

# axis\_1553\_encoder.v

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## AUTHORS

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## DATES

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## INFORMATION

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### Brief

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AXIS MIL-STD-1553 ENCODER

### License MIT

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## axis\_1553\_encoder

---

```
module axis_1553_encoder #(
    parameter
    CLOCK_SPEED
    =
    2000000,
    parameter
    SAMPLE_RATE
    =
    2000000
) ( input aclk, input arstn, input [15:0] s_axis_tdata, input s_axis_tvalid,
```

AXI streaming to MIL-STD-1553 encoder. This encoder can be used at 2 Mhz or above. TDATA is 16 bit data to be transmitted. TUSER sets how the core works.

## Parameters

<b>CLOCK_SPEED</b> parameter	This is the aclk frequency in Hz, must be 2 Mhz or above.
<b>SAMPLE_RATE</b> parameter	2 Mhz or above rate that is an even divisor of CLOCK_SPEED

## Ports

<b>aclk</b>	Clock for all logic
<b>arstn</b>	Negative reset
<b>s_axis_tdata</b>	Input data for 1553 encoder.
<b>s_axis_tvalid</b>	When set active high the input data is valid.
<b>s_axis_tuser</b>	Information about the AXIS data {TYY,NA,I,P} Bits explained below:

```
- TYY = TYPE OF DATA
  - 000 = NA
  - 001 = REG (NOT IMPLIMENTED)
  - 010 = DATA
  - 100 = CMD/STATUS
- D = DELAY ENABLED
- I = INVERT DATA
- P = PARITY
  - 1 = ODD
  - 0 = EVEN
```

<b>s_axis_tready</b>	When active high the device is ready for input data.
<b>diff</b>	Output data in TTL differential format.
<b>en_diff</b>	When diff is valid data, this is active high and can be used to switch a mux.

## base\_1553\_clock\_rate

```
localparam integer base_1553_clock_rate = 1000000
```

1553 base clock rate

## samples\_per\_mhz

```
localparam integer samples_per_mhz = SAMPLE_RATE / base_1553_clock_rate
```

sample rate to capture transmission bits at

## cycles\_per\_mhz

```
localparam integer cycles_per_mhz = CLOCK_SPEED / base_1553_clock_rate
```

calculate the number of cycles the clock changes per period

## **samples\_to\_skip**

---

```
localparam integer samples_to_skip = (  
    (cycles_per_mhz > samples_per_mhz) ? cycles_per_mhz / samples_per_mhz -  
    1  
    :  
    0  
)
```

calculate the number of samples to skip

## **bit\_rate\_per\_mhz**

---

```
localparam integer bit_rate_per_mhz = samples_per_mhz
```

bit rate per mhz

## **delay\_time**

---

```
localparam integer delay_time = cycles_per_mhz * 4
```

delay time, 4 is for 4 us (min 1553 time)

## **sync\_pulse\_len**

---

```
localparam integer sync_pulse_len = bit_rate_per_mhz * 3
```

sync pulse length

## **bits\_per\_trans**

---

```
localparam integer bits_per_trans = 20
```

bits per transmission

## **synth\_bits\_per\_trans**

---

```
localparam integer synth_bits_per_trans = (  
    bits_per_trans*bit_rate_per_mhz  
)
```

synth bits per trans

## **bit\_pattern**

---

```
localparam [(  
    bit_rate_per_mhz  
)-1:0]bit_pattern = {{bit_rate_per_mhz/2{1'b1}}, {bit_rate_per_mhz/2{1'b0}}}
```

---

create the bit pattern. This is based on outputting data on the negative and positive. This allows the encoder to run down to 1 mhz.

## synth\_clk

---

```
localparam [synth_bits_per_trans-1:0]synth_clk = {  
  bits_per_trans{bit_pattern}  
}
```

synth clock is the clock constructed by the repeating the bit pattern. this is intended to be a representation of the clock. Captured at a bit\_rate\_per\_mhz of a 1mhz clock.

## sync\_cmd\_stat

---

```
localparam [sync_pulse_len-1:0]sync_cmd_stat = {  
  sync_pulse_len/2{1'b0}},  
  sync_pulse_len/2{1'b1}}  
}
```

sync pulse command

## sync\_data

---

```
localparam [sync_pulse_len-1:0]sync_data = {  
  sync_pulse_len/2{1'b1}},  
  sync_pulse_len/2{1'b0}}  
}
```

sync pulse data

## cmd\_data

---

```
localparam cmd_data = 3'b010
```

tuser decode for data

## cmd\_data

---

tuser decode for command

## cmd\_data

---

enable diff output

## STATE MACHINE

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Variables that makeup the encoder state machine.

### data\_cap

---

```
localparam data_cap = 3'd1
```

data capture

### data\_invert

---

```
localparam data_invert = 3'd2
```

invert data

### parity\_gen

---

```
localparam parity_gen = 3'd3
```

parity generator

### process

---

```
localparam process = 3'd4
```

command processor

### pause\_ck

---

```
localparam pause_ck = 3'd5
```

check for pause (4us)

### trans

---

```
localparam trans = 3'd6
```

transmit data

### error

---

```
localparam error = 3'd0
```

someone made a whoops