



Optical Multiplexer

MPM-2000

Installation and Operation Manual



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Important Safety Notices

1. Read all safety notices and operating instructions before operating this unit.
2. Inspect the item for transport damage before using the 24VDC power supply for the first time.
3. Adhere to all warning stickers on the unit and all warnings contained in this manual.

Warranty

Our 3-Year Warranty covers Ocean Optics miniature fiber-optic spectrometers, spectral sensors, light sources and sampling accessories – regardless of the application – from manufacturing defects. It also covers fibers and probes for a full 12 months: <http://oceanoptics.com/services/exclusive-3-year-warranty/>.

This comprehensive warranty ensures you of the highest level of craftsmanship and reliability for years to come. No other manufacturer offers such a solid guarantee of quality and reliability.

The Ocean Optics 3-Year Warranty applies to Ocean Optics equipment (excluding OEM configurations) purchased on or after July 1, 2010. The warranty covers parts and labor needed to repair manufacturing defects that occur during the warranty period. We also will cover the costs of shipping warranty-related repairs from our customers to Ocean Optics and from us to our customers.

Warranty Handling

► Procedure

Follow the procedure below to process a warranty claim:

1. Determine the problem or fault with your local distributor.
2. If a problem is evident, obtain an RMA number from your local distributor.
3. Send the equipment to the local distributor for repair. If the item is under warranty, shipping will be free-of-charge both ways.
4. Contact your distributor for repair and delivery time. If the item is out of warranty, your distributor will provide a repair cost to you. In this situation, the distributor will not proceed with the repair until you order it.

Your system will be shipped back to you free of charge with insurance (if under warranty).

ISO Certification

Ocean Optics, the industry leader in miniature photonics, has been certified for ISO 9001:2008 certification applicable to the design and manufacture of electro-optical equipment since 2009.

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About This Manual

Document Purpose and Intended Audience

This document provides you with an installation section to get your system up and running.

What's New in this Document

This version of the *Optical Multiplexer MPM-2000 Installation and Operation Manual* updates the product photo and manufacturer information..

Document Summary

| Chapter | Description |
|--|--|
| Chapter 1: Setup | Contains a list of package contents and unpacking instructions. |
| Chapter 2: MPM-2000 Specifications | Contains operating environment specifications, as well as other physical details of the product. |
| Chapter 3: Operating Instructions | Provides instructions for operating Windows-based software that comes with the MPM-2000. |
| Appendix A: RS232 ASCII Commands | Provides the RS232 ASCII command information for the multiplexer. |

Product-Related Documentation

You can access documentation for Ocean Optics products by visiting our website at <http://www.oceanoptics.com>. Select *Support* → *Technical Documents*, then choose the appropriate document form the available drop-down lists.

Ocean Optics offers a Glossary of spectroscopy terms to help you further understand your state-of-the-art products and how they function, located at: <http://oceanoptics.com/glossary/>.

Upgrades

Occasionally, you may find that you need Ocean Optics to make a change or an upgrade to your system. To facilitate these changes, you must first contact Customer Support and obtain a Return Merchandise Authorization (RMA) number. Please contact an Ocean Optics Application Scientist for specific instructions when returning a product.

Chapter 1

Setup

Overview

The MPM-2000 Fiber Optic Multiplexer is a compact instrument that can optically couple one input channel to 16 different output channels. The MPM-2000 consists of a precisely controlled DC-motor with encoder and end switch on a rotator block. The optical path couples via UV collimating lenses.

The Multiplexer features a CNC controller working in positioning mode, which eliminates step loss. The MPM-2000 is software controlled and interfaces to a PC through the RS-232 protocol. It automatically saves all calibrated positions in the memory of the controlling unit, and easy-to-use software facilitates calibration. The software enables full control of the switching order and delay time.

The MPM-2000 is ideal for applications in process industry, where you need to measure multiple locations with multiple probes but with a single spectrometer channel and/or light source. The MPM-2000 operates as a stand-alone unit and includes a sample program to guide you in setting up your application.

The following sections provide instructions on unpacking and setting up your MPM-2000 Optical Multiplexer.



Unpacking the MPM-2000

► Procedure

1. Unpack the Optical Multiplexer carefully. Dropping this instrument can cause permanent damage.
2. Inspect the outside of the instrument and make sure that there is no damage. Do not use the instrument if damage is present. Contact your dealer for repair or replacement information, if necessary.
3. Use this instrument in a clean laboratory environment.
4. Submit the Registration Card to for warranty and support purposes.

Contents

Your MPM-2000 Optical Multiplexer package should contain the following:

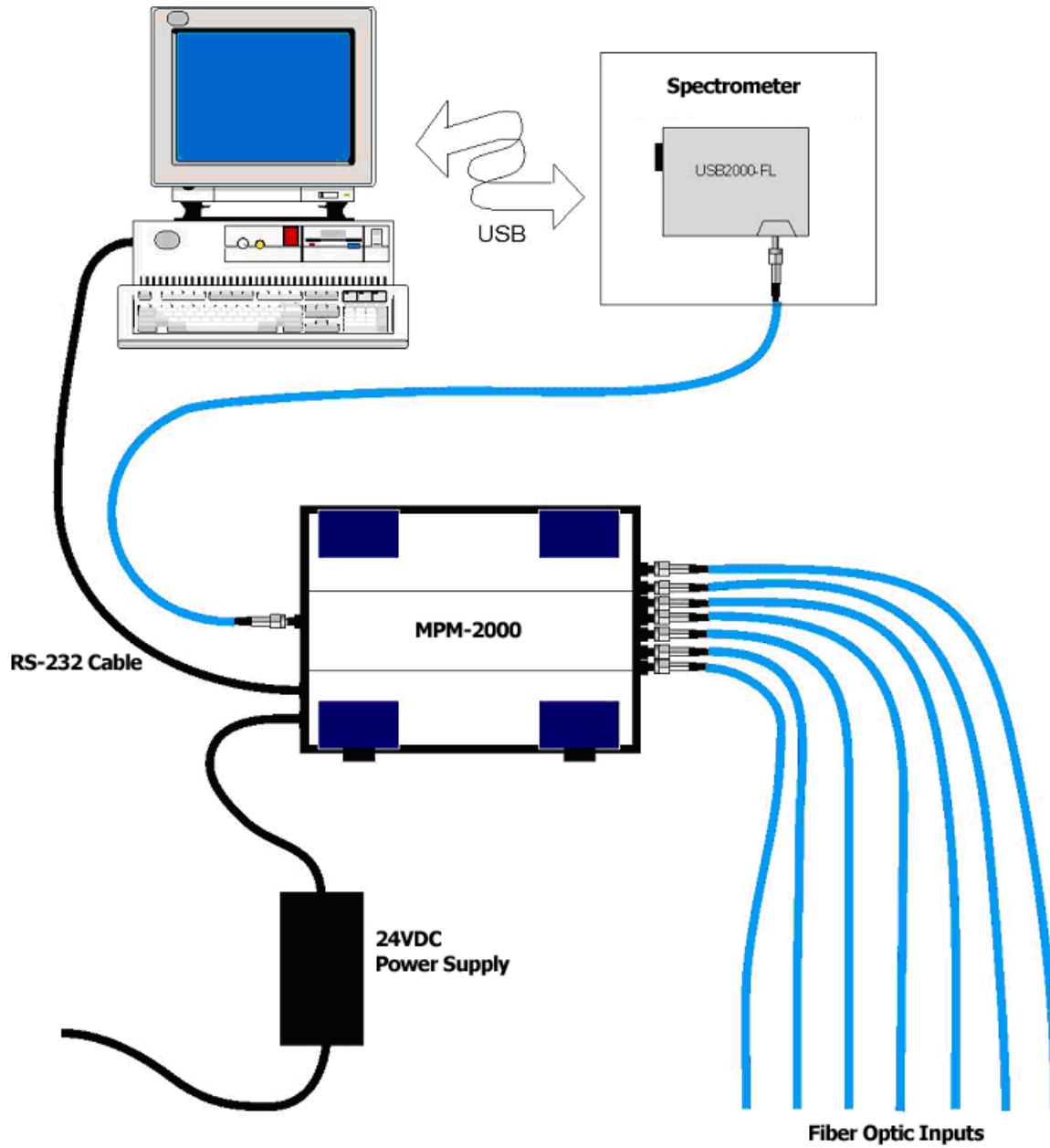
- MPM-2000 Main System
- MPM-2000 24VDC Power Supply

Caution

Before using the power supply of the MPM-2000 for the first time, inspect the item for transport damage. Be sure to adhere to all warnings on the unit and in this operational manual.

- Software CD (contains MPM-2000 software and Calibration software)
- PC-MPM-2000 Serial Cable

Typical System Configuration



Chapter 2

MPM-2000 Specifications

This section provides information on the operating environment and physical controls of the MPM-2000.

Operating Environment

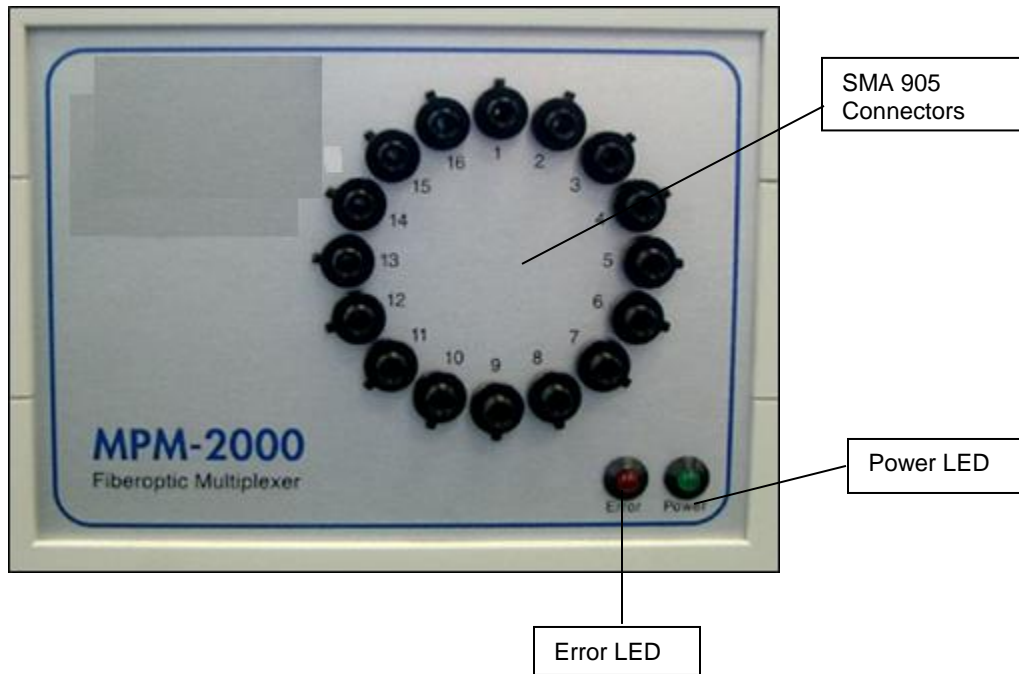
The following table provides information on optimizing the operating environment of your MPM-2000.

| Operating Environment | The MPM-2000 Unit . . . |
|------------------------------|--|
| Moisture | Is designed for operation in dry rooms only. |
| Ventilation | Should be situated so that its location or position does not interfere with proper ventilation. |
| Heat | Should be situated away from any device that emits excessive heat. |
| Object and Liquid Entry | Should be positioned so that objects do not fall on top of the unit. Additionally, ensure that no liquids are spilled into the enclosure through openings. |
| Power Sources | The unit should be connected to a power supply only of the type described in the operating instructions or as marked on the unit. |

MPM-2000 Components

The following sections describe the components located on the front and rear of the MPM-2000 unit.

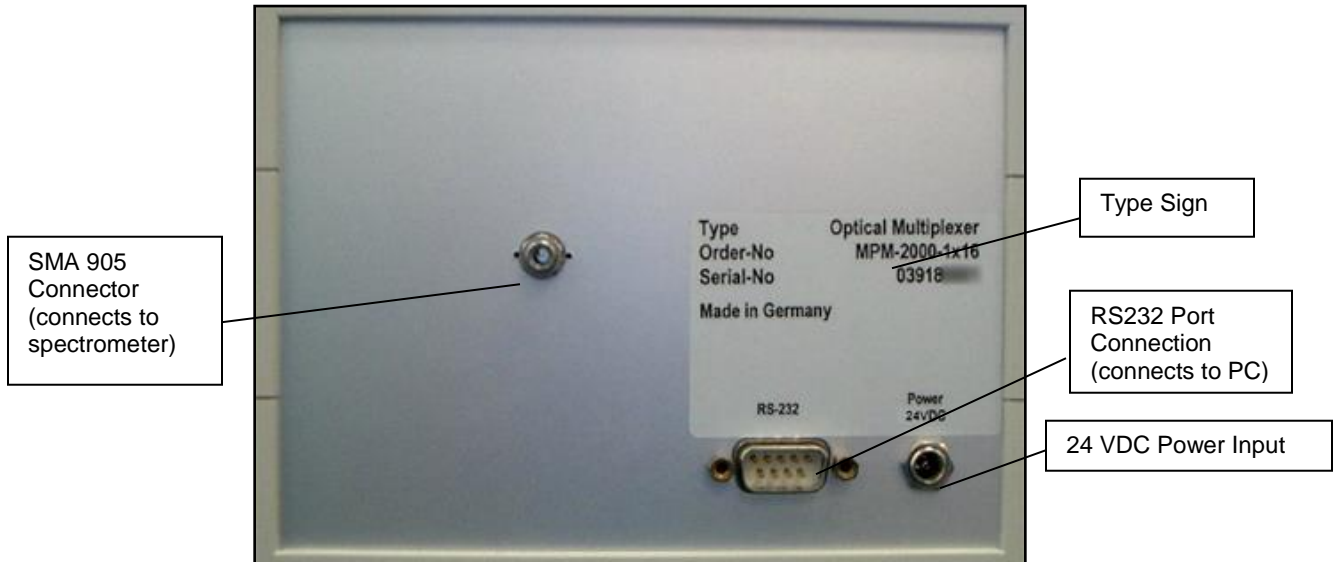
Front Panel



Note

The front panel of both the 1 x 16 and 2 x 8 versions of the MPM-2000 are identical. Only the rear panel will differ (two inputs on the 2 x 8 version).

Rear Panel



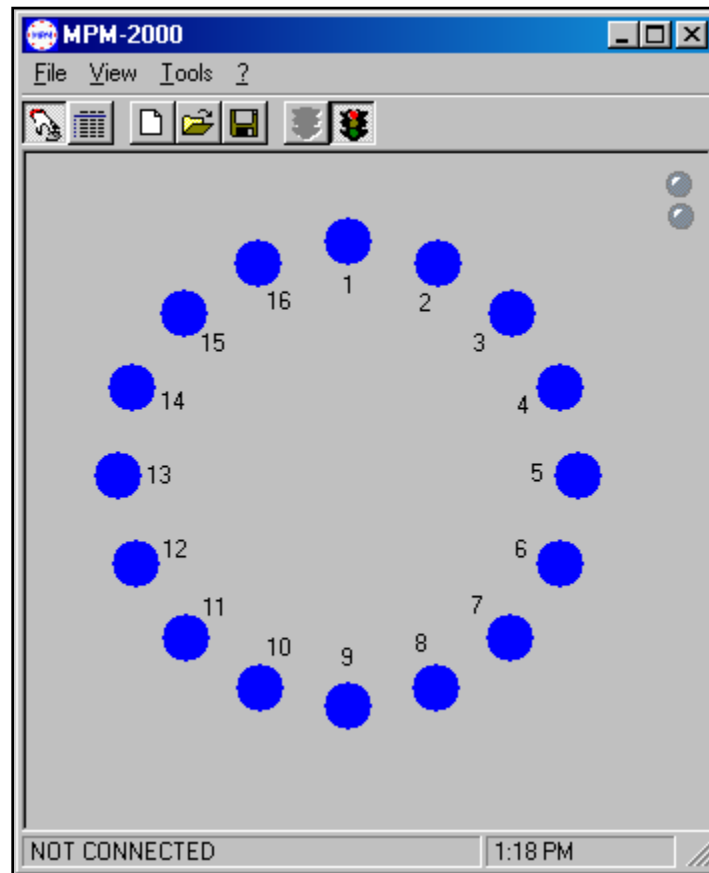
Operating Instructions

Operating Software

The MPM-2000 comes with easy-to-use Windows-based software that allows you to control the MPM-2000 Optical Multiplexer manually or create sequence programs (scripts) with preconfigured channel settings and delay times. The graphical software interface allows you to choose from three modes of operation:

- [Channel Mode](#)
- [Program Mode](#)
- [Small Mode](#)

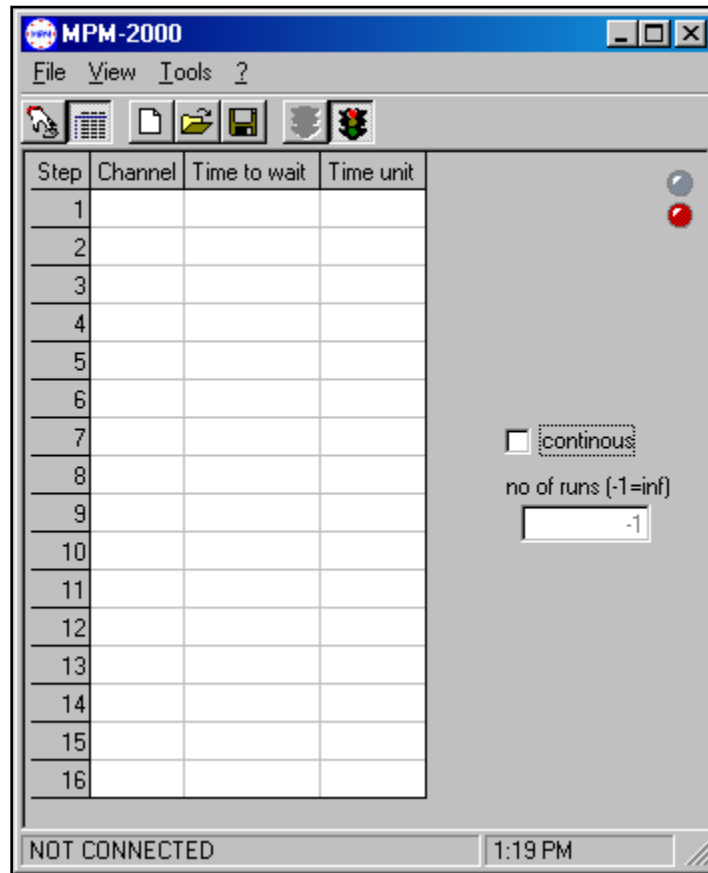
Channel Mode



Channel Mode allows you to change the active channel on the MPM-2000. You can click on any of the blue buttons associated with the SMA 905 Connectors on the front of the MPM-2000 to activate that channel.

Once you activate a channel, the button for that channel turns red until you activate another channel.

Program Mode



Program Mode allows you to create or change sequence programs used by the MPM-2000. The Program Mode interface contains the following items:





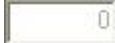





| Item | Description |
|--------------|---|
| Step Column | Identifies the individual step number in the sequence program |
| Channel | Identifies the channel that the MPM-2000 will switch to in this step |
| Time to wait | Identifies the delay time before the MPM-2000 proceeds to the next step |
| Time unit | Defines the unit of time for the Time to wait column |
| Continuous | When checked, instructs the software to run the sequence program a specified number of times (specified in the <i>no of runs</i> box) |
| No of runs | Specifies the number of times the software will execute the sequence program (a value of -1 instructs the software to run the program until manually stopped) |

Small Mode










Small Mode provides all functionality of the software in a condensed menu bar. When using another software package, the Always on Top feature of Small Mode eliminates the need to consistently switch back and forth between applications. This mode is only accessible via the **View** Menu.

The Small Mode screen contains the following options:

| Item | Function |
|---|--|
|  | Load an existing program sequence |
|  | Activate the loaded program sequence |
|  | Stop the currently running program sequence |
|  | Enable continuous mode |
|  | Specifies the number of times the program sequence will execute (if continuous mode is active) |
|  | Increase the active channel on the MPM-2000 by one (+ 1 channel) |
|  | Decrease the active channel on the MPM-2000 by one (- 1 channel) |
|  | Specify a channel on the MPM-2000 |
|  | Switch to the channel specified in the text box to the left of this button |
|  | Exit Small Mode and return to Channel Mode |

Main Toolbar

The Main Toolbar is only visible in Channel Mode and Program Mode. It contains the following buttons and features:

| Button | Function |
|---|---|
|  | Switch to Channel Mode |
|  | Switch to Program Mode |
|  | Open new program sequence |
|  | Open an existing program sequence |
|  | Save the current program sequence |
|  | Start the currently loaded program sequence |
|  | Stop the currently running program sequence |

Menu Options

The MPM-2000 software menu bar has four options:

- [File Menu](#)
- [View Menu](#)
- [Tools Menu](#)
- ? (help)

The sections that follow detail each of these options.

File Menu

The File Menu contains the following options:

| Menu Option | Description |
|-------------|--|
| New | Clear the program grid and open a new program sequence |
| Open | Open an existing program sequence |
| Save | Save the program sequence that you are currently editing |
| Save As | Save the program sequence that you are currently editing with a new filename |
| Options | Opens the Options dialog box |
| Exit | Exits the MPM-2000 software |

View Menu

The View Menu allows you to toggle between the three different application modes. You can only access Small Mode using this option.

Tools Menu

The Tools Menu contains the following options:

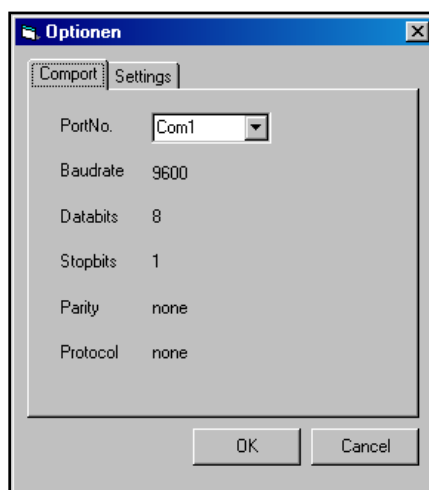
| Menu Option | Description |
|-------------|-------------------------------|
| Connect | Connects to the MPM-2000 |
| Disconnect | Disconnects from the MPM-2000 |
| Options | Opens the Options dialog box |

Options Dialog Box

The Options dialog box is accessible from the File Menu or Tools Menu. It contains the following two tabs:

- [Comport Tab](#)
- [Settings Tab](#)

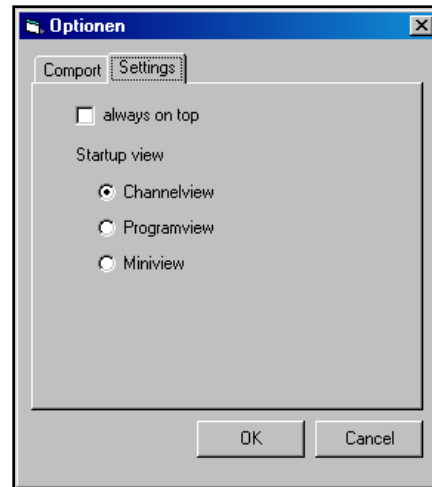
Comport Tab



Select the COM port on the PC that you will use to communicate to the MPM-2000, and then click the **OK** button.

You must ensure that this option is correct before the MPM-2000 will communicate with the PC.

Settings Tab



Click the **Always On Top** check box to position the software window above any other running applications, and then click the **OK** button to save your changes.

To specify the default mode that the MPM-2000 software will enter upon startup, select one of the three radio button options under the **Startup View** section of the **Settings** tab, and then click the **OK** button.

MPM-2000.drv

The MPM-2000.DRV is an interface DLL for use with Visual Basic or C/C++. It allows you to integrate the MPM-2000 in your own custom application.

The MPM-2000.DRV package contains a sample program written in Visual Basic® and a sample program written in Visual C++®.

For further details on how to use the MPM-2000.drv, consult the online documentation included with the MPM-2000.DRV.

RS232 ASCII Commands

Program File

The MPM-2000 Optical Multiplexer is interfaced via the RS232 protocol.

The settings for the serial communications are:

| | |
|--------------|------|
| Baudrate: | 9600 |
| Databits: | 8 |
| Parity: | None |
| Stop bits: | 1 |
| Handshaking: | None |

A program file stored in the MPM-2000's EEPROM contains all necessary data:

- Serial Number
- Software Version Number (only for the windows software)
- Calibration data (positions of all 16 channels)
- Startup / Reference-sequence

The program file looks like the following sample code except for the position data.

Note

For new devices with serial numbers of 039180029 and above or 050460021 and above, see [New Data Format](#).

A: RS232 ASCII Commands

| Line | Command | |
|-------------|----------------|--|
| 1 | answ0 | // asynchronous answers deactivated |
| 2 | jmp1 | |
| 3 | SWVersion100 | // version of the windows-software |
| 4 | SN03918XXXX | // serialnumber of the multiplexer |
| 5 | Ch01-400 | // absolute position of channel 1: -400 |
| 6 | Ch02-100 | // absolute position of channel 2: -100 |
| 7 | Ch03200 | // ... |
| 8 | Ch04500 | |
| 9 | Ch05800 | |
| 10 | Ch061100 | |
| 11 | Ch071400 | |
| 12 | Ch081700 | |
| 13 | Ch092000 | |
| 14 | Ch102300 | |
| 15 | Ch112700 | |
| 16 | Ch123000 | |
| 17 | Ch133300 | |
| 18 | Ch143600 | |
| 19 | Ch153900 | |
| 20 | Ch164200 | // absolute position of channel 16: 4200 |
| 21 | A1 | |
| 22 | v-60 | //----- |
| 23 | delay800 | // get reference position |
| 24 | gohix | // |
| 25 | delay50 | //----- |
| 26 | la-400 | // goto channel 1 |
| 27 | m | // execute movement |
| 28 | delay10 | |

New Data Format

| Line | Command |
|------|-------------|
| 1 | answ 0 |
| 2 | jmp 1 |
| 3 | la 200 |
| 4 | la 39180030 |
| 5 | la -1095 |
| 6 | la -188 |
| 7 | la 711 |
| 8 | la 1611 |
| 9 | la 2516 |
| 10 | la 3412 |
| 11 | la 4312 |
| 12 | la 5209 |
| 13 | la 6104 |
| 14 | la 6996 |
| 15 | la 7887 |
| 16 | la 8799 |
| 17 | la 9700 |
| 18 | la 10600 |
| 19 | la 11508 |
| 20 | la 12404 |
| 21 | a 1 |
| 22 | v -70 |
| 23 | delay 600 |
| 24 | gohix |
| 25 | delay 50 |
| 26 | la -1095 |
| 27 | m |
| 28 | delay 50 |

Syntax

Every command sent via RS232 to the MPM-2000 consists of the following parts:

Command sequence, Parameter (if needed), Carriage Return [CR]

To set an absolute position you need to send:

```
LA1000[CR]           // Load absolute position 1000
M[CR]                // initiate motion
```

| Command | Description | Example | |
|---------|---|---------------------|---|
| M | Initiate Motion (Move) | M[CR] | |
| LA | Load absolute target position Allows programming of the desired target position relative to the present zero or "home" position. | LA1000[CR] M[CR] | |
| POS | Get actual position This command returns the actual position | POS[CR] | |
| GST | Get Status This command returns motion controller status. | GST[CR] | |
| | Bit | | Description |
| | 0 | | 1 Position mode 0 velocity mode |
| | 1 | | 1 Speed command is analog input 0 Speed command comes via RS232 |
| | 2 | | 1 Speed command is PWM (SOR2) 0 Speed command is analog voltage (SOR1) |
| | 3 | | 1 amplifier enabled 0 amplifier disabled |
| | 4 | | 1 in position 0 not in position |
| | 5 | | 1 rising edge on external switch is valid 0 falling edge on external switch is valid |
| 6 | 1 external switch now high level 0 external switch now low level | | |

| Command | Description | Example |
|----------|---|--------------|
| GFS | Get Fault Status This command returns the fault status | GFS[CR] |
| | Bit Description | |
| | 0 Over-temperature condition | |
| | 1 Over-current condition | |
| | 2 Under-voltage (<10VDC) | |
| | 3 Over-voltage (>32VDC) | |
| ANSW | Asynchronous answer ON / OFF ANSW1 activated ANSW0 deactivated | ANSW0[CR] |
| GPROGSEQ | This command returns the complete program sequence stored in the EEPROM | GPROGSEQ[CR] |

Operating/Interfacing with the Optical Multiplexer

The software needs to execute the following steps:

1. Read the complete program out of the EEPROM in the multiplexer
2. Extract the Serial number of the MPM-2000
3. Extract the position for each channel out of the file and save them for example in an array
4. Set the position for any of the channels

The program can be read with the GPROGSEQ command. It will look like the sample program. Only the software version, the serial number and the positions will change with each device.

Check for an MPM-2000 by looking for the serial number as follows:

```
MPM-2000 1x16:    03918XXXX
MPM-2000 2x8:    05046XXXX
```

Where XXXX = a running serial number

The positions are stored in the file as follows:

```
CH01-500    Channel 1, absolute position -500
CH133000    Channel 13, absolute position 3000
```

Once the positions are extracted and stored you can set the position of the motor with the command sequence:

```
LAPosition[CR]
M[CR]
```

To check if the MPM-2000 has reached the given position you can poll the actual position (POS[CR]) and compare it with desired position.

Note: A difference of +/-1 between the desired position and the real position can occur. This is not a functional error.

Calibrating the MPM-2000

To calibrate the MPM-2000 Optical Multiplexer, you must write the complete program file to the EEPROM in the MPM-2000. This means that every line included in the original file must again be written to and stored in the EEPROM.

Caution

Do NOT change anything other than the numbers representing the channel positions! Any other change can lead to a system malfunction.

Commands to Save a File to the EEPROM

| Command | Description | Example |
|----------|---|---------------------|
| PROGSEQ | Defines the beginning of a Sequence program. All commands given after PROGSEQ will be sent directly to the EEPROM until the END command (Caution: Do NOT cut the supply power to the motor during programming). | PROGSEQ[CR] |
| END | Defines the end of the program. All commands given after the END will be immediately carried out by the motor. | END[CR] |
| GPROGSEQ | Gets program sequence This function returns the complete program stored in the EEPROM | GPROGSEQ[CR] |
| ENPROG | Starts the program This Program command can also be saved with the EEPSAV command. The program will then run directly after turning on the power to the motor. | ENPROG[CR] |
| DIPROG | Deactivates the program | DIPROG[CR] |
| LR | Loads relative position Loads new relative position | LA1000[CR] M[CR] |

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