MK 811 INSTRUCTION MANUAL

CONTENTS

MK 811 TWO-CHANNEL CONDUCTIVITY CONTROLLER

INSTRUCTION MANUAL

1.0 INTRODUCTION

This instruction manual provides a description of the MK 811 Two-Channel Conductivity Controller (including specifications), installation procedures, calibration procedures, operating information, and maintenance data (including troubleshooting). There are also appendices providing replacement parts and accessories information, a PPM (Parts Per Million) to Siemens conversion table, warranty and manual change information.

Before placing your MK 811 into service, read the entire contents of this manual to ensure a complete understanding of the functions of the unit. Any questions should be referred to your dealer or to Signet Scientific Co.

1.1 DESCRIPTION

The MK 811 Two-Channel Conductivity Controller is actually two instruments in one. It can monitor two sensors and control two relay outputs to solenoid pumps and valves simultaneously. In its most common use, monitoring both inlet and product water, it has the added feature of reject ratio display (this is a percentage equaling 100 times the quantity 1 minus the channel 2 value divided by the channel 1 value). It also displays temperature at either sensor.

NOTE

The MK 811 is designed to operate with two sensors connected at all times. If, for any reason, one sensor is disconnected, a 33K Ω resister should be connected between the T+ and the unused T-, and a 1K Ω resistor between P+ and P- terminals at the rear of the unit.

Operator-selected high and low alarm thresholds provide double-ended process control and alert operators when thresholds have been violated.

In addition to the control functions, a recorder output (4-20 mA) is provided. The recorder output, dedicated to channel 2, is either non-isolated (MK 811-3) or isolated (MK 811-4) for connection to sensitive computer-type equipment.

The large-numeral LCD readout provides three scale ranges of conductivity. The operator selects the range using the waterproof touch-sensitive switch on the front panel. The internal microprocessor computes the scale ranges from a single cell constant.

NOTE

An optional higher resolution model (MK 811.99) with a different cell constant is available for very low conductivity measurements.

No moving parts and solid state microprocessor circuitry make the MK 811 a highly reliable unit. It contains no operator-replaceable parts.

Figure 1 gives the dimensions of the MK 811. The front panel is waterproof and a waterproof back is available for stand-alone installation.

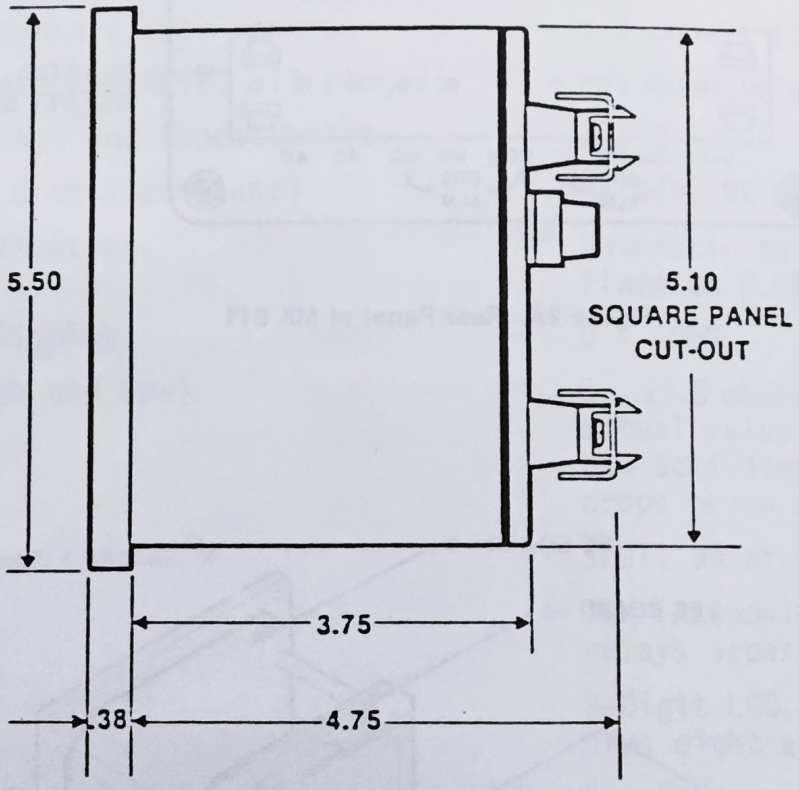

Figure 1. MK 811 Controller Dimensions

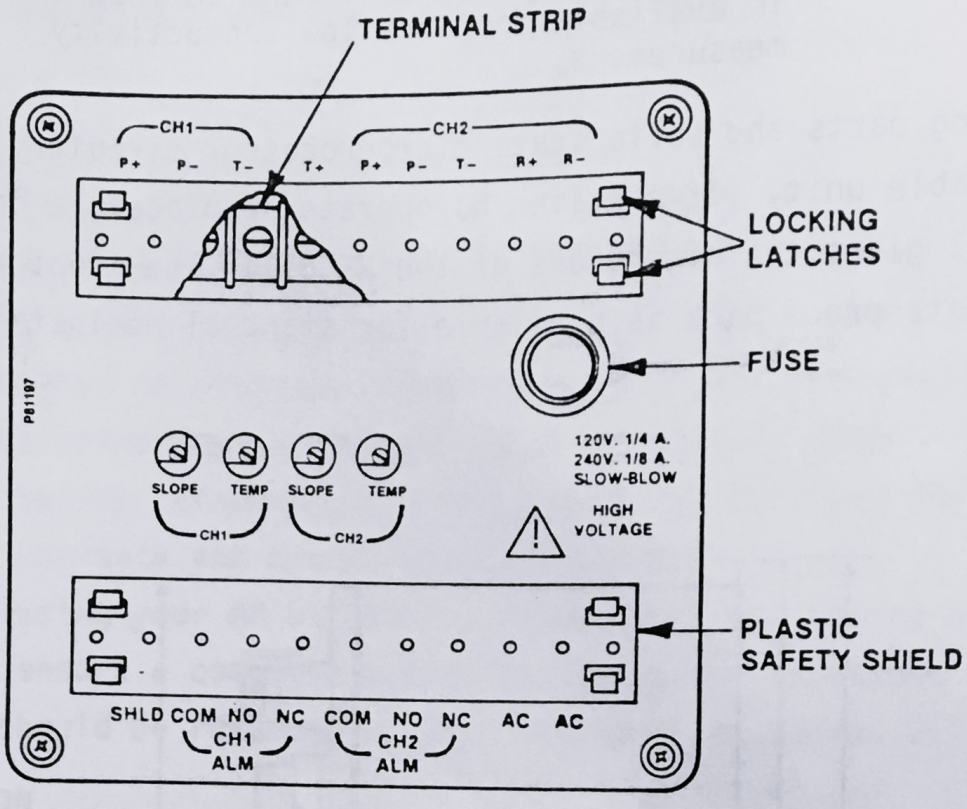

Figure 2A. Rear Panel of MK 811

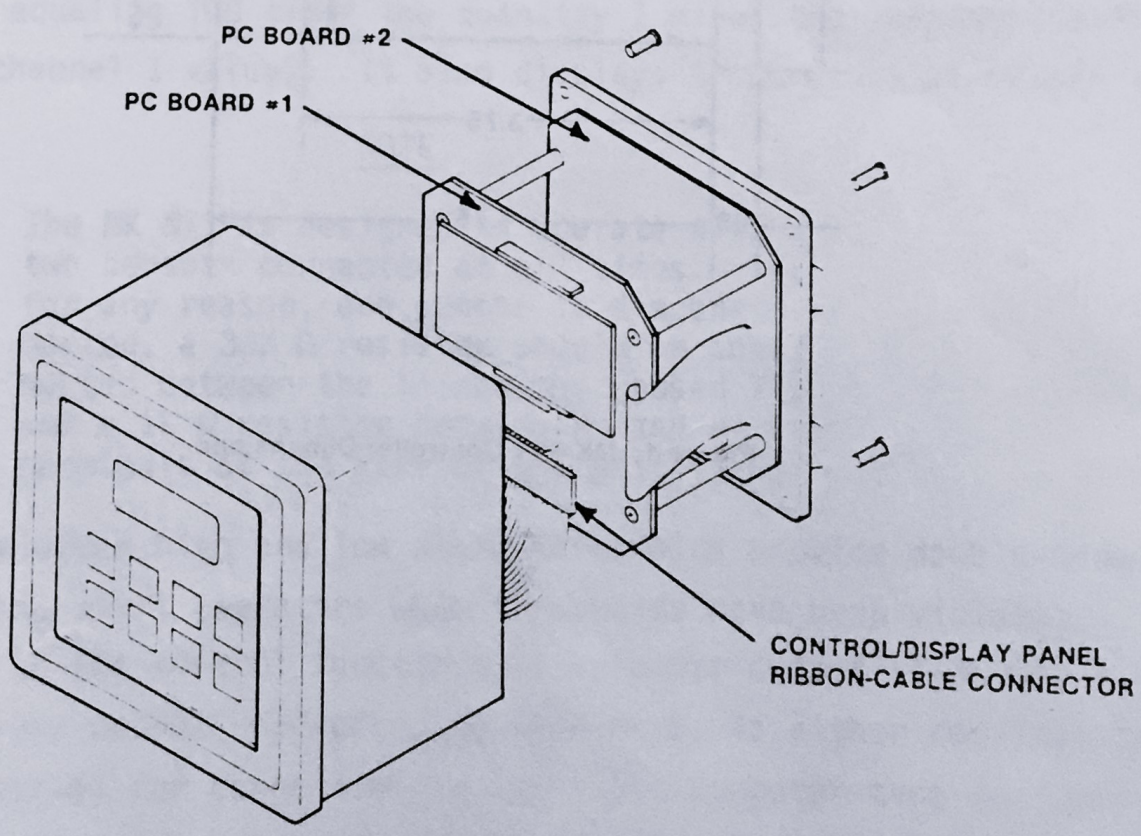

Figure 2B. Instrument Assembly

1.2 SPECIFICATIONS

Table 1 lists the pertinent specifications of the MK 811 Two-Channel Conductivity Controller.

Table 1. Specifications

Input Conductivity Range (both channels)	0 - 37.5 mS/cm (High Range) 0 - 3.75 mS/cm (Med. Range) 0 - 3.75 µS/cm (Low Range)
Input Temperature Range (both channels)	0 - 100°C
Display Range (both channels)	0 - 25.0 mS/cm (High Range) 0 - 2.50 mS/cm (Med. Range) 0 - 250 µS/cm (Low Range)
Display Temperature Range (both channels)	0 - 100°C
Accuracy (both channels, all ranges)	± 2 counts (least significant digit)
Repeatability (both channels, all ranges)	± 1 count (least significant digit)
Temperature Accuracy and Repeatability	± 1°C
Sensor Inputs (2.0 cell constant)	MK 815, MK 817, MK 818
Temperature Compensation	Automatic to 100°C Fixed at 2.00%/°C
Rejection Ratio Display	0 - 100%
Alarm Ranges (High and Low)	0 - 25.0 mS/cm (High activates when actual value exceeds set value. Low activates when actual value drops below set value)
Alarm Relays (1 per channel)	SPDT, 3A at 250 VAC or at 30 VDC ACK (Acknowledge) switch resets relays separately
Display Type	3-Digit LCD, 0.7" high numerals plus eight annunciators
Operating Temperature Range	0 - 50°C
Recorder Output (Non-isolated) -3	4-20 mA (drives up to 450 Ω)
Recorder Output (Isolated) -4	2-Wire, 4-20 mA (Additional P.S. Req'd.)
Memory Back-Up Battery	2-Year, 3 VDC Lithium Cell
Power Requirements	120 ± VAC, 50/60 Hz, 2.5 W or 240 ± VAC, 50/60 Hz, 2.5 W
Enclosure Type	General Purpose ABS Plastic
Enclosure Weight	2.25 lbs (1 Kg.)
Enclosure Dimensions	5.5 x 5.5 x 5.1 in. (140 x 140 x 130 mm.)

Table 1. Specifications (continued)

Software Option	811.99
Sensor Input	MK 825 (0.05 Cell K)
Display Range	0 - 250 µS/cm (High Range) 0 - 25.0 µS/cm (Med. Range) 0 - 2.50 µS/cm (Low Range)

2.0 INSTALLATION

The following paragraphs provide installation information for the MK 811 Two-Channel Conductivity Controller only. Refer to the appropriate sensor instruction manual for sensor installation information.

2.1 UNPACKING AND INSPECTION

Your package should include your MK 811 Controller, a clamp ring for panel installation, this instruction manual, and a warranty card. When unpacking the equipment, refer to the packing list to verify that all parts of your order are present. Carefully inspect each part for shipping damage and immediately notify the carrier and your dealer of any damage. Also, please fill out and return the warranty card as soon as possible.

2.2 PRE-INSTALLATION ADJUSTMENTS

If 120 VAC input power was specified when your MK 811 was ordered, it will be equipped with ¼-Ampere slow blow fuse. If 240 VAC input power was specified, it will have a 1/8-Ampere slow blow fuse installed. Line frequency may be either 50 or 60 Hz.

If the actual input AC voltage differs from that at which the unit was set to operate, the fuse must be changed and two shorting plugs inside the unit must be moved. Proceed as follows to change from 120 to 240 VAC operation (Figure 2):

1) Replace the ¼-A.S.B. fuse with a 1/8-A.S.B. fuse.
2) Remove the four screws fastening the front to the back of the unit.
3) Carefully separate the front case and the back electronics mounting assembly only far enough to expose both printed circuit boards.
4) Refer to figure 3 and locate the shorting plugs on the component side of PCB #2.
5) Remove both shorting plugs, then install one of them on the two middle pins as shown for 240 VAC operation.
6) Reassemble the instrument.
7) Reverse the procedure to change from 240 to 120 VAC operation.

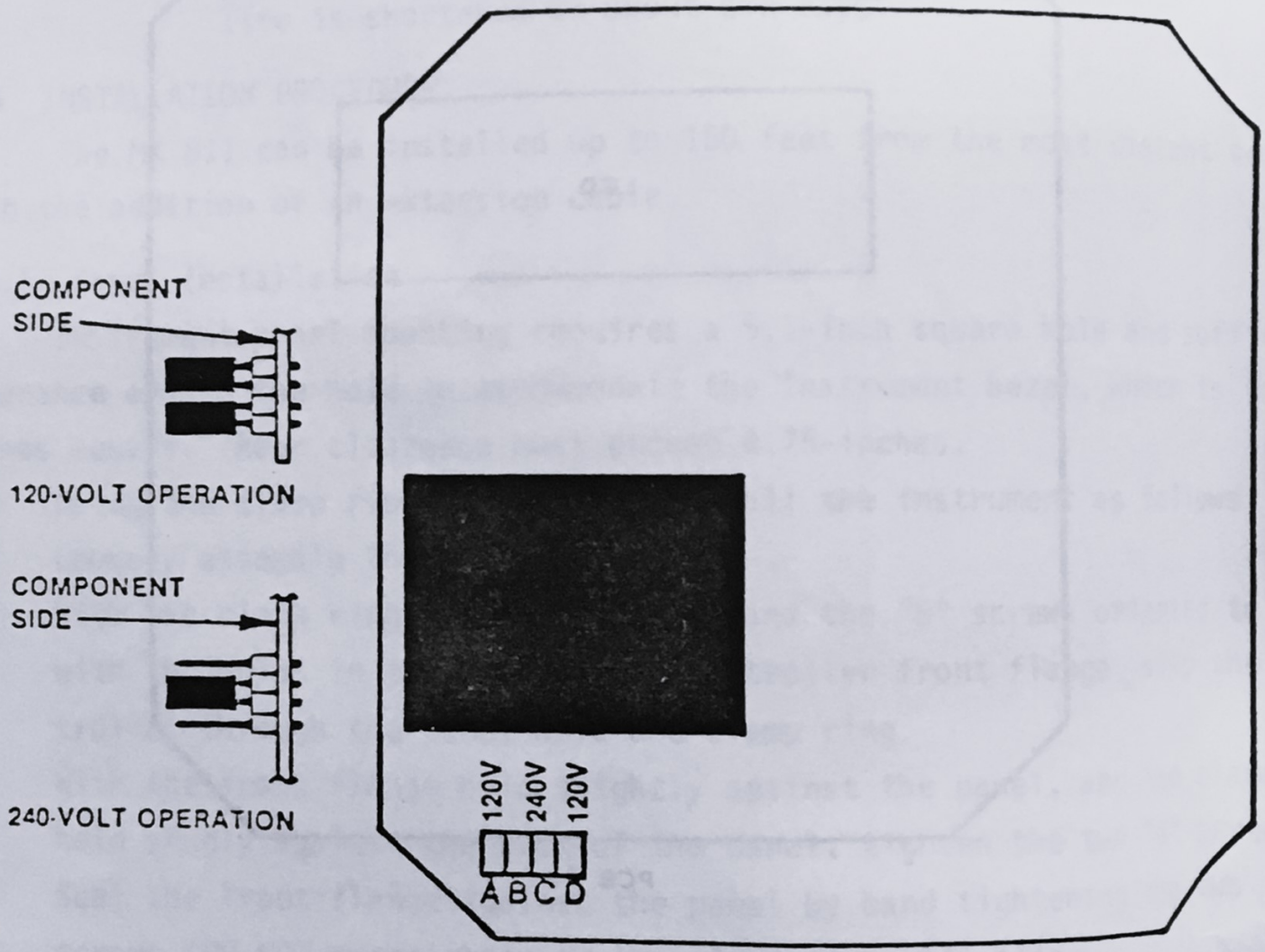

Figure 2. Checking Position of P.C.Board #2 Shorting Plugs.

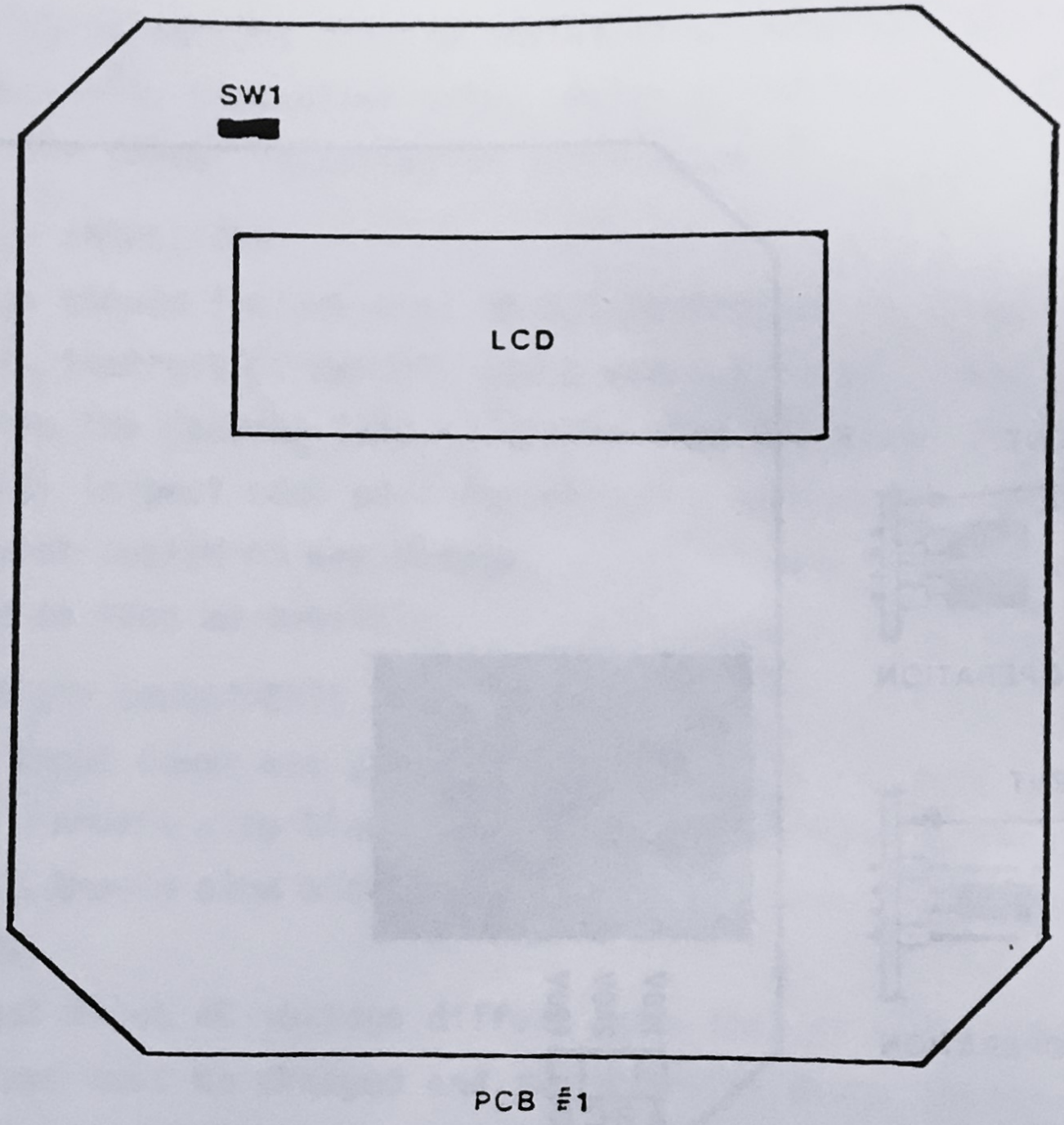

Figure 3. P.C.Board #1.

2.3 BATTERY SWITCH

Switch SW1 (figure 3) is used to power-on/reset the 3-volt Lithium back-up battery. In the ON position, battery power is constantly applied to the microprocessor circuitry whether AC power is applied or not. Thus, no data is lost in the event of failure of the AC power. The MK 811 Controller is shipped with this switch in the ON position.

CAUTION

If the battery is switched from ON to OFF and then ON again without AC power applied, the microprocessor will draw excessive current and battery life is shortened to about six days.

2.4 INSTALLATION PROCEDURE

The MK 811 can be installed up to 150 feet from the most distant sensor with the addition of an extension cable.

2.4.1 Panel Installation

Instrument panel mounting requires a 5.1-inch square hole and sufficient clearance around the hole to accommodate the instrument bezel, which is 5.5-inches square. Rear clearance must exceed 4.75-inches.

Using the clamp ring (figure 4), install the instrument as follows:

1) Loosely assemble the clamp ring.
2) With the clamp ring behind the panel and the "B" screws oriented to mate with the holes in the rear of the controller front flange, slip the controller through the panel hole and clamp ring.
3) With the front flange held thightly against the panel, and the clamp ring held snugly against the back of the panel, tighten the two "A" screws.
4) Seal the front flange against the panel by hand tightening the two "B" screws (DO NOT overtighten or the clamp ring will slip).

2.4.2 Electrical Connections

All electrical connections are made to the two shielded terminal strips at the rear of the instrument (figure 5). To remove the shields, pinch the plastic locking latches together.

CAUTION

Do not apply AC power before both sensors are properly connected. If, for any reason, only one sensor is used, a 33K Ohm resistor should be connected between the T+ and the unused T- terminals. Otherwise, a "TEMP Err" condition will exist.

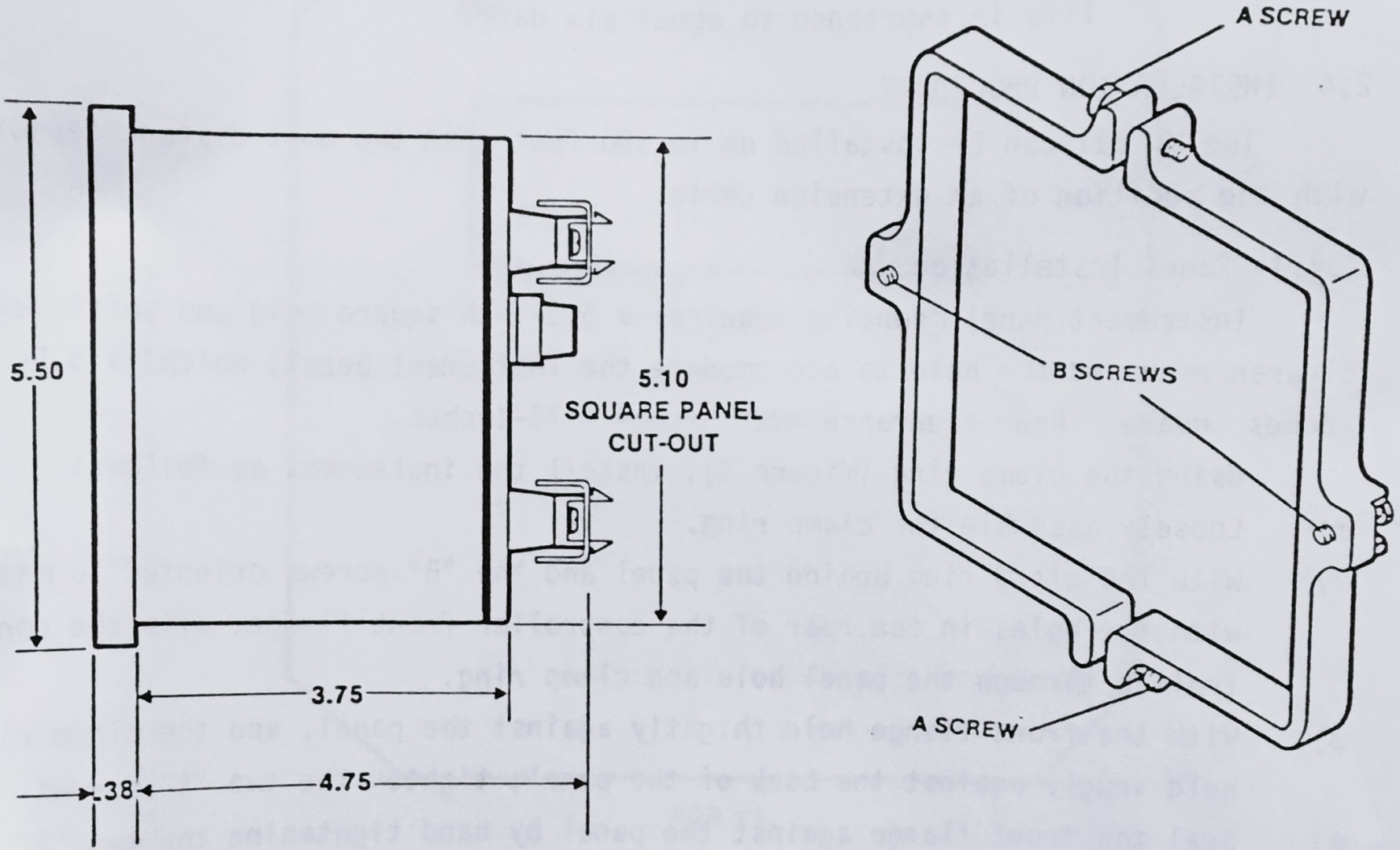

Figure 4. MK 811 Profile (left) and Clamp Ring (right).

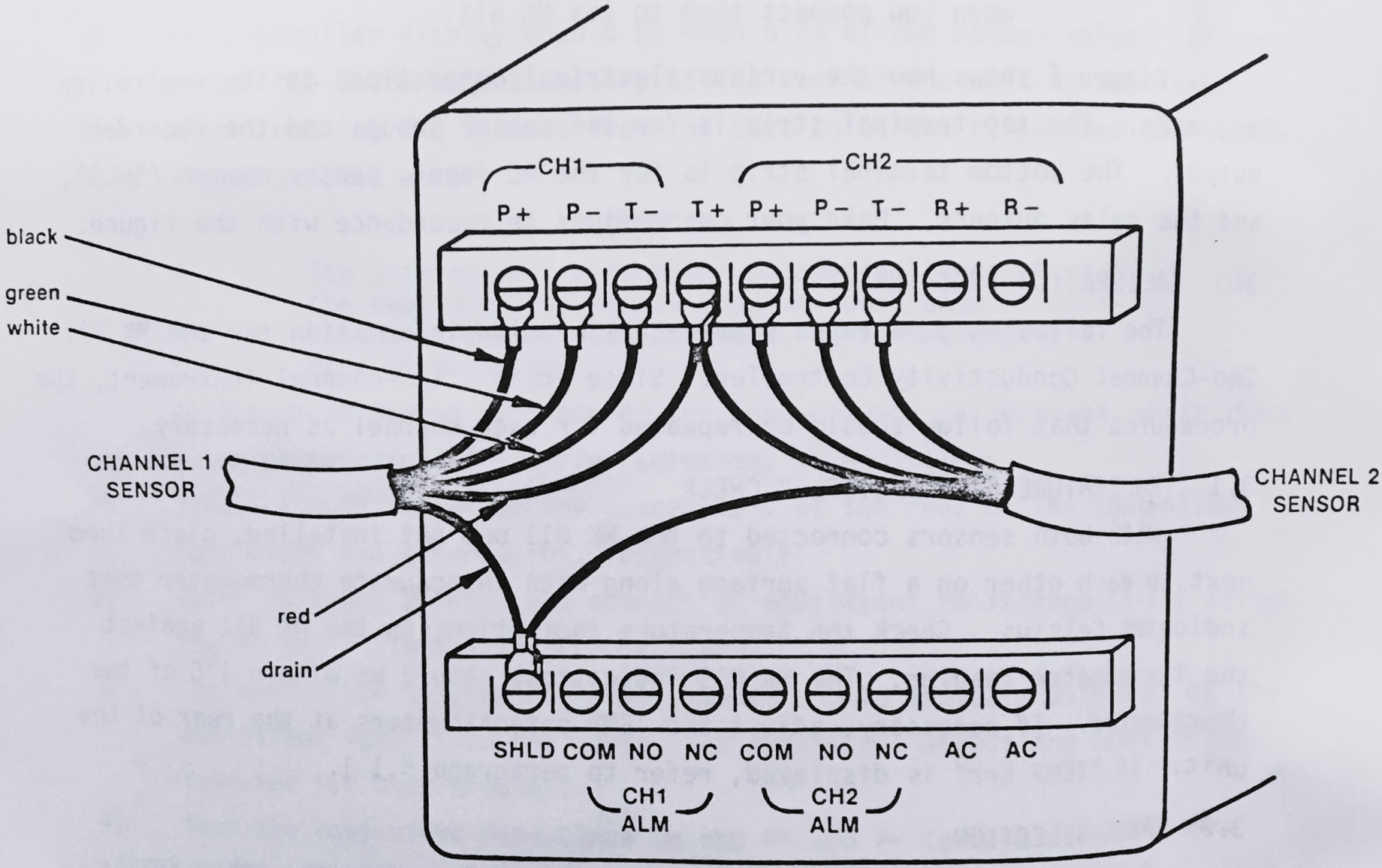

Figure 5. MK 811 Electrical Connections.

CAUTION

The terminal strips must be kept clean and dry at all times to ensure accurate and trouble-free operation of the MK 811.

CAUTION

The controller has no power switch, so input AC power should be switched at the panel. Make sure the AC power wires are not live when you connect them to the MK 811.

Figure 5 shows how the various electrical connections to the controller are made. The top terminal strip is for the sensor inputs and the recorder output. The bottom terminal strip is for the AC input, sensor common (SHLD), and the relay outputs. Make your connections in accordance with the figure.

3.0 CALIBRATION PROCEDURE

The following paragraphs provide calibration information for the MK 811 Two-Channel Conductivity Controller. Since it is a two-channel instrument, the procedures that follow should be repeated for each channel as necessary.

3.1 TEMPERATURE SENSOR/DISPLAY CHECK

With both sensors connected to the MK 811 but not installed, place them next to each other on a flat surface along with an accurate thermometer that indicates Celsius. Check the temperature indications on the MK 811 against the thermometer reading. The MK 811 indications should be within 1°C of the thermometer. If necessary, adjust the TEMP potentiometers at the rear of the unit. If "TEMP Err" is displayed, refer to paragraph 5.1.1.

3.2 RANGE SELECTION

Select range which provides best solution. To set range: when Resistivity reading is displayed, the range may be selected by the 'Range' key. The change of sequence is 'HI' to 'MED', 'MED' to 'LO', 'LO to 'HI'. Display will show dashes positioned top - hi range, middle - medium range, and low - low range.

3.3 INITIAL CALIBRATION

With both sensors connected to the MK 811 but not installed, choose the range display that will most probably be used after installation is complete and verify that both channels indicate zero. If both sensors are dry and not touching anything but air, conductivity should be zero. If any numbers other than zero are displayed, return the unit for repair.

To check the other end of the range, proceed as follows:

1) Prepare a known buffer solution at room temperature and near the high end of the selected range (e.g., 20.0 mS/cm for high range, 2 mS/cm for medium range, or 200 µS/cm for low range). Use the PPM to Siemens Conversion Chart (paragraph 6.2), if necessary.
2) Immerse the sensors in the buffer solution and allow the unit to stabilize (make sure the sensors do not touch any part of the container).
3) The controller display should be within 2% of the actual value. If not, adjust the SLOPE potentiometers at the rear of the unit as necessary.
4) After removing the sensors from the test solution, rinse them thoroughly with distilled water.

NOTE

The internal microprocessor automatically calibrates the remaining two ranges whenever one range is calibrated as above. Consequently, no further calibration is necessary.

An alternate method of checking the conductivity calibration, which does not require preparation of a buffer solution, is as follows:

1) Remove the P+ and P- sensor connections at the rear of the controller (the black and green wires, respectively).
2) Refer to table 2 below and connect an equivalent resistance (± 1%) across the P+ and P- terminals for one channel.
3) The controller display for that channel should indicate within 2% of the equivalent value from the table. If necessary, adjust the SLOPE potentiometer for that channel.
4) Move the equivalent resistance to the P+ and P- terminals for the remaining channel and repeat step 3 above.
5) Re-connect the sensors and remove the equivalent resistance.

The sensors can now be installed for normal operation. Refer to the installation procedures in the instruction manuals for the individual sensors.

Table 2. Equivalent Resistances

MK 811 RANGE	CONDUCTIVITY at 25°C	EQUIVALENT RESISTANCE
Low	2 µS/cm	1 Meg Ω
Low	20 µS/cm	100 K Ω
Low	100 µS/cm	20 K Ω
Low	200 µS/cm	10 K Ω
Med.	1 mS/cm	2 K Ω
Med.	2 mS/cm	1 K Ω
High	10 mS/cm	200 Ω
High	20 mS/cm	100 Ω
High	25 mS/cm	80 Ω

4.0 OPERATION (Figure 6)

Once the unit is installed and calibrated, operation is simple. Before unattended operation can take place, however, the alarm thresholds must be set. These settings should fall within the most-used range. The microprocessor will automatically convert the settings for the unremaining ranges.

NOTE

If the selected alarm value exceeds the maximum value of a lower range, switching to that range puts the unit into an over-range condition in which the display blanks, the alarm activates, and the relay actuates.

If only one alarm is to be used on one channel, the unused alarm threshold should be set at the end of the controller's operating range.

Set the alarms as follows:

1) Select the desired range.
2) Touch the CH.1/CH.2 switch and then either the LO or HI alarm switch. Annunciator will read CH.1 or CH.2 and LO or HI Alarm.
3) Touch $\frac{\text{ADJ}}{\text{ENABLE}}$, annunciator will flash LO or HI alarm set.
4) Using DIG 1, DIG 2, and DIG 3 switches, set the desired numeric value into display. Each digit rolls independently 0 to 9.
5) When the desired number is displayed, touch the ENTER switch.
6) The set level an an alarm can be verified at any time by touch the HI or LO alarm switch for either CH.1 or CH.2.

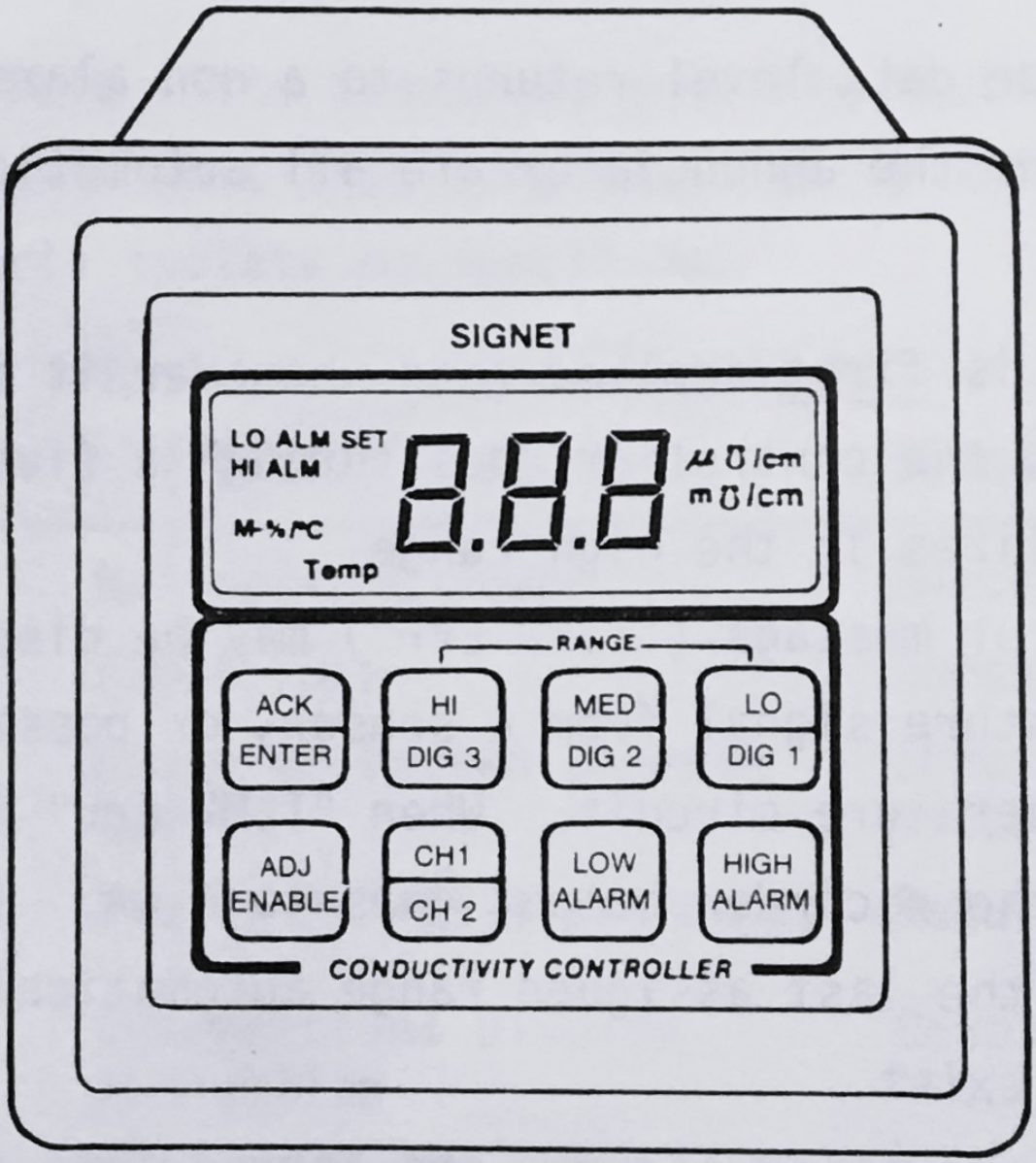

Figure 6. MK 811 Front Panel (All Annunciators and Digits shown).

NOTE

If an alarm is active, touching the appropriate ALARM switch de-activates it until ENTER is touched.

4.1 ALARM ACKNOWLEDGE

Since there are two alarms (one for each channel) and one ACK switch, Channel 1 has priority. In other words, in the unlikely event that both alarms activated at the same time, only the Channel 1 alarm would be acknowledged when the ACK switch is touched. To acknowledge both alarms, the operator would either touch ACK twice or hold it for more than three seconds.

When an alarm is acknowledged, the appropriate annunciator remains displayed. The ACK function can be reset by touching the RANGE switch, or an Alarm switch.

When the sensor data level returns to a non-alarm condition, the relay, the ACK function, and the annunciator are all automatically reset.

4.2 DISPLAYS

When AC power is first applied (and whenever it is applied with the battery switch OFF), the controller goes through a five-second initialization routine, then stabilizes in the high range.

A flashing error message ("TEMP Err") may be displayed. It indicates an out-of-range temperature signal from a sensor, or possibly a broken or loose connection in a temperature circuit. When "TEMP Err" is displayed, the relay is deactivated and the recorder output goes to 4 mA. The contoller returns to normal operation at the last assigned range automatically unless the error contition continues to exist.

When an alarm condition occurs, the appropriate annumciator is displayed but does not flash. The numeric display continues to provide real-time data without regard to the alarm condition.

To change the display from one channel to the other, simply touch the CH 1/CH 2 switch. Note that before the new channel is displayed, the reject ratio is shown momentarily. The reject ratio is displayed whenever the CH 1/CH 2 switch is touched. Reject ratio (RR) is a percentage derived as follows:

$$RR\ (\%) = 100 \times \left[1 - \frac{\text{CH.2 Display}}{\text{CH.1 Display}}\right]$$

If Channel 1 conductivity is being displayed, channel 1 temperature may be observed by touching the TEMP$^{\circ}$C switch. The temperature display will remain until the COND switch is touched.

5.0 MAINTENANCE

Maintenance of the MK 811 Two-Channel Conductivity Controller consists of periodic performance checks as well as troubleshooting in the event of a suspected malfunction. The instrument contains no user-replaceable parts, so if it happens to malfunction, it should be returned to Signet Scientific Company or an authorized service center (addresses furnished upon request) for repair. Unauthorized repair work can void the warranty (see paragraph 6.3).

5.1 FUNCTIONAL EVALUATION

Periodically, when changing sensors or when a malfunction is suspected, a functional evaluation should be performed. The procedures in paragraphs 3.0 through 3.2 may be used as a functional evaluation check.

5.2 TROUBLESHOOTING

The following table lists troubles, possible causes, and suggested remedies. By no means is this list complete. It is intended only as a guide for the user to properly isolate malfunctions.

Table 3. Troubleshooting

TROUBLE	POSSIBLE CAUSE	SUGGESTED REMEDY
No Display	No input AC power	Check AC power source.
	Blown Fuse	Check fuse at rear of unit.
	Loose or broken connection	Check input AC connection and ribbon cable inside unit.
	Faulty MK 811 electronics	Return unit for repair.
Random Display	Intermittent display connection	Check display connection.
	Faulty MK 811 electronics	Return unit for repair.
Range Display Problems	Incorrect calibration	Check calibration
	Faulty sensor or bad sensor electrical connection	Check sensor and electrical connections.
	Improperly grounded AC line	Check AC line ground.
	Shorted sensor cable	Check sensor cable.
	Faulty MK 811 electronics	Return unit for repair.

Table 3. Troubleshooting (continued)

TROUBLE	POSSIBLE CAUSE	SUGGESTED REMEDY
Temperature Display Problems	Solution below 0°C	Thaw solution.
	Faulty sensor or bad electrical connection	Check sensor and electrical connections.
	Incorrect calibration	Check calibration.
	Faulty temperature circuit	Return unit for repair.
Keypad Inoperative	Faulty keypad or MK 811 electronics	Return unit for repair.
Alarms Inoperative	Faulty MK 811 electronics	Return unit for repair.
No Recorder Output	Faulty MK 811 electronics	Return unit for repair.

NOTE: Since this is a two-channel device, a good way to check a suspected bad sensor is to switch the sensor wiring. If the same indications are obtained, the unit can be considered at fault rather than the sensor.

6.0 APPENDICES

6.1 REPLACEMENT PARTS AND ACCESSORIES

Mounting Strap Kit.....MK 151.59
Controller L-Shaped Mounting Bracket.....MK 500.60
Conduit Adapter Kit (Waterproof Back).....MK 500.78
Liquid Tight Kit (For Cable Connections to MK 500.78 Housing).....MK 500.75
Conductivity/Resistivity Test Box.....MK 808

6.2 PPM-TO-Siemens CONVERSION

The following is used to convert conductance in PPM (Parts Per Million) to conductance in Siemens (Same as Mhos):

Specific conductance (μS/cm) at 25°C = 1000 C σ(1 - a c + bc) where:

$$C = \text{normality} \cong \frac{\text{ppm}}{1000 \times \text{equivalent weight}},$$

(C should be a value between 0.001 and 0.1).

σ, a, and b are obtained for Table 4.

Table 4 Continued

Substance	Equivalent Weight	Λo (25°C)	a	b	Min./Max. ppm for use of formula
$CoAC_2$	118.04	90.1	1.74	1.4	11 - 12,000
$CoBr_2$	109.38	126	1.35	1.9	10 - 11,000
$CoCl_2$	64.92	124.5	1.37	1.2	6 - 7,000
$Co(NO_3)_2$	91.47	122.4	1.39	2.0	9 - 10,000
$CoSO_4$	77.50	100	2.07	1.65	7 - 8,000
CsCl	168.4	154.6	0.62	-0.7	16 - 17,000
CsOH	74.96	271	0.45	0.5	7 - 8,000
$CuAc_2$	90.82	60	2.36	2.2	9 - 10,000
$CuBr_2$	71.73	134	1.31	1.6	7 - 8,000
$CuCl_2$	67.22	131	1.33	1.5	6 - 7,000
$Cu(NO_3)_2$	93.78	128.8	1.38	1.7	9 - 10,000
$CuSO_4$	79.80	113	2.79	3.3	7 - 8,000
$FeCl_2$	63.38	137	1.34	1.05	6 - 7,000
$FeSO_4$	75.97	99	2.08	1.7	7 - 8,000
$GdBr_3$	132.33	139.9	1.63	3.2	13 - 14,000
$GdCl_3$	87.87	140	1.63	2.5	8 - 9,000
GdI_3	179.32	139	1.64	4.0	17 - 18,000
HBr	80.92	429.4	0.37	0.35	8 - 9,000
$HBrO_3$	128.92	408	0.37	-5	12 - 13,000
HCNS	59.09	404	0.38	0.37	5 - 6,000
HCl	36.46	426.0	0.37	0.38	3 - 4,000
$HClO_3$	84.46	408	0.36	0.4	8 - 9,000
$HClO_4$	100.46	417	0.37	0.4	10 - 11,000
H_2CrO_4	59.01	207	0.97	2.2	5 - 6,000
HI	127.91	428	0.37	0.42	12 - 13,000
HIO_3	175.91	391.2	0.38	-4.7	17 - 18,000
$HMnO_4$	119.95	410	0.38	0.2	11 - 12,000
HNO_3	63.01	420	0.37	0.36	6 - 7,000
KAc	98.15	115.4	0.75	1.3	9 - 10,000
KBr	119.01	151.7	0.62	0.62	11 - 12,000
$KBrO_3$	167.01	129.4	0.69	0.48	16 - 17,000
KCNS	97.18	140.0	0.65	0.63	9 - 10,000
KCl	74.56	149.8	0.63	0.64	7 - 8,000
$KClO_3$	122.55	138.7	0.66	0.4	12 - 13,000
K_2CrO_4	97.10	156	1.22	1.3	9 - 10,000
KF	58.10	128	0.70	0.5	5 - 6,000
$K_4Fe(CN)_6$	92.09	169	2.48	3.6	9 - 10,000
$K_3Fe(CN)_6$	109.75	167.8	1.56	1.8	10 - 11,000
$K_2Fe(CN)_5NO$	147.07	136.4	1.32	1.9	14 - 15,000
KI	166.01	150.8	0.63	0.62	16 - 17,000
KIO_3	214.00	115	0.53	0.4	20 - 22,000
$KMnO_4$	158.04	136	0.67	0.5	15 - 16,000
KNO_3	101.11	144.5	0.64	0.36	10 - 11,000
KOH	56.11	271	0.45	0.4	5 - 6,000
K_2SO_4	87.14	151.4	1.24	1.14	8 - 9,000
LiBr	86.85	121.4	0.72	0.5	8 - 9,000
LiCl	42.39	115	0.75	0.78	4 - 5,000
$LiClO_3$	90.39	104.1	0.81	0.3	9 - 10,000
Li_2CrO_4	64.93	123.6	1.46	1.5	6 - 7,000
LiI	133.84	117.7	0.74	0.8	13 - 14,000
$LiNO_3$	68.94	111	0.77	0.45	6 - 7,000
LiOH	23.95	236.5	0.48	0.5	2 - 3,000
Li_2SO_4	54.97	119.2	1.48	1.4	5 - 6,000
$MgBr_2$	92.07	129	1.34	2.2	9 - 10,000
$MgCrO_4$	70.15	125	2.64	3.2	7 - 8,000
$Mg_2Fe(CN)_6$	65.14	172	4.75	13	6 - 7,000
$Mg(NO_3)_2$	74.16	129.0	1.35	1.8	7 - 8,000
$Mg(OH)_2$	29.17	257	0.87	2.1	2 - 3,000
$MgSO_4$	60.19	116	2.75	3.7	6 - 6,000
$MnBr_2$	107.38	128	1.34	1.7	10 - 11,000
$MnCl_2$	62.92	126	1.36	1.6	6 - 7,000
$MnSO_4$	75.50	109	2.84	3.8	7 - 8,000

Table 4 Continued

Substance	Equivalent Weight	Λo (25°C)	a	b	Min./Max. ppm for use of formula
NH_4Br	97.95	155	0.62	0.60	9 - 10,000
NH_4CNS	76.12	140.8	0.65	0.5	7 - 8,000
NH_4Cl	53.49	150.5	0.63	0.49	5 - 6,000
NH_4IO_3	192.94	117	0.74	0	19 - 20,000
NH_4Pic	246.14	104.4	0.80	0.9	24 - 25,000
$(NH_4)_2SO_4$	66.07	149.9	1.25	1.1	6 - 7,000
NaAC	82.03	91.1	0.89	0.34	8 - 9,000
NaBr	102.90	126.0	0.70	0.5	10 - 11,000
$NaBrO_3$	150.90	106.1	0.79	0.60	15 - 16,000
NaCNS	81.07	110.5	0.77	0.75	8 - 9,000
Na_2CO_3	53.00	124.1	1.47	1.6	5 - 6,000
NaCl	58.44	126.5	0.70	0.74	5 - 6,000
$NaClO_3$	106.44	115	0.75	0.6	10 - 11,000
$NaClO_4$	122.44	110	0.77	0.6	12 - 13,000
$NaCrO_4$	161.97	132	1.38	1.5	16 - 17,000
NaF	41.99	106	0.79	0.6	4 - 5,000
$Na_4Fe(CN)_6$	75.98	155	2.74	4.7	7 - 8,000
$NaHCO_3$	84.01	96.0	0.85	0.6	8 - 9,000
NaI	149.89	127.0	0.70	0.80	14 - 15,000
$NaNO_3$	84.99	123	0.72	0.36	8 - 9,000
NaOH	40.01	246.5	0.47	0.3	4 - 4,000
NaPic	251.09	81	0.97	0.7	25 - 26,000
Na_2SO_4	71.02	129.0	1.39	1.50	7 - 8,000
$Na_2S_2O_3$	79.06	135.0	1.36	1.60	7 - 8,000
$NiAc_2$	88.40	89.5	1.75	1.3	8 - 9,000
$NiBr_2$	109.27	127	1.34	1.6	10 - 11,000
$NiCl_2$	64.81	123.3	1.37	1.7	6 - 7,000
$Ni(NO_3)_2$	91.36	124.5	1.37	1.8	9 - 10,000
$NiSO_4$	77.39	100	2.7	1.6	7 - 8,000
$PbCl_2$	139.05	145.0	1.26	-7	13 - 14,000
$Pb(NO_3)_2$	165.60	135.7	1.32	0.89	16 - 17,000
RbBr	165.37	148	0.63	0.2	16 - 17,000
RbCl	120.92	153	0.62	0.7	12 - 13,000
RbI	212.37	145.3	0.64	0.65	21 - 22,000
RbOH	102.48	272	0.45	0.5	10 - 11,000
$SmBr_3$	130.02	140.2	1.63	2.9	12 - 14,000
$SmCl_3$	85.57	139.8	1.64	3.0	8 - 9,000
SmI_3	177.02	138.5	1.64	3.4	17 - 18,000
$SrAC_2$	102.86	101	1.63	2.0	10 - 11,000
$SrBr_2$	123.72	136.0	1.30	1.8	12 - 13,000
$SrCl_2$	79.27	136.0	1.30	1.74	7 - 9,000
$Sr(NO_3)_2$	105.82	131.8	1.34	1.5	10 - 11,000
TlCl	239.82	150.3	0.63	-1.3	23 - 25,000
$TlClO_3$	287.82	137.6	0.65	0.45	28 - 30,000
TlOH	221.38	276.1	0.45	0.45	22 - 23,000
YBr_3	137.59	141	1.63	2.8	13 - 14,000
YCl_3	65.09	136	1.67	3.5	6 - 7 000
YI_3	156.54	143.8	1.60	2.6	15 - 16,000
$ZnAC_2$	91.73	88	1.77	1.2	9 - 10,000
$ZnBr_2$	112.60	159	1.23	0.7	11 - 12,000
$ZnCl_2$	68.14	130	1.48	2.3	6 - 7,000
$Zn(NO_3)_2$	94.69	125	1.37	2.2	9 - 10,000
$ZnSO_4$	80.72	105	2.90	4.2	8 - 8,000
Me_3HNCl	95.56	123.6	0.71	0.76	9 - 10,000
Me_4NI	201.03	118.6	0.73	0.35	20 - 21,000
Me_4NPic	290.22	76	1.02	0.5	29 - 30,000
Et_4NI	257.15	108	0.78	—	25 - 26,000
Et_4NPic	346.34	63	1.18	—	34 - 35,000
Pr_4NI	313.27	100	0.83	—	31 - 32,000

Ac = Acetate Pic = Picrate
Et = Ethyl Pr = Propyl
Me = Methyl