super Synthesizer  
WF 1956

**DDS(Digital Direct Synthesis) method allows generation of highly accurate broadband signals with high resolution**

Broadband lineup with frequency accuracy of  $\pm 5$  ppm, frequency setting resolution of  $0.01 \mu\text{Hz}$ , and frequency range of  $0.01 \mu\text{Hz}$  to 15 MHz/50 MHz/100 MHz.

**The best-in-class waveform vertical resolution delivers high-precision waveform output**

WF 1945A and WF 1946A achieve high-quality waveform and amplitude accuracy with 16-bit waveform resolution.

**Standard 5 waveforms and arbitrary waveform output**

In addition to arbitrary waveforms and standard five waveforms such as sine wave, square wave, triangular wave, and saw-tooth wave, these synthesizers can generate noise and DC.

**Variety of oscillation modes, sweep function, and modulation function**

In addition to burst, gate, trigger, and triggered gate oscillations, various sweep functions are provided. Various modulations such as FM, PM, AM, offset, and PWM can be achieved.

**Versatile-functions of 2-channel output**

WF 1944A, WF 1946A, WF 1966, and WF 1956 have 2-channel output. They can provide 2 independent channels, 2 phases (phase can be changed), constant frequency ratio, constant frequency difference, and differential output.

**Equipped with GPIB and USB interfaces**

Standard specification provides GPIB and USB interfaces. Their compatibility with computers is excellent (WF 1956 is equipped with GPIB interface only).

**Equipped with many advanced functions while being user friendly**

They are equipped with "Key Navigation" that only illuminates the key to be operated next. They realize smooth operations while providing many advanced functions.

**Well-developed 7 models from which you can choose according to your application and budget**

We lined up 7 models from which you can choose according to frequency, the number of channels, function and price you want.

\* Check with selection guide and main specifications for details on functions and performance of each model.

# Multiple Functions and Excellent Performance. Wave Factory Provides Well-Developed 7 Models to Choose from.

## Selection Guide

	15MHz Synthesizer WF 1943A	15MHz Pro-Synthesizer WF 1945A	2CH 15MHz Synthesizer WF 1944A	2CH 15MHz Pro-Synthesizer WF 1946A	50MHz Super Synthesizer WF 1965	2CH 50MHz Super Synthesizer WF 1966	100MHz Super Synthesizer WF 1956	
Frequency Range	0.01 $\mu$ Hz to 15MHz				0.01 $\mu$ Hz to 50MHz		0.01 $\mu$ Hz to 100MHz	
The Number of Channels	1		2		1	2	2	
Output Waveform	Arbitrary waveform, Noise, DC							
Waveform Vertical Resolution	14 bits	16 bits	14 bits	16 bits	14 bits	14 bits	12 bits	
Waveform and Frequency	(duty fixed at 50%)	0.01 $\mu$ Hz to 15MHz		0.01 $\mu$ Hz to 50MHz		0.01 $\mu$ Hz to 15MHz (CH2: Other than in HF mode)		
	(Duty Variable)	0.01 $\mu$ Hz to 500kHz <small><math>\square</math> duty variable range: 0.0100% to 99.9900% or 0.0000% to 100.0000%            Setting resolution: 0.0001%</small>		0.01 $\mu$ Hz to 2MHz <small><math>\square</math> duty variable range: 0.0100% to 99.9900% or 0.0000% to 100.0000%            Setting resolution: 0.0001%</small>		0.01 $\mu$ Hz to 500kHz <small><math>\square</math> duty variable range: 0.0100% to 99.9900%            Setting resolution: 0.0001%</small>		
		0.01 $\mu$ Hz to 500kHz		0.01 $\mu$ Hz to 2MHz		0.01 $\mu$ Hz to 500kHz		
	Arbitrary Waveform	0.01 $\mu$ Hz to 500kHz. Analogue frequency band: 10 MHz		0.01 $\mu$ Hz to 2MHz Analogue frequency band: 35 MHz		0.01 $\mu$ Hz to 500kHz Analogue frequency band: 10 MHz		
	Noise Bandwidth	500kHz				2MHz		500kHz
HF Mode	-	-	-	-	-	-	Output from CH2 100kHz to 100MHz	
Frequency Setting Resolution	0.01 $\mu$ Hz				0.01 $\mu$ Hz		0.01 $\mu$ Hz, 0.1 $\mu$ Hz in HF mode	
Arbitrary Waveform Size / Wave Number	Switching among 8K words/16K words/32K words. Arbitrary waveform wave numbers: 12 with 8K words, 6 with 16K words, and 3 with 32K words							
Maximum Output Voltage	20Vp-p/Open, 10Vp-p (50 )		CH1/CH2 : 20Vp-p/Open, 10Vp-p (50 )		20Vp-p/Open, 10Vp-p (50 )	CH1/CH2 : 20Vp-p/Open, 10Vp-p (50 )	CH1 : 20Vp-p/Open, 10Vp-p (50 ) CH2 : 4Vp-p/Open, 2Vp-p (50 )	
Output High Voltage Resolution	0.1mVp-p/Open (1V range)		CH1/CH2: 0.1mVp-p/Open (1V range)		0.1mVp-p/ Open (1V range)	CH1/CH2: 0.1mVp-p/ Open (1V range)	CH1: 0.1mVp-p/ Open (1V range) CH2: 1 $\mu$ Vp-p/ Open (20mV range)	
Functions	Continuous Oscillation	✓	✓	✓	✓	✓	✓	
	Burst/Trigger/Gate/Triggered Gate	✓ (0.01 $\mu$ Hz to 500kHz)	✓ (0.01 $\mu$ Hz to 500kHz)	✓ (0.01 $\mu$ Hz to 500kHz)	✓ (0.01 $\mu$ Hz to 500kHz)	✓ (0.01 $\mu$ Hz to 500kHz)	✓ (0.01 $\mu$ Hz to 500kHz)	✓ (0.01 $\mu$ Hz to 500kHz)
	Sweep	Frequency, Phase	Frequency, Phase, Amplitude, DC offset, Duty factor	Frequency, Phase	Frequency, Phase, Amplitude, DC offset, Duty factor	Frequency, Phase, Amplitude, DC offset, Duty factor	Frequency, Phase, Amplitude, DC offset, Duty factor	Frequency, Phase, Amplitude, DC offset, Duty factor
	Modulation	FM, PM	FM, PM, AM, Offset, PWM	FM, PM	FM, PM, AM, Offset, PWM	FM, PM, AM, Offset, PWM	FM, PM, AM, Offset, PWM	FM, PM, AM, Offset, PWM
	Square Wave Variable Rise / Fall Time	-	-	-	-	✓	✓	-
	2-Channel Mode	-	-	✓	✓	-	✓	✓
	External AM	-	✓	-	✓	✓	✓	✓
	External Addition	-	✓	-	✓	✓	✓	✓
	Output Floating	-	✓	-	✓	✓	✓	✓ (CH1 only)
	Key Navigation	✓	✓	✓	✓	✓	✓	✓
	User Unit	✓	✓	✓	✓	✓	✓	✓
	Number of Setting Memories	10	10	10	10	10	10	10
	Synchronized Operation (Factory Option)	-	✓	-	✓	✓	✓	✓
Digital Output (Factory Option)	-	✓	-	✓	-	-	✓	
GPIB Interface	✓	✓	✓	✓	✓	✓	✓	
USB Interface	✓	✓	✓	✓	✓	✓	-	
Power Supply	AC 100V/115V/230V Selectable	AC 100V/115V/230V Selectable	AC 100V/115V/230V Selectable	AC 100V/115V/230V Selectable	AC 100V/115V/230V Selectable	AC 100V/115V/230V Selectable	AC 100V	

1CH

## Single Channel Type with Advanced Functions and User-Friendliness and Furthermore, at Low Price

15MHz Synthesizer WF 1943A



15MHz Pro-Synthesizer WF 1945A



Frequency setting range: 0.01  $\mu$ Hz to 15MHz with setting resolution of 0.01  $\mu$ Hz and frequency accuracy of  $\pm$  5ppm.

Maximum output voltage: 20Vp-p/Open with maximum of 5 digits to be set and maximum offset voltage of  $\pm$  10V/Open.

Waveform vertical resolution: High resolution of 16 bits (WF 1945A) and 14 bits (WF 1943A) Output of five standard waveforms and arbitrary waveforms. The size of arbitrary waveform data can be changed among 8K/16K/32K words.

Square waveform duty: Variable between 0 and 100% with step of 0.0001%

Rich oscillation modes: Burst, trigger, gate, and triggered gate that repeats start/stop of oscillations at each triggering are provided besides continuous oscillation. The wave number can be set by the 0.5 wave.

Various sweep and modulation functions.

Key Navigation that illuminates only the key to be operated next for further user-friendliness.

User Unit function that sets/displays parameters in desired unit when conversion formula and unit are set in advance.

Load function that matches the set value and actual output terminal voltage when the unit is connected to any load impedance.

Convenient for applications as pulse generator. Signals can be set/displayed by the pulse period, pulse width, or high/low level. Furthermore, the unit is equipped with trigger delay function.

The number of memories to be set : 10

GPIB and USB interfaces are provided in the standard specification.

### Professional WF 1945A with expanded functions

- Various sweep functions: Frequency, phase, amplitude, offset, duty factor, sweep trigger input, synchronized output, stop/resume input, marker output, X drive output
- Rich modulation functions: Internal: FM (FSK), PM (PSK), AM, DC offset modulation, PWM External: AM, DSB-AM
- External addition: External addition frequency: 10 MHz
- Output floating
- Synchronized operation of multiple units (Option, maximum of 6 units)

2CH

## Powerful and Enriching 2-Channel Type Synthesizer with Multifunction

2CH 15MHz Synthesizer WF 1944A



2CH 15MHz Pro-Synthesizer WF 1946A



Frequency setting range: 0.01  $\mu$ Hz to 15 MHz with setting resolution of 0.01  $\mu$ Hz and frequency accuracy of  $\pm$  5ppm.

Maximum output voltage: 20Vp-p/Open with maximum of 5 digits to be set and maximum offset voltage of  $\pm$  10V/Open.

Waveform vertical resolution: High resolution of 16 bits (WF 1946A) and 14 bits (WF 1944A). Output of five standard waveforms and arbitrary waveforms. The size of arbitrary waveform data can be changed among 8K/16K/32K words.

Square waveform duty: Variable between 0 and 100% with step of 0.0001%

Enriching 2-channel output.

- Independent 2 channels
- 2 phases (phase variable at same frequency) with phase setting resolution of 0.001 °
- Constant frequency ratio that is set with N:M
- Constant frequency difference with setting resolution of 0.01  $\mu$ Hz
- Differential output that outputs the inverted waveform of the amplitude and DC offset at the same frequency.

Phase synchronization (f sync) function that restarts at the set phase of each channel.

Copy (Copy) function that copies the setting of one channel to the other channel.

Simultaneous setting (Both) function that sets two channels simultaneously.

GPIB and USB interfaces are provided in the standard specification

### WF 1946A Provides 2 Channels with Expanded Functions

- Enriching sweep functions: Frequency, phase, amplitude, offset, duty factor, sweep trigger input, synchronized output, stop/resume input, marker output, X drive output
- Rich modulation functions: Internal: FM (FSK), PM (PSK), AM, DC offset modulation, PWM External: AM, DSB-AM
- External addition: External addition frequency: 10MHz
- Output floating, channel-to-channel isolation
- Synchronized operation with multiple units (Option, maximum of 6 units)

## 1CH 2CH Full Synthesis with Broadband, High Frequency, and Total Range DDS Method

### 50MHz Super Synthesizer WF 1965



CE

### 2CH 50MHz Super Synthesizer WF 1966



CE

Frequency setting range: 0.01  $\mu$ Hz to 50MHz with setting resolution of 0.01  $\mu$ Hz and frequency accuracy of  $\pm$  5ppm  
 Maximum output voltage: 20Vp-p/Open with maximum of 5 digits to be set and maximum offset voltage of  $\pm$  10V/Open  
 Waveform vertical resolution: High resolution of 14 bits while using high frequency  
 Output of five standard waveforms and arbitrary waveforms. The size of arbitrary waveform data can be changed among 8K/16K/32K words.  
 Upper limit frequency for setting arbitrary waveform: 2 MHz, Analogue band: 35MHz.  
 White noise output with bandwidth of 2MHz.  
 Square waveform duty: Variable between 0 and 100% with step of 0.0001%  
 Square waveform variable rise/trail time: 7ns to 1ms with setting resolution of 3 digits  
 Enriching sweep functions: Frequency, phase, amplitude, offset, and duty factor.  
 Rich modulation functions: Internal: FM (FSK), PM (PSK), AM, DC offset modulation, PWM  
 External: AM, DSB-AM  
 External addition: External addition frequency: 10MHz  
 Output floating  
 Synchronized operation with multiple units (Option, maximum of 6 units)  
 GPIB and USB interfaces are provided in the standard specification.

### Multi-Function 2-Channel Broadband WF 1966 with High Frequency

- Independent 2 channels
- 2 phases (phase variable at same frequency), phase setting resolution of 0.001 °
- Constant frequency ratio that is set with N:M
- Constant frequency difference with setting resolution of 0.01  $\mu$ Hz
- Differential output that outputs the inverted waveforms of amplitude and DC offset at same frequency.
- Output floating, channel-to-channel isolation
- Phase synchronization (f sync) function that restarts at the set phase of each channel.
- Copy (Copy) function that copies the setting of one channel to the other channel.
- Simultaneous setting (Both) function that sets two channels simultaneously.

2CH

## 2-Channel Type Synthesizer with Maximum Frequency of 100MHz and High Frequency (HF) Mode

### 100MHz Super Synthesizer WF 1956



Frequency setting range: 0.01  $\mu$ Hz to 100MHz with frequency accuracy of  $\pm$  5ppm for total bandwidth.  
 Covers broadband of 0.01  $\mu$ Hz to 100MHz by combining DDS method (0.01  $\mu$ Hz to 15MHz) and PLL method (100kHz to 100MHz).  
 HF mode (CH2): 100kHz to 100MHz with setting resolution of 0.1  $\mu$ Hz.  
 CH1 maximum output voltage: 20Vp-p/Open with maximum of 5 digits to be set and maximum offset voltage of  $\pm$  10V/Open  
 CH2 minimum amplitude range is 20 mV. Minute setting with amplitude setting resolution of 1  $\mu$ Vp-p available.  
 Output of five standard waveforms and arbitrary waveforms. The size of arbitrary waveform data can be changed among 8K/16K/32K words.  
 CH2 square wave rise/fall time: 8 ns or less.  
 Burst, trigger, gate, various sweep functions and modulation functions.  
 Clock signal of 100MHz can be output from CH2 synchronized output. Output voltage: - 2V to +7V (Open), High/Low level can be set independently. Rise/Fall time is variable between 1.0V/ns to 2.8V/ns with setting resolution of 0.01V/ns  
 Broadband and multi-function 2-channel output.  
 GPIB interface is provided in the standard specification.

## 0105: Software to Create Arbitrary Waveform (Sold separately, Compatible with all the models)



Waveform created with 0105

You can easily create arbitrary waveforms on your PC by using separately-sold 0105, the software to create arbitrary waveforms. The waveforms you created can be transferred to Wave Factory via GPIB or USB interfaces.

[Waveform Creation Function] Standard waveforms, function expressions, linear and spline interpolations that specifies control points.

[Waveform Editing Function] Copy, cut, paste, and horizontal/vertical compression and expansion.

[Transferring Function] Waveform data and setting parameters are transferred via GPIB or USB interfaces.

[Displaying Function] Displaying created waveforms, displaying/editing created waveforms in digital pattern, and marker reading.

[File Operations] Save/Load waveform data, setting parameters, and waveform function expressions in/from a file.

Compatible OS: Windows 98, 2000, Me, XP

# Further Advanced User Friendliness and Function. New Series of Testing Signal Generators That Opened a Way to Tim

Wave Factory provides a lineup of multi-function synthesizers based on high-quality waveforms using DDS (Digital Direct Synthesis). These synthesizers are user-friendly while providing advanced functions. Various functions pursuing convenience such as easy panel operations with Key Navigation and User Unit function are provided. In addition, rich functions only available with Wave Factory series meet various waveform needs such as arbitrary waveform, sweep and modulation functions, 2-channel mode, and furthermore, application as a pulse generator.

15MHz Synthesizer	WF 1943A
15MHz Pro-Synthesizer	WF 1945A
2CH 15MHz Synthesizer	WF 1944A
2CH 15MHz Pro-Synthesizer	WF 1946A
50MHz Super Synthesizer	WF 1965
2CH 50MHz Super Synthesizer	WF 1966
100MHz Super Synthesizer	WF 1956

Frequency:  
0.01  $\mu$ Hz to 15MHz/50MHz/100MHz  
Resolution: 0.01  $\mu$ Hz with accuracy  
of  $\pm$  5ppm

Fluorescent display with high  
level of visibility and great  
amount of information.

Output voltage:  
Maximum output voltage of  
20Vp-p/Open  
Maximum of 5 digits to be  
displayed

Output range  
Output level over indication  
(AC + DC)

Displays functions of 2-channel  
mode.

Displays oscillation mode and  
waveform.

\* The photo shows WF 1946A.  
Panels are illuminated for explanation purpose.  
Actual display will not be as shown here.



Main parameter call key

Stores panel setting  
parameters.

Sets values as you do with  
analogue device.

Synchronized operation I/O  
(Option)

USB interface\*

Digital output (Option)

Auxiliary sweep I/O  
External addition input,  
External AM input

GPIO interface

Switching among  
AC 100/115/230V \*



\* Except for WF 1956.

# me of High Quality.

Lots of Useful Functions to Realize Excellent Operations and Various Waveforms only Wave Factory Can Provide.

## Reliable and Smooth Operations with Key Navigation All Models

Wave Factory series employs Key Navigation on the panel to facilitate key operations as much as possible. Only the keys that are to be operated next illuminate sequentially and only necessary and sufficient information is displayed. With conventional oscillators, a single key used to have too many functions and displays as a result of pursuing many advanced functions. This made operations difficult. Wave Factory series solves these problems.



Only necessary keys illuminate in the order of operation!

## 2-Channel Mode WF 1944A, WF 1946A, WF 1966, WF 1956

Various settings such as 2 independent channels, 2 phases (same frequency)/constant frequency ratio/constant frequency difference/differential output (amplitude and offsets in inverted waveforms at same frequency) are available.

Constant frequency ratio (RATIO) is a mode in which the frequency of 2 channels changes (is interlocked) so that the frequency ratio between 2 channels is constant. For example, this can be used as signal source for driving a device under test that uses gear mechanism.

Constant frequency difference (2TONE) is a mode in which the frequency of 2 channels changes (is interlocked) so that the frequency difference between 2 channels is constant. For example, this is convenient in simulating the relation of the target frequency and nearby noise in communication issue.

Differential output (DIFF) is a mode in which the one channel has amplitude and offset in the inverted waveform of those of the other channel at the same frequency. This can be used for testing differential output of amplifiers.

2 Phases	CH1	1 kHz/0°	→	10 kHz/0°
	CH2	1 kHz/90°	→	10 kHz/90°
Frequency Difference	CH1	1 kHz	→	10 kHz
	CH2	2 kHz	→	11 kHz
Frequency Ratio	CH1	1 kHz	→	10 kHz
	CH2	2 kHz	→	20 kHz



Differential Output

## User Unit Function\* All Models

Frequency, period, phase, amplitude, offset, and duty can be set and displayed in desired unit if desired unit name and conversion formula have been input. Because you do not need to conduct complicated calculations each time you make settings, the output can be easily obtained in desired unit.

For example...

If you would like to output frequency (Hz) according to the number of rotations (rpm) of car engine, enter a coefficient (x60) and unit (rpm) in advance. Setting 6000 (rpm) will output 100Hz.

\* Patent pending



## As pulse generator\*... All Models

Wave Factory series can be used as a pulse generator by combining variable duty factor, trigger oscillation, and trigger delay functions. Settings can be made in the pulse width or period, in addition to independent level settings with high/low. This can be used in various digital devices, data transmission devices, and device operation tests.

\* Patent pending

\* WF 1943A/WF 1945A/WF 1944A/WF 1946A  
Rise time: 20ns or less.

\* WF 1965/WF 1966 Rise/Fall time: 7ns to 1ms.

\* WF 1956 Rise time: 15ns or less.



## Arbitrary Waveform (ARB) All Models

Arbitrary waveforms can be output as well as the built-in waveforms of  $\sim$ ,  $\sphericalangle$ ,  $\square$ ,  $\square$  (variable),  $\sphericalangle$ ,  $\sphericalangle$ , and noise. Waveforms can be created through panel operations (point specification and linear interpolation), GPIB, or USB. Furthermore, maximum of 12 waveforms can be stored. This can be used as signal source for simulating excitation waveforms in vibration testing, electroencephalogram, and electrocardiogram.

You can easily create arbitrary waveforms on your PC by using separately-sold 0105, the software to create arbitrary waveforms. The waveforms you created can be transferred to Wave Factory products via GPIB or USB interfaces (see P.4).



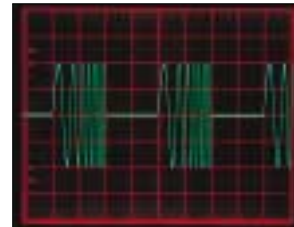
## Sweep Functions and Modulation Functions All Models

Each parameter of frequency / phase / amplitude / offset / duty factor ( $\square$  only)<sup>\*1</sup> can be swept in combination of continuous/single/gated sweep and linear/log (log is available only for frequency and amplitude). Needless to say, sweeping can be set to pause or resume. Auxiliary input/output terminals for hold input, marker output, and X drive output<sup>\*2</sup> are provided on the rear panel of the synthesizer. Modulation<sup>\*3</sup> can be applied not only to AM, FM(FSK), phase(PSK), and PWM as a matter of course, but also to offset.

<sup>\*1</sup> The sweep parameters for WF 1943A and WF 1944A are frequency and phase only.

<sup>\*2</sup> Auxiliary sweep input/output is featured in WF 1945A / WF 1946A / WF 1965 / WF 1966 / WF 1956.

<sup>\*3</sup> WF 1943A and WF 1944A can apply modulation only to FM (FSK) and phase (PSK).



Gated Sweep



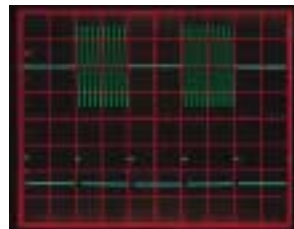
Offset Modulation

## Burst/Trigger/Gate/Triggered Gate All Models

Wave Factory series can control start/stop of the oscillation as you desire. With stop level function\*, you can set at which level the oscillation stops as you desire (resolution of 0.1% for WF 1956 and 0.01% for others).

In addition, the wave number to oscillate and stop can be set both independently by the 0.5 wave up to 500000.0 waves.

\* Patent pending



Triggered Gate



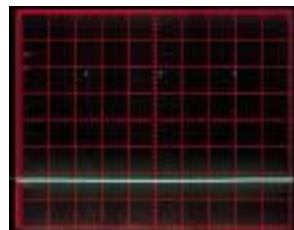
3-Value Pulse

## Square Wave Output with Universal Setting All Models

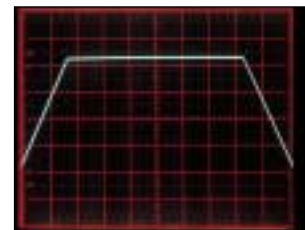
The square wave duty is variable between 0 to 100%<sup>\*1</sup> with setting resolution of 0.0001%. With this, precise simulation of the duty-controlled mechanism that is used in in-vehicle ECU can be performed. Furthermore, WF 1965 and WF 1966 can set rise/fall time of the square wave.<sup>\*2</sup> The setting can be made in wide variable range of 7ns to 1 ms with resolution of 3 digits. With this function, users can perform operation test on devices that use digital signal such as clock signal used in information equipment.

<sup>\*1</sup> Duty is variable between 0.01% to 99.99% in WF 1956.

<sup>\*2</sup> Only WF 1965 and WF 1966 feature variable rise/fall time.



Variable duty ratio



Variable rise/fall time

## Others

Input/Output floating above the chassis\*. Channels isolated from each other.

\* Featured in WF 1945A/WF 1946A/WF 1965/WF 1966/WF 1956 (1CH only)

(Only WF 1946A/WF 1966 have isolated channels)

External signals are added before being output.

(Featured in WF 1945A/WF 1946A/WF 1965/WF 1966/WF 1956)

Outputs 15-bit waveform data and clock (digital output). Memory, CPU, and D/A converter can be tested.

(Featured in WF 1945A/WF 1946A/WF 1956 as factory option <1992A>.

Two sets of this option are required when using 2 channels.)

Synchronized operation can be achieved among maximum of 6 units. Multi-channel (multi-phase) signal source is built. (Featured in WF 1945A/WF 1946A/WF 1965/WF 1966/WF 1956 as factory option <1991>.)

Displays the output terminal voltage when the unit is connected to a desired pre-set load impedance (Load function).

The output state when the power is turned on can be set to be the same as right before the power was turned off, or to keep the output off or on.



## Applications

### [Electronics/Information equipment]

Operation test on electronic circuits, LSIs, and components, signal source for information equipment and digital circuits, input signal source for A/D converters, RGB signal source for display check, drive test on LCD panels, driving multilayer piezoelectric actuators, driving ultrasonic motors, developing bias signal source for copying machine drums, test on pulse counters, signal source for testing differential and balanced input, and generation of noise simulation waveforms.

### [Mechanics/Control]

Driving signal for robots and servo systems, signal source for testing FA control circuits, simulated signal source for various sensors, timing signal source for switches and relays, driving pulse motors, signal source for driving PWM inverter motors, simulated signal source for rotary encoders, signal source for vibration and fatigue tests, and signal source for making waves.

### [Automobiles/Railroads]

Simulation of gear rotation signals, development and inspection of ABS and power steering, simulation signal source for ECUs, simulation signal source for various automobile sensors, testing traction control, testing power supply ripple fluctuation of electrical components, signal source for testing ATC systems, and signal source for testing track circuit devices.

### [Communication/Audio]

Terrestrial digital broadcasting, clock source for OFDM methods such as 5-GHz high speed wireless LAN, IQ signal source for next-generation cellular-phones, signal source for testing echo cancellers, signal source for simulating responses of radar and sonar, simulated signal source for fish finders, frequency response tests on amplifiers and speakers, evaluation tests on radio communication devices, and white noise source.

### [Components/Materials]

Inspection and evaluation of electronic components, driving piezoelectric elements, driving solenoids, driving heaters, trigger source for pulse lasers, signal source for plating power supplies, signal source for bending and fatigue tests on materials, measuring electrochemical characteristic of solution, charge/discharge test on batteries, use for generating simulated AE (acoustic emission) waves, and measuring lock-in amplifiers using reference signals.

### [Power/Medical electronics/Others]

Signal source for testing circuit breakers, signal source for testing JIS standards of earth leakage circuit breakers, simulation of 3-phase power sources, generating waveforms for power fluctuation environmental tests, simulation of biosignals, simulated signal source for electrocardiogram, source for auditory stimulation such as tone burst and tone pip, frequency standard in instrument control rooms, and simulated signal source for evaluating recorders and monitors.

## Related Products

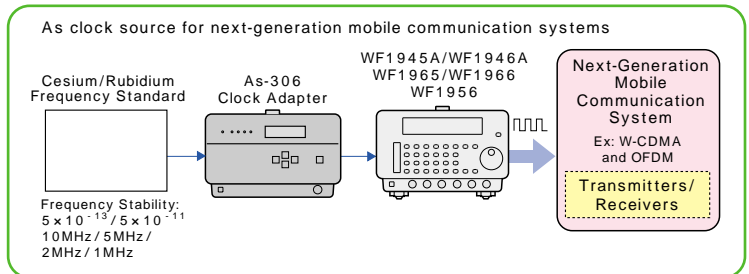
### Clock Adapter that Synchronizes Synthesizer with External Reference Frequency, Achieving Frequency Accuracy of $\pm 0.1\text{ppm}$

#### Clock Adapter As-306



As-306 is a clock adapter to be connected with WF 1945A / WF 1946A / WF 1965 / WF 1966 / WF 1956 featuring synchronized operation function to synchronize the synthesizer with external reference frequency. If highly stable reference frequency is also equipped, the adapter can achieve frequency accuracy of  $\pm 0.1\text{ppm}$  without using external standard frequency.

This can be used for synchronizing clocks of devices divided in multiple units such as transmitters/receivers of next-generation mobile communication systems.



### Power Amplifier that Enhances Outputs of Wave Factory to Drive Various Test Pieces

#### High-Speed Bipolar Power Supply HSA Series



HSA series is a high-speed wideband bipolar power amplifier with high voltage output that amplifies the outputs of Wave Factory. This supplies power from DC to maximum of 10 MHz. This power amplifier can perform four-quadrant operation that can be a source or a sink. Capacitive or inductive test components can also be driven stably.


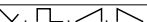
This is convenient when driving test components that lack voltage or current with output from signal generators only.

\* High voltage type HVA series is also available as well as HSA series.

\* The photo shows HSA 4101.

# Main Specifications



	WF 1943A	WF 1945A	WF 1944A	WF 1946A	WF 1965	WF 1966	WF 1956		
Frequency Range	0.01 μHz to 15MHz				0.01 μHz to 50MHz		0.01 μHz to 100MHz		
Channel(s)	1		2		1	2	2		
Output Waveform	(duty fixed at 50%), (Duty variable), Arbitrary waveforms, noise and DC								
Waveform Vertical Resolution	14 bits (arbitrary wave-forms)	16 bits (arbitrary wave-forms)	14 bits (arbitrary wave-forms)	16 bits (arbitrary wave-forms)	14 bits (arbitrary wave-forms)	14 bits (arbitrary wave-forms)	12 bits (arbitrary wave-forms)		
Output Waveform and Frequency Range	Continuous oscillation, (duty fixed at 50%); 0.01 μHz to 15MHz, (Duty variable); 0.01 μHz to 500kHz, Arbitrary waveform: 0.01 μHz to 500kHz (the range with which the unit can continuously output entire arbitrary waveform: (40MHz) / (Arbitrary waveform data size [Words]), Analogue frequency band: 10MHz, Burst, trigger, gate, triggered gate, and gated sweep: 0.01 μHz to 500kHz				Continuous oscillation, (duty fixed at 50%); 0.01 μHz to 50MHz, (Duty variable); 0.01 μHz to 2MHz, Arbitrary waveform: 0.01 μHz to 2MHz (the range with which the unit can continuously output entire arbitrary waveform: (160MHz) / (Arbitrary waveform data size [Words]), Analogue frequency band: 35MHz, Burst, trigger, gate, triggered gate, and gated sweep: 0.01 μHz to 500kHz		Same as WF-A (15MHz type synthesizers) CH2: In HF mode, ~: 100kHz to 100MHz (Continuous oscillation only)		
Frequency Setting Resolution	0.01 μHz						0.01 μHz, CH2 in HF mode: 0.1 μHz		
Frequency Accuracy	Default accuracy: ±5ppm, With aging: ±3ppm/year						±5ppm		
Periodic Setting	Reciprocal number of the set period (Less than 0.01 μHz rounded off)								
Duty Factor Variable Range	0.0100% to 99.9900% or 0.0000% to 100.0000% with setting resolution of 0.0001%						0.0100% to 99.9900% with setting resolution of 0.0001%		
Arbitrary Waveform Data Size/Wave Numbers	Switching among 8K words/16K words/32K words. Note that 1K word = 1024 words and arbitrary waveform wave number is 12 with 8K words, 6 with 16K words, and 3 with 32K words								
Arbitrary Waveform Vertical Resolution	14 bits	16 bits	14 bits	16 bits	14 bits		12 bits		
Arbitrary Waveform Data Creation	Data written for the specified point or linear interpolation through panel operations, or data written with external control (GPIB/USB).								
Noise Output	Noise source: Pseudo-M-series noise that corresponds to 42-stage shift register White noise band (equivalent noise bandwidth): 500kHz				Noise source: Pseudo-M-series noise that corresponds to 45-stage shift register White noise band (equivalent noise bandwidth): 2MHz		Same as WF-A (15MHz type synthesizers)		
HF Mode*	-						CH2: See back cover		
Output Characteristic	Frequency Characteristic of Amplitude	Continuous oscillation, load of 50 Ω, DC offset of 0V, amplitude setting of 10Vp-p/50 Ω, frequency reference of 1kHz, RMS value measurement ~: to 1MHz : ±0.2dB, -0.3dB 1MHz to 3MHz : +0.35dB, -0.7dB 3MHz to 10MHz : +0.5dB, -1.5dB 10MHz to 15MHz : +0.5dB, -2.0dB □ (duty fixed at 50%): to 1MHz : ±0.3 dB to 500kHz : ±0.3 dB △ (duty variable): to 500 kHz : ±0.5 dB				Continuous oscillation, load of 50 Ω, DC offset of 0V, amplitude setting of 10Vp-p/50 Ω, frequency reference of 100kHz (1kHz (other than ~)), RMS value measurement ~: to 1MHz : ±0.2dB 1MHz to 5MHz : +0.2dB, -0.5dB 5MHz to 10MHz : +0.2dB, -1.0dB 10MHz to 20MHz : +0.3 dB, -1.5 dB 20 MHz to 50 MHz : +1.0 dB, -3.0 dB □ (duty fixed at 50%): to 1MHz : ±0.3dB to 1MHz : ±0.3dB to 1MHz : ±0.5dB		Continuous oscillation, external AM OFF, load of 50 Ω, DC offset of 0V, amplitude setting of 10Vp-p/50 Ω, frequency reference of 1kHz, RMS value measurement ~: to 1MHz: ±0.2 dB 1MHz to 10MHz : +0.3dB, -1.0dB 10MHz to 15MHz: +0.3 dB, -2.0 dB □ (duty fixed at 50%): to 1MHz : ±0.3 dB to 1MHz : ±0.3 dB to 500kHz: ±0.3dB to 500kHz: ±0.5dB	
	Spectrum Purity	Continuous oscillation, load of 50 Ω, DCoffset of 0V, amplitude setting of 10Vp-p/50 Ω Total harmonic distortion 10Hz to 100kHz: 0.2% or less Harmonic spectrum 100kHz to 1MHz: -50dBc 1MHz to 15MHz: -30dBc Spurious to 15MHz : -35dBc				Continuous oscillation, load of 50 Ω, DCoffset of 0V, amplitude setting of 10Vp-p/50 Ω Total harmonic distortion factor 10Hz to 100kHz: 0.3% or less Harmonic spectrum 100kHz to 1MHz: -47dBc 1MHz to 50MHz: -35dBc to 50MHz : -30dBc Spurious to 50MHz : -30dBc		Continuous oscillation, external AM OFF, load of 50 Ω, DC offset of 0V, amplitude setting of 10Vp-p/50 Ω Total harmonic distortion factor 10Hz to 100kHz: 0.3% or less Harmonic spectrum 100kHz to 1MHz: -50dBc 1MHz to 15MHz: -30dBc to 15MHz: -35dBc Spurious to 15MHz: -35dBc	
	Waveform Characteristic	Continuous oscillation, load of 50 Ω, DC offset of 0V, amplitude setting of 10Vp-p/50 Ω Rise/Fall time: 20ns or less Overshooting: 5% or less				Continuous oscillation, load of 50 Ω, DC offset of 0V, amplitude setting of 10Vp-p/50 Ω Rise/Fall time: Variable with setting range of 7ns to 1ms Settling resolution: 3 digits Overshoot: 5% or less		Continuous oscillation, external AM OFF, load of 50 Ω, DC offset of 0V, amplitude setting of 10Vp-p/50 Ω Rise/Fall time: 15ns or less Overshooting: 5% or less	
	Duty Accuracy	Continuous oscillation, load of 50 Ω, DC offset of 0V, amplitude setting of 10Vp-p/50 Ω □ (duty fixed at 50%) to 1MHz : ±1% of period 1MHz to 10MHz : ±3% of period 10MHz to 15MHz : ±5% of period □ (duty variable) to 100kHz : ±1% of period Jitter: 30nsp-p or less				Continuous oscillation, load of 50 Ω, DC offset of 0V, amplitude setting of 10Vp-p/50 Ω □ (duty fixed at 50%) to 1MHz : ±1% of period 1MHz to 10MHz : ±5% of period 10MHz to 50MHz : ±20% of period □ (duty variable) to 100kHz : ±1% of period Jitter: 7nsp-p or less		Continuous oscillation, external AM OFF, load of 50 Ω, DC offset of 0V, amplitude setting of 10Vp-p/50 Ω □ (duty fixed at 50%) to 1MHz: ±1% of period 1MHz to 10MHz: ±5% of period 10MHz to 15MHz: ±10% of period □ (duty variable) to 100kHz: ±1% of period Jitter: 30nsp-p or less	
	Output Voltage Range	Fixed at the range of 10V/1V or automatically switched						CH1: Same as the left, CH2: See back cover	
Amplitude Setting Range	10V range: 0mVp-p to 20.000Vp-p/Open, 1V range: 0.0mVp-p to 2.0000Vp-p/Open						CH1: Same as the left, CH2: See back cover		
Amplitude Setting Resolution	10V range: 1mVp-p/Open, 1V range: 0.1mVp-p/Open						CH1: Same as the left, CH2: See back cover		
Amplitude Accuracy	Continuous oscillation, ~, 1kHz, RMS value measurement 10V range: ±(0.7% of the set amplitude [Vp-p] + 0.05Vp-p)/Open 1V range : ±(0.7% of the set amplitude [Vp-p] + 0.01Vp-p)/Open				Continuous oscillation, ~, 1kHz, RMS value measurement 10V range: ±(1% of the set amplitude [Vp-p] + 0.05Vp-p)/Open 1V range: ±(1% of the set amplitude [Vp-p] + 0.01Vp-p)/Open		CH1: Continuous oscillation, external AM OFF, ~, 1kHz, RMS value measurement 10V range: ±(2% of the set amplitude [Vp-p] + 0.2Vp-p)/Open 1V range: ±(5% of the set amplitude [Vp-p] + 0.03Vp-p)/Open CH2: See back cover		
DC Offset Setting Range	10V range: ±10.000V/Open, 1V range: ±1.0000V/Open						CH1: Same as the left, CH2: See back cover		
DC Offset Setting Resolution	10V range: ±1mV/Open, 1V range: ±0.1mV/Open						CH1: Same as the left, CH2: See back cover		
DC Offset Accuracy	10V range: ±(0.5% of the set DC offset [V] + 0.07V)/Open 1V range: ±(0.5% of the set DC offset [V] + 0.01V)/Open				10V range: ±(0.5% of the set DC offset [V] + 0.1V)/Open 1V range: ±(0.5% of the set DC offset [V] + 0.01V)/Open		CH1: 10V range: ±0.2V/Open 1V range: ±(5% of the set DC offset [V] + 0.02V)/Open CH2: See back cover		
Output Impedance	50 Ω, unbalanced								
Load Impedance	45 Ω or more						Nominal impedance of 50 Ω or more		
Others	Output voltage setting with high/low level								
Periodic Output	0/+5V/Open, □, Output impedance: 50 Ω, unbalanced						CH1: Same as the left, CH2: See back cover		
Oscillation Mode	Burst/Gate/Trigger/Triggered gate (Triggered gate is an oscillation mode in which gate turns on/off at each triggering)								
Mark/Space Wave Number	Mark wave number: 0.5 to 500000.0 by the 0.5 wave (Mark wave number is an oscillation wave number in burst/trigger mode) Space wave number: 0.5 to 500000.0 by the 0.5 wave (Space wave number is a stop wave number in burst mode)								
Phase	Starting phase setting range: -1800.000° to +1800.000° with setting resolution of 0.001°								
Trigger Source	Internal triggering oscillator/External trigger input. Panel keys. Triggering can be given with external control (GPIB/USB).								
External Trigger	Polarity Trigger: Rise/Fall, Gate: Positive/Negative logic, Minimum pulse width: 50ns, Pull up to +5V with input impedance of 10k Ω.								
Internal Trigger Period	Setting range: 1 μs to 100.0s. Setting resolution: 4 digits for 1ms or more, and 1 μs for less than 1ms								
Trigger Delay	Setting range: 0.3 μs to 100.0s. Setting resolution: 5 digits for 1ms or more, and 0.1 μs for less than 1ms (Effective when Trigger is selected as oscillation mode)								
Trigger Jitter	50ns or less								
Stop Level	On/Off selection (Stops at the set phase when this is set to Off, and stops at the set stop level when this is set to On)								
Stop Level Setting Range	-100.00% (Maximum negative value) to +100.00% (Maximum positive value) with setting resolution of 0.01%						-100.0% (Maximum negative value) to +100.0% (Maximum positive value) with setting resolution of 0.1%		

	WF 1943A	WF 1945A	WF 1944A	WF 1946A	WF 1965	WF 1966	WF 1956	
Sweep	Sweep Item	Frequency, Phase	Frequency, Phase, Amplitude, DC offset, Duty factor	Frequency, Phase	Frequency, Phase, Amplitude, DC offset, Duty factor			
	Setting Item	Sweep start/stop or Sweep center/span, Sweep marker, Sweep marker substituted to center, Sweep start state, Sweep stop state						
	Sweep Function	Continuous/Single/Gated sweep, LIN/LOG (LOG is for frequency and amplitude), 						
	Sweep Time	Setting range: 1ms to 10000.000s (when sweeping/modulating one of the 2 independent channels) or 2ms to 10000.000s (Other than mentioned). Setting resolution: 1ms						
	Sweep Triggering	Triggers to start single/gated sweep. Triggering period: 100ms or more (triggering with a period of less than 100ms gives triggering of 100ms period)						
	Trigger Source	Internal triggering oscillator/External trigger input, Panel key. Triggering can be given with external control (GPIB/USB).						
	External Trigger	Polarity: Rise/Fall, Minimum pulse width: 200ns, Trigger delay: 2ms						
	Internal Triggering Oscillator	Period setting range: 1 μs to 100.0s, Setting resolution: 4 digits for 1ms or more, and 1 μs for less than 1ms						
	Stop Level	On/Off selection effective in Gated sweep (Stops at the set phase when this is set to Off, and stops at the set stop level when this is set to On)						
	Stop Level Setting Range	- 100.00% (Maximum negative value) to + 100.00% (Maximum positive value) with setting resolution of 0.01%					- 100.0% (Maximum negative value) to + 100.0% (Maximum positive value) with setting resolution of 0.1%	
Internal Modulation	Sweep I/O	Sweep trigger input, Synchronized output	Sweep trigger input, Synchronized output, Stop/Resume input, Marker output, X drive output	Sweep trigger input, Synchronized output	Sweep trigger input, Synchronized output, Stop/Resume input, Marker output, X drive output			
	Modulation Item	FM (FSK), PM (PSK)	FM (FSK), PM (PSK), AM, DC offset modulation, PWM (┐ duty variable)	FM (FSK), PM (PSK)	FM (FSK), PM (PSK), AM, DC offset modulation, PWM (┐ duty variable)			
	Internal Modulation Frequency	Setting range: 0.1mHz to 500.00Hz Setting resolution: 5 digits for 1Hz or more, and 0.1mHz for less than 1Hz		Setting range: 0.1mHz to 500.00Hz (when sweeping/modulating one of the 2 independent channels) or 0.1mHz to 250.00Hz (other than above). Setting resolution: 5 digits for 1Hz or more, and 0.1mHz for less than 1Hz	Setting range: 0.1 mHz to 500.00 Hz Setting resolution: 5 digits for 1Hz or more, and 0.1mHz for less than 1Hz	Setting range: 0.1mHz to 500.00 Hz (when sweeping/modulating one of the 2 independent channels) or 0.1mHz to 250.00Hz (other than above). Setting resolution: 5 digits for 1Hz or more, and 0.1mHz for less than 1Hz		
	Internal Modulation Waveform							
External Modulation	Modulation Item	-	AM, DSB-SC AM, On/Off selection	-	AM, DSC-SC AM, On/Off selection		AM, On/Off selection	
	External Modulation Frequency	-	DC to 10MHz	-	DC to 10MHz		-	
	External AM Depth	-	- 3V input: - 100% - 1V input: 0% 0V input: 50% + 1V input: Set amplitude	-	- 3V input: - 100% - 1V input: 0% 0V input: 50% + 1V input: Set amplitude	- 1V input: 0% 0V input: 50% + 1V input: Set amplitude		
	Input Voltage Range	-	- 3V to + 1V	-	- 3V to + 1V		± 1V	
	Input Impedance	-	50	-	50		-	
External Addition	Function	-	Adds external signal to FUNCTION OUT signal, On/Off selection	-	Adds external signal to FUNCTION OUT signal, On/Off selection			
	External Addition Frequency	-	DC to 10MHz	-	DC to 10MHz			
	External Addition Gain	-	With no load 10V range: × 2 1V range: × 0.2	-	With no load 10V range: × 2 1V range: × 0.2	CH1: Same as left CH2: 2V range: × 2 200mV range: × 0.2 20 mV range: × 0.02		
	Input Voltage Range	-	± 5V	-	± 5V		CH1: ± 5V, CH2: ± 1V	
	Input Impedance	-	50	-	50		-	
2-Channel Operations	Channel Mode	-	-	Two independent channels. Two phases (same frequency). Constant Frequency Ratio, Constant frequency difference, Differential output (Amplitude and DC offset in inverted waveform at same frequency)	-	Two independent channels. Two phases (same frequency). Constant Frequency Ratio, Constant frequency difference, Differential output (Amplitude and DC offset in inverted waveform at same frequency)		
	Phase Setting Range	-	-	- 1800.000 ° to + 1800.000 ° with setting resolution of 0.001 °	-	- 1800.000 ° to + 1800.000 ° with setting resolution of 0.001 °		
	Frequency Difference Setting Range	-	-	Set CH2 frequency - CH1 frequency. Setting range: 0.00 μHz to 14.999999999999999MHz with setting resolution of 0.01 μHz	-	Set CH2 frequency - CH1 frequency. Setting range: 0.00 μHz to 49.999999999999999MHz with setting resolution of 0.01 μHz	Set CH2 frequency - CH1 frequency. Setting range: 0.00 μHz to 14.999999999999999MHz with setting resolution of 0.01 μHz	
	Frequency Ratio Setting Range	-	-	Set frequency of CH1 and CH2 as N:M. Setting range: 0000001 to 9999999 (for each) with setting resolution of 1	-	Set frequency of CH1 and CH2 as N:M. Setting range: 0000001 to 9999999 (for each) with setting resolution of 1		
	Phase Synchronization	-	-	Function to restart the output waveform of all the channels from the set phase. Manual or external control (GPIB/USB)	-	Function to restart the output waveform of all the channels from the set phase. Manual or external control (GPIB/USB)		
	Simultaneous Setting	-	-	Function to set values for two channels simultaneously	-	Function to set values for two channels simultaneously.		-
	Others	-	-	Function to copy the setting for CH1 and CH2 to the other one.	-	Function to copy the setting for CH1 and CH2 to the other one.		
User Unit Function	Function to set/display parameters in desired unit through conversion. Setting possible parameters: Frequency, Period, Amplitude, DC offset, Phase, Duty. Coefficient setting: [(Internal setting) + n] × m, or [log 10 (internal setting) + n] × m. Select either conversion formula and then set a value to n and m. Unit character string: Maximum of 4 characters are set/displayed.							
Load Function	Function to set/display according to actual voltage under arbitrary load. Load impedance setting range: 45 to 999 with setting resolution of 1 .							
Output On/Off	Turns on/off the output. State when power is turned on: Select from Resume the state before power was turned off, On, and Off.							
Setting Memory and Backup	Function to save/call 10 sets of setting items from 0 to 9 (setting memory) (some parameters excluded), Backup: Uses battery to back up the setting contents before power is turned off (some parameters excluded).							
Interface	GPIB, USB						GPIB	
I/O Ground	• WF 1945A, WF 1965, WF 1956 (CH1 only): Signal ground (common) for FUNCTION OUT, SYNC OUT, EXT AM IN, EXT ADD IN is floating from chassis. Signal ground withstanding voltage: ± 42V peak, 30V rms (DC to 20kHz, continuous). The ground for all other signal I/Os is connected to the chassis. • WF 1946A, WF 1966: Besides above, CH1 and CH2 are isolated. • WF 1943A, WF 1944A: The ground for all the I/Os is connected to the chassis.							
Power Supply	AC 100V/115V/230V ± 10% switching, 50/60Hz ± 2Hz							
Power Consumption	50VA or less	65VA or less	70VA or less	100VA or less	65VA or less	100VA or less	125VA or less	
Ambient Temperature/Humidity Range	Performance guaranteed: + 5 to + 35 , 5 to 85% RH, or absolute humidity of 1 to 25g/m <sup>3</sup> (No condensation) Storing: - 10 to + 50 , 5 to 95% RH, or absolute humidity of 1 to 29g/m <sup>3</sup> (No condensation)					Performance guaranteed: + 5 to + 35 , 5 to 95% RH (No condensation) Storing: - 10 to + 50 , 5 to 85% RH (No condensation)		
External Dimension (mm)	216(W) × 132.5(H) × 290(D) (Excluding protruding sections)							
Weight	Approx. 4.2kg	Approx. 4.3kg	Approx. 4.5kg	Approx. 4.6kg	Approx. 4.4kg	Approx. 4.7kg	Approx. 5.4kg	
Accessories	Power code (3P, 2m), Fuse							



\* See the back cover for main specifications for CH2 and HF mode in WF 1956.

## Main Specifications (Continued)

CH2 of WF 1956 (in HF mode)

Waveform	Output Waveform	 (Continuous oscillation only)
	Frequency Range	100kHz to 100MHz (Resolution of 0.1 $\mu$ Hz)
	Frequency Accuracy	$\pm$ 5ppm
	Periodic Setting	Reciprocal number of the specified period (Less than 0.1 $\mu$ Hz rounded off)
Output Characteristic	Frequency characteristics of Amplitude	With external AM off, load of 50 $\Omega$ , DC offset of 0V, amplitude setting of 2Vp-p/50 $\mu$ V. Reference frequency of 1MHz, RMS value measurement $\pm$ 0.3dB (100kHz to 10MHz), $\pm$ 3dB (to 100MHz)
	 Spectrum Purity	Harmonic component: - 30dB or less (to 100MHz), Spurious: - 35 dB or less (to 100MHz)

CH2 of WF 1956 (Except for HF mode)

Output Characteristic	Frequency characteristics of Amplitude	Same as CH1. Note that this applies only to continuous oscillation with external AM off, load of 50 $\Omega$ , DC offset of 0V, and amplitude setting of 2Vp-p/50 $\mu$ V.
	 Spectrum Purity	Total harmonic distortion factor: 0.2% or less (10Hz to 100kHz). Others are same as CH1. Note that this applies only to continuous oscillation with external AM off, load of 50 $\Omega$ , DC offset of 0V, and amplitude setting of 2Vp-p/50 $\mu$ V.
	 Waveform Characteristic	Rise/Fall time: 8ns or less, Overshooting: 10% or less. Note that this applies only to continuous oscillation with external AM off, load of 50 $\Omega$ , DC offset of 0V, and amplitude setting of 2Vp-p/50 $\mu$ V.
Output Voltage	Output Range	2V/200mV/20mV range or automatically switched
	Amplitude Setting Range	2V range: 0mVp-p to 4Vp-p/Open 200mV range: 0mVp-p to 400mVp-p/Open 20mV range: 0mVp-p to 40mVp-p/Open
	Amplitude Setting Resolution	2V range: 100 $\mu$ Vp-p/Open 200mV range: 10 $\mu$ Vp-p/Open 20mV range: 1 $\mu$ Vp-p/Open
	DC Offset Range	2V range: $\pm$ 2V/Open (Resolution of 100 $\mu$ V/Open) 200mV range: $\pm$ 200mV/Open (Resolution of 10 $\mu$ V/Open) 20mV range: $\pm$ 20mV/Open (Resolution of 1 $\mu$ V/Open)
	Mutual Restriction between Amplitude and DC Offset	OVER lamp illuminates when the output voltage exceeds the following value. 2V range: $\pm$ 3.5V/Open
	Output Impedance	50 $\Omega$ $\pm$ 4% (DC), unbalanced
Synchronized Output	Output Voltage Setting Range	- 2V to + 7V/Open (Resolution of 1mV/Open) Note that (High level) - (Low level) must be 0.5V or higher.
	Rise/Fall time	Slew rate is variable independently for rise and fall. They are 1.0V/ns to 2.8V/ns each with resolution of 0.01V/ns. Set with rise/fall time or slew rate.

## Options

1991: Synchronized Operation	Function to perform synchronized operation of multiple units (Factory option) WF 1945A/WF 1946A/WF 1965/WF 1966/WF 1956
1994: Cable for Synchronized Operation	Connection cable between devices to which option 1991 is installed WF 1945A/WF 1946A/WF 1965/WF 1966/WF 1956
1992A: Digital Output	Outputs clock and upper 15 bits of the 16-bit waveform. (Factory option) To be installed to WF 1945A/WF 1946A/WF 1956. Accessories: 1 digital output cable

## Wave Factory Service Information

### \* Driver software in using USB interface

When using USB interface of this unit, you need to install USB driver software in your host computer.

The drivers can be downloaded on the following Web site.

<http://www.nfcorp.co.jp/usb/>

- The description given in this catalogue is based on the information as of August 1, 2003.
- Some appearance and specifications may change without notice.
- Please check the latest specifications and price before purchasing.
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