# PMT5100 Series
# Photomultiplier Tube Modules

## User Guide



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# Chapter 1 Introduction

## 1.1 Intended Use

These products are intended to be used in laboratory environments to detect very low levels of light. Typical applications include light detection in a microscopy system that allow associated optics and software to render images of microscopic samples. Another application is photon counting. These products are controlled from a host computer over a USB 2.0 interface using a variety of available Thorlabs software products.

The product may only be used in accordance with the instructions described in this manual. Any other use will invalidate the warranty.

## 1.2 Explanation of Regulatory Markings

The CE/UKCA markings on the product are the manufacturer's declaration that the product complies with the essential requirements of the relevant European health, safety, and environmental protection legislation.

The wheelie bin symbol on the product, the accessories or packaging indicates that this device must not be treated as unsorted municipal waste but must be collected separately.

## 1.3 Description

The PMT5100 Series Photomultiplier Tubes (PMTs) have an integrated transimpedance amplifier, designed for the detection of signals from DC to 80 MHz. They have built-in low pass filters (250 kHz, 2.5 MHz, 30 MHz, and 80 MHz) selectable from our application software. A lockable USB cable powers and controls the PMT5100 module. A buffered output drives a 50 Ω impedance up to ±1.9 V. The housing includes SM1 (1.035"-40) or C-Mount (1.00"-32) threading for convenient mounting of external optics, emission filters, and irises.

The PMT5100 series photomultiplier tubes consist of the PMT5101 with an SM1-threaded aperture, imperial mounting threads, and 30 mm cage mount threads; the PMT5101/M with SM1-threaded aperture, metric mounting threads, and 30 mm cage mount threads; and the PMT5102 and PMT5103 with C-Mount 1.00"-32 threads, but no post or cage mounting capabilities. The PMT5103 is configured for 50% less overall amplifier gain to prevent output saturation when detecting higher intensity signals.

This user guide applies to the Item #s listed below, as well as models bundled with our imaging systems. Those units may have model numbers appended by an “R” or other special characters, i.e. PMT5102R. Refer to the specifications for the specific base model number, in this example PMT5102.

| Ordering Code (Item #) | Description |
|---|---|
| **PMT5101** | Non-Cooled GaAsP PMT with Built-in Amplifier, SM1-Threaded Aperture with Imperial Mounting Threads, 30 mm Cage Compatibility |
| **PMT5101/M** | Non-Cooled GaAsP PMT with Built-in Amplifier, SM1-Threaded Aperture with Metric Mounting Threads, 30 mm Cage Compatibility |
| **PMT5102** | Non-Cooled GaAsP PMT with Built-in Amplifier, C-Mount Threaded Aperture |
| **PMT5103** | Non-Cooled GaAsP PMT with Built-in Amplifier, C-Mount Threaded Aperture, Low-Gain Output |

## 1.4 Technical Data

### 1.4.1 General Specifications

| Specification | | Value |
|---|---|---|
| **Module Dimensions** | PMT5101(/M) | 3.19" x 1.60" x 2.12" (80.9 mm x 40.6 mm x 53.8 mm) |
| | PMT5102 PMT5103 | 3.19" x 1.35" x 1.97" (80.9 mm x 34.3 mm x 50.0 mm) |
| **Operating Temperature** | | 5 to 35 °C |
| **Storage Temperature** | | -20 to 50 °C |
| **Main Unit Input Voltage / Current** | | 5 VDC / <500 mA |
| **Output Voltage** | | ±3.8 V (±1.9 V into 50 Ω) |
| **Power and Control Connector** | | USB Type A to USB Mini-B |
| **Weight** | All Models | 0.66 lbs (300 g) |

### 1.4.2 PMT Specifications

| Specification | | Value |
|---|---|---|
| **PMT Type** | | Hamamatsu GaAsP H16201P-40 |
| **Cooling** | | Non-Cooled |
| **Photocathode Geometry** | | Head On |
| **Window** | | Borosilicate, Flat Window |
| **Spectral Response** | | 300 - 740 nm |
| **PMT Gain (Typical @ +0.8 V Control Voltage)** | | $2.0 \times 10^6$ |
| **Ripple Noise (Peak to Peak)[a]** | | 0.6 mV |
| **Settling Time of Sensitivity Control[b]** | | 0.2 s |
| **Photocathode Active Area** | | Ø5 mm |
| **Peak QE Wavelength** | | 520 nm |
| **Cathode Radiant Sensitivity at 520 nm** | **Minimum** | 168 mA/W |
| | **Typical** | 189 mA/W |
| **Dark Count[c,d]** | **Typical** | 6000 $s^{-1}$ |
| | **Maximum** | 18 000 $s^{-1}$ |
| **Warm-Up Time Before Control Voltage[e]** | | 30 to 60 minutes |
| **Anode Pulse Rise Time[a]** | | 1.00 ns |
| **Protection Circuit Trip Level (Average)** | | 40 µA |
| **Control Voltage Range** | | +0.5 to +0.8 V (Software Controlled) |
| **Maximum Input[f]** | | ±500 µA Peak, 40 µA Average |

a. Control Voltage: +0.8 V; Temperature Control at 25 °C
b. Stabilized Time in the Control Voltage Adjustment from +0.8 V to +0.5 V
c. After 30 Minutes Storage in Darkness
d. Control Voltage = Plateau; Temperature at 25 °C
e. The dark count rate specification is valid when the PMT has been turned on in the dark, no control voltage has been applied during the specified warm-up time, and no signal has been incident during the specified warm-up time.
f. Operation above this specification could damage the PMT. Note that the PMT is automatically shut down if the average current exceeds 40 µA.

### 1.4.3 Amplifier Specifications

| Specification | Conditions | Min | Typical | Max |
|---|---|---|---|---|
| **Noise** | | | | |
| **Input Current Noise**[a] | @ 1 MHz, $C_{in}$ = 4 pF | - | 6.5 pA/√Hz | - |
| **Total Input Noise**[a] | DC to 80 MHz | - | 5.8 pA/√Hz Avg | - |
| **Transfer Characteristics** | | | | |
| **Total Transimpedance**[b] | PMT5101, PMT5102 | - | 10 843 V/A | - |
| | PMT5103 | | 5422 V/A | |
| **Amplifier Bandwidth (at -6 dB)**[c] | Software Configurable | - | DC to 80 MHz<br>DC to 30 MHz<br>DC to 2.5 MHz<br>DC to 250 kHz | - |
| **Transresistance** | Input Stage TIA | - | 3.48 kΩ | - |
| **Input** | | | | |
| **Linear Input Range**[d] | PMT5101, PMT5102 | - | - | ±150 µA |
| | PMT5103 | | | ±300 µA |
| **DC Input Impedance** | - | - | 33 Ω | - |
| **Input Reference** | - | - | 0 V | - |
| **Output** | | | | |
| **DC Offset (±0.050 V)** | 50 Ω Load<br>(Software Adjustable) | -1.0 VDC | 0 VDC | 1.0 VDC |
| **Output Range**[e] | 50 Ω Load | -1.9 V | - | +1.9 V |
| **Impedance** | DC to 80 MHz | - | 65 Ω | - |
| **Slew Rate** | - | - | 250 V/µs | - |

a. Bandwidth and equivalent input current noise are typical values, which depend on the source capacitance. To achieve the best possible bandwidth and noise performance, short cables are used at the input of the amplifier.
b. Into 50 Ω Load Resistance, combined amplifier stages, DC
c. The bandwidth decreases as the output signal magnitude increases.
d. Peak Value @ 0 V Output Bias that will not saturate the output amplifier. Note: Average current will not exceed 40 µA – PMT will shut down.
e. Typical PMT output voltage is a negative going signal referenced to the output offset level.

### 1.4.4 Performance Plots

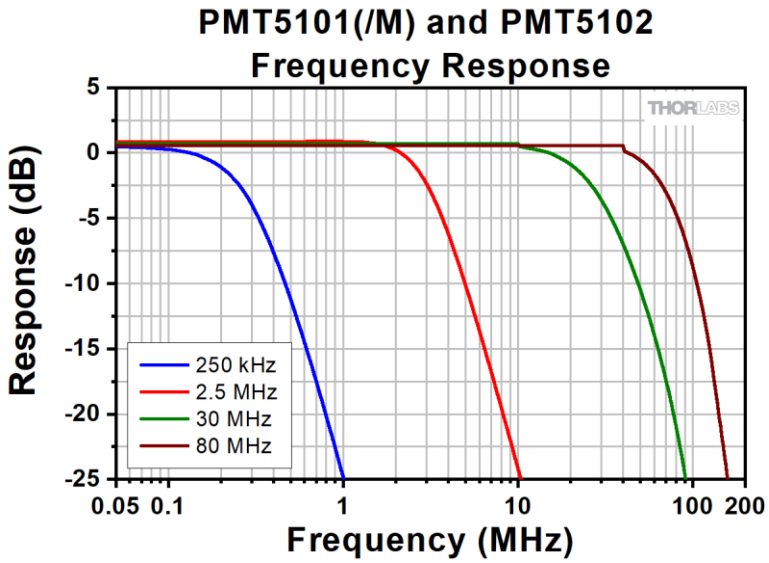



*Figure 1 Typical Frequency Response vs. BW Setting for PMT5101(/M) and PMT5102*

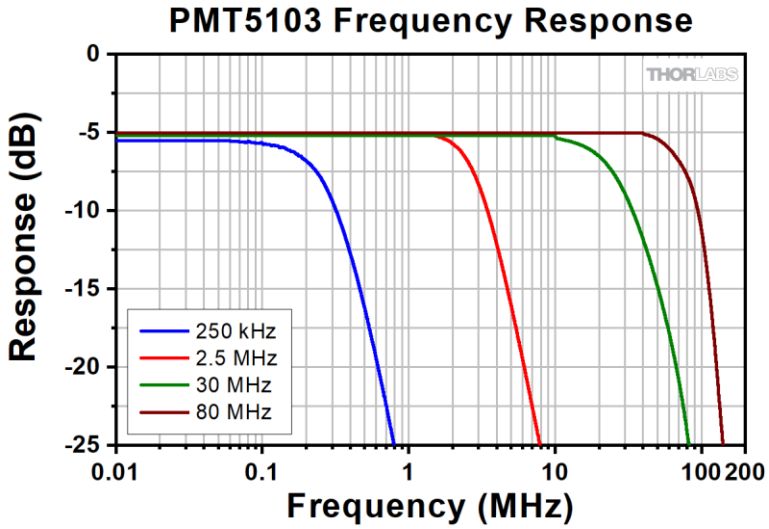



*Figure 2 Typical Frequency Response vs. BW Setting for PMT5103*

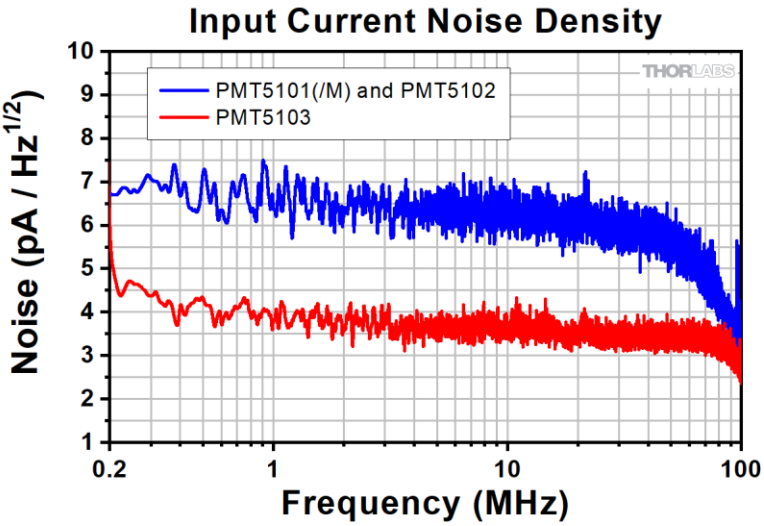



***Figure 3 Typical Noise Density***

### 1.4.5 Mechanical Drawings

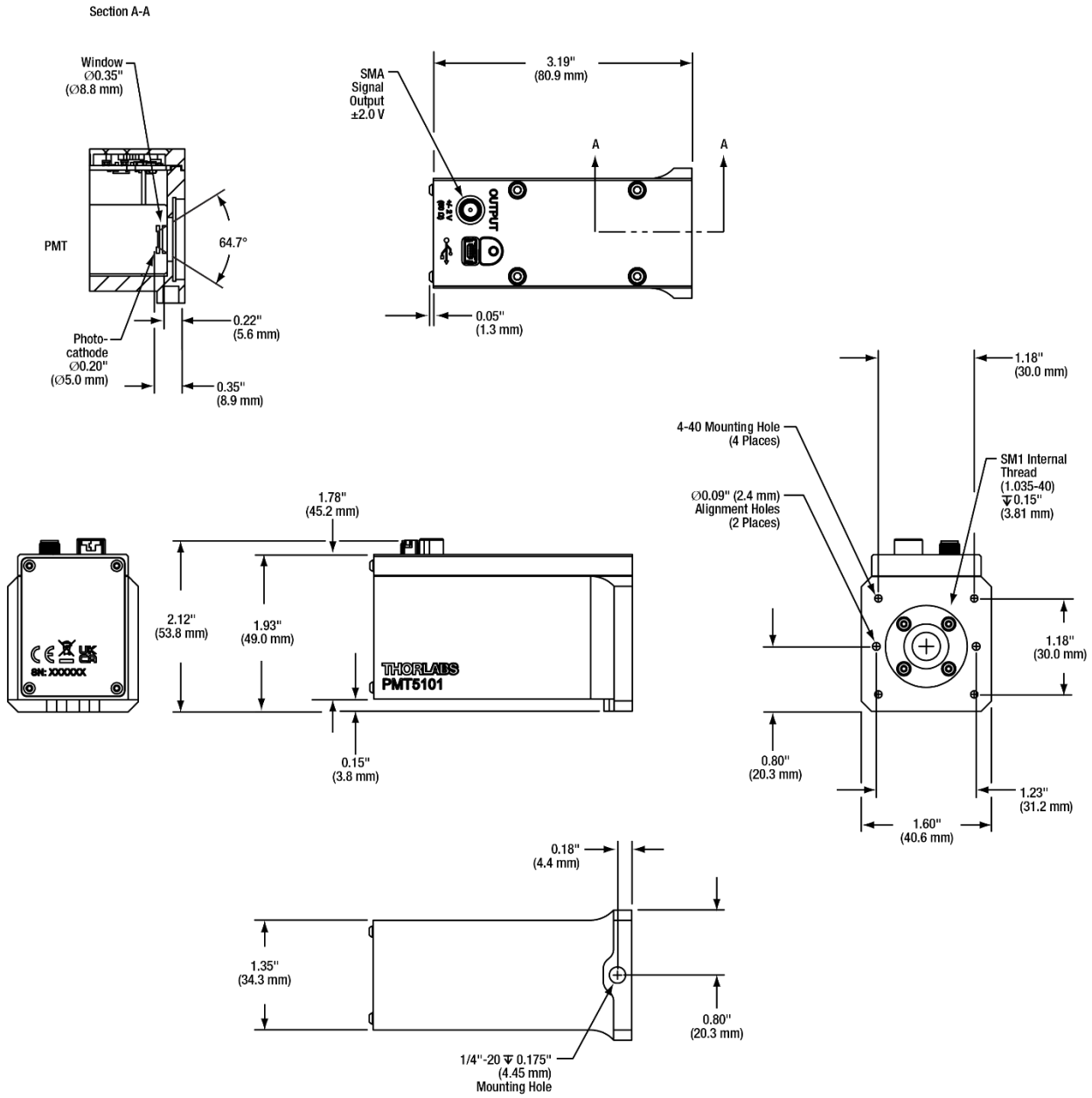



***Figure 4 PMT5101 Mechanical Drawing***

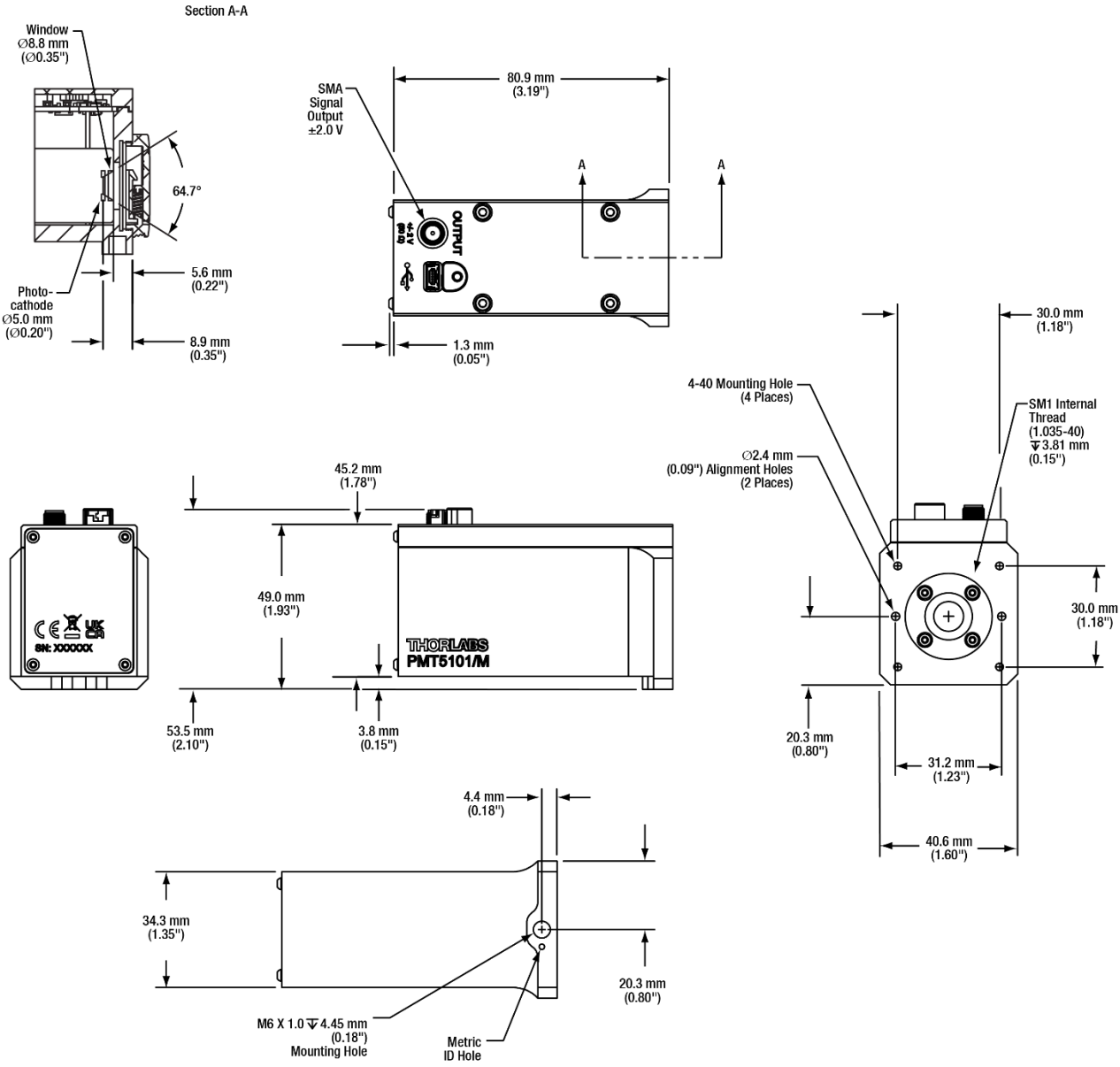



***Figure 5 PMT5101/M Mechanical Drawing***

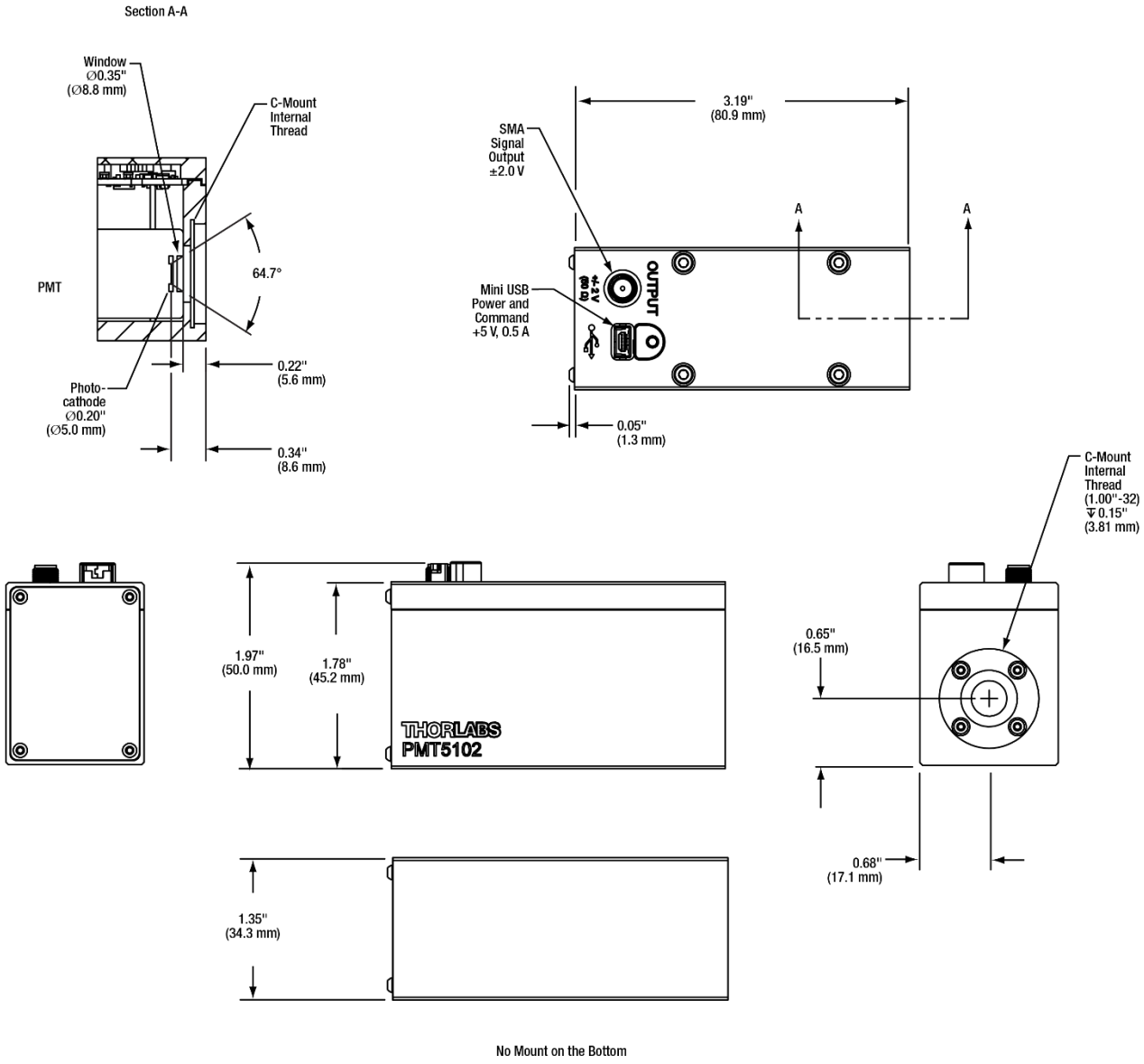



***Figure 6 PMT5102 and PMT5103 Mechanical Drawing***

### 1.4.6 Key Features

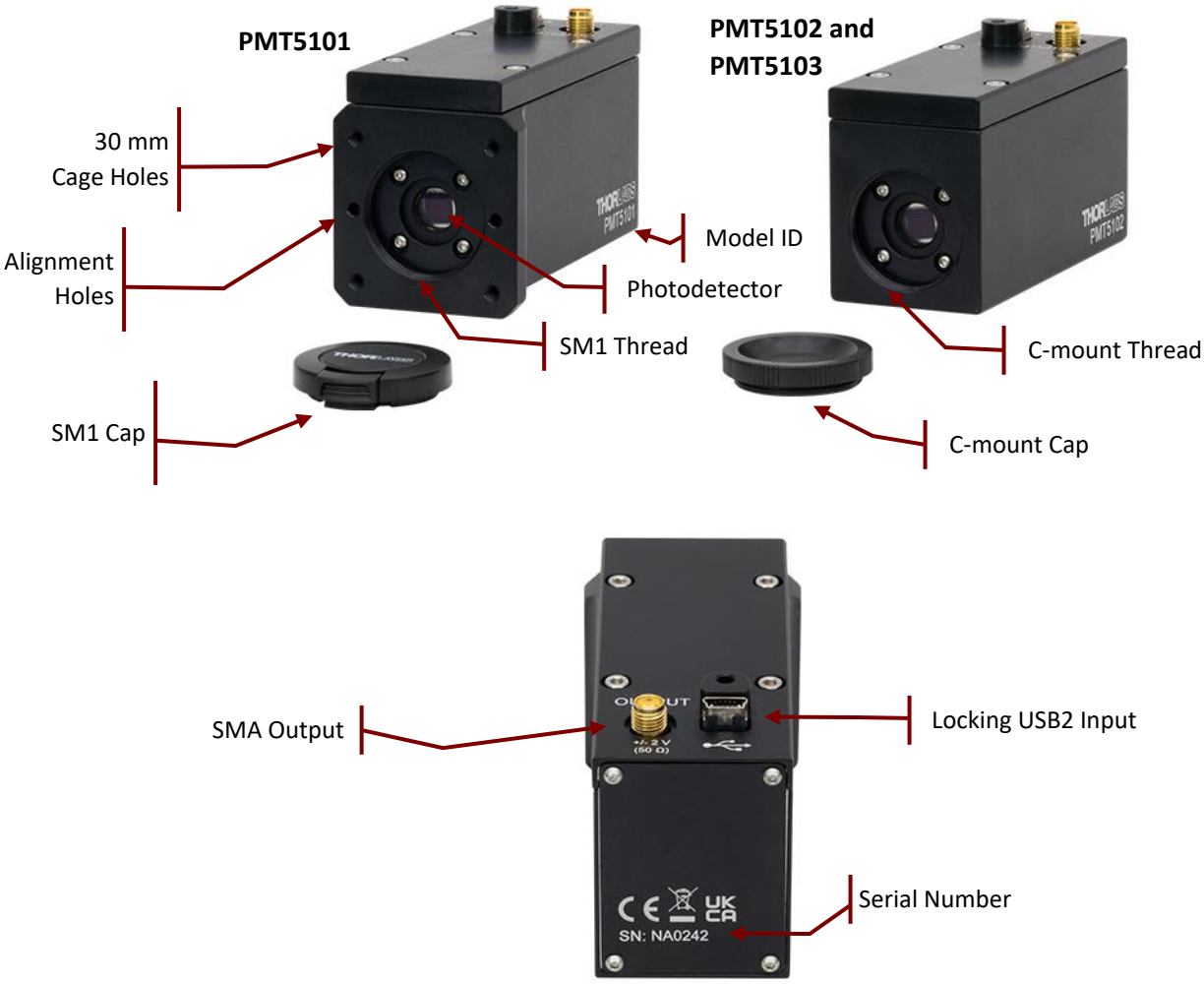



***Figure 7 Key Features of the PMT5100 Series***

## 1.5 Simplified Declaration of Conformity

The full text of the EU declaration of conformity is available in the support documentation of the PMT5100 series on the following page:

**https://www.thorlabs.com/f288228**

Click on the Docs icon to access all support documentation.

## 1.6 FCC Designation

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to

cause harmful interference in which case the user will be required to correct the interference at his own expense.

# Chapter 2 Safety and Warnings

**NOTICE** Indicates information considered important, but not hazard-related, such as possible damage to the product.

While the PMT5100 Series poses no threats to user safety, there may be situations where misuse of the device may result in damage to the product. If you encounter the Notice symbol above in the following sections of this User Guide, please heed the advice provided with them.

# Chapter 3 Installation

## 3.1 Warranty Information

Thorlabs warrants that all products sold will be free from defects in material and workmanship and will conform to the published specifications under normal use, when correctly installed and maintained.

Thorlabs provides the warranty for a period of one year.

This precision device is only serviceable if returned and properly packed into the complete original packaging including the complete shipment plus the cardboard insert that holds the enclosed devices. If necessary, ask for replacement packaging. Refer servicing to qualified personnel.

## 3.2 Packing List

- PMT5100 Series Photomultiplier Module
- USB Type A to USB Mini-B 2.0 Locking Cable, 3 m
- SM1 Threaded Lens Cap (PMT5101 and PMT5101/M)
- C-Mount Threaded Lens Cap (PMT5102 and PMT5103)
- Thorlabs Software and Manual Download Card

## 3.3 Unpacking Instructions

- Remove PMT module and USB cable from the shipping carton
- Leave the lens cap installed until the unit is installed and ready to operate

## 3.4 Installation Instructions

1. Mount the PMT on your optical table or application. Keep the PMT cap on until you are ready to start the experiment.
2. Connect the USB cable from the PMT (USB Mini-B) to a USB 2.0 port on the computer (Type A). Thread the thumbscrew on the USB Mini connector into the mating thread on the PMT housing.
3. Connect a 50 Ω coaxial SMA cable (not supplied with unit) from the **OUT** port of the PMT to your data acquisition equipment. Using a cable longer than 120" (3 m) is not recommended as it diminishes

performance and invalidates EMC conformity. We recommend that you terminate the opposite end of the cable with 50 Ω for maximum performance.

4. Install the required software/driver on your computer as described in Section **4.2 Software**.
5. Start the *ThorDetector* control software (**4.2 Software**) and adjust the PMT offset.
6. Turn on the light source.

**NOTICE** DO NOT expose the photomultiplier module to strong light sources (especially UV). The PMT5100 Series Detectors have internal protection circuitry that can turn off the PMT, but there is always potential for permanent damage to the unit.

7. Use the *ThorDetector* control software (**4.2 Software**) to control the output offset and gain of the PMT.

**Note:** The warm-up time required before applying control voltage is 30 to 60 minutes.

# Chapter 4 Operation

## 4.1 Signals and Hardware

The light to voltage conversion can be estimated by multiplying the wavelength-dependent responsivity of the photomultiplier tube by the transimpedance gain and input optical power:

Output (V) = Transimpedance Gain (V/A) x Sensitivity (A/W) x Gain x Input Optical Power (W)

The sensitivity can be estimated from Figure 8.

The gain can be estimated from Figure 9.

The PMT performance degrades over time.

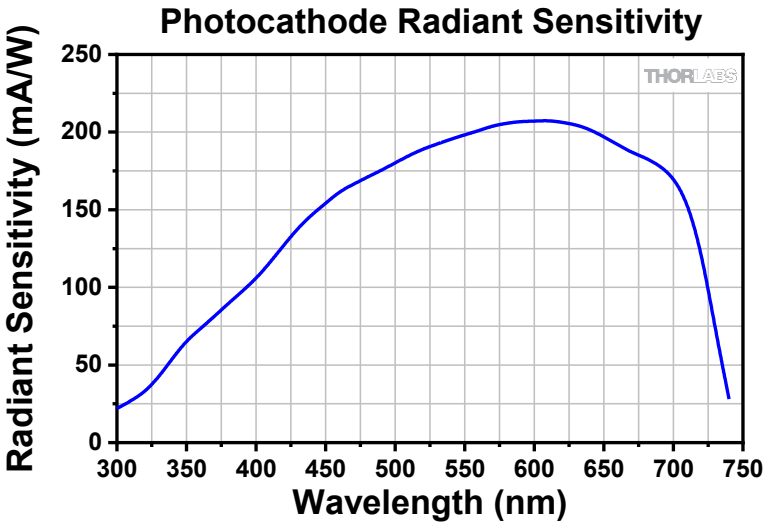



*Figure 8 Typical Spectral Response*

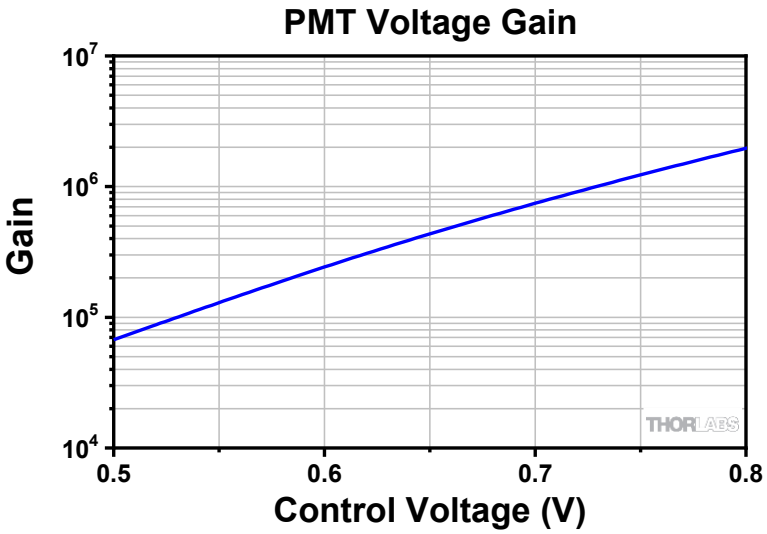



***Figure 9 Typical Control Voltage vs Gain***

The maximum output of a PMT5100 Series PMT is ±1.9 V for 50 Ω loads. To avoid saturation, use external neutral density filters (e.g., Item # NDC-50C-4M-A) to reduce the input light level.

Note: If the *average* current from the photomultiplier tube goes above 40 µA, the protection circuit will automatically shut down the PMT.

**NOTICE**

**DO NOT expose the photomultiplier module to strong light sources (especially UV). The PMT5100 has internal protection circuitry that can turn off the PMT, but there is always potential for permanent damage to the unit.**

## 4.2 Software

### 4.2.1 Software Installation

1. Download the *ThorDetector* software from the Thorlabs Web site:

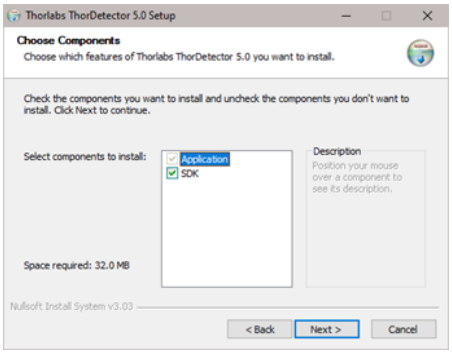
   **https://www.thorlabs.com/software_pages/viewsoftwarepage.cfm?code=PMT**

2. Unzip the contents of the download to a temporary folder and double click on:

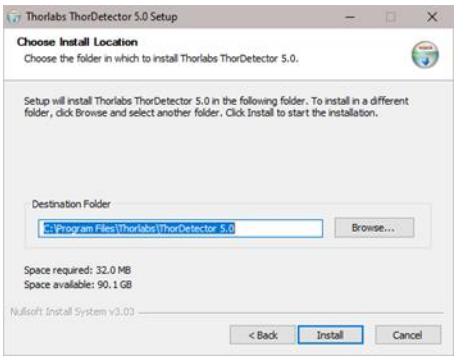
   70-0129 ThorDetector_SDK_x_x_202x_xxxxx_Installer.exe



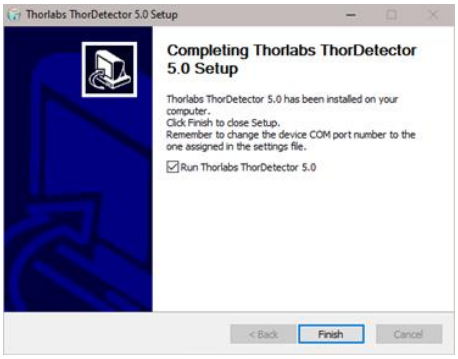
In the *Choose Components* window, select SDK if you want the software development kit files installed, then click *Next*.




3. In the *Choose Install Location* window, select the destination folder you would like the files installed, then click *Install*.




4. The *ThorDetector* setup will begin installation. When complete, press the *Finish* button.




5. An application icon will be placed on your Desktop:



### 4.2.2 Software Operation

The *ThorDetector* Control Software can control up to six PMT modules of various model families including the PMT5100 series. Double click the ThorDetector icon on the desktop and the C*onnection Settings* window appears.

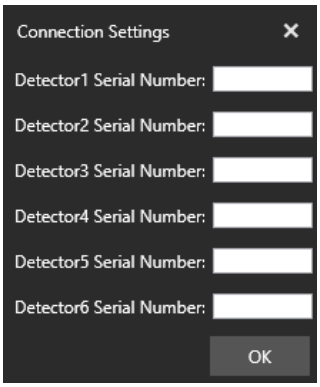



***Figure 10 Connection Settings Window***

6. In the *Connection Settings* window, if any or all the serial number fields are blank you can simply click the *OK* button and *ThorDetector* will assign the connected PMTs to an available slot. The *Control Window* will then open showing the connected PMTs.

   However, if the Connections Settings window is fully loaded with serial numbers, and you are connecting a new serial number device, you must manually delete one of the existing serial numbers that is no longer connected to the host PC prior to clicking *OK. ThorDetector* will then assign the new device to the blank Detector slot.

   You can also manually enter serial numbers into the Connection Settings window if you wish to put the units in a specific order, however, you can also rearrange the order of the units once the main window opens.

   **Note:** The software is case-sensitive. Use only uppercase alphabetical characters. For a six-digit alphanumeric Serial Number (SN), prefix the digits with 00. Copy-Paste works after highlighting a selected serial number.

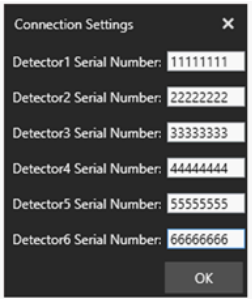



***Figure 11 Connection Settings Window with Serial Numbers***

After clicking the OK button, the main control panel will open showing up to six connected devices:




***Figure 12 ThorDetector Window***

7. Click the button next to each PMT to expand the respective PMT channel or click the group expand button to expand all channels. Click the button to minimize a channel or use the group button to minimize all channels.

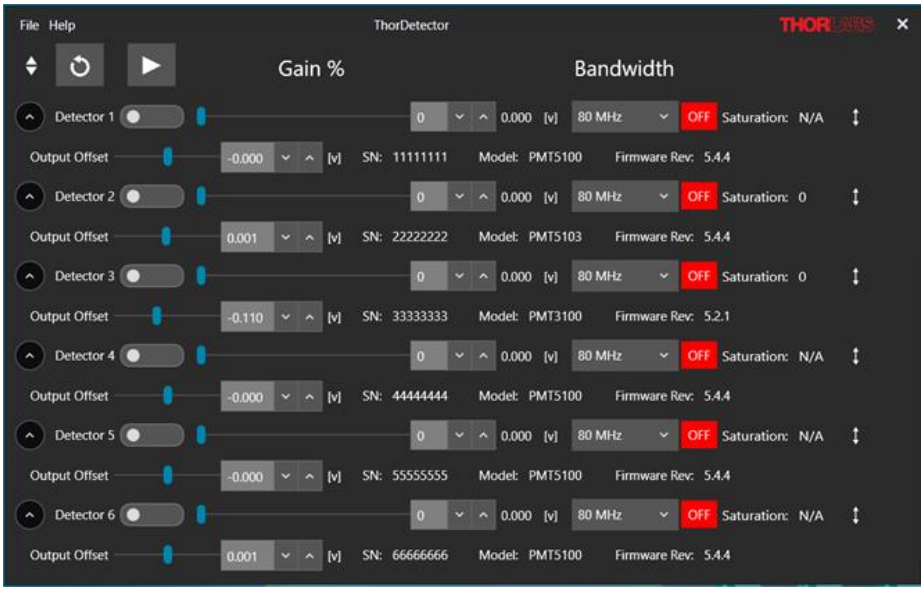



***Figure 13 Expanded ThorDetector Control Window for Six Devices***

The expanded *ThorDetector* GUI will expose the Output Offset control, Serial Number (SN), Model, and the unit's Firmware revision.

### 4.3 Graphical User Interface (GUI)

The GUI consists of the display area, the File menu, and the Help menu.

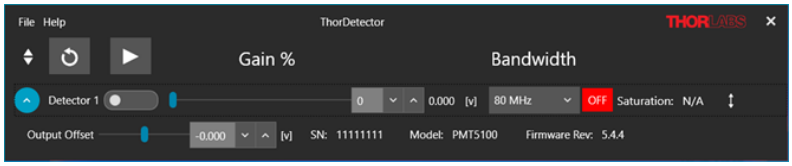
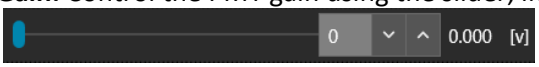
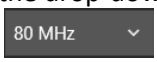



***Figure 14 Graphical User Interface***

You can control the PMT activities from the main display area. It displays all the PMTs (maximum six) that are connected to the system.

- **Channel Enable Switch** 

**:** Selects and enables a single PMT channel.

- **Gain:** Control the PMT gain using the slider, input field, or up/down buttons:
  
  
  Each adjustment step represents approximately 1% full-scale. The actual gain voltage appears on the right side of the up/down buttons. Gain % must be set to a non-zero value in order to fully activate the channel.
- **Activate Button**  **:** Activates ALL enabled PMT channels and then changes to . Click the Activate button, and the  icon appears in place of the  icon - **provided the Gain % is above zero and the channel is enabled.**
  If a PMT is activated, and you reduce the gain to zero, the PMT turns off.
- **Refresh Button**  **:** Refreshes the PMT connections. If the connection is lost and you need to reconnect, or you have added a new PMT to the mix, click this button to restore/initiate the PMT connection. All enabled PMT channels are disabled during a refresh. See Troubleshooting **Chapter 6**.
- **Output Offset:** Set the offset for the output using the slider, the input field, or the up/down buttons:
  
  
  The actual offset is displayed to the left of the up/down buttons and is only accurate when connected to a 50 Ω output load.
- **Bandwidth:** Changes the bandwidth to the desired frequency (80 MHz, 30 MHz, 2.5 MHz, or 250 kHz) from the drop-down menu:
  
  
- **Stop Button**  **:** Deactivates ALL enabled PMTs. This button appears after pressing the Activate the button.

***Note:*** You can update or preset the Gain %, Output Offset, and Bandwidth for a PMT with the channel disabled. Changes will not take effect until the channel is enabled, however. You can also change these parameters on-the-fly with the channel enabled.

Output Offset and Bandwidth frequency will be saved to memory approximately 10 seconds after the last change was enacted. These values will then persist through power cycles until changed again. Gain % values are not saved.

***Note:*** If the PMT "trips" off due to an overcurrent condition (too much gain or light), the  icon appears where the  icon was. Lower the Gain and/or lower the light incident on the PMT, then Click the  button to reset the trip.




***Figure 15 PMT Trip***

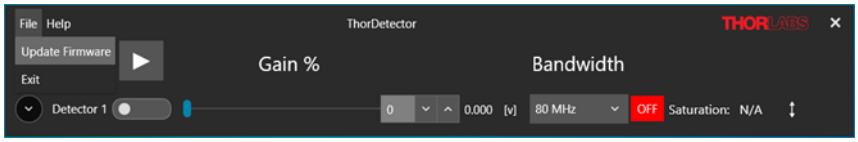
**NOTICE** Overcurrent conditions can damage or degrade the life of the PMT. The Trip function minimizes the amount of time an overexposure generates excessive current.

- **Saturation:** Available on some models, the saturation field provides a count of pulses that are approaching the saturation level of the output amplifier. The count is refreshed every second. If you encounter a non-zero value, you should lower the intensity of the light incident on the PMT.
- **Channel Reposition** **:** Detector channel positions can be repositioned in the main window by clicking, holding, and dragging the double arrow icon on a given channel to a new location in the window, releasing the icon at the desired location. The application will take a moment to finalize the move. All channels will become disabled when moving channels around.

### 4.3.1 File Menu

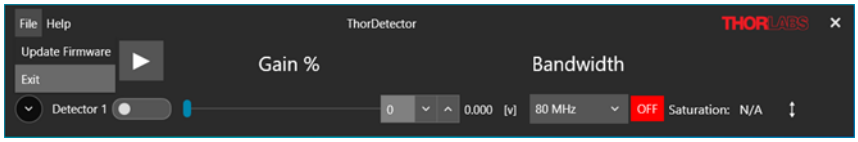
Use the *File* menu to update the firmware or to exit from the *ThorDetector* window.

- Click *File>Update Firmware* to open the file path for the .hex file (provided by Thorlabs). Select the .hex file and click *Open* to update the firmware. (Refer to **Section 4.6 Updating the Firmware** if you are updating the firmware for the first time.)



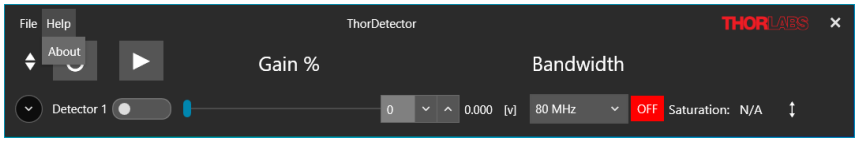

**Note:** DO NOT update the firmware until you receive a newer version of firmware from Thorlabs.

- Click *File>Exit* to close the *ThorDetector Control* window. You can also click on the X in the upper right corner to close the application.




### 4.3.2 Help Menu

Use the *Help* menu to access the *About* window. The About window will show information regarding the software version.




## 4.4 Setting the PMT Offset

You must set the offset for each of the PMT devices.

**Note:** For a Galvo-Resonant system, once the initial offset adjustment is set, you do not have to adjust the offset for every use. For a Galvo-Galvo system, you may need to adjust the offset depending on the Dwell Time setting.

1. Cover the aperture of the PMT. The lens cap can remain in place.

   **Note:** An unpowered PMT exposed to bright light can have a high dark count that may take several minutes to hours to dissipate.

2. DO NOT enable the PMT channel under consideration.

3. Open the *ThorDetector* application.
4. Use the table below to configure the PMTs:

| Scanner | Bandwidth | Gain |
|---|---|---|
| **Galvo-Resonant** | 80 MHz | 0 |
| **Galvo-Galvo** | Large Dwell Time (Slow Scan): 250 kHz<br>Small Dwell Time (Fast Scan): 2.5 MHz | 0 |

5. Observe the output signal of the PMT using an oscilloscope, Digital Multimeter, or the imaging system the PMT is installed in.
6. Adjust the Output Offset on the *ThorDetector* window until the output signal is at 0 V ± 10 mV. This can be done using the slide control, or by typing "0" into the entry box and using the up/down buttons to fine tune the offset.
   **Note:** The entry box will display the approximate offset voltage when connected to a 50 Ω output load.

### 4.5 Using the Gain % Controls

The Gain % controls consist of a slider, up/down buttons, and an input field. All controls adjust the level of gain in percentage of full scale, in minimum increments of approximately 1 percent. The range of values for the input field is 0 to 100. When the Gain setting is 0 it will disable the PMT, and the status indicator will show an "OFF" status. All settings greater than 0 will allow the PMT to be active, provided the channel is enabled and the master activate button has been pressed.

The Gain % setting changes the internal control voltage applied to the PMT. Using various calculations *ThorDetector* will counteract the PMT's exponential gain response, resulting in a linear response at the unit's output.

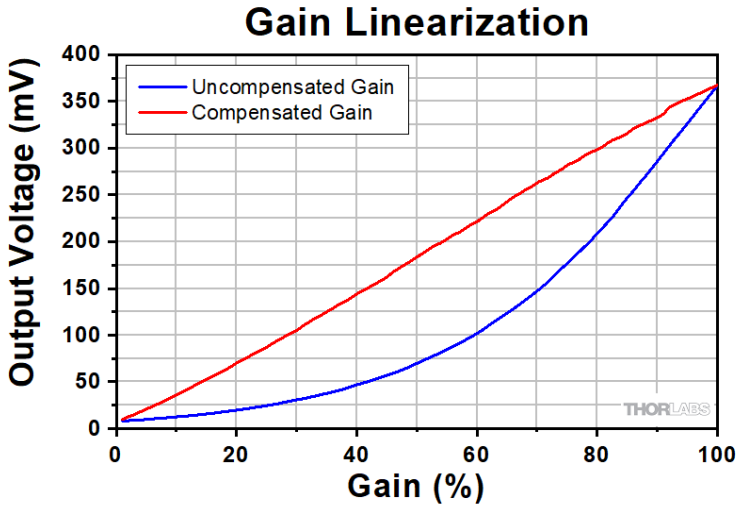



***Figure 16 Output Voltage vs. Gain Implementations***

### 4.6 Updating the Firmware

Make sure to update your firmware immediately if you receive a newer version of firmware from Thorlabs.

**Note:** If updating is necessary, you can update only one unit at a time.

1. Save the latest firmware (.hex file) on your computer.

2. Open the *ThorDetector* application and click *File>Update Firmware*. Make sure that the PMT's aperture is covered.

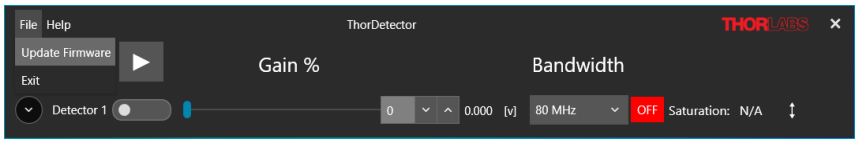



***Figure 17 Updating the Firmware***

3. A Firmware Update window appears; click *Yes* to continue.

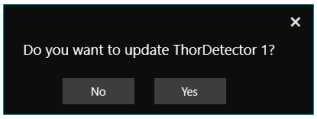
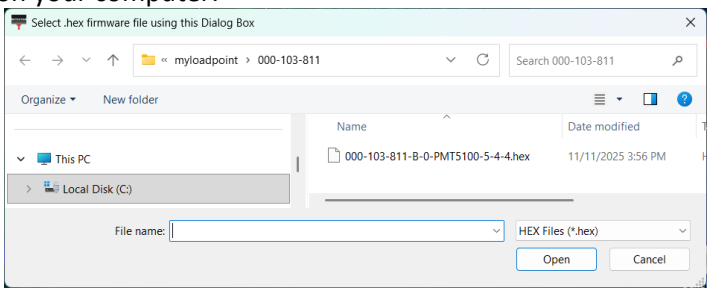
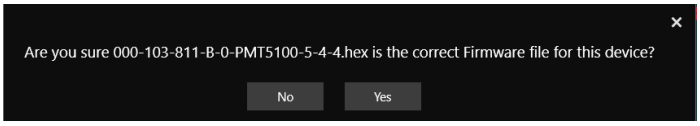



***Figure 18 Firmware Update***

4. Browse to the .hex file on your computer:

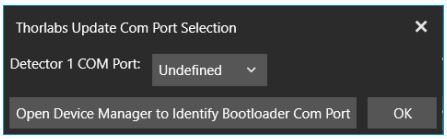



5. Then confirm the file choice:




Note: Your file name and location may differ from this example.

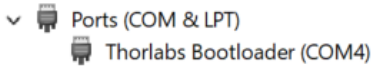
6. The *Thorlabs Update Com Port Selection* window will open:



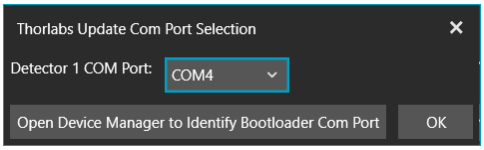

7. Go to Device Manager on the host computer and:

   *a.* Confirm that the unit has enumerated as "*Thorlabs Bootloader*"

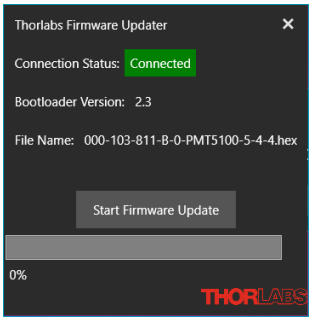
   *b.* Note the COM port it is now located on.



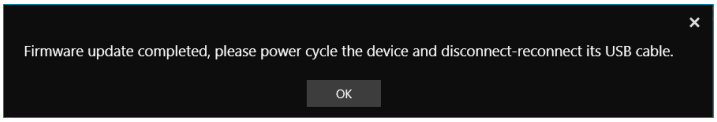

8. In the *Thorlabs Update Com Port Selection* window click on the down arrow and select the COM port that the bootloader is connected to, then click *OK.*



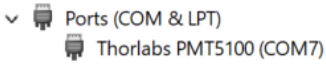

9. Click *Start Firmware Update* in the Updater window:




10. Do not close the Updater window until the process is 100% complete! If that does happen you will need to restart the process. The device will be in a bootloader state.
11. When the Updater is finished, cycle power to the device.




12. Open the Device Manager and confirm that the unit is no longer a Bootloader and has enumerated as the model number.




# Chapter 5 Maintenance and Cleaning

To clean the PMT5100 Series PMTs:

- Disconnect the unit from all power sources prior to cleaning.
- Use a soft, slightly damp cloth to clean the housing.
- Use only optical grade wipes to clean the window of the tube.

There are no serviceable parts in the PMT5100 Series' optical head. If you suspect a problem with the PMT5100 Series instrument, please contact our nearest office for assistance from an application engineer (See ***Chapter 8*** for details).

**NOTICE** **When not in use, store the PMT5100 series in an environment without light leakage or stray light, preferably with the lens cap installed.**

# Chapter 6 Troubleshooting and Repair

Below are a few checks to help troubleshooting problems that may arise. Please contact your local Thorlabs Technical Support office with any questions.

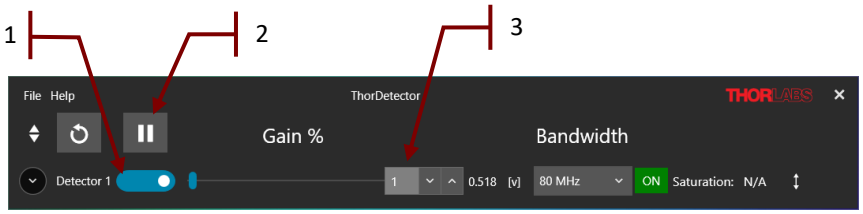
If the unit does not appear to turn on correctly, please check the following items:

- Ensure that USB cable is fully seated at both ends and locked into the PMT housing.
- Ensure that the host computer is operational, and the USB port is not disabled for any reason.

- Ensure that the latest USB drivers are installed on the host computer. These should have been installed along with the *ThorDetector* software.
- Check that the serial number (SN) is entered in the Connection Settings window (refer to Section **4.2.2 Software Operation**) and properly formatted. For a six-digit alphanumeric SN, prefix the digit with 00.
- Unplug and plug the USB cable back in.

If the unit appears to have no output signal:

- Ensure that the SMA cable is fully threaded onto the output port of the unit.
- Ensure that the output load on the receiver end of the cable is no less than 50 Ω.
- Ensure that the aperture is not blocked. Remove the lens cap if it is still installed.
- Ensure that the unit has not "Tripped" due to excessive light levels. This will be indicated on the *ThorDetector* window. Reduce the light levels and or Gain setting prior to clearing the trip event.
- Ensure that all three of the following conditions exist:
    1. Detector channel is enabled
    2. Channel is Activated
    3. Channel Gain is >0




If the output signal is low:

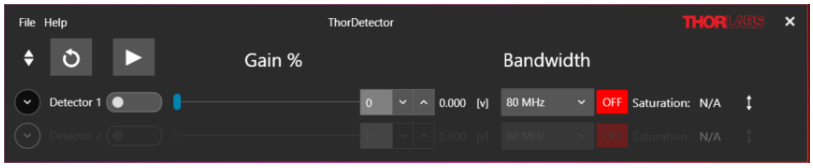
- Increase the Gain.
- Increase the light level.

If the output signal is saturated (±1.9 V):

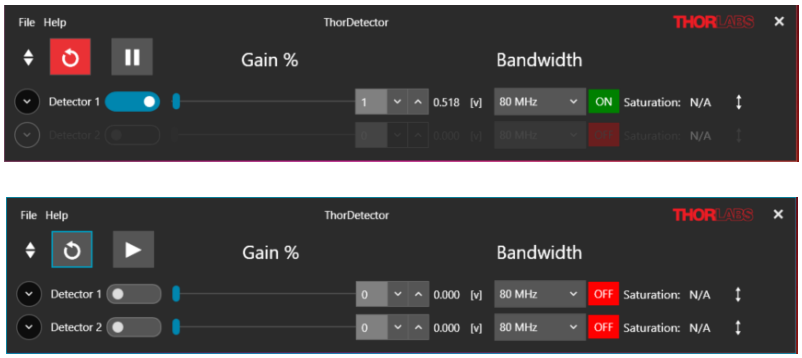
- Decrease the Gain.
- Decrease the light level.
- Ensure that the output offset setting is near zero volts.

If the channel for one or more Detectors is greyed out in the *ThorDetector* application it means that the unit was disconnected.

- Check the USB connection and reconnect the unit.




- Once the Detector is reconnected, the Refresh button will turn red and "throb" indicating a new connection. Press the Refresh button to refresh the application with the reconnected device.
  Note: All enabled devices will become disabled during the refresh process.




# Chapter 7 Disposal



Thorlabs verifies our compliance with the WEEE (Waste Electrical and Electronic Equipment) directive of the European Community and the corresponding national laws. Accordingly, all end users in the EC may return “end of life” Annex I category electrical and electronic equipment sold after August 13, 2005 to Thorlabs, without incurring disposal charges. Eligible units are marked with the crossed out “wheelie bin” logo (see right), were sold to and are currently owned by a company or institute within the EC and are not dissembled or contaminated. Contact Thorlabs for more information. Waste treatment is your own responsibility. “End of life” units must be returned to Thorlabs or handed to a company specializing in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site. It is the user’s responsibility to delete all private data stored on the device prior to disposal.

# Chapter 8 Thorlabs Worldwide Contacts

For technical support or sales inquiries, please visit us at www.thorlabs.com/contact for our most up-to-date contact information.



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