SAT 450

Service Manual

DRAFT

Analyzer Medical System™

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CHAPTER 01

- INSTALLATION -

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1 INSTALLATION

1.1 UNPACKING

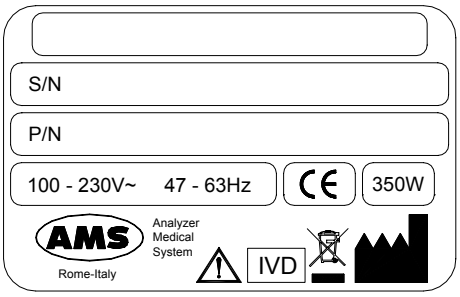
The SAT450 is packed and delivered in two separate wooden crates: one containing the analyzer and the other the computer along with its accessories. In the event that the order not include the PC, packing and delivery will involve one wooden crate plus a corrugated cardboard box.

This packing modality has been expressly studied and designed to insure maximum protection of the contents during shipping and handling. It is therefore extremely important that the crates or crate/box combo be carefully inspected upon delivery in order to ascertain their integrity.

Special attention should be dedicated to examining the color of the ShockWatch ® glued to the crates: it must be white. A 'red' ShockWatch ® indicates that the crate(s) have experienced some sort of mishandling (shock) during transport and/or delivery. This fact must be recorded by the courier on the delivery note, as must any and all visible external damage to the packing crates/box (e.g.: holes, dents, rips or tears, water marks, etc.) evident at the moment of consignment. This serves to simplify matters in the event of any future claims for damages.

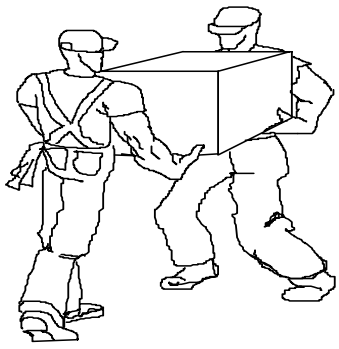
PLEASE NOTE: THE SHIPPER ASSUMES TOTAL RESPONSIBILITY FOR THE CRATES AND/OR BOX AND THEIR CONTENTS ONCE THE GOODS HAVE LEFT THE FACTORY UNTIL THE MOMENT THEY ARE CONSIGNED AT DESTINATION. FURTHERMORE, THE SHIPPER IS RESPONSIBLE FOR ANY AND ALL DAMAGES ARISING DURING HANDLING, STORAGE AND/OR TRANSPORT. ANY AND ALL DAMAGE CLAIMS MUST BE TAKEN UP WITH THE SHIPPER IMMEDIATELY UPON DISCOVERY.

Upon consignment of the crate(s)/box, take out the delivery note and make sure that all the items on the packing list are included in the crates/box and that they are undamaged. Check that the serial number on the delivery note/packing list corresponds to that impressed on the plate on the right side of the instrument.



Open the crate(s)/box from the top and very carefully take out:

- the instrument;
- the computer and other accessories.



MAKE SURE THAT UNPACKING IS CARRIED OUT BY TWO PEOPLE.

Do not discard the delivery crate(s)/box or the packing material until the correct functioning of the instrument has been ascertained.

Remove all the items from the crate(s)/box very carefully.

Remove the adhesive tape from the cover of the samples and reagents housings, from the front panels, and from the samples and reagents racks.

Before connecting the SAT450 instrument, remove the protective packing material placed under the Sampling Arm and under the Washing Station group.

Warning: in the event that it is necessary to repack any or all of the delivered items, the below-listed procedure must be carefully followed:

⇒ Reposition the protective packing material under the Sampling Arm and under the Washing Station group.

⇒ Tape down (using masking tape is possible) the cover of the samples and reagents housings.

⇒ Remove the Probe from the Sampling Arm and place it inside a cuvette, cap the cuvette and tape the cap in place.

⇒ Be very careful to not bend the Washing Station probes when repositioning the packing material.

⇒ Fill all the empty spaces around the accessories packed in the crate using pluriballs or other suitable packing material.

In the event that the repacking is carried out after clinical diagnostic use of the instrument, it is necessary to first perform the decontamination procedure as outlined in Chapter 7 of this same manual.

Ambient-climatic conditions for transportation, warehousing and storing the instrument inside its packing crate:

- Temperature: between –20° and +70°C
- Humidity: 10% ÷ 90%
- Warehoused: INDOOR
- Maximum length of warehousing: 6 months (after which length of time, preventive maintenance regarding certain components is required - e.g.: membranes)

1.2 INSTRUMENT INSTALLATION

The SAT450 instrument must be installed only by authorized, specialized technical personnel.

During instrument installation, the system will be checked once again to make sure that it functions correctly. The SAT450 is for professional use only; therefore, the operators who use the instrument (in addition to the academic qualifications and state certification required to meet government regulations) must be trained in its proper use and this training must also regard ordinary instrument maintenance practices. Maintenance activities are described in Chapter 7 of this same manual.

In order to preclude risks of potential biological hazards, it is absolutely necessary that good practices regarding the handling of biological samples, consumables and waste/refluents be scrupulously adhered to.

The SAT450 is a complex system and, as such, it is of utmost importance that the installation procedure be executed correctly in order to guarantee optimum levels of performance. In the event that the indications reported herein (in this manual) and/or relevant safety norms are not followed, AMS cannot and does not guarantee proper instrument functioning. Furthermore, user safety may be placed at risk.

1.2.1 ENVIRONMENT OF THE INSTALLING SITE

Make sure that the SAT450 instrument is not installed where it is in direct sunlight, subject to drafts, dust or strong magnetic fields. Observe the conditions outlined in the below-illustrated table regarding the installing site:

USE	Indoors and dry
POLLUTION DEGREE	2
ISOLATION CLASS	I
INSTALLATION CATEGORY	II
USAGE: TEMPERATURE	between 18°C and 30°C
HUMIDITY	20% ÷ 85%
ALTITUDE	Maximum: 3000 m
PLACEMENT	Counter-top or table: minimum surface area 110 x 70 cm. Stable surface with no vibrations. Position the instrument in such a manner that it can be easily disconnected.
VENTILATION	Leave a space of at least 10 cm around the instrument in order to allow air circulation. Make sure that the fans (located under the reagents housing) are not obstructed.

1.2.2 ELECTRICAL POWER SUPPLY

The electrical power tension/voltage for the instrument is indicated on the right-hand side of the instrument (see the label in Page 2). This same information is also reported on the label located above the input line socket. Make sure that power supply used conforms to that here-indicated and that it is properly grounded:

VOLTAGE	100 ÷ 230Vac 47/63Hz ±10%

PLEASE NOTE: IT IS IMPORTANT THAT THE LABORATORY'S ELECTRICAL POWER SOURCE BE EXTREMELY STABLE. IF SAID STABILITY CANNOT BE GUARANTEED, THE USE OF THE FOLLOWING DEVICES IS STRONGLY SUGGESTED:

- **ELECTRONIC STABILIZER**
  Used to stabilize the power source voltage in the laboratory. Any stabilizer available on the market can be used (power not less than 0.5 kW).

- **NO-BREAK MODULE (UPS - Uninterrupted Power Supply)**
  This module offers two important functions:
  - stabilizes the power voltage;
  - powers the instrument in the event of a power failure.

1.2.3 ACCESSORIES: CONNECTIONS

1.2.3.1 Power supply

Use the power supply cable that is provided to connect the instrument to the power source.

1.2.3.2 Instrument-Computer: connections

The SAT450 instrument and the Personal Computer are connected via a RS232 standard serial cable and/or USB standard cable, which constitutes the hardware for the exchange protocol.

1.2.3.3 Liquid Reservoir Bottles Container: installation

Install the container of the four liquid reservoir bottles on the *SAT450* instrument in the following way:

1. Make sure that the instrument is turned off.
2. Unscrew the two captive screws on the front underside of the instrument and lift up the Raising Top.
3. Take the container, unscrew the four screw nuts from the respective threaded pins (**Fig. 1**) and take off the four washers.

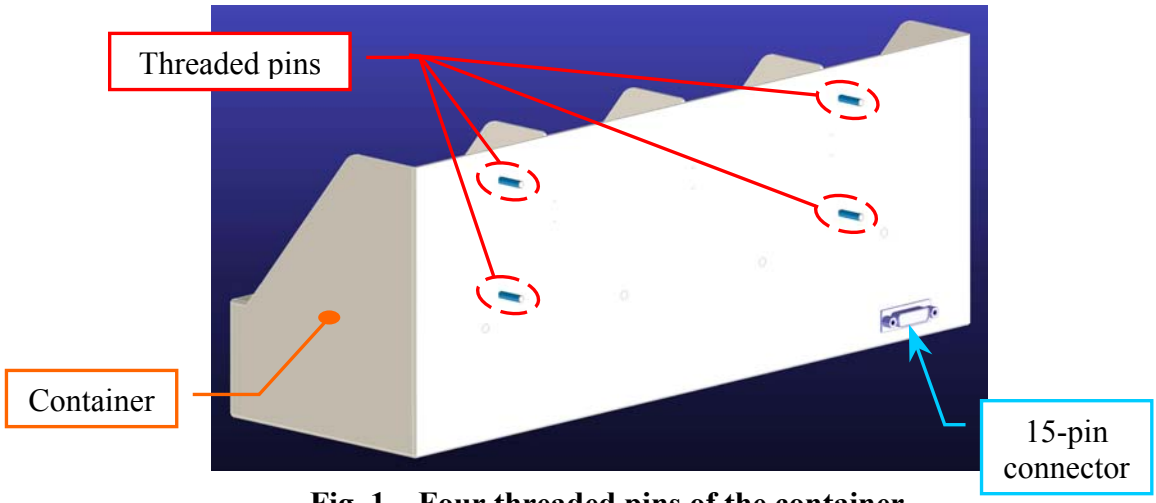


Fig. 1 – Four threaded pins of the container

4. Draw up the container to the left-hand side of the instrument and put on completely the four threaded pins in the four through holes located on the chassis (**Fig. 2**).

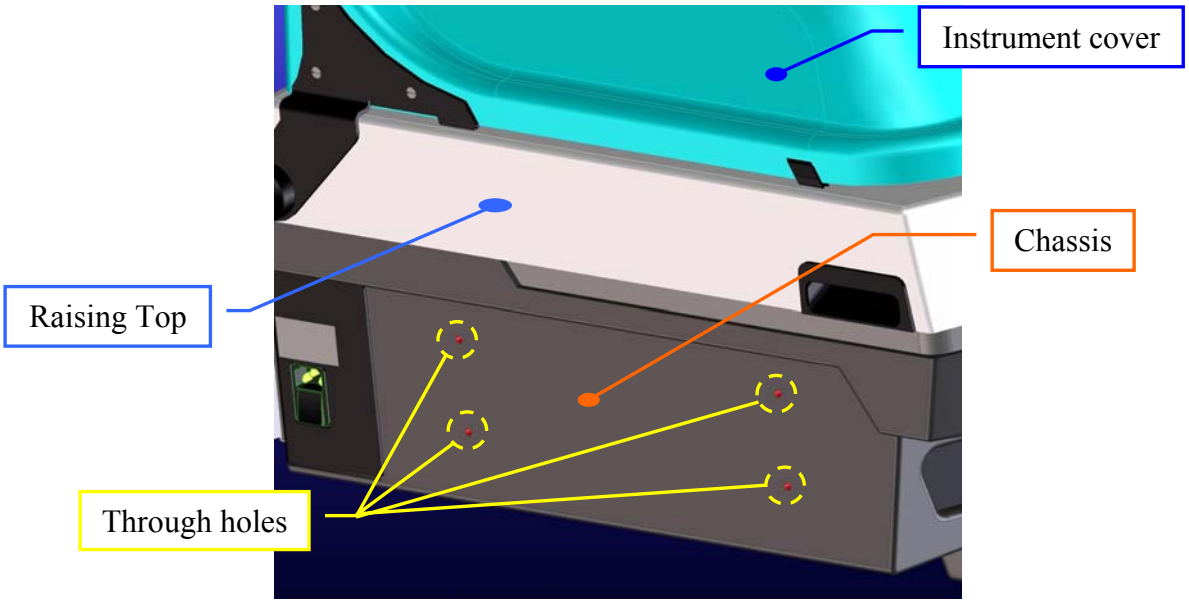


Fig. 2 – Four through holes located on the chassis

5. Put the four washers on the threaded pins from the left-hand interior side of the instrument (**Fig. 3**).
6. Screw completely the four screw nuts on the threaded pins from the left-hand interior side of the instrument (**Fig. 3**).

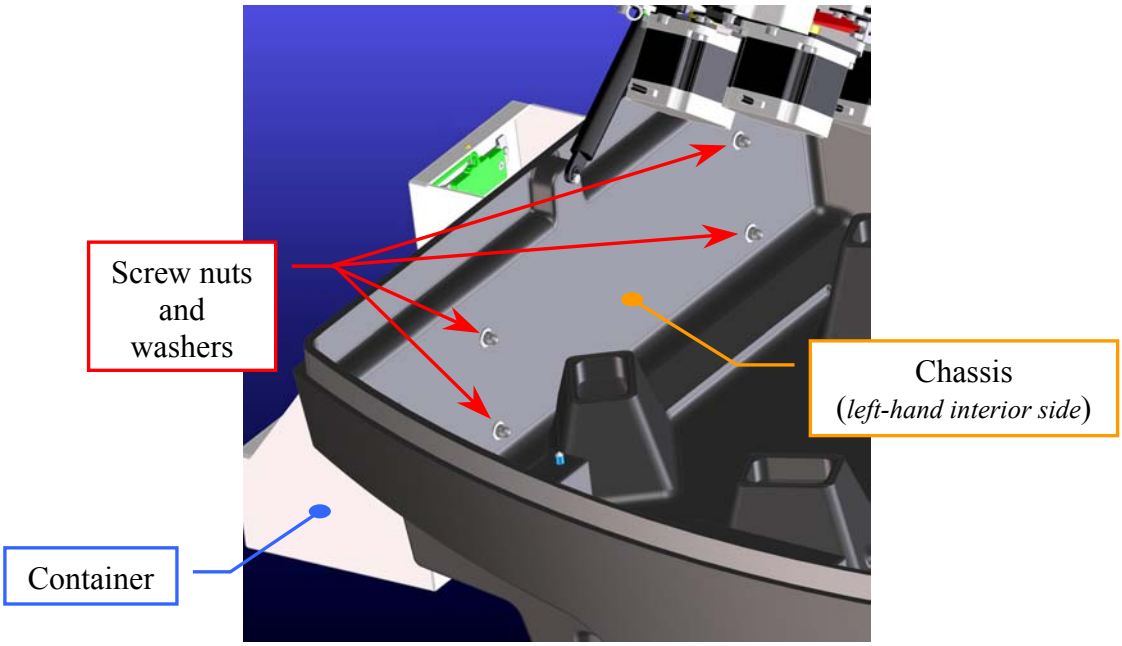
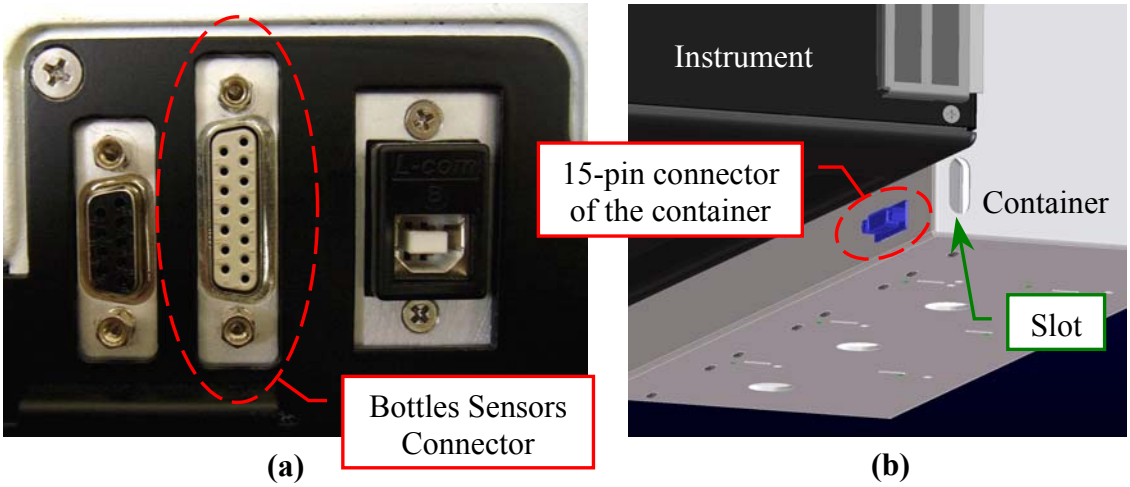


Fig. 3 – Container installed on the instrument

7. Bring down the Raising Top and screw the two captive screws on the front underside of the instrument.
8. Take the "Bottles Connection Cable" (P/N: 50-02684-00) and plug its 15-pin male connector in the 15-pin connector (showed in the **Fig. 4-a**) located on the back side of the instrument (*Bottles Sensors Connector*).
9. Plug the 15-pin female connector of the "Bottles Connection Cable" in the 15-pin connector of the container (showed in the **Fig. 4-b**) located on its back side.



(a) **(b)**

Fig. 4 [(a), (b)] – Connectors to plug the "Bottles Connection Cable"

1.2.3.4 Liquid Reservoir Bottles: connections

Carry out the following steps:

1. Position the four bottles on the container in the order indicated and illustrated here-below (**Fig. 5**):

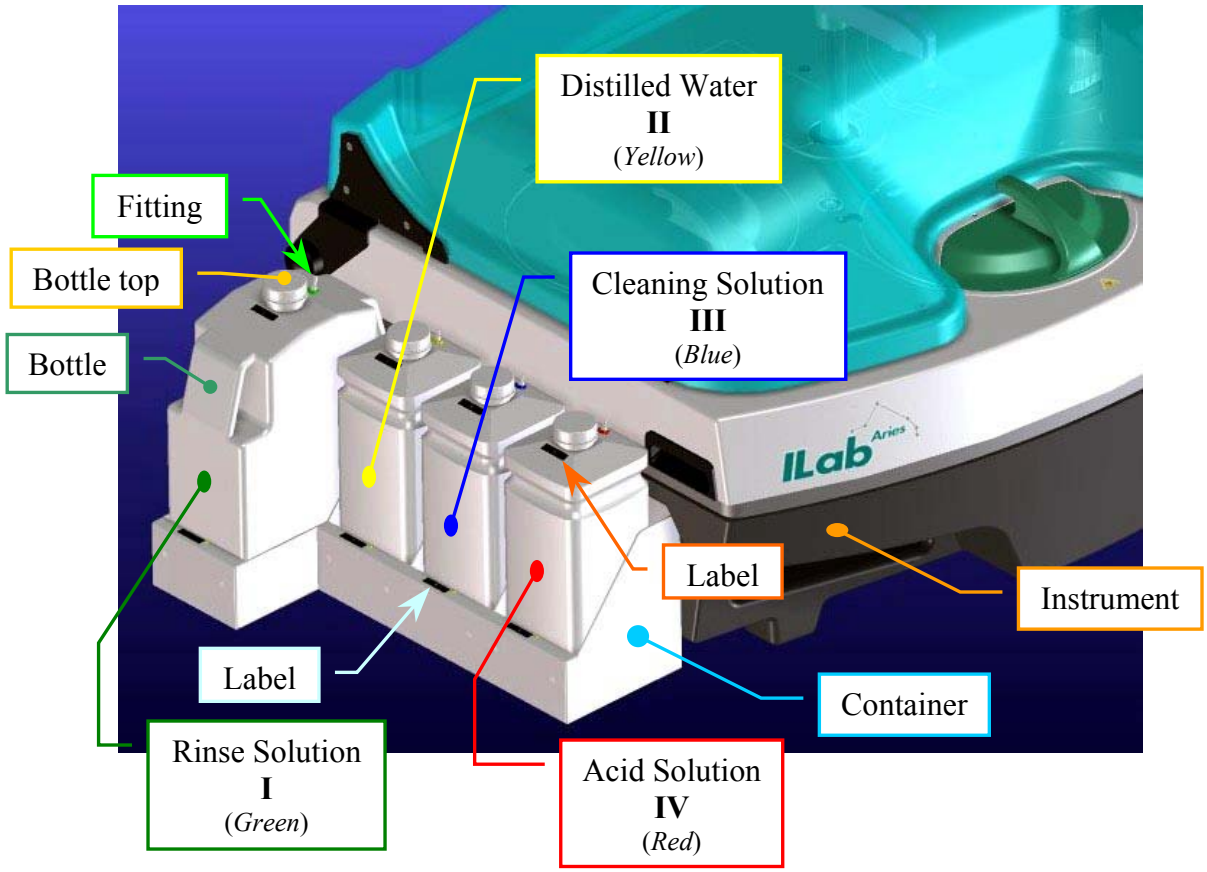


Fig. 5 – Four Liquid Reservoir Bottles

2. Connect the fittings of the four loading tubes on their respective fittings located on the back of the instrument (*Loading connections*). The *loading connections* on the back of the instrument are clearly labeled (**Fig. 6**). *Note: the fittings of the connections dedicated to **loading** are the same color as their respective bottles and are also numbered accordingly.*

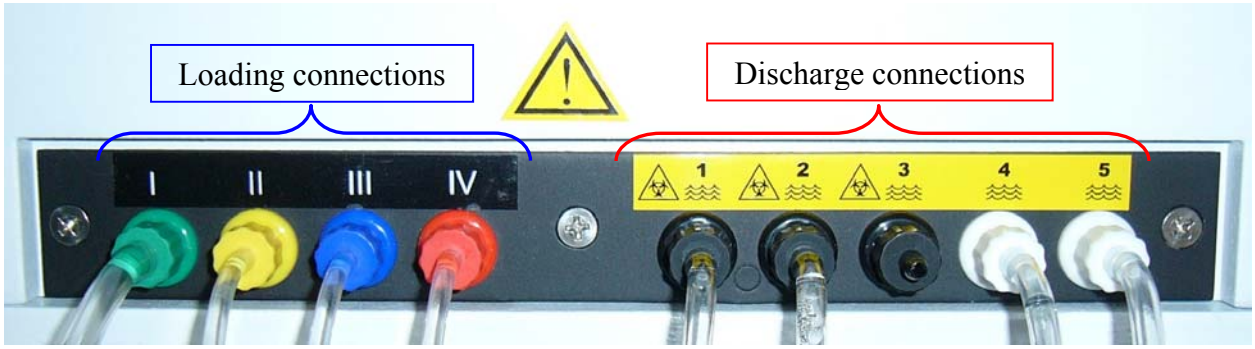


Fig. 6 – Loading and discharge connections

3. Push the four loading tubes through the slot of the container (**Fig. 4 (b)**) and pull them into the container.
4. Insert the other extremities of the four loading tubes in the fittings of the bottles according to the indications dictated by **Figures 5** and **6**.

1.2.3.5 Waste Tanks: connections

Carry out the following steps:

1. Connect the fittings of the discharge tubes on their respective fittings located on the back of the instrument (*Discharge connections*). The *discharge* (*Waste*) *connections* on the back of the instrument are clearly labeled. They are numbered (**Fig. 6**) and must be connected as specified following:
   - ⇒ tubes having black fitting on discharges 1 and 2 from Washing Wells, and on discharge 3 from the ISE module (if installed as *optional device*);
   - ⇒ tubes having white fitting on discharges 4 and 5 coming from the Washing Station for those liquids which do not constitute a biological hazard.

2. Insert the other extremities of the discharge tubes in the two waste tanks as specified following:
   - ❖ tubes having black fitting – discharges 1, 2 (and 3) – in the *biohazard waste tank*;
   - ❖ tubes having white fitting – discharges 4 and 5 – in the waste tank.

Note	The instrument does not come with the waste tanks. Laboratory personnel must see to acquiring the appropriately sized containers suited to their needs. The *biohazard waste tank* should be properly identified and labeled using the biological hazard symbol (please see the following paragraph).

1.2.4 LABELS AND SYMBOLS

CAUTION

The below-illustrated label can be found on the back on the instrument:

PLEASE NOTE: NEVER OPEN THE INSTRUMENT WITHOUT HAVING FIRST TURNED IT OFF AND DISCONNECTED IT FROM ITS POWER SOURCE (UNPLUG THE POWER SUPPLY CABLE).

CAREFULLY FOLLOW THE CLEANING AND MAINTENANCE PROCEDURES AS OUTLINED IN CHAPTER 7 OF THIS SAME MANUAL.

1.2.5 LEGEND AND SYMBOLS

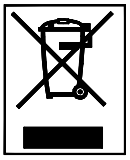
CAUTION! READ INSTRUCTIONS IN OPERATOR'S MANUAL

EARTH GROUND

BIOLOGICAL HAZARD

(Placed next to the Samples Plate and the waste discharge black fittings)
Wear proper protective clothing/equipment and handle all biological samples, consumables and waste liquids produced during analysis with extreme care. The disposal of the used consumables and the waste liquids produced must conform to all applicable government laws and regulations. Furthermore, to prevent overflow of the discharge tanks, make sure to periodically check the level of the waste liquids collected.

MANUFACTURING COMPANY
This symbol is placed next to the name of the company that has produced/manufactured the item.



This "crossed-out wheelie bin/trash can symbol" can be found on the label and reports information indicating that the instrument and parts are not to be disposed of with ordinary household waste/garbage. They must be disposed of according to applicable government regulations regarding electrical and electronic equipment (Directive 2002/96/EC WEEE).

1.2.6 WARRANTY

AMS guarantees the replacement of all defective components and/or materials for a period up to 12 (twelve) months from the date of invoice.

This warranty, as for all Technical Assistance in general, is intended as provided ex works, Rome, Italy.

This warranty does not cover consumables or those parts of the instrument in direct contact with liquids. A detailed list of the individual components excluded from and not covered by this warranty is provided in the table below.

Moreover, this warranty is not valid in those cases in which damage/s to the *SAT450* arise from or are the result of:

- improper use of the instrument (or use in any manner not in conformance with instructions provided by the Manufacturer or the Seller);
- mishandling and/or transportation errors;
- insufficient (or lack of) ordinary maintenance on the part of the User.

More in detail, any and all damages arising from mishandling or caused during transport must be immediately reported to the Shipping Company upon delivery of the goods.

LIST OF CONSUMABLES AND ACCESSORIES EXCLUDED FROM WARRANTY:

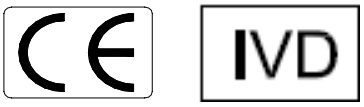
Description
Reagents bottles
Samples cups
Reaction Racks
Loading bottles
Tubes
Sampling Probe
Drying Pad
Photometer Lamp (6V – 10 W)
Interferential filters
Washing Station Probes
Micropumps
Electrovalves

1.2.7 APPLICABLE REGULATIONS

The SAT450 conforms to the following government regulations:

- **Directive 98/79/CE** relative to In-Vitro Diagnostic Devices

This compliance is certified by the here-illustrated symbols placed on the instrument:



1.2.8 USAGE LIMITATIONS

The SAT450 cannot be used by the blind as the user must interact with the instrument by reading/writing on the monitor.

Furthermore, the SAT450 must be used with extreme care by color-blind users as the user interface graphics employs and associates different colors to provide the user with important information.

1.2.9 REAGENTS AND SAMPLES BAR CODE READERS

Two bar code readers can be installed (*optionals*) for reagents and samples on the SAT450.

1.2.10 ISE MODULE

An ISE module can be installed (*optional*) on the SAT450.

CHAPTER 02

– SYSTEM DESCRIPTION –

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2 DESCRIPTION OF THE SYSTEM

2.1 INTRODUCTION

The SAT450 is a benchtop, fully automatic, random access, open analyzer for clinical and immunoturbidimetric assays.

It communicates with a computer through a USB and/or RS 232 port.

The SAT450 instrument is composed of the following main parts:

- Sampling Arm;
- Diluter;
- Reactions Plate;
- Samples Plate;
- Reagents Plate;
- Photometer;
- Washing Station;
- Electronic Boards.

2.2 SAMPLING ARM

One mechanical Arm performs all sampling operations. It is able to reach the aspiration point of the Reagents Plate, the aspiration point of the Samples Plate, the delivery point of the Reactions Plate and the two Washing Wells.

A specific sampling Probe is connected on its head (compare the scheme MA-15-02339-00). The Sampling Arm can move vertically and horizontally with respect to the Raising Top of the instrument by means of two stepper motors, respectively. The horizontally movement take place along a arch of circumference.

A Pre-Heater Assy allows a reagent pre-warming at 37.0 °C. Moreover, one Level Sensor Board - opportunely connected to the Sampling Probe - allows a liquid level (capacitive) sensing.

2.3 DILUTER

The Diluter allows to perform all the operations of aspiration and delivery of the liquid up till the capacity of 1000 µl. It is connected to the Sampling Arm and to its electrovalve and micropump as showed in the scheme MA-15-02339-00. It is able to sample volumes of 0.25 µl, with a CV less than 1%.

The device is actioned through the movement of a unique central piston for the operations of aspiration and delivery of the liquid. The piston is moved through a stepper motor without use of step-down gears to minimize the backlash. Moreover, in this device are implemented some solutions to avoid the presence of air microbubble inside it and inside the hydraulic circuit.

2.4 REACTIONS PLATE

The Reactions Plate of the instrument contains 4 disposable racks with 20 reaction cuvettes each, for a total of 80 cuvettes. Each of them has a optical path of 6 mm. The reactions racks can be removed individually. The plate is covered by a specific plate cover.

The plate can rotate through a stepper motor (compare the scheme MA-15-02353-00). This motor assures a high precision of positioning, superior to ±0.1°.

The basic operating cycle includes: aspiration and dispensing of the reagents and the samples by the Sampling Arm in the reaction cuvettes, optic reading of the cuvettes in incubation by the Photometer - along with the relative positioning of the Reactions Plate -, washing of the filled cuvettes by a Washing Station.

The incubation temperature in the reactions cuvettes is controlled at 37° C ± 0.3 by a controlled heating unit (Reactions Plate Resistor) placed inside the Reactions Plate .

2.5 SAMPLES PLATE

The Samples Plate is composed from a main plate that revolves around its axis and from the four Satellite Racks (“A”, “B”, “C” and “D”) which, each of them, revolve at the same time around to own axis. Therefore, the Samples Plate is apt to describe a substantially hypocycloidal motion.

The main plate can rotate through a stepper motor, whereas the four Satellite Racks can rotate through another stepper motor (compare the scheme MA-15-02338-00). This two motors assure a high precision of positioning. The two different rotations are controlled through the respective Home Sensors.

The four separate Satellite Racks (“A”, “B”, “C” and “D”) are universal racks for continuous loading of samples, calibrators and controls. Each Satellite Rack contains up to 15 cups and/or tubes with 10÷16 mm of diameter and 40÷100 mm of height. Moreover, 8 extra positions - for the same cups and/or tubes - are positioned on the main plate for urgent samples, calibrators and controls.

The Samples Plate is covered by means of two covers: Samples Plate cover and Samples Plate safety protection. Removing only the Samples Plate safety protection allows the replacement of the Satellite Racks for continuous loading. A urgent sample execution is allowed at any time.

2.6 REAGENTS PLATE

The Reagents Plate is composed from a main plate that revolves around its axis and from the four Satellite Racks (“A”, “B”, “C” and “D”) which, each of them, revolve at the same time around to own axis. Therefore, the Reagents Plate is apt to describe a substantially hypocycloidal motion.

The main plate can rotate through a stepper motor, whereas the four Satellite Racks can rotate through another stepper motor (compare the scheme MA-15-02348-00). This two motors assure a high precision of positioning. The two different rotations are controlled through the respective Home Sensors.

Each of four removable universal racks (“A”, “B”, “C” and “D”) contains 4 positions for rounded bottles of 10/20 ml and 4 positions for trapezoidal bottles of 50 ml. Each of four trapezoidal bottles of 50 ml can be substituted with two trapezoidal bottles of 25 ml or, by a adaptor, with one rounded bottle of 10/20 ml or with one squared bottle of 17 ml. Moreover, 8 extra positions for rounded

bottles of 10/20 ml are positioned on the main plate. Each of eight rounded bottles of 10/20 ml can be substituted, by a adaptor, with one cup of 2 ml.

All the bottles inside the Reagents Plate are cooled by four Cooler Modules positioned on its border. Each module is composed from two Peltier cells and two fans (as showed in the scheme MA-10-02536-XX) opportunely powered. One of them has a Cooler Temperature Sensor in order to control the refrigeration temperature.

The plate is covered by a specific plate cover.

2.7 PHOTOMETER

The Photometer allows the direct reading of the Optic Density (O.D.) of the reaction that take place in any cuvette of the Reactions Plate.

The device is composed from two reading channels: Sample Channel for the direct reading of the O.D. value and Reference Channel for its reference value. Each of them is provided of a Pre-Ampl./ADC board for the conversion in a digital signal of the light beam that pass through the cuvette.

The light source is a halogen lamp (6V/10W). It is powered by a Photometer Lamp Board.

The device contains a Filters Wheel for the reading of the reaction at different wavelengths. The wavelengths of the 9 narrow band interferential filters placed on the wheel are the following: 340 nm, 380 nm, 405 nm, 492 nm, 510 nm, 546 nm, 577 nm, 620 nm and 690 nm. Moreover, the Filters Wheel has a dark position (compare the scheme MA-15-02448-00).

The Filters Wheel can rotate through a stepper motor. The selection of the exact reading filter is controlled by means of the Filters Wheel Home Sensor and its reference on the wheel.

2.8 WASHING STATION

The Washing Station allows the washing operations of the Reactions Plate cuvettes.

The Washing Station is made up of a series of five small probes (compare the scheme MA-10-02181-00). It is situated on a part of the Reactions Plate and each probe can goes down into a single cuvette.

This said five probes are opportunely connected to the washing station electrovalves and micropumps (as showed in the hydraulic diagram SI-16-01873-00) for the emptying, washing and drying operations of the cuvettes. In particular, the last probe has a pad for the drying operations.

The vertical movement of the Washing Station on the Reactions Plate is allowed by its leadscrew connected to a stepper motor.

2.9 ELECTRONIC BOARDS

2.9.1 Introduction

The Electronic Diagram of the SAT450 instrument is reported on the document having the code SC-16-01873-XX. This scheme shows all the electronic boards of the instrument and the electric interconnessions between them.

The power supply is connected through a input line to the power grid (90 ÷ 250 VAC, 47 ÷ 63 Hz), whereas through a dedicated wiring to the electronic boards. The power supply has three output voltage modules: +24V, +12 V and +8 V (as showed in the scheme MA-46-02636-00).

All the electronics boards are following described.

2.9.2 Analytical Control Board [P/N: 30-02188-00]

The Analytical Control Board, integrated in the SAT450 instrument, is the heart of the low level, realtime and processing management. This board, on which is present the microcontroller Hitachi H8SX/1663 (compare the scheme SE-30-02188-00 – sheet 1 of 2), permits to manage all the input/output analogical and digital signals need to the instrument functionality.

Components, switchs and integrated circuits dedicated to the signals processing, to the microcontroller programming, to the microcontroller communication and those for I/O micro-controller ports protection are present on the board (compare the scheme SE-30-02188-00).

The microcontroller Hitachi H8SX/1663 is a high-speed CPU with an internal 32-bit architecture and a FP-144LV package (with 144 pins). It has sixteen 16-bit general registers, can handle a 4 Gbyte linear address space, and is ideal for a realtime control system. It has six independent serial communication interface (SCI) channels, a 40 Kbyte on-chip high-speed static RAM (the RAM is connected to the CPU by a 32-bit data bus) and 384 Kbytes of Flash Memory.

The Analytical Control Board is connected to the Stepper Motors Driver Board by a 64 pin frontal clutch connector by which transmits all the command signals for the 9 stepper motor drivers (compare the scheme SE-30-02188-00 – sheet 2 of 2).

The following further boards are directly connected to the Analytical Control Board by specific cables and connectors (as showed in the scheme SC-30-02188-00):

- the “Samples Plate Interface Board”, the ”Reagents Plate Interface Board”, the “Reactions Plate Interface Board”, the “Arm Interface Board” and the “Electrovalves Control Board” by which it communicates all the correspondent analogic and digital signals;
- the “Pre-Ampl./ADC Board (Sample Channel)” and the “Pre-Ampl./ADC Board (Reference Channel)” for reading the digital signals from main and reference channels of the Photometer.

The board is connected to the ISE Module (option), to the bottles liquid sensors connector, to the RS232 port and to the USB port (ports by which it communicates with the computer) through the specific cables and connectors.

The fan needed for the electronic vain cooling (vain wherein are placed the Analytical Control Board and the Stepper Motors Driver Board) is powered directly from this board.

The two stepper motors drivers U3 and U6 (Toshiba TA8435H or NMB SDI-C403) – compare the scheme SE-30-02188-00 / sheet 1 of 2 – control the Washing Station Motor and a “spare” motor, respectively. The Washing Station Motor is connected to the “Electrovalves Control Board”.

Finally, the power supply is connected to the Analytical Control Board by a wiring and a header connector to power it the GND and the following voltages: + 24 Vdc, + 12 Vdc. The +5 Vdc, +3.3 Vdc and the –12Vdc voltages needed to the board components are generated on the same board by voltage regulators.

2.9.3 Stepper Motors Driver Board [P/N: 30-01284-02]

The Stepper Motors Driver Board is the interface between the Analytical Control Board and the stepper motors (excluding the Washing Station stepper Motor).

On the boards are present nine bipolar stepping motor drivers (Toshiba TA8435H or NMB SDI-C403) as showed in the scheme SE-30-01284-02. Each driver is dedicated to drive one stepper motor and has its heatsink.

Components and switchs dedicated to the nine drivers are present on the board (compare the scheme SE-30-01284-02).

The Stepper Motors Driver Board is connected to the Analytical Control Board by a 64 pin frontal clutch connector by which receives all the command signals for its 9 stepper motor drivers (compare the scheme SE-30-01284-02).

The following four boards are directly connected to the Stepper Motors Driver Board by specific cables and connectors (as showed in the scheme SC-30-01284-02): the "Samples Plate Interface Board", the "Reagents Plate Interface Board", the "Reactions Plate Interface Board" and the "Arm Interface Board". They receive from it all the phase signals for the respective stepper motors.

The following table describes which are the stepper motors – with the relative board – controlled from its nine stepper drivers U1 … U9 (compare the scheme SE-30-01284-02):

Driver *ref.*	**Stepper Motor**	**Board (P/N)**
U1	Reactions Plate Motor	30-02192-..
U2	Vertical Mov. Arm Motor	30-02193-..
U3	Samples Plate Motor	30-02191-..
U4	Filters Wheel Motor	30-02192-..
U5	Horizontal Mov. Arm Motor	30-02193-..
U6	Satellites Mov. Samples Plate Motor	30-02191-..
U7	Diluter Motor	30-02193-..
U8	Reagents Plate Motor	30-02190-..
U9	Satellites Mov. Reagents Plate Motor	30-02190-..

Finally, the power supply is connected to the Stepper Motors Driver Board by a wiring and a header connector to power it the GND and the following voltages: + 24 Vdc, + 12 Vdc. The +5 Vdc voltage needed to the driver components is generated on the same board by a positive voltage regulator.

2.9.4 Reagents Plate Interface Board [P/N: 30-02190-00]

This board is the hardware interface between the Analytical Control Board and the Stepper Motors Driver Board with all devices pertinent to the Reagents Plate of the instrument (compare the scheme SC-30-02190-00).

The Reagents Plate Interface Board is connected to the Analytical Control Board through a specific cable and connector (as showed in the scheme SC-30-02190-00) by which communicates all needed input/output signals. It is connected to the Stepper Motors Driver Board through another specific cable and connector (as showed in the scheme SC-30-02190-00) by which receives the phase signals for the two following stepper motors: the Reagents Plate Motor and the Satellites Mov. Reagents Plate Motor.

All the bottles inside the Reagents Plate are cooled by four Cooler Modules positioned on its border. Each module is composed from two Peltier cells and two fans (as showed in the scheme MA-10-02536-XX). The Reagents Plate Interface Board is connected to each module through a dedicated wiring and four specific connectors (as showed in the scheme SC-30-02190-00) for the command signals and the needed power supply.

It is possible choose the fans power supply by the switch SW1. The lighting of the two yellow leds LD1 and LD2 show the power up to the Peltier cells Assy 1 and to the Peltier cells Assy 2, respectively (compare the scheme SE-30-02190-00). Components and integrated circuits dedicated to the devices management are all present on the board.

The Reagents Plate Cover Switch is connected to the Reagents Plate Interface Board by the same dedicated Cooler Modules cabling but by another connector. The Cooler Temperature Sensor, the Reagents Plate Motor, the Reagents Plate Home Sensor, the Satellites Mov. Reagents Plate Motor and the Satellites Mov. Reagents Plate Home Sensor are connected to the board by relative connectors.

Finally, the power supply is connected to the Reagents Plate Interface Board by a wiring and a header connector to power it the GND and the following voltages: +24 Vdc, +12 Vdc, +8 Vdc. The necessary +5 Vdc voltage is generated on the same board by a positive voltage regulator.

2.9.5 Samples Plate Interface Board [P/N: 30-02191-00]

This board is the hardware interface between the Analytical Control Board and the Stepper Motors Driver Board with all devices pertinent to the Samples Plate of the instrument (compare the scheme SC-30-02191-00).

The Samples Plate Interface Board is connected to the Analytical Control Board through a specific cable and connector (as showed in the scheme SC-30-02191-00) by which communicates all needed input/output signals. It is connected to the Stepper Motors Driver Board through another specific cable and connector (as showed in the scheme SC-30-02191-00) by which receives the phase signals for the two following stepper motors: the Samples Plate Motor and the Satellites Mov. Samples Plate Motor.

The Samples Barcode Reader and the Reagents Barcode Reader are needed to read the barcodes on the cups/tubes of the Samples Plate and on the bottles of the Reagents Plate, respectively. They are connected to the Samples Plate Interface Board through two distinct connectors for the respective tx/rx signals, the GND and the +5 V voltage (as showed in the scheme SE-30-02191-00).

The Luminous Detector, the Samples Plate Cover Switch, the Samples Plate Motor, the Samples Plate Home Sensor, the Satellites Mov. Samples Plate Motor and the Satellites Mov. Samples Plate Home Sensor are connected to the Samples Plate Interface Board by relative connectors. Instead, the J9, J10 and J11 are unused connectors (as showed in the scheme SE-30-02191-00).

Components, transistors and integrated circuits dedicated to the devices management are all present on the board (compare the scheme SE-30-02191-00).

Finally, the power supply is connected to the Samples Plate Interface Board by a wiring and a header connector to power it the GND and the following voltages: +24Vdc, +12Vdc. The necessary +5 Vdc voltage is generated on the same board by a positive voltage regulator.

2.9.6 Reactions Plate Interface Board [P/N: 30-02192-00]

This board is the hardware interface between the Analytical Control Board and the Stepper Motors Driver Board with all devices pertinent to the Reactions Plate of the instrument (compare the scheme SC-30-02192-00).

The Reactions Plate Interface Board is connected to the Analytical Control Board through a specific cable and connector (as showed in the scheme SC-30-02192-00) by which communicates

all needed input/output signals. It is connected to the Stepper Motors Driver Board through another specific cable and connector (as showed in the scheme SC-30-02192-00) by which receives the phase signals for the two following stepper motors: the Reactions Plate Motor and the Filters Wheel Motor.

The Photometer Lamp Board (described into the successive Section 2.9.10) is connected to the Reactions Plate Interface Board through a header connector (compare the scheme SC-30-02192-00).

The EV7 and EV8 waste electrovalves and the P8 and P9 waste micropumps, showed in the "Waste" area of the hydraulic diagram SI-16-01873-00, are connected to the Reactions Plate Interface Board through four connectors (compare the scheme SC-30-02192-00).

The Reactions Plate Resistor (compare the Section 2.4) is connected to the Reactions Plate Interface Board through a header connector, whereas the Temperature Sensor of the Reactions Plate is connected to the board by another connector (compare the scheme SC-30-02192-00).

The Instrument Cover Switch is connected to the Reagents Plate Interface Board by a dedicated cable and connector. The Reactions Plate Motor, the Reactions Plate Home Sensor, the Filters Wheel Motor, the Filters Wheel Home Sensor, the Reactions Plate Leak Sensor, the Photometer Fan and the Instrument Cover Interlock are connected to the board by relative connectors (compare the scheme SC-30-02192-00). Instead, the J15 connector for the Reactions Plate Cover Switch is spare (compare the scheme SE-30-02192-00).

It is possible choose between two control signals of the Photometer Lamp Board by the switch SW1. The lighting of the yellow led LD1 shows the power up to the Reactions Plate Resistor. Instead, the lighting of the red led LD2 shows the activation of the Reactions Plate Leak Sensor (compare the scheme SE-30-02192-00). Components and integrated circuits dedicated to the devices management are all present on the board.

Finally, the power supply is connected to the Reactions Plate Interface Board by a wiring and a header connector to power it the GND and the following voltages: +24 Vdc, +12 Vdc, +8 Vdc. The necessary +5 Vdc voltage is generated on the same board by a positive voltage regulator.

2.9.7 Arm Interface Board [P/N: 30-02193-00]

This board is the hardware interface between the Analytical Control Board and the Stepper Motors Driver Board with all devices pertinent to the Sampling Arm and the Diluter of the instrument (compare the scheme SC-30-02193-00).

The Arm Interface Board is connected to the Analytical Control Board through a specific cable and connector (as showed in the scheme SC-30-02193-00) by which communicates all needed input/output signals. It is connected to the Stepper Motors Driver Board through another specific cable and connector (as showed in the scheme SC-30-02193-00) by which receives the phase signals for the three following stepper motors: the Horizontal Mov. Arm Motor, the Vertical Mov. Arm Motor and the Diluter Motor.

The Pre-Heater Assy of the Sampling Arm is connected to the Arm Interface Board through a connector and to the Level Sensor Board - described into the successive Section 2.9.11 - by two connectors (compare the scheme SC-30-02193-00).

The EV1 Diluter Electrovalve, the EV6 Arm Washing Well Electrovalve, the P1 Diluter Micropump and the P7 Arm Washing Well Micropump - showed in the "Arm assy" area of the hydraulic diagram SI-16-01873-00 - are connected to the Arm Interface Board through four connectors (compare the scheme SC-30-02193-00).

The Horizontal Mov. Arm Motor, the Horizontal Mov. Arm Home Sensor, the Vertical Mov. Arm Motor, the Vertical Mov. Arm Home Sensor, the Diluter Motor, the Diluter Home Sensor and

the Arm Leak Sensor are connected to the Arm Interface Board by relative connectors (compare the scheme SC-30-02193-00).

It is possible choose the Pre-Heater power supply by the switch SW1 (compare the scheme SE-30-02193-00). The lighting of the yellow led LD1 shows the power up to the Pre-Heater Assy. The lighting of the yellow led LD2 shows the activation of the Level Sensor. Instead, the lighting of the red led LD3 shows the activation of the Arm Leak Sensor (compare the scheme SE-30-02193-00). Components and integrated circuits dedicated to the devices management are all present on the board.

Finally, the power supply is connected to the Arm Interface Board by a wiring and a header connector to power it the GND and the following voltages: + 24 Vdc, + 12 Vdc, +8 Vdc. The necessary +5 Vdc voltage is generated on the same board by a positive voltage regulator.

2.9.8 Electrovalves Control Board [P/N: 30-02194-00]

This board is the hardware interface between the Analytical Control Board with all devices pertinent to the Washing Station of the instrument (compare the scheme SC-30-02194-00).

The Electrovalves Control Board is connected to the Analytical Control Board through a two cables and connectors (as showed in the scheme SC-30-02194-00) by which – respectively – communicates all needed input/output signals and receives the phase signals for the two following stepper motors: the Washing Station Motor and a "spare" motor (compare the previous Section 2.9.2).

The EV2, EV3, EV4 and EV5 electrovalves of the Washing Station - indicated in the "Washing Station pumps assy" area of the hydraulic diagram SI-16-01873-00 - are directly welded on the Electrovalves Control Board in the relative four small areas showed on the scheme SC-30-02194-00. Instead, the P2, P3, P4, P5 and P6 micropumps of the Washing Station – indicated in the "Washing Station pumps assy" area of the hydraulic diagram SI-16-01873-00 – are connected to the board by five connectors (compare the scheme SC-30-02194-00).

The Washing Station Motor, the Washing Station Home Sensor and the Ambient Temperature Sensor are connected to the Electrovalves Control Board by relative connectors (compare the scheme SC-30-02194-00).

The J8 connector is used for the Temperature Service Probe (kit) and the J7 connector for the "spare" stepper motor (compare the scheme SE-30-02194-00).

Components and integrated circuits dedicated to the devices management are all present on the board.

Finally, the power supply is connected to the Electrovalves Control Board by a wiring and a header connector to power it the GND and the following voltages: +24Vdc, +12 Vdc. The necessary +5 Vdc voltage is generated on the same board by a positive voltage regulator.

2.9.9 "Pre-Ampl./ADC" Boards [P/N: 30-00107-XX]

The "Pre-Ampl./ADC Board (Sample Channel)" and the "Pre-Ampl./ADC Board (Reference Channel)" are two boards for reading from main and reference channels of the Photometer, respectively.

The Pre-Ampl./ADC Board allows the conversion in a digital signal of the light beam that pass through the reaction cuvette. They are mounted on the Photometer (as showed in the scheme MA-15-02448-00) and are connected to the Analytical Control Board by one flat cable and two connectors (as showed in the scheme SC-30-02188-00) with which – respectively – communicate all needed input/output signals and receive the two voltages +12 Vdc and –12 Vdc. The other necessary voltages are generated on the board by voltage regulators.

On the Pre-Ampl./ADC Board, the FD1 photodiode senses the light beam that pass through the reaction cuvette, the U2 amplifier amplifies the correspondent analogic signal, the U1 Analog–to–Digital Converter (ADS 1250) performs its Analogic-Digital conversion (compare the scheme SE-30-00107-XX). The TR1 and TR2 trimmers allow the adjusting of the Gain and Offset, respectively.

The components and integrated circuits dedicated to the signal amplification and to its digital conversion are all present on the same board.

2.9.10 Photometer Lamp Board [P/N: 30-01576-01]

This board is connected to the Reactions Plate Interface Board through its cable and a header connector (compare the scheme SC-30-02192-00). This board receives from the Reactions Plate Interface Board the control signal (coming from the Analytical Control Board) to regulate the light intensity of the Photometer Halogen Lamp. Moreover, it receives from the interface board the + 8 Vdc voltage (V_L) which is then opportunely converted on the same board by a positive adjustable regulator (U1) to power the halogen lamp.

The R6 trimmer (compare the scheme SE-30-01576-01) allows the adjusting of the Halogen Lamp voltage. The two wires of the Halogen Lamp are connected on the J2 feed clamp.

The needed components and integrated circuits are present on the board.

2.9.11 Level Sensor Board [P/N: 30-02365-00]

This board is connected to the Pre-Heater Assy by two connectors (compare the scheme SC-30-02193-00) and relative wires.

A connector allows the connection, through the Pre-Heater Assy, to the Arm Interface Board. In fact, it receives from the Pre-Heater Assy (coming from the Arm Interface Board) the +24Vdc voltage and the GND which is then opportunely converted on the Level Sensor Board by a positive voltage regulator (U5) to power the integrated circuits on it. The Level Sensor Board transmits the Level Sensor signal to the Pre-Heater Assy which, through the Arm Interface Board, transfers the signal to the Analytical Control Board.

Other connector allows the connection of the Level Sensor Board to the Sampling Probe.

The Level Sensor Board, through two timer (U3 and U4) and a operational amplifier (U2), effects a capacitive liquid level sensing (compare the scheme SE-30-02365-00). The needed components and integrated circuits are present on the board.

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4 DIAGNOSTIC PROGRAM

The Diagnostic program enables the operator to perform a complete check of each of the modules of the *SAT450* instrument.

This program has a folder structure, with each folder containing functions pertaining to the specific module. To launch the program the operator has to click with the left side of the mouse, on the **Diagnostic** area located on the lower right side of the screen of the System Monitor (**Fig. 1**).

The *SAT450* instrument must be in the stand-by state to access this area.

Fig. 1 – System Monitor

Once the "Diagnostic" program starts, the following folder appears (**Fig. 2**).

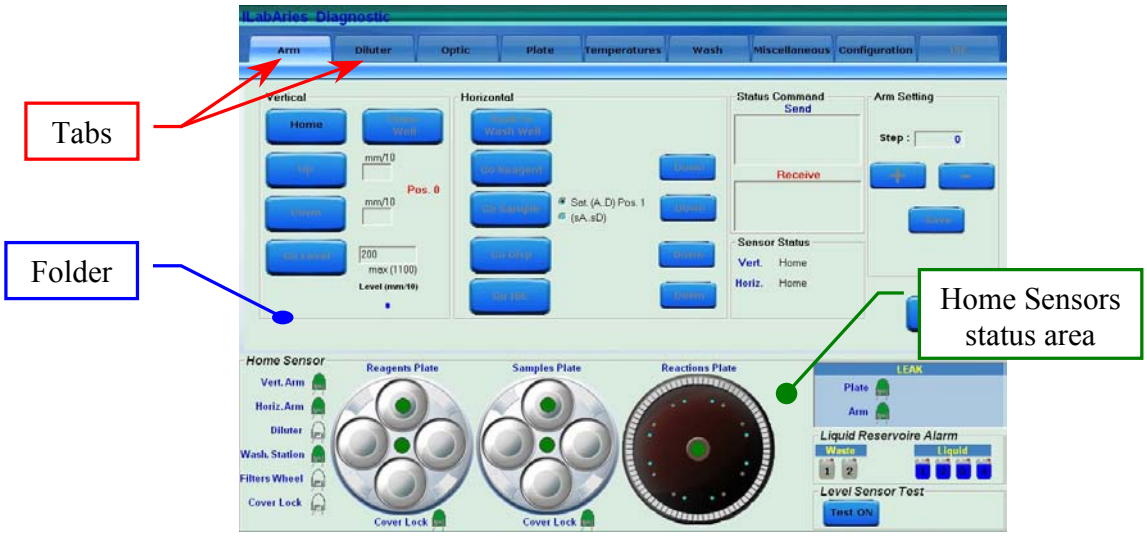


Fig. 2 – Diagnostic program

The Diagnostic program is subdivided into two distinct areas: Folder Test and Home Sensors status. This two areas are present on every diagnostic windows and enable the operator to verify multiple functions as specified below:

Folder Tests: checks the functionality of the various sub-systems. The individual functions are illustrated later on.

Home Sensors Status: visualizes the home sensor status that controls the Sampling Arm, the Diluter, the Washing Station, the Filters Wheel, the Reactions Plate, the Samples Plate, the Reagents Plate and the two Cover Locks, as well as the Liquid Reservoire Alarm and the Level Sensor Test (**Fig. 3**).

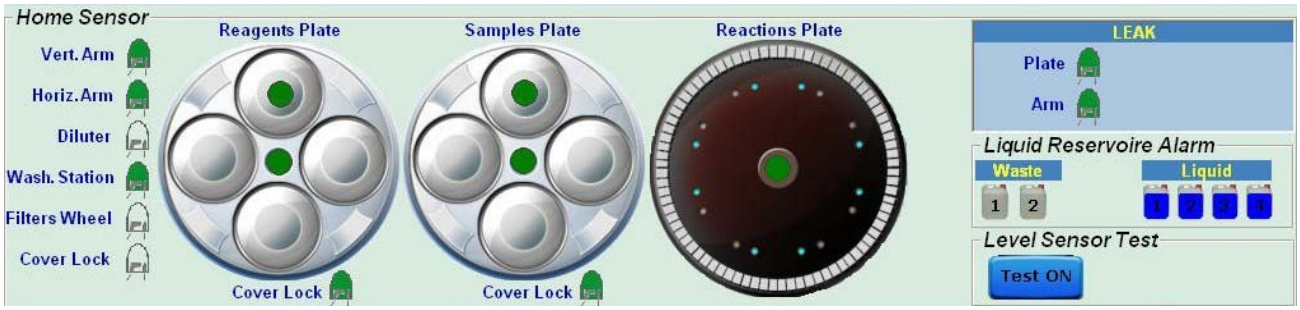


Fig. 3 – Home Sensors Status in the Diagnostic program

The Home Sensor:

- **Vertical Arm Home Sensor**
- **Horizontal Arm Home Sensor**
- **Diluter Home Sensor**
- **Washing Station Home Sensor**
- **Filters Wheel Home Sensor**
- **Reagents Plate Home Sensor**
- **Satellites Mov. Reagents Plate Home Sensor**
- **Samples Plate Home Sensor**
- **Satellites Mov. Samples Plate Home Sensor**
- **Reactions Plate Home Sensor**

turn green when the specific device is in the home position.

The **Cover Lock** Home Sensor is green when the Instrument Cover is closed.

The Home Sensor:

- **Reagents Plate Cover Lock**
- **Samples Plate Cover Lock**

turn green when the specific cover is positioned on its plate.

The following six fields signal the alarms for the two waste tanks and the four liquid bottles:

- **Waste1 - Liquid Reservoire Alarm**
- **Waste2 - Liquid Reservoire Alarm**

turn blue when the correspondent waste tank is full;

- **Liquid 1 - Liquid Reservoire Alarm**
- **Liquid 2 - Liquid Reservoire Alarm**
- **Liquid 3 - Liquid Reservoire Alarm**
- **Liquid 4 - Liquid Reservoire Alarm**

disappear the blue if the liquid quantity is below the predetermined minimum level (the bottle is almost empty).

Button **Test ON**: if pushed, on the right of it will be showed a red drop that becomes temporarily green when the liquid is detected with the Sampling Probe (*Level Sensor Test*).

The "Exit**"** button (**Fig. 4)** allows to exit from the Diagnostic program.

Fig. 4 – "Exit" button

4.1 DIAGNOSTIC FOLDERS

The Diagnostic program is subdivided into 8 folders:

- **Arm:** allows to perform and check the adjustments of the Sampling Arm;
- **Diluter:** checks the accurate functioning of the Diluter;
- **Optic:** checks the accurate functioning of the Photometer;
- **Plate:** checks the accurate functioning of the Reactions Plate, Samples Plate and Reagents Plate;
- **Temperatures:** checks the temperature of the Pre-Heater and Reactions Plate;
- **Wash:** checks the accurate functioning of the Washing Station;
- **Miscellaneous:** checks the accurate functioning of the Barcode Readers and allows to perform the General Reset of the instrument;
- **Configuration:** allows to adjust specific parameters of the instrument (*the access in this folder is restricted by password*).

4.2 "ARM" FOLDER

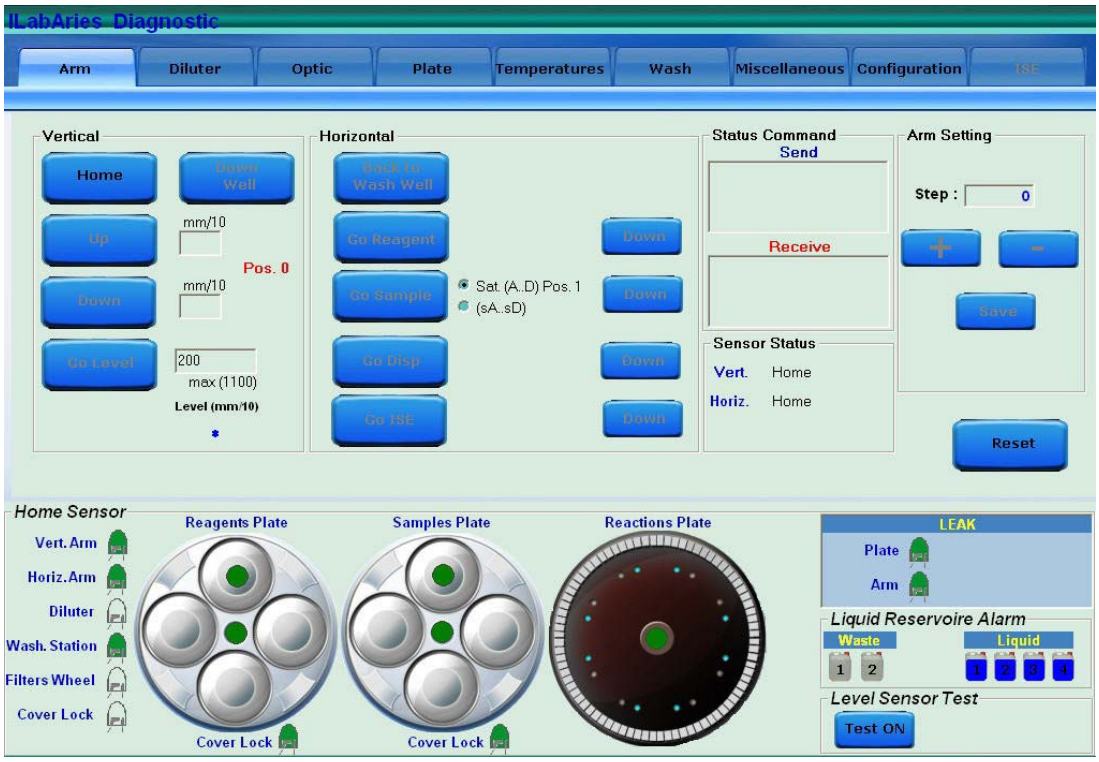


Fig. 5 – "Arm" folder

The wrong use of the functions described in this folder can damage the Sampling Probe.

The "Arm" folder is subdivided into five areas:

- **VERTICAL**
- **HORIZONTAL**
- **STATUS COMMAND**
- **ARM SETTING**
- **SENSOR STATUS**

4.2.1 "VERTICAL" COMMAND AREA

(*5 commands*)

Home: brings the Sampling Arm vertically to a home position;

Down Well: brings the Arm's axis "z" to the height of the Washing Well;

Up: raises the Sampling Arm tenths of a millimeter as preset in the square found immediately on the right, with relation to the previous down movement; the box becomes active when the Sampling Arm is positioned on a sample, a reagent, a standard or a cuvette;

Down: lowers the Sampling Arm tenths of a millimeter as pre-determined by the square found immediately on the right; the box becomes active when the Sampling Arm is positioned on a sample, a reagent, a standard or a cuvette;

Go Level: brings the Sampling Probe to either the reagent level, the sample or the standard and reads the level. Before giving this command, it is necessary to set the parameter for the Probe's maximum lowering level in the max area (*mm*).

4.2.2 "HORIZONTAL" COMMAND AREA

(*5 commands*)

Back to Wash Well: brings the Sampling Arm back to the home position;

Go Reagent: brings the Sampling Arm to the reagent position;

Go Sample: brings the Sampling Arm to the sample position; moreover, it's possible choose between two different positions: the first [Sat (A..D) Pos.1] allows to bring the Sampling Probe in correspondence of the position #1 of one of four Satellite Racks, instead the second [(sA..sD)] allows to bring the Sampling Probe in correspondence of the Peripheral Racks.

Go Disp.: brings the Sampling Arm to the dispense position.

Go ISE: *to be defined*.

The "Down" button allows to the Sampling Probe go down at the right height.

4.2.3 "STATUS COMMAND" AREA

Send: visualizes the commands sent from the program to the instrument's hardware;

Receive: visualizes the answers of the instrument's hardware to the commands sent by the program.

4.2.4 "ARM SETTING" COMMAND AREA

(*5 commands*)

Step: visualizes the number of steps;

+ : performs the counter-clockwise rotation of the Sampling Arm (to adjust the position);

- : performs the clockwise rotation of the Sampling Arm (to adjust the position);

Save: saves the adjustment data;

Reset: completely resets the Sampling Arm.

In this area the boxes can be activated when the Sampling Arm is positioned on a sample, a reagent, a standard, a control or a reaction cuvette.

4.2.5 "SENSOR STATUS" AREA

Sensor Status: indicates the home sensors status relative to the Sampling Arm's vertical axis (*Vertical*) and the Sampling Arm's latitudinal motion (*Horizontal*).

4.3 "DILUTER" FOLDER

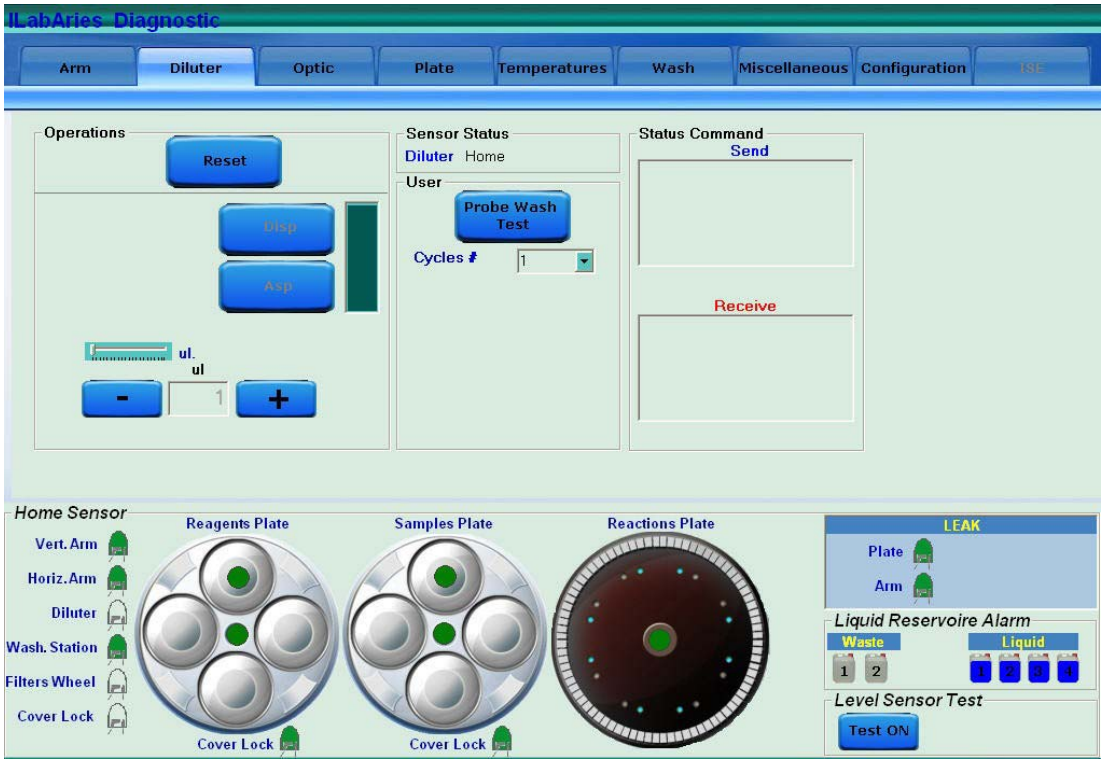


Fig. 6 – "Diluter" folder

The "Diluter" folder is subdivided into four areas:

- **OPERATIONS**
- **SENSOR STATUS**
- **USER**
- **STATUS COMMAND**

4.3.1 "OPERATIONS" AREA

(*3 commands*)

Reset: brings the Diluter to the home position;

Asp: aspirates the micro-litres as predetermined in the "ul." box (may be set manually through + and – or by using the cursor located immediately above);

Disp.: dispenses the micro-litres as predetermined in the "ul." box (may be set manually through + and – or by using the cursor located immediately above).

4.3.2 "SENSOR STATUS" AREA

In the Sensor Status area the Diluter home sensor status is indicated.

4.3.3 "USER" AREA

(*1 command*)

Probe Wash Test: activates/deactivates the Probe Wash Test. The number of the cycles for this test can be chosen with the field "Cycles #".

4.3.4 "STATUS COMMAND" AREA

Send: visualizes the commands sent by the program to the instrument's hardware;

Receive: visualizes the instrument hardware's response to the commands sent by the program.

4.4 "OPTIC" FOLDER

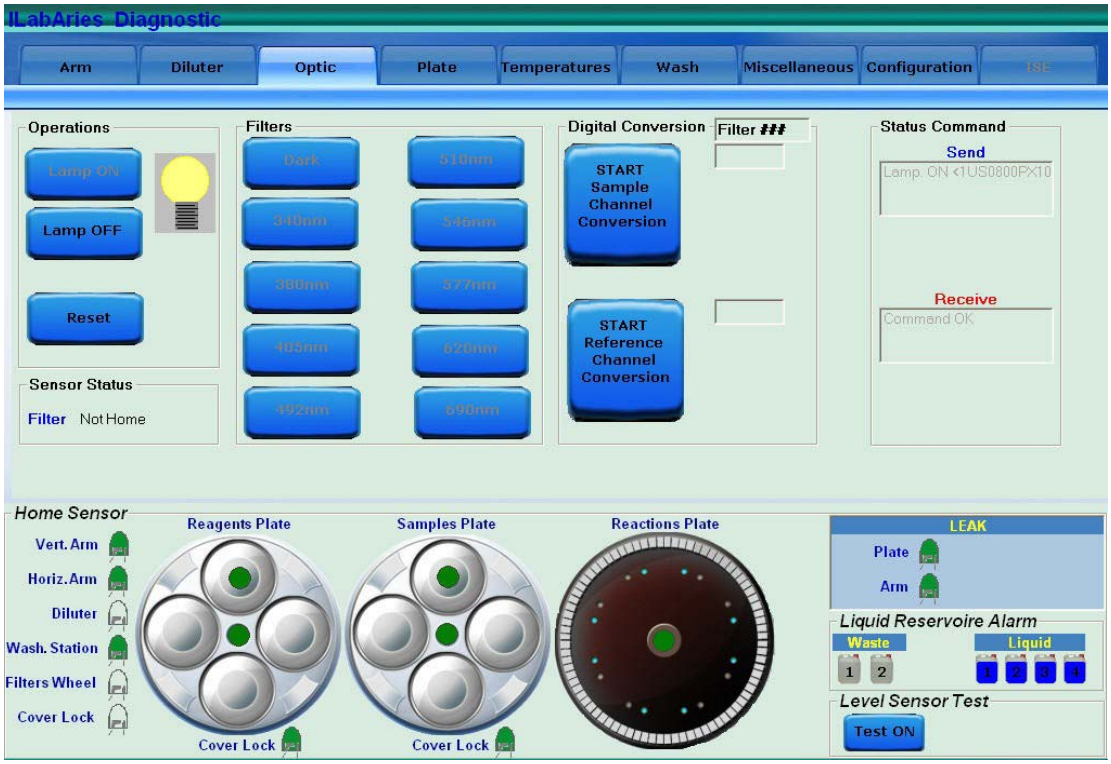


Fig. 7 - "Optic" folder

The "Optic" folder is subdivided into five areas:

- **OPERATIONS**
- **SENSOR STATUS**
- **FILTERS**
- **DIGITAL CONVERSION**
- **STATUS COMMAND**

4.4.1 "OPERATIONS" AREA

(*3 commands*)

Lamp ON: turns on the Photometer Halogen Lamp;

Lamp OFF: turns off the Photometer Halogen Lamp,

Reset: brings the Filters Wheel of the Photometer to the home position.

4.4.2 "SENSOR STATUS" AREA

This area indicates the status of the Filters Wheel home sensor.

4.4.3 "FILTERS" AREA

(*10 commands*)

Dark: positions the Filters Wheel in dark position;

340 nm: positions the int. filter n° 1 (*340 nm*) in front of the reading sensor;

380 nm: positions the int. filter n° 2 (*380 nm*) in front of the reading sensor;

405 nm: positions the int. filter n° 3 (*405 nm*) in front of the reading sensor;

492 nm: positions the int. filter n° 4 (*492 nm*) in front of the reading sensor;

510 nm: positions the int. filter n° 5 (*510 nm*) in front of the reading sensor;

546 nm: positions the int. filter n° 6 (*546 nm*) in front of the reading sensor;

577 nm: positions the int. filter n° 7 (*577 nm*) in front of the reading sensor;

620 nm: positions the int. filter n° 8 (*620 nm*) in front of the reading sensor;

690 nm: positions the int. filter n° 9 (*690 nm*) in front of the reading sensor.

4.4.4 "DIGITAL CONVERSION" AREA

(*2 commands*)

START/STOP Sample Channel Conversion: performs an analogical/digital conversion of the Sample Channel (*counts*);

START/STOP Reference Channel Conversion: performs an analogical/digital conversion of the Reference Channel (*counts*).

Moreover, a Output Box is present that shows the selected interferential filter.

4.4.5 "STATUS COMMAND" AREA

Send: visualizes the commands sent by the program to the instrument's hardware;

Receive: visualizes the instrument hardware's response to the commands sent by the program.

4.5 "PLATE" FOLDER

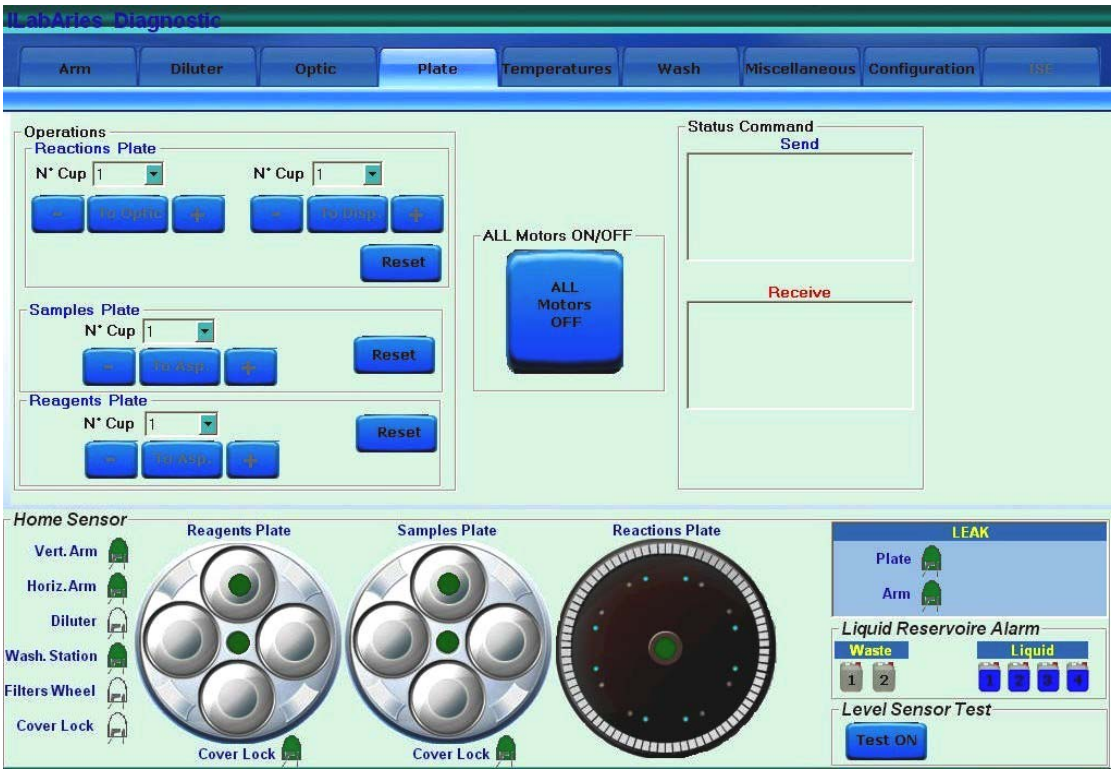


Fig. 8 – "Plate" folder

The "Plate" folder is subdivided into three areas:

- **OPERATIONS**
- **ALL MOTORS ON/OFF**
- **STATUS COMMAND**

4.5.1 "OPERATIONS" AREA

"Reactions Plate" area:
(*3 commands*)

To Optic: automatically positions the reaction cuvette, selected on the Pull Down Menu above, (*) in front of the Photometer;

To Disp.: automatically positions the reaction cuvette, selected on the Pull Down Menu above, (*) under the dispensing position;

Reset: performs the reset of the Reactions Plate by positioning the reaction cuvette #1 in the reading position (in front of the Photometer).

(*) { **+ :** automatically positions the next reaction cuvette;
- : automatically positions the previous reaction cuvette. }

"Samples Plate" area:

(*2 commands*)

To Asp.: automatically brings the sample cup, selected on the Pull Down Menu above, under the aspiration position;

- **+ :** automatically positions the next position;
- **- :** automatically positions the previous position.

Reset: performs the reset of the Samples Plate by positioning the position #1 of the Satellites Rack A under the aspiration position.

"Reagents Plate" area:

(*2 commands*)

To Asp.: automatically brings the reagent bottle, selected on the Pull Down Menu above, under the aspiration position;

- **+ :** automatically positions the next position;
- **- :** automatically positions the previous position.

Reset: performs the reset of the Reagents Plate by positioning the position #1 of the Satellites Rack A under the aspiration position.

4.5.2 "ALL MOTORS ON/OFF" AREA

(*1 command*)

ALL Motors ON/OFF: engages/disengages the motors to allow a manual movement of the modules (Sampling Arm, Reactions Plate, Reagents Plate, Samples Plate, Washing Station, Photometer Filters Wheel).

4.5.3 "STATUS COMMAND" AREA

Send: visualizes the commands sent by the program to the instrument's hardware;

Receive: visualizes the instrument hardware's response to the commands sent by the program.

4.6 "TEMPERATURES" FOLDER

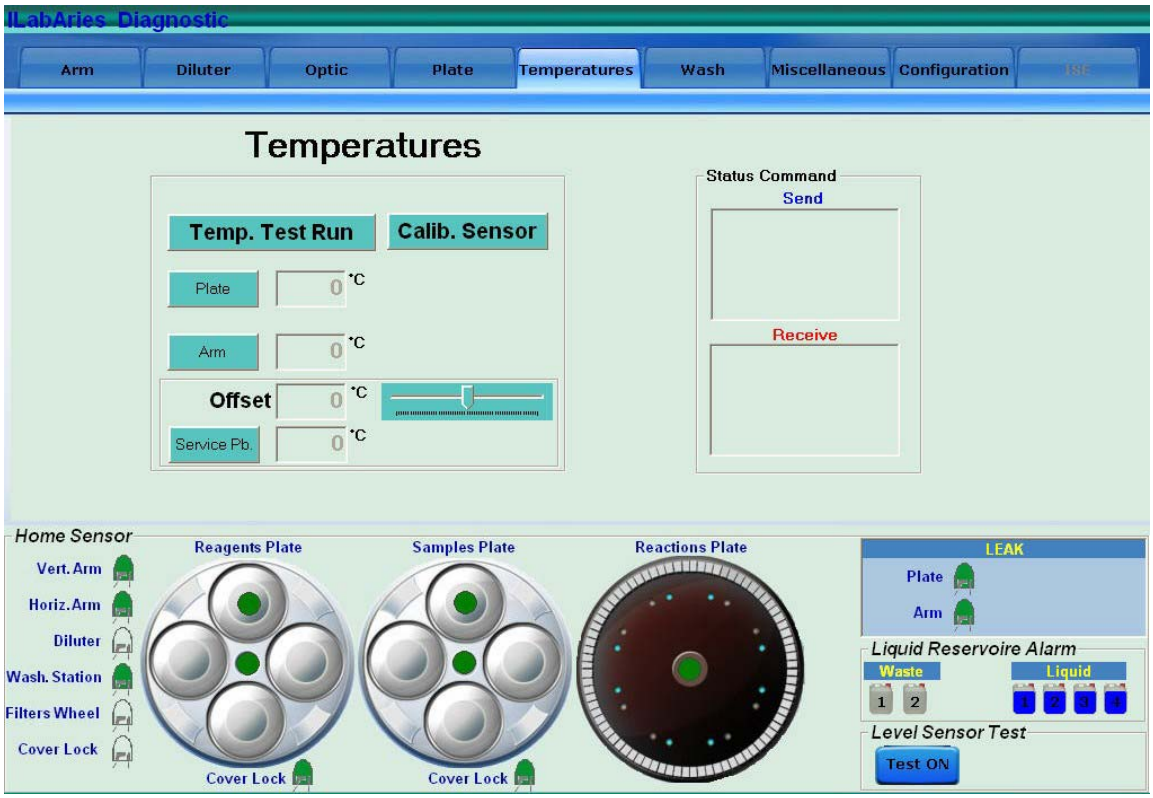


Fig. 9 – "Temperatures" folder

The "Temperatures" folder is subdivided into two areas:

- **TEMPERATURES**
- **STATUS COMMAND**

4.6.1 "TEMPERATURES" AREA

(*6 commands*)

Temp. Test Run: allows to get in the "Temperature Test" form (**Fig. 10**) and performs the Temperature Test;

Plate: performs a temperature reading (°C) in the Reactions Plate compartment;

Arm: performs a temperature reading (°C) in the Pre-Heater of the Sampling Arm;

Calib. Sensor: allows to perform the calibration procedure of the Service Probe included in the kit having P/N: 55-01204-00.

Offset: allows to enter (using the cursor located immediately to the right) the temperature offset value (°C) between the reference thermometer reading and the Service Probe reading (*note*: the offset value resets to zero when exit to the Diagnostic program).

Service Pb.: performs a temperature reading (°C) with the Service Probe.

4.6.1.1 "Temperature Test" form

(*3 commands*)

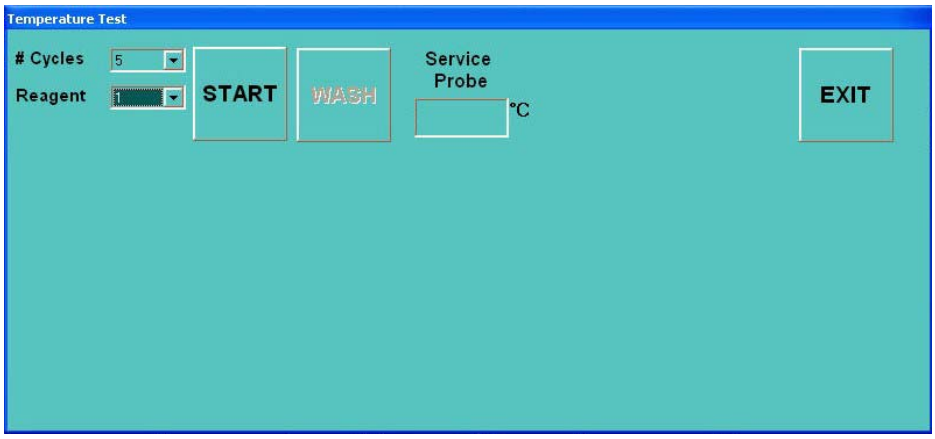


Fig. 10 – "Temperature Test" form

START: allows to start the Temperature Test;

WASH: allows to empty the five reaction cuvettes used in the Temperature Test;

EXIT: allows to exit from the "Temperature Test" form.

Service Probe: text box that shows the temperature reading (°C) with the Service Probe.

 # Cycles = 5: number of reaction cuvettes used in the Temperature Test;

Reagent =1: indicates the position **(**position #1 of the Satellites Rack A of the Reagents Plate) where take place the aspiration of the Sampling Arm.

4.6.2 "STATUS COMMAND" AREA

Send: visualizes the commands sent by the program to the instrument's hardware;

Receive: visualizes the instrument hardware's response to the commands sent by the program.

4.7 "WASH" FOLDER

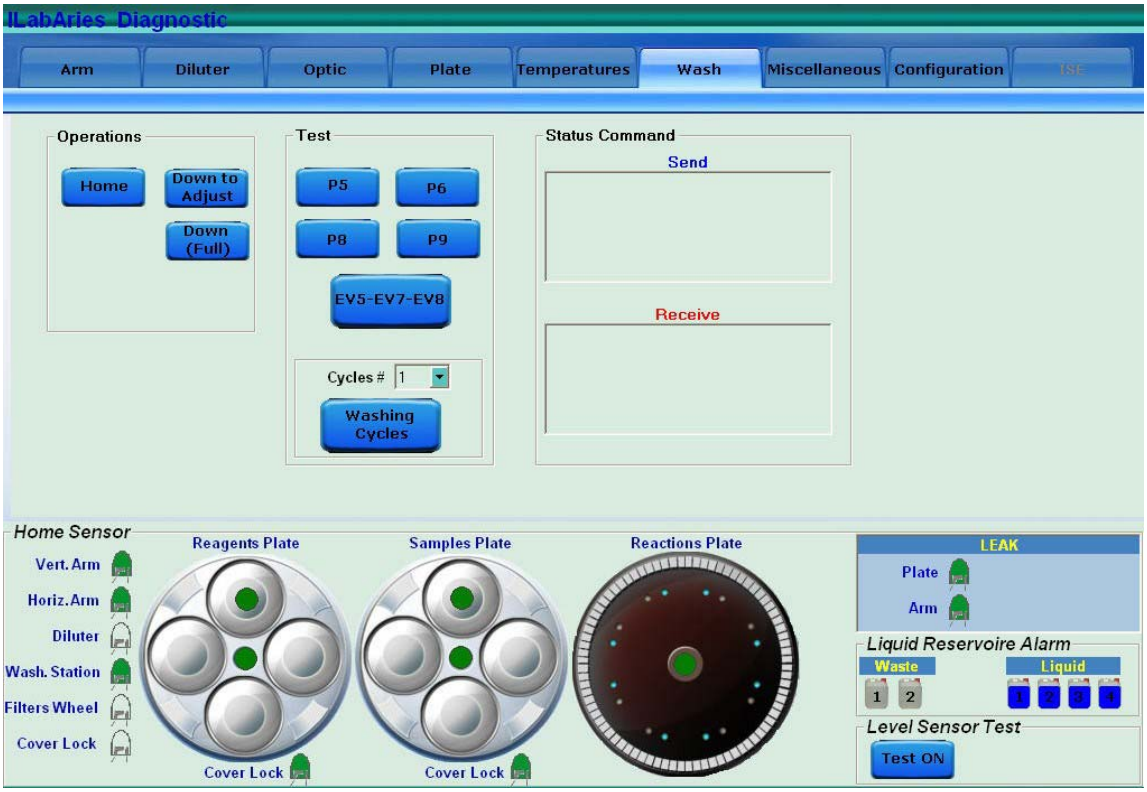


Fig. 11 – "Wash" folder

The "Wash" folder is subdivided into three areas:

- **OPERATIONS**
- **TEST**
- **STATUS COMMAND**

4.7.1 "OPERATIONS" AREA

(*3 commands*)

Home: brings the washing device of the Washing Station to the home position;

Down to Adjust: makes the washing device go down to the position for adjusting operations;

Down (Full): makes the washing device go down to the washing position.

4.7.2 "TEST" AREA

(*6 commands*)

P5: actives the P5 µ-pump and automatically turns it off after a period of 0,5 seconds;

P6: actives the P6 µ-pump and automatically turns it off after a period of 0,5 seconds;

P8: actives the P8 µ-pump and automatically turns it off after a period of 0,5 seconds;

P9: actives the P9 µ-pump and automatically turns it off after a period of 0,5 seconds;

EV5-EV7-EV8: actives the EV5, EV7 and EV8 electrovalves and automatically turns them off after a period of 0,5 seconds.

Washing Cycles: allows to perform the Functional Check of the Washing Station. The number of cycles is selectable on the Pull Down Menu "Cycles #".

4.7.3 "STATUS COMMAND" AREA

Send: visualizes the commands sent by the program to the instrument's hardware;

Receive: visualizes the instrument hardware's response to the commands sent by the program.

4.8 "MISCELLANEOUS" FOLDER

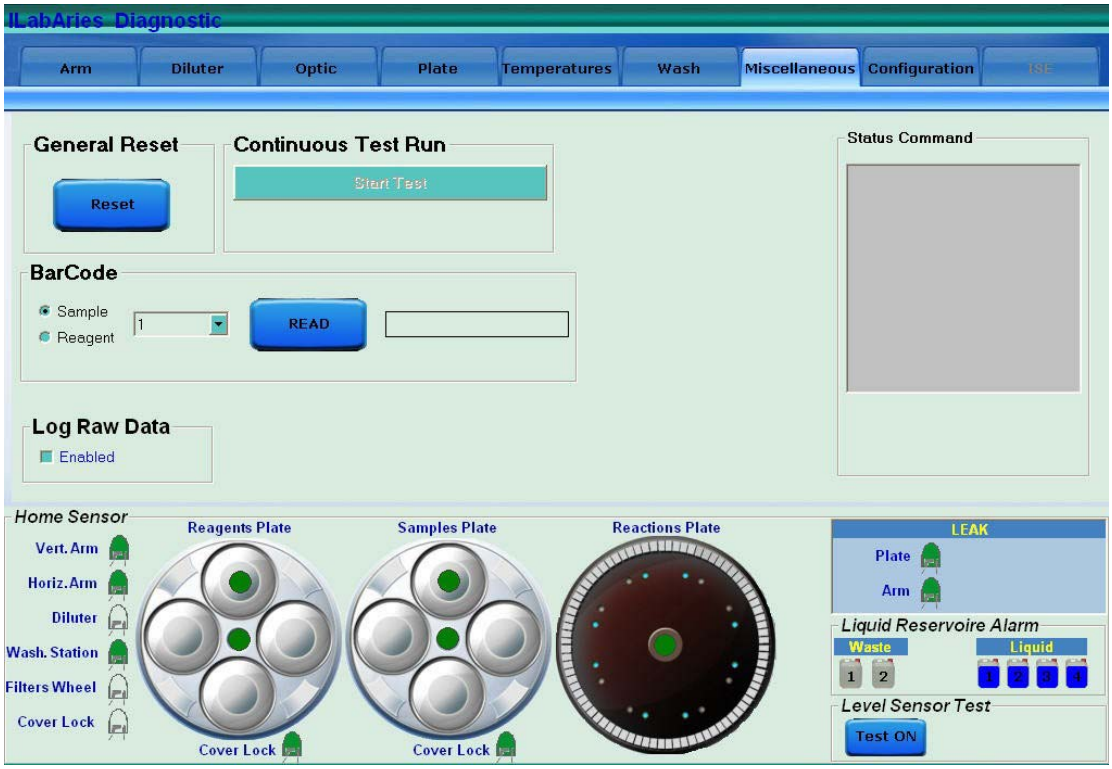


Fig. 12 – "Miscellaneous" folder

The "Miscellaneous" folder is subdivided into five areas:

- **GENERAL RESET**
- **CONTINUOUS TEST RUN**
- **BARCODE**
- **LOG RAW DATA**

4.8.1 "GENERAL RESET" AREA

(*1 command*)

Reset: performs the reset procedure of the general system.

4.8.2 "CONTINUOUS TEST RUN" AREA

(*1 command*)

Start Test: allows to start an automatic test during which the modules of the system are moved to all the different positions.

4.8.3 "BARCODE" AREA

(*1 command*)

Read: allows to read the *barcode* (visualized to its right) present on the bottle/cup in a specific position of the Samples Plate or Reagents Plate.

(2 options)

Sample: option to select the Samples Plate upon which read the barcode in the position choosed in the near Pull Down Menu;

Reagent: option to select the Reagents Plate upon which read the barcode in the position choosed in the near Pull Down Menu.

4.8.4 "LOG RAW DATA" AREA

(*1 check box*)

Enabled: if selected, allows to save a copy of the files for the technical diagnosis in case of malfunctions of the instrument. The files are memorized in a specific folder.

4.9 "CONFIGURATION" FOLDER

This folder must be accessible only by qualified technical operators.

It is necessary insert a password in the "Password" form (**Fig. 13**) to access in this folder.

Fig. 13 – "Password" form

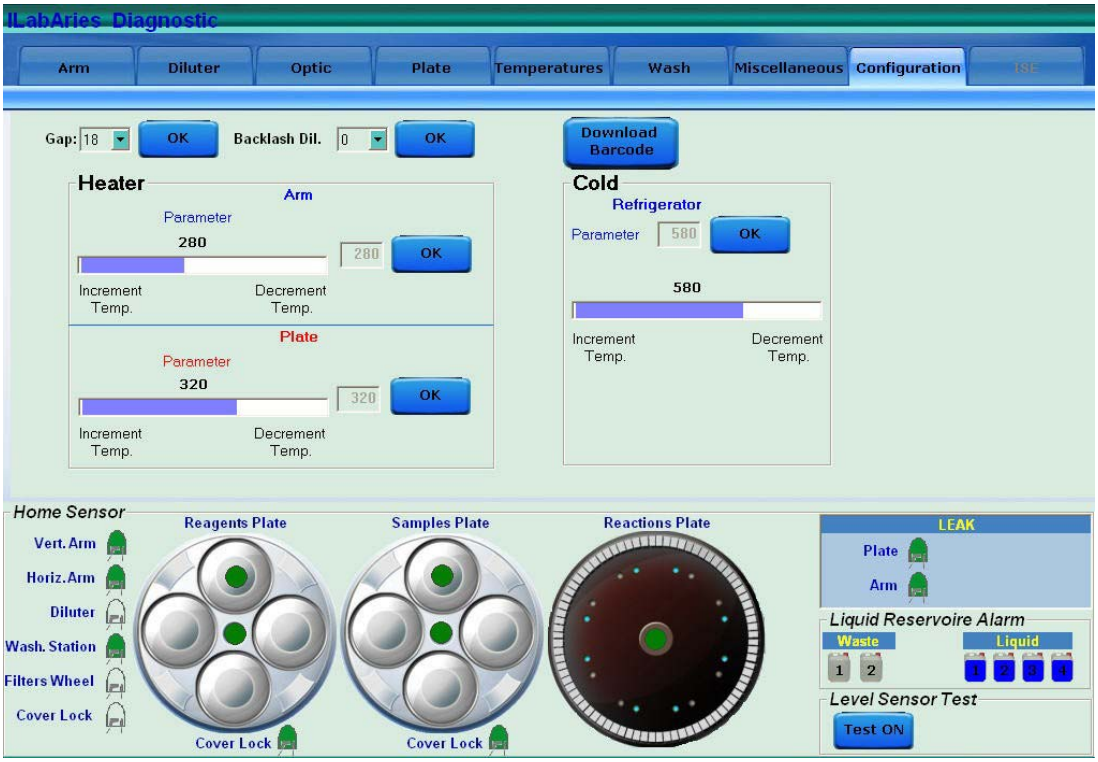


Fig. 14 – "Configuration" folder

The "Configuration" folder is subdivided into six areas:

- **GAP**
- **BACKLASH DIL.**
- **HEATER - ARM**
- **HEATER - PLATE**
- **COLD – REFRIGERATOR**
- **DOWNLOAD BARCODE**

4.9.1 "GAP" AREA

(*1 command*)

OK: allows to save the volume (in µL), selected in the relative Pull Down Menu, of the air bubble that separates the Rinse (the liquid column into the Sampling Arm tube) from the sampled Reagent. The default value is 18.

4.9.2 "BACKLASH DIL." AREA

(*1 command*)

OK: allows to save the redress value for the sampling imprecision generated by the Diluter motor when it inverts the rotation of its shaft. The setting value in the relative Pull Down Menu is expressed in µL. It is obtained by using the following procedure:

1. Select "Arm" folder and request an Sampling Arm reset. Wait until the reset Sampling Arm procedure has been completed.
2. Select "Diluter" folder and request an Diluter reset. Wait until the reset Diluter procedure has been completed.
3. Select the number "4" in the Pull Down Menu "Cycles #" and push "Probe Wash Test" in order to fill the hydraulic sampling line. Wait until the requested cycles have been completed.
4. Select "Arm" folder and push "Go Sample" button in order to move the Sampling Probe to sample position #1.
5. Put a sample cup containing distilled water (about 1ml) under the Sampling Probe.
6. Select **"**Diluter**"** folder and aspirate 300 µL of distilled water from the cup.
7. Remove the sample cup containing distilled water.
8. Select 1 µL to dispense and press "Disp." button consecutively until water appears on the tip of the Sampling Probe.
9. Substract 1 from the number of times that you pressed the "Disp" button. The obtained number has to be introduced in the relative Pull Down Menu as BACKLASH value.
10. Push "OK" button in the "Backlash Dil." area to save the inserted value.
11. Select "Arm" folder and request an Sampling Arm reset. Wait until the reset Sampling Arm procedure has been completed.

4.9.3 "HEATER - ARM" AREA

(*1 command*)

OK: allows to save the parameter to adjust the heating temperature of the Sampling Arm's Pre-Heater. This parameter is selectable in the relative slide and the value is visualized near to it.

4.9.4 "HEATER - PLATE" AREA

(*1 command*)

OK: allows to save the parameter to adjust the heating temperature of the Reactions Plate resistor. This parameter is selectable in the relative slide and the value is visualized near to it.

4.9.5 "COLD - REFRIGERATOR" AREA

(*1 command*)

OK: allows to save the parameter to adjust the cooling temperature of the Reagents Plate refrigerator. This parameter is selectable in the relative slide and the value is visualized above to it.

4.9.6 "DOWNLOAD BARCODE" AREA

(*1 command*)

Download Barcode: allows to download in the hardware of the instrument the firmware for the two BarCode Readers.

4.10 "ISE" FOLDER

[to be defined]

CHAPTER 05

- SETTINGS AND ADJUSTMENTS -

INDEX

5 SETTINGS AND ADJUSTMENTS

5.1 SAMPLING ARM

5.1.1 Alignments and adjustments of the Sampling Probe

1. Turn on the SAT450 system (instrument and computer) and launch the "Diagnostic" program.
2. Select "Miscellaneous" folder and request an Instrument General reset. Wait until the reset instrument procedure has been completed.
3. Make sure that all the Home Sensors of the Sampling Arm, Reactions Plate, Reagents Plate and Samples Plate light up in green.
4. Make sure that the Sampling Probe is vertically aligned (like show in the **Fig. 4**) and centered with respect to the Washing Well 1 (well places between Reagents Plate and Samples Plate indicated in the **Fig. 1**). If it not be so, adjust in the following way:

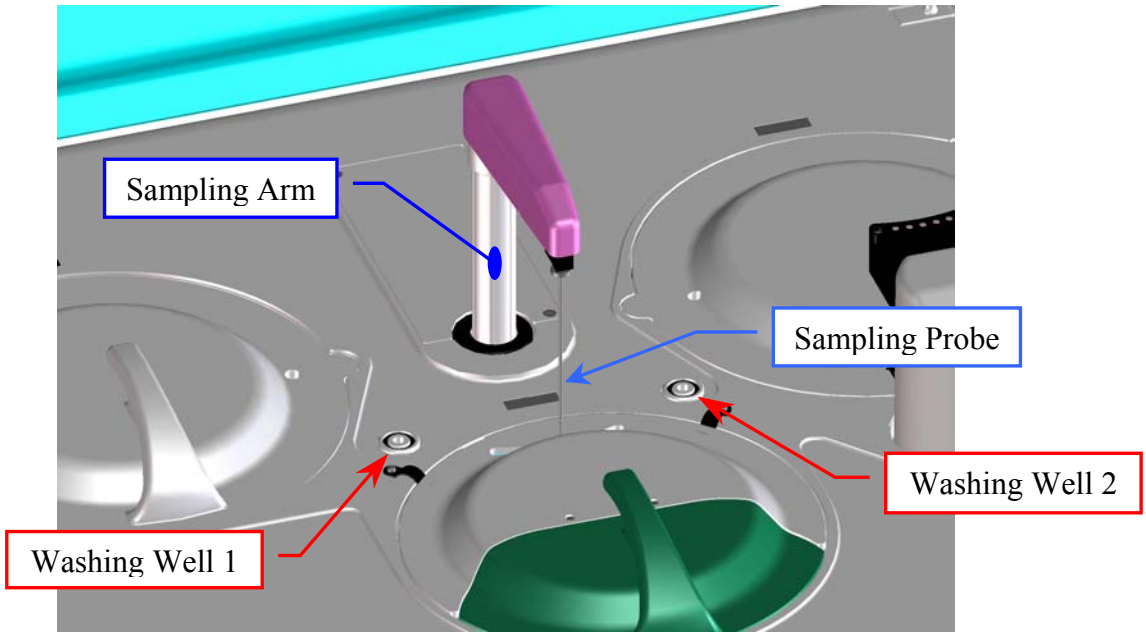


Fig. 1 – Sampling Arm and Washing Well 1

- **Sampling Probe horizontal alignment**:
  a. if the Sampling Probe is not latitudinal centered with respect to the Washing Well 1 (**Fig. 5**), adjust in the following way:
  b. select "Arm" folder and request an Arm reset. Wait until the reset Sampling Arm procedure has been completed;
  c. make sure that all the Home Sensors of the Sampling Arm (Vertical and Horizontal) light up in green;
  d. loosen slightly the two set screws of the Sampling Arm (**Fig. 2**);
  e. rotate slightly the Sampling Arm in the right toward in order to obtain the latitudinal centering with respect to the Washing Well 1 (**Fig. 5**);
  f. tighten the two set screws of the Sampling Arm (**Fig. 2**);

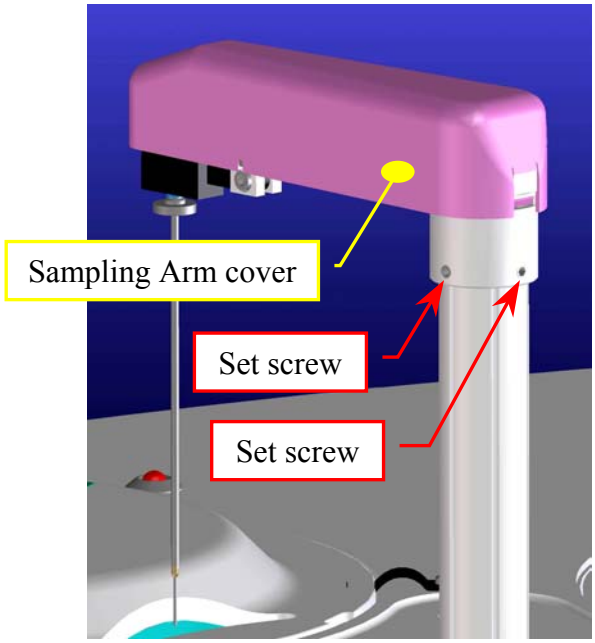


Fig. 2 – Set screws of the Sampling Arm

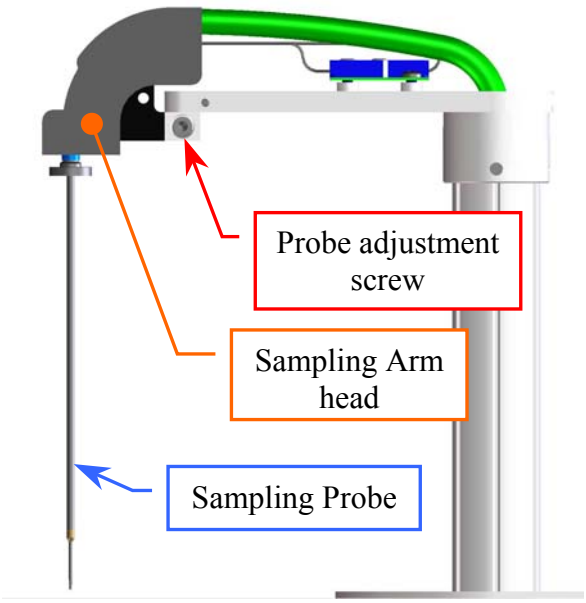


Fig. 3 – Probe adjustment screw

g. select "Arm" folder and request an Arm reset. Wait until the reset Sampling Arm procedure has been completed;

h. if the Sampling Probe is not longitudinal centered with respect to the Washing Well 1 (**Fig. 5**), adjust in the following way:

   i. select "Arm" folder and request an Arm reset. Wait until the reset Sampling Arm procedure has been completed;

   j. remove the Sampling Arm cover (**Fig. 2**);

   k. loosen slightly the Probe adjustment screw places on the Sampling Arm head (**Fig. 3**);

   l. rotate slightly the Sampling Arm in the right toward in order to obtain the longitudinal centering with respect to the Washing Well 1 (**Fig. 5**);

   m. tighten the Probe adjustment screw (**Fig. 3**);

   n. replace the Sampling Arm cover (**Fig. 2**);

   o. select "Arm" folder and request an Arm reset. Wait until the reset Sampling Arm procedure has been completed;

p. make sure that the Sampling Probe is centered with respect to the Washing Well 1.

- **Sampling Probe vertical adjustment**:

q. make sure that all the Home Sensors of the Sampling Arm (Vertical and Horizontal) light up in green;

r. remove the Reagents Plate and the Samples Plate covers (**Fig. 7**);

s. position a setscrew wrench with diameter equal to 2.5 mm between the point "A" (on mezzanine edge of the Reagents Plate) and the point "B" (on mezzanine edge of the Samples Plate) and with its midpoint centered with respect to the center of the Washing Well 1 (**Fig. 4**).

t. make sure that the tip of the Sampling Probe touch strictly the upper side of the setscrew wrench (like show in the **Fig. 4**). If it not be so, adjust in the following way:

u. turn off the SAT450 instrument and remove the setscrew wrench;

v. unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**);

w. measure the length "L" (**Fig. 9**) in the Sampling Arm Assy (**Fig. 8**);

x. loosen the two fastening screws of the Vertical Mov. Arm Home Sensor (**Fig. 9**);

y. move slightly the Vertical Mov. Arm Home Sensor to the right vertically toward in order to increase/decrease opportunely the length "L" and obtain the correct vertical height of the Sampling Probe;

z. tighten the two fastening screws of the Vertical Mov. Arm Home Sensor (**Fig. 9**);

aa. bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**);

bb. turn on the SAT450 instrument and launch the "Diagnostic" program;

cc. select "Arm" folder and request an Arm reset. Wait until the reset Sampling Arm procedure has been completed;

dd. repeat the above steps "q", "s" and "t";

ee. remove the setscrew wrench and replace the Reagents Plate and the Samples Plate covers (**Fig. 7**);

ff. select "Arm" folder and request an Arm reset. Wait until the reset Sampling Arm procedure has been completed.

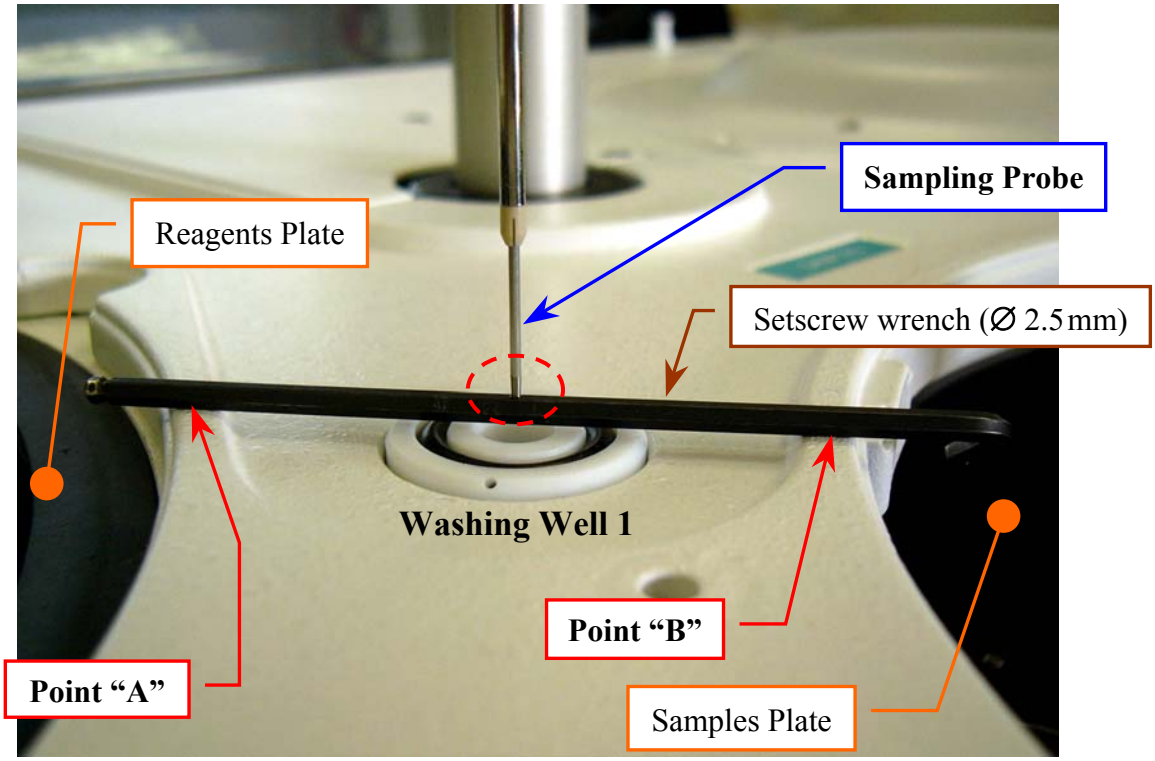


Fig. 4 – Vertical adjustment of the Sampling Probe

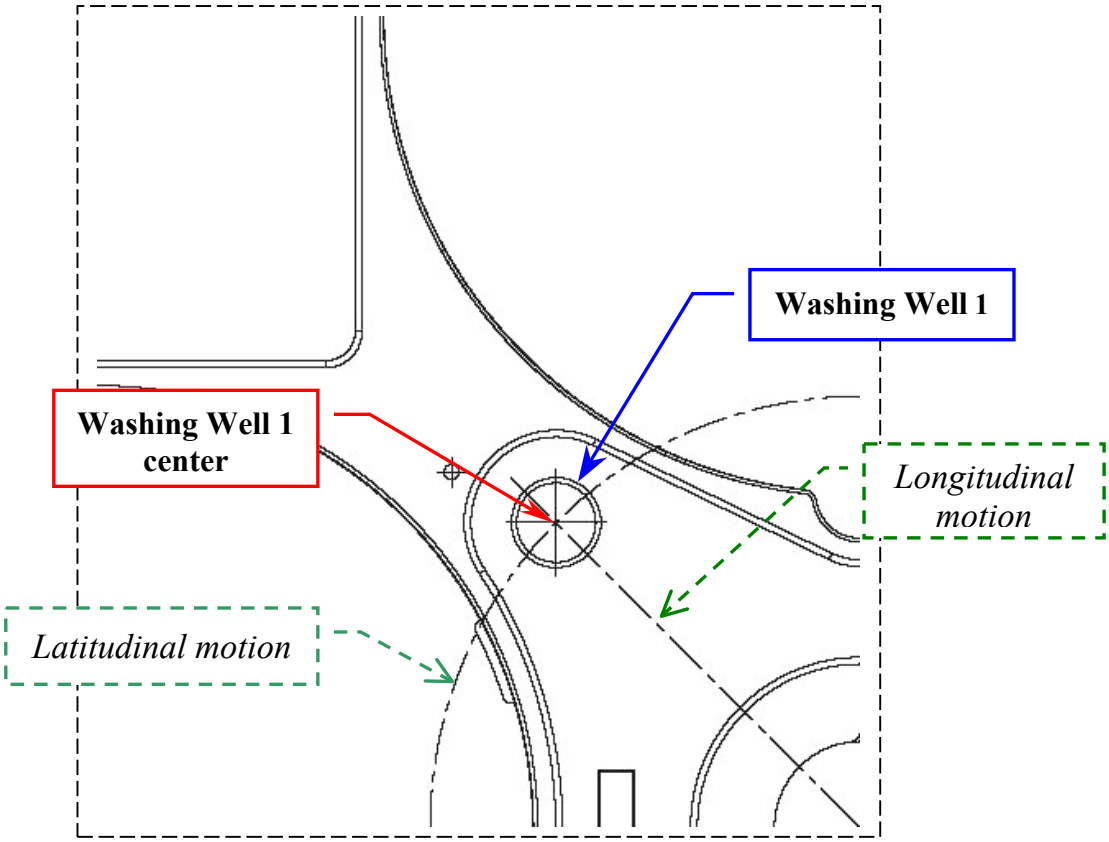


Fig. 5 – Longitudinal and latitudinal motion of the Sampling Probe

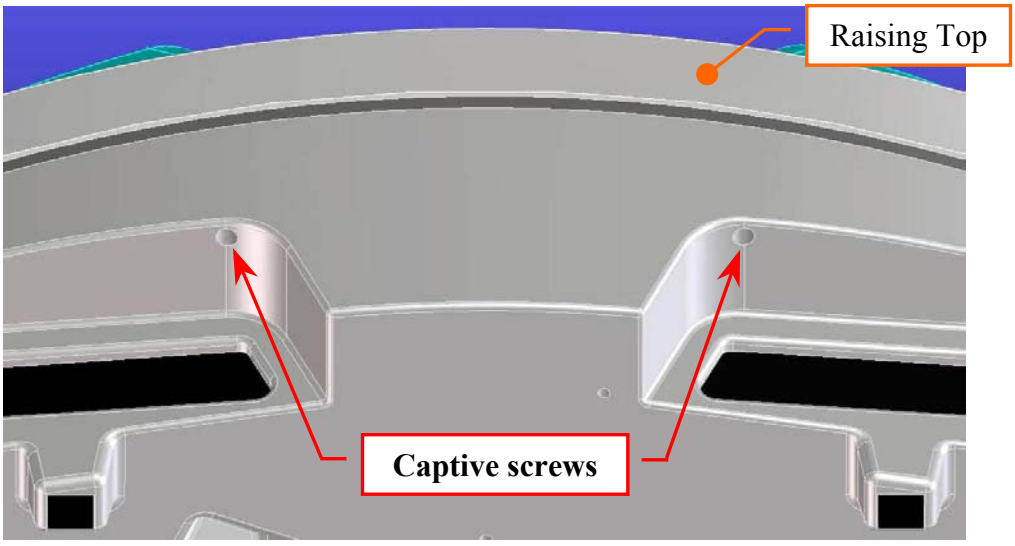


Fig. 6 – Captive screws on the front underside of the instrument

Rif.	Description
1	Instrument cover
2	Raising Top
3	Diluter cover
4	Sampling Arm cover
5	Reagents Plate cover
6	Samples Plate cover
7	Samples Plate safety protection
8	Reactions Plate cover
9	Washing Station cover

Fig. 7 – Covers of the SAT450 instrument

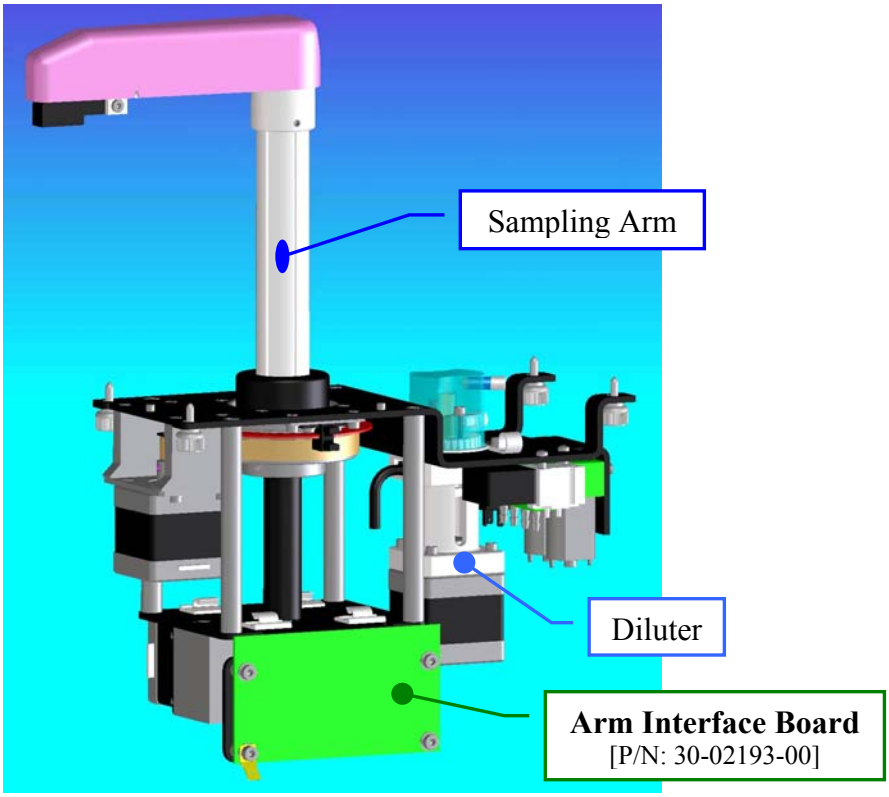


Fig. 8 – Sampling Arm Assy

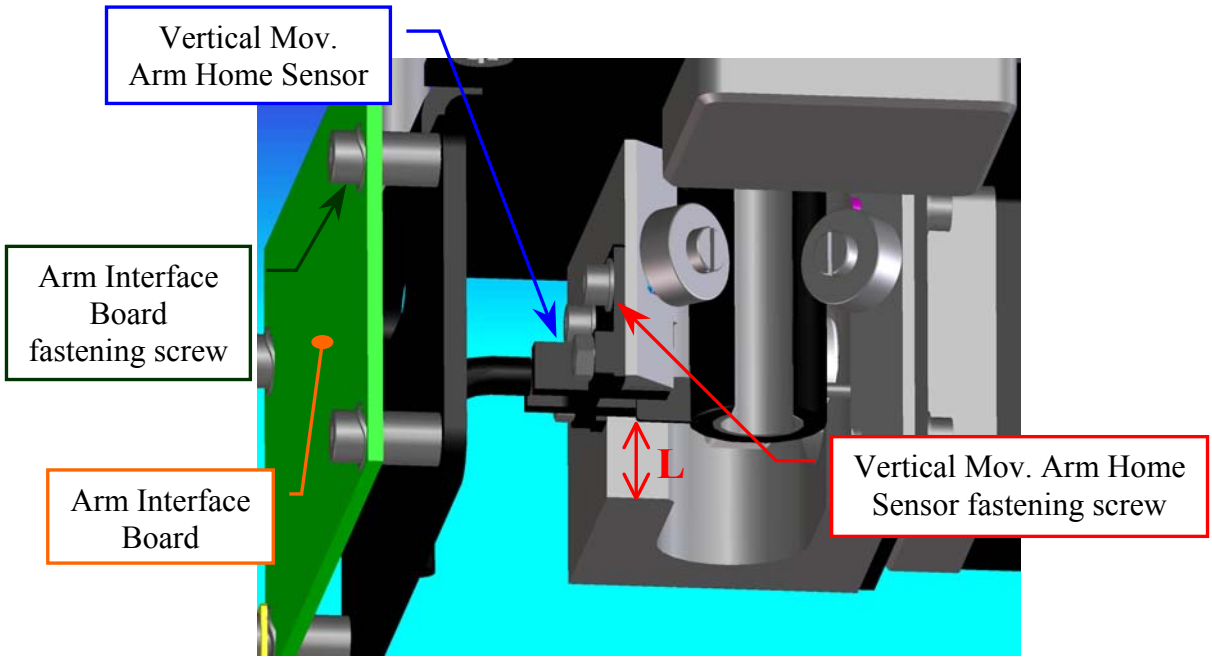


Fig. 9 – Vertical Mov. Arm Home Sensor [P/N: 9-10-0024-00]

5.1.2 Replacement of the Sampling Arm Assy

1. Make sure that the SAT450 instrument is turned off.
2. Remove the Sampling Probe from its housing performing the relative procedure described into the successive Section 6.1.3.
3. Unscrew the two fastening screws of the Diluter cover (**Fig. 7**), remove it from its housing, unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
4. Unplug the J1, J2 and J3 connectors and the ground wire from the Arm Interface Board (compare the scheme SC-30-02193-00).
5. Remove the tube with "16" label text and the tube with "17" label text from the "EV6" electrovalve and remove the tube with "G" label text from the "Y" fitting (compare the scheme SI-16-01873-00), making attention to the spillage of the Probe Rinse solution from the tubes and from the fitting (note: the Probe Rinse solution is NOT a dangerous liquid).
6. Unscrew the four Sampling Arm captive screws (**Fig. 10**) and pull down – moving carefully – the Sampling Arm Assy from its housing.

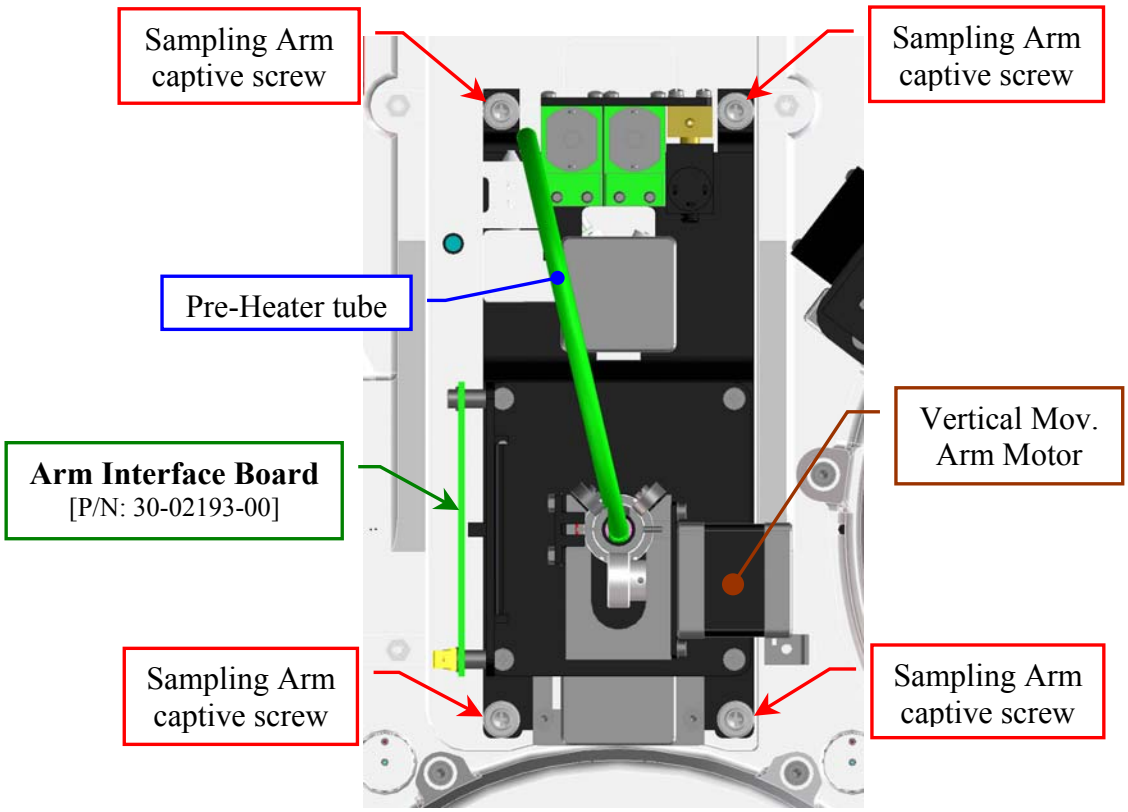


Fig. 10 – Sampling Arm (*bottom view*)

To replace the Sampling Arm Assy (**Fig. 8**) perform the following steps:

7. Repeat the above steps in inverse order: from 6 to 2.
8. Perform the procedure "Alignments and adjustments of the Sampling Probe" described into the previous Section 6.1.1.
9. Select "Diluter" folder in the "Diagnostic" program and perform – with the selection of the "Probe Wash Test" button – at least four successive Probe Wash Test to fill the hydraulic circuit with the liquid.
10. Verify the absence of liquid leakage from the hydraulic circuit.

5.1.3 Replacement of the Sampling Probe

- **Removing of the Sampling Probe**:

1. Turn on the SAT450 system (instrument and computer) and launch the "Diagnostic" program.
2. Select "Miscellaneous" folder and request an Instrument General reset. Wait until the reset instrument procedure has been completed.
3. Turn off the SAT450 instrument and lift up the instrument cover (**Fig. 7**).
4. Remove the Sampling Probe from its housing by unscrewing (clockwise) its ring nut (**Fig. 11**).

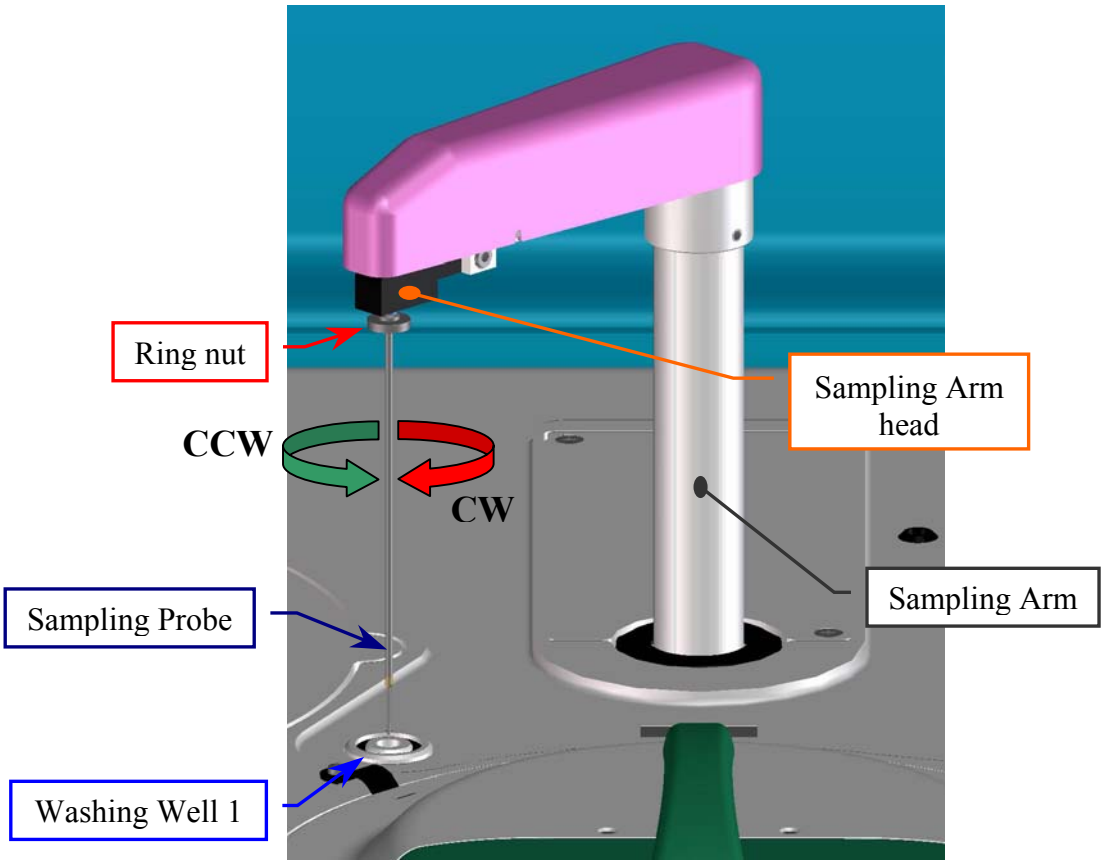


Fig. 11 – Sampling Probe

- **Replacement of the Sampling Probe**:

5. Turn on the SAT450 system (instrument and computer) and launch the "Diagnostic" program.
6. Select "Miscellaneous" folder and request an Instrument General reset. Wait until the reset instrument procedure has been completed.
7. Turn off the SAT450 instrument and lift up the instrument cover (**Fig. 7**).
8. Attach the (straight) Sampling Probe to the Sampling Arm head (**Fig. 11**).
9. Rotate slowly (counter clockwise) the Sampling Probe ring nut in its thread hold until you feel the stop (**Fig. 11**), then screw tight.
10. Perform the procedure "Alignments and adjustments of the Sampling Probe" described into the previous Section 6.1.1.

5.1.4 Replacement of the Horizontal Mov. Arm Motor

1. Remove the Sampling Arm Assy from its housing performing the relative procedure described into the previous Section 6.1.2, from step 1 to step 6.
2. Unplug the J7 connector from the Arm Interface Board (compare the sch. SC-30-02193-00).
3. Unscrew the four fastening screws of the Horizontal Mov. Arm Motor (**Fig. 12**).

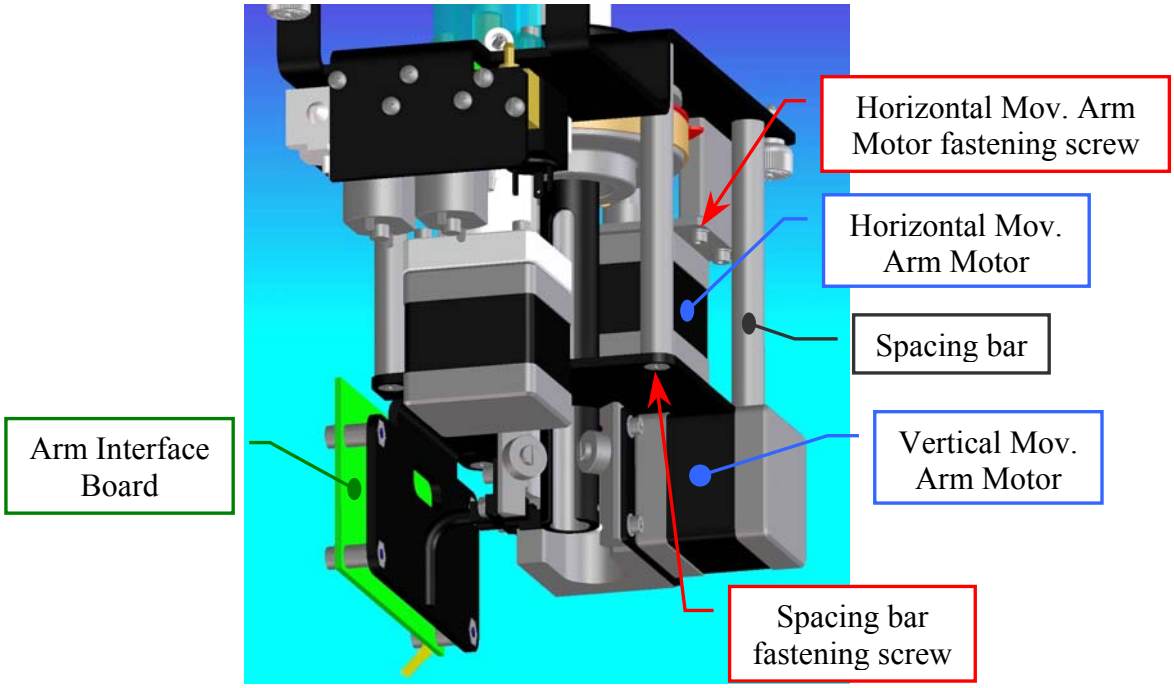


Fig. 12 – Horizontal Mov. Arm Motor fastening screws

4. Remove the belt from the pulley of the Horizontal Mov. Arm Motor and take out it from its housing.
5. Unscrew the four fastening screws of the Horizontal Mov. Arm Motor anchor plate (**Fig. 13**) and take out the anchor plate from the motor.
6. Loosen the two set screws of the pulley clamp and extract the pulley clamp and the pulley (**Fig. 14**) from the motor shaft.

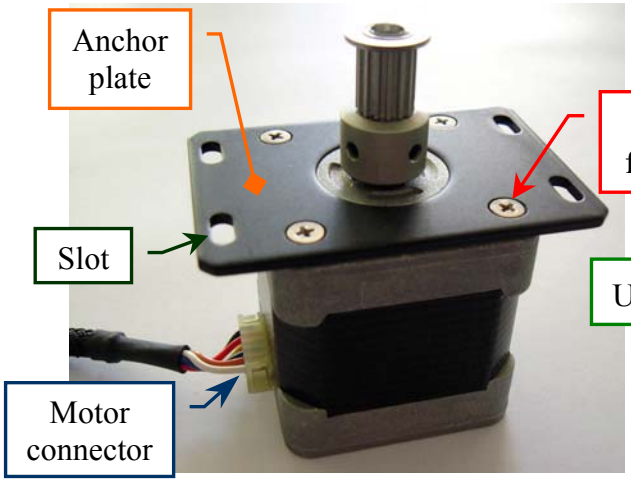


Fig. 13 – Horizontal Mov. Arm Motor anchor plate

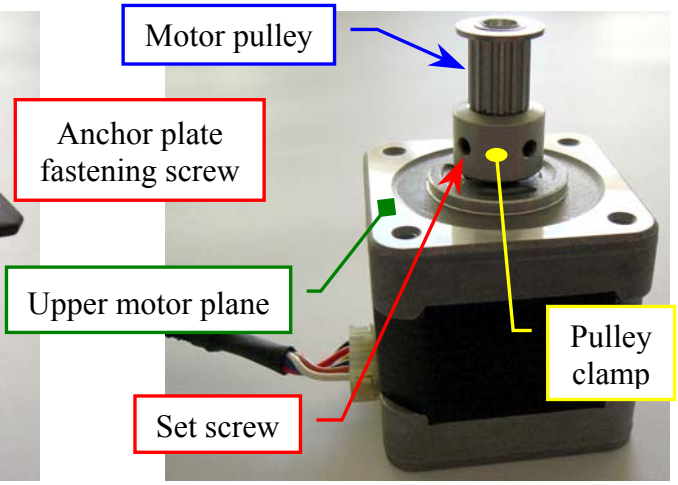


Fig. 14 – Horizontal Mov. Arm Motor [P/N: 10-00399-00]

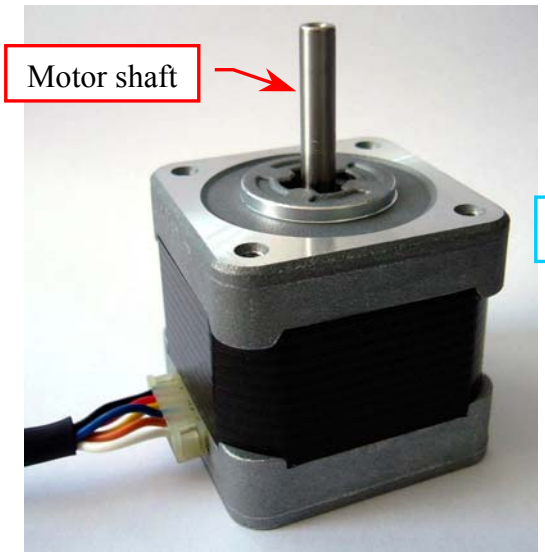


Fig. 15 – Horizontal Mov. Arm Motor
[P/N: 10-00399-00]

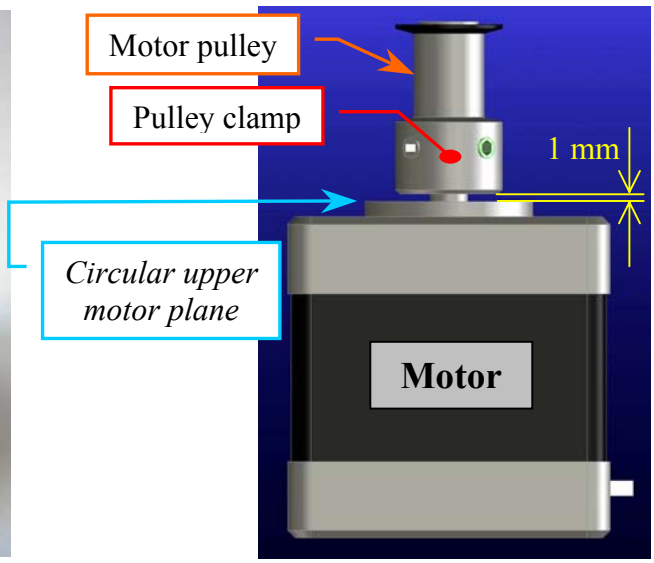


Fig. 16 – Plate Motor (*scheme*)

To replace the new Horizontal Mov. Arm Motor (**Fig. 15**) perform the following steps:

7. Insert the pulley clamp completely on the motor pulley and then insert all two on the motor shaft (**Fig. 14**).
8. Position the motor pulley to **1.00 mm** with respect to circular upper motor plane (**Fig. 16**), then tighten the two pulley clamp set screws (**Fig. 14**).
9. Position the anchor plate on the upper plane of the new Horizontal Mov. Arm Motor (**Fig. 14**) with either anchor plate slots sides on the side of the motor connector (as showed in the **Fig. 13**) and screw its four fastening screws.
10. Repeat the above steps in inverse order: from 4 to 2.
11. Replace the Sampling Arm Assy in its housing performing the relative procedure described into the previous Section 6.1.2, from step 7 to step 10.

5.1.5 Replacement of the Vertical Mov. Arm Motor

1. Remove the Sampling Arm Assy from its housing performing the relative procedure described into the previous Section 6.1.2, from step 1 to step 6.
2. Unplug the J4 connector from the Arm Interface Board (compare the scheme SC-30-02193-00).
3. Unscrew the four fastening screws of the Vertical Mov. Arm Motor (**Fig. 17**) and take out it from its housing.

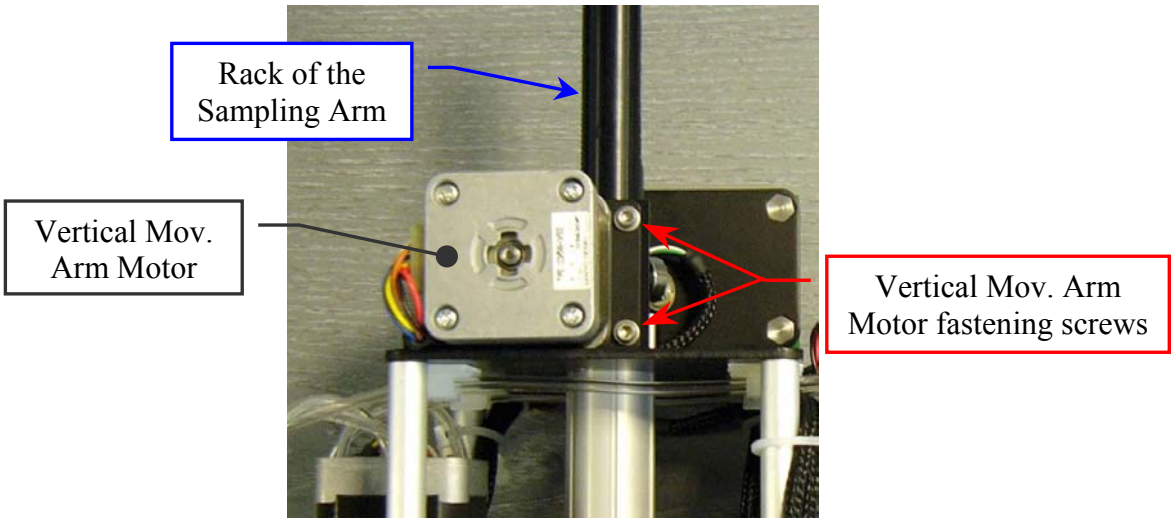


Fig. 17 – Vertical Mov. Arm Motor fastening screws

4. Unscrew the four fastening screws of the Vertical Mov. Arm Motor anchor plate (**Fig. 18**) and take out the anchor plate from the motor.

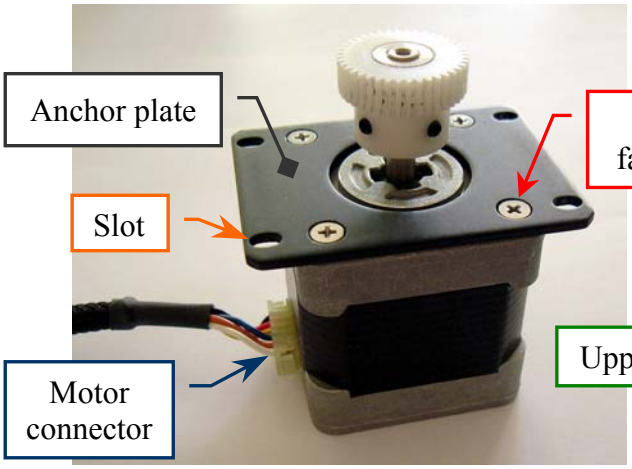


Fig. 18 – Vertical Mov. Arm Motor anchor plate

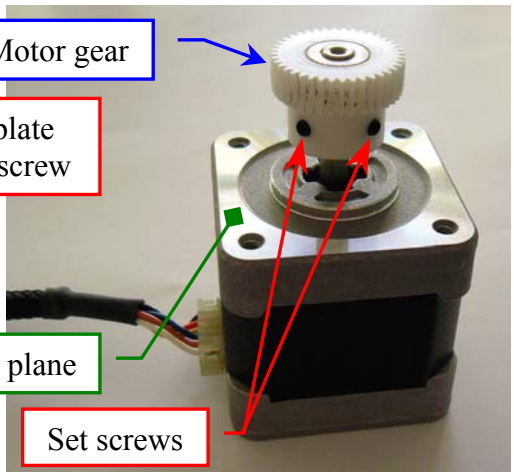


Fig. 19 – Gear of the Vertical Mov. Arm Motor

5. Loosen the two set screws of the motor gear (**Fig. 19**) and extract the gear from the motor shaft.

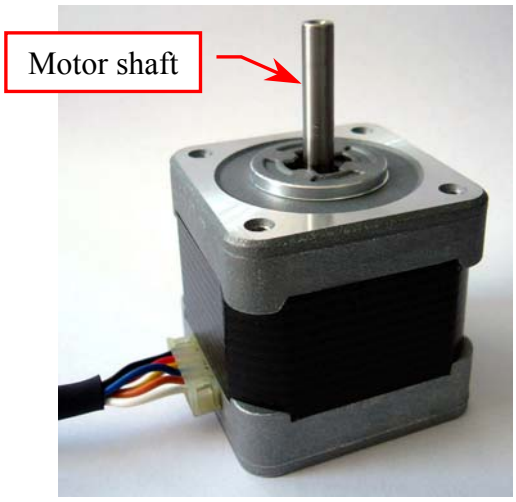


Fig. 20 – Vertical Mov. Arm Motor
[P/N: 10-00399-00]

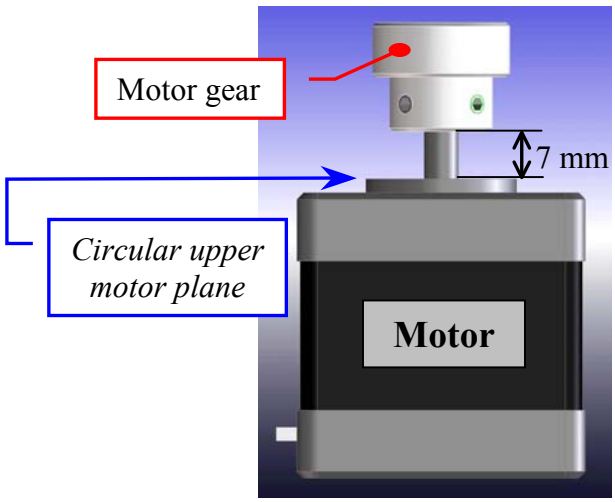


Fig. 21 – Plate Motor (*scheme*)

To replace the new Vertical Mov. Arm Motor (**Fig. 20**) perform the following steps:

6. Insert the gear on the motor shaft, position the gear to **7.00 mm** with respect to circular upper motor plane (**Fig. 21**), then tighten the two set screws of the gear (**Fig. 19**).
7. Position the anchor plate on the upper plane of the new Vertical Mov. Arm Motor (**Fig. 19**) with either anchor plate slots sides on the side of the motor connector (as showed in the **Fig. 18**) and screw its four fastening screws.
8. Replace the Vertical Mov. Arm Motor on its housing of the Sampling Arm Assy (**Fig. 17**).
9. Lean the gear of the Vertical Mov. Arm Motor on the rack of the Sampling Arm in order that the tooths of the gear has a right grip on the rack (**Fig. 22**).

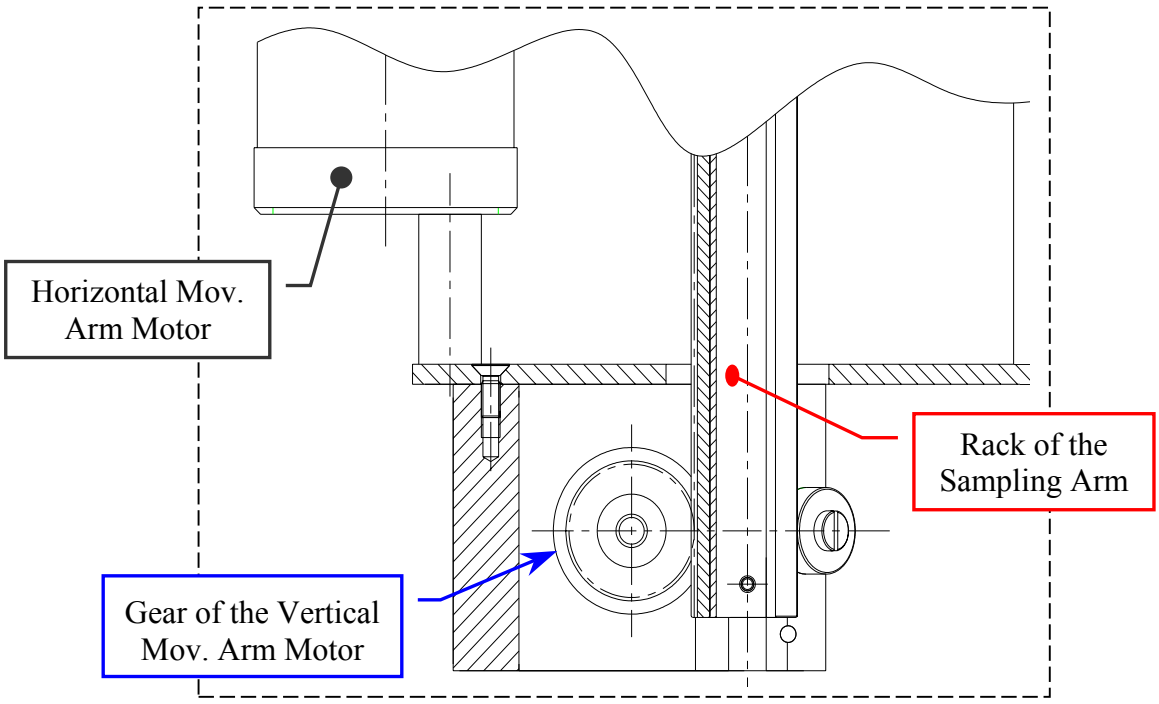


Fig. 22 – Vertical Mov. Arm Motor gear lean on the rack (detail drawing)

10. Screw the four fastening screws of the Vertical Mov. Arm Motor (**Fig. 17**).
11. Plug the J4 connector in the Arm Interface Board (compare the scheme SC-30-02193-00).
12. Replace the Sampling Arm Assy in its housing performing the relative procedure described into the previous Section 6.1.2, from step 7 to step 10.

5.1.6 Replacement of the Horizontal Mov. Arm Home Sensor

1. Remove the Sampling Arm Assy from its housing performing the relative procedure described into the previous Section 6.1.2, from step 1 to step 6.
2. Unplug the J8 connector from the Arm Interface Board (compare the scheme SC-30-02193-00).
3. Unscrew the two fastening screws of the Horizontal Mov. Arm Home Sensor (**Fig. 23**) and take out it from its housing.

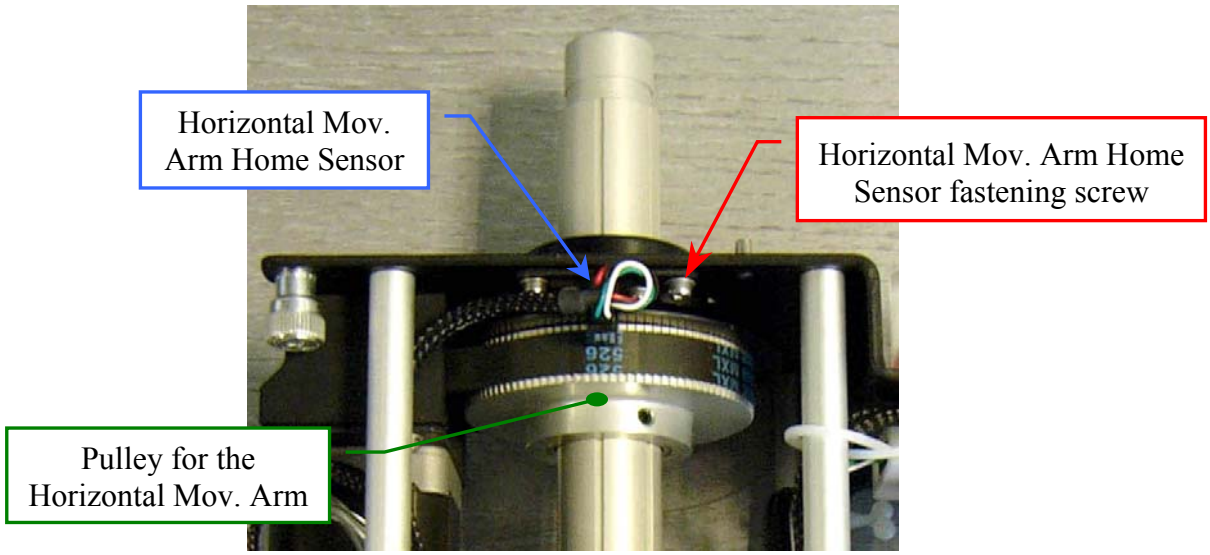


Fig. 23 – Horizontal Mov. Arm Home Sensor fastening screws

4. Unscrew the two keep plate fastening screws of the Horizontal Mov. Arm Home Sensor (**Fig. 24**) and take out the sensor from the keep plate.

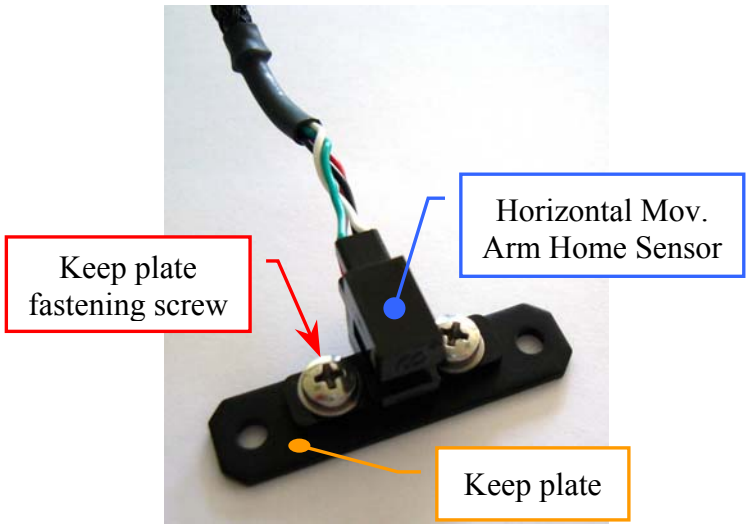


Fig. 24 – Keep plate fastening screws of the Horizontal Mov. Arm Home Sensor

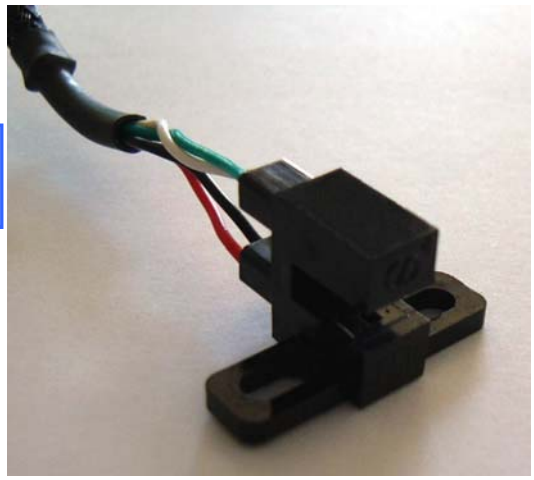


Fig. 25 – Horizontal Mov. Arm Home Sensor [P/N: 9-10-0023-20]

To replace the new Horizontal Mov. Arm Home Sensor (**Fig. 25**) perform the following steps:

5. Position the keep plate below the Horizontal Mov. Arm Home Sensor with the keep plate side proximal to the two central holes from the part of the threads of the sensor (as showed in the **Fig. 24**), center the sensor with respect the keep plate and screw its two fastening screws.
6. Repeat the above steps in inverse order: from 3 to 2.
7. Replace the Sampling Arm Assy in its housing performing the relative procedure described into the previous Section 6.1.2, from step 7 to step 10.

5.1.7 Replacement of the Vertical Mov. Arm Home Sensor

1. Make sure that the SAT450 instrument is turned off.
2. Unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
3. Unplug the J1, J2, J3, J6 connectors and the ground wire from the Arm Interface Board (compare the scheme SC-30-02193-00).
4. Unscrew the four fastening screws of the Arm Interface Board (**Fig. 9**) and push upward it.
5. Introduce the setscrew wrench in the eyelet of the Arm Interface Board mechanical support (**Fig. 26**), unscrew the two fastening screws of the Vertical Mov. Arm Home Sensor (**Fig. 27**) and take out it from its housing.
6. Unscrew the two keep plate fastening screws of the Vertical Mov. Arm Home Sensor (**Fig. 28**) and take out the sensor from the keep plate.

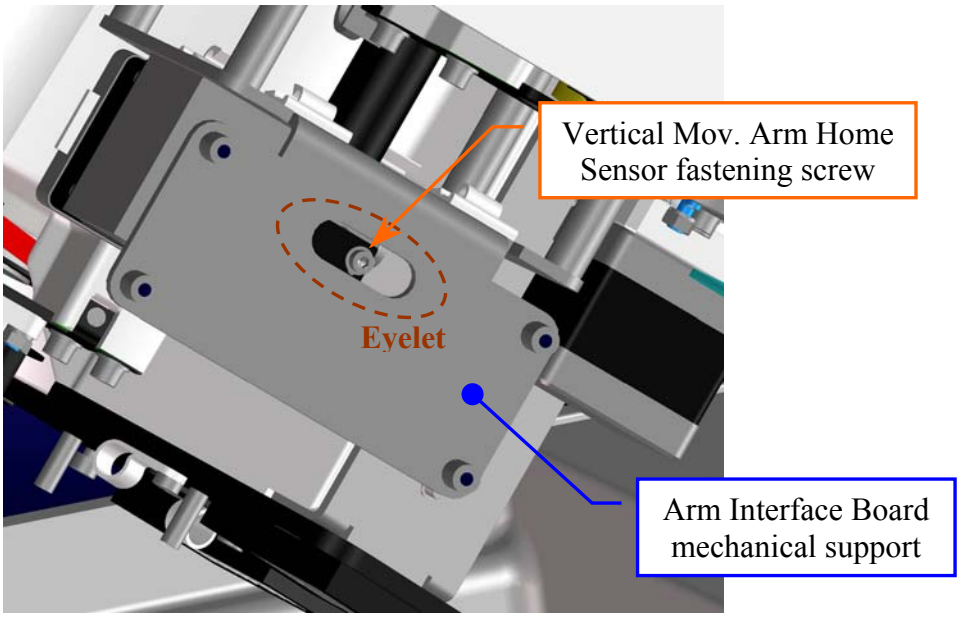


Fig. 26 – Arm Interface Board mechanical support

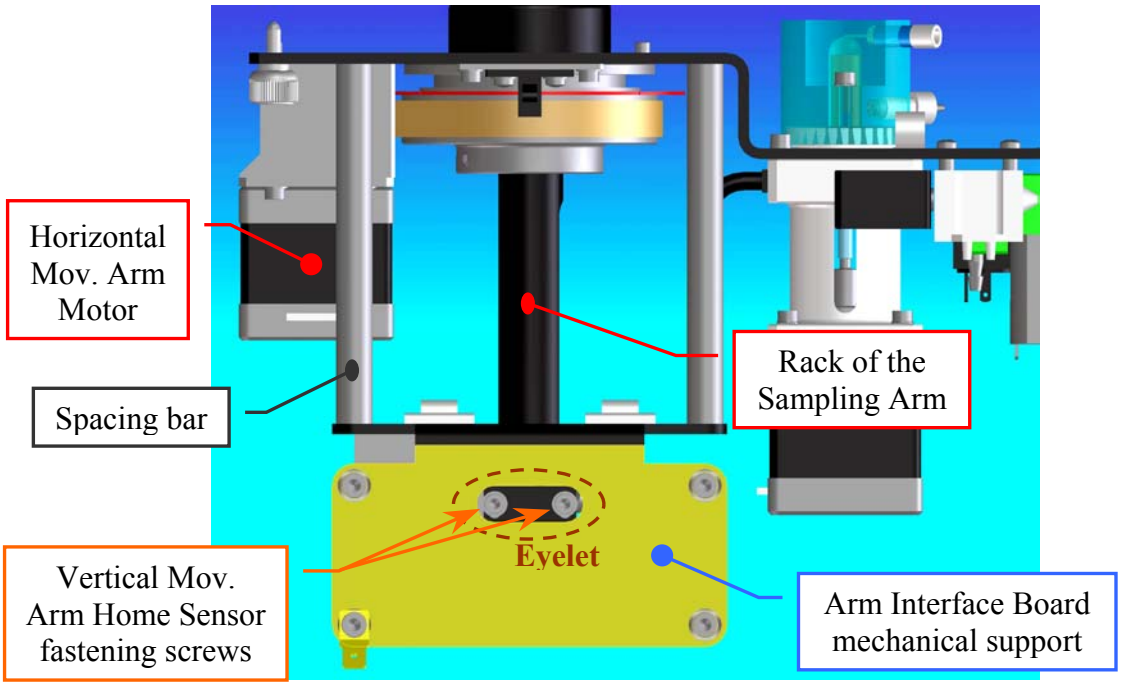


Fig. 27 – Vertical Mov. Arm Home Sensor fastening screws

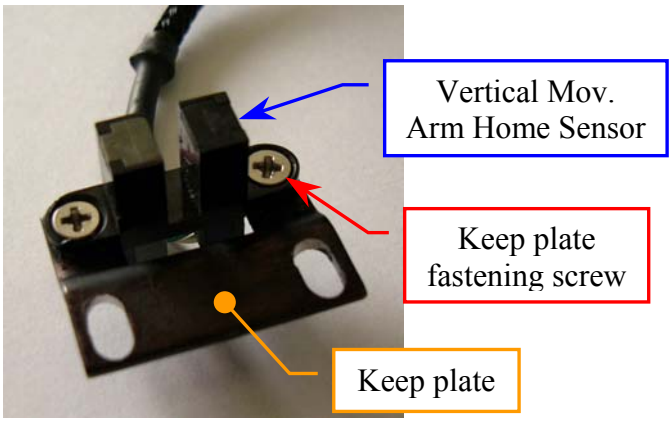


Fig. 28 – Keep plate fastening screws of the Vertical Mov. Arm Home Sensor

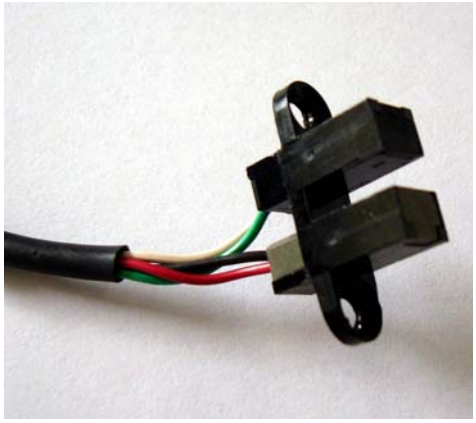


Fig. 29 – Vertical Mov. Arm Home Sensor [P/N: 9-10-0024-00]

To replace the new Vertical Mov. Arm Home Sensor (**Fig. 29**) perform the following steps:

7. Position the keep plate below the Vertical Mov. Arm Home Sensor as showed in the **Fig. 28**, center the sensor with respect to the keep plate and screw its two fastening screws.
8. Repeat the above steps in inverse order: from 5 to 2.
9. Perform the procedure "Alignments and adjustments of the Sampling Probe" described into the previous Section 6.1.1.

5.1.8 Replacement of the Horizontal Mov. Arm Belt

1. Remove the Sampling Arm Assy from its housing performing the relative procedure described into the previous Section 6.1.2, from step 1 to step 6.
2. Unscrew the four fastening screws of the Vertical Mov. Arm Motor (**Fig. 30**) and take out it from its housing.
3. Loosen the four fastening screws of the Horizontal Mov. Arm Motor (**Fig. 30**).
4. Let flow the Horizontal Mov. Arm Motor in the direction of the Horizontal Mov. Arm Pulley (**Fig. 30**) and remove the belt from the Horizontal Mov. Arm Motor Pulley.
5. Pull out the home sensor small flag from the Vertical Mov. Arm Home Sensor (**Fig. 30**), rotate the rack of the Sampling Arm and push it through the aperture of the Arm Interface Board mechanical support (**Fig. 30**).
6. Take out the Horizontal Mov. Arm Belt from the rack of the Sampling Arm.

To replace the new Horizontal Mov. Arm Belt (**Fig. 31**) perform the following steps:

7. Wrap the new belt around the Horizontal Mov. Arm Pulley and around the Horizontal Mov. Arm Motor Pulley, let flow the motor in the opposite direction of the Horizontal Mov. Arm Pulley, then tighten the four fastening screws of the motor.
8. Insert the rack of the Sampling Arm in the aperture of the Arm Interface Board mechanical support (**Fig. 30**), rotate the rack and pull the home sensor small flag in the Vertical Mov. Arm Home Sensor (**Fig. 30**).

9. Replace the Vertical Mov. Arm Motor in its housing performing the relative procedure described into the previous Section 6.1.5, from step 8 to step 10.
10. Turn the Horizontal Mov. Arm Pulley and make sure that the new belt thoots are correctly inserted on the Horizontal Mov. Arm Pulley and on the Horizontal Mov. Arm Motor Pulley.
11. Replace the Sampling Arm Assy in its housing performing the relative procedure described into the previous Section 6.1.2, from step 7 to step 10.

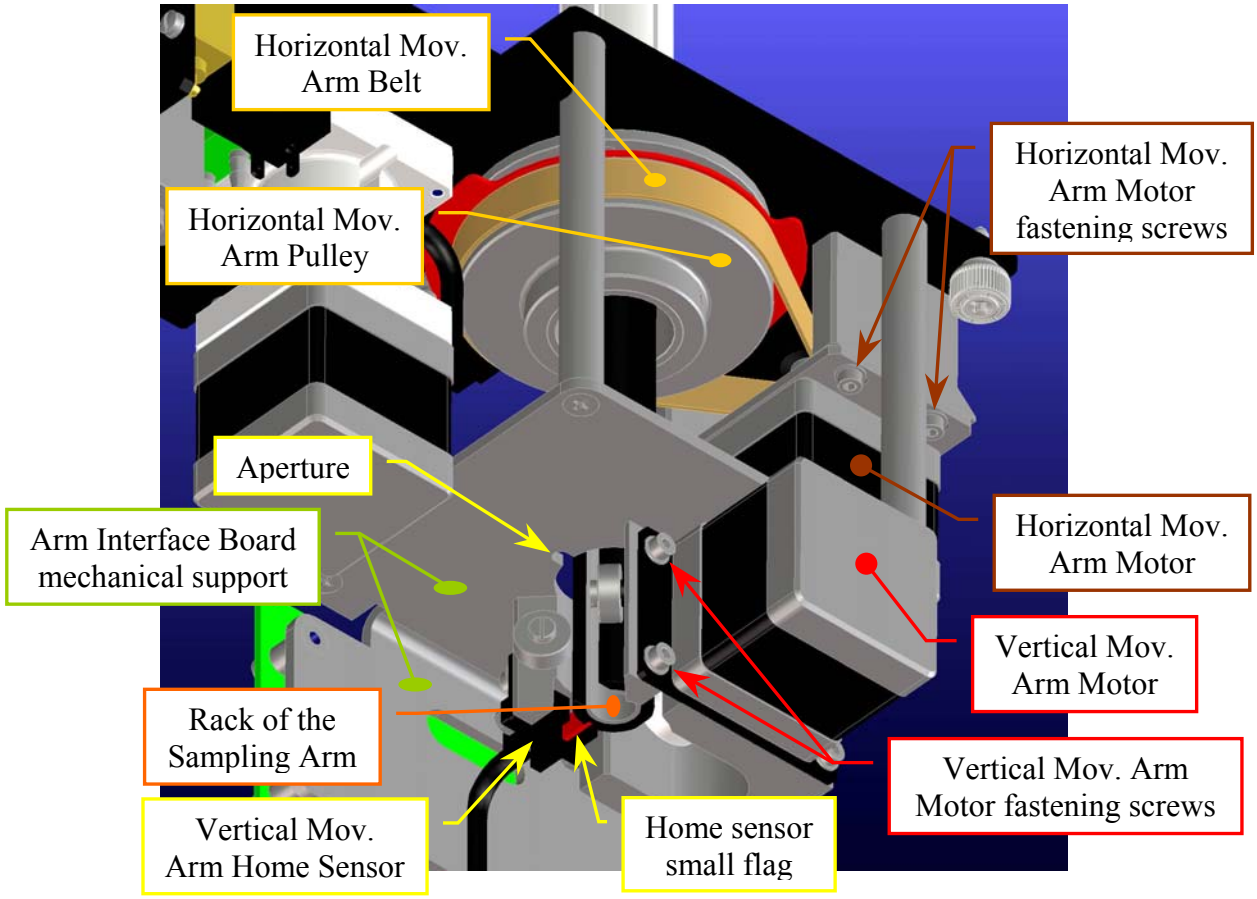


Fig. 30 – Horizontal Mov. Arm Belt and rack of the Sampling Arm

Fig. 31 – Horizontal Mov. Arm Belt [P/N: 86-01514-36]

5.2 DILUTER

5.2.1 Replacement of the Diluter Assy

1. Remove the Sampling Arm Assy from its housing performing the relative procedure described into the previous Section 6.1.2, from step 1 to step 6.
2. Unscrew the screw of the tube holder (**Fig. 32**) and remove the Pre-heater tube from it.
3. Unscrew the "Pre-heater" fitting and the "EV1" fitting from the head of the Diluter (**Fig. 32**), making attention to the spillage of liquid from the tubes.
4. Unplug the J9 and J10 connectors from the Arm Interface Board (compare the scheme SC-30-02193-00).
5. Unscrew the other three fastening screws of the Diluter (**Fig. 32**) and take out it from its housing on the Sampling Arm Assy.

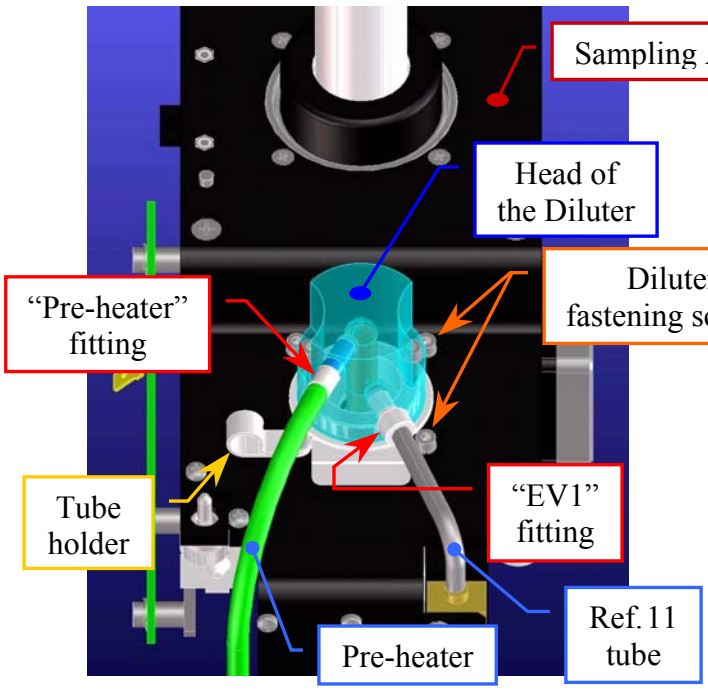


Fig. 32 – Diluter fastening screws

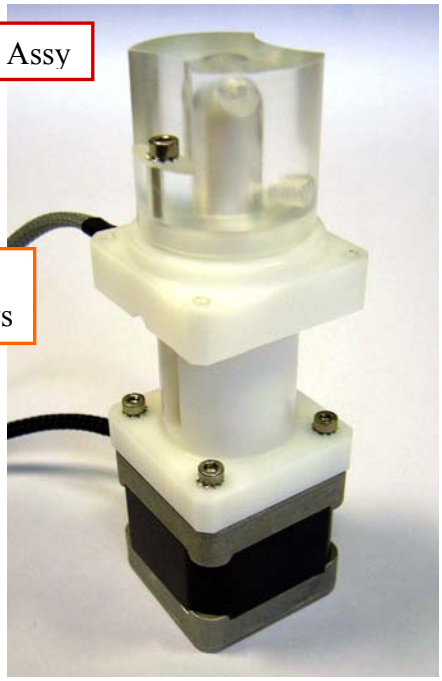


Fig. 33 – Diluter Assy [P/N: 10-00496-02]

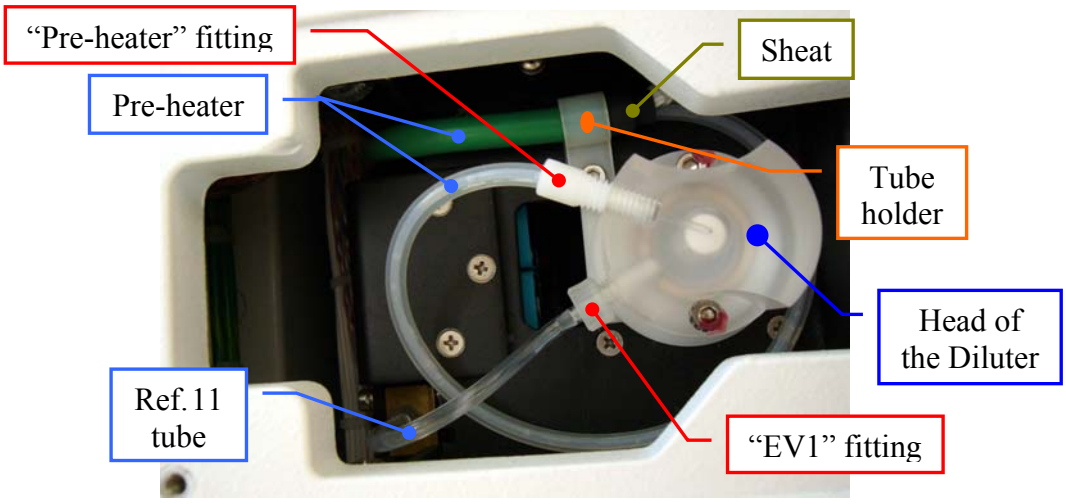


Fig. 34 – Head of the Diluter

To replace the new Diluter Assy (**Fig. 33**) perform the following steps:

6. Repeat the above steps in inverse order: from 5 to 4.
7. Replace the Pre-heater tube around the head of the Diluter as showed in the **Fig. 34**, push its piece of the sheat in the tube holder and screw the tube holder screw.
8. Screw the "Pre-heater" fitting and the "EV1" fitting on the head of the Diluter (**Fig. 34**).
9. Replace the Sampling Arm Assy in its housing performing the relative procedure described into the previous Section 6.1.2, from step 7 to step 10.
10. Perform the "Backlash Procedure" described into the previous Section 5.9.2.

5.2.2 Replacement of the Diluter Home Sensor

1. Remove the Diluter Assy performing the relative procedure described into the previous Section 6.2.1, from step 1 to step 5.
2. Unscrew the two fastening screws of the Diluter Home Sensor (**Fig. 35**) and take out it from its housing in the Diluter.

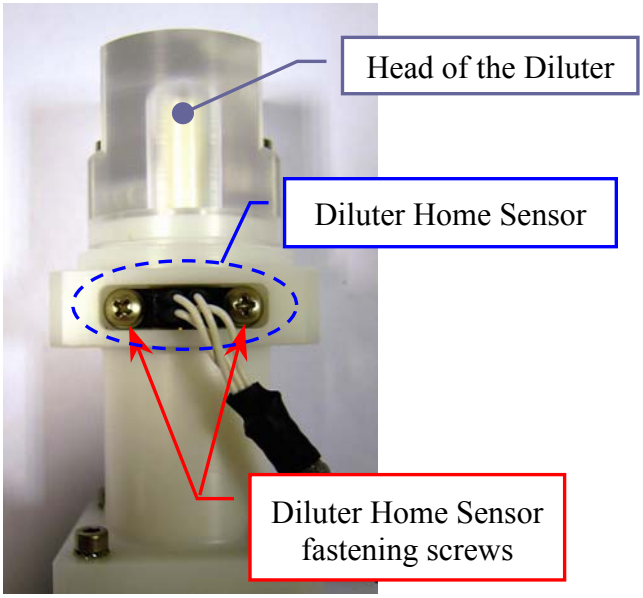


Fig. 35 – Diluter Home Sensor fastening screws

Fig. 36 – Diluter Home Sensor [P/N: 9-10-0024-00]

To replace the new Diluter Home Sensor (**Fig. 36**) perform the following steps:

3. Replace the home sensor in its housing in the Diluter as showed in the **Fig. 35** and screw its two fastening screws (**Fig. 35**).
4. Replace the Diluter Assy performing the relative procedure described into the previous Section 6.2.1, from step 6 to step 9.

5.2.3 Replacement of the Diluter Micropump (P1)

1. Remove the Sampling Arm Assy from its housing performing the relative procedure described into the previous Section 6.1.2, from step 1 to step 6.
2. Unplug the J13 connector from the Arm Interface Board (compare the sch. SC-30-02193-00).
3. Remove the tubes with Ref. 5 and 31 from the "P1" Diluter Micropump (compare the scheme SI-16-01873-00), making attention to the spillage of the Probe Rinse solution from the tubes (note: the Probe Rinse solution is NOT a dangerous liquid).
4. Unscrew the two fastening screws of the "P1" Diluter Micropump (**Fig. 37**) and take out it from the Diluter mechanical support.

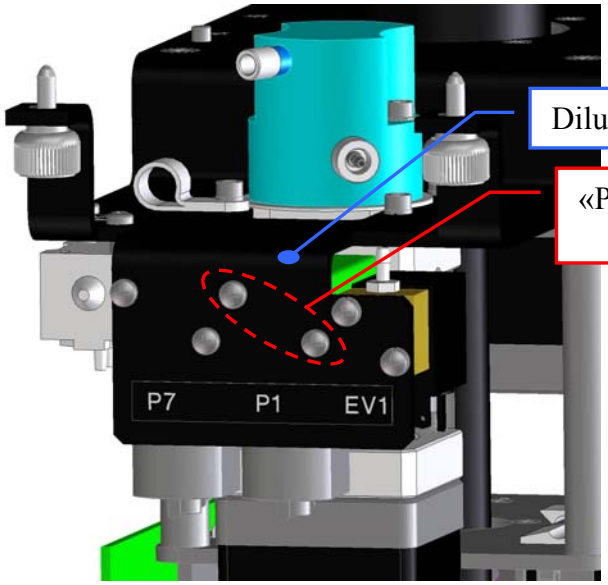


Fig. 37 – « P1 » Diluter Micropump fastening screws

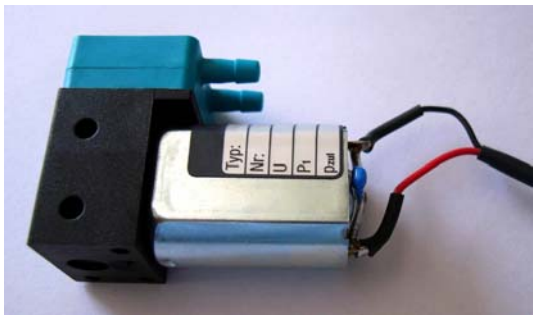


Fig. 38 – « P1 » Diluter Micropump [P/N: 05-01710-40]

To replace the new "P1" Diluter Micropump (**Fig. 38**) perform the following steps:

5. Compare the scheme MA-15-02339-00 and repeat the above steps in inverse order: from 4 to 2.
6. Replace the Sampling Arm Assy in its housing performing the relative procedure described into the previous Section 6.1.2, from step 7 to step 10.

5.2.4 Replacement of the Arm Washing Well Micropump (P7)

1. Remove the Sampling Arm Assy from its housing performing the relative procedure described into the previous Section 6.1.2, from step 1 to step 6.
2. Unplug the J11 connector from the Arm Interface Board (compare the sch. SC-30-02193-00).
3. Remove the tubes with Ref. 5 and 31 from the "P7" Arm Washing Well Micropump (compare the scheme SI-16-01873-00), making attention to the spillage of the Probe Rinse solution from the tubes (note: the Probe Rinse solution is NOT a dangerous liquid).
4. Unscrew the two fastening screws of the "P7" Arm Washing Well Micropump (**Fig. 39**) and take out it from the Diluter mechanical support.

To replace the new "P7" Arm Washing Well Micropump (**Fig. 40**) perform the following steps:

5. Compare the scheme MA-15-02339-00 and repeat the above steps in inverse order: from 4 to 2.

6. Replace the Sampling Arm Assy in its housing performing the relative procedure described into the previous Section 6.1.2, from step 7 to step 10.

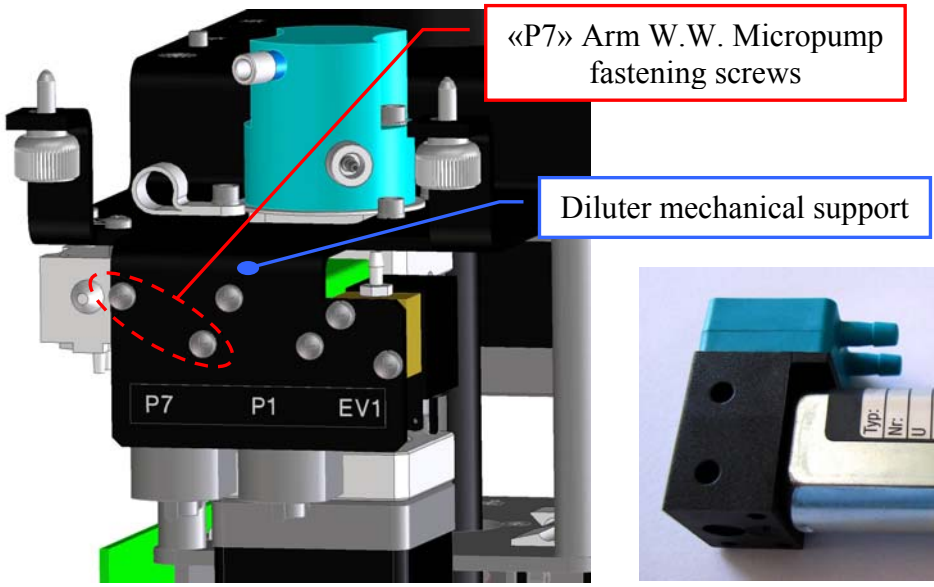


Fig. 39 – « P7 » Arm Washing Well Micropump fastening screws

Fig. 40 – « P7 » Arm W. Well Micropump [P/N: 05-02685-35]

5.2.5 Replacement of the Diluter Electrovalve (EV1)

1. Remove the Sampling Arm Assy from its housing performing the relative procedure described into the previous Section 6.1.2, from step 1 to step 6.
2. Unplug the J12 connector from the Arm Interface Board (compare the sch. SC-30-02193-00).
3. Remove the tubes with Ref. 11 and 13 from the "EV1" Diluter Electrovalve (compare the scheme SI-16-01873-00), making attention to the spillage of the Probe Rinse solution from the tubes (note: the Probe Rinse solution is NOT a dangerous liquid).
4. Unscrew the two fastening screws of the "EV1" Diluter Electrovalve (**Fig. 41**) and take out it from the Diluter mechanical support.

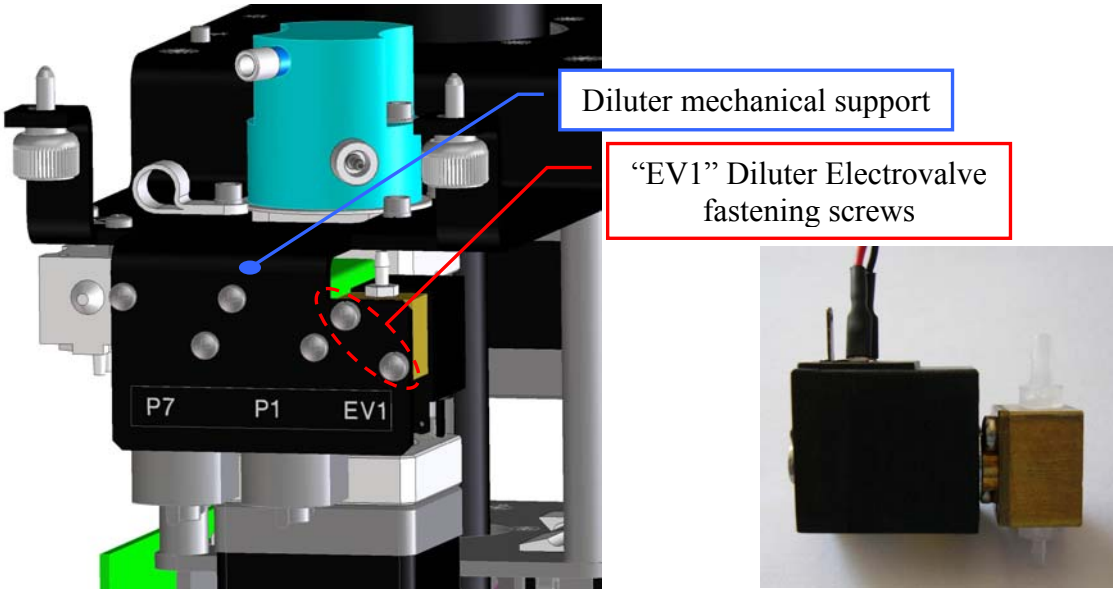


Fig. 41 – "EV1" Diluter Electrovalve fastening screws

Fig. 42 – "EV1" Diluter Electrovalve [P/N: 05-00700-48]

To replace the new "EV1" Diluter Electrovalve (**Fig. 42**) perform the following steps:

5. Compare the scheme MA-15-02339-00 and repeat the above steps in inverse order: from 4 to 2.
6. Replace the Sampling Arm Assy in its housing performing the relative procedure described into the previous Section 6.1.2, from step 7 to step 10.

5.2.6 Replacement of the Arm Washing Well Electrovalve (EV6)

1. Remove the Sampling Arm Assy from its housing performing the relative procedure described into the previous Section 6.1.2, from step 1 to step 6.
2. Unplug the J14 connector from the Arm Interface Board (compare the sch. SC-30-02193-00).
3. Remove the tube with Ref. 32, the tube with "16" label text and the tube with "17" label text from the "EV6" Arm Washing Well Electrovalve (compare the scheme SI-16-01873-00), making attention to the spillage of the Probe Rinse solution from the tubes (note: the Probe Rinse solution is NOT a dangerous liquid).
4. Unscrew the two fastening screws of the "EV6" Arm Washing Well Electrovalve (**Fig. 43**) and take out it from the Diluter mechanical support.

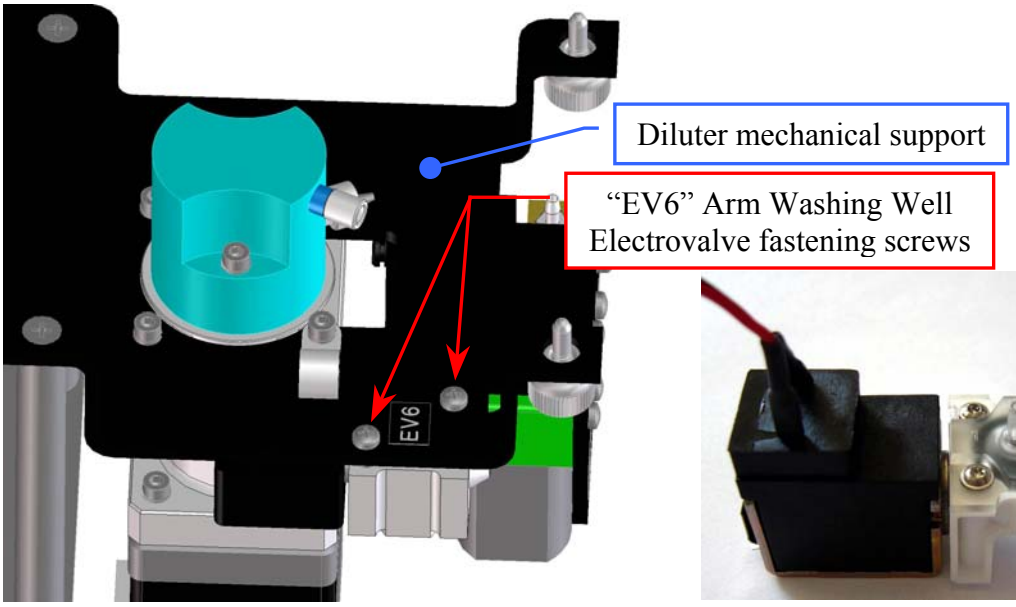


Fig. 43 – "EV6" Arm Washing Well Electrovalve fastening screws

Fig. 44 – "EV6" Arm W. Well Electrovalve [P/N: 05-02630-25]

To replace the new "EV6" Arm Washing Well Electrovalve (**Fig. 44**) perform the following steps:

5. Compare the scheme MA-15-02339-00 and repeat the above steps in inverse order: from 4 to 2.
6. Replace the Sampling Arm Assy in its housing performing the relative procedure described into the previous Section 6.1.2, from step 7 to step 10.

5.3 PRE-HEATER

5.3.1 Replacement of the Pre-Heater Assy

1. Remove the Sampling Probe from its housing performing the relative procedure described into the previous Section 6.1.3.
2. Remove the Sampling Arm cover (**Fig. 7**).
3. Unscrew the Probe adjustment screw places on the Sampling Arm head (**Fig. 3**).
4. Unplug the J1 and J2 connectors of the Pre-Heater from the Level Sensor Board (compare the scheme SC-30-02193-00 and the **Fig. 45**).

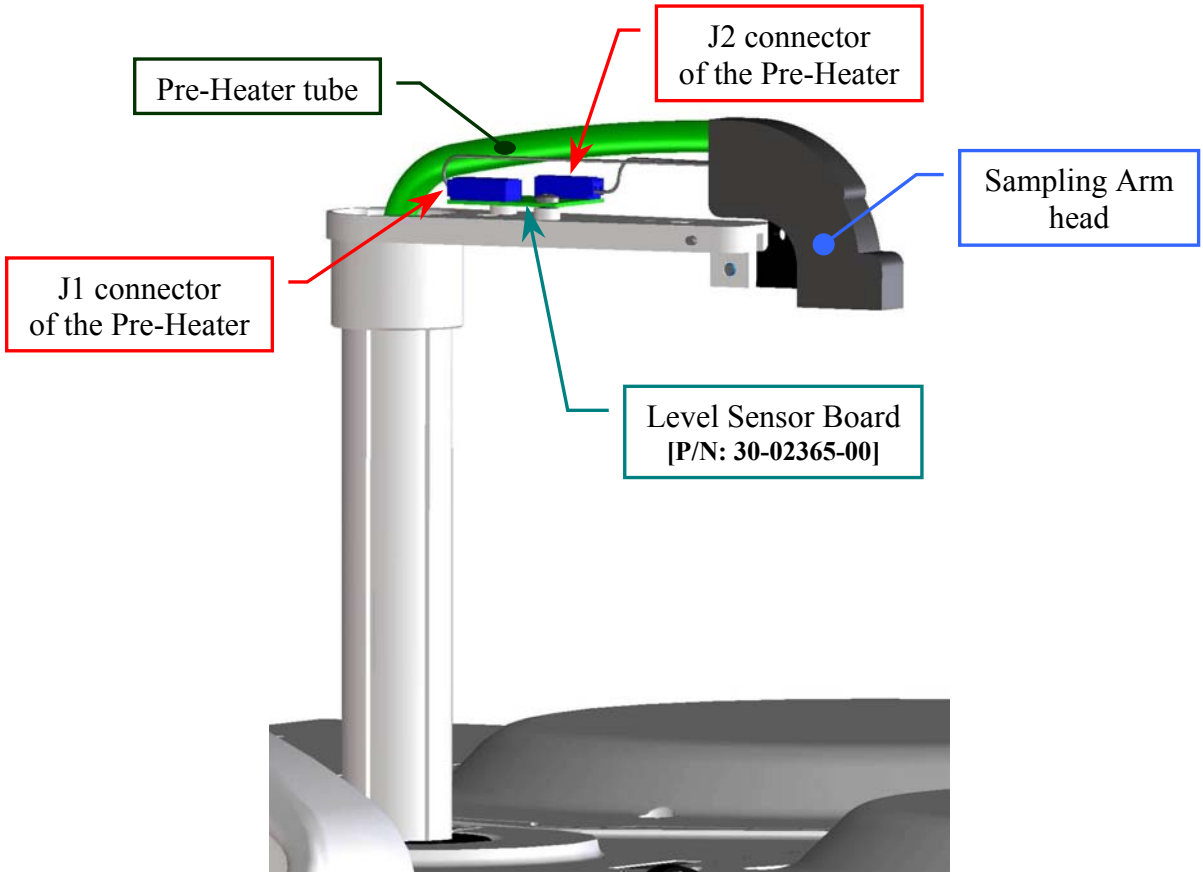


Fig. 45 – Head of the Sampling Arm

5. Unscrew the two fastening screws of the Diluter cover (**Fig. 7**) and remove it from its housing.
6. Unscrew the tube holder screw (**Fig. 32**) and remove the Pre-Heater tube from it.
7. Unscrew the "Pre-Heater" fitting from the head of the Diluter (**Fig. 32**) – making attention to the spillage of liquid from the tube – and move inside the instrument the relative part of the Pre-Heater tube.
8. Unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
9. Unplug the J3 connector of the Pre-Heater from the J15 connector of the Arm Interface Board (compare the scheme SC-30-02193-00 and the **Fig. 46**).
10. Take out the seven wires of the Pre-Heater (read the relative note of the **Fig. 51**) from the J3 connector (**Fig. 47**) and remove it.

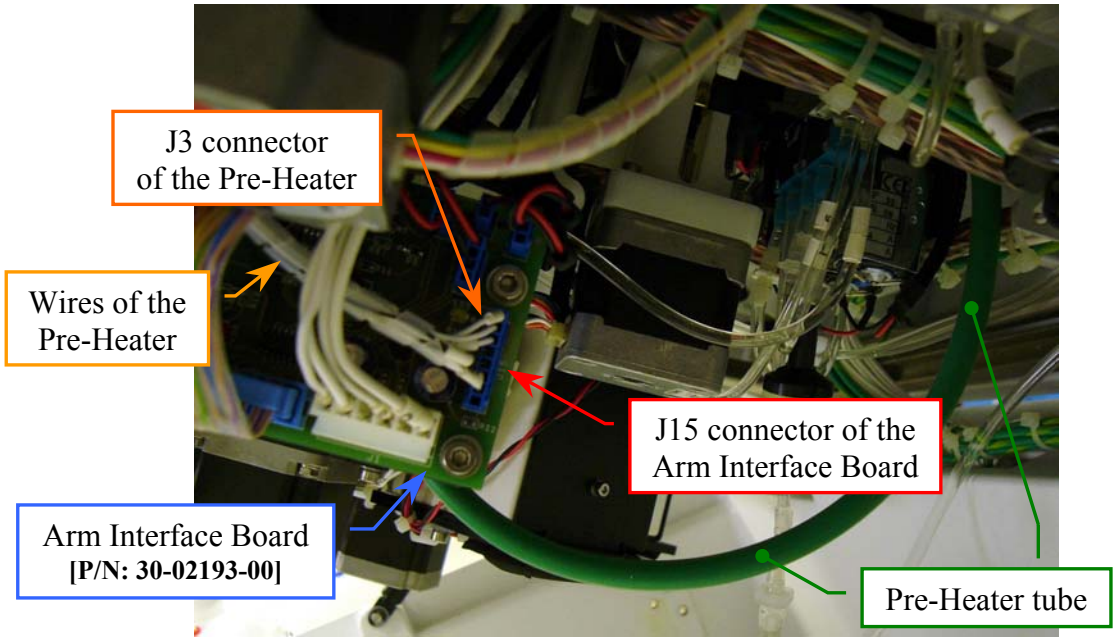


Fig. 46 – J15 connector of the Arm Interface Board

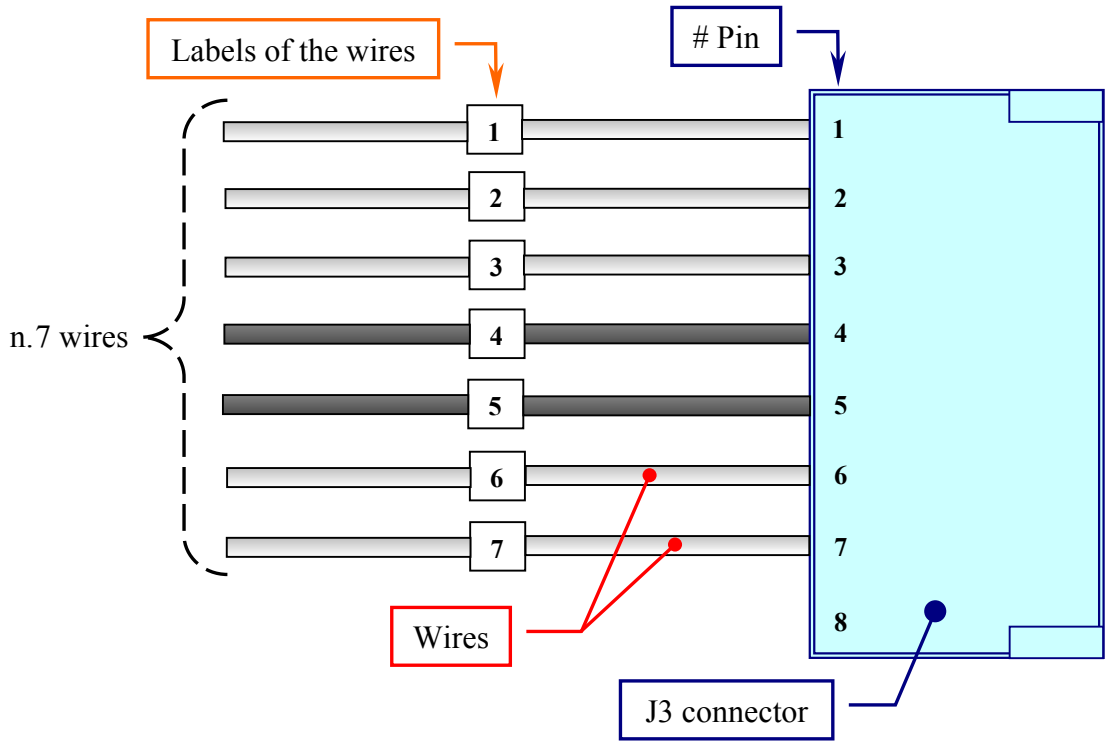
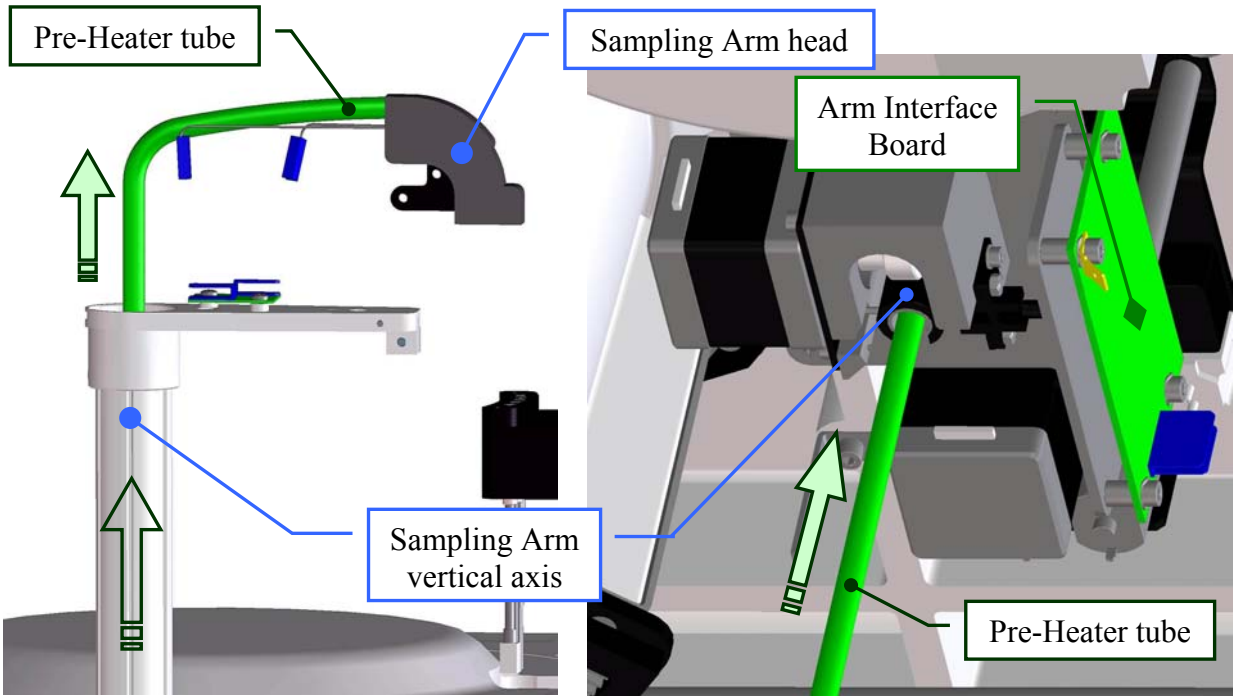


Fig. 47 – Connection scheme of the J3 connector of the Pre-Heater

11. Pull the Pre-Heater (tube and wires) up along the interior side of the Sampling Arm vertical axis (**Fig. 48(a)** and **Fig. 48(b)**) until it is completely outside of the Sampling Arm.



(a) – *Outside of the instrument* **(b) – *Inside of the instrument***

Fig. 48 [(a), (b)] – Extraction of the Pre-Heater from the Sampling Arm

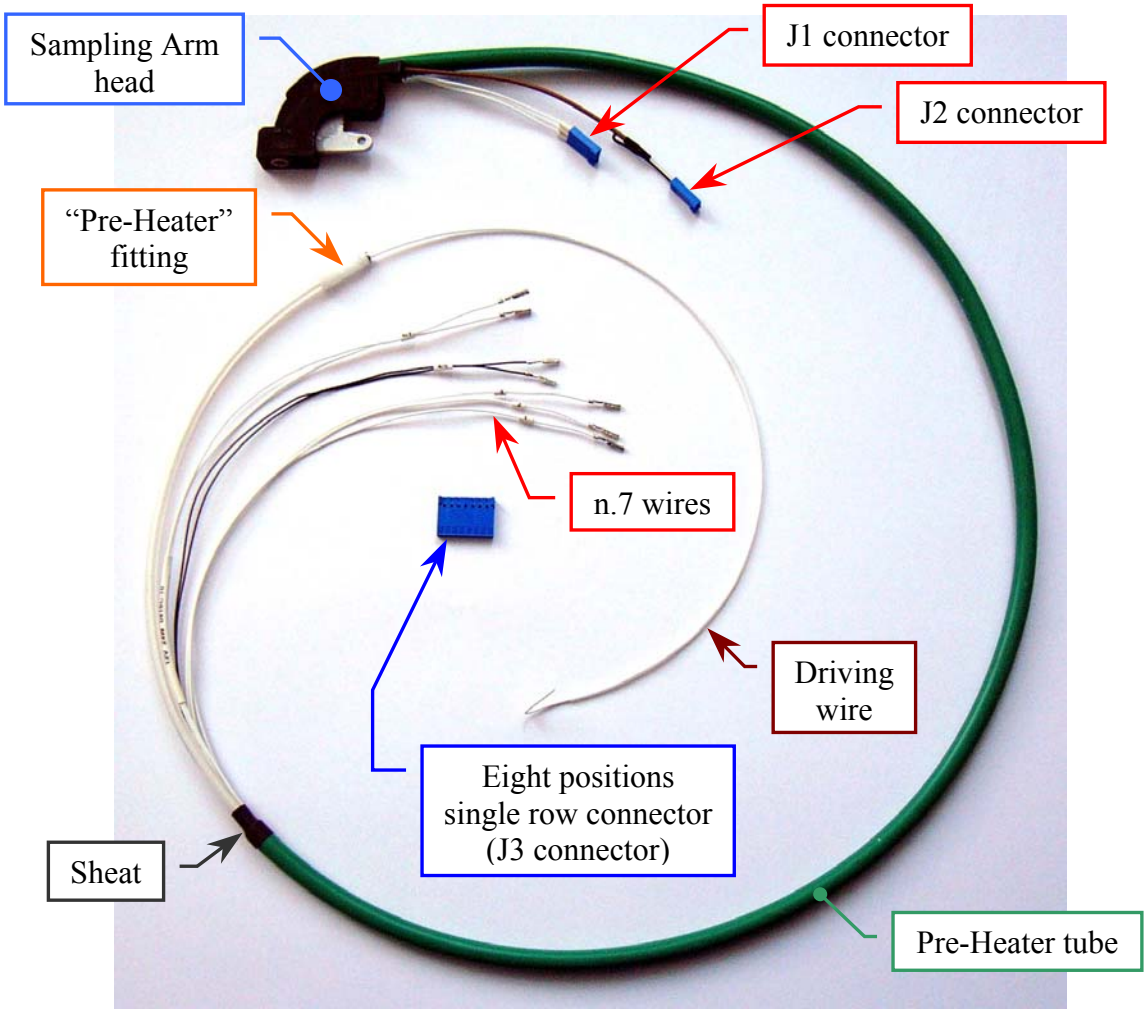
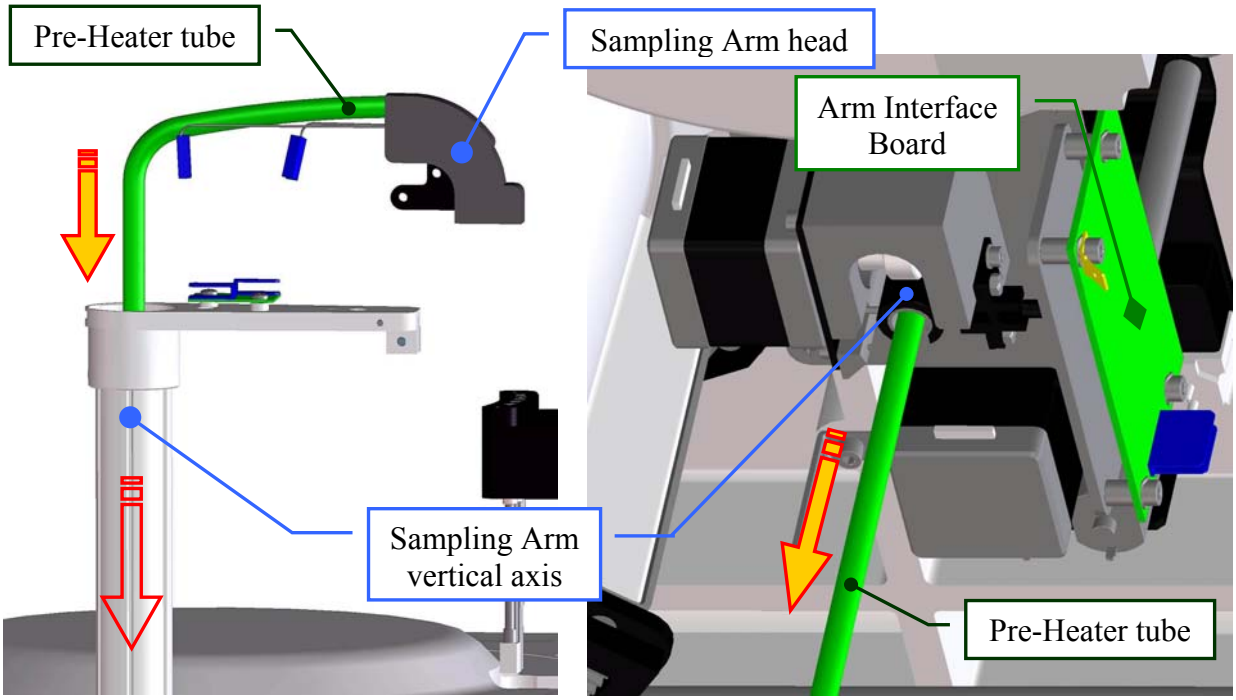


Fig. 49 – Pre-Heater Assy [P/N: 10-02335-00]



(a) – *Outside of the instrument* **(b) – *Inside of the instrument***

Fig. 50 [(a), (b)] – Replacement of the Pre-Heater in the Sampling Arm

To replace the new Pre-Heater Assy (**Fig. 49**) perform the following steps:

12. Pull the Pre-Heater (tube and wires) in the interior side of the Sampling Arm vertical axis (as showed in **Fig. 50(a)** and in **Fig. 50(b)**) until you reach the placement showed in **Fig. 45**.
13. Screw the Probe adjustment screw places on the Sampling Arm head (**Fig. 3**).
14. Plug the J1 and J2 connectors of the Pre-Heater (**Fig. 49**) in the J1 and J2 connectors – respectively – of the Level Sensor Board (compare the sch. SC-30-02193-00 and the **Fig. 45**).
15. Replace the Sampling Arm cover (**Fig. 2**).
16. Plug the seven wires of the Pre-Heater (**Fig. 49**) in the eight positions single row connector following the connection scheme showed in **Fig. 47**.

Each of the seven contacts of the wires must be inserted into the relative position of the single row connector as showed in **Fig. 51** until to fix it inside the connector.

17. Plug the J3 connector of the Pre-Heater in the J15 connector of the Arm Interface Board (compare the scheme SC-30-02193-00 and the **Fig. 46**).
18. Take the part of the Pre-Heater tube with the fitting near the head of the Diluter.
19. Bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
20. Extract the driving wire (**Fig. 49**) from the Pre-Heater.
21. Replace the Pre-Heater tube around the head of the Diluter as showed in **Fig. 34**, push its piece of the sheat in the tube holder and screw the tube holder screw.

22. Screw the "Pre-Heater" fitting on the head of the Diluter (**Fig. 34**).
23. Replace the Diluter cover in its housing (**Fig. 7**) and screw its two fastening screws.
24. Replace the Sampling Probe performing the relative procedure described into the previous Section 6.1.3, from step 5 to step 10.

	Make sure that the movement of the Pre-Heater tube inside the instrument during the operative phase of the Sampling Arm is not thwarted.

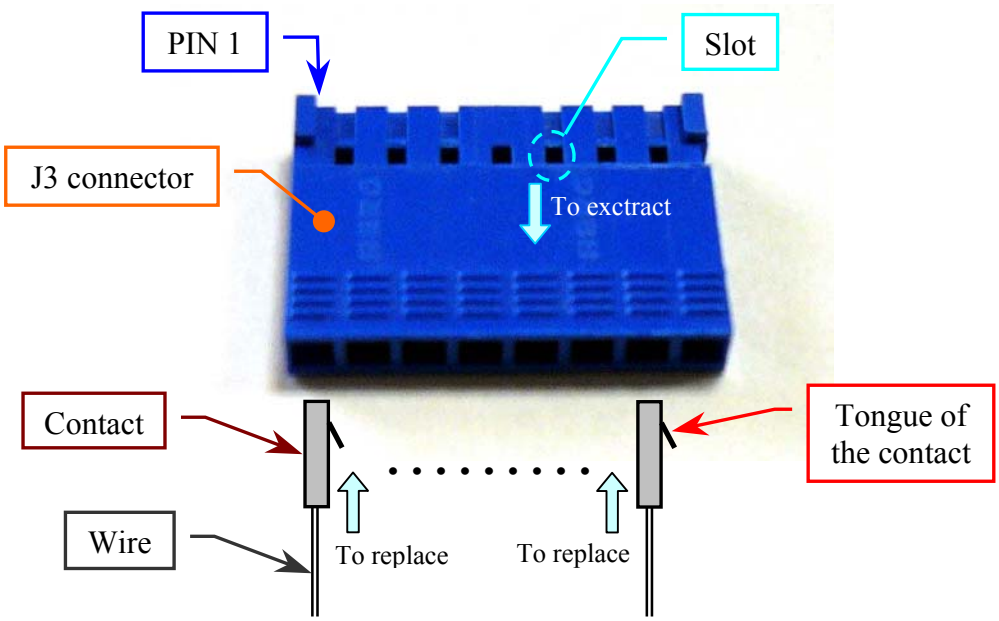


Fig. 51 – Replacement of the seven wires in the J3 connector of the Pre-Heater

Fig. 51 ***Note***	In order to exctract a wire from the J3 connector, insert a needlepoint in the correspondent slot of the connector, press the tongue toward the contact and take out the wire (**Fig. 51**).

5.4 PHOTOMETER

5.4.1 Electronic adjustments of the Photometer

Make sure that the Photometer Halogen Lamp and the Reactions Plate cuvettes are brand-new before applying the following electronic adjustments procedure.

1. Turn on the SAT450 system (instrument and computer) and launch the Diagnostic program.
2. Select "Miscellaneous" folder and request an Instrument General reset. Wait until the reset instrument procedure has been completed.
3. Make sure that all the Home Sensors of the Sampling Arm, Reactions Plate, Reagents Plate, Samples Plate and the Filters Wheel light up in green.
4. Remove the Reactions Plate cover (**Fig. 7**) and place 500 µL of distilled water in the cuvette # 1 of the Reactions Plate.
5. Replace the Reactions Plate cover (**Fig. 7**) on its plate (in order to avoid external interferences of light in the reading).
6. Select "Optic" folder and verify that the Photometer Halogen Lamp is in "ON" state.
7. Make sure that the voltage on the J2 connector of the "Photometer Lamp Board" (**Fig. 52**) is equal to **5.8 Volts** ± 0.1 . If it not be so, turn the R6 trimmer (**Fig. 52**) for adjusting the voltage.

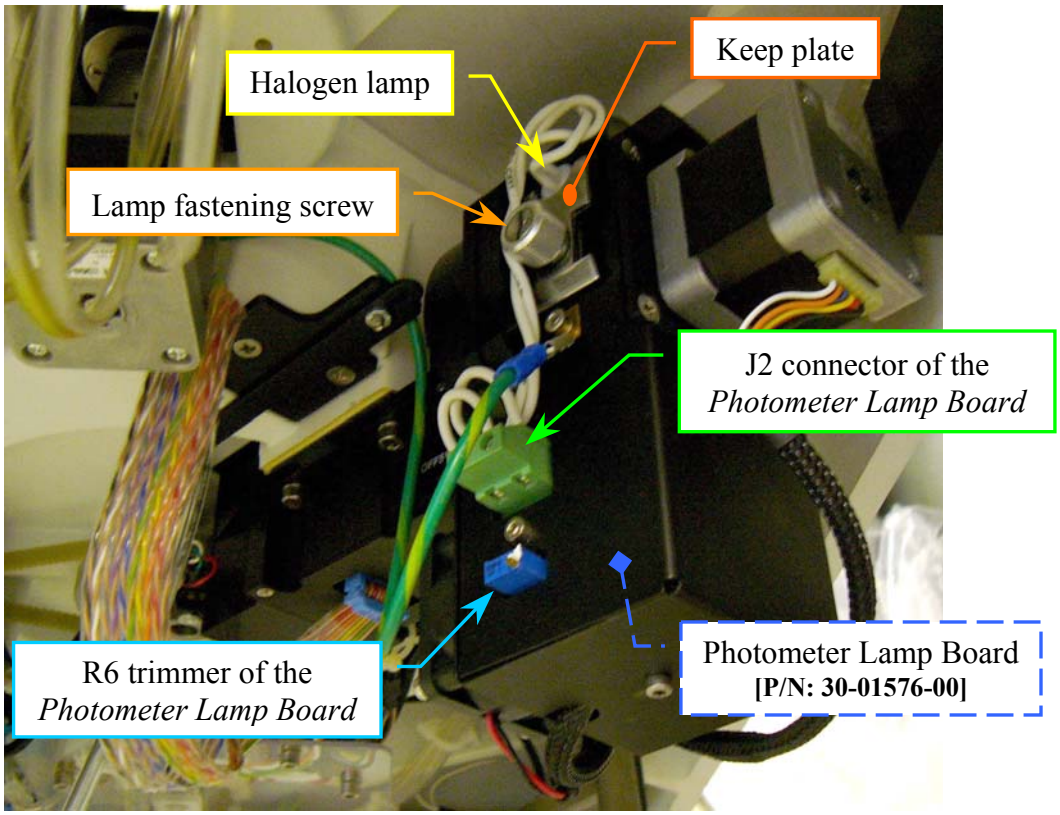


Fig. 52 – Photometer **[P/N: 15-02448-00]**

Make sure that the Reactions Plate cuvettes are perfectly clean. If it not be so, perform the “Washing cuvettes” operation (*form “Start Work”*).

The electric light and the daylight can influence the readings of the Photometer. Therefore, bring down the Raising Top and close the Reactions Plate with its cover (**Fig. 7**) before to perform the reading operations.

8. Click the “Dark” button, click the "START Sample Channel Conversion" button and make sure that the adjacent text box shows a counts value equal to **100 ± 50**. If it not be so, turn the OFFSET trimmer of the “Pre-Ampl./ADC Board (Sample Channel)” in order to set the correct counts value (**Fig. 53**).

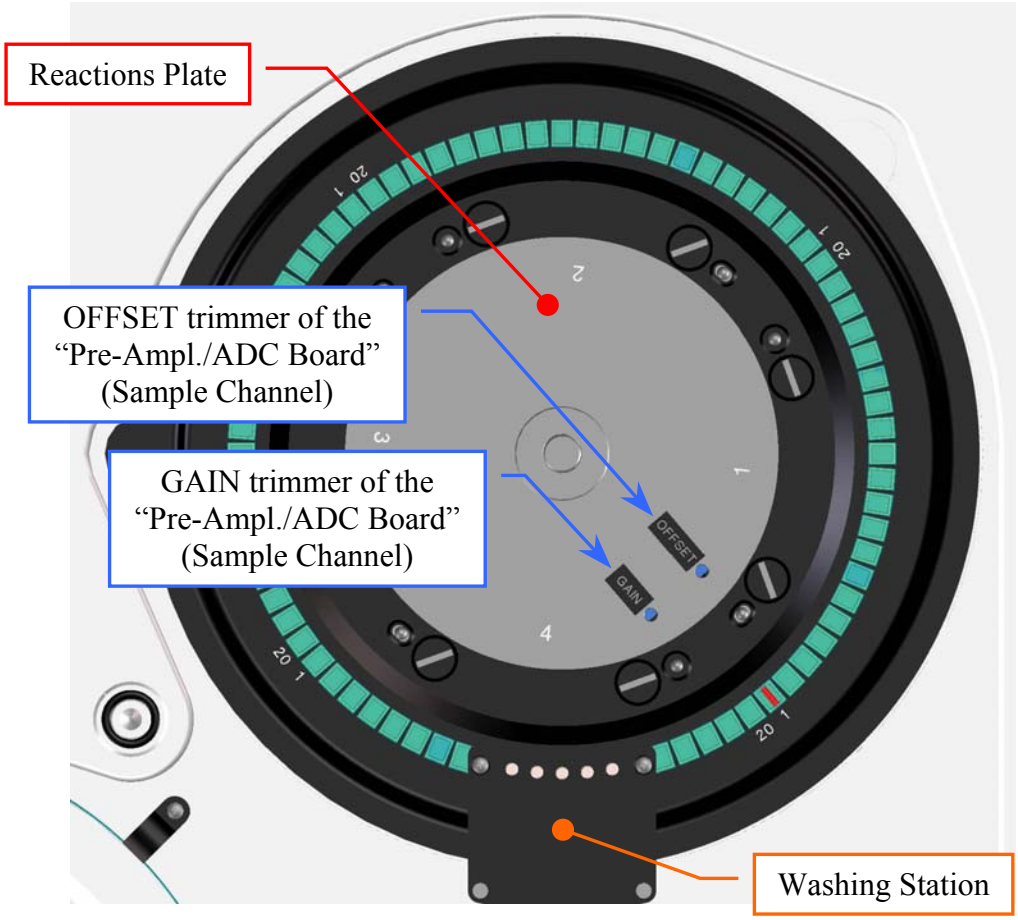


Fig. 53 – GAIN and OFFSET trimmers of the “Pre-Ampl./ADC Board” (Sample Channel)

9. After have to carry out the Sample Channel OFFSET adjusting, click the "STOP Sample Channel Conversion" button.
10. Click the "START Reference Channel Conversion" button (in the “Dark” position) and make sure that the adjacent text box shows a counts value equal to **100 ± 50**. If it not be so, turn the OFFSET trimmer of the “Pre-Ampl./ADC Board (Reference Channel)” in order to set the correct counts value (**Fig. 61**).

11. After have to carry out the Reference Channel OFFSET adjusting, click the "STOP Reference Channel Conversion" button.
12. Determine the **filter** which transmits the highest signal (for the Sample Channel)**,** selecting all buttons of the filters (from 340 nm to 690 nm) and, for each one of them, performing the following steps:
    a. click the ”START Sample Channel Conversion" button;
    b. read the counts value showed in the adjacent text box;
    c. click the ”STOP Sample Channel Conversion" button.
13. Make sure that the counts value of the filter which transmits the highest signal (for the Sample Channel) is between **58.000** and **62.000**. If it not be so, turn the GAIN trimmer of the “Pre-Ampl./ADC Board (Sample Channel)” in order to set the correct counts value (**Fig. 53**).
14. Select all buttons of the filters (from 340 nm to 690 nm) and, for each one of them, performing the following steps:
    a. click the ”START Sample Channel Conversion" button;
    b. make sure that the counts value showed in the adjacent text box is between 29.000 and 62.000;
    c. click the ”STOP Sample Channel Conversion" button.
15. Determine the **filter** which transmits the highest signal (for the Reference Channel)**,** selecting all buttons of the filters (from 340 nm to 690 nm) and, for each one of them, performing the following steps:
    a. click the ”START Reference Channel Conversion" button;
    b. read the counts value showed in the adjacent text box;
    c. click the ”STOP Reference Channel Conversion" button.
16. Make sure that the counts value of the filter which transmits the highest signal (for the Reference Channel) is between **53.000** and **57.000**. If it not be so, turn the GAIN trimmer of the “Pre-Ampl./ADC Board (Reference Channel)” in order to set the correct counts value (**Fig. 62**).
17. Select all buttons of the filters (from 340 nm to 690 nm) and, for each one of them, performing the following steps:
    a. click the ”START Reference Channel Conversion" button;
    b. make sure that the counts value showed in the adjacent text box is between 35.000 and 57.000;
    c. click the ”STOP Reference Channel Conversion" button.
18. Remove the Reactions Plate cover (**Fig. 7**), empty the cuvette # 1 of the Reactions Plate and replace the Reactions Plate cover on its plate.
19. Click the “Exit” button to exit from the Diagnostic program.

5.4.2 Replacement of the Optic Assy

1. Make sure that the SAT450 instrument is turned off.
2. Unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
3. Unplug the J4, J5, J18 and J19 connectors from the Reactions Plate Interface Board (compare the scheme SC-30-02192-00).
4. Unplug the flat cable connector from the "Pre-Ampl./ADC Board (Sample Channel)", the flat cable connector from the "Pre-Ampl./ADC Board (Reference Channel)" and the ground wire from the Photometer (**Fig. 54**).
5. Unscrew the four Photometer fastening screws (**Fig. 54**), pull down – moving carefully – the Photometer from its housing and take out it from the instrument.

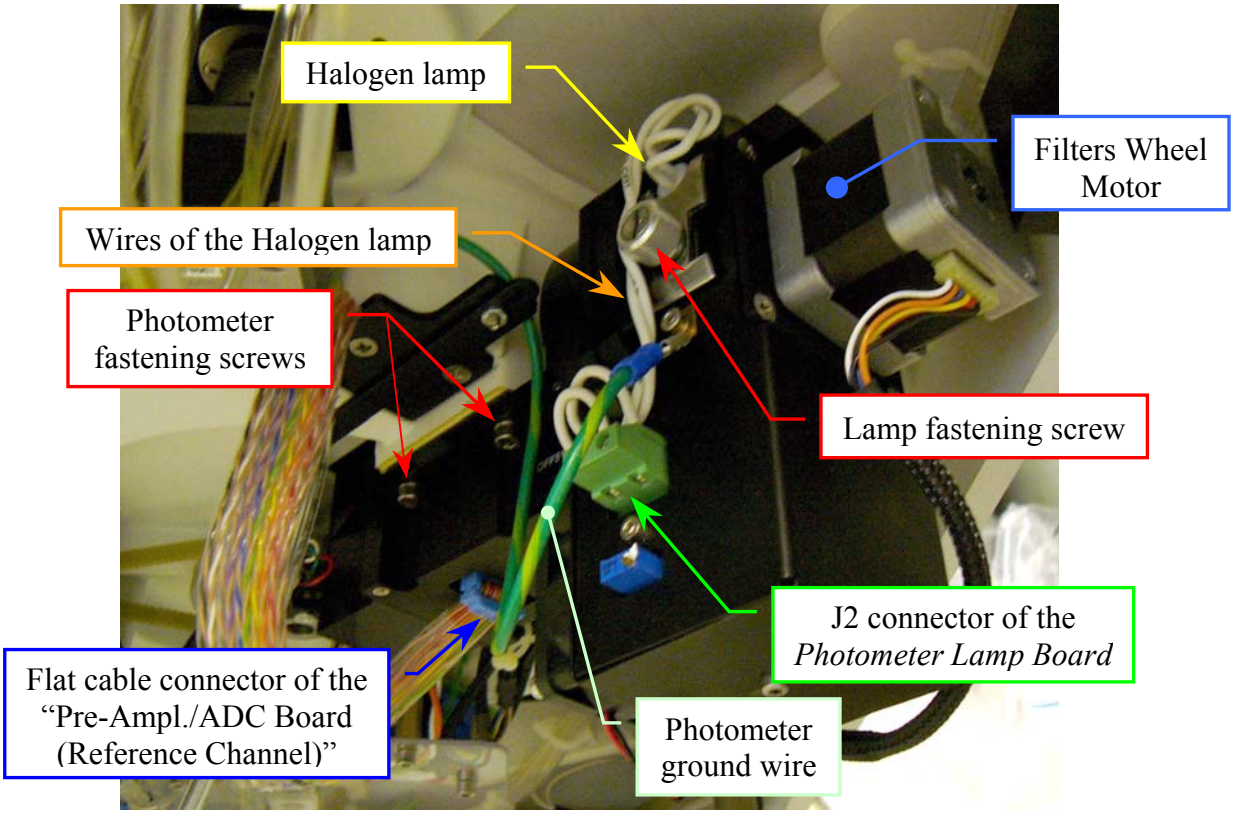


Fig. 54 – Photometer [P/N: 15-02448-00]

6. Unscrew the two screws of the J2 connector (**Fig. 54**) and take out the two halogen lamp wires from the connector.
7. Unscrew the two fastening screws of the "Photometer Lamp Board" cover (**Fig. 62**) and take out it from the Photometer (note well: in this mode – contemporaneously – take out from the Photometer the "Photometer Lamp Board" and the Photometer Fan obtaining the Optic Assy).

To replace the new Optic Assy **[P/N: 10-02449-00]** perform the following steps:

8. Repeat the above steps in inverse order: from 7 to 2.
9. Perform the procedure "Electronic adjustment of the Photometer" described into the previous Section 6.4.1.

5.4.3 Replacement of the Filters Wheel Motor

1. Remove the Optic Assy from its housing performing the relative procedure described into the previous Section 6.4.2, from step 1 to step 7.
2. Unscrew the four fastening screws of the Filters Wheel mechanical support (**Fig. 55**) and take out the Filters Wheel – together with the Filters Wheel Motor – from the Optic Assy.

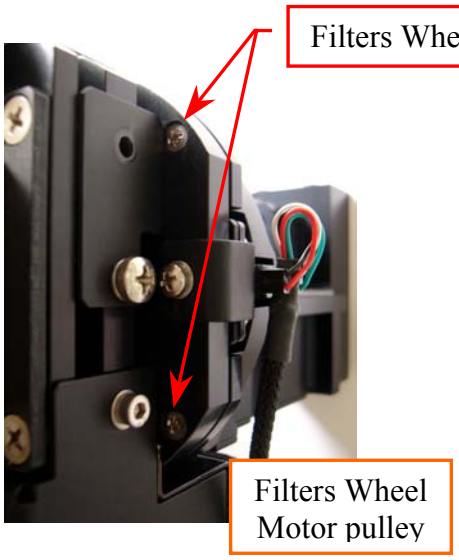


Fig. 55 – Filters Wheel mechanical support fastening screws

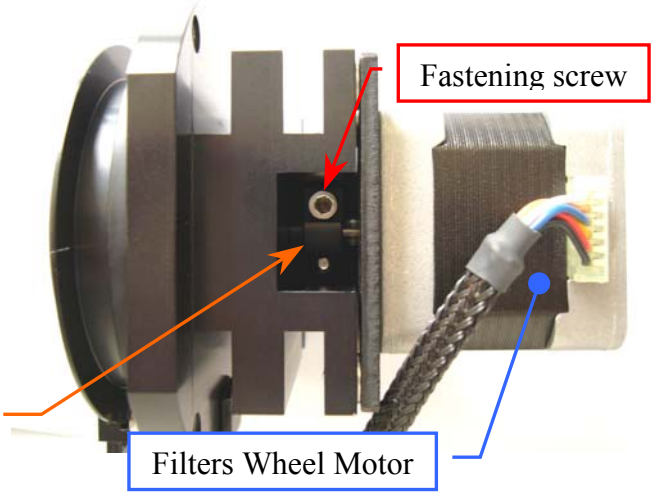


Fig. 56 – Fastening screws of the Filters Wheel Motor pulley

3. Turn the Filters Wheel around the Filters Wheel motor shaft until to see in the relative slot one of two screws of the Filters Wheel pulley (**Fig. 56**), then loosen little the screw.
4. Turn again the Filters Wheel around the Filters Wheel motor shaft until to see in the relative slot the second screw of the Filters Wheel pulley (**Fig. 56**), then loosen little the screw.
5. Unscrew the four fastening screws of the Filters Wheel Motor (**Fig. 57**) and take out it from the Filters Wheel (note well: don't lose the four washers placed between the anchor plate motor and the four holes of the Filters Wheel mechanical support!).
6. Unscrew the four fastening screws of the Filters Wheel Motor anchor plate (**Fig. 58**) and take out the anchor plate from the motor.

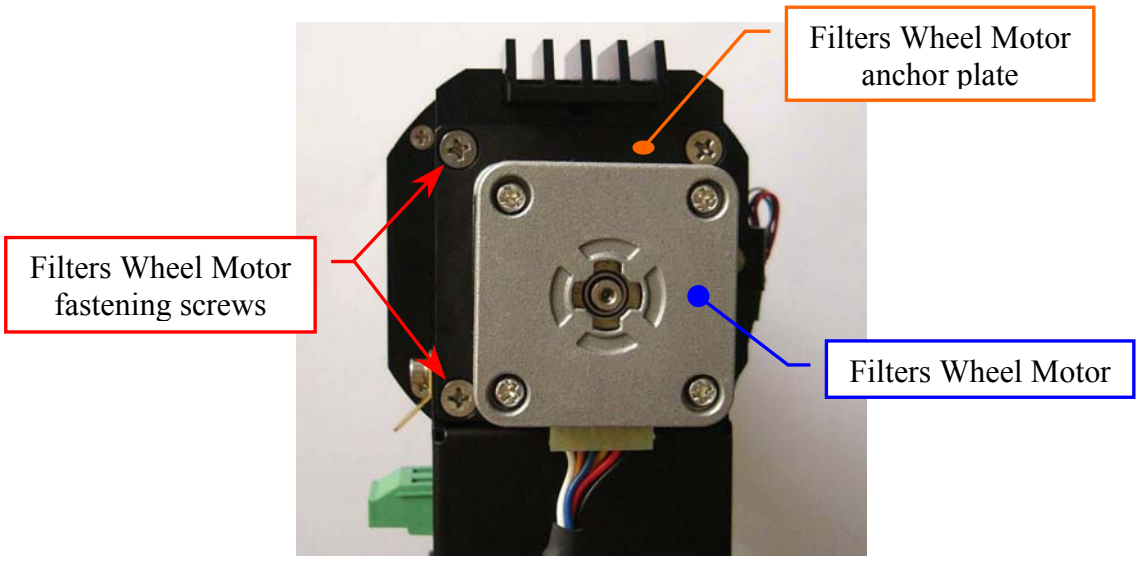


Fig. 57 – Filters Wheel Motor fastening screws

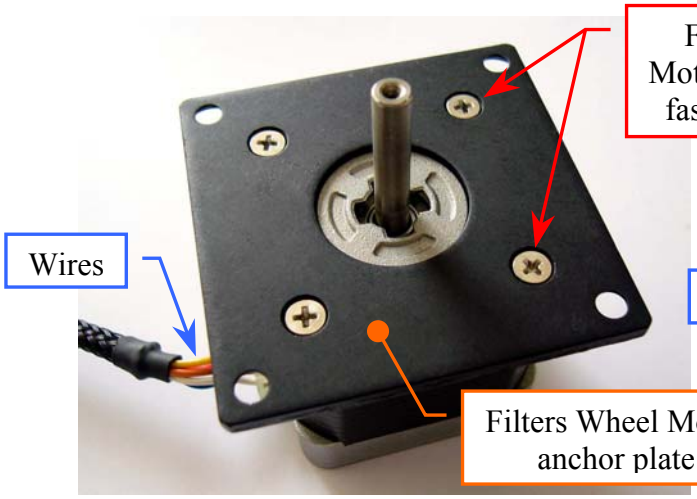


Fig. 58 – Filters Wheel Motor anchor plate

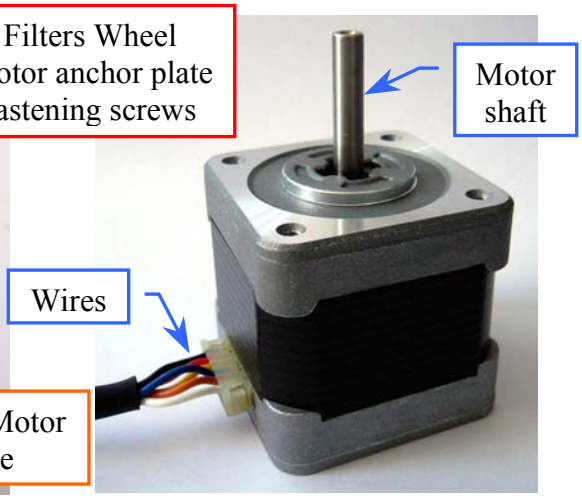


Fig. 59 – Filters Wheel Motor
[P/N: 10-00399-40]

To replace the new Filters Wheel Motor **(Fig. 59)** perform the following steps:

7. Position the anchor plate on the upper plane of the new motor as showed in **Fig. 58** and screw its four fastening screws.
8. Place the four washer between the motor and the four holes of the Filters Wheel mechanical support, insert the shaft of the motor in the Filters Wheel pulley (with the motor connector place on the opposite side in respect to the side of the Filters Wheel pulley slot), then screw the four fastening screws of the Filters Wheel Motor (**Fig. 57**).
9. Position the Filters Wheel to **0.5 mm** with respect to the upper side of the Filters Wheel mechanical support (**Fig. 60**) and tighten one of two screws of the Filters Wheel pulley (**Fig. 56**).

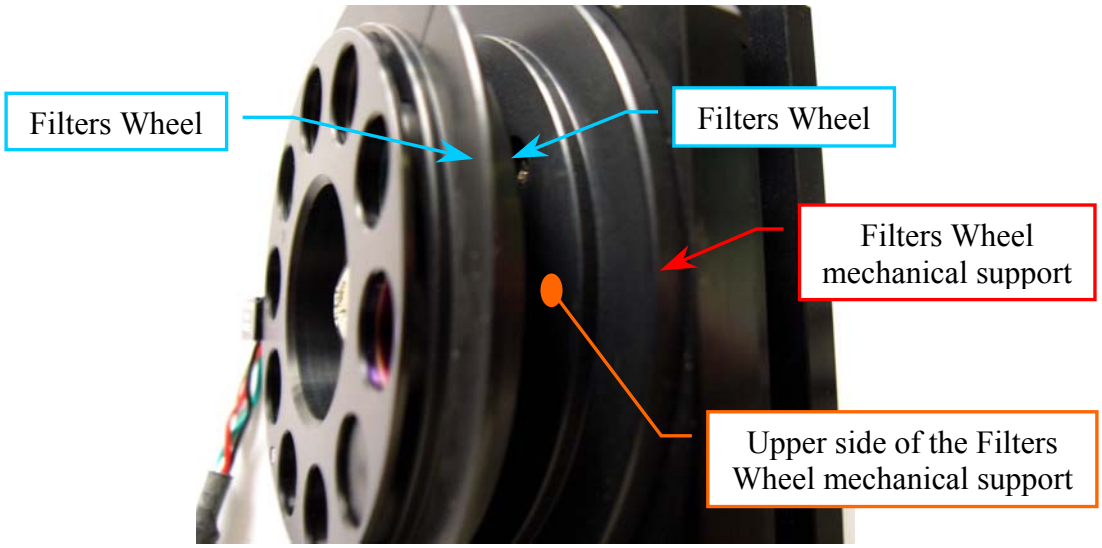


Fig. 60 – Upper side of the Filters Wheel mechanical support

10. Turn the Filters Wheel around the Filters Wheel Motor shaft until to see in the relative slot the second screw of the Filters Wheel pulley (**Fig. 56**) and tighten the screw.
11. Insert the Filters Wheel – together with the Filters Wheel Motor – in the outward part of the Optic Assy and screw the four fastening screws of the Filters Wheel mechanical support (**Fig. 55**).
12. Replace the Optic Assy in its housing performing the relative procedure described into the previous Section 6.4.2, from step 8 to step 9.

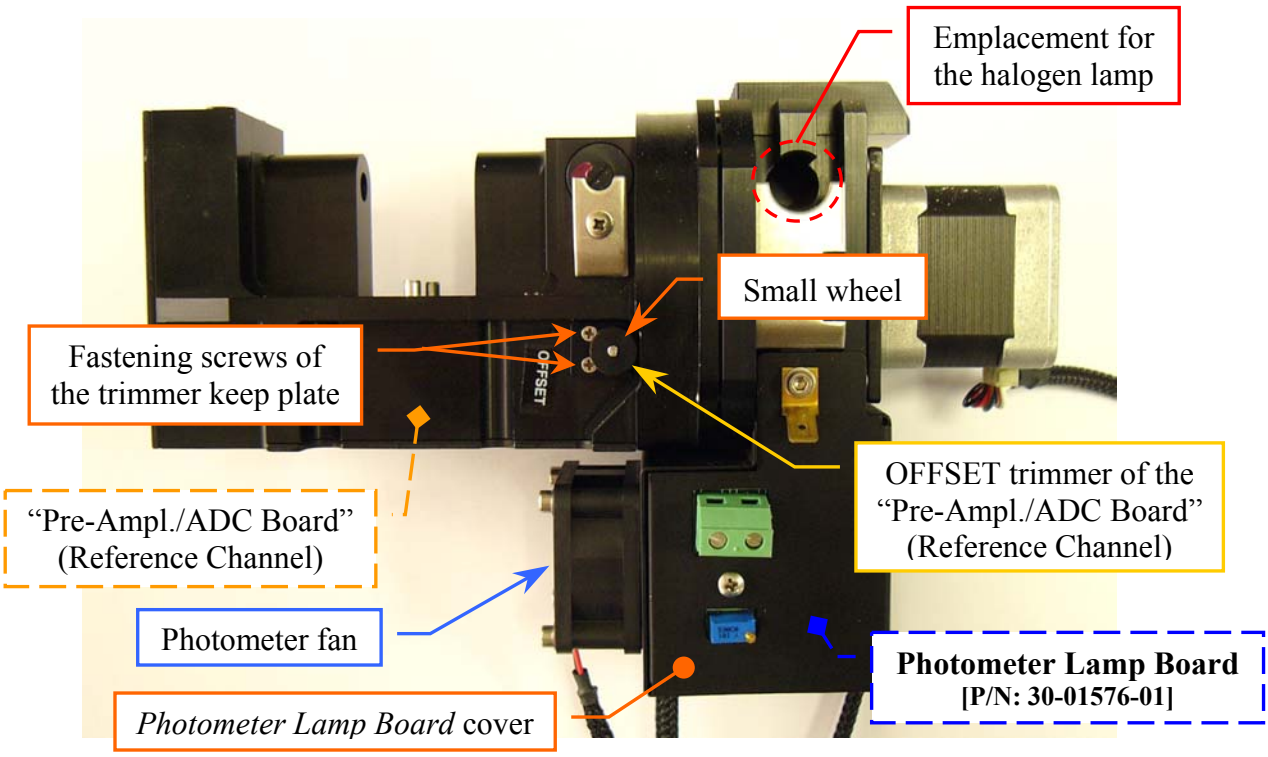


Fig. 61 – OFFSET trimmer of the "Pre-Ampl./ADC Board" (Reference Channel)

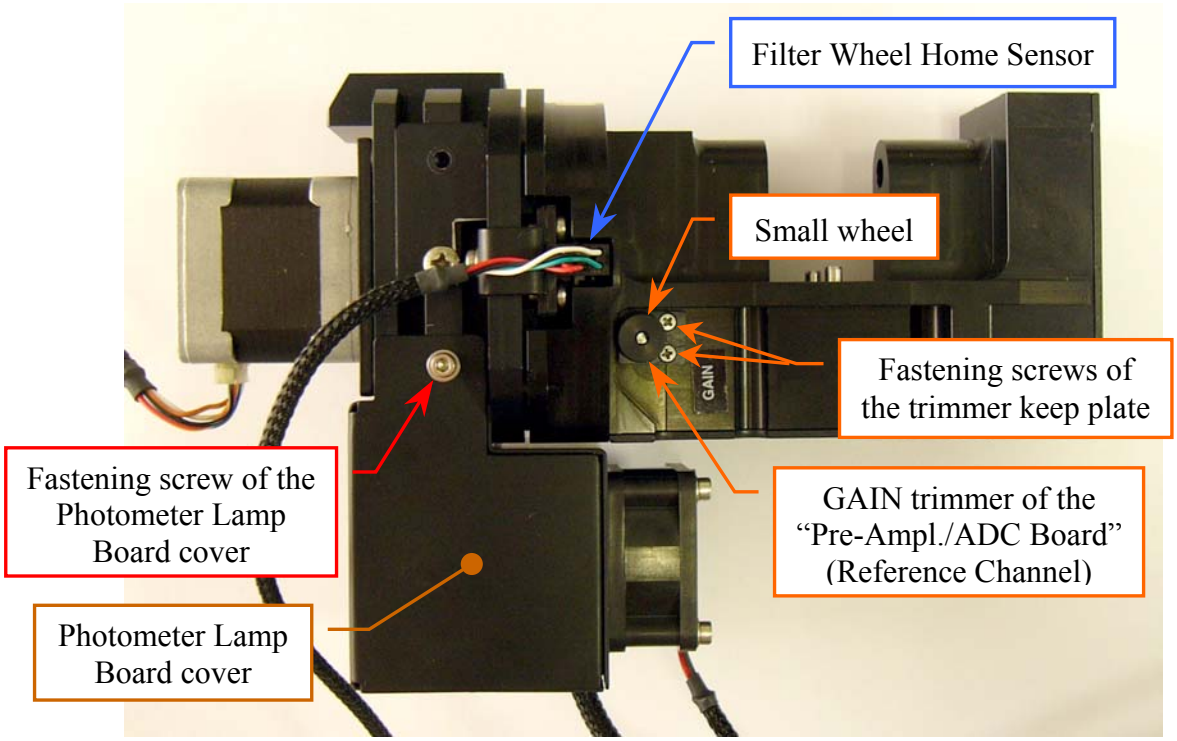


Fig. 62 – GAIN trimmer of the "Pre-Ampl./ADC Board" (Reference Channel)

5.4.4 Replacement of the Filters Wheel Home Sensor

1. Remove the Optic Assy from its housing performing the relative procedure described into the previous Section 6.4.2, from step 1 to step 7.
2. Unscrew the four fastening screws of the Filters Wheel mechanical support (**Fig. 55**) and take out the Filters Wheel – together with the Filters Wheel Motor – from the Optic Assy.
3. Turn the Filters Wheel around the Filters Wheel motor shaft until one filter is aligned with respect to the Filters Wheel Home Sensor, unscrew the fastening screw of the Filters Holder Wheel (**Fig. 72**), then remove it from the Filters Wheel (**Fig. 72**).
4. Remove the filter - using the tweezers - from its seating on the Filters Wheel (as showed in **Fig. 63**) and unscrew the first Home Sensor support fastening screw placed under the Filters Wheel (**Fig. 63**).

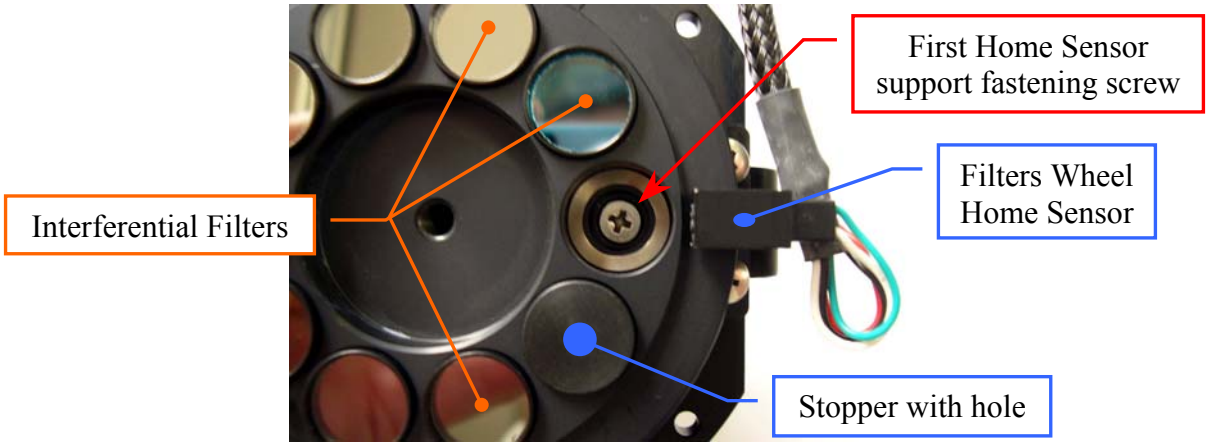


Fig. 63 – First Home Sensor support fastening screw

5. Unscrew the filler cap screw and the second Home Sensor support fastening screw placed on the Filters Wheel mechanical support (**Fig. 64**) and take out the Home Sensor support from its housing.
6. Unscrew the two fastening screws of the Filters Wheel Home Sensor (**Fig. 65**) and take out the sensor from the support.

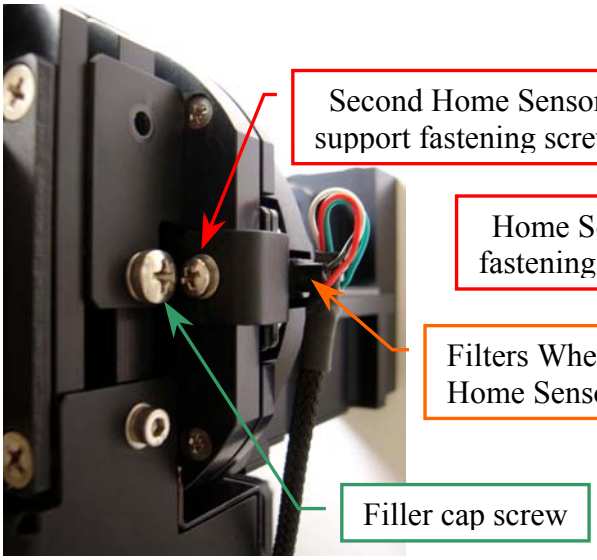


Fig. 64 – Second Home Sensor support fastening screw

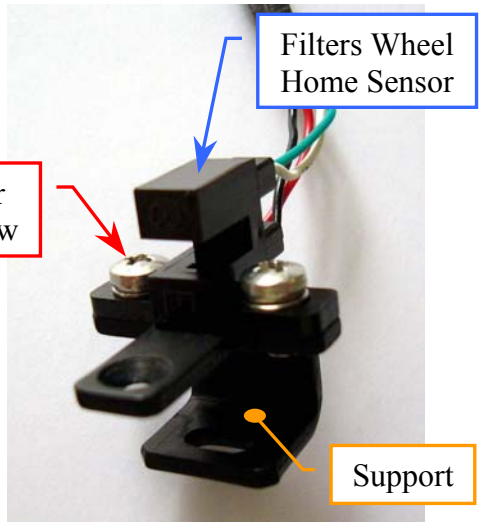


Fig. 65 – Filters Wheel Home Sensor fastening screws

To replace the new Filters Wheel Home Sensor (**Fig. 66**) perform the following steps:

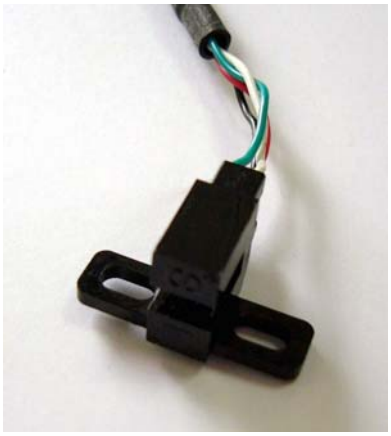


Fig. 66 – Filters Wheel Home Sensor [P/N: 9-10-0023-40]

7. Position the support below the Filters Wheel Home Sensor as showed in **Fig. 65**, center the sensor with respect to the support and screw its two fastening screws (**Fig. 65**).
8. Repeat the above steps in inverse order: from 5 to 3.
9. Replace the Filters Wheel – together with the Filters Wheel Motor – in the Optic Assy and screw the four fastening screws of the Filters Wheel mechanical support (**Fig. 55**).

Do not touch the filter with your hands. Make use of tweezers to replace it.

10. Replace the Optic Assy in its housing performing the relative procedure described into the previous Section 6.4.2, from step 8 to step 9.

5.4.5 Replacement of the Photometer Halogen Lamp

1. Make sure that the SAT450 instrument is turned off.
2. Unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
3. Unscrew the two screws of the J2 connector of the "Photometer Halogen Lamp" (**Fig. 52**) and take out the two lamp wires from the connector.

Fig. 67 – Photometer Halogen Lamp [P/N: 09-35-0016-00]

4. Unscrew the lamp fastening screw (**Fig. 52**) and remove the lamp keep plate (**Fig. 52**) from the Photometer.
5. Take out the Photometer Halogen Lamp from its emplacement on the Photometer (**Fig. 61**).

To replace the new Photometer Halogen Lamp **(Fig. 67)** perform the following steps:

Do not touch glass portion of Photometer Halogen Lamp with your hands.

6. Repeat the above steps in inverse order: from 5 to 3.
7. Bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
8. Perform the procedure "Electronic adjustment of the Photometer" described into the previous Section 6.4.1.

5.4.6 Replacement of the "Pre-Ampl./ADC Board" of the Sample Channel

1. Remove the Optic Assy from its housing performing the relative procedure described into the previous Section 6.4.2, from step 1 to step 5.
2. Unscrew the four fastening screws of the Sample Channel board cover (**Fig. 68**) and remove it from the Photometer.
3. Unscrew the four fastening screws of the "Pre-Ampl./ADC Board" of the Sample Channel (**Fig. 69**) and take off - handling with care - the board from its housing on the Photometer.

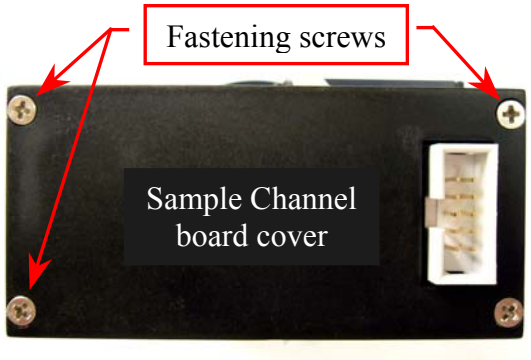


Fig. 68 – Fastening screws of the Sample Channel board cover

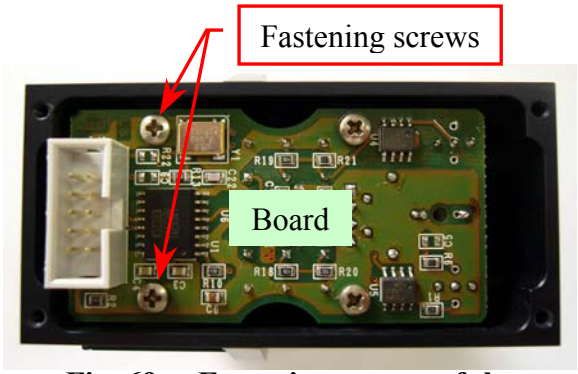


Fig. 69 – Fastening screws of the Sample Channel board

To replace the new "Pre-Ampl./ADC Board" of the Sample Channel (compare the scheme MA-15-02448-00) perform the following steps:

Do not touch light-sensitive portion of photodiode with your hands.

4. Replace the board - handling with care - in its housing in order to obtain the placement of the photodiode in its seating and the alignment of the trimmer screw, for each of two trimmers, with respect to the relative hole on the chassis board (compare the scheme MA-15-02448-00).
5. Repeat the above steps in inverse order: from 3 to 2.
6. Replace the Optic Assy in its housing performing the relative procedure described into the previous Section 6.4.2, from step 8 to step 9.

5.4.7 Replacement of the "Pre-Ampl./ADC Board" of the Reference Channel

1. Remove the Optic Assy from its housing performing the relative procedure described into the previous Section 6.4.2, from step 1 to step 5.
2. Unscrew the two keep plate screws of the external small wheel of the GAIN Trimmer of the Reference Channel board (**Fig. 62**), then remove the small wheel (together with its keep plate) from its hole.
3. Unscrew the two keep plate screws of the external small wheel of the OFFSET Trimmer of the Reference Channel board (**Fig. 61**), then remove the small wheel (together with its keep plate) from its hole.
4. Unscrew the four fastening screws of the Reference Channel board cover (**Fig. 70**) and remove it from the Photometer.
5. Unscrew the four fastening screws of the "Pre-Ampl./ADC Board" of the Reference Channel (**Fig. 71**) and take off - handling with care - the board from its housing on the Photometer.

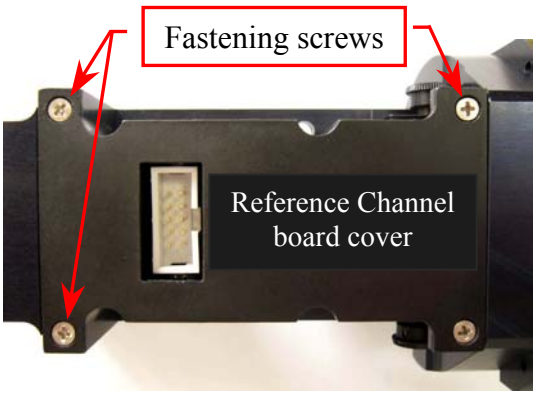


Fig. 70 – Fastening screws of the Reference Channel board cover

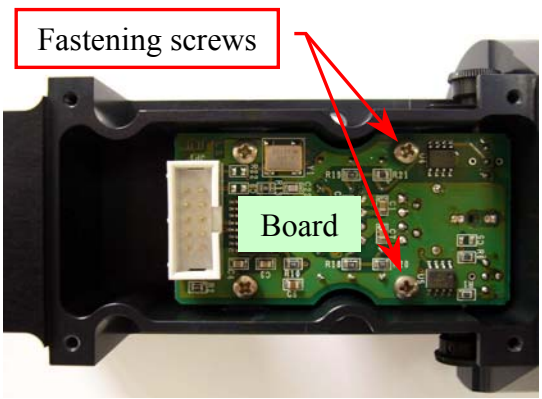


Fig. 71 – Fastening screws of the Reference Channel board

To replace the new "Pre-Ampl./ADC Board" of the Reference Channel (compare the scheme MA-15-02448-00) perform the following steps:

Do not touch light-sensitive portion of photodiode with your hands.

6. Replace the board - handling with care - in its housing in order to obtain the placement of the photodiode in its seating and the alignment of the trimmer screw, for each of two trimmers, with respect to the relative hole on the chassis board (compare the scheme MA-15-02448-00).
7. Screw the four fastening screws of the "Pre-Ampl./ADC Board" of the Reference Channel in its housing (**Fig. 71**).
8. Replace the external small wheel in the hole of the GAIN Trimmer of the Reference Channel board, make sure that the small wheel has a grip on the board trimmer screw and screw the two small wheel keep plate screws (**Fig. 62**).
9. Replace the external small wheel in the hole of the OFFSET Trimmer of the Reference Channel board, make sure that the small wheel has a grip on the board trimmer screw and screw the two small wheel keep plate screws (**Fig. 61**).
10. Replace the Reference Channel board cover on its place and screw its four fastening screws (**Fig. 70**).
11. Replace the Optic Assy in its housing performing the relative procedure described into the previous Section 6.4.2, from step 8 to step 9.

5.4.8 Replacement of the Interferential Filters

1. Remove the Optic Assy from its housing performing the relative procedure described into the previous Section 6.4.2, from step 1 to step 7.
2. Unscrew the four fastening screws of the Filters Wheel mechanical support (**Fig. 55**) and take out the Filters Wheel – together with the Filters Wheel Motor – from the Optic Assy.
3. Turn the Filters Wheel around the Filters Wheel motor shaft until the dark position of the Filters Wheel (compare the scheme MA-15-02448-00) is centered with respect to the Filters Wheel Home Sensor (**Fig. 74**), unscrew the Filters Holder Wheel fastening screw (**Fig. 72**) and remove the Filters Holder Wheel from its housing making drift it along the dowel (**Fig. 72**).

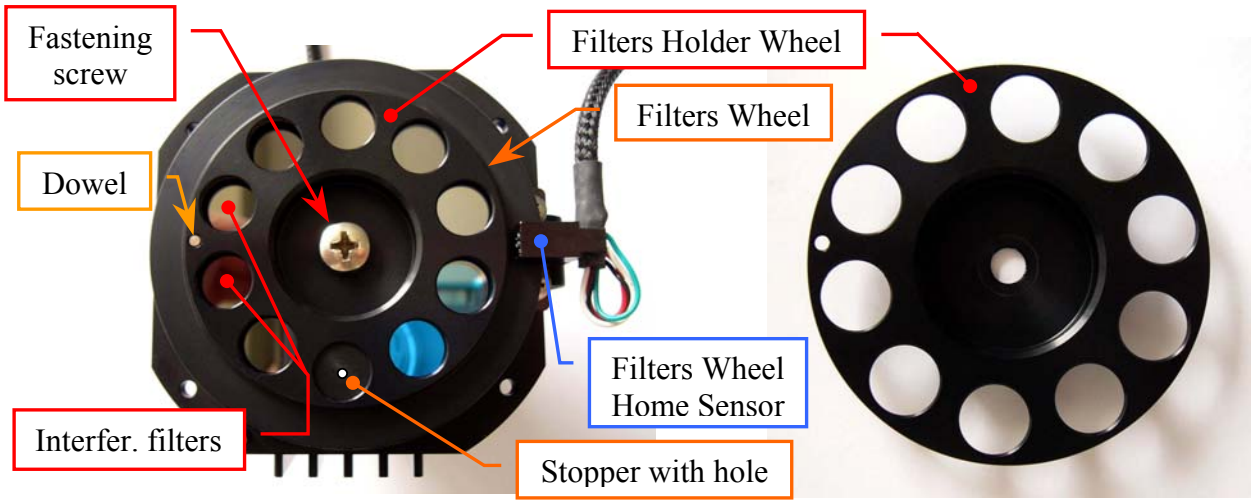


Fig. 72 – Filters Wheel

Fig. 73 – Filters Holder Wheel

4. Remove the specific interferential filter from its seating on the Filters Wheel (**Fig. 74**).

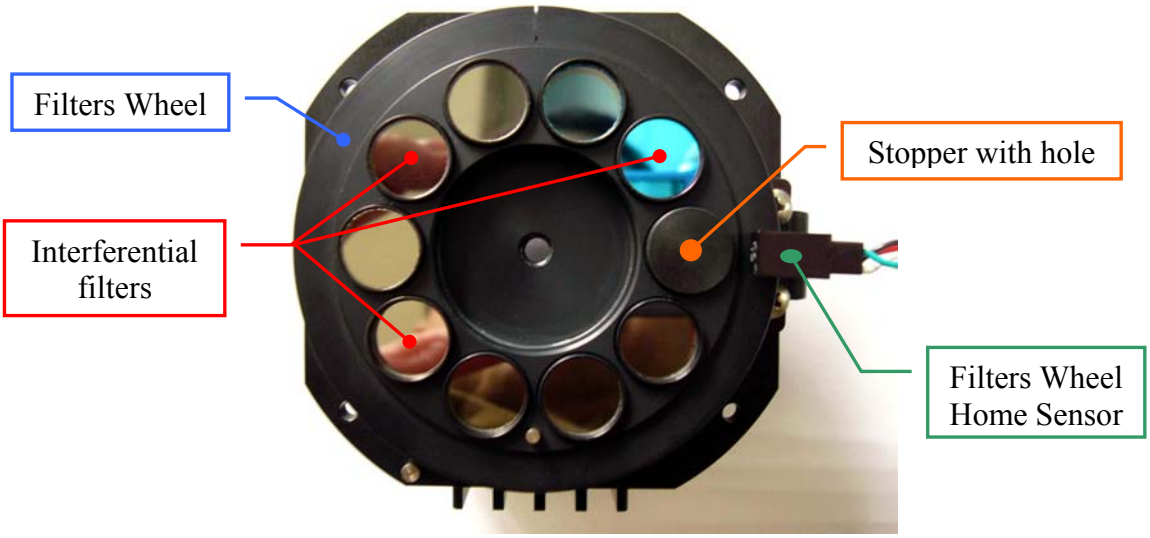


Fig. 74 – Interferential Filters on the Filters Wheel

To replace the new Interferential Filter (compare the scheme MA-15-02448-00) perform the following steps:

Do not touch the filter with your hands. Make use of tweezers to replace it.

5. Make sure that the new interferential filter is right, then replace it on the Filters Wheel positioning the smooth side of the small filter box on the bottom side of its specific seating (compare the scheme MA-15-02448-00) above its wave spring washer.
6. Repeat the above steps in inverse order: from 3 to 2.
7. Replace the Optic Assy in its housing performing the relative procedure described into the previous Section 6.4.2, from step 8 to step 9.

5.5 REAGENTS PLATE

5.5.1 Mechanical adjustments of the Reagents Plate

Make sure that the position #1 of the Satellite Rack "A" is contemporaneously aligned with respect to the position #1 of the Satellite Racks "B", "C" and "D" of the Reagents Plate (**Fig. 78**). If it not be so, perform the procedure "Mechanical alignments of the Satellite Racks of the Reagents Plate" described into the following Section 6.5.3.

1. Lift up the instrument cover and remove the Reagents Plate cover from the Reagents Plate (Fig. 7).
2. Turn on the SAT450 system (instrument and computer) and launch the "Diagnostic" program.
3. Select "Plates" folder and request an Reagents Plate reset. Wait until the reset Reagents Plate procedure has been completed.
4. Make sure that the two Home Sensors of the Reagents Plate light up in green.
5. Select "Arm" folder and request an Arm reset. Wait until the reset Sampling Arm procedure has been completed.
6. Make sure that the Vertical and Horizontal Home Sensors of the Sampling Arm light up in green.
7. Select "Plates" folder, choose the N° Cup #40 of the Reagents Plate, then click the correspondent "To Asp." button. Wait until the requested operation has been completed.
8. Select "Arm" folder, click the "Go Reagent" button, then click the correspondent "Down" button. The Sampling Arm will move to aspiration position of the Reagents Plate, then it will go down until to reach the right height.
9. Make sure that the Sampling Probe is centered with respect to the position #40 (rD-2 position) of the Reagents Plate. If it not be so, center the four Peripheral Racks of the Reagents Plate in the following way:
    a. unscrew the two captive screws on the front underside of the instrument (Fig. 6) and lift up the Raising Top (Fig. 7);
    b. loosen the two set screws of the primary pulley of the Reagents Plate (Fig. 75);
    c. center the position #40 (rD-2 position) with respect to the Sampling Probe, rotating slowly the Reagents Plate;
    d. tighten the two set screws of the primary pulley of the Reagents Plate (Fig. 75);
    e. bring down the Raising Top (Fig. 7) and screw the two captive screws on the front underside of the instrument (Fig. 6).
10. Select the N° Cup #1 of the Reagents Plate, then click the correspondent "To Asp." button. Wait until the requested operation has been completed.
11. Make sure that the Sampling Probe is centered with respect to the position #1 of the Reagents Plate (note: the position#1 of the Reagents Plate is the position#1 of the Satellite Rack "A"). If it not be so, center the four Satellite Racks of the Reagents Plate in the following way:
    f. unscrew the two captive screws on the front underside of the instrument (Fig. 6) and lift up the Raising Top (Fig. 7);
    g. loosen the two set screws of the secondary pulley of the Reagents Plate (Fig. 76);
    h. center the position #1 of the Satellite Rack "A" with respect to the Sampling Probe, rotating slowly the Satellite Rack "A";

i. lever on the primary pulley with a flat head screwdriver in order to obtain that the secondary pulley is locked on the end of the run, and then tighten the two set screws of the secondary pulley of the Reagents Plate (Fig. 76);
j. bring down the Raising Top (Fig. 7) and screw the two captive screws on the front underside of the instrument (Fig. 6).

12. Select "Arm" folder and request an Arm reset. Wait until the reset Sampling Arm procedure has been completed.
13. Make sure that the Vertical and Horizontal Home Sensors of the Sampling Arm light up in green.
14. Request an Reagents Plate reset in the "Plates" folder. Wait until the reset Reagents Plate procedure has been completed.
15. Make sure that the two Home Sensors of the Reagents Plate light up in green.
16. Replace the Reagents Plate cover on the Reagents Plate and bring down the instrument cover (Fig. 7).

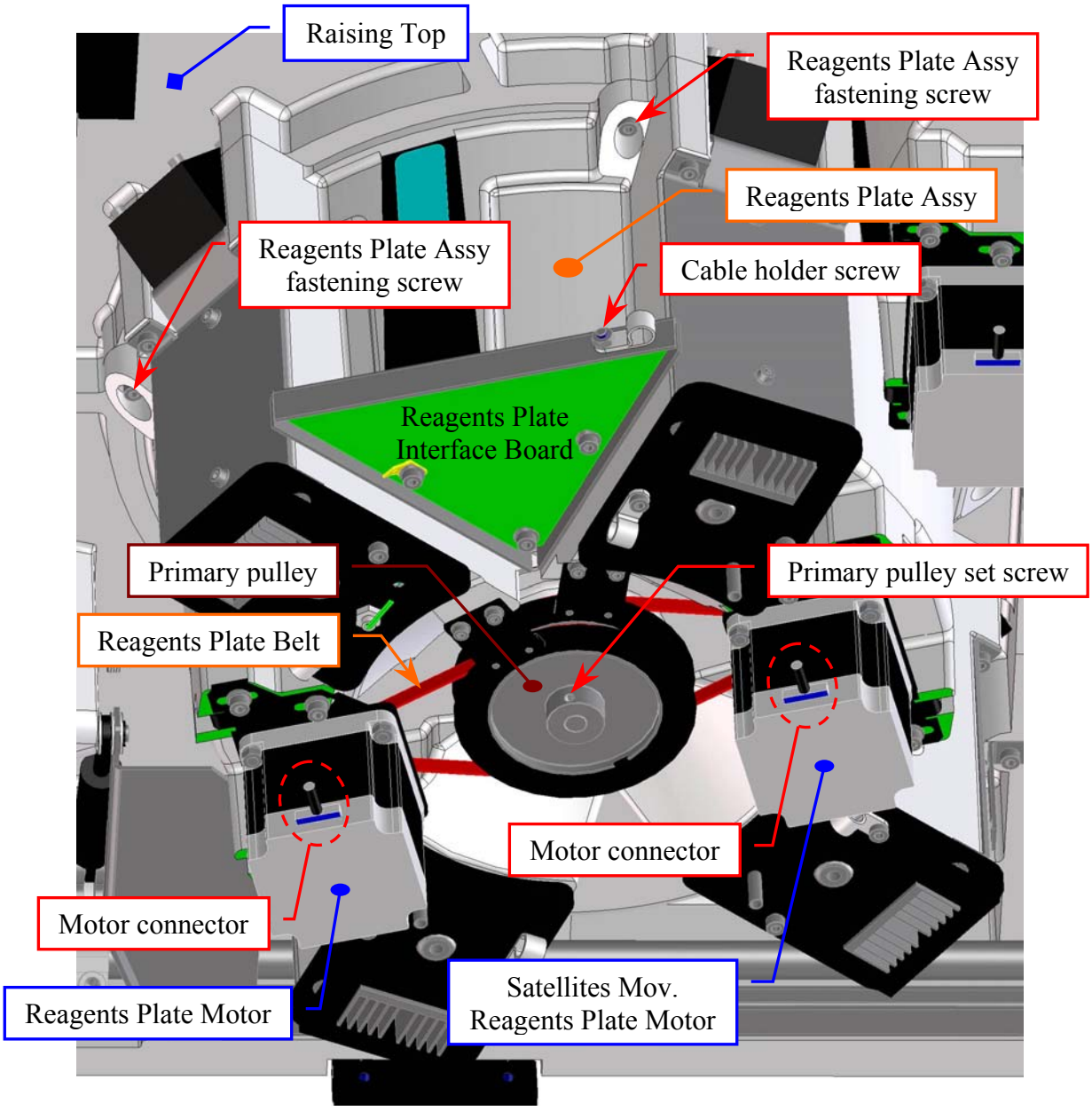


Fig. 75 – Primary pulley of the Reagents Plate Assy

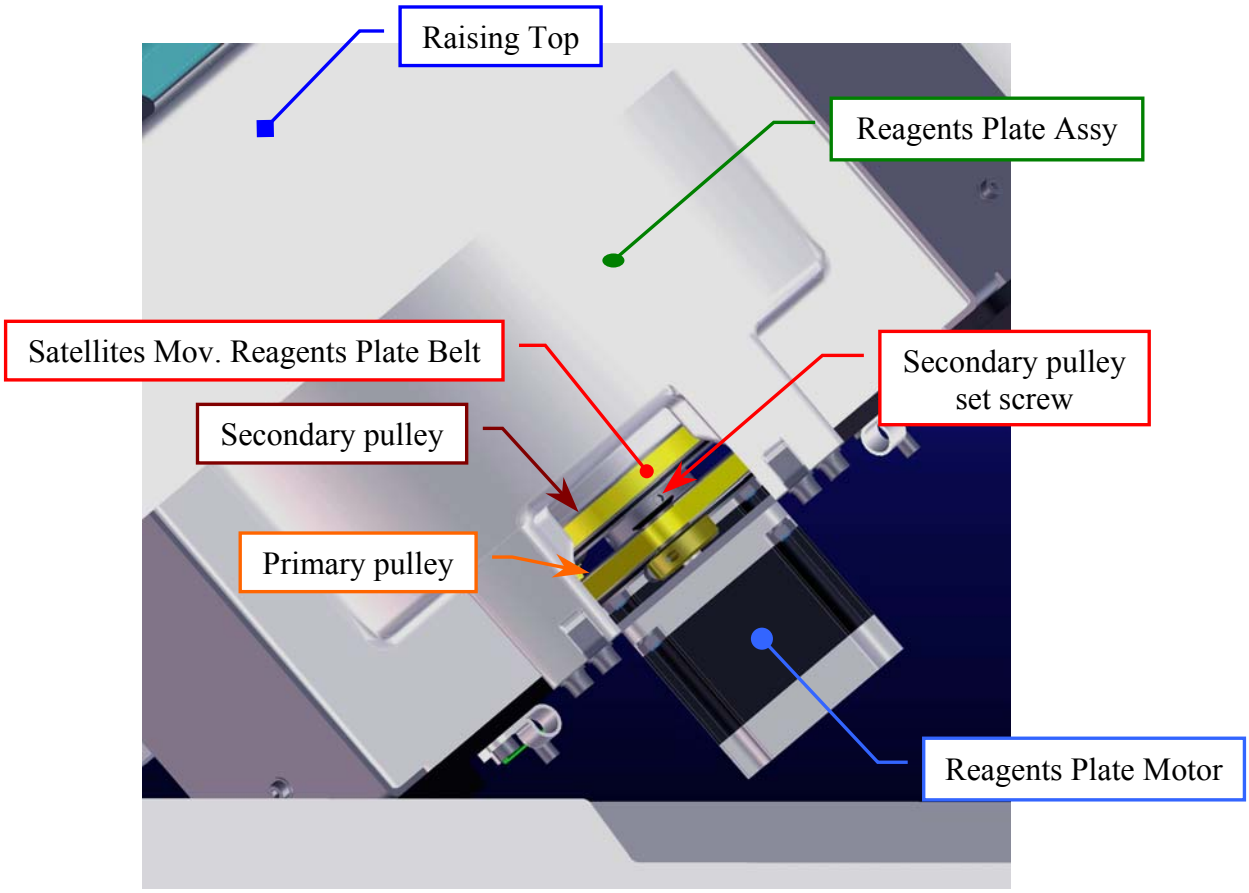


Fig. 76 – Secondary pulley of the Reagents Plate Assy

5.5.2 Remotion of the Reagents Plate Assy from the Raising Top

1. Make sure that the SAT450 instrument is turned off.
2. Lift up the instrument cover and remove the Reagents Plate cover from the Reagents Plate (Fig. 1).
3. Unscrew the two captive screws on the front underside of the instrument (Fig. 6) and lift up the Raising Top (Fig. 7).
4. Unplug the J1, J10 and J11 connectors and the ground wire from the Reagents Plate Interface Board (compare the scheme SC-30-02190-00).
5. Unscrew the cable holder screw (Fig. 75), remove the cable holder and put away the relative cables from the Reagents Plate Assy.
6. Unscrew the four Reagents Plate Assy fastening screws (Fig. 75) and take out – moving carefully – the Reagents Plate Assy from its housing.

To replace the Reagents Plate Assy (Fig. 77) perform the following steps:

7. Repeat the above steps in inverse order: from 6 to 3.
8. Perform the procedure “Mechanical adjustments of the Reagents Plate” described into the previous Section 6.5.1, from step 2 to step 16.

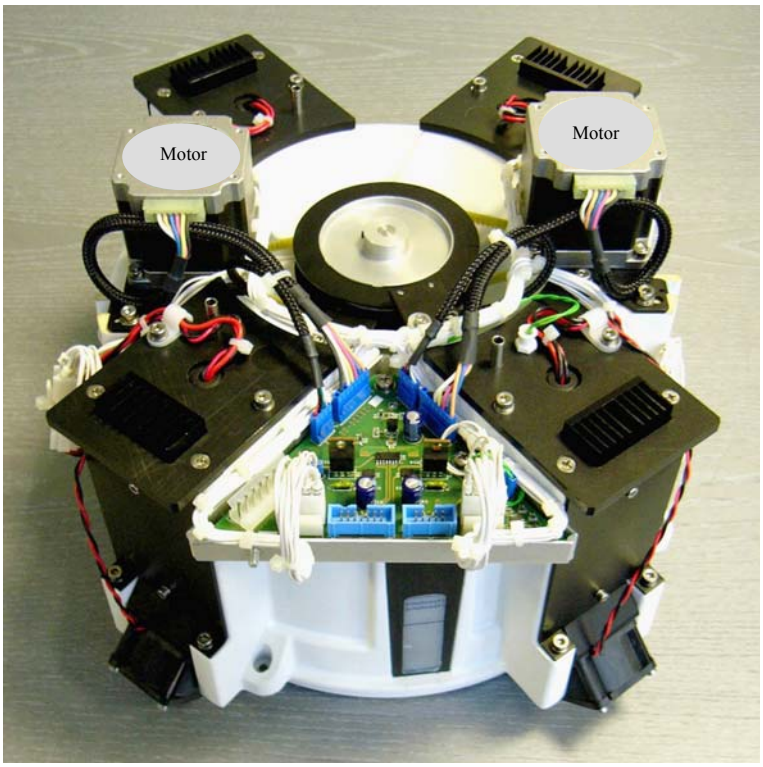


Fig. 77 – Reagents Plate Assy

5.5.3 Mechanical alignments of the Satellite Racks of the Reagents Plate

1. Remove the Reagents Plate Assy from its housing performing the relative procedure described into the previous Section 6.5.2, from step 1 to step 6.
2. Unscrew the four fastening screws of the Reagents Plate Motor (**Fig. 82**), push the motor toward the primary pulley in order to obtain the loosening of the belt, then screw one motor fastening screw.
3. Unscrew the four fastening screws of the Satellites Mov. Reagents Plate Motor (**Fig. 82**), push the motor toward the secondary pulley in order to obtain the loosening of the belt, then screw one motor fastening screw.
4. Unscrew the two fastening screws of the Reagents Plate Home Sensor (**Fig. 82**) and take out the sensor from its housing on the Reagents Plate Assy.
5. Unscrew the two fastening screws of the Satellites Mov. Reagents Plate Home Sensor (**Fig. 82**) and take out the sensor from its housing on the Reagents Plate Assy.
6. Loosen much the two set screws of the primary pulley of the Reagents Plate (**Fig. 75**).
7. Loosen much the two set screws of the secondary pulley of the Reagents Plate (**Fig. 76**).
8. Take out the plate base from the container of the Reagents Plate Assy (**Fig. 80**).
9. Identify with the names “anchor bolt I” and “anchor bolt IV” the two anchor bolt connected to the internal secondary belt of the plate base (**Fig. 79**).

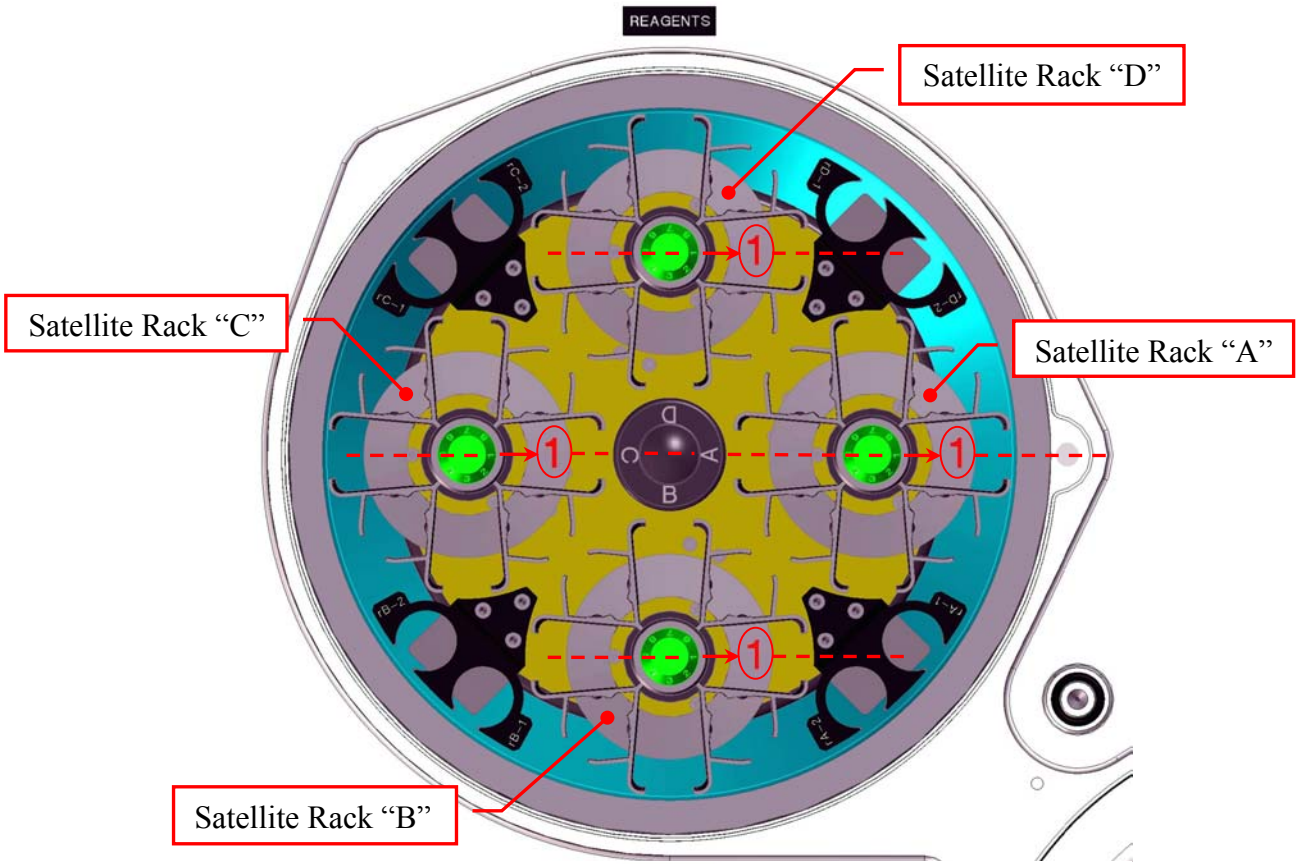


Fig. 78 – Satellite Racks "A", "B", "C", "D" of the Reagents Plate (*top view*)

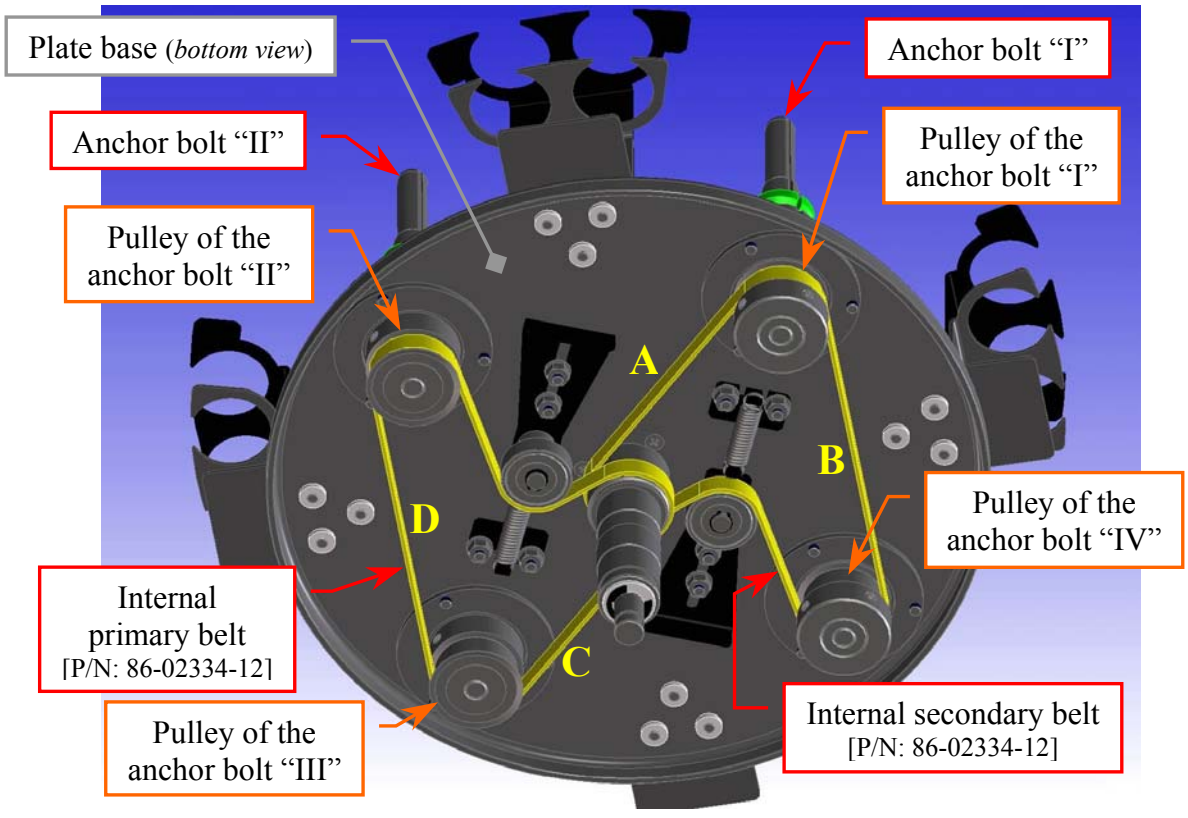


Fig. 79 – Internal primary and secondary belts of the Reagents Plate

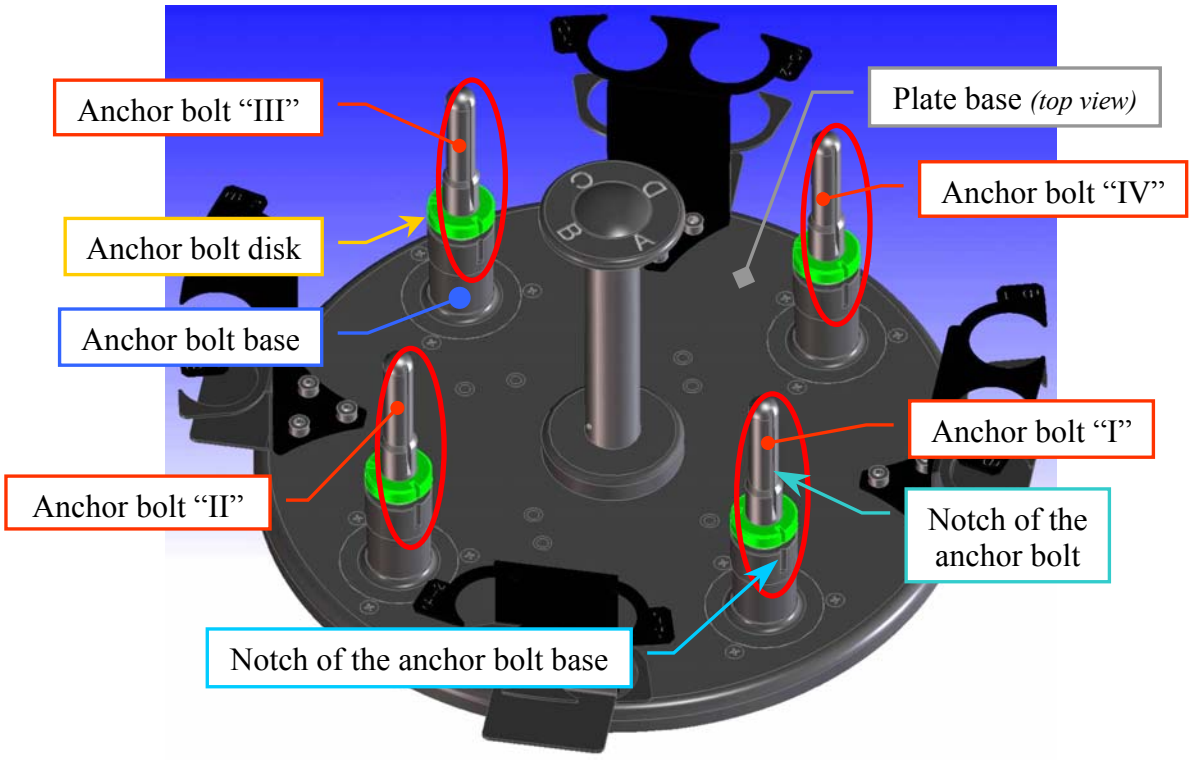


Fig. 80 – The plate base of the Reagents Plate

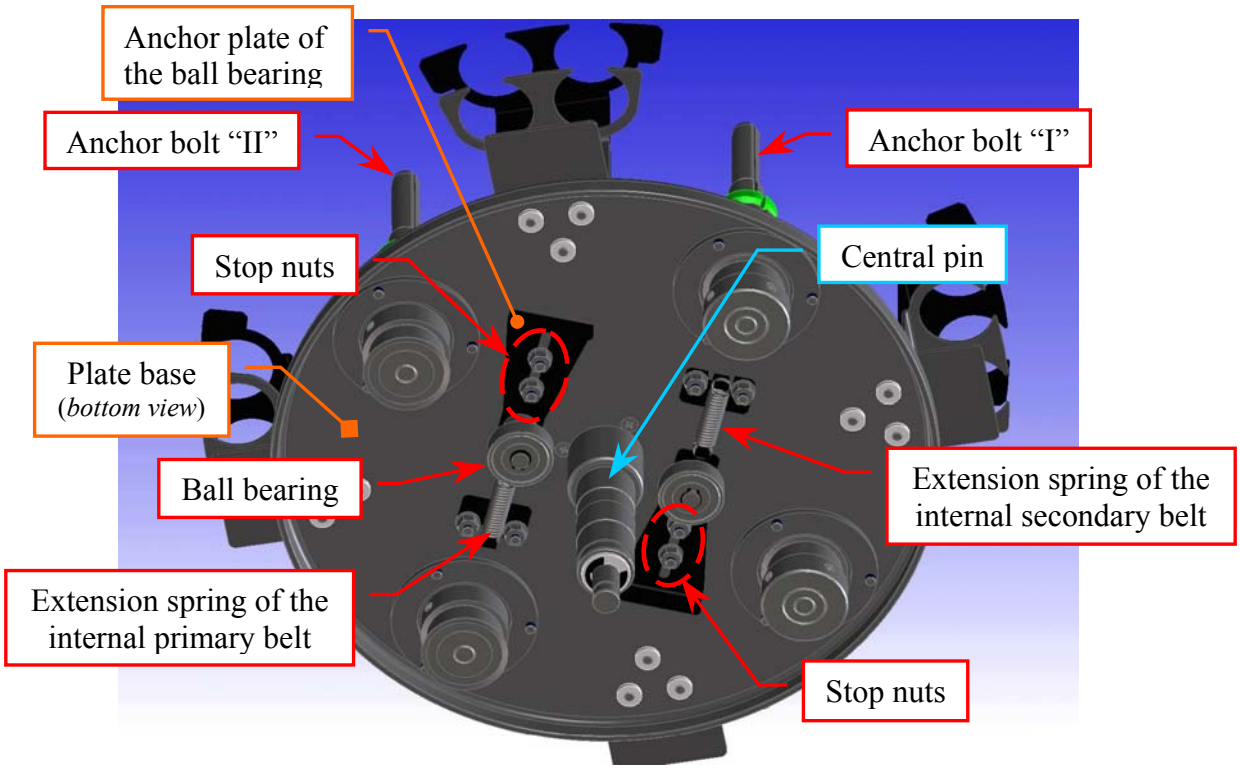


Fig. 81 – The two extension springs of the internal belts

10. Identify with the names “anchor bolt II” and “anchor bolt III” the two anchor bolt connected to the internal primary belt of the plate base (**Fig. 79**).
11. Loosen the two stop nuts of the anchor plate of the ball bearing relative to the internal primary belt, push the ball bearing until to obtain a sizable reduction in tension of the belt, then tighten one of two stop nuts (**Fig. 81**).
12. Loosen the two stop nuts of the anchor plate of the ball bearing relative to the internal secondary belt, push the ball bearing until to obtain a sizable reduction in tension of the belt, then tighten one of two stop nuts (**Fig. 81**).
13. Make sure that the internal primary and secondary belts (**Fig. 79**) are serviceability.
    - **If the internal secondary belt is not be so**, replace it with the new internal secondary belt in the following way:
        a. remove the internal primary belt from the pulley of the anchor bolt “II”, from the pulley of the anchor bolt “III” and from the pulley of the central pin;
        b. remove the internal secondary belt from the pulley of the anchor bolt “I”, from the pulley of the anchor bolt “IV” and from the pulley of the central pin;
        c. wrap the new internal secondary belt around the pulley of the anchor bolt “I”, around the pulley of the anchor bolt “IV”, around the pulley of the central pin, then tighten it slightly resting it on the relative ball bearing (**Fig. 79**);
        d. wrap the internal primary belt around the pulley of the anchor bolt “II”, around the pulley of the anchor bolt “III”, around the pulley of the central pin, then tighten it slightly resting it on the relative ball bearing (**Fig. 79**).
    - **If the internal primary belt is not be so**, replace it with the new internal primary belt in the following way:
        a. remove the belt from the pulley of the anchor bolt “II”, from the pulley of the anchor bolt “III” and from the pulley of the central pin;
        b. wrap the new internal primary belt around the pulley of the anchor bolt “II”, around the pulley of the anchor bolt “III”, around the pulley of the central pin, then tighten it slightly resting it on the relative ball bearing (**Fig. 79**).

➢ **Mechanical alignment between the two anchor bolts “I” and “IV”:**

14. Bring into alignment the notch of the anchor bolt “I” with respect to the notch of its base (**Fig. 80**) and – on the other side of the plate base – place in tension the part of the belt placed between the pulley of the anchor bolt “I” and the respective pulley on the central pin (part “A” of the belt in the **Fig. 79**) wrapping correctly the belt on them.
15. Bring into alignment the notch of the anchor bolt “IV” with respect to the notch of its base (**Fig. 80**) and – on the other side of the plate base – place in tension also the part of the belt placed between the pulley of the anchor bolt “I” and the pulley of the anchor bolt “IV” (part “B” of the belt in the **Fig. 79**) wrapping correctly the belt on the latter.
16. Loosen the stop nut of the anchor plate of the ball bearing relative to the internal secondary belt, leave free the ball bearing in order to obtain the right tension of the belt by means of the extension spring, then tighten the two stop nuts (**Fig. 81**).
17. Turn the central pin and make sure that the internal secondary belt thoots are correctly inserted on its pulley, on the pulley of the anchor bolt “I” and on the pulley of the anchor bolt “IV”.
18. Make sure that the notch of the anchor bolt “I” is aligned with respect to the notch of the anchor bolt “IV”.

- **Mechanical alignment between the two anchor bolts "II" and "III" and them with respect to the two anchor bolts "I" and "IV":**

19. Turn the anchor bolt "I" until to obtain the alignment of the notchs of the anchor bolts "I" and "IV" with respect to the respectives notchs of theirs bases.
20. Bring into alignment the notch of the anchor bolt "III" with respect to the notch of its base (**Fig. 80**) and – on the other side of the plate base – place in tension the part of the belt placed between the pulley of the anchor bolt "III" and the respective pulley on the central pin (part "C" of the belt in the **Fig. 79**) wrapping correctly the belt on them.
21. Bring into alignment the notch of the anchor bolt "II" with respect to the notch of its base (**Fig. 80**) and – on the other side of the plate base – place in tension also the part of the belt placed between the pulley of the anchor bolt "III" and the pulley of the anchor bolt "II" (part "D" of the belt in the **Fig. 79**) wrapping correctly the belt on the latter.
22. Loosen the stop nut of the anchor plate of the ball bearing relative to the internal primary belt, leave free the ball bearing in order to obtain the right tension of the belt by means of the extension spring, then tighten the two stop nuts (**Fig. 81**).
23. Turn the central pin and make sure that the internal primary belt thoots are correctly inserted on its pulley, on the pulley of the anchor bolt "II" and on the pulley of the anchor bolt "III".
24. Make sure that the notchs of the four anchor bolts "I", "II","III" and "IV" are aligned between them.

To replace the plate base (Reagents Plate support having P/N: 05-02271-01) in the Reagents Plate Assy (**Fig. 77**) and the Reagents Plate Assy in the instrument (**Fig. 75**) perform the following steps:

25. Put the plate base into the container of the Reagents Plate Assy inserting the central pin into the apposite hole until the end of the run.
26. Lock on well the primary and secondary pulley over the container and between them, then tighten the two set screws of the primary pulley and the two set screws of the secondary pulley of the Reagents Plate (**Fig. 75**).
27. Perform the procedure "Replacement of the Satellites Mov. Reagents Plate Belt" described into the next Section 6.5.9, from step 5 to step 14.

Note well	The **Fig. 78** shows the position #1 of the Satellite Rack "A" contemporaneously aligned with respect to the position #1 of the Satellite Racks "B", "C" and "D" in the *home position* of the Reagents Plate.

5.5.4 Replacement of the Reagents Plate Motor

1. Make sure that the SAT450 instrument is turned off, then unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
2. Unplug the J5 connector from the Reagents Plate Interface Board (compare the sch. SC-30-02190-00).
3. Unscrew the four fastening screws of the Reagents Plate Motor (**Fig. 82**).

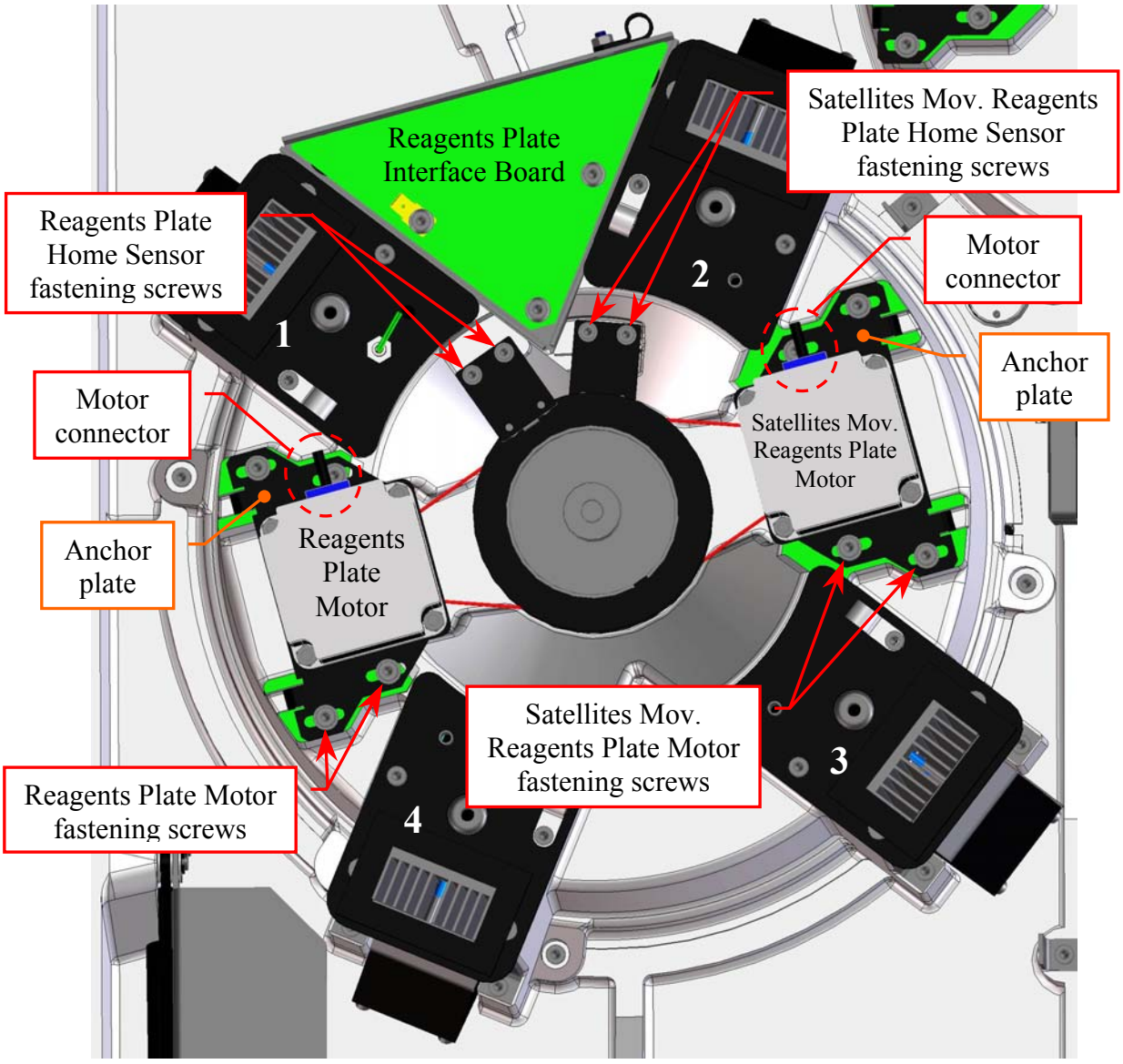


Fig. 82 – Reagents Plate Motor and Satellites Mov. Reagents Plate Motor

4. Remove the belt from the pulley of the Reagents Plate Motor and take out it from its housing and the two anchor plate springs from the anchor plate.
5. Unscrew the four fastening screws of the Reagents Plate Motor anchor plate (**Fig. 83**) and take out the anchor plate from the motor.

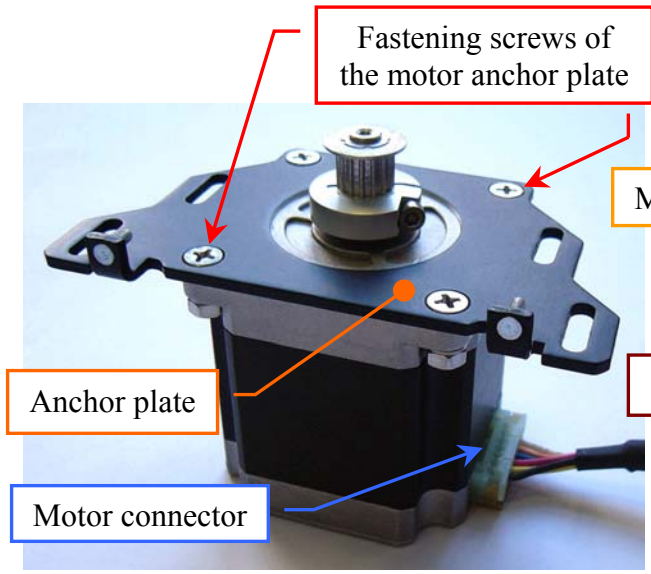


Fig. 83 – Reagents Plate Motor anchor plate

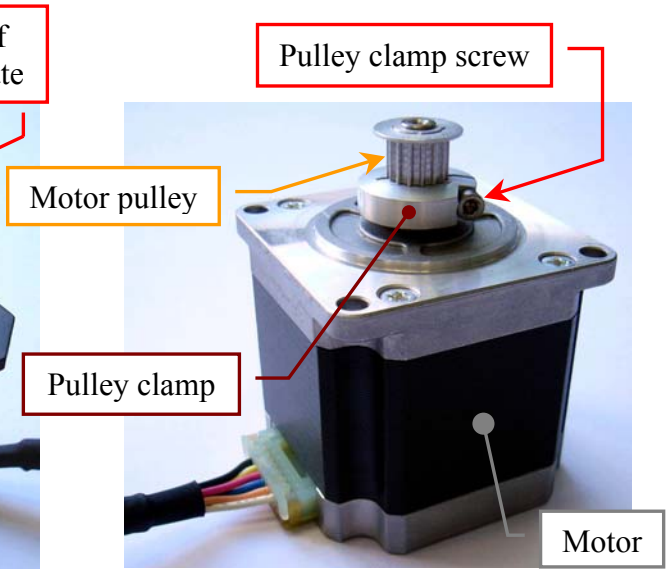


Fig. 84 – Motor pulley

6. Loosen the pulley clamp screw and extract the pulley clamp and the pulley from the motor shaft (**Fig. 84**).

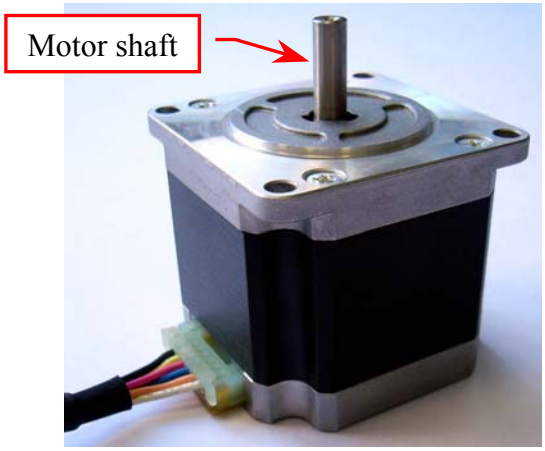


Fig. 85 – Reagents Plate Motor / Satellites Mov. Reagents Plate Motor
[P/N: 9-10-0016-00]

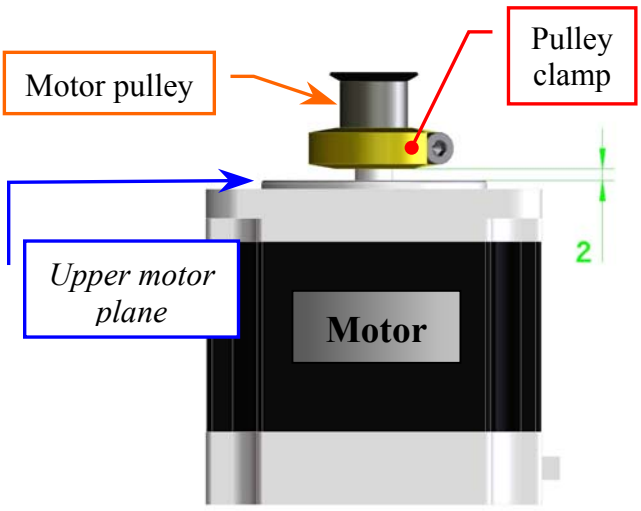


Fig. 86 – Plate Motor (*scheme*)

To replace the new Reagents Plate Motor (**Fig. 85**) perform the following steps:

7. Insert the pulley clamp completely on the motor pulley (**Fig. 86**) and then insert all two on the motor shaft.
8. Position the motor pulley to **2.00 mm** with respect to upper motor plane (**Fig. 86**), then tighten the pulley clamp screw (**Fig. 84**).
9. Position the anchor plate on the upper plane of the new motor as showed in **Fig. 83** and screw its four fastening screws.

10. Position the Reagents Plate Motor on its housing with the side of the motor connector oriented towards the Reagents Plate Interface Board (**Fig. 82**) and with the anchor plate springs placed in the relative slits, then tighten slightly its four fastening screws.
11. Push the motor toward the primary pulley, wrap the belt around the motor pulley, then leave free the motor (note: the anchor plate springs give the right tension to the belt).
12. Turn the primary pulley and make sure that the belt thoots are correctly inserted on the Reagents Plate Motor pulley and on the primary pulley.
13. Tighten the four fastening screws of the Reagents Plate Motor (**Fig. 82**).
14. Plug the Reagents Plate Motor connector in the J5 connector of the Reagents Plate Interface Board (compare the scheme SC-30-02190-00).
15. Bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
16. Perform the procedure "Mechanical adjustments of the Reagents Plate" described into the previous Section 6.5.1.

5.5.5 Replacement of the Satellites Mov. Reagents Plate Motor

1. Make sure that the SAT450 instrument is turned off, then unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
2. Unplug the J3 connector from the Reagents Plate Interface Board (compare the sch. SC-30-02190-00).
3. Unscrew the four fastening screws of the Satellites Mov. Reagents Plate Motor (**Fig. 82**).
4. Remove the belt from the pulley of the Satellites Mov. Reagents Plate Motor and take out it from its housing and the two anchor plate springs from the anchor plate.
5. Unscrew the four fastening screws of the Satellites Mov. Reagents Plate Motor anchor plate (**Fig. 87**) and take out the anchor plate from the motor.

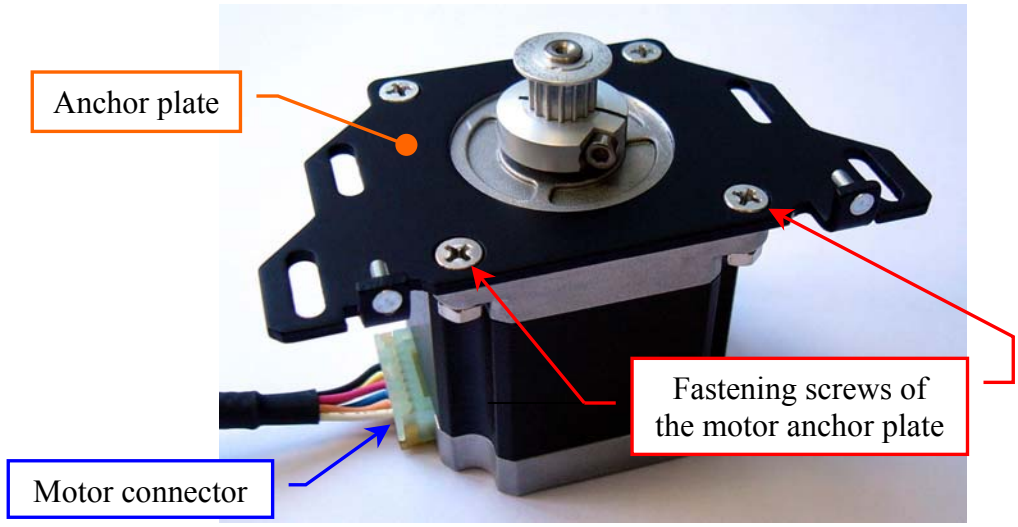


Fig. 87 – Satellites Mov. Reagents Plate Motor anchor plate

6. Loosen the pulley clamp screw and extract the pulley clamp and the pulley from the motor shaft (**Fig. 84**).

To replace the new Satellites Mov. Reagents Plate Motor (**Fig. 85**) perform the following steps:

7. Insert the pulley clamp completely on the motor pulley (**Fig. 86**) and then insert all two on the motor shaft.
8. Position the motor pulley to **2.00 mm** with respect to upper motor plane (**Fig. 86**), then tighten the pulley clamp screw.
9. Position the anchor plate on the upper plane of the new motor as showed in **Fig. 87** and screw its four fastening screws.
10. Position the Satellites Mov. Reagents Plate Motor on its housing with the side of the motor connector oriented towards the Reagents Plate Interface Board (**Fig. 82**) and with the anchor plate springs placed in the relative slits, then tighten slightly its four fastening screws.
11. Push the motor toward the secondary pulley, wrap the belt around the motor pulley, then leave free the motor (note: the anchor plate springs give the right tension to the belt).
12. Turn the secondary pulley and make sure that the belt thoots are correctly inserted on the Satellites Mov. Reagents Plate Motor pulley and on the secondary pulley.
13. Tighten the four fastening screws of the Satellites Mov. Reagents Plate Motor (**Fig. 82**).
14. Plug the Satellites Mov. Reagents Plate Motor connector in the J3 connector of the Reagents Plate Interface Board (compare the scheme SC-30-02190-00).
15. Bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
16. Perform the procedure “Mechanical adjustments of the Reagents Plate” described into the previous Section 6.5.1.

5.5.6 Replacement of the Reagents Plate Home Sensor

1. Make sure that the SAT450 instrument is turned off.
2. Unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
3. Unplug the J4 connector from the Reagents Plate Interface Board (compare the sch. SC-30-02190-00).
4. Unscrew the two fastening screws of the Reagents Plate Home Sensor (**Fig. 82**) and take out the sensor from its housing on the Reagents Plate Assy.
5. Unscrew the two keep plate fastening screws of the Reagents Plate Home Sensor (**Fig. 88**) and take out the sensor from the keep plate.

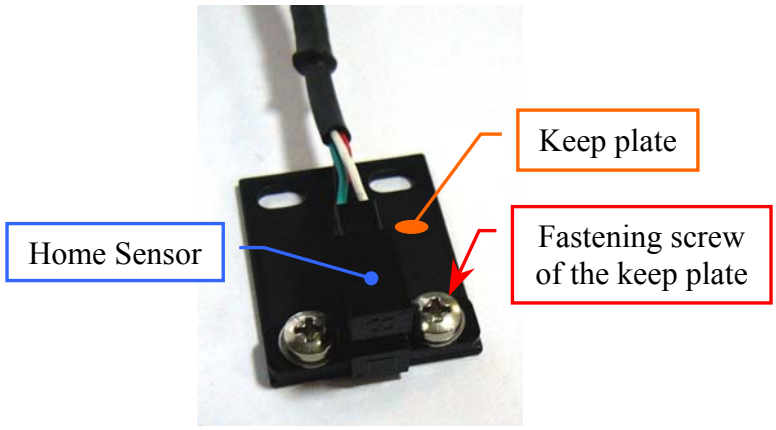


Fig. 88 – Keep plate fastening screws of the Home Sensor

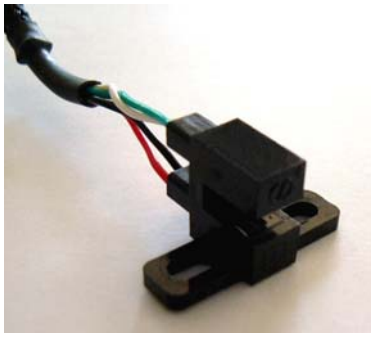


Fig. 89 – Home Sensor Assy [P/N: 9-10-0023-20]

To replace the new Reagents Plate Home Sensor (**Fig. 89**) perform the following steps:

6. Position the keep plate below the new home sensor as showed in **Fig. 88**, center the sensor with respect to the keep plate and screw its two fastening screws.
7. Position the new home sensor on its housing of the Reagents Plate Assy - as showed in **Fig. 82** - in order to obtain that the primary pulley disk is centered with respect to the internal sides of the home sensor.
8. Screw the two fastening screws of the Reagents Plate Home Sensor (**Fig. 82**).
9. Turn the primary pulley and make sure that the primary pulley disk does not touch the Reagents Plate Home Sensor.
10. Plug the Reagents Plate Home Sensor connector in the J4 connector of the Reagents Plate Interface Board (compare the scheme SC-30-02190-00).
11. Bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
12. Perform the procedure "Mechanical adjustments of the Reagents Plate" described into the previous Section 6.5.1 .

5.5.7 Replacement of the Satellites Mov. Reagents Plate Home Sensor

1. Make sure that the SAT450 instrument is turned off.
2. Unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
3. Unplug the J2 connector from the Reagents Plate Interface Board (compare the sch. SC-30-02190-00).
4. Unscrew the two fastening screws of the Satellites Mov. Reagents Plate Home Sensor (**Fig. 82**) and take out the sensor from its housing on the Reagents Plate Assy.
5. Unscrew the two keep plate fastening screws of the Satellites Mov. Reagents Plate Home Sensor (**Fig. 88**) and take out the sensor from the keep plate.

To replace the new Sat. Mov. Reagents Plate Home Sensor (**Fig. 89**) perform the following steps:

6. Position the keep plate below the new home sensor as showed in **Fig. 88**, center the sensor with respect to the keep plate and screw its two fastening screws.
7. Position the new home sensor on its housing of the Reagents Plate Assy - as showed in **Fig. 82** - in order to obtain that the secondary pulley disk is centered with respect to the internal sides of the home sensor.
8. Screw the two fastening screws of the Satellites Mov. Reagents Plate Home Sensor (**Fig. 82**).
9. Turn the secondary pulley and make sure that the secondary pulley disk does not touch the Reagents Plate Home Sensor.
10. Plug the Satellites Mov. Reagents Plate Home Sensor connector in the J2 connector of the Reagents Plate Interface Board (compare the scheme SC-30-02190-00).
11. Bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
12. Perform the procedure “Mechanical adjustments of the Reagents Plate” described into the previous Section 6.5.1.

5.5.8 Replacement of the Reagents Plate Belt

1. Make sure that the SAT450 instrument is turned off, then unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
2. Loosen the four fastening screws of the Reagents Plate Motor and remove the Reagents Plate Belt from the pulley of the Reagents Plate Motor (**Fig. 82**).
3. Unscrew the two fastening screws of the Reagents Plate Home Sensor (**Fig. 82**) and take out the sensor from its housing on the Reagents Plate Assy.
4. Remove the Reagents Plate Belt from the primary pulley (**Fig. 82**).

To replace the new Reagents Plate Belt (**Fig. 90**) perform the following steps:

5. Wrap the new belt around the primary pulley.
6. Push the Reagents Plate Motor toward the primary pulley, wrap the new belt around the motor pulley, then leave free the motor (note: the anchor plate springs give the right tension to the belt).

7. Turn the primary pulley and make sure that the new belt thoots are correctly inserted on the Reagents Plate Motor pulley and on the primary pulley.
8. Tighten the four fastening screws of the Reagents Plate Motor (**Fig. 82**).
9. Position the Reagents Plate Home Sensor on its housing of the Reagents Plate Assy - as showed in **Fig. 82** - in order to obtain that the primary pulley disk is centered with respect to the internal sides of the home sensor.
10. Screw the two fastening screws of the Reagents Plate Home Sensor (**Fig. 82**).
11. Turn the primary pulley and make sure that the primary pulley disk does not touch the Reagents Plate Home Sensor.
12. Bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
13. Perform the procedure "Mechanical adjustments of the Reagents Plate" described into the previous Section 6.5.1 .

Fig. 90 – Plate Belt [P/N: 86-02334-11]

5.5.9 Replacement of the Satellites Mov. Reagents Plate Belt

1. Remove the Reagents Plate Belt from the Reagents Plate Assy performing the relative procedure described into the previous Section 6.5.8, from step 1 to step 4.
2. Loosen the four fastening screws of the Satellites Mov. Reagents Plate Motor and remove the Satellites Mov. Reagents Plate Belt from the pulley of the Satellites Mov. Reagents Plate Motor (**Fig. 82**).
3. Unscrew the two fastening screws of the Satellites Mov. Reagents Plate Home Sensor (**Fig. 82**) and take out the sensor from its housing on the Reagents Plate Assy.
4. Remove the Satellites Mov. Reagents Plate Belt from the secondary pulley (**Fig. 82**).

To replace the new Satellites Mov. Reagents Plate Belt (**Fig. 90**) perform the following steps:

5. Wrap the new belt around the secondary pulley.
6. Push the Satellites Mov. Reagents Plate Motor toward the secondary pulley, wrap the new belt around the motor pulley, then leave free the motor (note: the anchor plate springs give the right tension to the belt).
7. Turn the secondary pulley and make sure that the new belt thoots are correctly inserted on the Satellites Mov. Reagents Plate Motor pulley and on the secondary pulley.
8. Tighten the four fastening screws of the Satellites Mov. Reagents Plate Motor (**Fig. 82**).

9. Position the Satellites Mov. Reagents Plate Home Sensor on its housing of the Reagents Plate Assy - as showed in **Fig. 82** - in order to obtain that the secondary pulley disk is centered with respect to the internal sides of the home sensor.
10. Screw the two fastening screws of the Satellites Mov. Reagents Plate Home Sensor (**Fig. 82**).
11. Turn the secondary pulley and make sure that the secondary pulley disk does not touch the Satellites Mov. Reagents Plate Home Sensor.
12. Replace the Reagents Plate Belt in the Reagents Plate Assy performing the relative procedure described into the previous Section 6.5.8, from step 5 to step 11.
13. Bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
14. Perform the procedure "Mechanical adjustments of the Reagents Plate" described into the previous Section 6.5.1 .

5.5.10 Replacement of the Cooler Module

1. Make sure that the SAT450 instrument is turned off.
2. Unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
3. Unplug the connector of the Cooler Module's cables from the relative connector of the Reagents Plate wiring (P/N: 50-02602-00) as showed in the scheme SC-30-02190-00.
4. Unscrew the six fastening screws of the Cooler Module (**Fig. 91**) and take out the Cooler Module from its housing on the Reagents Plate Assy (note: unscrewing the four fastening screw placed on the Cooler Module plate, it and the remain part of the module do not keep together).

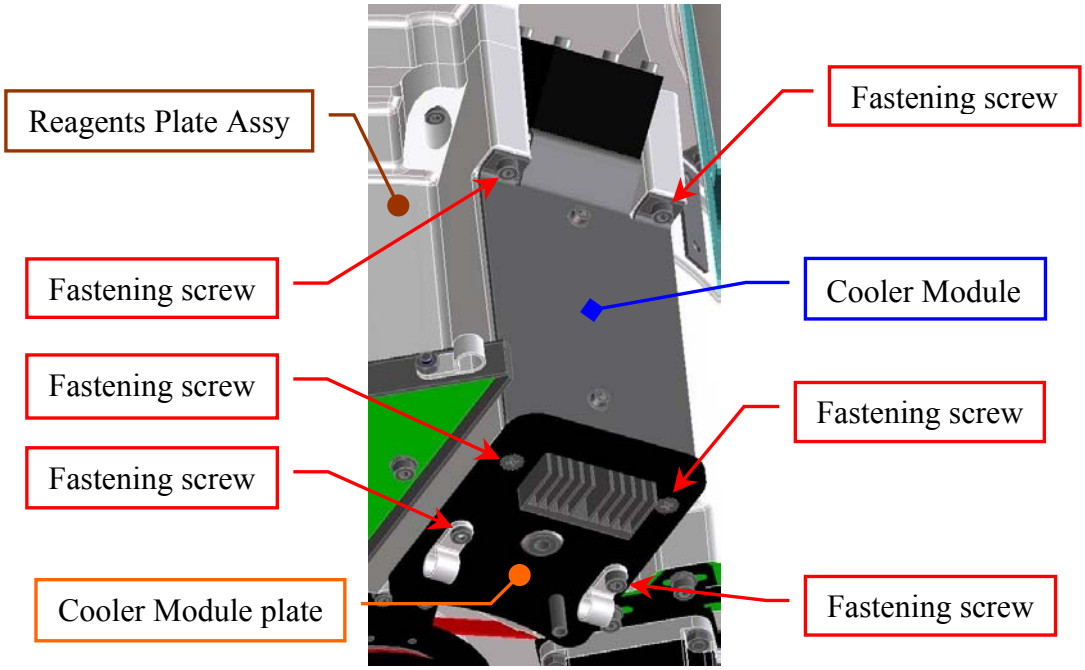


Fig. 91 – Cooler Module [P/N:10-02536-01] on the Reagents Plate Assy

To replace the new Cooler Module (compare the scheme MA-10-02536-01) perform the above steps in inverse order: from 4 to 2.

Replace the Cooler Module in the Reagents Plate Assy inserting the module from the bottom towards the top in its housing.

5.5.11 Replacement of the Cooler Module with Temperature Sensor

1. Make sure that the SAT450 instrument is turned off.
2. Unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
3. Unplug the connector of the Cooler Module's cables from the relative connector of the Reagents Plate wiring (P/N: 50-02602-00) as showed in the scheme SC-30-02190-00.
4. Unplug the J7 connector of the Cooler Temperature Sensor (P/N: 05-02351-28) from the Reagents Plate Interface Board (compare the scheme SC-30-02190-00).
5. Unscrew the six fastening screws of the Cooler Module with Temperature Sensor (**Fig. 92**) and take out the Cooler Module from its housing on the Reagents Plate Assy (note well: unscrewing the four fastening screw placed on the Cooler Module plate, it and the remain part of the module do not keep together).

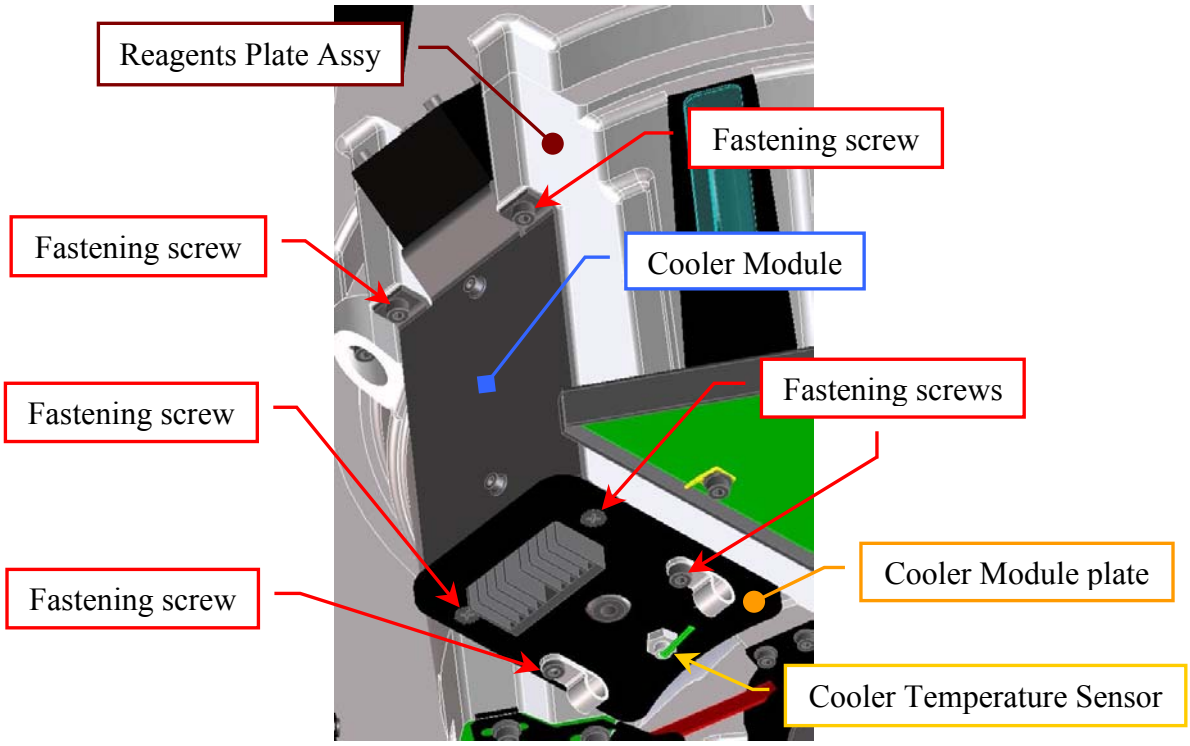


Fig. 92 – Cooler Module with Temperature Sensor [P/N: 10-02536-00] on the Reagents Plate Assy

To replace the new Cooler Module with Temperature Sensor (compare the sch. MA-10-02536-00), perform the above steps in inverse order: from 5 to 2.

Replace the Cooler Module with Temperature Sensor in the Reagents Plate Assy inserting the module from the bottom towards the top in its housing.

5.5.12 Replacement of the Cooler Temperature Sensor

1. Make sure that the SAT450 instrument is turned off.
2. Unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
3. Unplug the J7 connector of the Cooler Temperature Sensor (P/N: 05-02351-28) from the Reagents Plate Interface Board (compare the scheme SC-30-02190-00).
4. Unscrew the Cooler Temperature Sensor from the plate of the relative Cooler Module with P/N: 10-02536-00 (compare the scheme MA-10-02536-00 and the **Fig. 92**).

To replace the new Cooler Temperature Sensor (**Fig. 93**) perform the above steps in inverse order: from 4 to 2.

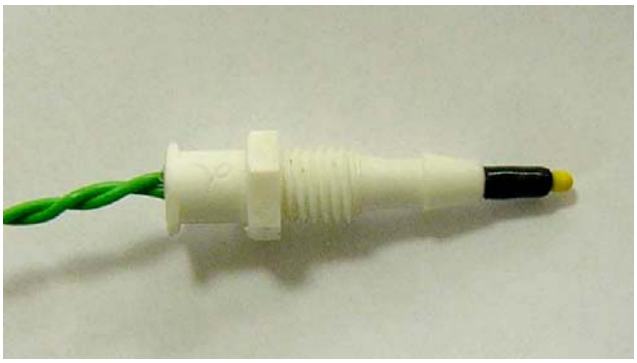


Fig. 93 – Cooler Temperature Sensor [P/N: 05-02351-30]

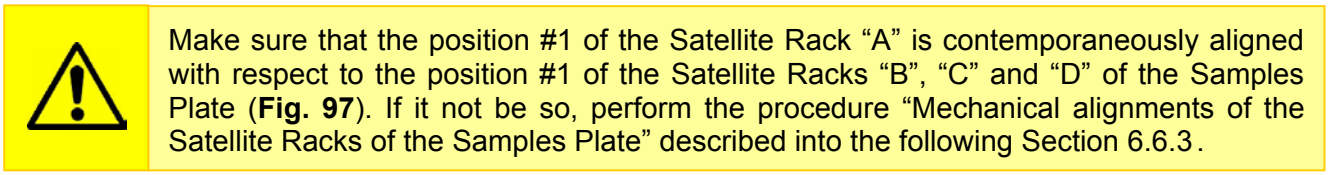
Note on the Cooler Modules

The Peltier cells of the Cooler Modules “1” and “3” (compare the Fig. 82) constitute the *Peltier cells Assy 2*, whereas the Peltier cells of the Cooler Modules “2” and “4” constitute the *Peltier cells Assy 1*.

The lighting of the two yellow leds LD1 and LD2 of the Reagents Plate Interface Board show the power up to the *Peltier cells Assy 1* and to the *Peltier cells Assy 2*, respectively (compare the scheme SE-30-02190-00).

5.6 SAMPLES PLATE

5.6.1 Mechanical adjustments of the Samples Plate



1. Lift up the instrument cover, remove the Samples Plate cover and the Sample Plate safety protection (**Fig. 7**) from the Samples Plate.
2. Turn on the SAT450 system (instrument and computer) and launch the “Diagnostic” program.
3. Select "Plates” folder and request an Samples Plate reset. Wait until the reset Samples Plate procedure has been completed.
4. Make sure that the two Home Sensors of the Samples Plate light up in green.
5. Select “Arm” folder and request an Arm reset. Wait until the reset Sampling Arm procedure has been completed.
6. Make sure that the Vertical and Horizontal Home Sensors of the Sampling Arm light up in green.
7. Select "Plates” folder, choose the **N° Cup #68** of the Samples Plate, then click the correspondent “To Asp.” button. Wait until the requested operation has been completed.
8. Select “Arm” folder, choose the “(sA..sD)” option of the “Go Sample” button, click the “Go Sample” button, then click the correspondent “Down” button. The Sampling Arm will move to selected aspiration position of the Samples Plate, then it will go down until to reach the right height.
9. Make sure that the Sampling Probe is centered with respect to the position #68 (sD-2 position) of the Samples Plate. If it not be so, center the four Peripheral Racks of the Samples Plate in the following way:
    a. unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**);
    b. loosen the two set screws of the primary pulley of the Samples Plate (**Fig. 94**);
    c. center the position #68 (sD-2 position) with respect to the Sampling Probe, rotating slowly the Samples Plate;
    d. tighten the two set screws of the primary pulley of the Samples Plate (**Fig. 94**);
    e. bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
10. Select "Arm” folder and request an Arm reset. Wait until the reset Sampling Arm procedure has been completed.
11. Select "Plates” folder and request an Samples Plate reset. Wait until the reset Samples Plate procedure has been completed.
12. Select the **N° Cup #1** of the Samples Plate, then click the correspondent “To Asp.” button. Wait until the requested operation has been completed.
13. Select "Arm” folder, choose the “Sat (A..D) Pos. 1” option of the “Go Sample” button, click the “Go Sample” button, then click the correspondent “Down” button. The Sampling Arm will move to selected aspiration position of the Samples Plate, then it will go down until to reach the right height.

14. Make sure that the Sampling Probe is centered with respect to the position #1 of the Samples Plate (note: the position#1 of the Samples Plate is the position#1 of the Satellite Rack "A"). If it not be so, center the four Satellite Racks of the Samples Plate in the following way:
    f. unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**);
    g. loosen the two set screws of the secondary pulley of the Samples Plate (**Fig. 95**);
    h. center the position #1 of the Satellite Rack "A" with respect to the Sampling Probe, rotating slowly the Satellite Rack "A";
    i. lever on the primary pulley with a flat head screwdriver in order to obtain that the secondary pulley is locked on the end of the run, and then tighten the two set screws of the secondary pulley of the Samples Plate (**Fig. 95**);
    j. bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
15. Request an Arm reset in the "Arm" folder. Wait until the reset Sampling Arm procedure has been completed.
16. Make sure that the Vertical and Horizontal Home Sensors of the Sampling Arm light up in green.
17. Select "Plates" folder and request a Samples Plate reset. Wait until the reset Samples Plate procedure has been completed.
18. Make sure that the two Home Sensors of the Samples Plate light up in green.
19. Replace the Samples Plate cover and the Samples Plate safety protection on the Samples Plate (**Fig. 7**) and bring down the instrument cover (**Fig. 7**).

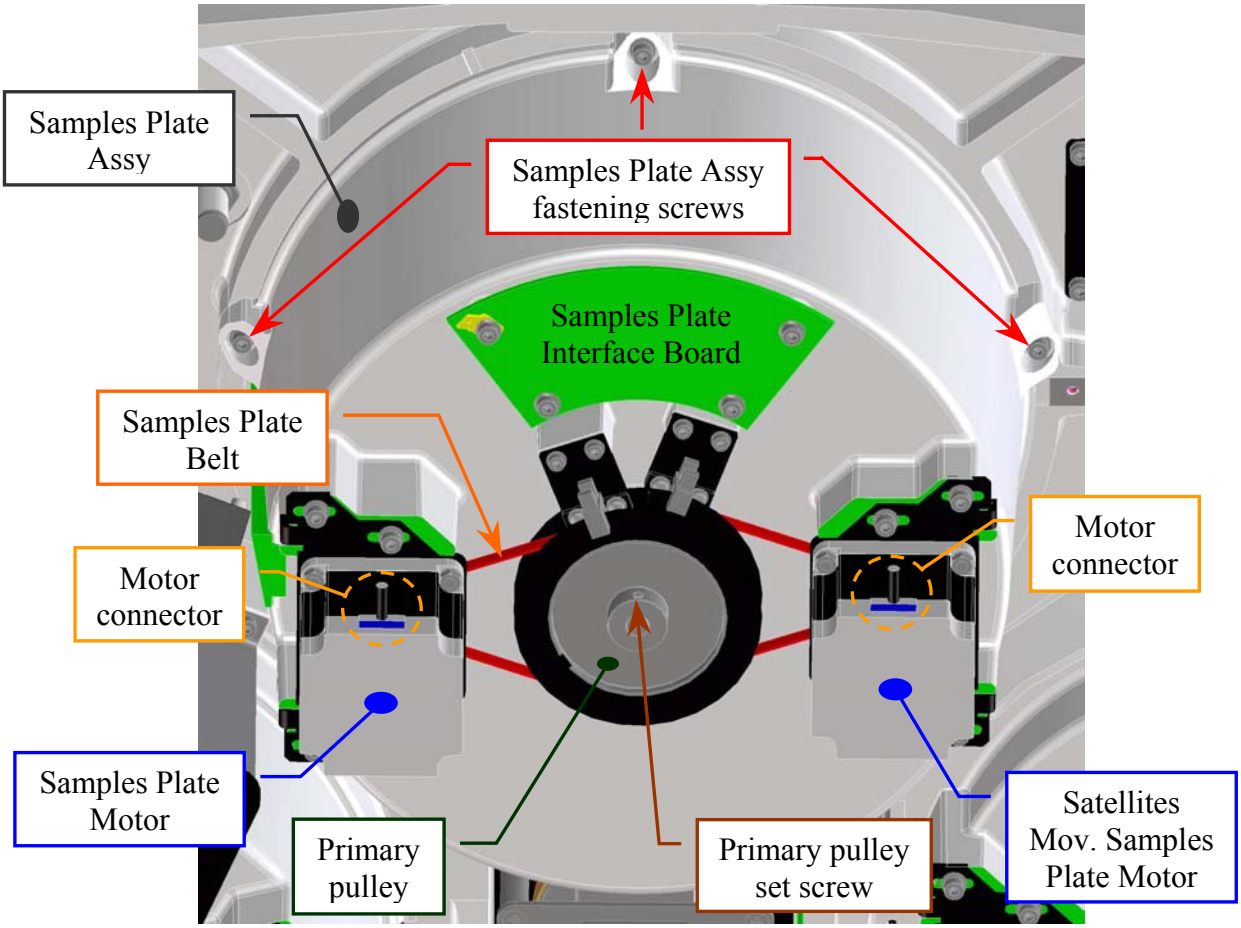


Fig. 94 – Primary pulley of the Samples Plate Assy

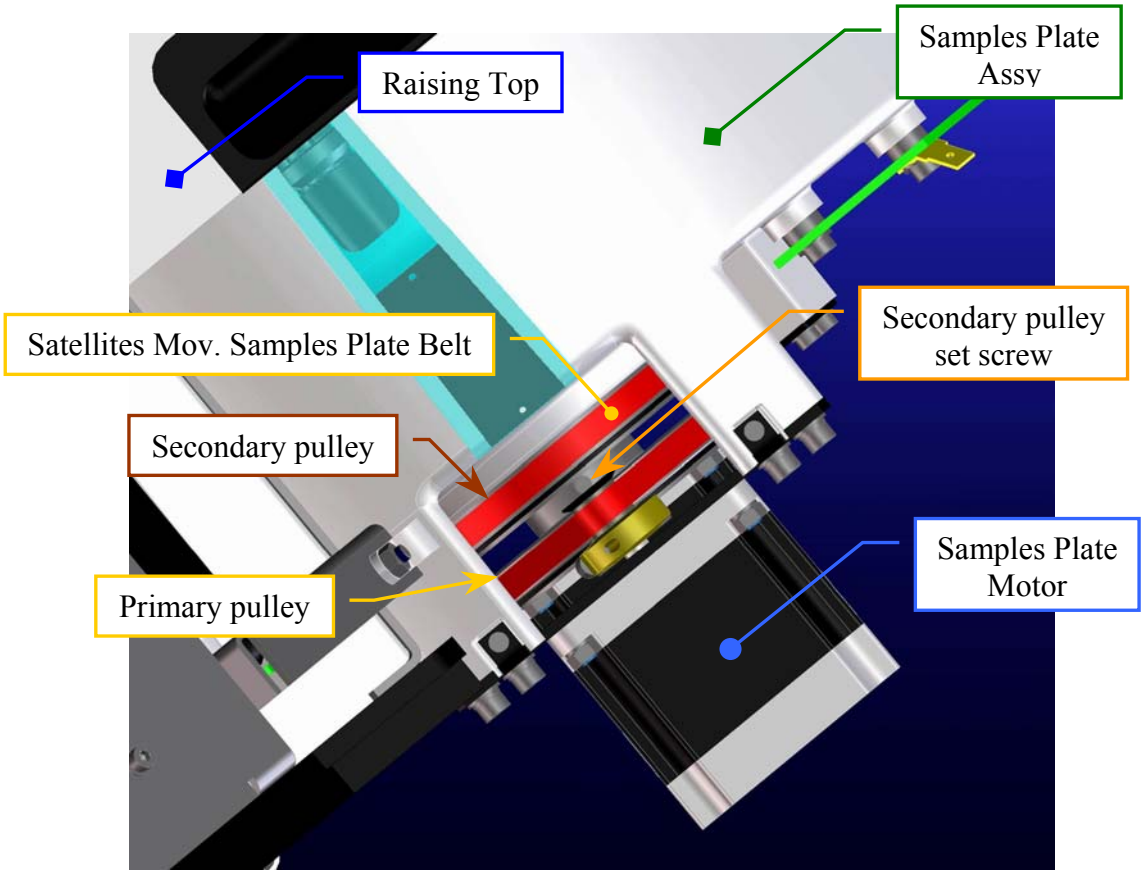


Fig. 95 – Secondary pulley of the Samples Plate Assy

5.6.2 Remotion of the Samples Plate Assy from the Raising Top

1. Make sure that the SAT450 instrument is turned off.
2. Lift up the instrument cover, then remove the Samples Plate cover and the Samples Plate safety protection (**Fig. 7**) from the Samples Plate.
3. Unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
4. Unplug the J1, J4, J5, J8, J13 and J14 connectors and the ground wire from the Samples Plate Interface Board (compare the scheme SC-30-02191-00).
5. Unscrew the five Samples Plate Assy fastening screws (**Fig. 94**) and take out – moving carefully – the Samples Plate Assy from its housing.

To replace the Samples Plate Assy (**Fig. 96**) perform the following steps:

6. Repeat the above steps in inverse order: from 5 to 3.
7. Perform the procedure “Mechanical adjustments of the Samples Plate” described into the previous Section 6.6.1, from step 2 to step 19.

Fig. 96 – Samples Plate Assy

5.6.3 Mechanical alignments of the Satellite Racks of the Samples Plate

1. Remove the Samples Plate Assy from its housing performing the relative procedure described into the previous Section 6.6.2, from step 1 to step 5.
2. Considering that the plate base of the Samples Plate is just alike to the plate base of the Reagents Plate (with the exception of the four Peripheral Racks), perform the procedure described into the previous Section 6.5.3, from step 2 to step 24, on the Samples Plate Assy.

   To replace the plate base (Samples Plate support having P/N: 05-02271-00) in the Samples Plate Assy (**Fig. 96**) and the Samples Plate Assy in the instrument (**Fig. 94**) perform the following steps:
3. Put the plate base into the container of the Samples Plate Assy inserting the central pin into the apposite hole until the end of the run.
4. Lock on well the primary and secondary pulley over the container and between them, then tighten the two set screws of the primary pulley and the two set screws of the secondary pulley of the Samples Plate (**Fig. 94**).
5. Perform the procedure "Replacement of the Satellites Mov. Samples Plate Belt" described into the next Section 6.6.9, from step 5 to step 14.

Note well	The **Fig. 97** shows the position #1 of the Satellite Rack "A" contemporaneously aligned with respect to the position #1 of the Satellite Racks "B", "C" and "D" in the *home position* of the Samples Plate.

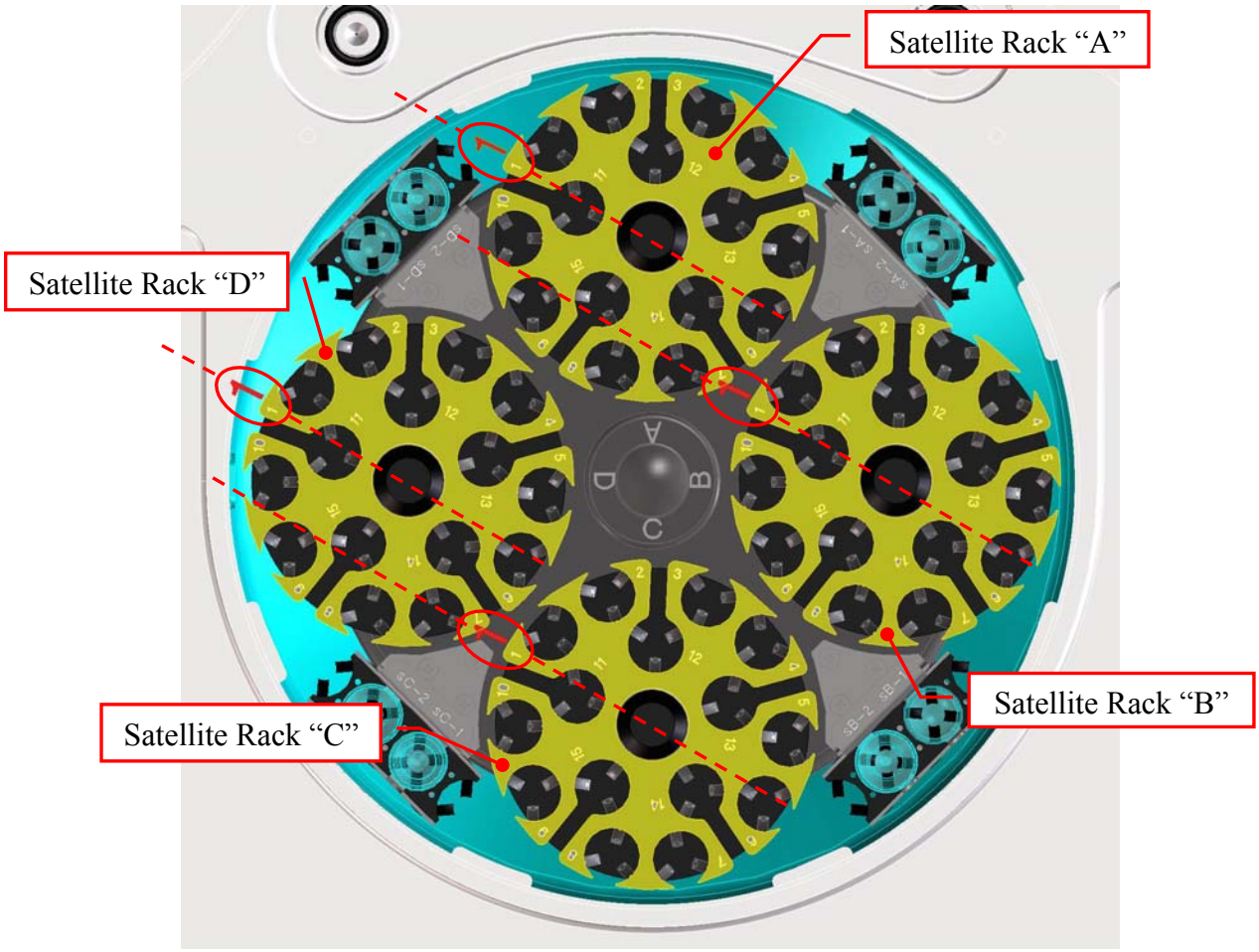


Fig. 97 – Satellite Racks “A”, “B”, “C”, “D” of the Samples Plate (top view)

5.6.4 Replacement of the Samples Plate Motor

1. Make sure that the SAT450 instrument is turned off, then unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
2. Unplug the J6 connector from the Samples Plate Interface Board (compare the sch. SC-30-02191-00).
3. Unscrew the four fastening screws of the Samples Plate Motor (**Fig. 98**).

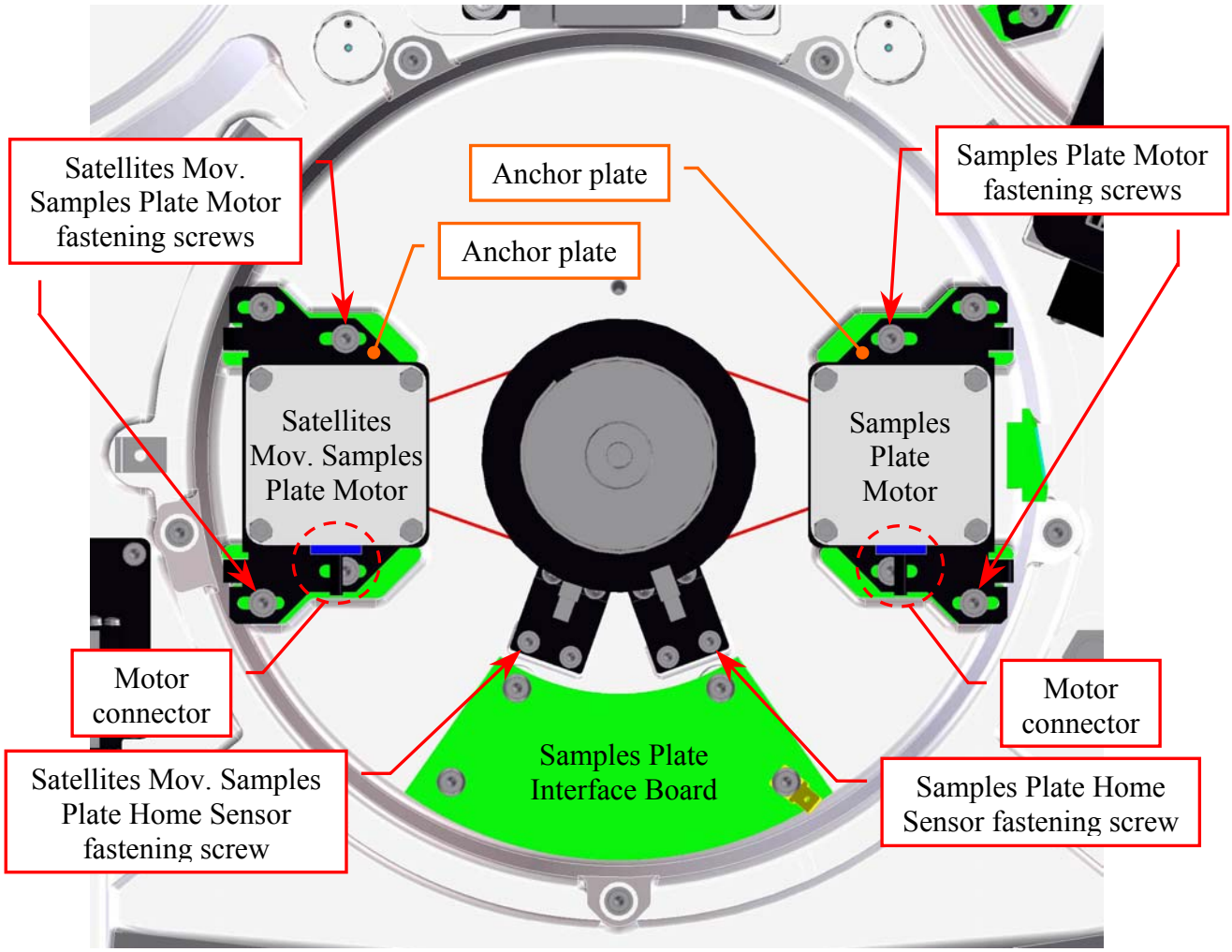


Fig. 98 – Samples Plate Motor and Satellites Mov. Samples Plate Motor

4. Remove the belt from the pulley of the Samples Plate Motor and take out it from its housing and the two anchor plate springs from the anchor plate.
5. Unscrew the four fastening screws of the Samples Plate Motor anchor plate (**Fig. 763**) and take out the anchor plate from the motor.

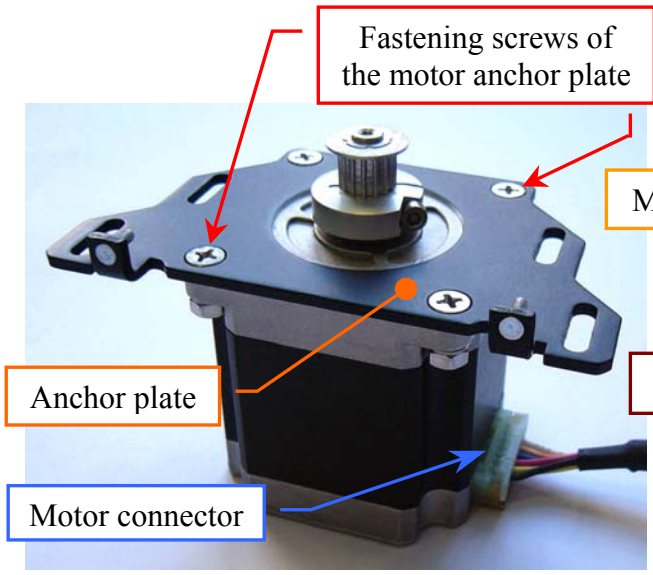


Fig. 99 – Samples Plate Motor anchor plate

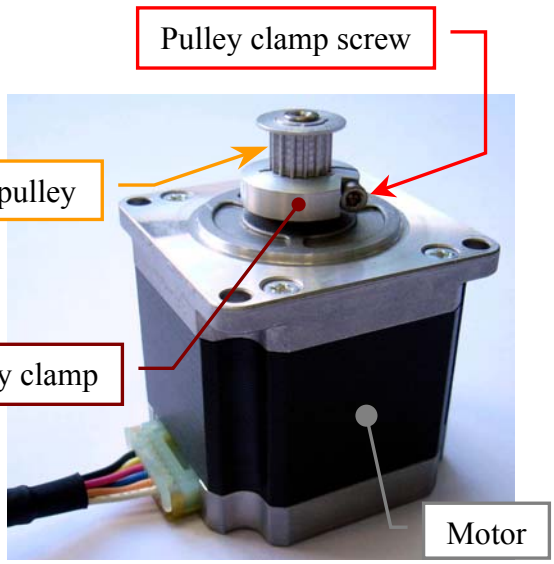


Fig. 100 – Motor pulley

6. Loosen the pulley clamp screw and extract the pulley clamp and the pulley from the motor shaft (**Fig. 100**).

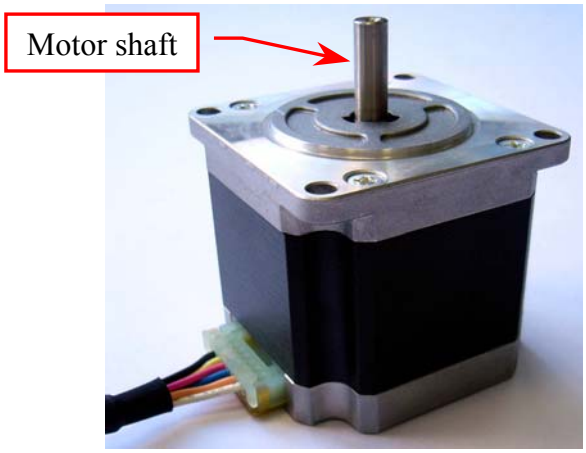


Fig. 101 – Samples Plate Motor / Satellites Mov. Samples Plate Motor
[P/N: 9-10-0016-00]

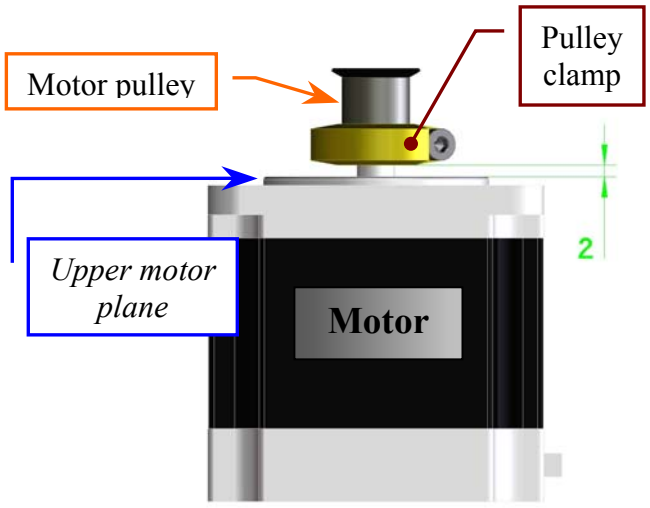


Fig. 102 – Plate Motor (*scheme*)

To replace the new Samples Plate Motor (**Fig. 101**) perform the following steps:

7. Insert the pulley clamp completely on the motor pulley (**Fig. 102**) and then insert all two on the motor shaft.
8. Position the motor pulley to **2.00 mm** with respect to upper motor plane (**Fig. 102**), then tighten the pulley clamp screw.
9. Position the anchor plate on the upper plane of the new motor as showed in **Fig. 99** and screw its four fastening screws.

10. Position the Samples Plate Motor on its housing with the side of the motor connector oriented towards the Samples Plate Interface Board (**Fig. 98**) and with the anchor plate springs placed in the relative slits, then tighten slightly its four fastening screws.
11. Push the motor toward the primary pulley, wrap the belt around the motor pulley, then leave free the motor (note: the anchor plate springs give the right tension to the belt).
12. Turn the primary pulley and make sure that the belt thoots are correctly inserted on the Samples Plate Motor pulley and on the primary pulley.
13. Tighten the four fastening screws of the Samples Plate Motor (**Fig. 98**).
14. Plug the Samples Plate Motor connector in the J6 connector of the Samples Plate Interface Board (compare the scheme SC-30-02191-00).
15. Bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
16. Perform the procedure "Mechanical adjustments of the Samples Plate" described into the previous Section 6.6.1.

5.6.5 Replacement of the Satellites Mov. Samples Plate Motor

1. Make sure that the SAT450 instrument is turned off, then unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
2. Unplug the J2 connector from the Samples Plate Interface Board (compare the sch. SC-30-02191-00).
3. Unscrew the four fastening screws of the Satellites Mov. Samples Plate Motor (**Fig. 98**).
4. Remove the belt from the pulley of the Satellites Mov. Samples Plate Motor and take out it from its housing and the two anchor plate springs from the anchor plate.
5. Unscrew the four fastening screws of the Satellites Mov. Samples Plate Motor anchor plate (**Fig. 103**) and take out the anchor plate from the motor.

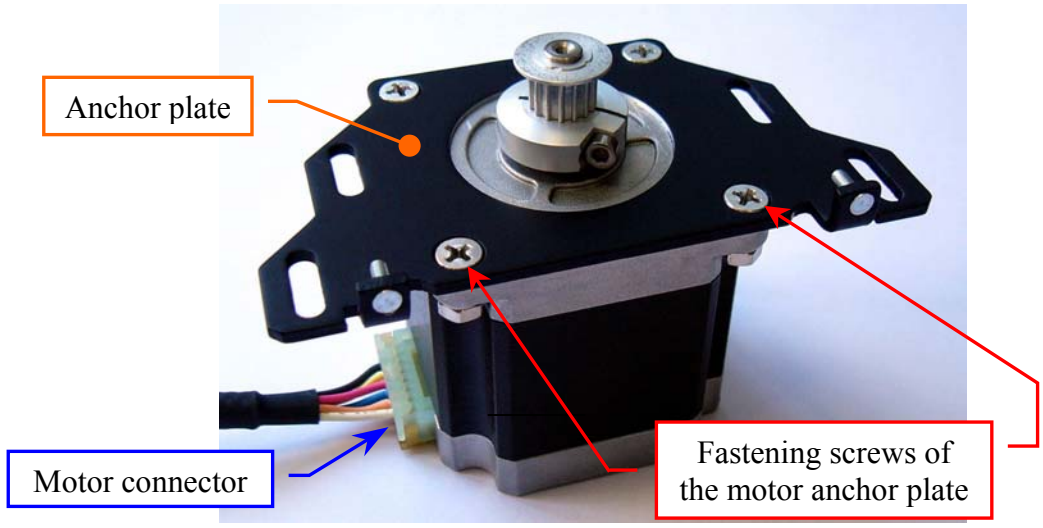


Fig. 103 – Satellites Mov. Samples Plate Motor anchor plate

6. Loosen the pulley clamp screw and extract the pulley clamp and the pulley from the motor shaft (**Fig. 100**).

To replace the new Satellites Mov. Samples Plate Motor (**Fig. 101**) perform the following steps:

7. Insert the pulley clamp completely on the motor pulley (**Fig. 102**) and then insert all two on the motor shaft.
8. Position the motor pulley to **2.00 mm** with respect to upper motor plane (**Fig. 102**), then tighten the pulley clamp screw.
9. Position the anchor plate on the upper plane of the new motor as showed in **Fig. 103** and screw its four fastening screws.
10. Position the Satellites Mov. Samples Plate Motor on its housing with the side of the motor connector oriented towards the Samples Plate Interface Board (**Fig. 98**) and with the anchor plate springs placed in the relative slits, then tighten slightly its four fastening screws.
11. Push the motor toward the secondary pulley, wrap the belt around the motor pulley, then leave free the motor (note: the anchor plate springs give the right tension to the belt).
12. Turn the secondary pulley and make sure that the belt thoots are correctly inserted on the Satellites Mov. Samples Plate Motor pulley and on the secondary pulley.
13. Tighten the four fastening screws of the Satellites Mov. Samples Plate Motor (**Fig. 98**).
14. Plug the Satellites Mov. Samples Plate Motor connector in the J2 connector of the Samples Plate Interface Board (compare the scheme SC-30-02191-00).
15. Bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
16. Perform the procedure "Mechanical adjustments of the Samples Plate" described into the previous Section 6.6.1.

5.6.6 Replacement of the Samples Plate Home Sensor

1. Make sure that the SAT450 instrument is turned off.
2. Unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
3. Unplug the J7 connector from the Samples Plate Interface Board (compare the sch. SC-30-02191-00).
4. Unscrew the two fastening screws of the Samples Plate Home Sensor (**Fig. 98**) and take out the sensor from its housing on the Samples Plate Assy.
5. Unscrew the two keep plate fastening screws of the Samples Plate Home Sensor (**Fig. 104**) and take out the sensor from the keep plate.

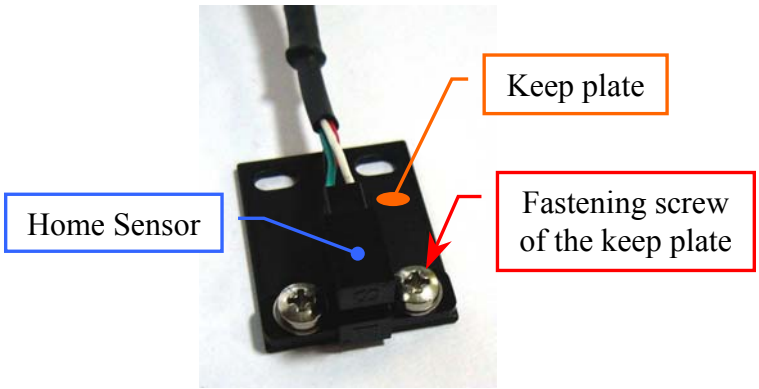


Fig. 104 – Keep plate fastening screws of the Home Sensor

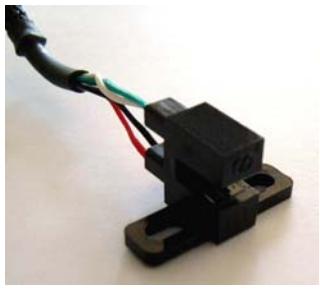


Fig. 105 – Home Sensor Assy [P/N: 9-10-0023-00]

To replace the new Samples Plate Home Sensor (**Fig. 105**) perform the following steps:

6. Position the keep plate below the new home sensor as showed in **Fig. 104**, center the sensor with respect to the keep plate and screw its two fastening screws.
7. Position the new home sensor on its housing of the Samples Plate Assy - as showed in **Fig. 98** - in order to obtain that the primary pulley disk is centered with respect to the internal sides of the home sensor.
8. Screw the two fastening screws of the Samples Plate Home Sensor (**Fig. 98**).
9. Turn the primary pulley and make sure that the primary pulley disk does not touch the Samples Plate Home Sensor.
10. Plug the Samples Plate Home Sensor connector in the J7 connector of the Samples Plate Interface Board (compare the scheme SC-30-02191-00).
11. Bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
12. Perform the procedure "Mechanical adjustments of the Samples Plate" described into the previous Section 6.6.1 .

5.6.7 Replacement of the Satellites Mov. Samples Plate Home Sensor

1. Make sure that the SAT450 instrument is turned off.
2. Unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
3. Unplug the J3 connector from the Samples Plate Interface Board (compare the sch. SC-30-02191-00).
4. Unscrew the two fastening screws of the Satellites Mov. Samples Plate Home Sensor (**Fig. 98**) and take out the sensor from its housing on the Samples Plate Assy.
5. Unscrew the two keep plate fastening screws of the Satellites Mov. Samples Plate Home Sensor (**Fig. 104**) and take out the sensor from the keep plate.

To replace the new Sat. Mov. Samples Plate Home Sensor (**Fig. 105**) perform the following steps:

6. Position the keep plate below the new home sensor as showed in **Fig. 104**, center the sensor with respect to the keep plate and screw its two fastening screws.
7. Position the new home sensor on its housing of the Samples Plate Assy - as showed in **Fig. 98** - in order to obtain that the secondary pulley disk is centered with respect to the internal sides of the home sensor.
8. Screw the two fastening screws of the Satellites Mov. Samples Plate Home Sensor (**Fig. 98**).
9. Turn the secondary pulley and make sure that the secondary pulley disk does not touch the Samples Plate Home Sensor.
10. Plug the Satellites Mov. Samples Plate Home Sensor connector in the J3 connector of the Samples Plate Interface Board (compare the scheme SC-30-02191-00).
11. Bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
12. Perform the procedure "Mechanical adjustments of the Samples Plate" described into the previous Section 6.6.1 .

5.6.8 Replacement of the Samples Plate Belt

1. Make sure that the SAT450 instrument is turned off, then unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
2. Loosen the four fastening screws of the Samples Plate Motor and remove the Samples Plate Belt from the pulley of the Samples Plate Motor (**Fig. 98**).
3. Unscrew the two fastening screws of the Samples Plate Home Sensor (**Fig. 98**) and take out the sensor from its housing on the Samples Plate Assy.
4. Remove the Samples Plate Belt from the primary pulley (**Fig. 98**).

To replace the new Samples Plate Belt (**Fig. 106**) perform the following steps:

5. Wrap the new belt around the primary pulley.
6. Push the Samples Plate Motor toward the primary pulley, wrap the new belt around the motor pulley, then leave free the motor (note: the anchor plate springs give the right tension to the belt).
7. Turn the primary pulley and make sure that the new belt thoots are correctly inserted on the Samples Plate Motor pulley and on the primary pulley.
8. Tighten the four fastening screws of the Samples Plate Motor (**Fig. 98**).
9. Position the Samples Plate Home Sensor on its housing of the Samples Plate Assy - as showed in **Fig. 98** - in order to obtain that the primary pulley disk is centered with respect to the internal sides of the home sensor.
10. Screw the two fastening screws of the Samples Plate Home Sensor (**Fig. 98**).
11. Turn the primary pulley and make sure that the primary pulley disk does not touch the Samples Plate Home Sensor.
12. Bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
13. Perform the procedure “Mechanical adjustments of the Samples Plate” described into the previous Section 6.6.1 .

Fig. 106 – Plate Belt [P/N: 86-02334-11]

5.6.9 Replacement of the Satellites Mov. Samples Plate Belt

1. Remove the Samples Plate Belt from the Samples Plate Assy performing the relative procedure described into the previous Section 6.6.8, from step 1 to step 4.
2. Loosen the four fastening screws of the Satellites Mov. Samples Plate Motor and remove the Satellites Mov. Samples Plate Belt from the pulley of the Satellites Mov. Samples Plate Motor (**Fig. 98**).
3. Unscrew the two fastening screws of the Satellites Mov. Samples Plate Home Sensor (**Fig. 98**) and take out the sensor from its housing on the Samples Plate Assy.
4. Remove the Satellites Mov. Samples Plate Belt from the secondary pulley (**Fig. 98**).

To replace the new Satellites Mov. Samples Plate Belt (**Fig. 106**) perform the following steps:

5. Wrap the new belt around the secondary pulley.
6. Push the Satellites Mov. Samples Plate Motor toward the secondary pulley, wrap the new belt around the motor pulley, then leave free the motor (note: the anchor plate springs give the right tension to the belt).
7. Turn the secondary pulley and make sure that the new belt thoots are correctly inserted on the Satellites Mov. Samples Plate Motor pulley and on the secondary pulley.
8. Tighten the four fastening screws of the Satellites Mov. Samples Plate Motor (**Fig. 98**).
9. Position the Satellites Mov. Samples Plate Home Sensor on its housing of the Samples Plate Assy - as showed in **Fig. 98** - in order to obtain that the secondary pulley disk is centered with respect to the internal sides of the home sensor.
10. Screw the two fastening screws of the Satellites Mov. Samples Plate Home Sensor (**Fig. 98**).
11. Turn the secondary pulley and make sure that the secondary pulley disk does not touch the Satellites Mov. Samples Plate Home Sensor.
12. Replace the Samples Plate Belt in the Samples Plate Assy performing the relative procedure described into the previous Section 6.6.8, from step 5 to step 11.
13. Bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
14. Perform the procedure “Mechanical adjustments of the Samples Plate” described into the previous Section 6.6.1 .

5.7 REACTIONS PLATE

5.7.1 Mechanical adjustment of the Reactions Plate

1. Lift up the instrument cover and remove the Reactions Plate cover from the Reactions Plate (**Fig. 7**).
2. Take a Reactions Plate Rack with a opaque cuvette #1, then substitute the Reactions Plate Rack #1 (**Fig. 107**) with this new Rack.

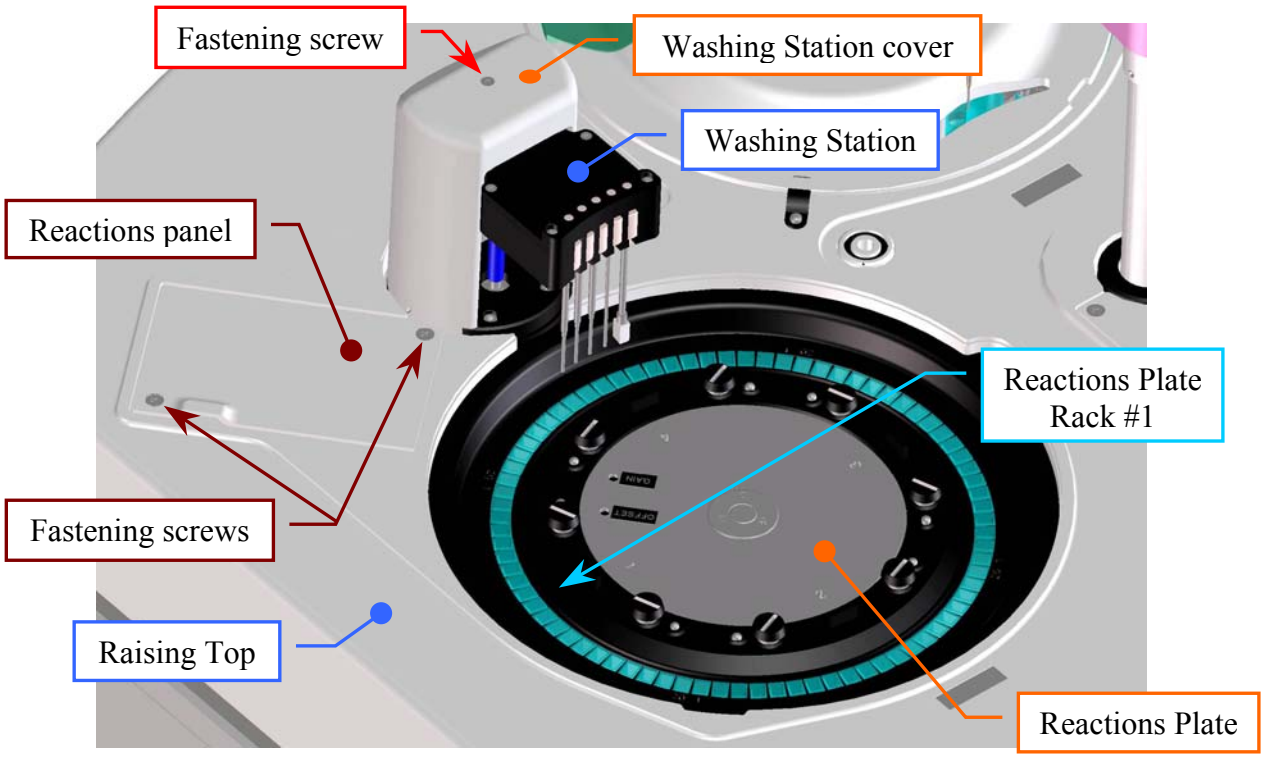


Fig. 107 – Reactions Plate

3. Turn on the SAT450 system (instrument and computer) and launch the "Diagnostic" program.
4. Select "Arm" folder and request an Arm reset. Wait until the reset Sampling Arm procedure has been completed.
5. Make sure that all the Home Sensors of the Sampling Arm (Vertical and Horizontal) light up in green.
6. Select "Optic" folder and request an Filters Wheel reset. Wait until the reset Filters Wheel procedure has been completed.
7. Make sure that the Home Sensor of the Filters Wheel light up in green.
8. Select "Plates" folder and request an Reactions Plate reset. Wait until the reset Reactions Plate procedure has been completed.
9. Make sure that the Home Sensor of the Reactions Plate light up in green.

10. Make sure that the light beam of the Photometer reading channel is centered with respect to the cuvette #1 of the Reactions Plate. If it not be so, center the Reactions Plate in the following way:
    a. unscrew the two fastening screws of the Reactions panel placed on the Raising Top near the Washing Station (**Fig. 107**) and take out the panel from the Raising Top;
    b. loosen the fastening screw of the Reactions Plate Home Sensor lever (**Fig. 108**);

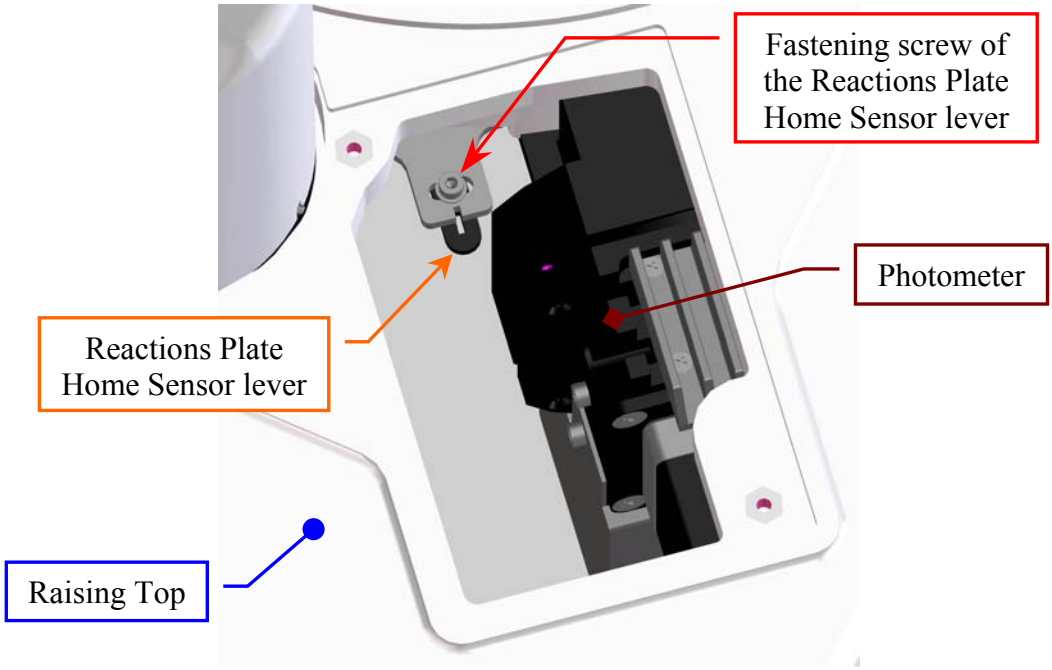


Fig. 108 – Fastening screw of the Reactions Plate Home Sensor lever

    c. turn slightly the Reactions Plate Home Sensor lever to the right toward in order to obtain the centering;
    d. tighten the fastening screw of the Reactions Plate Home Sensor lever (**Fig. 108**);
    e. request an Reactions Plate reset in the "Plates" folder and wait until the reset procedure has been completed;
    f. make sure that the Home Sensor of the Reactions Plate light up in green;
    g. make sure that the light beam of the Photometer reading channel is centered with respect to the cuvette #1 of the Reactions Plate. If it not be so, repeat from the **step 10-b**.

11. Position the Reactions panel in its housing on the Raising Top (**Fig. 107**) and screw its two fastening screws.
12. Select "Arm" folder, click the "Go Disp." button, then click the correspondent "Down" button. The Sampling Arm will move to cuvette #52 of the Reactions Plate, then it will go down until to reach the right height.
13. Make sure that the Sampling Probe is centered with respect to the cuvette #52 of the Reactions Plate. If it not be so, center the Sampling Probe in the following way:
    a. click the "+"/"–" buttons in the "Arm Setting" area of the "Arm" folder until to obtain - by means of the correspondent movement of the Sampling Arm - the centering of the Sampling Probe;
    b. click the "Save" button in the "Arm Setting" area of the "Arm" folder in order to obtain the memorization of the new Arm Setting value.

14. Request an Arm reset in the "Arm" folder. Wait until the reset Sampling Arm procedure has been completed.
15. Make sure that all the Home Sensors of the Sampling Arm (Vertical and Horizontal) light up in green.
16. Substitute the Reactions Plate Rack with the opaque cuvette #1 with the original Reactions Plate Rack #1 (**Fig. 107**).
17. Select "Wash" folder and request an Washing Station reset. Wait until the reset Washing Station procedure has been completed.
18. Make sure that the Home Sensor of the Washing Station light up in green.
19. Click the "Down to Adjust" button. The Washing Well will go down until to reach the right height.
20. Make sure that the five probes of the Washing Station are centered with respect to the five correspondent cuvettes of the Reactions Plate. If it not be so, perform the procedure "Mechanical adjustments of the Washing Station" described into the following Section 6.8.1, from step 2 to step 13.
21. Click the "Home" button in the "Wash" folder. Wait until the reset Washing Station procedure has been completed.
22. Replace the Reactions Plate cover on the Reactions Plate and bring down the instrument cover (**Fig. 7**).

5.7.2 Replacement of the Reactions Plate Motor

1. Unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
2. Unscrew the four fastening screws of the protection panel (**Fig. 109**) and take out it from its place.
3. Unplug the J12 connector from the Reactions Plate Interface Board (compare the sch. SC-30-02192-00).
4. Unscrew the four fastening screws of the Reactions Plate Motor (**Fig. 109**).
5. Remove the belt from the pulley of the Reactions Plate Motor and take out it from its housing and the two anchor plate springs from the anchor plate.
6. Unscrew the four fastening screws of the Reactions Plate Motor anchor plate (**Fig. 110**) and take out the anchor plate from the motor.
7. Loosen the pulley clamp screw and extract the pulley clamp and the pulley from the motor shaft (**Fig. 111**).

To replace the new Reactions Plate Motor (**Fig. 112**) perform the following steps:

8. Insert the pulley clamp completely on the motor pulley (**Fig. 113**) and then insert all two on the motor shaft.
9. Position the motor pulley to **2.00 mm** with respect to upper motor plane (**Fig. 113**), then tighten the pulley clamp screw.
10. Position the anchor plate on the upper plane of the new motor as showed in **Fig. 110** and screw its four fastening screws.
11. Position the Reactions Plate Motor on its housing with the side of the motor connector oriented towards the Reactions Plate Interface Board (**Fig. 109**) and with the anchor plate springs placed in the relative slits, then tighten slightly its four fastening screws.

12. Push the motor toward the plate pulley, wrap the belt around the motor pulley, then leave free the motor (note: the anchor plate springs give the right tension to the belt).

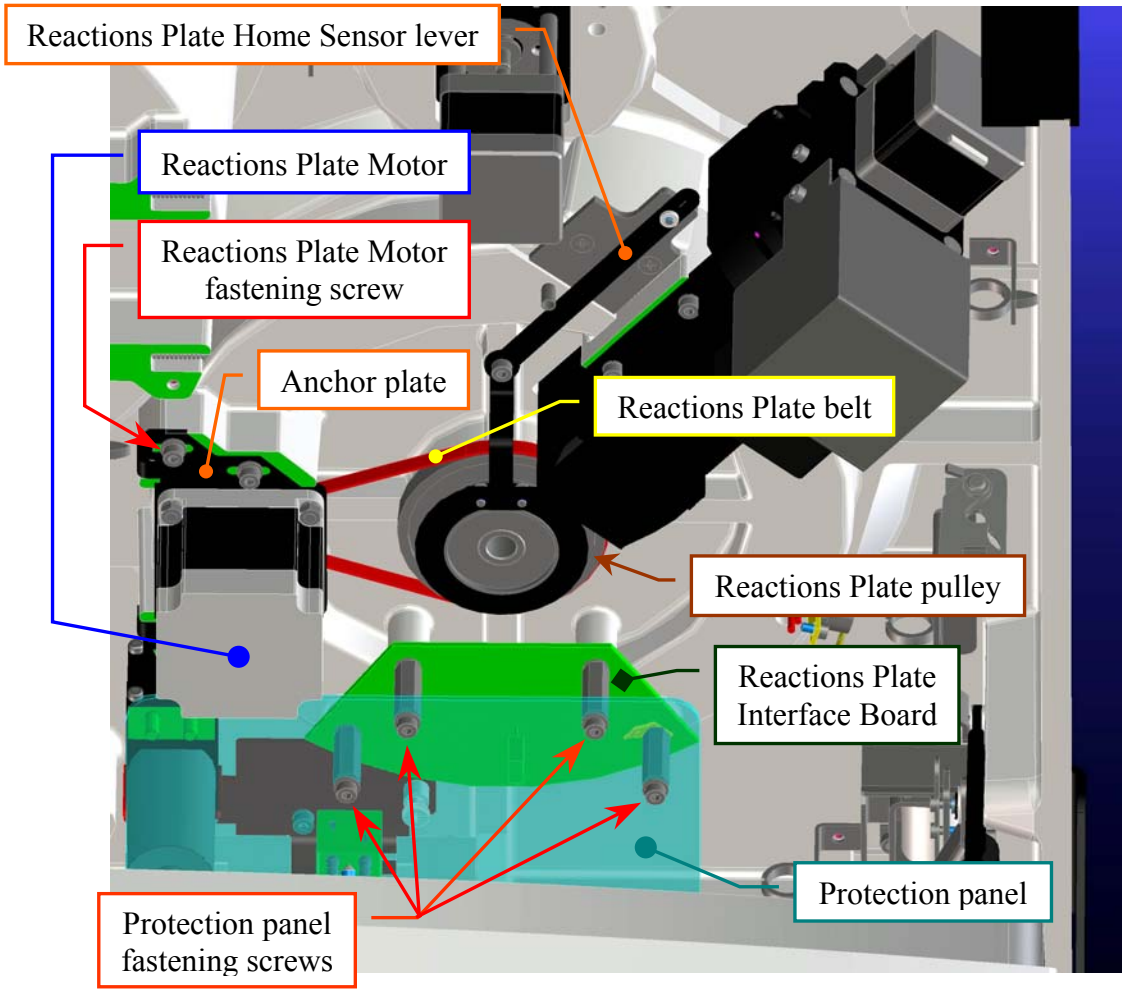


Fig. 109 – Reactions Plate Assy (bottom view)

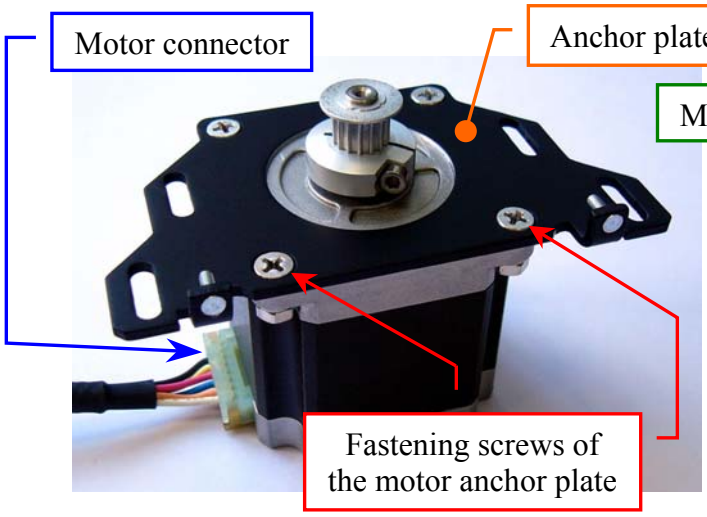


Fig. 110 – Reactions Plate Motor anchor plate

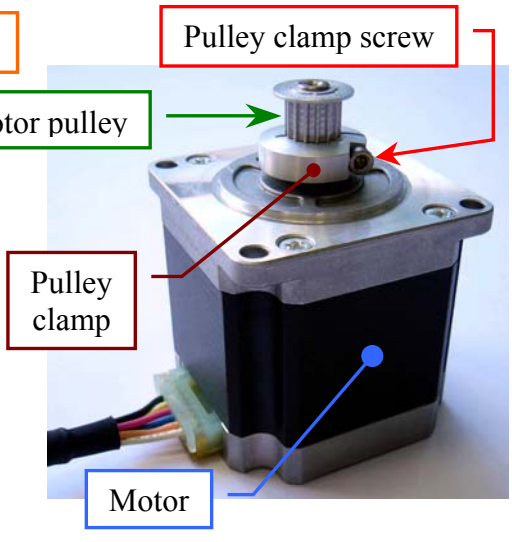


Fig. 111 – Motor pulley

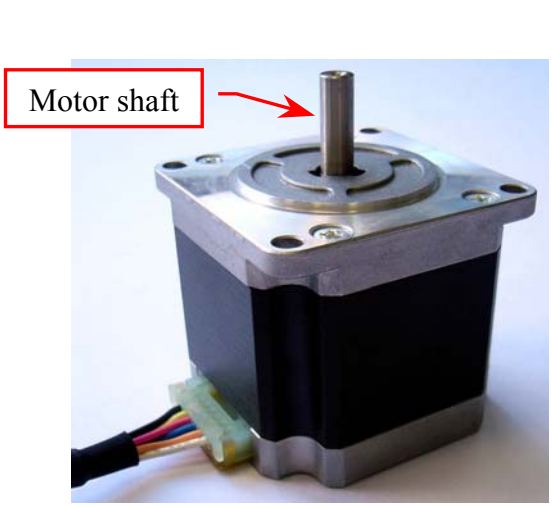


Fig. 112 – Reactions Plate Motor
[P/N: 9-10-0016-00]

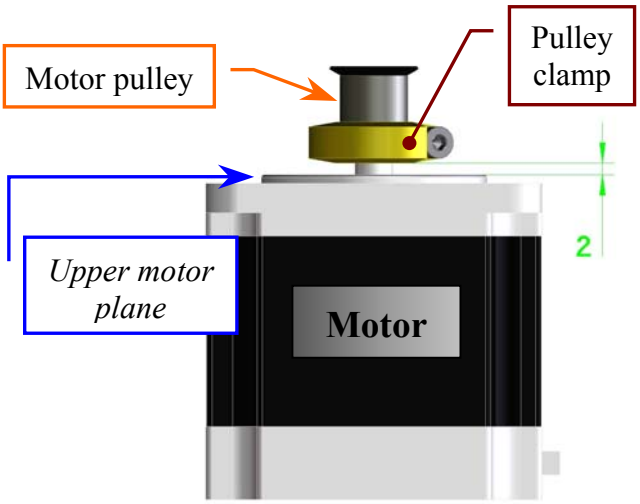


Fig. 113 – Plate Motor (*scheme*)

13. Turn the plate pulley and make sure that the belt thoots are correctly inserted on the Reactions Plate Motor pulley and on the plate pulley.
14. Tighten the four fastening screws of the Reactions Plate Motor (**Fig. 109**).
15. Plug the Reactions Plate Motor connector in the J12 connector of the Reactions Plate Interface Board (compare the scheme SC-30-02192-00).
16. Replace the protection panel on its place - as showed in **Fig. 109** - unscrewing its four fastening screws in the correspondent spacing bars.
17. Bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
18. Perform the procedure "Mechanical adjustment of the Reactions Plate" described into the previous Section 6.7.1.

5.7.3 Replacement of the Reactions Plate Home Sensor

1. Unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
2. Unscrew the four fastening screws of the protection panel (**Fig. 109**) and take out it from its place.
3. Unplug the J13 connector from the Reactions Plate Interface Board (compare the sch. SC-30-02192-00).
4. Unscrew the three fastening screws of the Reactions Plate Home Sensor lever (**Fig. 114**) and take out the lever from its place.
5. Unscrew the two lever fastening screws of the Reactions Plate Home Sensor lever (**Fig. 115**) and take out the sensor from the lever.

   To replace the new Reactions Plate Home Sensor (**Fig. 116**) perform the following steps:
6. Position the lever below the new home sensor as showed in **Fig. 115**, center the sensor with respect to the lever and screw its two fastening screws.

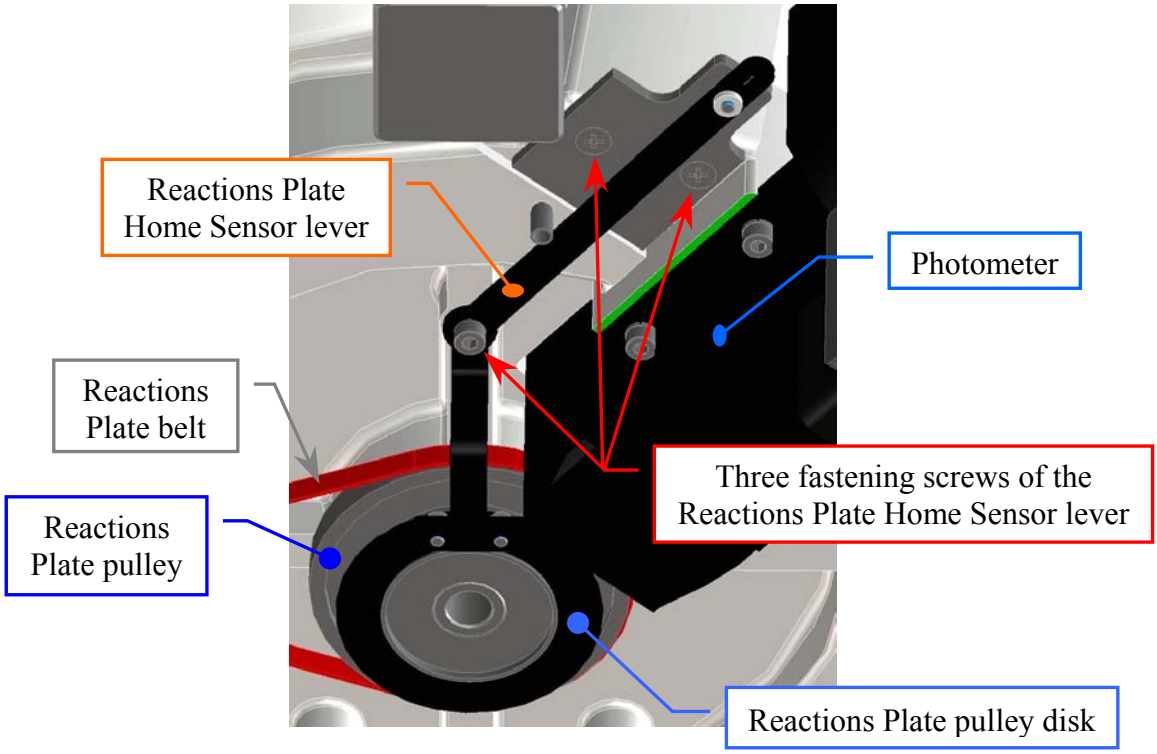


Fig. 114 – Reactions Plate Home Sensor lever

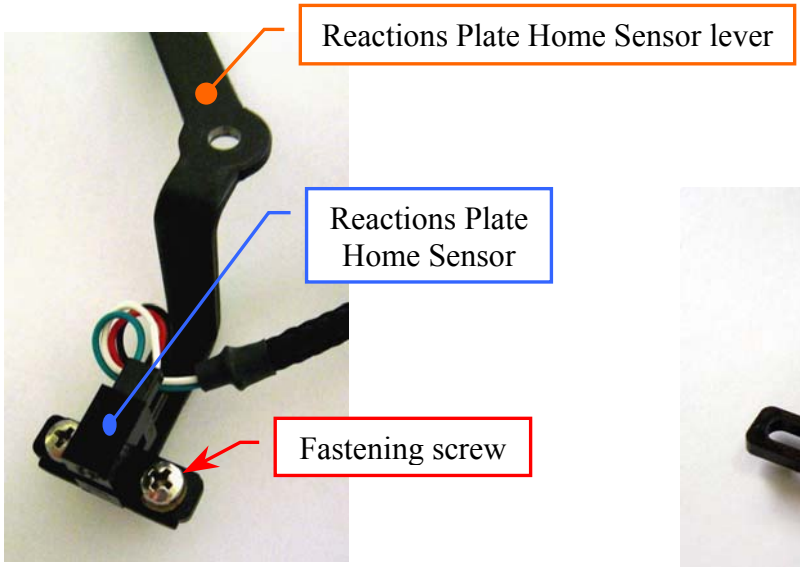


Fig. 115 – Two fastening screws of the Reactions Plate Home Sensor lever

Fig. 116 – Reactions Plate Home Sensor [P/N: 9-10-0023-40]

7. Position the lever on its housing - as showed in **Fig. 114** - in order to obtain that the plate pulley disk is centered with respect to the internal sides of the home sensor.
8. Screw the three fastening screws of the Reactions Plate Home Sensor lever (**Fig. 114**).
9. Turn the plate pulley and make sure that the plate pulley disk does not touch the Reactions Plate Home Sensor.

10. Plug the Reactions Plate Home Sensor connector in the J13 connector of the Reactions Plate Interface Board (compare the scheme SC-30-02192-00).
11. Replace the protection panel on its place - as showed in **Fig. 109** - unscrewing its four fastening screws in the correspondent spacing bars.
12. Bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
13. Perform the procedure "Mechanical adjustment of the Reactions Plate" described into the previous Section 6.7.1.

5.7.4 Replacement of the Reactions Plate Belt

1. Unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
2. Loosen the four fastening screws of the Reactions Plate Motor (**Fig. 109**), push the motor toward the plate pulley, then tighten only one fastening screw of the motor.
3. Unscrew the three fastening screws of the Reactions Plate Home Sensor lever (**Fig. 114**) and take out the lever from its place.
4. Remove the belt from the Reactions Plate Motor pulley and from the plate pulley.

To replace the new Reactions Plate Belt (**Fig. 106**) perform the following steps:

5. Wrap the belt around the plate pulley.
6. Wrap the belt around the Reactions Plate Motor pulley, loosen the screwed fastening screw of the motor, then leave free the motor (note: the anchor plate springs give the right tension to the belt).
7. Turn the plate pulley and make sure that the belt thoots are correctly inserted on the Reactions Plate Motor pulley and on the plate pulley.
8. Tighten the four fastening screws of the Reactions Plate Motor (**Fig. 109**).
9. Position the lever on its housing - as showed in **Fig. 114** - in order to obtain that the plate pulley disk is centered with respect to the internal sides of the home sensor.
10. Screw the three fastening screws of the Reactions Plate Home Sensor lever (**Fig. 114**).
11. Turn the plate pulley and make sure that the plate pulley disk does not touch the Reactions Plate Home Sensor.
12. Bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
13. Perform the procedure "Mechanical adjustment of the Reactions Plate" described into the previous Section 6.7.1.

5.8 WASHING STATION

5.8.1 Mechanical adjustments of the Washing Station

1. Center the cuvette #1 of the Reactions Plate with respect to the light beam of the Photometer reading channel performing the procedure "Mechanical adjustment of the Reactions Plate" described into the previous Section 6.7.1, from step 1 to step 12.
2. Unscrew the fastening screw of the Washing Station cover (**Fig. 107**) and remove the cover from its place on the Raising Top.
3. Select "Wash" folder and click the "Home" button. Wait until the reset Washing Station procedure has been completed.
4. Make sure that the Home Sensor of the Washing Station light up in green.

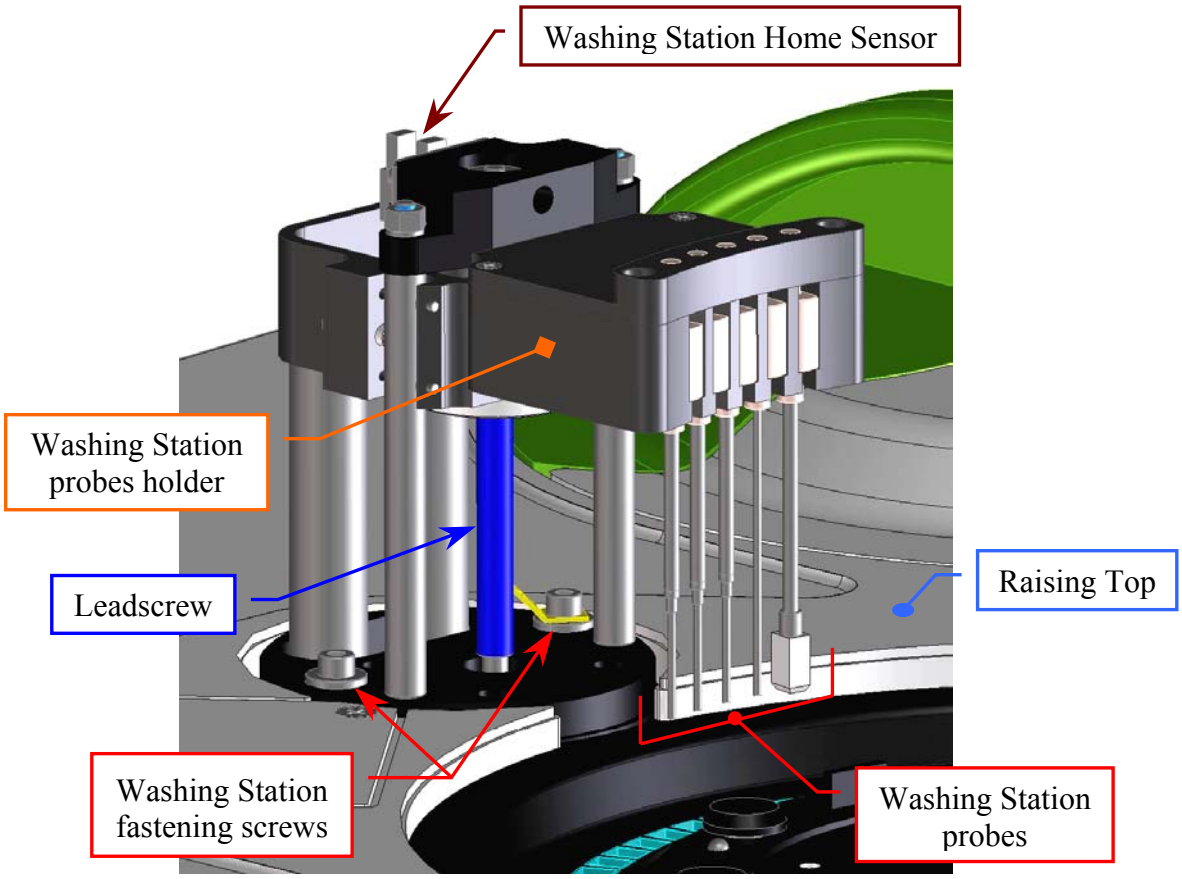


Fig. 117 – Fastening screws of the Washing Station

5. Click the "Down to Adjust" button in the "Wash" folder. The Washing Station will go down until to reach the right height for the adjusting.

6. Make sure that the five probes of the Washing Station are centered with respect to the five correspondent cuvettes of the Reactions Plate. If it not be so, adjust in the following way:
    a. loosen the two Washing Station fastening screws (**Fig. 117**);
    b. shift horizontally – carefully – the Washing Station in order to obtain the centering of the five probes with respect to the five correspondent cuvettes;
    c. tighten the two Washing Station fastening screws (**Fig. 117**);
    d. click the "Home" button in the "Wash" folder and wait until the reset Washing Station procedure has been completed;
    e. make sure that the Home Sensor of the Washing Station light up in green;
    f. click the "Down to Adjust" button in the "Wash" folder and wait until the request movement has been completed;
    g. repeat the step 6.

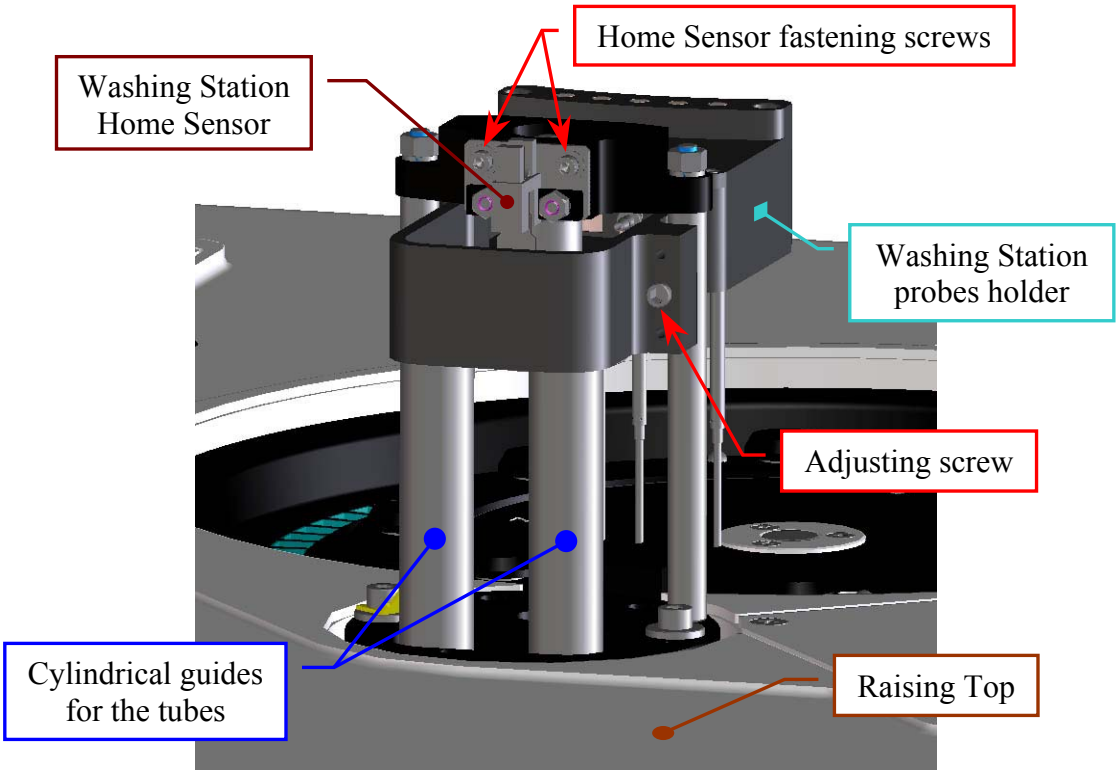


Fig. 118 – Home Sensor of the Washing Station

7. Click the "Home" button in the "Wash" folder. Wait until the reset Washing Station procedure has been completed.
8. Click the "Down (Full)" button in the "Wash" folder. The Washing Station will go down until to reach the cuvettes of the Reactions Plate.
9. Make sure that the five probes of the Washing Station are centered with respect to the five correspondent cuvettes of the Reactions Plate and, in particular, that the Drying Pad run freely along the walls of the correspondent cuvette.

10. Make sure that the five probes of the Washing Station are slightly raised. If it not be so, adjust in the following way:
    a. click the "Home" button in the "Wash" folder and wait until the reset Washing Station procedure has been completed;
    b. make sure that the Home Sensor of the Washing Station light up in green;
    c. loosen the two fastening screws of the Washing Station Home Sensor (**Fig. 118**);
    d. move slightly the Washing Station Home Sensor to the right vertically toward in order to obtain the positioning of the Washing Station probes to the correct height;
    e. tighten the two fastening screws of the Washing Station Home Sensor (**Fig. 118**);
    f. click the "Home" button in the "Wash" folder and wait until the reset Washing Station procedure has been completed;
    g. make sure that the Home Sensor of the Washing Station light up in green;
    h. click the "Down (Full)" button in the "Wash" folder and wait until the Washing Station has been reach the cuvettes of the Reactions Plate;
    i. repeat the step 10.
11. Click the "Home" button in the "Wash" folder. Wait until the reset Washing Station procedure has been completed.
12. Make sure that the Home Sensor of the Washing Station light up in green.
13. Replace the Washing Station cover on the Washing Station and screw its fastening screw (**Fig. 107**).
14. Replace the Reactions Plate cover on the Reactions Plate and bring down the instrument cover (**Fig. 7**).

⚠	Make sure that the Sampling Probe is centered with respect to the Reactions Plate cuvette. If it not be so, perform the procedure described into the previous Section 6.7.1, from step 13 to step 16.

Remember	If the horizontal backlash of the Washing Station probes holder is excessive, then adjust it acting on the adjusting screw (**Fig. 118**).

5.8.2 Replacement of the Washing Station Assy

1. Make sure that the SAT450 instrument is turned off.
2. Lift up the instrument cover (**Fig. 7**), unscrew the fastening screw of the Washing Station cover (**Fig. 107**) and remove the cover from its place on the Raising Top.
3. Unscrew the four fastening screws of the Washing Station tubes cover (**Fig. 119**) and remove the cover from the Washing Station.
4. Remove the five springs from the correspondent manifolds of the probes (**Fig. 120**).
5. Remove the eight tubes with "2", "3", "5", "6", "7", "8", "9" and "10" label texts from the correspondent manifolds of the probes (compare the hydraulic diagram SI-16-01873-00), making attention to the spillage of liquid from the tubes.

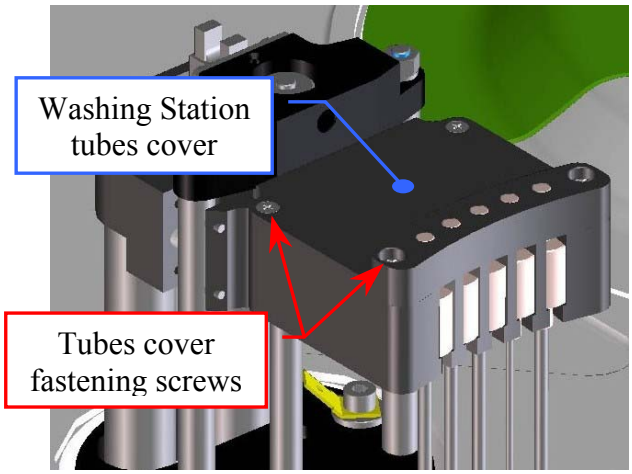


Fig. 119 – Washing Station tubes cover

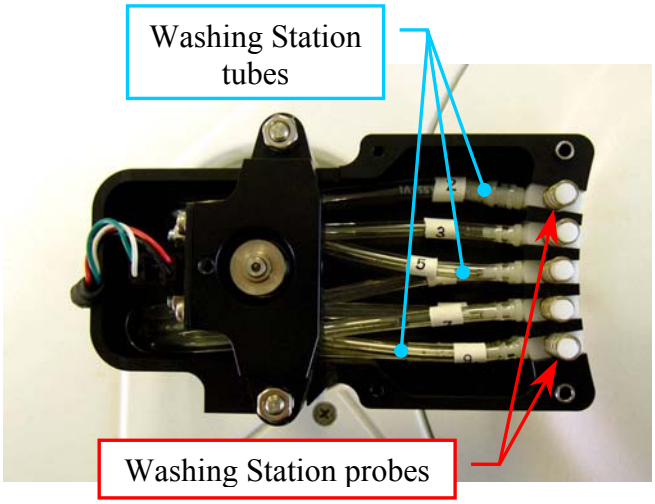


Fig. 120 – Washing Station tubes

6. Unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
7. Take out the eight tubes from the two Washing Station cylindrical guides (**Fig. 121**).

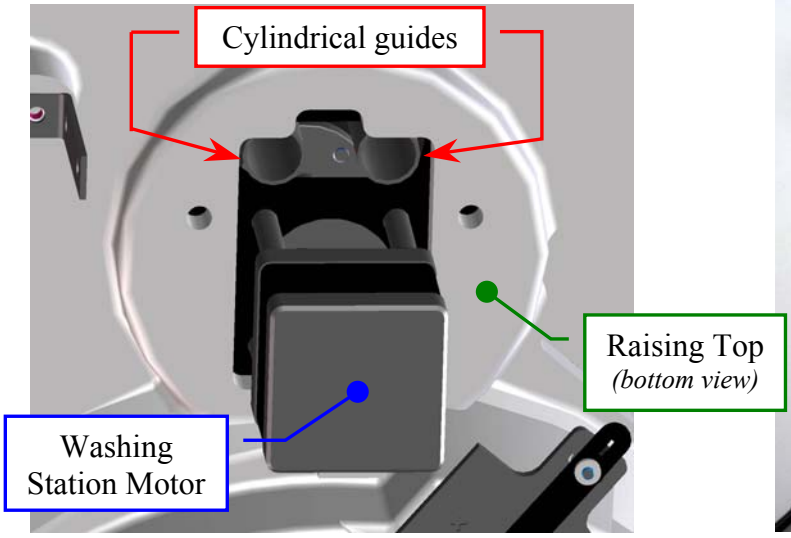


Fig. 121 – Cylindrical guides of the Washing Station

Fig. 122 – Washing Station Assy
[P/N: 10-02181-00]

8. Unplug the J10 and J11 connectors from the Electrovalves Control Board (compare the scheme SC-30-02194-00).
9. Bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
10. Unplug the ground wire from the Washing Station Assy, unscrew the two Washing Station fastening screws (**Fig. 117**) and take out the Washing Station Assy from its housing.

To replace the Washing Station Assy (**Fig. 122**) perform the following steps:

11. Repeat the above steps in inverse order: from 10 to 3.
12. Perform the procedure "Mechanical adjustments of the Washing Station" described into the previous Section 6.8.1, from step 3 to step 12.
13. Perform the "Functional check of the Washing Station" described into the next Section 6.8.2.1.
14. Replace the Washing Station cover on the Washing Station and screw its fastening screw (**Fig. 107**).
15. Replace the Reactions Plate cover on the Reactions Plate and bring down the instrument cover (**Fig. 7**).

5.8.2.1 Functional check of the Washing Station

1. Unscrew the two fastening pommels of the Reactions Plate Rack #4, carry up the Rack in order to put on the five probes of the Washing Station until the bottom of the correspondent cuvettes - as showed in the **Fig. 123 (a)** - .

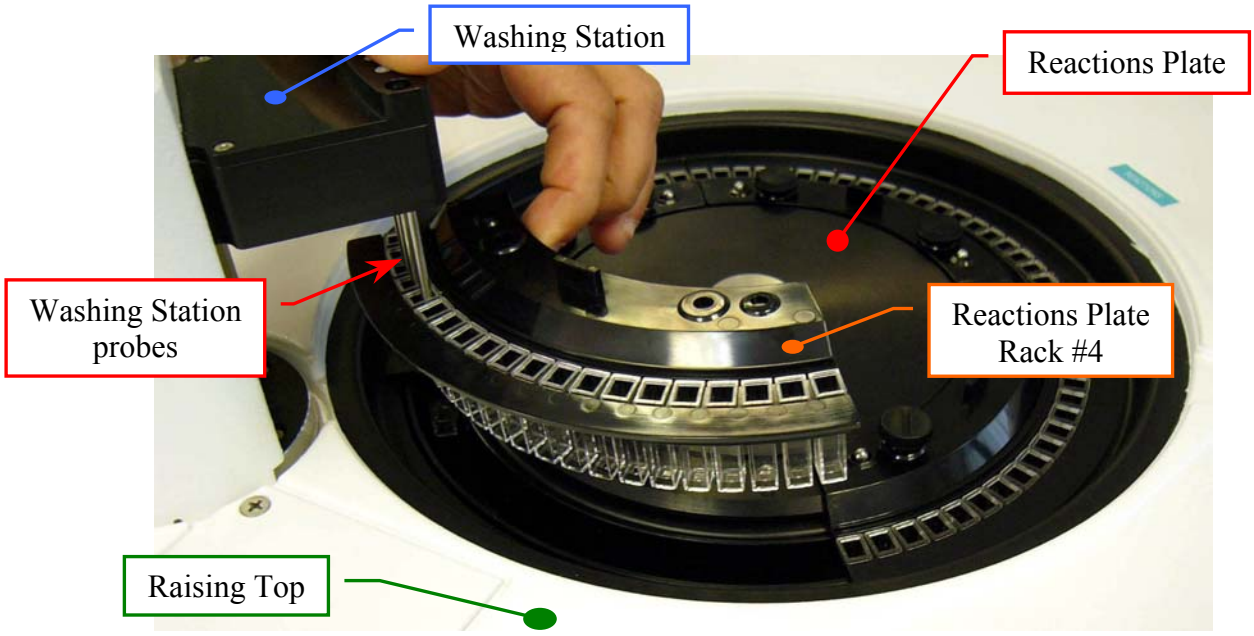
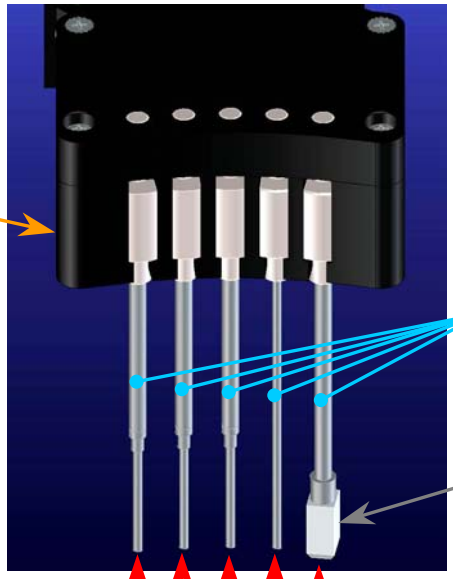


Fig. 123 (a) – Five probes of the Washing Station in the Reactions Plate Rack

2. Select the **Cycles #5** in the "Wash" folder of the "Diagnostic" program, click the "Washing Cycles" button and then, in the message box that appear, click the "OK" button to start the Cycles requested.
3. At the fourth and fifth cycle of the Washing Station (with the hydraulic circuit filled), check that each of five probes carries out correctly the specific operations described in the **Fig. 123 (b)**. If it not be so, check the hydraulic circuit – taking reference to the hydraulic diagram SI-16-01873-00 –, find the abnormalities and resolve them.
4. Replace the Rack #4 in its housing on the Reactions Plate and screw its two fastening pommels.



Washing Station probes holder

Washing Station probes

Drying Pad

Probe 1 (*wash*)
1. Aspiration of the reaction in the cuvette;
2. Dispensation and aspiration of the Acid Solution - contemporaneously -;
3. Dispensation of the Acid Solution;
4. Aspiration of all the Acid Solution contains in the cuvette.

Probe 5 (*drying*)
1. Drying (and aspiration) of the cuvette.

Probe 4 (*aspiration*)
1. Aspiration of all the contents of the cuvette.

Probe 2 (*wash*)
1. Dispensation and aspiration of the Cleaning Solution - contemporaneously -;
2. Dispensation of the Cleaning Solution;
3. Aspiration of all the Cleaning Solution contains in the cuvette.

Probe 3 (*wash*)
1. Dispensation and aspiration of the Distilled Water - contemporaneously -;
2. Dispensation of the Distilled Water;
3. Aspiration of all the Distilled Water contains in the cuvette;
4. Dispensation of the Distilled Water in the cuvette (to perform the "White on fly" reading with the analyzer in *running*);
5. Aspiration of all the Distilled Water contains in the cuvette.

Note: each cycle of the Washing Station start with one "beep" and finish with another "beep".

Fig. 123 (b) – Description of one Washing Station Cycle

5.8.3 Replacement of the Washing Station Motor

1. Remove the Washing Station Assy from its housing performing the relative procedure described into the previous Section 6.8.2, from step 1 to step 10.
2. Unscrew (only) the two set screws of the flexible joint placed near the bottom side of it (**Fig. 124**).
3. Unscrew the four fastening screws of the Washing Station Motor (**Fig. 125**) and take out it from the anchor plate of the Washing Station (**Fig. 125**).

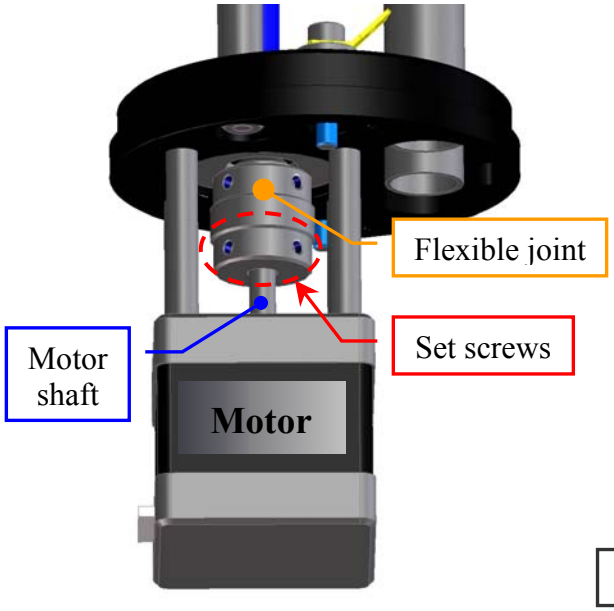


Fig. 124 – Set screws of the flexible joint

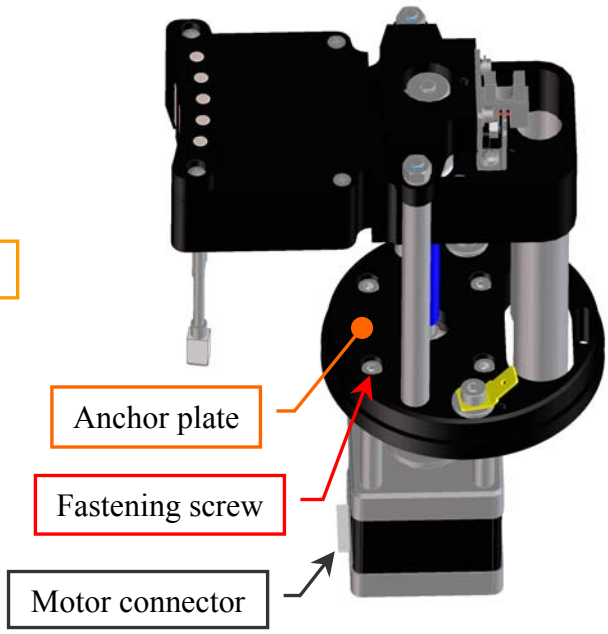


Fig. 125 – The four fastening screws of the Washing Station Motor

4. Unscrew the four spacing bars of the Washing Station Motor (**Fig. 126**) and take out them from the motor.

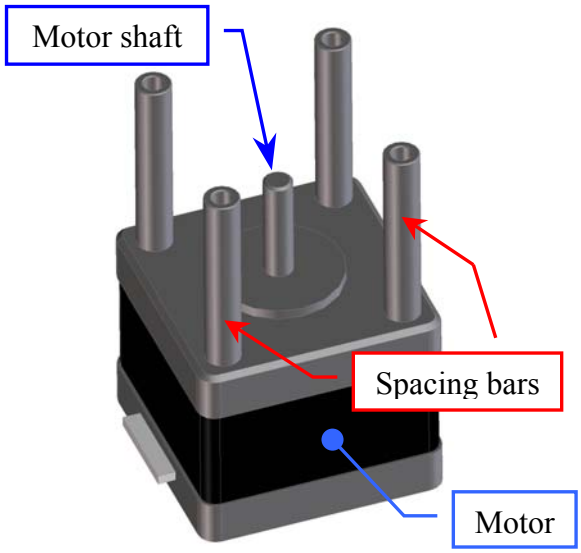


Fig. 126 – The four spacing bars of the Washing Station Motor

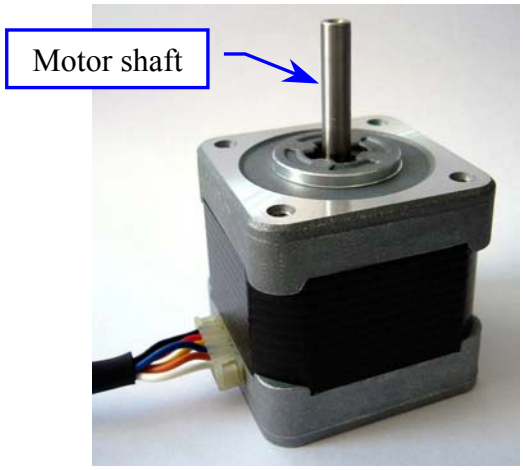


Fig. 127 – Washing Station Motor [P/N: 10-00399-01]

To replace the Washing Station Motor (**Fig. 127**) perform the following steps:

5. Screw the four spacing bars on the new Washing Station Motor (**Fig. 126**).
6. Position the new Washing Station Motor on the anchor plate with the side of the motor connector oriented towards the side of the Washing Station probes – as showed in **Fig. 125** – pushing the motor shaft in the flexible joint (**Fig. 124**), then screw the four fastening screws of the motor (**Fig. 125**).
7. Screw the two set screws of the flexible joint placed near the bottom side of it (**Fig. 124**).
8. Perform the procedure "Replacement of the Washing Station Assy" described into the previous Section 6.8.2, from step 11 to step 15.

5.8.4 Replacement of the Washing Station Home Sensor

1. Make sure that the SAT450 instrument is turned off.
2. Lift up the instrument cover (**Fig. 7**), unscrew the fastening screw of the Washing Station cover (**Fig. 107**) and remove the cover from its place on the Raising Top.
3. Unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
4. Unplug the J11 connector from the Electrovalves Control Board (compare the sch. SC-30-02194-00).
5. Bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
6. Unscrew the two fastening screws of the Washing Station Home Sensor (**Fig. 128**) and take out the sensor from its housing on the Washing Station Assy, pushing the cable and the connector of the sensor through the anchor plate aperture (**Fig. 129**).
7. Unscrew the two keep plate screw nuts of the Washing Station Home Sensor (**Fig. 130**) and take out the sensor from the keep plate.

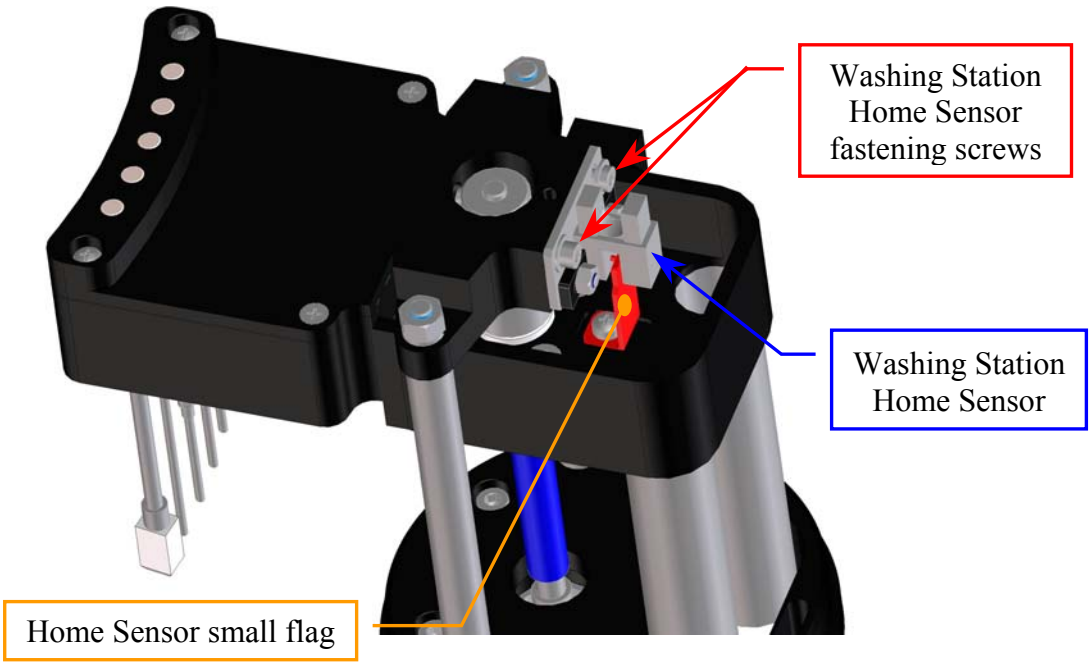


Fig. 128 – The two fastening screws of the Washing Station Home Sensor

To replace the new Washing Station Home Sensor (**Fig. 131**) perform the following steps:

8. Position the keep plate under the new home sensor as showed in the **Fig. 130**, center the sensor with respect to the keep plate and screw its two screw nuts.

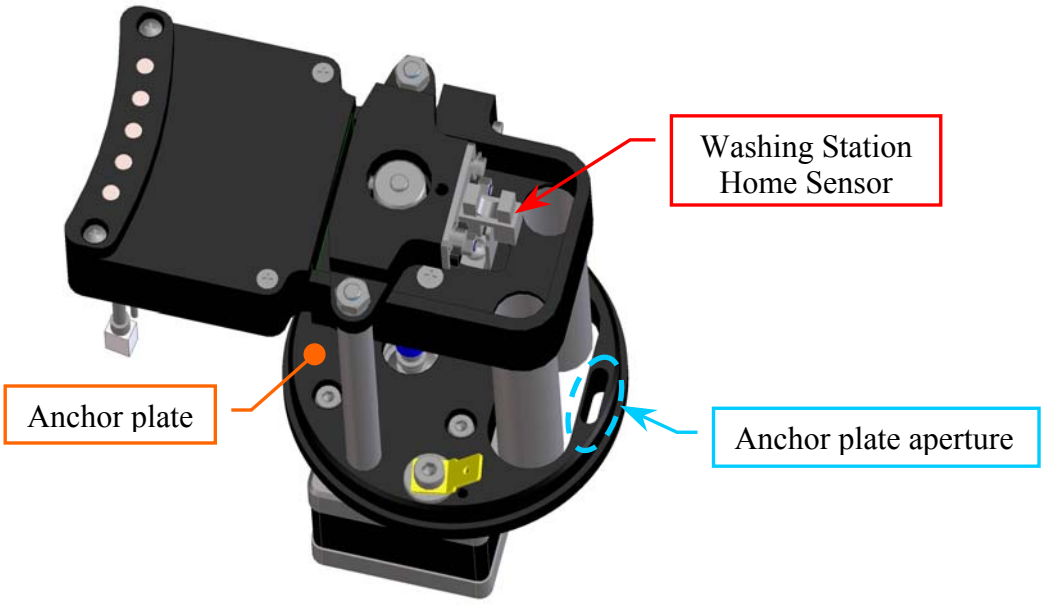


Fig. 129 – Anchor plate aperture of the Washing Station Assy

9. Position the Washing Station Home Sensor on its place in order to obtain that the home sensor small flag is centered with respect to the internal sides of the home sensor - as showed in the **Fig. 128** - .

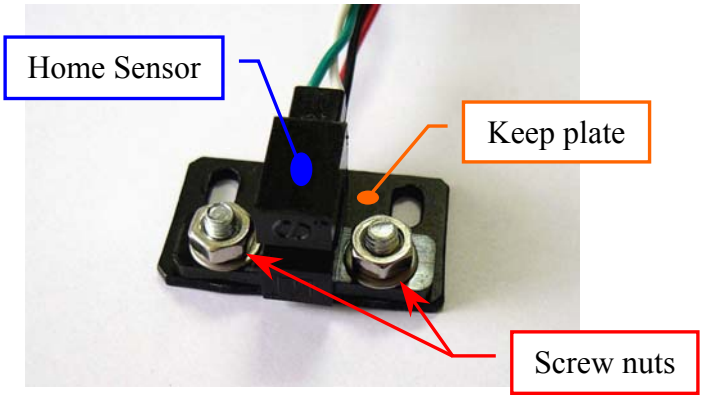


Fig. 130 – The two keep plate screw nuts of the Home Sensor

Fig. 131 – Washing Station Home Sensor [P/N: 9-10-0023-40]

10. Screw the two fastening screws of the Washing Station Home Sensor (**Fig. 128**).
11. Push the Washing Station Home Sensor connector through the anchor plate aperture (**Fig. 129**).
12. Unscrew the two captive screws on the front underside of the instrument (**Fig. 6**) and lift up the Raising Top (**Fig. 7**).
13. Pull down the cable of the Washing Station Home Sensor.
14. Plug the Washing Station Home Sensor connector in the J11 connector of the Electrovalves Control Board (compare the scheme SC-30-02194-00).
15. Bring down the Raising Top (**Fig. 7**) and screw the two captive screws on the front underside of the instrument (**Fig. 6**).
16. Remove the Reactions Plate cover from the Reactions Plate (**Fig. 7**).
17. Turn on the SAT450 system (instrument and computer) and launch the "Diagnostic" program.
18. Perform the procedure "Mechanical adjustments of the Washing Station" described into the previous Section 6.8.1, from step 3 to step 14.

5.9 TEMPERATURES ADJUSTMENTS

5.9.1 Procedure for the adjustment of the Reaction Cuvettes Temperature

1. Lift up the instrument cover (**Fig. 7**), unscrew the two fastening screws of the Reactions panel placed on the Raising Top near the Washing Station (**Fig. 107**) and take out the panel from the Raising Top.
2. Take the Service Probe of the Kit having P/N: 55-01204-00 and push it through the rectangular opening of the Raising Top (**Fig. 132**).

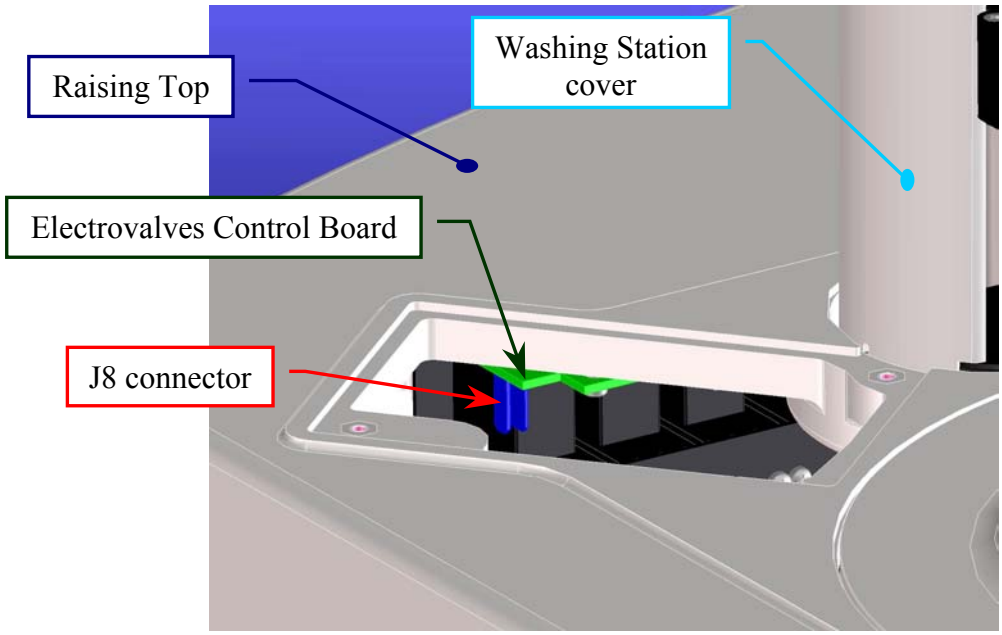


Fig. 132 – Rectangular opening of the Raising Top

3. Plug the connector of the Service Probe in the J8 connector of the Electrovalves Control Board (compare the **Fig. 132** and the scheme SC-30-02194-00).
4. Turn on the SAT450 system (instrument and computer), launch the "Diagnostic" program and wait at least 30 minutes for warm-up the instrument.
5. Select "Temperatures" folder, click the "Service Pb." button and read the temperature value (°C) showed in the adjacent text box.
6. Make sure that the said temperature value (°C) is about equal to the Ambient Temperature value (°C). If it not be so, calibrate the Service Probe in the following way:
    a. click the "Calib. Sensor" button in the "Temperatures" folder and wait until the "Calibration Temperature Sensor" form appears;
    b. unplug the connector of the Service Probe from the J8 connector of the Electrovalves Control Board;
    c. plug the 10 KΩ resistor [Kit having P/N: 55-01204-00] in the J8 connector of the Electrovalves Control Board (**Fig. 132**);
    d. click the "Read 10K" button in the "Calibration Temperature Sensor" form;
    e. unplug the 10 KΩ resistor from the J8 connector of the Electrovalves Control Board;

f. plug the 5.76 KΩ resistor [Kit having P/N: 55-01204-00] in the J8 connector of the Electrovalves Control Board (**Fig. 132**);
g. click the "Read 5K76" button in the "Calibration Temperature Sensor" form;
h. unplug the 5.76 KΩ resistor from the J8 connector of the Electrovalves Control Board;
i. click the "Save" button in the "Calibration Temperature Sensor" form to save the two calibration values;
j. click the "Exit" button in the "Calibration Temperature Sensor" form to exit from it;
k. plug the connector of the Service Probe in the J8 connector of the Electrovalves Control Board (**Fig. 132**).

7. Click the "Temp. Test Run" button in the "Temperatures" folder and wait until the "Temperature Test" form appears.
8. Insert a reagent bottle with distilled water in the position #1 of the Satellite Rack "A" of the Reagents Plate.
9. Make sure that the four racks are correctly inserted in the Reactions Plate.
10. Click the "START" button in the "Temperature Test" form. Wait until that the five cuvettes of the Reactions Plate - after the dispensation of the Sampling Arm - has been positioned under the five probes of the Washing Station.
11. Push the Service Probe through the aperture of the Reactions Plate cover (**Fig. 133**).

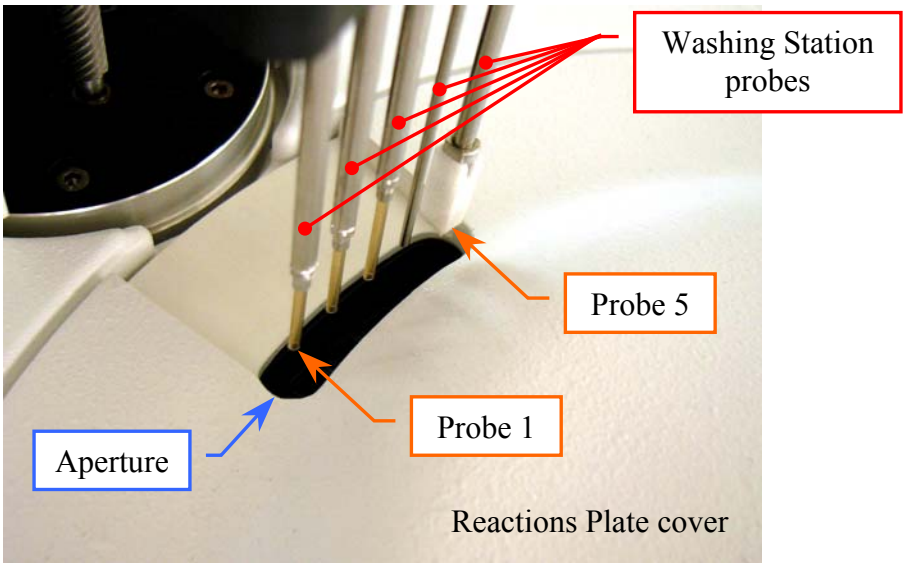


Fig. 133 - Aperture of the Reactions Plate cover

12. Insert the Service Probe inside the cuvette placed under the Probe 5 of the Washing Station (**Fig. 133**) until the NTC touches the bottom of the cuvette, shake slightly it and read the temperature value (°C) showed in the "Service Probe" text box (note: the temperature of the liquid of this cuvette is that more affected by the Pre-Heater heating).
13. Insert the Service Probe inside the cuvette placed under the Probe 1 of the Washing Station (**Fig. 133**) until the NTC touches the bottom of the cuvette, shake slightly it and read the temperature value (°C) showed in the "Service Probe" text box (note: the temperature of the liquid of this cuvette is that more affected by the Reactions Plate resistor heating).

14. Make sure that the two said temperature values are included in the following range: [37 °C – 0.3, 37 °C + 0.3]. If it not be so, adjust the reactions cuvettes temperature in the following way:
    a. pull out the Service Probe from the aperture;
    b. click the "WASH" button in the "Temperature Test" form and wait until the five cuvettes are emptyed;
    c. click the "EXIT" button in the "Temperature Test" form to exit from it;
    d. select "Configuration" folder, enter the password ("1234") in the "Password" form and push the "OK" button;
    e. taking into account the two said temperature values and that seven counts correspond to about one degree centigrade (7 counts ≅ 1 °C):
        ⇒ set a new parameter for the Pre-Heater heating shifting the cursor in the Heater–Arm area, then click the "OK" button to save it
        and/or
        ⇒ set a new parameter for the Reactions Plate resistor heating shifting the cursor in the Heater–Plate area, then click the "OK" button to save it;
    f. select "Temperatures" folder;
    g. wait 30 minutes to bring the instrument to the new(s) heating value(s);
    h. click the "Temp. Test Run" button and wait until the "Temperature Test" form appears;
    i. click the "START" button in the "Temperature Test" form. Wait until that the five cuvettes of the Reactions Plate - after the dispensation of the Sampling Arm - has been positioned under the five probes of the Washing Station;
    j. repeat the above steps 11, 12, 13 and 14.
15. Insert the Service Probe inside the cuvette placed under the Probe 2 of the Washing Station until the NTC touches the bottom of the cuvette, shake slightly it, read the temperature value (°C) showed in the "Service Probe" text box and make sure that it is included in the following range: [37 °C – 0.3, 37 °C + 0.3].
16. Insert the Service Probe inside the cuvette placed under the Probe 3 of the Washing Station until the NTC touches the bottom of the cuvette, shake slightly it, read the temperature value (°C) showed in the "Service Probe" text box and make sure that it is included in the following range: [37 °C – 0.3, 37 °C + 0.3].
17. Insert the Service Probe inside the cuvette placed under the Probe 4 of the Washing Station until the NTC touches the bottom of the cuvette, shake slightly it, read the temperature value (°C) showed in the "Service Probe" text box and make sure that it is included in the following range: [37 °C – 0.3, 37 °C + 0.3].
18. Pull out the Service Probe from the aperture, unplug its connector of the Service Probe from the J8 connector of the Electrovalves Control Board and take out it.
19. Click the "WASH" button in the "Temperature Test" form and wait until the five cuvettes are emptyed.
20. Click the "EXIT" button in the "Temperature Test" form to exit from it.
21. Click the "Exit" button to exit from the "Diagnostic" program.
22. Position the Reactions panel in its housing on the Raising Top (**Fig. 107**) and screw its two fastening screws.
23. Bring down the instrument cover (**Fig. 7**).

5.9.2 Procedure for the check of the Reagents Cooling Temperature

1. Turn on the SAT450 system (instrument and computer) and launch the "Diagnostic" program.
2. Select "Plates" folder and request an Reagents Plate reset. Wait until the reset Reagents Plate procedure has been completed.
3. Make sure that the two Home Sensors of the Reagents Plate light up in green.
4. Wait 30 minutes to bring the Reagents Plate to the correct cooling temperature.
5. Lift up the instrument cover and remove the Reagents Plate cover from the Reagents Plate (**Fig. 7**).
6. Take four IL cups and fill them with distilled water to the ambient temperature.
7. Position the four filled cups in the positions #1 – by the adaptors – of the four Peripheral Racks (rA-1, rB-1, rC-1 and rD-1 positions) as showed in the **Fig. 134**.
8. Replace the Reagents Plate cover on the Reagents Plate and bring down the instrument cover (**Fig. 7**).
9. Wait 60 minutes to bring the distilled water of the four cups to the right cooling temperature.

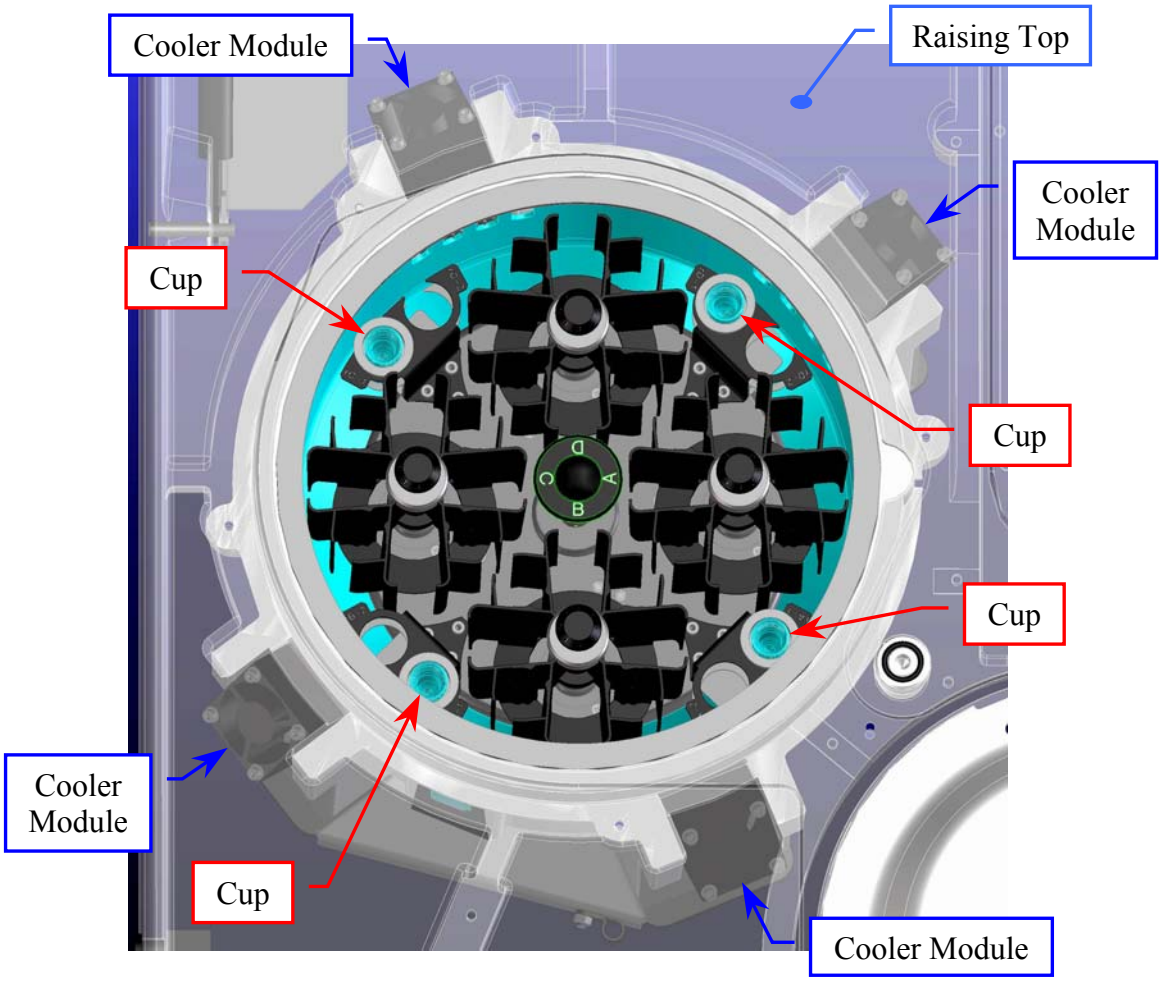


Fig. 134 – Reagents Plate and Cooler Modules

10. Turn on a calibrated thermometer with probe.
11. Lift up the instrument cover and remove the Reagents Plate cover from the Reagents Plate (**Fig. 7**).
12. Insert the probe of the thermometer inside the cup of the rA-1 position until the probe tip touches the bottom of the cup, shake slightly it and read the temperature value (in °C).
13. Check that said temperature value is included in the following range: [8 °C, 12 °C].
14. Insert the probe of the thermometer inside the cup of the rB-1 position until the probe tip touches the bottom of the cup, shake slightly it and read the temperature value (in °C).
15. Check that said temperature value is included in the following range: [8 °C, 12 °C].
16. Insert the probe of the thermometer inside the cup of the rC-1 position until the probe tip touches the bottom of the cup, shake slightly it and read the temperature value (in °C).
17. Check that said temperature value is included in the following range: [8 °C, 12 °C].
18. Insert the probe of the thermometer inside the cup of the rD-1 position until the probe tip touches the bottom of the cup, shake slightly it and read the temperature value (in °C).
19. Check that said temperature value is included in the following range: [8 °C, 12 °C].
20. Remove the four cups (and the adaptors) from the Peripheral Racks, replace the Reagents Plate cover on the Reagents Plate and bring down the instrument cover (**Fig. 7**).

CHAPTER 06

- MAINTENANCE -

INDEX

6 MAINTENANCE

This chapter contains all those routine operations, which concern SAT450 instrument maintenance. Said procedures, listed and described below, should be carefully and scrupulously followed in order to guarantee the specifications and the perfect working order of the instrument over time.

6.1 PREVENTIVE MAINTENANCE

The Table A, illustrated below, lists all those procedures to be carried out by the user/operator and the relative frequency schedule. Strict adherence to said schedule will guarantee the optimal operative efficiency of the SAT450 instrument.

FREQUENCY	PROCEDURE	NOTES
DAILY – Before launching "Start Work"	Check the levels of the four liquid reservoir bottles I, II, III and IV and, if necessary, fill their bottles	
DAILY – Before launching "Start Work"	Check the levels of the Reagents, Standards and Controls	
DAILY – Before launching "Start Work"	Check the levels of the two waste tanks and, if necessary, empty them	
DAILY – Before to start with daily routines	Carry out a WBL cycle	
DAILY – After Shutdown	Clean the Sampling Probe using either paper towel or gauze	See Section 7.2

Table A – Maintenance Schedule (*Daily*)

FREQUENCY	PROCEDURE	NOTES
EVERY TWO WEEKS	Clean the (four) Washing Station probes	See Section 7.3
EVERY TWO WEEKS	Clean the four liquid reservoir bottles	See Section 7.4
ONCE A MONTH	Clean the Pad	See Section 7.5
ONCE A MONTH	Clean the Hydraulic Circuit	See Section 7.7
EVERY THREE MONTHS	Change the Reaction Cuvettes	See Section 7.9
EVERY SIX MONTHS	Change the Pad	See Section 7.6
ONCE A YEAR	Change all the tubes (Tubes Kit)	See Section 7.10
EVERY 2000 HOURS	Change the Photometer Halogen Lamp	See Section 7.8

Table B – Maintenance Schedule

6.2 SAMPLING PROBE – Cleaning procedure

Use only lint free paper towel or gauze.

1. Make sure that the SAT450 instrument is turned off.
2. Dampen the gauze or the paper towel with distilled water and clean the outside of the Sampling Probe. Note: wipe the Probe from the top downwards only! This is to avoid that any bits of cloth, paper or lint fibres accidentally enter inside the Probe.

It is suggested that once weekly the above described cleaning procedure must be performed using a 5% sodium hypochlorite solution instead of distilled water to dampen the gauze or the paper towel. Then, repeat the procedure using distilled water.

6.3 WASHING STATION PROBES – Cleaning procedure

Use only lint free paper towel or gauze.

1. Make sure that the SAT450 instrument is turned off.
2. Place a sheet of paper under the Washing Station probes in order to keep any extraneous material from accidentally downfall into the reaction cuvettes.
3. Dampen the gauze or the paper towel with distilled water and clean the outside of the probes (with the exception of the last probe). Note: wipe the probes from the top downwards only! This is to avoid that any bits of cloth, paper or lint fibres accidentally enter inside the probes.
4. Remove the sheet of paper from under the Washing Station probes.

It is suggested that once monthly the above described cleaning procedure must be performed using a 5% sodium hypochlorite solution instead of distilled water to dampen the gauze or the paper towel. Then, repeat the procedure using distilled water.

6.4 FOUR LIQUID RESERVOIR BOTTLES – Cleaning procedure

During a normal use and over time, mold and dust can build up inside the four liquid reservoir bottles. For this reason, it is extremely important that they be periodically washed. The said cleaning must be thorough and meticulous in order to insure that every trace of mold or residue be removed.

How often the bottles must be cleaned depends on their use and on the quality of the distilled water used in that particular laboratory. However, it is recommended to make thorough washing at least once every two weeks.

It is extremely important that the user not underestimate the risks associated with mold and dust particles. They are to be regarded as a serious hazard as they can be the cause of instrument malfunction.

The four liquid reservoir bottles are located on the side of the instrument inside their container.

- **Cleaning procedure for the four liquid reservoir bottles:**

1. Make sure that the SAT450 instrument is turned off.
2. Take the caps off the bottles and empty them.
3. Fill each bottle with a 5% sodium hypochlorite solution.
4. Clean the inside of each bottle using a bottle-brush in order to remove all traces of mold and/or residue.
5. Leave the sodium hypochlorite solution stand in the bottles for at least ten minutes.
6. Empty the bottles, rinse them repeatedly and well with tap water, then twice more using distilled water.
7. Dry the bottles.
8. Fill the bottles with their proper solutions.
9. Replace the bottles in their respective positions inside the container.
10. Close the bottles with their caps and turn on the instrument.
11. Carry out two 'Washing Cuvettes' cycles and two 'WBL' cycles. Check the system efficiency by comparing the WBL values and the test results obtained against the laboratory's quality control values.

6.5 DRYING PAD – Cleaning procedure

The Pad is used to dry the cuvettes after they have been washed. This drying process is carried out via aspiration and therefore, over time, the Pad will necessarily absorb various contaminating particles.

It is suggested that the Pad be replaced every six months. Said frequency may vary depending on the workload of the individual laboratory and the operating conditions/environment of the single instrument.

The Pad must be washed regularly in order to guarantee proper functioning and must be replaced - if necessary - with a new Pad.

- **Cleaning procedure for the Pad:**

1. Make sure that the SAT450 instrument is turned off.
2. Unscrew the fastening screw of the Washing Station cover and remove the cover from its place on the Raising Top.
3. Unscrew the four fastening screws of the Washing Station tubes cover and remove the cover from the Washing Station.
4. Remove the probe that contains the Pad (the Probe 5) and its spring.
5. Disconnect the aspiration tube.
6. Once the probe has been removed, immerge it in a 5% solution of sodium hypochlorite for at least 15 minutes.
7. Attach a 10 ml syringe to the probe, then aspirate and dispense the hypochlorite solution through the probe (and the Pad) until the latter is completely clean. This aspirating and dispensing forces the liquid through the Pad fibers in both directions.

8. Once the Pad is clean, repeat the aspirating and dispensing cycle 10 more times using distilled water, then disconnect the syringe.
9. Reconnect the aspiration tube to the probe.
10. Re-position the probe in its housing being careful to not kink the aspiration tube.
11. Re-position the spring on the probe.
12. Re-position the tubes cover of the Washing Station – making sure that the cylindrical tops of the probes fit into the corresponding holes on it – and screw its four fastening screw.
13. Manually move the Washing Station downwards and centre the pad with the reaction cuvette turning it.
14. Re-position the Washing Station cover and screw its fastening screw.

6.6 PROCEDURE FOR REPLACING THE DRYING PAD

1. Make sure that the SAT450 instrument is turned off.
2. Unscrew the fastening screw of the Washing Station cover and remove the cover from its place on the Raising Top.
3. Unscrew the four fastening screws of the Washing Station tubes cover and remove the cover from the Washing Station.
4. Remove the probe that contains the Pad (the Probe 5) and its spring.
5. Disconnect the aspiration tube.
6. Remove the used Pad and replace it with a new one.
   Note: press lightly to push the new Pad into place – be careful to not press too hard as this could deform the Pad.
7. Insert the probe containing the new Pad into a reaction cuvette, pushing it down inside until it takes on the shape of the inside of the cuvette.
8. Remove the cuvette, connect the aspiration tube to the probe and reposition the probe back into its proper housing in the Washing Station. Note: be careful to not kink the aspiration tube while doing so.
9. Re-position the spring on the probe.
10. Re-position the tubes cover of the Washing Station – making sure that the cylindrical tops of the probes fit into the corresponding holes on it – and screw its four fastening screw.
11. Manually move the Washing Station downwards and centre the pad with the reaction cuvette turning it.
12. Re-position the Washing Station cover and screw its fastening screw.

6.7 HYDRAULIC CIRCUIT – Washing procedure

During normal use and over time, mold and dust can build up inside the bottles and can have a negative effect on the hydraulic circuit, compromising the correct functioning of the micropumps and electrovalves. This, in turn, can lead to inefficiency in the Sampling Probe and cuvette washing system.

For this reason, it is extremely important that the hydraulic circuit be periodically washed. Said cleaning must be thorough and meticulous in order to assure that every trace of mold or residue be removed.

How often the hydraulic circuit must be washed depends on the operating conditions/ environment of the single instrument and the quality of the distilled water used in that particular laboratory. It is recommended to make thorough washing at least once a month.

It is extremely important that the user not underestimate the risks associated with mold and dust particles. They are to be regarded as a serious hazard as they can be the cause of instrument malfunction.

The hydraulic circuit input straws are located inside the liquid reservoir bottles on the side of the instrument.

- **Washing procedure for the Hydraulic Circuit:**

1. Make sure that the SAT450 instrument is turned on.
2. Prepare a bottle containing 500 ml of a 5% sodium hypochlorite solution.
3. Insert the four aspiration straws, located inside the liquid reservoir bottles, into the bottle containing the sodium hypochlorite solution.
4. Carry out a ‘WBL’ cycle and then a ‘Washing cuvettes’ cycle.
5. Wait for fifteen minutes. Clean and dry the four straws and then insert them into a bottle containing distilled water.
6. Carry out a ‘WBL’ cycle and then a ‘Washing cuvettes’ cycle.
7. Insert the four aspiration straws back into their respective bottles. In the meantime, said bottles should have been cleaned and filled with a fresh supply of the required solution.
8. Carry out a ‘Washing cuvettes’ cycle and then a ‘WBL’ cycle. Check the system efficiency by comparing the WBL values and the test results obtained against the laboratory’s quality control values.

6.8 REPLACEMENT OF THE PHOTOMETER HALOGEN LAMP

It is suggested that the halogen lamp be replaced after approximately 2000 hours of use.

The halogen lamp is mounted on the Photometer, which is located on the side of the Reactions Plate.

Replace the Photometer Halogen Lamp performing the relative procedure described into the Section 6.4.5 (*Chapter 06*).

6.9 REPLACEMENT OF THE REACTION CUVETTES

Over time and through normal use the perfect transparency of the cuvettes diminishes. This has a negative impact on the quality of the optical readings. It is suggested that the cuvettes be replaced after three months of use. The four Reactions Plate Racks are located inside the Reactions Plate.

- **Replacement procedure of one Reactions Plate Rack:**

1. Turn on the SAT450 instrument and wait until the instrument has reached its proper operating temperature.
2. Remove the Reactions Plate cover from its housing.
3. Unscrew the two fastening pommels of the Rack.
4. Remove the Rack from its housing and replace it with a new one.
   Note: make sure to reinsert the new Rack in the Reactions Plate vertically.
5. Screw the two fastening pommels in order to fix the Rack.

> Be especially careful to not touch the external surface of the reaction cuvettes dedicated to photometric reading.

6. Replace the Reactions Plate cover on the Reactions Plate.
7. Carry out a 'WBL' cycle. Check the system efficiency by comparing the WBL values and the test results obtained against the laboratory's quality control values.

6.10 REPLACEMENT OF THE TUBES

Over time and through normal use, the tubes become worn.

It is suggested that the tubes be replaced at least once a year.

- **Replacement procedure of the tubes:**

1. Make sure that the SAT450 instrument is turned off.
2. Unscrew the two captive screws on the front underside of the instrument and lift up the Raising Top.
3. Remove the tubes following the indications provided in the hydraulic diagram (compare the diagram SI-16-01873-00), making attention to the spillage of liquid from the tubes.
4. Replace the new tubes following the indications provided in the hydraulic diagram (compare the diagram SI-16-01873-00).
5. Bring down the Raising Top.
6. Turn on the instrument and wait until it has reached its proper operating temperature.
7. Carry out a 'Washing cuvettes' cycle and then a 'WBL' cycle.
8. Lift up the Raising Top and make sure that there is no leakage.
9. Bring down the Raising Top and screw the two captive screws on the front underside of the instrument.
10. Check the system efficiency by comparing the WBL values and the test results obtained against the laboratory's quality control values.

6.11 MAINTENANCE PROCEDURES

The following table is a list of the maintenance procedures that can be performed by the operator or by the maintenance technician.

Note: the frequency indicated in the table may vary according to the individual instrument's daily workload.

PROCEDURE	FREQUENCY	EFFECTUATED BY
CLEANING THE SAMPLING PROBE	DAILY	OPERATOR
CLEANING THE FOUR WASHING STATION PROBES	EVERY TWO WEEKS	OPERATOR
CLEANING THE FOUR LIQUID RESERVOIR BOTTLES	EVERY TWO WEEKS	OPERATOR
REPLACING THE REACTION CUVETTES	EVERY THREE MONTHS	OPERATOR
CLEANING THE PAD	ONCE A MONTH	OPERATOR
REPLACING THE PAD	EVERY SIX MONTHS	OPERATOR
REPLACING THE PHOTOMETER HALOGEN LAMP	AFTER 2000 HOURS OF USE	OPERATOR
REPLACING THE SAMPLING PROBE	AS NEEDED	OPERATOR
CLEANING THE HYDRAULIC CIRCUIT	ONCE A MONTH	OPERATOR
REPLACING THE TUBES (Tubes Kit)	ONCE A YEAR	MAINTENANCE TECHNICIAN
REPLACING THE PRE-HEATER	AS NEEDED	MAINTENANCE TECHNICIAN
MECHANICAL ALIGNMENT OF THE SAMPLING ARM	AS NEEDED	MAINTENANCE TECHNICIAN

PROCEDURE	FREQUENCY	EFFECTUATED BY
REPLACING OR ADJUSTING THE HOME SENSORS	AS NEEDED	MAINTENANCE TECHNICIAN
REPLACING THE BELT	AS NEEDED	MAINTENANCE TECHNICIAN
REPLACING THE MOTOR	AS NEEDED	MAINTENANCE TECHNICIAN
MECHANICAL ALIGNMENT OF THE WASHING STATION	AS NEEDED	MAINTENANCE TECHNICIAN
MECHANICAL ALIGNMENT OF THE REACTIONS PLATE OR REAGENTS PLATE OR SAMPLES PLATE	AS NEEDED	MAINTENANCE TECHNICIAN
REPLACING THE PHOTOMETER	AS NEEDED	MAINTENANCE TECHNICIAN
ADJUSTING THE PHOTOMETER	AS NEEDED	MAINTENANCE TECHNICIAN
REPLACING THE ELECTRONIC BOARDS AND THE MECHANICAL MODULES	AS NEEDED	MAINTENANCE TECHNICIAN

6.12 DECONTAMINATION PROCEDURE

Before replacing any instrument parts, repairing any defective items or performing any instrument maintenance procedure(s), the operator or maintenance technician must carry out the below described decontamination procedure of the instrument part(s) involved in the operation(s).

This procedure can be performed on:

- the entire instrument;
- those part(s) of the instrument subject to possible contamination.

⇒ **Material necessary:**

- an ESOFENOL solution diluted to 6% (60 cc in one litre of distilled water) or a equivalent solution. Note: the ESOFENOL is an antibacterial and antiviral substance.
- Rubber gloves
- Face mask
- Lab coat

❖ Decontamination procedure:

❑ External surfaces and individual parts:

- Spray the solution all over the instrument, making particular attention to wetting:
  - the Sampling Arm;
  - the Reactions Plate (including the cuvettes);
  - the Reagents Plate (including the racks);
  - the Samples Plate (including the racks);
  - the instrument chassis.
- allow at the solution to stand for approximately 30 minutes;
- wipe the solution off the instrument and the various components using a sponge dampened with distilled water.

❑ Hydraulic circuit:

- Fill a container with a 5% sodium hypochlorite solution;
- disconnect the aspiration tubes from the nipples of their respective bottles;
- immerge the four tubes into the container filled with the 5% sodium hypochlorite solution;
- carry out two ‘Washing cuvettes’ cycles and then two ‘WBL’ cycles;
- remove the four tubes from the 5% sodium hypochlorite solution and immerge them in another container containing the instrument Rinse solution;
- carry out one ‘Washing cuvettes’ cycle and then one ‘WBL’ cycle;
- reconnect the aspiration tubes to the nipples on their respective bottles.

CHAPTER 07

– HOST COMMUNICATION –

INDEX

7 HOST COMMUNICATION

7.1 COMMUNICATION WITH THE HOST COMPUTER

The SAT450 can be connected to a host computer for the purpose of facilitating results print-out and patients management.

In order to enable communication between the SAT450 and the Host computer, select the "Host Link**"** field under "Options" in the "Parameters" menu.

7.1.1 COMMUNICATION PARAMETERS

The ILabAries is linked to the managing computer using an RS-232C serial connector having the following specifications:

- Baud Rate : 9600 Bit/sec.
- Data bits : 8
- Parity : None
- Stop bit : 1

7.2 PROTOCOL SPECIFICATIONS

This part of Help (**Protocol Specifications**) contains information for the laboratory computer and analyzer. This exchange of data follows specific **ASTM** protocols:

E 1381-95 Standard Specification for Low-Level Protocol to Transfer Messages between Clinical Laboratory Instruments and Computer Systems;

E 1394-97 Standard Specification for Transferring Information between Clinical Instruments and Computer Systems.

→**ASTM** uses a number of different terms to indicate the way it groups data.

- **Field:** an individual piece of data often referred to as a data field or a data element.
- **Record:** a number of logically related data fields grouped together to form one part of a complete message.
- **Repeat field:** a data field of the same type as the one immediately preceding it. A delimiter separates one instance of a repeat field from the next.
- **Component field:** part of data field that might contain more than one piece of data.

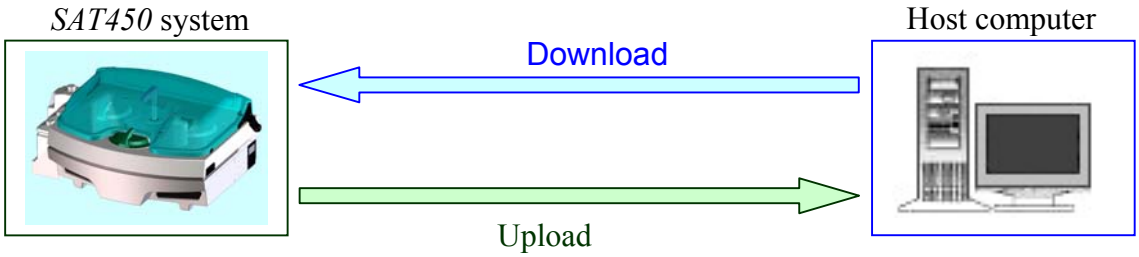
The default communication configuration for the program is the following: "9600, N, 8, 1".

→**ASTM** uses record types that are common and familiar to all laboratory personnel. It uses the following record types:

- **Header Record (H):** contains identifying information about the sending station, conventions that the device uses for field recognition, and the date and time of send station transmission.
- **Patient Record (P):** contains patient information and identification number.
- **Test Order Record (O):** contains information about the assay or requests themselves and includes other data.
- **Result Record (R):** contains information about the outcome of individual tests for an individual patient and follows a sample program record. The results contain the actual measurements derived from the test and a comparison of the individual result to certain ranges specified as norms for the laboratory.
- **Message Terminator Record (L):** although the ASTM protocol supports three additional record types - a Request for Information Record, a Scientific Record and a Manufacturer's Information Record - the program is not implementing these in the first release and will ignore them.
- **Request Information Record (Q):** is used by either clinical instruments or computer systems for a remote request for information from its reciprocal system.

The instrument does not send or accept comment records.

The following scheme shows the "Download" and "Upload" operations between the SAT450 system and the Host computer:



7.3 HEADER RECORD (H)

Field	Field Title	Down Load	Up Load	Max Len	Description and Valid Values
1	Record Type ID	**R**	**A**	1	This is a required field that contains an "H" identifying it as a header record.
2	Delimiters	**I**	**A**	4	The Analyzer System uses only the four default values shown here. Delimiters may not be duplicated. The field delimiter follows the escape character to separate the delimiter specification from a subsequent field in the header record. Using default values, the first six characters of the header record will appear using the following characters: H I\^&I Field Delimiter I Repeat Delimiter \ Component Delimiter ^ Escape Delimiter &
3	Message Control ID	**I**	**N**		
4	Access Password	**I**	**N**		
5	Sender Name or ID	**I**	**A**	10	'SHAnalyzer': this is the name of the device that is sending the data.
6	Sender Street Address	**I**	**N**		
7	Reserved Field	**I**	**N**		
8	Sender Tel. Number	**I**	**N**		
9	Characteristics of Sender	**I**	**N**		
10	Receiver ID	**I**	**N**		
11	Comments or Special Instructions	**I**	**N**		
12	Processing	**I**	**N**		
13	**ASTM** Version No.	**I**	**N**		

14	Date and Time	**I**	**A**	14	Date and Time of transmission: formatted as YYYYMMDDHHMMSS. For example: 3:35 PM on March 1, 1995 would be represented using the following characters: 19950301153500.

Legend:	**R** Required **O** Optional **I** Ignored **A** Always	**D** Down Load **U** Up Load **N** Never **S** Sometimes

Example Header Record Layouts (H)

Record sent by Host computer	H | \ ^ | | | HOST | | | | | | | | 19950301153500<CR>
Record sent by SAT450 system	H | \ ^ & | | | SHAnalyzer | | | | | | | | | 19950301154000<CR>

7.4 PATIENT RECORD (P)

Field	Field Title	Down Load	Up Load	Max Len	Description and Valid Values
1	Record Type ID	**R**	**A**	1	This is a required field that contains a "P" identifying it as a patient record.
2	Sequence Number	**R**	**A**	3	This field starts with a "1" for the patient and is incremented by 1 for each additional patient within the transmission.
3	Practice Assigned Patient ID	**R**	**A**	15	This field can be assigned by the instrument with no corresponding download.
4	Laboratory Assigned Patient ID	**I**	**N**		
5	Patient ID No. 3	**I**	**N**		
6	Patient Name	**O**	**S**	36	This field has two components: • Last Name (up to 20 characters) • First Name (up to 15 characters).
7	Mother's Maiden Name	**I**	**N**		
8	Birth Date	**O**	**S**	8	Formatted as YYYYMMDD: For example, a birth date of December 1, 1980 would be represented as: 19801201

9	Patient Sex	**R**	**O**	1	This field indicates the sex of the patient. The possible values are: • M: male • F: female • U: unspecified ➢ Download If present and equal to "U", the patient will be considered Male or Child depending to his birthdate received and to the Child/Adult Age Limit setted in the SAT450 system. ➢ Upload If patient has been received from the Host computer this field will be setted NULL. If the patient has not been received from Host computer this field will be: o M: male o F: female o U: if the patient is Child
10	Patient Race/Ethnic Origin	**I**	**N**		The Analyzer System will ignore this field at launch.
11	Patient Address	**O**	**S**	60	For Analyzer, this is a four- component field: • Address (25 characters) • City (25 characters) • State (2 characters e.g.: NY, IT) • Zip (5 characters)
12	Reserved Field	**I**	**N**		
13	Patient Tel Number	**I**	**N**		
14	Attending Physician ID	**I**	**N**		
15	Special Field 1	**I**	**N**		
16	Special Field 2	**I**	**N**		
17	Patient Height	**I**	**N**		
18	Patient Weight	**I**	**N**		
19	Patient Known or Suspected Diagnosis	**I**	**N**		
20	Patient Active Medications	**I**	**N**		
21	Patient's Diet	**I**	**N**		

22	Practice Field No. 1	**I**	**N**		
23	Practice Field No. 2	**I**	**N**		
24	Admission Date and Discharge Date (if desired)	**O**	**S**	8	Admission date only. Formatted as YYYYMMDD.
25	Admission Status	**I**	**N**		
26	Location	**O**	**S**	20	
27	Nature of Alternative Diagnostic Code and classifiers	**I**	**N**		
28	Alternative Diagnostic Code and classification	**I**	**N**		
29	Patient Religion	**I**	**N**		
30	Marital Status	**I**	**N**		
31	Isolation Status	**I**	**N**		
32	Language	**I**	**N**		
33	Hospital Service	**I**	**N**		
34	Hospital Institution	**I**	**N**		
35	Dosage Category	**I**	**N**		

Legend:		
	R Required	**D** Down Load
	O Optional	**U** Up Load
	I Ignored	**N** Never
	A Always	**S** Sometimes

Example Patient Record (P)

Record sent by Host computer	P | 1 | B108K | | | MW5910^Smith | | 19861002 | M | | Park Avenue^New York^NY^10002 | | | | | | | | | | | | 20020923 | | Hematology | | | | | | | | |
Record sent by SAT450 system	P | 1 | B108K | | | MW5910^Smith | | 19861002 | M | | Park Avenue^New York^NY^10002 | | | | | | | | | | | | 20020923 | | Hematology | | | | | | | |

7.5 TEST ORDER RECORD (O)

Field	Field Title	Down Load	Up Load	Max Length	Description and Valid Values
1	Record Type ID	**R**	**A**	1	This is required field that contains an "O" identifying it as an order
2	Sequence Number	**R**	**A**	3	This field starts with "1" for the first Test Order Record and is incremented by 1 for each additional Test Order Record within the record. This will be reset to "1" whenever another patient record is transmitted.
3	Specimen ID	**R**	**A**	15	Although the operator can manually edit this field at any time, the value of this field is usually assigned by the laboratory computer before down loading. The Analyzer uses and reports its results based on the assigned specimen ID.
4	Instrument Specimen ID	**I**	**N**		
5	Universal Test ID	**I** **I** **I** **R**	**N** **N** **N** **A**	9	This is a four-component field: • Universal Test ID Code (not used) • Universal Test ID Name (not used) • Universal Test ID Type (not used) • Manufacturer's or local code (6 characters): this is the code defined in the Analyzer.
6	Priority	**O**	**A**		This field indicates the test priority codes. ➢ Download If present and equal to "S" the test will be considered as STAT. If absent or present but different from "S", the test will be considered with no priority. ➢ Upload It will be setted to "S" if the test is a STAT, otherwise it will be a NULL field.

7	Request Ordered Date/Time	**I**	**N**		
8	Specimen Collected Date/Time	**I**	**N**		
9	Collection End Time	**I**	**N**		
10	Collection Volume/Units	**I**	**N**		
11	Collector ID	**I**	**N**		
12	Action Code	**O**	**N**		This field indicates the action to be taken with respect to the specimens that accompany or precede the request. ➢ Download If present and equal to "C", the test will be cancelled. If absent or present and not equal to "C", the test will be added. ➢ Upload It will always be setted to NULL.
13	Danger Code	**I**	**N**		
14	Relevant Clinical Info.	**I**	**N**		
15	Date/Time Specimen Received	**I**	**N**		
16	Specimen Type	**R**	**A**	1	This is a numeric field indicating the type of specimen: The Imm. System uses the following ASCII characters: **0**= Serum **1**= Urine
17	Ordering Physician	**I**	**N**		
18	Physician Tel. Number	**I**	**N**		
19	User Field No. 1	**I**	**N**		
20	User Field No. 2	**I**	**N**		

21	Lab Field No. 1	**I**	**N**		
22	Lab Field No. 2	**I**	**N**		
23	Date /Time Result Reported Last or Modified	**I**	**N**		
24	Instrument Charge	**I**	**N**		
25	Instrument Section ID	**I**	**N**		
26	Record Type	**I**	**A**	1	The field indicates the direction of the transmission: **O** - Down Loading **F** - Up Loading
27	Reserved Field	**I**	**N**		
28	Location or Ward of Specimen Collection	**I**	**N**		
29	Nosocomial Infection Flag	**I**	**N**		
30	Specimen Service	**I**	**N**		
31	Specimen Institution	**I**	**N**		
Legend:	**R** Required **O** Optional **I** Ignored **A** Always		**D** Down Load **U** Up Load **N** Never **S** Sometimes		

Example Test Order Record Layouts (O)

Record sent by Host computer	O | 1 | AR102 | | ^^^GLU | | | | | | | | | | 0 | | | | | | | | | | O | | | | |
Record sent by SAT450 system	O | 1 | AR102 | | ^^^GLU | | | | | | | | | | 0 | | | | | | | | | | F | | | | |

7.6 RESULTS RECORD (R)

Field	Field Title	Down Load	Up Load	Max Len	Description and Valid Values
1	Record Type ID		**A**	1	This is a required field that contains an "R" identifying it as a Results Record.
2	Sequence Number		**A**	3	This field starts with "1" for the first result and is incremented by 1 for each additional result within the record. This will be reset to "1" when the results from another test order record are transmitted to the laboratory computer.
3	Universal Test ID	**I** **I** **I** **R**	**N** **N** **N** **A**	9	This is a four-component field: • Universal Test ID Code (not used) • Universal Test ID Name (not used) • Universal Test ID Type (not used) • Local Manufacturer's or local code (6 characters): this is the code defined in the Analyzer.
4	Data or Measurement value		**A**	10	'Data' is a 10-character, floating point field that includes the decimal point. The number of precision point digits will vary according to the test and is configurable on the Analyzer.
5	Units of Measure		**A**	6	This is a field for up to 6 characters that the operator defines for analytic measurement.
6	Reference Ranges		**A**	21	This field has two components; one giving the lower limit and the other the upper limit of the range. The format for this field is N^N.
7	Result Abnormal Flags		**A**	2	This field indicates the normal status of the result. The following codes are valid values: L - Below Low normal H - Above High normal LL - Below Panic normal HH - Above Panic normal < - Below absolute low (under linearity) > - Above absolute high (over linearity) N - Normal A - Abnormal E - Edited

8	Nature of Abnormality Testing		**N**		
9	Result Status		**A**	1	The Imm. System currently implements only three valid values: I - pending results in the instrument; F - final results; V - operator verified/approved result.
10	Date of Change in Instrument Normative Values or Units		**N**		
11	Operator ID		**N**		
12	Date/Time Test Started		**N**		
13	Date/Time Test Completed		**A**	14	Date and Time of test completion: formatted as YYYYMMDDHHMMSS.
14	Instrument ID		**N**		

Legend:		
	R Required	**D** Down Load
	O Optional	**U** Up Load
	I Ignored	**N** Never
	A Always	**S** Sometimes

Example Result Record Layouts (R)

Record sent by SAT450 system	R | 1 | ^^^GLU | 70.97 | UL | 70^105 | N | | F | | | | 20020923114302 |

7.7 MESSAGE TERMINATOR RECORD (L)

Field	Field Title	Down Load	Up Load	Max Len	Description and Valid Values
1	Record Type ID	**R**	**A**	1	This is a required field that contains an "L" identifying it as an Message Terminator Record.
2	Sequence Number	**R**	**A**	1	For a message terminator, this message should always be "1".
3	Termination Code	**R**	**A**	1	This indicates the cause of termination. The following codes are valid values for the Analyzer : Null or **N**-normal termination

Legend:		
	R Required	**D** Down Load
	O Optional	**U** Up Load
	I Ignored	**N** Never
	A Always	**S** Sometimes

Example Message Terminator Record Layout (L)

Record sent by Host computer	L | 1 | N
Record sent by SAT450 system	L | 1 | N

7.8 REQUEST INFORMATION RECORD (Q)

Field	Field Title	Down Load	Up Load	Max Len	Description and Valid Values
1	Record Type ID		**A**	1	This is a required field that contains a "Q" identifying it as a request.
2	Sequence Number		**A**	1	It is always "1".
3	Starting Range ID Number		**A**	31	This field can either be: "ALL" - to mean all demographics and tests being ordered should be sent to the instrument at this time, or can have two components: • Computer system patient ID No. (up to 15 characters); • Computer system specimen ID No. (up to 15 characters).
4	Ending Range ID Number		**N**		
5	Universal Test ID		**N**		
6	Nature of Request Time Limits		**N**		
7	Beginning Request Results Date and Time		**N**		
8	Ending Request Results Date and Time		**N**		
9	Requesting Physician Name		**N**		
10	Requesting Physician Telephone Number		**N**		
11	User Field No. 1		**N**		
12	User Field No. 2		**N**		
13	Request Information Status Codes		**A**	1	It is always "O" (requesting test orders and demographics only).

Example Request Information Record Layouts (Q)

Record sent by SAT450 system	H | \^& | | | SHAnalyzer | | | | | | | | | 20020927100402 Q | 1 | ALL | | | | | | | | | | O L | 1 | N

CHAPTER 08

- ERROR SIGNALING AND TROUBLESHOOTING -

INDEX

8 ERROR SIGNALING AND TROUBLESHOOTING

8.1 ERROR SIGNALING

This chapter is dedicated to a description of the **error** signalling which may occur during the programming or carrying out of the various operations. Error signals can be divided into the following two groups:

- System Errors;
- Result Flags.

8.1.1 SYSTEM ERRORS

Whenever a system error is detected, it is signalled via the activation of the below listed warning lights/buttons:

- **Warning** Light: a triangle-shape located in the System Monitor screen. It lights up yellow when activated.

If this yellow triangle lights up, the operator needs simply to click on it to access the relative visual text warning message indicating the cause of the signalled anomaly (said window will open in that area dedicated to viewing data).

Following is a list of possible visual text "Warning!" messages:

- Liquid Alarm I
- Liquid Alarm II
- Liquid Alarm III
- Liquid Alarm IV
- Temperature Out-of-Range
- Host Serial Port cannot be opened

- **Fatal Error**: an "X"-shape located in the System Monitor mask. It lights up red when activated.

If this red "X" lights up, the operator needs simply to click on it to access the relative visual text message explaining the cause of the Fatal Error (said window will open in that area dedicated to viewing data).

Following is a list of possible Fatal Error visual text messages:

- Arm Error
- Filters Error
- ADC Error – Sample Channel
- ADC Error – Reference Channel
- Plates Error (home sensor not found)
- Washing System Error
- Diluter Error
- Interlock Open while Instrument is running

8.1.2 RESULT FLAGS

Result Flags are categorized under the following group headings. Each group is identified by a symbol, as listed here below:

X PHYSICAL ERRORS

R CONCENTRATION ERRORS

C CALIBRATION ERRORS

A OPTIC DENSITY ERRORS

E RESULTS EDITED MANUALLY

? PROGRAMMING ERRORS

Every Result Flag, signalling an error, is accompanied by a symbol representing the pertinent group. The operator needs simply to click on the small red square next to the Result Flag symbol to access the visual text message explaining the cause(s) of the signalled error.

In the central column of the following tables, the user will find those symbols which signal the type of error encountered, as used in the print-out of the final report. These symbols can be modified by the operator in the "Print Options" form of the "Parameters" section.

Note	The use of the Error Symbols in the print-out of the results (inclusion and/or exclusion) IS UNDER THE DIRECT AND SOLE RESPONSIBILITY OF THE USER.

8.1.2.1 DESCRIPTION OF THE RESULT FLAGS

X Physical Errors		
Temperature Error:	**T**	Reaction temperature (of the Reactions Plate) is out-of-range.
No Sample:	**S**	Either no sample or sample serum quantity below minimum or above maximum level for the declared container.
No Reagent:	**R**	Either no reagent or reagent level below minimum or above maximum level for the declared container.

R Concentration Errors

Very Low and Very High:	**L-H**	Flags determined by test results out-of-range as setup in the Methods.
Low Alert and High Alert:	**A**	Flags determined by test results out-of-range as setup in the Methods.
Low and High Linearity Limit:	**G**	Flags determined by test results out-of-range as setup in the Methods.
Calculation Error:	**C**	Concentration calculation error due to foreseeable causes (asymptote).

C Calibration Errors

RBL missing:	*	No Reagent Blank Level.
Calibration missing:	*	No Standard or no Calibration curve.
STD Replicate insufficient:	*	Insufficient number of valid Standard Replicates.
STD Replicate outside CV%:	*	Percentage Coefficient of Variation in the Standard Replicates over the set value.
Invalid Calibration:	*	Calibration curve not valid – either because it is not monotonic or because the Fit is above the set value.

A Optic Density Errors

Inversion:	**I**	Reaction direction not in line with that set-up.
End Point Limit:	**P**	Values over the limits setup in the Methods Parameters.
Depletion Limit:	**D**	Values over the limits setup in the Methods Parameters.
First Limit:	*****	Values over the limits setup in the Methods Parameters.
FIT:	**F**	Values over the limits setup in the Methods Parameters.
RBL out-of-range:	*****	Reagent Blank Levels outside the range defined.
Sample outside Standard:	**#**	Sample absorbance outside the calibration curve.
Expired	**!**	The Reagent Lot has expired.
Stability	**§**	The Reagent On Board stability has expired.

E Results Edited Manually

Results Edited:	**E**	This symbol automatically appears whenever the operator has manually modified the obtained results. This operation annuls all the symbols indicating errors which, in this case, will not be viewed.

? Programming Errors

All those software errors - which are deemed unforeseeable - are indicated using this symbol.

Moreover:

Result Asterisks

In the event that the following situations and/or error conditions occur, the system will notify the user via a visualization of two asterisks **(**)** in the Results field:

- PHYSICAL ERRORS
  1. very little or no sample;
  2. very little or no reagent;
  3. no rack.

- CONCENTRATION ERRORS
  4. calculation error;
  5. signalling depletion limit.

- PROGRAMMING ERROR
  6. all cases.

In the following situations and/or error conditions, the Results field will contain a “0”:

1. if the result is less than zero;
2. if the result is equal to zero.

- OPTIC DENSITY ERRORS
  3. flag signaling inversion.

8.2 TROUBLESHOOTING GUIDE

PROBLEM	➢ POSSIBLE CAUSE ❖ SOLUTION
Insufficient repeatability of results	➢ Sampling Probe dirty. ❖ Clean the Sampling Probe. ➢ Hydraulic leak and/or air bubbles in the hydraulic circuit. ❖ Check the Sampling Probe fit. ❖ Check the fit of the hydraulic tubes and their connection: if necessary, substitute the tubes and/or adjust their connections/fittings. ➢ Wash solution is contaminated. If the wash solution contains contaminating particles (e.g.: mold, dust, lint), these micro-particles can cause errors during the WBL running. ❖ Change the wash solution. ❖ Clean the liquid reservoir bottle(s) and carry out the Hydraulic Circuit washing procedure. ➢ Deterioration of the Reagent(s). ❖ Substitute the bad Reagent(s). ➢ Reaction cuvettes not dried correctly after being washed. ❖ Check the Pad used to dry the cuvettes after washing to make sure it is in good working condition. If necessary, clean the Pad or change it, following the relative procedure. ➢ Halogen lamp not stable. ❖ Halogen lamp nearing the end of its life cycle (2000 hours), or premature deterioration. In both cases, change the Halogen Lamp following the replacement procedure.
Insufficient volume/quantity of the various solutions	➢ This type of problem can present either when there is a lack of liquid in one/more bottle(s) or - during the test running - when the involved liquid has been finished. ❖ Refill the involved bottle(s). If the instrument is running tests, it will go automatically in “Pause”. Wait until sampling is suspended, then refill the involved bottle(s) with the required liquid(s). Press Start to run the rest of the programmed tests.