**How do I test my Analog Input board (A/D) for functionality in InstaCal?**

All Measurement Computing boards can be tested in some fashion in InstaCal. To test the analog inputs for functionality, there are 2 main tests you can run; the Analog Loop Back test and the Scan test.
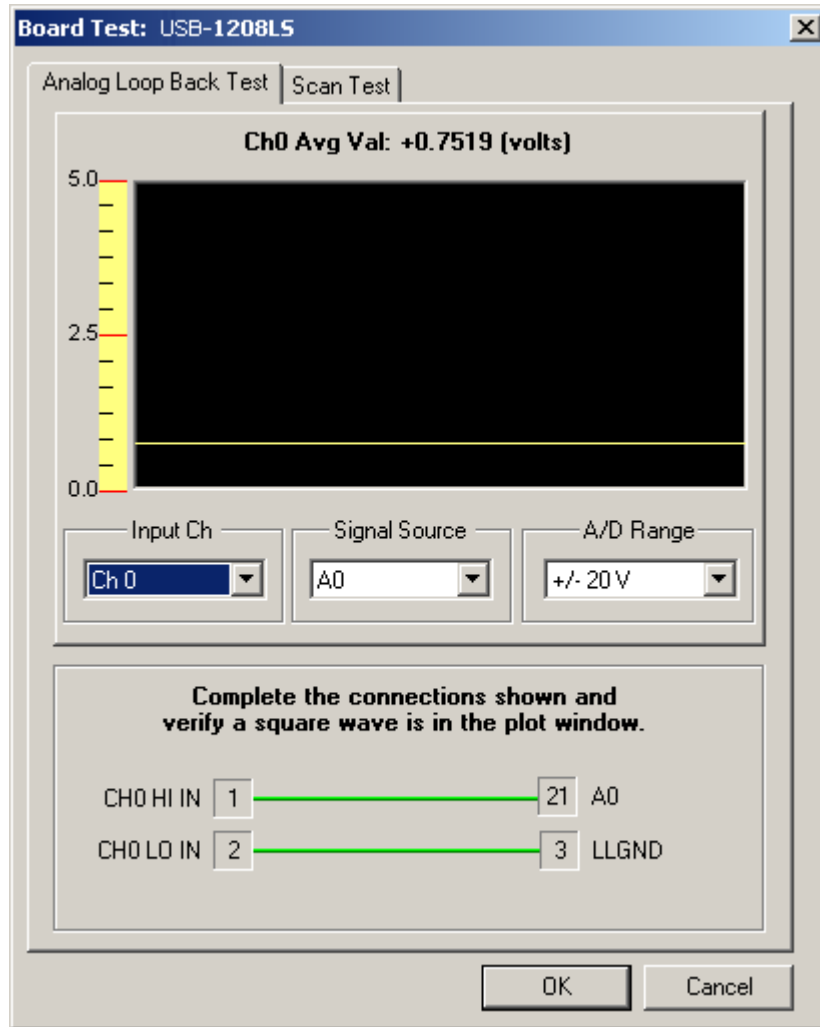
The Analog Loop Back test, aptly named as it performs a test where a digital bit, counter, and/or analog output are looped back to an analog input channel to provide an input signal that can be viewed on the display panel. There is also a provision in the Analog Loop Back test allowing you to inject your own signal and display it on the panel.

To start the test, launch InstaCal by clicking on Start > All Programs > Measurement Computing > InstaCal.

The following dialog box appears.
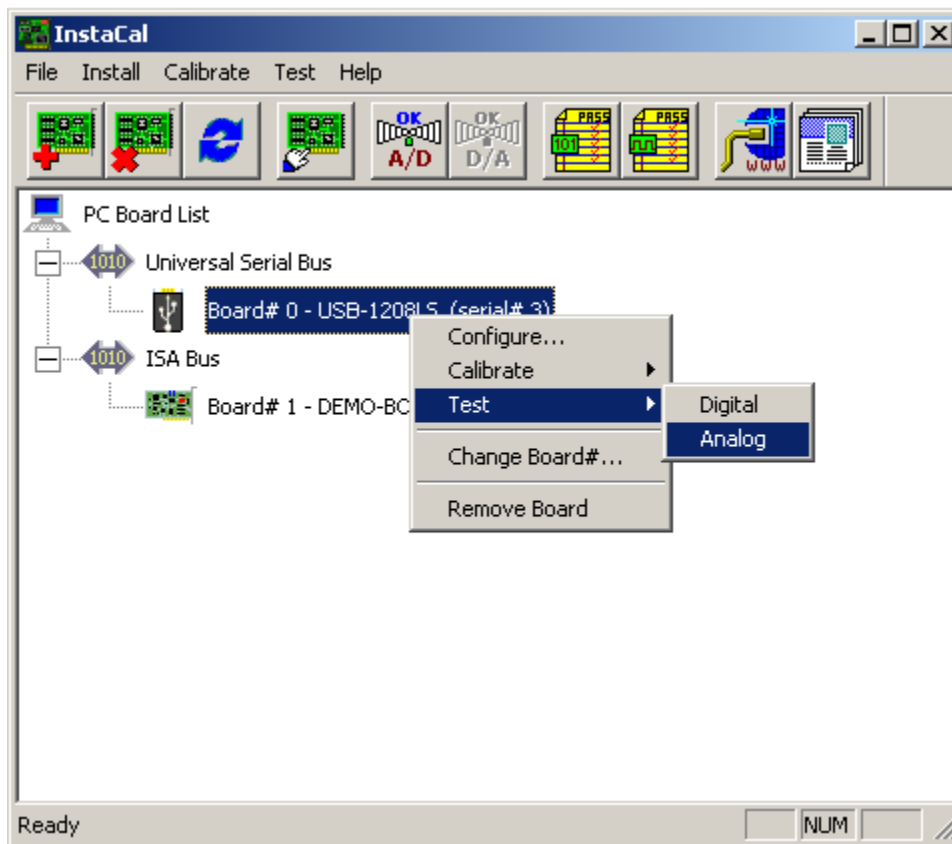
To start the Analog Loop Back test, you right click on the board you want to test, select Test > Analog as shown above. The following dialog box appears:

Board Test: USB-1208LS

Analog Loop Back Test | Scan Test

Ch0 Avg Val: +0.7519 (volts)

5.0
2.5
0.0

Input Ch
Ch 0

Signal Source
A0

A/D Range
+/- 20 V

Complete the connections shown and
verify a square wave is in the plot window.

CH0 HI IN 1 —————————— 21 A0
CH0 LO IN 2 —————————— 3 LLGND

OK   Cancel

As you can see, there are 3 combo boxes, labeled "Input Ch", "Signal Source", and "A/D Range."

Input Ch, or Input Channel is how you select the input A/D channel you want to test. This combo box will only show you the channels you have available based upon your configuration of Single Ended or Differential (if your hardware has that option).

Signal Source is a list of digital bits, counters, analog outputs (DACs) or may be set to External. The list varies depending on what hardware from Measurement Computing you are using.
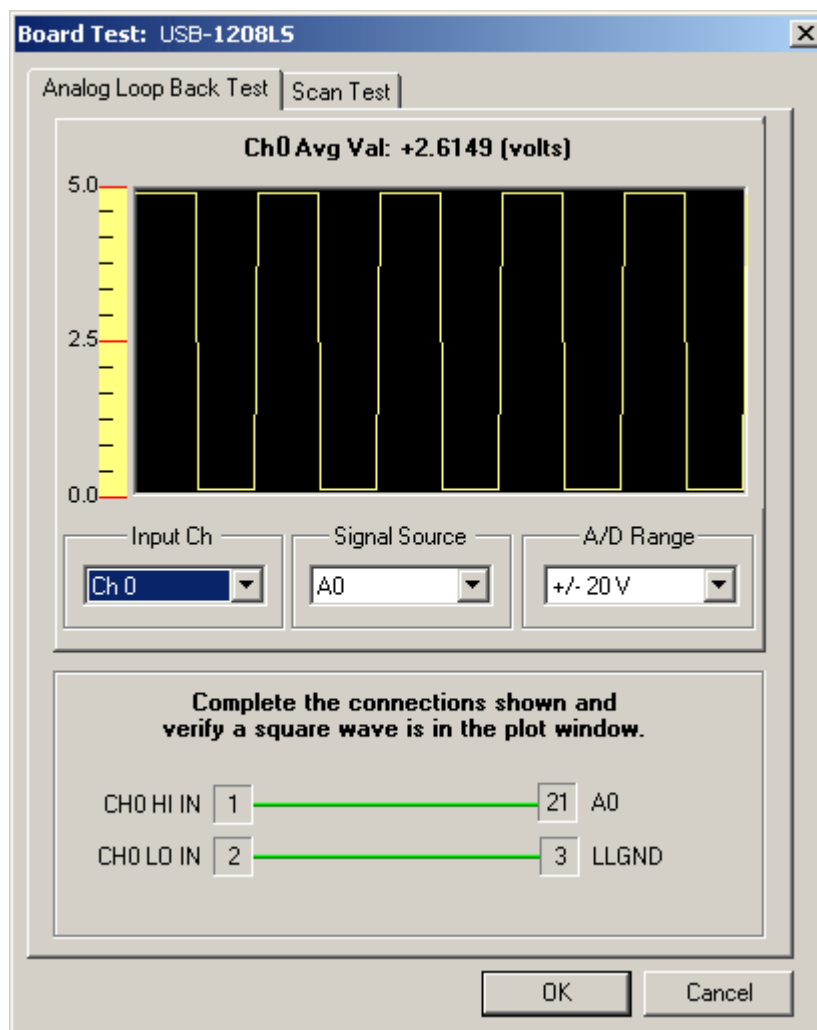
A/D Range is the voltage range you want to use to measure your input signal. Again, the list of available ranges varies depending on what data acquisition device you are using.

The graph displays the data acquired during the test in real time. Above the graph is a numeric value of the entire graphed data, averaged. So if you were putting in a sine wave with 0V DC offset, the numeric display would be close to 0VDC because the average values for the sine wave would work out to 0 mathematically.

Once you have selected the Input Channel, Signal Source, and A/D Range you want to use as test parameters, you will then need to make the connections to make it "Loop Back."

To aid you in this process, depending on the device you have to test, there are wiring instructions either below the graph or to the right of the graph. Using the view shown above, the wiring instructions are displayed below the graph.

As shown, you will need to wire from screw terminal 1 (Channel 0 HI IN) to screw terminal 21 (Port 'A', bit '0'), then another wire from screw terminal 2 (Channel 0 LO IN) to screw terminal 3 (Low Level Ground or LLGND). Once these connections are made, the graph will display a square wave as shown:

Board Test: USB-1208LS

Analog Loop Back Test | Scan Test

Ch0 Avg Val: +2.6149 (volts)

Input Ch: Ch 0
Signal Source: A0
A/D Range: +/- 20 V

Complete the connections shown and
verify a square wave is in the plot window.

CH0 HI IN 1 ──────────── 21 A0
CH0 LO IN 2 ──────────── 3 LLGND

OK   Cancel

Just above the graph display is the average value of the waveform. When using the Analog Loop Back test with a repeating wave form such as shown here, the value does not always return what you would expect. This is because the data coming in is not evenly distributed across the graph. You may have a few more data points on one side of

the average than the other. The goal here is not see the exact average value; the goal is to see the square wave.

Other inputs are also available to be viewed with the Analog Loop Back test. If your data acquisition device has an analog output or 'DAC', you can select it from the middle combo box labeled Signal Source. Drop down on the arrow and you can select DAC0 for example to use your device's channel 0 DAC:
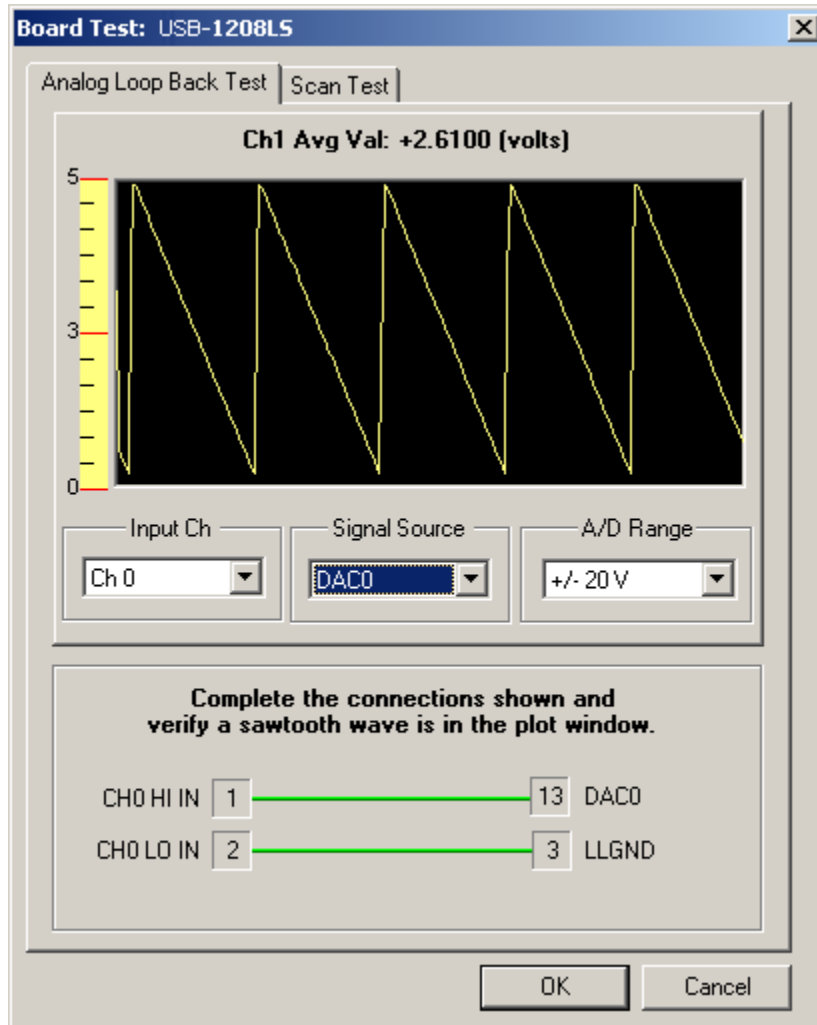
Some Measurement Computing multifunction data acquisition boards feature a counter, which can also be used as a signal source in the Analog Loop Back test:
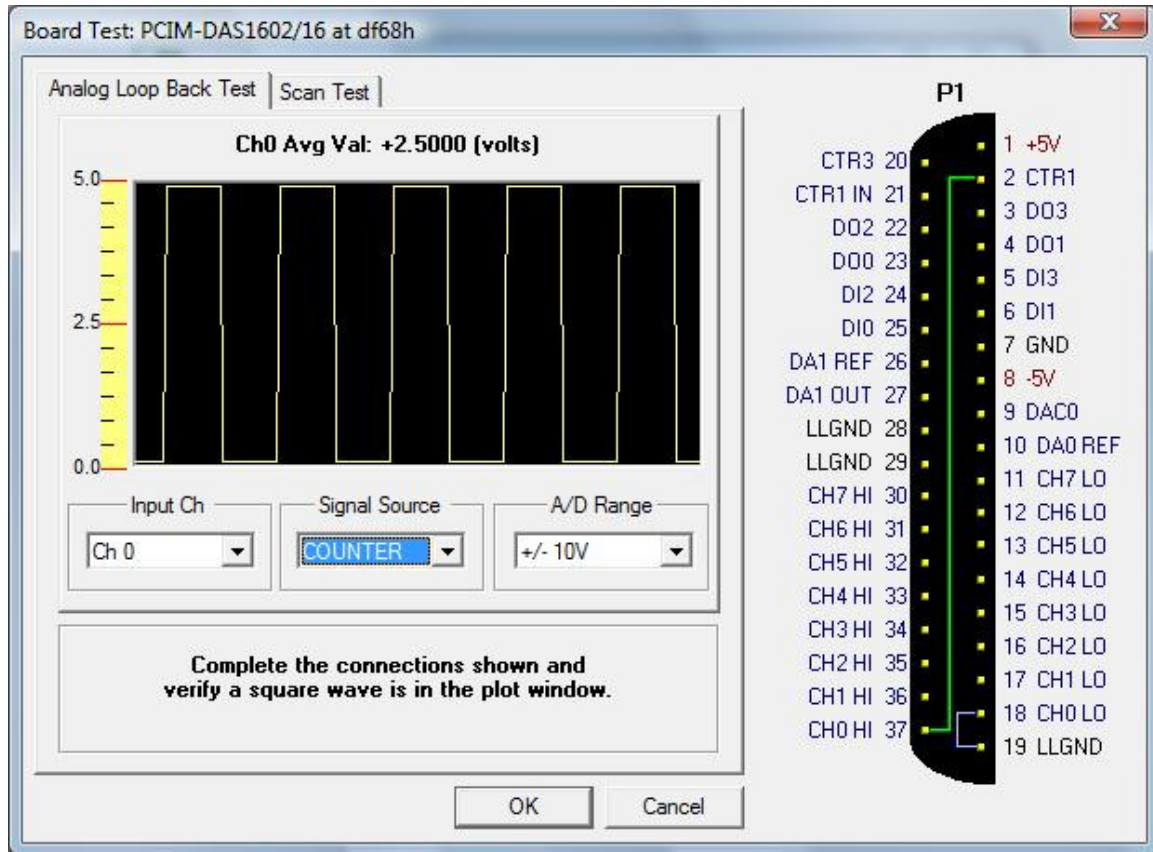
Note here, the connection diagram is located to the right of the plot window since the device being tested here has a different style connector.

Another very useful feature is, for you to confirm your input signal is really present, and your wiring is correct. You can do this by again, referring to the Signal Source list of options, and select EXTERNAL. This option allows you to inject your own signal whether it is a DC voltage, periodic wave form, etc.
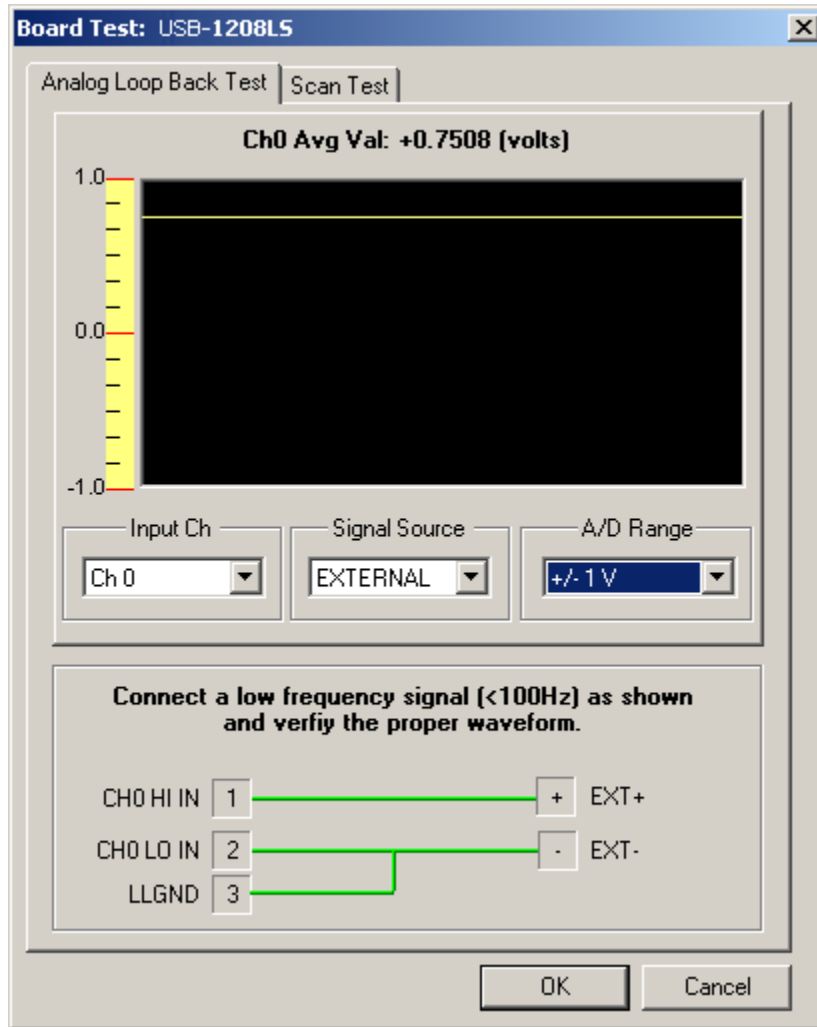
When EXTERNAL is selected as the Signal Source, the wiring instructions will be displayed as shown above.

It is important to note that the signal you connect for the EXT+ and EXT- must be a low frequency signal, less than 100Hz. If it is not, then you will observe aliasing[1].

To acquire data at rates above 100Hz, up to the speed of your Measurement Computing analog input device, you would use the Scan Test. This topic is covered in a separate application note entitled "Using InstaCal as a high speed diagnostic tool."

[1]Aliasing refers to an effect that causes different continuous signals to become indistinguishable (or *aliases* of one another) when sampled. It also refers to the distortion or artifact that results when a signal is sampled and reconstructed as an alias of the original signal.