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K-Function Generator Polled.vi: a LabVIEW ver 5 or LabVIEW ver 6 example program

Hardware Requirements:
A plug-in board with an analog output channel and DriverLINX driver. Examples of appropriate hardware are: KPCI-3102, KPCI-3104, KPCMCIA-12AIAO-C, KPCMCIA-12AIAOH-C, KPCMCA-16AIAO-C, KPCMCIA-8AOU-C, KPCMCIA-8AOB-C, KPCI-3130, KPCI-3132 and DDA-08 or DDA-16.

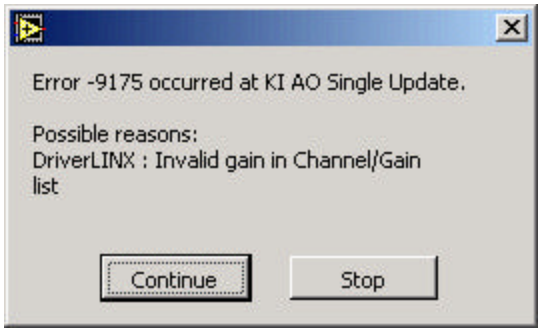
NOTE: polled mode is implemented in very simple D/A boards in which the hardware is not using any interrupt or DMA resources. In polled mode operation, the software updates the value to the D/A converter. Only one value is transferred at a time to the D/A converter. This mode requires considerable CPU time and the program can do little except output values to the D/A converter as fast as the CPU can execute instructions. In this example, we attempt to control the updates to the D/A converter by placing a CPU dependant time delay within our VI (1 ms time delay).

Another key to D/A operation is settling time. Settling time is the period a D/A converter will require to meet its new value after receiving a command to change. While a D/A converter's output can change as it receives a new value, the output requires some time to reach a new steady state value. Each of the Keithley hardware listed above has a unique settling time associated to the D/A converter. One should be aware of this specification and not attempt to over run the settling time of the D/A as this will cause output distortions.

If you require analog updates faster than 1 ms or require timing accuracy (jitter), then use of DMA or Interrupt mode is necessary. Boards such as the KPCI-3102, KPCI-3104 or KPCI-3130 Series do not have a DMA or Interrupt mode for their analog output feature. Use of alternate hardware is required. Consider the Keithley KPCI-3108, KPCI-3116, KPCI-3110, KPCI-1801HC, KPCI-1802HC or even the DAS-1802AO which all supported paced mode analog output tasks.

Use Consideration:

When using the K-Function Generator Polled.vi, one should be aware of software issues related to this example. First, you cannot enter an amplitude value greater than the hardware can support. For an example if one attempts to enter 11 volts, the VI will generate the following message box.



This error is due to the fact that the requested voltage is outside the range of the hardware. This same error message will be generated if the offset combined with the amplitude is higher than the hardware supported value. In general, plug-in board products can not source signals greater than +/-10 volts.

The other noticeable features are:

1. The example defaults to analog output Channel 0 of your data acquisition card

2. The device number is set to 1 and requires this LabVIEW device number assignment in the DriverLINX Configuration Panel(LabVIEW tab) for your installed DriverLINX device
3. Any observed jitter of the generated signal is due to software latency issues under the Windows operating system and variation in loop execution time. Windows is a multi-tasking operating system and there are other tasks running in the background that contribute to timing variations. This behavior is more noticeable when you attempt to run the VI with out any long time delays.
4. Typical update rate for KPCI-3102 card (without any ms delay) was in the range of 400 us (this benchmark was on a P3-933 MHz, Windows 2000 SP1, LabVIEW 6i). Note, other PCs may execute the VI faster or slower based on PC performance and Keithley D/A cards may vary based on hardware specification such as settling time.
5. The Triangle and Sawtooth waveforms are only unipolar signals while the Sine and Square waveforms are bi-polar.
6. The function buttons default to sine wave. You must turn off a previous function other than sine wave in order to activate another signal function option. Only the sine wave button will default to the on state.
7. The frequency is calculated by the following calculation:

   Hz = 1 / [update rate (ms delay) * total points per channel]

   Note, for more than one signal cycle the VI divides the frequency by that number.

Please Note: This example program was developed and tested by a Keithley Applications Engineer for technical support purposes. This code may not be completely tested and verified with each new revision of LabVIEW and DriverLINX software drivers.