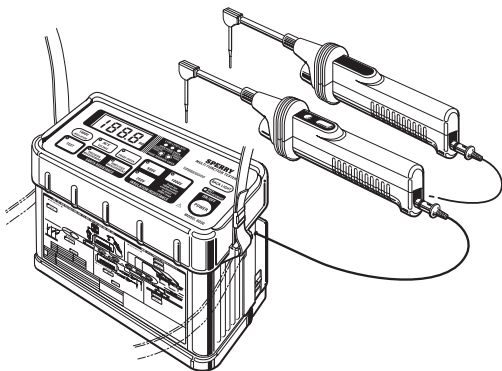


7/05

FORM#347

# OPERATING INSTRUCTIONS



## MULTI FUNCTION TESTER MODEL 6030

**A.W. SPERRY INSTRUMENTS INC.**

**The Professional's Choice®**

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# 1. Safety Precautions

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- This instrument is designed and tested to IEC 1010; over voltage category II
- This instruction manual contains warnings and safety rules that must be observed by the user to ensure safe operation of the instrument and retain it in safe condition. Therefore, read these operating instructions thoroughly and completely before using the instrument.
- The symbol  on the instrument means that the user must refer to the relevant section of this instruction manual for safe operation of the instrument.
- Pay particular attention to all WARNINGS and CAUTIONS in this instruction manual. WARNING indicates warnings to avoid electrical shock and CAUTION indicates cautions to avoid damage to the instrument.

- 1. Always make sure to set the range switch to the appropriate position before taking measurement.**
- 2. Always make sure to insert a plug of test leads fully into a terminal of the instrument.**
- 3. If the instrument is wet, do not connect test leads to the instrument.**
- 4. Never exceed the maximum allowable input of any measuring range when making measurement.**
- 5. Never shift ranges with test leads connected to the circuit of installation under test.**
- 6. Make sure not to apply a voltage more than 600V AC or DC between a terminal of the instrument and the earth.**
- 7. Never try to operate the instrument in an explosive atmosphere (i.e. the presence of flammable gases or fumes, vapor or dust). This can cause explosion.**
- 8. Always inspect the instrument, test leads and accessories for any sign of damage or abnormality before every use. If abnormal conditions exist (e.g. broken test leads, cracked enclosure of the instrument), do not try to make measurement.**

- 9. Make sure to remove test lead from the instrument and turn the power off before opening the battery compartment cover for battery replacement.**
- 10. Never replace batteries when the instrument is wet.**
- 11. Always turn the power off after use.**
- 12. Do not expose the instrument to the direct sun, dew fall, or extreme temperatures.**
- 13. Do not expose the instrument to a temperature of more than 50°C .**
- 14. Calibration and repair of any instrument should only be performed by qualified and trained service technicians. Do not attempt calibration or service unless another person capable of rendering first aid and resuscitation is present.**
- 15. Do not install substitute parts or perform any unauthorized modification of the instrument. Return the instrument to your distributor or authorized service center for service and repair to insure that safety features are maintained.**
- 16. The instrument must be used by a competent, trained person and operated in strict accordance with the instructions. Kyoritsu Electrical Instruments Works, Ltd will not accept liability for any damage or injury caused by misuse or noncompliance with the instructions or safety procedures. It is essential to read and understand the safety rules contained in the instructions. They must be observed when using the instrument.**

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## 2. Features

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MODEL 6030 is an all-weather universal tester designed for measurement and maintenance of distribution systems or electrical equipment rated at up to 600V AC or DC. It has five functions in one unit; Voltage, insulation resistance and earth resistance measurement; phase sequence check and open phase detection.

- Water resistant
- Test leads are stored in a cord reel module
- Easy-to-read large digital display
- The instrument automatically turns itself off in about 30 minutes to conserve battery life, if no push buttons are pressed.
- Illumination on test probes for work at night or in dimly lit locations
- Display back-light to improve legibility in poor lighting conditions
- Autoranging; three ranges for insulation resistance, two ranges for earth resistance and two AC voltage ranges
- The instrument and all accessories in one carrying case
- AC voltage range;
  - True RMS sensing makes accurate measurement of voltage with distortion and harmonics generated by equipment using SCRs or TRIACs.
- Insulation resistance range;
  - Three test voltages; 250V, 500V, 1000V
  - 1mA test current at the minimum load.
  - Automatically releases electric charges stored in the circuit under test.
  - Remaining charges can be observed on AC voltage range
  - Remote control switch on a test probe
- Earth resistance range;
  - Checks resistance of auxiliary earth bars
  - Can make both simplified and normal measurement
- Phase test;
  - LEDs indicate whether phase sequence is correct or reversed as well as open phases, if any.
  - Rarted voltage from 100V to 600V AC

### 3. Specifications

- Measuring ranges and accuracy( at  $23 \pm 5^{\circ}\text{C}$  , relative humidity 45-75%)

#### AC voltage

Measuring range	0-199.9V/100-600V(autoranging)
Accuracy	$\pm 1.0\% \text{rdg} \pm 4 \text{dgt}$
Sensing	True RMS(crest factor 2)
Input impedance	$2 \text{M}\Omega$

#### Insulation Resistance

Test voltage	250V	500V	1000V
Measuring range( $\text{M}\Omega$ )	0 ~ 1.999 1.00 ~ 19.99 10.0 ~ 199.9 (autoranging)		0 ~ 19.99 10.0 ~ 199.9 100 ~ 1999 (autoranging)
Accuracy	$\pm 2\% \text{rdg} \pm 3 \text{dgt}$ ( $\pm 10\% \text{rdg}$ at 1000 ~ 2000 $\text{M}\Omega$ )		
Output voltage on open circuit	Rated test voltage +20%, -0%		
Output current	DC1mA+20%, -0%		
Output short circuit current	About DC 1.3mA		
Influence of AC component of output voltage	$\pm 10\% \text{rdg}$ , with a $5 \mu\text{F}$ capacitor connected across the terminal		

#### Earth Resistance(Simplified/normal measurement)

Measuring range	0 ~ 199.9 $\Omega$ /100 ~ 1999 $\Omega$ (autoranging)
Accuracy	$\pm 2\% \text{rdg} \pm 3 \text{dgt}$ with an auxiliary earth bar resistance of 500 $\Omega$
Measuring principle	Constant current inverter; 820Hz, about 2mA

## Phase Test

Rated voltage	100-600V AC(50/60Hz) indicates whether the phase sequence is correct or reversed, and detects open phases, if any
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<b>Safety Standard</b>	IEC1010, overvoltage category II
<b>Response Time</b>	About 4 seconds on AC voltage and earth resistance ranges, about 5 seconds on insulation resistance ranges
<b>Digital Display</b>	3 1/2 digit(1999)liquid crystal display
<b>Insulation Resistance</b>	More than 50 M $\Omega$ at 1000V between electrical circuit and housing case
<b>Withstand Voltage</b>	5550 VAC for one minute between electrical circuit and housing case
<b>Dimension</b>	130 $\times$ 238 $\times$ 207mm(instrument and cord reel module) 105 $\times$ 238 $\times$ 207mm(the instrument)
<b>Weight</b>	About 1.6kg(the instrument), about 750g(cord reel module)
<b>Power Source</b>	1.5V alkaline batteries(LR6 or equivalent); 8 for the instrument, one for the test probe
<b>Operating temperature</b>	0-40 $^{\circ}$ C
<b>Storage temperature and humidity</b>	-10-50 $^{\circ}$ C , relative humidity up to 75% (Before being stored, the instrument should be dried.)
<b>Accessories</b>	Cord reel module Model 7092-1 piece Test probes Model 8082-1 set Test leads (large) Model 7089-1 set Test leads (small) Model 7090-1 set Test leads(for earth resistance) Model 7091-1 set Test leads(for phase indicator) Model 7088-1 set LR6 alkaline batteries - 9 pieces Auxiliary earth bars Model 8083 - 2 pieces Instruction manual - 1 piece Shoulder strap -2 pieces Shoulder pad - 1 piece Carrying case - 1 piece Model 9081 Set of "O" rings - 1 set

**Overload Protection** AC voltage ranges; 900V AC for one minute  
 Insulation resistance ranges; 1200V(DC+ACp-p) for one minute  
 Earth resistance ranges; 200V AC for 10 seconds between the terminals  
 Phase indicator; 660V AC for 10 seconds between the terminals

### Current Consumption

(Figures are typical values with a 12 V power supply)

AC voltage range	30mA			
Phase indicator	30mA			
Display being back-lit	Plus 30mA			
Insulation resistance range	Stand-by	During measurement		
		Short circuit	Rated current output	No load
250V	75mA	210mA	260mA at 0.25 M $\Omega$	150mA
500V	75mA	210mA	260mA at 0.5 M $\Omega$	150mA
1000V	75mA	210mA	320mA at 1M $\Omega$	180mA
Earth Resistance	Stand-by	During measurement		
Normal measurement	30mA	200mA		
Simplified measurement	50mA	220mA		

### Options

**DSA-2417 Water Proof**

**Leakage Clamp Meter**

40mm jaw diameter

True RMS

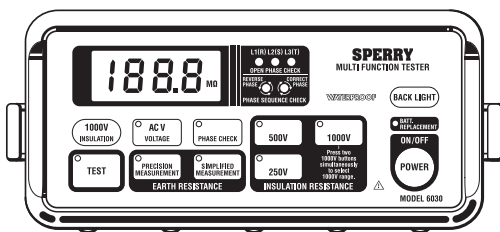
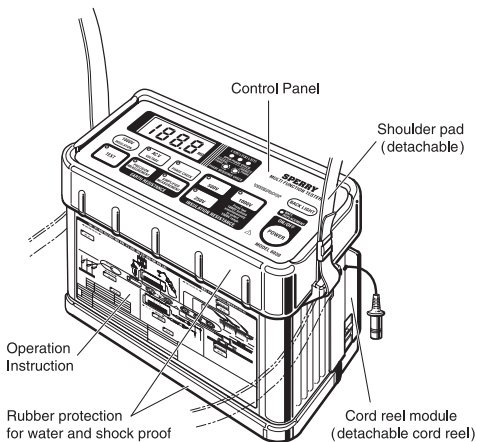
200 mA/2000 mA/20 A/200 A/500 A (5 ranges)

Available with frequency selector switch





## 4. Layout Diagram



Control Panel (Model 6030)

Fig.1

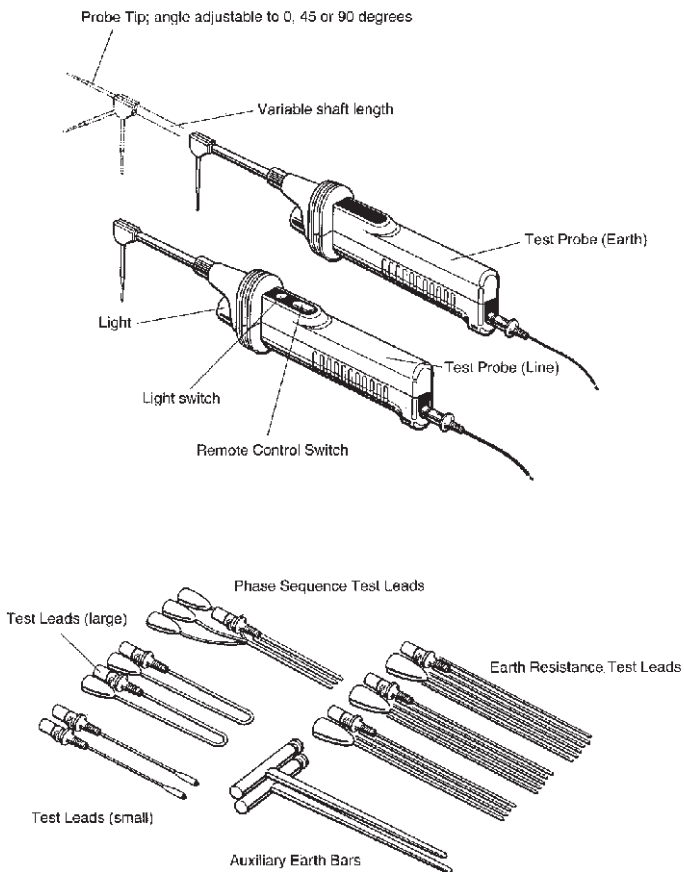


Fig.2

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## 5. Preparation for Measurement

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### 5-1 Battery Check

With Power Switch pressed, check if the LED “Replace Battery” does not illuminate. If Replace Battery is lit, replace the batteries according to section 7 for battery replacement.

Low voltage warning is set at following levels:

LED flashes at  $9V \pm 0.2V$

LED lights up at  $8V \pm 0.2V$

When the instrument is turned on, it is automatically set in AC voltage measuring function.

### 5-2 Test Lead Connection

The following table shows terminals and type of test leads to be used for each function.

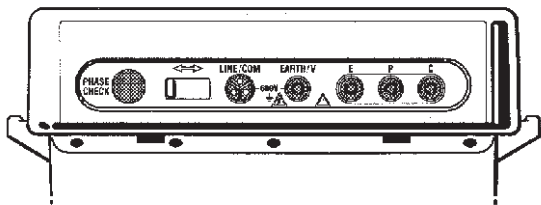


Fig.3

Function	Terminals	Test Leads
AC Voltage	EARTH/V, LINE/COM	Test Probes Voltage Leads (large) Voltage Leads (small)
Insulation Resistance	LINE/COM, EARTH/V	Test Probes Voltage Leads (large) Voltage Leads (small)
Earth Resistance (Simplified Measurement)	LINE/COM, EARTH/V	Test Probes Voltage Leads (large) Voltage Leads (small)
	E, P	Earth Resistance Leads
Earth Resistance (Normal Measurement)	E,P,C	Earth Resistance Leads
Phase Test	PHASE CHECK	Phase Test Leads

### 5-3 3-pin Plug Connection

#### 1. Connecting to the cord reel module

The 3-pin plug of test probes, test leads or the phase sequence test lead must be fully depressed into the red cord reel connector so that the triangle mark on the plug is aligned with that on the connector. The rubber ring encircling the cord reel connector should be covered entirely with the shroud of the plug in order to secure the water-resistance of the connection.

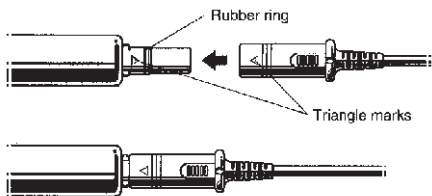


Fig.4

#### 2. Connecting to the instrument

When connecting the 3-pin plug, including that of the cord reel module, to PHASE CHECK or LINE/COM terminal on the instrument, the triangle mark on the plug must be on the front panel side.

## 6. Operation

### 6-1 AC Voltage Measurement (True RMS)

#### **⚠ WARNING**

1. To avoid possible electric shock, switch off the circuit under test before connecting the test leads.
2. Never apply any voltage higher than 900V AC.

- ① Press AC VOLTAGE button to select AC voltage range.
- ② Using the test probes, connect LINE/COM terminal to the earth side of the circuit under test and EARTH/V terminal to the line side.

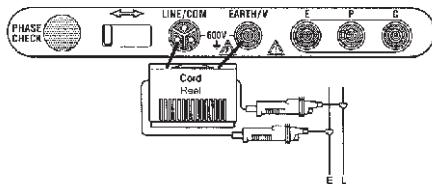


Fig.5 AC Voltage Measurement

#### < True RMS sensing >

True RMS sensing allows accurate measurement of DC as well as nonlinear waveform, including full-wave or half-wave rectified waveform, harmonic distortion and AC waveform superimposed on DC.

#### **⚠ CAUTION**

If the display reads **1** , immediately halt the measurement. This overrange indication appears when a voltage over the allowable input ( $630V \pm 4\%$ ) is applied to the instrument.

## 6-2 Insulation Resistance Measurement

### **⚠ WARNING**

To avoid electrical shock, do not touch the probe tips and the circuit under test during measurement.

### **⚠ CAUTION**

To avoid damage to the instrument, insulation measurement must be performed on the de-energized circuit only. Make sure that the circuit or equipment is disconnected before proceeding with an insulation test.

- ① Check if the circuit under test is not energized as follows.  
Connect the test probes to the circuit under test and select AC voltage range.  
If the circuit is live, the display reads the voltage.  
If the display reads 0 V, the circuit is dead.
- ② Select a test voltage  
Press 250V button to select 250V and 500V button to select 500V.  
To select 1000V, press 1000V button and 1000V INSULATION TEST button simultaneously.
- ③ Make sure that the connection is made as shown below:  
Press test button or the remote control switch on the test probe to start measurement.

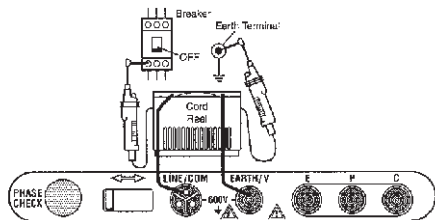


Fig.6 Insulation Resistance Measurement

<How to use Test Button and the Remote Control Switch>

Test: Press this button to start measurement and press again to halt the measurement.

Selecting another test voltage also halts the measurement.

Measurement is automatically aborted in three minutes.

Remote Control Switch:

This switch is on a test probe. Press the switch to make measurement and release it to halt the measurement.

- ④ After measurement, wait until electric charges stored in the circuit under test are fully discharged.

<Automatic Circuit Capacitance Discharge Function>

This facility automatically allows electric charges stored in the capacitance of the circuit under test to be automatically discharged after testing. Discharging can be monitored on AC voltage range.

 **WARNING**

**Do not touch the circuit under test immediately after testing. Electric charges stored in the circuit may cause electric shock.**

**After testing, select an AC voltage range and leave the test probes connected to the circuit until the display reads 0 V.**

<Number of measurements>

On a insulation resistance range, the instrument can take;

about 1,200 measurements or greater on Alkaline batteries;

about 500 measurements or greater on Manganese batteries.

These numbers of measurements may vary depending on measuring ranges used and insulation resistances. (Test method; making 5 seconds of measurements at an interval of 25 seconds)



## < Output Voltage Characteristics >

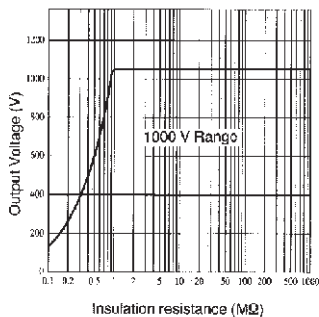
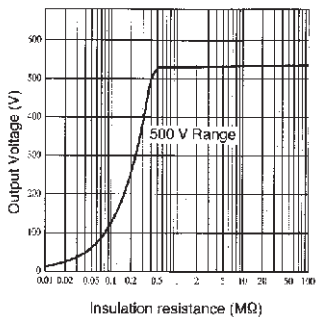
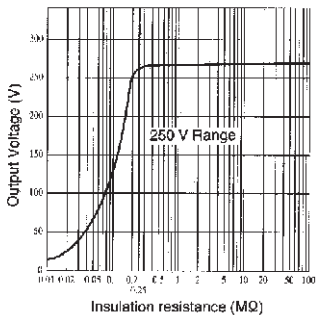


Fig.7 Output Voltage Characteristics

## 6-3 Earth Resistance Measurement

### **⚠ WARNING**

**Do not touch terminals during measurement because a maximum of 50V DC is present across E and C, or E and P terminals.**

### 6-3-1 Normal Measurement

#### ① Connecting Test Leads

Connect the earth electrode to E terminal of the instrument with the green test lead. Hammer an earth bar into the ground about 5 to 10 meters away from the earth electrode under test. Connect the earth bar to C terminal of the instrument with the red test lead.

Hammer the other earth bar into the ground in the middle of the above earth bar and the electrode under test. Connect this earth bar to P terminal of the instrument with the yellow test lead.

#### **(NOTE)**

**Make sure to stick the auxiliary earth bars in a moist part of the ground. If they have to be stuck into dry, stony or sandy part, give enough water to the ground.**

**Where it is not possible to drive the earth bars into a hard surface such as concrete ground, lay the earth bars there and cover them with a damp**

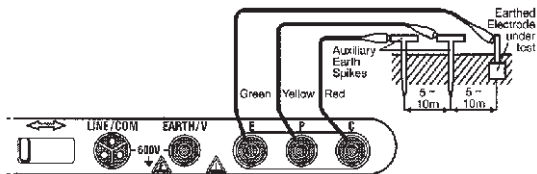


Fig.8 Earth Resistance Measurement (Normal Measurement)

② Checking earth voltage

Select AC voltage range and check if the reading is less than 10 V. An earth voltage more than 10 V may affect the accuracy of earth resistance measurement. To avoid this, reduce the earth voltage, for example, by turning off the installation connected with the earth electrode under test.

③ Measurement

Press PRECISION MEASUREMENT button and then TEST button. The display shows the earth resistance of the earth electrode under test.

**(NOTE)**

**If the overrange indication 1... appears, check if the connection of test leads is good and if resistance at auxiliary earth bars is within the limit.**

**⚠ CAUTION**

**When connecting the test leads, make sure that they are separated. If the test leads are twisted or in touch with each other, this affects accuracy of measurement.**

**Make sure to stick auxiliary earth bars (P and C) into moist ground as far as this is possible. If the resistance at an auxiliary earth bar exceeds 20 k $\Omega$ , this also affects accuracy of measurement.**

### **6-3-2 Simplified Measurement**

This method is an alternative where it is impossible to drive auxiliary earth bars into the ground. In this method, an approximate value of earth resistance can be obtained by using, instead of auxiliary earth bars, another earth electrode that is known to have a low earth resistance; e. g. a common earth of mains power supply, water supply piping and a building's earth electrode.

Either the test probes or the test leads (E and P terminals) can be used in this method.

① Connection

Make connection as shown below.

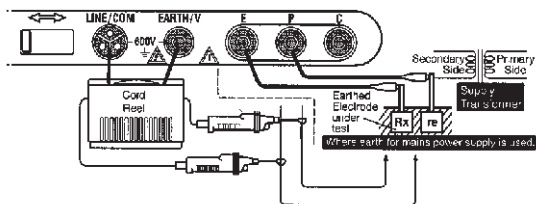


Fig.9 Earth Resistance Measurement (Simplified Measurement)

A. Using Test Probes

Connect Black probe to the earth electrode under test, and Red probe to the earth of a mains power supply.

B. Using E and P terminals

Make connection using test leads as above.

**(NOTE)**

**Choose whichever way more convenient for each location of measurement.**

**⚠ WARNING**

**Take extreme caution to avoid electrical shock, when using the earth of mains power supply.**

② Checking Earth Voltage

Select AC voltage range and check if the reading is less than 10 V. An earth voltage more than 10 V may affect the accuracy of earth resistance measurement. To avoid this, reduce the earth voltage, for example, by turning off the installation connected with the earth electrode under test.

### ③ Measurement

Press SIMPLIFIED MEASUREMENT button and then TEST button. The display shows the approximate value of earth resistance the earth electrode under test.

#### (NOTE)

If the overrange indication  appears, check if the connection of test leads is good and if resistance at auxiliary earth bars is within the limit.

#### (NOTE)

Simplified measurement using the earth of mains power supply does not trip a residual current circuit breaker incorporated in the supply circuit.

An accurate value of earth resistance can be calculated as follows.

$$R_x = R_E - r_e$$

$R_x$ : Earth resistance of the electrode under test

$R_E$ : Reading Value

$r_e$ : Earth resistance of the electrode used in place of auxiliary earth bars

### 6-4 Phase Testing

① Press PHASE CHECK button.

② Connect alligator clips of the test leads to the three phase system under test. LEDs indicate whether the system is wired in the correct or reversed sequence and whether there are any open phases. ( See Table 2)

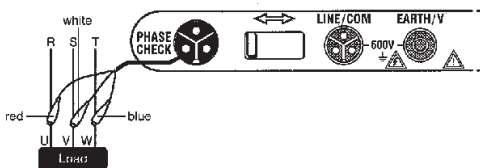


Fig.10 Phase Testing

**Table 2**

	Open Phase Check LED	Phase Sequence Check LED
Correct	All 3 LEDs are lit	Green LED is lit
Reverse	All 3 LEDs are lit	Red LED is lit
One open phase	LED for the open Phase	Both Green and Red LEDs are off

**⚠ WARNING**

**Take extreme caution to avoid electrical shock.**

**Even if all 3 open phase check LEDs are off, one phase may be live.**

### 6-5 How to use Illumination

The control panel display and the Line test probe have illumination function for ease of operation at night or in dimly lit locations.

#### <Display Back-light>

Press BACK-LIGHT button ( next to POWER switch) to turn on the display back-light.

#### <Probe light>

Press Light switch on the Line test probe to turn on the light. Press Light switch again to turn off the light.

### 6-6 How to Use Cord Reel Module

The two test leads are wound and stored on separate reels.

Set the Rewind Lever on the side of the module to Lock position(upper) to draw out a test lead. The lead is locked at the withdrawn length.

Set the Rewind Lever to Free position ( lower) to rewind the lead.

Remove the two screws on the bottom of the module to remove the reels.

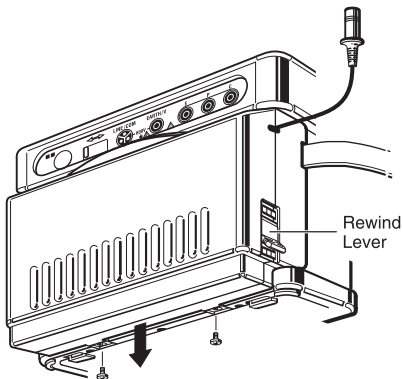


Fig.11 How to remove the reels from the module

### 6-7 Automatic Power Off function

The instrument automatically shuts itself off about 30 minutes after it was turned on. Press Power switch to turn on the instrument again.

### 6-8 How to Use Shoulder and Waist Strap

< Shoulder Strap >

Attach the shoulder strap to the instrument as shown on the right.

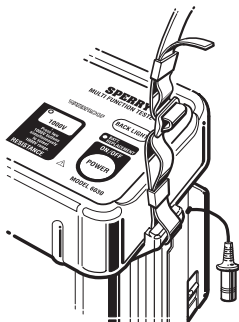


Fig.12

<Waist Strap>

Remove the cord reel module and attach the waist strap to the instrument as shown on the right. Then fix the cord reel module to the instrument again.

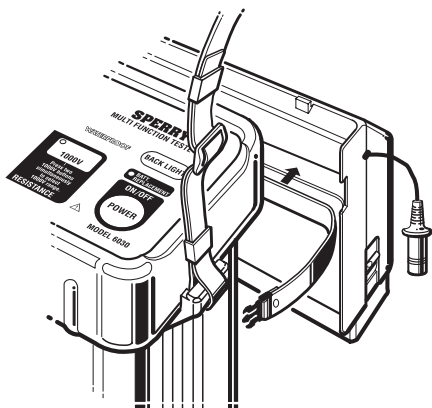


Fig.13



## 7. Battery Replacement

**⚠ WARNING**

- 1. If the instrument is wet, never open the battery compartment cover.**
- 2. Never replace batteries during measurement. To avoid possible electric shock, turn off the instrument and disconnect test leads and probes from it before replacing the batteries.**

Turn off the instrument and disconnect test leads and probes from it.

Untighten the two screws on the bottom of the instrument to remove the battery compartment cover.

Replace all eight batteries with new ones. Install new batteries in correct polarity as marked inside the compartment.

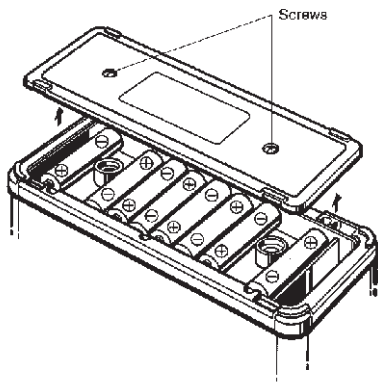


Fig.14 Battery Replacement

(Replacement of Test Probe Battery)

Unscrew the lamp cover.

Install new battery in correct polarity as shown below.

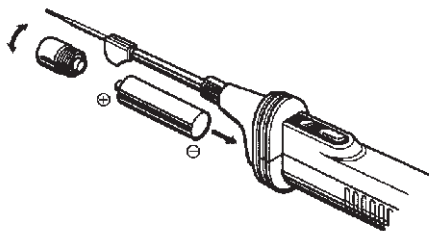


Fig.15 Replacement of Test Probe Battery

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## 8. Before Requesting Service

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Before requesting service, check the following points once again.

- Unable to turn on the instrument
  - Batteries are missing or installed incorrectly. See section 7 for opening the battery compartment cover.  
After unpacking the instrument, install batteries first.
- The instrument turns off during operation.
  - Automatic power off function has turned off the instrument about 30 minutes after it was turned on. Press Power switch to power up the instrument again.
- is displayed in AC voltage measurement.
  - AC voltage more than 600 V is applied to the instrument. Halt the measurement immediately, otherwise the instrument may be damaged.
- Display does not read an insulation resistance
  - Test button or Remote Control switch is not pressed.  
Note that three minutes after pressing Test button, measurement is automatically aborted. Press Test button again to read an insulation resistance.
  - Connection of test leads or test probes is incorrect. Test leads or test probes must be connected to LINE/COM and EARTH/V terminals on the instrument. Also check if they are properly connected to the circuit under test.
- Under to select 1000 V insulation resistance range
  - To select 1000 V range, press 1000 V button and 1000 V INSULATION TEST button simultaneously. To call for precaution against the high test voltage, buzzer beeps and an LED illuminates while 1000 V range is selected.
- is displayed in insulation resistance measurement on 250 V or 500 V range
  - A resistance of 200 M $\Omega$  or greater is applied to the instrument.

- is displayed in insulation resistance measurement on 1000 V range  
→A resistance of 2000 MΩ or greater is applied to the instrument.
- Display does not read an earth resistance  
→In NORMAL measurement, test has been halted automatically about three minutes after pressing TEST button and the LED on the TEST button goes out. Press TEST button again to restart measurement.
- is displayed in earth resistance measurement in NORMAL measurement  
→Resistance of auxiliary bars is too high.  
Stick the auxiliary bars deeper into the ground or move them to other locations.  
Give water to around the auxiliary bar connected to the red lead (Cterminal).  
Short the test leads (green, red any yellow) and check if the display reads near 0.00.  
See 6-3 for details.
- is displayed in earth resistance measurement in Simplified measurement.  
→The resistance of an alternative earth electrode being used in place of an auxiliary bar is too high.  
Check the connection to the alternative earth electrode ( e.g., common earth of mains power supply and water supply piping) or use another earth electrode.  
See 6-3 for details.

## **Lifetime Limited Warranty**

The attention to detail of this fine snap-around instrument is further enhanced by the application of A.W. Sperry's unmatched service and concern for detail and reliability. These A.W. Sperry snap-arounds are internationally accepted by craftsmen and servicemen for their unmatched performance. All A.W. Sperry's snap-around instruments are unconditionally warranted against defects in material and workmanship under normal conditions of use and service; our obligation under this warranty being limited to repairing or replacing free of charge, at A.W. Sperry snap-around instrument that malfunctions under normal operating conditions at rated use. <sup>1</sup>

### **Replacement procedure**

Securely wrap the instrument and its accessories in a box or mailing bag and ship prepaid to the address below. Be sure to include your name and address, as well the name of the distributor, with a copy of your invoice from whom the unit was purchased, clearly identifying the model number and date of purchase.

**A.W.SPERRY INSTRUMENTS INC.  
ATT: Customer service dept.  
2150 Joshua's Path, Suite 302,  
Hauppauge, NY 11788**

<sup>1</sup>The warranty is not applicable if the instrument has been: misused, abused, subjected to loads in excess of specifications, has had unauthorized repair or has been improperly assembled or used.

\*Note: Recommended calibration interval should not exceed one year. Calibration service charges are not covered terms and conditions of warranty.

**MEMO**



**A.W. SPERRY INSTRUMENTS INC.**  
**The Professional's Choice®**

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