

OPERATIONS MANUAL
SEA TEMPERATURE SYSTEM

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MOD. TW-1A

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Sept. 1976

This work was supported by the National Oceanic and Atmospheric Administration's Sea Grant College Program under Grant Number 04-6-158-44094 to Oregon State University.

INTRODUCTION

PURPOSE

The Model TW-1A sea temperature system was developed by Oregon State University for the U. S. Coast Guard so that the 13th District stations can report local sea temperature via teletype to National Weather Service forecast centers for their use in making coastal weather forecasts.

TYPE

A thermistor probe senses water temperature; the change in thermistor resistance with temperature unbalances a D.C. bridge circuit in a converter box and results in a voltage output which is linear with temperature over the range 32 - 68° F. The output voltage is read directly as temperature on an analog indicator meter at the station communications panel. The system requires 110v, 60 hz, single phase power at 0.1 amp. to the converter box only.

APPLICATION

Because the probe will normally be mounted in a bay or boat basin upstream from the river entrance, the surface water at that site may differ from the nearshore ocean surface water. By installing the probe near the bottom of the water column, nearshore ocean surface temperatures can be approximated. The closest comparison will occur at high slack tides when the sensing site is filled with ocean water.

EQUIPMENT

The thermistor probe, Fig. 1, consists of an epoxy encased bead with 50 feet of vinyl covered shielded two wire cable.

The converter box, Fig. 1, is a watertight aluminum box (with a neoprene gasket) that contains the printed circuit board, ON/OFF switch, fuse, and barrier strip. MS connectors are used for the input and output connections. Outside screw holes have been sealed with silicone grease. Conduit can also be used to feed the AC wires into the box.

The temperature is indicated on a 4-1/2 inch meter with scale markings from 30 - 70° F. A small board on the back of the meter contains a resistor and a 2.5 K potentiometer for calibration purposes. Press-on letters and numbers have been used for the meter dial scale markings. Figure 2 is the schematic diagram of the converter box.

Figure 1

Sea Temperature System Components

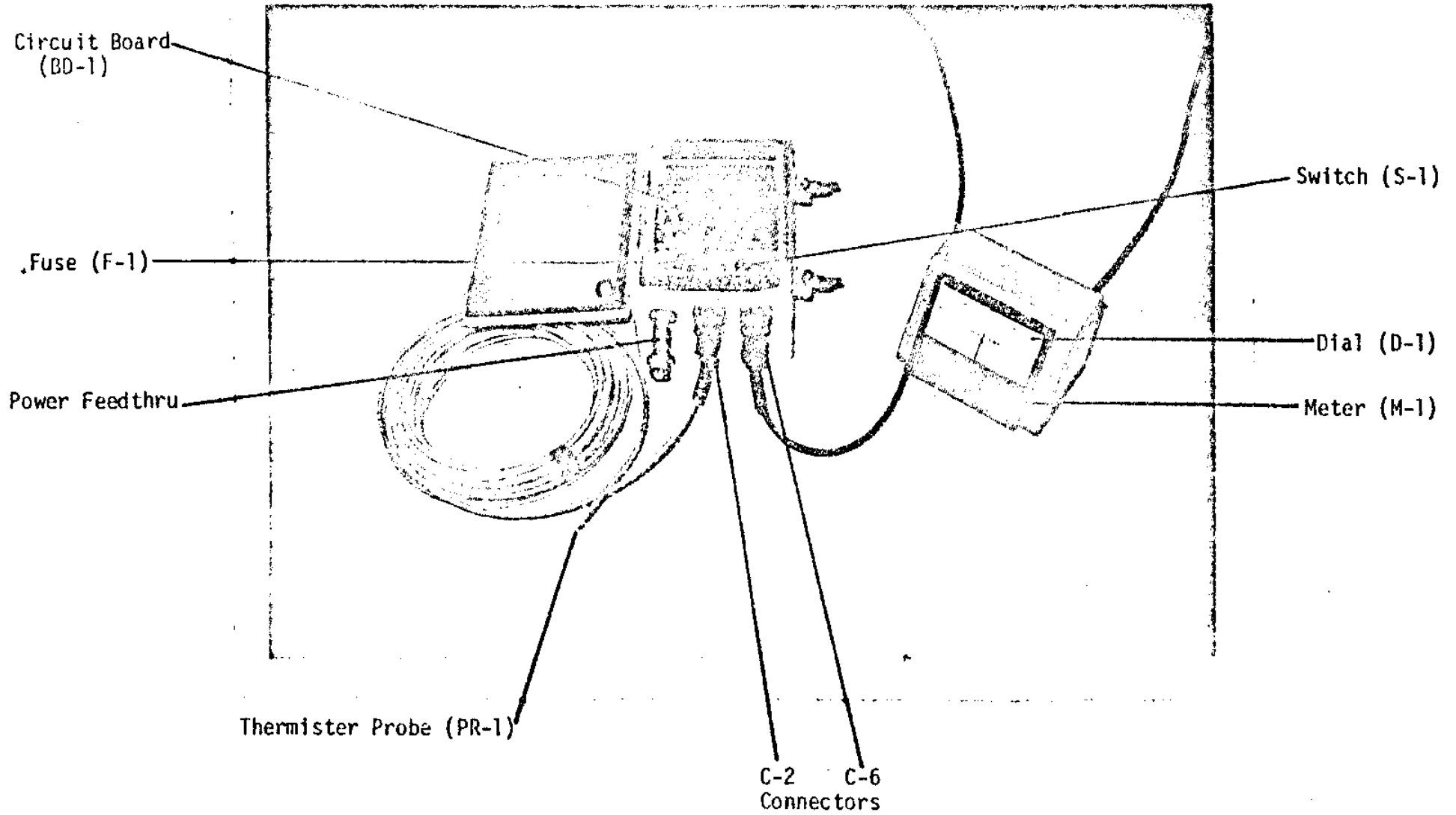
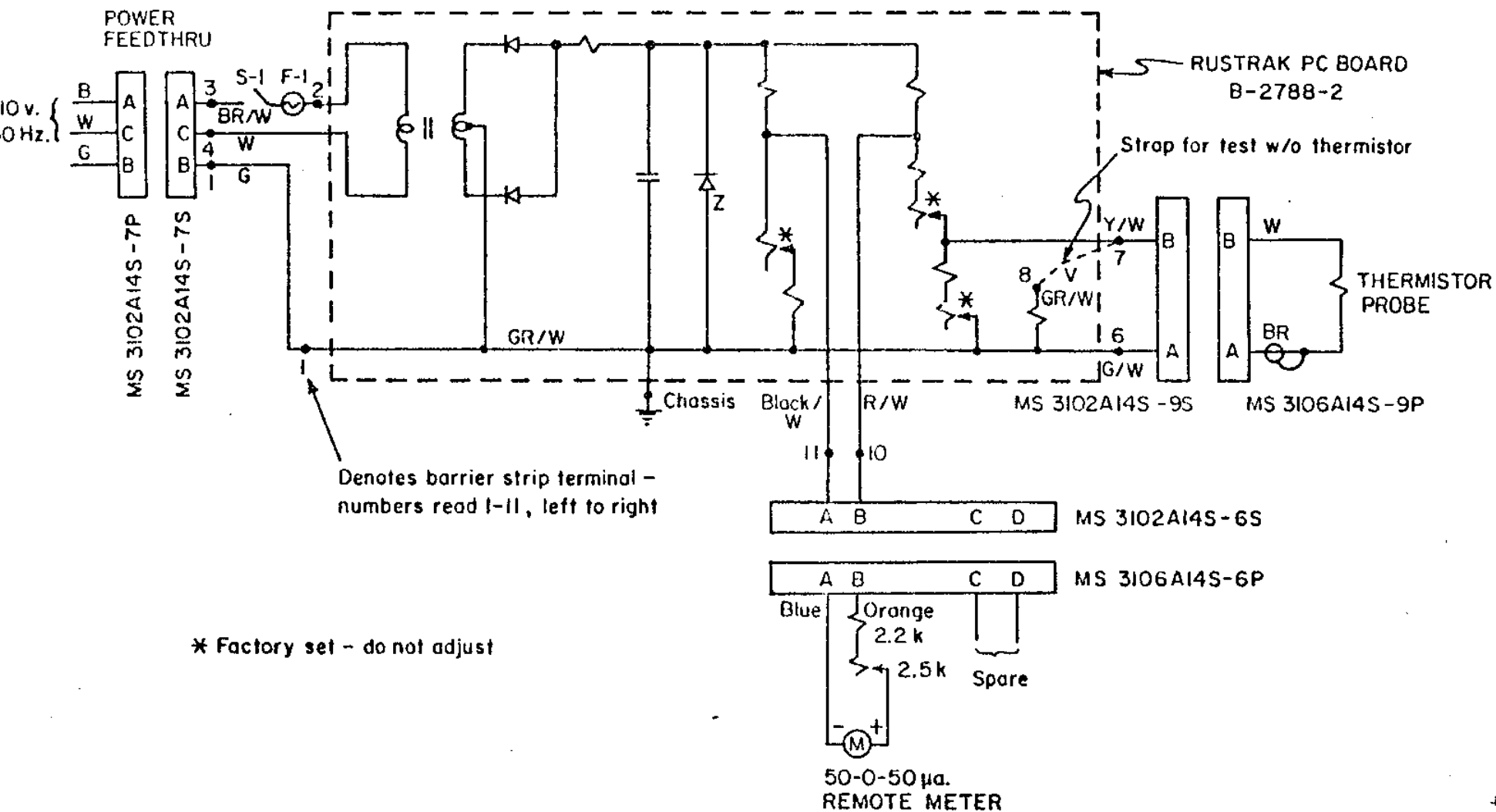


Figure 2

MODEL TW-1A CONVERTER BOX SCHEMATIC

18 January 1977



INSTALLATION

PIPE

The thermistor probe should be mounted inside a 1 or 2 inch pipe for protection as illustrated in Fig. 3. Mount the pipe one foot off the bottom as close to the ocean as possible such as on a piling or on the side boards of the covered moorage. Plastic (PVC schedule 80) 2 inch pipe is usually adequate for the upper portion. For unattached spans greater than 15 feet, 1" PVC clamped to and supported by 1/4" thick angle iron should be used. The lower foot of pipe should be brass and sealed with a threaded PVC or brass cap. Attach the brass pipe to the PVC pipe with a threaded coupling (standard pipe threads wrapped with Teflon tape). Upper sections of the plastic pipe can be glued together using socket type couplings. At the top of the pipe install a 90° elbow and a 2 by 3/4 inch reducing coupling. Fill only the brass portion with motor oil for greater conductivity. Anchor the pipe securely.

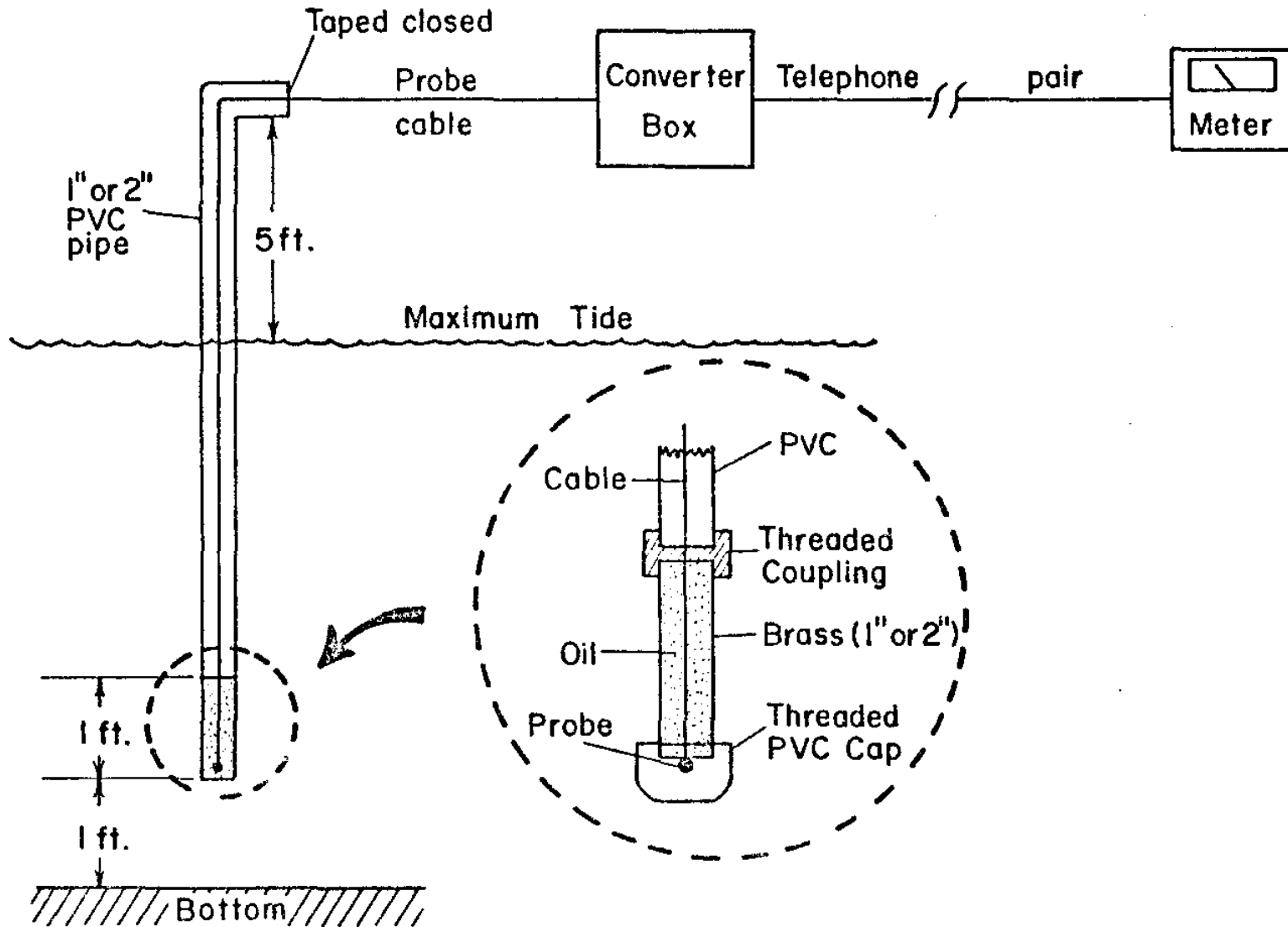
PROBE

Insert the probe into the pipe making sure the probe extends to the bottom of the pipe. Tape the probe cable as it leaves the pipe to minimize moisture condensation from the air inside the pipe. Attach the cable to the converter box using connector, C-2. For distances greater than 50 feet, connect RG58/U coax to the probe cable using BNC connectors UG88/U and straight adapter UG914/U. This additional coax cable will change the resistance of the input side of the bridge slightly, but distances of 100 feet or less will not affect the accuracy desired.

Fig. 3

INSTALLATION DIAGRAM

1 July 1976



CONVERTER BOX

The converter box should be mounted within 50 feet of the probe and reasonably close to AC power. Although the converter box is supposed to be water tight, it is best to mount it under cover. An electrical conduit containing 3 wires is recommended for power input, but a cord and 3 pin connectors (MS3106A14S-7P plug and MS3102A14S-7S socket) could also be used. Attach ground wires to terminals 1, 3 and 4 with spade lugs as shown in Fig. 2. Install a 2 wire telephone cable from the output connector C-6 to the nearest telephone terminal block. Connect telephone wires into communications room.

METER

The meter may be mounted in the communications panel (3 inch hole) or in a separate meter enclosure. Connect a short piece of wire or coax from the rear of the meter to the nearest telephone terminal.

CALIBRATION

The bridge circuit on the printed circuit board has been pre-calibrated for a 50 foot probe at the factory for temperatures between 32 and 68° F. DO NOT UNDER ANY CIRCUMSTANCES ADJUST THE 3 POTENTIOMETERS ON THE CIRCUIT BOARD. These silver colored pots are sealed with red glyptol upon factory adjustment.

A calibration field check can be made by turning power OFF, disconnecting lead 7 from the barrier strip (yellow wire) and shunting lead 8 (grey and white wire) to lead 7 (yellow and white wire) with the violet wire provided. Turn the power ON and adjust the 2.5K potentiometer on the back of the indicator meter to read 70.0° F. If it reads ~30° F., then the meter input leads are reversed. Reverse leads on back of meter, then adjust to 70.0° F. This adjustment compensates for the small added resistance due to the station telephone pair. After setting to 70° F., mark the position of the potentiometer with red glyptol or suitable sealant. Turn power OFF, disconnect shunt from terminal 7, tie down (violet wire) to lead 9 and reconnect lead 7 before turning power ON for operation.

OPERATION

After calibration, turn power ON, close cover and tighten two latch screws. The system should operate continuously without adjustment.

The communication watch stander should read the dial to the nearest degree and report sea temperature following the wave group on his 3 hourly teletype weather reports. He should also record the temperature on NOAA form 72-5A in the appropriate column.

Refer to Table 2 if problems occur.

Table 1.

TW-1A Converter Box Replaceable Parts

<u>Item</u>	<u>Description</u>	<u>Manufacturer</u>
BD-1	Board Assembly, B-2788-2	Rustrak, Gulton Industries Inc. East Greenwich, RI 02818
PR-1	Probe, thermistor, 1924- 50 foot	Rustrak
F-1	Fuse, 1/4A	Littlefuse
C-2	Connector, 2 pin MS3102A14S-6S	Amphenol
C-3 (if used)	Connector, 3 pin MS3102A14S-7S	Amphenol
C-6	Connector, 6 pin MS3102A14S-9S	Amphenol
M-1	Meter, 50-0-50 μ A	API, LFE Corporation Waltham, MA 02154
D-1	Dial, meter, 40 divisions 448-1001-40C6	API

Table 2
Trouble-shooting Guide

<u>Symptom</u>	<u>Probable Cause</u>	<u>Remedy</u>
Meter needle on 50° F No movement over several hours	Actual water temperature is 50° F	None
	110v AC power OFF	Flip station circuit breaker
	Power switch OFF	Turn ON (inside converter box)
	Bad fuse	Replace (inside converter box)
	Open BNC connector on meter enclosure	Resolder
Meter needle on 70° F	Open telephone pair	Repair
	Actual temperature 70° F	None
Meter needle on 30° F with test shunt connected	Test shunt connected between terminals 7 & 8 on barrier strip	Remove and attach probe
	Wrong polarity	Reverse input leads to meter
Meter needle off scale left	Input to converter box open	Connect thermistor
	Open connector	Resolder
	Open thermistor cable	Check continuity of thermistor cable, should be 2.5K ohms. If open, replace.

<u>Symptom</u>	<u>Probable Cause</u>	<u>Remedy</u>
Meter needle off scale right	Input to converter shorted	Check connector, repair Check resistance of thermistor cable, should be 2.5K ohms. If shorted, replace.
	Output shorted	Check connector, repair Check telephone pair, repair Check meter, replace Check potentiometer on back of meter, replace if shorted
Improper readings	Bad power supply	Check bridge voltage across zener diode. Should be $8 \pm 0.2v.$, otherwise replace circuit board.
	Potentiometers on circuit board out of adjustment	Send board to factory for recalibration. DO NOT ATTEMPT FIELD ADJUSTMENT.

