

Scans

This instructions for the Threshold Scan described here are for the old DAQ card and 4.0 software. There are some minor changes for the new DAQ card and 5.0 software, so if that is the equipment to be used, look at the end of this document for the differences.

Threshold Scan

In order to test the detectors that we create, it is necessary for us to determine what the “background noise” is that we read from them. If you plug a detector into an oscilloscope you will notice that the frequency of strikes that it reads varies by the trigger level that is chosen. When the trigger level on the scope is very low it is not uncommon to get readings in the kilohertz. If your detector is within a solid building, then the frequency of strikes should be from 80-110 Hz. The rest of these signals are background noise. Put simply, they are voltage jumps within the wire unrelated to what we are measuring. In order to “tune” our detectors so that they will pick up cosmic rays and not this background noise, it is necessary to determine the threshold voltage of the photomultiplier tube. In other words find the voltage level of the background noise produces and only accept signals above that level.

The CROP DAQ software has a method of determining this voltage. In essence, the software takes readings from the DAQ card as you constantly increase the amount of voltage necessary for a signal to get through. You can use up to 4 detectors at a time for testing.

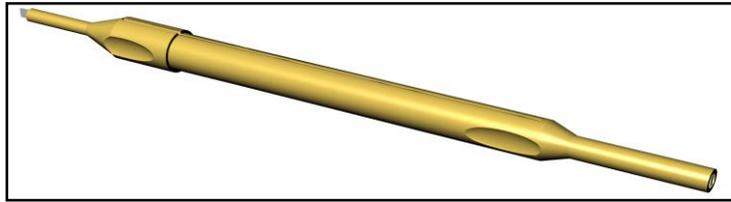
The following guide for Threshold scans is for the old DAQ card and 4.0 software. There are some minor changes for how the new DAQ card and 5.0 software works; please read the following section at the end of this document before continuing if this is the equipment you are going to use.

Equipment

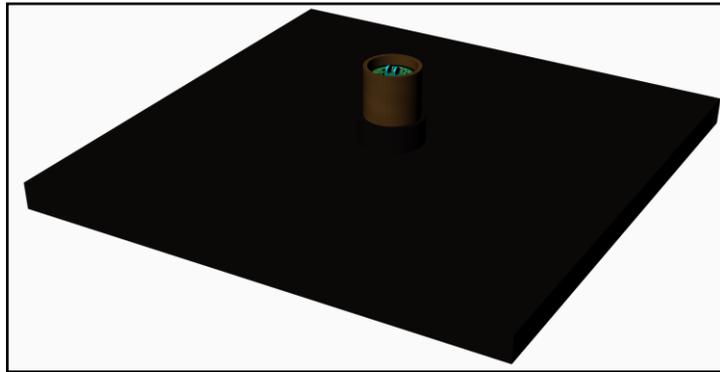
DAQ CARD (Left – Older DAQ Card; Right – New DAQ Card)



CROP Screwdriver (Required only for old DAQ Card)



Detectors

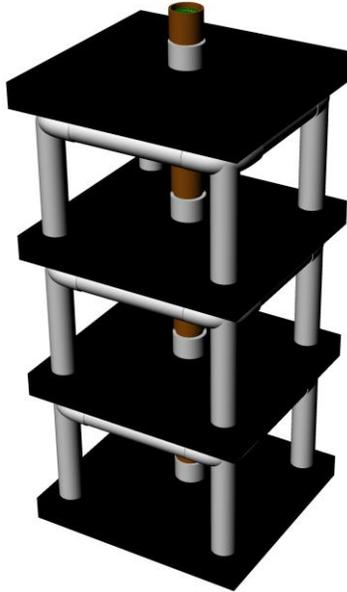


HV Supply



Instructions

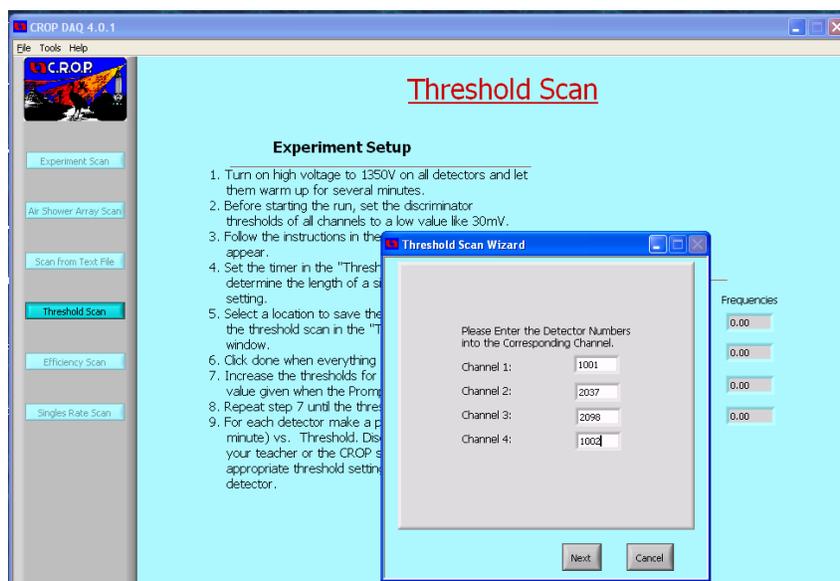
1. Stack your detectors in a tower.



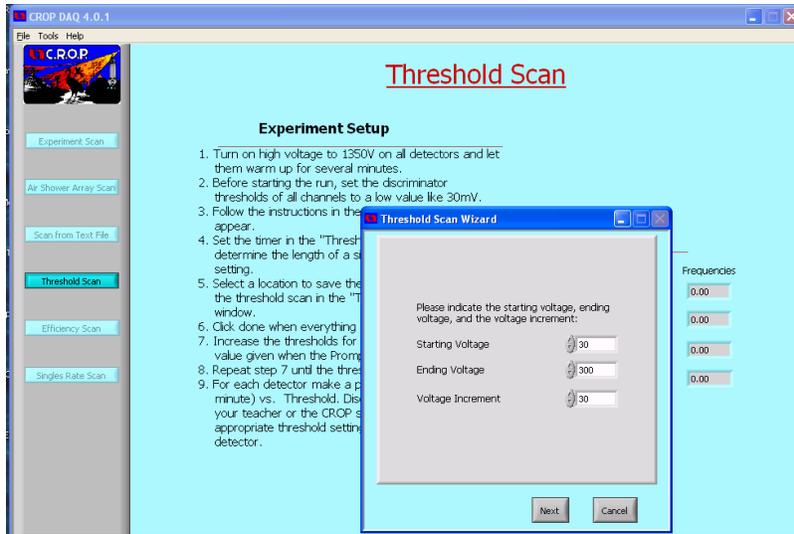
2. Hook up the power cords to a HV power supply and set to 1350 V
3. Plug in the Signal Cables to the DAQ Card
4. Using a CROP screwdriver (a jeweler's screwdriver will also work) set the thresholds on the DAQ cards to 30 mV
 - a. This requires use of a meter.
 - b. You change the meter to measure voltage
 - c. Place the ground from the meter on one of the large, circular, metal holes
 - d. Place the Vin probe on hole the metal indent above the blue potentiometer you are adjusting
 - e. Tighten or loosen the potentiometer to change the threshold voltage. (which can be viewed on the screen of the voltmeter)



5. Open the CROP DAQ program.
6. Click “Threshold Scan”
7. A window should appear prompts you to enter the detector numbers. These are located on the PMTs

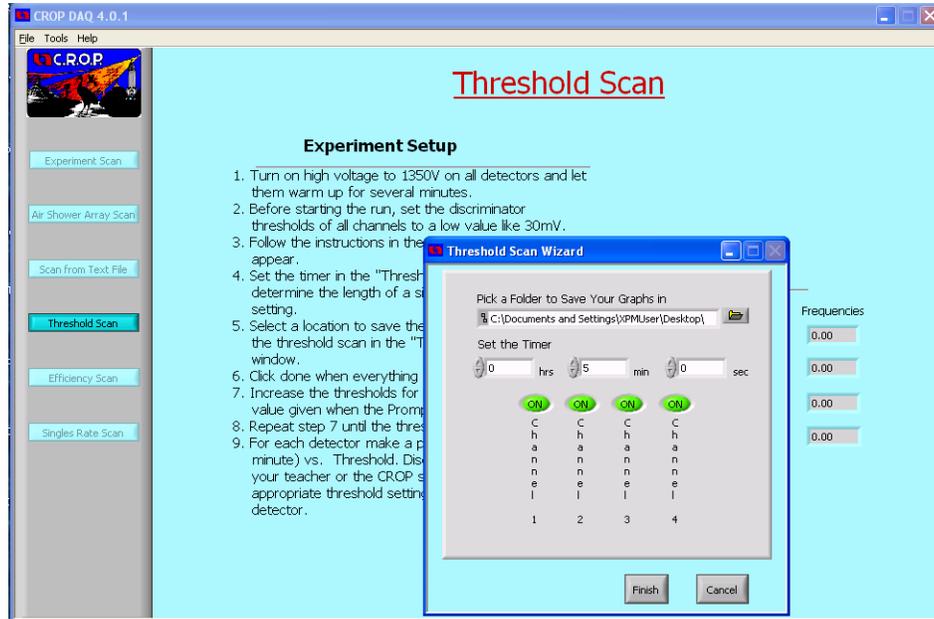


8. Click next on the window
9. A second window should appear asking for you to set the starting, ending, and increment voltages for the DAQ Card. Usually we keep these to be the given values 30mV to 300mV.

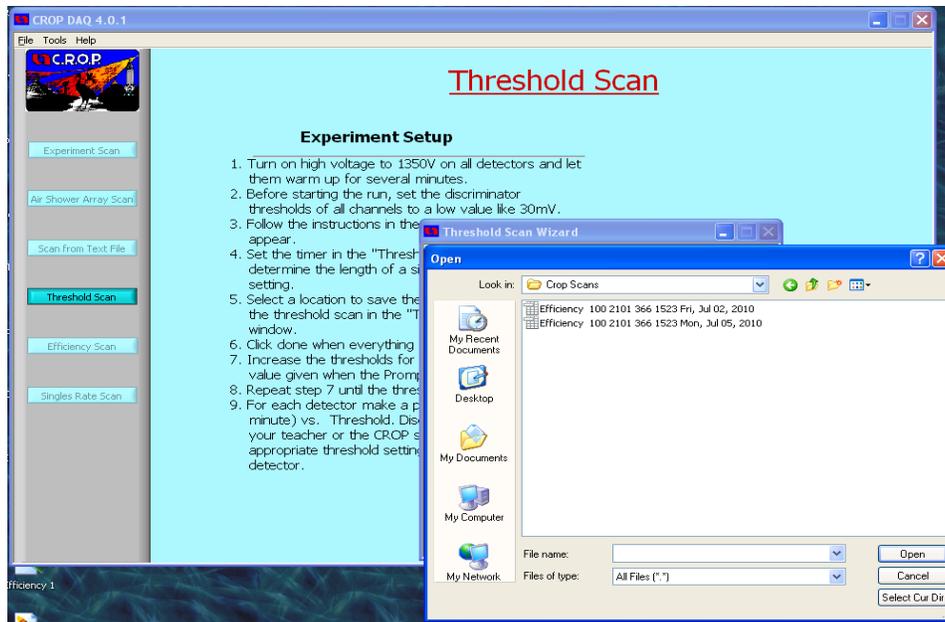


10. Click “Next”

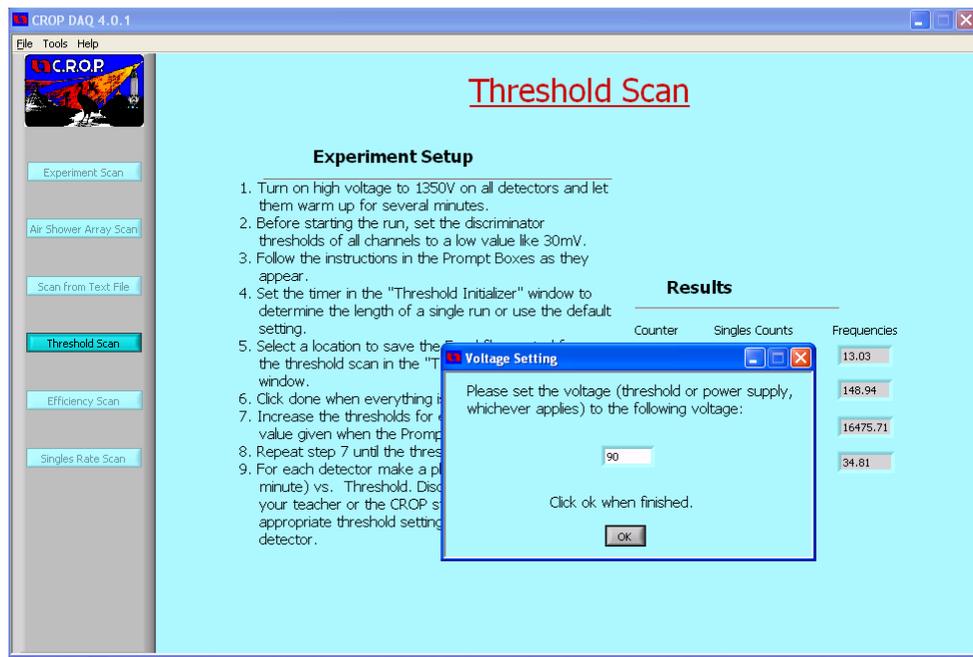
11. A new window should emerge that prompts the user to select a location to save the scan results. Click the open folder icon to select a location. This window will also ask you for the length of time you wish to test the threshold for each voltage increment. Normally we assign 5 minutes, however any amount of time over 3 minutes should work.



12. Select your scanning folder with the “select current directory” button.



13. After selecting next, you will begin the scan. Throughout the scan you will be prompted to change the threshold voltages to values listed on the screen.



14. After the scan completes, you will be brought to the following window. Click OK

CROP DAQ 4.0.1

File Tools Help

CROP

Experiment Scan
Air Shower Array Scan
Scan from Text File
Threshold Scan
Efficiency Scan
Singles Rate Scan

Threshold Scan

Experiment Setup

1. Turn on high voltage to 1350V on all detectors and let them warm up for several minutes.
2. Before starting the run, set the discriminator thresholds of all channels to a low value like 30mV.
3. Follow the instructions in the Prompt Boxes as they appear.
4. Set the timer in the "Threshold Test/scan" window to determine the length of the scan.
5. Select a location to save the threshold scan in a window.
6. Click done when everything is set.
7. Increase the thresholds for each active channel to the value given when the Prompt Box appears.
8. Repeat step 7 until the threshold scan is finished.
9. For each detector make a plot of Singles Rate (per minute) vs. Threshold. Discuss these graphs with your teacher or the CROP staff to determine appropriate threshold settings for each detector.

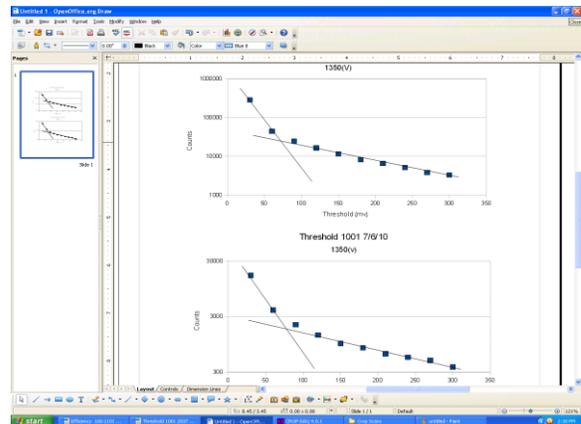
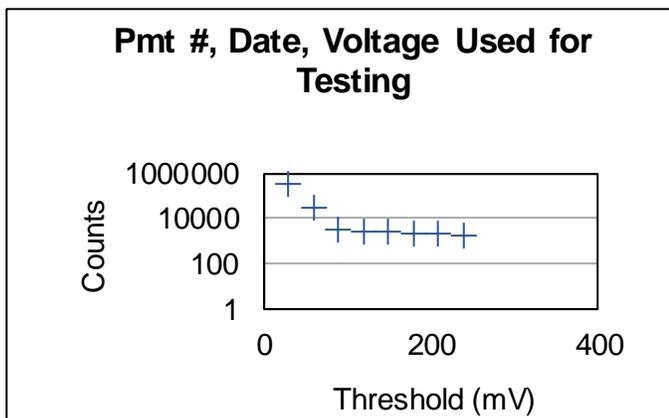
Scan completed.

OK

Results

Counter	Singles Counts	Frequencies
1001	372	1.24
2037	3285	10.95
2098	660411	2201.37
1002	847	2.82

15. Go to the saved file and open it in a spreadsheet. Plot the data in the following format.
16. To find the threshold, plot the noise line (the bottom line) and the signals line (top left line). If you are doing this in open office you can simply copy the charts in to Open Office Draw. Print these and attach them to the corresponding detectors.



New DAQ and 5.0 Software

Threshold Scan for 5.0 Software

The differences in the Threshold scan from the 5.0 software to the 4.0 software are very small. The new DAQ card allows electronic control of the threshold voltage so the program will automatically set the threshold to 30mV and go through the 30mV step increment up to 300mV by itself. This allows you to leave the program and card alone until the scan is complete. After this difference, follow the steps at the beginning of the threshold scan.