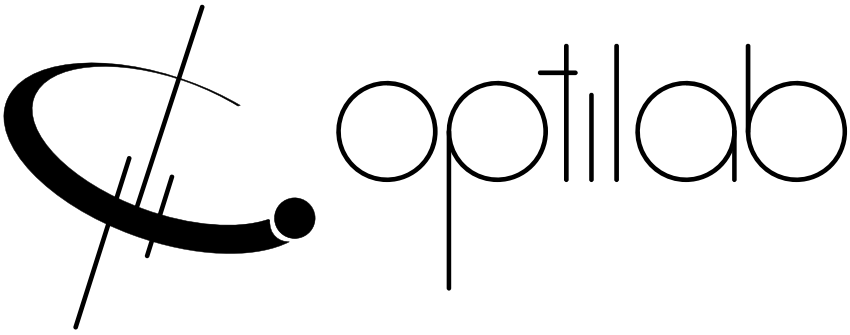

PTC-5000-MC Module User's Manual

Precision Temperature Controller Module

Caution: The user must read this manual before operating the PTC-5000-MC unit. Operations other than those described in this manual may result in personal injury and/or damage to the unit.

Note that any attempt to open or fix the equipment without prior approval by Optilab, LLC. voids the warranty.

Ver. 1.0
November 28th, 2022

Revision History

VERSION	DATE	SUMMARY
1.0	11/28/2022	Manual introduced.

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Information herein is preliminary and subject to change without any notices.

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1. General Information

1.1 Introduction

This manual contains information on the installation and operation of the PTC-5000-MC Precision Temperature Controller.

1.2 Product Overview

The Optilab PTC-5000-MC module is an all-in-one package, compact precise temperature controller for Optilab quantum devices (SPDC/SFG/SHG). This small size, low-cost module operates under a single +12V power supply. It comes with an LCD monitor, which shows the setting temperature and the device temperature in 0.01°C resolution. The module has a USB port and an RS-485 port for external PC control. The module is equipped with a 7-pin butterfly mounting socket and a metallic mounting seat, thus making it compatible with Optilab designed quantum devices., i.e., SPDC/SFG/SHG provided by Optilab. The PTC-5000-MC supports temperature setting range of 20.00°C~70.00°C with a setting resolution of 0.01°C and a temperature control accuracy of 0.05°C.

1.3 Features

- High Precision Temperature Control
- USB port and RS-485 port for External PC Control
- Operates Optilab SPDC devices and SFG/SHG devices
- 20.00°C~70.00°C temperature control range
- Temperature setting resolution of 0.01°C
- Temperature control accuracy of 0.05°C
- On Board LCD Display

1.4 User Safety

1. The equipment case is not protected against EMS damage. The end user should use proper ESD equipment and handling to prevent damage to the module.

2. The user should avoid using any solvent or vaporizing chemical to clean the equipment panel or case. It may result in damage to the surface and/or internal circuits.

2. Operation

2.1 Introduction

This chapter describes how to operate the PTC-5000-MC unit and introduces the location and function of the controls and connectors.

2.2 Initial Inspection

Your PTC-5000-MC module was carefully inspected before it is shipped to customer. It should be in proper working order upon receipt. You should, however, inspect the unit for any damage that may have occurred in transit. If the shipping container or the packing material is damaged, keep it until the contents of the shipment have been checked to be free of mechanical and electrical damages. Notify Optilab, LLC promptly if any notable damage is found.

Each PTC-5000-MC shipment should include the following:

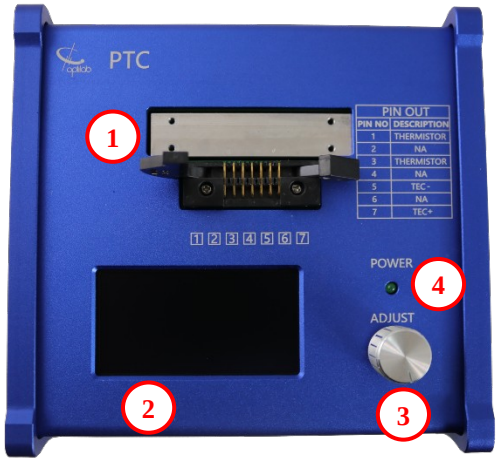
- PTC-5000-MC Controller Module Unit
- User Manual
- AC/DC Power Supply
- 4pcs M2 Mounting Screws
- USB 2.0 Cable
- RS485 Cable
- Test Data Report

2.3 Safety Precautions

1. Use caution to not short to any portion of the substrate.
2. Turn off the power of the module before exchanging the driven devices.
3. Please avoid the use and storage in the following locations:
   - High temperature, high humidity, and dusty areas
   - Direct sunlight
   - Locations subject to severe vibration
4. Operating temperature and humidity conditions: 15°C ~ 35°C (humidity 80% or less)
5. Storage temperature and humidity conditions: -10°C ~ 55°C (humidity 60% or less)
6. Always use a power supply of proper voltage and current rating to avoid damage to the unit.
7. Set the same ground potential with other equipment.
8. When in use, always apply countermeasure against static electricity.

2.4 Panel diagram and Control

PTC-5000-MC Top Panel



Feature	Function
①Mounting Socket and Seat	7 pin quantum device mounting socket, the pin-out number is labeled with the description shown on the right side. The driven device main body may be fixed on the metallic mounting seat using four M2 screws.
② LCD Display	Displays the various parameters, which include reading, and setting of the temperature as well as the module information.
③ Rotary Encoder w/ Push-button Knob	The knob for changing the LCD display and setting the temperature.
④LED for Module Power	Display for power state of the module. The LED lights Blue when the module is powered on.

PTC-5000-MC Front Panel

Feature	Function
** Expression is faulty ** AC Adapter Power Supply Socket	This receptacle accepts the DC power input (typical +12V/1A) from the AC power adapter.
** Expression is faulty **	The Switch is used to Turn ON/OFF the module.

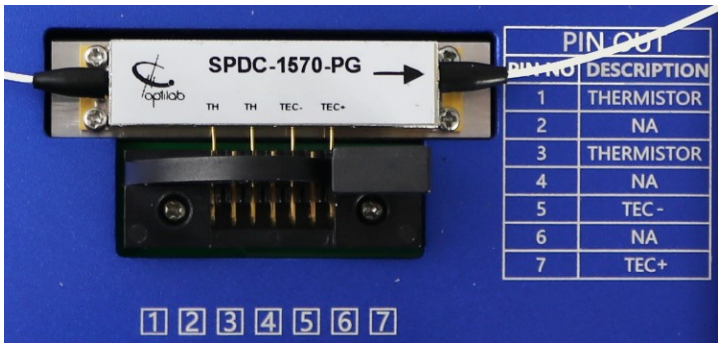
Device Power Switch	
** Expression is faulty ** **USB 2.0 Port**	This port provides USB connection for control/monitoring from a PC.
** Expression is faulty ** **Remote Connection Switch**	The remote connection switch enables the customer to select either the RS-485 connector or USB connector for remote control/monitoring.
** Expression is faulty ** **RS-485 Port**	This port provides RS-485 connection for control/monitoring from a PC. The pin-out is labeled or refer to section 2.6 for pin-out information.

2.5 Operation Instructions

2.5.1 Preparation

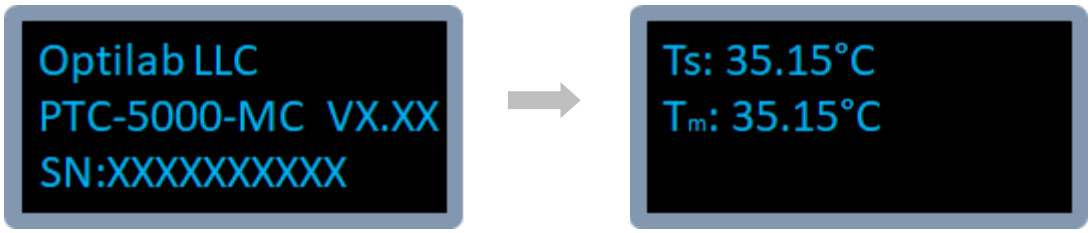
➢ Check the specifications and pin-out of the driven device before mounting. Typically, you can find the pin-out information on the driven devices that are fabricated by Optilab.

The figure below shows a typical mounting of Optilab SPDC device on a PTC-5000-MC



➢ Connect the DC output side of the included AC adapter to the power socket (⑤), connect the AC side of the included AC adapter to a 120 or 220 VAC power source. Power is supplied to the unit when the Power Switch (⑥) is pressed down, the LCD Display (②) turns on, the Module power LED (④) lights up.

Once the power switch is pressed down, The LCD turns on and the boot screen appears for about 1 second. It displays the module information. Then a standard operation panel is displayed.



PTC-5000-MC Boot Screen *PTC-5000-MC Standard Operation panel*

The parameters in the standard operation panel are:

T_s: 35.15 °C: Temperature setting, in the resolution of 0.01°C. The temperature setting range is 20.00°C ~70.00°C.

T_m: 35.15 °C: Temperature reading, shows the real time temperature of the driven device.

2.5.2 Operation

- Once the operation panel shows up, since the module has memory function, the temperature setting stays at the temperature value set in the last usage.
  The default setting of the temperature is 25.00°C when it leaves Optilab.

- Use the Knob (③) to set the temperature.
  - Press the Knob to select the digit (a line will appear under the value of the digit that is selected).
  - Rotate the Knob to change the number of the underlined digit.
  - Press the Knob to move to the next digit or exit the edit.

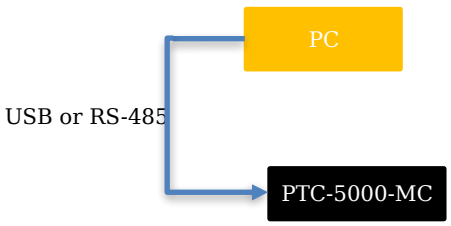
2.6 PC Connection Mode (OPTIONAL)

As an optional feature, PTC-5000-MC can be remotely controlled by a PC through the USB or RS485 port.

2.6.1 Set the remote connection switch (⑧) to either USB or RS485 connector type. Using an USB cable or RS485 cable to connect the module to a PC through the USB 2.0 port (⑦) or RS-485 port (⑨).

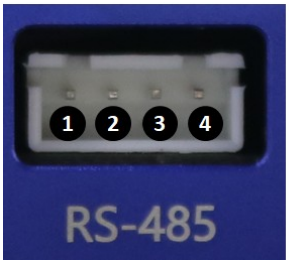
2.6.2 By using the Device Manager (or other similar PC device tools), the PTC-5000-MC should be recognized as COM Port device. If the PTC-5000-MC does not appear as a COM Port device, you may need to install the necessary driver first.

2.6.3 Once the device is recognized by the PC interface, you can use the following connection diagram and settings to initialize communication to the module:



Serial Port Settings
Baud rate: 19200 bps
Data bits: 8
Stop bits: 1
Parity: none
Flow control: None

2.6.4 The RS-485 connector pin-out is shown below:



1. NC
2. A
3. B
4. GND

2.6.5 When the electrical connections have been made, and the software settings for serial port transmission are set correctly, you are now able to send commands to the module. Please see the list on the following section for the available commands and actions.

COMMAND	DESCRIPTION	EXAMPLE (DEVICE ADDRESS = 07)	RESPONSE
⇩ NO ADDRESS REQUIRED ⇩			
SA	Set the address of the Module.	**SA 07{CR,LF}** *Space before data required* *2 digits required* *Range: 00 ~ 31* ***Note: The address of the PTC-5000-MC was set to 01 before it is shipped to customer***	ADD: 07
⇩ ADDRESS REQUIRED (xx = device address) ⇩			
RMxx?	Quiry if remote mode is enabled/disabled.	**RM07?**	RM07: ON *or* RM07: OFF
RMxx 0	Disables remote mode.	**RM07 0{CR,LF}** *Space before data required* *1 digit required*	RM07: OFF
RMxx 1	Enables remote mode.	**RM07 1{CR,LF}** *Space before data required* *1 digit required*	RM07: ON
⇩ REMOTE MODE MUST BE ENABLED ⇩ **(If remote mode is not enabled when these commands are sent with the proper address the device will return: "Remote Mode is OFF")**			
TSxx?	Quires the TEC set temperature in °C.	**TS07?{CR,LF}**	TS07: 25.05 C
TSxx nn.nn	Sets the TEC temperature in °C.	**TS07 25.10{CR,LF}** *Space before data required* *3 digits and decimal required* *Range: 20.00 ~ 70.00 C*	TS07: 25.10C *or* Out of Range(TS07:20.00 ~ 70.00 C)

TMxx?	Quires the TEC monitor temperature in °C.	**TM07?{CR,LF}**	TM07: 25.20 C
DTxx?	Quires all the current settings and monitors of the ULDC module.	**DT07?{CR,LF}**	07,25.01,25.02 *07: Device Address* *25.01: Temp Setting in °C* *25.02: Monitor Temp in °C*
FWxx?	Quires the version of the firmware	**FW07?{CR,LF}**	FW07: V1.00

3. Specifications

Parameter		Specifications
Power Supply	Voltage	+12V ±0.25V
	Power Consumption	10W max
Environment	Temperature	15~35 °C
	Humidity	humidity 60% or less
Mounting	Quantum Device Mounting	Butterfly 7pin standard socket Metallic mounting seat
TEC	TEC Alarm	TEC Monitor<10°C or TEC Monitor>85°C
	Driving Current	0~±1.0A
	Driving Voltage	0~±3.0V
Temperature	Operating Temperature Range	+20.00°C~+70.00°C
	Stability	±0.02°C (25°C)
	Setting Resolution	0.01°C
	Monitoring Range	+20.00°C~+70.00°C
	Display/Measurement Resolution	0.01°C
	Thermistor Standard Resistance	9k~11kΩ
	Temperature Control Accuracy	0.05°C
Setting Method	Push Rotary Encoder Button/ Remote Setting	Monitor/Temperature Setting
	Setting Items	Temperature
	Value Setting	Rotate Rotary Encoder Button/ Remote Commands

4. Troubleshooting

- **Strange display messages**

  The driven device might not be installed correctly and/or the wrong pin type is selected.

  - ✓ Check the pin-out of the device.
  - ✓ Check if the pin-out mounting is correct.

- **Cannot switch on the TEC**

  - ✓ Check the pin-out of the device.
  - ✓ Check if the pin-out mounting is correct.

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5. Service and Support

5.1 Warranty

Optilab, LLC guarantees its PTC-5000-MC unit to be free of defects for 1 year from the date of shipment. The guarantee does not cover any damages resulting from the misuse or improper handling of the equipment, or any incidental or consequential loss. Note that the warranty will be void upon any attempt to fix the equipment by the user without prior approval of Optilab, LLC.

Note that the warranty expressed does not cover any potential damage or degradation of the laser diodes, or any equipment that is on the receiving end of the laser diode output. Optilab will only cover any damages or defects to the PTC-5000-MC itself and is not responsible for any collateral damage for misuse of the equipment or the intended laser diodes for operation.

5.2 Service and Support

Your PTC-5000-MC unit has been designed to provide years of trouble-free operation. No internal maintenance is required provided that the equipment is properly handled, operated, and kept away from contamination. For any questions regarding the operation and performance of the unit, please contact Optilab, LLC at:

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