OPERATOR'S MANUAL

SIMPSON
THERM-O-METER

MODELS 388 AND 388-3L

SIMPSON ELECTRIC COMPANY

5200 W. Kinzie Street, Chicago 44, Illinois, EStebrook 9-1121

In Canada, Back-Simpson, Ltd., London, Ontario

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FIGURE 1. THE SIMPSON THERM-O-METER MODEL 388

FIGURE 2. THE SIMPSON THERM-O-METER MODEL 388-3L

SECTION I

DESCRIPTION

MODELS 388 AND 388-3L

1. GENERAL

SELF CONTAINED

SIMPSON THERM-O-METERS MODELS 388 and 388-3L are self contained electrically operated temperature indicators. They are very convenient to use for any application of a wide range thermometer. The temperature is indicated on a large 7-inch meter in degrees Fahrenheit and Centigrade. The standard range includes indications from −50° F to +1000° F and from −40° C to +500° C. Kelvin scale markings are available on special order.

INDICATES TEMPERATURE IN AN ENCLOSED SPACE

The measured temperature is that which affects the tip of an 8-foot lead which is connected to the instrument. So, the Simpson Therm-O-Meter is especially adapted to indicating the temperature within an enclosed space. Place the lead tip within the enclosed space and keep the indicating meter out where you can read it conveniently.

FOR CONTINUOUS OR SPOT CHECKS

The Simpson Therm-O-Meter may be used as a *continuous* indicator over a long period of time, or it may be used to *spot-check* a temperature at any time. There is a very short lag time between when you place the tip in the temperature which is to be measured and when you have that temperature indicated correctly on the meter.

2. PHYSICAL

TWO MODELS AVAILABLE

This book covers the use of two models (388 and 388-3L). They are similar to each other, and have the same general purposes, but one uses a single lead, and the other has provisions for using up to three leads. The single lead style is the Model 388. The three lead style is the Model 388-3L (shown in figure 2). Only one lead is furnished with either instrument. Additional accessory leads are available (see page 24).

FOR THREE LEADS WITH SELECTOR SWITCH

The Model 388-3L, with 3 leads, is convenient for use where there are several temperatures which must be checked in the same general vicinity. All three leads can be attached to the instrument at the same time. The selector switch in the lower left hand corner determines which of the three leads is connected to the meter circuit. By switching back and forth between the three indications, the operator can observe simultaneous temperatures at all these sources with the single instrument. This is especially valuable for laboratory control apparatus, production equipment, and many experimental applications.

ONE LEAD MODEL

The Model 388 is similar in appearance to the Model 388-3L, but it accomodates only one lead at a time. There is no selector switch in the lower left hand corner of the front panel. In all other respects the two models are the same.

POLARIZED PLUGS AND JACKS

Both models use plug-in leads, with jacks placed on the top of the instrument. The plugs and jacks are polarized; that is, they

only fit together one way. This is necessary because the polarity of the attached leads is important to the correct indication on the meter.

COMPENSATING CIRCUIT SWITCH

There is a compensating circuit switch in the lower right hand corner of the front panel in either model. It has no effect on current from the thermocouple lead circuit. The switch controls the circuit which compensates meter current to correct for meter temperature variations away from 80° F. This switch has three positions marked OFF, READ, and BATTERY TEST.

OFF POSITION

When the switch is in its OFF position, the compensating battery circuit is opened, and the meter circuit does not receive any correction voltage from it. However, if there is any temperature difference between the two ends of the thermocouple lead (when it is plugged in), the lead will furnish a voltage which will deflect the meter pointer away from 80°.

READ POSITION

With the compensating switch in the READ position, the compensating battery circuit will correct the meter reading for the actual temperature of the instrument. The meter will respond to the combined voltages from the thermocouple lead and the compensating circuit.

BATTERY TEST POSITION

With the compensating switch held in the BATTERY TEST position, you can check the condition of the battery which is

furnishing compensating voltage. There is a range of indication on the meter which shows whether the battery is satisfactory.

> NOTE: When you test the battery voltage, either place the lead tip near the plug at the top of the meter case, or substitute 2.9 ohms of resistance for the lead. The lead resistance must be in the circuit in order to obtain a satisfactory indication, but the thermocouple lead must not furnish any voltage at this time or it will affect the meter reading.

LENGTH & UNKINKED LEAD IMPORTANT

Both models are identical in size. They measure 7-15/16" x 6" x 2-15/16". Each weighs 3 lbs. One thermocouple lead is furnished with each instrument. The standard lead is 8 feet long, with a polarized plug on one end and an exposed and welded thermo-junction at the other. Keep the lead wound in a flat coil shape when it is not in use. DO NOT KINK THE LEAD OR CUT OFF ANY UNUSED EXCESS.

3. ELECTRICAL

LEAD DESCRIPTION

The lead which is furnished with each instrument is eight feet long and is made up of *two wires* with fiberglass insulation. The wires are made of two different metals, one iron and the other constantan, and are joined together and welded at the tip. This is what is known technically as a *thermocouple* or *thermo-junction.* A temperature difference between the two ends of this lead creates a d.c. voltage difference between the iron and the constantan. When the temperature at the tip is higher than the temperature at the plug end of the lead, the voltage at the plug end is positive on the iron wire and negative on the constantan

wire. When the two ends are at the same temperature, there is no voltage difference between the wires. When the temperature at the tip is lower than at the plug end, the voltage at the plug end is negative on the iron wire and positive on the constantan wire. As the temperature difference increases, the voltage increases between the wires. It is this voltage which is applied to the indicating meter circuit to deflect the pointer and indicate the temperature.

ZERO POSITION IS 80 DEGREES F

With the operating switch in the lower right hand corner at OFF and the lead tip and the plug and meter all at the same temperature, there is no voltage generated in the thermocouple lead to send current through the meter. The pointer will not be deflected from its zero current indication point at 80° F. on the dial. To correct the meter reading, set the operating switch at READ. This connects a compensating circuit which will correct the meter indications and show the actual temperature. *Note that the lead must be plugged in, even though it is not furnishing any voltage to the meter circuit, because its resistance (2.9 ohms) is a part of the circuit through which the compensating current will pass.*

COMPENSATING CIRCUIT

The compensating circuit is powered with a dry cell battery. There is a bridge network inside the case through which the battery current will pass. When the bridge temperature is 80° F., it is electrically balanced so there will be no difference in voltage between the two points where the meter is connected. Any variation in temperature away from 80° F. will change the resistance of a thermistor and unbalance the bridge. The polarity and amount of voltage difference between the two contacted points will send current through the meter to deflect it the direction and amount necessary to correct the meter indication.

NORMAL OPERATION

In normal operation, the meter is placed in any convenient location where the temperature is between 60° and 100° F. The lead tip is placed in a position to assume the temperature to be measured; this may be inside a furnace, in a freezer, under the surface of a liquid, or wherever a temperature is to be measured. Then, with the compensating switch set at READ, there will be a current through the meter due to both the thermocouple and the compensating circuit. The result will be an indication of the temperature present at the tip of the lead.

4. ABNORMAL TEMPERATURE OPERATION

BELOW 60°F OR ABOVE 100°F

If the instrument is placed in a temperature below 60° or above 100° F., it will operate, but the compensating circuit will not fully correct for the instrument temperature. Errors in indications will be in proportion to the number of degrees the instrument is operated from the normal operating range of 60° to 100° F. For example, an instrument operating at a temperature of approximately 40° (which is 20° lower than the normal operating temperature range) may indicate an error of approximately 3 to 6°, or if operating at 0° temperature (which is 60° below the normal operating range) an error of 15° or more could be expected.

LARGE TEMPERATURE DIFFERENCE

When transferring the Therm-O-Meter from one location to another where there is a large difference in temperature, it is necessary for the meter to stabilize to the new temperature environment before attempting to make accurate measurements. This may take from a few minutes to an hour or more, depending upon the difference in temperatures involved and the accuracy required.

5. ACCURACY

1½ SCALE DIVISIONS

When the instrument leaves the factory, it is capable of indicating any temperature within its range accurate to within 1½ scale divisions. To duplicate this accuracy, the instrument must be held in a horizontal position. Since the scale is not linear, a scale division represents a different number of degrees for various temperature ranges. Consult the dial scale in the vicinity of each reading to determine the number of degrees per scale division in that area. This changes from 2 to 5 to 10 to 25 as you go across the scale.

DECREASING BATTERY TERMINAL VOLTAGE

The accuracy of the compensating circuit depends on the terminal voltage of the dry cell battery. As the battery ages, its internal resistance increases and its terminal voltage decreases. For a quick check of the battery condition, there is a third position of the operating switch, marked BATTERY TEST. The operator should turn the switch to this position periodically to check the battery condition. When the meter indication is not within the BATTERY LIMITS area on the dial, replace the battery. See Section 3, Maintenance, for more detailed information.

CALIBRATING CONTROL

There is a removable snap type button which covers an access hole through the top of the instrument case near the lead jack. When this is removed, you have access to a screwdriver-adjusted variable resistor inside the case. This resistor, used for calibrating the instrument, is shown in the schematic diagram, figure 3, as R8. Do not change the setting of this resistance except during calibration, according to instructions in Section III, Maintenance.

SECTION II
OPERATING INSTRUCTIONS

1. PRELIMINARY STEPS

BATTERY TEST

Before each use, or at least once a day for a Therm-O-Meter which is in constant use, check to see that the dry cell battery inside the case of the instrument tests within its proper limits. Have a thermocouple lead plugged in, and place its tip near its plug so both ends come to the same temperature and the lead does not furnish any deflecting voltage. Turn the compensating switch in the lower right hand corner of the instrument to its BATTERY TEST position. This is a spring loaded position; that is, the switch will remain in that position only as long as you hold it there. Check the indication on the meter. The pointer will be within the area designated as BATTERY LIMITS as long as the battery has enough strength to be used for the compensating circuit. When the indication drops below the limits, the terminal voltage of the battery is too low. Replace the battery when this is true.

ZERO ADJUSTER

To check for correct setting, remove the plug at the end of the probe and turn the operating switch to its OFF position. The meter should now indicate 80°. If it does not, correct it by turning the zero adjuster screw directly under the meter window.

CONNECT THE LEAD (OR LEADS)

For the Model 388, insert the lead plug into the jack on the top of the meter case. It will fit only one way. For the Model 388-3L, connect one, two, or three leads into the jacks on the top of the meter case as desired for the application.

POSITION THE PROBE TIP (OR TIPS)

For the Model 388, place the probe tip in the area where temperature is to be measured. This may be in air or other gas, in a solid material, or under the surface of a liquid. For best results, be sure to have at least two inches of the end of the probe in the measured temperature. For the Model 388-3L, place each of the probe tips in the area where it is to measure a temperature and note the lead which is to be identified with each switch position - 1, 2, and 3.

2. OPERATION
COMPENSATING SWITCH AT READ POSITION

After the battery voltage has been checked and the leads have been connected to the meter, proceed to read the temperatures at the probe tips. Set the compensating switch at READ and allow time for the pointer to steady its indication. Then read the indicated temperature in degrees Fahrenheit.

SELECTOR SWITCH (MODEL 388-3L)

For the Model 388, there is only one test lead connection, and the indicated temperature is that for the tip of the single probe. For the Model 388-3L, use the switch in the lower left hand corner of the face of the instrument to select the temperature indicated at the tip of the associated probe. For example, when the switch is in the #1 position, the temperature will be that of the tip of the #1 probe. When the switch is in the #2 position, the temperature is indicated for the tip of the #2 probe. For the #3 position, the #3 probe tip temperature is indicated. Place the switch in the position which will cause the desired temperature to be indicated on the meter.

3. SETTING SWITCH AT OFF

KEEP SWITCH OFF WHEN NOT IN USE . . . SAVES BATTERY

Between readings, return the compensating switch to OFF. This will assist the battery to retain a longer use life, because the battery does not have to furnish current through any circuit when the switch is in its OFF position.

WHEN READING IS OTHER THAN 80° F . . .

Note that the meter may read some temperature other than 80°, if there is a lead connected to the instrument and the switch is set at OFF. It will not be a corrected temperature. The reason why there may be some variation in the meter indication is that the thermocouple lead puts out a voltage whenever there is a temperature difference between the two ends of the lead. This voltage will cause current to flow through the meter circuit and the meter pointer will be deflected as long as this condition remains. When both ends of the probes are at exactly the same temperature so they do not produce any voltage, the normal meter indication is 80° on the scale with the compensating switch set at OFF.

HOW TO USE WHEN BATTERY VOLTAGE IS TOO LOW

When you have too low a battery voltage, and know the meter temperature, you can still use the Model 388 to measure other temperatures. Leave the compensating switch at OFF, and place the test probe in position to measure temperature. Read the meter indication, and then correct the reading by adding or subtracting the difference between the meter temperature and 80° F. If the meter temperature is higher than 80°, add the difference to the reading. If the meter temperature is lower than 80°, subtract the difference from the reading.

NOTE: Whenever you use your Therm-O-Meter to read a temperature in a liquid, you will have to submerse the tip of the lead in the liquid at least two inches to get a satisfactory indication. After you finish taking the wet temperature, wait until the tip and insulation are thoroughly dried before you read a "dry bulb" temperature; evaporation of the liquid from the lead tip will lower the indicated temperature.

SECTION III

MAINTENANCE

1. THERMOCOUPLE LEAD

CARE OF LEAD

The thermocouple lead is made of two wires, one iron and the other constantan, with spun glass insulation covering each wire and another layer covering the pair. The length of the lead is 8 feet overall, and should remain approximately that length to produce accurate temperature indications. The resistance of the lead is a part of the circuit resistance through the indicating meter, so any change in the length will also change the electrical resistance in the meter circuit, and the resulting temperature and battery test indications.

DAMAGED LEAD

If your lead tip has been damaged by continued application of high temperatures, so the insulation has melted away, you can still use the lead as long as the two wires are separated from each other except where they are welded together at the junction.

DON'T KINK THE LEAD. . . ROLL IT FLAT

Do not kink the lead with a sharp bend. The metals of which the wires are made are somewhat brittle, and will either break at the sharp bend or will partially break to increase the lead resistance. When the lead is not in use, or if there is any excess lead, keep it rolled in a flat coil to prevent accidental damage.

2. BATTERY

ACCURACY DEPENDENT ON BATTERY VOLTAGE

The battery which is used in the Models 388 and 388-3L is a 1.5 volt dry cell, No. 2, Size D. As mentioned earlier, the battery strength will decrease over a period of time. When its terminal voltage decreases, the amount of compensating current will decrease correspondingly. To maintain the desired accuracy of your Therm-O-Meter, be sure that your battery is within the established tolerance which will provide the right amount of temperature correction on the meter.

HOW TO CHECK BATTERY

PUT LEAD IN CIRCUIT

To check your battery, *a thermocouple lead must be in the circuit with its junction at the same temperature as its plug end.*

SWITCH TO BATTERY TEST POSITION

Turn the compensating switch in the lower right hand corner of the instrument to its BATTERY TEST position. The meter

pointer will be deflected to indicate the terminal voltage available from the dry cell. There is a special space on the dial designated BATTERY LIMITS. If the indication is within the area shown for these limits, the battery is satisfactory. When the pointer shows that the terminal voltage has reduced below the allowable limits, replace the dry cell with a fresh one.

BATTERY EASY TO REPLACE

To replace the battery, remove the four screws through the back of the case and pull the back straight away from the front panel. Be careful to pull the back straight (not at an angle) as you remove it from the front panel. The battery is located in a compartment inside the instrument which is especially designed to hold it and to contact its two terminals. To remove the battery, pull it straight out of the compartment. When you replace it, be sure to observe polarity; the raised center cap of the battery should be at the end of the compartment where there is a + mark, and the base where there is a – mark. After the battery has been replaced, put the case back in place over the instrument. Be careful, as before, to slide it on straight, and not on an angle.

3. CALIBRATION PROCEDURE – GENERAL

REPLACEMENT OF PARTS

Whenever you replace any of the resistors or parts (other than the battery) in your Therm-O-Meter, recalibrate the instrument according to standard factory procedure. There are several steps in the complete calibration procedure, and you will require several special items to complete the procedure.

TEMPERATURE CONTROLLED ROOM OR BOX

To duplicate factory accuracy, you will need either a room or a box in which you can control the temperature, and into which you will place the instrument and its lead during calibration. Temperatures of 80° F, exactly, and 60° and 100°, approximately,

need to be held constant over periods of two or more hours. You will also need a mixture of ice water which is at least 50% ice and a container of water which is boiling at the time you use it. If these facilities are not available to you, either follow the procedure as closely as you can, with the understanding that your accuracy will probably be reduced, or return the instrument to the Repair Department at the Simpson Electric Co. factory for calibration. Always accompany the instrument with a letter of explanation when you send it to the Repair Department. Indicate exactly what you wish to have them do.

USE STANDARD THERMOMETERS FOR COMPARISON

For accuracy, use two standard thermometers. Tape one to the meter cover, to read the instrument temperatures in the box or room at 60°, 80°, and 100° F. The other should be placed in the same position as the probe tip, and will read temperatures from 32° to 212° F. The more accurate these standards are, the more accurately you will be able to calibrate your Simpson Therm-O-Meter.

AVOID TOUCHING THERM-O-METER OR PROBE

Do not handle the instrument or the probe unnecessarily during the calibration procedure. Your body temperature is different from any of the controlled temperatures to which the instrument and probe will be subjected, and will cause a temperature variation each time you touch them.

CALIBRATION PROCEDURE – STEP-BY-STEP

1. To set meter zero adjuster in the front panel of the instrument.
   A. Set compensating switch at OFF.
   B. Remove the probe (or probes) from the socket on the top of the Therm-O-Meter.

C. With a small screwdriver, turn the zero adjuster (slotted bakelite button) in the bottom of the instrument face slowly in either direction until the meter pointer rests over 80° on the dial. This is the zero current position for the pointer.

2. To balance the bridge in the compensating circuit.

A. Connect a probe to the instrument. For the Model 388-3L, set the switch in the lower left hand corner of the front panel to connect the probe for the instrument circuit.

B. Place the instrument and the probe in a temperature controlled box or room set for exactly 80° F. Allow one to two hours for the entire instrument and the probe to stabilize at this temperature.

C. Set the compensating switch at READ. Observe the meter indication. It should read 80°.

D. If it does not read 80°, remove the back cover and use a screwdriver to adjust potentiometer R2, located 2" from the bottom edge of the panel, until the meter indicates correctly.

3. Adjust the compensating circuit sensitivity.

A. Leave the instrument and probe as they were for step C above. Increase the controlled temperature to about 100° F. Allow one to two hours for the instrument and probe to stabilize at this temperature.

B. Observe the meter indication. It should be equal to that on the standard thermometer which is affected by the same controlled temperature.

C. If necessary, adjust the potentiometer located closest to the battery (R9) with a screwdriver to correct the temperature indication on the Therm-O-Meter.

D. Reduce the controlled temperature to about 60° F. Allow one to two hours for the instrument and probe to stabilize at this temperature.

E. Observe the meter indication again. It should be the same as that shown on the standard thermometer which is

affected by the same controlled temperature.

F. If necessary, compromise the setting of the potentiometer to average the 60° accuracy with that at 100°.

4. Final calibration; setting calibrating resistor.

A. Stabilize the instrument at room temperature, between 75° and 85° F.

B. Place the end of the probe in the mixture of ice water. Place at least two inches of the end of the probe in the water. Stir the water to maintain a constant temperature and measure the temperature with the standard thermometer at the point where the sensing end of the probe is immersed.

C. Adjust the calibrating resistor R8, located near the lead jack, until the meter reads the same as the standard thermometer. This will be near 32° F, but may vary one or two degrees due to barometric pressure and impurities in the water.

D. Remove the probe and the standard thermometer from the ice water and transfer them to the container of boiling water.

E. After the temperature indications have been stabilized, compare the meter indication with the thermometer reading. They should be the same. If they are not, readjust calibrating resistor R8 to average the accuracy of readings for ice water and boiling water.

There is no adjustment for the battery test circuit. A fresh dry cell should cause the meter to indicate within the upper two thirds of the BATTERY LIMITS area when the thermocouple lead is plugged in and the thermocouple tip and the meter are at the same temperature.

4. REPLACEMENT PARTS

Symbol	Description	Simpson Part No.
R1	Thermistor, approximately 1000 ohms at 80° F.	1-113771
R2	Potentiometer, 400 ohms	1-113774
R3	Resistor, 680 ohms ±1%, ½ w	1-115243
R4	Resistor, 510 ohms ±1%, ½ w	1-115242
R5	Resistor, 510 ohms ±1%, ½ w	1-115242
R6	Resistor, 1 ohm ±5%, ½ w	1-115241
R7	Resistor, N.T.C., 2.75 ohms at 80° F.	1-112271
R8	Potentiometer, 100 ohms	1-114224
R9	Potentiometer, 1000 ohms	1-114525
R10	Resistor, 100 ohms ±1%, ½ w	1-114091
S1	Switch, compensating	1-115245
S2	Switch, circuit selector (Model 388-3L only)	1-116645
	Knob, switch, with white arrow	1-115334
	Case,	
	Case back, machined (Model 388 only)	3-320135
	Case back, machined (Model 388-3L only)	3-320137
	Thermistor clamp	3-160064
	Thermistor holder	3-160065
	Jack assembly (Model 388-3L only)	10-890189
	Temperature probe, standard type	10-890190

Figure 3 is a schematic diagram which shows the circuits which are used in both models of the Simpson Therm-O-Meter. The portion of the internal circuit which is common to both models is shown on the right hand side. The differences are shown on the left and are indicated with the associated model number.

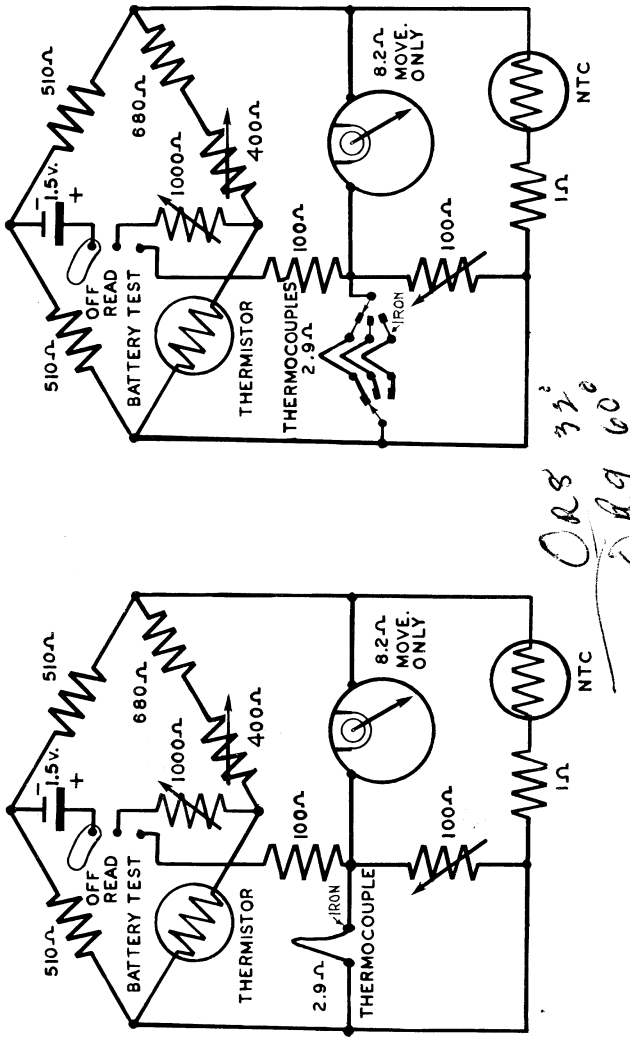


FIGURE 3. SCHEMATIC DIAGRAM FOR SIMPSON THERM-O-METERS, MODELS 388 AND 388-3L

SECTION IV

SUPPLEMENTARY INFORMATION

WET BULB TEMPERATURES

The Simpson Therm-O-Meter is very convenient to use as a wet bulb temperature indicator. Wrap some string or wicking around the end of the test lead and dip it in water to wet it thoroughly; then swing it back and forth gently to evaporate the water from the lead tip. Since the instrument remains stationary, you can read the exact wet bulb temperature while you are swinging the lead tip. Be careful to prevent kinking the lead as you swing it back and forth.

NOTE: After you make a wet bulb reading, remove the string wrapping and dry the lead tip thoroughly before you attempt to make a dry bulb reading: any moisture remaining on the tip of the lead or in the insulation will tend to lower the dry bulb reading.

CONVERSION TO CENTIGRADE

All the temperatures on the Simpson Therm-O-Meter are marked in degrees Fahrenheit. If you desire to convert the readings to degrees Centigrade, use the following formula:

$$C = \frac{5}{9}(F - 32°)$$

where C = degrees Centigrade
and F = degrees Fahrenheit

ACCESSORIES

There are several accessory items which are available to aid you in getting the best service from your Simpson Therm-O-Meter. See them at your Parts Jobber.

Additional standard type thermocouple leads can be obtained for use with either model Therm-O-Meter. Specify standard leads with Simpson part number 10-890190. Price is $4.95.

There is another type of lead available for you to use when you are measuring a surface temperature, such as the outer wall of a container. This lead is 7 feet long. The tip of the sensing end is enclosed in a bakelite sleeve and a teflon insulator. A small copper contactor is imbedded in the end of the plastic, and transmits the contacted heat back to the thermocouple junction inside the insulator. The other end of this lead has a plug which fits in the contact jack the same as the standard lead does. For the surface temperature probe, specify Simpson part number 10-890187. Probe temperature limitation 300°. Price is $8.90.

INSTRUMENT PROTECTION

To protect your instrument, there is an Ever-Redy style vinyl carrying case into which you can place the instrument and test lead. You can leave the instrument in the carrying case while you use it to read temperatures. The case protects the instrument from damage when it is in use as well as when it is stored away. Specify Simpson case number 1-115262 Price is $9.95.

MODEL 390

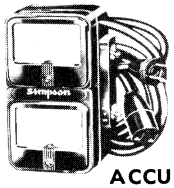
AC VOLT-AMP-WATTMETER

Model 390 provides four wattage ranges which cover practically any appliance. Ruggedly built.

AC CURRENT: 60 cycles.
VOLTS: 0-150, 0-300.
AMPERES: 0-3, 0-15.
WATTS: 0-300, 0-600, 0-1500, 0-3000.

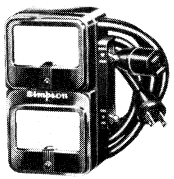
Model 390 with Break-in Plug, Leads **$48.95**

MODEL 391 AC-DC Volt-Wattmeters MODEL 392



3000 Watts Maximum
AC or DC Range
Volts: 0-130, 0-260
Watts: 0-1500, 0-3000

5000 Watts Maximum
AC or DC Range
Volts: 0-130, 0-260
Watts: 0-1000, 0-5000



ACCURACY: ±5% or better of full scale.

Both models used for simultaneous readings of volts and watts. Have two separate 3" square meters, built-in cord and plug for connection to the line outlet . . . and separate toggle switches for range selection.

Model 391 ..... **$43.95** **Model 392** **$43.95**

Both models supplied with cord, plug, and operator's manual.

SIMPSON WARRANTY REPAIR STATIONS AND PARTS DEPOTS

California, Los Angeles — ADams 2-4201
Quality Electric Company
3700 South Broadway
States: So. California below Fresno and Arizona

California, San Francisco — GArfield 1-7185
Pacific Electrical Instrument Lab.
111 Main Street
States: No. California above Fresno and Nevada

** Canada — GLadstone 1-9490
Bach-Simpson Ltd.
1255 Brydges Street - P.O. Box 484
London, Ontario, Canada

Colorado, Denver — RAce 2-8670
Meter-Master Instrument Service
2379 S. Downing Street
States: Wyoming, Utah, Colorado, and New Mexico

Georgia, Atlanta — PLaza 3-4128
Electro-Tech Equipment
690 Murphy Ave. S.W.
States: Alabama, Georgia, Florida, North & South Carolina and Tennessee

** Illinois, Chicago — EStebrook 9-1121
Simpson Electric Company
5200 W. Kinzie Street

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* Parts Depots only; no repairs
** Repair only; do not process parts orders
(All other are both repair stations and parts depots)

* Illinois, Chicago — COlumbus 1-1330
Pacific Indicator Company
5217 W. Madison Street
States: Chicago, Wisconsin and Indiana

Louisiana, New Orleans — TWinbrook 5-5621
Industrial Instrument Works
3328 Magazine Street
States: Arkansas, Mississippi and Louisiana

Massachusetts, Cambridge — UNiversity 4-2494
Alvin C. Mancib Company
363 Walden Street
States: Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island and Maine

Michigan, Detroit — LIncoln 7-1000
Ram Meter, Inc.
1100 Hilton Road, Ferndale
States: Michigan

Minnesota, Minneapolis — KEllogg 7-5411
Instrumentation Services
917 Plymouth Avenue
States: Minnesota, North and South Dakota

Missouri, St. Louis — FOrest 7-9800
Scherrer Instruments
5449 Delmar Blvd.
States: Illinois below Peoria, Iowa, Missouri and Kansas

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* Parts Depots only; no repairs
** Repair only; do not process parts orders
(All other are both repair stations and parts depots)

New York, Buffalo — EXport 2-2726
Electrical Instrument Labs
1487 Hertel Avenue
States: New York State Except Met. New York

New York 7, New York — BArclay 7-4977
Simpson Instrument Service Corp.
27 Park Place
States: Metropolitan New York and New Jersey, above Trenton

** New York, Syracuse — HYatt 2-1651
Syracuse Instrument Lab.
4895 South Ave., P. O. Box 96

Ohio, Cleveland — CLearwater 1-4609
Weschler Electric Company
4250 W. 130th Street
States: Ohio and Kentucky

** Oklahoma, Tulsa — TEmple 5-1890
Tri-State Instrument Lab
2216 N. Sheridan Road
States: Oklahoma

** Oregon, Portland — BElmont 4-6683
The Instrument Laboratory
1316 S. E. 7th Avenue

Pennsylvania, Philadelphia — ORchard 3-5600
Sunshine Scientific Instrument
1810 Grant Avenue
States: Pennsylvania, Maryland, New Jersey below Trenton, Virginia, W. Virginia, Washington D.C., Delaware

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* Parts Depots only; no repairs
** Repair only; do not process parts orders
(All other are both repair stations and parts depots)

Texas, Dallas — TAylor 4-2626
Nelson Electronic Eng. Co., Inc.
6329 Gaston Avenue
States: Oklahoma and Texas

** Texas, Houston — CApitol 8-2835
Nelson Electronic Eng. Co., Inc.
3615 Gulf Freeway

Washington, Seattle — ATwater 3-5850
The Instrument Laboratory, Inc.
934 Elliott Avenue West
States: Oregon, Washington, Idaho and Montana

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* Parts Depots only; no repairs
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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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