

8B47



Linearized Thermocouple Input Modules

Description

8B modules are an optimal solution for monitoring real-world process signals and providing high-level signals to a data acquisition system. Each 8B47 module isolates, filters, amplifies, and linearizes a single channel of temperature input from a thermocouple and provides an analog voltage output.

Linearization is accomplished using a four breakpoint piecewise linear approximation.

The 8B47 can interface to industry standard thermocouple types J, K, and T and has an output signal of 0 to +5V. Each module is cold-junction compensated to correct for parasitic thermocouples formed by the thermocouple wire and screw terminals on the mounting backpanel. Upscale open thermocouple detect is provided by an internal pull-up resistor.

Signal filtering is accomplished with a 3-pole filter optimized for time and frequency response which provides 70dB of normal-mode rejection at 60Hz. One pole of this filter is on the field side of the isolation barrier for anti-aliasing, and the other two are on the system side.

A special input circuit on the 8B47 module provides protection against accidental connection of power-line voltages up to 240VAC. Clamp circuits on the I/O and power terminals protect against harmful transients.

The modules are designed for installation in Class I, Division 2 hazardous locations and have a high level of immunity to environmental noise.

Features

- Interfaces to Types J, K, and T Thermocouples
- Linearizes Thermocouple Signal
- High-Level Voltage Outputs
- 1500Vrms Isolation
- ANSI/IEEE C37.90.1 Transient Protection
- Input Protection to 240VAC Continuous
- 120dB CMR
- 70dB NMR at 60Hz
- Low Drift with Ambient Temperature
- Accurate CJC -40°C to +85°C
- CE Compliant
- UL Listing Pending
- Mix and Match Module Types on Backpanel

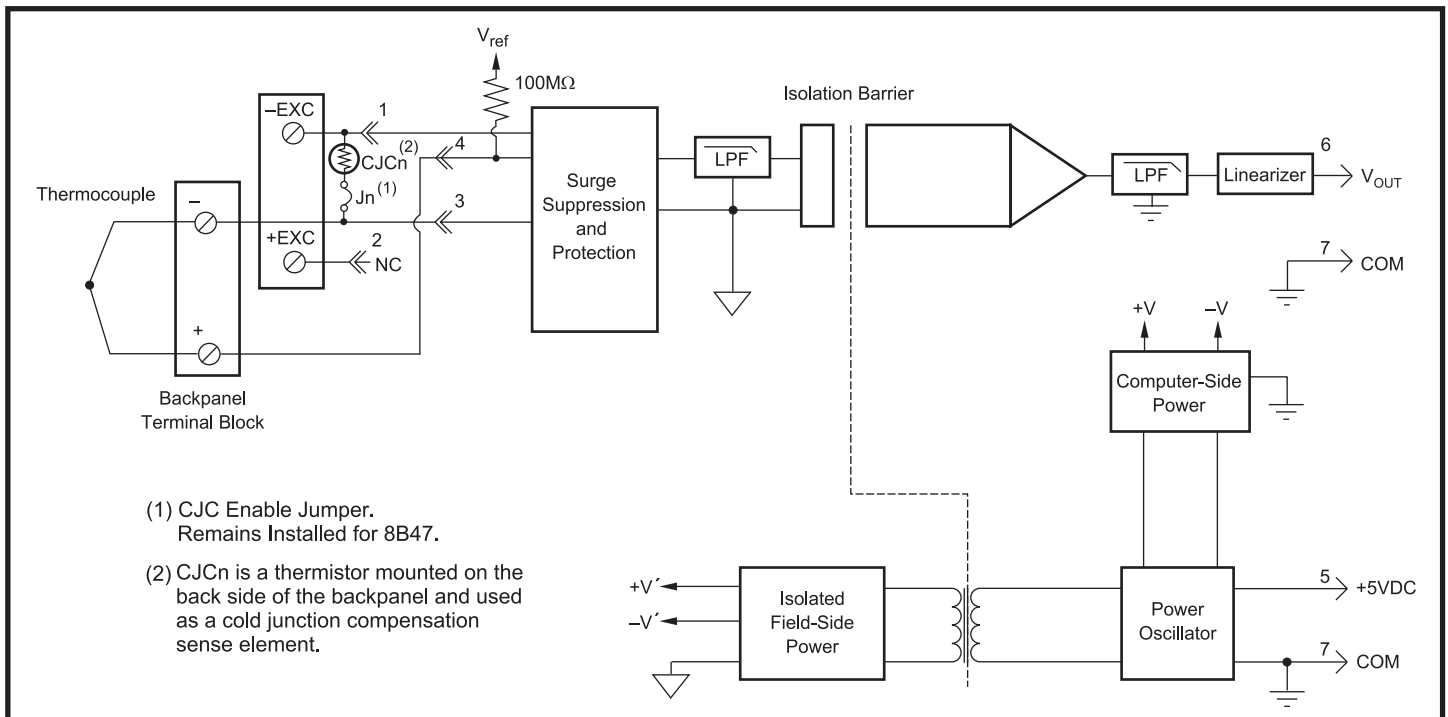


Figure 1: 8B47 Block Diagram

Specifications Typical at $T_A=+25^{\circ}\text{C}$ and +5V power

Module	8B47
Input Range	-0.1V to +0.5V
Input Bias Current	-25nA
Input Resistance	
Normal	50M Ω
Power Off	200k Ω
Overload	200k Ω
Input Protection	
Continuous ⁽¹⁾	240VAC
Transient	ANSI/IEEE C37.90.1
CMV, Input to Output	1500Vrms max
Transient, Input to Output	ANSI/IEEE C37.90.1
CMR (50Hz or 60Hz)	120dB
NMR	70dB at 60Hz
Accuracy	See Ordering Information
Stability	
Offset	$\pm 20\text{ppm}/^{\circ}\text{C}$
Gain	$\pm 75\text{ppm}/^{\circ}\text{C}$
Noise	
Output, 100kHz	250 μVrms
Bandwidth, -3dB	3Hz
Response Time, 90% Span	150ms
Output Range	0V to +5V
Output Protection	Continuous Short to Ground
Transient	ANSI/IEEE C37.90.1
Cold Junction Compensation	
Accuracy, 25 $^{\circ}\text{C}$	$\pm 0.5^{\circ}\text{C}$
Accuracy, -40 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$	$\pm 1.5^{\circ}\text{C}$
Open Input Response	Upscale
Open Input Detection Time	<10s
Power Supply Voltage	+5VDC $\pm 5\%$
Power Supply Current	30mA
Power Supply Sensitivity	$\pm 100\text{ppm}/\%$
Mechanical Dimensions (h)(w)(d)	1.11" x 1.65" x 0.40" (28.1mm x 41.9mm x 10.2mm)
Environmental	
Operating Temperature Range	-40 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$
Storage Temperature Range	-40 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$
Relative Humidity	0 to 95% Noncondensing
Emissions EN61000-6-4	ISM, Group 1
Radiated, Conducted	Class A
Immunity EN61000-6-2	ISM, Group 1
RF	Performance A $\pm 0.5\%$ Span Error
ESD, EFT	Performance B

NOTES:

- (1) 240VAC between +Input terminal and -Input, +EXC, or -EXC terminals.
 120VAC between -Input and +EXC or -EXC terminals.
 120VAC between +EXC and -EXC terminals.
- (2) Includes conformity, hysteresis and repeatability. Does not include CJC accuracy.

Ordering Information

Model	TC Type [‡]	Input Range	Output Range	Accuracy ⁽²⁾	
8B47J-01	J	0 $^{\circ}\text{C}$ to +760 $^{\circ}\text{C}$ (+32 $^{\circ}\text{F}$ to +1400 $^{\circ}\text{F}$)	0V to +5V	$\pm 0.24\%$	$\pm 1.82^{\circ}\text{C}$
8B47J-02	J	-100 $^{\circ}\text{C}$ to +300 $^{\circ}\text{C}$ (-148 $^{\circ}\text{F}$ to +572 $^{\circ}\text{F}$)	0V to +5V	$\pm 0.24\%$	$\pm 0.96^{\circ}\text{C}$
8B47J-03	J	0 $^{\circ}\text{C}$ to +500 $^{\circ}\text{C}$ (+32 $^{\circ}\text{F}$ to +932 $^{\circ}\text{F}$)	0V to +5V	$\pm 0.21\%$	$\pm 1.05^{\circ}\text{C}$
8B47J-12	J	-100 $^{\circ}\text{C}$ to +760 $^{\circ}\text{C}$ (-148 $^{\circ}\text{F}$ to +1400 $^{\circ}\text{F}$)	0V to +5V	$\pm 0.24\%$	$\pm 2.10^{\circ}\text{C}$
8B47K-04	K	0 $^{\circ}\text{C}$ to +1000 $^{\circ}\text{C}$ (+32 $^{\circ}\text{F}$ to +1832 $^{\circ}\text{F}$)	0V to +5V	$\pm 0.24\%$	$\pm 2.40^{\circ}\text{C}$
8B47K-05	K	0 $^{\circ}\text{C}$ to +500 $^{\circ}\text{C}$ (+32 $^{\circ}\text{F}$ to +932 $^{\circ}\text{F}$)	0V to +5V	$\pm 0.24\%$	$\pm 1.05^{\circ}\text{C}$
8B47K-13	K	-100 $^{\circ}\text{C}$ to +1350 $^{\circ}\text{C}$ (-148 $^{\circ}\text{F}$ to +2462 $^{\circ}\text{F}$)	0V to +5V	$\pm 0.24\%$	$\pm 3.60^{\circ}\text{C}$
8B47K-14	K	0 $^{\circ}\text{C}$ to +1200 $^{\circ}\text{C}$ (+32 $^{\circ}\text{F}$ to +2192 $^{\circ}\text{F}$)	0V to +5V	$\pm 0.24\%$	$\pm 2.88^{\circ}\text{C}$
8B47T-06	T	-100 $^{\circ}\text{C}$ to +400 $^{\circ}\text{C}$ (-148 $^{\circ}\text{F}$ to +752 $^{\circ}\text{F}$)	0V to +5V	$\pm 0.48\%$	$\pm 2.40^{\circ}\text{C}$
8B47T-07	T	0 $^{\circ}\text{C}$ to +200 $^{\circ}\text{C}$ (+32 $^{\circ}\text{F}$ to +392 $^{\circ}\text{F}$)	0V to +5V	$\pm 0.39\%$	$\pm 0.75^{\circ}\text{C}$

‡ Thermocouple Alloy Combinations

Standards: DIN IEC 584, ANSI MC96-1-82, JIS C 1602-1981

Type	Material
J	Iron vs. Copper-Nickel
K	Nickel-Chromium vs. Nickel-Aluminum
T	Copper vs. Copper-Nickel