

Ultra
FLEX

Frequency Counter

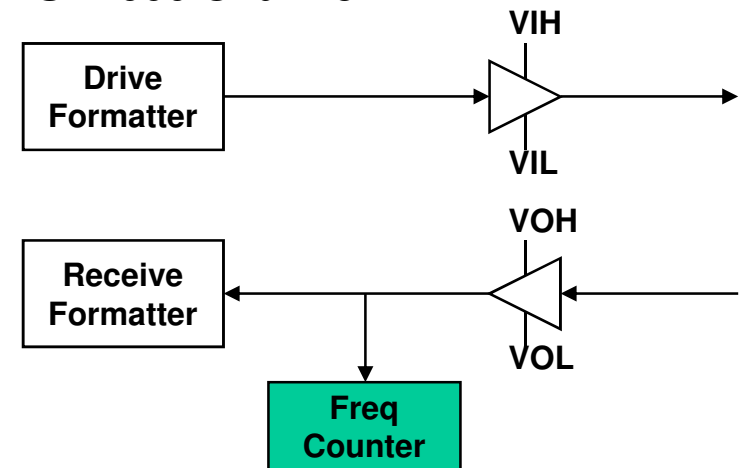


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HSD1000 Frequency Counter Overview

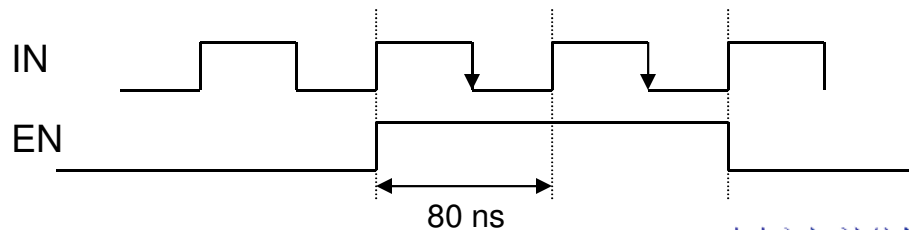
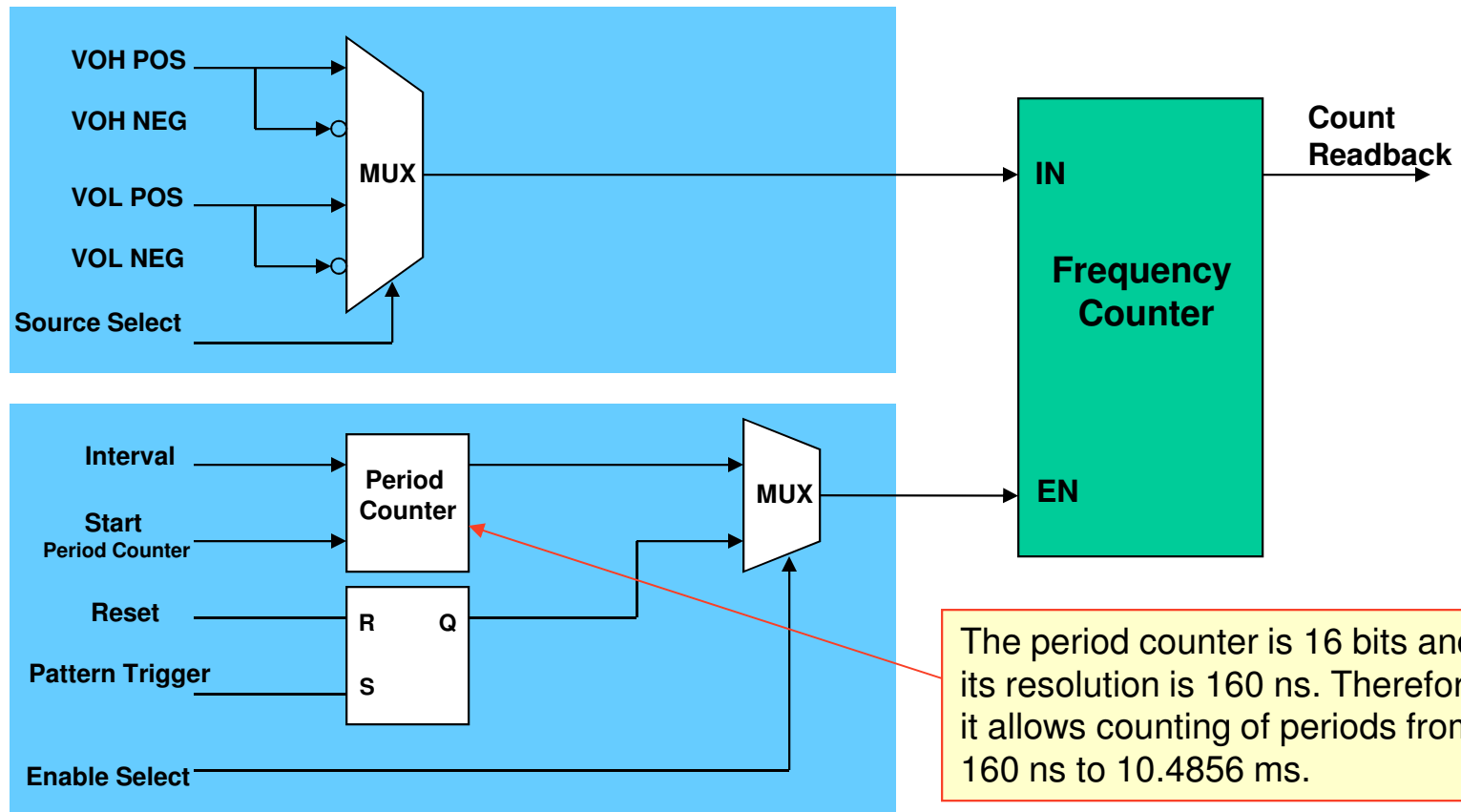
- **Frequency Counter** is an HSD1000 feature which allows a digital channel to count the number of positive or negative compare events within a controlled period.
- The frequency counter has a 1 GHz measurement range, a counter size of 31 bits plus overflow.

HSD1000 Channel



Frequency Counter	Per HSD1000 Pin
Measure Type	Frequency
Measure Range	1GHz
Counter Size	31 bits + overflow
Control	Period Counter Pattern Control (not implemented)

Frequency Counter Hardware



$$\text{Freq} = 2/160\text{ns} = 1/80\text{ns} = 12.5\text{Mhz}$$

VBT (for Period Counter Control Mode)

TheHdw.Digital.Pins(PinList).FreqCtr.		
VBT Statement	Enums	Description
Clear()		Clear frequency counter, Reset enable register, Reset period counter
Read() As PinListData		Read frequency count value
Start()		Start period counter to enable FC*
Enable As FreqCtrEnableSel	IntervalEnable	Use period counter to enable FC
	PatternTriggerEnable**	Use EG trigger to enable FC
	Disable	Disable FC
EventSource As FreqCtrEventSrcSel	VOL	Compare low
	VOH	Compare high
EventSlope As FreqCtrEventSlopeSel	Positive	Rising edge
	Negative	Falling edge
Interval As Double	160ns ~ 10.486ms @ 160ns steps	Duration to capture frequency count

** Not currently supported *FC: Frequency Counter

thehdw.Digital.Pins.FreqCtr

Option Explicit

```
Public Function MeasureFrequency(PatName As Pattern, PinToMeasure As PinList, _
    TimeInterval As Double, lowlimit As Double, _
    highlimit As Double, EvntSrc As FreqCtrEventSrcSel, _
    EvntSlope As FreqCtrEventsSlopeSel, Validating_ As Boolean) As Long
```

```
    Dim Site As Variant
    Dim ReadFreqCnt As New PinListData
    Dim MeasFreq As New PinListData
    Dim pinData As New PinListData
```

```
If Validating_ Then
    'If True during Validation cause the patterns/patsets to be loaded
```

```
    thehdw.Patterns(PatName).ValidatePatlist
```

```
        Exit Function
```

```
End If
```

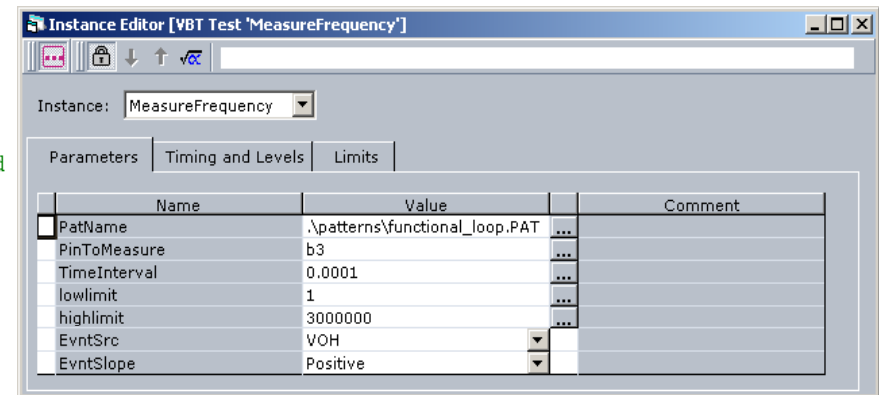
```
On Error GoTo errHandler
```

```
    ' Load level and timing.... use tlPowered for faster test time
    thehdw.Digital.ApplyLevelsTiming True, True, True, tlPowered
    ' Clear and reset the frequency counter.
    Call thehdw.Digital.Pins(PinToMeasure).FreqCtr.Clear
```

```
    ' Set up the frequency counter based on passed-in parameter values.
    With thehdw.Digital.Pins(PinToMeasure).FreqCtr
        .EventSource = EvntSrc
        .EventsSlope = EvntSlope
        .Enable = IntervalEnable
        .Interval = TimeInterval
    End With
```

```
    Call TheExec.Datalog.WriteComment("")
    Call TheExec.Datalog.WriteComment("Running Frequency counter test..")
    Call TheExec.Datalog.WriteComment("Time interval = " & TimeInterval * 1000 & " ms")
```

```
    ' Start pattern.
    thehdw.Patterns(PatName).Start
```



thehdw.Digital.Pins.FreqCtr (continued)

```
' Start the frequency counter and read measurements for all sites.
thehdw.Digital.Pins(PinToMeasure).FreqCtr.Start
ReadFreqCnt = thehdw.Digital.Pins(PinToMeasure).FreqCtr.Read
TimeInterval = thehdw.Digital.Pins(PinToMeasure).FreqCtr.Interval

' Divide count by time interval to calculate frequency.
MeasFreq = ReadFreqCnt.Math.Divide(TimeInterval)

' Halt the pattern.
thehdw.Digital.Patgen.Halt

' Apply test limits.
Call TheExec.Flow.TestLimit(ResultVal:=MeasFreq, lowVal:=lowlimit, hiVal:=highlimit, ScaleType:=scaleMega)

' Loop through sites and print results to datalog.
For Each Site In TheExec.Sites
    'For Each PinToMeasure In pinData.Pins(PinToMeasure)
        Call TheExec.Datalog.WriteComment("Number of pulses = " & ReadFreqCnt)
        Call TheExec.Datalog.WriteComment("Frequency of pin " & PinToMeasure & _
            " Site:" & Site & " is = " & MeasFreq / 1000000 & " MHz")
    'Next
Next Site

Exit Function

errHandler:
    TheExec.AddOutput "Error in the Frequency Counter Test"
End Function
```

Frequency Counter Debug Display

The screenshot shows the **b3(M) Frequency Counter Debug Display** window. It features a **Frequency Counter** section with fields for **Count** (201.000), **Frequency** (2.010 M Hz), and **Period** (497.512 n S), along with **Clear** and **Read** buttons. A **Period Counter** section includes an **Interval** of 100.000 μ S and a **Start** button. A **Receiver** block shows **Voh** (2.400 V) and **Vol** (400.000 m V), connected to a **Digital Channel**. A **Pin Name** dropdown is set to **b3** and the **Channel** is **16.n306 (16.ch4)**. A **Disable** checkbox is at the bottom left. A red line connects the **Read** button to a callout box. A yellow box with a red border contains text about clearing the counter. A menu is open on the right, showing the **Instruments** list with **Frequency Counter** selected.

Clears the frequency counter and resets the trigger enable register and period counter.

Returns the value from the frequency counter

Begins a measurement by the frequency counter

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TDE Debug Window Help

- Auto Display
- Restore Last Session
- ToolSets
- Tools
- Instruments
 - Broadband AC Capture
 - Broadband AC Source
 - DCDiffMeter
 - DCTime
 - DCVI
 - DCVS
 - DSSC
 - Digital Channel
 - Frequency Counter
 - PPMU
 - DIB Power
 - Utility Bits
- Subsystems
- MS Store State
- M- Compare State
- Validate Job
- Characterization Editor
- Excel
- Visual Basic Editor Alt+F11
- Refresh F12
- Options
- Toolbars

HSD1000 Frequency Counter: Typical Display Use Cases

- Check frequency measurements after executing a test instance of frequency measurement
 - Execute test instance
 - Bring up frequency counter debug display
 - Select pin of frequency measurement in frequency counter display
 - Click “Read” button of frequency counter to display frequency
- Measure frequency manually with an infinite pattern
 - Create VBT instance to load and run an infinite pattern
 - Set breakpoint at Patgen.Halt in VBT instance
 - Bring up frequency counter debug display
 - Set/Change Voh and Vol if necessary
 - Execute instance to breakpoint
 - Choose a pin for frequency measurement
 - Set up period counter interval
 - Set up frequency counter receiver or source signal
 - Click “Clear” button of Frequency counter to clear counter
 - Click “Start” button of period counter to start frequency counter
 - Click “Read” button of frequency counter to display frequency measurement
- Measure frequency manually with powering up the device
 - Create a VBT instance to set up power for device
 - Set a breakpoint after powering up device
 - Bring up frequency counter debug display
 - Set/Change Voh and Vol if necessary
 - Execute instance to breakpoint
 - Choose a pin for frequency measurement
 - Set up period counter interval
 - Set up frequency counter receiver or source signal
 - Click “Clear,” click “Start,” then click “Read” to display frequency measurement