

**SCIENTECH®**



High Resolution (HR)  
Pyroelectric Detectors  
Setup and Operating  
Procedures

Serial Number \_\_\_\_\_

Thank you for choosing a Scientech HR pyroelectric detector. Scientech, an ISO 9001 registered company, and our employees are pleased to provide you with a product designed for years of reliable service. Please read this manual completely before using your detector. This information will enable you to fully utilize the equipment and should be located nearby for reference. The detector is intended to be used only in the manner outlined in this manual. Misuse of the equipment may cause product failure.

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## DETECTOR OPERATING PARAMETERS:

### HR Pyroelectric Detector 1:

Model No: \_\_\_\_\_  
 Serial No: \_\_\_\_\_  
 Group No: \_\_\_\_\_  
 Calibration Wavelength: \_\_\_\_\_ nm or  $\mu\text{m}$   
 Output Sensitivity: \_\_\_\_\_ V/J or \_\_\_\_\_ V/mJ S \_\_\_\_\_ I \_\_\_\_\_ L \_\_\_\_\_  
 Calibration Temp: \_\_\_\_\_ °C

### HR Pyroelectric Detector 2:

Model No: \_\_\_\_\_  
 Serial No: \_\_\_\_\_  
 Group No: \_\_\_\_\_  
 Calibration Wavelength: \_\_\_\_\_ nm or  $\mu\text{m}$   
 Output Sensitivity: \_\_\_\_\_ V/J or \_\_\_\_\_ V/mJ S \_\_\_\_\_ I \_\_\_\_\_ L \_\_\_\_\_  
 Calibration Temp: \_\_\_\_\_ °C

## VECTOR™ HR PYROELECTRIC DETECTOR SPECIFICATIONS:

Model	PHF 02	PHF 05	PHF 09	P 05	P 09
Aperture Diameter	2 mm	5 mm	9 mm	5 mm	9 mm
Spectral Response	.193 - 26 μm				
Voltage Response				3.0 V/mJ	0.8 V/mJ
S, I	15 V/mJ	2.5 V/mJ	1 V/mJ		
L	0.15 V/mJ	0.025 V/mJ	0.01 V/mJ		
Electrical Decay Time (RC Time Constant)				2.0 msec	2.0 msec
S	0.05 msec	0.05 msec	0.05 msec		
I	0.5 msec	0.5 msec	0.5 msec		
L	2.5 msec	2.5 msec	2.5 msec		
Noise Equivalent Energy				15 nJ	35 nJ
S, I	3 nJ	15 nJ	35 nJ		
L	150 nJ	750 nJ	3500 nJ		
Minimum Energy				1.5 μJ	3.5 μJ
S, I	0.3 μJ	1.5 μJ	3.5 μJ		
L	15 μJ	75 μJ	350 μJ		
Rep Rate (max)				400 pps	200 pps
S	4000 pps	4000 pps	4000 pps		
I	400 pps	400 pps	400 pps		
L	80 pps	80 pps	80 pps		
Maximum Pulse Width (For Calibrated Response)				50 μsec	100 μsec
S	5 μsec	5 μsec	5 μsec		
I	50 μsec	50 μsec	50 μsec		
L	250 μsec	250 μsec	250 μsec		
Maximum Voltage Output	4.5 V				
Maximum Average Power	1 W	2 W	2 W	2 W	2 W
Accuracy	7%	7%	7%	5%	5%
Maximum Energy Density	Max J/cm <sup>2</sup> = 316 x (pulse width) <sup>1/2</sup>				
Dimensions D x L - inches/cm	1.75 x 4.24/ 4.45 x 10.8				
Weight - pounds/kgs	0.5/0.21				
Indicator Compatibility	S310, S310D, D200PC, D200P				

## CE MARK CERTIFICATION:

All of the detectors listed in this manual have been certified for the European CE mark.

## ENVIRONMENTAL REQUIREMENTS:

This product is intended for indoor use at altitudes up to 2000 meters, Pollution Degree 2 in accordance with IEC 664 and transient overvoltages according to Installation Categories (Overvoltage Categories) II. Note that each of the above detectors will not pass the IEC 801 Publication, Part 3, Radiated Electromagnetic Field Requirements. The system, meter and detector, is designed to measure radiation within the test's radiation band. The detectors were held outside the radiated electromagnetic field during this test. It is up to the user to be aware of RF fields present during measurements and their effects if any on those measurements.

## UNPACKING AND SET UP:

The detector and accessories are shipped in custom packing materials. All packing materials should be saved for future damage free shipments.

A ½" diameter mounting post is included. Screw the post into the mounting hole in the body of the detector. Mount the post to your optical bench or working surface. An optional mounting base, Scientech Model 301-019, is available for this purpose.

A 3 meter BNC interconnect cable is also included. If you are using a Scientech indicator, connect the detector to the indicator with the interconnect cable. Follow the detailed set up instructions that are in the indicator's instruction manual. If you are not using a Scientech indicator operating requirements are contained in this manual.

### HR Detector Outline

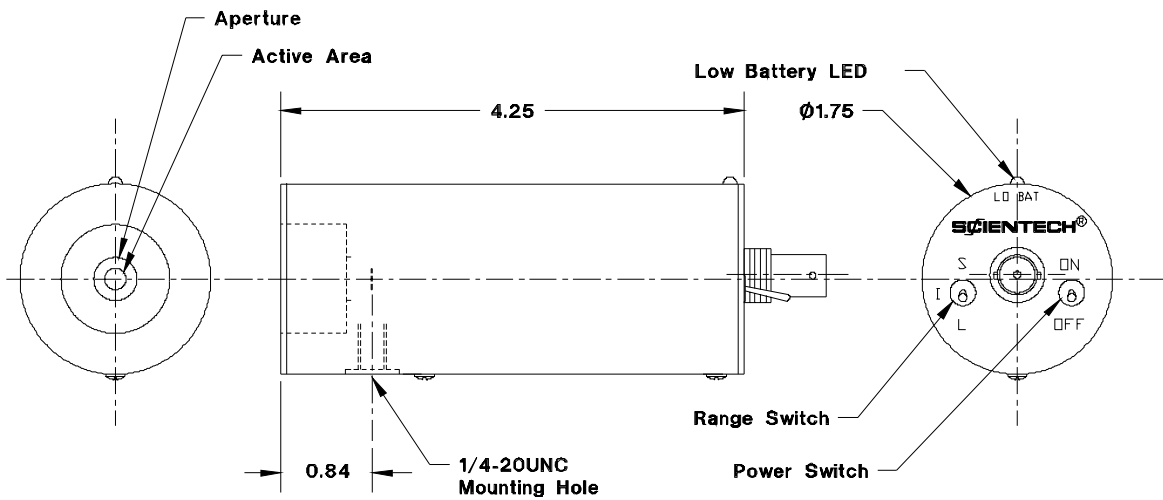


Figure 1

### BATTERY INSTALLATION:

A 9 volt alkaline battery comes installed with all HR pyroelectric detectors. Always select the OFF position of the power switch when the detector is not in use to spare the lifetime of the battery. Replace the battery when the low battery LED indicator lights up.

Refer to Figure 2. Remove the two slotted 4-40 binder head screws located on the underside of the detector. Pull off the outer housing to expose the battery. Remove the used battery from the battery holder and snap in the new battery. Slide the outer housing back in to place and secure with the screws.

Do not touch the delicate pyroelectric crystal in the HR Series detectors. It should only be cleaned with a stream of clean air, nitrogen or CO<sub>2</sub>.

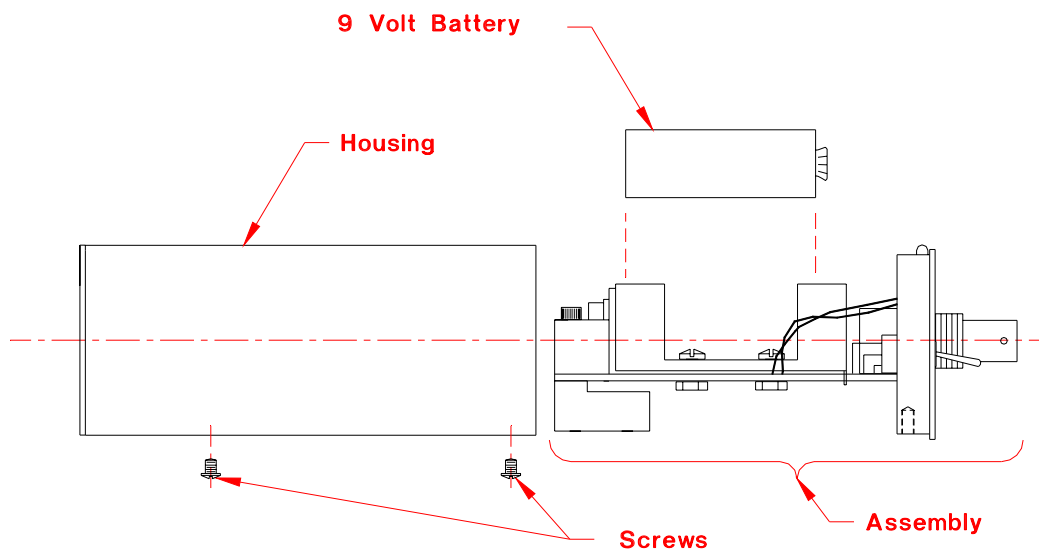


Figure 2

## GENERAL DESCRIPTION:

HR pyroelectric detector models P05 and P09 are coated with a special black absorbing material which provides a very flat spectral response over a broad wavelength band. Models PHF02, PHF05, and PHF09 have a partially absorbing, partially reflecting chromium coating. The relative spectral responses of these detectors are shown in Figure 3. More detailed information is contained in the table at the end of this manual.

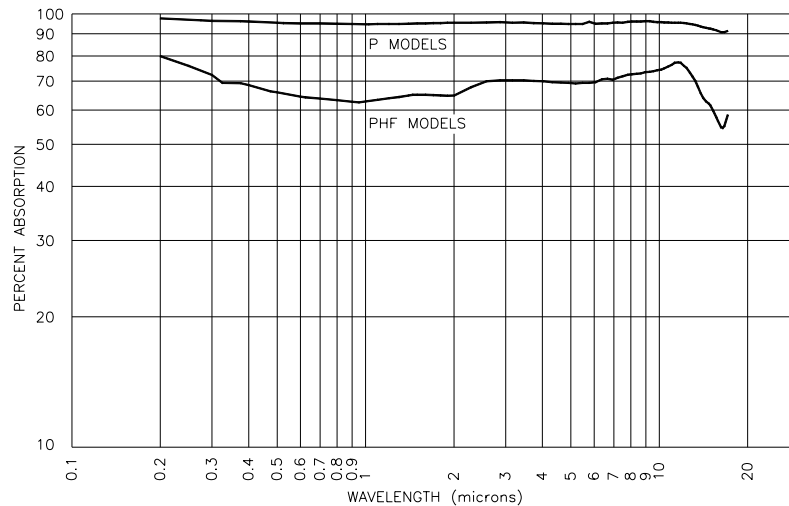


Figure 3

Before using your HR pyroelectric detector, please review the energy density formulas given in the chart at the front of this manual. Familiarize yourself with all of the specifications of the detector. A damage test slide is provided. Fire the beam at the test slide before using the detector to be sure you are operating under safe conditions.

## SETTING ELECTRICAL TIME CONSTANTS FOR MODEL PHF02, PHF05 AND PHF09:

The range switch located on the rear of the PHF02, PHF05, and PHF09 detectors selects one of three electrical time constants and should be set as follows:

**S (Short Pulses):** Select for pulse durations of 5  $\mu\text{sec.}$  or less. Repetition rates up to 4 kHz can be measured.

**I (Intermediate Pulses):** Select for pulse durations of 50  $\mu\text{sec.}$  or less. Repetition rates of up to 400 HZ can be measured.

**L (Long Pulses):** Select for pulse durations of 250  $\mu\text{sec.}$  or less. Repetition rates of up to 80 HZ can be measured.

There are no range settings on the P05 and P09 detectors because they utilize a highly absorbing material on the crystal. The pulse duration considerations function in the determination of damage thresholds.

## DETECTOR OPERATION WITHOUT AN INDICATOR:

HR pyroelectric detectors can be operated with a 50 $\Omega$  input oscilloscope. The peak voltage shown on the oscilloscope can be divided by the V/mJ output sensitivity of the detector to calculate energy.

## **CORRECTING HR DETECTOR OPERATING PARAMETERS FOR USE AT DIFFERENT WAVELENGTHS:**

HR detectors are calibrated at a specific wavelength and an output sensitivity determined for that wavelength. The calibration wavelength and output sensitivity are recorded in the Operating Parameters section at the front of the manual and on the detector's serial tag. When a detector is used at a wavelength other than the calibration wavelength, the detector's output sensitivity can be adjusted to compensate for the absorption rate at the new wavelength as follows:

1. Find the absorption rate from the chart at the end of this manual for the calibration wavelength of your HR detector.
2. Find the absorption rate for the wavelength where you will be working.
3. Determine the new output sensitivity using the following formula:  
$$\frac{\text{absorption rate of the new wavelength}}{\text{absorption rate of calibration wavelength}} \times \text{output sensitivity from serial tag} = \text{output sensitivity for new wavelength}$$

## HR DETECTOR ABSORPTION VS WAVELENGTH:

Wavelength $\mu\text{m}$	Painted (P) Detectors	High Frequency (PHF) Detectors
0.25	97.5	76.4
0.30	97.1	72.8
0.33	97.0	69.9
0.38	96.8	69.7
0.40	96.2	69.0
0.48	96.0	66.8
0.50	95.9	66.4
0.60	95.8	64.9
0.63	95.7	64.7
0.70	95.5	64.2
0.80	95.4	63.7
0.90	95.4	63.2
0.95	95.5	63.0
1.00	95.5	63.3
1.10	95.6	63.8
1.20	95.7	64.3
1.30	95.8	64.8
1.40	95.9	65.3
1.45	96.0	65.6
1.50	96.0	65.6
1.60	96.1	65.5
1.70	96.2	65.4
1.80	96.2	65.3
1.90	96.3	65.2
2.00	96.5	65.3
2.29	96.2	68.2
2.58	96.4	70.4
2.87	96.0	70.8
3.16	95.9	70.8
3.45	95.7	70.8
3.74	95.7	70.6
4.03	95.6	70.4
4.33	95.5	70.1
4.62	95.5	70.0
4.90	96.6	69.8
5.19	95.7	69.6
5.48	95.8	69.8
5.77	95.9	69.9
6.07	96.2	70.1
6.37	96.3	71.1
6.66	96.1	71.4
6.94	96.6	71.0
7.21	96.8	71.8
7.51	96.8	72.4
7.82	96.8	72.9
8.07	96.9	73.1
8.38	96.9	73.3
8.66	96.7	73.5
8.96	96.5	73.9
9.28	96.5	74.1
9.55	96.4	74.3
9.84	96.3	74.7
10.15	96.2	75.0

Wavelength $\mu\text{m}$	Painted (P) Detectors	High Frequency (PHF) Detectors
10.39	96.1	75.4
10.73	96.1	76.2
11.01	96.1	76.9
11.29	96.0	77.7
11.60	95.9	77.9
11.81	95.6	77.7
12.14	95.3	76.5
12.37	95.1	75.7
12.73	94.7	73.7
12.99	94.3	72.2
13.26	94.0	70.5
13.53	93.6	68.5
13.82	93.3	66.1
14.12	93.1	64.5
14.43	92.8	63.3
14.76	92.3	62.5
14.93	92.0	61.9
15.28	91.5	60.2
15.65	91.4	58.1
15.84	91.5	57.0
16.24	92.1	55.2
16.45	92.4	55.0
16.66	92.7	55.5
17.10	93.0	58.9
17.32	93.5	60.8
17.56	93.6	62.5
17.80	93.6	63.8
18.30	93.7	65.2
18.56	94.0	65.9
18.83	94.3	66.8
19.11	94.8	67.8
19.40	95.3	68.4
19.69	95.7	69.0
19.99	95.6	69.9
20.21	95.4	71.1
20.63	95.4	72.2
20.63	95.4	72.2
20.96	95.3	72.0
21.31	95.0	71.3
21.66	94.4	71.3
22.03	94.4	71.1
22.03	93.8	71.1
22.41	93.6	69.9
22.80	93.6	68.4
23.21	93.2	67.0
23.21	93.4	67.0
23.63	93.3	66.0
24.07		65.6
24.07		65.6
24.53		64.7
25.00		63.1
26.00		64.9

## **FACTORY RECALIBRATION:**

Scientech recommends that a complete calibration be performed annually to verify system accuracy. Please contact our Product Service Department at (800)525-0522 or (303)444-1361 or Fax (303)444-9229 or email [inst@scientech-inc.com](mailto:inst@scientech-inc.com) to arrange for a NIST traceable, factory calibration.

## **LIMITED WARRANTY:**

All Scientech Laser Power and Energy Measurement Systems are warranted against defects in materials and workmanship for two (2) years from date of delivery. During the warranty period, Scientech will repair, or at its option replace at no charge, components that prove to be defective. The equipment must be returned, shipping prepaid, to Scientech's product service facility. This limited warranty does not apply if the equipment is damaged by accident or misuse or as a result of service or modification by other than a Scientech service facility. The foregoing warranty is in lieu of all other warranties expressed or implied including but not limited to any implied warranty of merchantability, fitness, or adequacy for any special incidental or consequential damages whether in contract, tort, or otherwise.

## **RETURNED GOODS PROCEDURE:**

Should it become necessary to return any item to Scientech for any reason, please contact our Product Service Department at (800)525-0522 or (303)444-1361 or Fax (303)444-9229 or email [inst@scientech-inc.com](mailto:inst@scientech-inc.com). When you call, please be ready to provide model number, serial number, and a description of the problem. Frequently we can provide self-help information which will eliminate the need for returning the unit(s).

If equipment return is required, please pack the items in the original box and packing material. As an alternate, place the equipment in a snug-fitting box, and then pack that box in a larger box with at least four inches of packing material. Scientech does not assume responsibility for under packed items. Please include the name and phone number of the person we should contact regarding repair questions. Normally, products are repaired and shipped within 5 working days after their arrival at the product service facility. This is an average time and could vary depending on the workload.

Shipping Address:     Scientech, Inc.  
                              Product Service Department  
                              5649 Arapahoe Ave.  
                              Boulder, Colorado 80303 U.S.A.

## **DISPOSAL OF ELECTRICAL AND ELECTRONIC EQUIPMENT:**

Scientech, Inc. recommends the following for disposal of electrical and electronic equipment:

1. The best option is to reuse the equipment in its entirety.
2. Where the equipment can not be reused in its entirety, priority should be given to reuse of its subassemblies and components.
3. Where reuse is not appropriate, electrical and electronic equipment, including batteries, should be recycled according to local ordinances. It should never be mixed with municipal waste.

