7B34 Isolated, Linearized RTD Input

Functional Description

The 7B34 is a single-channel signal conditioning module that interfaces, amplifies and filters input voltages from a wide variety of two- and three-wire platinum, copper and nickel Resistor Temperature Detectors (RTDs) and provides a protected precision output of either +1 V to +5 V or 0 V to +10 V, linear with RTD temperature. Three-wire lead resistance compensation is provided and 2- or 3- wire RTDs may be used. RTD excitation current, and a predictable upscale open circuit indication provide a complete signal conditioning solution. Model 7B34 features a nonlinearity of ±0.05% maximum (Pt RTDs). To accurately measure low level signals in electrically noisy environments, 1500 V rms of galvanic transformer-based isolation with a common mode rejection (CMR) of 160 dB @ 50/60 Hz and a normal model rejection (NMR) of 60 dB @ 50/60 Hz are provided. Rated to operate with a nominal +24 V DC supply, Model 7B34 is mix-and-match and hot-swappable with other 7B Series input modules, so it can be inserted or removed from any socket in the same backplane without disturbing system power.

Inside the 7B34 Series Module

The three input pins of Model 7B34 are fully protected up to 120 V rms line voltage. A 250 µA excitation current is provided to create an input voltage to the 7B34. This current also provides the upscale open circuit indication. A one-pole 3 Hz filter preconditions the RTD signal prior to amplification, provided by a low drift input amplifier. Amplitude modulation is used to implement transformer isolation (1500 V rms input-to-output and power). Isolated front-end circuitry power is supplied by a DC/DC converter. The output section contains a two-pole low pass filter (-3 dB @ 3Hz), a buffer amplifier and a power oscillator. The two-pole output filter and subsequent buffer ensures that a low noise, low impedance (<1 Ω) signal is available at the output to drive loads to 2 kΩ minimum.

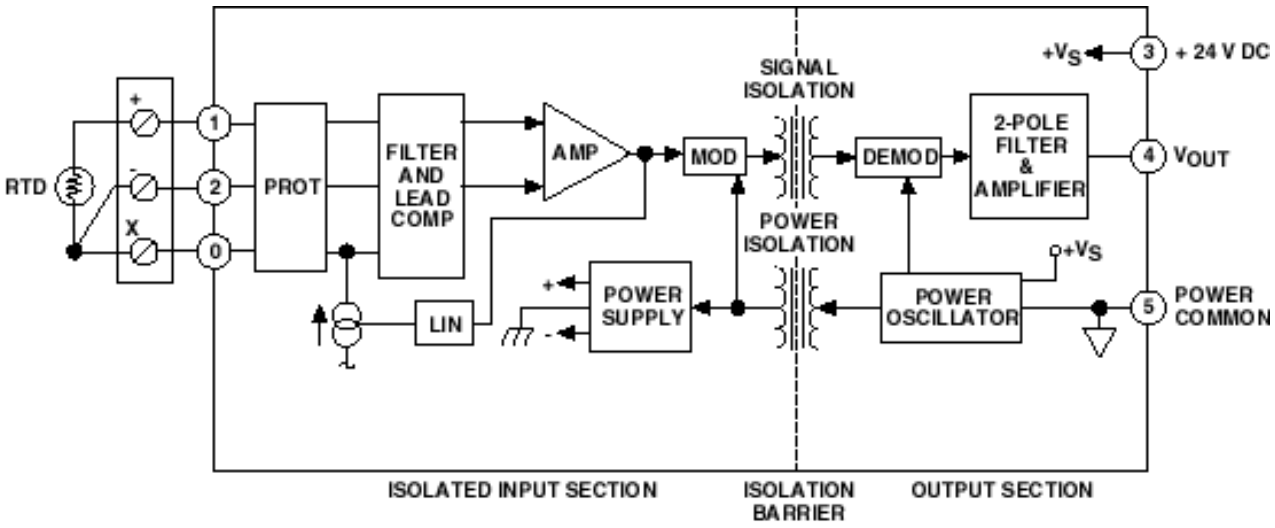

Figure 1. 7B34 Functional Block Diagram

Input Types

- 100 Ω Platinum RTDs
- 120 Ω Nickel RTDs
- 50 Ω Copper RTDs

Output Options

- +1 V to +5 V
- 0 V to +10 V

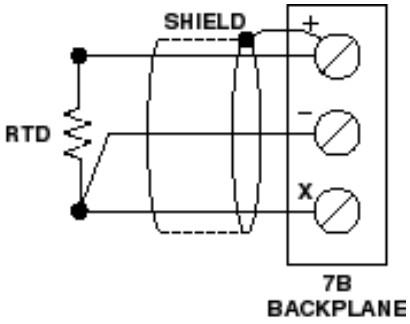

Figure 2. 7B34 Input Field Connections

120 Ω Nickel, 2-, 3-wire, α = 0.00672

7B34 Models Available

Model	RTD Sensor (2- or 3-wire)	Input Range	Output Range	Nonlinearity (maximum)	Accuracy (maximum)
7B34-01-1	100 Ω Pt, α = 0.00385	-100°C to +100°C	+1 V to +5 V	±0.05% span	±0.15% span
7B34-01-2	100 Ω Pt, α = 0.00385	-100°C to +100°C	0 V to +10 V	±0.05% span	±0.15% span
7B34-02-1	100 Ω Pt, α = 0.00385	0°C to +100°C	+1 V to +5 V	±0.05% span	±0.2% span
7B34-02-2	100 Ω Pt, α = 0.00385	0°C to +100°C	0 V to +10 V	±0.05% span	±0.2% span
7B34-03-1	100 Ω Pt, α = 0.00385	0°C to +200°C	+1 V to +5 V	±0.05% span	±0.15% span
7B34-03-2	100 Ω Pt, α = 0.00385	0°C to +200°C	0 V to +10 V	±0.05% span	±0.15% span
7B34-04-1	100 Ω Pt, α = 0.00385	0°C to +600°C	+1 V to +5 V	±0.05% span	±0.1% span
7B34-04-2	100 Ω Pt, α = 0.00385	0°C to +600°C	0 V to +10 V	±0.05% span	±0.1% span
7B34-N-01-1	120 Ω Ni, α = 0.00672	0°C to +300°C	+1 V to +5 V	±0.12% span	±0.3% span
7B34-N-01-2	120 Ω Ni, α = 0.00672	0°C to +300°C	0 V to +10 V	±0.12% span	±0.3% span
7B34-N-02-1	120 Ω Ni, α = 0.00672	0°C to +200°C	+1 V to +5 V	±0.14% span	±0.3% span
7B34-N-02-2	120 Ω Ni, α = 0.00672	0°C to +200°C	0 V to +10 V	±0.14% span	±0.3% span
7B34-C50-01-1	50 Ω Cu, α = 0.00214	-100°C to +100°C	+1 V to +5 V	±0.10% span	±0.15% span

7B34-C50-02-1	50 Ω Cu, α = 0.00214	0°C to +100°C	+1 V to +5 V	±0.02% span	±0.15% span
7B34-C50-06-1	50 Ω Cu, α = 0.00214	-50°C to +200°C	+1 V to +5 V	±0.08% span	±0.15% span

7B34 Specifications

(typical @ +23°C ±5°C and V_s = +24 V dc)

Description	Model 7B34
Input Range[1]	
RTD Types	100 Ω Platinum, 2-, 3-wire α = 0.00385
Standard Temperature Ranges	Refer to Model Table
Custom Ranges	Not Available*
Output Range Options (R_L > 2 kΩ)	+1 V to +5 V or 0 V to +10 V
Accuracy[1]	
Initial @ +25°C	Refer to Model Table
Nonlinearity[2]	Refer to Model Table
Input Offset vs. Temperature	±1 µV/°C
Zero Suppression vs. Temperature	±0.002% (R_Z/R_{span})3/°C
Span vs. Temperature	±60 ppm/°C
Output Offset vs. Temperature	±0.002% Span/°C
Lead Resistance Effect	±0.02°C/Ω
Output Noise	
5 MHz Bandwidth	10 mV peak
10 Hz to 100 kHz Bandwidth	0.4 mV rms
0.1 Hz to 10 Hz Bandwidth	0.6 µV peak
Bandwidth, -3 dB	3 Hz
Output Rise Time, 10% to 90% Span	250 ms
Common-Mode Voltage (CMV)	
Input-to-Output and Power	1500 V rms, continuous
Common Mode Rejection (CMR)	
Input-to-Output and Power @ 50/60 Hz	160 dB
Normal Mode Rejection @ 50/60 Hz	60 dB
Input Protection	120 V rms, continuous ±35 V dc, continuous

Input Transient Protection	ANSI/IEEE C376.90.1-1989 IEEE-STD 472 IEC 255-4, Class II
Output Resistance	< 1 Ω
Voltage Output Protection	Continuous Short to Ground
Power Supply	
Voltage Range, Operating	+14 V dc to +35 V dc
Current	+25 mA, maximum
Sensitivity	±0.0001%/% of Vs
Mechanical Dimensions	1.663" x 2.11" x 0.563" (42.24 mm x 53.6 mm x 14.3 mm)
Weight	60 grams
Environmental	
Temperature Range	
Operating	-40°C to +85°C
Storage	-40°C to +85°C
Relative Humidity, 24 hours	0 to 90% @ +60°C noncondensing
ESD Sensitivity	IEC 801-2, Level 2
RFI Susceptibility	±0.5% Span error @ 400 MHz, 5 Watt, 3 ft

Warm-up time required to meet specifications is approximately 10 minutes.
* Contact factory for OEM requirements.
[1]Includes the combined effects of repeatability, hysteresis, and nonlinearity.
[2]Nonlinearity is calculated using best-fit straight line method.
[3]Rz is the value of the RTD resistance at the lowest measurement point. R_{span} is the change in resistance over the measurement span.
Specifications subject to change without notice.