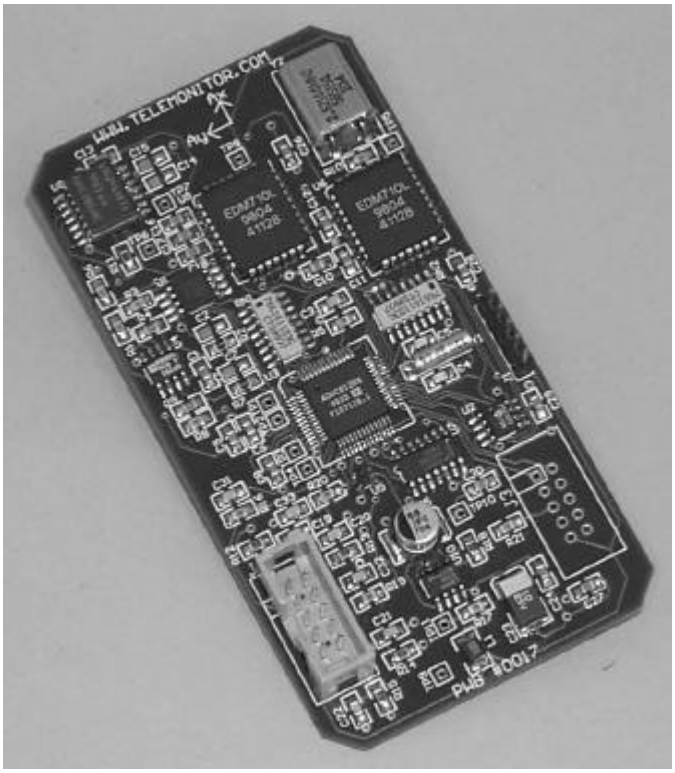
TMI CogniSense® Bi-Axial Acceleration/Tilt STIM

Telemonitor, Inc. **TMI 931A**

The TMI 931A Bi-Axial Acceleration/Tilt STIM (Smart Transducer Interface Module) can be used as a low-*g* accelerometer or as a tilt sensor. Both acceleration and tilt data are continuously available in digital format. Acceleration and tilt are measured by use of a bi-axial micro-machined accelerometer. The zero tilt position can be set and stored in non-volatile memory to compensate for mounting errors or non-flat installations.

The TMI 931A is an IEEE 1451.2 compliant STIM and has nine channels of data: an on-board temperature sensor, two channels for setting the zero tilt position, two for reading the stored zero tilt position, two for acceleration, and two for tilt. The acceleration and tilt channels are temperature-compensated.



Highlights

- **High resolution, high angle capacity.**
- **Temperature-compensated readings.**
- **Full analog signal conditioning including hardware anti-aliasing filters and firmware smoothing filters.**
- **Nine IEEE 1451.2 data channels including temperature, acceleration, and tilt.**
- **Compatible with Agilent Technologies BFOOT Embedded Ethernet Controller.**
- **Includes graphical front panel for remote access using only a standard browser (when used with BFOOT).**

The TMI 931A will work with any IEEE 1451.2 Network Capable Application Processor (NCAP), but is especially designed for use with the Agilent Technologies BFOOT-66501 or BFOOT-66502 Embedded Ethernet Controllers. The BFOOT line of NCAPs provide a thin web server so that the TMI 931A can be connected to an Intranet or to the Internet and accessed remotely using any computer with a standard browser. Additional information about these products is available at http://www.hpie.com.

Specifications

Electrical

Supply voltage	4.75 to 5.25 V
Operating current	45 mA

Performance

Temperature sensor range (CH1)	-40 to +85º C
Temperature sensor resolution (CH1)	0.5º C
Acceleration sensing range (CH6 and CH7)	± 19.6 m/s^2 (± 2 *g*)
Acceleration resolution (CH6 and CH7)	0.01 m/s^2 (0.001 *g*)
Hardware input anti-aliasing filter cutoff (CH6-CH9, -3 dB, programmable)	10 to 640 Hz
Hardware input anti-aliasing filter roll-off (CH6-CH9, fourth-order Butterworth)	-24 dB/octave
Oversampling rate (programmable)	2 to 16 times filter cutoff
Sample rate (resulting from setting oversampling rate)	20 to 2,560 Sa/s
ADC resolution (CH6 and CH7)	12 bits
Tilt sensing range (CH8 and CH9)	± 75°
Tilt resolution (CH8 and CH9, 0-30° tilt)	0.001 radian (0.06°)
Firmware filter cutoff (CH6-CH9, -3 dB, programmable)	1/4 to 1/256 of sample rate
Firmware filter roll-off (CH6-CH9, first-order exponential)	-6 dB/octave

Note: Exact ranges and resolutions vary due to calibration of individual units.

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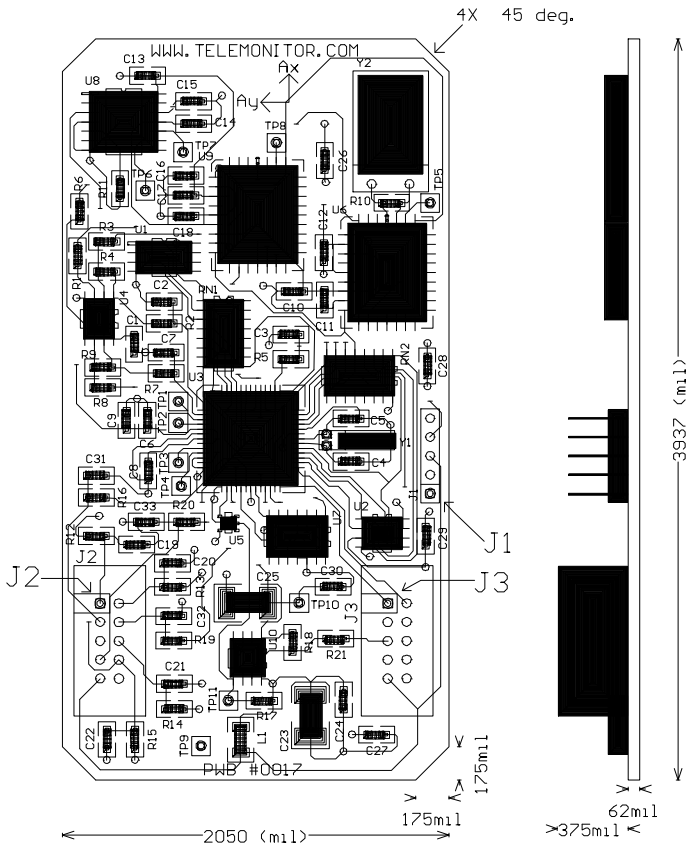
Mechanical Configuration



Notes on IEEE 1415.2 Connectors

1. J2 and J3 are the IEEE 1451.2 Transducer Independent Interface (TII). See IEEE 1451.2 for assignments and use of these pins.
2. J2 is a ribbon-cable connector compatible with the Agilent Technologies BFOOT-66501 or BFOOT-66502 NCAPs.
3. J3 is a stacking connector that can be installed on the opposite side of the board. The exact connector used depends on the NCAP and the board-to-board spacing. Not provided.

Data Channels

No.	Property	Type	Units	Minimum	Maximum
1	Temperature	Sensor	K	233.15 (-40° C)	358.15 (85° C)
2	Roll Zero	Actuator	radians	-1.57 (-90°)	1.57 (90°)
3	Pitch Zero	Actuator	radians	-1.57 (-90°)	1.57 (90°)
4	Roll Zero	Sensor	radians	-1.57 (-90°)	1.57 (90°)
5	Pitch Zero	Sensor	radians	-1.57 (-90°)	1.57 (90°)
6	X Acceleration	Sensor	m/s^2	-19.6 (-2 *g*)	19.6 (2 *g*)
7	Y Acceleration	Sensor	m/s^2	-19.6 (-2 *g*)	19.6 (2 *g*)
8	Roll (about X)	Sensor	radians	-1.31 (-75°)	1.31 (75°)
9	Pitch (about Y)	Sensor	radians	-1.31 (-75°)	1.31 (75°)

Notes on Data Channels

1. Units shown are the SI (metric) units which will be returned by the correction engine in the IEEE 1451.2 NCAP based on the calibration data stored in the electronic data sheet of the STIM.
2. Data provided by the NCAP correction engine will be in floating point format.
3. Channels 2 and 3 are used to set a zero position that can then be read using channels 4 and 5. Subtracting these stored values from channels 8 and 9 can be used to eliminate mounting offsets.
4. Useable range of the tilt channels (8 and 9) is limited by the geometry of converting acceleration to tilt to approximately ±75°. Performance degrades rapidly beyond that range.