FIGURE 1 - SIMPSON MILLIOHMMETER
MODEL 657

OPERATOR'S MANUAL
SIMPSON MILLIOHMMETER ADAPTER
MODEL 657

SECTION I
GENERAL DESCRIPTION

INTRODUCTION

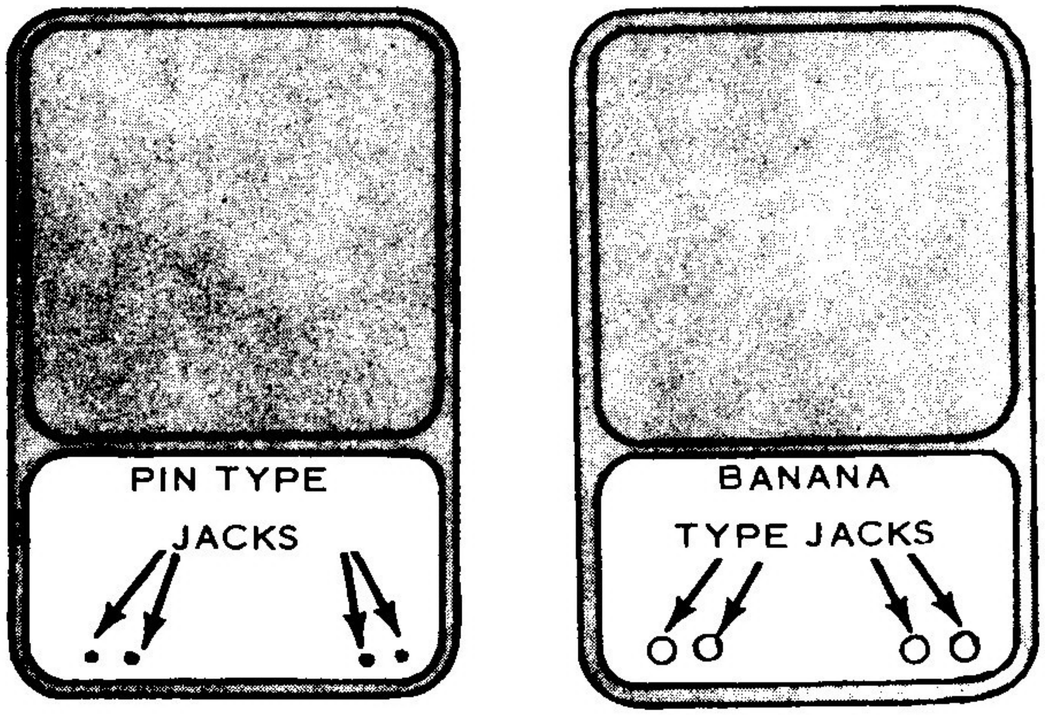
The Simpson Milliohmmeter Adapter Model 657 is a compact, accurate, wide range instrument. When it is used in conjunction with a Simpson **260®**, **261**, or **270**, resistance values from 1 milliohm to 1 ohm can be measured in four ranges.

The Simpson VOM-plus-adapter concept is completely unique in approach and versatility. Each of the adapter models, of which the Milliohmmeter is but one example, provides specific measurement and testing capabilities at a fraction of the cost normally required for separate testers.

ACCESSORIES FURNISHED

Each instrument is furnished with an Operator's Manual. Available are four extra pin-type plugs, 0–007255 used only when the Model 657 is to be used with a 260 Series II (see figure 2 for 260 Series II and Series III identification).

*Trade Mark Registered U.S. Patent Office



(a) 260, Series II

260, Series III, 260-4, 260-4M, 261, 270 and 270-2

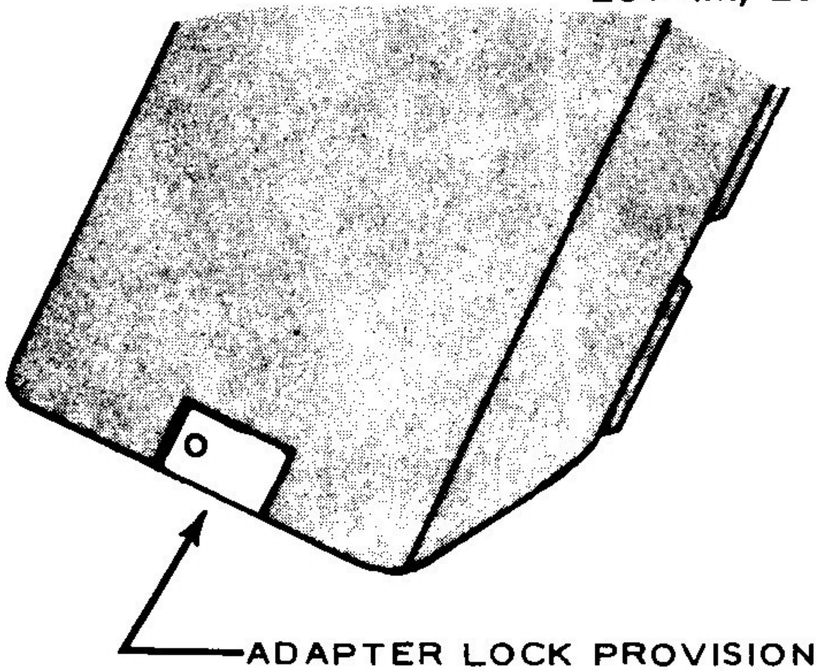


FIGURE 2 – 260 SERIES IDENTIFICATION

SPECIFICATIONS

Ranges: 0-.1 ohm F.S.
0-.25 ohm F.S.
0-.5 ohm F.S.
0-1.0 ohm F.S.

Accuracy: Adapter only; ± ½ %
Adapter with 260; ± 2%
Adapter with 261; ± 1½%
Adapter with 270; ± 1½%

Power Input: None required

Size: 5-5/16 x 4-3/8 x 3-7/16 inches

Weight: 2 pounds, 2 ounces

Battery Life: 1.5v - 150 hours nominal
9v - 250 hours nominal

Test Current: 156 milliamperes maximum

CONTROLS AND CONNECTORS

RANGE SWITCH

This is a five-position rotary switch located in the center of the front panel. The switch positions are marked OFF, 0.1, 0.25, 0.5, and 1.0 ohm. It is used as a range switch and as a power off - 260 Direct switch.

LEVER SWITCH

This switch, located at the bottom center of the front panel, is marked ZERO ADJ. - F.S. ADJ. - READ. When the switch is set at ZERO ADJ., it permits adjustment of the ZERO ADJ. control. When set at F.S., it permits adjustment of the F.S. control. Setting the switch at READ permits the value of the resistance being measured to be read on the proper **260/261/270** scale.

ZERO ADJ. CONTROL

The ZERO ADJ. control is located in the lower left corner of the front panel. When the lever switch is in the ZERO ADJ. position, it is used to set the meter current to zero.

F. S. ADJ. CONTROL

The F.S. ADJ. control is located in the lower right corner of the front panel. With the RANGE switch set at the proper range and the lever switch in the F.S. ADJ. position, this control is used to adjust for a full scale meter reading.

657 INPUT

The 657 INPUT, located to the right of the RANGE switch, consists of a pair of internally connected two conducter leads with special insulated alligator clips for connection to the unknown resistance.

260 DIRECT JACKS

The 260 DIRECT jacks are located at the left side of the RANGE switch. When the RANGE switch is set at OFF, these jacks are connected directly to the **260/261/270** input jacks marked + and COMMON −. This allows the use of the VOM without detaching the Model 657.

SECTION II

OPERATING INSTRUCTIONS

1. Initial Adjustments

a. 260/261/270 Control Settings (see figure 3)

1. With the Model 657 disconnected, check the meter pointer position for zero indication in its operating position. If the pointer is off zero, adjust the phenolic screw under the meter. Refer to the VOM Operator's Manual for further information on this adjustment.
2. Set the **260/261/270** polarity switch to the + DC position.
3. Set the **260/261/270** range switch to the 50V position.

b. Connecting the Model 657 to the VOM

1. Insert the top four plugs of the Model 657 into the lower four jacks of the **260/261/270.**
2. Insert the short lead from the Model 657 into the 50 μAMP jack.
3. Position the adapter locking latch underneath the instrument to secure the two units.

CAUTION

If your **260/261/270** does not have the locking provision, **avoid applying excessive pressure to the top of the Adapter when it is used in** in the Adjust-A-Vue position. A modification **kit, which includes a new case with an adapter locking provision, is recommended for optimum rigidity** (see page 3).

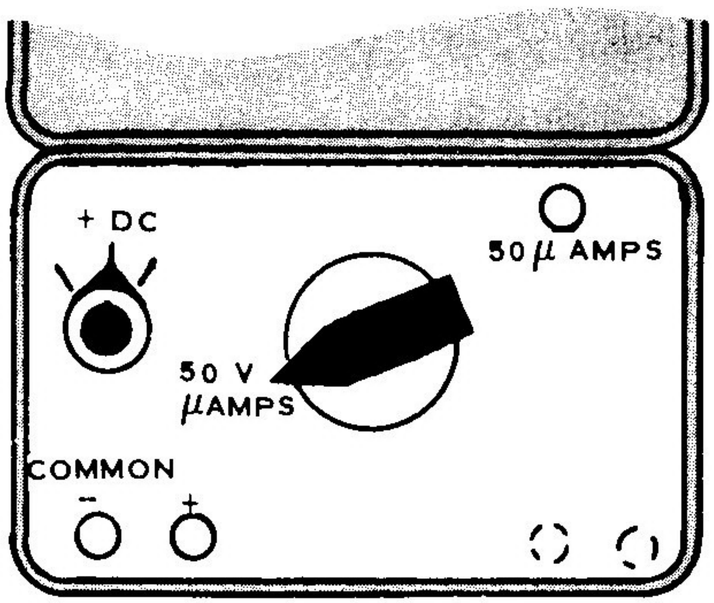
c. Model 657 Control Settings

1. Set the LEVER switch to the ZERO ADJ. position.
2. Set the RANGE switch to a position which is consistent with the resistance being measured. If the resistance to be measured is unknown, set the RANGE switch to the 1.0 ohm range and reset to a lower range if necessary for a more accurate reading.
3. Adjust the ZERO ADJ. control for a zero meter reading.

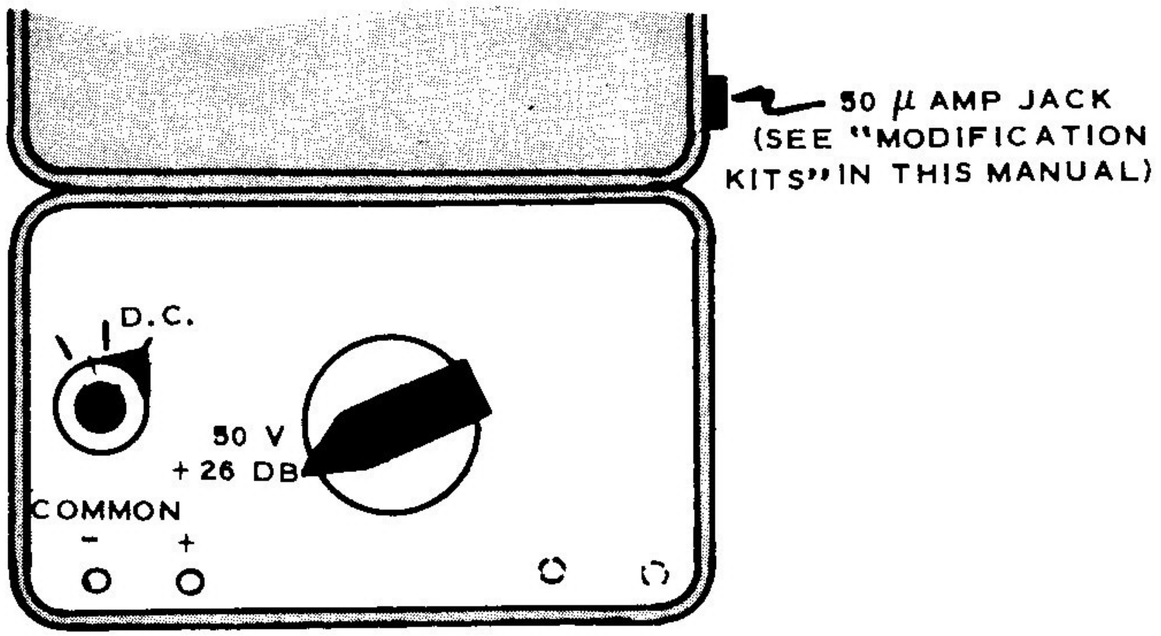
NOTE

The maximum test current (current through the resistance being measured) is:

0.1 ohm range – 156 ma
0.25 ohm range – 107 ma
0.50 ohm range – 91 ma
1.00 ohm range – 86 ma



(a) 260 Series III, 260-4, 260-4M, 261, 270 and 270-2, Control Positions and Jack used with Model 657.



(b) Modified Model 260 Series II, Control Positions and Jack used with Model 657.

FIGURE 3 – MODEL 260 CONTROL POSITIONS FOR USE WITH MODEL 657

2. Measuring Resistance

a. Connect the Model 657 test leads across the resistance to be measured.

b. Set the LEVER switch to F.S. ADJ. position.

c. Adjust the F.S. ADJ. control for a full scale meter reading.

d. Set the lever switch to ZERO ADJ. position.

e. Adjust the ZERO ADJ. control for a zero meter reading.

f. Repeat steps b and c.

g. Set the LEVER switch to the READ position, and read the resistance value on the linear D.C. scales as follows:

0.1 ohm Range – use 0 - 10 instrument scale and divide reading by 100, or multiply reading by 0.01.

0.25 ohm Range – use 0 - 250 instrument scale and divide reading by 1000, or multiply reading by 0.001.

0.5 ohm Range – use 0 - 50 instrument scale and divide reading by 100, or multiply reading by 0.01.

1.0 ohm Range – use 0 - 10 instrument scale and divide reading by 10, or multiply reading by 0.1.

h. Return the LEVER switch to the ZERO ADJ. position, turn the RANGE switch to the OFF position, and disconnect the test leads from the external resistance.

CAUTION

Do not disconnect the test leads from the resistance before the lever switch is returned to the F.S. ADJ. or the ZERO ADJ. position. When the LEVER switch is in the READ position and the test leads are removed from the unknown resistance, it causes the meter to read beyond full scale. This overload is considerably less than the overload capability of the meter. However, in the case of any precision instrument, repeated overloads should be avoided.

3. Using the VOM Circuit while the Model 657 is Attached

a. Set the RANGE switch of the Model 657 to the OFF position.

b. Connect the regular VOM test leads to the 260 DIRECT jacks at the left side of the Model 657. Proceed with the standard operating instructions for the VOM according to its Operator's Manual.

SECTION III

THEORY OF OPERATION

GENERAL

The operation of the Model 657 is based upon the principle of direct comparison of the resistance under measurement with a known internal resistance. This is accomplished by passing a current through the series combination of the two resistances, and consecutively measuring their voltage drops. The principle is outlined in the following simplified schematic and operating instructions.

1. Connect test leads to Rx as at A and B.
2. Set S1 to CAL to measure the voltage drop across Rstd.
3. Adjust R1 to produce a full scale reading on the 260/261/270.
4. Set S1 to "READ" position and read RX directly on the DC meter scales. This, of course, assumes that Rx is equal to or less than the Rstd selected.

NOTES

a. The low contact resistances of S1 and potential contacts "A" of the test lead clips

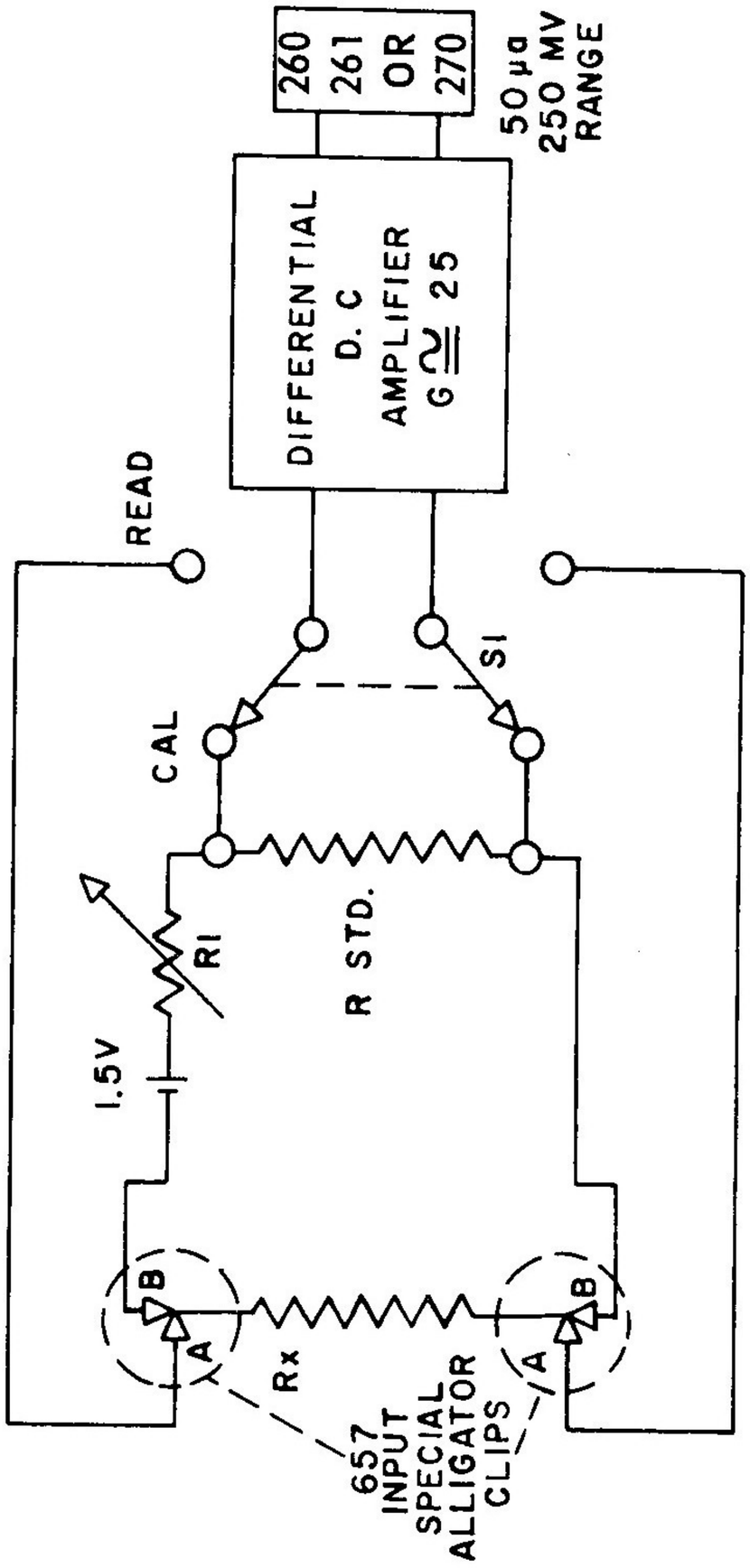


FIGURE 4 - MILLIOHMMETER OPERATION, SIMPLIFIED SCHEMATIC

do not introduce any significant error due to the high input resistance of the amplifier.

b. The contact resistances of the current contacts "B" of the test lead clips introduce no error since the potential measurement across Rx does not include the potential drops across these resistances.

c. The comparative nature of the two consecutive voltage measurements demands only that the system be stable for the duration of the two voltage measurements. This is accomplished by using a heavy duty battery and a DC amplifier having very good short term stability. The absolute gain of the amplifier is unimportant, as long as the amplitude response is linear.

SECTION IV

MAINTENANCE

CASE REMOVAL

To remove the instrument from the case, remove the four corner screws located on the back of the instrument case. All of the components are attached to the front panel.

BATTERY REPLACEMENT

Three batteries are located within the instrument. Two are heavy duty 1.5 volt cells, D size, held in place with a battery holder and a spring clip. To remove these batteries, open the unit as described above, remove the spring clip, and grasp both ends of the battery and pull in an outwardly direction. The other battery is a 9 volt snap type. To remove it, remove the snaps on the ends and pull out. When replacing batteries, be sure to observe the polarity as indicated by the leads and the stamping on the battery mounting plate.

PARTS REPLACEMENT

All of the components of the Model 657 have been engineered for many years of useful life. However, there are conditions under which parts may become damaged or faulty, and require replacement. Refer to the circuit diagram in figure 5 to help identify and locate any suspected part.

In the event of any component failure, order replacement parts from your nearest Simpson Authorized Parts Depot. A list of these parts depots is included, beginning on page 18 of this manual.

PARTS LIST

Description	Simpson Part No.
Knob, Fluted 1-¼" dia. (1 Req.)	1-115548
Knob, Fluted ¾" dia. (1 Req.)	11-115658
Knob, Fluted ¾" dia. for 1/8" dia. shaft	1-118724
Knob, Push-On ½" dia.	1-112547
Switch, Lever	1-118790
Switch, Rotary	1-118729
Case, Molded Phenolic	3-260352
Clip, Fuse Twin Type	1-118749
Test Lead Cord	1-118796
Clip, Battery part of test lead (2 Req.)	10-837566
Insulator, Battery Clip, Black (2 Req.)	1-111874
Battery, 1½ Volt "D" Size EVEREADY 1050	1-118722
Battery, 9 Volt EVEREADY 226	1-118723
Connector, Battery Male Snap	1-118794
Connector, Battery Female	1-118795

Reference Symbol	Description	Simpson Part No.	
R1	Resistor, 1 ohm, tapped	10–860545	•
R2	Potentiometer, 200 ohm ±20%, 2w	1–118726	
R3	Resistor, 18 ohms ±10%, ½w	1–118746	•
R4	Resistor 56 ohms ±10%, ½w	1–115388	
R5	Resistor, 150 ohms ±10%, ½w	1–113926	
R6	Resistor, 18 ohms ±10%, ½w	1–118746	
R7	Resistor, 1K ±10%, ½w	1–111689	
R8	Potentiometer, 1K ±35%, 1/10 w	1–118799	
R9	Potentiometer, 250 ohms ±30%, 1/3 w	1–118727	
R10	Resistor, 2.2K ±5%, ½w	1–118748	
R11	Resistor, 2.2K ±5%, ½ w	1–118748	
R12	Potentiometer, 60 ohms ±10%, 1 w	1–118763	
R13	Resistor, 390 ohms ±5%, ½ w	1–118747	
R14	Resistor, 27K, ±1%, 1/4 w	1–114793	
R15	Resistor, 4.7K, ±1%, 1/4 w	1–118730	
D1	Diode, Silicon	1–118750	•
T1, T2	Transistors, 2N591, matched (These transistors are selected on the basis of their Beta and stocked under four part numbers; any two transistors with the same part number can be used in circuit.)	1–118752 1–118753 1–118754 1–118755	•

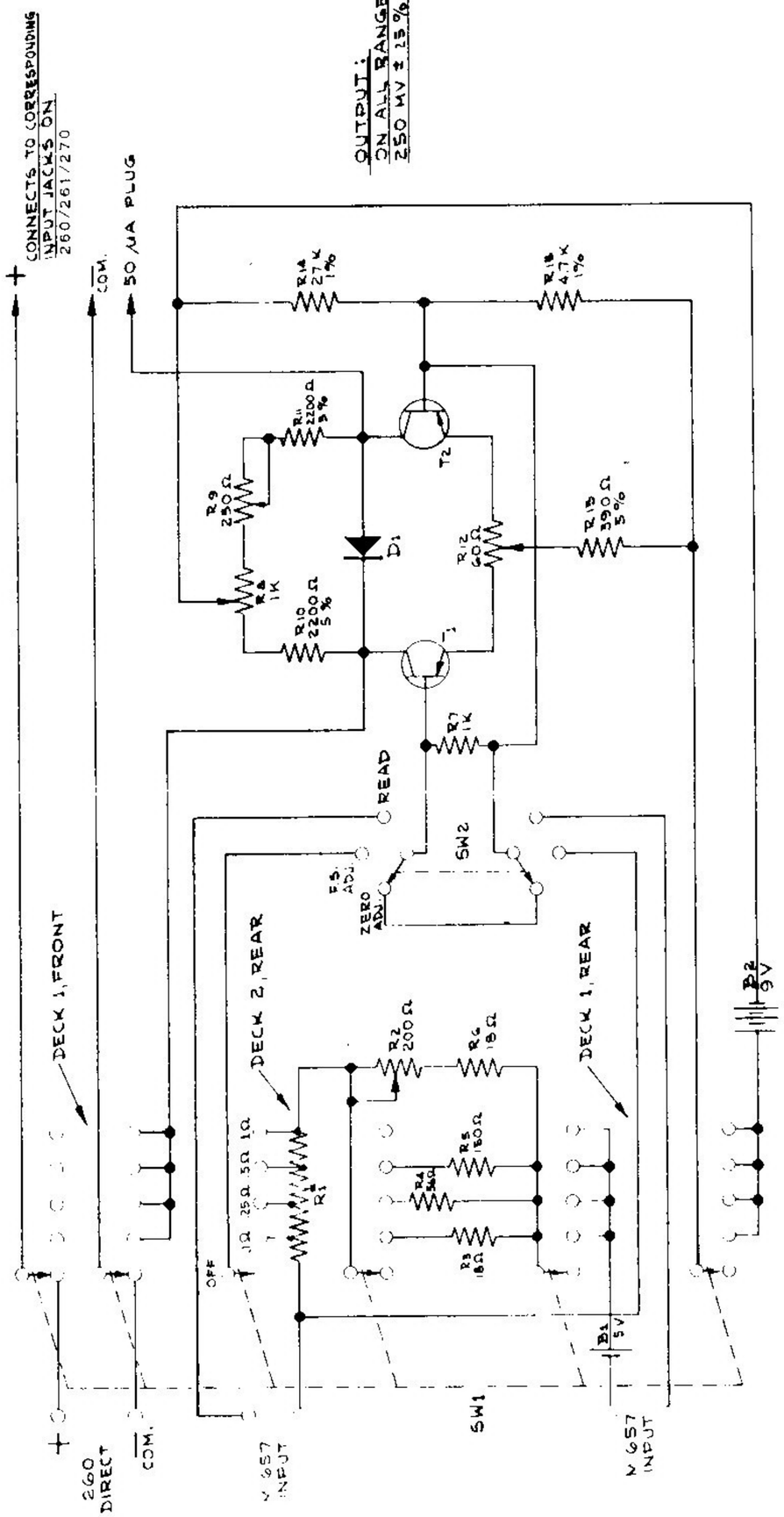


FIGURE 5 - MODEL 657 MILLIOHMMETER, OVERALL SCHEMATIC DIAGRAM