

PRESTO-TEK CORPORATION
INSTRUCTION MANUAL

SALT ANALYZER
MODEL SM - 10



A NEWPORT ELECTRONICS COMPANY
2229 SOUTH YALE STREET
SANTA ANA, CA, U.S.A. 92704-4426

USER MANUAL FOR
SM-10
SALT ANALYZER

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PART I - INTRODUCTION

General Description

The Presto-Tek Model SM-10 Salt Analyzer is a portable, battery and/or line voltage operated, two range meter. The instrument has a 3-1/2 digit (0 to 1999) liquid drystal display, and a front panel range switch to read 0 to 1.999% salt and 0 to 19.99% salt. The percent salt readings are temperature compensated and accurate without external adjustments over the entire range of the instrument.

There is a front panel switch that allows two modes of operation. In the variable mode, the user can vary the reading with an external gain adjustment (labeled "VAR") for $\pm 10\%$ of span variation. In the "CAL" mode the instrument is internally calibrated and cannot be adjusted from the front panel.

The conductivity probe is small enough to be placed in a test tube so that low volume samples may be taken. The probe is constructed so that there are negligable effects from the probe touching the end or sides of the test sample container.

The instrument case is constructed of ABS plastic. This material is mechanically strong and chemically resistant to most solvents.

The SM-10 may be operated from line voltage or from nickle cadmium rechargeable batteries. When the line cord is plugged in, the batteries will be on charge. The unit may be operated with or without the line cord plugged in. In the field the SM-10 will operate continuously for 24 hours without charging.

SM-10
SALT ANALYZER
SPECIFICATIONS

<u>RANGES</u>		.000 to 1.999% NaCl .00 to 19.99% NaCl
<u>ACCURACY</u>	0 to 1.999% 0 to 19.99%	± 2% of span (±.04% NaCl) ± 2% of span (± .4% NaCl)
<u>RESPONSE TIME</u> (Conductivity Probe)		12 Seconds
<u>TEMPERATURE COMPENSATION</u> (Probe)		±.075% of span/°C -5°C to +55°C
<u>TEMPERATURE STABILITY</u> (Ambient Operating)		±.01% of span/°C
<u>OPERATING TEMPERATURE RANGE</u>		-10 to +60°C
<u>STORAGE TEMPERATURE RANGE</u>		-25 to +85°C
<u>POWER REQUIREMENTS</u>		117 VAC @ 25mA
<u>BATTERIES</u>		(8) Ni-Cad 1.25V, 500 mA
<u>CALIBRATION SOLUTIONS</u>		.5%, 1%, 1.5%, 5%, 10%, 15%
<u>ENCLOSURE DIMENSIONS</u>		7-7/8"wide x 7-7/16"deep x 4-1/4"high
<u>SHIPPING WEIGHT</u>		7 lbs. 8 oz.
<u>INSTRUMENT WEIGHT</u>		3 lbs.

PART II - OPERATION

1. Unpacking

Carefully unpack the meter and its' accessories, inspect them for evidence of shipping damage. Follow any instructions on any tags attached to these items. The meter is calibrated to the probe shipped with it, connect the probe to the front panel connector and keep these units together.

2. INITIALIZATION

Turn the power switch on. Put the range switch in the "BATT" position--a fully charged battery will indicate greater than 11.2 Volts. Before the unit is field operated, the batteries should undergo an overnight charge. Fully discharged batteries (less than 9 V require around 14 hours of charge time. The batteries are on charge when the power cord is plugged in to a 117 VAC line. The meter may be operated while charging.

3. OPERATION (Cal Mode)

- A. When the front panel slide switch is in the "CAL" position, the meter is internally calibrated to the specification limits (ie $\pm 2\%$ of span) the front panel "VAR" adjustment has no effect.
- B. Connect the probe to the input connector and turn the power on. Put the range switch in "BATT" position and test for greater than 9 Volts. If the batteries are low, plug the power cord in.
- C. Always test with a clean probe. Rinse the probe with demineralized water immediately before and after testing. A clean probe will indicate close to 0% concentration in distilled water.
- D. Put the range switch in the 20% position and slide switch in the "CAL" position. Immerse the probe in the test solution to a depth of at least one and one half inches (3.8cm). Agitate the probe to remove trapped air bubbles and allow 12 seconds for the reading to stabilize. If the reading is less than 2%, switch to the 2% range for greater resolution. If the display blanks out indicating a reading of greater than 20%, the sample must be diluted.
- E. Rinse the probe with demineralized water immediately after use. The probe must be kept clean for accurate readings, refer to the maintenance section of the manual for the proper method of probe cleaning.

4. OPERATION (Variable Mode)

- A. When the front panel slide switch is in the "VAR" (variable) position, the user has the option of changing the indicated readings by means of front panel slope adjustment labeled "VAR". This adjustment will change the reading $\pm 10\%$ of span from the center position of the pot. Do not assume that the center position of the adjustment is the same as the internally calibrated adjustments, the center position of the adjustment is a reference point only.

- B. As an example, the variable mode could be used to externally calibrate the instrument to a solution with a known salt content obtained by titration methods. The meter will accurately indicate an increase or decrease of salt content from the externally calibrated reference point.

5. TECHNICAL DESCRIPTION

(Refer to the SM-10 block diagram Fig. (1). When the on-off switch is closed, the SM-10 operates from the built-in rechargeable batteries. The battery voltage is regulated and applied to the oscillator, amplifiers and digital display module. The probe is excited from a constant voltage A.C. source. The resultant probe current is amplified, corrected for temperature, linearized, rectified, filtered, digitized and displayed in percent salt.

The rechargeable batteries will be on charge whenever the instrument is connected to the 117 AC line. The instrument will operate when the power switch is on since it operates directly from the batteries.

Table I describes the relationship between conductivity and percent NaCl, the relationship is non-linear and the measurement of conductance has a negative 2nd order error term with respect to percent NaCl. The SM-10 is a conductance measuring meter. It contains circuitry to correct for this error term and provide a linear readout for percent NaCl over the entire range of the instrument. The conductivity probe contains a temperature sensing device to apply a correction signal to the conductivity measurement over the specified operating temperature range.

The linearized, temperature corrected signal is applied to a precision rectifier. The rectifier output is applied to an analog to digital converter and then displayed on a large liquid crystal readout.

PART III - CALIBRATION

1. Calibration Interval

The SM-10 is calibrated as a system with its probe. The accuracy of the readout largely depends on the condition of the probe. Because of the method of measurement and the precision components used, a calibration interval of 3 months is recommended if the probe remains clean and undamaged.

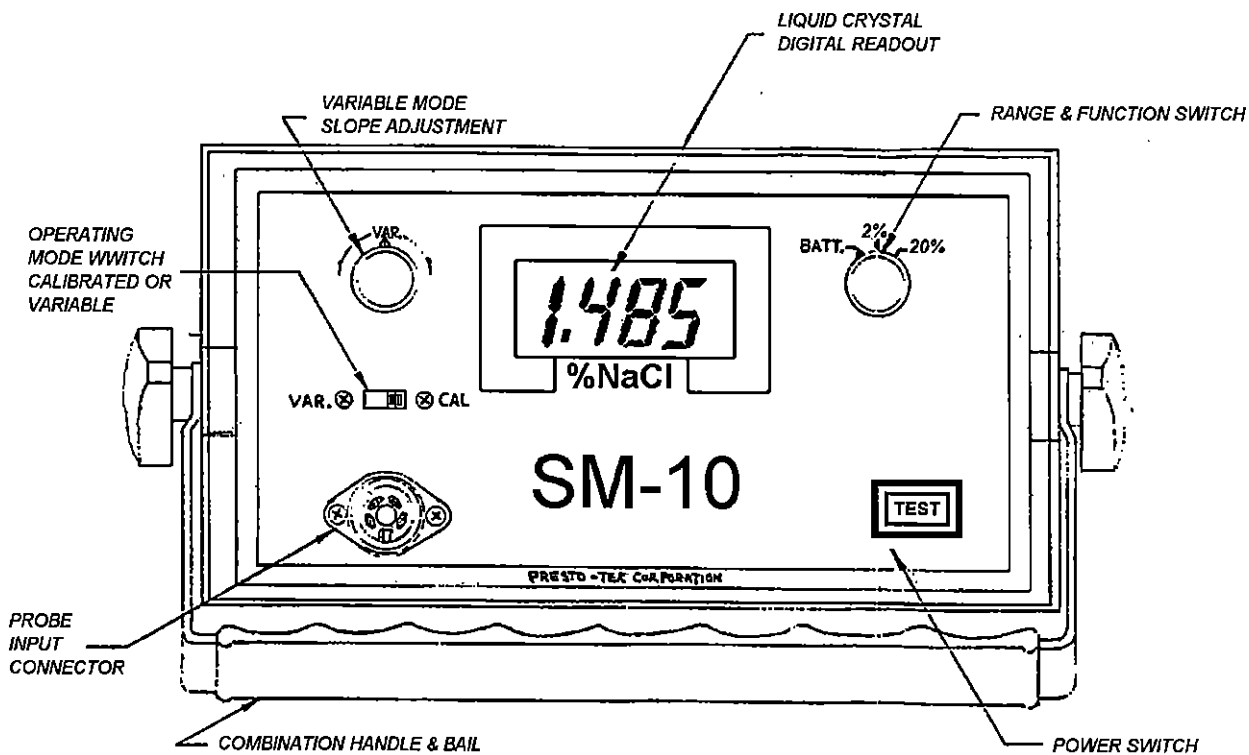
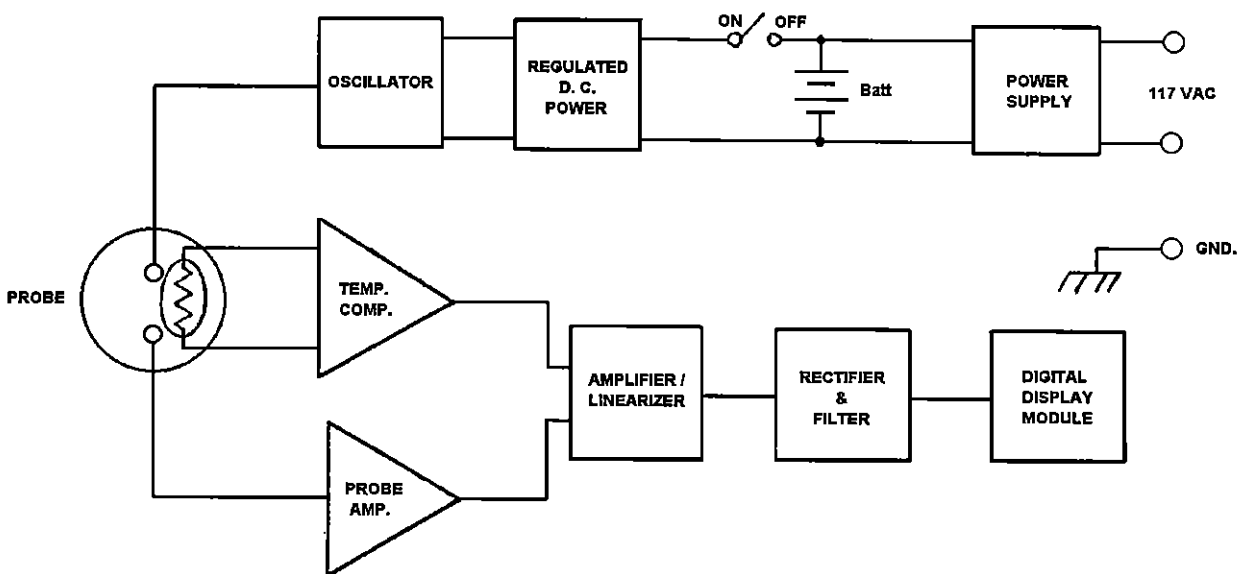
2. Equipment Required

- A. 1% NaCl solution
- B. 10% NaCl solution

3. Calibration Procedure 0-2% Range

- A. Turn the instrument on and perform a battery check. If the voltage is less than 9 Volts, plug the unit into the 117 VAC line and allow it to charge. Before making any adjustments, allow the SM-10 to stabilize with the power on for at least 10 minutes.

SM-10 BLOCK DIAGRAM



- B. Put the slide switch in the "CAL" position, and the range switch in the 2% position. Be certain that the probe is clean and immerse in the 1% calibration solution. Agitate the probe vertically until the reading reaches a maximum. The probe must be submerged a minimum of 1-1/2 inches into the solution.
- C. Remove the four screws on the bottom of the instrument case and lift off the top cover. The adjustments are accessible from the top of the instrument.
- D. When the reading has stabilized, adjust R 25 (refer to drawing #60349 for adjustment locations) until the meter reads 1.000% salt.
- E. Remove the probe and rinse it thoroughly in demineralized water, place the range switch in the 20% position and immerse it in the 10% calibration solution. Agitate the probe vertically until the reading reaches a maximum, observe the minimum depth requirement.
- F. When the reading has stabilized, adjust R 27 (refer to drawing #60349 for adjustment locations) until the meter reads 10.00% salt.

PART IV - MAINTENANCE

1. Probe Care

The probe may be cleaned in an "Alconox" detergent solution (40 grams of Alconox powder in one gallon of warm water). The conductive rings in the bore of the probe are gold plated and should not be scraped with a sharp or abrasive tool. Use a cotton swab or soft brush to clean the inside of the probe. Rinse the probe thoroughly with cold demineralized water after cleaning. If the probe is coated with organic materials or oils, first clean it with alcohol and then use the detergent solution.

2. Battery Charging

The SM-10 batteries will be on charge as long as the unit is plugged into a 117 VAC socket. There is no specific battery charging procedure. The batteries will not be damaged if the unit is left on charge; however, if the meter is not in use for long periods of time, it is best to leave it unplugged.

3. Battery Replacement

Replacement battery packs are supplied with a special adhesive to attach them to the circuit board. The connections must be soldered to the circuit board observing polarity, See Drawing #60349 for wire locations. For access to the batteries, remove the four screws on the bottom of the instrument case that holds it together, and remove the top cover. The battery pack wires should then be unsoldered and the batteries removed by prying them from the circuit board with a sharp, flat tool. The new battery pack should be pressed in place using the new double-backed adhesive and the wires soldered to the proper terminals.

SM-10 ACCESSORIES

Replacement Battery Pack	80392
Probe	80390
Carrying Case	80391
.5% NaCl Calibration Solution	80405
1% NaCl Calibration Solution	80388
1.5% NaCl Calibration Solution	80406
5% NaCl Calibration Solution	80389
10% NaCl Calibration Solution	80407
15% NaCl Calibration Solution	80408

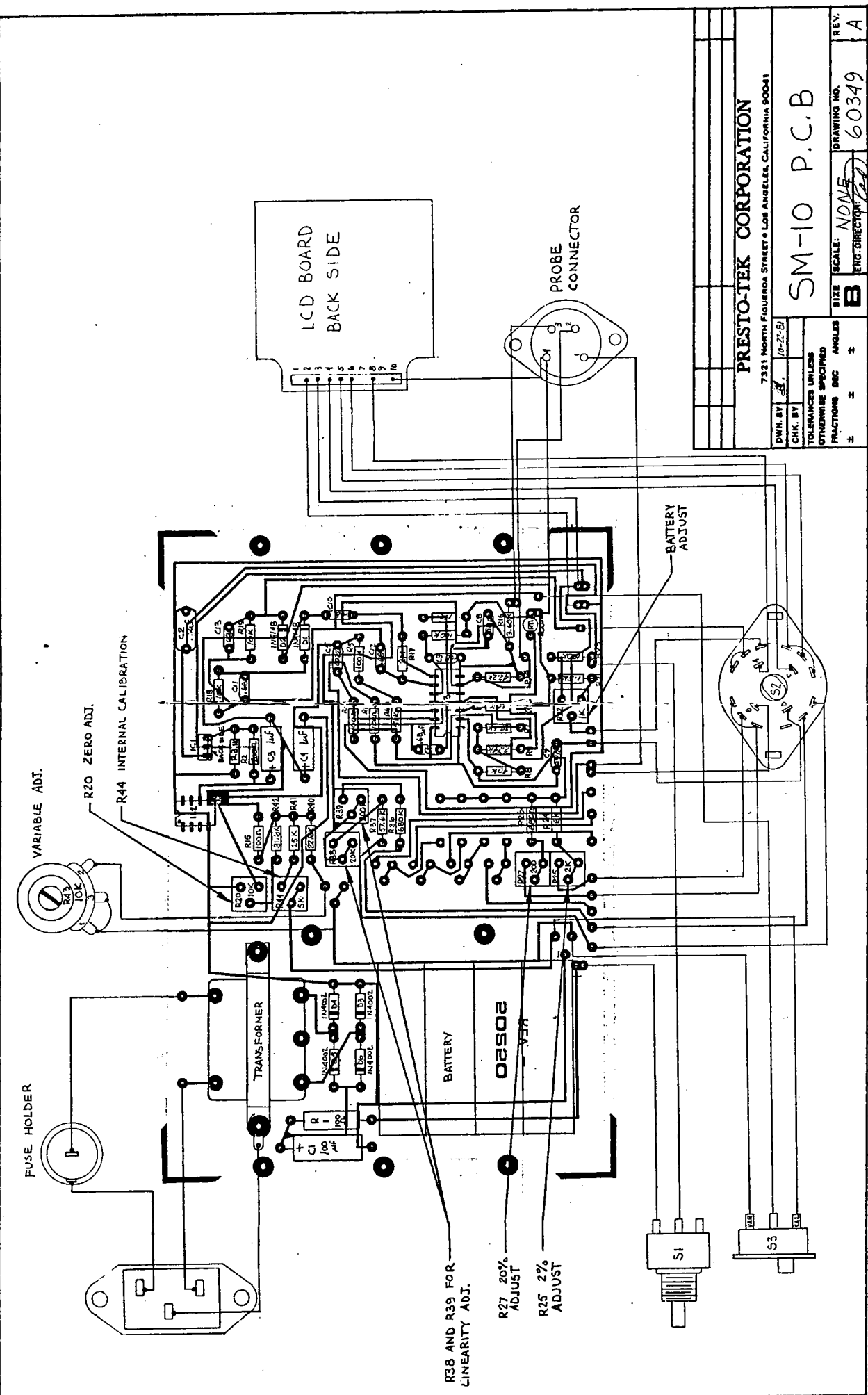
TABLE I
Sodium Chloride

<u>% BY WEIGHT</u>	<u>GRAMS/LITER</u>	<u>umhos/cm @ 20°C</u>
0.10	1.0	1,700
0.50	5.0	8,200
1.00	10.1	16,000
1.50	15.1	23,200
2.00	20.2	30,200
5.00	51.7	70,100
10.00	107.01	126,000
15.00	166.3	171,000

Solutions must be made using anhydrous reagent grade sodium chloride and demineralized water.

WARRANTY

ALL EQUIPMENT IS FULLY WARRANTED FOR A PERIOD OF ONE YEAR AS TO DEFECTS IN MATERIALS OR WORKMANSHIP. EQUIPMENT RETURNED IS PREPAID TO THE FACTORY. IF IN THE OPINION OF THE FACTORY, FAILURE WAS DUE TO MATERIAL OR WORKMANSHIP, REPAIR OR REPLACEMENT WILL BE MADE WITHOUT CHARGE AND RETURNED AT NO CHARGE. A NORMAL SERVICE CHARGE WILL BE MADE FOR REPAIRS MADE DUE TO MISTREATMENT, NORMAL WEAR, OR MADE ON EQUIPMENT OUT OF WARRANTY--IN WHICH CASE, EQUIPMENT IS RETURNED FREIGHT COLLECT.



PRESTO-TEK CORPORATION		7321 NORTH FIGUEROA STREET • LOS ANGELES, CALIFORNIA 90041
DWN. BY	10-22-81	
CHK. BY		
TOLERANCES UNLESS OTHERWISE SPECIFIED		
FRACTIONS	DEC	ANGLES
±	±	±
SIZE	SCALE: NONE	DRAWING NO. 60349
B	ENG. DIRECTOR	REV. A

R38 AND R39 FOR LINEARITY ADJ.

R27 20% ADJUST

R25 2% ADJUST

