



Using the Analog USB Device in HYPACK for Sub-Bottom or Side Scan

By Jerry Knisley

When using the National Instruments USB-6221 device to interface to HYPACK® there are a few steps that you must take to set up the device.

INSTALLING THE SOFTWARE

The first thing to do is install the software that comes with the USB-6221, then plug the device into the USB device. There are 8 analog inputs and two analog outputs that can be used; the digital and timing ports are not used.

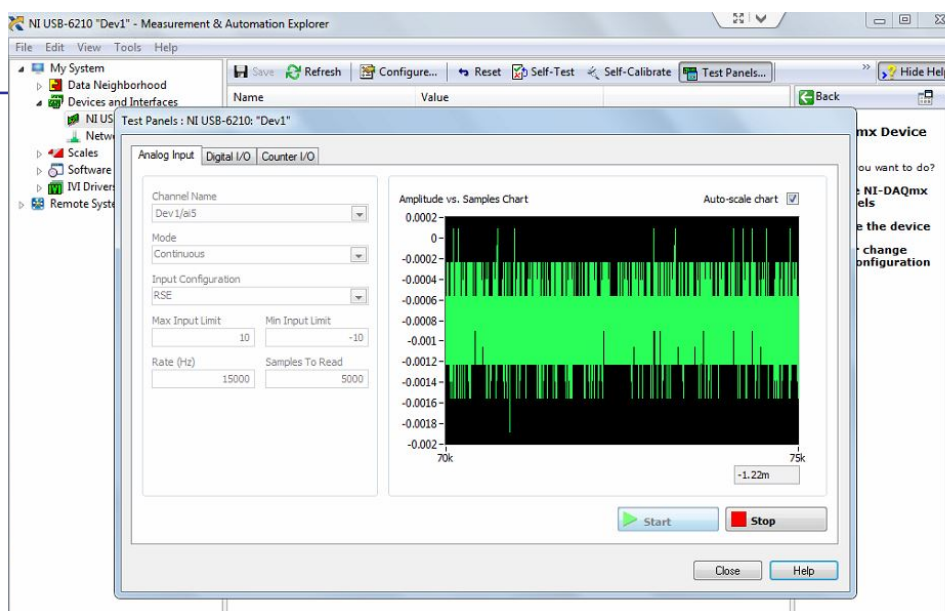
I like to test the device in the National Instruments software that comes with the

USB-6221 device. Figure 1 shows the Analog Channel 5 with nothing coming in. The way to determine that nothing is coming in is the scale on the left edge of the display. The display is set to Automatic, but the range of values is from -0.002 volts to 0.0002 volts.



FIGURE 1.
Analog Channel 5. No Input Data

Once the device is working in the National Instruments software, it is time to proceed to connecting the device. There are several device configurations, they will be explained individually.



ANALOG USB MONITORING PROGRAM

Within HYPACK®, there is a program used to interface to the NI USB-6221 device. This program automatically launches when the device is selected by either the SIDE SCAN SURVEY program or the SURVEY program running the Subbot driver.

FIGURE 2. Analog Monitor Window

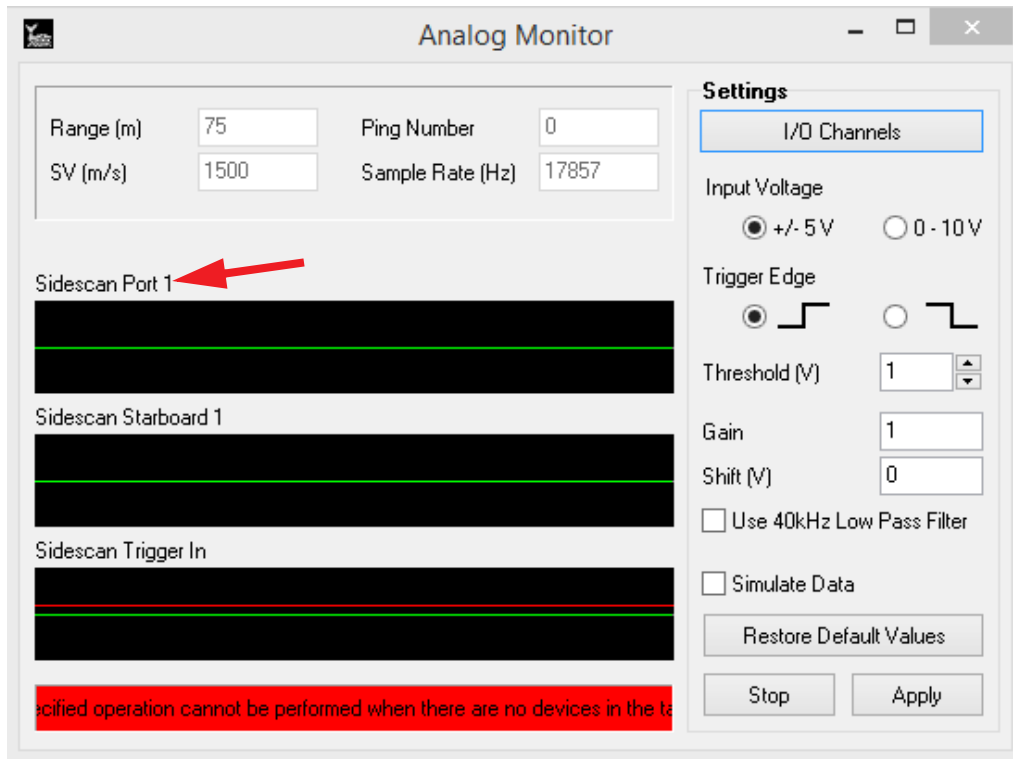
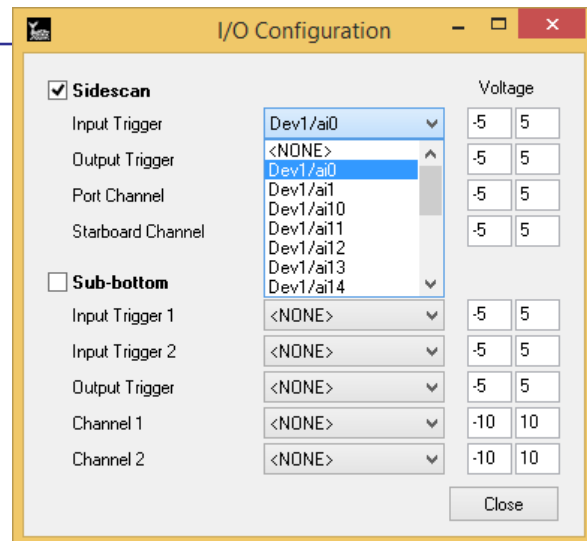


FIGURE 3. Configuring the Input/Output Channels

In Figure 3, the display is setup to monitor side scan data. The type of configuration is selected in the I/O Channels dialog:

- By selecting the **Side Scan** checkbox, the program uses the channels specified in the drop-down for trigger and the port/starboard channels to pass to the SIDE SCAN SURVEY program.
- If this was configured for **sub-bottom**, the program would pass the data coming in on those channels to the SUBBOT driver in SURVEY.

On the main Analog Monitor display, each of the signal windows can be configured to monitor either side scan or sub-bottom. You can click the label indicated with the arrow in Figure 2 and it will change the display in the signal



window below it. (If you see Side Scan Port 2, press the button to change it to Side Scan Port 1; Port 2 is the port channel second frequency.)

ANALOG SIDE SCAN WITH EXTERNAL TRIGGER

When using the device with a sensor that triggers itself (external trigger), the USB device does not need any of the Analog Output ports connected.

An analog side scan system with external triggering needs one input channel on which to bring the trigger in, and one input for each side scan channel. If the side scan has only one channel, you would use two channels, one trigger and one signal. For the example in Figure 4, the sonar has two channels.

FIGURE 4. Analog Side Scan Sonar with External Trigger and Two Channels

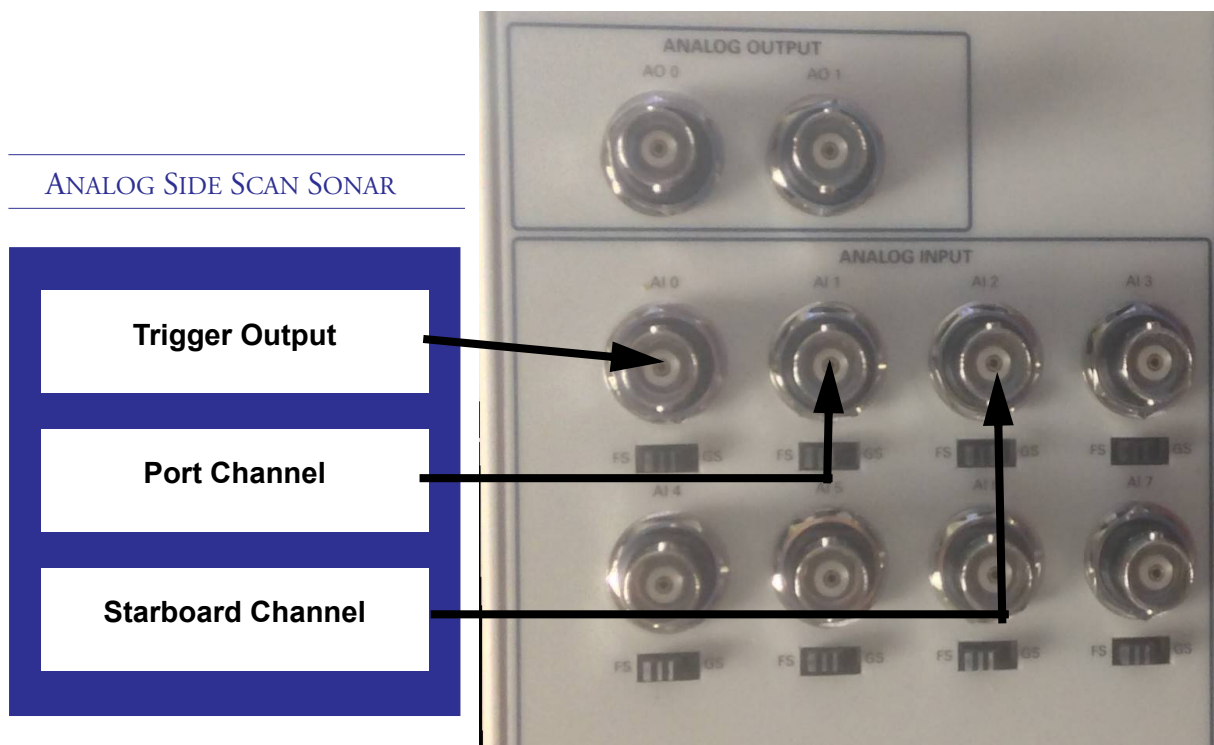


FIGURE 5. I/O Configuration for the ASCAN USB Program—Side Scan Sonar with External Triggering.

		Voltage	
☒ Sidescan			
Input Trigger	Dev1/ai0	-5	5
Output Trigger	<NONE>	-5	5
Port Channel	Dev1/ai1	-5	5
Starboard Channel	Dev1/ai2	-5	5
☐ Sub-bottom			
Input Trigger 1	<NONE>	-5	5
Input Trigger 2	<NONE>	-5	5
Output Trigger	<NONE>	-5	5
Channel 1	<NONE>	-10	10
Channel 2	<NONE>	-10	10
		Close	

ANALOG SIDE SCAN WITH INTERNAL TRIGGER

When using the device with a sensor that requires a trigger, the USB device does need to have the analog output 0 connected to a BNC T which is placed on Analog Input 1 and the other side goes to the sensor trigger input.

An analog side scan with internal triggering, needs one output channel to send the trigger, one input channel to receive the trigger and one input channel for each side scan signal. If the side scan has only one channel, you would use two channels: one trigger and one signal. For this example the sonar has two channels.

The trigger must both go out and come in so the HYPACK® software detects the trigger at the same time as the sonar.

FIGURE 6. Analog Side Scan Sonar with Internal Trigger

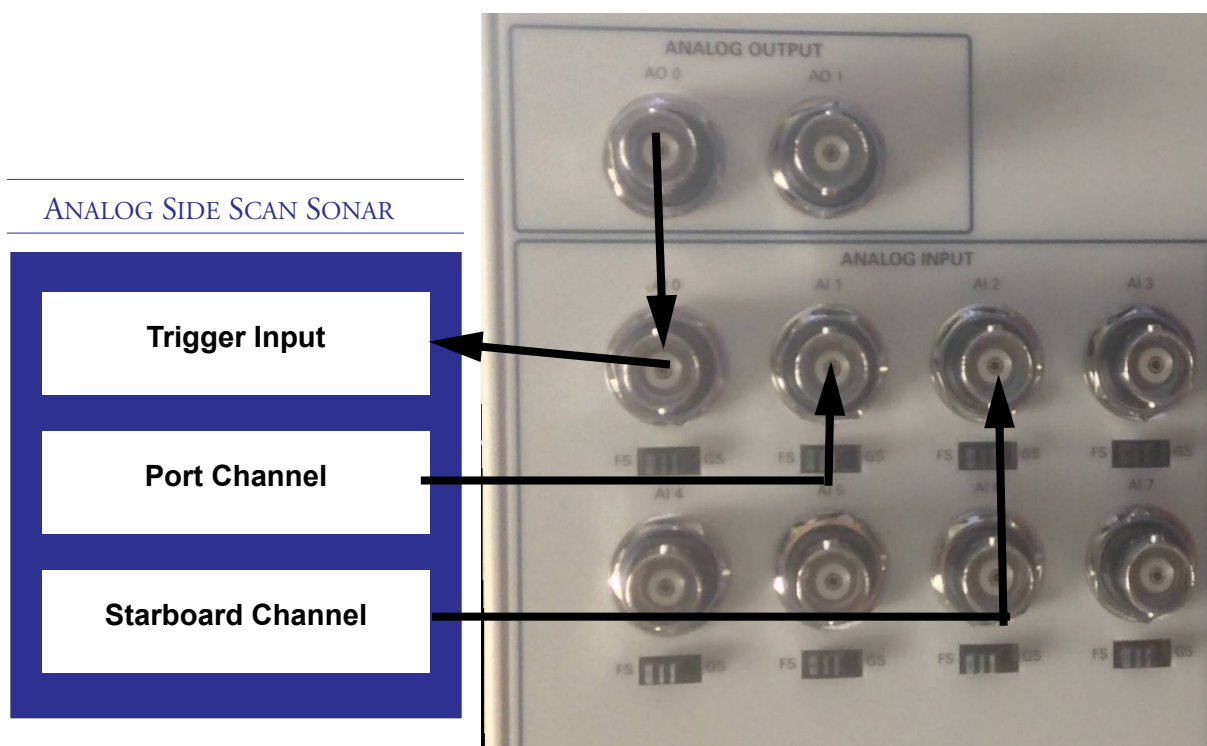
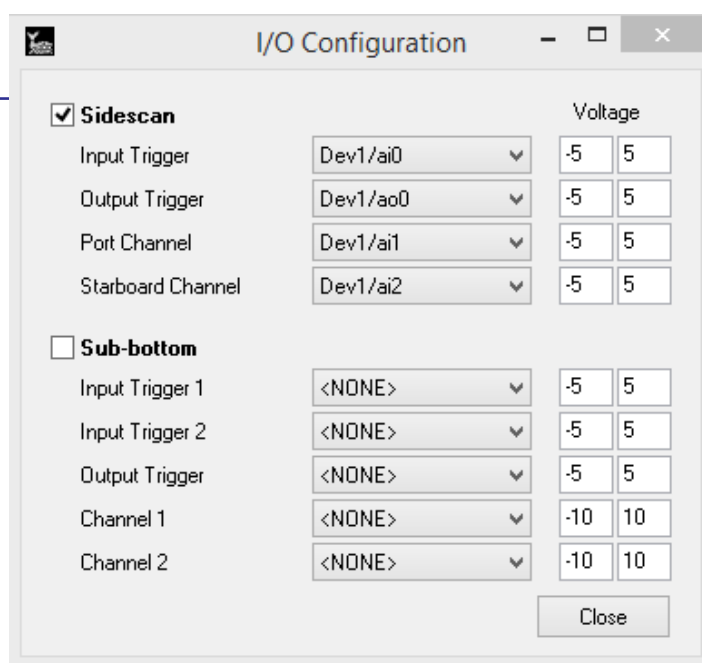


FIGURE 7. the I/O Configuration for the ASCAN USB Program — Side Scan Sonar with Internal Triggering



ANALOG SUB-BOTTOM CONFIGURATION

When using the NI USB-6221 device with sub-bottom sonar, the configuration remains nearly the same. The biggest difference is that the sub-bottom device can handle two channels. To handle this, you configure a second trigger input.

FIGURE 8. Analog Sub-bottom Sonar—External Trigger, One Channel

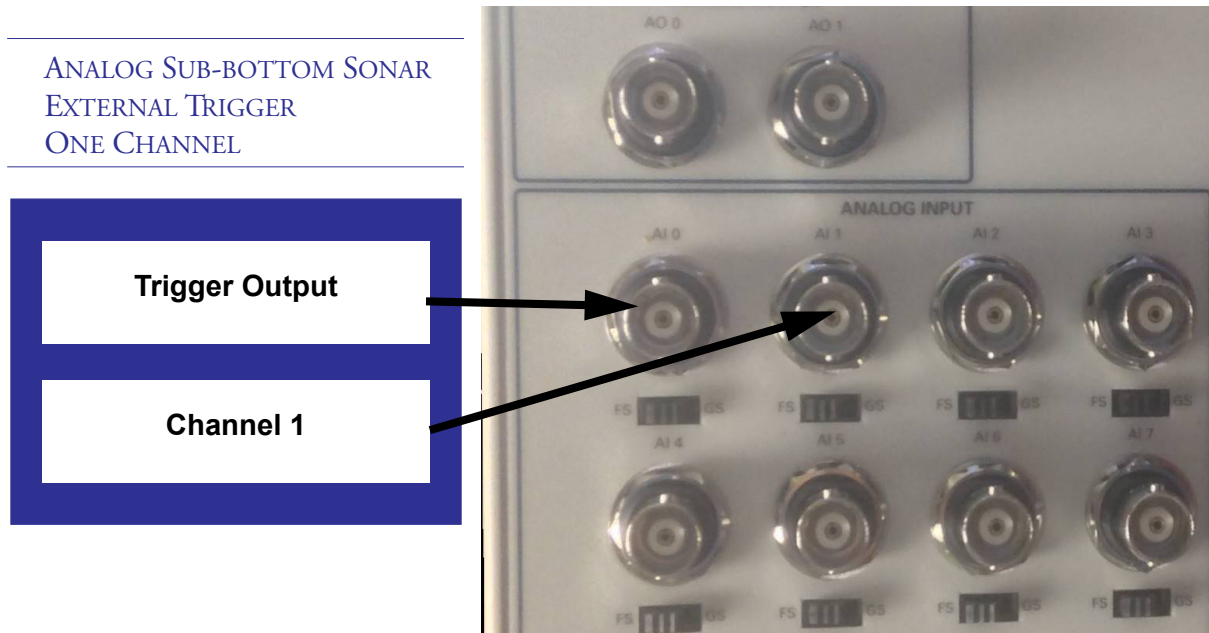


FIGURE 9. I/O Configuration for the ASCAN USB Program—Sub-bottom Sonar with Internal Triggering.



I/O Configuration

☐ Sidescan

Input Trigger

Output Trigger

Port Channel

Starboard Channel

<NONE>

<NONE>

<NONE>

<NONE>

Voltage

-5

5

-5

5

-5

5

-5

5

☒ Sub-bottom

Input Trigger 1

Input Trigger 2

Output Trigger

Channel 1

Channel 2

Dev1/ai0

<NONE>

<NONE>

Dev1/ai1

<NONE>

-5

-5

-5

-10

-10

5

5

5

10

10

Close

FIGURE 10. Analog Sub-bottom Sonar—External Trigger, Two Channels

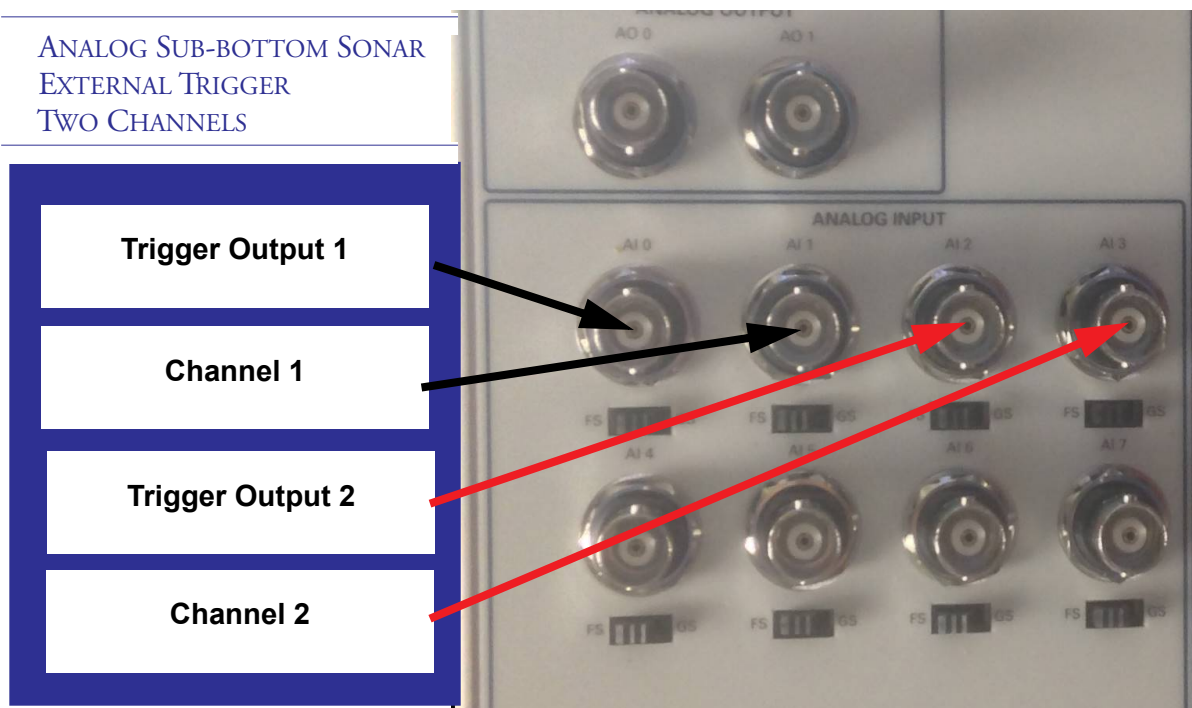


FIGURE 11. I/O Configuration for the ASCAN USB Program—External Trigger, Two Channels

I/O Configuration

☐ **Sidescan**

Input Trigger	<NONE>	-5	5
Output Trigger	<NONE>	-5	5
Port Channel	<NONE>	-5	5
Starboard Channel	<NONE>	-5	5

☒ **Sub-bottom**

Input Trigger 1	Dev1/ai0	-5	5
Input Trigger 2	Dev1/ai2	-5	5
Output Trigger	<NONE>	-5	5
Channel 1	Dev1/ai1	-10	10
Channel 2	Dev1/ai3	-10	10

Close

FIGURE 12. Analog Sub-bottom Sonar—Internal Trigger, Two Channels

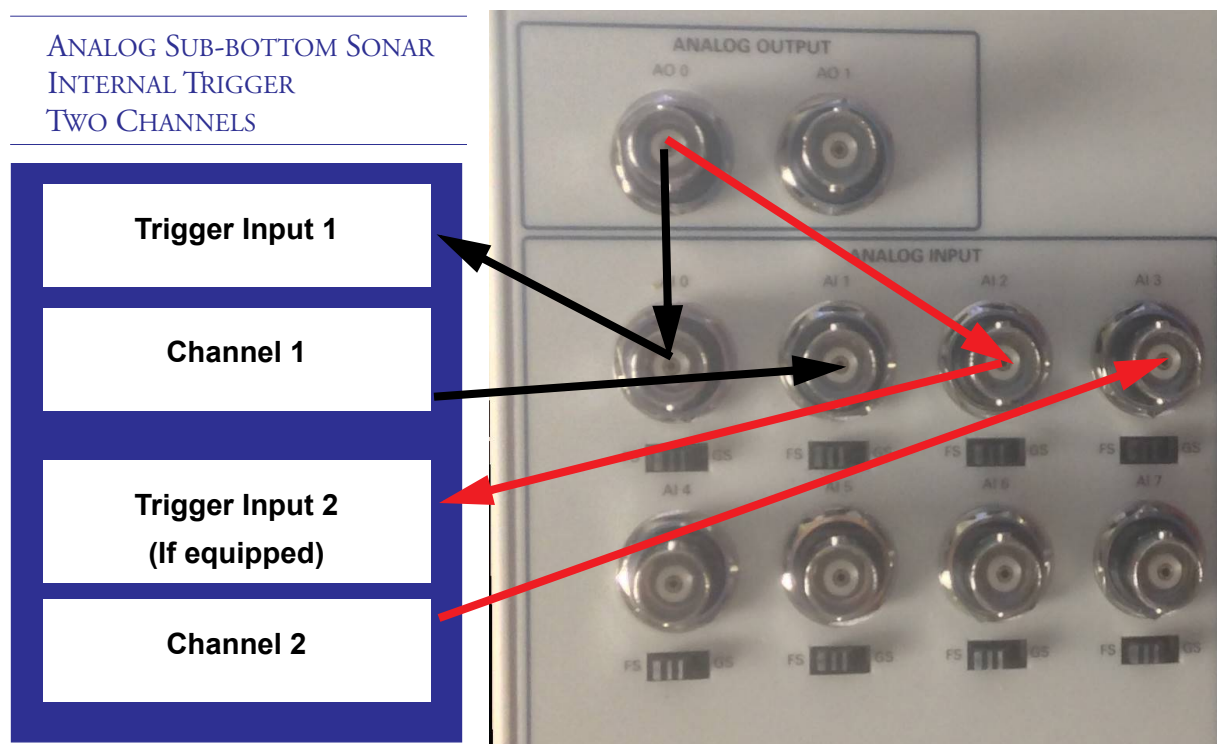


FIGURE 13. I/O Configuration for the ASCAN USB Program—Internal Trigger, Two Channels

In this configuration the output trigger is shared between both channels. Using a BNC T on the Analog Output 0 channel the signal is split to Analog Input 0 and Analog Input 2. The Analog input 0 and Analog Input 2 each must have a BNC T installed so that the signal can be passed to the sensor trigger inputs.

I/O Configuration

☐ **Sidescan**

Voltage

Input Trigger	<NONE>	-5	5
Output Trigger	<NONE>	-5	5
Port Channel	<NONE>	-5	5
Starboard Channel	<NONE>	-5	5

☒ **Sub-bottom**

Input Trigger 1	Dev1/ai0	-5	5
Input Trigger 2	Dev1/ai2	-5	5
Output Trigger	Dev1/ao0	-5	5
Channel 1	Dev1/ai1	-10	10
Channel 2	Dev1/ai3	-10	10

Close

FIGURE 14. Analog Sub-bottom Sonar—Internal Trigger, One Channel

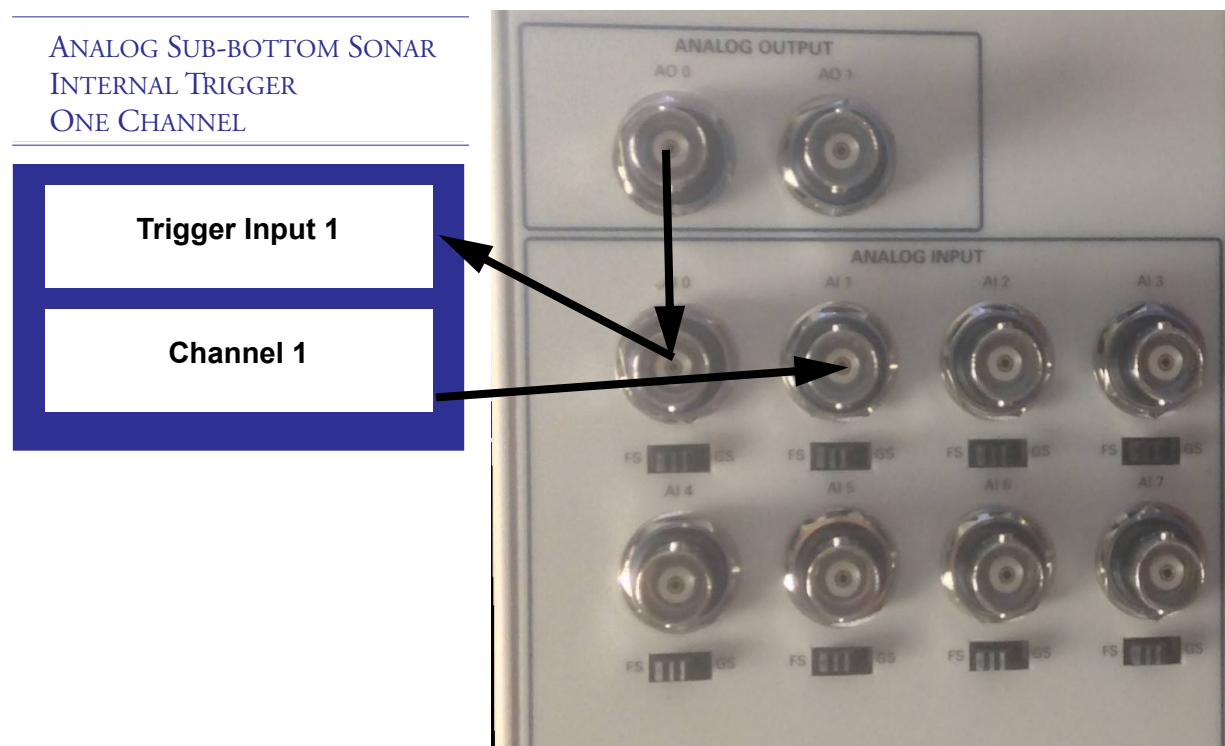
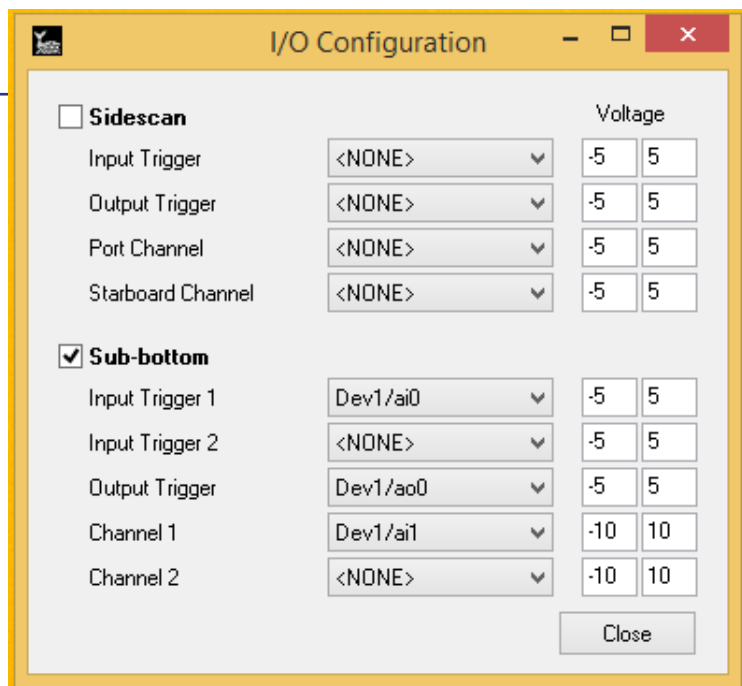


FIGURE 15. I/O Configuration for the ASCAN USB Program—Sub-bottom, Internal Trigger with One Channel

In this configuration the Analog Output 0 is sent to Analog Input 0. On Analog Input 0 there must be a BNC T so that the trigger can be sent to the sonar. Analog Input 1 is connected to the sonar signal output.



SIDE SCAN AND SUB-BOTTOM AT THE SAME TIME

It is possible to configure the device to handle both an analog side scan and an analog sub-bottom device. In the description below a dual channel sub-bottom and a dual channel side scan are portrayed with internal triggering. This is the most complicated setup. If a single channel sub-bottom is to be used eliminate the second channel setup.

FIGURE 16. Simultaneous Side Scan and Sub-Bottom

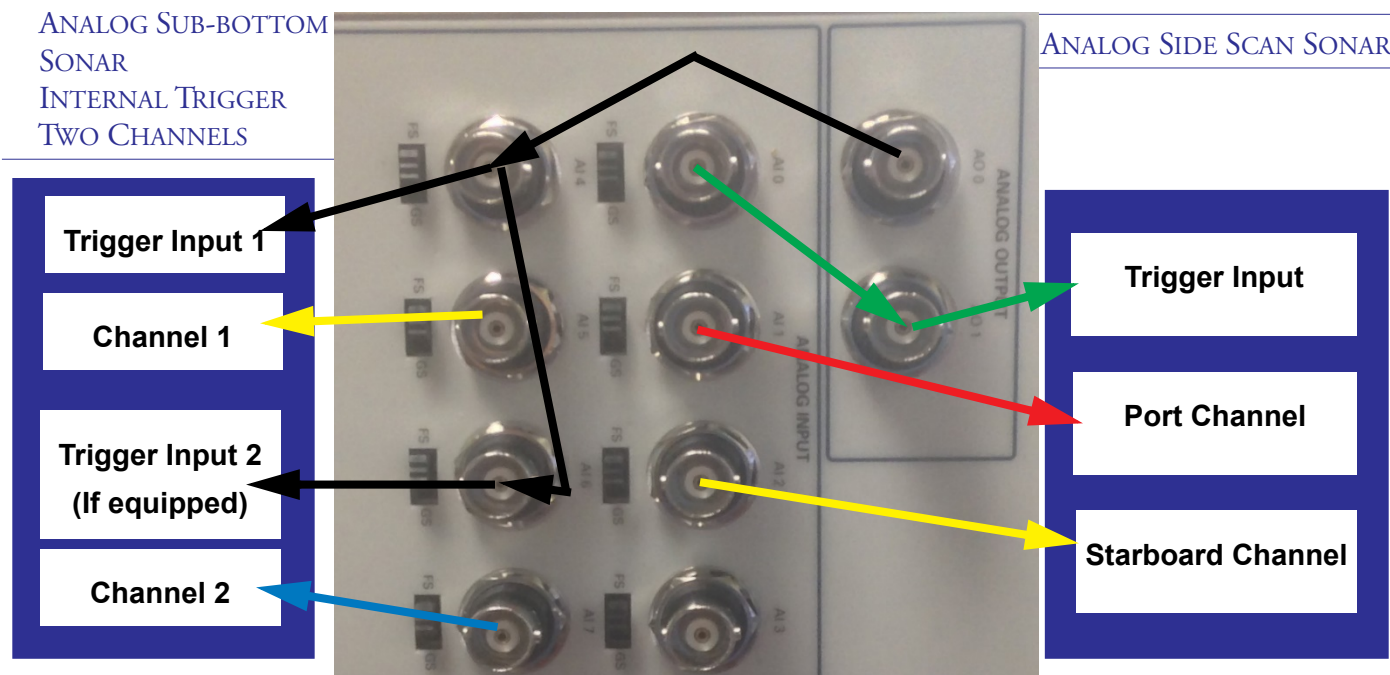


FIGURE 17. I/O Configuration for the ASCAN USB Program—Simultaneous Side Scan and Sub-Bottom

As promised this is the most complicated setup there could be using the NI USB-6221 device in HYPACK®. The trigger for the sub-bottom is the Analog Output 0 which is attached to a BNC T device that is installed on the Analog Input 4, where another BNC T is installed and carried on to Analog Input 6. Both Analog Input 4 and 6 must have BNC T devices so that the trigger can be carried on to the sonar. The sub-bottom channels are plugged into AI5 and AI7.

The trigger for the side scan is AO1 which is connected to AI 0. A BNC T is used to carry that signal out to the sonar. Port and Starboard side scan signals are connected to AI 1 and AI 2.

