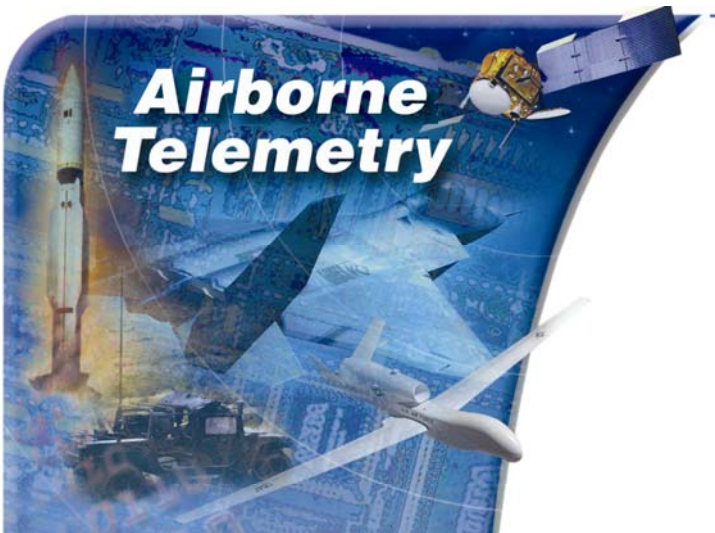

NSI-3101-2
NetDAS – Pressure Scanner Interface Module

Airborne Data Acquisition Products

DESCRIPTION

The NSI-3101-2 is designed to operate with the Esterline Pressure Systems Models ESP-32 DTC and ESP-64 DTC. The NSI-3101 provides the necessary interfaces to obtain all of the parameters that allow Digital Temperature Compensation to be performed by the ground processing system.

Pressure Scanner Channel

The Pressure Channel can read the Pressure output of the Pressure Scanner, or the V_Aux output of the Pressure Scanner to obtain the Excitation Voltage, and also is capable of shorting its inputs to ground to measure its zero reference in ZCAL mode. This provides the 3 items needed to calculate the normalized Pressure Voltage.

V_Aux Scanner Channel

The V_Aux Channel can read the Temperature output of the Pressure Scanner, or the Excitation Voltage output of the Pressure Scanner and it has the capability of shorting its inputs to ground to measure its zero reference in ZCAL mode. This provides the 3 items needed to calculate the normalized Temperature Voltage. It is also used to determine the Valve Position and the data in the Pressure Scanner EEPROM under I^2C control. The input to this channel includes a MUX that will allow the measurement of the +5 Volt Sense Line in order to interface with older Pressure Scanners that use this for the excitation voltage. Control for this option is not available on the NSI-3101-2.

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Calculating The Normalized Pressure & Temperature

The NSI-3101-2 will calculate the zero corrected temperature, pressure and excitation voltages eliminating the need to transmit the raw zero references. Realtime or post-processing on the ground will then calculate the normalized pressure and temperature that it will combine with the DTC Coefficients to provide the pressure and temperature in engineering units.

$$P_n = P_{zc} / E_{zcp}$$

$$T_n = T_{zc} / E_{zct}$$

Where

$P_{zc} = (p_r - z_{rp})$

$T_{zc} = (t_r - z_{ra})$

$E_{zcp} = (e_{rp} - z_{rp})$

$E_{zct} = (e_{ra} - z_{ra})$

p_r = scanned Pressure Channel's raw pressure voltage.

t_r = scanned V_Aux Channel's raw temperature voltage.

e_{rp} = raw excitation voltage measured by Pressure Channel.

z_{rp} = raw zero reference measured on Pressure Channel using ZCAL.

e_{ra} = raw excitation voltage measured by V_Aux Channel.

z_{ra} = raw zero reference measured on V_Aux Channel using ZCAL.

Scanner Control Interface

The NSI-3101-2 has six 12 volt CMOS compatible address lines A0 through A5 that are used to address the pressure channels of a Conventional Pressure Scanner. When used with a DTC Pressure Scanner they address the pair of pressure & temperature channels and provide control by implementing a modified I^2C interface using address lines A4 & A5 for output and the V_Aux line for input.

I^2C Bus Interface

Because the DTC Pressure Scanner has an inverter ahead of the devices that are controlled by the I^2C Bus the SCLK and SDATA output from the NSI-3101-2 must be inverted. The A5 line is used for the SCLK and the A4 line for the SDATA commands going to the pressure scanner. I^2C data coming from the DTC Pressure Scanner is not inverted and is output on the V_Aux Port. SCLK is high for 2 microseconds and low for one microsecond. At the start of an I^2C command both A4, SDATA and A5, SCLK must be low. A Start Bit occurs when A4 goes high while A5 is low. There after, data transitions occur only when A5 is high. At the end of the data sequence a Stop bit is sent by A4 going low while A5 is low. The I^2C commands are used to control the scanner's Output Mux, Mode of operation, Gain and to access the data stored in its memory.

SPECIFICATIONS

Control / Status	NSI-3101-x
Scanner Digital Control	
Address Lines	6
Level	+12V CMOS Compatible
Serial Interface	Modified I^2C protocol Address lines 5 and 4 re-defined as SCL and SDA to scanner. V_Aux is re-defined as SDA from scanner. Provides control of DTC Pressure Scanner Mux, Gain, Mode and allows reading of memory.

Control Specifications

Acquisition

The NSI-3101-2 supplies multiple registers/addresses to access pressure, temperature and calibration data. All accesses return 16-bit, straight binary quantities with the MSB first.

When the data being read from an address is larger than the system common word size, multiple reads of the address are required to transfer the full value. The first read clears a field pointer to 0 and returns the most significant common word size field of the value. Each specialty extended read advances the field pointer to the next field and returns the next common word size field of the value, MSB justified. If the last field is shorter than the common word size, undriven bits are set to “0”. If the entire data value is needed, all of the fields from an address must be read before reading the data from another address.

Calibration

System Zero Calibration (ZCAL)

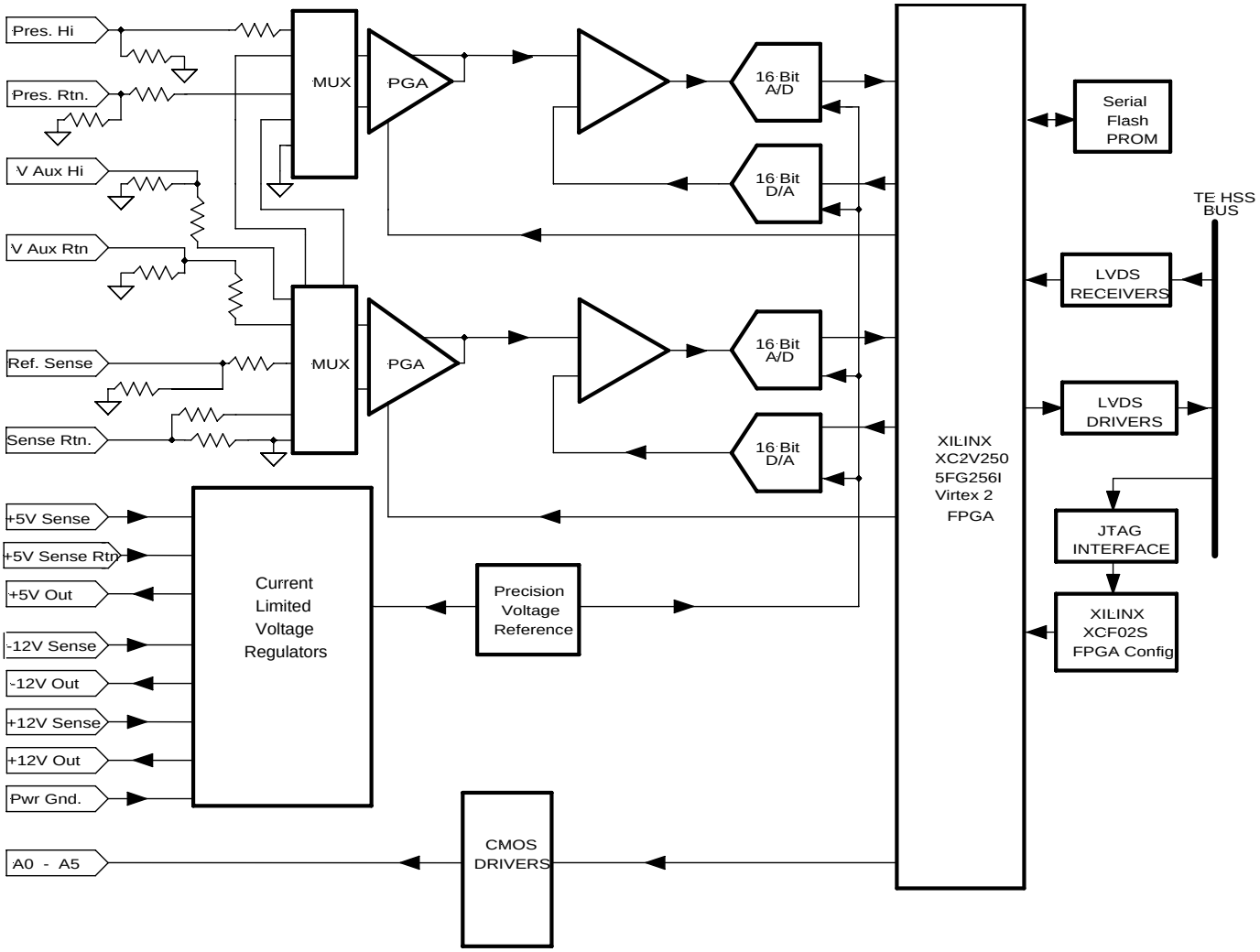
Both the Pressure and the V_Aux channel can be commanded to short the inputs of their amplifiers to signal ground to measure the offset from 0 volts.

System Numeric Calibration (NCAL)

When a system numeric cal command is received, the module outputs 106 for each channel.

Opamp Offset Auto Calibration (Balance)

When power is applied, a Balance command is executed. This command does a ZCAL on both the Pressure and V_Aux channels and then adjusts the offset DACs to bring the offsets to 0.



NSI-3101-2 Function Block Diagram

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