

# GM8015 Polarization Controller

## User Manual



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## **Safety Considerations**

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. UC Instruments Corp. assumes no liability for the customer's failure to comply with these requirements.

## General

This is a Safety Class 1 instrument (provided with a protective earth terminal) and has been manufactured and tested according to international safety standards.

Before operation, you should review the instrument and manual for safety markings and instructions. You must follow these to ensure safe operation and to maintain the instrument in safe condition.

**WARNING:** To avoid hazardous electrical shock, do not perform electrical tests when there are signs of shipping damage to any portion of the outer enclosure (covers, panels, and so on).

## Operating Environment

**WARNING:** The GM8015 polarization controller is not designed for outdoor use. To prevent potential fire or shock hazard, do not expose the instrument to rain or other excessive moisture.

**WARNING:** To avoid the possibility of injury or death, you must observe the following precautions before switching on the instrument.

- Insert the power cable plug only into a socket outlet provided with a protective earth contact. Do not negate this protective action by the using an extension cord without a protective conductor.
- Do not interrupt the protective earth connection intentionally.
- Do not remove protective covers. Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made only by qualified service personnel.
- Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.
- Defective, damaged, or malfunctioning laser sources must be returned to UC Instruments Corp. Maintenance Service Center.
- Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

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## Summarize

The UC INSTRUMENTS GM8015 Polarization Controller is a program motorized control polarization scrambler. Its polarization controlled capability enhances measurement speed, accuracy, and overall productivity. The continuous length of fiber enables high power and ultra-low insertion loss. This design offers a wide range of Auto Scan rates and high incremental angular resolution. Four fiber loop design has proven to provide excellent control with ultra-low power variations (PDL). This reliable design allows for a wide range of applications from component testing to PMD related activities.



Figure 1 GM8015 Polarization Controller

## Features

Single-fiber design

Ultra-low insertion loss, PDL, and back-reflection

Multi-rate polarization scrambling

Auto scan operation with a wide dynamic range of rotational speed

RS-232 communication

## Specifications

<i>Model #</i>	<i>GM8015</i>
<i>Principle</i>	<i>4 Motorized Fiber Loop</i>
<i>Wavelength Range</i>	<i>1200 ~ 1700 nm</i>
<i>Insertion Loss</i>	<i>&lt; 1.0 dB</i>
<i>Extinction Loss</i>	<i>40 dB</i>
<i>PDL</i>	<i>≤ 0.01 dB</i>
<i>Optical Connector</i>	<i>FC/PC</i>
<i>Operating Temperature</i>	<i>0 ~ 40 °C</i>
<i>Interface</i>	<i>RS232</i>
<i>Power</i>	<i>100 ~ 240 V AC, 50 - 60 Hz</i>
<i>Operation Temperature</i>	<i>0 ~ +40 °C</i>
<i>Storage Temperature</i>	<i>-30 ~ +80 °C</i>
<i>Dimensions</i>	<i>350 mm X 200 mm X 120 mm</i>
<i>Weight</i>	<i>5.3 kg</i>

## Description of the User Interface

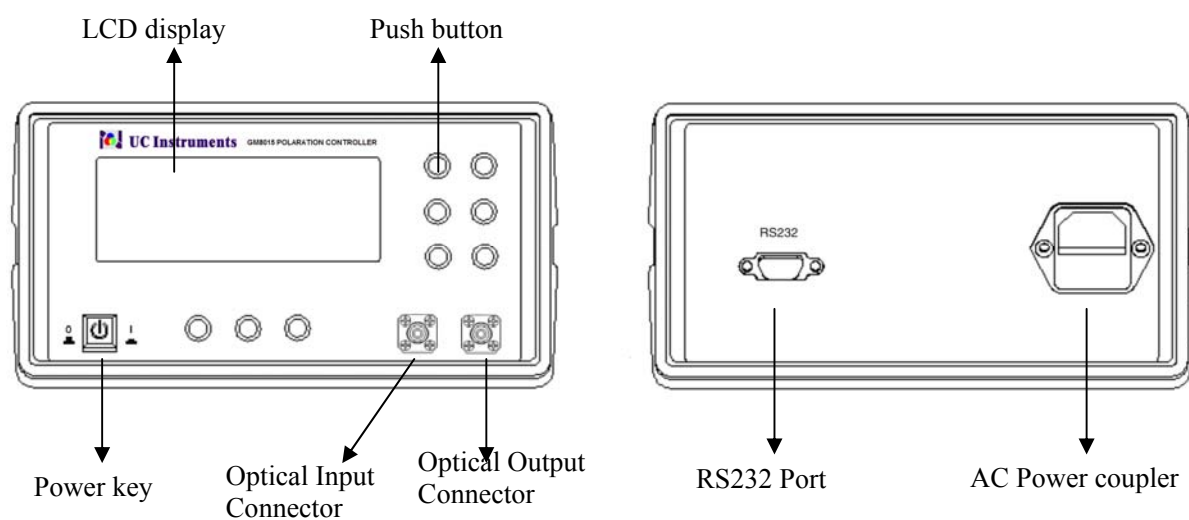


Figure 2 - User interface of the GM8015



## Push Buttons

All the control to GM8015 is via the push buttons.

## Optical input and output connectors

The GM8015 has two FC/PC connectors for optical input and output.



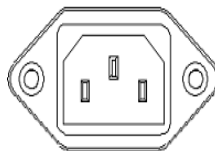
# AC Line Power Supply Requirements

## Line Power Requirements

The GM8015 polarization controller complies with over voltage category II and can operate from the single-phase AC power source that supplies between 100V and 240V at a frequency in the range 50 to 60 Hz.

The AC power requirements are summarized on the rear panel of the instrument.

AC INPUT:  
100-240V~, 50-60Hz,



AC Power Requirement Mark - GM8015

The power key on the front panel of the GM8015 may turn on or turn off the power.



GM8015 Power Key

## Line Power Cable

In accordance with international safety standards, the instrument has a three-wire power cable.

# Communication Interface

## RS232 Serial Interface Port

There is a RS232 serial interface port for communication on the rear panel of the GM8015.

The GM8015 serial interface has fixed parameters. The PC serial interface should be configured to match the instrument's fixed parameters.

### Fixed Parameters

These are:

Baud rate 115200

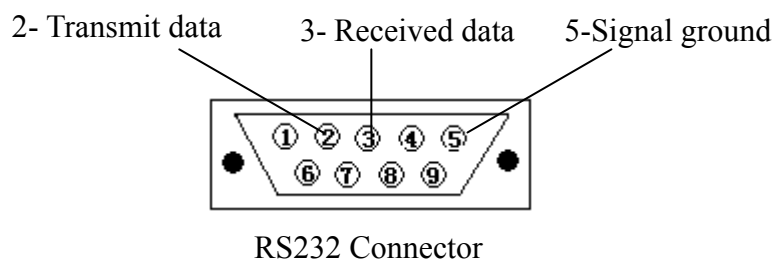
Data Bits 8

Parity None

Stop Bits 1

## RS232 Connector

The following figure shows the connector and pin assignments.



## Cable

The connectors pin assignments on the cable for RS232 Communication.

DB9 CONNECTOR		DB9 CONNECTOR	
PIN	NOTES	PIN	NOTES
2	<i>Received data</i>	2	<i>Transmit data</i>
3	<i>Transmit data</i>	3	<i>Received data</i>
5	<i>Signal ground</i>	5	<i>Signal ground</i>

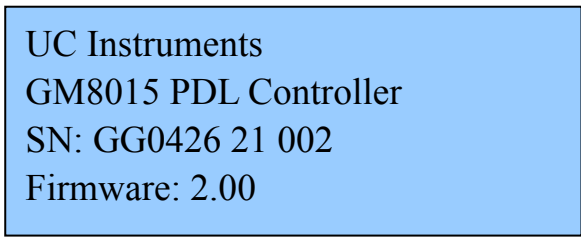
**NOTE** For serial communication use the null modem cable provided with your

instrument.

## How to Modify the Display?

### Initialization the Display Screen

When the GM8015 is powered up, the screen will show initial information, such as, the serial number, hardware revision, firmware revision of the GM8015.



UC Instruments  
GM8015 PDL Controller  
SN: GG0426 21 002  
Firmware: 2.00

Figure 3 The detecting information for GM8015

Then the system resets the position of fiber loop to zero, during reset, the LCD shows “Restoration...”.

### The Display Screen

After start-up, this screen will show immediately the control mode of GM8015 and the positions of four paddles, from left to right, from one to four.

The default display shows the Automatic mode for the instrument. Pressing [MAN/AUTO] button will transfer the control mode between Automatic mode and Manual mode.

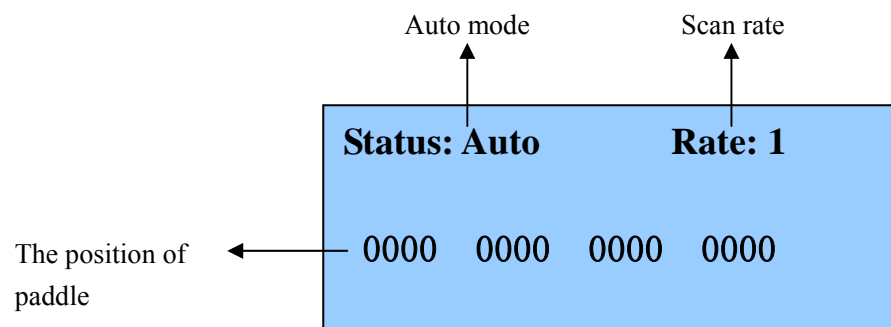


Figure 4 Display screen for Automatic mode

In the Manual mode, when you select a fiber loop by pressing the [Select] button, the position value for the selected paddle will be focused, and the font is increased.

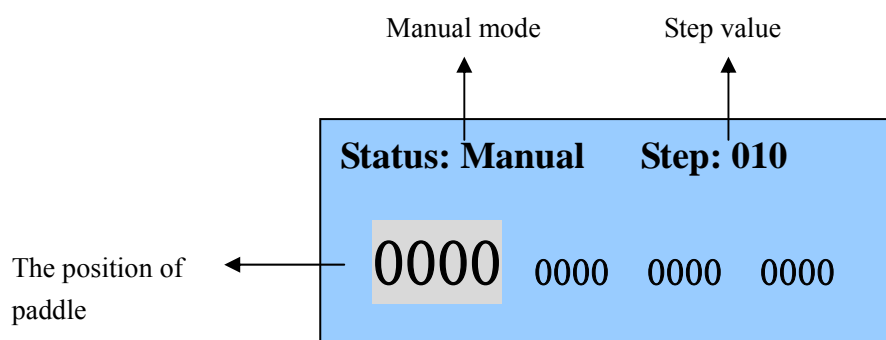
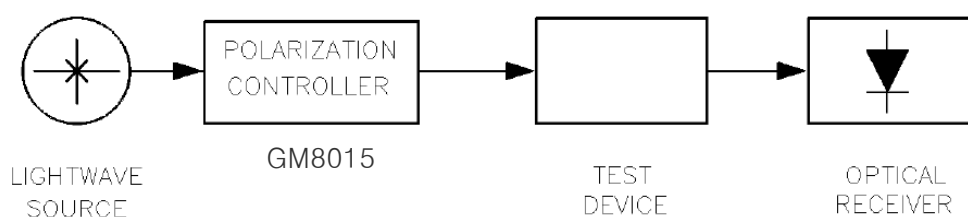


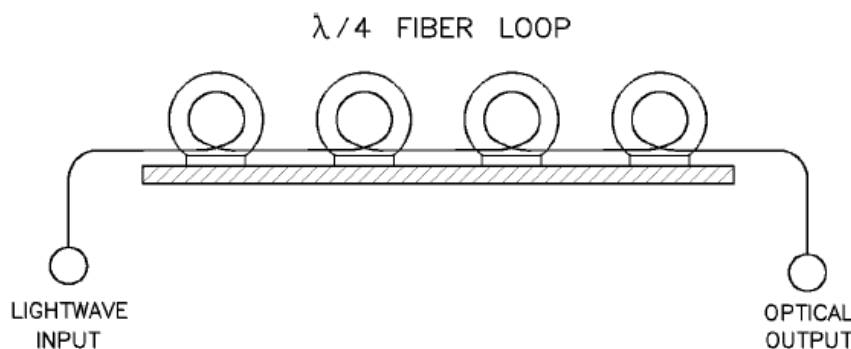
Figure 5 Display screen for Manual mode

## How to Use the GM8015?

The GM8015 polarization controller provides Manual and Automatic polarization state adjustments over a wide wavelength range from 1200 nm to 1700 nm. All possible states of polarization are achieved with extremely small optical insertion-loss variations ( $\leq 0.01\text{dB}$ ). This feature can achieve measurement accuracy maximum for power sensitive measurements such as polarization-dependent loss, gain and optical/electrical responsivity because the measurement uncertainty contributed by the polarization controller is minimized. A typical application configuration using the polarization controller is shown in the following figure.



## Theory of Operation



The transmitted signal enters the polarization controller and passes through the internal four-fiber-loop assembly. The dimensions of each loop are optimized to approximate a quarter-wave retarder response over the polarization controller's specified wavelength range. Complete and continuous polarization adjustability is achieved by independently adjusting each loop over an angular range of  $180^\circ$ . This range is divided into 1600 equal steps (0000 - 1600), providing an adjustment resolution of  $0.1125^\circ$ . Adjustments can be made manually, using the front-panel knobs, or automatically, using remote RS232 commands.

## Using the GM8015 Polarization Controller

Precise manual adjustment of the four paddles in the polarization controller can be made using the front-panel knobs while watching the display.

Each paddle can rotate  $180^\circ$  in 1600 discrete steps of  $0.1125^\circ$  each. The LCD displays the relative step count, where zero corresponds to  $0^\circ$  and 1600 corresponds to  $180^\circ$ .

The instrument presets four available polarization scan rates to match the speed of the application. In Auto mode, the instrument performs automatic scan all the polarization states with the selected scan rate until pressing the [CANCEL] button.

Remote interrogation of all instrument settings and remote control of all instrument functions are provided via RS232 Port.

## How to transfer control mode?

Press the [MAN/AUTO] button, if the LCD displays “Status: Manual” on the top, the module is in Manual mode. You will control the paddles from the buttons on the front panel of the module.

Press the [MAN/AUTO] button once again, the LCD displays “Status: Auto”, the module is in Automatic mode.

## How to adjust the position of paddle?

Precisely adjust the position of paddle via the [+] and [-] buttons in Manual mode. Each of the four paddles can now be controlled independently. Paddle positions are displayed on the LCD. “0000” corresponds to  $0^\circ$ , and 1600 corresponds to  $180^\circ$ .

- Press the [MAN/AUTO] to enter Manual mode.
- Press the [Select] button continuously to select the desired paddle. When a paddle is selected, the font of position value increases and the background is focused.
- Pressing [Rate] transfers the step value between 1,10 and 100.
- Press the [+] and [-] buttons to adjust the position value of the paddle in a step of rate value.

## How to continuously sweep all polarization states?

### Set the scan rate

The module presets eight available polarization scan rates which are indicated with 1, 2, 3, 4, 5, 6, 7, 8.

Pressing [Rate] button transfers the scan rate.

## **Perform the Auto scan operation**

Press [Enter] button, the module begins to sweep all the polarization states with the selected scan rate.

The sweep can pause if you press the [Cancel] button, and pressing [Enter] button again will continue.

## **How to reset the positions of paddles to zero?**

Press [RECALL/SAVE] button to reset the positions of the four paddles to zero.

If the instrument is performing the Auto scan, before reset zero, you must make the Auto scan operation pause by pressing the [Cancel] button.

## **How to unlock the remote control status?**

Press [RECALL/SAVE] button to reset the positions of the four paddles to zero.

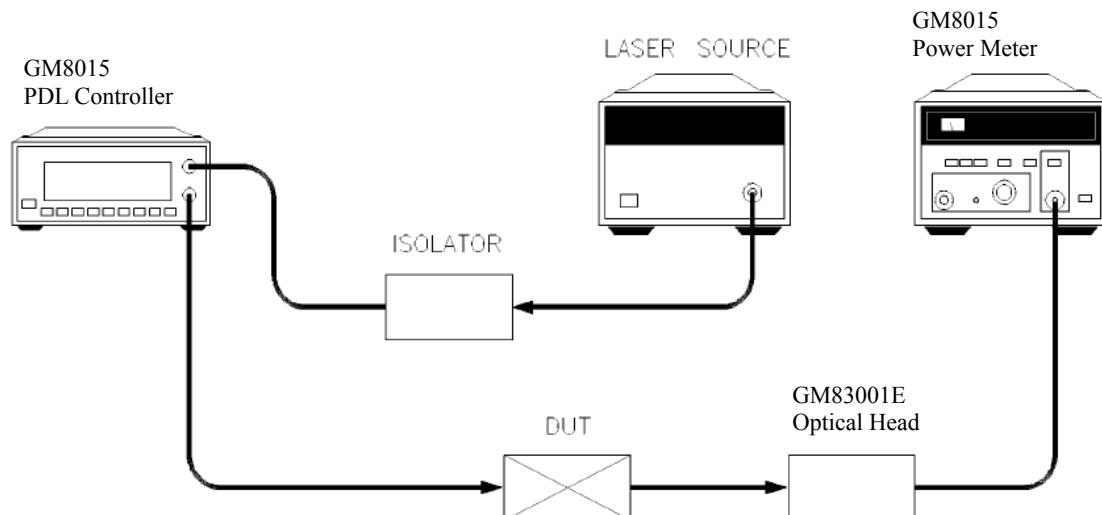
If the instrument is performing the Auto scan, before reset zero, you must make the Auto scan operation pause by pressing the [Cancel] button.

When the polarization controller is under remote RS232 control, all the manual buttons are locked except [Local]. Press the [Local] button to exit from the remote control.

## Polarization-dependent loss measurement

Polarization-dependent loss (PDL) measurement systems can be created by combining the UC Instruments GM8015 Polarization Controller, GM8012 Power Meter, GM83001E Optical Head.

The following figure shows how to configure the above described instruments for performing automatic single-wavelength PDL measurements.





## Claims and Repackaging

If physical damage is evident or if the instrument does not meet specification when received, notify the carrier and the UC Instruments Corp. Maintenance Service Center. The Maintenance Service Center will arrange for repair or replacement of the unit without waiting for settlement of the claim against the carrier.

## Return Shipments to UC Instruments Corporation

If the instrument is to be shipped to a UC Instruments Corp. Maintenance Service Center, attach a tag showing owner, return address, model number and full serial number and the type of service required.

The original shipping carton and packing material may be reusable, but the UC Instruments Corp. Maintenance Service Center will provide information and recommendation on materials to be used if the original packing is no longer available or reusable.

General instructions for repackaging are as follows:

- Wrap instrument in heavy paper or plastic.
- Use strong shipping container.
- Use enough shock absorbing material (3 to 4 inch layer) around all sides of the instrument to provide a firm cushion and prevent movement inside container.  
Protect control panel with cardboard.
- Seal shipping container securely.
- Mark shipping container **FRAGILE** to encourage careful handling.
- In any correspondence, refer to instrument by model number and serial number.

## Maintenance

- Avoid sharp vibration when operation.
- Keep the head face of sensor clean.
- Cover the channel adaptor on the front panel with the dust cap.
- Don't forcibly push or drag the connector out of the adaptor of GM8015.
- Be careful for crash and fall-off.

## **UC INSTRUMENTS CORP. CONTACT INFORMATION**

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