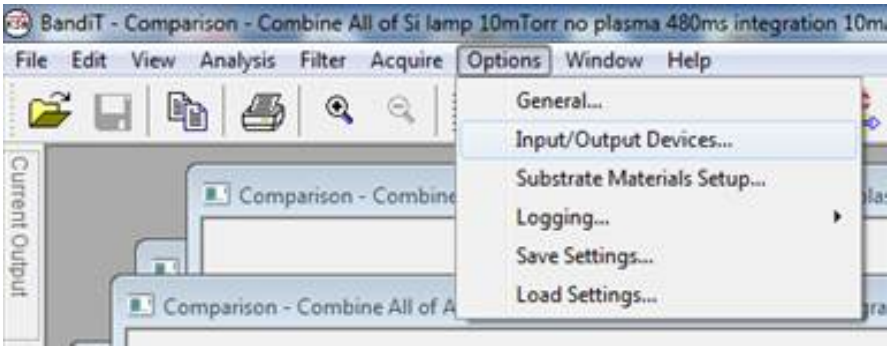
kSA Tech Note – kSA BandiT Analog Output Configuration

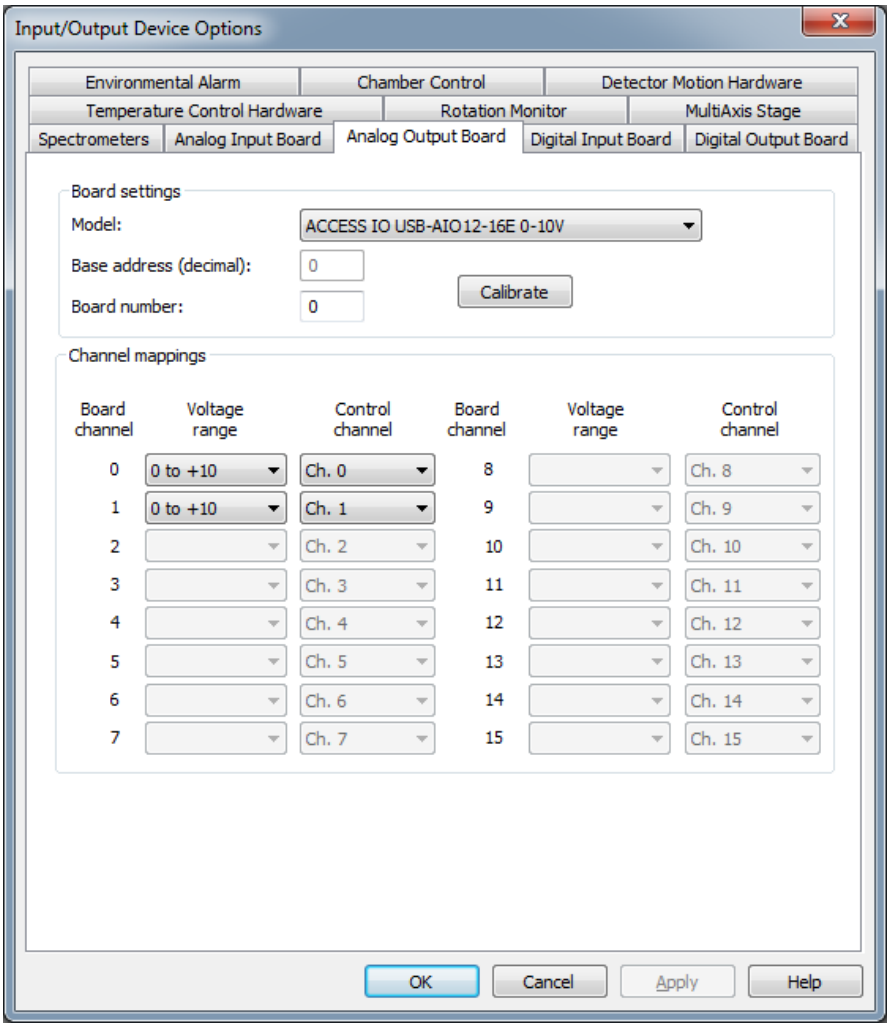
How to configure kSA BandiT analog outputs

The kSA BandiT system supports various data acquisition boards for real-time analog voltage output. It can be custom configured for specific process control and/or data logging applications, including mapping the output channel(s) to the desired voltage range. This tech note describes the steps required to configure kSA BandiT for such an application. For more information see the kSA BandiT user manual.

1. From the ***Options*** menu, select ***Input/Output Devices…***

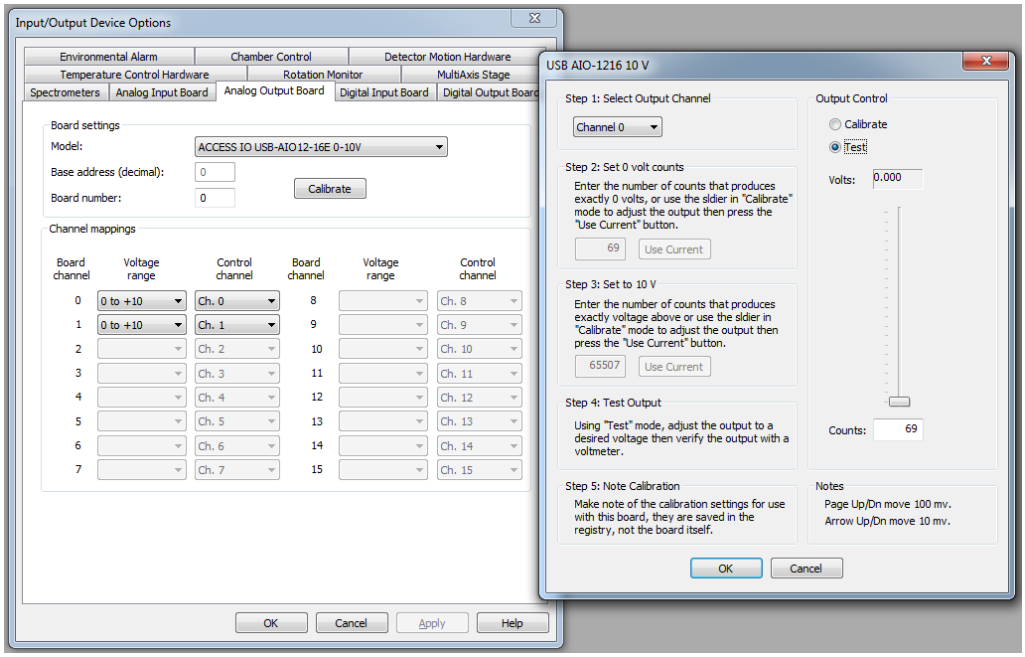


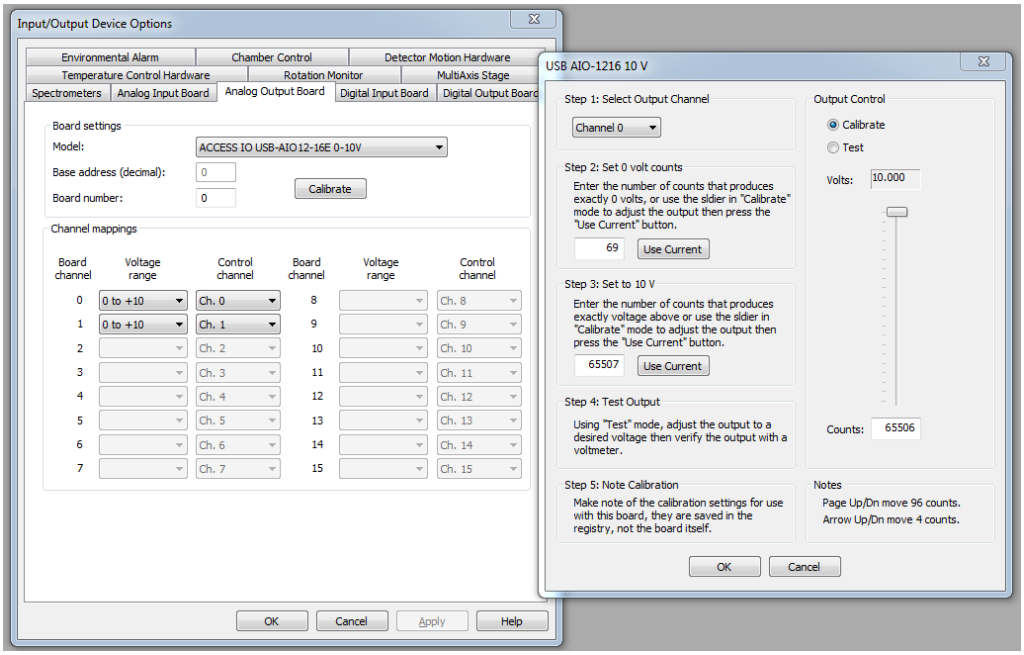
2. In the ***Input/Output Device Options*** dialog box, select the ***Analog Output Board*** tab. From the drop-down menu, select the model of the board present in your system. Most newer systems use the ***ACCES IO USB-AIO12-16E 0-10V*** board (12-bit resolution) that is referenced in this example. Note that older systems will likely have the ***ACCES IO USB-AIO12-16E 0-5V*** board (also 12 bit). For each of the desired output channels, verify that the ***Voltage range*** (0-10V in this case) and ***Control channel*** are set properly. Channel 0 is prewired to the bottom BNC connector labeled ***TEMP OUT*** on the back of the kSA BandiT rack and is typically used. Channel 1 is prewired to pins 3 (HI) and 4 (LO) of the ***I/O INTERFACE*** on the back of the rack (15 pin D connector).



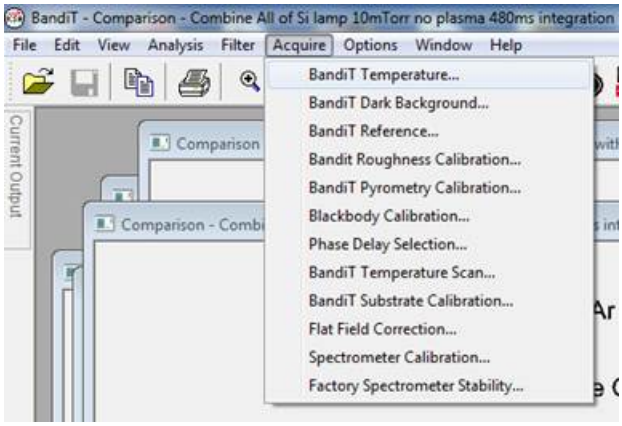
3. Next, select the ***Calibrate*** button to calibrate and/or test the output voltage(s). In the resulting dialog box, select the desired ***Output Channel*** from the drop-down menu. To calibrate, select

the ***Calibrate*** radio button. With a DVM connected to the appropriate output channel, adjust the slider to give a reading of precisely 0 volts. Note that the Up/Down arrow keys can be used to move the slider in increments of 4 counts, and the Page Up/Page Down keys can be used to move in increments of 96 counts. Select the ***Use Current*** button to accept the current value. Repeat this procedure for the maximum voltage (10V in this case). To test the calibration, select the ***Test*** radio button and move the slider while comparing the display value to the meter reading. Repeat the calibration procedure as needed. Select ***OK*** to close this dialog box.

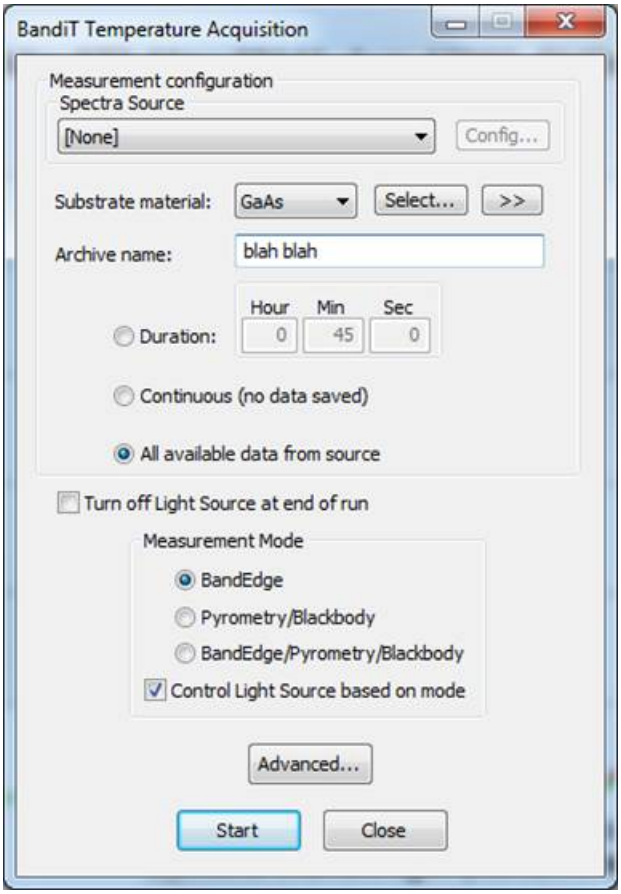




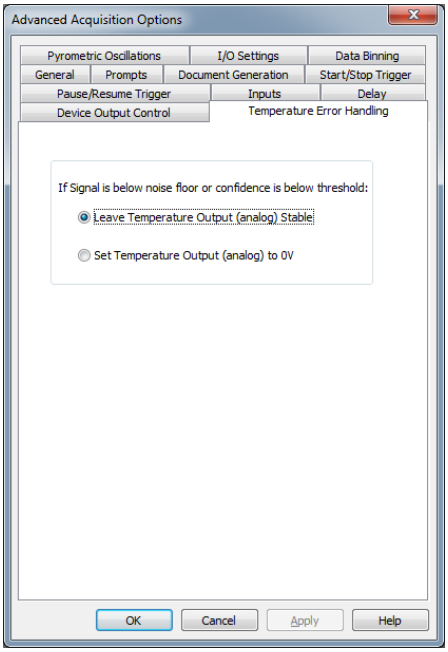
4. Select ***OK*** to close the ***Input/Output Device Options*** dialog box.
5. From the ***Acquire*** menu, select ***BandiT Temperature…***



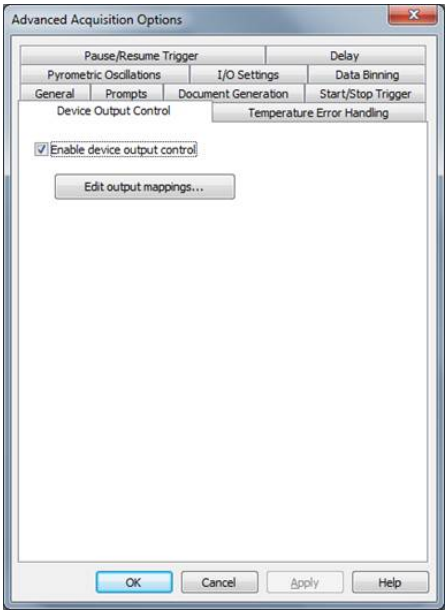
6. In the ***BandiT Temperature Acquisition*** dialog box, select the ***Advanced…*** button.



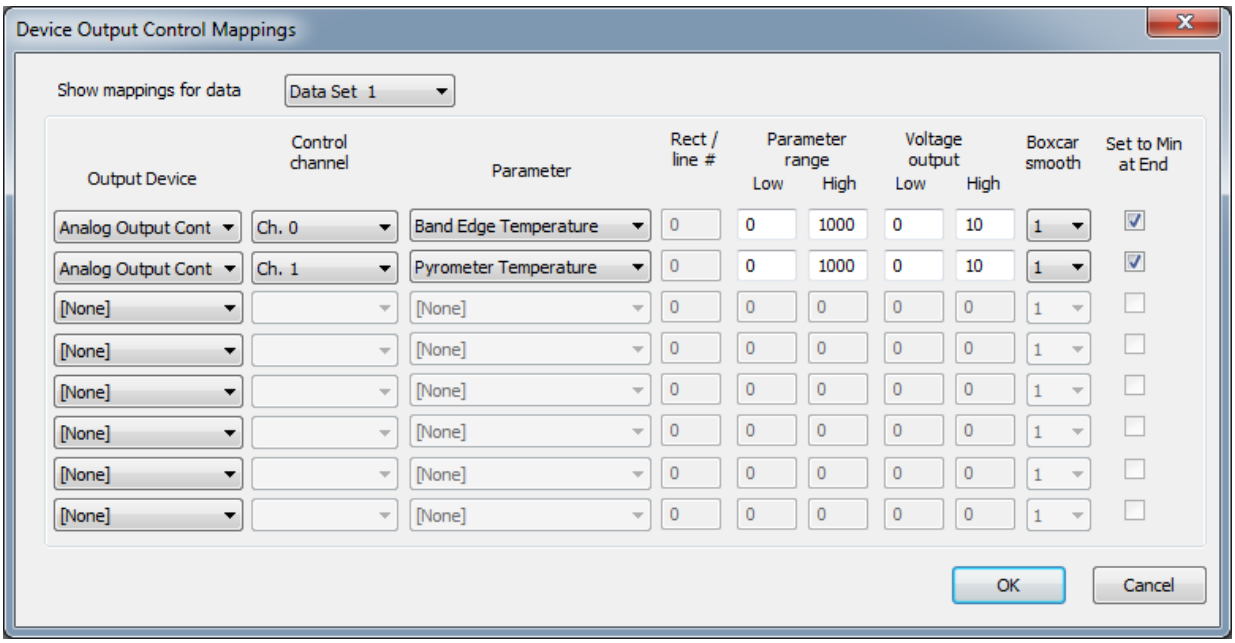
7. In the ***Advanced Acquisition Options*** dialog box, select the ***Temperature Error Handling*** tab. To determine the output voltage in the event of an error, select either ***Leave Temperature Output (analog) Stable*** or ***Set Temperature Output (analog) to 0V***.



8. Next, select the ***Device Output Control*** tab. Select the ***Enable device output control*** checkbox. Then select the ***Edit output mappings…*** button.



9. In the ***Device Output Control Mappings*** dialog box, enter the following settings for each output channel:



a) Select the desired output ***Parameter*** from the drop-down menu. Note that one can select from a variety of different parameters.
b) Enter the desired ***Parameter range*** and corresponding ***Voltage output*** range.
c) The ***Boxcar smooth*** drop-down menu allows for smoothing of the output using a moving average, a.k.a. boxcar. A setting of *N* results in each data point being averaged with the (*N*-1)/2 neighboring data points on either side. Note that *N* must be odd. The default value is 1, *i.e.* no smoothing.
d) The ***Set to Min at End*** checkbox will force the output voltage to go to the minimum value (0V in this example) at the end of the acquisition.

Note that the data set drop-down menu applies only to the kSA BandiT Multi-Wafer application, in which each marker is assigned a separate data set. In that case, only the voltage(s) corresponding to the specified marker is output. For more information see the kSA BandiT user manual.

10. Select ***OK*** to close this dialog box, and once again to close the ***Advanced Acquisition Options*** dialog box.
11. Verify that the analog input device to which kSA BandiT is connected is configured for the correct voltage to temperature mapping

12. Note that there may be applications for which it is advantageous to customize the output mapping to achieve greater resolution. For example, consider the case of a 0-10V kSA BandiT output with 12-bit DAC resolution. In this case, the smallest voltage step that could be resolved is 10V/4096 = 2.4 mV. If one were to map a temperature in the 0-1000°C range to a 0-10V output, the scaling factor would be 10 mV/°C. Given the 2.4 mV resolution, the smallest temperature step that could be resolved in this case is 2.4 mV / (10mV/°C) = 0.24°C. If instead, one were to adjust the mapping such that the 0-10V output corresponds to 500-1000°C, the scaling factor would now be 20 mV/°C, meaning that the smallest temperature step that could be resolved would be 2.4 mV / (20mV/°C) = 0.12°C. Thus a greater resolution could be achieved at the expense of a reduced range. In some cases, this represents a good trade-off, as many users are primarily concerned with a relatively small range around the process temperature. Also note that if a higher maximum temperature is desired, one could simply shift the mapping, *e.g.* to 750-1250°C.