



530 Main Street, Acton, MA 01720

**Phone:** (978)263-3584, **Fax:** (978)263-5086

**Web Site:** [www.acton-research.com](http://www.acton-research.com)

**Instruction Manual  
ID-442 Infrared Detector  
442-1A Temperature Controller  
442-2 Preampifier**

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## I. General Descriptions:

The Acton Research Corporation ID-442 is an infrared detector assembly for the wavelength range of 1.1 to 2.9 microns. It comes complete with housing and mounting for the SpectraPro monochromators and includes a fixed bias resistor. It also includes a single stage thermoelectric cooler capable of providing a stable operating temperature to  $-20$  degrees centigrade when used with a temperature controller such as the Acton Research Corporation 442-1A. A thermistor is provided to monitor the detector temperature and for controlling the detector cooling.

The 442-1A is the optional temperature controller for the ID-441IR detector. It provides the controlled power for the thermoelectric cooler in the detector and allows setting the detector operating temperature by adjusting the thermistor resistance set point.

Temperature stability is better than 0.1 degree centigrade. Both heating and cooling is provided.

The 442-2 is the optional preamplifier for the ID-442 IR detector. The AC preamplifier provides a fixed gain of 100 for the detector output. It is contained in the same enclosure as the detector and signal leads are kept short to minimize noise pickup. When ordered with the 442-1 Temperature Controller, the Amplifier and Bias Power Supplies are contained in the 442-1. Otherwise, the power supplies are provided in a separate module.

## II. Specifications

### Model ID442: IR Detector

|   |  |
|---|--|
| Type:                                   | PbS  |
| Active Area:                            | 5 x 5 mm                                   |
| Wavelength Range:                       | 1.1 to 2.9 microns                         |
| $D^*$ (Peak, 750,1):                    | $1 \times 10^{11}$ (see curve in appendix) |
| Max. current for thermoelectric cooler: | 1.8 amps @ 0.8 volts                       |

### Model 442-1A: Temperature Controller

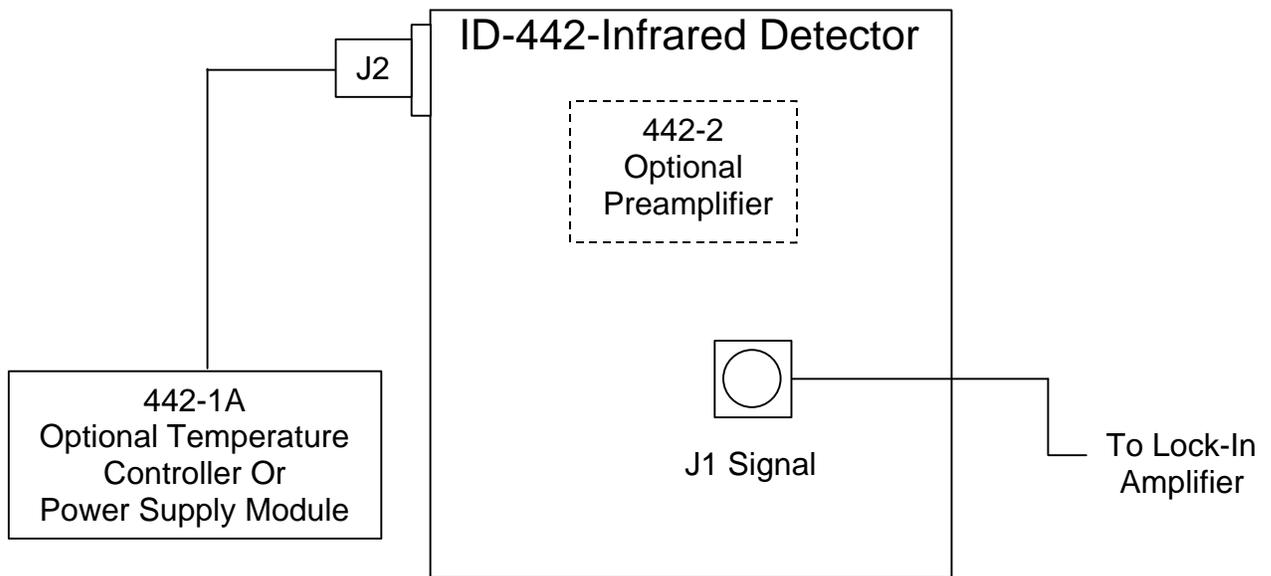
Temperature Stability: Better than 0.1 degree centigrade  
Provides up to 2.5 Amps of current for the thermoelectric cooler  
(When used with ID-442 Detector, set Current Limit to 1.8 amps)

### Model 442-2: Preamplifier

|                       |                 |
|-----------------------|-----------------|
| Gain:                 | 100 (fixed)     |
| Bandwidth:            | 70 Hz to 20 KHz |
| Noise:                | 870 nV/Hz       |
| Output voltage (max): | 20 V pk – pk    |

### III. Operation

Mount the ID-442 IR detector assembly to the exit slit assembly of the SpectraPro monochromator with the four cap screws provided and with the connectors on the ID-442 toward the front of the monochromator. Connect the ID-442 IR detector assembly and optional 442-1A temperature controller as shown in Figure 1 below. The optional ID-442-2 preamplifier is factory installed inside the ID-442 detector assembly when purchased.

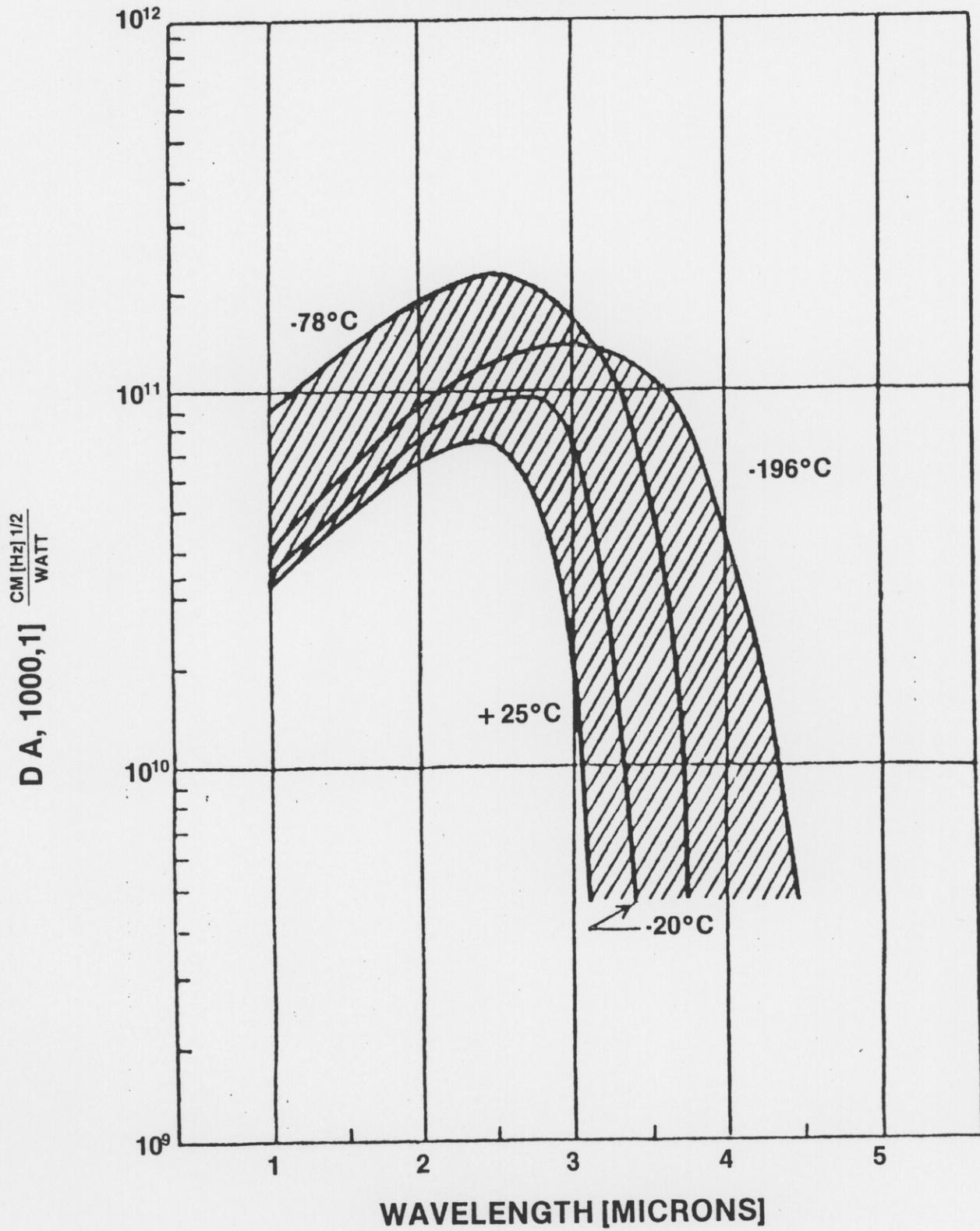


The detector bias and preamplifier draw less than 10 ma of power supply and current and the power supply may remain connected to the detector with no effect on the life of the detector or preamplifier.

The detector and preamplifier are meant to be operated with a chopped or alternating signal. The preamplifier output is typically connected to a lock-in amplifier. If using the 442-1A temperature controller, set the "TEC CURRENT MAX SSET" to 1.8 amps, the "TEC TEMPERATURE SET" to 7.52 . This value of thermistor resistance corresponds to  $-20^{\circ}$  C for this particular unit. If using a temperature controller other than the Acton Research 442-1A, be certain not to exceed the current and voltage ratings of the thermoelectric cooler (1.8 amps @ 0.8 volts).

IV. Appendix A: PbS Characteristic Curve

LEAD SULFIDE



## IV. Appendix B: Typical Resistance Values for 1K Thermistor

| Temp (°C) | Thermistor K | Temp (°C) | Thermistor K |
|-----------|--------------|-----------|--------------|
| 0         | 2.558        | 0         | 2.559        |
| -1        | 2.666        | 1         | 2.456        |
| -2        | 2.779        | 2         | 2.358        |
| -3        | 2.897        | 3         | 2.264        |
| -4        | 3.021        | 4         | 2.175        |
| -5        | 3.151        | 5         | 2.039        |
| -6        | 3.288        | 6         | 2.008        |
| -7        | 3.431        | 7         | 1.930        |
| -8        | 3.581        | 8         | 1.856        |
| -9        | 3.739        | 9         | 1.784        |
| -10       | 3.905        | 10        | 1.716        |
| -11       | 4.079        | 11        | 1.651        |
| -12       | 4.261        | 12        | 1.589        |
| -13       | 4.453        | 13        | 1.530        |
| -14       | 1.654        | 14        | 1.473        |
| -15       | 4.866        | 15        | 1.419        |
| -16       | 5.088        | 16        | 1.366        |
| -17       | 5.322        | 17        | 1.317        |
| -18       | 5.567        | 18        | 1.269        |
| -19       | 5.826        | 19        | 1.223        |
| -20       | 6.097        | 20        | 1.180        |
| -21       | 6.383        | 21        | 1.138        |
| -22       | 6.683        | 22        | 1.098        |
| -23       | 6.999        | 23        | 1.059        |
| -24       | 7.332        | 24        | 1.022        |
| -25       | 7.681        | 25        | 0.987        |
| -26       | 8.049        | 26        | 0.953        |
| -27       | 8.437        | 27        | 0.920        |
| -28       | 8.845        | 28        | 0.889        |
| -29       | 9.275        | 29        | 0.859        |
| -30       | 9.727        | 30        | 0.831        |
| -31       | 10.204       | 31        | 0.803        |
| -32       | 10.705       | 32        | 0.776        |
| -33       | 11.235       | 33        | 0.751        |
| -34       | 11.792       | 34        | 0.726        |
| -35       | 12.379       | 35        | 0.703        |
| -36       | 12.998       | 36        | 0.680        |
| -37       | 13.651       | 37        | 0.658        |
| -38       | 14.339       | 38        | 0.637        |
| -39       | 15.065       | 39        | 0.617        |
| -40       | 15.830       | 40        | 0.598        |

#### **IV. Appendix C: Connector Pin Descriptions:**

J1: Signal (BNC Connector)

J2: Power / Thermoelectric Cooler

|   |                         |
|---|-------------------------|
| 1 | thermoelectric cooler + |
| 2 | thermoelectric cooler – |
| 3 | thermistor              |
| 4 | thermistor              |
| 5 | open                    |
| 6 | open                    |
| 7 | +15volts DC 25mA        |
| 8 | –15 volts DC 25mA       |
| 9 | ground                  |