

Airborne Telemetry

NTC-2116-X NetDAS Thermocouple Input Module *Telemetry Products*

DESCRIPTION

Thermocouple Input Channels

The NTC-2116-X has 16 thermocouple input channels. Each channel has independent gain and offset control. The input of each channel has a MUX to short the input of the input instrumentation amplifier in order to do a ZCAL measurement. The instrumentation amplifier feeds a programmable gain amplifier. A difference amplifier takes this output and subtracts an offset voltage that is generated on a per channel basis by a D/A converter. Its output is then fed through a single pole filter and digitized by an A/D converter. The output of the A/D is reverse binary. The FPGA adds the corrections necessary and converts this to binary format and sends it to the TEBus to be included in the PCM Data Stream.

Cold Junction Correction Channels

The Cold Junction Correction Channels are designed to use the Analog Devices AD590M Two Terminal Temperature Transducer. Power for the transducers is supplied from the internal +15 Volt power supply through 9.4k resistors. The gain for these channels is fixed at 32 counts/°K at the 14 bit output of the A/D converter. An input MUX samples the two transducer inputs and a voltage source equal to the voltage a transducer would produce at 0°C. The signal is then buffered by a unity gain amplifier and fed through a single pole filter to a 14 bit A/D converter. The FPGA adds the necessary corrections and converts the 3 channels to 12 bit binary (8 counts/°K).

Module Types

There are two module types that are available:

- NTC-2116-1 that provides no compensated outputs
- NTC-2116-2 that also provides compensated floating point and scaled binary outputs



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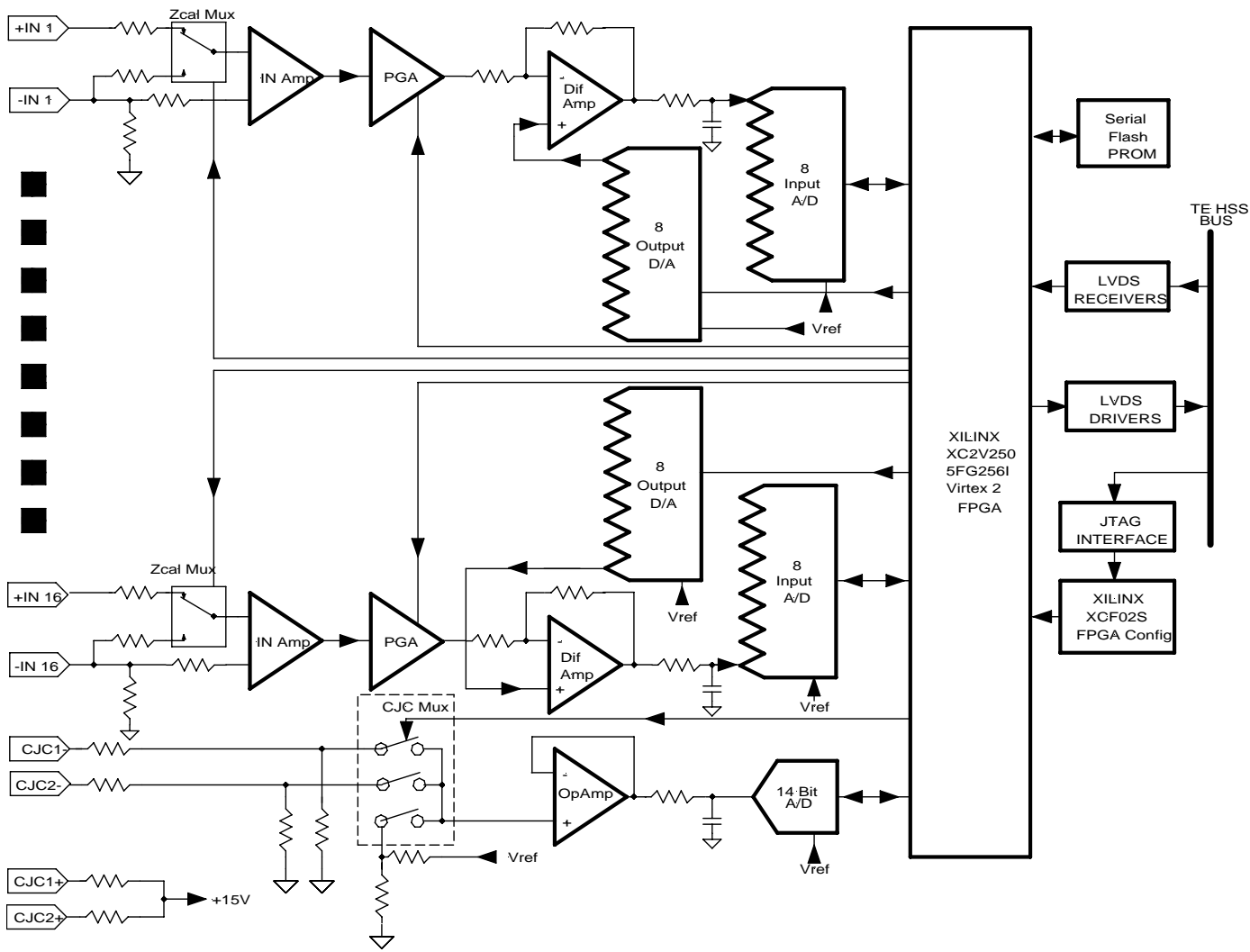
Excellence You Can Measure

TC Channels	
General	
Number of Channels	16 to +2 CJC
Input Protection	Power On or Off: $\pm 40V$
Interface	2 wire
Differential Input Impedance (Power on Magnitude of $V_{in} < 15V$)	> 10 Megohms
Differential or Single Ended Input Impedance (Power off or Magnitude of $V_{in} > 15V$)	$> 13k$
Single ended Input Impedance. (Power on Magnitude of $V_{in} < 15V$)	Positive Channel input > 10 Megohms Negative Channel input 1.0 Megohms Nominal to Analog Ground
Common Mode Rejection	> 100 dB
Sample Rate	> 20 Samples per second
Filter	Single Pole 5 Hz $\pm 20\%$
Gain	
Full Scale Range at Gain = 100	25 mV
Values	30 to 1064 Programmable
Accuracy	$\pm 0.5\%$
Calibration	ZCAL ($0^{\circ}C$)
Offset	
Capability	+73% to -48% of Full Scale
Accuracy	$\pm 0.5\%$ Full Scale
Automated Z Cal Compensation	Error value is stored and used to compensate each channel

TC CHANNEL SPECIFICATIONS

Compensation Functions

The NTC-2116-2 is provided with the ability to perform full temperature compensation, including linearization, for the full temperature range of the thermocouple. This is done by compensating the standard raw thermocouple measurement by the CJC measurement (both having been internally converted to microvolts) and then applying the appropriate IST-90 polynomial conversion to convert to the actual temperature. Once the temperature has been calculated in floating point format, it is additionally converted to a scaled binary value that is useful for those ground processing systems that required digital/count value measurements.



NTC-2116-X Functional Block Diagram

Outputs/Products

The two NTC modules offer a variety of outputs; select the module that is most suitable for your specific application and ground-station processing capabilities.

Output Product	Module	Function
Uncompensated Raw Outputs	NTC-2116-1, NTC-2116-2	The individual raw and CJC channels are output as separate measurements. The user is responsible for performing any of the required compensation processing.
Floating Point Outputs	NTC-2116-2	Output is the actual temperature in degrees C in IEEE single precision floating point. Multiple PCM words are required to output the measurement
Scaled Binary Outputs	NTC-2116-2	Output is the floating point temperature that has been scaled to fit into the specific PCM word size. The range is user defined and allows for as much resolution as possible. Examples (using a 10-bit word, 0-1023 counts): 1. Range: 0-300 C: $300/1023 = .3 \text{ }^\circ\text{C/count}$ 2. Range: -200-1352 (Full K Type) = $1.552 \text{ }^\circ\text{C/Count}$

NTC OUTPUTS

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