

# System Thermometers

- ▲ Models for Thermistor & Platinum RTDs
- ▲ Accuracy to 0.01°C, 0.001°Resolution
- ▲ 12 Individually Programmable Channels



*For many years Instrulab has been known for its design and manufacture of high accuracy, rugged Digital Temperature Indicators. These fine instruments have found use in metrology labs around the world. They are trusted not only for their high accuracy, but also for their day to day and long term stability. The United States Navy uses them to calibrate their "on line" temperature measuring devices, in the lab and on ship-board where environments are certainly less than ideal.*

## System Thermometers

Many industrial applications now demand accuracies which heretofore were found only in the metrology lab. But in addition to high accuracy, these applications require multiple inputs, multiple modes of operation and system capabilities. Instrulab System Thermometers were designed to meet these requirements with a variety of operating modes.

To meet the rigors of industrial applications, these instruments are housed in a metal case which will stand up to rough handling as well as provide reliable operation in electrically noisy environments. For accuracy and stability, critical analog components are aged at elevated temperatures. Each instrument is temperature cycled in a chamber to ascertain that specifications are fully met.

## Designed to be Versatile

The Instrulab 3312A Thermistor and 4312A Platinum RTD System Thermometers are designed to be versatile. They can operate in any of four modes; as a temperature monitor, as a calibrator, as a stand alone acquisition system or as an intelligent front end for an IBM PC. They accept up to 12 sensors with each input channel characterized for scan/skip, sensor calibration, units and resolution. A two line by 40 character, backlit LCD display is employed. All functions and setup programming are accessed via the front panel keypad and display using a "computer-like" menu.

### As a Monitor

The inherent high accuracy along with "scan/skip" and "monitor channel" capability make these instruments ideal for temperature monitoring applications.

Scan/skip allows each channel to be active or inactive as required. If, after a test has been initiated, you decide that the information from a specific channel is no longer of interest, then that channel can be skipped. If the data from a specific channel becomes critical, simply depress the appropriate channel key and its data will be continuously displayed in a separate *monitor channel* display area. As an added feature, this "monitor channel" is updated more frequently than the scanned channels to allow you to more closely monitor this critical temperature. To change the monitored channel, simply select another channel.

### As a Calibrator

The 3312A and 4312A are ideally suited to function as "working" calibration instruments. One input may be designated as the reference channel, set to read temperature, and connected to an appropriate secondary or working standard sensor, while the other 11 channels are set to measure resistance and connected to sensors that are to be calibrated. Using the reference channel as the "monitor channel", the measured temperature is displayed continuously while the resistance of the other 11 sensors are being measured. By placing the reference sensor and the sensors to be calibrated in a stable bath and measuring the resistance at known temperatures, an R vs T table can be calculated for the uncalibrated sensors. This calculation may be computer aided through the use of appropriate software. Contact factory or your nearest representative for details.

06/05/91	14:35:00	Data	Average	Minimum	Maximum	
		Ch 0	-123.44 C	-123.40 C	-123.35 C	-123.51 C
		Ch 1	835.876 F	825.994 F	820.234 F	832.768 F
		Ch 2	836.598 F	827.153 F	821.189 F	833.554 F
		Ch 5	614.33 K	615.05 K	612.47 K	616.77 K
		Ch 6	107.79 O	107.78 O	107.77 O	107.78 O

A. Real Time

DATA		Ch00 C	Ch01 F	Ch02 K	Ch09 F	Ch10 C	Ch11 O
06/05/91	17:20:00	387.098	583.441	273.16	-195.223	12.55	238.54
06/05/91	18:20:00	386.117	588.234	273.16	-195.007	12.58	238.55
06/05/91	19:20:00	386.257	586.498	273.16	-195.010	12.57	238.54
06/05/91	20:20:00	386.345	587.668	273.16	-195.015	12.56	238.53
06/05/91	21:20:00	387.398	587.111	273.16	-195.018	12.56	238.54
06/05/91	22:20:00	387.768	587.175	273.16	-196.200	12.55	238.55
06/05/91	23:20:00	387.558	587.173	273.16	-196.111	12.57	238.56
06/06/91	00:20:00	387.456	587.171	273.16	-195.105	12.56	238.55
06/06/91	01:20:00	387.505	587.227	273.17	-195.117	12.56	238.54

B. Measured Data History

### As a Stand Alone System

Instrulab System Thermometers may be used as a stand alone data acquisition system for measuring and storing up to 100 temperature readings per channel. Maximum, minimum and average temperatures along with a time signature are also stored. Data can be printed out using a serial (RS-232C) or a parallel (Centronics®) printer at preprogrammed time intervals, or manually using either of two formats shown above.

- A. **Real Time** printout with time, channel number, data, average, minimum and maximum temperature for all active channels.
- B. **Measured Data History** Printout for all active channels using a 132 column format. Average, maximum, and minimum may also be printed using this format.

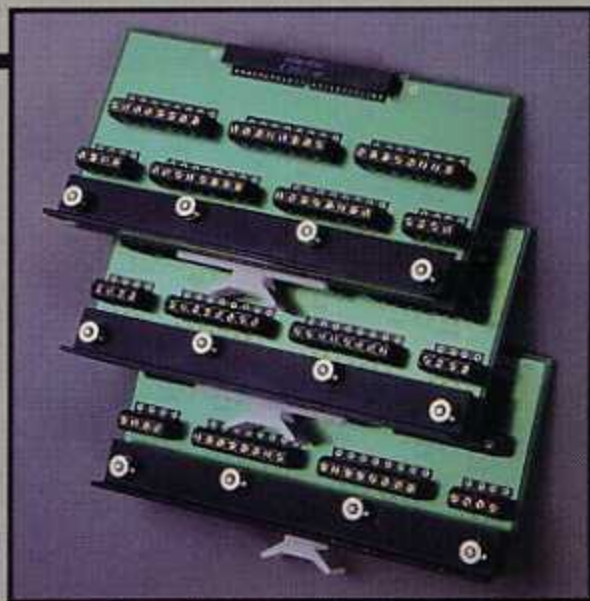
### As An Intelligent Front End for a PC

The 3312A and 4312A are designed to save PC time by measuring, calculating and storing data unattended, ready to send on demand.

System Thermometers equipped with optional RS-232C and/or IEEE-488 interfaces can send "real-time" or "stored" data directly to the computer (with supplied software) for further analysis. In addition, the computer can store all the required parameters for a specific test (time interval, measurement units, resolution, etc.) and sensor constants for a specific sensor connection card and download this information as required. When the instruments are used in repetitive multiple test setups, the ability to download program information is a real time-saver.

## Multiple Test Set-Ups

Multiple Sensor Connection Cards are convenient when using these instruments for multiple applications. Since all information for a specific "set-up" may be stored in your computer, simply plug-in the Sensor Connection Card with the appropriate sensors, download the required information and the system is ready to use.



# EASY TO CONNECT

Adding or changing sensors is quick and easy. Sensors are connected to convenient terminal strips on a unique sensor connection plug-in card. This card is inserted into the rear of the instrument without removing the case. Sensor cables are strain relieved to maintain integrity of connections.

Complete test setups may be changed by replacing the sensor connection card with another pre-wired card. When combined with the ability to download entire programs from a computer, this feature becomes a great time saver.



## OPTIONS

Any combination of options may be ordered; however, options 14, 15 and 23 may not be operated at the same time.

### **Rack/Panel Adapters (pair) Option 06**

Allows case to be flush mounted in either a rack or a panel.

### **Analog Output Option 08**

#### **Linearized**

**Output:**  $\pm 4.095$  VDC in 1 mV steps

**Accuracy:**  $\pm(0.1\%$  of reading +2 LSD)

**Connection:** Rear panel plug-in terminal block

**User Selects:**

1. Engineering units as selected by channel setup
2. Zero offset:  $\pm$  full scale
3. Resolution:  
1 mV = 0.001  
1 mV = 0.01  
1 mV = 0.1  
1 mV = 1  
1 mV = 10

### **RS-232C Interface Option 14**

Allows use with computer, terminal or printer. Selectable baud rate, bits/character, parity, stop bits, and echo on/off. Data can be transmitted by computer control, continuously or at programmed time intervals as determined by menu set-up. Program setups, including sensor coefficients, may also be transmitted to computer for subsequent downloading. Connector: 9 pin "D" (female).

### **IEEE-488 Option 15**

Allows use with IEEE-488 compatible computer or controller. Selectable primary address from 00 to 30. Program setup, including sensor coefficients, may be

uploaded/downloaded. Subset: SH1, AH1, T5, TE0, L4, LE0, SR1, RL0, PP0, DC1, DT0, C0, E2. Connector: 24 pin (female).

### **Parallel Printer (Centronics) Option 23**

Allows system to output to a printer using either an 80 or 132 column format. Date, time, measured data ( $^{\circ}$ C,  $^{\circ}$ F, K,  $\Omega$ ), minimum/maximum, and average data are recorded at programmed time intervals as determined by menu set-up. Connector: 25 pin "D" (female).

### **4 Wire Connections Option 24**

For use with Model 3312A when sensors with 4 leads are used to eliminate the effect of lead wire resistance. Important when sensors have greatly different lead lengths from channel to channel. Also recommended when glass bead thermistors are used for better accuracy and stability.

## ACCESSORIES

### **Sensor Connection Card**

Spare Card for Multiple Installations.

**4 Wire Connections** P/N 158-0366

**2 Wire Connections** P/N 158-0367

**IEEE-488 Cable; 2m** P/N 163-0110

**RS-232C Cable (9M to 9F); 6ft** P/N 163-0114

Cable adaptor (9M to 25F) P/N 163-0115

**Centronics Cable (25M to 36M); 6ft.** P/N 163-0112

## HOW TO ORDER

3312A or 4312A —   —   —

Options

Standard instrument is supplied with one output/interface option of your choice. Please specify.

# Specifications

Specification	Model 3312A	Model 4312A
Sensor Requirements	400 Series (or equal) Thermistor ( $R_t = 2,252\Omega @ 25^\circ\text{C}$ )	100 $\Omega$ Platinum RTD
Sensor Excitation Current	30 to 240 $\mu\text{A}$	1 mA (nominal)
Instrument Measurement Range	-5 $^\circ\text{C}$ to +105 $^\circ\text{C}$ 23 $^\circ\text{F}$ to 221 $^\circ\text{F}$ 268K to 378K 130 $\Omega$ to 9,999.9 $\Omega$	-189 $^\circ\text{C}$ to +500 $^\circ\text{C}$ -308 $^\circ\text{F}$ to +932 $^\circ\text{F}$ 84K to 773K 0 to 340 $\Omega$
Resolution	— Temperature .01 or .001, $^\circ\text{C}$ , $^\circ\text{F}$ or K (by menu selection) — Resistance .01 $\Omega$ to 999.99 $\Omega$ , .1 $\Omega$ to 9,999.9 $\Omega$ (autoranging)	.01 or .001, $^\circ\text{C}$ , $^\circ\text{F}$ or K (by menu selection) .001 $\Omega$
Instrument Accuracy (@25 $^\circ\text{C}$ + 5 $^\circ\text{C}$ ambient)	— Temperature $\pm 0.010^\circ\text{C}$ (0 $^\circ\text{C}$ to 100 $^\circ\text{C}$ ) — Resistance $\pm .004\%$ of reading + 4 digits	$\pm 0.010^\circ\text{C}$ to +200 $^\circ\text{C}$ $\pm 0.015^\circ\text{C}$ to +500 $^\circ\text{C}$ $\pm 0.003\%$ of reading or .005 $\Omega$ (whichever is greater)
Input Channels	12 — 2 wire (4 wire optional)	12 — 4 wire
Calibration	NIST (NBS) traceable to ITS-90 Recommended recalibration interval, 1 year	
Display Rate	From 1 Sec/channel to 5 Sec/channel (by menu selection)	
Scan Rate	2 channels/second, nominal, fixed	
Display	2 line by 40 character, supertwist, backlit LCD using alphanumeric for data and menu	
Measurement Technique	Multi-cycle ratiometric with auto-zero and thermal emf offset correction	
Data Memory	Battery backed, minimum 5 years. Backup includes calendar, clock history min/max and average data along with all programmed data.	
Operating Environment	+5 $^\circ\text{C}$ to +45 $^\circ\text{C}$ < 80% RH	
Long Term Stability	< 0.01 $^\circ\text{C}$ for 1 year	
Temperature Coefficient (Ref: 25 $^\circ\text{C}$ )	< 0.001 $^\circ\text{C}/^\circ\text{C}$	
Power Requirements	115/230 VAC switch selectable on rear panel 50/60 Hz, 10 VA Built in RFI/EMI line filter	
Dimensions	4 5/8" High x 10 1/4" Wide x 10 1/2" Deep, Metal Case	
Weight	8 lbs (Net) 10 lbs (Shipping)	

## Our Warranty

Instrulab warrants its products to be free from defects in material and workmanship for one year after date of shipment, provided the units have been used within published ratings. The warranty is limited to our repairing or replacing without charge, F.O.B. our factory any defective product if returned to our plant, transportation prepaid. No other representation or warranty, either expressed or implied, is made, and in no event shall Instrulab be liable for consequential or other damages.

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