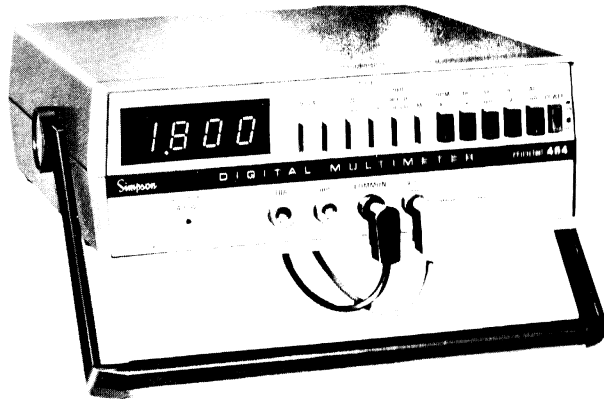


The New Simpson

GENERAL PURPOSE DIGITAL MULTIMETER



OPERATOR'S MANUAL

Courtesy of:
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SIMPSON 260® 6XL AND 6XLM VOLT-OHM-MILLIAMMETERS

Model 464

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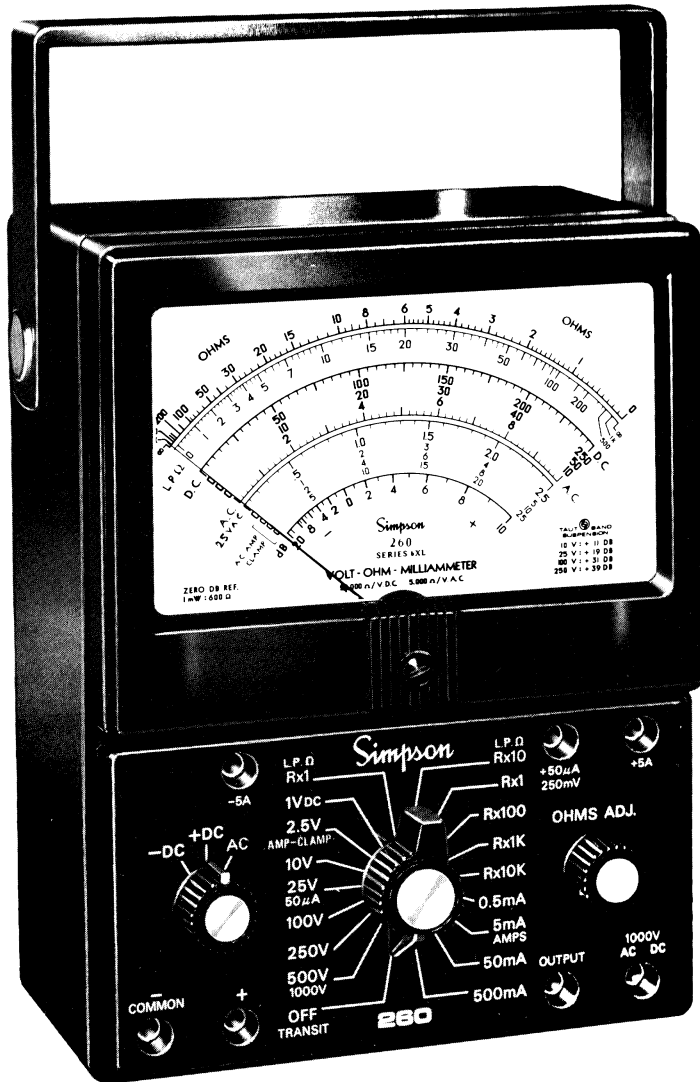


Figure 1-1. Simpson 260 Series 6XL Volt-Ohm-Milliammeter

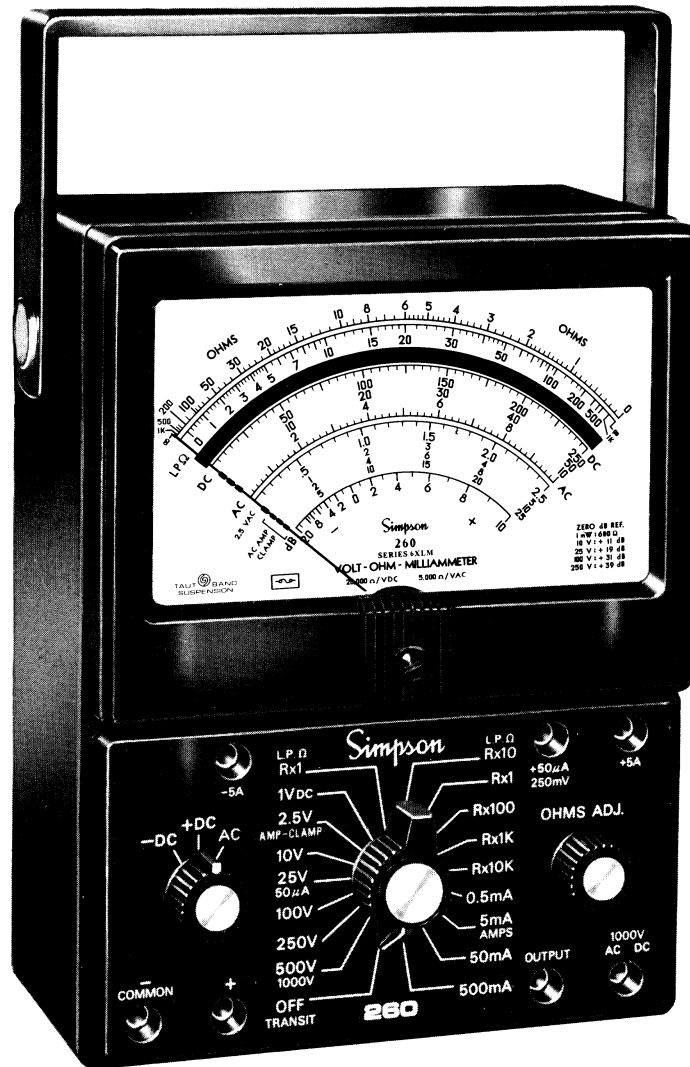


Figure 1-2. Simpson 260 Series 6XLM Volt-Ohm-Milliammeter

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WARNING

The Simpson 260-6XL and 6XLM are designed to prevent accidental shock to the operator when properly used. However, no engineering design can render safe an instrument which is used carelessly. Therefore, this manual must be read carefully and completely before making any measurements. Failure to follow directions can result in a serious or fatal accident.

SHOCK HAZARD: As defined in American National Standard, C39.5, Safety Requirements for Electrical & Electronic Measuring & Controlling Instrumentation, a shock hazard shall be considered to exist at any part involving a potential in excess of 30 volts rms (sine wave) or 42.4 volts DC or peak and where a leakage current from that part to ground exceeds 0.5 milliampere, when measured with an appropriate measuring instrument defined in Section 11.6.1 of ANSI C39.5.

NOTE: The proper measuring instrument for the measurement of leakage current consists essentially of a network of a 1500 ohm non-inductive resistor shunted by a 0.15 microfarad capacitor connected between the terminals of the measuring instrument. The leakage current is that portion of the current that flows through the resistor. The Simpson Model 229-Series 2 AC Leakage Current Tester meets the ANSI C39.5 requirements for the measurement of AC leakage current and can be used for this purpose. To measure DC Leakage current, connect a 1500 ohm non-inductive resistor in series with a Simpson 0-500 DC microammeter and use this as the measuring instrument.

SECTION I

INTRODUCTION

1.1 GENERAL

The Simpson Volt-Ohm-Milliammeters 260 Series 6XL and Series 6XLM are identical electrically and mechanically except that the Series 6XLM is equipped with a mirrored dial to eliminate parallax. They feature low power ohms and a wide range coverage. The case is made from high-impact ABS plastic and is contemporarily styled. These features, combined with the extended range coverage (see Table 1-1), make the 260-6XL and 6XLM extremely useful, general purpose, portable Instruments. They are equally well suited to servicing, production, inspection, engineering and laboratory applications. The 260-6XL utilizes the Simpson taut-band annular movement, which is inherently self-shielding. The taut-band suspension provides a high degree of repeatability and is highly resistant to shock or vibration.

NOTE: To avoid repetitive use of Instrument nomenclature, only the 260-6XL is used as a reference. However, all data in this manual is applicable to both the 260-6XL and 260-6XLM except where specifically indicated.

1.2 UNPACKING AND INSPECTION

1.2.1 Examine the shipping carton for obvious signs of damage before unpacking. If shipping carton is in good condition, then unpack and inspect the Instrument for possible damage incurred during shipment. If damage is noted, notify the carrier and supplier and do not attempt further use of the Instrument. If Instrument appears to be in good condition, read Operator's Manual in its entirety. Become familiar with the Instrument as instructed in the manual, then proceed to check the electrical performance as soon as possible. Save the shipping carton and packing materials for future storing or shipping of the Instrument.

1.2.2 After unpacking the 260-6XL, you will find a 1.5 V and 9 V battery in separate envelopes in the box with the Instrument and test leads. Two alligator clips for the test leads are in a polyethylene bag. See Section IV for instructions on how to open the battery compartment for installation of the batteries.

1.3 ACCESSORIES AND SUPPLIES

All supplies and accessories required for the operation of the Instrument are listed in Table 5-1. Other accessories are listed in Table 5-2.

1.4 DESCRIPTION

1.4.1 Instrument Case

A handle is attached to the side of the Instrument case. The handle may be used to support the Instrument in a convenient, sloping position for easy viewing. The Instrument case can also be placed in either a vertical or horizontal position. The horizontal position is preferable for greater accuracy since the Instrument is calibrated in this position.

1.4.2 Test Leads

- a. Each Instrument is furnished with one pair of test leads 4 feet long. For polarity identification, one lead is black and the other red. The test lead wire consists of a large number of fine strands to insure flexibility.
- b. The insulation of the wire is high-grade rubber and is more than adequate for the highest voltage the Instrument is intended to measure. 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 a probe or a clip for the operator's convenience.

1.5 TECHNICAL DATA

Table 1-1 lists the technical specifications for the Simpson 260-6XL Volt-Ohm-Milliammeter.

NOTE: Accuracy specifications apply to measurements made with the Instrument in a horizontal position.

Reference Conditions: +25°C ±5°C; 45% to 75% relative humidity.

Table 1-1. Technical Data

1. DC VOLTAGE:

Ranges (full scale):	250 mV, 1.0V, 2.5V, 10V, 25V, 100V, 250V, 500V, 1000V
Accuracy:	±2% of full scale on all ranges
Sensitivity:	20,000 ohms/volt

2. AC VOLTAGE:

Ranges (full scale):	2.5V, 10V, 25V, 100V, 250V, 500V and 1000V
Accuracy:	±3% of full scale on all ranges
Sensitivity:	5000 ohms/volt
Frequency Response:	See curves in Figure 3-1

3. OHMS:

Conventional Ohms:

Ranges:	RX1, RX100, RX1K and RX10K
Ohms Center:	6, 600, 6K and 60K
Maximum Scale Reading:	1000 ohms (RX1)

Introduction

Accuracy: $\pm 2.5^\circ$ of arc on the RX1 range; $\pm 2.0^\circ$ of arc on all other ranges.
 The nominal open-circuit voltage for all ranges up to and including RX1K is 1.5V. The RX10K range has an open circuit voltage of 9V.
 The maximum current drawn from the 1.5V battery is 250 mA (RX1 with test leads shorted).

Low Power Ohms:

Ranges: RX1 and RX10
 Ohms Center: 20 and 200 ohms
 Maximum Scale Reading: 1000 ohms (RX1)
 Accuracy: $\pm 2.5^\circ$ of arc
 The maximum open-circuit voltage for the low power ohms range is 100 mV and the maximum measuring power is 0.125 mW. The battery quiescent current is 4.3 mA at RX1 and 0.43 mA at RX10.

4. DC CURRENT:

Range (full scale)	Voltage Drop	Accuracy	Internal Resistance
0-50 μ A	250 mV	$\pm 1.5\%$ of F.S.	5000 Ω
0-0.5 mA	250 mV	$\pm 2.0\%$ of F.S.	500 Ω
0-5 mA	252 mV	$\pm 2.0\%$ of F.S.	50.4 Ω
0-50 mA	252 mV	$\pm 2.0\%$ of F.S.	5.04 Ω
0-500 mA	400 mV	$\pm 2.0\%$ of F.S.	.8 Ω
0-5 A	250 mV	$\pm 2.0\%$ of F.S.	.05 Ω

5. OUTPUT JACK:

A. Voltage (AC) 2.5V, 10V, 25V, 100V, 250V
 Frequency
 Response: See curves in Figure 3-2

Introduction

B. Decibels (dB)

Ref.: 1 mW into 600 Ω = 0 dB

Range (AC)

Range dB

2.5V

Read Direct

10V

Add 11 dB to reading

25V

Add 19 dB to reading

100V

Add 31 dB to reading

250V

Add 39 dB to reading

Accuracy:

± 1 dB at the zero dB point

6. * RATED CIRCUIT-TO-GROUND VOLTAGE:

Commonly called

“float potential”

1000 VDC or 1400 V peak

7. READOUT:

4-1/2 inch, 50 μ A (full scale) taut-band meter

8. OVERLOAD CAPABILITY:

Voltage:

Voltage ranges up to and including 100 volts AC and DC will withstand momentary overloads of 2 times full scale. The 500 volts AC and DC ranges will withstand momentary overloads of 2.5 times full scale.

Current:

Current ranges will withstand momentary overloads of 5 times full scale. A 1-ampere 250V quick-action fuse protects all resistance and current ranges (except the 5A current range).

9. POWER

REQUIREMENTS:

There are two batteries in the ohmmeter circuits. One is a NEDA 13F “D” size cell that furnishes 1.5 volts for all the resistance ranges up to RX1K. A NEDA 1604 battery furnishes 9 volts for the RX10K range. Refer to paragraph 4.4.2 for installation and battery replacement.

*Per ANSI C39.5 April 1974. “The maximum voltage, with respect to ground, which may safely and continuously be applied to the circuit of an Instrument”.

Introduction

- 10. FUSE PROTECTION:** A 1-ampere 250 V fuse is provided to protect the 260 circuits from misuse on the ohmmeter ranges and from excessive overloads on the milliamperere ranges. A spare fuse is furnished with the 260. Both fuses are located in the battery and fuse compartment. An additional 2-ampere 600 V fuse is provided to interrupt high fault currents during accidental high energy overload. This fuse is located under Instrument panel and enclosed by Instrument cover.
- 11. MOVEMENT OVERLOAD PROTECTION:** In addition to the fuse, a varistor protects the indicating instrument circuit. In the event of overload, the varistor limits the current through the moving coil. The fuse and varistor will prevent serious damage to the 260 in most cases of accidental overload. However, no overload protection system is completely foolproof and misapplication, when working with high voltage circuits, can damage the Instrument.
- 12. DIMENSIONS:** 5-1/4" wide x 7" long x 3-1/8" deep (133 x 178 x 79 mm)
- 13. WEIGHT:** 2-1/2 pounds (1.14 kg)
- 14. FUSES:** One 1-ampere, 250-Volt, type 3AG fuse, and one 2-ampere, 600 Volts, type BBS or KTK fuse.

SECTION II

CONTROLS, JACKS AND INDICATOR

2.1 GENERAL

All operating controls, jacks and indicator are shown in Figure 2-1. Become thoroughly familiar with each, before operating the Instrument for the first time.

2.2 DESCRIPTION

Description of front and rear panel controls, connectors and indicator is as follows:

NOTE: The item call-outs in Figure 2-1, correspond with the numerical order of the items listed in Table 2-1.

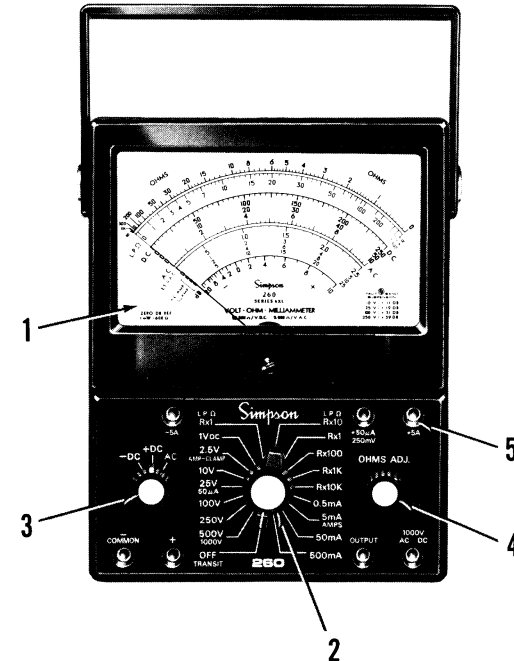


Figure 2-1. Simpson 260-6XL, Front Panel

Table 2-1. Controls, Jacks and Indicator

- 1. Front Panel:** The 260-6XL Volt-Ohm-Milliammeter has a large, easy-to-read 4½" indicating instrument. Below the indicating instrument are three controls and seven circuit jacks. Switch positions and circuit jacks are marked in white, blue, green and red characters which are printed on a vinyl panel overlay. The colors on the overlay correspond to the dial graphics.
- 2. Range Switch:** The range switch has 18 positions. It may be turned to any position in either direction. There are 7 voltage positions, 4 direct current positions, 6 resistance positions and one OFF/TRANSIT position. Two of the resistance positions are for "Low Power Ohms".
- 3. Function Switch:** The function switch has three positions: -DC, +DC and AC. To measure DC current or voltage, set the function switch at -DC or +DC, depending on the polarity of the signal applied across the test leads. For resistance measurements, the switch may be in either the +DC or -DC position. The function switch can reverse the test leads without need for removing the test leads from the circuit under test. To measure AC voltage, set the function switch in the AC position.
- 4. OHMS ADJ. Control:** The ohms adjust control is a variable resistor in the ohmmeter circuit which makes it possible to adjust the indicating instrument to infinity (∞) prior to resistance measurements on low ohms, or to zero on the conventional ohms ranges.

5. Circuit Jacks:

There are seven jacks on the front panel. They are the connections for the test leads. The elbow prods of the test leads are plugged into the proper jacks for the circuit and range desired for each application. At the lower left are -COMMON and + jacks. The black test lead is connected to -COMMON for all circuits and ranges except 5 amperes DC. The red test lead is connected to the + jack for all circuits and ranges except those designated by the other jacks.

Across the top of the panel are jacks marked -5A, dual marking of +50 μ A and 250 mV at a single jack, and +5A. For the 50 micro-ampere or 250 millivolt DC range, the red test lead is connected to this dual marked jack. For the 5-Ampere DC range, the black test lead and the red test lead are connected to the -5A and +5A jacks, respectively.

At the lower right are the OUTPUT and 1000V jacks. For all OUTPUT ranges, and for 1000 volts AC or DC, the red test lead is connected to the appropriate jack with the black lead in the -COMMON jack.

SECTION III

OPERATION

3.1 GENERAL

WARNING

The Simpson 260-6XL is designed to prevent accidental shock when properly used. However, no engineering design can render safe an instrument which is used carelessly. Therefore, this manual must be read carefully and completely prior to making any measurements. Failure to do so can result in a serious or fatal accident.

This section of the manual contains information required to operate the Instrument in a safe and proper manner.

3.2 SAFETY PRECAUTIONS

3.2.1 The Simpson 260-6XL is designed to be used only by personnel qualified to recognize shock hazards and trained in the safety precautions required to avoid possible injury. Refer to SHOCK HAZARD definition on page vi.

3.2.2 Do not work alone when making measurements where a shock hazard can exist. Notify another nearby person that you are or intend to make such measurements.

3.2.3 Remember, voltages might appear unexpectedly in defective equipment. An open bleeder resistor can result in a capacitor's retaining a dangerous charge. Remove all power and discharge all capacitors in the circuit being measured and remove all power from the 260-6XL before making connections or disconnections. The Instrument itself is well protected against electrical overload, as noted throughout paragraph 1.5. However, the above precautions are wise even in the laboratory, and especially in field usage of the Instrument where many strange or unknown safety hazards might prevail.

Operation

3.2.4 Locate all voltage sources and accessibility paths prior to making any measurement or connections.

3.2.5 For your own safety, inspect the test leads for cracks, breaks or crazes in the insulation, prods and connectors before each use. If any defects are noted, replace the test leads immediately.

3.2.6 Do not make measurements near a circuit where corona is present. Corona can be identified by a pale blue color emanating from sharp metal points in the circuit, or by a buzzing sound, or by the odor of ozone. In rare instances, such as around germicidal lamps, ozone might be generated as a normal function. Ordinarily, the presence of ozone indicates presence of high voltage and probably an electrical malfunction.

3.2.7 Hands, shoes, floor and workbench must be dry. Avoid making measurements under humid, damp, or other environmental conditions that could affect the dielectric withstanding voltage of the test leads or the Instrument.

3.2.8 For maximum safety, do not touch the Instrument leads while power is applied to the circuit being measured. Always inspect leads and connectors for cracks, breaks or crazes before each use. If any defects are noted, replace the defective item immediately.

3.2.9 Use extreme caution when making measurements in an rf circuit where a dangerous combination of voltages could be present, such as in a modulated rf amplifier.

3.2.10 Do not make measurements using test leads of lesser safety than those originally furnished with the Instrument.

3.2.11 Do not touch any object which could provide a current path to the common side of the circuit under test or power line ground. Always stand on a dry insulated surface capable of withstanding the voltage being measured.

3.3 ADJUST POINTER FOR ZERO

With the volt-ohm-milliammeter in operating position, check that the pointer indicates zero at the left end of the scale when there is no input to the 260-6XL. If pointer is off zero, adjust the screw

Operation

located in the case below center of the dial. Use a small screwdriver to turn the screw slowly clockwise or counterclockwise until the pointer is exactly over the zero mark at the left end of the scale. With the indicating pointer set on the zero mark, reverse the direction of rotation of the zero adjuster. Rotate the zero adjuster a sufficient amount to introduce mechanical freedom or "play" but insufficient to disturb the position of the indicating pointer. This procedure will avoid disturbances to the zero setting from subsequent changes in temperature, humidity, vibration and other environmental conditions.

3.4 POLARITY CORRECTION

When making DC measurements with the test leads connected to the + and COMMON jacks, polarity can be reversed with the function switch without reversing the test leads. When making measurements on the 50 $\mu\text{A}/250$ mV range, or 5A range, polarity can be corrected only by reversing the test leads.

NOTE: Change the range switch or function switch positions only when the power to the circuit being measured is turned off or when the test leads are disconnected. In addition to safety, this practice will eliminate arcing at the switch contacts and prolong the life of the Instrument.

3.5 DC VOLTAGE MEASUREMENT

NOTE: Review the safety precautions listed in paragraph 3.2.

3.5.1 0-250 Millivolts

CAUTION

When using the 260-6XL as a millivoltmeter, care must be taken to prevent damage to the indicating instrument from excessive voltage. Before using the 250 millivolt range, first use the 1.0 volt DC range to affirm that the voltage measured is no greater than 250 millivolts.

- a. Set the function switch at +DC.

Operation

- b. Plug the black test lead into the -COMMON jack and the red test lead into the +50 $\mu\text{A}/250$ mV jack.
- c. Set the range switch at the 25V (50 μA) position.
- d. Connect black test lead to negative side of the circuit being measured and the red test lead to positive side of the circuit.
- e. Turn power on and read the voltage on the black scale marked DC and use the figures μA marked 0-250. Read directly in millivolts.
- f. Turn power off, disconnect test leads and turn the range switch to the OFF/TRANSIT position.

3.5.2 Measuring DC Voltage: 0-1 through 0-500 volts

- a. Set the function switch to +DC.
- b. Plug the black test lead into the -COMMON jack and the red test lead into the + jack.
- c. Set the range switch at one of the seven voltage range positions marked 1V, 2.5V, 10V, 25V, 100V, 250V or 500V. When in doubt about the approximate voltage present, always use the highest voltage range as a protection to the Instrument. If the voltage reading is within a lower range, the switch then may be set to a lower range to obtain a more accurate reading.
- d. Be sure the power is off in the circuit being measured and all capacitors have been discharged.
- e. Connect black test lead to negative side of the circuit being measured and red test lead to the positive side of the circuit.
- f. Turn on the power to the circuit and read the voltage on the black scale marked DC. For the 2.5V and 25V ranges, use the 0-250 figures and divide by 100 and 10, respectively. For the 10V and 250V ranges, read the figures directly. For the 500V range, use the 0-50V figures and multiply by 10. For the 100V range, use the 0-10V figures and multiply by 10. For the 1V range, use 0-10 figures and divide by 10.
- g. Turn power off, disconnect test leads and return the range switch to the OFF/TRANSIT position.

Operation

3.5.3 Measuring DC Voltage: 0-1000 volts

WARNING

Be extremely careful when working with high voltage circuits. Do not touch the instrument or test leads while power is on in the circuit being measured.

- Set the function switch at +DC.
- Set the range switch at 1000V (dual position with 500V).
- Plug the black test lead into the – COMMON jack and the red test lead into the 1000V jack.
- Be sure power is off in the circuit being measured and that all capacitors have been discharged. Connect black lead to negative side and the red lead to the positive side of the circuit.
- Turn on power in the circuit being measured.
- Read the voltage on the black scale marked DC, using the 0-10 figures. Multiply the reading by 100.
- Turn the power off, disconnect the test leads and return the range switch to the OFF/TRANSIT position.

NOTE: To measure higher DC voltages, refer to Table 5-2 for high-voltage accessory probes.

3.6 AC VOLTAGE MEASUREMENTS

NOTE: Before making voltage measurements, review the SAFETY PRECAUTIONS listed in paragraph 3.2.

3.6.1 Measuring AC voltage

NOTE: The Simpson 260-6XL responds to the full-wave average value of an AC waveform. It is calibrated in terms of the RMS value of a pure sine wave. If the waveform is nonsinusoidal, the reading might be either higher or lower than the true RMS value, and could result in a substantial error. Also, accuracy is lessened at higher input frequencies (see Figure 3-1).

- Set the function switch at AC.

Operation

- Set the range switch at one of the six voltage range positions marked 2.5V, 10V, 25V, 100V, 250V, or 500V. When in doubt about the actual voltage, always use the highest voltage range as a protection to the Instrument. If the voltage is within a lower range, the switch may be set at a lower range to obtain a more accurate reading.
- Plug the black test lead into the – COMMON jack and the red test lead into the + jack.
- Connect the test leads across the voltage source.
- Turn on the power in the circuit being measured.
- For the 0-2.5V range, read the value directly on the red scale marked 2.5V.A.C. For the 10V, 25V, 100V, 250V and 500V ranges, read the **red scale marked AC** and use the black figures immediately above the scale. For the 10V and 250V range, read directly using the 0-10 and 0-250 figures respectively. For the 500V range, read directly on the 0-50 figures and multiply the reading by 10. For the 100V range, read directly the 0-10 figures and multiply the reading by 10. For the 25V range, use

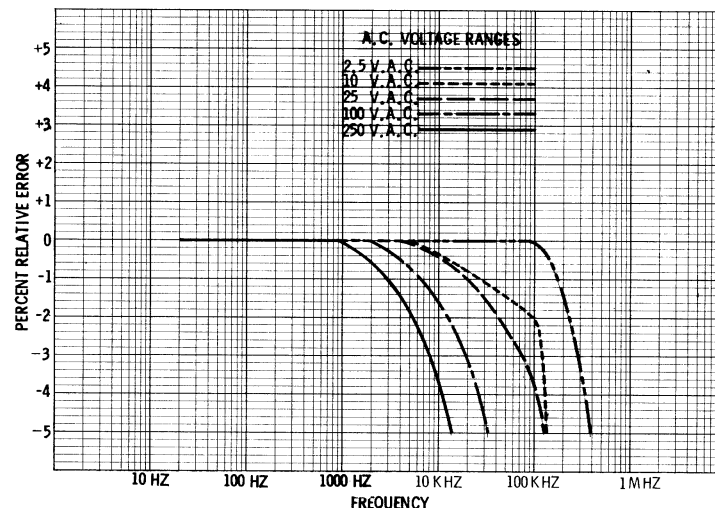


Figure 3-1. Typical Frequency Response AC Voltage Ranges

Operation

the 0-250 figures and divide by 10.

- g. Turn power off, disconnect the test leads and return the range switch to the OFF/TRANSIT position.

3.6.2 Measuring AC Voltage: 0-1000 volts

WARNING

For maximum safety, avoid touching the instrument or the test leads while the power is on in the circuit being measured.

- a. Set the function switch at AC.
- b. Set the range switch at 1000V (dual position with 500V).
- c. Plug the black test lead into the – COMMON jack and the red test lead into the 1000V jack.
- d. Be sure the power is off in the circuit being measured and that all its capacitors have been discharged. Connect the test leads across the voltage source, with the black lead on the ground side.
- e. Turn on the power in the circuit being measured.
- f. Read the voltage on the red scale marked AC. Use the 0-10 figures and multiply by 100.
- g. Turn power off, disconnect the test leads and return the range switch to the OFF/TRANSIT position.

3.7 MEASURING OUTPUT VOLTAGE

Often it is necessary to measure the AC component of a voltage consisting of a mixture of both AC and DC voltages, as in amplifier circuits. The 260-6XL has a 0.1 μF , 400 volt capacitor in series with the OUTPUT jack. The capacitor blocks the DC component of the voltage in the test circuit, but passes the AC component. The blocking capacitor alters the AC response of the Volt-Ohm-Milliammeter at low frequencies. See Figure 3-2 for frequency response (AC voltage ranges).

Operation

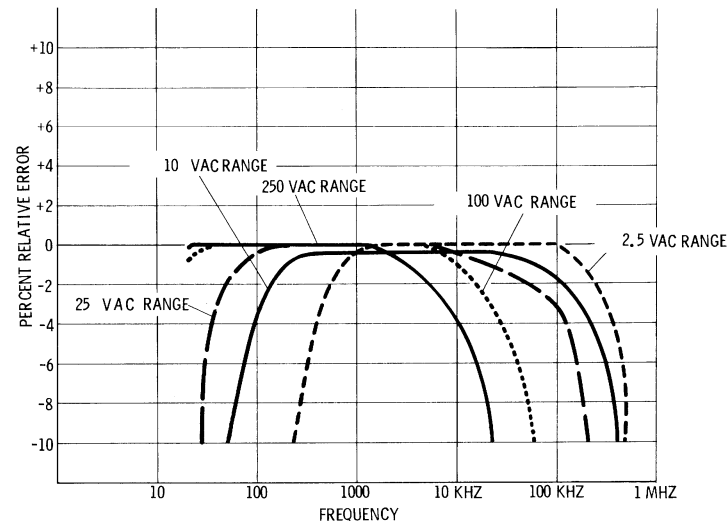


Figure 3-2. Typical Frequency Response Output Ranges

WARNING

When making OUTPUT measurements, do not connect the 260-6XL to a circuit whose DC voltage component exceeds the 400 volt rating of the blocking capacitor.

- a. Set the function switch at AC.
- b. Plug the black test lead into the – COMMON jack and the red test lead into the OUTPUT jack.
- c. Set the range switch at one of the range positions marked 2.5V, 10V, 25V, 100V or 250V.
- d. Connect the test leads across the circuit being measured with the black test lead to the ground side.
- e. Turn on the power in the test circuit. Read the output voltage on the appropriate AC voltage scale. For the 0-2.5V range, read the value directly on the red scale marked 2.5V.A.C. For the

Operation

10V, 25V, 100V or 250V ranges, **use the red scale marked AC** and read the black figures immediately above the scale.

3.8 MEASURING DECIBELS

3.8.1 For some applications, voltages frequently are measured in terms of decibels. The decibel (dB) scale at the bottom of the dial is marked from -20 to +10. To measure decibels, read the dB scale by following the instructions for measuring AC. When the range switch is set on the 2.5V position, read the dB scale directly.

3.8.2 The dB readings on the scale are referenced to zero dB power level of .001 watt into 600 ohms, or 0.775 VAC across 600 ohms. For the 10V range, read the dB scale and add +11 dB to the reading. For corresponding deflections on the 25V range, read the dB scale and add +19 dB to the reading. On the 100V range, add +31 dB to the reading. On the 250V range add +39 dB to the reading.

3.9 DIRECT CURRENT MEASUREMENTS

NOTE: The voltage drop across the 260-6XL on all milliamperere current ranges is approximately 250 millivolts measured at the jacks. An exception is the 0-500 mA range, where the drop is approximately 400 millivolts. The voltage drop will not affect most circuits whose current is being measured. In some transistor circuits, it might be necessary to take the voltage drop into account when making voltage measurements.

3.9.1 Measuring Direct Current: 0-50 microamperes

CAUTION

When measuring current in high voltage circuits, always connect the instrument in series with the ground side of the circuit. Never exceed the rated circuit to ground voltage (see Table 1-1, Item 6).

- a. **Prior to making current measurements, review the SAFETY PRECAUTIONS listed in paragraph 3.2.**

Operation

- b. Set the function switch at +DC.
- c. Plug the black test lead into the - COMMON jack and the red test lead into the +50 μ A/250 mV jack.
- d. Set the range switch at the 25V (50 μ A) position.
- e. Open the circuit in which the current is being measured. Connect Instrument in series with circuit. Connect red test lead at the positive side and black test lead at negative side.
- f. Turn the power on and read the current on the black DC scale. Use the 0-50 figures to read directly in microamperes.
- g. Turn the power off, disconnect test leads and return the range switch to the OFF/TRANSIT position.

NOTE: In all direct current measurements, be certain the power to the circuit being tested has been turned off before disconnecting test leads and restoring circuit continuity.

3.9.2 Measuring Direct Current: 0-0.5 through 0-500 milliamperes

- a. Set the function switch at +DC.
- b. Plug the black test lead into the - COMMON jack and the red test lead into the + jack.
- c. Set the range switch at one of the four range positions marked .5 mA, 5 mA, 50 mA or 500 mA.
- d. Turn the power off and open the circuit in which the current is being measured. Connect the Instrument in series with the circuit being tested. Connect the red test lead to the positive side and the black test lead to the negative side.
- e. Turn on the power to the circuit under test.
- f. Read the current in milliamperes on the black DC scale marked 0-50. For the .5 mA and 5 mA ranges, the reading is divided by factors of 100 and 10, respectively. The 50 mA range is read directly. The reading in the 500 mA range is multiplied by a factor of 10.
- g. Turn power off, disconnect the test leads and return the range

Operation

switch to the OFF/TRANSIT position.

3.9.3 Measuring Direct Current: 0-5 amperes

CAUTION

For maximum safety and for the protection of the Instrument, never remove a test lead from its panel jack while there is current in the circuit.

- Plug the black test lead into the -5A jack and the red test lead into the +5A jack.
- Set the range switch at 5 AMPS (dual position with 5 mA).
- With power OFF, open the circuit in which the current is being measured. Connect the Instrument in series with the circuit. Connect the red test lead at the positive side and the black test lead at the negative side.
- Turn on the power in the circuit under test.

NOTE: The function switch has no effect on polarity for the 5 AMPS range.

- Read the current directly on the black DC scale. Use the 0-50 figures; divide by 10 to read amperes.
- Turn power off, disconnect the test leads and return the range switch to the OFF/TRANSIT position.

3.10 RESISTANCE MEASUREMENTS

WARNING

Before making resistance measurements, all power to the circuit under test must be removed and all capacitors discharged.

3.10.1 The 260-6XL has six resistance ranges. Two are "Low Power Ohms" and the remaining are conventional ohm ranges, and are powered by two batteries. The "Low Power Ohms" ranges are used for accurate and safe measurement of the resistance within

Operation

semiconductor circuits. The low open-circuit voltage of 100 millivolts assures that the circuit measured will not be damaged or its resistance affected by conducting diodes. Depending on the range selected, the open circuit voltage for the conventional ohms ranges is 1.5V or 9V.

3.10.2 A single OHMS ADJ. control is provided for all the resistance ranges. This control compensates for variations in battery voltage and allows the user to zero the Instrument before measuring resistance.

3.10.3 Measuring Resistance: Using Low Power Ohms Ranges

- Turn the range switch to the desired resistance range marked in blue and the function switch to either the -DC or +DC position.
- Plug the black test lead into the - COMMON jack and red test lead into the + jack.
- With the test leads separated, rotate the OHMS ADJ. control to set the Instrument pointer at infinity (∞) on the blue LP ohm arc. If the pointer cannot be adjusted to infinity (∞), replace the 1.5V battery. See Section V for instructions.
- Connect the test leads to the circuit whose resistance is to be measured. Read the resistance on the blue arc and multiply it by the factor indicated on the range switch.
- Disconnect test leads and return the range switch to the OFF/TRANSIT position.

NOTE: When not in use, never leave the range switch in the "Low Power Ohms" position because power is drawn continuously from the 1.5V battery.

3.10.4 Measuring Resistance: Using Conventional Ohms Ranges

- Turn the range switch to the desired range and the function switch to either the +DC or -DC position.
- Plug the black test lead into the - COMMON jack and the red

Operation

- test lead into the + jack.
- c. Connect the ends of the test leads to short the Volt-Ohm-Milliammeter resistance circuit.
 - d. Rotate the OHMS ADJ. control to set the Instrument pointer to zero on the black ohms scale. If full deflection cannot be obtained, replace the 1.5V battery for Rx1. Replace the 9V battery if the Rx10K range cannot be adjusted to full scale. For battery replacement, refer to Section IV.
 - e. Disconnect ends of test leads and connect to component being measured.
 - f. Read the resistance on the black ohms scale. Multiply the reading by the factor indicated on the range switch.
 - g. Disconnect test leads and return the range switch to the OFF/TRANSIT position.

3.11 AC CURRENT MEASUREMENTS USING SIMPSON AMP-CLAMP MODEL 150

(See list of accessories Section V, Table 5-2)

3.11.1 Amp-Clamp Precautions

- a. Do not touch the current-carrying conductor. Keep hand at actuating lever position of the Amp-Clamp and away from the jaw end.
- b. Do not apply the Amp-Clamp to any conductor having a potential greater than 600 volts.
- c. Do not apply the Amp-Clamp to any conductor carrying a current which exceeds 250 amperes.

3.11.2 Operation With Simpson Amp-Clamp

The Simpson Amp-Clamp Model 150 is an accessory that permits AC current measurements without breaking the circuit under test. The Amp-Clamp works, in effect, as a transformer containing a split core that accommodates the current-carrying conductor. The current-carrying conductor becomes a transformer primary and a coil in the Amp-Clamp serves as the secondary winding. The Amp-Clamp output voltage is proportional to the current measured

and is applied to the 260-6XL as an AC voltage. The Amp-Clamp has a range selector with 6 positions. Any of the following current ranges can be used with the 260: 5, 10, 25, 50, 100 or 250 amperes.

- a. Set the function switch of the 260-6XL to AC and the range switch to 2.5V.
- b. Set the current range selector on the Amp-Clamp to a range which covers the probable current being measured.
- c. Connect the Amp-Clamp leads to the – COMMON and + jacks of the 260-6XL.
- d. Open the jaws of the Amp-Clamp and place around the conductor whose current is to be measured.
- e. Using the green AC scales, read the current on the red 2.5 VAC arc. Read the 5A, 10A and 25A ranges directly on the appropriate scale. The 50A, 100A and 250A ranges are read on the same arc; multiply the reading by 10.

SECTION IV

MAINTENANCE

4.1 GENERAL

The Simpson Model 260-6XL Volt-Ohm-Milliammeter has been designed carefully and constructed with high quality components. By providing reasonable care, and following the instructions in this manual, the user can expect a long useful service life from this Instrument.

4.2 WARRANTY

The Simpson Electric Company warranty policy is printed on the inside back cover of the manual. Read carefully prior to requesting a warranty repair.

NOTE: For assistance of any kind, including help with the Instrument under warranty, contact your nearest Authorized Service Center for instructions. These centers are listed on the last pages of this manual. If you wish to contact the factory directly, give full details of the difficulty and include the Instrument model number, serial number and date of purchase. Service data or shipping instructions will be sent to you promptly. There will be no charge for repair of the Instrument under warranty beyond one-way transportation charges. If an estimate of charges for non-warranty or other service work is required, a maximum charge estimate will be quoted. This charge will not be exceeded without your prior approval. Repair charges will be billed on the basis of cost.

4.3 SHIPPING

Pack the Instrument carefully, and ship prepaid to the destination indicated. Insure the shipment.

4.4 BATTERY AND FUSE REPLACEMENT

The batteries and 1-ampere fuse are located inside an isolated compartment at the top-rear of the 260-6XL case. To open the compartment, proceed as follows:

NOTE: If replacement of the 2-ampere high current interrupting fuse is necessary, the Instrument case must be removed (refer to paragraph 4.5 and Figure 4-1).

- a. Place the Instrument face down on a soft padded surface.
- b. Unscrew the single captivated screw on the cover.
- c. Remove the cover from the case and set it aside. Batteries and fuse now can be replaced.

4.4.1 Battery replacement is necessary: Whenever the Instrument cannot be adjusted to infinity (∞) with open test leads on the Low Power Ohmmeter ranges, or with shorted test leads on the conventional ohmmeter ranges. If these adjustments cannot be made, replace the 1.5V, D size cell. If the ohms adjustment cannot be made on the Rx10K range, replace the 9-volt battery.

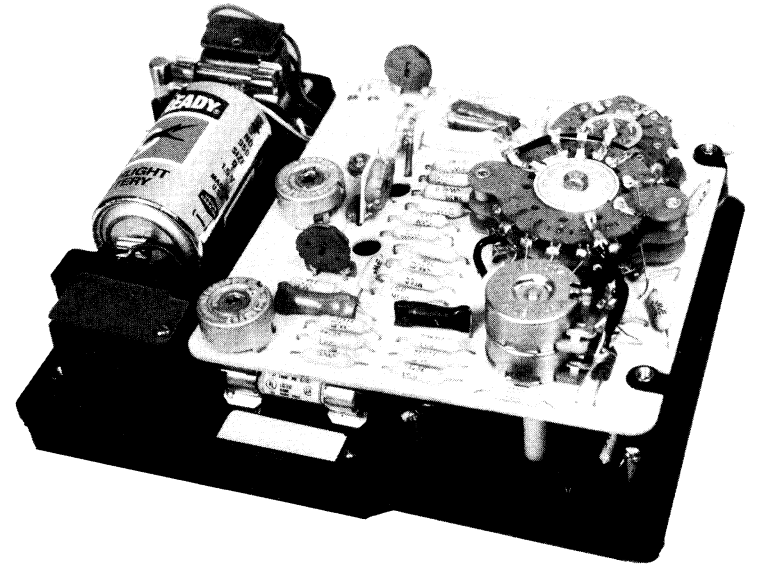


Figure 4-1. 260-6XL, Rear View With Cover Removed

4.4.2 The procedure for replacing batteries is as follows:

- a. To remove the D size cell, grasp the battery at the center and pull directly up. To install new cell, insert the (-) side first; push against the (-) terminal spring clip, and then gently push the (+) side of the cell into place.
- b. To remove the 9-volt battery, first withdraw battery, with mating connector, from the compartment.

- c. Remove the connector from the old battery and connect it to new battery.
- d. Put the new battery into the compartment.
- e. Place the connector leads so they rest between the cavity walls and clear the fuse terminals. Place the extended leads between the battery holder and top wall of the case.

4.4.3 One-ampere fuse replacement is necessary when there is no meter deflection on any of the DC, AC VOLTS or OHMS ranges but the DC AMPS range operates properly.

4.4.4 The procedure for replacing the 1-ampere fuse is as follows:

- a. Pull the defective fuse from its retaining spring clips (fuse holder).
- b. Snap-in the replacement fuse and reinstall cover.

NOTE: A spare fuse is located in a cavity next to the fuse clip. Use only if proper replacement fuse is not available; i.e., save the internal spare for an emergency.

4.5 CASE REMOVAL

Whenever maintenance other than battery and 1-ampere fuse replacement is required, remove the Instrument from its case.

4.5.1 The procedure is as follows:

- a. Place the Instrument face down on a soft padded surface.
- b. Remove the Battery and Fuse compartment cover, located at the top rear of the 260-6XL case, (refer to paragraph 4.4). Unscrew the 4 screws located at the 4 corners of the case.
- c. Lift the case off the Instrument and set it aside. Maintenance now can be performed on the Instrument (see Figure 4-1).

4.6 PREVENTIVE MAINTENANCE

4.6.1 Daily Care

- a. Immediately clean all spilled materials from the Instrument and wipe dry. If the spillage is corrosive, use a suitable cleaner to neutralize the corrosive action, and remove the spillage.
- b. Whenever the Instrument is not in use, rotate the range selector switch to the OFF/TRANSIT position.
- c. Whenever possible, avoid prolonged exposure or usage in areas which are subject to temperature and humidity extremes, vibration or mechanical shock, dust or corrosive fumes, or strong electrical or electromagnetic interferences.

4.6.2 Monthly Care

Verify Instrument accuracy by performing operational checks using known accurate, stable sources. If proper calibration equipment is not available, contact your nearest Simpson Authorized Service Center. Refer to last pages of this manual. If the Instrument has not been used for 30 days, check the batteries for leakage and replace if necessary.

4.6.3 Annual Care

It is recommended that the Instrument be returned annually to your nearest Simpson Authorized Service Center, or to the factory, for an overall check, adjustment and calibration.

4.6.4 Storage

When the Instrument is not in use, store it in a room free from temperature extremes, dust, corrosive fumes, and mechanical vibration or shock. If storage time is expected to exceed 30 days, remove the batteries.

SECTION V

ORDERING INFORMATION, ACCESSORIES AND REPLACEMENT PARTS

5.1 GENERAL

This section provides a listing of the replaceable parts for this Instrument and necessary ordering information. The parts are listed by Simpson part number, description and schematic reference symbol, to facilitate the ordering of the replacement parts.

5.2 ORDERING INFORMATION

If replacement parts are needed from any Simpson Authorized Service Center (see listing on following pages) provide the following information:

- a. Model and Series number of the Instrument (use 260-6XL).
- b. Simpson part number and description.

5.3 CUSTOMER REPAIR SERVICE

Repairs or recalibration of Simpson Products are performed by the Customer Service Department at the factory and/or Simpson Authorized Service Centers. However, before returning your Instrument to either the Simpson Electric Company or an Authorized Service Center, contact one of those listed for shipping instructions. Provide a detailed description of the Instrument difficulty, along with Instrument model number, serial number and date of purchase.

Table 5-1. Accessories Furnished With the Instrument

Quantity	Description	Catalog Number
1	Test Lead Set — One red and one black, 4 ft. long, each with combination probe tip and removable rubber-sleeved alligator clip at one end and banana plug on opposite end.	00115
*1	1.5 volt, D Cell, NEDA 13F	
*1	9.0 volt Cell, NEDA 1604	
1	1 Amp, 250V Fuse, Littelfuse #312001 or equivalent	
1	2 amp, 600V Fuse, Bussman BBS or KTK	
1	Operator's Manual	5-116871

*Batteries are standard items replaceable from local retail stores. Refer to Table 1-1, Item 9.

Table 5-2. Other Available Accessories

Description	Catalog Number
Utility Vinyl Case	00549
Leather Case	01818
Ever-Redy Leather Case	00805
5,000 Volts AC Probe	00505
5,000 Volts DC Probe	00506
10,000 Volts AC Probe	00036
10,000 Volts DC Probe	00034
40,000 Volts DC Probe	00168
Model 150 Amp-Clamp	00532
Model 151 Line Splitter	00534

WARNING

The high voltage probes are designed to extend the useful range of the 260-6XL. Do not use the high voltage probes in circuits whose available power is high, such as power distribution transformers. These probes are intended for high impedance circuits. Read the safety instructions of this manual before using the high voltage probes (page vi, and paragraphs 3.2, 3.4 and 3.5.3).

Table 5-3. Replacement Parts List

Reference Symbol	Description	Part No.
R-1	Potentiometer, 100 kΩ	5-116715
R-2	Potentiometer, 2 kΩ	5-116716
R-3	Potentiometer, 3 kΩ	5-116717
R-4	Resistor, 5 MΩ	5-110454
R-5	Resistor, 3 MΩ	5-113432
R-6	Resistor, 1.5 MΩ	5-113536
R-7	Resistor, 300 kΩ	1-113995

Reference Symbol	Description	Part No.
R-8	Resistor, 150 kΩ	1-117895
R-9	Resistor, 30 kΩ	1-115042
R-10	Resistor, 15 kΩ	1-113347
R-11	Resistor, 332Ω	5-116941
R-12	Resistor, 3.29 kΩ	5-117112
R-13	Resistor, 505 Ω	5-116731
R-14	Resistor, 45.5 Ω (Bobbin)	10-675462
R-15	Resistor, 4.5 Ω (Bobbin)	10-675264
R-16	Resistor, 0.45 Ω (Bobbin)	10-675463
R-17	Resistor, 0.05 Ω Shunt, 5A (Calibrate in VOM)	3-812003
R-18	Resistor, 7.5 MΩ	5-111668
R-19	Resistor, 2.5 MΩ	5-111669
R-20	Potentiometer (Dual) 600 Ω Front, 10 kΩ Rear	5-116752
R-21	Resistor, 1.6 kΩ	5-116119
R-22	Resistor, 22.3Ω 3W (Wire Wound)	5-119565
R-23	Resistor, 286 Ω	5-117111
R-24	(Not Used)	
R-25	Resistor, 8.2 kΩ	1-111030
R-26	Resistor, 54.2 kΩ	5-116725
R-27	Resistor, 3.47 kΩ	5-116753
R-28	Resistor, 1.84 kΩ	5-116723
R-29	Resistor, 4.68 kΩ	5-116718
R-30	Resistor, 89.5 Ω	5-116722
R-31	Resistor, 515 Ω	5-116732
R-32	Resistor, 5Ω 5W (Wire Wound)	5-119566
R-33	Resistor, 3 Ω (Bobbin)	10-675466
R-34	Resistor, 1.25 MΩ	5-115068
R-35	Resistor, 750 kΩ	5-116726
R-36	Resistor, 375 kΩ	1-113364
R-37	Resistor, 75 kΩ	1-117258
R-38	Resistor, 37.5 kΩ	5-116719
R-39	Resistor, 7.5 kΩ	5-116678
R-40	Potentiometer, 3 kΩ	5-116714
R-41	Resistor, 4 kΩ	5-114835
R-42	Resistor, 4 kΩ	5-114835

Reference Symbol

Description

Part No.

R-43	Potentiometer, 3 k Ω	5-116714
C-1	Capacitor, 0.1 μ F, 400V	1-113733
D-1	Diode, Germanium	5-115665
D-2	Diode, Germanium	5-115665
V-1	Varistor, Silicon	1-110670
F-1	Fuse, 1 Amp, 250V 3AG (1 $\frac{1}{4}$ " x $\frac{1}{4}$ ") Quick Acting	1-112507
F-2	Fuse, 2 Amp, 600V, Bussman BBSorKTK	5-119056
	Function Switch, Knob	5-116761
	Ohms Adjust, Knob	5-116762
	Range Switch, Knob	5-116760
	Case Assembly, Complete (including Handle, Less Battery Compartment Cover)	10-862883
	Battery Compartment Cover Assembly	10-560212
	Carrying Handle for Case	5-116711
	Rubber Bumper Plug	5-115039
	Front Panel Overlay	5-116869
	260-6XL Indicating Instrument with Panel Assy.	10-13771
	260-6XLM Indicating Instrument with Panel Assy.	10-13772
	Cover Assembly for Indicating Instrument	10-560217
	Combination Probe Tip Leads, One Red and One Black with Removable Alligator Clips	00115
	Crocodile Clip Test Leads, One Red and One Black	07500

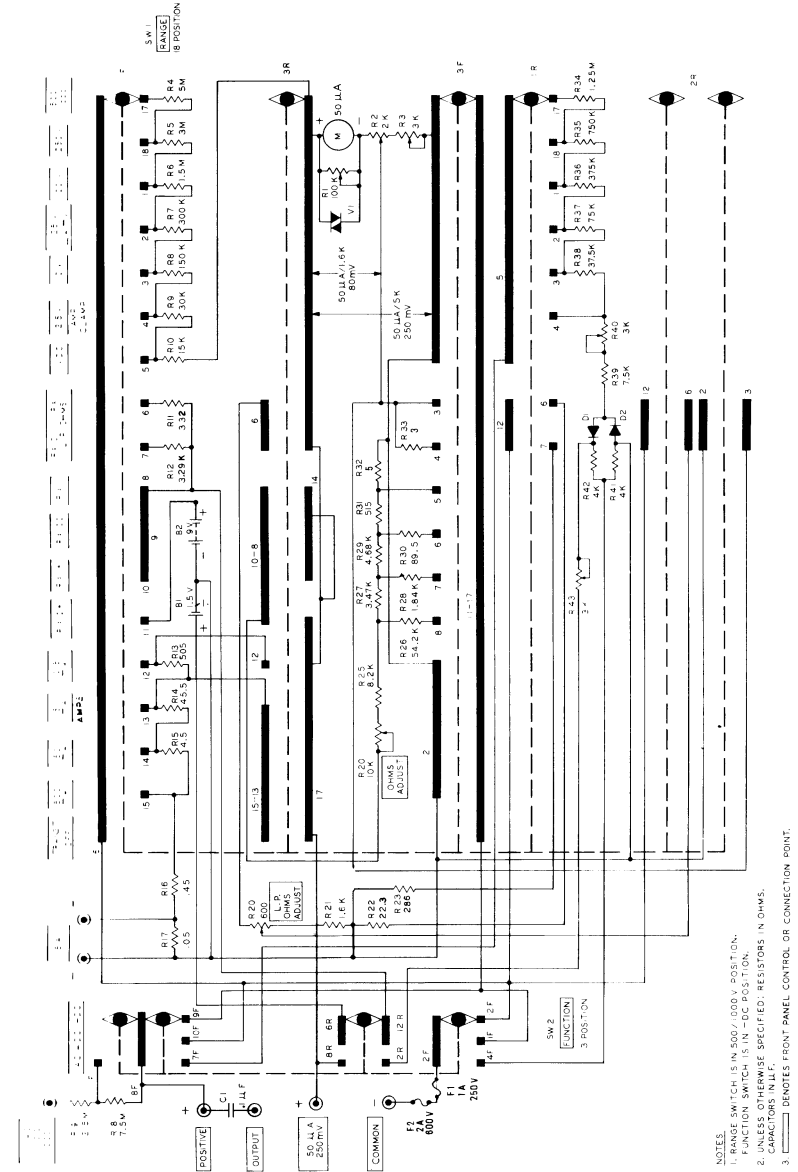
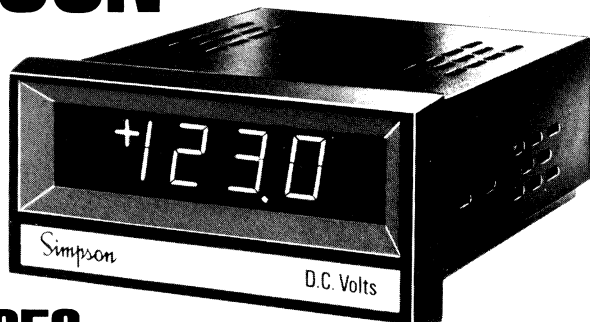


Figure 5-1. Simpson 260-6XL Schematic Diagram

NEW SIMPSON



SERIES 2850 DIGITAL PANEL METER

- 0.55" planar gas discharge display: Models 2850 and 2851
- 0.43" LED display: Models 2852 and 2853
- 3½ digit readout
- Automatic zero and polarity
- 0.1% of reading accuracy
- BCD output is standard
- Input/output edge connector included
- Highly reliable LSI circuitry
- Choice of 120/240 VAC, 50-400 Hz or 5 VDC operation

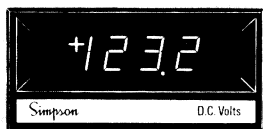
Model 2850 120/240 VAC input; 0.55" planar gas discharge display complete with panel mounting clips, edge connector and manual.

Model 2851 5 VDC input, 0.55" planar gas discharge display complete with panel mounting clips, edge connector and manual.

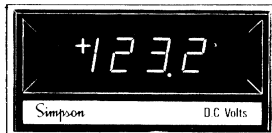
Model 2852 120/240 VAC input, 0.43" LED display complete with panel mounting clips, edge connector and manual.

Model 2853 5 VDC input, 0.43" LED display complete with panel mounting clips, edge connector and manual.

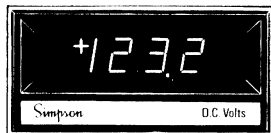
NOW... a single DPM for popular domestic and IEC/DIN cutouts



STANDARD CUTOUT
1.682" x 3.622"
(42.72 mm x 92 mm)



IEC/DIN CUTOUT
1.77" x 3.622"
(45 mm x 92 mm)



OTHER DOMESTIC CUTOUT
1.682" x 3.92"
(42.72 mm x 99.57 mm)

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.



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KATY INDUSTRIES



ELECTRICAL EQUIPMENT GROUP