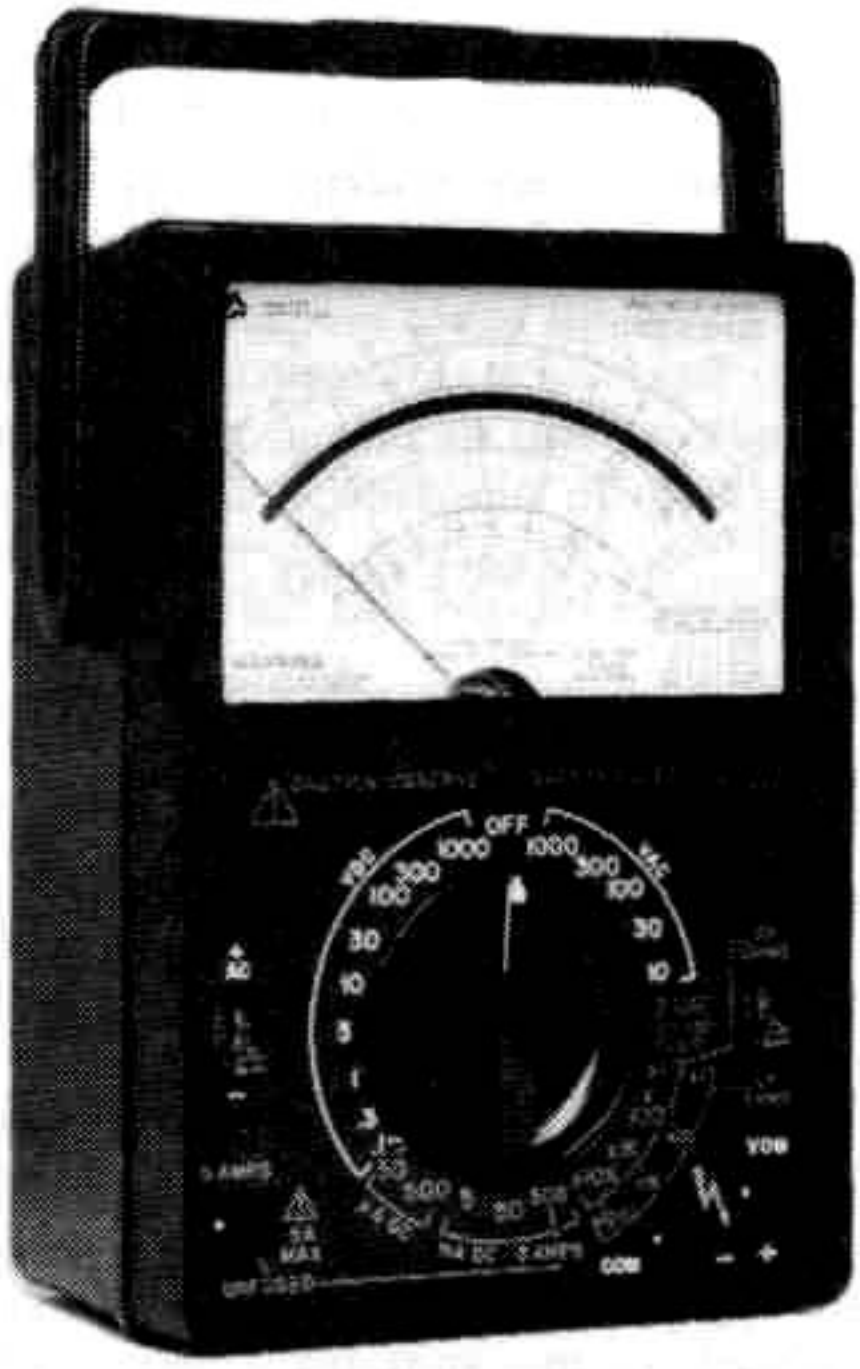
MODEL 60-M
VOLT-OHM
MILLIAMMETER



One Triplett Drive
Bluffton, Ohio 45817

TRIPLETT CORPORATION

SAFETY RULES

Warning

This tester has been designed with your safety in mind. However, no design can completely protect against incorrect use. Electrical circuits can be dangerous and/or lethal when lack of caution or poor safety practices are used.

Read The Manual

Read this Instruction Manual carefully and completely.

Voltages and currents within the capability of this test equipment can be hazardous. Follow the instructions in this manual for every measurement. Read and understand the general instructions before attempting to use this tester. Do not exceed the limits of the tester.

Safety Check

Double check the switch setting and lead connections before making measurements. Are you following all of the instructions?

Disconnect the tester or turn off the power before changing switch positions.

Do not connect to circuits with voltage present when switch is in any ohms or current position.

When replacing fuses use only specified type fuses and insert in correct fuse holder.

Don't Touch

Don't touch exposed wiring, connections or other "live" parts of an electrical circuit. If in doubt, check the circuit first for voltage before touching it.

Turn off the power to a circuit before connecting test probes to it. Be sure there is no voltage present before you touch the circuit.

Do not use cracked or broken test leads.

High Voltage Is Dangerous

Always start with the power off. Be sure there is no voltage present before making connections to the circuit.

Don't touch the tester, its test leads, or any part of the circuit while it is on.

Before disconnecting the tester, turn the circuit off and wait for the meter to return to "zero."

Distribution Circuits Pack A Punch

In high energy circuits such as distribution transformers and bus bars, dangerous arcs of explosive nature can occur if the circuit is shorted. If the tester is connected across a high energy circuit when set to a low resistance range, a current range, or any other low impedance range, the circuit is virtually shorted.

Special equipment designed for use with these circuits is available. Contact a qualified person for assistance before attempting to make measurements on any high energy circuit.

Safety Is No Accident

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INTRODUCTION

The Triplett Model 60-M Volt-Ohm-Milliammeter (VOM) is a multirange instrument designed for general purpose electrical and electronic trouble shooting and measurement. It satisfies the need for a precision instrument which is capable of withstanding the rigorous industrial environment while maintaining a high degree of safety and accuracy.

Safety Designed: The Model 60-M is designed for your protection. Some of the safety features are:

1) A set of safety designed test leads.
2) The use of flame retardant materials.
3) Isolation of all switches and controls by the use of insulating shafts and knobs.
4) Simplified switching and the use of only three jacks.
5) A unique, three fuse arrangement.
6) Conservative component specifications.
7) THIS MANUAL - READ IT BEFORE USING YOUR MODEL 60-M.

The Model 60-M is designed to withstand overloads within the range of the Instrument by virtually eliminating parts burn out other than fuses. Over twenty components are included solely for protection. Other components are over rated for additional overload withstand capability. Normal overload conditions will blow the 1/8 Amp and/or 1 Amp instrument fuses. Spares for each are included in the Model 60-M. For higher energy faults, the Model 60-M is protected by a 2 Amp/1000 Volt (20 KVA) high energy fuse.

Extra Rugged: The unique design of the Model 60-M permits the Instrument to withstand the normal accidental dropping and rough handling which occur in hard, day to day use. The model 60-M is warranted to withstand an accidental drop from a height of up to five feet with a deviation from its stated accuracy not exceeding +/- 4%. The warranty does not include mechanical parts being defaced (scratched, etc.) from a drop or normal usage. See the limited warranty in this manual for time and other limitations.

Convenient Features: The Model 60-M provides features to enhance the ease of use of the Instrument. The carrying handle may be rotated to provide a stand for placing the Instrument at a convenient 30 degree viewing angle. A separately sealed battery and fuse compartment permits access to these items without removing the case. Battery acids are also sealed off should a leak occur. The mirrored dial reduces parallax error and the dial is color keyed to the front panel to reduce the chance of operator error.

The Model 60-M has been designed with ranges to cover nearly all applications. Full scale voltage ranges of 0.1 to 1000 DC, and 3 to 1000 AC, cover nearly all normal requirements. Currents from 50 μA to 5 Amps DC may be measured with a nominal 100 mV burden voltage, lower than many other similar instruments. In addition to four normal (High Power Ohms) ohms ranges, four Low Power Ohms ranges allow in-circuit measurement of resistance to over 100 megohms, higher than most digital instruments. With the Model 10 AC Clamp On, AC currents to 300 Amps can be measured. A convenient dB scale allows relative measurements of gain or loss in AC circuits. Finally, there are no circuits within the Model 60-M that generate any RFI or EMI, reducing the chance that the Instrument will cause interference in any nearby, sensitive circuitry or equipment.

GENERAL SPECIFICATIONS

Meter:	Taut Band type, temperature compensated, mirrored dial, 95 degree full scale deflection.
Test Leads:	One red and one black test lead supplied (special safety jack), 48 inches long, with alligator clips.
Handle:	Position indent provides an inclined tester stand.
Fuses:	(See Replacement Parts for correct type.) One 1/8 Amp/250 Volt fuse, one 1 Amp/250 Volt fuse, and one 2 Amp/1000 Volt fuse.
Batteries:	One 1.5 V D-cell, NEDA 13. One 9 V transistor battery, NEDA 1604.
Temperature:	Operate: O°C to 50°C. Storage: -20°C to 70°C.
Weight:	Approximately 3 pounds.
Size:	Approximately 5¼" x 7¼" x 3¼".

ELECTRICAL SPECIFICATIONS

Specifications apply for a temperature of 20°C to 30° (68°F to 86°F) and a relative humidity of 45% to 75% unless otherwise stated.

OFF Position: Meter is shorted; Input circuitry is disconnected.

DC Voltage

Ranges: 0.1, 0.3, 1, 3, 10, 30, 100, 300, and 1000 Volts. (The 0.3, 3, 30, and 300 volt ranges represent an input of 0.316, 3.16, 31.6, and 316 volts respectively at 95 degress deflection.)

Accuracy: +/-1.5% of full scale.

Sensitivity: Approximately 20,000 ohms per volt.

Temp Effects: +/-100 ppm/°C typical, except 0.1 VDC range which has less than +/-2% of full scale error from 0°C to 50°C.

AC Voltage

Ranges: 3, 10, 30, 100, 300, and 1000 Volts. (The 30 and 300 volt ranges represent an input of 31.6 and 316 volts respectively at 95 degrees deflection.)

Accuracy: +/-3.0% of full scale at 60 Hz, average responding, RMS calibrated.

Sensitivity: Approximately 5,000 ohms per volt.

Temp Effects: +/-100 ppm/°C typical, except 3 VAC range which has less than +/-5% of full scale error from 0°C to 50°C.

Freq Response: (typical)

Range	Bandwidth	Additional Error
3 VAC	20 Hz to 40 KHz	+/-1.0%
10 VAC	20 Hz to 40 KHz	+/-1.0%
30 VAC	20 Hz to 10 KHz	+/-1.0%
100 VAC	20 Hz to 1.5 KHz	+/-1.0%
300 VAC	20 Hz to 700 Hz	+/-1.0%
1000 VAC	20 Hz to 400 Hz	+/-1.5%

dB: -20 to +52 dB ref to 1 mW across 600 ohms (0.775 V).

Accuracy: +/-1.0 dB at the 0 dB point, +/-0.3 dB at full scale.

AC Current (With Model 10 AC Clamp On)

Ranges: 6, 12, 30, 60, 120, and 300 Amps AC.

Accuracy: Same as 3 VAC range + accuracy of Model 10.

DC Current

Ranges: 50 and 500 μA; 5, 50, and 500 mA; and 5 Amps.

Accuracy: +/-1.5% of full scale.

Burden Volts: 125 mV max at the test leads except: 500 mA which is 300 mV typical, and 5 Amps DC which is less than 200 mV typical at the jacks.

Temp Effects: Less than +/-2.2% of full scale error from 0°C to 50°C.

Resistance

Ranges: See below.

Accuracy: +/-(1.5% of arc length + 0.5 ohms).

Temp Effects: +/-100 ppm/°C typical center scale value change.

Power Req: One, 9 volt transistor battery. Correct operation with a battery voltage from 7.2 to 9.5 volts. Typical life exceeds 2000 hours for an alkaline type battery. One, 1.5 volt D cell battery. Correct operation with a battery voltage of 1.0 to 1.8 volts.

Open Circuit Voltage: High Power Ohms (HP) Voltage of D-cell.
Low Power Ohms (LP) 90 mV typical, 100 mV max.

High Power Ohms (HP) Ranges:	Rx1	Rx100	Rx1K	Rx10K	ohms
Center Scale Value:	12.1	1.21K	12.1K	121K	ohms
Maximum Resistance Reading:	1K	100K	1M	10M	ohms
Maximum Current:	149	1.49	0.149	0.0149	mA
Maximum Power to Load:	66.9	0.669	0.0669	0.00669	mW
Low Power Ohms (LP) Ranges:	Rx1	Rx10	Rx1K	Rx100K	ohms
Center Scale Value	12.1	121	12.1K	1.21M	ohms
Maximum Resistance Reading:	1K	10K	1M	100M	ohms
Maximum Current:	8260	826	8.26	0.0826	μA
Maximum Power to Load:	207	20.7	0.207	0.00207	μW

PREPARATION FOR USE

Before using the Model 60-M, familiarize yourself with the Instrument and this manual. READ AND REVIEW THIS MANUAL FREQUENTLY. Refer to Figure 1 on page 11 for the locations and designations of the Operator Controls.

Each time the Instrument is used, check, and if necessary correct, the mechanical zero of the Meter. Refer to the METER MECHANICAL ZERO section, this page. Inspect the test leads as described in the TEST LEADS section, this page. Verify that the Instrument is free from condensation and other contaminants, and that all covers are securely in place. Perform the Battery and Fuse Test as described in the BATTERY AND FUSE TEST section on pages 9 and 10.

METER MECHANICAL ZERO: Place the Model 60-M on its back on a flat horizontal surface. Set the Range Switch to the OFF position. (Refer to Figure 1 on page 11 for the location of Operator Controls.) Examine the position of the Pointer on the Dial. If it is exactly on the "0" mark, then the Meter is mechanically zeroed, and no adjustment is necessary.

If the Pointer is not exactly aligned with the "0" mark, then the mechanical zero of the Meter needs adjustment. This is done by using a small, flat blade screwdriver to adjust the Zero Adjust Screw. Slowly turn the Zero Adjust Screw clockwise or counter-clockwise until the Pointer exactly aligns with the "0" mark on the Dial. Reverse the direction of rotation, turning the Zero Adjust Screw just enough to disengage it. This will reduce the affect that mechanical shock and vibration, and temperature changes, will have on the mechanical zero of the Instrument.

TEST LEADS: The test leads provided with the Model 60-M are designed for operator safety and convenience. Always check the test leads before using the Instrument. Check for worn or cut insulation. Check also, for deterioration of the insulation. Make certain that no exposed wire is visible and that the jack and prod insulators are not

cracked, broken, or otherwise damaged. Make certain that there are no loose parts. **IF THE TEST LEADS ARE IN ANY WAY DAMAGED OR DEGRADED, DO NOT USE THEM. THEY MUST BE REPLACED.**

WARNING

DO NOT USE TEST LEADS THAT:

ARE DAMAGED OR HAVE BEEN MODIFIED,
DO NOT MATE WITH THE SAFETY JACKS USED IN THIS INSTUMENT,
ARE DESIGNED TO OPERATE AT VOLTAGES OR CURRENTS LESS THAN THIS INSTRUMENT WILL ENCOUNTER.

FAILURE TO OBSERVE THE ABOVE AND/OR FAILURE TO PRACTICE GOOD SAFETY MEASURES CAN RESULT IN PROPERTY DAMAGE, BE DANGEROUS AND/OR LETHAL.

BATTERY AND FUSE TEST: Before using the Model 60-M, and frequently during use, the batteries and fuses in the Instrument should be tested. (Refer to the BATTERY AND FUSE REPLACEMENT section on pages 24 and 25 for instructions on installing and/or replacing the batteries and fuses, if necessary).

Fuse and 9 Volt Battery Test: Place the Instrument in the Rx100K LP OHMS range. (Refer to Figure 1 on page 11 for the location of Operator Controls.) Short the test leads together. Attempt to set the Meter to full scale by rotating the OHMS ADJ Control. If this is possible, then the fuses and the 9 volt battery are good. Proceed to the 1.5 Volt Battery Test on page 10.

If the Meter deflects but can't be adjusted to full scale, then the fuses are good, but the 9 volt battery needs to be replaced. Replace the 9 volt battery and repeat this test.

If the Meter does not deflect at all, then either the 9 volt battery is dead or missing, or one or more of the fuses are blown or missing. Remove and inspect the fuses and 9 volt battery, and replace if necessary. If the fuses are good, then replace the 9 volt battery. Repeat this test.

BATTERY AND FUSE TEST (continued)

IMPORTANT NOTE: It is highly recommended, that if the high energy 2 Amp/1000 Volt fuse blows, the Model 60-M be returned to the factory or an authorized repair center for a thorough check-out. There may be hidden and/or collateral damage to the Instrument.

1.5 Volt Battery Test: After performing a successful Fuse and 9 Volt Battery Test, place the Instrument in the Rx1 HP OHMS range. Short the test leads together. Attempt to set the Meter to full scale by rotating the OHMS ADJ Control. If this is possible, the 1.5 volt battery is good. This completes a successful FUSE AND BATTERY TEST.

If it was not possible to adjust the Meter to full scale, then the 1.5 volt battery is weak, dead, or missing. Install or replace the 1.5 volt battery and repeat both tests again.

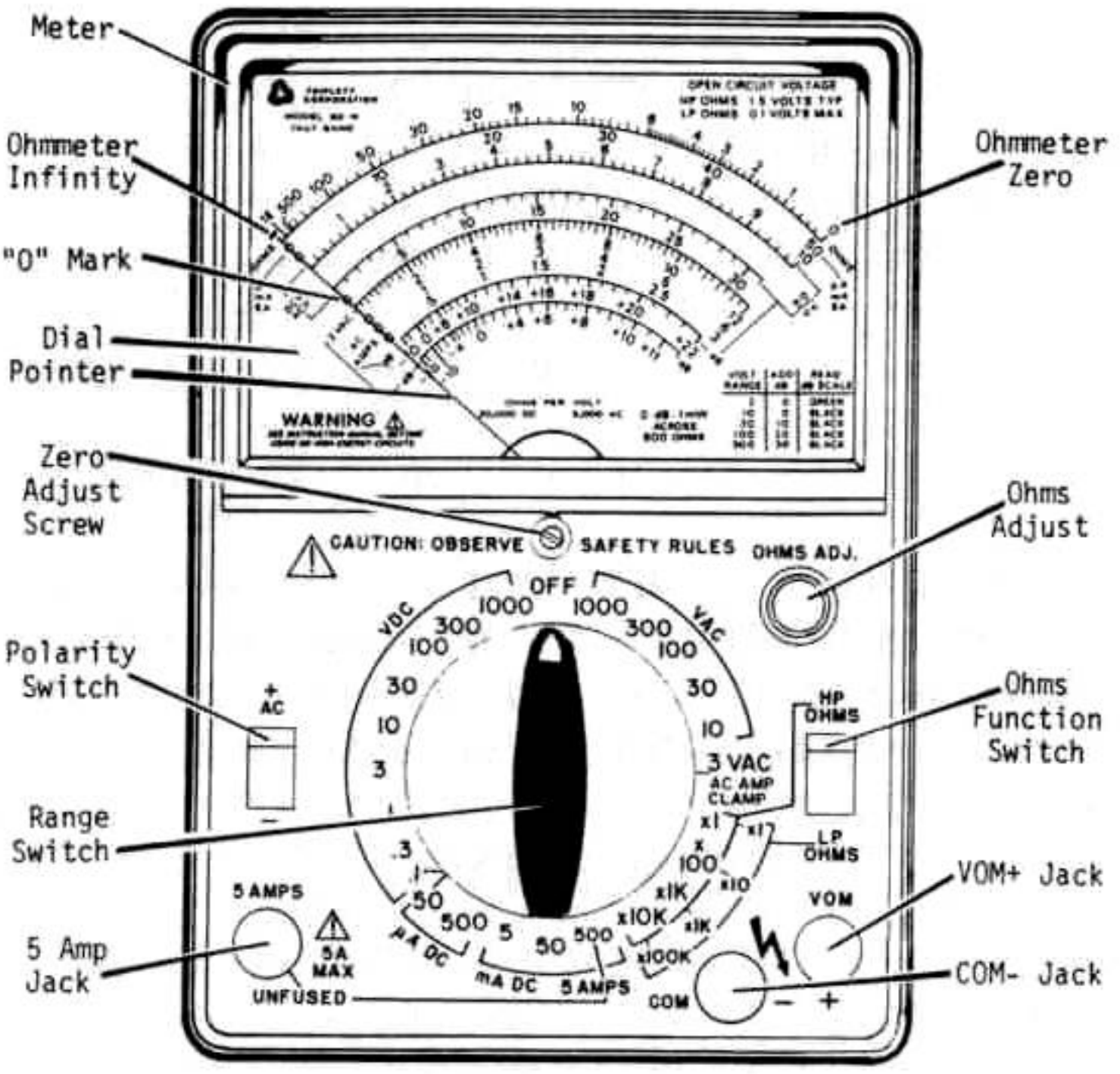
WARNING

NEVER USE THE INSTRUMENT WITHOUT SUCCESSFULLY PERFORMING THE BATTERY AND FUSE TEST. USE OF THE INSTRUMENT WITH A BLOWN OR MISSING FUSE MAY RESULT IN THE ASSUMPTION THAT NO VOLTAGE IS PRESENT IN A CIRCUIT WHEN, IN ACTUALITY, IT IS. FAILURE TO OBSERVE THE ABOVE AND/OR FAILURE TO PRACTICE GOOD SAFETY MEASURES CAN RESULT IN PROPERTY DAMAGE, BE DANGEROUS AND/OR LETHAL.

GENERAL OPERATION

This section describes the general operation of the Model 60-M. When making measurements of any type, refer to this section. **THE MODEL 60-M IS INTENDED FOR USE ONLY BY PERSONNEL TRAINED IN THE PROPER SAFETY PROCEDURES AND WHO CAN RECOGNIZE SHOCK AND SAFETY HAZARDS.** Always prepare the Instrument for use by reading and following the PREPARATION FOR USE section on page 8 through 10.

Figure 1. Operator Controls



GENERAL GUIDELINES: In order to prolong the life of the Model 60-M, do not change the Range Switch or the Polarity Switch settings while any voltage or current is applied to the Instrument. This may cause arcing which will seriously degrade even the high quality switches used in this Instrument. The proper procedure is to remove power from the equipment under test, change the appropriate switch position on the Instrument, then, reapply power to the equipment under test. This practice will result in increased life and reliability of the Instrument.

To prevent overloads when measuring an unknown voltage, start with the highest range. For example, to measure an unknown DC voltage, start with the Range Switch in the 1000 VDC position.

WARNING

NEVER USE THIS INSTRUMENT IN A CIRCUIT WHICH IS CAPABLE OF DELIVERING MORE THAN THE 20KVA INTERRUPTING CAPABILITY OF THE 2 AMP/1000 VOLT FUSE. DOING SO MAY CREATE A FIRE HAZARD, CAUSE PROPERTY DAMAGE, BE DANGEROUS AND/OR LETHAL.

When attempting to determine the presence of an unknown voltage in a possibly defective piece of equipment, start with the 1000 VAC range. The AC voltage functions on the Model 60-M will respond to AC and DC voltages. If an upscale indication results, an AC or DC voltage is present. Following the procedure for changing the Range Switch, select the appropriate DC voltage range. If there is no deflection of the Pointer, then the voltage which is present is AC. If the Pointer deflects, then the voltage present is either DC, or AC with a DC component.

When a measurement is complete or the Instrument is to be idle for a period of time, place the Range Switch in the OFF position.

UNDERSTANDING AND REDUCING MEASUREMENT ERRORS: For optimum accuracy, choose the range which will cause the Pointer to deflect in the upper (right hand) portion of the Dial. Accuracies are rated as a percentage of full scale, so the closer to full scale, the better accuracy.

If the Model 60-M has not been used for a long period of time, it is good practice to operate all the switches several times to wipe the contacts. This will asssure more stable and accurate readings.

Any instrument will cause errors when connected to a circuit. Consideration should be given to errors caused by circuit loading when measuring voltage. The resistance of the Model 60-M in any voltage range, can be calculated by multiplying the full scale voltage of the selected range by the sensitivity for that function (ACV or DCV). Refer to the ELECTRICAL SPECIFICATIONS on page 6 to obtain this information. For example, when in the 30 VAC range (31.6 VAC actual full scale value), the total resistance can be calculated by:

R = 31.6 volts x 5000 ohms/volt = 158,000 ohms

When measuring current, the additional resistance introduced in the circuit, may affect the readings. The resistance introduced by the Model 60-M may be calculated by dividing the burden voltage by the full scale current for that particular range. Refer to the ELECTRICAL SPECIFICATIONS on page 7 to obtain this information. For example, when in the 50 mADC range, the resistance can be calculated by:

R = 125 mV/ 50 mA = 2.50 ohms

When measuring resistance, any body contact with the circuit may produce an erroneous reading since the body will act as a shunt resistor around the resistor under test. Additionally, contamination on the circuit under test may result in additional shunt resistances not normally expected.

Since the Model 60-M is capable of measuring low values of voltage and current, thermoelectric and electro-chemical effects can produce erroneous readings. These effects are usually present even when the power to the circuit is off.

GENERAL OPERATION (continued)

READING THE DIAL: Below is a sample Meter indication and the appropriate reading for various Range Switch and Ohms Function Switch settings.

Figure 2. Sample Meter Indication

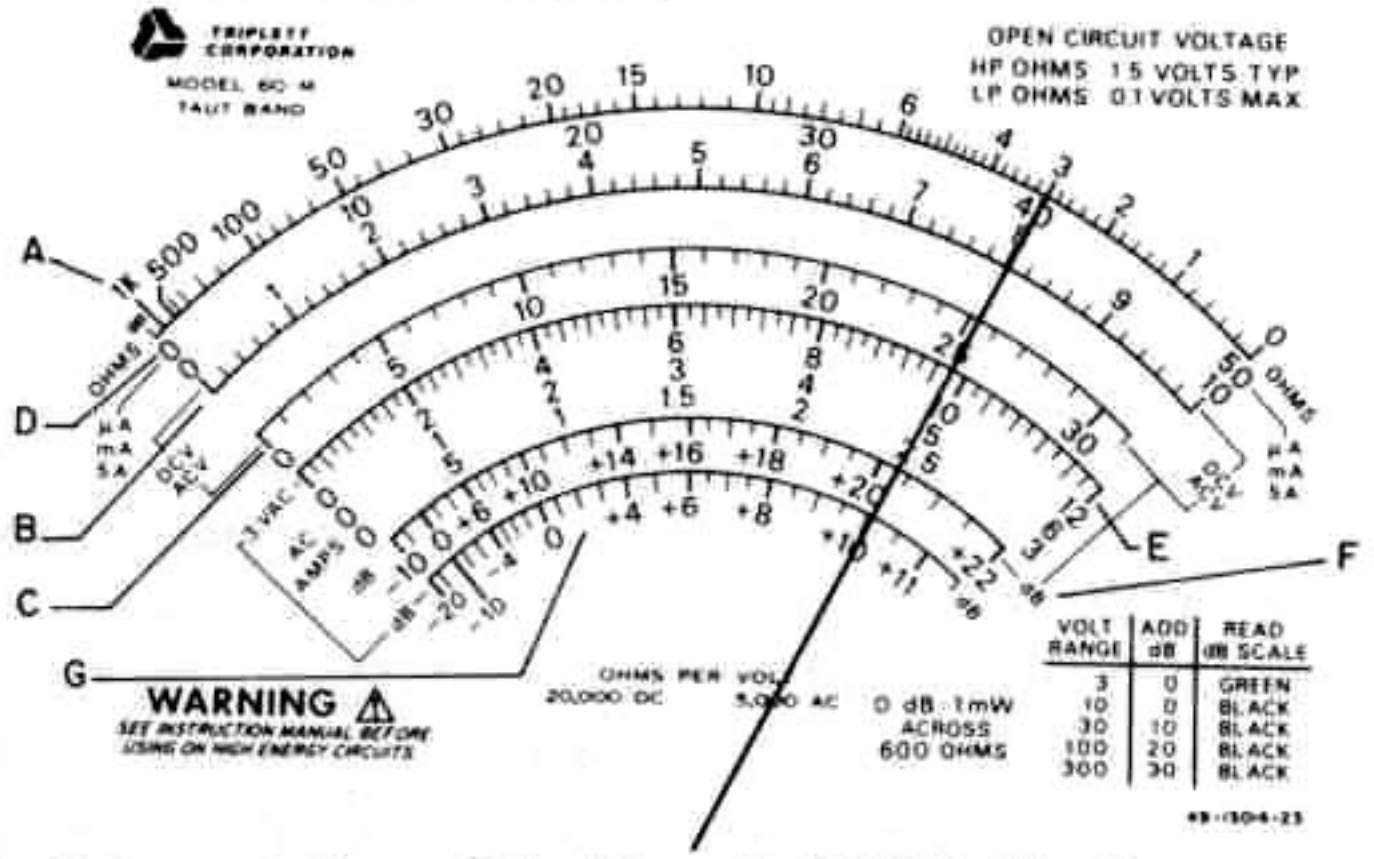


Table 1. Interpretation of the Sample Dial Indication

Range Switch	Read Scale	Reading	Range Switch	Ohms Sw	Read Scale	Reading
1000 VDC	B	800 V	1000 VAC	—	B	800 V
300 VDC	C	253 V	300 VAC	—	C,F	253 V, 50.3 dB
100 VDC	B	80.0 V	100 VAC	—	B,F	80 V, 40.3 dB
30 VDC	C	25.3 V	30 VAC	—	C,F	25.3 V, 30.3 dB
10 VDC	B	8.00 V	10 VAC	—	B,F	8.00 V, 20.3 dB
3 VDC	C	2.53 V	3 VAC	—	E, G	2.45 V, 10.0 dB
1 VDC	B	0.800 V				
0.3 VDC	C	0.253 V	x1/x1	HP	A	3 ohms
0.1 VDC	B	0.080 V	x100/x10	HP	A	300 ohms
			x1K/x1K	HP	A	3K ohms
50 μADC	D	40 μA	x10K/x100K	HP	A	30K ohms
500 μADC	D	400 μA				
5 mADC	D	4 mA	x1/x1	LP	A	3 ohms
50 mADC	D	40 mA	x100/x10	LP	A	30 ohms
500 mADC	D	400 mA	x1K/x1K	LP	A	3K ohms
5 ADC	D	4.0 A	x10K/x100K	LP	A	300K ohms

MEASURING VOLTAGE

1. Refer to the PREPARATION FOR USE section on pages 8 through 10 and the GENERAL OPERATION section on pages 10 through 14 before attempting any measurements.
2. Select the desired AC or DC voltage range with the Range Switch.
3. Select the proper polarity using the Polarity Switch. If AC voltage is to be measured, set the Polarity Switch in the +AC position.
4. Attach the test leads to the Model 60-M. The red lead plugs into the VOM+ jack and the black lead plugs into the COM- jack.
5. With power removed from the circuit under test, connect the test leads across the circuit to be measured. Refer to Figure 3 on page 17 for an example of the proper connections for measuring voltage.
6. Apply power to the circuit under test.

******************OBSERVE ALL SAFETY RULES*******************

7. Read the voltage on the appropriate scale as noted below.

Table 2. Reading DC Voltage

Range Switch	Read Scale	Multiply/Divide/Direct
1000 VDC	black 0-10	multiply indication by 100
300 VDC	black 0-30	multiply indication by 10
100 VDC	black 0-10	multiply indication by 10
30 VDC	black 0-30	direct reading
10 VDC	black 0-10	direct reading
3 VDC	black 0-30	divide indication by 10
1 VDC	black 0-10	divide indication by 10
0.3 VDC	black 0-30	divide indication by 100
0.1 VDC	black 0-10	divide indication by 100

Table 3. Reading AC Voltage and dB's

Range Switch	Read Scale	Multiply/Divide/Direct	dB scale and adder
1000 VAC	black 0-10	multiply indication by 100	____
300 VAC	black 0-30	multiply indication by 10	black + 30
100 VAC	black 0-10	multiply indication by 10	black + 20
30 VAC	black 0-30	direct reading	black + 10
10 VAC	black 0-10	direct reading	black direct
3 VAC	green 0-3	direct reading	green direct

8. Reverse this procedure to disconnect the Model 60-M from the circuit under test. Return the Range Switch to the OFF position.

MEASURING DECIBELS (dB): The decibel is a unit that expresses the ratio of power levels in an AC circuit. It is mathematically derived to reduce multiplication and division to addition and subtraction respectively. As power is increased (multiplied) decibels are added. As power is decreased (divided), decibels are subtracted. As an example, if an amplifier increases the power 100 times, we say that the signal has increased by 20 dB. If an attenuator reduces the level of a signal by 1000 times, then we say that the signal has decreased by 30 dB. The decibel roughly approximates human hearing ratios. For this reason, it is commonly used in audio and telephone measurements.

Because the decibel represents a ratio, there is a reference level. This reference level (0 dB), is defined as 1.0 milliwatt into 600 ohms (0.775 VAC across 600 ohms). Measurements made across loads other than 600 ohms are relative measurements.

To measure decibels, connect the Model 60-M as described in the MEASURING VOLTAGE section on pages 15 and 16, or as in the MEASURING OUTPUT VOLTAGE section on page 17. Instead of reading the voltage scale, read the dB scale and add the value indicated in Table 3.

Figure 3. Measuring Voltage

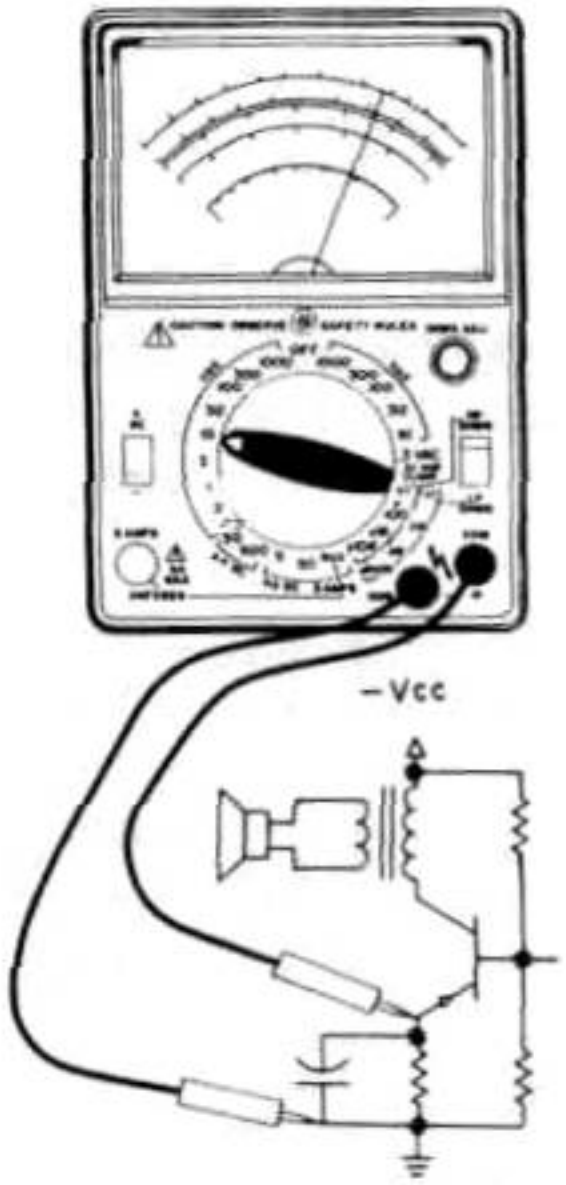
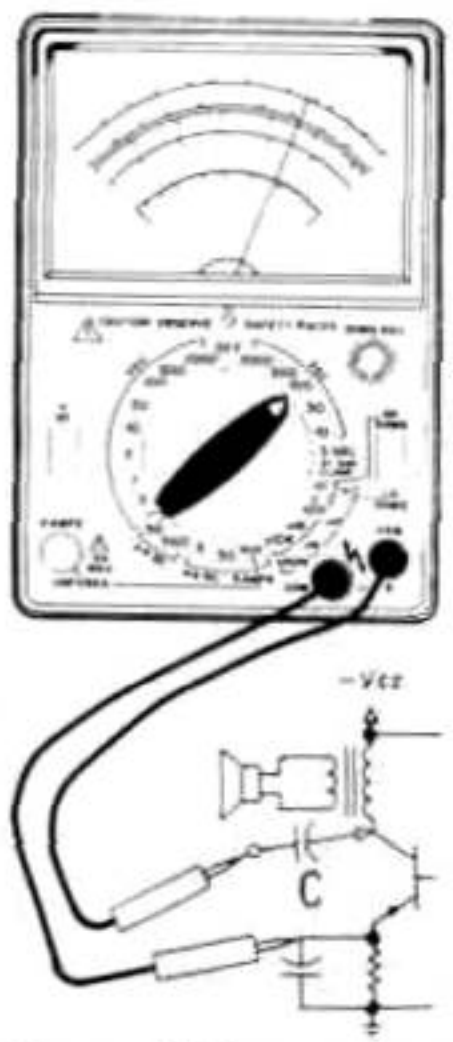


Figure 4. Measuring Output Voltage



For value of C see text

MEASURING OUTPUT VOLTAGE: If there is a DC component to the voltage to be measured and only the value of the AC component is desired, a capacitor may be placed in series with the red test lead to block the DC voltage. The remaining AC voltage is known as the "output voltage."

For general audio frequency measurements, use a 0.22 μF film type capacitor. For low frequency measurements (less than 40 Hz), use a 1.0 μF or larger film type capacitor. The capacitor working voltage must be higher than the sum of the DC voltage and the peak AC voltage. In general, a 600 volt capacitor is sufficient.

Refer to Figure 4 above for the proper connections. The procedure is identical to that in the MEASURING VOLTAGE section on pages 15 and 16. VAC or decibels may be read. **ALWAYS DISCHARGE THE CAPACITOR AFTER USE BY MEASURING THE VOLTAGE ACROSS IT WITH THE MODEL 60-M SET TO THE 1000 VDC RANGE. WAIT UNTIL THE INDICATION ON THE METER RETURNS TO ZERO VOLTS. THE CAPACITOR IS NOW DISCHARGED.**

MEASURING DC CURRENT

1. Refer to the PREPARATION FOR USE section on pages 8 through 10 and the GENERAL OPERATION section on pages 10 through 14 before attempting any measurements.

WARNING

THE 5 AMP RANGE ON THIS INSTRUMENT IS UNFUSED. USE EXTREME CAUTION WHEN USING THIS RANGE. NEVER USE THIS INSTRUMENT IN A CIRCUIT WHICH COULD EXCEED THE 5 AMP MAXIMUM RATING OF THE INTERNAL SHUNT. NEVER USE THIS RANGE TO MEASURE AC CURRENT. FAILURE TO OBSERVE THE ABOVE AND/OR FAILURE TO PRACTICE GOOD SAFETY MEASURES CAN RESULT IN PROPERTY DAMAGE, BE DANGEROUS AND/OR LETHAL.

2. Select the proper polarity using the Polarity Switch. Select the desired DC current range with the Range Switch and attach the test leads to the Model 60-M as follows:

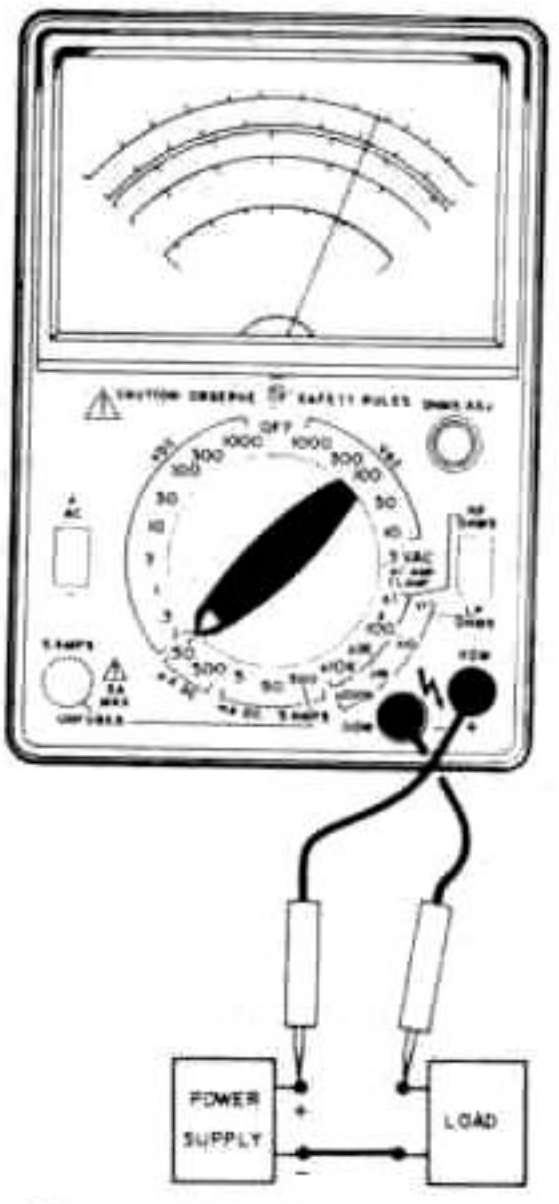
Table 4. Reading DC Current

To Measure	Set the Range Switch to:	Connect Red lead to:	Connect Black lead to:	Read the red 0-50 scale
0 - 50 μA	50 μA	VOM +	COM -	direct reading
0 - 500 μA	500 μA	VOM +	COM -	multiply by 10
0 - 5 mA	5 mA	VOM +	COM -	divide by 10
0 - 50 mA	50 mA	VOM +	COM -	direct reading
0 - 500 mA	500 mA/5 Amps	VOM +	COM -	multiply by 10
0 - 5 Amps	500 mA/5 Amps	5 AMPS	COM -	divide by 10

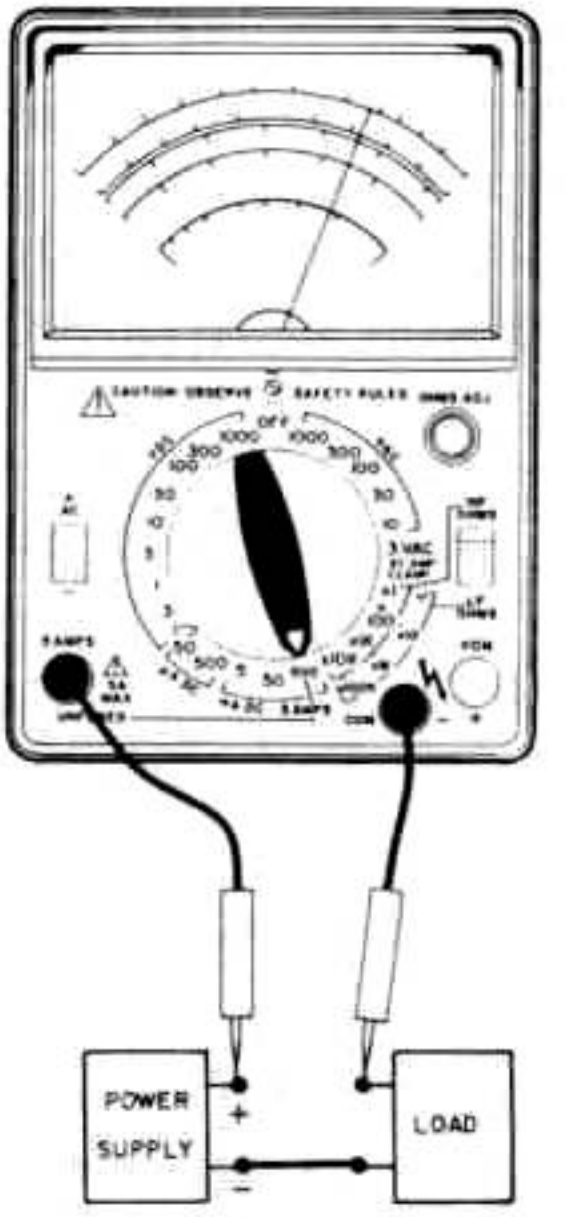
3. With power removed from the circuit under test, connect the test leads to the circuit to be measured. Refer to Figure 5 on page 19 for an example of the proper connections for measuring current.
4. Apply power to the circuit under test.

5. Read the current on the black 0-10 scale but use the red 0-50 numbers. Multiply or divide the indication, if necessary, as shown in Table 4 above.
6. Reverse this procedure to disconnect the Model 60-M from the circuit under test. Return the Range Switch to the OFF position.

Figure 5. Measuring DC Current



For 50uA, 500uA
5mA, 50mA, 500mA



5 Amps only
See WARNING in text

MEASURING RESISTANCE

CAUTION

Some semiconductor devices can be damaged by the voltages and currents available in the Ohmmeter circuit. To lessen the likelyhood of damage, compare the ratings of this Instrument with those of the semiconductor devices before making measurements.

NOTE: Due to the extreme sensitivity of the LP OHMS x 100K range, the Pointer may not rest on the infinite resistance mark with the test leads open or disconnected. This may be due to electrical interference and/or moisture build-up inside the Instrument. To correct this, remove the source of electrical interference and/or allow the Instrument to dry out before use.

WARNING

IF MOISTURE BUILD-UP INSIDE THE MODEL 60-M IS SUSPECTED DUE TO THE METER NOT RESTING ON THE INFINITY MARK, DO NOT USE THIS INSTRUMENT FOR ANY OTHER MEASUREMENTS. THE MOISTURE MAY REDUCE THE DIELECTRIC STRENGTH AND/OR ALTER THE INSULATING PROPERTIES OF THE INSTRUMENT MAKING IT A SHOCK AND SAFETY HAZARD. FAILURE TO OBSERVE THE ABOVE AND/OR FAILURE TO PRACTICE GOOD SAFETY MEASURES CAN RESULT IN PROPERTY DAMAGE, BE DANGEROUS AND/OR LETHAL.

The Model 60-M offers two test voltages for resistances. The normal, or High Power Ohms (HP OHMS) function, sets the test voltage at approximately 1.5 volts. This is typical of most Instruments of this type and is used for most normal testing. It is also the function typically used to test diode and transistor junctions. The Low Power Ohms (LP OHMS) function sets the test voltage at no more than 100 mV. This low voltage will not forward bias most semiconductor junctions, thereby making in-circuit tests of resistance possible. This function also transfers the least amount of power to the component under test. Life of the 1.5 volt D-cell battery is greatest in LP OHMS.

WARNING

DO NOT USE THIS INSTRUMENT ON ANY BLASTING CIRCUITS, BLASTING CAPS, DETONATORS, OR ANY CIRCUIT DESIGNED TO DETONATE AN EXPLOSIVE OR IGNITE A FLAME. FAILURE TO OBSERVE THE ABOVE AND/OR FAILURE TO PRACTICE GOOD SAFETY MEASURES CAN RESULT IN PROPERTY DAMAGE, BE DANGEROUS AND/OR LETHAL.

1. Refer to the PREPARATION FOR USE section on pages 8 through 10 and the GENERAL OPERATION section on pages 10 through 14 before attempting any measurements.
2. Select the desired polarity using the Polarity Switch. When the Polarity Switch is in the +AC position, the VOM+ jack is positive with respect to the COM- jack. When the Polarity Switch is in the "-" position, the VOM+ jack is negative with respect to COM- jack.
3. Select the desired resistance range with the Range Switch and the desired function (HP/LP OHMS) with the Ohms Function Switch.
4. Attach the test leads to the Model 60-M: red lead to the VOM+ jack and the black lead to the COM-jack.
5. Connect the tips of the test leads together. It is best to use the supplied alligator clips to do this so that the body does not introduce any errors, especially on the higher ranges.
6. Adjust the OHMS ADJ until the Pointer is exactly over the zero ohms mark at the right hand side of the dial. (See the BATTERY AND FUSE TEST section on pages 9 and 10 if this is not possible.) Separate the test leads.
6. Connect the test leads to the component or circuit to be tested and read the resistance on the blue Ohms scale. Multiply the indication by the multiplier as determined from the setting of the Range Switch and the Ohms Function Switch. See Figure 6 on page 22 for examples of testing resistance.

************OBSERVE ALL SAFETY PRECAUTIONS************

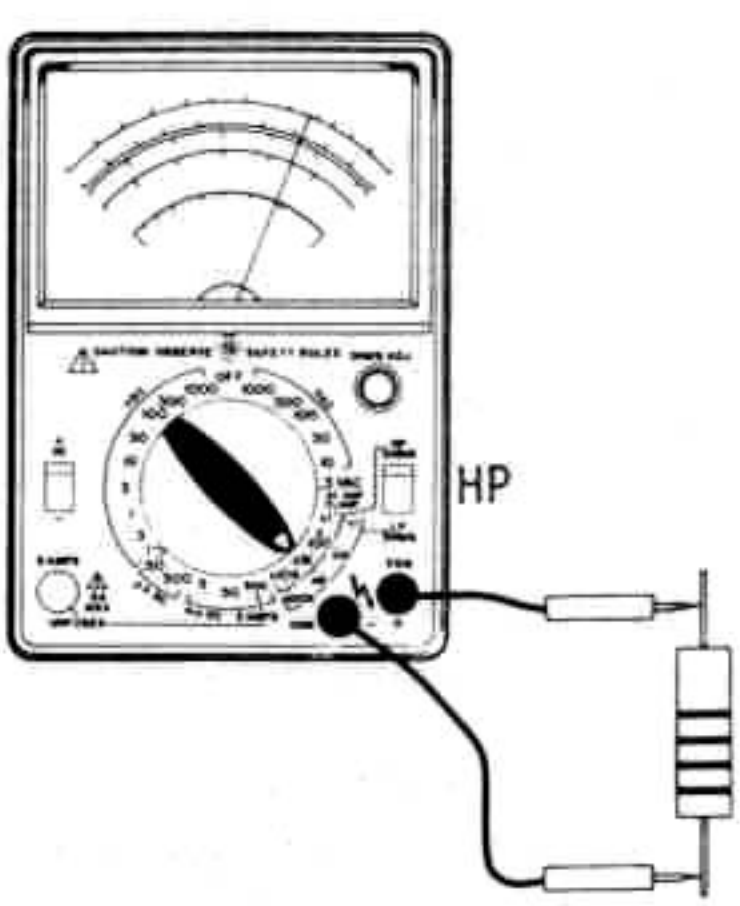
7. Disconnect the Model 60-M from the circuit or component under test. Return the Range Switch to the OFF position.

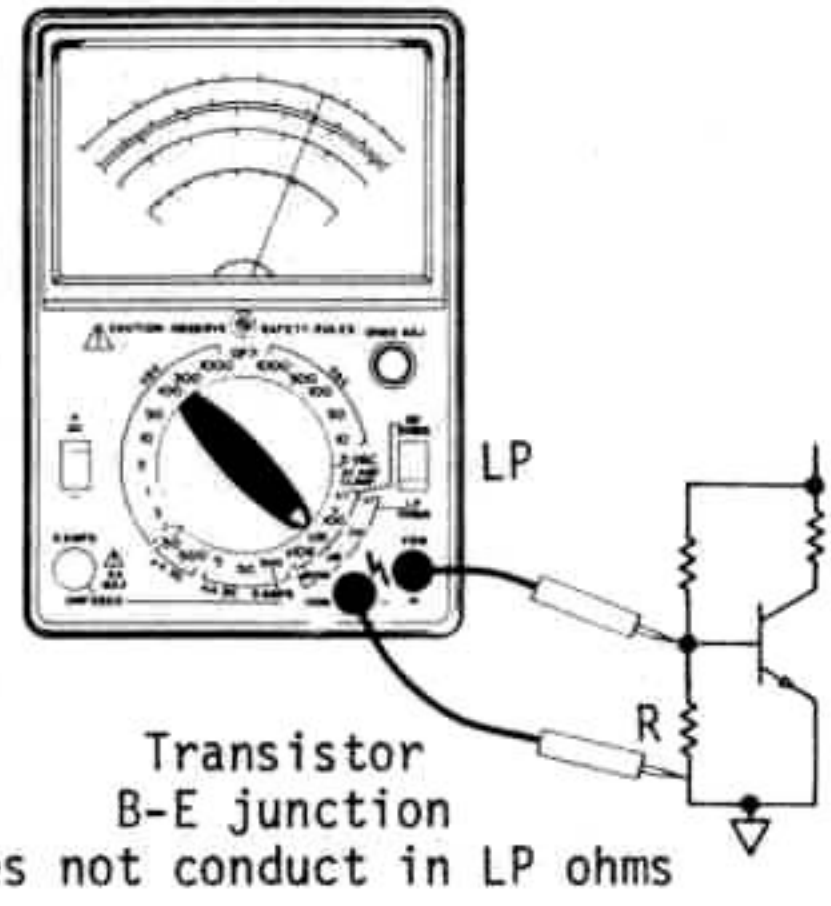
MEASURING RESISTANCE (continued)

CONTINUITY TESTING: For testing continuity, use the LP OHMS x1K range. This will extend battery life and prevent false continuity readings should a semiconductor junction be present.

DIODE TESTING: Use the HP OHMS x1K range. This range will provide enough voltage to forward bias most semiconductor junctions without damage. If the Meter reads upscale (low resistance) with the Polarity Switch in the + AC position, then the red lead is connected to the anode or P-type material. If the Meter is reading high resistance, switch the Polarity switch to the "-" position. If the Meter now reads upscale, then the black lead is connected to the anode or P-type material. If the reading changes very little when the Polarity switch is changed, then the diode or junction may be bad. High resistance in both directions indicates a probable open, although some high voltage diodes and LED's may act this way. If the indication is low resistance in both directions, then the junction is probably shorted.

Figure 6. Measuring Resistance





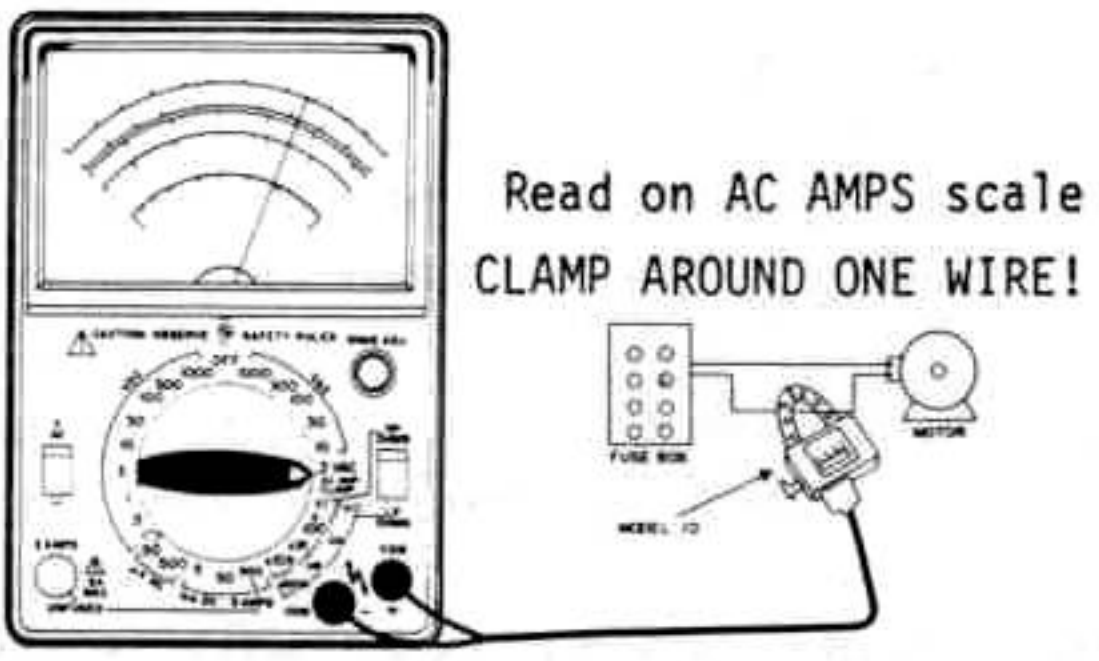
MEASURING AC CURRENT WITH THE MODEL 10 CLAMP ON

1. Refer to the PREPARATION FOR USE section on pages 8 through 10 and the GENERAL OPERATION section on pages 10 through 14 before attempting any measurements.
2. Set the Polarity Switch to the + AC position. Set the Model 60-M Range Switch to the 3VAC AC AMP CLAMP position. Select the desired AC current range with the Model 10 Range Switch and attach the Model 10 adapter leads to the Model 60-M.
3. With power removed from the circuit under test, press the plunger on the side of the Model 10 to open the jaws and place the jaws around ONE conductor of the circuit to be measured. Release the plunger. Do no place the jaws around more than one wire, an incorrect reading will result. Refer to Figures 7 for an example of the proper connections for measuring AC current.
4. Apply power to the circuit under test.

************OBSERVE ALL SAFETY PRECAUTIONS************

5. Read the current on the green AC AMPS scale appropriate to the setting of the Model 10 Range Switch. Multiply the indication, if necessary.
6. Reverse this procedure to disconnect the Model 60-M and the Model 10 from the circuit under test. Return the Range Switch to the OFF position.

Figure 7. Measuring AC Current with the Model 10 Clamp ON



USER MAINTENANCE

DISCONNECT THE TEST LEADS FROM THE TESTER BEFORE SERVICING.

CLEANING: For safe operation, the Model 60-M must be clean. Cotton dipped in alcohol will handle most of the cleaning requirements.

The window has been treated at the factory to dissipate static charge. If cleaning is required, use cotton dipped in a solution of common household detergent and water. After cleaning, allow the solution to dry with rubbing.

BATTERY AND FUSE REPLACEMENT: To access the battery and fuse compartment, proceed as follows.

Figure 8. Battery Cover Removal

Loosening the captive screws

Slide the cover off.

Figure 9. Battery Replacement

Remove the cover.

Remove the D-cell battery.

Remove the 9V battery.

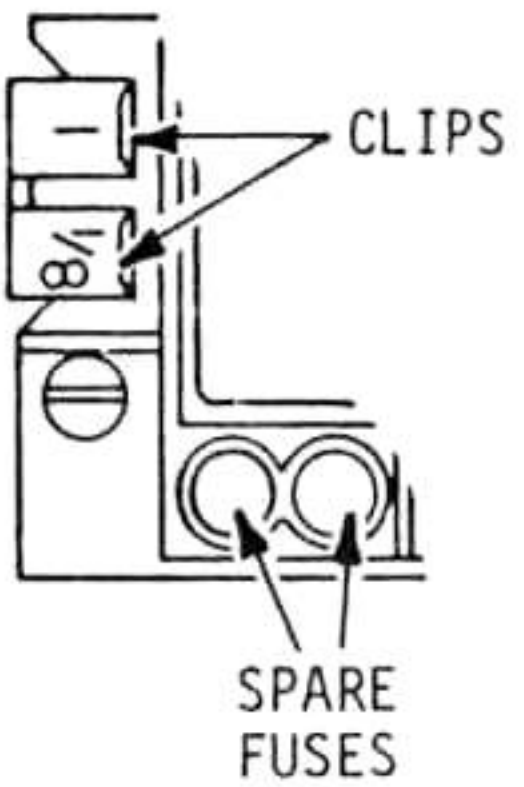
Replace the D-cell.

Replace the cover.

Figure 10. Fuse Replacement

CAUTION

USE ONLY THE SPECIFIED TYPE FUSES AND INSERT INTO THE CORRECT FUSE HOLDER.



Remove the cover
(See Figure 8.)

Slide the clip toward the edge of the case until the fuse releases.

Holding the clip towards the edge, insert the replacement fuse.

Press down on the fuse until the clip springs back over the fuse.

Replace the cover.

USER REPLACEABLE PARTS

IMPORTANT NOTE: For repair, calibration, or other service not noted on this page, refer to qualified service personnel.

Table 5. Electrical Items

Ref	Description	Part Number	Alternate
F1	Fuse, 1A/250V	3207-15	Littelfuse 312001 Bussmann AGC 1
F2	Fuse, 1/8A/250V	3207-45	Triplett Special Littelfuse 360.110 Bussmann MKB 1/8
B1	Battery, 9V Alk	37-36	NEDA 1604
B2	Battery, 1.5V D	2426-1	NEDA 13F

Table 6. Mechanical Items

Description	Part Number	Description	Part Number
Case Back Assy	10-3870	Screw, 6-32x1/4''	24-1035
Handle Kit	3206-59	Screw, #ABx1.0''	24-991
Rubber Foot	98-49	Screw, 6-32x3/8''	24-1000
Battery Cover	10-2830	Screw, 4-40x1/4''	24-1038
Sub-panel Assy	28-1392	Washer, Insulating	14-306
Knob, Ohms Adjust	34-267	Rocker Assy	22-868

Table 7. Accessories

Description	Part Number	Description	Part Number
Test Leads	79-374	Adapter Lead (Model 10)	79-417
Test Leads, mini	79-373	Carrying Case	10-2739
Model 10 AC Clamp On	60-211	Model 101 Line Separator	60-218

CALIBRATION PROCEDURE

IMPORTANT NOTE: Calibration is to be performed only by qualified personnel. An annual calibration is recommended.

EQUIPMENT REQUIRED -

1. DC Current Source - 50 μA +/-0.1%.
2. DC Voltage Source - 100 mV +/-0.1%.
3. AC Voltage Source - 3 VAC and 300 VAC RMS +/-0.4%, 60 Hz.
4. Insulated, straight blade screw-driver.

MECHANICAL ZERO - Zero the Meter as detailed in the METER ZERO section on page 8.

50 μA
- Set the Range Switch to the 0.1V/50 μA position. Set the Polarity Switch to the +AC position.
- Apply 50 μA DC from the DC Current Source to the VOM+ and COM-jacks.
- Adjust VR103 for a full scale indication on the 0-10 scale.

0.1V
- Apply 100 mV from the DC Voltage Source to the input jacks.
- Adjust VR102 for a full scale indication on the 0-10 scale.

VAC
- Set the Range Switch to the 3 VAC position.
- Apply 3.0 VAC from the AC Voltage Source to the input jacks.
- Adjust VR101 for a full scale indication on the green 0-3 scale.
- Set the AC Voltage Source to 0.00 volts. Set the Range Switch to the 300 VAC position.
- Set the AC Voltage Source to 300 VAC.
- Adjust VR104 for an indication of 300 VAC as read on the 0-30 scale.
- Set the AC Voltage Source to 0.00 VAC and repeat both adjustments until the Meter reads properly in both ranges.

OHMS
- Set the Range and Ohms Function Switches to the HP OHMS x1 position.
- Adjust VR106 until the Pointer rests on the OHMS Scale infinity mark.

Check all ranges with appropriate voltage, current, and resistance standards.

REPAIR PARTS

IMPORTANT NOTE: For repair and/or parts replacements, refer to qualified service personnel.

Table 8. Repair Parts

Ref	Description	Part No.	Ref	Description	Part No.
M1	Meter	52-9010	R105	Res. 137K, 0.5%	15K-1373UA3
F3	Fuse, 2A/1000V	3207-60	R106	Res. 43.2K, 0.5%	15K-4322UA3
	Cable Assy, Fuse	26-854	R107	Res. 13.7K, 0.5%	15K-1372UC5
	Cable Assy, Batt.	26-853	R108	Res. 4.32K, 0.5%	15K-4321UA3
	Wire Assy, Input	26-857	R109	Res. 3.42M, 1.0%	15-5954
	Spacer, nylon 7/16	2405-268	R110	Res. 1.08M, 1.0%	15-5955
J1	Jack, banana	2455-680	R111	Res. 342K, 1.0%	15-5956
J2	Jack, banana	2455-680	R112	Res. 108K, 1.0%	15K-1083TA3
J3	Jack, banana	2455-680	R113	Res. 35.0K, 1.0%	15K-3502TB4
PC100	Pc Bd Assy, 60-M	87-1020	R114	Res. 7.50K, 1.0%	15K-7501TC5
C101	Cap. 0.1 μf/10%/ 50V	43-582	R115	Res. 222,0.5%	15-5957
C102	Cap. 0.1 μf/10%/ 50V	43-582	R116	Res. 20.2,0.5%	15-5958
D101	Diode, 1N295	11056	R117	Res. 2.00, 0.5%	15-5959
D102	Diode, 1N295	11056	R118	Res. 0.180,0.5%	15-5960
D103	Diode, 1N4148	127-114	R119	Res. 4.99K, 1.0%	15K-4991TB4
D104	Diode, 1N4004	127-93	R120	Res. 4.99K, 1.0%	15K-4991TB4
D105	Diode, 1N4148	127-114	R121	Res. 3.83K, 1.0%	15K-3831TA3
D110	Diode, 1N4148	127-114	R122	Res. 750, 1.0%	15K-7500TA3
D111	Diode, 1N4148	127-114	R123	Res. 100, 5.0%	15-5967
D115	Diode, 1N4148	127-114	R124	Res. 4.32K, 1.0%	15K-4321TA3
D116	Diode, 1N4148	127-114	R125	Res. 1.21M, 1.0%	15K-1214TA3
D117	Diode, 1N4148	127-114	R126	Res. 178K, 1.0%	15K-1783TA3
D118	Zener, 1N5339	127-308	R127	Res. 549,1.0%	15K-5490TB4
D119	Zener, 1N5354	127-307	R128	Res. 11.8, 1.0%	15-5960
D121	Diode, 1N4004	127-93	R129	Res. 267, 1.0%	15-5965
DS101	Neon Lamp	67-98	R130	Res. 7.50K, 1.0%	15K-7501TA3
SA101	Rotary Switch assy	22-875	R131	Res. 127K, 1.0%	15K-1273TA3
SW102	Slide switch	22-874	R132	Res. 100K, 5.0%	15R-104JA
SW103	Slide switch	22-874	R133	Res. 910,5.0%	15R-911JA
J101	Connector, input	2455-681	R134	Res. 10K, 5.0%	15R-103JA
J102	Connector, meter	2455-673	R135	Res. 100K, 5.0%	15R-104JA
J103	Connector, battery	2455-690	R136	Res. 2.4K, 5.0%	15R-242JB
U101	IC, LM385-2.5	126-389	R137	Res. 10K, 5.0%	15R-103JA
U102	IC, TLC271ACP	126-301	R138	Res. 36.5K, 1.0%	15K-3652TA3
U103	IC, TLC271ACP	126-301	R139	Res. 1.00M, 1.0%	15K-1004TA3
Q101	Transistor, 2N5550	127-306	R142	Res. 100K, 5.0%	15R-104JA
VR101	Variable Res, 5K	16-351	R143	Res. 1.0K, 5.0%	15R-102JA
VR102	Variable Res, 1K	16-387	R145	Shunt, 5A/100mV	90-1170
VR103	Variable Res. 5K	16-351	R147	Res. 267, 1.0%	15-5965
VR104	Variable Res, 5K	16-351	R148	Res. 13.0K, 1.0%	15-5962
VR105	Variable Res, 2K	16-436	R149	Res. 681,1.0%	15K-6810TB4
VR106	Variable Res, 20K	16-375	R150	Res. 90.0, 1.0%	15K-909FTB4
R101	Res. 13.7M, 0.5%	15.5950	R151	Res. 100K, 5.0%	15R-104JA
R102	Res. 4.32M, 0.5%	15-5951	R152	Res. 0.7, 5.0%	15-5971
R103	Res. 1.37M, 0.5%	15-5952	R153	Res. 22, 5.0%	15-5968
R104	Res. 432K, 0.5%	15-5953	R158	Res. 5.0, 5.0%	15-5970
R105	Res. 137K, 0.5%	15K-1373UA3	R158	Res. 5.0, 5.0%	15-5970

Figure 11. PC BOARD COMPONENT LOCATIONS

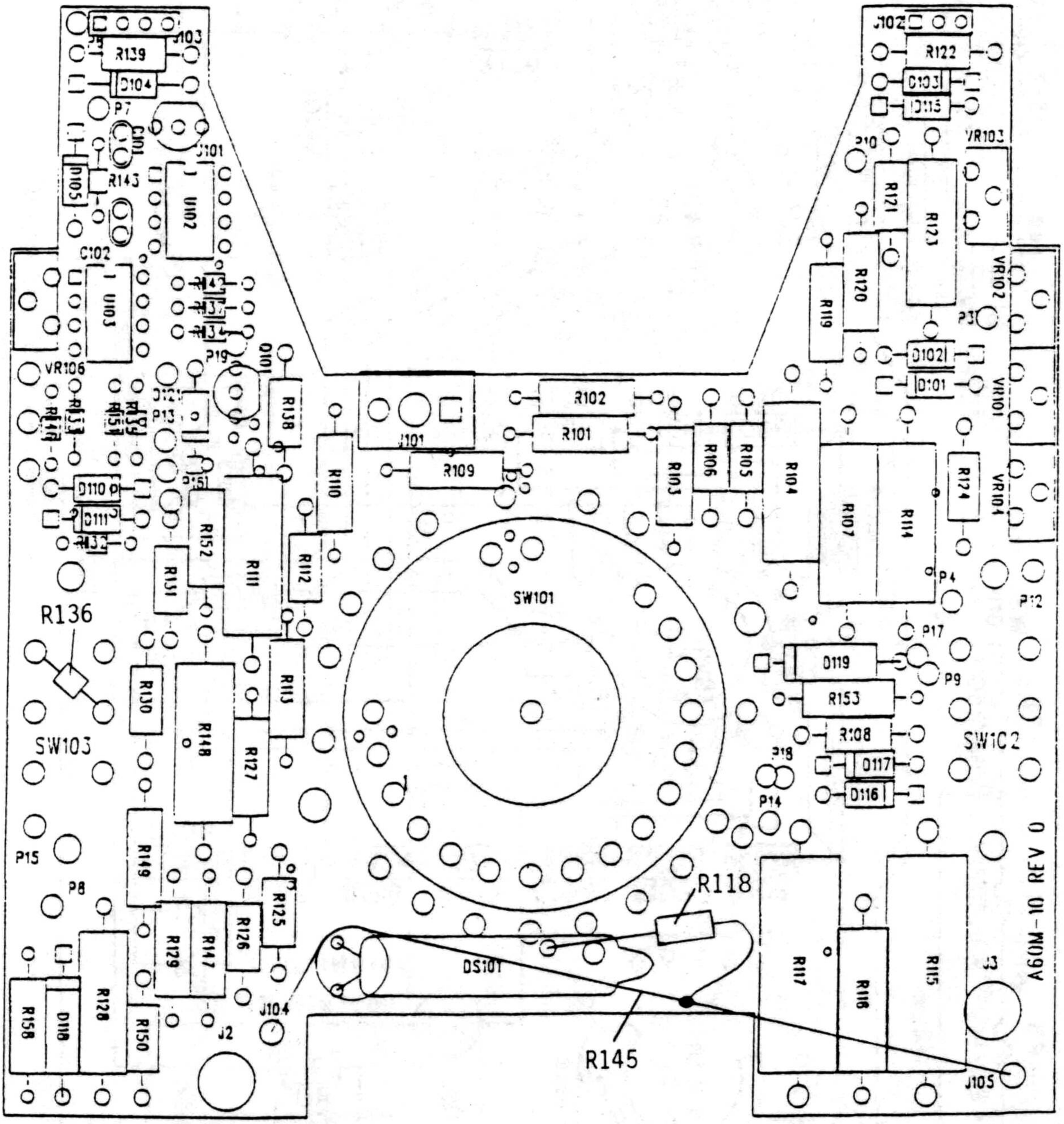
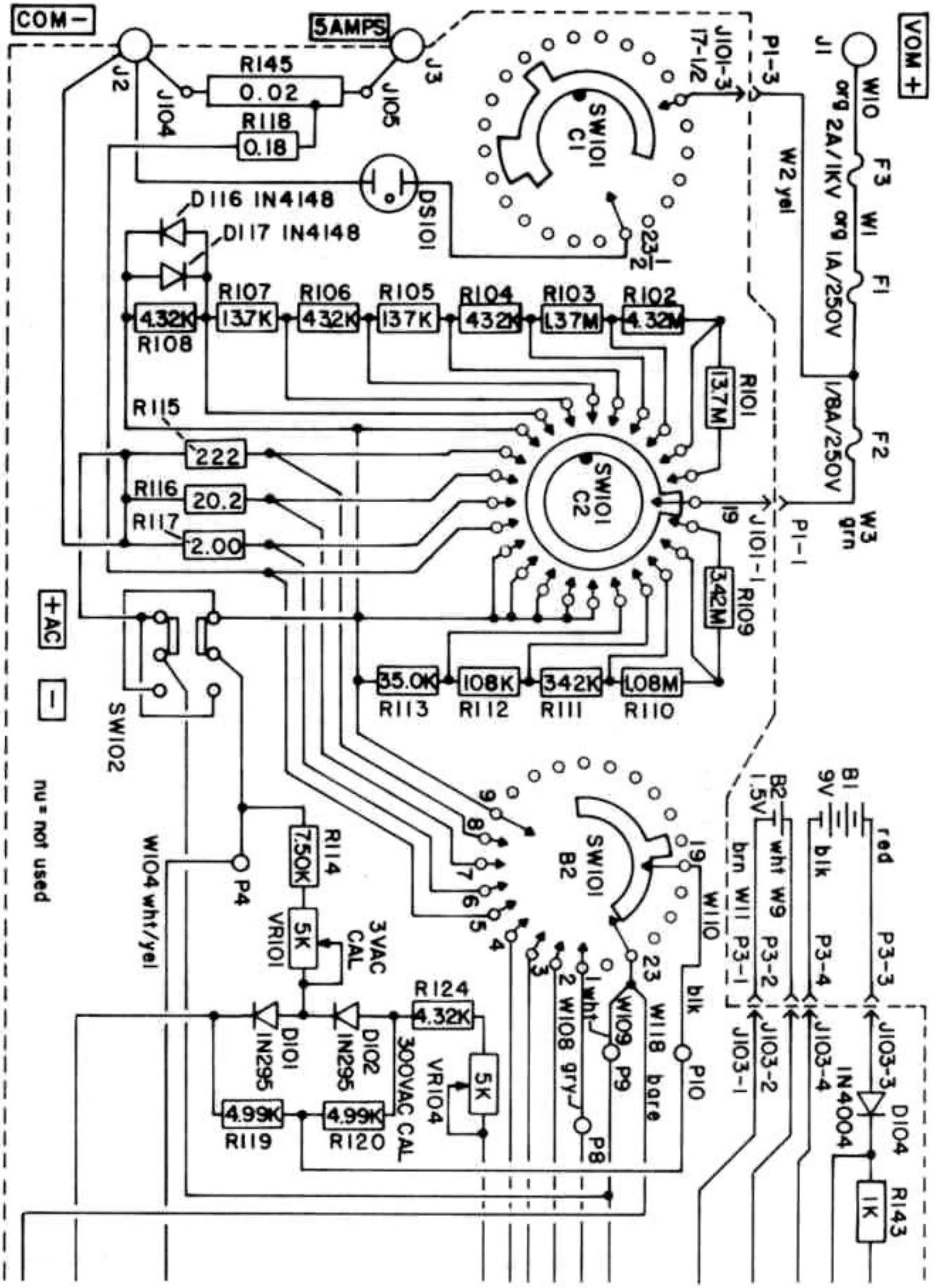
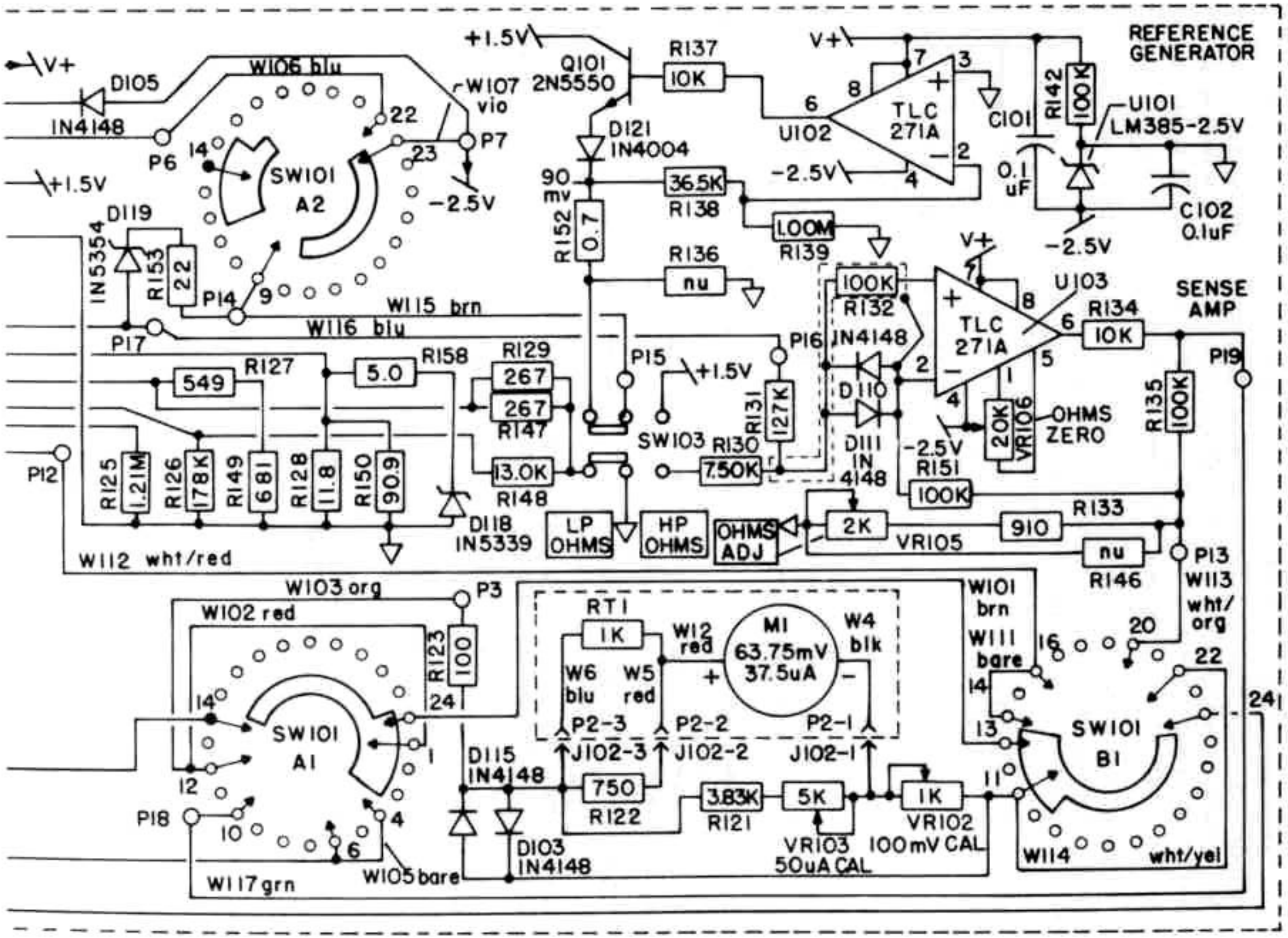


Figure 12. SCHEMATIC




REFERENCE GENERATOR
+1.5V
V+
D105
IN4148
W106 blu
W107 vio
P6
P7
SW101 A2
22
23
14
9
-2.5V
Q101 2N5550
R137 10K
D121 IN4004
90 mv
R152 0.7
36.5K R138
100M R139
R136 nu
TLC 271A
U102
C101 0.1 uF
R142 100K
U101 LM385-2.5V
C102 0.1uF
D119 IN5354
R153 22
P14
P17
W115 brn
W116 blu
P15
P16
100K R132
IN4148
D110
D111 IN 4148
U103
TLC 271A
R134 10K
SENSE AMP
P19
R135 100K
R131 127K
SW103
R130 7.50K
20K VR106
OHMS ZERO
R151 100K
R133
2K VR105
910
nu R146
P13
W113 wht/org
R158 5.0
R127 549
R129 267
267 R147
13.0K R148
R125 1.21M
R126 178K
R149 681
R128 11.8
R150 90.9
P12
D118 IN5339
LP OHMS
HP OHMS
OHMS ADJ
W112 wht/red
W103 org
P3
W102 red
R123 100
24
RT1
1K
W12 red
MI 63.75mV 37.5uA
W4 blk
W6 blu
W5 red
P2-3
P2-2
P2-1
J102-3
J102-2
J102-1
W101 brn
W111 bare
16
20
22
14
13
SW101 B1
24
SW101 A1
12
1
P18
10
6
4
D115 IN4148
750 R122
3.83K R121
5K
1K VR102
11
VR103 50uA CAL
100mV CAL
W114 wht/yel
D103 IN4148
W105 bare
W117 grn

LIMITED WARRANTY

The Triplett Corporation warrants instruments and test equipment manufactured by it to be free from defective material or factory workmanship and agrees to repair or replace such products which, under normal use and service, disclose the defect to be the fault of our manufacturing, with no charge for parts and service. If we are unable to repair or replace the product, we will make a refund of the purchase price. Consult the Instruction Manual for instructions regarding the proper use and servicing of instruments and test equipment. Our obligation under this warranty is limited to repairing, replacing or making refund on any instrument or test equipment which proves to be defective within three years (one year guaranteed calibration) from the date of original purchase.

This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons in any way so as, in our sole judgment, to injure their stability or reliability, or which have been subject to misuse, abuse, misapplication, negligence or accident or which have had the serial numbers altered, defaced, or removed. Accessories, including batteries and fuses, not of our manufacture used with this product are not covered by this warranty.

To register a claim under the provisions of this warranty, return the instrument or test equipment to Triplett Corporation, Bluffton, Ohio 45817, transportation prepaid. Upon our inspection of the product, we will advise you as to the disposition of your claim.

ALL WARRANTIES IMPLIED BY LAW ARE HEREBY LIMITED TO A PERIOD OF THREE YEARS, AND THE PROVISIONS OF THE WARRANTY ARE EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES EXPRESSED OR IMPLIED.

The purchaser agrees to assume all liability for any damages and bodily injury which may result from the use or misuse of the product by the purchaser, his employees, or others, and the remedies provided for in this warranty are expressly in lieu of any other liability Triplett Corporation may have, including incidental or consequential damages.

Some states (USA only) do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. No representative of Triplett Corporation or any other person is authorized to extend the liability of Triplett Corporation in connection with the sale of its products beyond the terms hereof.

Triplett Corporation reserves the right to discontinue models at any time, or change specifications, price or design, without notice and without incurring any obligation.

This warranty gives you specific legal rights, and you may have other rights which vary from state to state.

TRIPLETT CORPORATION
Bluffton, Ohio 45817