

INSTRUCTION MANUAL

WITHSTANDING VOLTAGE TESTER

MODEL 863A

KIKUSUI ELECTRONICS CORPORATION

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## 1. GENERAL

Model 863A Withstanding Voltage Tester provides a test voltage of up to 3 kV with an output current of 10 mA.

The instrument has a GO-NOGO judgement function, a remote control function of test on/off, and provides an NG output signal, thereby greatly contributing for labor economization in withstanding voltage test. The instrument is compact and light, and is readily applicable for intermediate-point tests on a manufacturing line or for tests of finished electronic products.

The instrument, which deals with a high voltage, has been designed with full attention to the safety of the operator.

## 2. SPECIFICATIONS

Power requirements: 100 V  $\pm$ 10%, 50/60 Hz AC

### Power consumption

No load (reset state): Approx. 2 VA

Full load (3 kV, 10 mA) Approx. 45 VA

Insulation resistance: 30 M $\Omega$  or over (500 V DC)

Withstanding voltage: 1000 V AC, 1 minute

Dimensions: 210 W  $\times$  140 H  $\times$  220 D mm

(8.27 W  $\times$  5.51 H  $\times$  8.66 D in.)

(Maximum dimensions): 215 W  $\times$  165 H  $\times$  270 D mm

(8.46 W  $\times$  6.50 H  $\times$  10.63 D in.)

Weight: Approx. 4.7 kg (10.3 lbs)

### Accessories:

High voltage test

leadwires (HTL-1.5W),

approx. 1.5 m long

(4.9 ft.) ..... 1 set

Instruction manual ..... 1 copy

### Test voltage

Application voltage: 0 - 3 kV AC

Wattage rating: 30 VA (5 kV, 10 mA, with 100 V line power)

Waveform: AC line waveform

Voltage regulation: 15% or better (with 3 kV output; for change from full rated load to no load)

### Output voltmeter

Scale: 3 kV full scale, linear scale

Accuracy:  $\pm$ 5% of full scale

Indication: Mean-value response, effective-value scale graduation

Output cut off by leak current detection

Ranges: 0.5/1/2/5/10 mA (five ranges)

Setting accuracy:  $\pm 5\%$

Detection method: Current is integrated, compared with the reference value, and calibrated in terms of rms value of sine wave.

Test method

TEST: As the TEST button is pressed, the test voltage is delivered.

RESET (HV OFF): As the reset button is pressed, the test voltage is cut off.

Test result judgement:

When a leak current larger than the set value is detected, the test voltage is instantaneously cut off and three types of NG alarm signals are generated as follows:

- o Lamp
- o Buzzer
- o Make-contact signal (100 V VC, 1 A, or 30 V DC, 1 A)

Remote control

The test/reset operation can be remote-controlled in the following cases:

- o When the remote control box (optional) is used.
- o When the high voltage test probe (optional) is used.
- o When make-contact signal control is done using an external relay or other device.
- o When low active control is done with logic elements.

The input conditions of this instrument are as follows:

High level input voltage: 11 - 15 V  
Low level input voltage: 0 - 5 V  
Low level sweep-out current: 1 mA

Options:

- o Model 913A Remote Control Box

Used being connected to a rear panel connector, for remote control of test and reset operations.

- o Model 914A Remote Control Box

The test is turned on only when test buttons are pressed with both hands. Used when extra high operation safety is required.

- o HTL-3W High Voltage Test Leadwire

Test cable approx. 3 m (9.8 ft.) long

- o HTP-1.5A High Voltage Test Probe

High voltage test probe designed for high operating safety and operability. Cable length approx. 1.5 m (4.9 ft.).

- o 9203 Buzzer Unit

Used as an additional NG alarm buzzer.

### 3. PRECAUTIONS BEFORE USE

#### 3.1 Unpacking and Inspection

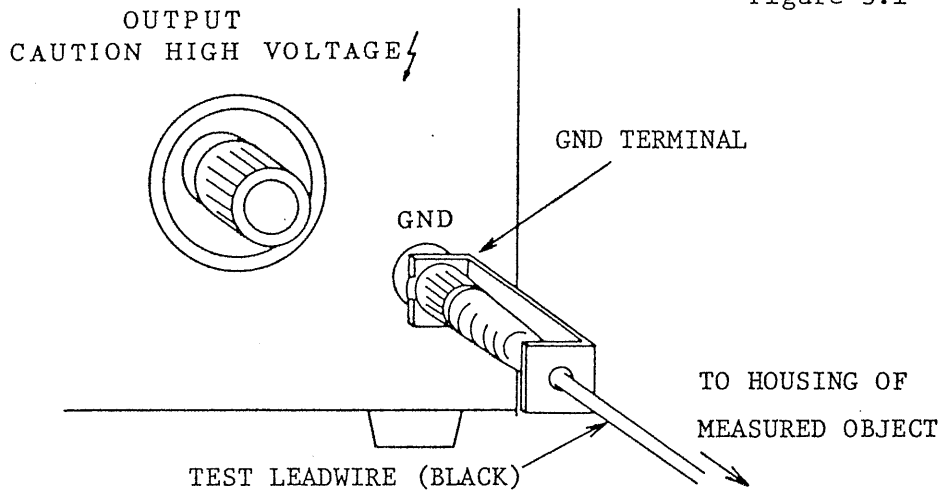
The instrument is shipped after being fully inspected and tested at the factory. Upon receiving the instrument, immediately unpack it and check for any signs of damage which might have been caused when in transportation. If any damage is found, immediately notify the bearer or, if malfunctioning is found, notify your Kikusui dealer.

#### 3.2 Precautions for Operation

This instrument has been designed with full attention to safety because this instrument handles a high voltage. Yet, as the instrument provides as high voltage as 3 kV to the external circuit, serious hazards are unavoidable unless the instrument is handled correctly. Be sure to be extremely careful and observe the following when operating the instrument.

- (1) Be sure to connect securely the GND terminal to a good grounding earth line. If grounding is imperfect, the instrument casing can be charged to the high voltage of the instrument when the output is shorted to the ground line or power line and hazards can be caused to the operator when he touches the instrument.
- (2) The connection method of the test leadwire of the GND side is shown in Figure 3.1. Be sure to check for that this leadwire is not open, each time the instrument is used. Also be sure to connect at first the GND terminal to the ground line of the measured object. If it is not securely connected, the measured object may become a floated state and a dangerously high voltage may be built up in the measured object.

Figure 3.1



- (3) Be sure to wear rubber gloves whenever operating this instrument, in order to guard against electric shock hazards.
- (4) Before turning on the power switch, make it sure that the TEST VOLTAGE dial is in the counterclockwise extreme position ("0" position).
- (5) Except when test is being done, keep the TEST VOLTAGE dial in the counterclockwise extreme position ("0" position). Also, press the RESET (HV OFF) button for the sake of safety. Be sure to turn off the power switch each time the instrument is not used even for a short period of time or when the operator leaves the instrument.
- (6) Never touch the tested object, leadwires or the output terminals when the instrument is in the TEST ON state and the test voltage is being delivered.
- (7) Before touching the test leadwires or output terminal, be sure to check the following:
  - (a) The output voltmeter indication is zero.
  - (b) The TEST ON lamp is off.

Also short the high voltage OUTPUT terminal to the GND terminal with the test leadwire of the GND terminal side.

- (8) Do not short the output to the ground line or AC power line, lest the instrument housing should be charged up to a hazardously high voltage. It is permissible, however, to short the high voltage OUTPUT terminal to the GND terminal when the instrument housing is grounded to an earth line.
- (9) In case of an emergency, immediately turn off the POWER switch and disconnect the AC power cord from the AC line receptacle.
- (10) If the TEST ON lamp does not go off even when the RESET button is pressed, it is possible that the output is delivered irrespective of TEST ON/OFF control. When such state is caused, immediately stop using the instrument and contact your Kikusui dealer for repair.

When the TEST ON lamp has failed and does not turn on, immediately replace it or contact your Kikusui dealer for repair.

- (11) When the instrument is remote-controlled, the high voltage output is turned on and off with an external signal. When operating the instrument in this mode, be extremely careful so that the high voltage output is not turned on inadvertently.

To make use of the instrument in good conditions for a long time, pay attention to the following:

- (1) When in the no-load state, the maximum output voltage of the instrument becomes higher than 3 kV. An output voltage higher than 3 kV may be produced also when the AC line voltage has surged up. Operate the instrument with an output voltage not higher than 3 kV, whenever possible.

- (2) This instrument operates normally with an AC power line voltage range of 100 V  $\pm 10\%$ . If the AC line voltage is not within this range, the instrument operation becomes unstable and damage may be caused to the instrument. When the AC line voltage in your area is not within this range, step it up or down into this range using an appropriate device.
- (3) Do not use or store the instrument in direct sunlight, in high temperature or humidity, or in dusty atmosphere.

## 4. OPERATION INSTRUCTIONS

### 4.1 Description of Front Panel

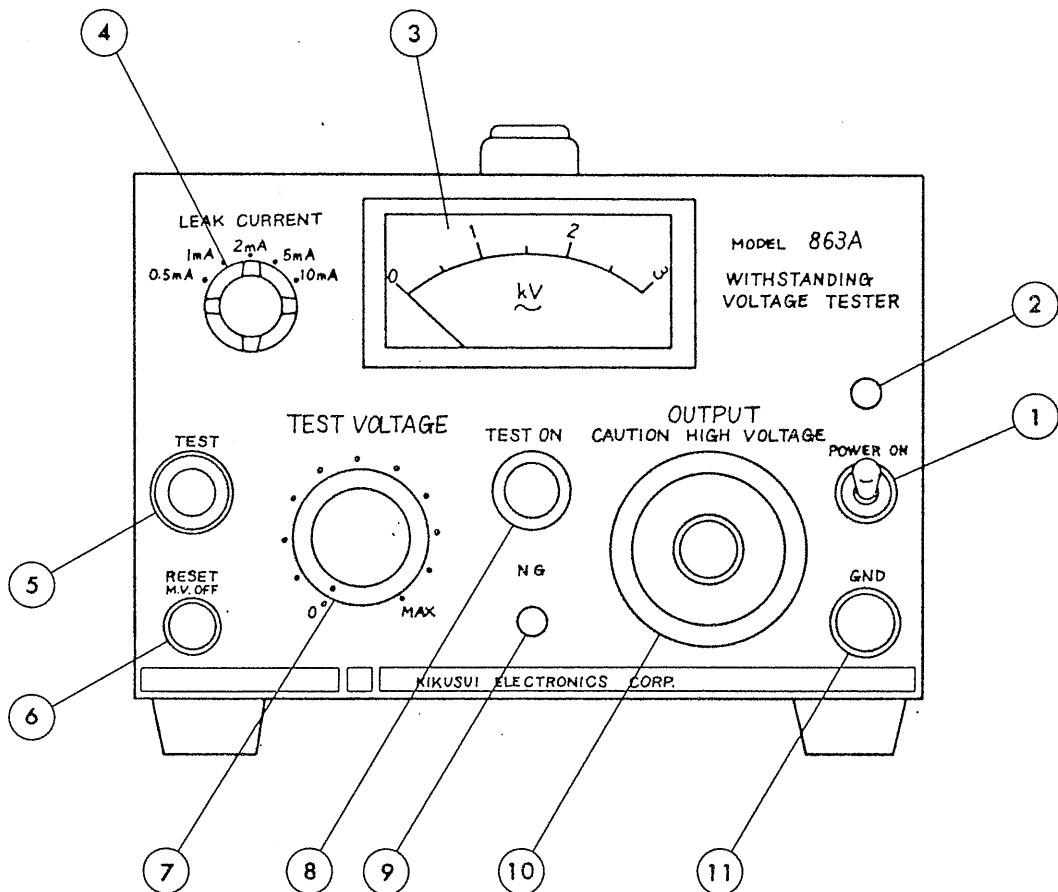


Figure 4.1

① POWER (ON/OFF) switch:

Main power switch of instrument. Before turning on this switch, be sure to read Section 3.2 "Precautions for Operation."

② Power pilot lamp:

Indicates that the instrument power is on.

③ Voltmeters:

Indicates the output voltage (test voltage).

④ LEAK CURRENT dial:

Sets the reference value for leak current detection. The value can be set at 0.5, 1, 2, 5, or 10 mA. If a leak current larger than the set value flows in the tested object, judgement is done to be NG and the output is instantaneously cut off. The dial should be set at a value corresponding to the requirement of the tested object.

⑤ TEST button:

As you press this button when the instrument is in the reset state, ⑧ TEST ON lamp lights and the test as set by ⑦ TEST VOLTAGE dial is delivered to ⑩ OUTPUT terminal.

⑥ RESET button (HV OFF):

To cut off the HV output after test operation is over, press this button. This button is used also to reset the NG alarm state.

⑦ TEST VOLTAGE dial:

For setting the test voltage. The "0" position is for the minimum output and the test voltage increases as this dial is turned clockwise.

⑧ TEST ON lamp:

This red lamp indicates that the test voltage is being delivered to ⑩ OUTPUT terminal.

⑨ NG lamp:

When the leak current has exceeded the limit set by ④ LEAK CURRENT dial, this NG lamp lights, the buzzer sounds, and the make-contact signal (100 V AC, 1 A, or 30 V DC, 1 A) is delivered.

⑩ OUTPUT terminal:

The high voltage line of the test voltage.

⑪ GND terminal:

The ground line of the test voltage. Electrically, this line is connected to the instrument chassis.

#### 4.2 Description of Rear Panel

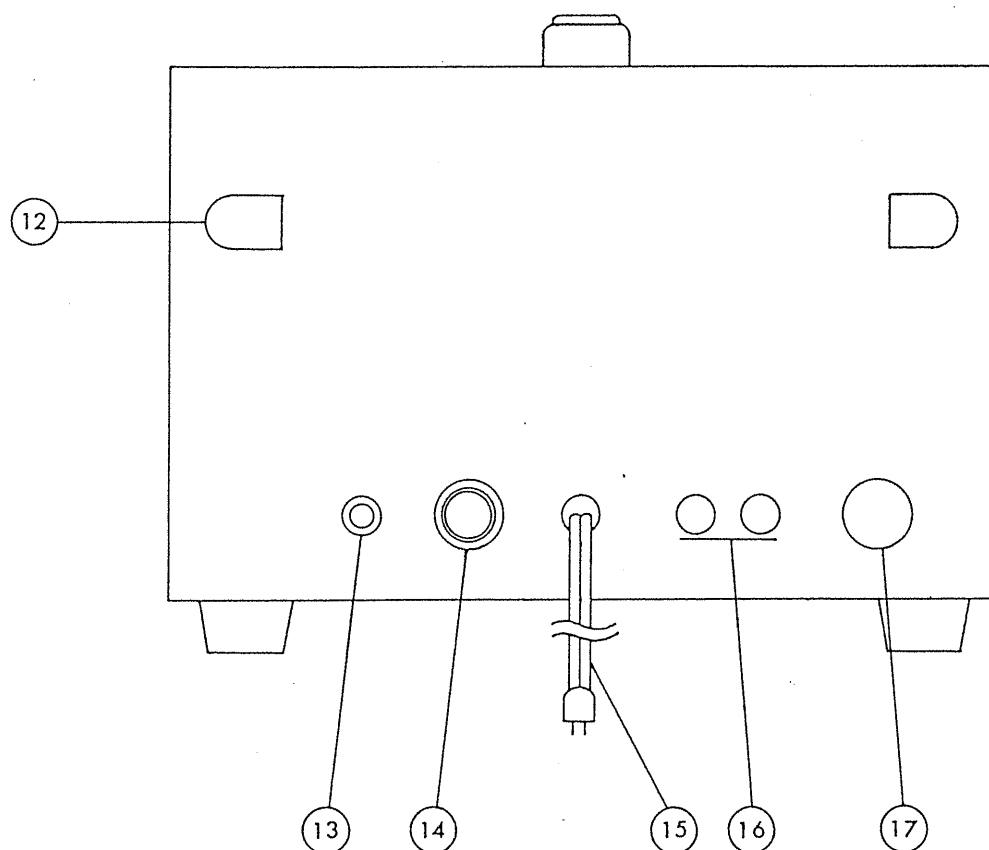


Figure 4.2

⑫ Cord hook:

When the instrument is not in use, the AC power cord may be taken up onto the hooks.

⑬ GND terminal:

To ground the instrument to an earth ground.

⑭ Fuse:

Fuse of the AC power line (1 ampere).

⑮ AC power cord

⑯ NG signal output terminal:

Provides a make-contact signal. The contact rating is 100 V AC, 1 A or 30 V DC, 1 A.

⑰ REMOTE CONTROL connector:

When the instrument is remote controlled, the cable of the remote control box is connected to this DIN-type connector.

#### 4.3 Operating Procedures

##### Test Procedure

Be sure to read thoroughly Subsection 3.2 "Precautions for Operation" before starting operating the instrument. To operate the instrument, proceed as follows.

(1) Turning on the instrument power:

Check that the TEST VOLTAGE dial is set at the counterclockwise extreme position ("0" position). Then, turn on the POWER switch.

(2) Setting the leak current limit reference value:

With the LEAK CURRENT dial, set the leak current limit reference value (one of the five ranges of 0.5, 1, 2, 5 and 10 mA) as required by the tested object.

(3) TEST button:

As you press this button, the test voltage is delivered and the TEST ON lamp turns on. Be careful not to press this button inadvertently.

(4) Setting the test voltage:

Set the test voltage to the required value by turning gradually the TEST VOLTAGE dial.

(5) RESET button:

As you press this button, the test voltage is turned off. After making it sure that the voltmeter is indicating "0" and the TEST ON lamp is not lighted, connect the test leadwires to the tested object. As you press again the TEST button, the test voltage will be delivered.

(6) NG judgement:

If the leak current exceeds the limit that has been set by the LEAK CURRENT dial, the tested object is judged to be NG and the test voltage is turned off instantaneously. At the same time, the NG lamp lights, the NG buzzer sounds, and an NG contact signal is delivered.

(7) RESET button:

As you press the RESET button again, the NG lamp goes off and the NG buzzer is silenced.

(8) Re-application of test voltage:

To apply again the test voltage after pressing the RESET button, press the TEST button.

(9) Ending the test:

When the test is over, press the RESET button to cut off the test voltage, turn the TEST VOLTAGE dial to the "0" position, and turn off the power switch.

#### Remote Control

This instrument can be remote-controlled with the remote control box (optional). As the plug of the remote control cable is connected to the REMOTE CONTROL connector on the

instrument rear panel, the internal circuit is automatically switched to the remote operation mode. In this case, the TEST button on the instrument front panel becomes idle. The reset operation can be done either from the instrument front panel or from the remote control box.

It also is possible to remote-control the instrument without using the remote control box. This method is explained below. Be extremely careful when using this method because the high voltage is on-off controlled with an external signal. Pay attention so that the high test voltage is not generated inadvertently. Also, provide full measures to ensure that the operator's body is not contacted with the output terminal or the test lead-wire when the test voltage is being delivered. When these measures are unavailable, do not use the following remote control method.

- (1) By controlling the TEST and RESET contacts shown in Figure 4.3, the test voltage can be on-off controlled in the same manner as done at the instrument front panel.
- (2) In the case of the setup shown in Figure 4.4, the test voltage is turned on when the switch is thrown to the NO Position, and instrument is forcefully reset when the switch is returned to the NC position.

Figure 4.3

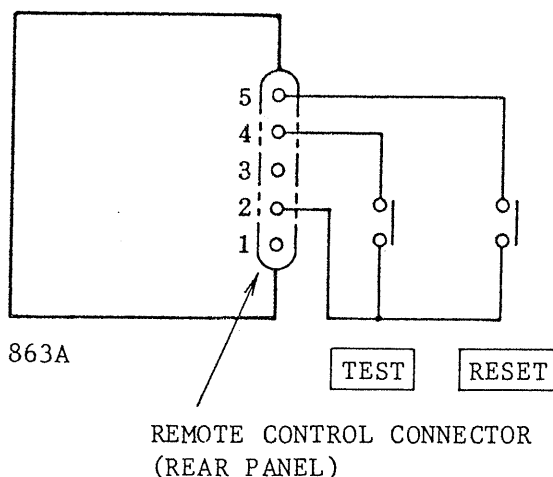
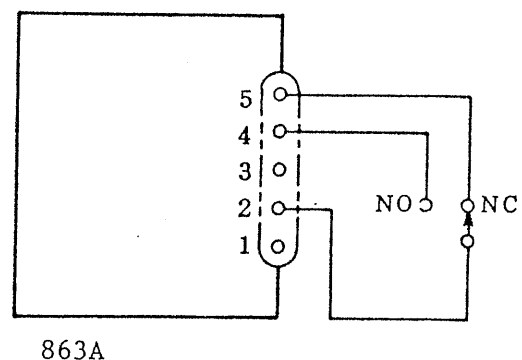


Figure 4.4



- (3) Logical elements or transistors may be used instead of the switches in Figure 4.3. The signal status for such operation is shown in Figure 4.5. The input conditions of this instrument for such operation are as follows:

- o High level input voltage: 11 - 15 V
- o Low level input voltage: 0 - 5 V
- o Low level sweep output current: 1 mA

The internal gate is pulled up to +15 V with resistors. Pay attention to the withstanding voltage rating of the transistors used. An impedance of 5 M $\Omega$  or more is required between the earth ground line and the power line or common line of the circuit which controls this instrument.

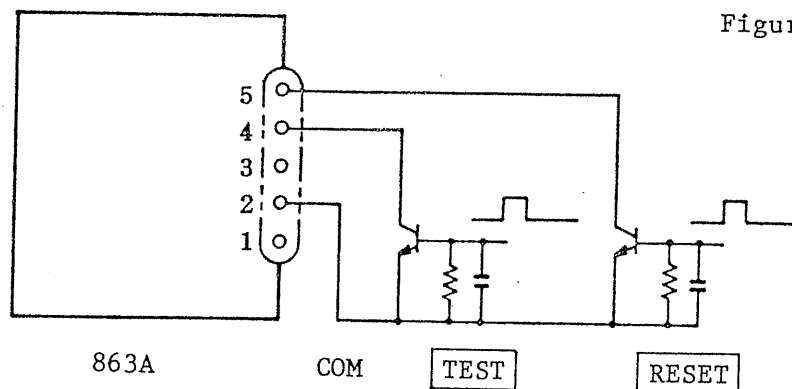


Figure 4.5

- (4) Note that the layout of pins of the REMOTE CONTROL connector is as per DIN standard and is not in the due order of number progression, as shown in Figure 4.6.

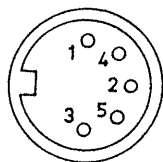


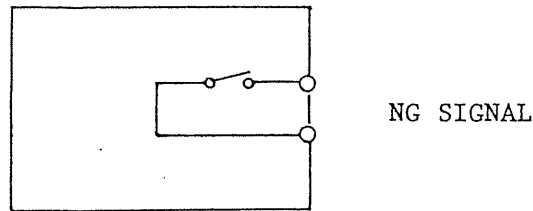
Figure 4.6

Layout of connector pins  
as viewed from panel side

#### Contact Signal Outputs

- (1) This instrument provides an NG signal (a make-contact signal) for external use. This signal lasts until the next reset signal is applied.

- (2) The contact signal is only with passive contacts and without any power source. Therefore, it cannot drive any load which has no power.



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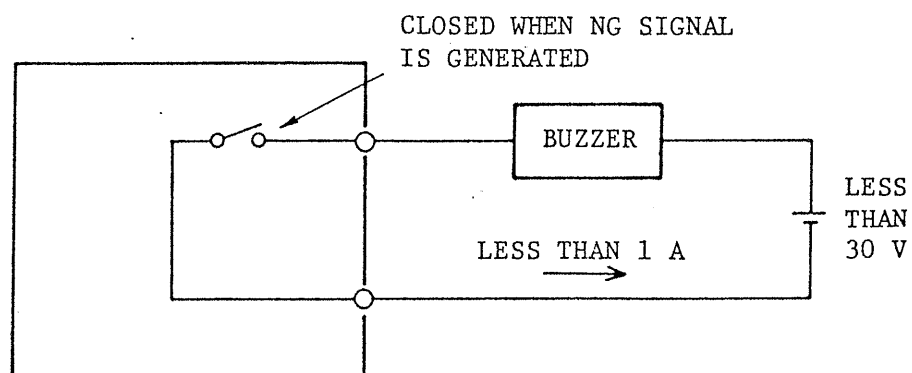
Figure 4.7

A contact which is closed when the signal is applied is called make contact, normally open contact, or form "a" contact; a contact which opens when the signal is applied is called break contact, normally closed contact, or form "b" contact.

The contact of this instrument is of the make-contact type and its rating is 100 V AC, 1 A or 30 V DC, 1 A.

- (3) Examples of use of the contact are illustrated in the following.

- (a) To drive a DC buzzer with the NG signal:



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Figure 4.8

- (b) To drive a lamp or buzzer with an AC power.

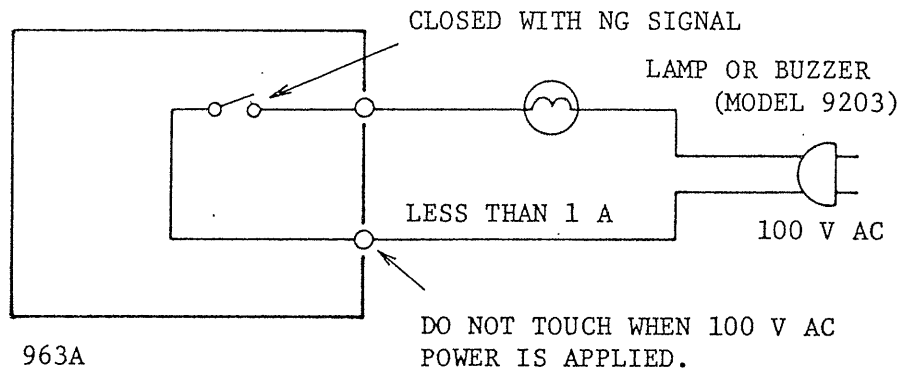


Figure 4.9

- (c) To obtain an "L" level digital signal with the contact signal:

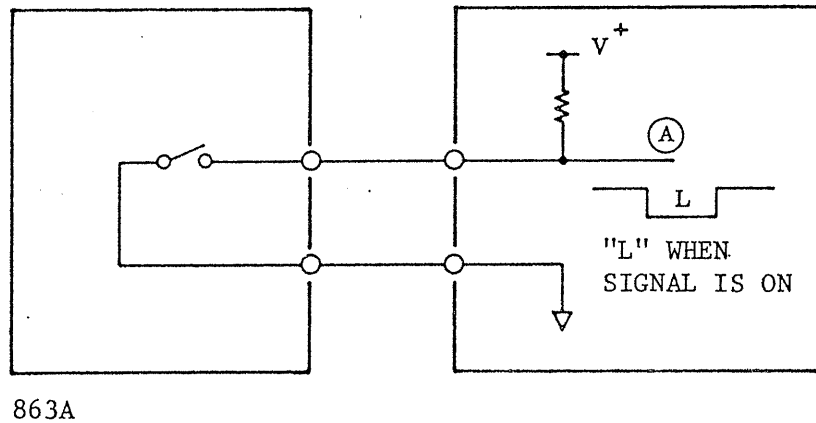
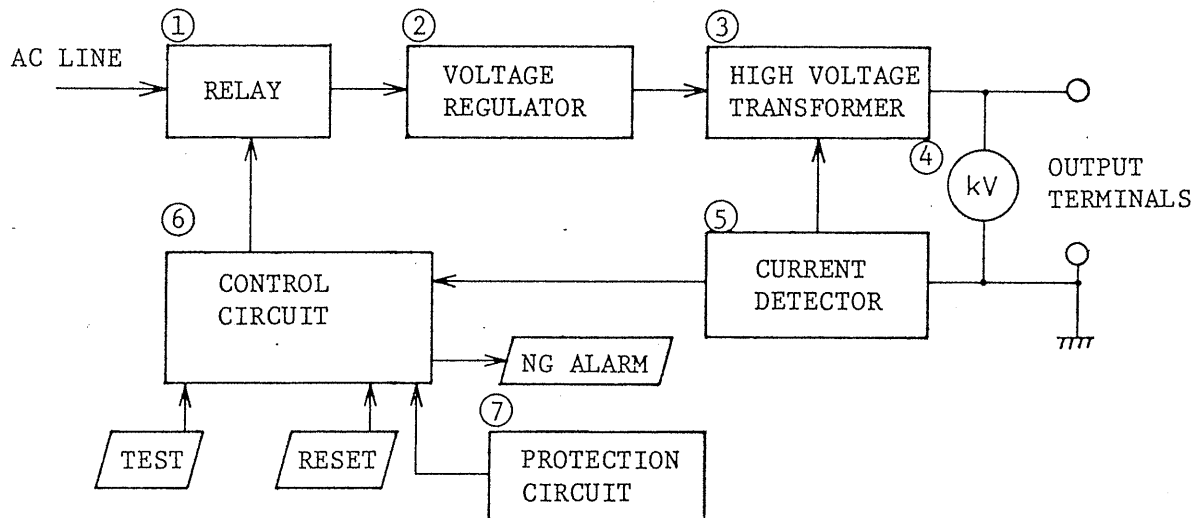


Figure 4.10

In the above illustration, an "L" level signal is obtained at point (A) when the contact output signal is on. However, since the signal obtained at point (A) include chattering, an appropriate chattering suppression provision should be provided depending on the nature of the circuit to be driven by this signal. In some cases, a noise suppression provision may be needed.

## 5. OPERATING PRINCIPLE

### 5.1 Block Diagram



### 5.2 Descriptions of Individual Circuit and Components

#### ① Relay:

ON/OFF-controls the AC line power applied to the voltage regulator for withstanding voltage test.

#### ② Voltage regulator:

A slide transformer is used to control the output voltage.

#### ③ High voltage transformer:

Boosts the voltage regulator output with a ratio of 1:30 into a high output voltage of 0 to 3.0 kV. The rating is 3 kV, 10 mA when the AC line voltage is 100 V.

#### ④ Voltmeter:

Indicates the output voltage (test voltage) of this instrument.

#### ⑤ Current detector:

Consists of a current detecting resistor, a reference voltage generator circuit, and a comparator.

⑥ Control circuit:

Controls overall operations of the instrument.

Fabricated in high-reliability logic circuits with CMOS IC.

⑦ Protection circuit:

Various protective features are incorporated for the safety of test.

## 6. MAINTENANCE

### 6.1 Maintenance

Hazardously high voltage of a level of 3 kV is generated within this instrument. Never attempt to calibrate, check or repair the instrument inside for yourself. For such service, contact your Kikusui dealer.

### 6.2 Calibration

#### (1) Leak current detection sensitivity calibration

- (a) Of the two semi-fixed potentiometers on the printed circuit board of the instrument, the one located closer to the instrument rear panel is for current sensitivity calibration.
- (b) Connect to the output terminals of the instrument a 3-M $\Omega$  resistor and a milliammeter (1 mA full scale, JIS Class 1 or better) in series. Connect the milliammeter in the GND-side line.
- (c) Gradually raise the test voltage to the point where the milliammeter indicates 1 mA and, in this state, adjust the above semi-fixed potentiometer so that the NG signal is generated.

#### (2) Voltmeter calibration

- (a) Of the two semi-fixed potentiometers on the printed circuit board of the instrument, the one located closer to the instrument front panel is for voltmeter sensitivity adjustment.
- (b) Connect to the output terminals of the instrument a voltmeter (such as Kikusui Model 149-10A Voltmeter) which can measure a voltage of 3 kV AC with an accuracy of a level of  $\pm 1\%$ .

- (c) Adjust the test voltage so that the external voltmeter indicates 3 kV and, in this state, adjust the above semi-fixed voltmeter so that the voltmeter of the instrument indicates 3 kV.

## 7. OPTIONS

The following options are available for this instrument.

### 7.1 Model 913A Remote Control Box

For remote control of test and reset operations.

#### Specifications

##### Functions

##### OPERATE switch:

The TEST button is effective only when this switch is ON. By turning OFF this switch, the output voltage is forcefully reset.

##### TEST button:

The test voltage is delivered as this button is pressed when the OPERATE switch is ON and the instrument is in the reset state.

##### RESET button:

This button is used to cut off the test voltage or to reset the NG alarm.

Dimensions: 150 (W) × 70 (H) × 40 (D) mm  
(5.90 (W) × 2.56 (H) × 1.58 (D) in.)

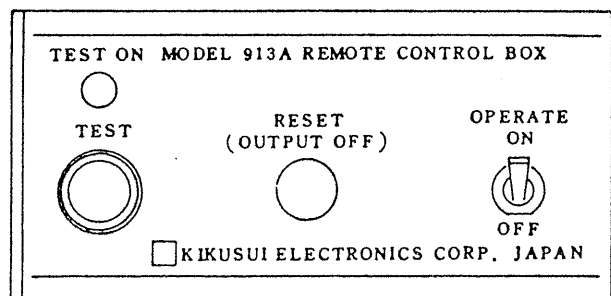


Figure 7.1

## 7.2 Model 914A Remote Control Box

With this control box, the test voltage is delivered only when the two test buttons are pressed simultaneously.

### Specifications

#### Functions:

Has two TEST buttons and the output voltage is delivered only when the two buttons are pressed concurrently.

Other functions are the same as those of Model 913A.

Dimensions: 280 (W) × 70 (H) × 40 (D) mm  
(11.0 (W) × 2.6 (H) × 1.6 (D) in.)

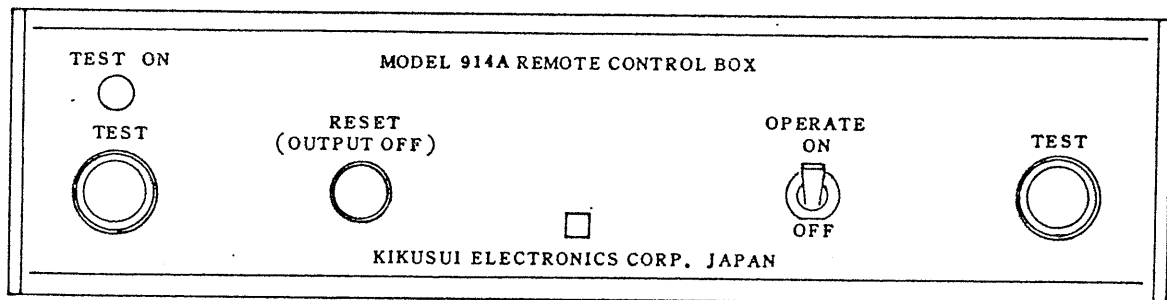


Figure 7.2

## 7.3 HTL-3W High Voltage Test Leadwire

A high voltage test leadwire approximately 3 m (4.9 ft.) long

## 7.4 HTP-1.5A High Voltage Test Probe

The HTP-1.5A is designed for high operation safety, yet maintaining good operability. The test switch can be pressed only after holding the grip, thereby preventing inadvertent turning on of the test voltage. When the test switch is released, the test voltage is reset forcefully.

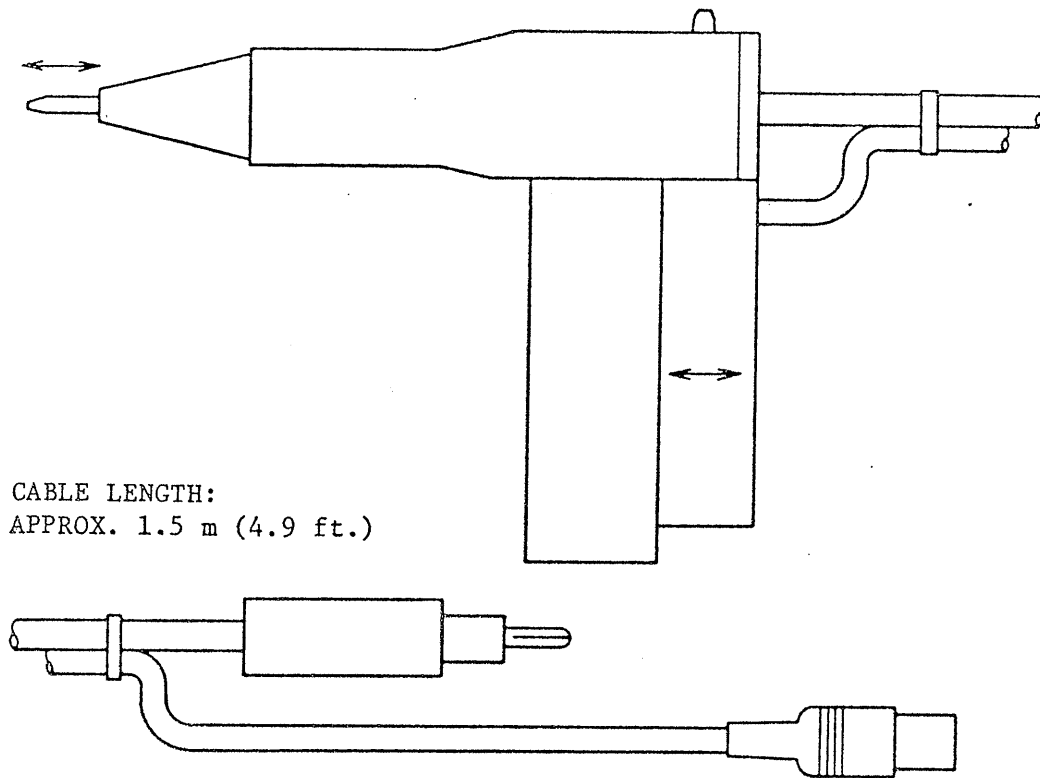


Figure 7.3

#### 7.5 9023 Buzzer Unit

This buzzer is used as an additional external buzzer when alarm loudness with the instrument's internal buzzer alone is insufficient.