



Isolated, Thermocouple Signal Conditioner

2B50

FEATURES

Accepts J, K, T, E, R, S or B Thermocouple Types
Internally Provided Cold Junction Compensation
High CMV Isolation: $\pm 1500V$ pk
High CMR: 160dB min @ 60Hz
Low Drift: $\pm 1\mu V/^{\circ}C$ max (2B50B)
High Linearity: $\pm 0.01\%$ max (2B50B)
Input Protection and Filtering
Screw Terminal Input Connections

APPLICATIONS

Precision Thermocouple Signal Conditioning For:
Process Control and Monitoring
Industrial Automation
Energy Management
Data Acquisition Systems

GENERAL DESCRIPTION

The model 2B50 is a high performance thermocouple signal conditioner providing input protection, isolation and common mode rejection, amplification, filtering and integral cold junction compensation in a single, compact package.

The 2B50 has been designed to condition low level analog signals, such as those produced by thermocouples, in the presence of high common mode voltages. Featuring direct thermocouple connection via screw terminals and internally provided reference junction temperature sensor, the 2B50 may be jumper programmed to provide cold junction compensation for thermocouple types J, K, T, and B, or resistor programmed for types E, R, and S.

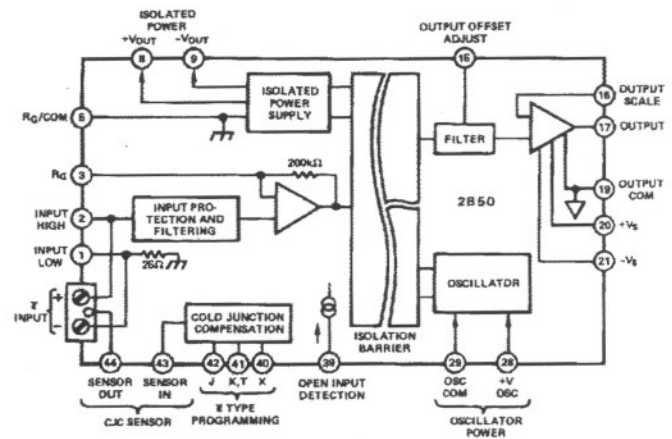
The high performance of the 2B50 is accomplished by the use of reliable transformer isolation techniques. This assures complete input to output galvanic isolation ($\pm 1500V$ pk) and excellent common mode rejection (160dB @ 60Hz).

Other key features include: input protection (220V rms), filtering (NMR of 70dB @ 60Hz), low drift amplification ($\pm 1\mu V/^{\circ}C$ max - 2B50B), and high linearity ($\pm 0.01\%$ max - 2B50B).

APPLICATIONS

The 2B50 has been designed to provide thermocouple signal conditioning in data acquisition systems, computer interface systems, and temperature measurement and control instrumentation.

FUNCTIONAL BLOCK DIAGRAM



In thermocouple temperature measurement applications, outstanding features such as low drift, high noise rejection, and 1500V isolation make the 2B50 an ideal choice for systems used in harsh industrial environments.

DESIGN FEATURES AND USER BENEFITS

High Reliability: To assure high reliability and provide isolation protection to electronic instrumentation, the 2B50 has been conservatively designed to meet the IEEE Standard for transient voltage protection (472-1974: SWC) and provide 220V rms differential input protection.

High Noise Rejection: The 2B50 features internal filtering circuitry for elimination of errors caused by RFI/EMI, series mode noise, and 50Hz/60Hz pickup.

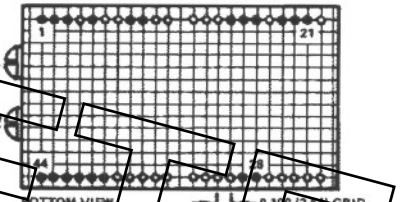
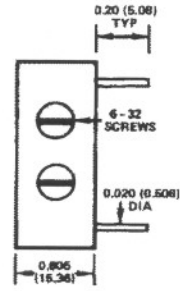
Ease of Use: Internal compensation enables the 2B50 to be used with seven different thermocouple types. Unique circuitry offers a choice of internal or remote reference junction temperature sensing. Thermocouple connections may be made either by screw terminals or, in applications requiring PC Board connections, by terminal pins.

Small Package: 1.5" X 2.5" X 0.6" size conserves board space.

2B50 — SPECIFICATIONS (typical @ +25°C and $V_s = +15V$ unless otherwise noted)

MODEL	2B50A	2B50B
INPUT SPECIFICATIONS		
Thermocouple Types		
Jumper Configurable Compensation	J, K, T, or B	*
Resistor Configurable Compensation	R, S, or E	*
Input Span Range	±5mV to ±100mV	*
Gain Range	50V/V to 1000V/V	*
Gain Equation	$1 + (200k\Omega/R_G)$	*
Gain Error	±0.25%	*
Gain Temperature Coefficient	±35ppm/°C max	±25ppm/°C max
Gain Nonlinearity ¹	±0.025% max	±0.01% max
Offset Voltage		
Input Offset (Adjustable to Zero)	±50μV	*
vs. Temperature	±2.5μV/°C max	±1μV/°C max
vs. Time	±1.5μV/month	*
Output Offset (Adjustable to Zero)	±10mV	*
vs. Temperature	±30μV/°C	*
Total Offset Drift	$\pm(2.5 + \frac{30}{G}) \mu V/^\circ C$	$\pm(1 + \frac{30}{G}) \mu V/^\circ C$
Input Noise Voltage		
0.01Hz to 100Hz, $R_G = 1k\Omega$	1μV p-p	*
Maximum Safe Differential Input Voltage	220V rms, Continuous	*
CMV, Input to Output		
Continuous, ac or dc	±150mV pk max	*
Common Mode Rejection		
@ 60Hz, 1kΩ Source Unbalance	160dB min	*
Normal Mode Rejection @ 60Hz	70dB min	*
Bandwidth	dc to 2.5Hz (-3dB)	*
Input Impedance	100MΩ	*
Input Bias Current ²	±5nA	*
Open Input Detection	Downscale	*
Response Time ³ , G = 250	1.4sec	*
Cold Junction Compensation		
Initial Accuracy ⁴	±0.5°C	*
vs. Temperature ⁵ (+5°C to +45°C)	±0.01°C/°C	*
OUTPUT SPECIFICATIONS		
Output Voltage Range ⁶	±5V @ ±2mA	*
Output Resistance	0.1Ω	*
Output Protection	Continuous Short to Ground	*
POWER SUPPLY		
Voltage		
Output ± V_s (Rated Performance)	±15V dc ±10% @ ±0.5mA	*
(Operating)	±12V to ±18V dc max	*
Oscillator + V_{OSC} (Rated Performance)	+13V to +18V @ 15mA	*
ENVIRONMENTAL		
Temperature Range, Rated Performance	0 to +70°C	*
Operating	-25°C to +85°C	*
Storage Temperature Range	-55°C to +85°C	*
RFI Effect (5W @ 470MHz @ 3ft)		
Error	±0.5% of Span	*
PHYSICAL		
Case Size	1.5" X 2.5" X 0.6"	*

OUTLINE DIMENSIONS
Dimensions shown in inches and (mm).



PIN DESIGNATIONS

PIN	FUNCTION	PIN	FUNCTION
1	INPUT LO	23	
2	INPUT HI	24	
3	R _G	25	
4		26	
5	R _G /COM	27	
6		28	+V OSC
7		29	OSC COM
8	+V ISO OUT	30	
9	-V ISO OUT	31	
10		32	
11		33	
12		34	
13		35	
14		36	
15	OUTPUT OFFSET ADJUST	37	
16	OUTPUT SCALE	38	OPEN INPUT DET.
17	OUTPUT	40	X T TYPE PROGRAMMING
18		41	K, T J
19	OUTPUT COM	42	J
20	+V _s	43	CJC SENSOR IN
21	-V _s	44	CJC SENSOR OUT
22			

MATING SOCKET:
AC1218

NOTES

- *Specifications same as 2B50A.
- ¹ Gain nonlinearity is specified as a percentage of output signal span representing peak deviation from the best straight line; e.g., nonlinearity at an output span of 10V pk-pk (±5V) is ±0.01% or ±1mV.
- ² Does not include open circuit detection current of 20nA (optional by jumper connection).
- ³ Open input response time is dependent upon gain.
- ⁴ When used with internally provided CJC sensor.
- ⁵ Compensation error contributed by ambient temperature changes at the module.
- ⁶ Output swing of ±10V may be obtained through output scaling (Figure 5).

Specifications subject to change without notice.