OPERATOR'S MANUAL

VOLT-OHM-MILLIAMMETER "THE HAMMETER"

SIMPSON MODEL 240 SERIES 4

Printed in U.S.A.
5-110659

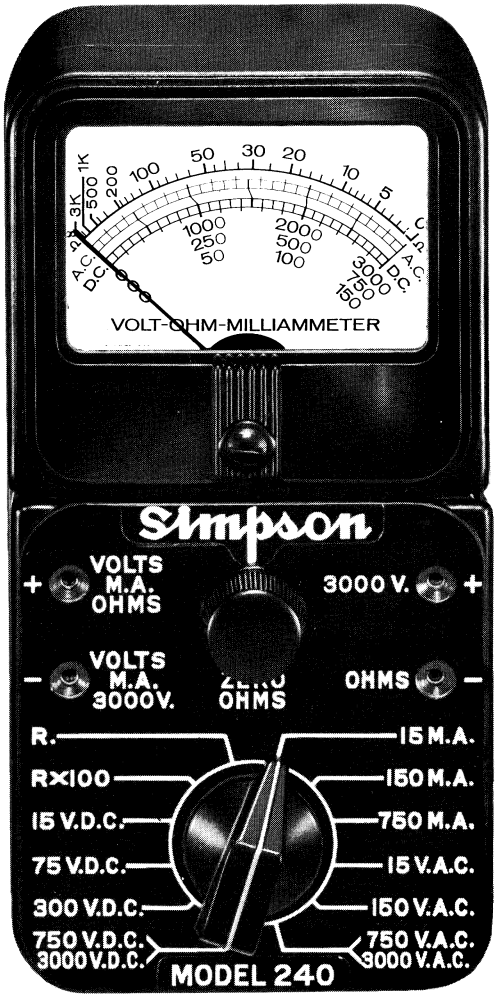

FIGURE 1. THE SIMPSON HAMMETER — MODEL 240-4

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SECTION I

SPECIFICATIONS

		Accuracy in % of full scale
D.C. Voltage		
Sensitivity:	1000 ohms per volt	
5 Ranges:	0-15-75-300-750-3000 volts	3
A.C. Voltage		
Sensitivity:	1000 ohms per volt	
4 Ranges:	0-15-150-750-3000 volts	4
Direct Current		
	(150 millivolt drop, maximum)	
3 Ranges:	0-15-150-750 milliamperes	3
Resistance		**Accuracy in degrees of arc**
2 Ranges:	R. for 0-3000 ohms (30 ohm center)	3
	Rx100 for 0-300,000 ohms (3000 ohm center)	3

Voltage supply for ohmmeter circuit

Battery, P.R. Mallory No. Mn-1500, or equivalent — 1.5 volt cell

Over all dimensions — 3-1/16" x 5-7/8" x 2-5/8"

Net Weight — 1-1/3 lbs.

SECTION II

GENERAL DESCRIPTION

The Simpson Volt-Ohm-Milliammeter Model 240, as shown in Figure 1, is popularly known as the "Hammeter." This is true because it was designed to serve the needs of "Hams" (Amateur Radio Operators) when they check the circuits in their transmitters and receivers. The same types of measurements and ranges which are needed for these checks make the instrument fit the requirements of many other applications, such as aircraft and marine maintenance, telephone, and teletype servicing, line voltage checking, and many others.

There are convenient ranges for measuring DC voltage, current, resistance, and AC voltage. All the ranges and circuits are selected easily and quickly with the range switch at the bottom of the front panel. The test leads connect into circuit jacks on the front panel, and are used for contacting each source of electrical characteristics to be measured.

The Hammeter is especially adapted to the needs of an amateur radio operator; he will have high voltages, both DC and AC, in his transmitter which he will have to test periodically. It is a convenience for him to be able to use the same instrument for this special application as will also help him with all his other test and service applications. It is es-

pecially convenient when he has all the components for the high voltage circuits present inside the case of the instrument rather than in an accessory which is hard to find when it is needed. The Hammeter is entirely self contained, and does not require any such external accessory for high voltage measurements.

METER MOVEMENT

The 3 inch indicating meter is one of the famous SIMPSON INSTRUMENTS THAT STAY ACCURATE. It has a sensitivity of 400 microamperes DC, an internal resistance of 365 ohms, and a special dial calibrated for all the measuring circuits of the instrument.

FRONT PANEL

There are two knobs on the front panel. One is for the RANGE switch. This has twelve positions, each marked for the circuit and the range which it will set up in the instrument. The second is the ZERO OHMS control. This operates a variable resistor which compensates for aging of the internal battery, which is in the circuit during resistance measurements.

There are four contact jacks on the front panel for test lead connections. There are three combinations of these contact jacks and they all are identified with engraved white

lettering which helps determine their use. The combinations are as follows:

1. For either DC or AC voltage up to 750 volts, use the two jacks on the left side of the front panel. Connect the black test lead in the jack marked —VOLTS M.A. 3000V., and the red test lead in the jack marked +VOLTS M.A. OHMS.

2. For either DC or AC voltage between 750 and 3000 volts, use the contact jack at the lower left and the one at the upper right. Connect the black test lead in the jack marked —VOLTS M.A. 3000V., and the red test lead in the jack marked +3000V.

3. For resistance measurements, connect the black test lead to the jack at the lower right marked —OHMS and the red test lead to the jack at the upper left marked +VOLTS M.A. OHMS.

SECTION III

OPERATING INSTRUCTIONS

CAUTION: When measuring voltages, as a protection to yourself, form the habit of turning off all power in the circuit to be measured, connect the test leads in the circuit, and then turn on power to make

the measurement. Turn off power before disconnecting leads. Do not touch the leads while voltage is applied.

ZERO ADJUSTMENT

Before making any measurements with the Simpson Hammeter Model 240, check to see that its pointer indicates zero with the instrument in its operating position. If the pointer is off zero, adjust the screw located in the bakelite meter case just below the center of the dial, as shown in Figure 1. Use a small screwdriver to turn this screw either clockwise or counterclockwise until the pointer rests over the zero indications at the left side of the meter dial.

D.C. VOLTAGE MEASUREMENTS, UP TO 750 VOLTS

1. Rotate the range selector knob until it indicates the range desired. These positions are marked 15 V.D.C., 75 V.D.C., 300 V.D.C., and 750 V.D.C. The last position is also marked 3000 V.D.C.; disregard the 3000 mark until using the 3000 volt range. WHEN IN DOUBT AS TO THE VOLTAGE PRESENT ALWAYS USE THE HIGHEST RANGE AS A PROTECTION TO THE INSTRUMENT. After taking the first reading,

the range selector may be set for a lower range if the voltage is within the lower range.

2. Plug the prod of the black test lead into the jack marked —VOLTS M.A. 3000 V. Plug the prod of the red test lead in the jack marked +VOLTS M.A. OHMS.

3. Connect the crocodile clip of the black test lead to the negative side of the circuit to be measured. Connect the crocodile clip of the red test lead to the positive side of the circuit.

4. Turn on power in the circuit to be measured. If the pointer deflects to the left of zero, the lead connections are reversed with respect to expected voltage polarity. Turn off the power, reverse the test lead connections in the circuit, and then turn on the power again.

5. Read the voltage on the black arc of the meter marked D.C. For the 15, 75, and 300 volt ranges, use the figures 0-15, 0-75, and 0-300 respectively, disregarding the red zeros. For the 750 volt range, use both black and red markings for the figures 0 to 750.

6. Turn off the power before disconnecting the test leads.

D.C. VOLTAGE MEASUREMENTS, 3000 VOLT RANGE

1. Set the range switch at 3000 V.D.C. This position is also marked 750 V.D.C.; disregard the 750 markings for this range.
2. Plug the prod of the black test lead into the jack marked —VOLTS M.A. 3000V. Plug the prod of the red test lead into the jack marked +3000V.
3. Connect the crocodile clip of the black test lead to the negative side of the circuit to be measured. Connect the crocodile clip of the red test lead to the positive side of the circuit.
4. Without touching the meter or the leads, turn on the power. If the meter pointer deflects to the left, the circuit polarity is opposite to that which was expected. Turn off the power, reverse the test leads, and then turn the power on again.
5. Read the black arc marked D.C. Use both the black and the red figures for the range 0 to 3000.
6. Turn off the power before disconnecting test leads.

A.C. VOLTAGE MEASUREMENTS, UP TO 750 VOLTS

1. Rotate the range selector knob on the

front panel until it indicates the range desired. These positions are marked 15 V.A.C., 150 V.A.C., and 750 V.A.C. The 750 V.A.C. position is also marked 3000 V.A.C.; disregard the 3000 volt marking. WHEN IN DOUBT AS TO THE VOLTAGE PRESENT, ALWAYS USE THE HIGHEST RANGE AS A PROTECTION TO THE INSTRUMENT. After taking the first reading, the range selector may be set for a lower range if the voltage is within the lower range.

2. Plug the prod of the black test lead into the jack marked —VOLTS M.A. 3000V. Plug the prod of the red test lead into the jack marked +VOLTS M.A. OHMS.
3. Connect the crocodile clips of the two test leads to the two sides of the circuit to be measured.
4. Turn on the power in the circuit to be measured.
5. Read the voltage on the red arc of the dial marked A.C. For the 15 volt range, use the figures 0 to 15, and disregard the red zeros. For the 150 and 750 volt ranges, use both black and red figures for 0 to 150 and 0 to 750 respectively.
6. Turn off all power before disconnecting the test leads.

A.C. VOLTAGE MEASUREMENTS, 3000 VOLT RANGE

1. Set the range switch at 3000 V.A.C. This is also marked 750 V.A.C.; disregard the 750 volt marking for this range.
2. Plug the prod of the black test lead in the jack marked —VOLTS M.A. 3000V. Plug the prod of the red test lead into the jack marked +3000V.
3. Connect the crocodile clips of the test leads to the two sides of the circuit to be measured.
4. Turn on the power in the circuit to be measured. Do not touch the meter or the test leads.
5. Read the voltage on the red arc of the meter marked A.C. Use both the black and red figures for the range 0 to 3000.
6. Turn off the power before disconnecting the test leads.

D.C. RESISTANCE MEASUREMENTS

CAUTION: Before making any resistance measurements in an electrical or electronic circuit, be sure the power is off and all capacitors are discharged, so no voltage exists in the circuit. Otherwise the meter may be damaged.

1. Rotate the range selector knob to indicate the range desired for resistance measurement. These ranges are marked R. and Rx100.
2. Plug the prod of the black test lead into the jack marked —OHMS. Plug the prod of the red test lead into the jack marked +VOLTS M.A. OHMS.
3. Short the crocodile clips together. While so connected, rotate the ZERO OHMS knob in the center of the instrument above the range switch. The pointer will move back and forth as the knob is rotated. Set it for a zero ohms indication, at the right hand end of the dial.
4. Separate the test leads and connect them across the resistance or the portion of a circuit which is to be measured. The more accurate resistance indication is given on the range which provides a reading nearest the center of the scale.
5. Read the value indicated on the black arc at the top of the dial, which is marked Ω Note that this scale increases from right to left. For the R. range, read the resistance directly on the Ω arc. For the Rx100 range, read the indication on the Ω arc and multiply the reading by 100 (add two zeros).

DIRECT CURRENT MEASUREMENTS

CAUTION: Never connect the test leads directly across any source of voltage when the Model 240 is set for current measurements. This will damage the instrument. Always connect the meter in series with the load.

1. Rotate the range selector knob until it indicates the range desired for current measurements. The positions are marked 15 M.A., 150 M.A., and 750 M.A. WHEN IN DOUBT AS TO THE CURRENT PRESENT, ALWAYS USE THE HIGHEST RANGE AS A PROTECTION TO THE INSTRUMENT. After the first reading, the range switch may be set for a lower range if the reading is within the lower range.
2. Plug the prod of the black test lead into the jack marked —VOLTS M.A. 3000V. Plug the prod of the red test lead into the jack marked + VOLTS M.A. OHMS.
3. Open the circuit in which the current is to be measured. Connect the Model 240 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 the power in the circuit to be measured. If the meter pointer moves to the left of zero, circuit current is flowing in a direction opposite to that which was expected. Turn off the power, reverse the lead connections, and then turn on the power again.

5. Read the current values on the black arc of the dial marked D.C. For the 15 milliamperes range, use the figures 0 to 15 and disregard the red zeros. For the 150 and 750 milliamperes ranges, use both the black and the red figures.
6. Turn off the power before disconnecting the test leads.
7. Connect the circuit together where it was opened to make the current measurement.

and 750 milliamperes ranges, use both the black and the red figures.

SECTION IV
MAINTENANCE

CARE

The meter is very rugged and will withstand many years of use without showing any signs of wear. However, the parts are made to fit together with the precision of a fine watch, and they can be damaged by careless handling. Be careful to prevent your Hammeter from receiving any unnecessary shocks. If you treat your instrument with care, it will reward you with many years of trouble-free service and accurate indications of all the values which you measure.

HOW TO OPEN INSTRUMENT

The lower half of the instrument can be taken out of the case for trouble-shooting, repair, and battery replacement when it is

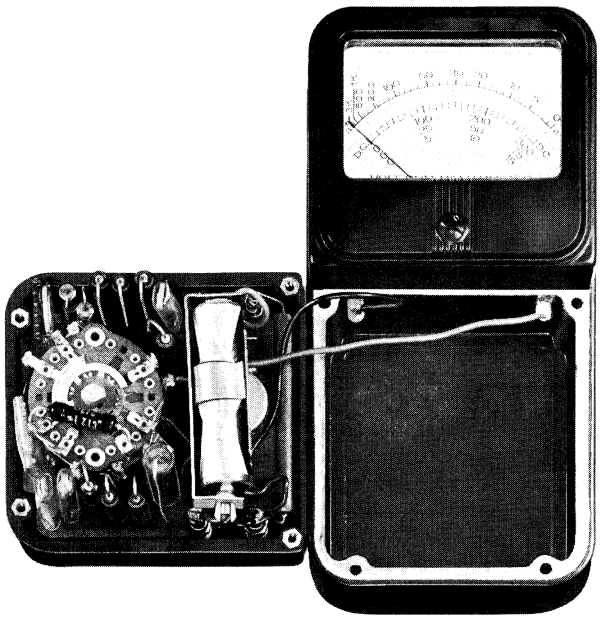

FIGURE 2. MODEL 240-4 WITH CASE OPENED TO SHOW INTERNAL COMPONENTS

necessary. To open the instrument, remove the four screws through the back of the case and pull the lower half of the instrument toward the bottom and out of the case. All the components will come out with the front panel as shown in **Figure** 2. There are two wire leads which connect these circuit portions to the indicating meter; when removing the lower portion of the instrument from the case, be careful to prevent damage to the leads.

REPAIRING THE METER

Since all repair to the meter portion of the Model 240 should be performed only by qualified repairmen with the proper tools, the top half of the instrument is sealed. Do not attempt to remove it from the case.

If any repair is necessary, return the entire Model 240 to the Repair Department at the factory, or to your nearest Authorized Simpson Repair Station.

Whenever you return an instrument to a repair station or to the factory, be sure to write a letter to explain exactly what you think is wrong with it and why. This will save both time and money for you.

Also indicate in the letter what you want the repair station or factory to do, so they have the necessary authorization from you to proceed with your repairs.

BATTERY REPLACEMENT

The 1.5 volt dry cell inside the case of the

Model 240-4 is used for resistance measurements. During its normal life, the battery will gradually increase its internal resistance. This will result in a decrease of terminal voltage under normal load.

When the pointer can no longer be brought to 0 on the Ω arc with the ZERO OHMS knob, remove the old battery and slip a new 1.5 volt, size AA manganese cell into the battery holding clamp. Place the battery into the holder so that the plus (+) pole is adjacent to the insulated contact with the brown lead.

RECTIFIER REPLACEMENT

Two germanium diodes are used to rectify the A.C. voltage for measurement. Both these diodes D1 and D2 are located on the printed circuit board as shown in Figure 3.

In case of rectifier failure replace defective diode with another 1N87G. Observe correct polarity and lead locations of the diodes when assembling and soldering them into the printed circuit board. Both diodes are mounted in standoff position with the anode pole adjacent to the printed circuit board. After replacement of the rectifier diodes test the accuracy of the A.C. ranges.

AC RECALIBRATION

After repair of the tester and replacement of

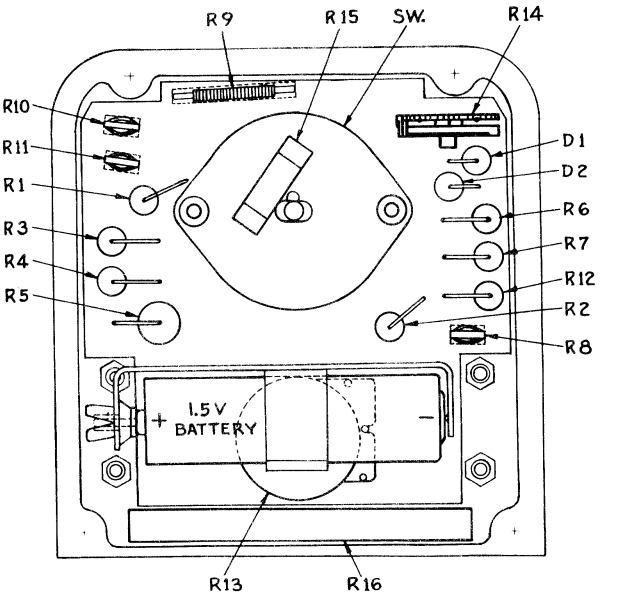

FIGURE 3. LOCATION OF PARTS ON PRINTED CIRCUIT BOARD

the rectifier diodes, AC recalibration may be required.

If necessary recalibrate the circuit by adjusting variable resistor R 14 located on the printed circuit board and shown in Figure 3 as follows:

1. Set the range switch at the 15 VAC position.

2. Plug red test lead into the +VOLTS jack.
3. Plug black test lead into the —VOLTS jack.
4. From a standard source apply 15 VAC to the test leads.
5. Adjust R 14 so that the meter pointer indicates full scale.
6. Then check other ranges.
7. Case the tester by sliding panel assembly carefully into the case. Do not touch and disarrange the rotor knob of the calibrating potentiometer R 14. Tighten four casing screws through the back of the case.

REMOVING THE PRINTED CIRCUIT BOARD

When you require access to the underside of the printed circuit board, remove the printed circuit board in the following manner.

1. Remove the knob for the ZERO OHMS control.
2. Remove the hex nut from the control bushing on the top of the front panel.
3. Lift the printed circuit board away from the front panel. The entire board with

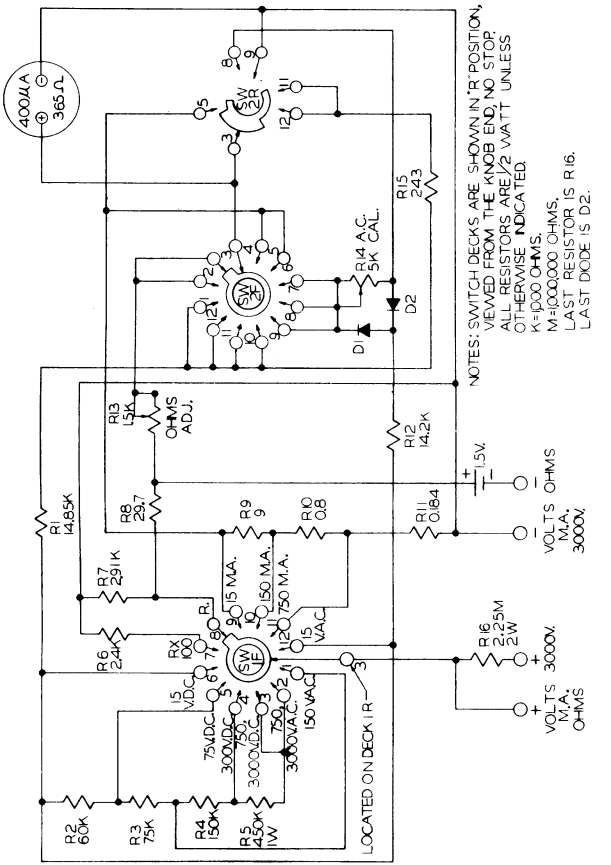

FIGURE 4. HAMMETER MODEL 240-4, OVERALL SCHEMATIC DIAGRAM

the switch wafers in place will come up in one piece.

4. After removal, do not turn range switch knob on the front panel or move range switch rotors on the printed circuit board until reassembled.

PARTS LIST

Reference Symbol	Description	Simpson Part No.
R1	Resistor, 14.85 K ohms, 1%, 1/2W	1-117106
R2	Resistor, 60K ohms, 1%, 1/2W	1-117013
R3	Resistor, 75 K ohms, 1%, 1/2W	1-117258
R4	Resistor, 150 K ohms, 1%, 1/2W	1-117895
R5	Resistor, 450 K ohms, 1%, 1W	1-116996
R6	Resistor, 2.4 K ohms, 1%, 1/2W	1-117107
R7	Resistor, 2.91 K ohms, 1%, 1/2W	1-110268
R8	Resistor, 29.7 ohms, 1/2%, 1/2W (wire-wound)	10-675274
R9	Resistor, 9 ohms, 1%, 1/2W (wire-wound)	10-805058
R10	Resistor, 0.8 ohms, 1% 1/2W (wire-wound)	10-805059
R11	Resistor, 0.184 ohms, 1%, 1/2W (wire-wound)	10-675275

PARTS LIST

Reference Symbol	Description	Simpson Part No.
R12	Resistor, 14.2 K ohms, 1%, 1/2W	1-117109
R13	Potentiometer, 1.5 K ohms ±20%	5-110650
R14	Potentiometer, 5 K ohms ±30%	5-110753
R15	Resistor, 243 ohms, 1%, 1/2W	1-119540
R16	Resistor, 2.25 M ohms, 1%, 2W	1-116997
D1	Diode, germanium, type 1N87G	1-115970
D2	Diode, germanium, type 1N87G	1-115970
SW	Switch, 2 sections, less frame assembly	5-110651
	Knob, for range switch, (less set screw)	3-262871
	Set Screw, (for knob 3-262871)	5-110242
	Knob, for Zero Ohms adjust, set screw incl.	1-114949
	Test Lead Set (one red and one black)	0-008375
	Battery, 1.5 volts, size AA, Mallory type No. Mn-1500	1-110550
	Meter Assembly, complete with case	15-302240-4

SECTION V

SPECIAL APPLICATIONS

MEASURING HIGH RESISTANCE

With the aid of a circuit such as shown in Figure 5, resistance values can be measured up to 3 megohms. Set the range switch at Rx100. The range set up will be Rx1000, so multiply each reading on the Ω scale of dial

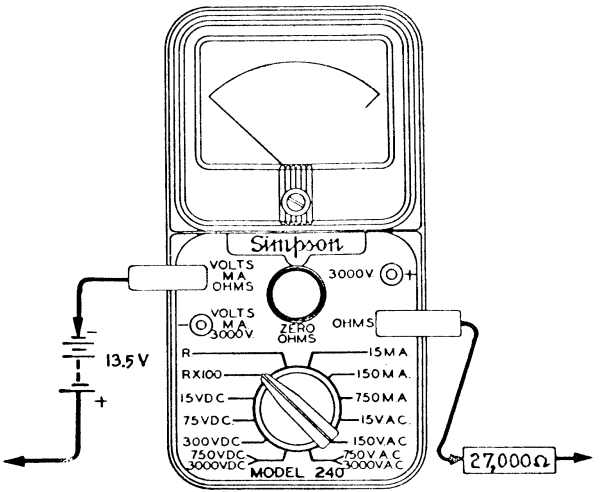

FIGURE 5. INCREASING THE RESISTANCE RANGES

by 1000 (add three zeros). Use whatever combination of batteries is available to make up 13.5 volts, which is 9 cells in series. One combination would be two 6 volt batteries and one 1.5 volt cell all in series. Another way to get it is to use two bias type batteries with five cells each, with taps at each 1.5 volts; use the entire 7.5 volts from one battery and four cells (6 volts) from the second, connected in series.

The series resistor is indicated as 27,000 ohms; any value close to that amount will provide satisfactory indications with the ohmmeter. More accuracy will be obtained when the series resistor value is exactly 27,000 ohms, but such accuracy is usually not required for resistance readings. This does not have to be a single resistor, but can be any combination which will produce a series equivalent resistance of 27,000 ohms.

MEASURING OUTPUT VOLTAGES

Output voltage is the name given to the AC portion of mixed AC and DC voltages. It is the signal voltage at the plates of audio amplifier tubes, and the ripple voltage on DC power supplies. To measure the AC portion separately, connect a blocking capacitor as shown in Figure 6. Set the range switch of the Hammeter for A.C. voltage measurements.

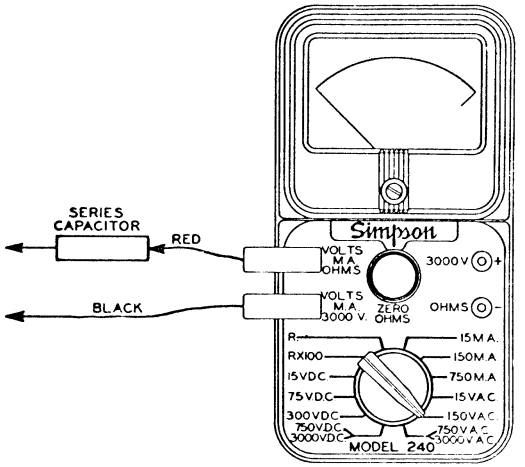

FIGURE 6. CIRCUIT FOR MEASURING OUTPUT VOLTAGES

Use a capacitor with a value of 0.25 or 0.5 microfarad, and with a working voltage equal to or greater than the combined DC and peak AC values.

The capacitor will block the DC voltage, but will allow the AC voltage to send a current through the measuring circuits of the Hammeter. This is measured the same as AC voltage; use the instructions in Section III.

THE RADIO AMATEUR AND HIS VOLT OHM-MILLIAMETER

There are many operations which can and should be performed around the radio amateur's transmitter, receiver, and associated equipment, but are not. The Hammeter will furnish the necessary tool for many of these jobs. By using it to its fullest advantage, a more satisfactory degree of efficiency can be achieved.

For trouble shooting and repair, standard procedures require that you check voltages, currents, and resistances in your circuits, and compare them to the expected values for properly operating circuits. The manufacturer of a commercial receiver or transmitter includes, as a standard part of his operating and maintenance instructions, a set of expected voltages and resistances at tube socket pins and at various other critical points in his circuit. If you have built your own equipment, it is very wise to make such a tabulation of the values in your own set. Do this while it is in good working order; then there will be information on which you can rely for future servicing.

To use the trouble shooting information, measure the voltages and resistances at points

in the circuit for which you have reference information. When you find some difference between the amount which exists and the amount which you should have, you have located a possible source of trouble. The kind of trouble and the type of indication will dictate your next move. Almost every possible trouble in your transmitter, receiver, or other associated equipment can be identified with the ranges and measuring circuits of your Model 240.

Use your Hammeter Model 240 to determine the power output of your final amplifier stage in your transmitter. If you have a plate current meter for this stage, use it to measure the current. If there is no plate current meter in the transmitter, use your Model 240 to measure this current. Open the lead to the final amplifier plate, and insert the Model 240 in series with this lead. Set up the Model 240 for current measurements according to the instructions in Section III. Connect the black test lead to the plate of the tube and the red test lead to the lead which you disconnected from the plate circuit.

CAUTION: Be sure that the power is turned off while you make the necessary connections for this current measurement. When the circuit is connected, turn

on the power while you read the current WITHOUT TOUCHING THE METER OR THE TEST LEADS. Voltage which is present at the plate of the final amplifier is usually dangerous to touch: it is present in the meter circuit during this measurement. Turn off the power before you disconnect the meter from the transmitter again.

After you have finished measuring the plate current, be sure to connect the circuit as it was again, in order to resume operation.

Next, measure the plate voltage. Do this according to the instructions for measuring voltage in Section III. Be sure to again connect and disconnect the meter leads while the power is off. Your Model 240 will measure any DC voltage up to 3000 volts, and this is more than enough for all the voltage measurements in average equipment.

When you have both the current and voltage values, you can calculate the plate power. Power, measured in watts, is equal to volts times amperes. Multiply the two values to get the power delivered to the plate of the final amplifier stage of the transmitter.

For maximum efficiency, neutralize the final amplifier stage. Ordinarily, there is a circuit

in the transmitter for this purpose, but it needs periodic adjustment. Use your Model 240 Hammeter to measure the results of adjusting the neutralizing capacitor. You will

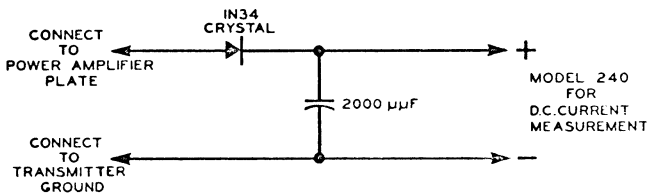

FIGURE 7. ACCESSORY DETECTOR CIRCUIT FOR TRANSMITTER POWER AMPLIFIER NEUTRALIZATION

need an accessory, which you can make according to the circuit in Figure 7. A 1N34 crystal and a 2000 uuf capacitor are required. This is a simple detector circuit with which you will change RF energy to DC.

To use the accessory detector, disconnect the B+ circuit for the final amplifier plate and connect the leads of the detector as indicated, to the power amplifier tube plate and to ground in the transmitter. Connect the test leads of the Hammeter across the output, shown at the right. Set the Model 240 for its 15 M.A. range.

Now turn on the transmitter power. There is no DC voltage on the final amplifier plate because you have disconnected the plate lead. If the stage is not neutralized, there will be some RF signal fed through the interelectrode capacity in the tube to the plate. It will cause an indication on the meter if it is strong enough. Your adjustment will reduce this indication to a minimum amount. When the indication on the meter shows that the current is less than 400 microamperes (each scale division is 500 microamperes for this range), you can increase the sensitivity of the meter for the final adjustment. Remove the lower half of the instrument from its case, unsolder the movement leads, and use the meter movement alone. As you look at the inside of the instrument in the position shown in Figure 2, the positive meter contact is at the right and the negative is at the left. There is no reading on the dial for a 400 microampere range, but you are adjusting the plate neutralization circuit for a minimum indication, so the exact value is not necessary.

After completing plate neutralization, turn off the power and connect the lead to the plate again; the transmitter is ready to be operated with improved efficiency.

Special Applications

There are many operating voltages which should be checked periodically in your equipment. Set up a schedule for these operational checks and maintain it. You will be able to detect and predict a developing fault, and then you can eliminate it before it causes any extensive damage to your equipment. Use your Model 240 to measure any and all voltages for which you do not have meters on the front panels of your equipment.

Tuning procedures require grid and plate current measurements for accuracy. Use your Hammeter for those applications, too.

For the amateur who builds his own transmitter or receiver, there are a variety of uses for the Hammeter. Of course, checking the continuity and resistance of all circuits before applying any voltage is an obvious use during construction. When the power is first applied, use your Hammeter to analyze general circuit operation.

In short, there are many special uses for your Simpson Hammeter Model 240 around the "shack." Its ranges are ideal for these applications.

SIMPSON WARRANTY REPAIR STATIONS AND PARTS DEPOTS

Arizona, Phoenix 85034 Metermaster/Phoenix 2633 E. Buckeye Road	Area Code 602 273-7331
California, Glendale 91201 JSD Engineering Company 6915 San Fernando Road	Area Code 213 849-6187
California, Los Angeles 90022 Metermaster/Los Angeles Division of Kierulff Elec., Inc. 5645 E. Washington Blvd.	Area Code 213 685-4340
California, Los Angeles 90007 Quality Electric Division of Kierulff Elec., Inc. 3700 South Broadway	Area Code 213 232-3501
California, Mountain View 94041 Kierulff/Metermaster 2484 Middlefield Road	Area Code 415 968-6292
California, San Diego 92111 Metermaster/San Diego 8137 Engineer Road	Area Code 714 276-5202
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 80209 Metermaster Instrument Corporation 748 So. Broadway	Area Code 303 722-8462
Connecticut, Middletown Mancib Company Randolph Road—PO Box 467	Area Code 203 Diamond 7-5629

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 Electro Tech Inc. 307 - 27th Street	Area Code 305 423-5589
Georgia, Hapeville 30054 Electro-Tech, Inc. 3020 Commerce Way	Area Code 404 758-7205
Hawaii, Honolulu 96817 Electronic Systems Inc. 1622-26 Silva Street	851-457 811-132
Illinois, Chicago 60625 (Niles) A & M Instrument, Incorporated 7800 N. Merrimac	Area Code 312 966-8100
Illinois, Chicago 60644 Pacific Indicator Company 5924 W. Madison Street	Area Code 312 261-1330
Illinois, Chicago 60644 Simpson Electric Company 5200 W. Kinzie Street	Area Code 312 379-1121
Kansas, Shawnee Mission 66205 Sturtz Instrument Co. 4705 Mission	Area Code 913 236-4705
Louisiana, New Orleans 70115 Industrial Instrument Works 3305 Tchoupitoulas Street	Area Code 504 895-5621
Maryland, Timonium 21093 Edgerly Instrument Labs., Inc. 110 West Timonium Road	Area Code 301 252-1260
Massachusetts, Cambridge 02138 A. S. Mancib 363 Walden Street	Area Code 617 864-2494
Massachusetts, Needham Heights 02194 Instruments, Incorporated 570 Hillside Avenue	Area Code 617 444-9410
Michigan, Detroit 48220 Ram Meter, Inc. 1100 Hilton Road Ferndale	Area Code 313 547-1000
Minnesota, Minneapolis 55411 Instrumentation Services Inc. 917 Plymouth Avenue	Area Code 612 521-8803
Missouri, St. Louis 63112 Scherrer Instruments 5449 Delmar Blvd.	Area Code 314 367-9800
New Jersey, Belleville 07109 Marshall Instruments, Inc. 236 Washington Avenue	Area Code 201 751-1190
New York, Buffalo 14216 Electrical Instrument Labs. 932 Hertel Avenue	Area Code 716 876-0880
N. Y., Great Neck, Long Island 11022 Simpson Instrument Sales & Service, Inc. 130 Cutter Mill Road	Area Code 212 683-0674 Area Code 516 482-3103
New York, Great Neck, L.I. 11022 A & M Instrument, Inc. Community Drive	Area Code 516 487-0500
New York, New York 10011 Electro-Tech Equipment Company 85 Tenth Avenue	Area Code 212 675-2400
New York, Syracuse 13215 Syracuse Instrument Lab. 4895 South Avenue Box 96	Area Code 315 492-1651
New York, Vestal 13850 Compton Industries Inc. 333 Vestal Parkway East P.O. Box 351	Area Code 607 748-3349
North Carolina, Charlotte 28206 Electro-Tech Inc. 3107 Gullman Avenue	Area Code 704 333-0326

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
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 261 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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