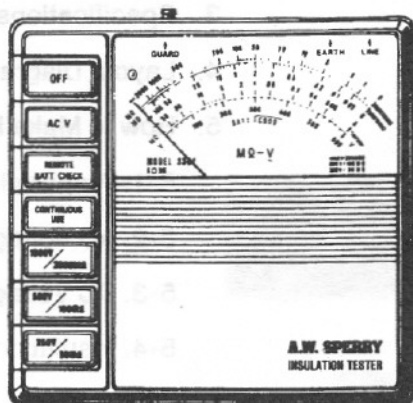


# ANALOG MEGOHM INSULATION/VOLTAGE TESTER MODELS 3301 & 3302



## CAUTION

Please read this Manual thoroughly and completely before putting instrument into use. Failure to do so might result in injury and/or damage to equipment. Observe all standard industry safety rules.

**A.W. Sperry Instruments, Inc.**

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Printed in Japan

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## ONE YEAR LIMITED WARRANTY

A. W. Sperry Instruments, Inc., warrants that this AWS instrument has been carefully tested, inspected, and warranted for one (1) year from the date of purchase by the original end user purchaser provided the completed warranty card is returned within ten (10) days after purchase and the instrument has not been misused, damaged due to negligence, neglect or unauthorized repair, abused or used contrary to the operating instructions. Instruments and proof of purchase in the form of a legible copy or original of the sales receipt clearly identifying the distributor, model number and date of purchase must be returned to A. W. Sperry Instruments Inc., Attention: Customer Service Center, 245 Marcus Boulevard, Hauppauge, New York 11788, postage prepaid for examination and verification of manufacturing defect under warranty. A. W. Sperry Instruments Inc., shall be the sole judge of such defect. The liability of A. W. Sperry Instruments Inc., shall be limited to the repair or replacement at its sole option of any defective product.

THIS WARRANTY AND THE OBLIGATIONS AND LIABILITIES OF SELLER THEREUNDER ARE EXCLUSIVE AND IN LIEU OF AND BUYER HEREBY WAIVES ALL OTHER REMEDIES, EXPRESS WARRANTIES, GUARANTEES OR LIABILITIES, OF AND FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OR WHETHER OR NOT OCCASIONED BY SELLER'S NEGLIGENCE. THIS WARRANTY SHALL NOT BE EXTENDED, ALTERED OR VARIED EXCEPT BY A WRITTEN INSTRUMENT SIGNED BY SELLER AND BUYER. SOME STATES ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIED LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.

### WARRANTY REGISTRATION

To validate warranty, please complete the warranty registration card enclosed with your instrument and return to A. W. Sperry Instruments Inc., 245 Marcus Blvd., Hauppauge, N.Y. 11788 within 10 days of purchase. No postage required.

### WARRANTY RETURN

Refer to section "Return for Repairs" for complete instructions. All warranty returns must include a legible copy or original of the sales receipt clearly identifying the model number, serial number and date of purchase.

**A. W. Sperry reserves the right to change specifications and designs described in this manual without notice and without obligations.**

# 1. Safety Precautions

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To avoid possible electric shock, instrument damage and/or damage to the equipment under test, read the operating instructions thoroughly and completely before operating your meter. Pay particular attention all WARNINGS which will inform you of potentially dangerous procedures. The instructions in these warnings must be followed for maximum personal safety.

- 1) Insulation tests are to be performed on de-energized (DEAD) circuits and equipment only. Do not perform tests on energized (LIVE) circuits.
- 2) Always test the circuit or equipment for the presence of voltage to insure it is de-energized. Make sure that you can visually see that the circuit or equipment is disconnected before proceeding with an insulation test. Do not proceed with any tests if you are not sure the circuit is DEAD!
- 3) Consult the manufacturer of the equipment you are going to test if you are not sure how to test it with a High Voltage Insulation Tester. Some equipment may contain sensitive electronic components which may be damaged during a test by applying a high DC Voltage. Consult the manufacturer for precautions that should be followed to avoid equipment damage.
- 4) This insulation tester will produce a High DC Voltage of 100V DC, 250V DC, 500V DC or 1000V DC in open circuit state. The current

output is limited to less than 2mA DC under full load which may pose a shock hazard to some individuals. Do Not touch the test leads during an Insulation Test. Do Not attempt to stimulate or shock anyone else with this tester. Horse play and fooling around can result in electric shock causing Ventricular Fibrillation.

- 5) Always inspect your meter, test leads and accessories for any sign of damage or abnormality before every use. If any abnormal conditions exist (eg. broken test leads, cracked cases, display not reading, etc.), do not attempt to take any measurements.
- 6) Never ground yourself when taking electrical measurements. Do not touch exposed metal pipes, outlets, fixtures, etc., which might be at ground potential. Keep your body isolated from ground by using dry clothing, rubber shoes, rubber mats, or any approved insulating material.
- 7) To avoid electric shock use CAUTION when working with voltages above 40V DC or 20V AC. Such voltages pose a shock hazard.
- 8) Never exceed the maximum allowable input value of any function on this measuring instrument when taking a measurement.
- 9) Never touch exposed wiring, connections or any live circuit when attempting to take electrical measurements. Treat the circuit as if it is energized (LIVE).
- 10) Do not attempt to operate this instrument in an explosive atmosphere (i.e. in the presence of flammable gases or fumes, vapor or dust).

- 11) When testing for the presence of voltage, make sure the voltage function is operating properly by reading a known voltage in that function before assuming that a zero reading indicates a no-voltage condition. Always test your voltage meter before and after taking measurements on a known live circuit.
- 12) Calibration and repair of any instrument should only be performed by qualified and trained service technicians. Do not attempt calibration or service unless trained and another person, capable of rendering first aid and resuscitation is present.
- 13) Do not install substitute parts or perform any unauthorized modification of the instrument. Return the instrument to your distributor authorized service center for service and repair to insure that safety features are maintained.
- 14) The instrument must be used by a competent, trained person and operated in strict accordance with the instructions. A.W. Sperry will not accept liability for any damage or injury caused by misuse or non-compliance 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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- **Four Functions in One Unit**

Perform the functions of three insulation testers with test voltages of 250V, 500V and 1,000V for Mode 3301 and 100V, 250V and 500V for Model 3302 plus a voltmeter. Permit a wide range of insulation test from low to high voltage circuits.

- **Engineered for Maximum Ease of Operation**

Illumination is provided to facilitate work at night or dimly lit locations. Drip-proof construction protects the instrument when it is used on rainy days. Push switch buttons permit the smooth operation of the instrument.

- **User Oriented Design**

Easy-to-read colour coded scales eliminate reading errors. With the instrument in the carrying case the batteries can be easily removed for replacement by pulling open the lower section of the front panel. Also, the carrying case is so designed as to permit two-hand operation with the strap hung around the neck.

- **Low Power Consumption**

The latest IC's used in the circuitry permits low power consumption. Also, a test probe with a remote control switch is available as a standard accessory.

### 3. Specifications

			MODEL 3301			
			MODEL 3302			
			100V/ 20M $\Omega$	250V/ 50M $\Omega$	500V/ 100M $\Omega$	1,000V/ 2,000M $\Omega$
Measuring Ranges	Insula- tion Resis- tance Tester	Rated Voltage	100V	250V	500V	1,000V
		Rated Resistance	20M $\Omega$	50M $\Omega$	100M $\Omega$	2,000M $\Omega$
		Effective Measuring Ranges	0.02 ~ 20M $\Omega$	0.05 ~ 50M $\Omega$	0.1 ~ 100M $\Omega$	2 ~ 2,000M $\Omega$
		Mid-Scale Value	0.5M $\Omega$	1M $\Omega$	2M $\Omega$	50M $\Omega$
		Primary Effective Measuring Ranges	0.02 ~ 10M $\Omega$	0.05 ~ 20M $\Omega$	0.1 ~ 50M $\Omega$	2 ~ 1,000M $\Omega$
		Secondary Effective Measuring Ranges	Over 10M $\Omega$ up to 20M $\Omega$	Over 20M $\Omega$ up to 50M $\Omega$	Over 50M $\Omega$ up to 100M $\Omega$	Over 1,000M $\Omega$ up to 2,000M $\Omega$
AC Voltmeter		600V				
Accuracy	Insulation Tester	Within $\pm 5\%$ of indicated value (at primary effective measuring ranges)				
		Within $\pm 10\%$ of indicated value (at secondary effective measuring ranges)				
AC Voltmeter		Within $\pm 3\%$ of full scale value				
Withstand Voltage			2,200V AC for one minute between electrical circuit and housing case			
Dimensions			140 (5.51") $\times$ 140 (5.51") $\times$ 90 (3.54") mm LWD			
Weight			Approx. 800 g (28 oz.)			
Batteries			8 $\times$ 1.5 V AA size battery			
Accessories			Test Probe with Remote Control Switch Model TL-59/Carrying Case Model C-59/ Hanging Strap/Case for Test Probe			

#### Overload Protection on Insulation Resistance

Ranges: 600V AC for 30 seconds (1200V AC for 30 seconds on 1000V range only)

#### 4. Layout Diagram

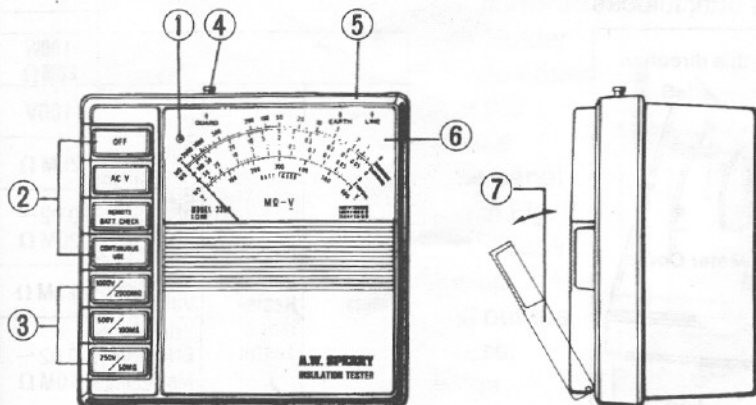


Fig. 1

- ① LED
- ② Function Switch Buttons
- ③ Range Switch Buttons
- ④ Guard Terminal
- ⑤ Probe Socket
- ⑥ Scale Plate
- ⑦ Mirrored Panel

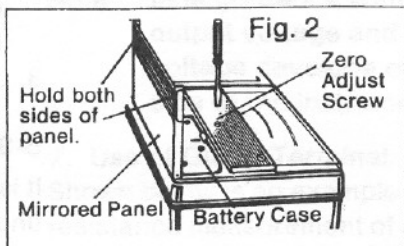
## 5. How to Make Measurements

### 5-1. Preparation for Measurement

#### 1. Mechanical Zero Adjustment

With OFF Switch Button pressed set the meter pointer to "0" mark on the AC V scale.

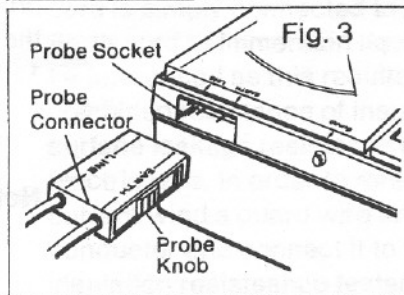
To make this zero adjustment open the mirrored panel and turn the zero adjust screw behind the panel with a screwdriver. The mirrored panel can be lifted up to 90 degrees by holding both sides as shown. (Fig. 2)



#### 2. How to Connect Test Probe

Plug the probe connector into the probe socket as shown in Fig. 3.

"EARTH" and "LINE" marked on the scale should be aligned with those indicated on the probe connector.



**Note** When removing the probe make sure to pull it by pressing the knob. Since a "stopper" is provided within the probe connector it is necessary to press the knob so that the test probe can be pulled out.

## 5-2. AC Voltage Measurement

### **WARNING**

To avoid possible electric shock, instrument damage and/or equipment damage, do not attempt to take any voltage measurements if the voltage is unknown. 600V AC is the maximum voltage that this instrument is designed to measure.

1. Press AC V Function Switch Button.
2. Connect Earth Clip (alligator clip) to one side of the equipment under test and touch the other side with Line Prod.
3. Take the reading on the AC voltmeter scale (black).

## 5-3. DC Voltage Measurement

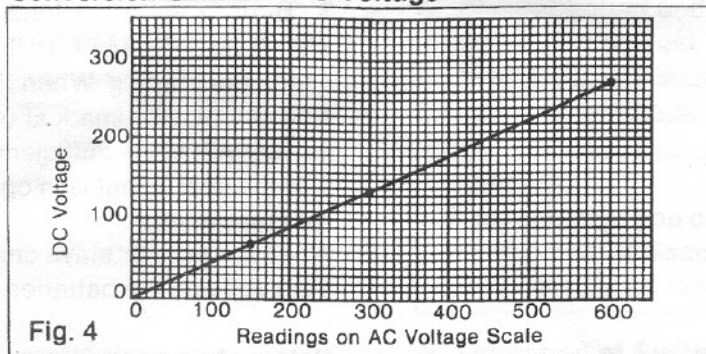
It is possible to measure DC voltage of the equipment under test by using the AC voltmeter. But the procedures outlined below should be followed due to the presence of polarity.

1. Connect Earth Clip (alligator clip) to plus (+) side of the equipment under test and touch minus (—) side with Line Prod.

**Note** There will be no indication when polarity is reversed. When polarity is unknown make measurements twice in an opposite way.

2. Take the reading on the AC voltmeter scale. However, pointer deflection is greater in DC voltage measurement than in AC voltage measurement. The true voltage value is about 0.45 times the reading on the AC voltmeter. Use the conversion chart (Fig. 4).

## Conversion Chart for DC Voltage



### 5-4. Insulation Resistance Measurement

#### 1. Selection of Measuring Range

Press a Range Switch Button desired.

#### 2. Check of Mechanical Zero Position

With OFF Switch Button pressed make sure that the pointer is set at  $\infty$  mark on the  $M\Omega$  scale to be used. If the pointer is off this position make the mechanical zero adjustment as outlined in section 5-1.

**Note** The scales are color coded according to each measuring range. The colors of the scales correspond to those of volt and  $M\Omega$  ranges indicated on the Range Switch Button as follows:

AC V — Black, 1,000V/2,000 $M\Omega$  &  
100V/20 $M\Omega$  — Blue, 500V/100 $M\Omega$  — Red,  
250/50 $M\Omega$  — Green

### 3. Battery Voltage Check

With REMOTE/BATT. CHECK Switch Button pressed check the reading. When the pointer stays on the right side of **GOOD** mark at the middle of the scale, battery voltage is sufficient (LED lights up indicating that the instrument is in operation for M  $\Omega$  measurement).

When the pointer stays on the left side of **GOOD** mark replace the batteries.

**Note** As power consumption becomes the largest when REMOTE/BATT. CHECK Switch Button is pressed make the battery voltage check quickly.

Power consumption differs with each of the three ranges provided. The battery check circuits are designed to check the battery voltage on each range. Power consumption is the largest on 500V/100M  $\Omega$  range (Model 3301, 3302), followed by 250V/50M  $\Omega$  and 1,000V/2,000M  $\Omega$  ranges (Model 3301) and 250V/50M  $\Omega$  and 100V/20M  $\Omega$  ranges (Model 3302). Even when the battery voltage is insufficient at a certain range, the instrument may be operated at other ranges where power consumption is less. Check the battery voltage on each range so that the batteries can be used most effectively. Battery voltage has nothing to do with the AC voltage measurement.

#### **4. Disconnection and Check of Power Source of Circuit under Test**

Turn off the power source of the circuit under test and connect the test leads to it.

##### **WARNING**

Make sure that you can visually see that the circuit or equipment is disconnected before proceeding with an insulation test.

#### **5. Operation of Switches**

##### **WARNING**

To avoid possible electric shock, instrument damage and/or damage to the equipment under test, insulation tests are to be performed on de-energized (DEAD) circuits and equipment only. Do not perform tests on energized (LIVE) circuits!

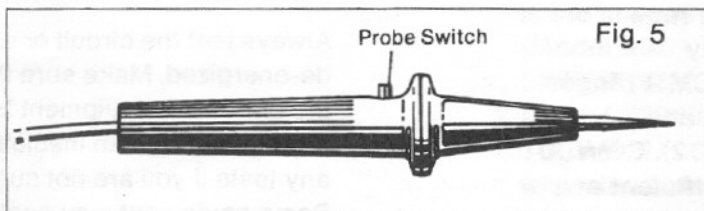
Always test the circuit or equipment to insure it is de-energized. Make sure that you can visually see that the circuits or equipment is disconnected before proceeding with an insulation test. Do not proceed with any tests if you are not sure the circuit is DEAD! Some equipment may contain sensitive electronic components which may be damaged during an insulation test when applying a HIGH DC Voltage. Consult the manufacturer of the equipment under test for precautions that should be followed to avoid equipment damage.

**Note** Using the AC voltage range, make sure that AC voltage or DC voltage is not applied to the circuit under test before insulation resistance measurements.

The instrument permits  $M\Omega$  measurement by operating a remote control switch provided on the probe. For continuous  $M\Omega$  measurement press "Continuous Use" Button.

- **Remote Control Measurement**

For remote control  $M\Omega$  measurement press REMOTE/BATT. CHECK Button and all the function switches will come up. Then, the power supply can be turned on or off by the probe switch, which you will find most convenient for an ordinary measurement need. Always press the "OFF" switch button after insulation tests in order to avoid possible electric shock through contact with the probe tip when the remote control switch is accidentally pressed.



- **Continuous Measurement**

Press Continuous Use Function Switch Button and the power supply will be left on whether the probe switch is on or off. This method is recommended especially where continuous checks are made at various places. After measurements keep OFF Switch Button pressed and the power supply will remain off regardless of the state of the probe switch.

## **6. Remote Control Measurement as Standard Measurement Method**

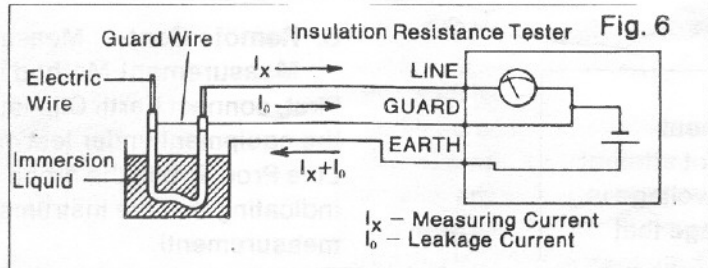
First, connect Earth Clip (alligator clip) to one side of the equipment under test and touch other side with Line Prod. Press the probe switch (LED lights up indicating that the instrument in operation for M  $\Omega$  measurement).

Read the resistance on the scale for which the range is set.

**Note** In accordance with JIS C-1302 plus (+) DC output voltage and minus (—) DC output voltage develop on Earth side and Line side of the instrument respectively.

## **7. Use of Guard Terminal**

Shown below is an example of the insulation resistance measurement of an electric wire. If Line cord is simply connected to the wire conductor and Earth cord to immersion liquid, measurement errors will be introduced as this results in the measurement of the combined resistance of insulation resistance and the surface leakage resistance at the cut end of the electric wire. In order to remove this surface leakage current wind a guard wire around the cut end of the conductor and connect it to the Guard terminal of the insulation resistance tester. Then, the surface leakage current will bypass the indicating meter of the insulation resistance tester. This will permit the correct measurement of the insulation resistance of the conductor.

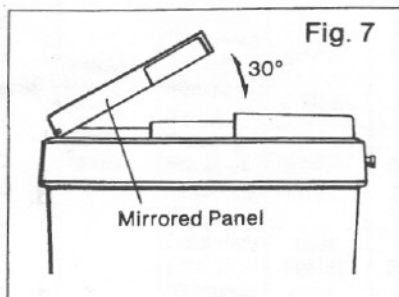


## 6. Illumination

### 6-1. How to Use Illumination

Illumination is provided to facilitate work at night or dimly lit locations. The light goes on when the mirrored panel is raised about 30 degrees up to the lock position by holding both sides as shown in Fig. 7.

The light will go off when the mirrored panel gets out of the lock position by  $\pm 10$  degrees. Make sure to close the mirrored panel when it is not in use.



### 6-2. Lamp Replacement

With the mirrored panel raised up to 90 degrees remove the lamp by turning it counter-clockwise. Use the subminiature lamp rated at 12V, 50mA or equivalent.

## 7. Battery Replacement

1. Raise the mirrored panel by 90 degrees until it locks.

2. Push the "Holder" pressing the upper section of the battery case toward the panel as shown in Fig. 8. The battery case will come up. Then, pull out the battery case.

3. Remove the battery hook on the bottom of the battery case.

4. Empty the battery case and install new batteries.

5. Eight pieces of 1.5V AA size battery are used. Install them according to the markings on the battery case.

6. Fit in the battery hook with polarity in correct position and push back the battery case until it catches the holder. Then, close the mirrored panel.

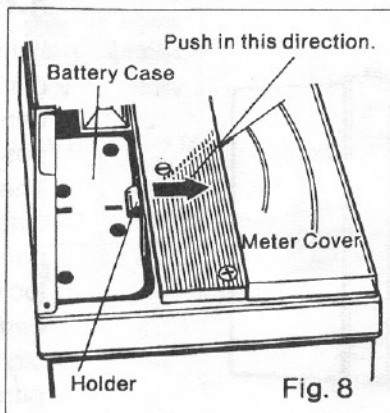
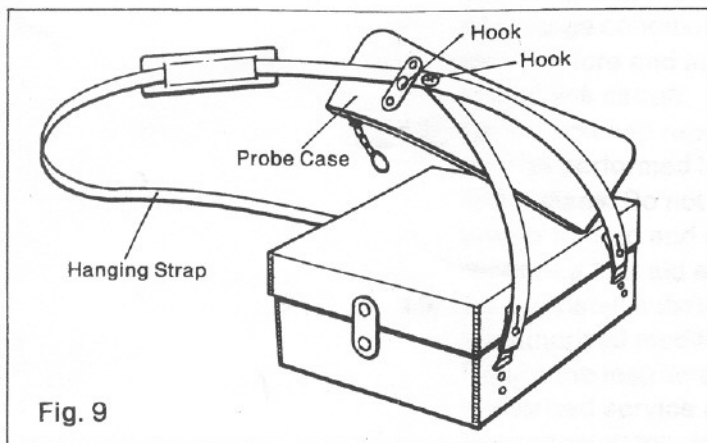


Fig. 8

## 8. How to Attach Hanging Strap



The hanging strap should be attached as shown in Fig. 9. Use the instrument with the hook of the probe case fitted into the hook on the parting section of the hanging strap.