TECAN.

Technical Manual for

infinite 200

![TECAN logo]

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	WARNING
	CAREFULLY READ AND FOLLOW THE INSTRUCTIONS PROVIDED IN THIS DOCUMENT BEFORE OPERATING THE INSTRUMENT.

Notice

Every effort has been made to avoid errors in text and diagrams; however, Tecan Austria GmbH assumes no responsibility for any errors, which may appear in this publication.

It is the policy of Tecan Austria GmbH to improve products as new techniques and components become available. Tecan Austria GmbH therefore reserves the right to change specifications at any time.

We would appreciate any comments on this publication.

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About the Manual

This document describes the **infinite 200** multifunctional microplate reader.
It is intended as instruction and reference for the service technician.

This document instructs how to:

- Install the instrument
- Operate the instrument
- Clean and maintain the instrument

Warnings, Cautions, and Notes

The following types of notices are used in this publication to highlight important information or to warn the user of a potentially dangerous situation:

	Note *Gives helpful information.*

	Caution **Indicates a possibility of instrument damage or data loss if instructions are not followed.**

	WARNING **INDICATES THE POSSIBILITY OF SEVERE PERSONAL INJURY, LOSS OF LIFE OR EQUIPMENT DAMAGE IF THE INSTRUCTIONS ARE NOT FOLLOWED.**

	WARNING **BIOHAZARD SIGN: INDICATES THE POSSIBLE PRESENCE OF BIOLOGICALLY HAZARDOUS MATERIAL. PROPER LABORATORY SAFETY PRECAUTIONS MUST BE OBSERVED.**

	Symbol for the address of the Legal Manufacturer

	ATTENTION NEGATIVE ENVIRONMENTAL IMPACTS ASSOCIATED WITH THE TREATMENT OF WASTE. ● **DO NOT TREAT ELECTRICAL AND ELECTRONIC EQUIPMENT AS UNSORTED MUNICIPAL WASTE.** ● **COLLECT WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT SEPARATELY.**

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1. Safety

1.1 Instrument Safety

1. Always follow basic safety precautions when using this product to reduce the risk of injury, fire, or electrical shock.

2. Read and understand all information in this document. Failure to read, understand, and follow the instructions in this document may result in damage to the product, injury to operating personnel or poor instrument performance.

3. Observe all WARNING and CAUTION statements in this document.

4. Never open the **infinite 200** while the instrument is plugged into a power source.

5. Never force a microplate into the instrument.

6. **infinite 200** is intended as a general purpose laboratory instrument for professional use. Observe proper laboratory safety precautions, such as wearing protective clothing and using approved laboratory safety procedures.

> **Caution**
>
> **Tecan Austria GmbH have taken great care when creating the stored Plate Definition Files that are received with the instrument software.**
> **We take every precaution to ensure that the plate heights and well depths are correct according to the defined plate type. This parameter is used to determine the minimum distance between the top of the plate and the ceiling of the measurement chamber. Additionally, Tecan Austria adds a very small safety gap to prevent any damage occurring to the measurement chamber as a result of small changes in plate height. This does not affect the performance of the instrument.**
>
> **Users MUST ensure that the plate definition file selected corresponds to the actual plate being used.**
>
> **Users should also take care that no potential fluorescent or luminescent contamination lies on top of the plate, for example: droplets and also be aware that some plate sealers leave behind a sticky residue that should be removed before reading.**

> **Caution**
>
> **Before starting measurements, make sure that the microplate position A1 is inserted correctly. The position of well A1 has to be on the upper left side.**

> **Caution**
>
> **To insure the optimal working of Tecan instruments we recommend a service interval of 6 months.**

It is assumed that the instrument operators, because of their vocational experience, are familiar with the necessary safety precautions for handling chemicals and biohazardous substances.

Adhere to the following laws and guidelines:

1. National industrial protection law
2. Accident prevention regulations
3. Safety data sheets of the reagent manufacturers

	WARNING
	DEPENDING ON THE APPLICATIONS, PARTS OF THE _infinite 200_ MAY COME IN CONTACT WITH BIOHAZARDOUS/INFECTIOUS MATERIAL. MAKE SURE THAT ONLY QUALIFIED PERSONNEL IS OPERATING THE INSTRUMENT. IN CASE OF SERVICE OR WHEN DISLOCATING OR DISPOSING THE INSTRUMENT, ALWAYS DISINFECT THE INSTRUMENT ACCORDING TO THE INSTRUCTIONS GIVEN IN THIS DOCUMENT.

2. General Description

2.1 Instrument

The Tecan **infinite 200** is a multifunctional microplate reader with injector option. The **infinite 200** provides high performance for the vast majority of today's microplate applications and research and is robotic compatible.

2.1.1 Intended Use

The **infinite 200** has been designed as a general purpose laboratory instrument for professional use, supporting common 6 to 384-well microplates conforming to the ANSI/SBS standards(see 2.1.2 Multifunctionality for further details).

> **Note**
> **System Validation by Operating Authority is Required**
>
> **The infinite 200 has been validated on a selected set of assays only.**
>
> **It is the responsibility of any operating authority to ensure that the infinite 200 has been validated for every specific assay used on the instrument.**

2.1.2 Multifunctionality

Depending on the type of wavelengths selection, the **infinite 200** is available in two different versions:

- **infinite M200** (monochromator-based instrument)
- **infinite F200** (filter-based instrument)

The following measurement techniques are supported by the **infinite M200**:

- Fluorescence Intensity (FI) Top
- Fluorescence Intensity (FI) Bottom
- Fluorescence Time Resolved (TRF)
- Flash Fluorescence
- Absorbance
- Absorbance with injectors
- Absorbance with cuvette
- Glow Type Chemi- or Bioluminescence
- Bioluminescence Resonance Energy Transfer (BRET [TM])
- Flash Luminescence

The fully equipped **infinite F200** provides the following measurement techniques:

- Fluorescence Intensity (FI) Top
- Fluorescence Intensity (FI) Bottom
- Fluorescence Time Resolved (TRF)
- Flash Fluorescence
- Fluorescence Polarization (FP)
- Absorbance
- Absorbance with injectors
- Glow Type Chemi- or Bioluminescence
- Bioluminescence Resonance Energy Transfer (BRET [TM])
- Flash Luminescence

Any common microplate ranging from 6 to 384 well formats conforming to the ANSI/SBS standards (ANSI/SBS 1-2004; ANSI/SBS 2-2004, ANSI/SBS 3-2004 and ANSI/SBS 4-2004) may be measured with any of the above measurement techniques. Switching between measurement techniques or plate formats is fully automated via software. It is not necessary to manually reconfigure the optics in order to switch between the reading modes supported by the **infinite 200**.

Both instrument versions, the filter-based (**infinite F200**) and the monochromator-based (**infinite M200**), may be equipped with up to two injectors.

2.1.3   Performance

The **infinite 200** has been designed to meet the requirements of a general-purpose laboratory instrument.

The **infinite 200** provides a range of parameters for optimizing the measurement results according to: the assay type (cell-based or homogeneous), the microplate type, and the dispensed volumes per well and dispensing speeds.

2.1.4   User Friendliness

The **infinite M200** offers unparalleled flexibility in wavelength selection for fluorescence intensity and absorbance measurements. Via software any wavelength can be easily adjusted within the specified wavelength range. In addition to single wavelength measurements, absorbance and fluorescence spectra can be recorded. When running a spectrum there is no restriction due to cut-off filters.

The **infinite F200** offers high flexibility for the customization of fluorescence and absorbance measurements; slides containing fluorescence and absorbance interference filters are easily accessible to the user.

> ***Note***
> ***If the instructions given in this document are not correctly performed, the instrument will either be damaged or the procedures will not be performed correctly and the safety of the instrument is not guaranteed.***

2.1.5 System Requirements

Minimum

- Pentium PIII 1 GHz
- 20 GB HDD
- 256 MB RAM
- 1 x USB 1.1 or 2.0
- CD ROM Drive
- Screen Resolution: 1024 x 768

Recommended

- Pentium P4 2 GHz
- 40 GB HDD
- 512 MB RAM
- 2 x USB 1.1 or 2.0, 1 x RS232
- CD ROM Drive
- Screen Resolution: 1280 x 1024

Operating System Requirements

- Windows XP Professional (English), Minimum Service Pack 1
- Microsoft Excel 2000 (English) or above (for i-Control)

2.2 Measurement Techniques

The following sections provide an introduction to the **infinite 200** measurement techniques when fully equipped. To keep this compact, a few simplifications have been made. For details see the references.

2.2.1 Fluorescence

The **infinite 200** offers the basic fluorescence measurement technique and some even more sophisticated variants:

- Fluorescence Intensity (or simply Fluorescence)
- Fluorescence Time Resolved

FI may also be used to measure Fluorescence Resonance Energy Transfer (FRET). For some microplate applications, FRET offers advantages over FI and TRF, because they simplify assay preparation. These preferably apply for **mix and measure** binding studies. Compared to FP, FRET requires both binding partners to be labeled in a suitable way. On the other hand, FRET may utilize TRF labels for increased sensitivity, then being referenced as HTRF (Homogeneous TRF).

TRF should not be confused with Fluorescence Lifetime Measurements.

Fluorescence (An Abstract)

Fluorescent molecules emit light of specific wavelength when struck by light of shorter wavelength (Stokes Shift). In particular, a single fluorescent molecule can contribute one fluorescence photon (quantum of light). This is a part of the energy, which has been absorbed before (electronic excitation), but could not be released quick enough into thermal energy.

The average time it takes between excitation and emission is called the fluorescence lifetime. For many fluorescent molecular species, fluorescence lifetime is on the order of nanoseconds (prompt fluorescence). After excitation, fluorescence emission occurs with a certain probability (quantum yield), which depends on the fluorescent species and its environmental conditions.

For a detailed treatise on fluorescence techniques and applications see:

Principles of Fluorescence Spectroscopy by Joseph R. Lakowicz, Plenum Press.

A) Fluorescence Intensity (FI)

In many microplate applications, the intensity of fluorescence emission is measured to determine the abundance of fluorescent labeled compounds. In these assays, other factors having an influence on fluorescence emission need to be controlled experimentally. Temperature, pH-value, dissolved oxygen, kind of solvent etc. may significantly affect the fluorescence quantum yield and therefore the measurement results.

B) Fluorescence Resonance Energy Transfer (FRET)

Some microplate applications utilize a sophisticated dual labeling strategy. The FRET effect enables you to measure how many of two differently labeled compounds are in close proximity. This makes it suitable for binding studies.

Basically, FRET is a fluorescence intensity measurement of one of the two fluorescent labels (acceptor). However, the acceptor is not susceptible to the excitation wavelength of the light source being used. Instead, the acceptor may receive excitation energy from the other fluorescent label (donor), if both are spatially close together. As a prerequisite, the excitation wavelength has to apply to the donor. Secondly, the emission spectrum of the donor has to overlap the excitation spectrum of the acceptor (resonance condition). Nevertheless, the transfer of excitation energy from donor to the acceptor is radiation free.

Some FRET-based applications utilize suitable pairs from the fluorescent protein family, like GFP/YFP (Green/Yellow Fluorescent Protein, (ref. **Using GFP in FRET-based applications** by Brian A. Pollok and Roger Heim – trends in Cell Biology [Vol.9] February 1999). Overview is given in the Review Article – **Application of Fluorescence Resonance Energy Transfer in the Clinical Laboratory: Routine and Research** by J. Szöllösi et al. in Cytometry 34, page 159-179 (1998).

Other FRET-based applications take advantage from using TRF labels as the donor. For example see, **High Throughput Screening** – Marcel Dekker Inc. 1997, New York, Basel, Hong Kong, section 19 Homogeneous, Time-Resolved Fluorescence Method for Drug Discovery by Alfred J. Kolb et al.

C) Fluorescence Time Resolved (TRF)

TRF applies to a class of fluorescent labels (chelates of lanthanides like Europium, [ref. **Europium and Samarium in Time-Resolved Fluoroimmunoassays** by T. Stâhlberg et. al. - American Laboratory, December 1993 page 15]), some of them having fluorescence lifetimes in excess of 100 microseconds. The **infinite 200** uses a Flash lamp light source with flash duration much shorter than fluorescence lifetime of these species. This offers the opportunity to measure fluorescence emission at some time, when stray light and prompt fluorescence have already vanished (Lag Time). Thus, background can be significantly lowered while sensitivity is improved.

The benefits of TRF consequently apply to assays using multiple labels with different fluorescence lifetimes.

D) Fluorescence Polarization (FP)

Fluorescence Polarization (FP) measures rotational mobility of a fluorescent labeled compound. FP is therefore particular suitable for binding studies, because the tumbling motion of small molecules may be dramatically slowed down after binding to a larger molecule.

Fluorescence polarization measurements are based on the detection of the depolarization of fluorescence emission after excitation of a fluorescent molecule by polarized light. A fluorescent molecule can be visualized as an antenna. Such a molecule can absorb energy if and only if the polarization of the excitation light matches the orientation of the antenna.

During the fluorescence lifetime, i.e. the time a molecule remains in the excited state, small molecules diffuse rotationally relatively rapidly. Hence they re-orient before they emit their photon. As a result and due to the random character of diffusion, a linearly polarized excitation light will be translated into a less polarized emission light. Thus, a high resultant mP value denotes the slow rotation of the labeled molecule, indicating that binding probably did occur. A resultant low mP value denotes a fast rotation of a molecule, indicating that binding probably did not occur.

The FP measurement result is calculated from two successive fluorescence intensity measurements. They differ in the mutual orientation of polarizing filters, one being placed behind the excitation filter, another ahead of the emission filter. By processing both data sets, it is possible to measure the extent of how much the fluorescent label has changed orientation in the time span between excitation and emission.

2.2.2   Absorbance

Absorbance is a measure for the attenuation of monochromatic light when transmitted through a sample. Absorbance is defined as:

$A = LOG_{10} (I_0/I_{SAMPLE})$,

Where I_{SAMPLE} **is** the intensity of the light being transmitted, I_0 the light intensity not attenuated by sample. The unit is assigned with Optical Density (O.D.)

Thus, 2.0 O.D. means $10^{2.0}$ or 100-fold attenuation (1% transmission),

1.0 O.D. means $10^{1.0}$ or 10-fold attenuation (10% transmission), and

0.1 O.D. means $10^{0.1}$ or 1.26-fold attenuation (79.4% transmission).

If the sample contains only one species absorbing in that narrow band of wavelengths, the background corrected absorbance (A) is proportional to the corresponding concentration of that species (Lambert-Beer's Law).

2.2.3   Luminescence

Caution
Switch on the instrument at least 15 minutes before starting a luminescence measurement. Some components need to warm up to guarantee stable conditions for the measurement.

Glow Type Chemi- or Bioluminescence

The **infinite 200** provides measurement of glow type chemi- or bioluminescence. Glow type means that the luminescence assay glows much longer than a minute. Luminescence substrates are available, which provide stable enough light output over hours.

As an example, luminescence can be measured to determine the activity of an enzyme labeled compound (-peroxidase, -phosphatase). Light emission results from a luminescence substrate being decomposed by the enzyme. Under excess of substrate the luminescence signal can be assumed to be proportional to the abundance of the enzyme labeled compound. As with enzyme-based assays, control of environmental conditions is rather critical (temperature, pH-value).

For practical aspects of luminescence assays see the following example:

Bioluminescence Methods and Protocols, ed. R.A. LaRossa, Methods in Molecular Biology 102, Humana Press, 1998

Bioluminescence Resonance Energy Transfer (BRET ^{TM})

BRET ^{TM} is an advanced, non-destructive, cell-based assay technology that is perfectly suited for proteomics applications, including receptor research and the mapping of signal transduction pathways. BRET ^{TM} is based on energy transfer between fusion proteins containing *Renilla* luciferase (Rluc) and a mutant of the Green Fluorescent Protein (GFP). The BRET ^{TM}signal is generated by the oxidation of p.a. DeepBlueC™, a coelenterazine derivative that maximizes spectral resolution for superior sensitivity. This homogeneous assay technology provides a simple, robust and versatile platform with applications in basic academic as well as applied research.

Flash Luminescence

In flash type luminescence assays the measurement is only done during the dispensing of the activating reagent or after a short delay time.[*]

Over the past years luminescence substrates have been improved towards providing more stable signals. In so-called glow type luminescence assays the luminescence signal is spread over a wide time scale (e.g. a half-life of 30 min.)

Flash Type Luminescence with Injectors

Flash type luminescence is one of the measurement modes that can be performed with injectors.

> *Note*
> *The plate detection sensor is only active if one of the injectors is in use (strips "injection" or "dispense").*

> *Note*
> *During luminescence measurements it is important to close the lid covering the syringes and bottles of the reagent system to minimize background signal.*

---

[*] For Flash reactions with the **infinite 200**, see also 2.3.1 Measurement with Injectors.

2.3 Injectors

The **infinite 200** can be optionally equipped with an injector module consisting of one or two syringe pumps (XE-1000, Tecan Systems) located in a separate box, which feed one or two injector needles. The injector needles are designed to inject liquid into any well equal to or larger than a standard 384-well plate.
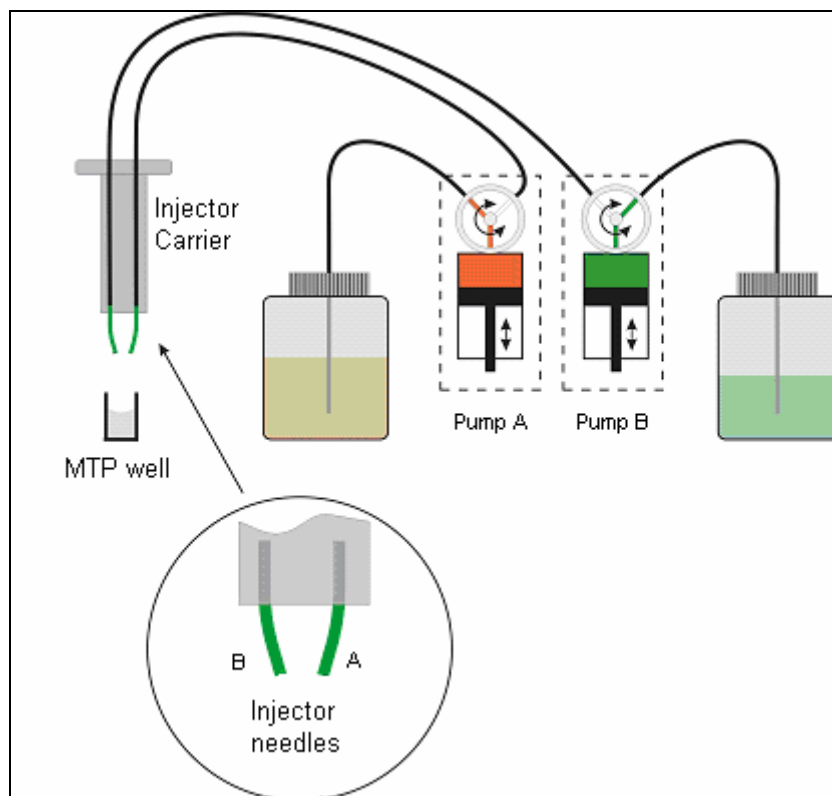
Figure 2-1: Schematic view of the injector module

There are up to two pumps available for the **infinite 200** (see *Figure 2-1* above):

- Pump A feeds injector needle A
- Pump B feeds injector needle B

The **infinite 200** can be equipped with one pump (pump A) or two pumps (pumps A and B).

One Injector Option (one pump): An **infinite 200** equipped with one pump allows injections in all SBS-conform microplate well types larger than or equal to a SBS standard 384-well plate.

Two Injector Option (two pumps): Some applications, such as flash luminescence reactions or dual reporter gene assays require the injection of two *independent* liquids into the same well; therefore, Tecan Austria offers a two-injector option.

2.3.1   Measurement with Injectors

The injectors of the **infinite 200** can be used with the following measurement modes: Fluorescence Intensity top and bottom, Time Resolved Fluorescence, Absorbance, Flash and Glow Type Luminescence and Dual Color Luminescence. As the measurement position is not the same as the injector position, a short time delay (approx. < 0.5 s) between injection and reading occurs.

For details on how to set up a measurement with injectors please refer to chapter 2.4.1 i-Control and Injectors.

2.3.2   Storage Bottles

The injector box may hold up to two 125 ml bottles. An adapter for smaller tubes allows using tubes of different size (1.5 ml, 15 ml, 50 ml tubes etc.)

The standard bottle set supplied with the Injector option consists of:

*   One 125 ml bottle and one 15 ml bottle for the "One Injector option" (one pump) or
*   Two 125 ml bottles and two 15 ml bottles for the "Two Injectors option" (two pumps).

Figure 2-2: Storage bottles and adapter for smaller tubes

2.3.3 Injector/Injector Carrier

The carrier, which includes the injector needles, can be easily removed from the instrument for priming or washing the system and for optimizing the injection speed.

Figure 2-3: Injector carrier

When using the injector during a measurement or for just dispensing a plate the injector carrier must be inserted correctly into the instrument. Remove the injector dummy and insert the carrier into the injector port. Press the carrier softly into the injector port until you hear a clicking noise.

The instrument contains an injector sensor that checks that the position of the injector carrier for the actions 'inject' and 'dispense' is correct.

If the injector carrier is not inserted correctly the injector sensor does not recognize the inserted carrier and neither dispensing nor injection is possible. On the other hand actions like washing and priming are enabled although the injector carrier is inserted. Therefore always make sure that the injector carrier is in the service position for washing and priming.
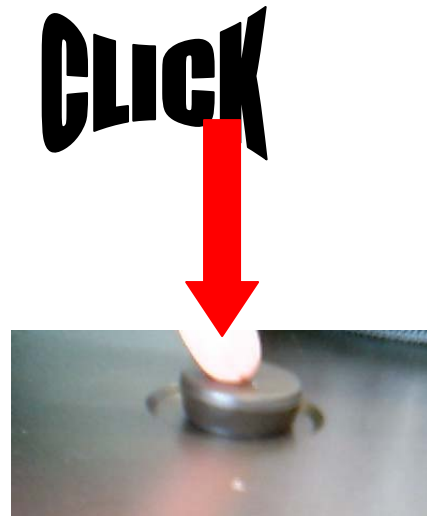
Picture 2-1: Inserting the injector carrier into the injector port

Caution
The injector carrier must be in the service position
for washing und priming.

Prime and Wash must not be performed
when the injector is in the instrument!

Caution
If the injector carrier is not inserted correctly in the injector port, the
injector sensor will not detect the inserted injector and therefore
washing and priming will be enabled, which can damage the instrument.

The dead volume of the injection system (injector needles, syringes, valves and tubing) is approximately 100 µl after '**backflush**' for each syringe. The function of *backflush* is to return any unused reagent to the reservoir bottles. The injection speed can be adjusted via the software to allow for good mixing of reagents. The optimum injection speed depends on the assay parameters, such as viscosity of fluids, the plate format and the measuring behavior of the liquids.

Prime/Wash buttons for injectors A and B
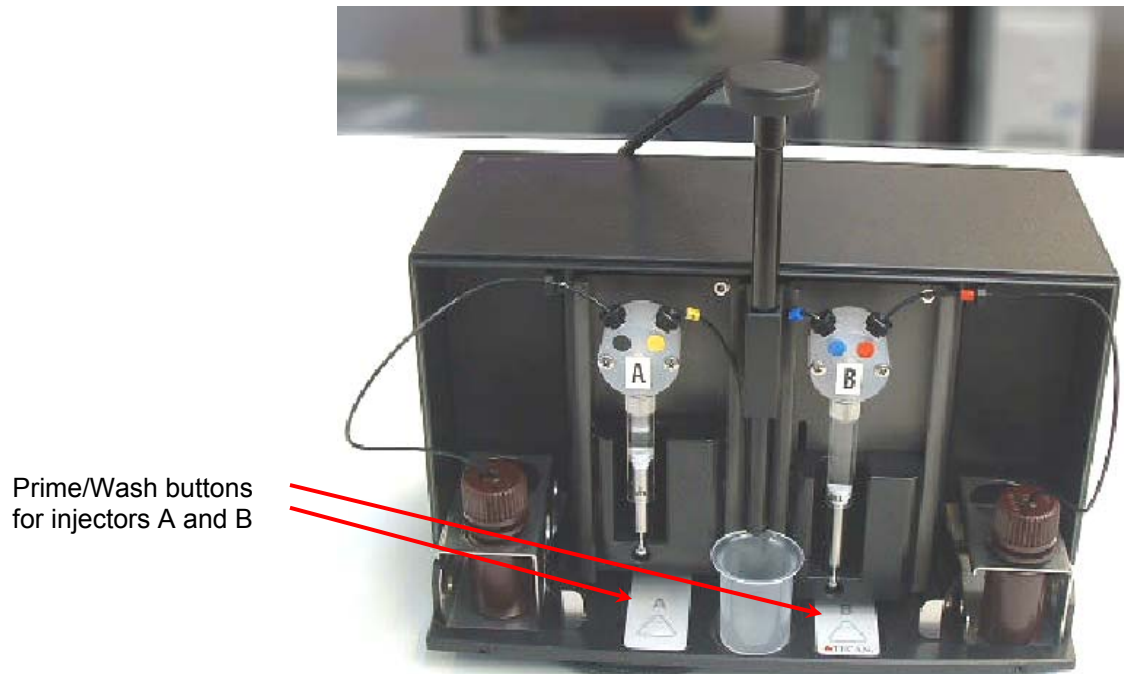
Figure 2-4: Injector-box with injector in 'service position'

Before starting a measurement make sure that:

1. The tubes are clean. If not please refer to chapter 2.3.4 Priming and Washing of the **infinite 200** for details how to clean the injector system.
2. The injector tubes are correctly inserted into the storage bottles and fixed.
3. The injector system is primed. It is not possible to start a measurement without priming the system.

When priming the system:

1. Check the tubes for leaks.
2. Check the tubes for kinks.
3. Make sure that the injector needles are not twisted.

If the tubes require replacement for any reason, after the tubes have been changed do not forget to perform washing and priming before starting a measurement.

2.3.4 Priming and Washing of the *infinite 200*

> **Caution**
> **The injector carrier must be in the service position for washing und priming. Prime and Wash must not be performed when the injector is in the instrument!**

The initial filling step of the injector system (priming) as well as the cleaning step of the injector system (washing) must take place outside of the instrument. For these procedures the injector carrier is removed from instrument and put into the service position of the injector box. For priming and washing steps of the injector system, a default setting for injection speed and volume dispensed is provided. If required the priming parameters can be adjusted in the injector control window of the i-Control software.

The prime volume depends on the tubing length. Two types of injector tubing are available: 'long': 105 cm, and 'short': 80 cm.

For the initial filling step of the injector system (priming) it is recommended to use at least 2000 µl to remove all air bubbles from the injection system. The minimum prime volume is therefore 2 ml. To save precious reagents, this initial filling step can be performed with distilled water. To replace the water with the required reagent, a second priming step is needed. For this second priming step, the priming volume can be reduced to approx. 1500 µl.

> **Caution**
> **A prime volume below 2 ml in an empty system may result in incomplete filling of the system, and therefore may negatively affect assay performance.**
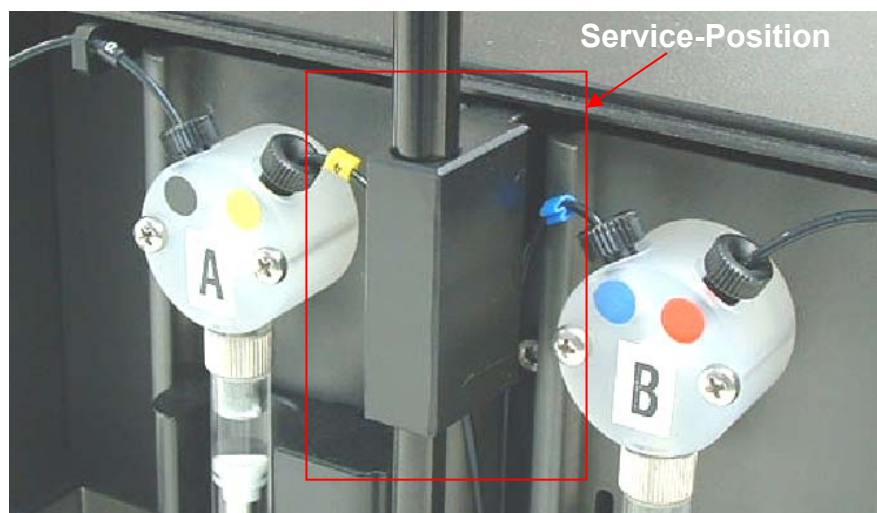
Figure 2-5 'Service Position' of the injectors. The injectors are removed from the carrier slot and inserted into the holder of the injector carrier system.

> **Caution**
> **Do not touch the injector needles. They can become easily bent or misaligned, which can cause injection problems or damage the instrument.**
> **If the injector carrier is not inserted correctly in the injector port, the injector sensor does not detect the inserted injector and therefore washing and priming is enabled which can damage the instrument. In addition to this, the actions 'dispense' and 'inject' will not be possible.**

Priming

Before the injection system can be used, an initial filling step (priming) is needed to remove all air and to completely fill the system with liquid.

It is recommended to perform a washing step before priming.

Priming can be performed by using the i-Control software or by using the hardware buttons on the injector box:

Priming procedure (general):

1. Fill the storage bottles with the necessary reagents and insert the feeding tube(s). Make sure, that the tube(s) reaches the bottom of the bottle.
2. Remove the injector from the carrier slot and insert it into the service position of the injector box.
3. Put an empty container under the injector.

Priming procedure (i-Control):

1. Adjust parameters at the prime tab of the injector maintenance dialog box in the settings menu
2. Activate the priming procedure by clicking the 'Start prime' button in the injector maintenance dialog box.
3. Visually inspect the syringes for air bubbles. Any bubbles should be removed after priming to ensure good injection performance.
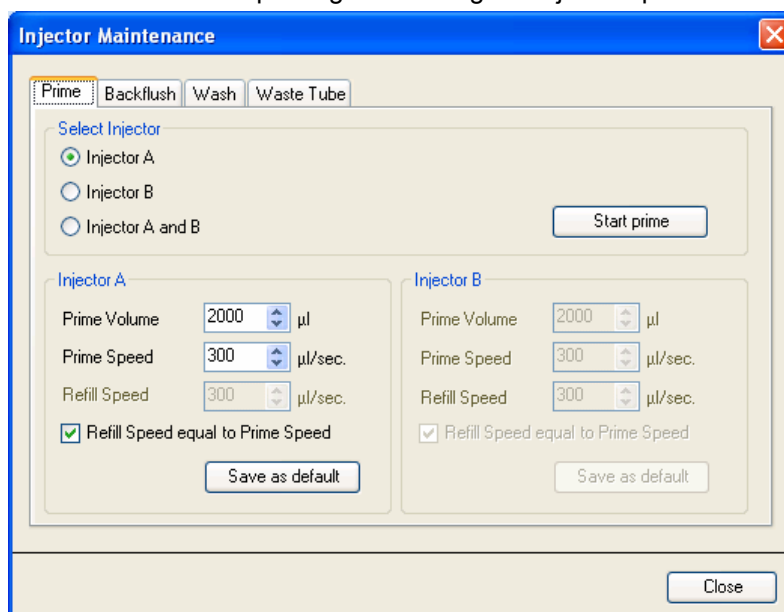
Prime

Select one of the injectors **Injector A** or **Injector B** or **Injector A and B**.

Select the '**Prime Volume**' (5 -60000 µl)

Select the '**Prime Speed**' (100 - 300 µl/sec).

Select the '**Refill Speed**' (100 – 300 µl/sec.) or select '**Refill Speed equal to Prime Speed**'.

Start prime by clicking the '**Start prime**' button.

Click the '**Save as default**' button to save the selected settings to the corresponding hardware button (A or B) on the injector box. When using the hardware buttons for priming, these settings will be applied.

Select '**Close**' to exit the dialog box

Priming Procedure (hardware button):

Priming can also be performed without using the software. Priming parameters can be stored on the injector by clicking **Save as Default** on the *Prime* tab of the *Injector Maintenance* dialog box of the i-Control software (in the *Settings* menu, click **Injectors...** and the *Injector Maintenance* dialog box appears). Press the Prime/Wash button on the injector box to start the priming sequence using the default parameters, (see Figure 2-4: Injector-box with injector in 'service position', page 2-12). The injector must be connected the instrument and the instrument must be switched on. Start the prime procedure by pressing the Prime/Wash button for less than 3 seconds.

Visually inspect the syringes for air bubbles. Any bubbles should be removed after priming to ensure good injection performance.

After a successful priming procedure, reinsert the injector into the instrument. Close the lid of the pump module completely before starting a measurement. The injectors are now ready to use.

When starting a measurement with the actions 'injection' or 'dispense', 5 µl of liquid are dispensed into a disposable container on the plate carrier before starting 'injection' or 'dispense'. This initial dispense step makes sure that the injection/dispense conditions are equal for each well.

Caution **Close the lid of the pump module (injector box) completely before starting a measurement.**

Priming Example – Operational Sequence of Pump System

The following example describes the operational sequence of the pump system when performing a prime step with 500 µl.

▪ The system is already washed (syringe is empty; piston in upper position):

- The first action is always that the syringe has to be filled completely with liquid. The piston therefore moves down to the lowest position to fill syringe completely (volume 1 ml).

- Now the system prepares for the priming step. The piston makes space for the selected prime volume: The selected prime volume is ejected: 500 µl – the piston moves up.

- The piston moves down again to prime the syringe with the selected volume. The syringe is now completely filled.

- After finishing priming the last action is to eject 5 ml. This step makes sure that the injection/dispense conditions are equal for each well (for details please refer to 'Waste tub')

Be aware that for selected prime volume of 500 µl, 1500 µl liquid are needed due to the initial filling step of the syringes.

▪ The system is not washed (the syringe is partly filled with liquid, the piston is not in the upper position):

- The first action is always that the syringe is emptied. The piston therefore moves up to the highest position to empty the syringe.

- The next actions are similar to case 1.

Note *For a selected prime volume of 500 µl, a minimum volume of 1500 µl of liquid is required to perform a complete priming step.*

Reagent Backflush

Reagent backflush allows reagents in the tubing system to be pumped back into storage bottles. This action can be performed optionally prior to washing the injector system to minimize the dead volume.

Reagent backflush procedure:

1. Remove the injector carrier from the instrument and insert the injector carrier into the service position of the injector box.

2. Insert the feeding tubing into the appropriate storage bottle.

3. Adjust parameters on the **Backflush** tab of the **Injector Maintenance** dialog box in the **Settings** menu

4. Start the reagent backflush procedure by clicking **Start backflush**.
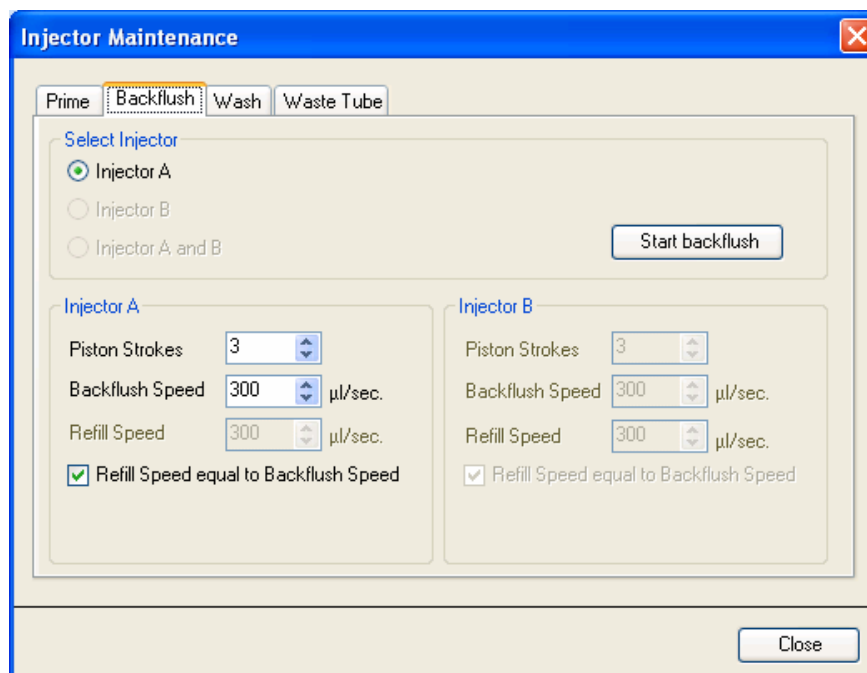
Backflush Select one of the injectors **Injector A** or **Injector B or Injector A and B** (only 'primed' injectors are available for 'backflush').

Select the **Piston Strokes** (1 – 60; 1 stroke equals 1 ml)

Select the **Backflush Speed** (100 - 300 µl/sec.).

Select the '**Refill Speed**' (100 – 300 µl/sec.) or select the **Refill Speed equal to Backflush Speed** check box.

Click **Start backflush** to start the reagent backflush procedure.

Click **Close** to exit the dialog box.

Caution
**The injector carrier must be in the service position
for the action 'backflush'.**

Do not perform backflush when the injector is in the instrument!

Washing

Before the instrument is switched off, it is recommended to perform a wash procedure to clean the injector system.

Wash procedure:

Washing can be performed by using the i-Control software or by using the hardware buttons on the injector box.

Washing (general procedure):

1. Fill the storage bottles with the appropriate wash reagents (distilled water, 70 % ethanol, …) and insert the feeding tube(s). Make sure, that the tube(s) reaches the bottom of the bottle.

2. Remove the injector from the carrier slot and insert it into the service position of the injector box.

3. Put an empty container under the injector.

Washing (i-Control):

1. Adjust the parameters on the **Wash** tab of the **Injector Maintenance** dialog box in the **Settings** menu

2. Start the washing procedure by clicking the **Start wash**.
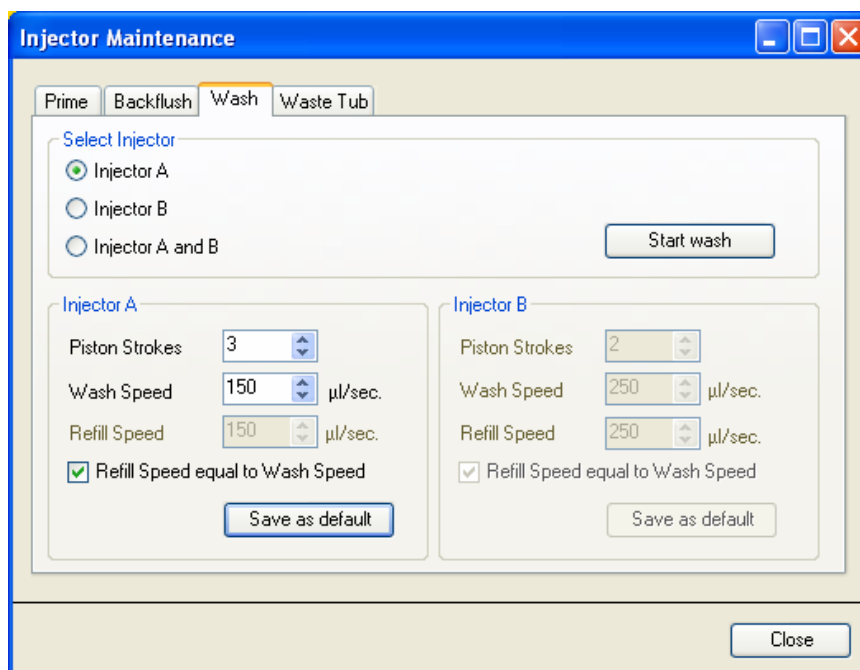
Wash	Select one of the injectors **Injector A** or **Injector B or Injector A and B**.
	Select the **Piston Strokes** (1 – 60; 1 stroke equals 1 ml)
	Select the **Wash Speed** (100 - 300 µl/sec).
	Select the **Refill Speed** (100 – 300 µl/sec.) or select **Refill Speed equal to Wash Speed**.
	Click **Start wash** to start the wash procedure.
	Click **Close** to exit the dialog box.

Washing (Hardware Buttons):

Washing can also be performed without using the software. Washing parameters can be stored on the injector by clicking **Save as Default** on the *Wash* tab of the *Injector Maintenance* dialog box (in the *Settings* menu, click **Injectors...** and the *Injector Maintenance* dialog box appears) of the i-Control software. Press the Prime/Wash button on the injector box to start the washing sequence using the default parameters. (see Figure 2-4: Injector-box with injector in 'service position', page 2-12). The injector must be connected the instrument and the instrument must be switched on. Start the wash procedure by pressing and holding the Prime/Wash button for more than 3 seconds.

STOP	**Caution** **The injector carrier must be in the service position** **for the action 'wash'.** **Do not perform washing when the injector is in the instrument!**

STOP	**Important** **Be sure to run a final wash procedure with distilled water and empty the injector system. For good care and lifetime fill the injector system with liquid (water) before turning off the instrument.**

STOP	**Important** **Please see the corresponding reagent kit for advice on how to remove the substrate completely from the tubing system.**

STOP	**Important** **Take good care of the injectors, because if they are damaged the accuracy of dispensing may be affected. This can result in damage to the instrument.**

i	*Note:* *Injector needles can be replaced by exchanging the injector carrier together with the corresponding tubing.*

STOP	**Important** **The button(s) on the injector box include two functions:** • **Press the button for less than 3 seconds to start PRIME.** • **Press the button for more than 3 seconds to start WASH.** **The parameters have to be set in the i-Control software.**

Waste Tub

When starting a measurement with the actions 'injection' or 'dispense', 5 μl of liquid are dispensed into a disposable container on the plate carrier before starting 'injection' or 'dispense'.

This initial dispense step makes sure that the injection/dispense conditions are equal for each well. This special dispense step depends on the selected refill mode selected on the injector or dispense strip (see chapter 2.4.1 i-Control and Injectors for details).

When using 'standard' refill mode, the dispense step is performed after each refill. When using 'refill for every injection' the dispense step is only performed once when starting the measurement.

The disposable waste container (waste tub) must therefore be emptied from time to time. The maximum filling volume is 1.5 ml. An internal counter checks the dispensed liquid volumes and the software alerts the user when it is time to empty the waste tub.

Picture 2-2: Waste tub on plate carrier
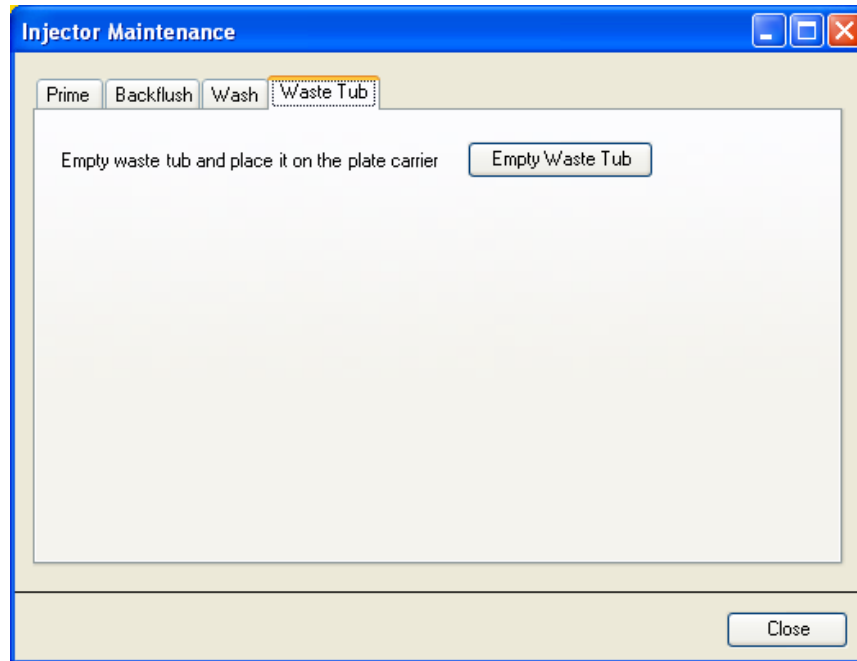
Waste tub:

Click the **'Empty Waste tub'** button and the plate carrier will move out automatically. Remove the waste tub and empty the contents. After the waste tub has been emptied place it back on the plate carrier. The i-Control software will alert you when the waste tub needs to be emptied again.

	Caution
	Place the waste tub on the plate transport before starting a measurement with the actions 'injection' and/or 'dispense'.

	Caution
	It is recommended to empty the waste tub before starting a measurement and to empty it at least once a day.

	WARNING
	BIOLOGICAL HAZARDS CAN BE ASSOCIATED WITH THE WASTE MATERIAL (MICROPLATE) OF THE PROCESSES RUN ON THE **infinite 200**.
	TREAT THE USED MICROPLATE, OTHER DISPOSABLES, AND ALL SUBSTANCES USED, IN ACCORDANCE WITH GOOD LABORATORY PRACTICE GUIDELINES.
	INQUIRE ABOUT APPROPRIATE COLLECTING POINTS AND APPROVED METHODS OF DISPOSAL IN YOUR COUNTRY, STATE OR REGION.

2.3.5   Injector Cleaning and Maintenance

The required maintenance may vary with your application. The following procedures are recommended for optimal performance and maximum life of the injector system.

Daily Maintenance:

If not otherwise stated by the manufacturer of the kit to be used, the following tasks must be performed at least daily:

- Inspect the pump(s) and tubing for leaks.
- Flush the whole system thoroughly with distilled or deionized water after each use and when the pump is not in use. Failure to do so can result in crystallization of reagents. These crystals can damage the syringe seal and valve plug resulting in leakage.

Caution
Do not allow the pump(s) to run dry for more than a few cycles.

Weekly/Periodical Maintenance:

The injector system (tubing, syringes, injector needles) must be cleaned weekly to remove precipitates and eliminate bacterial growth:

Follow these steps to clean the pump/injector system with 70 % EtOH (ethanol):

1. Depending on the user's application flush thoroughly the system with buffer or distilled water before washing with 70 % EtOH.
2. Prime the pump with 70 % EtOH with syringes fully lowered for 30 minutes.
3. After the 30-minute period, cycle all the fluid from the syringe and tubing into a waste container.
4. Wash the pump/injector system with 70 % EtOH
5. Wash the pump/injector system with distilled or deionized water
6. Prime the pump/injector system with distilled water. Leave the fluid pathway filled for storage.
7. Clean the end of the injector needles with a cotton swab soaked in 70 % ethanol or isopropanol.

2.4   Software

The **infinite 200** is delivered with the *i-Control* software, for operating the instrument and includes an online-help file and a printed Instructions for Use. The software is formatted as a self-extracting archive on CD-ROM.

For advanced data reduction and full regulatory compliance with CFR 2 part 11 guidelines, The *Magellan* software can be used to control the **infinite 200**. (For more information, contact your local Tecan representative).
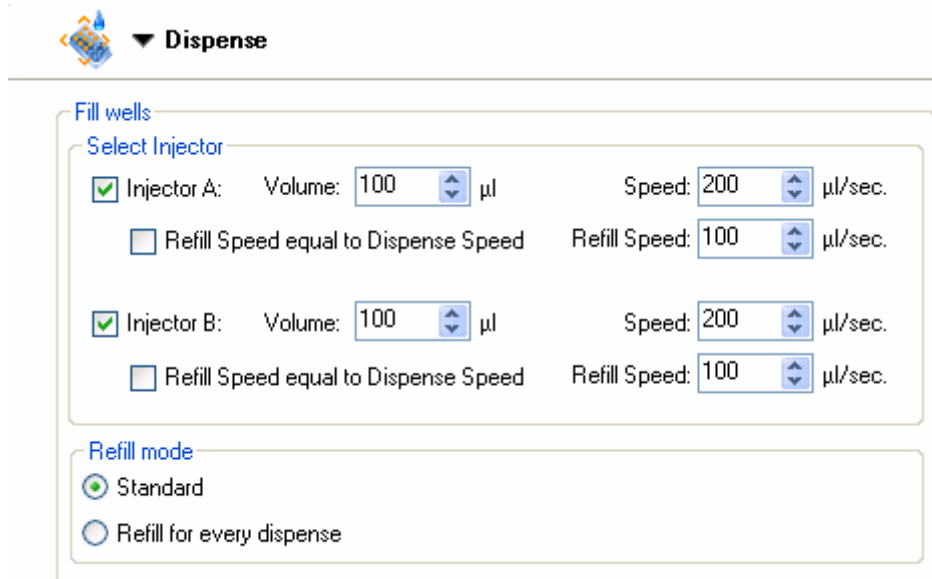
2.4.1   i-Control and Injectors

When using the injector, two modes are available:

- **Dispense**: The dispense mode allows liquid to be dispensed plate-wise into the selected wells
- **Injection**: This mode must be used in combination with a measurement strip. The injection is performed in a well-wise mode.

Dispense Mode

The dispense settings can be adjusted via the software:

Dispense   **Select Injector**: Injector A and/or Injector B can be selected.

Speed: The injection speed is selectable from 100 – 300 µl/sec for each injector.

Select '**Refill speed**' from 100 – 300 µl/sec. for each injector or select '**Refill Speed equal to Dispense Speed**'.

Select refill mode '**Standard**', if refill should be performed when syringe is empty (multiple dispense steps are performed before refilling, refill occurs after dispensing approx. 800 µl).

Select '**Refill for every dispense**' if refill should be performed for every dispense step.
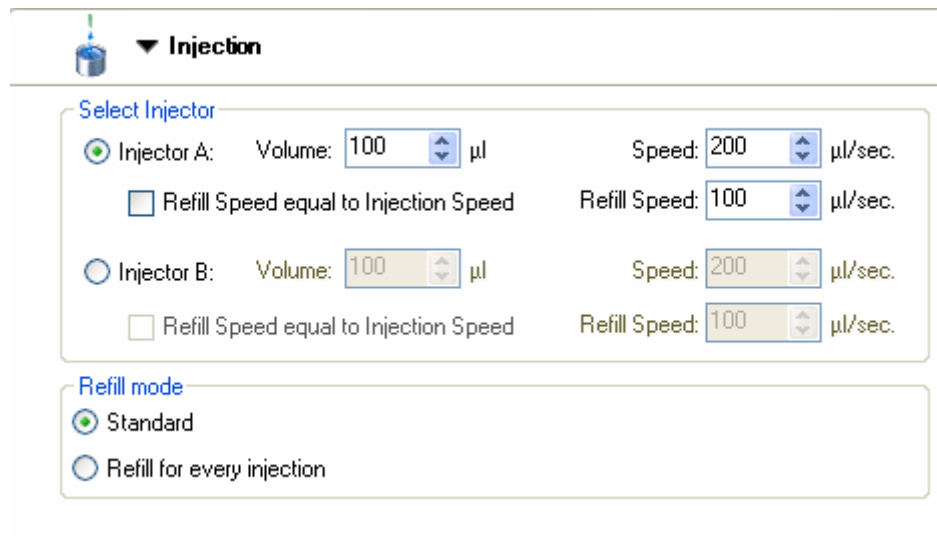
Using the Dispense Strip:
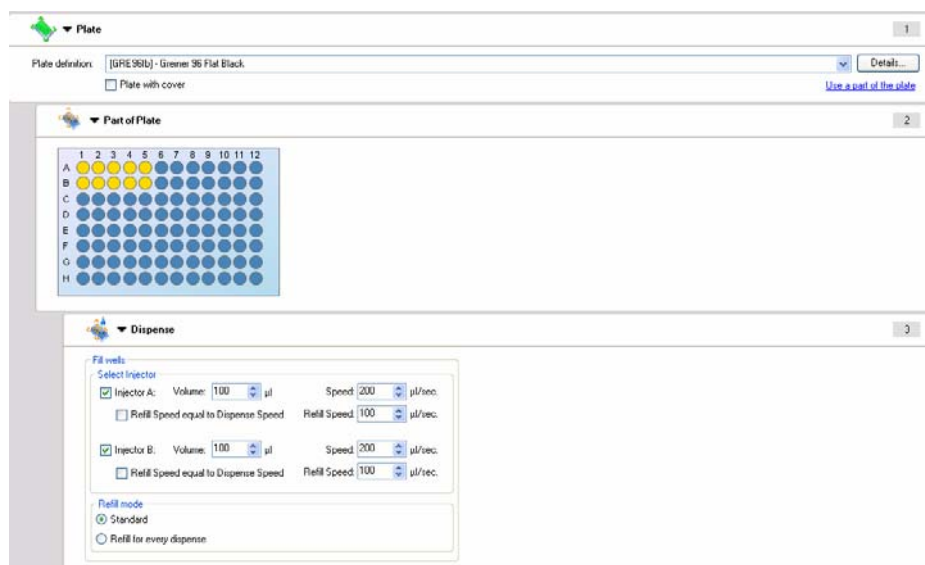
Plate	Select an appropriate plate type
Part of the plate	Optional;
	Select the wells to be dispensed
Dispense	Set up the dispense parameters.
	If both injectors are selected, all wells are first dispensed with injector A and then with injector B.
	The dispense strip does not require an additional measurement strip.
Dispense volume	The injection volume depends on the microplate type. The plate definition files include a so-called working volume. This working volume defines the maximum volume to be dispensed into the selected microplate. Therefore, always make sure that the selected plate definition file contains the correct setting for the working volume. The maximum dispense volume is 800 µl/dispense strip. If volumes greater than 800 µl are to be dispensed (e.g. into 6-well plates), more than one dispense strip has to be used.

Injection Mode

The injection settings can be adjusted via the software:

Injection	**Select Injector**:
	Injector A or Injector B can be selected. It is not possible to select both injectors on one strip. If a measurement with two injectors is to be performed, two injector strips are necessary.
	Speed: The injection speed is selectable from 100 – 300 µl/sec for each injector.
	Select a '**Refill speed**' from 100 – 300 µl/sec. for each injector or check the 'Refill Speed equal to Injection Speed' box.
	Select refill mode '**Standard**' if refill should be performed when syringe is empty (multiple injection steps are performed before refilling, refill occurs after dispensing approx. 800 µl). Select '**Refill for every injection**' if refill should be performed for every injection step.
Injection volume	The injection volume depends on the microplate type. The plate definition files include a so-called working volume. This working volume defines the maximum volume to be injected into the selected microplate. Therefore, always make sure that the selected plate definition file contains a correct setting for the working volume. The maximum injection volume is 800 µl/injection strip. If volumes greater than 800 µl are to be injected (e.g. into 6-well plates), more than one injection strip has to be used.

Using the Injection Strip:

Plate	Select an appropriate plate type.
Part of the plate	Optional; Select the wells to be dispensed
Well	The well strip is mandatory. Injection is only possible with a 'well' strip. This strip ensures that the following indented strips are performed well-wise.
Injection	Set up the injection parameters. Only one injector can be selected per strip. If both injectors are required or one injector will perform two injections, an additional injection strip has to be inserted.
Measurement strip (Example Absorbance)	It is mandatory to use at least one measurement strip in combination with the injection strip. The position of the measurement strip(s) (before and/or after the injection strip) depends on the application and is therefore user-selectable.

> **Note**
> *Make sure that the corresponding Working Volume value in your plate definition file is higher than the volume used for injection.*

Wait Strip

A Wait time (delay or settle time) can be inserted into the procedure.

Wait time	Select a time in hh:mm:ss from 00:00:01 up to 23:59:59
Options	If '**Wait for injection**' is selected, the wait time includes the injection time.
	If '**Wait for injection**' is NOT selected, the wait time is added to the injection time.

2.4.2 i-Control Examples

Example 1: Dual Luciferase Assay™ (Promega Corp.)

For assay details please refer to www.promega.com.

Plate	Select an appropriate plate type. For luminescence measurements, white microplates are recommended. For this example, a white 96-well plate was selected.
Part of the plate	(Not shown); can be optionally selected if only part of the plate is to be processed.
Well	Mandatory for measurements with 'injection'
Injection (1)	Injector A injects 100 µl with speed 200 µl/sec., refill mode: standard
Wait (Timer)	2 s wait time
Luminescence (1)	Luminescence measurement with 10 s integration time, attenuation 'none'
Injection (2)	Injector B injects 100 µl with speed 200 µl/sec., refill mode standard
Wait (Timer)	2 s wait time
Luminescence (2)	Luminescence measurement with 10 s integration time, attenuation 'none'
Move Plate	Plate is moved out after finishing all wells

Example 2: Enliten® ATP Assay System Bioluminescence Detection Kit for ATP (Promega Corp.)

For assay details please refer to www.promega.com.

▶ Plate		
	Well	
	▶ Injection	Injector A, Volume: 100, Speed: 100
	▶ Wait (Timer)	Wait: 00:00:02 (hh:mm:ss)
	▶ Luminescence (Ratio)	Attenuation: NONE
▶ Move Plate		Move plate out

Plate	Select an appropriate plate type. For luminescence measurements, white microplates are recommended. For this example, a white 96 well plate was selected.
Part of the plate	(Not shown); can be optionally selected if only part of the plate should be processed
Well	Mandatory for measurements with 'injection'
Injection	Injector A injects 100 µl with speed 100 µl/sec., refill mode: standard
Wait (Timer)	2 s wait time
Luminescence	Luminescence measurement with 10 s integration time, attenuation 'none'
Move Plate	Plate is moved out after finishing all wells

Example 3: Measurement of Ca^{2+} sensitive probes – Fura-2

Plate	Select an appropriate plate type. For fluorescence measurements, black microplates are recommended. For this example, a black 96 well plate was selected.
Part of the plate	(Not shown), can be optionally selected if only part of the plate should be processed
Well	Mandatory for measurements with 'injection'
Kinetic Cycle	Select the number of necessary cycles
Kinetic condition	This strip allows actions to be performed once in a kinetic run at a certain cycle. The intended injection strip below it is only processed once at the selected cycle.
Injection	Injector A injects 20 µl with speed 200 µl/sec., refill mode: not selectable; injection is performed at cycle 5 (defined by kinetic condition strip)
Fluorescence Intensity (1)	Select the appropriate parameters for the first label: Excitation wavelength: 380 nm, Emission wavelength: 510 nm; number of flashes: 25; integration time: 40; gain: manual
Fluorescence intensity (2)	Select the appropriate parameters for the second label: Excitation wavelength: 340 nm, Emission wavelength: 510 nm; number of flashes: 25; integration time: 40; gain: manual
Move Plate	Plate is moved out after finishing all wells

Example 4: Measurement of Ca^{2+} sensitive probes – Indo-1

Plate		Select an appropriate plate type. For fluorescence measurements, black microplates are recommended. For this example, a black 96 well plate was selected.
Part of the plate		(Not shown); can be optionally selected if only part of the plate should be processed
Well		Mandatory for measurements with 'injection'
Kinetic Cycle		Select the number of necessary cycles
Kinetic condition		This strip allows actions to be performed once in a kinetic run at a certain cycle. The intended injection strip below it is only processed once at the selected cycle.
Injection		Injector A injects 20 µl with speed 200 µl/sec., refill mode: not selectable; injection is performed at cycle 5 (defined by kinetic condition strip)
Fluorescence Intensity (1)		Select the appropriate parameters for the first label: Excitation wavelength: 340 nm, Emission wavelength: 410 nm; number of flashes: 25; integration time: 40; gain: manual
Fluorescence intensity (2)		Select the appropriate parameters for the second label: Excitation wavelength: 340 nm, Emission wavelength: 480 nm; number of flashes: 25; integration time: 40; gain: manual
Move Plate		Plate is moved out after finishing all wells

3.   Installation

3.1   Unpacking and Inspection

The delivered packaging includes the following items:

- CABLE USB 2.0 A/B 1.8 M Black with housing receptacle ferrite
- CDROM **infinite F200/infinite M200**
- OOB Quality Report
- Transport lock (mounted)
- Instructions for Use
- Final test protocol

The **infinite F200** packaging includes additionally the following items:

- Accessory Box
- Filter stop rings (8)
- Filter assembly tool
- Plastic tweezers
- Filter slide

The injector module packaging for 1 injector includes the following items:

- Bottle holder
- Beaker for priming
- 125 ml bottle brown
- Injector dummy (mounted)
- Waste tub
- 15 ml bottle

The second injector comes with the following items:

- Bottle holder
- Beaker for priming
- 125 ml bottle brown
- Waste tub
- 15 ml bottle

Unpacking Procedure

1. Visually inspect the container for damage before it is opened.
   Report any damage immediately.

2. Select a location to place the instrument that is flat, level, vibration free, away from direct sunlight, and free from dust, solvents and acid vapors. Allow at least 10 cm distance between the back of the instrument and the wall or any other equipment. Ensure that the plate carrier cannot be accidentally hit when moved out. Ensure that the main switch and the main cable can be reached at all times and are in no way obstructed.

3. Place the carton in an upright position and open it.

4. Lift the instrument out of the carton and place it in the selected location. Take care when lifting the instrument and ensure that it is held on both sides.

5. Visually inspect the instrument for loose, bent or broken parts.
   Report any damage immediately.

6. Compare the serial number on the rear panel of the instrument with the serial number on the packing slip.
   Report any discrepancy immediately.

7. Check the instrument accessories against the packing list.

8. Save packing materials and transport locks (see next section) for further transportation purposes.

⚠️	**WARNING** **THE infinite 200 IS A PRECISION INSTRUMENT AND FULLY EQUIPPED WEIGHS APPROX. 16 KG.**

🛑	**Caution** **The maximum load for the infinite 200 cover is 16 kg, however the load must be distributed evenly across the entire surface of the cover.**

🛑	**Caution** **The maximum load for the infinite 200 plate transport is 100 g.**

🛑	**Caution** **Allow at least 10 cm distance between the back of the instrument and the wall or any other equipment.**

3.2   Removal of the Transport Locks

**Caution
Remove the transport lock before operating the
instrument.**

The instrument is delivered with the plate carrier and filter carrier/cuvette carrier locked into place, so that they cannot be damaged. Before the instrument can be used, the transport locks must be removed using the following procedure:

1. Ensure that the instrument is disconnected from the main power supply.
2. Open the plate carrier door and filter carrier/cuvette carrier door.

3. Remove the screw from the transport lock, which extends into the filter carrier/cuvette carrier compartment from the plate carrier compartment (left transport lock in picture above).
4. Loosen the screw from other transport lock, which is only in the plate carrier compartment (right transport lock in picture above).
5. Pull the plate carrier out manually.

6. Remove the screw from the transport lock, which is only in the plate carrier compartment (right transport lock in picture above).
7. Slide the transport locks off of the pins and remove them from the plate carrier.
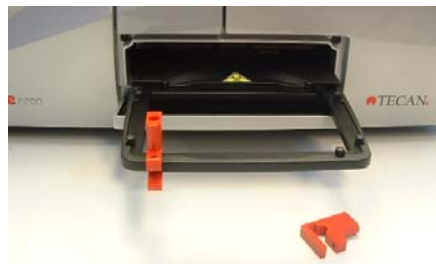
8. Save the transport locks for further transportation purposes.

3.2.1   Transport and Storage

Transport

The **infinite 200** must be shipped using the original packing and installed transport locks. Before shipping the instrument, it must be thoroughly disinfected (see 10.3 Instrument Disinfection).

Storage

Before storing the instrument the injectors must be rinsed using a wash procedure (see 2.3.4 Priming and Washing of the **infinite 200**). Select a location to store the instrument that is flat, level, vibration free, away from direct sunlight, and free from dust, solvents and acid vapors

Storage Specifications

Temperature	- 20 °C to + 60 °C - 4 °F to + 140 °F
Relative Humidity	< 90 % non condensing

3.3   Power Requirements

The instrument is auto sensing and it is therefore not necessary to make any changes to the voltage range. Check the voltage specifications on the rear panel of the instrument and ensure that the voltage supplied to the instrument is correct to this specification.

The voltage range is 100-120/220-240V.

If the voltage is not correct, please contact your distributor.

	Caution **Do not use the instrument if the voltage setting is not correct.** **If the instrument is switched ON with the incorrect voltage** **setting it will be damaged.**

	WARNING **IF THE INSTRUCTIONS GIVEN IN THIS DOCUMENT ARE NOT** **CORRECTLY PERFORMED, THE INSTRUMENT WILL EITHER BE** **DAMAGED OR THE PROCEDURE WILL NOT BE PERFORMED** **CORRECTLY AND THE SAFETY OF THE INSTRUMENT IS NOT** **GUARANTEED.**

3.4 Switching the Instrument On

	Caution
STOP	**Before the instrument is switched on for the first time after installation, it should be left to stand for at least 3 hours, so there is no possibility of condensation causing a short circuit.**

1. Ensure the computer is switched OFF and the instrument's main power switch on the back panel of the instrument is in the OFF position.

2. Connect the computer to the instrument with the delivered USB interface cable.

3. Insert the power cable into the main power socket (with protective ground connection) on the back panel of the instrument.

4. All connected devices must be proved and listed with regulations EN 60950-1, UL 60950-1 or CAN/CSA-C22.2 No. 60950-1-03 for Data Processing Devices.

5. Switch the instrument ON using the main power switch on the back panel of the instrument.

Rear View
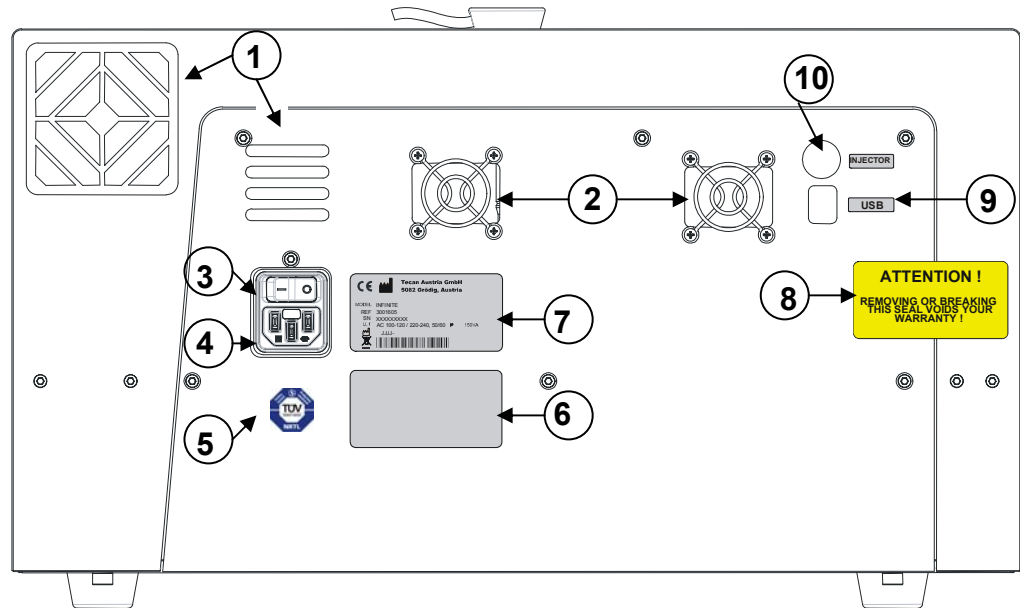
1   Instrument Fan

2   Power Supply Fan

3   Main Power Switch

4   Main Power Socket

5   Label – Technical Inspection Agency

6   Label – Options/Configuration

7   Name Plate

8   Warranty Label

9   USB Connection

10 Injector Connection

Caution
Only Tecan authorized service technicians are allowed to open the instrument. Removing or breaking the warranty seal voids the warranty.

4. Defining Filter Slides (infinite F200 only)

4.1 About Filters

Fluorescence Filters

The optical filters (bandpass style) in a filter slide are specially designed for fluorescence measurements. The spectral rejection and the bandwidth of the fluorescence filters are optimized for achieving excellent sensitivity.

Contact Tecan Austria for filters other than those supplied with the delivered filter slides.

Absorbance Filters

Bandpass filters, which are commonly used in microplate readers for absorbance measurements, usually have a bandwidth of 10 nm; therefore, it is not recommended to use fluorescence filters for absorbance measurements because the bandwidth (FWHM) is usually larger than 10 nm. This could cause a bright value error or low OD values when measuring dyes with narrow peaks.

4.2 Filter Slide and Filter Orientation

Filter Slide

The filter slide consists of an excitation and an emission part. The filter slide enables the user to work with four independent and non-interchangeable excitation/emission filter pairs, which can be defined on positions 1 to 4.
The information about the inserted filters is saved on the integrated microchip.

Infinite F200: Filter Slide
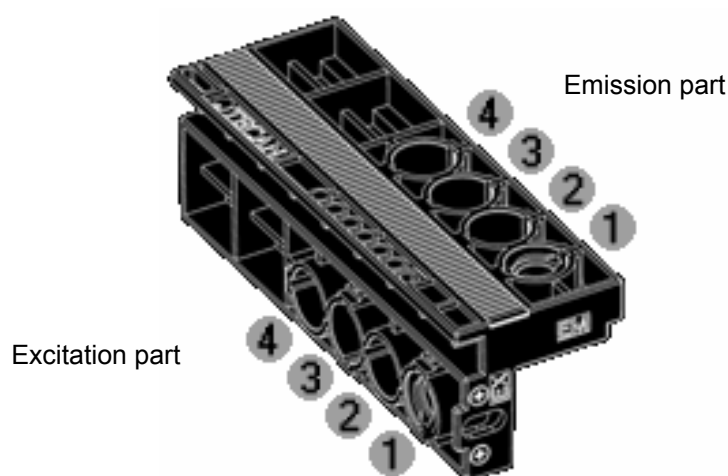
4.2.1   Position of Polarization Filters

> **Note**
> *Fluorescence polarization measurements on infinite F200 require two identical excitation and emission filters placed together with the polarizers either on the positions 1 and 2 or 3 and 4.*

The **infinite F200** filter slide can be equipped with maximal two different fluorescence polarization filter pairs as each fluorescence polarization measurement requires two identical excitation and emission filters, which are placed together with the polarizers either on the position 1 and 2 or 3 and 4.
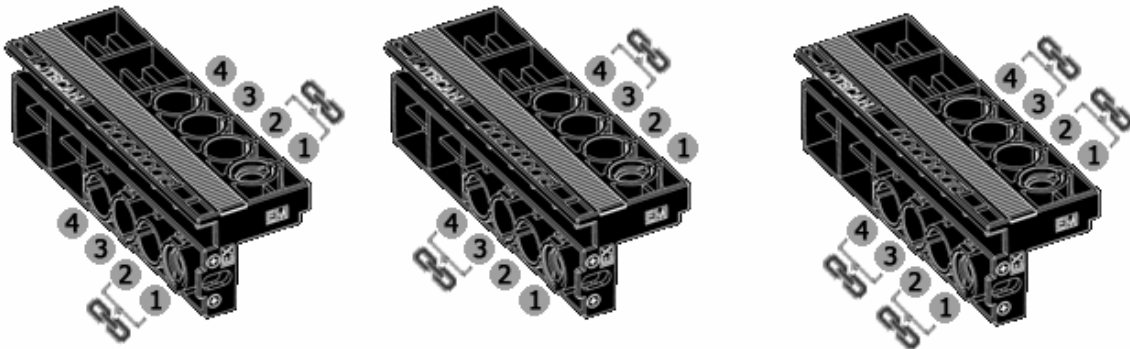
infinite F200: Filter slide with the indicated positions for fluorescence polarization filters and polarizers.

Filter Types

> **Caution**
> **There are two types of filters. It is important that light travels through both types of filter in the correct direction. Before inserting a new filter carefully consider the filter and the direction of light through the filter slide.**

1. Filters with an arrow on the side:
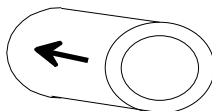
Light must travel in the direction of the arrow.

2. Filters without an arrow on the side:

Direction of light   Direction of light

Correct   Incorrect
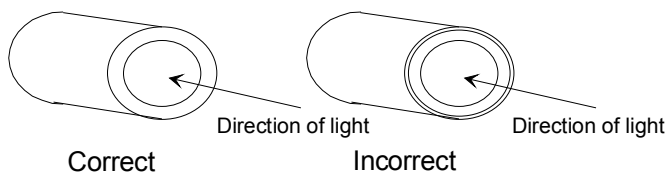
The end of the filter with the metal lip must face away from the light source.

infinite F200: Filter Slide - Direction of Light

Direction of light

(Emission)

Direction of light ⟶

(Excitation)
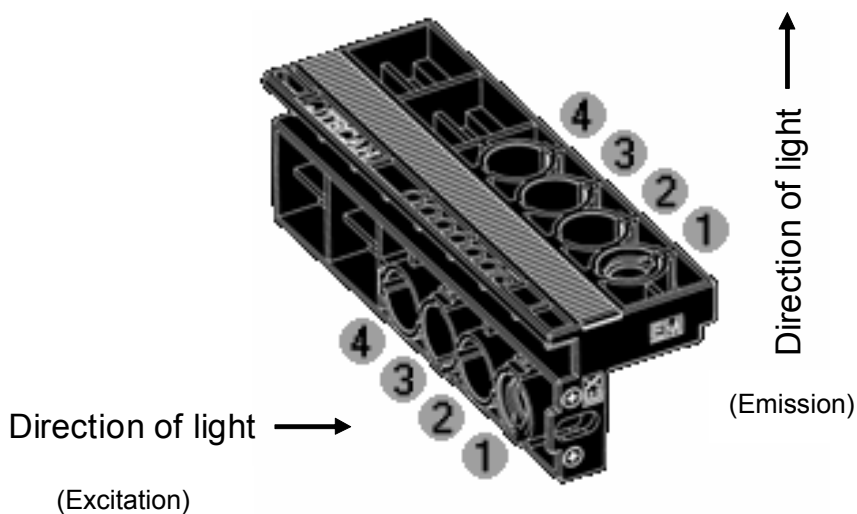
4.3 Installing a Custom Filter

When installing a new filter use the filter assembly tool included in the accessories case. For installing the polarizers use the soft tweezers (plastic).

4.3.1 Removing a Filter

1. Align the filter assembly tool with the notch of the stop-ring. Turn the tool and remove the stop-ring by pulling it out of the filter slot.

Stop-ring

2. The filter will slide out of the filter slot when the filter carrier is turned over. Do not use the filter assembly tool to remove filters.

4.3.2 Mounting a Custom Filter

A new filter must be inserted into the slide as shown below:

> ***Note***
> ***Make sure that the filters are inserted correctly (see Filter Types). To ensure proper function, do not reuse the stop-rings more than 5 times.***

> **Caution**
> **Take care to insert the polarizers and the filters into the filter slide when working with fluorescence polarization.**

Stop-ring

Filter

Filter slide

STOP
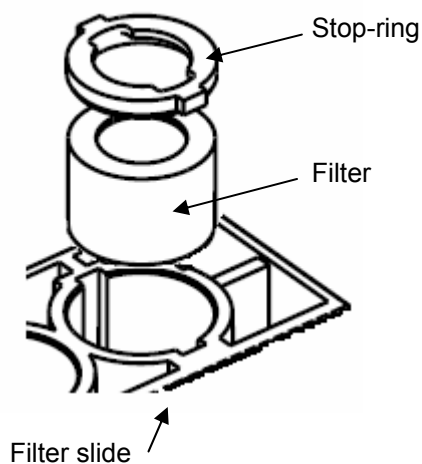
Caution
The filters are precision optical components, which should be handled by the edges and not scratched or stored face down in a drawer and so on. Once the filters are installed in the slide, they are relatively well protected, but care should be exercised when handling or storing them.

In order to install a custom filter do the following:

1. If required, carefully insert a polarizer at the excitation and emission half of the filter slide using tweezers, taking care not to scratch it or get fingerprints on it.

2. Carefully insert the filter into the opening, taking care not to scratch or get fingerprints on the filter.

3. Place the stop-ring on the end of the filter assembly tool and turn it so it cannot slip off.

Filter assembly tool with stop-ring
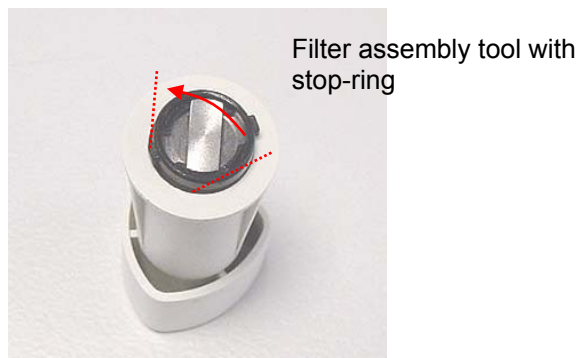
4. Using the filter assembly tool, push the stop-ring into the filter slot and press firmly into place.

5. Rotate the tool until the notch in the stop-ring is aligned with the end of the filter assembly tool and remove the tool.

6. If there are unused openings remaining after the required filters have been inserted (e.g. the emission part of an absorbance filter), filter dummies should be mounted in the holes that are still open.

4.4   Defining the Filters

<table>
<tr><td>STOP</td><td>Caution
Any changes to the filters in the filter slide are to be carried out by trained personnel! The instrument is able to recognize predefined filter slides and you should not attempt to change the filter values.
However, if the filters in the filter slide have been changed (by a service engineer) or if a new undefined customized filter slide is to be used, the filter slides need to be defined.</td></tr>
</table>

Define a filter (pair) as follows:

1. Select **Filter Definitions** from the **Setup** menu.
2. The following dialog box is displayed showing an overview tab and four filter definition tabs:
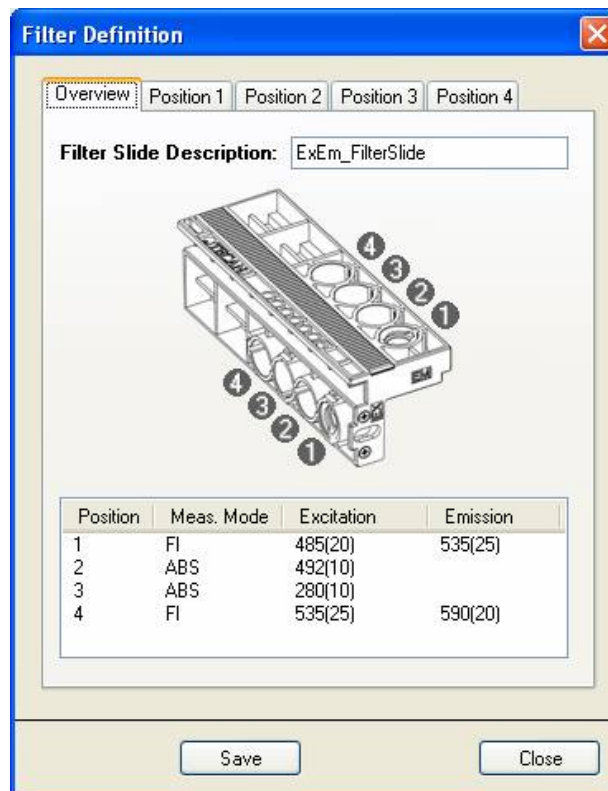
Overview: The overview provides the user with the current filter slide definition.

Position 1 - 4: Filter definition editor for the filters (filter pairs) on positions 1, 2, 3 and 4.

3. Select the appropriate filter position and enter the new wavelength, bandwidth, and measurement mode for each new filter:
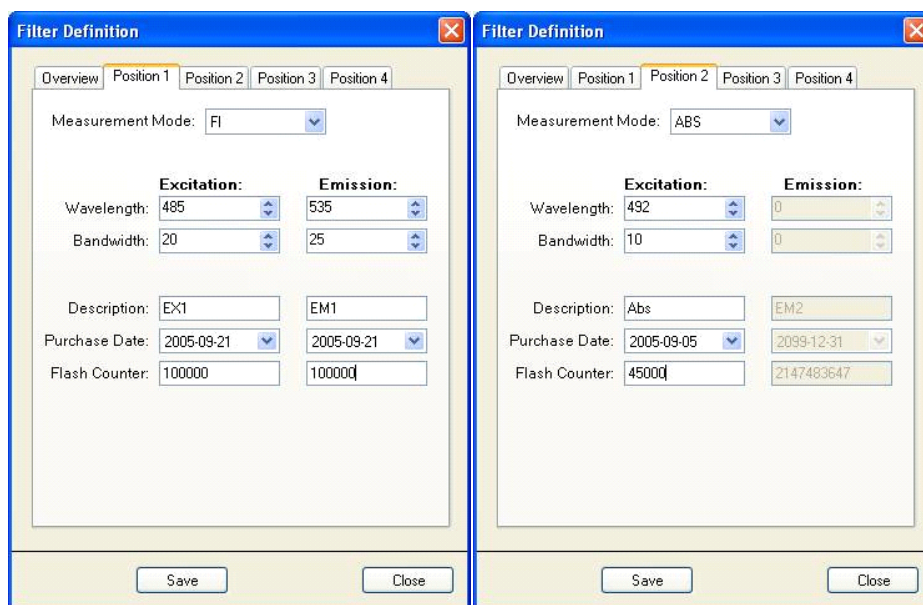
Measurement Mode: Chose from the dropdown list 'FI' for fluorescence intensity, 'ABS' for absorbance measurements and 'Empty' for filter-free positions

Wavelength: Enter the filter wavelength. For fluorescence intensity measurements, the filter wavelength is definable in the range of 230 to 850 nm (Excitation) and 280 to 850 nm (Emission). Absorbance filters are definable between 230 and 1000 nm

Bandwidth: Enter the bandwidth (nm) of the filter

Description: This field can be used for individual user's remarks about the filter (e.g. filter name, application, etc.)

Purchase Date: This option enables the user to enter the purchase or installation date of the filter

Flash Counter: The flash counter monitors the number of reads through a filter. The flash counter number provides the user only with additional information about the filter in use.

For a brand new filter set the counter to 0. For a previously used filter enter the last collected flash number if the number is available. The flash counter number is saved together with other information about the filter on the filter slide microchip. If you replace a filter, this information will be lost unless the last filter flash number is manually documented by the user.

4. Accept the new filter values by clicking **Save**. After closing the **Filter Definition** dialog box, the system is ready to collect data with the new filters.

5. Firmware & Software

5.1   Firmware Features

The **infinite 200** system has been manufactured using a modular approach, with certain modules being controlled by their own internal firmware. These individual modules are connected via an RS485 bus communication system, which enables the service technician to quickly and easily identify faulty modules using the service software packages supplied by Tecan Austria.

The individual modules with their own firmware are as follows:

- EX Module   – Address 1
- EM Module   – Address 2
- Filter Module – Address 3
- Lumi Module   – Address 4
- Heating   – Address 5
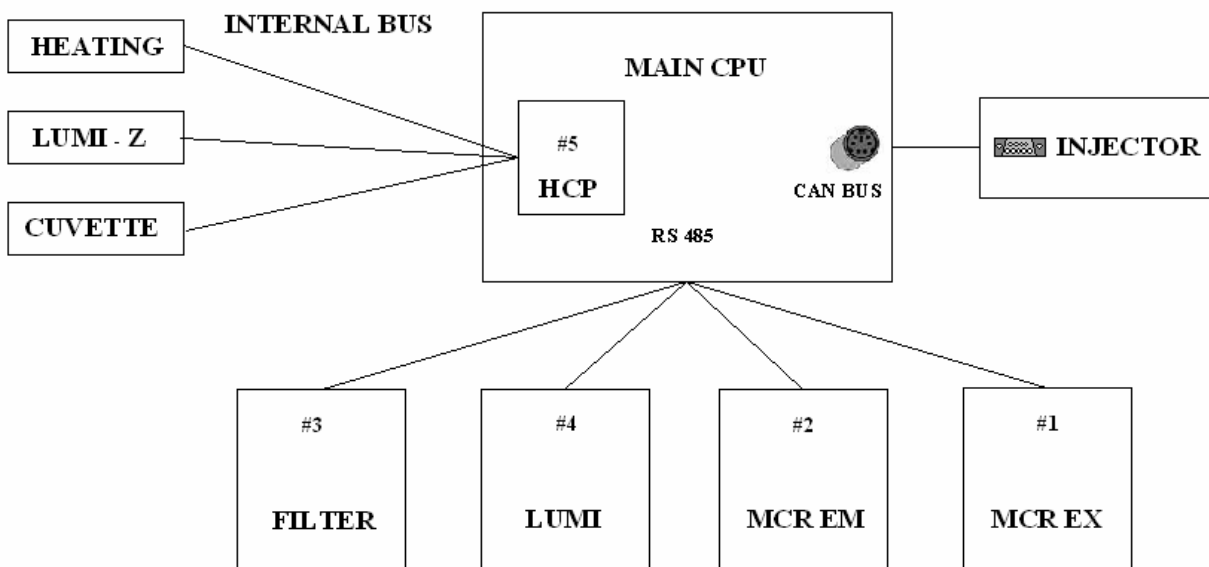
5.2 Xinfinite Service Software

The software is a useful troubleshooting tool that has been designed to allow easy access to the functions of individual modules within the **infinite 200**.

5.2.1 Install the Service Software

Before installing the software, make sure that Windows XP Service Pack 2 is installed. From the **Start** menu, select **Settings**/**Control Panel**/**System** and the *System Properties* dialog box appears. On the *General* tab under *System*, the Windows Version and Service Pack level can be viewed.
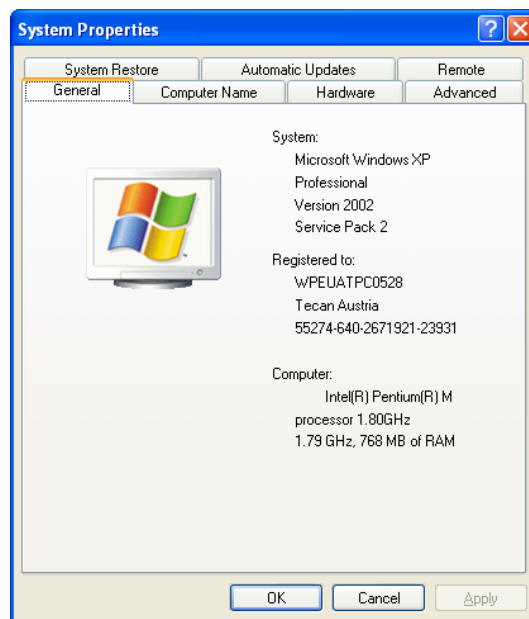
Once it has been determined that Service Pack 2 has been installed, the software can be installed using the following procedure:

1. Start the computer.
2. Insert the program CD into the required CD drive
3. Go to **Start** and select **Run**
4. Start the installation program by entering the command: **D:\setup.exe** (where "D" is the CD drive that contains the program CD) and click **OK**, or double-click the **Setup** icon in the Explorer window.
5. The installation program is started.
6. After a short time the Setup screen is displayed.
7. The Setup program starts and the software is installed onto the computer.

8. A series of screens will appear, read each one, enter any necessary information and click **Next** to continue.

9. The files are then installed and the program icon is created.

10. The new **Reader.net** will also be installed.
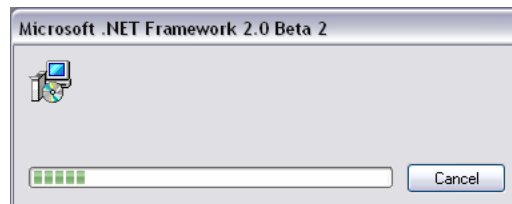
11. When the *Installation Complete* screen appears, click **Finish** and the program becomes operational.

12. It is also possible to install the **i-Control** software first.

5.2.2 The Toolbar

The toolbar is in the **Xinfinite** main window, below the menu bar. The toolbar provides quick mouse access to frequently used commands. Depending on the instrument connected, different icons are available for use.

The following table explains the buttons.

Click	To
	Connect the instrument to the PC
	Disconnect the instrument from the PC
	Move the transport in and out
	Set default parameters
	Set serial number
	Show log files

5.3 File Menu

5.3.1 Import Test plate

Select **Import Test plate** from the **File** menu to import MultiCheck plate data from a special *.xml file.
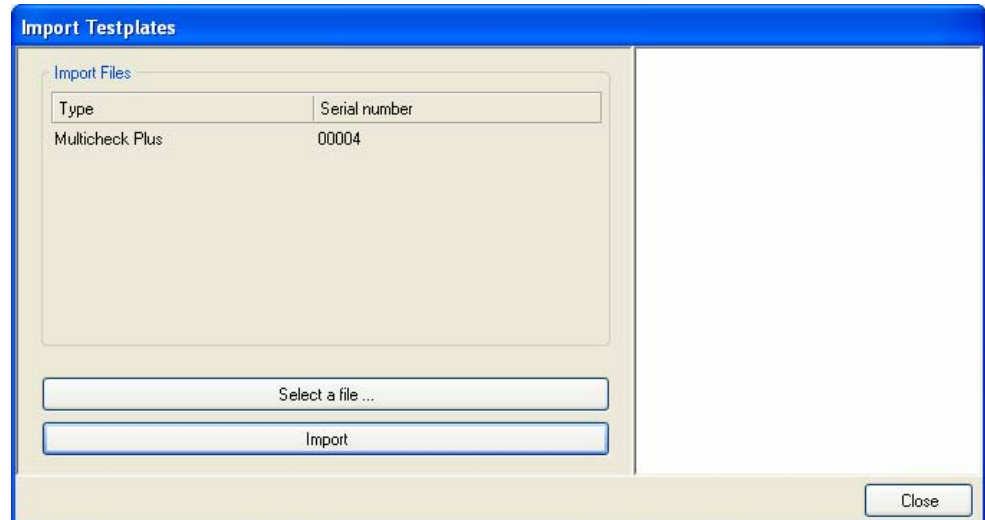
The file can be created with the **QC MultiCheck software** or can be found on the data CD of the MultiCheck plate.

Start the QC MultiCheck software and enter user name **"$$Calib"** and password "**Berli7n**" and click **Login**.

From the **File** menu select **View Normfile**.

Select the corresponding *.mpn file and click **Open**.

Go back to the *File* menu and select **Export Normfile Data**.

The exported *.xml file can be found in the MultiCheck '**NormFiles**' folder.

Now you can import this *.xml file into the **Xinfinite** software.

5.3.2 Log Off

To allow another user to login, select **Log off** from the *File* menu and the Login Xinfinite-200 dialog box appears. Enter the user name and click **Login**.

5.3.3 Exiting the Program

Select **Quit** from the *File* menu to exit the program.

5.4 Instrument Menu

From the **Instrument** menu, the user can connect or disconnect the instrument, move the plate in or out of the instrument, regulate temperature control and use the keyboard to send firmware commands to the instrument.

5.4.1 Connecting the Instrument

Start the **Xinfinite** service software. Click the **Connect** icon or use the **Connect** button in the **instrument** menu.

The following dialog box appears:

Select **infinite 200, USB Port** and click **OK** and the instrument will be connected. After the connection the red "LED" in the bottom frame changes to green and the serial number and instrument type will appear in the status bar.

5.4.2 Temperature Control

Temperature Control can only be enabled if the *Heating option* is installed.

This option performs *heating* and *temperature control*, and includes *temperature display* and the *switching off of fans* during heating

Enter the **Target Temperature** and click **Set**. Click **Read** to refresh the **Current Temperature** display. Select **Auto** to refresh the display automatically. Click **On** to start plate heating.

5.4.3 Move plate and Filter

Select **Move plate** and the **Movements** dialog box appears.

Select **plate In** or **plate Out** to move the transport plate in or out of the instrument.

Select **Filter In/Filter Out** (toggle button) to move the filter carrier in and out of the instrument (Filter instrument only).

Select **Cuvette In** or **Cuvette Out** to move the cuvette drawer in or out of the instrument.

5.4.4 Keyboard Operation

In the **Keyboard Operation** dialog box, select **Send** to send individual firmware commands to the instrument. **F12** opens this window.

5.5 Adjustment

In the **Adjustment** menu, the default settings can be defined, the instrument can be configured, various transport offsets can be defined, the intensity of the monochromator can be calibrated and the absorbance measurement range can be defined.

5.5.1 Instrument Configuration

The instrument must be configured according to the options installed.

Enable the installed options:

- Excitation Monochromator (Enabled/Disabled)
- Emission Monochromator (Enabled /Disabled)
- Fluorescence Top (**MCR**/ **Filter**/Disabled)
- Fluorescence Bottom (**MCR**/ **Filter**/Disabled)
- Absorbance (**MCR**/**Filter**/Disabled)
- Absorbance cuvette **MCR** (Enabled/Disabled)
- Luminescence (Enabled/Disabled)
- Fluorescence Polarization **Filter** (Enabled/Disabled)
- Option PMT (normal/ enhanced/disabled)
- 1st Injector (1st injector/Disabled)
- 2nd Injector (2nd injector/Disabled)
- Heating (Enabled/Disabled)

Click the arrows to view the drop down menu for each parameter. Select **Enabled**, **Disabled**, or one of the built-in options. Click **Set instrument** to confirm selections.

5.5.2 Reset

Set the current **Generation Number**, select the **Flash counter** check box and click **Reset** for each activated measurement mode.

Click **Close** to exit the dialog box.

5.5.3 *Set Serial Number*

Enter the serial numbers for the basic instrument and installed modules in the **new Serial Number** text boxes. Send a query first to see if the module is installed. Only the modules, which have been found by the query, should be displayed. Click set to send the new serial numbers to the instrument and modules. After clicking send, the **Current Serial Number** field should contain the new serial number.

- Set serial number AMR (**infinite 200**) (up to 18 digits)
- Set serial number Excitation Monochromator (up to 18 digits)
- Set serial number Emission Monochromator (up to 18 digits)
- Set serial number Filter measurement Head (up to 18 digits)
- Set serial number Luminescence Module (up to 18 digits)
- Set serial number Injectors (up to 18 digits)

Set Serial number

AMR
Current Serial Number: 509000014   new Serial Number: 509000014

Excitation Monochromator
Current Serial Number: [ ]   new Serial Number: [ ]

Emission Monochromator
Current Serial Number: [ ]   new Serial Number: [ ]

Filter Measurement Head
Current Serial Number: 508000008   new Serial Number: 508000008

Luminescence Module
Current Serial Number: 507000018   new Serial Number: 507000018

Injectors
Current Serial Number: L509000008   new Serial Number: L509000008

[Set]   [Close]

5.5.4 User Settings

The instrument must be given a unique alias, so that the computer recognizes the instrument when other USB devices are connected.

Enter the name in the **New Alias** text box for the selected module and click **Set Alias** to send the name to the instrument. After clicking **Set Alias**, the **Current Alias** field should contain the new name.

```
User Settings

Current Alias:  Example        New Alias:  Example

              Set Alias                 Close
```

Selection:

- **Set Alias** – set a new alias for each Module.

5.5.5 *Firmware Download*

Select **Firmware Download** from the instrument menu to start the Firmware Download program from the **infinite 200** instrument. Firmware can be downloaded for the various modules of the **infinite 200** instrument.

Click **Select a file** and the *Open Download* dialog box appears. Browse for the required ***.tdfx** file, making sure that it matches the installed module. Click **Open** and the firmware is downloaded to the instrument. All instrument settings will be read from the instrument and saved. Once the new firmware has been successfully downloaded, the saved instrument settings will be written to the instrument.

Some messages will appear during the process, for example, "Firmware Download in Progress", "Read Settings from instrument" and "Write Settings to instrument".

ℹ️	***Note*** ***After Main CPU Firmware download,*** ***switch the instrument off and on again.***

ℹ️	***Note*** ***If the operating system message "new hardware found" appears,*** ***follow the instructions provided!***

WARNING

SOME NOTEBOOKS WITH, FOR EXAMPLE, BLUETOOTH WILL NOT RECONNECT WITH THE INSTRUMENT AFTER FIRMWARE DOWNLOAD. DISABLE BLUETOOTH!

5.5.6   Set Default Settings

This option is for defining the default parameters for transport offsets, motor ramp, etc.

Caution
If default parameters are changed in a preset instrument, the previously defined Transport offsets for FI-Top, FI-Bottom, Absorbance, Luminescence and FP will be overwritten. These must then be redefined (see plate Transport)

Check that the respective modules are configured and then write the default values to the instrument. Enter the default parameters and click **Set Default** to write the new settings to the instrument.

Basic instrument:

- plate transport offsets for:
    - Fluorescence-Top (x, y) [688/-53]
    - Fluorescence-Bottom (x, y) [445/247]
    - Absorbance (x, y) [Mono:175/-40], [Filter:689/-54]
    - Luminescence (x, y) [171/448]
    - Built In Test Spot (x, y) [-73/76]
    - Fly Absorbance [0]
    - Fly FI [0]
- plate Load position (x, y) [850/-2255]
- Reference Absorbance position (x, y) [832/-150]
- Injection position (x, y) [171/240]
- Z-Transport offset Z_0 [4604]
- Z_{min}, Z_{max}, Z_{sec} [0, 5401.200]
- plate sensor offset (Y) [-270]
- plate sensor threshold [750]
- Lamp Check values [10000]
- Lamp check gain [20]
- Lid check value absorbance [10]
- Lid check value FI-Top [10]
- Lid check value FI Bottom [10]
- Lid check value Luminescence [200]
- Fiber check value Luminescence [10000]
- Temperature offset [0]

Injector:

- Prime1: Speed, volume, refill speed [300, 1000, 300]
- Prime2: Speed, volume, refill speed [300, 1000, 300]
- Rinse1: Speed, volume, refill speed [300, 1000, 300]
- Rinse2: Speed, volume, refill speed [300, 1000, 300]
- Pump volume A, B [0, 0]
- Syringe volume A, B [1000, 1000]

5.5.7   Plate Sensor Adjustment

The plate sensor is only activated when the injector is activated.

The mechanical offset of the plate transport is determined by positioning the sensor just inside the front of the plate transport. Move the plate transport about 5 mm out of the instrument, so that the sensor is in row A or B of a 96-well plate. Save this motor position as the plate sensor offset.

Read the value of the plate sensor in the offset position, and then move the plate transport to the load position. Place a transparent microplate on the plate transport and read the value of the plate sensor again.

Write the average of these two values to the instrument as the threshold value.

The difference between the two values must be at least 100.

Display:

Current offset: Displays the current offset

Current position: Displays the current motor position.

plate sensor value: displays FAILED if the difference between the two plate sensor values is less than 100

Selection:

Move In/Out button: Move plate in or out.

10/100 steps *check box*: number of steps plate carrier motor

Se*t offset* button: write current motor position as offset to the instrument

Set Threshold button*:* write the threshold value of the plate sensor to the instrument

5.5.8   Set Measurement Ranges

This option is only available when Absorbance MCR/Absorbance cuvette MCR measurement mode is active.

Absorbance scan from 230 nm to 1000 nm in 1 nm steps. When necessary, up to four partial scans can be combined.

Click **Start** to automatically check the gain range and the intensity maxima for the absorbance scan. A result of **Passed** or **Failed** is returned.

5.5.9   Monochromator

5.5.10   Fiber Fine Adjustment

This option is only available when at least an Excitation Monochromator (with Absorbance MCR) or FI Top MCR or FI Bottom MCR are installed.

- Should automatically be performed, in that the Signal of the Reference diode is recorded, while the fiber is moved (Exc Mono) step-wise over an across a specified range: from 1700 to 150 motor steps.

- For Excitation and Emission monochromator the following wavelengths must be set: ExcWL=250 nm; EmWL=700 nm.

- From the recorded measurement curves, the three centers of gravity of the curves will be determined (Average values of the half value positions in a range of –150 to 200, 600 to 1000 and 1400 to 1700), and from that the three offsets for the Fiber positions (offset, delta 0-1, delta 0-2) of the measurement modes FI-Top, Absorbance, FI-Bottom will be calculated and written to the instrument.

- Depending on the instrument configuration, with FI-Top, FI-Bottom, Absorbance the three offsets must be determined as follows:

Display:

- Measurement curves with determined offsets (offset, delta 0-1, delta 1-2).
- Current offset position: *Current offset.*
- PASSED/FAILED: offset: –150 bis +150, delta 0-1, delta 1-2: 670 bis 870

Selection:

- Button: *Start.*

5.5.11 Wavelength Accuracy

- Only active, if at least **Excitation Monochromator** with Absorbance MCR or FI Top MCR or FI Bottom MCR is available.

- If <u>Absorbance MCR is available</u> (with or without FI-Top MCR/Bottom MCR)

- Absorption spectrum of a BG20 Filter is recorded

- Measurement range: 300 - 850 nm in 1 nm steps.

- Then from the recorded absorption spectrum of the BG-20 Filters for each of the five wavelength ranges the Maximum will be determined and from that the „Delta" of the offset will be calculated. If the „Delta" of the offset is less than 1 nm, PASSED is returned, otherwise FAILED. Click **Set** and a new offset from the „Delta" of the offset will be calculated and written to the instrument.

Excitation Monochromator

Click **Start** to start the measurement. The message, "Please insert MultiCheck-Plus plate" appears. Insert the MultiCheck-Plus plate, which has a built-in BG20 filter. The absorption spectrum of the BG20 Filter will be measured. The measurement range is from 300 - 850 nm in 1 nm steps. The maximum will be determined for each of the following 5 wavelength ranges:

a) 340 – 370 nm; expected: nm

b) 520 – 540 nm; expected: nm

c) 560 – 590 nm; expected: nm

d) 730 – 745 nm; expected: nm

e) 780 – 830 nm; expected: nm

The difference between the expected and measured maximums will be calculated and from this the new offset will be calculated. If the absolute value of the new offset is less than or equal to 1.5 nm then PASSED is reported by the software, otherwise FAILED will be reported. Confirm the new offset by clicking **Set**.

Display:

- At the beginning of the measurement the following message appears: „Please insert MultiCheck-Plus plate".
- Measurement curves (spectrum) and determined Peak positions, Reference values and offsets in tables.
- PASSED/FAILED

Selection:

- Selection between MC-Plus plate with wavelength values from the xml-file or MC-Plus (default) with default wavelength values (see above).
- Button: **Set** - New Grating motor offset is written to the Monochromator.
- If an <u>Absorbance Cuvette</u> is available (with or without FI-Top MCR/Bottom MCR)
- Should automatically be performed, in that an absorption spectrum of a BG20 Filter in a Cuvette will be recorded in the Absorbance Cuvette Mode.
- Measurement range: 300 - 850 nm in 1 nm steps.
- Then from the recorded Absorption spectrum of the BG-20 Filters for each of the five wavelength ranges, the maximum is determined and from that the „Delta" of the offset is calculated. If the „Delta" of the <u>offset is less than 1.5 nm</u>, PASSED is returned, otherwise FAILED.

Display:

- At the beginning of the measurement The following message appears: „Please insert Cuvette with BG-20 filter"
- measurement curves (spectrum) and determined Peak positions, Reference values and offset in tables.
- PASSED/FAILED

Selection:

- If Absorbance MCR is not available, but FI-Top MCR or FI_Bottom MCR is.
- Fine adjustment of the offset of the Grating motor (Exc Mono).
- Should automatically be performed, in that the Signal of the reference diode is recorded, while the Grating motor moves across four wavelength ranges in 1 nm steps:
    (1)   410 - 435 nm; expected: 424.0 nm
    (2)   470 – 500 nm; expected: 486.5 nm
    (3)   510 – 550 nm; expected: 531.0 nm
    (4)   810 – 850 nm; expected: 825.5 nm
- Then from the recorded Spectra of the flash lamp for each of the four wavelength ranges, the Maximum is determined and from that the „Delta" of the offset calculated. If the „Delta" of the offset is less than 1 nm, PASSED is returned, otherwise FAILED. Click **Set** and a new offset from the „Delta" of the offset will be calculated and written to the instrument.
- Simultaneously, the wavelength tables WL (nm): EncPos will be calculated in 1 nm steps and saved in the Monochromator.
- If the measurement mode FI-Top MCR is available, but not Absorbance MCR, the setting should be done with the measurement mode FI-Top MCR (Exc-Scan).
- If FI-Top MCR is not available (and neither is Absorbance MCR), the setting should be done with the measurement mode FI-Bottom MCR (Exc-Scan) (If available).

Display:

- At the beginning of the measurement The following message appears: „Please remove plate"
- Measurement curves (spectrum) and the determined peak positions, reference values and offset in tables.
- After clicking *Set*, the following message appears: "After changing the offset you have to repeat the measurement ranges"
- PASSED/FAILED

Selection:

- Button: **Set** - New Grating motor offset in the Monochromator will be written.
  If the Emission Monochromator is also available then also:
  B.) EMISSION MONOCHROMATOR

- Only active, if **Excitation Monochromator** and Emission monochromator or FI Top MCR or Bottom MCR is available.
- Fine adjustment of the offset of the Grating motor (Em Mono)
- Should automatically be performed in that the Signal of the PMTs is recorded, while the Grating motor (Em Mono) moves across a specific wavelength range in 1 nm steps.
- The **Excitation Monochromator** should be set at 500 nm and the Emission Monochromator will be scanned from 300 – 600 nm in 1 nm steps.
- Then from the recorded curve the center of gravity determined (Mean of the Flank positions), and from that the „Delta" of the offset calculated.
- If the „Delta" of the offset is less than 1 nm, PASSED is returned, otherwise FAILED. Click **Set** and a new offset from the „Delta" of the offset will be calculated and written to the instrument.
- Simultaneously the wavelength tables WL(nm): EncPos in 1 nm steps will be saved in the Monochromator:

Display:

- At the beginning of the measurement, the following message appears: „Please remove plate"
- measurement curves (spectrum) with determined Peak positions, Reference values and offset.
- PASSED/FAILED

Selection:

- Button: **Set** – writes the new Grating motor offset in the Monochromator.

5.5.12   Reference Diode Calibration

Only active, if **Excitation Monochromator** is available.

The Calibration curve of the reference diode will be written to the instrument in the Main CPU.

Display:

- Progress Bar

Selection:

- Button: **Read from File** (Calibration curve from file read).
- Button: **Write to instrument** (Calibration curve in the instrument and saved to DHR)
- Button: **Start measurement** (Calibration curve written directly to the instrument)

DHR:

- Reference diode calibration curve.

5.5.13   Intensity Calibration Lamp

ES 2.3.12

- Only active, if also Emission Monochromator is available.
- Read the Calibration curve for the Emission monochromator from file and save to the instrument in the Main CPU.

Display:
Selection:

- Button: Read from File.
- Button: Write to instrument (Calibration curve written to the instrument and saved to DHR).

DHR:

- Calibration curve of the Emission monochromator.

5.5.14   Check Values MCR

- For each of the measurement modes FI-Top MCR, FI-Bottom MCR, Absorbance MCR, Absorbance cuvette MCR (If active) at 485 nm, records the measurement value of the reference diode.
- Read and Display the Reference diode Values and gains.
- Check value = Reference diode value/gain (for Plausibility check) for each measurement mode is determined (Filter version: only for one measurement mode)
- The Check Values must not deviate more than 70% from each other:

$$\frac{Max(CHECK) - Min(CHECK)}{Min(check)} \leq 0.7$$

- Use the gain and Reference diode value with the lowest „Check value"
- For the selected measurement, the Limit

$$R_{LAC}^{LIMIT} = \frac{(REF_{FC}^{bright} - REF_{FC}^{dark})}{2}$$ is determined and the Reference

diode gain g_{LAC} is saved to the instrument!

Display:

- Reference diode value, gain values and check values at 485 nm for each of the measurement modes (see above)
- PASSED/FAILED: Comparison of the measurement values with Norm values and the gain values with Norm values: Check value = Reference diode value/gain value > 1000

Reference Check Values

Lamp Check	Reference Diode	Reference Gain	Check Value	Result
FI-Top	41827	10	4182,70	PASSED
FI-Bottom	40911	25	1636,44	PASSED
Absorbance	41300	13	3176,92	PASSED
Difference Min/Max...			1,56	FAILED

Fiber Check	PMT Value	PMT Gain	Check Value	Result
FI-Top	44355	56	1375,96	PASSED
FI-Bottom	43126	80	2599,24	PASSED

| Start | – | Set | Close |

Selection:

- Button: **Start measurement**
- Button: **Save** (Save the check values to DHR and save FI Reference diode value and gain to the instrument)

DHR:

- Lamp Check gain and limit.

5.5.15 *Filter Measurement Head*

5.5.16 *Define Filter Carrier*

- Only active, if one of the measurement modes FI-Top Filter, FI-Bottom Filter, Absorbance Filter, Fluorescence Polarization Filter is active.
- Show Filter Definition (wavelength, Bandwidth, Purpose, number of flashes on each filter, life time (flashes)).
- Define Excitation/Absorbance Filter (wavelength, Bandwidth, Purpose, number of flashes on each filter, life time (flashes)
- Define Emission Filter (wavelength, Bandwidth, Purpose, number of flashes on each filter, life time (flashes).
- Save Definition (wavelength, Bandwidth, Purpose, number of flashes on each filter, life time.) to EEPROM on filter carrier.
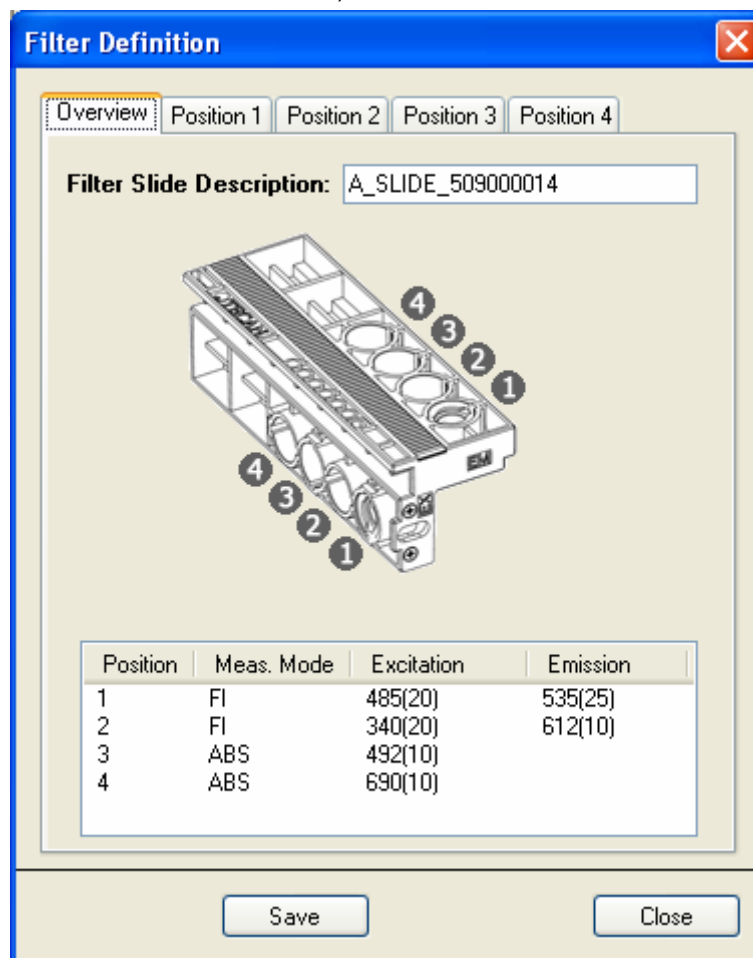
Display:

- Current Filter definition
- **Selection:** (wavelength, Bandwidth, Usage, Flash Counter; PurchaseDate)
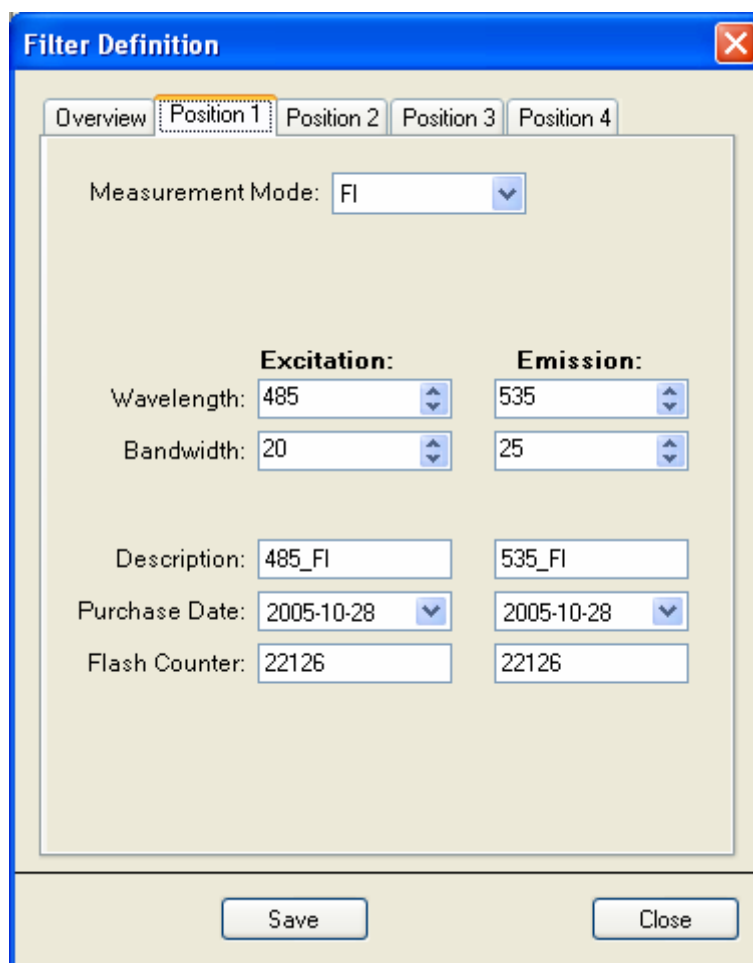
Selection:

- Define Filter (wavelength, Bandwidth, Usage, Flash Counter; Purchase Date).

5.5.17   Adjust Offset Filter Carrier

- Only active, if one of the measurement modes FI-Top Filter, FI-Bottom Filter, Absorbance Filter, Fluorescence Polarization Filter is active.
- The mechanical offset of the filter positions in relation to the position of the home sensor should be determined. Move the Filter carrier to the front of the Filter Module, so that the frame of the Filter Module is flush with the surface of the filter. This motor position should be set as offset.

Adjust Offset Filterslide

Current Offset: -230

Current Position: 0

Steps
- 1
- 10
- 100

Move In
Move Out
Use Arrow
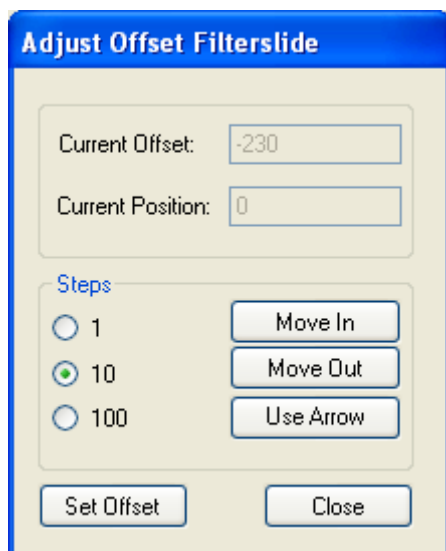
Set Offset   Close

Display:

- *Current offset:* Display of the currently set offset.
- *Current position:* Display the current motor position.

Selection:

Button: **Move In/Out** - move filter carrier motor in or out.

Check box **1, 10, 100** steps - select the number of steps the filter carrier motor should move.

Button: **Set offset**: Current Motor position written as offset in CPU.

5.5.18 Intensity Calibration Filter

- Only active, if filter module available.
- Calibration curve for the excitation and the emission conduit of the filter measurement head will be written to the instrument (Ex: and Em: for 200 –1000 nm in 1 nm steps for each one the value 300 will be written to the instrument)
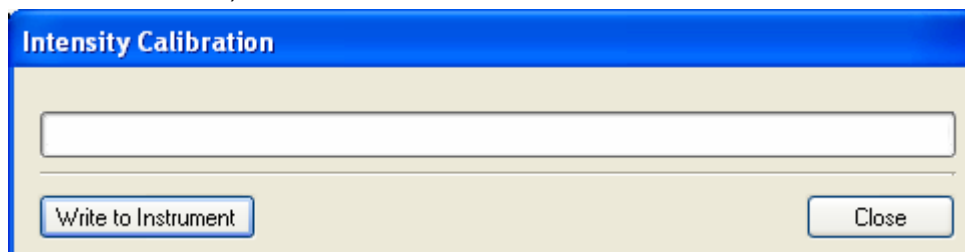
Display:

- Progress Bar

Selection:

- Button: **Write to instrument** (Calibration curve will be written to the instrument and saved to DHR).

5.5.19 Check Values Filter

- Only active, if one of the measurement modes FI-Top Filter, FI-Bottom Filter, Absorbance Filter, Fluorescence Polarization Filter is active.
- For each of the measurement modes FI-Top Filter, FI-Bottom Filter, Absorbance Filter, if active. measurement for:
  - o FI-Top (10flash)   Filter from Filter definition
  - o FI-Bottom (10flash)   Filter from Filter definition
  - o Absorbance (10flash)   Filter 492nm
- Read and display the reference diode value and gain values.
- Check value = reference diode value/gain value
- <u>Save only for FI: reference diode value and gain in the instrument!</u>
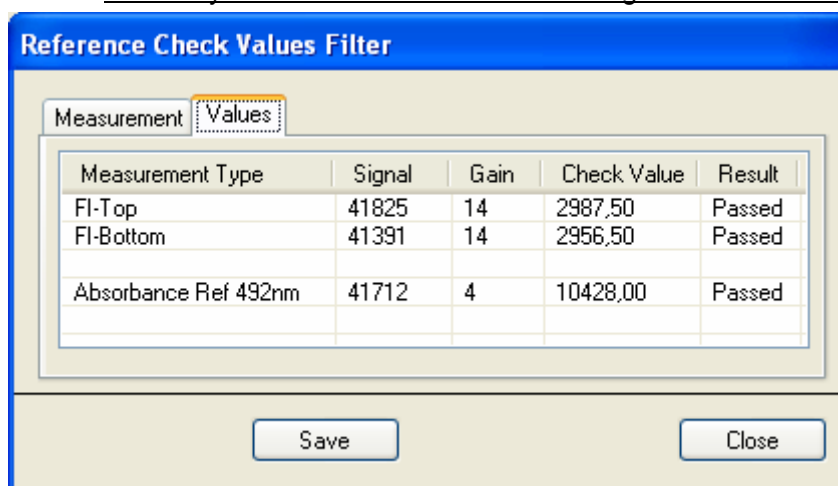
Display:

- Reference diode value, gain value and Check value for each of the measurement modes (see above).
- PASSED/FAILED: Comparison of the values with Norm values:
- Check value (FI-TOP/Bottom) = Reference diode value/gain value >2000
- Check value (Absorbance) = Reference diode value/gain value >5000

Selection:

- Button: **Start measurement**
- Button: **Save** (saves Check values in DHR and saves FI Reference diode value and gain to the instrument)

DHR:

- Check values for FI-Top, FI-Bottom, Absorbance, Absorbance cuvette.

5.5.20   *Luminescence Z-Transport Offset*

- Only active, if measurement mode Luminescence available.
- The offset of the z-Transports will be adjusted, in that the fiber of the Luminescence module step-wise (or in absolute positions) in the direction of plate carrier with test plate moves down.
- From the position of the z-Transports, at exactly where the fiber touches the test plate, the Z-Transport offset Z_0 will be calculated and written to the instrument.
- Z-offset = Z_0 = distance (init. position until it touches the test plate) + height of the test plate
- *[Comment: Z-position = Z-offset – distance from init position]*
- Z=0 is defined as the position at which the fiber touches the top of the plate carrier.
- The MultiCheck plate can be used as a test plate.
- Click **Set offset** to save Z_0 and also:
- Z_{min}= Z_0 – (24000/5.25) and Z_{max}= Z_0 – (8000/5.25) should be saved to the instrument.

Display:

- Current offset
- New offset

Selection:

- Button: Move Up/Move Down
- Button: Set offset (write offset to the instrument)
- Select plate (MultiCheck)
- Select steps/click (steps or mm/click)

5.5.21   Luminescence Check Values

- Only active, if measurement mode Luminescence is available.
- Per measurement, measure five times each with 1 sec of integration time (except Fiber check with 0.1 sec) and calculate the mean.
- Move plate transport in position Lid Check.
- Switch LED off and close Shutter for Dark measurement.
- If the value of the Dark measurement < 50 counts → PASSED, then save 100 as *Max dark counts value* in the instrument, if value of the Dark measurement > 50 counts → FAILED.
- Switch LED off and open Shutter for *Lid Check* measurement.
- If the value of the Lid check measurement < 100 counts → PASSED, then save 200 as *Lid check value* in the instrument, if the value of the Lid check measurement > 100 counts → FAILED.
- Move the plate transport to the *Fiber check* position, switch LED on and move the shutter to filter position for OD1, integration time 0.1sec.
- 0.5·(Value of the Light measurement minus Dark measurement), save as *Fiber check minimum value* in the instrument.
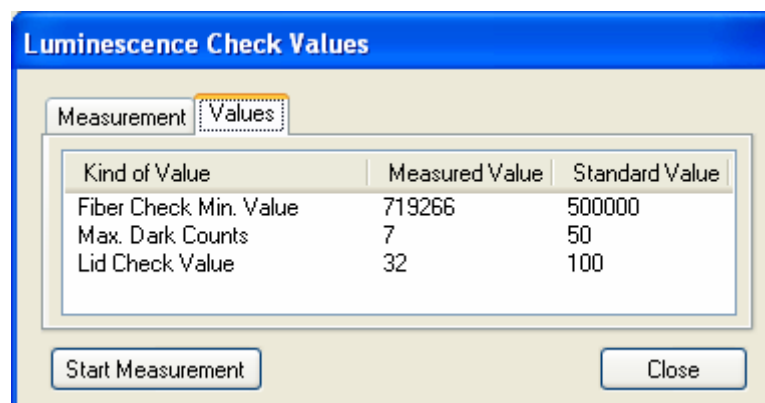
Display:

- PASSED/FAILED: Comparison with the Dark/Light/Lid Check value with Norm values.
- measurement value (Mean of five measurements)

Selection:

- Button: **Start measurement**
- Button: **Save** (saves the three measurement values to the instrument)

DHR:

- Fiber check value Luminescence, Dark value luminescence, Lid-check value luminescence, PASSED/FAILED

5.5.22 Plate Transport

- The adjustment of the plate transport should be performed for the measurement modes, if these are active:
- - Absorbance MCR /Filter (step size: Fine: 2 steps, Coarse: 6 steps)
- - Fluorescence Top MCR/Filter (step size: Fine: 2 steps, Coarse: 6 steps)
- - Fluorescence Bottom MCR/Filter (step size: Fine: 3 steps, Coarse: 7 steps)
- - Luminescence (step size: Fine: 4 steps, Coarse: 7 steps)
- - FP/Filter (step size: Fine: 2 steps, Coarse: 6 steps) (If FP without FI Top)
- The adjustment the plate transport offset for the above selectable measurement modes should be possible with the MultiCheck plate as a Test plate.
- The measurement should be performed for all activated measurement modes in series as also singly.
- In each adjusted measurement mode (see above), the plate transport (with test plate) using the selected step size (see above) will scan in X-Y direction and the corresponding measurement signal of the measurement mode will be recorded with 21 measurement points per axis.
- The gain will be automatically adjusted for the measurement modes FI Top/Bottom and Absorbance.
- Scan ranges in the X and Y direction of the currently adjusted offset (read from instrument) 10 steps in negative and positive direction.
- The measurement signals will be graphically represented in the X-Y plane. From the deviation of the coordinates to the center of gravities of the light spots to the coordinates of the centers of the measurement ranges (previous plate transport offset) a corrected plate transport offset (New offset) will be calculated.
- If the intensity from at least 5 neighboring points is greater than 10000 and the relationship of the maximum to the minimum intensity greater than 20 the measurement PASSED otherwise it FAILED.
- When PASSED, at the end of the measurement the offset will be automatically written to the instrument.

Values in OD
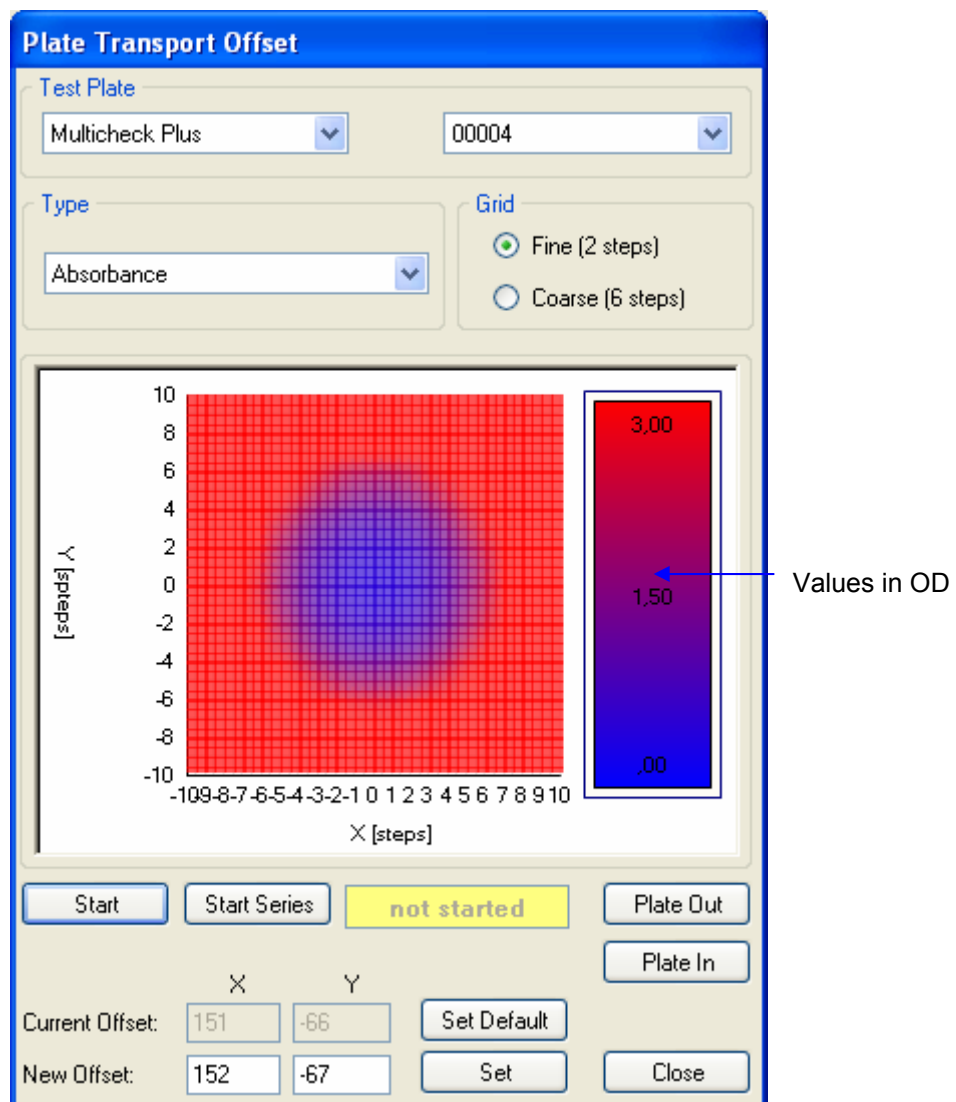
Display:

- Graphic: Measurement signal in X-Y plane, intensity in false color representation
- Current offset
- New offset

Selection:

- Button: Start measurement Series
- Button: Start measurement
- Select measurement Mode (see above)
- Select step size (Fine/Coarse)
- Select plate: MultiCheck
- Button: plate In/Out

5.5.23   *Built-in Test Spot*

- Active if one of the options Fluorescence Top MCR/Filter, Fluorescence Bottom MCR/Filter, Absorbance MCR/Filter is available.

- Measurement of the built-in fluorescence test spot should be performed with the following measurement modes:

- Fluorescence Top MCR/Filter (step size: Fine: 2 steps, Coarse: 6 steps)

- If not available
  Fluorescence Bottom MCR/Filter (step size: Fine: 3 steps, Coarse: 7 steps)

- If not available
  Absorbance MCR/Filter (step size: Fine: 2 steps, Coarse: 6 steps)

- Luminescence (step size: Fine: 4 steps, Coarse: 7 steps)

- the plate transport (with test spot plate), measurement mode FI-Top MCR or Filter (or FI-Bottom MCR or Filter, or Absorbance MCR/Filter, using the selected step size (see above) will scan in X-Y direction and the corresponding measurement signal will be recorded with 21 measurement points per axis.

- The gain for the measurement modes FI Top/Bottom and Absorbance will be automatically adjusted.

- Scan range in X and Y direction of the currently adjusted offset (read from instrument) 10 steps in negative and positive direction.

- The measurement signals will be graphically represented in the X-Y plane. From the deviation of the coordinates to the center of gravities of the light spots to the coordinates of the centers of the measurement ranges (previous test spot offset) a corrected test spot offset (New offset) will be calculated.

- If the intensity from at least 5 neighboring points is greater than 10000 and the relationship of the maximum to the minimum intensity greater than 20 the measurement PASSED otherwise it FAILED.

- When PASSED, at the end of the measurement the offset will be automatically written to the instrument.
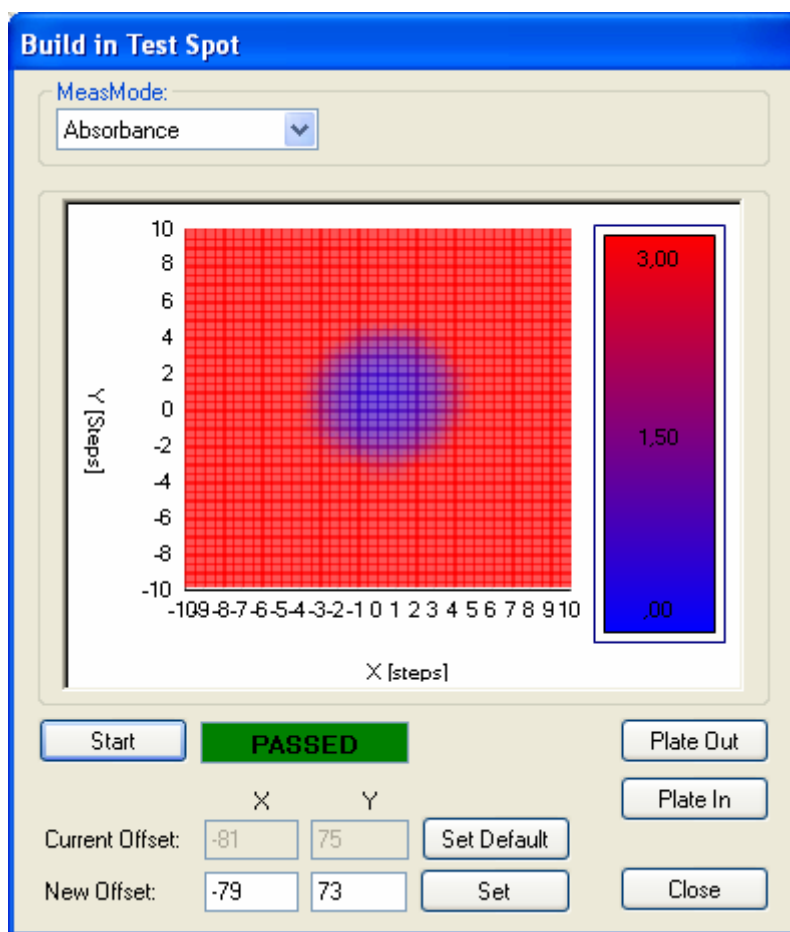
Display:

- Graphic: Measurement signal in X-Y plane, intensity in false color representation
- Current offset
- New offset

Selection:

- Button: Start measurement
- Select step size (Fine/Coarse)
- Button: plate In/Out
- Button: Set Default (saved in the instrument)
- Button: Set New offset (saved in the instrument)
- Field: New offset

5.5.24   *Injection position*

- Only active, with Injector option.
- The offsets for the injection position will be determined.
- The plate transport with a test plate must be moved under the injection needles.
- Only active, if injector available.
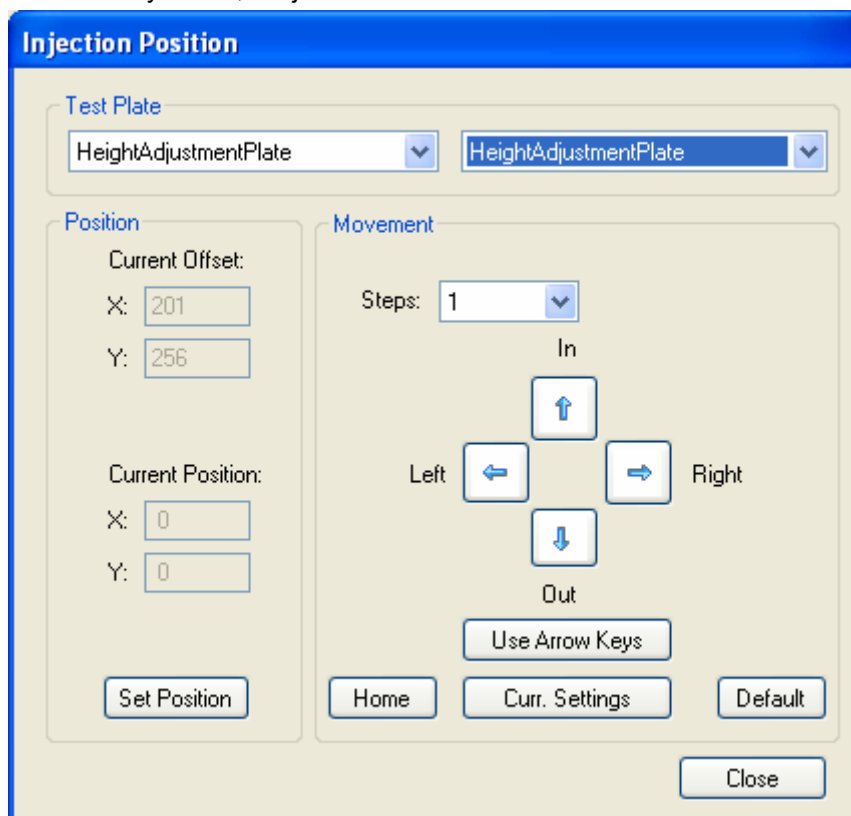
Display:

- *Current* offset (currently set offset)
- *Current position* (current position of the plate transports)

Selection:

- Click **Home** to move the plate transport to the Home position.
- Click **Default** to move the plate transport to the Default Injection position.
- Click **Current Settings** to move the plate transport to the current injection position.
- The current position of the plate transport and the current injection position will be displayed (x, y coordinates)
- With Buttons **In; Out; Left; Right** the plate transport will be moved in the corresponding direction, so that a fine adjustment of the injection position is possible.
- The step size can be adjusted by 1, 10, 100 steps.
- Click **Set position** to adjust the **Current Offset** and **Current Position** (see 8.8.4 Teaching the Injector Position)

5.5.25   Plate Load position

- The load position of the plate transport can be adjusted.
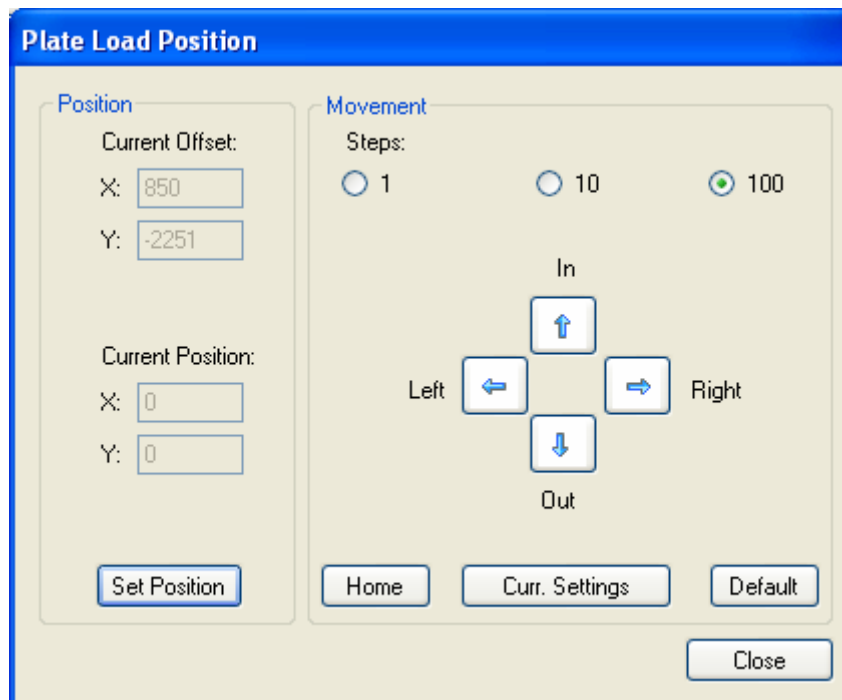
Display:

- *Current offset* (currently set offset)
- *Current position* (current position of the plate transport)

Selection:

- *Home* – move the plate transport to the Home position.
- *Default,* move the plate transport in the Default Load position.
- *Current Settings*, move the plate transport in the current Load position.
- *Buttons In; Out; Left; Right*
- *Steps* 1, 10, 100 steps.
- *Set New offset*, write offset to the instrument.

5.5.26   Temperature Offset

- Only active with Heating Option.
- The offset (difference in 1/10°C) between the displayed temperature of the temperature sensor on the heating plate and the measured temperature from a sensor in the test plate will be determined and written to the instrument.
- The plate transport is moved to the load position and the following message appears: Please insert Test plate!
- The instrument is heated to 37.0°C (target temperature 37.0°C). The fans should switch off during the heating of the instrument. Displays the current temperature from the sensor on the heating plate in the 0.5 sec intervals.

Temperature Offset

Adjust the temperature on 37 °Celsius

22,9

current Offset:
-1,6

reference Temperature:

Heating On   Starttime: Starttime
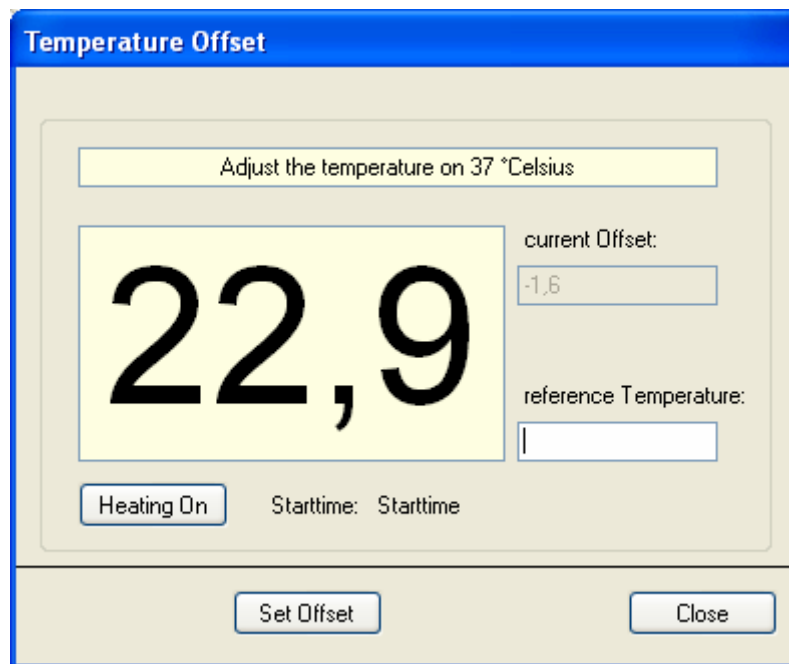
Set Offset   Close

Display:

- *Current offset* (currently set offset)
- As soon as the Heating On is clicked, the temperature from the Reference temperature field will be read and applied, the Temperature of the Sensors on the Heating foil will be read and from that the offset calculated and written to the instrument.

Selection:

- *Reference Temperature*: Field for Reference temperature.
- *Set offset* (difference between Reference temperature and measured Temperature will be written to the instrument).

5.6 Tools & Tests

Under the menu option **Tools & Tests** the user can run tests to check out every single module and function.

5.6.1 Module Communication Test

A) Module Communication

- The principal Function of the Module should be checked.
- Query the configured Module: if Answer positive, then Message „Module communication: PASSED" if Answer negative then Message „Module communication FAILED".

B) Module step loss

If corresponding Module available:

- Mono step loss test
- Filter Module step loss test
- Transport step loss
- Luminescence Filter wheel step loss
- Injector step loss test
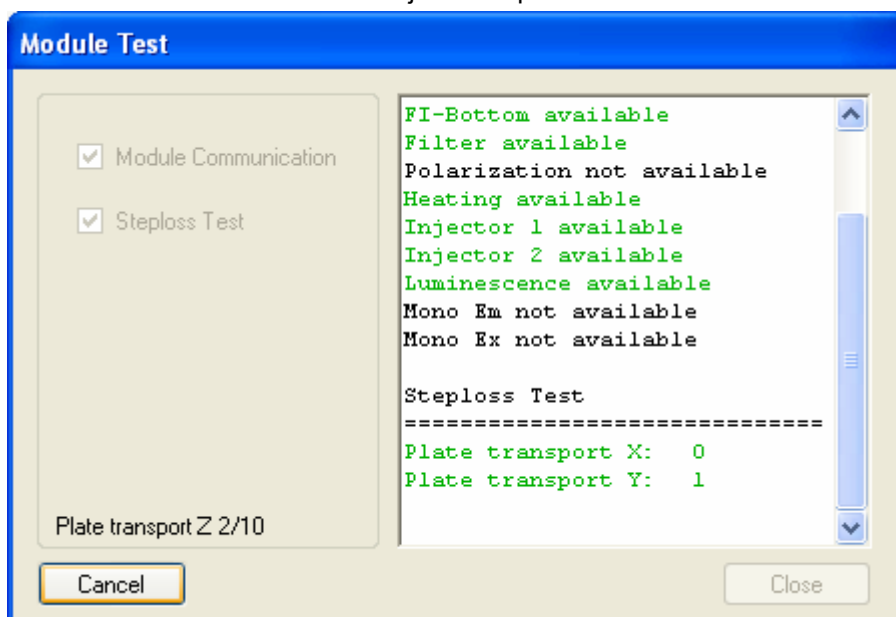
Display:

- Module Communication Test:
- Table with list of the activated (configured) Modules: (PASSED/FAILED)
- Module step loss: for respective Module: (PASSED/FAILED)
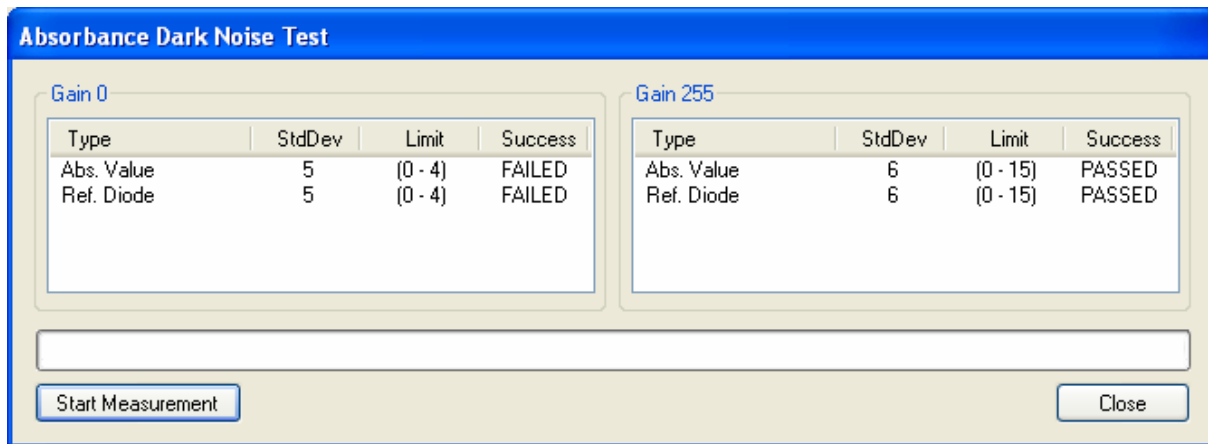
Selection:

- Button: Start Module Check

5.6.2 Dark Noise Tests

Absorbance Dark Noise Test

- Only active, if Absorbance MCR or Absorbance Filter enabled.
- Dark measurement Absorbance MCR/Filter at gain 0 and gain 255 with 100 flashes.
- The Absorbance diode value and the Reference diode value will be read and STDEV of the measurement value will be calculated.
- Assessment with PASSED/FAILED
- Limit for STDEV (gain 0)$\leq$ 4, STDEV(gain 255) $\leq$ 15

Absorbance Dark Noise Test

Gain 0

Type	StdDev	Limit	Success
Abs. Value	5	(0 - 4)	FAILED
Ref. Diode	5	(0 - 4)	FAILED

Gain 255

Type	StdDev	Limit	Success
Abs. Value	6	(0 - 15)	PASSED
Ref. Diode	6	(0 - 15)	PASSED

[Start Measurement]   [Close]

Display:

- STDEV/Limit
- PASSED/FAILED

Selection:

- Button: Start measurement

DHR:

(save under the corresponding serial number)

- PASSED/FAILED and measurement result.

Fluorescence Intensity Dark Noise Test

- Only active, if FI Top MCR or Filter or FI Bottom MCR or Filter enabled.
- Dark measurement with FI Top MCR or Filter or if no FI Top with FI Bottom MCR or Filter.
- The Reference diode value and the PMT value will be read. At gain 0 and gain 255 (or 40 and 100 for PMT); with 100 flashes. STDEV of the measurement value will be calculated.
- Assessed with PASSED/FAILED
- Limit for Ref-Diode: STDEV (gain 0)$\leq$ 7, STDEV(gain 255) $\leq$ 15;
- Limit for PMT: STDEV(gain 40) $\leq$ 7; STDEV(gain 100) $\leq$ 15;

Fluorescence Intensity Darknoise Test

Reference Diode

Gain	StdDev	Limit	Success
0	3	(0 - 7)	PASSED
255	6	(0 - 15)	PASSED

PMT

Gain	StdDev	Limit	Success
40	5	(0 - 7)	PASSED
100	5	(0 - 15)	PASSED

[Start Measurement]   [Close]
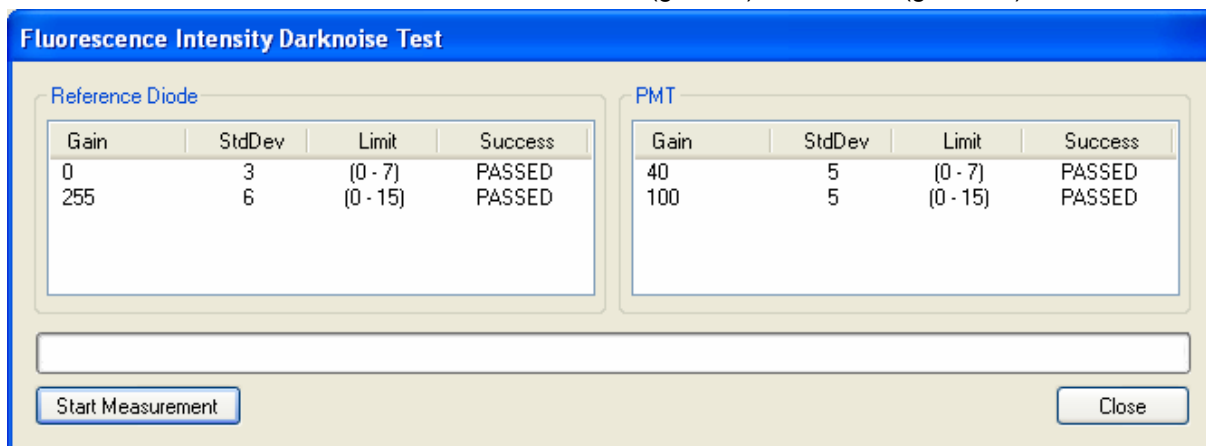
Display:
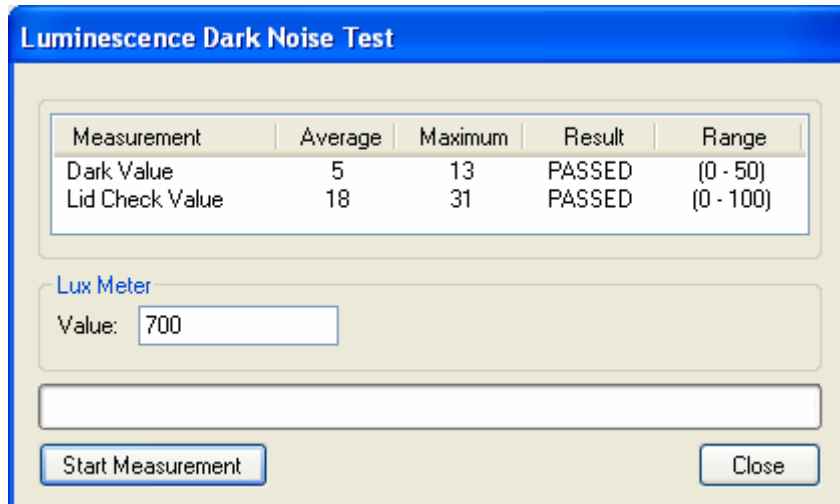
- STDEV/Limit
- PASSED/FAILED

Selection:

- Button: Start measurement

Luminescence Dark Noise

- Only active, if Luminescence enabled.
- Dark measurement with 1 sec integration time per measurement.
  20 measurements each for „open shutter" and „closed shutter".
- Assessment with PASSED/FAILED
- Limit for single measurement value: shutter closed ≤ 50 counts, shutter open≤ 100 counts
- Read Luxmeter over PC. Measurement only valid, if Luxmeter reads >700lux ambient light.

Luminescence Dark Noise Test

Measurement	Average	Maximum	Result	Range
Dark Value	5	13	PASSED	(0 - 50)
Lid Check Value	18	31	PASSED	(0 - 100)

Lux Meter

Value: 700

Start Measurement   Close

Display:

- Current measurement value
- PASSED/FAILED

Selection:

- Button: Start measurement
- Button: Open/Close Shutter (Bem.: position on the filter wheel)

DHR

(save under the corresponding serial number)

- PASSED/FAILED and measurement result.

5.6.3   Monochromator Tests

Mono Step-loss Test

- Only active If Exc. Monochromator or Em. Monochromator available.
- A Burn In Test should be performed for the OSF filter wheel, fiber switch and Grating motor.
- The drive mechanism of the filter wheel, fiber switch and Grating motor will be checked in n measurement cycles for step loss s_n. The number n of the measurement cycles can be set. (1–1000, default 250). The results s_n the single measurement cycles will be shown in the Log Window.

Display:

- Currently set serial numbers
- Currently set Module number
- Log Window
- Max (S_n)
- PASSED/FAILED

Selection:

- number the measurement cycles (250 default)
- Check-Box: OSF Filter/Fiber Switch/ Grating
- Start
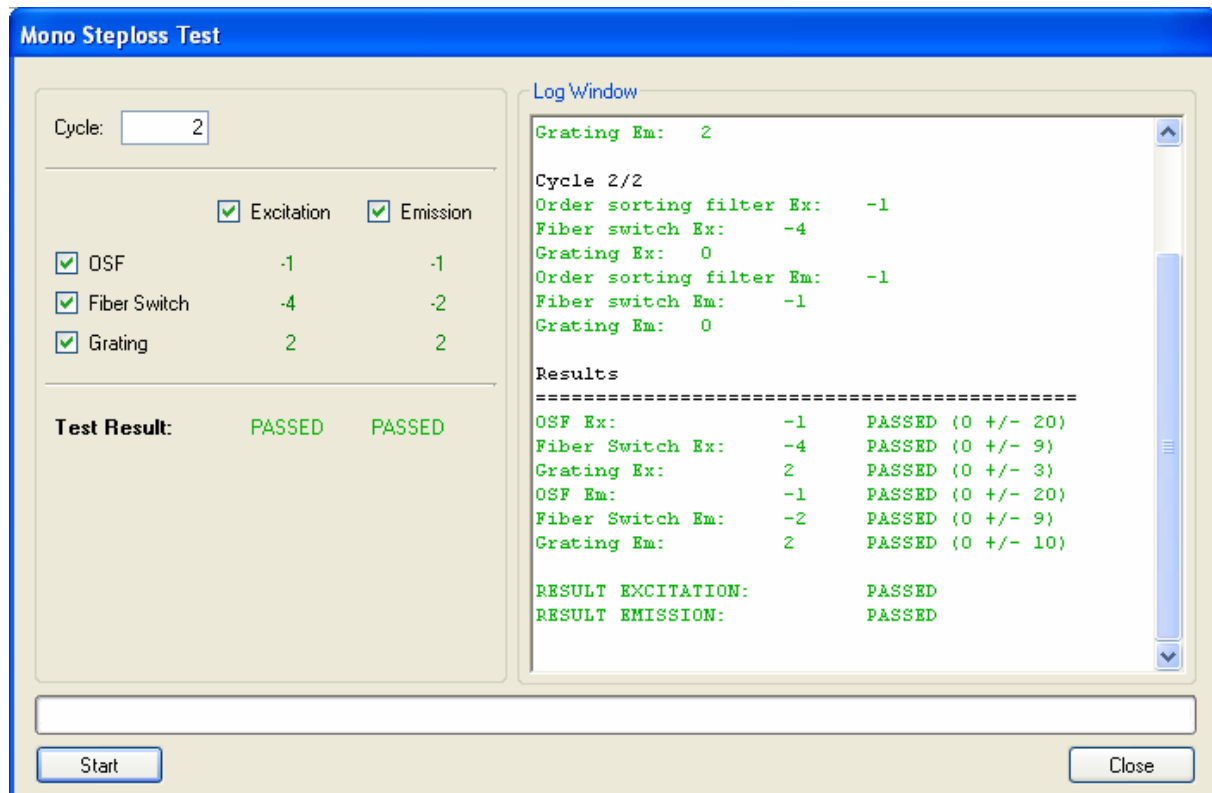
Acceptance criteria:

- The test result should be assessed with „PASSED" if $\max(s_n) \leq s_{max}$

  with s_{max} = 20 for OSF (<1°) s_{max} = 9 for Fiber Switch (<0.1mm)

  s_{max} = 3 for Grating motor

Reference Signal Test MCR

- • For each of the measurement modes FI-Top MCR, FI-Bottom MCR, Absorbance MCR, Absorbance cuvette MCR (If active) Flash lamp spectrum with Reference diode or Absorbance diode will be recorded.
- • Gain at 488 nm will be set automatically and with this gain, Scan from 230 to 1000 nm (Absorbance), 230-850 nm (FI enhanced), 230-600 nm(FI normal) in 10 nm steps, measure 1 Flash.
- • For each of the measurement modes, Reference diode value or Absorbance diode value and gain value for each Wavelength will be saved.
- • Comparison of the recorded Spectra with Norm values.

Display:

- • Spectra of the Check values for each of the measurement modes (see above)
- • PASSED/FAILED: Comparison the Spectra with Norm spectra.
- • Check value = Reference diode Value/gain
- • Check value = Absorbance diode Value/gain

Selection:

- • Button: Start measurement
- • PASSED/FAILED and measurement result

DHR

    (save under the corresponding serial number)

- • PASSED/FAILED and measurement result.

5.6.4 Filter Module Tests

Filter Carrier Memory Test

- Only active, if one of the measurement modes FI-Top Filter; FI-Bottom Filter, Absorbance Filter, Fluorescence Polarization Filter available.
- Filter carrier is moved in and the contents of the EEPROM are read.
- Check the contents of the EEPROMS and Assessment with PASSED/FAILED.
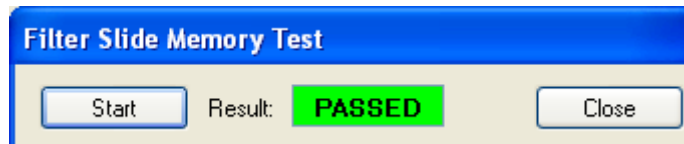
Display:

- „Please Insert Filter carrier"
- PASSED/FAILED

Selection:

- Button: Start measurement
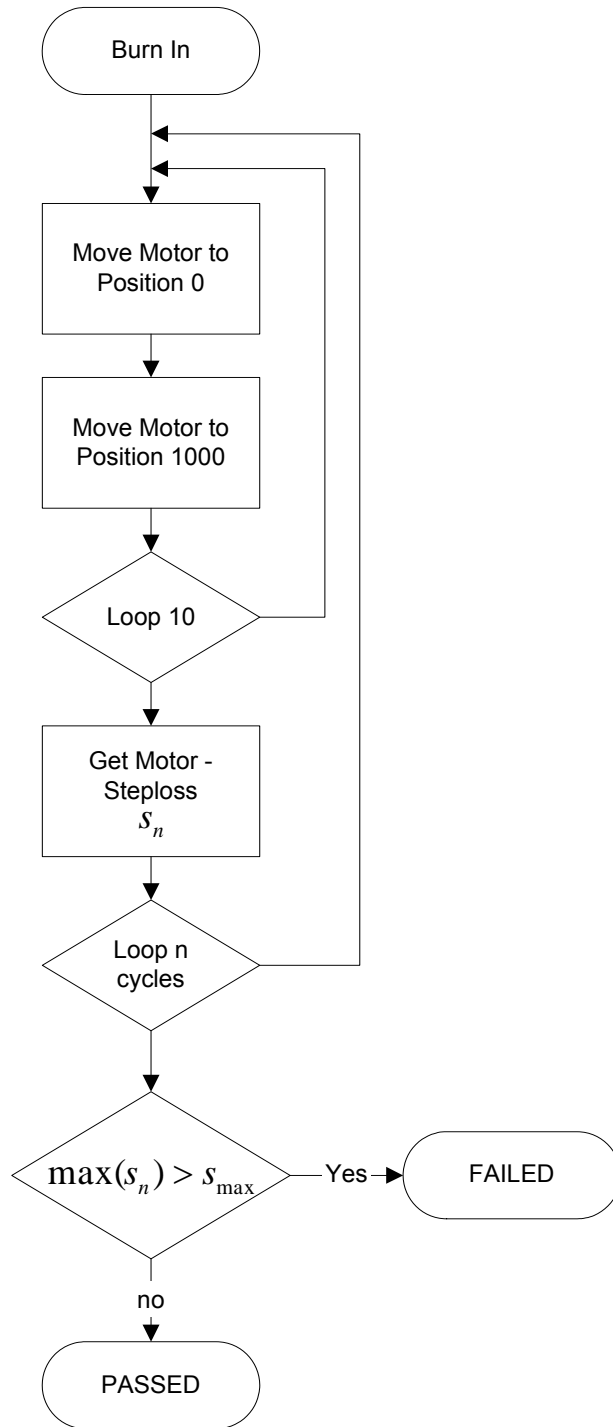
Figure 2: Step-loss Test of the Filter Module

Filter Module Step-loss Test

- Only active, if one of the measurement modes FI-Top Filter; FI-Bottom Filter, Absorbance Filter, Fluorescence Polarization Filter available.
- A Burn In Test will be performed on the Filter carrier and Beam splitter
- The drive mechanism of the carriers and of the beam splitters will be checked in n measurement cycles for step loss s_n. The number n of the measurement cycles can be set. (1–1000, default 250). The results s_n the single measurement cycles will be shown in the Log Window.

Display:

- Currently set serial numbers
- Currently set Module number
- Log Window
- Max (S_n)
- PASSED/FAILED
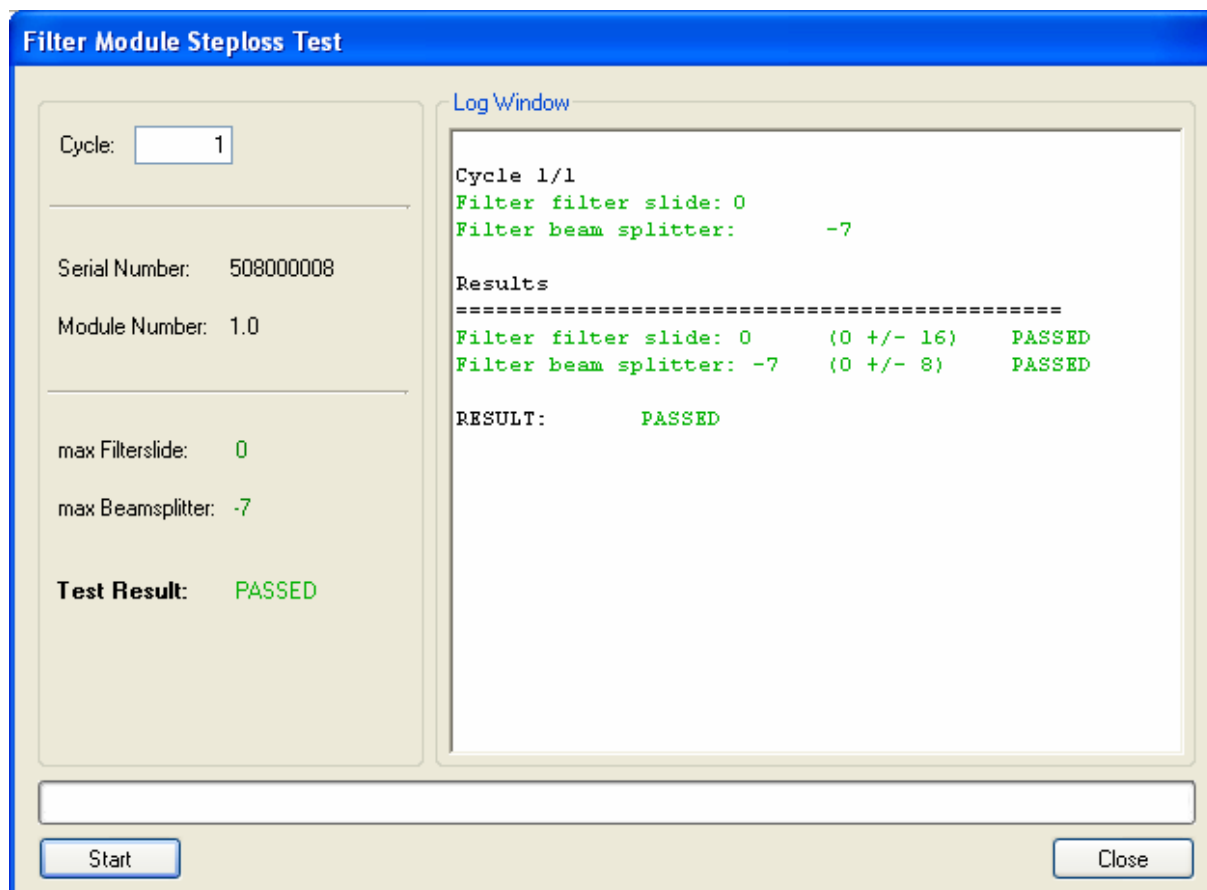
Selection:
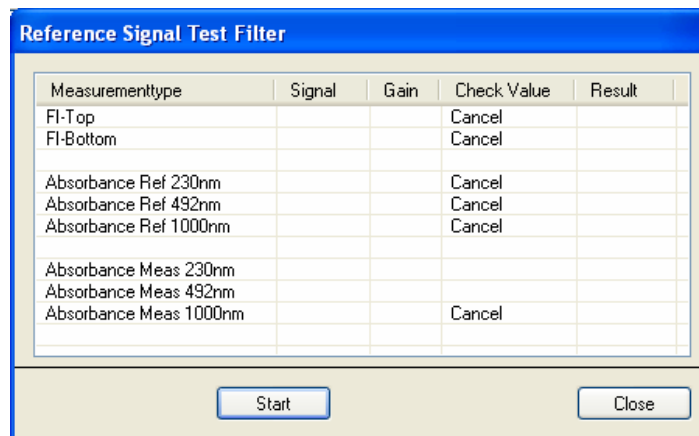
- number the measurement cycles (250 default)
- Start

Acceptance criteria:

- The test result will be assessed with „PASSED" if

$$\max(s_n) \leq s_{max}$$

- With s_{max} = 16 (Filter carrier)

- with s_{max} = 8 (beam splitter)

Reference Signal Test Filter

- Only active, if one of the measurement modes FI-Top Filter; FI-Bottom Filter, Absorbance Filter, Fluorescence Polarization Filter available.
- The measurements of the Reference diode signals and Absorbance diode signals (only at absorbance) will be performed in the following measurement modes (If available):
- FI-Top Filter (10 flash)   Filter
- FI-Bottom Filter (10 flash)   Filter
- Absorbance Filter (10 flash)   230, 492 nm and 1000 nm Filter for Absorbance diode signal
- The Reference diode signal (RefSig) with gain and Absorbance diode signal with 230, 492 nm and 1000 nm Filter (AbsSig) and gain with Norm values will be compared and assessed.

Measurementtype	Signal	Gain	Check Value	Result
FI-Top			Cancel	
FI-Bottom			Cancel	
Absorbance Ref 230nm			Cancel	
Absorbance Ref 492nm			Cancel	
Absorbance Ref 1000nm			Cancel	
Absorbance Meas 230nm				
Absorbance Meas 492nm				
Absorbance Meas 1000nm			Cancel	

Start   Close

Display:

- Reference diode value for each of the measurement modes (see above)
- PASSED/FAILED: Comparison the
- Check Values=Reference (Absorbance) Diode Values/gain with Norm values:
- Check Value (FI-Top/Bottom):   > 2000
- Check Value (AbsRef 230 nm):   > 1000
- Check Value (AbsRef 492nm):   > 2000
- Check Value (AbsRef 1000 nm):   > 1000
- Check Value (AbsMeas 230 nm):   > 1000
- Check Value (AbsMeas 492nm):   > 5000
- Check Value (AbsMeas1000 nm):   > 5000

Selection:

- Button: Start measurement
- PASSED/FAILED and measurement result.

5.6.5   Transport Tests

Transport Step Loss Test

- Adjustment the number of cycles: 1- 1000
- X-Transport:
- X- Y- and (Z)-Transport auf position Home, Y-Transport auf position 200.
- X-Transport exactly at position 2000 then at position 0, repeat the last two commands 10 times and then perform step loss query. With PASSED/FAILED assessed (Abs(step-loss) $\leq$ 3).
- Y-Transport:
- X- Y- and (Z)-Transport at position Home, X-Transport at position 500. Y-Transport exactly at position 1200 then at position 0, repeat the last two commands 3 times then 5 times between 550 and 500 then twice between Load and –1500 and then after 0 perform step loss query. With PASSED/FAILED assessed (Abs(step-loss) $\leq$ 3).
- Z-Transport (only if Luminescence is installed)
- X- Y- and Z-Transport at position Home. Z-Transport at exactly position 2000 then at position 0, repeat the last two commands 10 times and then perform step loss query. With PASSED/FAILED assessed (Abs(step-loss) $\leq$ 8).
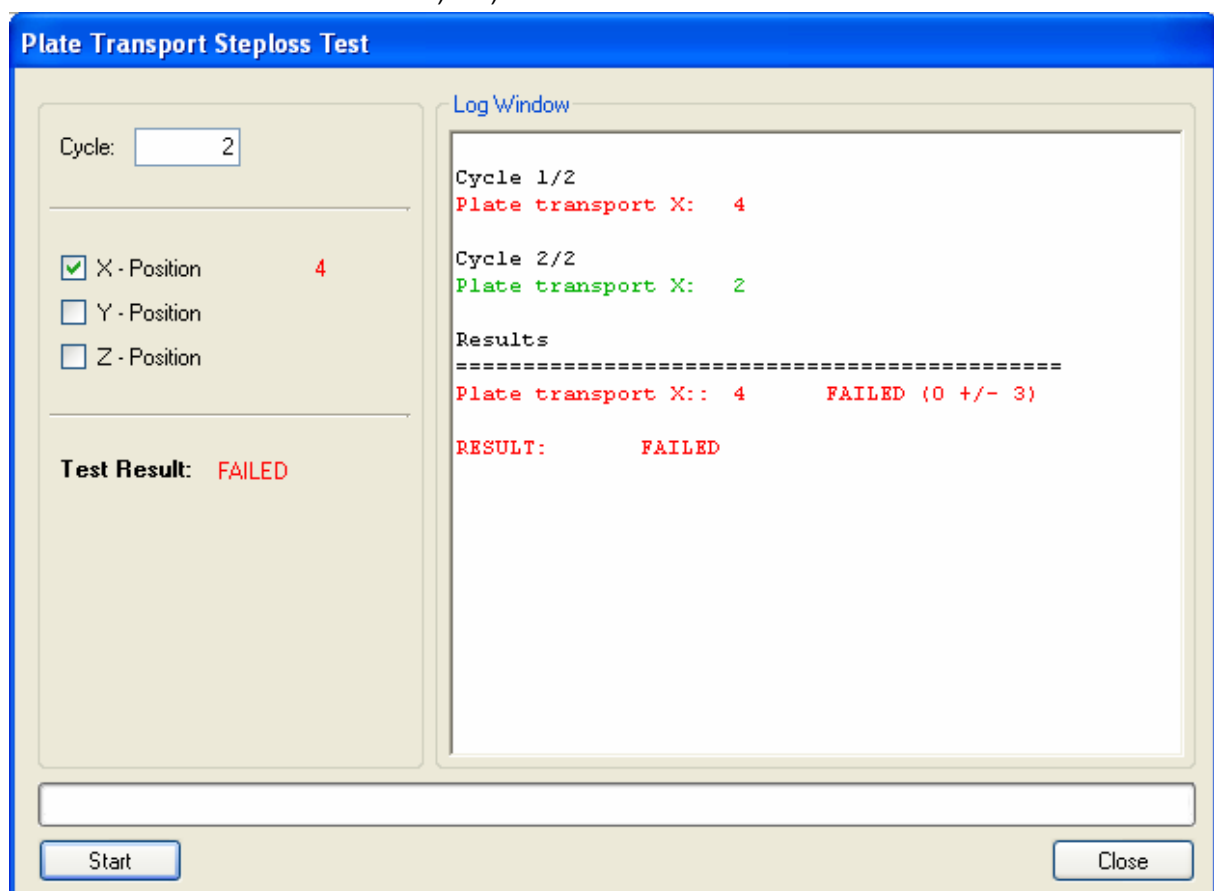
Display:

- Current measurement value in LOG-window
- Maximum step loss
- At the end of the measurement PASSED/FAILED

Selection:

- Button: Start measurement
- Select: X-Transport, Y-Transport, Z-Transport

Plate Transport Test

If the plate transport becomes misaligned, It can be determined how it is misaligned here.

- Only active, if Absorbance MCR or Absorbance Filter enabled.
- Checks the rotation of the plate carriers in the horizontal plane. The hole position measurement will be performed in the Absorbance MCR or Filter Mode on the 4 measurement points with the MultiCheck plate.
- From the specific X-Y-coordinates the 4 measurement points the rotation of the plate carriers will be calculated and the difference will be assessed with PASSED/FAILED (Abs(difference) $\leq$ 5 motor steps).

Display:

The picture represents the view of the plate transport when facing the instrument.
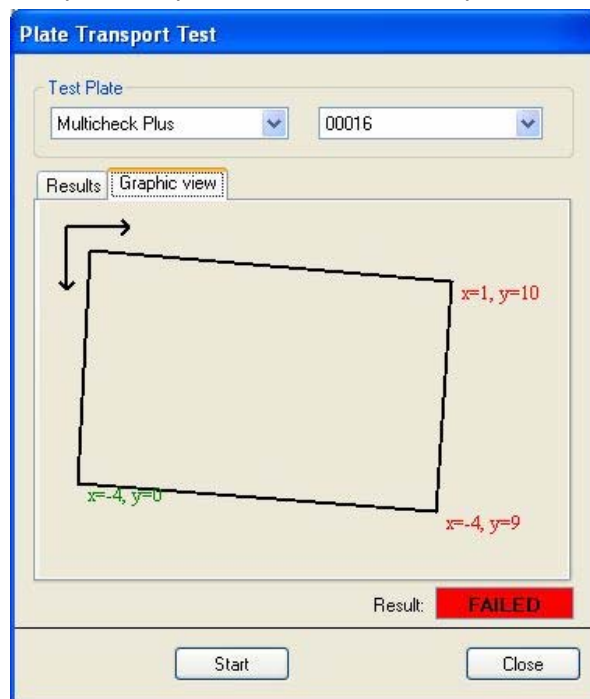
- Difference between the X-Y positions of the 4 corner points
- PASSED/FAILED

Selection:

- Button: **Start**
- Select: S-plate, MultiCheck

Plate Transport Dial Gauge Test

- Checks the rotation of the plate carriers in the horizontal and vertical plane.
- Message box appears: "Please remove the cover before starting this test".
- Insert Height Adjustment Plate.
- Rotation in the horizontal plane:
- Move the plate carrier 4 positions (2 in X direction and 2 in Y direction).
- The dial gauge must be pressed once on the front and once on the side of the plate.
- At each the positions the value from dial gauge must be entered then the plate must be moved to the next position.
- From the specific two X and two Y-Values the 4 measurement points of the rotation of the plate carriers will be calculated and the difference with PASSED/FAILED assessed (Abs(difference) $\leq$ 0.2 mm).
- Rotation in the vertical plane:
- Move with the plate carrier to 4 corner points (A, B; C; D) on the test plate.
- The dial gauge must be pressed against the surface of the test plate.
- At each of the positions the value from the dial gauge must be entered in a window then the plate must be moved to the next position.
- From the specific values of the 4 measurement points a difference A-B, B-C, C-D will be calculated and the difference with PASSED/FAILED assessed (Abs(difference) $\leq$ 0.2 mm).

Display:

Plate Transport Test Dial Gauge

Resultbox

A1:	2
A12:	9
H1:	50
H12:	10

Differences

A1-A12:	7,00
A1-H1:	48,00
A12-H12:	1,00
H1-H12:	40,00

Result: **FAILED**

[Start] [Close]
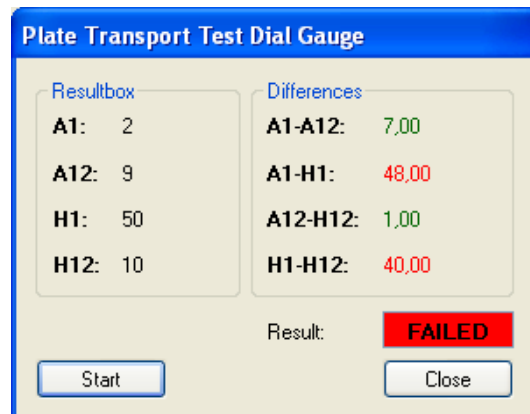
- Message: „Place dial gauge in front of test plate"
- Message: „Place dial gauge edgeways to the test plate"
- Windows: „Enter value of 1st point","Enter value of 2nd point", „Enter value of 3rd point",
- „Enter value of 4th point"
- Difference the X-Y positions the 4 Corner points
- Message: „Place dial gauge on the top of the test plate"
- Difference A-B; B-C; C.-D.
- PASSED/FAILED

Selection:

- Button: **Start**

5.6.6   Excitation Path

This test is just to switch on the lamp with different wavelengths to check the light path.

- Only active If FI-Top MCR or Filter or FI-Bottom MCR or Filter „enabled" or Absorbance Filter/Monochromator enabled.

- If the instrument has FI-MCR or FI-Filter options then the Excitation monochromator or Filter carrier should be moved to the selected Wavelength (see below) and the Flash lamp should flash with 30 Hz.
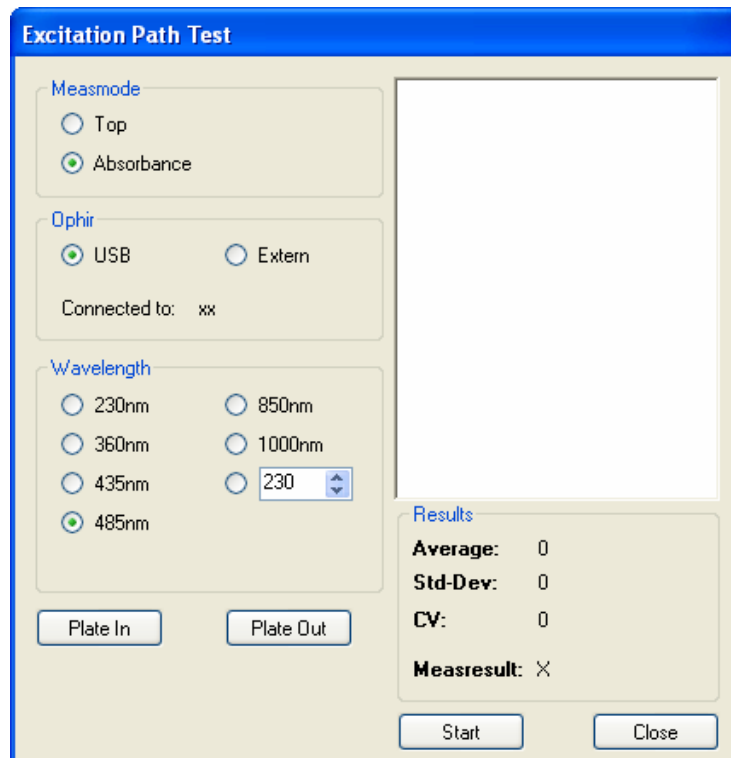
Display:

- Wavelength
- Mono: 485nm: >200nJ (FI-Top/Bottom), >5nJ (Absorbance)
- Filter: 485nm: >800nJ (FI-Top/Bottom), >20nJ (Absorbance)

Selection:

- Button: Start/Stop Flash
- Select: FI-Top/FI-Bottom/Absorbance
- Selection from fixed wavelengths (Default 485 nm): 230, 360, 435, 485, 850, 1000 nm and a field for Selection desired wavelengths between 230 and 1000 nm.
- For FI Filter: reading of the filter carriers and Selection between the available wavelengths.

5.6.7   Lamp

- Only active if at least one of the options FI-Top MCR/Filter; FI-Bottom MCR/Filter or Absorbance MCR/Filter enabled.
- For Absorbance Reference signal and Absorbance signal, for FI Top and FI Bottom only the Reference signal will be read.
- Absorbance Mono at 230 nm; Filter at 230 nm.
- FI-Top/Bottom Mono at 485nm, FI-Top/Bottom Filter with selected Filter.
- 10 mal 100 Flash Reference- and Absorbance diode values and read gain.
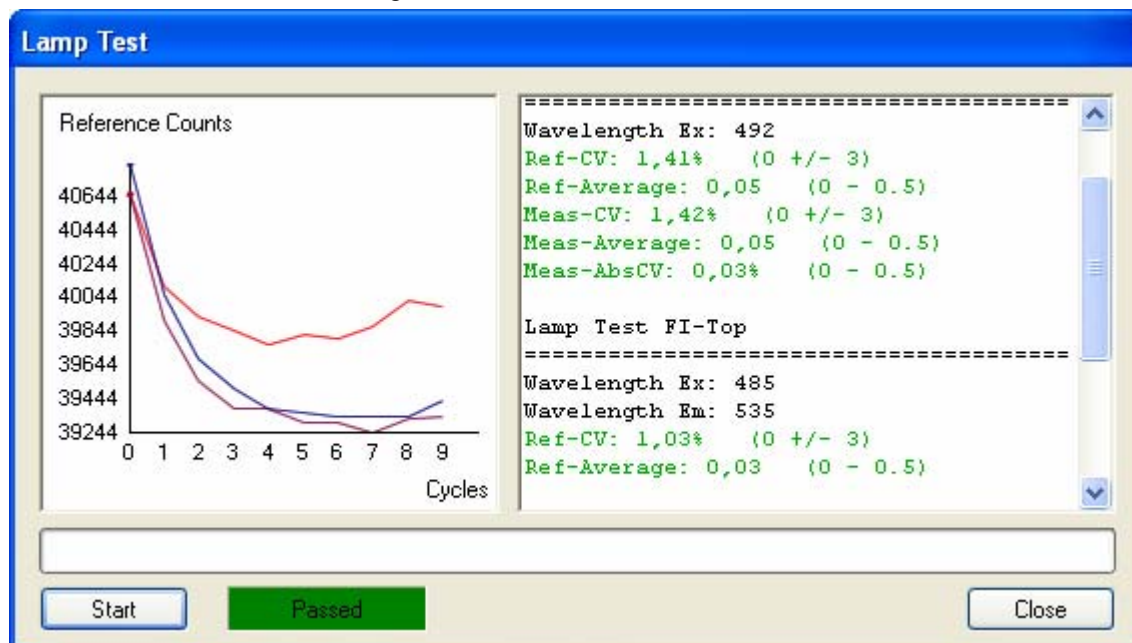
Display:

- PASSED/FAILED
- CV(Signal) =100·STDEV(Signal)/Mean(signal) $\leq$ 3%; for all signals
- (Average-Minimum)/Average $\leq$ 0.5% for all Signals
- CV(Abs/Ref)= 100·STDEV(Abs/Ref)/Mean(Abs/ref) $\leq$ 0.5% (only at Absorbance)

Selection:

- **Start** button starts the Flash lamp
- PASSED/FAILED
- CV(Signal) =100·STDEV(Signal)/Mean(signal) $\leq$ 3 %
- (Average-Minimum)/Average $\leq$ 0.5 %
- CV(Abs/Ref)= 100·STDEV(Abs/Ref)/Mean(Abs/ref) $\leq$ 0.5 %(only at Absorbance)

5.6.8 Luminescence

PMT and Filter Test

Function:

- Filter wheel (only if Luminescence is installed)
- A Burn In Test should be performed on the filter wheel.
- The drive mechanism of the filter wheel in *n* measurement cycles will be checked for step loss.
- The number *n* the measurement cycles is adjustable. (1–1000, default 250).
- The results s_n the single measurement cycles will be displayed in the Log-window.

Display:

- Currently set serial numbers
- Log Window
- Max (Sn)
- PASSED/FAILED

Selection:

- Number the measurement cycles
- Start

Acceptance criteria:

- The test result will be assessed with „PASSED"if

$$\max(s_n) \le s_{max}$$

With s_{max} = 10

Filter Wheel Steploss Test

Cycle: 2

Serial Number: 507000018

max Filterwheel: 0

Test Result: PASSED

Log Window

```
Cycle 1/2
Lumi filter wheel:    0

Cycle 2/2
Lumi filter wheel:    0

Results
=============================================
Lumi filter wheel: 0 (0 +/- 10)    PASSED

RESULT:        PASSED
```

Start   Close

Burn In

Move Motor to
Position 0

Move Motor to
Position (to be
defined)

Loop 10

Get Motor -
Steploss
s_n

Loop n
cycles

$\max(s_n) > s_{\max}$ — Yes→ FAILED

no

PASSED
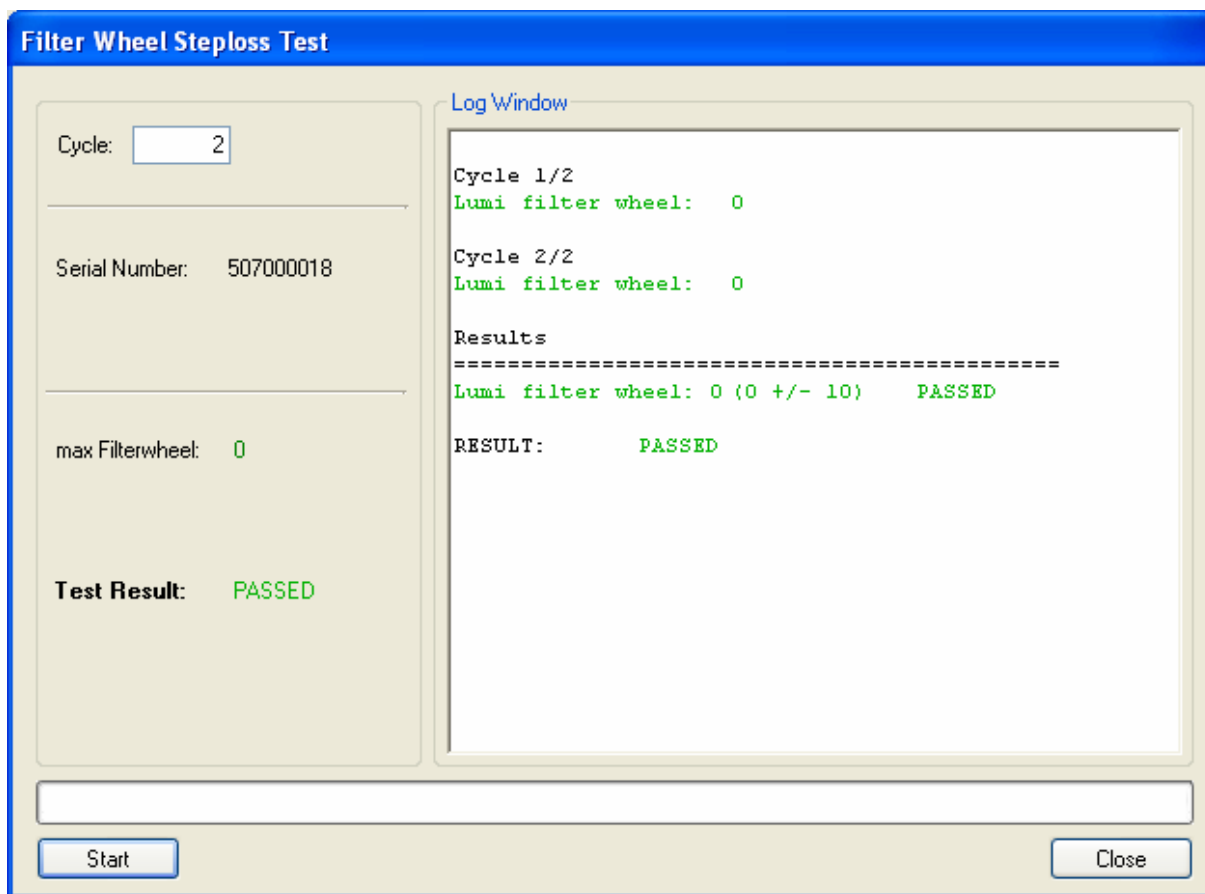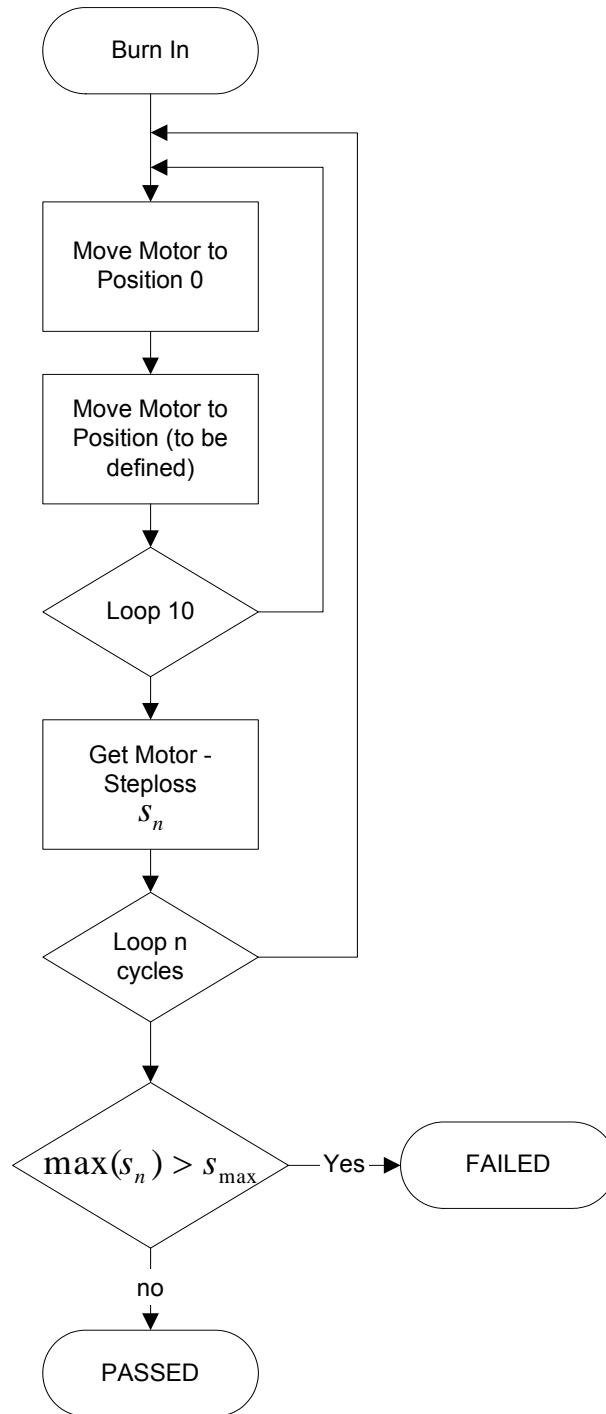
5.6.9 Injector

MTP Sensor Test

- Only active If Injector enabled.
- Reads plate sensor values with and without plate and checks, if the difference between the values is at least 100.
- Measures first as the plate carrier moves out without a plate, then a plate is inserted and the sensor value is measured with a plate.

MTP Sensor Test

Values / Result

Value without Plate: 697

Value with Plate: 903

Result: PASSED

[Start]   [Close]
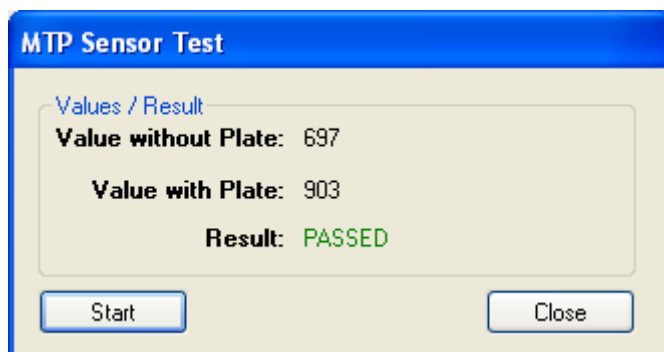
Selection:

- Select: Start measurement
- PASSED/FAILED and measurement result.

Prime Test

- Only active If Injector enabled.
- Fill the tubes and the pump with liquid.

Prime Test

Result Channel A: PASSED

Result Channel B: PASSED

[Start Prime] [Close]
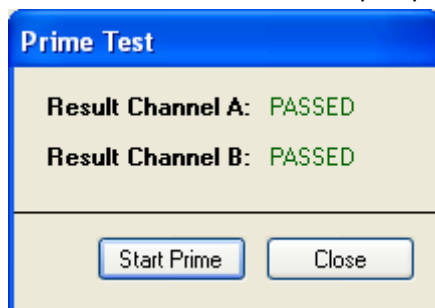
Display:

- Selected Prime-Volumes.

Selection:

- Select Prime Volume
- Start Prime
- PASSED/FAILED.

Injection Test

- Only active If Injector enabled.
- Move plate transport to Load position and insert test plate (384-well Test plate SAP 30004061) (message: „Insert Test plate").
- Inject the entire plate with 20 µl/well and move it back out (message box: „Check Test plate").
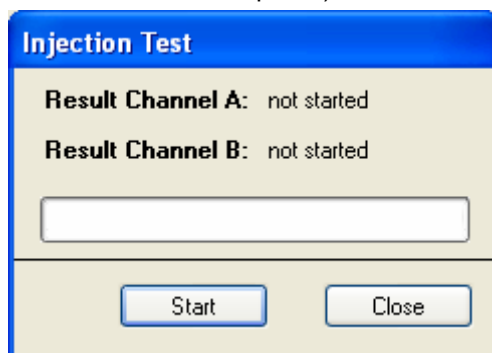
Display:

- Message Box: „Check Test plate"

Selection:

- Select: 384 well plate
- Start measurement
- PASSED/FAILED

Injector Carrier Sensor Test

Only active If injector is enabled

Insert the injector carrier and the sensor status will change:

- Green means sensor is inserted
- Red means sensor is not inserted.
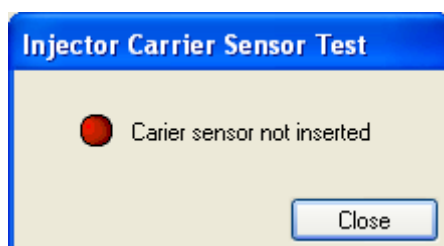
5.6.10   Heating

- Only active if Heating enabled.
- The start temperature of both Sensors will be read and saved
- Only performed, if start temperature <35°C.
- Target temperature of 42°C will be set and heating started.
- After 2 min end temperature of both sensors will be read.
- Turn off heating.
- End temperature minus start temperature must be greater than 1.5°C, then PASSED otherwise FAILED.

Heating Test

```
Press start to test the heating
Start-Temperature: 21,0°C
End-Temperature: 26,0°C
Result: PASSED, difference > 1,5°C
-----------------------------
```

Start   Result: PASSED   Close
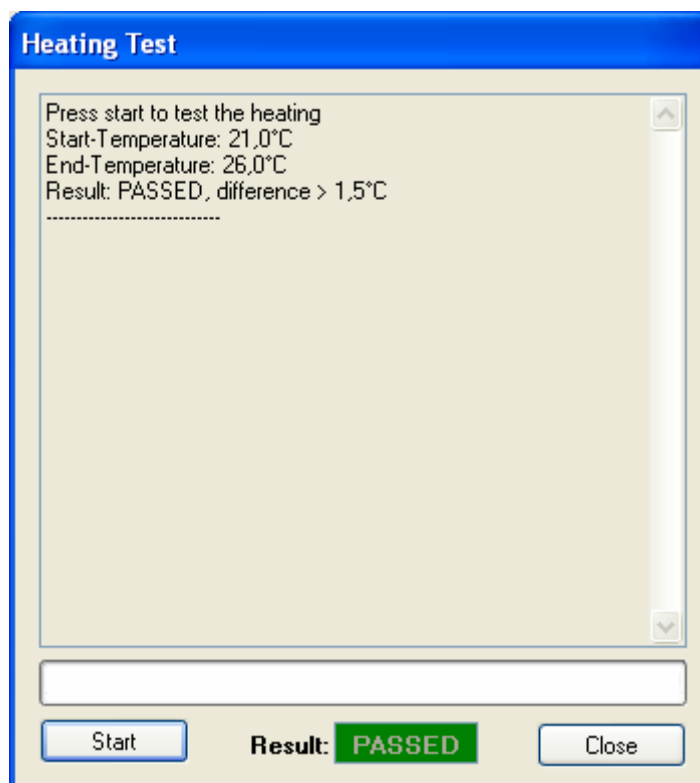
Display:

- LOG: start temperature and end temperature from temperature sensors PASSED/FAILED

Selection:

- Select: Start measurement
- PASSED/FAILED and measurement result.

5.6.11   *Fan Test*

Function

- If the program is ended or the test is interrupted, switch on the fans again.
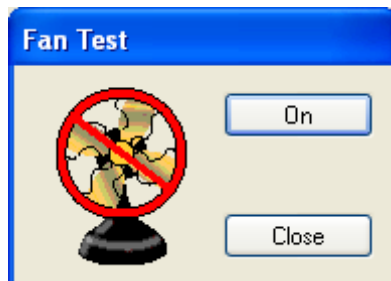
Display:

- Fan On/Fan Off

Selection:

- Button*:* On/Off

5.6.12   **Instrument Settings**

The following parameters will be shown in the instrument settings, in files saved and from there read and written to the instrument.

All Modules will be queried and only the data of the enabled modules will be shown.

- Instrument configuration:
    o   - Excitation Monochromator (Enabled/Disabled)
    o   - Emission Monochromator (Enabled /Disabled)
    o   -Fluorescence Top (MCR/ Filter/Disabled)
    o   - Fluorescence Bottom (MCR/ Filter/Disabled)
    o   - Absorbance (MCR/ Filter/Disabled)
    o   - Luminescence (Enabled /Disabled)
    o   - Fluorescence Polarization Filter (Enabled /Disabled)
    o   - Option PMT (normal/ enhanced/disabled)
    o   - 1st Injector (Enabled/Disabled)
    o   - 2nd Injector (Enabled/Disabled)
    o   - Heating (Enabled /Disabled)
- Serial numbers:
    o   - Set serial number AMR (up to 18 digits)
    o   - Serial number Fluorescence Top (up to 18 digits)
    o   - Serial number Fluorescence Bottom (up to 18 digits)
    o   - Serial number Fluorescence Polarization (up to 18 digits)
    o   - Serial number Absorbance (up to 18 digits)
    o   - Serial number PMT (normal/enhanced) (up to 18 digits)
    o   - Set serial number Excitation Monochromator (up to 18 digits)
    o   - Set serial number Emission Monochromator (up to 18 digits)
    o   - Set serial number filter measurement head (up to 18 digits)
    o   - Set serial number Luminescence module (up to 18 digits)
    o   - Set serial number Injectors (up to 18 digits)

- Firmware versions:
  - o Main CPU
  - o Excitation Monochromator
  - o Emission Monochromator
  - o Filter module
  - o Luminescence module
  - o Injectors (Pump 1 & Pump 2)
- General offsets:
  - o offset Absorbance (x, y) MCR/Filter
  - o offset Fluorescence Top (x, y)MCR/Filter
  - o offset Fluorescence Bottom (x, y)MCR/Filter
  - o offset Luminescence (x, y)
  - o Built In Test Spot (x, y)
  - o plate Load position (x, y)
  - o Reference Absorbance position (x, y)
  - o Fly offset FI (x, y)
  - o Fly offset Absorbance (x, y)
  - o Injection position (x, y)
  - o Z-Transport offset Z0
  - o Zmin, Zmax, Zsec (Minimum, maximum z-position, z- security distance)
  - o offset temperature
  - o plate sensor offset
  - o plate sensor Threshold (compare)
  - o Lamp Check values
  - o Lamp check gain
  - o Lid check value absorbance
  - o Lid check value FI-Top
  - o Lid check value FI Bottom
  - o Lid check value Luminescence
  - o Fiber check value Luminescence
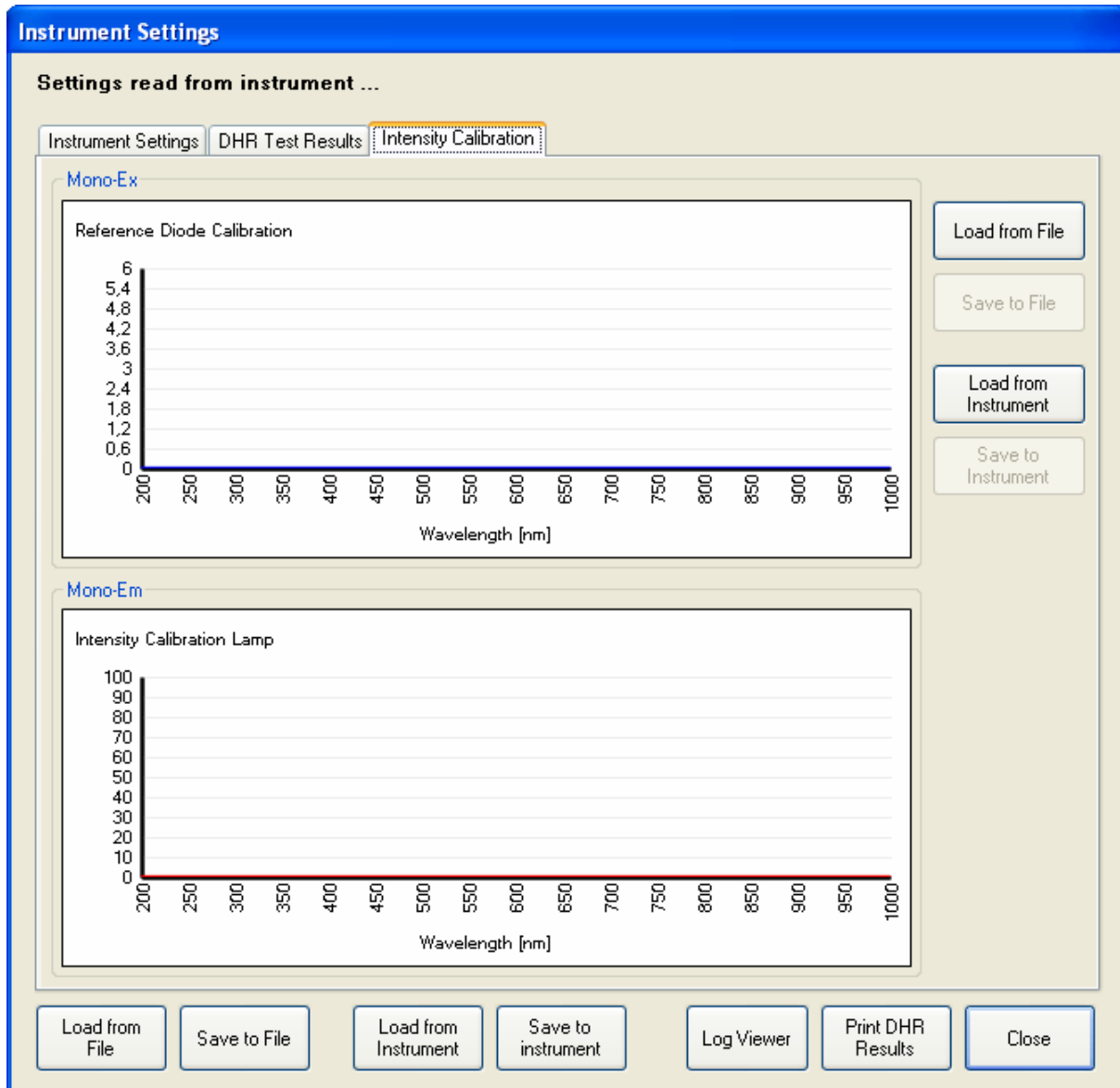
- Tables: (in the instrument and in the DHR saved)
  - o Table Intensity Calibration Excitation (Reference Diode)
  - o Table Intensity Calibration Emission
- Monochromator Exc.:
  - o offset Grating motor
  - o Grating correction factor
  - o offset OSF motor
  - o offset FS motor
  - o Delta FS 0-1
  - o Delta FS 0-2
  - o OSF switch wavelength 0-1
  - o OSF switch wavelength 1-2
  - o OSF switch wavelength 2-3
  - o OSF switch wavelength 3-4

- Monochromator Em.:
    - o offset Grating motor
    - o Grating correction factor
    - o offset OSF motor
    - o offset FS motor
    - o Delta FS 0-1
    - o Delta FS 0-2
    - o OSF switch wavelength 0-1
    - o OSF switch wavelength 1-2
    - o OSF switch wavelength 2-3
    - o OSF switch wavelength 3-4
- Filter module:
    - o offset motor filter carrier
    - o offset motor beam splitter
    - o offset Filter read position
    - o Luminescence
    - o Correction Time
    - o Discriminator Level
    - o High Voltage (PMT gain)
    - o Filter wheel offset
    - o Filter definition (position, Description, Type, Transmission)
    - o Max Dark counts Luminescence
- INJECTOR:
    - o Prime1: Speed, volume, refill speed
    - o Prime2: Speed, volume, refill speed
    - o Rinse1: Speed, volume, refill speed
    - o Rinse2: Speed, volume, refill speed
    - o Pump volume A, B
    - o Syringe volume A, B
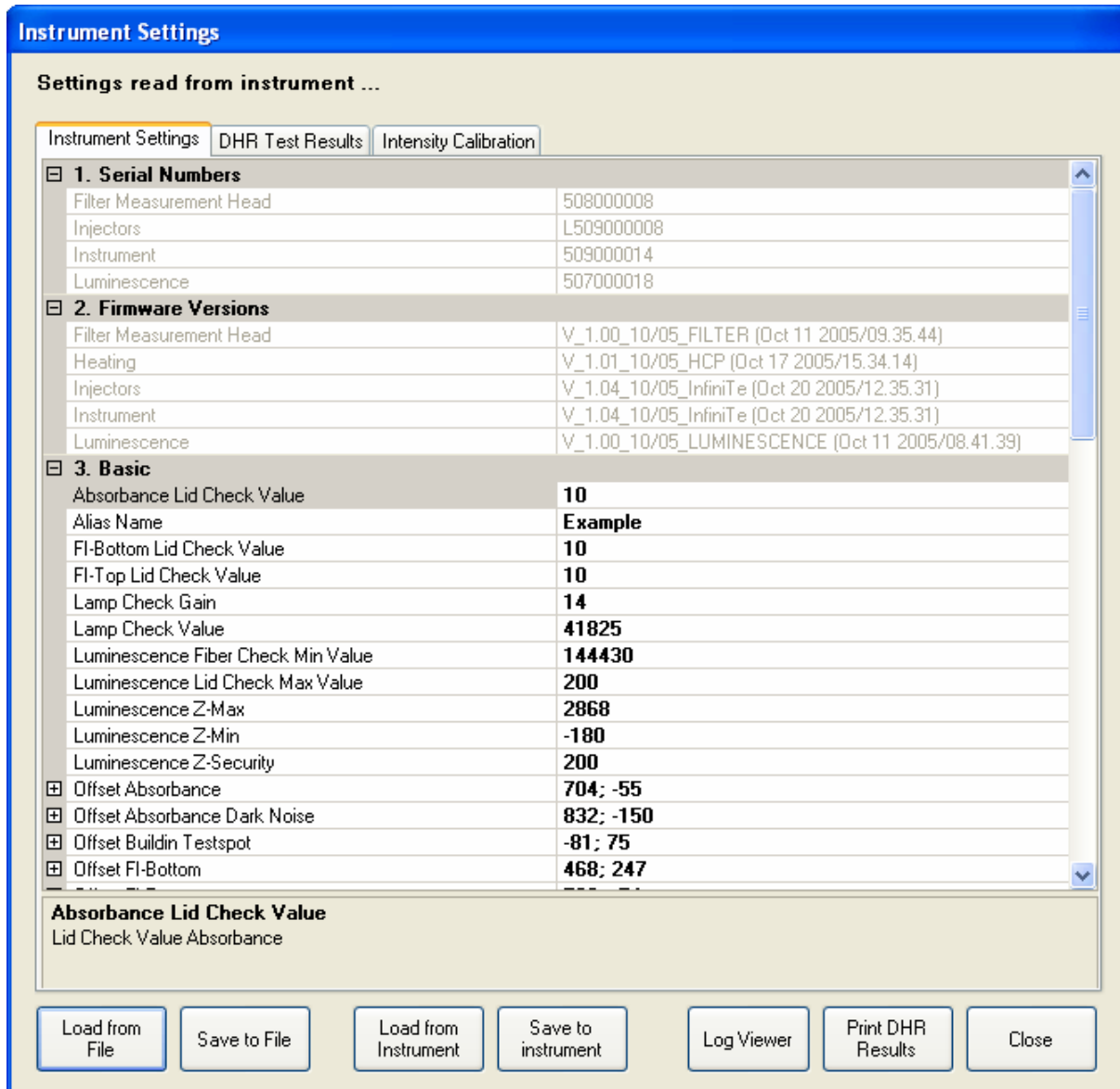
Display

- List the parameters (see above) will be read from the instrument and displayed.
- Origin of data (instrument with serial numbers, File)

Selection

- Button: Save to File: save in the DHR.
- Button: Load from file: load from file (DHR).
- Button: Write to instrument (write parameters to the instrument). From file only, if serial numbers in the file with serial numbers of the Instrument/Module match.
- Button: Read from instrument (read parameters from the instrument).

DHR (save under the corresponding serial number)

- Save all above parameters under the corresponding Instrument/Module serial number.

5.7   End Test

Under the menu option Tools & Tests the user can run tests to check out every single module and function.

5.7.1   3D Spectrum

- Only active If Excitation and Emission monochromator enabled.
- Prepare (Adjustment of the gain of the reference diode at approx. 420 nm)
- PMT gain 130
- For Emission Mono „standard":
- Excitation spectra 230 – 590 nm in 20 nm steps at Emissions wavelengths 330 – 590 nm in 20 nm steps.
- For Emission Mono „spectrally enhanced":
- Excitation spectra 230 – 850 nm in 20 nm steps at Emissions wavelengths 290 – 850 nm von in 20 nm steps.

Display

- Representation of the Emission spectra series (3D-spectrum) as color-coded area (20 subdivisions).

Selection

- Adjustable intensity scale from 8000 – 65000 counts (with 10 subdivisions.
- Selection of various measurement positions in a 96-well grid (A1 – H12).
- plate Out/plate In
- Saves the data in an Excel sheet.
- Start

Acceptance Criteria:

- PASSED, if Signal for the following 3 areas:
- ExcWL: 230 - 300 nm and EmWL: 360 - 850 (590) nm < 60000 counts
- ExcWL: 300 - 400 nm and EmWL: 460 – 850 (590) nm < 3000 counts
- ExcWL: 400 - 500 nm and EmWL: 560 – 850 (590) nm < 2000 counts

DHR (save under the corresponding serial number)

- 3D-spectrum
- PASSED/FAILED
- Print

5.7.2 Duration Test

- Query, which Module available (Exc. Mono, Em. Mono, Filter module, Luminescence and only the enabled Modules will be tested.
- Adjustable number the Cycles (1 – 1000, default 250, 50 for Service Version)
- After each cycle the step loss will be determined and the maximum step loss will be displayed. In addition, the results of the individual measurement cycles will be saved in a text file, with PASSED/FAILED assessed, and printed.
- The following Module with the following motors must be tested:
- a.) Monochromator Exc: OSF, FS, Grating
- b.) Monochromator Em: OSF, FS, Grating
- c.) Filter module: Filter carrier step loss
- Beam splitter motor step loss
- d.) Transport: X,-Y,-Z-Transport
- e.) Luminescence: Filter wheel
- f.) Cuvette: Transport cuvette

Display:
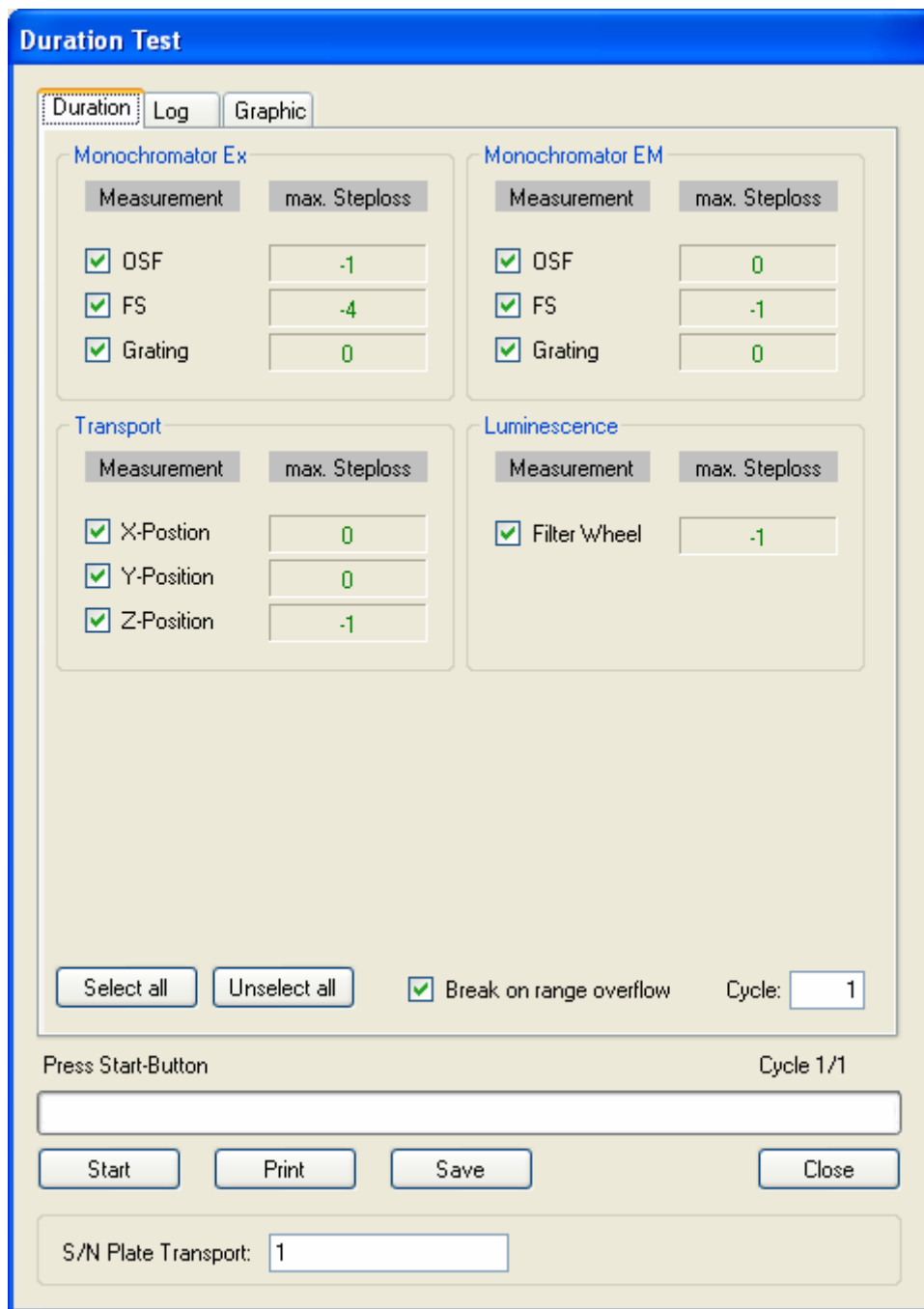
- Currently set serial numbers
- Number of the current cycle from number the total cycles.

Selection:

- number the measurement cycles (250 default)
- Check-Box (default all checked):
- - Exc/Em Monochromator: OSFilter/fiber switch/Grating/
- - X-Transport/Y-Transport/Z-Transport
-         - Luminescence: Filter wheel
-         - Injector
- Start
- Save to DHR

Acceptance criteria:

- The test result will be assessed with „PASSED" if

$$\max(s_n) \leq s_{max}$$

- with s_{max} (OSF, FS, Grating)= 20 , 9, 10

- with s_{max} (Filter slide, Beam splitter)= 15

- with s_{max} (X-, Y-Transport)= 3

- with s_{max} (Z-Transport)= 20

- with s_{max} (Filter wheel Luminescence)= 15

- with s_{max} (Transport cuvette)= 15

- The assessment will only be performed if at least 250 Cycles have been measured. otherwise Message: „Number of measured cycles <250"

- Except Service version: there 50 Cycles =default = allowed
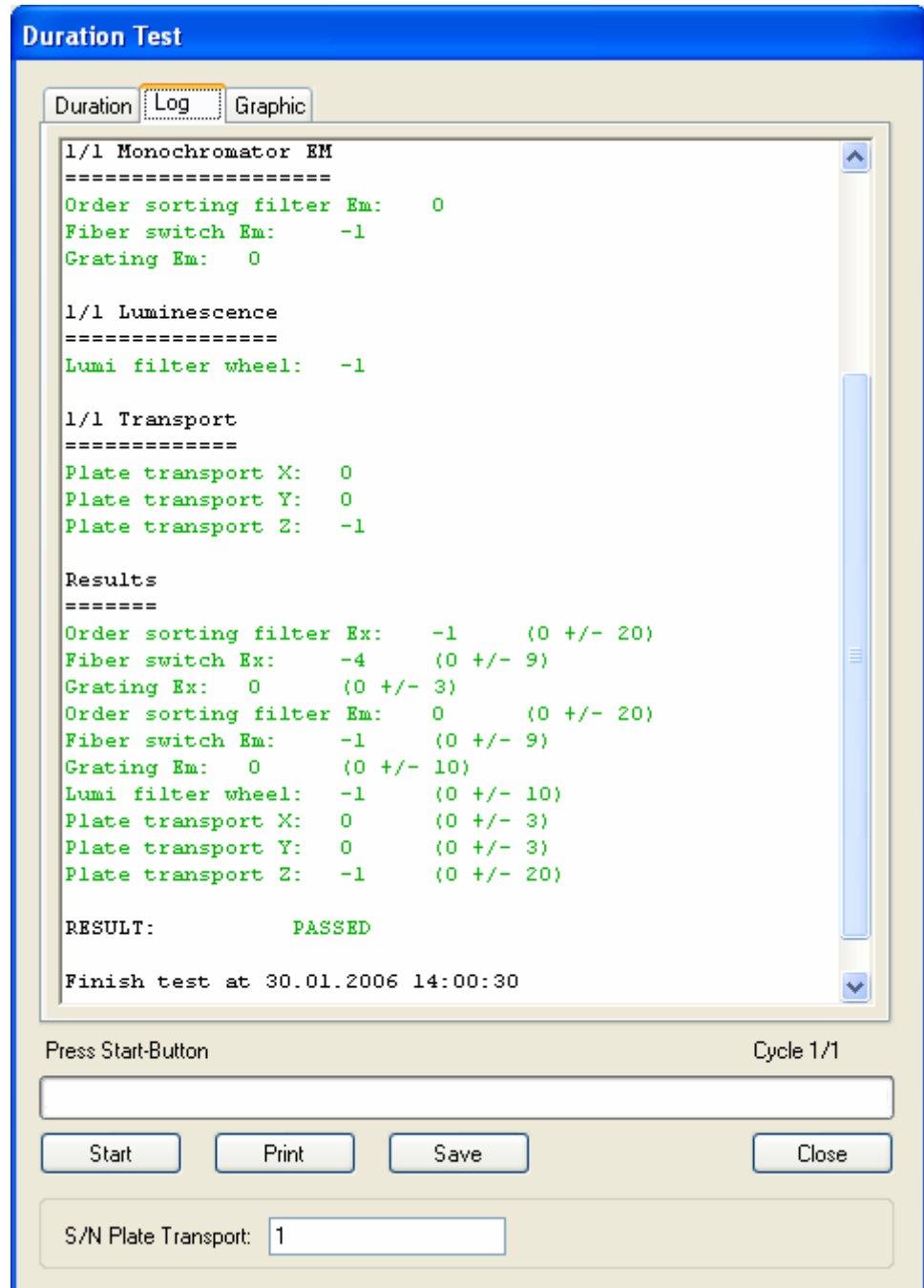
DHR (save under the corresponding serial number)

- Individual s_n and s_{max}
- Number of Cycles
- PASSED/FAILED

5.7.3 Specifications

- Injection Test for
- Mode   measurement
  Dye/Filter/Ref.   Format
- Injection precision (or Reproducibility), Accuracy Mettler Scale, Volume 10ul, 100ul, 400ul each 10 times
- Precision (or Reproducibility):

$$Precision(CV\%) = \frac{stdev_{wellA1} * 100}{mean_{wellA1}}$$

- Accuracy

$$Accuracy(\%) = 100 - \frac{meas * 100}{ref}$$
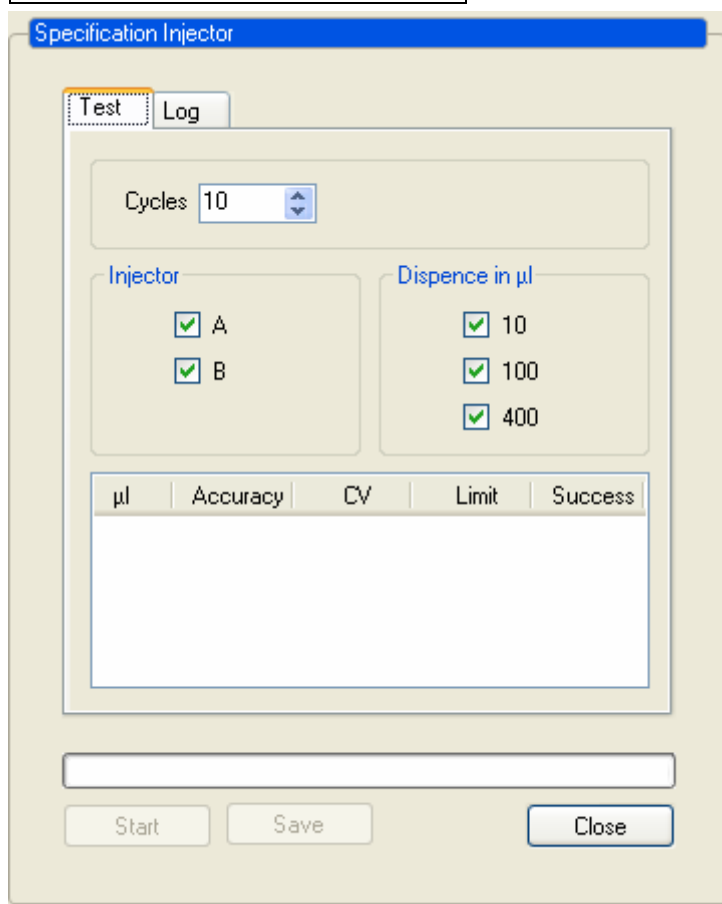
Display

- Measurement result of the measurement size in list (see above) with PASSED/FAILED assessed.
- Excel sheet with measurement result for each measurement.

Selection

- Check box for the single measurement modes (see above).
- plate In/ plate Out.
- Measure.

DHR (save under the corresponding serial number)

- Saves the measurement results with PASSED/FAILED in Excel sheet.
- PASSED for   Accuracy: < 10% for 10ul   Precision: < 10% for 10ul
- Accuracy: < 2% for 100ul   Precision: < 2% for 100ul
- Accuracy: < 0,66% for 400ul   Precision: < 0,66% for 400ul

5.7.4 Load Simulation

- Depending on the instrument configuration, the measurement modes will be performed and error messages will be shown, without the test being interrupted.
- When an error message appears, the test result is FAILED otherwise PASSED.
- The following message appears: "Please remove any plate"
- The Flash luminescence measurement should be performed without liquid in the injector
- The following message appears: "Please remove any liquid from the injection system"
- The following measurements can be performed if the corresponding Module is enabled:
  - Absorbance MCR fixed wavelength:
  - 96 MTP on the fly 230 nm
  - 96 MTP on the fly 435nm
  - 96 MTP on the fly 850 nm
  - 96 MTP on the fly 1000 nm
  - Absorbance MCR scans:
  - 96 MTP, well A1; 230-430 nm, 10 nm steps, 3 flash
  - 96 MTP, well H1; 290-1000 nm, 20 nm steps, 3 flash
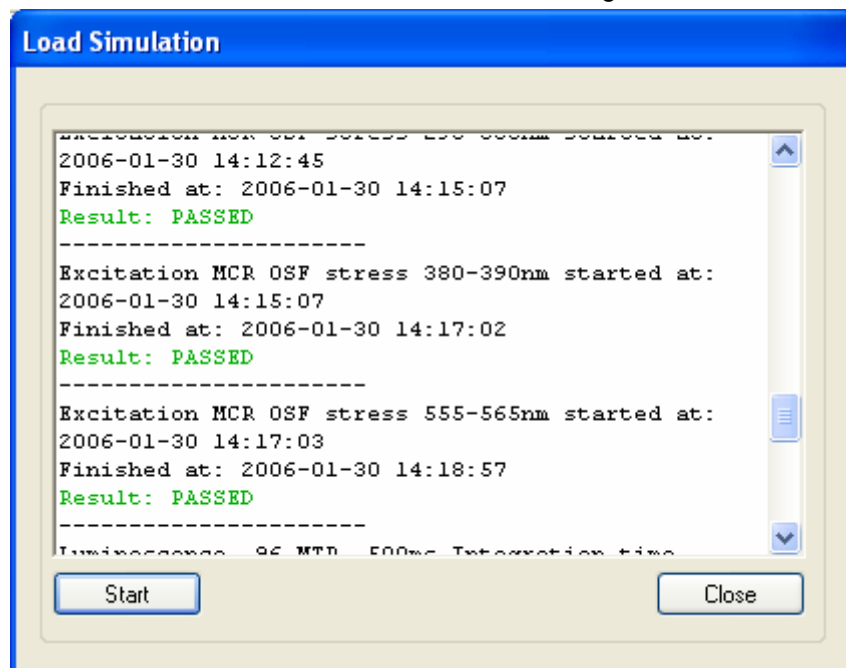 - 96 MTP, well H12; 230-1000 nm, 1 nm step, 1flash (on the fly)
  - Fluorescence Top MCR, Fixed wavelength:
  - 96 MTP Exc.=230 nm; Em.=600 nm; on the fly, PMT gain =50
  - 384 MTP Exc.=230 nm; Em.=600 nm; on the fly, PMT gain =50

  - Fluorescence Top MCR, scans:
  - 96 MTP, well A1; Exc. scan 230 – 850 nm, 1 nm step, on the fly; Em. 370 nm PMT gain = 50
  - 96 MTP, well A1; Em. Scan 330 – 600 nm, 1 nm step, on the fly; Exc. 370 nm PMT gain = 50
  - Emission MCR OSF stress
  - 96 MTP, Em. scan 395 – 405 nm, 10 nm step, Exc. 370 nm, 3flash, PMT gain= 50
  - 96 MTP, Em. Scan 615 – 625 nm, 10 nm step, Exc.370 nm, 3flash, PMT gain= 50
  - Excitation MCR OSF stress
  - 96 MTP, Exc. scan 290 – 300 nm, 10 nm step, Em. 330 nm, 3flash, PMT gain= 50
  - 96 MTP, Exc. Scan 380 – 390 nm, 10 nm step, Em. 330 nm, 3flash, PMT gain=50
  - 96 MTP, Exc. Scan 555 – 565 nm, 10 nm step, Em. 330 nm, 3flash PMT gain=50

- o   Absorbance Filter: (with test filter silde)
- o   96 MTP on the fly 230 nm
- o   96 MTP on the fly 340 nm
- o   96 MTP on the fly 492nm
- o   96 MTP on the fly 1000 nm
- o   Absorbance Filter ratio well based:
- o   384 MTP on the fly 340 nm/492nm
- o   Fluorescence Top
- o   Filter384 MTP Exc.=485/20 nm; Em.=535/25nm; on the fly, PMT gain =50
- o   Fluorescence Top Filter, ratio well base:
- o   384 MTP Exc1.=485/20 nm; Em1.=535/20 nm; Exc2=535/25nm; Em2=595/25nm, PMT gain =50
- o   Luminescence
- o   96 MTP, 500 msec Integration time
- o   Luminescence ratio well based
- o   96 MTP, dual color 500 msec Integration time

Load Simulation

```
2006-01-30 14:12:45
Finished at: 2006-01-30 14:15:07
Result: PASSED
---------------------
Excitation MCR OSF stress 380-390nm started at:
2006-01-30 14:15:07
Finished at: 2006-01-30 14:17:02
Result: PASSED
---------------------
Excitation MCR OSF stress 555-565nm started at:
2006-01-30 14:17:03
Finished at: 2006-01-30 14:18:57
Result: PASSED
---------------------
Luminescence  96 MTP  500ms Integration time
```

Start   Close

Display

- •   LOG-window with Display the current and the measured measurement modes and any error messages.

Selection

- •   Start.
- •   Print.
- •   save the performed measurement modes, and error messages, PASSED/FAILED.

5.8 Help

Under the menu option Tools & Tests the user can run tests to check out every single module and function.

5.8.1 About

Text: Setup and Service software for AMR reader.

Version number the **Xinfinite** software.

Copyright, year.

Version number of the Reader server.
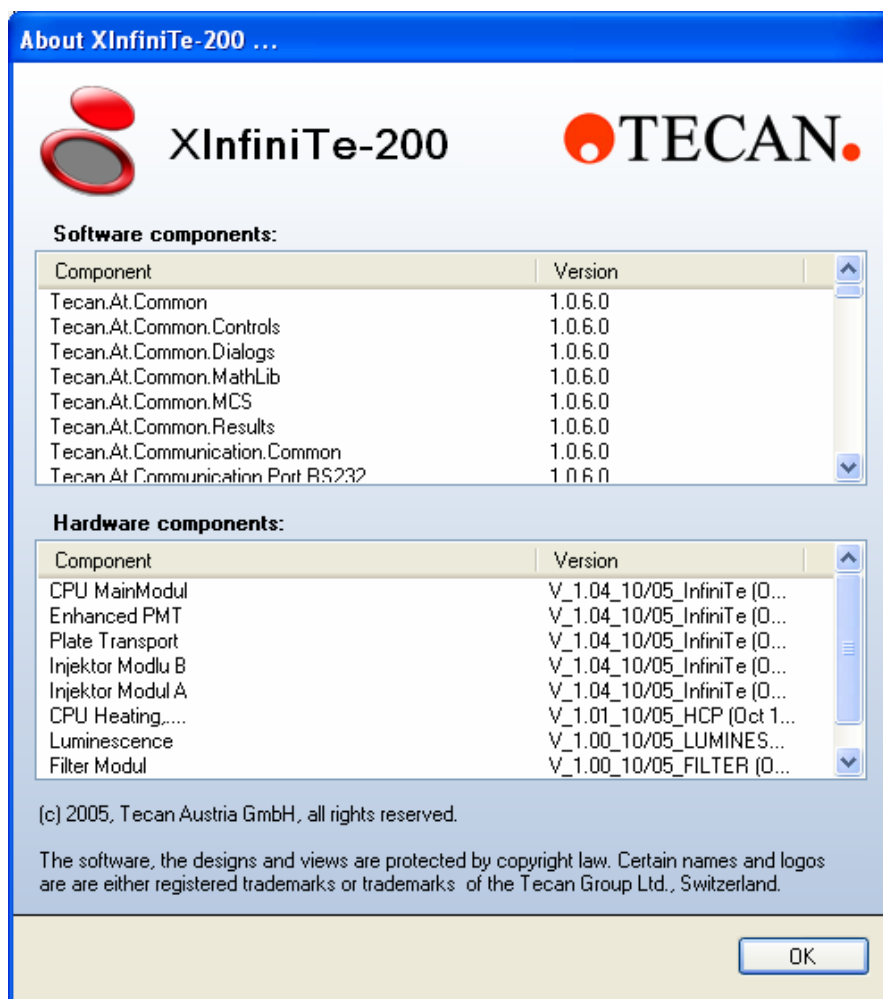
5.9   Log Files

For more information see chapter Trouble shooting!

If you have an error message from your instrument like shown in the picture below, close the error to continue the program.

The log files will be in the Exception folder under the path C:\Documents and Settings\All Users\Documents\Tecan\LogFiles\Exceptions.

You will see one of the last Zip-Files. In this ZIP-File are the following files below.

Please send the whole ZIP File to TECAN AU for further investigation. In the report.txt you will find all important information for service issue.

6. Optical System

6.1 Fluorescence Intensity System — infinite M200

Drawings of the optical system of the fluorescence top and bottom system of the monochromator based **infinite M200** appear below. The system is consists of the light source system including the excitation **double** monochromator, the fluorescence top optics, the emission **double** monochromator and the fluorescence detection PMT. The blue lines indicate the light path of the excitation light; the green lines indicate the emission light path.

For simplification, the 'Flash Monitor' (see chapter 6.1.1 Flash Monitor) is not shown. Each monochromator unit is built of two gratings.
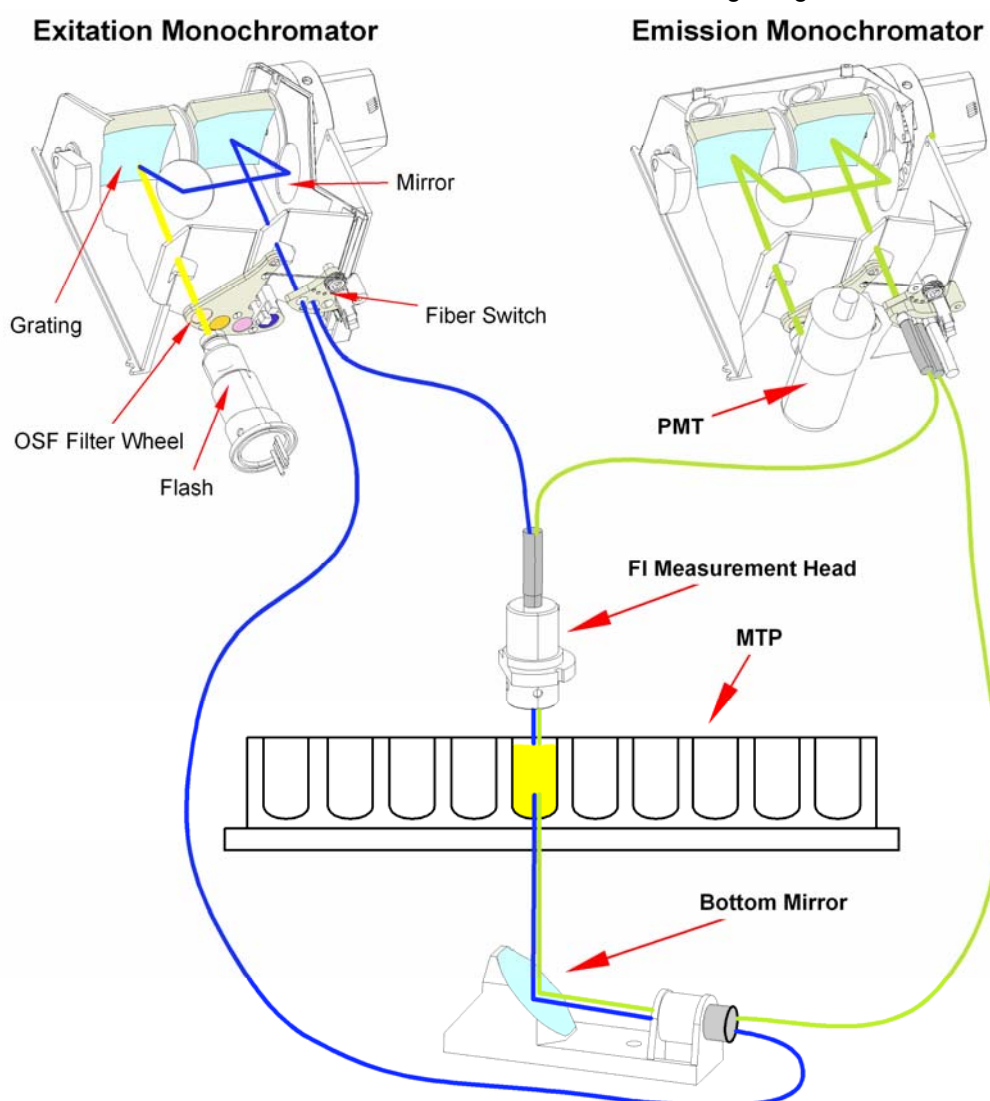

Figure 6-1 Optical System Fluorescence Top and Bottom

6.1.1 Light Source System Fluorescence Intensity

Fluorescence applications usually require a specific range of excitation wavelengths. Additionally, pulsed excitation light may be required (Time Resolved Fluorescence [TRF]).

The **infinite M200** light source system is built from the following components:

- Flash Lamp
- Condensing Optics
- Filter Wheel
- Excitation Double Monochromator
- Fiber Optic Bundle
- Flash lamp Monitor

Flash Lamp

The **infinite M200** utilizes a high energy Xenon arc discharge lamp (flash lamp). The flash sparks across a small gap between two electrodes. The lamp bulb contains a high pressure Xenon atmosphere. The flash decays within a few microseconds. The flash frequency is 40 Hz.

The **infinite M200** uses the flash lamp for fluorescence and for absorbance measurements, although pulsed illumination is a must only for TRF. The main benefits of this singular kind of lamp are:

1. High intensity from the deep UV to the near IR
2. Very long lifetime
3. Many applications - only one kind of lamp
4. No warm up time required

Condenser

Condenser type optics from fused silica focus the flash light onto the entrance slit of the excitation monochromator.

Filter Wheel

A filter wheel is located between the condenser and the excitation monochromator. The filter wheel contains wavelength specific optical filters, which are necessary to block undesired diffraction orders produced by the optical gratings. The filters are set automatically.

Excitation Double Monochromator

In both fluorescence and absorbance applications, the Excitation Double Monochromator is used to select any desired wavelengths from the flash lamp spectrum in the range from 300 nm to 600 nm (standard version) or 230 to 850 nm (spectrally enhanced version) for fluorescence intensity and from 230 nm to 1000 nm for absorbance applications.

Fluorescence emission spectra in many cases do not depend on the exact excitation wavelength. For a maximum total fluorescence signal; therefore, rather broad excitation bandwidth may be used. The bandwidth of the **infinite M200** monochromator system is < 9 nm for wavelengths > 295 nm and < 5 nm for wavelengths $\leq$ 295 nm.

For a more detailed description of how a monochromator works see below.

General Description of a Monochromator

A monochromator is an optical instrument that enables any wavelength to be selected from a defined optical spectrum. Its method of operation can be compared to a tunable optical filter, which allows both the wavelength and bandwidth to be adjusted.

A monochromator consists of an entrance slit, a dispersive element and an exit slit. The dispersive element diffracts the light into the optical spectrum and projects it onto the exit slit. A dispersive element can be realized by using a glass prism or an optical grating. Modern monochromators such as those used in the **infinite M200** are designed with optical gratings.

Rotating the optical grating around its vertical axis moves the spectrum across the exit slit and only a small part of the spectrum (bandpass) passes through the exit slit. This means that when the monochromator entrance slit is illuminated with white light, only light with a specific wavelength (monochromatic light) passes through the exit slit. The wavelength of this light is set by the rotation angle of the optical grating. The bandwidth is set by the width of the exit slit. The bandwidth is defined as full width at half maximum (FWHM).

Monochromators block undesired wavelengths, typically amounting to 10^3. This means when the monochromator is set for light with a wavelength of 500 nm and the detector detects a signal of 10,000 counts, light with different wavelengths creates a signal of only 10 counts. For applications in the fluorescence range, this blocking is often not sufficient, since the fluorescence light to be detected is usually much weaker than the excitation light. To achieve a higher level of blocking, two monochromators are connected in series, i.e. the exit slit of the first monochromator acts as the entrance slit of the second monochromator simultaneously. This is known as a double monochromator. In this case, the blocking count reaches a factor of 10^6, a value typically achieved by Interference filters.

In the **infinite M200**, a double monochromator is installed on both the excitation and detection side. This opens the opportunity for easy selection of excitation and fluorescence wavelengths with no limitations by cut off filters.

Fiber Optic Bundle

From the exit slit of the Excitation Monochromator the light will be coupled into a fiber optic bundle guiding the light either to the top measuring optics or the bottom measuring optics (see 6.1 Fluorescence Intensity System — infinite M200). The lower end of each fiber bundle acts as a color specific light source. In both cases a small portion of the light is always guided to the flash lamp monitor diode.

Flash Monitor

The light energy of single flashes may fluctuate slightly. To take these variations into account, a silicon photodiode monitors the energy of every single flash. Fluorescence and Absorbance measurement results are compensated correspondingly.

Fluorescence Top/Bottom Optics

Flash light enters the optical system being focused by the condenser onto the entrance slit of the Excitation Monochromator. The wavelength of the excitation light is selected within the monochromator. After passing the monochromator, the excitation light is coupled into a fiber bundle guiding the light to the top or bottom measuring head. The light is then focused into the sample by the top/bottom lens system.

The fluorescence light is collected by the top/bottom lens system again, coupled into the fluorescence fiber bundles and guided to the detection system.

The Fluorescence Measuring Optics Top is built from the following components:

- Fluorescence Intensity Lens System Top
- Fluorescence Fiber Bundle

The bottom optics consist of the following components:

- Fluorescence Bottom Mirror
- Fluorescence Fiber Bundle

Fluorescence Intensity Lens System Top

The exit side of the bundle acts as a color specific light source. The lens system at the end of the excitation top fiber is designed to focus the excitation light into the sample, and also collect the fluorescence light and focus it back onto the fluorescence fiber bundle.

The objective lenses are made from fused silica. This material provides high UV transmission and is virtually void of auto-fluorescence.

Excitation Spot Size

The size of the fiber bundle cross section determines the diameter of the beam waist (spot size) in the microplate well. The spot diameter for the M-series is about 3 mm for the top optics and 2 mm for the bottom optics.

Fluorescence Fiber Bundle Top and Bottom

The fiber bundle plugged into the top/bottom measuring head contains a homogeneous mixture of both excitation and emission fibers. The emission fibers guide the fluorescence light emission monochromator head where a lens system focus the light onto the entrance slit of the Emission Monochromator.

Fluorescence Bottom Mirror

The exit side of the bundle acts as a color specific light source. The mirror at the end of the excitation bottom fiber is designed to focus the excitation light into the sample and also collects the fluorescence light and focuses it back onto the fluorescence fiber bundle.

Fluorescence Intensity Detection

The fluorescence detection system is used for both measuring modes: fluorescence from above (top) and below the microplate wells (bottom).

The fluorescence light is focused onto the entrance slit of the Emission Monochromator. After passing the monochromator the light is focused onto the detector (PMT). A filter wheel is located between the monochromator and the PMT.

The Fluorescence Detection system is built from the following components:

- Emission Double Monochromator
- Filter Wheel PMT
- PMT Detector

Emission Double Monochromator

Similar to the Excitation Double Monochromator, the Emission Double Monochromator is used to select any wavelength of the fluorescence signal. It acts like an adjustable filter to discriminate scatter of excitation light and nonspecific fluorescence. The wavelength range is selectable from 330 – 600 nm in the standard instrument and from 280 – 850 nm in the spectrally enhanced instrument. The bandwidth is 20 nm.

Filter Wheel PMT

The filter wheel contains wavelength specific optical filters, which are necessary to block undesired diffraction orders produced by the optical gratings. The filters are set automatically.

PMT Detector

A photo-multiplier tube (PMT) is used for the detection of such low light levels associated with fluorescence. The **infinite M200** is available in two versions: The PMT of the standard version is sensitive up to 600 nm. The PMT of the spectrally enhanced version of the **infinite M200** is sensitive up to the near infrared (NIR) while still having low dark current. Electronic circuitry uses analog to digital conversion of PMT output current. Adjusting the PMT gain enables measurement of a wide range of concentrations in lower or higher concentration domains.

6.2 Fluorescence Intensity System — infinite F200

The following parts constitute the fluorescence intensity system of the **infinite F200** instrument:

- Light Source (1)
- Fluorescence Optics (2)
- Fluorescence Detection System (3).

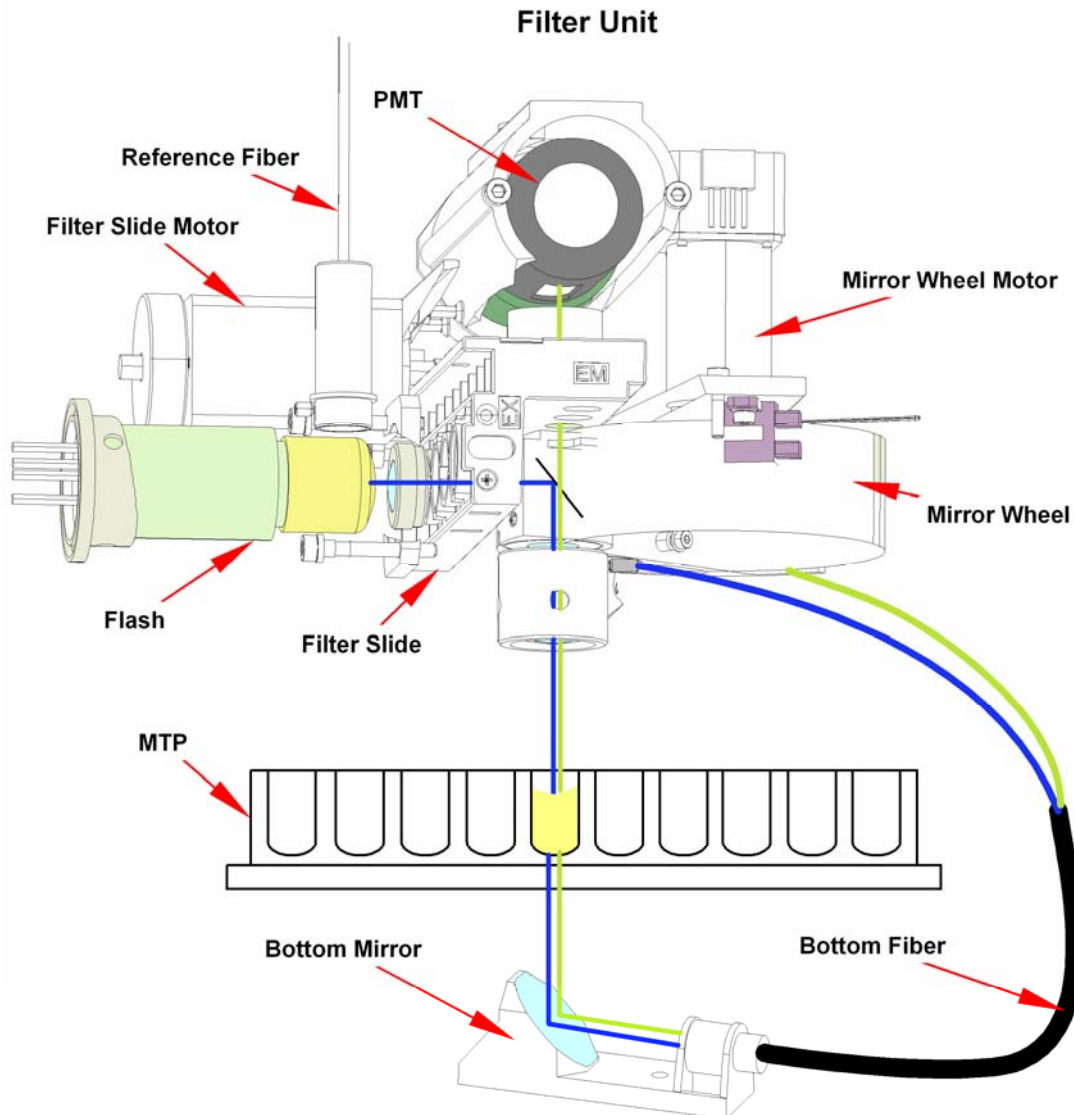The fluorescence top and bottom system is shown in the figure below.

Figure 6-2: Fluorescence intensity with top and bottom system of the filter-based **infinite F200**

6.2.1 Light Source System

Flash light enters the optical system by being focused through an orifice containing the filter. This opening acts as a color specific light source.

The **infinite F200** light source system is built from the following components:

- Flash lamp
- Condensing Optics
- Excitation Filters
- Flash lamp Monitor

Flash lamp

The **infinite F200** utilizes a high energy Xenon arc discharge lamp (Flash lamp). The flash sparks across a small gap between two electrodes. The lamp bulb contains a high pressure Xenon atmosphere. The flash decays within some microseconds.
The flash frequency is 40 Hz.

The **infinite F200** uses the Flash lamp for fluorescence and for absorbance measurements, although pulsed illumination is a must only for TRF. The main benefits of this singular kind of lamp are:

1. High intensity from the deep UV to the near IR
2. Very long lifetime
3. Many applications - only one kind of lamp
4. No warm up time required

Condenser

Condenser type optics focuses the light through the entrance orifice to the fluorescence optical system.

Bandpass Filter

In both fluorescence and absorbance applications, optical filters of bandpass type are necessary to select the useful wavelengths from the Flash lamp spectrum. Filters are mounted in removable slides.

Excitation Filter

In many cases, fluorescence emission spectra do not depend on the exact excitation wavelength. Therefore, for a maximum total fluorescence signal, relatively broad excitation bandpass filters (10 – 40 nm) may be used.

The spot diameter for the **infinite F200** is about 2 mm for the top optics and 2 mm for the bottom optics.

Flash Monitor

The light energy of single flashes may fluctuate slightly. To take these variations into account, a silicon photodiode monitors the energy of every single flash. Fluorescence measurement results are compensated correspondingly.

Fluorescence Optics Top

Flash light enters the optical system by being focused through an orifice. This opening acts as a color specific light source. A semi-transparent mirror (beam splitter) reflects 50% of the light towards the microplate. The objective lens system focuses the light into the sample.

Fluorescence Emission is measured from above the well. Fluorescence light is collected by the objective, directed through the 50% mirror, and focused through the exit orifice for detection.

Objective Lens System

The objective is designed to collect as much of the fluorescent light from a well and focus it through the exit orifice to the detection system.

The objective lenses are made from fused silica. This material provides high UV transmission and is virtually void of auto-fluorescence.

Fluorescence Optics Bottom

Flash light enters the optical system by being focused through an orifice. This opening acts as a color specific light source. The excitation bottom fiber guides the light to the bottom measurement head, which consists of an elliptical mirror focusing the light through the bottom of the microplate into the well. The emitted light is focused onto the excitation bottom fiber, which guides the light over a mirror through the emission filter into the fluorescence detection system.

Fluorescence Detection

Emission Filter

The emission filter discriminates scatter of excitation light and unspecific fluorescence. The emission filter is part of a filter set containing excitation filter, emission filter and a 50 % mirror.

PMT Detector

A photomultiplier tube (PMT) is used for the detection of such low light levels as involved with fluorescence.
For details see 6.1.1 Fluorescence Intensity Detection.

6.3 Absorbance System — infinite M200

For absorbance measurements, a similar optical path is used as for fluorescence excitation. For details of the light source (1) and the excitation monochromator (2), please refer to 6.1.1 Light Source System Fluorescence Intensity. A fiber bundle guides the light from the excitation monochromator to the absorbance microplate (MTP) optics (3), which focuses the light into the wells. The absorbance MTP measurement module (4) is located underneath the plate carrier. These modules measure the light being transmitted through the sample. Before measurement of the microplate, a reference measurement is performed with the plate carrier moved out of the light beam.
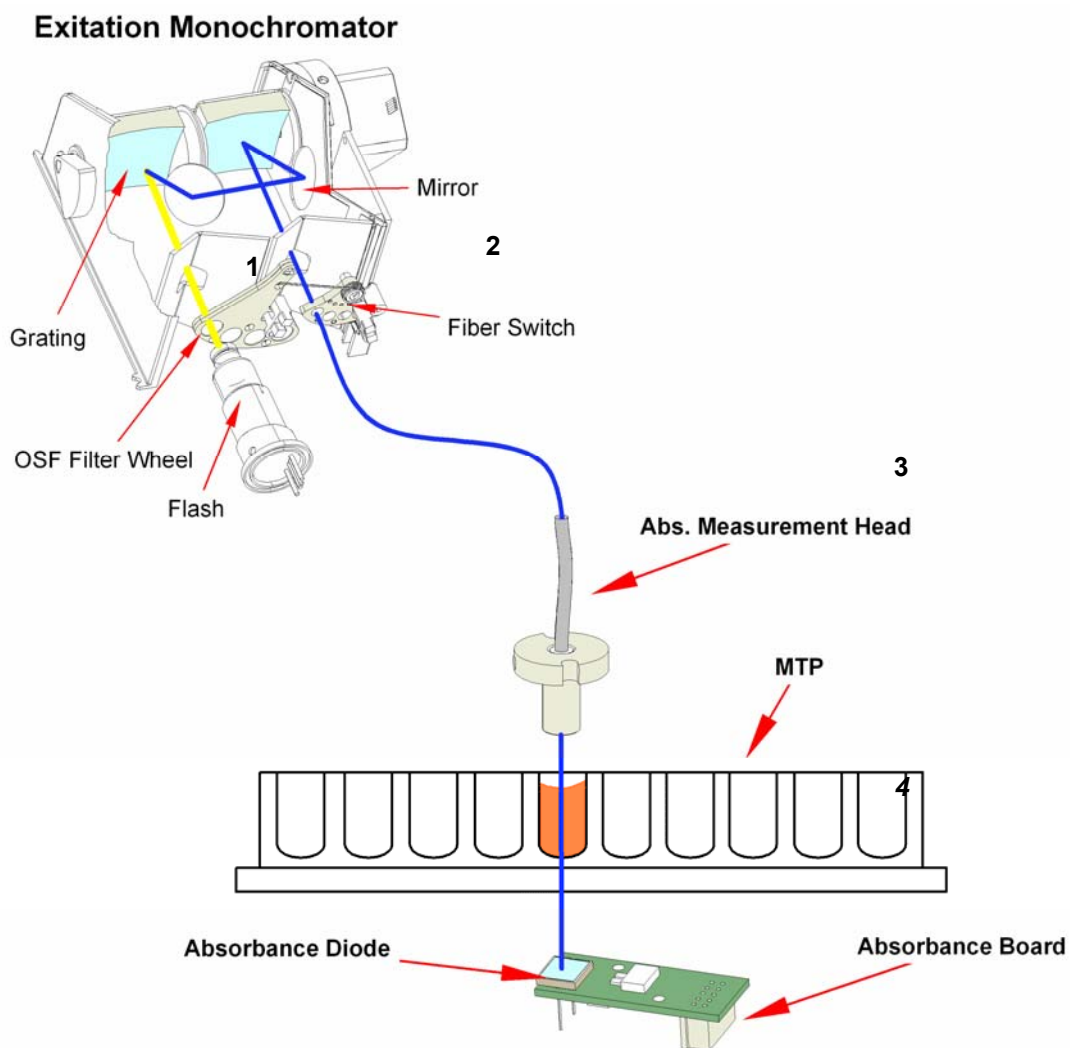
Figure 6-3 Optical System Absorbance **infinite M200**

Absorbance Optics MTP

A fiber bundle guides the light from the excitation monochromator system to the absorbance MTP optics.

The absorbance optics consists of a pair of lenses focusing the light beam into the well of the microplate.

The spot size of the absorbance light beam is 0.7 mm in diameter.

Absorbance Detection MTP

A silicon photodiode is used for the measurement of the transmitted light. It is sensitive to a wide range of wavelengths. The photodiode is well suited for the light levels being encountered with absorbance measurements up to 3 OD.

6.4 Absorbance System — infinite F200

For absorbance measurements a similar optical path is used as for fluorescence excitation. The Absorbance measurement module is located underneath the plate carrier. It measures the light being transmitted through the sample. Before measurement of the microplate, a reference measurement is performed with the plate carrier moved out of the light beam.

The absorbance system is shown in *Figure 6-4* and consists of the following components:

- Light Source
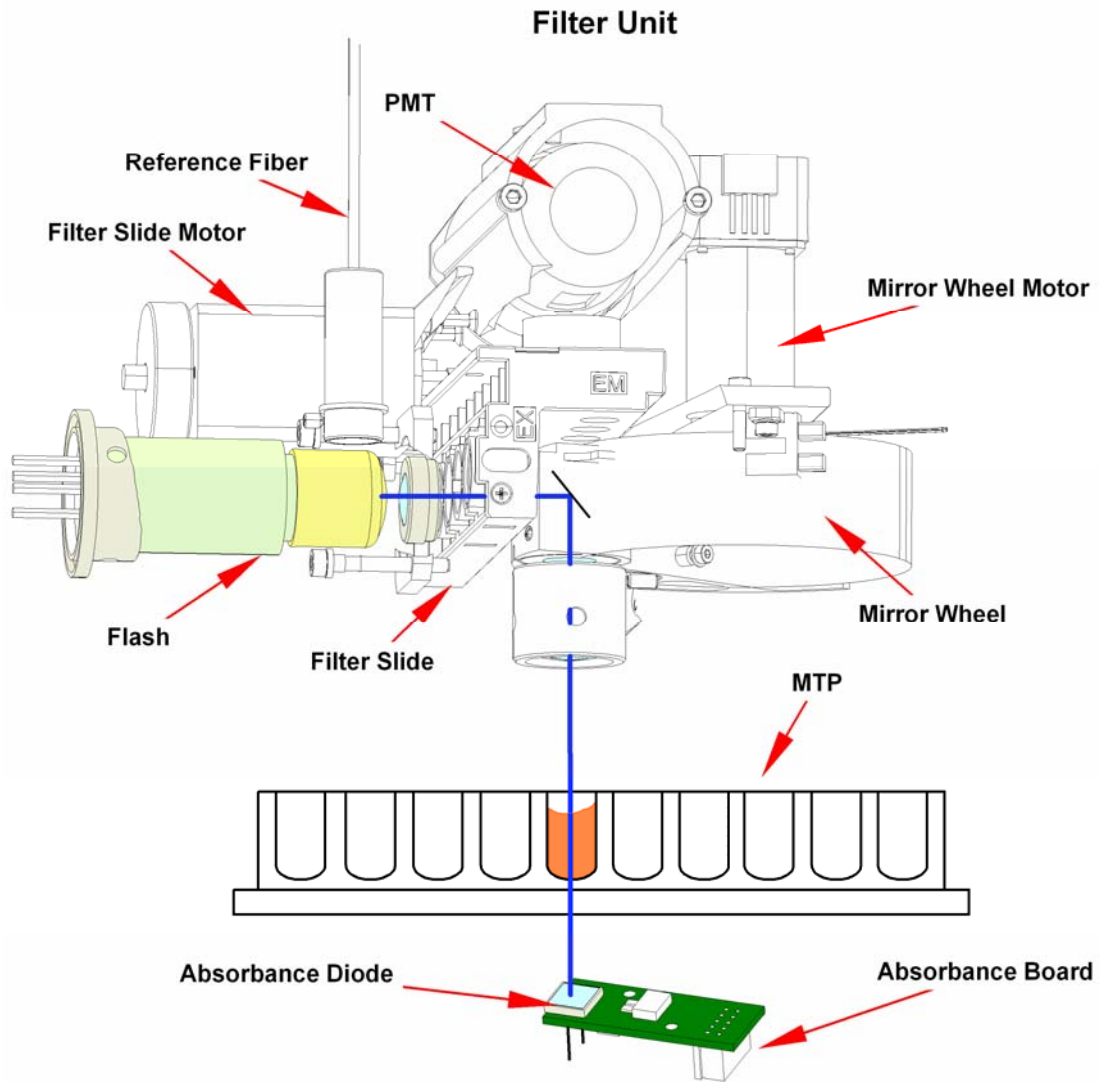- Absorbance Optics
- Absorbance Detection Unit

Filter Unit

Figure 6-4: Absorbance System of the **infinite F200**

Light Source System

The absorbance light source system is similar to the fluorescence top system. Please refer to 6.2.1 Light Source System.

Bandpass Filter

In absorbance applications, optical filters of bandpass type are necessary to select the useful wavelengths from the Flash lamp spectrum. Filters are mounted in removable slides.

Absorbance Filter

Absorbance measurements require relatively narrow bandpass filters (2 – 10 nm) with steep slopes.

Absorbance Optics

The mirror carriage has an absorbance position. A pair of small orifices forms a narrow and more collimated light beam when compared with fluorescence excitation.

Light being focused through the dispensed liquid is slightly refracted at the interfaces between air, liquid, and plate bottom. To accomplish a reliable measurement in the presence of the meniscus, a focusing lens recollects the rays of light, which might have been refracted too far away from the optical axis.

The spot size of the absorbance light beam is 0.5 mm (diameter).

Absorbance Detection

A silicon photodiode is used for the measurement of the light beam. It is sensitive to a wide range of wavelengths. The photodiode is well suited for the light levels being encountered with absorbance measurements up to 3 OD.

6.5   Luminescence System

The **infinite 200** Luminescence System consists of the following parts:

- Luminescence Optics
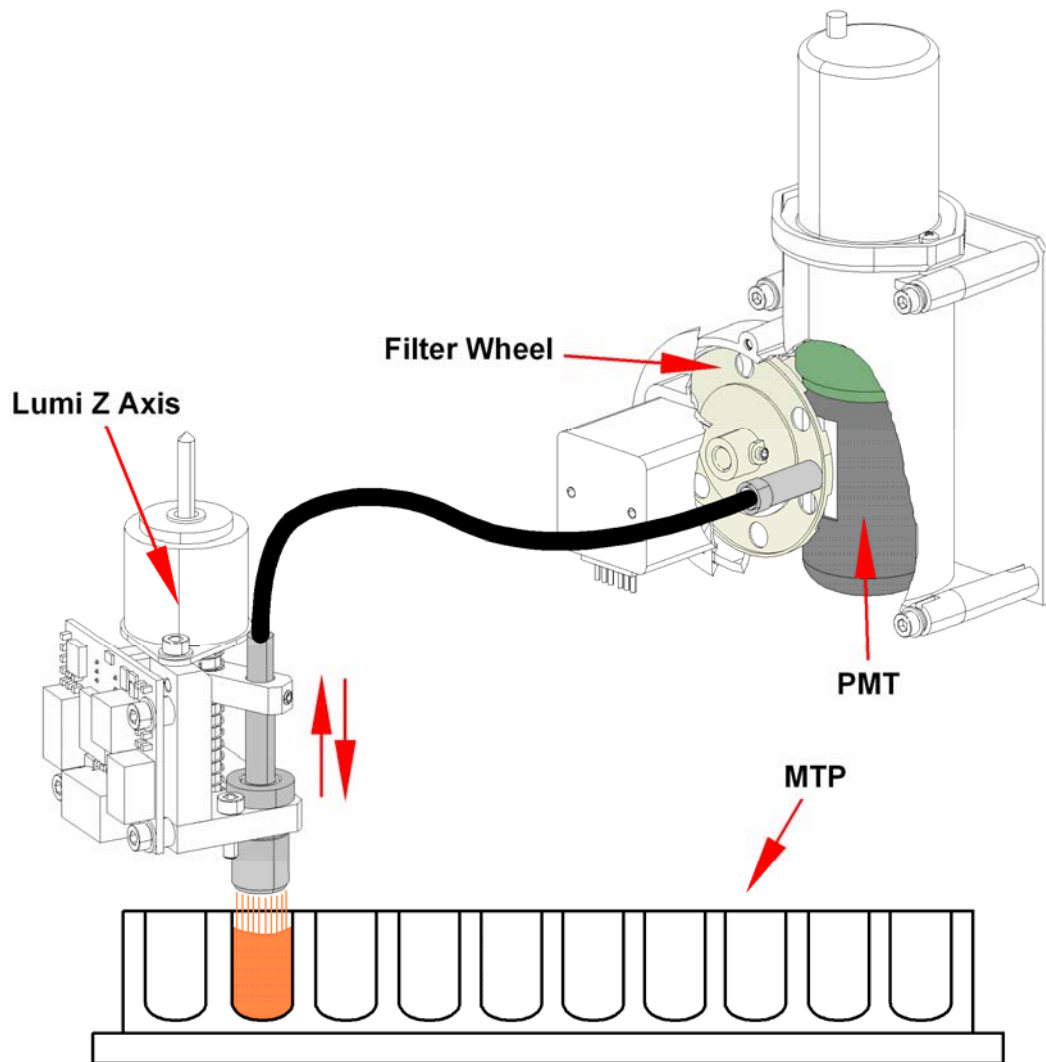- Detection Unit .

Figure 6-5: Optical System Luminescence

The luminescence fiber bundle guides the light from the sample to the detection unit (PMT) passing a filter wheel. The PMT (photomultiplier tube) is designed for applications in chemo- and bioluminescence providing a high dynamic range. The exceptional low noise and high sensitivity allows the detection of very low light levels.

The Z-position of the luminescence fiber bundle fixed onto the optics carrier is adjusted automatically by the software and depends on the selected plate definition file. As light is refracted at the sample liquid surface, z-adjustment helps to maximize signal to noise and minimize cross-talk.

Luminescence Optics

In luminescence measurement mode, the **infinite 200** uses fixed microplate position and a moveable luminescence measurement head (see *Figure 6-5: Optical System Luminescence*). The plate thickness is defined by selecting the corresponding plate type in the software (see the i-Control manual).

Fiber

A glass fiber guides the light from the sample to the detection unit. The fiber is designed to measure 96-well plates as well as 384-well plates.

Filter Wheel

A filter wheel with 6 filter positions in front of the PMT window is switched to the required luminescence channel. The sensitivity of the detection system makes it necessary to attenuate high luminescence light levels; therefore, the filter wheel can also switch a neutral density filter across the selected fiber exit.

Filter Wheel Position	Filter
Position 1	Lumi Green
Position 2	Lumi Magenta
Position 3	1 OD neutral density filter
Position 4	No attenuation
Position 5	Empty
Position 6	Empty

See *Figure 6-6* and *Figure 6-7* for transmission spectra of luminescence filters.
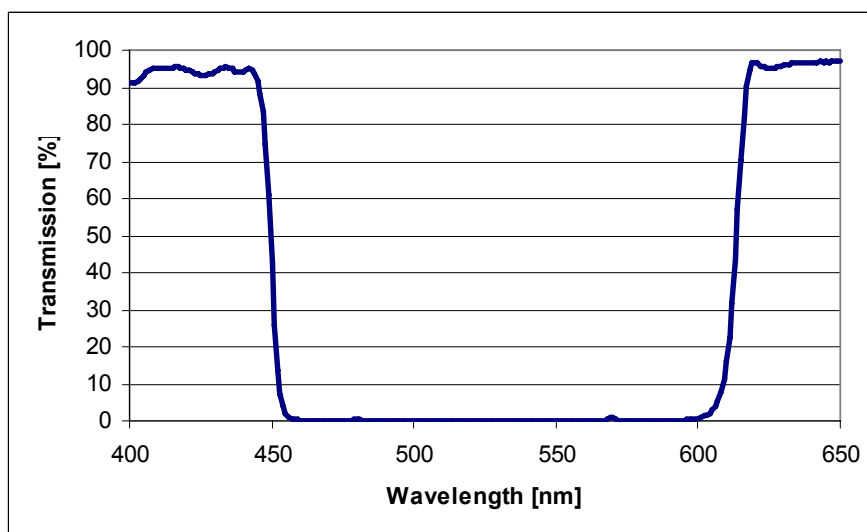
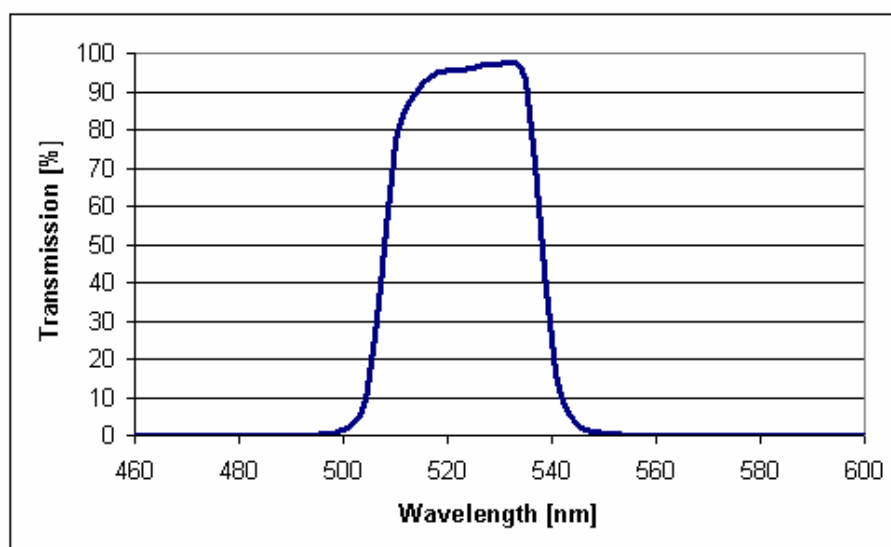
Figure 6-6: Transmission spectrum of filter 'Lumi Magenta'

Figure 6-7: Transmission spectrum of filter 'Lumi Green'

Luminescence Detection

	Caution
🛑 STOP	**Switch on the instrument at least 15 minutes before starting a luminescence measurement. Some components need to warm up to guarantee stable conditions for the measurement.**

The **infinite 200** luminescence detection system utilizes the single photon counting measurement technique. This is based on a dedicated luminescence PMT with appropriate measurement circuitry. This technique is very robust against noise. It is preferred for measurement of very low light levels.

For best performance it is recommended to use white plates for luminescence measurements.

6.6   Replacing the Lamp

To replace the lamp in the **infinite 200** proceed as follows.

+--+
| **WARNING (FOR YOUR SAFETY)** |
| |
| • **GLASS FLASHLAMP IS UNDER HIGH INTERNAL PRESSURE.** |
| **HANDLE TUBE WITH CARE. WEAR SUITABLE PROTECTIVE** |
| **DEVICES TO PREVENT POSSIBLE INJURY, ESPECIALLY TO** |
| **HAND AND FACE AREAS.** |
| |
| • **TAKE EXTREME CAUTION NOT TO DROP THE LAMP, SUBJECT** |
| **IT TO IMPACTS, APPLY EXCESSIVE FORCE TO IT OR** |
| **SCRATCH IT, BECAUSE THE LAMP IS UNDER HIGH INTERNAL** |
| **PRESSURE AND MAY RUPTURE.** |
| |
| • **LAMPS EMIT INTENSE ULTRAVIOLET RADIATION. NEVER** |
| **STARE DIRECTLY INTO THE OPERATING LAMP.** |
| |
| • **DO NOT ALLOW SKIN TO BE EXPOSED TO THE ULTRAVIOLET** |
| **RADIATION FROM THE OPERATING LAMP.** |
| |
| • **ALWAYS TURN OFF THE POWER SUPPLY WHEN INSTALLING** |
| **OR REMOVING THE LAMP, OR WHEN CLEANING ANY PART OF** |
| **THE EQUIPMENT.** |
| |
| • **WIPE THE LAMP BULB AND WINDOW USING SOFT CLOTH** |
| **MOISTENED WITH HIGH-QUALITY ALCOHOL BEFORE** |
| **OPERATION. NEVER TOUCH THE GLASS BULB OF THE LAMP** |
| **WITH BARE HANDS, BECAUSE DUST OR FINGERPRINTS ON** |
| **THE GLASS BULB MAY GREATLY REDUCE TRANSMITTANCE** |
| **IN THE ULTRAVIOLET RANGE.** |
| |
| • **INSERT THE LAMP SECURELY INTO THE SOCKET.** |
+--+

Tecan recommends using HAMAMATSU A6905 PROTECTIVE GLASSES (OR EQUIVALENT).

1. Remove the cover
2. Remove the cover from the Flash Power Supply
3. Disconnect the lamp connector (see No. 1 in the picture below)
4. Loosen the two screws from the Flash Power Supply (see No. 2 in the picture below)
5. Move the Flash Power Supply back from the lamp (see No. 3 in the picture below)
6. Remove the two screws (see No. 4 in the picture below) and replace the lamp.
7. Repeat the above steps in reverse order

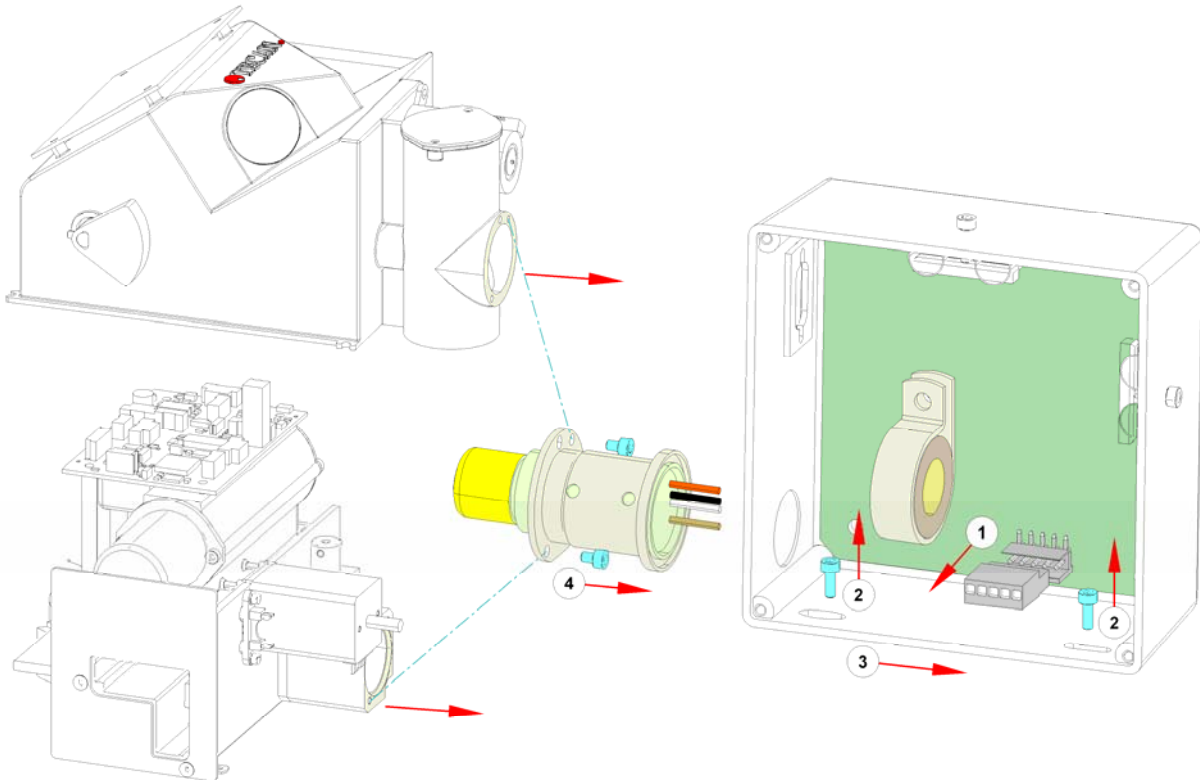|	
i	***Note*** ***Be careful with the magnetic core!***

Figure 6-8: Replacing the Lamp

Required Tests and Settings

Please see chapter 5.2 **Xinfinite** Service Software for all required tests and settings.

6.7   Replacing the Filter Module

To replace the Filter Module, see picture below and use the following procedure:

1. Remove the main cover and the front cover

2. Open the Flash Power Supply and disconnect ST4

3. Loosen the screw (see No. 1 in the picture below) and move the flash power supply away from the measurement head

4. Disconnect the lamp from ST3
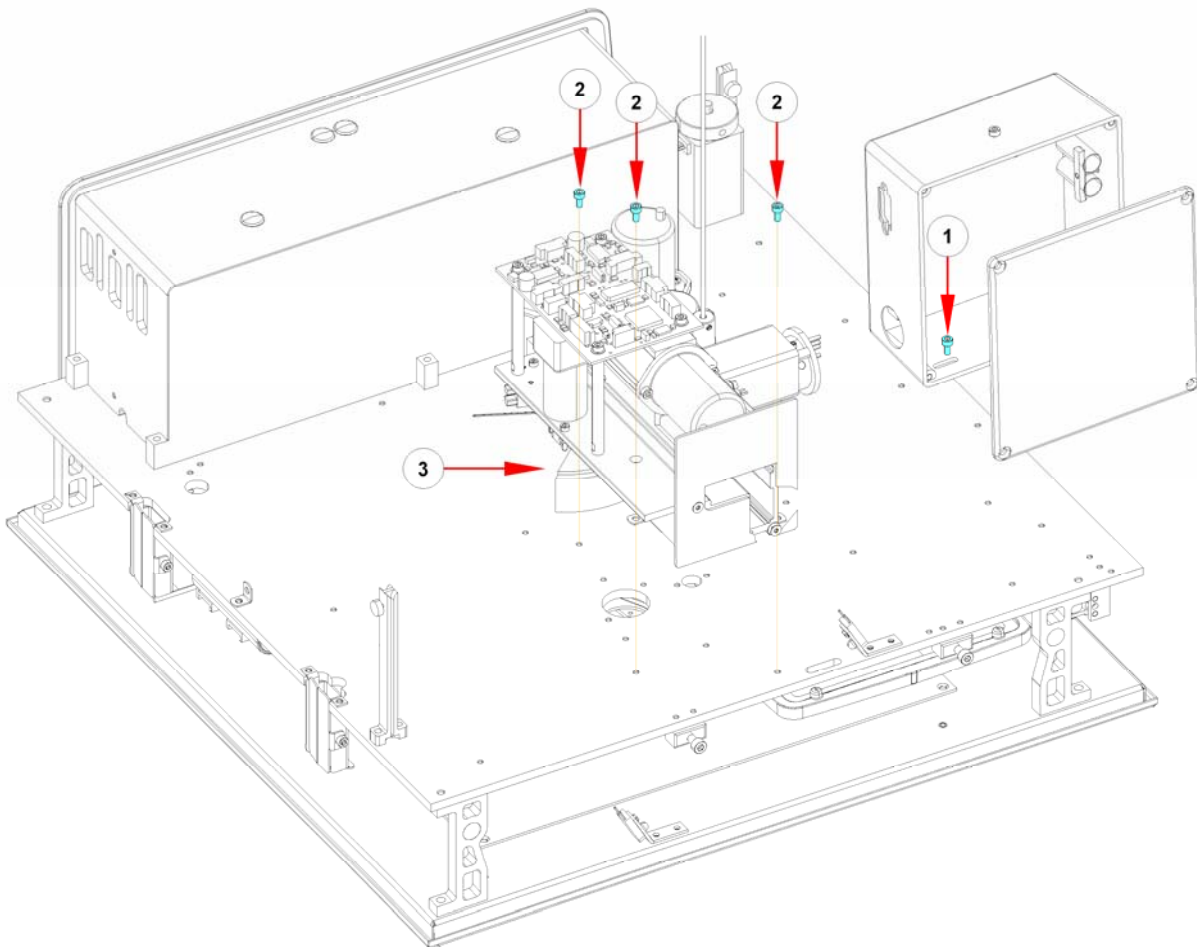
Figure 6-9: Filter Module

5. Remove screw (see No. 2 in the picture below)

6. Unplug all connectors

7. Remove the reference fiber

8. Remove fiber optic (see No. 3 in the picture below)

9. Lift the unit up

10. Remove the bottom fiber

11. Replace the Filter Module

12. Repeat the above steps in reverse order

Required Tests and Settings

1. Move the adjustment plate (SAP No. 30017149) under the lens of the measurement head. Loosen the lens nut (see No. 1 in the picture below) and move the lens close to the adjustment plate.
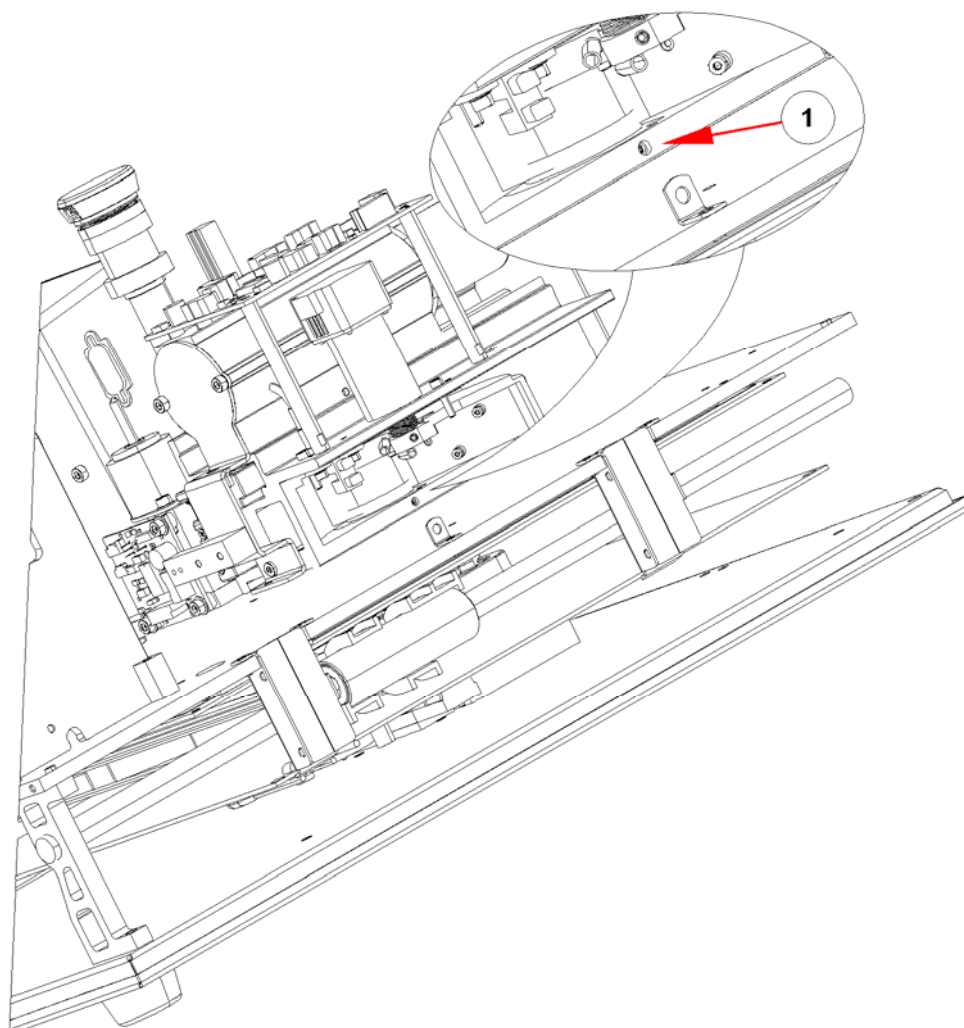
Figure 6-10: Measurement Head Lens Adjustment

2. Tighten the nut.
3. Please see11 Required Tests & Settings for all required tests and settings.

6.7.1 Replacing the Fiber Optics

To remove the Fiber Optics follow the procedure below:

- Remove the screws (see No. 1 in the picture below)

- Move fiber in direction shown (see No. 2 in the picture below)
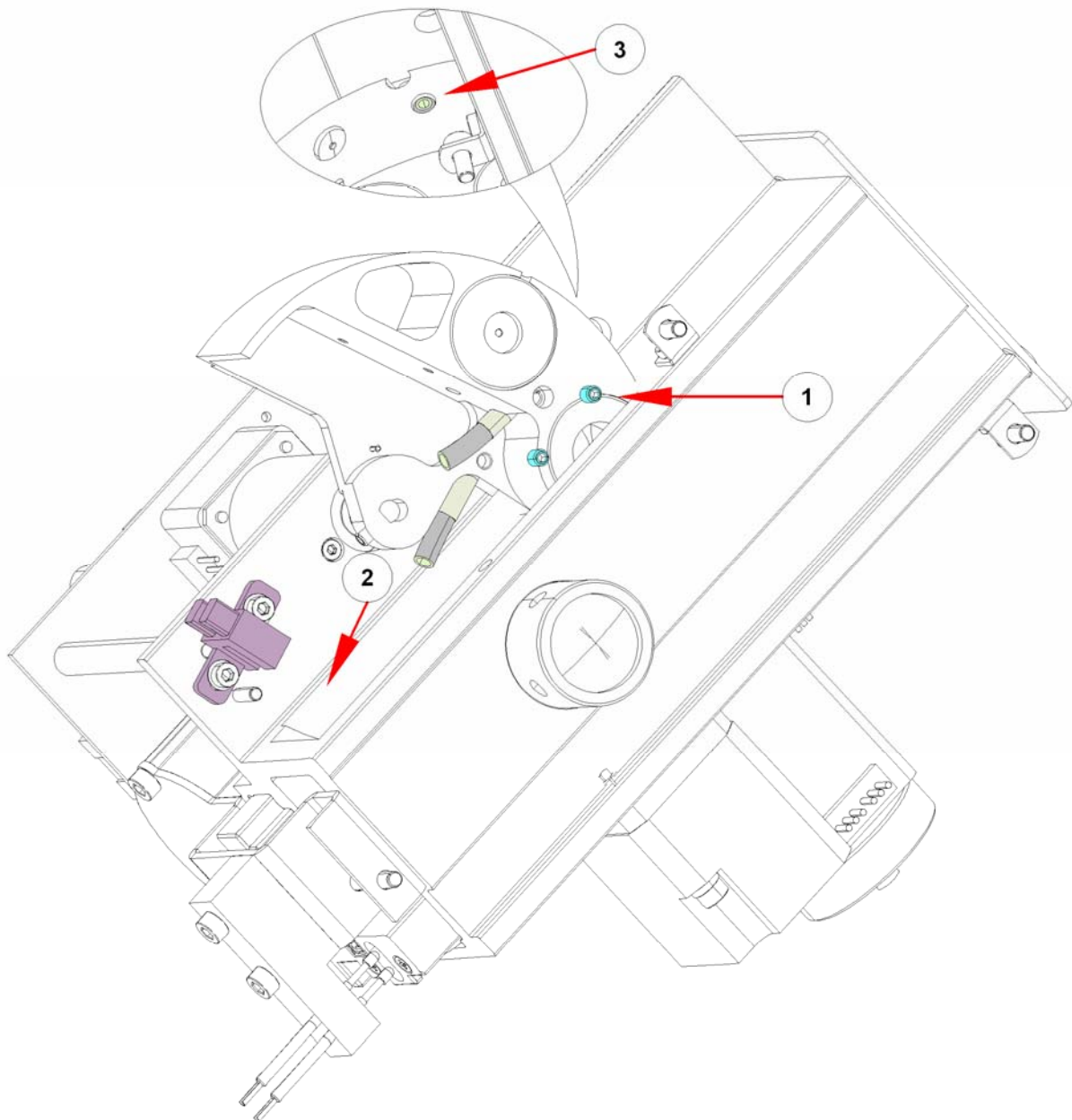
Figure 6-11: Fiber Optics

- To install the fiber optics, repeat the above steps in reverse order
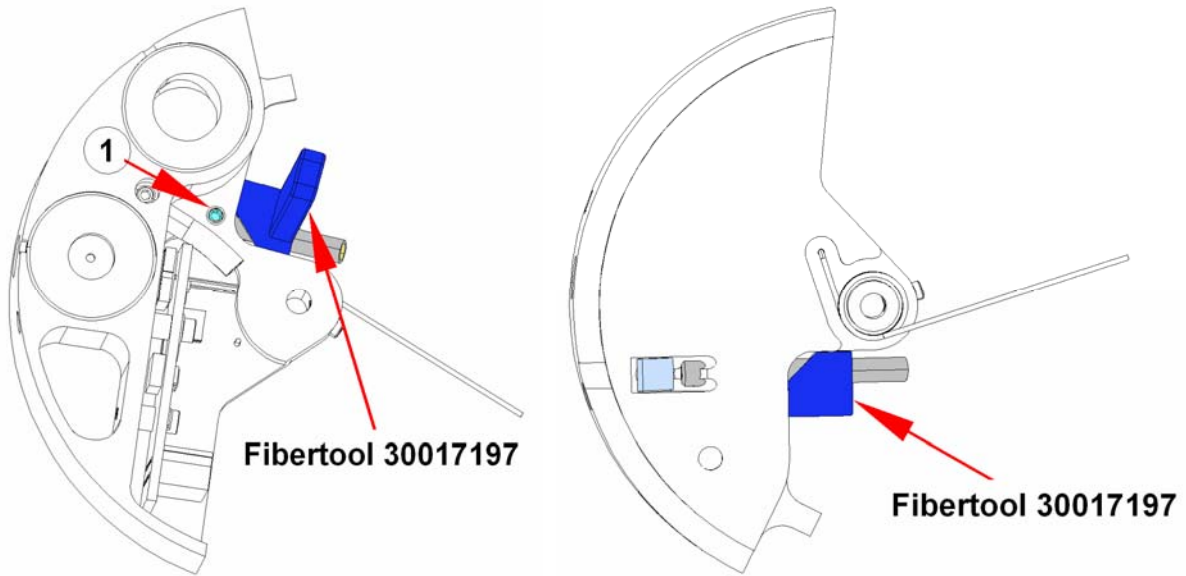
Figure 6-12: Fiber Tool 30017197

- To install the EM Bottom Fiber, use Tool 30017197 (see pictures above).
- Pull the EX Bottom Fiber until it is flush with the surface of the wheel as shown (see No. 3 in *Figure 6-11: Fiber Optics*).

6.7.2 Replacing the Filter Motor

To replace the filter motor, use the following procedure:

1. Remove the filter carrier
2. Loosen the nuts (marked red in the picture below).
3. Disconnect ST11
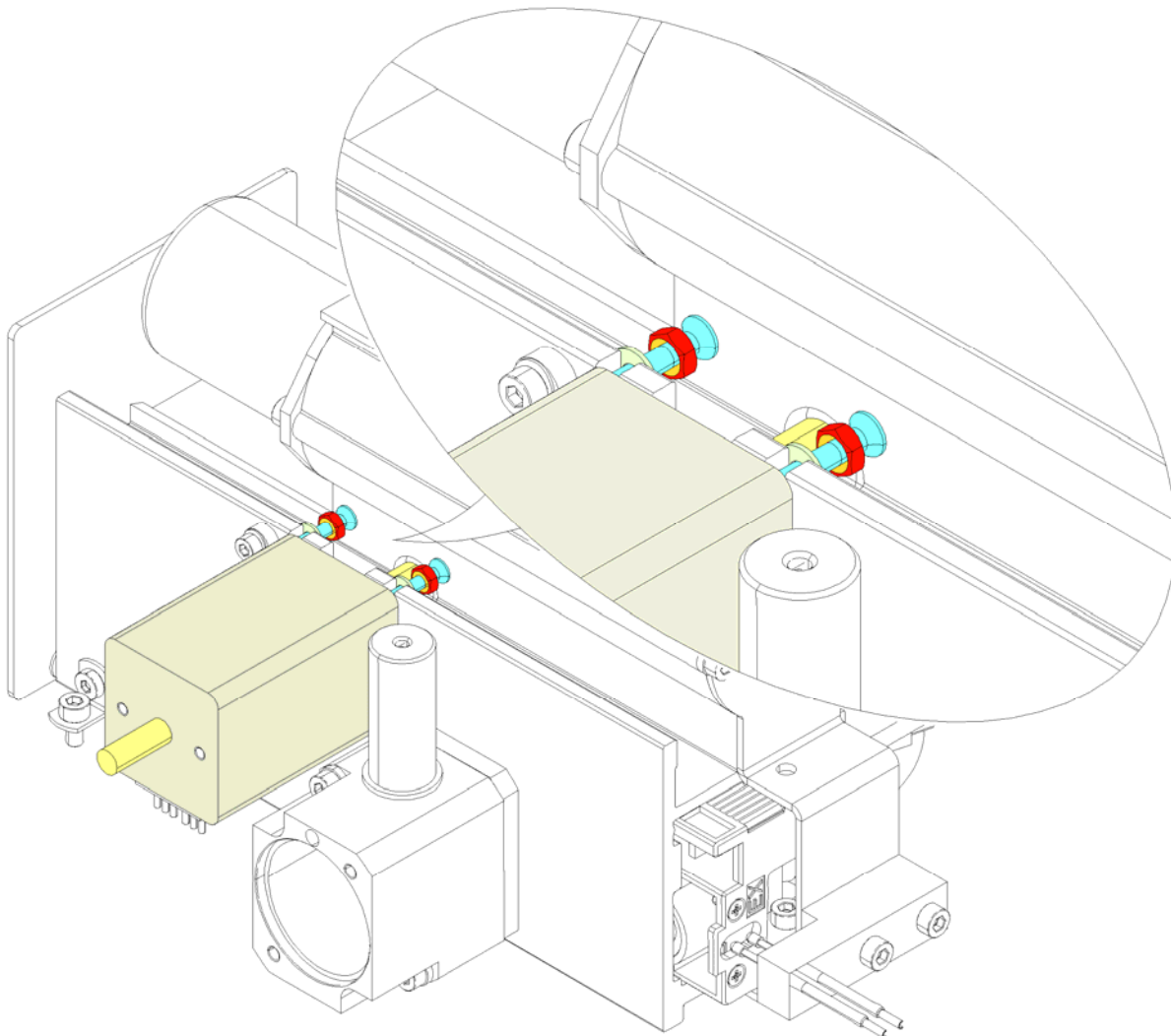
Figure 6-13: Filter Motor

4. Slide the motor out (see No. 1 in the picture below)
5. Pull the motor up (No. 2) to remove the motor (No. 3)
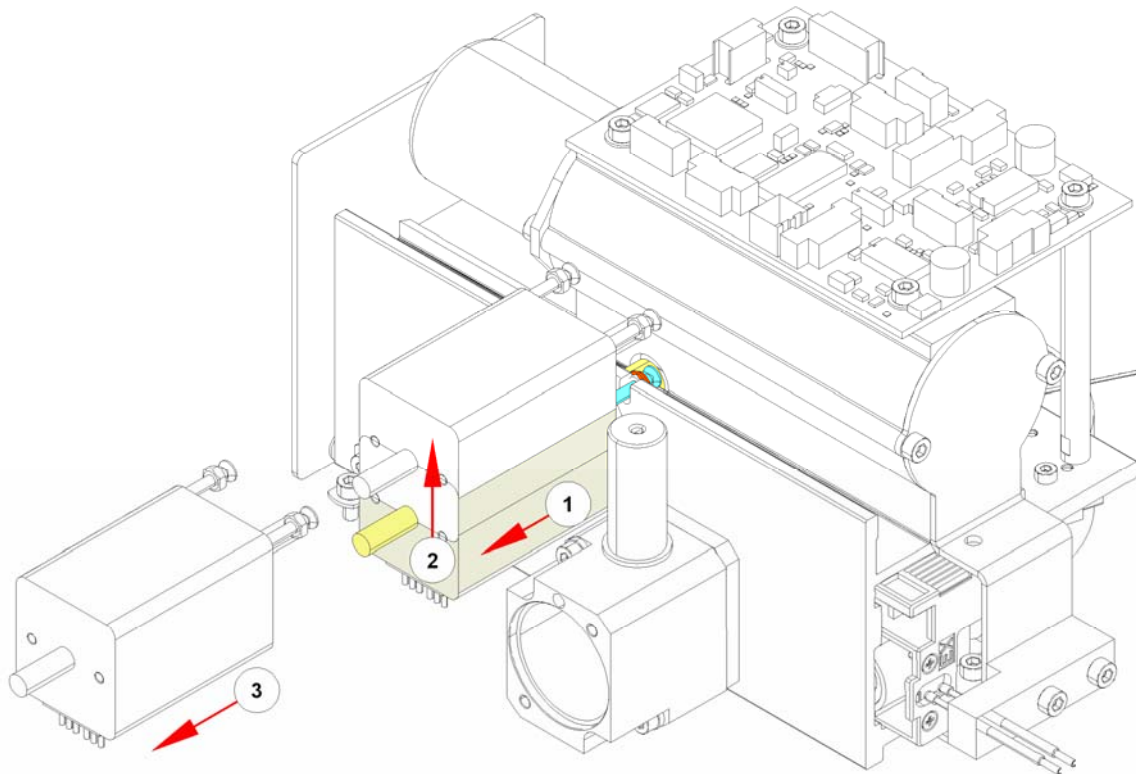
Figure 6-14: Filter Motor Removal

6. To install the motor perform the above steps in reverse order.

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

6.7.3 Replacing the Reference Board

To remove the Reference Board use the following procedure:

1. Disconnect ST2
2. Remove the two screws (marked blue in the picture below)
3. Remove the board
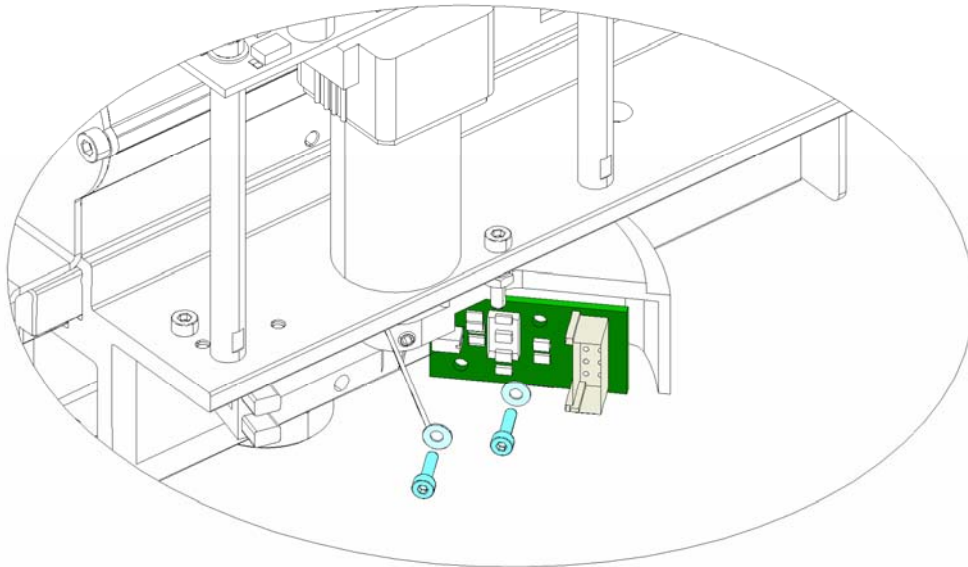
Figure 6-15: Reference Board

4. To install the board, perform the above steps in reverse order

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

6.7.4 Replacing the CPU Board

To remove the CPU board, use the following procedure:

1. Save the instrument settings
2. Disconnect all plugs (see picture below)
3. Remove the screws (marked in blue)
4. Remove the board
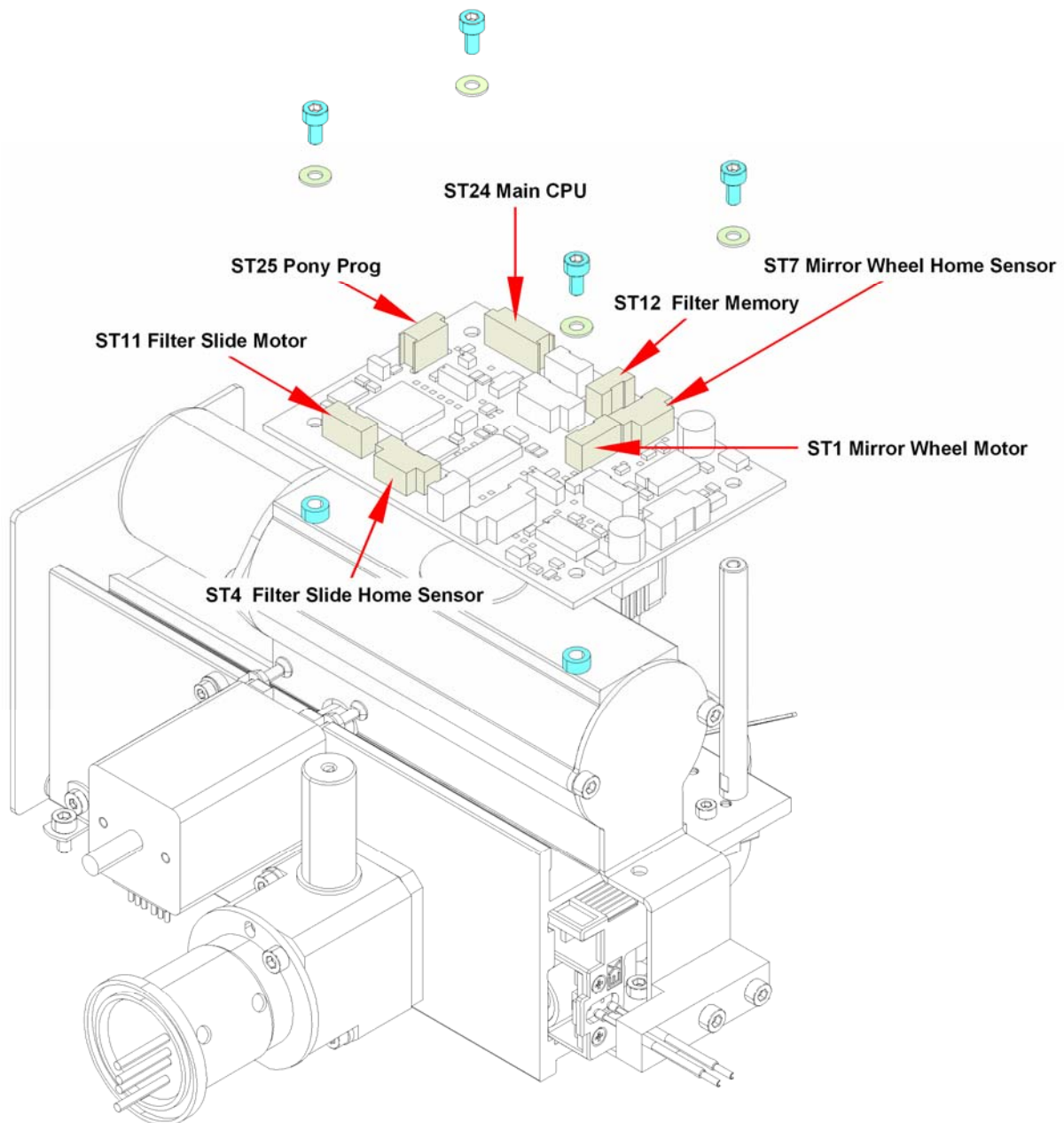
Figure 6-16: CPU Board

5. To install the board, perform the above steps in reverse order

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

6.7.5 Removing Filters from the Filter Carrier

To remove filter from the filter carrier, use the following procedure:

1. Save the instrument settings
2. Remove the filter carrier from the unit
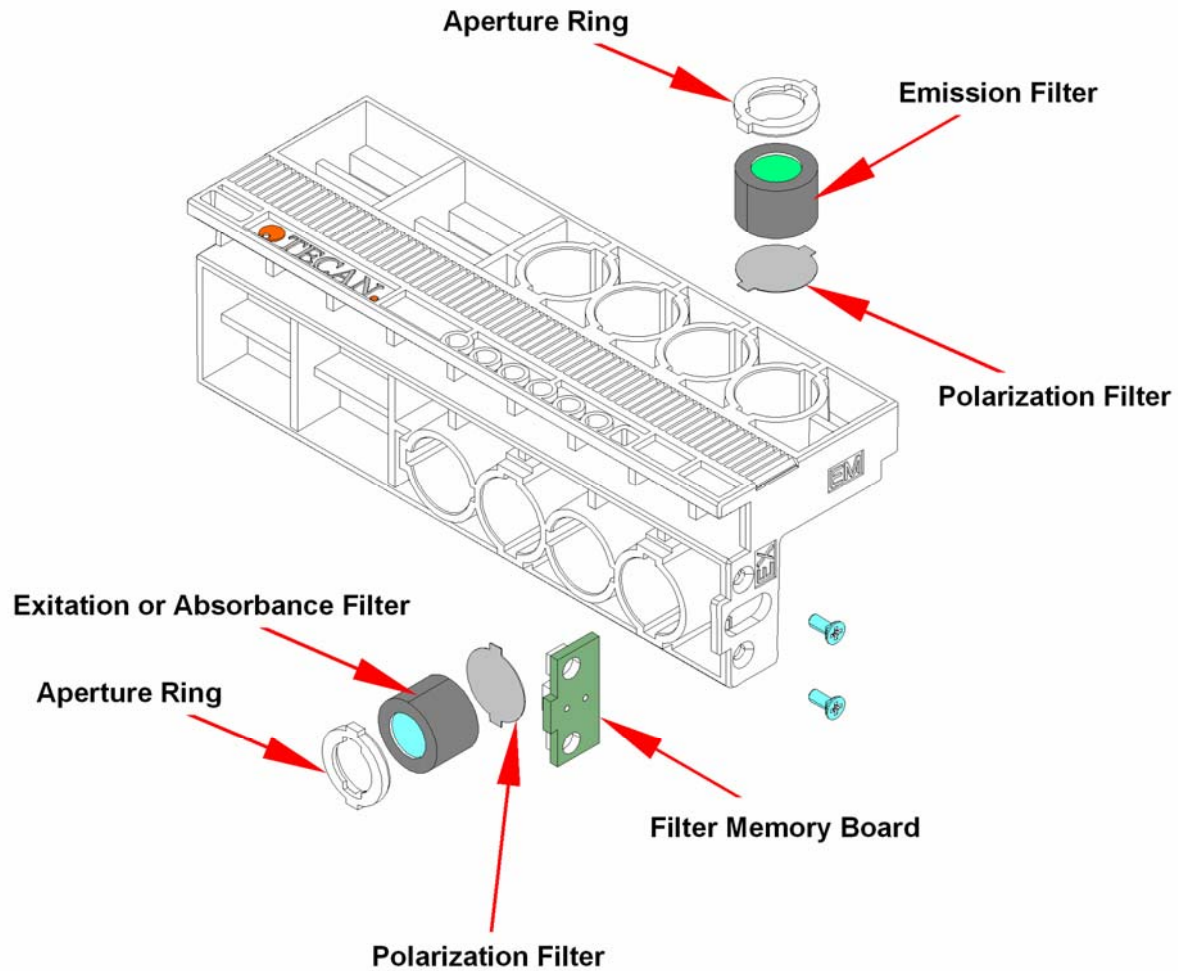
Figure 6-17: Removing Filters from the Filter Carrier

3. Use the filter tool to remove the filter (see picture below)
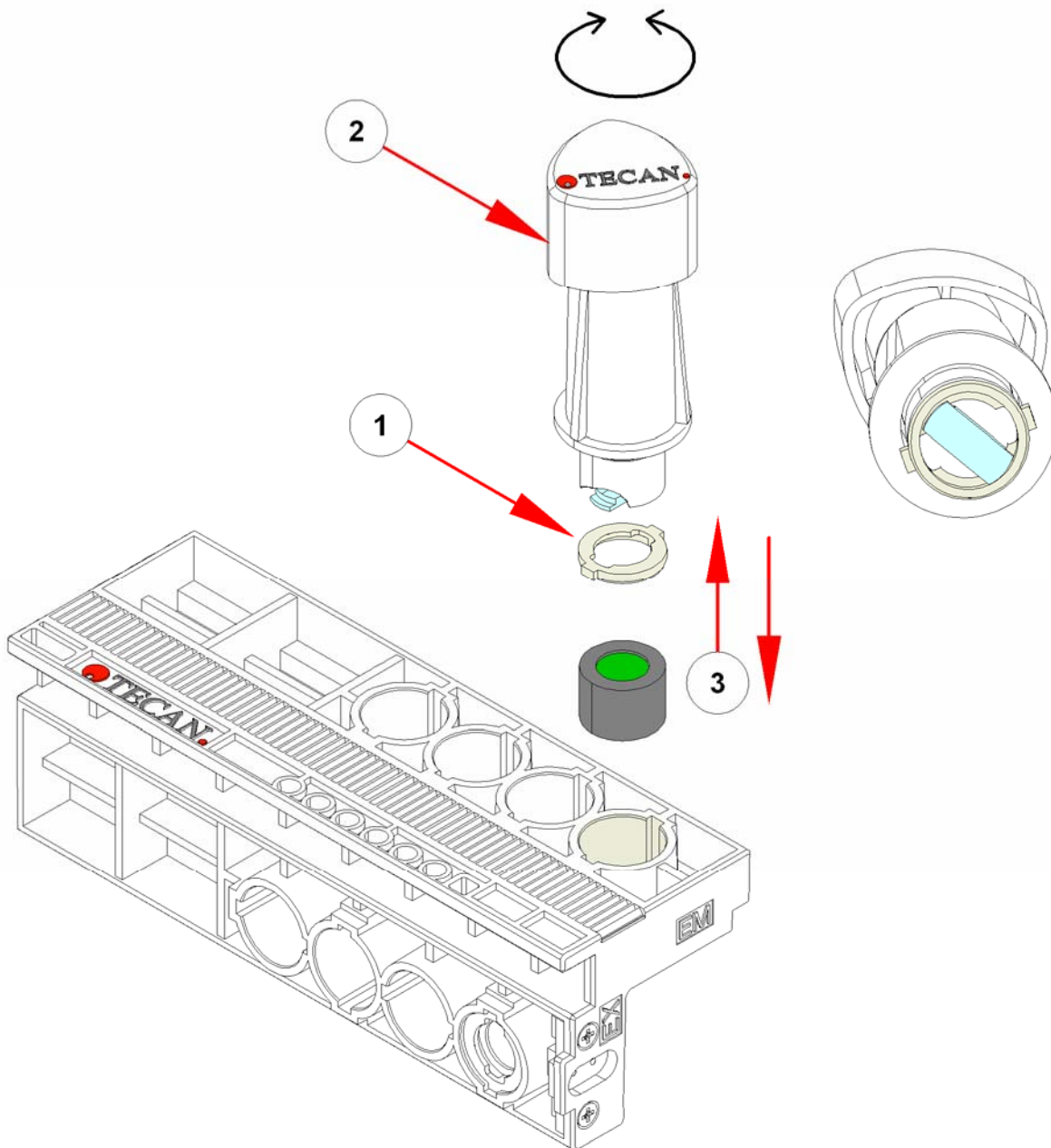
Figure 6-18: Removing Filters from the Filter Carrier

4. Put the aperture ring together with the tool (see No. 1 in the picture above)
5. Turn the tool (see No. 2 in the picture above) and move down to the filter (see No. 3 in the picture above)
6. Turn it back and move the tool up (see No. 3 in the picture above)
7. Check the instrument settings
8. Reset the filter data, when installing new filters (see chapter)

6.8   Replacing the Lumi Module

To replace the Lumi Module, use the following procedure:

1. Disconnect the ribbon cable from the main CPU and the fiber.
2. Remove the two screws from the lumi module.
3. The lumi module and the lumi board are replaceable. The settings are stored in the lumi board.
4. If the complete lumi module is replaced, the new settings must be saved to the instrument!

6.8.1 Replacing the Lumi-Fiber

To replace the fiber, proceed as follows:

1. Loosen the screw (see No. 1 in the picture below)
2. Remove the fiber (see No. 2 in the picture below)
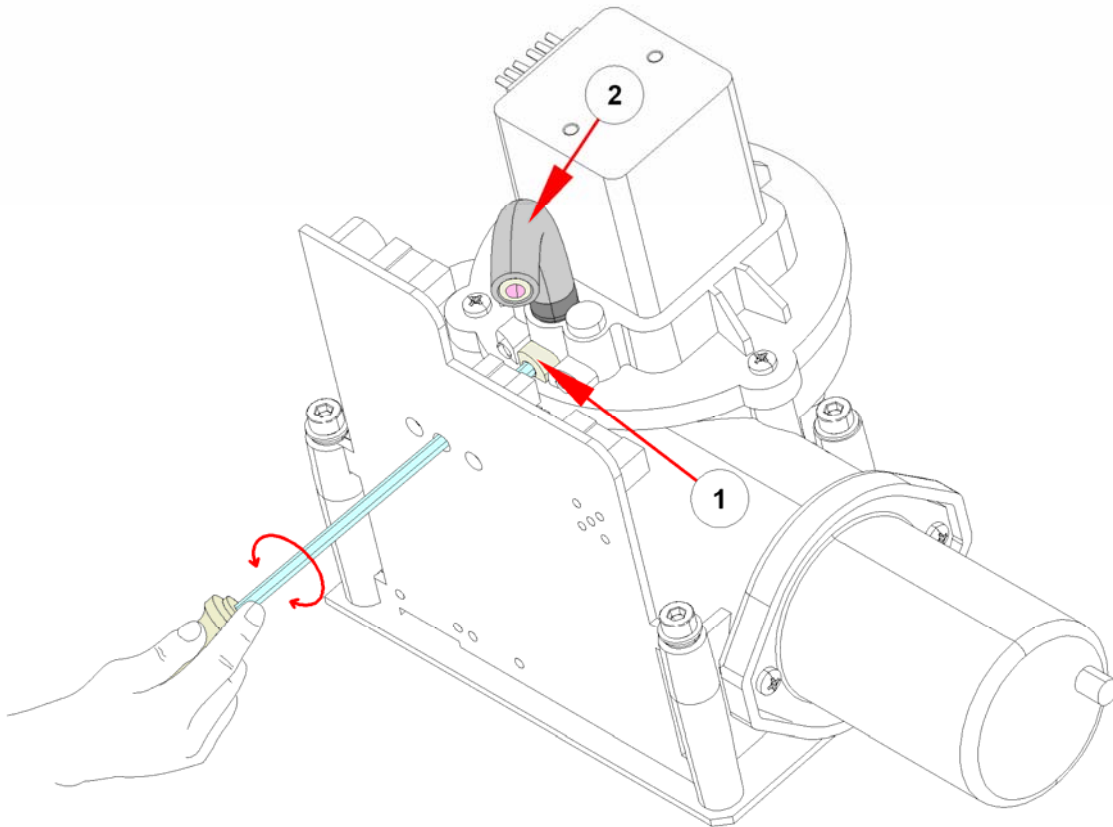
Figure 6-19: Replacing the Lumi-Fiber
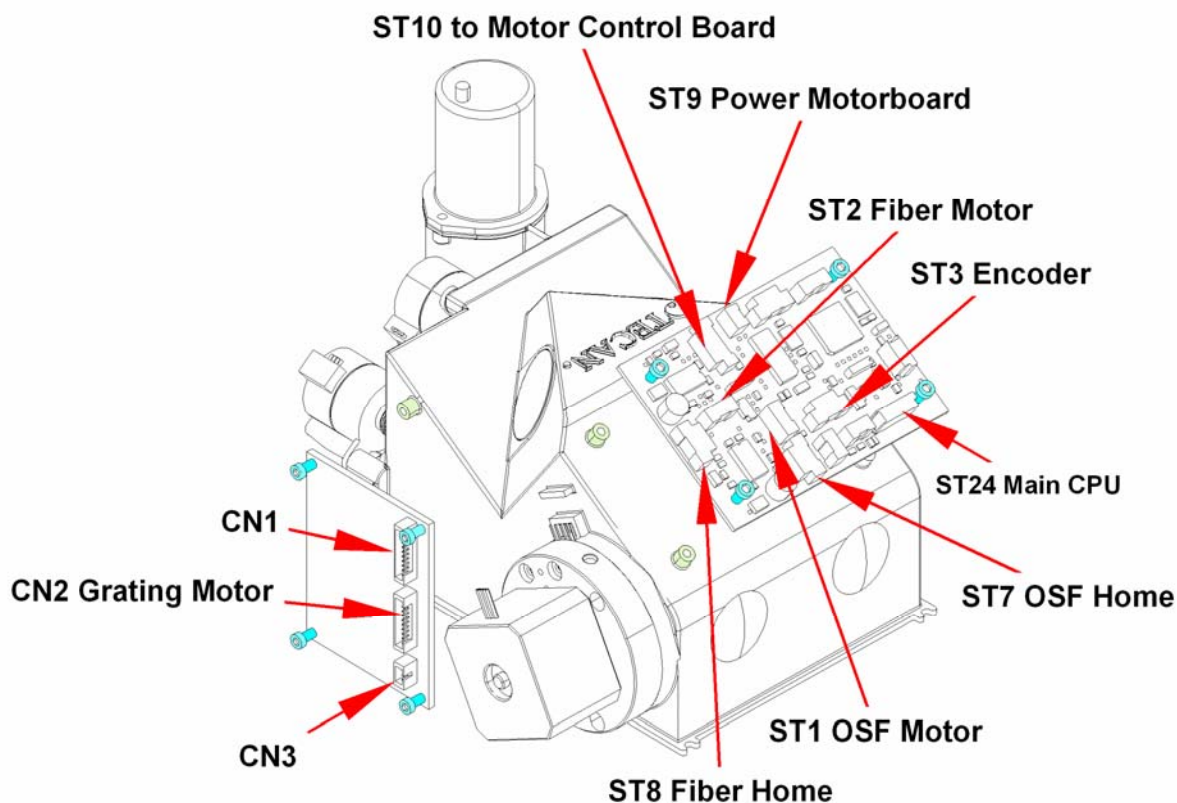
3. To install the fiber, push the fiber to the stop position and tighten the screw.

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

6.8.2 Replacing the Lumi Board

To replace the board, use the following procedure:

1. Save instrument settings
2. Loosen the screws and remove the screw marked No. 1 in the picture below
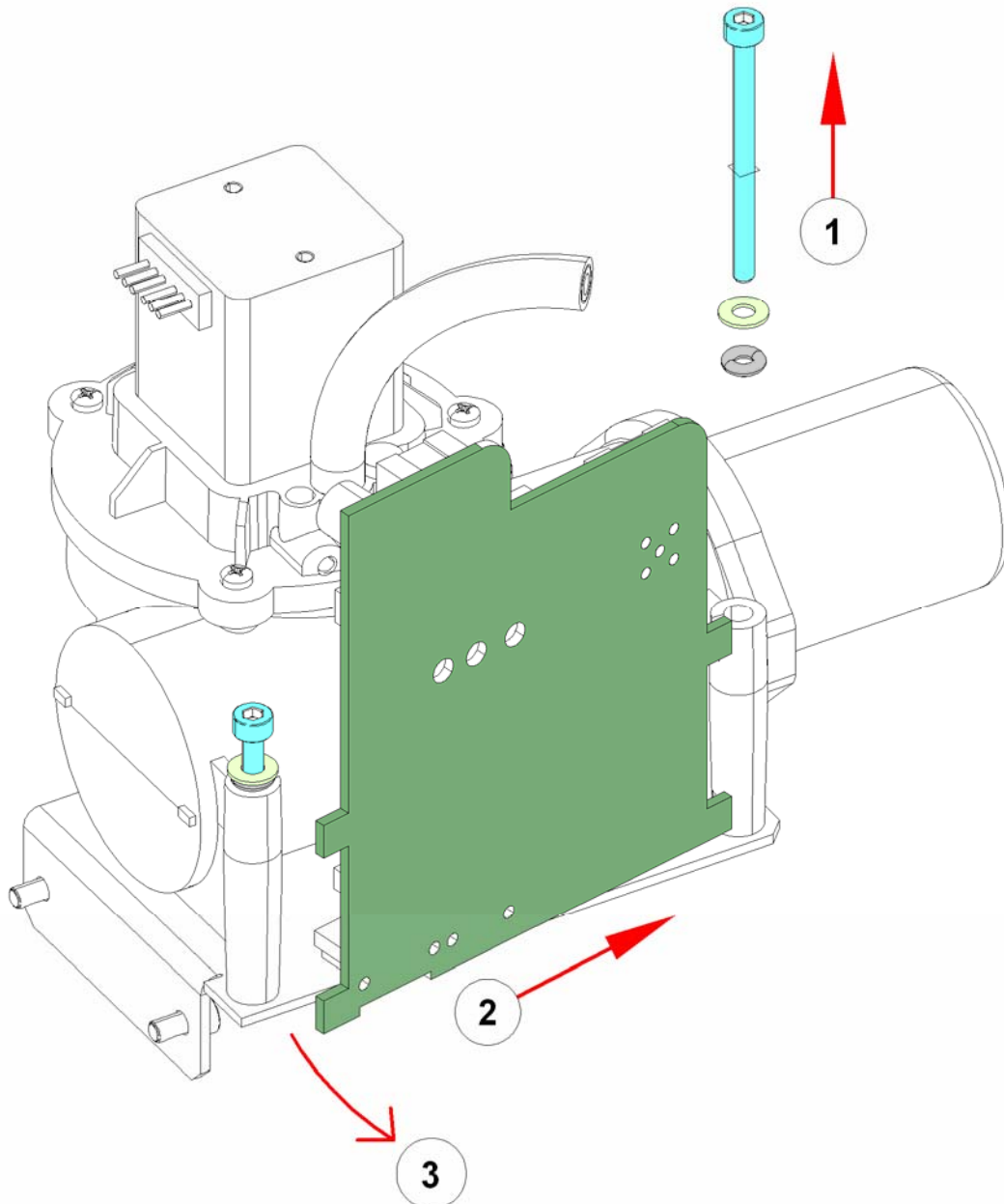
Figure 6-20: Replacing the Lumi Board

3. Push the board like No. 2
4. Turn it to remove like No. 3
5. Do all steps in reverse order
6. Reload the Instrument Settings

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

6.8.3 Replacing the Z-Axis Unit

To replace the Z-Axis Unit, use the following procedure:

1. Remove 2 screws (see No. 1 in the picture below).
2. Lift the unit out
3. To replace the Z-Axis board, remove the screws (see No. 2 in the picture below) and remove the board. Replace with a new board and attach with the screws.
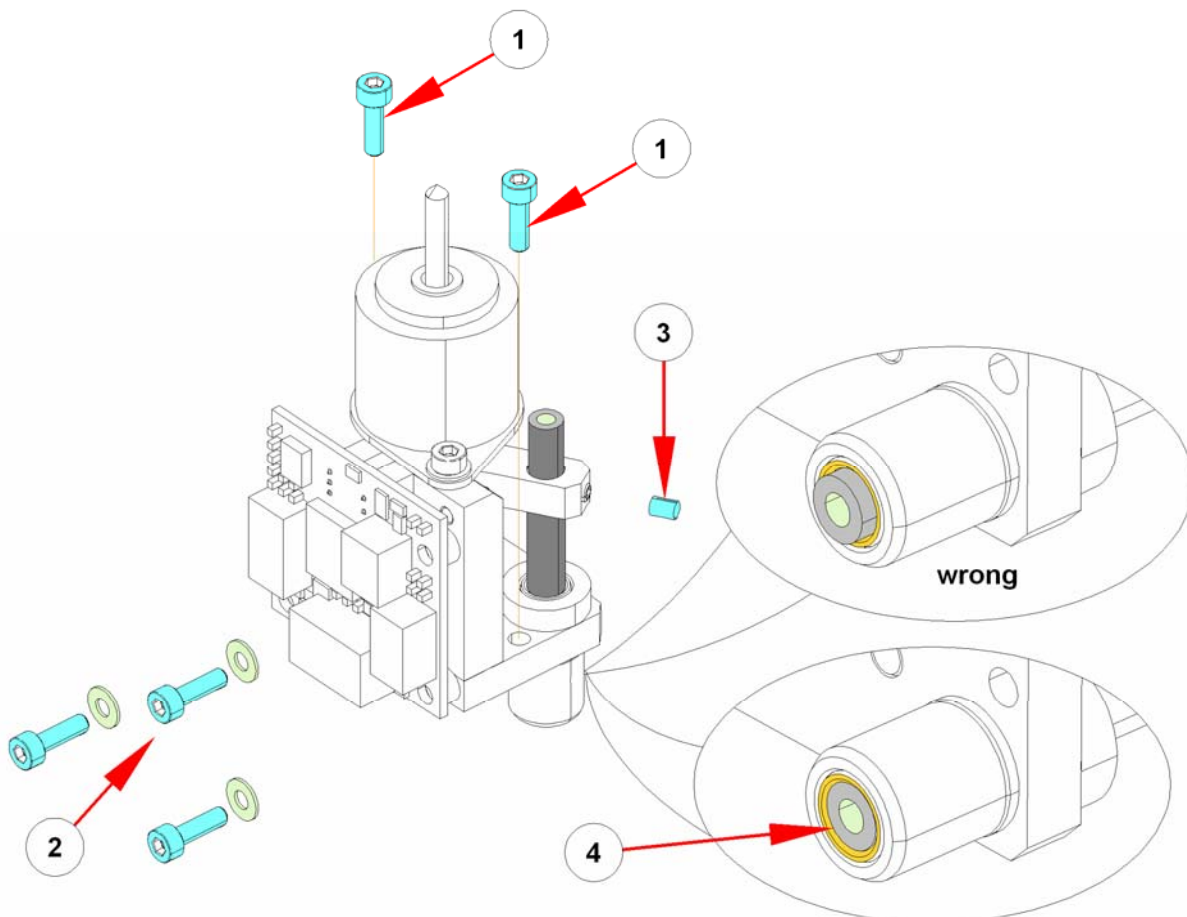
Figure 6-21: Replacing the Z-Axis Unit

4. To remove the fiber, remove the nut (see No. 3 in the picture above) and then remove the fiber
5. To install the unit, insert the fiber so that the end is flush with the housing (see No. 4 in the picture above). Then repeat steps 1 and 2 in reverse order.

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

6.9   Monochromator (MCR) Module

The following parts are replaceable:

- Motor Board

- CPU Board

- Flash Lamp (EX MCR Only)

- Complete Unit

6.9.1 Replacing the MCR Boards

To replace the boards, use the following procedure:

1. Save the instrument settings
2. Remove the cover
3. Disconnect the connections to the board
4. remove the screws (marked in blue in the picture below)
5. Remove the board
6. To install the board, repeat the above steps in reverse order.

Figure 6-22: Replacing the MCR Boards

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

6.9.2 Replacing the Lamp

To replace the lamp, see chapter 6.6 Replacing the Lamp.

6.9.3 Replacing the MCR Module

To replace the MCR Module, proceed as follows:

1. Save the instrument settings
2. Remove the cover
3. Remove the adapter screws (see No. 1 in the picture below) and remove the adapter (see No. 2 in the picture below)
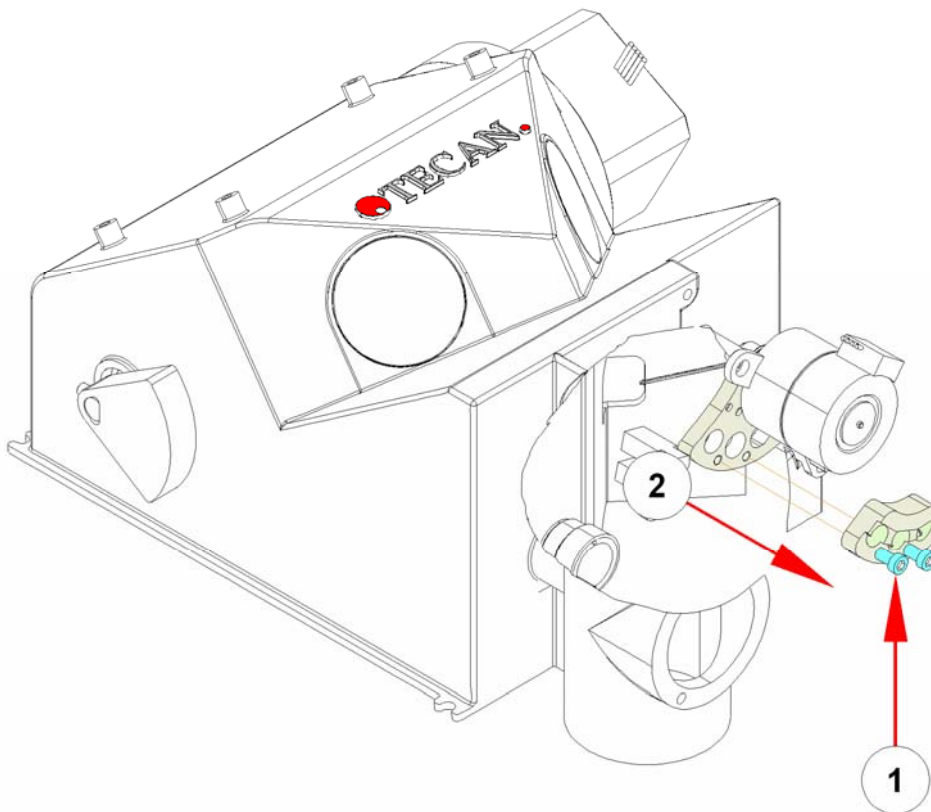
Figure 6-23: Replacing the MCR Module

4. Disconnect ST24 from the main CPU
5. Disconnect the PMT from the main board (EM MCR Only)
6. Move the Flash Power Supply (see No. 1 in the picture below) (EX MCR only) (see chapter 3.5)
7. Remove the 4 screws and the MCR Module (see No. 2 and No. 3 in the picture below)
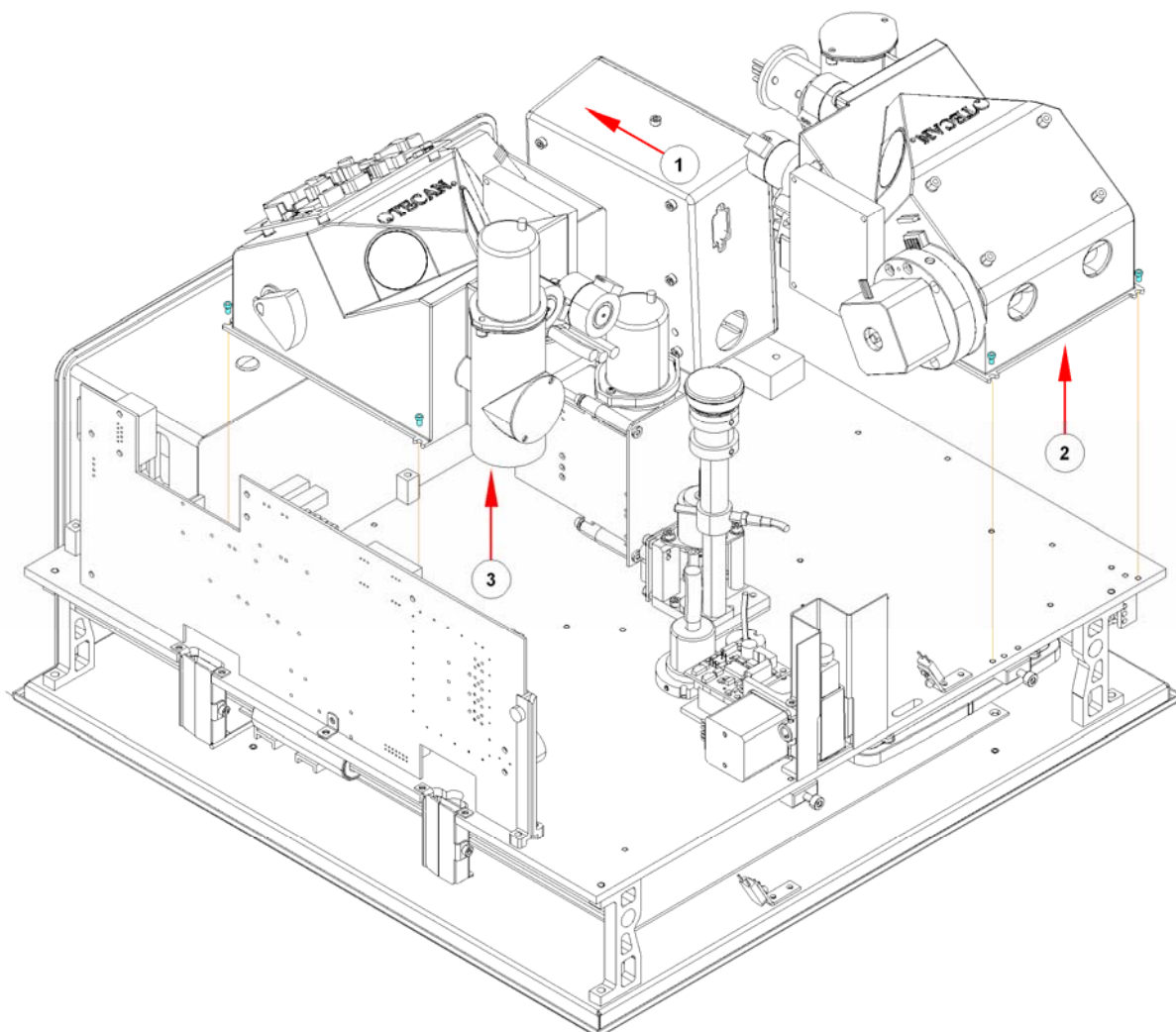
Figure 6-24: Replacing the MCR Module

8. To install the MCR module repeat the above steps in reverse order. See the following page for important information regarding the installation.

Because of all the ribbon cables, install the MCR Unit as shown in the picture below. Start with the left screw (No. 1) and rotate the unit in to the right screw (No. 2).
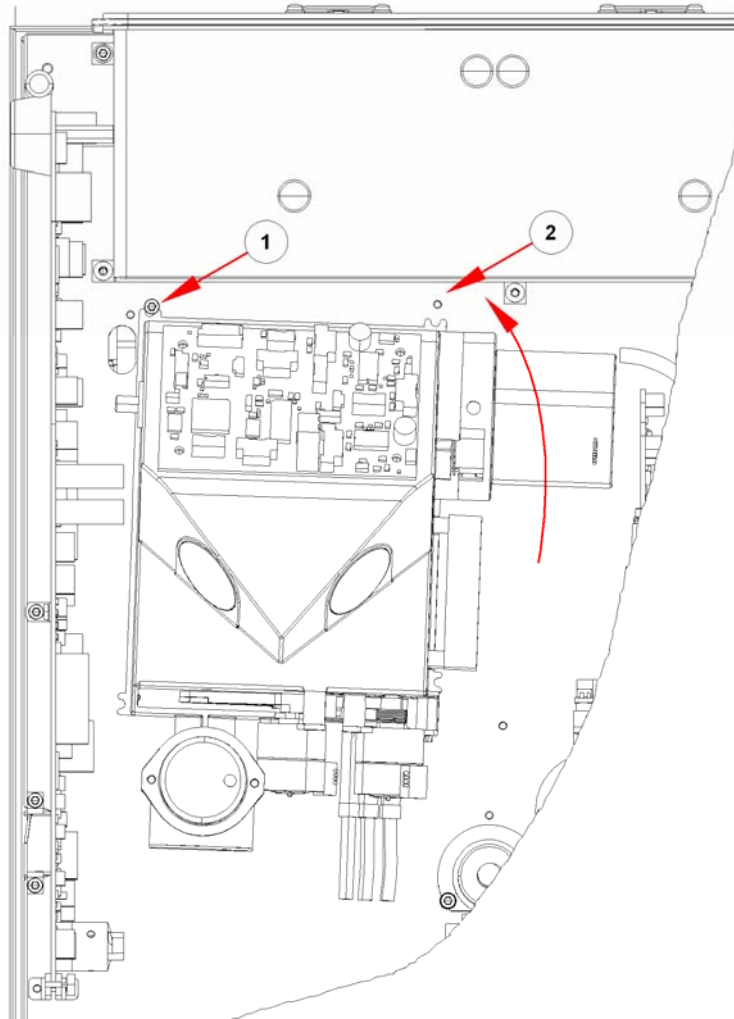
Figure 6-25: Replacing the MCR Module

Required Tests and Settings

1. Restore the instrument settings
2. Please see 11 Required Tests & Settings for all required tests and settings.

Note
if you use a new MCR Module, use the settings
which are delivered with the unit.

Replacing the MCR Module Fibers

To replace the MCR Module Fibers, proceed as follows:

1. Remove the adapter screws (see No. 1 in the picture below) and remove the adapter (see No. 2 in the picture below)

2. Pull the fibers out of the adapter (see No. 3 in the picture below)
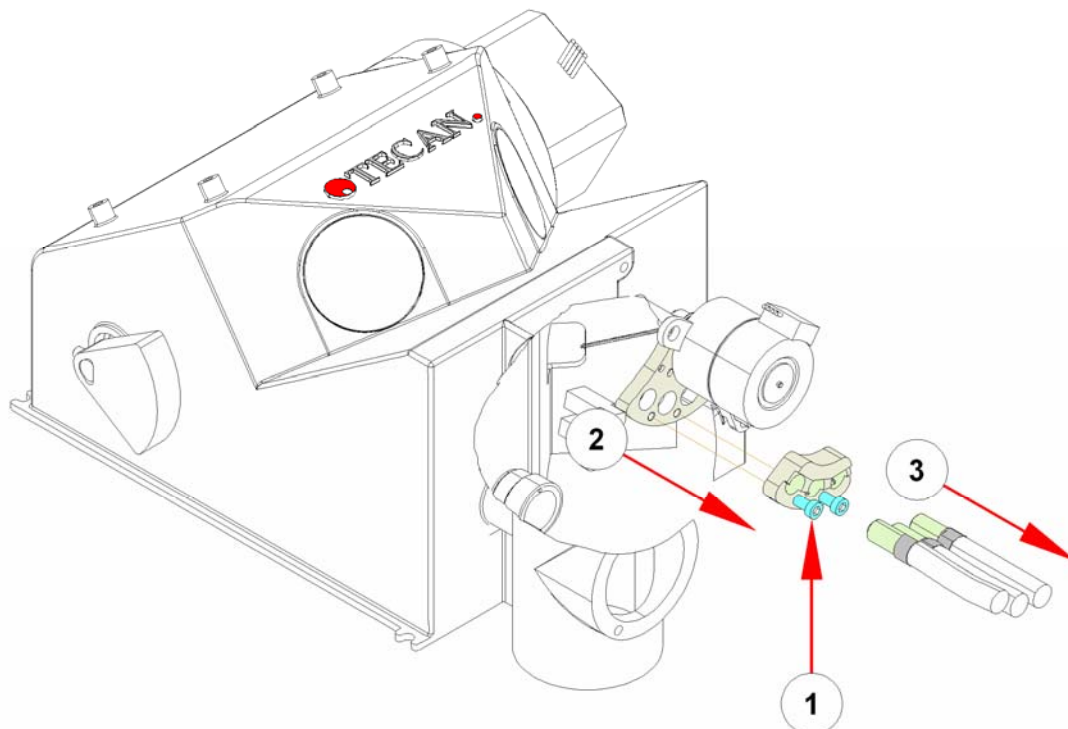
Figure 6-26: Replacing the MCR Module Fibers

3. To install the fibers, repeat the above steps in reverse order. See the following page for important information regarding the installation.

> *Note*
> *Insert all fibers into the MCR Module until mechanical stop!*
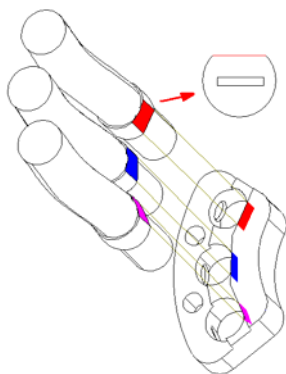
Figure 6-27: Replacing the MCR Module Fibers

1. The fibers must be inserted with the flat area in the correct orientation.
2. Secure the fibers with the set screws.
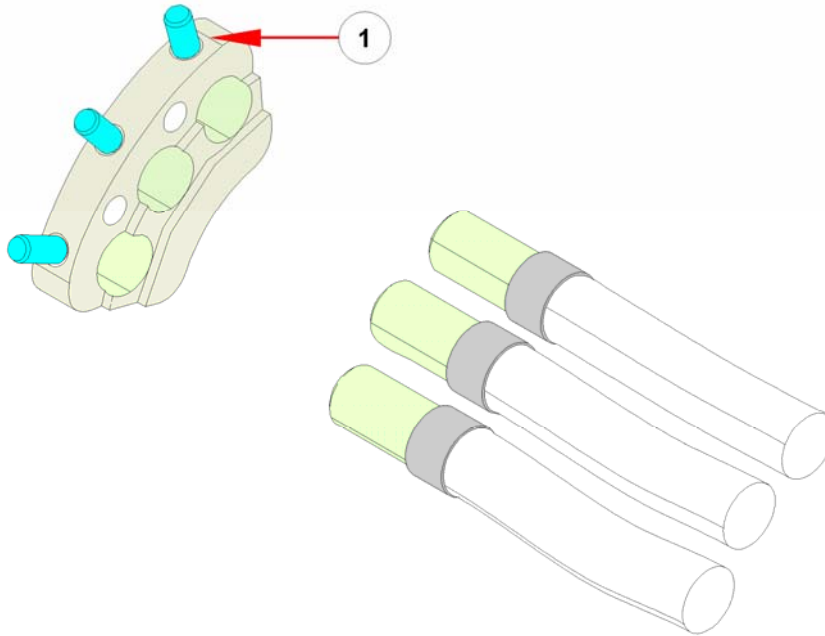
Figure 6-28: Replacing the MCR Module Fibers

3. Make sure each fiber is inserted at the correct position; see pictures on the following pages of fully loaded instruments.
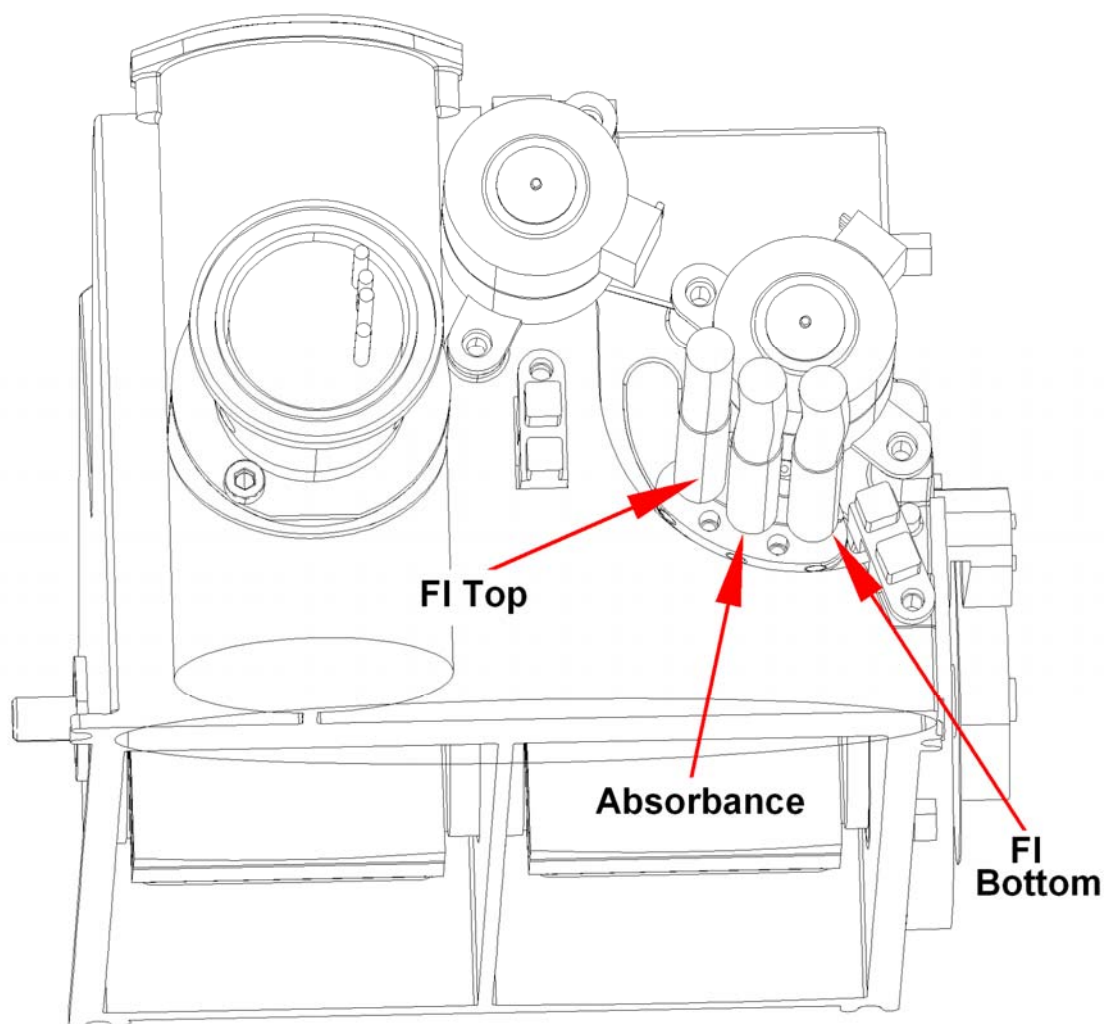
Figure 6-29: MCR Module Fully-Loaded infinite M200 (EX MCR)
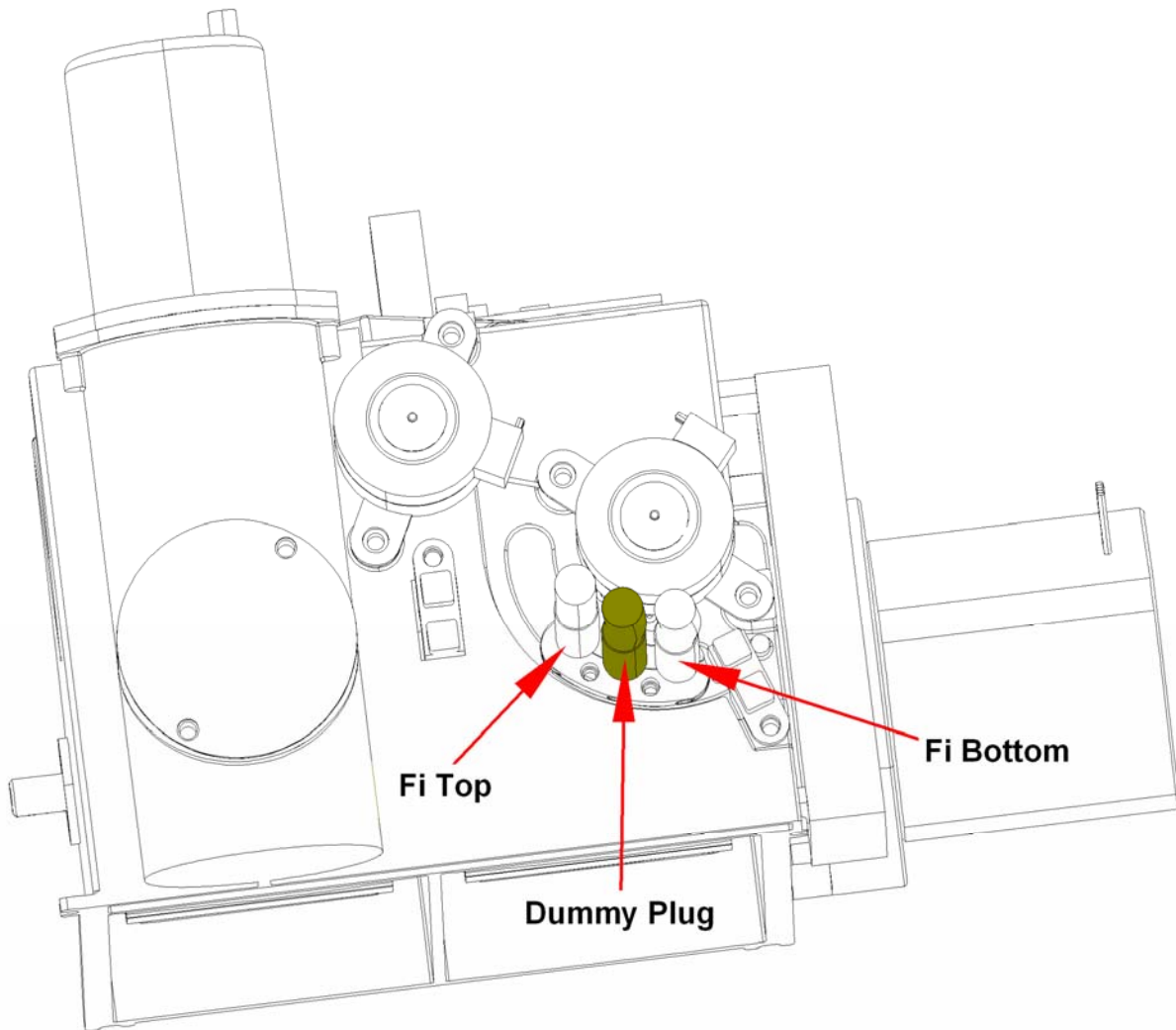
Figure 6-30: MCR Module Fully-Loaded infinite M200 (EM MCR)

6.10 Cuvette

The cuvette module consists of the cuvette carrier, cuvette motor, heating foil with temperature sensor, absorbance board and the motor board of the home sensor.
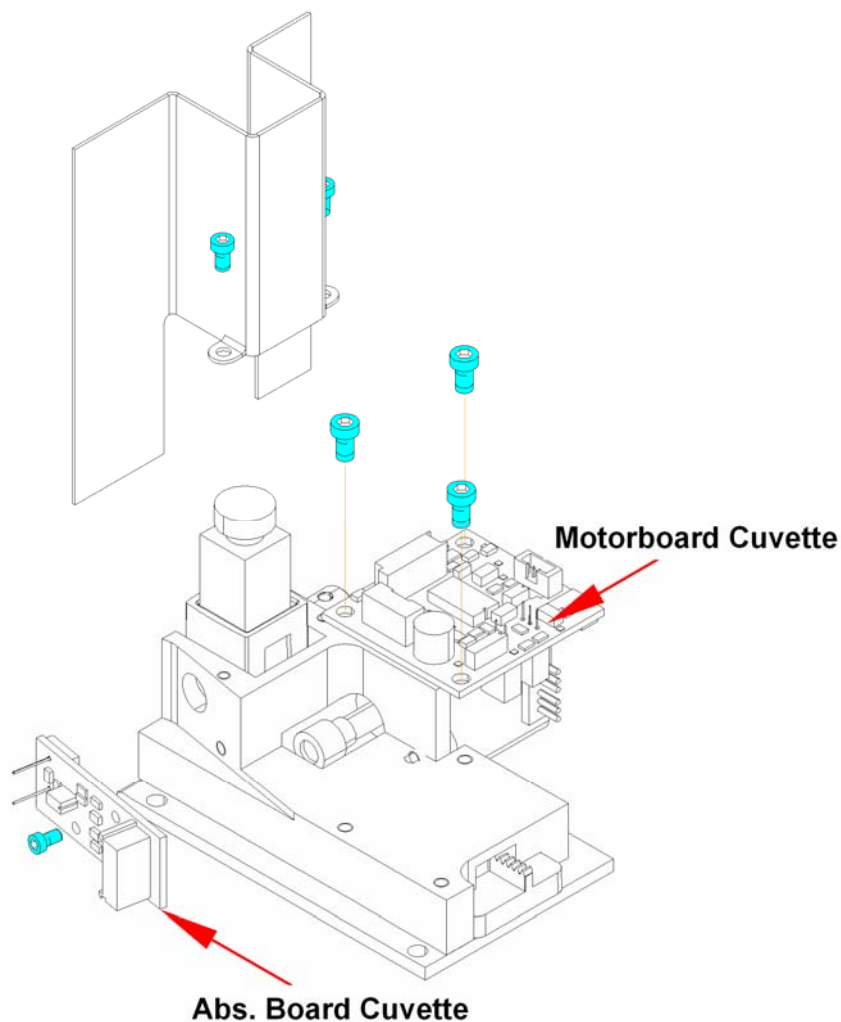
Figure 6-31: Cuvette

To remove the heating foil with temperature sensor, remove the two screws (marked in blue in the picture above).

To remove the absorbance board the motor board of the home sensor, remove the screws (marked in blue in the picture above).

To remove the cuvette carrier or cuvette motor, see below.
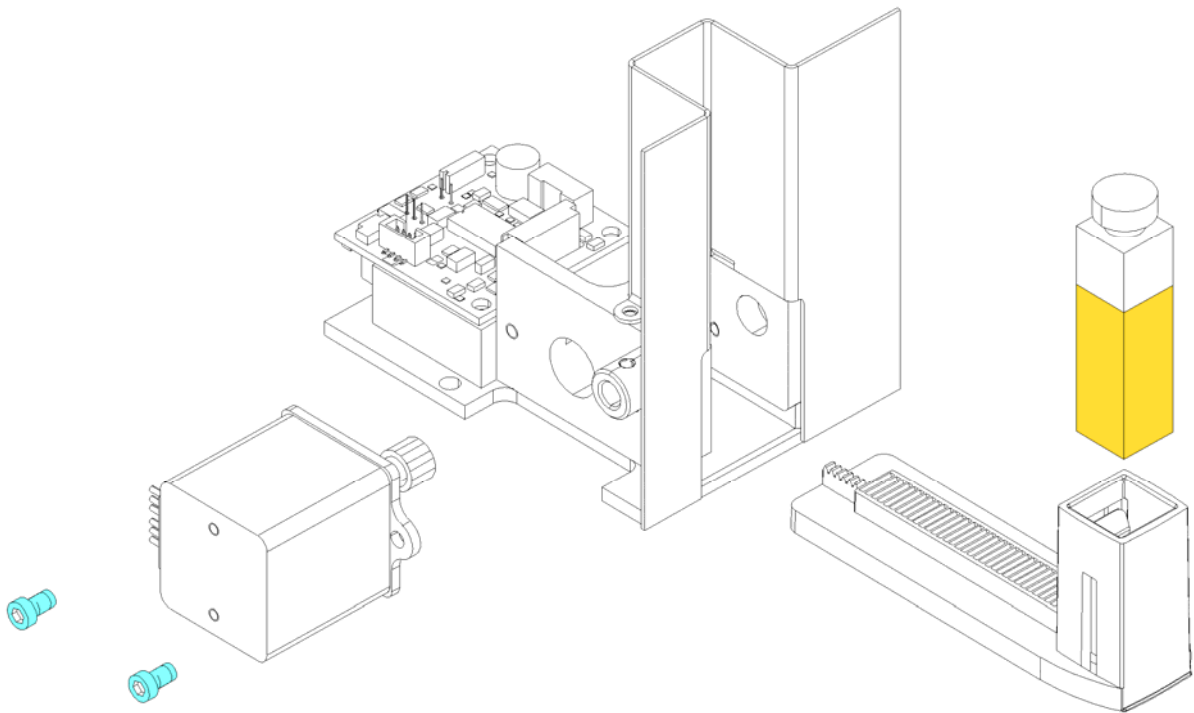
Figure 6-32: Cuvette

To replace the complete cuvette module, proceed as follows:
1. Save the instrument settings
2. Remove the cover
3. Remove screws
4. Disconnect all cables
5. Remove the fiber optic carefully
6. Remove the cuvette module
7. To install the cuvette module, perform the above steps in reverse order.

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

6.11 MTP Sensor

The plate ready sensor consists of two parts, sender and receiver that are positioned as shown in the picture below.
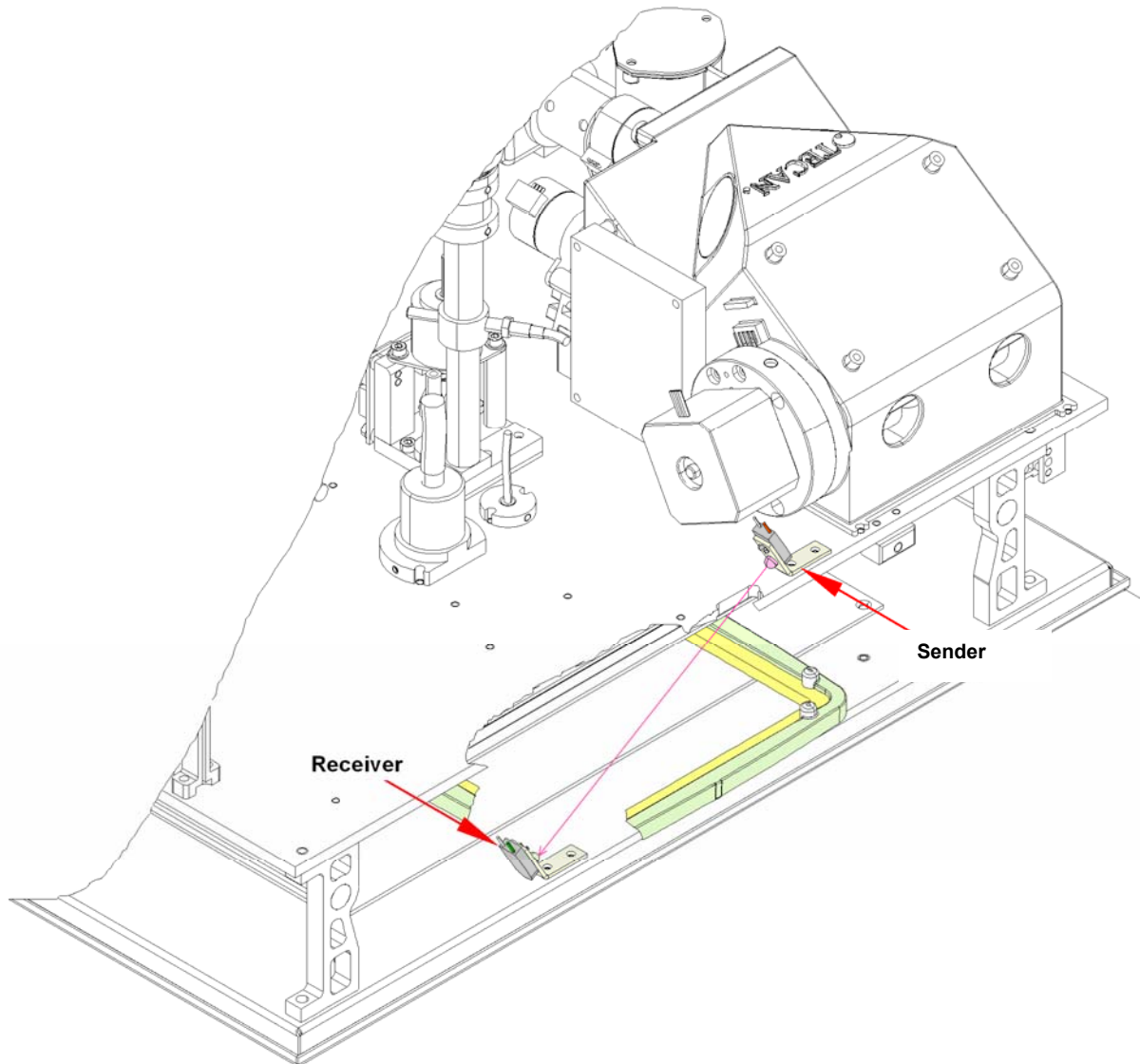
Figure 6-33: MTP Sensor – Sender and Receiver

To replace the MTP Sensor, proceed as follows:

1. Remove the cover
2. Remove 2 screws
3. Disconnect all cables from the main CPU
4. Remove the optic carefully
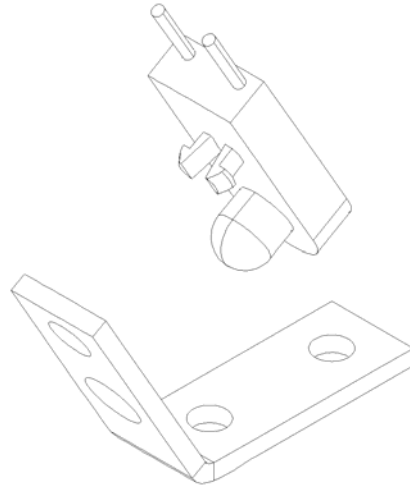
Figure 6-34: MTP Sensor

To install the sensor, repeat the above steps in reverse order.

the green part of this sensor is the lower one!

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

6.11.1   Adjusting the MTP Sensor

The mechanical offset of the plate transport when the sensor with a transparent Greiner 96-well plate row H shines through should hit the home position of the sensor - about 0.5 to 1 cm away from the edge of the Optic CPU. In addition, the plate carrier must be adjusted at this position and this motor position must be saved as the plate sensor offset.
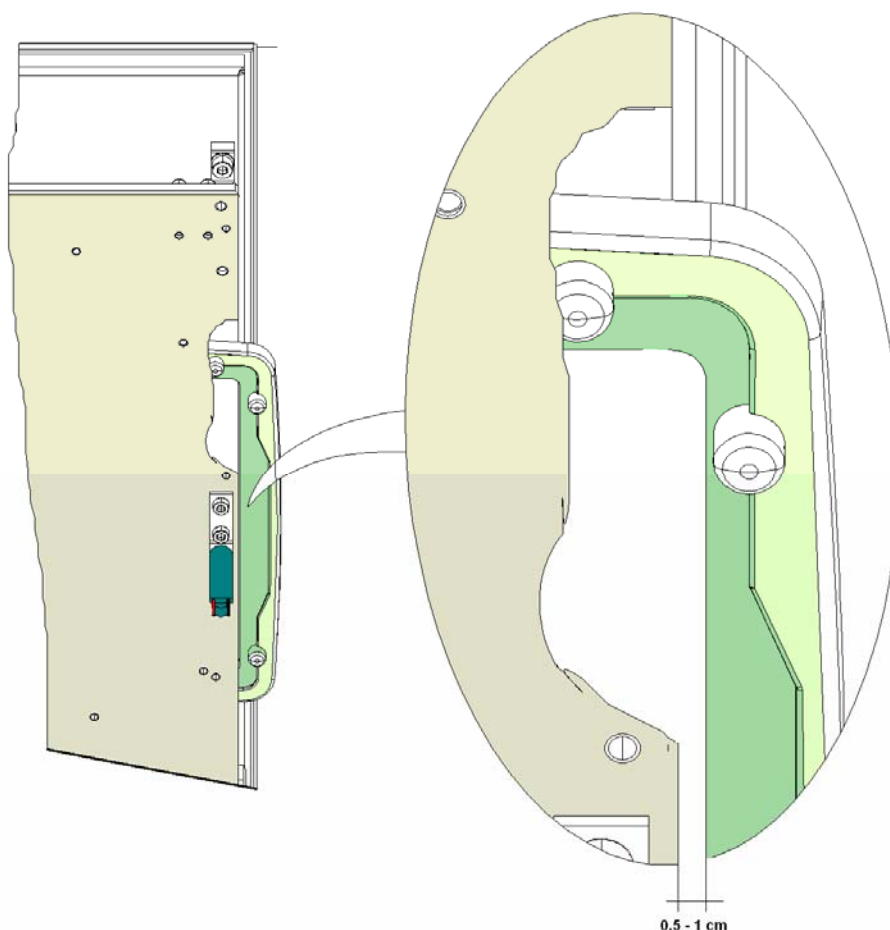

Figure 6-35: Adjusting the MTP Sensor

Then the value of the plate sensor in the offset position should be read, then the plate transport should be moved to the load position, a transparent plate should be inserted and the value of the plate transport should be read again.

The average value of both plate sensor values should be written to the instrument as the threshold value.

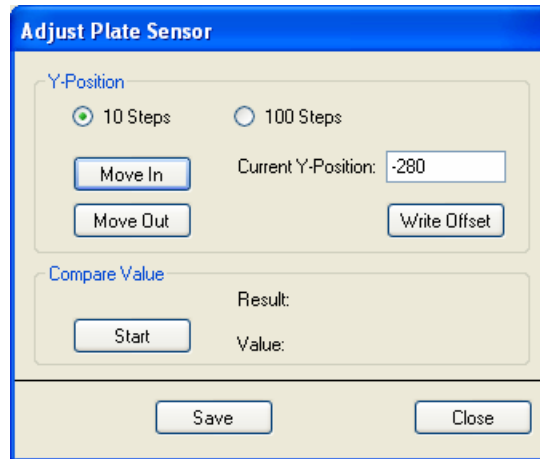The difference between the two plate sensor values must be at least 100.

Figure 6-36: Adjust Plate Sensor

Display:

Current Offset: Displays the current offset

Current Position: Displays the current motor position.

Plate sensor value: displays FAILED if the difference between the two plate sensor values is less than 100

Selection:

Move In/Out button: Move plate in or out.

10/100 steps *check box*: number of steps plate carrier motor

Se*t Offset* button: write current motor position as Offset to the instrument

Set Threshold button*:* write the threshold value of the plate sensor to the instrument

6.12   Bottom Optic

The bottom optic consists of the fluorescence mirror and the absorbance board. The position of the absorbance board depends on the instrument configuration and the options installed; see picture below.
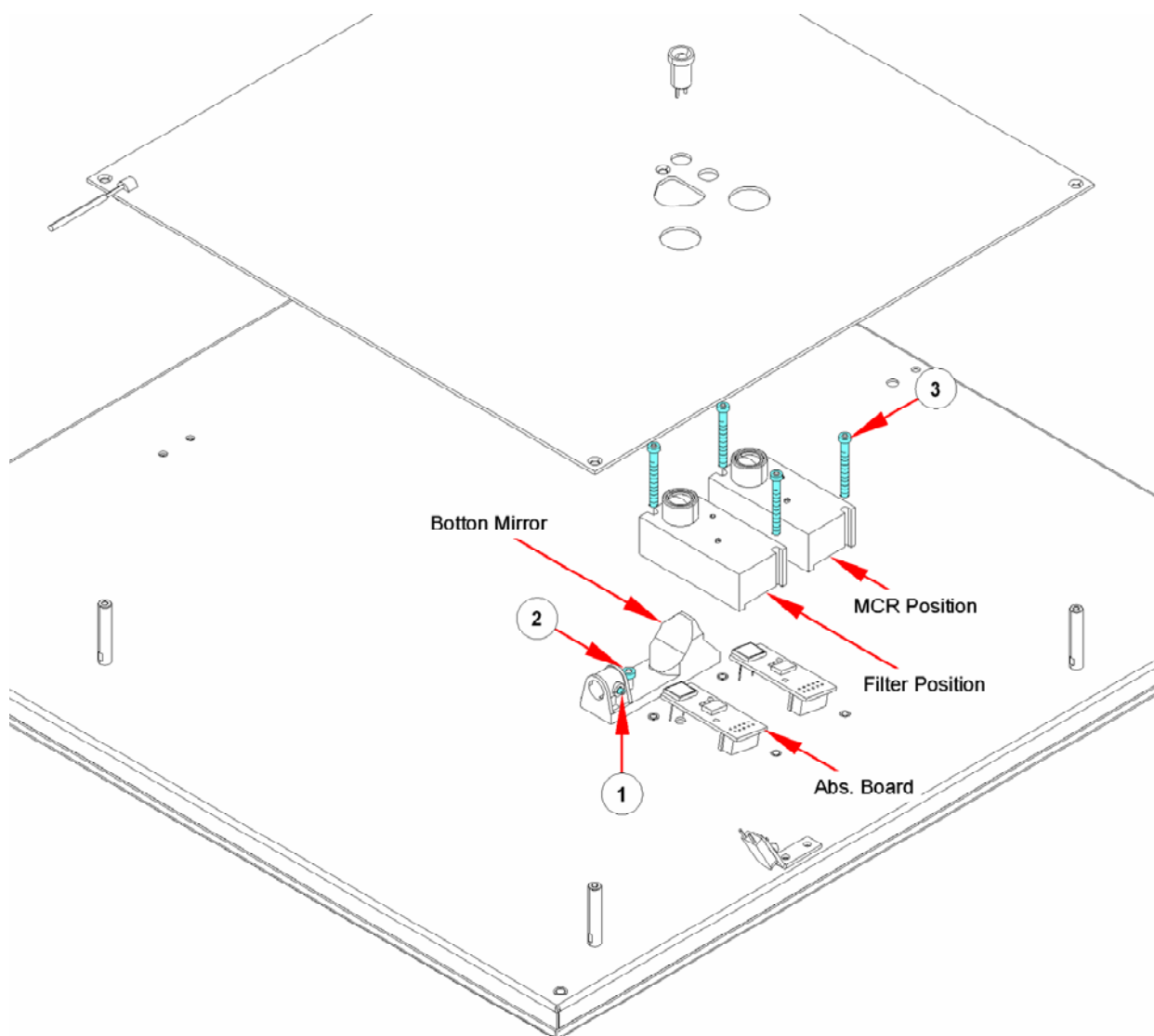

Figure 6-37: Bottom Optic

To replace parts of the bottom optic, proceed as follows:

Remove the screws No. 3 for the absorbance board

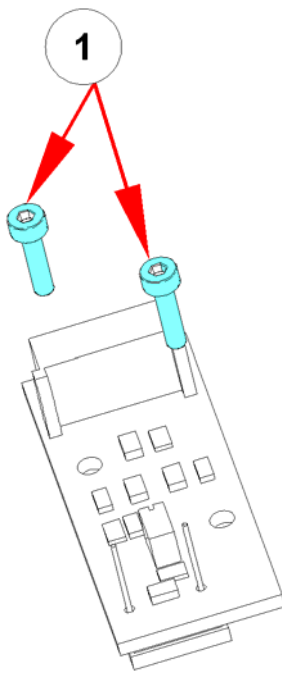Remove two screws No. 1 to replace the board see picture below

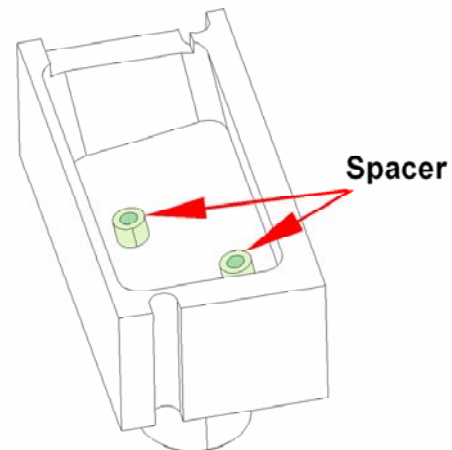Figure 6-38: Absorbance board   Figure 6-39: Bottom Optic Spacers

Be careful with the spacers

To replace the bottom fiber, loose the nut No. 1 and remove the fiber

To replace the bottom mirror screw out No. 2 and replace the mirror

Do all steps in reverse order

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

6.13 Replacing the Fiber Optics

6.13.1 FI Bottom Fiber

When replacing the Bottom Fiber it is very important that the end of the fiber is flush with the end of the connector.
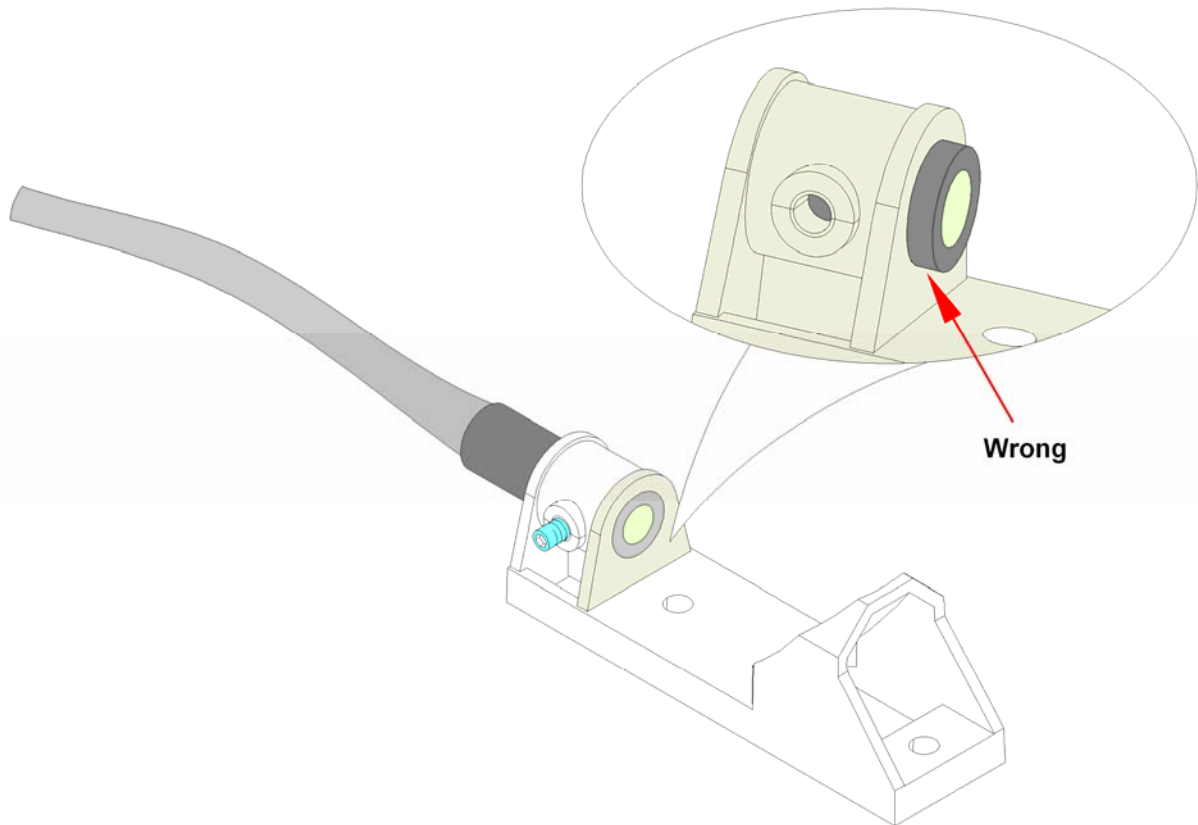

Figure 6-40: FI Bottom Fiber

> **Note**
> *Do not touch the end of the fiber!!*

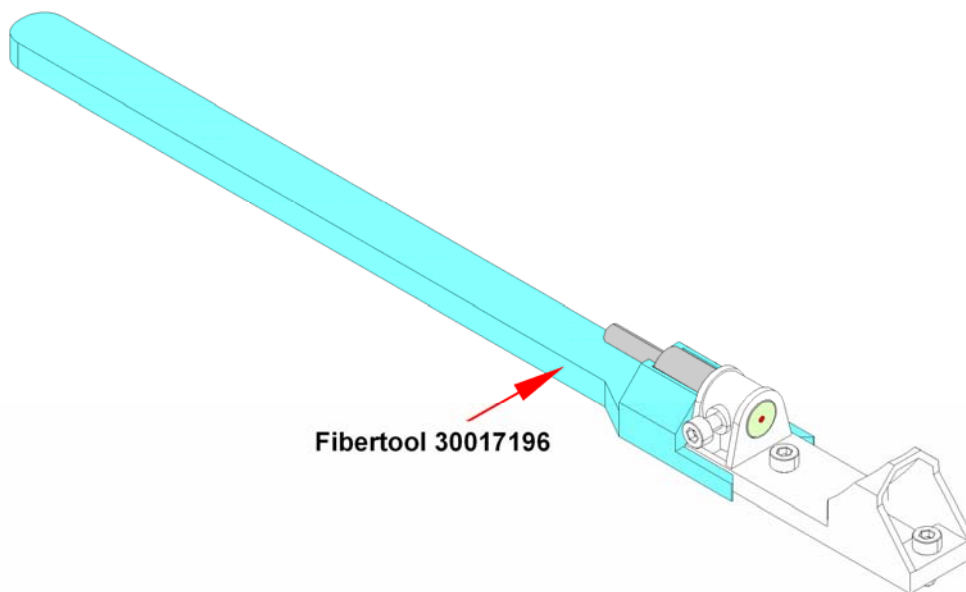Please use the Fiber Tool (SAP No. 30017196) to adjust the fiber and to insert it into the mirror! see picture below!

Figure 6-41: Fiber Tool 30017196

Tighten the nut carefully and remove the tool.

6.13.2 Absorbance Fiber

The Absorbance Fiber must be inserted into the measurement head until mechanical stop. It is very important not to forget to install the washer (SAP No. 30016551) again!
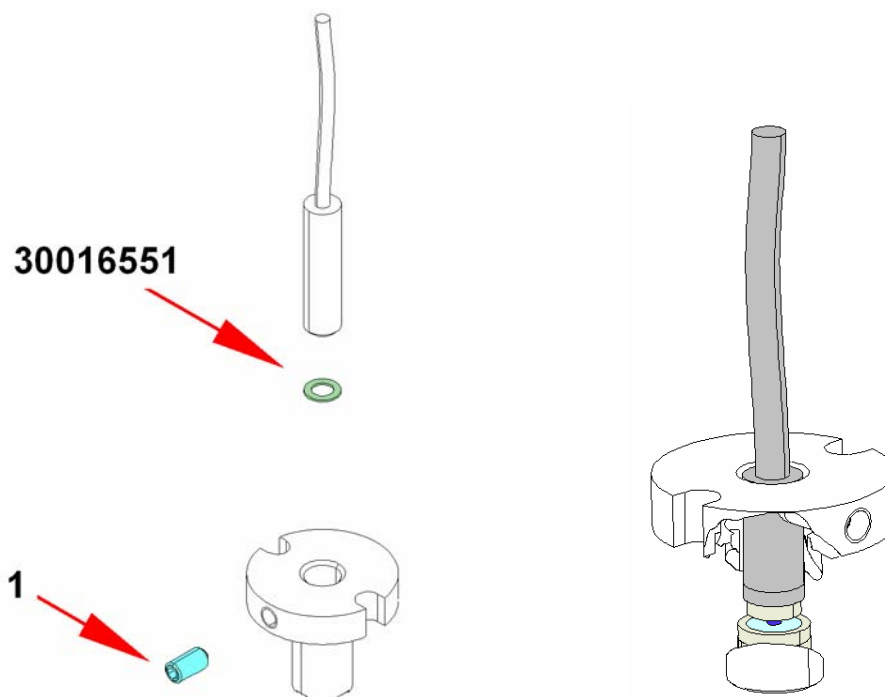

Figure 6-42: Absorbance Fiber

6.13.3   FI Top Fiber

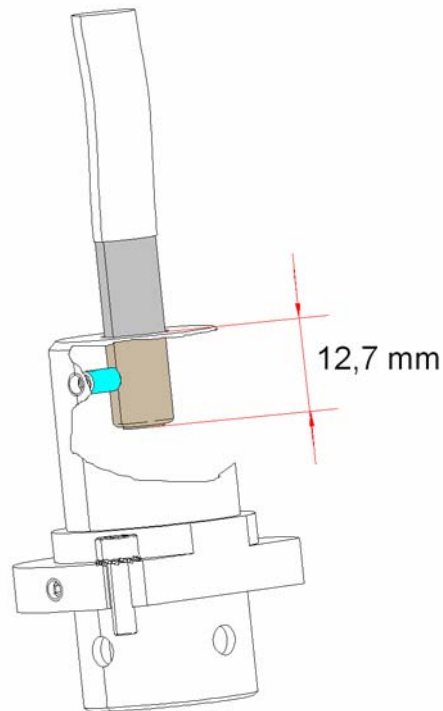Die FI Top Fiber must be inserted exactly 12.7 mm into the measurement head!

Figure 6-43: FI Top Fiber

When installing the measurement head it is very important that the flat side faces towards the front of the instrument, see picture below.
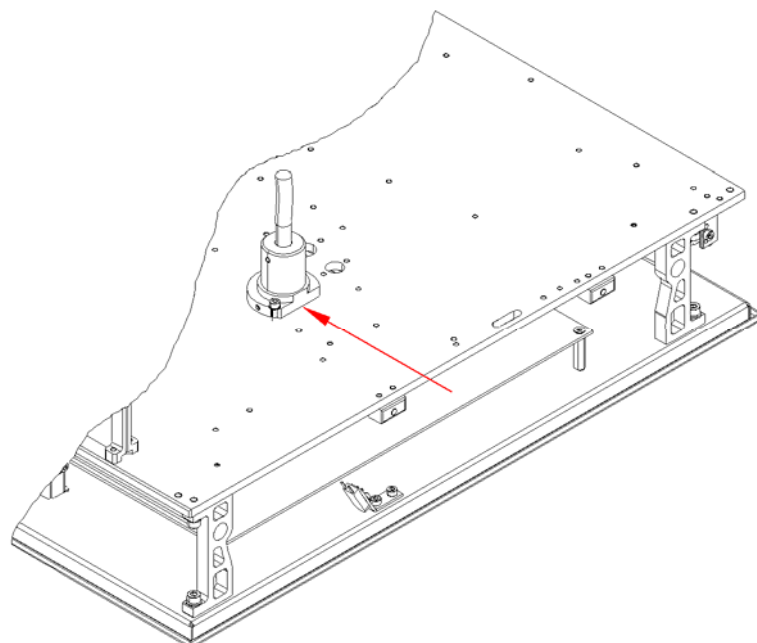

Figure 6-44: FI Top Fiber

7. Mechanical System

The **infinite 200** mechanical system consists of the following sections:

- Plate Transport System
- Cooling Fans
- Lower Heating Plate

## 7.1 Instrument Covers

7.1.1 Replacing the Main Cover

The main cover consists of one part.

To remove it, perform the following procedure:

1. Open the plate transport door and remove the screws (see No. 1 in the picture below)

2. Remove the cap from the top of the cover (see No. 2 in the picture below)

   - **With injector** (see "with injector" in the picture below) remove the tip and with wrench (SAP No. ???) remove the parts.

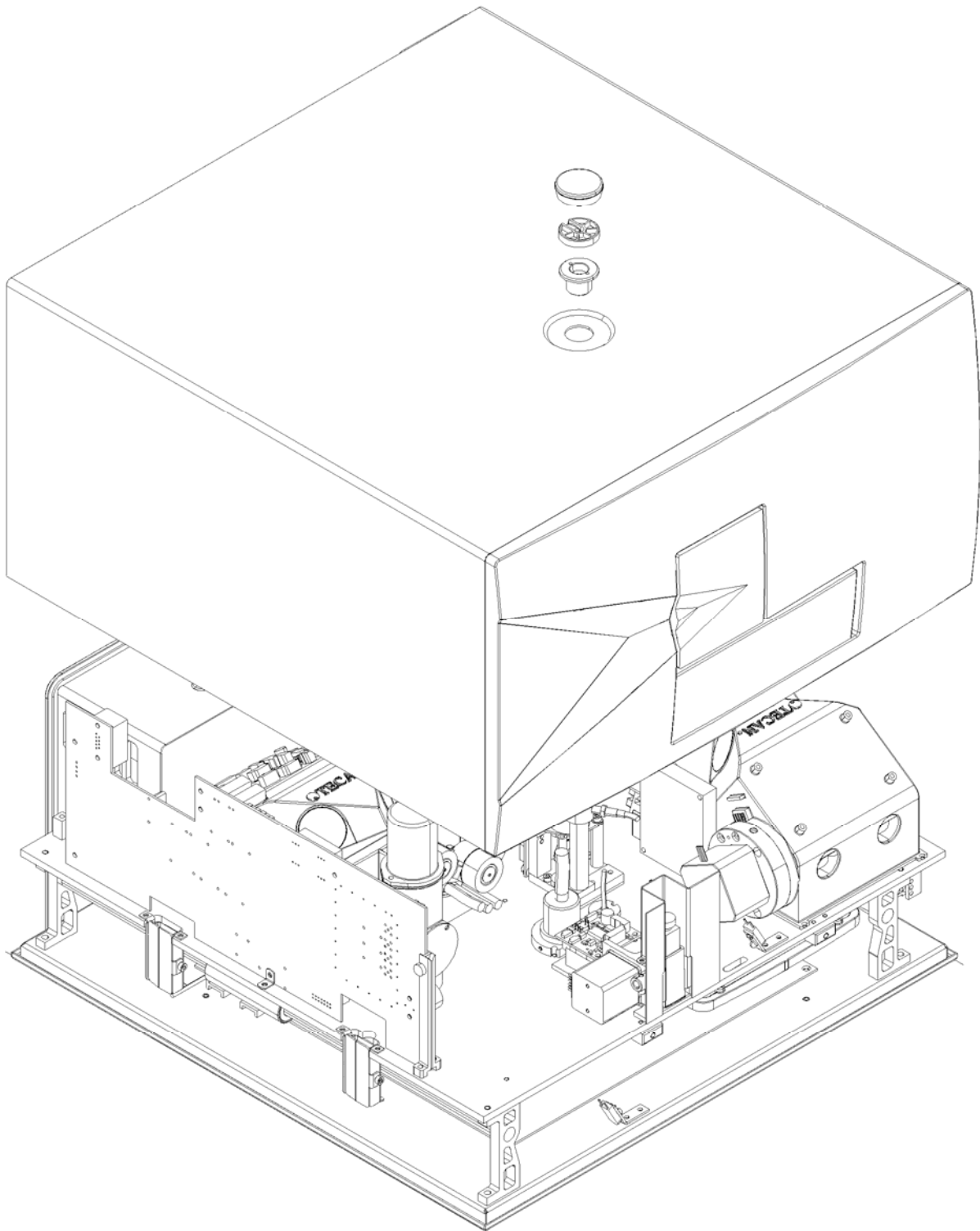   - **Without injector** (see No. 3 in the picture below) remove the parts with an Allen key.
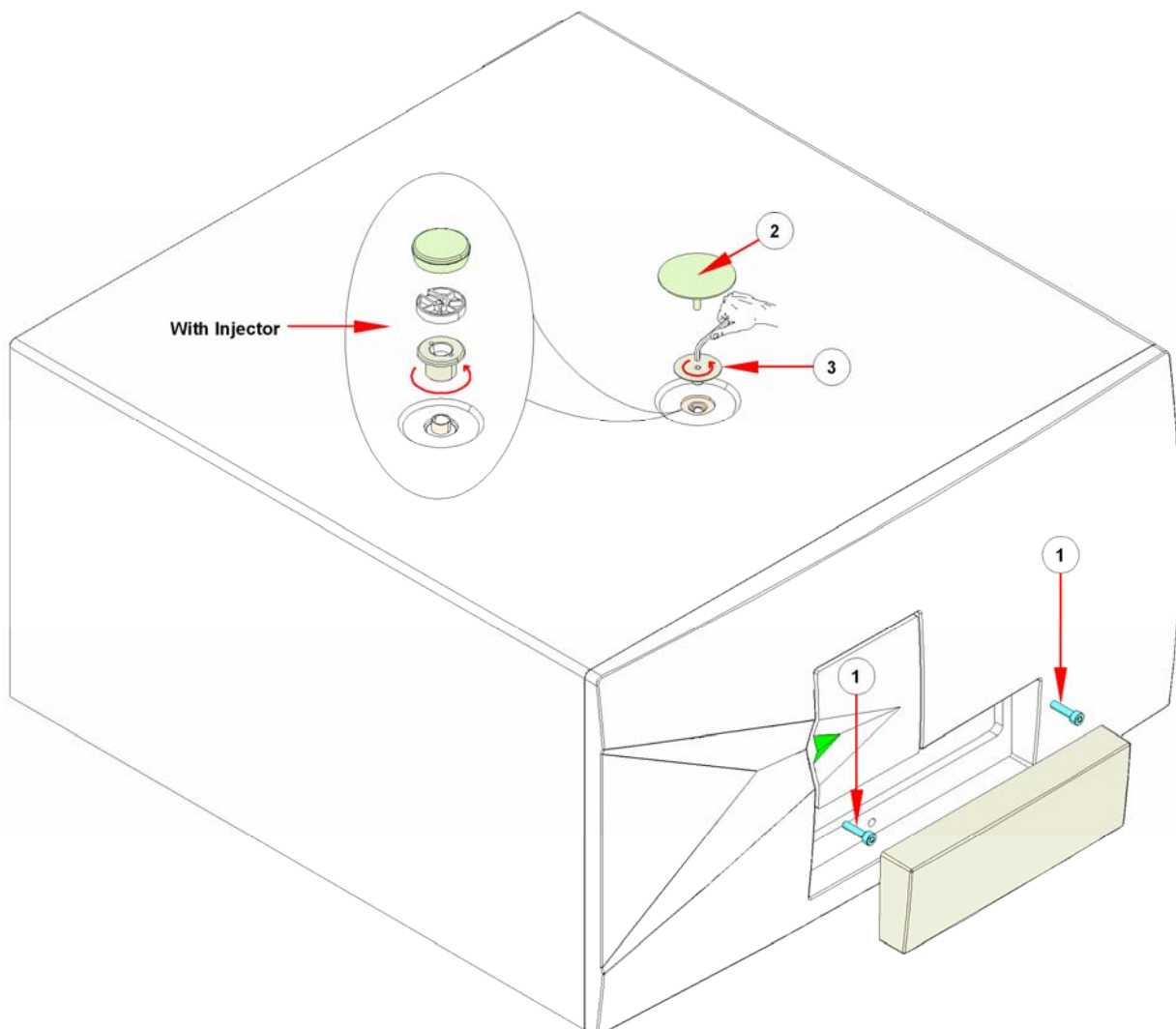
3. Remove the screws from the rear panel of the instrument
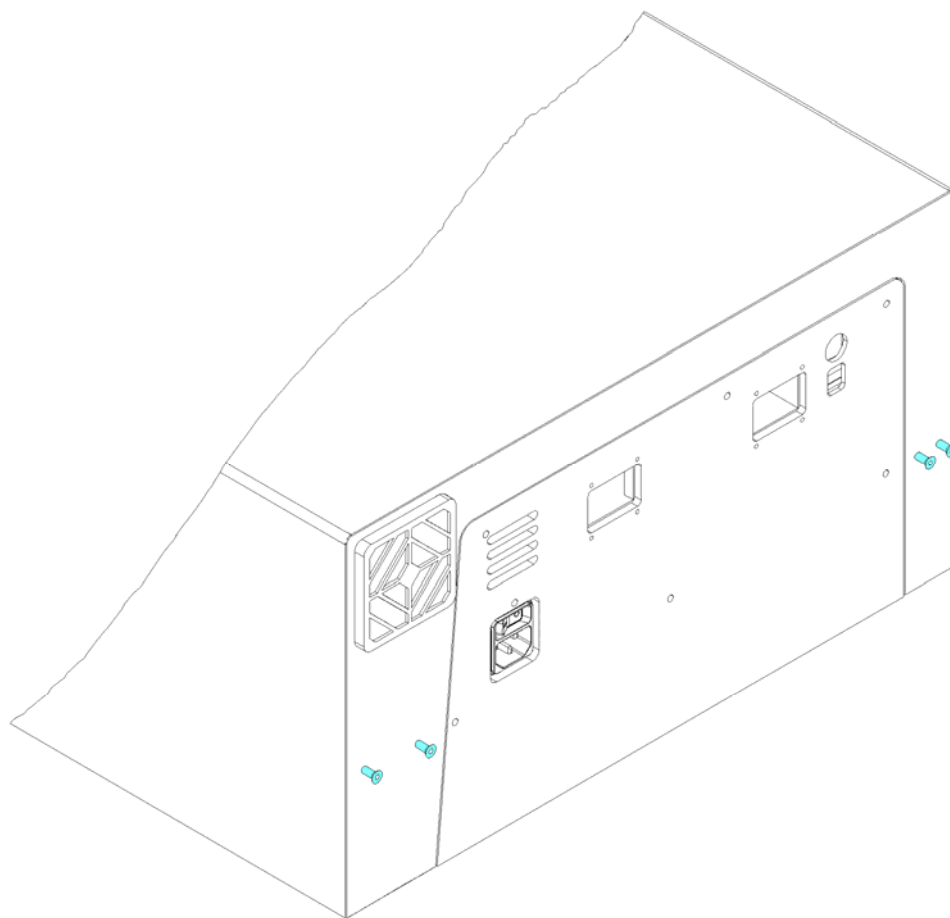
4. Lift the cover up slightly and remove the cable to the front LED

5. Remove the cover completely

6. To replace the cover, perform the above steps in reverse order.

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

7.1.2 Removing the Front Cover

The front cover is attached to the main cover with screws and can only be removed after the main cover has been removed from the instrument chassis.

To remove it, perform the following procedure:

1. Turn the main cover over
2. Remove the screws from the inside
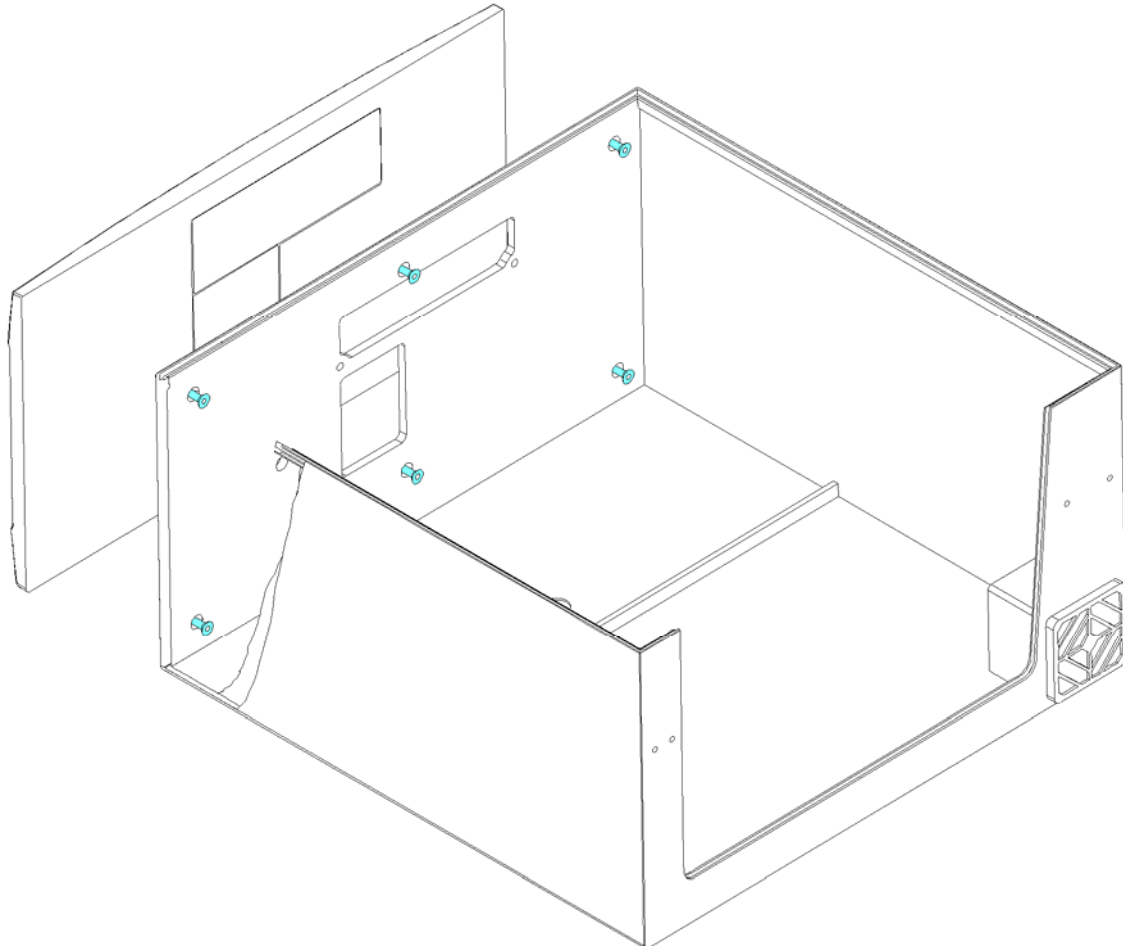
3. To replace the cover, perform the above steps in reverse order.

7.2 Plate Transport System

The **infinite 200** plate transport system consists of:

- Plate carrier
- X drive with X home sensor
- Y drive with Y home and load position sensor
- Transport cover

The transport system has been designed for very precise positioning of the plate carrier to ensure very accurate and sensitive measurements in all plate formats up to 384-well microplates.

7.2.1 Removing the Optical Unit

To work on the plate transport and on the bottom measurement heads, the entire optical unit can be removed and turned over.
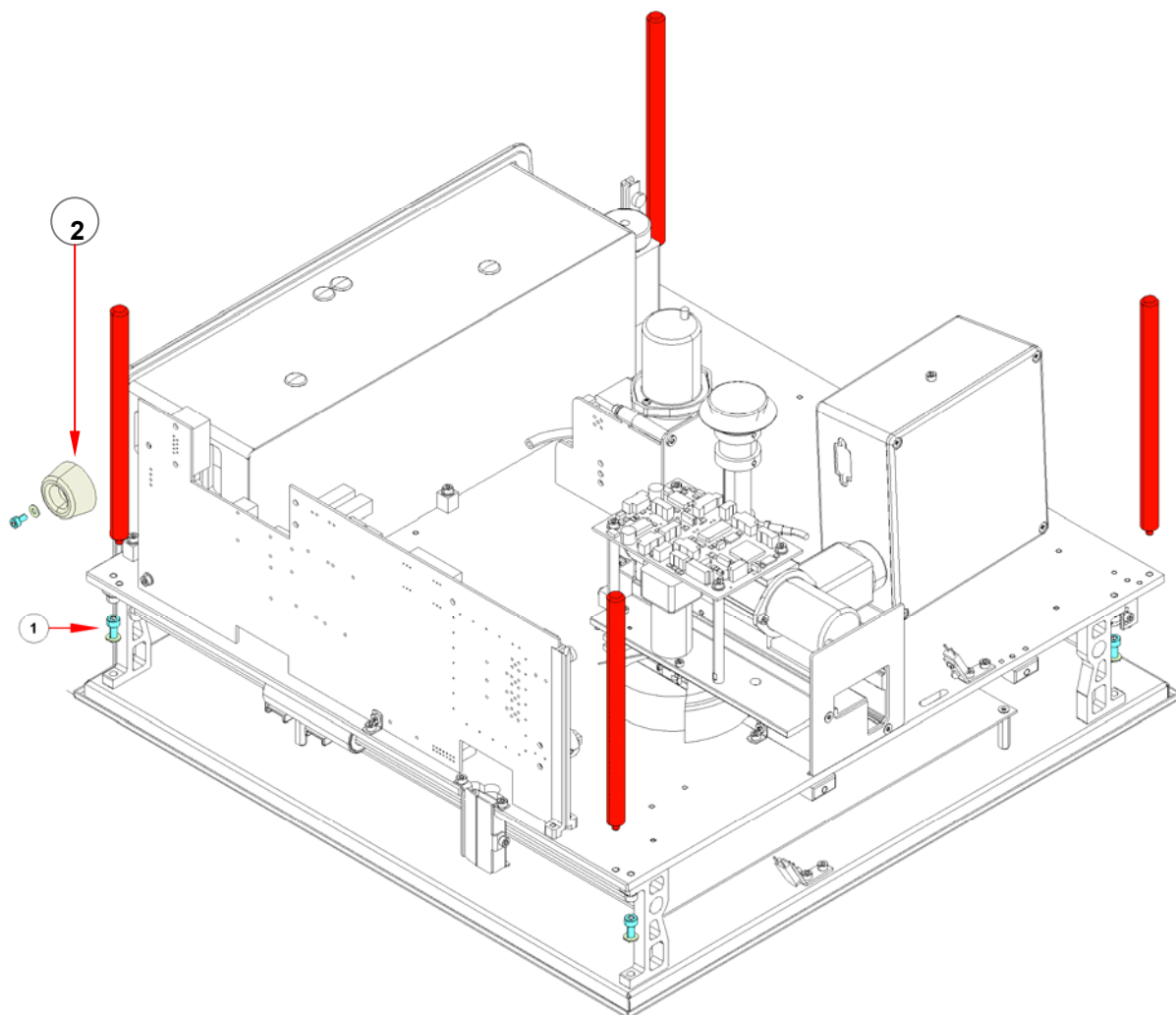

1. Install the four pins (marked in red in the picture above) and the rubber bushing (No. 2).
2. Remove the screws, which attach the spacers to the bottom plate (see No. 1 in the picture above)

3. Remove the ribbon cable from the holder (see No. 1 in the picture below).

4. Rotate the optical unit 90°, so that it sits on the rubber foot (see "service rubber in the picture below).

Note
Carefully turn the optical unit over and look at the plate transport!
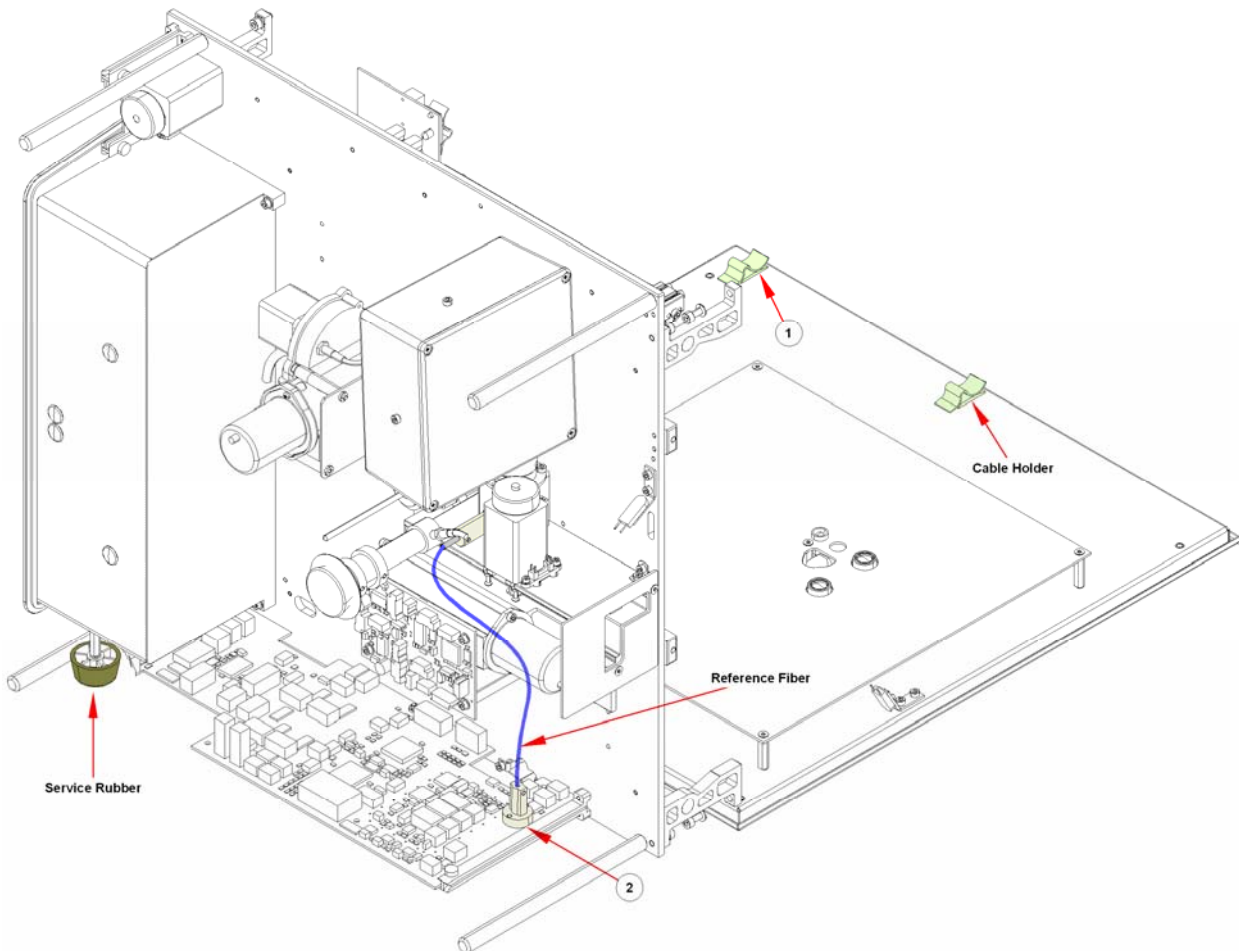
5. To turn the optical unit completely over onto the pins, the ribbon cable and reference fiber (No. 2 in the picture above) must be removed from the CPU.
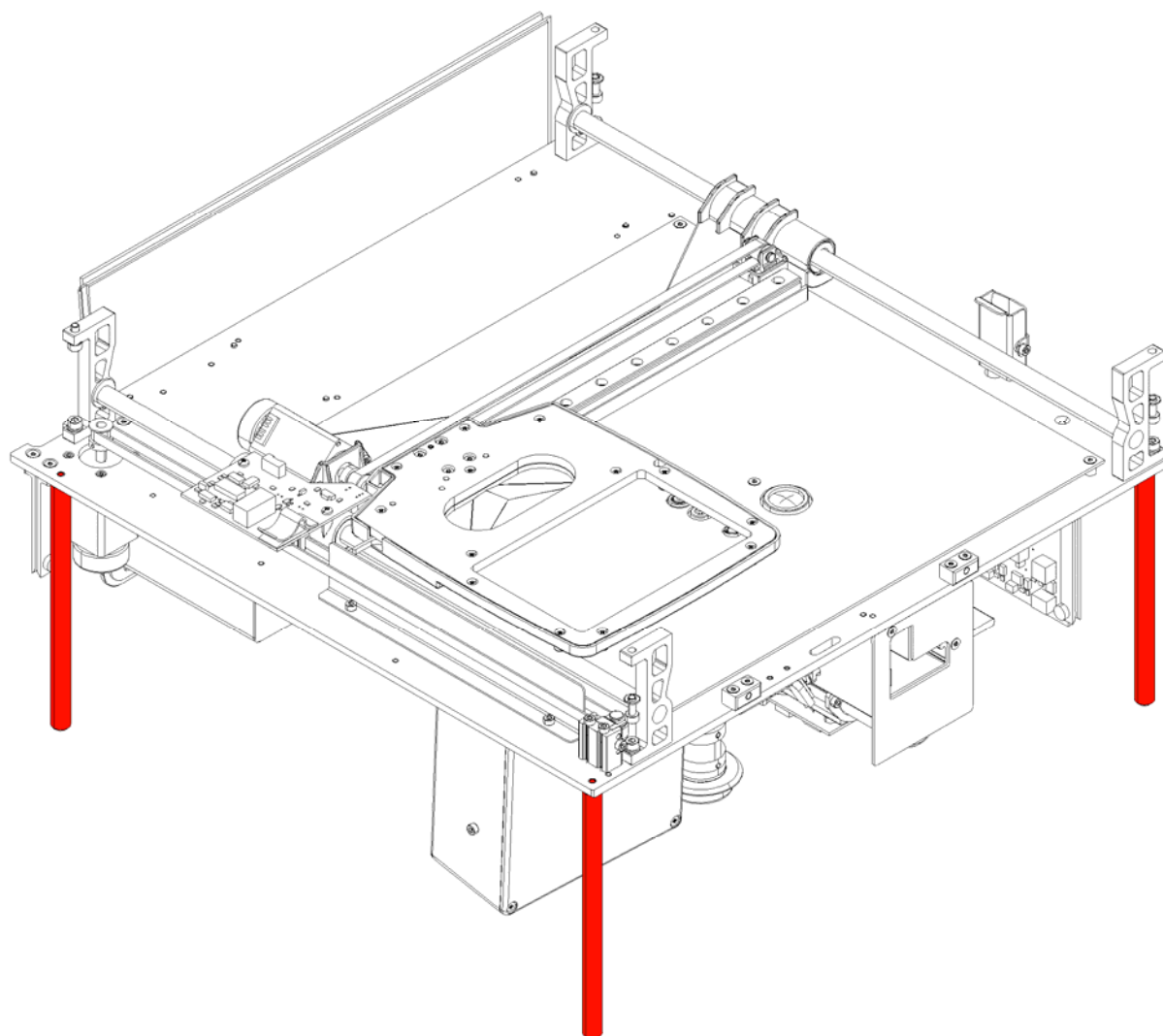
4.   To replace the optical unit, perform the above steps in reverse order.

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

7.2.2 Replacing the X-Transport

To work on the x-transport, the transport must be removed from the instrument chassis (see picture below).

1. Remove the four screws from the transport guide (see No. 1 in the picture below).
2. Remove the screws from the belt tension unit (see No. 2 in the picture below).
3. Use the end piece of the transport guide as spacer between the optical unit and bottom plate (see No. 3 in the picture below).
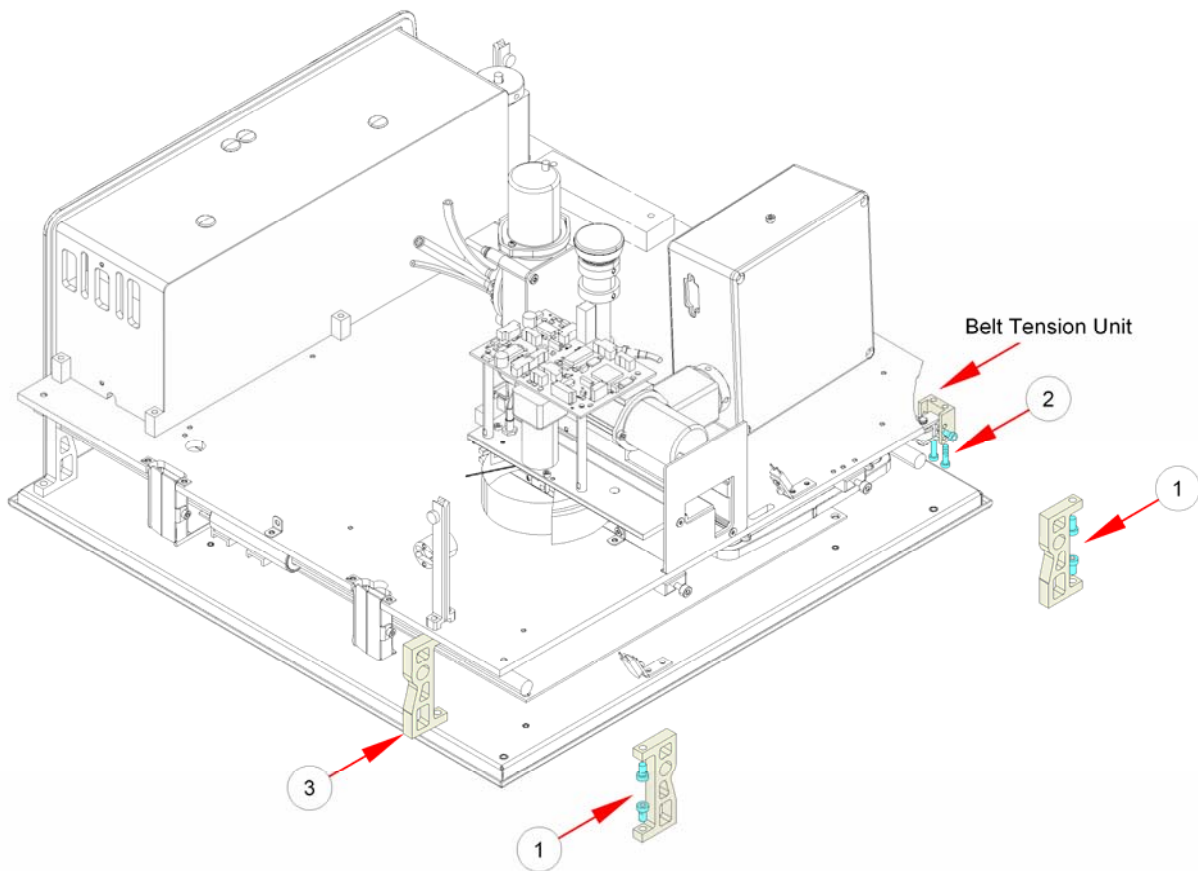
4. Disconnect all plugs and remove the x-transport
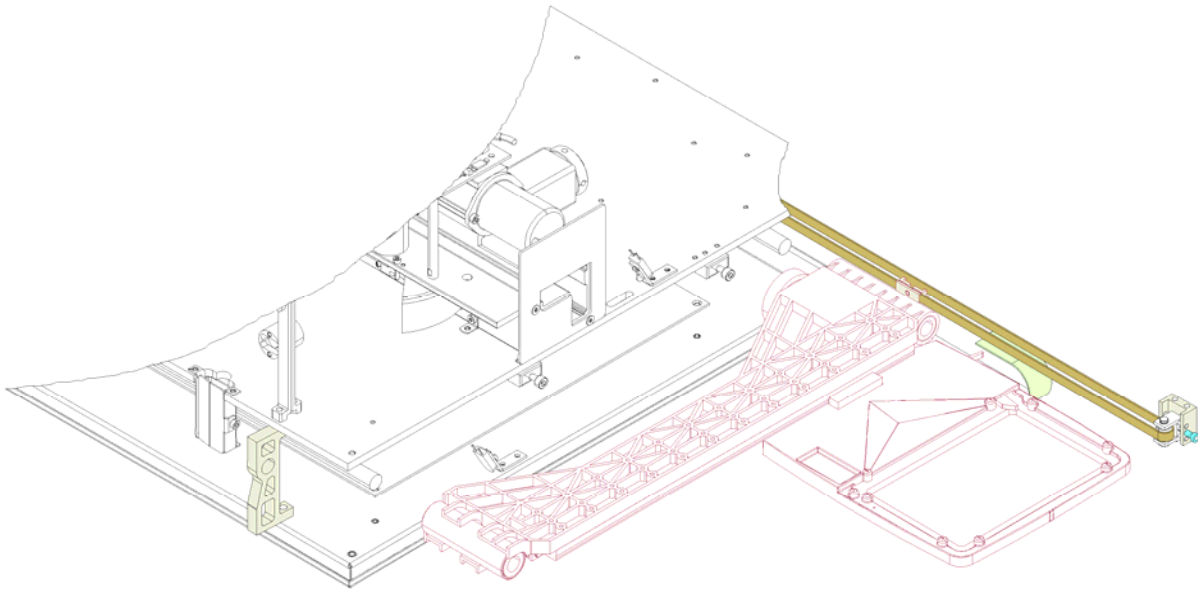
5. During the replacement of the x-transport, check the belt tension of the belts for the y and x axis.
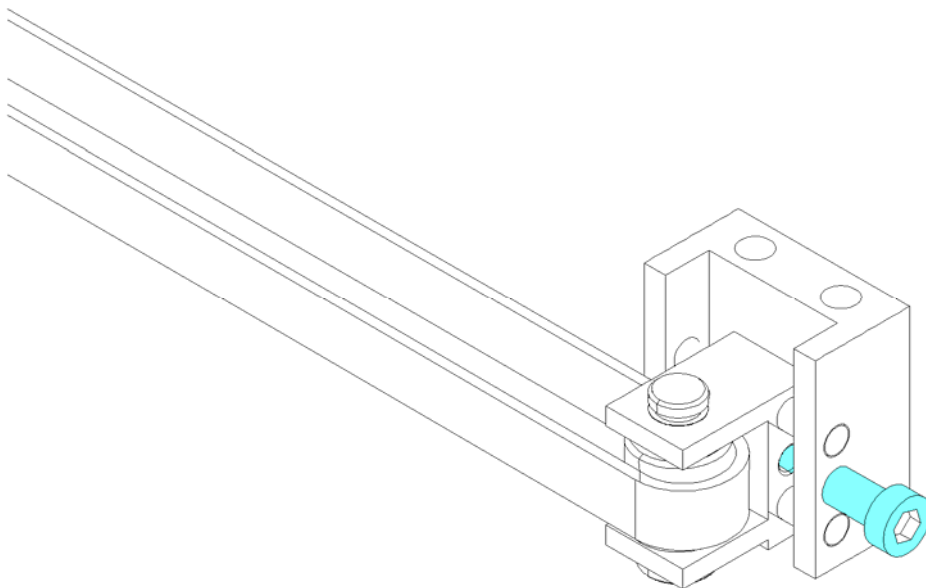
6. Tighten or loosen the screw (marked in blue in the picture above) to achieve the correct belt tension.

7. Use the belt tension meter to check the tension of both belts. The belts of the **infinite 200** contain no metal, so you have to use a paper clip to check the tension. (see picture above)

8. The tension should be 63.5 +/- 5Hz for the x axis and 50.5 +/- 5Hz for the y axis!

9. To install the x-transport, repeat steps 1 - 4 in reverse order.

Required Tests and Settings

1. First of all it is very important to check the inclination of the plate transport. Set up the alignment tool like the blue spot and move the transport on the y-axis motor balance wheel. The transport must be 0.1 mm higher in the front of the transport where the + 0.1 mm label is.
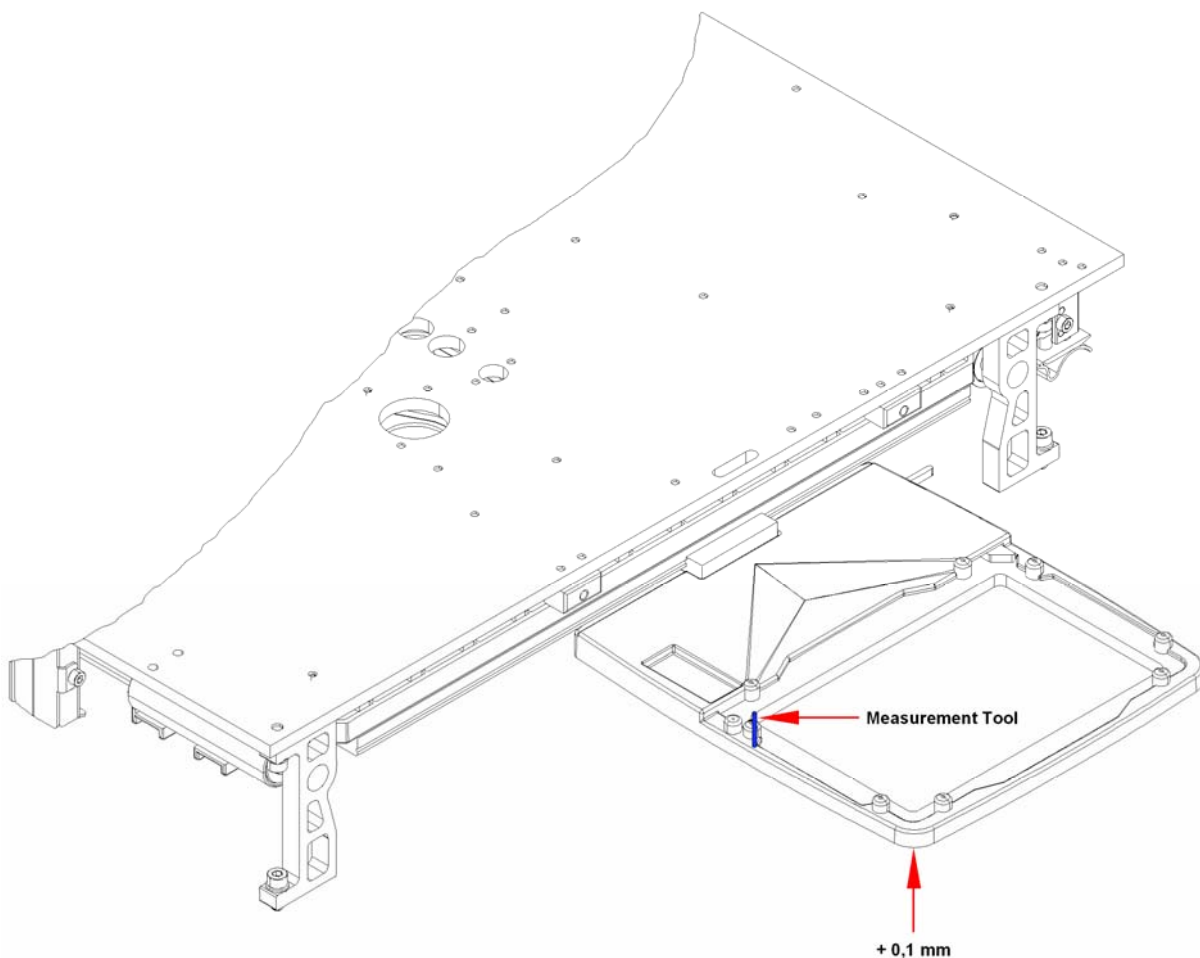
2. If it is not 0.1mm then adjust the plate carrier as shown in the next picture below.

3. Loosen the two screws (No. 1 in the picture below) and turn the nut (No. 2 in the picture below) in or out depending on the measurement result.

4. Tighten the screws again and take a new measurement.
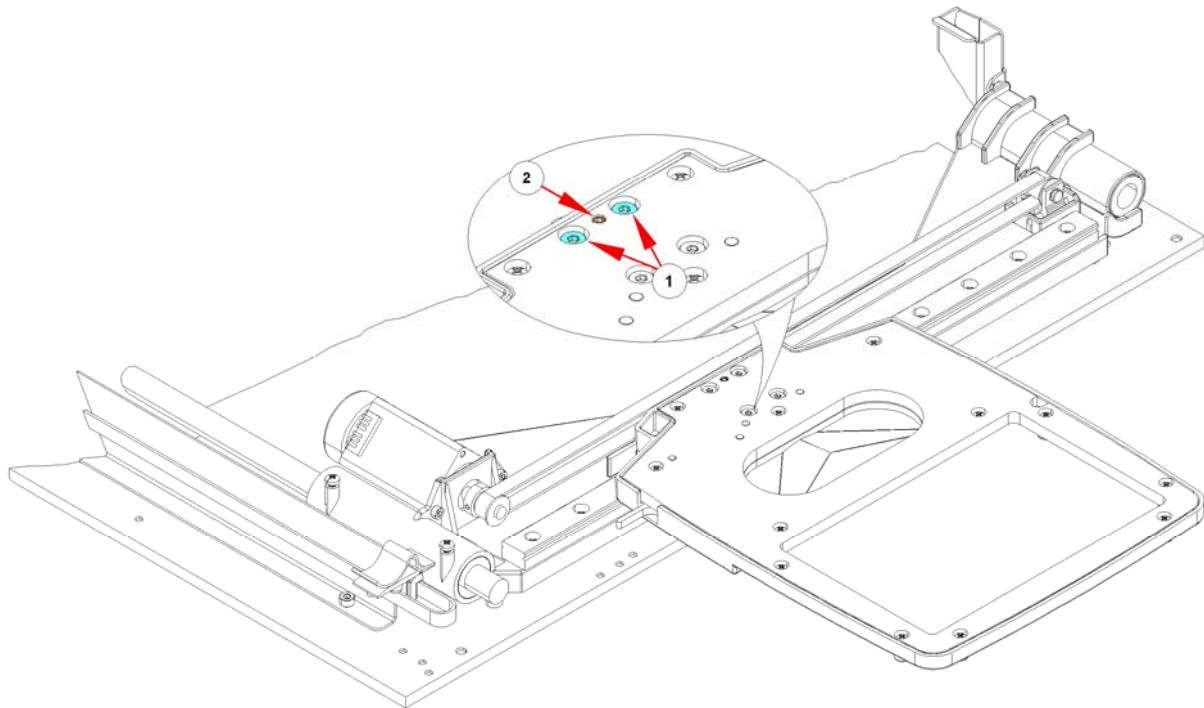
5. Please perform the Plate Transport Dial Gauge Test, see 5.6.5 Transport Tests; page 5-49.

6. Please see 11 Required Tests & Settings for all required tests and settings.

7.2.3 *Replacing the X-Transport Motor*

Use the following procedure to replace the motor:

1. Remove the X-Drive Board
2. Remove screws (see No. 2 in the picture below)
3. Remove Motor (see No. 3 in the picture below)
4. To install the X-Transport Motor, repeat the above steps in reverse order; be careful with the belt.
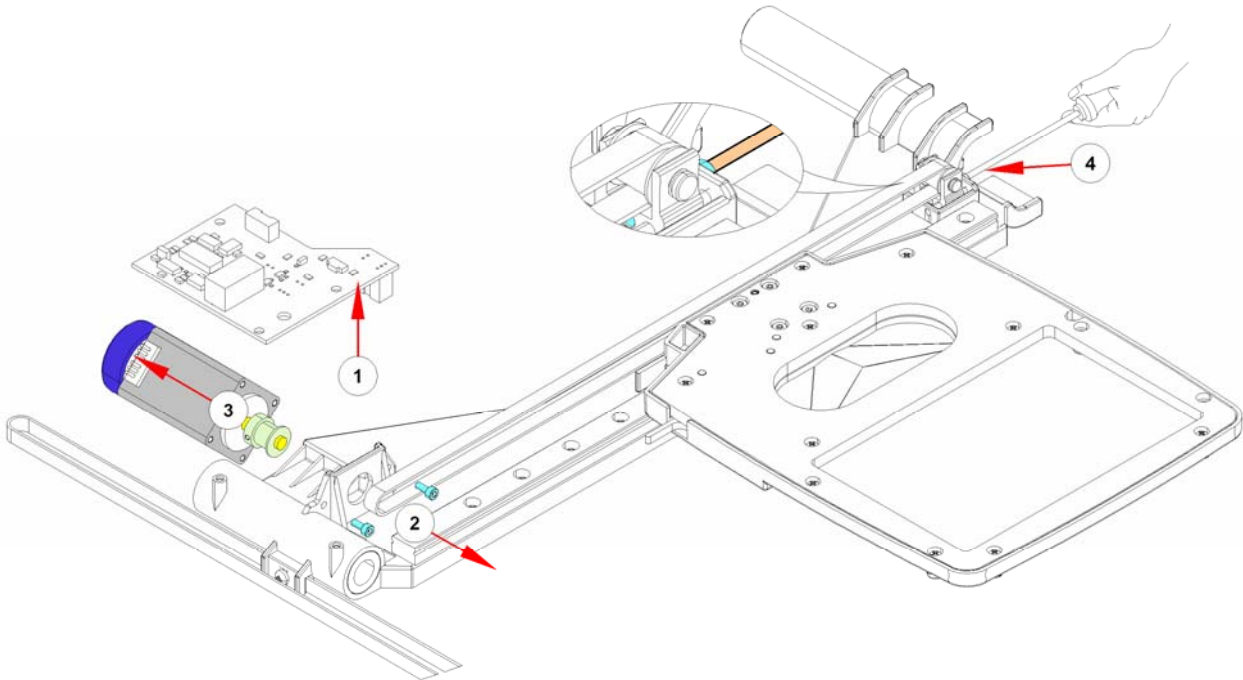
Required Tests and Settings

1. Check the belt tension (see No. 4 in the picture above) The tension should be 63.5 +/- 5Hz for the x axis
2. To check the belt tension move the ball bearing guides a little bit away.
3. Please see 11 Required Tests & Settings for all required tests and settings.

7.2.4 Replacing the Y-Transport Motor

The Y-Transport Motor is attached to the Optical Unit plate. Use the following procedure to replace the motor:

1. Remove the cover
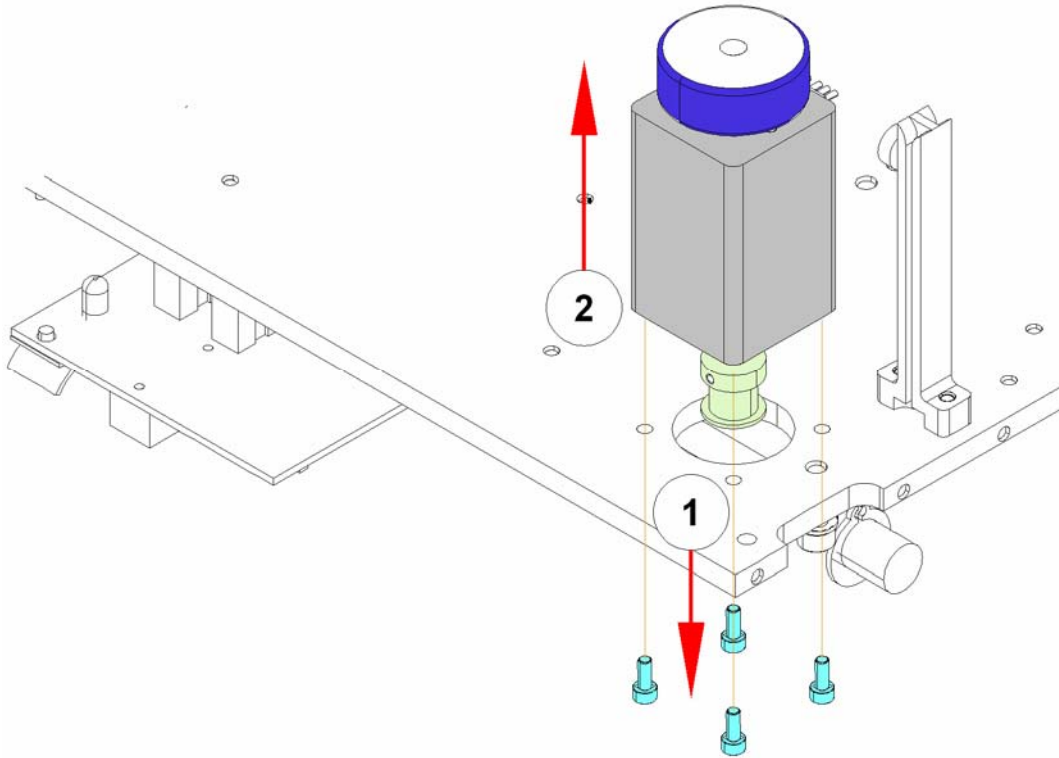
2. Disconnect the motor from the Optical Unit plate
3. Remove screws (see No. 1 in the picture above)
4. Lift up the motor (see No. 2 in the picture above)
5. To install the Y-Transport Motor, repeat the above steps in reverse order; be careful with the belt

⚠️

WARNING

JUST THE MOTOR AND THE BOARD CAN BE CHANGED IN THE FIELD. BY PROBLEMS WITH RIGHT ANGLE OR OTHER MECHANICAL PROBLEMS CHANGE THE WHOLE XTRAVERSE.

Required Tests and Settings

1. Check the belt tension. The tension should be 50.5 +/- 5Hz for the y axis
2. Please see 11 Required Tests & Settings for all required tests and settings.

7.2.5 Replacing the Cooling Fans

Use the following procedure to replace the cooling fans:

1. Remove the back cover (see No. 1 in the picture below)
2. Remove the caps and the screws (see No. 2 in the picture below)
3. Pull the fans out towards the rear of the instrument
4. Unfasten the cable connections
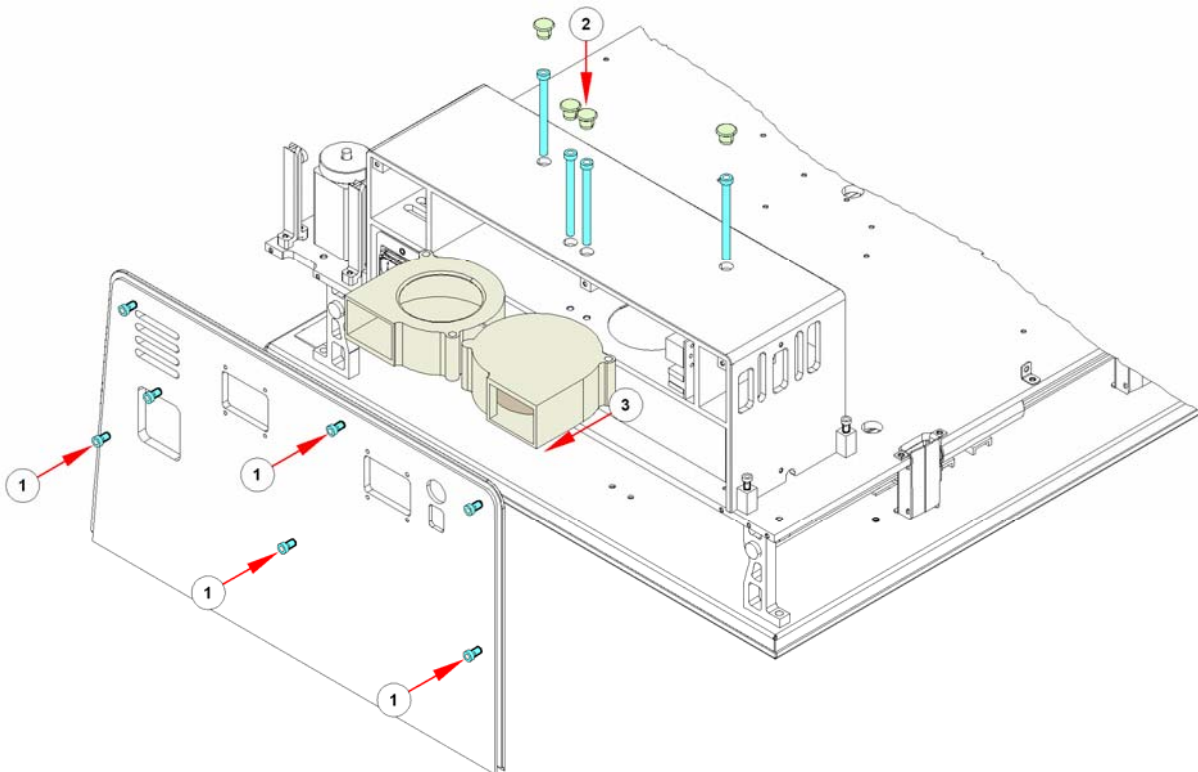
5. To install the cooling fans, repeat the above steps in reverse order.

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

7.2.6 Replacing the Heating Foils

The **infinite 200** has only one upper heating foil and under the MTP there is an endplate for heat circulation. The upper heating foil is attached directly to the transport with 5 screws. To replace the heating foil, use the following procedure:

1. Remove the cover.
2. Remove the Optical Unit from the bottom plate and turn over (see chapter 7.2.1 Removing the Optical Unit).
3. Remove the five screws (see No. 1 in the picture below).
4. Disconnect Temperature Sensor ST11 and Heating Sensor ST17 from the Main CPU.
5. Slide the heating foil out (see No. 2 in the picture below).

Heating Foil

Temperature Sensor

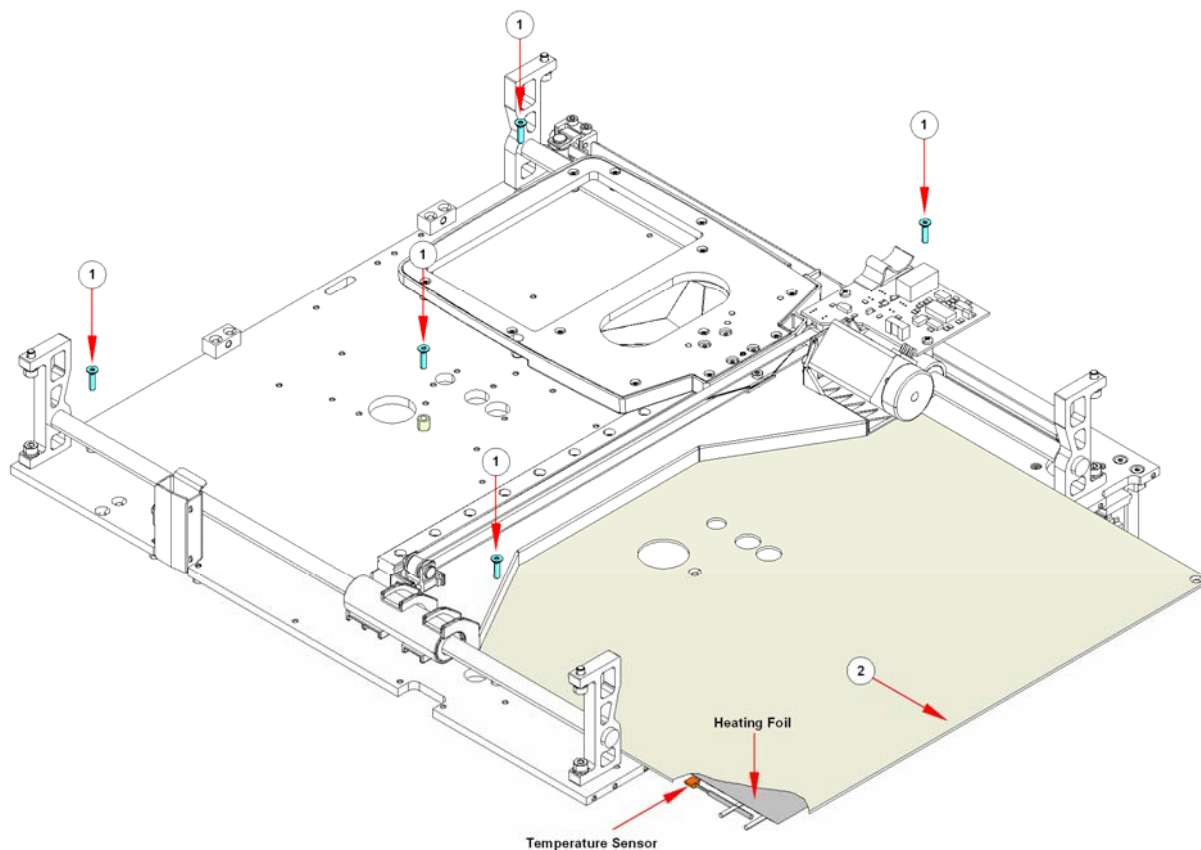6. To install the heating foil, repeat the above steps in reverse order.

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

7.2.7 Replacing the Lower Heating Plate

The Fluorescence Bottom Head and the Absorbance Measurement Head can be found under the plate. Depending on the options installed, the Absorbance Measurement Head will be attached to the left or right side.

To replace the Lower Heating Plate, follow the procedure below:

1. Remove the cover.

2. Remove the Optical Unit from the bottom plate and turn over (see chapter 7.2.1 Removing the Optical Unit).

3. Remove the four screws (marked blue in the picture below).
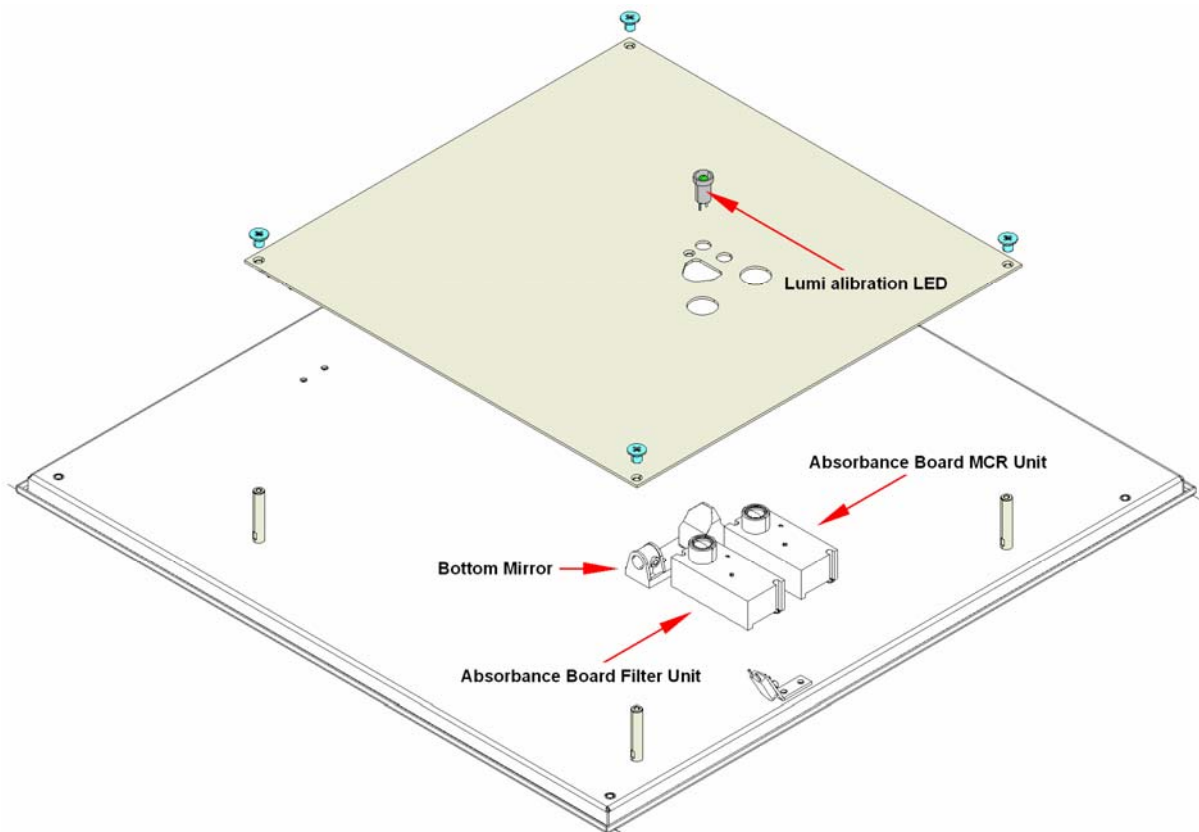
4. To install the heating plate, repeat the above steps in reverse order.

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

8. Description of Injectors

8.1 Functional Description of the XE 1000

The XE 1000 uses a stepper-motor driven syringe and valve design to aspirate and dispense measured quantities of liquid. Both the syringe and the valve are replaceable. Functional descriptions and illustrations of each major XE 1000 component are provided in the sections that follow.
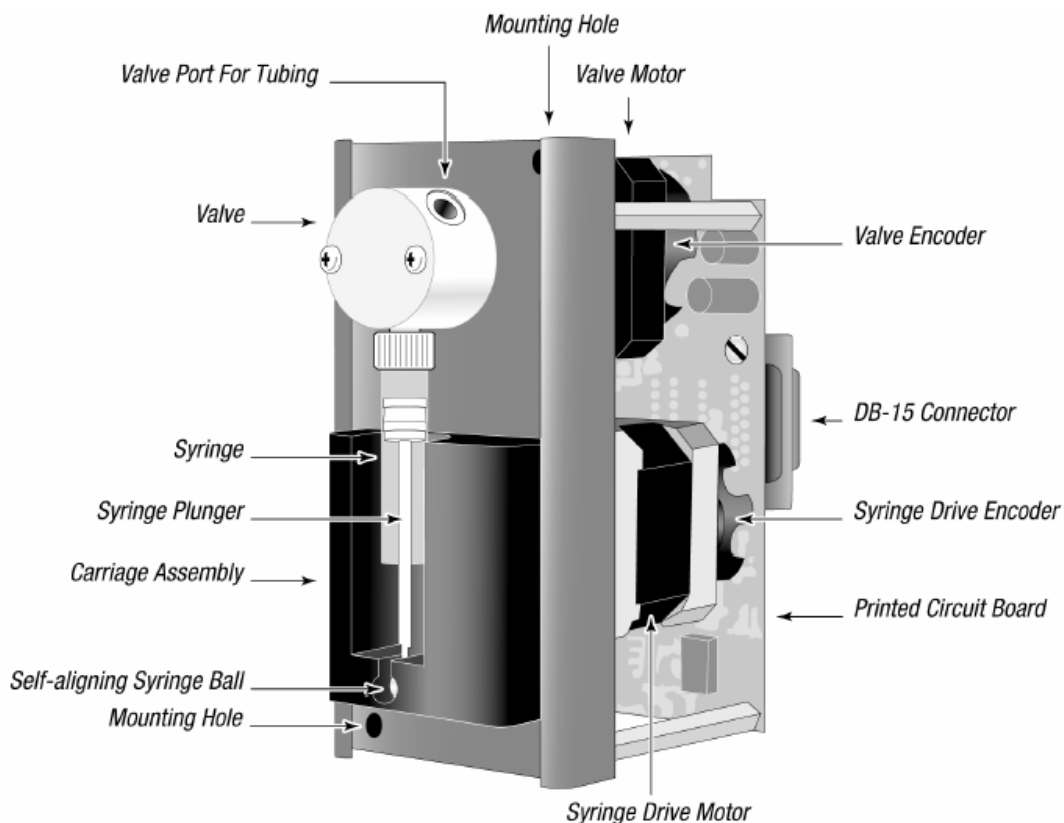
Figure 8.1. XE 1000 Front View
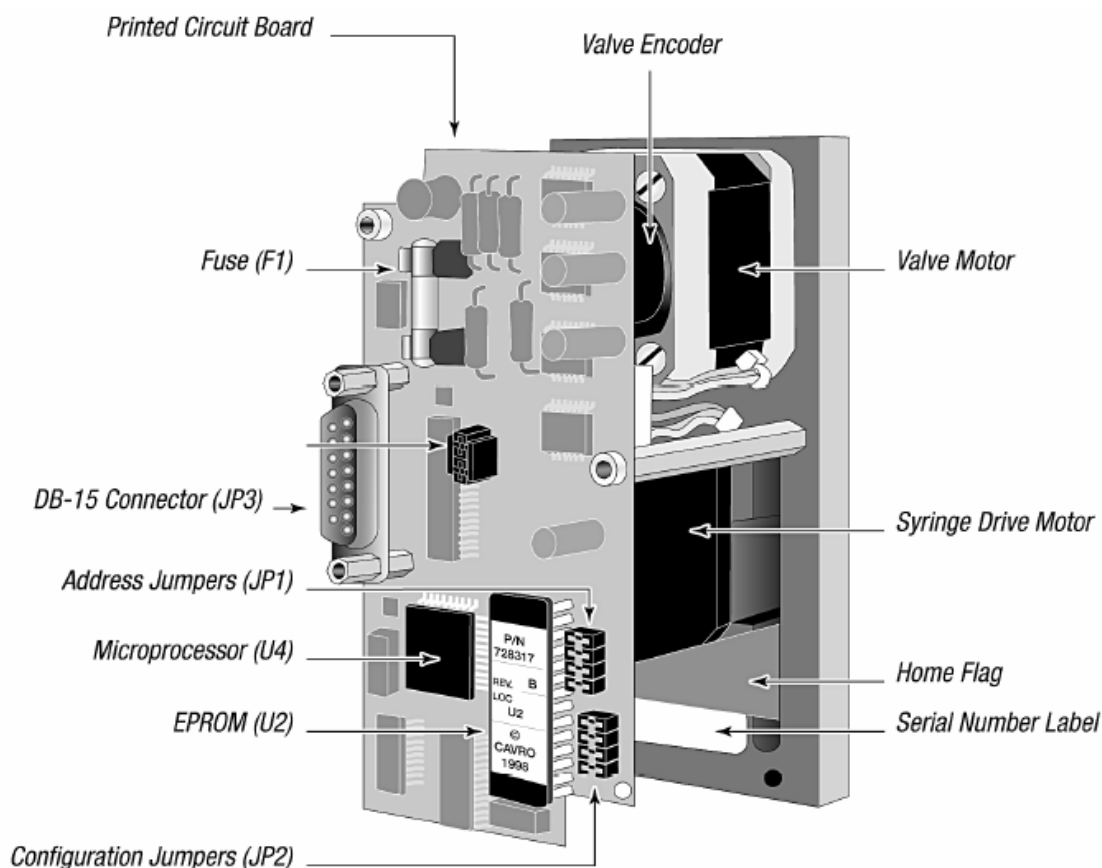
Figure 1-8.2. XE 1000 Pump, Rear View

Syringe and Syringe Drive

The syringe plunger is moved within the syringe barrel by a rack and pinion drive that incorporates a stepper motor and quadrature encoder to detect lost steps.

The syringe drive has a 30 mm travel length and resolution of 1000 steps. When power is not applied to the pump, the syringe drive can be moved by pushing up or down firmly on the plunger holder assembly. This facilitates syringe removal.

The base of the syringe plunger is held to the drive by a self-aligning ball that mates to the carriage. The top of the syringe barrel attaches to the pump valve by a 1/4-28" fitting.

Figure 1-2 shows the components of a typical syringe.
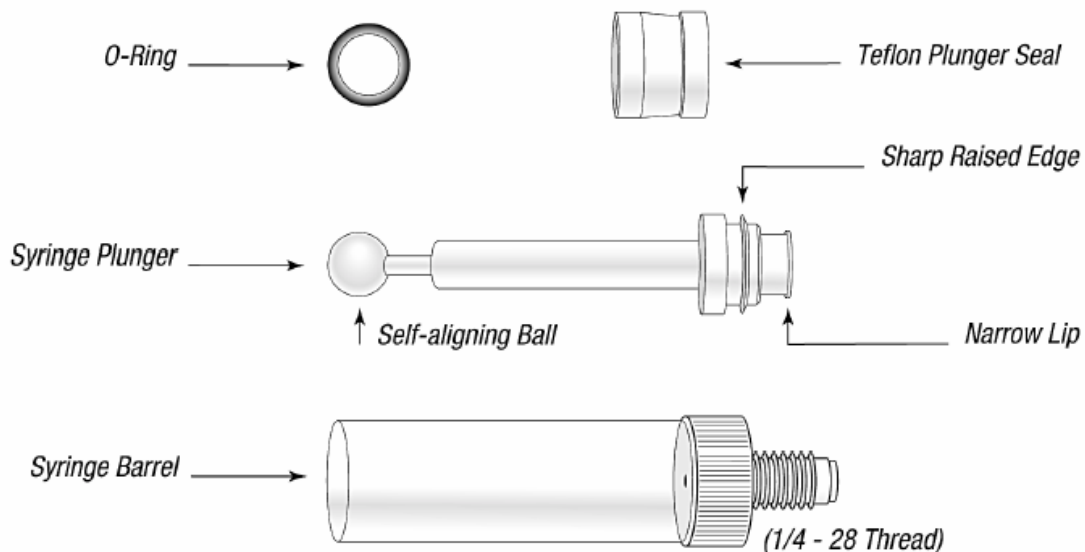
Figure 8.3. Syringe Components

Syringes are available in these sizes: 50 μL, 100 μL, 250 μL, 500 ml, 1.0 ml, 2.5 ml, and 5.0 ml. For ordering information, see Appendix A, "Ordering Information." infinite 200 use 1.0 ml syringes!

Valve and Valve Drive

The valve is made of a Kel-F body and a Teflon plug. The plug rotates inside the valve body to connect the syringe port to the input and output ports. Additionally, there is a bypass position. This position bypasses the syringe and connects the input and output ports. This position is often used for washing out the probe. The valve is turned by a stepper motor coupled to an encoder to provide positioning feedback.

Figure 1-3 shows the components of a 3-port valve.

Figure 8.4. 3-Port Valve Components

The XE 1000 in the infinite 200 is available with the following valves:

Three-port valve. This valve has an input port, output port, and syringe port. The syringe port is a "common" port, which means it is always connected to one of the other two ports. In the standard configuration, the ports are placed at 120° intervals around the circular valve body.

Printed Circuit Board

The printed circuit board (PCB) holds the microprocessor and circuitry to control the syringe and valve drives. The PCB provid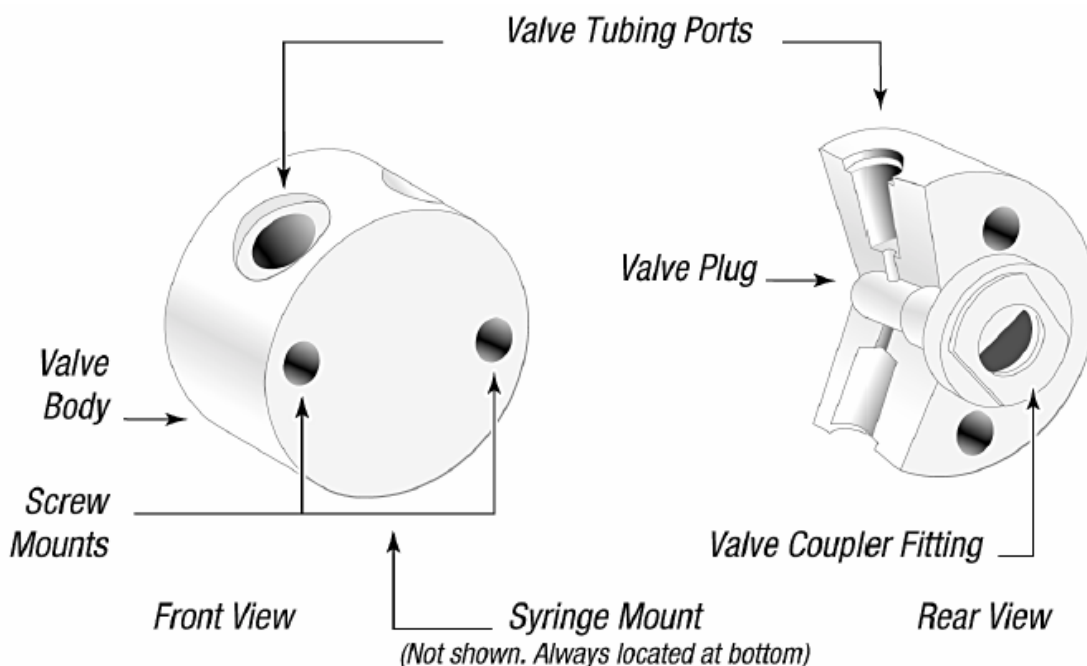es connectors for the auxillary input and output, jumpers for configuring different modes of operation, and communications addresses.
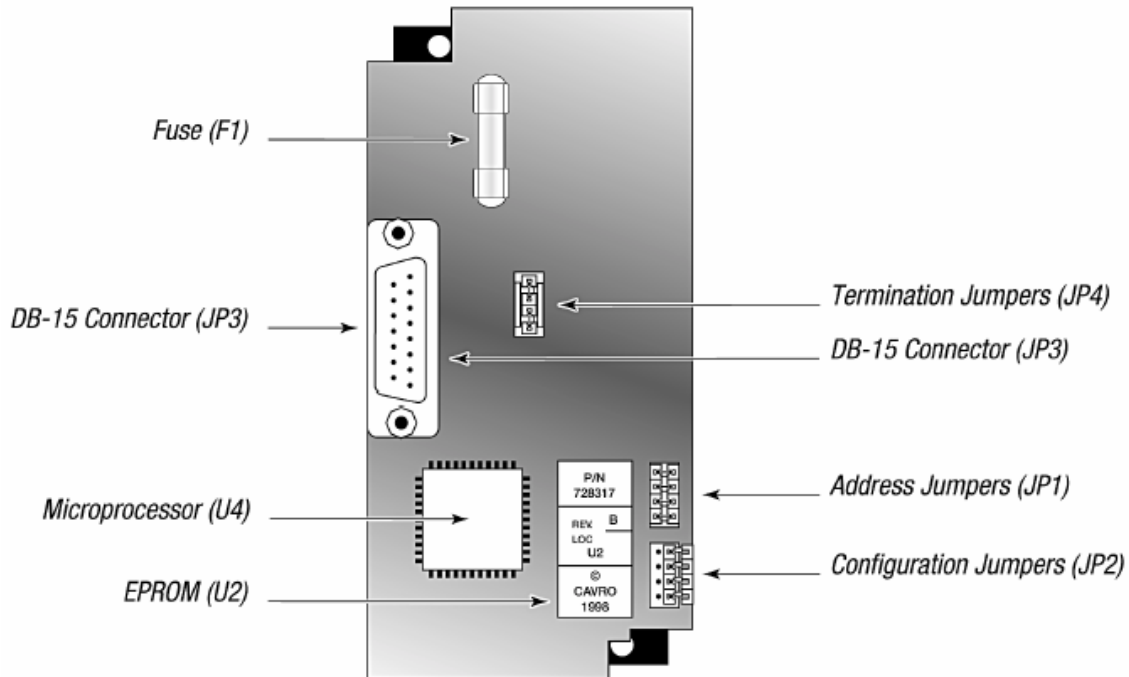
Figure 1-4 shows the accessible components of the printed circuit board.

Figure 8.5. XE 1000 Printed Circuit Board External Connectors

Communication Interfaces

Depending on the pump configuration, the XE 1000 can communicate singly or in a multi-pump configuration through an RS-232, RS-485, and CAN (Controller Area Network) interface. For RS-232 and RS-485, a baud rate of 9600 is supported. For CAN, a baud rate of 100K is supported.

In the **infinite 200** we use the CAN bus system.

Multi-Pump Configurations

Up to fifteen XE 1000s can be connected together in a *multi-pump configuration* (also called "daisy-chaining"). Within a multi-pump configuration, the RS-485 communications bus is required, although the first pump in the chain may receive either RS-232 or RS-485 communications. For CAN communication, neither RS-232 or RS-485 is required. Each pump can be addressed separately from a single terminal via its unique address, which is set using the address jumpers on the PCB. For more information on setting addresses, see Chapter 2, "Hardware Setup."

8.2   Tips for Setting Up the XE 1000

To ensure proper operation, follow these tips:

- Always set up and mount the pump in an upright position. Failure to do so can cause problems priming the system.

- Always run liquid through the syringe and valve when they are moving. Failure to do so can damage the sealing surfaces.

- Before running any organic solvents through the pump, see Appendix D, "Chemical Resistance Chart" for more information on solvents.

- Keep fingers out of the syringe slot while the pump is running. Failure to do so can cause injury.

- Always power down the instrument when connecting or disconnecting pumps.

8.3   Hardware Setup

This chapter includes these sections describing the various parts of hardware setup:

- Power & Cabling

- Printed Circuit Board Settings and Options

- Installing Components

- Liquid System

- Working the XE 1000 Option

8.4   Power & Cabling

The XE 1000 requires a 24VDC power supply with a current rating of at least 500mA, provided through a DB-15 connector.

A single cable 30017946 supplies both power and communications to the XE 1000 module. Set a unique address to identify each pump module. For more information, see "Address " in this chapter.

Table 2-1. DB-15 Connector Pin Assignments

Pin	Function	Remarks
1	24VDC	
2	RS-232 TxD line	Output data
3	RS-232 RxD line	Input data
4	Unused	
5	CAN high signal line	
6	CAN low signal line	
7	Auxiliary input #1	TTL level
8	Adress 0	
9	Ground	Power and logic
10	Ground	Power and logic
11	RS-485 A line	
12	RS-485 B line	
13	Auxiliary output	TTL level
14	Adress 2	
15	Adress 1	

Figure 2-1 shows the pin positions of the DB-15 connector on the printed circuit board. This is a male connector that requires a female connector on the mating cable.
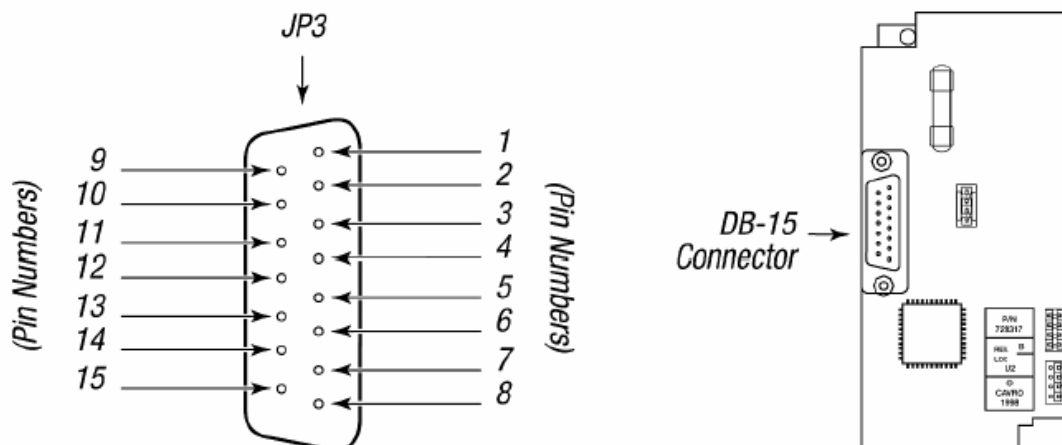
Figure 8.6. DB-15 Connector Pins

8.4.1 Communication Interfaces

The computer or controller communicates with the XE 1000 through an RS-485 interface, RS-232 interface, or CAN (Controller Area Network) interface. The RS-232 interface automatically converts the protocol to RS-485 for the benefit of any other devices which may be connected to the XE 1000's RS-485 communications bus (this constitutes a so called "multi-drop" device configuration).

Figure 2-2 shows the termination jumpers on the printed circuit board.
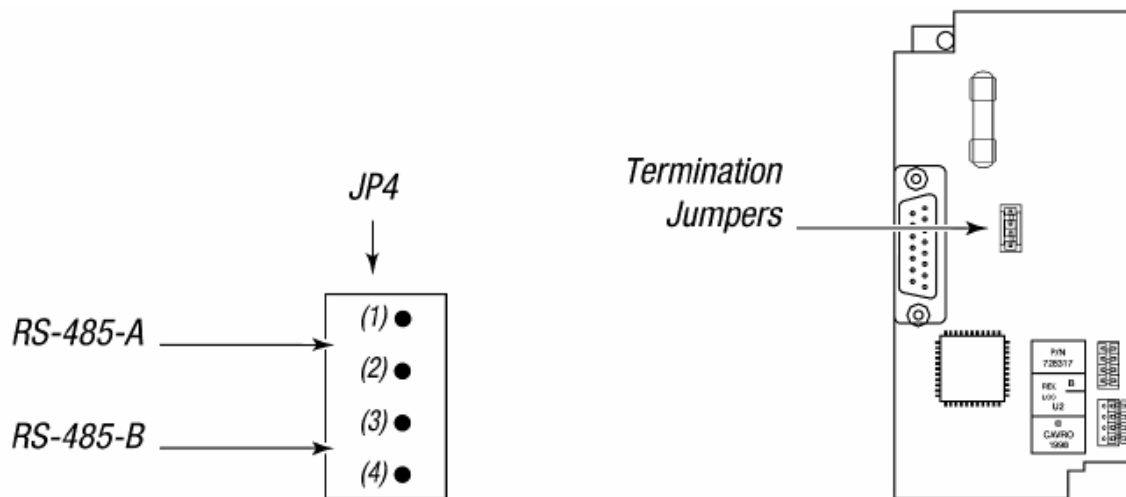
Figure 8.7. Termination Jumpers

	Note:
	Pumps are shipped with the RS-485 termination jumper installed on JP4. Please don not remove any jumper !

8.5 Printed Circuit Board Settings and Options

Configuration Jumpers (JP2) for Standard Firmware

Connector JP2 on the XE 1000 printed circuit board is used to configure different modes of operation. Jumpers are added or removed to enable or disable the different modes. The jumpers control set the following:

- Plunger overload detection (JP2-1)

- Holding Current (JP2-2)

- Valve diagnostics (JP2-3)

- Open (JP2-4)

Figure 8.8. Configuration Jumpers

> **Note:**
> *Always switch off the XE 1000 before changing any of the jumpers on JP2*

8.5.1   JP2-1: Plunger Overload Detection

This jumper position allows enabling or disabling of plunger overload detection. There are two settings:
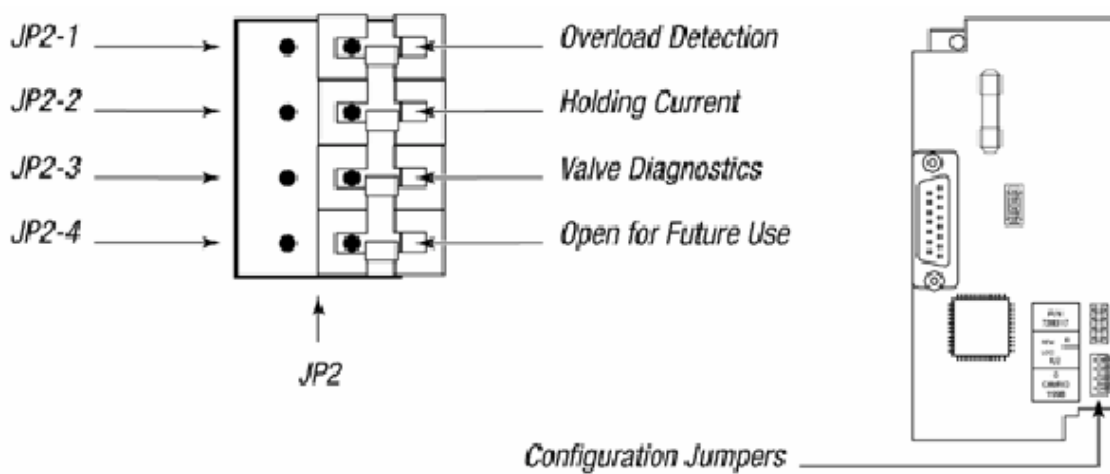
- JP2-1 removed   Plunger overload detection enabled (default setting)

- JP2-1 installed   Plunger overload detection disabled

Caution
Do not disable plunger overload detection; it is used for manufacturing test only. If a jumper is installed at JP2-1, plunger overload will not be detected and the pump will not generate an error code if it is losing steps.

8.5.2   JP2-3: Valve Diagnostics

This jumper position enables or disables the valve. There are two settings:

- JP2-3 removed   Valve enabled (default setting)

- JP2-3 installed   Valve disabled

This is a diagnostic test that can be used if the valve drive appears to malfunction. It runs the pump in a "valveless" mode.

8.5.3   JP2-2: Holding Current

This jumper position, when enabled, increases the holding current. There are two settings:

- JP2-2 removed   Maximum holding current disabled (default setting)

- JP2-2 installed   Maximum holding current enabled

This option is for applications that use viscous solutions or involve backpressure due to smaller ID tubing. When jumper JP2-2 is removed, the current will decrease when the pump is in a holding position. Installing the jumper will increase the holding current.

8.5.4 *JP2-4: Open For Future Use*

> **Note:**
> **The XE 1000 is shipped with spare jumper placed across the top of pin JP4. This can be used to change the default configuration setup.**
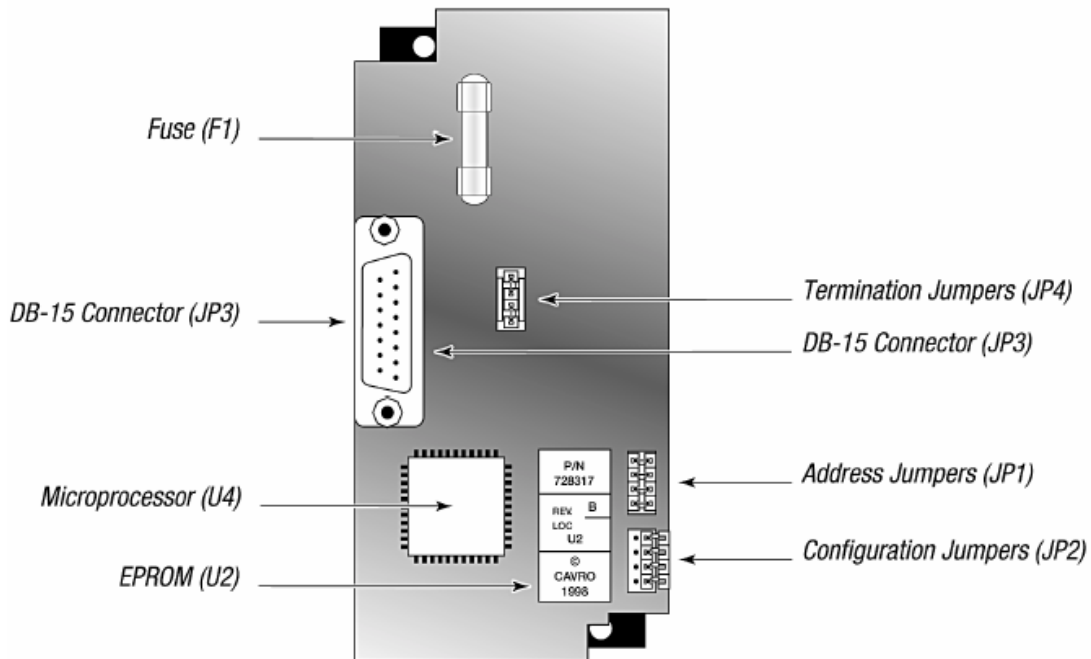
Figure 8.9. Printed Circuit Board Settings

8.5.5 *Address Jumpers (JP1)*

The address jumpers are located on the lower right of the XE 1000's printed circuit board. Each pump must be assigned a unique address number from 0 to 14. The address value is determined by the state of the jumpers JP1-1, JP1-2, JP1-3, and JP1-4 as shown above in Figure 8.8. Configuration Jumpers. They are used to give each XE 1000 in a multi-pump configuration a unique address, allowing the user to direct commands to specific pumps. The address jumpers set the pump to one of 15 different addresses. The address is determined by the state of the jumpers in JP1-1, JP1-2, JP1-3, and JP1-4.

Figure 8.10. Address Switch

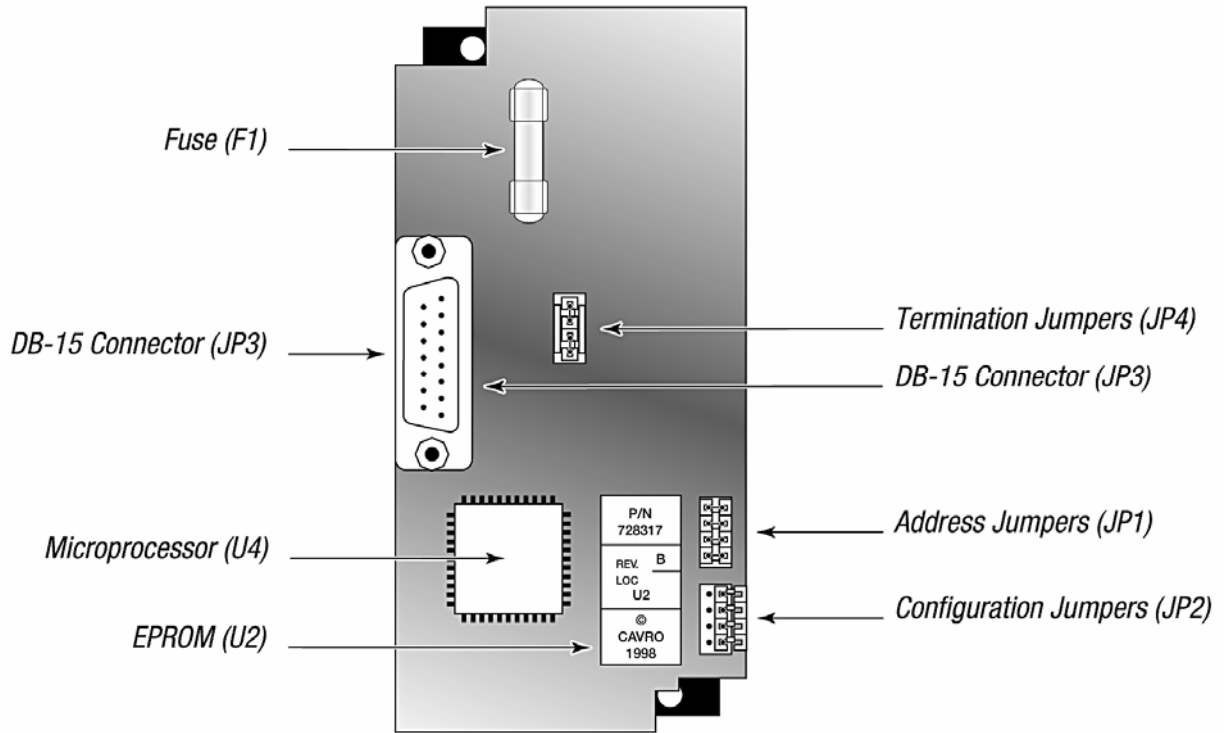> ***Note:***
> ***"Closed" means the jumper is in, and "open" means the jumper is out***

For **infinite 200** set the address jumper for the injector B like picture below.
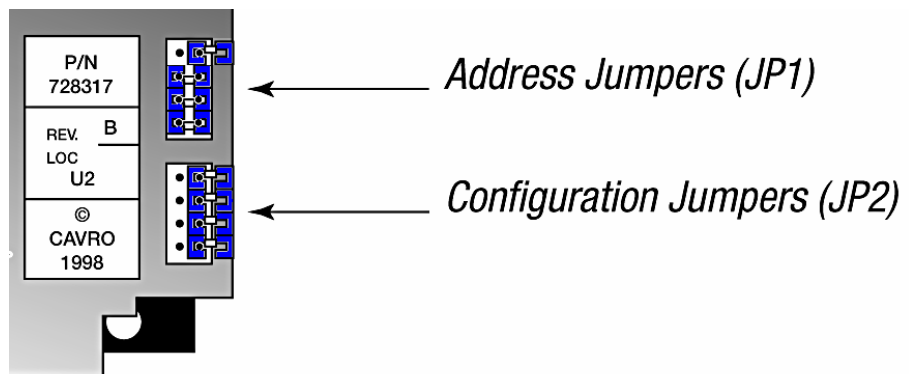Injector A is default set factory side.
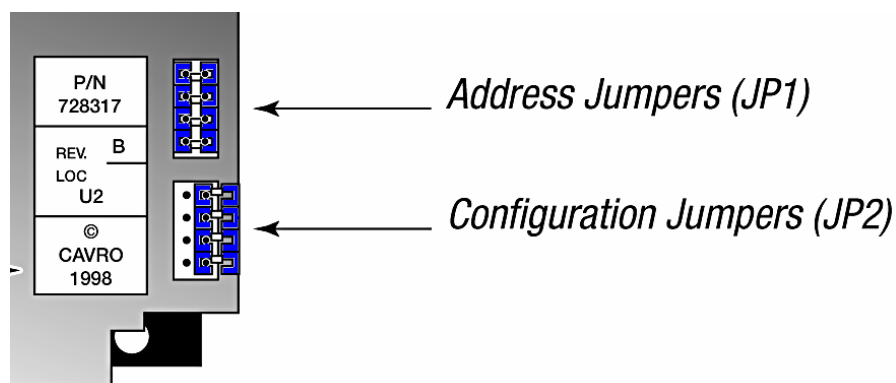

Figure 8.11 Injector B jumper

Figure 8.12 Injector A jumper

Self-Test

When all the jumpers in JP1 are left open, the XE 1000 is in self-test. Self-test causes the XE 1000 to initialize then cycle repeatedly through a series of plunger movements at different speeds. If an error condition occurs, the pump stops moving.

To run the self-test, remove all the jumpers in JP1. Then supply power to the pump.

Caution
Always run liquid through the syringe and valve. Failure to do so can damage the valve and syringe seal.
Do not run self-test with a 5.0 ml syringe installed. Remove the valve and 5.0 ml syringe. Failure to do so can result in plunger overloads.

Inputs/Outputs

The XE 1000 provides one auxiliary input and output that can be accessed through the DB-15 connector, JP3. They provide TTL level signals. The output is controlled by the [J] command.

The auxiliary input is located on JP3 pin 7. It can be read back using report command "**?I**". Additionally, the input can be used to externally trigger a command sequence using the [H] command. The commands are described in Chapter 3, "Software Communication."

The auxiliary output is located on JP3, pin 13.

8.6   Installing Components

See Chapter 5, "Maintenance," for the procedures for replacing and maintaining components.

8.6.1   *Installing the XE 1000 Valve*

> **ℹ**
>
> | *Note:* |
> | --- |
> | ***The valves are not interchangeable among pumps. To use a different model valve, contact Tecan Systems Customer Support*** |

All XE 1000 pumps are delivered with the valve installed. To install a new valve follow these steps.

1. Remove the fluid from the pump.

2. Initialize the pump using the ZR command so that the valve motor shaft is in the correct position.

3. Remove the syringe and tubing.

4. Remove the two Phillips head screws on the front of the valve, then remove the valve from the pump.

5. Install the new valve by placing it on the front panel so that the screw holes line up. The valve coupler fitting mates to the valve motor shaft. The shaft should be in the correct position. If it is not, re-initialize the pump using the command ZR.

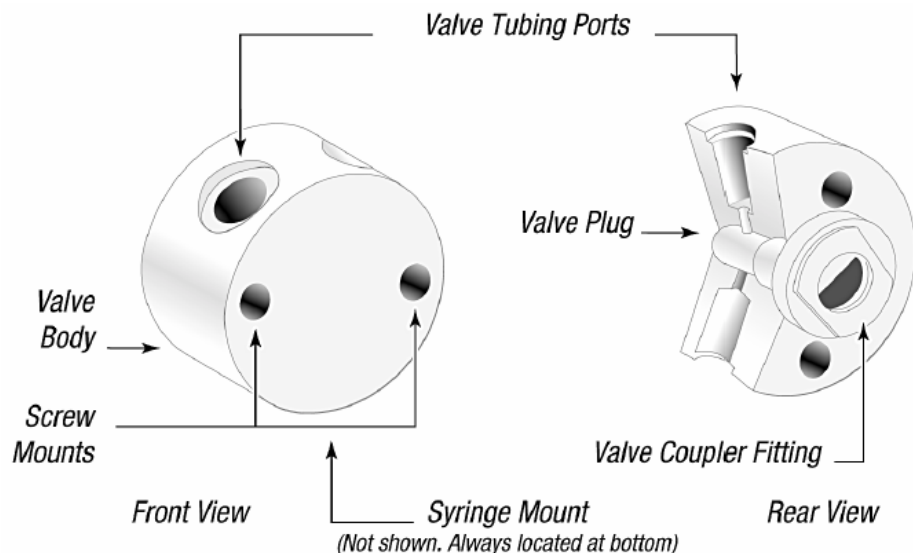6. Replace the valve screws. Tighten to ¼ to ½ turn after the screws contact the valve body.

Figure 8.13. XE 1000 Valve Installation (3-Port Valve)

Installing a Syringe

To install a syringe, follow these steps:

1. Lower the plunger drive by sending the command [A1000R]. If power is not applied, the plunger drive can be manually lowered by pushing down on the carriage assembly until it reaches the bottom of travel.

2. To install the syringe, do the following (as shown in Figure 8.14. Syringe Installation):

3. Place the self-aligning ball on the syringe plunger into the matching space in the carriage assembly.

4. Pull up on the syringe barrel and screw the 1/4-28 fitting into the valve until it is finger tight. Using pliers on the syringe 1/4-28 fitting, turn the syringe an additional quarter turn.

> *Note:*
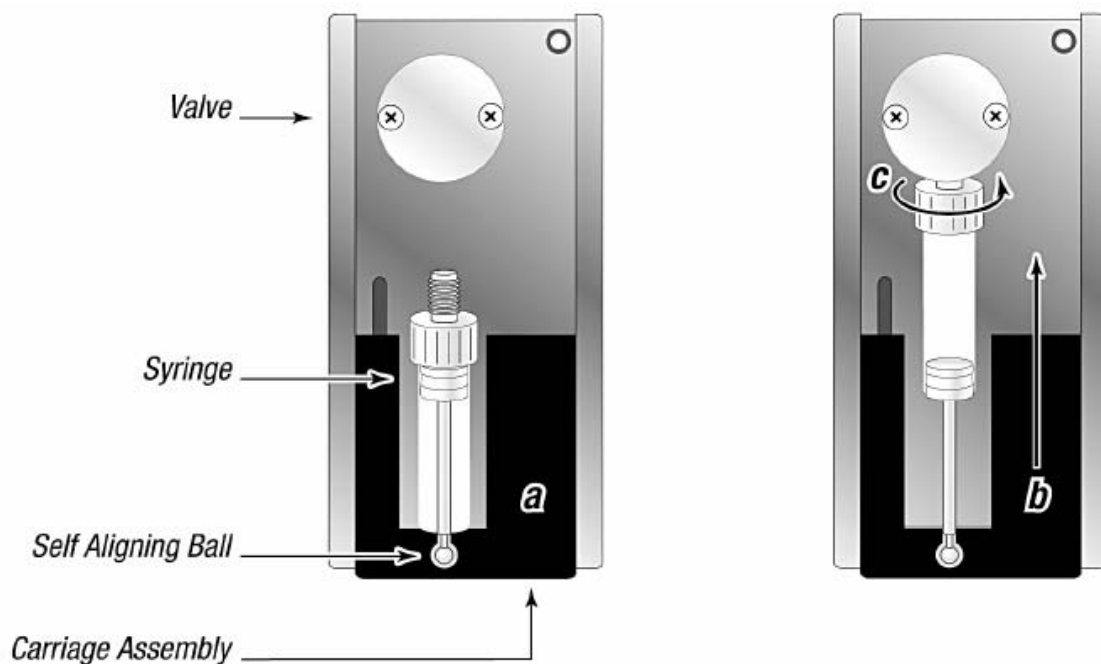> **Make sure the plunger lock screw is securely tightened.**

Figure 8.14. Syringe Installation

8.7   Liquid System

The **infinite 200** can be optionally equipped with an injector module consisting of two syringe pumps (XE-1000, Tecan Systems) located in a separate box, which feed two injector needles. The injector needles are designed to inject liquids into any well larger than or equal to a standard 384 well plate.
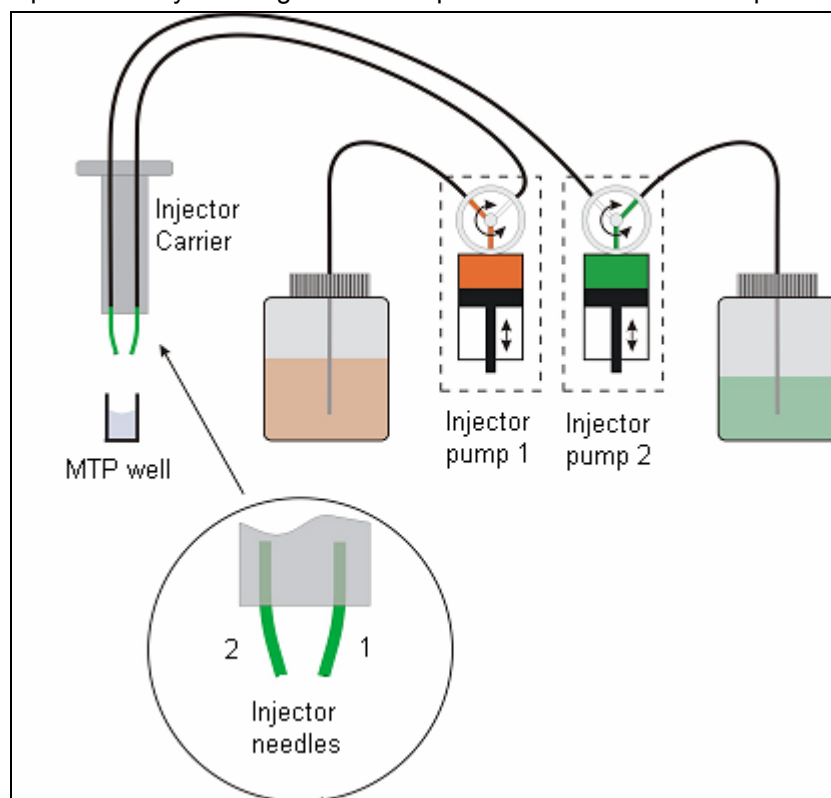
Figure 8.15: Schematic view of the injector module

There are up to two pumps available for the **infinite 200** (see Figure 2-1 above):

- Pump 1 feeds injector needle 1
- Pump 2 feeds injector needle 2

The **infinite 200** can be equipped with one pump (pump A) or two pumps (pumps A and B).

One Injector Option (one pump): An **infinite 200** equipped with one pump allows injections in all microplate well types larger than or equal to a standard 384 well plate using the same liquid. All reactions requiring injection of only one liquid per well can be performed with this option.

Two Injector Option (two pumps): Several reactions, such as flash luminescence reactions or dual reporter gene assays, require the injection of two *independent* liquids into the same well. This is achieved by using the additional injector pump 2.

By using pumps 1 and 2, two independent liquids can be dispensed into the same well of the size larger than or equal to a standard 384-well plate.

8.7.1 Measurement with injectors

For flash luminescence reactions, time is especially critical; therefore the **infinite 200** allows injection at the measurement position for 96-well plates. This means no movement of the plate must be carried out between injection and measurement. Also, a continuous measurement can be started at some time interval before the injection to obtain a background reference signal. These readings can be performed to obtain a baseline reading of a reaction and may be handled prior to the dispense step. The injection of liquids with the two injectors is performed sequentially.

Similar, Fluorescence-bottom measurements in 96-well plates (fast flash fluorescence reactions such as ion studies) can be performed during the injection, because the plate must not be moved from the injection position to the measurement position.

The injectors of the **infinite 200** can also be used with all other measurement modes: Fluorescence Intensity top (96-and 384-well plates), Fluorescence Intensity bottom (384-well plates), Time Resolved Fluorescence, Absorbance (96- and 384-well plates), Flash and Glow Type Luminescence and Dual Color Luminescence. However, as the measurement position is not the same as the injector position, a short time delay (approx. > 0.5 s) between injection and reading occurs.

8.7.2 Storage Bottles

In a drawer in the instrument up to two bottles with a volume of 125 ml or two Falcon tubes can be inserted. Additionally, a smaller container may be used via an adapter that can be mounted into the drawer of the **infinite 200**.

The standard bottle set supplied with the Injector option consists of:

- One 125 ml bottle and one 15 ml bottle for the "One Injector option" (one pump) or

- Two 125 ml bottles and two 15 ml bottles for the "Two Injectors option" (two pumps).

In cases in which very small volumes of reagent are required, 15 ml *Falcon* tubes can be used. The 125 ml bottles can be used as a support for the *Falcon* tubes.

Figure 8.16:Storage bottles and adapter for smaller tubes

8.7.3   Injector Carrier

The carrier, which includes the injector needles, can be easily removed (by the customer) from the instrument for priming or washing the system and for optimizing the injection speed.

Figure 8.17: Injector 'carrier'

	Caution
	The injector carrier must be in the service position
	for washing und priming.

The dead volume of the injection system (injector needles, syringes, valves and tubing) is approximately 100µl after '**backflush**' for each syringe. The function of the *backflush* is to return any unused reagent to the reservoir bottles. The injection speed can be adjusted via the software to allow for good mixing of reagents. The optimum injection speed depends on the assay parameters, such as viscosity of fluids, the plate format and the measuring behavior of the liquids. The removable injector carrier allows this process to be done outside of the instrument where a visual inspection can be easily performed.

Figure 8.18: Injector-box with injector in 'service position'

8.7.4 Priming and Washing of the *infinite 200*

The initial filling step of the injector system (priming) as well as the cleaning step of the injector system (washing) must take place outside of the instrument. For these procedures the injector carrier is removed from instrument and put into the service position of the injector box. For priming and washing steps of the injector system, a default setting for injection speed and volume dispensed is provided. If required the priming parameters can be adjusted in the injector control window of the i-Control software.

The prime volume depends on the tubing length. Two types of injector tubing are available: 'long': 105 cm, and 'short': 80 cm.

For the initial filling step of the injector system (priming) it is recommended to perform two pump strokes to remove all air bubbles from the injection system. The prime volume is therefore 2 ml. To save precious reagents this initial filling step can be performed with distilled water. To replace the water with the required reagent a second priming step is needed. For this second priming step the priming volume can be reduced to approx 1500 µl.

> **Caution**
> **A prime volume below 2 ml in an empty system may result in incomplete filling of the system, and therefore may negatively affect assay performance.**
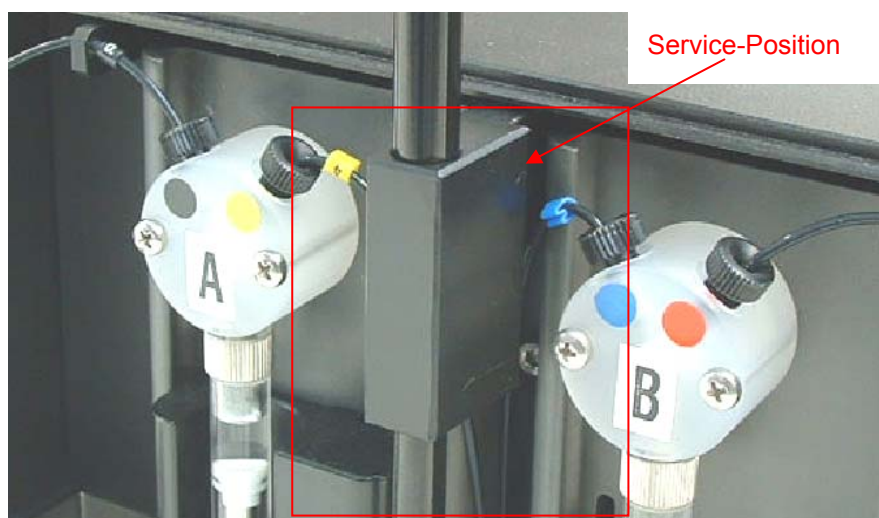

Figure 8.19 'Service Position' of the injectors. The injectors are removed from the carrier slot and insert in the holder at the injector carrier system.

> **Caution**
> **Do not touch the end of the injector, as he can become easily bent or misaligned, which can cause injection problems or damage the instrument.**
>
> **Be careful when inserting the injector carrier into the instrument, to fully load it into its home position (it must click into place).**

8.7.5 Priming

Before the injection system can be used, an initial filling step (priming) is needed to remove all air and to completely fill the system with liquid.

When performing a washing step, no priming step is needed as the wash step includes a priming step.

To perform the priming procedure:

Fill the storage bottles with the necessary reagents and insert the feeding tubes. Make sure, that the tube reaches the bottom of the bottle.

Remove the injector from the carrier slot and insert it into the service position of the injector box.

Position an empty container under the injector.

Adjust parameters if required

Activate the priming procedure via the injection control window of the i-Control software

Make absolutely sure that no air bubbles are in the system before starting the measurement!!!

After the procedure has been successfully performed, reinsert it into the instrument.

Prior to the first dispense step into a well of a microplate, a small dispense step into a disposable container on the plate carrier is performed automatically to condition the injector. After this step, the instrument is ready to use.

8.7.6 Reagent Backflush

Prior to the cleaning of the injector system, reagent backflushing allows the remaining reagent in the liquid system (injector needles, syringes, valves and tubing) to be pumped back into the storage bottles. This procedure is a cost effective solution for minimizing reagent consumption.

To perform the reagent backflushing procedure:

Put injectors in the service position

Place tubing in the storage bottle.

Adjust parameters if required in the i-Control software

Select **backflush** from the injector control menu.

8.7.7 Washing

Before the instrument is switched off, a wash procedure should be run to clean the injector system.

When performing a washing step, no priming step is needed as the wash step includes a priming step.

To perform a typical wash procedure:

Remove injector carrier and bring it into the 'service position'.

Perform a backflush procedure to feed unused reagent back into the storage bottle.

Fill bottle with distilled or deionized water and insert feeding tubes of the injector system.

Start wash procedure with distilled or deionized water (this will automatically flush the injector system. The default is three times).

Prepare a container with 70% ethanol as wash solution and prime the injectors with this solution.

Start wash procedure with a 70% ethanol wash solution (this will automatically flush the injector). It is preferable to allow the injector system to soak in a 70% ethanol solution for a few minutes, prior to removing the wash solution with water

To clean the ends of the injector needles from outside, a cotton swab soaked in 70% ethanol may be used.

Start final wash procedure with distilled or deionized water, to completely remove the ethanol wash solution.

|	
STOP	**Important** **Be sure to run a final wash procedure with distilled water and empty the injector system. For good care and lifetime fill the injector system with liquid (water) before turning off the instrument.**
STOP	**Important** **Please see the corresponding reagent kit for advice on how to remove the substrate completely from the tubing system.**
STOP	**Important** **Take good care of the injectors, because if they are damaged the accuracy of dispensing may be affected. This can result in damage to the instrument.**
i	*Note:* *Injector needles can be replaced by exchanging the injector together with the corresponding tubing.*

8.7.8   *Injector Cleaning and Maintenance*

For maintenance see chapter 8.7.8 Injector Cleaning and Maintenance.
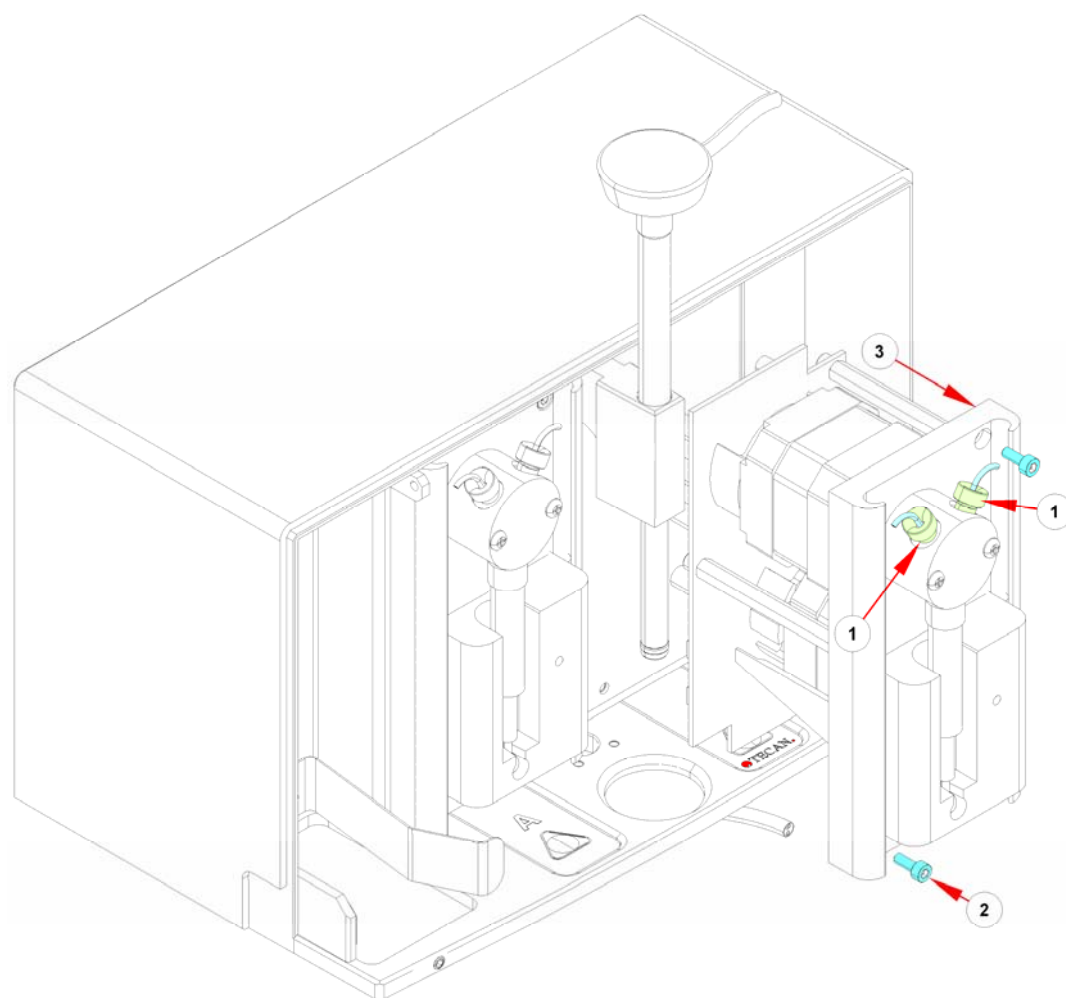
8.8 Working the XE 1000 Option

8.8.1 Replacing the Injectors

To replace the injector use the following procedure:
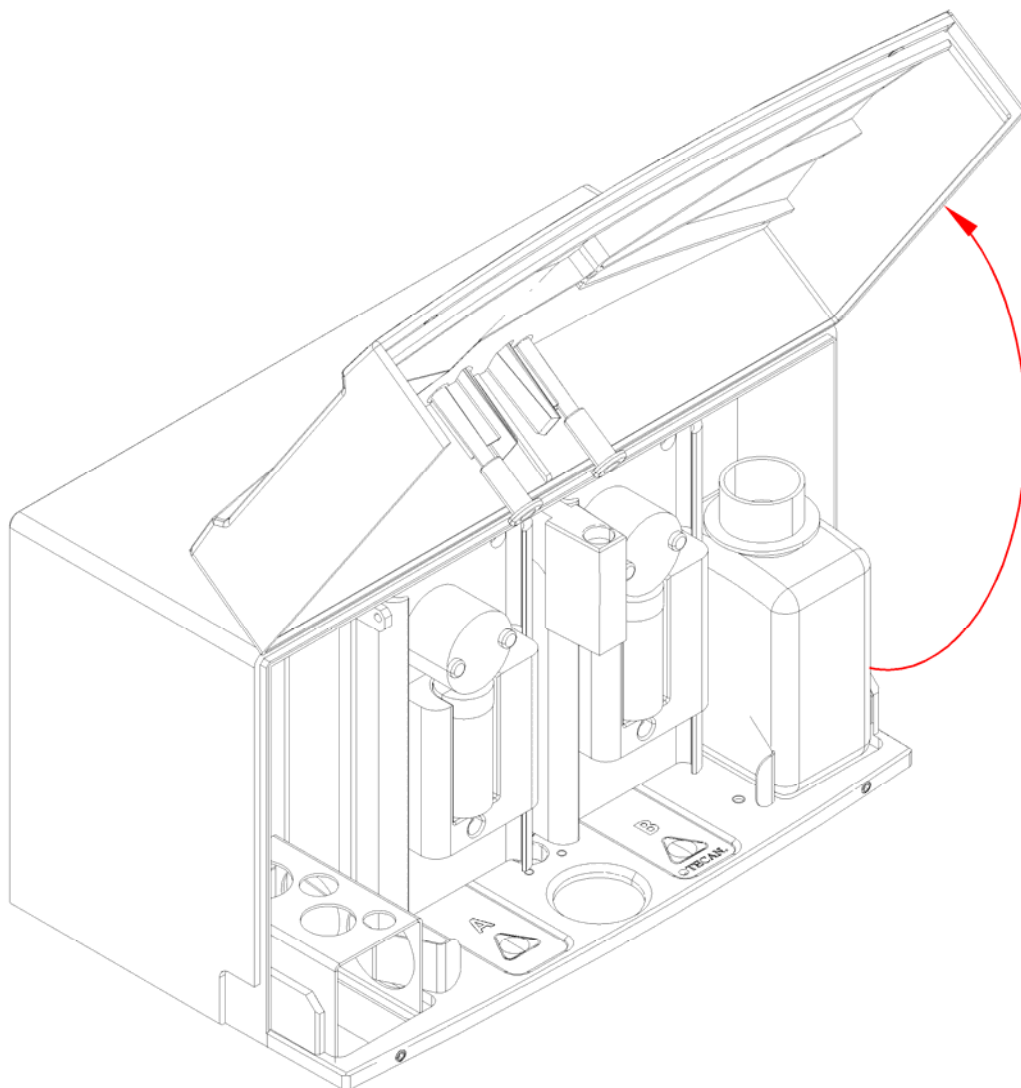
1. Open the Cover

2. Remove screw No. 2
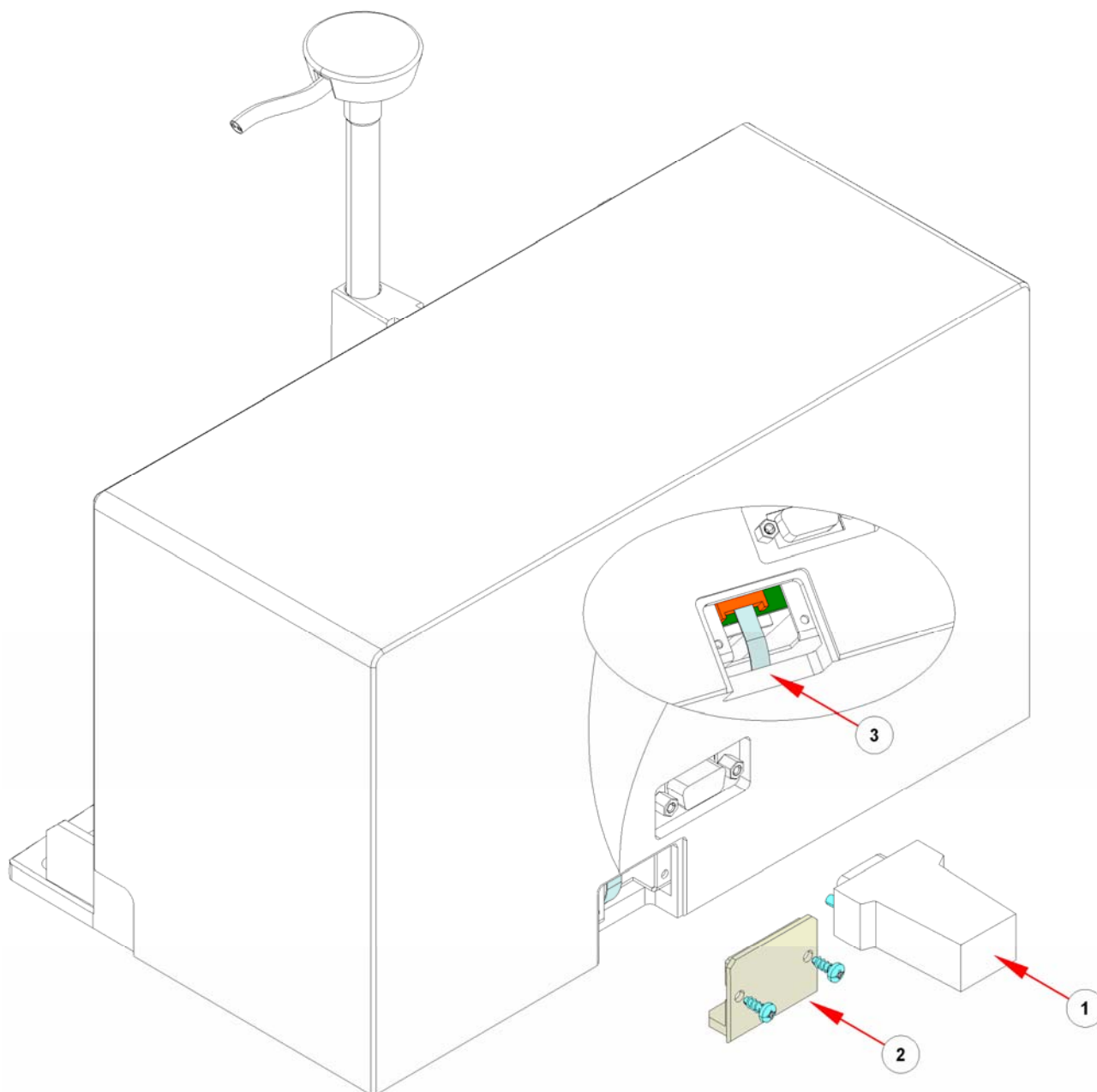3. Remove the tubes No. 1
4. Pull out the injector

5. Check the right address
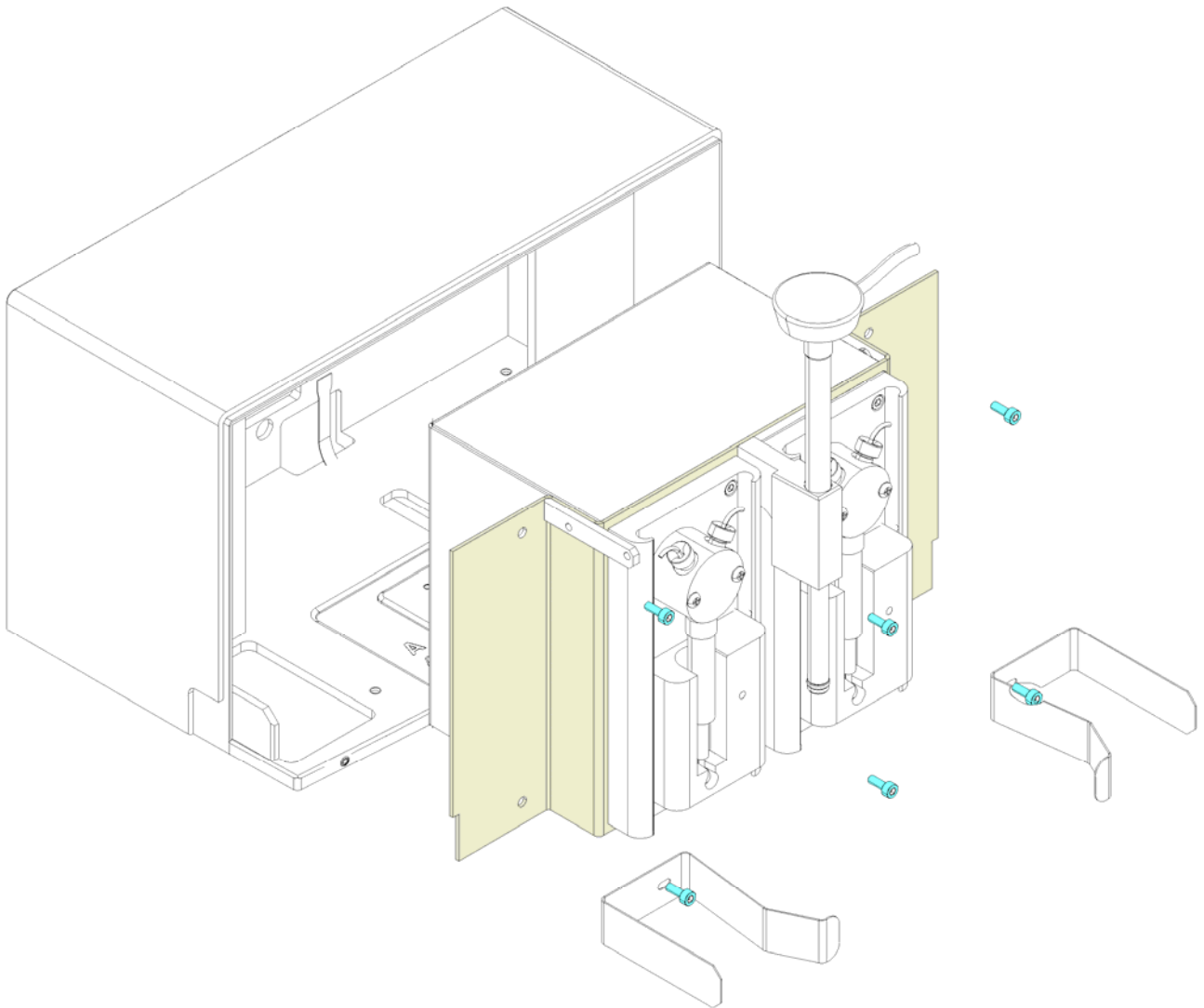6. Do all steps in reverse order

8.8.2 *Replacing the Connector Board*

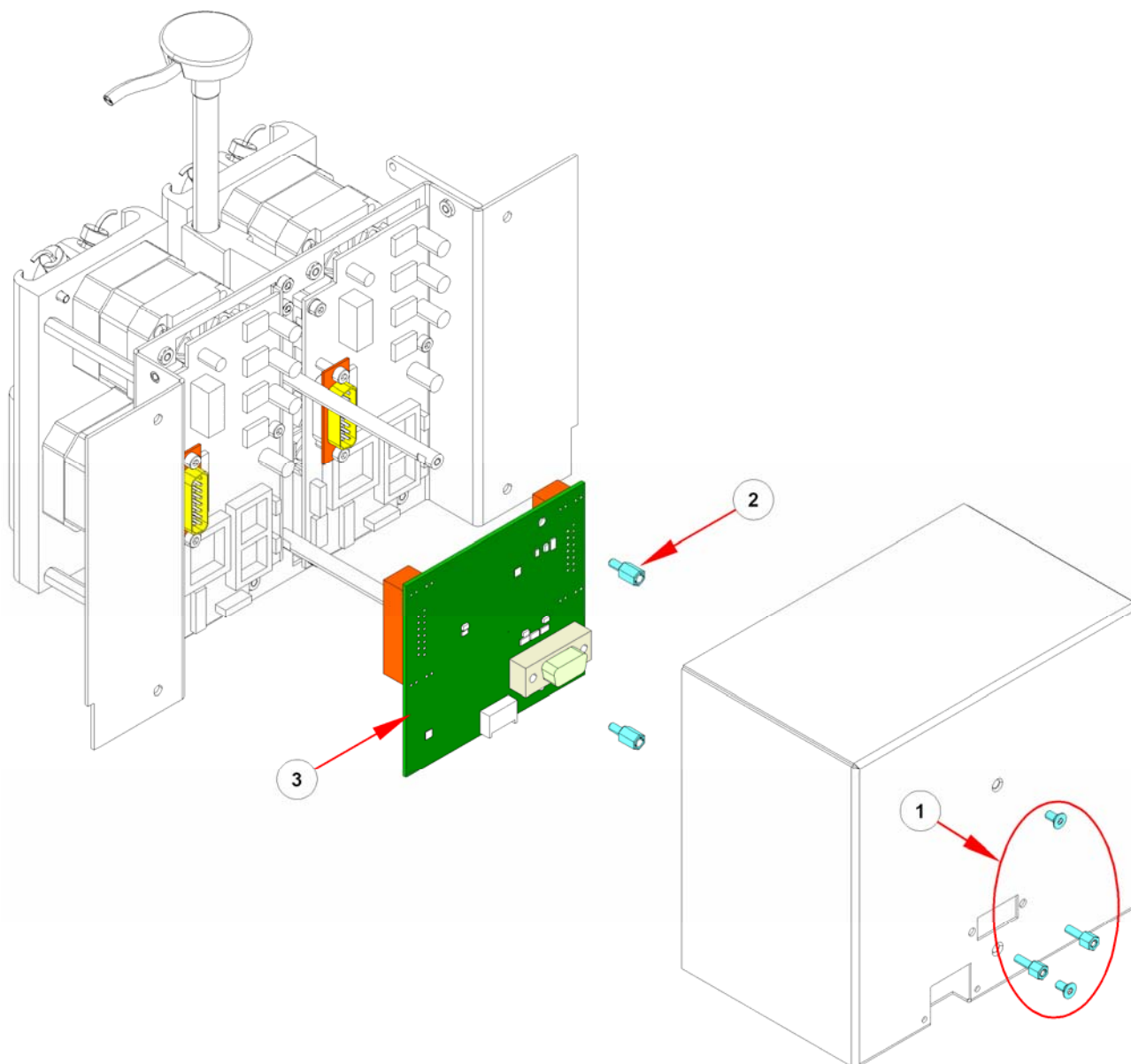To replace the Connector Board use the following procedure:

1. Open the Cover
2. Disconnect cable No. 1

3. Remove the door with screws No. 2
4. Unplug the flat cable No. 3 from the connector board.

5. Remove the screws above and pull out the unit.

6. Remove screws No. 1
7. Remove spacer No. 2
8. Change the Connector Board No. 3
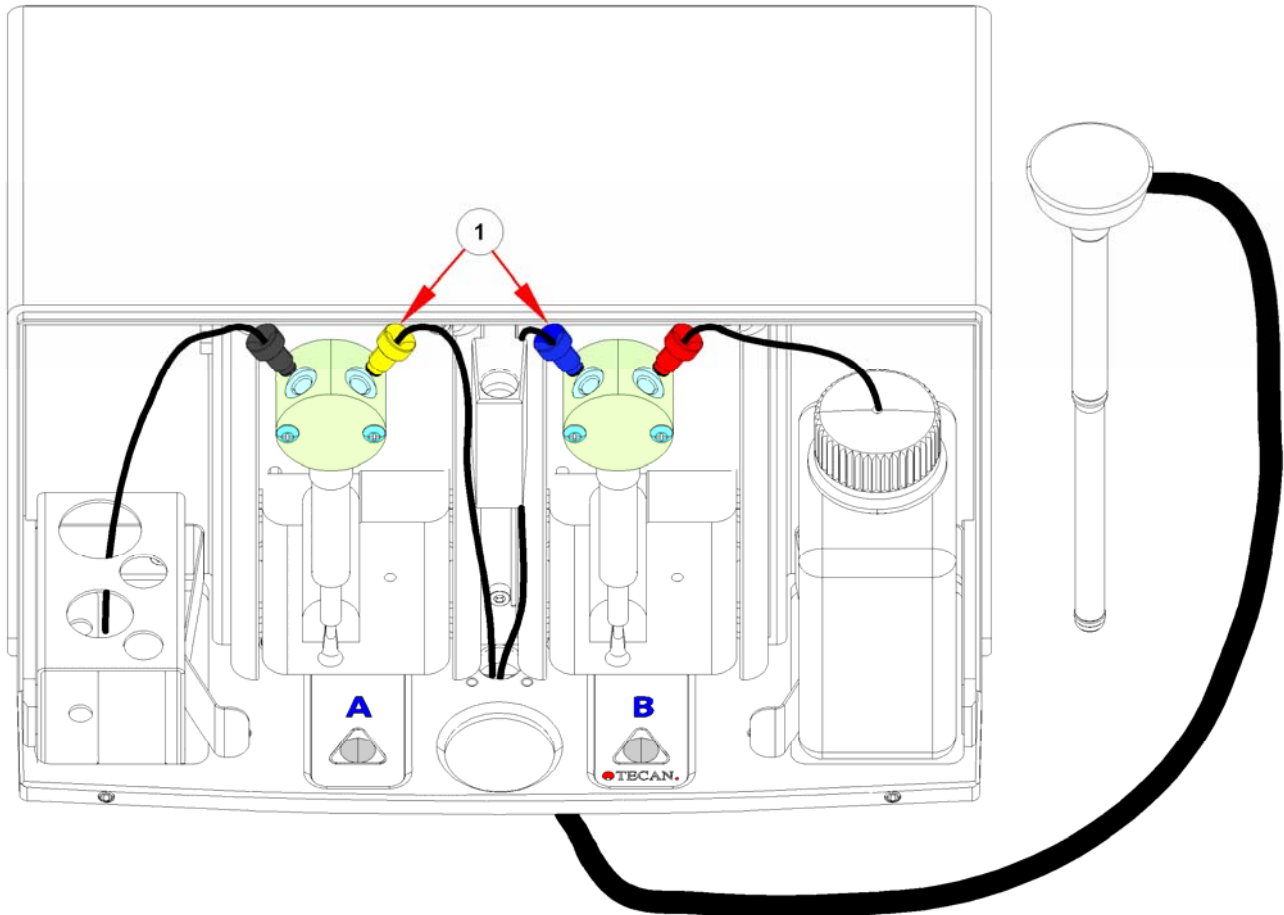9. Do all steps in reverse order

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

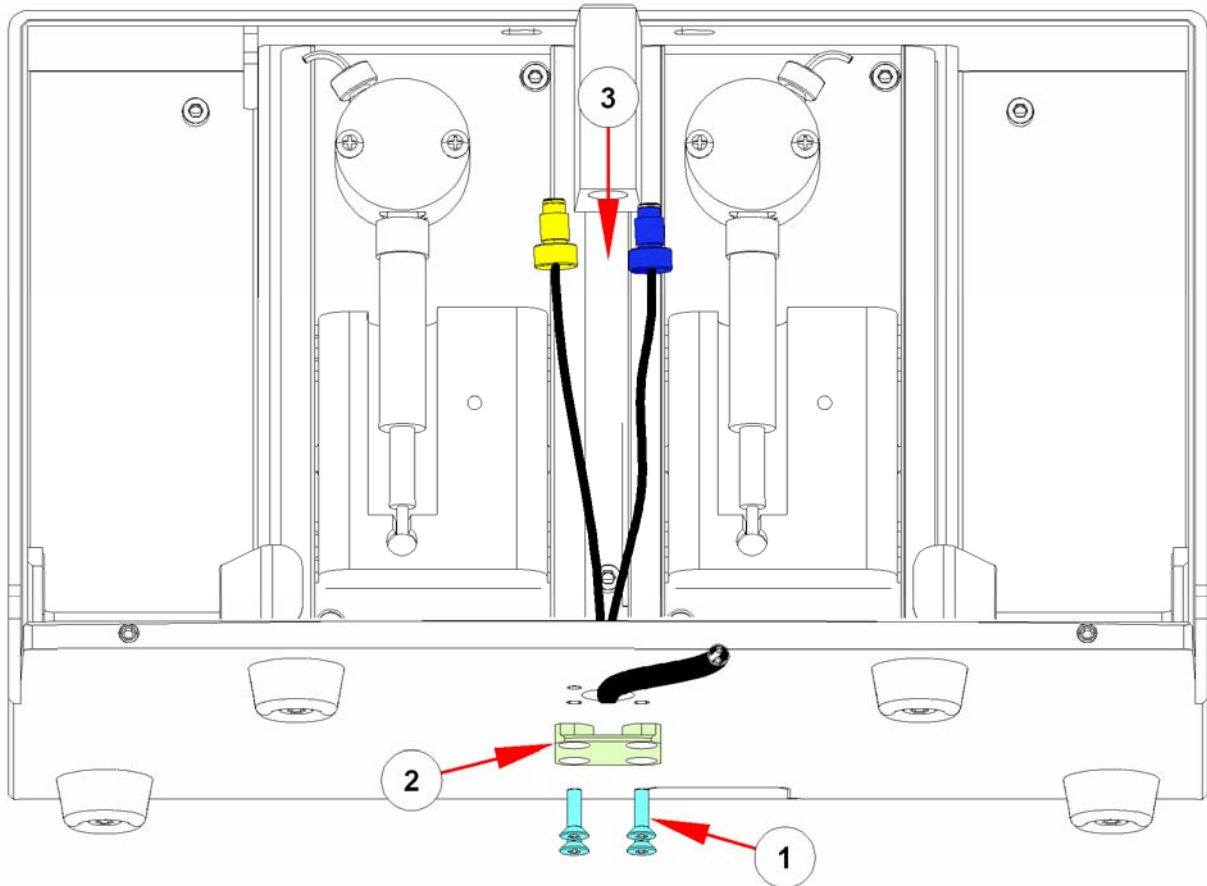### 8.8.3 Replacing the Injector Carrier

To replace the Injector Carrier use the following procedure:

1. Open the Injector Cover

2. Remove the blue and yellow tubes from the valve

3. Remove the screws No. 1 and the cover No. 2 below

4. Pull out the tubes No. 3

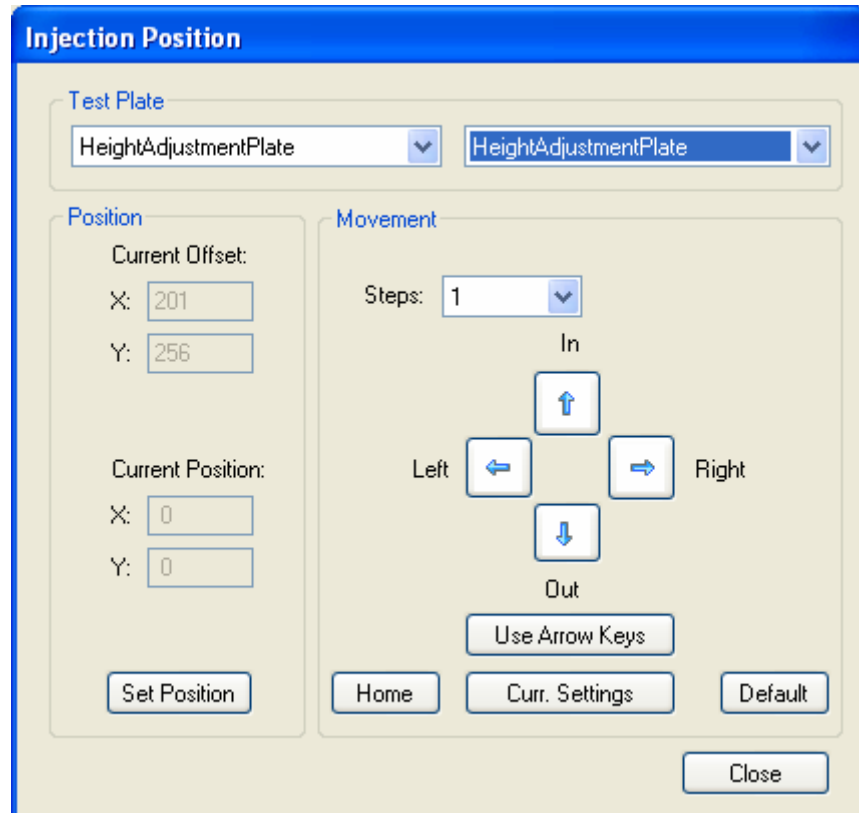5. Do all steps in reverse order

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

8.8.4   *Teaching the Injector Position*

After working on the Plate Transport, or on the Injector Holder, or after removal of the complete Optic Plate, the positions must be readjusted. Use the Blue Test Plate.
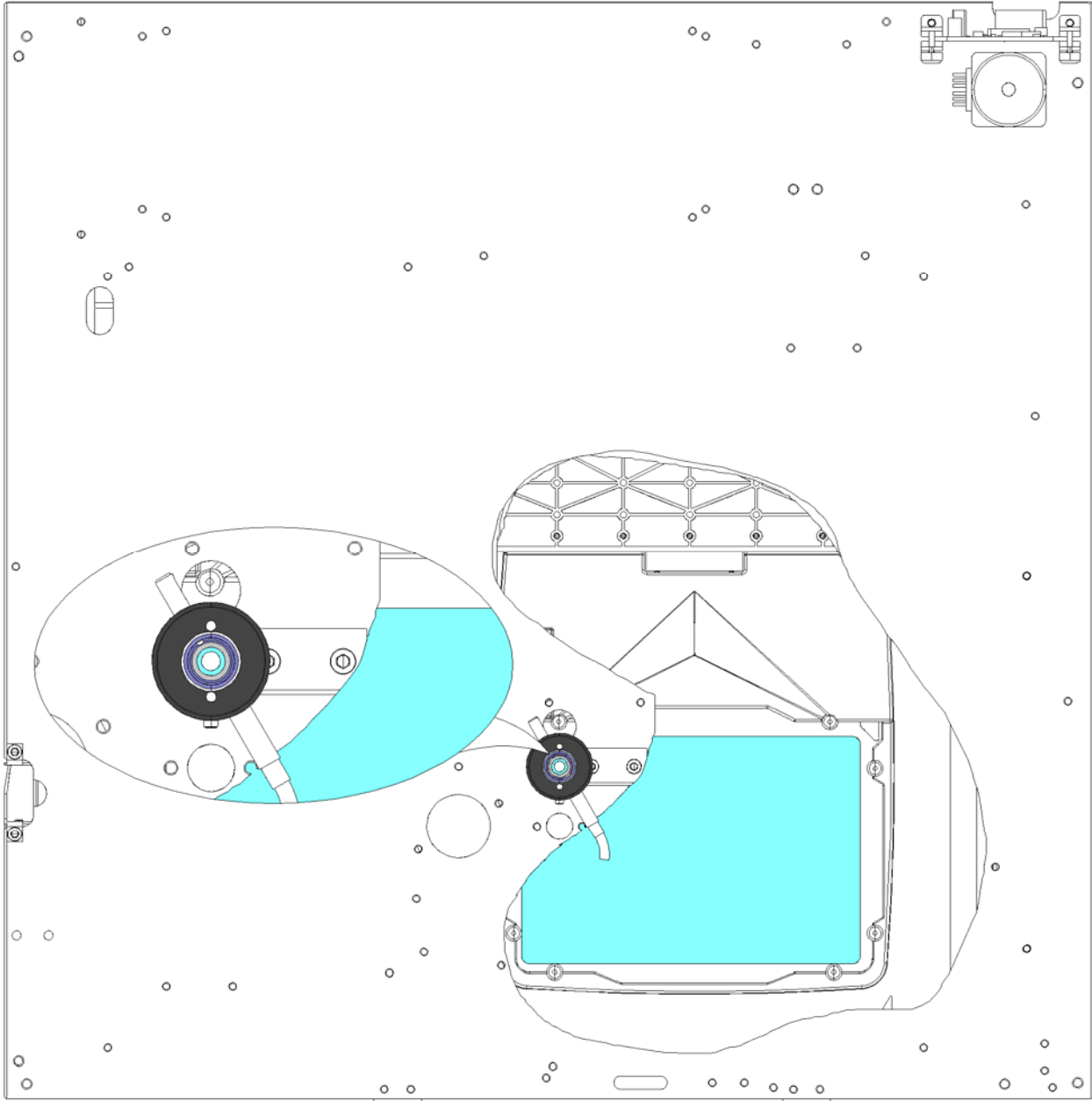
Via the Service Software, teach the position, so that the hole of the test plate is exactly aligned with the shaft of the injector. (Use a flashlight).

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

9. Electronic System

The **infinite 200** electronic system has been manufactured using a modular approach, with certain modules being controlled by their own internal firmware. These individual modules are connected via an RS485 bus communication system, which allows easier and faster identification of faulty modules using the **infinite 200** service software packages. Always wear anti-static protection equipment when changing electronic parts.

> *Note*
> *The following descriptions are valid for a fully loaded instrument with all options. If you do not have all options then ignore the description for that particular part!*

Please make sure to be careful that all of the connectors are connected properly.


ST6
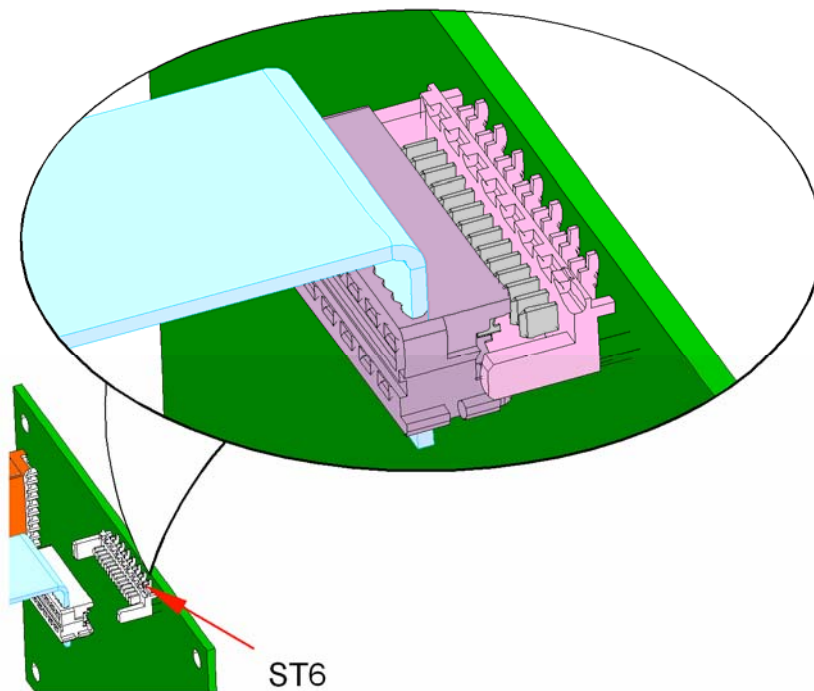
> **Caution**
> **Do not disconnect any connector when the instrument is switched ON!**

Wiring plans can be found in chapter Wiring Plans

9.1   Power Supply

The **infinite 200** is powered by an auto-sensing 24V DC output power supply. It accepts input voltages from 90V to 260V and frequencies of 50Hz and 60Hz without any adjustments required. The 24V DC output is connected to the Main Board.

The power supply can be replaced using the following procedure:
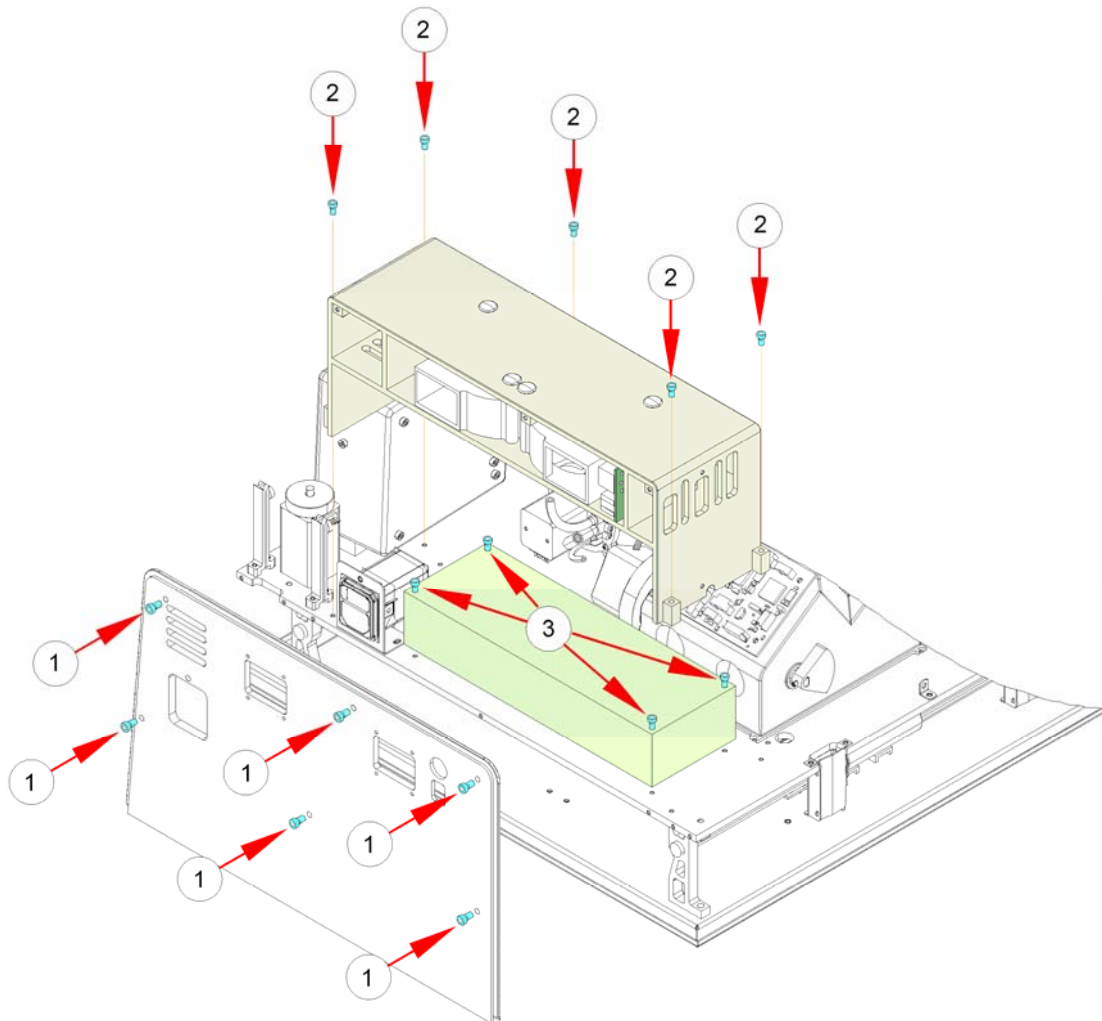
1. Remove the cover

2. Remove the back panel screws (No. 1)

3. Remove the power supply cover Screws (No. 2)

4. Disconnect the plugs CN1, CN2-3

5. Remove the power supply screws (No. 3)

6. to install the new power supply, perform the above steps in reverse order.

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

9.1.1 Voltage Specifications and Fuse Ratings

Check the voltage specifications on the rear panel of the instrument and ensure that the voltage supplied to the instrument is correct according to this specification.

The voltage range is 100-120 / 220-240V.

If the voltage is not correct, please contact your distributor.

STOP	**Caution** **Do not use the instrument if the voltage setting is not correct.** **If the instrument is switched ON with the incorrect voltage setting** **it will be damaged.**

Ensure that the correct type and rating of fuse is fitted.

Fuse = T 3.15 A / 250 V (slow blow)

⚠	**WARNING** **RISK OF FIRE!** **REPLACE ONLY WITH THE SAME TYPE AND RATING OF FUSE.**

9.2 Main CPU

The Main CPU is the heart of the instrument. All other modules are connected directly to the Main CPU. Mechanical movements as well as measurements are controlled and checked by the CPU.

The Flash Power supply is triggered and the various voltages are made available. As opposed to other instruments, the Main CPU of the **infinite 200** contains the Podi board and the Measurement CPU.

9.2.1 USB Communication

The **infinite 200** is connected to the personal computer with a USB 1.1 bus system. The interface is also USB 2.0 compatible. A driver must be installed for the initial connection. See chapter interfaces.

9.2.2 Bus System

The internal communication between the individual modules is supported by a RS485 bus system.
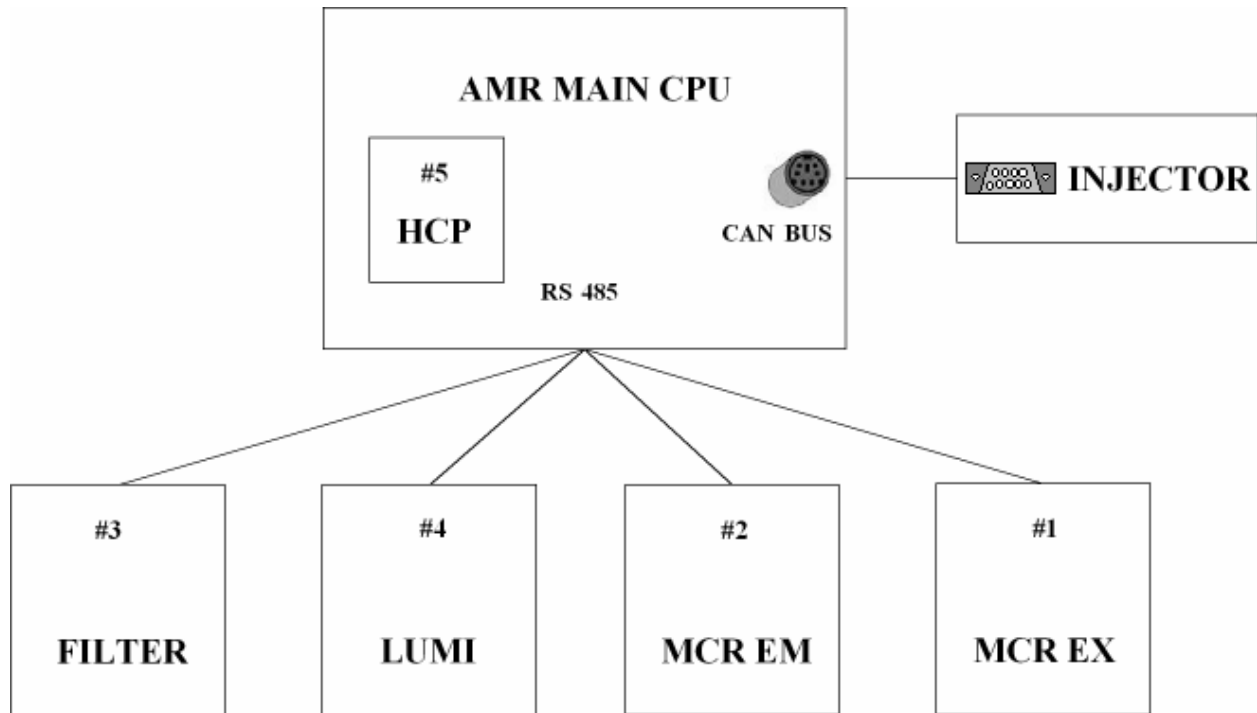
The communication to the injector is a CAN bus system The modules have the following addresses:

- Monochromator Excitation   1
- Monochromator Emission   2
- Filter module   3
- Lumi Module   4
- Internal Heating Control   5

Instrument Specific Parameters

Instrument specific parameters, such as offsets and filter definitions, are stored on the main CPU and the different modules. The integrity of these parameters is ensured by checksums, which are verified on instrument power up. If the checksums are corrupted, an error message will occur.

9.2.3 Instrument Heating Control

The **infinite 200** heating system consists one upper heating plate, with its own temperature sensor, which is connected to the main board. Operation of the heating foils is controlled by the internal HCP Chip. The heating foil cuvette is also controlled via the HCP Chip from the main CPU.

.
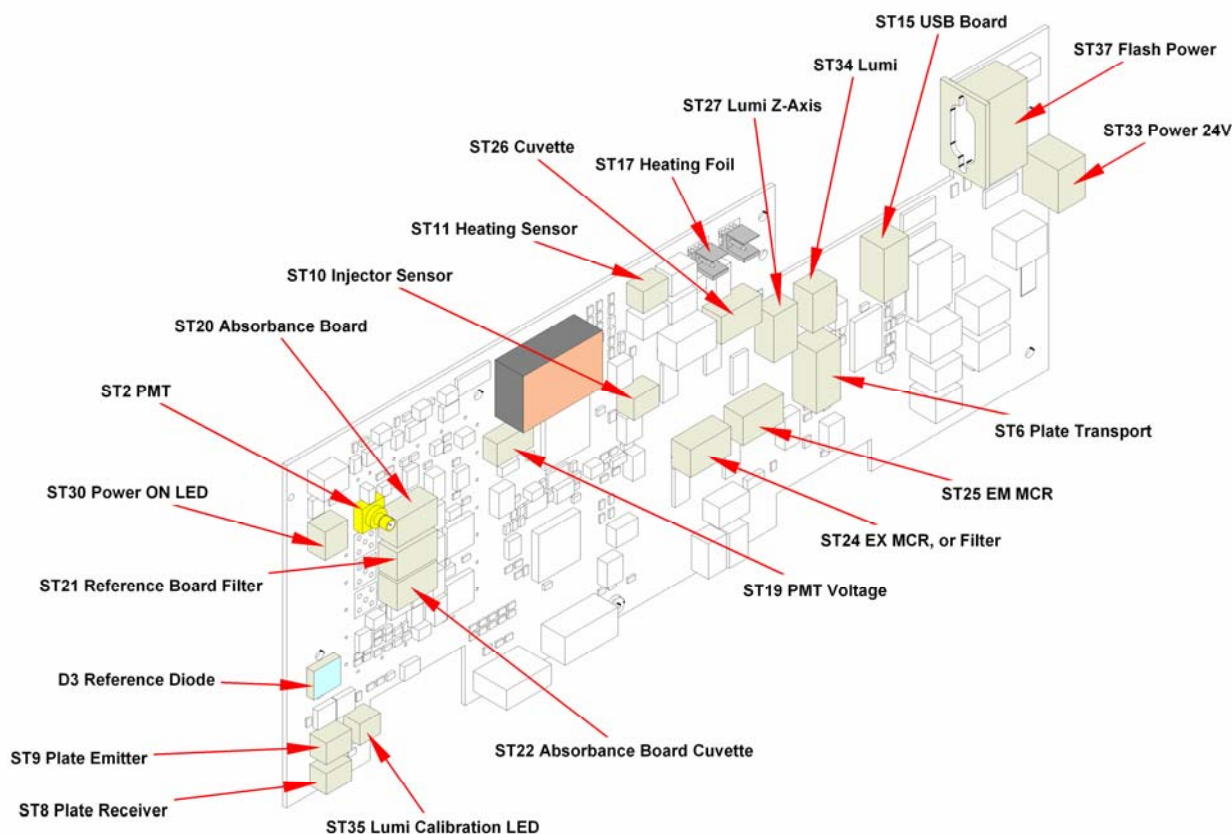
The CPU can be replaced using the following procedure:
1. Save all instrument settings
2. Remove the cover
3. Remove all connectors
4. Remove the reverence fiber
5. Remove the 3 screws and the board
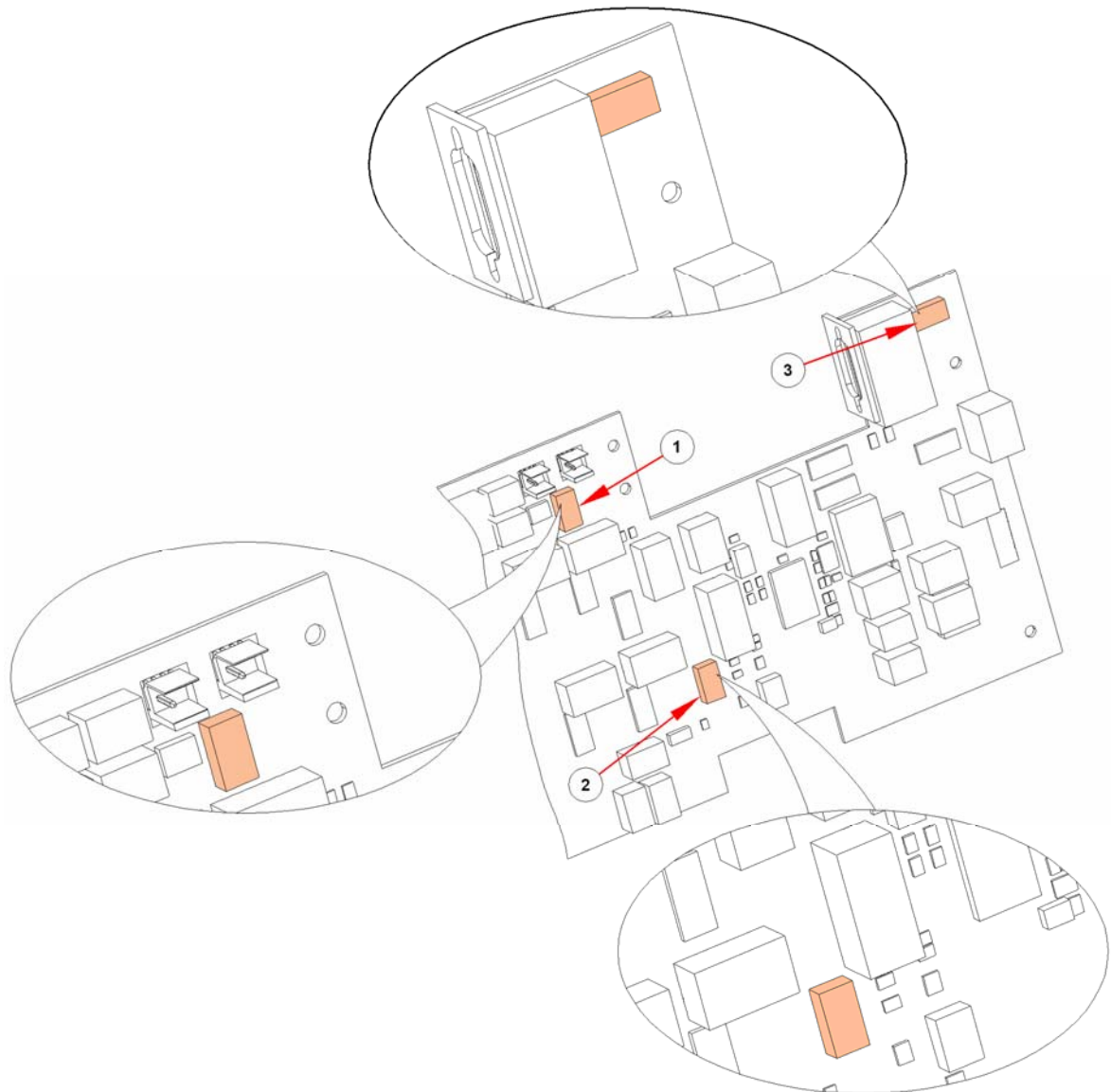6. To install the new CPU, perform the above steps in reverse order
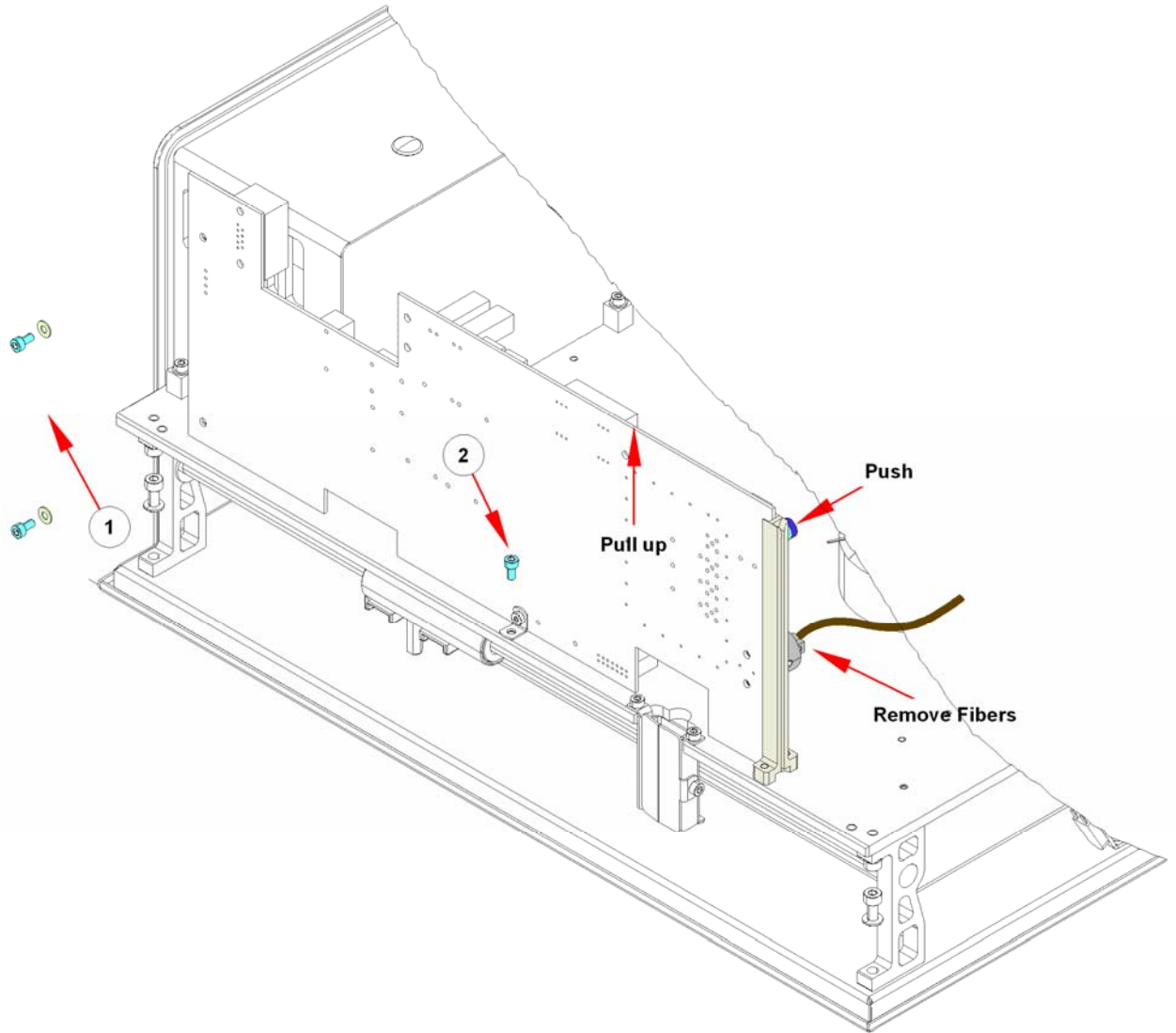
Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

9.2.4 Replaceable Fuses

The **infinite 200** has three removable fuses on the Main CPU. No. 1 is for the Heating System, No. 2 is for the Transport, and No. 3 is for the Flash power Supply.

> *Note*
> *If a fuse continues to blow, call for service.*

9.3 Flash Power Supply

The Flash Power Supply (FPS) generates an output of 600V DC and a trigger signal of approximately 150V DC. Two PWMs (pulse width modulators) generate the voltages.
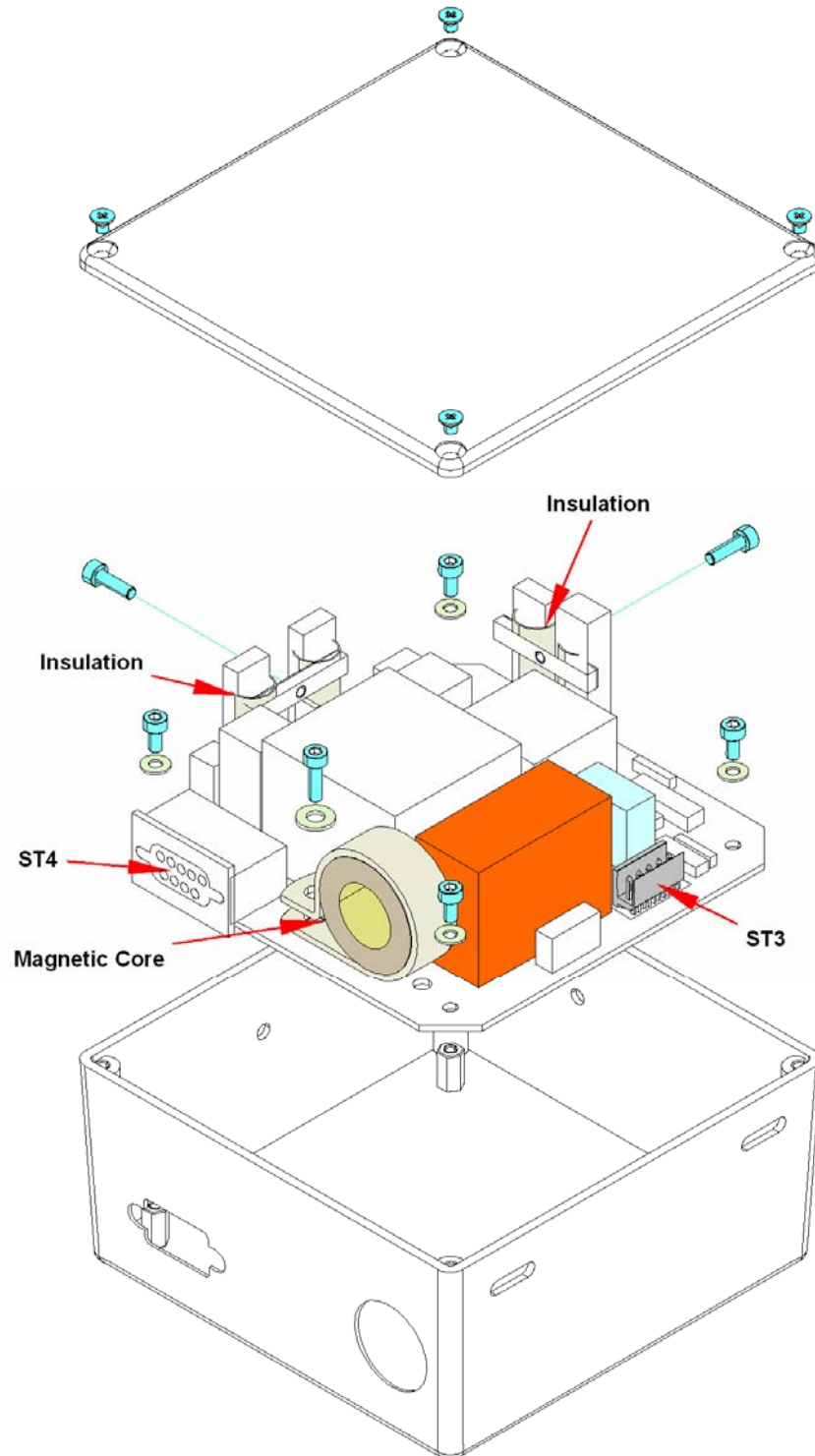
The FPS can be replaced using the following procedure:
1. Remove the cover
2. Disconnect ST3 & ST4
3. Remove the Flash Power Supply cover

> **WARNING!**
> **MAKE SURE THAT THE INSTRUMENT IS SWITCHED OFF -**
> **HIGH VOLTAGE FLASH POWER SUPPLY!**

4. Remove the screws from the insulation carefully
5. Remove the 5 screws from the board
6. Remove the magnetic core
7. To install the new FPS, perform the above steps in reverse order.

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

9.4   Filter Board

The board that controls the Filter Module is the same board that controls the Monochromator Module.
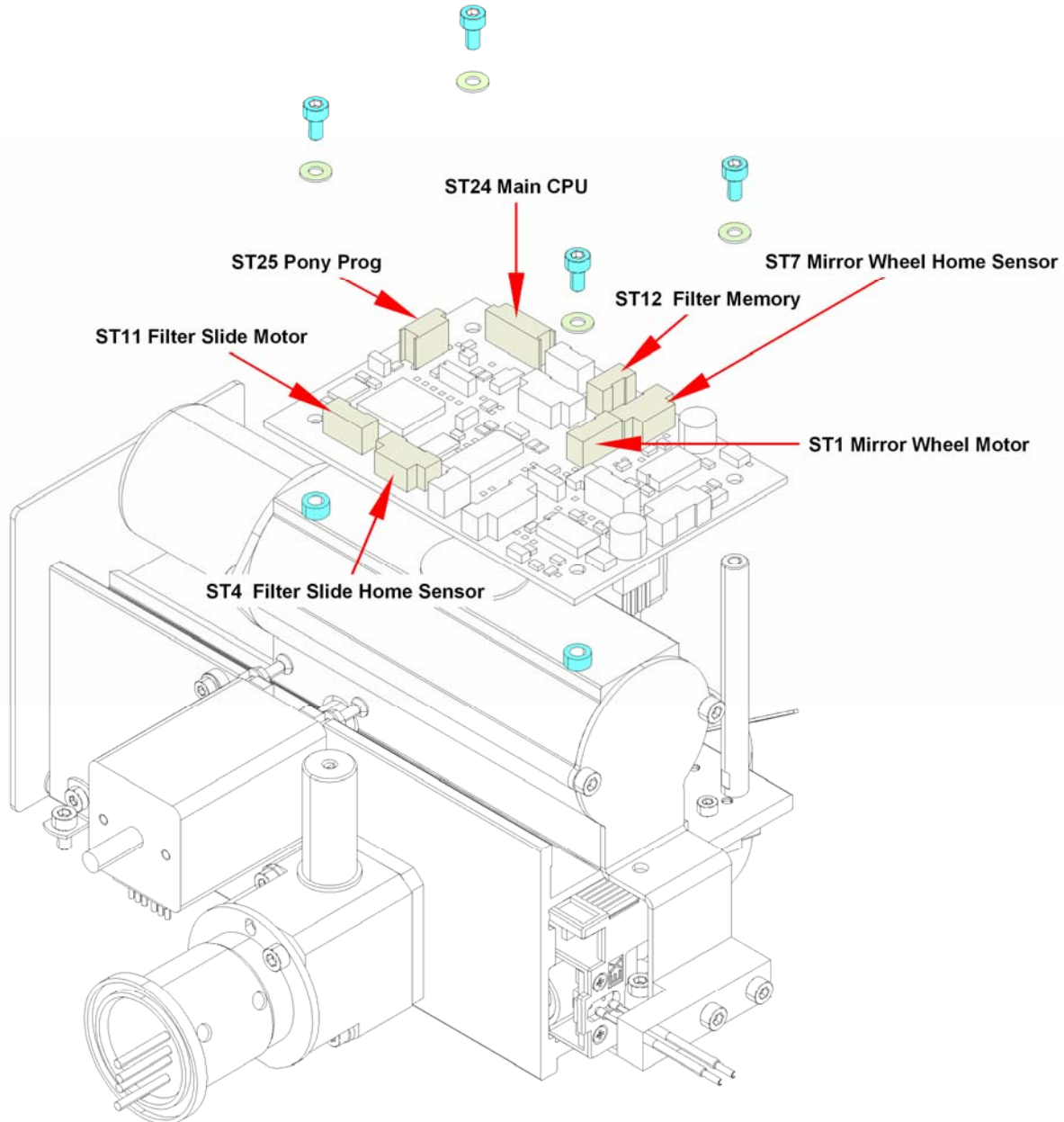
The Filter Board can be replaced using the following procedure:

- Remove the covers
- Save the instrument settings
- Disconnect all plugs
- Remove 4 screws and the board
- To install the new Filter Board, perform the above steps in reverse order

Required Tests and Settings

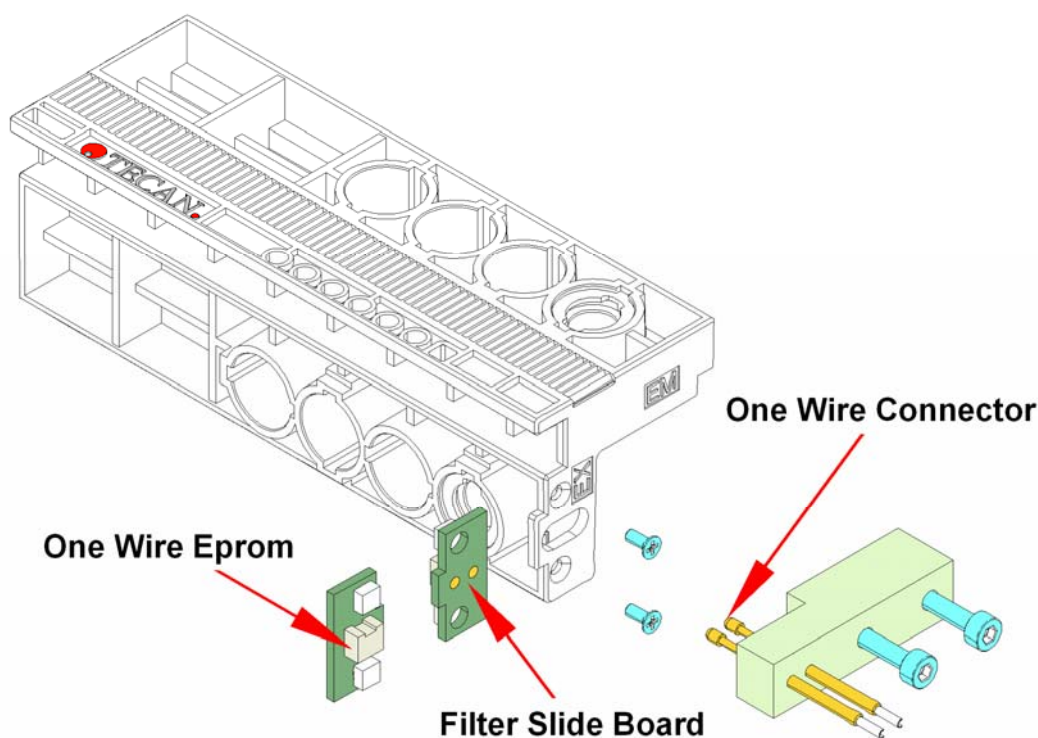Please see 11 Required Tests & Settings for all required tests and settings.

9.5 Filter Carrier Board

The **infinite 200** Filter Carrier is the first to contain both emission and excitation filters. A one-wire EPROM is also included and stores all the filter data of the installed filters. It also stores information regarding the life span of the filter.

When the instrument is switched on, the filter carrier is moved backwards onto the contact and the data is read. The instrument also performs this step whenever a new filter carrier is used.

The Filter Carrier Board can be replaced using the following procedure:

1. Save the instrument settings

2. Move the filter slide out of the instrument

3. Remove 2 screws

4. Replace the board

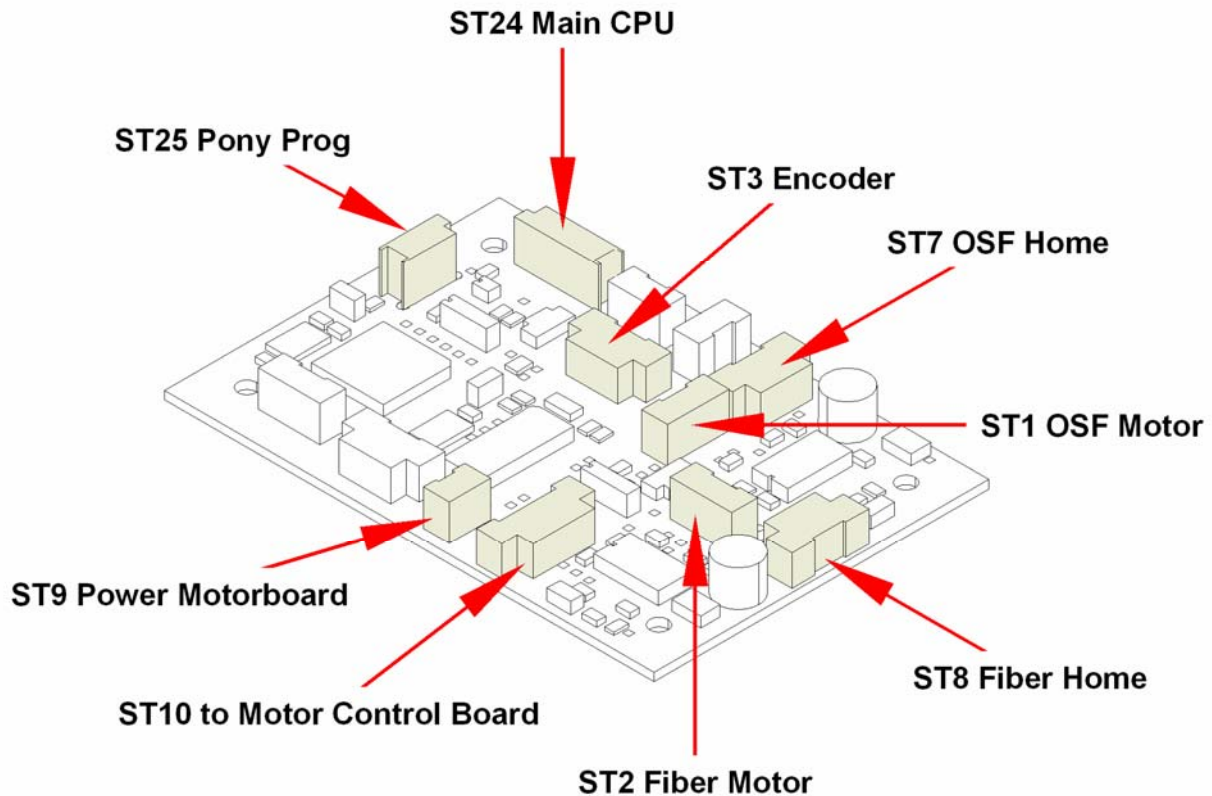5. To install the new board, perform the above steps in reverse order.

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

9.6 Monochromator Boards

The boards for both monochromators are identical, but the settings for each are different. The Monochromator CPU controls the OSF filter, the fiber switches and reads the data from the encoder. The SANYODENKI Motor Board is controlled through ST9 and ST10.

ST24 Main CPU

ST25 Pony Prog

ST3 Encoder

ST7 OSF Home

ST1 OSF Motor

ST9 Power Motorboard

ST8 Fiber Home

ST10 to Motor Control Board

ST2 Fiber Motor

The boards can be replaced using the following procedure:

- Save the instrument settings
- Remove the covers
- Disconnect all plugs
- Remove 4 screws and the board
- To install the new monochromator board, perform the above steps in reverse order
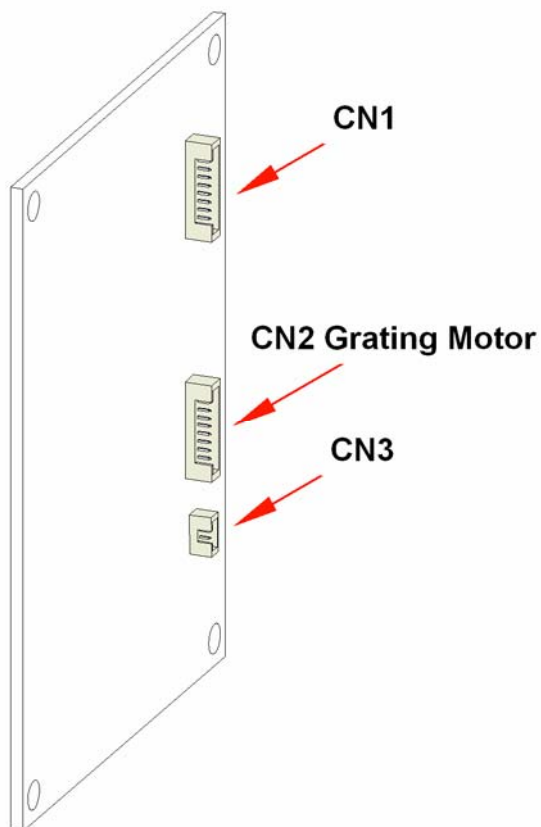
Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

9.7 Phase Grating Motor Boards

The **infinite 200** use SANYODENKI Motor Boards, which are included in each Monochromator Module, and control the five-phase stepper motor.

The boards for the EM and EX Monochromators are identical and therefore interchangeable.

CN1

CN2 Grating Motor

CN3

1. To replace the board, remove the 4 screws and the connectors and remove the old board.
2. Install the new board and replace the 4 screws and the connectors.

Required Tests and Settings

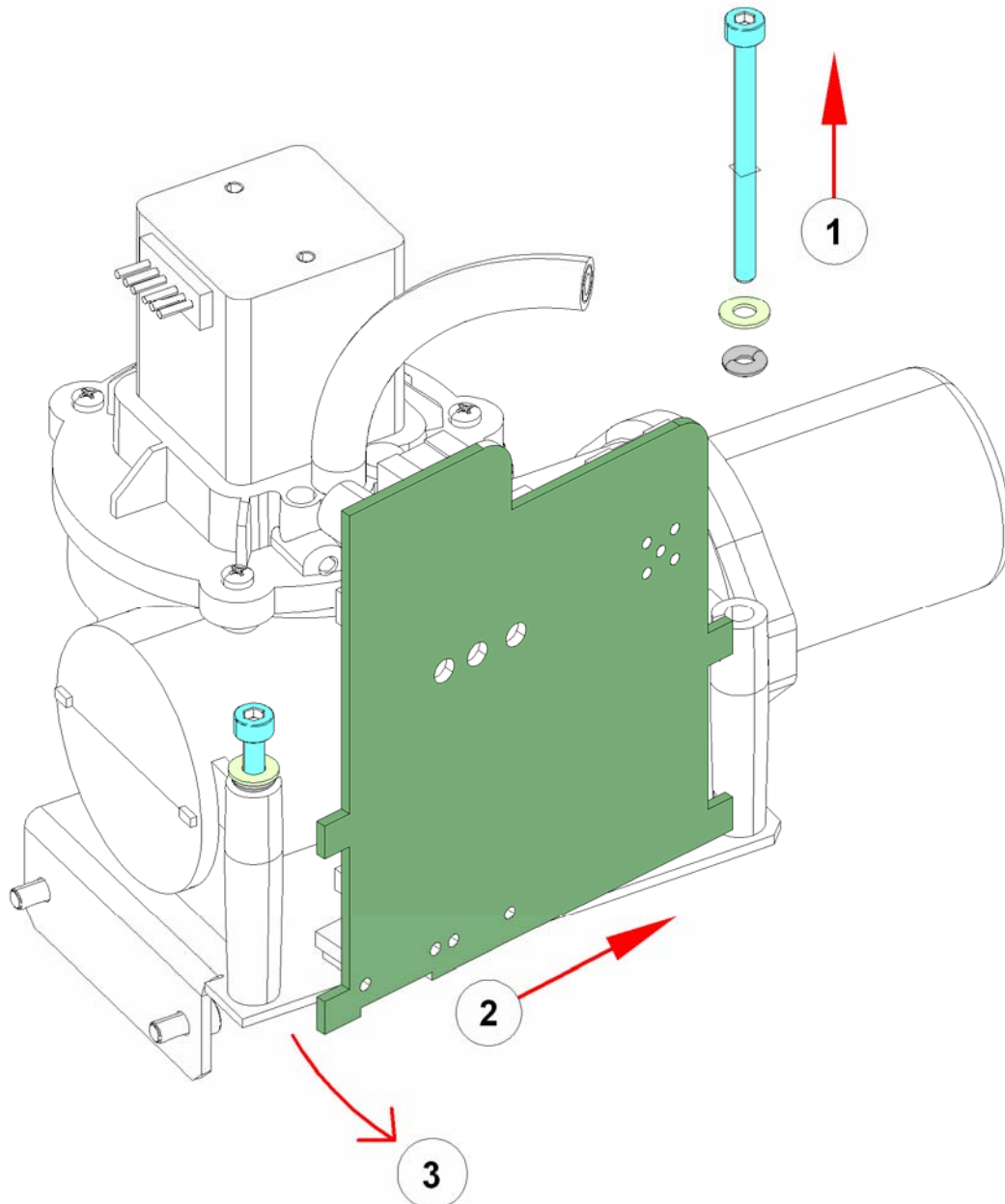Please see chapter 11 Required Tests & Settings for all required tests and settings.

9.8 Lumi Units

In the **infinite 200**, the luminescence detection system is a separate unit of the fluorescence detection system. The system consists of two parts, the Lumi Board and the Z-drive board. The Lumi Board controls the Filter Wheel and the PMT.
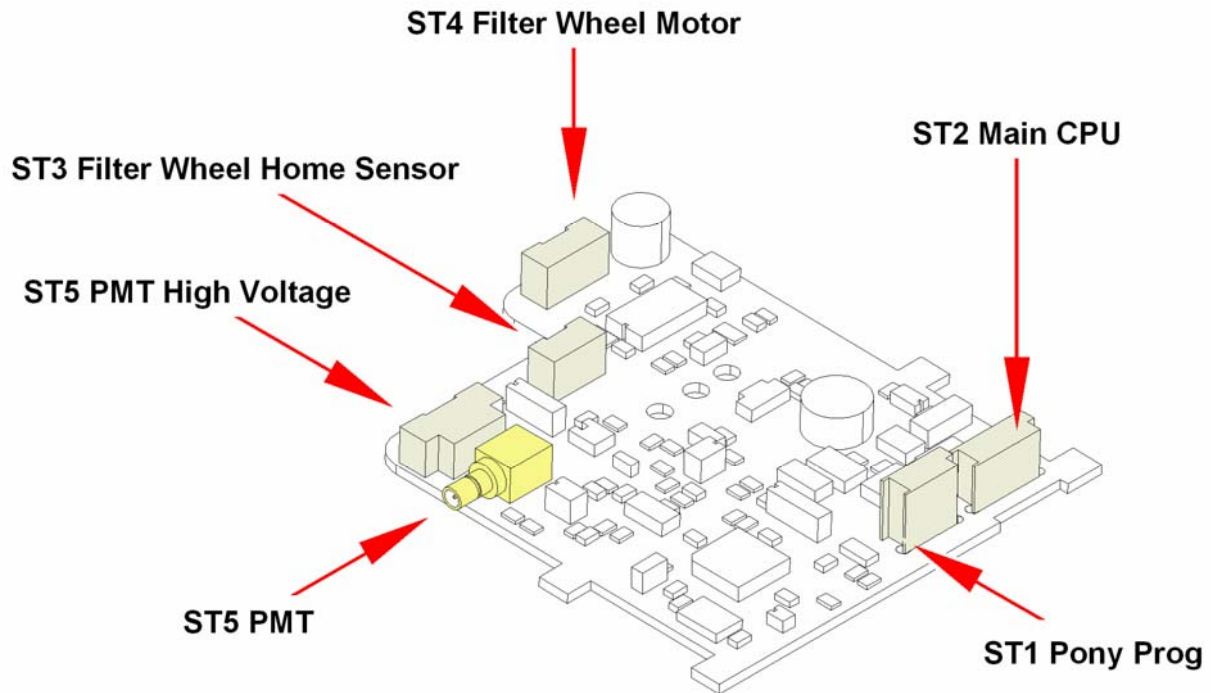
The boards can be replaced using the following procedure:

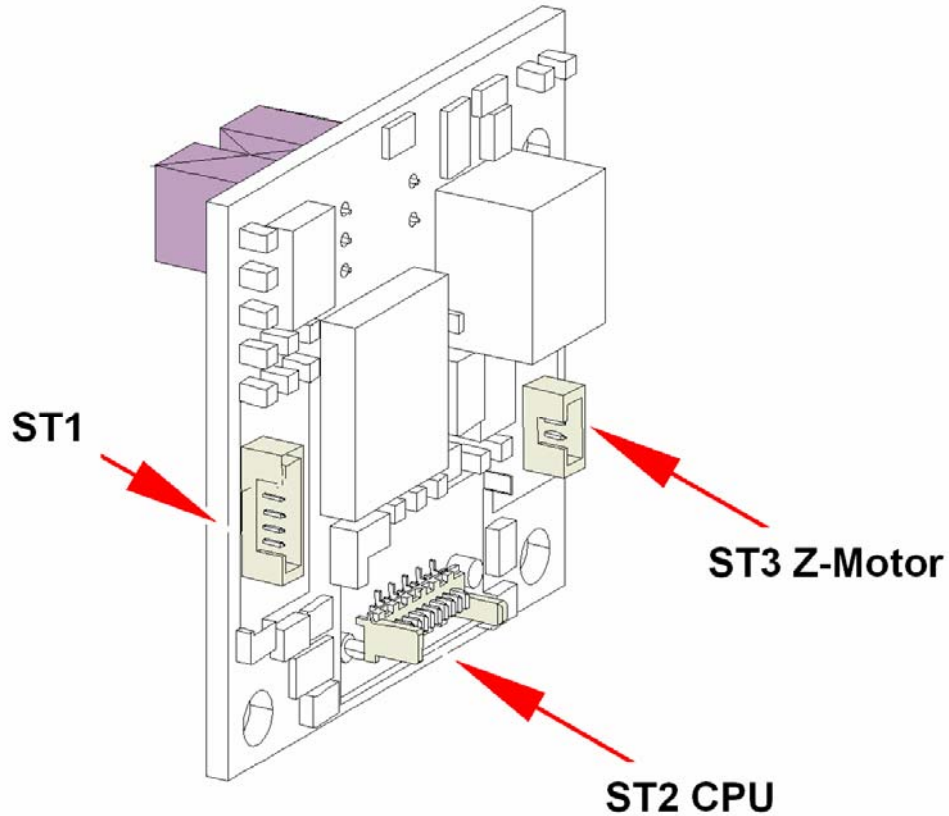1. Save the instrument settings
2. Remove the covers

3. Remove screw No.1 and loosen the other one

4. Push the board right side, see No. 2

5. Turn the board, see No. 3

6. Disconnect all plugs

7. To install the new board, perform all steps in reverse order

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

9.9   Z-Drive Board

The function of the Z-drive board is to control the Z-drive stepper motor for the Lumi Z Axis. It is important to adjust the MTP close to the fiber optic.

ST1

ST3 Z-Motor

ST2 CPU

To replace the board perform the following procedure:

- Remove the cover

- Save the Instrument settings

- Remove the 3 screws and the plugs

- To install the new board, perform the above steps in reverse order.
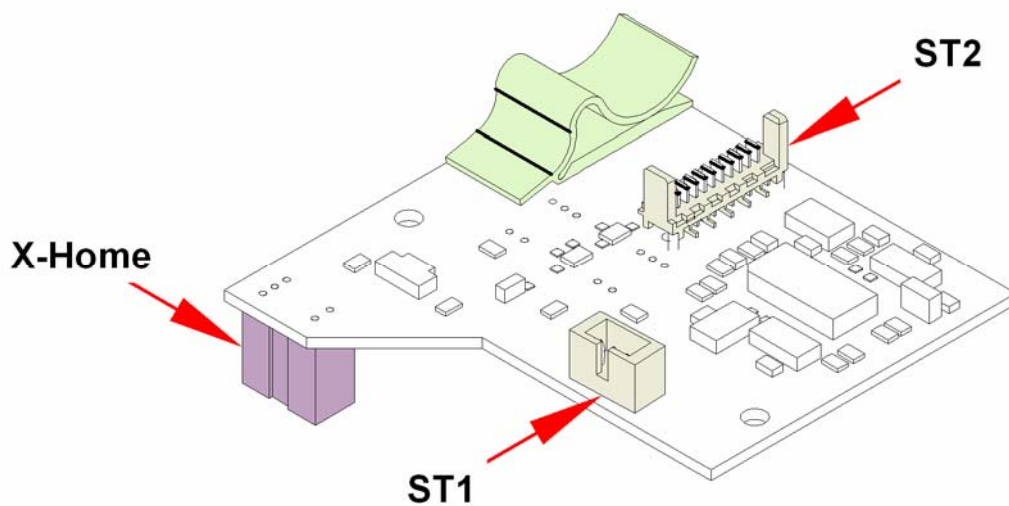
Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

9.10 X-drive Board

The function of the X-drive board is to control the X-drive stepper motor. Also situated on the X-drive board are the home position sensor for Y-Axis and X-Axis and the load pos Sensor.

To replace the board perform the following procedure:

1. Save the Instrument settings

2. Remove the cover

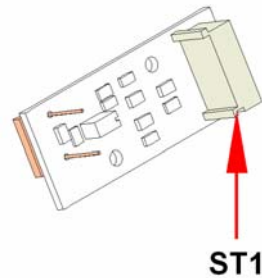3. To install the new board, perform the above steps in reverse order.

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

9.11 Absorbance & Reference Boards

The Absorbance Board is installed in three locations within the instrument.

1. At the bottom of the instrument as an Absorbance Board
2. In the Cuvette Module as an Absorbance board
3. In the Filter Measurement Head as a Reference Board

ST1

9.11.1 Filter Reference Board

To replace the filter reference board perform the following procedure:

1. Move the mirror wheel into the position shown below.
2. Remove the two screws and remove the flat cable
3. Remove the board
4. To install the new board, perform the above steps in reverse order
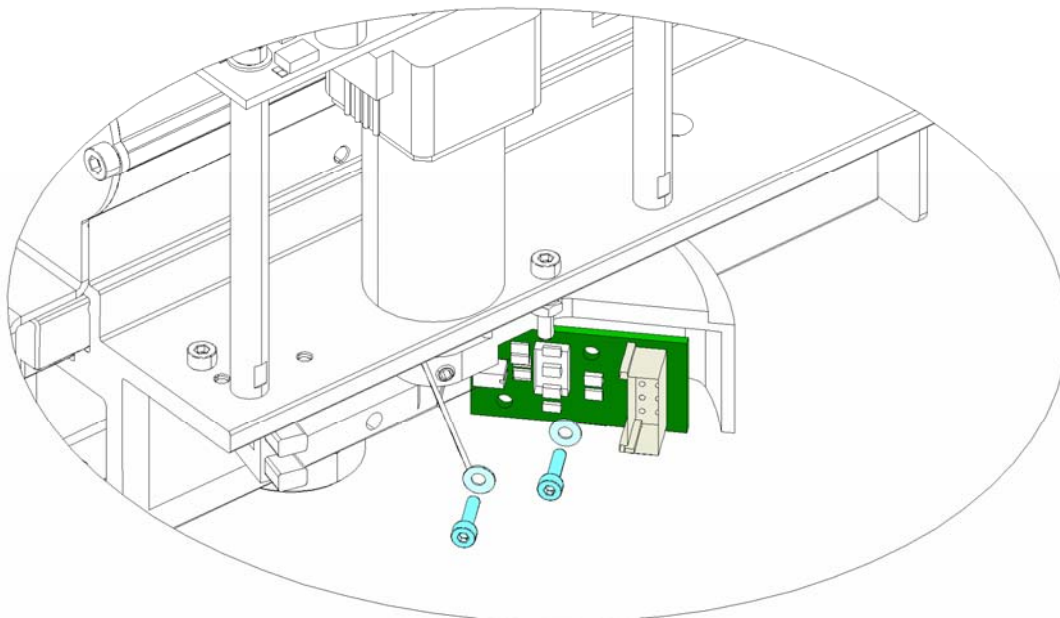
Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

9.12 Cuvette Absorbance Board

To replace the Cuvette Absorbance board, perform the following procedure:

1. Remove the two screws and remove the flat cable
2. Remove the board
3. To install the new board, perform the above steps in reverse order

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

9.13 Absorbance Board

The Absorbance Board and Optical Unit are attached to the bottom plate.

To replace the Absorbance board, perform the following procedure:

1. Remove the cover
2. Remove the optical unit from the bottom plate (see Optical Unit)
3. Remove the two screws and remove the flat cable
4. Remove the board
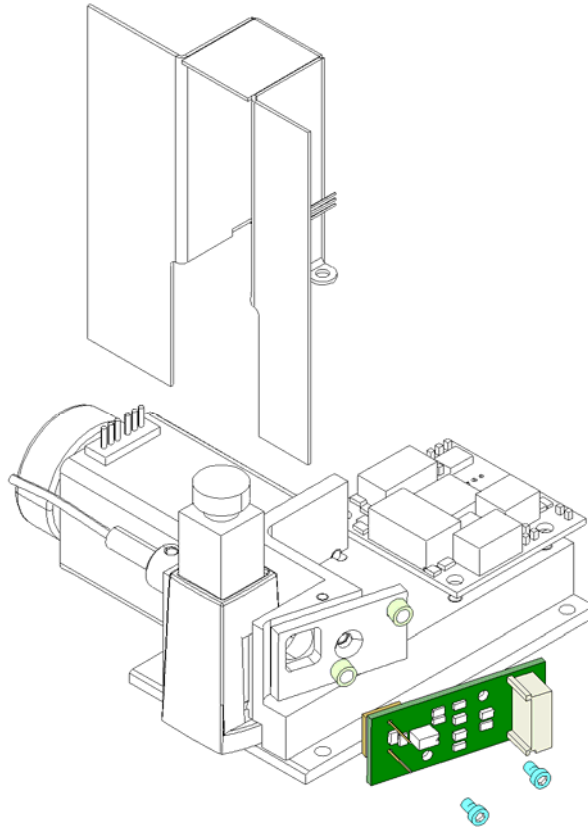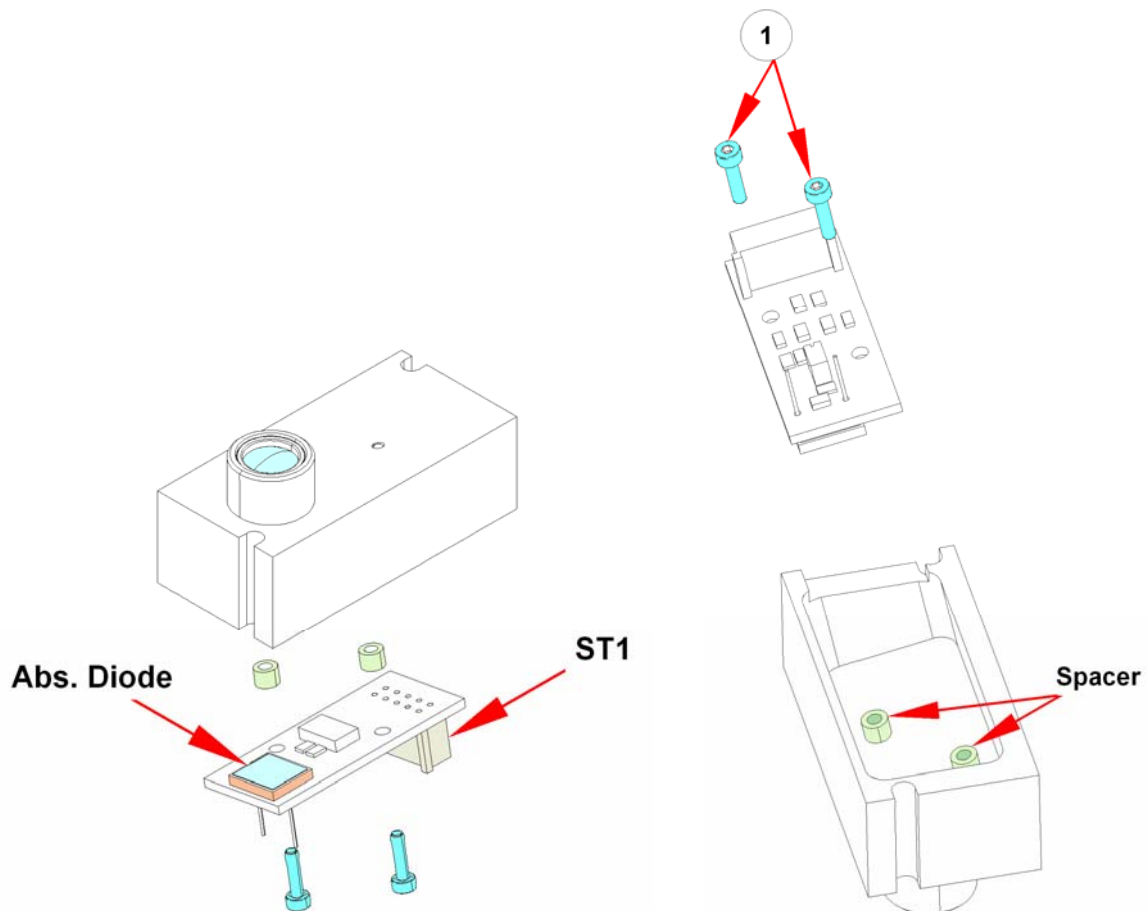5. To install the new board, perform the above steps in reverse order

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

9.14 Cuvette Board

The board in the Cuvette Module controls the movement of the cuvette carrier and module heating.

To replace the board perform the following procedure

1. Save the Instrument settings
2. Remove the cover
3. Remove the three screws and undo the connections
4. Remove the board
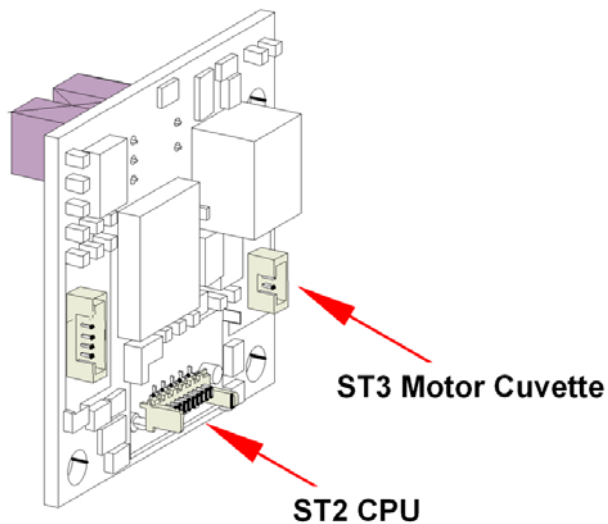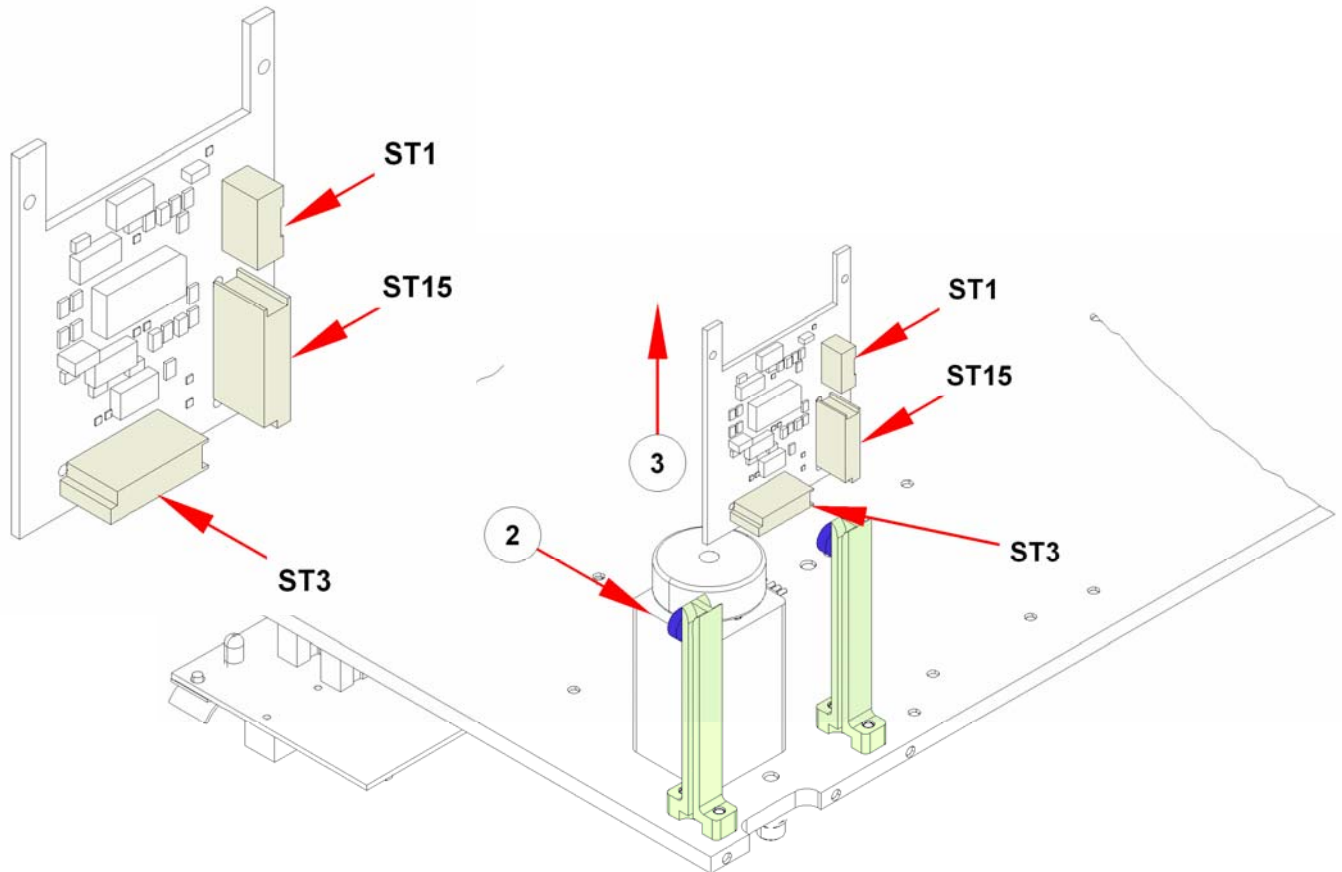5. To install the new board, perform the above steps in reverse order

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

9.15   Y-drive Board

The Y-drive board controls the Y-drive stepper motor. Also situated on the Y-drive board is the connector ST3 for the X-drive board.

To replace the board perform the following procedure

- Save the Instrument settings

- Remove the cover

- Unlatch board lock (see No. 2)

- Disconnect ST1, ST15, St3

- Remove the board (see No. 3)

- To install the new board, perform the above steps in reverse order

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

9.16 Power On LED Board
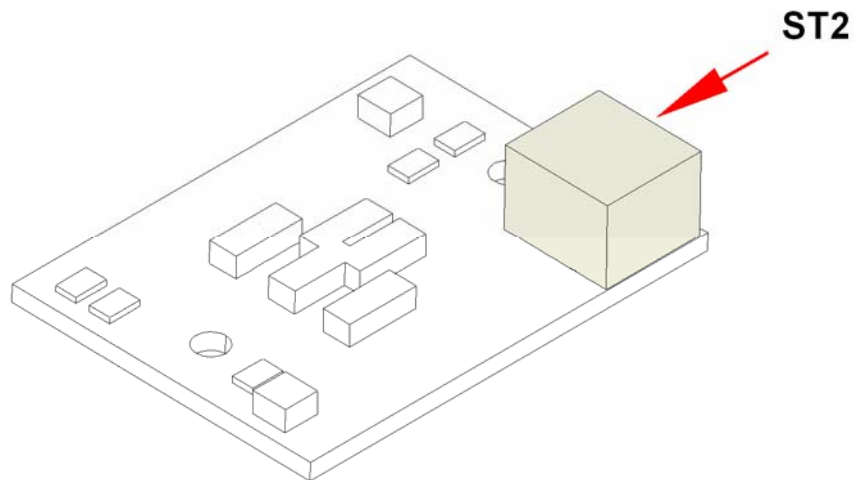
To replace the board perform the following procedure:

- Remove the cover
- Remove the front cover from the main cover
- Disconnect ST 2
- Remove the board
- To install the new board, perform the above steps in reverse order

Required Tests and Settings

Please see 11 Required Tests & Settings for all required tests and settings.

10. Cleaning and Maintenance

10.1 Introduction

> **Caution**
> **Ensure that the microplate is removed from the instrument before it is prepared for shipment. If a microplate is left in the instrument, fluorescent solutions may spill onto the optical parts and damage the instrument.**

The cleaning and maintenance procedures are important in order to prolong the instrument's life and to reduce the need for servicing.

This section contains the following procedures:

- Liquid Spills
- Instrument Disinfection
- Disinfection Procedure
- Disinfection Certificate
- Disposal

10.2 Liquid Spills

9. Wipe up the spill immediately with absorbent material.

10. Dispose of contaminated material appropriately.

11. Clean the instrument surfaces with a mild detergent.

12. For biohazard spills clean with B30 (Orochemie, Max-Planck-Str. 27, D-70806 Kornwestheim).

13. Wipe cleaned areas dry.

> **WARNING**
>
> **ENSURE THAT THE MICROPLATE IS REMOVED FROM THE INSTRUMENT BEFORE IT IS PREPARED FOR SHIPMENT. IF A MICROPLATE IS LEFT IN THE INSTRUMENT, FLUORESCENT SOLUTIONS MAY SPILL ONTO THE OPTICAL PARTS AND DAMAGE THE INSTRUMENT.**

10.3   Instrument Disinfection

All parts of the instrument that come into contact with the patient samples, positive control samples or hazardous material must be treated as potentially infectious areas.

	Caution
STOP	**It is very important that the instrument is thoroughly disinfected before it is removed from the laboratory or any servicing is performed on it.** **The disinfection procedure must be performed according to applicable local and national laws and regulations.**

Before the instrument is returned to the distributor for servicing, it must be disinfected and a disinfection certificate completed. If a disinfection certificate is not supplied, the instrument may not be accepted by the servicing center or it may be held by the customs authorities.

Disinfection Solutions

The instrument should be disinfected using the following solution:

B30 (Orochemie, Max-Planck-Str. 27; D-70806 Kornwestheim)

	Caution
STOP	**The disinfection procedure should be performed by authorized trained personnel in a well-ventilated room wearing disposable gloves and protective glasses and clothing.** **Please note that the disinfectant can influence the performance of your instrument if it applied inside the instrument.**

Disinfection Procedure

If the laboratory has no specific disinfection procedure, the following procedure should be used to disinfect the outside surfaces of the instrument:

1. Disconnect the instrument from the main power supply.
2. Disconnect the instrument from any accessories that are used. Make certain that you are wearing disposable gloves.
3. Carefully wipe all outside surfaces of the instrument with a wad of cotton wool soaked in the disinfecting solution.
4. Make certain, that the same disinfection procedure is performed with the plate carrier.
5. Repeat the disinfection procedure on any accessories, which are also being moved for returned.
6. After the disinfection procedure has been performed, make certain that the disinfection certificate is completed.

See 10.4 for an example of the disinfection certificate, which must be completed before the instrument is returned to the distributor for servicing.

10.4 Disinfection Certificate

This disinfection certificate must be completed before the instrument is returned to the distributor for servicing.

The certificate must be attached to the top of the outer package in which the instrument is returned.
It must be visible from the outside of the shipping container!

I declare that the instrument in this package has been decontaminated or disinfected to remove or inactivate any biological material, which could be dangerous to the service personnel, or that it has never been exposed to any hazardous biological material.

Name:...

Firm: ....

Address: ....

....

....

Country:...

Signature:...

✂--

I declare that the instrument in this package has been decontaminated or disinfected to remove or inactivate any biological material, which could be dangerous to the service personnel, or that it has never been exposed to any hazardous biological material.

Name:...

Firm: ....

Address: ....

....

....

Country:...

Signature:...

10.5 Disposal

Follow laboratory procedures for bio-hazardous waste disposal, according to national and local regulations.

This gives instructions on how to lawfully dispose of waste material accumulating in connection with the instrument.

Caution
Observe all federal, state and local environmental regulations.

ATTENTION
NEGATIVE ENVIRONMENTAL IMPACTS ASSOCIATED WITH THE TREATMENT OF WASTE. ● **DO NOT TREAT ELECTRICAL AND ELECTRONIC EQUIPMENT AS UNSORTED MUNICIPAL WASTE.** ● **COLLECT WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT SEPARATELY.**

Disposal of Packing Material

According to Directive 94/62/EC on packaging and packaging waste, the manufacturer is responsible for the disposal of packing material.

Returning Packing Material

If you do not intend to keep the packing material for future use, e.g. for transport and storage purposes, return the packaging of the product, spare parts and options via the field service engineer to the manufacturer.

Disposal of Operating Material

> **WARNING**
>
> **BIOLOGICAL HAZARDS CAN BE ASSOCIATED WITH THE WASTE MATERIAL (MICROPLATE) OF THE PROCESS RUN ON THE infinite 200.**
>
> **TREAT THE USED MICROPLATE, OTHER DISPOSABLES, AND ALL SUBSTANCES USED, IN ACCORDANCE WITH GOOD LABORATORY PRACTICE GUIDELINES.**
>
> **INQUIRE ABOUT APPROPRIATE COLLECTING POINTS AND APPROVED METHODS OF DISPOSAL IN YOUR COUNTRY, STATE OR REGION.**

Disposal of the Instrument

Please contact your local Tecan service representative before disposing of the instrument.

> **Caution**
> **Always disinfect the instrument before disposal.**

Pollution degree	2 (IEC/EN 61010-1)
Method of disposal	Contaminated waste

> **WARNING**
>
> **DEPENDING ON THE APPLICATIONS, PARTS OF THE infinite 200 HAVE BEEN IN CONTACT WITH BIOHAZARDOUS MATERIAL.**
> - **MAKE SURE TO TREAT THIS MATERIAL ACCORDING TO THE APPLICABLE SAFETY STANDARDS AND REGULATIONS.**
> - **ALWAYS DECONTAMINATE ALL PARTS BEFORE DISPOSAL.**

11. Required Tests & Settings

11.1 General

In the **Xinfinite 200** service software, all of the necessary tests are divided into groups, so that it is easy to perform the required tests after a repair to the instrument has been made.

For each test, a DHR (Device History Record) will be created. Tecan Austria recommends entering **Repair**, **Service**, or **Preventive Maintenance** as the reason for performing the test.

11.1.1 Tests and Adjustments

After every repair, some adjustments are necessary. It depends on the nature of the repair, whether it will be necessary to perform all tests and adjustments or only those associated with the parts being replaced.

It is possible to select and perform individual tests and adjustments. If more than one test is selected and **Auto Run** is clicked, the tests will be performed in the correct order.

For a description of the individual tests and adjustments, 5.2 **Xinfinite** Service Software.

General

Under **General**, it is normally recommended to perform Firmware Download; all of the tests must be performed only when the Main Board is replaced.

> *After replacing the Main Board, run the General adjustments and reload the basic instrument settings!*

Injector

Injector			
☐ Adjust Plate Sensor	TODO	Details	Run
☐ Injection Position	TODO	Details	Run

Adjustments to the Plate Transport, Injector, and Microplate Sensor can be performed here.

Luminescence

Luminescence			
☐ Z-Transport Offset	FAILED	Details	Run
☐ Reference Check Values	PASSED	Details	Run

When replacing the lumi-fibers or the Z-axis, or when working on the Lumi-Module, adjustments should be made here.

Monochromator

Monochromator			
☐ Wavelength Accuracy	TODO	Details	Run
☐ Fiber Fine Adjustment	TODO	Details	Run
☐ Reference Diode Calibration	TODO	Details	Run
☐ Intensity Calibration Lamp	TODO	Details	Run
☐ Reference Check Values	PASSED	Details	Run
☐ Measurement Ranges	TODO	Details	Run

> ***Note***
> ***After replacing the Monochromator Module,***
> ***reload the module instrument settings!***

When replacing the Monochromator Module, all of the adjustments and tests in this group must be performed after the instrument settings have been downloaded. The data for Reference Diode Calibration or Intensity Calibration Lamp must be rewritten to the instrument using the file "MonoIntensityCalibration.xml"!

Filter

> ***After replacing the Filter Module,***
> ***reload the module instrument settings!***

After working on or replacing the Filter Module, all of the adjustments and tests in this group must be performed.

Miscellaneous

Relevant tests and adjustments are dependent on the repairs made. **Plate Transport Offset** and **Buildin Test Spot** should always be performed.

11.1.2 Tools/Tests

Dark Noise Tests

Dark Noise Tests should always be performed.

Monochromator

The **Step-loss** test is only necessary when problems or errors have occurred.

The **Reference Signal Test** should be performed when a new Monochromator Module is installed.

Filter

The **Step-loss** test is only necessary when problems or errors have occurred.

The **Reference Signal Test** should be performed when a new Filter Module is installed.

The **Filter Slide Memory** test should be performed when Filter Definition problems arise.

Transport

When mechanical problems with the Plate Transport arise, the tests in this group should be performed for analysis.

Luminescence

When mechanical problems with the Lumi-Unit arise, the tests in this group should be performed for analysis.

Cuvette

When mechanical problems with the cuvette arise, the tests in this group should be performed for analysis.

Injector

After working on the Injector Tip or when performing Preventive Maintenance, the following tests should be performed.

Miscellaneous

The tests are for diagnostic purposes and should be used when necessary.

11.1.3 End Tests

General

These tests should be performed after every repair. **3D Spectrum** is only for monochromator instruments (**infinite M200**)

> **Note**
> **In addition to these tests,**
> **the QC MultiCheck should be performed afterwards.**

12. Troubleshooting

12.1   Error Handling - Log Files

With the new generation of reader server Reader.NET the whole process of saving and finding log files has become easier compared to the previous versions. It is very important to send not just the error code number for help; Tecan Austria needs the entire ZIP folder for a full analysis of the problem.
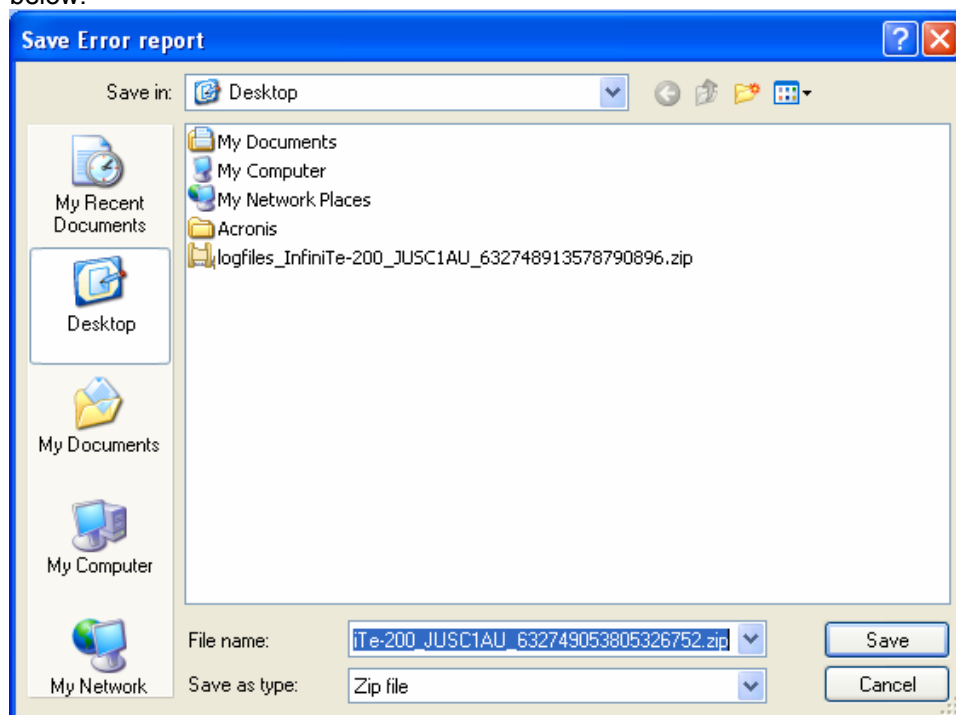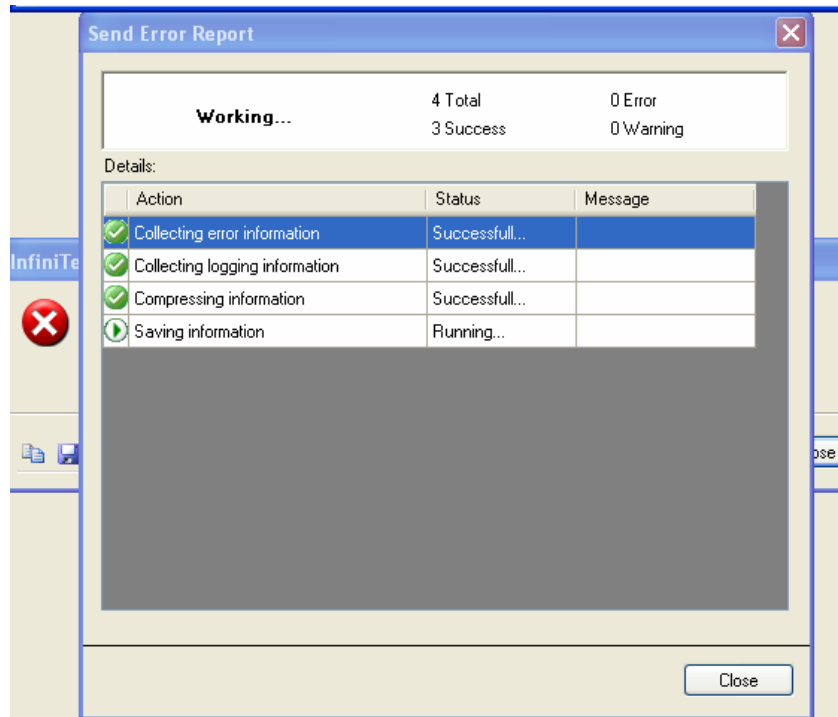
> ***For Troubleshooting send the entire ZIP folder to Tecan Austria Expertline-AT for investigation!***

If you have an error message from your instrument like picture below.
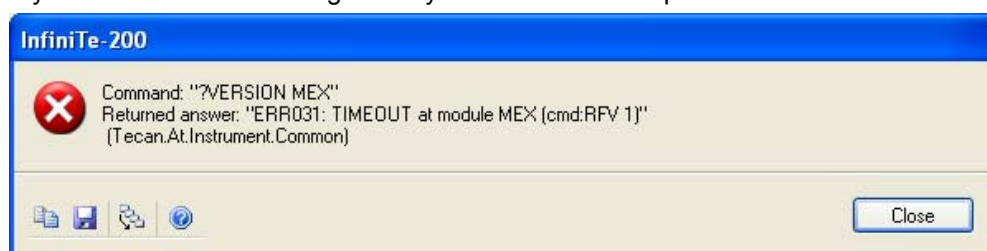
Click the **Save to Disk** icon and save the information. See picture below:

After saving, close the error to continue the program. Now you can have a look in the log files or send it to Tecan Austria for investigation.

12.2 Error Handling – Exception History

After each error, the Reader.NET collects log data and creates a ZIP Folder for the error. This ZIP folder with the log files will be in the Exception folder under the path C:\Documents and Settings\All Users\Documents\Tecan\LogFiles\Exceptions.

To send an account of the current problem to Tecan Austria or to find a solution yourself, select **Exception History** from the **Instrument** menu in the **Xinfinite** service software. In the i-Control software, it can be found in **Settings** menu.

select **Exception History** from the menu and search for the latest entry and save it separately. Open it or send to the Expertline-AT in an e-mail.
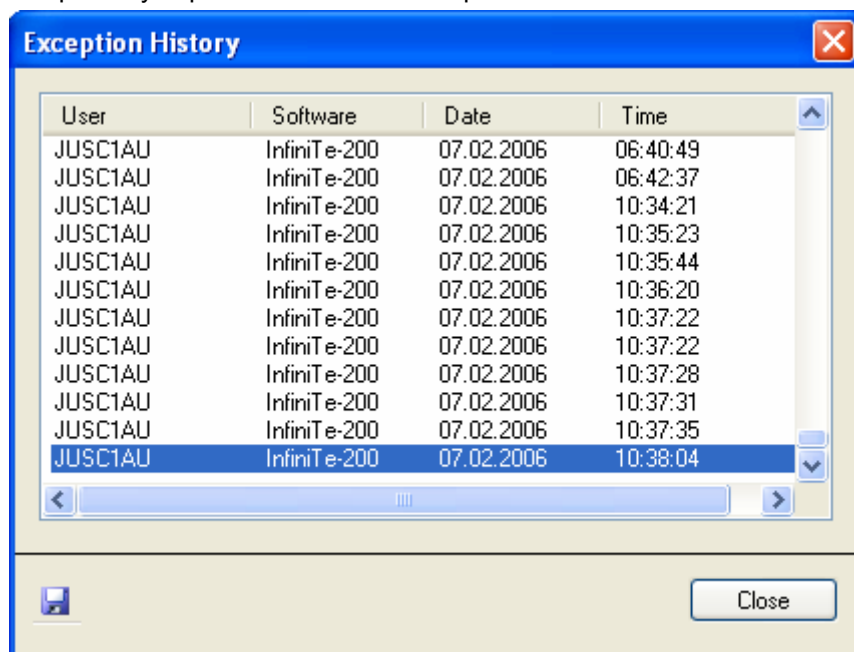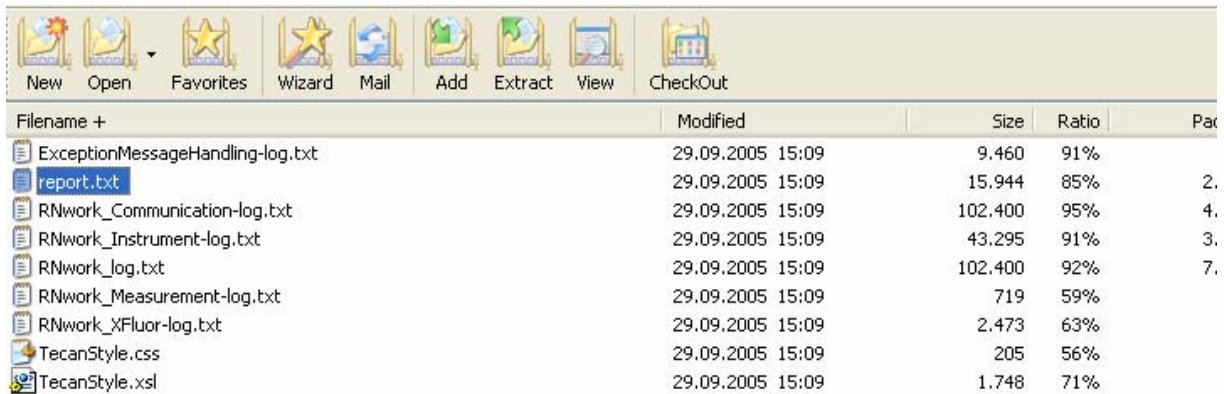

The log files can be found in the Exception folder under the path C:\Documents and Settings\All Users\Documents\Tecan\LogFiles\Exceptions.
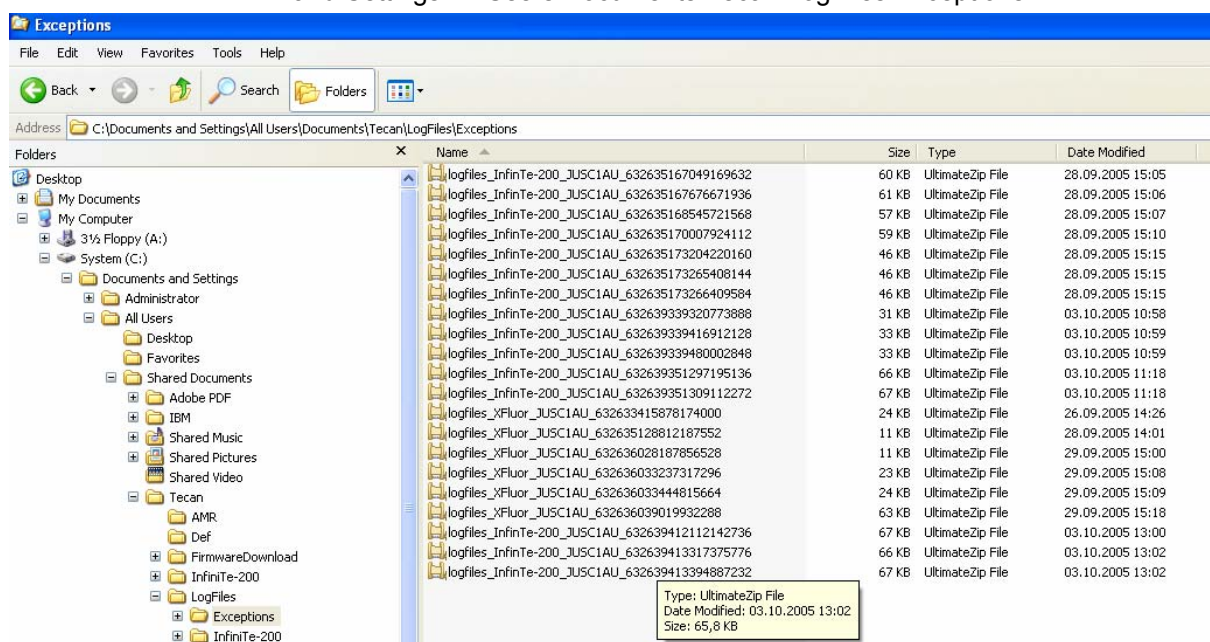
Select the Zip-Files concerning the error, based on **Date Modified**.

The ZIP-Files contain the following files:

Filename +	Modified	Size	Ratio	Pac
ExceptionMessageHandling-log.txt	29.09.2005 15:09	9.460	91%	
report.txt	29.09.2005 15:09	15.944	85%	2.
RNwork_Communication-log.txt	29.09.2005 15:09	102.400	95%	4.
RNwork_Instrument-log.txt	29.09.2005 15:09	43.295	91%	3.
RNwork_log.txt	29.09.2005 15:09	102.400	92%	7.
RNwork_Measurement-log.txt	29.09.2005 15:09	719	59%	
RNwork_XFluor-log.txt	29.09.2005 15:09	2.473	63%	
TecanStyle.css	29.09.2005 15:09	205	56%	
TecanStyle.xsl	29.09.2005 15:09	1.748	71%	

Please send the entire ZIP File to Tecan Austria for further investigation. In the report.txt file you will find all important information for the service issue.

12.3   Error Handling – Error History

The last ten error messages will be read from the Error Stack and listed in this dialog box. This is very helpful in determining the cause of errors. It is possible to erase the entries by clicking **Clear Error Stack**. The instrument can be reinitialized by clicking **Init. Instrument**.
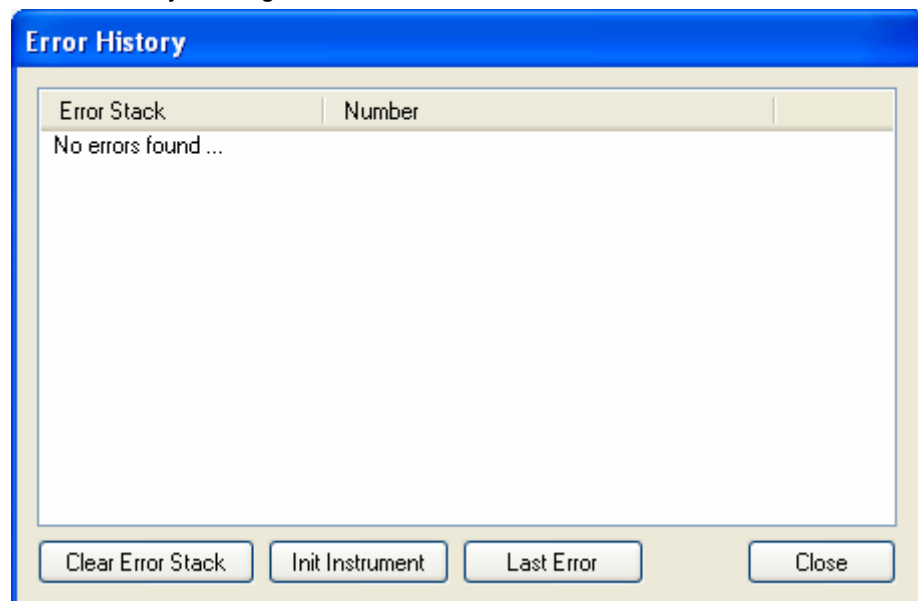
12.4   Error Messages

Definitions & Acronyms

- FW   Firmware
- PMT   Photo-Multiplier Tube
- RFU   Relative Fluorescence Unit
- MPT   Plate Transport
- MEX   Monochromator Module Excitation
- MEM   Monochromator Module Emission
- FIL   Filter module
- LUM   Lumi Module
- CUV   Cuvette
- HCP   Heating Control Processor
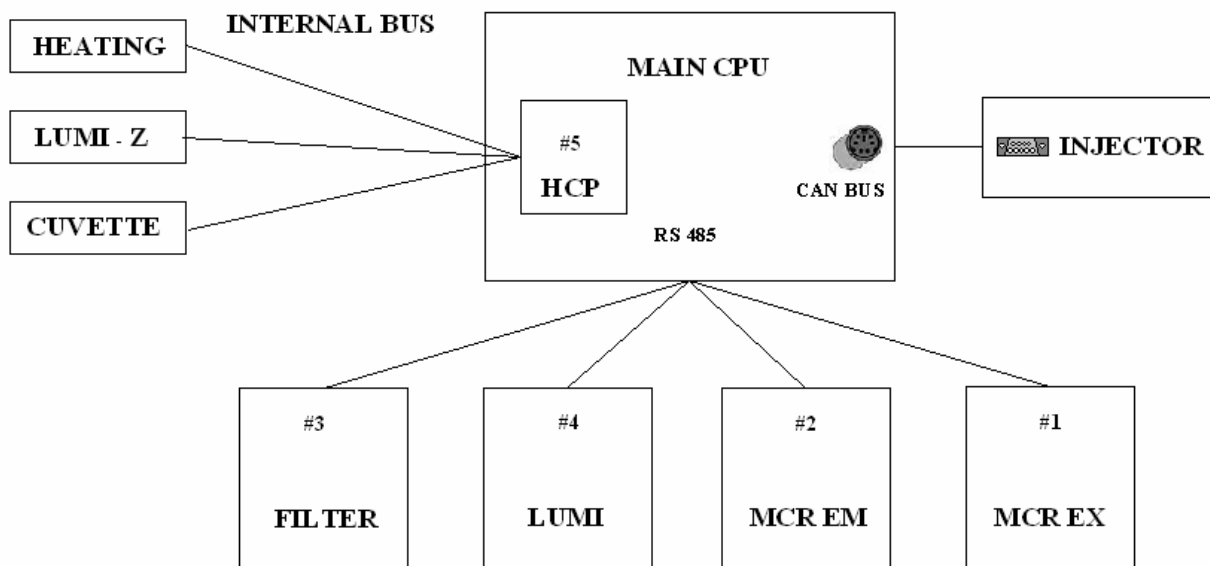
The HCP processor controls the Heating, Lumi Z-axis and the Cuvette Module.

If an initialization error occurs, the answer will be ERR37:Init Error at module HCP. The service software shows:
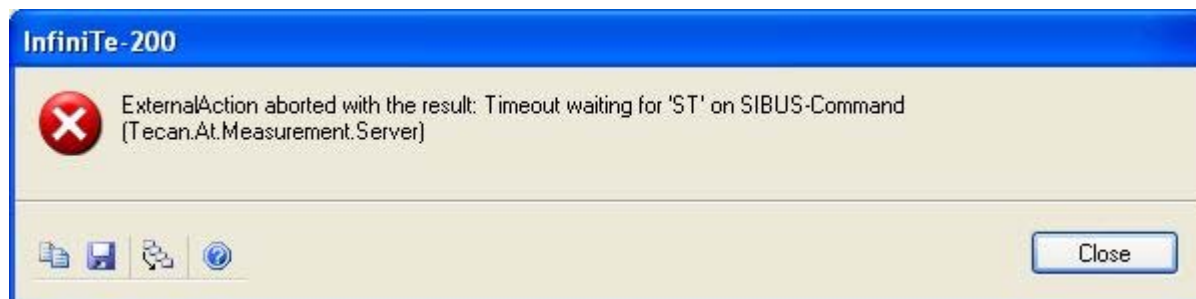
With a single Lumi or Cuvette Step Loss Test the error can be located.

ERR:1: INVALID_COMMAND

Error Text (Logfile)

- Command is not valid

Error Text (Display)

- Unspecific error in the Instrument - Computer communication protocol.

- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if you use e.g. an old firmware and a newer software

Involved Modules

- Firmware

- Software

Possible Reasons

- Software bug

- Customer software bug

Action (Customer Service)

- Report Bug to Tecan Austria

- Check with customer

ERR:2: PARAMETER_OUT_OF_RANGE

Error Text (Logfile)

- Parm. <#> out of Range MIN: <min> ,MAX: <max>

Error Text (Display)

- Unspecific error in the Instrument - Computer communication protocol.

- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if you use e.g. an old firmware and a newer software, or with customer software

Involved Modules

- Firmware

- Software

Possible Reasons

- Software bug

- Customer software bug

Action (Customer Service)

- Report Bug to Tecan Austria

- Check with customer

ERR:3: INVALID_NUMBER_OF_PARAMETERS

Error Text (Logfile)

- Wrong numbers of parameters desired

Error Text (Display)

- Unspecific error in the Instrument - Computer communication protocol.
- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if you use e.g. an old firmware and a newer software, or with customer software

Involved Modules

- Firmware
- Software

Possible Reasons

- Software bug
- Customer software bug

Action (Customer Service)

- Report Bug to Tecan Austria
- Check with customer

ERR:4: INVALID_PARAMETER

Error Text (Logfile)

- Invalid Parameter

Error Text (Display)

- Unspecific error in the Instrument - Computer communication protocol.
- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if you use e.g. an old firmware and a newer software, or with customer software

Involved Modules

- Firmware
- Software

Possible Reasons

- Software bug
- Customer software bug

Action (Customer Service)

- Report Bug to Tecan Austria
- Check with customer

ERR:5: ERR_INVALID_PARAMETER_AT

Error Text (Logfile)

- Invalid Parameter at pos: <pos>

Error Text (Display)

- Unspecific error in the Instrument - Computer communication protocol.
- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if you use e.g. an old firmware and a newer software, or with customer software

Involved Modules

- Firmware
- Software

Possible Reasons

- Software bug
- Customer software bug

Action (Customer Service)

- Report Bug to Tecan Austria
- Check with customer

ERR:6: PRAEFIX_MISSING

Error Text (Logfile)

- <prefix> is missing

Error Text (Display)

- Unspecific error in the Instrument - Computer communication protocol.
- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if you use e.g. an old firmware and a newer software, or with customer software

Involved Modules

- Firmware
- Software

Possible Reasons

- Software bug
- Customer software bug

Action (Customer Service)

- Report Bug to Tecan Austria
- Check with customer

ERR:7: RS485_TIMEOUT

Error Text (Logfile)

- RS485 Timeout at module <module descr> (cmd:<last cmd>)

Error Text (Display)

- Unspecific internal communication error

- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if during normal work communication problems between the hand shake wire occur

- Error can happen with MEM, MEX, FIL, LUM module

Involved Modules

- Main CPU

- Modules

- Firmware / Software

Possible Reasons

- Main CPU to Module communication

- Firmware bug

- Module broken

- Cable broken

- Main CPU broken

Action (Customer Service)

- Check Hardware for correct function use Service Software\Tools Test\ModuleTest

- If Hardware is ok, report bug to Tecan AU

ERR:8: INVALID_MODULE

Error Text (Logfile)

- Invalid module number %d

Error Text (Display)

- Unspecific error in the Instrument - Computer communication protocol

- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if under **Instrument Settings** a wrong module is enabled

Involved Modules

- Modules

- Service Software

Possible Reasons

- Main CPU to Module

- Customer software bug

Action (Customer Service)

- Report Bug to Tecan Austria

- Check with customer

ERR:9: ERR_BINARY_TRANSFER

Error Text (Logfile)

- Binary Transfer command: %s at module %d

Error Text (Display)

- Unspecific internal communication error.

- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if you use e.g. an old firmware and a newer software, or with customer software

- If a Module is not well connected

Involved Modules

- Firmware

- Software

Possible Reasons

- Software bug

- Broken Module, Module not connected

- Customer software bug

Action (Customer Service)

- Check Hardware for correct function

- Report Bug to Tecan Austria

- Check with customer

ERR:10: ERR_MODULE

Error Text (Logfile)

- Error at command %s at module %d

Error Text (Display)

- Unspecific internal communication error.

- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if you use e.g. an old firmware and a newer software

Involved Modules

- Firmware

- Software

Possible Reasons

- Software bug

- Customer software bug

Action (Customer Service)

- Report Bug to Tecan Austria

- Check with customer

ERR:11: ERR_LID_CHECK

Error Text (Logfile)

- LID open !

Error Text (Display)

- Hardware failure, please check if the Lid is completely closed/injector slot is closed

- Please report this error to your local Tecan customer support office

Detailed Error Description

- To much light in the whole system. Plate transport or filter slide lid were open during a measurement or the instrument was used in very bright environment (<< 500 LUX)

- Please check if the lid closes completely or if the environment was too bright

Involved Modules

- Front

- Injector

Possible Reasons

- Lids broken or clamp

- Injector Carrier, Cover not closed

- Lumi LED did not switched off

Action (Customer Service)

- Check Hardware for correct function, use Service Software**Tools Test\Dark Noise Test**

- If Hardware was OK, use FW command **?CONFIG CHECK,LUM.FIBER.MIN** and report value to Tecan Austria

ERR:12: ERR_FIBER_CHECK

Error Text (Logfile)

- LUMI FIBER broken !

Error Text (Display)

- Hardware Failure Luminescence Module
- Please report this error to your local Tecan customer support office

Detailed Error Description

- No Luminescence signal during fiber check

Involved Modules

- Lumi

Possible Reasons

- Fiber defective or dirty
- Plate transport offsets wrong
- Lumi filter wheel defective or wrong offsets
- Lumi PMT broken or wrong PMT settings
- Lumi LED did not switched on

Action (Customer Service)

- Check Hardware for correct function
- Service Software \Tools Test\Dark Noise Test
- Service Software \Tools Test\Lumi\Filter Wheel Step-loss
- Service Software \Adjustment\Lumi\Check Values

ERR:13: Z_OUT_OF_RANGE

Error Text (Logfile)

- Z Motor out of Safety-Range

Error Text (Display)

- Unspecific error in the Instrument - Computer communication protocol.
- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if the value for the max Z-axis is e.g. -290 and the software try to use e.g. -300.

Involved Modules

- Firmware
- Software

Possible Reasons

- Wrong Plate Definition File in Application Software

- Software bug

- Customer software bug

Action (Customer Service)

- Report Bug to Tecan Austria

- Check with customer

ERR:14: FILTER_NOT_DEFINED

Error Text (Logfile)

- Filter ist not defined

Error Text (Display)

- Unspecific error in the Instrument - Computer communication protocol.

- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if you use e.g. an old firmware and a newer software, or customer software

Involved Modules

- Firmware

- Software

Possible Reasons

- Software bug

- Customer software bug

Action (Customer Service)

- Report Bug to Tecan Austria

- Check with customer

ERR:15: X_INIT_ERROR

Error Text (Logfile)

- X drive init error

Error Text (Display)

- Hardware Failure Plate Transport

- Please report this error to your local Tecan customer support office

Detailed Error Description

- Init error in plate transport **X** axis

Involved Modules

- Main CPU

- Plate transport

Possible Reasons

- Transport lock not removed

- Plate to heavy

- Broken belt or home sensor

- Defective flat cable

- Mechanical problems (e.g. bal bearing guide)

Action (Customer Service)

- Check Hardware for correct function

- Change X-traverse, boards or cable

- Service Software **\Tools Test\Transport\Step-loss**

ERR:16: Y_INIT_ERROR

Error Text (Logfile)

- Y drive init error

Error Text (Display)

- Hardware Failure Plate Transport

- Please report this error to your local Tecan customer support office

Detailed Error Description

- Init error in plate transport **Y** axis

Involved Modules

- Main CPU

- Plate transport

Possible Reasons

- Transport lock not removed

- Plate to heavy

- Broken belt or home sensor

- Defective flat cable

- Mechanical problems (e.g. bal bearing guide)

Action (Customer Service)

- Check Hardware for correct function

- Change X-traverse, guides, boards or cable

- Service Software **\Tools Test\Transport\Step-loss**

ERR:17: Z_INIT_ERROR

Error Text (Logfile)

- Z drive init error

Error Text (Display)

- Hardware Failure Lumi Module

- Please report this error to your local Tecan customer support office

Detailed Error Description

- Init error in lumi module **Z** axis

Involved Modules

- Main CPU

- Lumi Module

Possible Reasons

- Plate to high

- Broken home sensor

- Defective flat cable

- Mechanical problems (e.g. bal bearing guide)

Action (Customer Service)

- Check Hardware for correct function

- Change Z-transport, guides, boards or cable

Service Software **\Tools Test\Transport\Step-loss**

ERR:18: INJA_NOT_AVAILABLE

Error Text (Logfile)

- Injector A not available

Error Text (Display)

- Hardware Failure Injector Module

- Please check for correct cable connection

Detailed Error Description

- Hardware problems with the injector

Involved Modules

- Main CPU

- Injector XE1000

Possible Reasons

- Injector Module not connected

- Defective injector XE1000

- Defective cable

- Lost jumper, wrong jumper setup

Action (Customer Service)

- Check Hardware for correct function

- Change Z-transport, guides, boards or cable

- Service Software **\Tools Test\Module Test**

ERR:19: INJB_NOT_AVAILABLE

Error Text (Logfile)

- Injector B not available

Error Text (Display)

- Hardware Failure Injector Module

- Please check for correct cable connection

Detailed Error Description

- Hardware problems with the injector

Involved Modules

- Main CPU

- Injector XE1000

Possible Reasons

- Injector Module not connected

- Defective injector XE1000

- Defective cable

- Lost jumper, wrong jumper setup

Action (Customer Service)

- Check Hardware for correct function

- Change Z-transport, guides, boards or cable

Service Software **\Tools Test\Module Test**

ERR:20: INJ_INIT_ERROR

Error Text (Logfile)

- Injector Init Error: %s

Error Text (Display)

- Hardware Failure Injector Module

Detailed Error Description

- Was not able to initialise the planger and the valve

Involved Modules

- Injector XE1000

Possible Reasons

- Defective injector XE1000

- Defective syringe

- Defective valve

Action (Customer Service)

- Check Hardware for correct function

- Change injector XE 1000

Service Software **\Tools Test\Module Test**

ERR:21: INVALID_COMMAND

Error Text (Logfile)

- Invalid Command [cmd}

Error Text (Display)

- Unspecific internal communication error

- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if you use e.g. an old firmware and a newer software, or customer software

Involved Modules

- Firmware

- Software

Possible Reasons

- Software bug

- Customer software bug

Action (Customer Service)

- Report Bug to Tecan Austria

- Check with customer

ERR:22: INVALID_OPERAND

Error Text (Logfile)

- Invalid Operand [cmd}

Error Text (Display)

- Unspecific internal communication error

- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if you use e.g. an old firmware and a newer software, or customer software

Involved Modules

- Firmware
- Software

Possible Reasons

- Software bug
- Customer software bug

Action (Customer Service)

- Report Bug to Tecan Austria
- Check with customer

ERR:23: INVALID_COMMAND SEQUENCE

Error Text (Logfile)

- Invalid Command Sequence [cmd}

Error Text (Display)

- Unspecific internal communication error
- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if you use e.g. an old firmware and a newer software, or customer software

Involved Modules

- Firmware
- Software

Possible Reasons

- Software bug
- Customer software bug

Action (Customer Service)

- Report Bug to Tecan Austria
- Check with customer

ERR:26: PLUNGER_UVERLOAD

Error Text (Logfile)

- Plunger Overload: %s

Error Text (Display)

- Hardware Failure Injector Module
- Please check for correct cable connection

Detailed Error Description

- Hardware problems with the injector syringe

Involved Modules

- Injector XE1000

Possible Reasons

- Mechanical problems in the injector

- Defective syringe

- Blockage tubing system

- Blockage valve

Action (Customer Service)

- Check Hardware for correct function

- Watch plunger movement

- Service Software **\Tools Test\Injector\Prime**

- Change the pump module

ERR:27: VALVE_UVERLOAD

Error Text (Logfile)

- Valve Overload: %s

Error Text (Display)

- Hardware Failure Injector Module

- Please check for correct cable connection

Detailed Error Description

- Hardware problems with the injector valve

Involved Modules

- Injector XE1000

Possible Reasons

- Mechanical problems in the injector

- Defective valve

- Blockage valve

Action (Customer Service)

- Check Hardware for correct function, change valve

- Watch valve movement

- Service Software **\Tools Test\Injector\Prime**

- Change the pump module

ERR:28: PLUNGER_MOVE_NOT_ALLOWED

Error Text (Logfile)

- Plunger Move not allowed: %s

Error Text (Display)

- Unspecific internal communication error
- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if you use e.g. an old firmware and a newer software, or customer software

Involved Modules

- Firmware
- Software

Possible Reasons

- Software bug
- Customer software bug

Action (Customer Service)

- Report Bug to Tecan Austria
- Check with customer

ERR:29: INJ_CMD_OVERFLOW

Error Text (Logfile)

- Command Overflow: %s

Error Text (Display)

- Unspecific internal communication error
- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if you use e.g. an old firmware and a newer software, or customer software

Involved Modules

- Firmware
- Software

Possible Reasons

- Software bug
- Customer software bug

Action (Customer Service)

- Report Bug to Tecan Austria
- Check with customer

ERR:30: REFERENCE_ERROR

Error Text (Logfile)

- Prepare:%s: Gain:%d, Counts:%d

Error Text (Display)

- Hardware Failure

- Wrong or missing absorbance filter

Detailed Error Description

- To much or not enough light during prepare on the reference diode or measurement channel

Involved Modules

- Main CPU

- MCR EX

- Flash power supply

Possible Reasons

- Broken fiber (Absorbance or Reference Mono)

- Wrong Offset (Mono)

- Defective flash power supply

- Defective flash lamp

- Grating problem, OSF Problem

- Reference board absorbance

- Broken main CPU

Action (Customer Service)

- Check Hardware for correct function

- Service Software **\Adjustment\Monochromator\Wavelenght accuracy**

- Service Software **\End Test\3D Spectrum**

- Run Service Software all Tests **\Tools Test**

ERR:31: MODULE_ERR

Error Text (Logfile)

- %s at module %s (cmd:%s)

Error Text (Display)

- Internal hardware error (%s = MEM, MEX, FIL, LUM, MTP)

- Please report this error to your local Tecan customer support office

Detailed Error Description

- Module report error. Could be a checksum problem, EPROM Error

Involved Modules

- Module

- Software

Possible Reasons

- Software bug

- Customer software bug

- Timeout problem

Action (Customer Service)

- Report Bug to Tecan Austria

- Check with customer

ERR:32: MTP_IN_OUT_POS

Error Text (Logfile)

- MTP is in Out-Position

Error Text (Display)

- Unspecific error in the Instrument - Computer communication protocol.

- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if you use e.g. an old firmware and a newer software, or Customer Software

Involved Modules

- Firmware

- Software

Possible Reasons

- Software bug

- Customer software bug

Action (Customer Service)

- Report Bug to Tecan Austria

- Check with customer

ERR:33: ERR_VALUE_NOT_SET

Error Text (Logfile)

- %s... not set at (Ratiolabel %d)

Error Text (Display)

- Unspecific error in the Instrument - Computer communication protocol.

- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if you use e.g. an old firmware and a newer software, or Customer Software

Involved Modules

- Firmware

- Software

Possible Reasons

- Software bug

- Customer software bug

Action (Customer Service)

- Report Bug to Tecan Austria

- Check with customer

ERR:34: INJ_NOT_ENABLED

Error Text (Logfile)

- Injectors are not enabled

Error Text (Display)

- Unspecific error in the Instrument - Computer communication protocol.

- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if you use e.g. an old firmware and a newer software, or Customer Software

Involved Modules

- Firmware

- Software

Possible Reasons

- Software bug

- Customer software bug

Action (Customer Service)

- Report Bug to Tecan Austria

- Service Software **Adjustment\Instrument Settings** checken

- Check with customer

ERR:35: INVALID_PARAMETER_LENGTH

Error Text (Logfile)

- Invalid Parameter Length (max:%d char allowed)

Error Text (Display)

- Unspecific error in the Instrument - Computer communication protocol.
- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if you use e.g. an old firmware and a newer software, or Customer Software

Involved Modules

- Firmware
- Software

Possible Reasons

- Software bug
- Customer software bug

Action (Customer Service)

- Report Bug to Tecan Austria
- Check with customer

ERR:36: ERR_USB_CHECKSUM

Error Text (Logfile)

- Checksum Error

Error Text (Display)

- Kommunikationsfehler USB
- Please report this error to your local Tecan customer support office

Detailed Error Description

- Instrument, PC-Communication problem USB handshake
- First Windows show a communication problem, second Reader.NET

Involved Modules

- PC
- infinite
- USB Cable

Possible Reasons

- Defective Cable
- Defectice Main CPU or PC USB Port

Action (Customer Service)

- Check Hardware for correct function

ERR:37: ERR_MODULE_INIT

Error Text (Logfile)

- Init Error at module %

Error Text (Display)

- Unspecific Hardware Failure

- Please report this error to your local Tecan customer support office

Detailed Error Description

- Electronically- mechanical problem

Involved Modules

- Module

Possible Reasons

- Module defective

Action (Customer Service)

- Report Bug to Tecan Austria

- Service Software Tests

- Use FW Command **LASTERROR 0** until **LASTERROR 9** to see the last errors

- To clarify the problem send **LASTERROR CLEAR** then **INIT FORCE** and again **LASTERROR 0** until **LASTERROR 9**

ERR:38: ERR_INSTRUMENT_INIT

Error Text (Logfile)

- Instrument Initialization Error

Error Text (Display)

- Unspecific Hardware Failure

- Please report this error to your local Tecan customer support office

Detailed Error Description

- Failure during instrument initialisirung. This could be a mechanical or software problem

- This error is higher ranking, other errors could occur

Involved Modules
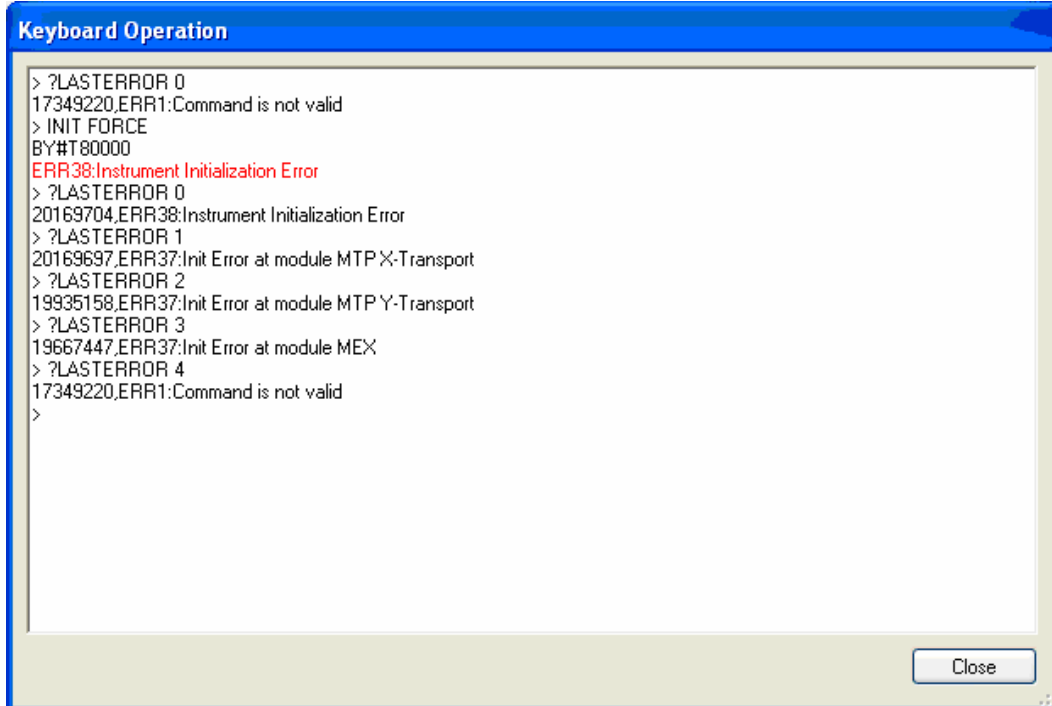
- All Module (MEM, MEX, LUM, FIL, MTP)

Possible Reasons

- Module defective

- Main CPU defective

Action (Customer Service)

- Report Bug to Tecan Austria

- Change the main CPU or Module

- Service Software Tests

- Use FW Command **LASTERROR 0** until **LASTERROR 9** to see the last errors

- To clarify the problem send **LASTERROR CLEAR** then **INIT FORCE** and again **LASTERROR 0** until **LASTERROR 9**


```
Keyboard Operation

> ?LASTERROR 0
17349220,ERR1:Command is not valid
> INIT FORCE
BY#T80000
ERR38:Instrument Initialization Error
> ?LASTERROR 0
20169704,ERR38:Instrument Initialization Error
> ?LASTERROR 1
20169697,ERR37:Init Error at module MTP X-Transport
> ?LASTERROR 2
19935158,ERR37:Init Error at module MTP Y-Transport
> ?LASTERROR 3
19667447,ERR37:Init Error at module MEX
> ?LASTERROR 4
17349220,ERR1:Command is not valid
>

                                              Close
```

ERR:39: INJ_A_COMM_TIMEOUT

Error Text (Logfile)

- Injector A Communication Timeout

Error Text (Display)

- Communication error Injector interface

- Please report this error to your local Tecan customer support office

Detailed Error Description

- Bus error, no communication with the pump

Involved Modules

- Injector

Possible Reasons

- Injector defective

- Flat cable defective

Action (Customer Service)

- Report Bug to Tecan Austria

- Change Injector

- Service Software Tests

ERR:40: INJ_B_COMM_TIMEOUT

Error Text (Logfile)

- Injector B Communication Timeout

Error Text (Display)

- Communication error Injector interface

- Please report this error to your local Tecan customer support office

Detailed Error Description

- Bus error, no communication with the pump

Involved Modules

- Injector

Possible Reasons

- Injector defective

- Flat cable defective

Action (Customer Service)

- Report Bug to Tecan Austria

- Change Injector

- Service Software Tests

ERR:41: PRIME_WASH_ERROR

Error Text (Logfile)

- External wash prime cycle running, no other action!

Error Text (Display)

- Injectors still priming or washing

- Please wait until prime or wash process is finished

Detailed Error Description

- If the user push the prime bottom on the injector module and start some software action this error occur

Involved Modules

- Injector

Possible Reasons

- User push the prime bottom

Action (Customer Service)

- Check Hardware for correct function

ERR:42: INSTRUMENT_LOCKED

Error Text (Logfile)

- Instument is locked

Error Text (Display)

- Instruement is locked after a serios hardware problem
- Please report this error to your local Tecan customer support office

Detailed Error Description

- Instruement is locked after a serios hardware problem
- PC is busy, and no data will be collect from the instrument
- Main CPU memory buffer is full with data

Involved Modules

- Main CPU

Possible Reasons

- PC problem, to much programs open
- USB<-> PC problem

Action (Customer Service)

- Report Problem to Tecan Austria
- For unlocking a reboot is necessary

ERR:43: ERR_PREPARE_WAVELENGTH

Error Text (Logfile)

- Prepare: [channel]: Wavelength:[lambda] Gain:[g], Counts: [cts]

Error Text (Display)

- Unspecific Hardware Failure
- Please report this error to your local Tecan customer support office

Detailed Error Description

- With a specific wavelength and maximum gain the counts are to low

Involved Modules

- MEX Module
- Main CPU

Possible Reasons

- Module defective
- Main CPU defective
- Fiber Optic defective

Action (Customer Service)

- Report Bug to Tecan Austria
- Change the main CPU
- Change fiber optic
- Service Software **\Tools Test\Excitation Path Test** check ref channel

ERR:44: STEP-LOSS_ERROR

Error Text (Logfile)

- Step-loss Error

Error Text (Display)

- Actuator Failure
- Please report this error to your local Tecan customer support office

Detailed Error Description

- Step-loss or Motor problem

Involved Modules

- Main CPU
- Module (MEM, MEX, FIL, LUM, CUV MTP)

Possible Reasons

- Broken home sensor
- Defective flat cable
- Mechanical problems (e.g. bal bearing guide)

Action (Customer Service)

- Check Hardware for correct function
- Service Software **\Tools Test\...\Step-loss Test**

ERR:45: SYNC_SCAN_ERROR (not infinite 200)

Error Text (Logfile)

- Sync Scan: Number of EX-Steps does not match EM-Steps Error

Error Text (Display)

- Unspecific error in the Instrument - Computer communication protocol.
- Please report this error to your local Tecan customer support office

Detailed Error Description

- EX- and EM gratings must be finish to the same time.

Involved Modules

- Main CPU
- Module EM MCR / EX MCR

Possible Reasons

- Broken encoder
- Defective MCR EX or EM Module
- Mechanical problems
- Wrong Offsets

Action (Customer Service)

- Check Hardware for correct function
- Service Software **\Adjustment\Monochromator\Wavelength Accuracy Test**
- Service Software **\Tools / Test\Monochromator\Step-loss Test**

ERR:46: HANDSHAKE_TIMEOUT_ERROR

Error Text (Logfile)

- Handshake timeout at module

Error Text (Display)

- Unspecific Hardware Failure
- Please report this error to your local Tecan customer support office

Detailed Error Description

- After a measurement no finish signal is comming from the handshake wire

Involved Modules

- Module

Possible Reasons

- defective flat cabel
- defective Module or Main CPU

Action (Customer Service)

- Check Hardware for correct function
- Service Software Tests

ERR:47: MOTOR_TIMEOUT_ERROR (not infinite 200)

Error Text (Logfile)

- Motor Time Out

Error Text (Display)

- Unspecific Hardware Failure
- Please report this error to your local Tecan customer support office

Detailed Error Description

-

Involved Modules

- Module

Possible Reasons

Action (Customer Service)

- Check Hardware for correct function

- Service Software Tests

ERR:48: [VALUE] IS_NOT_IN_DEFINED_RANGE

Error Text (Logfile)

- Handshake timeout at module

Error Text (Display)

- Unspecific error in the Instrument - Computer communication protocol.

- Please report this error to your local Tecan customer support office

Detailed Error Description

- This error can happen if you use e.g. an old firmware and a newer software or with customer software. This error occur it a command send parameter out of range.

Involved Modules

- Firmware

- Software

Possible Reasons

- Software bug

- Customer software bug

Action (Customer Service)

- Report Bug to Tecan Austria

- Check with customer

ERR:49: SENSOR_IS_BROKEN

Error Text (Logfile)

- Plate detection sensor at Module MTP is broken

Error Text (Display)

- Unspecific Hardware Failure

- Please report this error to your local Tecan customer support office

Detailed Error Description

- Plate detection sensor is broken

Involved Modules

- Module

Possible Reasons

- Sensor defective

Action (Customer Service)

- Check Hardware for correct function

- Change Sensor

- Service Software **\Adjustment\Injector\Adjust Plate Sensor**

13. Wiring Plans

14. Checklists

● TECAN.

Preventive Maintenance Checklist infinite 200

Purpose   This form serves as the Tecan authorized Service Technician ………

NOTE: Use reverse side for additional notes and comments.

Customer information		Service Technician	
Customer account		infinite 200 MCR ❑	Filter ❑
Contact person			
Address		Option Lumi ❑ Bottom Reading ❑	
		Injector ❑ Cuvette ❑	
ZIP code - City			
Country - State		Serial no. infinite 200 :	

	interval	variable — depending on stress condition	action	n/a	done	passed	print out
System and Accessories							
Check wavelength accuracy	12 months		check	❑	❑	❑	
Clean Dust filter	12 months		clean		❑		
Lamp check with **Xinfinite 200**	12 months		check		❑	❑	
Read counters	12 months		check	❑	❑	❑	❑
Save Instrument Settings	12 months		check		❑	❑	
Plate Transport Adjustment	12 months		check		❑	❑	❑
Plate Transport Test Dial Gauge	12 months		check		❑	❑	❑
Change syringes	Yearly pm		change	❑	❑	❑	
Change valves	Yearly pm		change	❑	❑	❑	
Change injector set	Yearly pm		change	❑	❑	❑	
Test		**Test cycles**					
Duration Test		10 to 50			❑	❑	❑
Load simulation test					❑	❑	❑
MultiCheck Test				❑	❑	❑	❑
Injector precision test				❑	❑	❑	❑

_____   _____   _____

Maintenance date   Service Technician   next due maintenance date

Installation Qualification infinite 200

Purpose   This form serves the TECAN authorized Service Technician as a checklist on the main installation process, however, this form does not contain the procedure in detail.

Customer information		Service Technician		
Customer account	_____			
Contact person	_____	**infinite 200**	MCR ❑	Filter ❑
Address	_____	Option	Lumi ❑	Bottom Reading ❑
	_____		Injector ❑	Cuvette ❑
ZIP code - City	_____			
Country - State		Serial no.:		

Site check and delivery control	done	passed
• Site check according to specifications, see Operating Manual NOTES:	❑	
• All items delivered and functional NOTES:	❑	

Hardware installation on instrument level	n/a	done	passed
❖ Install the Instrument according **infinite 200** Operating Manual		❑	❑

Install the Instrument	n/a	Done	Passed
➢ Remove the Transport Lock		❑	
➢ Save the Instrument Settings with **Xinfinite 200**		❑	❑
➢ Check the injector precision	❑	❑	
➢ Check the alignment of the plate transport	❑	❑	
Installation of PC-Software Package			
➢ i-Control		❑	
➢ Magellan		❑	
➢ **Xinfinite 200**	❑	❑	
➢ Other: _____	❑	❑	
Customer Instruction	❑	❑	

_____   _____   _____
Installation date   Service Technician   next due date maintenance

Service Checklist Infinite 200

Purpose   This form serves the TECAN authorized Service Technician as a checklist with regard to test requirements.

Tests required after / **Parts/ Components replaced**

Part/Component	Action	Set Serial Number	Fine Fiber Adjust	Dark Noise Tests	Reference Check Values	Lumi Check Values	OSF test	Fan Test	Lamp test	Wavelength Accuracy	Z-Transport Offset	Adjust Plate Transport	Built in Testspot	Injector Position	Injector Steploss	Injector Specification	Adjust Offset Cuvette	Temperature Offset	Modul Communication	Ref. Signal test Filter	Filter Slide Memory	Filter Slide Steploss	Filter Slide Offsett	Instrument Settings	Load Position teachen	Load Simulation Test	3D Spectrum	Stepploss Test	Heating test	Duration Test	QC Multicheck
Electronics																															
Flash Power Supply	replaced								☐	☐														☐	☐	☐					☐
Low Voltge Power	replaced																		☐					☐						☐	☐
CPU Board	replaced	☐		☐	☐		☐		☐	☐									☐					☐	☐	☐			☐	☐	☐
CPU Board MCR EX	replaced	☐		☐						☐									☐					☐	☐	☐				☐	☐
CPU Board MCR EM	replaced	☐	☐							☐									☐					☐	☐	☐				☐	☐
CPU Board Filter	replaced	☐		☐						☐									☐	☐	☐	☐	☐	☐	☐					☐	☐
Absorbance Boards	replaced			☐	☐																			☐						☐	☐
X/YDrive Board	replaced											☐	☐											☐							
CPU Lumi	replaced				☐					☐									☐					☐					☐	☐	☐
SANYODENKI	replaced											☐	☐											☐						☐	☐
Sensor	replaced																		☐					☐						☐	☐
USB Board	replaced																		☐					☐						☐	☐
Motor Board Lumi	replaced				☐																			☐					☐	☐	☐
Motor Board Cuvette	replaced																☐							☐					☐	☐	☐
Optical System																															
Xenon Flash Lamp	replaced		☐	☐	☐				☐	☐														☐		☐				☐	☐
EX MCR Modul	replaced	☐																	☐					☐						☐	☐
EM MCR Modul	replaced	☐		☐					☐	☐									☐					☐						☐	☐
Filter Modul	replaced	☐								☐									☐	☐	☐	☐	☐	☐						☐	☐
Bottom Mirror	replaced								☐	☐														☐						☐	☐
Lumi Modul	replaced	☐	☐							☐									☐					☐						☐	☐
Fiber Optic	replaced								☐	☐														☐						☐	☐
Cuvette Modul	replaced									☐							☐	☐	☐					☐						☐	☐
Injector																															
XE 1000	replaced													☐	☐	☐			☐					☐						☐	☐
Injector	replaced													☐	☐	☐								☐						☐	☐
Valve	replaced													☐	☐	☐								☐						☐	☐
Syringe	replaced													☐	☐	☐								☐						☐	☐
Transport System																															
Transport Belt	replaced											☐	☐											☐						☐	☐
X Transport	adjusted										☐	☐	☐											☐						☐	☐
Upper Heating Foil	replaced																	☐	☐					☐						☐	☐
Stepper	replaced										☐	☐	☐											☐						☐	☐
Falt cable	replaced											☐	☐											☐						☐	☐
Miscellaneous																															
Fan's	replaced							☐																☐							
Main Switch	replaced																							☐					☐		
Firmware	update																							☐						☐	☐

Date   Service Technician

●TECAN.

Preventive Maintenance Record Infinite 200

Purpose   This form is to keep record of preventive maintenance tasks carried out.

        NOTE: A checklist of daily and weekly maintenance is printed overleaf.

Month …	Notes	Inspect the tubing system	Wipe up all spills	Inspect the pump(s)	Flush the pump(s)	Clean the bottom part of the	Clean the waste tub	Weak detergent Weak acid and base 10% bleach				Daily Maintenance	Weekly Maintenance	Maintenance date	Visa, Initials
Day	Checklist	1	1	1	1	1	1	2				1	2		
1															
2															
3															
4															
5															
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Daily Maintenance

To ensure proper operation of the XE 1000, perform these tasks daily:

- Inspect the pump(s) for leaks, and correct any problems
- Wipe up all spills on and around the pump
- Flush the pump(s) thoroughly with distilled or deionized water after each use

Weekly Maintenance

The fluid path of the XE 1000 must be cleaned weekly to remove precipitates such as salts, to eliminate bacterial growth, and so on. Any of the two following cleaning procedures can be used:

- 70 % EtOH (ethanol)

To clean the pump with weak detergent, follow these steps:

1. Prime the pump with the weak detergent solution 70% EtOH and allow the solution to remain in the pump with the syringe fully lowered for 30 minutes.
2. After the 30-minute period, remove the reagent tubing from the detergent and cycle all the fluid from the syringe and tubing into a waste container.
3. Prime the pump a minimum of 10 cycles with distilled or deionized water. Leave the fluid pathways filled for storage.

15. Spare Parts

Description	Meaning
A	Accessories with warranty claim
S	Spare parts
C	Consumables such as DiTis, MTPs, etc.
W	Wear and tear parts, e.g. tubing, belts, etc.

SAP-Part No.	Description	Picture	Class
	Parts for Filter Module		
30022202	PCBA MONOCHROMATOR DRIVE		S
30013219	Absorbance Reference Board (PCBA PHOTODIODE)		S
30020669	MOTOR COMPLETE / FILTER SLIDE		S
30014044	WIRING FILTER MEMORY CONTACT		S
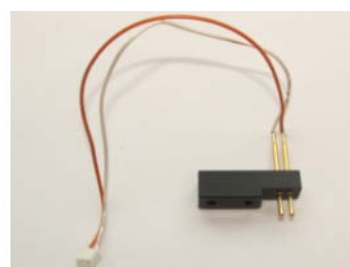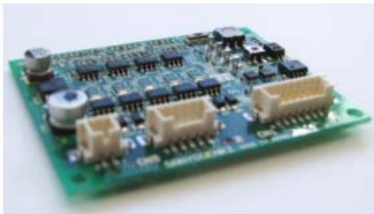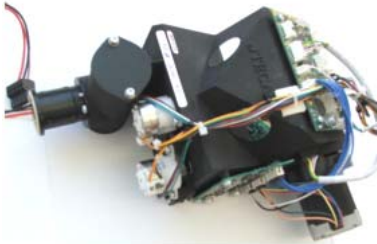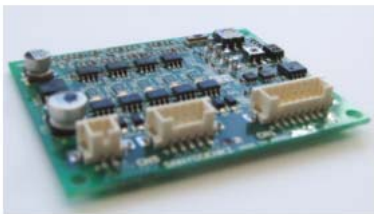
SAP- Part No.	Description	Picture	Class
30012992	WIRING OPB900W55 JST 20CM (Home Filter Slide)		S
30013832	WIRING OPB940W51 JST 15CM (Mirror Wheel Home Sensor)		S
30014038	WIRING MICA-MICA 10 PIN FLAT CABLE 50CM (Absorbance Board to main CPU)		S
30013823	WIRING MICA-MICA 10 PIN FLAT CABLE 40CM (Absorbance Ref. Board to Main CPU)		S
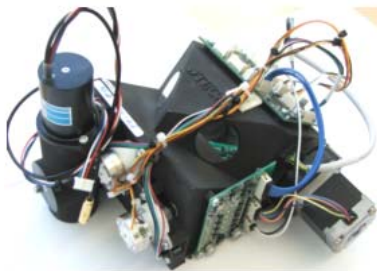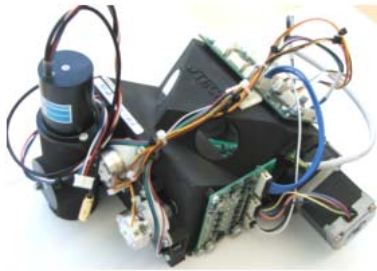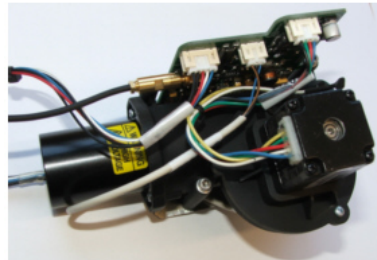
Parts for Excitation MCR Module
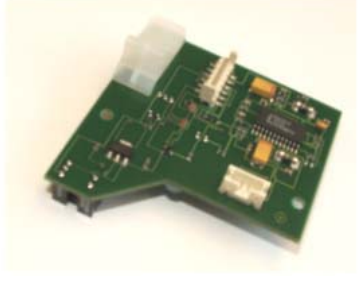
30023353	PCBA MONOCHROMATOR DRIVE		S
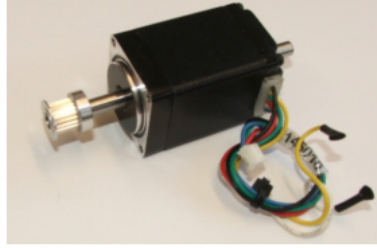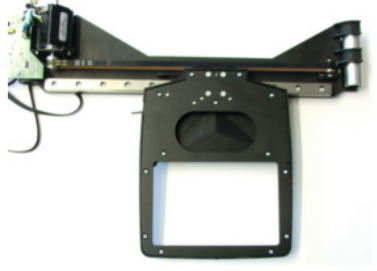
SAP-Part No.	Description	Picture	Class
30014992	PCBA 5-PHASE		S
30022199	MONOCHROMATOR EX		S
30013827	WIRING MICA-MICA 10 PIN FLAT CABLE 80CM (Flat Cable Module Main CPU)		S

Parts for Emission MCR Module

30023354	PCBA MONOCHROMATOR DRIVE		S
30014992	PCBA 5-PHASE		S

SAP-Part No.	Description	Picture	Class
30022201	MCR EM standard PMT		S
30022197	MCR EM enhanced PMT		
30013827	RING MICA-MICA 10 PIN FLAT CABLE 80CM (Flat Cable Module Main CPU)		S

Parts for Lumi Module

SAP-Part No.	Description	Picture	Class
30022183	FILTERWHEEL LUMINESCENCE COMPLETE		S
30013879	WIRING LED GREEN 24V CLIP 35CM		S

SAP-Part No.	Description	Picture	Class
30013830	WIRING MICA-MICA 8 PIN FLAT CABLE 40CM (Flat Cable Lumi Main CPU)		W

Parts for Transport Module

SAP-Part No.	Description	Picture	Class
30013383	PCBA STEPPER DRIVER TMC222 Lumi Transport Board		S
30013823	WIRING MICA-MICA 10 PIN FLAT CABLE 40CM (Flat Cable Z-Lumi to Main CPU)		S
30013380	PCBA X-DRIVE AMR		S
30013381	PCBA Y-DRIVE AMR		S

SAP-Part No.	Description	Picture	Class
13640003	GUIDE PCB (Plate holder)		S
30020666	WIRING STEP MOTOR ST2818M1004B JST 5CM Y-Drive Motor		S
30023345	X-Traverse		S
30013885	WIRING 12POL FLATE HIGH FLEXIBLE 55CM (Y-Drive Flat Cable)		S
30020668	X - Belt		S

SAP- Part No.	Description	Picture	Class
30020734	Y - Belt		S
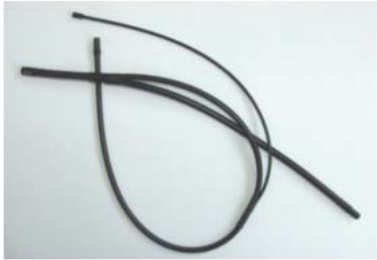
Parts for Optics

30013013	FIBERBUNDLE GLASS LUMI 384 (Lumi Fiber)		S
30013723	HEAD BOTTOM ELLIPSOID-MIRROR (Bottom Fiber Connector)		S
30016485	FIBERBUNDLE ABS 2-ARM (Absorbance MCR Fiber 1:2)		S
30013014	FIBERBUNDLE Y- BOTTOM QUARZ (FI Bottom Fiber Filter)		S
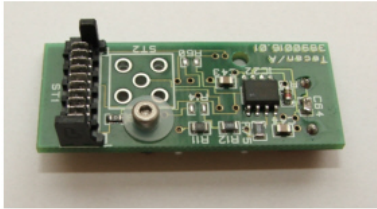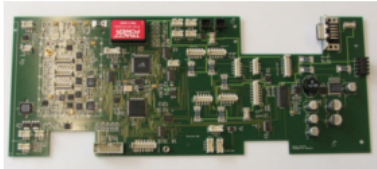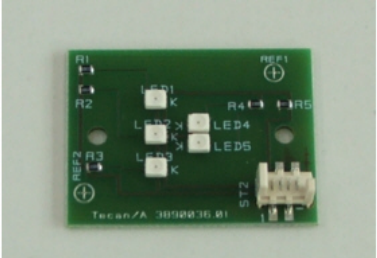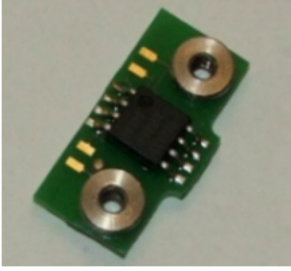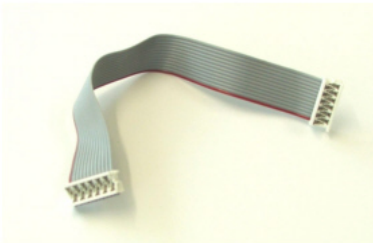
SAP-Part No.	Description	Picture	Class
30016483	FIBERBUNDLE FI BOTTOM MCR (Fiber FI Bottom MCR)		S
30016482	FIBERBUNDLE FI TOP MCR (FI Top Fiber)		S
30020729	FLASH LAMP COMPLETE		W

Parts for Electronics
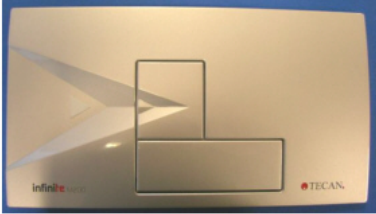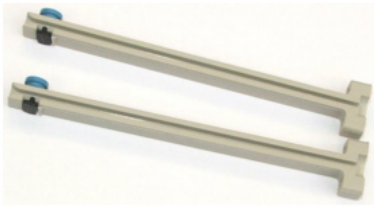
SAP-Part No.	Description	Picture	Class
30013219	PCBA PHOTODIODE Absorbance Board		S
30022198	PCBA MAIN-MEASUREMENT CPU		S

SAP-Part No.	Description	Picture	Class
30015854	Flash Power Supply		S
30013890	Ferrit Ring		S
30016758	POWERSUPPLY ZWS150PF-24LAMBDA		S
30017062	PCBA POWER ON LED INFINITE FLEX		S
30013392	PCBA FILTERSLIDE MEMORY IF		S

SAP- Part No.	Description	Picture	Class
30016446	SWITCH MAINS COMBI ELEMENT		S
30013384	PCBA USB/CAN		S
30013888	Main Connector Board Flat Cable		S
30013823	Flat Cable Absorbance Board Main CPU		S
30020737	HEATER TOP		S

SAP-Part No.	Description	Picture	Class
30015952	POWERSUPPLY COVER / VENTILATION MODULE Fan		S

Miscellaneous

30017268	SAFETY DEVICE TRANSPORT		S
30020637	HOOD SUPPORT Spacer		S
30015234	SCREW COVER SUPPORT		S
30014371	COVER HOOD Cover Nipple		S

SAP-Part No.	Description	Picture	Class
30015834	FRONT COMPLETE F200		S
30017583	FRONT COMPLETE M200		S
30020741	CABLE SHAFT INFINITE 200		S
30014886	HEATINGPLATE BOTTOM		S
30018009	CABLE USB 2.0 A/B 1.8M BLACK		S

SAP-Part No.	Description	Picture	Class
30016544	HOLDER BOARD PA (1.6*120/M3)		S
30018524	FUSE SLOW-BLOW 3A SURFACE MOUNT		S
15170407	FOOT INSTRUMENT 30*15		

Injector

			S
30020744	XP1000 A		S
30020761	XP1000 B		S

SAP-Part No.	Description	Picture	Class
30020763	WIRING PLATE INJECTOR INFINITE 200		S
30015972	SPRING RETAINING		S
30014720	HOLDER BOTTLE		S
20729370	Valve		S
30014721	KEYBOARD FOIL PRIMEN		W
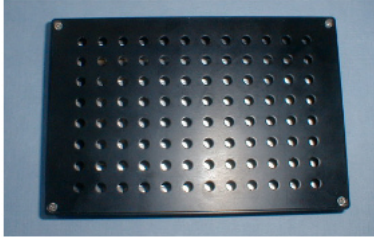
SAP-Part No.	Description	Picture	Class
30020793	TUBE INJECTOR		W
20728662	SYRINGE 1ML BALL-END CAVRO		W
20730131	SET TEFLON CAPS 4 PCE.PLUNGER		W
30020641	INJECTOR LONG COMPLETE		W
30020644	INJECTOR SHORT COMPLETE		W
30020673	INJECTOR INSERT COMPLETE incl. Sensor		S

SAP- Part No.	Description	Picture	Class
30013841	WIRING IND.SENSOR IFRM05P15A1L JST 80CM		S
30017946	Connection Cable Instrument/Injector		W
30019767	PRIME BEAKER 0148		S
30017597	BOTTLE INJECTOR MODULE 15ML		
30023367	Front Injector		S

SAP-Part No.	Description	Picture	Class
30019865	BOT.DISP.125ML BROWN LID REWORK		
30015840	Cover Nut		W
30016551	Washer Distance Absorbance Measurement Head		
30019777	WASTE TUB		
	Servicetools		A
30017149	KIT SERVICE TOOL VERT. ADJUSTMENT PLATE		A

SAP- Part No.	Description	Picture	Class
30017195	Injector Tips Cover Nut Tool		A
30020823	Service Filter Slide		A
30019916	Empty Filter Slide		
30017196	KIT SERVICE TOOL BOTTOM FIBER		A
30017174	KIT SERVICE TOOL POSTITION BLOCK CUVETTE		A

SAP-Part No.	Description	Picture	Class
30016414	KIT SERVICE TOOL DISTANCE		A
30013103	HOLDER ROLLER		A
TBD	Positioning Spacer for Optic Unit at 90°		A
30017194	KIT SERVICE TOOL INJECTOR BALANCE		A
30017197	Spacer for Filter Wheel Fibers of the Filter Module		A
30000153	UniTemp Temperature Calibration kit		A

SAP-Part No.	Description	Picture	Class
30012440	MULTICHECK-S2 PACKAGE SAFIRE II		A
15170194	Belt Tension Measuring Instrument for Transport Belt Adjustment		A
30004060	TOOL TEST 96 INJECTOR GENIOS PRO		A
30004061	TOOL TEST 384 INJECTOR GENIOS PRO		A