Electrical Safety Tester

GPT-9800 Series

CALIBRATION MANUAL

GW INSTEK PART NO.

ISO-9001 CERTIFIED MANUFACTURER

GW INSTEK

The information in this manual was correct at the time of printing. However, Good Will continues to improve products and reserves the rights to change specification, equipment, and maintenance procedures at any time without notice.

Good Will Instrument Co., Ltd.
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Table of Contents

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 GPT-9800.

⚠ 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 GPT-9800 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 GPT-9800. • Avoid severe impact or rough handling that leads to damaging the GPT-9800. • Do not discharge static electricity to the GPT-9800. • Use only mating connectors, not bare wires, for the terminals. • Do not block the cooling fan opening. • Do not disassemble the GPT-9800 unless you are qualified. (Measurement categories) EN 61010-1:2010 specifies the measurement categories and their requirements as follows. the GPT falls under category I. • 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. • Measurement category I is for measurements performed on circuits not directly connected to Mains.
Power Supply ⚠ WARNING	• AC Input voltage range: 100/120/220/230VAC ±10% • Frequency: 50Hz/60Hz • To avoid electrical shock connect the protective grounding conductor of the AC power cord to an earth ground.
Cleaning the GPT-9800	• 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-9800 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.

EC Declaration of Conformity

We
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No. 7-1, Jhongsing Rd, Tucheng Dist., New Taipei City 236, Taiwan

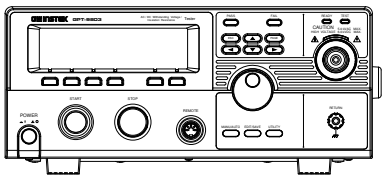
GOOD WILL INSTRUMENT (SUZHOU) CO., LTD.
No. 69 Lushan Road, Suzhou New District Jiangsu, China.
declare that the below mentioned product
Type of Product: Electrical Safety Tester
Model Number: GPT-9801, GPT-9802, GPT-9803, GPT-9804
are herewith confirmed to comply with the requirements set out in the 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 (2006)
Conducted Emission Radiated Emission EN55011: 2009+A1: 2010	Electrostatic Discharge EN 61000-4-2: 2009
Current Harmonics EN 61000-3-2: 2006+A2:2009	Radiated Immunity EN 61000-4-3: 2006 +A2:2010
Voltage Fluctuations EN 61000-3-3: 2008	Electrical Fast Transients EN 61000-4-4: 2004 +A2:2010
----------	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

Overview

The Overview chapter helps service engineers become familiar with the GPT-9800 series and this service manual by introducing their structures including series lineup, panel overview, and specification. Read the Document Overview section to get a perspective of how this service manual is organized, and to go directly to the chapter that describes the operation service engineers need.



Document Overview

This document consists of the following chapters.

Safety Instruction	Describes the important safety instructions that must be followed before, during, and after operating the instrument.
Overview	Helps service engineers become familiar with the GPT-9800 series and this calibration manual, by introducing the overall structure of the instrument including the series lineup, panel overview, and specifications.
Preparation	The preparation chapter shows what equipment and items are needed for calibration and the preliminary procedures required to prepare for calibration.
Calibration/ Verification	Describes how to calibrate and verify the GPT-9800 using the built-in calibration menu.

GPT-9800 Series Lineup

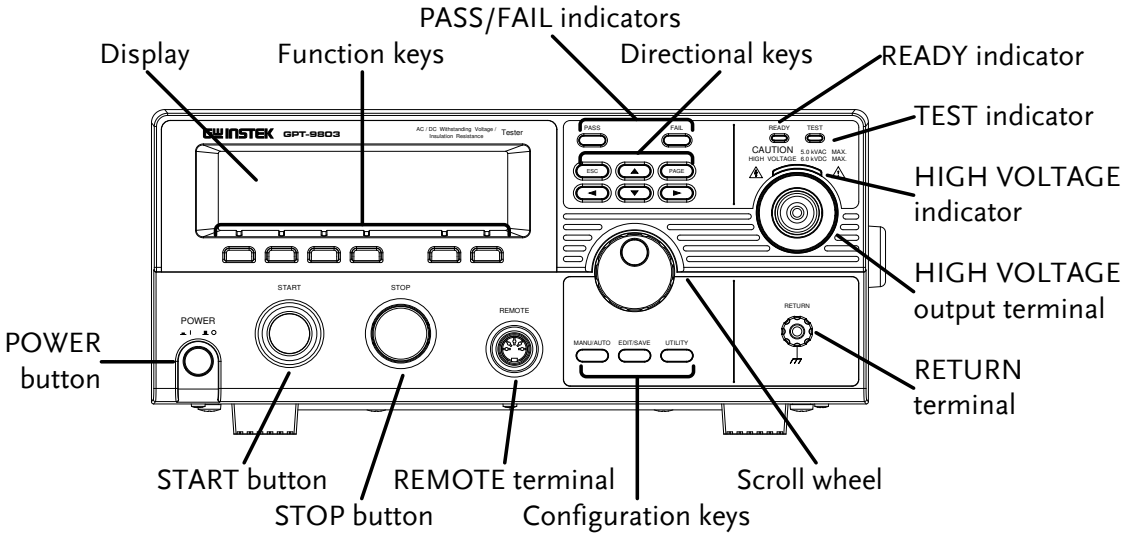
The GPT-9800 Series Safety Testers are AC/DC withstanding voltage, insulation resistance and ground bond safety testers. The GPT-9801 is an AC withstanding voltage tester, the GPT-9802 is an AC/DC withstanding voltage tester and the GPT-9803 is an AC/DC withstanding voltage and insulation resistance tester. The GPT-9804 includes all the functions of the other models as well as ground bond testing. All models can operate at up to 5kVAC for AC withstanding voltage testing. The GPT-9802, GPT-9803 and GPT-9804 can also operate at up to 6kVDC for DC withstanding voltage testing.

The GPT-9800 Series can store up to 100 manual tests, as well as run up to 16 manual tests sequentially as an automatic test, allowing the safety testers to accommodate any number of safety standards, including IEC, EN, UL, CSA, GB, JIS and others.

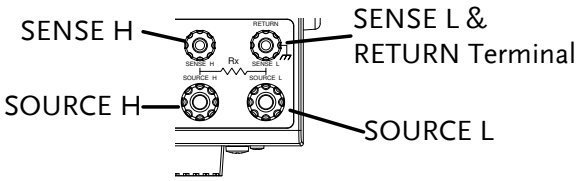
Model name	ACW	DCW	IR	GB
GPT-9801	✓			
GPT-9802	✓	✓		
GPT-9803	✓	✓	✓	
GPT-9804	✓	✓	✓	✓

Front/Rear Panel Overview

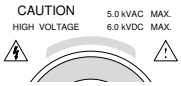
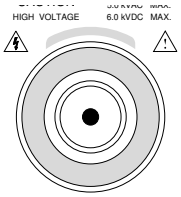
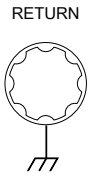
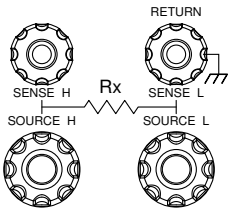
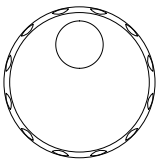
GPT-9801/9802/9803 Front Panel



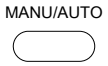
GPT-9804 Front Panel



Display	240 X 64 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 at the end of a manual test or automatic test.
ESC key	ESC	The ESC key is used to exit out of a menu or cancel a setting.
PAGE key	PAGE	The PAGE key is used to view automatic test information and test results.
Directional arrow keys	▲ ◄ ▼ ►	The directional arrow keys are used to navigate menus and parameter settings.

READY indicator		The READY indicator is lit when the tester is ready to begin testing. The STOP button is used to put the tester into READY status.
TEST indicator		The TEST indicator is lit when a test is on. The START button is used to put the tester into TEST status.
HIGH VOLTAGE indicator		The HIGH VOLTAGE indicator will light up when an 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 GPT-9801/9802 /9803		The RETURN terminal is the return terminal for all tests. For GB testing, the RETURN terminal is also the SENSE L terminal.
RETURN/ SENSE L, SENSE H, SOURCE L, SOURCE H terminal (GPT-9804)		The RETURN terminal is used for IR, DCW and ACW tests. For GB tests, it is used as the SENSE L terminal. SENSE H terminal for GB tests. GPT-9804 only. SOURCE L terminal for GB tests. GPT-9804 only. SOURCE H terminal for GB test. GPT-9804 only.
Scroll wheel		The scroll wheel is used to edit parameter values.
UTILITY key		Used to enter the MANU Utility or Common Utility menu.
EDIT/SAVE key		Used to start editing MANU/AUTO tests as well as save settings and parameters.

MANU/AUTO key

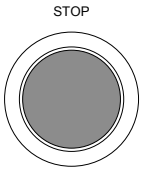


The MANU/AUTO key is used to select manual tests (MANU) or automatic tests (AUTO).

REMOTE terminal

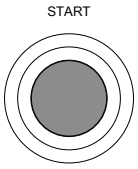
The REMOTE terminal is used to connect to a remote controller.

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.

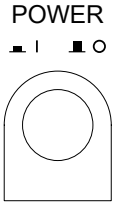
START button



The START button is used to start tests.

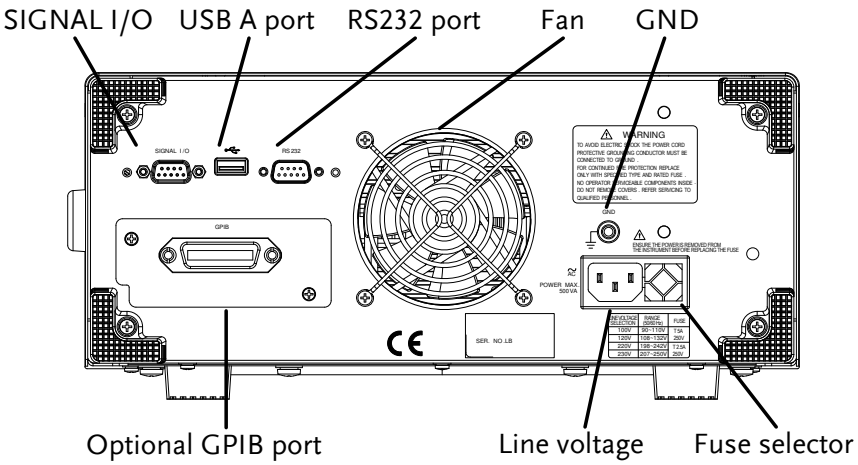
The START button can be used to start tests when the tester is in the READY status. Pressing the START button will put the tester in the TEST status.

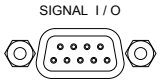
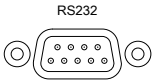
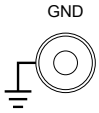
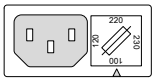
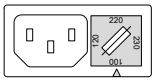
POWER switch



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

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.
USB A port		Used for remote control.
RS232 interface port		Used for remote control and firmware updates.
Fan		Exhaust fan.
GND		Connect the GND (ground) terminal to the earth ground.
Line voltage input		Line voltage input: 100/120/220/230VAC ±10%
Line voltage fuse		Line voltage selector and fuse: 100V/120V T5A 250V 220V/230V T2.5A 250V
Optional GPIB port		Optional GPIB interface for remote control.

GPT-9800 Specifications

The specifications apply when the GPT-9800 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	0.100kV~ 5.000kV
Output Voltage Resolution	2V
Output Voltage Accuracy	± (1% of setting +5V) with no load
Maximum Rated Load(Table1)	200 VA (5kV/40mA)
Maximum Rated Current	40mA 0.001mA ~ 10mA(0.1kV≤V≤0.5kV) 0.001mA ~ 40mA(0.5kV<V≤5kV)
Output Voltage Waveform	Sine wave
Frequency	50 Hz / 60 Hz
Voltage Regulation	± 1% +5V [Maximum rated load → no load]
Voltmeter Accuracy	± (1% of reading+ 5V)

Current Measurement Range	0.001mA~040.0mA
Current Best Resolution	1uA 0.001mA(0.001mA~0.999mA) 0.01mA(01.00mA~09.99mA) 0.1mA(010.0~040.0mA)
Current Measurement Accuracy	± (1.5% of rdg + 30 counts) when HI SET<1.00mA ± (1.5% of rdg + 3 counts) when HI SET≥1.00mA
Window Comparator Method	Yes
ARC DETECT	Yes
Rise-time Control Function	Yes
RAMP (Ramp Time)	0.1~999.9S
TIMER (Test Time)	OFF*, 0.5S~999.9S
GND	ON/OFF

* The timer can only be turned off under special MANU mode (MANU=***-000)

DC Withstanding Voltage

Output Voltage Range	0.100kV~ 6.000kV
Output Voltage Resolution	2V
Output Voltage Accuracy	± (1% of setting +5V) with no load
Maximum Rated Load(Table1)	50W (5kV/10mA)
Maximum Rated Current	10mA 0.001mA ~ 2mA (0.1kV≤V≤0.5kV) 0.001mA ~ 10mA (0.5kV<V≤6kV)
Voltmeter Accuracy	± (1% of reading+ 5V)

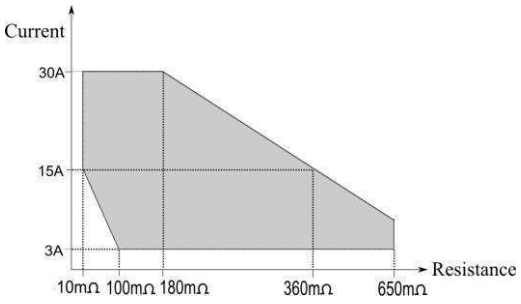
Voltage Regulation	± 1% +5V [Maximum rated load → no load]
Current Measurement Range	0.001mA~010.0mA
Current Best Resolution	1uA 0.001mA(0.001mA~0.999mA) 0.01mA(01.00mA~09.99mA) 0.1mA(010.0mA)
Current Measurement Accuracy	± (1.5% of reading +30uA)
Window Comparator Method	Yes
ARC DETECT	Yes
Rise-time Control Function	Yes
RAMP (Ramp Time)	0.1~999.9S
TIMER (Test Time)	OFF*, 0.5S~999.9S
GND	ON/OFF

* The timer can only be turned off under special MANU mode (MANU=***-000)

Insulation Resistance Test

Output Voltage	50V~1000V
Output Voltage Resolution	50V
Output Voltage Accuracy	(1% of setting+5V) with no load
Resistance Measurement Range	1MΩ~ 9500MΩ

Test Voltage	Measurement Range	Accuracy
50V≤V<500V	1~50MΩ	±(5% of reading +1MΩ)

	51~2000MΩ	±(10% of reading +1MΩ)
500V≤V≤1000V	1~500MΩ	±(5% of reading +1MΩ)
	501~9500MΩ	±(10% of reading +1MΩ)
Voltage Regulation	±1% +5V [Maximum rated load → no load]	
Window Comparator Method	Yes	
Rise-time Control Function	Yes	
RAMP (Ramp Time)	0.1~999.9S	
TIMER (Test Time)	1S~999.9S	
GND	OFF	
Ground Bond Test		
Output Current Range	03.00A~30.00A	
Output Current Accuracy	± (1% of reading +0.2A) when 3A≤I≤8A ± (1% of reading +0.05A) when 8A<I≤30A	
Output Current Resolution	0.01A	
Frequency	50Hz/60Hz selectable	
Ohmmeter Measurement Accuracy	± (1% of reading +2mΩ)	
Ohmmeter Measurement Range	10mΩ~650.0mΩ (depending on output current) 	
Test Voltage	Max. 6V(AC)open-circuit	

Ohmmeter Measurement Resolution	0.1mΩ
Windows Comparator Method	Yes
TIMER (Test Time)	0.5S~999.9S
GND	OFF
Interface	
REMOTE (Remote terminal)	Yes
SIGNAL IO	Yes
RS232	Yes
USB (Device)	Yes
GPIB	Yes (OPTION)
General	
DISPLAY	240 x 64 dot matrix LED back light LCD
MEMORY	AUTO/MANU mode 100 memory blocks total
POWER SOURCE	AC100V/120V/220V/230V ±10% 50Hz/60Hz
ACCESSORIES	Power cord x1, Quick Start Guide x1 User Manual x1 (CD) GHT-114x1 for GPT-9801, GPT-9802, GPT-9803 GHT-114x1, GTL-115x1 for GTP-9804
DIMENSIONS & WEIGHT	Approx. 330(W) x 150(H) x 460(D) mm (Max.), 19kg(Max)

Table 1: Output Limitation in Withstanding Voltage Testing

	Upper Current	Pause	Output Time
AC	30mA≤I≤40mA	At least as long as the output time	Maximum 240 seconds
	0.001mA≤I<30mA	Not necessary	Continuous output possible

DC	0.001mA≤I≤10mA	Not necessary	Continuous output possible
GB	15A<I≤30A	At least as long as the output time	999.9
	3A≤I≤15A	Not necessary	999.9

NOTE: Output Time = Ramp Time + Test Time.

PREPARATION

The preparation chapter shows what equipment and items are needed for calibration and the preliminary procedures required before starting calibration.

Package Contents

Below is a list of the all the standard and optional accessories for the GPT-9800

Optional items

Standard Accessories	Part number	Description
	GHT-114 x1	Test lead
	Region dependent	Power cord
	GTL-115 x1	GB Test leads (GPT-9804)
	N/A	Remote terminal male plug
	N/A	Interlock key
Optional Accessories	Part number	Description
	GHT-205	High Voltage Test Probe
	GHT-113	High Voltage Test Pistol
	GTL-232	RS232C cable
	GTL-248	GPIB cable
	GTL-247	USB cable
	GRA-402	Rack Adapter Panel (19", 4U)
Options	Part number	Description
	Opt.01 GPIB Interface	GPIB module

Setup Procedure

Line Voltage Connection and Power Up

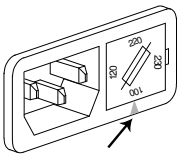
Background

Before powering up the GPT-9800 ensure the correct voltage has been selected on the rear panel. The GPT-9800 supports line voltages of 100V/120V/220V and 230V.

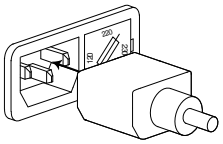
Procedure

1. Check the line voltage and the fuse in the fuse holder.

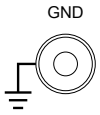
   The desired line voltage should line up with the arrow on the fuse holder.



2. Connect the power cord to the AC voltage input.



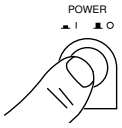
3. If the power cord does not have an earth ground, ensure the ground terminal is connected to an earth ground.



⚠ Note

Ensure the power cord is connected to an earth ground. Failure could be harmful to the operator and instrument.

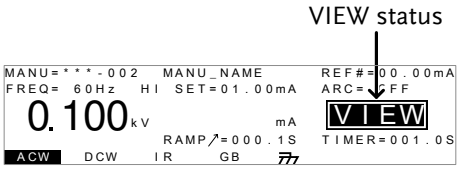
4. Press the Power button.



5. When the unit is powering up, all the LED indicators will light. Check to make sure all 5 LED indicators are working.

6. Check to make sure the System Self Test passes without errors.

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



⚠ WARNING

See the Appendix on page 109 for details if a self-test error is detected.

List of Equipment

Here is the list of all equipment used in the calibration operations.

Measurement Instruments

Item	Requirement	Used In
High voltage (HV) meter	• KIKUSUI 149-10A – High Voltage Meter	AC/DC Withstanding voltage
3MΩ, 30kΩ, 300kΩ, standard resistor	• 30kΩ, ±1%,300W, 300kΩ, ±1%,200W, 3MΩ, ±1%,30W	Withstanding current,
1MΩ, 10MΩ, 50MΩ, 500MΩ, 5000MΩ standard resistor	• HIOKI SR-2- Standard Resistor Box	Insulation resistance current,
3MΩ, standard resistor	• 3MΩ, ±1%,30W	Cutoff current
200mΩ, standard resistor	• 200mΩ, ±1%,180W	GBI/GBV calibration
Multimeter	• No model specified –ACA measurement range: 3A~30A, 0.1% accuracy	GBI calibration
Multimeter	• FLUKE 8808A – Multimeter (–ACV measurement range: 0.3V~5V, 0.1% accuracy)	GBV calibration

Cables & Connectors

Item	Requirement	Used In
Test leads	• GHT-114	Calibration
	• GHT-115	Calibration

CALIBRATION

The Calibration chapter describes how to calibrate the GPT-9800 using the in-built software calibration tools without internally accessing the instrument.

Preparation

Calibration item overview

Item	Description
Pre-Calibration	Pre-Calibration preparation is used to check basic functionality before calibration. These checks include an LED light check, a system self test, resetting the instrument to the factory default settings and checking the system version before calibration.
W-V DAC CAL	Withstanding voltage DAC calibration is used to calibrate the output voltage of the GPT-9800.
W-V ADC CAL	Withstanding voltage ADC calibration is used to check the read back accuracy only.
W-I ADC CAL	Withstanding current ADC calibration is used to calibrate the current output under load.
IR-I ADC CAL	Insulation resistance current ADC calibration is used to calibrate the insulation resistance measurement with standard resistors.
CUTOFF CAL	Cutoff current Calibration is used to verify and calibrate the cutoff current for a number of ranges.

Calibration environment

Calibration Environment	• Location: Indoor, no direct sunlight, dust free, almost non-conductive pollution • Relative Humidity: ≤ 70% (no condensation) • Temperature: +15°C~+35°C • Warm-up time: ≥ 30 minutes

Calibration log

Printout this page and write down the calibration result. Keep it together with the GPT-9800.

Model	GPT-_____	Serial No._____
Date	Year_____ Month_____	Date_____
Calibrated by	Name_____	
	Company/Contact_____	
Environment	Temperature_____°C	Humidity_____%

	CAL Point	Spec	Result
W-V DC Voltage Output Calibration	50V	50V±2V	_____
	600V	600V±2V	_____
	3000V	3000V±2V	_____
	6000V	6000V±2V	_____

	CAL Point	Spec	Result
W-V AC 50Hz Voltage Output Calibration	50V	50V±2V	_____
	600V	600V±2V	_____
	3000V	3000V±2V	_____
	5000V	5000V±2V	_____

	CAL Point	Spec	Result
W-V AC 60Hz Voltage Output Calibration	50V	50V±2V	_____
	600V	600V±2V	_____
	3000V	3000V±2V	_____
	5000V	5000V±2V	_____

W-V DC Voltage ADC READ CAL	CAL Point		Spec	Result
	50V		50V±2V	_ _ _ _ _ _ _ _
	600V		600V±2V	_ _ _ _ _ _ _ _
	3000V		3000V±5V	_ _ _ _ _ _ _ _
	6000V		6000V±5V	_ _ _ _ _ _ _ _
W-V AC_50Hz Voltage ADC READ CAL	CAL Point		Spec	Result
	50V		50V±2V	_ _ _ _ _ _ _ _
	600V		600V±2V	_ _ _ _ _ _ _ _
	3000V		3000V±5V	_ _ _ _ _ _ _ _
	5000V		5000V±5V	_ _ _ _ _ _ _ _
W-V AC_60Hz Voltage ADC READ CAL	CAL Point		Spec	Result
	50V		50V±2V	_ _ _ _ _ _ _ _
	600V		600V±2V	_ _ _ _ _ _ _ _
	3000V		3000V±5V	_ _ _ _ _ _ _ _
	5000V		5000V±5V	_ _ _ _ _ _ _ _
W-I_Width No Load Current ADC READ	CAL Point	Load	Spec	Result
	DC_1mA_50V_ Guard (OPEN)	No load	N/A	_ _ _ _ _ _ _ _

W-I_DC Current ADC Read CAL

DC_1mA Range Current ADC

CAL Point	Load	Spec	Result
300V_0.1mA	3MΩ	N/A	_ _ _ _ _ _ _ _
600V_0.2mA	3MΩ	N/A	_ _ _ _ _ _ _ _
1500V_0.5mA	3MΩ	N/A	_ _ _ _ _ _ _ _
3000V_1.0mA	3MΩ	N/A	_ _ _ _ _ _ _ _

DC_10mA Range Current ADC

CAL Point	Load	Spec	Result
300V_1.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _
600V_2.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _
1500V_5.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _
3000V_10.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _

W-I_AC_50Hz Current ADC Read CAL.

AC_50Hz_1mA Range Current ADC

CAL Point	Load	Spec	Result
300V_0.1mA	3MΩ	N/A	_ _ _ _ _ _ _ _
600V_0.2mA	3MΩ	N/A	_ _ _ _ _ _ _ _
1500V_0.5mA	3MΩ	N/A	_ _ _ _ _ _ _ _
3000V_1.0mA	3MΩ	N/A	_ _ _ _ _ _ _ _

AC_50Hz_10mA Range Current ADC

CAL Point	Load	Spec	Result
300V_1.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _
600V_2.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _
1500V_5.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _
3000V_10.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _

AC_50Hz_100mA Range Current ADC

CAL Point	Load	Spec	Result
300V_10.00mA	30kΩ	N/A	_ _ _ _ _ _ _ _
600V_20.00mA	30kΩ	N/A	_ _ _ _ _ _ _ _
1200V_40.00mA	30kΩ	N/A	_ _ _ _ _ _ _ _

W-I_AC_60Hz Current ADC Read CAL

AC_60Hz_1mA Range Current ADC

CAL Point	Load	Spec	Result
300V_0.1mA	3MΩ	N/A	_ _ _ _ _ _ _ _
600V_0.2mA	3MΩ	N/A	_ _ _ _ _ _ _ _
1500V_0.5mA	3MΩ	N/A	_ _ _ _ _ _ _ _
3000V_1.0mA	3MΩ	N/A	_ _ _ _ _ _ _ _

AC_60Hz_10mA Range Current ADC

CAL Point	Load	Spec	Result
300V_1.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _
600V_2.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _
1500V_5.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _
3000V_10.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _

AC_60Hz_100mA Range Current ADC

CAL Point	Load	Spec	Result
300V_10.00mA	30kΩ	N/A	_ _ _ _ _ _ _ _
600V_20.00mA	30kΩ	N/A	_ _ _ _ _ _ _ _
1200V_40.00mA	30kΩ	N/A	_ _ _ _ _ _ _ _

DC Cutoff Current CAL

CAL Point	Load	Spec	Result
3MΩ_0.1mA_300V	3MΩ	N/A	_ _ _ _ _ _mA
3MΩ_0.2mA_600V	3MΩ	N/A	_ _ _ _ _ _mA
3MΩ_0.5mA_1500V	3MΩ	N/A	_ _ _ _ _ _mA
3MΩ_1.0mA_3000V	3MΩ	N/A	_ _ _ _ _ _mA

AC_50Hz Cutoff Current CAL

CAL Point	Load	Spec	Result
3MΩ_0.1mA_300V	3MΩ	N/A	_ _ _ _ _ mA
3MΩ_0.2mA_600V	3MΩ	N/A	_ _ _ _ _ mA
3MΩ_0.5mA_1500V	3MΩ	N/A	_ _ _ _ _ mA
3MΩ_1.0mA_3000V	3MΩ	N/A	_ _ _ _ _ mA

AC_60Hz Cutoff Current CAL	CAL Point	Load	Spec	Result
	3MΩ_0.1mA_300V	3MΩ	N/A	_ _ _ _ _ _mA
	3MΩ_0.2mA_600V	3MΩ	N/A	_ _ _ _ _ _mA
	3MΩ_0.5mA_1500V	3MΩ	N/A	_ _ _ _ _ _mA
	3MΩ_1.0mA_3000V	3MΩ	N/A	_ _ _ _ _ _mA
IR_I (OPEN) Offset ADC Calibration	CAL Point	Load	Spec.	Result
	100V(2k*1)->R	No load	100V±2V	_ _ _ _ _ _ _ _
	100V(2K*10)->R	No load	100V±2V	_ _ _ _ _ _ _ _
IR_I 100V RANGE Calibration	CAL Point	Load	Spec.	Result
	100V_2k*1	1MΩ	100V±2V	_ _ _ _ _ _ _ _
	100V_2k*10	10MΩ	100V±2V	_ _ _ _ _ _ _ _
	100V_100k*1	50MΩ	100V±2V	_ _ _ _ _ _ _ _
	100V_100k*10	500MΩ	100V±2V	_ _ _ _ _ _ _ _
IR_I 1000V RANGE Calibration	CAL Point	Load	Spec.	Result
	1000V_2k*1	1MΩ	1000V±2V	_ _ _ _ _ _ _ _
	1000V_2k*1	10MΩ	1000V±2V	_ _ _ _ _ _ _ _
	1000V_2k*10	10MΩ	1000V±2V	_ _ _ _ _ _ _ _
	1000V_2k*10	100MΩ	1000V±2V	_ _ _ _ _ _ _ _
	1000V_100k*1	50MΩ	1000V±2V	_ _ _ _ _ _ _ _
	1000V_100k*1	500MΩ	1000V±2V	_ _ _ _ _ _ _ _
	1000V_100k*10	500MΩ	1000V±2V	_ _ _ _ _ _ _ _
	1000V_100k*10	5000MΩ	1000V±2V	_ _ _ _ _ _ _ _

GB Calibration

GB-I 50Hz

CAL Point	Load	Spec	Result
200mΩ_3A	200mΩ	N/A	_ _ _ _ _ _ A
200mΩ_10A	200mΩ	N/A	_ _ _ _ _ _ A
200mΩ_30A	200mΩ	N/A	_ _ _ _ _ _ A

GB-I 60Hz

CAL Point	Load	Spec	Result
200mΩ_3A	200mΩ	N/A	_ _ _ _ _ _ A
200mΩ_10A	200mΩ	N/A	_ _ _ _ _ _ A
200mΩ_30A	200mΩ	N/A	_ _ _ _ _ _ A

GB-V 50Hz

CAL Point	Load	Spec	Result
200mΩ_0V	200mΩ	Offset only	N/A
200mΩ_0.3V	200mΩ	N/A	_ _ _ _ _ V
200mΩ_5V	200mΩ	N/A	_ _ _ _ _ V

GB-V 60Hz

CAL Point	Load	Spec	Result
200mΩ_0V	200mΩ	Offset only	N/A
200mΩ_0.3V	200mΩ	N/A	_ _ _ _ _ V
200mΩ_5V	200mΩ	N/A	_ _ _ _ _ V

Entering the Calibration Menu

Background

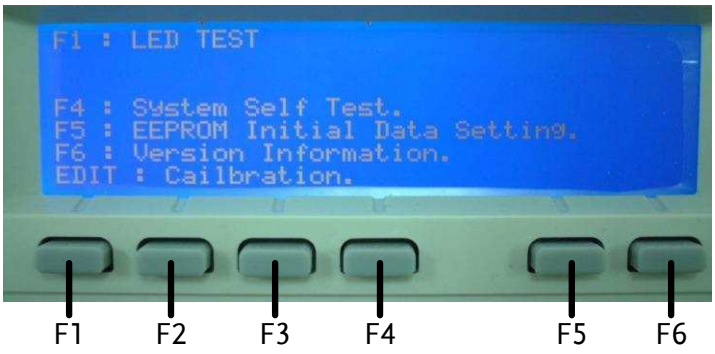
The calibration menu is accessible from the special menu mode by pressing a set key sequence. The special menu includes the following items:

- LED TEST
- System Self Test
- EEPROM Initial Data Setting
- Version Information

Conventions

The special menu and the calibration menu use the function keys, located under the LED display to access menu items. These keys are named F1 to F6 in this calibration manual.

- Pressing one of the F1~F6 keys will access the corresponding menu item.



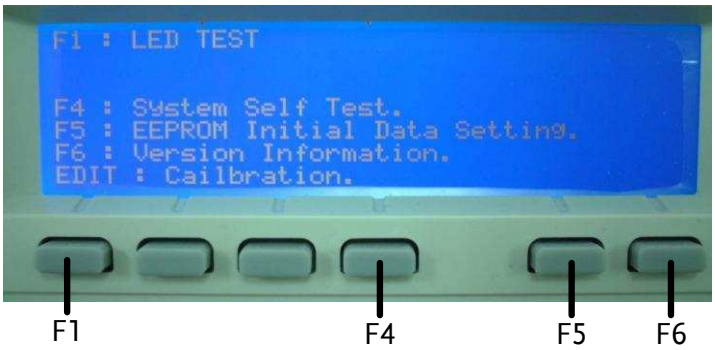
- The ESC key can be pressed at any time to go back to the previous menu or to escape from the calibration menus or special menu.

Accessing the special menu

1. Power the GPT-9800 up.
2. Make sure the safety tester is in the MANU/VIEW status.

3. Press the directional arrow keys in the following order to make the special menu appear:
   Up, Up, Down, Down, Left, Right, Left, Right.

4. The special menu mode appears:



Special menu description

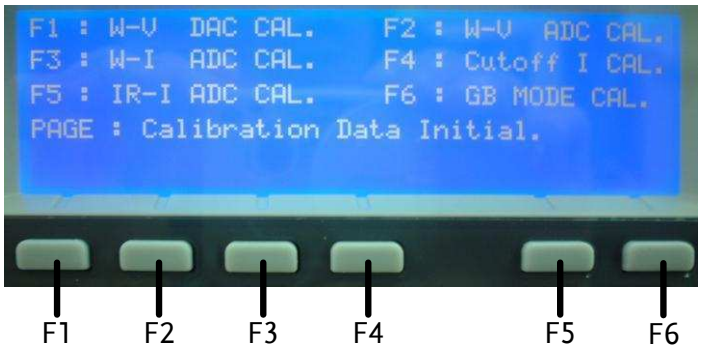
5. The special menu has the following menu items:

F1: LED TEST	This a manual function test of each indicator to ensure all indicators can turn on/off.
F4: System Self Test.	This is to manually perform the same system test that is performed at start up.
EEPROM Initial Data Setting	Recalls the factory default state of the tester from EEEPROM. This will overwrite the MANU and AUTO configuration settings stored in memory.
Version Information	Displays the model name, serial number, firmware version and test functions configuration (ACW, DCW, IR, GB).
EDIT: Calibration	Enters the calibration menu.

Enter calibration menu

6. Press the EDIT/SAVE key to enter the calibration menu.

7. The calibration menu mode appears:



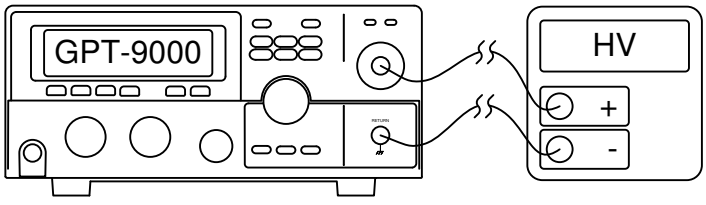
Calibration menu description

8. The calibration menu has the following menu items:

F1: W-V DAC CAL.	Withstanding voltage DAC calibration.
F2: W-V ADC CAL.	Withstanding voltage ADC calibration.
F3: W-I ADC CAL.	Withstanding current DAC calibration.
F4: Cutoff I CAL.	Cutoff current calibration.
F5: IR-I ADC CAL.	Insulation resistance current calibration.
F6: GB MODE CAL	Ground bond calibration
Calibration Data Initialization. Default calibration data is loaded to improve calibration accuracy. The loaded data are mean values only, they may not be accurate.	Reset to factory default settings

Withstanding Voltage – DAC Calibration

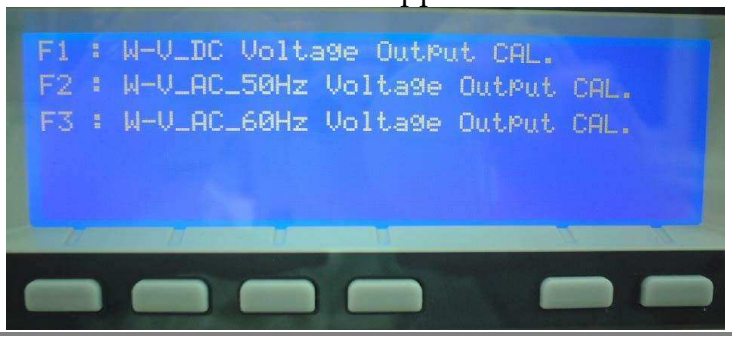
Description	The withstanding voltage DAC calibration is used to calibrate the voltage output of the safety tester.
Calibration Items	CAL Item1: W-V_DC Voltage Output CAL. CAL points: 50V±2V, 600V±2V, 3000V±2V, 6000V±2V CAL Item2: W-V_AC_50Hz Voltage Output CAL. CAL points: 50V±2V, 600V±2V, 3000V±2V, 5000V±2V CAL Item3: W-V_AC_60Hz Voltage Output CAL. CAL points: 50V±2V, 600V±2V, 3000V±2V, 5000V±2V
Equipment	• High Voltage (HW) meter • GHT-114 test leads
Connection	1. GPT-9800: HIGH VOTLAGE output terminal → HV meter positive terminal. 2. GPT-9800: RETURN terminal → HV meter negative terminal.



Enter the Withstanding Voltage DAC Calibration

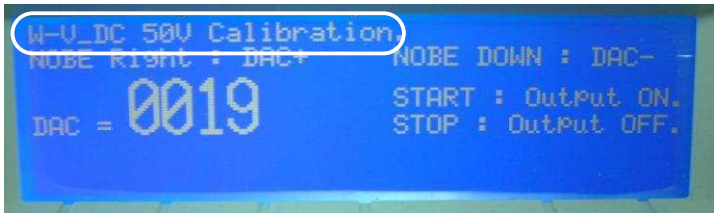
3. Open the calibration menu. For details, see page 35.
4. Press F1: W-V DAC CAL.

5. The W-V DAC CAL menu appears:

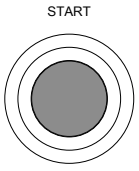


F1: W-V_DC Voltage Output CAL.

6. Press F1 for W-V_DC Voltage Output CAL.
7. The first calibration point (50V) appears:

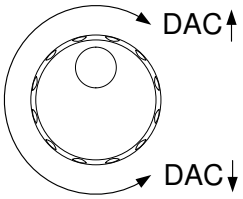


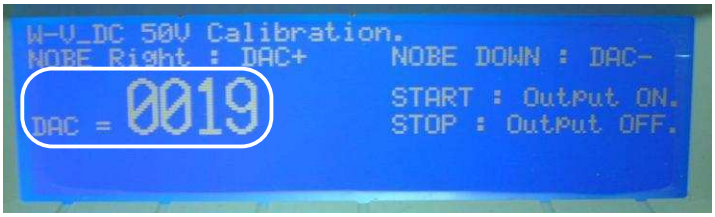
8. Press the START button to turn on the output voltage.



9. Check to see if the voltage measured on the high voltage meter is within specifications. In this case 50V±2V.

10. If the measured result is not within specifications, adjust the scroll wheel to edit the "DAC" value.





11. Repeat steps 6~8 again until the output voltage is within specification.

12. Press the EDIT/SAVE key to save the calibration point and automatically move onto the next calibration point.

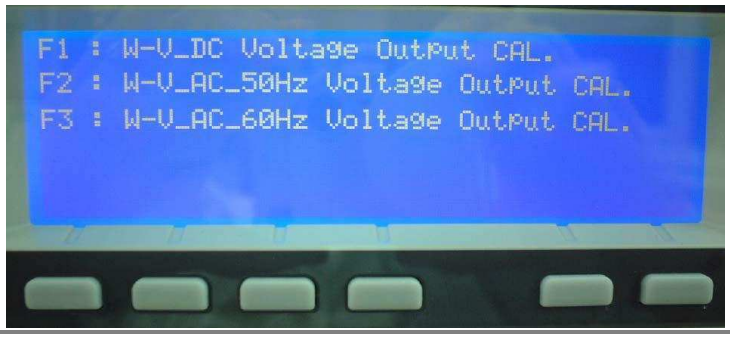
13. Repeat the above procedures for the remaining calibration points.

14. Record the results in the calibration log, page 29.

W-V_DC Voltage Output CAL

CAL Point	Spec	Result
50V	50V±2V	_ _ _ _ _ _ _ _
600V	600V±2V	_ _ _ _ _ _ _ _
3000V	3000V±2V	_ _ _ _ _ _ _ _
6000V	6000V±2V	_ _ _ _ _ _ _ _

15. After the last calibration point has completed, you will be returned to the W-V DAC CAL menu to continue to the other calibration items.



F2: W-V_AC_50Hz Voltage Output CAL.

16. Press F2 for W-V_AC_50Hz Voltage Output CAL.
17. Repeat steps 5 to 13 above for the following calibration points:

W-V_AC_50Hz Voltage Output CAL

CAL Point	Spec	Result
50V	50V±2V	_ _ _ _ _ _ _ _
600V	600V±2V	_ _ _ _ _ _ _ _
3000V	3000V±2V	_ _ _ _ _ _ _ _
5000V	5000V±2V	_ _ _ _ _ _ _ _

F3: W-V_AC_60Hz Voltage Output CAL.

18. Press F3 for W-V_AC_60Hz Voltage Output CAL.
19. Repeat steps 5 to 13 above for the following calibration points:

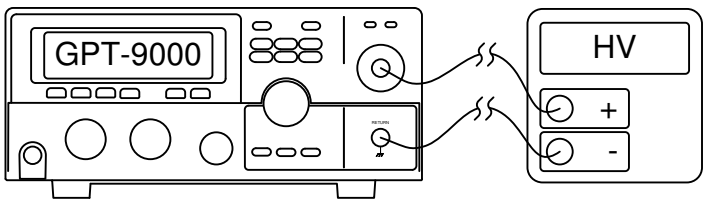
W-V_AC_60Hz Voltage Output CAL

CAL Point	Spec	Result
50V	50V±2V	_ _ _ _ _ _ _ _
600V	600V±2V	_ _ _ _ _ _ _ _
3000V	3000V±2V	_ _ _ _ _ _ _ _
5000V	5000V±2V	_ _ _ _ _ _ _ _

20. After the last calibration point has completed, press the ESC key to return to the calibration menu.

Withstanding Voltage – ADC Calibration

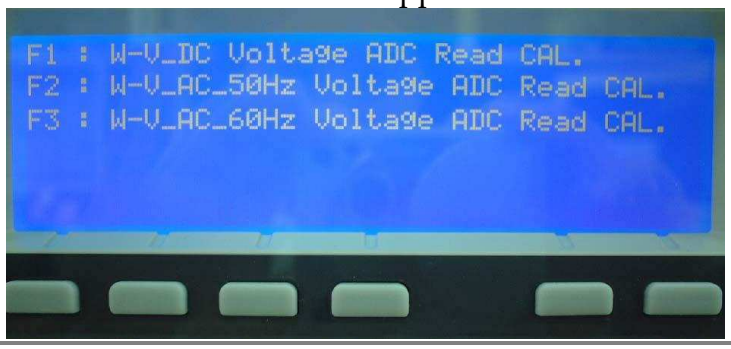
Description	The withstanding voltage ADC calibration is used to verify the read-back accuracy only.
⚠ NOTE	If any of the results are out of specification, please return to the "Withstanding Voltage – DAC Calibration" on page 39.
Calibration Items	CAL Item1: W-V_DC Voltage ADC Read CAL. CAL points: 50V±2V, 600V±2V, 3000V±2V, 6000V±2V CAL Item2: W-V_AC_50Hz Voltage ADC Read CAL. CAL points: 50V±2V, 600V±2V, 3000V±2V, 5000V±2V CAL Item3: W-V_AC_60Hz Voltage ADC Read CAL. CAL points: 50V±2V, 600V±2V, 3000V±2V, 5000V±2V
Equipment	• High Voltage (HW) meter • GHT-114 test leads
Connection	1. GPT-9800: HIGH VOTLAGE output terminal → HV meter positive terminal. 2. GPT-9800: RETURN terminal → HV meter negative terminal.



Enter the Withstanding Voltage ADC Calibration

1. Ensure the tester is in the calibration menu. For details, see page 35.
2. Press F2: W-V ADC CAL.

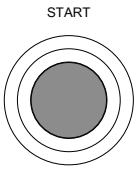
3. The W-V ADC CAL menu appears:



F1: W-V_DC Voltage ADC Read CAL.

4. Press F1 for W-V_DC Voltage ADC Read CAL.
5. The first calibration point (50V) appears:

6. Press the START button to turn on the output voltage.



7. Check to see that the voltage measured on the high voltage meter is within specifications. In this case 50V±2V.

8. If the measured result is not within specifications, return to the "Withstanding Voltage – DAC Calibration" on page 39 to re-calibrate that calibration point.

9. Press the EDIT/SAVE key to save the calibration value for the ADC and automatically move onto the next calibration point.

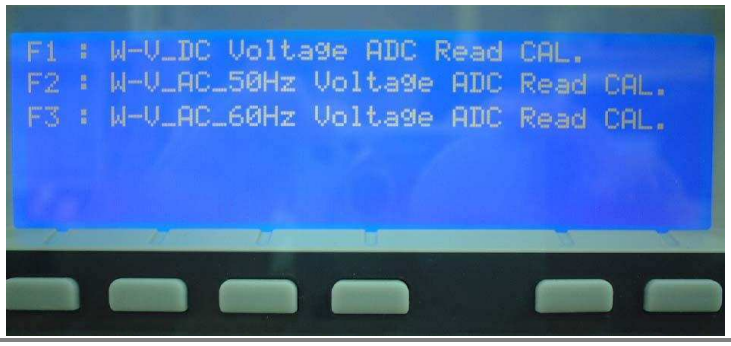
10. Repeat the above procedures for the remaining calibration points.

11. Record the results in the calibration log, page 29.

W-V_DC Voltage ADC Read CAL

CAL Point	Spec	Result
50V	50V±2V	_ _ _ _ _ _ _ _
600V	600V±2V	_ _ _ _ _ _ _ _
3000V	3000V±5V	_ _ _ _ _ _ _ _
6000V	6000V±5V	_ _ _ _ _ _ _ _

12. After the last calibration point has completed, you will be returned to the W-V ADC CAL menu to continue to the other calibration items.



F2: W-V_AC_50Hz Voltage ADC Read CAL.

13. Press F2 for W-V_AC_50Hz Voltage ADC Read CAL.
14. Repeat steps 5 to 12 above for the following calibration points:

W-V_AC_50Hz Voltage ADC Read CAL

CAL Point	Spec	Result
50V	50V±2V	_ _ _ _ _ _ _ _
600V	600V±2V	_ _ _ _ _ _ _ _
3000V	3000V±5V	_ _ _ _ _ _ _ _
5000V	5000V±5V	_ _ _ _ _ _ _ _

F3: W-V_AC_60Hz Voltage ADC Read CAL.

15. Press F3 for W-V_AC_60Hz Voltage ADC Read CAL.
16. Repeat steps 5 to 12 above for the following calibration points:

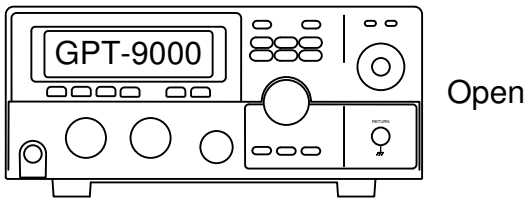
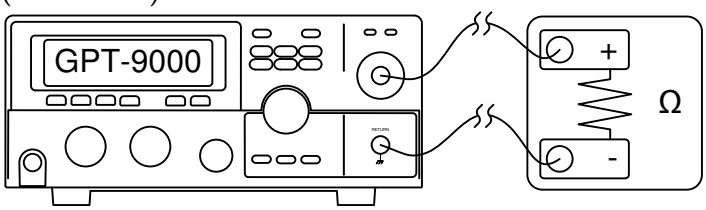
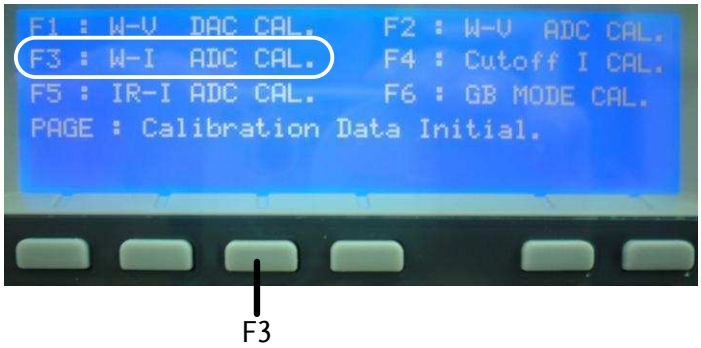
W-V_AC_60Hz Voltage ADC Read CAL

CAL Point	Spec	Result
50V	50V±2V	_ _ _ _ _ _ _ _
600V	600V±2V	_ _ _ _ _ _ _ _
3000V	3000V±5V	_ _ _ _ _ _ _ _
5000V	5000V±5V	_ _ _ _ _ _ _ _

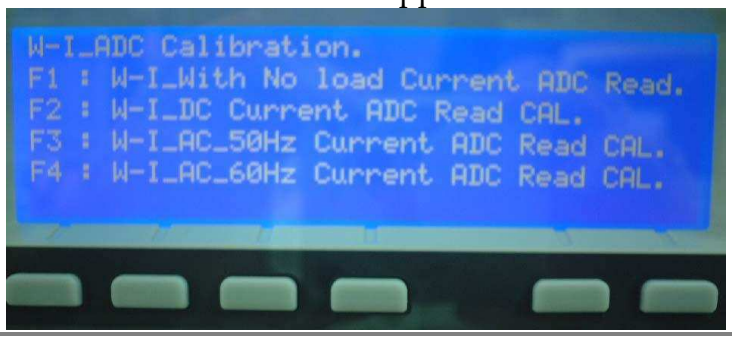
17. After the last calibration point has completed, press the ESC key to return to the calibration menu.

Withstanding Current – ADC Calibration

Description	The withstanding current ADC calibration is used to verify the output current under a number of standard resistances.		
Calibration Items	CAL Item1:	W-I _With No load Current ADC Read.	
	CAL points:	1mA range: (no load)	1mA_50V_Guard
	CAL Item2:	W-I_DC Current ADC Read CAL.	
	CAL points:	1mA range (3MΩ):	300V_0.1mA, 600V_0.2mA, 1500V_0.5mA, 3000V_1.0mA
		10mA range (300kΩ):	300V_1.00mA, 600V_2.00mA, 1500V_5.00mA, 3000V_10.00mA,
	CAL Item3:	W-V_AC_50Hz Voltage ADC Read CAL.	
	CAL points:	1mA range (3MΩ):	300V_0.1mA, 600V_0.2mA, 1500V_0.5mA, 3000V_1.0mA,
		10mA range (300kΩ):	300V_1.00mA, 600V_2.00mA, 1500V_5.00mA, 3000V_10.00mA,
		100mA range (30kΩ)	300V_10.0mA, 600V_20.0mA, 1200V_40.0mA
	CAL Item4:	W-V_AC_60Hz Voltage ADC Read CAL.	
	CAL points:	1mA range (3MΩ):	300V_0.1mA, 600V_0.2mA, 1500V_0.5mA, 3000V_1.0mA,
		10mA range (300kΩ):	300V_1.00mA, 600V_2.00mA, 1500V_5.00mA, 3000V_10.0mA,
		100mA range (30kΩ)	300V_10.0mA, 600V_20.0mA, 1200V_40.0mA

Equipment	• Standard resistors (30kΩ, 300kΩ, 3MΩ) • GHT-114 test leads
Connection (No load)	1. GPT-9800: HIGH VOTLAGE output terminal → GPT-9800: RETURN terminal. 
Connection (With load)	1. GPT-9800: HIGH VOTLAGE output terminal → Standard resistor (+ terminal). 2. GPT-9800: RETURN terminal → Standard resistor (- terminal). 
Enter the Withstanding Voltage ADC Calibration	1. Ensure the tester is in the calibration menu. For details, see page 35. 2. Press F3: W-I ADC CAL. 

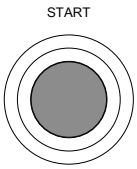
3. The W-V ADC CAL menu appears:



F1: W-I_With No Load Current ADC Read

4. Press F1 for W-I_With No Load Current ADC Read.
5. The first calibration point (DC_1mA_50V_Guard) appears:

6. Press the START button to turn on the output voltage.
   Note: Terminals should be "open".

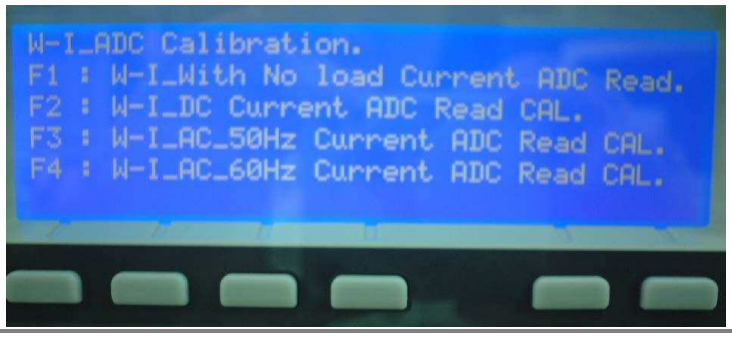


7. Press the EDIT/SAVE key to save the calibration value for the ADC and automatically move onto the next calibration point.
8. Record the results in the calibration log, page 29.

W-I_With No Load Current ADC Read

CAL Point	Load	Result
DC_1mA_50V_Guard	No load	_ _ _ _ _ _ mA

9. After the calibration point is saved, you will be returned to the W-I ADC Calibration menu to continue to the other calibration items.



F2: W-I_DC Current ADC Read CAL.

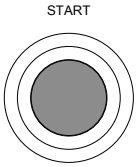
10. Press F2 for W-I_DC Current ADC Read CAL.
11. The range selection for W-I_DC_ADC Calibration appears.

12. Press F1 to select the DC_1mA Range Current ADC.

13. The first calibration point (300V_0.1mA) appears:

14. Ensure a 3MΩ load is connected for the DC_1mA range.

15. Press the START button to turn on the output voltage.



16. Check to see that the voltage is close to the defined voltage and that the ADC reading is not "0".

Note that the "Read" value above is just the reference value and not a real current value.

17. Press the EDIT/SAVE key to save the calibration value for the ADC and automatically move onto the next calibration point.

18. Repeat the above procedures for the remaining calibration points.

19. Repeat the above procedures for the 10mA range. Ensure the correct load resistance is used for the new range.

20. Record the results in the calibration log, page 29.

DC_1mA Range Current ADC

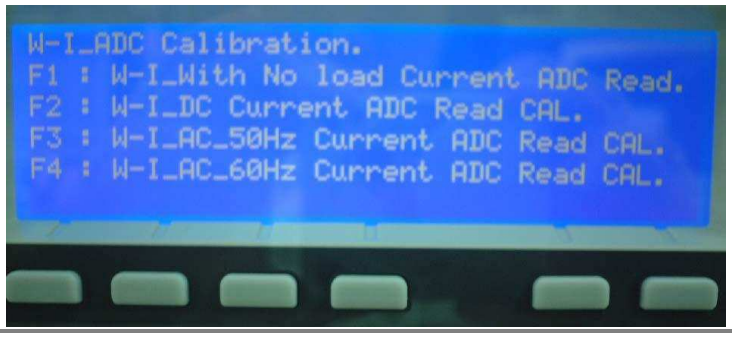
CAL Point	Load	Spec	Result
300V_0.1mA	3MΩ	N/A	_ _ _ _ _ _ _ _
600V_0.2mA	3MΩ	N/A	_ _ _ _ _ _ _ _
1500V_0.5mA	3MΩ	N/A	_ _ _ _ _ _ _ _
3000V_1.0mA	3MΩ	N/A	_ _ _ _ _ _ _ _

DC_10mA Range Current ADC

CAL Point	Load		Result
300V_1.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _
600V_2.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _

1500V_5.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _
3000V_10.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _

21. After the last calibration point has completed, you will be returned to the W-I ADC Calibration menu to continue to the other calibration items.



F3: W-I_AC_50Hz Current ADC Read CAL.

22. From the W-I ADC Calibration menu, press F3 for W-I_AC_50Hz Current ADC Read CAL.

23. Repeat steps 11 to 21 above for the following ranges and calibration points:

AC_50Hz_1mA Range Current ADC

CAL Point	Load	Spec	Result
300V_0.1mA	3MΩ	N/A	_ _ _ _ _ _ _ _
600V_0.2mA	3MΩ	N/A	_ _ _ _ _ _ _ _
1500V_0.5mA	3MΩ	N/A	_ _ _ _ _ _ _ _
3000V_1.0mA	3MΩ	N/A	_ _ _ _ _ _ _ _

AC_50Hz_10mA Range Current ADC.

CAL Point	Load	Spec	Result
300V_1.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _
600V_2.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _
1500V_5.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _
3000V_10.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _

AC_50Hz_100mA Range Current ADC.

CAL Point	Load	Spec	Result
300V_10.0mA	30kΩ	N/A	_ _ _ _ _ _ _ _

600V_20.0mA	30kΩ	N/A	_ _ _ _ _ _ _ _
1200V_40.0mA	30kΩ	N/A	_ _ _ _ _ _ _ _

F4: W-I_AC_60Hz Current ADC Read CAL.

24. From the W-I ADC Calibration menu, press F4 for W-I_AC_60Hz Current ADC Read CAL.

25. Repeat steps 11 to 21 above for the following ranges and calibration points:

AC_60Hz_1mA Range Current ADC

CAL Point	Load	Spec	Result
300V_0.1mA	3MΩ	N/A	_ _ _ _ _ _ _ _
600V_0.2mA	3MΩ	N/A	_ _ _ _ _ _ _ _
1500V_0.5mA	3MΩ	N/A	_ _ _ _ _ _ _ _
3000V_1.0mA	3MΩ	N/A	_ _ _ _ _ _ _ _

AC_60Hz_10mA Range Current ADC.

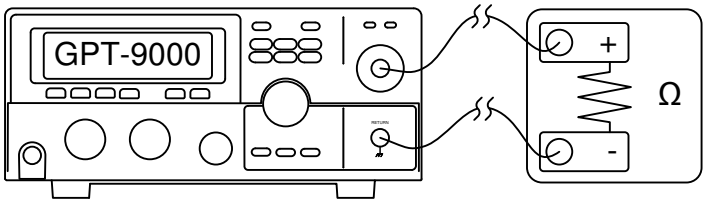
CAL Point	Load	Spec	Result
300V_1.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _
600V_2.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _
1500V_5.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _
3000V_10.00mA	300kΩ	N/A	_ _ _ _ _ _ _ _

AC_60Hz_100mA Range Current ADC.

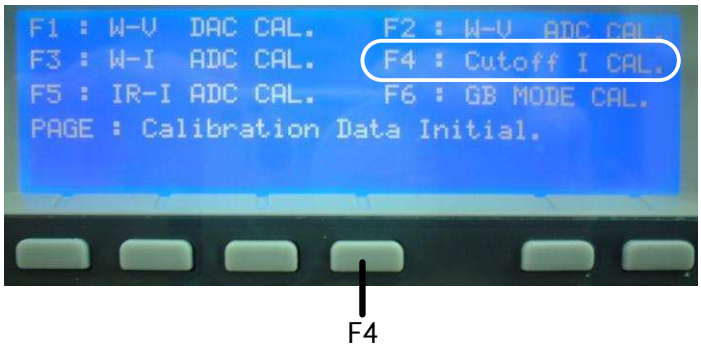
CAL Point	Load	Spec	Result
300V_10.0mA	30kΩ	N/A	_ _ _ _ _ _ _ _
600V_20.0mA	30kΩ	N/A	_ _ _ _ _ _ _ _
1200V_40.0mA	30kΩ	N/A	_ _ _ _ _ _ _ _

26. After the last calibration point has completed, press the ESC key to return to the calibration menu.

Cutoff Current Calibration

Description	The cutoff current calibration is used to verify the cutoff current level.
⚠ NOTE	If any of the results are out of specification, please return to the "Withstanding Voltage – DAC Calibration" on page 39.
Calibration Items	CAL Item1: DC Cutoff Current CAL CAL points: 3MΩ_0.1mA_300V, 3MΩ_0.2mA_600V, 3MΩ_0.5mA_1500V, 3MΩ_1.0mA_3000V CAL Item2: AC_50Hz Cutoff Current CAL CAL points: 3MΩ_0.1mA_300V, 3MΩ_0.2mA_600V, 3MΩ_0.5mA_1500V, 3MΩ_1.0mA_3000V CAL Item3: AC_60Hz Cutoff Current CAL CAL points: 3MΩ_0.1mA_300V, 3MΩ_0.2mA_600V, 3MΩ_0.5mA_1500V, 3MΩ_1.0mA_3000V
Equipment	• Standard resistors (3MΩ) • GHT-114 test leads
Connection	1. GPT-9800: HIGH VOTLAGE output terminal → Standard resistor (+ terminal). 2. GPT-9800: RETURN terminal → Standard resistor (- terminal). 
Enter the Withstanding Voltage ADC	1. Ensure the tester is in the calibration menu. For details, see page 35. 2. Press F4: Cutoff I CAL.

Calibration

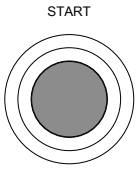


3. The Cutoff Current Calibration menu appears:

F1: DC Cutoff Current CAL.

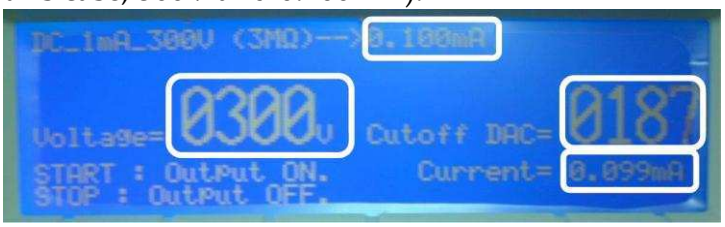
4. Press F1 for DC Cutoff Current CAL.
5. The first calibration point (3MΩ_0.1mA_300V) appears:

6. Ensure a 3MΩ load is connected.
7. Press the START button to turn on the output voltage.

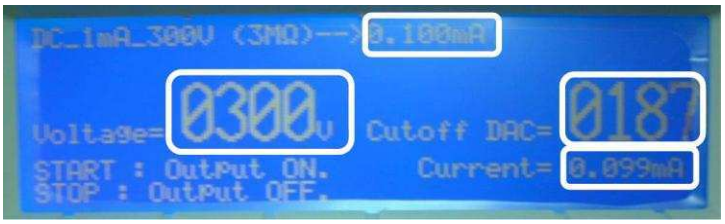


8. After the START button is pressed the, the TEST and High Voltage output indicators will flash.

9. During this time, check to make sure the "Voltage" and "Current" values are close to the calibration point (In this case, 300V and 0.100mA).



10. Wait for the Cutoff DAC value to drop down and stabilize.



11. The TEST and High Voltage indicators will then stop flashing at this point.

12. Press the EDIT/SAVE key to save the calibration value and automatically move onto the next calibration point.

13. Record the results in the calibration log, page 29.

DC Cutoff Current CAL

CAL Point	Load	Spec	Result
3MΩ_0.1mA_300V	3MΩ	N/A	_ _ _ _ _ _
3MΩ_0.2mA_600V	3MΩ	N/A	_ _ _ _ _ _
3MΩ_0.5mA_1500V	3MΩ	N/A	_ _ _ _ _ _
3MΩ_1.0mA_3000V	3MΩ	N/A	_ _ _ _ _ _

14. After the last calibration point is saved, you will be returned to the Cutoff Current Calibration menu to continue to the other calibration items.

F2: AC_50Hz Cutoff Current CAL.

15. From the Cutoff Current Calibration menu, press F2 for AC_50Hz Cutoff Current CAL.

16. Repeat steps 5 to 13 above for the following calibration points:

AC_50Hz Cutoff Current CAL.

CAL Point	Load	Spec	Result
3MΩ_0.1mA_300V	3MΩ	N/A	_ _ _ _ _ _
3MΩ_0.2mA_600V	3MΩ	N/A	_ _ _ _ _ _
3MΩ_0.5mA_1500V	3MΩ	N/A	_ _ _ _ _ _
3MΩ_1.0mA_3000V	3MΩ	N/A	_ _ _ _ _ _

F3: AC_60Hz Cutoff Current CAL.

17. From the Cutoff Current Calibration menu, press F3 for AC_60Hz Cutoff Current CAL.

18. Repeat steps 5 to 13 above for the following calibration points:

AC_60Hz Cutoff Current CAL.

CAL Point	Load	Spec	Result
3MΩ_0.1mA_300V	3MΩ	N/A	_ _ _ _ _ _
3MΩ_0.2mA_600V	3MΩ	N/A	_ _ _ _ _ _
3MΩ_0.5mA_1500V	3MΩ	N/A	_ _ _ _ _ _
3MΩ_1.0mA_3000V	3MΩ	N/A	_ _ _ _ _ _

19. After the last calibration point has completed, press the ESC key to return to the calibration menu.

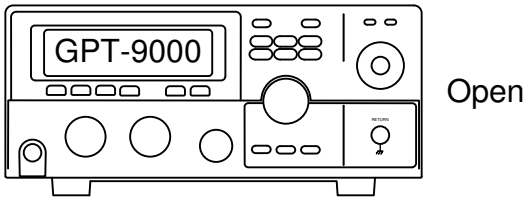
20. Press the ESC key again to exit the calibration menu.

Insulation Resistance Current – ADC Calibration

Description	The insulation resistance current ADC calibration is used to verify the output voltage under a number of standard resistances at a number of current ranges.
⚠ NOTE	If any of the results are out of specification, please return to the "W-V-DC Voltage output CAL" on page 39.
Calibration Items	CAL Item1: IR_I (OPEN) Offset ADC Calibration CAL points: 100V(2k*1)->R OPEN, 100V(2K*10)->R OPEN CAL Item2: IR_I 100V RANGE Calibration CAL points: 100V_2k*1->1MΩ, 100V_2k*10->10MΩ, 100V_100k*1->50MΩ, 100V_100k*10->500MΩ CAL Item3: IR_I 1000V RANGE Calibration CAL points: 1000V_2k*1->1MΩ, 1000V_2k*1->10MΩ, 1000V_2k*10->10MΩ, 1000V_2k*10->100MΩ, 1000V_100k*1->50MΩ, 1000V_100k*1->500MΩ, 1000V_100k*10->500MΩ, 1000V_100k*10->50000MΩ
Equipment	• Standard resistors (1MΩ, 10MΩ, 50MΩ, 500MΩ, 5000MΩ) • GHT-114 test leads

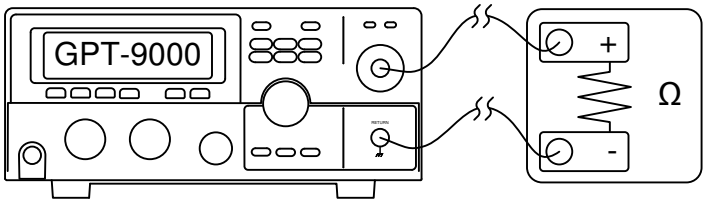
Connection (No load)

1. GPT-9800: HIGH VOTLAGE output terminal → open
   GPT-9800: RETURN terminal → open



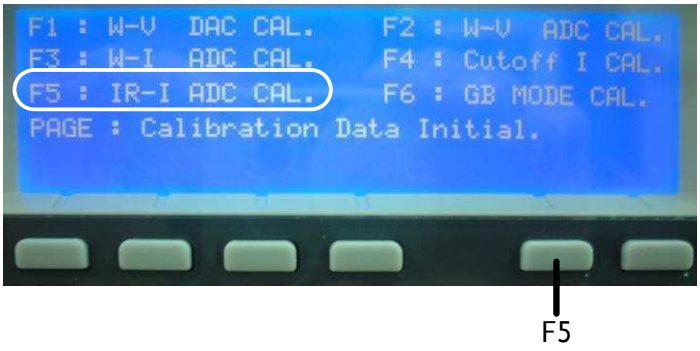
Connection (With load)

1. GPT-9800: HIGH VOTLAGE output terminal → Standard resistor (+ terminal).
2. GPT-9800: RETURN terminal → Standard resistor (- terminal).



Enter the Insulation Resistance Calibration

1. Ensure the tester is in the calibration menu. For details, see page 35.
2. Press F5: IR-I ADC CAL.

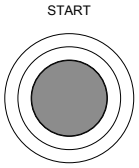


3. The IR-I_DC_ADC Calibration menu appears:

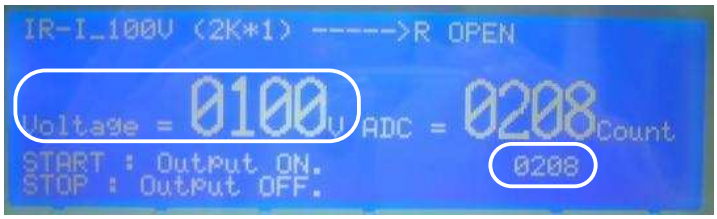
F1: IR_I (OPEN) Offset ADC Calibration

4. Press F1 for IR_I (OPEN) Offset ADC Calibration.
5. The first calibration point (IR-I_100V(2k*1)->R OPEN) appears:

6. Ensure the terminals are not connected to a load (open).
7. Press the START button to turn on the output voltage.



8. Wait for the value under the ADC count reading to stabilize. If the voltage reading is within specification, press the EDIT/SAVE key to save the calibration value and automatically move onto the next calibration point. If the voltage is out of specification, perform the "W-V DC Voltage Output Calibration" again (page 39).



9. Record the results in the calibration log, page 29.

IR_I (OPEN)

CAL Point	Load	Spec.	Result
100V(2k*1)->R OPEN	No load	100V±2V	_ _ _ _ _ _
100V(2k*10)->R OPEN	No load	100V±2V	_ _ _ _ _ _

10. After the last calibration point is saved, you will be returned to the IR-I_DC_ADC Calibration menu to continue to the other calibration items.

F2: IR_I 100V RANGE Calibration

11. From the IR-I_DC_ ADC Calibration menu, press F2 for IR_I 100V RANGE Calibration Range Calibration.

12. Repeat steps 5 to 10 above for the following calibration points and loads:

CAL Point	Load	Spec.	Result
100V_2k*1->1MΩ	1MΩ	100V±2V	_ _ _ _ _ _
100V(2k*10)-> 10MΩ	10MΩ	100V±2V	_ _ _ _ _ _
100V(100k*1)-> 50MΩ	50MΩ	100V±2V	_ _ _ _ _ _
100V(100k*10)-> 500MΩ	500MΩ	100V±2V	_ _ _ _ _ _

F3: IR_I 1000V RANGE Calibration

13. From the IR-I_DC_ ADC Calibration menu, press F3 for IR_I 1000V RANGE Calibration Range Calibration.

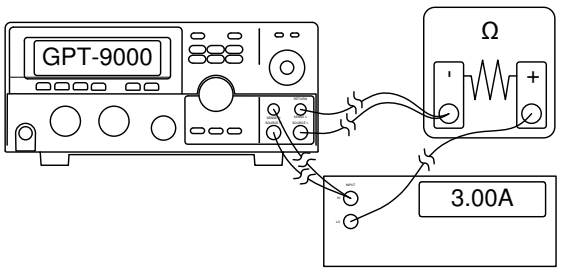
14. Repeat steps 5 to 10 above for the following calibration points and loads:

CAL Point	Load	Spec.	Result
1000V_2k*1->1MΩ	1MΩ	1000V±2V	_ _ _ _ _ _
1000V_2k*1->10MΩ	10MΩ	1000V±2V	_ _ _ _ _ _
1000V_2k*10->10MΩ	10MΩ	1000V±2V	_ _ _ _ _ _
1000V_2k*10->100MΩ	100MΩ	1000V±2V	_ _ _ _ _ _
1000V_100k*1->50MΩ	50MΩ	1000V±2V	_ _ _ _ _ _
1000V_100k*1->500MΩ	500MΩ	1000V±2V	_ _ _ _ _ _
1000V_100k*10->500MΩ	500MΩ	1000V±2V	_ _ _ _ _ _
1000V_100k*10->5000MΩ	5000MΩ	1000V±2V	_ _ _ _ _ _

15. After the last calibration point has completed, press the ESC key to return to the calibration menu.

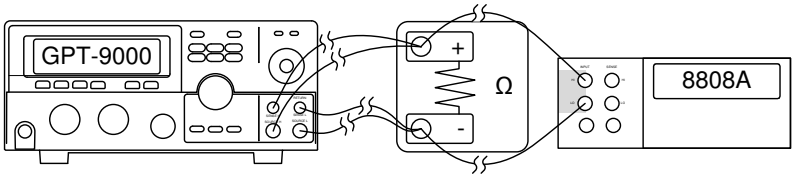
GB Calibration (For GPT-9804 only)

Description	The GB calibration section is used to calibrate ground bond current and voltage.
Calibration Items	CAL Item1: GB-I 50Hz ADC Read CAL points: 200mΩ_3A, 200mΩ_10A, 200mΩ_30A CAL Item2: GB-I 60Hz ADC Read CAL points: 200mΩ_3A, 200mΩ_10A, 200mΩ_30A CAL Item1: GB-V 50Hz DAC Read CAL points: 200mΩ_0V, 200mΩ_0.3V, 200mΩ_5V CAL Item2: GB-V 60Hz DAC Read CAL points: 200mΩ_0V, 200mΩ_0.3V, 200mΩ_5V
Equipment	• Standard resistors (200mΩ) • GHT-115 (GB test leads) • Fluke 8808A • Ammeter (3A~30A range, 1% accuracy)
Connection (GB-I)	1. GPT-9800: SOURCE H+SENSE H terminal → Ammeter (+ terminal). 2. GPT-9800: SOURCE L+SENSE L terminal → Standard resistor (- terminal). 3. Ammeter:- Terminal → Standard resistor (+ terminal).



Connection (GB-V)

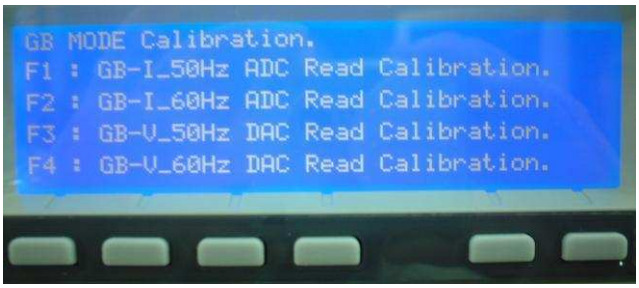
1. GPT-9800: SENSE H terminal → Standard resistor (+ terminal).
2. GPT-9800: SOURCE H terminal → Standard resistor (+ terminal).
3. GPT-9800: SENSE L terminal → Standard resistor (- terminal).
4. GPT-9800: SOURCE L terminal → Standard resistor (- terminal).
5. 8808A: INPUT H terminal → Standard resistor (+ terminal).
6. 8808A: INPUT L terminal → Standard resistor (- terminal).



Enter the Withstanding Voltage ADC Calibration

1. Ensure the tester is in the calibration menu. For details, see page 35.
2. Press F6: GB MODE CAL

3. The GB MODE Calibration menu appears:



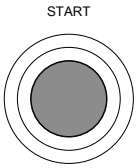
F1: GB-I 50Hz

4. Press F1 for GB-I 50Hz ADC Read Calibration.

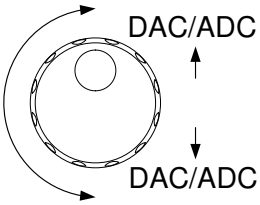
5. The first calibration point (GB_I_50Hz 3A → 200mΩ) appears:

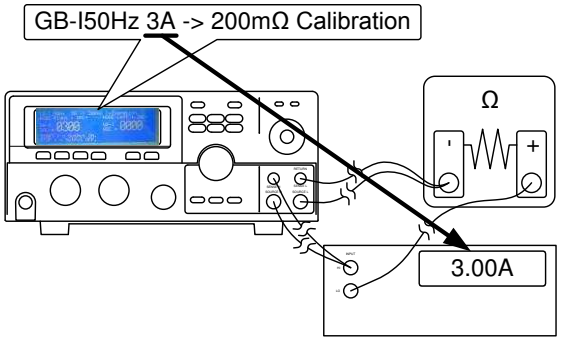
6. Ensure a 200mΩ load is connected.

7. Press the START button to turn on the output.



8. Use the scroll wheel to ensure that the value displayed on the meter matches that shown on the GPT-9800 display.





9. Ensure the value is as close as possible to the ideal value.

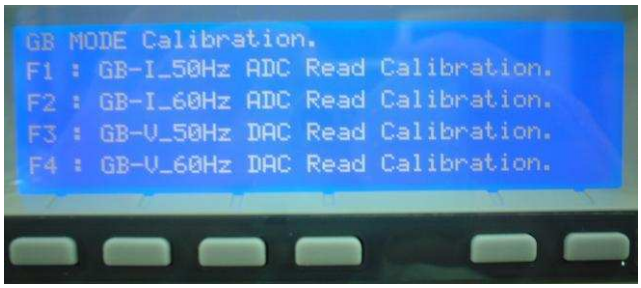
10. Press the EDIT/SAVE key to save the calibration value and automatically move onto the next calibration point.

11. Record the results in the calibration log, page 29.

GBI 50Hz

CAL Point	Load	Spec	Result
200mΩ_3A	200mΩ	N/A	_ _ _ _ _ A
200mΩ_10A	200mΩ	N/A	_ _ _ _ _ A
200mΩ_30A	200mΩ	N/A	_ _ _ _ _ A

12. After the last calibration point is saved, you will be returned to the GB Calibration menu to continue to the other calibration items.



F2: GB-I 60Hz

13. From the GB Calibration menu, press F2 for GB-I 60Hz ADC Read Calibration.

14. Repeat steps 8 to 15 above for the following calibration points:

GB-I 60Hz

CAL Point	Load	Spec	Result
200mΩ_3A	200mΩ	N/A	_ _ _ _ _ A
200mΩ_10A	200mΩ	N/A	_ _ _ _ _ A
200mΩ_30A	200mΩ	N/A	_ _ _ _ _ A

F3: GB-V 50Hz

15. Connect the Fluke 8808A in parallel with the 200mΩ standard resistor for voltage measurement.
16. From the GB Calibration menu, press F3 for GB-V 50Hz DAC Read CAL.
17. Repeat steps 8 to 15 above for the following calibration points:

GB-V 50Hz

CAL Point	Load	Spec	Result
200mΩ_0V	200mΩ	N/A	Offset only
200mΩ_0.3V	200mΩ	N/A	_ _ _ _ _ V
200mΩ_5V	200mΩ	N/A	_ _ _ _ _ V

F4: GB-V 60Hz

18. Connect the Fluke 8808A in parallel with the 200mΩ standard resistor.
19. From the GB Calibration menu, press F4 for GB-V 60Hz DAC Read CAL.
20. Repeat steps 8 to 15 above for the following calibration points:

GB-V 60Hz

CAL Point	Load	Spec	Result
200mΩ_0V	200mΩ	N/A	Offset only
200mΩ_0.3V	200mΩ	N/A	_ _ _ _ _ V
200mΩ_5V	200mΩ	N/A	_ _ _ _ _ V

21. After the last calibration point has completed, press the ESC key to return to the calibration menu.

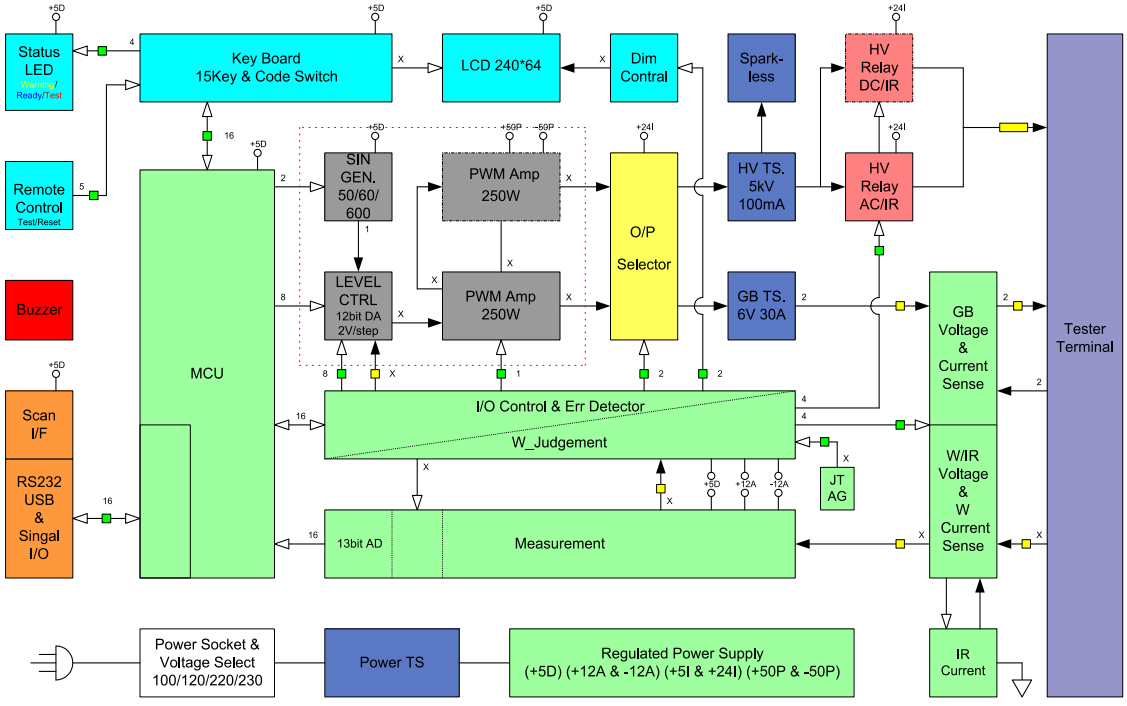
22. Press the ESC key again to exit the calibration menu.

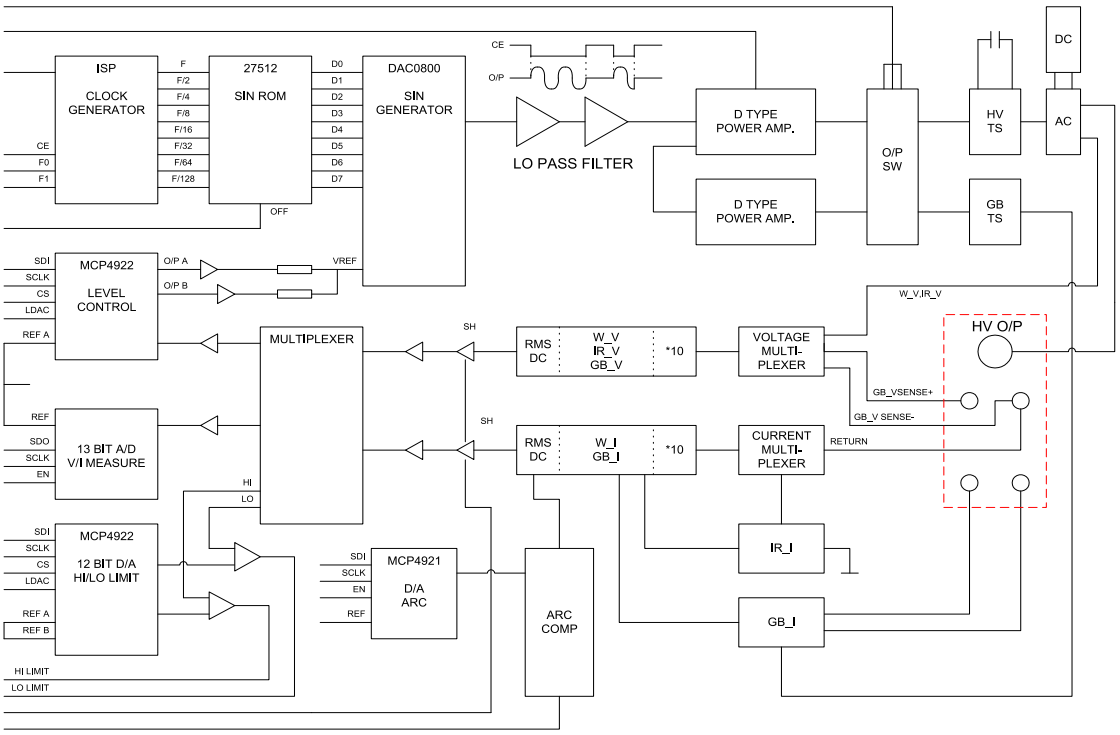
OPERATION THEORY

Overview

- GPT-9800 consists of the following blocks as illustrated in the figure below.
- MCU
- DAC
- High-voltage transformer
- Power AMP
- Half-wave rectifier CPU/Digital control
- BG transformer
- Multiplexer

Block diagram





MCU	The MCU controls the level of the DAC to generate 50/60/600 Hz sine wave.
Power AMP	AC /DCV is amplified through the power AMP.
High-voltage transformer	The amplified AC /DCV drives the high-voltage transformer to generate the high-voltage. The AC high-voltage is directly output through the high-voltage relay. The DCV high-voltage is output after it is rectified by a 600Hz half-wave rectifier.
GB transformer	The GBI is amplified by a power amplifier and then drives the GB transformer to output 50/60Hz high-current.
Multiplexer	The MCU measures the present voltage or current which running through the switchable multiplexer and computes the difference between setting value and the measured value and compensates the voltage /current, it then displays the measured value on the LCD display.

TROUBLE SHOOTING GUIDE

In this chapter we evaluate the test points to diagnose possible problems with the instrument. Please refer to the block diagrams or schematic diagrams in this manual to locate the corresponding test points.

Diagnose Possible Trouble

⚠ Note Use the trouble shooting section to diagnose common problems for servicing. If the trouble shooting section does not resolve the problem, please contact the GW Instek service center.

Item	Problem	Test Step	Refer Page
1	Power can't be turned on	1. Check if power cord is plugged into the correct socket. 2. Check if the fuse was burned out. 3. Check the power voltage. Please check U101, U102, U103, U104 and U105 one by one to see which component doesn't work properly.	P78, P85
2	Push button doesn't work properly	1. Check push button.	P78, P86
3	Nothing appears in the display when the power is on.	1. Replace the LCD module. 2. Check U119(Mcu). 3. Check U304(Cpld).	P85 P86

4	No output comes out when the power is on.	1. Check board PT01P02C. ● LED1 indicator is lit red when the device has a fault. The LED is not lit when the device works well. ● LED2 indicator is lit blue when the device works well. The LED is not lit when the device is ahs a fault. ● Check D212 Pin1 +B >=56V ● Check D212 Pin4 - B <=56V	P86
		2. Check the control signal in the high voltage relay	P79, P85, P87, P88
5	ACI DCI current is not normal	1. Check if the negative terminal is connected to the Return terminal rather than the other terminals.	
		2. Connect an Ammeter between the Return and DUT in series. Check if the measured current value same as that shown in the display.	
		3. Check current range table.	P79, P85
		4. Check if there is no-load current.	P80
6	DCV output is not consist with setting value	1. Check J107 Pin1.	P80, P85
		2. Check J202 Pin1.	P80, P86
		3. Check J110 Pin9.	P80, P85
7	ACV output is not consistent with the setting value	1. Check J107 Pin1.	P80, P85
		2. Check J202 Pin1.	P80, P86
		3. Check J110 Pin9.	P80, P85
8	IR voltage is not accurate	Be aware of IR internal resistance. If the internal resistance is 600K, it will act as a voltage divider with DUT.	

9	IR resistor is abnormal	Check the load on Return terminal. It can't be connected to ground.
10	GB is abnormal	1. Perform a zero check with a short circuit wire to check if the output is normal. It can't be faulty. 2. Measure the voltage on Sense H and Sense L to check if it is same with the displayed value.
11	UART can't transmit or receive signals	1. Check if utility interface setting is correct(USB or RS232). 2. Check the Baud rate to see if it is normal.

Checking the Power Voltage

Check the following locations on the PT01P01B PCB with a DMM to see if the power voltage matches with the value showed in the table below.

No.	Location	Power voltage in the corresponding location
1	U105:pin2-3	+5V
2	U104: pin2-3	+3.3V
3	U101: pin2-3	5V
4	U103: pin2-3	12V
5	U102:pin1-3	-12V

Checking push button

Check the following locations on board the PT01P03C-1 PCB with a DMM and an oscilloscope to see if the displayed voltage matches the value showed in the table below while the corresponding button is press on the GPT-9800

No.	Location	KEY pressed on the GPT-9800	Power voltage in the corresponding location
1	U302: pin2	/Start	3.3V
2	U302: pin4	/Stop	3.3V
3	U302: pin6	/R_Stop	3.3V
4	U302: pin8	R_Stop	0V
5	U302: pin10	/R_Start	3.3V
6	U302: pin12	/R_Check	3.3V
7	U303: pin2	/Manu-Auto	3.3V
8	U303: pin4	/Edit-Save	3.3V
9	U303: pin6/	Utility	3.3V
10	U303: pin8	Stop	0V
11	U303: pin10	Scroll wheel clockwise	3.3V
12	U303: pin12	Scroll wheel counterclockwise	3.3V
13	U305: pin2	Esc	3.3V
14	U305: pin4	Page	3.3V
15	U305: pin6	Down	3.3V
16	U305: pin8	Up	3.3V
17	U305: pin10	Right	3.3V

18	U305: pin12	Left	3.3V
19	U301: pin6	F1	3.3V
20	U301: pin4	F2	3.3V
21	U301: pin2	F3	3.3V
22	U301: pin8	F4	3.3V
23	U301: pin10	F5	3.3V
24	U301: pin12	F6	3.3V

 Note Use an oscilloscope to check test point items 11 and 12

Checking Hi-V Relay Control Signal

No.	Control Location	Relay Location	Function
1	Q120	K702	DC Relay output
2	Q121	K701	DC Relay
3	Q122	K401	AC Relay output

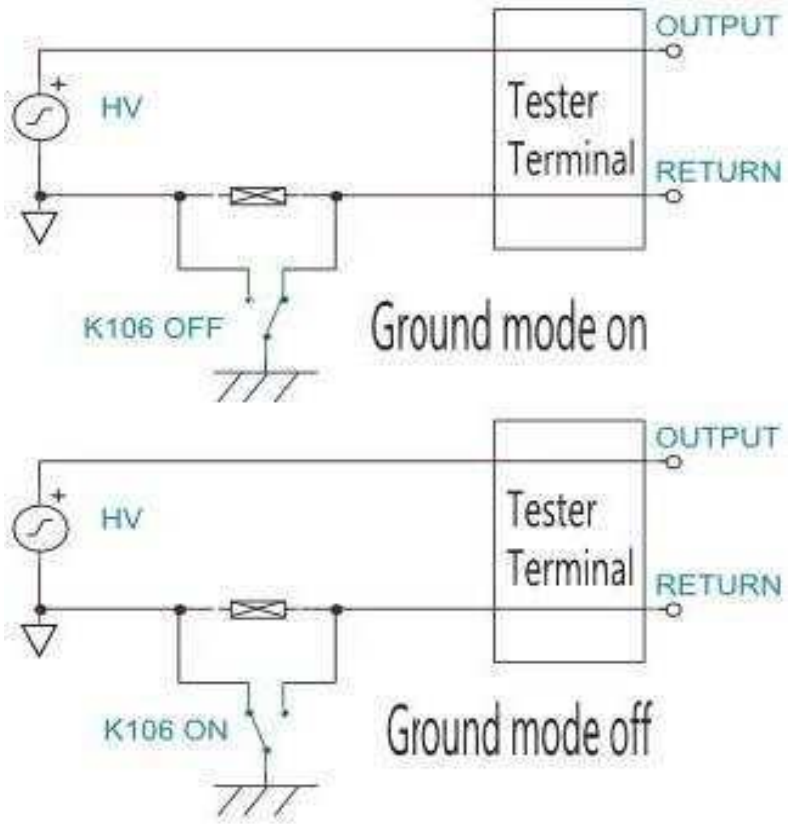
Current Range Table for Checking ACI DCI Current

No.	Location	Resistor value	Range	Full Scale Voltage
1	R178	1000	1mA	1V
2	R176	100	10mA	1V
3	R181+R182	10	100mA	1V

Set the Ground Mode Off

Setting the ground mode off in the utility menu will eliminate the minute leakage current to the earth ground caused by the stray capacitance /resistance.

Ground mode

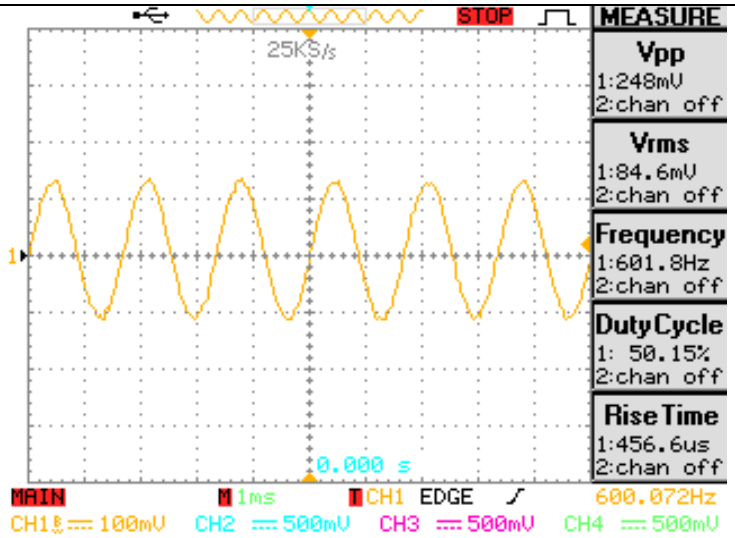


⚠ WARNING When GROUND MODE is set to OFF, the DUT, fixtures or connected instrumentation cannot be grounded. This will short circuit the internal circuitry during a test.

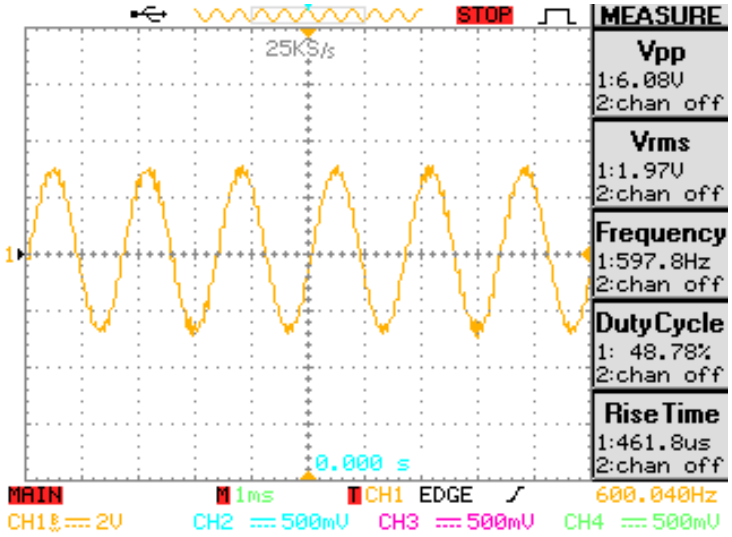
Checking DCV Voltage

Please follow the steps below to check the DCV voltage.

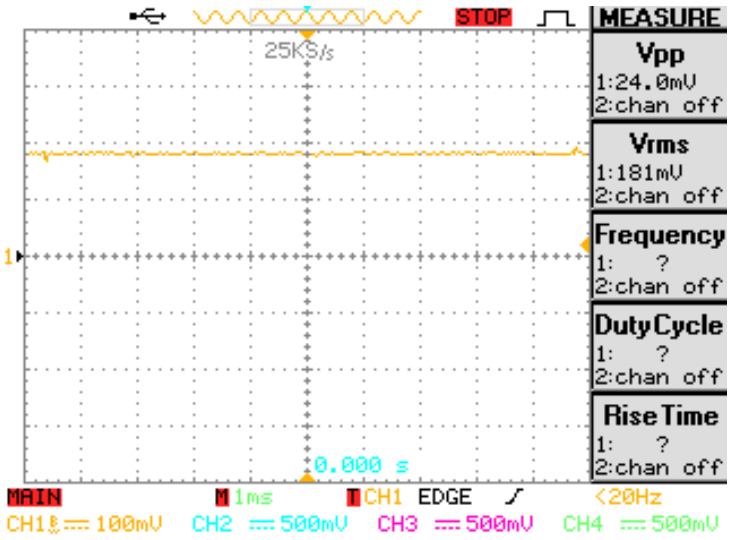
Configuration	Calibration mode: W-V_DC:600V DAC: 200
Step	1. Check J107: Pin1 Voltage rms: 84.6mV Frequency: 600Hz



2. Check J202: Pin1
   Voltage rms: 1.97V
   Frequency: 600Hz



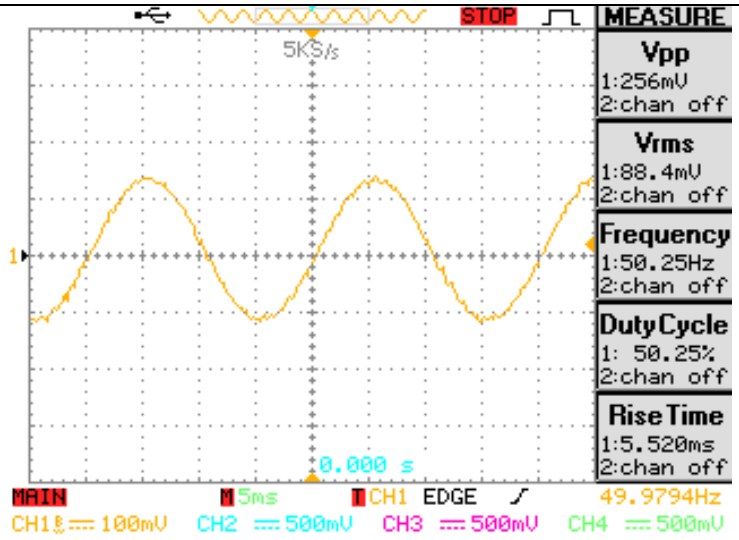
3. Check J110: Pin9
   Voltage rms: 181mV
   DCV



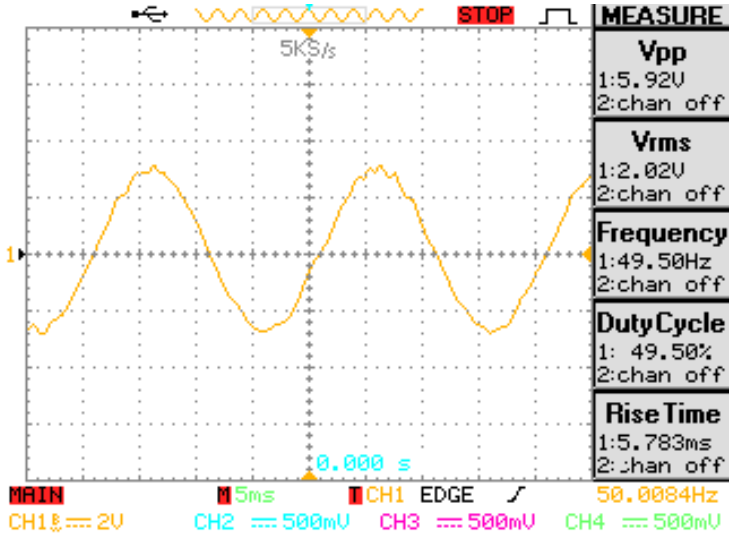
Checking ACV Voltage

Please follow the steps below to check the DCV voltage.

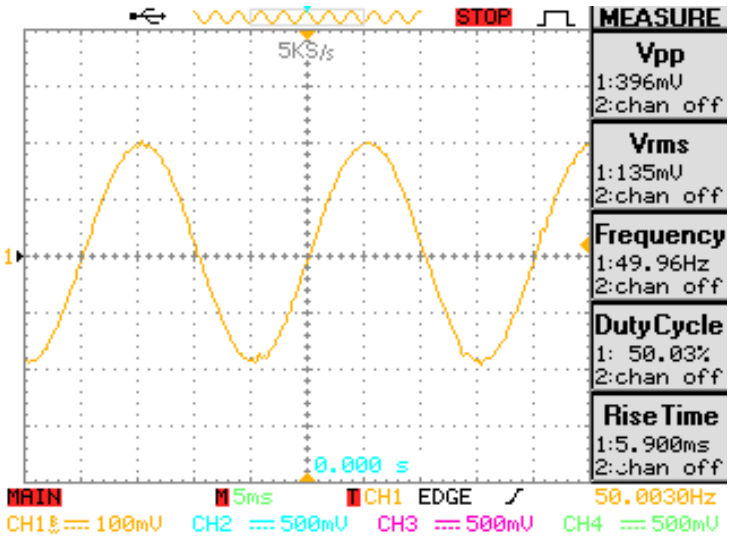
Configuration	Calibration mode: W-V_AC:50Hz 600V DAC: 200
Step	1. Check J107: Pin1 Voltage rms: 88.4mV Frequency: 50Hz

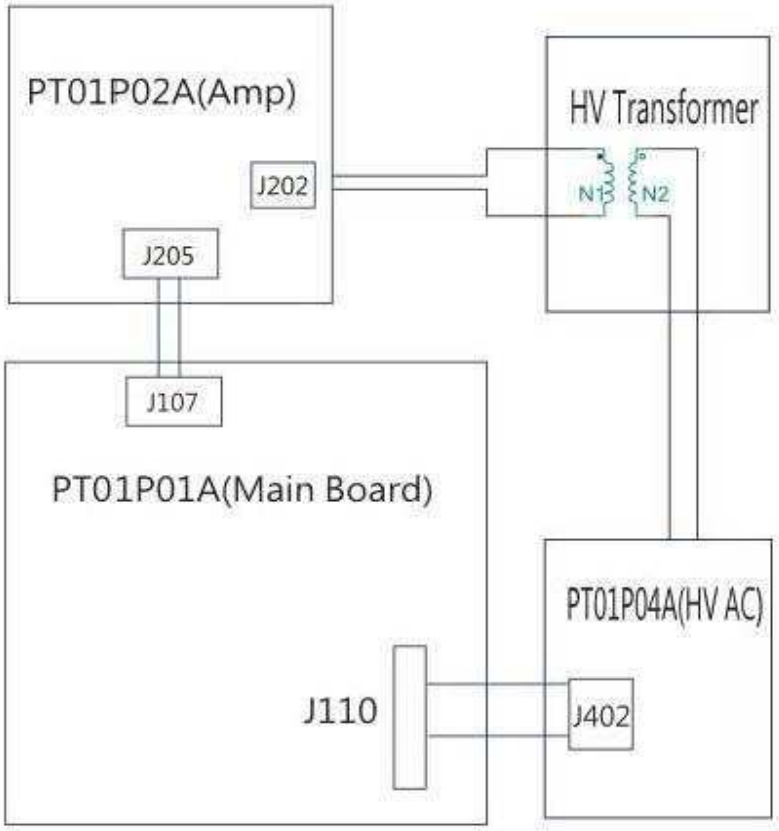


2. Check J202: Pin1
   Voltage rms: 2.02V
   Frequency: 50Hz

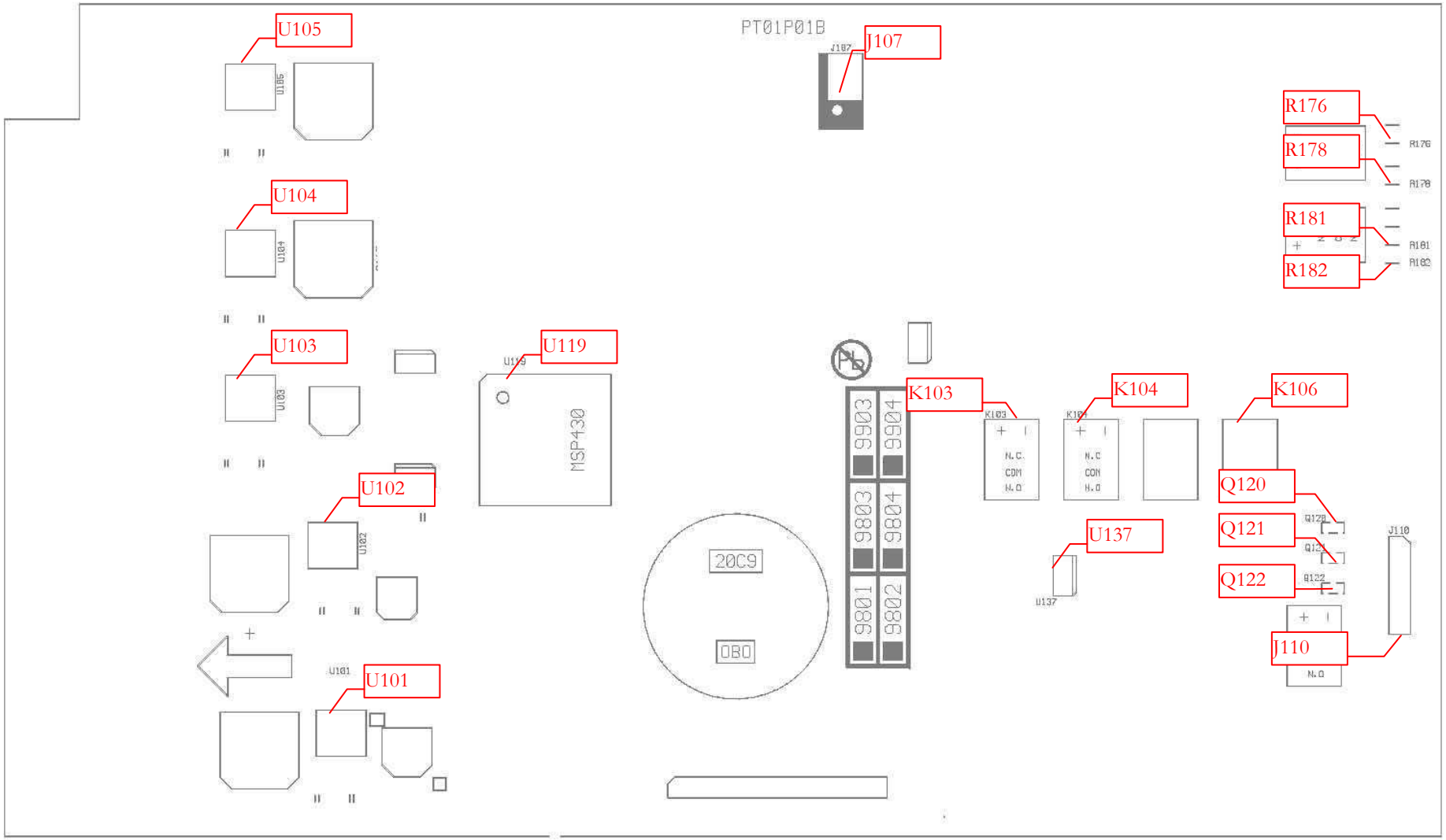


3. Check J110: Pin9
   Voltage rms: 135mV
   Frequency: 50Hz

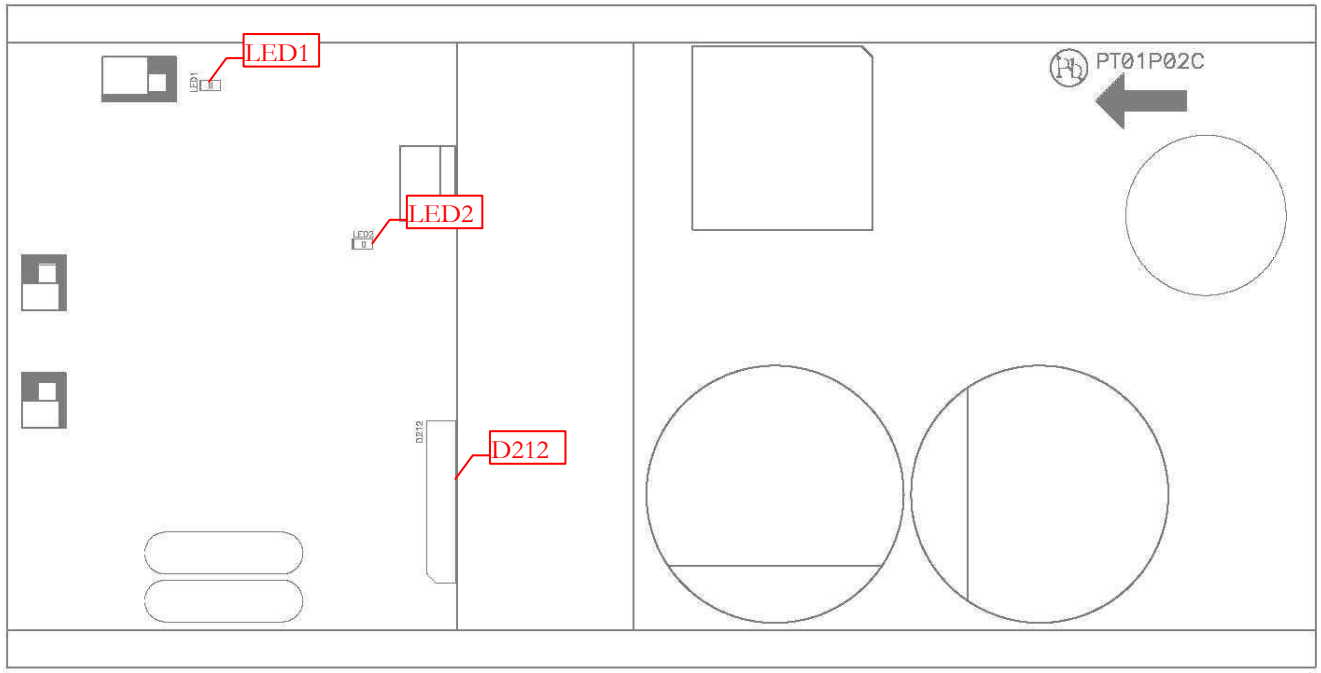




PT01P01B PCB

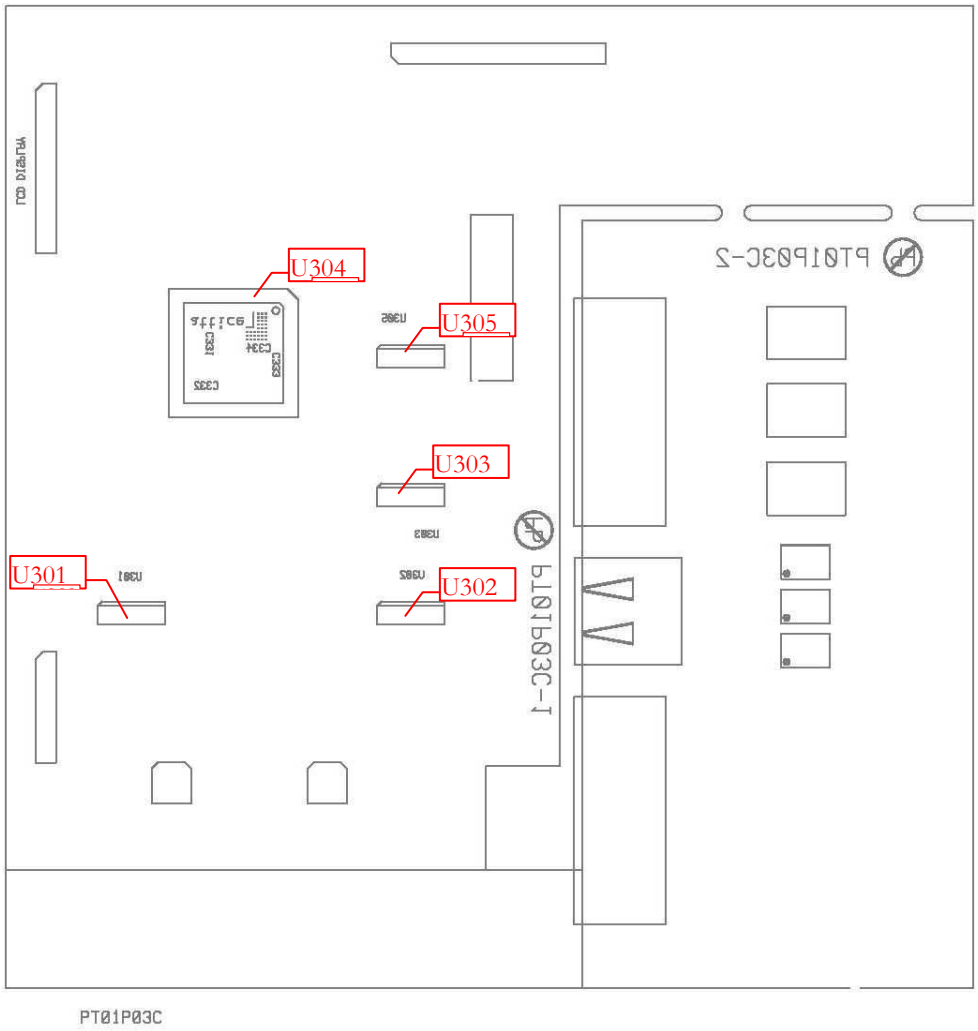


PT01P02C PCB

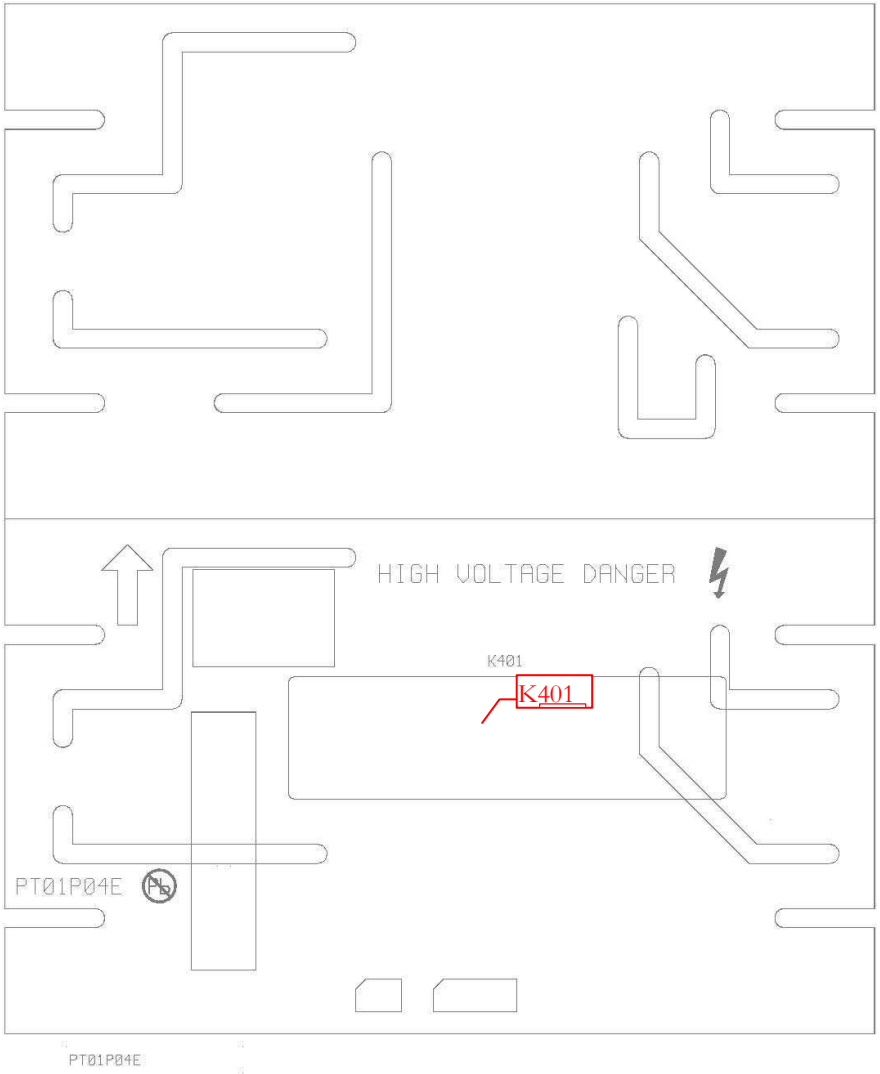


PT01P02C

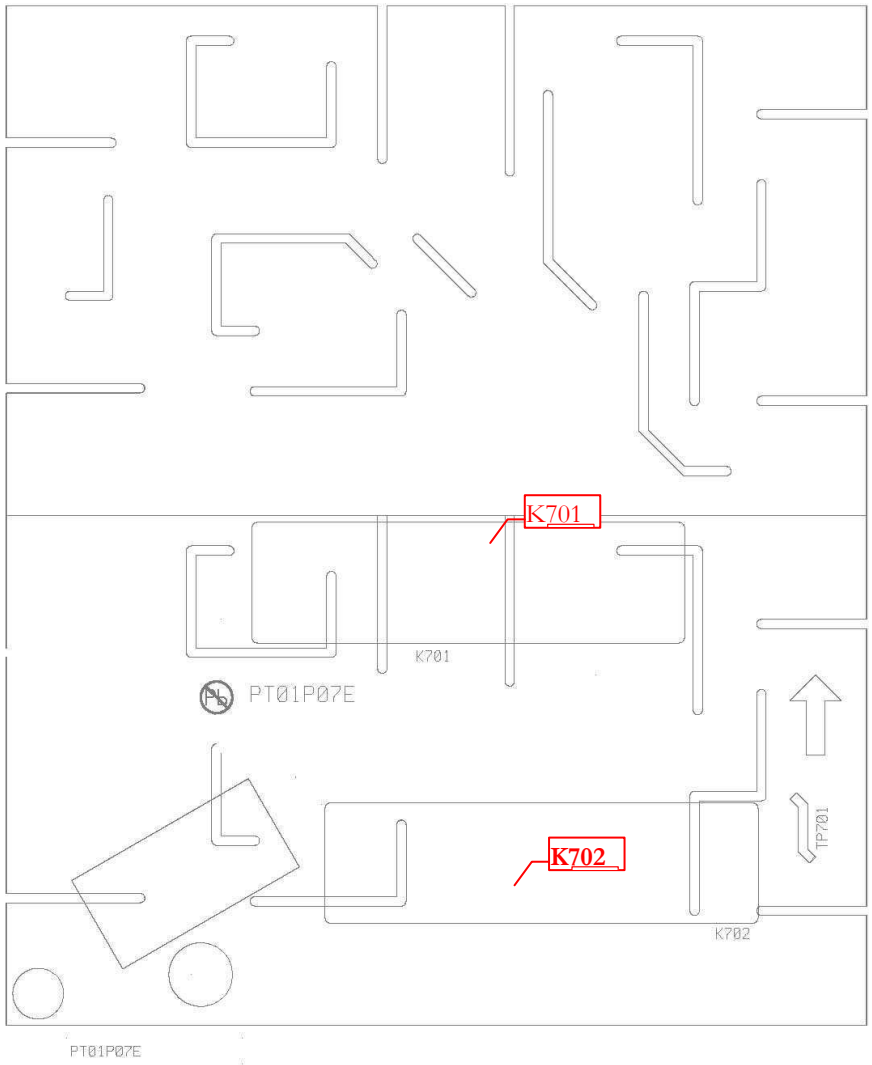
PT01P03C PCB



PT01P04E PCB



PT01P07E PCB



UPDATING THE FIRMWARE

The Firmware update chapter describes how to overwrite (update) the GPT-9800 firmware via the RS232C interface.

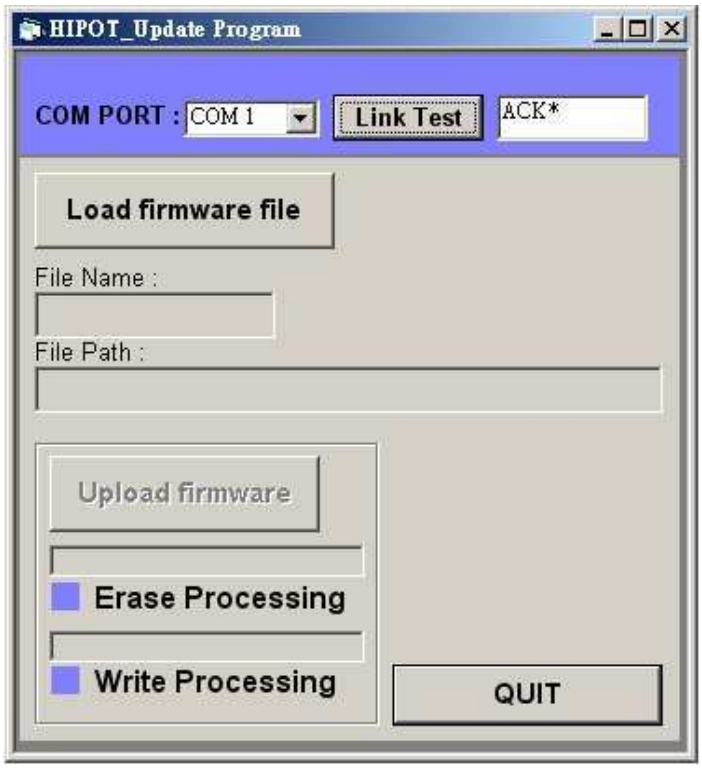
Operation

1. Connect the GPT and PC with an RS232C cable.
2. Press and hold the START and STOP buttons together then turn the power on. (Note: The GPT display will become fuzzy-it is normal)

3. Execute the "HIPOT_Program.exe" file in the Update Program folder.
4. Press the "Link Test" button to make sure the connection is successful.

Note

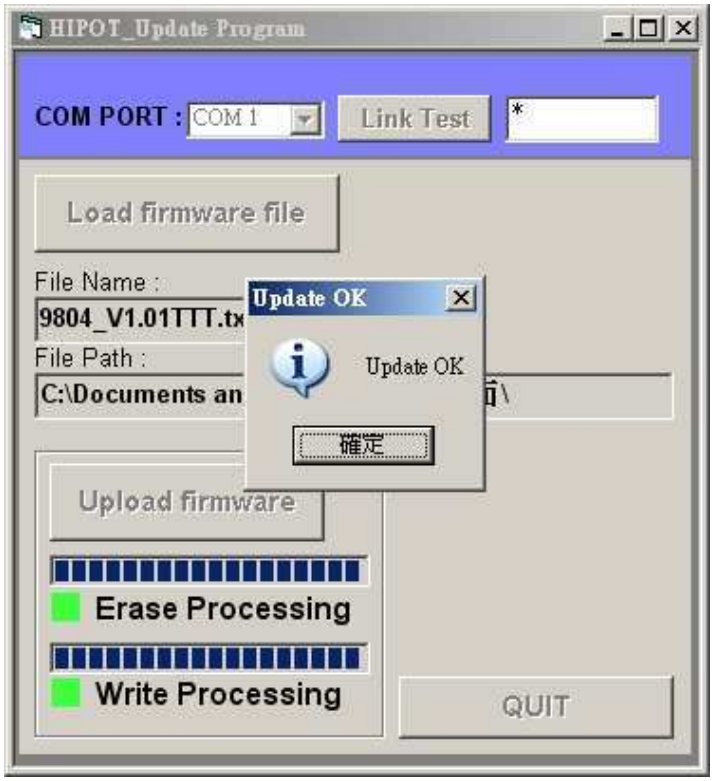
The message "**ACK***" appears beside the Link Test button when the connection is successful; if not, check the COM PORT and try again.



5. Press the "Load firmware file" button to select the firmware file.

6. Press the "Upload Firmware" button to start uploading the firmware to the instrument.

7. Wait 2~3 min for the firmware to upload. When the upload is complete, the "Update OK" message appears and the tester automatically turns on.



PARTS LIST

PCB Mount Parts

These parts, listed below, belong to the GPT-9800 PCB.

Part Number	Description	Location	Note
37FT-11945021	FUSE T 5.0*20 ,5A 250V, S506 ,RoHS	AC120V,	
37FT-11942521	FUSE T 5.0*20 ,2.5A 250V, S506 ,RoHS	AC230V,	
2504-104S0201	BRIDGE DI104S ,1A ,400V ,SMD ,RoHS	BD101,BD102,BD103,	
3811-09100101	BUZZER DC9V ,12mm ,24.5@*16(H) ,P ,OBO-20C9 ,RoHS	BZ101,	
225G-25477M01	CSE2 25V ,470uM ,SMD G 10@*10.2 ,EEEFK1E471P	C101,C115,C119,	
224D-16227M01	CSE1 16V ,220uM ,SMD,@6.3 ,ECS220/16W6ASC ,RoHS	C102,CA53,CA54,CA57,C118,	
22EJ-50104M01	CSL 50V ,0.1uM ,X7R ,CC0603MRY5V9BB104 ,RoHS	C103,C104,C107,C108,C112,C113,C116,C117,C120, C121,C122,C123,C124,C127,C130,C132,C146,C147, C148,C150,C151,C152,C155,C156,C157,C160,C161, C163,C165,C167,C168,C169,C171,C172,C173,C194, CA02,CA03,CA05,CA06,CA11,CA12,CA18,CA19,CA20, CA21,CA22,CA23,CA39,CA40,CA44,CA45,CA55,CA56, CA58,CA59,CA60,CA62,	
225G-35337M01	CSE2 35V ,330uM ,SMD G 10@*10.2 ,EEEFK1V331P	C105,C109,C110,	
224C-16476M01	CSE1 16V ,47uM , C CASE ,EEE1CA470WR ,RoHS	C106,	

225L-35107M01	CSE2 35V ,100uM ,SMD D8 6.3@*7.7 EEEFK1V101XP	C111,CA52,
225F-16477M01	CSE2 16V 470uM SMD F 8@*10.2 EEEFK1C471P RoHS	C114,
22EJ-50103K01	CSL 50V ,0.01UK ,0603 ,X7R ,RoHS	C125,C128,C137,C138,C140,C141,C162,C144,C134,
22EJ-50101J01	CSL 50V, 100pJ, NPO, 0603, RoHS	C126,C139,CA09,CA42,CA43,
22EJ-16105K01	CSL 16V ,1uK ,X5R ,0603 C1608X5R1C105K TDK RoHS	C133,C153,C154,C159,CA04,CA37,
22EJ-50472K01	CSL 50V ,4700pK ,X7R ,0603 ,RoHS	C143,
22EJ-25474Z01	CSL 25V ,0.47uZ ,Y5V ,0603 ,RoHS	C158,
22EJ-06475Z01	CSL 6.3V ,4.7uZ ,Y5V ,0603 ,CC0603ZRY5V5BB475 RoHS	C170,
22EJ-16105K01	CSL 16V ,1uK ,X5R ,0603 C1608X5R1C105K TDK RoHS	C191,
224C-25226M01	CSE1 25V ,22uM ,SMD ,CSM220M1ED05W ,RoHS	C201,C203,C208,C209,C210,C219,
22EJ-50102J01	CSL 50V, 1000pJ, NPO, 0603, RoHS	C202,C204,C205,C206,
22E7-16226K01	CSL 16V ,22uK ,X5R ,1210 ,EMK325BJ226KM-T ,RoHS	C207,
22E6-1A104K01	CSL 100V ,0.1uK ,X7R ,SMD 1206 ,C3216X7R2A104KT	C211,C215,C228,C232,C233,
2241-1A478M01	CSE1 100V ,4700uM ,35@*45 ,LPW472M2AQ45M ,RoHS	C212,C216,
22E5-2X151J01	CSL 250V ,150pJ ,C0G ,0805 ,C2012C0G2E151JT ,TDK	C213,C226,C234,
2271-4A104K01	CSD 400V ,0.1uK ,PMD400P10K0 ,RoHS	C214,C218,C237,
2271-4A105J01	CSD 400V ,1uJ ,P=22.5 ,6C2G105J-B0 ,RoHS	C217,C238,
22EJ-50104M01	CSL 50V ,0.1uM ,X7R ,CC0603MRY5V9BB104 ,RoHS	C220,C222,C223,C227,C229,C230,C231,C239,
224D-16227M01	CSE1 16V ,220uM ,SMD,@6.3 ,ECS220/16W6ASC ,RoHS	C221,
2271-1X105K01	CSD AC125V ,1uK ,P-22.5 ,6P5B105K-B0 ,RoHS	C224,C225,
22E7-25106K01	CSL 25V ,10uK ,X5R ,1210 ,TMK325BJ106MM-T ,RoHS	C236,
22EJ-25104K01	CSL 25V ,0.1uK ,X7R ,0603 ,RoHS	C301,C303,C304,C305,C306,C307,C308,C309,C311, C312,C313,C314,C315,C316,C317,C318,C322,C323, C324,C325,C327,C328,C329,C330,C331,C332,C333, C334,C335,C336,C337,C338,C339,C340,C341,C342, C343,C344,C345,C346,C348,C349,C351,C352,C353,

		C354,C355,C507,C509,C511,
224C-16226M01	CSE1 16V ,22uM ,C CASE ,EEE1CA220SR ,RoHS	C302,C310,C347,C350,C501,C502,
22EJ-50103K01	CSL 50V ,0.01UK ,0603 ,X7R ,RoHS	C319,C320,
22EJ-16105K01	CSL 16V ,1uK ,X5R ,0603 C1608X5R1C105K TDK RoHS	C326,C356,
2204-50473Z01	CSC 50V ,0.047uZ ,6@ ,VT ,FYU6473ZH ,RoHS	C401,
22EJ-25224Z01	CSL 25V ,0.22uZ ,Y5V ,0603 ,YAGEO ,RoHS	C505,C506,C504,
22EJ-50102J01	CSL 50V, 1000pJ, NPO, 0603, RoHS	C513,C514,C515,C516,C517,C503,
2204-50473Z01	CSC 50V ,0.047uZ ,6@ ,VT ,FYU6473ZH ,RoHS	C701,C702,
2291-8K153K01	CSK 8KV ,0.015uK ,±10% ,MPC TYPE ,AID ,RoHS	C703,
2291-2Y684K01	CSK AC275V ,0.68UK ,X2 ,UTX ,RoHS	C901,
22EJ-50102J01	CSL 50V, 1000pJ, NPO, 0603, RoHS	CA01,
22EJ-25473K01	CSL 25V ,0.047uK ,X7R ,0603 ,RoHS	CA10,
2291-63103J11	* CSK 63V ,0.01uJ ,B32529C0103J ,EPCOS ,RoHS	CA16,
22EJ-50101J01	CSL 50V, 100pJ, NPO, 0603, RoHS	CA31,CA33,C196,
22EJ-50104M01	CSL 50V ,0.1uM ,X7R ,CC0603MRY5V9BB104 ,RoHS	CA32,CA34,C189,C190,C193,
22EJ-50102J01	CSL 50V, 1000pJ, NPO, 0603, RoHS	CA35,
2271-4B334K01	CSD 450V 0.33uK 7Y2L334K-CCCC 13*12*7.5T P=10 RoHS	CA36,
22EJ-50223K01	CSL 50V ,0.022uK ,X7R ,0603 ,RoHS	CA38,
4694-50222S01	EMI FILTER CNF10R222S-TM ,50V ,2200pS ,0603 ,RoHS	CA46,CA47,CA48,
224C-25226M01	CSE1 25V ,22uM ,SMD ,CSM220M1ED05W ,RoHS	CA51,
22E5-50473K01	CSL 50V ,0.047uK ,X7R ,0805 ,RoHS	CA61,
2503205100501	ZENER 1/2W, 5.1V, TZMC5V1, SMD, VISHAY, RoHS	D101,D102,D111,D112,
2502-N4148201	DIODE RLS4148NTE-11 ,SMD (LL34) ,ROHM ,RoHS	D103,D104,D108,D109,D113,D116,D117,
2506-10006101	TVS SA10CA ,10V ,500W ,3uA ,LITTELFUSE ,RoHS	D105,
2502-N4148201	DIODE RLS4148NTE-11 ,SMD (LL34) ,ROHM ,RoHS	D106,D107,
2503205100501	ZENER 1/2W, 5.1V, TZMC5V1, SMD, VISHAY, RoHS	D110,
2503203600501	ZENER 1/2W ,3.6V ,TZMC3V6 ,SMD ,VISHAY ,RoHS	D115,

2502-56VGS081	SWITCHING DIODE BAW56-V-GS08 ,SMD ,VISHAY ,RoHS	D118,	
2503205600501	ZENER 1/2W ,5.2-6.0V ,SMD ,TZMC5V6 (+/-5%) ,RoHS	D201,D203,	
2502-N4148201	DIODE RLS4148NTE-11 ,SMD (LL34) ,ROHM ,RoHS	D202,	
2501-071M2201	FAST RECOVERY DIODE RF071M2STR ,SMD ,RoHS	D204,D206,D216,	
2503215000501	ZENER 1/2W ,15V ,SMD ,TZMC15 ,VISHAY ,RoHS	D205,D207,	
2501-R4004201	DIODE RLR4004 ,SMD (LL41) ,ROHM ,RoHS	D208,D209,	
2503268000501	ZENER 1/2W ,68V ,SMD ,MM1Z5266BH ,RoHS	D210,	
2503239800501	ZENER 1/2W ,39V ,SMD ,TZM5259B-GS08 ,RoHS	D211,	
2504-GBU8D001	BRIDGE GBU8D-E3 ,8A ,200V ,VISHAY ,RoHS	D212,	
2506-10006101	TVS SA10CA ,10V ,500W ,3uA ,LITTELFUSE ,RoHS	D213,	
2503224000501	ZENER 1/2W ,24V ,TZMC24 ,SMD ,VISHAY ,RoHS	D214,D215,	
2502-N4148201	DIODE RLS4148NTE-11 ,SMD (LL34) ,ROHM ,RoHS	D301,D501,D502,D503,D504,D505,D506,	
2501-N4002H01	DIODE 1N4002-E3 ,G.I ,HT ,T52 ,VISHAY ,RoHS	D401,	
2506-10006101	TVS SA10CA ,10V ,500W ,3uA ,LITTELFUSE ,RoHS	D402,	
2501-V0516001	** DIODE HV05-16 ,VR=16KV Io=550mA ,RoHS	D701,	
2501-N4002H01	DIODE 1N4002-E3 ,G.I ,HT ,T52 ,VISHAY ,RoHS	D702,D703,	
2501-N4002H01	DIODE 1N4002-E3 ,G.I ,HT ,T52 ,VISHAY ,RoHS	D801,D802,D803,	
37FT-7BA41021	FUSE T 8.35*7.7 ,1A 250V , MST	F101,F102,F103,F104,	
37FT-B8137021	FUSE T SMD 7A 125V,SET7A125V ,RoHS	F201,F202,	
40WA-B2BXHA01	WAFER B2B-XH-A (LF)(SN) ,RoHS	J101,J109,	
40WA-B7BXHA01	WAFER B7B-XH-A(LF)(SN) ,RoHS	J102,	
40PC-008PH091	PIN HEADER 1141003083 ,1*8P (4 X) ,180' ,RoHS	J103,	
40FC-100S0811	FPC 1.0*8P ,VERT ,SMD ,GFP-230221-30804G ,RoHS	J104,	
4231-20365101	FFC 20P ,650mm ,N-20C57-642-8S4 ,RoHS	J105,	TO J501
40FC-100S2031	FPC 1.0*20P ,VERT ,SMD ,GFP-230221-32004G ,RoHS	J105,	
4231-26325101	FFC 26P ,250mm ,N-26C37-242-8S4 ,RoHS	J106,	TO J304
40FC-100S2601	FPC 1.0*26P ,VERT ,SMD ,GFP-230221-32604G ,RoHS	J106,	
40WCJ10303241	XHXH-07#24-59B-1 ,GW1105019-5 ,RoHS	J107,	

40WA-B3BXHA01	WAFER B3B-XH-A (LF)(SN) ,RoHS	J107,	
4231-05317101	FFC 5P ,170mm ,K-5*170-1.0-0.05*0.65-4/4-8/8	J108,	TO J804
40FC-100S0501	FPC 1.0*5P ,VERT ,SMD ,GFP-230221-30504G ,RoHS	J108,	
40WCJ10203941	XHRT-07#22-150mm-2B-1 ,GW1109007-1 ,RoHS	J109,	TO SENSE H
4231-10315101	FFC 10P ,150mm ,N-10C57-142-8S4 ,RoHS	J110,	TO J402
40FC-100S1031	FPC 1.0*10P ,VERT ,SMD ,GFP-230221-31004G ,RoHS	J110,	
62SH-006ST301	CA 250M PIN-1 ,SOLDER PLATE , RoHS	J111,J112,J113,	
40WCJ10104331	OTRT-15#10-220mm-0-0 ,GW9905007-12 ,RoHS	J114,	TO SOURCE
62SH-006ST301	CA 250M PIN-1 ,SOLDER PLATE , RoHS	J114,J115,	
40WA-B3PVH001	WAFER B3P-VH (LF)(SN) ,RoHS	J201,	
40WA-B2PVH001	WAFER B2P-VH (LF)(SN) ,RoHS	J202,	
40WA-B2BXHA01	WAFER B2B-XH-A (LF)(SN) ,RoHS	J203,J204,	
40WA-B3BXHA01	WAFER B3B-XH-A (LF)(SN) ,RoHS	J205,	
4231-12340001	FFC 12P ,40mm ,N-12C37-32-8S4 ,RoHS	J301,	TO J305
40FC-100S1221	FPC 1.0*12P ,VERT ,SMD ,GFP-230221-31204G ,RoHS	J301,	
4231-08398001	FFC 8P ,90mm ,N-8C37-82-8S4 ,RoHS	J302,	TO J309
40FC-100S0811	FPC 1.0*8P ,VERT ,SMD ,GFP-230221-30804G ,RoHS	J302,	
4231-20350001	FFC 20P ,50mm ,N-20C37-42-8S4 ,RoHS	J303,	TO LCD
40FC-100S2031	FPC 1.0*20P ,VERT ,SMD ,GFP-230221-32004G ,RoHS	J303,J501,	
40FC-100S2601	FPC 1.0*26P ,VERT ,SMD ,GFP-230221-32604G ,RoHS	J304,	
40PC-008PH091	PIN HEADER 1141003083 ,1*8P (4 X) ,180' ,RoHS	J305,	
40FC-100S1221	FPC 1.0*12P ,VERT ,SMD ,GFP-230221-31204G ,RoHS	J305,	
44DJ-00500901	DIN JACK YE-0506 ,5P ,RoHS	J306,	
40WA-S2BXHA01	WAFER S2B-XH-A(LF)(SN) ,RoHS	J307,	
40FC-100S0811	FPC 1.0*8P ,VERT ,SMD ,GFP-230221-30804G ,RoHS	J309,	
4231-04310101	FFC 4P ,100mm ,N-4C57-92-8S4 ,RoHS	J401,	J701
40FC-100S0411	FPC 1.0*4P ,TOP ,DIP ,GFP-232221-10402G ,RoHS	J401,	
40FC-100S1021	FPC 1.0*10P ,TOP ,DIP ,GFP-232221-11002G ,RoHS	J402,	
40DS-00900301	D-SUB DRF09SNJ-H ,9P,MALE,90' ,RoHS	J502,	

44UB-K0400301	USB JACK 90' ,4P ,5075AR-04-WH ,RoHS	J503,	
40DS-20900301	D-SUB 5504F1C-09S-02A ,9P ,FEMALE ,90' ,RoHS	J504,	
40WA-B4BXHA01	WAFER B4B-XH-A (LF)(SN) ,RoHS	J505,	
62SW-080HP501	CA PSW ANALOG DIGITAL HP ,14mm ,RoHS	J506,J507,	
40FC-100S0411	FPC 1.0*4P ,TOP ,DIP ,GFP-232221-10402G ,RoHS	J701,	
40WCJ30400981	VHVH-15#20-350mm-BB20-2 ,GW1108022-1 ,RoHS	J801,	TO J202
40WA-B4PVH001	WAFER B4P-VH (LF)(SN) ,RoHS	J801,	
40WA-B2PVH001	WAFER B2P-VH (LF)(SN) ,RoHS	J802,	
40WA-B3PVH001	WAFER B3P-VH (LF)(SN) ,RoHS	J803,	
40FC-100S0501	FPC 1.0*5P ,VERT ,SMD ,GFP-230221-30504G ,RoHS	J804,	
40WA-B5PSVH01	WAFER B5PS-VH (LF)(SN) ,RoHS	J901,	
3322-05021001	RELAY FTR-B3GA4.5Z ,4.5V ,2A ,DPDT ,SMD ,RoHS	K101,K102,K105,K106,K107,K108,	
3322-05021001	RELAY FTR-B3GA4.5Z ,4.5V ,2A ,DPDT ,SMD ,RoHS	K103,K104,	
3200-11P00501	SW ROTARY EVR16V-015,1 POLE,24 POSITIONS,RoHS	K304,	
3311-24030201	*REED RELAY HM24-1A69-03(GP) ,DC24V,3A ,10KV RoHS	K401,	
3311-24030201	*REED RELAY HM24-1A69-03(GP) ,DC24V,3A ,10KV RoHS	K701,K702,	
3312-24100801	RELAY JQC-3FF/024-1ZS,DC24V,10A,SPDT (W/O SORTING)	K801,K802,K803,	
2900-22000101	CHOKE 22uH+/-20% ,EP20 ,APS-12846-2-NL	L201,	
2900-162502A1	COIL 1.6mH ,5A Q>=2.0 ,18T 0.75@ ,APS-10452-NL(CE)	L202,	
2900-232120Q1	CHOKE 2.3mH min ,Q>=12 ,1.0@ , 832-R2201-00, RoHS	L401,	
3112-02T10101	LED RED ,KPT-1608SURCK ,SMD ,1.6*0.8 ,RoHS	LED1,LED3,	
3112-06T10101	LED BLUE ,KPT-1608QBC-C ,SMD ,1.6*0.8 ,RoHS	LED2,	
3112-0DT00101	LED YELLOW/GREEN 67-21/G6C-FN2P2B/2T ,SMD ,RoHS	LED301,	

3112-02T00101	LED RED 67-21/R7C-AP2R1B/2T ,SMD ,RoHS	LED302,LED303,LED304,LED305,
3112-06T00101	LED BLUE ,67-21/BHC-FP1Q2F/2T ,SMD ,RoHS	LED306,
3112-04T00401	LED YELLOW ,67-21/Y2C-AQ1R2B/2T ,SMD ,RoHS	LED307,
2615-114EK0T1	TR DTC114EKAT146 ,SMD ,ROHM ,RoHS	Q103,Q104,Q105,Q108,Q109,Q110,Q111,Q112,Q113 ,
2615-114EK0T1	TR DTC114EKAT146 ,SMD ,ROHM ,RoHS	Q106,Q107,
2510-21700201	DN DAN217T146 ,SMD ,RoHS	Q114,
2510-21700201	DN DAN217T146 ,SMD ,RoHS	Q115,Q119,
2614-114EK0T1	TR DTA114EKAT146 ,SMD ,ROHM ,RoHS	Q116,
2666-548500T1	FET SST5485-E3, SMD, VISHAY, RoHS	Q117,
2502-TPAD5211	DIODE SSTPAD5-LF ,SMD ,RoHS	Q118,
2637-114EK0T1	TR DTD114EKT146 ,SMD ,ROHM ,RoHS	Q120,Q121,Q122,
2624-390400T1	* TR PMBS3904 ,SMD ,PHILIPS ,RoHS	Q124,
2674-610TG001	FET TP0610T-G ,SMD ,SUPERTEX ,RoHS	Q201,
266A-4020H001	MOSFET,RoHS	Q202,
2607-31CL00T1	TR TIP31CL-TN3-R ,SMD TO-252 ,UTC ,RoHS	Q203,Q209,
2624-390600T1	* TR PMBS3906 ,SMD ,PHILIPS ,RoHS	Q204,Q206,Q208,
2624-390400T1	* TR PMBS3904 ,SMD ,PHILIPS ,RoHS	Q205,Q207,
2636-114EK0T1	TR DTB114EKT146 ,SMD ,ROHM ,RoHS	Q301,
2614-114EK0T1	TR DTA114EKAT146 ,SMD ,ROHM ,RoHS	Q302,Q303,Q304,Q305,
2615-114EK0T1	TR DTC114EKAT146 ,SMD ,ROHM ,RoHS	Q306,Q307,Q308,Q309,Q310,Q311,Q312,
2637-114EK0T1	TR DTD114EKT146 ,SMD ,ROHM ,RoHS	Q503,Q504,Q505,
20C0-1002F211	R CHIP 1/10W ,10kF ,RC0603 ,RoHS	R101,R103,R105,R106,R111,R114,R118,R119,R122,R129,R131,R132,R133,R134,R135,R149,R158,R161,R163,R165,R167,R172,R185,R190,RA09,RA11,RA13,RA15,RA16,RA19,RA33,
20C0-200DF211	R CHIP 1/10W ,20RF ,RC0603 ,RoHS	R104,R130,
20C0-4991F211	R CHIP 1/10W ,4.99kF ,RC0603 ,RoHS	R112,R113,R102,
20C0-2002F211	R CHIP 1/10W ,20kF ,RC0603 ,RoHS	R120,R157,R166,R183,RA14,

20C0-4702F211	R CHIP 1/10W ,47kF ,RC0603 ,RoHS	R124,R125,R126,R127,R173,R174,R187,R189,RA21,R A22,RA28,
20C0-2001F211	R CHIP 1/10W ,2kF ,RC0603 ,RoHS	R128,
20C0-1003F211	R CHIP 1/10W ,100kF ,RC0603 ,RoHS	R136,
20C0-1002F211	R CHIP 1/10W ,10kF ,RC0603 ,RoHS	R137,R143,R150,R196,R198,RA01,
20C0-2002F211	R CHIP 1/10W ,20kF ,RC0603 ,RoHS	R138,R140,RA20,RA23,
20C0-4022F211	R CHIP 1/10W ,40.2kF ,RC0603 ,RoHS	R139,R162,R164,R169,R170,RA10,RA12,RA17,RA18,
20C0-4022F211	R CHIP 1/10W ,40.2kF ,RC0603 ,RoHS	R142,R148,R151,
20C0-2003F211	R CHIP 1/10W ,200kF,RC0603 ,RoHS	R144,R147,
20C0-4702F211	R CHIP 1/10W ,47kF ,RC0603 ,RoHS	R145,R146,R153,
4260-20D07601	NICHROME WIRE ,0.01R ,M TYPE ,FBA002000-00730	R154,R155,R156,
20C0-20B6J211	R CHIP 1/10W ,20MJ ,RC0603 ,RoHS	R160,
20C0-3002F211	R CHIP 1/10W ,30kF ,RC0603 ,RoHS	R168,R171,
20M1C1000F231	M CHIP 1/8W ,100RF ,1206 ,AR06FTD1000 ,RoHS	R176,
20M1C1001F231	M CHIP 1/8W ,1kF ,1206 ,AR06FTD1001 ,RoHS	R178,
20M1C499CF231	M CHIP 1/8W ,4.99RF ,1206 ,AR06FTD4R99 ,RoHS	R181,R182,
20C0-1001F211	R CHIP 1/10W ,1kF ,RC0603 ,RoHS	R184,
20C0-4751F211	R CHIP 1/10W ,4.75kF ,RC0603 ,RoHS	R186,R188,R191,R192,RA27,
2013-200DFT01	RM 1/2W ,20RF ,T26 ,MFR0623FAEU0200 ,RoHS	R193,R194,
20C0-2000F211	R CHIP 1/10W ,200RF ,RC0603 ,RoHS	R195,
20C0-1821F211	R CHIP 1/10W ,1.82kF ,RC0603 ,RoHS	R197,
20C0-4704F211	R CHIP 1/10W ,4.7MF ,RC0603 ,RoHS	R199,
20C0-1003F211	R CHIP 1/10W ,100kF ,RC0603 ,RoHS	R201,R232,R233,
20C0-3320F211	R CHIP 1/10W ,332RF ,RC0603 ,RoHS	R202,
20C0-3011F211	R CHIP 1/10W ,3.01kF ,RC0603 ,RoHS	R203,
20C0-7872F211	R CHIP 1/10W ,78.7kF ,0603 ,CR03FL778K7 ,RoHS	R204,
20C0-4751F211	R CHIP 1/10W ,4.75kF ,RC0603 ,RoHS	R205,R229,R231,
20C0-2000F211	R CHIP 1/10W ,200RF ,RC0603 ,RoHS	R206,
20C0-1000F211	R CHIP 1/10W ,100RF ,RC0603 ,RoHS	R207,R242,R243,

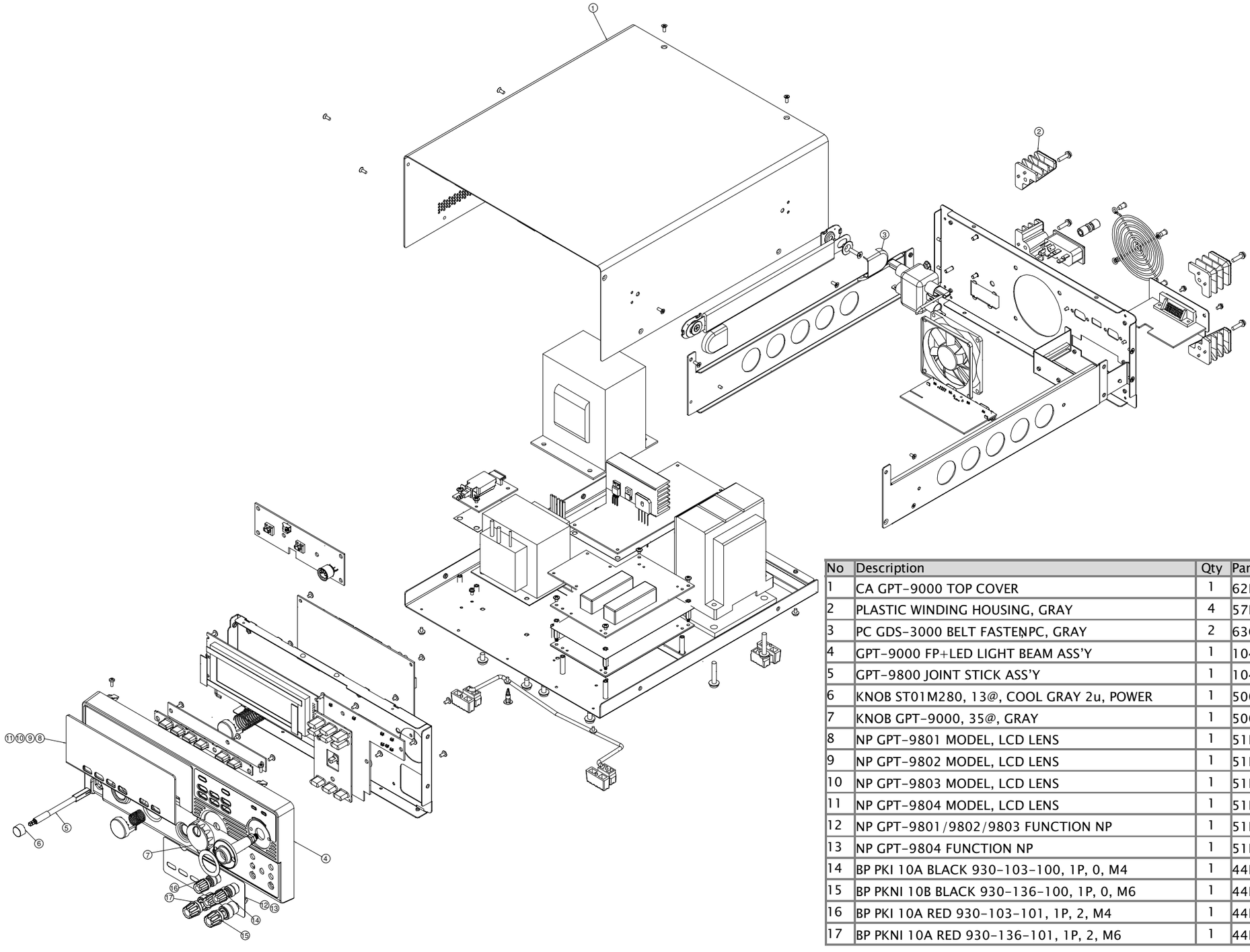
20C0-2741F211	R CHIP 1/10W ,2.74kF ,RC0603 ,RoHS	R208,R215,
20C4-1621F261	R CHIP 1W ,1.62kF ,2512 ,CR12FL41K62 ,RoHS	R210,R211,R245,R246,
20CI-4752F241	R CHIP 1/3W ,47.5kF ,1210 ,CR10FL747K5 ,RoHS	R212,
20C0-1002F211	R CHIP 1/10W ,10kF ,RC0603 ,RoHS	R213,R220,R230,R234,R235,R236,R237,R239,R252,
20C0-7151F211	R CHIP 1/10W ,7.15kF ,RC0603 ,RoHS	R214,R209,
20C0-475CF211	R CHIP 1/10W ,4.75RF ,RC0603 ,RoHS	R216,
20C0-4021F211	R CHIP 1/10W ,4.02kF ,RC0603 ,RoHS	R217,
20C1-6041F221	R CHIP 1/8W ,6.04kF ,RC0805 ,RoHS	R218,
20C0-100DF211	R CHIP 1/10W ,10RF ,RC0603 ,RoHS	R219,R223,R224,R244,R253,
20C0-200DF211	R CHIP 1/10W ,20RF ,RC0603 ,RoHS	R221,R222,
20C4-2211F261	R CHIP 1W ,2.21kF ,2512 ,CR12FL42K21 ,RoHS	R225,
20C0-1502F211	R CHIP 1/10W ,15kF ,RC0603 ,RoHS	R226,
20C4-5620F261	R CHIP 1W ,562RF ,2512 ,CR12FL4562R ,RoHS	R227,
20C0-7150F211	R CHIP 1/10W ,715RF ,0603 ,CR03FL7715R ,RoHS	R228,
20C0-47B3J211	R CHIP 1/10W ,47kJ ,RC0603 ,RoHS	R238,
20C0-2202F211	R CHIP 1/10W ,22kF ,RC0603 ,RoHS	R240,R241,
20C4-4320F261	R CHIP 1W ,432RF ,2512 ,CR12FL4432R ,RoHS	R247,
20C4-1600F261	R CHIP 1W ,160RF ,2512 ,CR12FL4160R ,RoHS	R248,R249,
20C4-1002F261	R CHIP 1W ,10kF ,2512 ,RC2512FK-0710K9L ,RoHS	R250,
20C0-47B3J211	R CHIP 1/10W ,47kJ ,RC0603 ,RoHS	R301,R302,R303,R304,R308,R317,R318,R319,R320,R321,R322,R323,R324,R325,R326,R327,R328,
20C0-47B2J211	R CHIP 1/10W ,4.7kJ ,RC0603 ,RoHS	R305,
20C0-47B0J211	R CHIP 1/10W ,47RJ ,RC0603 ,RoHS	R306,R329,
20C0-100DF211	R CHIP 1/10W ,10RF ,RC0603 ,RoHS	R307,
20C0-2002F211	R CHIP 1/10W ,20kF ,RC0603 ,RoHS	R311,
20C0-2491F211	R CHIP 1/10W ,2.49kF ,RC0603 ,RoHS	R312,
20C0-4023F211	R CHIP 1/10W ,402kF ,0603 ,CR03FL7402K ,RoHS	R313,
20C0-2003F211	R CHIP 1/10W ,200kF,RC0603 ,RoHS	R314,
20C0-1003F211	R CHIP 1/10W ,100kF ,RC0603 ,RoHS	R315,

20C0-4992F211	R CHIP 1/10W ,49.9kF ,RC0603 ,RoHS	R316,
20C0-2000F211	R CHIP 1/10W ,200RF ,RC0603 ,RoHS	R330,
20C0-10B5J211	R CHIP 1/10W ,1MJ ,RC0603 ,RoHS	R331,
20C0-10B1J211	R CHIP 1/10W ,100RJ ,RC0603 ,RoHS	R332,R333,R334,R335,
20C0-1500F211	R CHIP 1/10W ,150RF ,RC0603 ,RoHS	R336,
2002-27B0J001	RC 1/4W ,27RJ ,CF1/4W27RJM ,RoHS	R401,
2012-6041FT01	RM 1/4W ,6.04kF ,MF1/4DCT26A6041F ,RoHS	R402,
20D4-10B6J031	THICK FILM 1W ,10MJ ,RK92-8CD106J ,KOA ,RoHS	R403,R404,
20C0-1002F211	R CHIP 1/10W ,10kF ,RC0603 ,RoHS	R503,R504,R502,
20C0-47B1J211	R CHIP 1/10W ,470RJ ,RC0603 ,RoHS	R508,R509,R501,
2002-27B0J001	RC 1/4W ,27RJ ,CF1/4W27RJM ,RoHS	R701,R702,
2077B50B2J151	RO 5W ,5kJ ,HOR P=30mm ,RSS05J5001S000NH ,RoHS	R703,R704,
2013-1004FT01	* RM 1/2W ,1MF ,HT ,RoHS	R901,
20C0-1003F211	R CHIP 1/10W ,100kF ,RC0603 ,RoHS	RA02,
20C0-2001F211	R CHIP 1/10W ,2kF ,RC0603 ,RoHS	RA03,
20C0-3902F211	R CHIP 1/10W ,39kF ,RC0603 ,RoHS	RA05,
20C4-3003F261	R CHIP 1W ,300KF ,2512 ,CR12FL4300K ,RoHS	RA06,RA07,
20C0-1005F211	R CHIP 1/10W ,10MF ,RC0603 ,RoHS	RA08,
20C2-10B4J231	R CHIP 1/4W ,100kJ ,RC1206 ,RoHS	RA24,
20C0-0000J211	R CHIP 1/10W ,0RJ ,RC0603 ,RoHS	RA25,
20C0-47B2J211	R CHIP 1/10W ,4.7kJ ,RC0603 ,RoHS	RA30,RA31,RA32,RA35,
20C0-4700F211	R CHIP 1/10W ,470RF ,RC0603 ,RoHS	RA34,
3322-05021001	RELAY FTR-B3GA4.5Z ,4.5V ,2A ,DPDT ,SMD ,RoHS	RL501,RL502,RL503,
2063L47B3J821	RN 1/16W ,47KJ*4 ,8P ,0603*4 ,YC-164 ,RoHS	RP301,RP302,RP303,RP304,RP305,RP306,RP307,RP308,RP309,RP310,RP311,RP312,RP313,
3202-11213501	KDC-A11-E210-S(750M)(SDDFA3117U-GW),DPDT,4P* 1 PP	S901,
3206-0X000501	KEY BOARD SW ML1A-11JW ,UNLOCK ,RoHS	SW301,SW302,
2505-22220011	THR NTC TTC3A222F39H2EY ,2.2kF ,TKS ,RoHS	T201,

2505-225D0011	THR NTC SCK202R5 ,2.5RM ,20mm ,RoHS	T901,	
62SH-006ST301	CA 250M PIN-1 ,SOLDER PLATE , RoHS	TP401,TP402,TP405,TP406,	
62PT-900ST101	CA PCF250 SOLDER PLATE 90' ,RoHS	TP403,TP404,	
40WCJ10203841	OTOT239#22-99-0 ,GW1105019-2 ,RoHS	TP406,	TO TP703,J113
40WCJ10106831	OTOT-39#22-120mm-9-0 ,GW1105019-6 ,RoHS	TP701,TP702,	TP701 TO TP402 ,TP702 TO TP404
62SH-006ST301	CA 250M PIN-1 ,SOLDER PLATE , RoHS	TP702,TP703,TP701,	
2733-7805DL11	IC NJM7805DL1A-TE1 ,SMD ,JRC ,RoHS	U101,U105,	
2733-79M12DL1	IC NJM79M12DL1A-TE1 ,SMD ,JRC ,RoHS	U102,	
2733-7812DL11	IC NJM7812DL1A-TE1 ,SMD ,JRC ,RoHS	U103,	
2733-2855DL11	IC NJM2855DL1-33-TE1 ,SMD ,JRC ,RoHS	U104,	
2799-08300401	*IC GLS27SF512-70-3C-NHE SMD GPT-9800 V1.00(FE807D	U106,	
2743-4064V011	IC	U107,	
2713-0800LCM1	IC DAC0800LCM ,SMD ,NATIONAL ,RoHS	U108,	
2733-072M0001	IC NJM072M-TE1 ,SMD ,JRC ,RoHS	U110,U122,U132,U133,U134,U138,U139,	
27AB-1G132DT1	IC MC74VHC1G132DTT1G ,SMD ,ON ,RoHS	U111,U112,	
2761-4922ESL1	IC	U113,U114,	
2733-201AM001	IC NJU201AM-TE1 ,SMD ,JRC ,RoHS	U115,	
2799-06400001	IC AT25640AN-10SU-2.7.R4 (BLANK) SMD ATMEL RoHS	U116,U118,	
2799-06300001	IC	U119,	
2785-431APXZ1	IC TL431APX, SMD, AIC, RoHS	U120,	
2761-33010001	IC	U121,	
2715-1201ARZ1	IC ADUM1201ARZ ,SMD ,ANDE ,RoHS	U123,U124,	
27AT-2102GM01	IC	U126,	
2764-202ECSE1	IC MAX202ECSE+ ,SMD ,MAXIM ,RoHS	U127,	
2733-072M0001	IC NJM072M-TE1 ,SMD ,JRC ,RoHS	U128,U137,	

2711-2062ACD1	IC TLE2062ACDR ,SMD ,TEXAS ,RoHS	U129,
2713-311MX001	IC LM311MX/NOPB, SMD, NATIONAL, RoHS	U130,U135,U136,
2711-2062ACD1	IC TLE2062ACDR ,SMD ,TEXAS ,RoHS	U131,
2794-2092S001	IC	U201,
2711-071CDRZ1	IC TL071CDR ,SMD ,TEXAS ,RoHS	U202,
270174HC14MX1	IC MM74HC14MX ,SMD ,FAIRCHILD ,RoHS	U301,U302,U303,U305,
2799-02980001	IC LC4128V-75TN100C (BLANK) ,SMD ,RoHS	U304,
27AB-1G132DT1	IC MC74VHC1G132DTT1G ,SMD ,ON ,RoHS	U306,
2744-817S0001	IC LTV-817S ,SMD ,LITEON ,RoHS	U501,U502,U503,
2804-38M40021	CRYSTAL 38.4MHz ,3SWO-AT-38.400 ,SMD ,RoHS	X101,
2506-98008101	ZNR 90V ARR-BM090M-CA8 ,8@ ,RoHS	ZD201,ZD202,
2506-60207101	VARISTOR YA-602M ,6000V ,6.5mm ,RoHS	ZD401,

Explosion Diagram



No	Description	Qty	Part number
1	CA GPT-9000 TOP COVER	1	62PT-900UP101
2	PLASTIC WINDING HOUSING, GRAY	4	57FC-10G00401
3	PC GDS-3000 BELT FASTEN PC, GRAY	2	63CH-AG1001A1
4	GPT-9000 FP+LED LIGHT BEAM ASS'Y	1	1042-PT9K101
5	GPT-9800 JOINT STICK ASS'Y	1	1042-PT9K201
6	KNOB ST01M280, 13@, COOL GRAY 2u, POWER	1	5004-130G0101
7	KNOB GPT-9000, 35@, GRAY	1	5005-350G0101
8	NP GPT-9801 MODEL, LCD LENS	1	51PT-980101A1
9	NP GPT-9802 MODEL, LCD LENS	1	51PT-980201A1
10	NP GPT-9803 MODEL, LCD LENS	1	51PT-980301A1
11	NP GPT-9804 MODEL, LCD LENS	1	51PT-98040101
12	NP GPT-9801/9802/9803 FUNCTION NP	1	51PT-98030201
13	NP GPT-9804 FUNCTION NP	1	51PT-98040201
14	BP PKI 10A BLACK 930-103-100, 1P, 0, M4	1	44BJ-01100901
15	BP PKNI 10B BLACK 930-136-100, 1P, 0, M6	1	44BJ-01101001
16	BP PKI 10A RED 930-103-101, 1P, 2, M4	1	44BJ-21100801
17	BP PKNI 10A RED 930-136-101, 1P, 2, M6	1	44BJ-21100901

APPENDIX

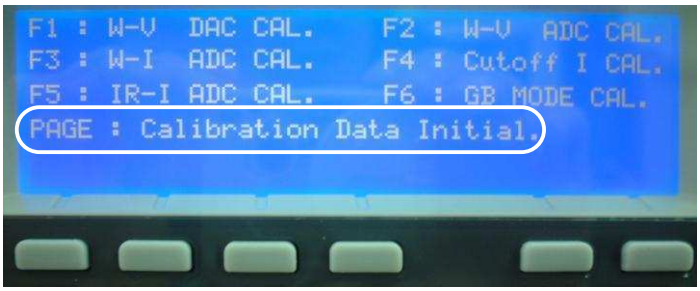
Factory Menu

Background

The factory menu allows the GPT-9800 to revert back to it's factory pre-set state.

Accessing the factory menu

1. Enter the Calibration menu, page 35.



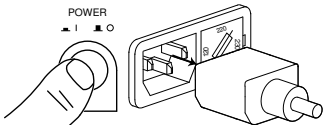
3. Press the PAGE key to recall the factory default settings.

Fuse Replacement

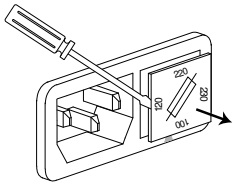
⚠ WARNING Make sure the cause of fuse blowout is fixed before replacing the fuse.

Step

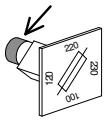
1. Turn the power off and remove the power cord.



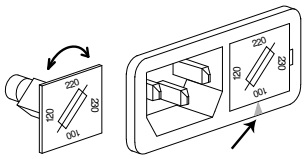
2. Remove the fuse socket using a minus driver.



4. Replace the fuse in the holder.



3. Ensure the correct line voltage is lined up with the arrow on the fuse holder. Insert the fuse socket.



Rating		
	100V/120V	T5A 250V
	220V/230V	T2.5A 250V

Error Messages

The following error messages or messages may appear on the GPT-9800 screen during the Start-Up initialization. If any of these error messages appear on the GPT-9800, please see an authorized GW Instek distributor.

Error Messages	Description
0x11	EEPROM1 Error
0x12	EEPROM1 Error
0x21	W-V Offset Error (W-V: ACW/DCW voltage)
0x22	W-I Offset Error (W-I: ACW/DCW current)
0x23	IR-I Offset Error
0x24	GB-I Offset Error