DAS-TC/B

16-Channel Thermocouple Voltage Board

- Thermocouples connect directly to the PC without external signal conditioning
- J, K, T, E, R, S, and B thermocouples can be mixed with voltage and millivolt inputs
- Onboard microprocessor linearizes and converts readings to degrees or volts
- Optional per channel averaging
- Resolution greater than 15 bits (<0.1°C for J type)
- High accuracy and repeatability
- Automatic cold junction compensation
- Open thermocouple detection
- Programmable line rejection rates for high noise immunity
- Basic Function Call Driver included
- Up to 100 samples/second
- Windows- and DOS-based DataLogger utilities
- Two options for attaching signals, each with an isothermal bar with embedded CJC sensor
  - Separate box with screw terminal connections and plastic enclosure, or
  - Screw terminal connector that plugs onto the back of the DAS-TC/B
- 32-bit DriverLINX drivers plus a suite of bundled software including ExceLINX, TestPoint, and LabVIEW drivers

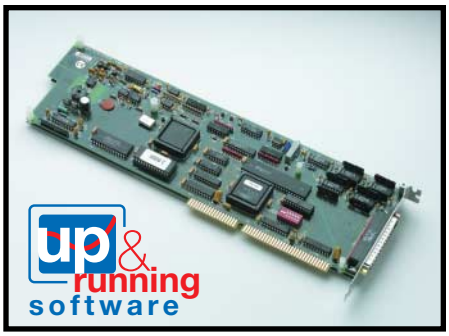
Ordering Information

DAS-TC/B 16-Channel Thermocouple Input Board with the Standard Software Package

Measure temperature with high accuracy and repeatability

PCI/ISA/PCMCIA

Functional Description



Use the DAS-TC/B to measure temperature where high accuracy and repeatability are required. The onboard microprocessor will have you up and running in minutes. This easy-to-use board allows you to measure almost any mix of thermocouples (J, K, T, E, R, S, and B) with millivolt and volt inputs.

Up to 16 differential inputs are provided, as well as one cold junction compensation (CJC) sensor input. Automatic calibration, gain selection, CJC, thermocouple linearization, conversion to degrees or volts, and averaging are performed by the onboard microprocessor.

The heart of the measurement section is a voltage-to-frequency (V/F) converter. The V/F converter allows highly accurate and stable thermocouple readings even in noisy environments. Programmable rejection rates can be selected to match the line voltage for best noise immunity. The input and measurement section is also isolated from the computer to prevent damage to the computer from high common mode voltages.

A configuration utility is supplied with the DAS-TC/B that allows you to set up each channel for thermocouple type or voltage input, °C or °F, number of readings to average, and the board's rejection rate. This configuration file is downloaded into memory on the DAS-TC/B upon initialization of the board. The PC initiates a scan by sending a command to the DAS-TC/B indicating the channels to scan and the acquisition mode to use. Channel readings proceed at the rate determined by the user-programmable rejection rate. The reading for each channel is then corrected for any gain or offset errors. For thermocouple inputs, the onboard microprocessor converts the readings to temperature measurements and adjusts for the CJC reading. To convert the raw counts to temperature measurements, the controller refers to look-up tables for each thermocouple stored in ROM. The look-up tables optimize accuracy by using more reference points along ranges of greatest temperature versus voltage change than along ranges of minimal change. This temperature reading is then converted to °C or °F. For voltage inputs, the count is converted to a voltage reading according to the gain configured for that channel. Once the scan is complete and the readings have been converted to degrees or voltages, the DAS-TC/B issues an interrupt and transfers all measurements to the PC.

The DAS-TC/B is calibrated automatically upon initialization and periodically thereafter. A precision voltage reference is switched in to determine the gain error and offset coefficients. These coefficients are stored in the onboard memory and are used to adjust the measurements of the DAS-TC/B. The CJC sensor is read at initialization and during calibration, and this value is also stored in memory.

To connect signals to the DAS-TC/B, you can use the STA-TC/B or the STC-TC/B accessories. Both accessories provide the same functionality, but in different form factors. Both accessories provide screw terminal connections for all I/O lines of the DAS-TC/B. The screw terminals are located on top of an isothermal bar. This sensor measures the contact temperature. Pull-up resistors and switches are provided on each channel for enabling or disabling open thermocouple detection. This insures that all connections are made at the same temperature. A CJC sensor is embedded in thermal compound inside the isothermal bar.

ACCESSORIES AVAILABLE

C1800	DAS-TC/B to STA-TC/B Cable
MS-TC/B	Upgrade to the latest version of DriverLINX software and hardware manuals for DAS-TC/B
STC-TC/B	Screw Terminal Connector
STA-TC/B	Screw Terminal Accessory Board
TESTPOINT	TestPoint Software Package

APPLICATIONS

- Temperature monitoring
- Environmental testing
- Process monitoring
- Product reliability testing
- Laboratory experimentation
- Temperature logging

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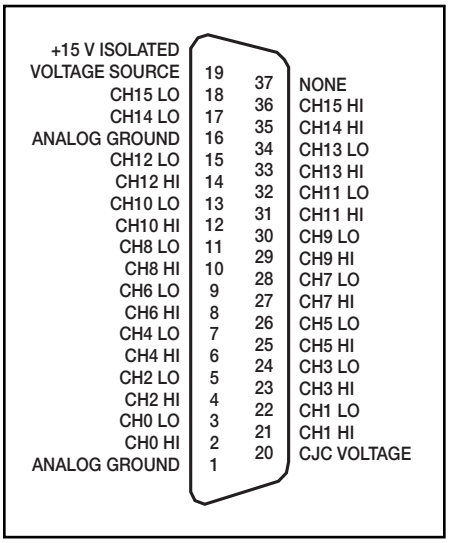
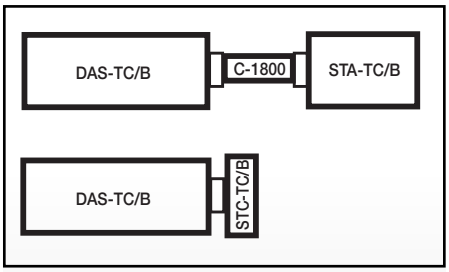
DAS-TC/B

16-Channel Thermocouple Voltage Board

Connector Pin Assignments



Configuration Guide



Specifications

All specifications are at 25°C unless stated otherwise. All specifications are subject to change.

ANALOG SPECIFICATIONS

CHANNELS: 16 differential inputs.

CJC CHANNELS: 1.

THERMOCOUPLE TYPES: J, K, T, E, R, B, S.

TEMPERATURE RANGES:

J	–200° to	+750°C
K	–200° to	+1250°C
E	–200° to	+1000°C
T	–200° to	+400°C
R	0° to	+1768°C
S	0° to	+1450°C
B	+400° to	+1700°C

VOLTAGE RANGES

GAIN	RANGE
1	–2.5 V to +10V
125	–20 mV to +80mV
166.7	–15 mV to +60mV
400	–6.25 mV to +25mV

CONVERSION RATES

REJECTION RATE	THERMOCOUPLES	VOLTAGES
50 Hz	47 ms/chan	43 ms/chan
60 Hz	40 ms/chan	36 ms/chan
400 Hz	10 ms/chan	6 ms/chan

* Conversion speed includes the time to acquire a reading, and for thermocouples, the time to linearize and compensate for the CJC and convert to degrees or volts in integer format. For floating point format, add 1ms to each value. Note results are transferred by scan groups; individual channels are not available at this rate.

ACCURACY

TYPE	RANGE		ACCURACY (worst case)	RESOLUTION AT 50Hz	60Hz	400Hz
J	–200° to	–1 °C	±1.0 °C	0.1°C	0.1°C	0.7°C
	0° to	+750 °C	±0.5 °C	0.04°C	0.05°C	0.3°C
K	–200° to	–1 °C	±1.4 °C	0.1°C	0.2°C	1.0°C
	0° to	+900 °C	±0.7 °C	0.05°C	0.06°C	0.4°C
	+901° to	+1250 °C	±0.9 °C	0.06°C	0.07°C	0.5°C
E	–200° to	–50 °C	±1.1 °C	0.1°C	0.1°C	0.8°C
	–49° to	1000 °C	±0.6 °C	0.05°C	0.05°C	0.4°C
T	–200° to	–120 °C	±0.9 °C	0.05°C	0.06°C	0.4°C
	–119° to	+400 °C	±0.5 °C	0.03°C	0.04°C	0.2°C
R	0° to	+299 °C	±2.3 °C	0.1°C	0.2°C	1.0°C
	+300° to	+1768 °C	±1.5 °C	0.08°C	0.1°C	0.6°C
S	0° to	+299 °C	±2.3 °C	0.1°C	0.2°C	1.0°C
	+300° to	+1450 °C	±1.7 °C	0.09°C	0.1°C	0.7°C
B	+400° to	+799 °C	±3.0 °C	0.2°C	0.2°C	1.5°C
	+800° to	+1700 °C	+1.7 °C	0.1°C	0.1°C	0.8°C

Note: Accuracy values do not include CJC error.

GAIN	RANGE		ACCURACY (WORST CASE)		RESOLUTION AT 50 Hz	60 Hz	400 Hz
1	-2.5 V to	10 V	±0.01% reading ±	2.5 mV	312.5 µV	375 µV	2.5 mV
125	-20 mV to	80 mV	±0.02% reading ±	26 µV	2.5 µV	3.0 µV	20 µV
166.7	-1 mV to	60 mV	±0.02% reading ±	22 µV	1.88 µV	2.25 µV	15 µV
400	-6.25 mV to	25 mV	±0.03% reading ±	12.5 µV	0.781 µV	0.938 µV	6.25 µV

NOISE (TYPICAL):
G = 1: 0.75 × resolution rms.
G = 125, OR E TYPE T/C: 1.0 × resolution rms.
G = 166, OR J, K TYPE T/C: 1.5 × resolution rms.
G = 400, OR B,R,S,T TYPE T/C: 4.0 × resolution rms.

OVERVOLTAGE PROTECTION: ±30V max. powered.
±20V max. unpowered.

INPUT IMPEDANCE: 100MΩ min.

CJC ERROR: ±0.5°C max. (@ 25°C).
±1.2°C max. (@ 0 to 70°C).

COMMON MODE REJECTION RATIO:
VOLTAGE RANGE GAIN = 1:72dB min. (DC to 60Hz).
ALL OTHER RANGES: 100dB min. (DC to 60Hz).

NORMAL MODE REJECTION RATIO: 55dB min. (@ 50/60Hz).

INPUT ISOLATION FROM PC: 500VDC min.

TEMPERATURE UNITS (USER CONFIGURABLE): Degrees C or F.

TEMPERATURE / VOLTAGE DATA FORMAT:
INTEGER: 32-bit signed.
REAL: 32-bit IEEE-754 standard floating point.

GAIN ERROR TEMPERATURE COEFFICIENTS (MAX):

Thermocouple Inputs	
J	±12 ppm/°C
K	±12 ppm/°C
E	±10 ppm/°C
T	±17 ppm/°C
R	±17 ppm/°C
S	±17 ppm/°C
B	±17 ppm/°C

Voltage Inputs	
Gain = 1	±7 ppm/°C
Gain = 125	±10 ppm/°C
Gain = 166.7	±12 ppm/°C
Gain = 400	±17 ppm/°C

Note: The offset errors are canceled via periodic automatic self-calibration of the DAS-TC/B.

ENVIRONMENTAL

OPERATING TEMPERATURE: 0°C to +50°C.

STORAGE TEMPERATURE: –20°C to +70°C.

HUMIDITY: 0 to 95% non-condensing.

EMC: Conforms to European Union Directive 89/336/EEC.

DIMENSIONS: 13.3 in L × 4.25 in H × 0.75 in D
(33.8cm × 10.8cm × 1.9cm).