Electrical Safety Tester

GPT-9600 Series

USER MANUAL

PART NO. 82PT-96030EA1

ISO-9001 CERTIFIED MANUFACTURER

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SAFETY INSTRUCTIONS

This chapter contains important safety instructions that you must follow during operation and storage. Read the following before any operation to ensure your safety and to keep the instrument in the best possible condition.

Safety Symbols

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

WARNING	Warning: Identifies conditions or practices that could result in injury or loss of life.
CAUTION	Caution: Identifies conditions or practices that could result in damage to the instrument or to other properties.
	DANGER High Voltage
	Attention Refer to the Manual
	Protective Conductor Terminal
	Frame or Chassis Terminal
	Earth (ground) Terminal

Do not dispose electronic equipment as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased.

Safety Guidelines

General Guideline CAUTION	• Do not place any heavy object on the instrument. • Avoid severe impact or rough handling that leads to damaging the instrument. • Do not discharge static electricity to the instrument. • Use only mating connectors, not bare wires, for the terminals. • Do not block the cooling fan opening. • Do not disassemble the GPT-9600 unless you are qualified. (Measurement categories) EN 61010-1:2010 specifies the measurement categories and their requirements as follows. The GPT-9600 does not fall under category II, III or IV. • Measurement category IV is for measurement performed at the source of low-voltage installation. • Measurement category III is for measurement performed in the building installation. • Measurement category II is for measurement performed on the circuits directly connected to the low voltage installation.
Power Supply WARNING	• AC Input voltage range: 100-120/220-240VAC ±10% • Frequency: 50Hz/60Hz • Fuse: T 4A 250V • To avoid electrical shock connect the protective grounding conductor of the AC power cord to an earth ground.

Cleaning the GPT-9600	• Disconnect the power cord before cleaning. • Use a soft cloth dampened in a solution of mild detergent and water. Do not spray any liquid. • Do not use chemicals containing harsh material such as benzene, toluene, xylene, and acetone.
Operation Environment	• Location: Indoor, no direct sunlight, dust free, almost non-conductive pollution (Note below) • Relative Humidity: ≤ 70% (no condensation) • Altitude: < 2000m • Temperature: 0˚C~40˚C (Pollution Degree) EN 61010-1:2010 specifies the pollution degrees and their requirements as follows. The GPT-9600 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 • Temperature: -10°C to 70°C • Relative Humidity: ≤ 85% (no condensation)
Disposal	Do not dispose this instrument as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased. Please make sure discarded electrical waste is properly recycled to reduce environmental impact.

Power cord for the United Kingdom

When using the safety tester in the United Kingdom, make sure the power cord meets the following safety instructions.

NOTE: This lead/appliance must only be wired by competent persons

WARNING: THIS APPLIANCE MUST BE EARTHED

IMPORTANT: The wires in this lead are coloured in accordance with the following code:

Green/ Yellow:	Earth
Blue:	Neutral
Brown:	Live (Phase)

As the colours of the wires in main leads may not correspond with the coloured marking identified in your plug/appliance, proceed as follows:

The wire which is coloured Green & Yellow must be connected to the Earth terminal marked with either the letter E, the earth symbol ⏚ or coloured Green/Green & Yellow.

The wire which is coloured Blue must be connected to the terminal which is marked with the letter N or coloured Blue or Black.

The wire which is coloured Brown must be connected to the terminal marked with the letter L or P or coloured Brown or Red.

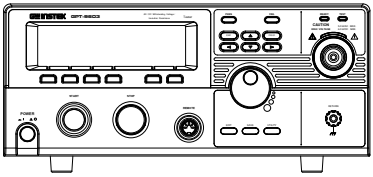
If in doubt, consult the instructions provided with the equipment or contact the supplier.

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

Any exposed wiring from a cable, plug or connection that is engaged in a live socket is extremely hazardous. If a cable or plug is deemed hazardous, turn off the mains power and remove the cable, any fuses and fuse assemblies. All hazardous wiring must be immediately destroyed and replaced in accordance to the above standard.

GETTING STARTED

This chapter describes the safety tester in a nutshell, including its main features and front / rear panel introduction. After going through the overview, please read the safety considerations in the Set Up chapter.



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GPT-9600 Series Overview

Series lineup

The GPT-9600 Series Safety Testers are AC/DC withstanding voltage and insulation resistance safety testers.

The GPT-9603 is an AC/DC withstanding and insulation resistance safety tester.

The GPT-9602 is an AC/DC withstanding safety tester.

The GPT-9612 is an AC withstanding and insulation resistance safety tester.

The GPT-9601 is purely an AC withstanding safety tester.

Note: Throughout this user manual, the terms ACW, DCW and IR refer to AC Withstanding, DC Withstanding and Insulation Resistance, respectively. GPT-9600 refers to any of the GPT-96XX models.

Model Overview

Model name	ACW	DCW	IR
GPT-9603	✓	✓	✓
GPT-9602	✓	✓	
GPT-9612	✓		✓
GPT-9601	✓		

Main Features

Performance	• ACW: 5kVAC • DCW: 6kVDC • IR: 50V, 100V, 250V, 500V, 1000V

Features	• Timer control • Safety discharge • Over temperature, voltage and current protection • Pass, Fail, Test, High Voltage and Ready indicators • PWM output (increased reliability) • Interlock (configurable)
Interface	• Remote control start/stop interface terminal • Signal I/O port for pass/fail/test monitoring and start/stop control/interlock

Accessories and Package Contents

Check the package contents to make sure all accessories and optional items are included before using the GPT-9600.

Standard Accessories	Part number	Description
	N/A	GPT-96XX unit.
	N/A	User manual CD
	N/A	Quick start guide
	GHT-114 x1	Test lead
	Region dependent	Power cord
	N/A	Remote terminal male plug
	N/A	Interlock key
	N/A	CTC (Calibration Traceable Certificate)
Optional Accessories	**Part number**	**Description**
	GHT-205	High voltage test probe
	GHT-113	High voltage test pistol

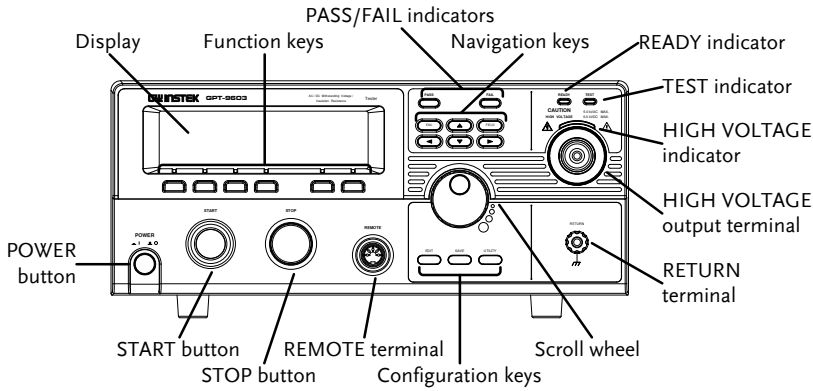
	GRA-417	Rack adapter panel (19”, 4U)

Note

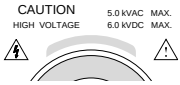
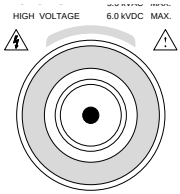
Keep the packaging, including the box, polystyrene foam and plastic envelopes should the need arise to return the unit to GW Instek.

Appearance

GPT-9603/9602/9612/9601
Front Panel

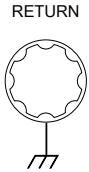


Display	240 X 48 dot matrix display (LCD)	
Function keys	The function keys correspond to the soft-keys directly above on the main display.	
Pass/Fail indicators	PASS FAIL	The PASS and FAIL indicators light up upon a PASS or FAIL test result.
Navigation keys		
ESC key	ESC	The ESC key is used to exit out of a menu or cancel a setting.
FIELD key	FIELD	The FIELD key is navigate to the next menu item when the tester is either in the EDIT status or in one of the Utility menus.

Directional arrow keys		The directional arrow keys are only used for calibration. They are not used during normal operation by the operator. The directional arrow keys can essentially be ignored by the operator.
READY indicator		The READY indicator is lit when the tester is ready to begin testing.
TEST indicator		The TEST indicator is lit when a test is on. The START button is used to put the tester into TEST status from READY status.
HIGH VOLTAGE indicator		The HIGH VOLTAGE indicator will flash when the output terminal is active. Only after the test has finished or stopped will the indicator turn off.
HIGH VOLTAGE output terminal		The HIGH VOLTAGE terminal output is used for outputting the testing voltage. The terminal is recessed for safety. This terminal is used in conjunction with the RETURN terminal.

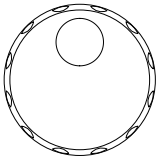
⚠ WARNING
USE EXTREME CAUTION.
Do not touch the HIGH VOLTAGE terminal during testing.

RETURN terminal



The RETURN terminal is used for IR, DCW and ACW tests.

Scroll wheel



The scroll wheel is used to edit parameter values or menu settings.

UTILITY key

Used to enter the TEST Utility or Common Utility menu.

EDIT key

Used to enter the EDIT status. The EDIT status allows you to select the test mode and the test parameters.

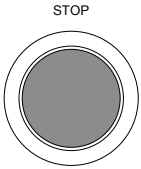
SAVE key

The SAVE key is used to save test parameters when in the EDIT status or to save utility settings.

REMOTE terminal

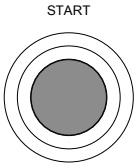
The REMOTE terminal is used to connect to a remote controller.

STOP button



The STOP button is used to stop/cancel tests. The STOP button will also put the safety tester in the READY status to begin testing.

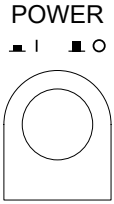
START button



The START button is used to start tests.

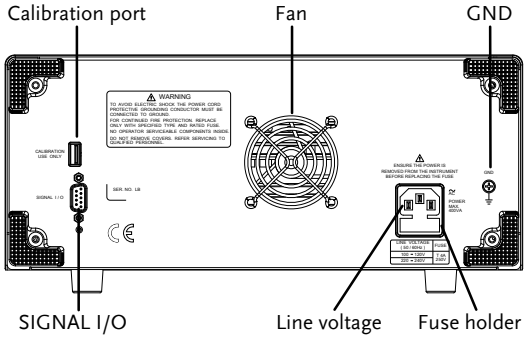
The START button can be used to start tests when the tester is in the READY status. Pressing the START button will put the tester in the TEST status.

POWER switch

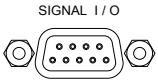


Turns the power on. The safety tester will always start up with the last test setting from when the instrument was last powered down.

GPT-9603/9602/9612/9601 Rear Panel



SIGNAL I/O port



The SIGNAL I/O port is used to monitor the tester status (PASS, FAIL, TEST) and input (START/ STOP signals). It is also used with the Interlock key.

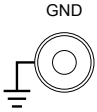
Calibration port

The Calibration port is used for calibration purposes only. Calibration is not supported for end-users. Please see your distributor for details.

Fan/Fan Vents

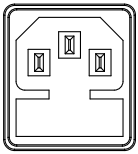
Exhaust fan. Allow enough room for the fan to vent. Do not block the fan openings.

GND



Connect the GND (ground) terminal to the earth ground.

Line voltage input and fuse holder

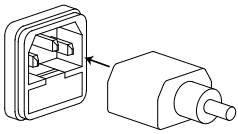
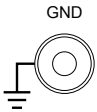
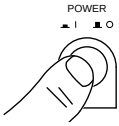


Line voltage input:
100-120/220-240VAC

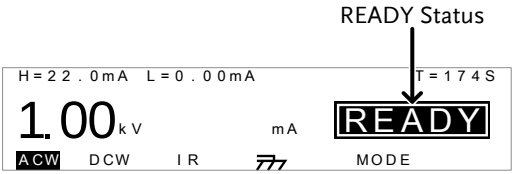
Line Voltage Fuse: T 4A 250V

Set Up

Power Up

Background	The GPT-9600 accepts line voltages of 100-120V and 220-240V at 50Hz or 60Hz.
Steps	1. Connect the power cord to the AC voltage input. 
	2. If the power cord does not have an earth ground, ensure the ground terminal is connected to an earth ground. 
Warning	Ensure the power cord is connected to an earth ground. Failure could be harmful to the operator and instrument.
	3. Press the Power button. 
	4. When the unit is powering up, all the LED indicators will light. Check to make sure all 5 LED indicators are working.
	5. Check to make sure the System Self Test passes without errors.

After the System Self Test completes, the tester will go into READY status and be ready to operate.



Workplace Precautions

Background	The GPT-9600 Series are a high voltage instruments that output dangerous voltages. The following section describes precautions and procedures that must be followed to ensure a safe work environment.
⚠ WARNING	The GPT-96XX generates voltages in excess of 5kVAC or 6kVDC. Follow all safety precautions, warnings and directions given in the following section when using the instrument.

1. Only technically qualified personnel should be allowed to operate the safety tester.

2. The operating workplace must be fully isolated, especially when the instrument is in operation. The instrument should be clearly labeled with appropriate warning signage.

3. The operator should not wear any conductive materials, jewelry, badges, or other items, such wrist watches.

4. The operator should wear insulation gloves for high voltage protection.

5. Ensure the earth ground of the line voltage is properly grounded.

6. Ensure any devices that are adversely affected by magnetic fields are not placed near the tester.

Operating Precautions

Background	The GPT-9600 Series are high voltage instruments that output dangerous voltages. The following section describes precautions and procedures that must be followed to ensure that the testers are operated in a safe manner.
⚠ WARNING	The GPT-96XX generates voltages of up to 5kVAC or 6kVDC. Follow all safety precautions, warnings and directions given in the following section when using the instrument.

1. Never touch the safety tester, lead wires, terminals, probes and other connected equipment when the tester is testing.

2. Do not turn the safety tester on and off quickly or repeatedly. When turning the power off, please allow a few moments before turning the power back on. This will allow the protection circuits to properly initialize.

   Do not turn the power off when a test is running, unless in an emergency.

3. Only use those test leads supplied with the instrument. Leads with inappropriate gauges can be dangerous to both the operator and the instrument.

4. Do not short the HIGH VOLTAGE terminal with ground. Doing so could charge the chassis to dangerously high voltages.

5. Ensure the earth ground of the line voltage is properly grounded.

6. Only connect the test leads to the HIGH VOLTAGE terminals before the start of a test. Keep the test leads disconnected at all other times.

7. Always press the STOP button when pausing testing.

8. Do not leave the safety tester unattended. Always turn the power off when leaving the testing area.

9. When remotely controlling the safety tester, ensure adequate safety measures are in place to prevent:

- Inadvertent output of the test voltage.

- Accidental contact with the instrument during testing. Ensure that the instrument and DUT are fully isolated when the instrument is remotely controlled.

10. Ensure an adequate discharge time for the DUT.

    When DCW or IR tests are performed, the DUT, test leads and probes become highly charged. The GPT-96XX has discharge circuitry to discharge the DUT after each test. The time required for a DUT to discharge depends on the DUT and test voltage.

    Never disconnect the safety tester before a discharge is completed.

Basic Safety Checks

Background	The GPT-9600 Series are high voltage devices and as such, daily safety checks should be made to ensure safe operation.

1. Ensure all test leads are not broken and are free from defects such as cracks or splitting.

2. Ensure the safety tester is always connected to an earth ground.

3. Test the safety tester operation with a low voltage/current output:
   Ensure the safety tester generates a FAIL judgment when the HIGH VOLTAGE and RETURN terminals are shorted (using the lowest voltage/current as the testing parameters).

⚠ WARNING	Do not use high voltages/currents when the HIGH VOLTAGE and RETURN terminals are shorted. It may result in damage to the instrument.

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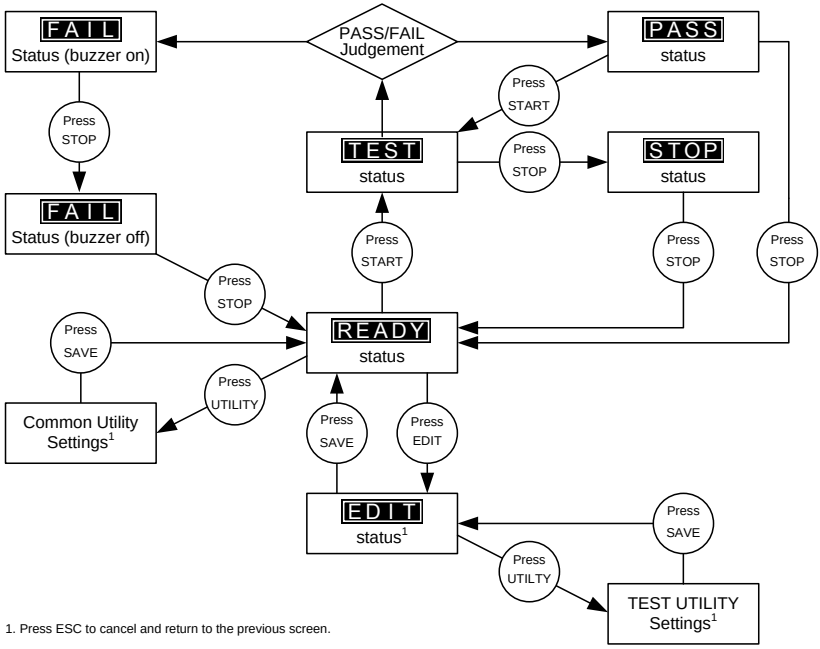
Menu Tree

This section describes the overall structure of the operation statuses and modes for the GPT-9600 safety testers. The testers have 6 operation statuses (EDIT, READY, TEST, STOP, PASS and FAIL).

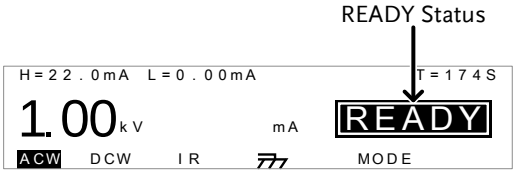


1. Press ESC to cancel and return to the previous screen.

Menu Tree Overview

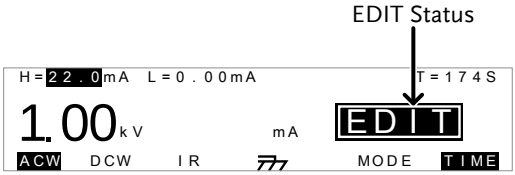
READY status

When the tester is in READY status, it is ready to begin testing. Pressing the START button will begin testing and put the tester into TEST status. Pressing the EDIT key will put the tester into the EDIT status. Pressing the UTILIY key will enter the Common Utility settings.



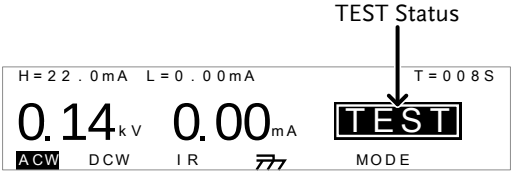
EDIT status

EDIT status is used to edit the test parameters. Pressing the SAVE key will save any changes and return to the READY status. Pressing the ESC key will cancel any changes and return to the READY status. Pressing the UTILITY key will enter the TEST Utility settings.



TEST status

TEST status is active when a test is running. Pressing STOP will cancel the test and put the tester into the STOP status. Waiting for the test to complete will result in a PASS or FAIL judgment.

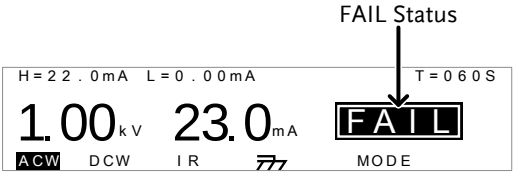


STOP status

STOP status is shown when a test did not finish running and has been stopped by the operator. Pressing STOP will return the tester to READY status.

FAIL status

When a DUT fails a test, the FAIL status is displayed. Pressing STOP twice will return the tester to the READY status.



PASS Status

When a DUT passes a test, the PASS status is displayed. Pressing STOP returns the unit to the READY status, pressing START will re-run the test again.

Common Utility Settings

This utility controls the LCD and control settings. These settings are system wide.

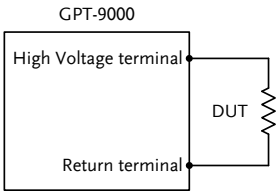
TEST Utility Settings

The TEST Utility configures the ARC mode (ACW, DCW) and the ACW test frequency.

Test Lead Connection

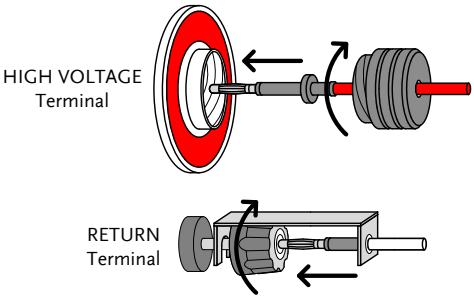
This section describes how to connect the GPT-9600 to a DUT for withstanding or insulation resistance tests.

ACW, DCW, IR Connection

Background	ACW, DCW and IR tests use the HIGH VOLTAGE terminal and RETURN terminal with the GHT-114 test leads.
ACW, DCW, IR Connection	

Steps

1. Turn the power off on the safety tester.
2. Connect the high voltage test lead(red) to the HIGH VOLTAGE terminal and screw firmly into place.
3. Connect the return test lead(white) into the RETURN terminal and screw the protector bar into place, as shown below.



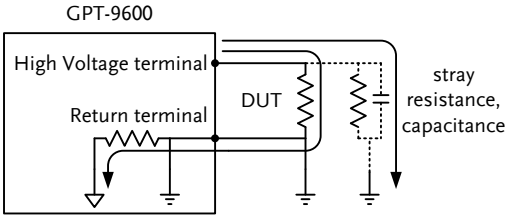
ACW and DCW Grounding Mode Information

Background

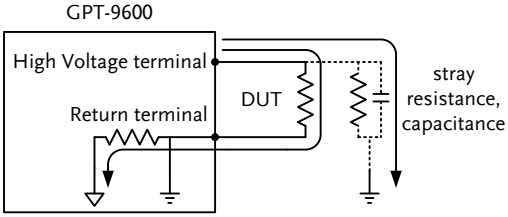
For ACW and DCW tests, the GROUND MODE is always set to ON. In the ON setting, the GPT-9600 grounds the return terminal to the ground. This mode is best for DUTs that are grounded to an earth ground by their chassis, fixtures or operation environment. This mode measures the potential of the HIGH VOLTAGE terminal with respect to earth ground. This means that any stray capacitance/resistance that leaks to earth ground will also be measured.

Example

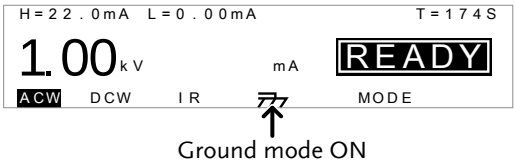
GROUND MODE = ON, DUT grounded



GROUND MODE = ON, DUT floating



Ground Mode Icon for ACW or DCW tests



IR Grounding Mode Information

Background

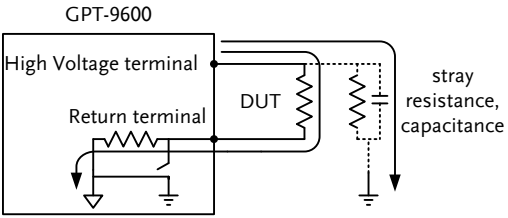
For IR tests the GROUND MODE is always set to OFF. Here, the return terminal is floating with respect to the earth ground. This mode is for DUTs that are floating and not directly connected to an earth ground. In this mode any stray capacitance/resistance that leaks to the earth ground from the DUT side of the testing circuit and will not be measured.

Warning

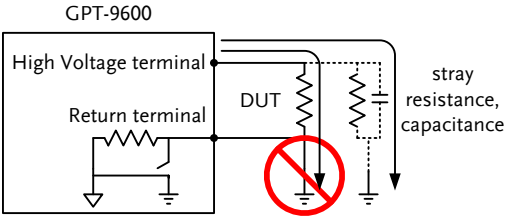
When GROUND MODE is set to OFF, the DUT, fixtures or connected instrumentation cannot be grounded. This will short circuit the internal circuitry during a test.

Example

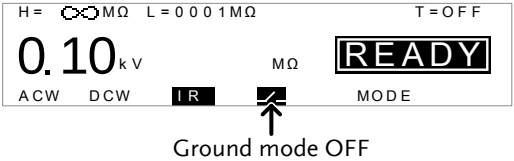
GROUND MODE = OFF, DUT floating



GROUND MODE = OFF, DUT grounded



Ground Mode
Icon for IR tests



ACW, DCW and IR Testing

This section describes how to create, edit and run a single ACW, DCW or IR safety test. Each setting described in this chapter only applies to the selected test mode – For example the test time setting for an ACW test is different to the DCW and IR test time settings.

- Setting the Test Function→ from page 34.
- Editing the Test Settings → from page 34.
- Setting the Upper and Lower Limits → from page 35.
- Setting the Test Time (Timer) → from page 37.
- Setting the ARC Mode → from page 39.
- Saving and Exiting EDIT Status→ from page 41.
- Setting the Test Voltage and Running a Test → from page 42.
- PASS/FAIL Test Judgments → from page 45.
- Auto Mode Testing → from page 49.
- PASS/FAIL Test Judgments for Auto Mode → from page 52.

Before operating the GPT-9600 please read the safety precautions as outlined in the Set Up chapter on page 18.

Setting the Test Function

Background

There are three test functions, AC Withstand, DC Withstand and Insulation Resistance.

Steps

1. To choose the test function, press the ACW, DCW or IR soft-keys when the tester is in the READY or EDIT status.

2. The test function soft-key is highlighted.

Edit Test Settings

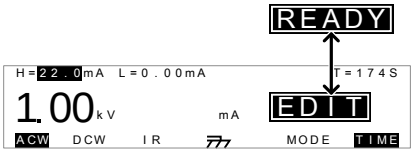
Background

To edit any test settings, the tester must be in EDIT status.

Any settings or parameters that are edited only apply to the currently selected test function.

Steps

1. Press the EDIT key when in READY status to enter the EDIT status. This will enter the EDIT status for the current test function.



2. The Status changes from READY to EDIT.

Note

Pressing the SAVE key will save the settings for the current test function and return back to READY status.

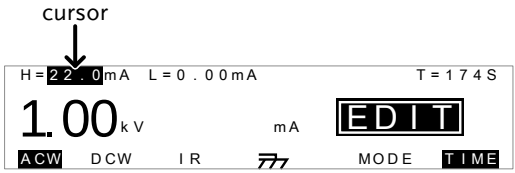
Setting the Upper and Lower Limits

Background

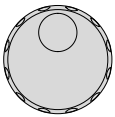
There is both L (low) and H (high) judgment settings. When the measured value is below the L setting, the test will be judged as FAIL. When the value exceeds the H setting the test will be judged as FAIL. Any measurement between the L and H setting is judged as PASS. The L limit cannot be made greater than the H limit.

Steps

1. Press the FIELD soft-key to bring the cursor to the H setting or the L setting when in the EDIT status.

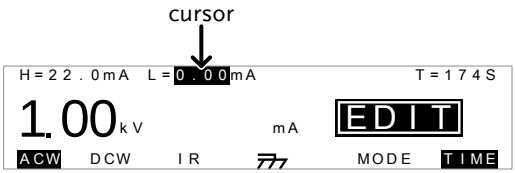


2. Use the scroll wheel to set the H limit*.

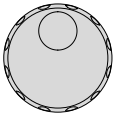


ACW (H)	0.01mA~22.0mA
DCW (H)	0.01mA~6.00mA
IR (H)	0002MΩ~∞Ω

3. Press the FIELD soft-key to bring the cursor to the L setting or the H setting.



4. Use the scroll wheel to set the H/L limit*.



ACW (L)	0.00mA~21.9mA
DCW (L)	0.00mA~5.99mA
IR (L)	0001MΩ ~ 2000MΩ

Note

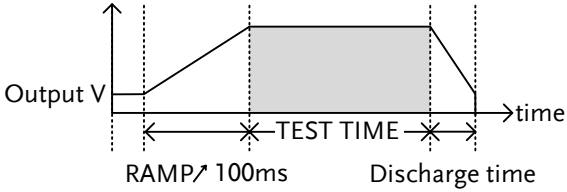
The L limit cannot be greater than the H limit.

When setting the current, be aware that a maximum of 100VA can be set for ACW and 25W for DCW.

Setting the Test Time (Timer)

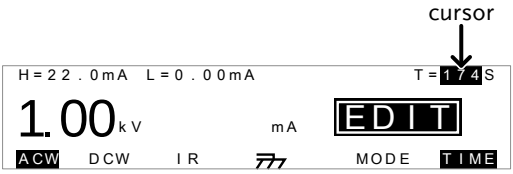
Background

The TIMER setting is used to set the test time for the test. The test time determines how long to run the test at the test voltage. This test time does not include the Ramp up time (fixed at 100ms) or initial start time. The test time can be set from 001 seconds to 180 seconds for ACW, DCW and IR tests, with a resolution of 1 second for all modes. The timer can also be turned off. The total discharge time depends on the DUT and is not specified.

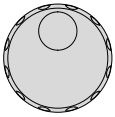


Steps

1. When in the EDIT status, press the FIELD key to bring the cursor to the T setting.



2. Use the scroll wheel to set the T value*.



Range 001s~180s

Note

*Note that the T value cannot be edited with the scroll wheel if it is set to OFF. See below to toggle the test time on or off.

When the output current exceeds 15mA, AC withstanding tests cannot be continuously performed without a cool down period between tests. For 15mA≤I≤20mA, the cool down period must equal or exceed the test time. See the AC Withstanding specifications on page 71 for details.

Turning the test time off.

The test time (T setting) can be turned on or off. When turned off, a test will run indefinitely until the test has failed or is stopped by the user.

Press the TIME soft-key to toggle the test time (T setting) on or off.

Setting the ARC Mode

Background

ARC detection, otherwise known as flashover detection, detects fast voltage or current transients that are not normally detected. Arcing is usually an indicator of poor withstanding insulation, electrode gaps or other insulating problems that cause temporary spikes in current or voltage during ACW.

There are three ARC detection settings: OFF, ON AND CONTINUE, ON AND STOP.
The ON AND CONTINUE setting will detect arcs over the ARC current level and continue the test, the ON AND STOP setting will stop the test when an arc is detected.

ARC mode settings only apply to ACW and DCW tests.

Steps

1. Press the UTILITY key on the front panel when the tester is in EDIT status. The tester will go to the TEST Utility.

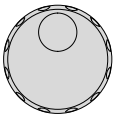
```
TEST UTILITY
ARC    MODE : OFF
FREQUENCY : 60HZ
```

Note

The TEST utility applies to the ACW and DCW test functions only.

2. Use the FIELD key to move to the ARC MODE setting.

3. Use the scroll wheel to set the ARC mode.



ARC MODES: OFF, ON AND CONTINUE, ON AND STOP

4. Press the SAVE key to save and exit the TEST Utility and go back to EDIT status.

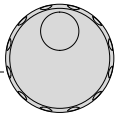
Note

The ESC key can be pressed at any time in the Utility menu to cancel and exit.

5. If the ARC MODE was set to either ON AND CONTINUE, or ON AND STOP, the ARC current level will now appear on the display and can be edited.

6. Use the FIELD key to move the cursor to the ARC setting.

7. Use the scroll wheel to edit the ARC level.



ACW	1.00mA~40.0mA
DCW	1.00mA~12.0mA

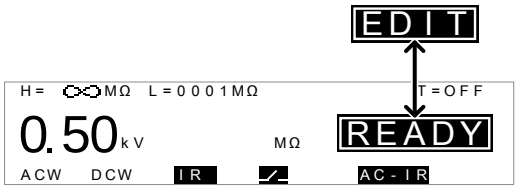
Saving and Exiting EDIT Status

Background

After all test parameters have been set, the test can be saved.

Steps

1. When in EDIT status, press the SAVE key to save the test.



2. The Status changes from EDIT to READY.

Note

Pressing the SAVE key again will return the tester back to EDIT status for the current test.

Setting the Test Voltage and Running a Test

Background

The test voltage can be set when the tester is in the READY status. After the test voltage has been set, the test can then be run.

Note

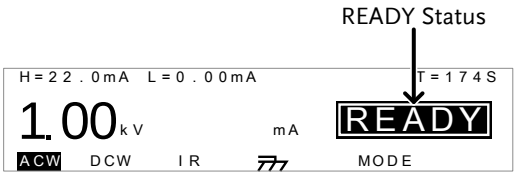
The tester cannot start to run a test under the following conditions:

- The INTERLOCK function is ON and the Interlock key is not inserted in the signal I/O port (page 56).
- The STOP signal has been received remotely.

If Double Action is ON, ensure the START button is pressed immediately after the STOP button (<0.5s). See page 56.

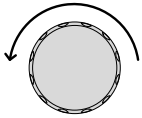
Steps

1. Connect the DUT to the tester. Page 29
2. Ensure the tester is in READY status and that all the testing parameters have been set for the test. From Page 30



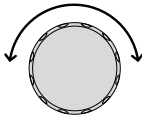
3. The READY indicator will be lit blue when in the READY status.

4. For ACW and DCW tests, turn the scroll wheel to set the desired test voltage.



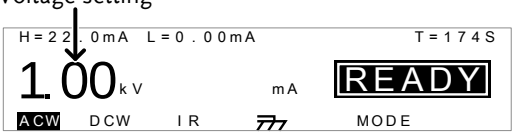
Range 0.1kV ~ 5.0kV(ACV)/6.0kV(DCV)

5. For IR tests, turn the scroll wheel to set the voltage to one of five settings.

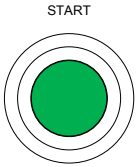


Range 50V, 100V, 250V, 500V, 1000V

Voltage setting



6. Press the START button. The test starts automatically and the tester goes into the TEST status.



7. The TEST indicator will be lit orange when in the TEST status.

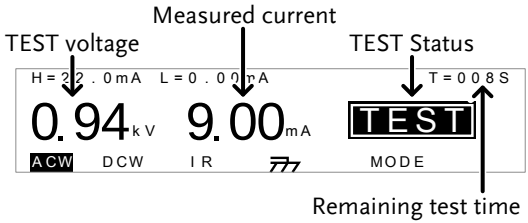
8. The test will start by showing the remaining test time. The test will continue until the test is finished or the test is stopped.

Note

ACW and DCW mode can also edit the test voltage when a test is running.

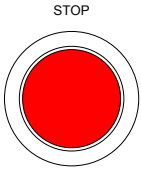
Conversely, IR tests cannot edit the test voltage when a test is running.

Example



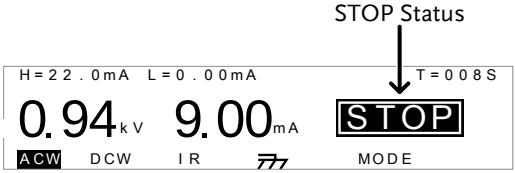
Stop the Test

9. To stop the test at any time when it is running, press the STOP button. The test will stop immediately. When the STOP button is pressed, a judgment is not made on the test.

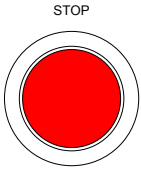


All panel keys except the STOP button are locked when the tester is in STOP status.

Example



10. To put the tester back into READY status, press the STOP button again.



Note

Do not touch any terminals, test leads or any other connections when the test is on.

PASS / FAIL Test Judgments

Background

If the test is allowed to run to completion (the test is not stopped or a protection setting is not tripped) then the tester will judge the test as either PASS or FAIL.

Note

The test will be judged PASS when:

- The H and L limits (high and low limits) have not been tripped during the test time.

The test will be judged FAIL when:

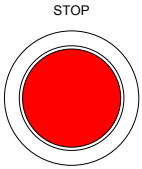
- Either the H or L limit has been tripped during the test time.
- The ARC current limit has been tripped during a test (if enabled).

PASS Judgment

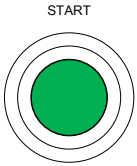
1. When the test is judged as PASS, PASS will be displayed, the buzzer will sound once and the PASS indicator will be lit green.

2. The PASS judgment will be held on the display until the STOP or START button is pressed.

Pressing the STOP button will return the tester to the READY status.



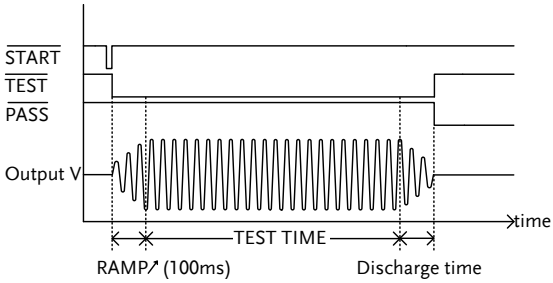
Pressing the START button will restart the test again.



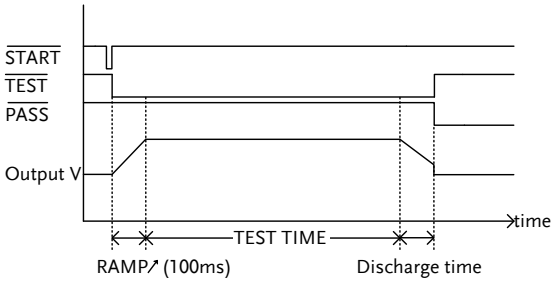
PASS Timing Diagrams

The timing diagrams below show the ACW, DCW and IR timing for the START status, TEST status and PASS judgment.

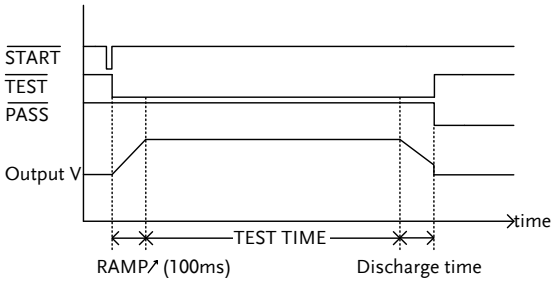
ACW PASS Timing



DCW PASS Timing



IR PASS Timing

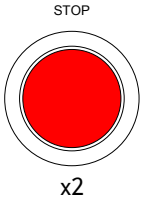


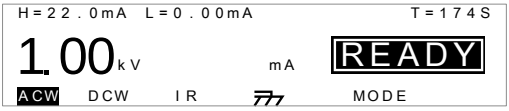
FAIL Judgment

1. When the test is judged as FAIL, FAIL will be displayed, the buzzer will sound and the FAIL indicator will be lit red.

As soon as a test is judged FAIL, the output is cut from the terminals.

2. The FAIL judgment will be held on the display until the STOP button is pressed twice. Pressing the STOP button once will stop the buzzer, pressing the STOP button again will return the tester to the READY status.

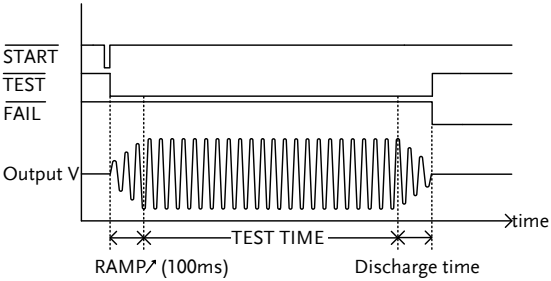




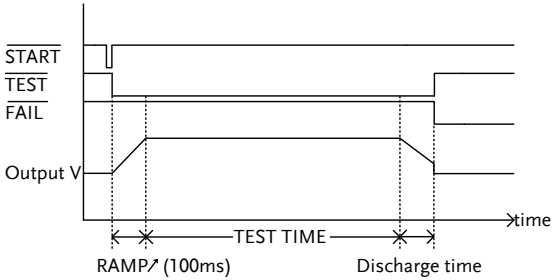
FAIL Timing Diagrams

The timing diagrams below show the ACW, DCW and IR timing for the START status, TEST status and FAIL judgment.

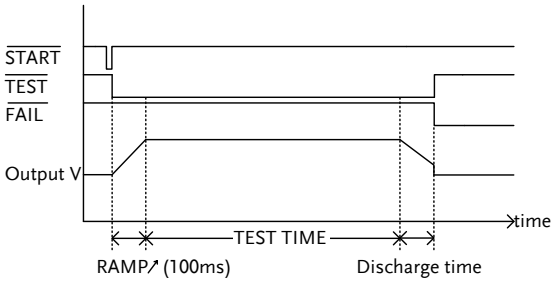
ACW FAIL Timing



DCW FAIL Timing



IR FAIL Timing



Auto Mode Testing

Background

The Auto Mode function allows you to run two test functions back to back automatically. Only after both tests have run will a PASS/FAIL judgment be determined on the tests.

Steps

1. Connect the DUT to the tester. Page 29

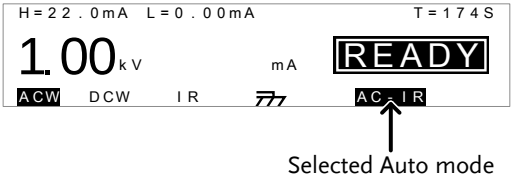
2. Ensure the tester is in READY status and that *all the testing parameters have been set for both the tests** that you wish to run in Auto Mode. From Page 33

3. Press the Mode key to toggle between each of the Auto Modes.

Each mode indicates the order that the tests will execute in. For example:
IR-DC indicates that an IR test will be followed by a DCW test.

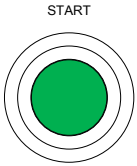
Range: MODE, AC-IR, IR-AC, DC-IR, IR-DC

Note: MODE is the default setting which only runs a single test a time.



4. The Auto Mode function is now ready to test two tests in succession.

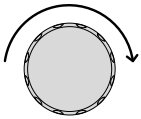
5. With the tester in READY status, press the START button. The test starts the first test and goes into the TEST status for the first test.



6. The TEST indicator will be lit orange when in the TEST status.

7. The first test will start by showing the remaining test time.

8. For ACW or DCW tests, the scroll wheel can be used to edit the test voltage when the tester is in the TEST status.



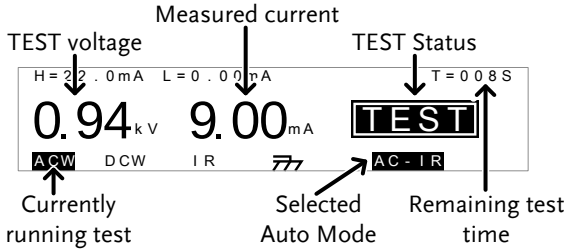
ACW	0.10kV ~ 5.0kV
DCW	0.10kV ~ 6.0kV

9. The test will continue until the test time runs down or the test is stopped. When the test time ends, the tester will automatically go onto the second test.

   Like the first test, the second test will show the remaining test time and will continue until the test time runs out or the test is stopped.

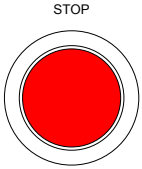
   If both tests run to completion, each test will be judged as a PASS or a FAIL, see page 52 for details.

Example



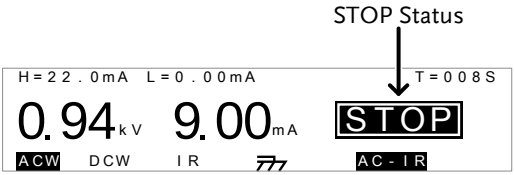
Stop the Test

10. To stop the tests at any time when they are running, press the STOP button. Testing will stop immediately. When the STOP button is pressed, a judgment is not made on the current test. If a test has already been run, its judgment is still valid.

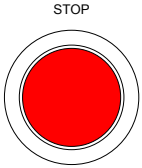


All panel keys except the STOP button are locked when the tester is in STOP status.

Example



11. To put the tester back into READY status, press the STOP button again.



Note

Do not touch any terminals, test leads or any other connections when the test is on.

PASS / FAIL Test Judgments for Auto Mode

Background

The test results for the Auto Mode testing are identical as the results from a single test, however:

- If one of the tests fails, then the FAIL judgment for that test will be shown on the display, even if the other test is judged as PASS.
- Only one test result can be viewed at any one time.

Note

A test will be judged PASS when:

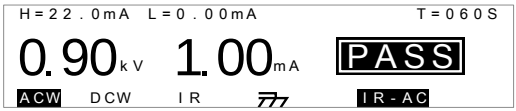
- The H and L limits (high and low limits) have not been tripped during the test time.

A test will be judged FAIL when:

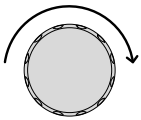
- Either the H or L limit has been tripped during the test time.
- The ARC current limit has been tripped during a test (if enabled).

View Test Results~PASS

1. When both tests are judged as PASS, PASS will be displayed for the last test, the buzzer will sound once and the PASS indicator will be lit green.

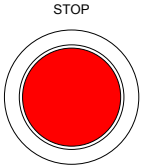


2. Turn the scroll wheel left to view the first test result. Turn the scroll wheel back to the right to view the last test result again.

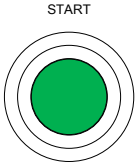


3. The PASS judgment will be held on the display until the STOP or START button is pressed.

   Pressing the STOP button will return the tester to the READY status.



   Pressing the START button will restart the tests again.



FAIL Judgment

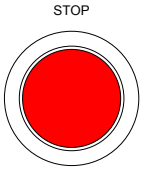
4. After both tests have finished, if any or both of the tests are judged as FAIL, the output will be cut from the terminals, FAIL will be displayed on the screen, the buzzer will sound and the FAIL indicator will be lit red.

Note

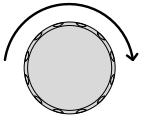
If both tests fail, then the last test will be shown on the display.

5. The FAIL judgment will be held on the display until the STOP button is pressed.

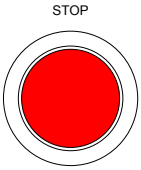
   Pressing the STOP button will turn the buzzer sound off and allow you to view the test results.

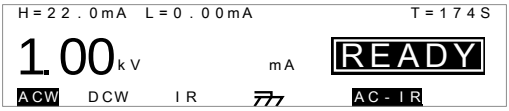


6. Turn the scroll wheel left to view the first test result and turn the scroll wheel back to the right to view the last test result again.



7. Pressing the STOP button again will return the tester to the READY status.





Timing Diagrams

The PASS/FAIL timing diagrams for the Auto Mode are same as those for single tests. See page 45 for PASS/FAIL judgments and timing diagrams.

Common Utility Settings

The Common Utility settings are system-wide settings that apply to all function tests.

The Common Utility menu includes the following settings:

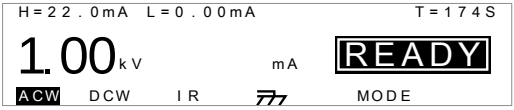
- LCD settings → from page 55.
- Control settings → from page 56.

LCD Settings

Description	The LCD settings include contrast and brightness controls.

Steps

1. Ensure the tester is in READY status.

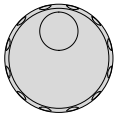


2. Press the UTILITY key.

3. Press the LCD soft-key to bring up the LCD Common Utility menu.

4. Press the FIELD key to choose a menu item: LCD Contrast, LCD Brightness.

5. Use the scroll wheel to select a parameter for the chosen menu item.



LCD Contrast	1(low) ~ 8(high)
LCD Brightness	BRIGHT, DARK

6. Press SAVE to save the settings and exit to READY status.

Note

The ESC key can be pressed at any time to cancel and exit back to READY status.

Control Settings

Description

The Control settings are accessed in the Common Utility menu. The Control settings include: Start Control, Double Action, Key Lock and Interlock.

Start Control is used to determine how a test is started. Tests can be started via the front panel (START/STOP buttons), from a remote controller or via the SIGNAL I/O port.

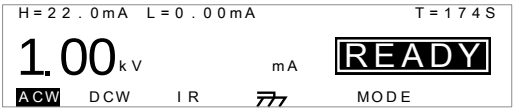
The Double Action function is a safety feature used to prevent accidentally starting a test. Normally to start a test, the START button is pressed when the tester is in the READY status. To start a test when Double Action is ON, the STOP button must first be pressed, followed by the START button within 500ms.

Key Lock disables the front panel keys from changing the test function or testing parameters. Only the Utility menu and any keys required for testing are not disabled.

The Interlock function is a safety feature. The interlock function prevents a test from running, unless the interlock pins on the signal I/O port connector are shorted. The included interlock key can be used for this purpose. See page 65 for details.

Steps

1. Ensure the tester is in READY status.

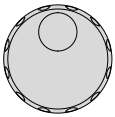


2. Press the UTILITY key.

3. Press the CTRL soft-key to bring up the Control Common Utility menu.

4. Press the FIELD key to choose a menu item: Start Ctrl, Double Action, Key Lock or INTERLOCK.

5. Use the scroll wheel to select setting for the chosen menu item.



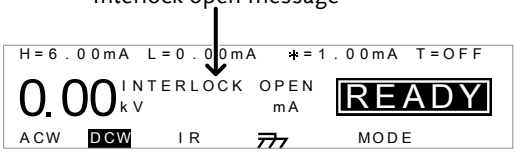
Start Ctrl	FRONT PANEL, REMOTE CONNECT, SIGNAL IO
Double Action	ON, OFF
Key Lock	ON, OFF
INTERLOCK	ON, OFF

6. Press SAVE to save the settings and exit to READY status.

Note

If a test is started with INTERLOCK ON, but the interlock signal I/O pins are not shorted (either with the included interlock key or manually), the INTERLOCK OPEN message will be displayed, preventing the test from starting.

Interlock open message



EXTERNAL CONTROL

The External Control chapter covers the REMOTE terminal and the SIGNAL I/O port.

External Control Overview 60
Remote Terminal Overview 60
Remote Controller Operation 61
SIGNAL I/O Overview 62
Using the SIGNAL I/O to Start/Stop Tests 64
Using the Interlock Key 65

External Control Overview

The External Control section describes the front panel REMOTE terminal connection and the rear panel SIGNAL I/O port.

Remote Terminal Overview

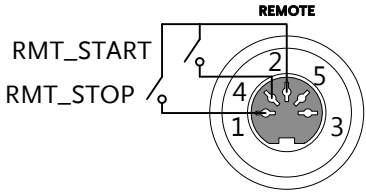
Overview

The REMOTE terminal connector is a standard 5-pin DIN terminal suitable for a remote controller.

WARNING

Keep any cables that are connected to the REMOTE terminal away from the HIGH VOLTAGE and RETURN terminals.

Pin Assignment and Connection



Pin	Pin name	Description
1	RMT_STOP	Remote Stop signal
2	COM	Common line
3	Not used	
4	RMT_START	Remote Start signal
5	Not used	
Signal Properties		
High level input voltage		2.4V~3.3V
Low level input voltage		0~0.8V
Input period		minimum of 1ms

Remote Controller Operation

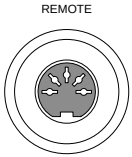
Description

The GPT-9600 accepts external remote controllers with a START and STOP button. To use the REMOTE terminal, the GPT-9600 must first be configured to accept a remote controller.

Operating a remote controller is the same as operating the START and STOP buttons on the front panel.

Steps

1. Insert the lead of remote controller into the REMOTE terminal.



2. Configure the Start Ctrl option to REMOTE CONNECT in the Common Utility menu. Page 56

3. The tester will now only be able to start a test using a remote controller.

NOTE

Even if the GPT-9600 is configured to use the REMOTE CONNECT option, the STOP button on the front panel can still be used to stop a test.

4. To return the operation control to the front panel, configure the Start Ctrl option to FRONT PANEL. Page 56

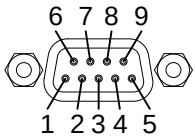
SIGNAL I/O Overview

Overview

The SIGNAL I/O port can be used to remotely start/stop tests and monitor the test status of the instrument. The SIGNAL I/O port is also used for the interlock function (page 56).

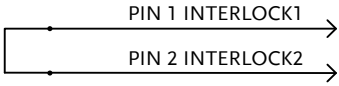
The SIGNAL I/O port uses a DB-9 pin female connector.

Pin Assignment

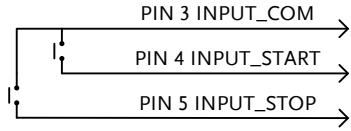


Pin name	Pin	Description
INTERLOCK1	1	When INTERLOCK is ON, a test is only allowed
INTERLOCK2	2	to start when both INTERLOCK pins are shorted.
INPUT_COM	3	Common input line
INPUT_START	4	Start signal input
INPUT_STOP	5	Stop signal input
OUTPUT_TEST	6	Indicates that a test is in progress
OUTPUT_FAIL	7	Indicates that a test has failed
OUTPUT_PASS	8	Indicates that a test has passed
OUTPUT_COM	9	Common output line

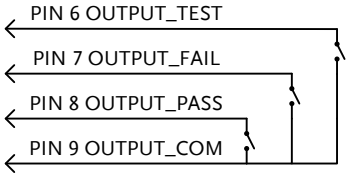
Interlock connection



Input Connection



Output Connection



Signal Properties

Input Signals	
High level input voltage	5V ~ 32V
Low level input voltage	0V ~ 1V
Low level input current	Maximum of -5mA
Input period	Minimum of 1ms
Output Signals	
Output Type	Relay form A
Output Rated Voltage	30VDC
Maximum output current	0.5A

Using the SIGNAL I/O to Start/Stop Tests

Background	To use the SIGNAL I/O port the Start Ctrl settings have to be set to SIGNAL I/O in the Common Utility menu.
Panel operation	1. Set the Start Ctrl option to SIGNAL I/O. Page 56 2. Connect the Input/Output signals to the SIGNAL I/O port. 3. To start the testing, short the INPUT_STOP and INPUT_COM line for a minimum of 1ms to put the tester into READY status. 4. To start the testing, short the INPUT_START and INPUT_COM lines for a minimum of 1ms. 5. To stop the testing, temporarily short the INPUT_STOP and INPUT_COM line again.
NOTE	Even if the GPT-9600 is configured to use the SIGNAL I/O interface, the STOP button on the front panel can still be used to stop a test.

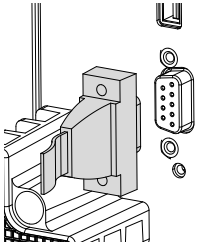
Using the Interlock Key

Background

When the INTERLOCK function is set to ON, tests are only allowed to start when both Interlock pins on the signal I/O port are shorted. Using the Interlock key will short the INTERLOCK1 and INTERLOCK2 pins on the signal I/O port.
See page 62 for the Signal I/O pin assignment.

Panel operation

1. Insert the Interlock key into the SIGNAL I/O port on the rear panel.



2. Set the INTERLOCK option to ON in the Common Utility. Page 56

Note

With INTERLOCK set to ON, the tester can now only start a test when the Interlock key is connected. Do not remove the interlock after starting a test. It must be connected after a test has started or is running.

Set INTERLOCK to OFF to disable this feature.

FAQ

- The tester will not turn on.
- The panel keys are not working.
- When I press the START button the tester will not start testing.
- The accuracy does not match the specification.

The tester will not turn on.

Ensure the power cord is connected. Check to make sure the fuse is not blown. See page 68.

The panel keys are not working.

Ensure the tester is not in SIGNAL I/O or Remote Connect mode, page 56.

When I press the START button the tester will not start testing?

The tester must first be in the READY status before a test can be started. Ensure the tester displays READY before pressing the START button, page 42.

If "Double Action" is enabled, the START button must be pressed within 0.5 seconds after the STOP button is pressed, otherwise the tester will not start testing. See the Control Settings section on page 56.

If “Interlock” is enabled, the interlock key must be inserted into the signal I/O port on the rear panel before a test can be started. See page 65 for details.

Lastly, ensure that the Start Ctrl setting is correctly configured in the Common Utility menu. For example, to enable the START button to start a test, ensure that the Start Ctrl setting is set to FRONT PANEL. See page 56 for details.

The accuracy does not match the specification.

Make sure the tester is powered on for at least 30 minutes, within +15°C~+35°C. This is necessary to stabilize the unit to match the specification.

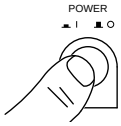
For more information, contact your local dealer or GWInstek at www.gwinstek.com / marketing@goodwill.com.tw.

APPENDIX

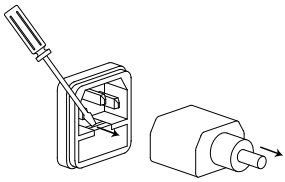
Fuse Replacement

Steps

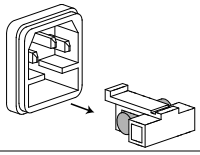
1. Turn the instrument off.



2. Remove the fuse socket using a flat screwdriver.



3. Replace the fuse in the fuse holder.



Fuse Rating T 4A, 250V

Error Messages

Test Errors

The following error messages or messages may appear on the GPT-9600 screen when configuring or running tests.

Error Messages	Description
I ERR	For ACW, DCW tests. Shown when the current is set too high.
SHORT	Voltage is too low. Indicates that the DUT could be shorted.
V ERR	For ACW, DCW and IR tests. Indicates that the voltage is too high.
R ERR	For IR tests. Resistance=0Ω. Check to see whether the DUT or test lead is shorting.
TIME ERR	For ACW tests. TIME ERR is displayed when the H setting is ≥15~20mA if the TIME setting is OFF.
OVER 25W	For DCW tests. OVER 25W is displayed if the H setting multiplied by the voltage setting is greater than 25W.

GPT-9600 Specifications

The specifications apply when the GPT-9600 is powered on for at least 30 minutes at 15˚C~35˚C.

Specifications

Environment

Range	Temperature	Humidity
Warranty	15˚C ~ 35˚C	≤70% (No condensation)
Operation	0˚C ~ 40˚C	≤70% (No condensation)
Storage	-10˚C ~ 70˚C	≤85% (No condensation)
Installation Location	Indoors at an amplitude of up to 2000m.	

AC Withstanding Voltage

Output Voltage Range	0.10kV~ 5.00kV
Output Voltage Resolution	10V
Maximum Rated Load	100 VA (5kV/20mA)
Maximum Rated Current	20mA 0.01mA ~ 5mA(0.1kV≤V≤0.5kV) 0.01mA ~ 20mA(0.5kV<V≤5kV)
Output Voltage Waveform	Sine wave
Frequency	50 Hz / 60 Hz
Voltage Regulation	± 1.5%+2 counts [Maximum rated load → no load]
Output Voltage Accuracy	± (1.5% of setting +2 counts)with no load
Voltmeter Accuracy	± (1.5% of reading+ 2 counts)
Current Measurement Range	0.01mA~20.0mA
Current Best Resolution	10uA 0.01mA(0.01mA~9.99mA) 0.1mA(10.0mA~20.0mA)
Current Measurement Accuracy	± 2% of reading + 5 counts when I <1.00mA ± 2% of reading + 3 counts when I ≥1.00mA
Current Judgment Accuracy	± 3% of setting + 5 counts when I <1.00mA ± 3% of setting + 3 counts when I ≥1.00mA
Window Comparator Method	Yes
ARC DETECT	Yes
RAMP (Ramp Time)	0.1S fixed
TIMER (Test Time)	OFF, 1S~180S
GND	ON
Judgment Valid Range	H/L Setting: 0.10mA to 9.99mA 10.0mA to 20.1mA

Continued…

Output Limitation for Withstanding Voltage Testing	Upper Current	Pause	Output Time
	15mA≤I≤20mA	At least as long as the output time	Maximum 180 seconds
	0.01mA≤I<15mA	Not necessary	Continuous output possible

DC Withstanding Voltage

Output Voltage Range	0.10kV~ 6.00kV
Output Voltage Resolution	10V
Maximum Rated Load	25W (5kV/5mA)
Maximum Rated Current	6mA 0.01mA ~ 2mA (0.1kV≤V≤0.5kV) 0.01mA ~ 6mA (0.5kV<V≤6kV)
Voltmeter Accuracy	±(1.5% of reading + 2 counts)
Output Voltage Accuracy	±(1.5% of setting + 2 counts) with no load
Voltage Regulation	± 1.5% +2 counts [Maximum rated load → no load]
Current Measurement Range	0.01mA~6.00mA
Current Best Resolution	10uA 0.01mA(0.01mA~6.00mA)
Current Measurement Accuracy	± 2% of reading + 5 counts when I <1.00mA ± 2% of reading + 3 counts when I ≥1.00mA
Current Judgment Accuracy	± 3% of setting + 5 counts when I <1.00mA ± 3% of setting + 3 counts when I ≥1.00mA
Window Comparator Method	Yes
ARC DETECT	Yes
RAMP (Ramp Time)	0.1S fixed
TIMER (Test Time)	OFF, 1S~180S
GND	ON
Judgment Valid Range	H/L Setting: 0.10mA to 6.00mA

Insulation Resistance Test

Output Voltage	50V, 100V, 250V, 500V, 1000V	
Output Voltage Accuracy	±(3% of setting+1 count) with no load	
Resistance Measurement Range	1MΩ ~ 2000MΩ	
Test Voltage	Measurement Range	Accuracy
50V/100V/250	1 ~ 50MΩ	±(5% of reading + 2MΩ)
	51~2000MΩ	±(10% of reading + 2MΩ)
500V/1000V	1 ~ 500MΩ	±(5% of reading + 2MΩ)
	501~2000MΩ	±(10% of reading + 2MΩ)
Voltmeter accuracy	±(3% of reading + 1 count)	

Continued…

Voltage Regulation	±1.5% + 2 counts [Maximum rated load → no load]
Window Comparator Method	Yes
RAMP (Ramp Time)	0.1S fixed
TIMER (Test Time)	OFF, 1S~180S
GND	OFF
Output Impedance	600kΩ

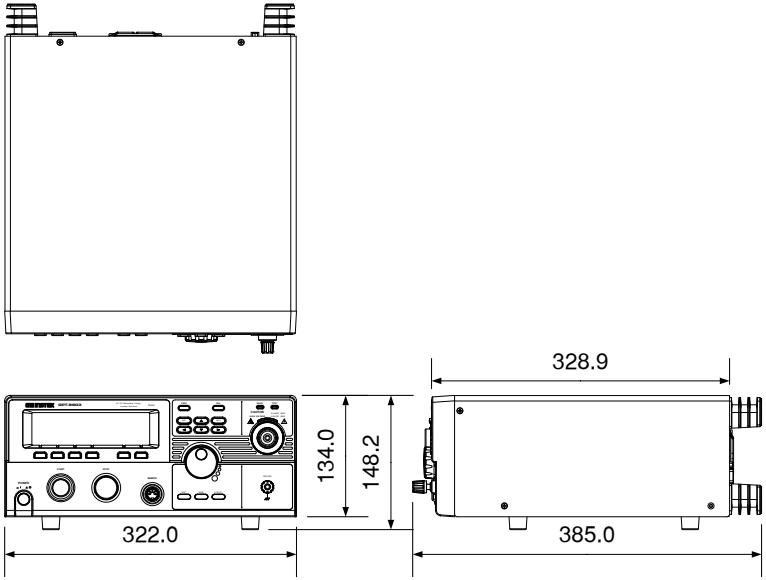
Interface

REMOTE (Remote terminal)	Yes
SIGNAL IO	Yes

General

DISPLAY	240 x 48 dot matrix LED back light LCD
AUTO MODE	AC-IR / IR-AC / DC-IR / IR-DC
POWER SOURCE	AC 100V-120V/220V-240V ±10% 50Hz/60Hz
ACCESSORIES	Power cord x1, Quick Start Guide x1 User Manual x1 (CD) GHT-114x1
DIMENSIONS & WEIGHT	Approx. 330(W) x 148(H) x 385(D) mm (Max.), 9kg(Max)

GPT-9600 Dimensions



Declaration of Conformity

We

GOOD WILL INSTRUMENT CO., LTD.
No. 7-1, Jhongsing Rd, Tucheng Dist., New Taipei City 236, Taiwan

GOOD WILL INSTRUMENT (SUZHOU) CO., LTD.
No. 69 Lushan Road, Suzhou New District Jiangsu, China.

declare that the below mentioned product

Type of Product: Electrical Safety Tester
Model Number: GPT-9603, GPT-9602, GPT-9612, GPT-9601
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 (2004/108/EC) and Low Voltage Directive (2006/95/EC).
For the evaluation regarding the Electromagnetic Compatibility and Low Voltage Directive, the following standards were applied:

◎ **EMC**	
EN 61326-1 EN 61326-2-1	Electrical equipment for measurement, control and laboratory use –– EMC requirements (2013)
Conducted Emission Radiated Emission EN55011: 2009+A1: 2010	Electrostatic Discharge EN 61000-4-2: 2009
Current Harmonics EN 61000-3-2: 2006+A1:2009 +A2:2009	Radiated Immunity EN 61000-4-3: 2006 +A1:2008 +A2:2010
Voltage Fluctuations EN 61000-3-3: 2008	Electrical Fast Transients EN 61000-4-4: 2012
----------	Surge Immunity EN 61000-4-5: 2006
----------	Conducted Susceptibility EN 61000-4-6: 2009
----------	Power Frequency Magnetic Field EN 61000-4-8: 2010
----------	Voltage Dip/ Interruption EN 61000-4-11: 2004

Low Voltage Equipment Directive 2006/95/EC	
Safety Requirements	EN 61010-1: 2010 EN 61010-2-030: 2010

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