

Warranty

SIMPSON ELECTRIC COMPANY warrants each instrument and other articles of equipment manufactured by it to be free from defects in material and workmanship under normal use and service, its obligation under this warranty being limited to making good at its factory any instrument or other article of equipment which shall within 90 days after delivery of such instrument or other article of equipment to the original purchaser be returned intact to it, or to one of its authorized service stations, with transportation charges prepaid, and which its examination shall disclose to its satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities on its part, and SIMPSON ELECTRIC COMPANY neither assumes nor authorizes any other persons to assume for it any other liability in connection with the sale of its products.

This warranty shall not apply to any instrument or other article of equipment which shall have been repaired or altered outside the SIMPSON ELECTRIC COMPANY factory or authorized service stations, nor which has been subject to misuse, negligence or accident, incorrect wiring by others, or installation or use not in accord with instructions furnished by the manufacturer.

SIMPSON ELECTRIC COMPANY

A Katy Industries Subsidiary

853 Dundee Avenue, Elgin, Illinois 60120
(312) 697-2260 • Cable SIMELCO • Telex 72 2416

IN CANADA: Bach-Simpson, Ltd., London, Ontario

IN ENGLAND: Bach-Simpson (U.K.) Ltd., Wadebridge, Cornwall

OPERATOR'S MANUAL

Simpson 150-2
AMP-CLAMP

Courtesy of :
Simpson260.com



17C1278(123.01)

Effective Date: 6/82

Edition: 2nd

Part No. 6-111125

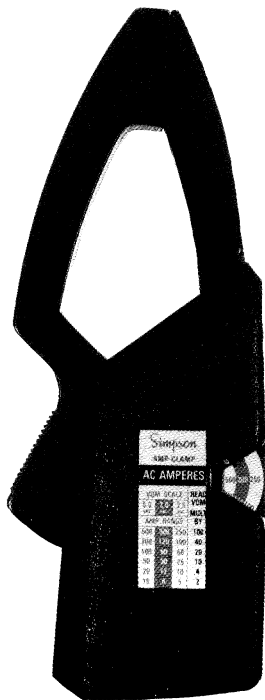


Figure 1-1. Simpson 150-2 Amp-Clamp

TABLE OF CONTENTS

SECTION I

| | |
|---------------------------------|-----|
| Introduction | 1-1 |
| 1.1 General | 1-1 |
| 1.2 Items and Accessories | 1-1 |
| 1.3 Safety Considerations | 1-2 |
| 1.4 Technical Data | 1-2 |

SECTION II

| | |
|------------------------------------|-----|
| Installation | 2-1 |
| 2.1 General | 2-1 |
| 2.2 Unpacking and Inspection | 2-2 |
| 2.3 Warranty | 2-2 |
| 2.4 Shipping | 2-2 |
| 2.5 Care | 3-1 |

SECTION III

| | |
|--------------------------------------|-----|
| Controls and Connectors | 3-1 |
| 3.1 General | 3-1 |

SECTION IV

| | |
|-----------------------------------|-----|
| Operation | 4-1 |
| 4.1 General | 4-1 |
| 4.2 AC Current Measurements | 4-2 |

SECTION V

| | |
|---------------------------|-----|
| Applications | 5-1 |
| 5.1 General | 5-1 |

| | |
|------------------------------------|-----|
| 5.2 Low Current Measurements | 5-2 |
|------------------------------------|-----|

SECTION VI

| | |
|--|-----|
| Servicing Instructions | 6-1 |
| 6.1 General | 6-1 |
| 6.2 Replacement Parts and Schematic Diagram | 6-1 |

LIST OF TABLES

| | |
|--|-----|
| 1-1 Technical Data | 1-2 |
| 1-2 Items and Accessories | 2-1 |
| 1-3 Items and Accessories | 2-1 |
| 1-4 Additional Accessories | 2-1 |
| 3-1 Controls and Connectors | 3-2 |
| 4-1 Meter Scale Multiplication Factors.... | 4-4 |
| 6-1 Replacement Parts | 6-1 |

LIST OF ILLUSTRATIONS

| | |
|-----------------------------------|-----|
| 1-1 Simpson 150-2 Amp-Clamp | ii |
| 5-1 Amp-Clamp Connections | 5-2 |
| 6-1 Schematic Diagram | 6-3 |

Note: This Operator's Manual contains information essential to the operation of this instrument. Therefore, it should be kept in a convenient place and used for reference as required.

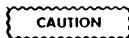
SAFETY SYMBOLS



This marking, adjacent to another marking, or a terminal, or an operating device, indicates that the operator must refer to an explanation in the operating instructions to avoid damage to the equipment and/or to avoid personal injury.



The **WARNING** sign denotes a hazard. It calls attention to a procedure, practice or the like, which if not correctly performed or adhered to, could result in personal injury.



The **CAUTION** sign denotes a hazard. It calls attention to a procedure, practice or the like, which if not correctly adhered to could result in damage to or destruction of part or all of the Instrument.

WARNING

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.

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

1.1.1 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.

1.1.2 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.

1.2 ITEMS AND ACCESSORIES

1.2.1 All items and accessories required for the operation of the 150-2 are furnished with each instrument and listed in Table 1-2. Available replacement parts are listed in Table 6-1.

1.3 SAFETY CONSIDERATIONS

1.3.1 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 headings throughout this publication, where applicable, and is defined at the front of the manual 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.

1.4 TECHNICAL DATA

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

Table 1.1. Technical Data

- (1) INSTRUMENT REQUIRED: AC Voltmeter, Microammeter or a regular VOM.
Sensitivity: 5000 ohms per volt AC
Range and Scale: 2.5 or 3 volts full scale
Accuracy error of the instrument is added to the error of the Amp-Clamp.
- (2) 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.

(3) ACCURACY:

On all ranges, with current conductor centered: 3 percent of full scale.

(4) OPERATING FREQUENCY:

Standard model is calibrated for operation on 60 Hz circuits. Optional models calibrated for operation on 50 Hz and other frequencies are available on special order.

Note: Standard model is usable on circuits ranging from 30 Hz to 1000 Hz with an additional error as follows:

25/30/50

50/60/100

100/120/200

250/300 ampere

ranges:

from 40 to 800 Hz $\pm 2\%$

from 30 to 1000 Hz $\pm 3\%$

10/12/20 ampere

range:

from 40 to 1000 Hz $\pm 4\%$

5/6/10 ampere

range:

from 40 to 1000 Hz $\pm 15\%$

(5) EFFECT OF CONDUCTOR POSITION:

The effect of moving current conductor from center to any position within core jaws: $\leq 3\%$

(6) 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.

(7) INSULATION CHECK:

Polycarbonate housing designed for operation to 600V rms/60 Hz.

(8) 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.

(9) OVERALL DIMENSIONS:

7-3/4 x 3 x 1-1/16 in.

(196.85 x 76.2 x 23.9 mm)

(10) WEIGHT: 12 oz. (340.2 grams)

**Table 1-2. Items and Accessories Furnished
For use with the Models 250, 255, 260,
260XL, 261 and 270 Testers**

| Description | Cat. No. |
|--------------------|-----------------|
| 150-2 Amp-Clamp | 00541 |
| Test Leads | 00533 |
| Instruction Manual | 6-111125 |

**Table 1-3. Items and Accessories Furnished
For use with the 260 Series 7 Tester**

| | |
|--------------------|----------|
| 150-2 Amp Clamp | 00545 |
| Test Leads | 00529 |
| Instruction Manual | 6-111125 |

Table 1-4. Additional Accessories

| | |
|----------------------|-------|
| Adapter Pins for 160 | 02056 |
| Carrying Case | 00548 |

SECTION II INSTALLATION

2.1 GENERAL

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

2.2 UNPACKING AND INSPECTION

2.2.1 Examine the shipping carton for signs of damage prior to unpacking. If there are none, unpack the instrument and inspect it for possible damage in shipment. Check the electrical performance as soon as possible. If damage is noted, notify the carrier and supplier before using the instrument. Also, check that all furnished items and accessories are included (Table 1-2).

2.3 WARRANTY

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

NOTE: For assistance of any kind, including help with the instrument under warranty, contact the nearest Authorized Service Center for instructions (listed on the last pages of this manual). If it is

necessary to contact the factory directly, give full details of the difficulty and include the instrument model number, serial number (at the back of the instrument) 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.

2.4 SHIPPING

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

2.4.2 Save the shipping carton and packing materials for future storing or shipping of the instrument.

2.5 CARE

2.5.1 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.

2.5.2 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.

SECTION III CONTROLS AND CONNECTORS

3.1 GENERAL

3.1.1 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 prior to operating the Amp-Clamp.

Table 3-1. Controls and Connectors

(1) 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 the 150-2, clamping it around the test current conductor, and switching the ranges at the same time.

(2) 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. 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 three volt AC scale.

(3) OUTPUT TERMINALS:

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

(4) ELECTRICAL CIRCUIT:

The circuit containing range selector switch, load resistors, calibration resistors R7 and R8, and voltage limiter zeners, is a one-piece, printed circuit board assembly encased in a molded plastic housing designed for high-impact strength.

(5) MAGNETIC CORE

a. 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.

b. To obtain consistent, effective air gap, magnetic circuit reluctance and repeatability in the indicated readings, the jaw tips of the split core are closed tightly by a pre-loaded torsion spring.

c. To prelude shock hazard and short circuiting of the bare wires and buss bars under test, the core jaws are encased in high-dielectric molded plastic shells.

**SECTION IV
OPERATION**

4.1 GENERAL

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

WARNING

Amp-Clamp core and circuit housings are made of high quality insulating material and designed to hold the stresses of daily service involvements. Nevertheless, **BE EXTREMELY CAREFUL WHEN MEASURING HIGH MAGNITUDE CURRENTS OR APPROACHING WIRES OR APPLIANCES CARRYING HIGH POWER LINE VOLTAGES.**

4.2 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 3 volt AC range, whichever of these three 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.

4.2.1 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 (amp) | 3 VAC (amp) | 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 reading on the meter scale used, multiplied by the factor for the current range selected.

SECTION V APPLICATIONS

5.1 GENERAL

5.1.1 The 150-2 is a valuable tool for tracing faults, diagnosing troubles and checking and balancing distribution circuits without shutting down the equipment.

5.1.2 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 the higher ranges on the 150-2 for safety.

5.2 LOW CURRENT MEASUREMENTS

5.2.1 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.

5.2.2 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

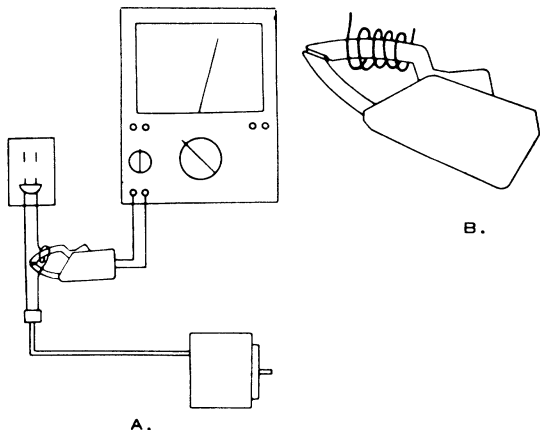


Figure 5-1. Amp-Clamp Connections

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 upper half of the scale, and reading is easier and more accurate.

5.2.3 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.

5.2.4 By employing this looping technique with the 150-2 set on a range higher than 10 amperes, the full advantage of the essentially flat frequency response curve of the high current ranges can be utilized. Low currents, falling into the 5 or 10 ampere range, can be checked. For example, by looping 10 turns of the conductor through the jaws of the 150-2 set on the 50 ampere range, the 0-50 ampere range is converted into the range of 0-5 amperes with excellent frequency characteristics, as specified for the 50 ampere range in Table 1-1.

SECTION VI SERVICING INSTRUCTIONS

6.1 GENERAL

6.1.1 The following information is provided as an adjunct to the overall text contained in this manual and should be read and understood thoroughly prior to ordering replacement parts for the 150-2.

WARNING

These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.

6.2 REPLACEMENT PARTS AND SCHEMATIC DIAGRAM

6.2.1 Table 6-1 lists parts in alphanumeric order of their reference designators and indicates the description. (Refer to Table 1-2, Items and Accessories Furnished With This Instrument.)

6.2.2 To obtain replacement parts, address order to the nearest Authorized Service Center (listed on the last pages of this manual). Refer to paragraph 2.3.1 for ordering instructions.

Table 6-1. Replacement Parts

| Symbol | Description | Part No. |
|--------|---|----------|
| R1 | Resistor, 38.2 ohms, 1/2 % 1W, metal film | 5-116491 |
| R2 | Resistor, 96.5 ohms, 1/2 %, 1/2 W | 6-112022 |

| | | |
|------|---|-----------|
| R3 | Resistor, 200 ohms, 1/2 %, 1/2 W, | 6-111085 |
| R4 | Resistor, 417 ohms, 1/2 %, 1/2 W | 6-112021 |
| R5 | Resistor, 910 ohms, 5%, 1/2 W | 5-117187 |
| R6 | Resistor, 3.0k ohms, 5% 1/2 W | 5-117952 |
| R7 | Potentiometer, trimmer, 470 ohms,20%, 0.2W | 5-112831 |
| R8 | Potentiometer, trimmer, 1 k ohm, 20%, 0.2 W | 5-112830 |
| Z1 | Diode, zener, 6.8 volts, 20%, 1W | 5-112829 |
| Z2 | Diode, zener, 6.8 volts, 20%, 1 W | 5-112829 |
| P1 | Coil, pick-up | 6-112053 |
| SW-1 | Switch, 1 section, 6 position, P.C.terminals (less detent assembly) | 5-112053 |
| | P.C. Board and detent spring assembly | 10-864179 |
| | Board, Terminal, 2 pins | 5-112655 |
| | Spring, Torsion, lever actuator | 5-112051 |
| | Casing screw, thread cutting, #4-24 x 3/4 lg. | 6-182094 |
| | Cord, Test Leads | 00533 |

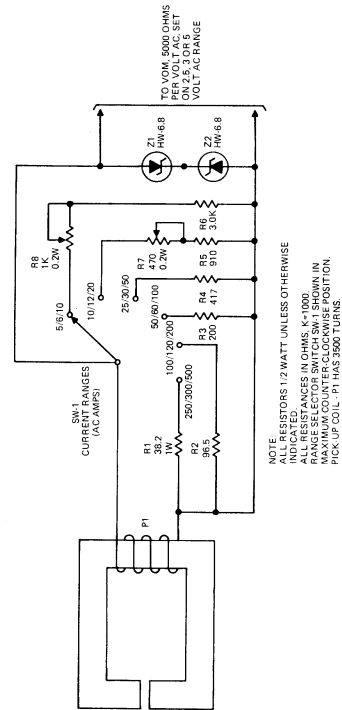


Figure 6-1. Schematic Diagram