Q: How to use microsecond timer with real-time performance?

Applied to:

Platform	*OS version*	*XPAC SDK version*	*XPAC Net version*
XP-8000-CE6	**V1.3.2.2 or later**	**V2.0.0.7 or later**	**V1.1.1.x or later**
XP-8000-Atom-CE6	**V1.0.0.2 or later**	**V2.0.0.7 or later**	**V1.1.1.x or later**

In X5-05 How-to document, we have discussed how to use Multimedia Timer to realize real-time operation. The Multimedia Timer can be adjusted the thread priority to meet the real-time requirement, but the timer unit is only in millisecond.
XPAC series controller provides the backplane timer that supports the high resolution timer in microsecond unit. In addition, the thread priority of this timer also can be adjusted for meeting the real-time requirement.

Backplane API functions:
(1).pac_SetBPTimerOut
(2).pac_SetBPTimer
(3).pac_KillBPTimer
(4).pac_SetBPTimerInterruptPriority

Refer to the XPAC Standard API manual at ftp://ftp.icpdas.com/pub/cd/xp-8000-ce6/document/sdk/
Or ftp://ftp.icpdas.com/pub/cd/xpac-atom-ce6/document/sdk/

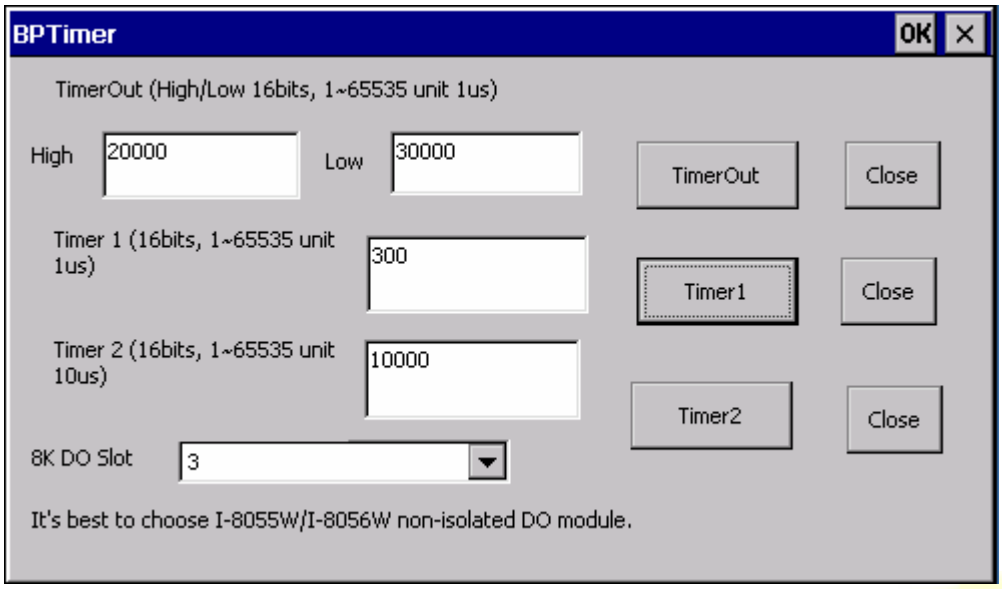
What is the input range of the priority of backplane Timer?
The range is 8 to 256.

How to use Backplane Timer?

1. VC++ demo

Use any one 8K DO module to output square wave to test real time. Change the timer priority to enhance the real-time capability. Use the oscilloscope to monitor the square wave.

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2. C sharp/VB.net demo

It isn't recommended to write the managed code by C# or VB running in the .net compact framework for real-time work. **The feature of JIT compiler and garbage collector of .net compact framework will interfere with deterministic system behavior.**
But we provide the XPACNET.dll to use the P/Invoke functionality to enable managed code to call unmanaged native dynamic-link library entry points of XPACSDK.dll.

Refer to http://msdn.microsoft.com/en-us/library/ms836789.aspx for more detail regarding of Read-time behavior of the .NET Compact Framework.

XPACNET.dll must be put with the executable file in the same folder.

3. The **limitation** of using Backplane timer

Backplane timer is a hardware timer which is triggered by interrupted signals. The interrupt signal on XPAC series is shared use for I-8K interrupt modules, COM4/COM5 and the Backplane timer.

It isn't recommended to use the Backplane time with I-8K interrupted modules, COM4/COM5 at the same time, But It's applied to run with the I-8K DIO/AIO modules.

Note:

I-8K interrupted modules includes I-811xW/I-814xW/I-8048W/I-8014W/I-812xW.

Location of demo download

C sharp:
http://ftp.icpdas.com/pub/cd/xp-8000-ce6/demo/xpac/c%23/standard/bptimer/
or
http://ftp.icpdas.com/pub/cd/xpac-atom-ce6/demo/xpac/c%23/standard/bptimer/

VC++:
http://ftp.icpdas.com/pub/cd/xp-8000-ce6/demo/xpac/vc2005/standard/bptimer/
or
http://ftp.icpdas.com/pub/cd/xpac-atom-ce6/demo/xpac/vc2005/standard/bptimer/

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VB.net:
http://ftp.icpdas.com/pub/cd/xp-8000-ce6/demo/xpac/vb.net/standard/bptimer/
or
http://ftp.icpdas.com/pub/cd/xpac-atom-ce6/demo/xpac/vb.net/standard/bptimer/

The Actual Test

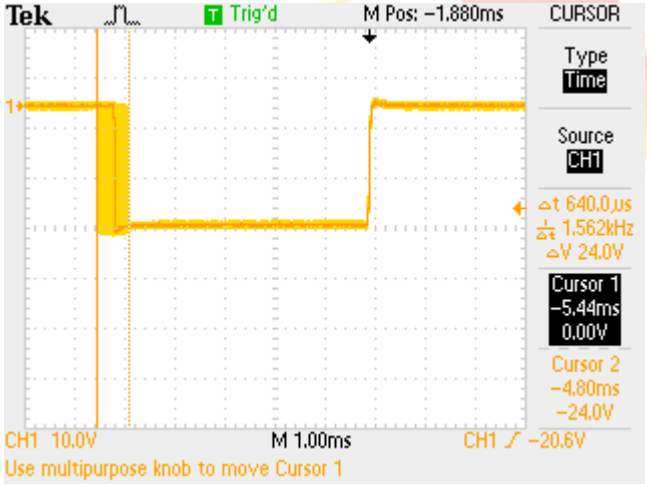
Test platform: XP-8000-Atom-CE6, OS V1002
Test modules: I-8054W (Isolation)
Test conditions:

1. Run the following programs to make CPU loading 100%
   - Do endless loop to write data to a file on \Temp.
   - FTP data upload and download between PC and XPAC.
   - Play video file using TCPMP.

Test methods:

Connect any one DO channel of I-8054W to an oscilloscope. Run C# or VC real-time timer program, and set timer's interval and then press "timeSetEvent function" button to start the timer. Use the persistence feature on the oscilloscope, which records and overwrites ALL traces for a total of many thousands of traces for 12 hours. The results of the Jitter time can be measured from the oscilloscope. Lower jitter time represents the real-time performance is better.

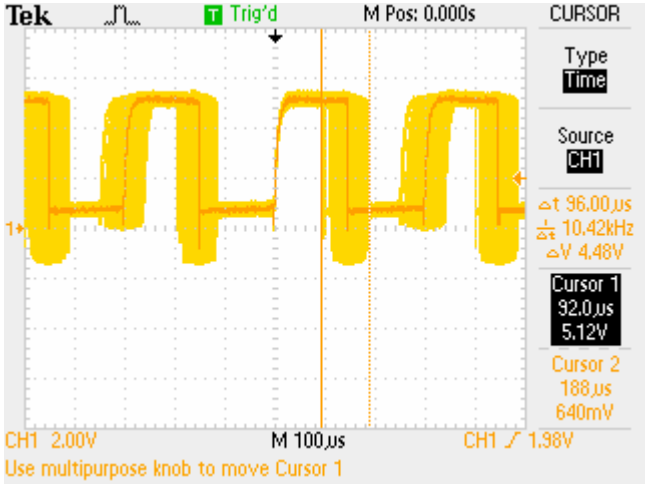
C# BP Timer1
pac_SetBPTimer(1, 5000, ..) (5000μs)
The period of timer is 2ms (50% duty cycle waveform)



Jitter is about 640μs.
According to the actual test, the time interval must large than or equal to 5ms for development using C# language.

VC BP Timer1
pac_SetBPTimer(1, 150, ..) (150μs)
The period of timer is 300μs (50% duty cycle waveform)

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Jitter is about 96µs.

According to the actual test, the time interval must large than or equal to 150µs for development using VC language.

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