TGPMT / PMT-200

The PMT-200 (also referred as TGPMT) card is part of the TG-1000 Tiger Controller that lets users power and interface with two Photo Multiplier Tubes (PMT).

Features

- High Sensitivity
- Controls up to 2 PMTs
- Manual or Programmable PMT Gain
- Automatic overexposure shutdown
- C-mount fits most camera ports
- Wide Dynamic Range
- Easy to Use

Supported PMT

The PMT-200 is compatible with Hamamatsu's Voltage Output PMT modules like, H5784, H10722 , H10723 and others.

Photosensor Modules

Type	Type No.	Spectral Response (200 400 600 800 (nm))	Frequency Response (DC 100 200 (kHz))	Photosensitive Area (mm)	Outside Size: Cubic Ratio	Outside Size: Dimensions (mm)	Input Voltage (V)	Remarks
Voltage Output	H10722 Series	230 to 920	20	φ8	1.3	22 × 22 × 60	+/-5	Feedback resistance 1 MΩ
	H10723 Series	230 to 920	200	φ8	1.4	51 × 24 × 25	+/-5	Feedback resistance 100 kΩ
	H9306 Series	185 to 900	20	3.7 × 13	2.3	19 × 53 × 51	+/-15	Feedback resistance 1 MΩ
	H9307 Series	185 to 900	200	3.7 × 13	2.3	19 × 53 × 51	+/-15	Feedback resistance 100 kΩ
	H11462 Series	185 to 900	20 200	4 × 20	8.0	38 × 95 × 50	+/-5	Feedback resistance 1 MΩ (20 kHz) Feedback resistance 100 kΩ (200 kHz)
	H7827 Series	300 to 850	20 200	φ15	3.2	26 × 50 × 56	+/-15	Feedback resistance 1 MΩ (20 kHz) Feedback resistance 100 kΩ (200 kHz)
	H10492 Series	300 to 850	20 200 8000	φ22	5.1	φ35 × 120	+/-15	Feedback resistance 1 MΩ (20 kHz) Feedback resistance 100 kΩ (200 kHz, 8 MHz)
	H10493 Series	185 to 850	20 200 8000	φ25	8.2	φ35 × 192	+/-15	Feedback resistance 1 MΩ (20 kHz) Feedback resistance 100 kΩ (200 kHz, 8 MHz)

List of PMT modules compatible with PMT-200. Excerpt from Hamamatsu's PMT catalog

Note: Contact ASI if your preferred PMT isn't shown above. We will be happy to look into it.

Precautions when handling PMT

A Photo Multiplier tube(PMT) is a very sensitive instrument. Great care must be taken when handling and using it. Please read the PMT manufacture's notes on Safety precautions and Handling instructions before using the PMT. Below are excerpts from Hamamatsu's PMT catalog.

- Do Not expose the photocathode of the PMT module to excessive light such as sunlight. If exposed, noise will increase and photocathode sensitivity will deteriorate.
- Do not touch the light input window with bare hands, Dirt and grime on the window causes loss

of optical transmittance. If the window becomes soiled with dirt or grime, wipe it clean using alcohol.
- Helium will penetrate through silica(quartz) glass windows and increase noise. Avoid using or storing those PMT modules in an atmosphere where helium is present.
- Do not apply strong vibrations or impacts to PMT modules.
- Do not let moisture or dust penetrate inside.
- Do not hotplug the PMT into PMT-200 card.

Configuring PMT-200 to operate with 15V or 5V PMTs

Some PMT modules like H10722 operate with +/- 5Volts, and others like H9306 operate with +/- 15Volts. PMT-200 is compatible with both PMTs, however it needs to be configured with Jumper to provide the necessary voltage to the PMTs.

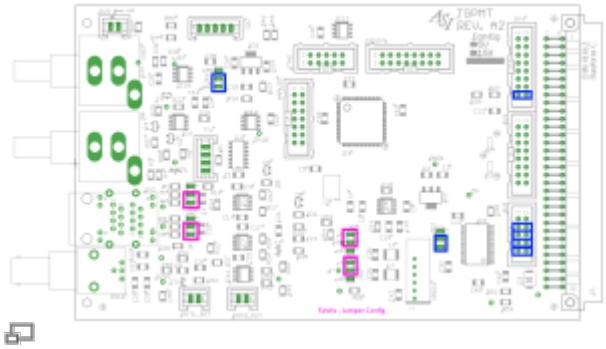
Note the configuration is card wide and applies to both channels. Two PMTs with different input voltages cannot be used with the PMT-200 card at the same time.

5V Configuration

This Configuration is for H10722 , H10723, H11462 and other PMT series.

The Blue Jumpers stay the same between configurations . The Pink Jumpers apply to +/- 5 Volt configuration. They are

- JP5 and JP6 with 2-3 pins jumpered
- JP1 and JP2 with 1-2 pins jumpered



Click to Enlarge

15V Configuration

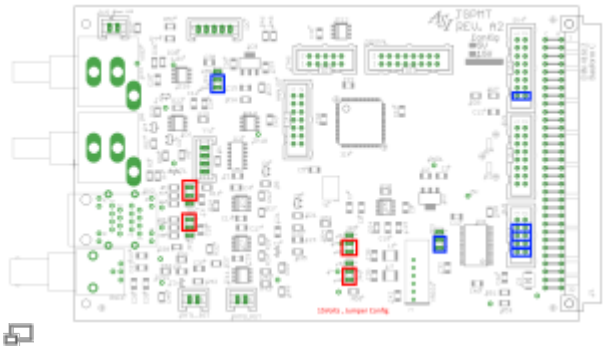
This configuration is for H5784, H7827 , H10492 , H10493 and others PMT series.

Not always true, if the PMT has a 7-pin HiRose connector its more likely a H5784 PMT

The Blue Jumpers stay the same between configurations . The Red Jumpers apply to +/- 15 Volt

configuration. They are

- JP5 and JP6 with 1-2 pins jumpered
- JP1 and JP2 with 2-3 pins jumpered



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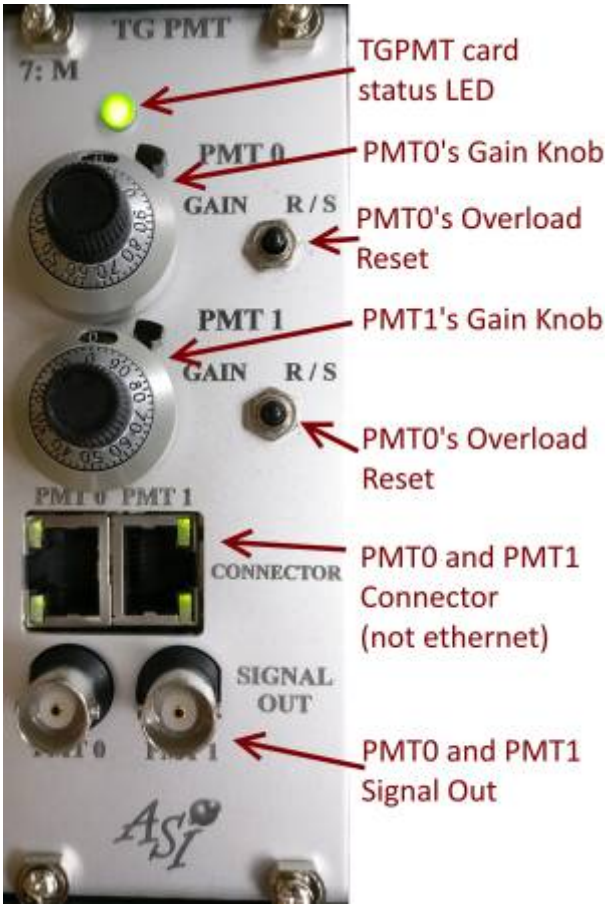
Operation

Panel Indicators, knobs and connector



Connections

RJ45 Ethernet cable in EIA-568B confg

PMT-200 connects to the PMT tubes thru a RJ45 Ethernet cable in EIA-568B configuration. This is common cable used in IT/networking. If your cable is malfunctioning or misplaced, in a pinch a common ethernet cable could be used instead. If in doubt contact ASI for a replacement.

TGPMT card shown connected to two PMTs

The connector on the PMT and PMT-200 are **NOT** ethernet connector. They are wired in a different manner. Connecting anything other than a PMT to the PMT-200, or vice-versa will cause damage and failure.

Connector Pinout

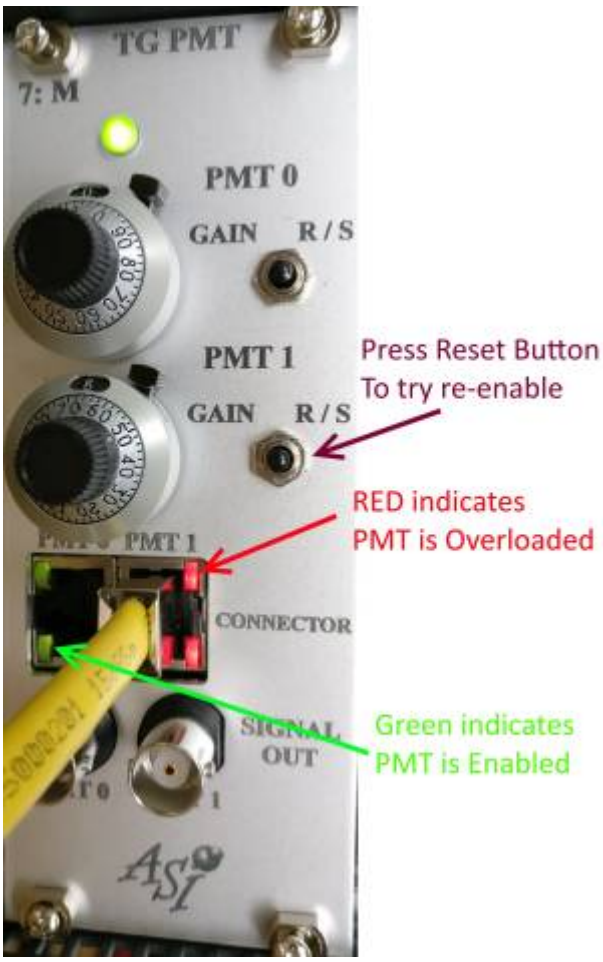
RJ45 Pin	Desp
1	V+ to PMT (+5V or +15V)
2	GROUND
3	V- to PMT (-5V or -15V)
4	Gain set voltage to PMT (upto 1V)
5	GROUND
6	VREF from PMT (+1.2V)
7	Signal from PMT
8	GROUND

Automatic overexposure shutdown(Overload)

The PMT-200 has an electronics mechanism where if the PMT output signal reaches 80% of the maximum output voltage, it shuts off the PMT by setting the Gain control voltage to 0 Volts. This mechanism helps protect the PMT from excessive light which deteriorates the photocathode's sensitivity.

PMT-200 indicates the overload state with the Faceplate LED going from Green to red, and the [addr#]LOCK X? Y? queries return a **0**.

Before the user attempts to recover from overload state. They should check if the PMT is exposed to excessive light, or turn down the PMT Gain so that the photocathode is not over stimulated.



Controlling the Card

The PMT-200 can be controlled manually or thru serial command.

Gain

PMT gain can be set manually by adjusting the Dial or with WRDAC command. There is no switch to pick your prefered control method , instead a OR function is used. So if you prefer serial command control to set gain , make sure Dial is set to 0. Vice-Versa , if you prefer dial to control the gain , set [addr#]WRDAC X=0 Y=0.

The dial or the command adjust a control voltage to the PMT. This changes the high voltage applied to the Photomultiplier tube that changes the ratio of anode output current to cathode output current ie Gain.

Note: Over stimulating the PMT with high gain over extended period of time will lead to decrease in PMT's sensitivity.

Overload state Reset

When PMT overloads , it can recovered manually by pressing the Overload Reset button or by issuing the LOCK X Y reset command.

PMT Signal

The PMTs signal can be read as a 0-4V analog signal or can be queried with a RDADC serial command which reads it from an ADC on board the PMT card.

The PMT signal out of the PMT-200 has a 50ohm output impedance. When driving a load with 50ohm input impedance , expect ×½ gain.

ADC Specification

- ADC resolution is 10bits, PMT signal is represented as a integer between 0 and 1024
- ADC can be read with RDADC command.
- Signal is sampled every 500usec or 2kHz
- Controller can average the ADC reading with a Simple Moving Average routine. Sample size can be 0(ie average is disabled) to 32 .Sample size of the average can be set with the ERROR command.
- User can Zero the ADC reading (subtract background) with the HERE serial command.

Serial Command

Serial commands which control function on PMT-200:

- Command:ERROR (E) 2016/03/15 19:46
- Command:HERE (H) 2016/03/15 19:56
- Command:LOCK (LK) 2016/02/23 20:02
- Command:PZINFO (PZI) 2016/03/17 19:33
- Command:RDADC (RA) 2016/03/16 15:27
- Command:RTIME (RT) 2016/02/22 19:30
- Command:WRDAC (WD) 2016/02/22 20:03

MicroManager Support

PMT-200 is supported by MicroManager 1.4.23 and above . It can be found as part of the ASITiger Device Plugin , and is classed as a SignalIO device.

Each PMT-200 card supports upto two PMTs, MicroManager automatically detects this and defines them as two separate SignalIO devices.

Below is a brief description of the device functions and properties,

Device Member Functions

`GetSignal(double& volts)` , Used to Query the ADC reading form the PMT. Same function as RDADC serial command. The readings are in ADC counts and not in voltage. Refer to ADC Spec for

more info.

`GetLimits(double& minVolts, double& maxVolts)` , Use to query the device for maximum and minimum values that can be returned.

`SetSignal(double volts)`, Not relevent for a PMT , hence not implemented.

`GetGateOpen(bool& open)`, when a PMT is exposed to excessive light , PMT-200 triggers an overload state which shuts the PMT off. More info on Overload is here. This function can be used to query the PMTs current state. Returns **True** when PMT is enabled or working. **False** when PMT is overloaded and disabled. Same function as LOCK serial command.

`SetGateOpen(bool open)` , this function can be used to try reset the PMTs overload state. **True** attempts to Reset the overload state. **False** performs no action. Same function as LOCK serial command. More info Overload state reset is here

Device Member Properties

`ADC Averaging Size`, View and set the PMT-200 ADC Simple Moving Average routine's sample size. Same function as ERROR serial command. Refer to ADC spec for more info. This is a card wise settings , so changing this property for one PMT will also change it for another PMT that shares the same card.

`PMT Gain`, View and set the PMT's Gain. Serves the same function as WRADC serial command. More info on Gain is here.

`PMT Overloaded`, a read only property with a **Yes** or **No** state , to indicate if the PMT is Overloaded or not. More info on Overload is here . Same function as LOCK serial command.

`PMT Signal`, a read only property that shows the ADC reading of the PMT. Same function as RDADC serial command.

`PMT Overload Reset`, a write only property that lets the user try reset the PMT's overload state. Possible states are **OFF** (default) , **ON** which immediately applies the Reset pulse, and then changes to **RESET applied** state. More info on Overload state reset is here

`SaveCardSettings`, a write only property , which lets the user save the current settings into the PMT-200 cards's memory , or restore everything to factory defaults.

tiger, tgpmt, manual, micromanager