Three Channel DSP Module

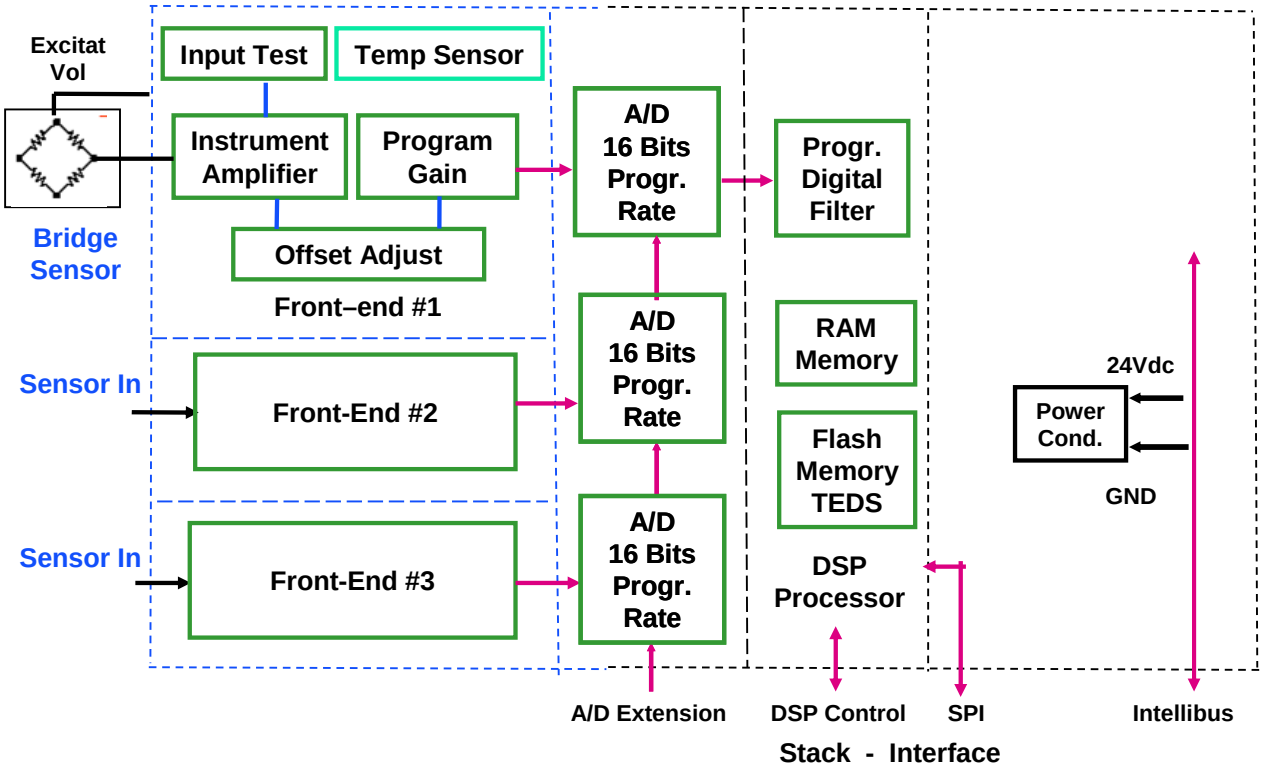
MODEL 6005

- **3 Differential or Single-Ended Voltage Inputs**
- **Programmable Gain and Offset**
- **Programmable Digital Filter**
  - **64th Order FIR Type**
  - **Filter Corners: 10 Hz to 12 KHz**
- **A/D Converter**
  - **16 Bits**
  - **Programmable Sample Rate up to 250 Ksps/ch, 300 Ksps Aggregate**
- **Stack Network Interface**

1.5" x 1.5" x 0.6"

Description

The VIP Sensors Model 6005 DSP IBIM is an add-on module which communicates to the transducer bus through a base module. It does not have its own bus interface stage. It consists of three channels of differential input instrumentation amplifiers with programmable gain (0.5 to 1000) and programmable offset which allow conditioning of bridge type transducers such as strain gages, accelerometers, thermocouples, etc. Each of the front end signal conditioners is followed by two selectable 3-pole anti-aliasing filters, one with a cut-off frequency at 2 KHz and another at 360 Hz. There is one 16-bit A/D converter per channel with programmable rate up to 250 Ksps max, but the aggregate rate for all three channels must be less than 300 Ksps.



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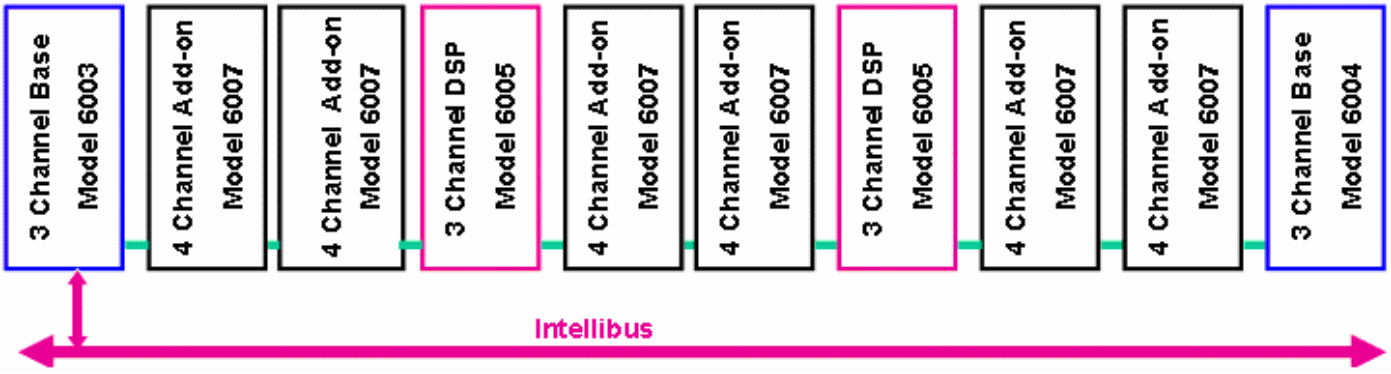
Description

Over sampled data is acquired simultaneously in all three channels and piped into a powerful DSP processor capable of implementing real time digital signal processing algorithms. The processor also performs self-testing functions of its electronics.
Each of the IBIM Channels have dedicated non-volatile memory to store the Transducer Electronic Data Sheet (TEDS).
Filters (programmable filter types and comer frequencies, such as 6 pole low pass type) are easily implemented by choosing the proper fitter coefficients and storing them as part of TEDS through the transducer bus.

Module with Stack-Up Access

Multiple IBIM's are stacked to increase its channel count density per node. Model 6005, underneath its top and bottom plate, contains the necessary connectors to support stacking of multiple modules.
Interconnection within a stack is done through the SPI port, the DSP processor control lines or through Intellibus without the need of additional bus connectors. A single Base Module may support up to a thirty three channel stack with one node bus address as shown below. A Digital Signal Processor (DSP) Module Model 6005 supports stacking of up to two Add-on Modules Model 6007, as shown below.



IBIM Stack: The Three Channel DSP Module Supports Stacking up to Two Add-on Modules 6006

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SPECIFICATIONS

The following performance specifications are at +75°F (+24°C) and 100 Hz, unless otherwise noted.

Electrical Inputs Characteristics		
Differential Input		
Input Impedance	10 MΩ Minimum for gain ≥4	27KΩ Max for gain ≤4
Voltage Input	0 to 3.5V Max for gain ≥4	0 to 16 V Max for gain ≤4
Common Mode Rejection	60dB	
Electrical Transfer Characteristics		
Gain	Programmable 0.5 to 1000	
Accuracy	0.2%	
Linearity	0.005%	
Frequency Response		
Bandwidth Without Filter	DC to ≥ 30K Hz	
Anti-aliasing Low Pass Filter	3 pole Butterworth	
-3dB Upper Freq. Corner	2,000 Hz or 360 Hz Software selectable and factory customized	
Programmable Filter	64th Order FIR type – TEDS programmable coefficients	
Programmable Cutoff Freq	Proportional to sample rate , decimation factor and filter's coefficients – See application Notes	
Residual Noise	< 2mV RMS RTO	
Analog/Digital Conversion		
Sample Rate	250 Ksps maximum or 300 Ksps aggregate for all 3 channels	
Resolution	16-Bits	
Electrical Output Characteristics		
Excitation Voltage Output	5Vdc 40 mA Maximum	
Transducer Bus	½ Duplex Intellibus compatible	
Data Rate	15Mbps. See sample rate Vs Number of IBIMs plot	
POWER		
Supply Voltage	12 to 28 VDC	2.4 Watts Maximum
Warm-Up Time	3 seconds to within 10% of final basis	
Case Isolation	Output and signal ground, 100 MΩ minimum @ 100 Vdc	
ENVIRONMENTAL CONDITIONS (MIL-STD-810)		
Temperature	Operating -40°F TO 185°F (-40°C TO +85°C)	
	Non-operating -76°F TO 302°F (-60°C TO +150°C)	
Vibration	Sine 30g, 10 Hz to 2,000 Hz	
	Random 30g, 10z to 2,00 Hz	
Shock	50g, half sine	
Humidity	to 95% RH non-condensing	
EMI	Per MIL-STD-461, 462	
PHYSICAL		
Weight	1.6 Oz.	
Case Material	Anodized Aluminum	
Cable Type	Double shielded 2 pairs, 24AWG: Tensolite NF24Q100-01	
Intellibus Connector	Lemo: FGG-OB-304-CLAD42 and FGG-OB-304-CLLD42	

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Digital Filter:

Different analysis and control functions may be implemented using DSP algorithms that can be downloaded to an IBIM through the transducer bus. A 64 order FIR filter is provided as a standard function. Its coefficients may be customized and downloaded through the IntelliBus network as part of the system setup and stored in TEDS memory. The low pass filter cutoff frequency (Fc) is determined by the A/D sample frequency and a preset constant

$$Fc = Fad/R \qquad \text{Where} \quad R= 4, 8, 12, 16, 24, 32$$

The Sample rate frequency over the transducer bus (Fs) is determined by the A/D sample frequency and the decimation factor D

$$Fs=Fad/D \qquad \text{Where} \quad D \le R/2 \text{ Integer}$$

One of the two anti-aliasing filters is selected depending on the over sample frequency according to the Nyquist criteria. The recommended over sample frequency should be between 100 kHz and 16 kHz when the 2 kHz anti-aliasing filter is used, or between 11,520 Hz and 2,880 Hz when the 360 Hz anti-aliasing filter is used.

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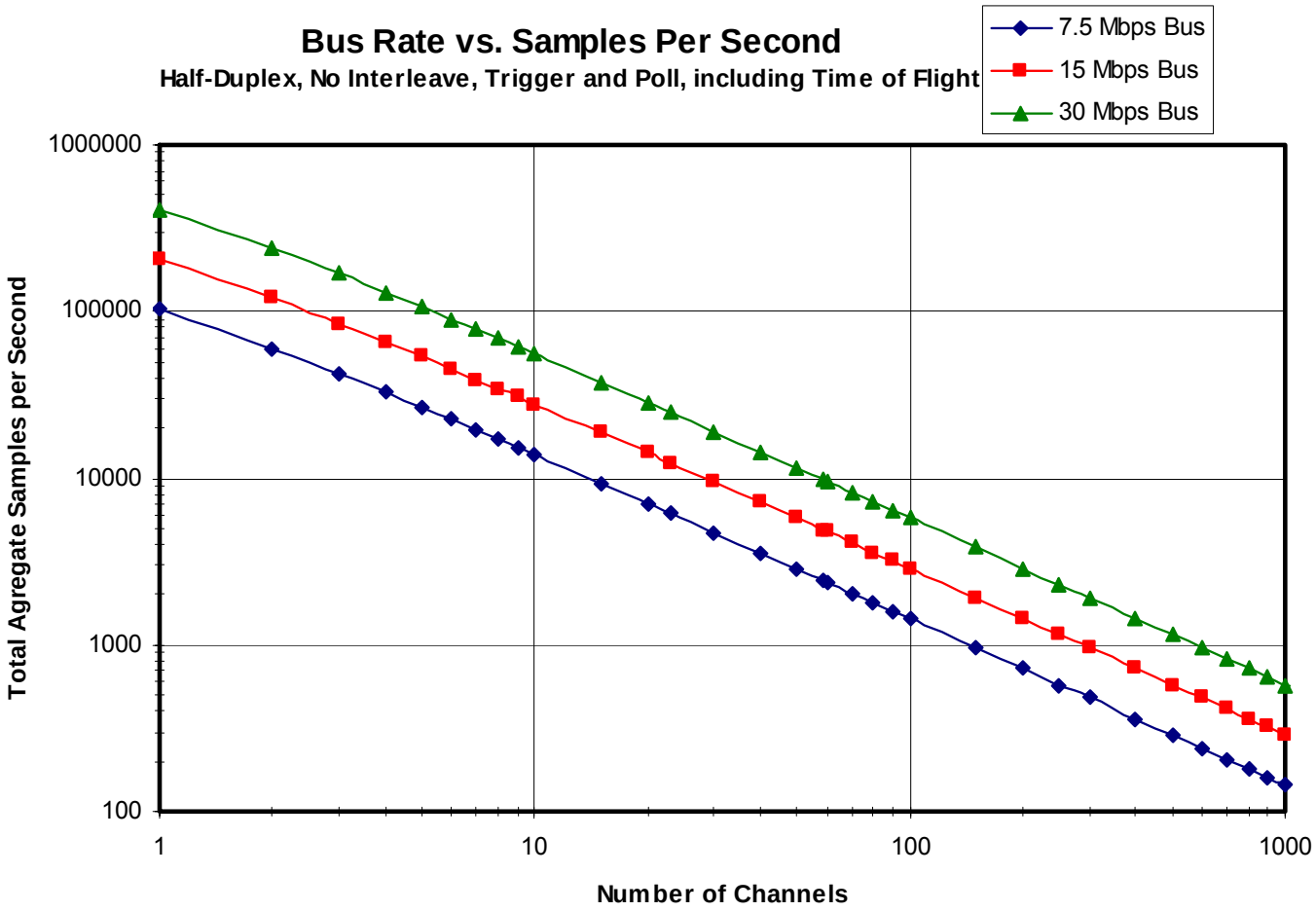

Bus Transfer Rate – Sample Rate Versus Number of IBIMs