Contents

Introduction

Thank you for purchasing this HIOKI "3157 AC GROUNDING HiTESTER."
To get the maximum performance from the unit, please read this manual first, and keep this at hand.

Inspection

When the unit is delivered, check and make sure that it has not been damaged in transit. In particular, check the accessories and connectors. If the unit is damaged, or fails to operate according to the specifications, contact your dealer or HIOKI representative.

Checking the main unit and accessories

Main unit

"3157 AC GROUNDING HiTESTER"

Accessories

Verify that the following standard accessories are complete.
(1) Instruction Manual
(2) Spare fuse (built into the power inlet)
(3) Grounded three-core power cord
(4) Short bar (installed between the SOURCE and SENSE terminals) × 2

NOTE The 9296 CURRENT PROBE and 9297 CURRENT APPLY PROBE are not included. Please purchase separately according to your needs.

Shipment of the unit

If reshipping the unit, preferably use the original packing.

Warranty

HIOKI cannot be responsible for losses caused either directly or indirectly by the use of the 3157 with other equipment, or if ownership is transferred to a third party.

Safety Notes

⚠ DANGER **This equipment is designed according to IEC 61010-1 Safety Standards, and has been tested for safety prior to shipment. Incorrect measurement procedures could result in injury or death, as well as damage to the equipment. Please read this manual carefully and be sure that you understand its contents before using the equipment. The manufacturer disclaims all responsibility for any accident or injury except that resulting due to defect in its product.**

This Instruction Manual provides information and warnings essential for operating this equipment in a safe manner and for maintaining it in safe operating condition. Before using this equipment, be sure to carefully read the following safety notes.

Safety symbols

	• This symbol is affixed to locations on the equipment where the operator should consult corresponding topics in this manual (which are also marked with the ⚠ symbol) before using relevant functions of the equipment. • In the manual, this mark indicates explanations which it is particularly important that the user read before using the equipment.
	Indicates a fuse.
	Indicates AC (Alternating Current).
	Indicates both DC (Direct Current) and AC (Alternating Current).

The following symbols are used in this Instruction Manual to indicate the relative importance of cautions and warnings.

⚠ DANGER	Indicates that incorrect operation presents extreme danger of accident resulting in death or serious injury to the user.
⚠ WARNING	Indicates that incorrect operation presents significant danger of accident resulting in death or serious injury to the user.
⚠ CAUTION	Indicates that incorrect operation presents possibility of injury to the user or damage to the equipment.
NOTE	Denotes items of advice related to performance of the equipment or to its correct operation.

Notes on Use

In order to ensure safe operation and to obtain maximum performance from the unit, observe the cautions listed below.

⚠ WARNING

- **Before turning on the power, make sure that the voltage of the power supply being used matches the supply voltage indicated on the rear panel of the unit.**
- **If an attempt is made to use an improper supply voltage, there is danger of damage to this unit and of life-threatening risk to the operator.**
- **The unit is constructed so as to be connected to a ground line via a three-core power cord that is supplied with the unit. In order to avoid electric shock, connect the unit to a properly grounded (3-pin) outlet using the power cord provided.**
- **The interior of the unit contains some components which are subject to high voltage, and therefore dangerous. Absolutely do not remove the cover panel.**
- **To prevent electric shock, do not allow the unit to become wet and do not use the unit when your hands are wet.**
- **The unit should always be operated indoors in a range from 0℃ to 40℃ and 30% to 90% RH. Do not use the unit in direct sunlight, dusty conditions, or in the presence of corrosive gases.**
- **Only use fuses of the specified type that is rated for the specified current and voltage. Using a fuse that does not meet the specifications or shorting the fuse holder may cause an accident that might result in injury or death. (Specified fuse: 250 V T3.15 AL)**

⚠ CAUTION

- Before using the unit, make sure that the sheathing on the probes (9296 or 9297) is not damaged and that no bare wire is exposed. If there is damage, using the unit could cause electric shock. Contact your dealer or HIOKI representative.
- In order to avoid electric shock, turn off the power to all devices before plugging in or unplugging the measurement network or RS-232C connector.
- When unplugging the power cord from the power receptacle or from the unit, grasp the plug, not the cord, in order to avoid damaging the cable.
- To avoid damaging the probes, do not bend or pull the probes.
- Use caution when taking measurements in circuits where the power lines are hot.
- Take care not to block the ventilation openings on the sides of the unit.
- For safety reasons, only use the optional 9296 or 9297 probe for measurement.
- To avoid damage to the unit, do not subject the equipment to vibrations or shocks during transport or handling. Be especially careful to avoid dropping the equipment.
- Do not insert a board other than optional interface boards into the Interface slot. The unit software or calibration data may be lost.
- In the event that the equipment malfunctions in any manner during use, turn off the power immediately, and contact your dealer or HIOKI representative.

NOTE Do not use the unit near any device which generates strong electromagnetic radiation or near a static electrical charge, as these may cause errors.

Contents and Indications of this Manual

Chapter 1: Overview
Describes an overview, features, and the names and functions of the parts of the unit.

Chapter 2: Testing Arrangements
Describes particulars of testing arrangements.

Chapter 3: Testing Method
Describes procedures for setting, testing, and test results judgement.

Chapter 4: Optional Functions
Describes procedures for setting optional functions.

Chapter 5: Saving/loading Preset Values
Describes procedure for saving and loading test values.

Chapter 6: External I/O
Describes use of the external I/O.

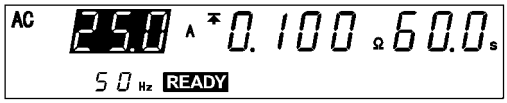
Chapter 7: Maintenance, Inspection and Ultimate Disposal
Covers the maintenance and inspection, fuse replacement, and ultimate disposal.

Chapter 8: Specifications
Contains the unit specifications such as the general specifications, measurement accuracy, etc. of the unit.

Chapter 9: Appendix
Covers the options of the unit and standards.

Indications in the Instruction Manual

OPTION Indicates that settings can be made for optional functions.
For more information, see Chapter 4, "Optional Function."



In this Instruction Manual, the flashing area of the screen is represented in reverse mode.
In this figure, for example, the current value of 25.0 A flashes.

Chapter 1
Overview

1.1 Product Introduction

The HIOKI "3157 AC GROUNDING HiTESTER" is designed for protection circuit testing of a wide range of electrical equipment, including industrial machinery, medical equipment, and measuring instruments.
Using a constant current system, the HIOKI 3157 provides stable output current. The unit is capable of accurate four-terminal measurement. The comparator function, timer function, and screening function permit simple testing, conforming to technical standards and regulations.

1.2 Features of the 3157

(1) Simple testing procedures conforming to technical standards

This unit incorporates a constant current method to provide stable output current. Voltage drop is measured with four terminals. The 3157 is also equipped with a function timer and a screening function, using maximum and minimum values, allowing straightforward testing in conformance with applicable technical standards.

(2) Test data counting function

This function enables test point counting for measured objects that have large numbers of test points.

(3) Soft-start function

By constantly monitoring current fluctuations, this function checks that the probe is connected to the measured object. The function also prevents sparking when the probe is connected to a test point after measurement begins.

(4) Compact and lightweight

With a compact lightweight design, the unit is highly portable and well-suited to maintenance measurement.

(5) Fluorescent indicator

The large, easy-to-read fluorescent display permits quick checking of the testing state and result.

(6) Probe

The 3157 is equipped with an alligator-clip probe (the 9296 CURRENT PROBE) and a switching probe (the 9297 CURRENT APPLY PROBE).
To improve testing efficiency, the push switch on the switching probe starts testing and inactivates result-checking mode.

(7) Saving testing set values

This unit is provided with a function for saving the set values used in a test, allowing quick switching between different testing set values to meet a variety of standards and regulations. Up to 20 values may be saved.

(8) Interface

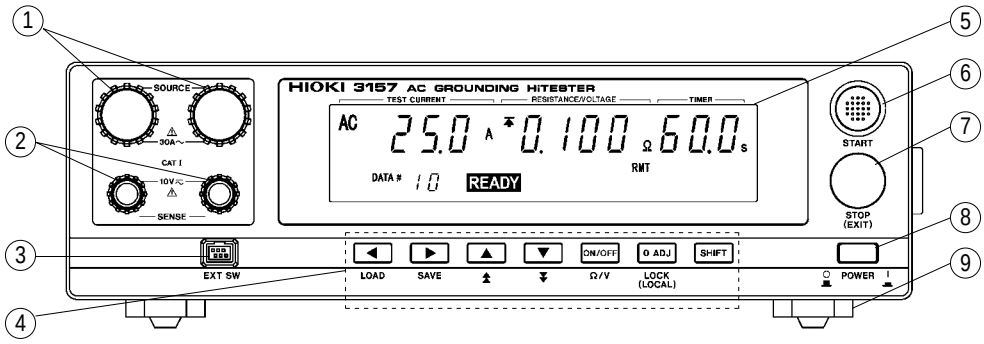
By using the optional 9593-02 RS-232C and 9518-02 GP-IB INTERFACE boards, the user can perform automatic testing and save the test results by means of a PC. Test results can be printed on the optional 9442 PRINTER. Connecting with the optional 3155 LEAK CURRENT HiTESTER enables testing and the test results can be saved and printed together with the 3155 leakage current test results.

(9) External I/O

The external I/O terminal generates signals according to the state of the 3157. It can be used to feed signals for the start and stop key.

1.3 Names and Functions of Parts

Front panel



① Current output terminal

Providing current during a test, this terminal serves as the source terminal for four-terminal measurement.

② Voltage measurement terminal

Used to measure voltage. This terminal serves as the sense terminal for four-terminal measurement.

③ External switch terminal

Used for the switch signal line connected to the switching probe (the 9297 CURRENT APPLY PROBE), the 9613 REMOTE CONTROL BOX (SINGLE) or the 9614 REMOTE CONTROL BOX (DUAL).

④ Rubber keys

The seven rubber keys include six function keys and a [SHIFT] key.
The six function keys offer a variety of settings, used in combination with the [SHIFT] key.

⑤ Fluorescent indicator

Displays various kinds of information, such as test state and results.

⑥ START key

Used to start a test. On starting a test with a preset value, the unit enters TEST mode. The test starts whether or not the flashing cursor is displayed.

⑦ STOP key

- Used to perform forcible ending of a test.
- Pressing the STOP key when the flashing cursor is displayed causes it to disappear. To display the flashing cursor again, press the ◄ or ► key. The cursor appears, displaying the preset current value.

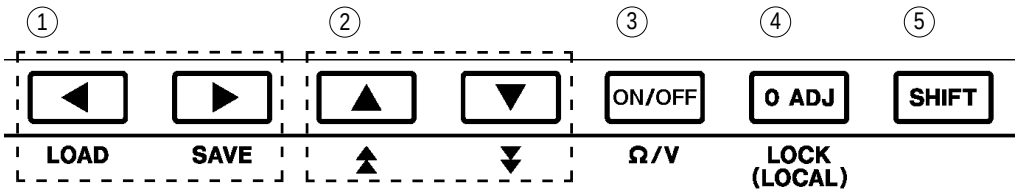
⑧ Main power switch

Powers the 3157 on or off.

⑨ Stand

The 3157 can be tilted up by using this stand.

Rubber keys (in READY state)



① Left/Right cursor key

Moves the flashing cursor. The switching range is preset before shipment: Preset current value ↔ Maximum Test Value ↔ Testing time ↔ Output Frequency.

The key can be set to shift to the minimum test value and the test data count, when these values are set with the optional functions.

To display the flashing cursor, press the ◀ or ▶ key. The cursor appears, displaying the preset current value.

② Up/Down cursor key

Changes the position at which the flashing cursor appears.

③ ON/OFF (Ω/V) key

Switches on/off the set value for the position of the flashing cursor. However, this key can't perform the switching on/off of the preset current value. If turned off, the set value is not used in testing.

④ Zero Adjustment key

Use this key to perform zero adjustment within the effective range of adjustment. The zero adjustment function is active when the 0ADJ lamp is lit. For zero adjustment procedure, see Section 3.4, "Zero Adjustment Function."

⑤ SHIFT key

Used in combination with other keys.

(1) Switching between voltage and resistance indicators

Press [ON/OFF] (Ω/V) while holding down the [SHIFT] key ([SHIFT] + [ON/OFF] (Ω/V)) to switch between voltage and resistance indicators.

(2) Setting the key lock

Press [SHIFT] + [0ADJ] (LOCK) key to activate key-lock mode.
For more information, see Section 3.5, "Key-lock Function."

(3) Displaying the Preset-data loading screen

Press [SHIFT] + ◀ to display the Preset-data loading screen.
For more information, see Chapter 5, "Saving/loading the Parameters Set."

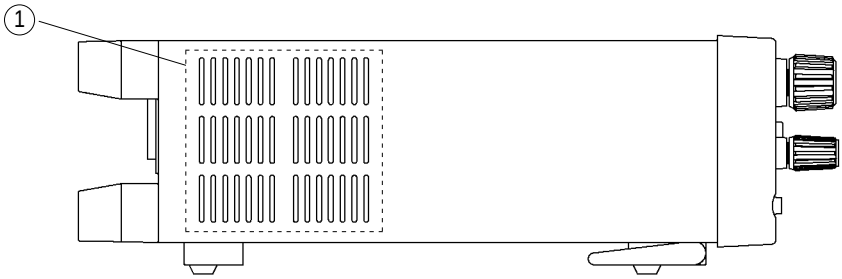
(4) Displaying the Preset-data saving screen

Press [SHIFT] + ▶ to display the Preset-data saving screen.
For more information, see Chapter 5, "Saving/loading the Parameters Set."

(5) Displaying the Optional function setting screen

Press [SHIFT] + [STOP] to display the Optional function setting screen.
For more information, see Chapter 4, "Optional Functions."

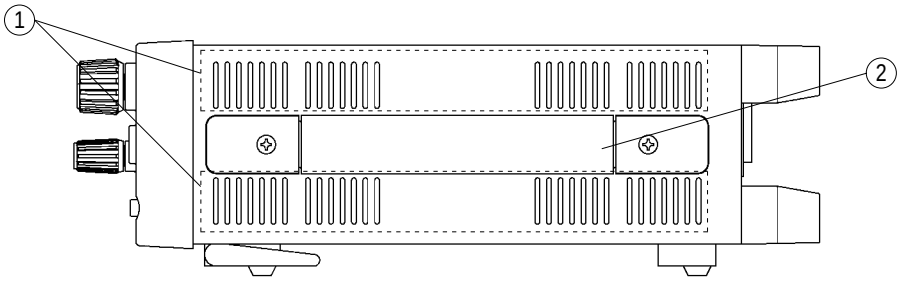
Left side view



① Air outlet

Never touch the air outlet. The air outlet is provided with an internal cooling fan.

Right side view



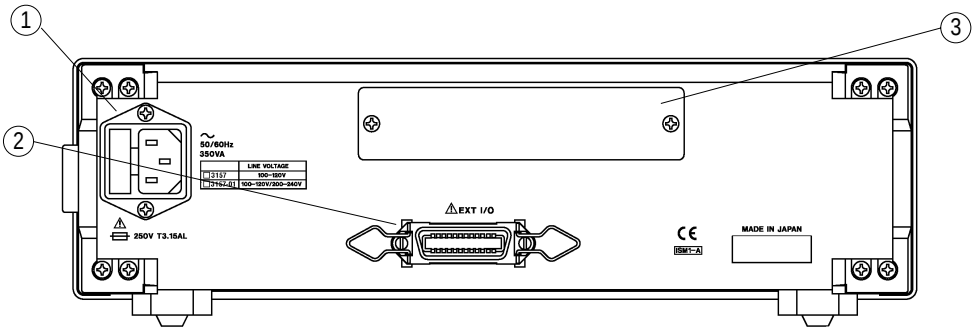
① Air inlet

Never touch the air inlet. Air for cooling is drawn through this opening.

② Handle

This is used for transporting the 3157.

Rear panel



① Power inlet

Connect the grounded three-core power cord supplied here. Integrated with a fuse holder.

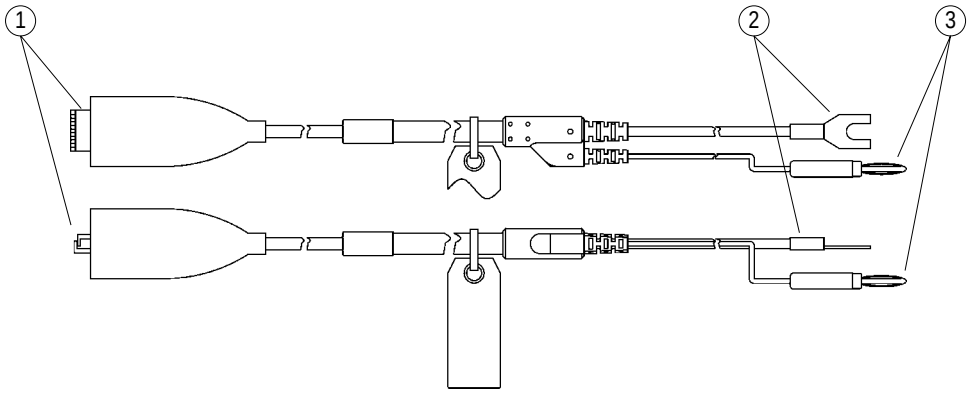
② External I/O terminal

For output of 3157 state and input of start and stop signals.

③ Interface slot

Expansion slot for installation of the optional 9593-02 RC-232C or 9518-02 GB-IB INTERFACE board.

9296 CURRENT PROBE

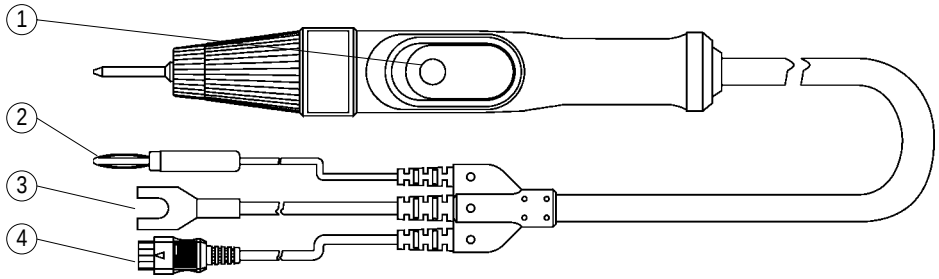


① Alligator clip
Clipped to the measured object.

② Current output plug
Connected to the unit's current output terminal.

③ Banana-type voltage measurement plug
Connected to the unit's voltage measurement terminal.

9297 CURRENT APPLY PROBE



① Push switch
External switch equivalent for the START and STOP keys.

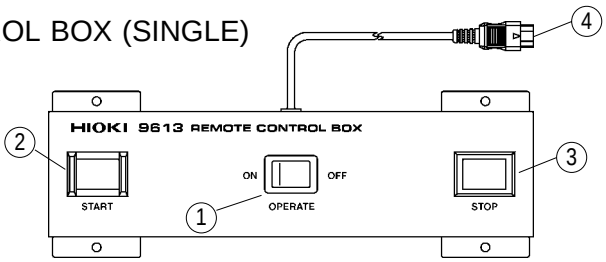
② Banana-type voltage measurement plug
Connected to the unit's voltage measurement terminal.

③ Current output plug
Connected to the unit's current output terminal.

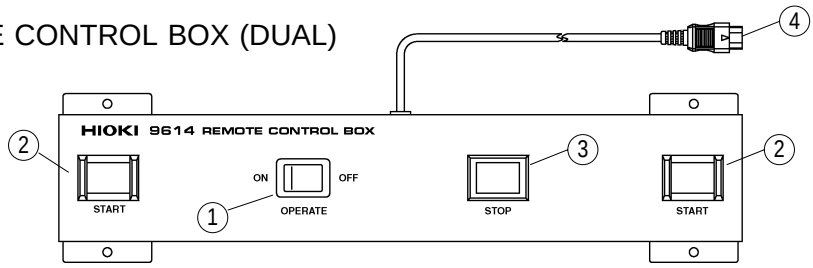
④ Switch signal line plug
Connected to the unit's controller terminal.

REMOTE CONTROL BOX

9613 REMOTE CONTROL BOX (SINGLE)



9614 REMOTE CONTROL BOX (DUAL)



① OPERATE switch

Used to enable remote-control operation. When this switch is ON, the START and STOP keys for remote control are active.

② START key

Works in the same manner as the START key on the unit. With the 9614 dual remote-control box, the two START switches must be pressed.

③ STOP key

Works in the same manner as the STOP key on the unit. The STOP key is ON during a test or when a voltage is being output.

④ Switch signal line plug

Connect to the external switch terminal on the unit.

NOTE

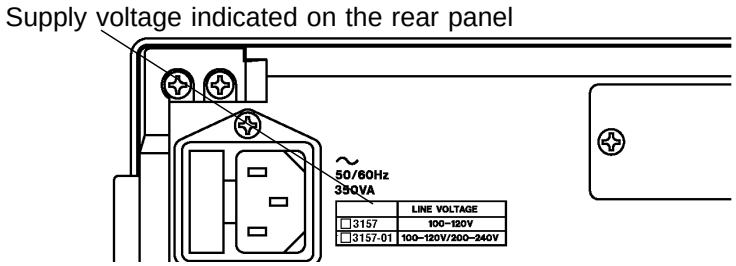
Priority for control of the START key is in the following order: the external switch, the external I/O, and the front panel of the unit. Connecting the switch signal line plug disables the START key on the front panel of the unit and the start signal for the external I/O.

Chapter 2
Testing Arrangements

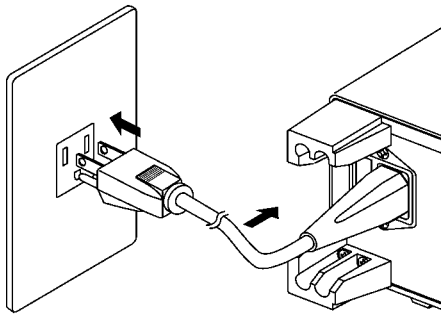
2.1 Power Cord Connection

⚠ WARNING

- **The 3157 and the 3157-01 use different rated power voltages. Before turning on the power, make sure that the voltage of the power supply being used matches the supply voltage indicated on the rear panel of the unit.**
- **The unit has no protective ground terminal other than the power inlet, and is connected to a ground line via a three-core power cord that is supplied with the unit. In order to prevent electric shock, always connect the unit to a properly grounded power outlet using the power cord provided.**



(1) Be sure that the main power switch is turned to OFF.
(2) Connect the grounded three-core power cord provided to the power inlet on the back of the unit.
(3) Insert the plug into the grounded outlet.



2.2 Powering on and off the Unit

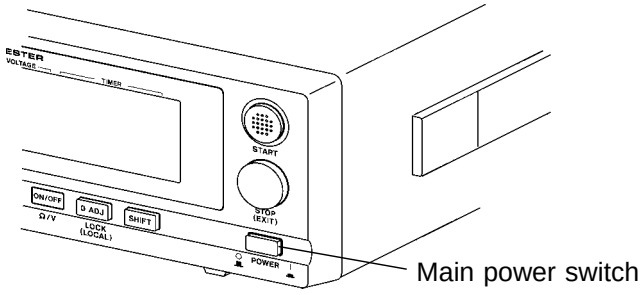
⚠ WARNING **Before turning on the power, make sure that the voltage of the power supply being used matches the supply voltage indicated on the rear panel of the unit. If an attempt is made to use an improper supply voltage, there is danger of damage to this unit and of life-threatening risk to the operator.**

NOTE

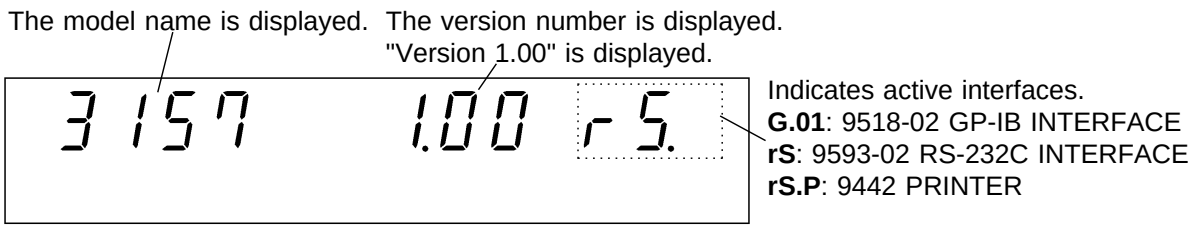
- Allow 10 minutes warming up after powering on.
- To use the external controller, the external I/O terminal, and the interface, you must connect them before startup. Only devices or peripherals connected before startup are activated. Connection following startup may lead to operational or equipment failure.
  For connection procedures, see Section 2.3, "Connection of Probe" for the external controller, Chapter 6, "External I/O" for the external I/O terminal, and the instruction manual accompanying the interface for each interface.

Powering on the unit

(1) Turn the main power switch to ON (l).



(2) The model name and version number are displayed as below:



(3) The unit enters READY state five seconds after startup.
Key operation is disabled unless the **READY** lamp is lit.

Powering off the unit

After the testing has finished, being sure that the **READY** lamp is turned on, turn the main power switch on the back of the unit to OFF.
Note that the unit may be damaged if the main power switch is turned to OFF while the unit is outputting current.

NOTE

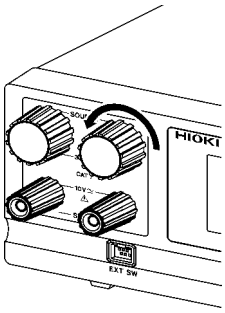
The current settings are all preserved when the unit is next turned on. If there has been a power failure or other malfunction of the power supply, the settings in effect at the time the malfunction occurred are preserved.

2.3 Probe Connection

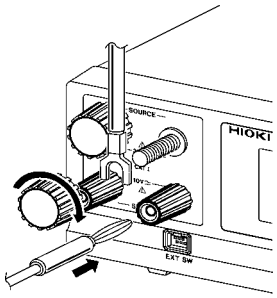
⚠ WARNING

- **To reduce risk of electrical accidents, avoid connecting the probe when power is being supplied to the unit and the measured object. Shut off power before connecting the probe or taking similar action.**
- **Before beginning a test, make sure that the current output terminal is securely attached. Passing a large current through a loosened terminal may overheat the terminal.**

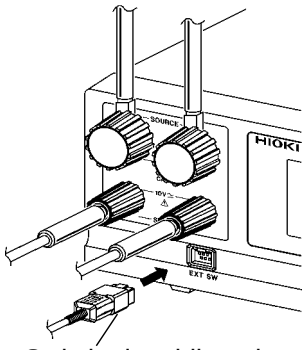
The 9296 CURRENT PROBE (with alligator clip) and 9297 CURRENT APPLY PROBE are available as optional probes. Connect two sets of the 9296 or a single combined set of 9296 and 9297.
You can use a custom-built probe. If you do use a custom-built probe, make sure the wire/cable used for it has sufficient current capacity (12 or more of AWG).



(1) Rotate the current output terminal counter-clockwise to open.



(2) Connect the current output plug as shown in the figure on the left.
(3) Rotate the current output terminal clockwise to close.
(4) Insert the banana-type voltage measurement plug into the voltage measurement terminal.



Switch signal line plug

(5) With the 9296 CURRENT PROBE, be sure to connect the probe to the other terminals using the same procedure.
To use the 9297 CURRENT APPLY PROBE, insert the switch signal line plug into the external switch terminal.

- To use the push switch on the 9297 CURRENT APPLY PROBE, use the current output terminal and the voltage measurement terminal on the right, as shown in the figure.
- Make sure the switch signal line plug is correctly oriented. If the plug is dislocated during testing, the unit will enter READY state.

NOTE

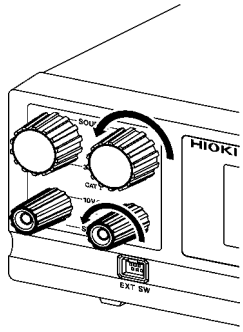
- To activate the push switch, connect the switch signal line plug to the external switch terminal before startup. For more information on the push switch, see Section 4.9, "Momentary OUT."
- The 9297 CURRENT APPLY PROBE can be used unless it is connected to the external switch terminal. In this case, the push switch cannot be used.

2.4 Short Bar Connection

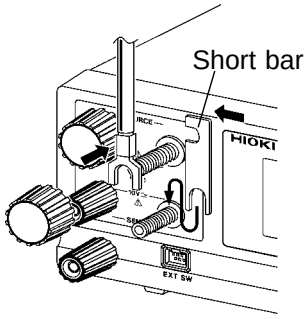
⚠ WARNING

- **To reduce risk of electrical accidents, avoid connecting the short bar when power is being supplied to the unit. Shut off power before connecting the probe or taking similar action.**
- **Before beginning a test, make sure that the current output terminal is securely attached. Passing a large current through a loosened terminal may overheat the terminal.**
- **In a test using two terminals, be sure to use the current output terminal. Use of the voltage measurement terminal may lead to the terminal overheating, resulting in burns or equipment damage.**

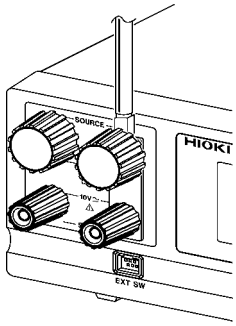
When connecting a probe incompatible with four-terminal measurement, or when measuring with two terminals, connect the short bar between the voltage measurement terminal (the SENSE terminal) and the current output terminal (the SOURCE terminal) on the right. In this case, be sure to connect the probe to the current output terminal.



(1) Rotate the current output terminal and the voltage measurement terminal counter-clockwise to open.



(2) Connect the probe and short bar as shown in the figure on the left.



(3) Rotate the current output terminal and the voltage measurement terminal clockwise to close. Be sure to connect the other terminals using the same procedure.

In a test using two terminals, be sure to use the current output terminal.

NOTE Measurement with two terminals will be affected by a voltage drop in the probe, leading to inaccurate results. Before beginning a test, perform zero adjustment (see Section 3.4, Zero Adjustment Function).

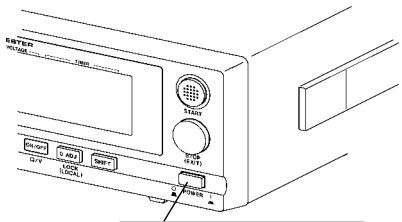
2.5 Connecting the REMOTE CONTROL BOX

⚠ WARNING

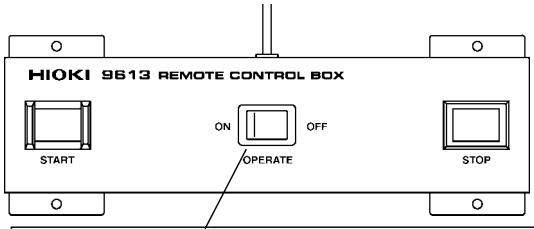
- **To prevent electrical accidents, do not connect the remote-control box when the power unit and tested object are live. Before making connections, turn off the power unit and the tested object.**
- **To prevent malfunctions, do not remove the remote-control box following startup. Before removing it, be sure to turn OFF the power.**

Connection of the remote-control box (9613/9614) enables start/stop operations to be performed easily.

(1) Make sure the Main Power switch and OPERATE switch on the remote-control box are OFF.



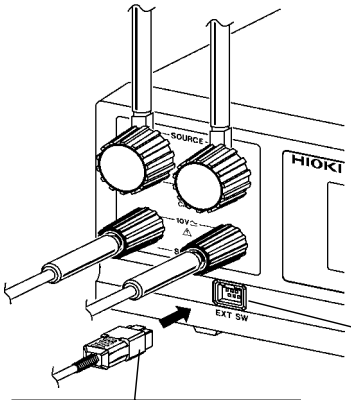
Main power switch



OPERATE switch on the remote-control box

(2) Insert the switch signal line plug into the external switch terminal. Check the direction of the switch signal line.

(3) Turn ON the OPERATE switch of the remote-control box. The OPERATE switch can be turned ON/OFF even following startup.



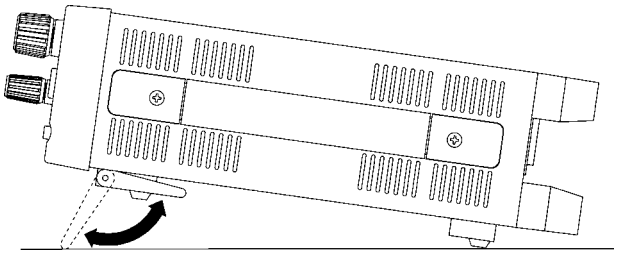
External switch terminal

Switch signal line plug

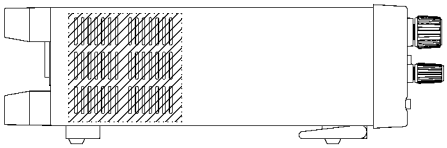
2.6 Installation Site and Position

Place on a stable, flat surface, using the four-footed stand. Orienting the unit vertically will block its air outlet, greatly increasing the risk of overheating. In positioning the unit, make sure the air inlet and outlet are kept open.

Stand

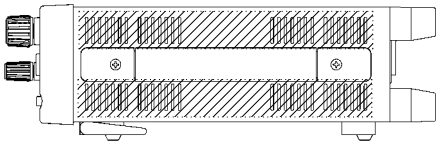


Left side view



Air outlet

Right side view



Air inlet

NOTE

- Do not insert the foreign objects into the air inlet or outlet.
- When using the stand, avoid placing objects or exerting pressure upon the unit.
- Magnetic fields generated by the unit may affect CRT displays. During testing, keep the current probe away from such subjects.

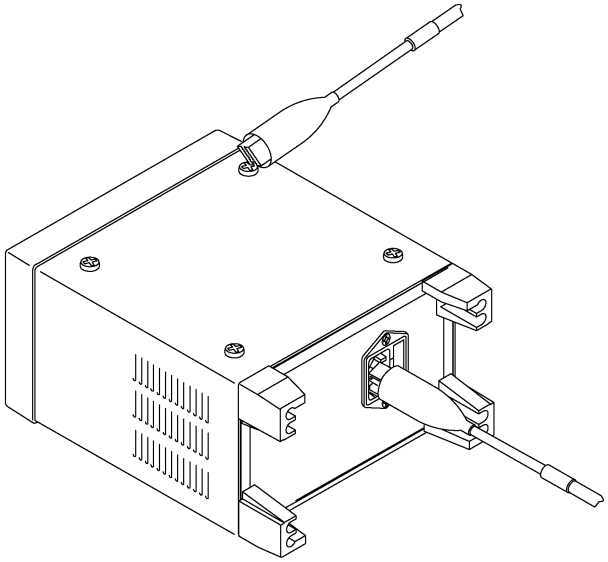
2.7 Connection to the Measured Object

⚠ WARNING

- **To avoid burns, never touch the output current terminal, probe tip, or contact point while testing (i.e., in TEST state).**
- **Take particular care to avoid touching the tip of the current application probe, which may be quite hot when operating, due to its small surface area.**

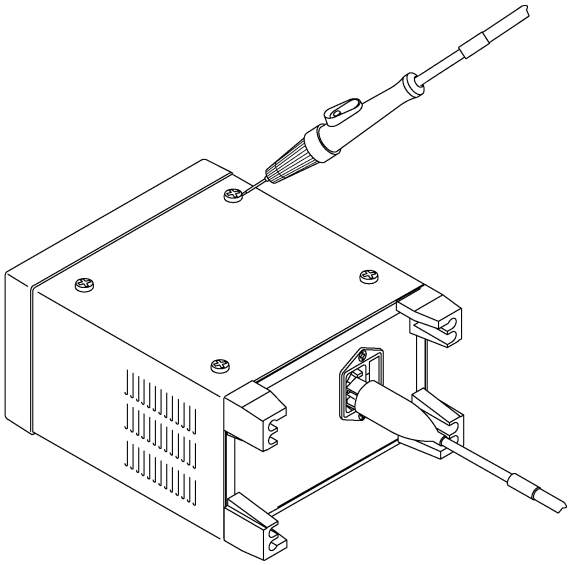
(1) Connecting using two 9296 units

Connect one 9296 to the protection ground terminal on the measured object. Connect the other 9296 to the test point. Connect the probe firmly to prevent disconnection during testing.



(2) Connecting using a single combined set of 9296 and 9297

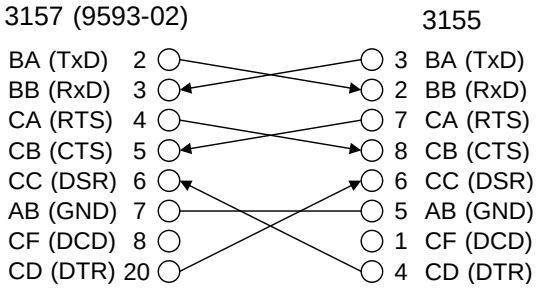
Connect the 9296 to the protection ground terminal on the measured object. Connect the 9297 to the test point. Connect the probe firmly to prevent disconnection during testing.



2.8 Connection to the 3155 LEAK CURRENT HiTESTER

Attaching optional 9593-02 RS-232C INTERFACE to 3157 enables testing when connected with 3155.
3155 sends command to 3157 to start testing and receives test results when the 3157 testing is complete. The test results can be saved and printed together with the 3155 leakage current test results.
For usage for the 3155, see 3155 (-01) Instruction Manual.

When connecting 3155 with 3157 (9593-02), use connection cable as specified below.



Specification: D-subminiature 25-pin male to D-subminiature 9-pin female connectors, with "crossed" data connections

Settings

(1) Leave power OFF for both 3155 and 3157 while connecting each RS-232C connector with the RS-232C cable.

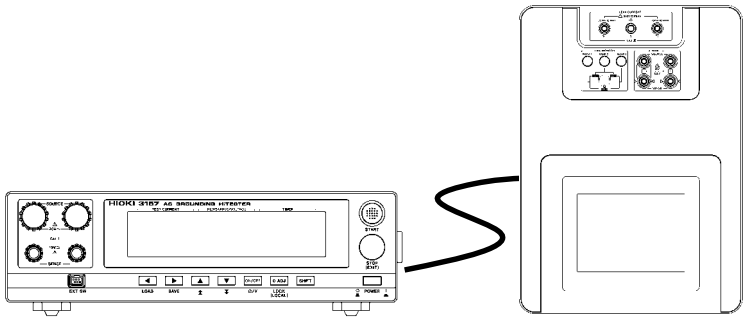
(2) Turn the power ON for both 3155 and 3157.

(3) Set up 3157 test settings. Measurement does not start unless the following conditions are met.

1. Test settings
   - Unit of the maximum and minimum test values: Resistance
   - Test time: ON
   - Maximum test value: ON

   When the optional minimum test value setting function is ON.
   - Minimum test value: OFF

2. Optional function setting
   Endless timer function: Not set



Chapter 3
Testing Method

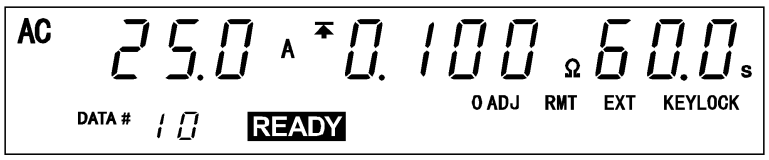
This chapter describes the procedural flow for testing, making settings, and proper testing procedure.
Read Chapter 2, "Arrangements for Testing" and make the necessary arrangements for testing.
Press SHIFT + STOP to display the Optional function setting screen.
Setting the optional functions allows testing under various conditions.
For more information, see Chapter 4, "Optional Functions."

3.1 Procedural Flow for Testing and Setting Parameters

The 3157 is in one of four states:

READY state

The unit is ready for starting a test. The **READY** lamp is turned on.
To enter TEST state, press the START key while in READY state.



- Setting in READY state
  - Setting the output current value
  - Setting the maximum value
  - Setting the testing time — Settings can't be made if the endless timer is set at "1: Set."
  - Setting the minimum value — The minimum value can be set if the minimum test value is set at "1: Set."
  - Setting the output current frequency or changing the test count value — The output current frequency can be set only if the test count value is set at "0: Not set." Otherwise, setting and display of the test count value are enabled.
- Setting other functions
  - Performing zero adjustment
  - Setting the key-lock function

Setting the optional functions allows testing under various conditions.
Press SHIFT + STOP to display the Optional Function Setting screen.

- Setting optional functions
  - Switching the output current frequency
  - PASS/FAIL hold function
  - Hold function
  - Setting the minimum test value
  - Endless timer function
  - Test data count
  - Setting the buzzer
  - Changing currents in TEST state
  - Momentary OUT
  - Test mode
  - Printer output

TEST state

This state indicates that a test is underway. The **TEST** lamp is turned on. The current preset in the READY state is output.
The current output value, a decrease in voltage, and resistance are measured and displayed. The measured values are compared against the comparator values preset in the READY state.
If the measured value deviate from the comparator value, the unit enters FAIL state and halts measurement.
If the preset testing time completes without the measured value deviating from the comparator value, the unit enters PASS state.

Key operation in the TEST status

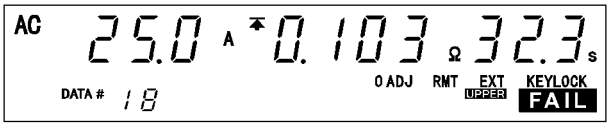
- Changing output current values: The output current value can be made changeable by pressing the ▲ and ▼ keys if the current is set to "1: Changeable" in TEST status.
- Forced ending: Press the STOP key.

PASS state

PASS indicates that the measured object passed the test set in READY state. The **PASS** lamp is turned on. The PASS state screen is displayed for about 1 second before switching to READY state.
Enabling the PASS hold function in the optional settings makes it possible to retain the PASS state. To check the test results, enable the PASS/FAIL hold function.
To switch the display between resistance and voltage, press SHIFT + ON/OFF (Ω/V) while in PASS state (see Section 4.2, "PASS/FAIL hold function").

FAIL state

FAIL indicates that the measured object failed the test set in READY state. Both the **FAIL** and **UPPER** lamps light when the measured value exceeds the maximum test value. Both **FAIL** and **LOWER** lamps light when the measured value drops below the minimum test value. The FAIL state screen is displayed for about 1 second before switching to READY state.
Enabling the FAIL hold function in the optional settings makes it possible to retain the FAIL state. To check the test results, enable the PASS/FAIL hold function.
To switch the display between resistance and voltage, press SHIFT + ON/OFF (Ω/V) while in FAIL state (see Section 4.2, "PASS/FAIL hold function").

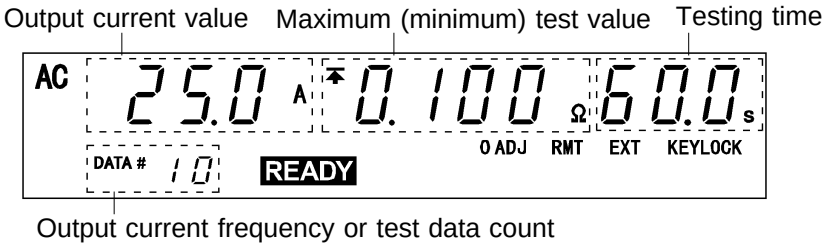


3.2 Making Testing Arrangements (in READY State)

Make testing arrangements in READY state, including test parameter settings, key-locking, and zero adjustment. Saving and loading for setting data and the setting of optional functions are made following the READY state. The **READY** lamp remains lit to indicate READY state.

Starting and completing settings

Display the flashing cursor to change set values. Press the ◄ or ► key to display the flashing cursor with the output current value.



Press the ◄/► keys to move the flashing cursor through different settings when it is lit till the cursor reaches the value to be re-set. Then, press the ▲/▼ keys to change the settings.
To erase the flashing cursor, or when settings are complete, press the STOP key.

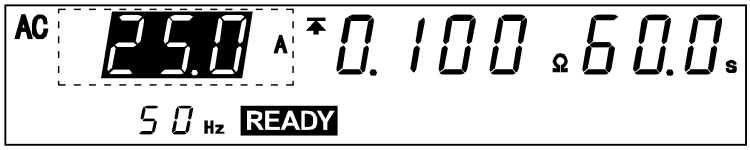
OPTION The set values can be printed using the printer output function (see Section 4.11).

NOTE The value range that can be set on the flashing cursor depends on the minimum test value, the state of the endless timer, and the test data count value on optional settings.
The range set at the factory is as follows: Output current value ↔ Maximum test value ↔ Testing time ↔ Output frequency.

Standards and examples of settings (For more information, see Section 9.3, "Standards.")

Standard (No.)	Test setting	Specified value
Safety requirements for mains operated electronic and related apparatus for household and similar general use (IEC 60065)	25 A, 1 min	Not exceeding 0.1 Ω
Electrical equipment of industrial machines - Part 1: General requirements (IEC 60204-1)	10 A, at least 10 s	Not exceeding 1.0 V
Safety of household and similar electrical appliances - Part 1: General requirements (IEC 60335-1)	25 A or 1.5 times the rated current	Not exceeding 0.1 Ω
Medical electrical equipment - Part 1: General requirements for safety (IEC 60601-1)	25 A or 1.5 times the rated current, 5 s to 10 s	Not exceeding 0.1 Ω
Safety of information technology equipment (IEC 60950)	25 A or 1.5 times the rated current	Not exceeding 0.1 Ω
Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements (IEC 61010-1)	25 A or twice the rated current, 1 min	Not exceeding 0.1 Ω

3.2.1 Setting Output Current Values



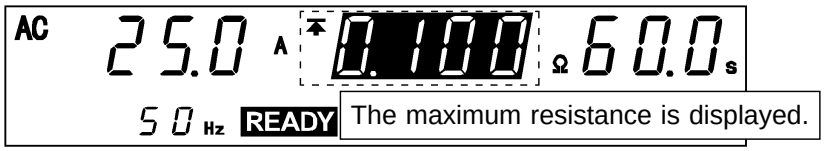
(1) If no flashing cursor is displayed in the READY state, press either the ◄ key or the ► key to display the cursor while the output current value is lit.

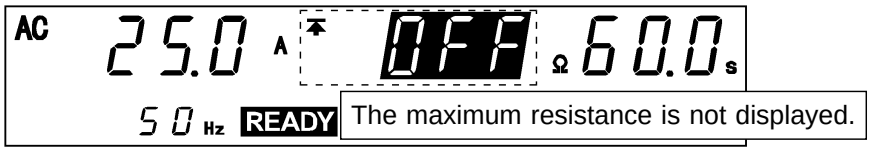
(2) Change output current values using the ▲/▼ keys. The value changes in 0.1 A increments.
To change the value by 1.0 A, press SHIFT + ▲/▼ keys.
The output current value can be set from 3.0 A to 31.0 A.

(3) When settings are complete, press the STOP key.

OPTION The output current can be changed using the current changeability in TEST State (see Section 4.8).

3.2.2 Setting the Maximum (Minimum) Test Value





(1) Using the ◄/► keys, move the flashing cursor to the maximum test value.

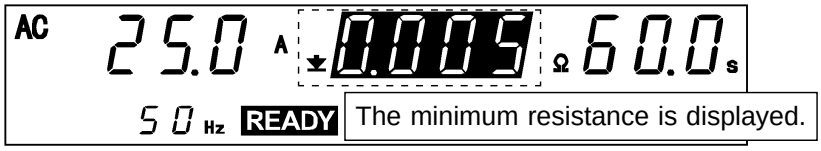
(2) Switching between resistance and voltage indicators
The maximum test value can be set for both resistance and voltage. If both are set, only the one displayed in READY state is activated.
Press SHIFT + ON/OFF (Ω/V) to switch between resistance and voltage indicators. (This key operation is valid no matter where the flashing cursor is located.)

(3) Setting the maximum test value
After selecting between the resistance and the voltage, set the maximum value using the ▲/▼ keys.
To change the value by 0.010 Ω, press SHIFT + ▲/▼ keys (0.10 V when the voltage is displayed).
Resistance may be set from 0.000 Ω to 2.000 Ω, while voltage may be set from 0.00 V to 6.00 V.
If no maximum test value is required, turn off the ON/OFF key.

(4) When settings are complete, press the STOP key.

OPTION The minimum test value can be set using the minimum test value setting function (see Section 4.4).

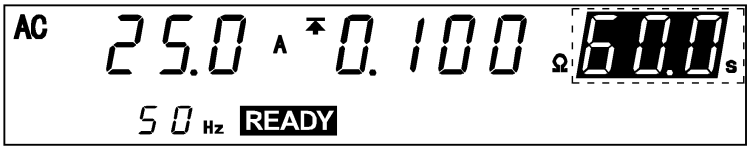
Once a minimum test value is set, both minimum and maximum values are provided for resistance or voltage.
To set a minimum test value, activate the optional minimum test value setting function.

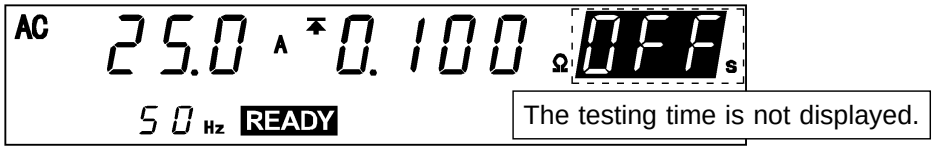


To set a minimum test value, do the same as when setting a maximum test value. The minimum test value must be smaller than the maximum test value. Otherwise, a test will not start when the START key is pressed.

NOTE
- Four values may be set - the maximum and minimum test values for resistance and maximum and minimum test values for voltage. However, the reference value for testing is expressed in the unit displayed in TEST state. That is, screening is conducted using the reference resistance when resistance is displayed, and reference voltage when voltage is displayed.
- A combination of resistance and voltage values (such as a maximum resistance value and a minimum voltage value) can't be tested.

3.2.3 Setting the Testing Time





(1) Using the ◄/► keys, move the flashing cursor to the testing time.

(2) Set the testing time using the ▲/▼ keys.
With time set at 0.5 s to 99.9 s, the time changes in 0.1 s increments (1 s increments when the set time scale is 100 s to 999 s).
With time set at 0.5 s to 99.9 s, press SHIFT + ▲/▼. The time changes in 1.0 s increments (10 s increments when the set time scale is 100 s to 999 s).
Settings may be made along a scale ranging from 0.5 s to 999 s (in gradations of 0.1 s for the range 0.5 s to 99.9 s and 1 s for the range 100 s to 999 s).
If no testing time is required, turn off the ON/OFF key.

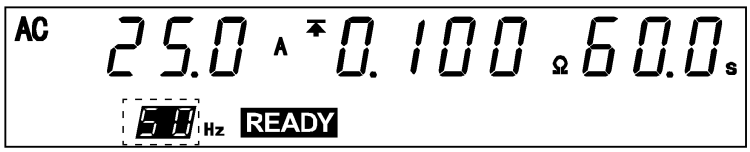
(3) When settings are complete, press the STOP key.

OPTION The endless timer function allows continuous testing regardless of the testing time set (see Section 4.5).

NOTE The test automatically stops after the lapse of 999 s while the testing time setting can be disabled by using the ON/OFF key.

3.2.4 Setting the Output Current Frequency (in READY State)

If the optional test data count function is activated, the output current frequency is not displayed in READY state. To display or modify the output current frequency in READY state, change the setting for the test data count to "0: Not set."



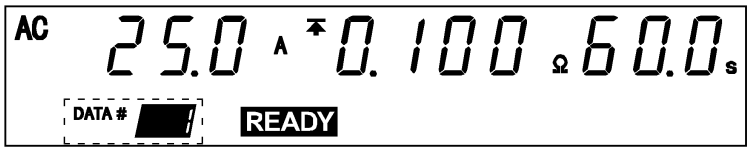
(1) Using the ◄/► keys, move the flashing cursor to the testing time.
(2) Change the output current frequency (50/60 Hz) using the ▲/▼ keys.
(3) When settings are complete, press the STOP key.

OPTION The frequency can also be changed using the output current frequency switching function (see Section 4.1).

NOTE Changing the frequency in READY state automatically changes the contents of the optional output current frequency switching function.

3.2.5 Setting the Test Data Count (in READY State)

The number of test data may be changed in the READY state.
For the test data count setting, see Section 4.6, "Test Data Count Function."

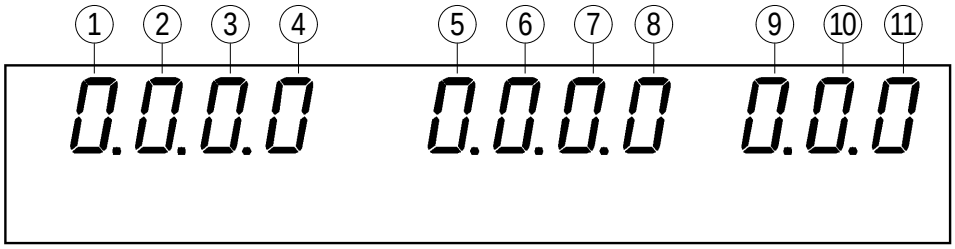


(1) Using the ◄/► keys, move the flashing cursor to the test data count.
(2) Change the test data count using the ▲/▼ keys.
(3) When settings are complete, press the STOP key.

NOTE If you make settings for the test data count, output frequency cannot be changed in the READY state. To change output frequency, use the optional function setting screen.

3.3 Initial Settings for Optional Functions

Press SHIFT + STOP while in READY state to display the Optional function setting screen.
Setting the optional functions allows testing under various conditions.
Settings can be made for the following eleven optional functions. One number is assigned to each function. Settings are made by changing the number by using the ▲/▼ keys.
For more information on the settings, see Chapter 4, "Optional Functions."



The optional functions of the 3157 are factory-preset to the following settings:

Setting item	Initial setting
① Switching the output current frequency	**0**: 50 Hz
② PASS/FAIL HOLD function	**0**: PASS not held, FAIL held
③ HOLD function	**0**: Not held
④ Setting the minimum test value	**0**: Not set
⑤ Endless timer function	**0**: Not set
⑥ Test data count	**0**: Not set
⑦ Setting the buzzer	**0**: ON at screening, ON at error
⑧ Changing currents in TEST state	**0**: Not changeable
⑨ Momentary OUT	**0**: Not set
⑩ Test mode	**0**: Soft start mode
⑪ Setting the printer output	**0**: Not used

NOTE

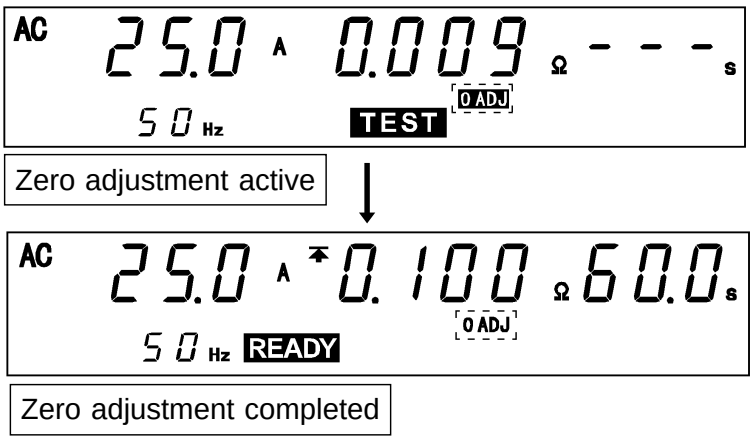
To reset the system, turn on power while pressing the SHIFT key. Once the system is reset, settings for the optional functions and the recorded parameters will return to their default values (factory-preset values). For more information, see Section 7.5, "Resetting the System."

3.4 Zero Adjustment Function

Measurements may be affected by a voltage drop in the probe. Zero adjustment is necessary for accurate measurement, especially when measuring with two terminals using the short bar. The **0ADJ** lamp is lit while the zero adjustment function is active. Following zero adjustment, the probe's voltage drop is accounted for in returning measurement data. Note that the zero adjustment function is automatically disabled if the output current value is changed or when setting data is loaded.

Zero adjustment procedure

(1) Confirm that the unit is in READY state, then short-circuit the probe.
(2) Set an output current value. The value set must be the same as the one used in the test.
(3) Press the [0ADJ] key; **0ADJ** lamp starts flashing and then zero adjustment is executed.
Note that a preset current is output during zero adjustment.
Zero adjustment is completed in about 3 seconds. On completion, the unit enters READY state, and the **0ADJ** lamp lights.



Zero adjustment is possible within a range equivalent to a resistance between 0.000 Ω and 0.100 Ω, on either the voltage or resistance indicator. If the measured value falls outside this range, either the resistance value or the voltage value will blink, and the unit will enter READY state.

Canceling zero adjustments

To disable zero adjustment function, press the [0ADJ] key while it is active. When the zero adjustment function is inactivated, the **0ADJ** lamp goes out, indicating that the function is inactive. This function is automatically inactivated when the output current value is changed or when setting data is loaded.

NOTE

- The zero adjustment function will not be inactivated, even if you change the output current by selecting "1: Changeable" on the optional "Current Changeability in TEST State." Note that if the zero adjustment function is active, changing the output current value may produce inaccurate results.
- Current outputs will soft-start during zero adjustment, regardless of the setting for "Test mode" on the optional function (see Section 4.10.1, "Soft Start Mode").

3.5 Key-lock Function

This function is used to keep lock the current set values. It inactivates all keys except the START key, STOP key, and the resistance/voltage switch. The **KEYLOCK** lamp is lit while the key-lock function is active.

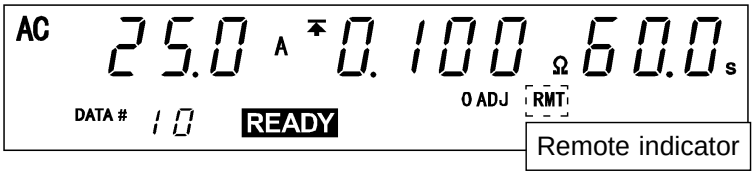
Setting and inactivating the key-lock function

To activate the key-lock function, press SHIFT + 0ADJ.
To inactivate the key-lock function, press SHIFT + 0ADJ while the function is active.

NOTE Even when the key-lock function is activated, the external switch and the start and stop signals on the external I/O terminal remain active.

How to inactivate key-lock function in REMOTE state

Once interface communication starts in REMOTE state (the **RMT** lamp lights), all keys except the STOP key are inactivated.



To inactivate the REMOTE state, press SHIFT + 0ADJ (LOCK).

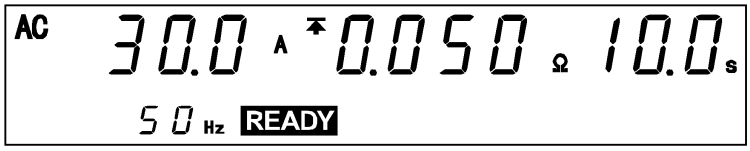
NOTE Even in REMOTE state, the external switch and the start and stop signals on the external I/O terminal remain active.

3.6 Examples of Settings

Output current value set: 25.0 A, Maximum test value: 0.100 Ω, Testing time: 1 minute.
Assume that "0: not set" is selected for "Minimum test value setting," "Timer setting," and "Test data count" on the optional functions.
The following provides an example of changing set values.

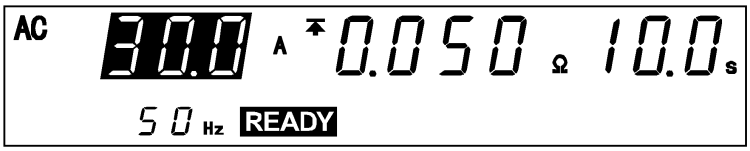
Values currently set	
Output current value	30.0 A
Maximum test value	0.050 Ω
Testing time	10.0 s

Values to be set	
Output current value	25.0 A
Maximum test value	0.100 Ω
Testing time	60.0 s

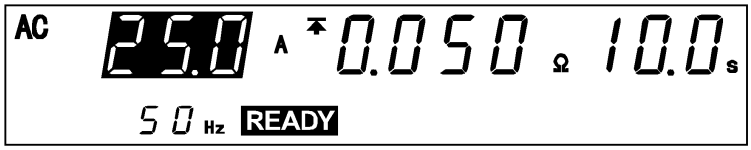


(1) Setting output current values

Using the ◄/► keys, move the flashing cursor to the output current value.



Using the ▲/▼ keys, set "Output current value" to 25.0 A.
To change the value by 1.0 A, press SHIFT + ▲/▼ keys.
In this example, press the ▼ key five times while holding down the SHIFT key to set the output current value to 25.0 A.

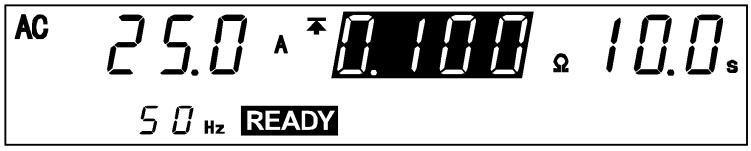


(2) Setting the maximum test value

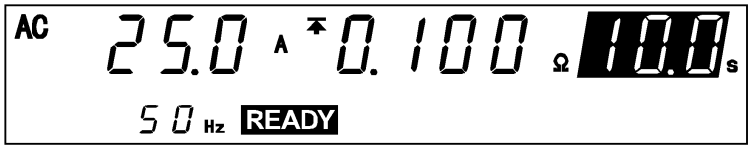
Using the ► key, move the flashing cursor to the maximum test value.

In this example, "Maximum test value" is preset to the resistance value.
Using the ▲/▼ keys, set "Maximum test value" to 0.100 Ω.
To change the value by 0.010 Ω, press SHIFT + ▲/▼ keys (0.10 V when the voltage is displayed).
In this example, press the ▲ key five times while holding down the SHIFT key to set the maximum test value to 0.100 Ω.

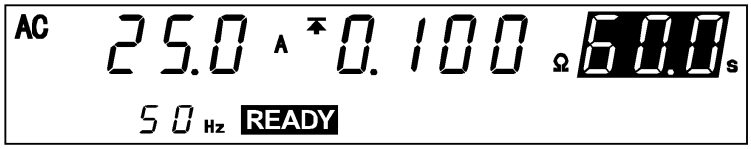
When the voltage indicator is displayed, or to set in a voltage value, first switch to the resistance indicator, then set the maximum and minimum test values.
Press [SHIFT] + [ON/OFF] (Ω/V) to switch between resistance and voltage indicators.



(3) Setting the testing time
Using the [▶] key, move the flashing cursor to the testing time.



Using the [▲]/[▼] keys, set "Testing time" to 60.0 s.
To change the time by 1.0 s, press [SHIFT] + [▲]/[▼] keys.



The new parameters following setting are shown below:

Output current value	25.0 A
Maximum test value	0.100 Ω
Testing time	60.0 s

Press the [START] key while in this state. The unit enters TEST state to begin testing.
Press the [STOP] key to finalize the test parameters. The flashing cursor disappears.
Press the [◀] or [▶] key to restore the flashing cursor and allow the test parameters to be changed.

NOTE

Even if "Minimum test value setting" on the optional function is active, you can get the same results obtained in the example above by moving the flashing cursor to the minimum test value and turning it off with the [ON/OFF] key.
Output current value: 25.0 A, Maximum test value: 0.100 Ω, Minimum test value: OFF, Testing time: 60.0 s.

3.7 Starting a Test

⚠ WARNING

- **Before beginning a test, make sure that the current output terminal is securely attached. Passing a large current through a loosened terminal may overheat the terminal.**
- **To avoid burns, never touch the output current terminal, probe tip, or contact point while testing (i.e., in TEST state).**
- **Take particular care to avoid touching the tip of the current application probe, which may be quite hot when operating, due to its small surface area.**

Normally, the 9296 CURRENT PROBE should be connected to the protection ground terminal on the equipment being tested. Connect the probe securely, so that it's not easily dislodged. In most cases, the 9297 CURRENT APPLY PROBE is connected to a test point on the equipment being tested.

Starting a test

The test start procedure varies according to the test mode setting. The unit is initially set to Soft start mode. For more information, see Section 4.10, "Setting the Test Mode."

Depending on the output current value and the state of the test object, it will generally takes about 2 seconds to output the set current. After a while, the output current value equals the set current value ±1 A, and the test screening function activates.

(1) Set the appropriate parameters in the READY state.
(2) Press the [START] key to start the test. If the probe is detached from the measured object, the test will not start, and the unit will enter the stand-by state (as indicated by a blinking **TEST** lamp). If this state continues for more than 30 seconds, the unit returns to the READY state. The test begins when the probe is connected to the measured object.
(3) The **TEST** lamp lights when the unit enters TEST state. While the **TEST** lamp is lit, be careful not to cause electrical shock by touching the terminal or other parts through which the current is passing.
(4) If the probe is detached from the measured object during testing, the **FAIL** lamp lights together with the **UPPER** and the **LOWER** lamps, and the unit enters FAIL state.
(5) To end the test normally, the probe must contact the measured object throughout the test.

NOTE

- The soft start mode is active only with a load 0.200 Ω or less. If the load exceeds this value, the state of connection of the probe is not known, and a test cannot be started. In this case, set the test mode to normal mode.
- Priority for control of the [START] key is in the following order: the external switch, the external I/O, and the front panel of the unit. Connecting the switch signal line plug disables the [START] key on the front panel of the unit and the start signal for the external I/O.

Forcible ending of a test

To perform forcible ending of a test, press the STOP key. This stops current output, and the unit enters READY state. No screening operation is performed.

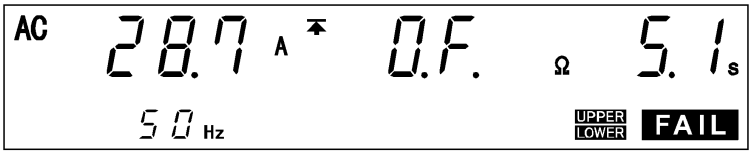
OPTION The value at which to forcibly end the test can be held using the hold function (see Section 4.3).

Failure to start a test

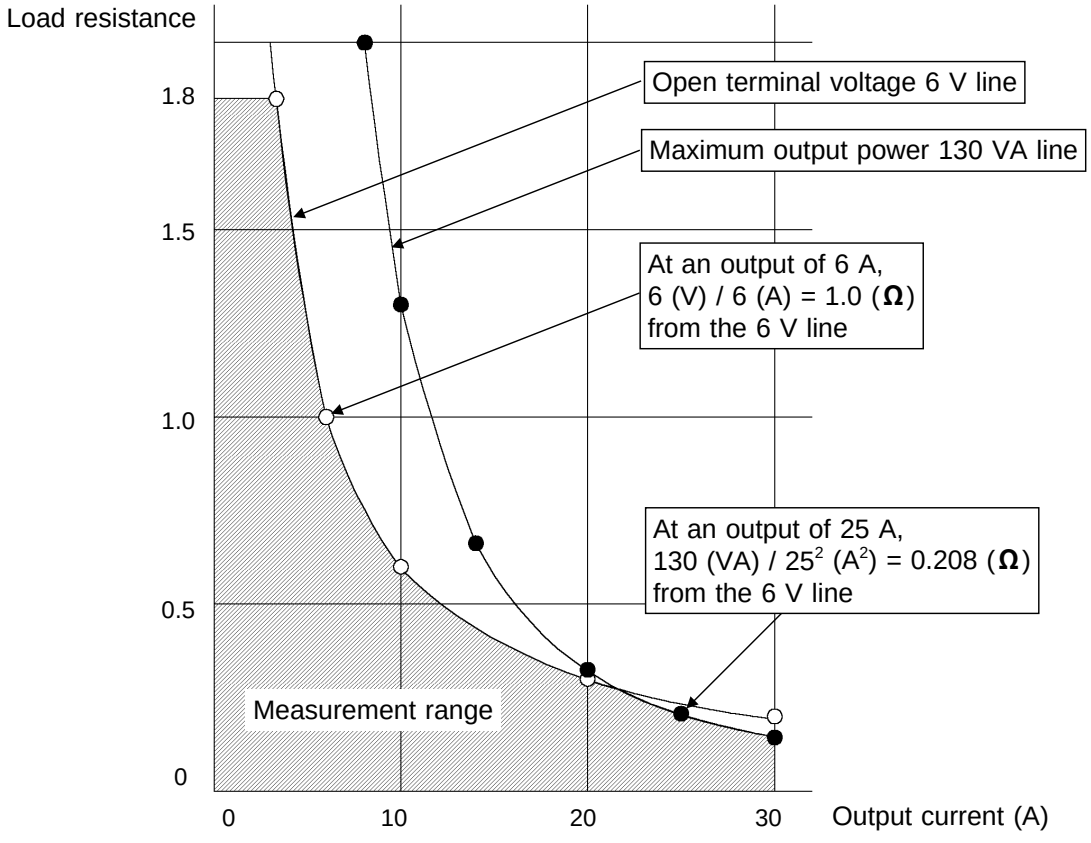
The following cases may make prevent starting a test. In case of failure, check the settings and reset parameters, if necessary.

(1) The maximum test value is lower than the minimum test value:
After the minimum test value flickers, the unit returns to the READY state. Reset the maximum or minimum test values.

(2) The output current value is lower than the output current set value:
- The probe can be disconnected from the tested equipment.
  Never attempt to reconnect the probe before the unit returns to READY state. Sparks may be given off. Before reconnecting, make sure the unit has returned to READY state.
- The load resistance may exceed the output capacity of this unit.
  In this case, the **FAIL** lamp lights together with the **UPPER** and the **LOWER** lamps, and the unit enters FAIL state.

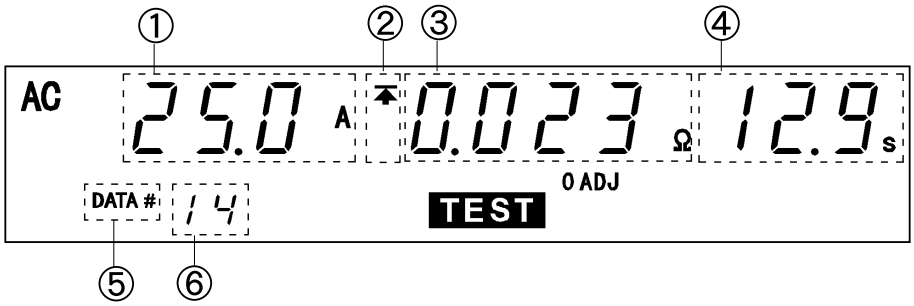


Measurement range



3.8 Testing (in TEST State)

TEST state indicates that the unit is performing a test. Be careful not to cause electrical shock by touching the terminal or other parts though which the current (the value of which has been set in READY state) is passing.



① Measured current value

Indicates the current value being output.

OPTION The output current can be changed using the current changeability in TEST State (see Section 4.8).

② Maximum value icon and minimum value icon

The symbol ⮝ appears when the maximum test value is set, and the symbol ⮟ appears when the minimum value is set.

③ Measured voltage value and measured resistance value

The measured voltage value is displayed if the voltage indicator is selected and the measured resistance value is displayed if the resistance indicator is selected. Press [SHIFT] + [ON/OFF] (Ω/V) to switch between resistance and voltage indicators. Only the indicators are switched. The maximum and minimum test values are not changed.

④ Testing time elapsed

When the testing time is set, countdown starts from the time set, and is displayed.

When the testing time is set to OFF, the time elapsed after the start of the test is displayed. Once elapsed testing time reaches 999 s, the unit completes the test and returns to READY state. If either the maximum or minimum test value has been set, the unit enters PASS state.

OPTION The endless timer function allows continuous testing regardless of the testing time set (see Section 4.5).

⑤ Data count indicator

Lights when the optional test data count function is set to "1: Set."

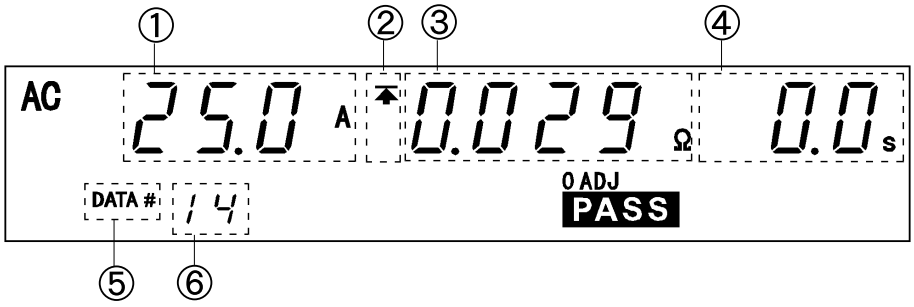
⑥ Test data count (output current frequency)

Displays test data when the data count indicator described in ⑤ above is lit or the output frequency.

3.9 Screening (in PASS State)

The unit enters PASS state when either the maximum or minimum test value is set, and when the test is completed. The **PASS** lamp lights while in PASS state, displaying the value established at the end of the testing period. The PASS state screen is displayed for about 0.5 second before the unit resumes READY state.

OPTION The PASS state is held using the PASS/FAIL HOLD function (see Section 4.2).
The test data count can be displayed using the test data count function (see Section 4.6).
The test result can be printed using the printer output function (see Section 4.11).



① Measured current value at the end of a test
Displays the current value being output at the end of the test.

② Maximum value icon and minimum value icon
The symbol ⤒ appears when the maximum test value is set, and the symbol ⤓ appears when the minimum value is set.

③ Measured voltage value and measured resistance value at the end of a test
The measured voltage value is displayed if the voltage indicator is selected and the measured resistance value is displayed if the resistance indicator is selected. Press SHIFT + ON/OFF (Ω/V) to switch between resistance and voltage indicators.

④ Test completion time
Displays the time in which the test has been completed. In PASS state, "**0.0s**" is displayed.

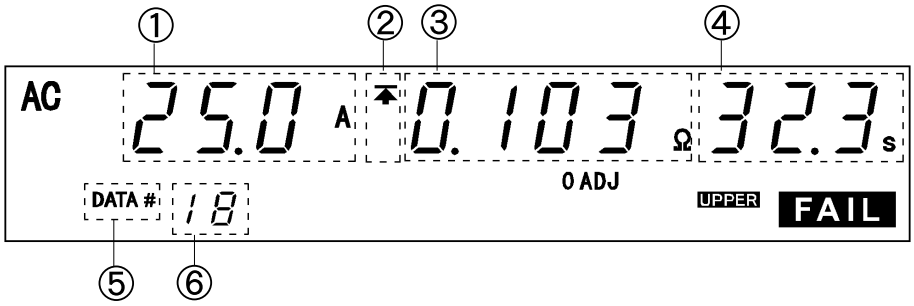
⑤ Test data count indicator
Lights when the optional test data count function is set to "1: Set."

⑥ Test data count (output current frequency)
Displays test data when the data count indicator described in ⑤ above is lit or the output frequency.

3.10 Screening (in FAIL State)

The unit enters FAIL state if the measured value deviates from the maximum (or minimum) test value set.
The FAIL state indicates the time at which the measured value deviated from the maximum (or minimum) value. The **FAIL** lamp lights together with the **UPPER** or the **LOWER** lamp while in FAIL state (together with the **UPPER** and the **LOWER** lamps if the set current cannot be output).
The FAIL state screen is displayed for about 1 second before the unit resumes READY state.

OPTION The FAIL state is held using the PASS/FAIL HOLD function (see Section 4.2).
The test data count can be displayed using the test data count function (see Section 4.6).
The test result can be printed using the printer output function (see Section 4.11).



① Measured current value at the end of a test
Displays the current value being output at the end of the test.

② Maximum value icon and minimum value icon
The symbol ⤒ appears when the maximum test value is set, and the symbol ⤓ appears when the minimum value is set.

③ Measured voltage value and measured resistance value at the end of a test
The measured voltage value is displayed if the voltage indicator is selected and the measured resistance value is displayed if the resistance indicator is selected. Press [SHIFT] + [ON/OFF] (Ω/V) to switch between resistance and voltage indicators.

④ Test completion time
If the testing time is set in FAIL state, the testing time elapsed displays the set testing time remaining.
When the testing time is set to OFF, the elapsed time is displayed.

⑤ Test data count indicator
Lights when the optional test data count function is set to "1: Set."

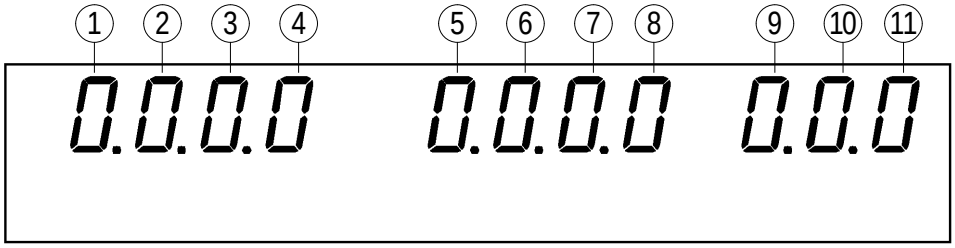
⑥ Test data count (output current frequency)
Displays test data when the data count indicator described in ⑤ above is lit or the output frequency.

Chapter 4
Optional Functions

Setting the optional functions allows testing under various conditions. Settings can be made for the following eleven optional functions. One number is assigned to each function. Settings are made by changing the number by moving the cursor key.
Since improper settings can produce inaccurate results, this chapter explains the correct way to make settings. Please read it carefully.

Entering the Optional function setting screen

Press SHIFT + STOP while in READY state to display the Optional function setting screen.



Setting optional functions

Use the ◄/► keys to move the flashing cursor to the target function.
Use the ▲/▼ keys to set a value at the flashing cursor location.
To complete the optional settings, press SHIFT + STOP. The unit reverts to the READY state.
Press the STOP key to abort the setting process. The unit reverts to the READY state without finalizing settings.

The following describes the numbers corresponding to the functions. For additional information, see Section 9.2, "Table of Optional Functions."

① Switching the output current frequency Switches output current frequencies (50 Hz or 60 Hz). When the test data count is at "0: Not set," the frequency is displayed in the READY state.	
Selection	**0**: 50 Hz, **1**: 60 Hz

② PASS/FAIL hold function This function retains PASS and FAIL states to help verify the value screened in the test.	
Selection	**0**: PASS not held, FAIL held **1**: PASS held, FAIL held **2**: PASS not held, FAIL not held **3**: PASS held, FAIL not held

③ Hold function When the hold function is set in the following cases, the current state is retained: ・ Following selection of only the test time, some time has elapsed without setting the maximum or minimum test value. ・ Press the STOP key to cancel the test in progress.	
Selection	**0**: Not held, **1**: Held

④ Setting minimum test value The minimum test value can be set as a test parameter.	
Selection	**0**: Not set, **1**: Set

⑤ Endless timer function If this function is not selected, the test ends after 999 s, after which the test time is set to OFF in the READY state. Select this function to continue until it returns a FAIL state, or until you press the STOP key.	
Selection	**0**: Not set, **1**: Set

⑥ Test data count function The test data count function can be preset. This function counts the number of tests, and is used when testing a large number of points for a single measured object.	
Selection	**0**: Not set, **1**: Set

⑦ Buzzer setting The buzzer ON/OFF may be set in the PASS, FAIL, error state, and other states.	
Selection	**0**: ON at screening, ON at error **1**: OFF at screening, OFF at error **2**: OFF at screening, ON at error **3**: ON at screening, OFF at error

⑧ Changing the current value in TEST state In TEST state, the current value can be changed during output by pressing the ▲/▼ keys.	
Selection	**0**: Not changeable, **1**: Changeable

⑨ Momentary OUT	
The momentary OUT function allows current output only while the START key is held down. Once this function is set, working with the 9297 CURRENT APPLY PROBE requires different procedures.	
Selection	**0**: Not set (Trigger operation), **1**: Set (Momentary OUT operation)

⑩ Test mode	
Soft start mode, normal mode and continuous test mode can be set. For more information, see Section 4.10, "Test mode."	
Selection	**0**: Soft start mode, **1**: Normal mode, **2**: Continuous test mode

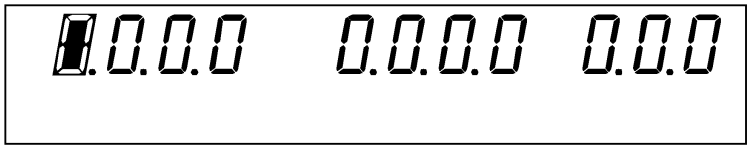
⑪ Printer output	
You can print test parameters and results with the optional 9442 PRINTER. This printer offers the following two print modes.	
Selection	**0**: Not used (Initial setting) **1**: Automatically print for PASS/FAIL screening. **2**: Print selectively when the PASS/FAIL state is held.

4.1 Switching the Output Current Frequency

Changes the output current frequency. When the optional test data count function is set to "1: Not set," the output current frequency set in the READY state is displayed and can be changed. If you change the frequency in the READY state, the output current frequency can be changed automatically in the optional function setting screen.

Setting procedure

(1) Press [SHIFT] + [STOP] while in READY state to display the Optional function setting screen.



(2) Use the [◄]/[►] keys to move the flashing cursor to the position shown in the figure.

(3) Use the [▲]/[▼] keys to set a value at the flashing cursor location.

0: 50 Hz (Initial setting)
1: 60 Hz

(4) To complete the optional settings, press [SHIFT] + [STOP]. The unit reverts to the READY state.

NOTE Setting the optional test data count function prevents display of the output current frequency in the READY state. To display and change the frequency in the READY state, set the test data count function to "1: Not set."

4.2 PASS/FAIL Hold Function

If the maximum or minimum value has been set, this function retains the value for the PASS or FAIL state on test completion. If the PASS or FAIL hold function is not selected, the test result is displayed for about 0.5 second before the unit reverts to the READY state.
To check test results, press the [SHIFT] + [ON/OFF] (Ω/V). This allows you to switch the display between resistance and voltage. The conditions at which the settings are made do not change, even after switching.
To inactivate the hold function, press the [STOP] key. The unit reverts to the READY state.

Setting procedure

(1) Press [SHIFT] + [STOP] while in READY state to display the Optional function setting screen.

(2) Use the ◄/► keys to move the flashing cursor to the position shown in the figure.

(3) Use the ▲/▼ keys to set a value at the flashing cursor location.

0: PASS not held, FAIL held (Initial setting)
1: PASS held, FAIL held
2: PASS not held, FAIL not held
3: PASS held, FAIL not held

(4) To complete the optional settings, press [SHIFT] + [STOP]. The unit reverts to the READY state.

NOTE

- Even when the key-lock function is activated, to switch the display between resistance and voltage, press [SHIFT] + [ON/OFF] (Ω/V).
- When continuous test mode is selected on the optional function, the PASS/FAIL hold function works somewhat differently. For more information, see Section 4.10.3, "Continuous Test Mode."

4.3 HOLD Function

If a test is conducted with both the maximum test value and the minimum test value turned off, the unit enters the READY state as soon as test time elapses (after the lapse of 999 s if the testing time is set to OFF), or if the test is aborted with the [STOP] key. Select "1: Held" to retain the last value and to check test results.
To check test results, press the [SHIFT] + [ON/OFF] (Ω/V). This allows you to switch the display between resistance and voltage. The conditions at which the settings are made do not change, even after switching.
To inactivate the hold function, press the [STOP] key. The unit reverts to the READY state.

Setting procedure

(1) Press [SHIFT] + [STOP] while in READY state to display the Optional function setting screen.

(2) Use the ◄/► keys to move the flashing cursor to the position shown in the figure.

(3) Use the ▲/▼ keys to set a value at the flashing cursor location.

0: Not held (Initial setting)
1: Held

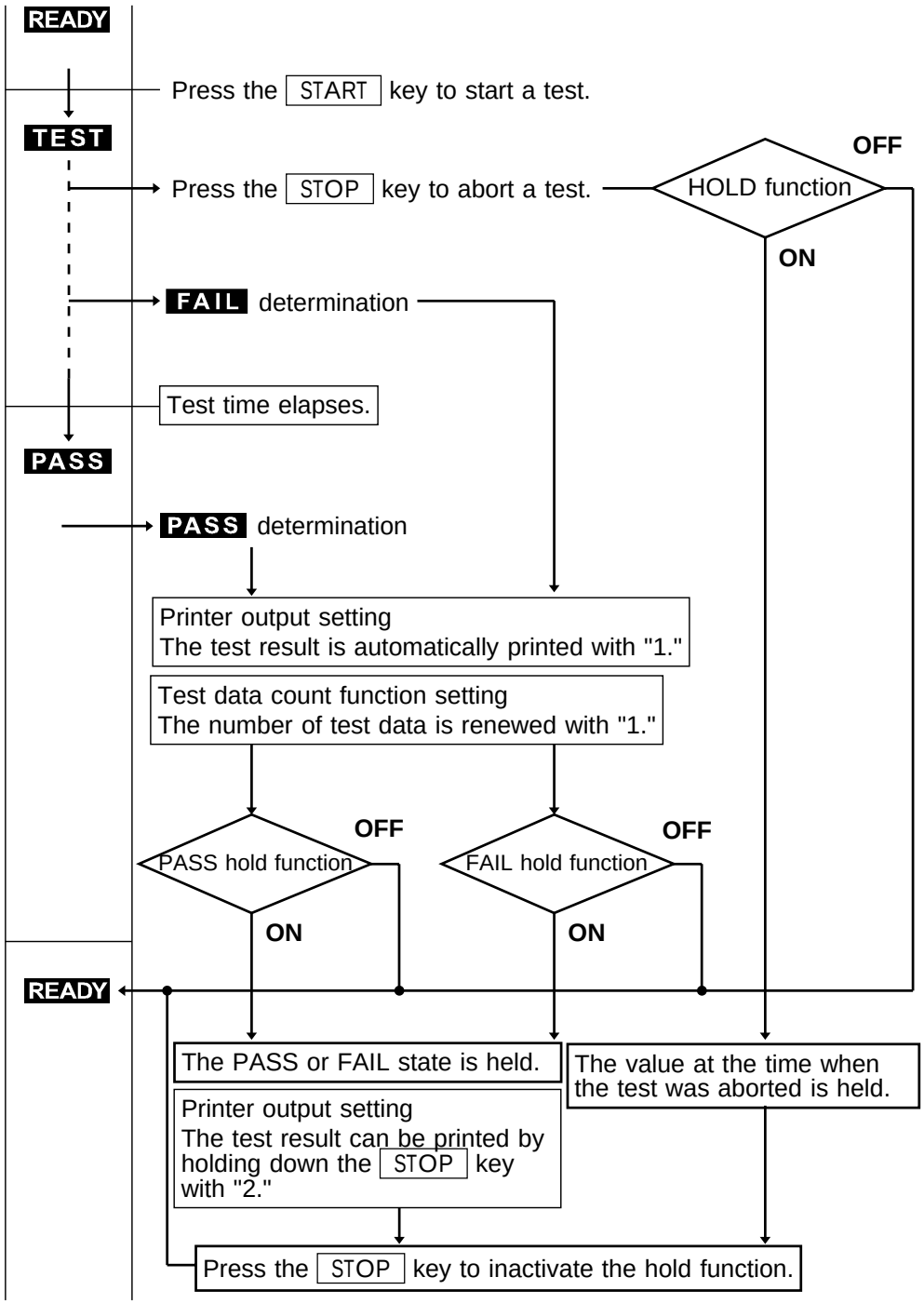
(4) To complete the optional settings, press [SHIFT] + [STOP]. The unit reverts to the READY state.

NOTE

- Even when the key-lock function is activated, to switch the display between resistance and voltage, press [SHIFT] + [ON/OFF] (Ω/V).
- When continuous test mode is selected on the optional function, the hold function works somewhat differently. For more information, see Section 4.10.3, "Continuous Test Mode."

Differences between PASS/FAIL hold and hold functions

- Unless the test reference value is set, PASS/FAIL screening is not performed.
- If a test is conducted with both the maximum test value and the minimum test value turned off, the unit enters the READY state as soon as test time elapses (after the lapse of 999 s if the testing time is set to OFF). If the hold function is set to "ON," the last value is retained. This function is disabled if you use the endless timer.



NOTE

- To print test results with an optional 9442 PRINTER with the printer output function set to "2," the unit must be in a PASS/FAIL hold state.

4.4 Setting the Minimum Test Value

If the minimum test value is set to "0: Not set," the flashing cursor does not move to the minimum test value, thus disabling test settings.
If the minimum test value is set to "1: Set," both maximum and minimum test values may be set.
Even selecting OFF with the ON/OFF key will not reflect the minimum test value in the test, but the flashing cursor will move to the minimum test value.
Select "0: Not set," unless the minimum test value is required.
These settings are saved or loaded along with the test data.

Setting procedure

(1) Press SHIFT + STOP while in READY state to display the Optional function setting screen.

(2) Use the ◄/► keys to move the flashing cursor to the position shown in the figure.

(3) Use the ▲/▼ keys to set a value at the flashing cursor location.

0: Not set (Initial setting)
1: Set

(4) To complete the optional settings, press SHIFT + STOP. The unit reverts to the READY state.

NOTE

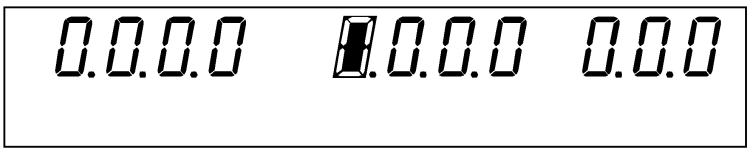
- The maximum and minimum resistance values and maximum and minimum voltage values can be set independently. The value displayed just before you enter the TEST state serves as the reference test value; if a resistance value is displayed, the reference resistance value is used for screening. Similarly, the voltage resistance value is used if a voltage value is displayed.
- A combination of resistance and voltage values (e.g. the maximum resistance value and the minimum voltage) is not possible.

4.5 Endless Timer Function

In setting the endless timer, if "1: Set" is selected, currents are continually output in the TEST status regardless of the test time elapsed. In the READY state "- - -" is displayed for the test time, and the cursor stops moving to "Test Time."
To end the test, the unit must enter the FAIL state or the STOP key must be pressed.
These settings are saved or loaded along with the test data.

Setting procedure

(1) Press SHIFT + STOP while in READY state to display the Optional function setting screen.

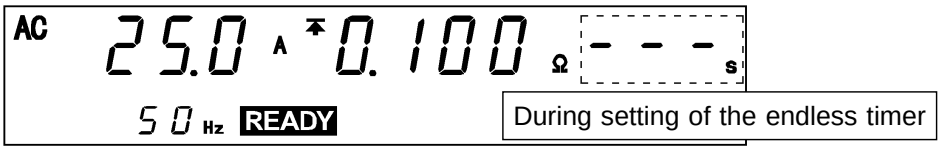


(2) Use the ◄/► keys to move the flashing cursor to the position shown in the figure.

(3) Use the ▲/▼ keys to set a value at the flashing cursor location.

0: Not set (Initial setting)
1: Set

(4) To complete the optional settings, press SHIFT + STOP. The unit reverts to the READY state.



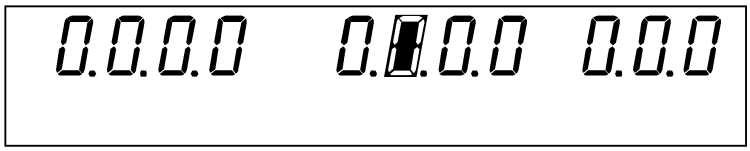
NOTE If the test time is set to OFF with the ON/OFF key instead of using the endless timer function, the test is ended after the test time of 999 s.

4.6 Test Data Count Function

Use the test data count function to display the number of test data.
The test begins with "the number of test data: 1." The number increments by one each time a test completes. Once the maximum number of data is attained, counting restarts at "1."
Increase or decrease of the number of test data can be performed in the READY state, except for the maximum number of test data which cannot be changed. To change the number of test data in the READY state, see Section 3.2.5, "Setting the Test Data Count."

Setting procedure

(1) Press SHIFT + STOP while in READY state to display the Optional function setting screen.

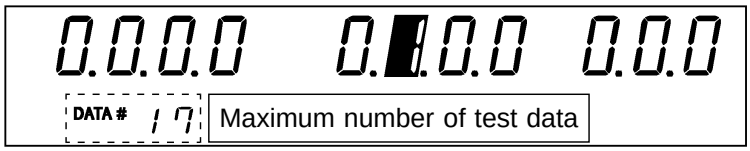


(2) Use the ◄/► keys to move the flashing cursor to the position shown in the figure.

(3) Use the ▲/▼ keys to set a value at the flashing cursor location.

0: Not set (Initial setting)
1: Set

(4) Setting the maximum number of test data
Select "1: Set" to display the maximum number of test data.



In this example, the maximum number of test data is set at 17. Counting starts at 1 and ends at 17, after which the number reverts to 1.
To change the maximum number of test data, move the flashing cursor to the test data count using the ◄/► keys. Change the maximum number of test data using the ▲/▼ keys. To change the number by 10, press SHIFT + ▲/▼ keys. The maximum number may be set from 1 to 99.

(5) To complete the optional settings, press SHIFT + STOP. The unit reverts to the READY state.

NOTE

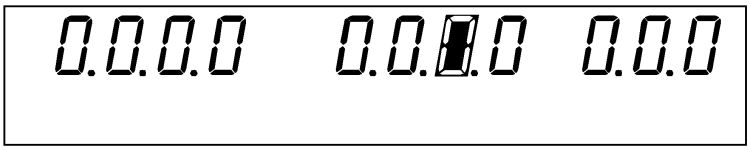
- The data can be renewed as the PASS or FAIL state shifts to the READY state. To perform PASS/FAIL screening, you must set maximum and minimum test values and the test time.
- If the test is stopped with the STOP key without performing test screening, as in the case of aborting a test, the number of test data is not renewed.
- Output frequency cannot be changed in the READY state if you set the test data count function. To change the frequency, make your settings in the Optional function setting screen.

4.7 Buzzer Setting

The buzzer function is enabled in PASS or FAIL state, or when an error occurs with setting or key operation.
When the buzzer is set to ON, the sound of the buzzer cannot be controlled.
The sound is disabled when the buzzer is set to OFF.

Setting procedure

(1) Press [SHIFT] + [STOP] while in READY state to display the Optional function setting screen.



(2) Use the [◄]/[►] keys to move the flashing cursor to the position shown in the figure.

(3) Use the [▲]/[▼] keys to set a value at the flashing cursor location.

0: ON at screening, ON at error (Initial setting)
1: OFF at screening, OFF at error
2: OFF at screening, ON at error
3: ON at screening, OFF at error

(4) To complete the optional settings, press [SHIFT] + [STOP]. The unit reverts to the READY state.

4.8 Changing the Current Value in TEST State

Selecting "1: Changeable" makes it possible to change the output current value during testing in 0.1 A increments, using the ▲/▼ keys. To change the value by 1.0 A, press SHIFT + ▲/▼ keys.
The output current value can be set from 3.0 A to 31.0 A. The value cannot be changed if the key-lock function remains active.
If the current value is changed in the TEST state, the current value set in the READY state cannot be changed.
A current value set in the TEST state remains valid until the test is completed.
Selecting "0: Not changeable" disables changing the value, even if you press the ▲/▼ keys in the TEST state.

Setting procedure

(1) Press SHIFT + STOP while in READY state to display the Optional function setting screen.

(2) Use the ◄/► keys to move the flashing cursor to the position shown in the figure.

(3) Use the ▲/▼ keys to set a value at the flashing cursor location.

0: Not changeable (Initial setting)
1: Changeable

(4) To complete the optional settings, press SHIFT + STOP. The unit reverts to the READY state.

NOTE

- Because the measured current value is displayed after an averaging operation, there is a brief delay after you press the key before the display reflects the change.
- The zero adjustment function will not be inactivated, even if you change the output current. Note that if the zero adjustment function is active, changing the output current value may produce inaccurate results.

4.9 Momentary OUT

The momentary OUT function allows current output only while the START key is held down. Releasing the START key is equivalent to pressing the STOP key and ends the test.
Keep the START key depressed until the test time elapses. After the test time elapses, the unit enters the READY or PASS state, depending on the optional settings. In either state, the next test will not begin even if the START key is held down.
To start the next test, release, then press the START key. When the unit enters the PASS or FAIL state, cancel the state with the STOP key.

If you set the momentary OUT function to "1: Set," a different procedure is required with the START key, the START signal for the external I/O terminal and the 9297 CURRENT APPLY PROBE.
For the 9297 CURRENT APPLY PROBE, selecting "0: Not set" enables trigger operation, and selecting "1: Set" enables the momentary OUT function.

Setting procedure

(1) Press SHIFT + STOP while in READY state to display the Optional function setting screen.

(2) Use the ◄/► keys to move the flashing cursor to the position shown in the figure.

(3) Use the ▲/▼ keys to set a value at the flashing cursor location.

0: Not set (Initial setting) (Trigger operation is performed with the 9297.)
1: Set (Momentary OUT operation)

(4) To complete the optional settings, press SHIFT + STOP. The unit reverts to the READY state.

NOTE

- Priority for control of the START key is in the following order: the external switch, the external I/O, and the front panel of the unit. Connecting the switch signal line plug disables the START key on the front panel of the unit and the start signal for the external I/O.
- For the switching probe, you can select between "trigger operation" and "momentary OUT operation." Note that a different switching procedure is required for the operations.
- When the optional continuous test mode is selected, the momentary OUT function is automatically set to "0."

4.9.1 Trigger Operation with Switching Probe

When in the READY state, the push switch performs the same functions as the START key.
When not in the READY state, the push switch performs the same functions as the STOP key. Pressing the push switch in the TEST state is equivalent to pressing the STOP key and ends the test.
If the optional PASS/FAIL state hold function is active, pressing the push switch in either the PASS or FAIL state is equivalent to pressing the STOP key, with both actions canceling the hold state.

NOTE

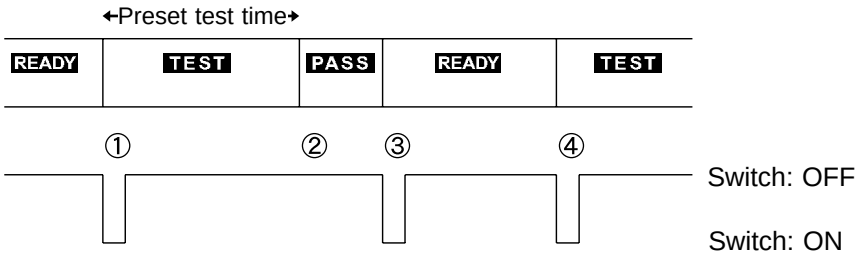
For the switching probe, you can select between "trigger operation" and "momentary OUT operation." Note that a different switching procedure is required for the operations.

In setting "momentary OUT," select "1: Not set."
The push switch is turned ON at LO level and OFF at HI level in the timing chart.

Example 1 PASS/FAIL hold function: "1: PASS held, FAIL held"
Endless timer function: "0: Not set"

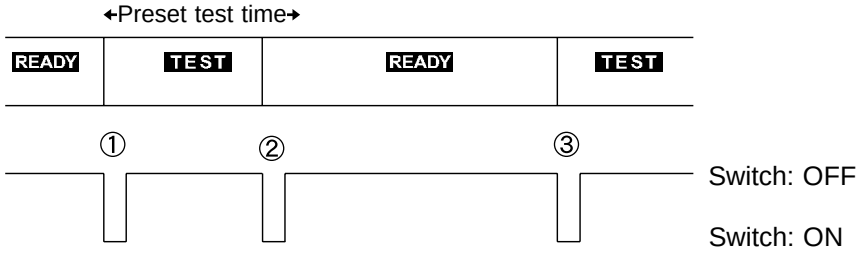
(1) When the tested sample passes the test:

① To start the test, press the push switch while in the READY state.
② The test is complete when the preset test time elapses. The unit enters the PASS state. Since the PASS hold function is active, the PASS state is retained.
③ To release the hold state, press the push switch. The unit enters the READY state.
④ To restart the test, press the push switch.



(2) When the test is aborted:

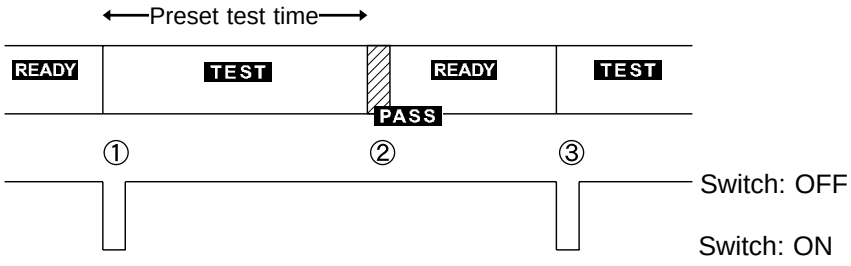
① To start the test, press the push switch while in the READY state.
② The test is aborted if the push switch is pressed before the preset test time elapses, with the unit then entering the READY state.
③ To restart the test, press the push switch.



Example 2 PASS/FAIL hold function: "0: PASS not held, FAIL held"
Endless timer function: "0: Not set"
Hold function: "0: Not held"

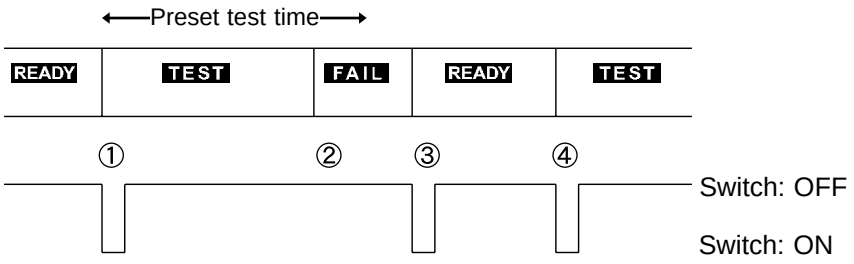
(1) When the tested sample passes the test:

① To start the test, press the push switch while in the READY state.
② The test is complete when the preset test time elapses. The unit enters the PASS state. Since the PASS hold function is inactive, the unit enters the READY state in about 0.5 seconds.
③ To restart the test, press the push switch.



(2) When the tested sample fails the test:

① To start the test, press the push switch while in the READY state.
② The unit enters the FAIL state. Since the FAIL hold function is active, the FAIL state is retained.
③ To release the hold state, press the push switch. The unit enters the READY state.
④ To restart the test, press the push switch.



4.9.2 Momentary OUT Operation with Switching Probe

The momentary OUT function allows current output only while the push switch is held down. Releasing the push switch is equivalent to pressing the STOP key and ends the test.
A test ends when the test time elapses, even if the push switch is held down. Depending on the settings, the unit enters either the READY or PASS state.
The test also ends if the unit enters the FAIL state during testing, even if you hold down the push switch.
If the optional PASS/FAIL state hold function is active, pressing the push switch in either the PASS or FAIL state is equivalent to pressing the STOP key, with both actions canceling the hold state.

NOTE

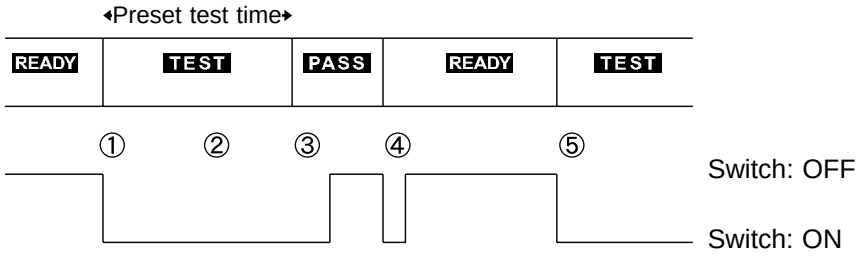
For the switching probe, you can select between "trigger operation" and "momentary OUT operation." Note that a different switching procedure is required for the operations.

In setting "momentary OUT," select "1: Set."
The push switch is turned ON at LO level and OFF at HI level in the timing chart.

Example 1 PASS/FAIL hold function: "1: PASS held, FAIL held"
Endless timer function: "0: Not set"

(1) When the tested sample passes the test:

① To start the test, press the push switch while in the READY state.
② Hold down the push switch for the duration of the test. Releasing this switch will abort the test.
③ The test is complete when the preset test time elapses. The unit enters the PASS state. Since the PASS hold function is active, the PASS state is retained. In this state, the push switch may be released. The same state is maintained.
④ To release the hold state, press the push switch. The unit enters the READY state.
⑤ To restart the test, press the push switch.

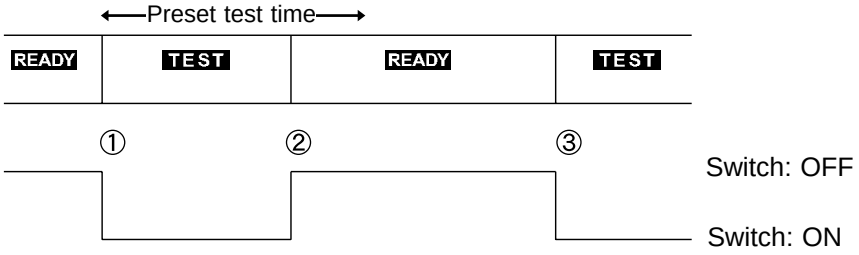


(2) When the test is aborted:

① To start the test, press the push switch while in the READY state. The TEST state is maintained as long as the push switch is held down.

② The test is aborted if the push switch is released before the preset test time elapses, with the unit then entering the READY state.

③ To restart the test, press the push switch.



Example 2 PASS/FAIL hold function: "0: PASS not held, FAIL held"
Endless timer function: "0: Not set"
Hold function: "0: Not held"

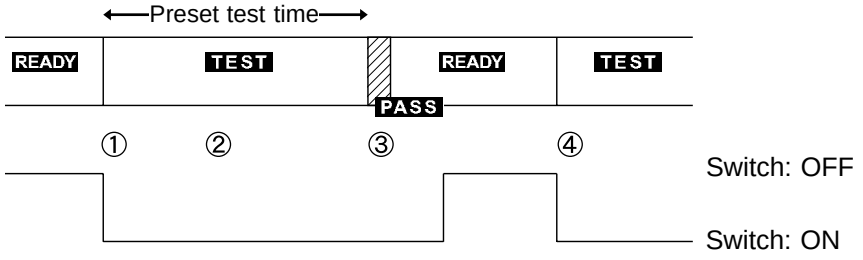
(1) When the tested sample passes the test:

① To start the test, press the push switch while in the READY state.

② Hold down the push switch for the duration of the test. Releasing this switch will abort the test.

③ The test is complete when the preset test time elapses. The unit enters the PASS state. Since the PASS hold function is inactive, the unit enters the READY state in about 0.5 seconds. In this state, the push switch may be released. The same state is maintained.

④ To restart the test, press the push switch.



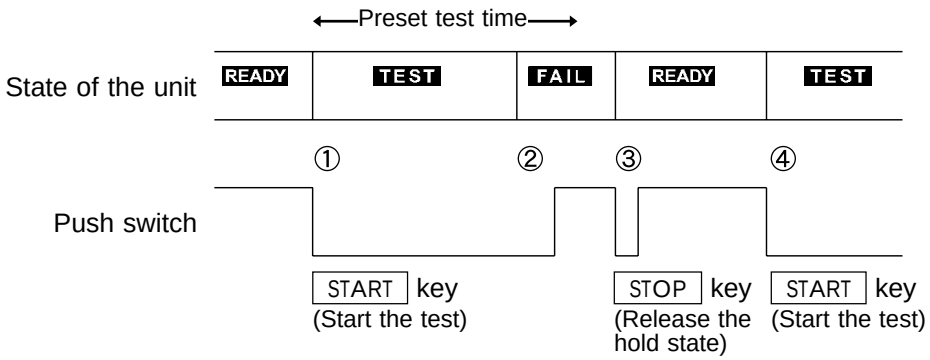
(2) When the tested sample fails the test:

① To start the test, press the push switch while in the READY state.

② Hold down the push switch for the duration of the test. The unit enters the FAIL state. Since the FAIL hold function is active, the FAIL state is retained. In this state, the push switch may be released. The same state is maintained.

③ To release the hold state, press the push switch. The unit enters the READY state.

④ To restart the test, press the push switch.

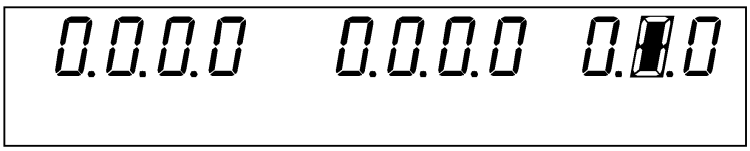

Preset test time
State of the unit
READY
TEST
FAIL
READY
TEST
①
②
③
④
Push switch
START key
(Start the test)
STOP key
(Release the hold state)
START key
(Start the test)

4.10 Setting the Test Mode

Soft start mode, normal mode and continuous test mode can be set.

Setting procedure

(1) Press [SHIFT] + [STOP] while in READY state to display the Optional function setting screen.



(2) Use the [◄]/[►] keys to move the flashing cursor to the position shown in the figure.

(3) Use the [▲]/[▼] keys to set a value at the flashing cursor location.

0: Soft start mode (Initial setting)
1: Normal mode
2: Continuous test mode

(4) To complete the optional settings, press [SHIFT] + [STOP]. The unit reverts to the READY state.

NOTE When the continuous test mode is selected, the optional momentary OUT function is automatically set to "0."

4.10.1 Soft Start Mode

This function checks whether the probe is in contact with the measured object by constantly monitoring the output current value. With this function selected, no current is output if the test begins with a disconnected probe. When the probe contacts the measured object, the test begins without sparks. The instant the probe is detached from the measured object during testing, output current is halted, and the unit enters the READY state.

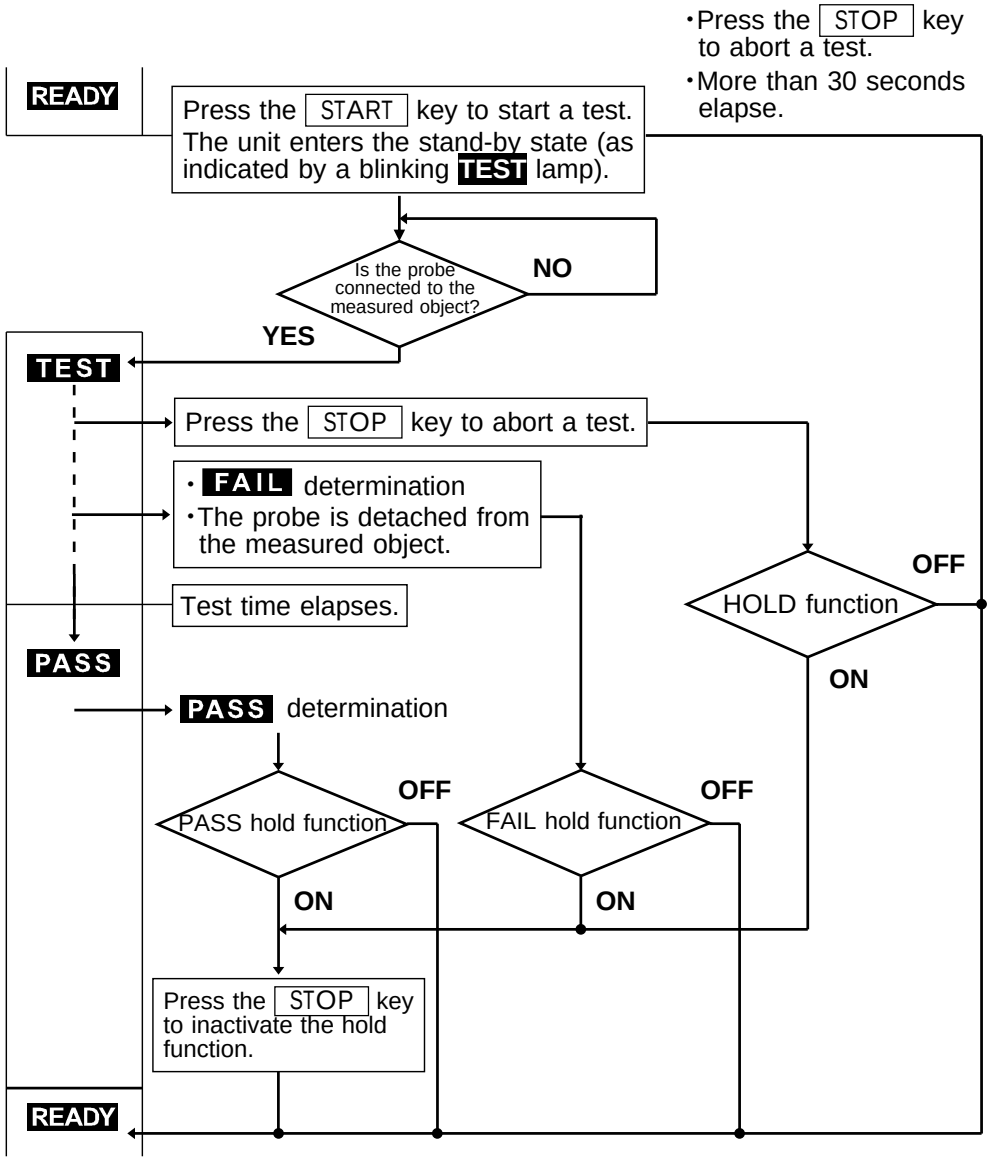
(1) Set the appropriate parameters in the READY state.

(2) Press the [START] key to start the test. If the probe is detached from the measured object, the test will not start, and the unit will enter the stand-by state (as indicated by a blinking **TEST** lamp). If this state continues for more than 30 seconds, the unit returns to the READY state. The test begins when the probe is connected to the measured object.

(3) If the probe is detached from the measured object during testing, the **FAIL** lamp lights together with the **UPPER** and the **LOWER** lamps, and the unit enters FAIL state.

(4) To end the test normally, the probe must contact the measured object throughout the test.

Flow of operation in Soft start mode



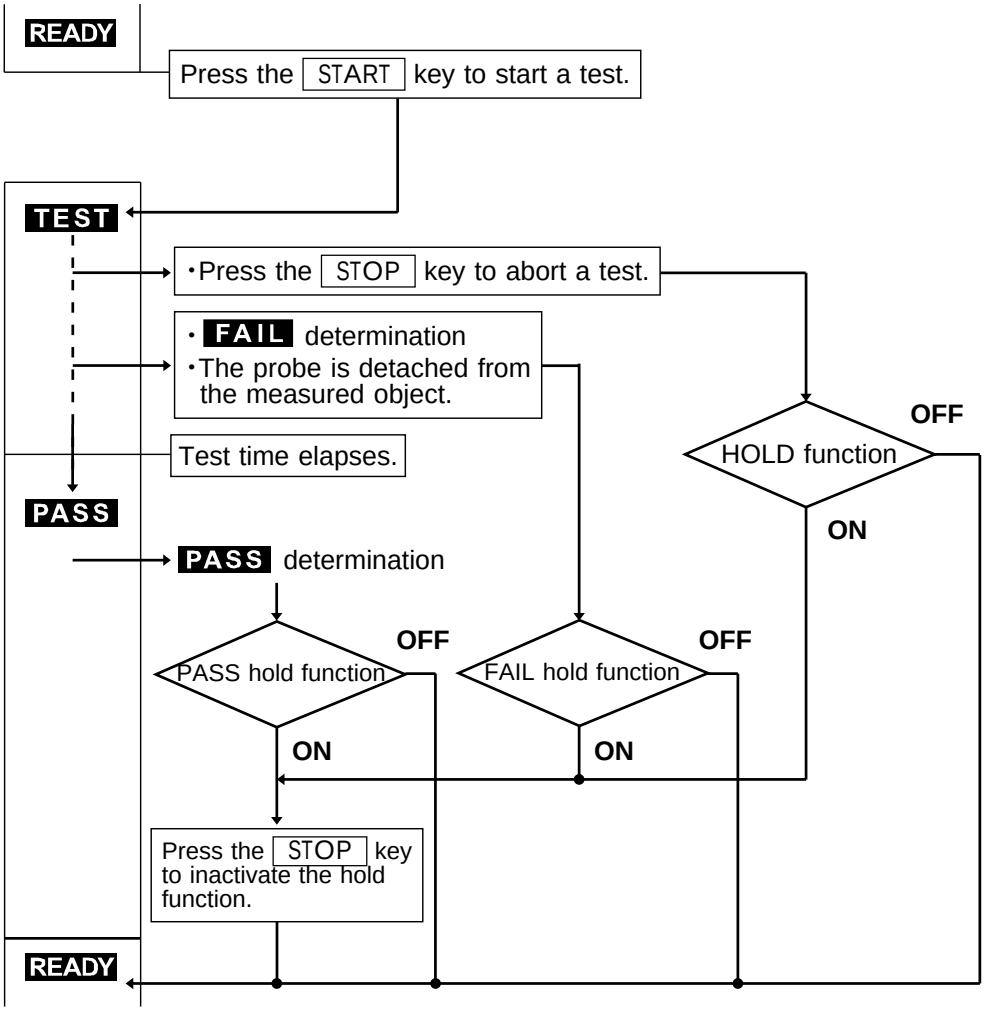
NOTE

The soft start mode is active only with a load 0.200 Ω or less. If the load exceeds this value, the state of connection of the probe is not known, and a test cannot be started.

4.10.2 Normal Mode

Select normal mode if the anticipated load resistance is 0.200 Ω or greater.
In normal mode, press the START key in READY state while the soft start function is in the stand-by state (as indicated by a blinking **TEST** lamp). When the START key is pressed, the unit enters TEST state.
If the probe is detached from the measured object during testing, the **FAIL** lamp lights together with the **UPPER** and the **LOWER** lamps, and the unit enters FAIL state.
The unit will not detect the connection state of the probe. To avoid occurrence of sparks between the probe and the device being tested, make the connections before pressing the START key.

Flow of operation in Normal mode



NOTE Select normal mode if the anticipated load resistance is 0.200 Ω or greater.

4.10.3 Continuous Test Mode

Unlike the soft start mode, the continuous test mode places the unit into the hold state if the probe is detached from the measured object, suspending output. To restart the test, cancel the hold state and connect the probe to the measuring object.

(1) Set the appropriate parameters in the READY state.

(2) Press the START key to start the test. If the probe is detached from the measured object, the test will not start, and the unit will enter the stand-by state (as indicated by a blinking **TEST** lamp). If this state continues for more than 30 seconds, the unit returns to the READY state. The test begins when the probe is connected to the measured object.

(3) If the probe is detached from the measured object during testing, the test is aborted. The unit enters the hold state instead of the READY state.
To end the test normally, the probe must contact the measured object throughout the test.
When the test finishes, the screening results will determine a state of PASS or FAIL.

(4) Cancel the hold state. The unit enters the stand-by state (as indicated by a blinking **TEST** lamp) preparatory to beginning a test. The values measured in the preceding test are retained, even in this state.

Canceling hold state

HOLD ON: Press the STOP key and detach the probe from the measured object (the reverse step is allowed).

HOLD OFF: Detach the probe from the measured object.

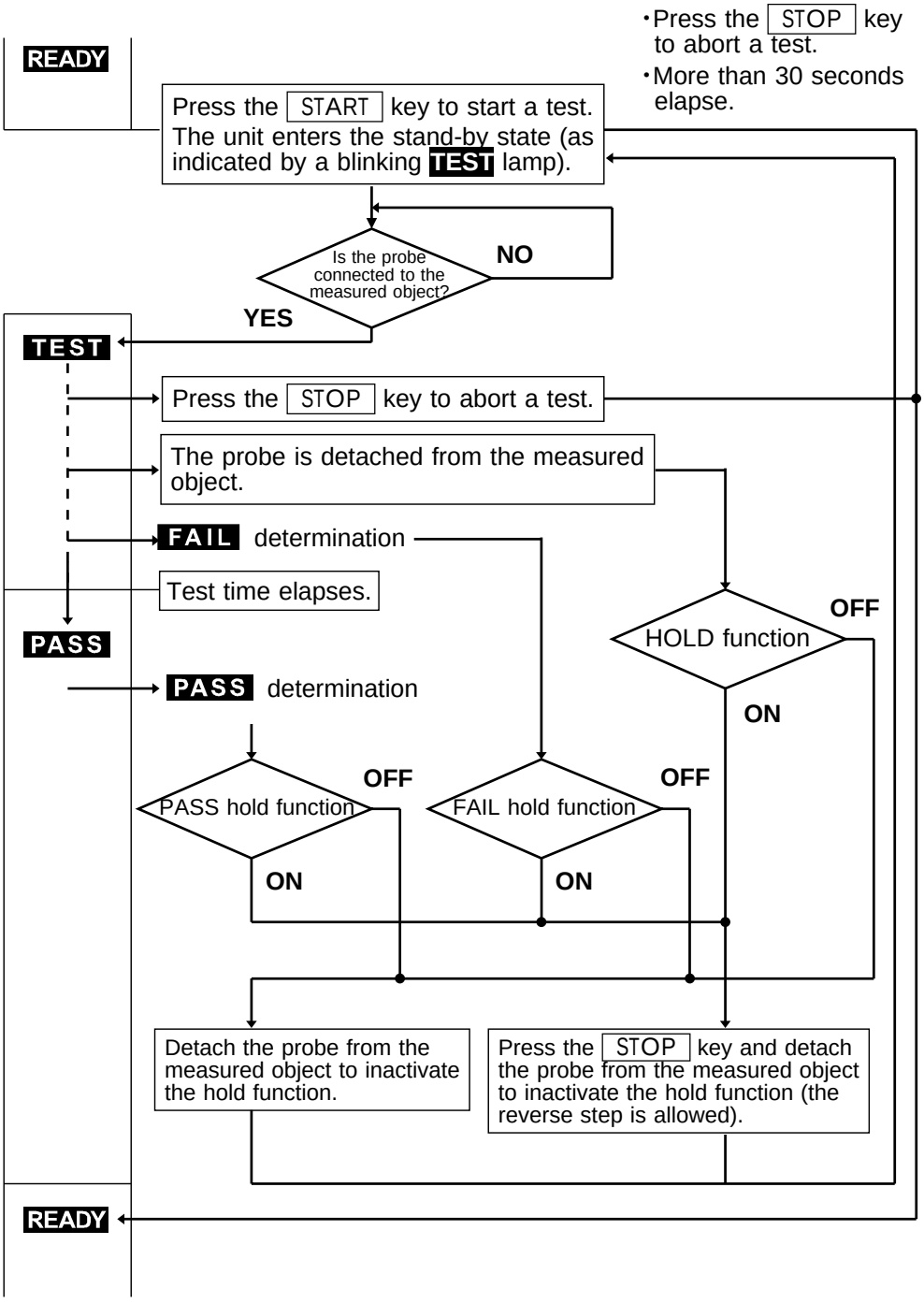
(5) Connect the probe to begin the next test.

(6) To enter the READY state after testing, press the STOP key in the TEST or stand-by state (as indicated by the blinking **TEST** lamp). If you press the STOP key while the unit is in the hold state, the unit will not enter the READY state. This is because the action is interpreted as canceling the hold state.

NOTE

- The values measured in the test are retained by the PASS/FAIL hold function and the hold function at the end of the testing if the unit is in continuous test mode. Note that different settings require different methods of canceling.
- The continuous test mode and the momentary OUT function are not compatible. If continuous test mode is selected in test mode, the momentary OUT function is automatically reset to "0."

Flow of operation in Continuous test mode



4.11 Printer Output

You can print test parameters and results with the optional 9442 PRINTER. This printer offers the following two print modes.
When "0: Not used" is selected, the printer will not print, even if connected.
When "1: Automatically print for PASS/FAIL screening" is selected, press the [STOP] key for about two seconds in the READY state to print the test results. The test results are printed automatically when the unit enters the PASS or FAIL state, whether or not the state is retained.
When "2: Selectively print when the PASS/FAIL state is held" is selected, printing begins about two seconds after the [STOP] key is pressed to cancel the PASS/FAIL hold state. Unless the [STOP] key is kept pressed, the [STOP] key cancels the PASS/FAIL hold state without printing, and the unit reverts to the READY state.
To print the test results, you must make the appropriate settings to retain either the PASS or FAIL state, using the PASS/FAIL hold function.

Setting procedure

(1) Press [SHIFT] + [STOP] while in READY state to display the Optional function setting screen.

(2) Use the [◄]/[►] keys to move the flashing cursor to the position shown in the figure.

(3) Use the [▲]/[▼] keys to set a value at the flashing cursor location.

0: Not used (Initial setting)
1: Automatically print for PASS/FAIL screening.
2: Print selectively when the PASS/FAIL state is held.

(4) To complete the optional settings, press [SHIFT] + [STOP]. The unit reverts to the READY state.

NOTE

- The printer output settings apply only when the 9593-02 RS-232C INTERFACE and the 9442 PRINTER are connected. Connect the 9593-02 and the 9442 before starting up.
  For more information on settings, see the accompanying manual and Chapter 9, "Appendix."
- If the printer output function is set to "1: Automatically print for PASS/FAIL screening" and the PASS/FAIL hold function to "PASS/FAIL not held," the PASS or FAIL state may be verified on the printer, but not on screen.
  If the continuous test mode and the test data count mode are set, you can continue testing as the results print by keeping your hand on the probe.
- The test parameters cannot be printed using the push switch on the 9297 CURRENT APPLY PROBE.

Example of printing

Example of set value printing

Example of test result printing

```
SETTING
CURRENT     : 25.0 A  ,  50 Hz
UPPER       : 0.100 ohm
LOWER       : 0.005 ohm
TIME        : 60.0 s
MAX DATA #  : 10


HIOKI 3157 AC GROUNDING HiTESTER
DATA #      : 1 / 10
JUDGEMENT   : PASS
RESISTANCE  : 0.030 ohm   ( 0.75 V )
CURRENT     : 24.9 A  ,  50 Hz


DATA #      : 2 / 10
JUDGEMENT   : UPPER FAIL
              5.1 s / 60.0 s
RESISTANCE  : 0.129 ohm   ( 3.23 V )
CURRENT     : 25.0 A  ,  50 Hz
```

Actual size

Set value printing

SETTING	Shows test parameter printing.
CURRENT	Set current value and output current frequency
UPPER	Maximum test value
LOWER	Minimum test value "---" is printed if the optional minimum test value setting function is set to "0: Not set."
TIMER	Testing Time "---" is printed if the optional endless timer function is set to "1: Set."
MAX DATA #	Maximum number of test data (Not printed for OFF)

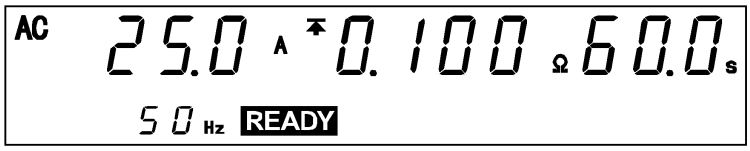
Test result printing

HIOKI 3157 GROUNDING HiTESTER	Model name This is printed if the test data count function is not used or if the number of test data is 1.)
DATA #	Number of test data and maximum number of test data These are not printed if the test data count function is not used.
JUDGEMENT	Test result PASS, UPPER FAIL or LOWER FAIL is printed. The elapsed time and testing time are also printed for FAIL.
RESISTANCE	Measured resistance value and measured voltage value at the end of a test
CURRENT	Measured current value and frequency at the end of a test

4.12 Example of Optional Function Settings

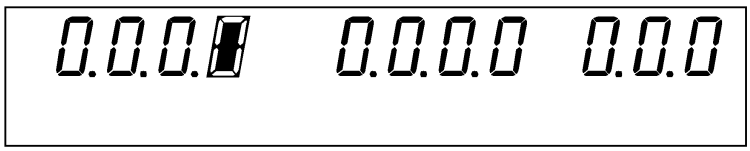
We assume that the 3157 is in the READY state and that the minimum test value setting function and the test data count function are inactive.
The following example shows how to set the number of test data to "5," after activating the minimum test value setting and test data count functions.

Since the minimum test value setting function is disabled, the flashing cursor does not move to the minimum test value. Because the test data count function is also inactive, the output current frequency is displayed.



(1) Press SHIFT + STOP to display the Optional function setting screen.

(2) To change the setting of the minimum test value, move the flashing cursor to the fourth number from the left. In the optional function setting screen, the flashing cursor will first appear at the leftmost position. Press the ▶ key three times to move to the fourth number.

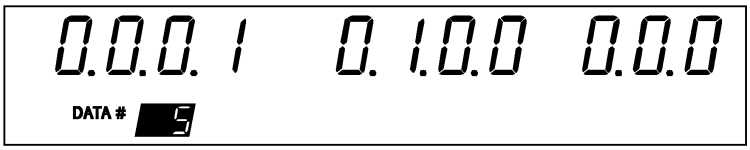


(3) "Minimum test value setting" is set to "0: Not set." Using the ▲/▼ keys, change the setting to "1: Set."

(4) Next, using the ▲/▼ keys, change "Test data count" from "0: Set" to "1: Not set." In "Test data count," change the sixth number from the left to "1."

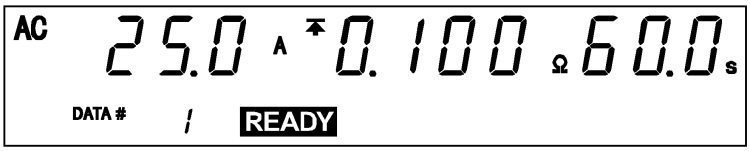
When "Test data count" is activated, the screen shifts to allow you to set a maximum value for the number of test data. In this example, the current maximum number is "1."

(5) To change the maximum number of test data to "5," move the flashing cursor by using the ◄/► keys to the maximum value in "Number of test data."



Use the ▲/▼ keys to change the maximum value for the number of test data. In this example, press the ▲ key four times.

(6) Press SHIFT + STOP. This operation finalizes the optional settings, after which the unit reverts to the READY state.

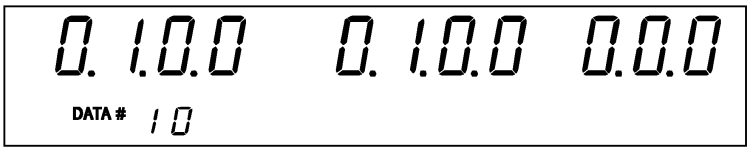


After "Test data count" is set, the output current frequency is replaced by "Number of test data."

4.13 Example of Optional Functions Use

The following describes how 3157 optional functions are used in testing. Varying combinations of optional functions are available for testing.

(1) Testing to check test results, using the 3157
Optional function settings

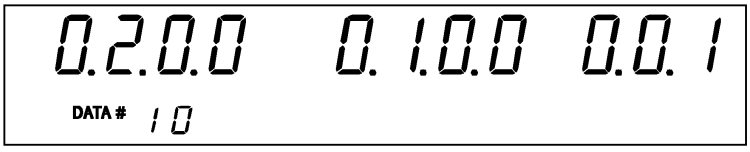


Optional function	Selection
PASS/FAIL hold function	1: PASS held, FAIL held
Test data count function	1: Set
Test mode	0: Soft start mode

Advantages of these settings

- PASS or FAIL state is held, allowing inspection of test results. Test results can also be checked with the buzzer.
- The number of tests can be counted using the test data count function.
- The soft start function allows safe testing.

(2) Testing to check test results, using the printer
Optional function settings



Optional function	Selection
PASS/FAIL hold function	2: PASS not held, FAIL not held
Test data count function	1: Set
Test mode	0: Soft start mode
Printer output	1: Automatically print for PASS/FAIL screening.

Advantages of these settings

- The test results are output to a printer, which is set to "Automatically print for PASS/FAIL screening." The results will not appear on screen, since the PASS or FAIL state is not held. This setting is useful when checking results after performing a number of tests.
- Once enabled, the test data count function allows you to print the total number of test data. This permits inspection of failed items.
- The soft start function allows safe testing.

(3) Continuous test mode using the 9297 CURRENT APPLY PROBE
Optional function settings

Optional function	Selection
PASS/FAIL hold function	2: PASS not held, FAIL not held
Hold function	0: Not held
Test data count function	1: Set
Test mode	2: Continuous test mode
Printer output	1: Automatically print for PASS/FAIL screening.

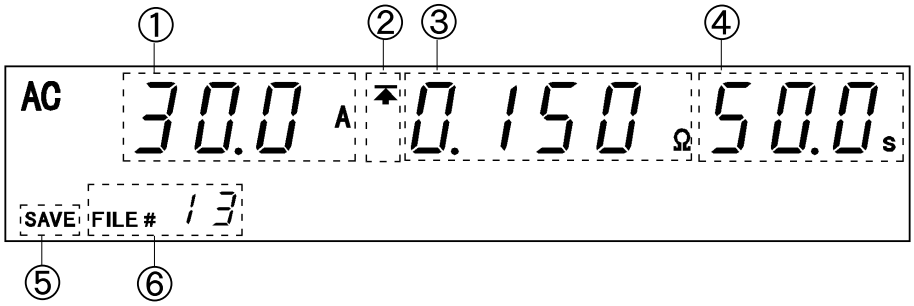
Advantages of these settings

- This setting is useful when testing a device with more than one test point. Connect the 9296 CURRENT PROBE to the protection conduction terminal and apply the 9297 CURRENT APPLY PROBE to a test point. Since continuous test mode is active, test results are displayed for the preset time period as long as the probe is held against a test point.
- In continuous test mode, a new test begins when the probe comes in contact with the next test point. The PASS/FAIL hold function and the hold function must be set to "Not held."
- If the maximum number of test data is set to the number of tests, the number of test data is reset to "1" after all test points are tested. This allows accurate counting of test points.
- Test results are sent to the printer after each device is tested.

Chapter 5
Saving/loading Preset Values

5.1 Saving Preset Values

The following describes a function used to save values set in the READY state. Up to twenty parameters may be saved. To retrieve saved data, follow the procedures described in Section 5.2, "Loading Preset Values."



① Preset current value
Shows the preset current value for the set data being displayed.

② Maximum value icon and minimum value icon
The symbol ⮝ appears when the maximum test value is displayed, and the symbol ⮟ appears when the minimum value is displayed.

③ Maximum and minimum test values
Shows maximum and minimum test values for the data being displayed.

④ Test time
Shows the test time for the data being displayed.

⑤ SAVE
Shows that the screen appearing is for saving the data (the save screen).

⑥ File number
This value indicates the file number for the data containing the preset current value, maximum test value, minimum test value, and the test time currently displayed.

5.1.1 Procedure for Saving Data

To select a preset value to be saved, the unit must be in the READY state. Preset values cannot be changed in the save screen.

The following six parameters may be saved:
① Preset current value
② Maximum test value
③ Minimum test value
④ Test time
⑤ Optional maximum test value setting function
⑥ Optional endless timer setting function

(1) Displaying the save screen
With the target preset value displayed in the READY state, press SHIFT + ▶ key to shift to the save screen.
In the save screen, the saved data for the file number replaces the target value displayed in the READY state.
The first saved data displayed is the last data from the previous save screen.

(2) Selecting a file to save
The new data overwrites the previous data. Look for the saved data to be deleted, using the ▲/▼ keys. Press SHIFT + ▲/▼ keys to increase the file number by five.
Use the ◀/▶ keys to switch between maximum and minimum test values (these keys are disabled if the saved data is set to "0: Not set" by the optional minimum test value setting function).

(3) Saving and canceling data
When the saved data to be deleted is displayed, press SHIFT + ▶. This deletes the saved data and saves the value set in the READY state.
After the **SAVE** lamp flashes, the unit reverts to the READY state.
Press the STOP key to revert to the READY state without saving the target data.

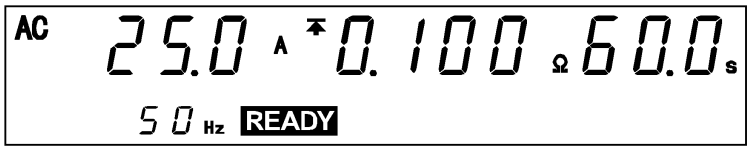
NOTE

- Even if maximum and minimum test values for data to be saved are expressed in resistance, voltage values are also saved. The voltage value saved is the one displayed when the display shifts between resistance and voltage in the READY state. This process is reversed when data is represented in voltage.
  Since information is also saved that determines whether the maximum and minimum test values for the saved setting data is in resistance or in voltage, the set value is displayed in the save screen. Since all of this data is loaded, the screen also displays irrelevant values.
- The minimum test value and test time are saved even if the optional minimum test value setting function and endless timer functions are set to "0: Not set." If these settings are modified after loading, the screen may display irrelevant values.
- Even if it is preset, the zero adjustment value is not saved. This value is valid when the unit reverts to the READY state from the save screen.

5.1.2 Example of Saving

The following example shows how to save in File No.3. We assume that the 3157 is in the READY state.

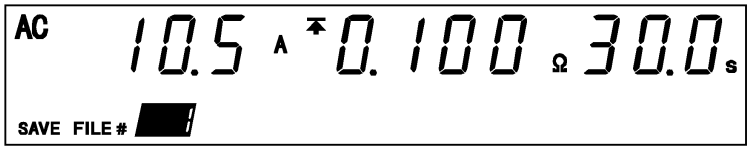
(1) In the READY state, set the preset value to save. For more information on making these settings, see Chapter 3, "Testing Method."



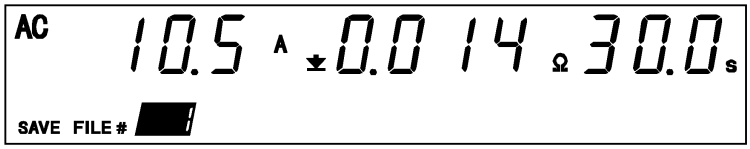
In this example, settings are made as follows:

Preset current value	25.0 A
Maximum test value	0.100 Ω
Minimum test value	OFF
Testing time	60.0 s

(2) Press SHIFT + ▶ to bring up the save screen.
In the save screen, the value set in the READY state is replaced by the saved data being displayed. The first saved data displayed is the last data item from the previous save screen. This example shows "File No.1."
The new data overwrites the previous data. Use the ▲/▼ keys to select the data to be overwritten. The new data in this example is to be saved in File No.3.



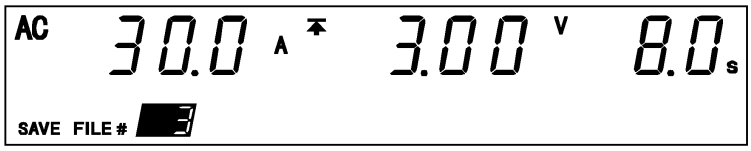
In this status, the preset minimum test valve can be checked by using the ◀ or ▶ key.



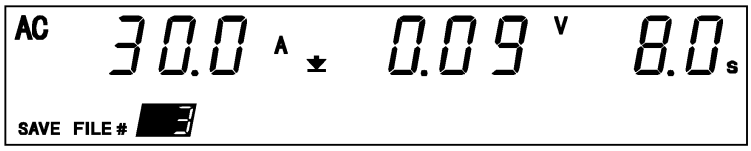
In this example, File No. 1 contains the following settings.

Preset current value	10.5 A
Maximum test value	0.100 Ω
Minimum test value	0.014 Ω
Testing time	30.0 s

(3) Use the ▲/▼ keys to select File No.3.
This example shows File No. 1. Press the ▲ key twice to display File No.3.



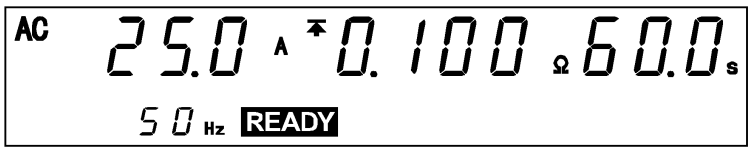
(4) Use the ◄/► keys to check maximum and minimum test values.



In this example, File No. 3 contains the following settings.

Preset current value	30.0 A
Maximum test value	3.00 V
Minimum test value	0.09 V
Testing time	8.0 s

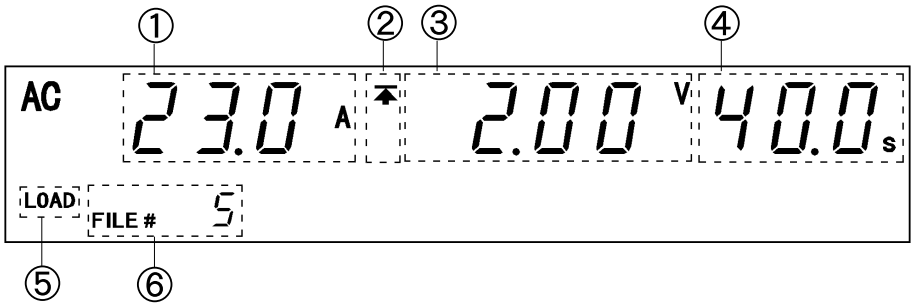
(5) To save the data, press SHIFT + ►. The unit reverts to the READY state.
Once saved, the value set in the READY state is retained in File No.3.
Note that File No.3, shown in Step (4) above, is deleted.



To abort the save procedure, press the STOP key at Step (4). The unit halts the save procedure and reverts to the READY state.

5.2 Loading Preset Values

The following describes how to load saved data. Twenty preset values may be saved. Use this function to instantly change a preset value.



① Preset current value

Shows the preset current value for the set data being displayed.

② Maximum value icon and minimum value icon

The symbol ⤒ appears when the maximum test value is displayed, and the symbol ⤓ appears when the minimum value is displayed.

③ Maximum and minimum test values

Shows maximum and minimum test values for the data being displayed.

④ Test time

Shows the test time for the data being displayed.

⑤ Load

Shows that the screen appearing is for loading the data (the load screen).

⑥ File number

This value indicates the file number for the data containing the preset current value, maximum test value, minimum test value, and the test time currently displayed.

5.2.1 Procedure for Loading Data

Before loading, carefully read Section 5.1, "Saving Preset Values" and prepare the data to be saved. The following are factory-set data.

Preset current value	25.0 A
Maximum test value	0.100 Ω (2.5 V)
Minimum test value	OFF (OFF)
Testing time	60.0 s
Minimum test value setting	Inactive
Testing time setting	Active

( ): Voltage value

The following six parameters may be loaded:

① Preset current value
② Maximum test value
③ Minimum test value
④ Test time
⑤ Optional maximum test value setting function
⑥ Optional endless timer setting function

(1) Displaying the load screen

To load the saved data, Press SHIFT + ◄ key in the READY state to shift to the load screen.
In the load screen, a number for saved data equal to the file preset replaces the target value displayed in the READY state.
The first saved data displayed is the last data from the previous load screen.

(2) Selecting a file to save

Look for the saved data to be loaded, using the ▲/▼ keys.
Use the ◄/► keys to switch between maximum and minimum test values (these keys are disabled if the saved data is set to "0: Not set" by the optional minimum test value setting function).

(3) Loading and canceling data

When the saved data to be loaded is displayed, press SHIFT + ►. This loads the saved data and the unit reverts to the READY state.
Press the STOP key to revert to the READY state without loading the target data.

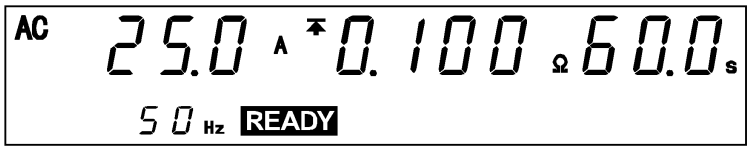
NOTE

- Even if maximum and minimum test values for data to be saved are expressed in resistance, voltage values are also saved. The voltage value saved is the one displayed when the display shifts between resistance and voltage in the READY state. This process is reversed when data is represented in voltage.
  Since information is also saved that determines whether the maximum and minimum test values for the saved setting data is in resistance or in voltage, the set value is displayed in the load screen. Since all of this data is loaded, the screen also displays irrelevant values.

- The minimum test value and test time are saved even if the optional minimum test value setting function and endless timer functions are set to "0: Not set." If these settings are modified after loading, the screen may display irrelevant values.
- If data is loaded with the zero adjustment value set, the zero adjustment function is automatically disabled. This value is valid when the unit reverts to the READY state from the load screen without loading data.

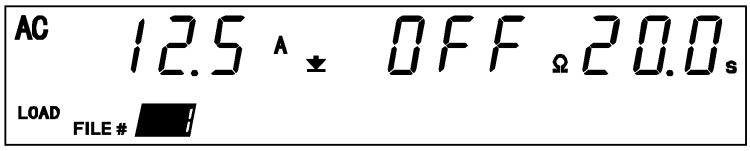
5.2.2 Example of Loading

The following example shows how to load File No.3. We assume that the 3157 is in the READY state.



(1) Press SHIFT + ◄ to bring up the load screen.
In the load screen, the value set in the READY state is replaced by the saved data being displayed. The first saved data displayed is the last data item from the previous load screen. This example shows "File No.1."

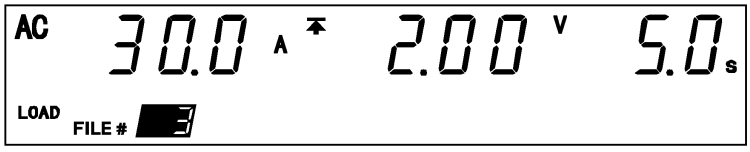
In this status, the preset minimum test valve can be checked by using the ◄ or ► key.



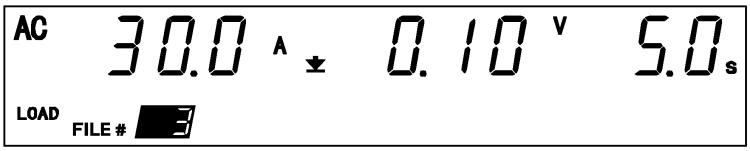
In this example, File No. 1 contains the following settings.

Preset current value	12.5 A
Maximum test value	0.050 Ω
Minimum test value	OFF
Testing time	20.0 s

(2) Use the ▲/▼ keys to select File No.3.
This example shows File No. 1. Press the ▲ key twice to display File No.3.



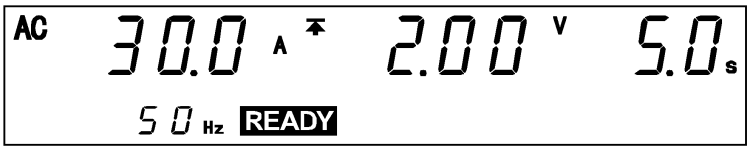
(3) Use the ◄/► keys to check maximum and minimum test values.



In this example, File No. 3 contains the following settings.

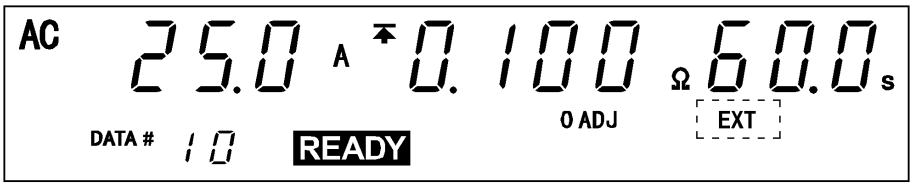
Preset current value	30.0 A
Maximum test value	2.00 V
Minimum test value	0.10 V
Testing time	5.0 s

(4) To load the data, press SHIFT + ◄. The unit reverts to the READY state. To abort the load procedure, press the STOP key.



Chapter 6
External I/O

Both output signals regarding the status of the 3157 (e.g., READY state) and input signals to the START key and the STOP key are controlled through the external I/O terminal, located at the back of the unit.
All signal lines are internally insulated by the photocoupler. Prepare an external power source (5 V to 24 VDC). The external I/O function can be temporarily used since the internal power source (5 V) and GND are output from the external I/O terminal. Care must be taken because the signal lines are not insulated when the external I/O function is used.



When $\overline{\text{EXT-E}}$ of the external I/O terminal is at LO, the **EXT** lamp lights to indicate that the external I/O is active.

NOTE

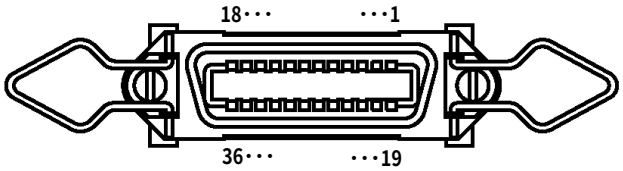
When $\overline{\text{EXT-E}}$ of the external I/O terminal is at LO, the unit START key is disabled. If you use an external switch, the START signal for the external I/O terminal is disabled. The priority hierarchy for the START keys is given below. When a START key with a higher priority is in use, lower-priority keys are disabled:
Priority: External switch > External I/O > Front panel of the unit.

6.1 Signal Line

The following external I/O connectors are used.

Connector used — Honda communication Co.
ADS-B36BLFDR116
36-pin receptacle

Compatible connector — Honda communication Co.
ADS-HC360001-010
ADS-B36LMR
ADS-B36LMR2
ADF-36MR
ADF-36RMR
36-pin



External I/O connector pin numbering

Pin number	I/O	Signal line name	Pin number	I/O	Signal line name
1	OUT	$\overline{\text{READY}}$	19	OUT	INT.GND
2	OUT	$\overline{\text{L-FAIL}}$	20	OUT	INT.GND
3	OUT	$\overline{\text{U-FAIL}}$	21	OUT	INT.GND
4	OUT	$\overline{\text{PASS}}$	22	OUT	INT.GND
5	OUT	$\overline{\text{TEST}}$	23	OUT	INT.GND
6	OUT	INT.GND	24	OUT	INT.GND
7	IN	$\overline{\text{EXT-E}}$	25	OUT	INT.GND
8	IN	$\overline{\text{START}}$	26	OUT	INT.GND
9	IN	$\overline{\text{STOP}}$	27	OUT	INT.GND
10	OUT	INT.GND	28	OUT	INT.GND
11	IN	EXT.DCV	29	OUT	INT.DCV
12	IN	EXT.DCV	30	OUT	INT.DCV
13	IN	EXT.DCV	31	OUT	INT.DCV
14	IN	EXT.DCV	32	OUT	INT.DCV
15	IN	EXT.COM	33	OUT	INT.GND
16	IN	EXT.COM	34	OUT	INT.GND
17	IN	EXT.COM	35	OUT	INT.GND
18	IN	EXT.COM	36	OUT	INT.GND

Function of the signal line

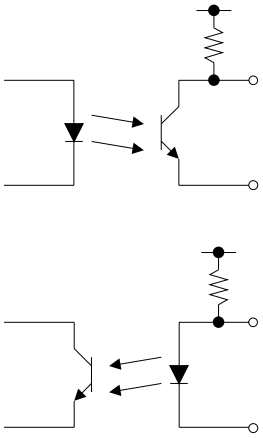
Signal line name	I/O	Function
$\overline{\text{READY}}$	OUT	LO in the READY state
$\overline{\text{L-FAIL}}$	OUT	LO in the FAIL state at LOWER (minimum value)
$\overline{\text{U-FAIL}}$	OUT	LO in the FAIL state at UPPER (maximum value)
$\overline{\text{PASS}}$	OUT	LO in the PASS state
$\overline{\text{TEST}}$	OUT	LO in the TEST state
$\overline{\text{EXT-E}}$	IN	When this signal becomes LO, the START signal on the external I/O connector becomes valid.
$\overline{\text{START}}$	IN	LO is equivalent to pressing the unit [START] key and provides the same functions.
$\overline{\text{STOP}}$	IN	LO is equivalent to pressing the unit [STOP] key and provides the same functions. This signal is valid regardless of EXT-E status.
EXT.DCV	IN	Terminal for supplying power from external equipment. Use this to insulate the unit from external equipment. Effective source voltage: 5 V to 24 VDC.
EXT.COM	IN	This terminal is used to input GND for the external equipment. Use this to insulate the unit from external equipment.
INT.DCV	IN	Generates an internal source (5 VDC) for the unit. Used temporarily to activate the external I/O function. Note that the signal line is not insulated.
INT.GND	IN	Generates an internal GND for the unit. Used temporarily to activate the external I/O function. Note that the signal line is not insulated.

The output signal ($\overline{\text{STOP}}$) is valid regardless of $\overline{\text{EXT-E}}$ status.

External I/O

The output signals are the open collector outputs of the photocouplers, and are connected to the external DC power supply (EXT. DCV) via 4.7 kΩ pull-up resistors.

The input signals are connected to the drive of the photocouplers, and are connected to the external DC power supply (EXT. DCV) via 4.7 kΩ pull-up resistors.



The insulation of the signal lines is for eliminating mutual influences between the signals. Any external device which is connected to the 3157 unit should always be properly protectively grounded. If proper connection to a protective ground is not established, there is a danger of damage to the insulation.
The voltage of the external DC power supply to be connected to the EXT DCV and EXT COM terminals should be from 5 V to 24 V. Do not supply DC voltage greater than 24 V. If you do, there is a danger of damage to the unit.
Moreover, for driving the circuitry, connect any device which is capable of providing an output current of more than 200 mA.

The relationship between the external DC power supply voltage, the voltage of the output signals, and the current, is as shown in the following table:

External DC power supply voltage	Output signals (internal pull-up resistors 4.7 kΩ)			
	High level	Low level		
		Output current 10 mA	Output current 40 mA	Output current 60 mA max.
5 V	5V	0.9 V	1.1 V	1.2 V
12 V	12 V	0.9 V	1.1 V	1.2 V
24 V	24 V	0.9 V	1.1 V	1.2 V

Direct connection of a circuit whose input voltage is regulated to a maximum of 0.8 V or the like is not possible.
In such a case, keep input voltage below 0.8 V by incorporating a transistor or a drive capable buffer circuit or the like.

NOTE

- The internal DC power supply of 5 VDC is provided between INT DCV and INT GND. The maximum current capacity is 100 mA. Do not connect any external circuit whose current consumption is greater than 100 mA. INT GND is grounded to the chassis of the 3157 unit.
- When using the external I/O connector, be sure always to supply power to the external DC power supply.
  The output signal low level output current is a maximum of 60 mA. If a current greater than this is required, you should connect a transistor circuit using a current amplifier driven by an external power source or the like externally.

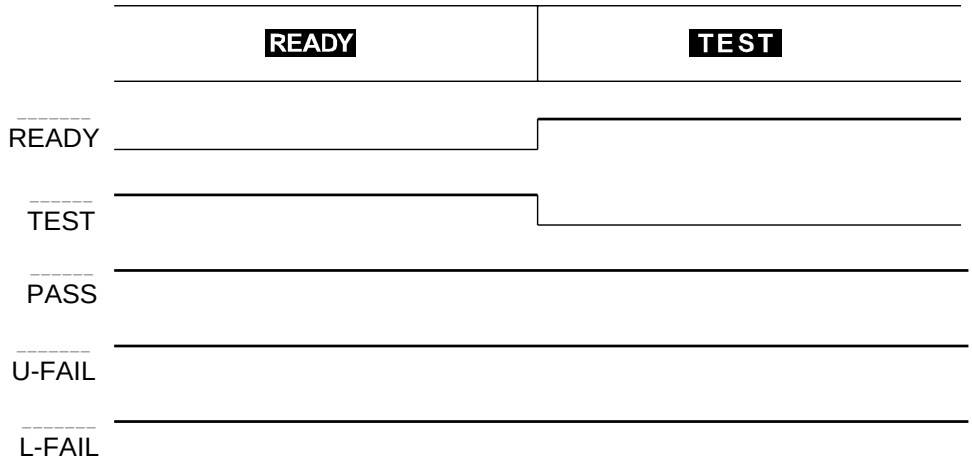
6.2 Timing Chart of External I/O Terminal

(1) Timing chart at time of start of testing

When a test starts, the READY signal indicates HI and the TEST signal indicates LO.

The TEST signal changes according to the **TEST** indicator on the fluorescent display, indicating LO at zero adjustment as well as during testing.

The TEST signal will indicate LO in the stand-by state (as indicated by a blinking **TEST** lamp) if soft start or continuous test mode is active.



(2) Timing chart during a test decision

The figure shows the timing chart of the unit in PASS state after a test. In PASS state, the TEST signal indicates HI.

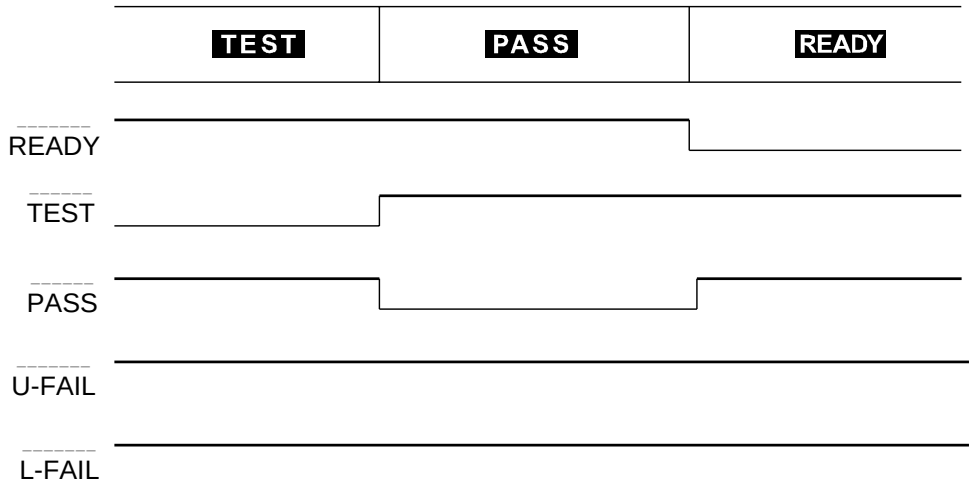
The PASS signal changes according to the **PASS** indicator on the fluorescent display. If the PASS hold function is enabled, the PASS signal continues to indicate LO until the function is disabled.

If the hold function is disabled or if the unit automatically returns to READY state, the PASS signal indicates HI and the READY signal indicates LO.

In UPPER-LOWER FAIL state, which results when output currents remain below the set value, both the U-FAIL signal and the L-FAIL signal indicate LO.

Likewise, in FAIL state, the U-FAIL signal indicates LO in the UPPER FAIL state, and the L-FAIL signal indicates LO in LOWER FAIL state. If the FAIL hold function is enabled, the signals will continue to indicate LO until the function is disabled.

If the hold function is disabled or if the unit returns automatically to READY state, the signal will indicate HI, and the READY signal will indicate LO.



(3) Timing chart when testing is aborted

No test determination is returned if the STOP key is pressed to abort testing, or if the testing duration passes without settings for maximum test value or minimum test value. Under these conditions, the unit does not enter PASS or FAIL state, and signals indicate HI. The signal lines also continue to indicate HI as long as this state is held by the hold function.

All signal lines will indicate HI while set values are saved, loaded, or when no state indicator (READY/TEST/FAIL/PASS) lights - as when optional functions are being set.

Chapter 7
Maintenance, Inspection and Ultimate Disposal

7.1 Maintenance and Inspection

To ensure the safe operation of this unit, perform maintenance regularly.

- Be sure to read assiduously the various items highlighted in this manual for attention, in order to use the unit correctly.
- If the unit is not functioning properly, check the "Troubleshooting" list. If a problem is found, contact your dealer or HIOKI representative. Pack the unit carefully so that it will not be damaged during transport, and write a detailed description of the problem. HIOKI cannot bear any responsibility for damage that occurs during shipment.
- If the unit has been subject to moisture, or if oil and dust have accumulated in the unit interior, the danger of electrical shock or fires resulting from the deterioration of insulation increases greatly. If the unit is ever subject to excessive moisture, oil, or dust, cease use immediately, and return the unit to us for maintenance.
- Periodic calibration is necessary to verify and maintain accuracy. If calibration becomes necessary, return the unit to us for maintenance.
- This product uses a lithium battery to back up it's memory. As the battery power is consumed, it's ability to store measurement conditions diminishes. In the event that measurement conditions can no longer be stored, please contact the manufacturer for repair service.
- Spare and replacement parts for this product are guaranteed to be available only until 7 years after manufacture of this model is terminated.

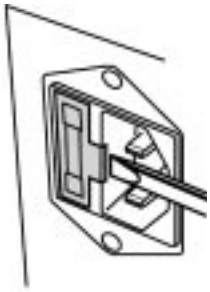
Cleaning

- Gently wipe dirt from the surface of the unit with a soft cloth moistened with a small amount of water or mild detergent.
  Do not try to clean the unit using cleaners containing organic solvents such as benzine, alcohol, acetone, ether, ketones, thinners, or gasoline. They may cause discoloration or damage.

7.2 Fuse Replacement

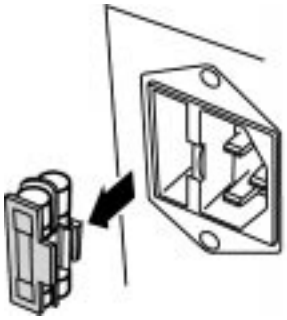
⚠ WARNING

- **To prevent electric shock when replacing the power source fuse, always turn the power switch off and disconnect the power cord and probe before beginning.**
- **Only use fuses of the specified type that is rated for the specified current and voltage. Using a fuse that does not meet the specifications or shorting the fuse holder may cause an accident that might result in injury or death. (Specified fuse: 250 V T3.15 AL)**



(1) Turn the power OFF, and disconnect the power cord.

(2) Using a slot head screwdriver or the like, bias sideways the catch which holds the fuse box into the power inlet socket as shown in the figure, and then remove the fuse box.



(3) Replace the fuse with an equivalent replacement.

(4) Replace the fuse box by reinserting it into the power inlet socket.

7.3 Troubleshooting

If the unit is not functioing properly, check the following items before sending it for repair.

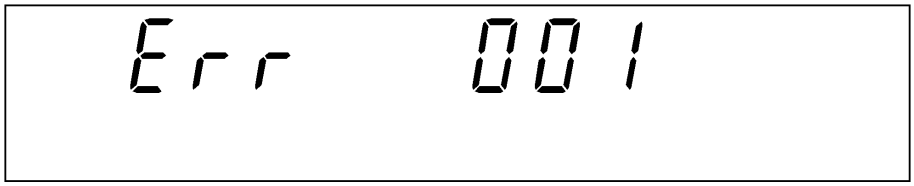
Symptom	What to check	Solution
The screen does not illuminate when the power is turned on.	Is the power cord disconnected?	Connect the power cord.
	Has the fuse blown?	Replace the fuse.
The keys do not operate. ("**RMT**" lights.)	Is the unit being remotely controlled through the RS-232C or GP-IB interface?	Set RS-232C or GP-IB to local. (The keys do not operate during RS-232C or GP-IB communication.)
	Has the unit been put into the key lock condition?	Clear the key lock condition.

If any of the following should occur, stop using the unit, disconnect the power cord and probe, and contact your dealer or HIOKI representative.

- If you are certain that the unit is damaged.
- If the measurement you wish to perform is inoperative.
- If the unit was stored for a long period of time in high temperatures and humidity, or other undesirable conditions.
- If the unit was damaged in transit.

7.4 Displaying Errors

If an error occurs, the 3157 displays the following on the screen.



If this indication appears, shut off power and start up again. If the same indication appears, an internal circuit may be defective. Continuing after an error message displayed can be dangerous. If an error occurs, record the error number and immediately contact your dealer or HIOKI representative.

7.5 Resetting the System

Resetting the system

While pressing the SHIFT key, press the main power switch to turn on power.

Parameters after resetting the system

When the system is reset, the following parameters are initialized.

(1) Testing set values and saved data

Preset current value	25.0 A
Maximum test value	0.100 Ω (2.5 V)
Minimum test value	OFF (OFF)
Testing time	60.0 s
Minimum test value setting	Inactive
Testing time setting	Active

(2) Optional functions

Switching the output current frequency	0: 50 Hz
PASS/FAIL HOLD function	0: PASS not held, FAIL held
HOLD function	0: Not held
Setting the minimum test value	0: Not set
Endless timer function	0: Not set
Test data count	0: Not set
Setting the buzzer	0: ON at screening, ON at error
Changing currents in TEST state	0: Not changeable
Momentary OUT	0: Not set
Test mode	0: Soft start mode
Setting the printer output	0: Not used

7.6 Ultimate Disposal (Removal of the Lithium Battery)

⚠ WARNING

- **To prevent electric shock when removing the lithium battery, always disconnect the power cord and probe.**
- **Dispose of the removed lithium battery in accordance with local regulations.**
- **If the protective functions of the unit are damaged, either remove the unit from service or post warnings to prevent others from using the unit inadvertently.**

This unit uses a lithium battery as a power source for recording measurement settings. When disposing of this unit, open the unit, remove the lithium battery and dispose of it properly.

Tools necessary for opening the unit:
Phillips screwdriver, College pliers

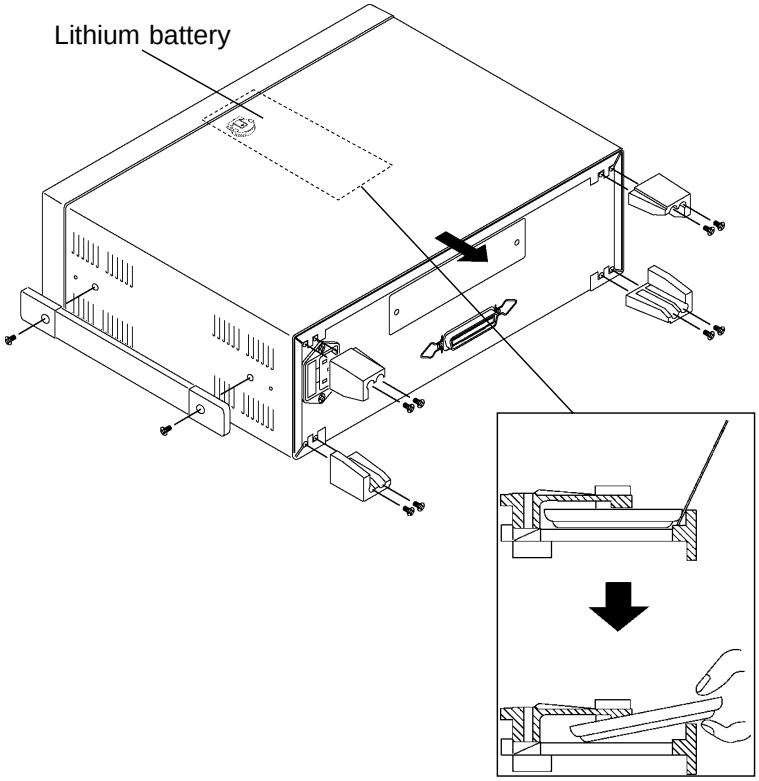
Procedure

(1) Turn OFF the power switch, and disconnect the power cord and probe.

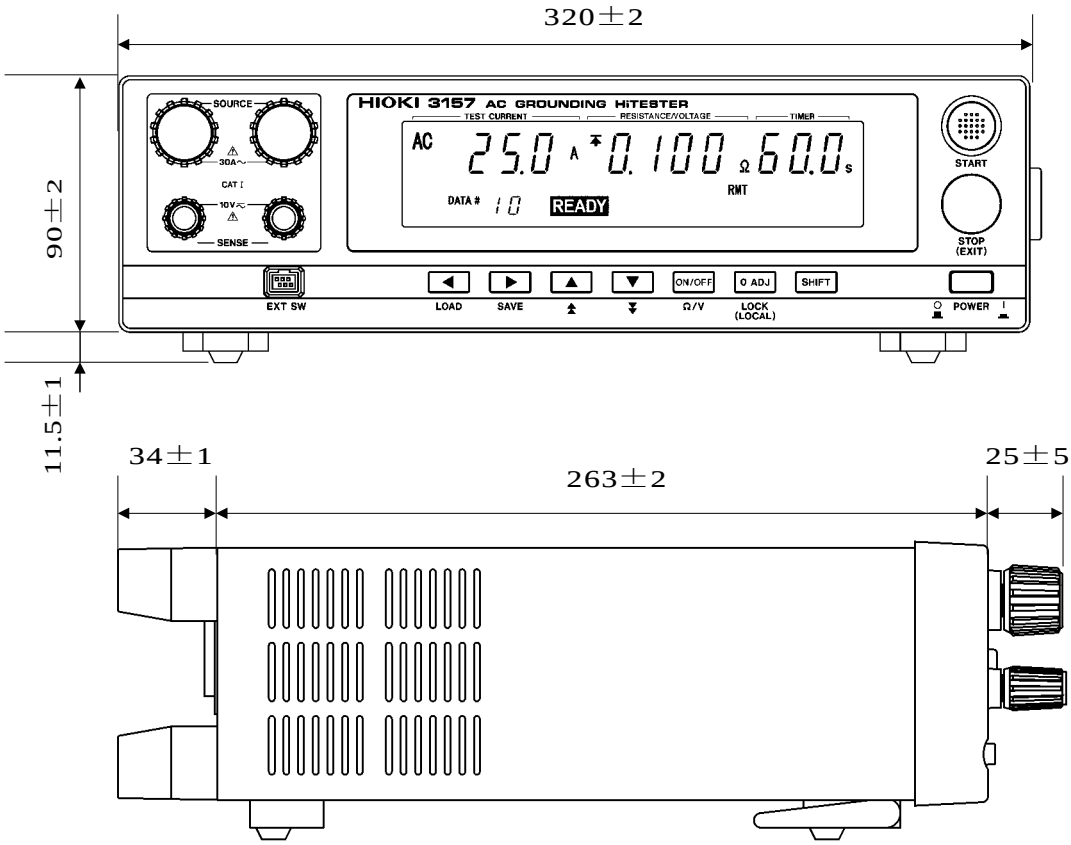
(2) Remove the four feet (fastened with eight screws) at the back of the 3157 and the two screws on the handle on the right side.

(3)Move the cover backward and remove it.

(4) The figure indicates the location of the battery holder.
Insert a sharp object (e.g. college pliers) between the battery and the battery holder, then remove the battery while lifting it.



7.7 External Dimensions



Chapter 8
Specifications

8.1 Basic Specifications

Current generator

Current generating method	PWM constant current control
Current preset range	3.0 A to 31.0 AAC (resolution of 0.1 A) at a resistance of 0.1 Ω.
Current preset accuracy	±(1% of setting + 0.2 A) within maximum output power.
Maximum output power	130 VA (on output terminal) *[1]
Open terminal voltage	6 VAC max.
Generated frequency	50 Hz or 60 Hz sine wave adjustable.
Distortion factor	5% max. (at an output of 5 A or greater).
Soft start function	Increase to the preset current value after checking power supply to load.

Monitor

Measuring method	AC low-resistance measurement with four terminals.
Monitor parameter	Output current and loaded terminal voltage.
Monitor cycle	Twice per second
Current monitoring range	0 A to 35.0 AAC (resolution of 0.1 A).
Current monitoring accuracy	±(1% rdg. + 5 dgt.) at 3 A or greater
Voltage monitoring range	0 V to 6.00 VAC (single range, resolution of 0.01 V).
Voltage monitoring accuracy	±(1% rdg. + 5 dgt.)
Resistance measurement range	0 Ω to 1.800 Ω (resolution of 0.001 Ω).
Resistance measurement accuracy	±(2% rdg. + 4 dgt.) after zero adjustment.

NOTE

The specifications in this manual include figures for "measurement accuracy" when referring to digital measuring instruments, and for "measurement tolerance" when referring to analog instruments.

rdg. (displayed or indicated value)
This signifies the value actually being measured, i.e., the value that is currently indicated or displayed by the measuring instrument.

dgt. (resolution)
Signifies the smallest display unit on a digital measuring instrument, i.e., the value displayed when the last digit on the digital display is "1".

Timer

ON preset: Displays remaining time by counting down from the preset time
OFF preset: Displays elapsed time

Setting range	0.5 s to 999 s
Setting resolution	0.1 s (0.5 s to 99.9 s), 1 s (100 s to 999 s)
Timer accuracy	±50 ms (0.5 s to 99.9 s), ±0.5 s (100 s to 999 s)

Interface

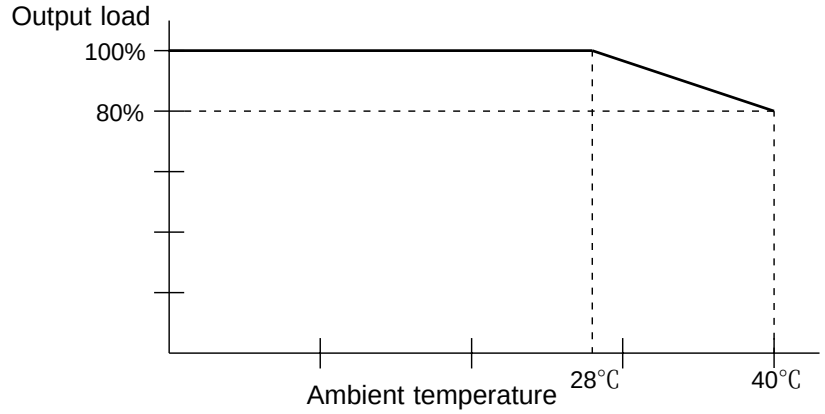
External I/O	Output signal: PASS, UP_FAIL, LOW_FAIL, TEST, READY (open collector) Input signal: START, STOP, External I/O_ENABLE (5 V to 24 VDC)
Front EXT terminal	Inputs external START/STOP signals (contact signal) The unit [START] key is not acceped when the external terminal is used)
RS-232C or GP-IB (May not be used in combination)	Remote function Outputs measurement data. (Key-locked when the **RMT** lights, accepting only the [LOCAL], [STOP] and external keys)

Other functions

Maximum/minimum test value screening function	Screening with maximum and minimum test values (PASS/FAIL)
Screening result output	Internal buzzer (ON/OFF enabled in PASS/FAIL state), and I/O output.
Zero adjustment function	Cancels the resistance of the measurement probe.
Zero adjustment range	0 Ω to 0.100 Ω
Saving test parameters	Saves up to twenty values (saving/loading enabled).

*[1]: Derating is necessary at the operating ambient temperature.

Output characteristics



8.2 General Specifications

3157

Display	Fluorescent display tube (digital)
Operating temperature and humidity range	0 to 40°C (32 to 104°F), 30 to 90% R.H. (no condensation)
Storage temperature and humidity range	-10 to 50°C (14 to 122°F), 10 to 95% R.H. (no condensation)
Temperature and humidity range to guarantee specification	23±5°C (73±9°F), 30 to 90% R.H. (no condensation) (after 30 minutes of warm-up operation)
Operating place	Indoors, max. 2000 m (6562 feet) height
Backup battery lifetime	Average of 10 years (at 25°C reference value)
Rated power voltage range	100 to 120 VAC (3157) 100 to 120 VAC / 200 to 240 VAC (3157-01)
Rated power frequency	50 to 60 Hz
Dielectric strength	1.35 kVAC, 20 mA, 1 minute between power supply and frame
Maximum rated power	350 VA (when options are installed)
Dimensions	Approx. 320 (W) × 90 (H) × 263 (D) mm (12.60" (W) × 3.54" (H) × 10.35" (D)) (excluding projections)
Mass	Approx. 7 kg (246.9 oz.)
Fuse	250 V T3.15 AL
Accessories	Grounded three-core power cord, instruction manual, spare fuse (built into the power inlet), short bar (installed between the SOURCE and SENSE terminals) ×2
Options	9296 CURRENT PROBE (with alligator clip) 9297 CURRENT APPLY PROBE 9613 REMOTE CONTROL BOX (SINGLE) 9614 REMOTE CONTROL BOX (DUAL) 9518-02 GP-IB INTERFACE 9593-02 RS-232C INTERFACE 9442 PRINTER 1196 RECORDING PAPER (25 m, 10 rolls) 9443 AC ADAPTER (for printer) 9446 CONNECTION CABLE (for printer)
Standards applying	EMC EN55011:1991+A1:1997+A2:1996 Group 1 CLASS A EN50082-1:1992 Safety EN61010-1:1993+A1:1995 Pollution Degree 2, Overvoltage Category Ⅱ (anticipated transient overvoltage 2500 V)

9296 CURRENT PROBE

Rated voltage	30 VAC or 60 VDC
Rated current	30 AAC or 30 ADC
Dielectric strength	400 VAC, 1 mA, 1 minute
Test point	Between current and voltage, and coated cable
Operating temperature and humidity range	0 to 40℃ (32 to 104°F), 90% R.H. max. (no condensation)
Storage temperature and humidity range	-10 to 50℃ (14 to 122°F), 95% R.H. max. (no condensation)
Operating place	Indoors, max. 2000 m (6562 feet) height
Dimension	1450 mm (57.09")
Mass	Approx. 190 g (6.7 oz.)
Standards applying	EN61010-2-031:1994 Pollution Degree 2, Overvoltage Category Ⅰ (anticipated transient overvoltage 330 V)

9297 CURRENT APPLY PROBE

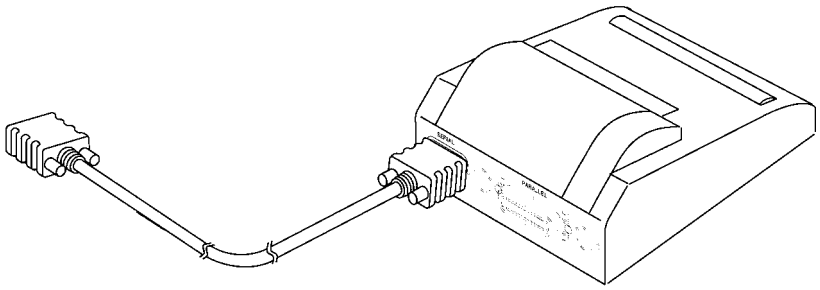
Rated voltage	30 VAC or 60 VDC
Rated current	40 AAC or 40 ADC
Trigger switch	Outputs contact signals. START/STOP operations
Dielectric strength	400 VAC, 1 mA, 1 minute
Test point	Between current and voltage, and exterior and coated cable
Operating temperature and humidity range	0 to 40℃ (32 to 104°F), 90% R.H. max. (no condensation)
Storage temperature and humidity range	-10 to 50℃ (14 to 122°F), 95% R.H. max. (no condensation)
Operating place	Indoors, max. 2000 m (6562 feet) height
Dimension	1480 mm (58.27")
Mass	Approx. 250 g (8.8 oz.)
Standards applying	EN61010-2-031:1994 Pollution Degree 2, Overvoltage Category Ⅰ (anticipated transient overvoltage 330 V)

Chapter 9
Appendix

9.1 Options

9.1.1 9442 PRINTER

Using with the optional 9593-02 RS-232C INTERFACE, 9442 PRINTER, and 9446 CONNECTING CABLE, the test values can be printed out.



Use the 9442 PRINTER, the 9443* AC ADAPTER, and the 1196 RECORDING PAPER. To connect the main unit and printer, use the 9593-02 RS-232C INTERFACE and the 9446 CONNECTING CABLE. (All are options.)

9442	DPU-414	Seiko Instruments Inc.
*9443-01	PW-4007-J1	Seiko Instruments Inc. (for Japan)
*9443-02	PW-4007-E1	Seiko Instruments Inc. (for EU)
*9443-03	PW-4007-U1	Seiko Instruments Inc. (for U.S.A.)

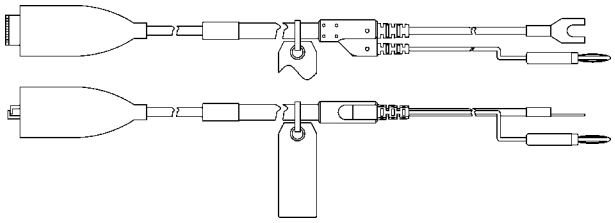
NOTE

- The 9442 is shipped with the function settings for use with the HIOKI 3166 CLAMP ON POWER HiTESTER. Before using, always change the settings of the DIP switches.
- For details on connection of the printer and the 9593-02 RS-232C INTERFACE, refer to the instruction manual for the 9593-02.
- For details on the operations and handling of the printer, refer to the operation manual supplied to the printer. For the printer, use the 1196 RECORDING PAPER or an equivalent.

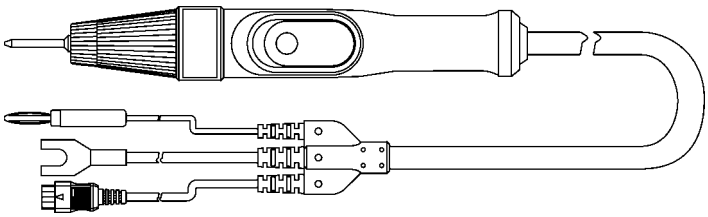
9.1.2 Probe

The 9296 CURRENT PROBE (with alligator clip) and 9297 CURRENT APPLY PROBE are available.
Use two sets of the 9296 or a single combined set of 9296 and 9297.
An external switch can be used for the 9297 CURRENT APPLY PROBE.

9296 CURRENT PROBE



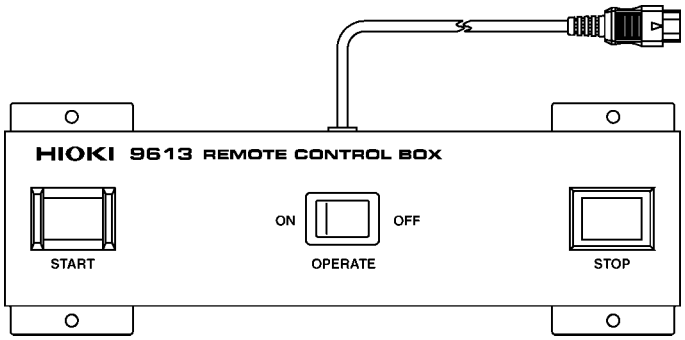
9297 CURRENT APPLY PROBE



9.1.3 9613 REMOTE CONTROL BOX (SINGLE)

Two types of remote-control boxes are available: the 9613 for use with a single hand and the 9614 for use with both hands. The 9613 REMOTE CONTROL BOX (SINGLE) is equipped with a START key, a STOP key, and an OPERATE switch, which turns ON/OFF the remote-control box. The STOP key remains lit as long as a voltage is being output.

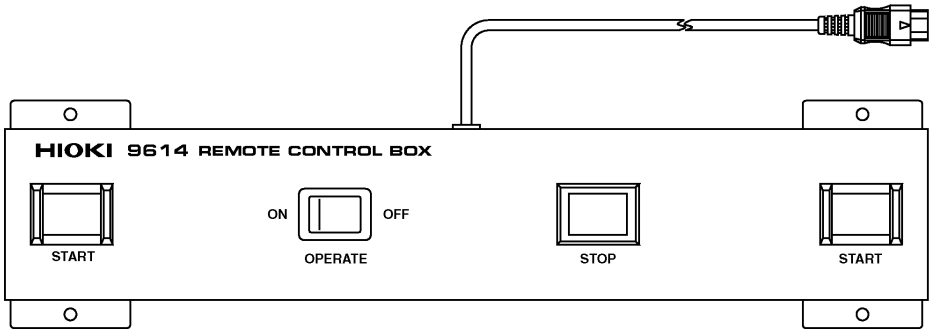
Operating temperature and humidity range	0 to 40°C (32 to 104°F), 20 to 80% R.H. (no condensation)
Storage temperature and humidity range	-10 to 50°C (14 to 122°F), 90% R.H. max. (no condensation)
Operating place	Indoors, max. 2000 m (6562 feet) height
Dimensions	Approx. 193 (W) × 50 (H) × 30 (D) mm (7.60" (W) × 1.97" (H) × 1.18" (D)) (excluding projections)
Mass	Approx. 500 g (17.6 oz.)
Cord length	Approx. 1500 mm (59.06")



9.1.4 9614 REMOTE CONTROL BOX (DUAL)

Unlike the 9613, the 9614 REMOTE CONTROL BOX (DUAL) has two START keys. Pressing both keys is equivalent to pressing the START key on the unit. By using the Momentary-OUT function in Optional Functions, the 9614 allows the control box to be used with both hands, thus ensuring safer testing.

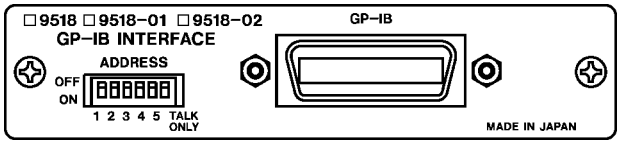
Operating temperature and humidity range	0 to 40℃ (32 to 104°F), 20 to 80% R.H. (no condensation)
Storage temperature and humidity range	-10 to 50℃ (14 to 122°F), 90% R.H. max. (no condensation)
Operating place	Indoors, max. 2000 m (6562 feet) height
Dimensions	Approx. 270 (W) × 50 (H) × 30 (D) mm (10.63" (W) × 1.97" (H) × 1.18" (D)) (excluding projections)
Mass	Approx. 700 g (24.7 oz.)
Cord length	Approx. 1500 mm (59.06")



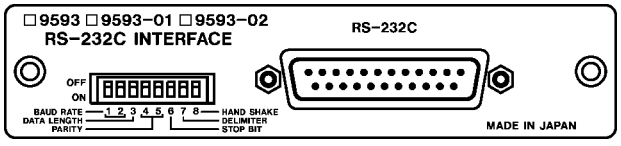
9.1.5 Interface Board

The unit can be remotely controlled through the 9518-02 GP-IB INTERFACE or the 9593-02 RS-232C INTERFACE.
For information on installation, use, and various commands, please refer to the specific instruction manual for each interface.

9518-02 GP-IB INTERFACE

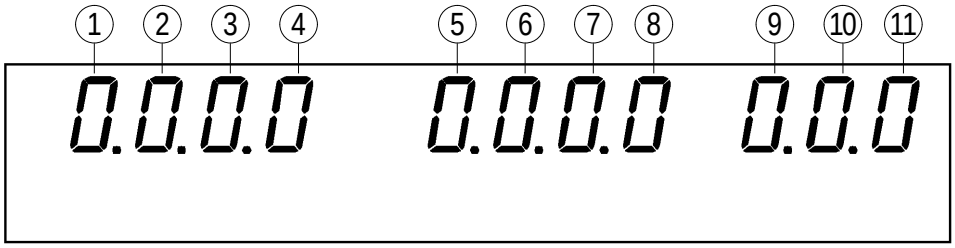


9593-02 RS-232C INTERFACE



9.2 Table of Optional Functions

The following shows the optional functions.
For more information on settings, see Chapter 4, "Optional Functions."



Optional function	Selection
(1) Switching the output current frequency	0: 50 Hz 1: 60 Hz
(2) PASS/FAIL hold function	0: PASS not held, FAIL held 1: PASS held, FAIL held 2: PASS not held, FAIL not held 3: PASS held, FAIL not held
(3) Hold function	0: Not held 1: Held
(4) Setting minimum test value	0: Not set 1: Set
(5) Endless timer function	0: Not set 1: Set
(6) Test data count function	0: Not set 1: Set
(7) Buzzer setting	0: ON at screening, ON at error 1: OFF at screening, OFF at error 2: OFF at screening, ON at error 3: ON at screening, OFF at error
(8) Changing the current value in TEST state	0: Not changeable 1: Changeable
(9) Momentary OUT	0: Not set (Trigger operation) 1: Set (Momentary OUT operation)
(10) Test mode	0: Soft start mode 1: Normal mode 2: Continuous test mode
(11) Printer output	0: Not used 1: Automatically print for PASS/FAIL screening. 2: Print selectively when the PASS/FAIL state is held.

9.3 Standards

Medical electrical equipment - Part 1: General requirements for safety (IEC 60601-1)

Test current: A current of 25 A or 1.5 times the rated current of the EQUIPMENT, whichever is greater (±10%), from current source with a frequency of 50 Hz or 60 Hz with a no-load voltage not exceeding 6 V

Test time: 5 s to 10 s

Test point: Through the PROTECTIVE EARTH TERMINAL or the protective earth contact in the APPLIANCE INLET or the protective earth pin in the MAINS PLUG and each ACCESSIBLE METAL PART which could become LIVE in case of failure in BASIC INSULATION

Allowable range: The voltage drop between the parts described is measured and the impedance determined from the current and voltage drop.

- For EQUIPMENT without a POWER SUPPLY CORD the impedance between the PROTECTIVE EARTH TERMINAL and any ACCESSIBLE METAL PART which is PROTECTIVELY EARTHED shall not exceed 0.1 Ω.
- For EQUIPMENT with an APPLIANCE INLET the impedance between the protective contact in the APPLIANCE INLET and any ACCESSIBLE METAL PART which is PROTECTIVELY EARTHED shall not exceed 0.1 Ω.
- For EQUIPMENT with a non-detachable POWER SUPPLY CORD the impedance between the protective contact in the MAINS PLUG and any ACCESSIBLE METAL PART which is PROTECTIVELY EARTHED shall not exceed 0.2 Ω.

Safety requirements for mains operated electronic and related apparatus for household and similar general use (IEC 60065)

Test current: 25 A a.c. or d.c.; the test voltage shall not exceed 12 V.

Test time: 1 min

Test point: Between the protective earth terminal or contact and the part to be connected thereto

Allowable range: Not exceeding 0.1 Ω
The resistance shall be calculated from the current and voltage drop. The resistance of the protective earth conductor of the power supply cord shall not be included.

Safety of household and similar electrical appliances - Part 1: General requirements (IEC 60335-1)

Test current: A current equal to 1.5 times rated current of the appliance or 25 A, whichever is the greater
(A source having a no-load voltage not exceeding 12 V (a.c. or d.c.))

Test time: Not specified

Test point: Between the earthing terminal or earthing contact and each of the accessible metal parts

Allowable range: Not exceeding 0.1 Ω
The resistance shall be calculated from the current and voltage drop. The resistance of the supply cord is not included.

Safety of information technology equipment (IEC 60950)

Test current: The test current is 1.5 times the current capacity of any HAZARDOUS VOLTAGE circuit at the point where failure of BASIC INSULATION would make the earthed part live. The test voltage does not exceed 12 V and the test current can be either a.c. or d.c. but not more than 25 A.

Test time: Not specified

Test point: Between the protective earthing terminal or earthing contact and the part required to be earthed

Allowable range: Not exceeding 0.1 Ω
The resistance is calculated from the current and voltage drop. The resistance of the protective earthing conductor of the power supply cord is not included.

Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements (IEC 61010-1)

Test current: The test current is the greater of:
- 25 A d.c. or a.c. r.m.s. at RATED mains frequency;
- a current equal to twice the RATED current of the equipment.

Test time: 1 min

Test point: Between the PROTECTIVE CONDUCTOR TERMINAL and each ACCESSIBLE part for which PROTECTIVE BONDING is specified

Allowable range: Not exceeding 0.1 Ω
The resistance is calculated from the current and voltage drop. The resistance of the power supply cord is not included.

Electrical equipment of industrial machines - Part 1: General requirements (IEC 60204-1)

Test current: At least 10 A

Test time: At least 10 s

Test point: Between the PE terminal and the various points that are part of the protective bonding circuit

Allowable range: 1.0 V (depending on the protective conductor cross-sectional area)

Professional video and audio equipment (UL 1419)

Test current: 25 A with a no-load voltage not exceeding 12 V

Test time: Not specified

Test point: Between the equipment grounding means and the grounded accessible conductive part

Allowable range: Not exceeding 0.1 Ω
The resistance is calculated from the current and voltage drop. The resistance of the power supply cord is not included.

Index

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- R -

- S -

- T -

- V -

- Z -

- Others -

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name: HIOKI E.E. CORPORATION
Manufacturer's Address: 81 Koizumi, Ueda, Nagano
386-1192, Japan

Product Name: AC GROUNDING HiTESTER
Model Number: 3157-01
Product Options: 9518-02 GP-IB INTERFACE
9593-02 RS-232C INTERFACE
Separately Available Accessories:
9296 CURRENT PROBE
9297 CURRENT APPLY PROBE

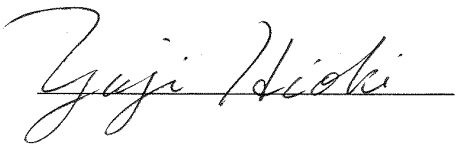
The above mentioned product conforms to the following product specifications:

Safety: EN61010-1:1993+A2:1995
EN61010-2-031:1994
EMC: EN55011:1991 +A1:1997 +A2:1996 Group1 ClassA
IEC801-2:1984/EN50082-1:1992 ±8kV AD
IEC801-3:1984/EN50082-1:1992 3V/m
IEC801-4:1988/EN50082-1:1992 1kV

Supplementary Information:
The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC.

HIOKI E.E. CORPORATION

4 February 1999



Yuji Hioki
President

3157A999-00