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# User Manual for MRX®

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DYNEX TECHNOLOGIES

# MRX
# Microplate Reader

# User Manual

*IMPORTANT*
*Please read carefully before using the MRX Microplate Reader*

Rev. 11-04-02 Part No: 99001840

Software Version:

Instrument N°:

DYNEX Technologies reserves the right to make technical improvements to this equipment and documentation without prior notice as part of a continuous program of product development. This manual supersedes all previous editions.

## MS DOS® Licensing

This product contains software licensed from Microsoft Corporation.

1. The MRX contains intellectual property, that is, software programs, that are licensed for use by the end user customer (hereinafter referred to as the "end user").
2. This is not a sale of such intellectual property.
3. The end user shall not copy, disassemble or reverse compile the software program.
4. The software programs are provided to the end user "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability and fitness for a particular purpose. The entire risk of the quality and performance of the software program is with the end user.
5. DYNEX Technologies and its suppliers shall not be held to any liability for any damages suffered or incurred by the end user (including, but not limited to, general, special, consequential or incidental damages including damages for loss of business profits, business interruption, loss of business information and the like), arising from or in connection with the delivery, use or performance of the software program.

## Limitations of Warranty Relating to Software

1. DYNEX Technologies accepts no liability for the maintenance or support of Microsoft software.
2. DYNEX Technologies accepts no liability for any consequential loss arising from the use of software on this product outside the scope of the above definition.

## Limitations of Use

The user of the MRX must follow the specific manufacturer's assay package insert when modifying parameters and establishing results calculation methods.

The performance characteristics of the MRX have not been established with specific serology or antigen detection assays. The user must evaluate the MRX in conjunction with the specific serology and/or antigen detection assays. This evaluation must include the establishment of performance characteristics for the specific assays.

Under no circumstances does the MRX have any direct patient contact or perform any therapeutic patient function.

Specific diagnostic results are not provided by the device. Diagnostic decisions are made only after independent confirmation by additional methods under the supervision of a qualified professional.

## WARNING:

**If this equipment is used in a manner not specified by the manufacturer then the protection provided by the equipment may be impaired.**

**Before using any decontamination method, except those recommended by the manufacturer, users should check with the manufacturer that the proposed method will not damage the equipment.**

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# Table of Contents

# About This Manual

This manual has been written for the laboratory technician and describes how to use the MRX Microplate Reader.

With the information in this manual, you can:

- Install the Reader.
- Configure the Reader, using the Setup menu, to suit your particular needs.
- Connect the Reader to a printer.
- Perform basic maintenance procedures.

This manual also describes all the features and specifications of the Reader hardware and software.

For information on how to use any software you have installed, such as Endpoint or Barcode software, refer to the individual user manuals.

For information on how to connect the Reader to an external computer, refer to the *Endpoint Program User Manual*.

For explanations of error messages and possible solutions, refer to the *Troubleshooting Guide*.

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# Safety Information

If there is any doubt or concern about the safety of the instrument, contact an approved service center.

**Warning: Electric Shock Hazard**

Although this instrument is fully insulated and earthed (grounded), it is important for all users to be aware of the potential hazard of using liquids in close proximity to an electrical supply. If any liquids are spilled, disconnect the instrument from the mains electrical supply immediately and clean the liquid up. DO NOT reconnect the electrical supply until the instrument has been fully inspected by an approved service engineer.

Take care when using non-rigid, non-standard microplates as spillages are more likely to occur.

To switch this instrument off, press the power switch on the front panel. Remove the mains power cable from the socket on the rear panel.

**Warning: Incorrect Operation**

Operating this equipment in ways other than detailed in this manual may impair the protection provided by the instrument.

- DO NOT operate this equipment with the covers removed as potentially lethal voltages are contained within.
- DO NOT operate this equipment with the safety earth (ground) disconnected.
- DO NOT install unauthorized cards, spare components or accessories as this may impair the safety of the Reader and will invalidate its warranty.
- DO NOT place any objects, or stand within 150mm of the front of the Reader as this will obstruct the plate carrier.
- DO NOT overfill the microplate wells as this may lead to liquid contamination of the wells and impair the safety of the Reader.
- BE PREPARED for unexpected plate carrier movement when the Reader is controlled by an external computer.
- MAKE SURE that the voltage ratings on the rear panel of the Reader correspond to the local mains supply.

- MAKE SURE that the mains power cable is correctly wired. Color codes are as follows:

| **Europe** | | **United States** | |
|---|---|---|---|
| Brown | Live | Black | Live |
| Blue | Neutral | White | Neutral |
| Green/yellow | Earth (ground) | Green | Ground |

**Fuses**

The instrument does not contain any user-replaceable internal fuses. However, the power supply contains an internal fuse in the primary circuit. If the fuse needs to be changed, it must be replaced with a CSA approved 20x5mm, 4A cartridge fuse with a voltage rating of 250V. This fuse **should not** be replaced by the user. If the fuse blows, contact an approved service center.

# Symbols

## Warning Symbol

For your safety the Reader is marked with a warning symbol to remind you of certain hazards:

- On the back panel: this indicates that the optics door may be hot. If you want to remove the optics door, make sure that you allow the Reader to cool before touching it.
- Adjacent to the mains outlet: this indicates that the outlet should only be used for an external monitor with a power rating of up to 120VA and an earth leakage current of less than 1 mA at 264V and 60 Hz.

## Plate Carrier Diagram

The diagram on the inside of the floppy disk drive door shows the mechanism for moving the plate carrier in and out.

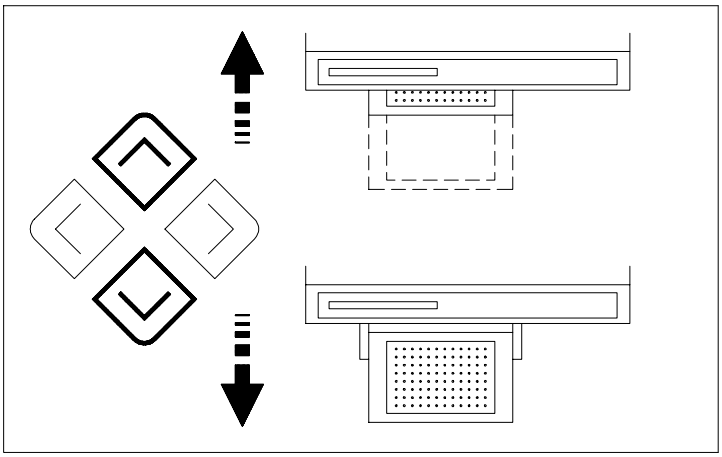

Figure 1 Plate Carrier Diagram

While the Main menu is displayed, the plate carrier can be moved in and out using the up and down (∧ ∨) cursor keys. The up key moves the plate carrier in, and the down key moves it out.

Do not place any objects, or stand within 150mm (6.5 in) of the front of the Reader as this will obstruct the plate carrier.

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# Chapter 1 Features of the Reader

The MRX Microplate Reader is a microprocessor-controlled photometer. It is designed to measure the optical density (OD) of fluid samples in 96-well microplates in order to determine the level of chemical reactions.

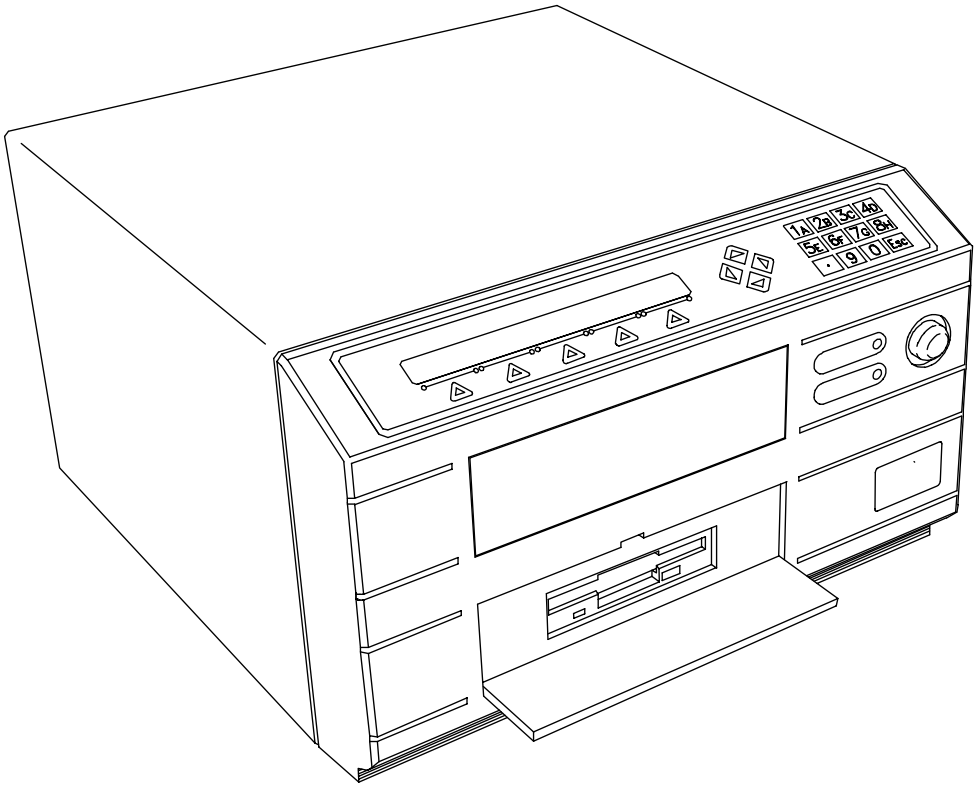

Figure 2 MRX Microplate Reader

A full list of the Reader's technical specifications can be found in Appendix C.

The Reader provides the following features:

- Endpoint, Kinetic, and Agglutination Software
- PC-compatibility for additional control and data storage
- Multi-lingual display which guides you through menu choices
- Single and dual wavelength reading modes
- Selection of up to six filter wavelengths
- Data analysis and presentation as OD matrices and/or graphically using curve fitting routines
- Data output to printer

- Storage of assay test procedures and microplate data on 3.5" floppy disk drive or hard disk
- Barcode option
- Test plate option
- Temperature Control option

# Chapter 2 Installation and Setup

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# 2.1 Installation

**CAUTION** **DO NOT connect the instrument to the mains electrical supply or switch it on before you have completed this installation procedure.**

To review the critical functions of installation, operation, maintenance, and software use, refer to the MRX Training Checklist in Appendix D.

## Unpacking the Reader

If you ordered an upgrade, you will only receive an upgrade disk and a manual.

The Reader is packed to provide maximum protection during shipment. Take care when unpacking it and examine it carefully for any damage. Report any damage to the carrier immediately. Check the contents against the shipping checklist enclosed and report any omissions to your supplier.

Remove the Reader from the carton and place it on a level surface free of dust, moisture, vibration, draughts and away from direct sunlight. (Keep the packing materials so that they can be used if the Reader has to be transported.)

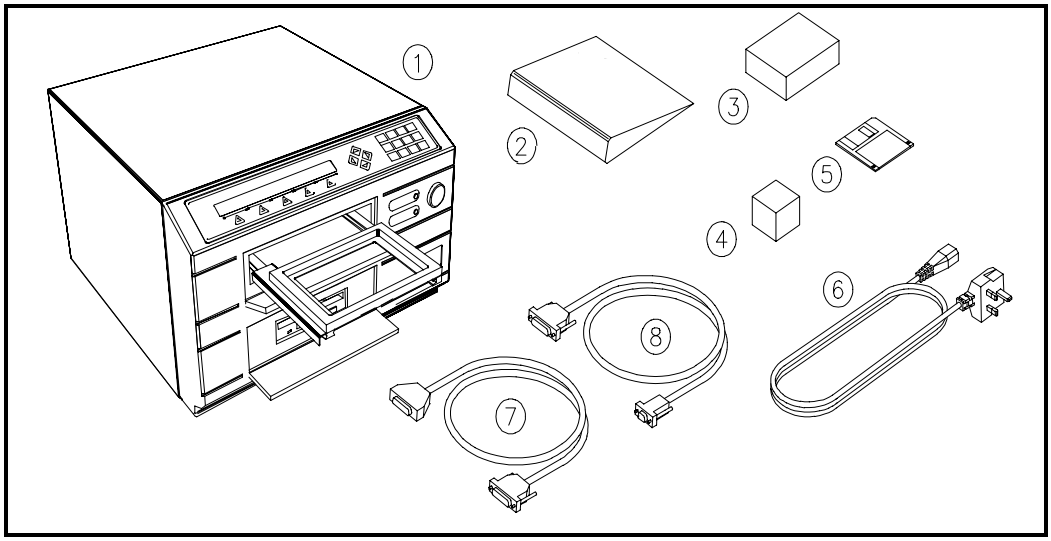


Figure 3 Packing Contents Example

1 Reader
2 Manual Set
3 Optical Filters
4 Lamp
5 Software disks
6 Power Cord
7 Printer Cable
8 Interface Cable
9 RS 232 Filter (not shown)

# The MRX$_{II}$ and MRX$_{plus}$ Back Panel

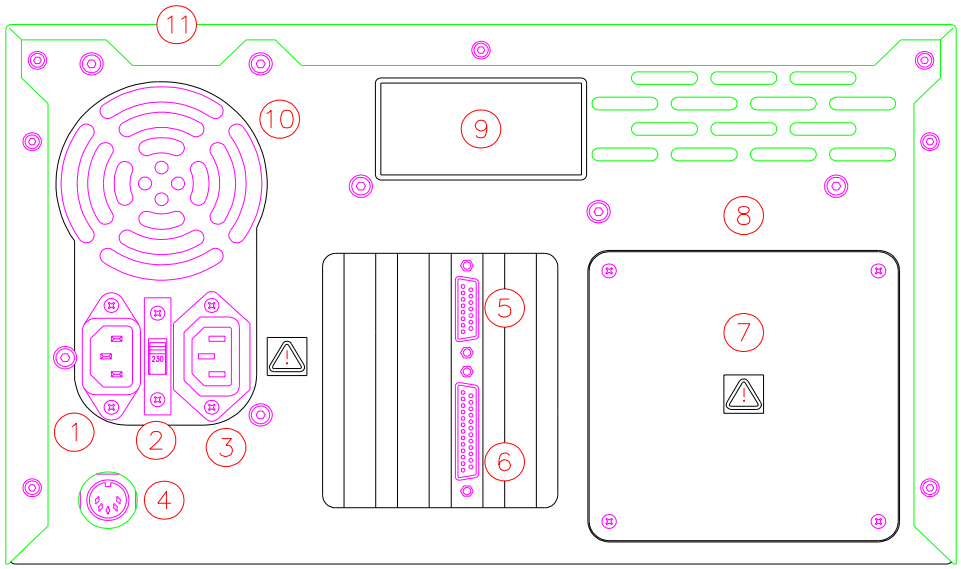


Figure 4 MRX$_{II}$ and MRX$_{plus}$ Back Panel

| | | | |
|---|---|---|---|
| 1 | Mains Inlet | 7 | Optics Door |
| 2 | Voltage Selector (see page 14) | 8 | Optics Cooling Vents |
| 3 | Monitor Mains Socket | 9 | Serial Number Plate |
| 4 | Keyboard Socket | 10 | PSU Cooling Vents |
| 5 | Serial Port | 11 | Main Enclosure |
| 6 | Printer Port | | |

*Notes:*

1. The warning symbols on the back panel indicate that the optics door may be hot, and that no appliances other than a monitor should be plugged into the mains outlet. For more details, refer to the discussion on Symbols earlier in this manual.
2. The positions of ports 5 and 6 may not be exactly as shown, but the number of pins or pin sockets in each port will remain the same.
3. Remove the port protectors, connector protector and styrofoam packing inside the Optics Door (#7).

# The MRX*Revelation* Back Panel

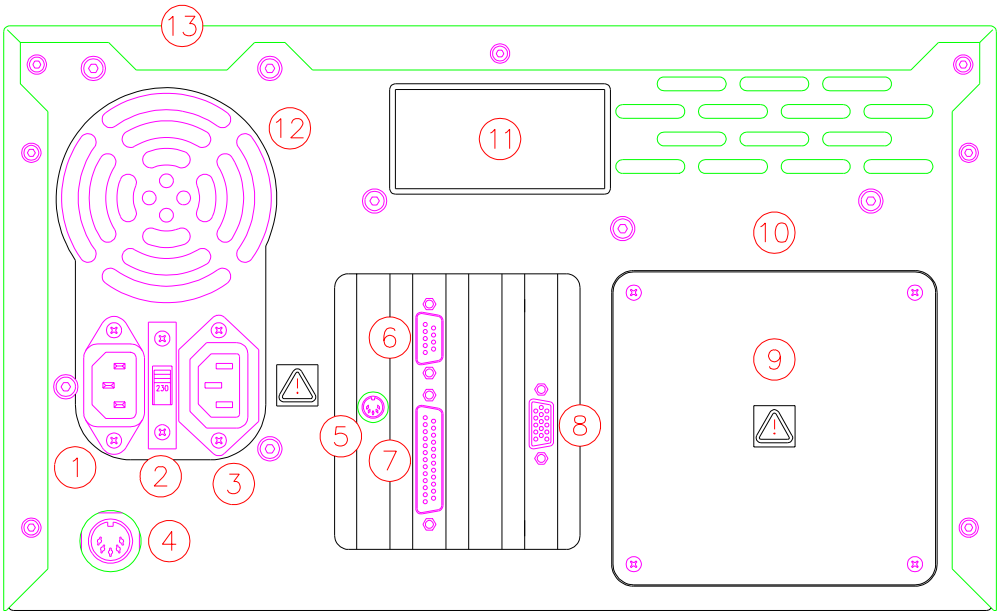


Figure 5 The MRX*Revelation* Back Panel

| | | | |
|---|---|---|---|
| 1 | Mains Inlet | 8 | Monitor Port |
| 2 | Voltage Selector (see page 14) | 9 | Optics Door |
| 3 | Monitor Mains Socket | 10 | Optics Cooling Vents |
| 4 | Keyboard Socket | 11 | Serial Number Plate |
| 5 | PS/2 Mouse Socket | 12 | PSU Cooling Vents |
| 6 | Serial Port | 13 | Main Enclosure |
| 7 | Printer Port | | |

*Notes:*

1. The warning symbols on the back panel indicate that the optics door may be hot, and that no appliances other than a monitor should be plugged into the mains outlet. For more details, refer to the discussion on Symbols earlier in this manual.
2. The positions of ports 5 through 8 may not be exactly as shown, but the number of pins or pin sockets in each port will remain the same.
3. Remove the port protectors, connector protector and styrofoam packing inside the Optics Door (#7).

## Voltage Selector

The position of the voltage selector (see Figure 4 or Figure 5) is very important and must be adjusted to match the line voltage of the mains power supply **before** switching the Reader on.

| Position of Voltage Selector | Mains Line Voltage |
|---|---|
| 115V | 100-120V |
| 230V | 200-240V |

**CAUTION** **FAILURE TO FOLLOW THE PROCEDURES DETAILED BELOW MAY RESULT IN DAMAGE TO THE MICROPLATE READER DUE TO PARTS FALLING INTO THE POWER SUPPLY.**

There are **two** types of plastic cover fitted to the voltage selector switch:

- If the plastic cover has a slot cut in it and the voltage selector is not in the correct position, insert a suitable small flat-bladed screwdriver through the slot and move the selector to the desired voltage. DO NOT LOOSEN THE SCREWS USED TO RETAIN THE PLASTIC COVER.
- If the plastic cover does not have a slot cut in it and the voltage selector is not in the correct position, use a No. 1 Posi driver to remove **one** of the screws and loosen the other screw to allow the plastic cover to be pushed aside. Move the switch to the desired voltage, replace the cover and tighten the screws. DO NOT REMOVE BOTH SCREWS USED TO RETAIN THE PLASTIC COVER.

## The MRX Front Panel

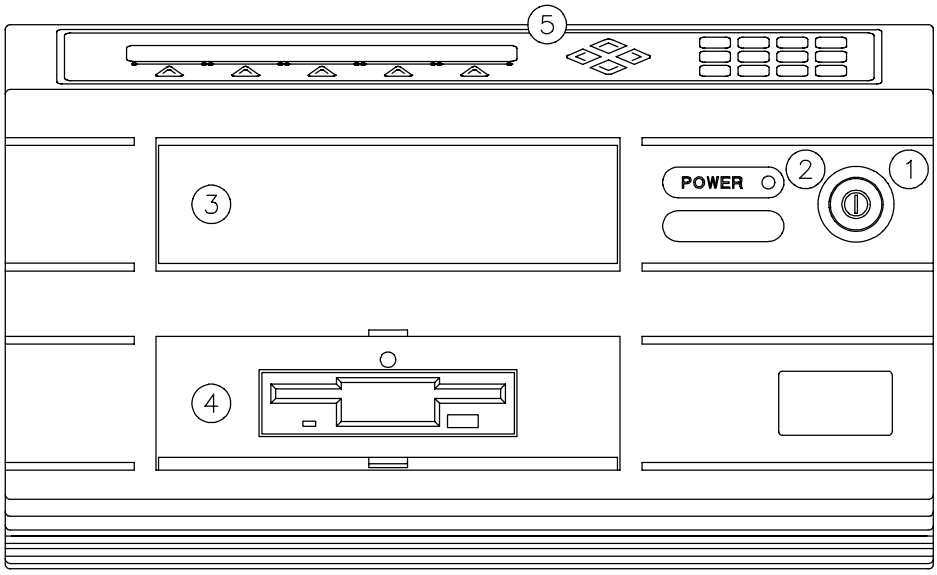


Figure 6 The MRX Front Panel

1 Power Switch (marked **I**/**O** for on/off)

2 Power Light

3 Plate Carrier Door

4 Floppy Disk Drive

5 Keypad and display

## The Keypad and Display

The Reader is controlled by menu-driven software which responds to the user's menu choices. The menus are displayed on a liquid crystal display which can show up to five options at a time. Choices are entered using the keypad.

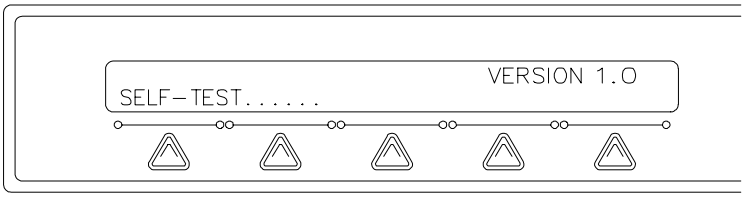


Figure 7 Function Keys and Display

- **Function keys** – menu options are shown on the bottom line of the display and selected by pressing the function key below.

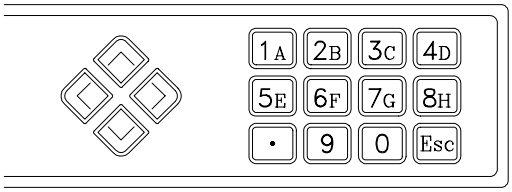


Figure 8 Alphanumeric Keys and Cursor Keys

- **Alphanumeric keys** – used to enter numbers and well locations.
- **Esc key** – returns the display to the Main menu.
- **Cursor keys** – used to scroll through well locations and menus, and (in some menus) to move the plate carrier in and out.

☞ *Note: When the Reader is operating under the control of an external computer, the keypad will not operate.*

## Windows QWERTY Keyboard Option

If you have bought the MRX*Revelation,* you will have to install the monitor, keyboard and mouse.

| | | |
|---|---|---|
| **Keyboard** | 1. | Plug the keyboard cable into the Keyboard Socket (labeled #4 on Figure 5). |
| | 2. | Place the protective cover over the keys. |
| **Monitor** | 1. | Place the monitor on top of the Reader. |
| | 2. | Plug the power cord into the Monitor Mains Socket (labeled #3 on Figure 5). |
| | 3. | Plug the monitor cable into the Monitor Port (labeled #8 on Figure 5). |
| **Mouse** | 1. | Plug the mouse cable into the PS/2 Mouse Socket (labeled #5 on Figure 5).<br>*If you are also running DOS programs, they will not run correctly while the mouse is plugged in. Always unplug the mouse before running a DOS program.* |

☞ *Only use the monitor, keyboard, mouse, and software supplied with the MRX*Revelation*. Do not install any unauthorized hardware or software, as this may affect the reliability of the Reader and will invalidate the warranty.*

## Fitting the Lamp and Optical Filters

**Warning** **Disconnect the mains cable before fitting lamp and filters.**

☞ *Note: DO NOT touch the filters, bulb or reflector directly.*

**1.** Using a No. 1 Posi driver remove the optics door and, if fitted, remove the packing materials from behind the door.

**1.** Slide the optics assembly out of the instrument.

*If you have an older instrument (check your serial number panel: newer Readers have 1CXCxxxx or 2CXCxxxx numbers), you need to disconnect the optics assembly's 10-way connector and then slide the assembly out of the instrument.*

**1.** Insert the lamp into the assembly and plug the connector into its back (see Figure 9).

Make sure that the lamp is seated correctly with the locating pip on the lamp fitted into the notch on the optics assembly.

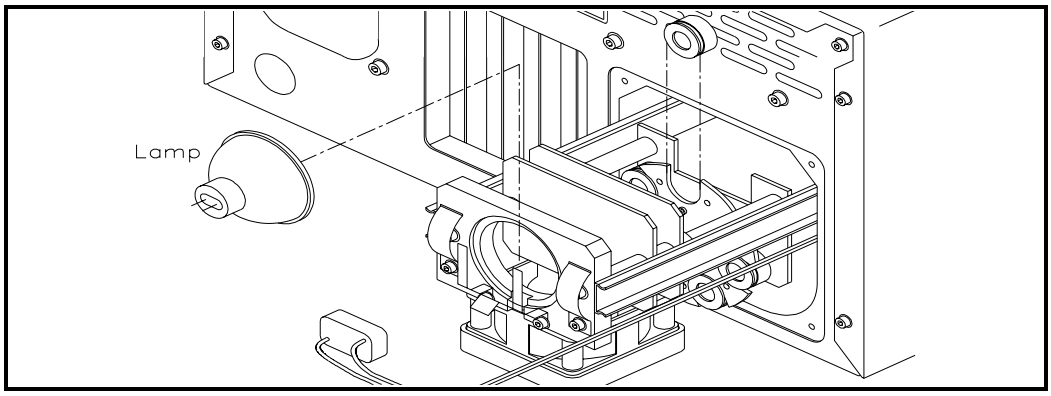


Figure 9 Fitting the Lamp and Filters

**4.** Insert the filters into the filter wheel.

a) Place the filter with the lowest wavelength in position 1, the next lowest in position 2 and so on.

a) Make sure the side of the filter that has the shorter distance from the groove to the end is toward the lamp.

a) The Filter Blanks must be fitted into the unoccupied filters positions in the Filter Wheel.

a) Make sure the Filter Springs are around the sides of the Filter as shown in Figure 10. The Springs must not extend past the rear face of the Filter as shown in Figure 11. Otherwise, the self-test will fail due to "Filter Motor Errors."

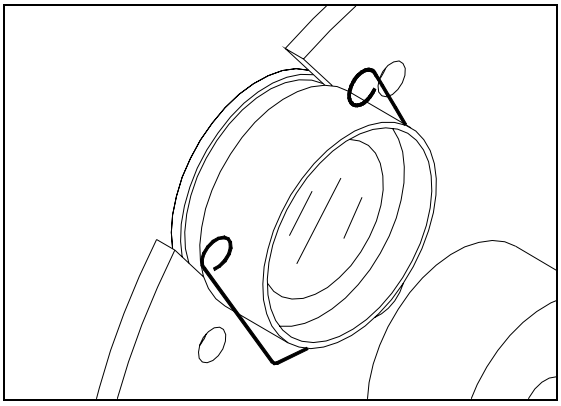

Figure 10 Correct Filter Spring Positioning (view of Filter Wheel from filter spring side)

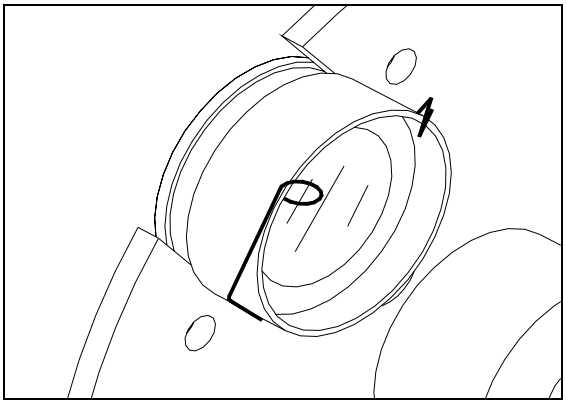

Figure 11 Incorrect Filter Spring Positioning

**5.** Slide the optics assembly back in *(if you have an older instrument, you must also reconnect the 10-way connector)* and replace the optics door. Attach the lamp connector to back of lamp.

## Switching the Reader On

**Before** switching the Reader on, note the position of the voltage selector (see Figure 4 or Figure 5). The position of the selector is very important and must be adjusted to match the line voltage of the mains power supply.

| Position of Voltage Selector | Mains Line Voltage |
|---|---|
| 115V | 100-120V |
| 230V | 200-240V |

If the voltage selector is not in the correct position, refer to the Voltage Selector discussion on page 14.

**DO NOT place any objects, or stand within 150mm of the front of the Reader as this will obstruct the plate carrier.**

1. Make sure that the instrument is switched off. The power switch is ON when it is flush with the front panel and OFF when it stands out from the panel.
2. For a MRX$_{II}$: insert a Reader program disk into the floppy disk drive.
3. Insert the power cord supplied into the socket at the rear of the instrument.
4. Connect the power cord to a suitable power source with a protective earth (ground).
5. Connect the printer cable from the Reader to the printer.
6. Switch the printer on.
7. Switch the Reader on by pressing the power switch on the front panel.
8. Verify that the Reader completes the self-test routine successfully.

## Self-Tests

When the Reader is switched on, it carries out several self-tests to check that the instrument is working correctly. Appendix A shows a list of these tests and a sample printout. During the self-tests, a series of symbols are displayed on the bottom line of the LCD: these indicate the optional extras that are installed in your Reader.

If the Reader fails any of the tests, an error message is displayed. If the Reader's data files have been corrupted, the Reader requests your serial number (this can be found on the Reader's back panel or inside of the floppy disk drive's door). If an error message persists, contact the service center.

## Maintenance Reminder

On first power up, the Reader may display a maintenance reminder.

```
HAVE YOU PERFORMED YOUR
MAINTENANCE CHECKS ?
```

To clear the message, press any key. The reminder is intended for use by laboratories which routinely verify the operation of their instruments.

The self-test printouts and the frequency of the maintenance reminders may be altered from the **SETUP** menu.

## Main Menu

If no faults are detected, the instrument displays the Main menu which shows all the available software programs and **SETUP**. If there are more

than four software programs installed, use the < and > cursor keys to view them.

While the Main menu is displayed the plate carrier can be moved in using the ∧ cursor key and out using the ∨ cursor key. The plate carrier should not be left out of the Reader for more than a few minutes at a time as it will gather dust and may become damaged. If it is left for five minutes without using the software, the Reader will move the plate carrier in automatically.

## Switching between DOS Applications

On a MRX$_{II}$:

1. Press the Esc key to return the Reader to the Main menu.
1. Switch the Reader off.
1. Change the software disk.
1. Switch the Reader on again.

☞ *Note: If you have changed any settings in the Setup menu, you will have to re-enter them for the new program.*

On a MRX$_{plus}$:

1. Press the Esc key to return the Reader to the Main menu.
1. Select the required program using one of the function keys.

# 2.2 Setup Procedures

The Reader has a number of settings which can be adjusted to suit the assays which will be run on it. The settings are altered using the Setup menu. To use the Setup menu options, select **SETUP** from the Main menu. The options accessed by this menu are summarized in the table below and described in detail in this section.

| Menu | Setting | Value |
|---|---|---|
| **FILTERS** (p. 23) | Number of Filters | 1/2/3/4/5/6 |
| | Wavelengths | 340 – 850 nm |
| **CLOCK** (p. 24) | Time mode | 12/24 hour |
| | Date mode | dd.mm.yy/mm.dd.yy |
| **SYSTEM** (p. 25) | Language | English/French/Italian German/Spanish |
| | Display | 2x40 |
| | Keypad | 21 key |
| | Printer | various |
| **MAINT.** (p. 27) | Print self test | yes/no |
| | Retest | yes/no |
| | Reminder | no/daily/weekly/monthly |
| **COMMS** (p. 28) | Comms modes | MRX/MR700/Custom |
| | Comms Ports | COM1 |
| **PARAM** (p. 30) | Over/Under limit | 0 – 4.000 (3.500) |
| | Data Conversion | yes/no |
| | Plate Type | 12x8/10x4 |
| | Repeatability | 1 – 4 readings |

☞ *Note: If you are using a $MRX_{II}$ Reader and you make changes to the Setup settings, these changes will only apply to the current software program. If you insert a different program disk, you will have to re-enter the settings.*

## Setup Menu

The Setup menu allows you to view and if necessary alter, the Reader settings.

```
SETUP ?              4:45P  30.06.94
 OTHER  FILTERS  CLOCK  SYSTEM     CE
```

Select **OTHER** to access a second Setup menu

```
SETUP?               4:45P  30.06.94
 MAINT.   COMMS  MEMORY   PARAM     CE
```

In the menus shown on the following pages, the options available are shown on the bottom line of the display. To select an option press the function key below it or, where appropriate, key in a value.

☞ *Note: In most of the menus the default or previously defined value is shown. To enter a different value you must press **CE**. This will access the alternatives available.*

**Example**

To change the display language from English to Spanish:
Select **SYSTEM** from the Setup menu to access the System menu. Select **LANGUAGE** from the System menu to access the Language menu.

The default or previously defined menu language is displayed:

```
LANGUAGE : ENGLISH     4:45P  30.06.94
                  ENTER    CE
```

To access the alternative languages select **CE**.

```
LANGUAGE ?           4:45P  30.06.94
ENGLISH FRANCAIS DEUTSCH ITALIANO OTHER
```

Select one of the languages displayed by pressing the function key directly below it, or select **OTHER** to access the Spanish option.

```
LANGUAGE ?           4:45P  30.06.94
ESPANOL                        CE
```

To select Spanish as the display language press the function key below **ESPANOL**. The menus will then be displayed in Spanish.

## Filters Menu

The Filters menu allows you to install new filters and enter filter wavelengths.

Select **FILTERS** from the Setup menu to display the number of filters installed:

```
NO. OF FILTERS = 2      4:45P  30.06.94
                  ENTER    CE
```

**ENTER** Confirm the number of filters shown.

**CE** Clear the number of filters and enter a new number. Minimum: 1 filter. Maximum: 6 filters.

Once the number of filters has been entered, the Reader prompts you to enter the wavelength of each filter in turn.

*Note: When installing new filters, remember that the filter with the lowest wavelength should be in position 1 on the filter wheel, and so on in ascending order of wavelength.*

The Reader will display Filter 1 and a wavelength, for example:

```
FILTER 1=410 nm         4:45P  30.06.94
                  ENTER    CE
```

Select **ENTER** to confirm the wavelength shown and move on to Filter 2. Select **CE** to clear the wavelength shown, and enter a new wavelength. Press **ENTER.**

When wavelengths have been entered for all the filters installed, the display will return to the Setup menu.

## Clock Menu

Select **CLOCK** from the Setup menu to access the Clock menu and view the time and date settings.

```
SETUP?              4:45P  30.06.94
 TIME   DATE                 CE
```

### Time

Select **TIME** to set the clock mode and time. The Reader will display the current setting. Select **ENTER** to confirm the mode shown, or select **CE** to display the alternatives.

```
CLOCK MODE ?        4:45P  30.06.94
12-HOUR 24-HOUR             CE
```

Select **12-HOUR** or **24-HOUR** mode.

The Reader will allow you to change the time display.

```
TIME  =             4:45P  30.06.94
                  ENTER   CE
```

Select **ENTER** to confirm the time shown or enter the correct time using the keypad.

- If you selected the 24-hour mode, enter the time and press **ENTER.**
- If you selected the 12-hour mode, enter the time and then select **A.M.** or **P.M.**

### Date

Select **DATE** to display the date mode. The Reader will display the current setting. Select **ENTER** twice to confirm the mode shown, or select **CE** to display the alternatives.

```
DATE MODE ?         4:45P  30.06.94
dd.mm.yy      mm.dd.yy        CE
```

Select **dd.mm.yy** or **mm.dd.yy**.

The Reader will allow you to change the date display.

```
DATE =              4:45P  30.06.94
                  ENTER   CE
```

Select **ENTER** to confirm the date shown or type in a new date. To edit the date entered, select **CE,** use the keypad to enter a new date, and then select **ENTER**.

## System Menu

Select **SYSTEM** from the Setup menu to access the System menu and view the printer and user interface settings.

```
SETUP ?              4:45P  30.06.94
LANGUAGE DISPLAY KEYPAD  PRINTER   CE
```

### Language

Select **LANGUAGE** to set the language options. The Reader will display the current language setting. Select **ENTER** to confirm this setting or **CE** to access the options:

```
LANGUAGE ?           4:45P  30.06.94
ENGLISH FRANCAIS DEUTSCH ITALIANO OTHER
```

**OTHER** accesses a second Language menu with the **ESPANOL** option.

Select the required language, or select **CE** to return to the System menu. The language chosen will be used to display all subsequent menus.

### Display

Select **DISPLAY** to view the Reader display format.

```
DISPLAY : 2 X 40      4:45P  30.06.94
                   ENTER    CE
```

Press **CE** or **ENTER** to return to the System menu.

### Keypad

Select **KEYPAD** to view the Reader keypad format.

```
KEYPAD : 21 KEY       4:45P  30.06.94
                   ENTER    CE
```

Select **ENTER** to move on. The keypad has an optional beep which sounds each time a key is pressed. The Reader will display the current key beep setting. Select **ENTER** to confirm the setting, or select **CE** to access the options:

```
KEY BEEP?            4:45P  30.06.94
  YES     NO                   CE
```

Select **YES** to switch the beep on, or **NO** to switch it off.

### Printer

Select **PRINTER** to view the printer settings.

```
EPSON LX-810          4:45P  30.06.94
 NEXT    LAST          ENTER    CE
```

Select **ENTER** to accept the printer shown or use the **NEXT** and **LAST** commands to scroll through the list of printers.

The Reader is supplied with a number of standard printer drivers. If your printer is not listed here, contact the service center.

*Page Size*

The Reader asks you to enter the page size (in inches). For example:

```
PAGE LENGTH = 11.000     4:45P  30.06.94
                    ENTER    CE
```

Select **ENTER** to accept the page length and width shown or press **CE** to enter new values.

*Lab Name*

The Reader asks if you want to print a laboratory name at the top of each print-out sheet.

```
LAB. =                4:45P  30.06.94
     YZ ABCD           ENTER    CE
```

Enter a laboratory name, or select **ENTER** to return to the System menu.

Laboratory names may be up to 16 characters in length and consist of the following characters.

- Numbers 0–9 and a decimal point. Enter these using the keypad.
- Upper-case letters, lower-case letters and symbols. Enter these in the following way:

  **a)** Choose upper-, or lower-case letters or the symbols using the ∧ and ∨ cursor keys.

  **a)** Scroll through the display characters on the display using the < and > cursor keys.

  **a)** Enter the character shown by the flashing cursor by pressing the ∧ function key below it.

When the name is complete, select **ENTER**.

## Maintenance Menu

Select **MAINT.** from the Setup menu to access the Maintenance menu and view the self-test printouts and maintenance reminder settings.

### Self-Tests

Self-tests are performed when the Reader is switched on, to make sure everything is working correctly. The self-test can be printed, if necessary, so that a record can be kept. The Reader will display the current self-test print setting. Select **ENTER** to confirm the setting or **CE** to access the options.

```
PRINT SELF-TEST ?      4:45P  30.06.94
 YES    NO                   CE
```

Select **YES** to print the self-tests each time they are run.

☞ *Note: The printer must be connected directly to the Reader for the self-test to print.*

An extra self-test (retest) is also available which is carried out before each plate is read. The Reader will display the current setting for the test. Select **ENTER** to confirm the current setting or **CE** to access the options.

```
TEST BEFORE READ ?     4:45P  30.06.94
 YES    NO                   CE
```

Select **YES** to perform the extra test or **NO** to omit it.

☞ *Note: Adding the extra test will lengthen the reading time.*

### Maintenance Reminder

The Reader has a maintenance reminder which can be displayed at regular intervals on power up. The reminder is intended for use by laboratories which routinely verify the operation of their instruments.

The Reader will display the current setting. Select **ENTER** to confirm the current setting or **CE** to access the options.

```
MAINTENANCE ?          4:45P  30.06.94
 NO   DAILY   WEEKLY   MONTHLY    CE
```

Select **NO** if you do not want any reminders to be displayed, or select the appropriate frequency.

## Comms Menu

Select **COMMS** from the Setup menu to access the Communications menu and view PC communications settings.

☞ *Note: Do not alter the default settings unless you are proficient in RS232 communications protocols.*

```
SETUP ?              4:45P  30.06.94
 MR700   MRX   USER            CE
```

### MR700

Select **MR700** to set the Reader communication parameters to a format suitable for all DYNEX Technologies application programs. The MR700 settings are:

| | |
|---|---|
| Baud Rate | 9600 |
| Stop Bits | 1 |
| Data Bits | 8 |
| Parity | even |
| Data Format | MR700 |

*Communications Port*

The Reader asks which communication port is being used. Select **COM1** or **COM2** to specify the port, or select **CE** to return to the Comms menu.

### MRX

Select **MRX** to set the Reader communication parameters to an enhanced format suitable for most application programs. When MRX is selected, the display flashes briefly and then redisplays the setup menu.

The MRX settings are:

| | |
|---|---|
| Baud Rate | 9600 |
| Stop Bits | 1 |
| Data Bits | 8 |
| Parity | even |
| Data Format | MRX |

*Communications Ports*

The Reader asks which communication port is being used. Select **COM1** or **COM2** to specify the port, or select **CE** to return to the Comms menu.

☞ *Note: When using a $MRX_{II}$ , no COM2 option exists.*

### User

Select **USER** to customize the communication settings. The User options allow you to set the values for baud rate, stop bits, data bits, parity and data format.

The settings available are:

| | |
|---|---|
| Baud Rate | 110/150/300/600/1200/2400/4800/9600 |
| Stop Bits | 1/2 |
| Data Bits | 7/8 |
| Parity | none/even/odd |
| Data Format | MR700/extended/MRX |

## Memory Menu

Select **MEMORY** from the Setup menu to access the Memory menu which allows you to reset the Reader memory or to upgrade the software.

```
SETUP MEMORY ?          4:45P  30.06.94
 RESET  UPGRADE                   CE
```

To upgrade the Reader, follow the instructions provided with the upgrade disk.

### Reset

The **RESET** command resets the Reader's default settings, overwriting all user-defined setup parameters. The Reader will ask you to confirm this action.

```
ARE YOU SURE ?          4:45P  30.06.94
 YES   NO                         CE
```

Select **YES** to reset all the Reader's parameters, or **NO** to return to the Memory menu.

### Upgrade

The **UPGRADE** option allows you to upgrade the Reader with a software upgrade disk. Only Reader application software obtained from your supplier should be used with this command.

If you are upgrading the Main menu Setup software, refer to "Upgrading From a Previous Version" in Chapter 3 in the *Endpoint Program User Manual.*

## Param Menu

Select **PARAM** from the Setup menu to access the Parameters menu and view the OD limit, data conversion, plate type and repeatability settings.

### Over Limit

The Over limit is used to set a range within which ODs should fall. ODs above the limit will not be processed. The limit is also used as an Under limit to set the negative limit of the range.

For example: If 3.500 is set as the over limit, ODs above 3.5 will not be stored and will be printed as “OVER”. ODs below -3.5 will be printed as “UNDER”.

The Reader will display the current Over Limit. Select **ENTER** to confirm the value shown and move on to the Param Plate Type menu. Select **CE** to clear the value shown, and enter a new value.
Minimum: 0.000. Maximum: 4.000.

*Note: Take care when setting the Over limit; if it is too low valid test results may be rejected. The normal limit is 3.500.*

*Data Conversion*

If the Over limit is altered, the Reader asks if ODs which lie outside the range should be assigned a conversion value for use in quality control equations. If no value is assigned to these ODs, the QC equations which contain them will fail.

```
DATA CONVERSION        4:45P  30.06.94
  YES    NO              ENTER   CE
```

Select **YES** to enter a value for Over and Under ODs or select **NO** to define the plate type. The Reader will ask for the Over value, followed by the Under value. For example:

```
OVER VALUE =9.999          4:45P  30.06.94
                        ENTER   CE
```

Enter Over and Under values and select **ENTER**.

Min. Over value: 0.000. Max. Over value: 9.999.
Min. Under value: -9.999. Max. Under value: 0.000.

### Plate Type

Two types of plate format can be used with the Reader. One is the standard 12 rows by 8 columns format and the other is the 10 rows by 4 columns format or the “Chinese plate” format.

The Reader will display the current plate type setting.

Select **ENTER** to confirm the current plate type setting, or **CE** to access the options.

```
PLATE TYPE ?          4:45P  30.06.94
 12x8    10x4                  CE
```

Select **12x8** or **10x4** to the specify the plate type.

## Repeatability Mode

Using the repeatability mode you can specify that each reading the Reader takes is repeated a number of times and averaged into a single result.

The Reader will display the current repeatability setting. Select **ENTER** to accept the current setting and return to the Setup menu, or select **CE** to enter a different number.

```
REPEATABILITY MODE =   4:45P  30.06.94
                    ENTER    CE
```

Minimum: 1 (no reading repeats). Maximum: 4.

*Note: Repeated readings will require a longer reading time and this option should be used with caution for time-critical plate readings.*

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# Chapter 3 Printer Interface

If the Reader has been supplied with a printer, this printer will be completely compatible with it. The following information is for users whose printer was not supplied with the Reader.

Any printer which communicates through a Centronics parallel printer interface will operate successfully with the Reader.

☞ *Note: Once the printer has been correctly installed, it should always be switched on before switching on the Reader.*

An external printer can be connected to the Reader using the interface cable shipped with the instrument. This is a ribbon cable terminated by a standard IEEE / Centronics style, 36 way connector (see Figure 12).

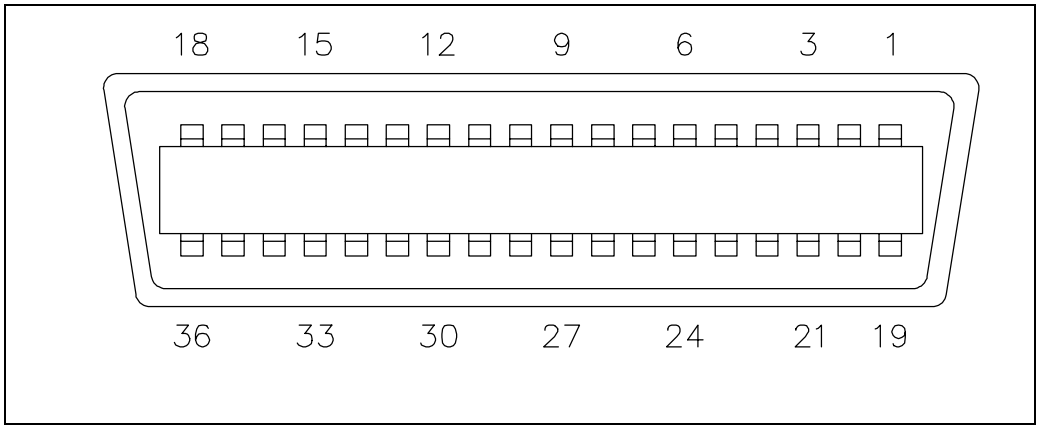


Figure 12 Printer Cable Connector (Centronics)

The table below shows the relevant pin assignments.

| Pin No | Signal Name | Pin No | Signal Name |
|---|---|---|---|
| 1 | STROBE | 19 | GROUND |
| 2 | DATA 1 | 20 | GROUND |
| 3 | DATA 2 | 21 | GROUND |
| 4 | DATA 3 | 22 | GROUND |
| 5 | DATA 4 | 23 | GROUND |
| 6 | DATA 5 | 24 | GROUND |
| 7 | DATA 6 | 25 | GROUND |
| 8 | DATA 7 | 26 | GROUND |
| 9 | DATA 8 | 27 | GROUND |

| | | | |
|---|---|---|---|
| 10 | ACKNLG | 28 | GROUND |
| 11 | BUSY | 29 | GROUND |
| 12 | PE | 30 | GROUND |
| 13 | SLCT | 31 | INIT |
| 14 | Not Used | 32 | Not Used |
| 15 | Not Used | 33 | Not Used |
| 16 | Not Used | 34 | Not Used |
| 17 | Not Used | 35 | Not Used |
| 18 | Not Used | 36 | Not Used |

# Chapter 4 Maintenance

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**IMPORTANT**

**The first section in this manual contains safety information for all the equipment in the system. You should be familiar with this information anyway, but if not, you must read through this section before carrying out any maintenance.**

**The warranty on the Reader may become void if you do not follow the safety and maintenance instructions contained in this manual, or if the covers are removed by anyone other than approved service personnel.**

# 4.1 Routine Maintenance Procedures

The Reader requires very little maintenance, however, certain simple procedures should be carried out on a regular basis.

**On a daily basis:**

- Verify self test passes.
- Remove the microplate from the plate carrier, wipe the plate carrier down and return it to the In position.
- Wipe down the external surfaces. Section 4.2 contains more detailed cleaning instructions.

**On a weekly basis:**

- Review the results of the self-test that occurs when you switch the Reader on to make sure the instrument is functioning correctly. If you want to retain this information for your records, print out the self-test results (see Appendix A for a sample) or save them to a file.
- Back up the data files for a MRX*II* (remove the disk and back it up using the File Manager program on an external PC).

**On a yearly basis**:

- Remove the filters and clean them. Section 4.2 contains more detailed cleaning instructions.

Periodic maintenance should be determined by the user.

# 4.2 Cleaning

**Warning** **Always switch the instruments off and disconnect the power cable before cleaning the Reader.**

The Reader is constructed from high quality materials, nevertheless spilt saline solutions, solvents, acids or alkaline solutions must be removed from outer surfaces immediately to prevent damage.

## Autoclaving

**DO NOT autoclave any part of this instrument.**

## External Painted and Plastic Surfaces

Clean external surfaces with a mild laboratory detergent, followed by 10% bleach or 70% alcohol. Always dilute detergents according to the manufacturer's instructions.

## Filters

Clean the filters by wiping them with a lint-free cloth or a lens tissue. If necessary a little alcohol may be used with the cloth or tissue.

## Decontamination

If you need to return the Reader to the service center, and it has been in contact with human blood, other potentially infectious body fluids, pathological samples, toxic or radioactive materials, it must be decontaminated.

Before shipping the instrument, do the following:

- Clean the surface with a mild laboratory detergent followed by 10% bleach.
- Fill out an **Equipment in Transit** form (refer to Appendix B for a copy of the form).

# 4.3 Repacking the Reader

This procedure assumes that the original Reader packaging materials are being used. Figure 13 summarizes the repacking instructions.

1. Remove the optics door and take out the lamp and filters. When you replace the optics door, insert the optics door packing materials.
1. Pack the lamp and each of the filters separately.
1. Make that there is no microplate in the plate carrier, and no disk in the floppy drive.
1. Place the Reader in the original anti-static plastic bag.
1. Place the bottom end caps into the carton and lower the Reader into the carton. Fit the top end caps to the Reader.
1. Place the filters and lamp in the accessories box and fit this between the end caps.
1. Seal the box carefully and securely. Make sure that the box is not dropped or handled in a rough manner.

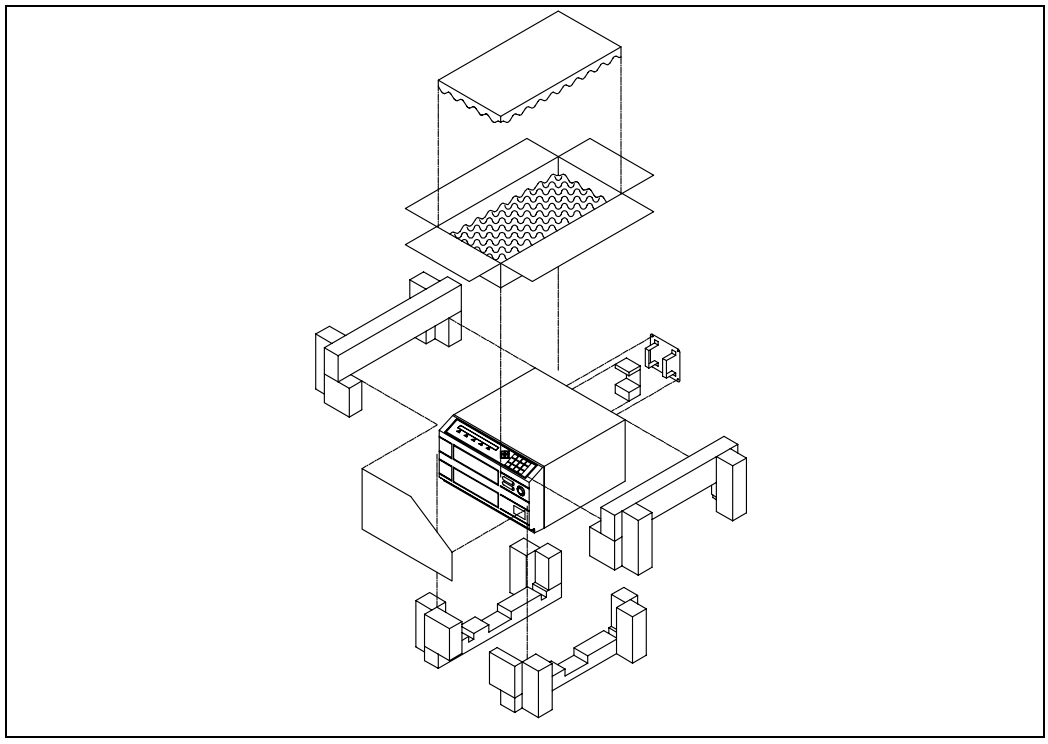

Figure 13 Repacking the Reader

# 4.4 Replacing the Lamp

**Warning** **If the Reader has been used recently, the optics door and the lamp in the optics assembly may still be hot. Allow time for the Reader to cool before touching it. Take care when removing the optics door as there may be broken glass in the optics assembly.**

Figure 14 summarizes the lamp replacement instructions.

☞ *Note: DO NOT touch the bulb or reflector directly.*

1. Switch off the mains power supply and disconnect the cable.
1. Using a No. 1 Posi driver remove the optics door.
1. Slide the optics assembly out of the instrument.

   *If you have an older instrument (check your serial number panel: newer Readers have 1CXCxxxx or 2CXCxxxx numbers), you need to disconnect the optics assembly's 10-way connector and then slide the assembly out of the instrument.*
1. Detach the lamp from the assembly and replace with a new one. Make sure that the lamp is seated correctly (refer to "Fitting the Lamp and Optical Filters" on page 17).
1. Slide the optics assembly back in *(if you have an older instrument, you must also reconnect the 10-way connector).*
1. Replace the optics door and reconnect the power supply.

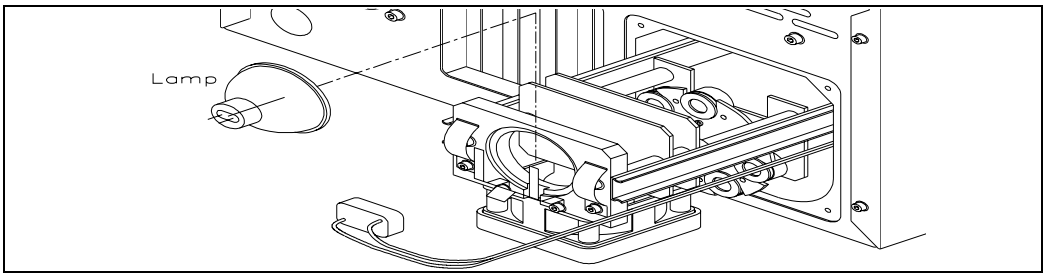


Figure 14 Replacing the Lamp

# 4.5 Changing the Optical Filters

**Warning** **If the Reader has been used recently, the optics door and the lamp in the optics assembly may still be hot. Allow time for the Reader to cool before touching it. Take care when removing the optics door as there may be broken glass in the optics assembly.**

Figure 15 summarizes these instructions.

☞ *Note: DO NOT touch the filters, bulb or reflector directly.*

1. Switch off the power supply and disconnect the mains cable.
1. Using a No. 1 Posi driver remove the optics door.
1. Slide the optics assembly out of the instrument.

   *If you have an older instrument (check your serial number panel: newer Readers have 1CXCxxxx or 2CXCxxxx numbers), you need to disconnect the optics assembly's 10-way connector and then slide the assembly out of the instrument.*
1. Remove the relevant filter from its socket in the filter wheel, and replace with the new one.
   - Make sure the side of the filter that has the shorter distance from the groove to the end is toward the lamp.
   - Make sure the Filter Springs are around the sides of the Filter as shown in Figure 10 on page 18. The Springs must not extend past the rear face of the Filter as shown in Figure 11 on page 18. Otherwise, the self-test will fail due to "Filter Motor Errors."
1. Slide the optics assembly back in *(if you have an older instrument, you must also reconnect the 10-way connector).*
1. Replace the optics door and reconnect the power supply.

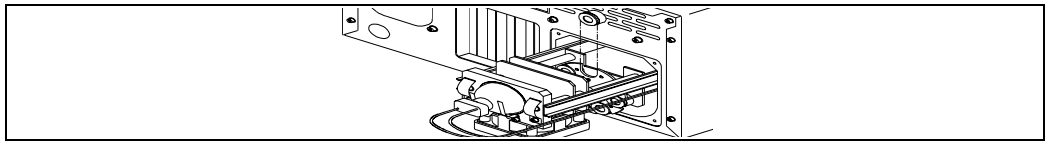

Figure 15 Changing the Optical Filters

☞ *Note: If you install new filters, you should run the test plate software. Be certain to run PARAMS to establish new baselines.*

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# Appendix A: Self-Test Diagnostics

On power up and (optionally) before every read, the Reader performs several self-tests. These cover:

| | |
|---|---|
| **A/D Status** | • Begins conversion and checks that the status line goes high and low.<br>• Verifies that hardware can be detected and chosen. |
| **Plate Motor** | • Moves the plate to Out position and then to the In position.<br>• Verifies that the plate carrier position sensors are operating correctly.<br>• Checks motor and sensors. |
| **Background Light** | • Checks for light leakage into the reading compartment. |
| **Bulb** | • Verifies that current is flowing through the bulb when it is switched on.<br>• Checks that the bulb has not blown. |
| **Filter Motor** | • Moves the filter motor to the first position.<br>• Checks the filter motor and optical alignment. |
| **Transmission Levels** | • Verifies that all fibres are capable of transmitting at least 33% of the maximum transmission level.<br>• Checks for blocked channels or broken diodes. |
| **Filters** | • Checks that gains can be selected for all filters.<br>• Checks for damaged or missing filters. |

# Self-Test Sample Printouts

```
                    SELF-DIAGNOSTIC SEQUENCE

Reader Serial # 2CXC2549              Technologist: . . . . .

Date    : 3/17/98
Time    : 11:15:02 AM



Test 1  : A/D                          Pass
Test 2  : Plate motor                  Pass
Test 3  : Background light levels      Pass
Test 4  : Bulb                         Pass
Test 5  : Filter motor                 Pass
Test 6  : Transmission levels          Pass
Test 7  : Filters                      Pass


Self-Diagnostic Summary

Reader Status : Ready
```

# Appendix B: Accessories

| Description | DYNEX Technologies Part Number |
|---|---|
| Barcode Reader, Wedge | 0119780410 |
| Cable, Printer | 1119760008 |
| Cable, RS-232 (9 pin to 9 pin) | 1119760007 |
| Cable, RS-232 (9 pin to 25 pin) | 50600120 |
| Euro Power Cord | 6090405008 |
| Filter 340nm | 6329780340 |
| Filter 405nm | 6329780405 |
| Filter 450nm | 6329780450 |
| Filter 490nm | 6329780490 |
| Filter 540nm | 6329780540 |
| Filter 550nm | 6329780550 |
| Filter 620nm | 6329780620 |
| Filter 630nm | 6329780630 |
| Lamp (UV)--shipped standard with single board unit | 549000600 |
| Dust Cover ($MRX_{II}$ and $MRX_{plus}$) | 9119780012 |
| Dust Cover ($MRX_{Revelation}$) | 9119780011 |
| Lens Cleaning Cloth | 41000070 |
| Service Manual single board | 99000500 |
| RS-232 Filter, 9 way D Connector | 50400380 |
| Test Plate 12 way (non UV) 450nm with Manual, Insert, and Sofware | 0119780004 |
| Test Plate 12-way (UV) with Manual, Insert, and Sofware | 0119780001 |
| Test Plate Software (for use with single board unit only) | 04000100 (upgrade for $MRX_{plus}$)<br>04000110 (system for $MRX_{II}$) |
| US Power Cord | 6090405009 |

| | |
|---|---|
| MRX$_{II}$ User Manual | 17000010 |
| MRX$_{plus}$ User Manual | 17000020 |
| MRX$_{Revelation}$ User Manual | 17000030 |

DYNEX
TECHNOLOGIES

**EQUIPMENT IN TRANSIT**

***IMPORTANT:*** Please include a copy of this form with each instrument. If your instrument contains a hard drive, please retain back-up copies of any stored files. Failure to do so may result in the loss of those files.

Return Authorization Number: _____
Contact Technical Service, DYNEX Technologies
phone: (703)631-7800
fax: (703)803-7816
Equipment: _____
Serial Number: _____

**EQUIPMENT DECLARATION**

Clearly indicate fault condition or reason for return.

**CERTIFICATE OF DECONTAMINATION**

I certify that the equipment described above has been disinfected/decontaminated* and is clean, dry and fit for transport.

Signed: _____
Title: _____
Date: _____

(DYNEX Technologies reserves the right to refuse improperly cleaned equipment)

Shipping Address: DYNEX Technologies
Attn.: (Above return number)
14340 Sullyfield Circle
Chantilly, VA 20151-1683

***Suggested decontamination methods:**

Readers- Wash all surfaces with a 10% bleach solution, Follow that with a mild detergent solution.

Washers- Please follow the "Decontamination Procedure" found in the back of the manual.

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# Appendix C: Specifications

## Software Specifications

| | |
|---|---|
| **Menu language** | English/French/German/Italian/Spanish |
| **Clock function** | Day, date and time |
| **MRX*II*** | **Standard:** Endpoint Program<br>**Optional:** Kinetic Program and Agglutination Program |
| **MRX*plus*** | **Standard:** Endpoint Program, Kinetic Program, and Agglutination Program |
| **MRX*Revelation*** | **Standard:** Revelation Program |
| **Program Load Time** | Using MRX*II*: < 40 seconds<br>Using MRX*plus*: < 1 second |

## Hardware Specifications

### MS DOS Version

| | |
|---|---|
| **Keypad** | 21 key tactile membrane |
| **Display** | 2 line by 40 character LCD |
| **No. of filters** | 2-6 |

### Windows Option

| | |
|---|---|
| **Keypad** | QWERTY |
| **Display** | Super VGA Color |
| **No. of filters** | 2-6 |

## Performance

| | | |
|---|---|---|
| **Read cycle time** | Single Wavelength: | < 4 seconds |
| | Dual Wavelength: | < 6 seconds |

## 405 to 850nm Wavelength Range

| | | |
|---|---|---|
| **Dynamic range** | | -0.100 to +4.000 OD |
| **Linearity**† | *0.000 to 2.000 OD:* | ± 1.0% |
| | *2.001 to 3.500 OD:* | ± 1.5% |
| **Filter band width** | *(FWHM)* | 10 nm ± 2 nm |
| **Center Wavelength Accuracy** | | ± 2 nm |
| **Precision*** | *0.000 to 2.000 OD:* | 0.2% CV or 0.005 OD whichever is greater |
| | *2.001 to 3.000 OD:* | 0.6% CV |
| | *3.001 to 3.500 OD:* | 1.0% CV |
| **Accuracy** | *0.000 to 3.500 OD:* | 2.5% or 0.005 OD whichever is greater |

## 340 to 400 Wavelength Range (Option)

| | | |
|---|---|---|
| **Dynamic range** | | -0.100 to +3.000 OD |
| **Linearity**† | *0.000 to 2.500 OD:* | ± 2.0% |
| **Filter band width** | *(FWHM)* | 18nm ± 2 nm |
| **Center Wavelength Accuracy** | | ± 2 nm |
| **Precision*** | *0.000 to 2.000 OD:* | 0.6% CV or 0.005 OD whichever is greater |
| | *2.001 to 2.500 OD:* | 1.0% CV |

† Linearity is the maximum percentage deviation of a reading from the ideal straight line plot of OD versus concentration. (Measured by the manufacturer at 410nm in the visible range and 340nm in the UV range).

***** Precision is the mean Coefficient of Variation (CV) figure for all wells on a plate that has been read 20 times in succession. (Measured by the manufacturer at 410nm in the visible range and 340nm in the UV range).

# Interface

| | |
|---|---|
| **Printer Interface** | Parallel Centronics Compatible with up to 850 printers.<br>All printers must be compliant with EMC directive 89/336.<br>A number of standard printer drivers are included. If your printer is not one of these, contact the service center. |
| **Computer Interface** | Bi-directional RS232C with user-definable protocol. |

# Electrical

| | |
|---|---|
| **Light source** | 75W tungsten halogen lamp |
| **Mains input** | 100 to 120V or 200 to 240V<br>50 to 60 Hz |
| **Power consumption** | 500 VA |
| **Fuses** | There are no internal user-replaceable fuses. The power supply contains a CSA approved 20x5mm, 4A cartridge fuse with a voltage rating of 250V in the primary circuit. If the fuse blows, contact the service center. |
| **Mains Power Fuse (U.K. mains plug/powercord)** | 5A |
| **Safety** | Class I apparatus |

# Physical/Environmental Conditions

| | |
|---|---|
| **Weight** | 12.5 kg (27.5lb) |
| **Dimensions** | D390 x W360 x H220 mm |
| **Operating Temperature** | 10 – 40°C |
| **Operating Humidity** | 10 – 90% RH |
| **Storage Temperature** | 0 – 50°C |
| **Storage Humidity** | 10 – 90% RH |
| **Altitude** | < 2000m |

# Appendix D: MRX Training Checklist

The MRX Training Checklist is provided as a guide to ensure the critical functions of installation, operation, maintenance and use of software have been reviewed.

## MRX All Types

- ☐ Reader set-up
- ☐ Serial number
- ☐ Power outlet, on/off button, communication ports and floppy drive
- ☐ Lamp, filters and software
- ☐ Printer set-up (and other peripherals)

### Maintenance

- ☐ Replace lamp
- ☐ Change filters
- ☐ Cleaning

### Run Verification Plate

### Review User's Manual Table of Contents

### Review List of Software Anomalies (If Any)

# MRX$_{II}$

## Power On -- Self-Diagnostic Test

- ☐ Print self-test

## Proper Care of Disks and Backup of Assays and Data Stored on Disks

## Endpoint Software

### Set-Up

- ☐ Filters
- ☐ Printer (check setting anytime printer goes off-line)
- ☐ Clock
- ☐ MRX parameters
- ☐ Maintenance schedule
- ☐ Communication parameters -- interface with external computer (see next section)

### Creating a New Test

- ☐ Test numbers, names and plate ID
- ☐ Shaking
- ☐ Defining a template
  - ⇒ Well types (B,S,T,C…user-definable)
  - ⇒ Replicates
  - ⇒ Fill (row, column)
  - ⇒ Change
- ☐ Wavelength mode (single, dual, multiple)
- ☐ Blanking options
- ☐ Optical Density (OD) Data Matrix

- ☐ Data reduction
  - ⇒ Curve-Fitting
  - ⇒ Thresholds
  - ⇒ Ratios
  - ⇒ Differences
  - ⇒ QC equations
  - ⇒ Area statistics
- ☐ Password protection

Editing a Test

Running a Test and Recalling Data

Printing -- Data/Tests/Directories

## Utilities

- ☐ Manual control of the reader
- ☐ Long and short menus
- ☐ Version
- ☐ Statistical data
  - ⇒ Coefficient of Variation
  - ⇒ Statistical data for stored plates
- ☐ Batch
- ☐ Spectral Response Curve

## Temperature Control

- ☐ Safety information
- ☐ Features
- ☐ Software installation
- ☐ Setting the temperature

## Kinetics Software

- ☐ Features - values determined from a reaction curve
- ☐ Calculation mode
  - ⇒ Endpoint
  - ⇒ Kinetics -- Delta
    Total - total rate of change in OD/Min.
    Best - greatest rate of change in OD/Min.
    Linear - average rate of change in OD/Min.
  - ⇒ Kinetics -- Time
    OD (time to a certain OD)
    OD/Min (time to a certain rate of reaction)
    Relative (time to an OD relative to the first OD taken)
  - ⇒ Kinetics -- single well monitoring
  - ⇒ Options
    Increasing or decreasing OD
    Time intervals
    No. of readings
    Scaling -- Results Log
  - ⇒ Display a well
- ☐ Creating a New Test
  - ⇒ Test numbers, names and plate ID
  - ⇒ Shaking
  - ⇒ Defining a template
  - ⇒ Wavelength mode (single, dual, multiple)
  - ⇒ Blanking options
  - ⇒ Start mode
    Immediate
    OD
    OD/Min.
    Time
  - ⇒ Data reduction
    Curve-Fitting
    Thresholds
    Ratios
    Differences
    QC equations
    Area statistics

- ☐ Editing a test and ODs
- ☐ Running a test and recalling data
  - ⇒ Kinetic output
    All (matrix of plots of 96-Wells)
    Zoom (plot of single well)
    Row and column plots
- ☐ Printing -- data/tests/directories

## Agglutination Software

- ☐ Agglutination mode
  - ⇒ Principles
  - ⇒ Interpreting results
  - ⇒ Calculation modes (Formula and Rules)
- ☐ Tissue Culture Growth (TCG) mode
  - ⇒ Principles
  - ⇒ Interpreting results
- ☐ Creating a new test
  - ⇒ Test numbers, names and plate ID
  - ⇒ Shaking
  - ⇒ Filter selection
  - ⇒ Read mode -- Agglutination
    Noise filtering
    Transmission graphs
    Defining a template
    Data Log
    Calculation mode
    Threshold matrix
    Recalculating results
  - ⇒ Read mode -- Tissue Culture Growth (TCG)
    Plate speed
    Readings per well
    Defining the template
    Blanking
    Results matrix
    Transmission graphs
    Threshold matrix
- ☐ Editing a test

- ☐ Running a test and recalling data
- ☐ Printing -- data/tests/directories

# MRX*plus* or MRX*II* from an External Computer Using Revelation Software

## Self-Tests

- ☐ Print the self-test

## The Utility Menu

- ☐ Configure reader
  - ⇒ Internal MRX/External MRX
  - ⇒ Set-up MRX
  - ⇒ Filters
- ☐ Spectral Response Curve
- ☐ Sample ID entry
- ☐ Options
  - ⇒ Quick assay buttons
  - ⇒ Preferences
    Automatic data save
    Auto print
    Plate ID
  - ⇒ Laboratory information
  - ⇒ Directories
- ☐ System password

## Pull-Down Menus/Tool Bar/Short Cut Keys/Assay Buttons

- ☐ New assay
  - ⇒ Endpoint
  - ⇒ Kinetics
- ☐ Open various types of files
  - ⇒ Assays/data/sample IDs/text files/curves
- ☐ Importing files

## Creating an Assay -- Assay Wizard

- ☐ Title/password/bar code
- ☐ Reader control
  - ⇒ Read modes
    Single/Dual
    Multi-Wavelength
    Agglutination
  - ⇒ Shake modes
  - ⇒ Start/Stop modes
  - ⇒ Kinetics
    Time interval
    Calculation mode (OD/Min. modes, Time modes, Moving Average, Cut-Off)
    Graphs
- ☐ Defining a template
  - ⇒ Well types (B,S,T,C…user-definable)
  - ⇒ Replicates
  - ⇒ Fill (row, column, random)
  - ⇒ Change template
- ☐ Blanking options
- ☐ QC equations for raw data

- ☐ Data reduction
  - ⇒ Curve-Fitting
    Standards
    Fit types and axes
    Combine on same graph
    Use stored fit
    Calculated QC
    Data conversion
    Output format
  - ⇒ Thresholds
    Threshold equations
    Segments
    Labels
    QC
    Output format
  - ⇒ Ratios
  - ⇒ Spreadsheet
- ☐ Report options
  - ⇒ Report layout
  - ⇒ Data Matrix
  - ⇒ Text file
    Options
    Open Microsoft® Excel® and import text file
- ☐ Assay options
  - ⇒ Area statistics
  - ⇒ Sample IDs
  - ⇒ Processing order

## Running a Plate

- ☐ Auto save/print/search for sample IDs
  - ⇒ Run a partial plate even though all wells are defined by well type
- ☐ Adding assays to the check list
  - ⇒ Multiple assays on a plate

## Data Menu

- ☐ Reprocessing data
  - ⇒ Data refresh
  - ⇒ Select new assay
- ☐ Variable parameters
- ☐ Reagent lot number
- ☐ Outlier removal
- ☐ Titration multiplier
- ☐ Fit information
- ☐ Kinetic graphs
- ☐ Sample IDs

## View Menu

## Utilities Menu

- ☐ Plate-Plate statistics

## Temperature Control Option

- ☐ Features
- ☐ Setting
- ☐ Control Log

## Barcode Option

- ☐ Types
- ☐ Features

## Agglutination Option

- ☐ Plate speed
- ☐ Calculation modes
- ☐ Transmission graphs
- ☐ Data Log
- ☐ Removing readings
- ☐ Filtering noise
- ☐ Calculating results as a percentage of a specific well

# Index