

### FEATURES

- Single-channel isolated signal-conditioning modules.
- Accepts outputs from platinum, nickel and copper RTD sensors.
- Complete microcomputer-based data acquisition systems.
- Can be remotely reconfigured for various sensor types and input ranges.

### APPLICATIONS

- Process Monitoring & Control
- Test Stand Automation
- Machine Monitoring
- Material Testing
- Remote Energy Mangement
- Laboratory Data Acquisition

### PRODUCT OVERVIEW

The 6B Series delivers sensor-to-host signal-conditioning for remote applications. Software-configurable for a wide variety of sensor types, including: analog input, analog output, and digital I/O, the 6B Series is intended for remote data acquisition, machine monitoring, remote energy management and process monitoring and control applications.

Including transformer-based isolation, ranging, linearization, A/d conversion and RS-232C/RS-485 serial communication for up to 256 channels per serial port, the 6B Series modules and boards are a complete, low-cost interface between computers and analog signals.

All 6B Series input/output modules are fully encapsulated and identical in pin-out and size, facilitating their ability to be mixed and matched with all other 6B Series modules on the same backplane. The 6B Series is fully rated over the industrial temperature range of -25°C to +85°C.

Each 6B Series module and board is a complete microcontroller-based process monitoring and control system, with all calibration, address and linearizing parameters stored in

non-volatile memory. Being microcontroller-based, 6b Series modules can be configured for various sensor types, including RTD and thermocouple, and a wide variety of input ranges. This reduces the number of different modules that need to be used in a given application and carried in inventory.

### FUNCTIONAL BLOCK DIAGRAM

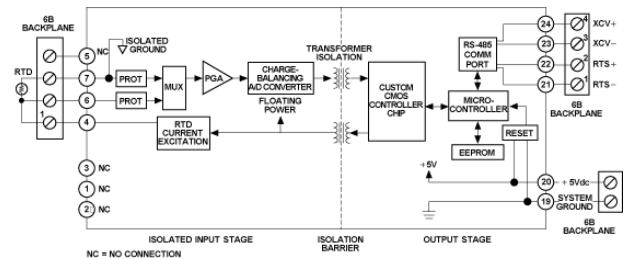


Figure 1. 6B13 & 6B13HV Functional Block Diagram

Designed for industrial applications, the 6B Series modules incorporate transformer-based isolation with surface-mount manufacturing technology – providing increased reliability at low cost. The compact, rugged 6B Series analog modules can be mixed and matched on a 16-channel backplane for high density, remote process monitoring and control.

Communications between backplanes, modules and host is in ASCII over an RS-232C link or RS-485 bi-directional serial bus. Circuitry to convert RS-232C to RS485 is built into the 6B backplane. Baud rates are software programmable, with speeds up to 19.2 K Baud.

The 6B Series digital subsystem communication is compatible with the overall 6B Series communication protocol. Each digital I/O board can be configured for its address, baud rate and checksum status. Connection to the 16 and 24-channel solid state relay backplanes is by a 50-conductor ribbon cable. This enables interfacing with input and outputs from 4 V to 240 V. Power control modules are also available that can switch up to 3A and come with a variety of ratings for low voltage DC up to 280 VAC.

### Rev. 0

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## GENERAL DESCRIPTION

The 6B13 and 6B13HV are single-channel isolated signal-conditioning modules which accept outputs from platinum, nickel and copper RTD sensors. Unlike conventional signal conditioners, the 6B13 and 6B13HV are complete microcomputer-based data acquisition systems. A major advantage of the on-board microcontroller is its ability to be remotely reconfigured for various sensor types and input ranges.

**Software Configuration** – The 6B13 and 6B13HV linearize 100Ω platinum RTDs (alphas of 0.00385 and 0.003916), 120Ω nickel RTDs and 10Ω copper RTDs. Software is used to configure the 6B13 and 6B13HV modules for address, input range, baud rate, data format, checksum status and integration time. All programmable parameters are stored in the nonvolatile memory of the module.

RTD sensor excitation current of 250  $\mu$ A (2.25 mA for copper

RTDs) is supplied by a tracking pair of current sources. The resulting analog input signal is conditioned and scaled by a programmable-gain amplifier and digitized by a 16-bit integrating converter under microprocessor control. The digitized value is passed serially across a magnetically isolated barrier (1500 V rms – Model 6B12; 2500 V rms – Model 6B13HV) and clocked in by a custom controller chip. The on-board microprocessor then converts the data into engineering units or as a percentage of full scale, as determined by the channel parameters. In between conversions, the microprocessor auto zeros the offset and gain by monitoring the on-board temperature and compensating for reference drift. The 6B13 and 6B13HV use compensation factors to ensure the highest accuracy possible.



Figure 2

## Models 6B13 and 6B13HV

Range Description (Software Configurable)	Accuracy (Typical)	Error (Maximum)	Noise (Peak-to-Peak)
Pt, -100°C to +100°C, $\alpha = 0.00385$	$\pm 0.02^\circ\text{C}$	$\pm 0.15^\circ\text{C}$	0.03°C
Pt, 0°C to +100°C, $\alpha = 0.00385$	$\pm 0.03^\circ\text{C}$	$\pm 0.15^\circ\text{C}$	0.04°C
Pt, -100°C to +200°C, $\alpha = 0.00385$	$\pm 0.03^\circ\text{C}$	$\pm 0.15^\circ\text{C}$	0.04°C
Pt, -100°C to +600°C, $\alpha = 0.00385$	$\pm 0.05^\circ\text{C}$	$\pm 0.15^\circ\text{C}$	0.05°C
Pt, -100°C to +100°C, $\alpha = 0.003916$	$\pm 0.03^\circ\text{C}$	$\pm 0.15^\circ\text{C}$	0.03°C
Pt, 0°C to +100°C, $\alpha = 0.003916$	$\pm 0.05^\circ\text{C}$	$\pm 0.15^\circ\text{C}$	0.03°C
Pt, 0°C to +200°C, $\alpha = 0.003916$	$\pm 0.03^\circ\text{C}$	$\pm 0.15^\circ\text{C}$	0.04°C
Pt, 0°C to +600°C, $\alpha = 0.003916$	$\pm 0.04^\circ\text{C}$	$\pm 0.15^\circ\text{C}$	0.05°C
Ni, -80°C to +100°C	$\pm 0.05^\circ\text{C}$	$\pm 0.15^\circ\text{C}$	0.02°C
Ni, 0°C to +100°C	$\pm 0.03^\circ\text{C}$	$\pm 0.15^\circ\text{C}$	0.02°C
Cu, (0 °C @ +25°C), 0°C to +120°C	$\pm 0.13^\circ\text{C}$	$\pm 1.4^\circ\text{C}$	0.04°C
Cu, (10 °C @ +25°C), 0°C to +120°C	$\pm 0.11^\circ\text{C}$	$\pm 1.4^\circ\text{C}$	0.04°C

## 6B13 and 6B13HV Specifications (typical @ +25°C and $V_s = +5$ V dc)

Description	Model 6B13 and 6B13HV
<b>Inputs, Software Selectable</b>	
RTD Types	Platinum, 100 $\Omega$ , $\alpha = 0.00385$ or 0.003916 Nickel, 120 $\Omega$ Copper, 10 $\Omega$
Temperature Ranges	Refer to Model Table
<b>Communications</b>	
Protocol	RS-485
Baud Rates, Software Selectable	300 K, 600 K, 1.2 K, 2.4 K, 9.6 K, 19.2 K
<b>Accuracy</b>	
Initial @ +25°C	Refer to Model Table
Input Offset vs. Temperature	$\pm 0.005^\circ\text{C}/^\circ\text{C}^1$
Span vs. Temperature	$\pm 0.005^\circ\text{C}/^\circ\text{C}^1$
<b>Sensor Excitation Current</b>	
100 $\Omega$ Pt; 120 $\Omega$ Ni	0.25 mA
10 $\Omega$ Cu	2.25 mA
<b>Lead Wire Resistance, each lead</b>	10 $\Omega$ maximum
<b>Lead Resistance Effect</b>	
100 $\Omega$ Pt; 120 $\Omega$ Ni	$\pm 0.0007^\circ\text{C}/\Omega$
10 $\Omega$ Cu	$\pm 0.01^\circ\text{C}/\Omega$

<b>Bandwidth, -3 dB</b>	4 Hz
<b>Conversion Rate</b>	9 samples/second
<b>Common-Mode Voltage (CMV)</b>	
Input-to-Output and Power	
Model 6B13	1500 V rms, continuous
Model 6B13HV	2500 V rms, continuous
<b>Common Mode Rejection (CMR)</b>	
1 k $\Omega$ Source Imbalance @ 50/60 Hz	160 dB
<b>Normal Mode Rejection (NMR)</b>	
1 k $\Omega$ Source Imbalance @ 50/60 Hz	56 dB
<b>Input Protection</b>	240 V dc, continuous
<b>Input Transient Protection</b>	ANSI/IEEE C376.90.1-1989
<b>Power Supply</b>	
Voltage, Operating	+5 V dc $\pm$ 5%
Voltage, maximum safe limit	+6.5 V dc
Current	+100 mA
<b>Mechanical Dimensions</b>	2.3" x 3.1" x 0.79" (58.4 mm x 78.7 mm x 19.1 mm)
<b>Environmental</b>	
Temperature Range	
Rated Performance	-25°C to +85°C
Operating	-25°C to +85°C
Storage	-40°C to +85°C
Relative Humidity, 24 hours	0 to 95% @ +60°C non-condensing

<sup>1</sup> Combined effect of zero drift and span drift.  
Specifications subject to change without notice.

# PIN CONFIGURATIONS AND FUNCTIONAL DESCRIPTIONS

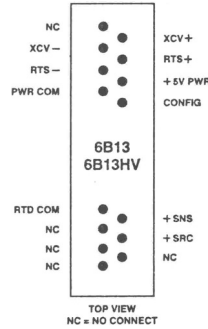


Figure 3 . Model 6B Series Module, with pin-out assignments.

Table 1. Pin Function Descriptions—

Pin No.	Description
1	N/C
2	HI
3	LO
4	N/C

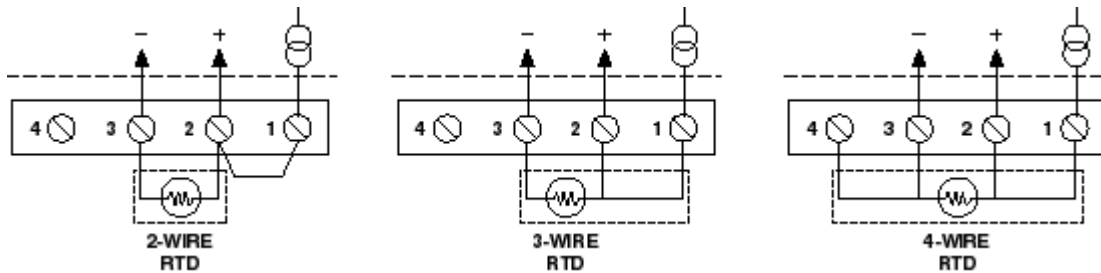


Figure 4 6B13 & 6B13HV Input Field Connections

## ESD CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although this product features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.



OUTLINE DIMENSIONS

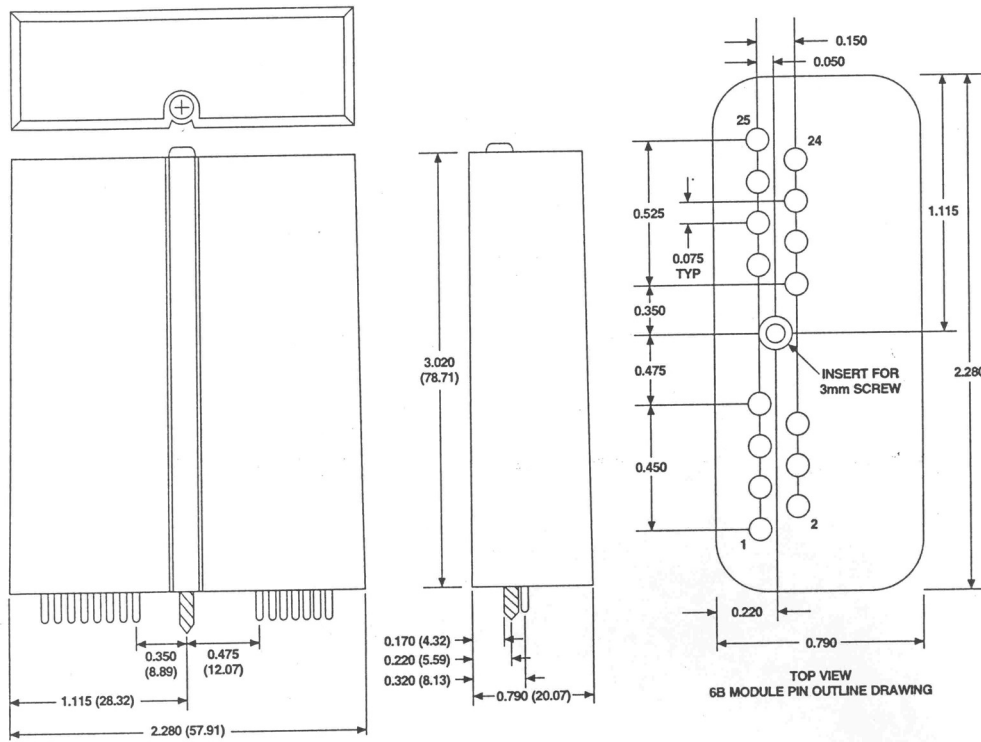


Figure 5. Outline Dimensions

**NOTES**

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