



# USER MANUAL

**GW INSTEK**



# Dual Trace Oscilloscope with Function Generator

GOS-620FG

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## USER MANUAL

GW INSTEK PART NO. 82OS-620FGMF1



ISO-9001 CERTIFIED MANUFACTURER **GW INSTEK**

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# SAFETY INSTRUCTIONS

This chapter contains important safety instructions that you must follow when operating the instrument and whilst in storage. Read the following instructions before operating the instrument to ensure your safety and to keep it in the best possible condition.

## Safety symbols

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

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### 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 instrument or to other properties.



DANGER: High Voltage



Attention: Refer to the Manual



Protective Conductor Terminal



Earth (Ground) Terminal

## Safety guidelines

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### Operating



### WARNING

- Before connecting the power plug to an AC outlet, ensure that the voltage selector on the rear panel is set to the correct voltage. Failure to do so may damage the instrument.

### General Guideline

- Never connect a hazardous live voltage to the ground side of the BNC connectors. It might lead to fire or electric shock.



### CAUTION

- Do not place heavy objects on the instrument.
- Avoid severe impacts or rough handling that can lead to damaging the instrument.
- Do not discharge static electricity onto the instruments.
- Use only mating connectors, not bare wires, for the terminals.
- Do not block the cooling fan opening.
- Do not perform measurements at power generating sources and building installation sites (See note below).
- Do not disassemble the instrument unless you are technically qualified.
- To prevent permanent damage to the CRT phosphor, avoid excessively brightening the trace or holding a light spot for an unreasonably long time.
- Do not operate the instrument in a place where a strong magnetic or electric field exists as it may disturb the measurement.
- Make sure the input voltage does not exceed the following values.

Input Terminal	Maximum Input Voltage
CH1, CH2 input	300Vpeak
EXT TRIG input	300Vpeak
Probe input	600Vpeak
Z AXIS input	30Vpeak

**CAUTION**

To avoid any damage, do not apply exceeding maximum input voltage of the frequency less than 1 kHz to the instrument.

(Measurement categories) EN 61010-1:2001 specifies the measurement categories and their requirements as follows. The GOS-620FG falls under category II.

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

**Power Supply****WARNING**

- AC Input voltage: 115V/230V AC, 50/60Hz
- The power supply voltage should not fluctuate more than approximately 15%.  
97-132V and 195-250V respectively.
- To avoid electric shock, connect the protective grounding conductor of the AC power cord to an earth ground.

**Fuse****WARNING**

- Fuse type: T0.63A/250V (AC 115V),  
T0.315A/250V (AC230V)
  - Make sure the correct type of fuse is installed before power up.
  - To avoid a fire hazard, replace the fuse only with the specified type and rating.
  - Disconnect the power cord before fuse replacement.
  - Make sure the identity of the fuse blowout is repaired before replacing the fuse.
- 

**Cleaning the instrument**

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

**Operating Environment**

- Location: Indoor, no direct sunlight, dust free, almost non-conductive pollution (See note below)
- Relative Humidity: < 85%, non-condensing
- Altitude: < 2000m
- Temperature: 0°C to 40°C (32°F to 104°F) (Max operating ranges)
- Temperature: 10°C to 35°C (50°F to 95°F) (Specification operating ranges)

(Pollution Degree) EN 61010-1:2001 specifies the pollution degrees and their requirements as follows. The GOS-620FG 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

## Power cord for the United Kingdom

When using the instrument 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 EARTED**

**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 mains leads may not correspond with the colours 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 the letter E or by the earth symbol or coloured Green or 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.

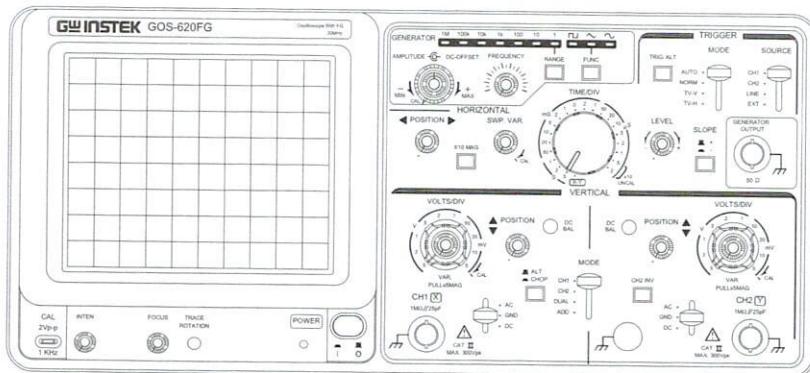
This cable/appliance should be protected by a suitably rated and approved HBC mains fuse: refer to the rating information on the equipment and/or user instructions for details. As a guide, cable of 0.75mm<sup>2</sup> should be protected by a 3A or 5A fuse. Larger conductors would normally require 13A types, depending on the connection method used.

Any moulded mains connector that requires removal /replacement must be destroyed by removal of any fuse & fuse carrier and disposed of immediately, as a plug with bared wires is hazardous if engaged in live socket. Any re-wiring must be carried out in accordance with the information detailed on this label.

# PRODUCT OVERVIEW

## Product Description

The GOS-620FG is a portable, dual-channel oscilloscope and function generator. The GOS-620FG provides a maximum 20MHz bandwidth and a maximum of 1mV/DIV sensitivity (X5 Mag). Its time base reaches 0.2 $\mu$ s/DIV with a sweep speed of 100nS/DIV. The GOS-620FG uses a 6-inch rectangular cathode ray tube display with a red internal graticule. The function generator creates triangle, sine and square waves with a frequency range of 0.1Hz to 1 MHz. This is a sturdy, easy-to-operate and highly reliable product.



## Package Contents

Item	Description
1	Oscilloscope GOS-620FG 20MHz analog dual channel oscilloscope/function generator
2	Power cord Varies with country
3	Passive probe kit Passive probe kit containing: <ul style="list-style-type: none"><li>• x1 plastic case</li><li>• x1 probe instruction manual</li><li>• x1 red 1MΩ switchable passive probe</li><li>• x1 blue 1 MΩ switchable passive probe</li><li>• x1 test lead (GTL-101)</li><li>• x1 probe screwdriver</li><li>• x8 colored probe rings</li><li>• x2 probe caps</li></ul>
4	Instruction Manual GOS-620FG dual channel oscilloscope instruction manual
5	Calibration certificate Certificate of traceable calibration.

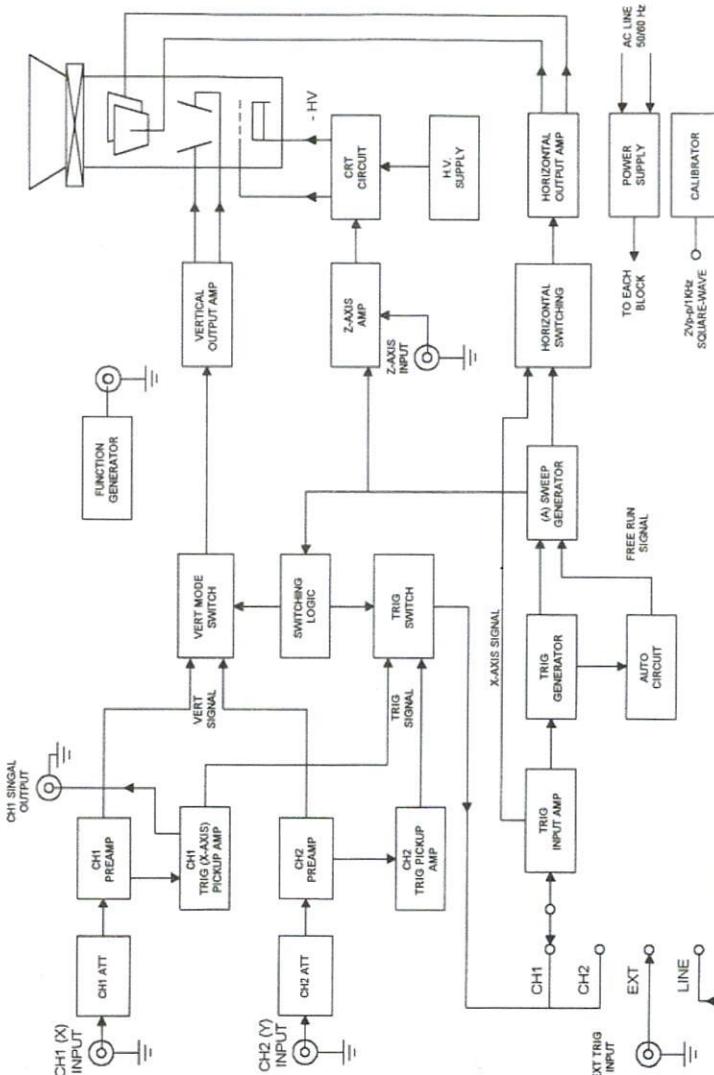
## Main Features

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High intensity and acceleration CRT	High intensity CRT with high acceleration voltage. The CRT incorporates a high intensity beam with a 2kV acceleration voltage. The fast CRT display is able to clearly show traces even at high sweep speeds.
Wide bandwidth and sensitivity	In addition to the DC-20MHz (-3dB) wide bandwidth, the oscilloscope has 5mV/DIV sensitivity (1mV at X5 magnification). Using improved triggering synchronization the ASO is able to obtain a 20MHz frequency range.
Alternate triggering	Even when observing two waveforms at different frequencies, both waveforms can be stably triggered using the alternate triggering mode.
TV sync triggering:	The oscilloscope has a sync separator circuit for the TV-V and TV-H signal triggering.
CH1 output	The CH1 signal is output from a rear panel terminal, which can be applied to external devices.
Z-axis input	Input terminal for external intensity modulation. Ensure that the external signal has a frequency similar to the measured signal. When the external signal has a higher amplitude (voltage) than the measured signal the display intensity increases, and vice versa.
X-Y mode	The X-Y mode compares the CH1 and CH2 signal amplitude. It is useful for comparing the phase difference. CH1 and CH2 are set as X and Y respectively.

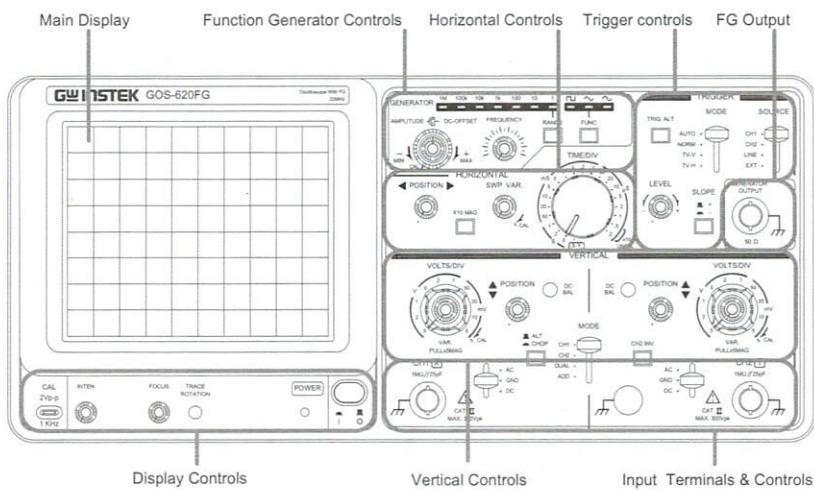
<b>Function Generation</b>	Built in Function Generator with BNC output ( $50\Omega$ ). Three waveform types, sine, square and triangle with a frequency ranging from 0.1Hz to 1MHz.
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# Block Diagram



# P ANEL OVERVIEW

## Front Panel Overview



Detailed descriptions of each block start from the next page.

**Main Display** Shows the waveforms of input signals.

**Display Controls** Controls power on/off, display configuration, and the probe compensation output.

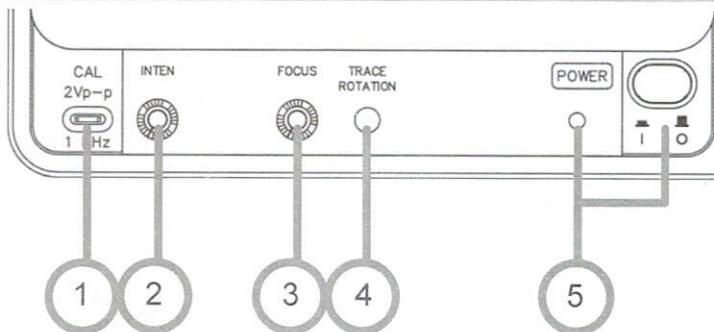
**Horizontal Controls** Controls the horizontal scale, horizontal position, sweep length, and x10 magnification.

**Vertical Controls** Controls the vertical scale, vertical position, display mode, CH2 inversion, and alternate display mode.

**Trigger Controls** Controls the trigger mode, trigger level, trigger coupling source, trigger slope, and alternate triggering mode. Accepts the external trigger input.

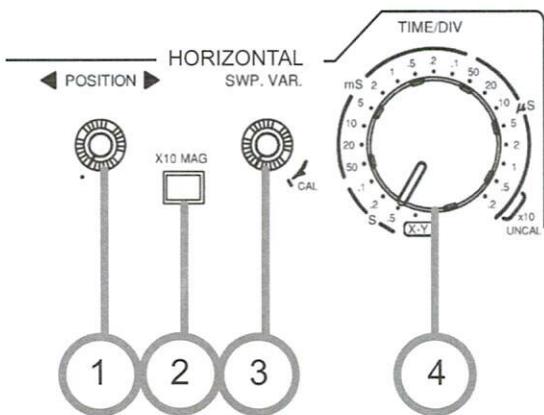
Input Terminals	Accepts the CH1 and CH2 input signals and ground wires. Controls the input signal coupling mode.
Function Generator	Controls the wave type, frequency and amplitude of the included function generator.
FG output	The Function Generator Output.

## Display Controls



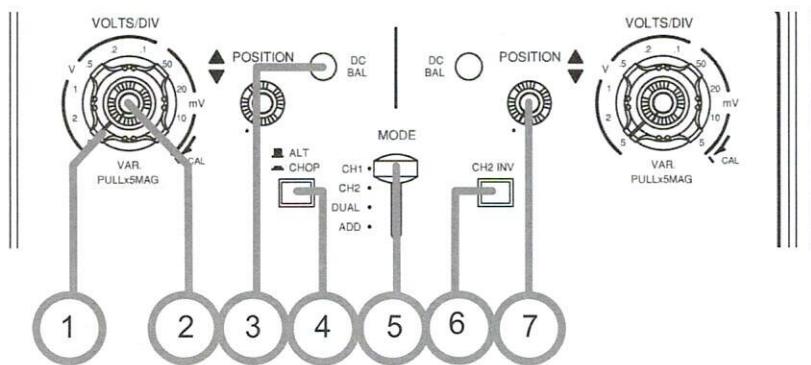
- 1 CAL Output Generates the probe compensation signal; 2Vp-p, 1kHz, positive square wave. For probe compensation details, see page32.
- 2 INTEN Knob Controls the intensity of the trace spot/line in the display.
- 3 FOCUS Knob Controls the focus (sharpness) of the displayed signal in the display.
- 4 TRACE ROTATION Point Controls the alignment of the horizontal trace in parallel with the graticule lines.
- 5 POWER Switch Turns on or off the oscilloscope's main power. When the power is on, the LED lights up.

## Horizontal Controls



- |             |  |  |
|-------------|--|--|
| <b>1</b>    | <b>Horizontal POSITION</b>               | Controls the horizontal position of traces and light spots.  |
| <b>Knob</b> |  |  |
| <b>2</b>    | <b><math>\times 10</math> MAG Switch</b> | Magnifies the horizontal scale by a factor of 10. For horizontal magnification details, see page41.  |
| <b>3</b>    | <b>SWP VAR Knob</b>                      | The sweep variable (SWP VAR) knob is used to alter the sweep of the oscilloscope. When SWP VAR is not in the CAL position it can be used to change the sweep time by up to 2.5 times the TIME/DIV setting. |
| <b>4</b>    | <b>TIME/DIV Knob</b>                     | Controls the horizontal scale from 0.2 $\mu$ s/div to 0.5 s/div in 20 steps.<br>When "X-Y" is selected, the oscilloscope works in the X-Y mode. For X-Y mode details, see page40.                          |

## Vertical Controls



**1 VOLTS/DIV** Controls the CH1/CH2 vertical scale from Knob 5mV/DIV to 5V/DIV in 10 steps.

**2 VAR Knob** Adjusts the vertical scale.

At the minimum position, the vertical scale becomes 2.5 times wider than the original value selected by the VOLTS/DIV knob. For example, if the original scale is 1mV/DIV, the adjusted scale becomes 2.5mV/DIV.

At the maximum (CAL) position, there is no change in the vertical scale.

**3 DC balance** CH1 & CH2 DC balance is used to adjust the attenuator balance.

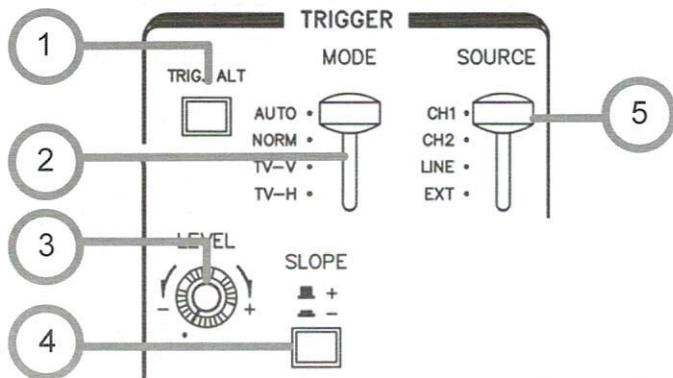
**4 ALT/CHOP Switch** Selects how the CH1 and CH2 signals appear in the display, in the DUAL trace mode.

CHOP  
■ **CHOP**

The two signals are chopped and displayed simultaneously (generally used in slow sweep, 1ms/DIV or slower).

	<b>ALT</b>  <b>ALT</b>	The two signals are displayed alternatively (generally used in fast sweep, 0.5ms/DIV or faster).
5	<b>Vertical MODE Switch</b>	Selects CH1 and CH2 display modes.
	<b>CH1/CH2</b>	The CH1 or CH2 signal is displayed independently.
	<b>DUAL</b>	The CH1 and CH2 signals are displayed simultaneously.
	<b>ADD</b>	The CH1 and CH2 signals are added or subtracted, and then the result is displayed. For CH1/CH2 addition/subtraction details, see page39.
6	<b>CH2 INV Switch</b>	Inverts the CH2 input signal vertically. When the vertical mode switch is in the ADD position, CH2 is subtracted from CH1 instead of being added to CH1. For CH1/CH2 addition/subtraction details, see page39.
7	<b>Vertical POSITION Knob</b>	Controls the vertical position of traces and light spots for CH1/CH2.

## Trigger Controls



- 1 Trigger ALT** When pressed, the TRIG ALT switch constantly toggles the trigger source between CH1 and CH2 signal, so that both signals can be clearly viewed.

The TRIG ALT switch works when the vertical mode is in the DUAL position and also the trigger source is in the CH1 or CH2 position.

**Note**



The TRIG ALT switch does not work when the ALT/CHOP switch is in the CHOP position.

The ALT switch is not suitable for observing phase or timing comparisons.

- 2 Trigger MODE** Switch

The TRIGGER MODE switch selects when the oscilloscope responds to the trigger conditions.

**AUTO**

The oscilloscope sweeps regardless of the existence of trigger conditions. AUTO mode must be used for DC and low amplitude signals in order not to trigger the sweep.

**NORM** The oscilloscope sweeps only when a signal source crosses the trigger level threshold. The trigger level threshold can be adjusted by using the trigger LEVEL knob. During ALT mode, normal mode will have no trace unless both CH1 and CH2 signals are able to be triggered.

**TV-V** The oscilloscope triggers when a vertical video synchronization signal appears. For triggering on the field, select 2ms/DIV as the horizontal scale; for triggering on the frame (two interlaced fields), 5ms/DIV.

**TV-H** The oscilloscope triggers when a horizontal video synchronization signal appears. For triggering on the line, select 10us/DIV as the horizontal scale. Use the SWP VAR knob to control the number of waveforms.

**Note**



- For TV-V and TV-H trigger, the oscilloscope responds only to negative polarity signals.



- The oscilloscope cannot trigger input signals when their frequencies are less than 25Hz.

**3 Trigger** Changes the trigger level vertically.

**LEVEL Knob** The trigger level moves up when the trigger LEVEL knob is turned clockwise.

The trigger level moves down when the trigger LEVEL knob is turned counterclockwise.

**Note**



If you rotate the Trigger LEVEL knob to its extreme positive or negative in NORMAL mode, no sweep will be triggered because the trigger threshold will exceed the peak amplitude of the sync signal.

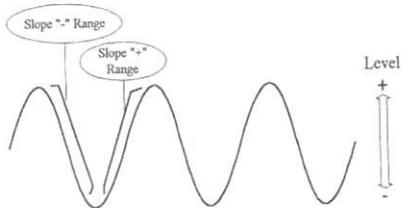
If the LEVEL knob is centered, the trigger level will be comparable to the average of the signal used as a trigger source.

**4 Trigger** Selects the triggering slope.

**SLOPE Switch**

When in the "+" position (■ +), the oscilloscope triggers when the positive slope of the trigger source signal crosses the trigger level.

When in the "—" position (■ -), the oscilloscope triggers when the negative slope of the trigger source signal crosses the trigger level.

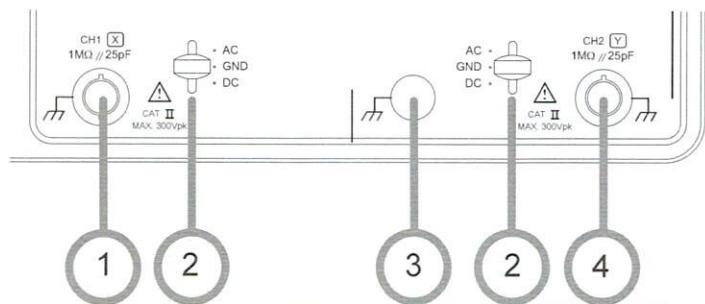


**5 Trigger SOURCE Switch** Selects the signal on which the oscilloscope sweeps.

CH1 CH1 signal becomes the trigger source.

CH2	CH2 signal becomes the trigger source.
LINE	AC power line signal becomes the trigger source. Useful when the input signal synchronizes with the power line frequency.
EXT	The external trigger input (TRIG IN terminal) signal becomes the trigger source.
Note	The external signal must have a periodic relationship with the measure signal. 

# Input Terminals



**1 CH 1 (X) Input Terminal** Accepts the CH1 input signal. In X-Y mode, the CH1 input signal becomes the X-axis.

**2 AC/GND/DC Switch** Selects the coupling mode for the input signal.

**AC** The oscilloscope blocks DC components included in the input signal.

**GND** Shows the ground (zero volts) level on the display. This mode is only for checking the reference level; input signal does not appear on the display.

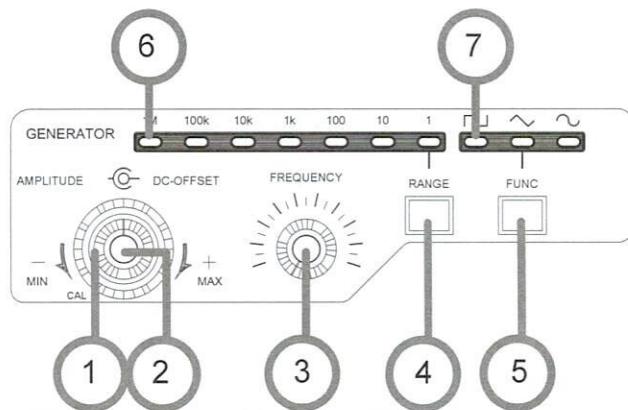
**DC** The oscilloscope displays the entire input signal.

**3 GND Terminal** Accepts a ground wire. The GND terminal is connected to the oscilloscope mainframe.

**4 CH 2 (Y) Input Terminal** Accepts the CH2 input signal. In X-Y mode, the CH2 input signal becomes the Y-axis.

- For X-Y mode details, see page40.

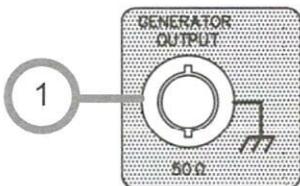
# Function Generator Panel



- 1 AMPLITUDE** Controls the signal amplitude voltage.  
knob Anticlockwise reduces the amplitude and clockwise increases the amplitude up to 20Vp-p (open circuit)
- 2 DC-OFFSET** DC-OFFSET is enabled by turning the inside knob clockwise, out of the CAL position (you will hear a click when CAL is disengaged). When the DC-OFFSET knob is turned clockwise DC-offset is increased (+) whilst turning anticlockwise will decrease (-) the DC-offset. A DC-offset of  $\pm 10V$  is possible. To return to a 0V DC offset, turn the DC-offset knob to the CAL position until you hear a click.
- 3 FREQUENCY** The Frequency knob is used to finely adjust the frequency. Left reduces the frequency, right increases the frequency.
- 4 RANGE Selector** The RANGE selector, changes the frequency range from 1M, 100k, 10k, 1k, 100, 10 and 1 Hz.
- 5 FUNC Selector** The FUNC selector changes the waveform function from Square, Triangle or Sine waveforms.

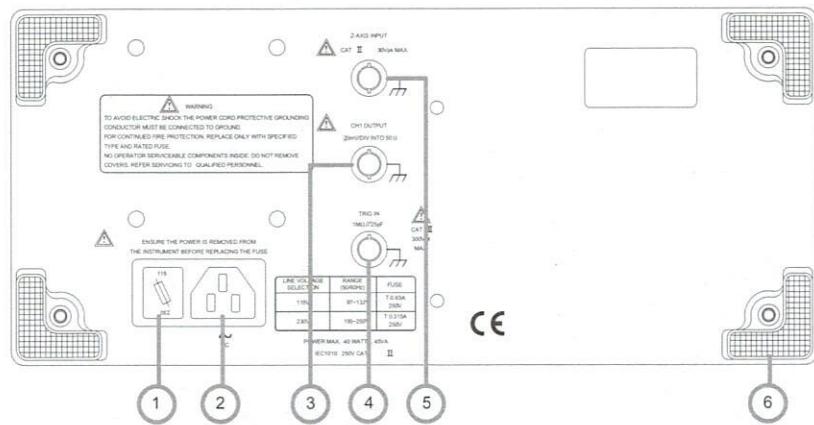
- 6 RANGE Shows the currently selected frequency range.  
Indicator
- 7 FUNC Shows the currently selected waveform. (Square,  
Indicator Triangle, Sine)

## Function Generator Output Terminal



- 1 Function Generator Output      Function Generator BNC 50Ω output impedance.

## Rear Panel Overview



- 1 FUSE & Line Selector** Holds the AC mains fuse and selects the AC line voltage, 115V or 230V.
  - 2 AC Power Input Connector** Accepts the AC power cord.
  - 3 CH1 OUTPUT Terminal** Outputs the CH1 signal; approximately 20mV/DIV when terminated with  $50\Omega$ .
  - 4 TRIG IN Terminal** Input terminal for external triggering. Use by setting the SOURCE switch to EXT.  $1M\Omega 25pF$
  - 5 Z AXIS INPUT Terminal** Used to mark intensity markers. Accepts an external intensity modulation (Z-axis) signal; 1kHz square wave, DC – 2MHz. For detailed specifications, see page49.
  - 6 Studs** Used when the oscilloscope is in an upright position or to wind up the power cord.
- For AC line voltage selection and fuse replacement, see page47.

# SETUP

## Oscilloscope Default Settings

Before connecting the power cord to an AC outlet, ensure that the AC line input is correctly set for the correct AC line voltage through the fuse (page47) (115V or 230V).

Before powering up the oscilloscope, set up the front panel as follows.

POWER Switch		Off
INTEN Knob		Center
FOCUS Knob		Center
Vertical MODE Switch		CH1
ALT/CHOP Switch		ALT (▲)
CH 2 INV Switch		Released (Inversion disabled)

CH1/CH2



Center of the display

Vertical

POSITION

Knob

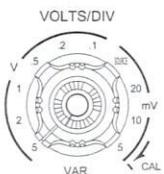
CH1/CH2



50mV/DIV

VOLTS/DIV

Knob



CAL

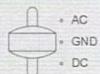
CH1/CH2

VARIABLE

Knob



CH1/CH2



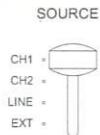
GND

Coupling

Switch

Trigger

SOURCE Switch



CH1

Trigger SLOPE



+ (Positive slope)

Switch

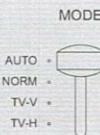
TRIG ALT



Released (alternating trigger disabled)

Switch

Trigger MODE

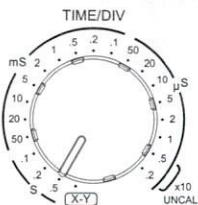


AUTO

Switch

TIME/DIV

Knob



0.5ms/DIV

Horizontal

SWP.VAR Knob

SWP. VAR.

CAL



Horizontal

POSITION

Knob

◀ POSITION ▶

Center of the display



x10 MAG

Switch

X10 MAG

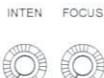


Released (x10 magnification disabled)

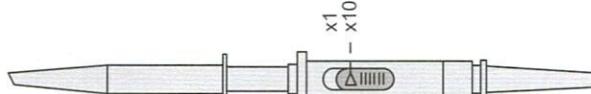
## Set up & Probe Compensation

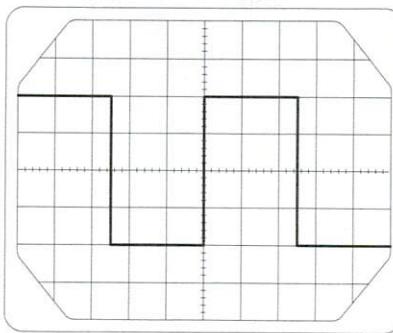
After the default settings have been set, follow these steps and properly set up the oscilloscope. Make sure it is functioning properly and compensate the probe.

- 1 Power on** Press the Power switch and turn on the oscilloscope's power. The LED lights when the power is on.  
The trace line starts to appear after 20 – 30 seconds.  

- 2 Intensity and focus adjustment** Use the INTEN knob and FOCUS knob to adjust the trace line appearance to the best condition.  

- 3 Trace rotation** Ensure that the trace line is aligned with the horizontal graticule. Use the supplied screwdriver and adjust the TRACE ROTATION knob.  

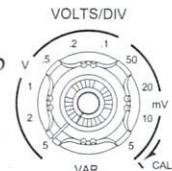
- 4 Probe connection** Connect the probe between the CAL output and the CH1 input terminal.  

- 5 Probe attenuation** Select x10 (attenuation) on the probe.  

- 6 Coupling mode selection** Select the DC position in the CH1 AC-DC-GND switch. A square waveform appears in the display.  

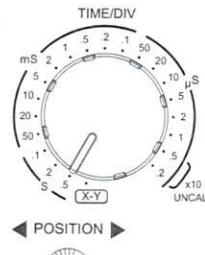
### 7 Vertical adjustment

Use the CH1 VOLTS/DIV knob and CH1 vertical POSITION knob to adjust the vertical scale to 50mV and position the waveform in the center of the display.



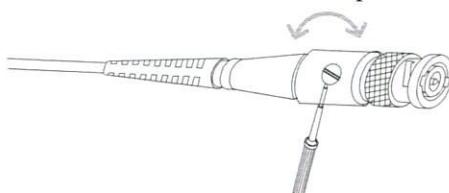
### 8 Horizontal adjustment

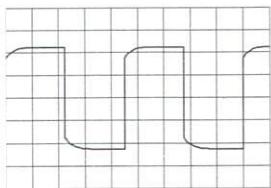
Use the CH1 TIME/DIV knob and CH1 horizontal POSITION knob to adjust the horizontal scale and position of the waveform. (0.2ms is adequate)



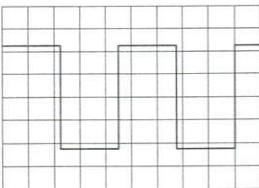
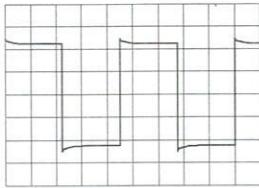
### 9 Probe compensation

Adjust the compensation point on the probe so that the waveform becomes square.





Under compensation

Correct  
Compensation

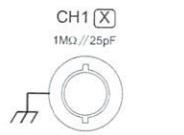
Over compensation

**10 Completion** Now setting up the oscilloscope is completed. For more advanced measurements, see page35.

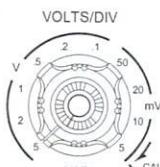
# MEASUREMENT

## Single Channel (Basic) Measurement

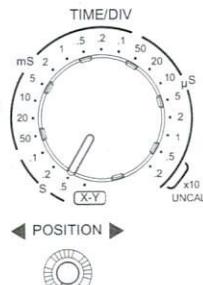
- Steps
1. Ensure that the probe and oscilloscope have been properly set up.(page32)
  2. Connect the input signal to the CH1 or CH2 terminal.



3. Select the vertical coupling between AC (DC components are blocked) or DC (all signal components appear).
4. Configure the trigger settings. For details, see page21.
5. Use the VOLTS/DIV knob and vertical POSITION knob to adjust the vertical scale and position of the waveform.



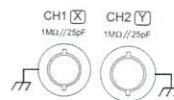
6. If necessary, use the TIME/DIV knob to adjust the horizontal scale manually. Use the horizontal POSITION knob to adjust the position of the waveform.



## Dual Channel Measurement

### Steps

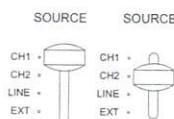
1. Connect both CH1 and CH2 signals to the input terminals.



2. Select the vertical coupling between AC (DC components are blocked) or DC (all signal components appear) for both channels.



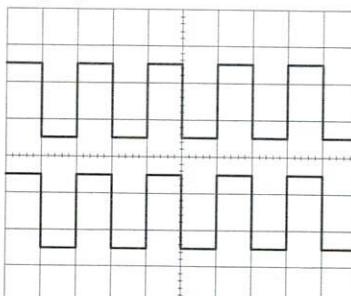
3. Configure the trigger settings. For details, see page 21.  
Make sure the trigger SOURCE switch is in either the CH1 or CH2 position.



4. Set the vertical MODE switch to the DUAL position.



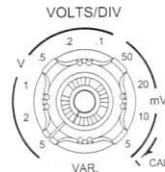
5. Both the CH1 and CH2 signals appear on the display.



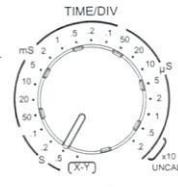
6. Use the vertical ALT/CHOP switch to select how the two waveforms appear on the display: alternately (ALT mode) or simultaneously (CHOP mode). See page19 for details.



7. If necessary, use the VOLTS/DIV knob and vertical POSITION knob to adjust the vertical scale and position of the waveform.



8. If necessary, use the TIME/DIV knob and horizontal POSITION knob to adjust the horizontal scale and position of the waveform.



#### Note



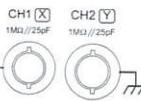
The trigger ALT switch does not work when the ALT/CHOP switch is in the CHOP position.



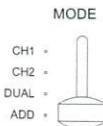
## Waveform Addition/Subtraction

### Steps

1. Make sure both CH1 and CH2 waveforms appear on the display. For details, see page37.



2. Set the vertical MODE switch to the ADD position. The two waveforms are added and appear on the display as a single waveform.



3. To subtract the CH2 signal from the CH1 signal, invert the CH2 signal by pressing the CH2 INV switch.



4. Use the vertical position knob if necessary to adjust the vertical position. (Use the channel that is triggered.)

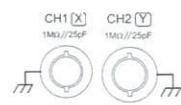


## X-Y Mode

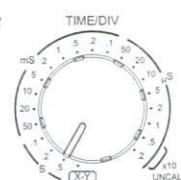
**Background** The X-Y mode compares the amplitude of two signals (CH1 and CH2), one as X-axis (CH1) and the other as Y-axis (CH2). The X-Y mode is useful for measuring the phase difference of two signals, video color patterns, and frequency response.

**Steps**

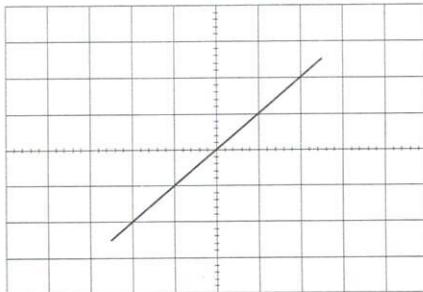
1. Make sure both CH1 and CH2 waveforms appear on the display. For details, see page 37.



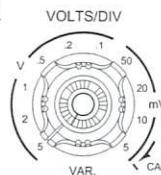
2. Move the TIME/DIV knob to the **X-Y** position.



3. The CH1 and CH2 signals appear in the X-Y mode.



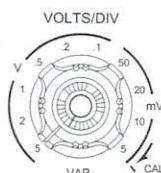
4. To adjust the X-axis position and deflection, use the horizontal POSITION knob (position) and CH1 VOLTS/DIV knob (deflection).



◀ POSITION ▶



5. To adjust the Y-axis position and deflection, use the CH2 vertical POSITION knob (position) and CH2 VOLTS/DIV knob (deflection).



▲ POSITION ▼



## Waveform Magnification

### Background

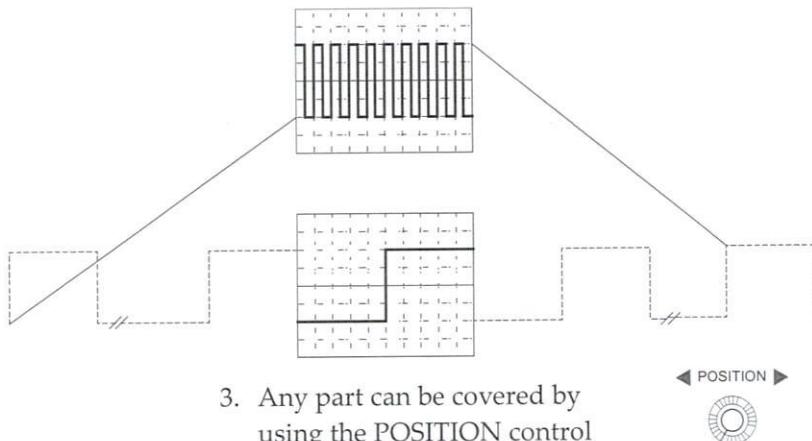
The oscilloscope can magnify the waveform by ten times in the horizontal direction. The magnification is useful for observing complex signals.

### Steps

1. Make sure the waveform is shown on the display.
2. Press the  $\times 10$  MAG switch. The waveform becomes magnified by ten times in the horizontal direction.



$\times 10$  magnification



## DC Balance Adjustments

**Background** Adjusts the vertical DC balance.

**Steps**

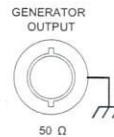
1. Set the input coupling switches of CH1 and CH2 to GND
2. Set the TRIG MODE to AUTO
3. Set the VOLTS/DIV switches to 5mV-10mV.
4. Using a screwdriver, position CH1 and CH2 DC balance to the center line.

# Function Generator

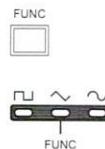
**Background** The Function generator section provides simple and intuitive signal generation. To observe a simple signal via channel one.

## Steps

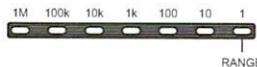
1. Connect the Function Generator output to the input of a desired device. I.e. CH1 on the GOS-620FG.



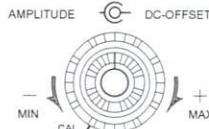
2. Select the waveform type with the FUNC selector. The selection will be highlighted on the FUNC indicator.



3. Choose a frequency range with the RANGE selector. The range will be highlighted on the RANGE indicator.



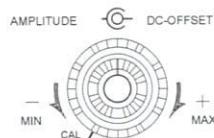
4. Configure the voltage amplitude by turning the AMPLITUDE knob. (outer knob)



5. Fine tune the frequency with the FREQUENCY knob.



6. Configure the DC-OFFSET by turning the inside knob clockwise, out of the CAL position (you will hear a click when CAL is disengaged). When the DC-OFFSET knob is turned clockwise DC-offset is increased (+) whilst turning anticlockwise will decrease (-) the DC-offset. A DC-offset of  $\pm 10V$  is possible. To return to a 0V DC offset, turn the DC-offset knob to the CAL position.



# FAQ

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## The probe waveform is distorted.

---

You might need to compensate the probe. For details, see page32. Note that frequency accuracy and duty factor are not specified for the probe compensation waveform and therefore it should not be used for reference purpose.

---

## The trace line does not appear on the display.

---

Make sure that the trigger mode is in the AUTO mode. In the NORMAL mode, the trace does not appear unless a trigger condition occurs.

---

## The alternate trigger (TRIG ALT switch) does not work.

---

Make sure that the ALT/CHOP switch is released (ALT position). The TRIG ALT switch does not work in the CHOP mode. Make sure the time base is low enough for alternative triggering.

---

## The TV trigger does not work.

---

Make sure that the video synchronization signal is positive. The TV-V/TV-H trigger works only when the synchronization signal is negative.

The input signal does not appear on the display.

---

Check the following settings.

- The coupling mode is not set at the GND mode, in which the waveform does not appear on the display. See page25 for details.
- The appropriate trigger source is selected. See page21 for details.
- Make sure the correct voltage and time base is adequate.
- Make sure that the focus knob has been adjusted.

The oscilloscope accuracy does not match the specifications.

---

Make sure the oscilloscope is powered on for at least 30 minutes, within +20°C – +30°C. This is necessary to stabilize the oscilloscope.

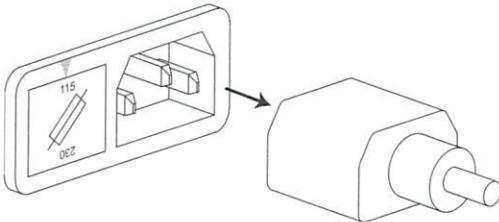
For more information, contact your local dealer, Good Will Instruments website [www.gwinstek.com](http://www.gwinstek.com) or [marketing@goodwill.com.tw](mailto:marketing@goodwill.com.tw).

# APPENDIX

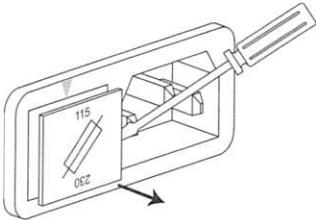
## Line Voltage & Fuse Replacement

---

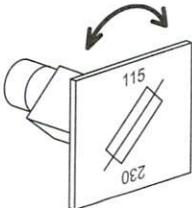
1. Take off the power cord.



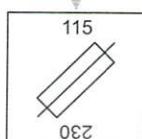
7. Use a small minus driver and pull out the fuse socket.



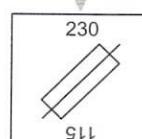
8. Rotate the holder so that the target voltage marking moves to the upper side.



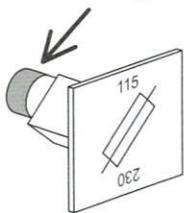
AC115V



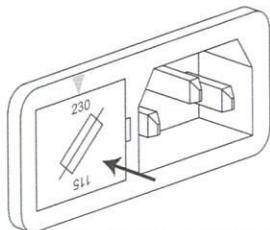
AC230V



9. If necessary, replace the fuse that is attached to the fuse holder.



10. Push the fuse holder back into the socket.



---

Fuse rating    AC 115V: T0.63A/250V, AC 230V: T0.315A/250V

# Specifications

The specifications apply when the GOS-620FG is powered on for at least 30 minutes under +20°C – +30°C.

## OSCILLOSCOPE

Vertical	Sensitivity	5mV ~ 5V/DIV, 10 steps in 1-2-5 sequence.
	Sensitivity Accuracy	≤3% ( $\times$ 5 MAG : ≤5%).
	Vernier Vertical sensitivity	Up to 1/2.5 or less of panel-indicated value.
	Frequency bandwidth	DC~20MHz ( $\times$ 5MAG: DC~7MHz). AC coupling: Low limit frequency of 10Hz. (With reference to 100kHz, 8DIV). Frequency response at -3dB).
	Rise time	Approx. 17.5nS ( $\times$ 5 MAG: Approx. 50nS).
	Input impedance	Approx. 1M ohm // Approx. 25pF.
	Square Wave	Overshoot : ≤ 5% (At 10mV/DIV range).
	Characteristics	Other distortions and other ranges: 5% added to the above value.
	DC Balance Shift	Panel adjustable.
	Linearity	< ± 0.1DIV of amplitude change when waveform of 2 DIV at graticule center is moved vertically. CH1 : CH1 single channel. CH2 : CH2 single channel.
Vertical modes		DUAL : CH1 and CH2 are displayed. ALT or CHOP selectable at any sweep rate. ADD : CH1 + CH2 algebraic addition.
	Chopping Frequency	Approx. 250kHz.
	Input Coupling	AC, GND, DC.
	Maximum Input Voltage	300Vpeak (AC: frequency 1kHz or lower). Set probe switch at 1: 1, the maximum effective readout is 40Vpp (14Vrms at Sine wave), set probe switch at 10: 1, the maximum effective readout is 400Vpp (140Vrms at Sine wave).
	Common Mode Rejection Ratio	50:1 or better at 50kHz sinusoidal wave. (When sensitivities of CH1 and CH2 are set equally).

	Isolation between channels (At 5mV/DIV range)	>1000:1 at 50kHz. >30:1 at 20MHz.
	CH1 signal output	At least 20 mV/DIV into a $50\Omega$ terminal, Bandwidth is 50Hz to 5MHz at least.
TRIGGERING	Triggering source	CH1, CH2, LINE, EXT (CH1 and CH2 can be selected only in the DUAL or ADD vertical mode). In ALT mode, if the TRIG. ALT switch is pushed in, it can alternate triggering of two different sources.
	Coupling	AC: 20Hz to full bandwidth.
	Slope	+ / -.
		20Hz ~ 2MHz : 0.5 DIV, TRIG-ALT:2 DIV, EXT : 200mV.
	Sensitivity	2 ~ 20MHz : 1.5 DIV, TRIG-ALT:3 DIV, EXT : 800mV. TV : Sync pulse more than 1 DIV (EXT: 1V).
	Triggering modes	AUTO : Sweeps run in the free mode when no triggering input signal is applied. (Applicable for repetitive signals of frequency 25Hz or over.). NORM : When no triggering signal is applied, the trace is in the ready state, but is not displayed. TV-V : This setting is used when observing the entire vertical picture of television signal. TV-H : This setting is used when observing the entire horizontal picture of television signal. (Both TV-V and TV-H synchronize only when the synchronizing signal is negative)
HORIZONTAL AXIS	EXT Triggering Signal Input	
	Input Impedance	Approx.: 1M ohm // approx. 25pF.
	Max. Input Voltage	300V (DC+AC peak), AC: Frequency not higher than 1kHz.
	Sweep Time	$0.2\ \mu\text{Sec} \sim 0.5\ \text{Sec}/\text{DIV}$ , 20 steps in 1-2-5 sequence.
	Sweep Time Accuracy	$\pm 3\%$ .
	Vernier Sweep Time Control	$\leq 1/2.5$ of panel-indicated value.

Sweep Magnification	10 times
x10MAG Sweep Time Accuracy	$\pm 5\%$ (20nSec~50nSec are uncalibrated).
Linearity	$\pm 3\%$ , x10MAG; $\pm 5\%$ (20ns and 50ns are uncalibrated).

X-Y MODE	Sensitivity	Same as vertical axis (X-axis:CH1 input signal; Y-axis:CH2 input signal.).
Z AXIS	Frequency Bandwidth	DC to at least 500kHz.
	X-Y Phase Difference	$\leq 30^\circ$ at DC $\sim 50$ kHz.
	Sensitivity	5 Vp-p (Positive-going signal decreases intensity).
	Frequency Bandwidth	DC $\sim 2$ MHz.
CALIBRATION	Input resistance	Approx. $47k\Omega$ .
VOLTAGE	Maximum Input Voltage	30V (DC+AC peak, AC frequency $\leq 1$ kHz).
	Waveform	Positive-going Square wave.
	Frequency	Approx. 1 kHz.
	Duty Ratio	Within 48:52.
	Output Voltage	2 Vp-p $\pm 2\%$ .
	Output	Approx. $1 k\Omega$ .
CRT	Impedance	
	Type	6-inch rectangular type, internal graticule.
	Acceleration	Approx. 2kV.
	Voltage	
	Effective Screen Size	8 $\times$ 10 DIV (1 DIV = 10mm (0.39in)).
	Graticule	Internal.
	Trace Rotation	Provided.
Power Source	AC115V, 230V $\pm 15\%$ selectable, 50Hz or 60Hz.	
Power Consumption	Approx. 45VA, 40W (max.)	

Operation Environment	Indoor use Altitude up to 2000 m Ambient temperature : To satisfy specifications :10°C to 35°C(50°F to 95°F) Maximum operating ranges: 0°C to 40°C(32°F to 104°F) Relative humidity: 85% RH(max.) non condensing Installation Category II Pollution degree 2			
Storage	-10°C to 70°C, 70%RH (maximum).			
Temperature & Humidity				
Accessories	Power cord	x1,	Instruction manual	x1
	Probes	x2,	GTL-101	x1
Dimensions	310 (W) x 150 (H) x 455 (D) mm.			
Weight	Approx.8kgs (17.6lbs).			

## FUNCTION GENERATOR

Output Range	0.1Hz-1MHz (7 steps).
Waveform type	Sine, Square, Triangle waveforms.
Frequency Variable Range	Greater than 10:1.
	$50\Omega \pm 10\%$ .
Output Impedance	
Output Voltage	Over 20Vp-p (open circuit) continuous conversion. DC offset possible over $\pm 10V$ when opened.
Sine wave	1% Max(10Hz-20kHz), (Specification applied from Max to 1/10 level).
Distortion	$\pm 3\%$ or less (in 1kHz maximum).
Square wave	
Unsymmetry	
Square wave	50Ω output: 120ns or less.
Rise/Fall Time	

# 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.

declare that the below mentioned product

**Type of Product: Oscilloscope**

**Model Number: GOS-620FG**

is 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 (73/23/EEC & 93/68/EEC). For the evaluation regarding the Electromagnetic Compatibility and Low Voltage Equipment Directive, the following standards were applied:

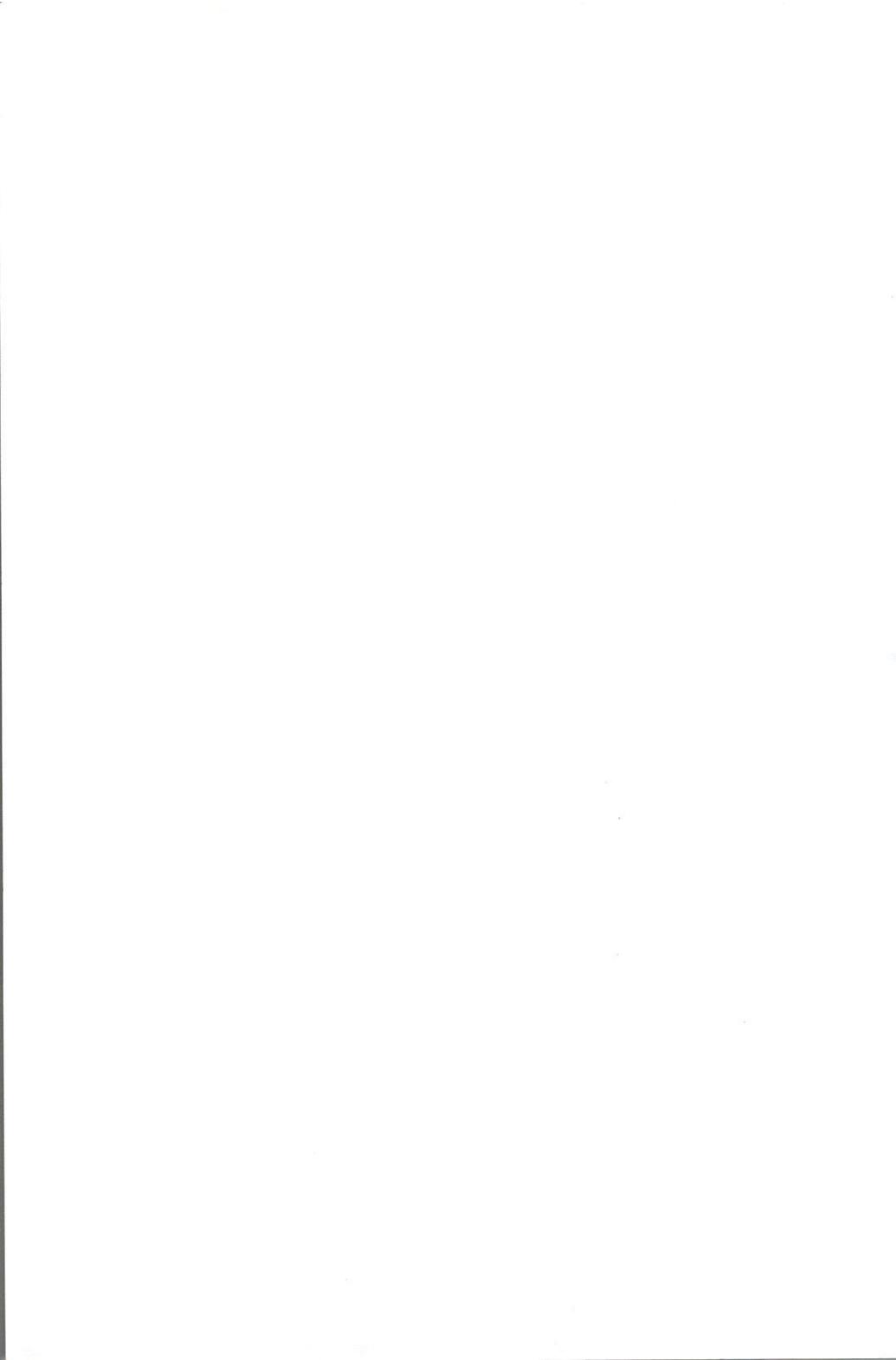
© EMC

EN 61326-1 ;EN 61326-2-1: Electrical equipment for measurement, control and laboratory use—EMC requirements (2006)

Conducted Emission Radiated Emission CISPR 11: 2003+A1: 2004 +A2: 2006	Electrical Fast Transients IEC 61000-4-4: 2004+Corr.1: 2006+Corr.2: 2007
Current Harmonics EN 61000-3-2: 2006	Surge Immunity IEC 61000-4-5: 2005
Voltage Fluctuations EN 61000-3-3:1995+A1:2001+A2:2005	Conducted Susceptibility IEC 61000-4-6: 2003+A1: 2004+A2: 2006
Electrostatic Discharge IEC 61000-4-2: 2001	Power Frequency Magnetic field IEC 61000-4-8: 1993+A1: 2000
Radiated Immunity IEC 61000-4-3: 2006+A1: 2007	Voltage Dip/Interruption IEC 61000-4-11: 2004

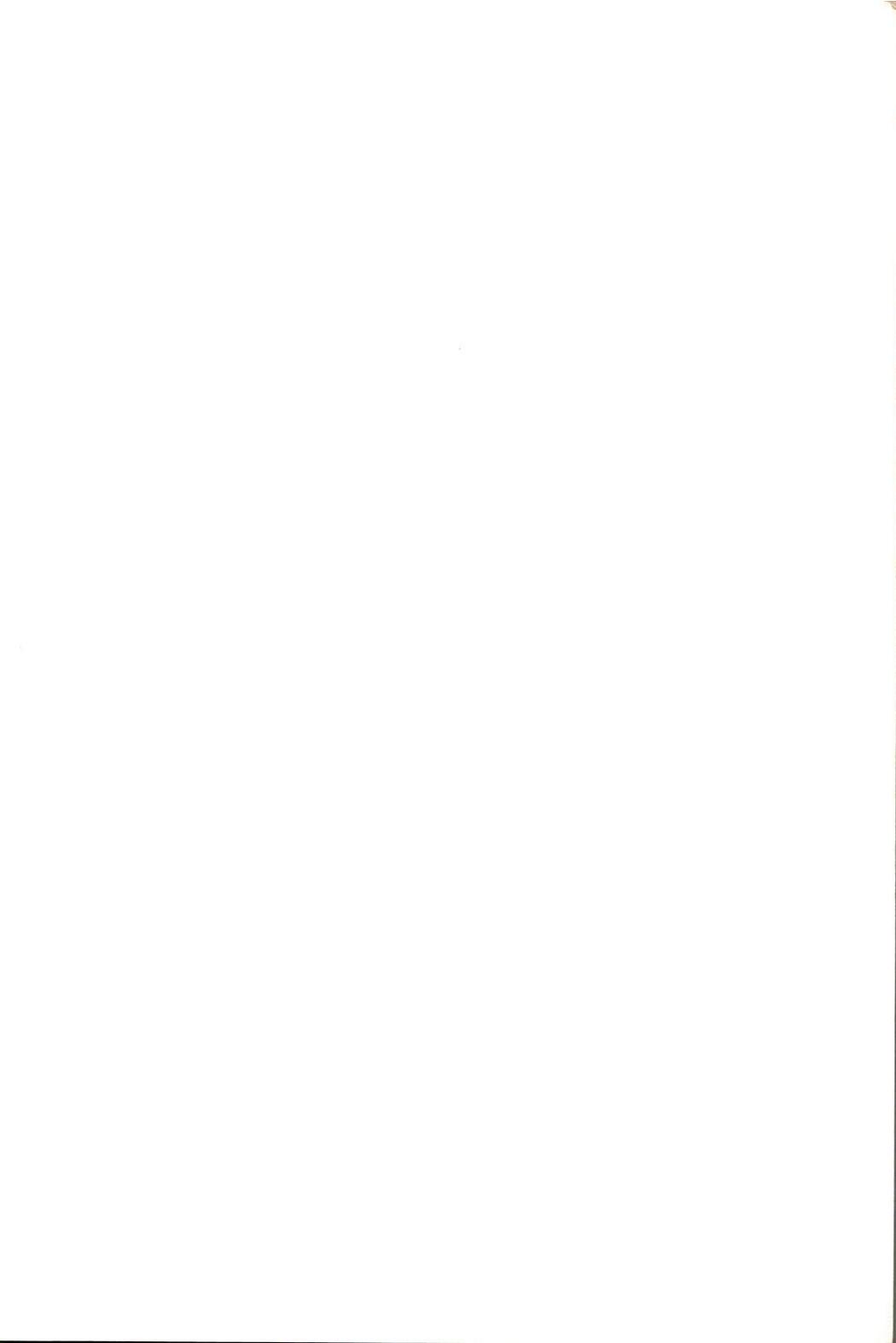
Low Voltage Equipment Directive 73/23/EEC & 93/68/EEC

Low Voltage Directive IEC/EN 61010-1: 2001









Headquarters **GOOD WILL INSTRUMENT CO., LTD.** No. 7-1, Jhongsing Road, Tucheng City, Taipei County, 236, Taiwan. T (886) 2 2268-0389 F (886) 2 2268-0639

Manufacturer **GOOD WILL INSTRUMENT (SUZHOU) CO., LTD.** No. 69, Lu Shan Road, New District, Suzhou, P.R.C. T (86)512-6661-7177 F (86)512-6661-7277

<http://www.gwinstek.com>