Service Manual

Microplate Reader

Expert Plus

EZ read 800

EZ Read 800 Plus

Version: 5.1

Model	Display	Data connection
Expert Plus	Yes	RS232
EZ read 800 Plus	Yes	Mini USB
EZ read 800	No	Mini USB

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1.0 Health and Safety

Please note that only suitably qualified service engineers should open up and work on this equipment due to the hazards involved.

1.1 Warnings and Hazards

There a number of warning labels and symbols on your instrument. These are there to inform you of a potential danger that may exist or where particular caution is required. Before commencing installation, please take time to familiarise yourself with these symbols and their meaning.

Safety Symbols			
Meaning	Warning	High voltage	Biohazard

High Voltage

High voltages exist inside these instruments. Do not remove covers whilst connected to the mains supply.

Repair, maintenance and service should only be carried out by individuals trained specifically to work on these instruments and that have been made aware of the potential hazards.

Trained Users

These instruments are intended to be used by individuals trained in and familiar with, the use of plate readers and washers and their associated hazards. In the event of a malfunction or hazard occurring, disconnect the unit from power and isolate for decontamination and /or repair.

Lamp Source

Lamp sources used within the reader units produce a light beam that passes through the well positions and is normally confined within the instrument. The unit should not be operated with the covers removed as prolonged exposure to the beam intensity and potential UV content of the beam could cause eye damage.

Personal Protective Equipment

There are no bio-hazardous materials within the instrument; however, this microplate reader may well be used with bio-hazardous samples. Before using the instrument the user should have in place decontamination procedures designed to protect laboratory workers from occupationally acquired infections. A set of suggested decontamination procedures for microplate readers are provided in this manual.

Decontamination. Equipment should be maintained in a clean state. Equipment returned for repair should include an appropriate decontamination certificate (refer to website: http://www.biochrom.co.uk/content/1/65/returns.html)

Any chemicals used with the microplate reader should be used, stored and disposed of in accordance with manufacturer's guidelines and local safety regulations.

Toxic Fumes. Efficient laboratory ventilation must be provided when working with volatile solvents or toxic substances.
Waste disposal. Disposal of some solvents and chemicals may be classed as hazardous waste and must be dealt with in accordance with local regulatory practice.
Personal protective equipment including but not limited to gloves, laboratory coats and safety glasses is recommended when using this instrument. A local risk assessment should be performed to determine the extent of required PPE.

Changes or modifications
Any changes or modifications made to the instrument could void the user's authority to operate the instrument.
If the instrument is operated in a manner not specified, then the protection provided by the equipment may be impaired and the instrument warranty withdrawn.

1.2 Rated Operating Conditions

Name	EZ Read 800 (plus) / Expert Plus
Ambient temperature	+10 to + 35° C (operation) 25°C - +50°C (storage)
Consumption	65VA
Dimensions (W x H x L)	27 x 24 x 43cm (10.8 x 9.6 x 17.2 inches)
Frequency range	47 - 63 Hz (auto-sensing)
Height over sea level (operation):	up to 2000m
Power Requirements	100 to 240 VAC 50/60Hz 65VA
Fuse	3.15A TH 250VAC
Outer lighting influences	Precaution, avoid direct sunlight
PC connection	EZ read 800 (plus) USB A to USB B mini cable / Expert Plus RS232
Relative humidity	5 to 95%, non-condensing (storage only)
Warming-up time	None required
Weight	10 kg (No special instructions are required for lifting or moving the instrument)

1.3 Cleaning and Disinfecting the Instrument

For disinfection, authorized trained personnel must operate in a well-ventilated room while wearing disposable gloves, protective glasses and clothing.

A declaration of decontamination form is given in Appendix 1 (at the end of this document). This should be completed and signed by the person who decontaminates the equipment.

Details of cleaning procedures are listed below.
To disinfect the instrument:
Switch off the reader and disconnect it from the mains power supply and the PC.

Carefully wipe off the entire reader with lint-free tissues that have been moistened in a protein degrading mild detergent or a saline solution.

Carefully wipe off the entire reader with non-lint tissues that have been moistened in a 70% ethanol or a 0.5% bleach solution.

Soak non-lint tissues in a 70% ethanol or a 0.5% bleach solution and place onto the plate transport mechanism and let it soak for ± 30 minutes.

If a bleach solution has been used, carefully wipe off the entire reader with non-lint tissues that have been soaked in water.

Dry the reader by wiping it off with non-lint tissues.

Please Note: Before the reader can be returned to base for service, it must be disinfected and a Declaration of Decontamination Certificate must be completed. This document can be downloaded from the Biochrom website: http://www.biochrom.co.uk/content/1/65/returns.html
The instrumentation will not be accepted for servicing or return until the above form is completed fully. Instrumentation that has not been cleaned sufficiently or decontaminated may be subject to additional charge.

1.4 Emergency Instructions

In the event of an emergency, the instrument should be disconnected from the power supply, power source and PC.

2.0 Introduction

2.1 General Description

The EZ read 800 (Plus) and Expert Plus instruments are a microprocessor controlled 8-channel microplate reader designed to measure the optical density of liquids in the wells of 96-well microplates. It combines a large, graphics display with easy to use on-board software, making it ideal for use in any laboratory performing ELISA and other colorimetric microplate assays. It can perform single and dual end point measurements at any two wavelengths between 400 and 800nm. Quantitative, qualitative and Kinetics assays can be easily defined and stored in the non-volatile memory. Up to 100 sets of measured data can be stored and recalled for later evaluation.

2.2 Technical Specifications

Parameter	***Specification of EZ read 800 (plus) / Expert Plus***
Measurement range:	0--4.000 O.D
Wavelength range:	400 to 800 nm
Accuracy:	+/- 1% and +/- 0.005 O.D. at 2.5 OD.
Precision:	+/- 0.5% and +/-0.005 OD. at 2.5 OD
Reading speed:	5 seconds single wavelength
Interference filters:	405, 450, 492 and 620 nm .Up to 6 filters possible
Light source:	Halogen lamp,50W
Measurement system:	8-channel optical system with self-calibration and self-check
Display:	On plus version only - Graphic LCD, 240 x 128 dots
Keyboard:	24-keys
Printer interface:	EZ read 800 (plus) No printer interface / Expert Plus Parallel
Computer interface:	EZ read 800 USB A to Mini USB / Expert Plus RS232-C
Power:	90 to 250V AC, 50/60 Hz, 80 VA
Dimensions:	28 x 43 x 24 cm (W x D x H)

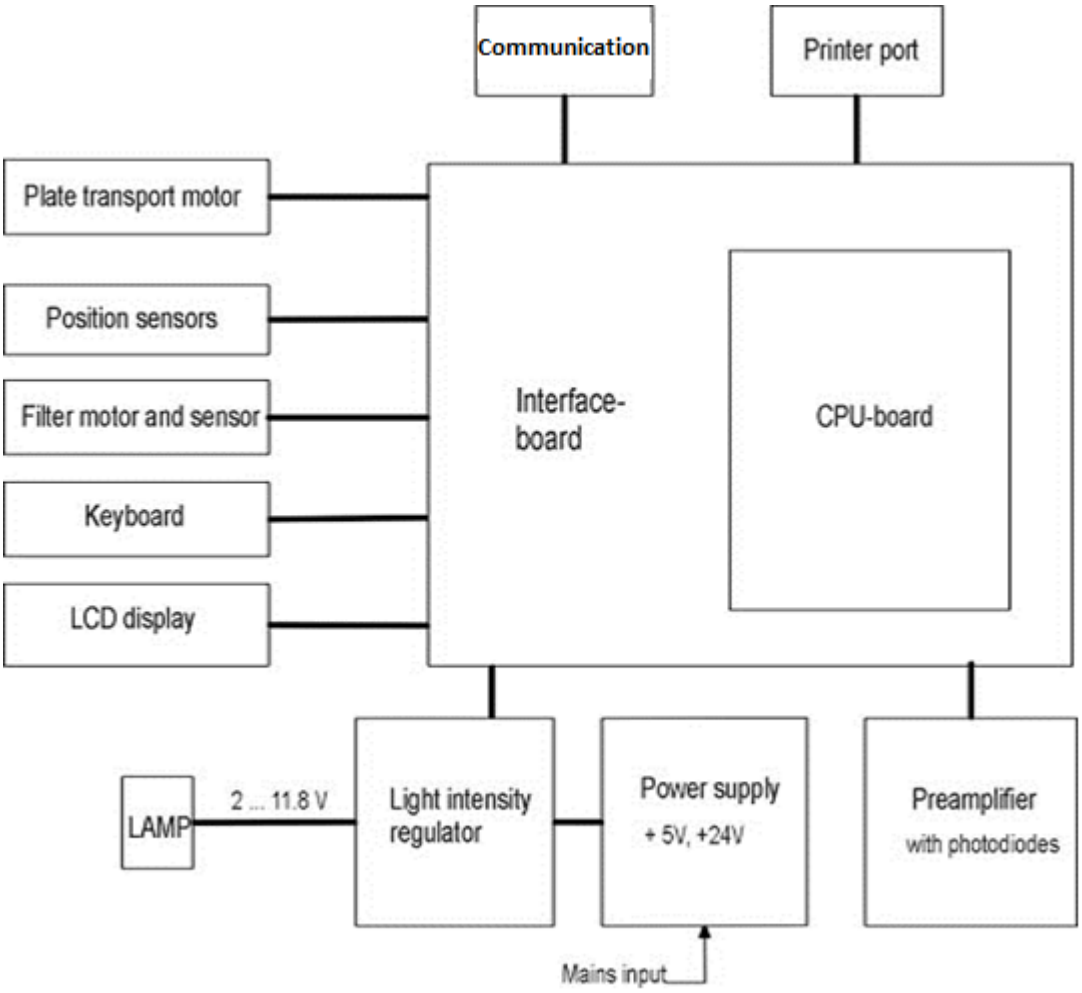
3.0 Theory of Operation

3.1 Introduction

This chapter gives the description of the main components, the optical system layout and description.

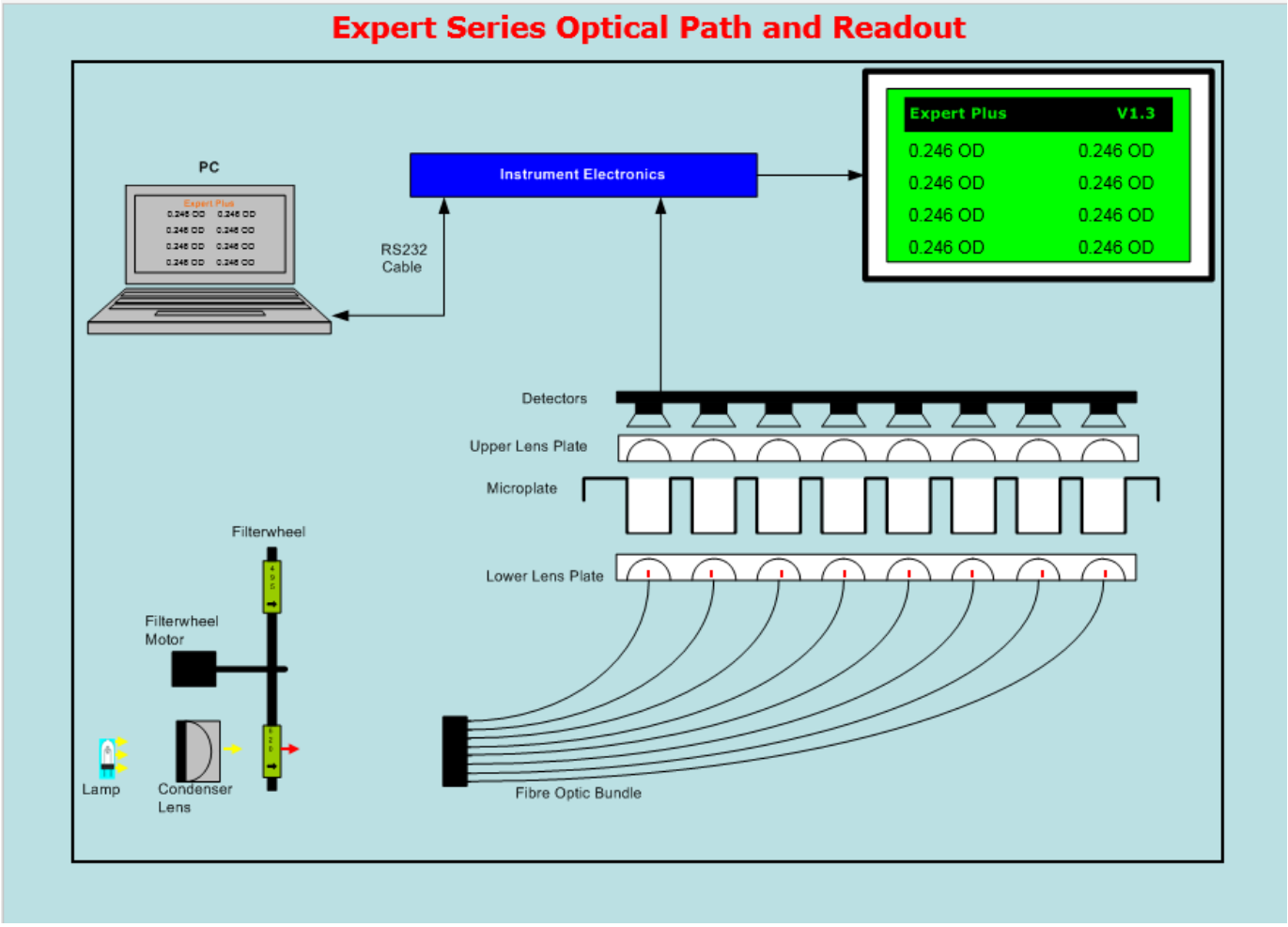
3.2 Main components

The main components of the instrument are the CPU board, the pre-amplifier board with the photodiodes, the plate transport mechanism, the light source, the filter wheel and the power supply unit. The following block diagram shows the interconnection of all main components:



3.3 Optical system

The optical system consists of the lamp, the condenser lens, the interference filters on the six position filter wheel, the fibre bundle, a focusing lens for each of the eight measurement channels and eight silicon photodiodes with a focusing lens in front of each detector.



3.4 Process Control

The CPU of the Expert Plus reader can control the lamp intensity by means of a 16-bit Digital-Analogue converter in combination with the lamp power-supply. This is controlled by the CPU board.
The digital light control makes it possible to detect lamp aging before the lamp has reached the end of its lifetime.
Another important feature is the active filter detection. If light intensity for a wavelength is different to the value stored in the memory, an error message will be displayed. Any wrongly inserted or defective filter will therefore cause an error message.

3.5 Calibration run

The calibration run should be done every time a filter is added, replaced or removed. During the calibration run the lamp intensity for each wavelength is adjusted to a value that guaranties optimum measurement conditions and highest resolution.
These values are stored in the instrument memory. Before each measurement, the actual required light intensity is compared with the stored value, and in this way the system ensures that filters are correctly positioned and are in good condition.

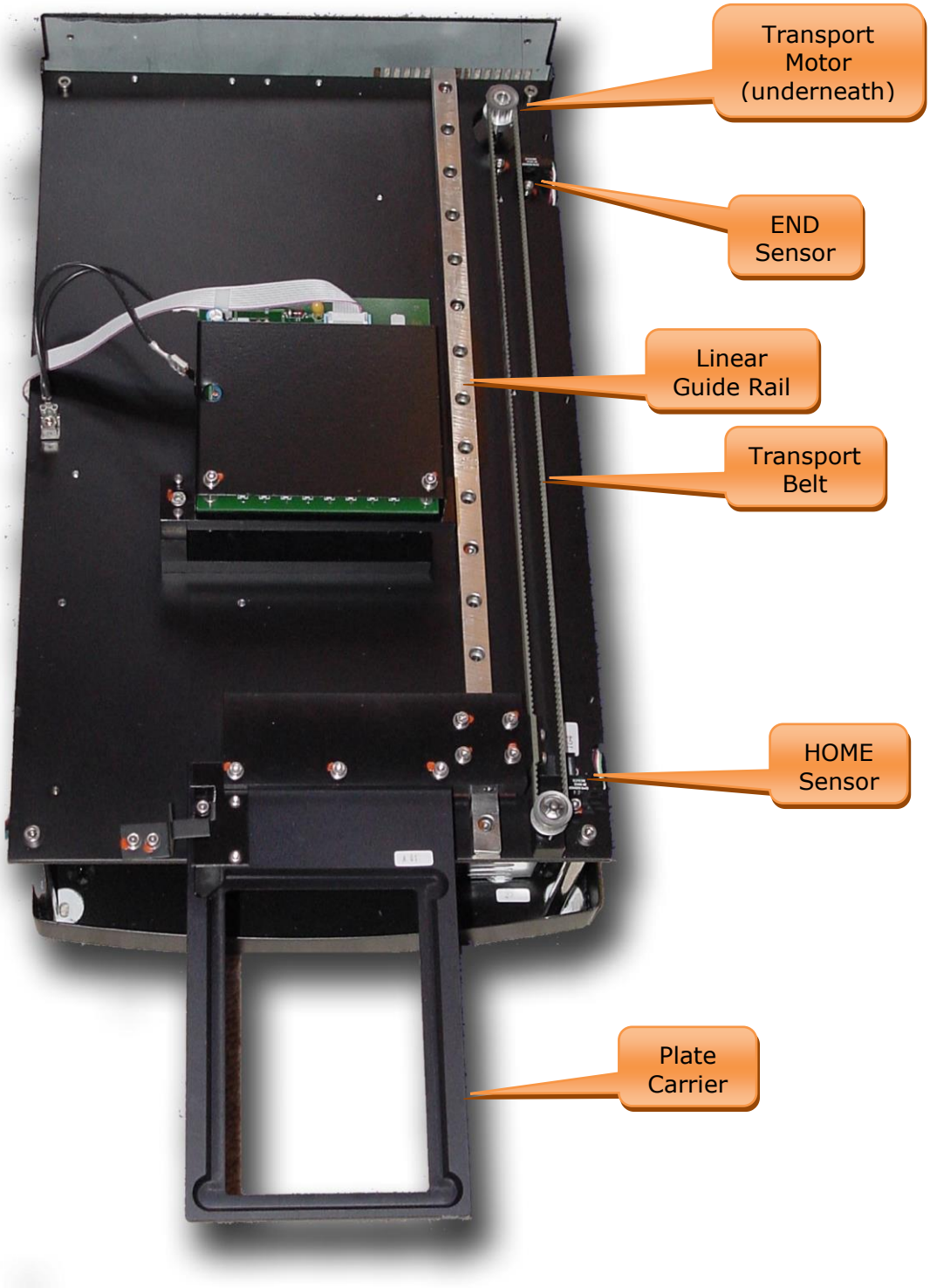
3.6 Measurement

After the initial calibration run, the required light intensity for each wavelength is “known” by the system, this means that for any subsequent measurements the light intensity is set to the stored value and only a check as described below is performed.
The plate carrier moves partially inside the reader to avoid influence of external light. The measured light intensity for each channel is compared with the one obtained during the calibration. When the light intensity is within the tight tolerance range, the intensity is monitored for approximately 2 seconds and then the measurement starts. In case the difference is higher than the set limit but below the warning level the light intensity is readjusted, so that optimum conditions are achieved.
When the difference of the light intensity is too high, an error message is displayed and the measurement is terminated. Also when one channel is below a set limit, a respective error message is shown.
If no errors occur, the output for each of the eight channels, known as the 100% value, is stored and the plate transport starts moving.
At a position where the plate carrier blocks the light path, the so-called Zero measurement is taken. Then several measurements are taken in the centre of each well and then the average for each well is calculated. After the measurement is finished, the absorbance is calculated under consideration of the 100% values and the Zero-measurement. The results are then transmitted to the CPU for further calculations.

3.7 Plate transport system

The plate transport system consists of the plate carrier, a linear guide and a stepper motor driving the belt. The Plate Carrier itself features an auto centring function, so that any plate type can be inserted easily and is being brought into correct position as soon as the plate carrier moves the plate inside the instrument for reading.

The total movement – range of the plate carrier is limited and controlled by two optical sensors at the front and the end of the movement range.



3.8 Keyboard and Display (Expert Plus/EZread800 Plus only)

The display and the keyboard of the instrument represent the user interface and the components for the operator to communicate with the instrument.

The Display **is a graphical LCD display.**
The Keyboard **gives access to all functions and menus of the instrument; it comprises:**
4 Function keys (F1 – F4)
Service menu entry key
Numerical keys 0 – 9, comma
Back / Delete key
Enter Key
Esc (Escape) Key
4 Cursor Keys

The 4 Function keys **are used for selecting menu points that are directly displayed above the respective key. The menu points vary, depending on the menu or submenu selected.**

Example: Setting time and Date
F1 will scroll through the available date formats
F2 will scroll through the available time formats
F4 will save the set time and exit the menu

The **Service menu entry key** is required to enter the Instrument Service Menu (see chapter 5)

The **Numerical keys** and the **Decimal point key**, as well as the **Back/Delete key** are used for entry of numerical values, whenever required during operation the instrument

The **Enter key** is used to confirm entered values, make selections etc.

The **Esc key** is used to exit from menus and submenus. Pressing the esc key, will leave the actual menu and bring to instrument back to the previous level menu.

The **Cursor keys** are used to select menus, menu points and entry fields.

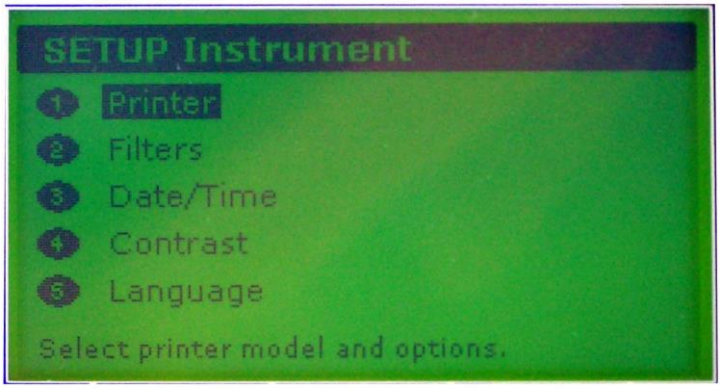
The **Power "On" LED** verifies that the instrument is switched on. This may be useful in case the display remains dark due to any malfunction, even after the instrument has been powered on.

4.0 Instrument Setup Menu

4.1 Introduction

This chapter gives the description of the Instrument Setup software menu.
When the instrument is first switched on, or during standby, the display shows following main (home) screen:

To enter the Instrument Setup Menu, press key “5”. The instrument now enters the Setup menu and displays the following screen:



4.2 Functions of the Setup Menu

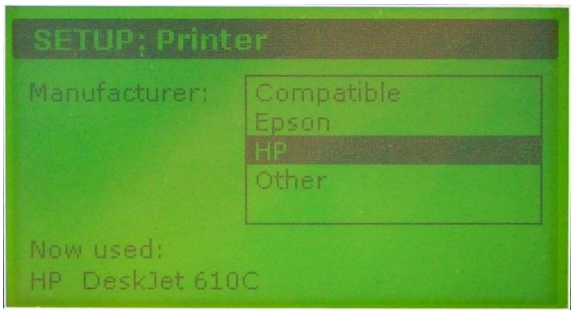
The possible settings in the Instrument Setup Menu are:

Printer:	Printer Manufacturer and Model
Filters:	Calibrate Filters
Date/Time:	Set Date and Time Format
Contrast:	Set the Display Contrast
Language:	Select the preferred language for display messages

The next pages explain the settings in detail.

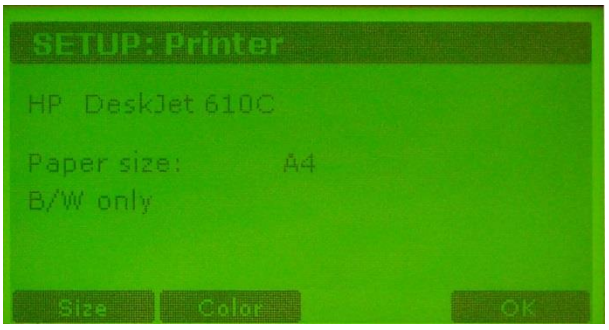
4.2.1 Printer type/model selection

The instrument has a range of printer drivers pre-programmed, these however are all for old printers that are no longer available. This setting is used to define which printer is connected to the instrument, so that the correct printer driver is being used.
Enter the Instrument Setup Menu as described in chapter 4.1. When the Instrument Setup menu start screen is displayed, select the menu point “Printer” by pressing the numerical key “1” and the display will show the following screen:



Using the keys “Cursor Up” and “Cursor Down” select the manufacturer of the printer you are using with the instrument. Confirm your selection with the “Enter “key.
As soon as the selection has been confirmed, you are requested to select the model from the list of the previously selected manufacturer:

Using the keys “Cursor Up” and “Cursor Down” select the manufacturer of the printer you are using with the instrument. Confirm your selection with the “Enter” key.
As soon as the selection has been confirmed, you are requested to enter the paper format used, and if the printer should print in color or in B/W:

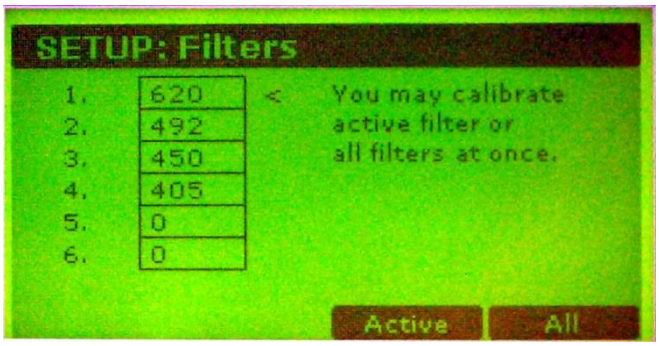


By pressing the key “F1” you can toggle between the available paper sizes

By pressing the key “F2” you can toggle between Color and B/W (if available for this printer)
By pressing the key “F4” the selections are being stored into the instruments memory, and the instrument will return to the Instrument Setup Menu start screen.

4.2.2 Setup Filters

This menu point is used for entering / changing filter wavelengths when new / other filters are being inserted, and for calibrating filters.
Calibrating the filters is required after first installation of the instrument. Also, when replacing one or more of the optical filters, the optical system must be calibrated to these (see more detailed explanation in chapter 3.5.1.2).
Enter the Instrument Setup Menu as described in chapter 4.1. When the Instrument Setup Menu Start screen is displayed, select the menu point “Filters” by pressing the numerical key “2” and the display will show the following screen:



4.2.2.1 Set / Change Filter Wavelength:

By using the keys “Cursor Up” and “Cursor Down” move the selector (<) to the required filter position. The wavelength setting for the selected filter position will start to blink. Enter the new wavelength by using the numerical keys.
When the wavelength has been entered, press the key “F3” for calibration of the optical system to the new inserted filter. Only after this calibration will the new wavelength be accepted and stored into the instruments memory.

4.2.2.2 Calibrate Filters:

Either single filter positions or all filters can be calibrated. It is recommended to calibrate all filters. To calibrate all filters, press “F4”; to calibrate one specific filter, use the keys “Cursor Up” and “Cursor Down” to select the required filter and then start the calibration by pressing “F3”.

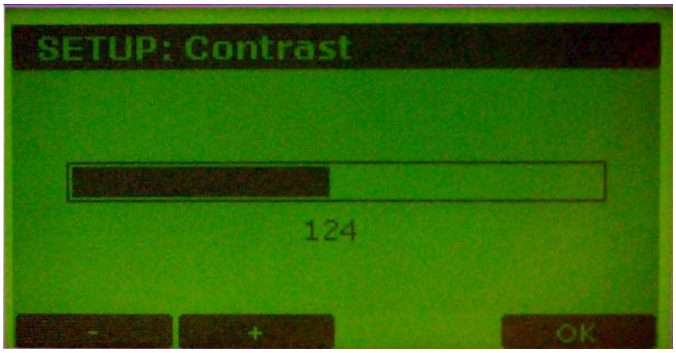
4.2.3 Date / Time Setting

Enter the Instrument Setup Menu as described in chapter 4.1. When the Instrument Setup Menu Start screen is displayed, select the menu point “Date/Time” by pressing the numerical key “3” and the display will show the following screen:

Press “F1” to select between the available date formats (*dd.mm.yy* or *mm-dd-yy* or *yy/mm/dd*)
Press “F2” to select between the available time formats (24H/M or M/24H)
Enter the correct date using the numerical keys.
Use the keys “Cursor Up” and “Cursor Down” to switch between Date and Time setting
Enter the correct time using the numerical keys.
Press “F4” to confirm settings and store them into the instrument memory.

4.2.4 Display Contrast Setting

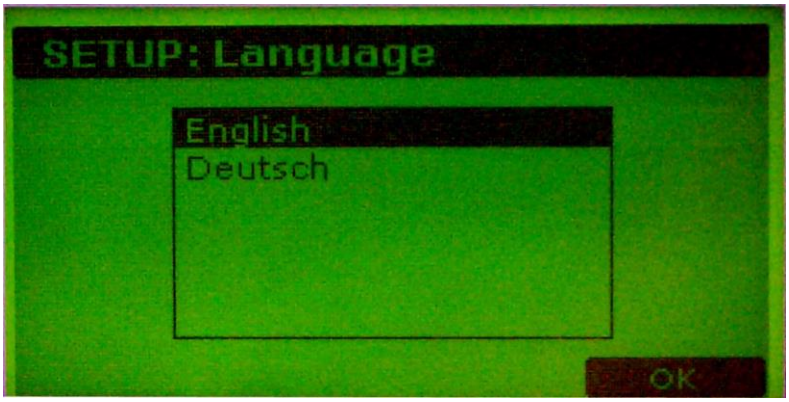
Enter the Instrument Setup Menu as described in chapter 4.1. When the Instrument Setup Menu Start screen is displayed, select the menu point “Contrast” by pressing the numerical key “4” and the display will show the following screen:



Press “F1” to increase display contrast
Press “F2” to decrease display contrast
Press “F4” to confirm settings and store them into the instrument memory.

4.2.5 Language Setting

Enter the Instrument Setup Menu as described in chapter 4.1. When the Instrument Setup Menu Start screen is displayed, select the menu point “Language” by pressing the numerical key “5” and the display will show the following screen:



Use the keys “Cursor Up” and “Cursor Down” to switch between “English”, “Portuguese” and “Deutsch”
Press “F4” to confirm settings and store them into the instrument memory.

4.2.6 Exit the Instrument Setup Menu

At the end of each setting, when performed correctly, the instrument will always return to the start screen of the instrument setting menu. Pressing the key “esc” at that point, will exit the instrument setup menu.
However, pressing the key “esc” at any menu / submenu will always bring the instrument to the next higher level of the software menu structure. At the end the instrument will display the standby screen:

5.0 Service / Diagnostic Menu

5.1 Introduction

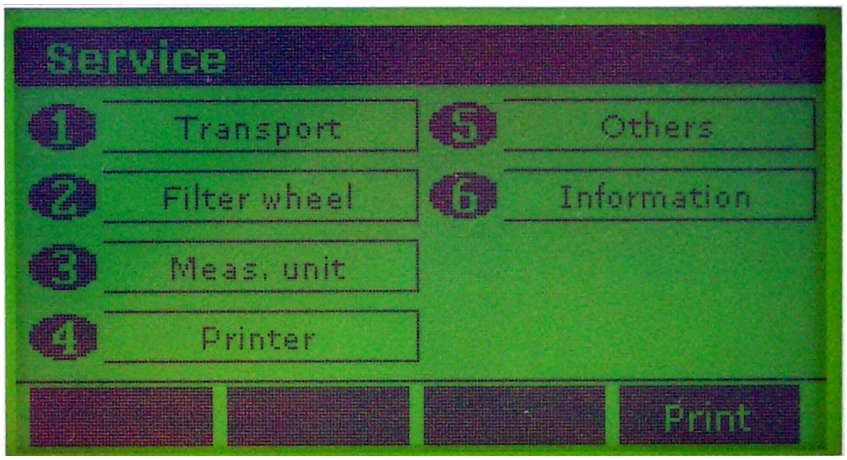
This instrument is fitted with a highly sophisticated service and diagnosis software for verification of instrument functions, trouble shooting and special settings.
This chapter will explain the functions and the handling of this menu.

5.2 Enter the Instrument Service / Diagnostic Menu

When the instrument is first switched on, or during standby, the display shows following screen:

This menu allows settings that, if performed by un-authorised personnel or not performed properly, may cause major malfunctions of the instrument!

To enter the Service/Diagnosis menu, press the key “  ”. The instrument will now request you to enter the password.
Use the numerical keys to enter the password: 5020 and confirm with “enter”
The instrument now enters the Service/Diagnostic menu and displays the following screen:



5.3 Functions of the Service/Diagnostic Menu

The possible settings/checks in the Service/Diagnosis menu are:

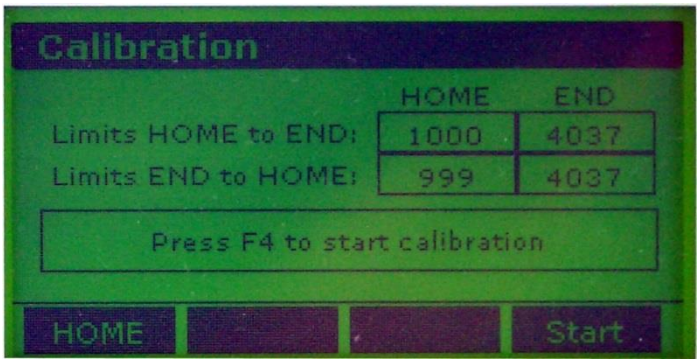
Transport: Calibration and Position test
Filter Wheel: Calibration, Position test and Zero setting
Meas. Unit: Diode Tests, Filter Calibration, Simulated reading (Duration test), Recall of measured plates, Set Plate definitions.
Printer: IO Port setting, Printer type setting, HW setting, Printer Test
Others: Check Sensors, DAC – output, Test Keyboard
Information: Information on versions of onboard firmware / software

5.3.1 Service - Submenu “Transport”

This submenu allows to calibrate the plate transport and to check specific positions, and to move the plate transport “manually” step by step.
Enter the Service/Diagnosis Menu as described in chapter 5.2. When the Service/Diagnosis menu start screen is displayed, select the menu point “**Transport**” by pressing the numerical key “**1**” and the display will show the following screen:

5.3.1.1 Calibrate Transport

To enter the **Calibrate** menu, press “**1**” when the screen as above is displayed. The display will now show the following screen:



Pressing “**F1**” will move the transport to the home position (= out), pressing “**F2**” will move the transport to the end position (= in).
Pressing “**F4**” will start the calibration run. During this calibration run, the plate transport will be moved in and out to its home and end positions 5 times.
During these movements, the distance between transport home sensor and transport end sensor will be automatically calibrated. This procedure is required to be performed when parts of the transport system (e.g.: sensors, belt etc.) have been replaced.

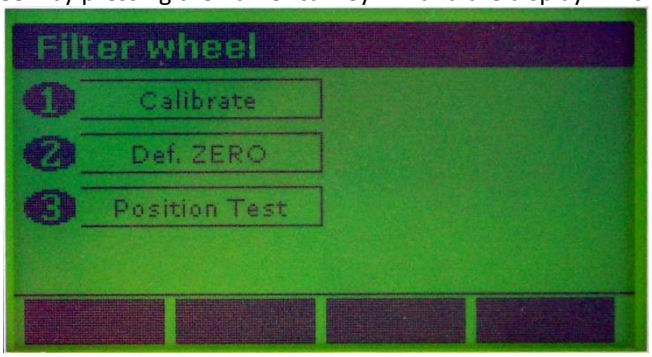
5.3.1.2 Position Test

To enter the **Position Test** menu, press “**2**” from the transport sub menu (5.3.1), the following screen is displayed:

This menu allows you to define specific positions, to move the plate carrier and to manually step the transport in and out.
Use the keys "**Cursor Up**" and "**Cursor Down**" to select the entry fields for "Move to". Enter values (between 0 and 3037) using the numerical keys. After the requested position has been entered, you must confirm the value by pressing "**Cursor Up**" and then "**Cursor Down**" and then "**Enter**"
Use the keys "**Cursor Left**" and "**Cursor Right**" to manually step the transport motor in and out.
Use the keys "**F1**" and "**F2**" to move the transport to End (=in) and Home (=out) positions.

5.3.2 Service - Submenu "Filter Wheel"

This submenu allows you to calibrate the filter wheel, to check specific positions and define the zero position of the filter wheel.
Enter the Service/Diagnosis menu as described in chapter 5.2. When the Service/Diagnosis menu start screen is displayed, select the menu point "**Filter Wheel**" by pressing the numerical key "**2**" and the display will show the following screen:

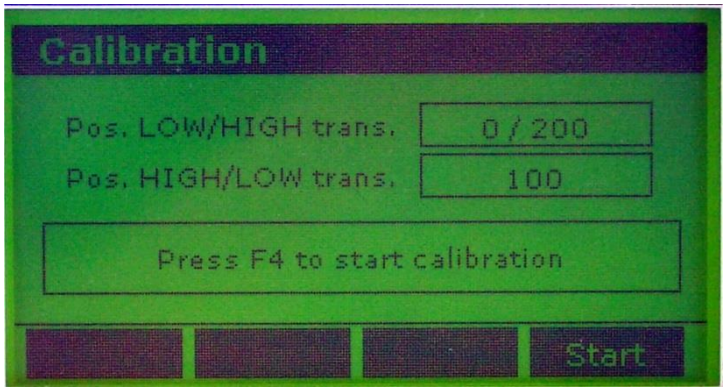


***ATTENTION:* The Submenu "Define Zero" should never be opened, except after replacing the filter wheel sensor (see chapter 7.8.2)!**

When the Zero value of the filter wheel is being changed to an invalid value, the filter wheel will not position properly, and readings will give incorrect results!

5.3.2.1 Calibrate Filter Wheel

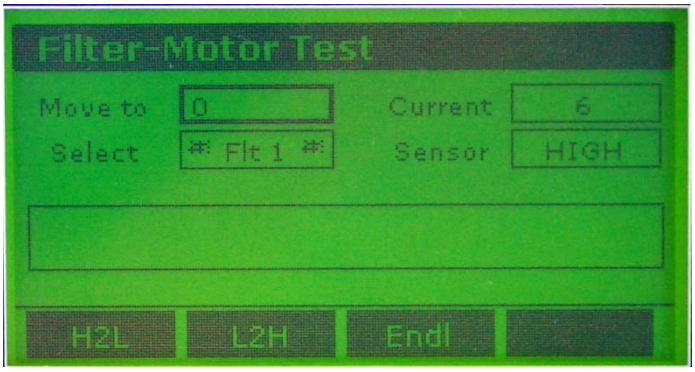
To enter the **Calibrate menu**, press "**1**" from the filter wheel sub menu (5.3.2). The display will now show the following screen:



Pressing "**F4**" will calibrate the Filter wheel home position sensor.

5.3.2.2 Filter Wheel Position Test

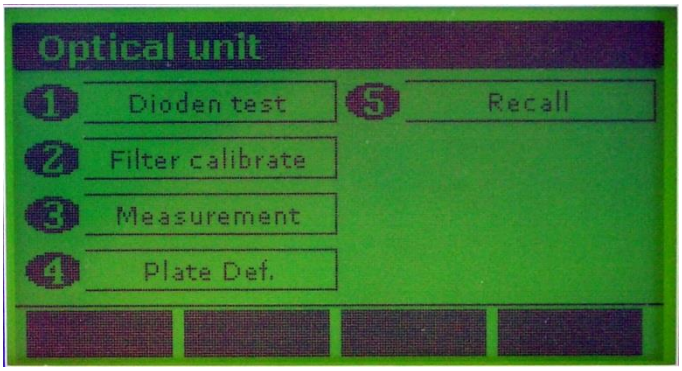
To enter the **Position Test** menu, press "**3**" from the filter wheel sub menu (5.3.2). The display will now show the following screen:



This menu allows you to define specific positions to move the filter wheel to, and to check the Filter wheel sensor.
Use the keys "**Cursor Up**" and "**Cursor Down**" to select the entry fields "Move to" or "Select Filter Position". Enter values (between 0 and 198) using the numerical keys. After the requested position has been entered, you must confirm the value by pressing "**Cursor Up**" and then "**Cursor Down**" and then "**Enter**".
Use the keys "**F1**" to perform a ***Sensor High to Low cycle***, and "**F2**" to perform a ***Sensor Low to High cycle***. Use "**F3**" to start an endless rotation of the filter wheel.

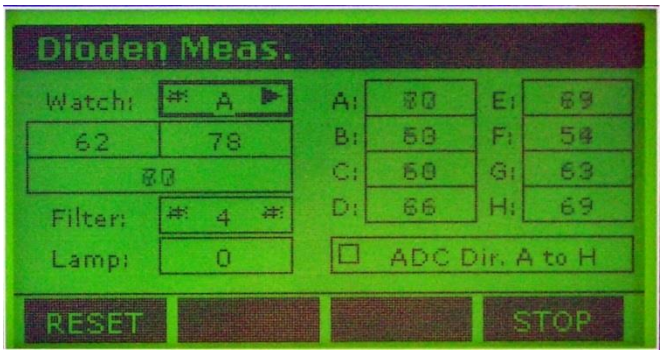
5.3.3 Service - Submenu "Meas. unit"

This submenu allows all kinds of checks and verifications of the optical system, pre-amplifier board and signal amplification.
Enter the Service/Diagnosis menu as described in chapter 5.2. When the Service/Diagnosis menu start screen is displayed, select the menu point "**Meas. unit**" by pressing the numerical key "**3**" and the display will show the following screen:

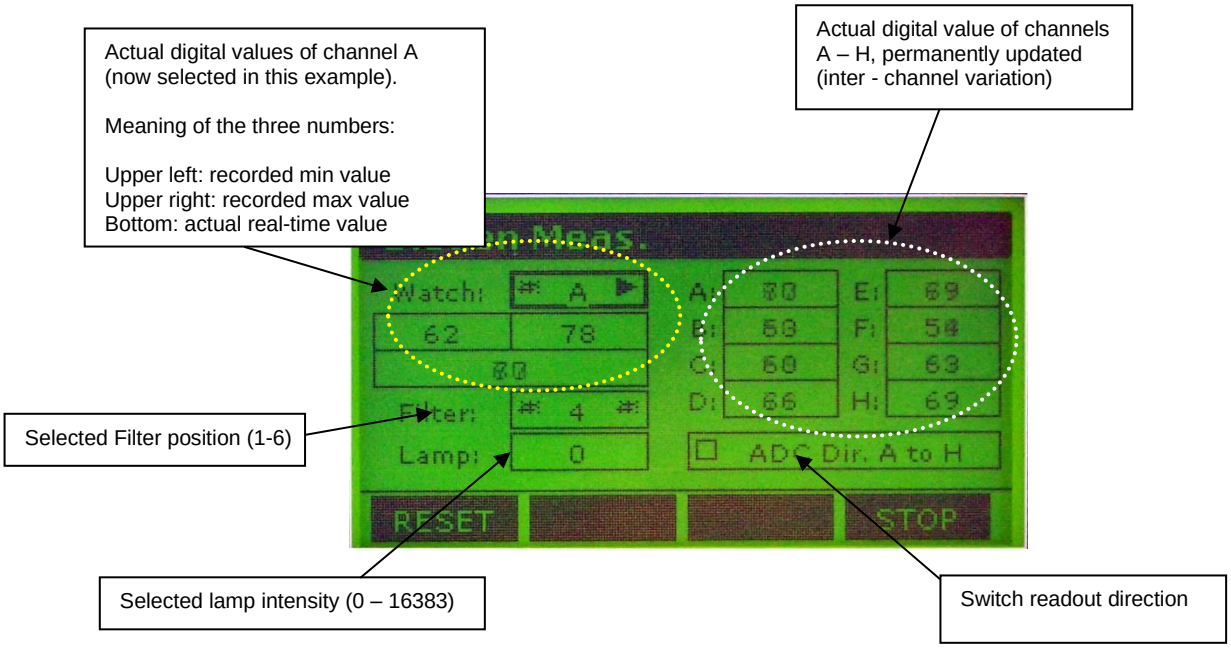


5.3.3.1 Dioden Test

This submenu can be considered as the main verification tool of the optical system of the instrument.
To enter the "**Dioden Test"** menu, press "**1**" from the meas. unit submenu (5.3.3). The display will now show the following screen:



This menu allows you to check each of the eight optical channels, with each of the available wavelengths and at selectable lamp intensity.
This menu is also used for calibration / adjustments in case parts of the optical system have been changed (e.g.: Fiber bundle, condenser lens etc.).
This screen allows you to verify the functionality of the:
Lamp and mains lens
Optical filters
Lenses of the upper or lower lens blocks
Fiber optic loom
Optical channel alignment



Use the keys "Cursor Up" and "Cursor Down" to select the entry fields "Watch", "Filter", "Lamp" and "ADC Dir. A to H".
Use the keys "Cursor left" and "Cursor right" to select channels and filters.
Use the numerical keys to enter the lamp intensity (0 – 16383).
Use "F1" to reset the recorded max and min values of the selected channel.
Use "F4" to freeze all values

Light distribution verification

1) Set Lamp intensity to 15000, use the keys “Cursor Up” and “Cursor Down” to apply the change in light to the lamp. The digital values of all channels must be in overflow (65535), with all filters.

2) Select Filter 1, increase lamp intensity step by step until the highest digital value is approx. 61000. Now, the lowest digital value must not be lower than 46000 (43000 for UV version).

3) Repeat step 2 with all installed filters (you need to re-adjust lamp intensity for each filter separately)

Press “esc” to escape from this menu and to return to the Service Start Screen.

5.3.3.2 Filter Calibrate

This submenu has the same function as the menu “Setup Filters” in instrument setup menu (chapter 4.2.2).

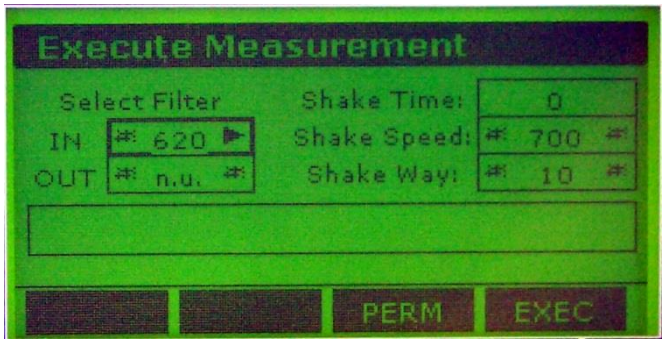
For setting and calibrating filters, refer to chapter 4.2.2.

5.3.3.3 Measurement

This submenu is used for testing the complete instrument by simulating a definable plate reading in either single or endless mode. There will be no recording / reporting of measurement results.

This menu is used for duration testing during the manufacturing process of the instrument.

To enter this submenu, press “**3**” from the meas. unit submenu (5.3.3). The display will then show the following screen:



Use the keys “**Cursor Up**” and “**Cursor Down**” to select the entry fields.

Use the keys “**Cursor left**” and “**Cursor right**” to select values.

Use “**F3**” to start a permanent (endless) run.

Use “**F4**” to start a single run.

5.3.3.4 Define Plate Positions

This submenu is used for setting reference values for the plate transport system.

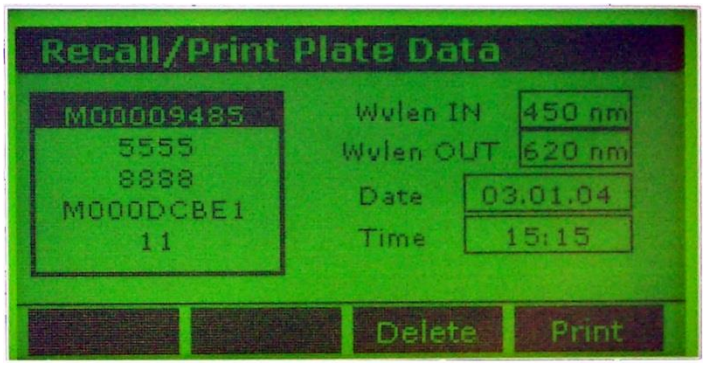
Do not change any of these values without having the manufacturers QC plate available!

To enter this submenu, press “4” from the meas. unit submenu (5.3.3). The display will then show the following screen:

Use the keys “Cursor Up” and “Cursor Down” to select the entry fields. Use the keys “Cursor left” and “Cursor right” to select values.
The values in “Bright” and “Dark” are factory set and should not be changed.
The values in “1st Col” (Meas. IN and Meas. OUT) determine the measurement position column 1 of a 96 well microplate during single (Meas. IN) and dual (Meas. OUT) measurements.
Adjustment of these values is necessary if the plate carrier does not measure in the correct location. Measurement of an Asys QC plate can determine whether these values are set correctly as there are 8 holes in row A and H; therefore correct parameters will result in rows A and H reading less than 0.004 for single and dual measurements.
Use the numerical keys to enter the required numbers.
Do not change any of these values without having the manufacturers QC plate available!

5.3.3.5 Recall

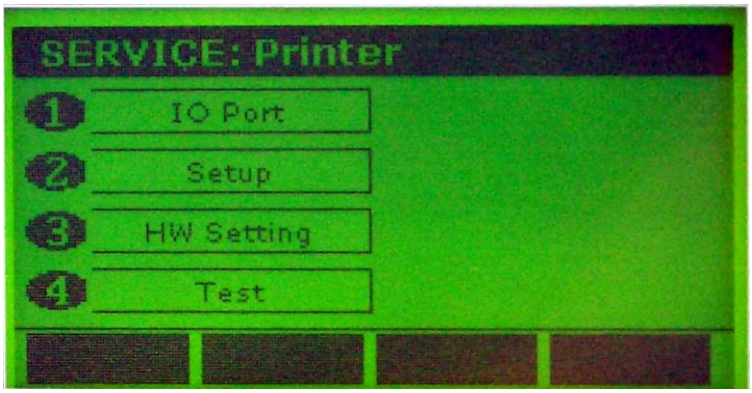
This submenu is used to recall and/or delete measured plates from the instruments memory. These functions are also available in “Recall Plate Data” from the instrument main menu (see user manual).
To enter this submenu, press “5” from the meas. unit submenu (5.3.3). The display will then show the following screen:



Use the keys “Cursor Up” and “Cursor Down” to select the plate data of interest.
Press “F3” to delete, or “F4” to print the selected plate data.

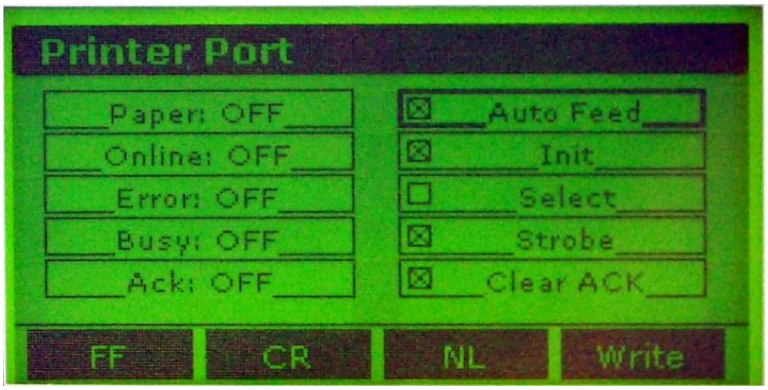
5.3.4 Service - Submenu “Printer”

This submenu allows all kinds of checks and adjustments for the printer that is connected to the instrument.
Enter the Service/Diagnosis menu as described in chapter 5.2. When the Service/Diagnosis menu start screen is displayed, select the menu point “Printer” by pressing the numerical key “**4**” and the display will show the following screen:



5.3.4.1 IO Port

This submenu is used to define some of the settings for communication between the instrument and connected printer. These settings should only be changed if there are problems with the printout and only after prior consultation of the manufacturer.
To enter this submenu, press “1” from the printer submenu (5.3.4). The display will then show the following screen:



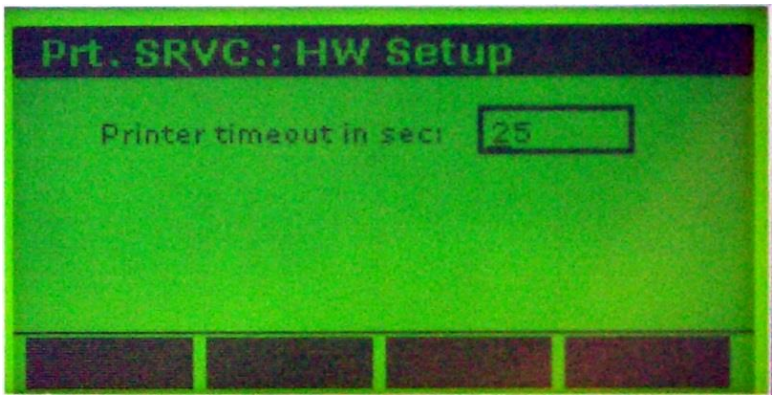
Use the keys “Cursor Up” and “Cursor Down” to select the parameter that requires changes.
Use the keys “Cursor left” and “Cursor right” to activate or de-activate the selection.
Press “F1” to initiate a Form Feed, “F2” to initiate a carriage return, “F3” to make a line feed and “F4” to send a print command to the printer. Pressing F4 once will print “A”, pressing F4 three times, will print “ABC” etc.

5.3.4.2 Setup

This submenu has exactly the same function as “Printer” in the instruments setup menu (chapter 4.2.1).

5.3.4.3 HW Setting

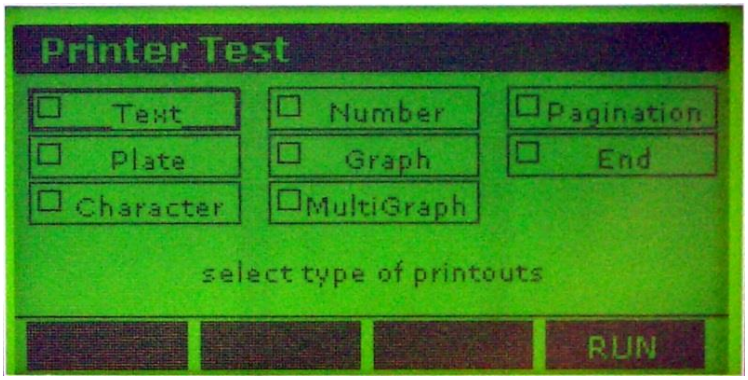
This submenu is used to define the printer timeout (the time the instrument will wait for a connected printer to respond, before giving the error “Printer timeout”)
To enter this submenu, press “3” from the printer submenu (5.3.4). The display will then show the following screen:



Use the numerical keys to enter the required printer timeout.

5.3.4.4 Test

This submenu is used to test the communication between the instrument and printer, and may be used for testing printer commands. The instrument has pre-defined test sets, which can be sent to the connected printer.
To enter this submenu, press “4” from the printer submenu (5.3.4). The display will then show the following screen:

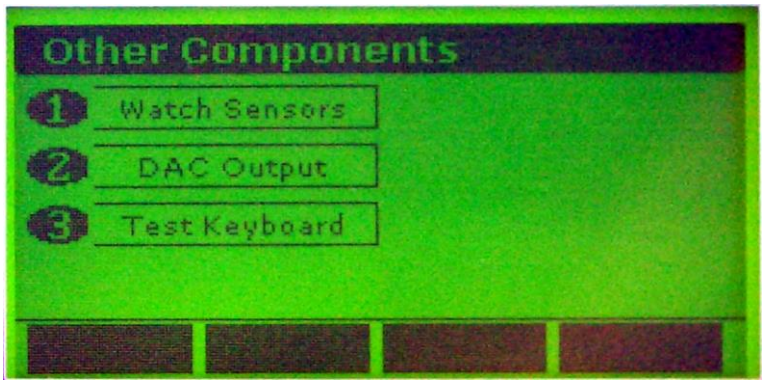


Use the keys “Cursor Up” and “Cursor Down” to select the function to be tested. Single, several or all functions may be selected at once.
Use the keys “Cursor left” and “Cursor right” to activate or de-activate the selection.
Press “F4” to start the test.

5.3.5 Service - Submenu “Others”

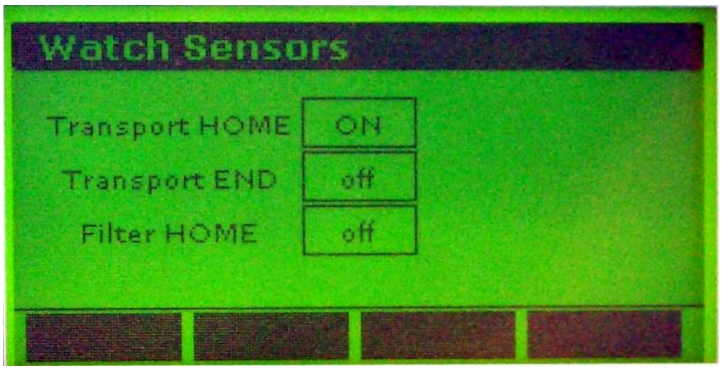
This submenu allows you to test/check the function of the position sensors, the function of the display and the digital light intensity control, as well as the function of the keyboard.

Enter the Service/Diagnosis menu as described in chapter 5.2. When the Service/Diagnosis menu start screen is displayed, select the menu point “Others” by pressing the numerical key “**5**” the display will show the following screen:



5.3.5.1 Watch Sensors

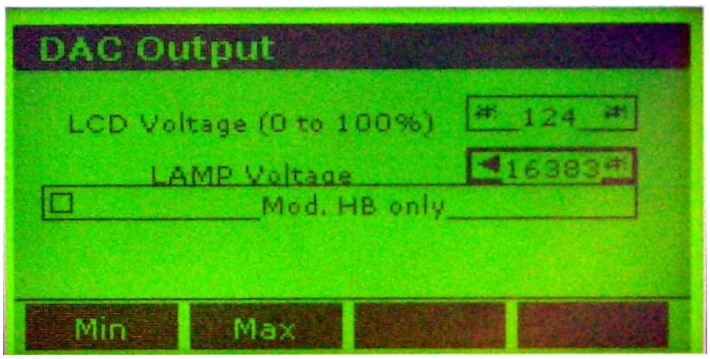
This submenu is used to test the function of the optical sensors of the instrument.
To enter this submenu, press "**1**" from the "others" submenu (5.3.5). The display will then show the following screen:



This screen shows the actual status of all three sensors of the instrument. The instrument has three sensors: Transport Home, Transport End and Filter wheel.
The status is updated permanently, which allows a manual function test of the sensors when the instrument is opened. *See Chapter 7 'Parts Replacement' on how to open the instrument!*
Sensors can be manually checked by using a small piece of paper and moving it into the sensor area. The change of the status can be watched in this screen.

5.3.5.2 DAC Output

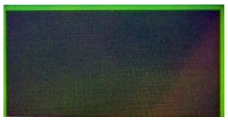
This submenu is used to test the function of the digital-analogue-converter for the Display and lamp.
To enter this submenu, press "2" from the "others" submenu (5.3.5). The display will then show the following screen:



Use the keys "Cursor Up" and "Cursor Down" to select the function to be tested.
Use the keys "Cursor left" and "Cursor right" to change the actual value stepwise.
Press "F1" to set the selected function to minimum supply.
Press "F2" to set the selected function to maximum supply.

ATTENTION:
Setting LCD voltage to either Min or Max will have one of the following effects:


LCD Min


LCD Max

Pressing the key “esc” will escape this submenu and get the display contrast back to the preset range (as defined in instruments settings, “Display Contrast”, chapter 4.2.4).

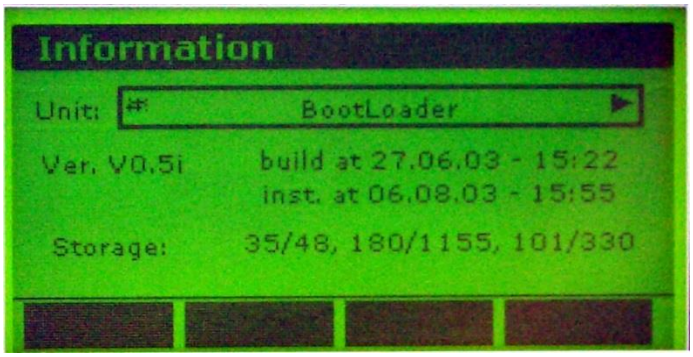
5.3.5.3 Test Keyboard

This submenu is used to test the function of the instrument keyboard.
To enter this submenu, press “3” from the “others” submenu (5.3.5). The display will then show the following screen:

Pressing any key will insert the code of the respective key into the field “Code”. As long as the key is kept pressed, the field “Repeat” will keep increasing. As soon as the pressed key is released, a “YES” will be displayed in the field “Release”.
Pressing and Holding “esc” has the same function as described above, releasing “esc” will exit this submenu.

5.3.6 Service - Submenu “Information”

This submenu gives information on the versions of the inbuilt firmware and software. This information may be required in case support by the manufacturer is required.
Enter the Service/Diagnosis menu as described in chapter 5.2. When the Service/Diagnosis menu start screen is displayed, select the menu point “Information” by pressing the numerical key “**6**” and the display will show the following screen:



Use the keys “**Cursor left**” and “**Cursor right**” to select the firmware / software module of interest.

5.3.7 Exit from Service Menu

To exit from Menus and submenus, press the “esc” key. Each time the “esc” key is pressed, the instrument will switch to the next upper level in the menu structure.

If the “esc” key is pressed when the Service Menu Start screen is displayed, the instrument will perform an initialization routine and return to standby (home screen).

6.0 Error handling and fault finding

6.1 Error indication

If an error occurs during measurement, the corresponding error message or number is displayed in the status window of the PC measurement software or alternatively on the instrument display itself if being used in stand-alone mode.

Error Codes for instrument errors:
Instrument errors are indicated by a numeric and/or textual error message in the status window. In the case of an error during a measurement, try to restart the measurement. Error codes are usually displayed by PC measurement software whilst the instrument is in remote mode.

If the error continues, see the table below for a possible remedy.

Error code	Error name	Error description	Possible cause
1	General System Error	Time-out druing initialization	Transport or Filterwheel not moving
2	Transport Error	Plate carrier does not reach the required sensor	Plate carrier jammed, opto sensor faulty
3	Invalid measurement position	Plate transport position error	
5	Measurement value too high	A/D converter output overflow	Lamp voltage regulator faulty or filter missing
6	Measurement value too low	A/D converter output too low	A/D converter faulty, power supply failure, lamp failure, faulty filter or wrong filter position
7	Lamp drift	Light intensity differs from stored calibration values	Calibration required, filter defective, lamp defective
8	Channel low	Output of one measurement channel below the set minimum stored value	One optical path blocked by spillage, filter defective
9	Light intensity too high	The light intensity measured during self-check is too high.	Light regulation board defective
11	Measurement time-out	Unstable readings	Extraneous light is entering measurement area. Possible lamp drift issue (lamp has reached end of life)
14	Measurement error	AD-converter does not respond to CPU	AD-Converter defective

NOTE: Perform board level repair only if you have a good knowledge of the circuits and if you have an ESD (electro static discharge) safe working place. In doubt replace boards only.

Instrument Error Messages

The following error messages may be displayed on the instrument screen when in stand-alone operation mode:

Error Message	Error Description	Possible Remedy
Filter wheel movement timeout	Filter wheel movement jammed.	Check for wrongly inserted or loose filter.
Filter wheel is too late in Low/High	Filter wheel movement jammed.	Check for wrongly inserted or loose filter.
Filter wheel is too late in High/Low	Filter wheel movement jammed.	Check for wrongly inserted or loose filter.
Filter wheel reached the Low/High too early	Sensor problem.	Replace sensor, clean black & white filter sensor disc.
Calibration Timeout	Filter cannot be calibrated in allocated time.	Bad filter, bad lamp, dirty optics.
Lamp permanently high	A-D converter shows permanent overflow.	No filter present.
Lamp permanently low	A-D converter shows permanent Zero.	Light path blocked, lamp defective.
Meas. Val. Less than min	Light intensity too low.	Perform calibration, dirty optics, bad filter, check light distribution across optics.
Meas. Val. Higher than max	Light intensity too high.	Perform calibration, check for lamp drift.
Drift of maximum value	Light intensity too far off the calibration value.	Perform calibration, bad filter, dirty optics.
Drift of minimum value	Light intensity too far off the calibration value.	Perform calibration, wrong filter.
Cannot reach stability criteria	Light intensity not stable.	Lid not closed, light control board faulty
Trp error: too early in HOME sensor	Sensor problem.	Check / replace sensor, run transport calibration.
Trp error: too early in END sensor	Sensor problem.	Check / replace sensor, run transport calibration.
Trp error: did not reach HOME sensor	Plate transport not moving.	Plate jammed, run transport calibration.
Trp error: did not reach END sensor	Plate transport not moving.	Plate jammed, run transport calibration.
Trp error: could not reach sensor	Plate transport not moving.	Plate jammed, run transport calibration.

6.2 Trouble-shooting Error Codes

Error 1: General system error

This error can happen during the initialisation of the reader after switch-on only. When one of the initialization procedures does not finish within a certain time, the error message no. 1 will be shown.

Transport blocked, filterwheel blocked

Components to be checked in case of Error 1:
Plate transport, optical sensors, filter wheel, AD-converter.

Error 2: Transport Error

In case the plate carrier does not reach the opposite sensor within the number of programmed steps the Error 2 appears.

Possible causes and remedies:
Plate transport jams. Clean the guide bar and add silicon grease or similar as lubricant on the guide bar.
Sensor or sensor circuit defective. Sensor output must change between < 1 Volt & > 4 Volts.

Error 3: Invalid measurement position

Error in the transport position table

Error 5: Measurement error high

AD-converter output overflow

When the output of the AD-converter is permanent above 64000 counts during calibration or measurement, the Error 5 is displayed. The 64000 counts are representing an input voltage of more than 10 Volt on pin 1 of IC6.

Possible causes and remedies:
No filter present
IC 6 defective. Check input voltage, if voltage is below 10 V and the output is still in overflow condition most probably IC 6 is defective.
IC1, IC2, IC4 or IC5 defective. To find the defective IC, measure both input and output voltage at each IC with no light at the photo diodes. Both the input and output voltage should be close to zero.
The negative 12V supply is missing or below nominal.

Error 6: Measurement error low

AD-converter output too low

When the output of the AD-converter does not reach 64000 counts during calibration or self-check, the error 6 is indicated.

Possible causes and remedies:
The filter is defective, its transmittance is too low. Change the filter.
Filter in the wrong position. Check the value written on the filters against the value stored in the software.

AD-converter defective

Lamp Failure

The lamp does not produce enough light intensity. Check the lamp voltage, it must be 11.7V +/- 0.2 V when the lamp intensity is set to 15500 counts.
If the voltage is OK change the lamp, otherwise check the power supply.
The optics is dirty. Check for liquid spillage and dirt on the lenses.

Error 7:

In case the light intensity for the lowest and/or the highest channel measured before the actual reading is different from the light intensity found during the calibration, the error message 7 is shown.

Possible causes and remedies:
The lamp has changed the intensity. Perform a calibration and try some repeated measurements. If the error 7 disappears, monitor the instrument for the next days. If the error 7 is shown again, replace the lamp.
The filter selected for the measurement is different from the filter during the last calibration. Check if the wavelength indicated on the filter corresponds to the wavelength displayed for the relevant position on the filter wheel. The wavelengths can be seen best using the calibration menu of the service program. If a wrong inserted filter is found, put the filter back into the correct position and perform a calibration run.
The filter has become defective. Remove the filter. Hold it against a bright light source and check for dark spots or opaque areas. Replace the filter in case of visual impurities.
The filter wheel is not in the correct position. Open the lid for the filter compartment and start a measurement. Watch if the light beam is in the centre of the filter. If this is not the case, the position of the filter wheel must be readjusted. See 8.6 'Define Filter Zero Position' for instructions.
The lenses have become dirty. Check if you can see dirt or spillage on the lenses. In case of dirt remove the diaphragm on the lower lens bloc carefully by lifting it up with a small screwdriver or similar. Clean the lenses with a lens cleansing agent or alcohol. After cleaning glue the diaphragm back on its original position.

Error 8/9:

In case one of the channels does not receive enough light during the self-check, before each measurement, Error 8 is indicated. This can happen for one, several and all wavelengths.

To find the channel with low light, follow the chapter 5.3.3.1 'Dioden Test'

Possible causes and remedies:
The lenses have become dirty or foreign particles are blocking the light path. . Check if you can see dirt, spillage or foreign particles on the lenses respectively on the diaphragm. In case of dirt on the lenses remove the diaphragm carefully by lifting it up with a small screwdriver or similar. Avoid bending of the diaphragm. Clean the lenses with a lens cleansing agent or reagent-grade isopropyl alcohol. After cleaning glue the diaphragm back on its original position.
The filter wheel is not in the correct position. Open the lid for the filter compartment and start a measurement. Watch if the light beam is in the centre of the filter. If this is not the case, the position of the filter wheel must be readjusted.
The lamp has become loose. Check the tight fit of the lamp in the spring loaded lamp holder. The lamp must be snap-in into the correct position.
When error 8 happens with one filter only, this filter may have become defective.

Error 11:

Ensure that all grounding connections have been made to the reader. This fault is commonly caused by a bad ground connection causing interference through the AD converter board.
Run multiple measurements from Digiread without a plate, all readings obtained on all 96 wells should read from -0.001 to +0.002. If the values steadily increase from one measurement to the next, then the lamp is drifting and requires replacement.

Error 14:

Switch off power to reader module. Check the connections between the AD board and interface/CPU board assembly.

Error 15:

Insufficient Reaction of ADC to Lamp Control'
The customer needs to calibrate the filters, this can be done with the display or the PC software:-
Display xxxxxxx
Galapagos – Select the 'Setup' tab and click the 'instrument', select down arrow. Select all the filters that are installed and click 'Recalibrate All'.

6.3 Trouble-shooting Error Messages

6.3.1 General error

This error may happen during the initialisation of the reader after switch-on. When one of the initialisation procedures cannot be finished within a certain time, error **"1"** will be shown.

Components to be checked in case of Error 1:

Plate transport, optical sensors, filter wheel, AD-converter.

6.3.2 Transport error

This error appears, when the plate carrier does not reach the opposite sensor within the number of programmed steps.

Possible causes and remedies:

Plate transport jams

→ Clean the linear guide bar and add a light silicon free grease or similar as lubricant on the linear guide bar.

Sensor or sensor circuit defective. Sensor output must change between
< 1 Volt and > 4 Volt.

→ Check function of sensor and sensor circuit in Instrument Service Menu (see chapter 5.3.5.1)

If required, replace the sensors as described in chapter 7.8.1

6.3.3 Measurement error high

When the output of the AD-converter is permanently above 64000 counts during calibration or measurement, the 'Measurement error high' error is displayed. The 64000 counts represent an input voltage of more than 10 Volt on pin 2 of IC5.

The output signal of the AD-converter can be checked in the instrument Service Menu (see chapter 5.3.3.1)

Possible causes and remedies:

No filter present

→ Check that all filters as defined in the Instrument Setup Menu are present, at the correct position on the filter wheel.

Interface board defective

→ Replace Interface board (see chapter

The negative 12V supply is missing or below nominal

6.3.4 Measurement error low

When the output of the AD-converter does not reach 63000 counts during calibration or self-check, the Measurement error low is indicated.

Possible causes and remedies:

The filter is defective; its transmittance is too low.

→ Change the filter.

The lamp does not produce enough light intensity.

→ Check the lamp voltage, it must be 11.7 +/- 0.2 V when the lamp intensity is set to 15500 counts.

→ If the voltage is OK change the lamp, otherwise check the power supply.

The optics are dirty.

→ Check for liquid spillage and dirt on the lenses.

6.3.5 Lamp drift

In case the light intensity for the lowest and/or the highest channel measured before the actual reading is different from the light intensity found during the calibration, the error message "Lamp drift" is shown.

Possible causes and remedies:

The lamp has changed the intensity.

→ Perform a calibration

→ Try some repeated measurements without a microplate, all readings should be between -0.001 and 0.003, if the values steadily increase as you perform more measurements, replace the lamp.

The filter selected for the measurement is different from the filter during the last calibration.

→ Check if the wavelength indicated on the filter corresponds to the wavelength displayed for the relevant position on the filter wheel. The wavelengths can be seen best using the calibration menu of the service program. If a wrong inserted filter is found, put the filter back into the correct position and perform a calibration run.

The filter has become defective.

→ Remove the filter. Hold it against a bright light source and check for dark spots or opaque areas. Replace the filter in case of visual impurities.

The filter wheel is not in the correct position.
→ Open the lid for the filter compartment and start a measurement. Watch if the light beam is in the centre of the filter. If this is not the case, the position of the filter wheel must be readjusted:
Open the filter compartment at the right side of the instrument.

Start the service filter wheel sub-menu as described in 5.3.2 and select “Define Zero”.
Select Filter 1 and look at the filter wheel. Filter 1 (usually the 620 nm filter) should be exactly in the centre of the light beam. When this is not clearly seen, you can check that filter 1 and filter 4 are at the same horizontal level.
In case the position of filter 1 is not correct, you can move the position with the Up / down arrow keys. When the position is correct, press key F4 ‘Set’ to store the new position. Check the position again by pressing the Enter key, the filter wheel will make one revolution and should be at the same location as before.
The lenses have become dirty.
→ Check if you can see dirt or spillage on the lenses. In case of dirt remove the diaphragm on the lower lens bloc carefully by lifting it up with a small screwdriver or something similar. Clean the lenses with a lens cleansing agent or alcohol. After cleaning, glue the diaphragm back on its original position.

6.3.6 Channel low

In case one of the channels does not receive enough light during the self-check, the error “Channel low” is indicated. This can happen for one, several and all wavelengths.
To find the channel with low light start a measurement using the service program. After the error message is displayed, press F7 to display the light intensity for all the channels. Now you can see at the bottom line of the diode window, which of the channels is below the lower limit of 48000 counts.

Possible causes and remedies:
The lenses have become dirty or foreign particles are blocking the light path.
→ Check if you can see dirt, spillage or foreign particles on the lenses or on the diaphragm plate. In case of dirt on the lenses remove the diaphragm plate carefully by lifting it up with a small screwdriver or something similar. Avoid bending of the diaphragm plate. Clean the lenses with a lens cleansing agent or reagent-grade isopropyl alcohol. After cleaning, glue the diaphragm plate back to its original position.
The filter wheel is not in the correct position.
→ Open the lid for the filter compartment and start a measurement. Watch if the light beam is in the centre of the filter. If this is not the case, the position of the filter wheel must be readjusted.
The lamp has become loose.
→ Check the tension of the lamp in the spring loaded lamp holder. The lamp must snap-in into the correct position.
If the error occurs with one filter only this filter may have become defective and needs replacing.

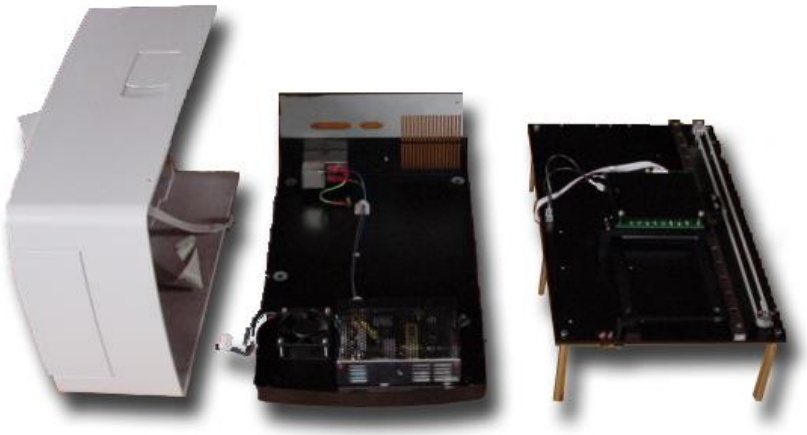
7.0 Parts Replacement

7.1 Introduction

This chapter will give instructions on how to replace parts and components of the instrument and how to perform adjustments that might be necessary after replacing any parts.
Some parts and components of the instrument can be replaced with the cover closed. Most parts however, require at least a partial disassembly of the instrument.

7.2 Disassembly of Instrument

This chapter will give instructions on how to disassemble the instrument into the three main components



Instrument Top Cover Bottom Plate Base plate

The Instrument Top Cover contains the front lid (for light protection of optical system during plate reading) and the filter compartment lid (for easy access to the filter wheel).
The Bottom Plate holds the Mains connector with Power switch and Mains fuse holder, the Power supply unit and the cooling fan.
The Base plate holds the complete Optical system, the complete Plate transport and most of the electronic boards.

7.2.1 Instrument Cover Removal

The instrument cover is mounted to the bottom plate by 6 screws:

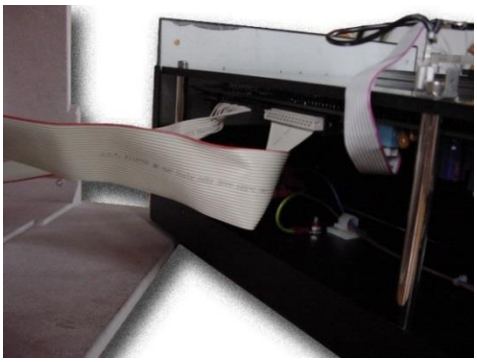
= Location of cover screws

1. DANGER: Switch off the instrument and disconnect the power cable.
2. Remove these 6 screws using a 2 mm Allen Key.

3. Turn the instrument so that the front is towards you.

4. Carefully lift the cover up and place to the left.

The cover is now connected to the instrument by the display and keyboard cables. To completely remove the cover, disconnect the two ribbon cables from the instrument.



To re-assemble the cover, follow the above description in reverse order. Do not tighten screws until they have all been located in the corresponding threaded holes.

7.2.2 Bottom Plate Removal

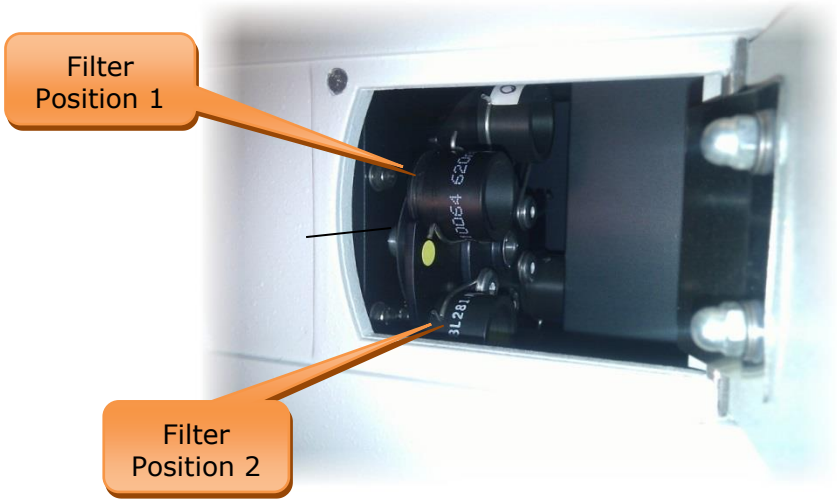
Remove the five 3mm hex bolts from the underside of the bottom plate assembly.

Gently pull the base plate away from the bottom plate. Reach between the assemblies and disconnect the power connection from the light control board.
Remove the bottom plate completely. All three segments of the main instrument are now accessible in separate forms.

7.3 Replace Filters

The instrument can accommodate up to 6 interference filters on a filter wheel. The filter wheel can be accessed by opening the filter compartment door, located on the right side of the instrument:

The filters are held in place on the filter wheel by spring wires and can easily be replaced without using tools.



To prevent fingerprints on the filters, NEVER hold the filters by the glass surface!

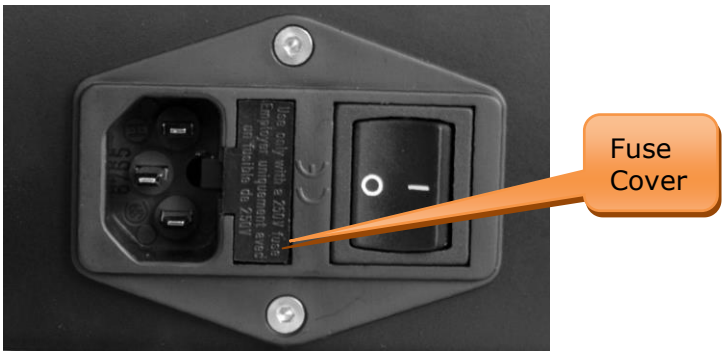
The filter wheel has 6 positions; the position next to the yellow label is position 1. Each filter is labeled with its specific wavelength. These wavelengths, with their position on the filter wheel are stored in the instruments memory. If an existing wavelength is being replaced by a new wavelength, the new value must be entered in the instrument's memory (see Chapter 4.2.2)

If defective filters are being replaced by new ones, please make sure to replace filters always only with filters of the same wavelength.

After replacing filters, a Calibration run must be performed (see Chapter 4.2.2)

7.4 Replace Mains Fuse

The following steps must be performed to replace the mains fuse, which is in mains receptacle block, in the rear panel of the instrument.

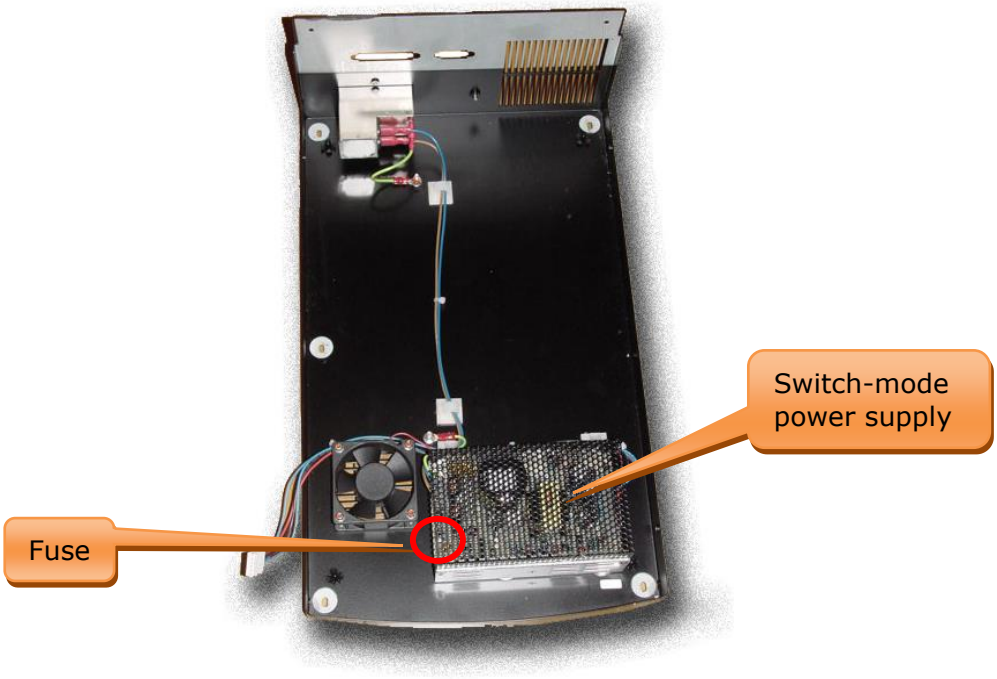


Switch off the instrument and unplug the power cord.
Open the plastic cover of the fuse compartment, by inserting a small screw driver into the slot at the right of the cover and pushing the cover out.
Pull the fuse holder out of the socket.

Replace the fuse only with the same type and rating.
Ensure that the fuse has the correct rating (T3.15 Amp (slow blow))
Push the fuse holder back into the socket.

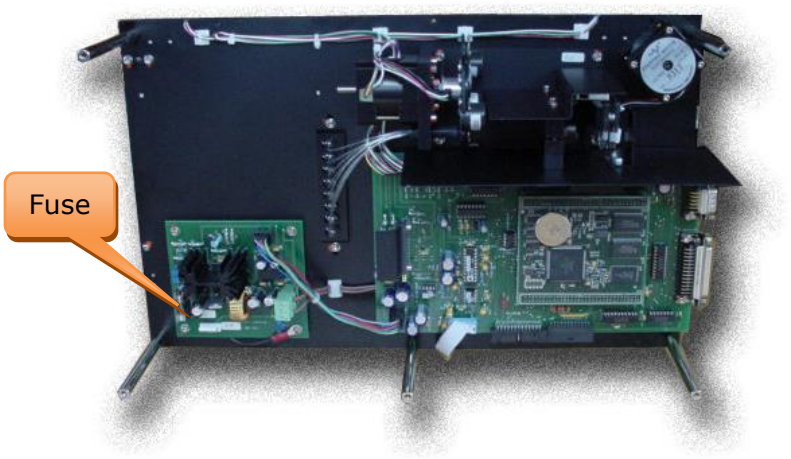
7.5 Replace Power Supply Fuse

The switch mode power supply is mounted to the bottom plate, and the fuse is at the left side of the power supply:



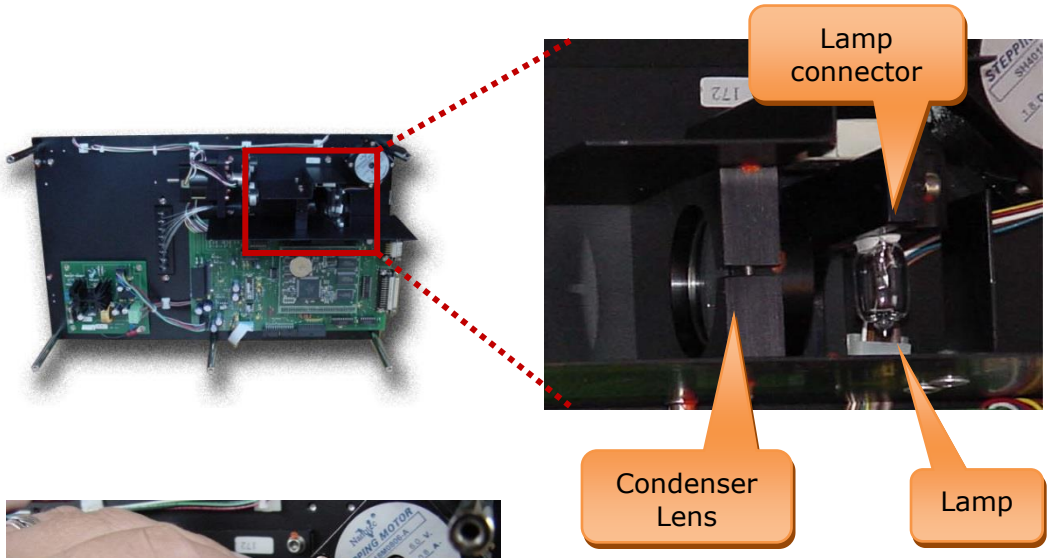
7.6 Replace Light Control Board Fuse

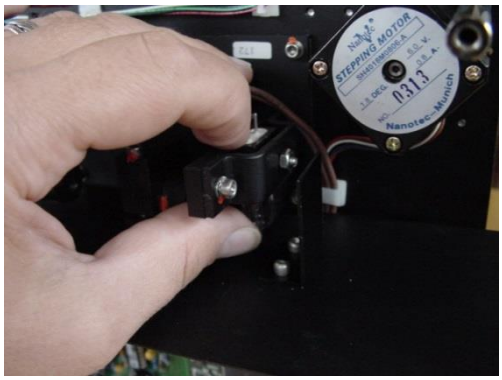
This fuse protects the 24V supply used for the lamp and the stepper motors and is located on the light regulation board. Before this fuse can be accessed, the instrument cover, base plate and bottom plate must be dis-assembled as described in Chapters 7.2.1. and 7.2.2.
The light regulation board can be found at the bottom side of the base plate:



7.7 Replace Lamp

Before the lamp can be accessed, the instrument cover, base plate and bottom plate must be disassembled.
The lamp is mounted onto the bottom side of the base plate on the light source assembly:





Disconnect the white/grey connector from the base of the lamp.

Whilst refraining from touching the bulb, push the base of the lamp out of the lamp bracket and slide out to remove completely.

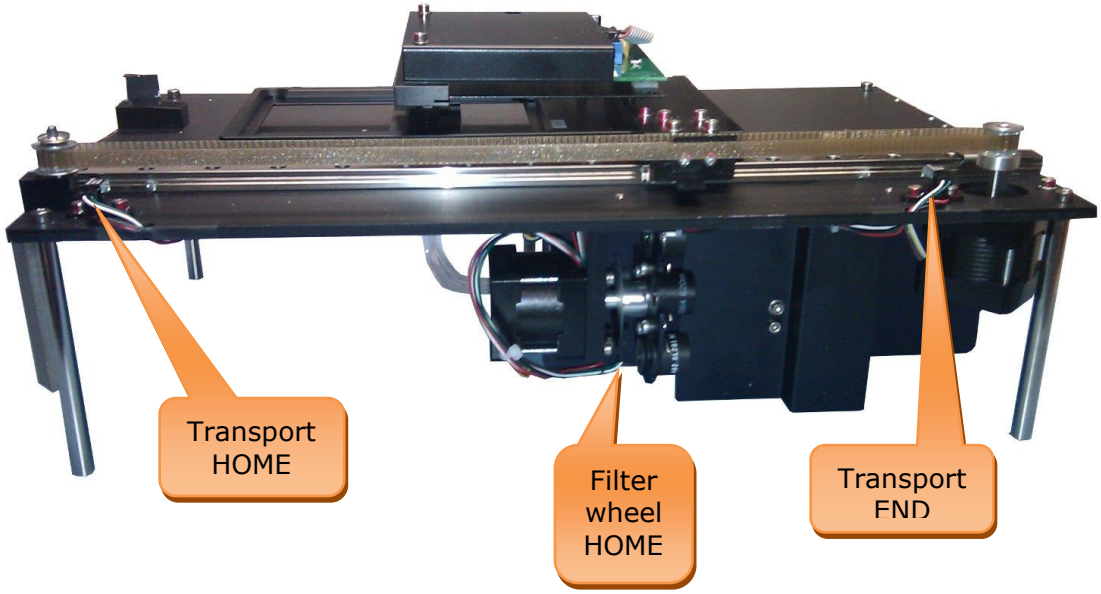
The lamp is held in the right position by a spring loaded ball, which snaps into a notch on the lamp socket.

Note that the bulb used in the old UV variant differs to the standard reader. The filament is much smaller in the UV version.

Insert the new lamp, making sure that the spring loaded ball snaps into the notch of the lamp socket.
Re-assemble the instrument in reverse order.
After replacing the lamp, filter calibration must be performed and the light distribution should be verified to be within tolerance.

7.8 Replace Sensors

The instrument is fitted with three optical sensors:



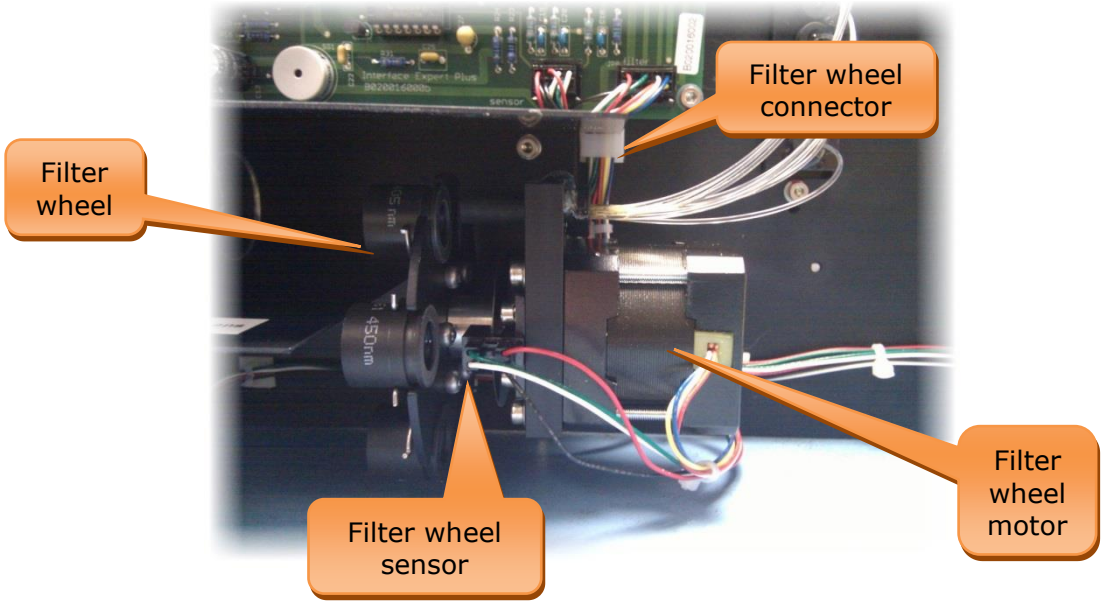
Before the sensors can be accessed, the instrument cover, base plate and bottom plate must be dis-assembled.

7.8.1 Transport Sensors Replacement

Disconnect the transport sensors from the interface board connector marked ‘sensor’
For easier setup later, mark the current position of the sensors then remove the 2.5mm hex bolts holding the opto-sensors to the base plate.
Unclip and cut any cable ties in order to remove the sensors and wiring loom completely.
Fit new sensors and looms, ensuring that all wiring will not obstruct any mechanism.

7.8.2 Filter Wheel Sensor Replacement

The filter wheel sensor shares the connector of the filter wheel motor. The sensor is supplied with the filter wheel motor assembly; therefore the entire assembly must be replaced if a new sensor is required.

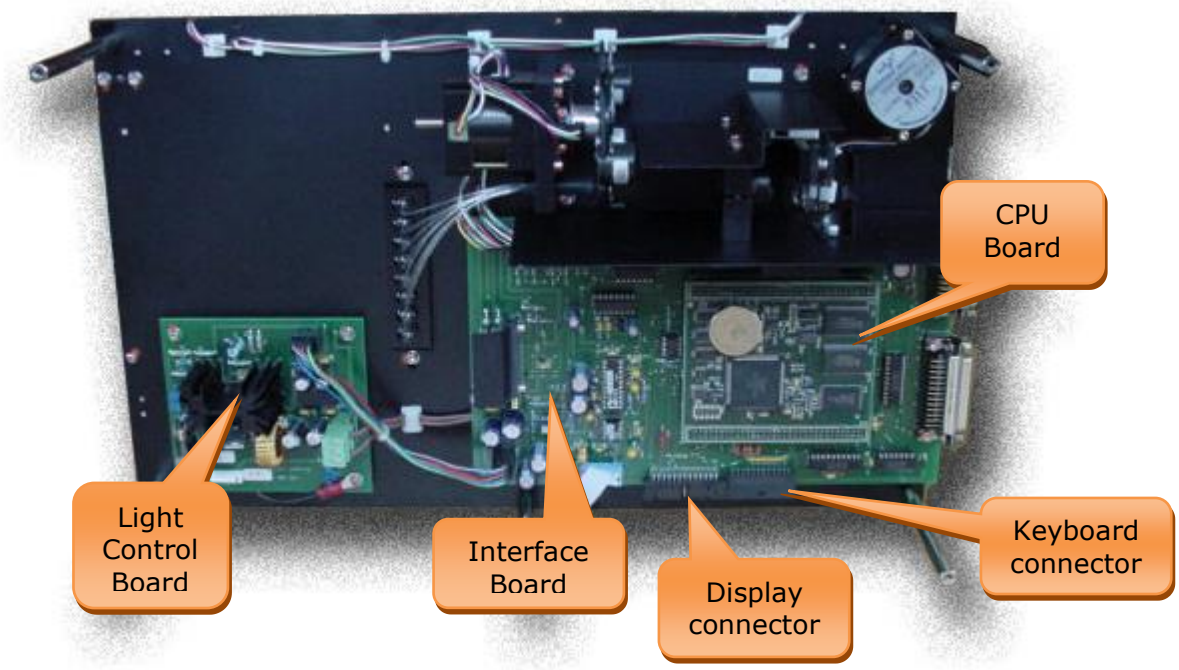


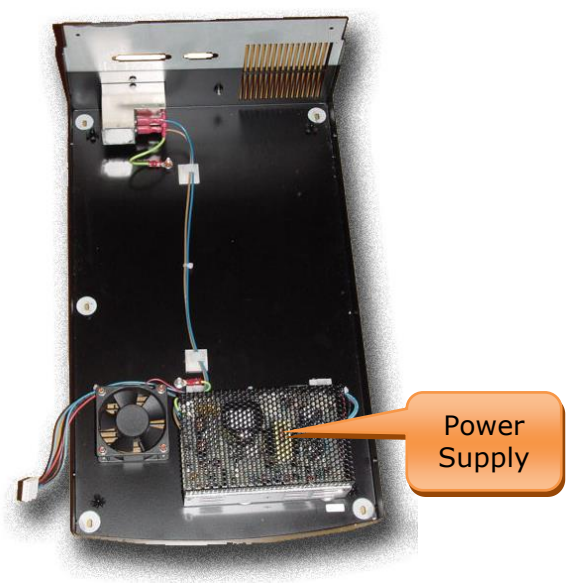
Remove the two 2.5mm bolts holding the lamp shield onto the condenser lens bracket. This will give you space to remove the filter assembly.
Loosen the 1.5mm hex grub screw which holds the central spindle of the filter wheel to the filter wheel motor shaft.
Remove the filter wheel by sliding it to the left off of the motor shaft. The filter wheel sensor disc can be flexed in order to remove it from in between the sensors.
Remove the two 2.5mm bolts which hold the filter wheel sensor to the motor bracket.
Remove the four 2.5mm bolts which hold the filter wheel motor to its bracket.
Unplug the filter connector from the interface board marked as “filter”
It is recommended to clean the filter wheel sensor disc with a cloth to ensure no grease exists which may impair the functionality of the sensors.
Refitting is a reversal of the above instructions. Ensure that the sensor is aligned so that the filter wheel sensor disc is centrally inside the opto-sensor.

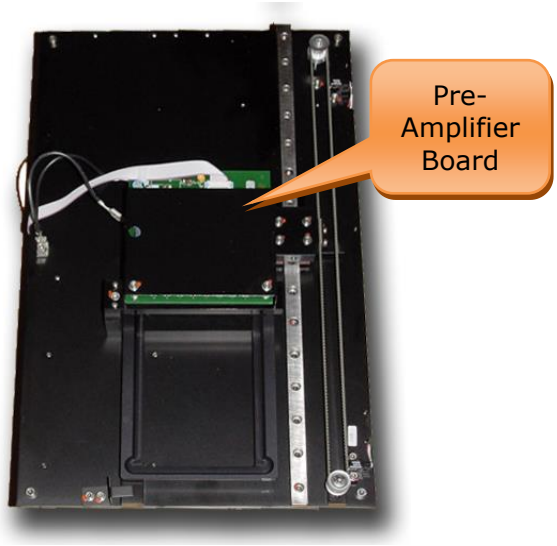
7.9 Replace Boards

WARNING:
Always ensure you use ESD (Electro-Static Discharge) equipment whilst handling PCBs. An ESD wrist band and work mat are highly recommended.

The instrument is fitted with five boards as shown below.







7.9.1 Replace the CPU board

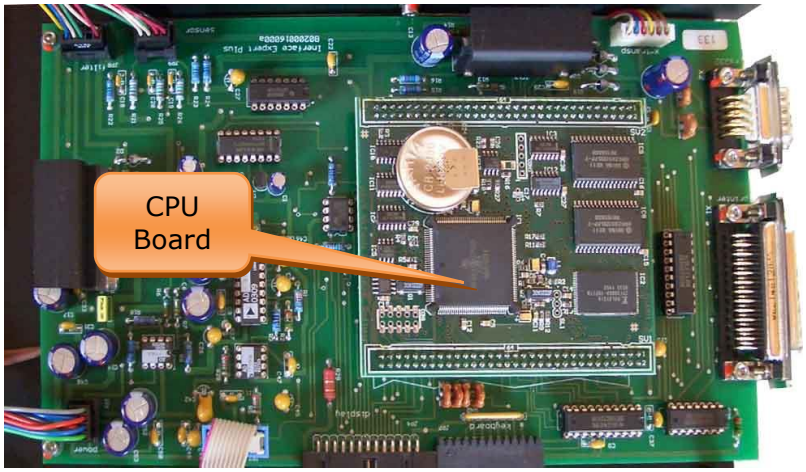
All plate data, methods and important instrument setup data are stored in the memory components of the CPU board. Therefore it is important to save these data before a CPU board has to be changed. This is only possible when the CPU board is at least partially functioning.
On the Service CD, you find the required programs for backup and restoring CPU data.
In case the CPU board is completely non-functional, a set of default data should be loaded into the replacement board (see 7.9.1.4) and the plate transport and the filter wheel must be adjusted.

7.9.1.1 Data Backup

Connect the reader to the computer, do not switch the reader on,
Copy VrBackup.exe from the service CD to your chosen directory.
To start the Backup program, double click VrBackup.exe to launch. Wait for a message to appear asking you to switch on the reader, switch on the reader. If successful, the program will begin backing up the data, at the end of the procedure the screen will show 'Successfully finished ...'.
Switch off the reader and close the program window.
Now the CPU board can be physically replaced.

7.9.1.2 Physically replace CPU board

Before the CPU board can be accessed, the instrument cover, base plate and bottom plate must be dis-assembled as described in Chapters 7.2.1 and 7.2.2.
The CPU board is located on the bottom side of the base plate, it is "sitting" on the Interface board.
Carefully lift the CPU board from the connectors that hold it onto the Interface board.



Old Style Interface Board

Carefully insert the new CPU board into the sockets in the correct orientation as displayed in the image above.
Re-assemble the instrument
Now the CPU board data must be restored (7.9.1.3)

7.9.1.3 Restoring the original Data (*if a backup as in 7.9.1.1 was possible*)

Connect the reader to the computer, do not switch the reader on
Copy VrRestore.exe from the service CD to your chosen directory.
Copy vrdata.s3 and vrprog.s3 from the directory where you stored VrBackUp.exe to the directory where VrRestore.exe resides.
To start the restore program, double click VrRestore.exe to launch. Wait for a message to appear asking you to switch on the reader, switch on the reader. If successful, the program will begin restoring the data, at the end of the procedure the screen will show 'Successfully finished ...'.
Switch off the reader and close the program window.
Now this CPU is a "Clone" copy of the old CPU board.

7.9.1.4 Restoring default Data (if a backup as in 7.9.1.1 was not possible)

Connect the reader to the computer, do not switch the reader on
Copy VrRestore.exe, vrdata.s3 and vrprog.s3 from the service CD to your chosen directory.
To start the restore program, double click VrRestore.exe to launch. Wait for a message to appear asking you to switch on the reader, switch on the reader. If successful, the program will begin restoring the data, at the end of the procedure the screen will show 'Successfully finished ...'.
Switch off the reader and close the program window.
Calibrate both plate transport, and filter wheel (see 5.3.1.1 and 5.3.2.1).
Use the manufacturer's QC - plate to adjust the Plate Positions as described in 5.3.3.4
The zero position of the filter wheel must be adjusted as described in chapter 8.6 'Define Filter Zero Position'.
The serial number must be edited as described in chapter 8.2 'Set Serial Number'

7.9.2 Replace the Interface board

Before the Interface board can be accessed, the instrument cover, base plate and bottom plate must be dis-assembled as described in Chapters 7.2.1 and 7.2.2.
The interface board is located on the bottom side of the base plate and "carries" the CPU board. It is mounted to the base plate with 6 hex-screws indicated below in red circles:

Old Style Interface Board

Carefully lift the CPU board from the connectors that hold it onto the Interface board.
Disconnect all wiring connections.
Disconnect and remove the defective Interface board.
Mount and reconnect the new Interface board.
Carefully insert the CPU board into the sockets (noting correct orientation above)
Re-assemble the instrument, there are no further adjustments required.

7.9.3 Replace the Power Supply board

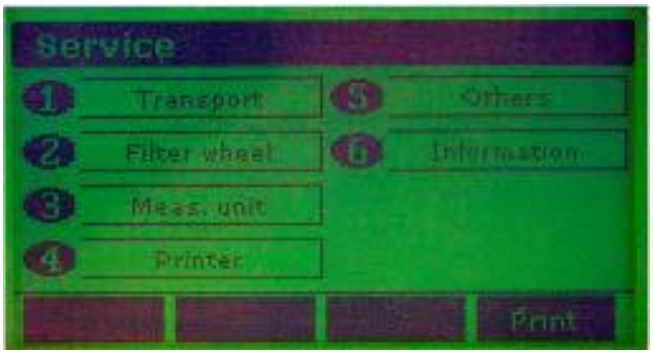
Before the Power Supply board can be accessed, the instrument cover, base plate and bottom plate must be dis-assembled as described in Chapters 7.2.1 and 7.2.2.
ATTENTION: Before touching the Power Supply Board, make sure that the power cord is disconnected from the instrument!
The Power Supply board is located in the bottom plate. It is mounted to the base plate with 4 slot-head screws, which can be accessed from the under side of the bottom plate.
To replace the Power Supply board, disconnect the cables, remove and replace the unit.
After the replacement, no further adjustments are required.

7.9.4 Replace the Light Intensity regulation board

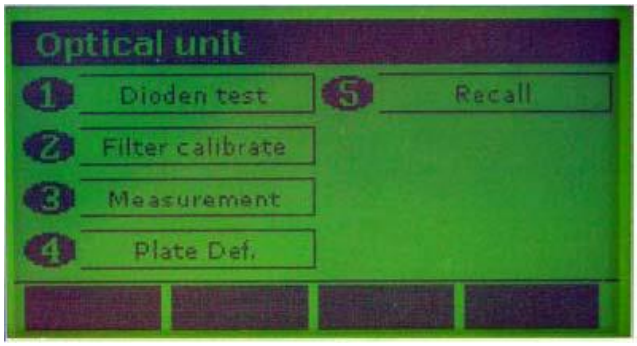
In order to exchange the light regulator board (SB018011) for new, please follow these instructions.

Disconnect the instrument from the power source and remove the six case screws from the instrument top cover.
Rotate the top cover to the left hand side (with plate carrier door facing you) so that you can disconnect the keyboard & display cables.
Remove all connections from the light regulator board
Remove the four screws holding the light regulator board to the chassis.
Remove the light regulator board and replace with new
Replace the four screws to secure the board in place.
Reconnect all the wiring connections to the board.
Temporarily refit the keyboard and display cable but leave the top cover to the left side of the instrument on its side.
Reconnect the power supply to the instrument and switch on.

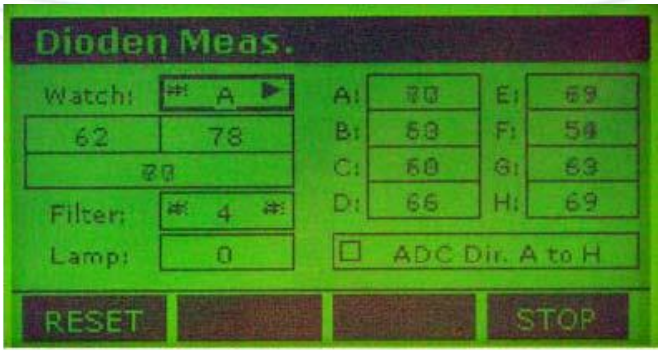
From the main screen, enter the service function by pressing the  or the  key. The password is “5020”. You will then enter the ‘Service’ screen as displayed below.



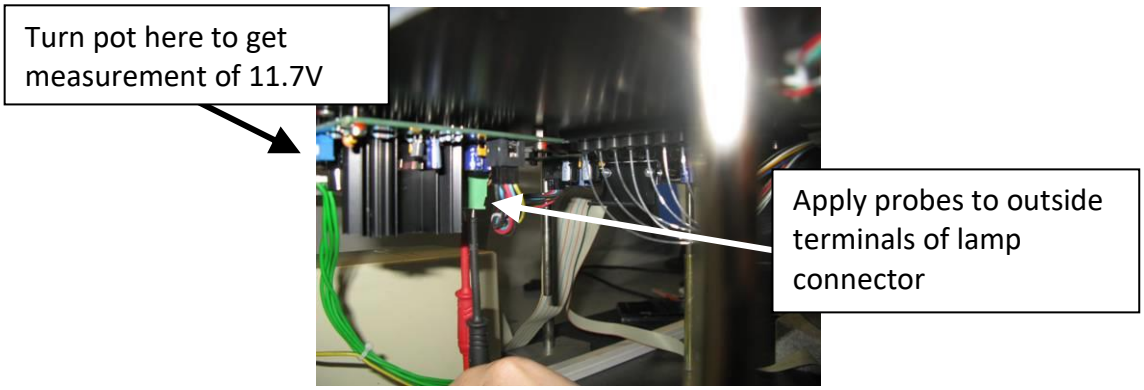
From the “Service” screen, select #3 “Meas. Unit” which will display the screen below.



Select #1 “Dioden test”.



Arrow down to highlight 'lamp'. Enter a value of 15500, followed by the up key that will highlight the box above and apply the changes to the lamp.
With the lamp at this brightness, you must quickly turn the filter wheel to cover the optics and prevent damage to the fibre optics.
Connect a voltage meter to the outer terminals of the lamp connector.



Adjust the pot to measure 11.7v
Re-select the lamp box, enter 00000 then press the up arrow to change the lamp back to normal brightness.
Switch off the instrument and replace the top cover
Secure with the 6 top cover screws.

7.9.5 Replace the Pre-Amplifier board

Before the light control board can be accessed, the instrument cover must be removed. Ensure the power to the instrument is OFF.

Remove the two 2.5mm hex bolts holding the black pre-amplifier board shield to the base plate.
Place to one side or disconnect the earth cable and remove completely.
Disconnect the grey ribbon cable from the board.
Using a 5mm nut spinner, remove the two columns and washers holding the PCB to the upper lens block.
Remove the pre-amplifier board and replace with new
Centrally align the screw holes in the pre-amplifier board with the screw holes in the upper lens block. Hold the PCB in position whilst replacing the columns and washers.
Re-fit the grey ribbon cable
Re-fit the black shield and ensure the earth connector is re-fitted if previously removed.
Replace the top cover but do not fit the screws.
Follow 8.4 'Darkness Value Adjustment'

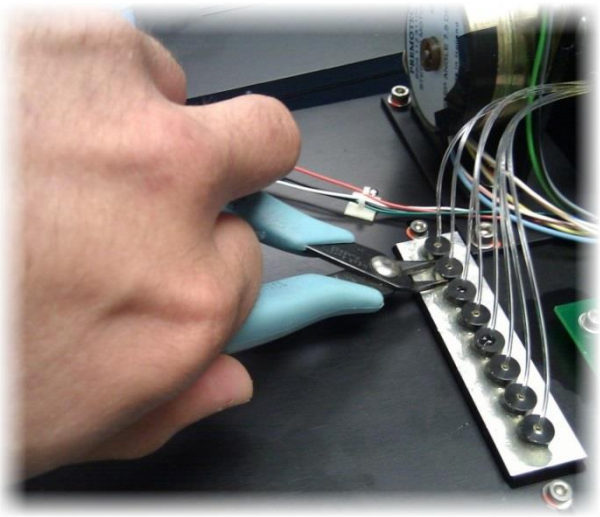
7.10 Replace LCD display

The display is replaced complete with its cable. Before the Display board can be replaced, the instrument cover must be removed as described in Chapter 7.2.1.
The display is mounted to the cover with 4 hex screws.
After replacing the display, adjust the contrast as described in chapter 4.2.4 'Display Contrast setting'.

7.11 Replace Fibre Optic Loom

Before the fibre optic loom can be accessed, the instrument cover, base plate and bottom plate must be disassembled. The fibre optic loom cannot be repaired, if damage exists, it must be replaced.

The loom is held to the base plate using two-part epoxy resin glue, to remove use a hammer and a small chisel or flat blade screwdriver to break away the glue.
Once the glue has been removed, the loom is removable. If you cannot remove a ferrule from the lens block, the use of a pair of small cutters can be helpful and used to lever out the ferrule:

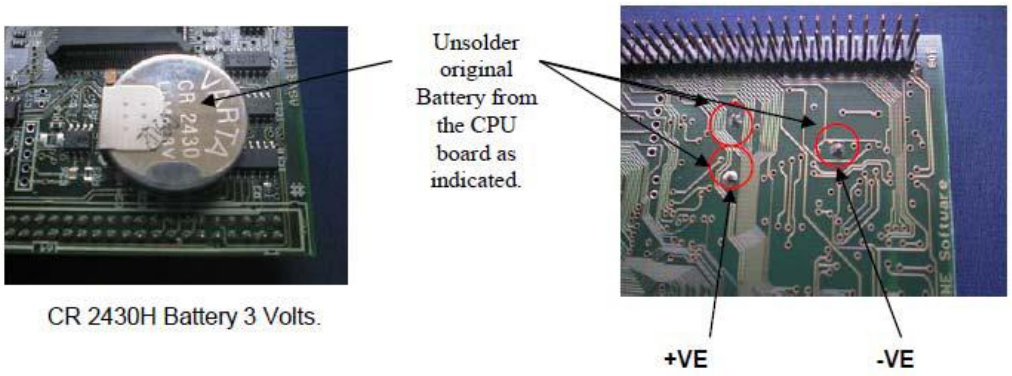


The new fibre optic loom should be fitted so that the longest optic fits to the furthest away hole in the lens block and the shortest optic fits to the nearest.
Follow section 8.7 'light distribution' before applying 2 part epoxy glue.

7.12 CPU Board Battery Replacement

If the date/time or method settings reset themselves between switch on and off, then the battery has lost its charge and requires replacement. The factory standard battery is a 3V CR2430 battery, although higher capacity batteries can be obtained if required. The standard battery has a capacity of 280mAh (milliampere-hour), higher capacity batteries can store up to six times this capacity whilst retaining 3V.

Follow instructions from chapter 7.9.1.2 'Physically replace CPU board' in order to remove the CPU board and gain access the battery



CR 2430H Battery 3 Volts.

If you wish to use a non-standard higher capacity 3V battery, then solder it to the +VE and –VE contact points as indicated in the image above.

8.0 Adjustments

Several adjustments are required after certain parts replacement. Use the sections below if instructed to in previous chapters or by the manufacturer.

Important: Adjustments specified within this section have a major role in terms of functionality in accordance to the specification. Do not edit any parameter unless instructed to. This may void a warranty case.

Tools required:
Asys QC test plate
Mikrowin 2000 (v4.43 at time of writing) (Demo version will suffice, obtainable from www.mikrotek.de)
Expert Plus driver for Mikrowin 2000 (supplied with Mikrowin 2000)
Biochrom Digiread software
Small rectangular piece of tracing paper (Approx 8cm x 2cm)
Digital Voltage Meter

8.1a Measurement Position Adjustment

Proceed to step 8.1b if you are certain that the plate carrier is physically misaligned with the lower lens block before carrying out this section.

Positioning Check
Place an Asys QC test plate into the reader and take a measurement with any filter with Digiread. All results in row 1 and 12 should read less than 0.010 (under 0.004 is preferred for optimum performance) as the light beams in the optical system should read directly through the holes in row 1 and 12 of the Asys QC test plate.

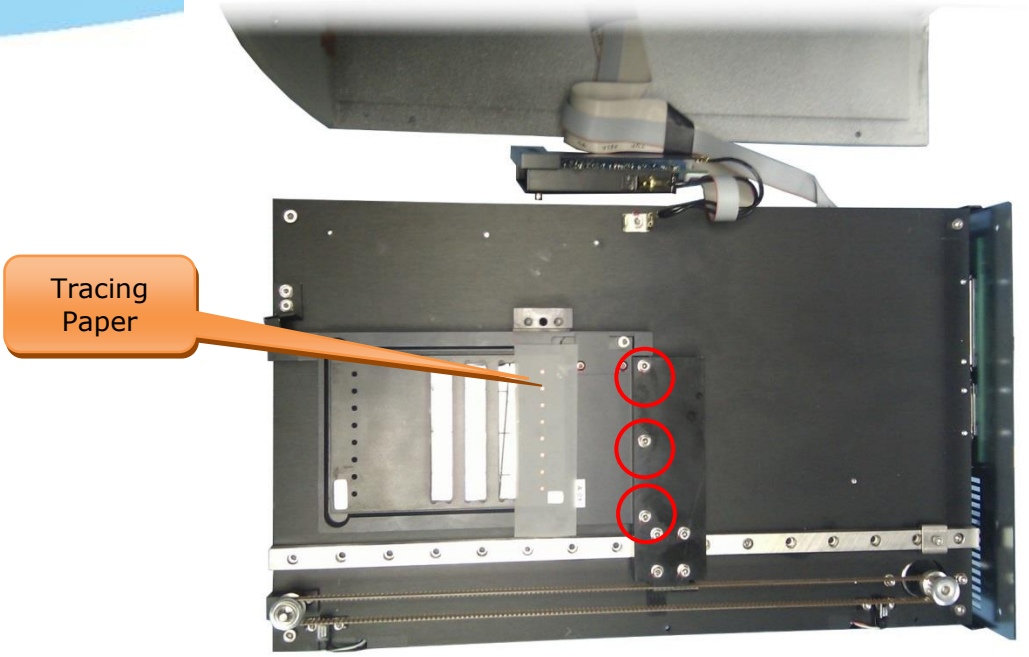
If the readings in row 1 and 12 are over 0.010, then adjustment is required:
Follow chapter 5.3.3.4 'Define Plate Positions'

8.1b Measurement Position Adjustment

The following section is required if you suspect that the plate carrier is misaligned physically or if you followed all steps in 8.1a without success.

To ensure correct functionality of the measurement system, the plate carrier must be aligned correctly with the lens block.
Remove the instrument top cover, but leave the display and keyboard cables attached to the interface board.
Switch on the instrument
Turn the filter wheel to a position where no filter wheel exists or remove a filter so that all the lamp energy reaches the fibre optics without disturbance.
Remove the 3mm bolt holding the upper lens block assembly (complete with pre-amplifier board) to the base plate.
Gently lift the entire upper lens block assembly from the base plate and remove, place to one side.
Fit an Asys QC test plate into the plate carrier.
Slide the plate carrier to row 1 of the test plate

Place a piece of tracing paper over the row of holes in row 1 of the test plate to see how aligned the light beams are in relation to the holes:



Make adjustment to the position of the plate carrier by loosening the three 2.5mm hex bolts as shown in red circles above. Ensure that the holes in row 12 are correct after correct adjustment for the holes in row 1. The light beam must be perfectly central in relation to the holes in the Asys QC test plate.

8.2 Set Serial Number

Connect the reader to a PC with Mikrowin 2000
Open Mikrowin and select Installation > Driver. From the list of installed reader drivers, double click on "Asys HiTech Expert Plus" to access the control window.
Click the 'Service Routines' button and enter the service password (ABACAB)
Type 'Ap' into the command window followed by the 'Enter' keyboard key to retrieve the current serial number information.
To set the new serial number, type 'Zp' followed by the serial number and date information in the following format:

Zp512345<SPACE>**WWYY**<SPACE><SPACE>**rWWYY**

Week number & year of repair (if any)

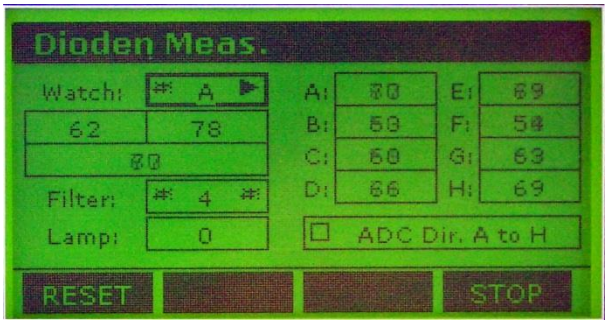
Week number & year of manufacture

This would be typed into the program as "Zp512345 0509 r2510" followed by the 'Enter' key.
It is vital to type 'G' followed by the 'Enter' key to finalise communication.
Now type 'Ap' again followed by 'Enter' to ensure the serial number has been edited successfully. Click the 'OK' button to exit when finished.

8.3 Light Intensity Voltage Adjustment

If you suspect an issue with the light control board or you need to verify the light control board functionality, these steps will ensure correct voltage.

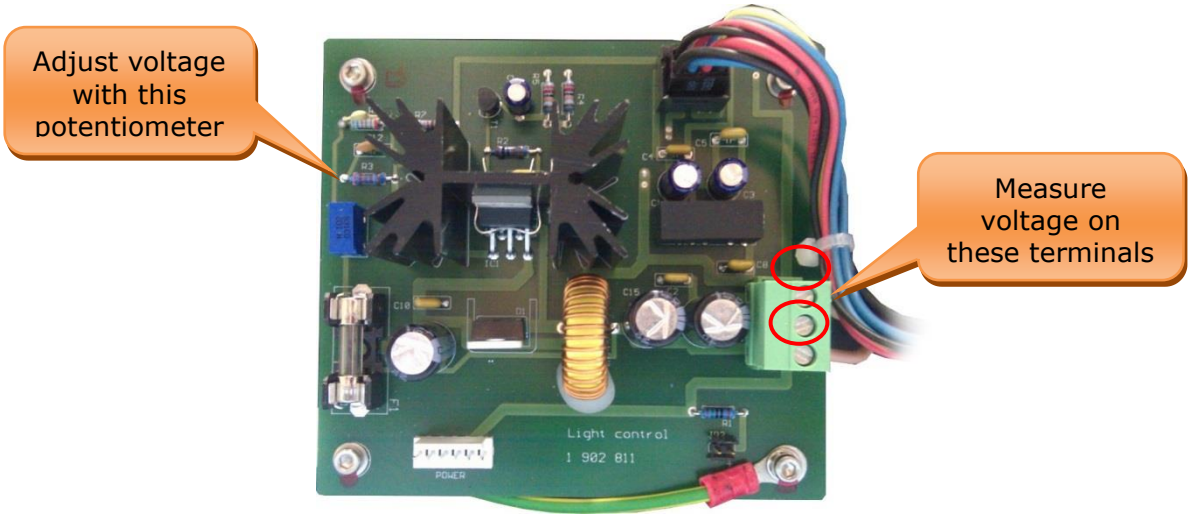
The Light intensity board is fitted with one potentiometer, which defines the range for the light intensity and which is factory adjusted. To adjust this potentiometer after replacement of the board, start the Service menu “Dioden Test” as described in chapter 5.3.3.1.
When the display shows the following screen:



Select the lowest wavelength filter from the ‘Filter:’ selection window as you will be using the lamp at near maximum brightness. If you cannot use a filter then manually turn the filter wheel to block the light reaching the fibre optic loom.

Important: If the lamp is left on high brightness for a long time without the use of a filter or light block, then this could cause heat damage to the fibre optic loom.

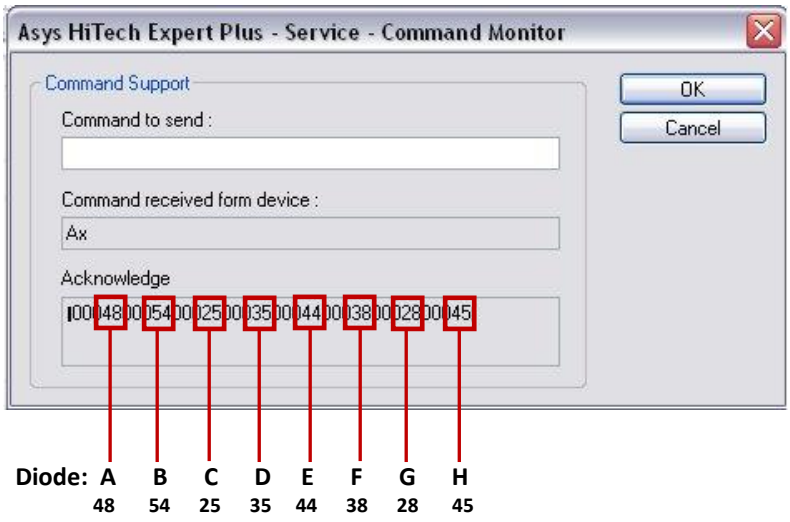
Type 15500 into the ‘Lamp:’ text box
Connect your digital voltage meter to the outer terminals on the lamp connector on the light control board as shown on the following page.



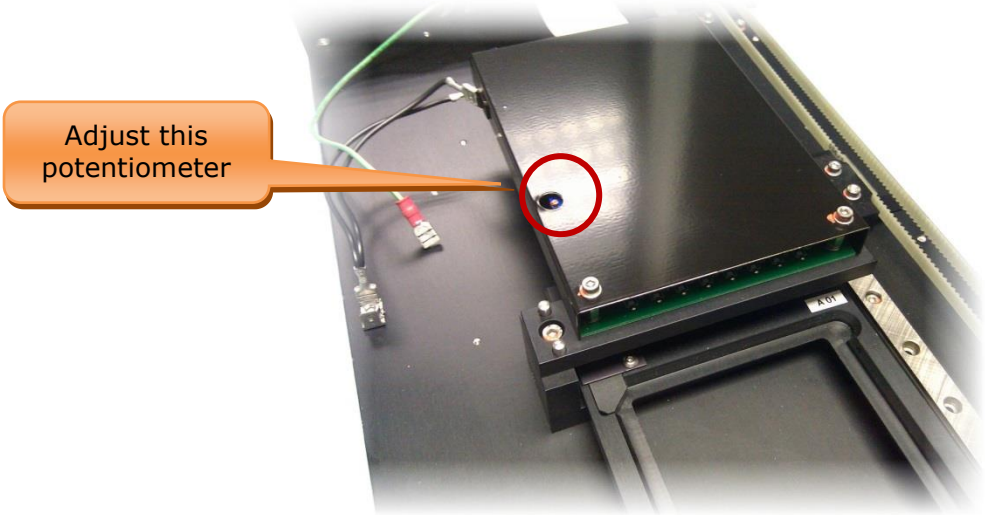
Click the “**Cursor Up**” button to apply the changes to the lamp setting, at 15500 counts, the lamp must have 11.7V
Adjustment is made via the blue potentiometer as annotated above.
When adjustment has been made, click the “**esc**” button three times to exit the Diode Monitor window and initialise the reader.

8.4 Darkness Value Adjustment

The darkness values are the values of each photodiode when they are receiving no light. The instrument top cover must be on during this check.
Connect the reader to a PC with Mikrowin 2000
Open Mikrowin and select Installation > Driver. From the list of installed reader drivers, double click on 'Asys HiTech Expert Plus' to access the control window.
Click the 'Service Routines' button and enter the service password (ABACAB)
Type 'Mm1500G' into the command window followed by the 'Enter' keyboard key. This will move the plate carrier to a position where it blocks the light from the lower lens block.
Type 'XnG' into the command window followed by Enter
Type 'Ax' into the command windows followed by Enter to retrieve the current diode readings in this format:



All readings should read between 15 – 220, usually all reading can be easily set to be between 30 – 100.
If the readings are too high or too low, then adjustment is made via the potentiometer located on the pre-amplifier board:



After any adjustment, replace the top cover and repeat steps 5 – 7 until the readings are within tolerance.

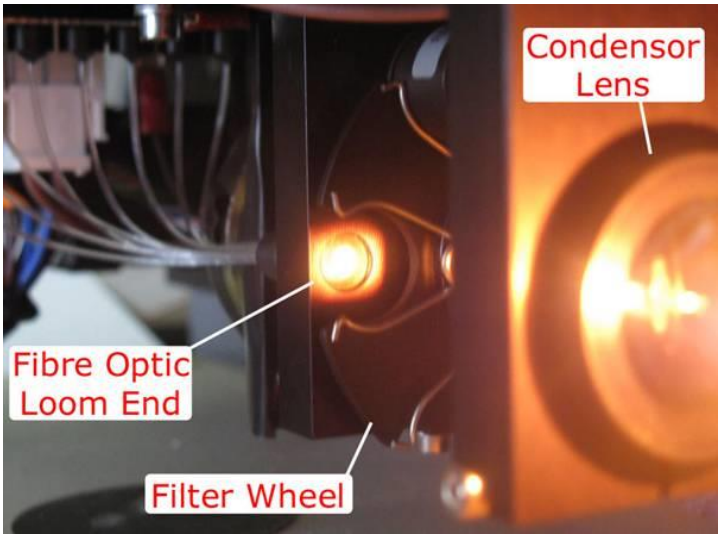
8.5 Condenser Lens Adjustment

If the light absorbed by the diode boards does not reach the maximum tolerance (**62000**) then adjustment to the condenser lens may be necessary.

Tools required:

2mm Hex Driver
2.5mm Hex Driver

Remove the six screws holding the upper housing of the instrument to the base assembly.
With the instrument door facing you, lift the cover off towards the left side and place next to the instrument.
Switch on the instrument
Press the key symbol on the keypad and enter **423599** as the password
From the production menu, select Meas. Unit > Dioden Test then arrow down to highlight 'lamp'.
Enter value 2000, followed by the up key to apply the changes to the lamp.
Remove the two 2.5mm bolts that hold the lamp screen in place.
Loosen the screw that holds the condenser lens in position, then move the lens to get a focussed image centrally over the fibre optic loom end. (If necessary, you may need to move the lamp bracket assembly to obtain a central light beam.)
Now slide the condenser lens towards the lamp to diffuse the light so that it covers the whole circular end of the fibre optic loom.



8.6 Define Filter Zero Position

Open the lid for the filter compartment to see if the light beam is in the centre of the filter. If this is not the case, the position of the filter wheel must be adjusted:
Open the filter compartment at the right side of the instrument or remove the instrument top cover.
Start the Service filter wheel sub-menu as described in 5.3.2 and select "**2**" for "Define Zero"
Select Filter 1 and look at the filter wheel. Filter 1 (usually the 620 nm filter) should be exactly in the centre of the light beam.
In case the position of filter 1 is not correct, you can move the position with the "**Cursor Up**" and "**Cursor Down**" keys.

Note: The filter wheel is extremely precise and thus the step changes in position are very small each time your press the "Cursor Up" or "Cursor Down" keys.

When the position is correct, press key "**F4**" 'Set' to store the new position and "**enter**" key to confirm and save changes.
Check the position by following the chapter 5.3.2.2 'Filter Wheel Position Test'

8.7 Light Distribution

If you are experiencing issues with the optical system, it is necessary to check the light output from each of the 8 channels. This guide should also be followed if new fibre optics are fitted.

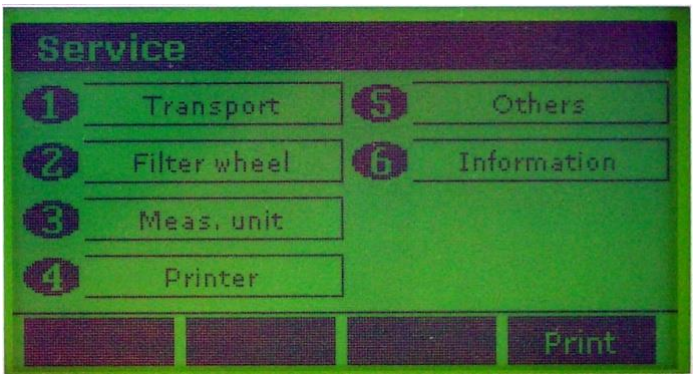
Enter the instrument service / diagnostic menu.

When the instrument is first switched on, or during standby, the display shows the following screen:

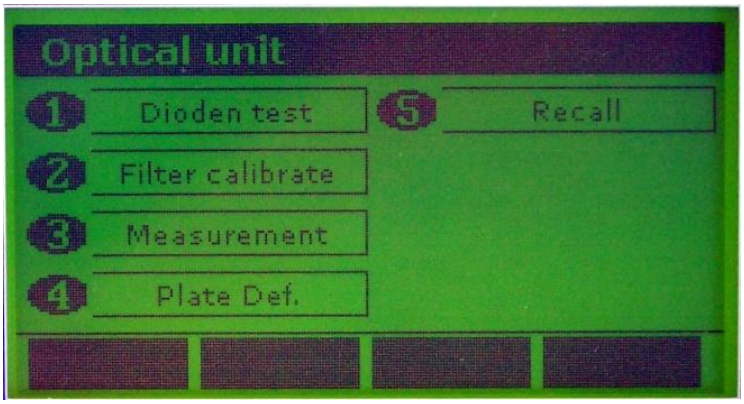
This menu allows settings that, if performed by un-authorised personnel or not performed properly, may cause major malfunctions of the instrument!

To enter the service/diagnosis menu, press the key “  ”. The instrument will now request you to enter the password. Use the numerical keys to enter the password: 423599 and confirm with “enter”

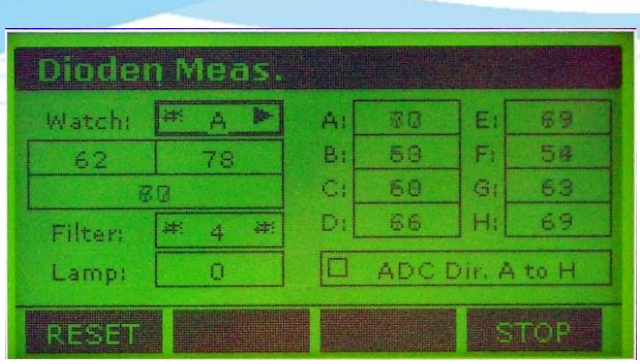
The instrument now enters the service/diagnostic menu and displays the following screen:



When the service/diagnosis menu start screen is displayed, select the menu point “**meas. Unit**” by pressing the numerical key “**3**“ and the display will show the following screens.

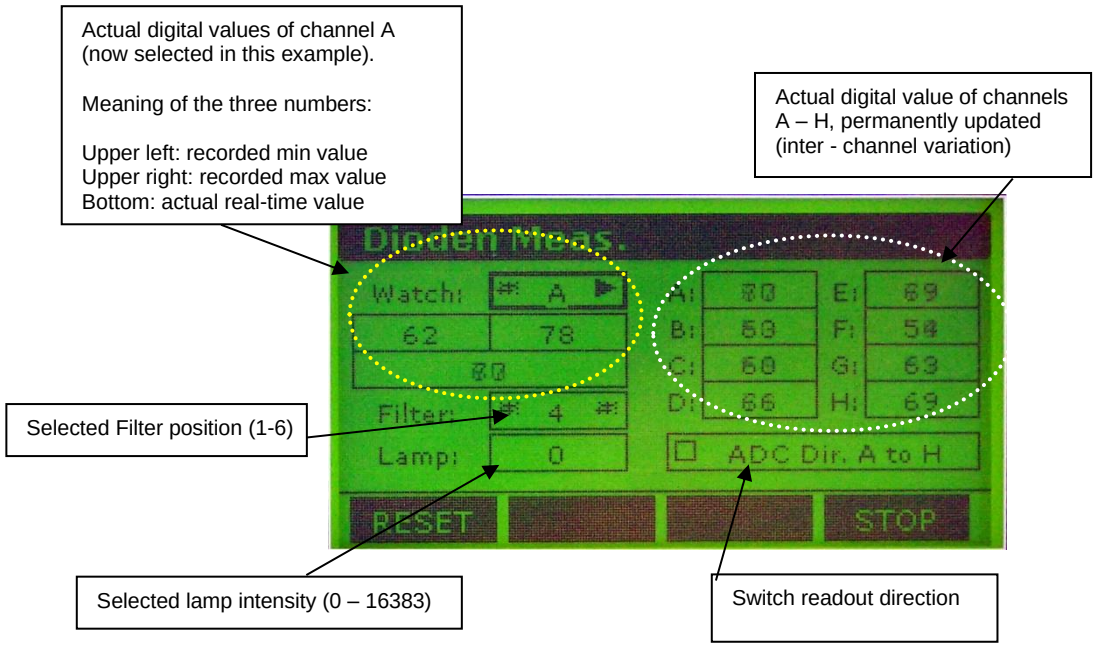


Enter the **Dioden test** menu; press “**1**”. The display will now show the screen below:



This menu allows you to check each of the eight optical channels, with each of the available wavelengths and at selectable lamp intensity

This screen allows you to verify the functionality of the:



Use the keys “cursor up” and “cursor down” to select the entry fields “watch”, “filter”, “lamp” and “adc dir. A to h”.
Use the keys “cursor left” and “cursor right” to select channels and filters.
Use the numerical keys to enter the lamp intensity (0 – 16383).
Use “f1” to reset the recorded max and min values of the selected channel.
Use “f4” to freeze all values

Set lamp intensity to 15000, use the keys “cursor up” or “cursor down” to apply the change in light to the lamp.
The digital values of all channels must be in overflow (65535), with all filters.
Reset the lamp intensity to 1000 counts (ensure you press up or down button after change)
Select filter 1, increase lamp intensity step by step until the highest digital value (A – H) is approx. 61000. Now, the lowest digital value must not be lower than 46000 (43000 for UV version).
Repeat step 6 with all installed filters (you will need to re-adjust lamp intensity for each filter separately – more light counts for lower wavelengths)
Press “esc” to escape from this menu and to return to the service start screen.

If adjustments are required, remove the instrument top cover and place black cloth over the top section of the reader otherwise outside light will influence the results. Adjustments to the light distribution can be made in several different ways, in order of preference:
Ensuring the filters are clean.

Fine adjustment of the condenser lens position.
Adjustment of the lamp position.
By polishing the ferrule end of the optics on fibres with low light levels (a cotton swab is good for polishing)
Fine adjustment of the fibre optic loom, it is possible to turn the ferrules slightly. Do not turn them too much or they will break!

If *new fibre optics are fitted or old removed for adjustment*

Once all values are within tolerance, apply two-part epoxy resin glue to the ferrules on both ends of the optics loom to ensure they do not come loose.

9.0 Cleaning and Disinfection

9.1 Introduction

This chapter gives instructions on how to clean parts, and how to properly maintain the instrument in order to assure longest possible functionality. Also the procedure for disinfection of the instrument is described.

9.2 Cleaning the instrument

This instrument is a precision instrument and requires regular cleaning to ensure the continued precision.

Liquid Spills
If any liquid is spilled in the instrument, it should be IMMEDIATELY removed so that the liquid does not run in to the Optical System and cause a loss of accuracy.

Regular cleaning
The housing of the instrument should be cleaned regularly with a mild household cleaning agent.
Warning: *Do not use aggressive solutions.*

9.3 Cleaning Filters

If an interference filter is dirty it needs to be cleaned. For the cleaning procedure you need low-lint cotton-tipped swabs and a lens cleaning solution or reagent-grade isopropyl alcohol.
Blow away dust and dirt with pressurized gas. Apply a few drops of the cleaner on both sides of the filter and wipe-off with the cotton swabs. Allow the cleaner to evaporate and then visually check the filter surface for streaks or spots. If required, repeat the procedure.

When streaks or spots are visible which cannot be removed by the procedure as described above most probably they are inside the filter. In such a case the filter must be replaced.

Note: Interference filters have a limited lifetime; depending on the humidity and ambient temperature. Under tropical conditions a filter may become unusable within less than two years.

9.4 Instrument Disinfection

All parts of the instrument that come into contact with patient sera or positive controls must be treated as potentially infectious. It is very important that the instrument is thoroughly disinfected before it is removed from the Laboratory or any servicing is performed on it.

9.4.1 Disinfection Procedure

If the laboratory has no specific disinfection procedure, the following procedure should be used to disinfect the instrument. The instrument should be disinfected using a suitable disinfection solution.

1. Disconnect the instrument from the mains power supply.
2. Disconnect the instrument from the computer.
3. Carefully wipe all the outside surfaces of the instrument and the plate support area with a wad of cotton wool that has been soaked in the disinfection solution.
   Ensure that disposable gloves are worn.
4. Place the instrument in to a large plastic bag.
5. Place a wad of cotton wool that has been soaked in the disinfection solution in to the plastic bag.
   Ensure that the wad is not touching the instrument.
6. Close and seal the plastic bag.
7. Leave the instrument to stand in the plastic bag for at least 24 hours.

After the standing time, remove the instrument from the plastic bag and wipe all the outside surfaces of the instrument and the plate support area with a wad of cotton wool which has been soaked in a 50% Alcohol solution.

Repeat the disinfection procedure on any accessories which are also being moved or returned.

11.0 Performance Verification

QC Plate (P/N: SG010160):
To check the performance of the Instrument, we recommend the use of an Asys QC plate with WinQC software. The QC plate checks the mechanical alignment of the plate transport, the optical path and tests the accuracy and precision.
The QC plate consists of a precisely machined aluminium body in the dimensions of a standard microplate and three neutral density glass filters. In contrast to other neutral density filters the sensitive coated area is protected by another glass layer, avoiding the known problems with scratches and degradation caused by frequent cleaning. The neutral density filters cover all of the eight measurement channels.
An instructional manual and WinQC software are supplied with the plate for correct operation and verification.

Orange Test Plate (P/N: S5450174):
An alternative to the QC plate is the so-called **'Orange Test plate'**. The results obtained with this plate are not as accurate as with the QC-plate but usually sufficient for service purposes.
The "Orange Test Plate" is a simple tool to check the correct wavelength and function of an interference filter. This is performed by comparing the enclosed reference OD data with OD data obtained by a measurement using the filter in question.
Furthermore the results of the measurement can demonstrate the correct function of the reader.

Note: The correlation of the reference data with the measured data is not 100% proof of the correct wavelength.

Operation of the Orange Test Plate
1. Make sure that the surface of the plate is free of dirt and fingerprints.
2. Perform single wavelength measurements with the filter in question and print the results.
3. Compare the results with the reference data. The results should be within +/- 20% and +/- 0.005 OD of the reference data for the wavelength used. If the result is off, most likely the filter is defective or has a wrong wavelength.
4. Check for similar readings in the 8 rows. There should be no more than +/- 6 % and +/- 0.005 OD difference between the readings of different rows in the same column. If the difference is higher, then the filter is likely to be defective. You may see irregular spots or rings if you look through the filter into a light source.

Note: For a complete performance check of the Instrument use the QC plate with WinQC software.

12.0 Preventative Maintenance

The use of the following checklist is at the discretion of the service engineer.
It is intended to help service engineers conduct servicing in a consistent and methodical manner. Copies of this check list are not formally required for instrument user or Biochrom Ltd.
This section can however be printed, filled out and kept as a record of the service history.

12.1 Details

Institute:		Date:	
Department:		Contract No:	
City:		Engineer:	
Customer name:		Instrument:	
Telephone:		Serial No:	
Computer model:		Software used:	
Software version:		Accessories:	
Engineer name:		Representative name	
Engineer sign:		Representative sign	

12.2 Functional tests

Check	Notes and Rectification if this fails	Pass / Fail
Ensure that the instrument has been cleaned and decontaminated by the customer.	Use the form in Appendix 1; disinfection is covered in section 1.3.	
Check the condition of the mains power supply and the mains lead, these should be safe with no exposed inner insulation.		
Check the overall condition of the unit, it should be safe to use.		
Run the QC test plate (as described in section 6) and obtain a pass.	Depending on the problem, refer to the relevant section in the manual.	
Perform a portable appliance electrical safety check on the instrument.		
Initial and date a 'serviced' sticker and place it over the existing sticker on the instrument.		

13.0 Spare Parts list

Description	Part Number
Orange Test Plate	S5450174
Dust cover (for instruments without a display)	80-4002-61
Dust cover (for instruments with a display)	80-4002-62
Stepper Motor (X Transport)	80-4000-31
Motor Gear Wheel (Pack of 3)	S5480010000
Cog (Rear - X Transport)	S5480009
Plate Transport Sensors & Wiring Loom	SB019019
Toothed belt	S4110012
Linear Guide Rail	S4140001
Filter Wheel Sensor wired	SB019003
Upper Lens block (with lenses & fittings)	SB018007
Filter Wheel Stepper Motor	80-4001-46
Spare Lamp (Expert Plus)	SB020007
Fibre Optic assembly UV and visible Reader	80-4000-92
Condenser lens	SB020006
Spare Lamp (Expert Plus UV)	SB020009
Interface Board/Main PCB (Old Style) with RS232 Connector	SB020016002
Interface Board/Main PCB (New Style) with USB Connector	80-4002-68
CPU Board Programmed	SB020017001EPP
Power Supply	S6200121
Light regulation Board	SB018011
Keyboard	S1350206
3V Battery for CPU Board (280mAH)	S1660001
Battery Upgrade Kit (Higher Capacity 1350mAH)	80-4000-02
Preamplifier Board	SB020015
Upper housing Expert Plus (Complete with display & keyboard)	SB020028001
Top cover assembly EZRead 800	80-4001-95
RS232 to USB Converter	80-4001-77
QC Plate with WinQC program	80-4000-37
QC Plate Calibration	80-4000-66
RS-232 cable (for the UVM340).	80-2118-11
Mini USB cable (for the EZ read 800 and EZ read 800 Plus)	80-4002-65
340nm Filter (UV Variant ONLY) (Standard UV) Obsolete	SB010075
Display with loom (Expert Plus, EZread800 Plus)	80-4002-63
Keypad Overlay (EZRead 800 Plus Plus)	80-4002-67
Keyboard Extension Cable V0200	80-4000-32
405nm Filter (Standard)	SB010060
450nm Filter (Standard)	SB010061
492nm Filter (Standard)	SB010062
620nm Filter (Standard)	SB010064
365nm Filter (UV Variant ONLY) obsolete	SB010099
370nm Filter (UV Variant ONLY) obsolete	SB010077
380nm Filter (UV Variant ONLY) obsolete	SB010098
410nm Filter	SB010083
415nm Filter	SB010065
420nm Filter	SB010087
460nm Filter	SB010073

Description	Part Number
500nm Filter	SB010080
504nm Filter	SB010074
510nm Filter	SB010079
517nm Filter	SB010085
520nm Filter	SB010082
525nm Filter	SB010081
535nm Filter	SB010297
540nm Filter	SB010086
546nm Filter	SB010105
550nm Filter	SB010063
560nm Filter	SB010084
562nm Filter	SB010096
570nm Filter	SB010067
580nm Filter	SB010094
590nm Filter	SB010070
595nm Filter	SB010072
600nm Filter	SB010095
630nm Filter	SB010092
650nm Filter	SB010068
655nm Filter	SB010093
660nm Filter	SB010091
690nm Filter	SB010066
700nm Filter	SB010071
720nm Filter	SB010076
740nm Filter	SB010088
750nm Filter	SB010089
800nm Filter	SB010069

Appendix 1 - DECLARATION OF CONTAMINATION STATUS

Prior to the Inspection, Servicing, Repair or Return of Medical and Laboratory Equipment.

Customer:

Address:

Tel No Fax No:

Instrument Type Serial Number:

Complete section A / C and if applicable complete all of section B, providing further information as requested or appropriate.

A. Has this instrument and its accessories been used in any invasive procedure or been in contact with blood, other body fluids, respired gases or pathological samples?

YES/NO If YES please complete section B / If NO please proceed to section C

B. This instrument and its accessories have been exposed internally or externally to hazardous material as indicated below.

YES/NO. Blood, body fluids, respired gases, pathological samples, other biohazards.

YES/NO. Radiation, chemicals or substances hazardous to health.

YES/NO. Other hazards – if YES please specify.

C. Has the instrument and its accessories been cleaned / decontaminated and suitably prepared for safe handling/transportation?

YES/NO If YES please indicate the methods and materials used for decontamination.

If the instrument and its accessories could not be decontaminated please state the reasons why.

I declare that I have taken all reasonable steps to ensure the accuracy of the above information, in accordance with MHRA DB 2006(05)

Authorised signature:

Name (printed):

Position:

Date:

Please note that instrumentation will not be accepted for servicing or return until this form is completed fully. Instrumentation that has not been cleaned sufficiently or decontaminated may be subject to additional charges.