

INSTRUCTION MANUAL FOR

30kV DIODE CURVE TRACER

MODEL 5830

KIKUSUI ELECTRONICS CORPORATION

# Power Requirements of this Product

Power requirements of this product have been changed and the relevant sections of the Operation Manual should be revised accordingly.

(Revision should be applied to items indicated by a check mark ☒)

## ☐ Input voltage

The input voltage of this product is \_\_\_\_\_ VAC,  
and the voltage range is \_\_\_\_\_ to \_\_\_\_\_ VAC. Use the product within this range only.

## ☐ Input fuse

The rating of this product's input fuse is \_\_\_\_\_ A, \_\_\_\_\_ VAC, and \_\_\_\_\_.

### WARNING

- To avoid electrical shock, always disconnect the AC power cable or turn off the switch on the switchboard before attempting to check or replace the fuse.
- Use a fuse element having a shape, rating, and characteristics suitable for this product. The use of a fuse with a different rating or one that short circuits the fuse holder may result in fire, electric shock, or irreparable damage.

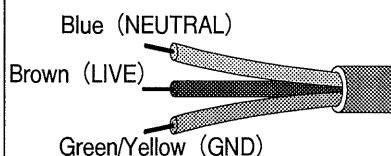
## ☐ AC power cable

The product is provided with AC power cables described below. If the cable has no power plug, attach a power plug or crimp-style terminals to the cable in accordance with the wire colors specified in the drawing.

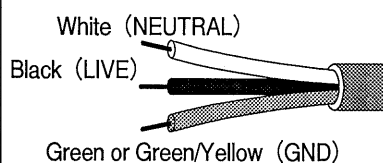
### WARNING

- The attachment of a power plug or crimp-style terminals must be carried out by qualified personnel.

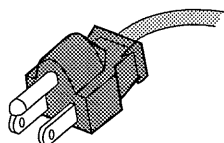
#### ☐ Without a power plug



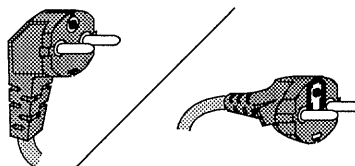
#### ☐ Without a power plug



#### ☐ Plugs for USA



#### ☐ Plugs for Europe



#### ☐ Provided by Kikusui agents

Kikusui agents can provide you with suitable AC power cable.  
For further information, contact your Kikusui agent.

#### ☐ Another Cable \_\_\_\_\_

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## 1. GENERAL DESCRIPTION

The 5830 is designed primarily for testing PIV (PRV) characteristics of high voltage rectifier diodes employing an oscilloscope as its display. It generates a continuously variable test voltage of 0 to 30 kV (to approximately 38 kV at no load) through half-wave-rectification of the line power.

The current measuring sensitivity is as high as 1  $\mu$ A/DIV as displayed on the oscilloscope graticule. Accurate measurement is ensured with a calibrated horizontal and vertical axis selector switch.

The slide transformer for adjusting the test voltage can be externally installed. This feature, together with other safety features, ensures rapid and safe observation and measurement.

## 2. SPECIFICATIONS

Power requirements:	100 V AC, 50/60 Hz, approx. 300 VA at full load
Dimensions (maximum):	530 (800) W x 1100 (1220) H x 525 (825) D mm
Weight:	Approx. 130 kg
Accessories:	Instruction manual ..... 1 copy Test data ..... 1 copy Connector for safety control ..... 1 Blind panel for slide transformer ... 1 Test terminal ..... 1
Graticule:	10 DIV x 10 DIV, 8 mm/DIV, white or red illumination
CRT:	5UP1F, acceleration voltage approx. 1500 V
Test voltage source:	Half-wave-rectification of line power
Test voltage:	0 - 30 kV peak, 10 mA peak max. 0 - 38 kV peak at no load
Overcurrent protector relay:	Trips when current exceeds 12 - 14 DIV as displayed on graticule
Test circuit fuse:	5 A
Dissipation limiting resistor:	1 M $\Omega$ (30 W)
Looping compensator:	Approx. 25 pF max.
Voltage sensitivity (horizontal axis):	200/500/1k/2k/5kV/DIV (5 ranges), accuracy 3%
Current sensitivity (vertical axis):	1/2/5/10/50/100/200/500/1mA/DIV, accuracy 3%
Calibration voltages (for amplifier sensitivity calibration)	
Voltage axis:	0.5 V <sub>p-p</sub> square wave/10 DIV
Current axis:	0.1 V <sub>p-p</sub> square wave/10 DIV

### 3. EXPLANATION OF FRONT PANELS

#### SPEC 701661 TEST VOLTS SOURCE UNIT

- POWER:** The main power switch of the voltage source unit. When this switch is thrown to the upper position, the power is turned on and the green pilot lamp lights.
- TEST VOLTS:** The test voltage increases as this knob is turned clockwise and vice versa. When turned to the extremely counterclockwise position (minimum test voltage position), the reset switch trips. The reset switch is provided in order to reset the test voltage when the test voltage source is turned off by any one of the protective circuits while the test voltage is being applied. For the sake of safety, the operator is requested to become used to turn this TEST VOLTS knob to the zero position whenever measurement is not being made.
- TEST ON:** This red pilot lamp lights when the test voltage circuit is on. The lamp goes off when a protective circuit is tripped and the test voltage circuit is turned off.
- TEST TERMINALS:** The test terminals are enclosed in an acryl resin box to prevent electric shocks. Do not touch the terminals when measurement is being made.
- To connect a sample to the test terminals, proceed as follows: Turn off the POWER switch. Open carefully the door of the test box. Connect the sample to Terminal A (high voltage side) and Terminal K (low voltage side) observing the polarity indicated on the test box door. The position of Terminal K (low voltage side) is adjustable to suit the dimension of the sample.

The test box door is provided with interlock switches to turn off automatically the test voltage when the door is opened. These switches are for the safety feature.

CAPACITY BAL:

FINE

Used to reduce the trace loop through compensation for parallel capacitance of the sample. If the sample is of such a nature that its parallel capacitance varies depending on the applied voltage, complete compensation cannot be successfully made. The red knob is for fine adjustment.

## SPEC 701651 OSCILLOSCOPE

**POWER ON-OFF:** The main power switch of the oscilloscope. When this switch is thrown to the upper position, the power is turned on and the power pilot lamp lights.

**INTENSITY:** CRT trace intensity increases as this control is turned clockwise. It is recommended to keep the trace at a subdued intensity when no measurement is performed, in order to make the CRT screen life longest.

**FOCUS:** This control, in conjunction with the ASTIG control, is used to obtain a sharp trace on the screen.

**ASTIG:** The astigmatism control, in conjunction with the FOCUS control, also is used to obtain a sharp trace.

**SCALE ILLUM:** Control for graticule illumination. Illumination color can be changed from white to red by turning the graticule upside down.

**VERTICAL:**  $\mu\text{A}/\text{DIV}$   
Selects vertical (current) sensitivity from 1  $\mu\text{A}/\text{DIV}$  to 1000  $\mu\text{A}/\text{DIV}$  in ten ranges.

**HORIZONTAL:** Volts/DIV  
Selects horizontal (voltage) sensitivity from 200 V/DIV to 5 kV/DIV in five ranges.

**POSITION**  
**(VERT and HORIZ):** For vertical and horizontal positioning of the trace. The trace moves upward or rightward as the VERT or HORIZ control, respectively, is turned clockwise.

## 10 DIV CALIBRATION

PUSH TO CAL and GAIN ADJ: For calibration of the vertical and horizontal amplifiers. When the PUSH TO CAL button is depressed, a vertical or horizontal trace with an amplitude of approximately 10 DIV is displayed. Under this state, remove the cap (threaded) of the GAIN ADJ (semi-fixed resistor) and turn it so that the amplitude is made accurately 10 DIV. The PUSH TO CAL button can be locked by twisting it clockwise under the depressed state.

#### 4. PRECAUTIONS IN OPERATION

- (1) Be especially careful against electric shocks when operating this instrument which employs a very high voltage. Whenever the instrument is not in use, turn off the POWER switch of the TEST VOLTS SOURCE UNIT. Before inspecting the internal components of the instrument, make sure that the power plug is disconnected.
- (2) When the test box door is opened for replacement of the sample, the interlock switches turn off and the test voltage and the TEST ON lamp goes off. Before replacing the sample, ensure that the lamp is off.

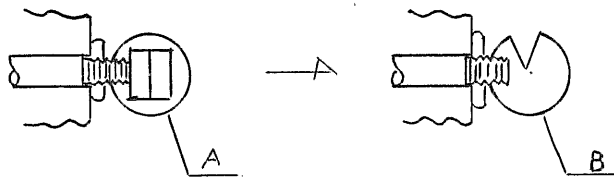
Although the interlock switches are incorporated as a safety feature, the TEST VOLTS control should be turned to the minimum position before opening the test box door for sample replacement. This recommendation should be strictly observed from the viewpoint of protecting both the instrument and the tested sample.

- (3) When it is unavoidable to lead the test voltage to outside of the test box using extension cables, be extremely careful against electric shocks and, to prevent hazards, install the protective device by means of the EXT SAFETY CONTROL connector on the rear panel of the instrument. As shown in the schematic diagram, the instrument is delivered to the customer in the state that Pins #1 and #2 of the plug of the EXT SAFETY CONTROL connector are shorted. Remove the shorting jumper, install the ON-OFF switch of the protective circuit, and connect a 100V lamp to Pins #3 and #4.
- (4) Before operating the instrument, ensure that the GND terminal on the rear panel of the instrument is securely grounded to the earth.
- (5) The test voltage is a one-side-grounded half-wave-rectified positive voltage. Terminal "A" located to the left is the positive high voltage terminal and Terminal "K" is the low voltage terminal. The

latter is grounded through the current measuring resistor (one of the resistors selected by the VERTICAL RANGE switch).

- (6) When it is required to operate the slide transformer being placed outside of the instrument, undo the four clamping-screws of the transformer and then take out the slide transformer together with its cables. When this is done, mount the slide transformer blind panel (supplied) on the instrument in order to prohibit access to the instrument inside through the vacancy produced by the removal of the transformer.
- (7) The accessory test terminal is used to test the sample not by holding in but simply by placing on the terminal. The terminal is used for the high voltage terminal only.

#### High voltage terminal



Replace the terminal A with the terminal B.

## 5. TEST PROCEDURE

- (1) Open the rear door and ensure that the oscilloscope power plug, vertical and horizontal input cables, and overcurrent circuit are securely connected. Close the rear door and connect the power cord of the instrument.
- (2) Turn on the POWER switch of the oscilloscope. Set the TEST VOLTS knob of the test volts source unit to its minimum position and turn off the power of this instrument.
- (3) Adjusting the controls of the oscilloscope, display a sharp spot in an adequate position on the screen and select the vertical and horizontal ranges as required.
- (4) Before connecting the sample to the test terminals, turn on the POWER switch of the test volts source unit and, gradually turning clockwise the TEST VOLTS knob, check for that the horizontal trace on the oscilloscope screen extends rightwards in response.
- (5) To connect the sample, turn the TEST VOLTS knob to the zero position and check that the TEST ON lamp goes off at the instant the test box door is opened and, then, connect the sample.

The sample must be securely connected. It is hazardous if the sample falls off while measurement is being performed. Especially when the accessory test terminal is used, be extremely careful not to give shocks to the instrument during the measuring period.

- (6) If the trace draws a loop due to the capacitance of the sample, make compensation by means of the CAPACITY BAL knob on the panel of the test volts source unit. Note, however, that complete compensation is not to be expected for a sample of which capacitance varies depending on the applied voltage or when measurement is made with a high voltage and a low current.

- (7) When the current flowing in the sample has exceeded a value corresponding to  $\pm 7$  DIV in the vertical direction from the graticule center, the overcurrent circuit operates and the test voltage is turned off. The test voltage is not restored unless the TEST VOLTS knob is turned to the zero position.

The trip point of the overcurrent circuit is adjustable with the OVERCURRENT ADJ (semi-fixed resistor) located in the oscilloscope.

## 6. MAINTENANCE

### SPEC 701661 TEST VOLTS SOURCE UNIT

- (1) Maximum test voltage of approximately 38 kV peak (when the line voltage is 100V) is developed between the test terminals. These terminals must be always kept clean in order to prevent leakage current and arcing discharge.
- (2) When the TEST ON lamp (T-13, E-12) has failed, replace it immediately. Check periodically the operation of the test box safety circuit.
- (3) The voltage dividing ratio of the high voltage divider is adjustable with the DIVIDER ADJ (semi-fixed resistor) located on the rear panel. This adjustment should be made after the sensitivity adjustment of the oscilloscope has been done. (Refer to Section MAINTENANCE, SPEC 701651 OSCILLOSCOPE.) Set the sensitivity of the oscilloscope at 1 kV/DIV, turn off the POWER switch of the test volts source unit, apply an accurate 10 kV DC voltage to the test terminals (ensuring that the positive polarity appearing at the high voltage terminal), and adjust the DIVIDER ADJ so that the spot on the CRT screen deflects by 10 DIV.

## SPEC 701651 OSCILLOSCOPE

(For locations of adjusting semi-fixed resistors, refer to the layout diagram.)

### (1) DC BALANCE

Unless the amplifier circuits are correctly DC balanced, the 10 DIV calibration with the GAIN ADJ cannot be successfully made because the reference point shifts. For DC balancing, of both vertical and horizontal axes, adjust the DC BALANCE control (semi-fixed resistor) so that the shift caused by turning the GAIN ADJ control is made minimum.

### (2) 10 DIV CALIBRATION

This control is for amplifier sensitivity calibration. Calibration is made with a square wave calibration signal of 0.5 Vp-p for the horizontal axis and that of 0.1 Vp-p for the vertical axis. These calibration signals themselves are calibrated by applying an accurately-known external DC voltage to the horizontal amplifier and comparing the resultant movement of the spot with the trace deflection amplitude produced by the internal calibration signal. For actual calibration, proceed as follows: Set the horizontal range switch in the maximum sensitivity position (200 V/DIV), apply an external voltage of accurately 0.5 V between the input terminal J<sub>2</sub> of printed board A1-2 and the chassis, and determine the resultant trace deflection amplitude on the graticule and memorize the determined value. Next, depress the PUSH TO CAL button so that the horizontal trace is produced, and adjust the CAL V ADJ control (semi-fixed resistor) so that the trace amplitude is made the same with that of the above-determined value.

To calibrate the sensitivity of the oscilloscope with the above calibration voltage, depress the PUSH TO CAL button so that the trace is displayed and then adjust the GAIN ADJ control so that the trace amplitude is made 10 DIV.

(3) HV ADJ

The HV ADJ control (semi-fixed resistor) is for adjustment of the CRT acceleration voltage. This control must be so adjusted that the voltage between CRT cathode (pin # 3) and chassis is made -1500 V as measured with a voltmeter of a high input impedance (10 M $\Omega$  or over). As the deflection sensitivity depends on this voltage, the amplifier gain (GAIN ADJ) must be adjusted with the 10 DIV CALIBRATION whenever after the CRT acceleration voltage has been varied.

LAYOUT DIAGRAM OF SPEC 701651 OSCILLOSCOPE

