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

Applied to:

Platform	*OS version*	*WinPAC SDK Version*	*WinPACNet SDK Version*
WP-8x3x	*OS V1201 and later*	**V2011 or later**	**V110 or later**
WP-8x4x	*OS V1501 and later*	**V2011 or later**	**V110 or later**
VP-25W1	*N/A*	**N/A**	**N/A**
VP-23W1	*N/A*	**N/A**	**N/A**
WP-5000	*N/A*	**N/A**	**N/A**

In W5-05 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 PAC Standard API manual at http://ftp.icpdas.com/pub/cd/winpac/napdos/wp-8x4x_ce50/document/sdk_document/

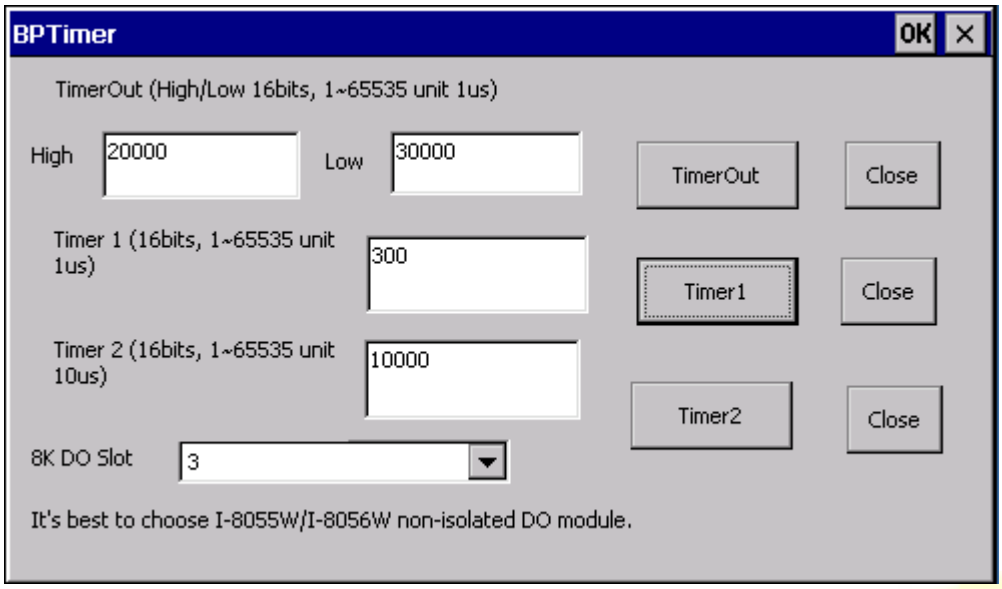
What is the input range of the priority of backplane Timer?
The range is 8 to 256.

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.**

In addition of above, The C# or VB program running WinPAC series takes more CPU usage than XPAC series, we don't provide the C# or VB demo for WinPAC series. Only eVC/VC demo provided.

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, COM3/COM4 and the Backplane timer. It isn't recommended to use the Backplane time with I-8K interrupted modules, COM3/COM4 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

eVC++:

http://ftp.icpdas.com/pub/cd/winpac/napdos/wp-8x4x_ce50/demo/winpac/evc/standard/bptimer/

VC++:

http://ftp.icpdas.com/pub/cd/winpac/napdos/wp-8x4x_ce50/demo/winpac/vc2005/standard/bptimer/

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The Actual Test

Test platform: WP-8441, OS V1601

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 WinPAC.

Test methods:

Connect any one DO channel of I-8054W to an oscilloscope. Run 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.

VC BP Timer1

pac_SetBPTimer(1, 200, ..) (200µs)

The period of timer is 400µs (50% duty cycle waveform)

Jitter is about 150µs.

According to the actual test, the time interval must large than or equal to 200µs for development using VC language.

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