OPERATING INSTRUCTIONS

ELECTRO-PROBE ®

Model DM-6593A
Digital Multimeter

A.W. SPERRY INSTRUMENTS INC.

245 MARCUS BLVD.,HAUPPAUGE, N.Y. 11788
800-645-5398 (N.Y. and Alaska call 516-231-7050)
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WARRANTY

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, provided 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 INCIDENTIAL 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 OR BUYER. SOME STATES ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU. THIS WARRANTY GIVE YOU SPECIFIED LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.

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 distributor, model number and date of purchase.

Sec. 1 INTRODUCTION

Congratulations on your purchase of an AWS ELECTRO-PROBE® Digital Multimeter.

The ELECTRO-PROBE® is one of the smallest and most convenient-to-use of all hand-held digital multimeters. its unique styling and design make the ELECTRO-PROBE® ideal for taking readings in cramped or hard-to-reach areas. Having the meter probing right into the work area eliminates the need to keep looking away from your work to observe the meter reading.

The ELECTRO-PROBE® is designed for easy operation. All controls are laid out to enable simple, fingertip operation. Non-skid ribs provide positive grip control to prevent instrument sliding. Additional features include autoranging, an audible and visual continuity range and a unique Probe Tip which can easily be replaced or interchanged with the enclosed extra-long Probe Tip.

Electronic overload protection against accidental application of voltage to resistance and continuity circuits and rugged construction make the ELECTRO-PROBE® a durable and reliable instrument. With proper care, it will provide you with many years of service.

Sec. 2 FEATURES

- High accuracy.
- Easy-to-read, large, digital display.
- Low cost.
- Instant continuity buzzer.
- Small size, light weight.
- One-hand operation.
- Autoranging.
- Overload protection on all ranges.
- Data-hold switch freezes readings.
- Interchangeable probe tip.

Sec. 3 SPECIFICATIONS

Display:	3.5 digit LCD, 0.31" numerals, maximum reading 1999 with automatic sign and function annunciators.
Range Selection:	Autoranging.
Overrange Indication:	"1" most significant digit blinks.
Sampling Rate:	2 times per second.
Operating Environment:	0° to 40° C (32° to 104° F) at < 80% relative humidity.
Storage Environment:	–25° to 70° C (–13° to 158° F) at < 70% relative humidity.
Power Source:	Two (2) 1.5V button-type batteries, AWS Part #B-6 (IEC #LR-44, NEDA #1166A).
Power Consumption:	3mW typical.
Battery Life:	100 hours typical with LR-44.
Battery Indicator:	" B " symbol appears in display to indicate low battery voltage.
Dimensions:	6.3"L x 1.2"W x 0.8"D (160 x 30 x 20mm).
Weight:	2.29 oz. (65 g).

*NOTE: It is recommended that the DM-6593A should not be used on circuits above 700Vac measured to earth ground to avoid possible electric shock, instrument damage and damage to

RANGES:

DC VOLTS

Range	Resolution	Accuracy (18° - 28° C)	Input Impedence
200mV	0.1mV	0.5% rdg ± 2 dgt	100MΩ
2V	0.001V	0.7% rdg ± 2 dgt	11MΩ
20V	0.01V	"	10MΩ
200V	0.1V	"	"
500V	1V	"	"

Overload Protection: 700Vdc or peak ac for 1 min., all ranges

AC VOLTS (Average responding calibrated in rms of a sinewave, 40Hz to 500Hz)

Range	Resolution	Accuracy (18° - 28° C)	Input Impedence
2V	0.001V	1.0% rdg ± 8 dgt	11MΩ
20V	0.01V	"	10MΩ
200V	0.1V	"	"
500V	1V	"	"

Overload Protection: 700 Vdc or peak ac for 1 min., all ranges

RESISTANCE

Range	Resolution	Accuracy (18° - 28° C)	Test Current
200Ω	0.1Ω	0.7% rdg ± 3 dgt	0.7mA
2KΩ	1Ω	0.7% rdg ± 2 dgt	0.1mA
20KΩ	0.01KΩ	"	30μA
200KΩ	0.1KΩ	"	4μA
2000KΩ	1KΩ	1.0% rdg ± 2 dgt	0.4μA
20MΩ	0.01MΩ	2.0% rdg ± 4 dgt	40ηA

Overload Protection: 250Vac/dc for 1 min dc or ac peak.

CONTINUITY

Indication: Buzzer sounds at less than approx. 450Ω
Response time: less than 50 m sec.
Open circuit voltage: approx. 1.5Vdc
Overload protection: 250Vac/dc for 1 minute

All specifications are subject to change without notice.

CONTROLS AND INDICATORS

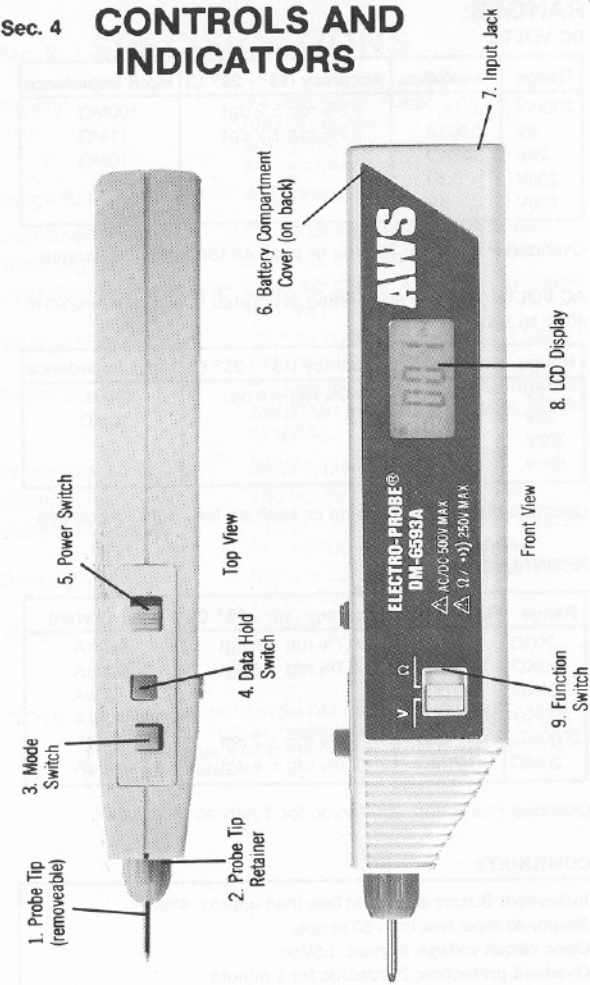


Fig. 1 DM-6593A Controls and Indicators

1. Probe Tip - Positive input to ELECTRO-PROBE®. Performs the same function as test lead prod tip.
2. Probe Tip Retainer - Unscrew to interchange or replace Probe Tips.
3. Data Hold Switch - Freezes reading on LCD Display when depressed. Depress a second time to release.
4. Mode Switch - Switches between AC and DC or Ω and •))) when depressed.
5. Power Switch - Slide switch used to turn the ELECTRO-PROBE® on and off.
6. Battery Compartment Cover - Remove for access to batteries.
7. Input Jack - Negative input to ELECTRO-PROBE®. Insert Test Lead for voltage, resistance and continuity measurements.
8. LCD Display - A 3 1/2 digit display (maximum reading 1999) indicates measured values, and displays symbols indicating low battery, continuity and overrange.
9. Function Switch - Two-position slide-switch used to select voltage, resistance and continuity functions.

Sec. 5 PREPARATION FOR USE

Sec. 5-1 Unpacking and Contents Check

The DM-6593A comes complete and ready to use. Check the following contents list when unpacking. If any pieces are missing, notify the distributor from whom you purchased the instrument or A.W. Sperry Instruments Inc.

- ELECTRO-PROBE® Meter
- Test lead (AWS Part TL-49).
- Push-on alligator clip (AWS Part AG-940).
- Two 1.5V batteries, installed (AWS Part B-6).
- Probe Tip, installed (AWS Part TIP-1).
- Probe Tip, long, insulated (AWS Part TIP-2).
- Carrying case (AWS Part C-49).
- Operating Instructions Form #167-2.

Sec. 5-2 Pre-Operation Procedures

Every AWS ELECTRO-PROBE® is fully inspected, tested and calibrated prior to shipment. Before each operation, the following procedure should be performed to insure the safe and trouble-free operation of this instrument.

1. Inspect the instrument, test leads and accessories to be used for any signs of damage, including excessive dirt and/or grease contamination. If any abnormal conditions exist, do not attempt to take any measurements. Refer to Sections 7 (Maintenance) and 8 (Return for Repairs).
2. Set the Power Switch to ON and the Function Switch to V. Insert the test lead into the Input Jack and short the prod tip of the test lead to the Probe Tip on the DM-6593A. The display should read 00.0mV ± 2 digits.
3. Depress the Mode Switch. AC should appear on the display.
4. Set the Function Switch to Ω. Short the prod tip of the test lead to the Probe Tip on the ELECTRO-PROBE®. The display should read 00.0 ± 2 digits.
5. Depress the Mode Switch. Short the prod tip of the test lead to the Probe Tip on the ELECTRO-PROBE®. The buzzer should sound and the •)) symbol should appear on the display.

   NOTE: Ignore the display readings that appear when the test leads are separated.

Sec. 5-3 Changing Probe Tips

The DM-6593A is supplied with an extra long, insulated Probe Tip (AWS Part TIP-2) which can be used to probe into hard-to-reach areas. To install the TIP-2:

1. Unscrew Probe Tip Retainer and remove TIP-1 installed on instrument.
2. Insert the threaded end of the TIP-2 into the Probe Tip Retainer and tighten.

Sec. 6 OPERATION

Before taking any measurements, read Section 6-1, Safety Precautions. Always examine the instrument and accessories to be used with the instrument for damage, contamination (excessive dirt, grease, etc.) and defects. Examine the test lead for cracked or frayed insulation and

make sure the lead plug fits snugly into the instrument jack. If any abnormal conditions exist, do not attempt to take any measurements.

Sec. 6-1 Safety Precautions

The following safety precautions must be observed to insure the maximum personal safety during operation, service and repair of this instrument:

1. Read these operating instructions thoroughly and completely before operating your ELECTRO-PROBE®. Pay particular attention to **WARNINGS,** which will inform you of potentially dangerous procedures. The instructions in these warnings must be followed.
2. Always inspect your ELECTRO-PROBE®, test leads and accessories for any sign of damage or abnormality before every use. If any abnormal conditions do exist, do not attempt to take any measurements. Refer to Section 8, (Return for Repairs).
3. Do not operate this instrument in an explosive atmosphere (i.e., in the presence of flammable gases or fumes, vapor or dust).
4. Never take any measurement if the value of that function is possibly greater than the maximum allowable input in that function of the ELECTRO-PROBE®. Refer to the chart on page 7 for maximum inputs.
5. Never ground yourself when taking electrical measurements. Keep your body isolated from ground by using dry clothing, rubber shoes, rubber mats or any approved insulating material.
6. Never touch exposed wiring, connections or any live circuit when attempting to take measurements.
7. Calibration and repair should be performed by qualified maintenance personnel.
8. Do not attempt calibration or service unless another person, capable of rendering first aid and resuscitation is present.
9. Do not install substitute parts or perform any unauthorized modification of the instrument. Return the instrument to A.W. Sperry Instruments for service and repair to insure that safety features are maintained.

Sec. 6-2 Voltage Measurements

1. Set the Function Switch to V.
2. Set the Power Switch to ON. The letter mV will appear at the right side of the display indicating the voltage function.
3. Insert the Test Lead into the Input Jack.

> **WARNING**
>
> To avoid possible electric shock, instrument damage and/or equipment damage, do not attempt to take any measurements if the voltage is above 500Vac/dc or if the voltage is unknown. 500Vac/dc is the maximum voltage that this instrument is designed to measure. The Input Jack potential should not exceed 700Vac/dc measured to ground.

4. Apply the Test Lead and Probe Tip to the two points where a voltage reading is to be taken. If the Probe tip is negative with respect to the Input Jack, a "-" sign will appear on the display. Depress the Mode Switch for AC voltage measurements. AC will appear on the display.

   NOTE: For maximum safety, slide the AG-940 push-on alligator clip over the prod tip of the test lead and connect the clip to one point in the circuit. This will allow readings to be taken without having to use both hands.

5. The meter will automatically select the proper range for the reading being taken.
6. Remove the Probe Tip and Test Lead from the points of voltage measurement and then remove the Test Lead from the instrument.

Sec. 6-3 Resistance Measurements

1. Set the Function Switch to Ω .
2. Turn on the Power Switch. The MΩ symbols should appear on the display.
3. Insert the Test Lead into the Input Jack.

WARNING

All resistance measurements should be made on de-energized circuits only to insure safe and accurate measurements. Protection is provided up to 250Vac/dc, but readings will not be accurate.

To avoid possible electric shock, instrument damage and/or equipment damage, do not connect the Input Jacks to circuits having a potential difference exceeding 250Vac/dc. Do not connect the Input Jack to potentials exceeding 700Vac/dc to ground.

4. Connect the Test Lead and Probe Tip together to obtain a zero reading on the display. If the display does not zero, then subtract this number from subsequent resistance readings. This number represents the test lead resistance.

5. Completely de-energize the circuit or device in which the resistance is to be measured. Connect the Probe Tip and Test Lead to the device. The Probe Tip is positive with respect to the Test Lead.

6. The meter will automatically select the proper range for the reading being taken.

NOTE: A reading of "1"000 indicates an overrange condition. This will occur with the test leads open on all resistance ranges.

Sec. 6-4 Continuity Checks

1. Set the Function Switch to the Ω position.

2. Set the Power Switch to ON. Depress the Mode Switch. The •)) symbol will appear on the display.

3. Insert the Test Lead into the Input Jack.

WARNING

All continuity checks should be made on de-energized circuits only to insure safe and accurate measurements. Protection is provided up to 250Vac/dc, but readings will not be accurate.

To avoid possible electric shock, instrument damage and/or equipment damage, do not connect the Input Jacks to circuits having a potential difference exceeding 250Vac/dc. Do not connect the Input Jack to potentials exceeding 700Vac/dc to ground.

4. Connect the Test Lead and the Probe Tip to the two points at which continuity is to be tested. The buzzer will sound when the resistance is less than approximately 450Ω. Continuity measurements are taken on the 2KΩ resistance range and resistance readings are displayed along with the audible continuity indication.

Sec. 7 MAINTENANCE

Maintenance consists of periodic cleaning, battery replacement and re-calibration.

Sec. 7-1 Cleaning

CAUTION

Do not use aromatic hydrocarbons or chlorinated solvents for cleaning. These chemicals will react with the plastics which are used in the cases.

The exterior of the instrument can be cleaned with a soft, clean cloth to remove any oil, grease and grime from the surface. Never use liquid solvents or detergents. If the instrument sets wet for any reason, dry it using low-pressure air less than 25 PSI. Use care and caution around the LCD display protector and areas where air could enter the interior of the instrument while drying.

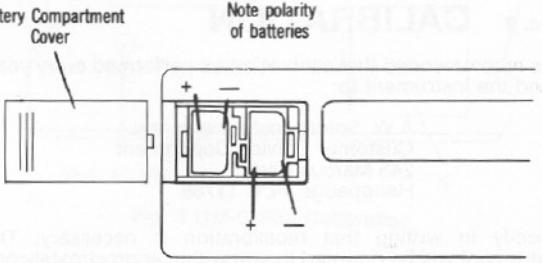
Sec. 7-2 Battery Replacement

Power is supplied to the ELECTRO-PROBE® by two button-type batteries (NEDA 1166A, AWS Part B-6). "B" appears on the LCD display when replacement is needed.

WARNING

Before attempting to replace the battery, first disconnect the test lead from any energized circuit, then disconnect the test lead from the instrument.

1. Disconnect the test lead from any energized circuit and then from the instrument.
2. Turn the Power Switch to the OFF position.
3. Slide off the Battery Compartment Cover (see Fig. 2).
4. Remove the batteries from the compartment.
5. Replace the batteries with two 1.5V button-type batteries (NEDA 1166A, AWS Part B-6).
6. Replace the Battery Compartment Cover.



CAUTION

Batteries must be installed with the correct polarity for the DM-6593A to operate correctly.

Fig. 2 Battery Replacement

Sec. 8 RETURN FOR REPAIRS

Should your ELECTRO-PROBE® malfunction, be sure that the failure to operate is not due to the following:

1. Weak or incorrectly installed batteries.
2. Open test lead.
3. Data-hold switch depressed.

If these conditions do not exist and the instrument fails to operate properly, return the instrument and accessories prepaid to:

A.W. Sperry Instruments Inc.
Customer Service Department
245 Marcus Blvd.
Hauppauge, N.Y. 11788

State, in writing, what is wrong with the instrument. All warranty returns must include 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. See warranty statement on page 4 for a full warranty disclosure. Repair estimates will be furnished if requested for out of warranty instruments. Be sure to include all accessories which may be related to the product problem.

Sec. 9 CALIBRATION

It is recommended that calibration be performed every year. Send the instrument to:

A.W. Sperry Instruments Inc.
Customer Service Department
245 Marcus Blvd.
Hauppauge, N.Y. 11788

Specify in writing that recalibration is necessary. The instrument will be returned to you within approximately one week.

Calibration procedure:

> **CAUTION**
>
> The following procedure should be performed by persons trained and qualified in electronics equipment service. Do not attempt this procedure if not qualified.

This procedure should be performed at an ambient temperature of 23° ± 1°C and a relative humidity of less than 70%. Allow the instrument to stabilize at this temperature for at least 30 minutes.

1. Remove Probe Tip by unscrewing Probe Tip Retainer.
2. Remove back case screw. Lift off front case. Carefully remove PCB from case.
3. Set the Power Switch to the ON position. Set the Function Switch to V.
4. Connect the output of a calibrator to the DM-6593A and set the calibrator to 190.0mVdc ± 0.1%. Adjust VR-1 until 190.0mV is displayed on the DM-6593A (See Fig. 3).

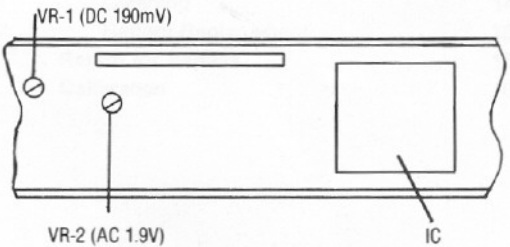


Fig. 3 DM-6593A Calibration

5. Set the Mode Switch for AC voltage. Set the calibrator to 1.90Vac ± 0.1%. Adjust VR-2 until 1.900V is displayed on the DM-6593A.