

Model 4040A

- **Differential 100 V Common Mode Input**
- **DC-50 MHz Bandwidth**
- **AC/DC Coupling**
- **Programmable Attenuation/Gain/Offset**
- **9 nV/ $\sqrt{\text{Hz}}$ Input Noise**
- **50 Ω Output**

Differential Instrumentation Amplifier

The TEGAM Model 4040A easily connects your digitizer or analog inputs to real-world signals ranging from 100 V supply voltages to millivolt detector outputs. Elevated voltages and noisy environments present a barrier to making acceptable measurements with common digitizers that are limited by input impedance and voltage levels. Your investment in a high performance digitizer is significantly enhanced by having an instrumentation grade connection to the point of measurement.

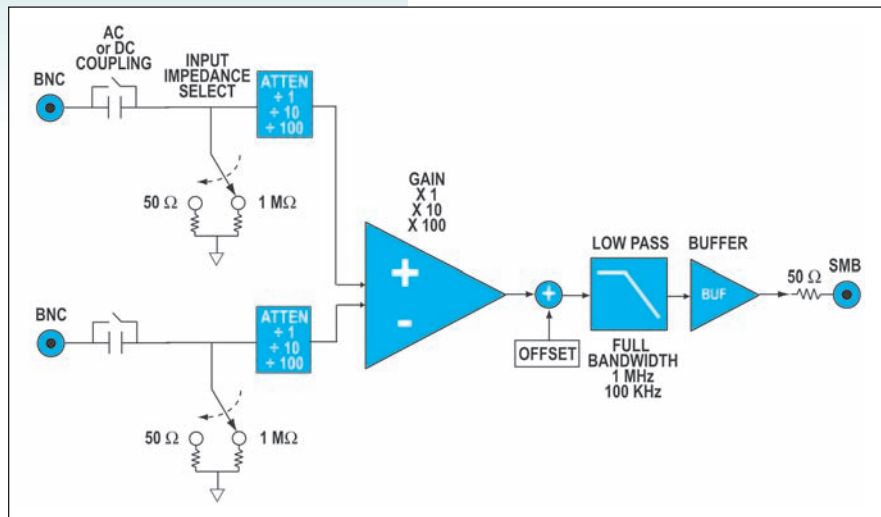


Figure 1 Block Diagram

Range Table

Peak Amplitude Input Range (Differential)	Total Gain	Input Attenuator	Amplifier Gain	Max Input Volts to Chassis ^{a,b,c}	Noise (Referred to Attenuator Input) Typ.	DC Bandwidth (3dB Point with no Filter)
100 V	÷100	÷100	1	100	990 nV/ $\sqrt{\text{Hz}}$	20 MHz
10 V	÷10	÷100	10	100	990 nV/ $\sqrt{\text{Hz}}$	50 MHz
10 V	÷10	÷10	1	40	99 nV/ $\sqrt{\text{Hz}}$	20 MHz
1 V	x1	÷100	100	100	990 nV/ $\sqrt{\text{Hz}}$	20 MHz
1 V	x1	÷10	10	40	99 nV/ $\sqrt{\text{Hz}}$	50 MHz
100 mV	x10	÷10	100	40	99 nV/ $\sqrt{\text{Hz}}$	20 MHz
100 mV	x10	÷1	10	4	9 nV/ $\sqrt{\text{Hz}}$	50 MHz
10 mV	x100	÷1	100	4	9 nV/ $\sqrt{\text{Hz}}$	20 MHz

^{a)} DC coupled, 1 M Ω Input.

^{b)} If AC coupled, 1 M Ω , MAX line-chassis 100 V and use numbers in this column as limit on total AC line-chassis.

^{c)} If in 50 Ω mode, reduce numbers in this column to MAX of 10 V.

The TEGAM Model 4040A includes six stages of signal-matching to ensure that you get the maximum use from your high-speed digitizer:

1. Selectable input impedance of 50 Ω or 1 M Ω , to match impedance with coaxial cables or oscilloscope probes.
2. Selectable AC or DC coupling allows processing of small AC signals with large DC offset.
3. Selectable input attenuations of ÷10 and ÷100 allows input levels as high as 100 V to be safely processed by the digitizer¹.

4. Instrumentation amplifier to reject common-mode voltages and provides gain of X1, X10 and X100 for measuring small signals¹.

5. Programmable low-pass filters to assist with noisy signals or to anti-alias at lower sampling rates.

6. Programmable output offset allows centering the output signal in the digitizer's span to maximize dynamic range.

¹See the Range Table for specific combinations and limitations of settings.

Software

The TEGAM Model 4040A comes complete with an IVI-compliant driver for LabVIEW, Microsoft C++ and Visual Basic. In addition, an interactive front panel application provides manual control of all of the board's features.



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Model 4040A

DIFFERENTIAL INSTRUMENTATION AMPLIFIER

Preliminary Specifications

	<u>VALUE</u>	<u>CLARIFICATIONS</u>
Input		
Channels	Single Channel	Differential Inputs
Gains	100, 10, 1, 0.1, 0.001	
Maximum Voltage Range	±100 V	DC + Peak AC
Coupling	AC-10 Hz, DC	
Input Impedance	1 MΩ 20 pF 50 Ω	Selectable
Input Voltage Range	±100 V	For Gain 1, 0.1 and 0.01 @ 1 MΩ Input Impedance
	±10 V	For Gain 10, 1 and 0.1
	±1 V	For Gain 100, 10 and 1
CMRR	70 dB at 60 Hz	> 50 dB at 1 MHz
Total Harmonic Distortion	<-60 dB @ 1 MHz	Output 1 Vp-p in 50 Ω
DC Gain Accuracy	±(0.1 % input + 100 μV)	Offset set to 0
AC Gain Accuracy	1 %	10 kHz Sine Wave, Calibrated
Overvoltage Protection in Any Range	±100 V	DC + Peak AC
Offset Range (Referred to Input)	0-Full Scale	All Gain Ranges
Offset Resolution	40 μV	65,535 steps
Offset Accuracy	±(0.5 % of Setting + 300 μV)	Referenced to 1 V Range
Temperature Stability	±(0.01 % of rdg + 40 μV)/°C	All Gains
Noise	9 nV/√Hz	CMR=±1 V, Gain 10 and 100, Referred to Input for Frequencies >100 Hz
Rise Time	≤10 ns	Attenuate = ÷1, Gain = 1, 2 Vp-p @ 20 MHz, Square Wave Applied
Output		
Type	Single Ended 2 Vp-p	
Output Resistance	50 Ω	
Bandwidth	See Range Table	See Range Table
Passband Ripple	±0.2 dB	DC to 10 MHz Referred to 10 kHz
	±0.3 dB	10 MHz to 50 MHz Referred to 10 kHz
LP Filter, Cutoff Frequency	100 kHz, 1 MHz	Single Pole Filter
Included Accessories	Software Driver for LabVIEW	P/N 1000019
	Manual	P/N 4040A-901-01A
Optional Accessories	SMB to BNC Adapter Cable	P/N 1000018

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