

Airborne Telemetry

NFP-3104-X

NetDAS Frequency/Period Module

Airborne Data Acquisition Products

DESCRIPTION

Period (Frequency) Mode (-501 and -502)

The period mode provides for up to a 32 bit counter that updates at the reference clock rate. In the raw counts mode, the word inserted into the PCM stream represents the number of reference clock periods present in one measurement period of the input. There is a provision for averaging the result over a programmable number of input periods prior to sampling into the PCM stream. In the -501 version, a processed output is provided which converts the raw count to a percentage of the full-scale setting.

Pulse Accumulation Mode (-501)

The pulse accumulator has two modes of operation, raw counts and engineering units. Raw counts mode outputs a 32-bit PCM word that represents a preset number plus the number of pulses that have occurred since the preset value was loaded into the accumulator. The accumulator state is saved to non-volatile memory prior to losing power and subsequently re-loaded at power-up. When an external reset or internal command is activated, the preset value is loaded into the accumulator and the stored accumulator state is cleared.

In the Engineering Units mode, the user enters two values for fuel consumption. One value is fuel density (lbs / gal) and the second is pulses per gallon (ppg). For each pulse detected, the raw count is incremented and multiplied by the constant, fuel density / pulses per gallon to generate the pounds of fuel consumed.

Control Inputs (-501)

The discrete channels provide additional 2 control lines for each frequency channels. Typical types of inputs would be open/close switches and power to circuits that are turned on and off. Each input can be separately programmed as to threshold voltage (-10V to +10V) and high or low active. The inputs also have a place for an optional 10 Kohm termination resistor to ground.

Typical use of one of the line is as "Reset", the other line is reserved for future definition.



communications
Telemetry & RF Products

Excellence You Can Measure

DESCRIPTIONS *(Continued)*

Acquisition

The NFP-3104-X supplies multiple registers or addresses to access frequency and pulse accumulation 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

When a system zero cal command is received, the module outputs 5 for each channel.

When a system numeric cal command is received, the module outputs 105 for each channel.

When a system balance command is received, no action is taken.

Design Notes

The accuracy of the NFP sampling can be determined based upon the following clocking characteristics.

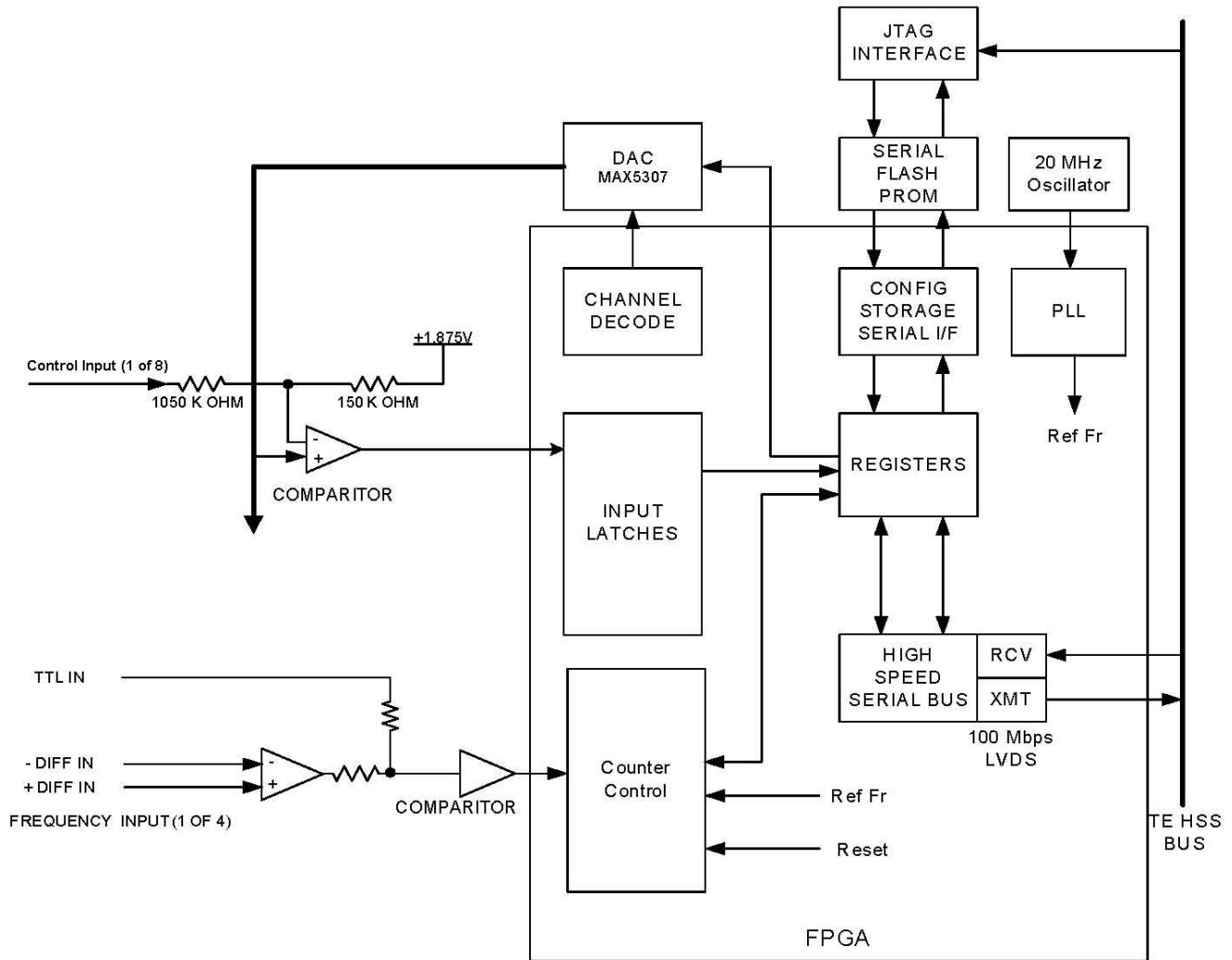
- 20 MHz \pm 50 ppm oscillator multiplied by 5 (PLL) to generate 100 MHz reference frequency
- $F_{rmax} = 100.005$ MHz and $F_{rmin} = 99.995$ MHz
- 200 kHz input, measurement period = 20 usec (4 periods of 200 kHz)
 - F_{rmax} counts = 2000.1, F_{rmin} counts = 1999.9 counts; oscillator frequency tolerance yields an error of ± 0.1 counts
 - Sampling error yields an error of ± 1 count
 - Error of ± 1.1 counts is an accuracy of $(1.1 \times 10 \times 10^{-9} / 20 \times 10^{-6})$ ppm or 0.055%
 - By increasing the measurement period to 40 usec, the accuracy improves to 275ppm (0.0275%)
- 2 kHz input, measurement period = 500 usec (1 period of 2 kHz), $F_r = 10$ MHz \pm 50 ppm
 - Accuracy = $(1.25 \times 100 \times 10^{-9} / 500 \times 10^{-6})$ ppm or 0.0025%

For lower input frequencies (15 kHz or less), sample frequency can be reduced to 10 MHz to achieve the same accuracy.

SPECIFICATIONS

Frequency Channel Specifications	
Frequency Input	
Number	4
Type	AC or DC Differential (-501, -502) or TTL (-501). AC couple roll off = 1500Hz (-502)
Impedance	> 1 Mohm
Signal Amplitude	20 mVpp to 75 Vpp differential. Not to exceed ± 40 V on either input, referenced to digital ground.
Waveshape	Filtered square wave or pulses.
Rate	1 Hz to 200 kHz
Period Measurement (-501, -502)	
Modes	Raw Counts (-501, -502) Engineering Unit Conversion (-501)
Reference Clock	Selectable 100 MHz or 10 MHz
Counter Length	32 bits
Output Word Size	Programmable: 12, 16, 24, or 32 bits
Accuracy	Nominal 0.05%
Average	Programmable number of input periods : 1, 4, 8, or 16.
Pulse Accumulator (-501)	
Modes	Raw Counts or Engineering Unit Conversion.
Reference Clock	10 MHz
Counter Length	32 bits
Output Word Size	Programmable : 12, 16, 24, or 32 bits
External Reset (see Table 3-3 for characteristics)	Edge triggered, Rising or Falling. Clears preset value to zero .
Non-volatile memory	1 Mbit FLASH. Stores accumulator preset value.

External Control Specifications (-501)	
Number	8
Input Range	± 150 V (normal), ± 35 V (option)
Input Impedance	1 Mohm minimum (normal), 10 Kohm (option)
Threshold	Programmable from - 10V to + 10V.
Threshold Level	$\pm 5\%$ of full scale over all conditions.



NFP-3104-X Functional Block Diagram

www.L-3Com.com/te



L-3 Communications Telemetry-East
 1515 Grundy's Lane
 Bristol, PA 19007
 Tel: 267-545-7000
 Fax: 267-545-0100



L-3 Communications Telemetry-West
 9020 Balboa Avenue
 San Diego, CA 92123-3507
 Tel: 858-694-7500, 800-351-8483
 Fax: 858-279-0693