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User-selectable Sampling Frequencies in the Analog Monitor for Sub-Bottom & Side Scan Data Collection

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INTRODUCTION

In 2018, HYPACK tested two new National Instruments analog-to-digital devices (NI-DAQ) to replace the NI USB-6221 BNC DAQ which is nearing the end of design life (see Sounding Better article January 2018). Our new recommendation for a USB 16-bit National Instruments digital acquisition device is either of the following:

- USB-6341 with BNC connectors, or the slightly cheaper
- USB-6212 BNC

These two NI-DAQ devices are capable of significantly higher sampling rates of 500 ks/s (USB-6341 BNC) and 400 ks/s (USB-6212 BNC) compared to 250 ks/s for the older USB-6221 BNC.

The HYPACK® Analog Monitor software is used to configure and connect to the National Instruments analog-to-digital devices (NI-DAQ). Further functional improvements to the Analog Monitor were added earlier this year including a choice of grounding options which was documented in Sounding Better July 2018. For most users, HYPACK recommends the default RSE mode (referenced single-ended) combined with the floating source (FS) switches on the analog input lines of the NI-DAQ device.

NEW USER-SELECTABLE SAMPLNG FREQUENCIES

In HYPACK® versions 18.0.0 and older, the Analog Monitor sampling frequency was not user-selectable. It was capped at a 48 kHz sampling rate per channel and would degrade from this rate as necessary to accommodate older NI-DAQ devices.

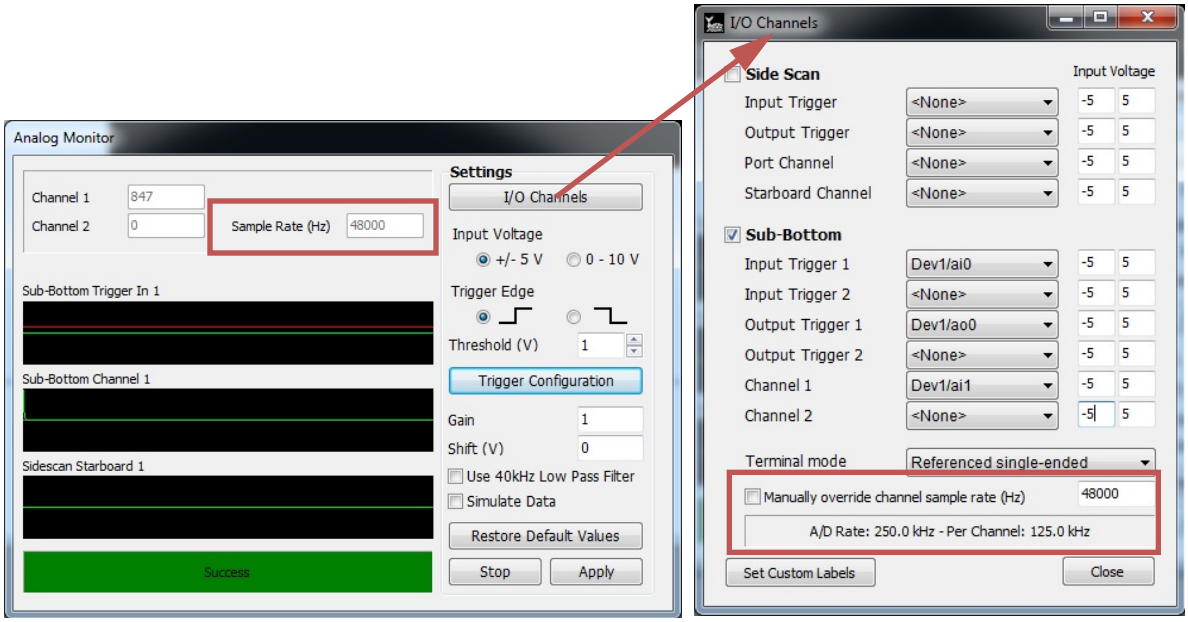
In HYPACK® 18.1, two new sampling rate features were added to the Analog Monitor:

- A display of the capabilities of the NI-DAQ system in the I/O Channels dialog window (maximum sampling rate), and
- A sample rate manual override in which one can select a custom sampling rate higher or lower than the default 48 kHz.

Various examples are provided overleaf, which demonstrate the functionality of the default and user-selectable sampling rate options.

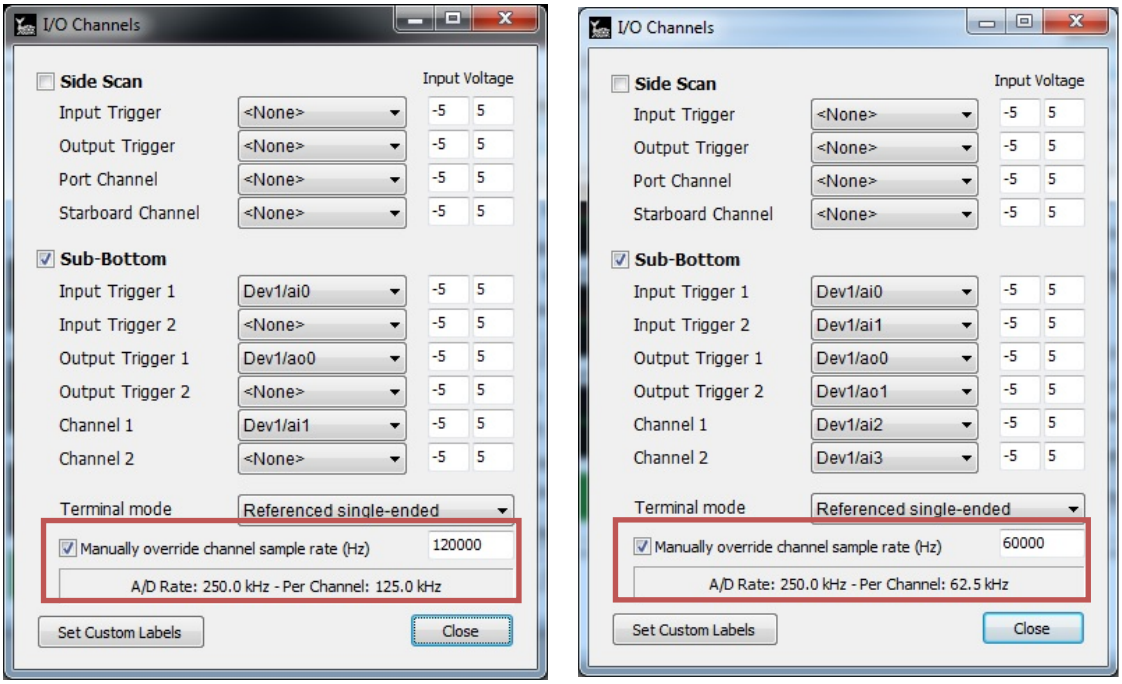
Example 1: Default sampling rate of 48 kHz with a single sub-bottom profiler (SBP) and internal trigger

FIGURE 1. *The Analog Monitor Main Window (left) showing the default sampling rate of 48 kHz. In the I/O Channel window (right), an option is provided to change the default sampling rate. HYPACK provides recommendations for the maximum allowable sampling frequency based on the specification of the NI-DAQ and the number of channels used. In this example two NI-DAQ channels are used.*



Example 2: User-selectable sampling rates for a single channel sub-bottom profiler and two sub-bottom profilers collected simultaneously with internal triggers.

FIGURE 2. *The I/O Channel configuration (left) for a single SBP allows for a user-selectable sampling frequency of up to 125 kHz (for two channels). The I/O Channel configuration (right) for two SBP's allows for a user-selectable sampling frequency of up to 62.5 kHz (for four channels). Remember to select the Manually Override option and then click [Apply] in the Analog Monitor main window.*



Example 3: User-selectable sampling rates for a two channel side-scan and a single channel sub-bottom profiler collected simultaneously with internal triggers.

FIGURE 3. *The I/O Channel configuration (left) for two channels of side scan sonar and a single SBP allows for a user-selectable sampling frequency of up to 50 kHz (for five channels).*

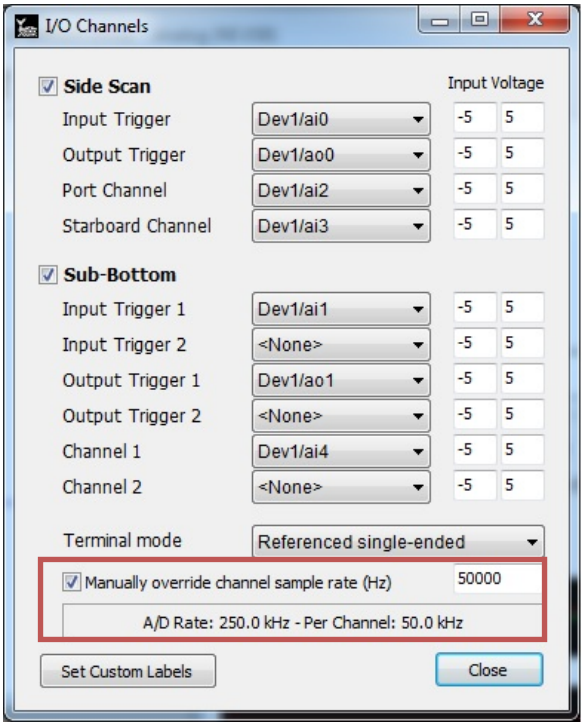
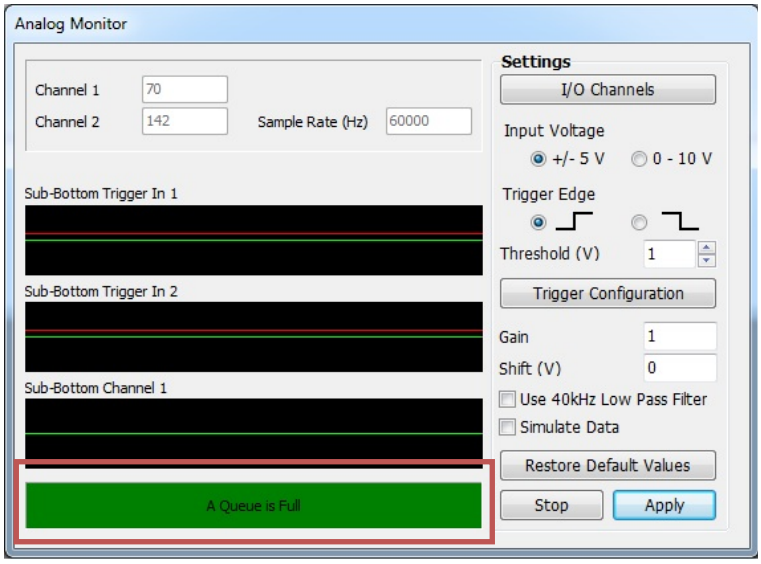


FIGURE 4. *If too high a sampling frequency is selected for the type of NI-DAQ device and the number of channels selected, a "Queue is Full" message will appear in the Analog Monitor main window.*



CONCLUSION

The updated Analog Monitor in HYPACK® 18.1 allows one to select a custom sampling frequency based on the specifications of the NI-DAQ device and number of channels used. If

you are changing the sampling rate from the default value of 48 kHz, it is prudent to select a sampling frequency slightly below what HYPACK recommends as the maximum allowable frequency per channel. Changing the sampling frequency should only be considered for advanced users and situations where very high sampling frequencies are necessary. The default sampling frequency is high enough for most side-scan sonar and sub-bottom profiling applications.