OPERATOR'S MANUAL

VOLT-OHM-MILLIAMMETER
MODEL 262, SERIES 3

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FIGURE 1. THE SIMPSON MODEL 262 SERIES 3, VOLT-OHM-MILLIAMMETER

SECTION I

GENERAL DESCRIPTION

INTRODUCTION

The Simpson Volt-Ohm-Milliammeter Model 262 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 A.F. Output voltages.

The Simpson Model 262 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.

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 $1\frac{1}{2}$ ampere, and is soldered to terminals on the printed circuit inside the case.

The instrument is housed in a sturdy, black, 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.

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 top of the black test lead for measuring high negative voltage.

ACCESSORIES AVAILABLE

HIGH VOLTAGE PROBES
16 KV D.C. Simpson Part No. 0146
40 KV D.C. Simpson Part No. 0145

SPECIFICATIONS

RANGES

D.C. Voltage (20,000 ohms per volt)

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

Volume Level in Decibels
(Calibrated for use across a 600 ohm Line)

−12 to +11 D.B.	+10.5 to +33.5 D.B.
−3.5 to +19.5 D.B.	+22.5 to +45.5 D.B.

D.C. Resistance

0-500 ohms	(4.5 ohms center)
0-5,000 ohms	(45 ohms center)
0-50,000 ohms	(450 ohms center)
0-500,000 ohms	(4,500 ohms center)
0-5 megohms	(450,000 ohms center)
0-50 megohms	(4.5 megohms center)

Direct Current
(181 Millivolt Drop, Maximum)

0-80 Microamperes	0-160 Milliamperes
0-160 Microamperes	0-1.6 Amperes
0-1.6 Milliamperes	0-8 Amperes
0-16 Milliamperes	

Accuracy

D.C. Volts up to 1600 V	±2% of full scale
D.C. Volts 0-4000 (with external multiplier)	±3% of full scale
D.C. Current	±2% of full scale
A.C. Volts	±3% of full scale
Resistance Ranges	2.5° of linear arc
OVERALL DIMENSIONS	6" x 7¼" x 3¼"
WEIGHT	3¼ lbs.

FREQUENCY RESPONSE (Nominal)
A.C. Voltage Measurements

Range	±3%	±5%
3 VAC	20 C.P.S. — 500 K.C.	20 C.P.S. — 750 K.C.
8 VAC	20 C.P.S. — 500 K.C.	20 C.P.S. — 750 K.C.
40 VAC	20 C.P.S. — 80 K.C.	20 C.P.S. — 80 K.C.
160 VAC	40 C.P.S. — 10 K.C.	20 C.P.S. — 30 K.C.
400 VAC	40 C.P.S. — 3 K.C.	20 C.P.S. — 30 K.C.

OUTPUT VOLTAGE MEASUREMENTS

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

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 262. 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 connection 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 μf 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

(As defined in Underwriters Laboratories Radio 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 $75T\text{-}350T^2$ millicoulombs, where T is time in seconds.

E. If the potential is more than 5 kilovolts peak and if the total capacitance of the circuit 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-Milliammeter Model 262, 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. If the voltage

is within a lower range, the switch may then be set for a 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 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.

   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 in 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 in the COM.— jack, and the red test lead in the 1600 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, 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 of 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 28 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-Milliammeter Model 262 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.

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. 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.

   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 figures 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 position 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 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 262 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 mentioned 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 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 0-3 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, DC 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 262 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 $\pm$ 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) in 500 ohms, and the Model 262 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 262 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 25.)
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 262. 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 262 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. 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.
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.

   For the 80 μA range, read the figures 0-8 and multiply by 10 for microamperes.
   For the 160 μA 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 262 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 262 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 175 millivolts, or 0.175 volt.

VOLTAGE MEASUREMENTS —DC CIRCUIT

Since the resistance of the basic meter circuit is 3500 ohms, and the voltage sensitivity is 175 millivolts for a full scale reading, the sensitivity in terms of ohms per volt, is 20,000 ohms/volt. For each higher range the model 262 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
1.6	32,000
8	160,000
40	800,000
160	3,200,000
400	8,000,000
800	16,000,000
1600	32,000,000

VOLTAGE MEASUREMENTS—AC CIRCUIT

To measure AC voltages, a modified bridge rectifier within the Model 262 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 262 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 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 capa-

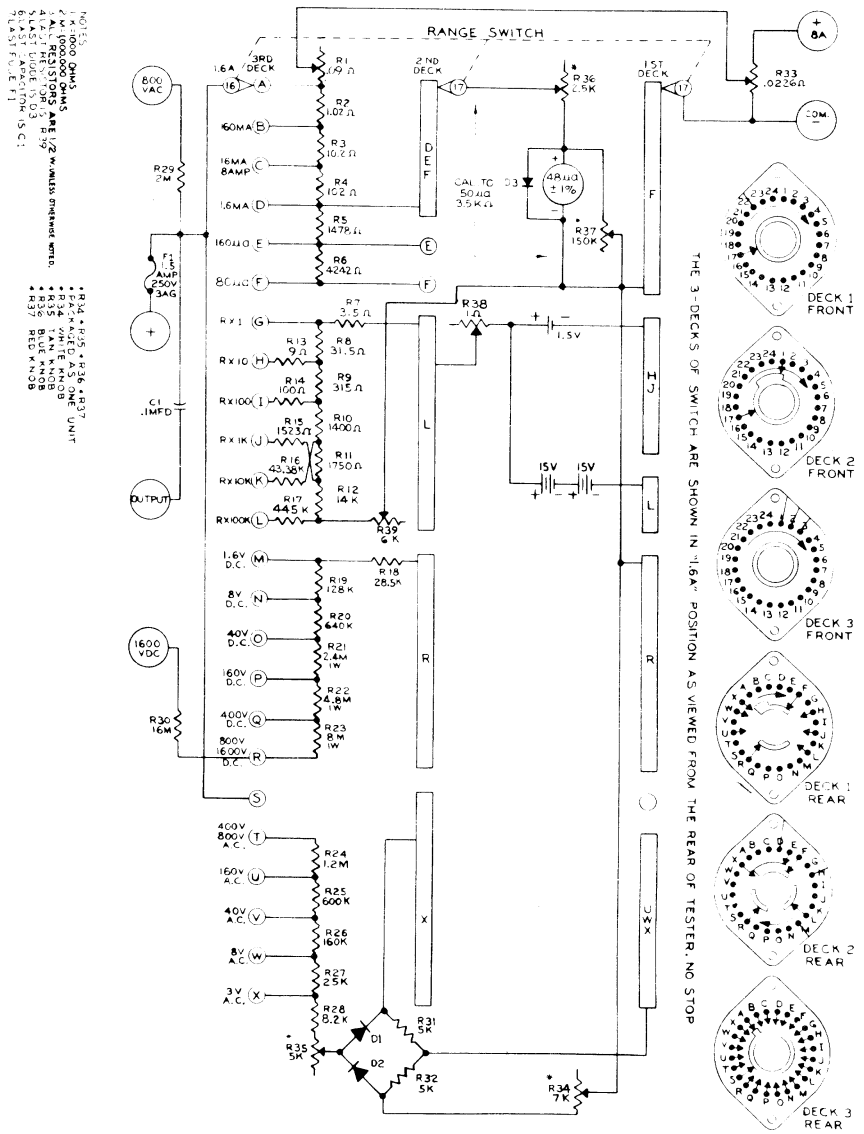

FIGURE 2. SCHEMATIC DIAGRAM. SIMPSON VOLT-OHM-MILLIAMMETER MODEL 262-3

citor may be great enough to reduce the relative amount of voltage which is actually applied to the AC measuring circuit; see frequency response on page 6.

CURRENT MEASUREMENTS

When the Model 262 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 in inverse proportion to their resistances. Meter resistance remains at 3500 ohms for all current ranges. The shunt resistance is less for each succeeding higher current range.

RESISTANCE MEASUREMENTS

When the Model 262 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 262 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, two 15V cells are used in series.

NOTE

Do not make resistance measurements with the Model 262 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

PARTS LIST

Reference Symbol	Description	Simpson Part No.
R1	1.6 amp Shunt (calibrated in tester)	1-111032
R2	Resistor 1.02 ohms (bobbin)	10-675240
R3	Resistor 10.2 ohms	1-111011
R4	Resistor 102 ohms	1-111012
R5	Resistor 1478 ohms	1-111013
R6	Resistor 4242 ohms	1-111014
R7	Resistor 3.5 ohms (bobbin)	10-675241
R8	Resistor 31.5 ohms	1-111015
R9	Resistor 315 ohms	1-111016
R10	Resistor 1400 ohms	1-111017
R11	Resistor 1750 ohms	1-111018
R12	Resistor 14K ohms	1-111019
R13	Resistor 9 ohms	1-111020
R14	Resistor 100 ohms	1-111021
R15	Resistor 1523 ohms	1-111022
R16	Resistor 43.38K ohms	1-111023
R17	Resistor 445K ohms	1-110740
R18	Resistor 28.5K ohms	1-111024
R19	Resistor 128K ohms	1-111025
R20	Resistor 640K ohms	1-111026
R21	Resistor 2.4 Megohms	1-111027
R22	Resistor 4.8 Megohms	1-111028
R23	Resistor 8 Megohms	1-111031
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 8.2K ohms	1-111030
R29	Resistor 2 Megohms	1-110172

PARTS LIST

Reference Symbol	Description	Simpson Part No.
R30	Resistor 16 Megohms	1-111029
R31	Resistor 5K ohms	1-117902
R32	Resistor 5K ohms	1-117902
R33	Shunt Assembly 8 ampere (calibrated in tester)	10-650015
R34	Potentiometer 7K ohms	Packaged as 1 unit Part Number
R35	Potentiometer 5K ohms	
R36	Potentiometer 2.5K ohms	
R37	Potentiometer 150K ohms	1-111005
R38	Rheostat 1 ohm	1-111008
R39	Potentiometer 6K ohms	1-111006
D1	Diode 1N87G	1-115970
D2	Diode 1N87G	1-115970
D3	Diode, Silicon	1-110231
C1	Capacitor .1 mfd, 400V, ± 20%	1-113733
F1	Fuse 1½ amp 3AG	1-110409
	Test Lead Set (one black and one red Lead)	0115
	High Voltage Multiplier 4000V DC	0165
	Molded Phenolic Case	3-330112
	Adjust-A-Vue Handle Assembly	3-310812
	Knobs	1-110170
	Meter Assembly	Spec. 2262-3

BATTERY REPLACEMENT

To replace batteries it is only necessary to remove 3 screws holding the battery plate on the bottom of the case. When it is no longer possible to bring the pointer to zero on the Rx1, Rx10, Rx100 and Rx1K ranges, (see Measuring Resistances 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 two 15 volt batteries. 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

Both 15 volt batteries to have + mark at same end.

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 262, 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 1½ 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-Milliammeter Model 262 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 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-Milliammeter Model 262, 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 could reduce the insulation strength of the leads. When replacement is indicated, ask your local distributor for catalog number 0115.

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.

SECTION V
ACCESSORY DC HIGH VOLTAGE PROBES

D.C. HIGH VOLTAGE TEST PROBES
(20,000 OHMS PER VOLT)

Part No. 0146	16,000 Volts, D.C.
Part No. 0145	40,000 Volts, D.C.

The DC high voltage probes extend the range of a 20,000 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 wires are needed.

The probe is used with the tester in the 1.6 Volt D.C. position, therefore, when the probe is operated at full capacity, the voltage drop across the tester is 1.6 volts. The balance of the voltage drop takes place across the resistor in the probe.

SIMPSON WARRANTY REPAIR STATIONS AND PARTS DEPOTS

Arizona, Phoenix 85016 Metercraft Inc. 3308 N. 24th St.	Area Code 602 279-6249
California, San Diego 92111 Meter Master, Inc. 8139 Engineer Road	Area Code 714 278-2200
California, Glendale 91201 JSD Engineering Company 6915 San Fernando Road	Area Code 213 849-6187
California, Los Angeles 90022 Meter Master, L.A. Div. of Kierulff Electronics, Inc. 5645 East Washington Blvd.	Area Code 213 685-7313
California, Mountain View 94041 Kierulff/Metermaster 2484 Middlefield Road	Area Code 415 968-6292
California, San Francisco 94105 Pacific Electrical Instrument Lab. 111 Main Street	Area Code 415 421-7185
Canada, London, Ontario Bach-Simpson Ltd. 1255 Brydges Street P.O. Box 484	Area Code 519 451-9490
Colorado, Denver 80223 Meter-Master Instrument Service 2145 S. Kalamath Street	Area Code 303 934-4601 934-8614
Connecticut, New Haven 06511 Kaufman Instrument Labs Inc. 810 Dixwell Avenue	Area Code 203 776-7201
Florida, Miami 33136 Florida Precision Instrument Corp. 800 N.W. 7th Avenue	Area Code 305 374-1731

Florida, Orlando 32806 — Area Code 305
Electro Tech Inc. — 423-5589
307 - 27th Street

Georgia, Atlanta 30310 — Area Code 404
Electro-Tech Inc. — 758-7205
690 Murphy Ave. S.W.

Hawaii, Honolulu 96817 — 851-457
Electronic Systems Inc. — 811-132
1622-26 Silva Street

Illinois, Chicago 60625 — Area Code 312
A & M Instrument, Incorporated — 539-4460
4801 North Ridgeway Avenue

Illinois, Chicago 60644 — Area Code 312
Pacific Indicator Company — 261-1330
5217 W. Madison Street

Illinois, Chicago 60644 — Area Code 312
Simpson Electric Company — 379-1121
5200 W. Kinzie Street

Kansas, Shawnee Mission 66205 — Area Code 913
Sturtz Instrument Co. — 236-4705
4705 Mission

Louisiana, New Orleans 70115 — Area Code 504
Industrial Instrument Works — 895-5621
3305 Tchoupitoulas Street

Maryland, Baltimore 21211 — Area Code 301
Edgerly Instrument Lab., Inc. — 243-6611
205 West 28th Street

Massachusetts, Cambridge 02138 — Area Code 617
A. S. Mancib — 864-2494
363 Walden Street

Massachusetts, Needham Heights 02194 — Area Code 617
Instruments, Incorporated — 444-9410
570 Hillside Avenue

Michigan, Detroit 48220 — Area Code 313
Ram Meter, Inc. — 547-1000
1100 Hilton Road Ferndale

Minnesota, Minneapolis 55411 — Area Code 612
Instrumentation Services Inc. — 521-8803
917 Plymouth Avenue

Missouri, St. Louis 63112 — Area Code 314
Scherrer Instruments — 367-9800
5449 Delmar Blvd.

New Jersey, Belleville 07109 — Area Code 201
Marshall Instruments, Inc. — 751-1190
236 Washington Avenue

New York, Buffalo 14216 — Area Code 716
Electrical Instrument Labs. — 392-2726
932 Hertel Avenue

N. Y., Great Neck, Long Island 11022 — Area Code 212
Simpson Instrument Sales & Service, Inc. — 683-0674
130 Gutter Mill Road — Area Code 516
482-3103

New York, Long Island City 11103 — Area Code 212
A & M Instrument Inc. — 726-4343
48-01 31st Avenue

New York, New York 10011 — Area Code 212
Electro-Tech Equipment Company — 675-2400
85 Tenth Avenue

New York, Syracuse 13215 — Area Code 315
Syracuse Instrument Lab. — 492-1651
4895 South Avenue Box 96

New York, Vestal 13850 — Area Code 607
Compton Industries Inc. — 748-3349
333 Vestal Parkway East
P.O. Box 351

North Carolina, Charlotte 28206 — Area Code 704
Electro-Tech Inc. — 333-0326
3107 Gullman Avenue

Ohio, Cleveland 44135 Weschler Electric Company 4250 W. 130th Street	Area Code 216 251-4609
Ohio, Cleveland 44103 Pioneer-Standard Electronics, Inc. 5403 Prospect Avenue	Area Code 216 432-0010
Ohio, Dayton 45404 SREPCO Electronics Div. of Pioneer Standard Electronic, Inc. 314 Leo Street	Area Code 513 224-0871
Oklahoma, Tulsa 74011 Tri-State Instrument Lab. 3244 East 15th Street, Box 5057	Area Code 918 936-0489
Oregon, Portland 97217 Industrial Instrument Repair Lab. 1910 N. Killingsworth St.	Area Code 503 285-6629
Pennsylvania, Philadelphia 19115 Sunshine Scientific Instrument 1810 Grant Avenue	Area Code 215 673-5600
Texas, Dallas 75204 Ultra Instrument Lab., Inc. 3515 Swiss Avenue, Suite 117	Area Code 214 826-6395 826-6396
D.C., Washington 20001 Electronic Wholesalers, Inc. 2345 Sherman Avenue N.W.	Area Code 202 483-5200
Washington, Seattle 98119 The Instrument Lab. Inc. 934 Elliott Avenue West	Area Code 206 283-5850
Wisconsin, Milwaukee 53202 The Electro-Mechano Company 241 East Erie Street	Area Code 414 272-4050

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
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In Canada: Bach-Simpson, Ltd., London, Ontario


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