

MICRONIX

Arbitrary Function Synthesizer MFG206

1mHz to 20MHz / 30Vp-p (at open load)
Highly accurate and stable frequency due to synthesized method
Formation of arbitrary waveform with Windows 98/Me/2000/XP



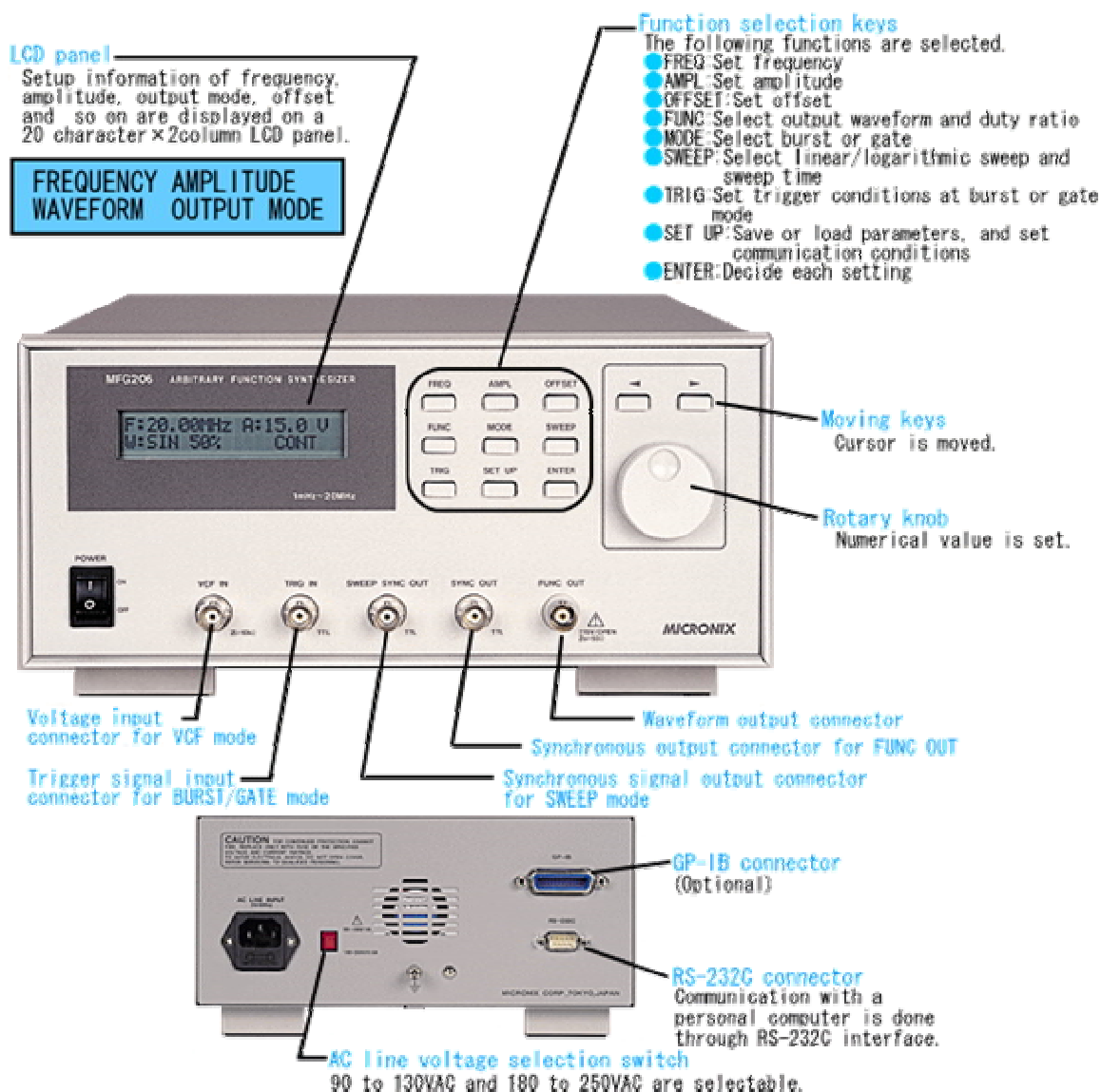
Technical material

- [Application example-1 of MFG206](#)
- [Application example-2 of MFG206](#)

Equipping with Dual Functions of Function Synthesizer and Arbitrary Waveform Generator

Features of MFG206

1. 1mHz to 20MHz / 30Vp-p (at open load)
2. High accuracy and stability of frequency due to synthesizing method
3. Arbitrary waveform generator function (10Mwords / s, 12bits, 128Kwords)
4. BURST / GATE functions
5. Dual functions of linear and logarithmic sweep
6. Wide application due to VCF function
7. RS-232C (standard) and GP-IB (optional)



Simplified and low-cost design with high accuracy, high stability, and dual functions

The model MFG206 synthesizer is a function generator equipped with a phase-locked loop (PLL) circuit that is capable of generating a highly accurate and stable frequency. The arbitrary function synthesizer can be used for the following applications : (1) A function synthesizer that can generate sine, triangle, or square wave in the wide bandwidth of 1mHz to 20MHz with a wide amplitude, as high as 30Vp-p at open load. (2) A 12-bit and 128K-word arbitrary waveform generator that has a sampling frequency of 10MHz maximum.

The model MFG206 synthesizer is a superb function generator having high signal accuracy and stability despite its simplified and low cost design, whose superior cost effectiveness justifies its uses for many applications.

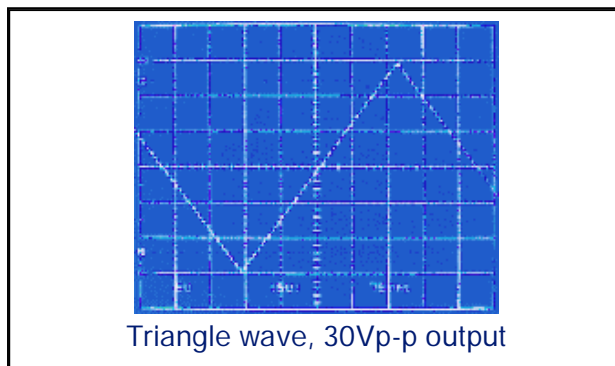
Function synthesizer section

● **Wide frequency range : 1mHz to 20MHz**

The synthesizer can output signals that range as wide as 1mHz (0.001Hz) to 20MHz. Note that the upper limit frequency for the triangular wave is 10 MHz.

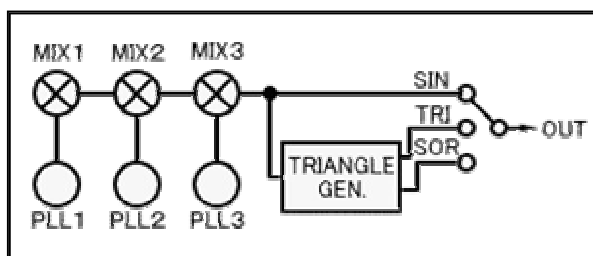
■ Wide amplitude : 30Vp-p

The synthesizer can output a signal that has wide amplitude, as high as 30Vp-p at open load. The maximum amplitude is 15Vp-p when it is terminated with a 50-ohm load.



■ Synthesizing method

The synthesizer generates the sine wave by means of the three pairs of PLL circuits (PLL1, PLL2, and PLL3) and frequency mixers (MIX1, MIX2, and MIX3). The triangle and square waves are generated based on the PLL circuit formed between the sine wave as a reference frequency and the triangle wave generator as a voltage control oscillator. As stated above, all the three waveforms are output as highly stable wave signals that are phase-locked by the reference crystal oscillator.

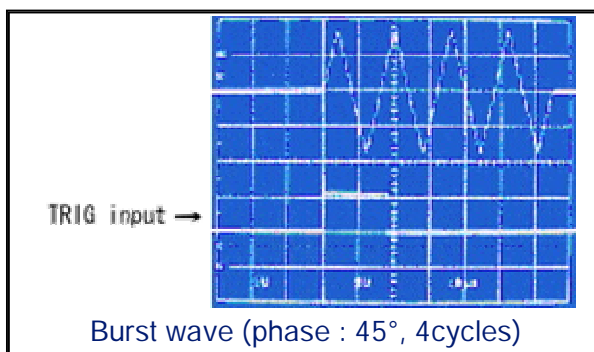


■ Burst and gate functions

Burst or gated waveform can also be output in addition to the continuous waves.

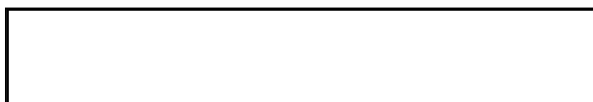
(1) Burst

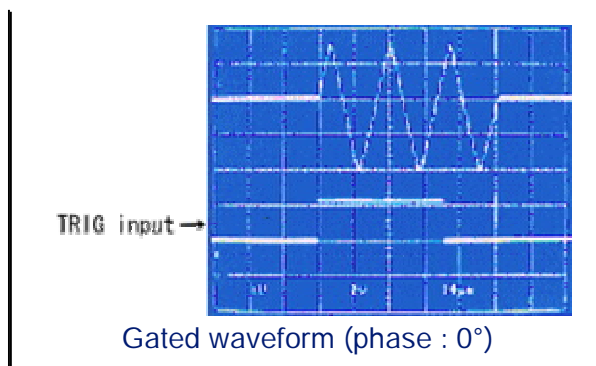
The synthesizer can output a given waveform having a specified cycle number (1 to 4096) starting from the predetermined phase (-90° to +90° with 1° step). The wave output begins at the rising edge of the TRIG input pulse or at the manual operation. The burst waves can be output in the frequency range of 0.100Hz to 999.9kHz.



(2) Gate

The wave is output at the predetermined phase (-90° to +90° with 1° step) when TRIG input reaches the high level. The wave output stops at the predetermined phase after TRIG input reaches the low level. The gated wave can be output in the frequency range of 0.1000Hz to 999.9kHz.

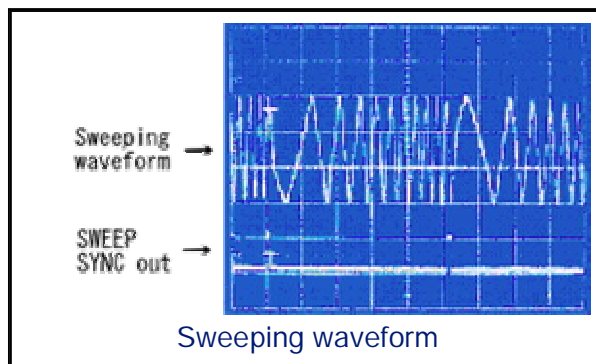




Sweep

The frequency can be swept up to the ratio of 1 : 100 by setting the start and stop frequencies. The sweep time can be set within the range of 0.01 to 10 seconds. It is also possible to select the sweep mode, either to the linear sweep or logarithmic sweep mode. In addition, the SWEEP SYNC output synchronized with the sweep is also available. This is a very convenient function. The four sweep ranges (200kHz to 20MHz, 10kHz to 1MHz, 1kHz to 100kHz and 100Hz to 10kHz) will be automatically selected after setting the start and stop frequencies. An error message will be displayed on the LCD unit if the two frequencies are set beyond the specified sweep frequency range.

Example : $\left\{ \begin{array}{l} \text{Start frequency : 20kHz} \\ \text{Stop frequency : 2MHz} \end{array} \right\} \rightarrow \text{Error message}$



VCF input

A frequency is output, which is proportional to the voltage applied to the VCF input. The dynamic range is approximately 1 : 100. Six sweep ranges are available (200kHz to 20MHz, 10kHz to 1MHz, 1kHz to 100kHz, 100Hz to 10kHz, 10Hz to 1kHz, and 1Hz to 100Hz).

Example : 10V → 20MHz 0.1V → 200kHz
(In the frequency range of [200kHz to 20MHz])

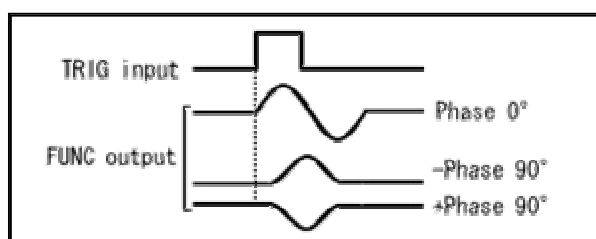
Saving and loading of the settings

A maximum of 10 parameters can be saved in the memory. The saved data will not be erased even when the equipment power supply is turned off since it is backed up by a battery.

Applications of the function synthesizer

(1) Applications of the burst function (Driver for ultrasonic devices)

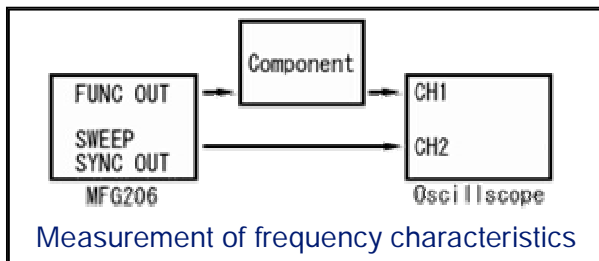
The synthesizer can be used as an optimum driver for the ultrasonic devices since it can output the high voltage signal of 30V, and a wide variety of waveforms can be created by varying the phase and cycle number. The signal can be obtained by inputting the pulses into the TRIG input.



Application of burst function (sine wave)

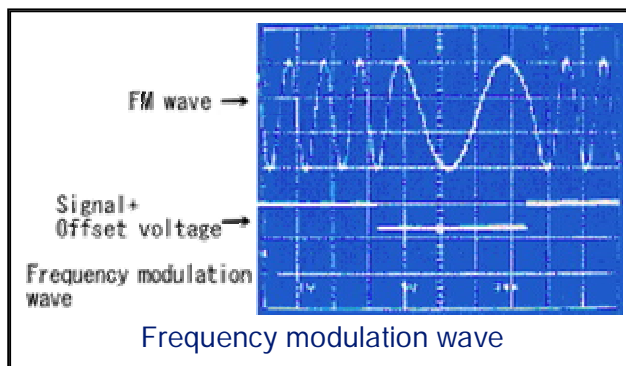
(2) Application of the sweep function (Measurement of the frequency characteristics)

Connect the FUNC OUT to the input terminal of a component such as the filter, amplifier, or equivalent. Then, connect the component output to CH1 of the oscilloscope and SWEEP SYNC OUT to CH2. The sweep range can be varied up to 100 times either in the linear or logarithmic mode.



(3) Application of the VCF function (Frequency modulator)

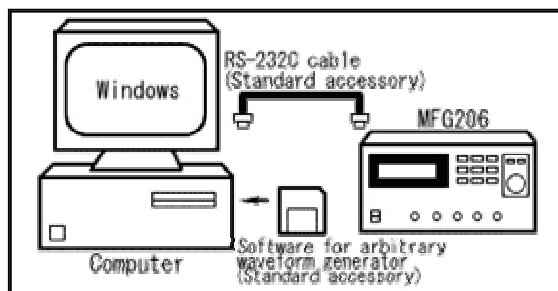
Apply the signal and offset voltage to the VCF input. Any desired frequency modulation effect can be obtained by setting the offset voltage to the carrier frequency.

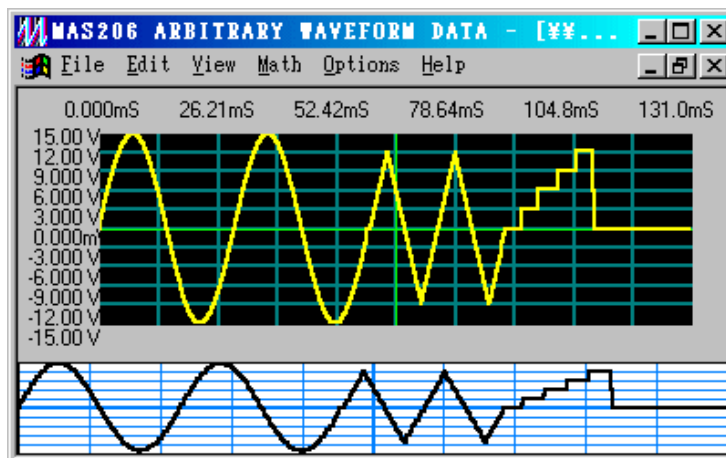


Arbitrary waveform generator

Overall construction

The arbitrary waveform generator creates and edits a given waveform using the Windows 98/Me/2000/XP (the software to generate the arbitrary waveform and RS-232C cable are included as the standard accessories). The waveform is then transmitted to the MFG206 synthesizer. Any waveform can be easily formed and edited using the Windows. In addition, this function can also be used for a wide variety of applications with its high-capacity and high-resolution waveform data (128K words and 12 bits per word) since its sampling frequency is as high as 10MHz maximum.





Windows screen for forming waveform

Forming of a waveform

(1) Standard waveform input

<Standard waveform>

Sine, triangle, square, ramp, $\sin X / X$, $(1-\epsilon^{-ax})$, ϵ^{-ax} , white noise, and DC.

There are nine standard waveforms available as stated above. It is also possible to form a special waveform since the parameters can be precisely specified for any one of the waveforms shown above.

Parameter	Setting value	Subject waveform
Data number	8 to 131072	All of waveform
Amplitude	0.001 to 1.00	Waveforms excluding DC
Offset	-1.00 to +1.00	All of waveforms
Cycle	1.00 to 100.00	Waveforms excluding white noise and DC
Phase (°)	0.00 to 360.00	Waveforms excluding white noise and DC
Duty ratio (%)	0.00 to 100.00	Square wave
Zero cross	0 to 100	$\sin X / X$
Damp fact	-15 to +15	$(1-\epsilon^{-ax})$ and ϵ^{-ax}

*Time can be plotted on the horizontal axis in addition to the number of data. The voltage can be plotted on the vertical axis in addition to the full scale.

Waveform	Triangle
Data number	2750
Amplitude	1.00
Offset	0.00
Cycle	1.38
Phase (°)	45.00

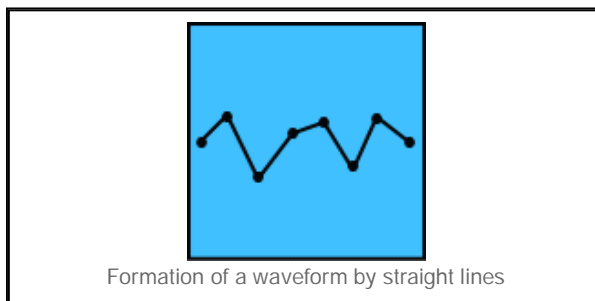
Waveform	Sine
Data number	2000
Amplitude	0.60
Offset	0.00
Cycle	2.00
Phase (°)	180.00

Waveform	DC
Data number	1250
Offset	-0.40

Formation of a waveform by standard waveforms

(2) Line input

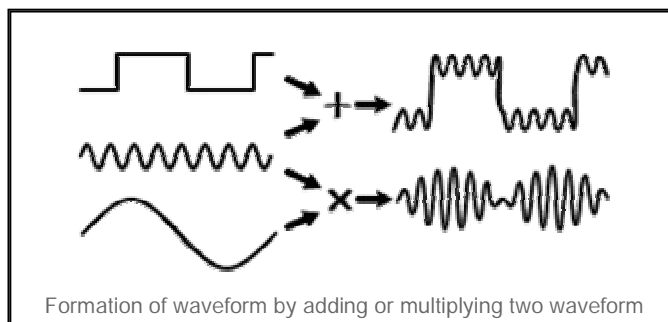
Specified two points can be connected by a straight line.



(3) Calculation input

- Addition (+)
- Subtraction (-)
- Multiplication (x)

Specified two waveforms can be added.
 Specified two waveforms can be subtracted.
 Specified two waveforms can be multiplied.



- Clipping
- Absolute value
- Mirror
- Smoothing
- Resizing
- Offset

A value specified on the Y-axis can be clipped.
 A value specified on the Y-axis can be converted into an absolute value.
 Data can be switched vertically or horizontally (upside down or right-hand side to the left and left-hand side to the right).
 The waveform can be averaged (moving average).
 The data size can be changed, either on the X-axis or Y-axis or both.
 An offset can be added to the Y-axis.

(4) One-point input

A given waveform can be created by inputting multiple points.

■ Editing of the waveform

- (1) Cut A specified range is cut.
- (2) Copy A given waveform within the specified range is copied.
- (3) Paste A separately specified waveform is pasted.
- (4) Undo The operation that has just been made is cancelled.

■ File

- (1) New A window to form a new waveform is opened.
- (2) Open File is opened.
- (3) Close File is closed.
- (4) Save The data contained in the waveform creation window is saved.
- (5) Data import The data in the ASCII format is read.
- (6) Data export The data in the ASCII format is output.

Burst rate	DC to 500kHz
Cycle number range	1 to 4096 cycles
Phase range	-90°C to +90°C / 1°C step (0.100Hz to 9.999kHz) -75°C to +75°C / 1°C step (10.00 to 999. 9kHz)
Phase accuracy	less than $\pm 3^\circ\text{C}$ (0.100Hz to 1.000kHz)
Trigger source	External and Manual
Gate	
Frequency range	0.100Hz to 999.9kHz
Frequency accuracy	less than ($\pm 10\%$ of setting)
Gate rate	DC to 500kHz
Phase range	-90°C to +90°C / 1°C step (0.100Hz to 9.999kHz) -75°C to +75°C / 1°C step (10.00 to 999. 9kHz)
Phase accuracy	less than $\pm 3^\circ\text{C}$ (0.100Hz to 1.000kHz)
Trigger source	External
Sweep function	
Subject waveform	Sine wave
Sweep time axis	Linear and Logarithmic
Sweep time range	0.01 to 10.0 sec / 0.01sec step
Sweep time accuracy	less than ($\pm 10\%$ of setting)
Start freq. range	100.0Hz to 20.00MHz
Start freq. accuracy	less than ($\pm 5\%$ of setting) @ sweep range of 200kHz to 20MHz less than ($\pm 10\%$ of setting $\pm 0.05\text{K [Hz]}$) (excepting above sweep range, K : maximum value of sweep range)
Stop freq. range	100.0Hz to 20.00MHz
Stop freq. accuracy	less than ($\pm 5\%$ of setting $\pm 10 \times (1+T)$ [kHz]) @ sweep range of 200kHz to 20MHz less than ($\pm 10\%$ of setting $\pm 0.05\text{K [Hz]}$) (excepting above sweep range, K : maximum value of sweep range)
Sweep range	4 ranges ([200kHz to 20MHz], [10 kHz to 1MHz], [1kHz to 100 kHz], [100Hz to 10 kHz])
Control input	
Trigger input	
Input resistance	10kohm $\pm 5\%$
Threshold level	TTL level
Min. pulse width	more than 25ns
Input damage level	$\pm 20\text{V}$ (DC + ACpeak) max.
VCF input	
Input resistance	10kohm $\pm 5\%$
Frequency range	6 ranges ([200kHz to 20MHz], [10kHz to 1MHz], [1kHz to 100kHz], [100Hz to 10kHz], [10Hz to 1kHz], [1Hz to 100Hz])
Max. sweep width	approx. 1 : 100 @ 0.1 to 10V input
Frequency accuracy	less than ($\pm 10\%$ of setting $\pm 0.05\text{K [Hz]}$) (sine wave, K : maximum value of sweep range)
Input damage level	$\pm 20\text{V}$ (DC + ACpeak) max.
Control output	
SYNC output	
Waveform	Square wave
Output level	TTL level
Rise/Fall time	less than 25ns
Output resistance	approx. 100ohm
Sweep SYNC output	
Waveform	Square wave
Output level	TTL level
Rise/Fall time	less than 25ns

Output resistance approx. 100ohm

■ Arbitrary waveform generator section

Waveform

Waveform

Horizontal axis 8 to 131072 (128K) words

Vertical axis 12 bits

Sampling frequency

Setting range 100Hz to 10MHz / 4digits setting

Accuracy less than ±50ppm (0 to 40°C)

Forming of waveform

Standard waveforms

Sine, Triangle, Square, Ramp, $\sin X / X$, $(1 - \epsilon^{-ax})$, ϵ^{-ax} , White noise and DC

Straight line

Link two points by a line

Calculation

+, -, ×, Clipping, Absolute, Mirror, Smoothing, Resize, Offset

One-point input

Input each point

Editing of waveform

Cut, Copy, Paste, Undo, Delete

File

New, Open, Close, Save, Save as, Data import, Data export, Print, Printer setup, Transmit, Exit

■ Others

Display system

Monitor

LCD (20characters × 2columns)

Contents

Frequency, Amplitude, Waveform, Mode and other

Save of parameters

Save number 10

Interface

Interface

Communication method

RS-232C (GP-IB is optional)

Baud rate

2,400 to 57,600

Commands

Writing and readout parameters, and writing of an arbitrary waveform

General

Operating temperature

0 to 40°C (Guaranteed at 23 ± 5°C)

Operating humidity

less than 40°C / 80%RH (Guaranteed at less than 28°C / 80%RH)

Storage temperature

-10 to +60°C / less than 80%RH

Warm-up time

more than 30min.

Power Supply

90 to 130VAC / 180 to 250VAC
(selected by a switch located on a rear panel)

Dimensions

260 (W) × 115 (H) × 360 (D) mm (excluding projection)

Weight

approx. 4.1kg

Standard accessories

Instruction manual (1pc), Power cable (1pc), Fuse (1pc),
Floppy disk for arbitrary waveform generator (1pc), RS-232C cable (1pc)

Optional

MFG206-GPIB (GP-IB board for MFG206 and factory option),

GP-IB cable, BNC coaxial cable (1m)

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