LEAKAGE CURRENT TESTER

GLC-9000

QUICK START GUIDE
GWINESTEK PART NO.: 82LC-90000MB1

ISO-9001 CERTIFIED MANUFACTURER
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INTRODUCTION

This quick start guide is designed to help those who are not familiar with the GLC-9000 to quickly learn the fundamentals. For details on system settings, parameter settings, save/recall, remote instructions and other operation features and functions, please refer to the user manual.

Introduction

Overview

This quick start guide provides the basics on:

- Front and rear panels with descriptions of all features and functions on the panels
- Description of the Leakage current modes
- Basic preparation and power up
- Main screen display overview
- Summaries of the different leakage current measurement operations
- Summary of the EUT Voltage and Current Check function and the Voltage Meter function.
# Front Panel

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>POWER</strong></td>
<td>The power switch turns the power on or off.</td>
</tr>
<tr>
<td><img src="image.png" alt="Power Button" /></td>
<td><img src="image.png" alt="Power Button Description" /></td>
</tr>
<tr>
<td>2. <strong>START</strong></td>
<td>The green START button starts measurements.</td>
</tr>
<tr>
<td><img src="image.png" alt="Start Button" /></td>
<td><img src="image.png" alt="Start Button Description" /></td>
</tr>
<tr>
<td>3. <strong>RESET</strong></td>
<td>The red RESET button stops measurements.</td>
</tr>
<tr>
<td><img src="image.png" alt="Reset Button" /></td>
<td><img src="image.png" alt="Reset Button Description" /></td>
</tr>
<tr>
<td>4. <strong>Display</strong></td>
<td>5.6” inch touch screen LCD display. The touch screen display is the primary user interface.</td>
</tr>
<tr>
<td><img src="image.png" alt="Display" /></td>
<td><img src="image.png" alt="Display Description" /></td>
</tr>
</tbody>
</table>
### 5. Warning Indicator

The warning indicator lights up when high voltages are produced from terminals T1, T2 or T3. The warning indicator will flash when in standby mode.

### 6. Measuring Terminals

Measuring Terminals T1 and T2 are used to measure leakage current. Terminal T2 has a replaceable fuse (250V, 32mA).

### 7. Circuit Breaker

The circuit breaker has over-current protection for the EUT rated at 15A. When testing, the warning indicator will illuminate.

I: ON, normal operation
O: OFF, inactive or during over-current protection.

### 8. EUT AC Terminal Block

Supplies AC power for the EUT. Includes automatic shut-down (circuit breaker) with over-current protection. Maximum current output 10A, maximum power output, 1500VA.

### 9. T3 110% Voltage Application

An isolated voltage (1:1) is output to T3 from the EUT AC IN voltage by an isolation transformer. This terminal is limited to medical networks (MD:F)

### 10. USB HOST

USB host terminal.
# Rear Panel

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. EUT AC IN</td>
<td>EUT AC inlet. AC voltage range: 85V ~ 250V AC, 50 ~ 60Hz 10A Max</td>
</tr>
<tr>
<td>2. RS-232 Terminal</td>
<td>RS-232 Interface</td>
</tr>
<tr>
<td>3. USB connector</td>
<td>USB terminal for remote control.</td>
</tr>
<tr>
<td>4. EXT I/O connector</td>
<td>External input/output remote control connector.</td>
</tr>
<tr>
<td>5. GPIB connector</td>
<td>GPIB Interface for remote control.</td>
</tr>
<tr>
<td>6. Power Socket/Fuse socket</td>
<td>The power socket accepts AC mains power for the GLC-9000.</td>
</tr>
</tbody>
</table>

- Power: 100V/120/220/ 230V AC
- Fuse: T0.4A/250V
Leakage Current Modes

1. **Earth Leakage Current**
   Refers to the current that flows through a protective grounding wire to earth. (General Electrical, Medical Equipment)

2. **Enclosure Leakage Current**
   Refers to the current that flows through a human body in contact with a device enclosure. (General Electrical, Medical Equipment)

3. **Patient Leakage Current I**
   Refers to the current that flows through a human body that is directly connected to a device. (Medical Equipment)

4. **Patient Leakage Current II**
   Refers to the current that flows through a human body that is directly connected to a device under faulty conditions. (Medical Equipment)
5. **Patient Leakage Current III**

   Refers to the current that flows through a human body that is directly connected to a device that malfunctions. (Medical Equipment)

6. **Patient Auxiliary Current**

   Refers to the current that flows through a human and a device during normal operation. This is not intended to be perceptive. (Medical Equipment)

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### Key Features

**International Standards and Regulations**

The GLC-9000 has nine measurement networks (Measuring Devices: MD) supporting GB/12113, IEC/UL and other international standards for electrical products:

1. MD-A: IEC60990
2. MD-B: IEC60990
3. MD-C: IEC60990
4. MD-D: UL
5. MD-E (1kΩ): general application
6. MD-F: Medical
7. MD-G: UL
8. MD-H (2kΩ): general application
9. MD-I: JIS
There are a number of leakage current measurement tests covering general electrical equipment and medical electrical equipment.

(1) Earth Leakage Current.
(2) Leakage current from enclosure and earth.
(3) Leakage current from enclosure to enclosure.
(4) Leakage current from enclosure to line.
(5) Patient Auxiliary Current*.
(6) Patient leakage current I*.
(7) Patient leakage current II*.
(8) Patient leakage current III*.

*Tests 5,6,7,8 are applicable to medical MD-F devices.

### Leakage Current Types
Leakage current measurement modes:
- DC, AC, AC+DC, AC Peak.

### Measurement Range
- Automatic/Manual ranges:
  - DC/AC/AC+DC: 50uA/500uA/5mA/25mA (Range: 4uA~25mA)
  - AC Peak: 500uA/1mA/10mA/75mA (Range: 40uA~75mA)
### Operation
- Auto/Manual/Programmable
  - Single fault conditions and power supply polarity switch
- Measurement/Delay time settings
- Maximum / minimum hold
- PASS/FAIL(Upper, Lower) Judgement (limits)
- save and recall setup and measurement results
- System clock settings
- Multilanguage support
- System Self test
- EUT voltage/current/power consumption
- High voltage alarm and led indicators.
- Remote control interface options

### Interface
With the exception of the Start, Reset and power switches, the user-interface is entirely controlled via a touch screen.

### LCD
The simple, user-friendly interface is extremely intuitive with a large 5.6” color TFT screen.

### EUT Test Status
The voltage, current and power consumption of the EUT can be measured.

### Built-in Voltage Meter
The built in voltage meter detects 0-300V. The voltage meter is activated when the Safety Extra Low Voltage (SELV) function is on.

### Memory
- 30 sets of memory for user defined test conditions
- 50 sets of standard test conditions. (e.g., IEC60990)
- 100 sets of measurements can be saved/recalled
Remote Interface  There are a variety of remote control interfaces including: RS-232, USB (Host/Device), GPIB and the EXT I/O connector.

Protection  The LED warning indicator will illuminate and emit a tone by default for:
- Judgment limits. (high/low limits).
- High Voltages output from the testing terminals.
- Overload protection (fuse protection).
- Relay protection for EUT overloads.
Power and Probe Connection

Mains Power

1. Ensure the power is switched off from the front panel.

2. Insert the AC mains power into the power socket on the right-hand side of the rear panel.

The arrow above shows the location of the AC main power socket.

EUT Power

1. Ensure the power switch is off on the front panel.

2. Insert the power cord as shown on the right into the EUT AC Line In.

The arrow above shows the EUT AC line in socket, located on the left-hand side of the rear panel.
Caution: If network B (MD B) is selected an isolation transformer that outputs 110% of the rated voltage specified for the EUT is required. The neutral line must be grounded (from the secondary side of the transformer).

Measurement networks (MD) A, B, C all require an isolation transformer.

T1/T2/T3 Terminals

1. Insert the test leads to one of the terminals

2. The measuring mode determines which terminal will be used.

Terminals T1, T2 and T3 are shown above.

Warning: To avoid the risk of electric shock, do not touch the tips of the test leads when operating.

Foil Probe

1. The foil probe is used to measure the surface leakage current (touch current) of the EUT. Attach the probe metal-foil-side down onto the enclosure of the EUT.

2. Attach the test leads to the foil probe using alligator clips to the area on the right, as shown in the diagram
1. Plug a test lead into the rear panel.
2. Use an alligator clip to clip to the metal foil or to other points under test.

The arrow mark indicates the location that the test lead and alligator clips are clipped together.
Preparation

Voltage Line Selection

Before power is turned on, ensure the line voltage is correct for the environment. The line voltage is shown on the rear panel.

Voltage: 100/120/220/230V ±10% Frequency: 50~60Hz

⚠️ Warning

Ensure a three pronged grounded power socket is used.

Fuse

Ensure the correct fuse is used before power up. (Fuse: T0.4A/250V)

EUT AC Line In

Before connecting power to the EUT AC Line In, confirm the EUT input power and test requirements do not exceed the EUT AC Line In requirements.

Voltage Range: 85V ~ 250V / 50 ~ 60Hz

⚠️ Caution

* EUT : 10A(max), 1500VA(max)
Power Up

Press the power switch to turn on the power. The system will enter the measurement interface after a quick initialization. The interface panel will appear after a short time.

Shutdown

Before shutdown, ensure the EUT is shut down properly. As illustrated below, power off the circuit breaker before turning off the equipment. After the EUT is powered down, the GLC-9000 can be powered down.
Interface

Main Display

Network  Leakage  Displays the current measuring network types (general electrical equipment and medical networks):
  - Earth leakage current
  - Enclosure to earth leakage current
  - Enclosure to enclosure leakage current
  - Enclosure to line leakage current
  - Patient auxiliary leakage current
  - Patient leakage current I
  - Patient leakage current II
  - Patient leakage current III

Probe  Shows the probe terminals used for the current measuring network.
### GLC-9000 Quick Start Guide

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Judge:</td>
<td>Shows the test result judgment.</td>
</tr>
<tr>
<td>Set Limits</td>
<td><strong>Upper Limit:</strong> Displays the upper test limit.</td>
</tr>
<tr>
<td></td>
<td><strong>Lower Limit:</strong> Displays the lower test limit</td>
</tr>
<tr>
<td></td>
<td><strong>Wait Time:</strong> Displays the wait time before a test commences.</td>
</tr>
<tr>
<td>Meas Time</td>
<td>Measurement time.</td>
</tr>
<tr>
<td></td>
<td><strong>Graph</strong> Toggle the Set Limit display from graphical to text mode. Graphical mode graphs the results in real-time.</td>
</tr>
<tr>
<td></td>
<td><strong>Text</strong> Clear the Max/Min test results from the screen.</td>
</tr>
</tbody>
</table>

### Power State

<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displays the current power state settings.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wait for Setting</strong></td>
<td>Occurs when the instrument is powered up or when the measurement network, class or leakage current mode has changed.</td>
</tr>
<tr>
<td><strong>Ready</strong></td>
<td>Occurs when the Meas key is pressed after Network, Class or Leakage is chosen.</td>
</tr>
<tr>
<td><strong>Testing</strong></td>
<td>Press the START button whilst in Ready mode to enter Testing mode. The RESET option will be displayed when in Testing mode.</td>
</tr>
</tbody>
</table>
Indicates that the touch panel is currently unlocked. Press the Lock key to lock the front panel.

Indicates the front panel is locked. To unlock press and hold the unlock key for 3 seconds.

Note: The front panel will also become locked when Start is pressed or the remote control function is used.

Remote Control
There are four types of remote control.
- RS-232
- GPIB
- USB
- EXT I/O

Time Displays the current system date and time.

Operation Keys
- Network Measuring network selection
- Class Equipment class type
- Leakage Leakage current mode selection
- Limit Set leakage current limits
- System Access the system parameters
- AUTO Meas Sets the measurement mode
- AC+DC Current Leakage current type selection
- AUTO Range Leakage current range selection
Save a screen image (BMP)

Recall settings

Save settings. Manual measurements can be saved in real-time.
When a measurement network is selected, different measuring terminals are required for each test and equipment class. The tables below list which terminals are used for with which network/test.

## Non-medical Network (General Electrical Appliance)

<table>
<thead>
<tr>
<th>MD-A, B, C, D, E, G, H, I</th>
<th>CLASS I</th>
<th>CLASS II</th>
<th>Internal Power Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth leakage current</td>
<td>Not used</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Enclosure and earth leakage current</td>
<td>T2</td>
<td>T2</td>
<td>T2</td>
</tr>
<tr>
<td>Enclosure and enclosure leakage current</td>
<td>T1,T2</td>
<td>T1,T2</td>
<td>T1,T2</td>
</tr>
<tr>
<td>Enclosure and line leakage current</td>
<td>T2</td>
<td>T2</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Medical Equipment

MD-F

<table>
<thead>
<tr>
<th>Earth leakage current</th>
<th>CLASS I Type B</th>
<th>CLASS II Type B</th>
<th>Internal Power Type B</th>
<th>Internal Power Type F*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enclosure and earth leakage current</td>
<td>T2, T3</td>
<td>T2, T3</td>
<td>T2, T3</td>
<td>T2, T3</td>
</tr>
<tr>
<td>Normal</td>
<td>T2, T2</td>
<td>T1, T2</td>
<td>T1, T2</td>
<td>T1, T2</td>
</tr>
<tr>
<td>Fault</td>
<td>T1~3</td>
<td>T1~3</td>
<td>T1~3</td>
<td>T1~3</td>
</tr>
<tr>
<td>Patient auxiliary current</td>
<td>T1, T2</td>
<td>T1, T2</td>
<td>T1, T2</td>
<td>T1, T2</td>
</tr>
<tr>
<td>Patient leakage current I</td>
<td>T2</td>
<td>T2</td>
<td>T2</td>
<td>T1, T2</td>
</tr>
<tr>
<td>Patient leakage current II</td>
<td>T2, T3</td>
<td>N/A</td>
<td>T2, T3</td>
<td>N/A</td>
</tr>
<tr>
<td>Patient leakage current III</td>
<td>N/A</td>
<td>T2</td>
<td>N/A</td>
<td>T2</td>
</tr>
</tbody>
</table>

*Type F = Type BF and Type CF.
Leakage Current Testing Connections

**Background**
Confirm all settings including MD, leakage current mode, measurement time, upper and lower limits, and other parameters.

**Earth Leakage Current**

**Enclosure Leakage Current**

- T2 to enclosure

**Non-medical type (General electrical equipment)**

- T2 to enclosure
- T3 to signal I/O (Unground)

**Medical type (MD-F)** Requires 110% power supply voltage output.
The T3 terminal is high voltage. Avoid contact with the terminal. The T3 terminal should not be connected with an earth conductor.

Enclosure to Enclosure Leakage Current

Non-medical type (General electrical equipment)

Medical type (MD-F) Requires 110% power supply voltage output.

The T3 terminal is high voltage. Avoid contact with the terminal. The T3 terminal should not be connected with an earth conductor.
Enclosure and Line Leakage Current

T2 to enclosure

Non-medical type (General electrical equipment)

The T2 terminal is high voltage. Avoid contact with the terminal. The T2 terminal should not be connected with an earth conductor.

Patient Auxiliary Current

T1/T2 to applied part

Medical network

Patient Leakage Current I

T2 to applied part

Medical network (Class I and Class II)
Medical network (Internal power supply)

Type B Medical Network

The T3 terminal is high voltage. Avoid contact with the terminal. The T3 terminal should not be connected with an earth conductor.

Type F Medical Network

The T2 terminal is high voltage. Avoid contact with the terminal. The T2 terminal should not be connected with an earth conductor.

For more details on leakage current connections, please see the GLC-9000 user manual.
EUT Voltage and Current Check

Background
The EUT voltage and current check tests voltage, current and power consumption.

Panel Operation
1. To access the EUT voltage & current check menu, press the V/A Check key from the System setup menu.

![EUT Voltage and Current Check Interface]

Voltage, current, power consumption and voltage between Live and Earth as well as Neutral to Earth will be displayed.

2. To perform the voltage and current check again, press Recheck.
Voltage Measurement

Background
From the System menu, the meter function can measure different types of voltages: AC, DC, AC+DC and AC peak. The safety extra low voltage limit can also be set from the Meter menu.

Meter Mode

1. From the System Menu, press the Meter key to access the Voltage Meter (T1/T2) menu.

   ![Voltage Meter (T1/T2) Menu]

   Ready will be displayed before starting measurements.

2. Choose the measurement type. Press the START button to begin measuring. Press RESET to stop measuring.

   Range AC, DC, AC+DC, AC Peak

SELV
When a voltage exceeds the safety extra low voltage (SELV), the warning indicator will become illuminated and an alarm will sound. SELV can be auto configured or turned off.
1. To set the safety extra low voltage, press the SELV key.

2. To set the SELV use the number pad and press **Confirm**.

   SELV Range 0~99 volts

3. Press **ON** to enable the SELV.

   SELV Setting On/Off

For more details see the *System Settings* chapter of the GLC-9000 user manual.