

**50/30 MHz DIGITAL STORAGE
OSCILLOSCOPE
GRS-6052/6032**

User Manual



Good Will Instrument Co., Ltd.

GW Part No. 82RS-60520MA

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Good Will Instrument Co., Ltd.

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Declaration of Conformity

We

GOOD WILL INSTRUMENT CO., LTD.

No. 95-11, Pao-Chung Rd., Hsin-Tien City, Taipei Hsien, Taiwan

declares that the below mentioned product

GRS-6052, GRS-6032

are herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Law of Member States relating to Electromagnetic Compatibility (89/366/EEC, 92/31/EEC, 93/68/EEC) and Low Voltage Equipment Directive (73/23/EEC).

For the evaluation regarding the Electromagnetic Compatibility and Low Voltage Equipment Directive, the following standards were applied:

◎ EMC

EN 61326-1: Electrical equipment for measurement, control and laboratory use — EMC requirements (1997+A1: 1998)	
Conducted and Radiated Emission EN 55011: 1998 Group I class B	Electrostatic Discharge EN 61000-4-2: 1995
Current Harmonic EN 61000-3-2: 2000	Radiated Immunity EN 61000-4-3: 1996
Voltage Fluctuation EN 61000-3-3: 1995	Electrical Fast Transients EN 61000-4-4: 1995
-----	Surge Immunity EN 61000-4-5: 1995
-----	Conducted Susceptibility EN 61000-4-6: 1996
-----	Power Frequency Magnetic Field EN 61000-4-8: 1993
-----	Voltage Dips/ Interrupts EN 61000-4-11: 1994

◎ Safety

Low Voltage Equipment Directive 73/23/EEC & amended by 93/68/EEC
EN 61010-1: 1993+A2: 1995
IEC 1010-1: 1990+A1: 1992+A2: 1995

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SAFETY TERMS AND SYMBOLS

These terms may appear in this manual or on the product:



WARNING. Warning statements identify condition or practices that could result in injury or loss of life.



CAUTION. Caution statements identify conditions or practices that could result in damage to this product or other property.

The following symbols may appear in this manual or on the product:



DANGER
High Voltage



ATTENTION
refer to Manual



Protective
Conductor
Terminal



Earth(ground)
Terminal

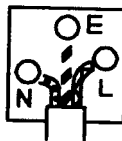
FOR UNITED KINGDOM ONLY

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 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^2 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.

GRS-6052/6032 OSCILLOSCOPE

USER MANUAL

1. PRODUCT INTRODUCTION

1-1. Description

The GRS-6052 and GRS-6032 set a standard in performance and economy, each equips with two professional scopes in one. They can be operated as a real time 50 or 30MHz analog oscilloscope and become a full function digital storage oscilloscope by pressing a button. Now, you have the power for digital capture and analysis of elusive single shots with a full 20MS/s sample rate. The instruments provide with a high speed A/D converter for each channel to enable the measurement, memory, and analysis of high-speed phenomena. A microprocessor-based operating system controls most of the functions of the instrument, including cursor readout and digitized panel setting. On-screen alphanumeric readout and cursor function for voltage, time and frequency measurement provide extraordinary operational convenience. Ten different user defined instrument settings can be saved and recalled without restriction.

The vertical deflection system has two input channels. Each channel has 14 basic deflection factors from 1mV to 20V per DIVision. The horizontal deflection system provides sweep time from 100s to 0.2 μ s per DIVision. The trigger system provides stable triggering over the full bandwidth of the vertical deflection system.

1-2.Features

Additionally, the oscilloscope offers several other features:

1) High intensity and internal graticule CRT

The oscilloscope employs a high intensity 6-inch rectangular type cathode-ray tube with red internal graticule. It displays clear readable traces even at high sweep speeds. Internal graticule lines eliminate parallax-viewing error between the trace and the graticule line.

2) Multiple Digital Storage Functions

- Digitizing repetitive waveform up to full bandwidth 50/30MHz through the use of equivalent sampling (500MS/s).
- 2k-word acquisition memory per channel up to 10 sets SAVE/RECALL reference memories (with back-up) are provided.
- Pre-trigger function for observing waveforms before triggering. The trigger point can be selected from 0~10 DIV (in 0.02DIV steps).
- Roll mode is ideal for observing flickering low-speed signals. The TIME/DIV range up to 100s.
- The averaging function can be selected freely from 2 to 256. This effectively reduces noise from repetitive signals.
- The smoothing (dot-join) function provides linear connections between the captured point, ensuring that digitized signals are displayed without gaps.
- In the magnification mode, the DOT or LINEAR interpolation can be selected according to the waveform.
- The built-in RS-232C interface enables remote control operation and signal processing via a PC.

- The X-Y mode is same as the real time mode. The X (horizontal) signal is connected to the input of CH1, the Y (vertical) signal is applied to the input of CH2, and the storage waveform bandwidth up to 50MHz/30MHz.
- 3) ALT-MAG Function (both Real Time Mode and Storage Mode)

The primary sweep waveform along with the magnified sweep waveform can be displayed simultaneously using the ALT-MAG function. The magnification ratio can be selected from among three stages of $\times 5$, $\times 10$, $\times 20$ for magnifying the displayed waveform in the center of the CRT.
 - 4) Convenient VERT-MODE Triggering

The sync signal source is decided automatically when vertical axis mode is switched. This means that you need not change the trigger source every time you switch the VERT-MODE.
 - 5) TV triggering

Exclusive TV sync separator circuit technology provides stable TV signal measurements on fields, frames and lines.
 - 6) Hold Off (Real Time Mode only)

The function allows the obtaining of stable synchronization for even complex waveforms that are difficult to synchronized by adjusting the trigger level alone.
 - 7) CH1 Signal Output

The CH1 signal output is obtained by branching the input signal in the middle of the signal line. As the connector outputs the input signal at a rate of 50mV/DIV, connecting a frequency counter makes it possible to measure the frequency of a very low signal while observing its waveform.

8) Z-axis intensity modulation (Real Time Mode only)

For applying a blanking signal from an external source. The trace displayed on the screen may be intensity-modulated where pulse signal or time-scale marks are required.

9) LED indicator and buzzer alarm

The LED's located in the front panel assist operation and indicated additional information. Incorrect operation and the electrical end position of control knobs are indicated by a warning beep.

10) SMD manufacturing technology

The instrument is built by using the most advanced SMD technology so as to reduce the number of internal wiring and shorten the foil route on the pc board. This will also greatly increase the high frequency performance and the reliability of the product.

11) Compact size (275W × 130H × 370D) mm and front panel layout groups for easy-to-use.

2. TECHNICAL SPECIFICATIONS

CRT	Type	6-inch rectangular type with internal graticule; 0%, 10%, 90% and 100% markers. 8 x 10 DIV (1 DIV = 1 cm)		
	Accelerating Potential	Approx. 10kV (GRS-6052), 2kV (GRS-6032)		
	INTEN and FOCUS	Front panel control.		
	Illumination	Provided		
	Trace Rotation	Provided.		
	Z-axis Input (REAL TIME mode only)	Sensitivity: at least 5V Polarity : positive going input decrease intensity Usable frequency range: DC to 2MHz. Max. input voltage: 30V (DC +AC peak) at 1kHz or less. Input Impedance: approx. 33k Ω (GRS-6052) 47k Ω (GRS-6032)		
VERTICAL SYSTEM	Sensitivity Accuracy	1mV~2mV/DIV \pm 5%, 5mV~20V/DIV \pm 3%, 14 calibrated steps in 1-2-5 sequence.		
	Vernier Vertical Sensitivity	Continuously variable to 1/2.5 approx. of panel indicate value.		
	Bandwidth(-3dB) and Rise Time	GRS-6052	Bandwidth(-3dB)	Rise Time
		5mV~20V/DIV	DC~50MHz	Approx. 7ns
		1mV~2mV/DIV	DC~7MHz	Approx. 50ns
		GRS-6032	Bandwidth(-3dB)	Rise Time
	5mV~20V/DIV	DC~30MHz	Approx. 11.7ns	
	1mV~2mV/DIV	DC~7MHz	Approx. 50ns	
	Maximum Input Voltage	400V (DC + AC peak) at 1kHz or less.		
	Input Coupling	AC, DC, GND		
Input Impedance	Approx. 1M Ω \pm 2% // approx. 25pF			
Vertical Modes	CH1, CH2, DUAL(CHOP/ALT), ADD, CH2 INV.			
CHOP Frequency	Approx. 250kHz.			
Dynamic Range (REAL TIME mode only)	GRS-6052: 8DIV at 40MHz, 6DIV at 50MHz GRS-6032: 8DIV at 20MHz, 6DIV at 30MHz			

HORIZONTAL SYSTEM (REAL TIME mode)	Sweep Time	0.2 μ s/DIV~0.5s/DIV, 20 steps selectable in 1-2-5 sequence, continuous variable control between steps at least 1:2.5.			
	Accuracy	$\pm 3\%$, $\pm 5\%$ at $\times 5$ and $\times 10$ MAG, $\pm 8\%$ at $\times 20$ MAG			
	Sweep Magnification	$\times 5$, $\times 10$, $\times 20$ MAG			
	Maximum Sweep Time (at MAG)	GRS-6052:20ns/DIV (10ns/DIV uncalibrated) GRS-6032:50ns/DIV(10ns/DIV~40ns/DIV uncalibrated).			
	ALT-MAG Function	Available.			
TRIGGER SYSTEM	Trigger Modes	AUTO, NORM, TV			
	Trigger Source	VERT-MODE, CH1, CH2, LINE, EXT.			
	Trigger Coupling	AC, HFR, LFR, TV-V(-), TV-H(-).			
	Trigger Slope	"+" or "-" polarity.			
	Trigger Sensitivity	GRS-6052	CH1, CH2	VERT-MODE	EXT
		20Hz~5MHz	0.5 DIV	2.0 DIV	200mV
		5MHz~40MHz	1.5 DIV	3.0 DIV	800mV
		40MHz~50MHz	2.0 DIV	3.5 DIV	1V
		GRS-6032	CH1, CH2	VERT-MODE	EXT
		20Hz~2MHz	0.5 DIV	2.0 DIV	200mV
2MHz~20MHz		1.5 DIV	3.0 DIV	800mV	
20MHz~30MHz	2.0 DIV	3.5 DIV	1V		
	TV sync pulse more than 1 DIV (CH1, CH2, VERT-MODE) or 200mV (EXT).				
External Trigger Input	Input impedance: Approx. 1M Ω //25pF(AC coupling) Max. input voltage: 400V (DC + AC peak) at 1kHz.				
Hold-off Time	Variable (Real Time Mode only).				
X-Y OPERATION (REAL TIME mode)	Input	X-axis : CH1, Y-axis : CH2			
	Sensitivity	1mV/DIV~20V/DIV.			
	Bandwidth	X-axis: DC~500kHz (-3dB)			
	Phase Difference	3° or less from DC to 50kHz			

DIGITAL STORAGE FUNCTIONS	Acquisition Digitizer	8 bit ADC × 2
	Max. Sampling Rate	500MS/s for equivalent time sampling. 20MS/s for normal sampling.
	Storage Bandwidth(-3dB)	Single shot: DC to 5MHz. Repetitive : DC to 50MHz (GRS-6052) DC to 30MHz (GRS-6032)
	Dynamic Range	± 5DIV.
	Memory Length	
	Acquisition Memory	2k words/CH×2, 1k words/CH (equivalent)
	Save REF Memory	1k words/CH×10 with back-up memory(REF 0~9)
	Display Memory	1k words/CH×4 waveform (max.)
	Sweep Time	Equivalent: 0.2 μs/DIV ~ 2 μs/DIV Normal: 5 μs/DIV ~ 0.1s/DIV Roll Mode: 0.2s/DIV ~ 100s/DIV
	Sweep Magnification	× 5, × 10, × 20
	Max. Sweep Time	10ns/DIV
	MAG Interpolation	Dots, Linear
	ALT-MAG Function	Available
	Operation Mode	Auto, Norm, Single, Single-roll, Roll, X-Y Average (2 ~ 256), Run/Stop
	Smoothing Function	Dot Joint ON/OFF selectable
	Pre-trigger	0 ~ 10DIV in 0.02DIV steps (at 5 μs/DIV ~ 0.1s/DIV)
	X-Y Operation	X-axis: CH1, Y-axis: CH2 Storage Bandwidth : DC~50MHz (GRS-6052) DC~20MHz (GRS-6032)
Display Resolution	H : 100 points/DIV V : 25 points/DIV X-Y: 25 × 25 points/DIV	
Waveform SAVE/RECALL	10 sets (REF0 ~ REF9) with back-up memory.	
OUTPUT SIGNAL	CH1 Signal Output	Voltage : approx. 20mV/DIV (with 50 Ω terminal.) Bandwidth: 50Hz to at least 5MHz.
	Calibrator Output	Voltage : 0.5V ± 3%, Frequency: approx. 1kHz, square wave.

CURSOR READOUT & CONTROL INTERFACE	Panel Setting Display	CH1/CH2 sensitivity, sweep time, trigger condition, digital storage function.
	Panel Setting Save & Recall	10 sets
	Cursor Measurement	Cursor Measurement Function: ΔV , ΔT , $1/\Delta T$. Cursor Resolution: 1/25 DIV. Effective Cursor Range: Vertical: ± 3 DIV, Horizontal: ± 4 DIV
	Text Readout Intensity	Adjustable
	RS232 Interface	Remote control via a PC.
LINE POWER REQUIREMENT	Voltage	AC100V, 120V, 230V $\pm 10\%$ selectable.
	Frequency	50Hz or 60Hz.
	Power Consumption	Approx. 70VA, 60W(max).
MECHANICAL SPEC.	Dimensions	275(W) \times 130(H) \times 370(D) mm.
	Weights	8.5 kg
OPERATING 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 TEMPERATUR E & HUMIDITY	-10° to 70°C, 70%RH(maximum)	
ACCESSORIES	Power cord..... 1 Instruction manual..... 1 Probe ($\times 1/\times 10$)..... 2	

3. PRECAUTIONS BEFORE OPERATION

3-1. Unpacking the Oscilloscope

The product has been fully inspected and tested before shipping from the factory. Upon receiving the instrument, please unpack and inspect it to check if there is any damages caused during transportation. If any sign of damage is found, notify the bearer and/or the dealer immediately.

3-2. Checking the Line Voltage

The oscilloscope can be applied any kind of line voltage shown in the table below. Before connecting the power plug to an AC line outlet, make sure the voltage selector of the rear panel is set to the correct position corresponding to the line voltage. It might be damaged the instrument if connected to the wrong AC line voltage.



WARNING. To avoid electrical shock the power cord protective grounding conductor must be connected to ground.

When line voltages are changed, replace the required fuses shown as below:

Line voltage	Range	Fuse
100V	90-110V	T 1A 250V
120V	108-132V	
230V	207-250V	T 0.4A 250V



WARNING. To avoid personal injury, disconnect the power cord before removing the fuse holder.

3-3.Environment

The normal ambient temperature range of this instrument is from 0° to 40°C (32° to 104°F). To operate the instrument over this specific temperature range may cause damage to the circuits.

Do not use the instrument in a place where strong magnetic or electric field exists as it may disturb the measurement.

3-4.Equipment Installation, and Operation

Ensure there is proper ventilation for the vents in the oscilloscope case. If the equipment is used not according to the specification, the protection provided by the equipment may be impaired.

3-5.CRT Intensity

To prevent permanent damage to the CRT phosphor, do not make the CRT trace brighten excessively or leave the spot stay for an unreasonably long time.

3-6.Withstanding Voltages of Input Terminals

The withstanding voltages of the instrument input terminals and probe Input terminals are shown in the following table. Do not apply voltages higher than these limits.

Input terminal	Maximum input voltage
CH1, CH2, inputs	400V (DC + AC peak)
EXT TRIG input	400V (DC + AC peak)
Probe inputs	600V (DC + AC peak)
Z AXIS input	30V (DC + AC peak)



CAUTION. To avoid damaging the instrument, do not apply input voltages of the frequency over 1 kHz to the instrument.

4. PANEL INTRODUCTION

After the instrument is switched on, all the important settings are displayed in the readout. The LED's located on the front panel assist operation and indicate additional information. Incorrect operation and the electrical end positions of control knobs are indicated by a warning beep.

All of the pushbuttons, VOLTS/DIV control knobs, TIME/DIV control knobs are electronically selected, and their functions and settings can therefore be stored and remotely controlled as well. Some controls are only operated in the digital storage mode or have a different function. Explanation pertaining to them are indicated with the hint of "storage mode only".

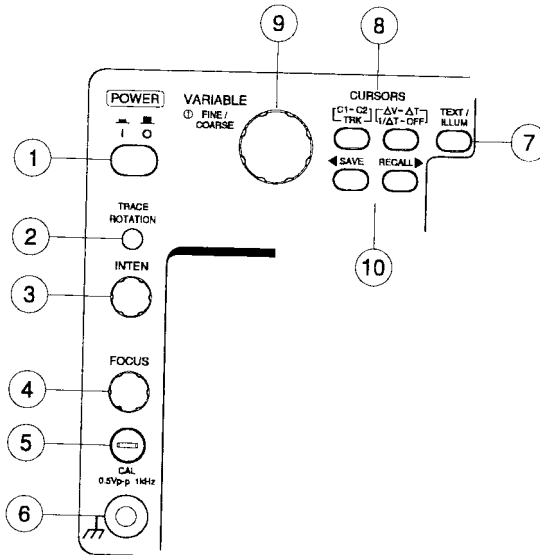
The front panel is subDIVided into five sections:

- Display controls
- Vertical controls
- Horizontal controls
- Trigger controls
- Digital storage functions

4-1. Front Panel

Display controls

The display controls adjust the on-screen appearance of the waveform and provide a probe compensation signal source.



(1) POWER – Pushbutton

When switch on the oscilloscope to have all LEDs lighted and wait a few seconds, the normal operation mode is present. Then the last settings become activated and the LED indicates “ON” condition.

(2) TRACE ROTATION

The TRACE ROTATION is for aligning the horizontal trace in parallel with graticule lines. This potentiometer can be adjusted with a small screwdriver.

(3) INTEN—Control knob (REAL TIME Mode only)

The control knob is used for adjusting the traces intensity in the real time mode. Turning the knob clockwise to increase the intensity while turning it counterclockwise to decrease the intensity.

(4) FOCUS

The control knob effects both the trace and the readout sharply.

(5) CAL

The terminal provides a reference signal of 0.5Vp-p at 1kHz for probe adjustment.

(6) Ground Socket—Banana Socket galvanically connected to safety earth

This socket can be used a reference potential connection for DC and low frequency signal measurement purpose.

(7) TEXT/ILLUM—Control knob with a double function.

The pushbutton is for selecting the text readout intensity function or scale illumination function, and indicates the letter “TEXT” or “ILLUM” in the readout. Press the pushbutton for the following sequences:

“TEXT” — “ILLUM” — “TEXT”

The TEXT/ILLUM function is associated the VARIABLE (9) control knob. Turning the knob clockwise to increase the text intensity or scale illumination, while turning the knob counterclockwise to decrease it. Pressing the knob to switch the TEXT/ILLUM on or off.

In the STORAGE mode, the brightness of the waveform on the screen can be controlled by the “TEXT”.

(8) CURSORS MEASUREMENT FUNCTION

There are two pushbutton and associated the VARIABLE (9) control knob. When the pushbutton is pressed, the three measurement functions will be selected in the sequence as follows:

ΔV — ΔT — $I/\Delta T$ —OFF

ΔV : Two horizontal cursors appear. The voltage between the two cursors

is calculated according to the setting of VOLTS/DIV, and displayed with ΔV on the upper side of the CRT.

Single channel mode (CH1 or CH2):

The ΔV measuring result is automatically related to the deflection coefficient of the active channel. The readout displays " $\Delta V1...$ " or " $\Delta V2...$ ".

Dual channel mode:

The cursor lines must be set on the CH1 or CH2 signal. As the deflection coefficients may be different, it will be required to select between the deflection coefficient of CH1 and CH2.

ADD mode:

In ADD (addition) mode, normally two input signals are displayed as one signal (sum or difference). As the result can only be determined if both (calibrated) deflection coefficients are equal, the readout indicates " $\Delta V...$ " without any additional channel information. Different deflection coefficient settings or uncalibrated deflection coefficients are indicated in the readout as " $\Delta V=...DIV$ ".

X-Y mode:

In the X-Y mode, the instrument is automatically set to ΔV measurement. The deflection coefficient selected for each channel may be different, thus as in DUAL mode the ΔV cursor measurement requires a channel selection. Under channel 1 (X signal) measuring condition the cursor lines are displayed as vertical lines and the readout displays " $\Delta VX...$ ". Pressing the pushbutton, select channel 2 (Y signal) measuring, then the cursor lines are displayed as horizontal lines and the readout indicates " $\Delta VY...$ ".

ΔT : Two vertical cursors appear. The time between the two cursors is calculated according to the setting of TIME/DIV, and displayed with