

Arbitrary Function Generator

AFG-3000 Series

QUICK START GUIDE

GW INSTEK PART NO. 82FG-30820MA1



ISO-9001 CERTIFIED MANUFACTURER

GW INSTEK

October 2010 edition

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Good Will Instrument Co., Ltd.
No. 7-1, Jhongsing Rd., Tucheng City, Taipei County 236, Taiwan.

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S SAFETY INSTRUCTIONS

This chapter contains important safety instructions that should be followed when operating and storing the function generator. Read the following before any operation to ensure your safety and to keep the function generator in the best condition.

Safety Symbols

These safety symbols may appear in this manual or on the instrument.



WARNING

Warning: Identifies conditions or practices that could result in injury or loss of life.



CAUTION

Caution: Identifies conditions or practices that could result in damage to the function generator or to other objects or property.



DANGER High Voltage



Attention: Refer to the Manual



Protective Conductor Terminal



Earth (Ground) Terminal



DANGER Hot Surface



Double Insulated



Do not dispose electronic equipment as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased.

Safety Guidelines

General Guideline



CAUTION

- Do not place heavy objects on the instrument.
- Do not place flammable objects on the instrument.
- Avoid severe impact or rough handling that may damage the function generator.
- Avoid discharges of static electricity on or near the function generator.
- Use only mating connectors, not bare wires, for the terminals.
- The instrument should only be disassembled by a qualified technician.

(Measurement categories) EN 61010-1:2001 specifies the measurement categories and their requirements as follows. The AFG-3000 falls under category II.

- Measurement category IV is for measurement performed at the source of a low-voltage installation.
- Measurement category III is for measurement performed in a building installation.
- Measurement category II is for measurement performed on circuits directly connected to a low voltage installation.
- Measurement category I is for measurements performed on circuits not directly connected to Mains.

Power Supply



WARNING

- AC Input voltage: 100 ~ 240V AC, 50 ~ 60Hz.
 - Connect the protective grounding conductor of the AC power cord to an earth ground to prevent electric shock.
-

Fuse



WARNING

- Fuse type: T0.63A/250V.
- Only qualified technicians should replace the fuse.
- To ensure fire protection, replace the fuse only with the specified type and rating.
- Disconnect the power cord and all test leads before replacing the fuse.
- Make sure the cause of fuse blowout is fixed before replacing the fuse.

Cleaning the function generator

- Disconnect the power cord before cleaning the function generator.
- Use a soft cloth dampened in a solution of mild detergent and water. Do not spray any liquid into the function generator.
- Do not use chemicals containing harsh products such as benzene, toluene, xylene, and acetone.

Operation Environment

- Location: Indoor, no direct sunlight, dust free, almost non-conductive pollution (Note below) and avoid strong magnetic fields.
- Relative Humidity: < 80%
- Altitude: < 2000m
- Temperature: 0°C to 40°C

(Pollution Degree) EN 61010-1:2001 specifies pollution degrees and their requirements as follows. The function generator falls under degree 2.

Pollution refers to “addition of foreign matter, solid, liquid, or gaseous (ionized gases), that may produce a reduction of dielectric strength or surface resistivity”.

- Pollution degree 1: No pollution or only dry, non-conductive pollution occurs. The pollution has no influence.
- Pollution degree 2: Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.
- Pollution degree 3: Conductive pollution occurs, or dry, non-conductive pollution occurs which becomes conductive due to condensation which is expected. In such conditions, equipment is normally protected against exposure to direct sunlight,

precipitation, and full wind pressure, but neither temperature nor humidity is controlled.

Storage environment

- Location: Indoor
- Relative Humidity: < 70%
- Temperature: -10°C to 70°C

Disposal



Do not dispose this instrument as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased. Please make sure discarded electrical waste is properly recycled to reduce environmental impact.

Power cord for the United Kingdom

When using the function generator in the United Kingdom, make sure the power cord meets the following safety instructions.

NOTE: This lead/appliance must only be wired by competent persons



WARNING: THIS APPLIANCE MUST BE EARTHED

IMPORTANT: The wires in this lead are coloured in accordance with the following code:

| | |
|----------------|--------------|
| Green/ Yellow: | Earth |
| Blue: | Neutral |
| Brown: | Live (Phase) |



As the colours of the wires in main leads may not correspond with the coloured marking identified in your plug/appliance, proceed as follows:

The wire which is coloured Green & Yellow must be connected to the Earth terminal marked with either the letter E, the earth symbol (⊕) or coloured Green/Green & Yellow.

The wire which is coloured Blue must be connected to the terminal which is marked with the letter N or coloured Blue or Black.

The wire which is coloured Brown must be connected to the terminal marked with the letter L or P or coloured Brown or Red.

If in doubt, consult the instructions provided with the equipment or contact the supplier.

This cable/appliance should be protected by a suitably rated and approved HBC mains fuse: refer to the rating information on the equipment and/or user instructions for details. As a guide, a cable of 0.75mm² should be protected by a 3A or 5A fuse. Larger conductors would normally require 13A types, depending on the connection method used.

Any exposed wiring from a cable, plug or connection that is engaged in a live socket is extremely hazardous. If a cable or plug is deemed hazardous, turn off the mains power and remove the cable, any fuses and fuse assemblies. All hazardous wiring must be immediately destroyed and replaced in accordance to the above standard.

G ETTING STARTED

The Getting started chapter introduces the function generator's main features, appearance and introduces a quick instructional summary of some of the basic functions. For comprehensive operation instructions, please see the user manual.

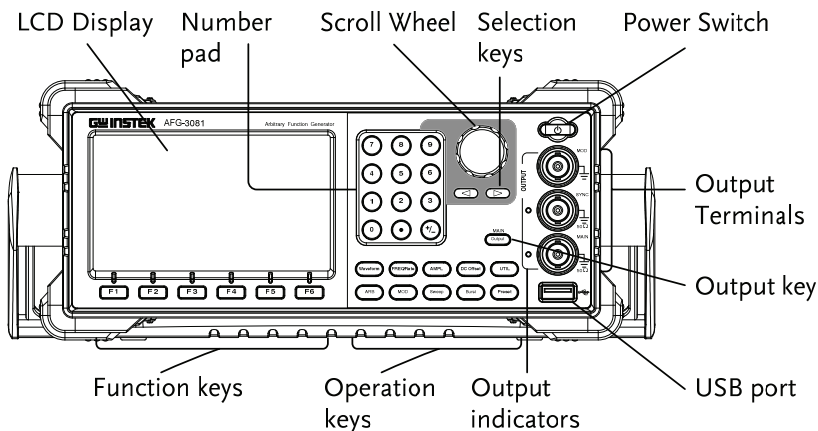
Main Features

| Model name | Frequency bandwidth |
|-------------|---|
| AFG-3081 | 80MHz |
| AFG-3051 | 50MHz |
| Performance | <ul style="list-style-type: none">• DDS Function Generator series• 1μHz high frequency resolution maintained at full range• 1ppm frequency stability• Full Function Arbitrary Waveform Capability<ul style="list-style-type: none">200 MSa/s sample rate100 MSa/s repetition rate1 M-point waveform length16-bit amplitude resolutionTen 1M waveform memoriesTrue waveform output to displayUser define output sectionUser defined marker output sectionDWR (Direct Waveform Reconstruction) capability |

| | |
|-----------|--|
| | Waveform editing capability sans PC |
| | N Cycle and Infinite output mode selectable |
| | • -60dBc low distortion sine wave |
| Features | <ul style="list-style-type: none">• Sine, Square, Ramp, Pulse, Noise, Sinc standard waveforms• Internal and external LIN/LOG sweep with marker output• Int/Ext AM, FM, PWM, FSK modulation• Modulation/sweep signal output• Burst function with internal and external triggers without marker output• Store/recall 10 groups of setting memories• Output overload protection |
| Interface | <ul style="list-style-type: none">• GPIB, RS232, USB standard interfaces• 4.3 inch Color TFT LCD (480 × 272) Graphical User Interface.• AWES (Arbitrary Waveform Editing Software) PC software |

Panel Overview

Front Panel



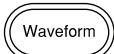
LCD display TFT color LCD display, 480 x 272 resolution.

Function keys:
F1~F6

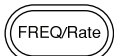


Activates the functions which appear in the bottom of the LCD display.


Operation keys



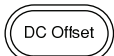
Waveform is used to select a waveform type.



The FREQ/Rate key is used to set the frequency or sample rate



AMPL sets the waveform amplitude.



Sets the DC offset.



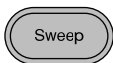
The UTIL key is used to access the save and recall options, set the remote interface (USB, GPIB, RS232), use DSO link, update and view the firmware version, access the calibration options, output impedance settings, set the language and access the help menu.



ARB is used to set the arbitrary waveform parameters.



The MOD, Sweep and Burst keys are used to set the modulation, sweep and burst settings and parameters.

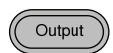


Preset



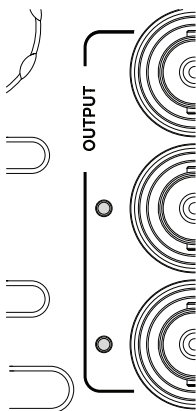
The preset key is used to recall a preset state.

Output key



The Output key is used to turn on or off the waveform output.

Output indicators



When an Output indicator is green, it indicates that the output is active.

USB host connector

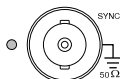


The USB Host connector is used to save and restore waveform data and images, as well as update the firmware.

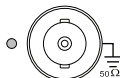
Output terminals



Modulation output terminal.

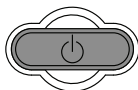


The SYNC output terminal. 50Ω output impedance.



The primary output terminal. 50Ω output impedance.

Standby key



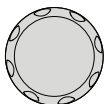
The standby key is used to turn the function generator on (green) or to put the function generator into standby mode (red).

Selection keys

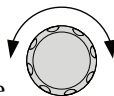


Used to select digits when editing parameters.

Scroll Wheel

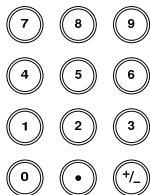


The scroll wheel is used to edit values and parameters.



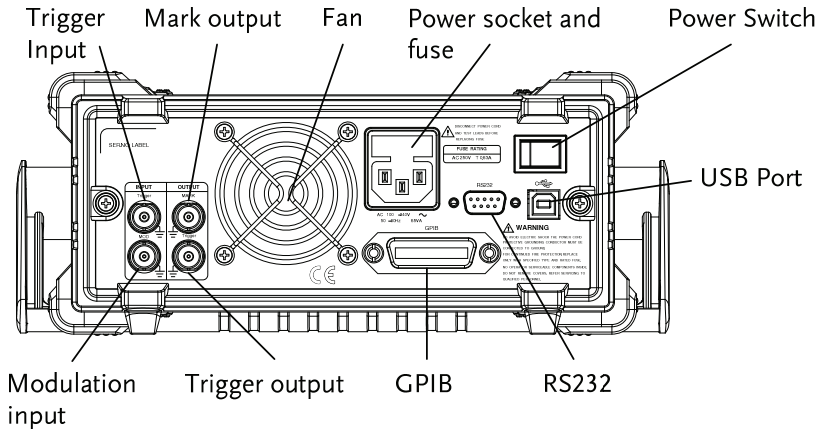
Decrease Increase

Keypad



The digital keypad is used to enter values and parameters. The keypad is often used in conjunction with the selection keys and variable knob.

Rear Panel



Trigger input



External trigger input. Used to receive external trigger signals.

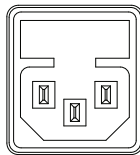
MARK output



Mark output signal. Used for Sweep and ARB mode only.

Fan

Power Socket Input and fuse



Power input: 100~240V AC
50~60Hz.
Fuse: T0.63A/250V

Power Switch



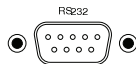
Main power switch.

USB port

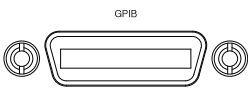



The Mini-B type USB connector is used to connect the function generator to a PC for remote control.


RS232 port



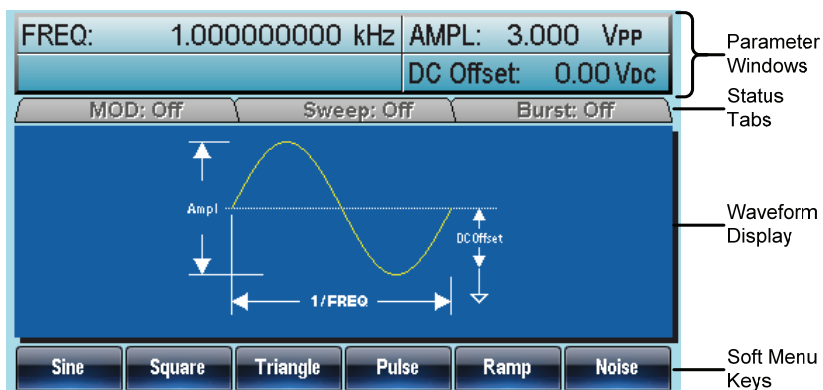
9 pin female RS232 socket used for PC remote control.

GPIB  24 pin female GPIB connector for PC remote control.

Trigger output  Trigger output terminal.

MOD input  Modulation input terminal.

Display



Parameter Windows The Parameter display and edit window.

Status Tabs Shows the status of MOD, Sweep and Burst modes.

Waveform Display The Waveform Display is used to output the waveform on the display.

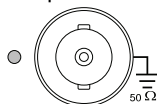
Soft Menu Keys The function keys (F1~F6) below the Soft Menu keys correspond to the soft keys.

Selecting a Waveform

Square Wave

Example: Square Wave, 3Vpp, 75% Duty, 1 kHz

Output



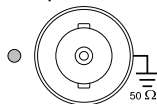
Input: N/A

1. Press **Waveform** > **Square** (F2).
2. Press **Duty**(F1) > 7 > 5 > % (F5).
3. Press **Freq/Rate** > 1 > kHz (F5).
4. Press **AMPL** > 3 > VPP (F6).
5. Press **Output**.

Triangle Wave

Example: Triangle Wave, 5Vpp, 10kHz

Output



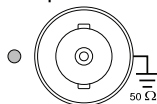
Input: N/A

1. Press **Waveform** > **Triangle** (F3).
2. Press **Freq/Rate** > 1 > 0 > kHz (F5).
3. Press **AMPL** > 5 > VPP (F6).
4. Press **Output**.

Sine Wave

Example: Sine Wave, 10Vpp, 100kHz

Output



Input: N/A

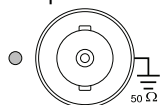
1. Press **Waveform** > **Sine** (F1).
2. Press **Freq/Rate** > 1 > 0 > 0 > kHz (F5).
3. Press **AMPL** > 1 > 0 > VPP (F6).
4. Press **Output**.

Modulation

AM

Example: AM modulation. 100Hz modulating square wave. 1kHz Sine wave carrier. 80% modulation depth.

Output



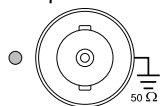
Input: N/A

1. Press **MOD>AM (F1)**.
2. Press **Waveform>Sine (F1)**.
3. Press **Freq/Rate>1>kHz (F5)**.
4. Press **MOD>AM (F1)>Shape (F4)>Square (F2)**.
5. Press **MOD>AM (F1)>AM Freq (F3)**.
6. Press **1>0>0>Hz (F2)**.
7. Press **MOD>AM (F1)>Depth (F2)**.
8. Press **8>0>% (F1)**.
9. Press **MOD>AM (F1)>Source (F1)>INT (F1)**.
10. Press **Output**.

FM

Example: FM modulation. 100Hz modulating square wave. 1kHz Sine wave carrier. 100 Hz frequency deviation. Internal Source.

Output



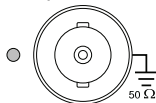
Input: N/A

1. Press **MOD>FM (F2)**.
2. Press **Waveform>Sine (F1)**.
3. Press **Freq/Rate>1>kHz (F5)**.
4. Press **MOD>FM (F2)>Shape (F4)>Square (F2)**.
5. Press **MOD>FM (F2)>FM Freq (F3)**.
6. Press **1>0>0>Hz (F2)**.
7. Press **MOD>FM (F2)>Freq Dev (F2)**.
8. Press **1>0>0>Hz (F3)**.
9. Press **MOD>FM (F2)>Source (F1)>INT (F1)**.
10. Press **Output**.

FSK Modulation

Example: FSK modulation. 100Hz Hop frequency. 1kHz Carrier wave. Triangle wave. 10 Hz Rate. Internal Source.

Output



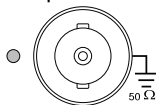
Input: N/A

1. Press **MOD>FSK (F3)**.
2. Press **Waveform>Triangle (F3)**.
3. Press **Freq/Rate>1>kHz (F5)**.
4. Press **MOD>FSK (F3)>FSK Rate (F3)**.
5. Press **1>0>Hz (F2)**.
6. Press **MOD>FSK (F3)>Hop Freq (F2)**.
7. Press **1>0>0>Hz (F3)**.
8. Press **MOD>FSK (F3)>Source (F1)>INT (F1)**.
9. Press **Output**.

PWM Modulation

Example: PWM modulation. 800Hz Carrier wave. 15 kHz modulating sine wave. 50% Duty Cycle. Internal Source.

Output



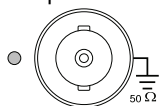
Input: N/A

1. Press **Waveform>Square (F2)**.
2. Press **MOD>PWM (F4)**.
3. Press **Freq/Rate>8>0>0>Hz (F4)**.
4. Press **MOD>PWM (F4)>Shape (F4)>Sine (F1)**.
5. Press **MOD>PWM (F4)>PWM Freq (F3)**.
6. Press **1>5>kHz (F3)**.
7. Press **MOD>PWM (F4)>Duty (F2)**.
8. Press **5>0>% (F1)**.
9. Press **MOD>PWM (F4)>Source (F1)>INT (F1)**.
10. Press **Output**.

Sweep

Example: Frequency Sweep. Start Frequency 10mHz, Stop frequency 1MHz. Log sweep, 1 second sweep, Marker Frequency 550 Hz, Manual Trigger, Trigger out, rising edge.

Output



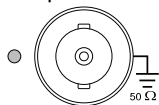
Input: N/A

1. Press **Sweep>Start (F3)**.
2. Press **1>0>mHz (F2)**.
3. Press **Sweep>Stop (F4)**.
4. Press **1>MHz (F5)**.
5. Press **Sweep>Type (F2)>Log (F2)**.
6. Press **Sweep>SWP Time (F5)**.
7. Press **1>SEC (F2)**.
8. Press **Sweep>More (F6)>Marker (F3)>ON/OFF (F2)>Freq (F1)**.
9. Press **5>5>0>Hz (F3)**.
10. Press **Sweep>More (F6)>TRIG out (F4)>ON/OFF (F3)>Rise (F1)**.
11. Press **Output**.
12. Press **Sweep>Source (F1)>Manual (F3)>Trigger (F1)**.

Burst

Example: Burst Mode, N-Cycle (Internally triggered), 1kHz burst frequency, Burst count = 5, 10 ms Burst period, 0° burst phase, Internal trigger, 10 us delay, rising edge trigger out

Output



Input: N/A

1. Press **FREQ/Rate>1> kHz (F5)**.
2. Press **Burst>N Cycle (F1)>Cycles (F1)**.
3. Press **5>Cyc (F5)**.
4. Press **Burst>N Cycle (F1)>Period (F4)**.
5. Press **1>0>msec (F2)**.
6. Press **Burst>N Cycle (F1)>Phase (F3)**.
7. Press **0>Degree (F5)**.

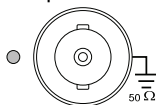
8. Press **Burst>N Cycle (F1)>TRIG Setup (F5)>INT (F1)**.
9. Press **Burst>N Cycle (F1)>TRIG Setup (F5)>Delay (F4)**.
10. Press **1>0>uSEC (F2)**.
11. Press **Burst>N Cycle (F1)>TRIG Setup (F5)>TRIG out (F5)>ON/OFF (F3)>Rise (F1)**.
12. Press **Output**.

ARB

ARB – Add Built-In Waveform

Example: ARB Mode, Exponential Rise. Start 0, Length 100, Scale 32767.

Output

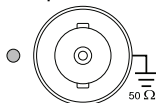


1. Press **ARB>Built in (F3)>More (F5)>Exp Rise (F1)**.
2. Press **Start (F1)>0>Enter (F5)>Return (F6)**.
3. Press **Length (F2)>100>Enter (F5)>Return (F6)**.
4. Press **Scale (F3)>32767>Enter (F5)>Return (F6)>Done (F4)**.

ARB - Add Point

Example: ARB Mode, Add point, Address 40, data 300.

Output

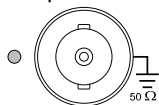


1. Press **ARB>Edit (F2)>Point (F1)>Address (F1)**.
2. Press **4>0>Enter (F5)>Return (F6)**.
3. Press **Data (F2)>3>0>0>Enter (F5)**.

ARB - Add Line

Example: ARB Mode, Add line, Address:Data (10:30, 50:100)

Output

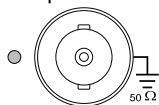


1. Press **ARB>Edit (F2)>Line (F2)>Start ADD (F1)**.
2. Press **1>0>Enter (F5)>Return (F6)**.
3. Press **Start Data (F2)>3>0>Enter (F5)>Return (F6)**.
4. Press **Stop ADD (F3)>5>0>Enter (F5)>Return (F6)**.
5. Press **Stop Data (F4)>1>0>0>Enter (F5)>Return (F6)>Done (F5)**.

ARB – Output Section

Example: ARB Mode, Output ARB Waveform, Start 0, Length 100.

Output

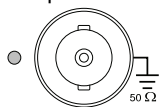


1. Press **ARB>Output (F6)**.
2. Press **Start (F1)>0>Enter (F5)>Return (F6)**.
3. Press **Length (F2)>100>Enter (F5)>Return (F6)**.

ARB – Output N Cycle

Example: ARB Mode, Output N Cycle, Start 0, Length 100, Cycles 10.

Output

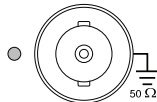


1. Press **ARB>Output (F6)**.
2. Press **Start (F1)>0>Enter (F5)>Return (F6)**.
3. Press **Length (F2)>100>Enter (F5)>Return (F6)**.
4. Press **N Cycle (F4)>Cycles(F1)>10>Enter (F5)>Return (F6)**.
5. Press **Trigger (F6)** to output once.

ARB – Output Infinite

Example: ARB Mode, Output Infinite, Start 0, Length 100.

Output

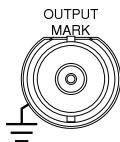


6. Press **ARB>Output (F6)**.
7. Press **Start (F1)>0>Enter (F5)>Return (F6)**.
8. Press **Length (F2)>100>Enter (F5)>Return (F6)**.
9. Press **Infinite (F5)**.

ARB – Output Markers

Example: ARB Mode, Output Markers, Start 0, Length 80.

Output

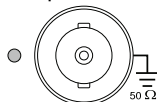


1. Press **ARB>Output (F6)>Marker (F3)**.
2. Press **Start (F1)>30, Enter (F5)>Return (F6)**.
3. Press **Length (F2)>80>Enter (F5)>Return (F6)**.

ARB – Save

Example: ARB Mode, Save ARB waveform, Start 0, Length 100.

Output

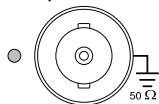


4. Press **ARB>Save (F4)**.
5. Press **Start (F1)>0>Enter (F5)>Return (F6)**.
6. Press **Length (F2)>100>Enter (F5)>Return (F6)**.
7. Press either **Memory(F3) or USB(F4)**.
8. Choose a file using the scroll wheel and press **Select (F1)**.

ARB – Load

Example: ARB Mode, Load ARB waveform.

Output



1. Press **ARB>Load (F5)**.
2. Press either **Memory(F1)** or **USB(F2)**.
3. Choose a file using the scroll wheel and press **Select (F1)**.
4. Press **To (F3)>0>Enter (F5)>Return (F6)**.
5. Press **Done (F5)**.

Utility Menu

Save

Example: Save to Memory file #5.

1. Press **UTIL>Memory (F1)>Store (F1)**.
2. Choose a file using the scroll wheel and press **Select (F1)>Done (F5)**.

Recall

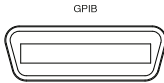
Example: Recall Memory file #5.

1. Press **UTIL>Memory (F1)>Recall (F2)**.
2. Choose a file using the scroll wheel and press **Select (F1)>Done (F5)**.

Interface GPIB

Example: GPIB interface, Address 10.

GPIB

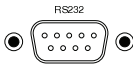


1. Press **UTIL>Interface (F2)>GPIB (F1)>Address (F1)**.
2. Press **10>Done (F5)**.

Interface RS232

Example: RS232 interface, Baud 115200, Parity None, Bits 8.

RS232



1. Press **UTIL>Interface (F2)>RS232 (F2)**.
2. Press **Baud Rate (F1)>115k (F5)**.
3. Press **UTIL>Interface (F2)>RS232 (F2)**.
4. Press **Parity/Bits (F2)>None/8Bits (F1)**.

Interface USB

Example: USB interface.



1. Press **UTIL>Interface (F2)>USB (F3)**.

AFG-3000 Series Specifications

The specifications apply when the function generator is powered on for at least 30 minutes under +20°C~+30°C.

| Waveforms | AFG-3051 | AFG-3081 |
|-----------|---|----------|
| | Sine, Square, Ramp, Pluse, Noise, DC, Sin(x)/x, Exponential Rise, Exponential Fall, Negative Ramp | |

| Arbitrary Waveforms | | |
|-----------------------------|---|--|
| ARB Function | Built in | |
| Sample Rate | 200 MSa/s | |
| Repetition Rate | 100MHz | |
| Waveform Length | 1M points | |
| Amplitude | 16 bits | |
| Resolution | | |
| Non-Volatile Memory | Ten 1M waveforms(1) | |
| User defined Output Section | Any section from 2 to 1M points | |
| User define Mark Output | Any section from 2 to 1M points | |
| Output mode | 1 to 1048575 cycles or Infinite mode selectable | |

| Frequency Characteristics | | | |
|---------------------------|----------------|---------------------|-------|
| Range | Sine | 50MHz | 80MHz |
| | Square | 50MHz | 80MHz |
| | Triangle, Ramp | | 1MHz |
| Resolution | | | 1μHz |
| Accuracy | Stability | ±1 ppm 0 to 50°C | |
| | | ±0.3 ppm 18 to 28°C | |
| | Aging | ±1 ppm, per 1 year | |
| | Tolerance | ≤ 1 μHz | |

| Output Characteristics(2) | | |
|---------------------------|------------|---|
| Amplitude | Range | 10 mVpp to 10 Vpp(into 50Ω) 20 mVpp to 20 Vpp(open-circuit) |
| | Accuracy | ± 1% of setting ±1 mVpp (at 1 kHz,>10 mVpp) |
| | Resolution | 0.1 mV or 4 digits |

| | | |
|-----------------------------|----------------------------|--|
| | Flatness | ± 1% (0.1dB) <10 MHz ± 2% (0.2 dB) 10 MHz to 50 MHz ± 10% (0.9 dB) 50 MHz to 70 MHz ± 20% (1.9 dB) 70 MHz to 80 MHz (sine wave relative to 1 kHz) |
| Offset | Units | Vpp, Vrms, dBm, |
| | Range | ±5 Vpk ac +dc (into 50Ω) ±10Vpk ac +dc (Open circuit) |
| Waveform Output | Accuracy | 1% of setting + 2 mV + 0.5% Amplitude |
| | Impedance | 50Ω typical (fixed) > 10MΩ (output disabled) |
| | Protection | Short-circuit protected Overload relay automatically disables main output |
| Sync Output | Level | TTL-compatible into>1kΩ |
| | Impedance | 50Ω nominal |
| Sine wave Characteristics | | |
| | Harmonic distortion(5) | -60 dBc DC~1 MHz, Ampl<3 Vpp -55 dBc DC~1 MHz, Ampl>3 Vpp -45 dBc 1MHz~5 MHz, Ampl>3 Vpp -30 dBc 5MHz~80 MHz, Ampl>3 Vpp |
| | Total Harmonic Distortion | < 0.2%+0.1mVrms DC to 20 kHz |
| | Spurious (non-harmonic)(5) | -60 dBc DC~1 MHz -50 dBc 1MHz~20MHz -50 dBc+ 6 dBc/octave 1MHz~80MHz |
| | Phase Noise | < -65dBc typical 10MHz, 30 kHz band < -47dBc typical 80MHz, 30 kHz band |
| Square wave Characteristics | | |
| | Rise/Fall Time | <8 ns(3) |
| | Overshoot | <5% |
| | Asymmetry | 1% of period +1 ns |
| | Variable duty Cycle | 20.0% to 80.0% ≤ 25 MHz 40.0% to 60.0% 25~50MHz 50.0%(Fixed) 50~80MHz |
| | Jitter | 0.01%+525ps < 2 MHz 0.1%+75ps > 2 MHz |
| Ramp Characteristics | | |
| | Linearity | < 0.1% of peak output |
| | Variable Symmetry | 0% to 100% |
| Pulse Characteristics | | |
| | Period | 20ns~ 2000s |

| | | | |
|----------------------|----------------------|--|--------------|
| | Pulse Width | 8ns ~ 1999.9s Minimum Pulse Width: 8nS when $FREQ \leq 50MHz$ 5% of setting period when $FREQ \leq 6.5MHz$ Resolution: 1nS when $FREQ \leq 50MHz$ 1% of setting period when $FREQ \leq 6.5MHz$ | |
| | Overshoot | <5% | |
| | Jitter | 100 ppm +50 ps | |
| AM Modulation | | | |
| | Carrier Waveforms | Sine, Square, Triangle, Ramp, Pulse, Arb | |
| | Modulating Waveforms | Sine, Square, Triangle, Up/Dn Ramp | |
| | Modulating Frequency | 2 mHz to 20 kHz | |
| | Depth | 0% to 120.0% | |
| | Source | Internal / External | |
| FM Modulation | | | |
| | Carrier Waveforms | Sine, Square, Triangle, Ramp | |
| | Modulating Waveforms | Sine, Square, Triangle, Up/Dn Ramp | |
| | Modulating Frequency | 2 mHz to 20 kHz | |
| | Peak Deviation | DC to 50 MHz | DC to 80 MHz |
| | Source | Internal / External | |
| PWM | | | |
| | Carrier Waveforms | Square | |
| | Modulating Waveforms | Sine, Square, Triangle, Up/Dn Ramp | |
| | Modulating Frequency | 2 mHz to 20 kHz | |
| | Deviation | 0% ~ 100.0% of pulse width | |
| | Source | Internal / External | |
| FSK | | | |
| | Carrier Waveforms | Sine, Square, Triangle, Ramp, Pulse | |
| | Modulating Waveforms | 50% duty cycle square | |
| | Internal Rate | 2 mHz to 100 kHz | |
| | Frequency Range | DC to 50 MHz | DC to 80 MHz |
| | Source | Internal / External | |
| Sweep | | | |
| | Waveforms | Sine, Square, Triangle, Ramp | |
| | Type | Linear or Logarithmic | |

| | | |
|----------------------------------|-------------------|---|
| | Direction | Up or Down |
| | Start/Stop Freq | 100 μ Hz to 50 MHz 100 μ Hz to 80 MHz |
| | Sweep Time | 1 ms to 500 s |
| | Trigger | Single, External, Internal |
| | Marker | Falling edge of Mark signal (Programmable frequency) |
| | Source | Internal / External |
| Burst | | |
| | Waveforms | Sine, Square, Triangle, Ramp |
| | Frequency | 1 μ Hz to 50 MHz(4) 1 μ Hz to 80 MHz(4) |
| | Burst Count | 1 to 1000000 cycles or Infinite |
| | Start/Stop Phase | -360.0 $^\circ$ to +360.0 $^\circ$ |
| | Internal Period | 1 ms to 500 s |
| | Gate Source | External Trigger |
| | Trigger Source | Single, External or Internal Rate |
| Trigger Delay | N-Cycle, Infinite | 0s to 85 s |
| External Modulation Input | | |
| | Type | For AM, FM, Sweep, PWM |
| | Voltage Range | \pm 5V full scale |
| | Input Impedance | 10k Ω |
| | Frequency | DC to 20kHz |
| External Trigger Input | | |
| | Type | For FSK, Burst, Sweep |
| | Input Level | TTL Compatibility |
| | Slope | Rising or Falling (Selectable) |
| | Pulse Width | >100ns |
| | Input Impedance | 10k Ω , DC coupled |
| Latency | Sweep | <10us (typical) |
| | Burst | <100ns (typical) |
| Jitter | Sweep | 2.5 us |
| | Burst | 1 ns; except pulse, 300 ps |
| Modulation Output | | |
| | Type | For AM, FM, Sweep, PWM |
| Amplitude | Range | \geq 1Vpp |
| | Impedance | >10k Ω typical (fixed) |
| Trigger Output | | |
| | Type | For Burst, Sweep |
| | Level | TTL Compatible into 50 Ω |
| | Pulse Width | >450 ns |
| | Maximum Rate | 1 MHz |
| | Fan-out | \geq 4 TTL load |
| | Impedance | 50 Ω Typical |
| Marker Output | | |
| | Type | For ARB, Sweep |

| | |
|--------------|---|
| Level | TTL Compatible into 50Ω |
| Fan-out | ≥4 TTL load |
| Impedance | 50Ω Typical |
| Store/Recall | 10 Groups of Setting Memories |
| Interface | GPIB, RS232, USB |
| Display | 4.3 inch TFT LCD 480 × 3 (RGB) × 272 |

System Characteristics

| | | | |
|-------------------------------|---|------------|----------|
| Configuration Times (typical) | Function Change: Standard---->102ms Pulse----->660ms Built-In Arb->240ms Frequency Change: 24ms Amplitude Change: 50ms Offset Change: 50ms Select User Arb: < 2s for 1M points Modulation Change: < 200ms | | |
| Arb Download Times (typical) | Binary Code | ASCII Code | |
| | GPIB/RS232 (115 Kbps) | USB Device | USB Host |
| 1M points | 189 sec | 34 sec | 70 sec |
| 512K points | 95 sec | 18sec | 35 sec |
| 256K points | 49 sec | 9 sec | 18 sec |
| 64K points | 16 sec | 3 sec | 6 sec |
| 16K points | 7 sec | 830 ms | 1340 ms |
| 8K points | 6 sec | 490 ms | 780 ms |
| 4K points | 6 sec | 365 ms | 520 ms |
| 2K points | 5 sec | 300 ms | 390 ms |

General Specifications

| | |
|-----------------------|---|
| Power Source | AC100~240V, 50~60Hz |
| Power Consumption | 65 VA |
| Operating Environment | Temperature to satisfy the specification : 18 ~ 28°C Operating temperature : 0 ~ 40°C Relative Humidity: ≤ 80%, 0 ~ 40°C ≤ 70%, 35 ~ 40°C Installation category : CAT II |
| Operating Altitude | 2000 Meters |

| | | |
|-----------------------|---|--------------------------------|
| Dimensions (WxHxD) | Pollution Degree | IEC 61010 Degree 2, Indoor Use |
| | Storage Temperature | -10~70°C, Humidity: ≤70% |
| | Bench Top | 265 (W) x 107 (H) x 374 (D) |
| | Weight | Approx. 4kg |
| | Safety Designed to | EN61010-1 |
| | EMC Tested to | EN 55011, IEC-61326 |
| Accessories | Test cable(GTL-110× 1), User Manual Compact Disk × 1, Quick Start Guide × 1, Power cord × 1 | |

- (1). A total of ten waveforms can be stored. (Every waveform can be composed of 1M points maximum.)
- (2). Add 1/10th of output amplitude and offset specification per °C for operation outside of 0 °C to 28 °C range (1-year specification).
- (3). Edge time decreased at higher frequency.
- (4). Sine and square waveforms above 25 MHz are allowed only with an “Infinite” burst count.
- (5). Harmonic distortion and Spurious noise at low amplitudes is limited by a -70 dBm floor.

EC Declaration of Conformity

We

GOOD WILL INSTRUMENT CO., LTD.

No.7-1, Jhongsing Rd., Tucheng City, Taipei County 236, Taiwan

GOOD WILL INSTRUMENT (SUZHOU) CO., LTD.

No. 69, Lushan Road, Suzhou New District Jiangsu, China

declares that the below mentioned product

AFG-3081, AFG-3051

Are herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Law of Member States relating to Electromagnetic Compatibility (2004/108/EC) and Low Voltage Equipment Directive (2006/95/EC). For the evaluation regarding the Electromagnetic Compatibility and Low Voltage Equipment Directive, the following standards were applied:

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| EN 61326-1 : EN 61326-2-1: | Electrical equipment for measurement, control and laboratory use — EMC requirements (2006) | |
|---|--|--|
| Conducted and Radiated Emissions EN 55011: 2007+A2: 2007 | Electrostatic Discharge EN 61000-4-2: 2009 | |
| Current Harmonic EN 61000-3-2: 2006+A1: 2009+A2: 2009 | Radiated Immunity EN 61000-4-3: 2006+A1: 2008 | |
| Voltage Fluctuation EN 61000-3-3: 2008 | Electrical Fast Transients IEC 61000-4-4: 2004+Corr.1 : 2006+Corr.2 : 2007 | |
| ----- | Surge Immunity EN 61000-4-5: 2006 | |
| ----- | Conducted Susceptibility EN 61000-4-6: 2009 | |
| ----- | Power Frequency Magnetic Field EN 61000-4-8: 1993+A1: 2001 | |
| ----- | Voltage Dips/ Interrupts EN 61000-4-11: 2004 | |

© Safety

| Low Voltage Equipment Directive 2006/95/EC |
|--|
| Safety Requirements IEC/EN 61010-1: 2001 |

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