Multi-Channel Function Generator

MFG-2000 Series

QUICK START GUIDE

GW INSTEK PART NO. 82MF-2KoooMD1

ISO-9001 CERTIFIED MANUFACTURER

GW INSTEK

The information in this manual was correct at the time of printing. However, Good Will continues to improve its products and therefore reserves the right to change the specifications, equipment, and maintenance procedures at any time without notice.

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

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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 61010-1:2010 (Third Edition)specifies the measurement categories and their requirements as follows. The MFG-2000 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. Or 100 ~ 120V AC, 220 ~ 240V AC,50 ~ 60Hz (With power amplifier) • Connect the protective grounding conductor of the AC power cord to an earth ground to prevent electric shock.
Fuse ⚠ WARNING	Fuse type: T0.5A/250V. T1A/250V(With power amplifier). • 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 61010-1:2010(Third Edition)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.

GETTING STARTED

The Getting started chapter introduces the function generator's main features, appearance, set up procedure and power-up.

Main Features

Model

MFG-2000 series specific functions						
	CH1 Function With 200MSa/sARB	CH2 Function With 200MSa/sARB	25MHz Pulse Generator	RF Generator (function with ARB)	Power Amplifier	Modulation /Sweep/Burst/ Frequency.Counter
MFG-2110	●10MHZ		●			
MFG-2120	●20MHZ		●			
MFG-2120MA	●20MHZ		●		●	●
MFG-2130M	●30MHZ		●			●
MFG-2160MF	●60MHZ		●	●160MHZ		●
MFG-2160MR	●60MHZ		●	●320MHZ		●
MFG-2230M	●30MHZ	●30MHZ	●			●
MFG-2260M	●60MHZ	●60MHZ	●			●
MFG-2260MFA	●60MHZ	●60MHZ	●	●160MHZ	●	●
MFG-2260MRA	●60MHZ	●60MHZ	●	●320MHZ	●	●

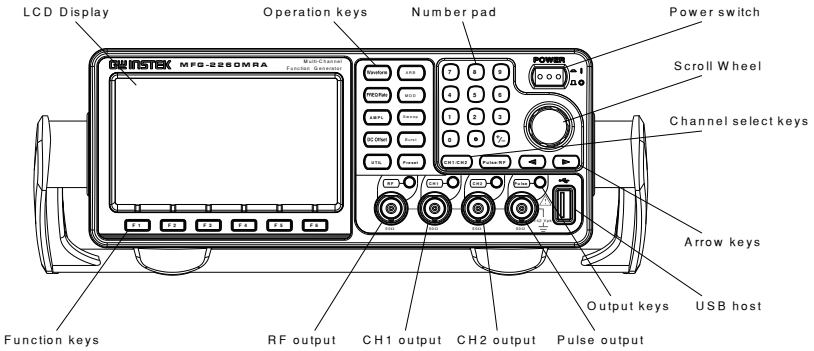
Performance

- DDS Function Generator series
- 1μHz high frequency resolution maintained at full range
- 20ppm frequency stability
- Arbitrary Waveform Capability
- 200 MSa/s sample rate
- 100 MSa/s repetition rate
- 16k-point waveform length
- 10 groups of 16k waveform memories
- True waveform output to display
- User-defined output section
- User-defined marker output section

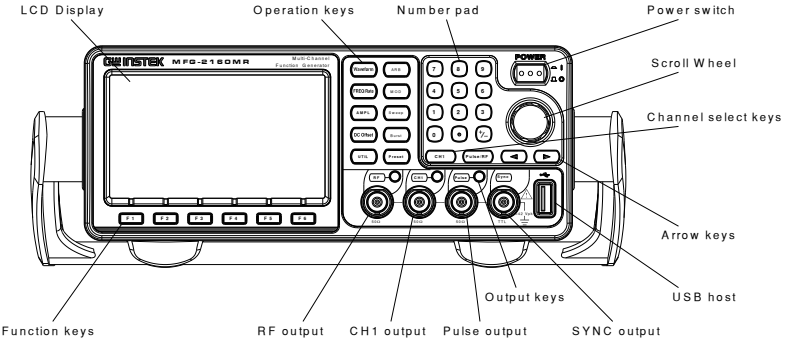
	• DWR (Direct Waveform Reconstruction) capability • Ability to edit waveforms without a PC • -60dBc low distortion sine wave
Features	• Sine, Square, Ramp, Pulse, Noise waveforms • Internal and external LIN/LOG sweep with marker output • Int/Ext AM, FM, PM, FSK, SUM, PWM modulation • Burst function with internal and external triggers • 42Vpk signal ground chassis isolation • Pulse waveform with configurable rise times & fall times • Store/recall 10 groups of setting memories • Output overload protection
Interface	• USB interface as standard, LAN interface(MFG-22XX only) • 4 inch Color TFT LCD (480 X 272) graphical user interface • AWES (Arbitrary Waveform Editing Software) PC software

Panel Overview

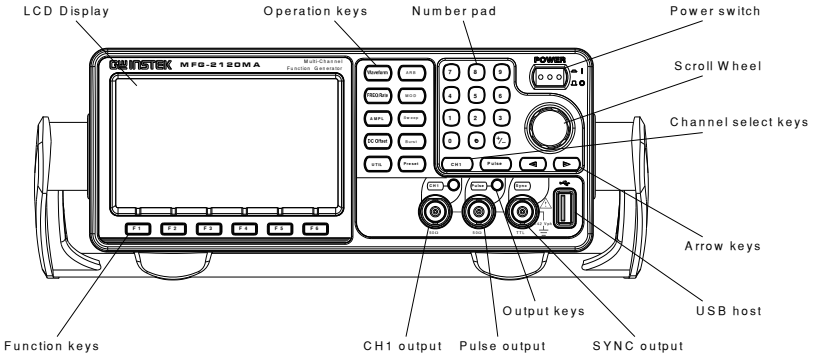
MFG-2260MRA/2260MFA Front Panel



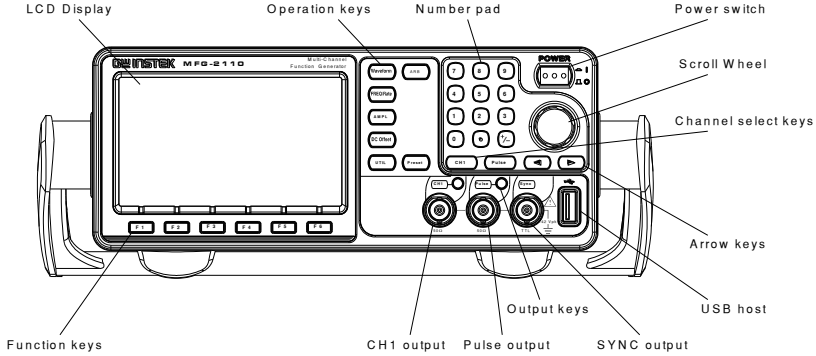
MFG-2160MR/2160MF Front Panel



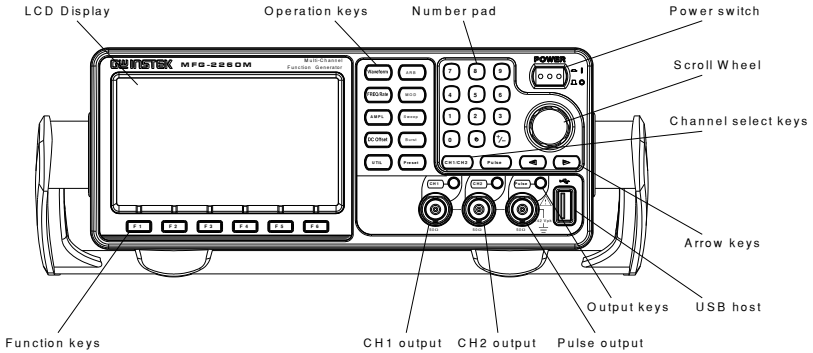
MFG- 2120MA/2130M Front Panel



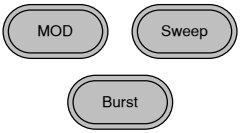
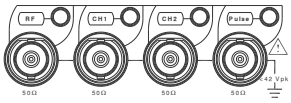
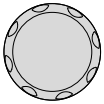
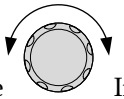
MFG- 2110/2120 Front Panel

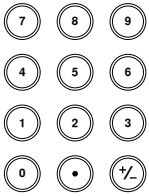


MFG- 2260M/2230M Front Panel

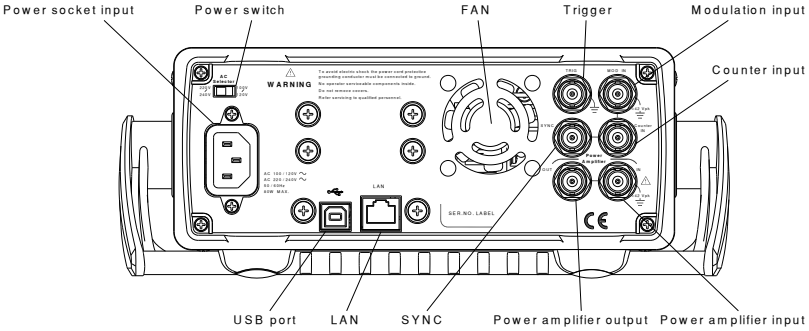


LCD Display	TFT color display, 480 x 272 resolution.	
Function Keys F1~F6	F1	Activates functions that appear on the bottom of the LCD screen.
Operation Keys	Waveform	The waveform key is used to select a type of waveform.
	FREQ/Rate	The FREQ/Rate key is used to set the frequency or sample rate.
	AMPL	AMPL sets the waveform amplitude.
	DC Offset	Sets the DC offset.
	UTIL	The UTIL key is used to access the save and recall options, update and view the firmware version, access the calibration options, system setting, Dual channel functions and frequency meter.

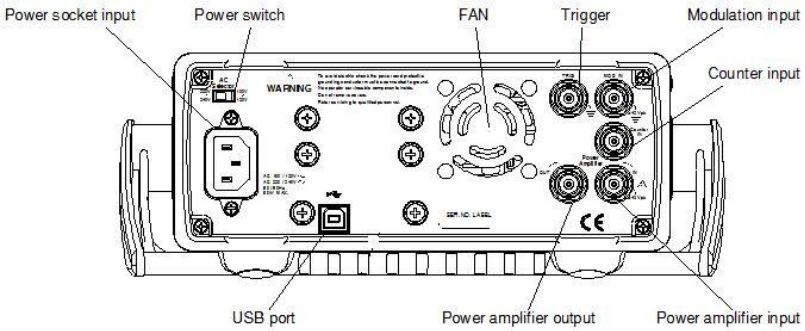
		ARB is used to set the arbitrary waveform parameters.
		The MOD, Sweep and Burst keys are used to set the modulation, sweep and burst settings and parameters.
Preset Key		The preset key is used to recall a preset state.
Output Key		The Output key is used to turn on or off the waveform output.
Channel Select Keys		The channel select key is used to switch between the four output channels.
Output ports		CH1: Channel 1 output port CH2: Channel 2 output port Pulse: Pulse output port RF: RF output port
Power Button		Turns the power on or off.
USB Host		USB type-A host port.
Arrow 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 arrow keys and variable knob.

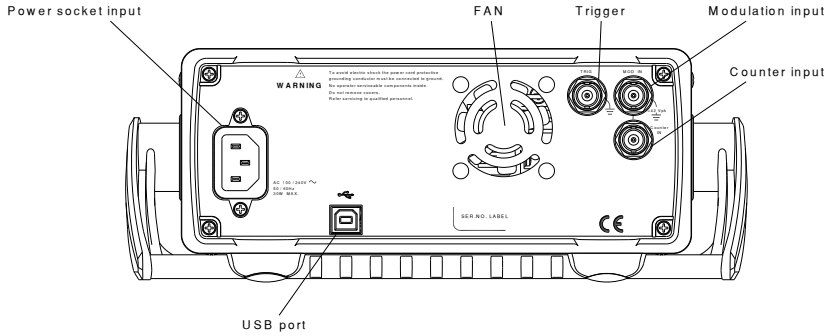
MFG-2260MRA/2260MFA Rear Panel



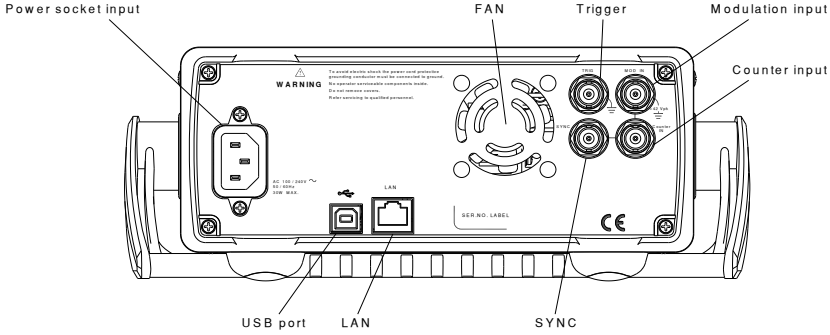
MFG-2120MA Rear Panel



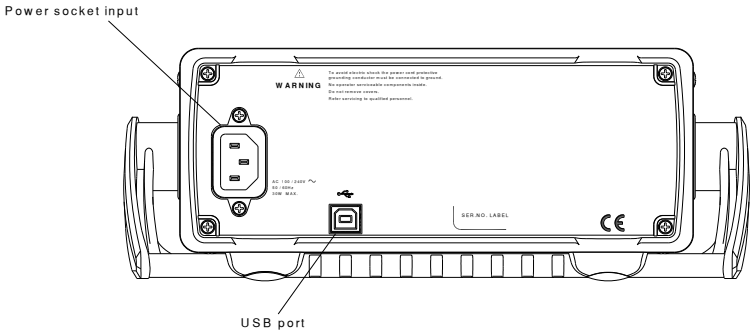
MFG-2160MR/2160MF/2130M Rear Panel

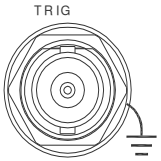
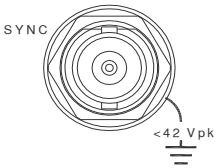
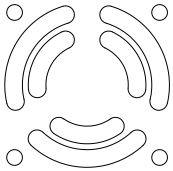


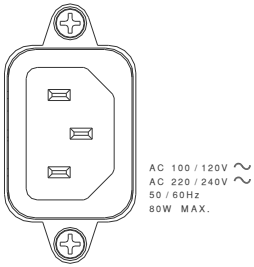
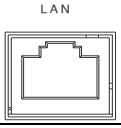
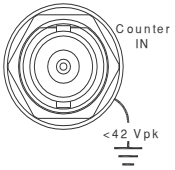
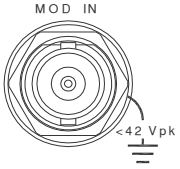
MFG-2260M/2230M Rear Panel

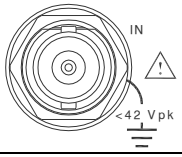
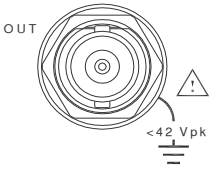


MFG-2110/2120 Rear Panel



Trigger		Please refer to the tables on Page 21.
Sync		Please refer to the tables on Page 21.
Fan		Fan.

Power Input Socket		Power input: 100~240V AC 50~60Hz. Or 100~120V AC 220~240V AC 50~60Hz.
Power Switch		Selects AC voltage: 100V~120V Or 220V~240V. This function can only be used in the models with power amplifier machines such as MFG-2120MA, MFG-2260MFA, MFG-2260MRA.
LAN Port		The LAN port is used for remote control over a network (MFG-22XX only)
USB Device Port		USB type-B device port is used to connect the function generator to a PC for remote control.
Counter Input		Frequency counter input.
MOD Input		Please refer to the tables on Page 21.

Power Amplifier in		Power Amplifier input port
Power Amplifier out		Power Amplifier output port

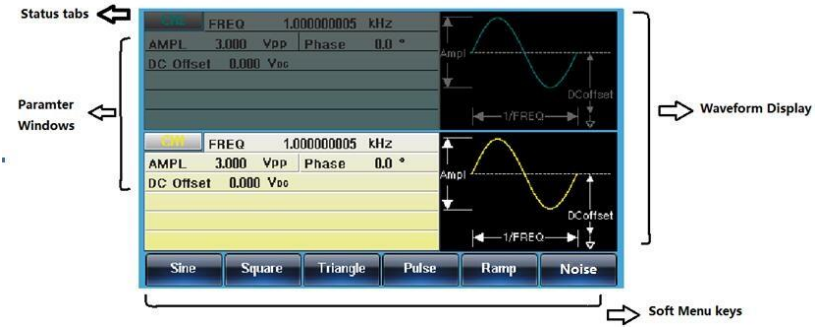
21XX:

Terminal	Function	Mode
Trigger	Trigger in(EXT)	CH1:FSK,SWEEP,BURST RF:ASK,FSK,PSK,BURST
	Trigger out	CH1:BURST
	Marker	CH1:SWEEP,ARB
MOD IN	EXT	CH1:AM,FM,PM,SUM,PWM
SYNC	Sync signal output	CH1

22XX:

Terminal	Function	Mode
Trigger		CH1/CH2:FSK,SWEEP,BURST RF:ASK,FSK,PSK,SWEEP,BUR ST
MOD IN	EXT	CH1/CH2:AM,FM,PM,SUM,B URST
SYNC	Trigger out	CH1/CH2:SWEEP.BURST
	Marker	CH1/CH2:SWEEP.ARB
	Sync signal output	CH1,CH2

Display



Parameter Windows	The Parameter display and edit window.
Status Tabs	Displays the current channel and setting status.
Waveform Display	Used to display the waveform
Soft Menu Keys	The function keys (F1~F6) under the LCD display correspond directly to the soft menu keys.

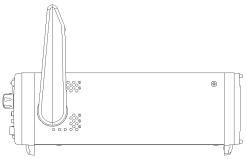
Setting Up the function Generator

Background

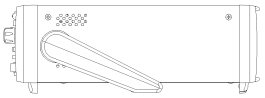
This section describes how to adjust the handle and power up the function generator.

Adjusting the Handle

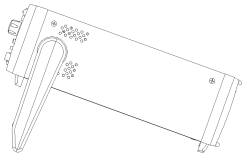
Pull out the handle sideways and rotate it.



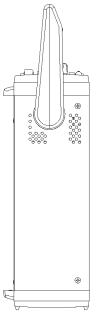
Place the MFG-2000 horizontally,



Or tilt the stand.

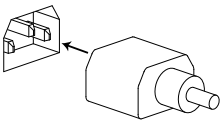


Place the handle vertically to hand carry.

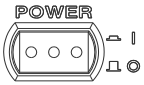


Power Up

1. Connect the power cord to the socket on the rear panel.



2. Turn on the power switch on the front panel.



3. When the power switch is turned on the screen displays the loading screen.

The function generator is now ready to be used.

QUICK REFERENCE

This chapter describes the operation shortcuts, built-in help and factory default settings. This chapter is to be used as a quick reference, for detailed explanations on parameters, settings and limitations, please see the operation chapters.

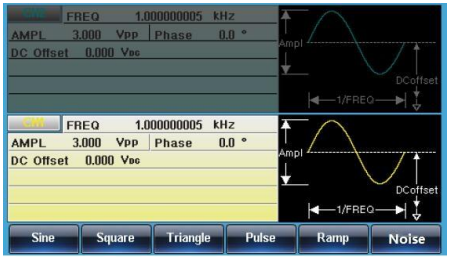
How to use the Digital Inputs

Background

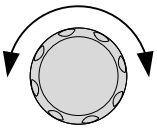
The MFG-2000 has three main types of digital inputs: the number pad, arrow keys and scroll wheel. The following instructions will show you how to use the digital inputs to edit parameters.

1. To select a menu item, press the corresponding function keys below (F1~F6). For example the function key F1 corresponds to the Soft key “Sine”.

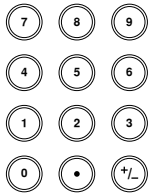
2. To edit a digital value, use the arrow keys to move the cursor to the digit that needs to be edited.



3. Use the scroll wheel to edit the parameter. Clockwise increases the value, counter clockwise decreases the value.



4. Alternatively, the number pad can be used to set the value of a highlighted parameter.



How to use the Help Menu

Background

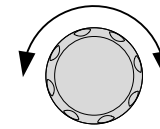
Every key and function has a detailed description in the help menu.

1. Press UTIL

2. Press System (F4)

3. Press Help (F3)

4. Use the scroll wheel to navigate to a help item. Press Select to choose the item.

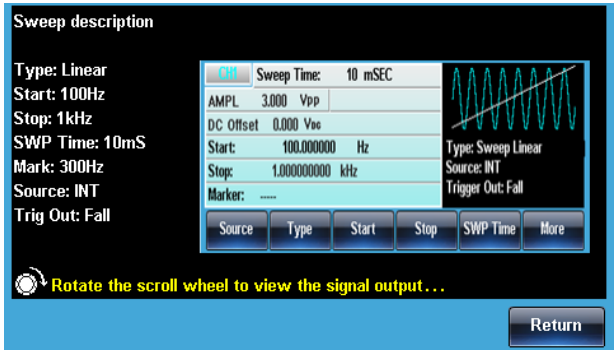


Keypad	Provides help on any front panel key that is pressed.
Create Arbitrary Waveform	Provides help on creating arbitrary waveforms.
Modulation Function	Explains how to create Modulated waveforms.

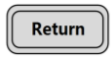
Sweep Function	Provides help on the Sweep function.
Burst Function	Provides help on the Burst function.
DSO Link	Provides help on DSO link.
Hardcopy	Explains how to use the Hardcopy function.

5. For example, select item 4 to see help on the sweep functions.

6. Use the scroll wheel to navigate the help information.



7. Press Return to return to the previous menu.



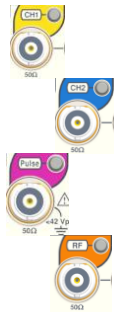
Display area allocation

Output channel

MFG is divided into 21XX and 22XX two series of 10 models. It has mainly 4 different output channels CH1/ CH2/ Pulse/ RF to collocate with, CH1/ Pulse is standard configuration and CH2/ RF is optional. The display position for CH1 is fixed and the display position for Pulse changes depending on if the the CH2 available.

In order to effectively distinguish various channels, we assign different color to each channel respectively.

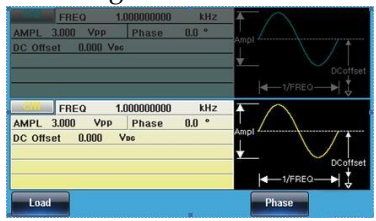
CH1	Yellow
CH2	Blue
Pulse	Pink
RF	Orange



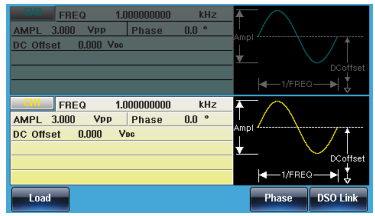
DSO Link

This function is only for the 22XX series models. The procedure for switching channel is list below:

21XX



22XX

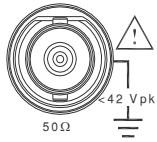


Selecting a Waveform

Square Wave

Example: Square wave, 3Vpp, 75% duty cycle, 1kHz.

Output:



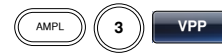
1. Press Waveform and select Square (F2).

2. Press Duty (F1), 7 + 5 + %(F5).

Input: N/A

3. Press Freq/Rate, 1 + kHz (F5).

4. Press AMPL followed by, 3 + VPP (F6).

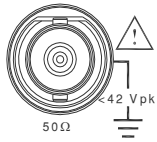


5. Press the Output key.

Ramp Wave

Example: Ramp Wave, 5Vpp, 10kHz, 50% Symmetry.

Output:



1. Press the Waveform key, and select Ramp (F5).

2. Press SYM(F1), 5 + 0 +%(F5).

Input: N/A

3. Press the Freq/Rate key then 1 + 0 + kHz (F5).

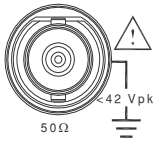
4. Press the AMPL key then 5 +VPP (F6).

5. Press the Output key.

Sine Wave

Example: Sine Wave, 10Vpp,100kHz

Output:

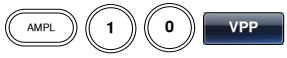


Input: N/A

1. Press the Waveform key and select Sine (F1).

2. Press the Freq/Rate key, followed by 1 + 0 +0 + kHz (F5).

3. Press the AMPL key, followed by 1 + 0 +VPP (F6).



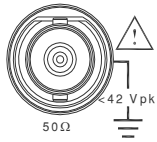
4. Press the output key.

Modulation

AM

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

Output:



Input: N/A

1. Press the MOD key and select AM (F1).

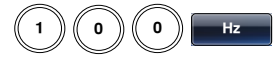
2. Press Waveform and select Sine (F1).

3. Press the Freq/Rate key, followed by 1 + kHz (F5).

4. Press the MOD key, select AM (F1), Shape (F4), Square (F2).

5. Press the MOD key, select AM (F1), AM Freq (F3).

6. Press 1 + 0 + 0 + Hz (F2).



7. Press the MOD key, select AM (F1), Depth (F2).

8. Press 8 + 0 + % (F1).

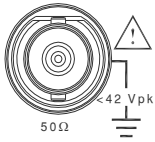
9. Press MOD, AM (F1), Source (F1), INT (F1).

10. Press the Output key.

ASK

Example: ASK modulation. 50% duty cycle. 1kHz sine carrier wave. 10Hz rate . Internal source.

Output:



Input: N/A

1. Press MOD and then select ASK(F2).

2. Press Waveform and select Sine(F1).

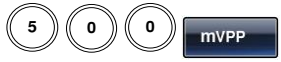
3. Press the Freq/Rate key, followed by 1 + kHz (F5).

4. Press the MOD key, select ASK(F2), ASK Rate (F3).

5. Press 1+ 0 + Hz (F2)

6. Press the MOD key, select ASK(F5), ASK Ampl(F2).

7. Press 5+0+0+mVpp(F5).



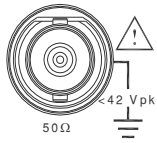
8. Press MOD, ASK(F5), Source (F1), INT (F1).

9. Press the Output key.

FM

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

Output:



Input: N/A

1. Press the MOD key and select FM (F2).

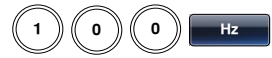
2. Press Waveform and select Sine (F1).

3. Press the Freq/Rate key, followed by 1 + kHz (F5).

4. Press the MOD key, select FM (F2), Shape (F4), Square (F2).

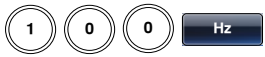
5. Press the MOD key, select FM (F2), FM Freq (F3).

6. Press 1 + 0 + 0 + Hz (F2).



7. Press the MOD key, select FM (F2), Freq Dev (F2).

8. Press 1 + 0 + 0 + Hz (F3).



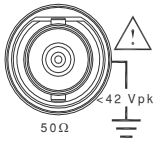
9. Press MOD, FM (F2), Source (F1), INT (F1).

10. Press the Output key.

FSK

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

Output:



Input: N/A

1. Press the MOD key and select FSK (F3).

2. Press Waveform and select Sine (F1).

3. Press the Freq/Rate key, followed by 1 + kHz (F5).

4. Press the MOD key, select FSK (F3), FSK Rate (F5).

5. Press 1 + 0 + Hz (F5).

6. Press the MOD key, select FSK (F3), Hop Freq (F5).

7. Press 1 + 0 + 0 + Hz (F3).

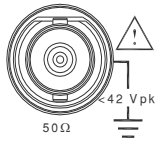
8. Press MOD, FSK (F3), Source (F1), INT (F1).

9. Press the output key.

PM

Example: PM modulation. 800Hz sinusoidal carrier wave. 15 kHz modulating sine wave. 180˚ phase deviation. Internal Source.

Output:

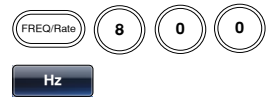


1. Press Waveform and select Sine (F1).

2. Press the MOD key and select PM (F4).

Input: N/A

3. Press the Freq/Rate key, followed by 8 + 0 + 0 + Hz (F4).



4. Press the MOD key, select PM (F4), Shape (F4), Sine (F1).

5. Press MOD, then PM (F4), PM Freq (F3).

6. Press 1 + 5 + kHz (F3).

7. Press MOD, PM (F4), PM Dev (F5).

8. Press 5 + 0 + Degree (F1).

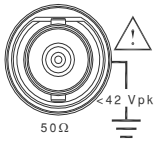
9. Press MOD, PM (F4), Source (F1), INT (F1).

10. Press the Output key.

PSK

Example: PSK modulation. 50% phase deviation. 1kHz sine carrier wave. 10Hz PSK rate. Internal source.

Output



1. Press MOD and select PSK (F6).

2. Press Waveform and select Sine(F1).

Input: N/A

3. Press the Freq/Rate key, followed by 1 + kHz (F5).

4. Press the MOD key, select PSK (F6), PSK Rate (F3).

5. Press 1 + 0 + Hz (F2)

6. Press the MOD key, select PSK (F6), PSK Phase (F2).

7. Press 5+ 0 + %(F3)

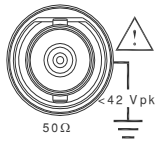
8. Press MOD, PSK(F6), Source (F1), INT (F1)

9. Press the Output key

PWM

Example: PWM modulation. 800Hz carrier, 15kHz modulated sine wave. 50% duty cycle. Internal source.

Output:

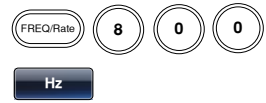


Input: N/A

1. Press Waveform and select Square (F2)

2. Press MOD and select PWM(F6)

3. Press the Freq/Rate key, followed by 8+0+0 Hz (F4).



4. Press the MOD key, select PWM (F6), Shape (F4), Sine(F1).

5. Press MOD, select PWM(F6),PWM Freq(F3)

6. Press 1 + 5+ kHz (F3).

7. Press MOD, select PWM(F6),Duty(F2)

8. Press 5 + 0 + % (F1)

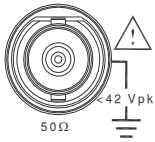
9. Press MOD, PWM(F6), Source(F1),INT(F1)

10. Press the Output key.

SUM

Example: SUM modulation. 100Hz modulating square wave, 1kHz sinusoidal carrier wave, 50% SUM amplitude, internal source.

Output:



Input: N/A

1. Press the MOD key, then SUM (F5).

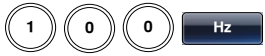
2. Press Waveform, and select Sine (F1).

3. Press Freq/Rate followed by 1 + kHz (F5).

4. Press the MOD key, SUM (F5), Shape (F4), Square (F2).

5. Press the MOD key and select SUM (F5), SUM Freq (F3).

6. Press 1 + 0 + 0 + Hz (F2).



7. Press the MOD key and select SUM (F5), SUM Ampl (F2).

8. Press 5 + 0 + % (F1).

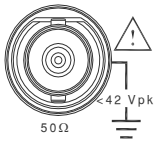
9. Press MOD, SUM (F5), Source (F1), INT (F1).

10. Press the Output key.

Sweep

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

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).

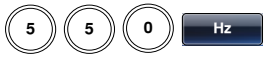
5. Press Sweep, Type (F2), Log (F2).

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).



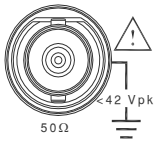
10. Press the Output key.

11. 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 set (F5), INT (F1).

9. Press Burst, N Cycle (F1), TRIG set (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).

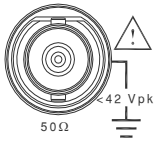
12. Press the Output key.

ARB

ARB–Add Built-In Waveform

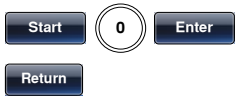
Example: ARB Mode, Exponential Rise. Start 0, Length 100, Scale 327.

Output:



1. Press ARB, Built in (F3), Wave (F4), Math(F2), use the scroll wheel to select Exporise and then press Select(F5).

2. Press Start (F1), 0 + Enter (F2), Return.



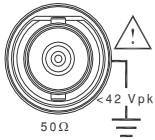
3. Press Length (F2), 100, Enter (F2), Return.

4. Press Scale (F3), 327, Enter (F2), Return, Done (F5).

ARB–Add Point

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

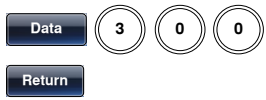
Output:



1. Press ARB, Edit (F2), Point (F1), Address (F1).

2. Press 4 + 0 + Enter (F5), Return.

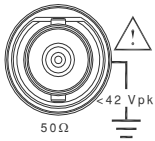
3. Press Data (F2), 3+0+0, Enter (F5).



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.

3. Press Start Data (F2), 3 + 0, Enter (F5), Return.

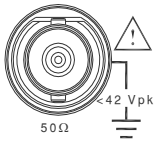
4. Press Stop ADD (F3), 5 + 0, Enter (F5), Return.

5. Press Stop Data (F4), 1 + 0 + 0, Enter (F5), Return, Done (F5).

ARB–Output Section

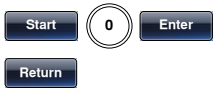
Example: ARB Mode, Output ARB Waveform, Start 0, Length 1000.

Output:



1. Press ARB, Output (F6).

2. Press Start (F1), 0 + Enter (F5), Return.

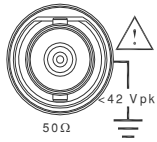


3. Press Length (F2), 1 + 0 + 0, Enter (F5), Return.

ARB–Output N Cycle

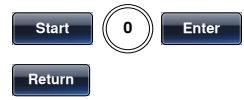
Example: ARB Mode, Output N Cycle, Start 0, Length 1000, N Cycle 10.

Output:



1. Press ARB, Output(F6).

2. Press Start(F1), 0+Enter (F5), Return(F6).



3. Press Length(F5), 1+0+0, Enter(F5), Return(F6).

4. Press N Cycle (F4).

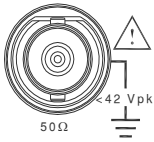
5. Press Cycle(F1), 1+0.

6. Press Trigger(F5) to trigger the output once.

ARB–Output Infinite Cycles

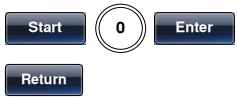
Example: ARB Mode, output N cycle, start 0, length 1000, cycles infinite.

Output:



1. Press ARB, Output(F6).

2. Press Start (F1), 0 + Enter (F5), Return(F6).



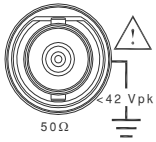
3. Press Length (F2), 1+0+0+0, Enter (F5), Return (F6).

4. Press Infinite(F5), Return(F6).

ARB–Output Marker

Example: ARB mode, output marker, Start 30, Length.

Output:



1. Press ARB, Output (F6), Marker (F3).

2. Press Start (F1), 3+0, Enter (F5), Return.

3. Press Length (F2), 8 + 0, Enter (F5), Return.

Utility Menu

Save

Example: Save to Memory file #5.

1. Press UTIL, Memory (F1), Store (F1).

2. Choose a setting using the scroll wheel and press Done (F5).

Recall

Example: Recall Memory file #5.

1. Press UTIL, Memory (F1), Recall (F2).

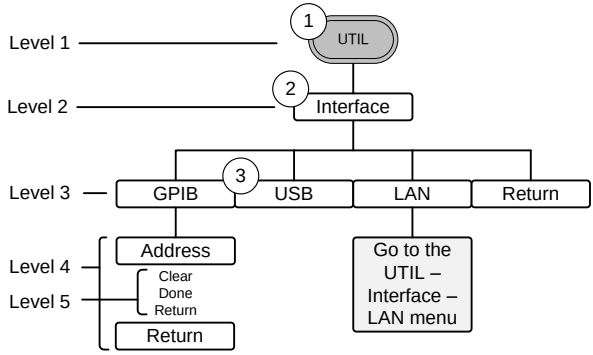
2. Choose a setting using the scroll wheel and press Done (F5).

Menu Tree

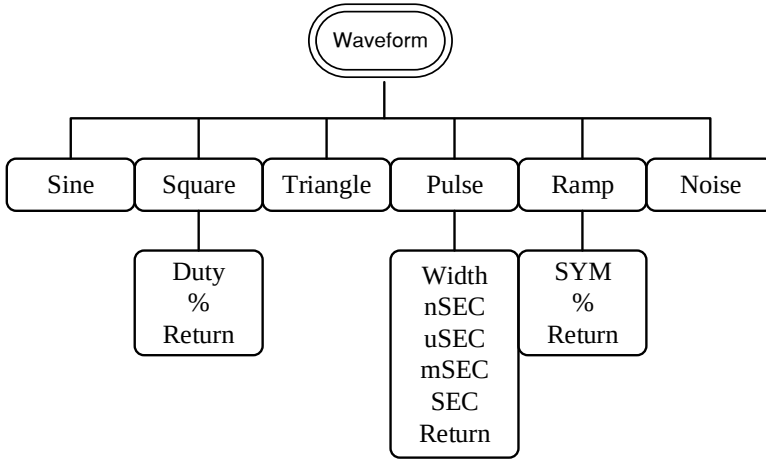
Conventions

Use the menu trees as a handy reference for the function generator functions and properties. The MFG-2000 menu system is arranged in a hierarchical tree. Each hierarchical level can be navigated with the operation or soft menu keys. Pressing the Return key will return you to the previous menu level.

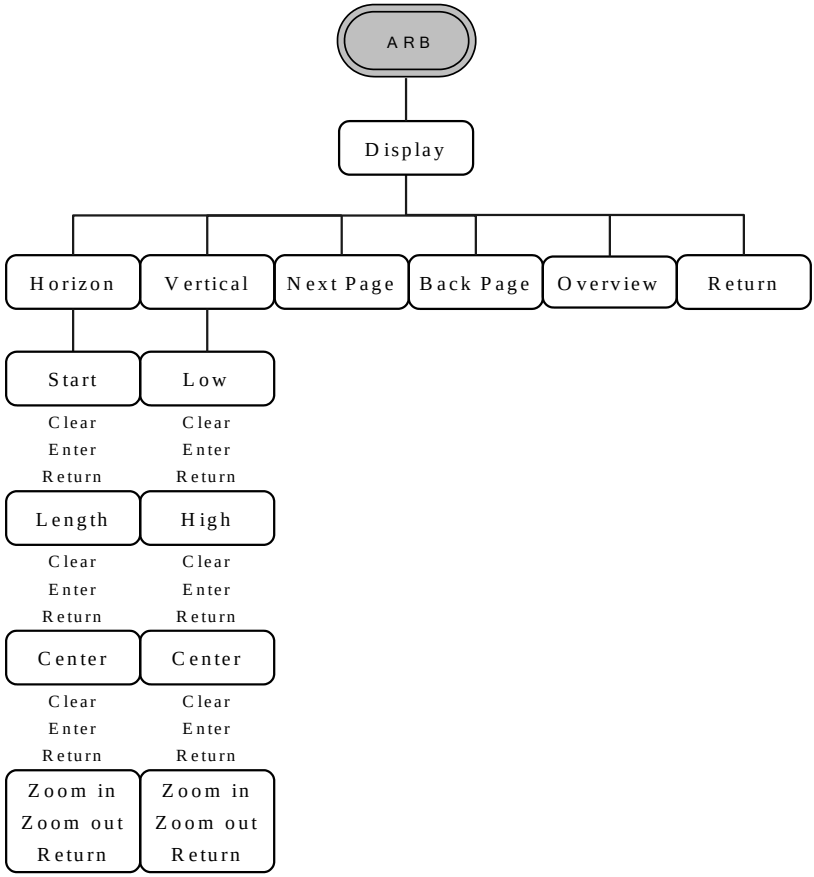
For example: To set the interface to USB;
(1) Press the UTIL key.
(2) The Interface soft-key.
(3) USB.



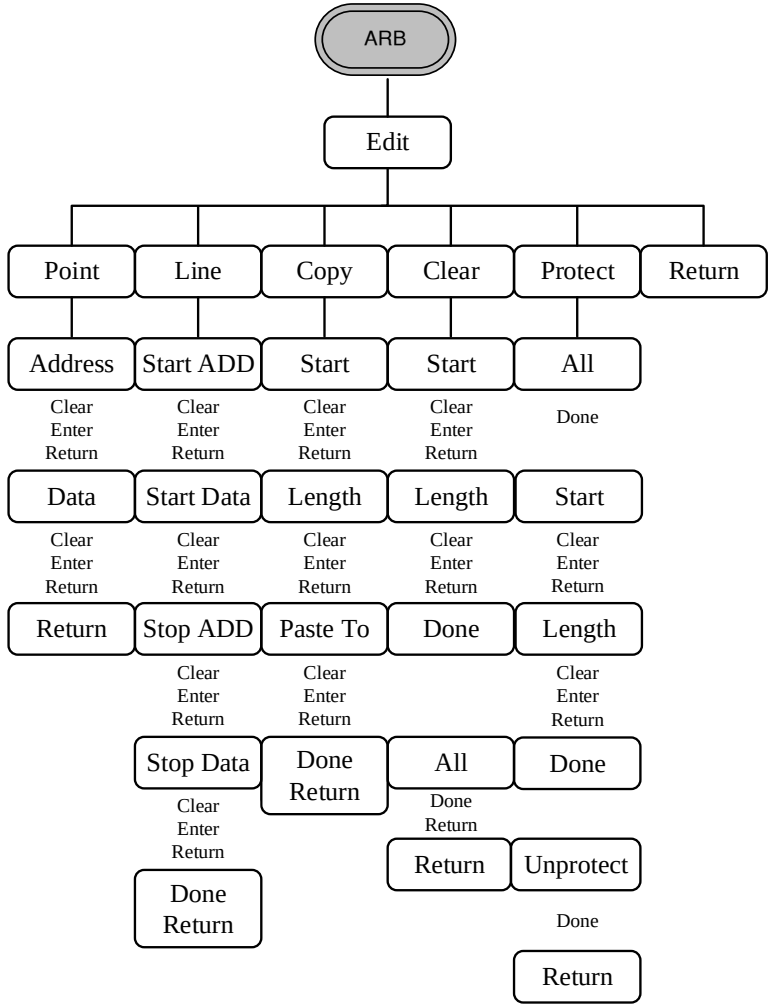
Waveform


Waveform
Sine
Square
Triangle
Pulse
Ramp
Noise
Duty
%
Return
Width
nSEC
uSEC
mSEC
SEC
Return
SYM
%
Return

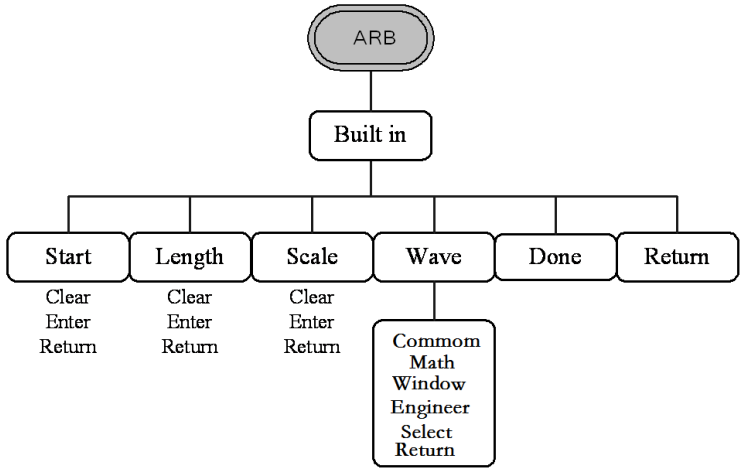
ARB_Display


ARB
Display
Horizon
Vertical
Next Page
Back Page
Overview
Return
Start
Clear
Enter
Return
Low
Clear
Enter
Return
Length
Clear
Enter
Return
High
Clear
Enter
Return
Center
Clear
Enter
Return
Center
Clear
Enter
Return
Zoom in
Zoom out
Return
Zoom in
Zoom out
Return

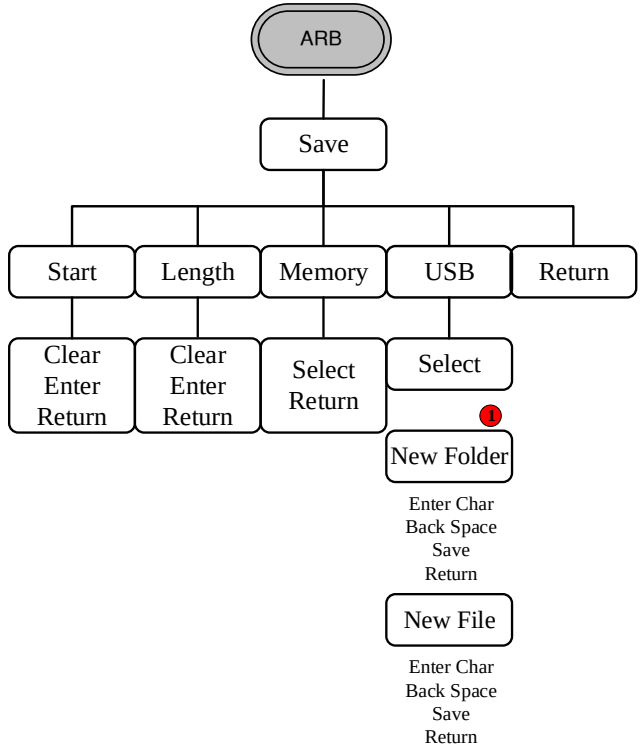
ARB_Edit


ARB
Edit
Point
Line
Copy
Clear
Protect
Return
Address
Start ADD
Start
Start
All
Clear
Enter
Return
Done
Data
Start Data
Length
Length
Start
Return
Stop ADD
Paste To
Done
Length
Stop Data
Done
Return
All
Done
Return
Unprotect

ARB_Built In


ARB
Built in
Start
Length
Scale
Wave
Done
Return
Clear
Enter
Return
Clear
Enter
Return
Clear
Enter
Return
Commom
Math
Window
Engineer
Select
Return

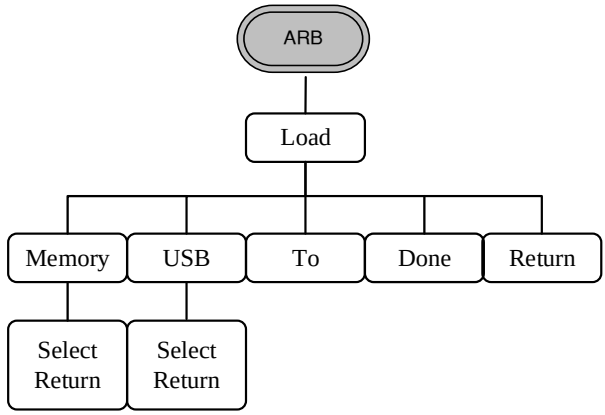
ARB_Save



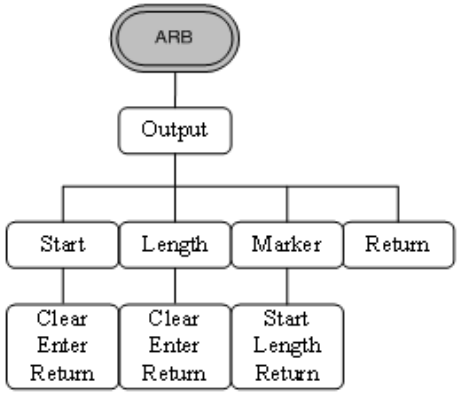
Note

The part "new folder' listed below ❶ is only available in the MFG-22XX series.

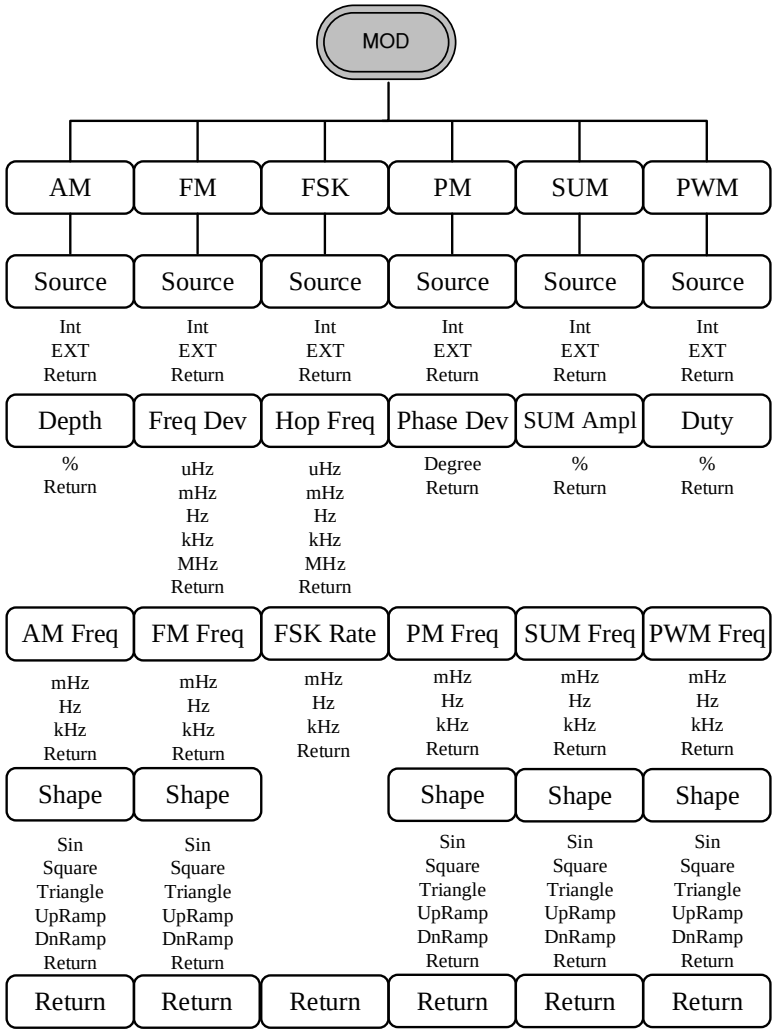
ARB_Load



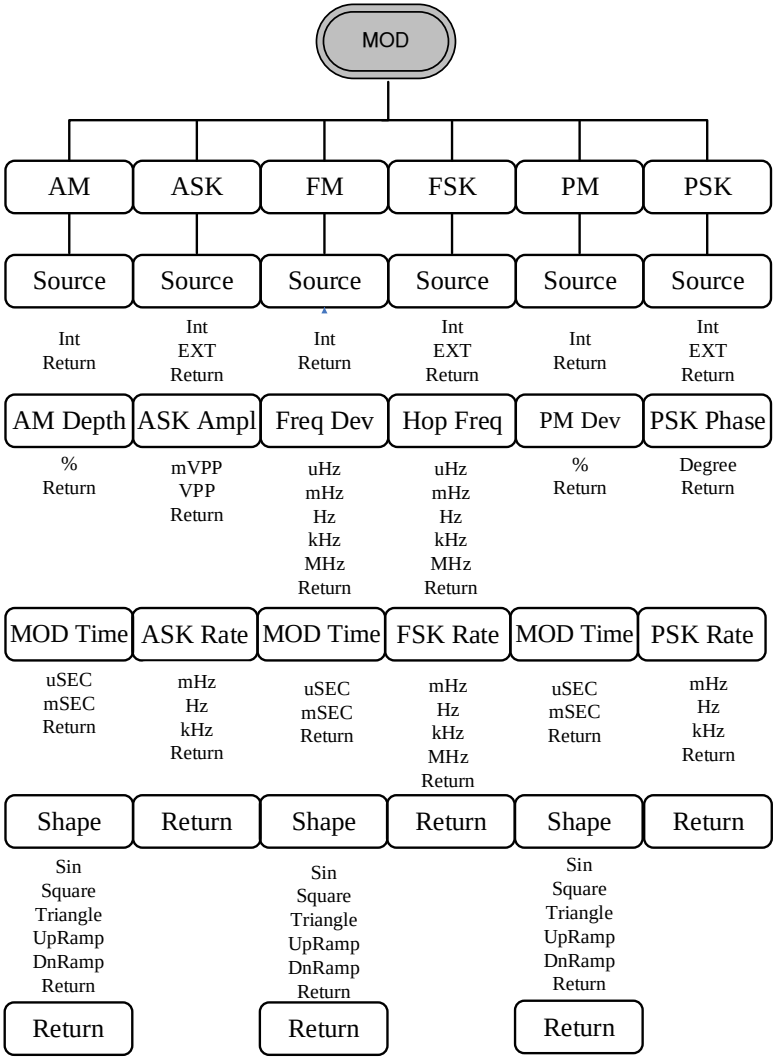
ARB_Output



MOD_(CH1/CH2)


MOD
AM
FM
FSK
PM
SUM
PWM
Source
Int
EXT
Return
Depth
%
Return
Freq Dev
uHz
mHz
Hz
kHz
MHz
Return
Hop Freq
uHz
mHz
Hz
kHz
MHz
Return
Phase Dev
Degree
Return
SUM Ampl
%
Return
Duty
%
Return
AM Freq
FM Freq
FSK Rate
PM Freq
SUM Freq
PWM Freq
mHz
Hz
kHz
Return
Shape
Sin
Square
Triangle
UpRamp
DnRamp
Return

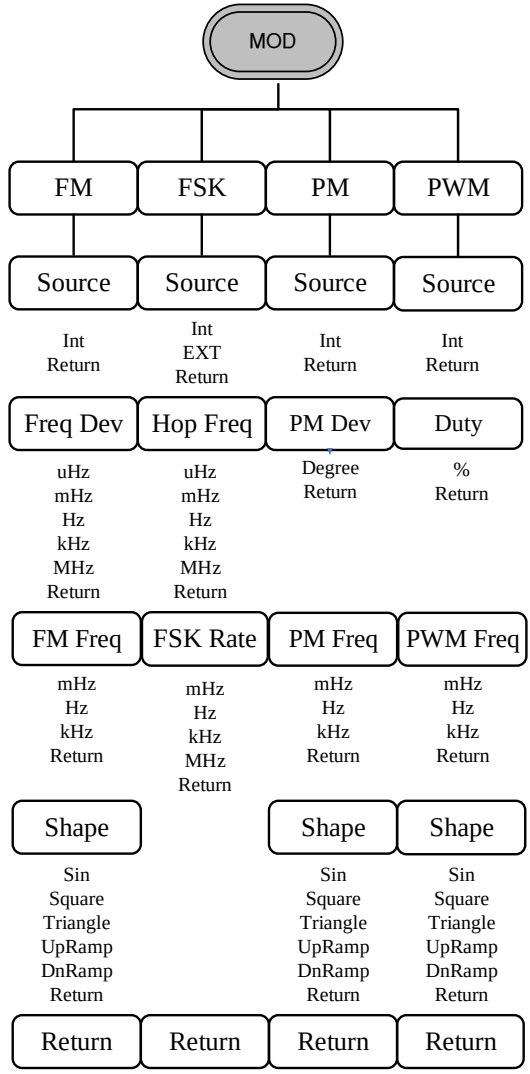
MOD_(Sine-DDS)



Note

This function is for selecting the modulation function of Sine-DDS under RF waveforms.

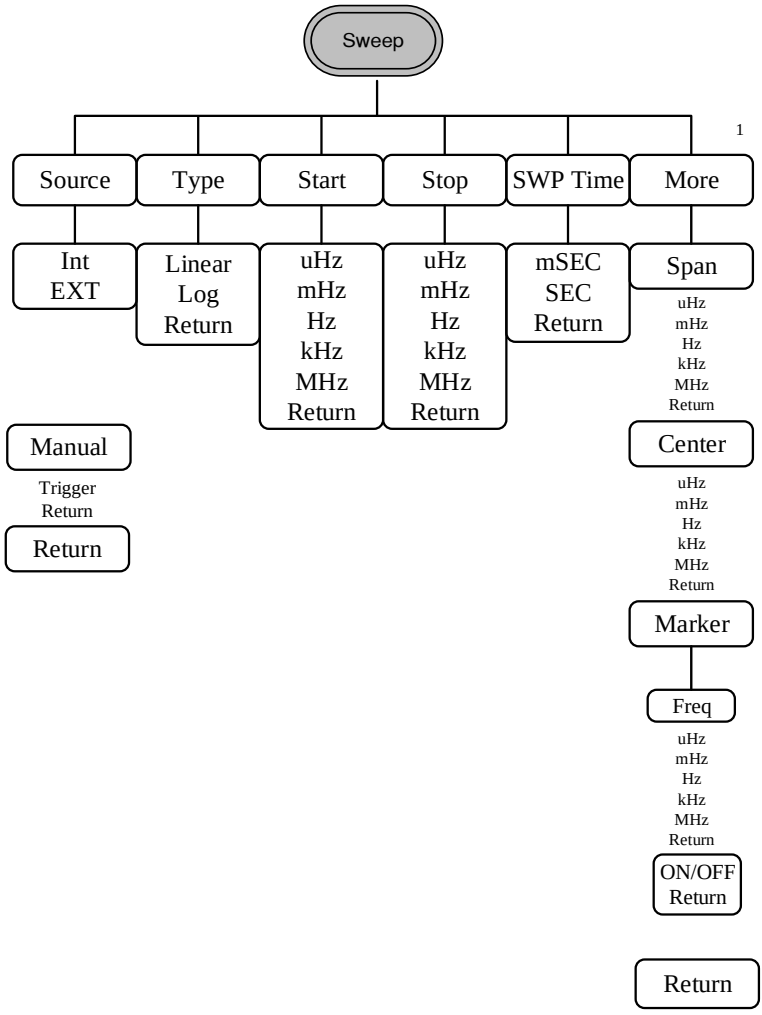
MOD_(Sine-ARB)



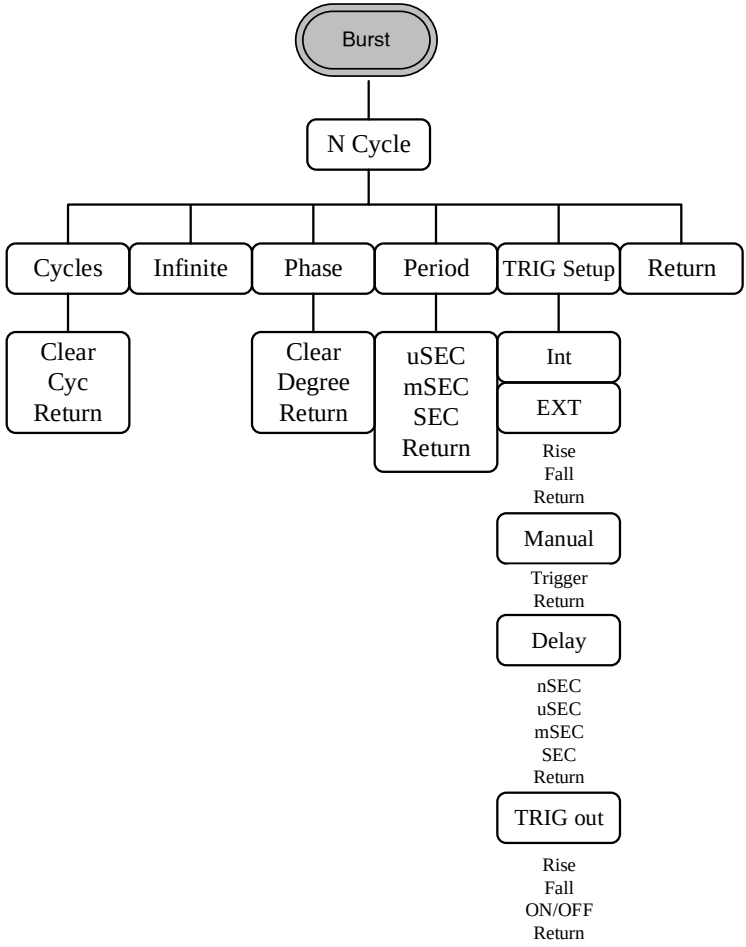
Note

This function is for selecting the modulation function of Sine-ARB under RF waveforms.

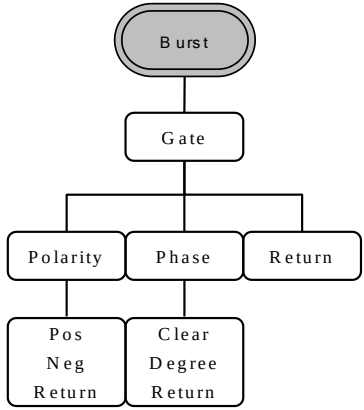
SWEEP


Sweep
1
Source
Type
Start
Stop
SWP Time
More
Int
EXT
Linear
Log
Return
uHz
mHz
Hz
kHz
MHz
Return
uHz
mHz
Hz
kHz
MHz
Return
mSEC
SEC
Return
Span
uHz
mHz
Hz
kHz
MHz
Return
Manual
Trigger
Return
Return
Center
uHz
mHz
Hz
kHz
MHz
Return
Marker
Freq
uHz
mHz
Hz
kHz
MHz
Return
ON/OFF
Return
Return

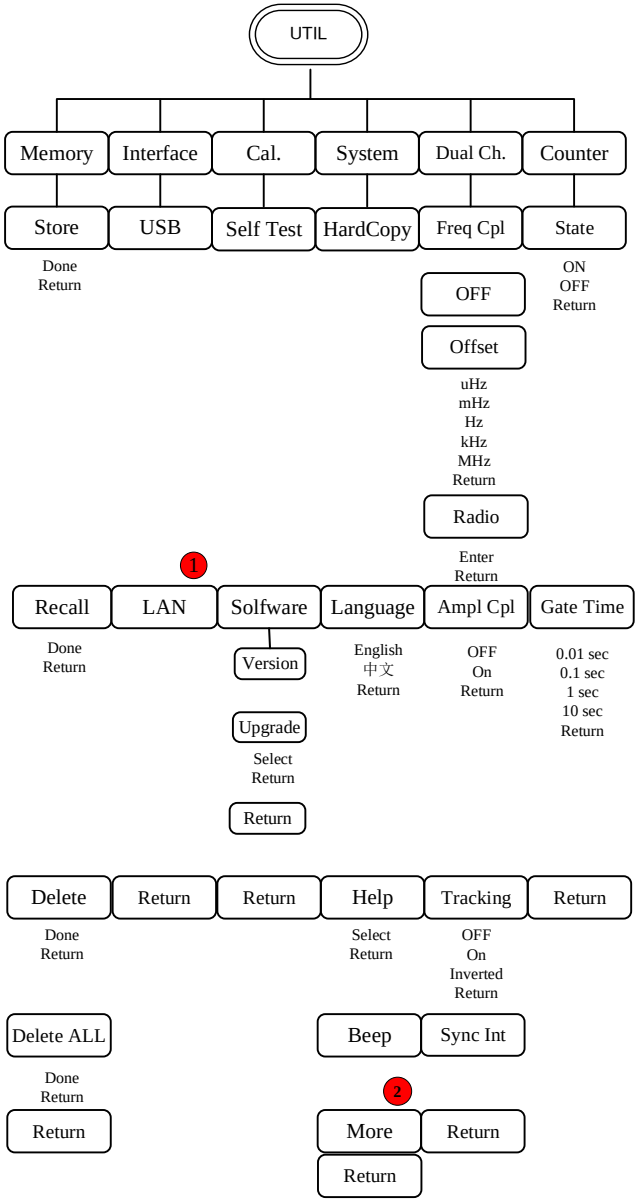
Burst_N Cycle

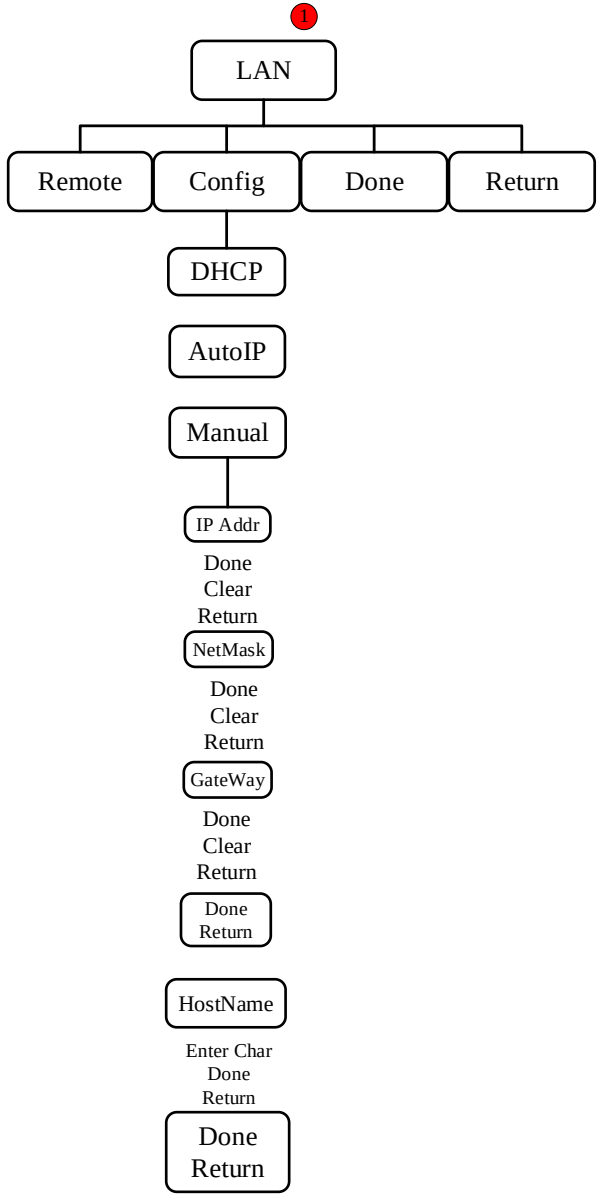


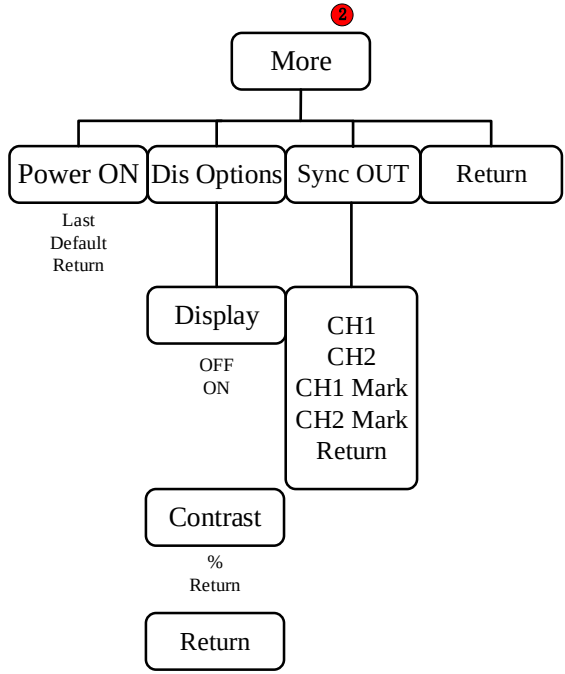
Burst_Gate


Burst
Gate
Polarity
Phase
Return
Pos
Neg
Return
Clear
Degree
Return

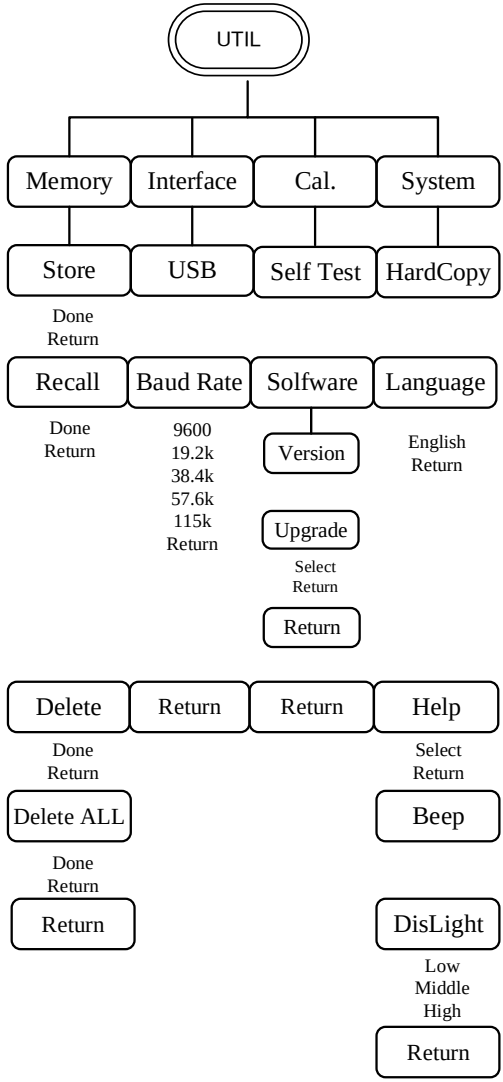
UTIL_(22XX)


UTIL
Memory
Interface
Cal.
System
Dual Ch.
Counter
Store
USB
Self Test
HardCopy
Freq Cpl
State
Done
Return
OFF
Offset
uHz
mHz
Hz
kHz
MHz
Return
ON
OFF
Return
Radio
Enter
Return
1
Recall
LAN
Solfware
Language
Ampl Cpl
Gate Time
Done
Return
Version
Upgrade
Select
Return
Return
English
中文
Return
OFF
On
Return
0.01 sec
0.1 sec
1 sec
10 sec
Return
Delete
Return
Return
Help
Tracking
Return
Done
Return
Select
Return
OFF
On
Inverted
Return
Delete ALL
Done
Return
Return
Beep
Sync Int
2
More
Return
Return

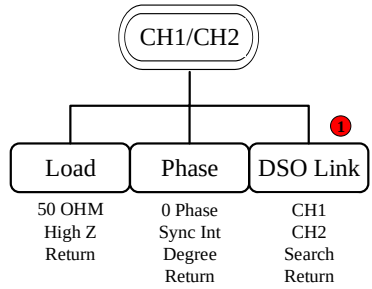

1
LAN
Remote
Config
Done
Return
DHCP
AutoIP
Manual
IP Addr
Done
Clear
Return
NetMask
Done
Clear
Return
GateWay
Done
Clear
Return
Done
Return
HostName
Enter Char
Done
Return
Done
Return


2
More
Power ON
Dis Options
Sync OUT
Return
Last
Default
Return
Display
OFF
ON
CH1
CH2
CH1 Mark
CH2 Mark
Return
Contrast
%
Return
Return

UTIL_(21XX)


UTIL
Memory
Interface
Cal.
System
Store
USB
Self Test
HardCopy
Done
Return
Recall
Baud Rate
Solfware
Language
Done
Return
9600
19.2k
38.4k
57.6k
115k
Return
Version
Upgrade
Select
Return
Return
English
Return
Delete
Return
Return
Help
Done
Return
Delete ALL
Done
Return
Return
Select
Return
Beep
DisLight
Low
Middle
High
Return

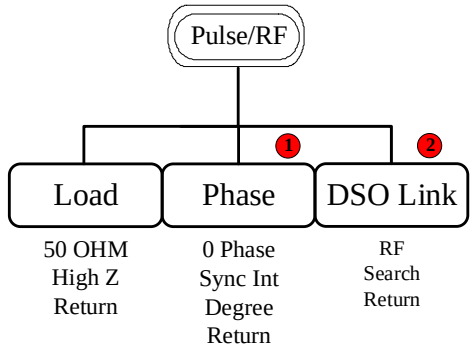
CH1/CH2



Note

The part "DSO Link' listed below ❶ is only available in the MFG-22XX series.

Pulse/RF



Note

❶ means that phase function is not available on RF channel and ❷ means DSO-link function is not available on Pulse channel. DSO-link is only available on the RF channel of MFG-2200X series.

Default Settings

The Preset key is used to restore the default panel settings.

Output Settings	Function	Sine Wave
	Frequency	1kHz
	Amplitude	3.000 Vpp
	Offset	0.00V dc
	Output units	Vpp
	Output terminal	50Ω
Modulation (AM/ASK/FM/FSK/PM/PSK/SUM)	Carrier wave	1kHz sine wave
	Modulation wave	100Hz sine wave
	AM depth	100%
	ASK amplitude	500mVpp
	ASK frequency	10Hz
	FM deviation	100Hz
	FSK hop frequency	100Hz
	FSK frequency	10Hz
	PM phase deviation	180°
	PSK phase	180°
	PSK frequency	10Hz
	SUM amplitude	50%
	Modem status	Off
PWM Modulation	Carrier wave	1kHz Square wave
	Modulation wave	20kHz sine wave

	PWM duty cycle	50%
	Modem status	Off
Sweep	Start/Stop frequency	100Hz/1kHz
	Sweep time	1ms
	Sweep type	Linear
	Sweep status	Off
Burst	Burst frequency	1kHz
	Ncycle	1
	Burst period	10ms
	Burst starting phase	0°
	Burst status	Off
System Settings	Power off signal	On
	Display mode	On
	Error queue	Cleared
	Memory settings	No change
	Output	Off
Trigger	Trigger source	Internal (immediate)
Calibration	Calibration Menu	Restricted

MFG-2000 Series Specifications

The specifications apply when the function generator is powered on for at least 30 minutes under +18°C~+28°C.

MFG-2000 series specific functions						
	CH1 Function With 200MSa/sARB	CH2 Function With 200MSa/sARB	25MHz Pulse Generator	RF Generator (function with ARB)	Power Amplifier	Modulation /Sweep/Burst/Frequency.Counter
MFG-2110	●10MHZ		●			
MFG-2120	●20MHZ		●			
MFG-2120MA	●20MHZ		●		●	●
MFG-2130M	●30MHZ		●			●
MFG-2160MF	●60MHZ		●	●160MHZ		●
MFG-2160MR	●60MHZ		●	●320MHZ		●
MFG-2230M	●30MHZ	●30MHZ	●			●
MFG-2260M	●60MHZ	●60MHZ	●			●
MFG-2260MFA	●60MHZ	●60MHZ	●	●160MHZ	●	●
MFG-2260MRA	●60MHZ	●60MHZ	●	●320MHZ	●	●

CH1/ CH2

Waveforms	Standard	Sine,Square,Ramp,Pulse,Noise
Arbitrary Functions	ARB function	Built-in
	Sample Rate	200 MSa/s
	Repetition Rate	100MHz
	Waveform Length	16k points
	Amplitude Resolution	14 bits
	Non-Volatile Memory	10sets 16k points(1)
	User-defined output section	From point 2~16384 (optional)
	User-defined output marker section	From point 2 ~ 16384(optional)
	Output mode	1~1000000 cycles or infinite mode
	Built-in Arbitrary	Absatan,Abssine,Abssinehalf,Ampalt,Attalt,Diric.even,Diric.odd,Gauspuls,Havercosine,Haversin,N_pulse,Negramp,Rectpuls,Roundhalf,Sawtoot,Sinetra,Sinever,Stair_down,Stair_ud,Stair_up,Stepresp,Traperia,Tripuls,Airy,Bessel,Beta,Gamma,Legendre,Neemann,Arccos,Arccot,Arccsc,Arcsec,Arcsin,Arcsinh,Arctan,Arctanh,Cosh,Cot,Csc,Dlorentz,expofall,exporise,gauss,ln,lorentz,Sec,Sech,Sinc,Sinh,Sqrt,Tan,Tanh,Xsquare,Barthannwin,Bartlett,Blackman,Bohmanwin,Chebyshev,Flatttop

		win,Hamming,Hann,Hanning,Kaiser,Triang,Tukeywin
Frequency Characteristics		
	Range	Sine 60MHz(max)
		Square 25MHz(max)
		Triangle, Ramp 1MHz
	Resolution	1μHz
	Accuracy Stability	±20 ppm
	Aging	±1 ppm, per 1 year
	Tolerance	≤1μHz
Output Characteristics(2)		
	Amplitude Range	1mVpp to 10 Vpp (into 50Ω) 2mVpp to 20 Vpp (open-circuit)
	Accuracy	±2% of setting ±1 mVpp (at 1 kHz/into 50Ω without DC offset)
	Resolution	0.1mV or 4 digits
	Flatness	± 1% (0.1dB) ≦1MHz ± 3% (0.3dB) ≦50 MHz ± 16% (1.5dB) ≦60MHz(6) (sinewave relative to 1 kHz/into 50Ω)
	Units	Vpp, Vrms, dBm
Offset	Range	±5 Vpk ac +dc (into 50Ω) ±10Vpk ac +dc (Open circuit)
	Accuracy	±(1% of setting + 5mV+ 0.5% of amplitude)
Waveform Output		
	Impedance	50Ω typical (fixed) >10MΩ (output disabled)
	Protection	Short-circuit protected Overload relay automatically disables main output
	Ground Isolation	42Vpk max
Sync Output	Range	TTL-compatible into>1kΩ
	Impedance	50Ω standard
	Ground Isolation	42Vpk max
Sine wave		

Characteristics(3)		
	Harmonic distortion	–60 dBc <200kHz, Ampl>0.1 Vpp –55 dBc 200kHz～1 MHz, Ampl>0.1 Vpp –45 dBc 1MHz～10 MHz, Ampl ＞0.1Vpp –35 dBc 10MHz～30 MHz, Ampl ＞0.1Vpp –27 dBc 30MHz～60MHz, Ampl ＞0.1Vpp
	Total harmonic distortion	< 0.1% (Ampl>1Vpp) DC~100 kHz
Square wave Characteristics		
	Rise/Fall Time	<15ns
	Overshoot	<5%
	Asymmetry	1% of period +5 ns
	Variable duty Cycle	0.01% to 99.99%(limited by the current frequency setting)
	Jitter	20ppm+500ps(4)
Ramp Characteristics		
	Linearity	< 0.1% of peak output
	Variable Symmetry	0% to 100%
Pulse Characteristics		
	Frequency	1uHz~25MHz
	Pulse Width	≧20nS(limited by the current frequency setting)
	Variable duty Cycle	0.01%~99.99%(limited by the current frequency setting)
	Overshoot	<5%
	Jitter	20ppm+500ps(4)
Pulse Generator		
	Amplitude	1mVpp to 2.5 Vpp (into 50Ω) 2mVpp to 5 Vpp (open-circuit)
	Offset	±1 Vpk ac +dc (into 50Ω) ±2Vpk ac +dc (Open circuit)
	Frequency	1uHz~25MHz

	Pulse Width	20nS~999.7ks(limited by the current frequency setting)
	Variable duty Cycle	0.1%~99.9%(limited by the current frequency setting)
	Leading and Trailing Edge Time(5)	10nS~20S(1ns resolution) (limited by the current frequency and pulse width settings)
	Overshoot	<5%
	Jitter	100ppm+500ps(4)
RF Generator		
Arbitrary Functions		
	ARB function	Built-in
	Sample Rate	200 MSa/s
	Repetition Rate	100MHz
	Waveform Length	16k points
	Amplitude Resolution	14 bits
	User-defined output section	From point 2~16384 (optional)
	Jitter	20ppm+5ns
Frequency Characteristics		
	Range	Sine MFG-2XXXMF 1uHz~160MHz (DDS) 1uHz~60MHz (ARB) (MFG-2XXXMR) 1uHz~320MHz (DDS) 1uHz~60MHz (ARB)
		Square 25MHz(max)
		Triangle, Ramp 1MHz
	Resolutio	1μHz
	Accuracy Stability	±20 ppm
	Aging	±1 ppm, per 1 year
	Tolerance	≤1μHz
Output Characteristics(2)		
	Amplitude(into 50Ω)	1mVpp to 2 Vpp (MFG-2XXXMF) 1mVpp to 1 Vpp (MFG-2XXXMR)
	Accuracy	±2% of setting ±1 mVpp (at 1 kHz/into 50Ω without DC

		offset))
	Resolution	1mV or 3 digits
	Flatness	± 1% (0.1dB) ≦1MHz ± 3% (0.3dB) ≦50 MHz ± 10% (0.9dB) ≦160MHz ± 35% (3.5dB) ≦320MHz (sinewave relative to 1 kHz/into 50Ω)
Offset		±1 Vpk ac +dc (into 50Ω) ±2Vpk ac +dc (Open circuit)
Waveform Output	Impedance	50Ω typical (fixed) >10MΩ (output disabled)
Sine wave Characteristics(3)		
	Harmonic Distortion(sine,1vpp,50Ω)	–60 dBc <200kHz –55 dBc 200kHz～1 MHz –45 dBc 1MHz～10 MHz –30 dBc 10MHz～320MHz
	Total harmonic distortion	< 0.1% (Ampl>1Vpp) DC~100 kHz
Square wave Characteristics		
	Rise/Fall Time	<15ns
	Overshoot	<5%
	Asymmetry	1% of period +5 ns
	Variable duty Cycle	0.01% to 99.99%(limited by the current frequency setting)
	Jitter	20ppm+500ps(4)
Ramp Characteristics		
	Linearity	< 0.1% of peak output
	Variable Symmetry	0% to 100%
Modulation/ Sweep		
	Modulation Type	AM,ASK,FM,FSK,PM,PSK,PWM (The detail same as CH1 modulation specification)
	Sweep type	Frequency
	Source	INT/EXT（INT only for AM,FM,PM, PWM)
	Modulating Frequency	Sine-DDS 5us~327.68mS

		(Resolution:5uS) Sine-ARB 2mHz to20kHz (Resolution:1mHz)
PSK		
	Carrier Waveforms	Sine-DDS
	Modulating Waveforms	50% duty cycle square
	Internal Frequency	2mHz to 1 MHz
	Phase Range	0° ~360.0°
	Source	Internal / External
ASK		
	Carrier Waveforms	Sine-DDS
	Modulating Waveforms	50% duty cycle square
	Internal Frequency	2mHz to 1 MHz
	Amplitude Range	0%~100.0%
	Source	Internal / External
Power Amplifier		
	Input Impedance	10KΩ
	Input voltage	1.25Vpmax
	Working Mode	Constant Voltage
	Gain	20dB
	Output Power （RL=8Ω）	20W(Square)
	Output Voltage	12.5Vpmax
	Output Current	1.6Amax
	Rise/Fall Time	<2.5uS
	FullPower Bandwidth	DC-100KHz
	Overshoot	5%
	Total harmonic distortion	< 0.1% (Ampl>1Vpp) 20Hz~20 kHz
	Ground Isolation	42Vpk max
Advanced Functions		
AM Modulation		
	Carrier Waveforms	Sine, Square, Triangle, Ramp, Pulse,Arb
	Modulating Waveforms	Sine, Square, Triangle,Upramp, Dnramp
	Modulating Frequency	2mHz to 20kHz (Int)DC to

		20kHz (Ext)
	Depth	0% to 120.0%
	Source	Internal / External
FM Modulation		
	Carrier Waveforms	Sine, Square, Triangle, Ramp
	Modulating Waveforms	Sine, Square, Triangle,Upramp, Dnramp
	Modulating Frequency	2mHz to20kHz (Int)DC to 20kHz (Ext)
	Peak Deviation	DC to max frequency
	Source	Internal / External
PM Modulation		
	Carrier Waveforms	Sine, Square, Triangle, Ramp
	Modulating Waveforms	Sine, Square, Triangle, Upramp, Dnramp
	Modulation Frequency	2mHz to20kHz (Int)DC to 20kHz (Ext)
	Phase deviation	0° ~360.0°
	Source	Internal / External
SUM Modulation		
	Carrier Waveforms	Sine, Square, Triangle, Ramp
	Modulating Waveforms	Sine, Square, Triangle, Upramp, Dnramp
	Modulation Frequency	2mHz to20kHz (Int)DC to 20kHz (Ext)
	SUM depth	0%~100.0%
	Source	Internal / External
PWM Modulation		
	Carrier Waveforms	Sine, Square, Triangle, Ramp
	Modulating Waveforms	Sine, Square, Triangle, Upramp, Dnramp
	Modulation Frequency	2mHz to20kHz (Int)DC to 20kHz (Ext)
	Phase deviation	0%~100.0% pulse width
	Source	Internal / External
FSK		
	Carrier Waveforms	Sine, Square, Triangle, Ramp,Pulse

	Modulating Waveforms	50% duty cycle square
	Internal Frequency	2mHz to 1 MHz
	Frequency Range	1μHz to max frequency
	Source	Internal / External
Sweep		
	Waveforms	Sine, Square, Triangle, Ramp
	Type	Linear or Logarithmic
	Sweep direction	Sweep up or sweep down
	Start/Stop Freq	1uHz to max frquency
	Sweep Time	1ms to 500s
	Source	Internal / External
	Trigger	Single, External, Internal.
	Marker	Marker signal on falling edge(programmable)
	Source	Internal / External
Burst		
	Waveforms	Sine, Square, Triangle, Ramp
	Frequency	Max Frequency 25MHz
	Pulse count	1~1000000 Cycles or intfinite
	Start/ Stop Phase	-360.0° ~+360.0°
	Internal Frequency	1 us~500 s
	Gate source	External Trigger
	Trigger Source	Single, External, Internal.
Trigger Delay	NCycle, Infinite	0s~100 s
External Trigger Input		
	Type	For FSK, Burst, Sweep
	Input Level	TTL Compatibility
	Slope	Rising or Falling(Selectable)
	Pulse Width	>100ns
	Input Impedance	10kΩ，DC coupled
External Modulation Input		
	Type	For AM,FM, PM,SUM,PWM
	Voltage Range	±5V full scale
	Input Impedance	10kΩ
	Frequency	DC to 20kHz
	Ground Isolation	42Vpk max

Trigger Output		
	Type	For ARB,Burst,Sweep
	Level	TTL Compatible into 50Ω
	Pulse Width	>16ns
	Maximum Rate	25MHz
	Fan-out	≥4 TTL Load
	Impedance	50Ω Typical
Frequency Counter		
	Range	5Hz to 150MHz
	Accuracy	Time Base accuracy±1count
	Time Base	±20ppm (23°C ±5°C)
	Resolution	The maximum resolution is: 100nHz for 1Hz, 0.1Hz for 100MHz.
	Input Impedance	1kΩ/1pf
	Sensitivity	35mVrms ~ 30Vrms (5Hz to 150MHz)
	Ground Isolation	42Vpk max
Dual Channel Function (CH1/CH2)		
	Phase	-180° ~180°
		Synchronize phase
	Track	CH2=CH1
	Coupling	Frequency(Ratio or Difference)
		Amplitude & DC Offset
	Dsolink	√
Save/Recall		10 Groups of Setting Memories
Interface		LAN, USB
Display		4.3'' TFT LCD 480 × 3 (RGB) × 272
General Specifications		
	Power Source	AC100~240V, 50~60Hz or AC100~120V, AC220~240V, 50~60Hz
	Power Consumption	30W or 80W (With power amplifier)

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
Pollution Degree	IEC 61010 degree 2, Indoor use
Storage Temperature	-10~70°C, Humidity: ≤70%
Dimensions (WxHxD)	266(W) x 107(H) x293(D)mm
Weight	Approx. 2.5kg
Safety designed to	EN61010-1
Accessories	GTL-101× 1(MFG-21XX) GTL-101× 2(MFG-22XX) Quick Start Guide ×1 CD (user manual + software) ×1 Power cord×1

(1). A total of ten waveforms can be stored. (Every waveform can be composed of a maximum of 16k points.)
(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). DC offset set to zero,
(4). Jitter specification for RF Generator: 20ppm+5ns.
(5).Only Pluse channel support
(6). Only one channel output

EC Declaration of Conformity

We

GOOD WILL INSTRUMENT CO., LTD.

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

GOOD WILL INSTRUMENT (SUZHOU) CO., LTD.

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

declares that the below mentioned product

MFG-2110, MFG-2120,MFG-2120MA,MFG-2130M,MFG-2230M,MFG-2260M,MFG-2160MF,MFG-2260MFA,MFG-2160MR,MFG-2260MRA

Are here with 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&2014/30/EU) and Low Voltage Equipment Directive EMC: 2014/30/EU, LVD: 2014/35/EU, WEEE: 2012/19/EU and RoHS: 2011/65/EU. For the evaluation regarding the Electromagnetic Compatibility and Low Voltage Equipment Directive, the following standards were applied:

◎ EMC

EN 61326-1: EN 61326-2-1:	**Electrical equipment for measurement, control and laboratory use — EMC requirements (2013)**
Conducted and Radiated Emissions EN 55011: 2009+A1:2010	Electrostatic Discharge EN 61000-4-2: 2009
Current Harmonic EN 61000-3-2: 2014	Radiated Immunity EN 61000-4-3: 2006+A1 : 2008+A2:2010
Voltage Fluctuation EN 61000-3-3: 2013	Electrical Fast Transients IEC 61000-4-4: 2012
----------	Surge Immunity EN 61000-4-5: 2006
----------	Conducted Susceptibility EN 61000-4-6: 2014
----------	Power Frequency Magnetic Field EN 61000-4-8: 2010
----------	Voltage Dips/ Interrupts IEC 61000-4-11: 2004

◎ **Safety**

Low Voltage Equipment Directive 2014/35/EU
Safety Requirements **IEC/EN 61010-1: 2010(Third Edition)**

GLOBL HEADAQARTERS

GOOD WILL INSTRUMENT CO., LTD.
No. 7-1, Jhongsing Road, Tucheng Dist., New Taipei City 236, Taiwan
Tel: +886-2-2268-0389
Fax: +866-2-2268-0639
Web: www.gwinstek.com
Email: marketing@goodwill.com.tw

GOOD WILL INSTRUMENT (SUZHOU) CO., LTD.
No. 521, Zhujiang Road, Snd, Suzhou Jiangsu 215011, China
Tel: +86-512-6661-7177
Fax: +86-512-6661-7277
Web: www.instek.com.cn
Email: marketing@instek.com.cn

Europe Subsidiary

GOOD WILL INSTRUMENT EURO B.V.
De Run 5427A, 5504DG Veldhoven, The Netherlands
Tel: +31(0)40-2557790
Fax: +31(0)40-2541194
Email: sales@gw-instek.eu