SCIENTIFIC INSTRUMENTS, INC. 4400 W. Tiffany Drive • Mangonia Park • West Palm Beach, FL 33407
407/881-8500 • Fax: 407/881-8556 • Telex: 51-3474

INSTRUCTION MANUAL
for
MODELS 1900 AND 1901
MICROPROCESSOR-BASED
TEMPERATURE INDICATORS

RECORD OF REVISIONS

REV.	DATE	DESCRIPTION	AFFECTED PAGES	AUTHORIZED BY
0	24 Jul 91	Initial Issue	---	JHR
A	02 Aug 91	Software Changes	---	CHG
B	16 Aug 91	Miscellaneous Changes	---	CHG
C	23 Aug 91	Miscellaneous Changes	---	CHG
D	09 Jul 92	Miscellaneous Changes	---	CHG

SCIENTIFIC INSTRUMENTS, INC.
MANUAL # A090-199

SCIENTIFIC INSTRUMENTS Inc. ®
West Palm Beach
Florida   33407

.D 27 VER. (DISK # 1)

Change NO. LTR		Description			Date	Approved
	A	ADDED MOUNTING SPECS.			3-10-92	
	B	DWG NO. WAS 020-098			7-7-92	
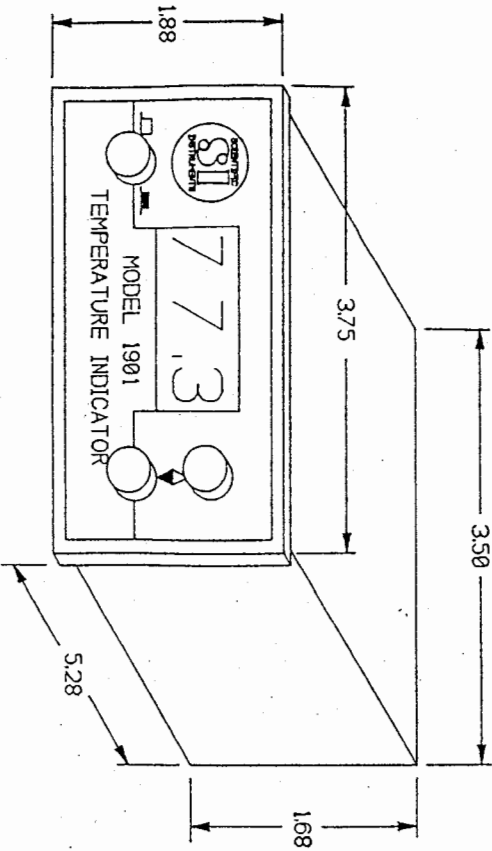
NOTES:

1. HOUSING IS SUPPLIED WITH 2 REMOVABLE MOUNTING CLIPS.

2. PANEL MOUNTING HOLE TO BE 3.65 +.00/-.01 WIDE X 1.80 +.00/-.01 HIGH.

1.88

3.75

3.50

5.28

1.68

MODEL 1901 TEMPERATURE INDICATOR

77.3

	Qty.	Material		Title		
		Product INSTR		OUTLINE / MOUNTING SPECIFICATIONS		
		Model 1900/1901	Scale NONE			
Finish						
				FSCM No. 53547	Size A	Dwg. No. 020-098-1
Dwn R.A. DOVE	9-19-91					Rev. B
Ctd.	9-19-91					Sheet 1 OF 1
Apd						

Qty.		
Decimal .XX +/-.015 .XXX +/-.005		
Fractional +/- 1/32		
Angular +/- 2 Deg.		

SECTION 1

GENERAL DESCRIPTION

1-1 INTRODUCTION

The Model 1900 Microprocessor-Based Temperature Indicator is a 3-digit instrument designed to operate in conjunction with a silicon diode sensor to furnish accurate temperature measurement over the range of 1.5 to 450 K. Three different types of silicon diodes can be accommodated. These are:

  a) Scientific Instruments, Inc. Model SI410,
  b) Lakeshore Cryotronics, Inc. Model DT470 and
  c) Laser Analytics, Inc. "Stabl-Temp".

Typical voltage-vs-temperature data for these specific sensors are stored in internal EPROMs to match the instrument to the actual sensor being used.

The Model 1901 Indicator has the added features of two alarm setpoints, two associated alarm relay outputs, and an RS232C interface port. A 0 to 1 volt DC analog output is also available as an option.

Two front-panel switches enable the user to access a "Single Point Calibration" (SpCal) function and to set the temperature alarm points. The SpCal function is a selectable positive or negative offset which is applied to the temperature reading.

1-2 SPECIFICATIONS

Sensor Excitation	10 Microamperes Constant Current.
Display	3-Digit LED.
Temperature Range	1.5 to 450 K.
Resolution	0.1 K from 1.5 to 99.9 K. 1.0 K from 100 to 450 K.
Accuracy (SpCal) *	±0.1 K from 1.5 to 99.9 K. ±1.0 K from 100 to 450 K.
Power Required	9 VDC @ 500 ma., via a furnished 120 VAC/9 VDC or 220 VAC/9 VDC power converter.
Alarm Outputs (1901 only)	Two SPDT Relays (C,NO,NC). 28 VDC @ 0.25a.
Alarm Setpoints (1901 only)	Two, via front panel switches.
RS232 Interface (1901 only)	a) Output of Temperature. b) External Setting of Alarm Setpoints.
Analog Output (1901 Option)	0 to 1 volt DC, corresponding to 0 to 450 K. (2K ohm minimum load)

* Single-Point Calibration (SpCal) is an integrated calibration function which enables the user to achieve the highest possible system accuracy at his most important temperature point.
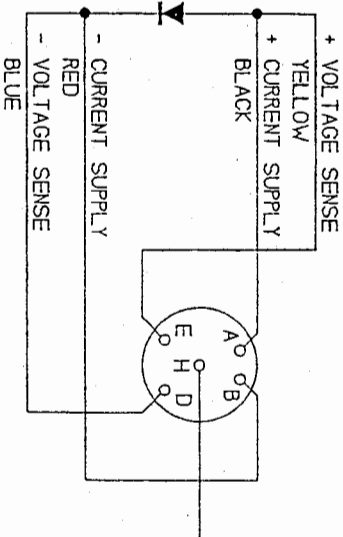
2-1 INPUT/OUTPUT CONNECTIONS

All input and output connections are made at the rear panel of the instrument:

a) Insert the plug from the power converter into the receptacle at the extreme right-hand side of the rear panel.

b) Wire the silicon diode sensor to the furnished 5-pin plug as follows:

```
+ VOLTAGE SENSE    YELLOW
+ CURRENT SUPPLY   BLACK
- CURRENT SUPPLY   RED
- VOLTAGE SENSE    BLUE
```

Insert the cable assembly into the receptacle on the rear panel.

c) Connect the conductors of the RS232 modular IDC cable assembly (Model 1901 only), to the host computer or terminal as follows:

```
BLK - Ground          GRN - Receive (In)
RED - Transmit (Out)  YEL - (No Connection)
```

Insert this plug into its corresponding receptacle on the rear panel.

d) The alarm relay outputs are available at the 6-pin terminal block (Model 1901 only). Pin assignments are as follows:

```
1 - Relay #1 NO    4 - Relay #2 NO
2 - Relay #1 C     5 - Relay #2 C
3 - Relay #1 NC    6 - Relay #2 NC
```

e) The analog output is available at a miniature double banana jack located between the sensor input and power converter receptacles.

2-2 OPERATING PROCEDURES

Several moments after power is applied to the instrument, it will assume its principal mode of operation which is to display temperature as sensed by the associated silicon diode. If desired, the operator can:

a) access a special diagnostic subroutine to check operational readiness of the instrument,
b) access the single point calibration mode, and
c) change temperature set points (if the instrument is a Model 1901).

The following paragraphs describe how all of these functions are accomplished.

2-2.1 Accessing the Diagnostic Subroutine.

a) Before applying power, press and release the "down" switch. Apply power and release the "down" switch. The instrument will now enter the diagnostic subroutine and all eight segments of all readout decades will be displayed.

b) Press the "down" switch again. The instrument will display a legend designating which particular silicon diode curve is being used in the temperature calculation software. legends are as follows:

```
410 - Scientific Instruments, Inc. Model S1410
470 - Lakeshore Cryotronics, Inc. Model DT470
LAS - Laser Analytics, Inc. "Stabl-Temp"
```

c) Press the "down" switch again. The instrument will display the version of software in the instrument.

d) Press the "down" switch again. The instrument will display a "d1" legend and output 0 volts at the analog output (assuming this option is installed).

e) Press the "down" switch again. The instrument will display a "d2" legend and output 1 +/- 0.010 volt at the analog output.

f) Press the "down" switch once more to return the instrument to its normal display of temperature.

2-2.2 Accessing Single Point Calibration Mode.

a) Before applying power, press and hold the red "up" switch. Apply power and release the "up" switch. The temperature readout will now display the current single point calibration value.

b) To change this value, immediately press and hold both the "up" and "down" switches. When the readout begins to flash, release both switches and press the "up" switch to increase the calibration setting or the "down" switch to decrease the setting. When either switch is pressed once and released, the calibration value changes by one unit. If either switch is held for one second, the value changes rapidly.

c) Three seconds after either switch is released, the new calibration value is stored (and displayed for an additional two seconds), and then temperature is displayed again.

Accessing Set Point Mode (Model 1901 only).

NOTE: The function of the set points is to control operation of the two internal alarm relays. If the temperature rises to, or above the set point established for a given relay (i.e. set point #1 for relay #1; set point #2 for relay #2), that relay will energize. If the temperature falls below the set point, that relay de-energizes.

a) With the instrument in its normal mode of operation (i.e. displaying temperature), press and release the "up" switch to display set point #1 or the "down" switch to display set point #2.

b) To change either set point, press and release the appropriate switch, then immediately press and hold both the "up" and "down" switches. When the readout begins to flash, increase the set point by pressing the "up" switch or decrease the set point by pressing the "down" switch. When either switch is pressed and released once, the set point changes by one unit. If either switch is held for one second, the value changes rapidly.

c) Three seconds after either switch is released, the new set point is stored (and displayed for an additional two seconds), and then temperature is displayed again.

2-3 CALIBRATION PROCEDURES

By means of the front panel switches, the operator can access the sensor curve data stored in the internal EPROMs and select a different curve, if he so desires. In addition, through the use of a sensor simulator, the operator can reset an internal reference voltage. The following paragraphs describe how these functions are accomplished.

2-3.1 Accessing EPROM Sensor Curve Data.

a) Before applying power, press and hold both the "up" and "down" switches. Apply power. After 2 seconds, release both switches, then press and hold the "up" switch. After 2 seconds, release the "up" switch the press and hold it again for 2 seconds.

b) When the "up" switch is released, the applicable legend will be displayed to signify which silicon diode curve is being used. The display will flash for 2 seconds if neither switch is again pressed.

NOTE: The display will cycle through its programmed operations (briefly showing reference voltage) until the legend "CAL" is displayed. At that time, remove power unless a different curve is to be selected.

c) To select a different curve, press and release either the "up" or "down" switch while the display is flashing. At this time, the next sequential legend will be displayed. Subsequent pressing and releasing of either switch will cause the instrument to toggle through each curve legend. When the desired legend is displayed, do not press either switch; simply wait until the display cycles through its programmed operations until the legend "CAL" is displayed. At that time, remove power and the selected curve will be entered into memory.

WARNING: DO NOT PRESS BOTH SWITCHES WHEN THE "CAL" LEGEND IS DISPLAYED, OTHERWISE THE INSTRUMENT WILL RECALIBRATE ITSELF AND ITS TEMPERATURE READINGS WILL NO LONGER BE VALID.

2-3.2 Setting of Reference Voltage.

a) Connect a 1 Megohm decade resistance box (General Radio Model 1433-B, or equivalent) to the sensor input receptacle in lieu of the silicon diode sensor.

b) Connect a digital voltmeter (Fluke Model 8800A, or equivalent) across the decade box terminals.

c) Perform steps "a" and "b" of paragraph 2-3.1.

d) When the legend "CAL" is displayed, set the simulated sensor input to 1.000 +/- 0.005 volts by means of the decade box.

e) Press both the "up" and "down" switches. The instrument will then accept this new reference voltage and return to the temperature display.

WARNING: PERFORM THIS PROCEDURE ONLY WITH A 1.000-VOLT INPUT, OTHERWISE INACCURATE TEMPERATURES WILL BE DISPLAYED.

2-4 RS232 OPERATION(Model 1901 Only)

a) Connect the conductors of the RS232 modular IDC cable assembly to the computer as follows:

BLK - Ground   GRN - Receive (In)
RED - Transmit (Out)   YEL - (No Connection)

Insert the cable assembly receptacle into the RS232 port located at the extreme left-hand side of the rear panel.

b) Set the computer to a baud rate of 9600, no parity, 8 data bits and 1 stop bit.

2-4.1 Temperature Data.

a) The Model 1901 will transmit the current temperature reading to the host computer when a "T" and carriage return ..<CR>.. are received.

NOTE: The instrument responds to both upper-case and lower-case letters.

2-4.2 Setpoint Data.

a) The Model 1901 will accept a new alarm setpoint value for the selected relay when the host computer transmits the following code:

S1,N,<CR>

In which:

    S1 indicates that the setpoint is for relay # 1.
        (S2 is used for relay # 2).

    N is the temperature setpoint in degrees Kelvin (to
        tenths of degree resolution), with the least
        significant digit being the tenth's digit.

    <CR> is a carriage return.

Example: a setpoint value of 12.3 K for relay # 2 should
        be transmitted as:

            S2,123,<CR>

Since the maximum range of the instrument is 450 Kelvin, the
largest alarm setpoint value that will be interpreted
correctly is 4500.

b)   The Model 1901 will transmit the current setpoint value for the
    selected relay when the host computer transmits the following
    code:

        S1,<CR>   or   S2, <CR>

as applicable.