

Modified NIM Phillips Scientific Model 706 Discriminator S/N 22217

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1 Testing Process

In the EEL, the modified Philips Scientific discriminator was tested. This modification adds an additional LEMO port to the back of the module which takes a DC bias voltage which is capable of tuning the discrimination threshold of the module.

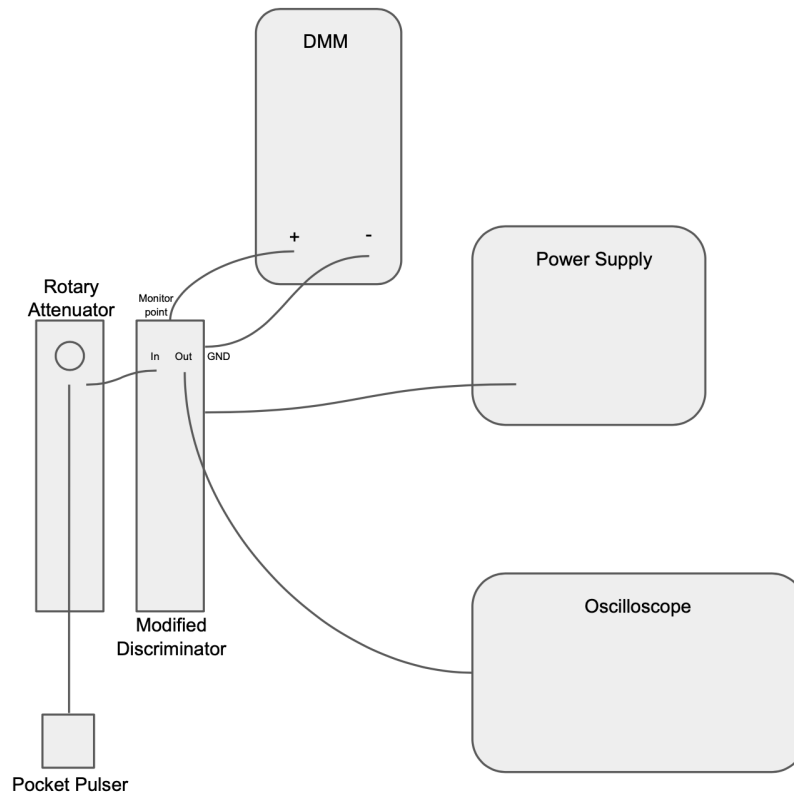
We tested the following:

1. Functionality and threshold of all channels with a given threshold setting.
2. Effect of manual threshold setting on overall threshold with bias from back LEMO port.
3. Current draw of module from LEMO port over range of bias voltages.

For all tests:

1. A power supply is connected to the threshold control port on the discriminator.
2. Output signals from the discriminator are monitored with an oscilloscope.
3. Input signals to the discriminator are monitored with an oscilloscope.
4. Nominal thresholds (-mV) are measured via DMM from the monitor point on the front face of the discriminator.
5. An input pulse generated with an attenuated 5 ns FWHM, 1.1 ΔV pocket pulser (Phillips Scientific model 417) is connected to each input by channel. This attenuation is via a Phillips Scientific model 804 Rotary Attenuator.

Modified Model 706 Test Setup



Note: Due to the positioning of the LEMO port on the back of the module, a T-junction is necessary for clearance.

2 Threshold Functionality

For the first set of tests, the basic functionality of the discriminator was verified. The following hold:

1. A high threshold is tuned down with the power supply until the point that the discriminator signal out appears on the oscilloscope (this point ± 3 mV).
2. All output signals observed to appear with threshold within 10mV of input pulse amplitude.

All channels functional.

Note: The bias voltage from the power supply has **inverted polarity** (the positive and negative leads are reversed out of the power supply) so that the DC voltage supplied to the back of the module is negative when the setting on the power supply is positive.

3 Remote Threshold Setting

For the second set of tests, the effects of bias voltage from the power supply on the discriminator voltage are investigated. The following hold:

1. For Table 2, the manual discriminator setting (the port on the front of the discriminator) is set to the lowest possible setting (-9 mV).
2. For Table 3, the manual discriminator setting is set to -50 mV.
3. The power supply voltage is confirmed with greater precision with a second DMM in parallel.
4. Trendlines are qualitative.

Table 1: Bias vs Threshold, -9mV Manual Setting

PS Bias (mV)	Nominal Threshold (-mV)
0	8.9
100	18.7
200	29.3
300	38.5
400	49.1
500	58.7
1000	107
1500	157
2000	206
2500	255
3000	303
3500	354
4000	401
4500	451
5000	500
5500	550
6000	599
6500	648
7000	698
7500	746
8000	797
8500	845
9000	895
9500	943
10000	993

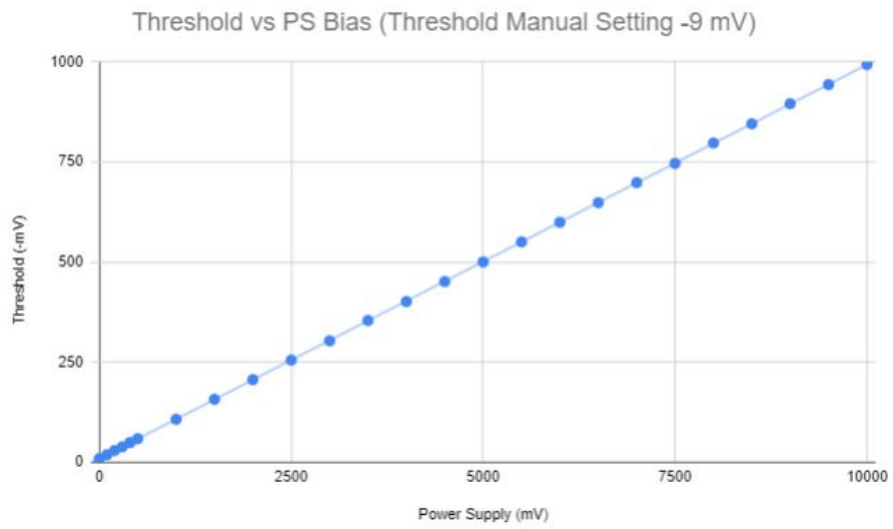
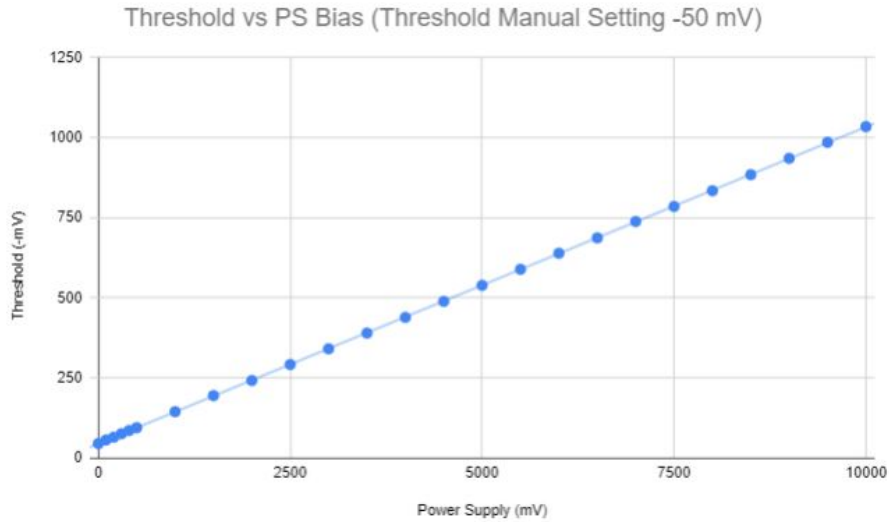


Table 2: Bias vs Threshold, -50mV Manual Setting

PS Bias (mV)	Nominal Threshold (-mV)
0	45.3
100	56.6
200	65.2
300	76
400	86.1
500	94.9
1000	144.8
1500	194.9
2000	242
2500	292
3000	341
3500	390
4000	439
4500	489
5000	539
5500	589
6000	639
6500	687
7000	738
7500	785
8000	834
8500	884
9000	935
9500	985
10000	1034



These data support the following map from power supply bias to threshold:

$$Th = \frac{V_{PS} * A}{10} + V_{MS}$$

Where Th is the threshold, V_{PS} is the power supply bias voltage, A is the attenuation of the bias voltage over cables, and V_{MS} is the manual setting of the discriminator as measured without the power supply connected.

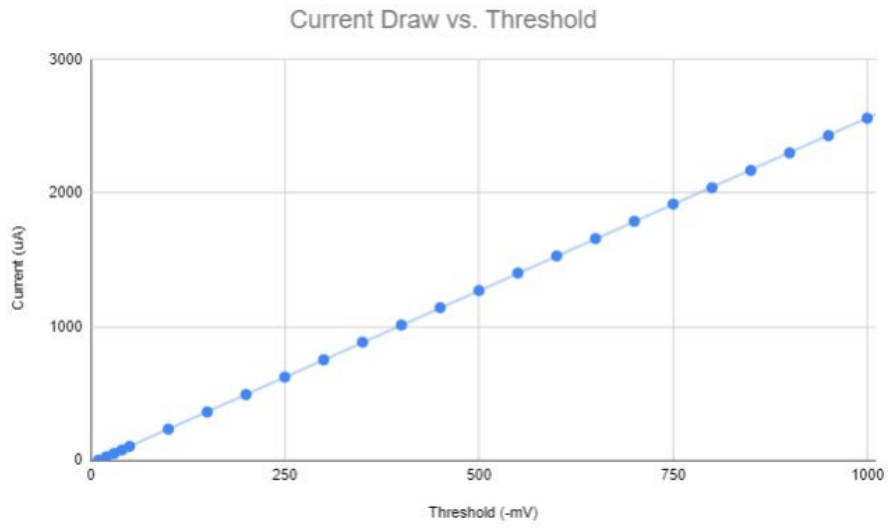
4 Current Draw by Module

For the third set of tests, the input current was monitored across a range of threshold values tuned by the power supply. The following hold:

1. All current measurements made with DMM in series immediately following the power supply.
2. The manual setting of the discriminator is -9mV and nominal thresholds are adjusted via power supply.
3. All thresholds in table 4 are nominal thresholds measured with DMM via monitor point on module.
4. All current measurements in uA.
5. Trendlines are qualitative.

Table 3: Current Draw by Nominal Threshold

Thresh (-mV)	Current (-uA)
10	1.6
20	27.4
30	52.3
40	78.1
50	105
100	234
150	363
200	493
250	624
300	753
350	885
400	1013
450	1143
500	1271
550	1402
600	1530
650	1660
700	1789
750	1918
800	2040
850	2170
900	2300
950	2430
1000	2560



With resistance fixed, all current measurements meet expectations.