T.O. No. 33A1-12-238-1

VOLT-OHM-MICROAMMETER

MODEL 269AF

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SIMPSON ELECTRIC COMPANY

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FIGURE 1. SIMPSON VOLT-OHM-MICROAMMETER MODEL 269AF

SECTION 1

GENERAL DESCRIPTION

INTRODUCTION

The Simpson Volt-Ohm-Microammeter, Model 269AF is a rugged accurate, compact, easy to operate, instrument which may be used for measuring electrical characteristics of circuits and circuit components. It indicates quantity measurements for DC and AC voltages, Direct Currents, Resistances, Decibels, and Audio Frequency Output voltages.

The Simpson Model 269AF features a large 7 inch meter for optimum readability and resolution. The extremely high sensitivity of the basic meter (10 microamperes) provides a completely portable instrument with measurement characteristics exceeding those of many popular vacuum tube voltmeters. No external power is required for the operation of the instrument; internal batteries are used to furnish the power for resistance measurements.

The instrument is housed in a medium impact Phenolic case. It is molded with reinforced walls for maximum durability. All of the component parts in the tester are attached to the front panel, the entire instrument slips into and out of the case in one piece.

Conforming to the latest engineering developments most of the component parts are mounted on a printed circuit board. This simplifies assembly, reduces maintenance, and extends the useful life of the instrument.

The Adjust-A-Vue handle is attached on each side of the instrument case. The handle may be used to support the instrument in a convenient sloping position for easy viewing on the bench top. Of course, the tester can also be placed in either a vertical or a horizontal position.

OVERLOAD PROTECTION

Your Model 269AF has been designed to minimize the possibility of accidental damage due to overloads. Specially produced diodes protect the movement from burnout or mechanical damage such as bent pointer even with 1000 times the normal current applied.

In addition a fuse is provided to help protect the circuitry of your Model 269AF from damage due to overloads. This protective combination will prevent serious damage to your Model 269AF in most cases of accidental misuse. However, no overload protection system is completely foolproof, and misapplication on high voltage circuits can damage any VOM protected or not. Care and caution should always be exercised to protect both you and your Model 269AF.

ACCESSORIES FURNISHED

Each instrument is supplied with an operator's manual, a pair of test leads with removable alligator clips, and a 4000 volt D.C. probe extension. The red and black test leads have probe tips which are threaded near the base. The alligator clips may be screwed on or off either test lead to provide either a probe or a clip for the operator's convenience. The 4000 volt D.C. probe extension is intended to screw on over the tip of the red test lead for measuring high positive voltage or over the tip of the black test lead for measuring high negative voltage.

ACCESSORIES AVAILABLE

HIGH VOLTAGE PROBES

16 KV D.C.	Simpson Part No. 0119
40 KV D.C.	Simpson Part No. 0120

SPECIFICATIONS

RANGES

D.C. Voltage (100,000 ohms per volt)

0-1.6 volts	*0-160 volts*	*0-1600 volts*
0-8 volts	*0-400 volts*	*0-4000 volts*
0-40 volts	*0-800 volts*	

A.C. Voltage 5000 ohms per volt

0-3 volts	*0-160 volts*
0-8 volts	*0-400 volts*
0-40 volts	*0-800 volts*

A.F. Output Voltage
(with 0.1 MFD Internal Series Capacitor)
0-3 volts
0-8 volts
0-40 volts
0-160 volts

Volume Level In Decibels
(Calibrated for use across a 600 ohm Line)
-1 to +11 D.B.
-3.5 to +19.5 D.B.
+10.5 to +33.5 D.B.
+22.5 to +45.5 D.B.

D.C. Resistance

0-2000 ohms	(12 ohms center)
0-20,000 ohms	(120 ohms center)
0-200,000 ohms	(1200 ohms center)
0-2 Megohms	(12,000 ohms center)
0-20 Megohms	(120,000 ohms center)
0-200 Megohms	(1.2 Megohms center)

Direct Current
(215 Millivolt Drop, Maximum)

0-16 Microamperes
0-160 Microamperes
0-1.6 Milliamperes
0-16 Milliamperes
0-160 Milliamperes
0-1.6 Amperes
0-8 Amperes

Accuracy

D.C. Volts up to 1600 V	±2% of full scale
D.C. Volts 0-4000 (with external multiplier)	±4% of full scale
D.C. Current	±2% of full scale
A.C. Volts	±3% of full scale
Resistance Ranges	±3° of linear arc

OVERALL DIMENSIONS 6" x 7¼" x 3¼"

WEIGHT 3¼ lbs.

FREQUENCY RESPONSE (Nominal)

A.C. Voltage Measurements

The frequency response of the A.C. Ranges is essentially flat over the wide range of 40 cycles per second to 500,000 cycles per second.

Output Voltage Measurements

The frequency response of the output ranges are essentially the same as the A.C. voltage ranges except that a small error is introduced at the lower frequency end of the lower ranges due to the capacitive reactance of the series capacitor at these frequencies.

CONTROLS AND CONNECTORS

FUNCTION AND RANGE SWITCH

The control for the function and range switch is located in the lower right corner of the front panel. The function and range indicator is located in the meter dial area, and is driven by a chain linkage from this control. The switch shaft is connected directly to the indicator, so there is no chance that any difference will ever occur between the indicator reading and the actual function and range for which the instrument is set. The switch may be turned in either direction to obtain any of the 24 positions desired for a specific application.

ZERO OHMS CONTROL

The control located at the lower left on the front panel is the ZERO OHMS control. This is used to obtain a zero indication for the ohmmeter when the test leads are shorted together. During operation, the zero indication is checked each time the ohmmeter is to be used; this counteracts the effect of aging of the internal batteries and permits them to be used for a longer period of time.

CIRCUIT JACKS

There are six circuit jacks on the Model 269AF. Three are on the left side of the case, and the other three are on the right side of the case.

The three jacks on the right are legended COM. -, + and +8 AMP. The COM.- jack is used for all ranges and functions. The + jack is used in conjunction with the COM.- jack for all ranges and functions with the exception of the +8 AMP, 800 V. A.C., 1600 V. D.C. and Output ranges. The +8 AMP jack is used in conjunction with the COM.- jack for 0-8 AMP D.C. current measurements.

The legending of the three jacks on the left are OUTPUT, 1600 V.D.C. and 800 V.A.C.

The OUTPUT jack connects a 0.1 uf capacitor in series with the AC volt ranges to provide DC isolation as required in some output voltage measurements.

The 1600 V.D.C. jack is used to extend the 800 V.D.C. range to 1600 V.D.C. and the 800 V.A.C. jack is used to extend the 0-400 V.A.C. range to 800 V.A.C.

Whenever polarity is involved, as for DC voltage and current measurements, the black lead, connected to the COM.-jack, is used for negative polarity and the red lead is used for positive polarity. For AC and OUTPUT voltage measurements, polarity is not identified. For resistance measurements, positive polarity is applied through the + jack to the resistance being measured, and negative polarity is applied through the COM. - jack.

SECTION II

OPERATING INSTRUCTIONS

CAUTION

When making voltage or current measurements, as a safety precaution, form the habit of turning off all power to the circuit under test and discharging all capacitors. Connect the test leads at the desired points in the circuit. Then turn on the power while taking the readings. Turn off the power and discharge all capacitors before disconnecting test leads from the circuit.

SHOCK HAZARD

Shock Hazard (as defined in Underwriters Laboratories Radios and Television Receiving Appliances Standards for Safety, Eleventh Edition, dated November, 1964.)

"A shock hazard is considered to exist at any part involving a potential of between 30 volts and 40 kilovolts peak in the following cases:

A. If the current through a load of not less than 500 ohms exceeds 300 milliamperes after 0.0003 seconds.
B. If the current through a load of not less than 500 ohms exceeds 5 milliamperes after 0.2 seconds.
C. If the time required for the current through a load of not less than 500 ohms to decrease to 5 milliamperes is between 0.1 and 0.2 seconds, and the total quantity of electricity passed through the load up to that time exceeds 4 millicoulombs.
D. If the time required for the current through a load of not less than 500 ohms to decrease to 5 milliamperes is between 0.03 and 0.1 seconds, and the total quantity of electricity passed through the load up to that time exceeds $75T\ 350T^2$ millicoulombs, where T is time in seconds.
E. If the potential is more than 5 kilovolts peak and if the total capacitance of the circuits is more than 3000 micromicrofarads."

INITIAL ADJUSTMENTS

POSITION THE INSTRUMENT

Place the instrument in its operating position. It may be positioned vertically or horizontally or the Adjust-A-Vue handle may be used as a support to position the instrument at a convenient angle. The most accurate measurements will always be obtained when the instrument is positioned horizontally because the meter pivots have the least bearing friction when the meter is in this position.

ZERO DEFLECTION

Before making any measurements with the Simpson Volt-Ohm-Microammeter Model 269AE, check to see that the pointer indicates zero when the meter is in its operating position. If the pointer is off zero, turn the screw located in the case below the center of the meter scale to correct the pointer position. Use a small screwdriver to turn this screw slowly either clockwise or counterclockwise until the pointer is exactly over the zero mark at the left side of the scale.

MEASURING D.C. VOLTAGES 0-800 VOLTS

1. Connect the black test lead into the COM.-jack and the red test lead into the + jack.
2. Set the range switch for any one of the six V.D.C. positions. These are marked 1.6 VDC, 8 VDC, 40 VDC, 160 VDC, 400 VDC, 800 VDC. WHEN IN DOUBT AS TO WHICH RANGE SHOULD BE USED, ALWAYS USE THE HIGHEST VOLTAGE RANGE FIRST AS A PROTECTION TO THE INSTRUMENT.
3. Connect the black test lead to the negative side of the circuit to be measured, and the red test lead to the positive side of the circuit.
4. Turn the power on in the circuit to be tested; if the pointer deflects to the left of the zero, the actual circuit polarity is the reverse of the anticipated polarity; turn the power off in the circuit, reverse the test lead connections, and turn power on again. This will apply the correct polarity to the meter.
5. Read the voltage on the black arc marked D.C. which is second from the top arc of the dial. If the voltage is within a lower range, the switch may then be set for a lower range to obtain a more accurate reading.

   For the 1.6 volt range, read the 0-160 scale and divide the reading by 100.

   For the 8, 40, 160 volt ranges, read the corresponding scale directly.

   For the 400 volt range, read the 0-40 scale and multiply the reading by 10.

   For the 800 volt range, read the 0-8 scale and multiply the reading by 100.

6. Turn the power off in the circuit which is being measured and discharge all capacitors before disconnecting the test leads.

MEASURING DC VOLTAGES, 0-1600 VOLT RANGE ONLY

CAUTION

Be extremely careful when working in high voltage circuits. Never touch the meter or the test leads while power is on the circuit being measured.

1. Set the range switch at 1600 VDC (the same switch position as for the 800 VDC range).
2. Connect the black test lead to the COM.-jack, and the red test lead in the 1600 VDC jack.
3. Be sure the power is off in the circuit to be measured and discharge all capacitors. Then connect the black test lead to the negative side of the circuit and the red test lead to the positive side of the circuit.
4. Turn power on for the circuit. Do not touch the meter or the test leads. If the pointer deflects to the left side of zero, the actual circuit polarity is the reverse of the anticipated polarity; turn power off in the circuit, discharge the capacitors, reverse the test leads, and turn power on again. This will apply the correct polarity to the meter.

5. Read the voltage, using the 0-160 scale on the black arc which is second from the top on the dial. Multiply the reading by 10.

6. Turn power off and discharge all capacitors before removing the test leads.

D.C. VOLTAGE MEASUREMENTS FROM 1600 TO 4000 VOLTS

CAUTION

Use extreme care when checking high voltage. Always turn off the power before making meter connections, and do not touch the meter or the test leads while taking the measurements. Turn off the power before disconnecting the meter leads.

1. Rotate the Range Selector Switch so the range pointer reads 800-1600 VDC.

2. Plug the black test lead into the jack marked COM.- and the red test lead into the jack marked 1600 VDC.

3. Screw the high voltage probe extension over the red test probe, if a high positive voltage is to be measured, or over the black test probe, if a high negative voltage is to be measured.

4. Be sure the power is turned off in the circuit to be measured and that all its capacitors have been discharged. Screw the alligator clips over the ends of the test probes. Connect the black probe to the negative side and the red probe to the positive side of the voltage which is to be measured.

5. Turn the power on. Do not touch the meter or the leads.

6. Read the voltage, using the 0-40 figures and the black arc marked "DC" which is second from the top of the dial. Multiply the reading by 100.

7. Turn power off and discharge all capacitors before removing the test leads.

NOTE

To measure higher D.C. Voltages see page 27 on High Voltage Testing.

MEASURING AC VOLTAGES, 0-400 VOLTS

CAUTION

Be extremely careful when working in high voltage circuits. Never touch the meter or test leads while power is on in the circuit being measured, particularly in power type circuits with voltages greater than 250 volts and current capabilities greater than 25 amperes. Discharge all capacitors before connecting or disconnecting test leads.

The Simpson Volt-Ohm-Microammeter Model 269AF rectifier circuit responds to the average value of the AC voltage being applied. The meter dial, however, is calibrated in terms of the RMS sine wave measurements.

1. Connect the black test lead in the COM.- jack, and the red test lead in the + jack.

2. Set the range switch for any of the five VAC range positions, these are marked 3 VAC, 8 VAC, 40 VAC, 160 VAC, and 400 VAC. WHEN IN DOUBT AS TO WHICH RANGE SHOULD BE USED, ALWAYS USE THE HIGHEST VOLTAGE RANGE FIRST AS A PROTECTION TO THE INSTRUMENT.

3. Be sure power is turned off in the circuit to be measured, and connect the test leads across the voltage to be measured.

4. Turn power on in the circuit to be tested.
If the voltage is within a lower range, the switch may be set for the lower range to obtain a more accurate reading.

   For the 0-3 VAC range, read the value directly on the red arc marked 3 VAC ONLY.

   For the 8 VAC, 40 VAC, and 160 VAC ranges, read the red arc marked AC, and use the corresponding black numbers immediately above the arc.

   For the 400 VAC range, read the red arc marked AC; use the 0-40 black figures and multiply the reading by 10.

5. Turn power off and discharge all capacitors before disconnecting the test leads.

MEASURING AC VOLTAGES, 0-800 VOLT RANGE ONLY

1. Set the range switch at 800 VAC (the same switch as for the 400 VAC range).

2. Connect the black test lead in the COM.-jack, and the red test lead in the 800 VAC jack.

3. Be sure power is off in the circuit to be measured and discharge all capacitors. Then connect the test leads across the voltage to be measured.

4. Turn power on in the circuit to be measured. Do not touch the meter or the test leads. Read the voltage on the red arc marked AC; use the 0-8 black numbers immediately above the arc and multiply the reading by 100.

5. Turn off the power and discharge all capacitors before disconnecting the test leads from the circuit.

MEASURING OUTPUT VOLTAGES

An Output Voltage is the AC component only in a mixture of AC and DC voltage, such as the normal condition in an audio amplifier. The Model 269AF has a capacitor connected in series with its OUTPUT jack which blocks the DC component of the current from passing into the measuring circuit, but permits the AC component to pass. The blocking capacitor has some effect on the AC response characteristics at the lower frequencies as shown on page 6.

1. Connect the black test lead in the COM.-jack, and the red test lead in the OUTPUT jack.

2. Set the range switch for any of the four VAC ranges which is appropriate for the output voltage to be measured. The ranges are 3 VAC, 8 VAC, 40 VAC, and 160 VAC.

NOTE

Do not make measurement in circuits where the DC Voltage present exceeds the voltage rating (400 volts DC) of the internal series capacitor.

3. Connect the black test lead to the grounded side of the circuit to be measured, and the red test lead to the "hot" side. If either side of the circuit is grounded, connect the black test lead to the side which is the closer to ground potential.

4. Turn on power in the circuit. Read the output voltage on the AC voltage arcs of the scale.

   For the 0-3 VAC range, read the voltage directly on the special arc marked 3 VAC ONLY.

   For the 8 VAC, 40 VAC and 160 VAC ranges, use the red arc marked AC and read the corresponding black numbers immediately above the arc.

5. Turn off the power and discharge all capacitors before disconnecting the test leads from the circuit.

MEASURING DECIBELS

For some applications, output voltages or audio frequency voltages are to be measured in terms of decibels. The decibel scale (DB), at the bottom of the dial, is numbered from - 12 through 0 to +11. To measure decibels, proceed according to instructions for Output Voltages or for AC Voltages, and read the DB arc. The DB readings will be correct on an absolute scale if 0 DB is 0.001 watt (1 milliwatt) across 600 ohms (0.774 volt), and if the voltage read with the Model 269AF was measured across 600 ohms.

To obtain DB values across 600 ohms:

For the 3 VAC range, read the DB arc directly.

For the 8, 40, and 160 volt ranges, add a fixed number as shown at the lower right corner of the dial to the reading on the DB arc. The accuracy of the correction factors is a function of the DB reading. In general, the error will not exceed ±1 DB. If better accuracy is required, calculate the DB from the indicated AC voltage.

If the reference level is 0 DB = 0.006 watt (6 milliwatts) is 500 ohms, and the Model 269 readings are made across 500 ohms, subtract 7 DB from the reading to obtain the absolute value of decibels.

MEASURING RESISTANCES

When DC resistances are measured in ohms, the batteries inside the case of the Model 269AF furnish power for the measuring circuit. Correction for battery deterioration over long periods of time is provided by means of the ZERO OHMS control which is part of the ohmmeter circuit.

Each time the ohmmeter is to be used, set the ZERO OHMS control to provide full scale deflection of the pointer when the test prods are shorted together. Check and adjust as required each time a different range is used. Use the following procedure:

1. Set the range switch at the desired resistance range position.

2. Connect the black test lead in the COM. - jack, and the red test lead in the + jack.

3. Connect the contact ends of the test leads together to provide zero ohms resistance between them.

4. Observe the meter indication. It should read 0 at the right end of the OHMS arc, which is at the top of the dial.

5. If the pointer does not read zero, rotate the ZERO OHMS knob at the lower left on the front panel until it does. If the pointer cannot be brought up to the 0 mark, one or more batteries need to be replaced. (See Battery replacement procedure page 27.)

6. After the pointer is adjusted for zero, separate the contact ends of the test leads and the ohmmeter is ready for use on that range.

7. Disconnect power from any resistor or circuit before measuring its resistance with the ohmmeter. Do not apply any power before the measurements are complete and the test leads are disconnected.

8. Connect the test leads across the resistance which is to be measured. If there is a "forward" and "backward" resistance such as in rectifiers and diodes, observe polarity in the lead connections to control each direction of test. The red test lead will provide positive polarity, and the black test lead will provide negative polarity.

NOTE

The resistance of rectifiers may measure as different values on different ranges of the model 269AF. For example, a crystal diode could measure 80 ohms on Rx1 range, and then measure 300 ohms on the Rx100 range. This is normal, and is a result of the diode characteristic. The difference in readings does not indicate a fault in the ohmmeter.

9. Read the indication on the OHMS arc at the top of the dial. Note that this arc reads from right to left for increasing values.

10. Multiply the reading by the multiplier factor indicated at the switch position; the result is the resistance value in ohms. K on the dial stands for "thousand".

DIRECT CURRENT MEASUREMENTS, 0-1.6 AMPERES

CAUTION

Never connect the test leads across any source voltage directly when the Model 269AF is used as a current meter. This will damage the instrument. Always connect the meter in series with the load across the source of voltage.

1. Rotate the Range Selector Switch in the lower right hand corner of the instrument to any of the D.C. current ranges required. The D.C. current ranges are marked black in the area identified as "DC". WHEN IN DOUBT AS TO THE VALUE OF CURRENT PRESENT, ALWAYS USE THE HIGHEST RANGE AS A PROTECTION TO THE INSTRUMENT.

2. Plug the black test lead into the jack marked COM.- and the red test lead into the jack marked +. These jacks are both located on the right hand side of the instrument.

3. Open the circuit in which the current is to be measured. Connect the meter in series with the circuit. Connect the red test probe toward the positive side, and the black test probe toward the negative side of the opened circuit.

4. Turn on the power in the circuit which is to be measured.

5. Read the current value on the black arc marked "DC" which is the second from the top of the dial. If the pointer is deflected to the left of the scale, the test probes are connected opposite to the way they should be. Turn off the power, reverse the connections of the test probes, and turn on the power again.

After obtaining the first reading, reset the range switch for a lower range and a more accurate reading if the current value is within the lower range.

For the 16 uA range, read the figures 0-160 and divide by 10 for microamperes.

For the 160 uA range, read the figures 0-160 directly for microamperes.

For the 1.6 MA range, read the figures 0-160 and divide by 100 for milliamperes

For the 16 MA range, read the figures 0-160 and divide by 10 for milliamperes.

For the 160 MA range, read the figures 0-160 directly for milliamperes.

For the 1.6A range, read the figures 0-160 and divide by 100 for amperes.

DIRECT CURRENT MEASUREMENTS, 0-8 AMPERES.

CAUTION

Never connect the test leads across any source voltage directly when your Model 269AF is used as a

current meter. This will damage the instrument. Always connect the meter in series with the load across the source of voltage.

1. Rotate the Range Selector Switch in the lower right hand corner of the instrument to place the range pointer at 8 AMP - 16 MA.

2. Plug the black test lead into the jack marked COM.– on the right hand side of the instrument. Plug the red test lead into the jack marked +8 AMPS on the right hand side of the instrument.

3. Open the circuit in which the current is to be measured. Connect the meter in series with the circuit. Connect the red test probe toward the positive side, and the black test probe toward the negative side of the opened circuit.

4. Turn on the power in the circuit which is to be measured.

5. Read the current value on the black arc marked "DC" which is the second from the top of the dial. Read the figures 0-8 directly for amperes. If the pointer is deflected to the left of the scale, the test probes are connected opposite to the way they should be. Turn off the power, reverse the connections of the test probes, and turn the power on again.

SECTION III

THEORY OF OPERATION

GENERAL

The basic meter movement of the Model 269AF will be deflected to full scale whenever 10 microamperes of direct current passes through its circuit. When less current passes through its circuit, the amount of its deflection is proportional to the quantity of current. Since the meter movement has a fixed resistance, the amount of voltage drop across it is proportional to the current and to the amount of pointer deflection. For full scale, the voltage drop is 200 millivolts, or 0.20 volt.

VOLTAGE MEASUREMENTS - DC CIRCUIT

Since the resistance of the basic meter circuit is 20,000 ohms, and the voltage sensitivity is 200 millivolts for a full scale reading, the sensitivity in terms of ohms per volt, is 100,000 ohms/volt. For each higher range the Model 269AF has precision resistors which are added in series with the basic current meter. To calculate the total instrument resistance, multiply 100,000 ohms (per volt) by the number of volts for full scale deflection. Thus, the total instrument resistance for each DC range is:

RANGE	Total Meter Resistance in Ohms
1.6	160,000
8	800,000
40	4,000,000
160	16,000,000
400	40,000,000
800	80,000,000
1600	160,000,000

VOLTAGE MEASUREMENTS - AC

To measure AC voltages, a modified bridge rectifier within the Model 269AF develops a DC voltage which is proportional to the average value of the measured voltage, and this is used to pass direct current through the meter movement. Deflection of the pointer is proportional to the DC voltage, which is in turn proportional to the average AC value

applied. The meter scale is calibrated in terms of the RMS value, and will be correct assuming that the measured voltage is in the form of a sine wave. The basic sensitivity of the AC circuit is 3 volts, with an AC circuit resistance of 15,000 ohms. In terms of ohms per volt the basic sensitivity is 5000 ohms/volt. For each higher range the Model 269AF has precision resistors which are added in series with the basic AC circuit. To calculate the total instrument resistance, multiply 5000 ohms (per volt) by the number of volts for full scale deflection. Thus the total instrument resistance for each AC range is as follows:

RANGE	Total Meter Resistance in Ohms
3	15,000
8	40,000
40	200,000
160	800,000
400	2,000,000
800	4,000,000

VOLTAGE MEASUREMENTS – OUTPUT

For measurements of Output Voltages, a series capacitor prevents the DC components of voltage from affecting the meter circuit, but permits the AC component to be applied to the normal AC voltage measuring circuit. For very low AC frequencies, the capacitive reactance of the series capacitor may be great enough to reduce the relative amount of voltage actually applied to the AC measuring circuit; see frequency response data on page 6.

CURRENT MEASUREMENTS

When the Model 269AF is used to measure direct current, resistance is connected in parallel with the meter movement. The total circuit current divides between the meter and its parallel shunt, inversely proportional to their resistances.

The meter millivolt drop of 200 MV. remains essentially the same for all current ranges. A ring shunt is used on all, but the lowest current range, eliminating errors due to switch contact resistance. The shunt resistance is less for each succeeding higher current range.

RESISTANCE MEASUREMENTS

When the Model 269AF is used to measure resistance, dry cell batteries within the instrument furnish a known voltage through the meter circuit and through the measured resistance in series with the meter. With zero resistance in series with the test leads (test leads shorted together), the pointer is deflected to full scale; as resistance is added between the test leads, total current is decreased, and the pointer is deflected to a point less than full scale. The markings on the Model 269AF show relative pointer deflection which results from adding the indicated amount of resistance in series between the test leads. For the RX1, RX10, RX100 and RX1000 Ranges one "D" size dry cell furnishes 1.5 volts DC for measuring resistances. For the RX10K and RX100K Ranges, a 22.5 volt battery is used.

NOTE

Do not make resistance measurements with the Model 269AF where any voltage is present in any circuit or on any component since this voltage could result in a reading error and/or damage to the ohmmeter circuit.

SECTION IV

MAINTENANCE

PARTS LIST

Reference Symbol	Description	Simpson Part No.
R1	1.6 amp Shunt (calibrated in tester)	1-110458
R2	Resistor 1.2 ohms (bobbin)	10-805196
R3	Resistor 12 ohms	1-110161
R4	Resistor 120 ohms	1-115322
R5	Resistor 1.2K ohms	1-113418
R6	Resistor 32K ohms	1-110158
R7	Resistor 11.2 ohms	1-110165
R8	Resistor 100.8 ohms	1-110157
R9	Resistor 1.008K ohms	1-110156
R10	Resistor 6.35K ohms	1-110154
R11	Resistor 3.73K ohms	1-110153
R12	Resistor 63.47K ohms	1-110152
R13	Resistor 8.1 ohms	1-110462
R14	Resistor 89 ohms	1-110155
R15	Resistor 1.82K ohms	1-110151
R16	Resistor 112.9K ohms	1-110150
R17	Resistor 1.17 Megohms	1-110149
R18	Resistor 140K ohms	1-110147
R19	Resistor 640K ohms	1-110146
R20	Resistor 3.2 Megohms	1-110145
R21	Resistor 12 Megohms	1-119136
R22	Resistor 24 Megohms	1-110144
R23	Resistor 40 Megohms	1-110143
R24	Resistor 1.2 Megohms	1-119147
R25	Resistor 600K ohms	1-110164
R26	Resistor 160K ohms	1-110163
R27	Resistor 25K ohms	1-110162
R28	Resistor 7.5K ohms	1-117901
R29	Resistor 2 Megohms	1-110172
R30	Resistor 80 Megohms	1-110142
R31	Resistor 5K ohms	1-117902
R32	Resistor 5K ohms	1-117902
R33	Resistor 45K ohms	1-117894
R34	Resistor 17K ohms	1-113349
R35	Shunt Assy. 8 ampere (calibrated in tester)	10-650015
R36	Potentiometer 50K ohms	1-110141
R37	Potentiometer 20K ohms	Packaged as 1 unit under Part No. 1-110140
R38	Potentiometer 5K ohms	
R39	Potentiometer 10K ohms	
R40	Potentiometer 150K ohms	
R41	Resistor 91K ohms	
D1	Diode IN87G	1-115970
D2	Diode IN87G	1-115970
D3	Diode, silicon (2 REQ)	1-110231
C1	Capacitor, 0.1 Mfd., 400V, +20%	1-113733
C2	Capacitor, 0.1 Mfd., 250V, ±10%	1-110997
F1	Fuse 1-½ amp 3AG	1-110409
	Test Lead Set (one black and one red lead)	0115
	High Voltage Multiplier 4000 VDC	0151
	Med. impact Phenolic Case	3-330155
	Adjust-A-Vue Handle Assy.	3-310812
	Knobs	1-110170
	Meter Assembly	15-302269AF

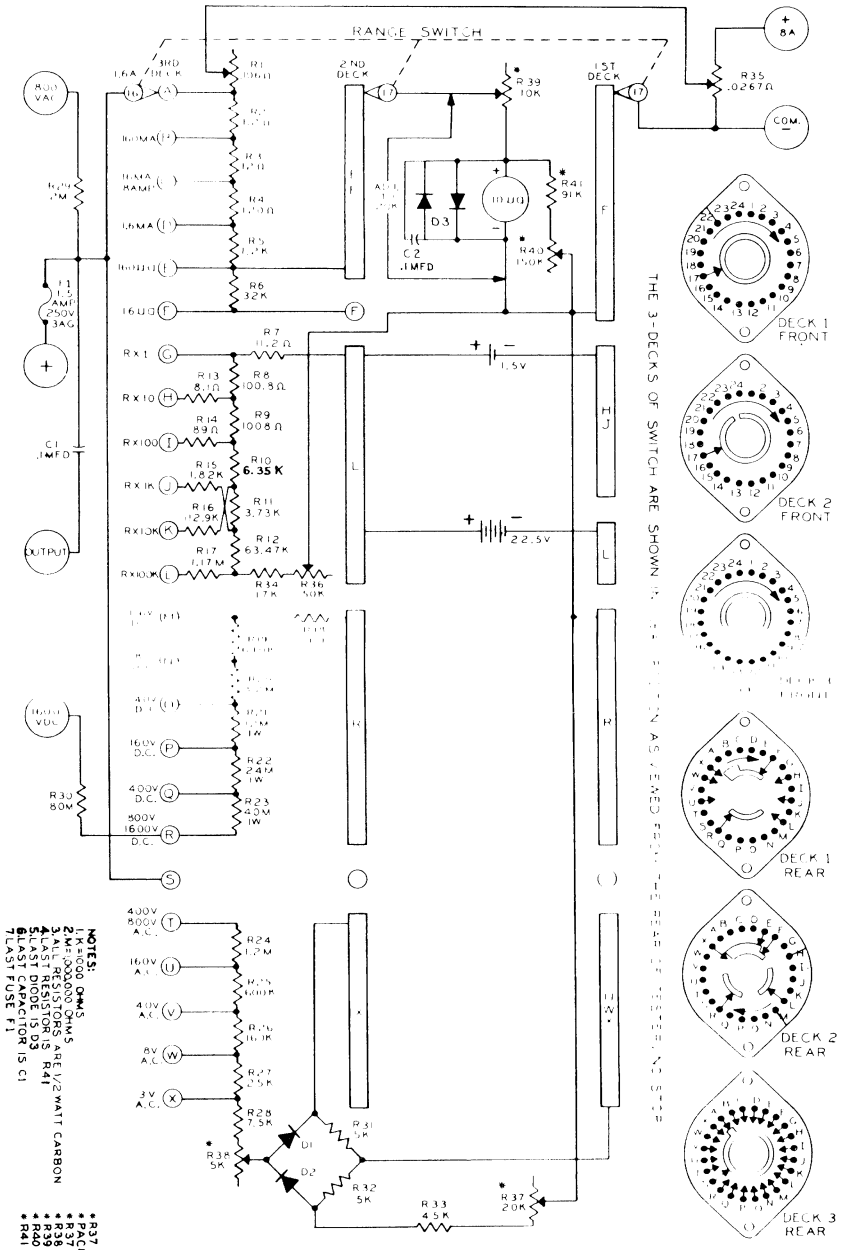

FIGURE 2. OVERALL SCHEMATIC, SIMPSON VOLT-OHM-MICROAMMETER MODEL 269AF.

D.C. HIGH VOLTAGE TESTING

D.C. HIGH VOLTAGE TEST PROBES
(100,000 OHMS PER VOLT)

The DC high voltage probes extend the range of a 100,000 ohms per volt multimeter in a safe, convenient manner at nominal cost. Their primary purpose is the measurement of terminal potentials of very high voltage, very low power capacity, direct current sources, example of which are anode supplies used in television receivers and other cathode ray tube type circuitry.

The probe body is made of high temperature polystyrene in order to provide high dielectric strength and low leakage. It contains a high megohm precision resistor.

A shielded cable and internal probe shield are used to protect the operator from any possible flash-over and ground any electrostatic charge that might accumulate on the probe body.

The internal shield and cable shield are connected to the ground return lead by a flexible copper braid between the two elbow connectors. A 48 inch ground return lead with an insulated clip completes the test lead set. No additional leads are needed.

Part No. 0119	16,000 Volts, D.C.
Part No. 0120	40,000 Volts, D.C.

BATTERY REPLACEMENT

To replace batteries it is only necessary to remove 3 screws holding the battery plate on the back of the case. When it is no longer possible to bring the pointer to zero on the RX1, RX100, and RX1K ranges, (see MEASURING RESISTANCES on page 16) replace the #2 Size D flashlight cell. When it is no longer possible to bring the

pointer to zero on the RX10K & RX100K ranges, replace the 22.5 volt battery. This will restore operation of the ohmmeter circuits.

Whenever these batteries are replaced be sure to observe correct polarity. The positive polarity for both batteries is indicated by a raised + mark in the center of the Battery Compartment.

NOTE:

When batteries reach the end of their useful life, they should be replaced promptly. Failure to do so may result in extensive damage to your Model 269 AF due to battery leakage, even though the battery may be advertised as "Leakproof."

FUSE REPLACEMENT

Remove the front panel from the case and disconnect the burned-out fuse, using a small (60 watt or less) soldering iron. Replace with a 1-1/2 amp, 250 volt pigtail fuse, type 3AG or equivalent only. Never use a fuse with a higher current rating.

SERVICE NOTE

It is recommended that all service of the printed circuit boards be referred to an Authorized Repair Station or to the Simpson Electric Company factory.

If it is necessary to replace components, do not apply heat directly to the printed circuit board. Cut leads close to the body of the component and solder the replacement to the leads.

OPENING THE CASE

The Simpson Volt-Ohm-Microammeter Model 269AF has been designed to provide easy access for all necessary adjustments and replacement of parts. Use a ¼ inch screwdriver to remove the four screws through the back of the case. Then remove the front panel assembly from the case. This assembly includes the meter movement, front panel, printed circuit, and will come out as a unit.

NOTE

The test leads must be removed from their jacks to permit opening and closing of the case.

TEST LEADS

Each Simpson Volt-Ohm-Microammeter Model 269AF is furnished with one pair of four-foot test leads. One lead is black and the other red for easy polarity identification.

The wire is very finely stranded and extra-flexible. Its insulation is a special high grade rubber which has far more insulation strength than the largest voltages to which your instrument will ever be subjected.

TEST LEAD INSPECTION

Periodic inspection of the test leads is recommended to detect cuts, burns or other damage that would reduce the insulation strength of the leads. When replacement is indicated, ask your local distributor for catalog number 0115.