OPERATOR'S MANUAL

VOLT-OHM-MILLIAMMETER
MODEL 267

SIMPSON ELECTRIC COMPANY

5200 W. Kinzie St., Chicago 44, Illinois, ES 9-1121
Long Distance Dial 312
In Canada, Bach-Simpson, Ltd., London, Ontario

Fig. 1. Simpson Model 267 Volt-Ohm Milliammeter

SECTION I

GENERAL DESCRIPTION

INTRODUCTION

The Simpson Volt-Ohm-Milliammeter Model 267 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 Output Voltages.

The Simpson Model 267 features a large 7-inch meter for optimum readability and resolution. No external power is required for the operation of the instrument; internal batteries are used to furnish the power required for resistance measurements.

The instrument is housed in a heavy black bakelite case. It is molded with heavy reinforced walls for maximum durability. All of the component parts in the Model 267 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. This simplifies assembly, reduces maintenance, and extends the useful life of the instrument.

The comfortable Adjust-A-View 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 Model 267 can also be placed in either a vertical or a horizontal position.

To protect those circuits most apt to be overloaded, the instrument includes a fuse. If the ohmmeter ranges are misused or the milliammeter ranges are overloaded, the fuse will burn out to protect the circuits from damage. The fuse is a pigtail type 3AG rated at 1 ampere, and is soldered in eyelets on the printed circuit inside the case.

ACCESSORIES FURNISHED

Each Simpson Volt-Ohm-Milliammeter Model 267 is furnished with one pair of four-foot test leads; one black and the other red for easy polarity identification. The wire is very finely stranded and extra-flexible. The insulation is a special high-grade rubber which has far more insulation strength than the highest voltages which your instrument will ever be subjected.

ACCESSORIES AVAILABLE

HIGH VOLTAGE PROBES AND MULTIPLIERS

2500 V DC Simpson Part Number 0–008568
2500 V AC Simpson Part Number 0–008570
5000 V DC Simpson Part Number 0–008569
5000 V AC Simpson Part Number 0–008571

TEST LEADS WITH PRODS 10–837538

SPECIFICATIONS

MEASUREMENT RANGES

DC VOLTAGE (Sensitivity: 20,000 ohms per volt)

0– 250 millivolts (+ 50 ua Range)		0– 250 volts
0– 2.5 volts		0– 500 volts
0– 10 volts	**0– 50 volts**	0–1000 volts

AC VOLTAGE (Sensitivity: 5,000 ohms per volt)

0– 2.5 volts	0– 250 volts
0– 10 volts	0– 500 volts
0– 50 volts	0–1000 volts

AF OUTPUT VOLTAGE
(With 0.1 uf internal series capacitor)

0– 2.5 volts
0– 10 volts
0– 50 volts
0– 250 volts

VOLUME LEVEL IN DECIBELS
(With zero DB equal to 1 milliwatt across a 600 ohm line)

– 20 to + 10 DB
– 8 to + 22 DB
+ 6 to + 36 DB
+ 20 to + 50 DB

DC RESISTANCE

R x 1 for 0 to 2000 ohms (12 ohms center)
R x 100 for 0 to 200,000 ohms (1200 ohms center)
R x 10,000 for 0 to 20 megohms (120,000 ohms center)

DIRECT CURRENT

0– 50 microamperes (Resistance 5000 ohms)
0– 1 milliampere (Resistance 238 ohms)
0– 10 milliamperes (Resistance 25 ohms)
0–100 milliamperes (Resistance 2.5 ohms)
0–500 milliamperes (Resistance 0.5 ohms)
0–10 amperes (Resistance 0.025 ohms)

ACCURACY

DC voltage and current	± 3% of full scale
AC voltage, AF voltage, and Decibels	± 5% of full scale
Resistance	± 3° of arc

OVERALL DIMENSIONS

6" x 7¼" x 3¼"

WEIGHT

3¼ lbs.

FREQUENCY RESPONSE (Nominal)

AC VOLTAGE MEASUREMENTS

Range	Essentially Flat (± 1%)	± 3%	± 5%
2.5 V AC	100 kc	1 M cps	
10 V AC	100 kc	500 kc	600 kc
50 V AC	15 kc	40 kc	60 kc
250 V AC	7 kc	10 kc	20 kc

OUTPUT VOLTAGE MEASUREMENTS

Range	Essentially Flat (± 1%)	± 3%	± 5%
2.5 V AC	1 kc – 100 kc	400 cps – 1 M cps	200 cps
100 V AC	150 cps – 100 kc	100 cps – 500 kc	70 cps–600 kc
500 V AC	30 cps – 15 kc	10 cps – 40 kc	10 cps–20 kc

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 in-

dicator 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, and as such 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 eighteen 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 267. 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 COMMON –, +, and +10 AMP. The COMMON– jack is used for all ranges and functions. The + jack is used in conjunction with the COMMON– jack for all ranges and functions with the exception of the +10 AMP DC, 1000 V DC, 1000 V AC, and OUTPUT ranges. The +10 AMP jack is used in conjunction with the COMMON– jack for 0–10 AMP DC current measurements.

The three jacks on the left are legended OUTPUT, 1000 V AC, and 1000 V DC.

GENERAL DESCRIPTION

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 1000 V AC, and 1000 V DC jacks are used to extend the 500 V DC, and 500 V AC ranges of the instruments to 1000 V DC, and 1000 V AC.

Whenever polarity is involved, as for DC voltage and current measurements, the black lead is used for negative polarity and the red lead for positive polarity, providing the black lead is the the one which is connected into the COMMON – jack. For AC and OUTPUT voltage measurements, polarity is not identified. For resistance measurements, positive polarity is applied through the red test lead to the resistance being measured, and negative polarity is applied through the black test lead.

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. Connect the test leads at the desired points in the circuit. Then turn on the power while taking the readings. Turn off the power before disconnecting the test leads from the circuit.

INITIAL ADJUSTMENTS

POSITION THE INSTRUMENT

Place the instrument in its operating position. It may be positioned vertically or horizontally, or the Adjust-A-View 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-Milliammeter Model 267, check to see that the pointer indicates zero when the meter is in its operating position. If the pointer is off zero, tum 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 DC VOLTAGES, 0–250 MILLIVOLT RANGE ONLY

CAUTION

Be extremely careful when using the Model 267 as a millivoltmeter to prevent damage to the meter. An excessive voltage applied to the meter when it is in this range could be detrimental to the meter circuit.

1. Connect the black test lead in the COMMON – jack, and the red test lead in the + jack.
2. Set the range switch at 50 uAMPS.
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 power on in the circuit. If the meter deflects to the left of zero, turn off the power, reverse the test lead connections, and turn power on again.
5. Read the voltage on the black arc marked DC, and use the figures marked 0–250; read directly in millivolts.
6. Turn power off in the circuit which is being measured before disconnecting the meter leads.

MEASURING DC VOLTAGES, 0–500 VOLTS

1. Connect the black test lead in the COMMON – jack, and the red test lead in the + jack.
2. Set the range switch for any of the five VDC range positions. These are marked 2.5 VDC, 10 VDC, 50 VDC, 250 VDC, and 500 VDC. When in doubt as to which range should be used, always use the highest voltage range first as a protection to the instrument. Observe the meter reading. If the voltage is within a lower range, the switch may be set for the lower range to obtain a more accurate reading.
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 power on in the circuit to be tested. If the pointer deflects to the left of zero, the actual circuit polarity is the reverse of the anticipated polarity; turn power off in the circuit, reverse the test leads, and turn power on again. This will apply the correct polarity to the meter.
5. Read the voltage on the black arc marked DC, which is second from the top of the dial.

   For the 2.5 VDC range, use the 0–250 scale and divide by 100.

   For the 10 VDC, 50 VDC, and 250 VDC ranges, read the corresponding scale directly.

   For the 500 VDC range, use the 0–50 scale and multiply by 10.
6. Turn power off in the circuit which is being measured before disconnecting the test leads.

MEASURING DC VOLTAGES, 0–1000 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 in the circuit being measured.

1. Set the range switch at 1000 VDC (the same switch position as for the 500 VDC range).
2. Connect the black test lead in the COMMON – jack, and the red test lead in the 1000 VDC jack.
3. Be sure 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, reverse the test leads, and turn power on again. This will apply the correct polarity to the meter.

5. Read the voltage, using the 0–10 scale on the black arc which is second from the top on the dial. Multiply the reading by 100.

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

MEASURING AC VOLTAGES, 0–500 VOLTS

The Simpson Volt-Ohm-Milliammeter Model 267 rectifier circuit responds to the average value of the AC voltage being applied. The meter dial however is calibrated in terms of the RMS value, which will be correct for all sine wave measurements.

The Model 267 has been especially designed to provide a wide frequency range. The data on page 6 shows the response for the 2.5, 10, 50, and 250 volt ranges.

1. Connect the black test lead in the COMMON – 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 2.5 VAC, 10 VAC, 50 VAC, 250 VAC, and 500 VAC. When in doubt as to which range should be used, always use the highest voltage range first as a protection to the instrument. Observe the meter reading. If the voltage is within a lower range, the switch may be set for the lower range to obtain a more accurate reading.

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. Read the voltage on the red arc marked AC, as follows:

   For the 0–2.5 VAC range, read the value directly on the special arc marked 2.5 VAC ONLY.

   For the 10 VAC, 50 VAC, and 250 VAC ranges, read the red marked AC, and use the correspondend black scale immediately above the arc.

   For the 500 VAC range, read the red arc marked AC; use the 0–50 black scale and multiply the reading by 10.

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

MEASURING AC VOLTAGES, 0–1000 VOLT RANGE ONLY

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 250V and current capabilities greater than 25 amperes.

1. Set the range switch at 1000 VAC (the same switch position as for the 500 VAC range).

2. Connect the black test lead in the COMMON – jack, and the red test lead in the 1000 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 0–10 black DC scale 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 267 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 affect on the AC response characteristics, at the lower frequencies as shown on page 6.

1. Connect the black test lead in the COMMON – 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 2.5 VAC, 10 VAC, 50 VAC, and 250 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 neither 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 0–2.5 VAC range, read the voltage directly on the special arc marked 2.5 VAC ONLY.

   For the 10 VAC, 50 VAC and 250 VAC ranges, use the red arc marked AC and read the corresponding black DC numbers immediately above the arc.

5. Turn power off in the circuit before disconnecting the test leads.

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 –20 through 0 to +10. 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 267 was measured across 600 ohms.

To obtain absolute DB values across 600 ohms:

For the 2.5 VAC range, read the DB arc directly.

For the 10 VAC range, read the DB arc and add +12 DB to the reading.

For the 50 VAC range, read the DB arc and add +26 DB to the reading.

For the 250 VAC range, read the DB arc and add +40 DB to the reading.

If the reference level is 0 DB = 0.006 watt (6 milliwatts) in 500 ohms, and the Model 267 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 267 furnish power for the measuring circuit. Correction for battery deterioration over long periods of time is provided by means of the external zero adjust 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 COMMON – jack, and the read 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.

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 for 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 267. 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".

MEASURING DIRECT CURRENTS, 0 TO 50 MICROAMPERES

CAUTION

Never connect the test leads directly across any source of voltage when the Model 267 is used as a current measuring instrument, except when it is used as a 0–250 millivoltmeter. This will damage the instrument. Always connect the meter in series with the circuit being measured.

1. Connect the black test lead in the COMMON – jack, and the red test lead in the + jack.
2. Set the range switch at 50 uAMPS.
3. With the circuit power turned off, open the circuit at the point where its current is to be measured. Connect the meter in series with the circuit; connect the red test lead toward the positive side, and the black test lead toward the negative side.
4. Turn power on for the circuit. Observe the meter. If the pointer is deflected to the left, the polarity is opposite to that which was anticipated; turn power off and reverse the leads.
5. Read the current directly on the black arc marked DC, using the 0–50 scale. The current value is shown in microamperes.
6. Turn off power for the circuit. Remove the test leads and restore the circuit continuity.

MEASURING DIRECT CURRENTS, 50 MICROAMPERES TO 500 MILLIAMPERES

1. Connect the black test lead in the COMMON – jack, and the red test lead in the + jack.

2. Set the range switch for the appropriate milliampere range. The switch positions are marked 1 MA, 10 MA, 100 MA, and 500 MA.
3. With the circuit power turned off, open the circuit at the point where its current is to be measured. Connect the meter in series with the circuit; connect the red test lead toward the positive side, and the black test lead toward the negative side.
4. Turn power on for the circuit. Observe the meter. If the pointer is deflected to the left, the polarity is opposite to that which was anticipated; turn power off and reverse the leads.
5. Read the current on the black DC arc.

   For the 1 MA range, use the 0–10 scale and divide by 10.

   For the 10 MA range, read the 0–10 scale directly.

   For the 100 MA range, use the 0–10 scale and multiply by 10.

   For the 500 MA range, use the 0–50 scale and multiply by 10.

   All current values are in milliamperes.
6. Turn off power for the circuit. Remove the test leads and restore the circuit continuity.

MEASURING DIRECT CURRENTS, 500 MILLIAMPERES TO 10 AMPERES

1. Connect the black test lead in the COMMON – jack, and the red test lead in the +10 AMP jack.
2. Set the range switch at 10 MA/10 A.
3. With the circuit power turned off, open the circuit at the point where its current is to be measured. Connect the meter in

series with the circuit, connect the red test lead toward the positive side of the circuit, and the black test lead toward the negative side.

4. Turn on power for the circuit. Observe the meter. If the pointer is deflected to the left, the circuit polarity is opposite to that which was anticipated; turn power off and reverse the leads.

5. Read the current directly on the black DC arc. Use the 0–10 scale. The current values are in amperes.

6. Turn off power for the circuit. Remove the test leads and restore the circuit continuity.

SECTION III

THEORY OF OPERATION

GENERAL

The basic meter movement of the Model 267 will be deflected to full scale whenever 50 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 250 millivolts, or 0.25 volt.

VOLTAGE MEASUREMENTS – DC CIRCUIT

When the basic meter circuit is used to measure DC voltage, with the range switch set at 50 uAMPS, the voltage sensitivity is

250 millivolts for a full scale reading, and the meter resistance is 5000 ohms. In terms of ohms per volt, the sensitivity is 20,000 ohms/volt. For each higher range the Model 267 has precision resistors which are added in series with the basic current meter. To calculate the total instrument resistance, multiply 20,000 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
0.25 (50 ua DC Range)	5,000
2.5	50,000
10	200,000
50	1,000,000
250	5,000,000
500	10,000,000
1000	20,000,000

VOLTAGE MEASUREMENTS – AC

To measure AC voltages, a modified bridge rectifier circuit within the Model 267 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 2.5 volts and with an AC circuit resistance of 12,500 ohms. In terms of ohms per volt the basic sensitivity is 5000 ohms/volt. For each higher range the Model 267 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
2.5	12,500
10	50,000
50	250,000
250	1,250,000
500	2,500,000
1000	5,000,000

VOLTAGE MEASUREMENTS – OUTPUT

For measurement of Output Voltages, a series capacitor prevents the DC component 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 which is actually applied to the AC measuring circuit; however, readings within any one instrument range for any single frequency will be relative and will provide comparative results.

CURRENT MEASUREMENTS

When the basic meter movement is used to measure direct current, with the range switch set at 50 uAMPS, the meter circuit is the same as for measuring 250 millivolts DC; all circuit current passes through the meter movement and 50 microamperes through the circuit causes full scale deflection. To measure higher ranges of current, resistance is connected in parallel with the meter movement. The total circuit current divides between the meter

and its parallel shunt in inverse proportion to their resistances. Meter resistance remains at 5,000 ohms for all current ranges. The shunt resistance is less for each succeeding higher current range.

RESISTANCE MEASUREMENTS

When the Model 267 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 267 show relative pointer deflection which results from adding the indicated amount of resistance in series between the test leads. For the Rx1 and Rx100 ranges, one "D" size dry cell furnishes 1.5 volts DC for measuring resistances. For the Rx10,000 range, four "Z" size dry cells are connected in series with the one "D" size dry cell to furnish 7.5 volts DC for the measuring circuit.

NOTE

Do not make resistance measurements with the Model 267 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 meter circuit.

SECTION IV

MAINTENANCE

OPENING THE CASE

The Simpson Volt-Ohm-Milliammeter Model 267 has been designed to provide easy access for all necessary adjustment and replacement of parts. Use a ¼-inch screwdriver to remove the four screws through the bottom of the case. Then remove the front panel assembly from the case. This assembly includes the meter movement, front panel, printed circuit, and batteries, and will come out as a unit.

NOTE

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

BATTERY REPLACEMENT

Five dry cell batteries are installed in the Model 267. They are used to supply the voltages for resistance measurements. One is a large size (#2, Size D) flashlight cell, and the other four are smaller (#Z) flashlight cells. When it is no longer possible to bring the pointer to zero for the Rx1 and Rx100 ranges (see ZERO OHMS ADJUST in Section II), replace the large cell with a fresh one. When it is no longer possible to bring the pointer to zero on the Rx10,000 range, replace the four smaller cells with fresh ones. This will restore operation of the ohmmeter circuits.

Whenever dry cells are replaced, be sure to observe polarity for each cell. The cells are held in place with specially designed spring clips which also act as battery contacts. Battery polarity is marked on the printed circuit board and on the battery plate.

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 amp, 250 volt pigtail fuse, type 3AG or equivalent only. Never use a fuse with a higher current rating.

REPAIR STATIONS AND PARTS DEPOTS

Simpson Official Repair Stations and Parts Depots have been established throughout the United States and Canada. To obtain repair or recalibration for any item of Simpson equipment, contact the Repair Station which has been provided for your area, and arrange with them for the service which you require. A list of these Repair Stations and Parts Depots is included in the rear of this manual

PARTS LIST

Reference Symbol	Description	Simpson Part No.
R1	Resistor, 11.2 ohms (bobbin)	10–805073
R2	Resistor, 1138 ohms ± 1%	1–117889
R3	Resistor, 110 ohms ± 1%	1–117890
R4	Resistor, 21.85 K ± 1%	1–117891
R5	Resistor, 117.7 K ± 1%	1–117892
R6	Resistor, 238 ohms ± 1%	1–117893
R7	Resistor, 22.5 ohms ± 1%	1–119107
R8	Resistor, 2 ohms (bobbin)	10–805077
R9	Resistor, 0.437 ohm (bobbin)	10–805094
R10	Resistor, 45 K ± 1%	1–117894
R11	Resistor, 150 K ± 1%	1–117895
R12	Resistor, 800 K ± 1%	1–117896
R13	Resistor, 4 Megohms ± 1%	1–117897
R14	Resistor, 5 Megohms ± 1%	1–117906
R15	Resistor, 1.25 Megohms ± 1%	1–117905
R16	Resistor, 1 Megohm ± 1%	1–117898
R17	Resistor, 200 K ± 1%	1–117899
R18	Resistor, 37.5 K ± 1%	1–117900
R19	Resistor, 7.5 K ± 1%	1–117901
R20	Rheostat, 4 K	1–115767
R21	Resistor, 5 K ± 1%	1–117902
R22	Resistor, 5 K ± 1%	1–117902
R23	Rheostat, 4 K ± 1%	1–115767
R24	Potentiometer, 10 K	1–117881
R25	Rheostat, 4 K	1–115767
R26	Resistor, 0.025 ohm shunt assembly, 10 ampere	0–007110
R27	Resistor, 2.5 Megohms ± 1%	1–117904
R28	Resistor, 10 Megohms ± 1%	1–117903

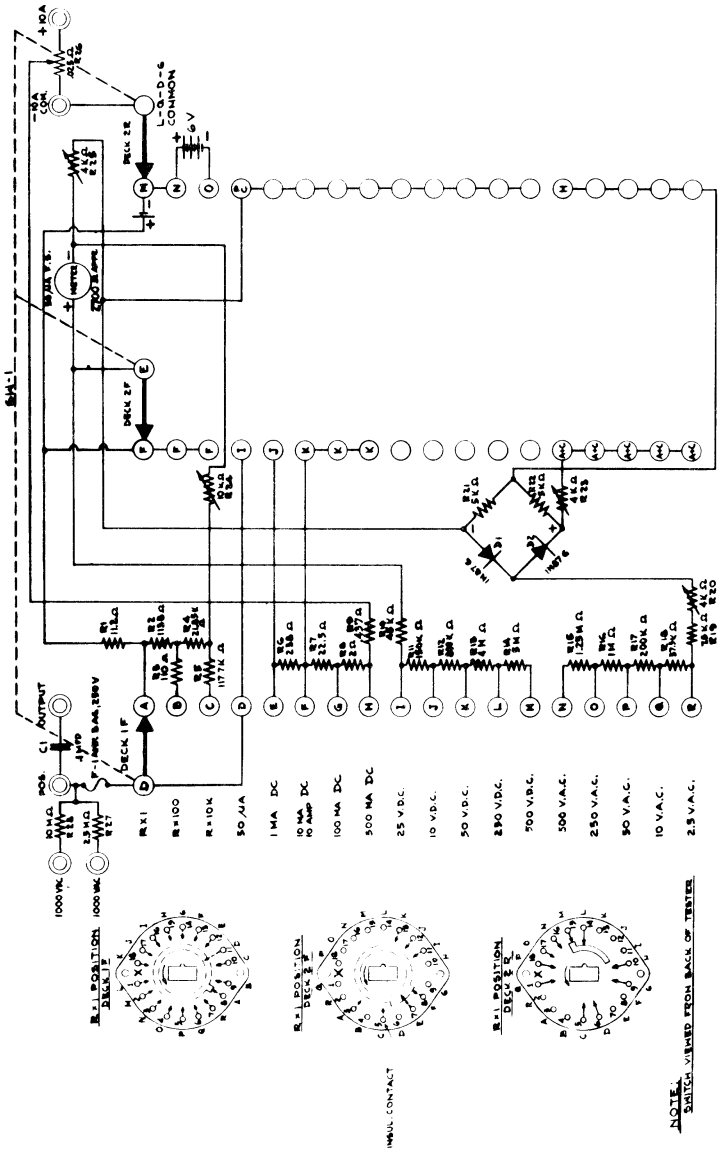

Figure 2. Schematic Diagram, Simpson Volt-Ohm Milliammeter Model 267

MAINTENANCE

F1	Fuse, 1 ampere, 250 volt, type 3AG (or equivalent)	1–117702
C1	Capacitor, 0.1 uf, 400 v.	1–113733
D1	Diode, Germanium	1–115970
D2	Diode, Germanium	1–115970
	Test,Lead Set (one black lead and one red lead)	10–837500
	Molded bakelite case	3–330067
	Adjust-A-View Handle assembly	3–310812
	Knobs	1–114814

SIMPSON WARRANTY REPAIR STATIONS AND PARTS DEPOTS

**ARIZONA, PHOENIX
Metercraft, Inc.
3304 N. 24th Street
States: Arizona
Phone: CRestwood 9-5287

CALIFORNIA, LOS ANGELES
Quality Electric Company
3700 South Broadway
States: Southern California below Fresno and Arizona
Phone: ADams 2-4201

CALIFORNIA, SAN FRANCISCO
Pacific Electrical Instrument Lab.
111 Main Street
States: Northern California above Fresno and Nevada
Phone: GArfield 1-7185

**CANADA
Bach-Simpson Ltd.
1255 Brydges Street, P.O. Box 484, London, Ontario, Canada
Phone: GLadstone 1-9490

COLORADO, DENVER
Meter-Master Instrument Service
2379 S. Downing Street
States: Wyoming, Utah, Colorado, and New Mexico
Phone: RAce 2-8670

CONNECTICUT, NEW HAVEN
Kaufman Instrument Labs, Inc.
810 Dixwell Avenue
States: Connecticut
Phone: SPruce 6-7201

FLORIDA, ORLANDO
Electro Tech Corp.
307 - 27th Street
States: Florida
Phone: GArden 3-5589

*Parts Depots only; no repairs.
**Repair Stations only; no resale of parts.
(All other stations repair instruments and sell repair parts)

GEORGIA, ATLANTA
Electro-Tech Equipment
690 Murphy Ave., S.W.
States: Alabama, Georgia, Carolina and Tennessee
Phone: PLaza 3-4128

**ILLINOIS, CHICAGO
Simpson Electric Company
5200 W. Kinzie Street
Phone: EStebrook 9-1121

*ILLINOIS, CHICAGO
Pacific Indicator Company
5217 W. Madison Street
States: Chicago, Wisconsin and Indiana
Phone: COlumbus 1-1330

**KANSAS, KANSAS CITY
Sturtz Instrument Co.
4705 Mission Road
States: Kansas
Phone: STarline 1-4711

LOUISIANA, NEW ORLEANS
Industrial Instrument Works
3328 Magazine Street
States: Arkansas, Mississippi and Louisiana
Phone: TWinbrook 5-5621

MASSACHUSETTS, CAMBRIDGE
Alvin C. Mancib Company
363 Walden Street
States: Vermont, New Hampshire, Massachusetts, Rhode Island and Maine
Phone: UNiversity 4-2494

MICHIGAN, DETROIT
Ram Meter, Inc.
1100 Hilton Road, Ferndale
States: Michigan
Phone: LIncoln 7-1000

*Parts Depots only; no repairs.
**Repair Stations only; no resale of parts.
(All other stations repair instruments and sell repair parts)

MINNESOTA, MINNEAPOLIS
Instrumentation Services
917 Plymouth Avenue
States: Minnesota, North and South Dakota
Phone: KEllogg 7-5411

MISSOURI, ST. LOUIS
Scherrer Instruments
5449 Delmar Blvd.
States: Illinois below Peoria, Iowa, Missouri
Phone: FOrest 7-9800

NEW YORK, BUFFALO
Electrical Instrument Labs
932 Hertel Avenue
States: New York State except Metropolitan New York
Phone: EXport 2-2726

NEW YORK, NEW YORK 7
Simpson Instrument Service Corporation
27 Park Place
States: Metropolitan New York and New Jersey above Trenton
Phone: BArclay 7-4977

**NEW YORK, SYRACUSE
Syracuse Instrument Lab
4895 South Avenue, Box 96
Phone: HYatt 2-1651

OHIO, CLEVELAND
Weschler Electric Company
4250 W. 130th Street
States: Ohio and Kentucky
Phone: CLearwater 1-4609

**OKLAHOMA, TULSA
Tri-State Instrument Lab
2216 N. Sheridan Road
States: Oklahoma
Phone: TEmple 5-1890

*Parts Depots only; no repairs.
**Repair Stations only; no resale of parts.
(All other stations repair instruments and sell repair parts)

**OREGON, PORTLAND
Industrial Instrument Repair Lab.
1910 N. Killingsworth St.
States: Oregon
Phone: BElmont 4-6683

PENNSYLVANIA, PHILADELPHIA
Sunshine Scientific Instrument
1810 Grant Avenue
States: Pennsylvania, Maryland, New Jersey below Trenton, Delaware
Phone: ORchard 3-5600

TEXAS, DALLAS
Nelson Electronic Engineering Co., Inc.
6329 Gaston Avenue
States: Texas
Phone: TAylor 4-2626

**TEXAS, HOUSTON
Nelson Electronic Engineering Co., Inc.
3615 Gulf Freeway
Phone: CApitol 8-2835

VIRGINIA, FALLS CHURCH
United Instrument Lab., Inc.
110 Jefferson Street
States: Washington, D.C., West Virginia, Virginia
Phone: JEfferson 2-1212

WASHINGTON, SEATTLE
The Instrument Lab., Inc.
934 Elliott Avenue West
States: Oregon, Washington, Idaho and Montana
Phone: ATwater 3-5850

*Parts Depots only; no repair.
**Repair Stations only; no resale of parts.
(All other stations repair instruments and sell repair parts)

WARRANTY

SIMPSON ELECTRIC COMPANY warrants each instrument and other articles of equipment manufactured by it to be free from defects in material and workmanship under normal use and service, its obligation under this warranty being limited to making good at its factory any instrument or other article of equipment which shall within 90 days after delivery of such instrument or other article of equipment to the original purchaser be returned intact to it, or to one of its authorized service stations, with transportation charges prepaid, and which its examination shall disclose to its satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities on its part, and SIMPSON ELECTRIC COMPANY neither assumes nor authorizes any other persons to assume for it any other liability in connection with the sale of its products.

This warranty shall not apply to any instrument or other article of equipment which shall have been repaired or altered outside the SIMPSON ELECTRIC COMPANY factory or authorized service stations, nor which has been subject to misuse, negligence or accident, incorrect wiring by others, or installation or use not in accord with instructions furnished by the manufacturer.

Simpson ELECTRIC COMPANY
5200 Kinzie St., Chicago 44, Illinois • Phone: EStebrook 9-1121
In Canada: Bach-Simpson, Ltd., London, Ontario


LAC DU FLAMBEAU PLANT
WISCONSIN


LAKE STREET PLANT
CHICAGO


KINZIE STREET PLANT
CHICAGO


AURORA PLANT
AURORA, ILL.