

Simpson[®]

**Simpson 150-2
Amp Clamp
OPERATOR'S MANUAL**



About this Manual

To the best of our knowledge and at the time written, the information contained in this document is technically correct and the procedures accurate and adequate to operate this instrument in compliance with its original advertised specifications.

Notes and Safety Information

This Operator's Manual contains warning symbols which alert the user to check for hazardous conditions. These appear throughout this manual where applicable, and are defined below. To ensure the safety of operating performance of this instrument, these instructions must be adhered to.



Warning, refer to accompanying documents.



Caution, risk of electric shock.



This instrument is 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.

Technical Assistance

SIMPSON ELECTRIC COMPANY offers assistance Monday through Friday 8:00 am to 4:30 pm Central Time. To receive assistance contact Technical Support or Customer Service at (715) 588-3311.

Internet: <http://www.simpsonelectric.com>

Warranty and Returns

SIMPSON ELECTRIC COMPANY warrants each instrument and other articles 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 or other article of equipment which shall within one (1) year 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 centers, 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 sales of its products.

This Instrument is 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 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 milliamperes, 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.

MEETS FEDERAL PERFORMANCE STANDARDS

The Simpson 380-2 Microwave Leakage Tester has been tested and evaluated by the Bureau of Radiological Health, Education and Welfare.

When correctly used, in accordance with the instructions contained within this Operator's Manual, the Simpson 380-2 meets the measurement requirements of the Federal Performance Standard for Leakage from Microwave Ovens for both production and Field Service Testing.

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1. INTRODUCTION

The Simpson 150-2 Amp-Clamp (hereafter referred to as the 150-2 or the Amp-Clamp) allows current measurements without breaking the current line and interrupting the working appliance under test. In effect, the 150-2 works as a transformer, containing a split core for accommodation of the current conductor under test. The transformer split core is made of two sections, hinged at one end, and pivoted so that it can be attached around the wire carrying the current to be measured.

The current-carrying wire becomes the transformer primary; a coil in the 150-2 circuit serves as the secondary winding. The Amp-Clamp output voltage is proportional to the current measured, and is applied to an AC instrument for indication and reading.

1.1 Items And Accessories

All items and accessories required for the operation of the 150-2 are furnished with each instrument and listed in Table 1-2.

1.2 Safety Considerations

This Operator's Manual contains cautions and warnings alerting the user to hazardous operating and service conditions. This information is flagged by CAUTION or WARNING symbols throughout this publication, where applicable, and is defined on the inside front cover under SAFETY SYMBOLS. To ensure the safety of operating and servicing personnel, and to retain the operating condition of the Instrument, these instructions must be adhered to.

1.3 Technical Data

Table 1-1 lists the technical data for the 150-2.

Table 1-1. Technical Data

INSTRUMENT REQUIRED:	AC Voltmeter or a regular VOM.
Sensitivity:	5000 Ω per volt AC
Range and Scale:	2.5 or 3V full scale

Accuracy error of the Instrument is added to the error of the Amp-Clamp.

AC CURRENT RANGE:	
6 Ranges:	0-5-10-25-50-100-250 amperes AC when used with an instrument containing 2.5 volt AC scale.
6 Ranges:	0-6-12-30-60-120-300 amperes AC when used with an instrument containing 3 volt AC scale.

ACCURACY:	On all ranges, with current conductor centered: 3% of full scale.
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OPERATING FREQUENCY:	These amp clamps are calibrated for operation on 60 Hz circuits, however, they can be calibrated for operation on 50 Hz circuits or other frequencies on special order.
EFFECT OF CONDUCT OR POSITION:	The effect of moving current conductor from center to any position within core jaws: $\leq 3\%$.
TEST CONDUCTOR SIZE CHECK:	Round wires and buss bars, 1-1/8 inch maximum outside diameter. Rectangular and square-shaped conductors to 1 inch square inch cross-sectional area. Foils and sheets with maximum thickness of 3/8 inch and 2-3/8 inches wide.
INSULATION CHECK:	Polycarbonate housing designed for operation to 600V rms/60 Hz.
OUTPUT VOLTAGE LIMITER:	To protect the operator against electrical shock and the meter movement from heavy overload, an over-voltage limiter is employed to restrict the output terminal voltage to below 8.5 volts, regardless of the test current magnitude or the range selector setting.
OVERALL DIMENSIONS:	7-3/4 x 3 x 1-1/6 in. (196.85 x 76.2 x 23.9 mm)
WEIGHT:	12 oz. (340.2 grams)

Table 1-2. Items & Accessories Furnished for Use with Models 250, 255, 260-6, 260XL, 261 & 270 Testers

Item	Catalog No.
150-2 Amp-Clamp	00541
Instruction Manual	6-111125

Table 1-3. Items & Accessories Furnished for Use with 260 Series 8 & 270 Series 5 Tester

Item	Catalog No.
150-2 Amp Clamp	00545
Instruction Manual	6-111125

Table 1-4. Additional Accessories

Item	Catalog No.
Carrying Case	00548

2. INSTALLATION

The following contains instructions for installation and shipping of the 150-2. Included are unpacking and inspection procedures, warranty, shipping and care.

2.1 Unpacking And Inspection

Examine the shipping carton for signs of damage before unpacking. If undamaged unpack the instrument and inspect it for possible damage. Check that all furnished items and accessories are included (Table 1-2). Check the electrical performance as soon as possible. If instrument is damaged, notify the carrier and supplier before using .

2.2 Warranty

The Simpson Electric Company warranty policy is printed on the inside front cover of this manual. Read it carefully before requesting a warranty repair. For all assistance, contact the nearest Authorized Service Center for instructions. If necessary, 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 mailed promptly. If an estimate of charges for non-warranty or other service work is required, a maximum charge estimate will be quoted and will not be exceeded without prior approval.

2.3 Shipping

Pack the Instrument carefully and ship it prepaid and insured to the proper destination.

2.4 Care

The housing, made of high quality Polycarbonate, has high impact strength and a low water absorption coefficient. However, care must be taken to avoid solvents or vapors which might attack the housing. For cleaning purposes, alcohol (wood, grain, isopropyl or denatured alcohol) or higher aliphatic hydrocarbons such as white kerosene, petroleum ether, V.M. & P. Naptha, can be used.

Keep the magnetic surfaces at the jaw locking area clean and free from dust, wire insulation or any other particles. Only with completely closed jaws is the magnetic reluctance of the core held to a minimum and full accuracy and repeatability of the current readings assured.

3. CONTROLS AND CONNECTORS

All operating and adjustment controls and connectors are described in this section, along with a list (Table 3-1) describing their functions. Become familiar with each item before operating the Amp-Clamp.

Table 3-1. Controls and Connectors

RANGE SELECTOR

SWITCH:

The range selector switch has six positions. Each position is marked for two AC current ranges. The two current ranges selected are indicated in a recessed sector on the upper right side of the housing. The current range used depends upon the dial scale available on the AC instrument used with the 150-2. The range selector switch is operated by a large diameter recessed thumbwheel. It enables one hand operation for holding the 150-2, clamping it around the test current conductor, and switching the ranges at the same time.

CURRENT RANGES:

One of the current ranges, 5, 10, 25, 50, 100 to 250 amps, marked in red on a white background, is read when the 150-2 is used with an instrument containing a 2.5 volt AC scale. A range of 6, 12, 30, 60, 120 or 300 amps, marked in white on a red background, is used with an instrument containing a 3 volt AC scale.

OUTPUT TERMINALS:

Output terminal pins mounted on the terminal board are recessed into the housing and are accessible at the bottom left edge of the tester. The output pins accept the female type plug connector used on the test leads supplied with the 150-2.

MAGNETIC CORE

The magnetic core is made of high-quality, low-loss silicon steel. Laminations are uniquely shaped to accommodate various conductors and to allow easy insertion into crowded wire assemblies. Sufficiently large spacing between hand-operated actuator lever and high current/high voltage wires under test is provided.

4. OPERATION

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

Amp-Clamp core and circuit housings are made of high quality insulating material and designed to hold the stresses of daily service involvements.

BE EXTREMELY CAREFUL WHEN MEASURING HIGH MAGNITUDE CURRENTS OR APPROACHING WIRES OR APPLIANCES CARRYING HIGH POWER LINE VOLTAGES.

4.1 AC Current Measurements :

1. Before starting measurements, connect a 5000 ohms per volt AC instrument containing either 2.5, or 3 volt scale to the output terminals of the 150-2. The test lead cord required to make this connection is supplied with the 150-2.
2. Set the indicating instrument to 2.5, or 3V AC range, whichever of these two ranges and scales is available on the instrument being used.
3. Set the current range selector switch on the 150-2 to a range which covers the probable current to be measured. While the 150-2 circuit contains the voltage limiter and will not be easily damaged, it is best to set the range selector for a higher current range than needed as a protection against banging the meter pointer beyond the full scale deflection point. After the first reading, set the range selector thumbwheel for a lower range, if necessary, to provide a more accurate reading on the upper half of the meter scale.
4. While holding the 150-2 in the palm of the hand, press the finger tips against the core lever exposed on the left side of the tester to open the core jaws. Place the tester, with open jaws, around the conductor carrying current to be measured and release the pressure on the lever to close the core jaws around the conductor. The 150-2 acts now as a transformer, because of the magnetic field around the conductor placed within the core loop. The instrument connected to the Amp-Clamp will indicate the voltage induced in the pick-up coil mounted on the core section within the 150-2 circuit.

NOTE: There is no pointer deflection obtained with the Amp-Clamp jaws clamped around both of the conductors as, for example, in an appliance line cord, because the magnetic field of one wire opposes and cancels that of the other. However, if a split cord is used, as shown in Figure 5-1-A either of the wires may be selected for the current test of the circuit. Such a split cord is made up easily from a readily available power line plug, receptacle, and two pieces of insulated wire.

5. Observe and read the meter indication on the same scale arc for all current ranges as set by the selector switch on the 150-2. The range marking for a current range set on the 150-2 is expressed in amps, which corresponds to the full scale indication on the meter scale.

To convert the reading observed on the meter scale directly to the current measured on one of the 150-2 ranges, multiply the reading from the meter scale by the factor as indicated on the Amp-Clamp instruction plate and listed in Table 4-1.

Table 4-1. Meter Scale Multiplication Factors

Meter Scale	2.5 VAC Range	3 VAC Range	Factor
Current	5	6	2
Range	10	12	4
	25	30	10
	50	60	20
	100	120	40
	250	300	100

Current measured, in amperes: the readings on the meter scale used, multiplied by the factor for the current range selected.



Motor starting surges may overload and damage the Instrument. Either start with the highest range and reset the Amp-Clamp to a lower range after the motor has started, or start the motor before applying the Amp-Clamp.

5. APPLICATIONS

The 150-2 is valuable for tracing faults, diagnosing troubles and checking and balancing distribution circuits without shutting down the equipment. Sufficient range overlap provides excellent readability up to 300 amperes, and thereby covers most frequently encountered currents in production, utility, maintenance, industrial and engineering work. The 150-2 is particularly useful when measuring split phase, repulsion-induction and capacitor motor current, as it can be snapped around a current conductor after the motor is up to speed (eliminating the problem of by-passing a heavy starting current). To observe the amount of current drawn while a motor is starting, however, use one of higher ranges on the 150-2 for safety.

5.1 Low Current Measurements

When required testing of very small appliances and fractional horsepower motors make better readability a necessity, the current range sensitivity can be multiplied and the scale of any range can be expanded. An accurate reading is difficult to obtain when the meter deflection is small. To read a current of about 1.5 amperes with the 150-2 set at the 0-5 ampere range, loop the conductor through the jaws of the 150-2 as indicated in Figure 5-1, A. The sensitivity of the probe is then multiplied by two, changing the 0-5 ampere scale, in effect, to a 0-2.5 ampere scale. As a result, the meter pointer deflects to the

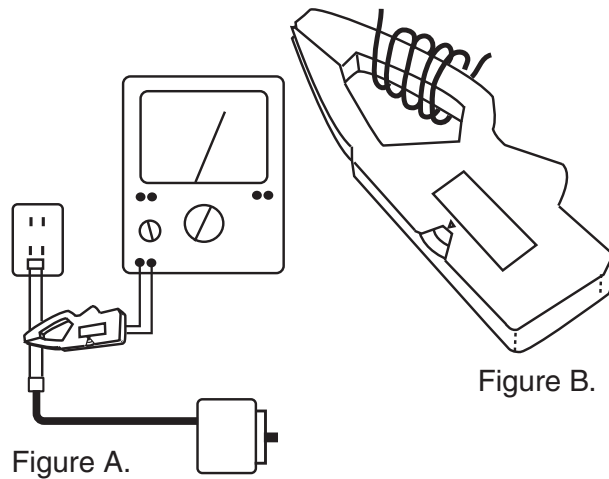


Figure 5-1. Amp-Clamp Connections

upper half of the scale, and reading is easier and more accurate. The same technique may be used to make lower current measurements than would normally be possible. For instance, by looping ten turns of the conductor through the jaws of the 150-2, the 0-5 ampere scale is changed, in effect, to a 0-500 mA scale. Currents as low as 50 milliamperes can then be measured with reasonable accuracy.

NOTE: Each time the wire passes through the jaws of the clamp is considered one turn. In Figure 5-1, B, there are five turns.

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SIMPSON ELECTRIC COMPANY 520 Simpson Avenue
Lac du Flambeau, WI 54538-0099 (715) 588-3311 FAX (715) 588-3326
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Visit us on the web at: www.simpsonelectric.com