INSTRUCTION MANUAL
FOR
MODELS ~~1900 AND~~ 1901
MICROPROCESSOR-BASED
TEMPERATURE INDICATORS

SCIENTIFIC INSTRUMENTS, INC.
MANUAL #090-199 Rev I

Figure 1

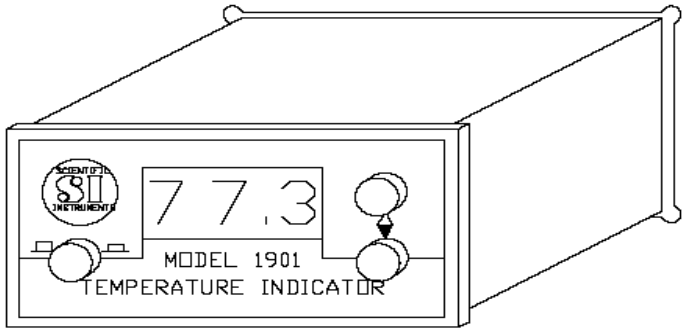
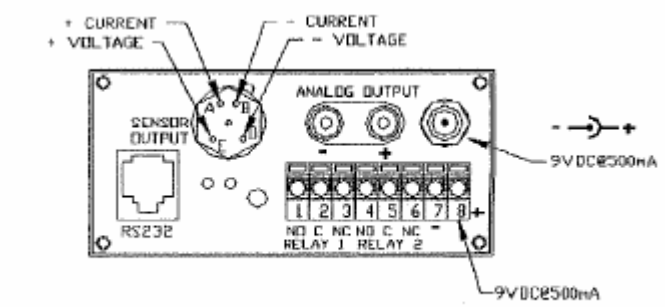


Figure 2



Example: A set point value of 12.3K for relay #2 should be transmitted as:

S2123 <CR>

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

b) The Model l901 will transmit the current set point value for the selected relay when the host computer transmits the following code:

S1 <CR> or S2 <CR>

as applicable.

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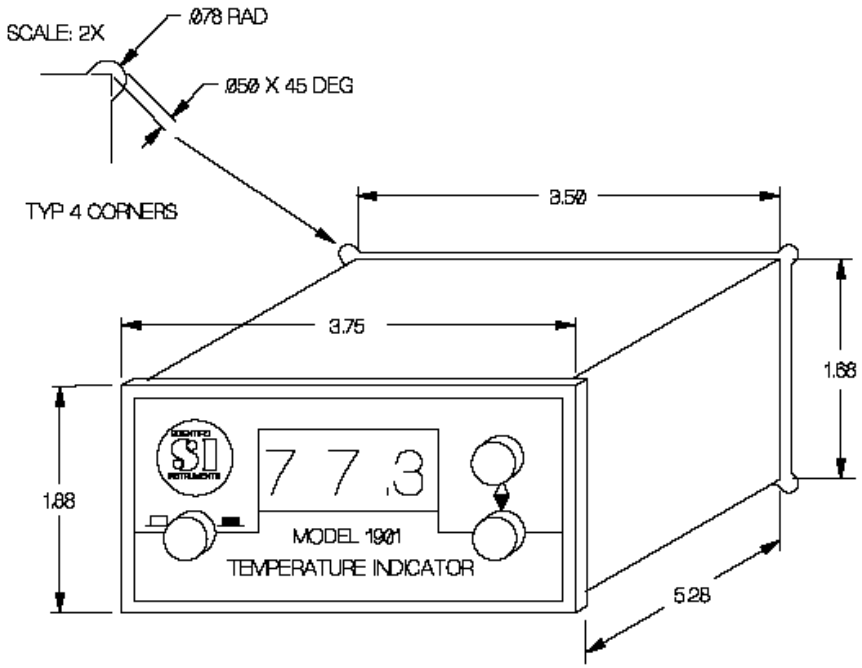


NOTES:

1. HOUSING IS SUPPLIED WITH 2 REMOVABLE MOUNTING CLIPS.
2. PANEL MOUNTING HOLE TO BE 3.56 +.02/-.00 WIDE X 1.72 +.02/-.00 HIGH.

WARNING: DO NOT PRESS BOTH SWITCHES WHEN THE 'CAL' LEGEND IS DISPLAYED WITHOUT THE PROPER EQUIPMENT CONNECTED, OTHERWISE THE INSTRUMENT WILL RECALIBRATE ITSELF, AND ITS TEMPERATURE READINGS WILL NO LONGER BE VALID.

2-3.2 Calibration 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 ± 0.0005 volts by means of the decade box.
e) Press both the 'up' and 'down' switches. The instrument will accept the new reference voltage and return to the normal temperature display.

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

2-4 RS-232 OPERATION (Model 1901 Only)

a) Connect the conductors of the RS-232 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 RS-232 port located at the lower left-hand side of the rear panel.

b) Set the computer to a 9600 baud rate, 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. All characters received are also echoed back to the host computer.

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

2-4.2 Set Point Data

a) The Model l901 will accept a new alarm set point value for the selected relay when the host computer transmits the following code:

S1N <CR>

in which:

S1 indicates that the set point is for relay #1. (S2 is used for relay #2).
N is the temperature set point in degrees Kelvin (to tenths of degree resolution), with the least significant digit being the tenth's digit.
<CR> is a carriage return.

2-2.3 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 instruments 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 view available curves stored in internal EPROM space (if applicable), and also select a different curve. In addition, the instrument can be recalibrated (which in effect, sets the internal reference voltage). The following paragraphs describe how these functions are accomplished.

2-3.1 Accessing Sensor Curve Choice (and Checking Voltage Reference Setting)

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

b) When the '**up**' switch is released, (with multiple curves) the applicable legend will be displayed to signify which silicon diode curve is being used. The display will flash for two seconds if neither switch is pressed again. If the curve is to be changed, quickly press one of the switches, as described in step c, below.

NOTE: If no key is pressed, the display will cycle through its programmed operations (briefly showing reference voltage) until the legend **'CAL'** is displayed. At that time, remove power, unless the instrument is to be recalibrated.

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 and the legend **'CAL'** is displayed. At that time, remove power and the selected curve will be put into effect.

SECTION I

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 450K. Six different types of silicon diodes can be accommodated. These are:

a) Scientific Instruments, Inc. Model Si410,
b) Scientific Instruments, Inc. Model Si430,
c) Scientific Instruments, Inc. Model Si440,
d) Lake Shore Cryotronics, Inc. Model DT470,
e) Lake Shore Cryotronics, Inc. Model DT670, and
f) Scientific Instruments, Inc. Model 110-234 (CTI).

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

The Model 1901 Indicator has two alarm set points, two associated alarm relay outputs, and an RS-232C interface port. A 0 to 1 volt DC or a 0 to 4 volt DC analog output representation of temperature is 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 450K
Resolution	0.1K from 1.5 to 99.9K 1.0K from 100 to 450K
Accuracy (SpCal)*	± 0.1K from 1.5 to 99.9K ± 1.0K from 100 to 450K
Power Required	100-230VAC
Alarm Set Points (1901 Only)	Two via front panel switches
Alarm Outputs (1901 Only)	Two SPDT relays (C,NO,NC) 28 VDDC at 0.25a
RS-232 Interface (1901 Only)	a) Output of Temperature b) External setting of Alarm Set Points
Analog Output (1901 Option)	0 to 1 volt DC or 0 to 4 volt DC, corresponding to 0 to 450K (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 the most important temperature point.

SECTION II

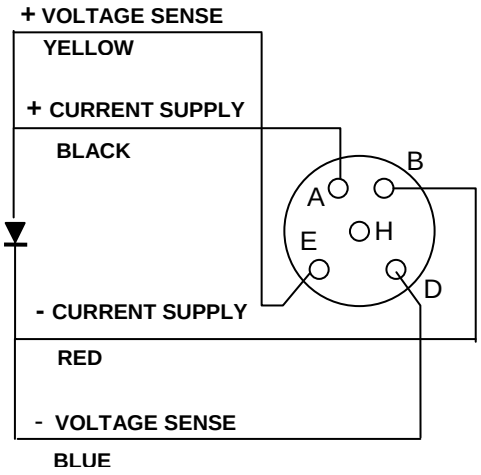
OPERATION

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 or use a 9 volt DC at 500 milliamps input, located at pin 7(ground) and pin 8 (positive) of terminal block.

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



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

c) Connect the conductors of the RS-232 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 the cable assembly receptacle into the RS-232 port located at the lower left-hand side of the rear panel.

d) The alarm relay outputs are available at the 8-position terminal block (Model 1901 Only). Pin assignments are as follows:

1 - Relay #1 NO	4 – Relay #2 NO	7 - Ground (- power input)
2 – Relay #1 C	5 – Relay #2 C	8 - Positive (+ power input)
3 – Relay #1 NC	6 – Relay #2 NC	

* Please refer to Figure 2 for rear panel configuration.

2-2 OPERATING PROCEDURES

Several moments after power is applied to the instrument, it will assume its normal 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 verify instrument operation,
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 these functions are accomplished. Note that some versions of the instrument have only one sensor curve stored in EPROM; with these the instructions for multiple curves do not apply.

2-2.1 Accessing the Diagnostic Subroutine

a) **Before** applying power, **press and hold** 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; (if applicable) 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 Si410
430 - Scientific Instruments, Inc. Model Si430/Si440
470 - Lakeshore Cryotronics, Inc. Model DT470
670 - Lakeshore Cryotronics, Inc. Model DT670
CTI - Scientific Instruments, Inc. Model 110-234 (CTI)

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

d) **Press** the '**down**' switch again. The instrument will display a 'dl' 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 (or 4 volts, if that option is chosen) 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 setting, or **press** 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.