

## Scans

This instructions for the Efficiency 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.

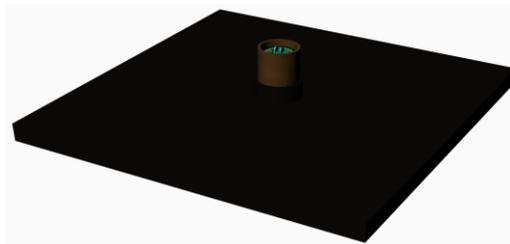
### **Efficiency Scan**

Efficiency testing is a process used to determine how well the detectors function. To do this requires the use of what are called “trigger counters.” These are counters whose efficiencies have already been mapped and deemed worth using. The process works via a method of linear strikes. Cosmic rays travel in very quick, straight lines. If you have detectors stacked vertically, it is possible for a particle to pass through all of the detectors. Now let’s suppose that the top and bottom detector said that this particle passed through them, but the two detectors in the middle didn’t get a reading on it. In this situation, it is very likely that the particle did go through all four detectors, but the center two simply missed it. We calculate efficiency by dividing the number of particles that went though all four detectors by the number that the top and bottom detected.

The following guide for the Efficiency scans is for the old DAQ card and 4.0 software. There are some small changes on 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

4 detectors: 2 untested and 2 triggers



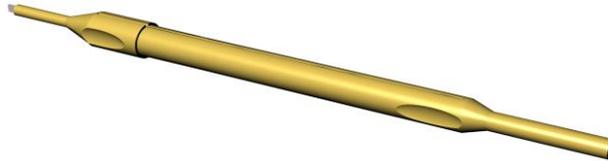
DAQ CARD (Left – Older DAQ Card Right – New DAQ Card)



## 2 Power Supplies

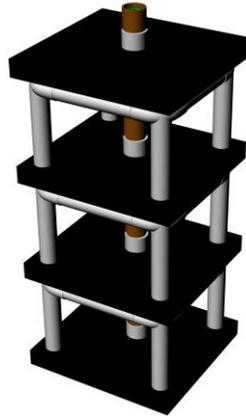


CROP Screwdriver (Required for old DAQ card only)

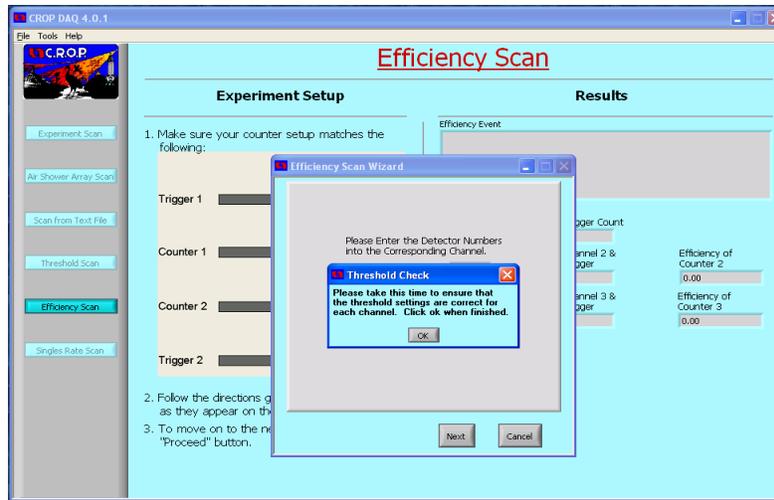


## Instructions

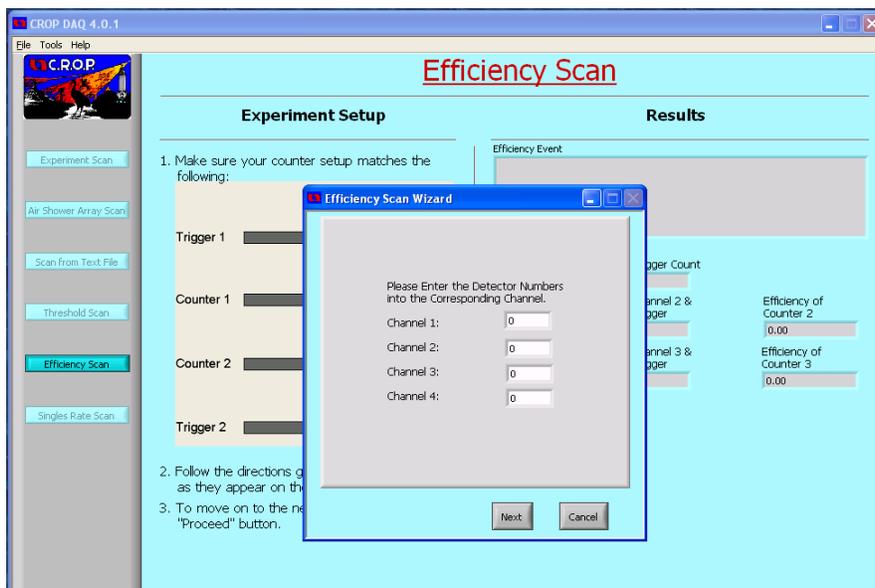
1. Stack the detectors into a tower with the top and bottom detector being the triggers



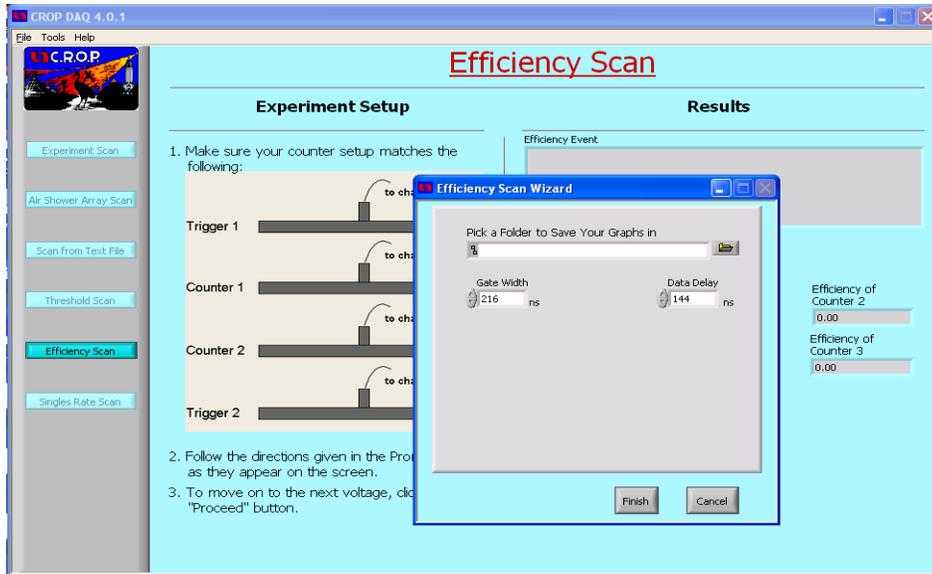
2. Plug the two trigger detectors into one power supply, and the non-tested detectors into the other. Turn the voltage of the triggers to a level in which they both have high efficiency.
3. Enter the thresholds of the detectors into the DAQ card.
4. Start the CROP DAQ program and select "Efficiency Scan." A dialogue box will appear asking if you entered the thresholds. You have, so select OK.



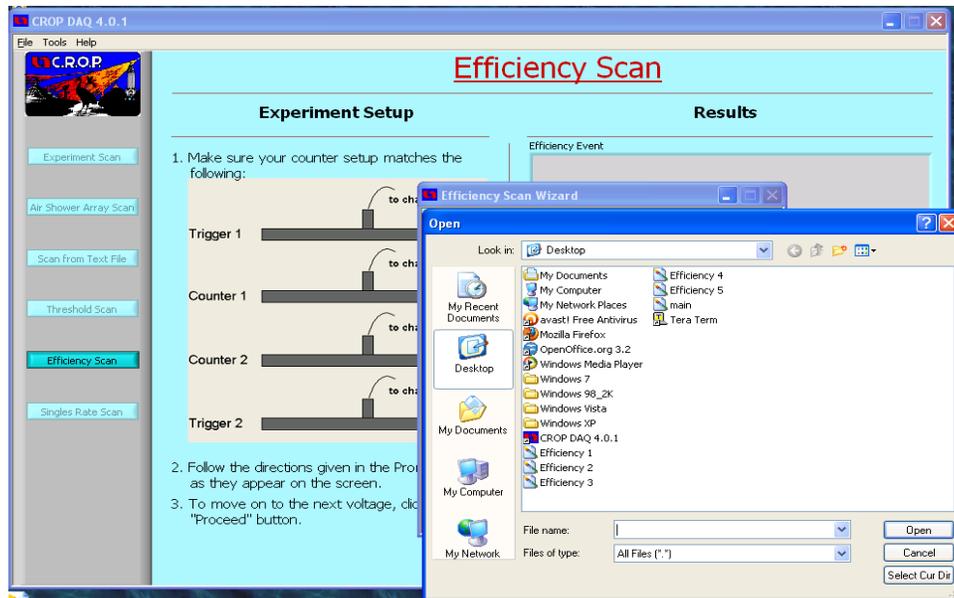
5. A screen will appear that asks you to enter PMT numbers into their correct channels. Do so and click Next.



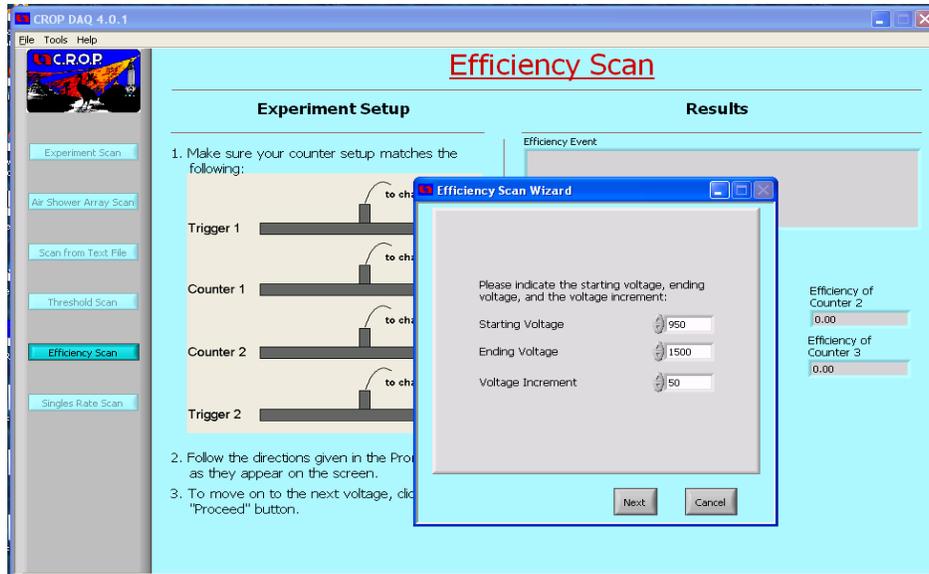
6. You should then see a box that asks you to pick a folder to enter your data into. Click on the small folder icon.



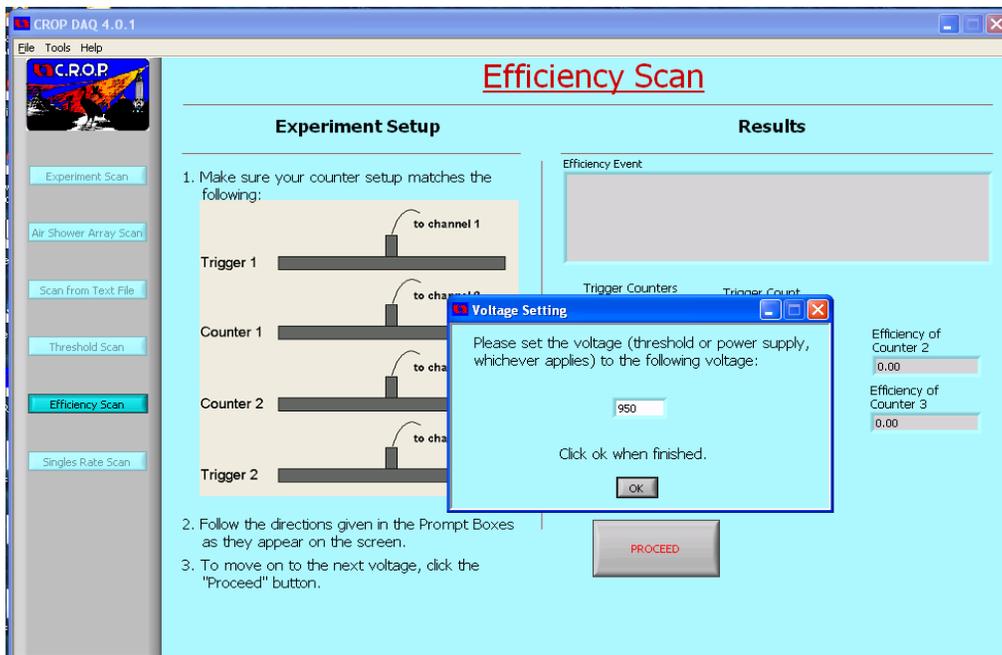
7. Double click on the folder you wish to place the scan into. Then click “Select Cur Dir”



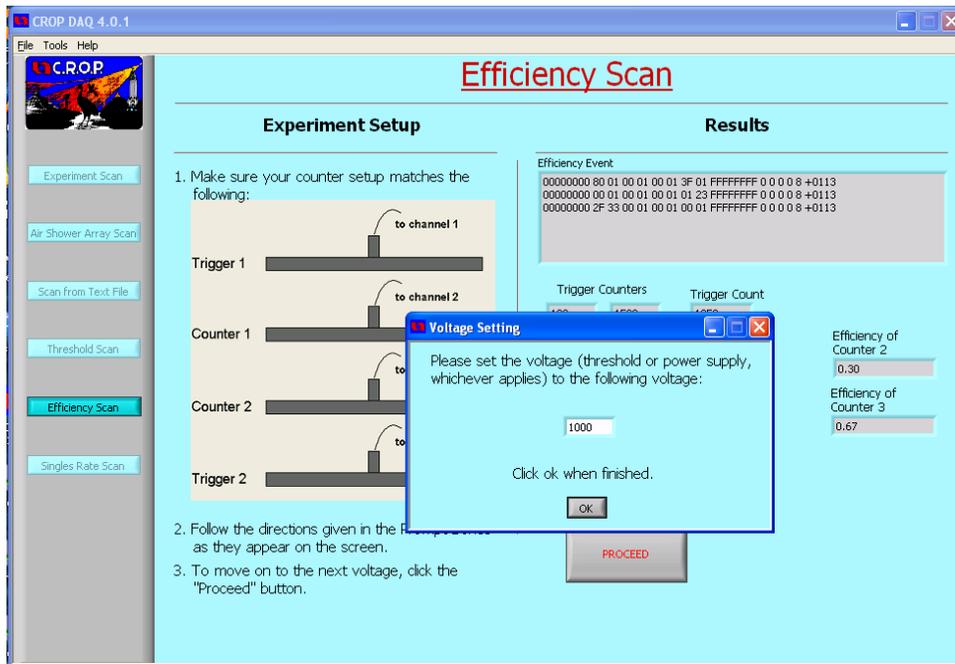
8. The next window asks you for the starting and finishing voltage for the scan. Generally we start at 950 and go to 1350 V or higher.



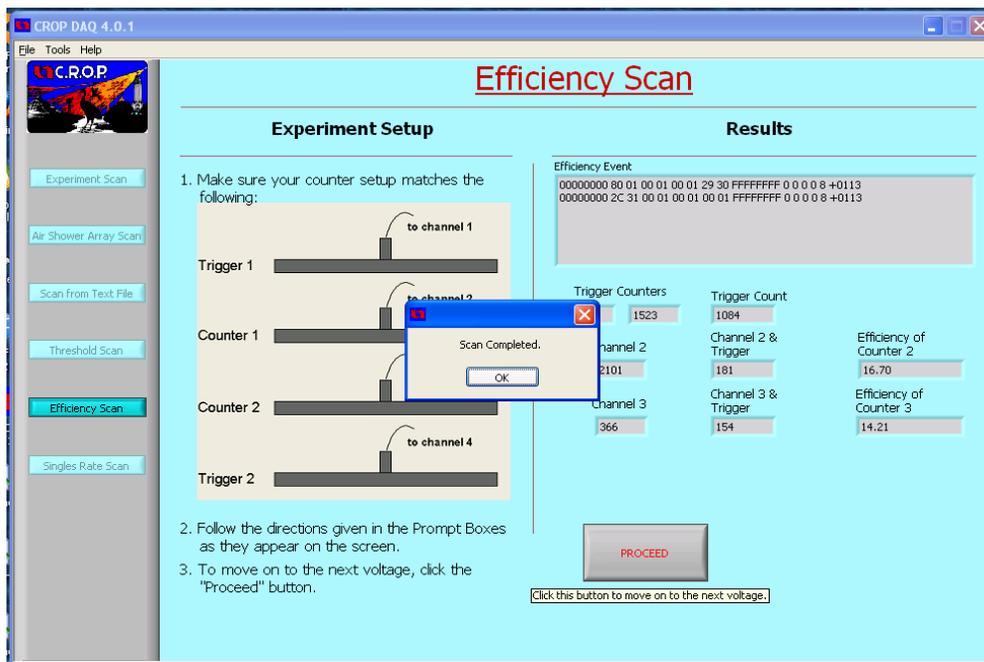
9. The program will tell you to change the voltage of the untested detectors to 950. Do so and click "OK"



10. When the text box labeled "trigger count" gets over 1000, click proceed.
11. Increment the voltage of the untested counters by 50V. Then click "OK" on the window.



12. Repeat steps 10-11 until the scan finishes.



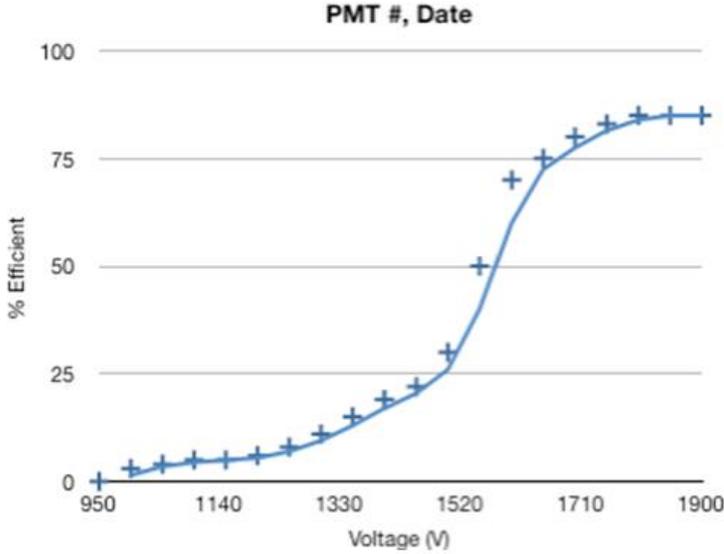
13. Open the file in which you saved the data using a spreadsheet. The first column will be the voltage, while the second and third columns will be the

detectors efficiencies at those voltages. The first row are the detector numbers

Efficiency 100 2101 366 1523 Fri, Jul 02, 2010.xls - OpenOffice.org Calc

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	0	2101	366														
2	950	0.3	0.67														
3	1000	1.09	0.49														
4	1050	2.28	1.49														
5	1100	1.69	2.29														
6	1150	2.68	2.68														
7	1200	4.08	4.17														
8	1250	4.57	3.49														
9	1300	5.31	5.31														
10	1350	7.88	6.08														
11	1400	11.2	7.8														
12	1450	13.08	8.92														
13	1500	16.7	14.21														
14	1550	2101	366														
15	1600	23.36	16.4														
16	1650	25.65	20.46														
17	1700	30.24	23.12														
18	1750	33.73	29.25														
19	1800	38	32.34														
20	1850	39.1	33.86														
21																	
22																	

14. Graph the data into a scatter plot. Label it as shown in the diagram below. The best fit line is pretty, but not necessary.



## New DAQ and 5.0 Software

### *Efficiency Scan for 5.0 Software*

The biggest difference between the 5.0 software and the 4.0 software is again the new card allows electronic changes of the threshold voltages. There is only one extra step which requires you to input the thresholds. This pop out prompt is called "Channel Thresholds". Make sure that the correct port is selected. Then input the threshold voltages found in the threshold scan for the correct power supply voltage. Once the threshold voltages are entered then click "select" and then "set". The image to the right shows the channel threshold prompt. After this extra step, follow the steps at the beginning of the efficiency scan.

