

Programmable Function Generator

Users Manual



G5100_E200403_R00



Programmable Function Generator

EC Declaration of Conformity

This is to certify that this equipment conforms to the protection requirements of the council directive 89/336/EEC, in the approximation of laws of the member states relating to Electromagnetic compatibility and 73/23/EEC, The Low Voltage Directive by application of the following standards:

EN 61010-1:2001 (2 nd Edition)	LVD Test Standard
EN 61326:1998	EMC Test Standard

To ensure conformity with these standards, this instrument must be operated in accordance with the instructions and specifications given in this manual.

CAUTION:

Even though this instrument complies with the immunity standards, the accuracy can be affected by strong radio emissions not covered in the above standards. Sources such as hand held radio transceivers, radio, and TV transmitters, vehicle radios and cellular phones generate electromagnetic radiation that could be induced into the test leads of this instrument. Care should be taken to avoid such situations or alternatively, check to make sure that the instrument is not being influenced by these emissions.

GENERAL GUIDELINES

ALWAYS

Test this equipment before using to ensure proper operation.
Inspect the test leads before using to make sure there are no breaks or shorts.
Double-check all connections before testing.
Have some check on you periodically if working alone.
Have a complete understanding of the circuit being measured.
Disconnect power to the circuit, and then connect the test leads to the equipment, then to the circuit being measured.

NEVER

Attempt to measure unknown high voltages.
Attempt to measure current with the meter in parallel to the circuit.
Connect the test leads to a live circuit before setting up the instrument.
Touch any exposed metal part of the test lead assembly.

Safety Regulations

Do not touch any part of high voltage circuit or make any unnecessary high voltage measurements. Do not remove the top or bottom covers of this unit unless you are a qualified service person. Remove the power from this unit before removing the top and bottom covers.

When servicing this unit, the work area should be free from any electrical hazards. The floor and workbench where the unit is operated should be insulated and free from any exposed high voltage conductors. Remove any source of water or other conductive liquids in the working area.

Connect this unit only to a 3-prong AC outlet, which conforms to electrical safety, codes. Do not use any adapters to connect this unit to an AC receptacle.

Before operating or servicing this instrument, read the instruction manual and fully understand the operating procedures. If you are servicing the unit, check the circuit you are testing for high voltage.

Do not use this device in a room alone; be sure there are other people in the vicinity of your work area in case of an emergency arises. Have emergency telephone numbers posted in the work area in case a quick response is necessary.

SAFETY CONSIDERATIONS



WARNING

Please follow manufacturers test procedures whenever possible.
Do not attempt to measure unknown voltages or components until a complete understanding of the circuit is obtained.

INTERNATIONAL SYMBOLS



DANGEROUS VOLTAGE



AC (ALTERNATING CURRENT)



DC (DIRECT CURRENT)



REFER TO INSTRUCTION MANUAL



GROUND



FUSE



DOUBLE INSULATION



BOTH DIRECT AND ALTERNATING CURRENT

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Chapter 1. General specification

1. Product summary

This programmable function generator is one of a series of programmable test instruments that has enhanced features over similar type of test instruments on the market today. This instrument features:

- 1) **Output frequency range: 1Hz to 15MHz.**
- 2) **Waveforms: Sine, Triangle, Rectangular, RAMP and Pulse waveforms**
- 3) **DC Offset: -7.5V to +7.5V (no load).**
- 4) **Digitally synthesized for a stable output**
- 5) **Settings and functions may be selected and stored in memory from the front panel. Eight setups may be stored in memory.**
- 6) **Function and ranges may be controlled from a PC via the RS232C or the optional GP-IB interface.**
- 7) **May be used with any line voltages from 100V to 240V AC may be used with out any internal changes.**
- 8) **Low Distortion**

* Indoor use: altitude up to 2000m

2. General specifications

- 1) **CAT II Pollution Degree 2**

- 2) **AC line and fuse rating:**

Rated voltage	Fuse	Power consumption (max)
100V to 240Vac (50/60Hz)	T2A 250V	20W

- 3) **Operating Temperature:**

0°C to +40°C (+32°F to +104°F) at a relative humidity 80% or less

- 4) **Storage Temperature:**

-20°C to +70°C (-4°F to +158°F) with a relative humidity of 80% less

- 5) **Dimensions:**

235mm (width) x 296mm (depth) x 85mm (height)
9.25" (width) x 11.65" (depth) x 3.34" (height)

- 6) **Weight: about 1.5 kg**

3. Electrical Specifications

Note: Electrical specifications are at 25°C.

1) Frequency characteristics

- Freq. Range: 1Hz to 15MHz.
- Resolution: 4 digits
- Accuracy: $\pm(\text{Set Value} * 0.5\% + 1 \text{ digit})$

2) Output characteristics

- Output wave forms: Sine, Triangle, Square, TTL rectangular, Pulse, Step, etc.
- Output range: Max. 20Vpp (No load); Max. 10Vpp into 50Ω
- Impedance: 50Ω±5%
- Attenuator: 0dB, 20dB
- DC Offset: ±7.5V DC (No Load)

3) Wave form characteristics

(1) Sine wave:

- Frequency range: 1Hz to 15MHz
- Amplitude: Max. 10Vpp (into an Impedance 50Ω)
- Distortion: <1.5% (10Hz to 100kHz)

(2) Triangle wave:

- Frequency range: 1Hz to 100kHz
- Linearity: 1%

(3) Square wave

- Frequency range: 1Hz to 15MHz
- Rise and Fall times: < 35nS (Maximum output)
- Symmetry: 20% to 80%

4) SWEEP characteristics

- SWEEP period: 9.95S to 0.05S
- SWEEP range: 1:1 to 10:1
- External SWEEP is controlled by the VCF input.

5) VCF input

- VCF accuracy: 1%
- Input voltage 10V DC Max, maximum sweep occurs at 5V DC
- VCF input impedance: approximately 1kΩ

6) TTL output: To 20 TTL/CMOS DRIVES

- Level(TTL): Fixed amplitude, < 0.4V: for a low "L", and > 2.4V: for a high "H".

7) FUNC output

- Level (TTL): Variable Amplitude (Max. 10Vpp, Impedance 50Ω)

4. Accessories

This unit is shipped with the following accessories:

1) Standards

- (1) Manual 1 copy
- (2) BNC cable 1 unit
- (3) Line Cord 1 unit
- (4) Spare fuse (T2A 250V) 1 unit
- (5) RS232 Cable (9Pin to 9Pin) 1 unit
- (6) RS232 Program 1 unit

2) Optional

- (1) GPIB Interface (Factory Installed)

Note:

The accessories may be changed to improve the product quality without notifying the customers. Optional accessories will be made available at a later date.



WARNING

Use only correct size, voltage, and current rated fuses.
Test leads: Inspect the test leads for damaged insulation or exposed metal. Check test lead continuity. Damaged leads should be replaced.

Chapter 2. Installation of the equipment

This chapter supplies all the necessary information to install this equipment. It includes: initial inspection, preparation for use, appropriate voltage selection, packing for the return, etc.

1. Initial inspection

- 1) When received, inspect the shipping box for damage. If the shipping carton is damaged verify that there is no mechanical damage to the instrument and it is functional. Verify that all accessories are present.**
- 2) Save the shipping carton and packing material until the unit is verified functional and within specification.**
- 3) If the unit is not functional or accessories are missing, report all problems to the vendor where the unit was purchased as soon as possible to arrange for repair or replacement.**
- 4) Report any shipping damaged to the shipping carrier's agent.**

2. Preparation for use

- 1) Before turning the unit on verify that the AC line is within 100V to 240Vac, at a line frequency of 50/60Hz.**
- 2) Check to see if the fuse has the correct rating. (T2A 250V)**
- 3) Make sure the unit is connected properly and is being used within the specifications listed above.**

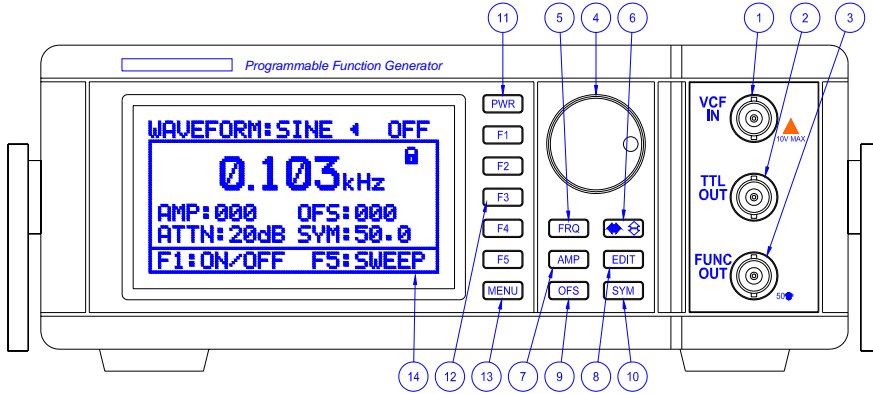
3. Environmental

- 1) This equipment should be operated in a well-ventilated area, with in a temperature range of 0 to +40°C and a relative humidity 80% or less and stored in a dry place within temperature range between -20°C to +70°C with a relative humidity 80% less.**

Chapter 3. Product description

In this chapter, the front and rear panel buttons, controls and connectors are described.

1. Front Panel buttons and connectors description



[Front Panel]

1) VCF input terminal

An external voltage applied to this input causes the frequency to deviate. A +5 Volts applied to the input causes a maximum frequency deviation and a -5 Volts a minimum frequency deviation. The maximum deviation is 100:1 which is useful for external sweep and FM modulation.

2) TTL output terminal

A TTL signal level with the same frequency as displayed on the LCD is available from this terminal.

3) FUNC output terminal

The output waveform with the characteristics (amplitude, offset, etc) as displayed on the LCD is available from this terminal

4) Rotary dial

The rotary dial when turned moves the cursor position on the LCD between the menu items and is used to select waveforms, set the output amplitude, symmetry, frequency and offset values. It is also used to set the sweep rate and width and edit the setup menu.

5) [FRQ] Button

This Button when pressed moves the cursor to indicate the frequency value.

6) Button

Toggles the cursor between the selection mode cursor displayed as a (← or →) symbol and the edit mode cursor displayed as a (▣ or ▤) symbol when changing waveforms, amplitude, offset values or sweep settings on the display or in the setup menu.

When the edit mode cursor is displayed (◀ or ▶) and numerical data is being edited, rotating the rotary dial, changes the cursor symbol to a (⊕) symbol indicating the digit selection mode and a digit is highlighted. Pressing the (◀▶) Button again the cursor changes to a (⊕) symbol indicating the digit edit cursor mode. Rotating the rotary dial changes the digit value.

7) [AMP] Button

Pressing this button moves the cursor to the waveform amplitude setting on the LCD

8) [EDIT] Button

Displays the cursor in the setup or Equipment menus for editing generator settings and data values.

9) [OFS] Button:

Moves the cursor to indicate the Offset voltage setting on the LCD.

10) [SYM] Button

Moves the cursor to indicate the waveform symmetry setting on the LCD.

11) [PWR] Button

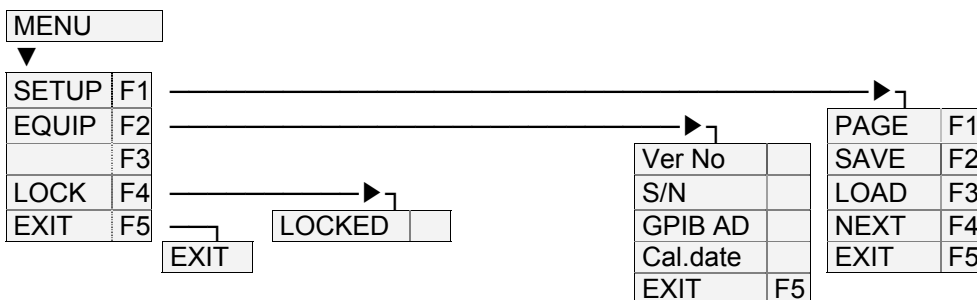
Pressing this button for 1.5 to 2 second will turn the unit on. Pressing this button again for 1.5 to 2 seconds will turn the power off.

12) [F1, F2, F3, F4, F5] Buttons

These buttons have a corresponding menu item displayed on the LCD when the MENU buttons are pressed. Pressing the F button selects the desired item.

13) [MENU] Button

Displays the MENU and submenus. The menu is explained in detail in a later chapter.

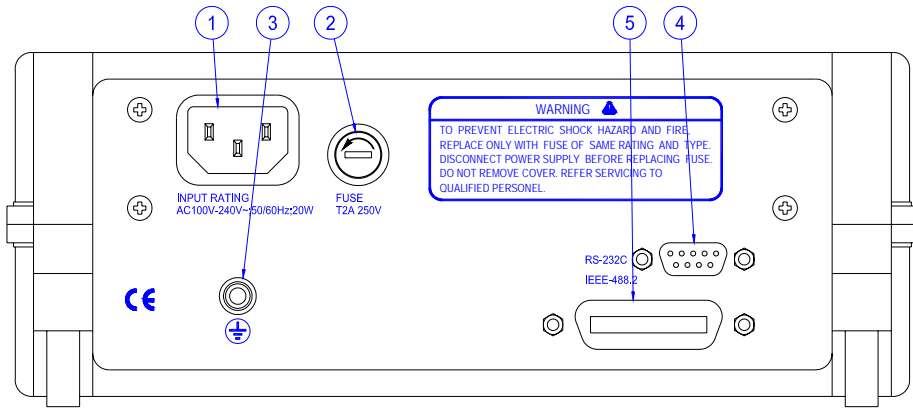


[Menu Layout]

14) LCD

Displays the Waveform, Frequency, offset, Amplitude, (etc) settings and menus.

2. Rear Panel



[Rear Panel]

CAUTION

Before using, check that the AC line voltage is within the specified line voltage range.

1) AC input

The AC line cord is inserted in to this connector. The allowable AC voltage range is 100V to 240Vac, 50/60 Hz.

2) Fuse Holder

Holds the 2amp 250-volt fuse.

CAUTION

Remove the AC line power when changing this fuse.

3) GND TERMINAL

Chassis ground terminal

4) RS232 PORT

A 9pin DIN connector for connecting an RS-232 cable from the instrument to the PC. This is used along with the software for controlling the instrument from a PC.

5) GP-IB port [Option]

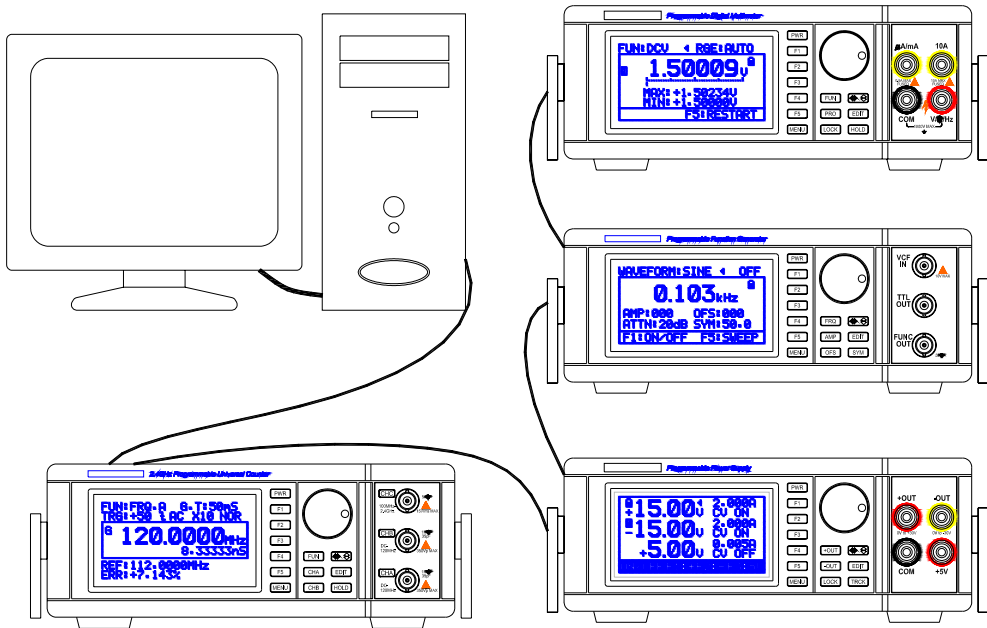
Standard IEEE-488.2 connector for connecting multiple devices to the GP-IB interface.

* Note

The total cable length should be less than 25m(80ft) and the maximum number of device connections (including controller) is 15.

◆ GP-IB Example

Figure below is an example of connecting multiple devices to the GP-IB port.



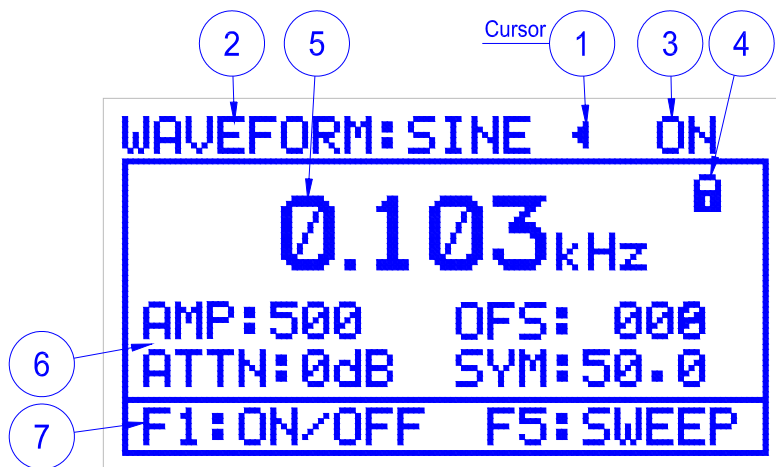
[GP-IB Connection Example]

Chapter 4. LCD, Front panel buttons and menus

1. LCD display description


Section 1-TOP DISPLAY	<p>← Displays The current waveform, the output status (on/off) and the selection/edit cursor.</p>
Section 2.MAIN-DISPLAY	<p>← Displays</p> <ul style="list-style-type: none"> • The Frequency, Amplitude, attenuator, offset and symmetry values. • The Sweep rate and width when the F5 button pressed.
Section 3-BOTTOM-DISPLAY	<p>← Displays F buttons for:</p> <ul style="list-style-type: none"> • Turning the output ON/OFF F1 • Setting the sweep values F5 • Exit sweep settings F5.



[LCD display areas]



[LCD Display]

1) Cursor (←, →, ↑, ↓, ✎, ✎)



(1) The cursor is displayed in the upper part of the LCD when the unit is first turned on. It is used to indicate and change Waveforms, amplitude, symmetry, offset, and attenuator values. When the cursor is displayed as a (← or →) symbol it is the selection cursor and can be moved to the desired menu item by turning the rotary dial or pressing the appropriate front panel button (waveform, OFS, SYM). Pressing the  Button again the cursor appears as a (↑ or ↓) the edit cursor and is used to change waveform, Attenuator and ON/OFF settings by turning the rotary dial.

(2) The cursor can be used to change numerical values (Frequency, amplitude, symmetry, offset values) by indicating the setting to be changed with the selection cursor (← or →), and then pressing the  Button to display the edit cursor (↑ or ↓). Rotating the rotary dial changes the cursor to the digit selection cursor displayed as a (✎) symbol and highlights a digit. Turning the rotary dial further moves the highlight to the next consecutive digit. Pressing the  Button on the highlighted (selected) digit changes the cursor to the Digit edit cursor displayed as a (✎) symbol. Turning the rotary dial clockwise increases the digit value; counter clockwise decreases the digit value.

(3) The cursor is also displayed in the Menu when the edit button is pressed is used to change settings and data values using the procedures in the above paragraph

2) WAVE FORM

- Displays the currently selected WAVE FORM.
- SINE, TRI or SQUIRE may be selected and displayed.
 - To change the Wave form.

- (a) Press the  Button to display the selection mode cursor(← or →).
- (b) Turn the rotary dial until the cursor indicates "WAVEFORM: _____"
- (c) Press the  button to change the cursor to the edit mode (↑ or ↓).
- (d) Rotate the rotary dial to display the new wave form.

3) Output status

- The output status displays whether the output is ON or OFF
 - To Turn the output ON/OFF


- (a) Press the F1 Button.
- (b) Pressing this button again will turn the unit ON/OFF.


4) (Lock)

- When displayed, all front panel buttons except the [MENU] are disabled:
- To unlock (or lock) the front panel press the [MENU] →[F4] buttons



5) Setting a frequency value

- Range : 1Hz to 15MHz
- To change the frequency value.


(a) Press [FRQ] Button. → Display: “ ____Hz ”.

(b) When the Rotary dial is turned counter clockwise, the cursor changes to a  symbol.

(c) Rotate the dial until the digit to be changed is highlighted.

(d) Press the  button to select digit edit mode cursor ().

(e) And turn the Rotary dial to change the digit value. The highlighted digit will increase if the rotary dial is turned clockwise; counter clockwise decreases the digit value.


(f) To change another digit press the  button, turn the rotary dial to highlight the next digit to be changed and repeat steps (1e and 1f).


6) Setting the waveform amplitude

(1) AMP (Amplitude): 0 to 999



The amplitude may be set from 0 to 10V p-p (in to a 50 Ω load) in a scale from 0 to 999.

- To set the Amplitude of a waveform:


(a) Press [AMP] Button. → Display: “AMP: ____ ”. Note: If the generator is in the Sweep mode, press the F5 button to move the cursor to the AMP symbol.

(b) When the Rotary dial is turned counter clockwise, the cursor changes to a  symbol.

(c) Rotate the dial until the digit to be changed is highlighted.

(d) Press the  button to select digit edit mode cursor ().


(e) Turn the Rotary dial to change the digit value. The highlighted digit will increase if the rotary dial is turned clockwise; counter clockwise decreases the digit value.

(f) To change another digit press the  button, turn the rotary dial to highlight the next digit to be changed and repeat steps (1e and 1f).

(2) OFS (DC Offset): -999 to 999

The DC off offset adds a 0 to ± 7.5V DC level (no load) to the waveform in a scale from -999 to +999



- To change the Offset.

(a) Press [OFS] Button. → Display: “OFS: ____ ”.

(b) To set the offset Volt use the same procedure in 6) steps (1b, 1c, 1d, 1e and 1f) Setting the waveform amplitude.

(3) ATT (Attenuator): 0dB or 20dB

- To change the Attenuator.

- Press the  Button to display the selection mode cursor (< or >).
- Turn the rotary dial until the cursor indicates "ATTN: ____"
- Press the  button to change the cursor to the edit mode (▀ or ▁).
- Rotate the rotary dial to display the new Attenuator.

(4) SYM (Symmetry): 0.00 to 99.9

The waveform symmetry can be adjusted from 1:1 to 10:1 in a scale from 00.0 to 99.9

- To change the Symmetry.

- Press [SYM] Button. → Display: "SYM: ____ ▀".
- To set a Symmetry value, use the same procedure in 6) steps (1b, 1c, 1d, 1e and 1f) Setting the waveform amplitude

7) SWEEP MODE:



- To Select the Sweep mode, press [F5] button)



[LCD Display]



(1) SWEEP mode Output:

- To turn the Sweep mode ON.

- Press  Button to display the selection mode cursor (◀ or ▶).
- Turn the rotary dial until the cursor indicates "SWEEP: ____"
- Press  button to change the cursor to the edit mode (▀ or ▁).
- Rotate the rotary dial to display Sweep ON.



(2) RATE (Sweep rate): 0.05S to 9.95S

- To change the Sweep rate.

- Press the  Button to display the selection mode cursor (◀ or ▶).
- Turn the rotary dial until the cursor indicates "RATE: ____"
- Press the  button to change the cursor to the edit mode (▀ or ▁).
- Rotate the rotary dial to display the new Sweep rate.

(3) WIDTH (Sweep width): The sweep width can be adjusted from 0.05 to 19.95Sec in a scale from 0 to 99.

▪To change the Sweep width.

- (a) Press the  Button to display the selection mode cursor (◀ or ▶).
- (b) Turn the rotary dial until the cursor indicates "WIDTH: ____"
- (c) Press the  button to change the cursor to the edit mode (▀ or ▁).
- (d) Rotate the rotary dial to display the new Sweep width.

8) Help Menu

- The help-menu is located at the bottom of the LCD and displays a menu of F keys and their function. (F1:output ON/OFF, F5: AMP/Sweep).

2. MENU description

This section explains the items in the menus and sub menus and the F soft buttons [F1], [F2], [F3], [F4], [F5] for selecting items in the menus.

Table below is the diagram of the Menu structure that is displayed when the MENU button is pressed.

SETUP	F1	PAGE	F1	Lists setup values on the current memory page Setup page
		SAVE	F2	Saves all values on the current setup page to the specified address
		LOAD	F3	Displays a previously stored memory page
		NEXT	F4	Next page
		EXIT	F5	Exit

EQUIP	F2	Ver. No.		The firmware version
		S/N		Unit serial number
		GPIB		GP-IB address
		Cal date		Last date the unit was calibrated.
		EXIT	F5	

EXIT	F3	Not used.
------	----	-----------

EXIT	F4	Disables all front panel buttons except the [MENU] button.
------	----	--

EXIT	F5	Exit, returns the display to the normal mode.
------	----	---

[Menu structure]

1) MENU Description

- (1) [F1] SETUP: Displays a list of settings, data values and the PAGE, SAVE, LOAD, NEXT, EXIT soft Keys for selecting a memory page, saving the current screen or recalling a previously saved setup screen. Eight setup screens may be saved or recalled from memory.
- (2) [F2] EQUIP: Displays information about your instrument including the serial number, CALIBRATION date, GP-IB address, and Firmware.
- (3) [F3] Not used
- (4) [F4] LOCK: Disables all front panel buttons except the [MENU] button.
- (5) [F5] EXIT: Exit the menu and return to the normal screen.

2) SETUP Menu Description

[F1] PAGE: Selects the page in memory where the currently displayed list of settings is to be saved or recalled. Eight setups may be stored from Addresses 0 to 7. To select a memory page press and release the F1 button until the desired memory page is displayed.

[F2] SAVE: Seven setup screens may be edited and stored prior to using the generator. The functions and data displayed in the list on page 16/17 may be changed prior to saving by pressing the EDIT button and using the editing procedures.

Note: Page 0 is reserved for storing the current settings and values. When the unit is power off and then on, these will be the default settings and values.

[F3] LOAD: Loads a previously saved memory address page to the display. This list now becomes the operating parameters of the function generator. Press and release the F1 button until the desired paged is displayed then press the F3 button. Page 0 is the default page that is loaded into memory when the unit is powered off and then on.

[F4] NEXT: Go to the next page of menu items.

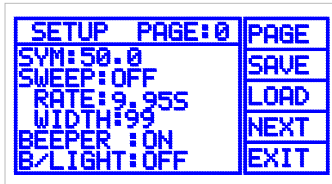
[F5] EXIT: Exit the setup menu.

(1) SETUP menu displays the current generator settings, Frequency, Amplitude, Offset, Attenuator, Symmetry and Sweep values. Pressing the NEXT (F4) button advances the display to the next menu screen; exit returns the display to the normal screen.

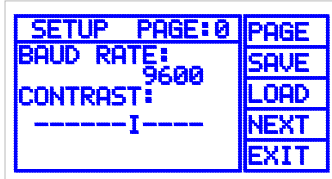
SETUP PAGE: 0	PAGE
FREQ: 15.00MHz	SAVE
W/FORM: PULSE	LOAD
OUTPUT: OFF	NEXT
AMPL: 000	EXIT
OFFSET: +999	
ATTEN: 20dB	

Selects memory page address: 0 to 7

- ◆FREQ
- ◆WAVE FORM
- ◆ OUTPUT STATUS
- ◆AMPL
- ◆OFFSET
- ◆ATTEN



- ◆ SYM:
- ◆ SWEEP:
 - RATE
 - WIDTH
- ◆ BEEPER ON/OFF
- ◆ BACK LIGHT ON/OFF



- ◆ RS 232 Baud rate selection
- ◆ LCD Contrast adjust

(2) The above screens may be edited to enter new (W/FORM, OUTPUT, ATTEN, etc) settings or data values by using the following procedure:

- (a) Press the [EDIT] button to display the Selection mode cursor (◀).
- (b) Turn the Rotary dial until the cursor is indicating the item to be changed.
- (c) Press the button to select the Edit Cursor (▶).
- (d) Turn the Rotary dial until the new setting is displayed.
- (e) To change another item in the menu, press the button, and repeat steps (b) through (d).

(3) To edit numerical data values: (FREQ, AMPL, OFFSET)

- (a) Turn the rotary dial to indicate the data value to be changed with the selection cursor (◀).
- (b) Press the button to select the edit cursor (▶).
- (c) Turning the rotary dial the cursor changes to a symbol and highlights a digit or label (HZ, KHz, etc). Turn the rotary dial to highlight the digit to be changed.
- (d) Press the button to select the digit edit mode cursor (). Turn the rotary dial until the new digit or frequency label is displayed.
- (e) To change another digit, press the button and repeat steps (c) and (d).

(4) To save this menu page, press and release the [F1] button until the desired address page is displayed, then press the [F2] button. To exit the menu, press the [F5] button.

(5) Load and display a previously saved menu page.

Press and release the [F1] button until the desired menu page is displayed. Press the [F3] LOAD button.

(6) Press the [F5] EXIT button to exit this menu.

3) Equipment menu description:

This menu displays the specific information about a unit. It contains the Model number, Program Version, Serial number, GP-IB Address and Calibration date.

(1) The GP-IB address and Cal date may be changed using the edit cursor as described above.

Model Number	
VER NO.:3.22	
S/N:A123456	
GP-IB ADD.:0A	
CAL. DATE: 2001/06/09	EXIT

- ◆ Model Number
- ◆ Program Version
- ◆ Serial Number
- ◆ GP-IB Address
- ◆ Calibration Date

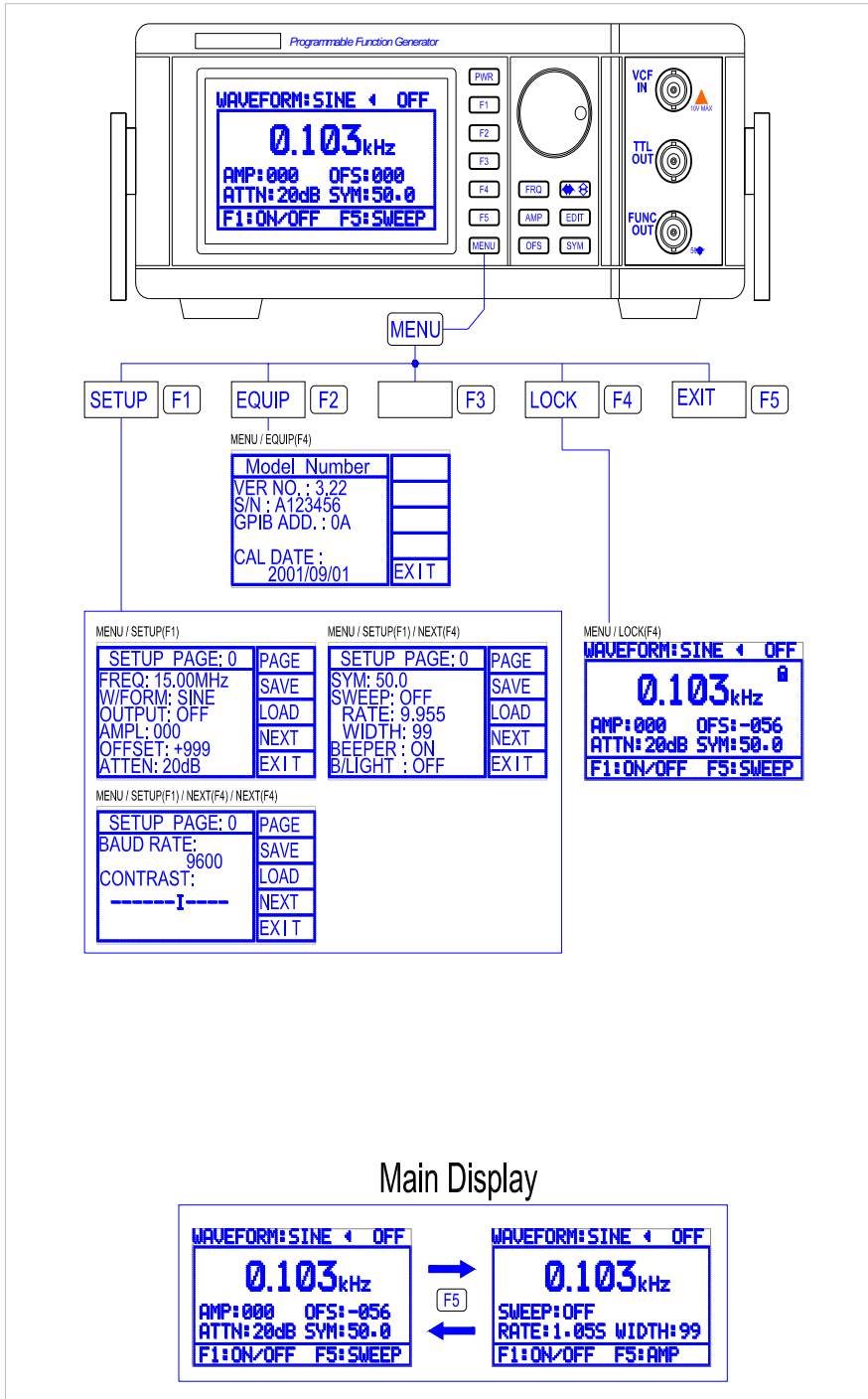
[Equipment menu screen]

[F5] EXIT button: Pressing the [F5] button returns the to the counter display.

3. Rotary Dial:

The Rotary dial is used to move the selection cursor (◀ or ▶) from one item to another on the LCD or in the set up menu. It is also used to change the value of the settings when it is indicated by the edit cursor (▣ or ▤) and to select and change numerical digit values.

4. Quick Reference Guide



Chapter 5. Using this instrument

1. Equipment Needed

- 1) Oscilloscope: Frequency Bandwidth of 20MHz or greater
- 2) Frequency counter: Frequency bandwidth greater than 20MHz.
- 3) Distortion analyzer: less than 0.01% distortion greater than 100kHz
- 4) BNC cable: 50Ω
- 5) Termination: 50Ω

2. Preliminary setup

- 1) Check whether the AC input voltage is within the specified range before turning the unit on.
- 2) Connect the AC power cord to the receptacle on the rear panel.
- 3) Turn on the power on by pressing the [PWR] button for 1.5 to 2 seconds.
- 4) Let the unit Warm up for about 10 to 20 minutes before taking measurements.

3. How to use the function wave generator

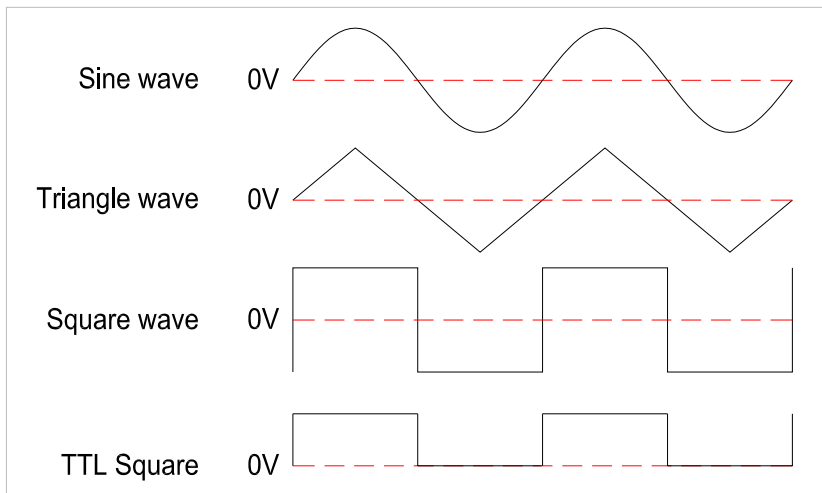
This chapter explains the LCD indicators and the various settings.

	<p>Description</p> <ul style="list-style-type: none"> ① Waveform ② Output ON/OFF ③ Frequency ④ AMP <p>OFFSET ATTENUATOR SYMMETRY</p> <p>Press [F5] Button ↓</p>
	<p>↑ Press [F5] Button</p> <ul style="list-style-type: none"> ⑤ SWEEP ON/OFF <p>RATE WIDTH</p>

[LCD Display]

1) Procedure

- (1) Set the G5100 function generator for the following conditions.
 - DC OFFSET : 0
 - ATTENUATOR: 0dB
 - SYM (Symmetry) : 50.0
 - SWEEP : OFF
- (2) Set the generator to the desired frequency
- (3) Select the appropriate waveform (triangle, sine or square wave)
- (4) Connect the 50Ω cable from the FUNT OUT terminal of the function generator to the device under test.
- (5) Adjust the AMP (Amplitude) to desired value
- (6) Apply the appropriate DC offset voltage (+) or (-) to the output signal by adjusting the OFS control
- (7) If the TTL out put is to be used, it is a square wave with a fixed amplitude level not affected by the Amplitude, Attenuator and DC Offset controls.



[Output waveform and phase relation]

2) Reference (supplementary explanation)

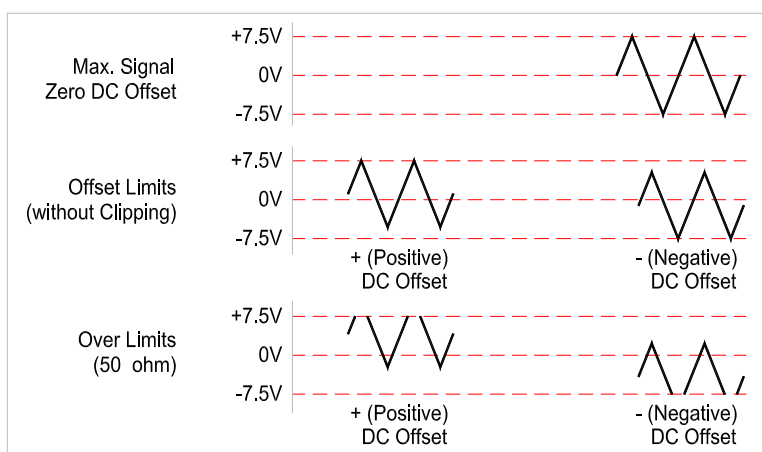
The following material is basic to the operation of this equipment and should be remembered when using this instrument.

- (1) The output is limited to $\pm 10V$ no load or $\pm 5V$ into a 50Ω load. When the OFS (DC OFFSET) is added to the output waveform, limiting will occur when the amount of OFS Volts + output amplitude is greater than $\pm 10V$ (no load) or ($\pm 5V$ into a 50Ω load).

(2) The output Impedance of the generator is 50Ω and can be connected to many different types of equipment. When you are connecting a device having an input impedance of other than 50Ω , the output level will be in some proportion depending on the input impedance of the device under test. If the input impedance of the device under test is greater than 500Ω place a 50Ω load across the input terminals of the device under test.

(3) When using high frequency or square waves, terminate the device under test with a 50Ω adapter and use a cable that is as short as possible to reduce Ringing.

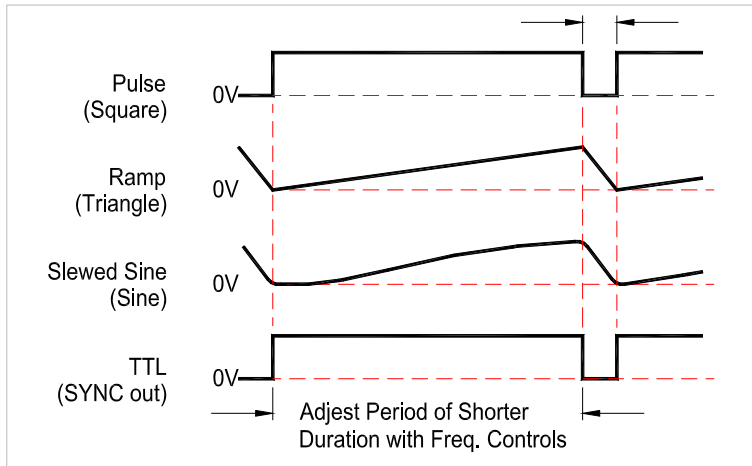
(4) To adjust output level of the generator exactly, use an oscilloscope or a wide band AC true rms voltmeter



[Output waveform when you use DC OFFSET]

4. Generating a pulse waveform

A sine or square wave has symmetry of 1:1, which means the time and shape of the positive alternation is equal to the time and shape of the negative alternation. This is the default state of the symmetry control in this unit. The symmetry can be adjusted from a maximum of 14:1 to a minimum of 1:14 in a scale from 0.00 to 99.9 so a pulse wave form may be generated from a square wave and a saw tooth wave from the Triangle waveform. Setting the amount of symmetry may also generate a skewed Sine wave.



[Pulse wave, gear wave, distorted sin]

1) Procedure

- (1) Set the desired frequency.
- (2) Select the output waveform and amplitude.
- (3) Set the SYMMETRY to adjust the waveform to the appropriate duty cycle.

2) Reference (supplementary Information)

(1) When creating a saw tooth, skewed sine or pulse waveform, the frequency and period of the waveform can be measured using an oscilloscope.

(2) To measure the pulse width easily and accurately, use a higher Sweep Speed to spread the waveform over several divisions of the screen using the time/Div switch. To measure the Repetition rates use a lower sweep speed.

(3) Repetition Rate can be expressed either as a frequency or time period. Repetition Rate can be measured in time on the Oscilloscope and changed to a frequency by using the formula $F=1/T$ where T is the total time units as shown on the oscilloscope screen. Repetition Rate is the total time period of the waveform. The pulse width normally is the time the pulse is in positive portion of the waveform. The Repetition rate of a ramp waveform may be measured using this procedure.

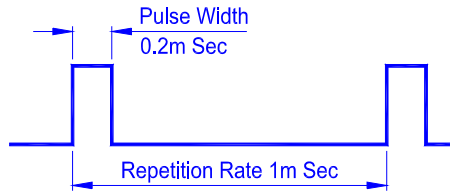
(4) The Repetition Rate of a waveform is easily and accurately measured by using a Frequency Counter. The frequency is read directly from the counter readout

(5) The Width of a square wave can be measured by using a Frequency Counter. The pulse Width is equal to 1/2 period of the Square waveform. $\text{Frequency} = 1/(\text{Pulse width} \times 2)$

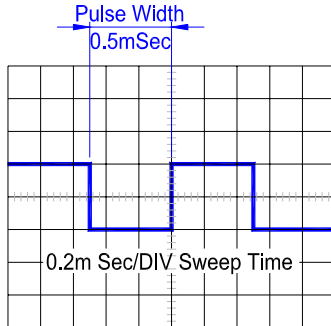
(6) $\text{Frequency} = 1/(\text{Pulse width} \times 2)$

1. Waveform

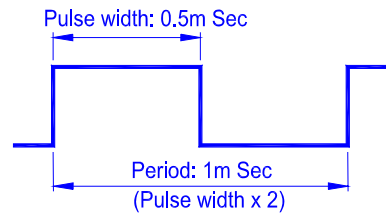
* Frequency: 1kHz



2. Pulse Width (in Oscilloscope)

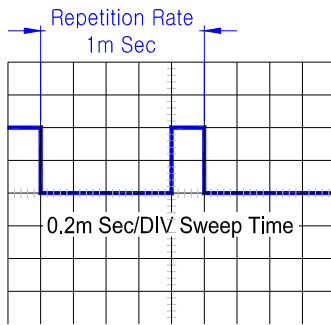


3. Pulse Width (in Frequency Counter)

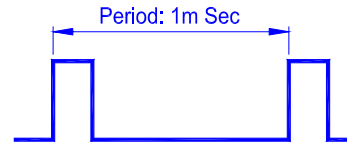


$$\begin{aligned} \text{Equivalent Frequency} &= \\ &= 1 / (\text{Pulse Width} \times 2) \\ &= 1 / 1\text{m Sec} = 1\text{ kHz} \end{aligned}$$

4. Period (in Oscilloscope)



5. Period (in Frequency Counter)



$$\begin{aligned} \text{Equivalent Repetition Rate Frequency} &= \\ &= 1 / (\text{Rep. Rate Period}) \\ &= 1 / 1\text{m Sec} = 1\text{ kHz} \end{aligned}$$

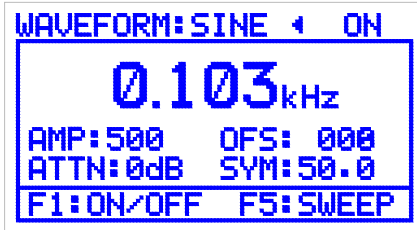
$$\begin{aligned} \text{Repetition Rate} \\ \text{Period} &= 1 / \text{Rep. Rate Freq.} \\ &= 1 / 1\text{ kHz} = 1\text{m Sec} \end{aligned}$$

[Typical pulse measure and Set-up technique]

5. Using the SWEEP waveform generator

1) Procedure





- (1) Set the highest frequency on the LCD that needs to be SWEPT (Fig A).
- (2) Press [F5] Button to select the sweep mode screen (Fig B).



[Figure A]



[Figure B]

- (3) Set the SWEEP ON by rotating the Function dial
- (4) Press the  button to select the selection cursor (◀) and move the cursor to SWEEP WIDTH by rotating the rotary dial,
- (5) Press the  button to display the change cursor (▶) and rotate the rotary dial until the desired Sweep width is displayed.
- (6) To set the sweep rate, press the  button to display the selection cursor (◀) and move the cursor to Sweep rate by rotating the rotary dial.
- (7) Press the  button to display the change cursor (▶) and rotate the rotary dial until the desired Sweep Rate is displayed.

6. TTL output function

The TTL Output is used for testing DIGITAL LOGIC circuits. The output is a fixed amplitude square wave with a fast Rise and fall time. This output can be used as a clock generator for testing, repairing and analyzing digital circuitry. The TTL output can drive 20 or more TTL loads.

7. VCF input function

Applying a voltage to the VCF input causes the output frequency to vary in accordance with the amplitude of applied voltage. The frequency can be varied with the VCF in 3 ways.

- 1) The application of an AC voltage will frequency modulated the output frequency according to the AC Rate and amplitude of the applied voltage
- 2) If a DC Voltage is applied, the output frequency will change to the new CW value depending on the amplitude of the applied voltage.
- 3) The application of a ramp voltage will cause the output frequency to vary linearly according the ramp time and amplitude; therefore it can be used as an external sweep input.

◆ Frequency selection by DC voltage applied from the exterior
You can select the output frequency regularly by DC voltage applied to VCF IN, which is equivalent to frequency dial selection. You can use this operation usefully in case you need the reselection to the regular frequency periodically. To get the accurate frequency select the output frequency by putting the output

frequency measure and the time that you have to control the frequency dial accurately again on the minimum spot and changing the DC voltage applied to VCF IN. If you need regular frequency output more than two, you can select the output frequency by using the switch or electronic switching circuit and by changing DC voltage applied to VCF IN.

◆ Operation as a exterior control sweep generator

Waveform of the ramp voltage that user wants or of the other shape also can be applied to operate as a exterior control sweep generator. The voltage change from $-5V$ to $+5V$ will sweep the frequency to the proportion of 100:1. You have to use the SETTING of the equipment as when you use the interior control sweep generator. But, you have to put the sweep width controller on the '0'. Amplitude of the sweep signal that DC voltage in VCF IN terminal is removed decides the width of a sweep, and the frequency or iteration ratio decides the ratio of the sweep. Therefore, use it as a sweep generator that you want by controlling it appropriately.

8. RS232C Interface

1) Hardware and Software requirement:

- (1) IBM PC/XT/AT (8088,80286,80386,80486) or Compatible Computer.
- (2) Microsoft Windows VER 3.1 OR Windows 95, 98, 2000, ME, NT, XP.
- (3) Serial Port for Connection with Instrument.

2) RS232 Cable Pin Connection

Instrument		Computer		
D-sub 9-Pin Male		D-sub 9-Pin Female	D-sub 25-Pin Female	Pin Name
2	_____	2	3	Rx
3	_____	3	2	Tx
4	_____	4	20	DTR
5	_____	5	7	GRD
6	_____	6	6	DSR
7	_____	7	4	RTS
8	_____	8	5	CTS

3) Installation of Supplied Software

- (1) Insert the supplied diskette into the Drive A. (or B).
- (2) Select File from the Program Manager screen, and then select Run.
- (3) Type A:\(or B:\) Setup.exe. Then ENTER.
- (4) If you are using Windows 95/98/2000/ ME/NT/XP click the mouse on MY computer ICON, then Floppy Drive A icon. When the menu is displayed click on SETUP.EXE
- (5) Monitor Program will be installed and create a directory named "Model No." automatically in Hard Disk.

4) Connection of PC and Instrument:

Connect the RS-232 cable to the built-in RS-232 connector in the Instrument and to the PC serial port.

5) Communication with PC

- (1) Connect the RS232C cable between PC and Instrument.
- (2) Start the program by clicking the mouse on the icon.
- (3) Click on the SetUp Button to open the setup dialog. Then select appropriate Serial Port and Baud Rate and click on the OK button.
- (4) Click on the S TIME button and type in the appropriate sampling time:
[1~∞(s)]
- (5) Turn off the equipment.
- (6) Turn on the equipment.
- (7) Click the "START" button with mouse to start the program.
Start : Starts the program.
Stop : Stops the program.

Note

For detailed operation instructions, refer to the "Readme.doc" file on the supplied diskette.

Chapter 6. Maintenance

This section provides some basic maintenance procedure.



WARNING

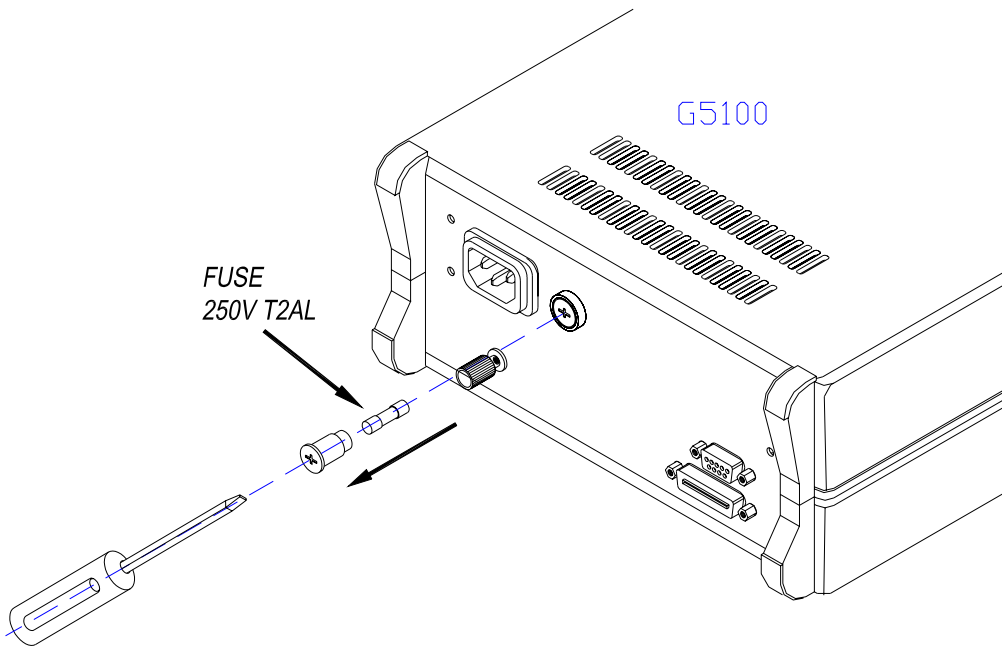
The following instructions are for use by qualified service personnel only. To avoid electric shock, do not perform servicing other than contained in the operating instructions unless you are qualified to do so.
Always unplug the equipment before performing service procedure.

1. Fuse Replacement:



WARNING

Fuse replacement should be carried out by a suitable skilled and competent person.



Line Fuse Removal

- 1) Have a handy flat-bladed screwdriver.
- 2) Set the equipment so its bottom is down on the work surface and its rear is facing you.
- 3) Find the fuse holder on the rear panel.
- 4) Rotate fuse holder counter-clockwise with the flat-bladed screwdriver.
- 5) Pull the fuse holder away.
- 6) Remove the line fuse.
- 7) Reinstall: Do in reverse steps to reinstall the line fuse and fuse holder.

2. Cleaning your instrument:

Periodically wipe the case with a damp cloth and detergent; do not use abrasives or solvents.

Calibrate the meter once a year to maintain its performance specification.

