A25

SERVICE MANUAL

ENGLISH

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1. INTRODUCTION

The ***A25*** analyzer is an automatic random access analyzer specially designed for performing biochemical and turbidimetric clinical analyses. The instrument is controlled *on-line* in real time from an external dedicated PC.

In each of the components of the A25 analyzer, BioSystems has used leading edge technology to obtain optimum analytical performance, as well as taking into account economy, robustness, easy use and maintenance. A three-axis Cartesian operating arm prepares the reactions. Dispensing is performed by means of a pump with a ceramic piston via a detachable thermostatised needle with *Fuzzy Logic* control. A washing station guarantees that the needle is kept perfectly clean throughout the process. The reactions take place in a thermostatised rotor in which absorbance readings are taken directly by means of an integrated optical system.

This manual contains the information required for learning about, maintaining and repairing the ***A25*** automatic analyzer. It should be used by the Technical Service as a learning and consultation document for the maintenance and repair of the instrument. Chapter 2 describes the different mechanical components that form the analyzer together with their functionality, and chapter 3 describes the electronic system. Chapter 4 describes the Service Program. All the adjustments and checks of the analyzer are carried out through this program, which is independent from the application program (User Program). The separation of both programs enable it to be maintained separately and the extensions and improvements of one do not affect the other. The user does not have the service program. The Technical Service must install it on the user's computer in order to carry out the service requirements. Once said tasks have been carried out, the Technical Service must uninstall the program. Chapter 5 offers instructions for the different maintenance, repair and cleaning operations that can be carried out by the Technical Service. The annexes contain a summary of the technical specifications of the analyzer, the adjustment margin tables, the lists of accessories and spares, a list of software versions and their compatibility and a software troubleshooting guide.

1.1. GENERAL DESCRIPTION OF THE ANALYZER

The ***A25*** analyzer is made up of three basic components: the operating arm, the dispensing system and the reading and reactions rotor. The electronic system of the instrument controls said components and communicates with the external

computer containing the application program. Through this program, the user can control all the operations of the analyzer. The analyzer may be fitted with the option of an external module for measuring ion concentration.

1.1.1. Operating arm

This is a three-axis XYZ Cartesian mechanism. The X and Y axes move the dispensing needle over the analyzer horizontally and the Z axis moves it vertically. It is operated by three step-by-step motors. In each 15-second preparation cycle, the operating arm performs the following actions: first of all, it sucks in the reagent from the corresponding bottle. Next, the needle is washed externally in the washing station and sucks in the sample from the corresponding tube. It is washed externally again and dispenses the sample and the reagent into the reactions rotor. Finally, it is exhaustively washed internally and externally before proceeding with the next preparation. The arm has a system for controlling vertical movement to detect whether or not the needle has collided into anything on descending. If a collision occurs, as may be the case if, for example, a lid has been left on a bottle of reagent, the arm automatically restarts, verifies the straightness of the needle and continues working issuing the corresponding alert to the user. A vertical axis retention system prevents the needle from falling in the case of a power cut, avoiding injury from the needle to the user or the needle being bent by an attempt to move the arm manually. The operating arm only makes the preparations if the general cover of the analyzer is closed. If the cover is raised while it is functioning, the arm automatically aborts the task in progress and returns to its parked position to avoid injury to the user.

1.1.2. Dispensing system

This system consists of a thermostatised needle, supported and displaced by an operating arm and connected to a dispensing pump. The needle is detachable to enable cleaning and replacement. The analyzer has capacity level detection to control the level of the bottles and tubes and prevent the needle from penetrating too far into the corresponding liquids, thus minimising contamination. An automatic adjustment system informs the user if the needle is not mounted or if it is too bent. The needle has a sophisticated Peltier thermostatisation system, with *Fuzzy Logic* control, capable of thermostatising the preparations at approximately 37º in less than 6 seconds. Dispensing is carried out by means of a low maintenance ceramic piston pump driven by a step-by-step motor. It is capable of dispensing between 3 and 1250 µL. The exterior of the needle is kept constantly clean by means of a washing station, which consists of a font specially designed to clean and dry the needle, integrated in the racks tray. A system of diaphragm pumps supplies the font with distilled water and transports the waste to its container.

The ***A25*** analyzer has a tray with 6 free positions for racks of reagents or samples, plus three fixed positions for bottles opposite the washing station. Each reagents rack can carry up to 10 reagents in 20 ml or 50 ml bottles. Each samples rack can contain up to 24 tubes of samples. The samples can be patients, calibrators or controls. The analyzer can be configured to work with 13 mm or 15 mm diameter tubes of samples with a length of up to 100 mm or with paediatric wells. Any possible configuration of racks can be mounted from 1 rack of reagents (10 reagents) and 5 racks of samples

(120 samples) to 5 racks of reagents (50 reagents) and 1 rack of samples (24 samples). Any reagent may be placed in the fixed positions, but it is recommendable to use them for the bottles of distilled water, saline solution for the automatic pre-dilutions and washing solution. The rack tray detects and identifies the type of racks. In this way, if the physical disposition of the racks does not coincide with that programd on the computer, the analyzer alerts the user.

On the left of the analyzer are the waste and distilled water containers. The analyzer constantly controls the level of these containers and issues the appropriate alerts if the distilled water is nearly empty or if the waste container is full.

1.1.3. Reactions rotor and reading

The preparations are dispensed in an optical quality methacrylate reactions rotor thermostatised at 37ºC. The optical absorbance readings are taken directly on this rotor. Each reaction can be read for 15 minutes. The readings are taken as they are programd in each measurement procedure. The reaction wells have been designed to enable the mixture of the sample and the reagent during the dispensing. Each rotor has 120 reaction wells. The length of the light path is 6 mm. The minimum volume required to take the optical reading is 200 µL. The wells have a maximum useful capacity of 800 µL. When the reactions rotor is completely full, the user must change it with one that is empty, clean and dry. The reactions rotors can be reused up to 5 times if they are carefully cleaned immediately after use. The *Cleaning the semi-disposable reactions rotor section* in the User's Manual describes how to clean the rotors. The user has a test in the computer program, which he or she may use to check the condition of the rotor. The rotor is driven by a step-by-step motor with a transmission. A Peltier system with PID control thermostatises the rotor at 37ºC.

An optical system integrated in the rotor takes the readings directly on the reaction wells. The light source is a 20 W halogen lamp. The detector is a silicon photodiode. The wavelength is selected by a wheel with 9 positions available for optic filters. The filters are easily changed by the user from the exterior of the analyzer, without the need for disassembling the filter wheel. A step-by-step motor positions the wheel. The optical system is capable of taking 5 readings per second, with or without a filter change in between. The light beam of the lamp passes through a compensated interferential filter to select the desired wavelength and through focalisation lenses. It then passes through the rotor well and finally reaches the photodiode, where the light signal is turned into an electric signal. A sophisticated analogical digital integrator-converter system converts the electric signal into a digital value with which the analyzer obtains the absorbance values.

The optical system continues to work when the general cover of the analyzer is open, whereby the analyzer can continue to take readings while the user handles, for example, the sample tubes or the reagent bottles. The rotor cover must be in place for the optical system to work correctly. A detector tells the analyzer of the presence of the cover. The analyzer aborts the readings if the user removes the rotor cover while the optical system is taking photometric measurements. If the rotor is not covered, the analyzer informs the user so that he or she places the rotor cover when it sends samples to be analyzed.

1.1.4. Electronic system

The described components are controlled by an electronic system based on a microprocessor. The microprocessor has two external communication channels that make it possible to link up the instrument to the computer containing the application program and to an optional external module for measuring ion concentration. The electronic system is made up of the following independent boards:

- Microprocessor board
- Photometric system board
- Needle conditioning board
- Racks detection board
- Front indicator board
- Power supply board
- Communications board

1.1.5. Application program

The application program makes it possible to control all the operations of the analyzer. From this program, the user can monitor the state of the analyzer and the work session, program parameters, e.g. technique parameters, prepare the work session, prepare results reports, configure different analyzer options, activate various test utilities, prepare and maintain the instrument and carry out internal quality control processes. The purpose of this manual is not to explain the functioning of the user program. For detailed information to this regard, please consult the User's Manual included with the analyzer.

1.2. FUNCTIONING OF THE ANALYZER

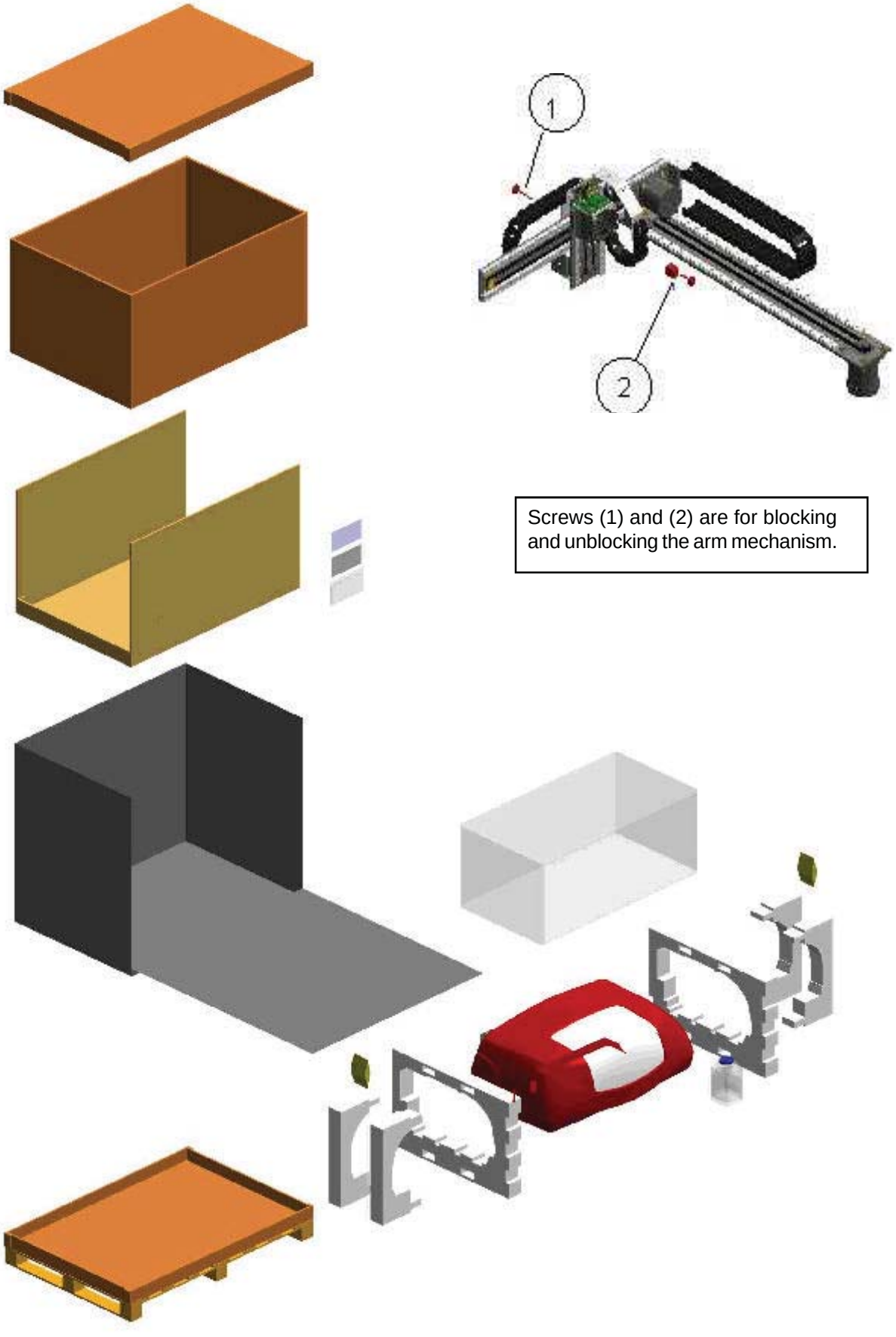
The ***A25*** analyzer is an automatic random access analyzer specially designed for performing biochemical and turbidimetric clinical analyses. The analyzer performs patient-by-patient analyses and enables the continual introduction of samples. The analyzer is controlled from a dedicated PC that is permanently communicated to the instrument. The program, installed on the computer, keeps the user constantly informed of the status of the analyzer and the progress of the analyses. As results are obtained, the computer shows them to the user immediately.

When a *Work Session* is begun, the analyzer proposes performing the blanks, calibrators and controls programd for the measurement procedures it is to carry out. The user may choose between performing the blanks and the calibrators or not. If they are not performed, the analyzer uses the last available memorised data. The controls can also be activated or not. During a session, while the analyzer is working, the user can introduce new normal or urgent samples to be analyzed. Each time a new sample is added, the analyzer automatically proposes the possible new blanks, calibrators or controls to be performed. A work session can remain open for one or more days. When a session is closed and another new session is opened (Reset Session), the analyzer again proposes performing the blanks, calibrators and controls. It is recommended that the session is reset each working day.

The analyzer determines the concentrations of the analytes based on optical absorbance measurements. To measure the concentration of a certain analyte in a sample, the analyzer uses a pipette to take a specific volume of the sample and the corresponding reagent, quickly thermostatises them in the needle itself and dispenses them into the reactions rotor. The very dispensing speed together with the geometry of the reaction well causes the mixture to be shaken and the chemical reaction begins. In the bireagent modes, the reaction begins when the analyzer later dispenses a second reagent in the same reaction well. The reactions can be biochemical or turbidimetric. In both cases, the reaction or the chain of reactions produced generate substances that attenuate certain wavelengths, either by absorption or by dispersion. Comparing the light intensity of a certain wavelength that crosses a well when there is a reaction and when there is not a reaction can determine the concentration of the corresponding analyte. This comparison is quantified with the physical magnitude called *absorbance*. In some cases, the concentration is a direct function of the absorbance, and in other cases, it is a function of the variation of the absorbance over time, depending on the analysis mode.

1.3. TRANSPORT AND RESHIPMENT OF THE ANALYZER

If the analyzer is to be reshipped or moved using a transport vehicle, it is important to block the operating arm and use the original packaging to ensure that the apparatus is not damaged. To package the instrument, we recommend you follow the following instructions: (on the unpackaging instructions sheet).



Screws (1) and (2) are for blocking and unblocking the arm mechanism.

2. MECHANICAL COMPONENTS

2.1. Instrument breakdown

The physical structure of the analyzer can be broken down as follows:

· Operating arm
  - X guide.
  - X carriage.
  - Y carriage. This includes the spring and encoder of the Z carriage.
  - Z carriage. This is the carriage carrying the thermostated needle. It includes the electronic needle conditioning board.
  - Cable carrier chains. These contain the electrical hoses of the arm and the dispensing tube.
· Dispensing system.
  - Thermostated probe.
  - Dispensing pump.
  - Tubes and containers.
  - Container level control scales.
  - Racks tray with integrated washing station. This includes the electronic racks detection board.
  - Washing pumps.
· Reactions rotor with integrated optical system.
  - Thermostated rotor and photometric system. This contains the electronic photometric system board.
  - Lighting system.
· Back covers
· Main cover hinges.
· Base. This houses the electronic boards of the microprocessor, the power supply and the front indicator.
· Housings.
  - Back housing.
  - Front housing. This houses the optical and rotor covers.
  - Arm housing.
  - Main cover.

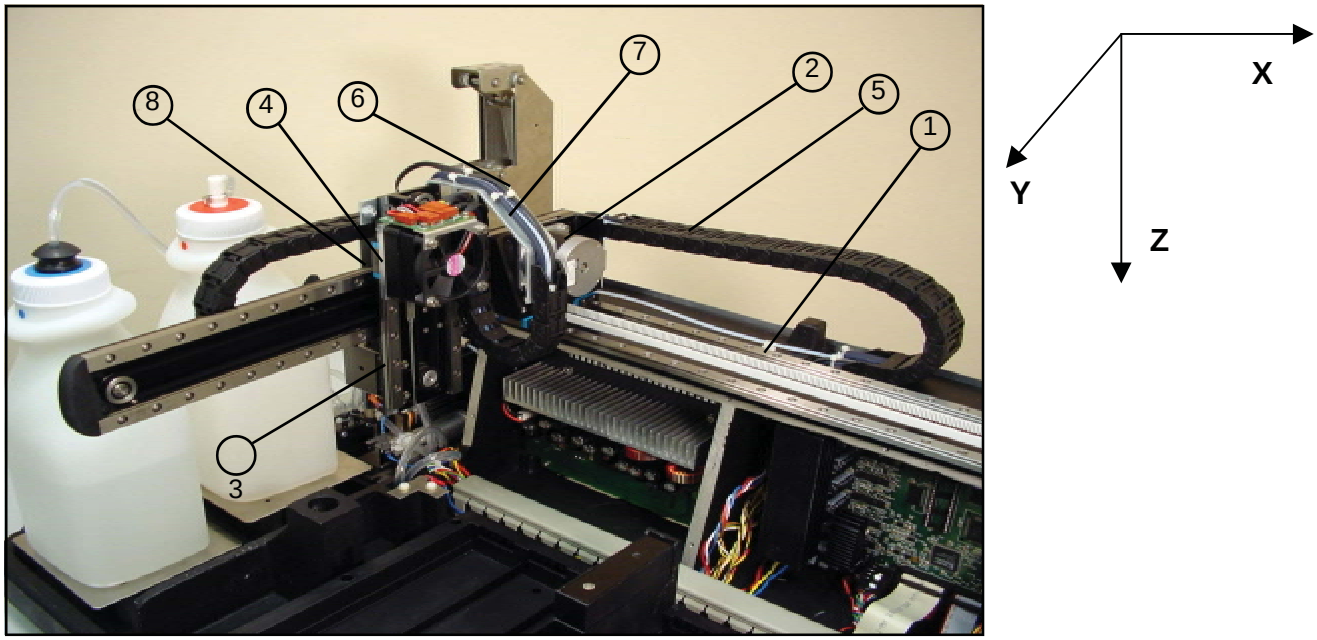
The following is a brief description of each of the mechanical components that make up the analyzer.

2.2. Description of the mechanical components

2.2.1. Operating arm

This mechanism positions the dispensing needle appropriately during the preparation of the analyses. An encoder checks the vertical movement of the needle and a spring automatically stops it from falling in the case of a power cut. The dispensing tube and the electrical hoses of the arm are housed in cable carrier chains, which guide them appropriately. A housing unit covers the Y and Z carriages.

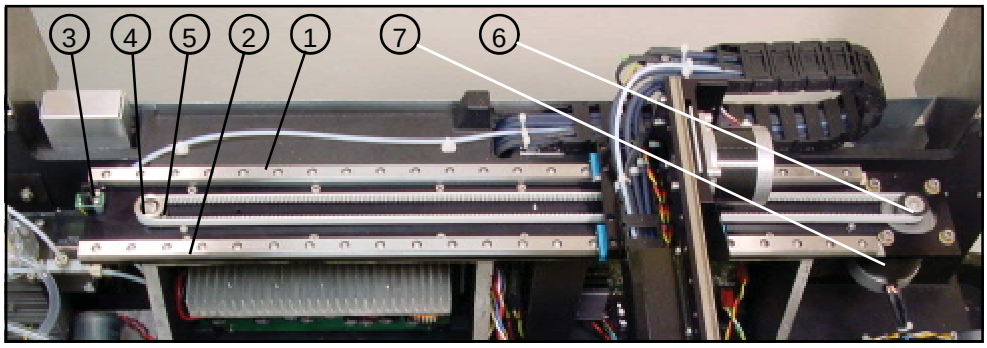
(1) X GUIDE
(2) X CARRIAGE
(3) Y CARRIAGE
(4) Z CARRIAGE
(5) CABLE CARRIER CHAIN
(6) TEFLON DISPENSING TUBE
(7) ELECTRICAL HOSES
(8) Y CARRIAGE CHAIN SUPPORT COVER



The Z carriage (4) supports the thermostated needle and can be displaced over the Y carriage (3), which, in turn, can be displaced over the X carriage (2), which, in turn, can be displaced over the X guide (1). In this way, the needle can be displaced in the three Cartesian directions of X, Y and Z. The cable carrier chain (5) houses the Teflon dispensing tube (6) and all the electrical hoses (7) of the arm. The support cover (8) guides the cable carrier chain of the Y carriage along the X carriage.

2.2.1.1. X guide

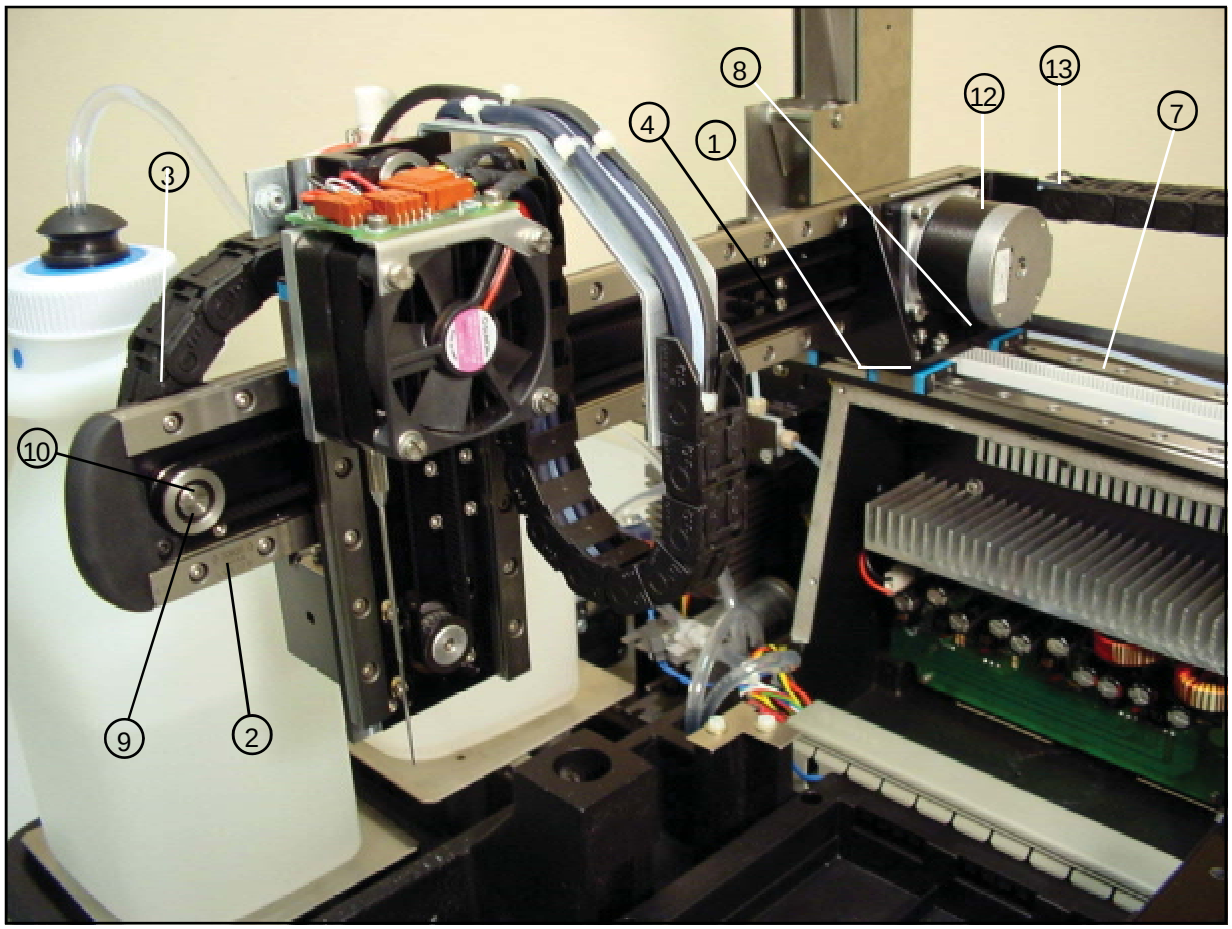
(1) X GUIDE PROFILE
(2) X TRACK RAILS
(3) X START PHOTODETECTOR
(4) RETURN PULLEY
(5) BEARING
(6) OPERATING PULLEY
(7) X MOTOR

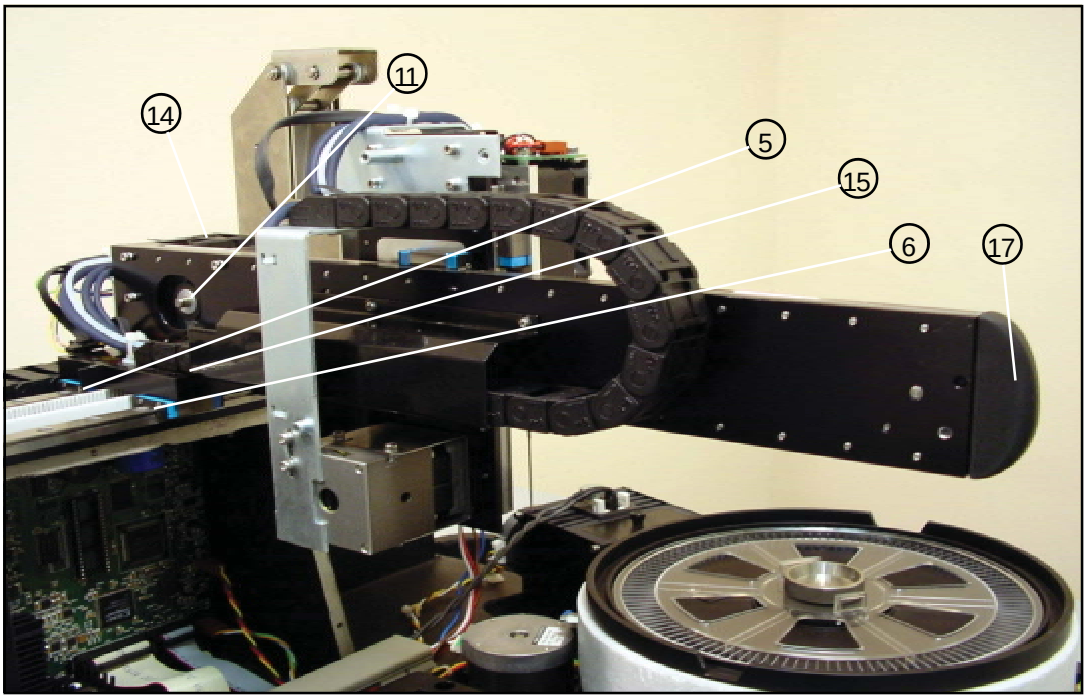


This consists of an aluminium profile (1) which holds the steel rails (2) on which the X carriage runs. The photodetector (3) indicates the position of the start of the movement of the X carriage. The motor (7) operates the belt of the X carriage by means of the pulley (6). The pulley (4), fitted on the bearing (5), returns the belt operated by the motor.

2.2.1.2. X carriage

(1) X CARRIAGE BODY
(2) Y GUIDE PROFILE
(3) Y TRACK RAILS
(4) Y START PHOTODETECTOR
(5) X START DETECTION BARRIER
(6) LINEAR SLIDE UNIT
(7) NOTCHED BELT
(8) BELT FASTENING
(9) RETURN PULLEY
(10) BEARING
(11) OPERATING PULLEY
(12) Y MOTOR
(13) X CARRIAGE CHAIN SUPPORT COVER
(14) X CARRIAGE CHAIN TERMINAL
(15) Y CARRIAGE CHAIN TERMINAL
(16) Y GUIDE RUBBER PROTECTION

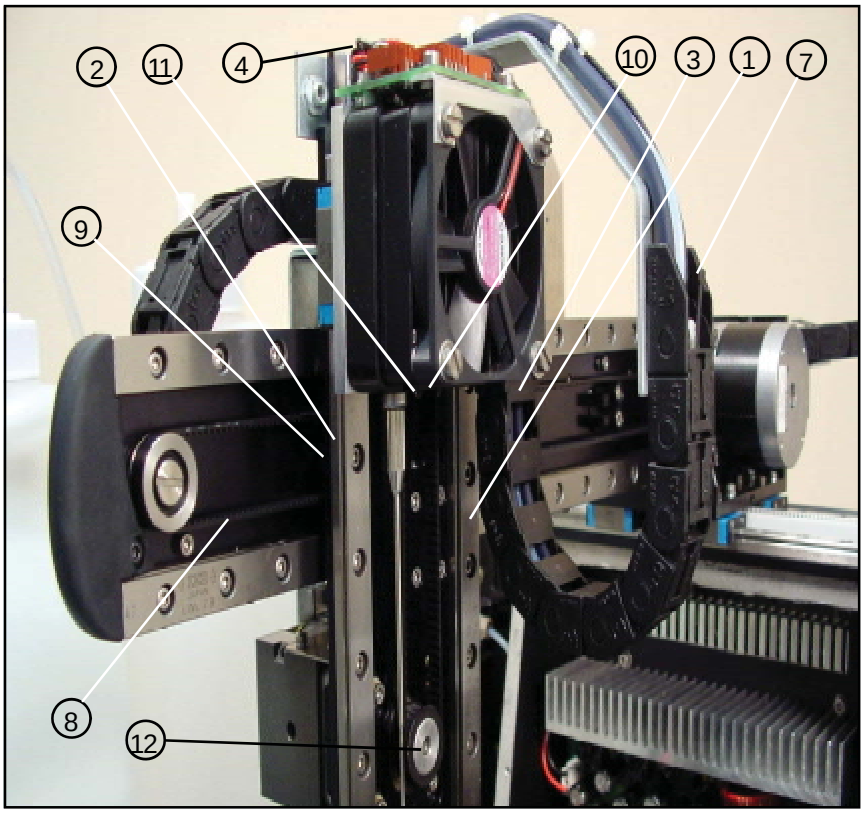




The X carriage can run over the X guide. The body of the X carriage (1) supports the aluminium profile (2) that holds the steel rails (3) on which the Y carriage runs. The photodetector (4) indicates the start position of the movement of the Y carriage. The motor (12) operates the Y carriage belt by means of the pulley (11). The pulley (9), fitted on the bearing (10), returns the belt operated by the motor. The barrier (5) obstructs the X start photodetector when the X carriage reaches its start position. The X carriage runs on its guide using the linear slide unit (6) fastened to the carriage body. The belt (7) operates the X carriage. It is held to the body of the X carriage by means of the fastening (8). The support (13) holds the terminal of the X carriage chain (14). The Y carriage chain terminal (15) is screwed directly onto the X carriage. The rubber protection (16) prevents the Y guide from injuring the user.

2.2.1.3. Y carriage

(1) Z GUIDE PROFILE
(2) Z TRACK RAILS
(3) Y START DETECTION BARRIER
(4) Z START DETECTION BARRIER
(5) LINEAR SLIDE UNIT
(6) Y CARRIAGE CHAIN TERMINAL
(7) Z CARRIAGE CHAIN TERMINAL
(8) NOTCHED BELT
(9) BELT FASTENING
(10) RETURN PULLEY
(11) BEARING
(12) OPERATING PULLEY
(13) Y CARRIAGE CHAIN SUPPORT COVER
(14) ENCODER PHOTODETECTOR
(15) ENCODER
(16) SPRING
(17) SPRING FASTENING
(18) SUPPORT BODY
(19) COVER
(20) BONDING STRIP
(21) UNIT HOLDING
(22) Z MOTOR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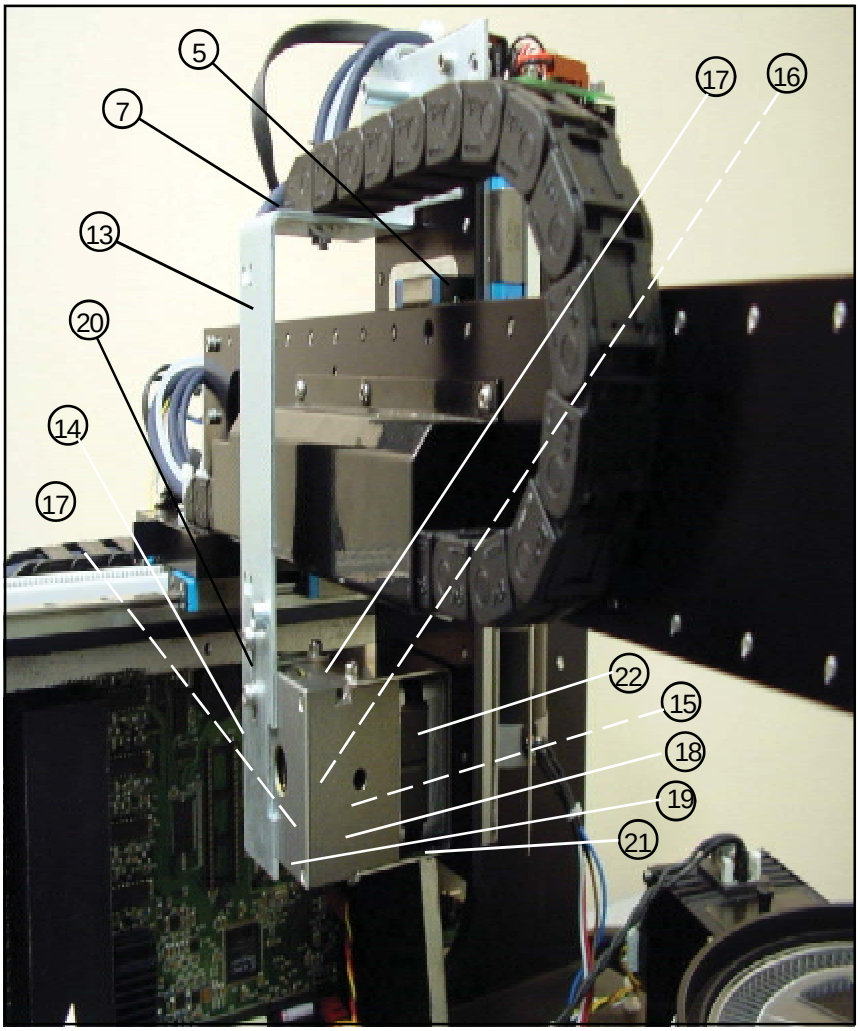
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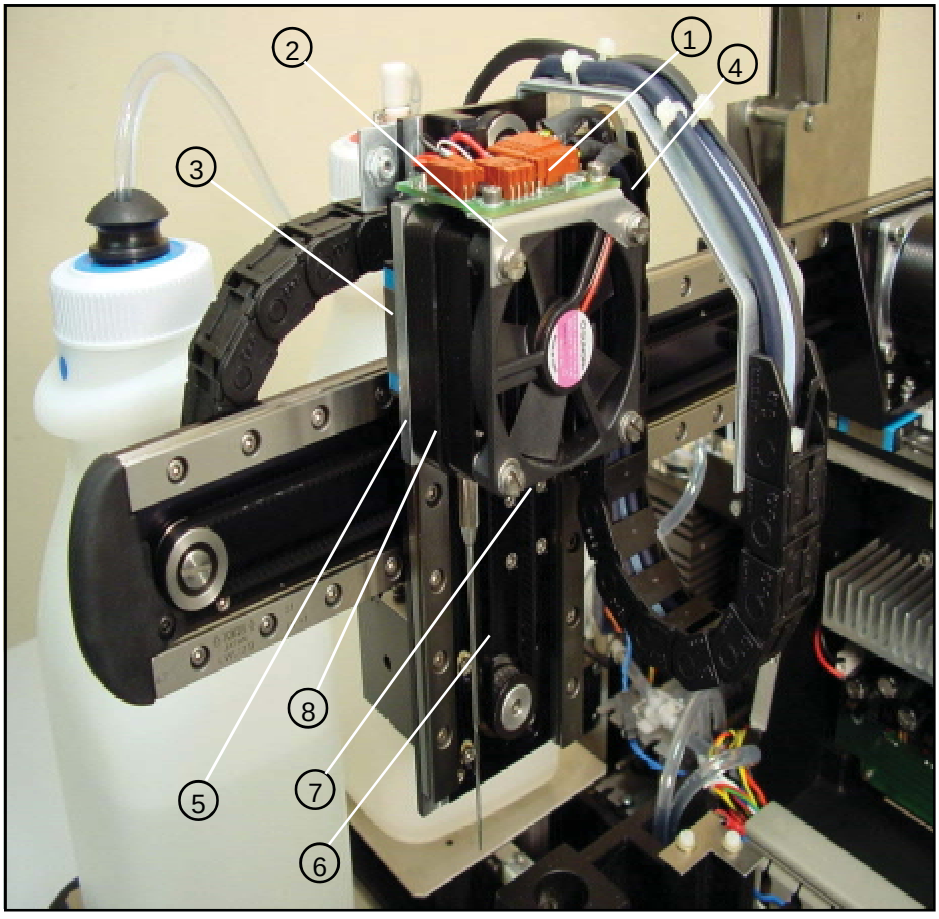
The Y carriage can run on the Y guide, which forms part of the X carriage. The aluminium profile (1), which holds the steel rails (2) on which the Z carriage runs, constitutes the body of the Y carriage itself. The motor (22) operates the Z carriage belt through the pulley (13). The pulley (11), fitted on the bearing (12), returns the belt operated by the motor. The barrier (3) obstructs the X start photodetector when the X carriage reaches its start position. The barrier (4) obstructs the Z start photodetector when the Z carriage reaches its start position. The Y carriage runs on its guide using the linear slide unit (5) fastened to the carriage body. The belt (9) operates the Y carriage. It is held to the body of the Y carriage by means of the fastening (10). The support (14) holds the Y and Z carriage chain terminals (7) and the arm housing. The spring-encoder unit of the Z carriage is made up of components (15)-(22). Part (19) is made up of the system body and contains the self-raising spring (17) and the encoder (16) for the detection of vertical collisions. Part (18) joins the spring to the encoder. The photodetector (15) detects the turn of the encoder when it runs along the Z carriage. The cover (20) closes the system. The motor (23) has two shafts. Its back shaft has the encoder (16) and its front shaft has the operating pulley of the Z carriage (13). Part (22) holds the system body (19) to the motor. The board (21) joins the system to the instrument frame.

2.2.1.4. Z carriage

(1) ELECTRONIC NEEDLE CONDITIONING BOARD
(2) BOARD SUPPORT
(3) LINEAR SLIDE UNIT
(4) Z CARRIAGE CHAIN TERMINAL
(5) Z CARRIAGE BODY
(6) GEARED BELT
(7) BELT FASTENING
(8) THERMOSTATED NEEDLE



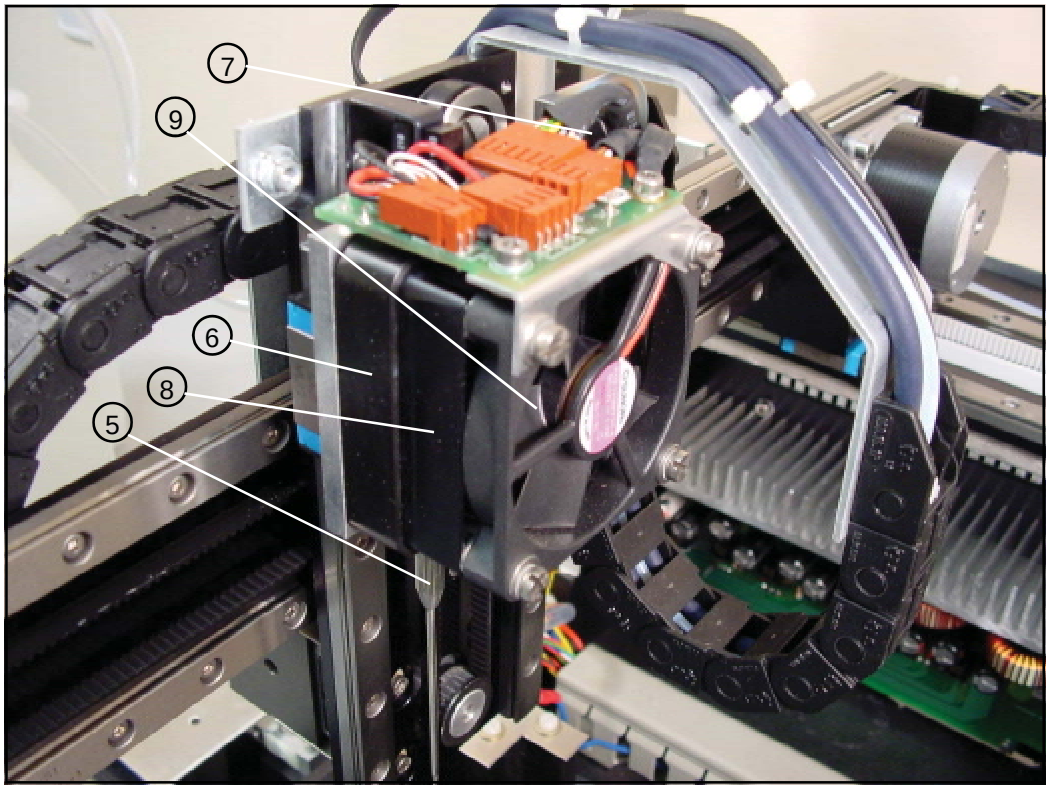
The Z carriage holds the thermostated needle (9). It can run along the Z guide, which forms part of the Y carriage, by means of the guide rollers (3) fastened to the carriage body (6). The belt (7) that operates the Z carriage is held to the body of the carriage by means of the fastening (8). The terminal of the Z carriage chain (5) is screwed to the carriage body. The electronic needle conditioning board (1) is screwed to the needle body and to the support plate (2). This board contains the Z carriage start photodetector.

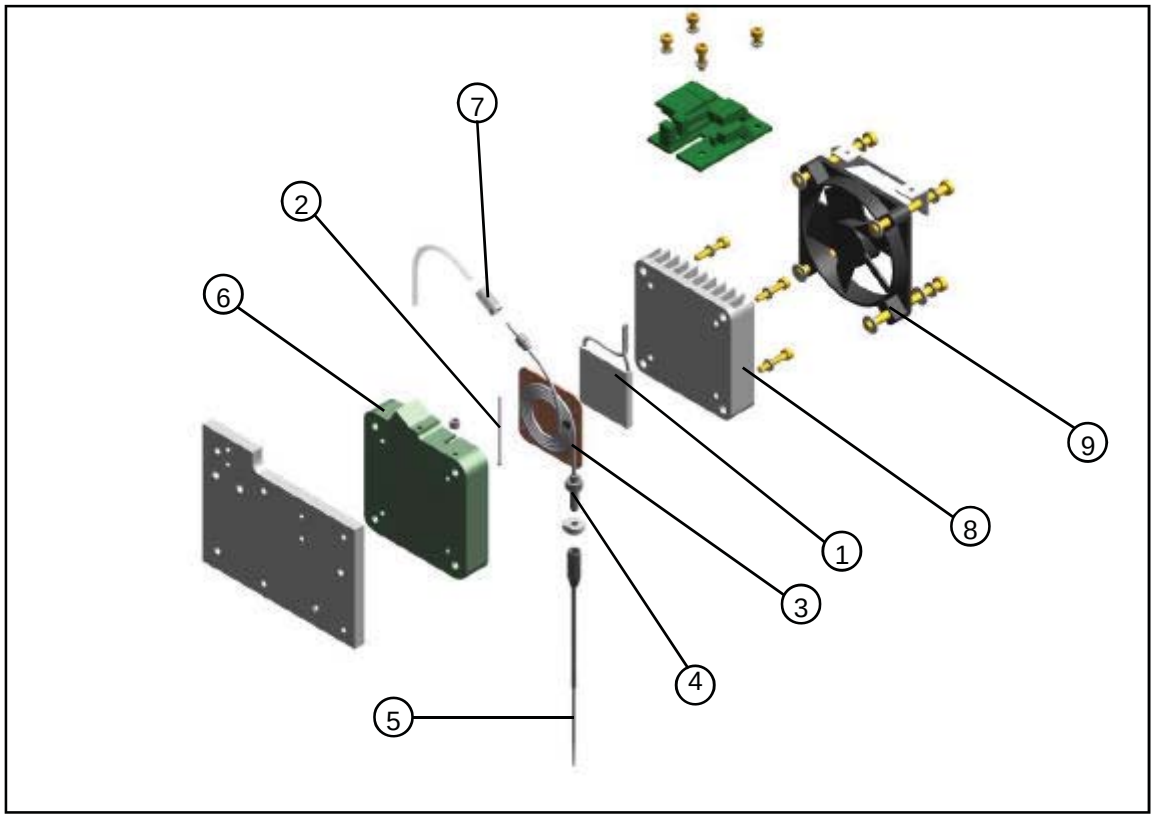
2.2.2. Dispensing system

The dispensing pump dispenses the preparations through the thermostated needle. The needle is washed internally and externally at the washing station. The racks tray makes it possible to position the samples to be analyzed and the required reagents. The level of the distilled water and waste containers is controlled by the analyzer by weight.

2.2.2.1. Thermostated needle

(1) PELTIER CELL
(2) THERMISTOR
(3) SPIRAL UNIT
(4) NEEDLE FASTENING FITTING
(5) REMOVABLE NEEDLE
(6) BODY
(7) FASTENING FITTING
(8) RADIATOR
(9) FAN

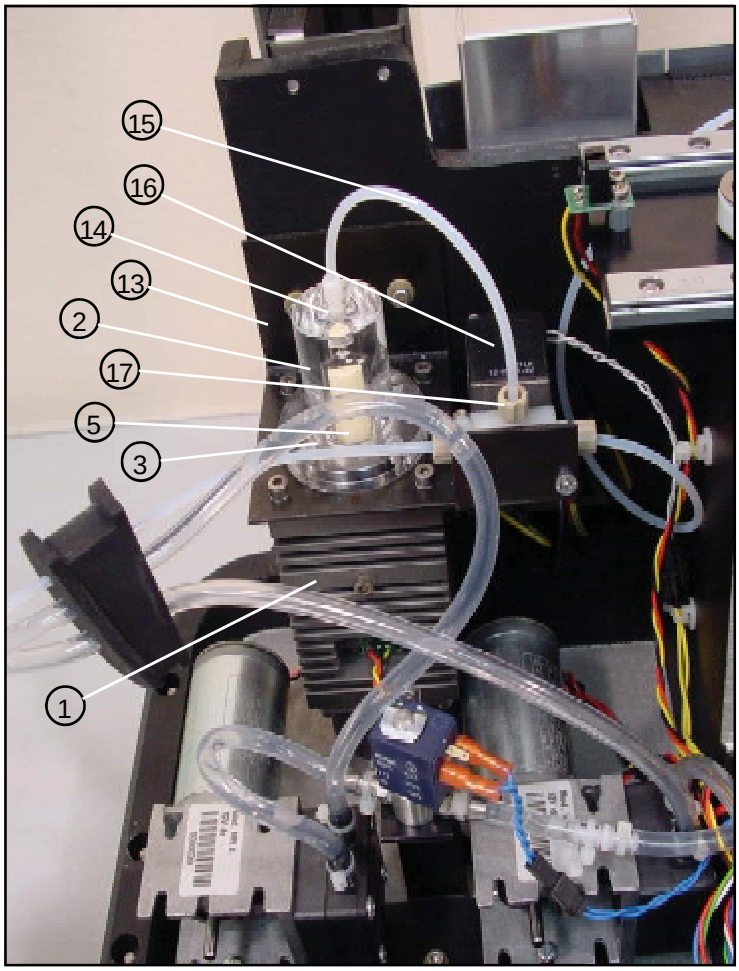




The spiral unit (3) is made up of a spiral tube with fittings at both ends, welded to a copper plate. This unit is housed in the interior of the plastic body (6). The thermistor (2) is held between these two parts and is the sensor used to control the system temperature. The lower end of the tube of the spiral unit is firmly fastened to the body by the nut (4). The removable needle (5) is screwed to this end of the tube. The upper end of the spiral tube is connected to the Teflon dispensing tube of the operating arm. The fastening fitting (7) ensures said connection. The Peltier cell (1) that controls the temperature is in contact with the copper plate of the spiral unit. The radiator (8), which is screwed to the plastic body, closes the system. The bolts that hold the radiator fan (9) are bushing bolts and are used to fasten the entire needle unit to the Z carriage of the operating arm.

2.2.2.2. Dispensing pump

(1) BODY
(2) FLUIDIC CHAMBER
(3) SEAL
(4) SEAL SUPPORT
(5) CERAMIC PISTON
(6) PISTON SUPPORT
(7) TRANSMISSION PROTECTOR
(8) START DETECTION BARRIER
(9) WORM
(10) AXIAL BEARING
(11) MOTOR
(12) START PHOTODETECTOR
(13) PUMP SUPPORT
(14) PUMP FITTING
(15) PUMP-ELECTROVALVE TEFLON TUBE
(16) 3-CHANNEL ELECTROVALVE
(17) ELECTROVALVE FITTING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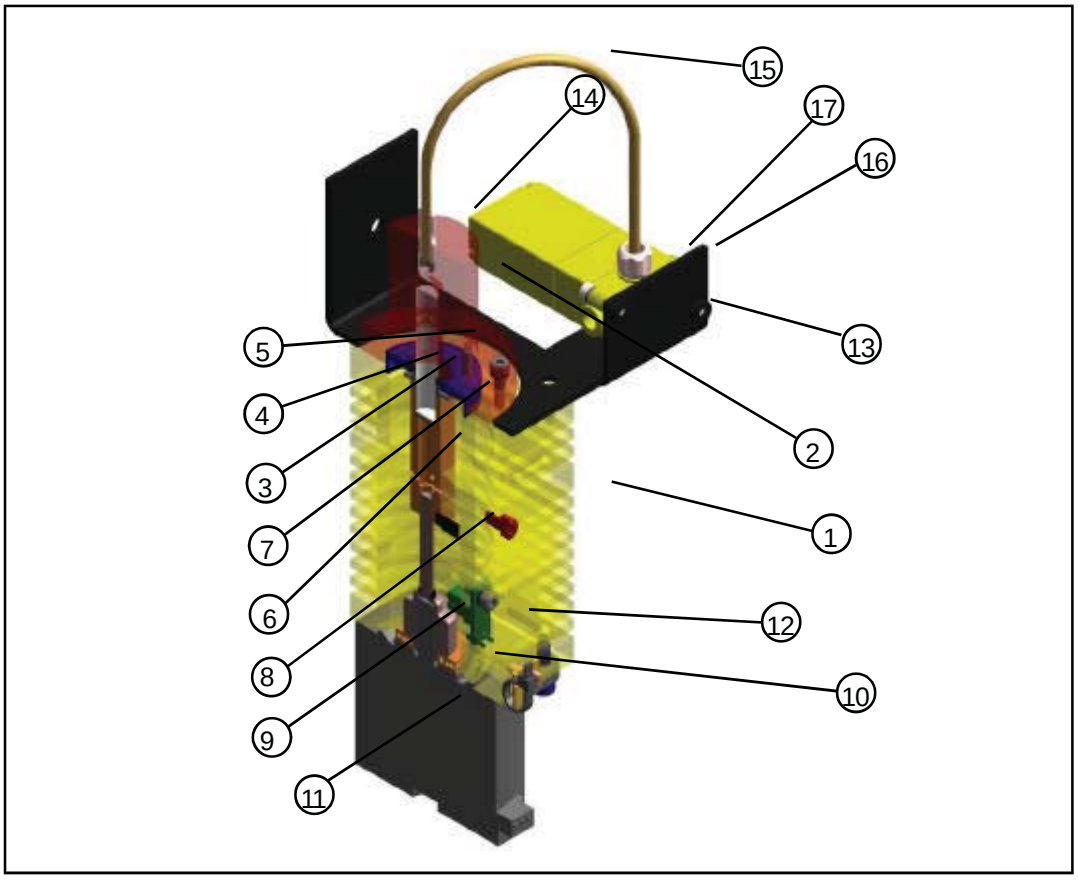
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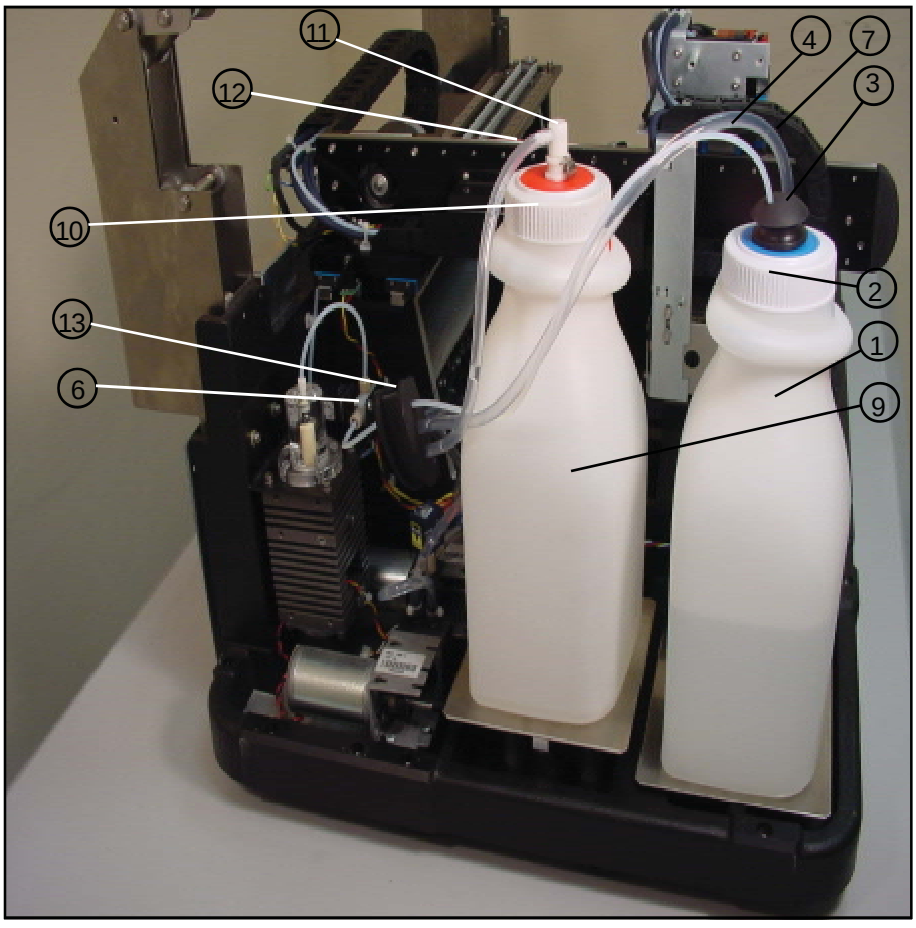
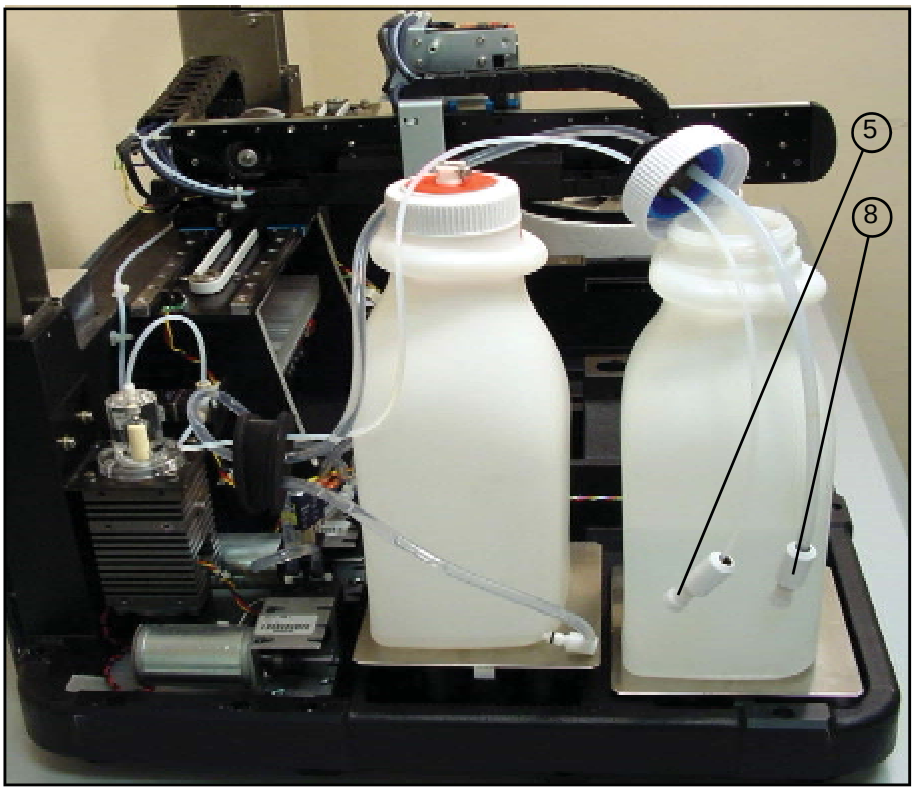
The aluminium body (1) joins the different components that make up the pump. The transparent methacrylate fluidic chamber (2) makes it possible to observe the flow of liquid through the pump. The support (4) fastens the seal (3) to the chamber. The ceramic piston (5) dispenses by displacing a certain volume of liquid in the chamber. The plastic protection (7) prevents the pump transmission from getting wet if the seal fails. The piston is adhered to the support (6), which moves alternatively by the rotation of the worm (9) fixed to the motor shaft (11). The barrier (9), joined to the piston support, obstructs the photodetector (12) when the piston reaches its start position. The axial bearing (10) prevents any longitudinal displacement of the motor shaft for greater precision in the dispensing operation. The 3-channel electrovalve (16) makes it possible to connect the pump chamber to the distilled water container or to the thermostated needle. The support (13) makes it possible to fasten the pump and the electrovalve to the analyzer. The Teflon tube (15) connects the chamber to the electrovalve. It is connected to each of these components by the fittings (14) and (17).

2.2.2.3. Tubes and containers

(1) WATER CONTAINER
(2) WATER CONTAINER LID
(3) WATER CONTAINER TUBES FASTENING
(4) WATER CONTAINER TEFLON TUBE
(5) TEFLON TUBE FILTER
(6) ELECTROVALVE FITTING
(7) WATER CONTAINER PVC TUBE
(8) PVC TUBE FILTER
(9) WASTE CONTAINER
(10) WASTE CONTAINER LID
(11) FAST COUPLING FITTING
(12) WASTE CONTAINER PVC TUBE
(13) GROMMET

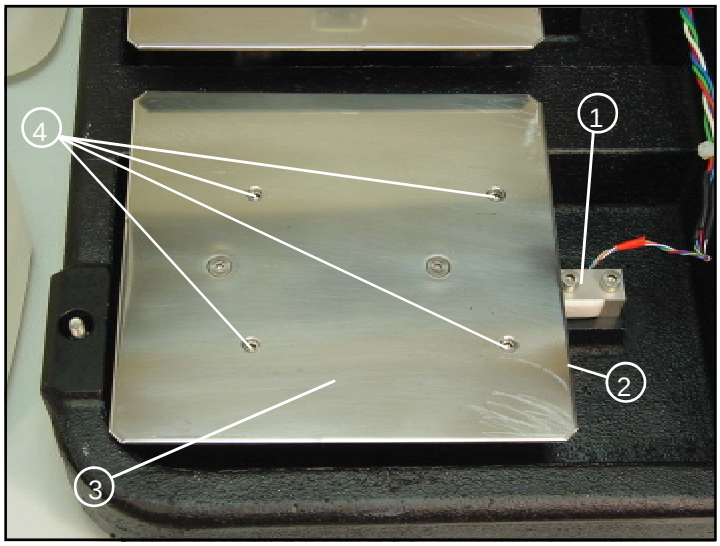




The Teflon tube (4) connects the distilled water container (1) to the electrovalve of the dispensing pump. This tube is installed at the end of the filter container (5). It is connected to the electrovalve of the dispensing pump through the fitting (6) The PVC tube (7) connects the distilled water container to the diaphragm pump of the washing water. This tube is installed at the end of the filter container (8). Both water tubes pass through the rubber piece (3) in the lid (2) of the container, which fastens them in position. The PVC tube (12) connects the waste extraction diaphragm pump to the waste container (9). The waste container lid (10) has a fast coupling fitting (11) with automatic drip-proof closing when disconnected. All the tubes pass into the interior of the analyzer through the rubber grommet (13).

2.2.2.4. Container level control scales

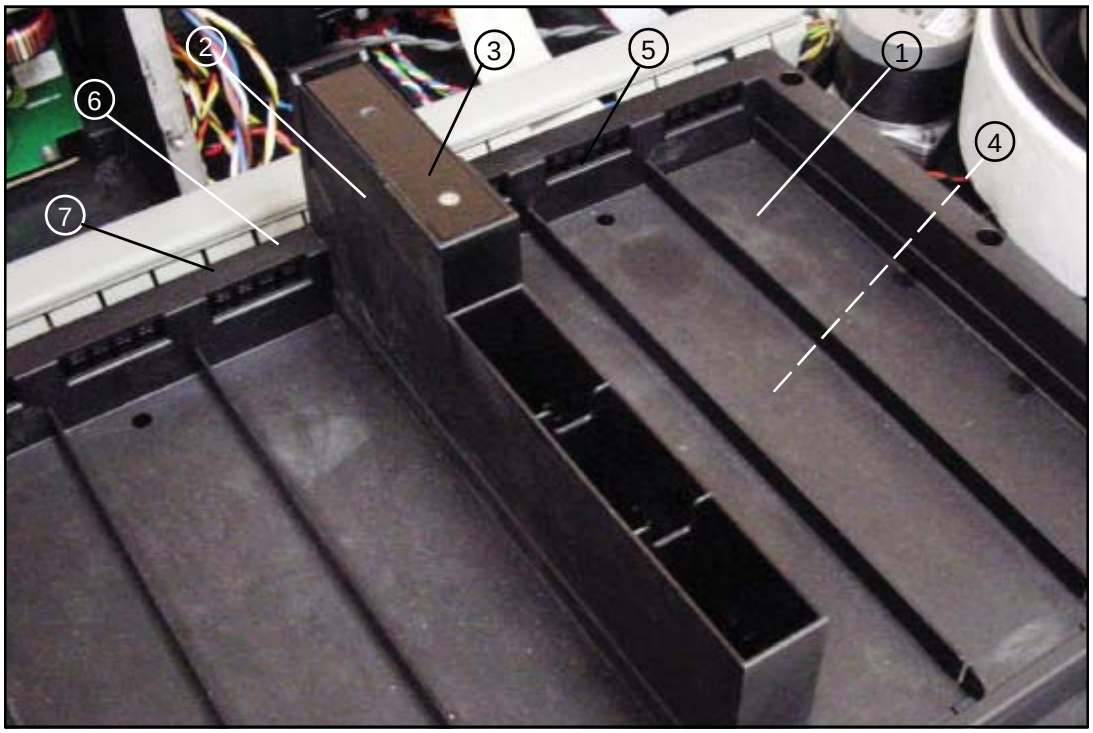
(1) LOAD CELL
(2) BASE SUPPORT
(3) BASE
(4) ADJUSTABLE MAXIMUMS



The analyzer has two scales to control the level of the distilled water and waste containers by weight. Each of these scales has a load cell (1) as a weighing component. One of the ends of the cell is fastened to the base of the instrument. The support of the base (2) is screwed to the other free end. The base (3) is the stainless steel board on which the containers stand. The base of the analyzer has 4 adjustable maximums (4) for regulating the maximum allowed deformation of the load cell. The maximums prevent the cells from deteriorating if the user puts the containers on the scales in a brusque manner.

2.2.2.5. Racks tray with integrated washing station

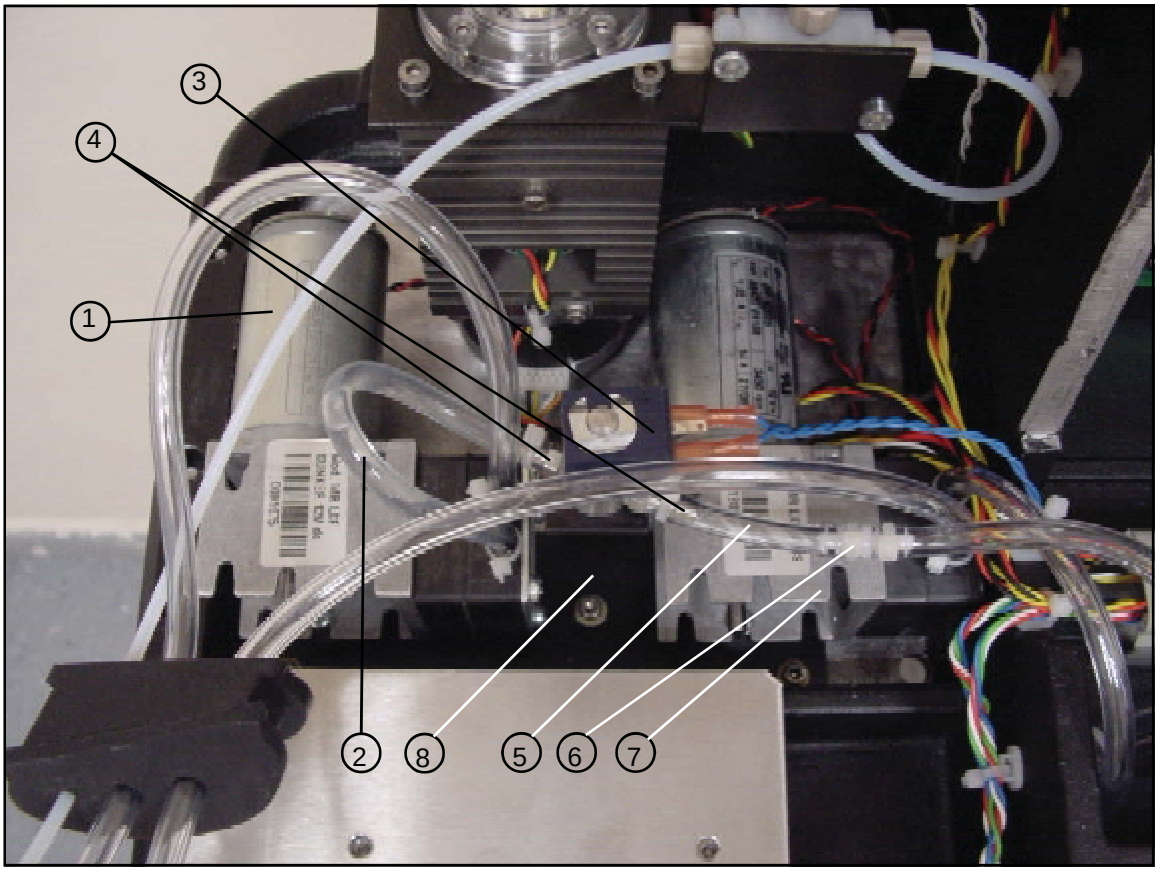
(1) TRAY
(2) WASHING STATION
(3) WASHING STATION COVER
(4) LEVEL DETECTION SHEETING
(5) ELECTRONIC RACKS DETECTION BOARD
(6) WASHING WATER PVC TUBE
(7) WASTE EXTRACTION PVC TUBE



The plastic injection tray (1) is fastened directly to the base of the instrument. In the centre is the stainless steel washing station (2), covered by the lid (3). The sheeting (4) enables the detection of the level of the dispensing needle. The electronic board (5) detects the rack type placed in each of the 6 positions of the tray. The PVC tube (6) connects the washing station to the flow volume limiter of the washing pump. The PVC tube (7) connects the washing station drain to the waste extraction pump.

2.2.2.6. Washing pumps

(1) WASHING WATER diaphragm PUMP
(2) PUMP-ELECTROVALVE PVC TUBE
(3) 2-CHANNEL ELECTROVALVE
(4) FITTINGS
(5) ELECTROVALVE-LIMITER PVC TUBE
(6) FLOW VOLUME LIMITER
(7) WASTE EXTRACTION diaphragm PUMP
(8) SUPPORT



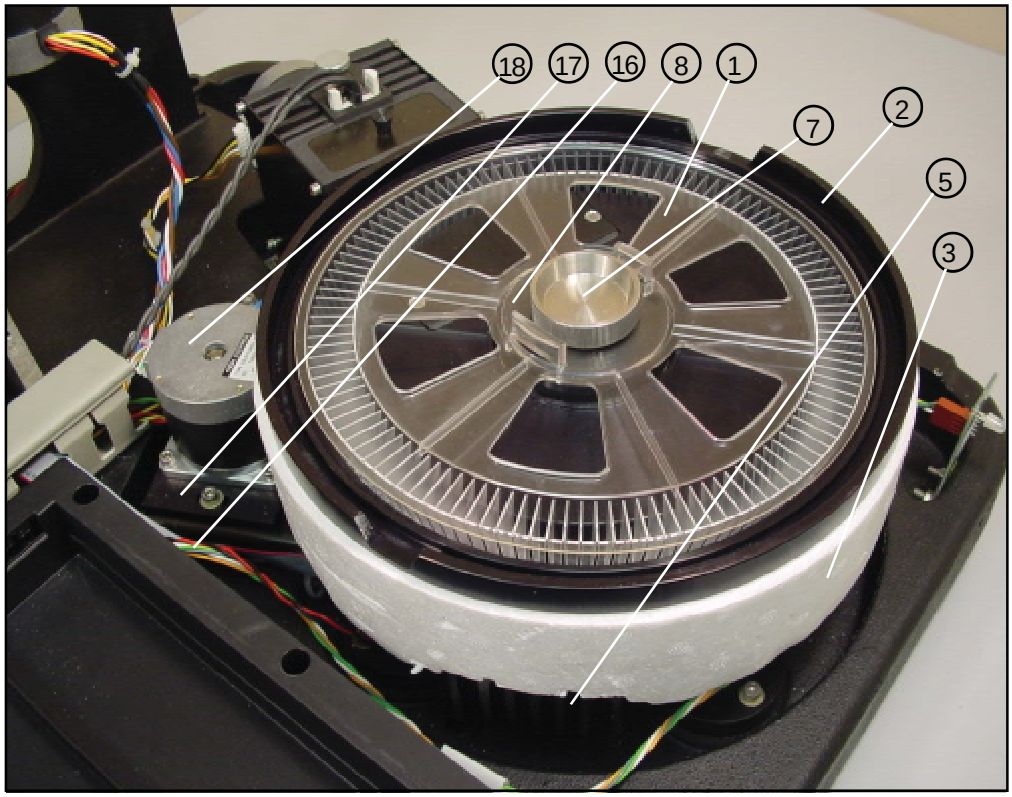
The needle washing system has two diaphragm pumps, one for the washing water (1) and another for waste extraction (7). The PVC tube (2) connects the washing pump to the 2-way electrovalve (3), which is used to prevent the washing station from unloading and to establish the precise amount of washing water. The PVC tube (5) connects the electrovalve to the flow volume limiter (6). The electrovalve has stainless steel fittings for the connection of the PVC tubes. The support (8) fastens the pumps and the electrovalve to the base of the instrument.

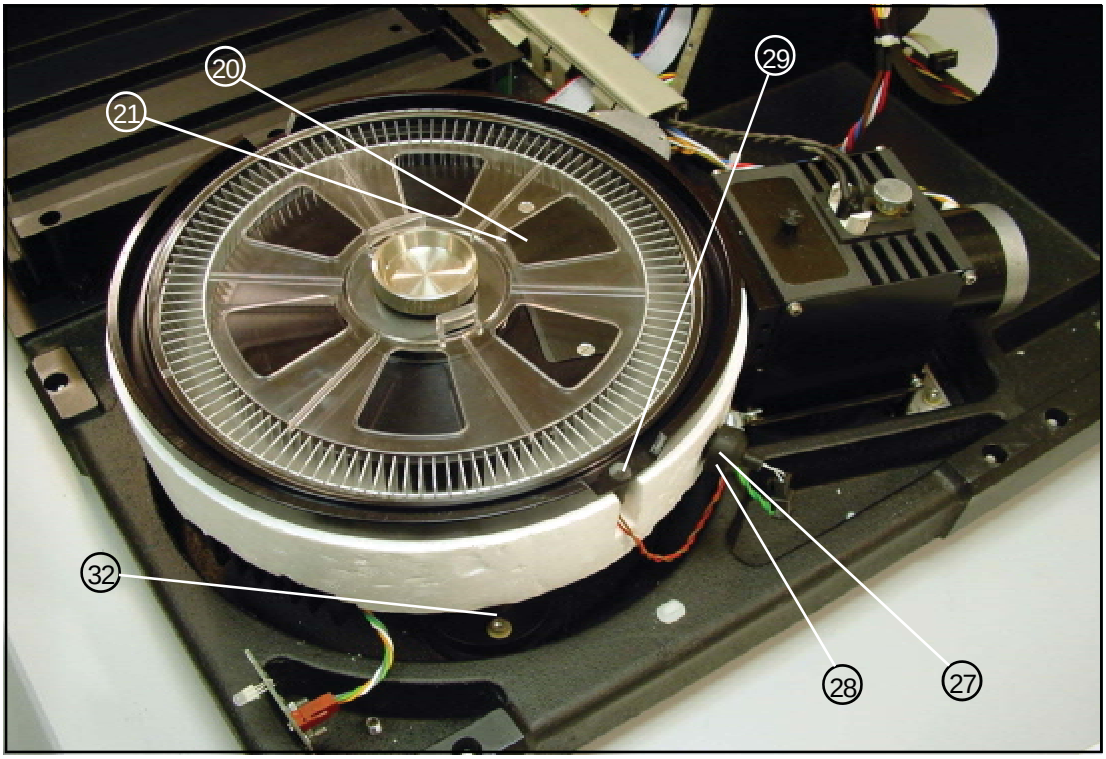
2.2.3. Reactions rotor with integrated optical system

The reactions rotor is thermostated at 37ºC. The optical system, made up of a lighting system and a photometric system takes the readings directly on the rotor reaction wells. The lighting system has a halogen lamp, a filter wheel for the selection of the wavelength and various lenses to form the appropriate beam of light. The photometric system contains a silicon photodiode and the corresponding electronics to obtain a digital value that is proportionate to the light intensity received.

2.2.3.1. Thermostated rotor and photometric system

(1) METHACRYLATE ROTOR
(2) HEATING CHANNEL
(3) THERMAL INSULATION OF THE HEATING CHANNEL
(4) PELTIER CELLS
(5) RADIATORS
(6) THERMAL INSULATION BUSHES
(7) ROTOR FASTENING SCREW
(8) ROTOR CENTERER
(9) THERMAL INSULATION OF THE GEAR SUPPORT
(10) GEAR SUPPORT
(11) START PHOTODETECTOR
(12) ROTOR SHAFT
(13) BEARINGS
(14) ROTOR PULLEY
(15) GEARED BELT
(16) MOTOR SUPPORT
(17) MOTOR SPACER
(18) MOTOR
(19) MOTOR PULLEY
(20) PHOTOMETRIC SYSTEM SUPPORT COVER
(21) LEAKPROOF SEAL
(22) LOWER PHOTOMETRIC SYSTEM SUPPORT COVER
(23) PHOTODIODE GRILL CENTERER
(24) PHOTOMETRIC SYSTEM BOARD
(25) PHOTODIODE SPACER
(26) ROTOR GRILL
(27) TEMPERATURE PROBE
(28) THERMAL INSULATION OF PROBE
(29) COVER DETECTOR
(30) EARTH CONNECTION
(31) DRAINAGE TUBES
(32) COLUMNS

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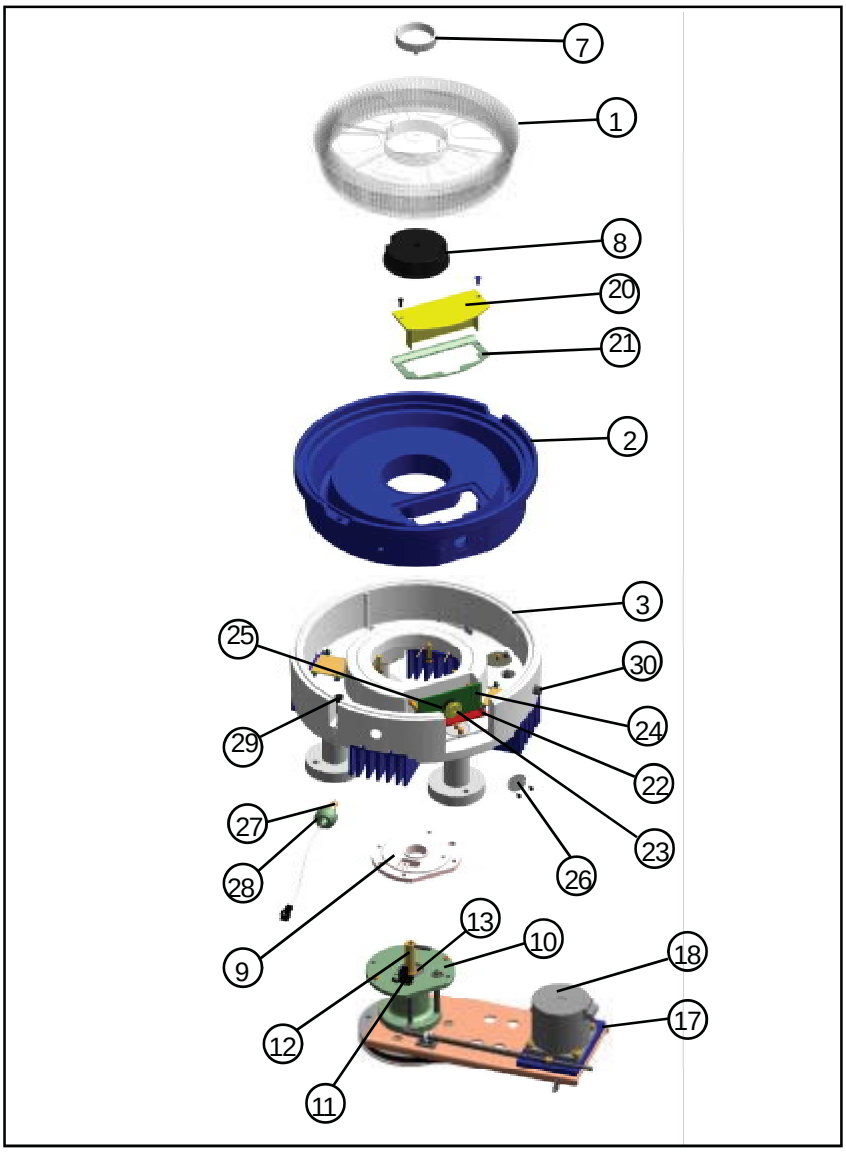
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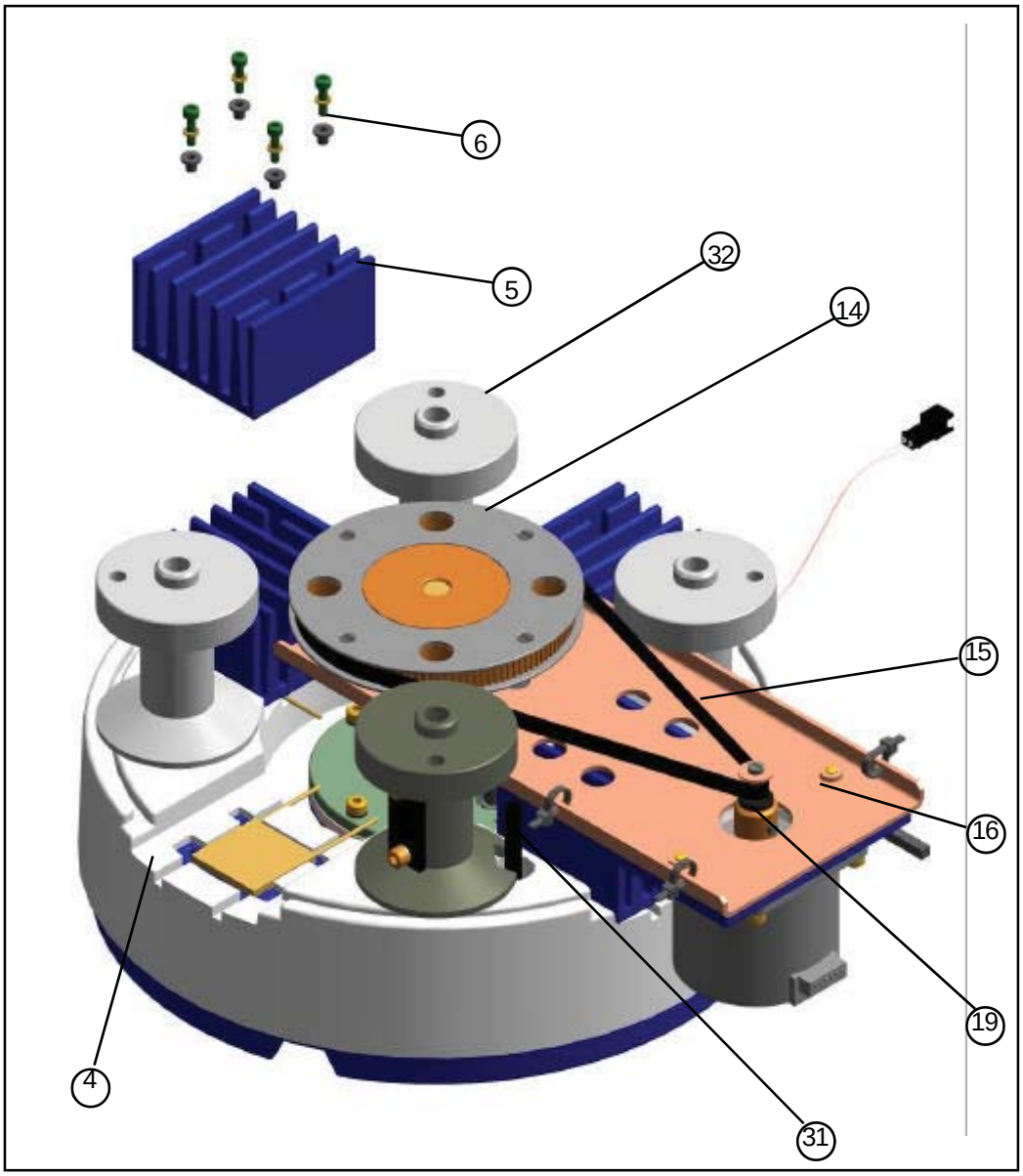
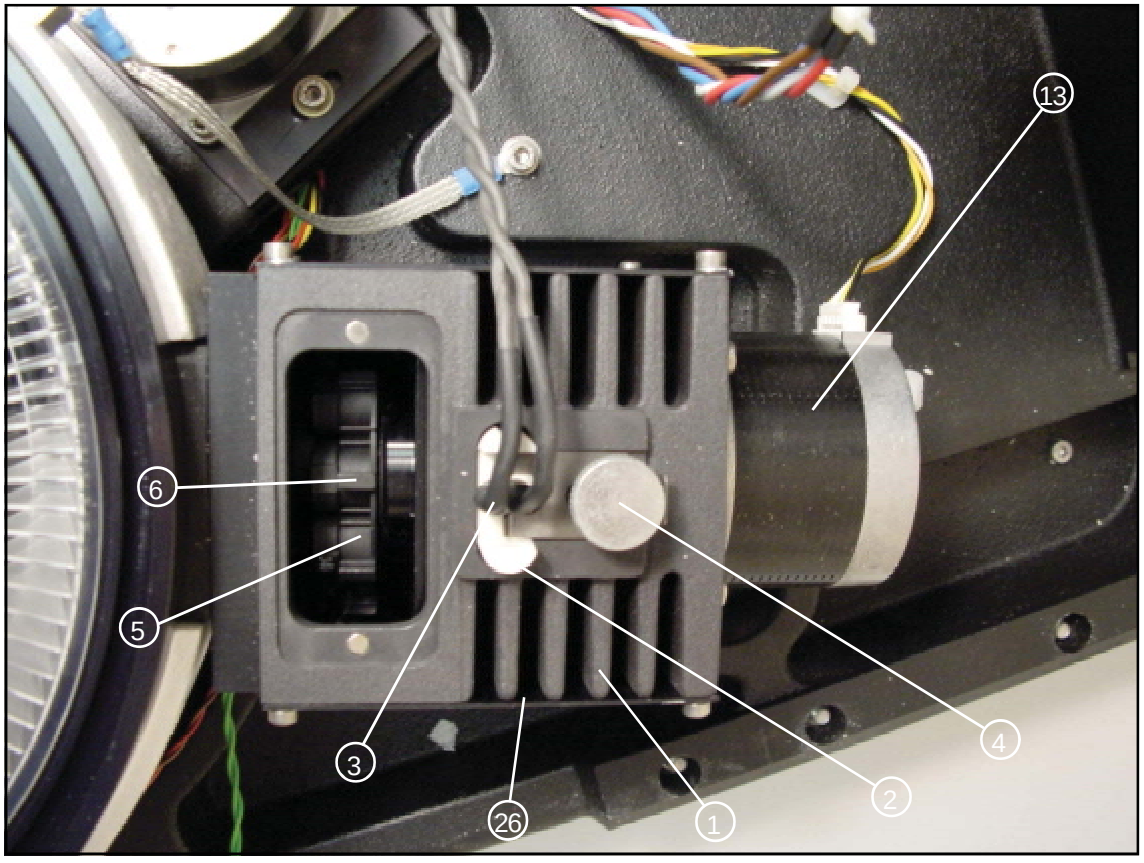


The dispensing system dispenses the reagents and the samples in the methacrylate rotor (1). The optical system measures the absorbance directly on the rotor wells. The aluminium heating channel (2) surrounds the rotor and keeps it at 37ºC. The channel is thermally insulated from the exterior by means of the molded expanded polystyrene insulation (3). The Peltier cells (4), with their respective radiators (5), act on the channel to control the temperature. The screws that fasten the radiators are thermally insulated from the former by the bushes (6). The sensor used to control the temperature is the probe (27), which is thermally insulated from the exterior of the channel by means of the sleeve (28). The methacrylate rotor is fastened to its centerer (8) by means of the screw (7). The centerer is fastened to the rotor (12), which is mounted on bearings (13) in the gear support (10). This support is screwed to the heating channel. The plastic part (9) thermally insulates both parts from each other. The barrier obstructing the photodetector (11) when the rotor reaches its start position forms part of the centerer (8). The pulley (19), fastened to the motor (18), acts, by means of the belt (14), on the pulley (14) fastened to the rotor. The gear ratio is 1:12. The spacer (17) makes it possible to move the motor on its support (16) to adjust the belt tension correctly. The electronic board of the photometric system (24) is housed in a cavity in the heating channel. The upper cover of this cavity (20) supports the electronic board. The seal (21) keeps the cavity hermetically closed in the case of possible liquid spillage. The cavity is closed at the bottom by the cover (22). The photodiode is welded onto the board on the spacer (25). The part (23) centers the photodiode with regard to the lighting system and also acts as a grill to prevent the incidence of unwanted light. The grill (26) limits the light hitting the reactions rotor. The detector (29) tells the analyzer if the rotor cover is in position or not. The part (30) connects the heating

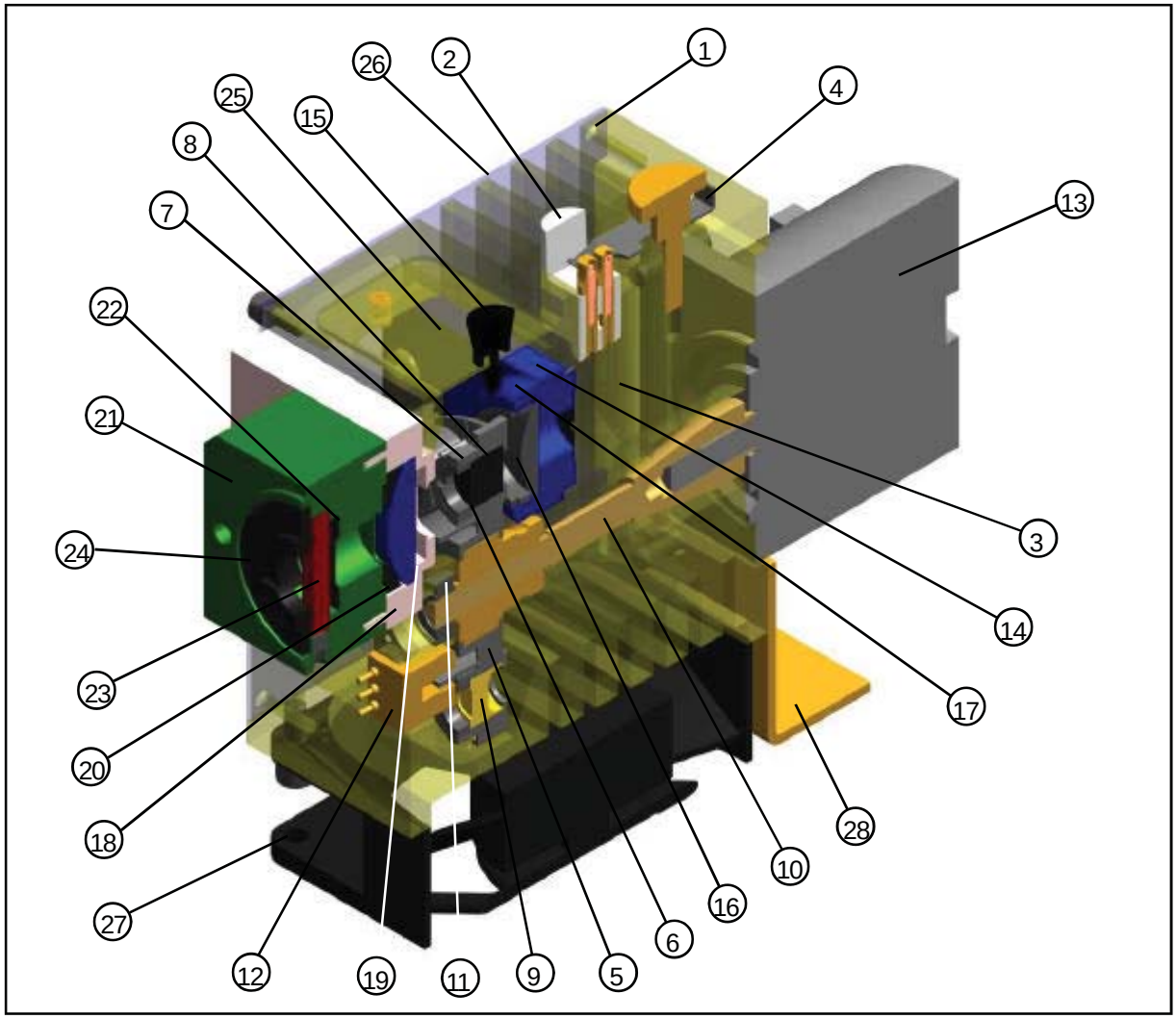
CHANNEL to the instrument frame. The tubes (31) drain the rotor of any possible liquid spillage. The columns (32) fasten the rotor to the base of the analyzer.

2.2.3.2. Lighting system

(1) BODY
(2) LAMP HOLDER
(3) HALOGEN LAMP
(4) LAMP HOLDER FASTENING
(5) FILTER WHEEL
(6) FILTER HOLDER
(7) FILTER HOLDER NUT
(8) FILTER COVER
(9) MATCHED INTERFERENTIAL FILTERS
(10) FILTER WHEEL SHAFT
(11) BEARING
(12) START PHOTODETECTOR
(13) MOTOR
(14) PCX LENS SUPPORT
(15) DIAPHRAGM
(16) PCX LENS
(17) PCX LENS NUT
(18) LCP129 LENS SUPPORT
(19) LCP129 LENS
(20) LCP129 LENS FASTENING
(21) LCP125 LENS SUPPORT
(22) SLOT BETWEEN LENSES
(23) LCP125 LENS
(24) LCP125 LENS FASTENING
(25) FILTER WHEEL WINDOW COVER
(26) SIDE COVERS



(27) FAN
(28) FASTENING BRACKET



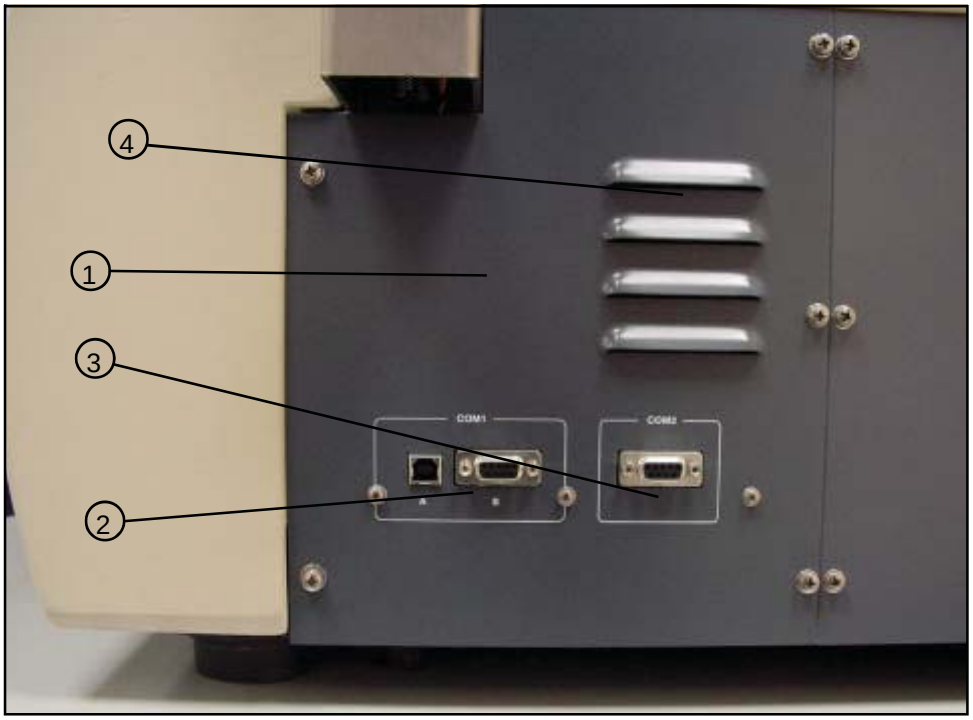
The aluminium body (1) is the structure that supports all the components of the lighting system. The lamp holder (2), fastened to the body by means of the fastening system (4), keeps the halogen lamp (3) in position without the need for adjustments. The filter wheel (5) has 10 positions for optical filters. Position 0 must always be taken up by a covered filter (8). The other positions can be taken up by an interferential filter (9) or by other covered filters. No position in the wheel must be left unoccupied. Each filter is fitted on a filter holder (6) and fastened to it by the nut (7). The filter holders can be dismounted from the wheel by simply pulling on them. The cover (25) allows easy access to the filter wheel. The filter wheel is fastened to the shaft (10). This shaft can be turned by the direct action of the motor (13). Its end is guided by the bearing (11). The photodetector (12) indicates the start position of the wheel. The light from the lamp, limited by the diaphragm (15), passes through the collimating lens (16) fastened to its support (14) by the nut (17). The light passes through the filter wheel, which selects the desired wavelength, and passes through the lenses (19) and (23) and the slot (22), which adapt the form of the light beam to the geometry of the rotor wells. These lenses are mounted on their respective supports (18) and (21) and are fastened by parts (20) and (24), respectively. The system body is laterally closed by the covers (26) and the fan (27) keeps it at a desired temperature. The lighting system is fixed to the rotor and, by the bracket (28), to the base of the analyzer.

2.2.4. Back covers

Three metallic covers close the back of the instrument.

2.2.4.1. Connectors cover

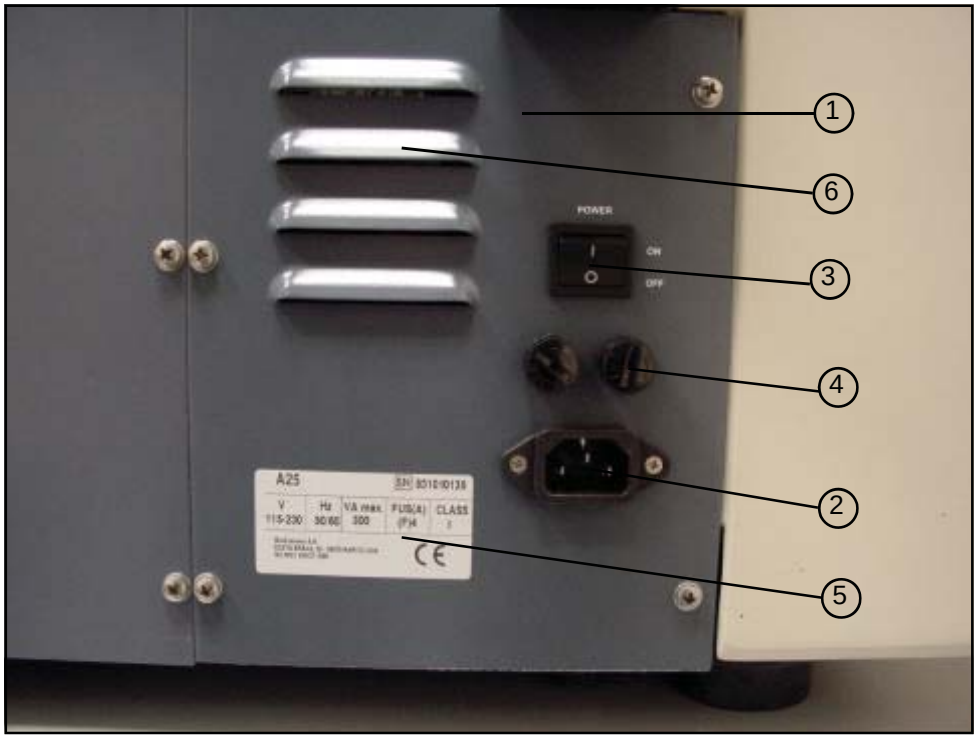
(1) CONNECTORS SUPPORT COVER
(2) COM1 CONNECTOR (DB9 FEMALE OR USB)
(3) COM2 CONNECTOR OR AUXILIARY (DB9 MALE)
(4) VENTILATION GRILL



The metallic cover (1) supports the connectors (2) and (3) that connect the instrument to the PC. There are two connectors marked as COM1 and COM2.
The COM1 is for connecting the computer and can be connected using an RS-232 cable or a USB cable.
The COM2 is an auxiliary communications channel.

2.2.4.2. Switch cover

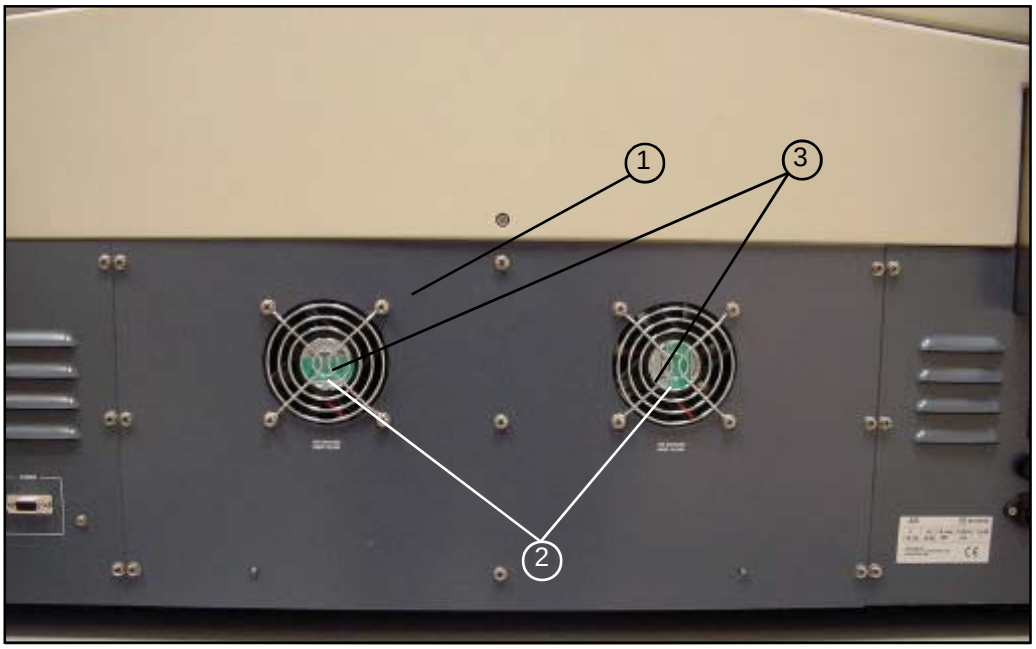
(1) SWITCH SUPPORT COVER
(2) MAINS CONNECTOR
(3) SWITCH
(4) FUSE HOLDER
(5) ID LABEL
(6) VENTILATION GRILL



The metallic support (1) supports the connector (2) for the network cable, the instrument switch (3) and the fuse holder (4).

2.2.4.3. Electronics cover

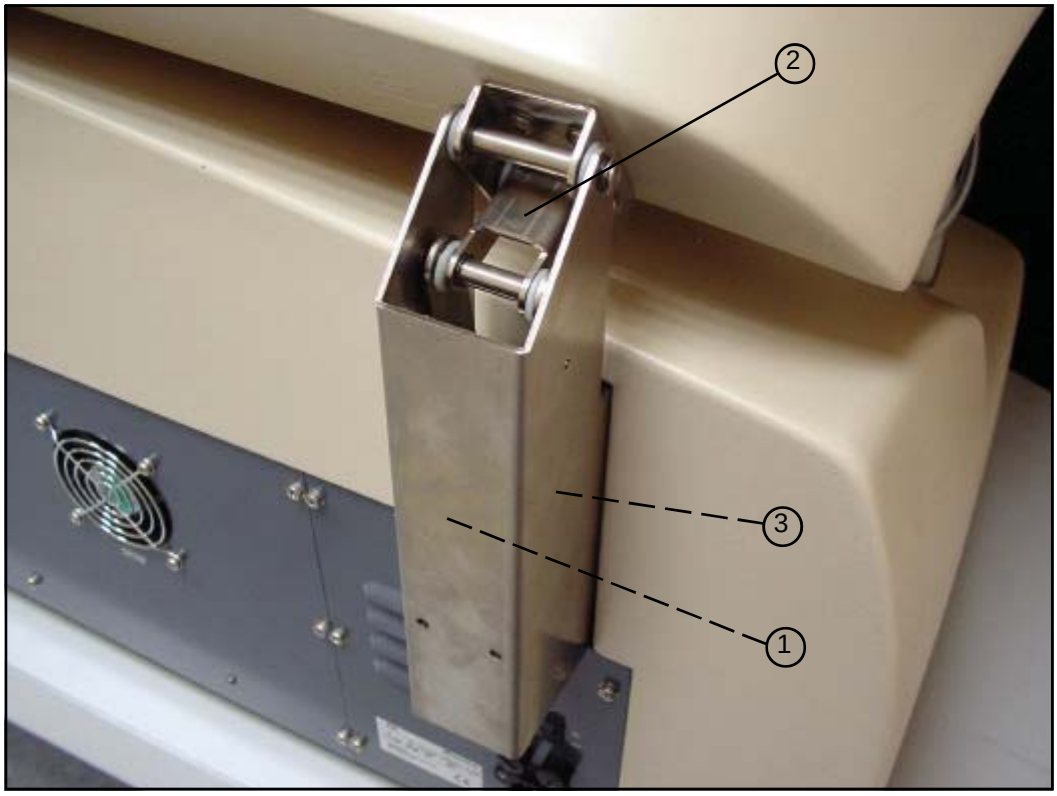
(1) BACK COVER OF THE ELECTRONICS
(2) FAN GRILLS
(3) FANS



The metallic cover (1) supports the central fans (3) protected by the grills (2).

2.2.5. Main cover hinges

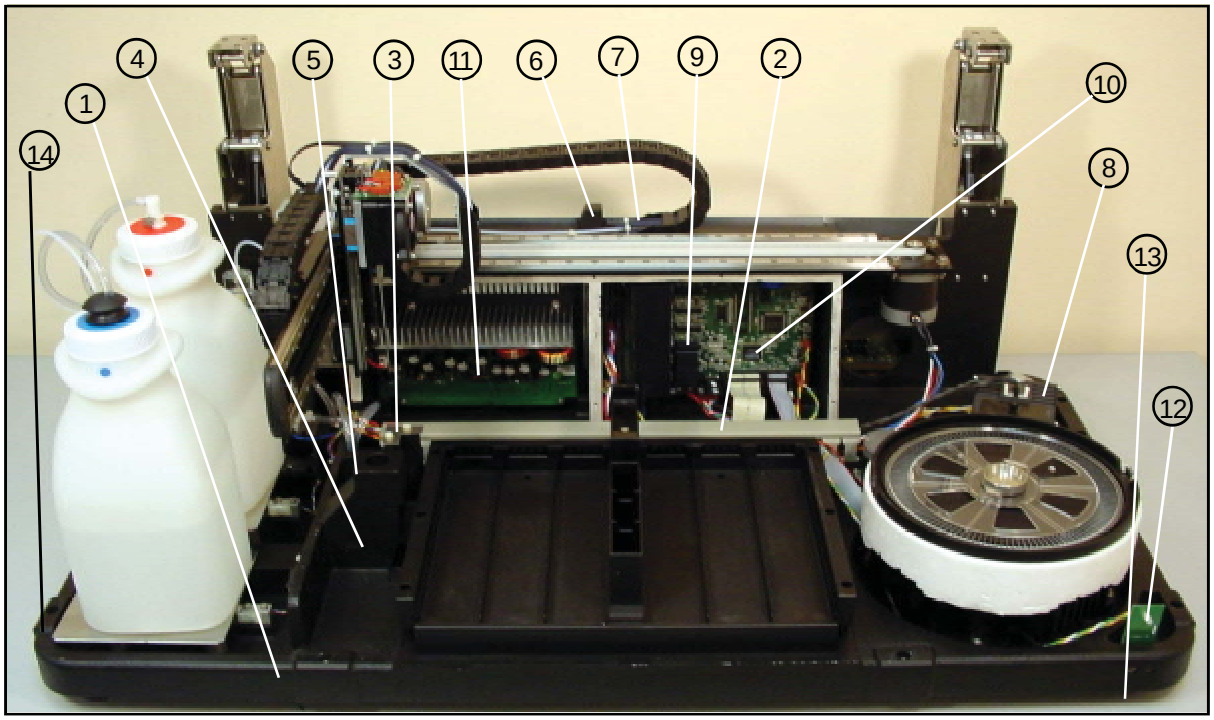
(1) HYDRO-PNEUMATIC SPRING
(2) ARTICULATED STEEL STRUCTURE
(3) COVER OPEN PHOTODETECTOR (on right-hand hinge only)



The two hinges enabling the raising of the main cover of the analyzer consist of an articulated steel structure (2) operated by a hydro-pneumatic spring (1). The right-hand hinge includes a photodetector (3) to detect whether or not the cover of the analyzer is open or closed.

2.2.6. Base

(1) CAST ALUMINIUM BASE
(2) CABLE GUIDE CHANNEL
(3) NEEDLE VERIFICATION BRACKET
(4) AUXILIARY DEVICES CONDUIT COVER
(5) FASTENING FOR AUXILIARY DEVICES
(6) CLAMP SUPPORT
(7) X CARRIAGE CHAIN TERMINAL
(8) FAN GRILL
(9) FRONT COVER OF THE ELECTRONICS
(10) MICROPROCESSOR BOARD
(11) POWER SUPPLY BOARD
(12) FRONT INDICATOR BOARD
(13) ADJUSTABLE LEG
(14) LEGS



The base (1) on which all the components of the analyzer are fastened is made of cast aluminium, machined and painted. The plastic channel (2) carries the cable hoses of different components to the electronic boards of the microprocessor (10) and the power supply (11). The metallic bracket (3) is used by the analyzer to check the state of the needle. The metallic cover (4) closes the conduit for optional auxiliary devices at the bottom of the base. The support (6) makes it possible to fasten the ends of the hoses of the operating arm by means of plastic CLAMPs. The terminal of the X carriage chain (7) is screwed directly to the base. The grill (8) protects the lighting system fan. The metallic covers (9) (removed to see the boards) close at the front of the electronic boards of the microprocessor and the power supply. The board (12) contains the front LED indicator of the instrument and is fastened directly to the base. The instrument stands on 4 rubber legs (14). The front right leg (13) is adjustable in height to adapt the instrument to the work surface.

2.2.7. Housings

(1) FRONT HOUSING
(2) REAR HOUSING
(3) MAIN COVER
(4) COVER WINDOW
(5) ARM HOUSING
(6) OPTICAL SYSTEM COVER
(7) ROTOR COVER
(8) AUXILIARY DEVICES HOUSING COVER

The front housing (1) is screwed to the base and can be removed very easily without the need for removing any other analyzer component. The rear housing (2) is also screwed to the base. The main cover (3) is screwed to the hinges. The methacrylate (4) makes it possible to observe the functioning of the analyzer with the cover closed. The housing (5) covers the Y carriage and the Z carriage of the analyzer. The cover (6) gives access to the optical system, making it possible to change the lamp and filters with ease. The cover (7) covers the reactions rotor and readings.

3. ELECTRONIC SYSTEM AND FLUIDS

1. Description of the electronics of the A25 analyzer.
2. CPU Board (CIIM00006)
3. Power Supply Board (SP300 & CIIM00007)
4. Needle Board (CIIM00008)
5. Photometry Board (CIIM00009)
6. Racks Board (CIIM00010)
7. LED Board (CIIM00011)
8. Communications Board (CIIM00019)
9. Interconnection between boards

Description of the electronics of the A25 analyzer.

The electronics of the analyzer are made up of different boards located at different points in the analyzer and dedicated to specific functions. Their different locations correspond to functionality and performance criteria for the functioning of the analyzer.

There are 8 different boards, which correspond to:

CPU Board (CIIM00006)
Power Supply Board (SP300 & CIIM00007)
Needle Board (CIIM00008)
Photometry Board (CIIM00009)
Racks Board (CIIM00010)
LED Board (CIIM00011)
Communications Board (CIIM00019)
Varistor Board (I37008A)

3.1 CPU Board (CIIM00006)

This is the brain of the machine, containing the microprocessor (H8/3003), responsible for controlling all the components of the machine. The board has different data storage systems using either static RAM (U21), FLASH memory (U18) or EPROM (U20). The slot associated with the EPROM is used to check the functionality of the board and the recording of the MONITOR program in the production phases of the analyzer. The other two memories are associated with the normal functioning of the analyzer. The FLASH memory holds the application itself as well as different databases related to factory settings, adjustments, state of the rotor and possible extensions to the application.

The U34 device also exists on the board. This is a logical programmable device (FPGA) dedicated to the control of motors, mapped in register memory associated with end-of-run control, electrovalves, decoding of racks (CIIM00010), level sensing and control of the photometry-associate board (CIIM00009).

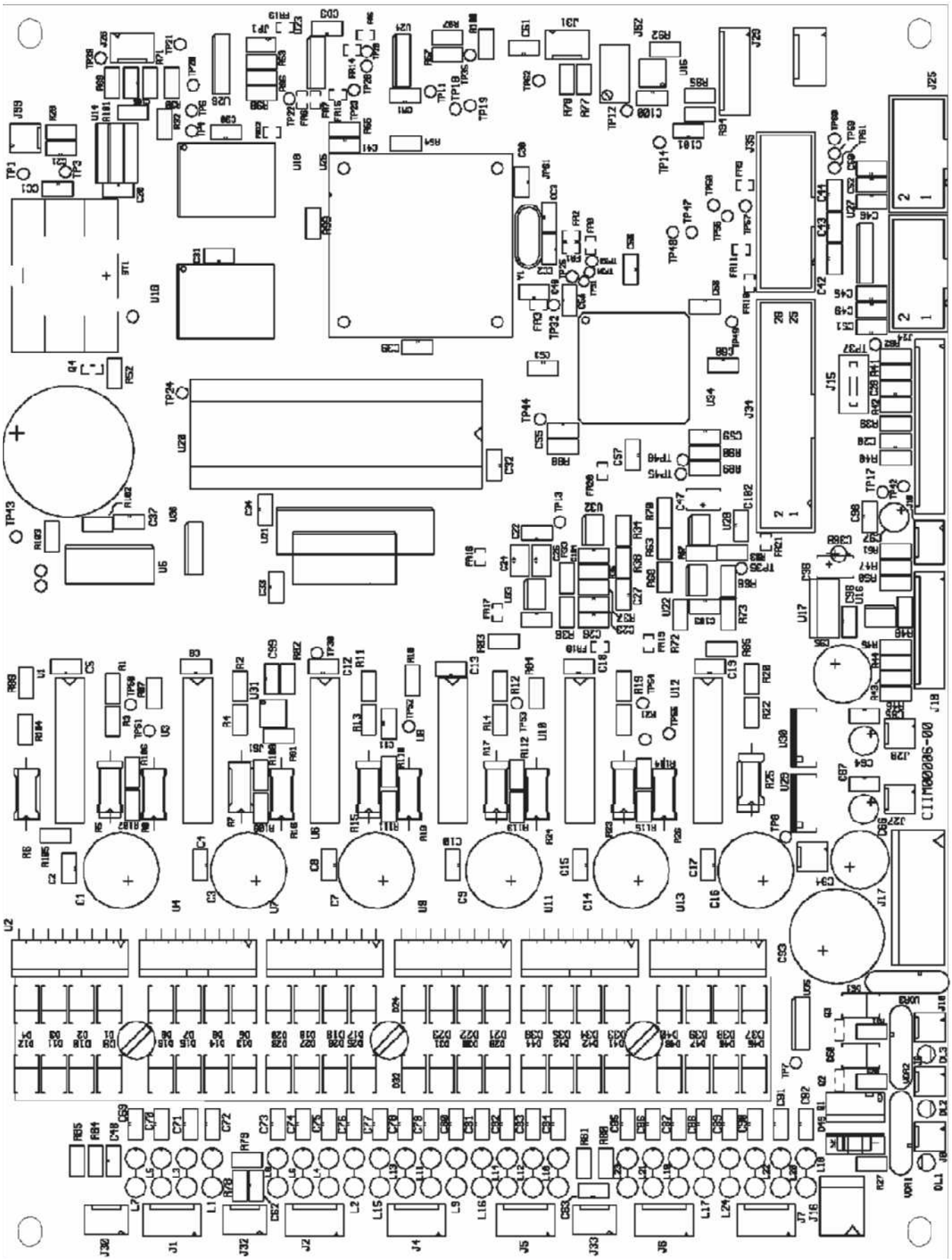
The control of the motors acts directly on the sequencers corresponding to each of the analyzer axes (U1,U3,U6,U8,U10,U12) and these, in turn, on the power drivers (U2,U4,U7,U9,U11,U13) to act on the motor. The sequencer-driver pair is made up of the integrated L297 and L298. The regulation of the current of each axis can be configured by means of a DAC that sets the current set point independently (U5). The sequencers are supplied through the U17 regulator and the drivers take their supply through the J16 connector, which corresponds to the 36V input on the CIIM00006 board.

The action on the thermostatation systems of the analyzer (needle and rotor) is carried out through H-shaped bridges based on MOS technology (U29 and U30) and controlled directly from the microprocessor. The heating elements are connected to J27 (needle) and J28 (rotor), respectively.

Connector	Function	Pins
J1	Motor Z	1 - coil 1 2 - coil 1 3 - coil 2 4 - coil 2
J2	Motor Y	1 - coil 1 2 - coil 1 3 - coil 2 4 - coil 2
J4	Motor X shaft	1 - coil 1 2 - coil 1 3 - coil 2 4 - coil 2
J5	Pump Motor	1 - coil 1 2 - coil 1 3 - coil 2 4 - coil 2
J6	Filter Drum Motor	1 - coil 1 2 - coil 1 3 - coil 2 4 - coil 2
J7	Rotor Motor	1 - coil 1 2 - coil 1 3 - coil 2 4 - coil 2
J8	Diaphragm Pump	1 - motor 2 - motor
J9	3-way electrovalve	1 - coil 1 2 - coil 1
J10	2-way electrovalve	1 - coil 1 2 - coil 1
J15	The signal enabling level detection by the analyzer needle is injected into the racks tray through this connector.	1- Faston
J16	36V voltage	1 - 36V 2 - GND
J17	12V voltage	1 - GND 2 - 12 V analogical 3 - GND 4 - 12 V peltier 5 - GND 6 - 12 V valves
J18	5V voltage	1 - Vcc 2 - GND 3 - Enable

Connector	Function	Pins
J19	Weighting system for waste and system liquid bottles	1 - Vdc 2 - GND 3 - V+ 4 - V- 5 - Vdc 6 - GND 7 - V+ 8 - V-
J24	Rotor connector	1 - Vdc 2 - Rotor cover 3 - Home rotor 4 - GND 5 - Vdc home rotor 6 - Filter wheel home 7 - GND 8 - Vdc Filter wheel home 9 - Rotor thermostatation 10 - GND 11 - Analogic 12 V 12 - GND
J25	Communications Board Connection (CIIM00019)	1 - Vdc 2 - GND 3 - Tx0 4 - GND 5 - Rx0 6 - GND 7 - GND 8 - Tx1 9 - GND 10 - Rx1
J27	Needle Peltier	1 - peltier, red 2 - peltier, black
J28	Rotor Peltier	1 - peltier, red 2 - peltier, black
J29	Needle Board Interconnection (CIIM00008)	1 - GND 2 - Home Z 3 - Needle thermistor 4 - Needle level detector 5 - GND 6 - 12 V

Connector	Function	Pins
J30	Z axis encoder	1 - Encoder detector 2 - GND 3 - Vdc
J31	X axis home	1 - Home 2 - GND 3 - Vdc
J32	Y axis home	1 - Home 2 - GND 3 - Vdc
J33	Ceramic pump home	1 - Home 2 - GND 3 - Vdc
J34	Rack decoding board connection (CIIM00010)	1 - Detector 1 2 - Detector 2 . . 24 - Detector 24 25 - GND 26 - Vdc
J35	Photometric board connection (CIIM00009)	1 - 12 V 2 - GND 3 - DVALID 4 - DCLK 5 - DOUT 6 - DXMIT 7 - RANGE2 8 - RANGE1 9 - RANGE0 10 - TEST 11 - CONV 12 - GND 13 - CLKAD 14 - GND 15 - GND 16 - Vdc
J36	LED board connection (CIIM000011)	1 - GND 2 - LED 3 - LED 4 - Vdc
J99	Fan	1 - 12V 2 - GND


CIIM00005-00

As for analogical circuitry on the board, the J19 connector corresponds to the input of the sensors for machine water and waste control. These sensors are load cells and they are conditioned by U16 and associated components. The sensor signal is linearised and amplified and is then redirected to the analogical-digital converters in the microprocessor. There is also a circuit for conditioning the signal of the thermistor associated to the thermostatation of the rotor that is made up of the U22 and U28 circuits. The signal used to detect the level is generated by U28. The injection of the signal is done by J15 and it is collected through the cables that come from the analyzer needle and connect on J29.

There are also different integrated circuits for the encoding of the control signals for all the components that share the data and address bus (U26, U23, U24 and U36), control signals inversion (U35).

The board has an acoustic alarm.

TP1 - VRAM
TP3 - LOW-LINE
TP4 - RESET
TP6 - WATCHDOG
TP12 - Needle level detector
TP13 - LSO
TP14 - RW
TP20 - CS_EPROM_L
TP21 - CS_RAM_L
TP22 - CSF2_L
TP23 - CSF1_L
TP24 - RD_L
TP25 - CLK system (16 MHz)
TP28 - LWR_L
TP29 - HWR_L
TP30 - Motor chopper frequency
TP36 - Conditioned signal output from the rotor thermistor
TP37 - Analyzer cover
TP39 - Rotor cover
TP40 - CS_FPGA_L
TP44 - INIT_L
TP45 - DONE
TP46 - PROGRAM_L
TP47 - CCLK
TP48 - DIN
TP50 - Z shaft motor vref
TP51 - Y shaft motor vref
TP52 - X shaft motor vref
TP53 - Dispensation/aspiration pump motor vref
TP54 - Filter drum motor vref
TP55 - Rotor motor vref
TP56 - IN1 Needle Peltier Driver
TP57 - EF Needle Peltier Driver
TP58 - IN2 Needle Peltier Driver
TP59 - IN1 Rotor Peltier Driver
TP60 - EF Rotor Peltier Driver
TP61 - IN2 Rotor Peltier Driver

3.2 Power Supply Board (CIIM00007)

This is made up of 5 different switched voltage regulators that enable distribution of the power supply in accord with the requirement of each subsystem.

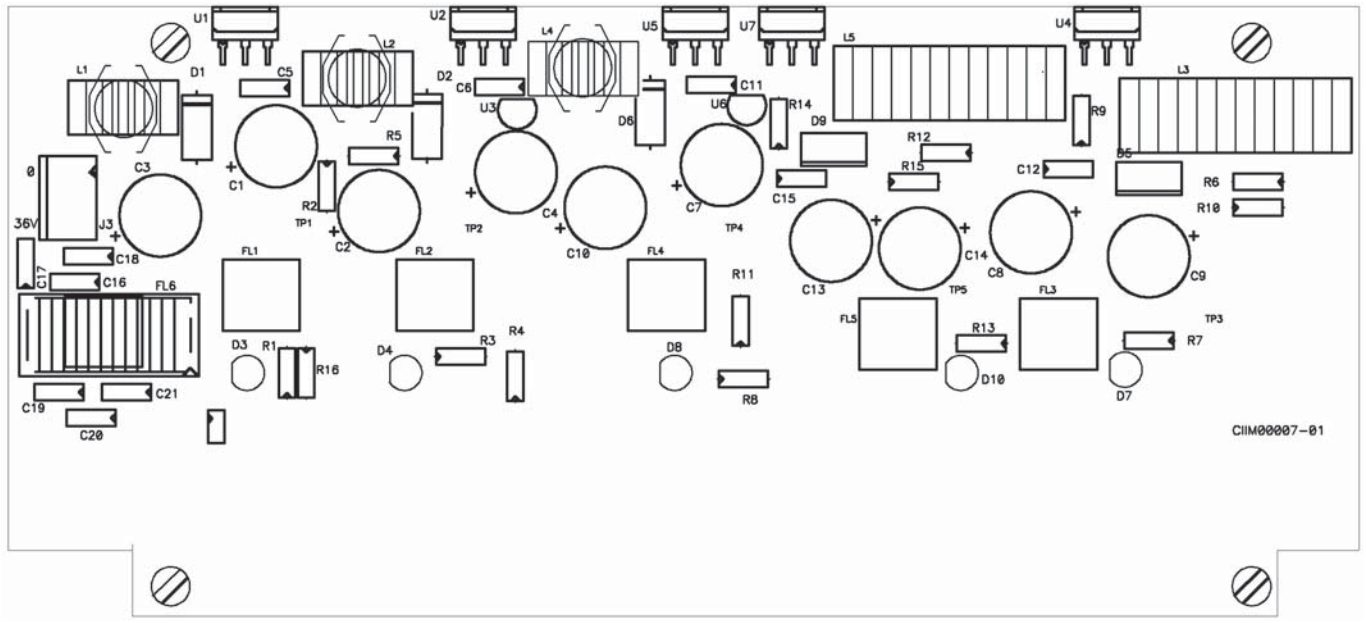
Connector	Function	Pins
J1	5 V output and enabling of power supply board	1 - 5V 2 - GND 3 - ENABLE
J2	Output voltage 12 V for lamp supply	1 - 12 V 2 - GND
J3	36 V input from the SP300-36 power supply board	1 - 36V 2 - NC 3 - GND
J4	36V and 12 V output voltage. Supplies voltage for motors, electrovalves and membrane pumps and thermostatisation systems.	1 - 36V 2 - GND 3 - 12V Valves 4 - GND 5 - 12 V thermostatisation 6 - GND 7 - 12 V analogic 8 - GND
J5,J6	Fan connection on the central back cover.	1 - 12V 2- GND

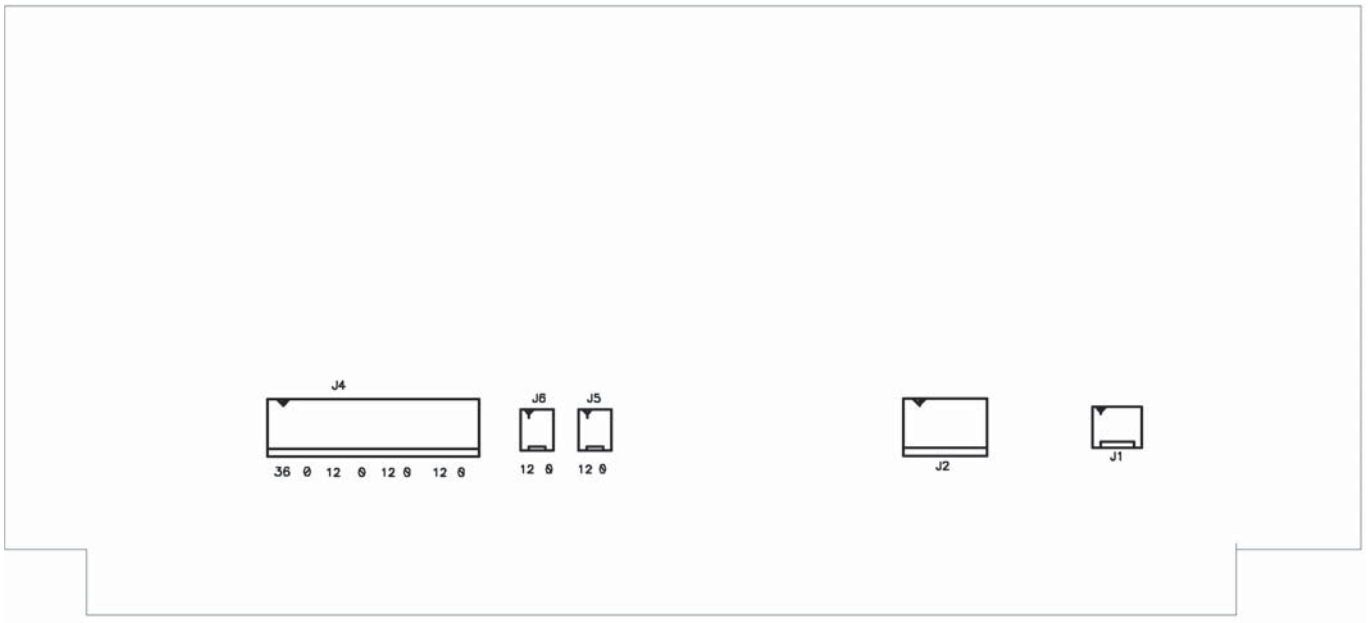
TP36V - 36V voltage
TPGND - GND
TP1 - 5V digitals
TP2 - Lamp voltage from 11.7 V <12V
TP3 - 12V Analogicals
TP4 - 12V Valves and diaphragm pumps
TP5 - 12V thermostatation

The existing bridge is to enable the different supply voltages. It has the same function as the enable of the J1 connector.

List of LED diodes:

D3 - Indicates 5V activated
D4 - Indicates 12V lamp activated
D7 - Indicates 12V valves activated
D8 - Indicates 12V analogicals activated
D10 - Indicates 12V thermos activated


U1
U2
U3
U4
U5
U6
U7
L1
L2
L3
L4
L5
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C17
C18
C19
C20
C21
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
FL1
FL2
FL3
FL4
FL5
FL6
TP1
TP2
TP3
TP4
TP5
J3
36V
CIIM00007-01


J4
36 0 12 0 12 0 12 0
J6
J5
12 0
12 0
J2
J1

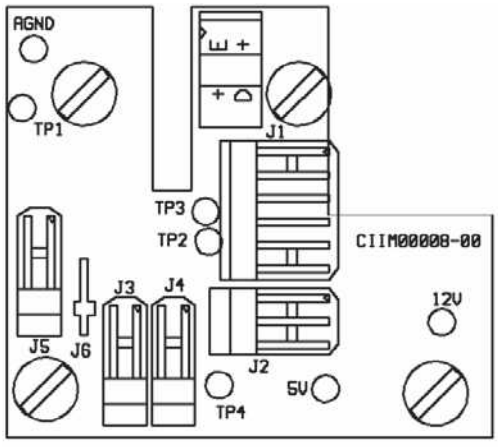
3.3 Needle Board (CIIM00008)

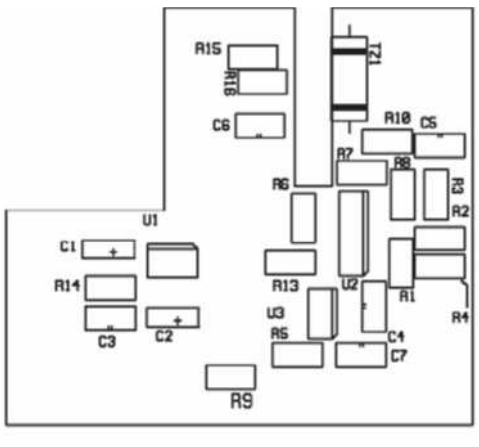
This board conditions the thermistor signal associated with the thermostatation of the needle, the preamplification of the level detection signal and the Z home. It receives, from the needle-fan unit associated with thermostatation, the Peltier cell, the thermistor and the level signal detected by the needle itself.

Two sets of cables leave this needle and join this board with the CIIM00006-01 board (specifically with the J29 and J27 connectors) for its J1 and J2 connectors.

Connector	Function	Pins
J1	CPU board connection (CIIM00006)	1 - Fan control 2 - Home Z 3 - Thermistor 4 - Sensor level 5 - GND 6 - 12V
J2	CPU board connection (CIIM00006) for the Peltier	1 - Peltier 2 - Peltier 3 - Chassis
J3	Thermistor	1 - GND 2 - Thermistor
J4	Peltier	1 - Peltier, red 2 - Peltier, black
J5	Fan	1 - Fan control 2 - 12V
J6	Needle connection for level detection	1 - needle

TP1 - Needle signal
TP2 - Output preamplifier needle signal
TP3 - Output amplifier thermistor signal
TP4 - Thermistor
12V - 12V voltage
5V - 5V voltage
AGND - GND



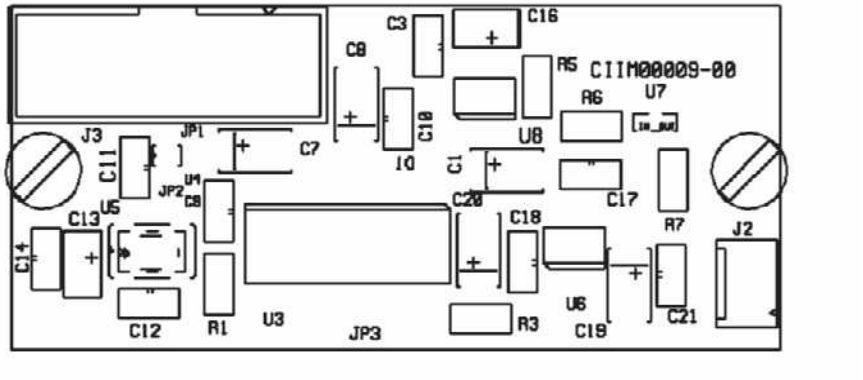


3.4 Photometry Board (CIIM00009)

This board also has the heart of the absorbance measuring system for the samples to be analyzed. It is made up of a photodetector and an associated analogical-digital conversion circuitry (DDC112).

Connector	Function	Pins
J3	Photometric board connection (CIIM00009)	1 - 12 V 2 - GND 3 - DVALID 4 - DCLK 5 - DOUT 6 - DXMIT 7 - RANGE2 8 - RANGE1 9 - RANGE0 10 - TEST 11 - CONV 12 - GND 13 - CLKAD 14 - GND 15 -GND 16 - Vdc

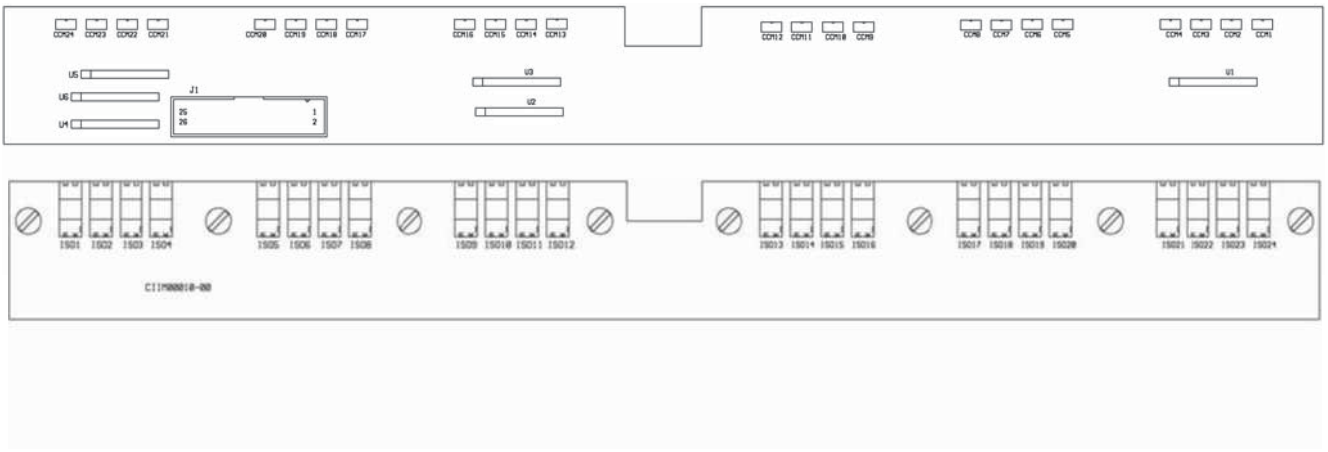
JP1 - soldering bridge - Solder only if the local oscillator and the U4 and U5 flip-flop, respectively, are not present.
JP2 - soldering bridge - The same than JP1
JP3 - soldering bridge - joins together the analogical and digital ground



3.5 Racks Board (CIIM00010)

This board decodes the rack type the analyzer has at each of the positions for said racks. It is made up of a battery of photobarriers that allow or stop light passing through the rack identification tabs at logical levels the analyzer firmware can handle.

Connector	Function	Pins
J1	CPU board connection (CIIM00006)	1 - Detector 1 2 - Detector 2 . . 24 - Detector 24 25 - GND 26 - Vdc



3.6 LED Board (CIIM00011)

This board indicates the different states of the analyzer. It is made up of a bicolor LED and the circuitry associated with action.

Connector	Function	Pins
J36	LED board connection (CIIM000011)	1 - GND 2 - LED 3 - LED 4 - Vdc

D1 - Bicolor LED

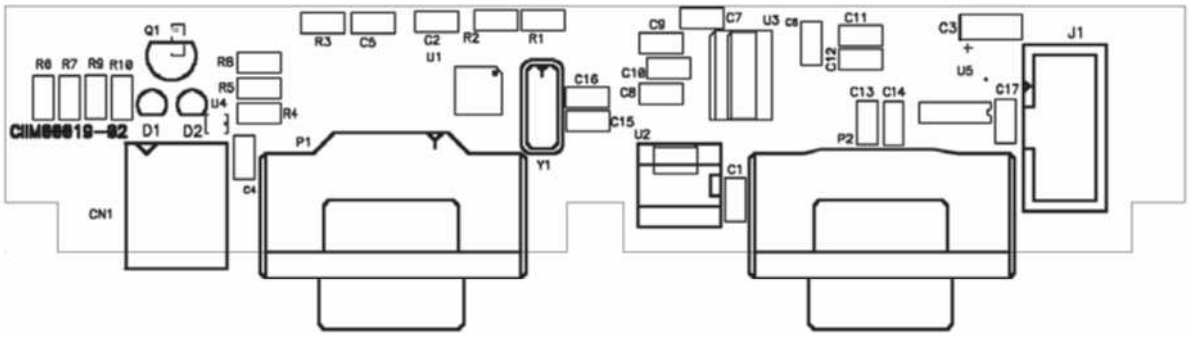
3.7 Communications Board (CIIM00019)

This enables communication with the exterior of the analyzer through a USB channel or a RS232 channel. It also includes an auxiliary RS232 channel for monitoring the functions of the analyzer during its execution.

Connector	Function	Pins
J1	LED board connection (CIIM000011)	1 - Vdc 2 - GND 3 - Tx0 4 - GND 5 - Rx0 6 - GND 7 - GND 8 - Tx1 9 - GND 10 - Rx1

CN1 - USB Connector
P1 - Main RS232 connector
P2 - Auxiliary RS232 connector

D1 - USB TX LED indicator
D2 - USB Rx LED indicator



3.8 Interconnection between boards

The following diagrams show the connections between the boards and the different components that make up the analyzer.

3.8 Auxiliar channel information

The rear left part of the instrument is where the communications cables are connected. There are two connections, the COM1 and the COM2.

The COM1 is the main connection from the analyser to the computer. This connection should be always present to analyser run propertly.

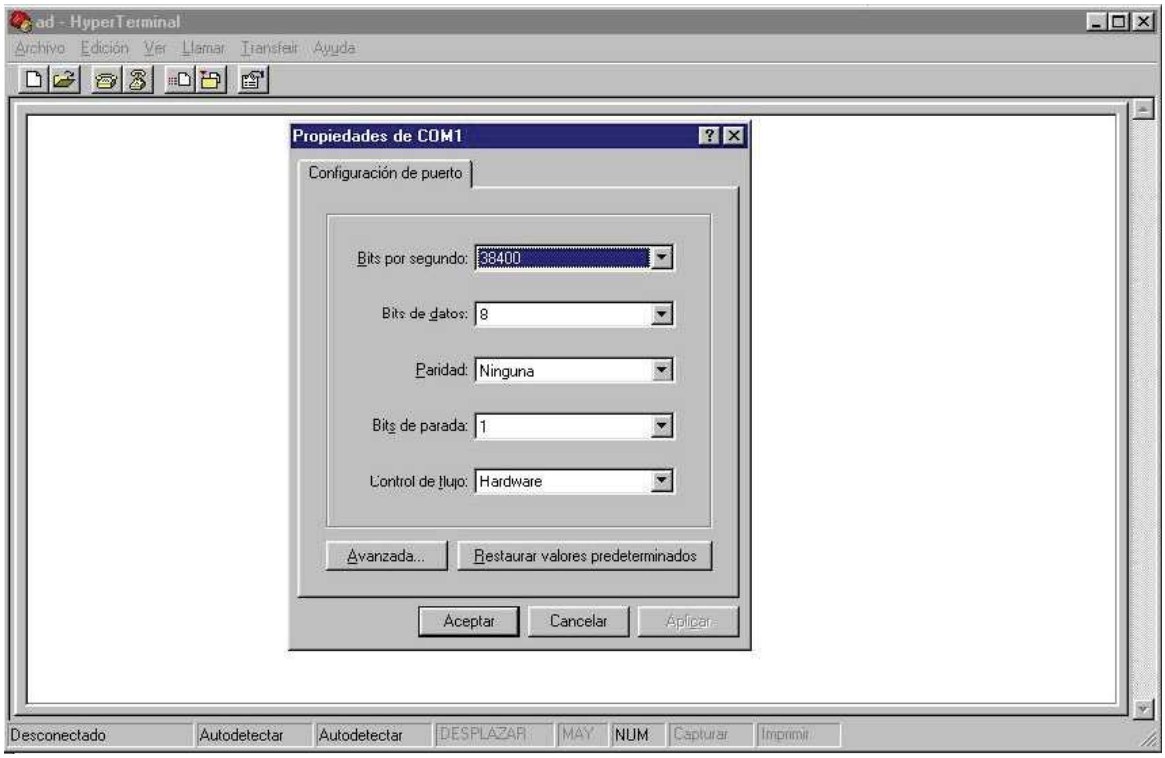
there are two connection types:

A - Cable type USB
B - Cable type RS-232

Only connect one cable type.

The labeled connector COM2 is the auxiliar connector.
This connector is used to communicate with a second serial port in the computer. The function of this cable is to monitor the internal states of the analyser.
To show all this information, the user should execute the program: windows HyperTerminal and configure with the following parameters:

Baud Rate: 38400
Número de bits: 8
Stop bits: 1
Paridad: none



Onces is configured and connected the cable, switch on the analyser. In this moment will appear in the HyperTerminal screen information about the analysers mode and the different executes states. In the initializate mode, the analyser do an internal checking for each element, if someone has any error then in the screen will show the element that fails. The following lines shows an exemple of the instructions during an initialization, (this information could change with the improvements of the firmware) :

BIOSYSTEMS A25

```
Firmware initialization
    Firmware Version: A25 User V2.80

    Serial Number: 831011284

    FLASH functions transferred to RAM
    Interrupt Vectors transferred to RAM
        Interrupts enabled

    Checking firmware integrity
        Checking program checksum:
            Checksum correct! Program Checksum=0xDF32 Size=439296

        Checking A25 configuration checksum:
            Checksum correct! Configuration Checksum=0x21C2 Size=250

        Checking A25 configuration backup checksum:
            Checksum correct! Configuration backup Checksum=0x21C2 Size=250

    Loading A25 Configuration from FLASH
        Configuration in FLASH is correct

    Adjustments loaded:

        Temperature correction for Rotor=-0.19
        Temperature correction for Probe=-0.50
        System Liquid Low Level=500 (0%)
        System Liquid High Level=780 (100%)
        Waste Low Level=724 (0%)
        Waste High Level=984 (100%)
        Sensitivity of level detection=70
       Origin X=23
       Origin Y=20
        Origin Z=445
        Tray Reference X=1349
        Tray Reference Y=335
        Washing station X=1349
        Washing station Y=22
        Washing station Z=275
        Reactions Rotor X=2887
        Reactions Rotor Y=678
        Reactions Rotor Z=415
        Rotor Distance between the dispensation point and the optic system=1427
        Rotor Position correction regard to the dispensation point=7
        Rotor Position correction regard to the optic system=-4
        Filters Wheel correction=-4
        Filters and their Integration Times:

          Filter   1=000   Integration Time= 10ms ( 20)    Reference Time= 10ms ( 19)
          Filter   2=340   Integration Time= 70ms (136)    Reference Time= 70ms (136)
          Filter   3=405   Integration Time= 14ms ( 28)    Reference Time= 14ms ( 27)
          Filter   4=505   Integration Time= 15ms ( 29)    Reference Time= 15ms ( 29)
          Filter   5=535   Integration Time= 16ms ( 31)    Reference Time= 16ms ( 31)
          Filter   6=560   Integration Time= 13ms ( 26)    Reference Time= 13ms ( 25)
          Filter   7=600   Integration Time= 19ms ( 37)    Reference Time= 19ms ( 37)
          Filter   8=635   Integration Time= 14ms ( 28)    Reference Time= 14ms ( 27)
          Filter   9=670   Integration Time= 25ms ( 48)    Reference Time= 25ms ( 48)
          Filter 10=000   Integration Time= 10ms ( 20)    Reference Time= 10ms ( 19)

        Zmax Reference=194
            - Pediatric Offset=0
           - 13mm Offset=0
           - 15mm Offset=0
            - Reagent Offset=100
            - Central Reagent Offset=0

    A25 Mechanical History

        - X axis: 1207 Steps
        - Y axis: 1157 Steps
        - Z axis: 1449 Steps
```

```
      - Rotor: 88 Steps
      - Filter Wheel: 1771 Steps
      - Ceramic Pump: 1418 Steps
      - Washing Station Pump: 903 Cycles
      - Washing Station Valve: 903 Cycles
      - Ceramic Pump Valve: 1341 Cycles
      - Lamp: 661 Minutes

  A25 Statistics

      - Biochemistry Tests: 0
      - Turbidimetry Tests: 171
      - Biochemistry Bireagent Tests: 0
      - Turbidimetry Bireagent Tests: 0
      - Predilutions: 0
      - Initial/Final Washings: 0
      - Washing Solution Washings: 0
      - System Liquid Washings: 50
      - New Rotor: 1
      - Bireagent Contaminations Solved: 0


  Detecting Main Board version (CIIM00006-XX)
      Ok. Main Board version is CIIM00006-02/03

  Configuration Load from X9279: STT= 3 RD=0 TD=1 GD=0

  Setting racks layout

     Tray Ref. X=1349 => Distance from tray reference to tray corner X=1082
     Tray Ref. Y=335 => Distance from tray reference to tray corner Y=432

     Absolute position of tray corner X=267
     Absolute position of tray corner Y=-97
     Generating Zmax Map:Ok

  CPU settings: MDCR=c4;ABWCR=0;ASTCR=ff

                        BioSystems  A25
                          Hello World


   A25 MAGIC KEYS

  H: Help
  R: Rotor Temperature
  P: Probe Temperature
  S: Level Scales
  A: Last A25 Stress Results
  L: Actual Sensitivity of Level Detection
  N: Enable Level Detection Debug
  K: Power Supply On
Buzzer Control
  B: Buzzer On
  b: Buzzer Off
Encoder
  E: Generate Encoder Error
  I: Enable Encoder IRQ
Rotor Reading
  1: Choose Filter +
  2: Choose Filter -
  9: Start Rotor Readings
     Notes: Use only in Service Mode
                after a Base Line Test.
Rotor Read
  1: Choose Filter +
  2: Choose Filter -
User Mode Test
  G: Test
     Notes: Use only after a Worklist in
              Stand By.
               This tests dumps all the preparations
                 parameters received and the photometric
                 readings. Finally performs a general test
```

```
                of the analizer.
               After this test press New Rotor
                for continue working.
   DDC112/Photometry
    D: Choose Mode
        - DDC112 internal test mode
        - DDC112 Photometry Mode
       - Stop
    +: Integration Time +0.5ms
    -: Integration Time -0.5ms
       Notes: Only works in Service Mode
               This tests performs continuous
               readings with the DDC112.
              Remember stop the test for
               continue working.

     Caution: Dont't abuse of this functions while the
               analizer is running.


CONNECTED WITH PC!
Rx s=0
Stand by mode!
Send Status
Rx s=1
Inicio modo servicio!

 Hardware Initialization

   Programming FPGA XCS30TQ144
    - Clearing FPGA program memory: OK!
    - Programing FPGA: OK
   FPGA XCS30TQ144 is programmed


   Initialization of level detection system
    - Generating Sensitivity Map:Ok
    - Programming X9279: .OK
   Sensitivity is programmed

   Initializating Motors
    - Axis Z in HOME
    - Axis Y in HOME
    - Axis X in HOME
    - ROTOR in HOME
    - FILTERS WHEEL in HOME
    - CERAMIC PUMP in HOME
   Motors Initializated

   Optics Initialization
    - Filter correction=4
    - Rotor correction=1113 Rotor Lect. correction=-4
    - Used wells:28

    - Check DDC112.OK (FPGA 8Mhz Clock: OFF)
    - DDC112 test: OK!  (Result => 0045140)
   Optics Initializated

 Generating Pattern: 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0
 Generating Gate:     0 0 0 1 1 1 0 0 0 0 0 0 1 1 1 1 1 0 0 0
 OK
   Z Axis Initialization
    - Axis Z in HOME
   Z Axis initializated

   Programming the encoder: 0000| OK

   Z Axis Initialization
    - Axis Z in HOME
   Z Axis initializated

   Auto-Adjustment of the probe
    - Positioning ARM
    - Detecting X side: OK. The correction is X=Xcal+0
```

```
    - Detecting Y side: OK. The correction is Y=Ycal+-1
   Auto-Adjustment of the probe is done

   Peltier Cells and Drivers Test
     - Probe Peltier Driver Test: Ok!
     - Rotor Peltiers Driver Test: Ok!

 Hardware Initializated

HC
   Detecting the reactions rotor
     - Filter 340nm Found! (1)
     - The lamp doesn't need time for stabilization
     - Rotor detected!   (Average= 749967 Desvest=150577.36)
Send Status
Rx s=0
Rx service task
N=1 T=0 F=156 P1=0 P2=0 P3=0
End Service Recipe
Send service
Rx s=1
Rx service task
N=1 T=0 F=157 P1=0 P2=0 P3=0
End Service Recipe
Send service
Rx s=0
Rx service task
N=1 T=0 F=152 P1=0 P2=0 P3=0
End Service Recipe
E=>0
Send service
```

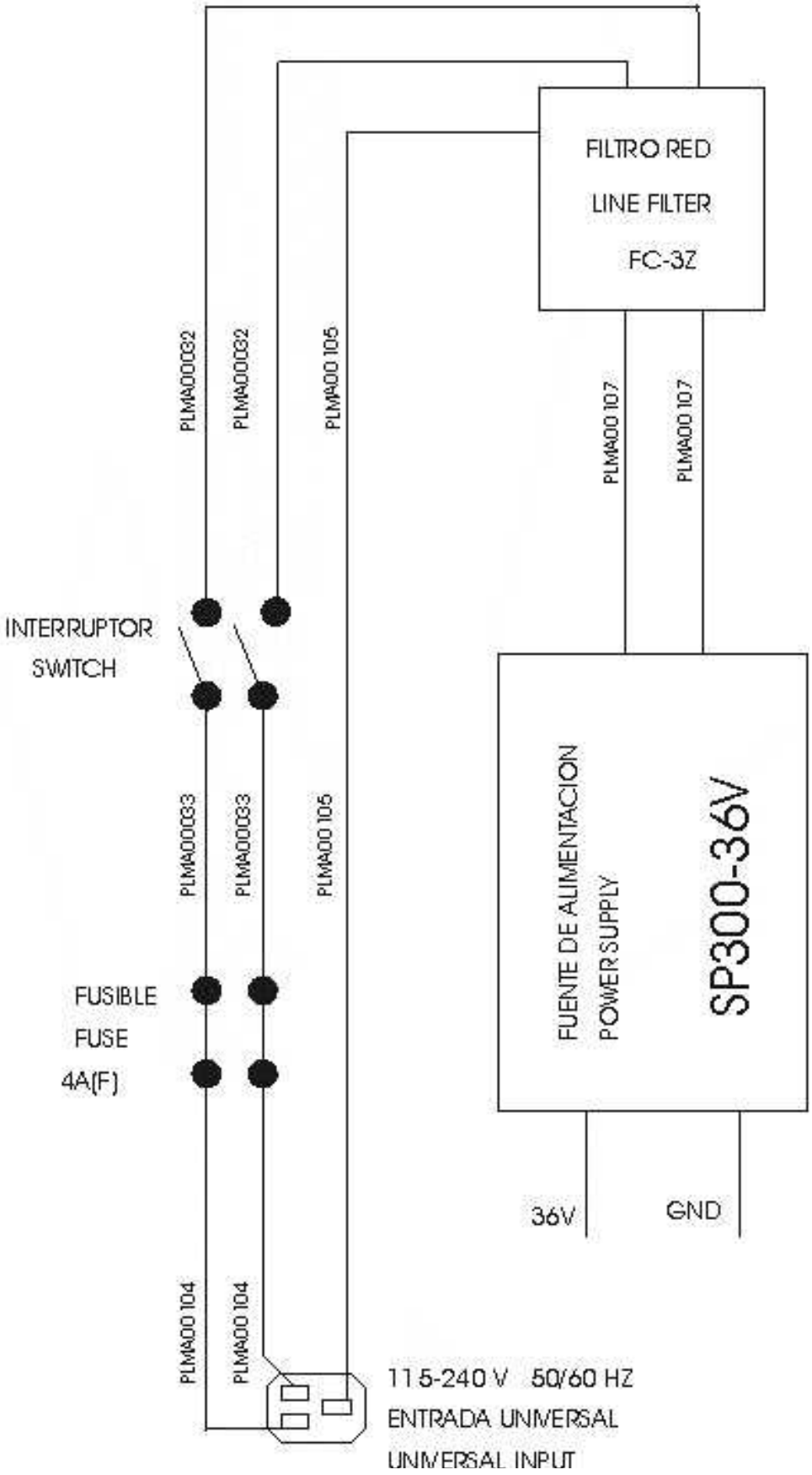
There are a few keys that work with the Hyperterminal, to press some keys the analyser give information about some element, the following keys has the function:

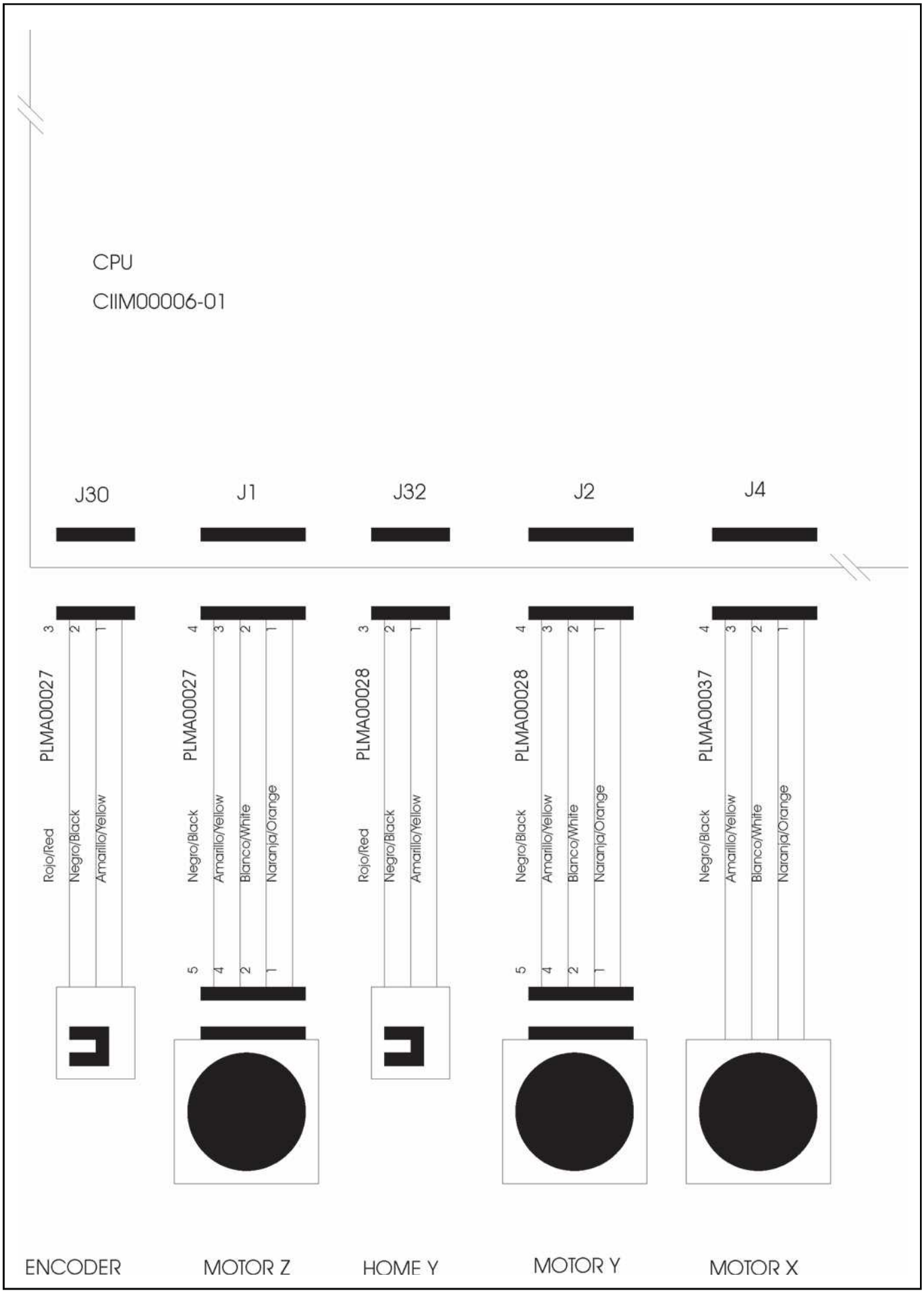
```
H: Help, help, shows the help text
R: Rotor Temperature, shows the rotor temperature
P: Probe Temperature, shows the needle temperatare
S: Level Scales, shows the scales mesures in %
A: Last A25 Stress Results
L: Actual Sensibility of Level Detection
N: Activate additional information of level detection (only internal use)
K: Deactivate the power supply
B: Activate the buzzer
b: Deactivate the buzzer
E: Generate an encoder error (only internal use)
I: Activate the encoder interrupt (only internal use)

1: Increase the filter wheel position
2: Decrease the filter wheel position
9: Mesure the whole rotor, step by step

G: Once finish a work list, push the G and send to the hyperteminal more detailed
   information of the work list managemnet

D: Show the mesure depending on the number of key pressed
     1st press: activate the internal test DDC112, always show the same count number
     2nd press: activate the normal mesure DDC112, show the count number mesured
     3th press: stop the DDC112 mesure
+: Increase the integration time in 0.5ms
-: Decrease the intergration tie in 0.5ms
```

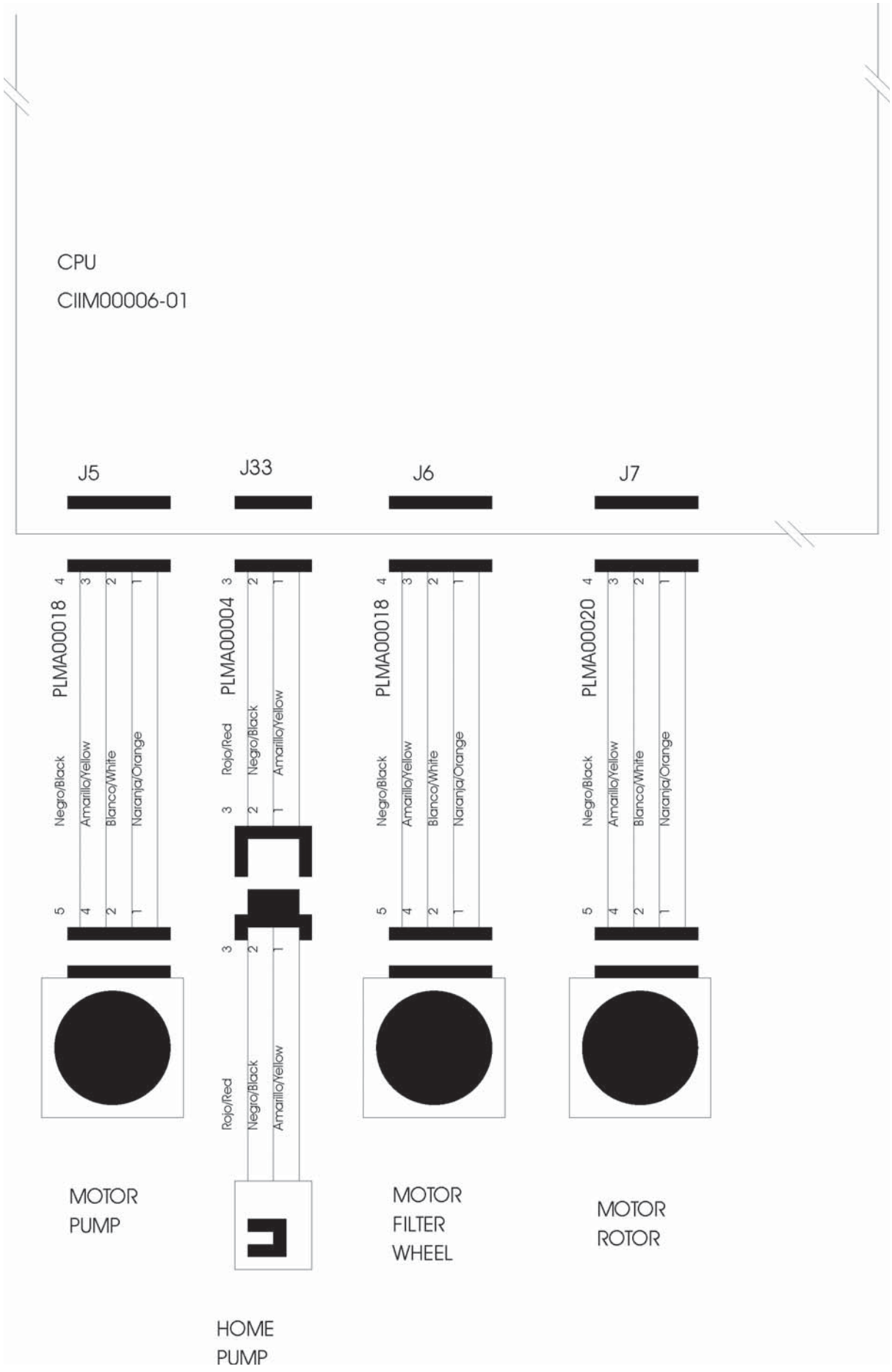
3.9 Boards interconnection

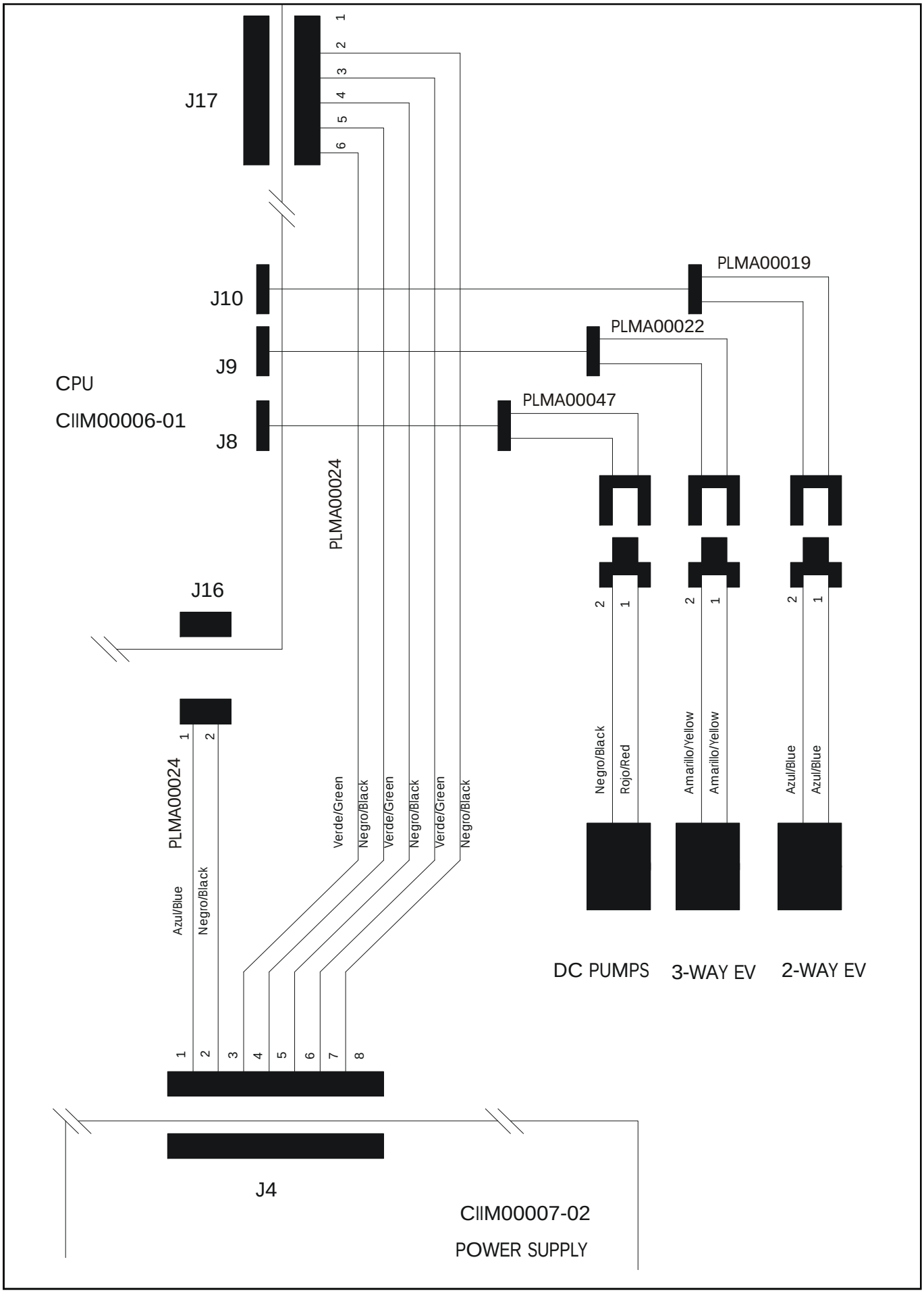
The following schematics shows the connection between boards and the differents elements has the analyser.

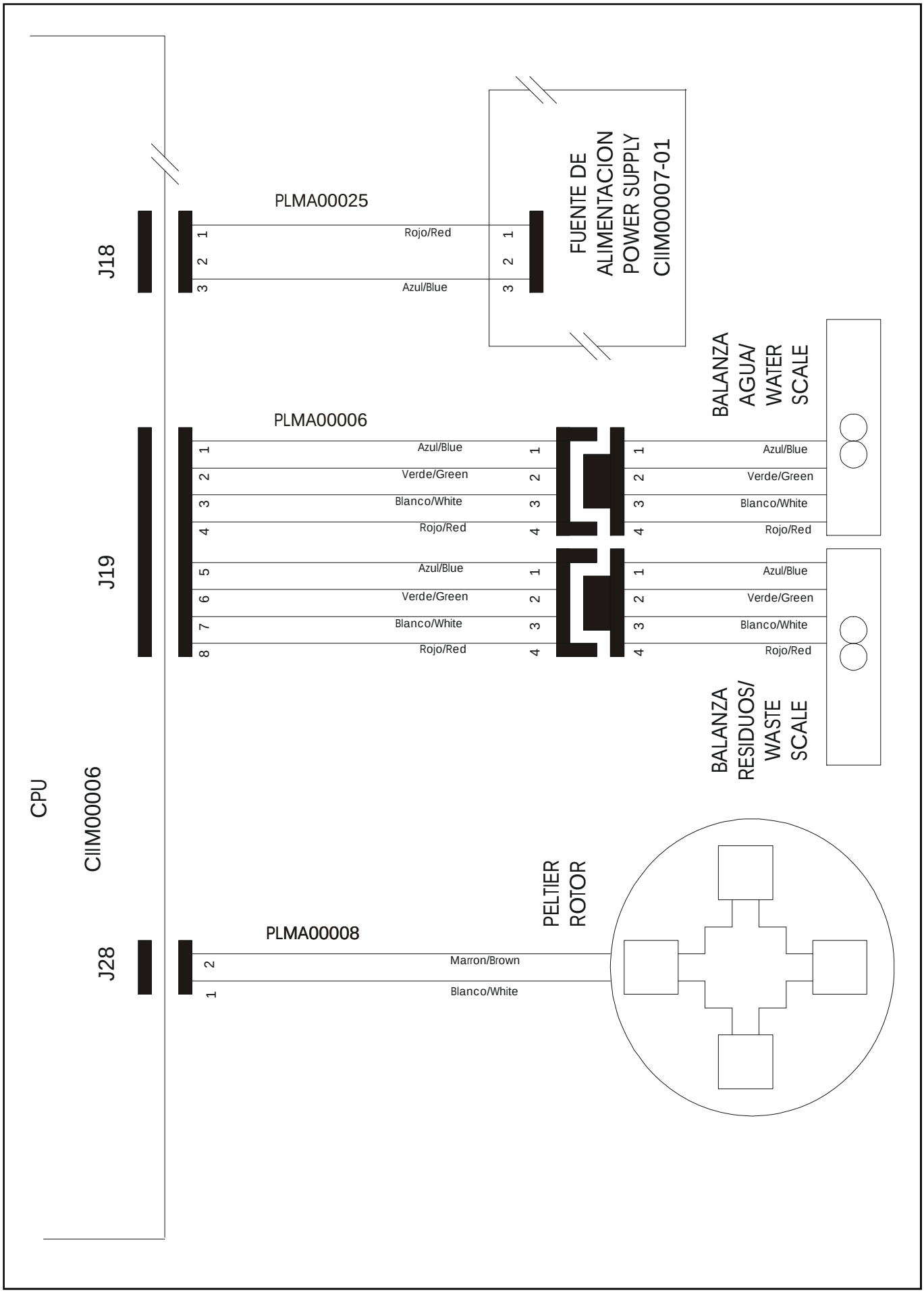
Esquema de Alimentación
Power-In Scheme

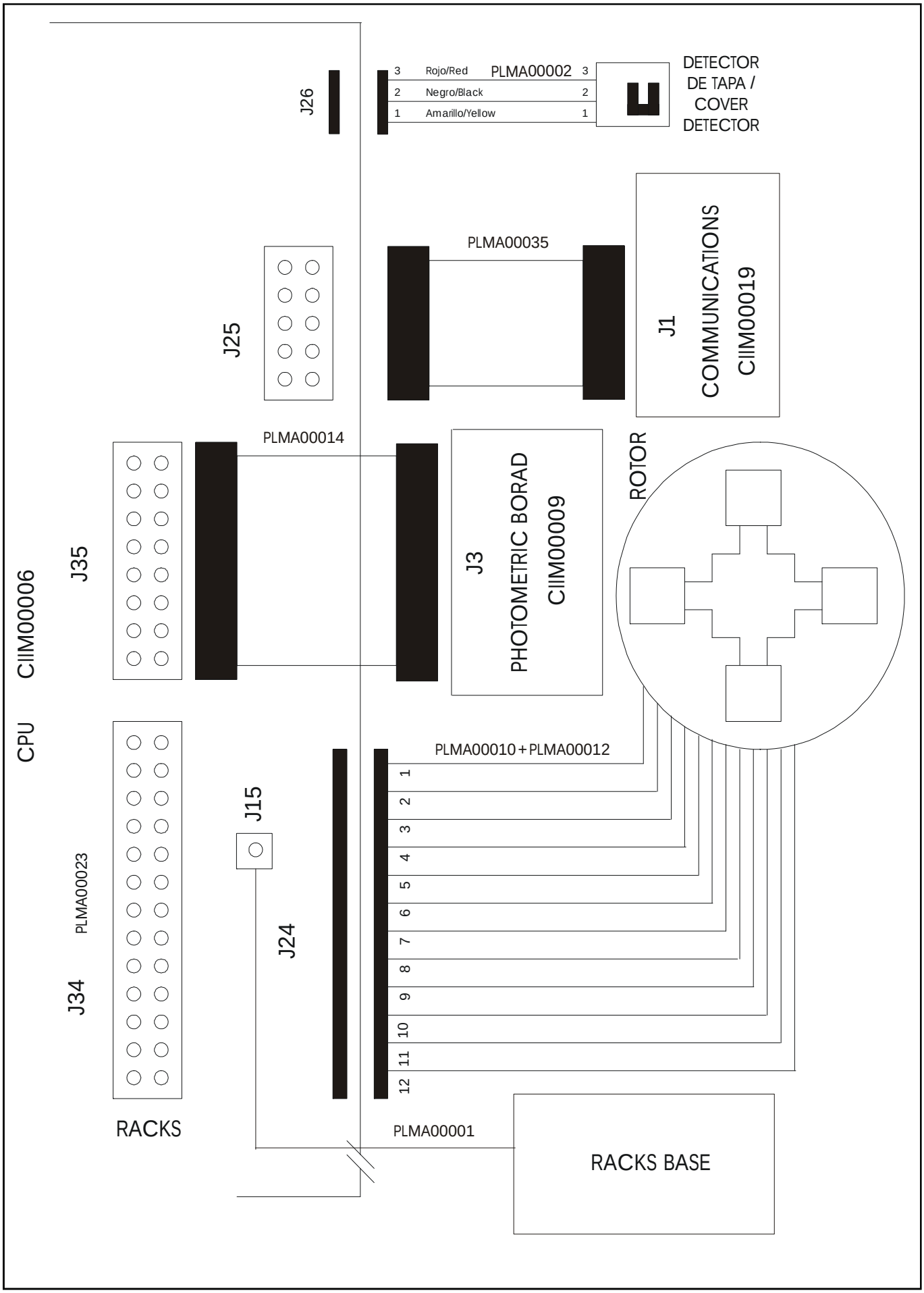


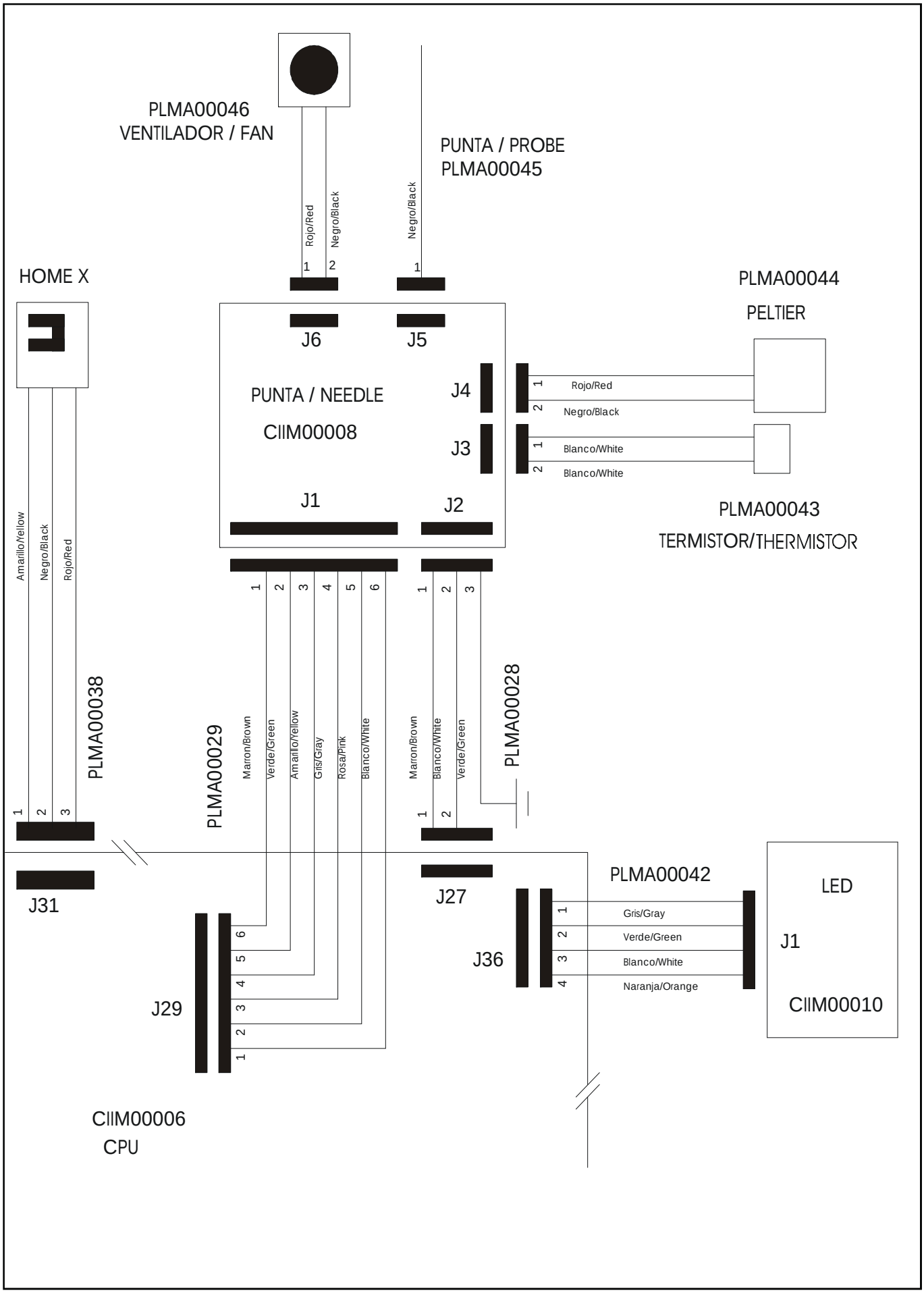

CPU
CIIM00006-01
J30
J1
J32
J2
J4
PLMA00027
Rojo/Red
Negro/Black
Amarillo/Yellow
PLMA00027
Negro/Black
Amarillo/Yellow
Blanco/White
Naranja/Orange
PLMA00028
Rojo/Red
Negro/Black
Amarillo/Yellow
PLMA00028
Negro/Black
Amarillo/Yellow
Blanco/White
Naranja/Orange
PLMA00037
Negro/Black
Amarillo/Yellow
Blanco/White
Naranja/Orange
ENCODER
MOTOR Z
HOME Y
MOTOR Y
MOTOR X


CPU
CIIM00006-01
J5
J33
J6
J7
PLMA00018
PLMA00004
PLMA00018
PLMA00020
Negro/Black
Amarillo/Yellow
Blanco/White
Naranja/Orange
Rojo/Red
MOTOR
PUMP
HOME
PUMP
MOTOR
FILTER
WHEEL
MOTOR
ROTOR

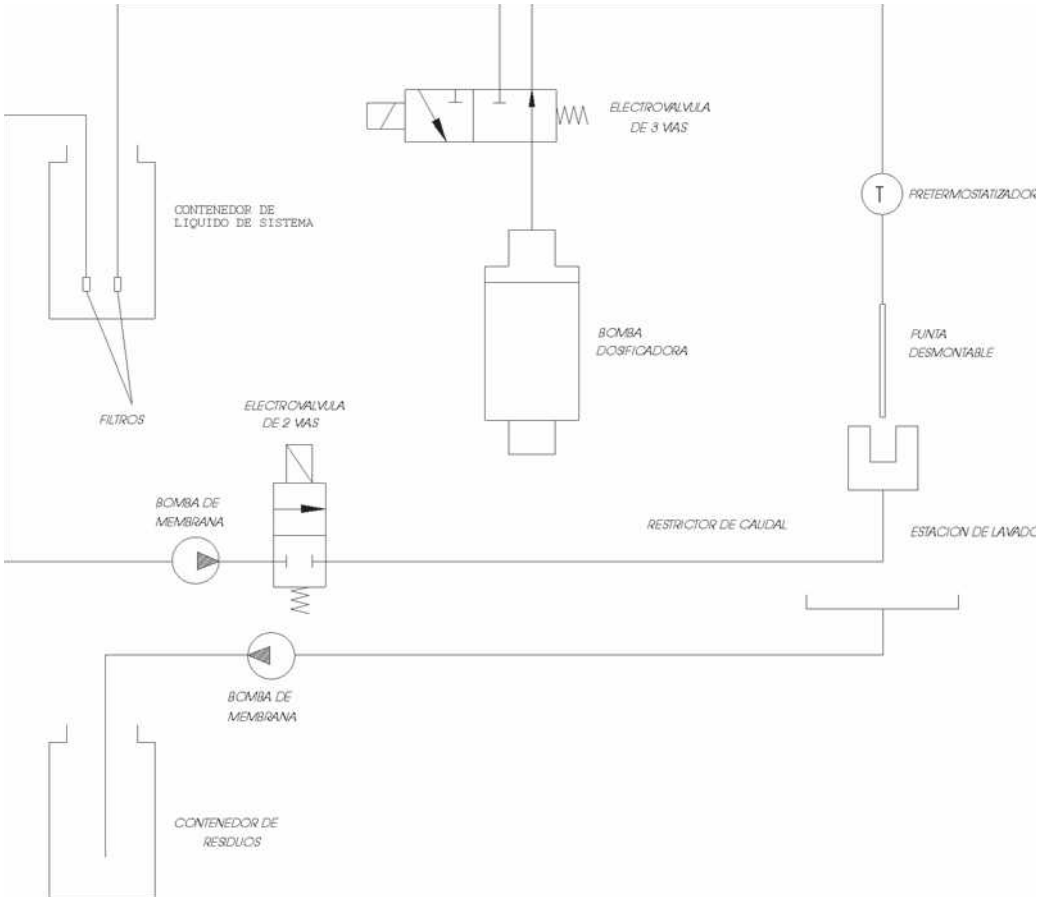

J17
1
2
3
4
5
6
J10
J9
J8
CPU
CIIM00006-01
J16
PLMA00024
PLMA00019
PLMA00022
PLMA00047
2
1
Negro/Black
Rojo/Red
Amarillo/Yellow
Amarillo/Yellow
Azul/Blue
Azul/Blue
DC PUMPS
3-WAY EV
2-WAY EV
PLMA00024
Azul/Blue
Negro/Black
Verde/Green
Negro/Black
Verde/Green
Negro/Black
Verde/Green
Negro/Black
1
2
3
4
5
6
7
8
J4
CIIM00007-02
POWER SUPPLY


CPU
CIIM00006
J18
J19
J28
PLMA00025
Rojo/Red
Azul/Blue
FUENTE DE ALIMENTACION
POWER SUPPLY
CIIM00007-01
PLMA00006
Azul/Blue
Verde/Green
Blanco/White
Rojo/Red
BALANZA AGUA/ WATER SCALE
BALANZA RESIDUOS/ WASTE SCALE
PLMA00008
Marron/Brown
Blanco/White
PELTIER ROTOR


CPU CIIM00006
J26
J25
J35
J34
PLMA00023
J15
J24
RACKS
3 Rojo/Red
2 Negro/Black
1 Amarillo/Yellow
PLMA00002
DETECTOR DE TAPA / COVER DETECTOR
PLMA00035
J1 COMMUNICATIONS CIIM00019
PLMA00014
J3 PHOTOMETRIC BORAD CIIM00009
ROTOR
PLMA00010 + PLMA00012
1 2 3 4 5 6 7 8 9 10 11 12
PLMA00001
RACKS BASE


PLMA00046
VENTILADOR / FAN
Rojo/Red
Negro/Black
1
2
PUNTA / PROBE
PLMA00045
Negro/Black
1
HOME X
J6
J5
PLMA00044
PELTIER
PUNTA / NEEDLE
CIIM00008
J4
J3
J1
J2
1
Rojo/Red
2
Negro/Black
1
Blanco/White
2
Blanco/White
PLMA00043
TERMISTOR/THERMISTOR
Amarillo/Yellow
Negro/Black
Rojo/Red
1
2
3
PLMA00038
PLMA00029
1
2
3
4
5
6
Marron/Brown
Verde/Green
Amarillo/Yellow
Gris/Gray
Rosa/Pink
Blanco/White
1
2
3
Marron/Brown
Blanco/White
Verde/Green
PLMA00028
1
2
J31
J27
PLMA00042
LED
J1
J36
1
Gris/Gray
2
Verde/Green
3
Blanco/White
4
Naranja/Orange
CIIM00010
J29
6
5
4
3
2
1
CIIM00006
CPU

3.10 Schematic liquid circuit



4. SERVICE PROGRAM

The service program is used for the adjustment, checking and maintenance of the different components of the analyzer. It is not supplied with the instrument, it is supplied to authorised technical services only. The personal of the Technical Service must install it on the user's computer in order to carry out the service requirements. Once the tasks have finalised, the program must be uninstalled. To install the program, follow the instructions on the installation CD ROM called *Service*. The original password for using this program is ***A25***. The password can be changed from the service program itself. If the service personnel forget the password, the original password can be reinstalled by deleting the hidden file *code.a25* from the application directory and relaunching the program. Once the password has been introduced, the analyzer serial number is given and the name of the operator is requested (by default *Operator1*). Press the *Accept* button and the main program appears. The different functions of the service program are classified in the following categories:

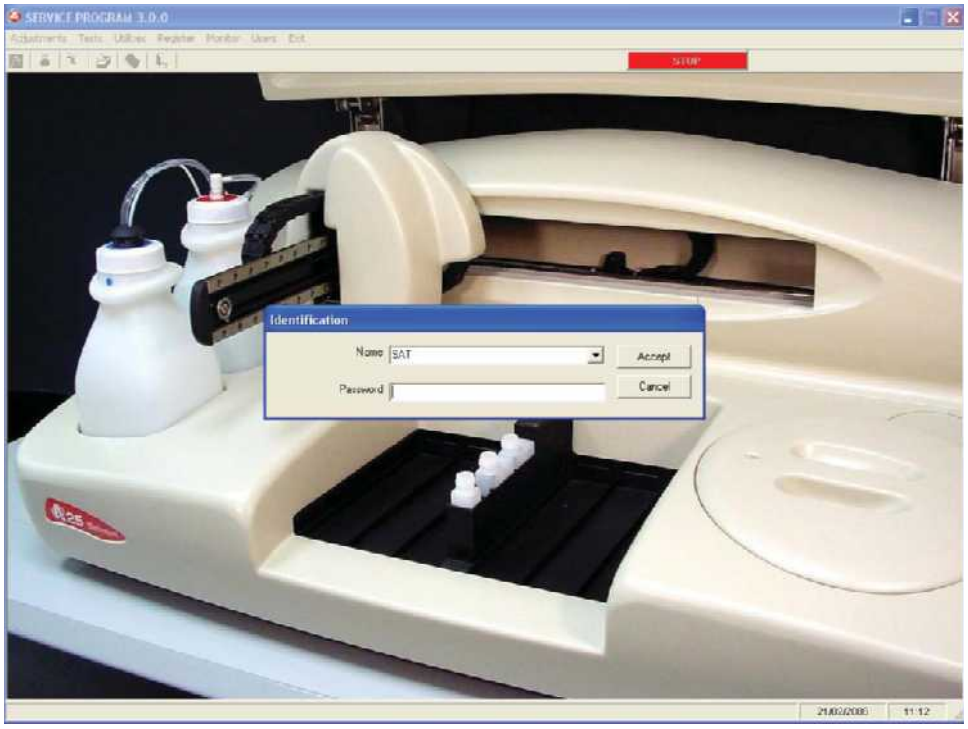
- **Adjustments**: These make it possible to make different parameter adjustments required for the correct functioning of the analyzer.
- **Tests**: Tests for checking the functionality of the analyzer.
- **Utilities**: Different technical utilities, such as, for example, washing or priming the dispensing system or changing an optical filter.
- **Registers**:This enables the management of past adjustments, tests, incidences, repairs and maintenance of the instrument.
- **Monitor**:These enable the low level communication with the analyzer to load new versions of the program in the *flash* memory of the analyzer (*firmware*) or to consult the internal parameters of the instrument.

An emergency stop button (*STOP on a red background*) will be accessible at all times, and when pressed, it switches off the analyzer and closes the application quickly.

4.1 Initialising the analyser

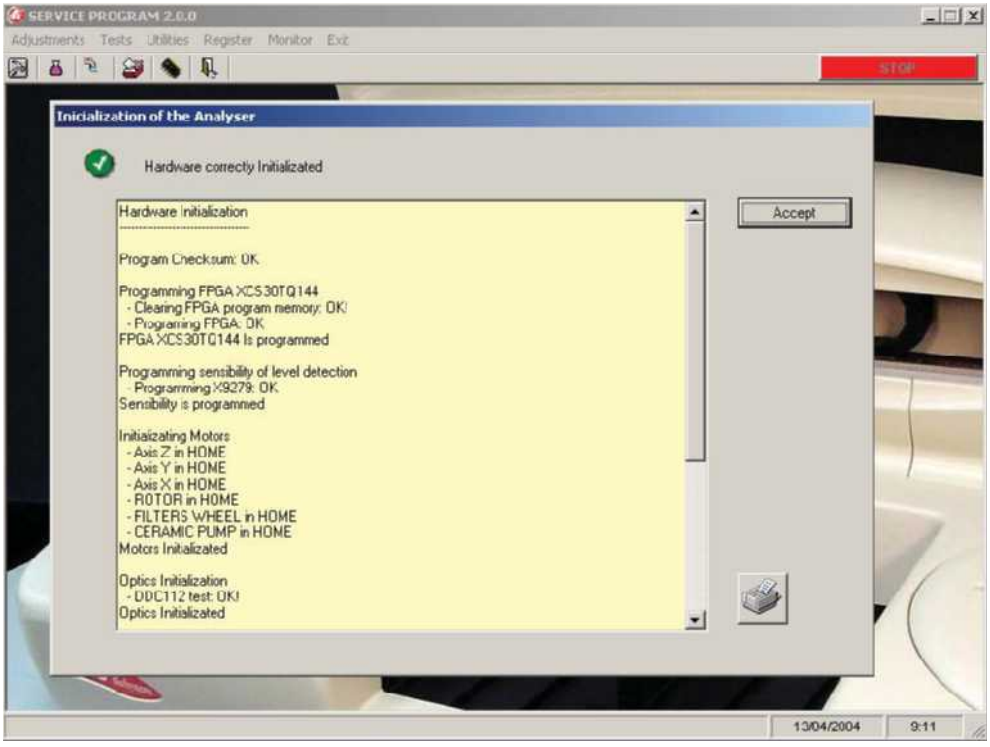
To initialise the analyser in service mode, first launch the A25 Service application. The program first of all requests a user or technician ID to be used in the program. Depending on the type of user identified, access to the different parts of the program will be allowed or denied. The following screen appears:

For full access, enter the following codes:
Name (login): ***SAT***
Password: ***A25***



Once the user has been identified correctly, the service program starts to initialise the analyser.

This screen appears when the analyser has finished the previous operations done to enter the SERVICE mode. If the complete hardware of the analyzer is in correct conditions, the result “Hardware initiated correctly» displays. If any hardware element presents an operational problem, it will appear “Hardware not initiated completely” in the screen, and the element that is not working correctly will be shown.
In order to close the screen and continue working, you should press the *Accept* button.
In order to get a printed copy of this initialization report, you should press the *Print* button.
NOTE: If an error has been reported and the technician continues working with the service program, he must consider that there is a hardware element that is not working properly.

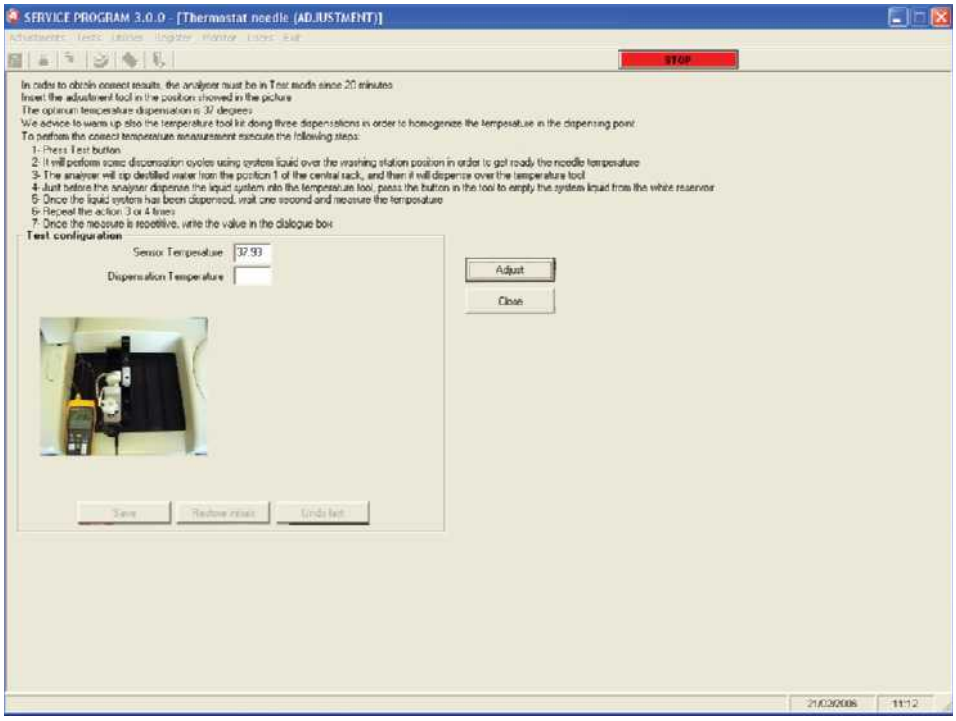


4.2. ADJUSTMENTS

These make it possible to make different parameter adjustments required for the correct functioning of the analyzer. All the values to be adjusted have certain limited ranges, indicated by the service program. These values are also given in an appendix at the back of this manual. If, after varying any of the parameters within its permitted range, the analyzer is not tuned up, it indicates that the corresponding system is broken and in need of repair.

4.2.1. Adjustment of the needle thermostatation system

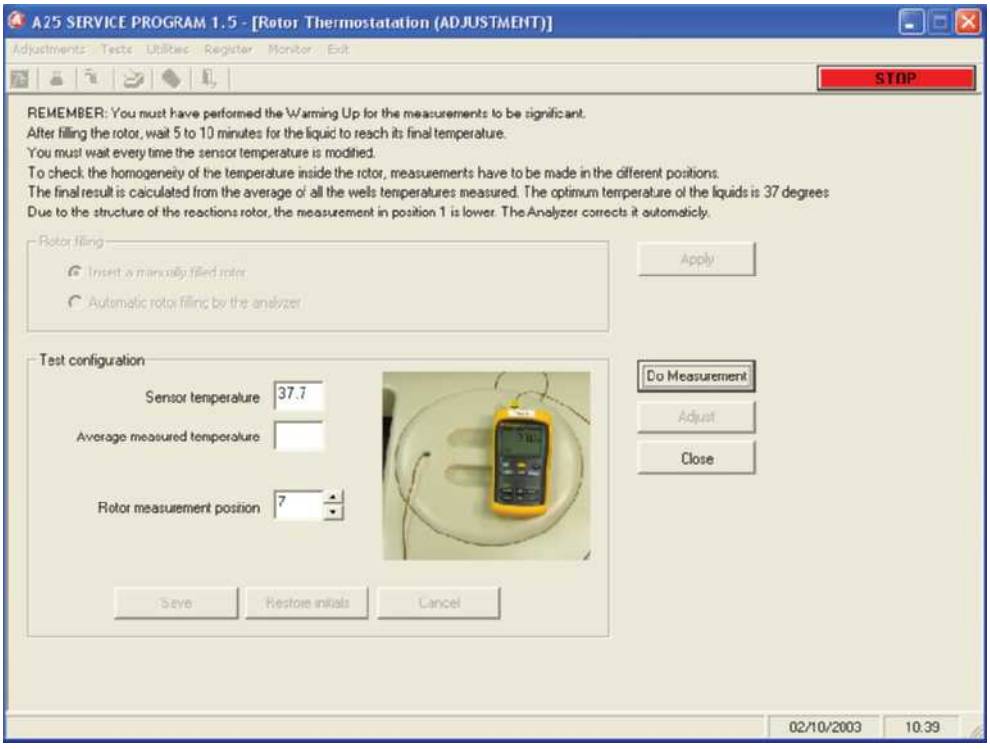
This screen adjusts the needle thermostatation in such a way that the dispensing temperature of the reactions is as close as possible to 37ºC. To make this adjustment, the analyzer must be initialised. The liquid to be dispensed



is taken from the system liquid container or from the bottle of reagent selected by the technician. The technician must measure the temperature of the dispensed liquid with a thermometer calibrated at 37ºC. The program shows the control set point temperature, which is the parameter that must be adjusted for the dispensing temperature to be correct. This parameter must be different from 37ºC. When the technician so indicates, the analyzer dispenses thermostated distilled water on a certain position in the racks tray shown on the screen. The technician must measure the temperature of the water with the calibrated thermometer and introduce the temperature on the screen. The analyzer automatically modifies the set point temperature in accord with the temperature measured with the thermometer for the dispensing temperature to be 37ºC. The technician can modify this set point temperature proposed by the program. On pressing *Adjust*, the analyzer thermostates the needle with the new set point and, when the technician so requests, performs new dispensing operations. Each time the set point temperature is modified, wait 1 minute before performing new dispensing operations for the needle temperature to become stabilised. The technician must repeat this process until the dispensing temperature is as near as possible to 37ºC. Pressing the *Store* button, the analyzer stores the current value of the adjusted set point temperature. Pressing the *Cancel* button keeps the last stored value and the current value is not stored. Pressing the *Restore* button restores the initial screen input value.

4.2.2. Adjustment of the rotor thermostation system

This screen makes it possible to adjust the thermostation system of the rotor in such a way that the reactions temperature is 37ºC. To make this adjustment, place a well rotor in position and ensure that the analyzer has been initialised. The rotor can be automatically filled with distilled water by pressing the corresponding button. Once filled, the technician must wait a few minutes for the rotor to be thermostated. The temperature in the rotor wells must be measured with a temperature calibrated at 37ºC through the dispensing hole of the rotor cover. A button makes it possible to turn the rotor in increases of 15 wells to change the well on which the measurement is being taken. The program shows the control set point temperature, which is the parameter that must be adjusted for the temperature of the rotor to be correct. This parameter must be other than 37ºC. The technician must measure the temperature of the water with the calibrated thermometer in the wells and enter the temperature on the screen. The analyzer automatically modifies the set point temperature in accord with the temperature measured with the thermometer for the rotor reactions temperature to be 37ºC. The technician can modify this set point temperature proposed by the program. On pressing *Adjust*, the analyzer thermostates the rotor with the new set point. Each time the set point temperature is modified, wait 5 minutes before performing new dispensing operations for the rotor temperature to become stabilised. The technician must repeat this process until the rotor temperature is as near as possible to 37ºC. Pressing the *Store* button, the analyzer stores the current value of the adjusted set point temperature. Pressing the *Cancel* button keeps the last stored value and the current value is not stored. Pressing the *Restore* button restores the initial screen input value.

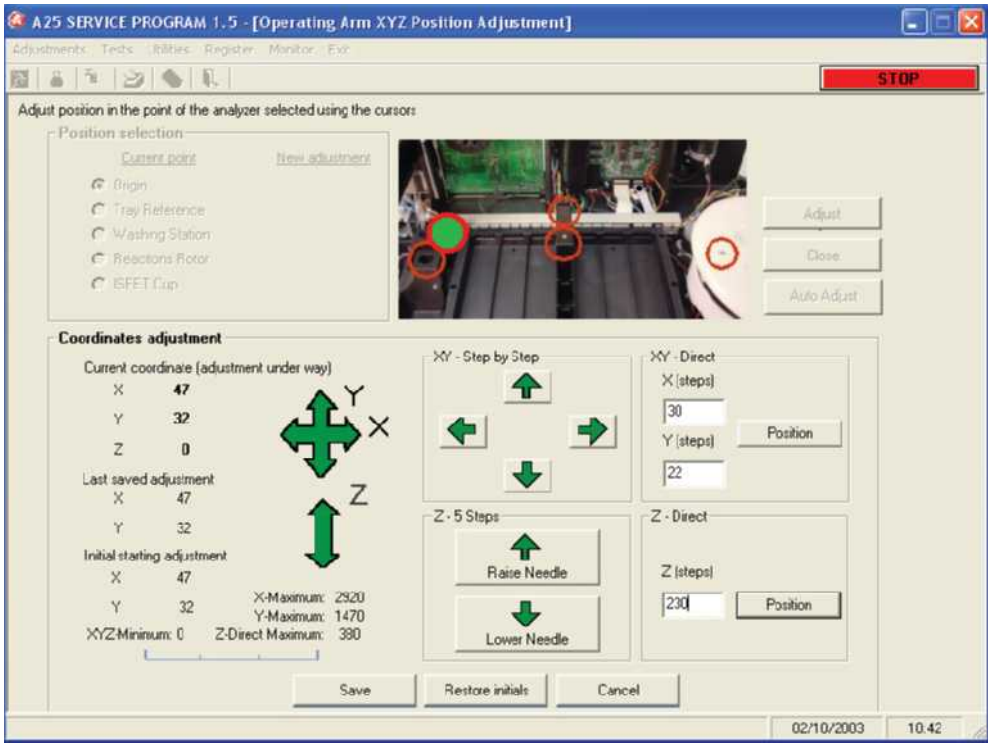


4.2.3. Adjustment of the positioning of the operating arm

This screen makes it possible to adjust the horizontal positioning (X, Y) of the arm. The arm housing must be removed to see the position of the needle. Before making the adjustments, visually check the verticality of the needle. If necessary, carefully straighten it up ensuring you do not damage it. On the screen, select the point at which you wish to adjust the horizontal positioning. On pressing the *Adjust* button the arm initialises and positions itself over said point. The technician has buttons to move the arm step by step over the horizontal plain (X, Y) and vertically (Z). The arm can also be moved introducing a certain number of absolute movement steps. These absolute movements of the arm must be made with the needle at its highest position so as not to damage it (coordinate 0). The technician must lower the needle to the adjustment point and adjust its horizontal position. When the position is satisfactory, save the current coordinates (X, Y) by pressing the *Store* button. Pressing the *Cancel* button keeps the last adjustment values stored. Pressing the *Restore* button restores the initial screen input values. At all times, the screen shows the current coordinates of the arm for the selected point, the last coordinates stored and the initial screen input coordinates, as additional information for the technician. The technician may repeat the procedure to adjust the positioning of the arm at the different possible adjustment points. These points are as follows:

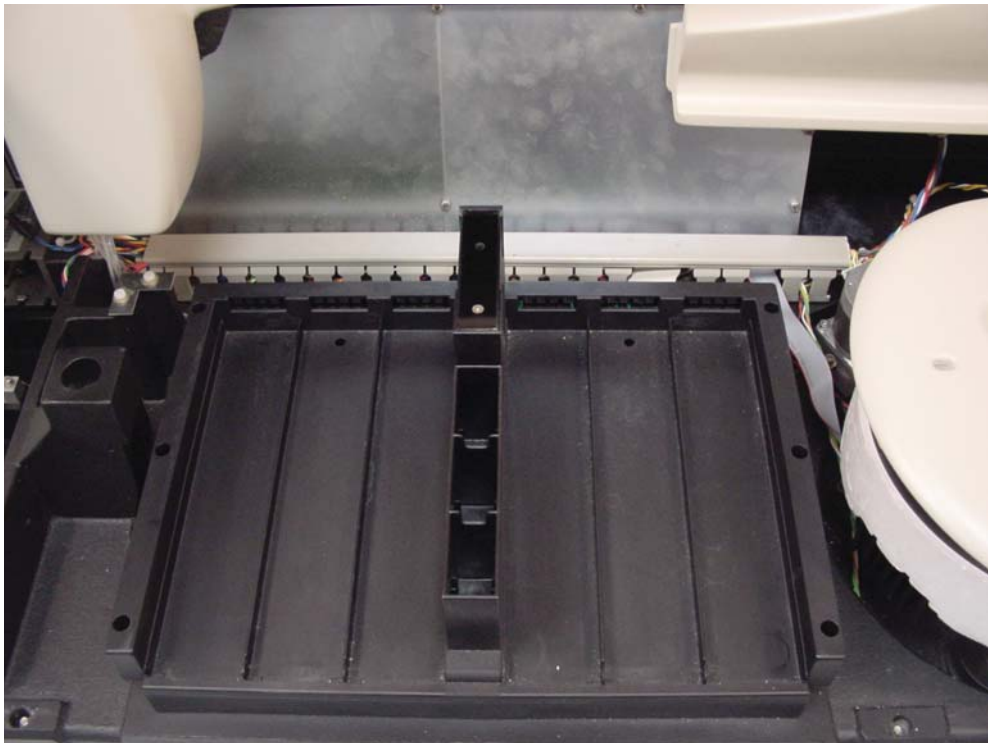
(1) Origin. Vertex of the self-centering plate of the needle.
(2) Rack tray Screw that fastens the washing station cover.
(3) Washing station. Centre of the stainless steel font of the washing station.
(4) Reactions rotor. Dispensing point on the rotor reactions cover.
(5) Zmax (on tray reference) Screw that fastens the wash station cover.

If you select the point of origin, automatic adjustment is possible in this position by pressing an AutoAdjustment button (the process can take around 3 minutes).

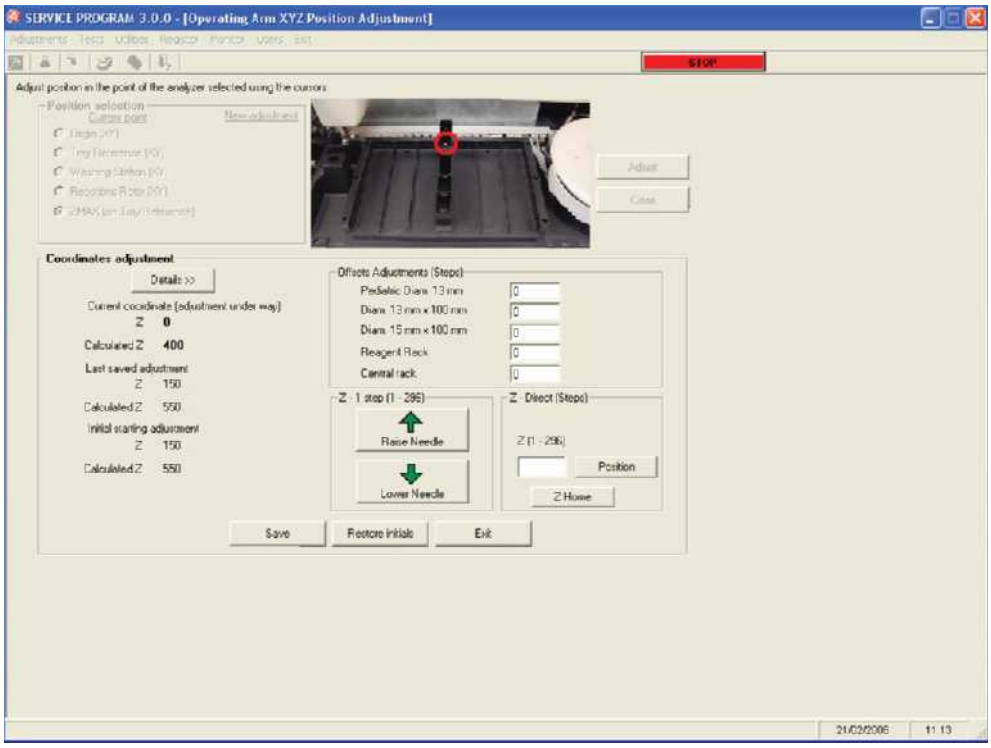


4.2.3.1 Adjusting the maximum sweep of the Z axis.

This adjustment prevents the needle from colliding with the rack tray and minimises the zero volume of reagents and samples.
The adjustment is separated into two parts: (1) the adjustment of the maximum sweep; (2) fine tuning (offsets) by rack type.



- Part 1 adjusts the needle to the central position screw (same position as the adjustment of the rack tray reference). This adjustment consists of moving the needle until it comes into contact with the reference screw on the rack tray. This operation can be completed by moving the needle to an absolute Z coordinate, Z-direct box, and then using the *needle up* and *needle down* keys until contact is made with the screw. The programme then calculates the real reference by adding a constant value so that the needle is lowered to the rack position. Bear in mind that the encoder detection of the needle is not enabled. Consequently, if there is a collision by entering a high value in the Z-direct box, it may collide with the screw. In this case, use the *Home* button to reinitialise the Z axis and repeat the process from the beginning.
- Part 2 adjusts the offsets to reduce the zero volume without colliding with the racks, adding or subtracting steps to or from the value adjusted in part 1. This operation must be carried out by trial and error. First enter a



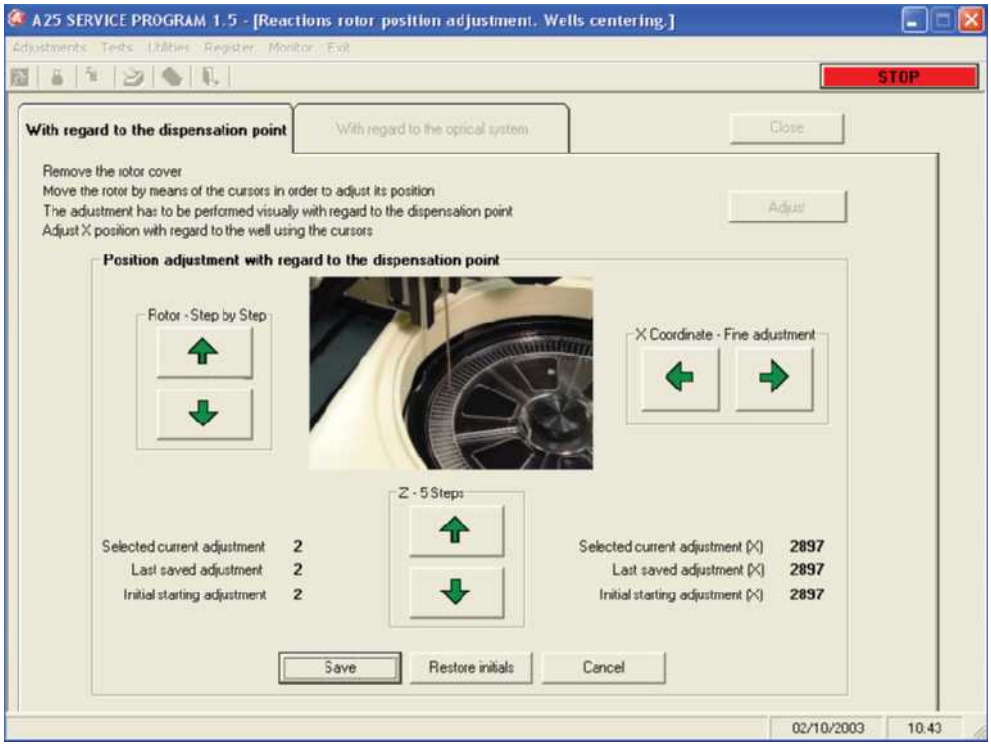
low step value for the type of rack and then proceed to the Zmax verification motor test. Indicate the type of rack and position on the tray. Position the rack with the bottles and the primary or paediatric wells, as applicable. Perform the test and check whether the needle is far from or collides with the bottom. As necessary, return to the Zmax adjustment menu and increase or decrease the step value on the offset that corresponds to the rack type. Remember that if the needle collides with the bottom during the test, it retreats a few steps since encoder detection is not enabled.

4.2.4. Adjustment of the positioning of the rotor

This screen enables the adjustment of the positioning of the rotor with regard to the dispensing point and the optical system. One or the other is selected by means of two different tabs.

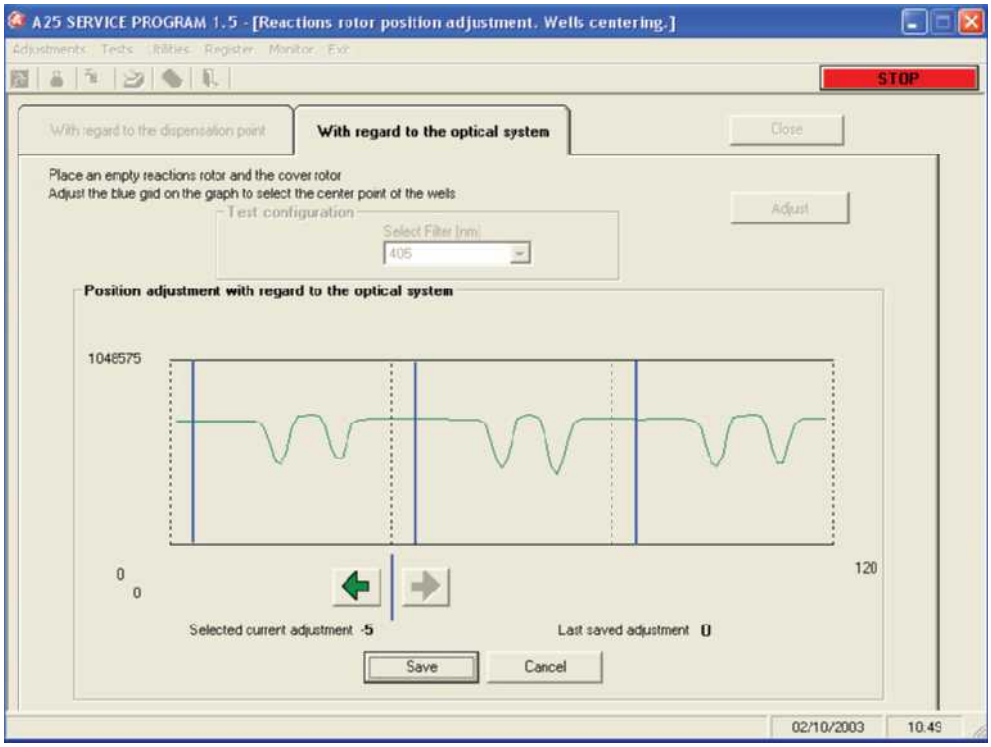
4.2.4.1. Centering of the rotor with regard to the dispensing point

The analyzer initialises the rotor and positions the first rotor well at the currently programd dispensing position. The technician has buttons to move the rotor step by step to adjust, if necessary, this position and buttons for finer adjustment of the X coordinate over the dispensing point. At all times, the screen shows the current dispensing coordinate on the first well and of the X axis position, the last coordinate stored and the initial screen input coordinate, as additional information for the technician. When this is satisfactory, the current coordinate of the dispensing point of the first well can be stored by pressing the *Store* button. Pressing the *Cancel* button keeps the last stored value and the current value is not stored. Pressing the *Restore* button restores the initial screen input value.



4.2.4.2. Centering of the rotor with regard to the optical system

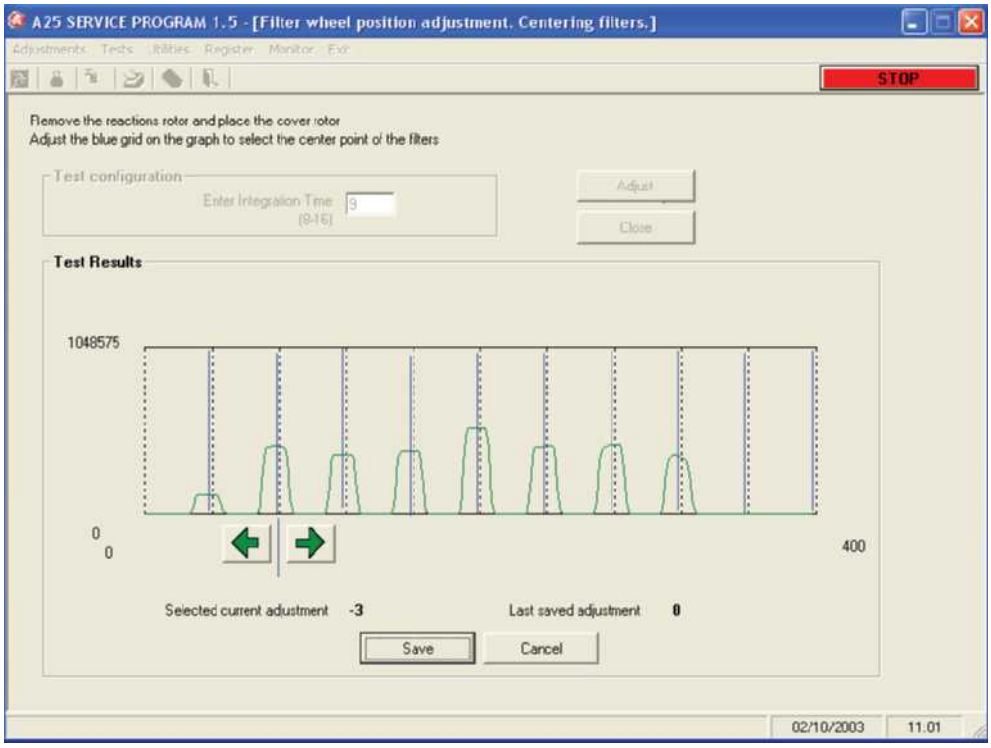
This adjustment is necessary only if the *Rotor Centering Adjustment* has been carried out with regard to the dispensing point (4.1.4.1.). This adjustment must be made with the rotor cover in position. The analyzer initialises the rotor and fills the first 3 wells of the rotor with distilled water. Next, step-by-step optical readings are made through these wells at the wavelength selected by the technician. Once the readings have ended, the program shows a graph of the light intensity measured on the rotor steps. On this graph, the program indicates at which points the optical readings are made on each of the 3 wells when the analysis is made, with the coordinate of the reading point of the first well currently programd in the analyzer. If necessary, the technician can move the reading points over the graph jointly using two buttons. The optimum reading point is that which globally maximises the light intensity for the three wells. At all times, the screen shows the current coordinate of the reading in the first well and the last coordinate stored, as additional information for the technician. When the position is satisfactory,



the current coordinate of the reading point of the first well can be stored by pressing the *Store* button. Pressing the *Cancel* button keeps the last stored value and the current value is not stored.

4.2.5 . Adjustment of the positioning of the filter wheel

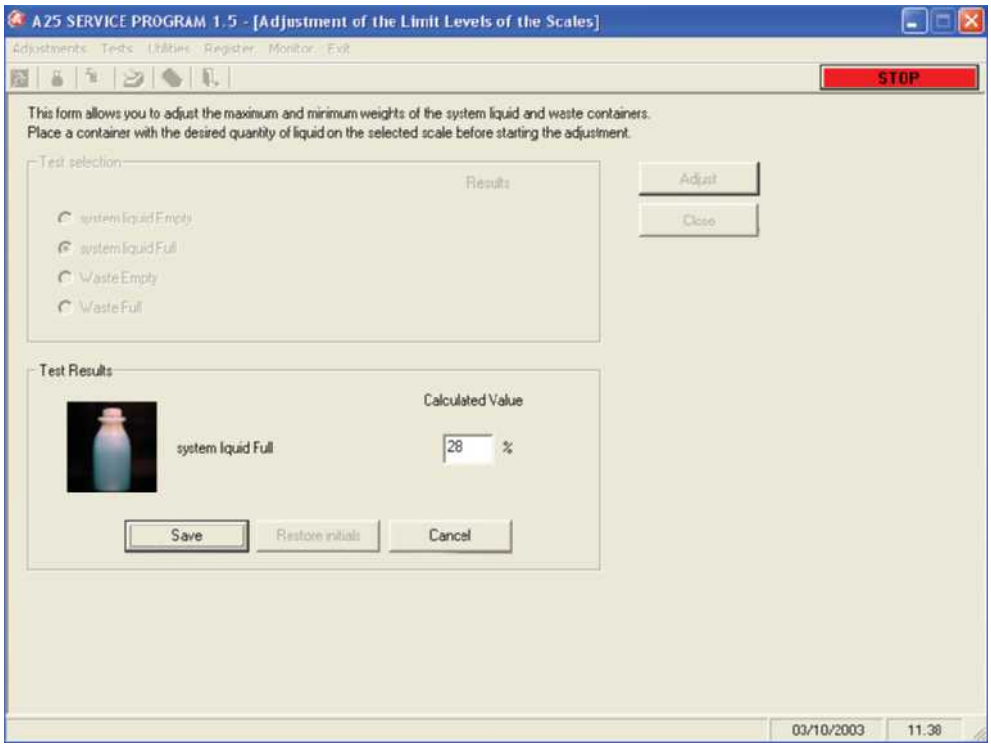
This adjustment must be made with the rotor cover in position. The analyzer initialises the rotor and the filter wheel and fills the first rotor well with distilled water. Next, it takes optical readings through this well, turning the filter wheel step by step, with a certain integration time as indicated by the technician (the concept of *integration time* is explained in the section on photometric adjustments). Once the readings have ended, the program shows a graph of the light intensity measured on the steps of the filter wheel. On this graph, the program indicates at which points each of the filters is positioned when optical readings are taken when the analysis is carried out, with the coordinate of the positioning of the filter 0 currently programd in the analyzer. If necessary, the technician can



move the reading points over the graph jointly using two buttons. The optimum reading point is that which globally maximises the light intensity for all the filters. At all times, the screen shows the current coordinate of the filter 0 and the last coordinate stored, as additional information for the technician. When the position is satisfactory, the current coordinate of the positioning of the filter 0 can be stored by pressing the *Store* button. Pressing the *Cancel* button keeps the last stored value and the current value is not stored.

4.2.6. Adjustment of the level control scales

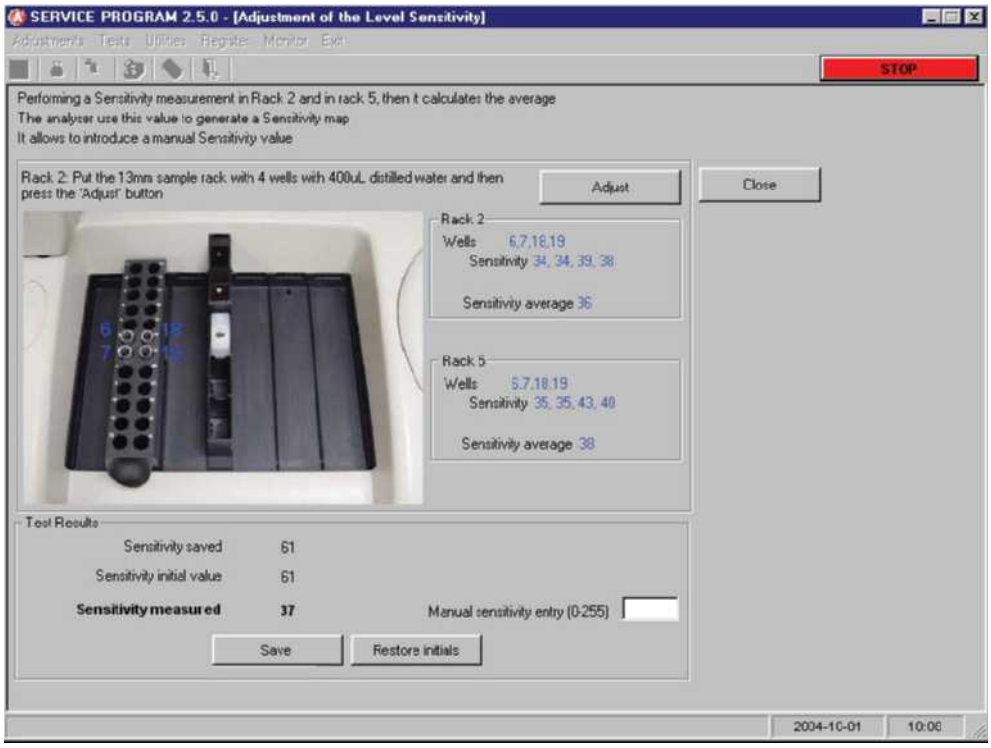
This screen makes it possible to set the level control scales with the empty waste and distilled water containers (0% capacity) and when they are full (100% capacity). The maximum capacity of the containers is approximately 3L. The technician must choose whether he wishes to set the distilled water or waste container scales, with the corresponding container full or empty. According to the requested adjustment, the corresponding container, full or empty, must be placed in position and the *Adjust* button pressed. Based on the settings made, the analyzer automatically adjusts the scales. On pressing the *Store* button, the analyzer saves the new values of the adjusted parameters. Pressing the *Cancel* button keeps the last stored values and the current values are not stored.



4.2.7. Adjustment of the level detection sensitivity

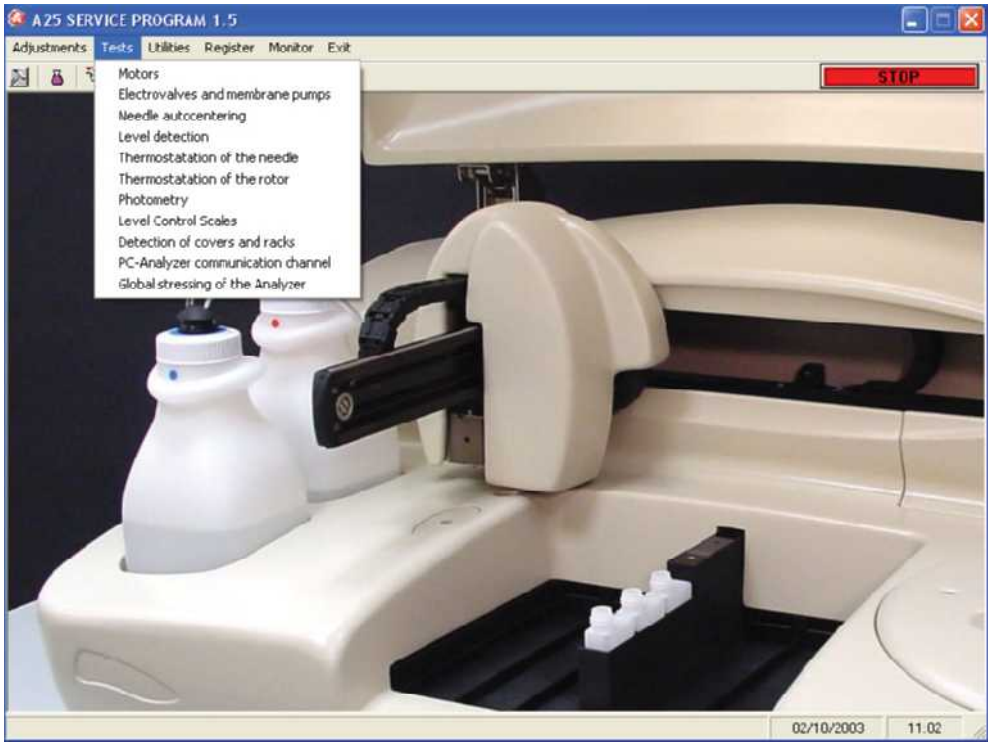
This screen allows fitting the sensitivity of the capacity level detection system of the end. In the position 2 of the tray of racks (beginning by the left), you should place a 13 mm rack with four tubes in positions 6, 7, 18 and 19 with about 400 mL of distilled water. It is possible to see a graphic with the position of the tubes and racks in the screen photo. When pressing the Adjust button, the arm takes some sensitivity readings automatically until detecting the water in each one of the tubes. Once this operation is finished, the arm is parked in its original position and it shows the sensitivity results of each one of the tubes. Move rack to position 5 and repeat the adjustment. Once these second readings are finished, the program calculates the average of all sensitivities; the result is the average sensitivity. The technician should notice that the sensitivity values of each tube have to be similar; otherwise, he should repeat the whole measurement.

Pressing the button Save, the analyser saves the new adjusted sensitivity value. Pressing the button Close, the old value stays. Pressing the button Restore, the initial value of entry to the screen is restored. A manual sensitivity value can be inserted in the corresponding box.



4.3. TESTS

Various tests make it possible to check that the different components of the analyzer function correctly.



4.3.1. Motor tests

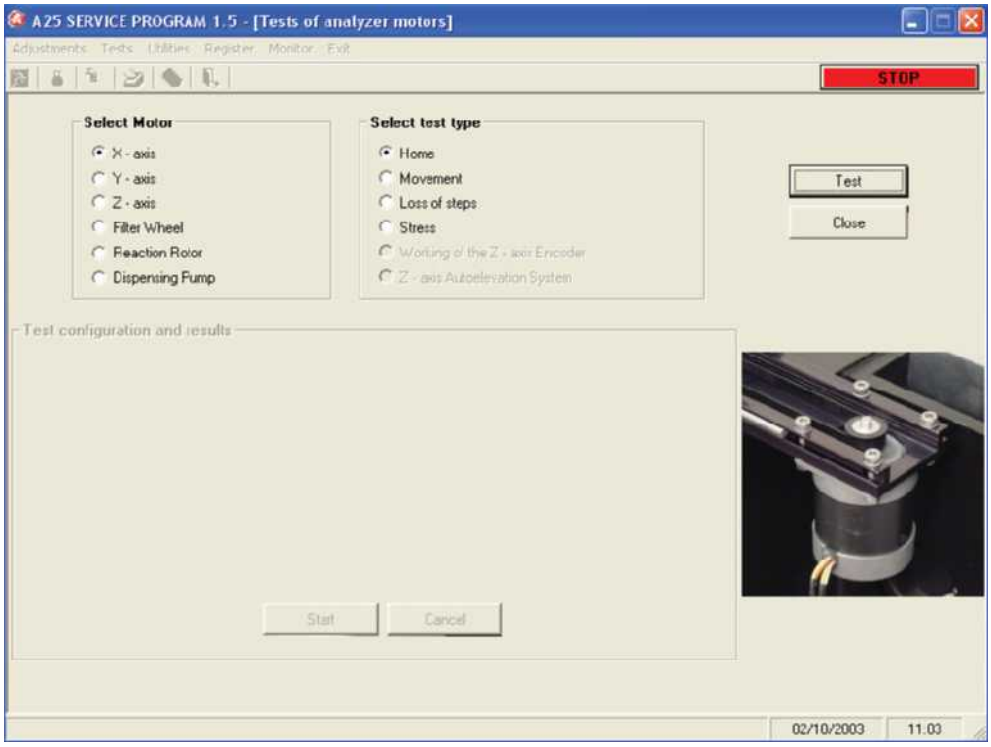
Through these tests, the technician can check the correct functioning of all the analyzer motors step by step. The screen makes it possible to choose the motor to be tested and the test that is to be carried out. The analyzer uses the following motors step by step:

- X axis of the operating arm.
- Y axis of the operating arm.
- Z axis of the operating arm.
- Dispensing pump
- Rotor
- Filter wheel

All the motor tests can be performed without the covers and housing of the analyzer. After the verifications, the operating arm always returns to its resting position. To test the motor of the dispensing pump, the arm is positioned over the washing station. It is convenient for the dispensing system to be primed so that the piston does not function dry. The following is a description of the different tests that can be performed.

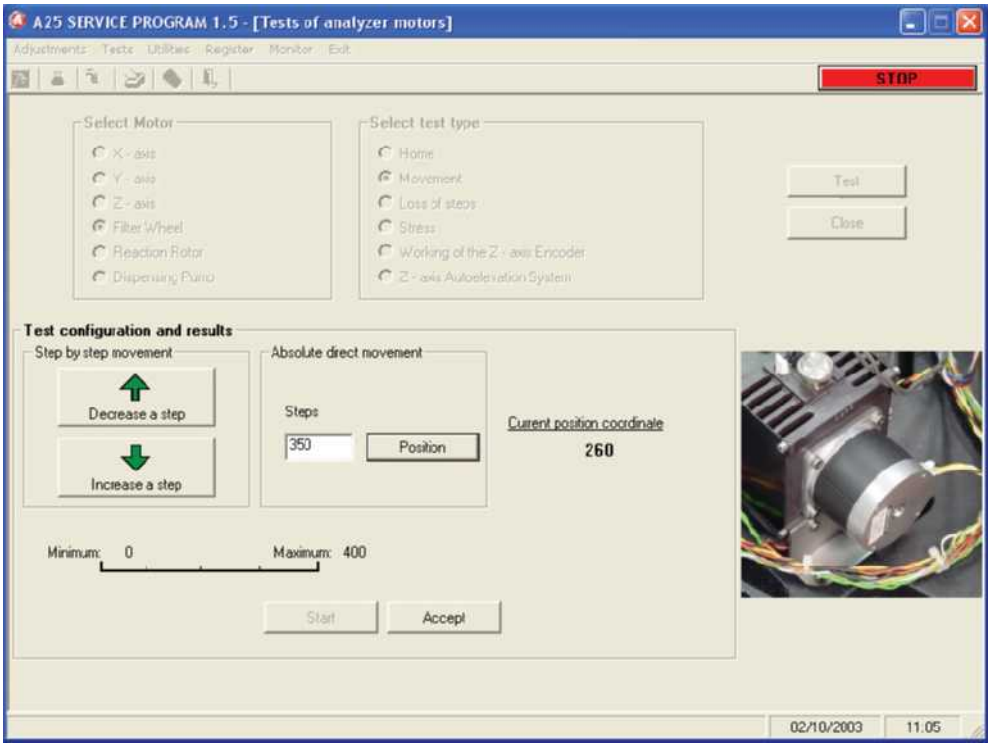
4.3.1.1. Initialization test

This test verifies the start detector of each of the motors.



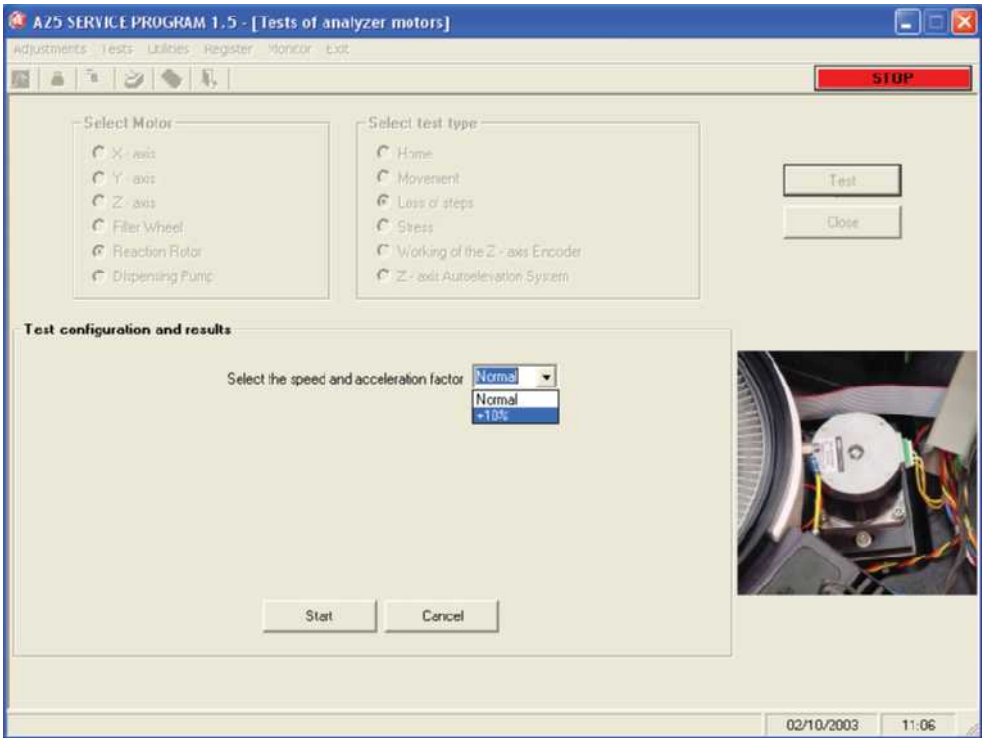
4.3.1.2. Movement test

This test displaces any of the mobile components to the desired point along its range of functioning, introducing the corresponding absolute coordinate or moving it step by step. The speed and acceleration of the movement are those used in the normal functioning of the analyzer.



4.3.1.3. Loss step test

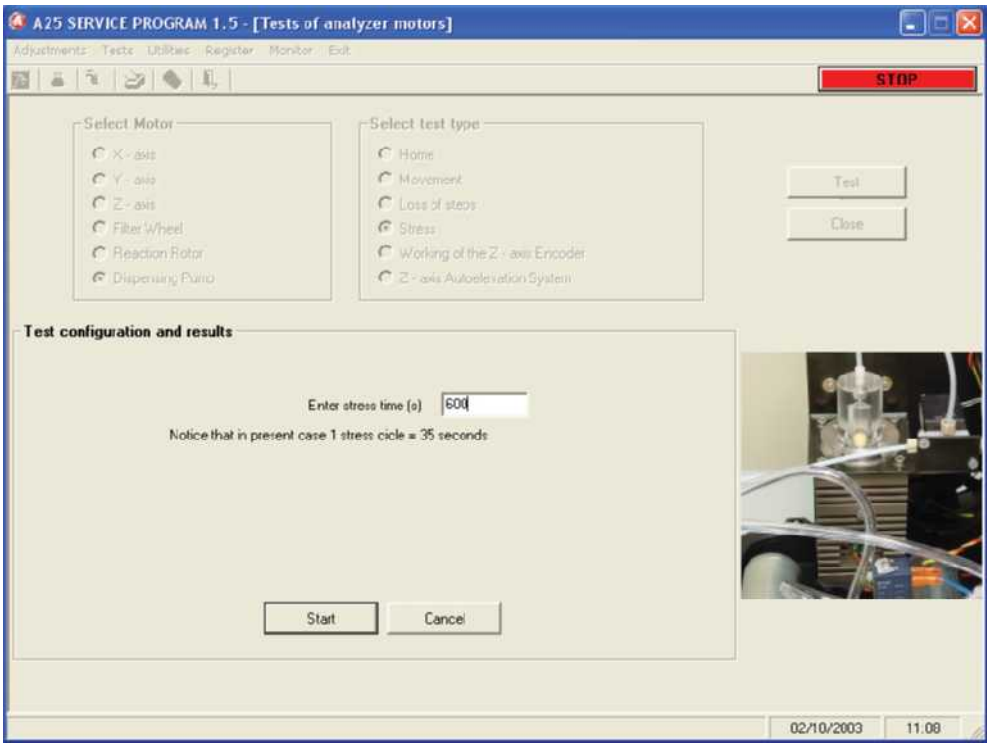
This test makes it possible to check if a motor misses steps when performing a certain sequence of movements. The test can be carried out with the speed and acceleration used in the normal functioning of the analyzer or with these magnitudes increased by 10% to check the functioning safety margin.



4.3.1.4. Stress mode test

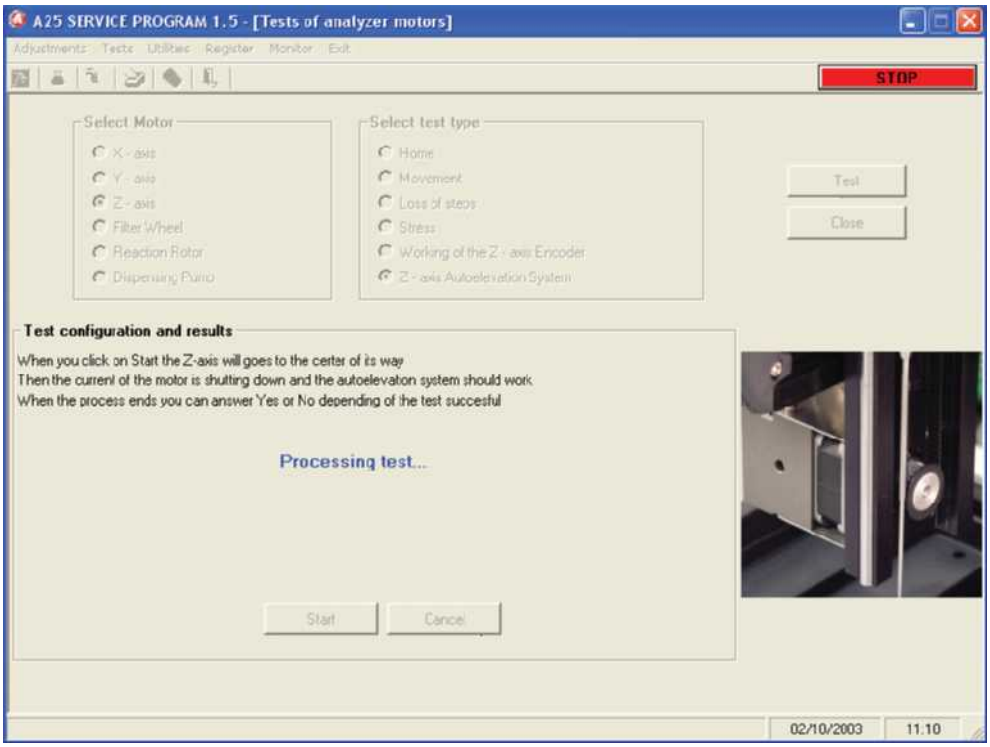
This test makes it possible for a certain sequence of movements to be performed continually. The technician can program the duration of the test, which can be cancelled at any moment. Depending on the motor selected, there

is a minimum stress mode time (but in no case is it higher than 50 seconds).



4.3.1.5. Z axis security systems test

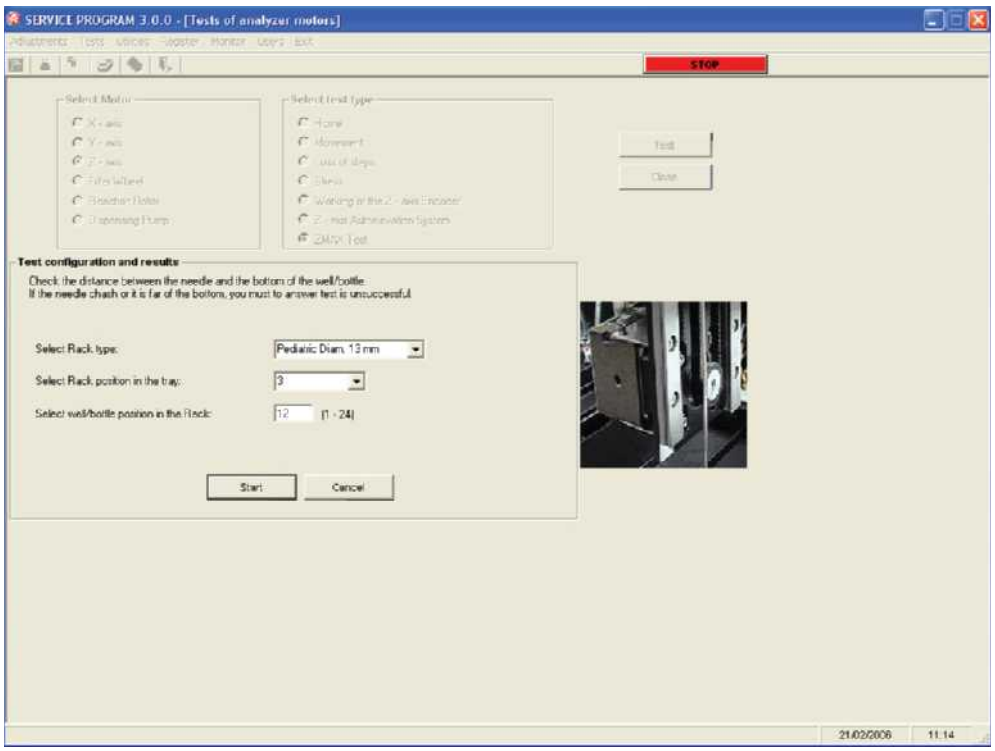
The Z axis of the operating arm has an encoder to detect if there have been missed steps as a result of a collision with the needle. In the case of a power failure, a mechanical system automatically raises the needle. On selecting the corresponding options, the analyzer checks the functioning of each of these devices.



4.3.1.6 Maximum Z verification test

This test checks that the needle does not collide with the bottles on the rack tray. Select the rack type (reagent, paediatric, 30 mm or 15 mm), the position of the rack on the tray and the position of the bottle or well on the rack. Press the *Start* button to move to the selected position and check if the needle collides with the bottle or well or

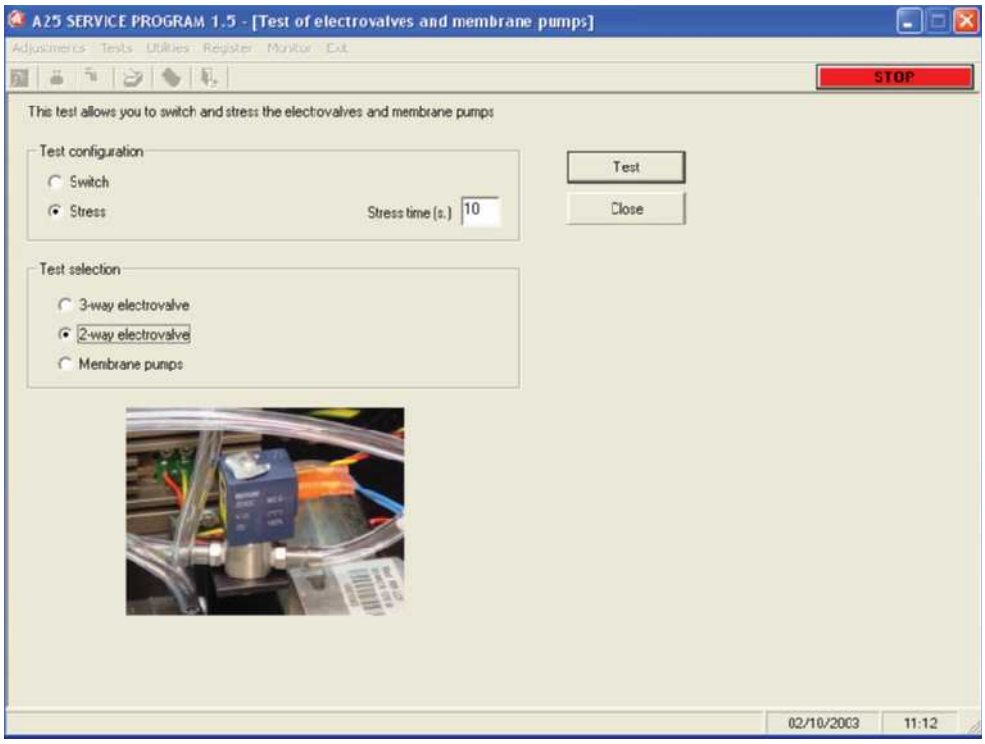
if there is space between the needle and the bottle.
Repeat the process in the positions required by the user.



4.3.2. Diaphragm pumps and electrovalves test

The analyzer uses a 3-way electrovalve to manage the dispensing operations. The washing system of the needle uses a 2-way electrovalve and two diaphragm pumps. The screen makes it possible to choose the device to be tested and the test that is to be carried out. The devices that can be tested independently are:

- 3-channel electrovalve of the dispensing pump.
- 2-channel electrovalve of the washing system.
- Washing system diaphragm pumps



To carry out these tests, the dispensing system should be primed. The following is a description of the different tests that can be performed.

4.3.2.1. Functioning test

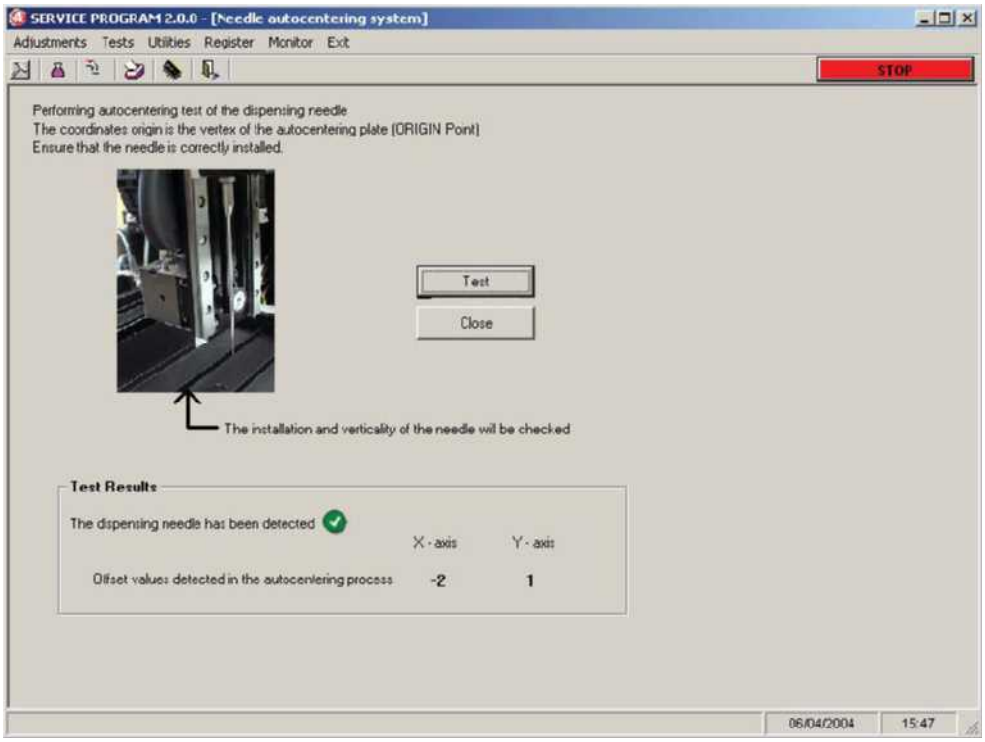
This test makes it possible to manually switch the selected device.

4.3.2.2. Stress mode test

This test makes it possible for a certain sequence of device switching to be performed continually. The technician can program the duration of the test, which can be cancelled at any moment.

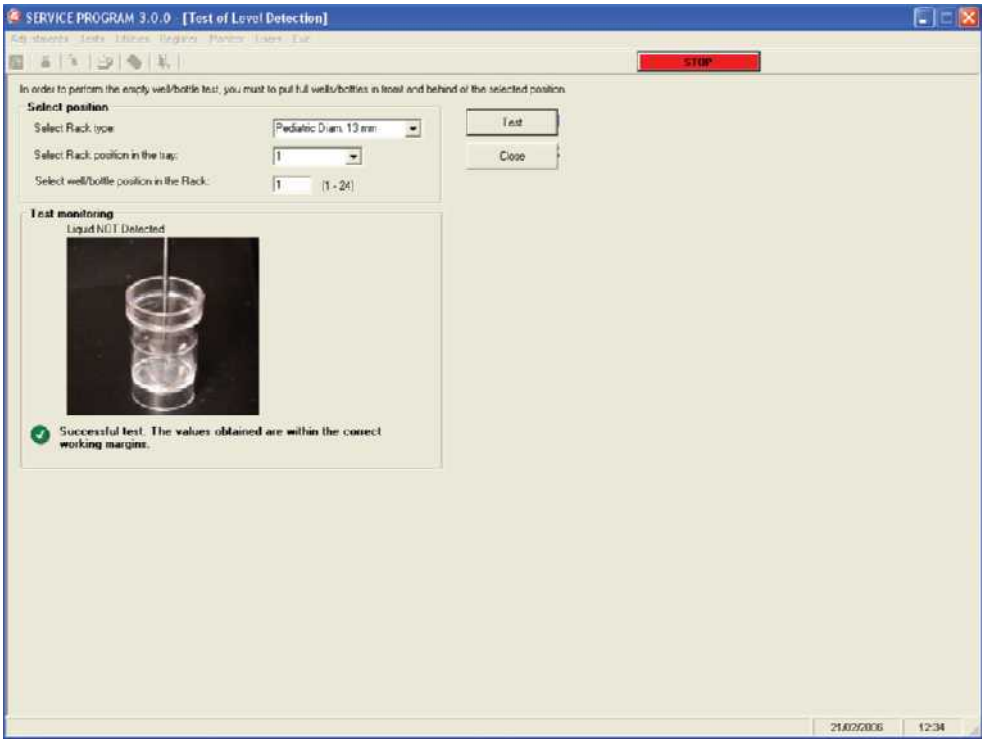
4.3.3. Needle self-centering system test

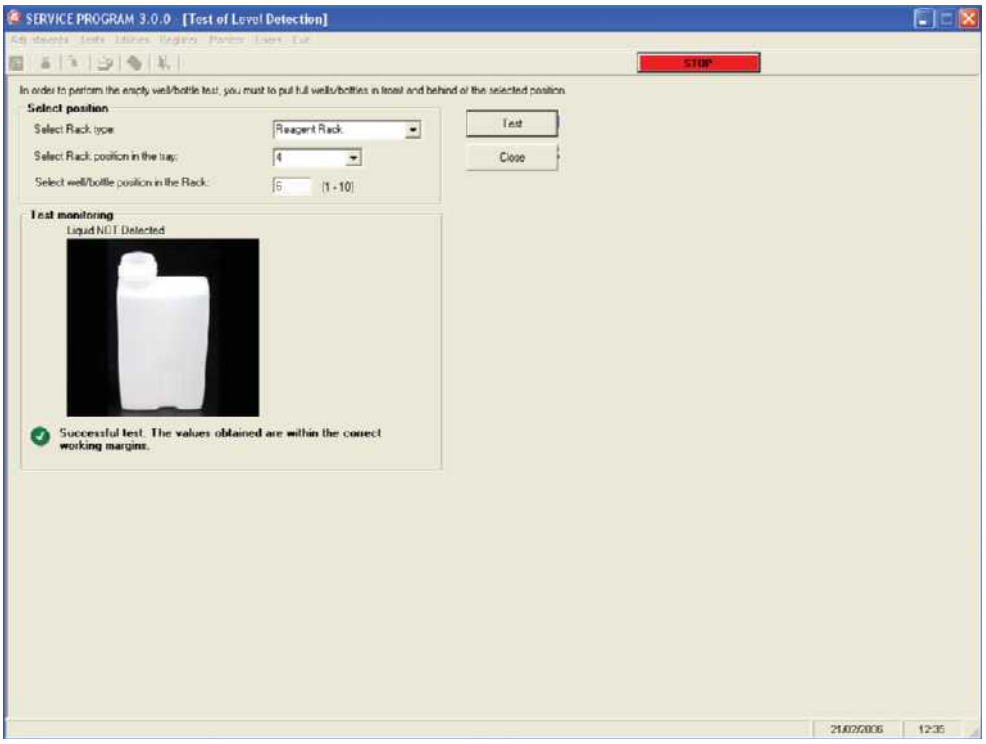
This test makes it possible to check the functioning of the needle self-centering system. During its initialisation, the analyzer uses this system to check the presence of the needle and its verticality and automatically correct small deviations. The test consists of simply running this process. The technician can remove the housing of the arm to observe the test. On the finalisation of the test, the program shows the deviation (x, y) found in the motor steps.



4.3.4. Needle level detection system test

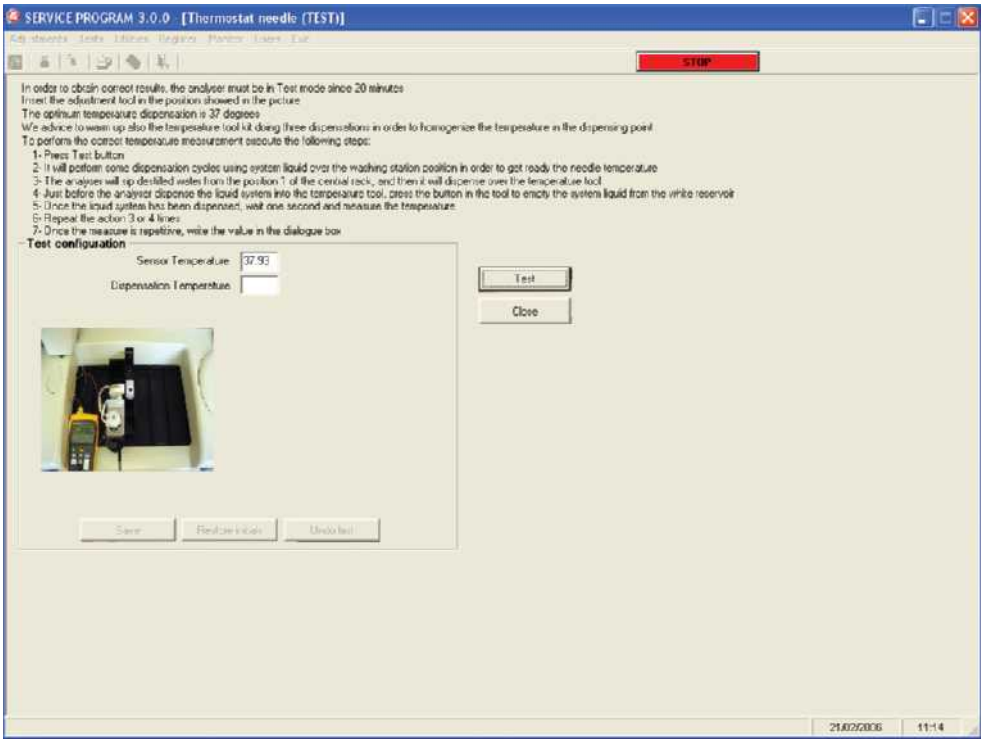
This test checks the functioning of the system for detecting the capacity of the needle in bottles of reagent and sample tubes.
This test checks the functioning of the system for detecting the capacity of the needle in reagent bottles and sample wells. The test can be performed in any position on the tray.
First select the rack type, then the position of the rack on the tray and, finally, the position of the bottle/well on the rack. Press the *Test* button and the program will move the arm to the indicated position and check whether or not liquid is detected, depending on whether the bottle is full or empty.
Repeat the test as many times as the user considers necessary.





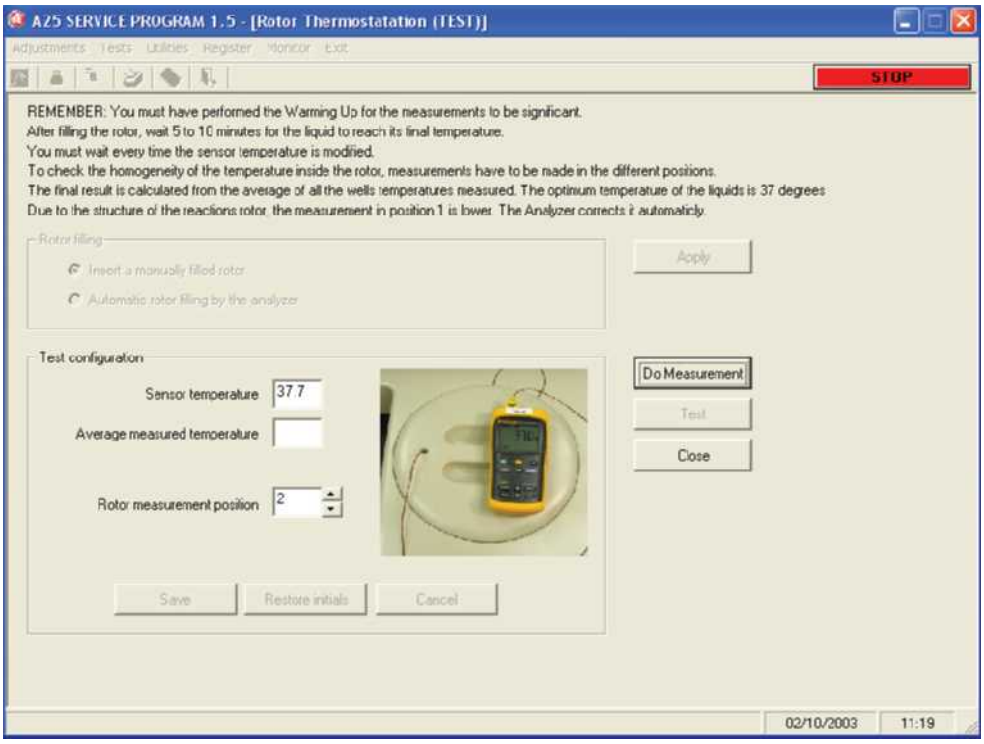
4.3.5. Needle thermostatation system test

This screen makes it possible to check that the dispensing temperature of the reactions is around 37ºC. To make this adjustment, the analyzer must be initialised. The technician must measure the temperature of the dispensed liquid with a thermometer calibrated at 37ºC. The program shows the set point temperature of the current control. This parameter must be different from 37ºC. When the technician so indicates, the analyzer dispenses thermostated distilled water on a certain position in the racks tray shown on the screen. The technician must measure the temperature of the water with the calibrated thermometer and introduce the temperature on the screen. The program indicates if the temperature measured is within the tolerated error margins and stores this value for the test result reports. The liquid to be dispensed is taken from the system liquid container or from the bottle of reagent selected by the technician.



4.3.6. Needle rotor thermostatation system test

This screen makes it possible to check that the temperature of the rotor reactions is 37ºC. To make this test, the analyzer must be initialised. The methacrylate rotor can be automatically filled with distilled water by pressing the corresponding button. Once filled, the technician must wait a few minutes for the rotor to be thermostated. The temperature in the rotor wells must be measured with a temperature calibrated at 37ºC through the dispensing hole of the rotor cover. A button makes it possible to turn the rotor in increases of 15 wells to change the well on which the measurement is being taken. The program shows the set point temperature of the current control. This parameter must be other than 37ºC. The technician must measure the temperature of the water with the calibrated thermometer in the wells and enter the temperature on the screen. The program indicates if the temperature measured is within the tolerated error margins and stores this value for the test result reports.



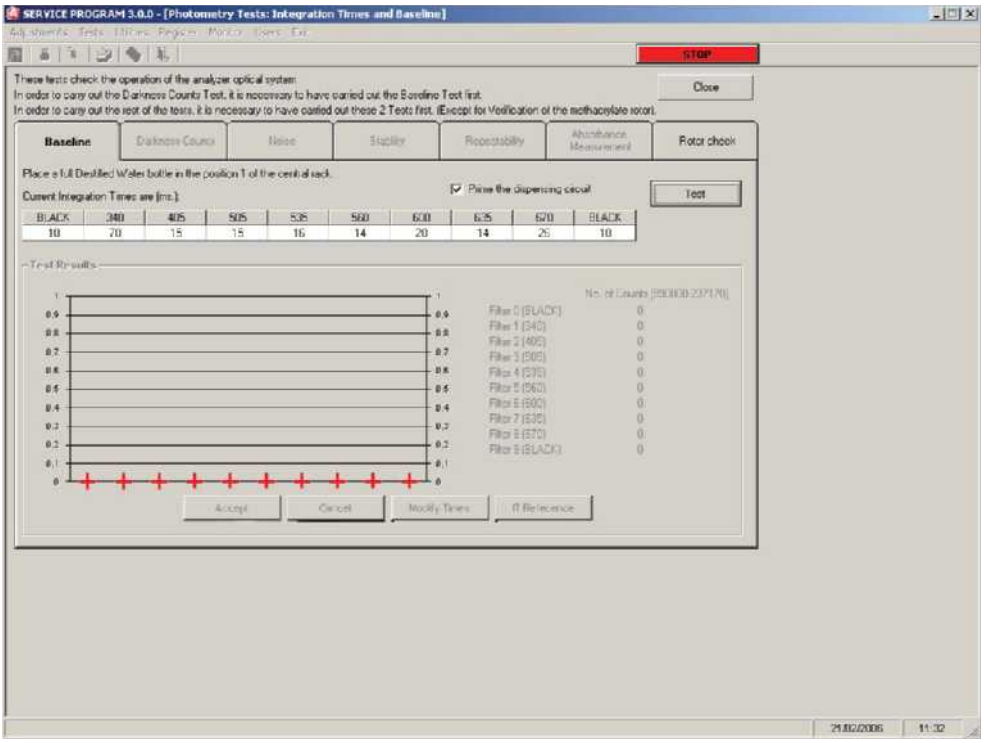
4.3.7. Photometry tests

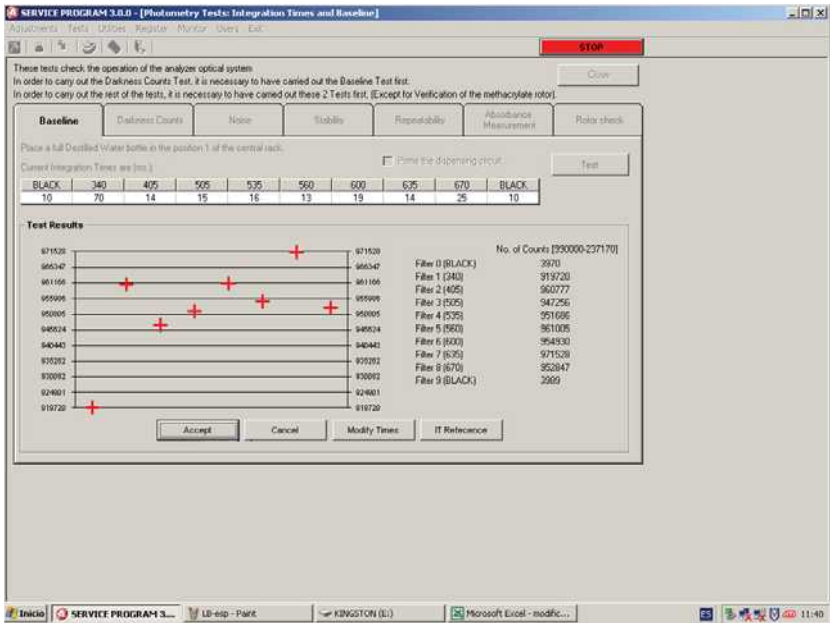
This screen contains a set of tests to check the functioning of the optical system. The tests are classified under different tabs. First of all, the base line and darkness count tests must be made in order to be able to carry out the remaining tests. To perform these tests, the analyzer must be initialised.

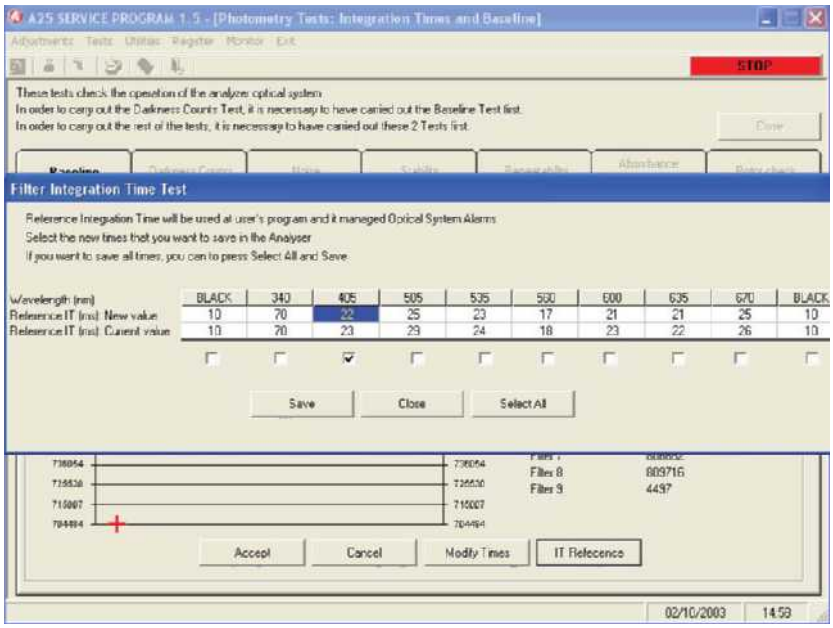
The optical system has a photodiode that generates an electrical current proportionate to the light intensity on it. *time*. An AD converter converts the accumulated load into a digital value called *count number*, between 0 and 1048576. During normal functioning, the analyzer automatically adjusts the integration time for each filter when the analysis begins and after initialisation. When the first photometry test is performed, the integration times are also automatically adjusted. These times are adjusted in such a way that the count number of the base line for each wavelength is as near as possible to 950000. In this way, the dynamic range of the detection system is adapted to the light intensity present at each wavelength. The filter wheel has 10 positions. Position 0 must always contain a covered filter so that the analyzer can perform the darkness adjustment. Positions 1 to 9 can be used for optical filters.

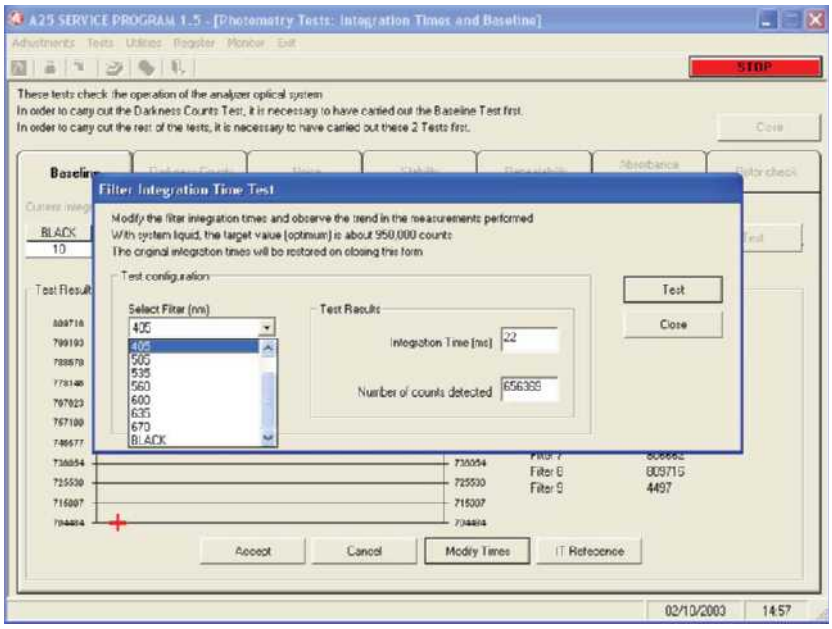
4.3.7.1. Base line and integration times

When this test is run for the first time, the analyzer fills the first 3 rotor wells with distilled water. The analyzer automatically adjusts the integration times and makes a base line with each of the available filters in each of the 3 wells. The program shows the current integration times for each of the filters and the average for the 3 wells of the count numbers obtained with each filter. The screen shows the corresponding alarms in the case of anomaly. It is also possible to access a screen where it is possible to manually vary the integration times to check their effect on the count numbers. And another screen where it is possible to assign calculated integration times as reference integration times for each filter. This screen is recommended when a filter or the lamp is physically changed. After performing the test, the analyzer continues to take optical readings using the automatically adjusted integration times.



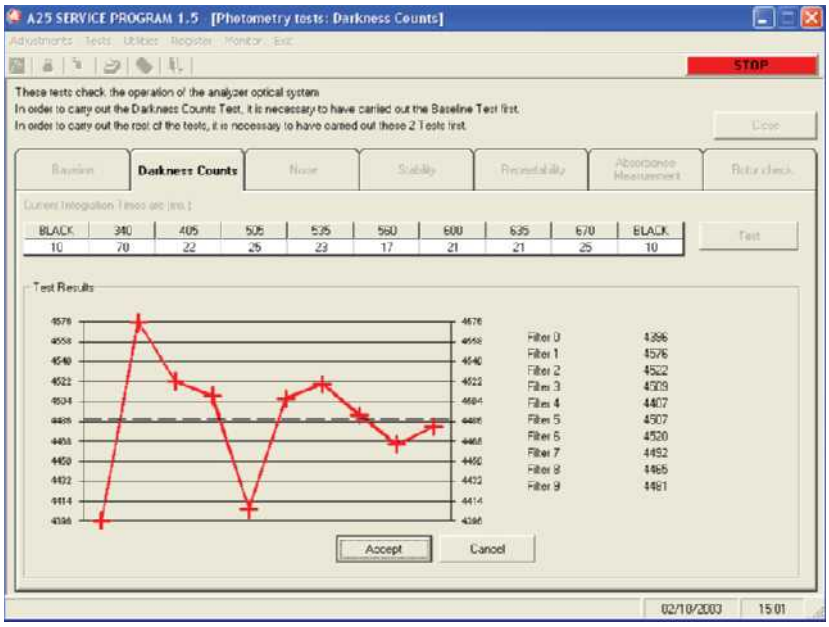

SERVICE PROGRAM 3.0.0 - [Photometry Tests: Integration Times and Baseline]
STOP
Baseline
Test Results
Accept
Cancel
Modify Times
IT Reference


A25 SERVICE PROGRAM 1.5 - [Photometry Tests: Integration Times and Baseline]
STOP
Filter Integration Time Test
Reference Integration Time will be used at user's program and it managed Optical System Alarms
Select the new times that you want to save in the Analyser
If you want to save all times, you can to press Select All and Save
Wavelength (nm)
Reference IT (ms) New value
Reference IT (ms) Current value
Save
Close
Select All
Accept
Cancel
Modify Times
IT Reference
02/10/2003
14:59


A25 SERVICE PROGRAM 1.5 - [Photometry Tests: Integration Times and Baseline]
STOP
Filter Integration Time Test
Modify the filter integration times and observe the trend in the measurements performed
With system liquid, the target value (optimum) is about 950.000 counts
The original integration times will be restored on closing this form
Test configuration
Select Filter (nm)
Test Results
Integration Time (ms)
Number of counts detected
Test
Close
Accept
Cancel
Modify Times
IT Reference
02/10/2003
14:57

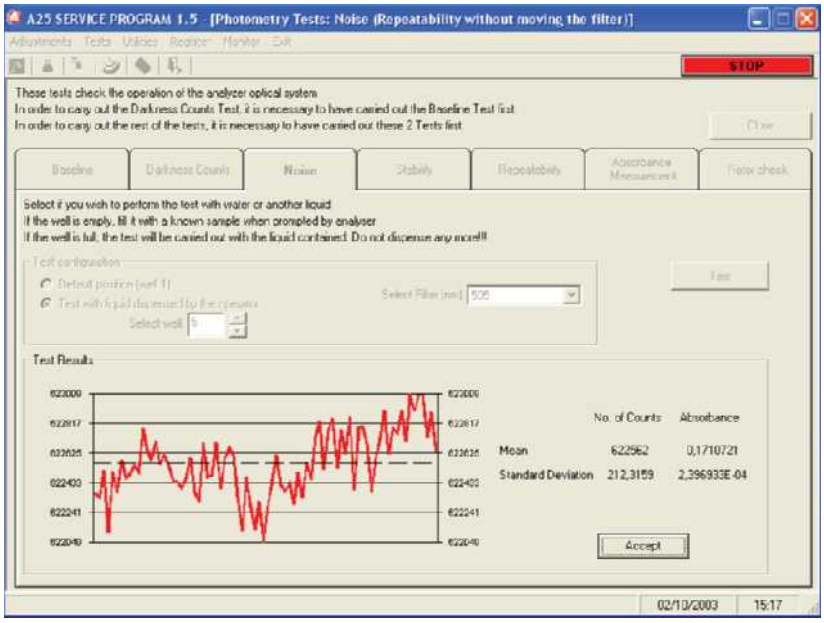
4.3.7.2. Darkness counts

The program shows the current integration times for each filter. On running the test, the analyzer positions the covered filter and measures the darkness counts with each of the integration times. Each time an optical reading is taken, the analyzer subtracts these darkness counts from the count numbers measured to obtain the light intensity. The program shows the values obtained and issues the corresponding alarms in case of anomaly. The values should be around 4100 - 4300. All the count numbers shown by the tests given as follows have the darkness counts subtracted.



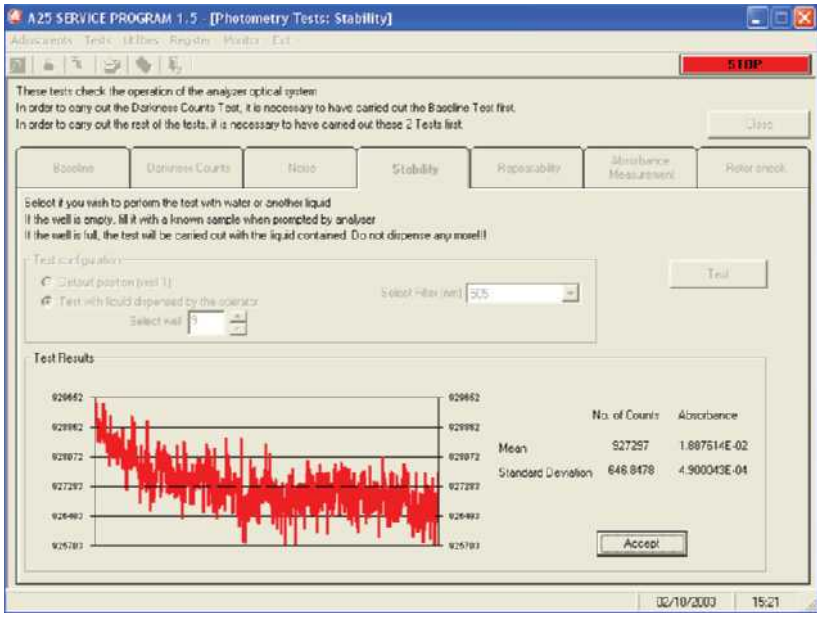
4.3.7.3. Repeatability without moving the filter wheel

To perform this and the following tests, the base line and darkness count test must have first of all been performed. This test takes absorbance readings during 1 minute with the filter wheel in fixed position. The technician can choose the rotor well on which he wishes to take the readings and fill it with the liquid he desires. He can choose which wavelength he wishes to use. The test can also be performed with the filter covered. When the readings end, the screen graphically displays the count numbers obtained and the absorbances with regard to the corresponding base lines. The program also shows the averages and/or standard deviations of the count numbers and the absorbances.



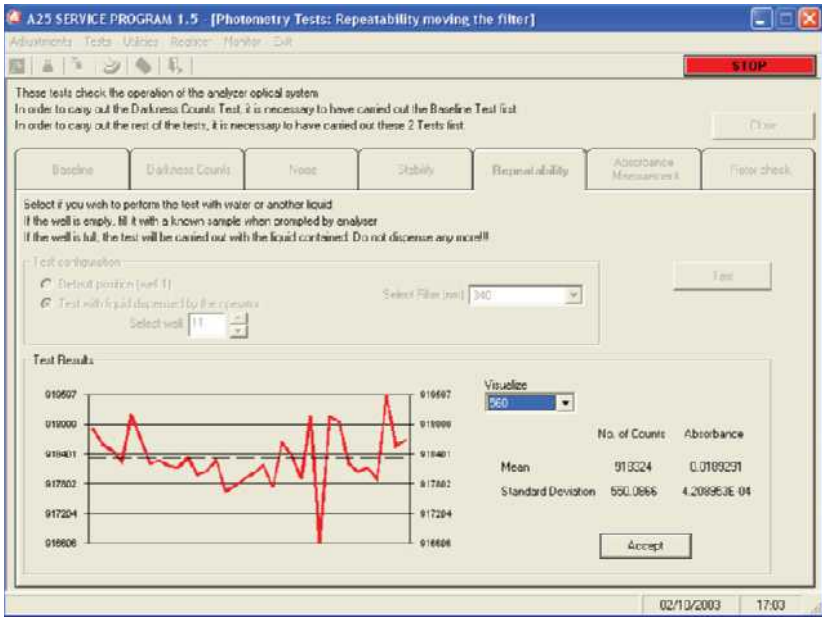
4.3.7.4. Stability

This test takes absorbance readings during 30 minute with the filter wheel in fixed position. The technician can choose the rotor well on which he wishes to take the readings and fill it with the liquid he desires. He can choose which wavelength he wishes to use. The test can also be performed with the filter covered. The test can be cancelled at any time. When the readings end, the screen graphically displays the count numbers obtained and the absorbances with regard to the corresponding base lines. The program also shows the averages and/or standard deviations of the count numbers and the absorbances.



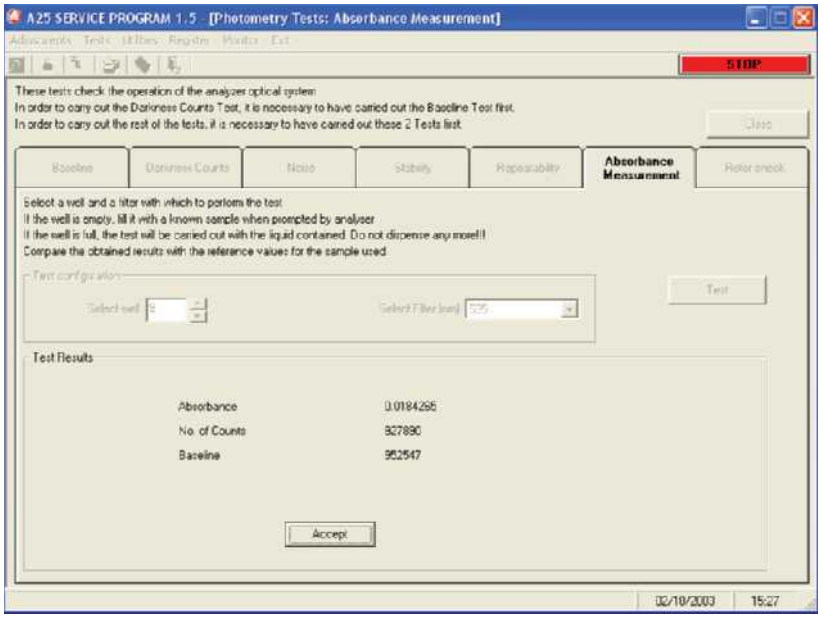
4.3.7.5. Repeatability moving filter wheel

This test takes absorbance readings during 10 minute moving the filter wheel randomly. The technician can choose the rotor well on which he wishes to take the readings and fill it with the liquid he desires. The test can be cancelled at any time. When the readings end, the screen graphically displays the count numbers obtained and the absorbances for each filter with regard to the corresponding base lines. The program also shows the averages and/or standard deviations of the count numbers and the absorbances for each filter.



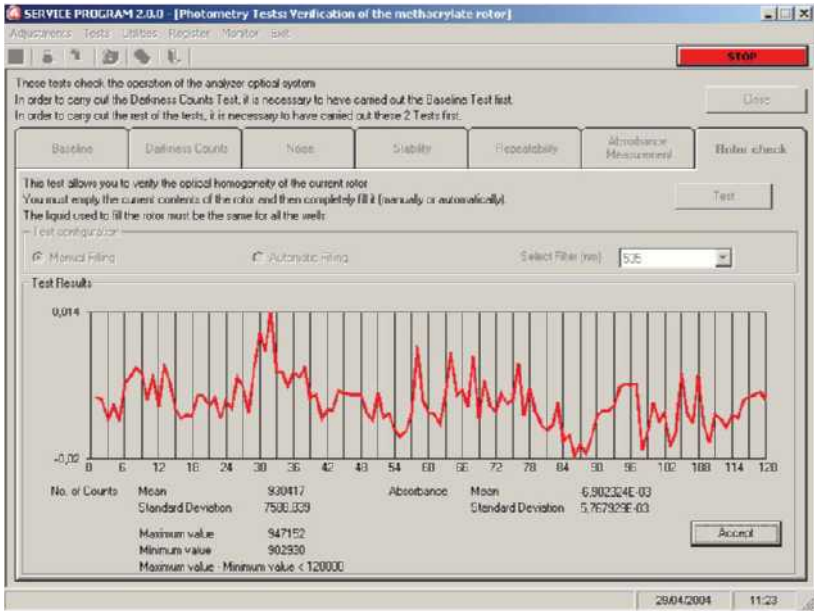
4.3.7.6. Absorbance measurement

This test enables individual absorbance readings. The technician can choose the rotor well on which he wishes to take the readings and fill it with the liquid he desires. He can choose which wavelength he wishes to use. The screen shows the count number obtained, the absorbance with regard to the corresponding base line, the value of the base line.



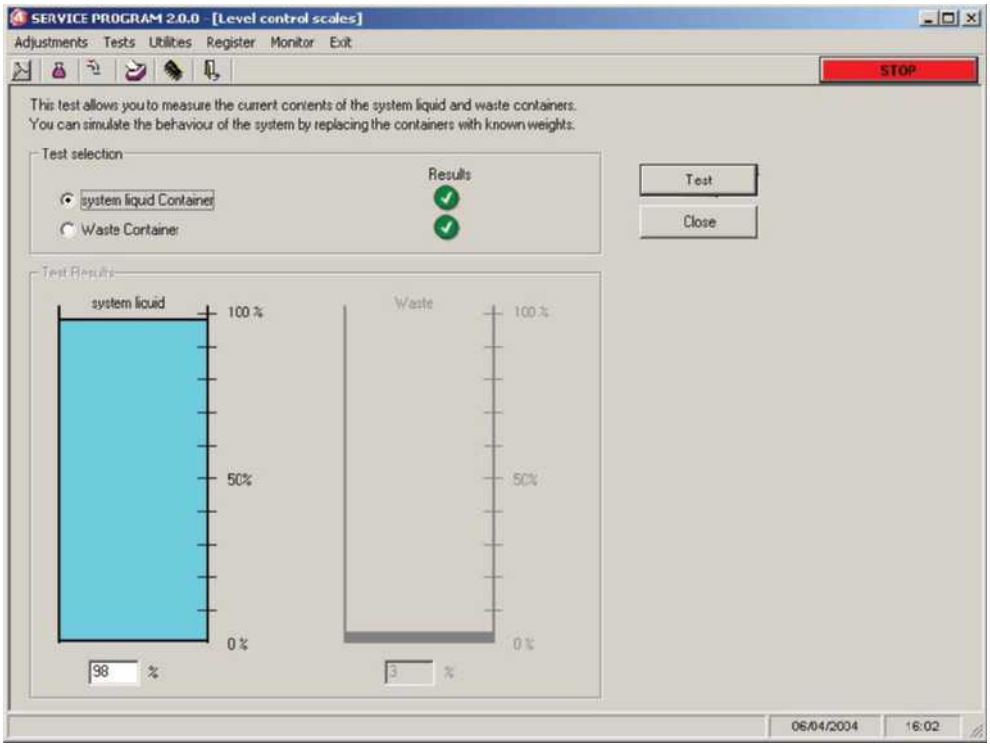
4.3.7.7. Reactions rotor check

The user can use this test to check the optical status of a reactions rotor. He or she can choose the optical filter with which the test is to be performed. The technician must place the rotor in the analyzer and press the *Test* button. If the *Automatic Fill* option has been chosen, the analyzer fills the 120 rotor wells with distilled water and then makes a base line on each well with the chosen filter. The analyzer graphically displays the absorbances related to the average of all the wells and tells the technician the state of the rotor (optimal, adequate or unusable). After the test, the user must remove the rotor of the analyzer, empty it and dry it completely before using it for analyses.



4.3.8. Level control scales test

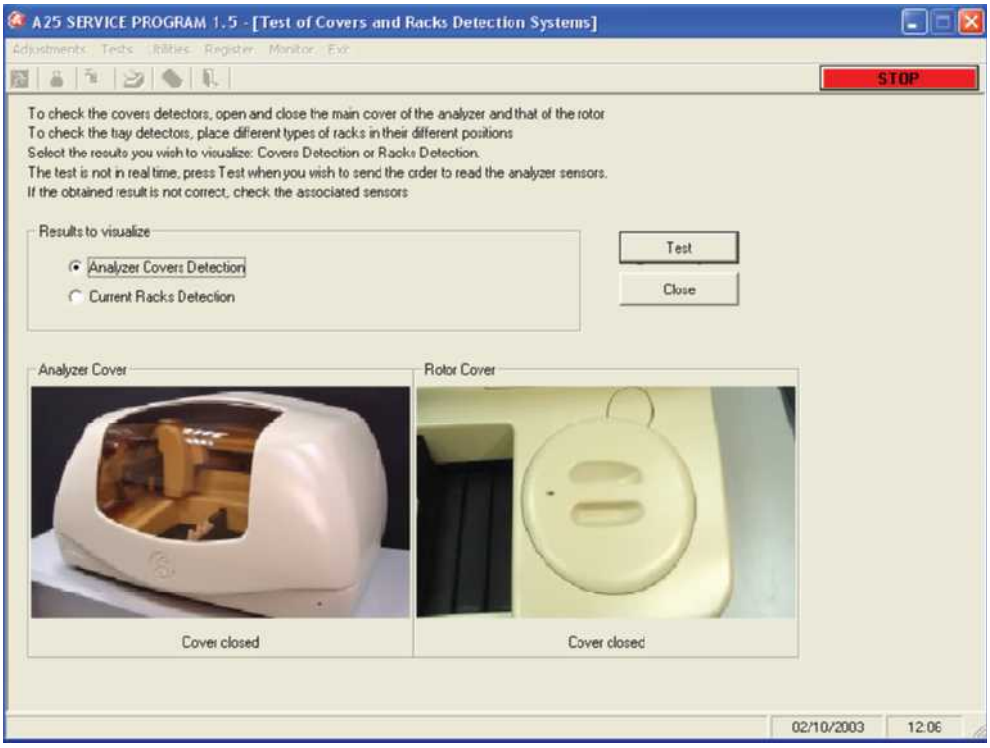
This screen makes it possible to check the functioning of the level control scales of the waste and distilled water containers. The technician must select which scales he wishes to check and place a certain amount of liquid in the corresponding container. On pressing the *Test* button, the screen shows the level of liquid measured by the analyzer.



4.3.9. Racks and covers detection test

This test makes it possible to check the functioning of the different detectors incorporated in the analyzer.

- Open detector of the general cover of the analyzer.

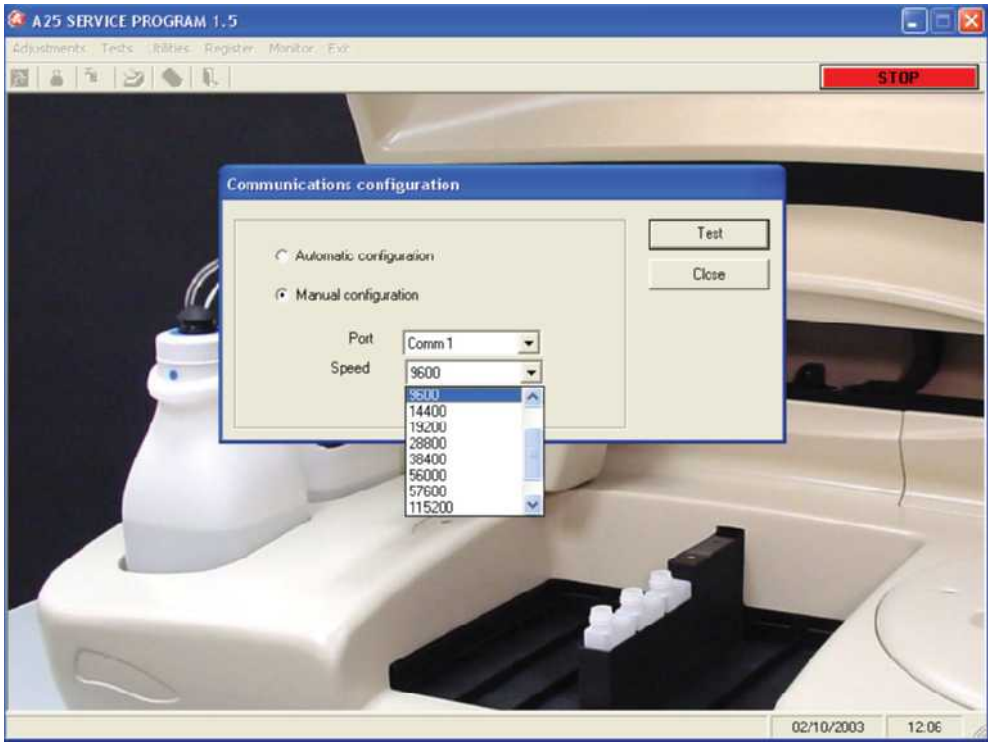


Rotor cover presence detector.
- Racks identification detectors

The technician can manipulate the corresponding components, for example, open and close the cover of the analyzer and the screen shows the state of the detectors in each case.

4.3.10. PC-Analyzer communications channel test

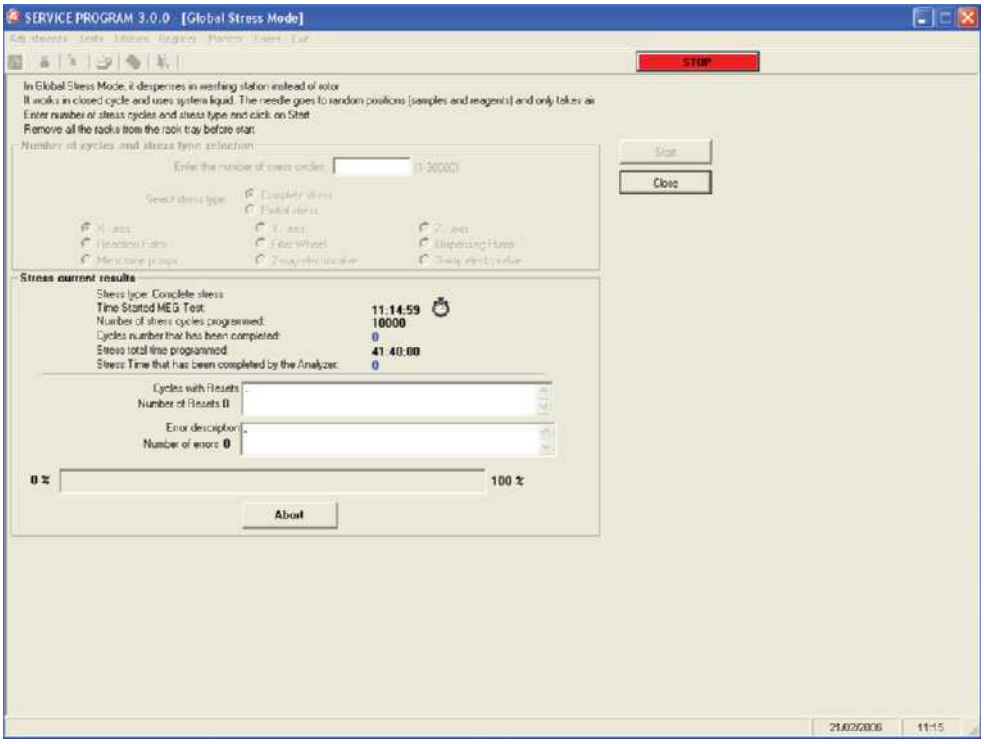
On pressing the *Test* button, the computer attempts to establish communication with the analyzer. The program tells the technician if it has been possible or not.
The technician can select *Automatic Configuration* or *Manual Configuration*. In the case of the latter, he can define the *Port* and the *Speed*.



4.3.11. Global stress mode of the analyzer

This test makes it possible to continually reproduce work cycles of the analyzer similar to those made during the preparation and reading of reactions in a normal working routine, but dispensing at the washing station instead of the rotor. It is necessary for the dispensing system to be primed so that the piston does not function dry. All the racks must be removed from the racks tray. This test can be made without the covers and housing of the analyzer.
The technician can program the number of cycles he wishes (1 cycle = 15 seconds). The test can be cancelled at any time.
Once the test has been launched, the screen provides regular information about the current status of the process. If an error occurs during the process, the test ends and the screen displays a message indicating the element causing the error.
Partial stressing of the elements of the analyser is possible. The following elements can be stressed partially:

- X axis
- Y axis
- Z axis
- Reactions rotor
- Filter wheel
- Dispensation pump
- Membrane pumps
- 2-way electrvalve
- 3-way electriovalve

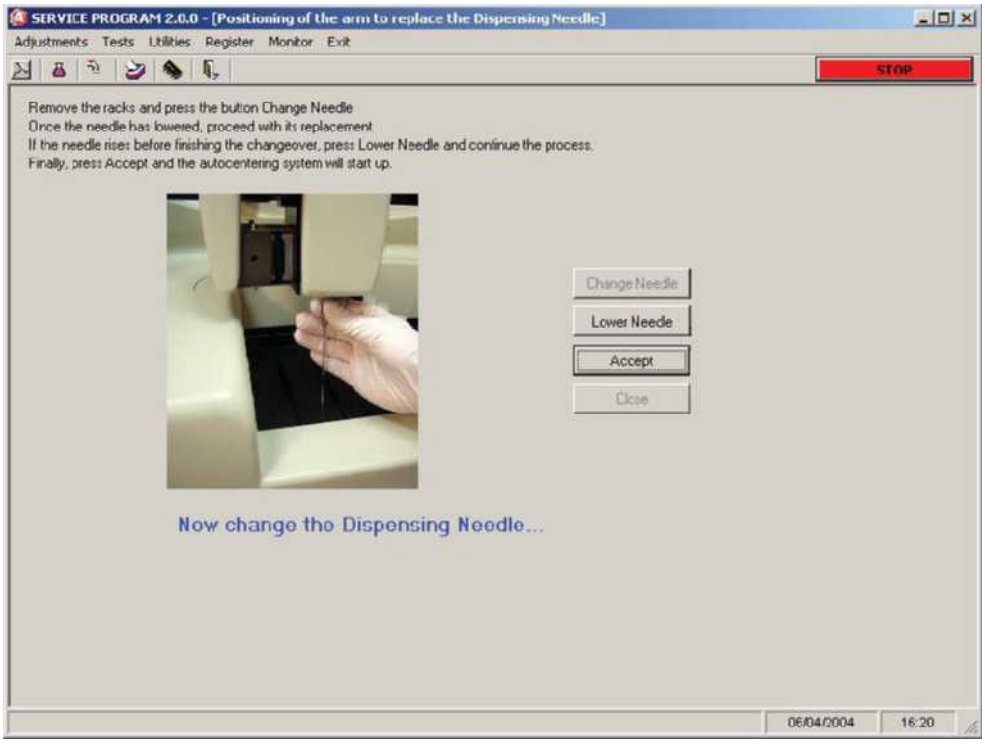


4.4. UTILITIES

The program contains various technical utilities. These utilities are also accessible from the user program.

4.4.1. Disassembly of the dispensing needle

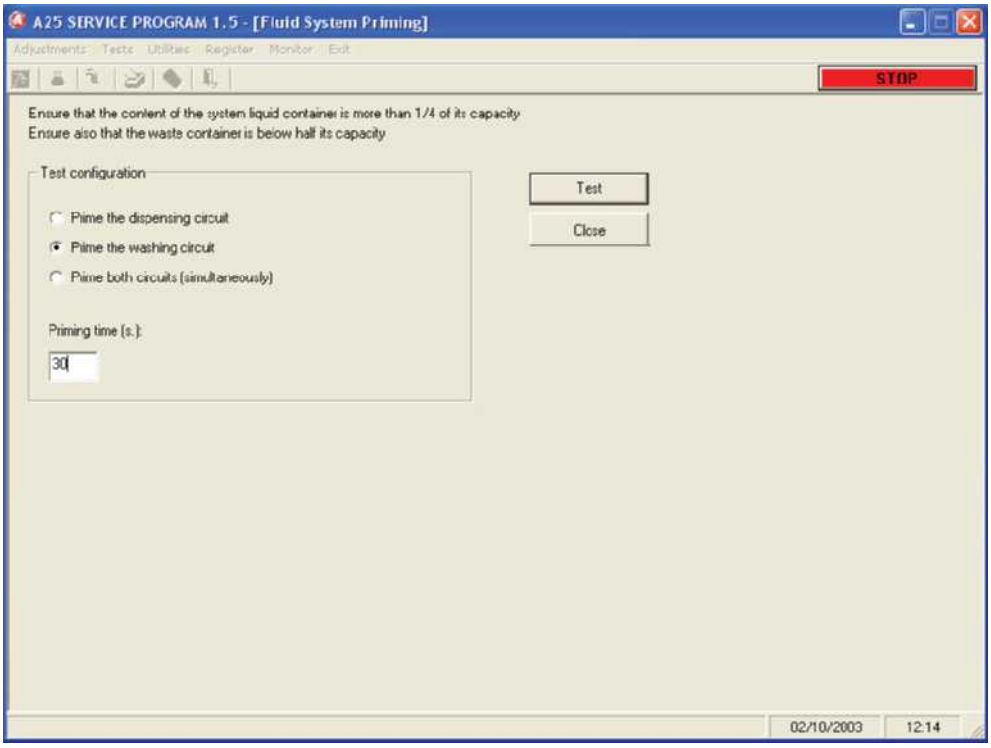
On clicking on the Disassemble Needle button, the operating arm positions itself over the rack tray. The program alerts the technician to remove any object positioned under the arm. On clicking OK, the needle descends and the technician can remove it to work with it or change it. To remove the needle, unscrew it by holding the top fitting. If, while handling the needle, the carriage rises due to the pressure made by the technician, press the Lower Needle



button for the needle to descend once again. Once the needle has been reassembled on the analyzer, press the *Park* button for the needle to rise. It performs the self-centering test and the arm finally returns to its parked position. These operations must be done with utmost care since they are carried out with the analyzer cover open and the needle may be contaminated. Laboratory gloves must always be used.

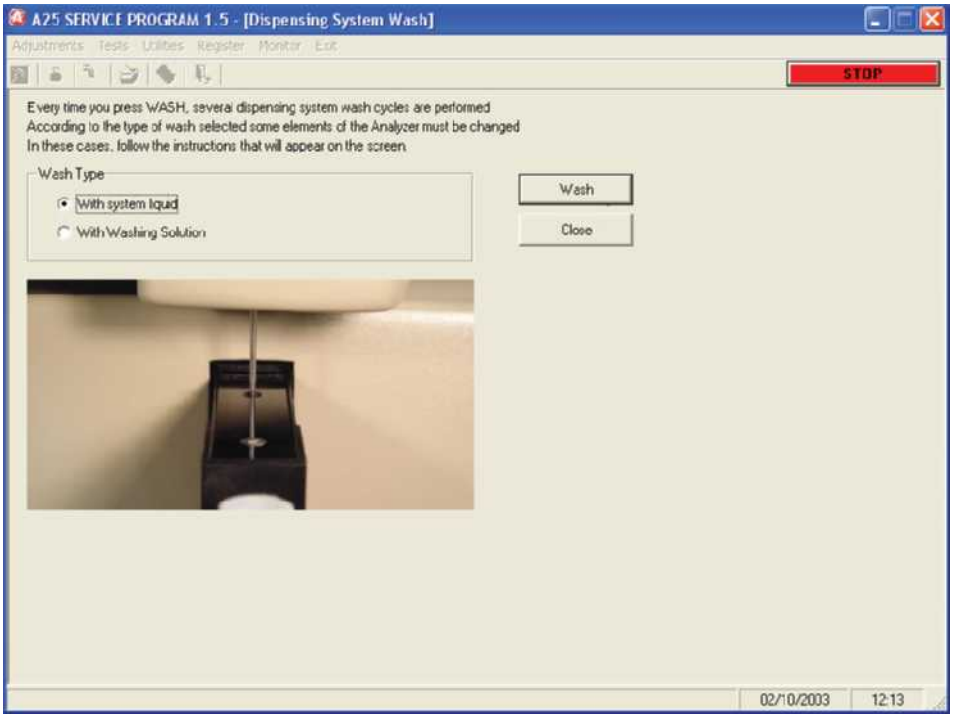
4.3.2. Fluid system supply

On pressing the *Test* button, the analyzer fills the conduits of the dispensing system and the washing station with distilled water. To perform this operation, the operating arm is moved to the washing station. The technician can choose whether he wishes to prime the dispensing system, the washing system or both.



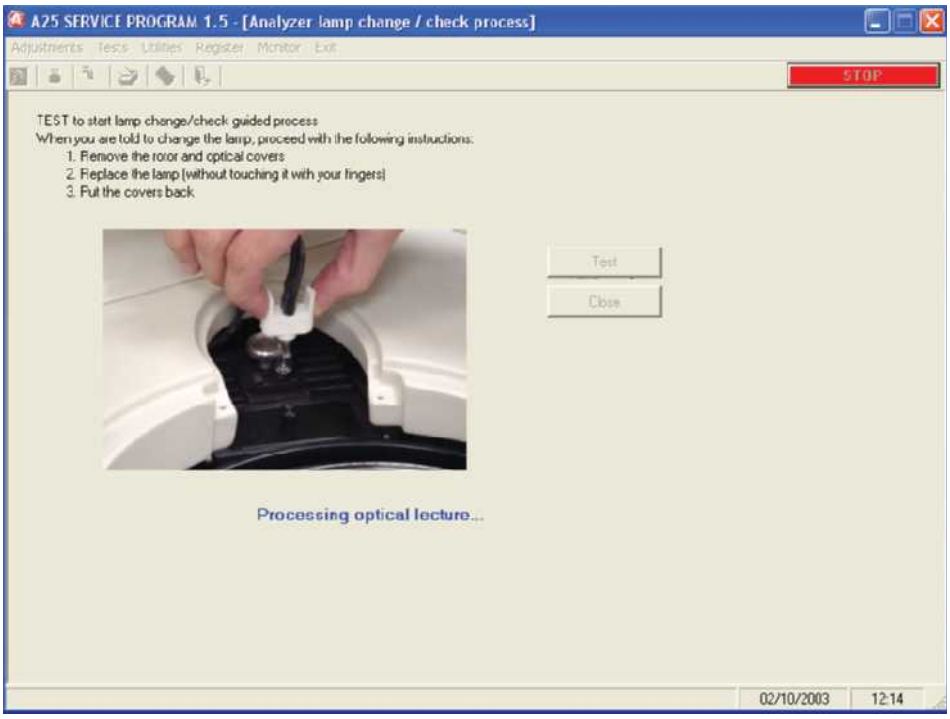
4.3.3. Cleaning of the dispensing system

On pressing the *Wash* button, the analyzer washes the dispensing system internally and externally. To perform this operation, the operating arm is moved to the washing station. The technician can choose between performing the wash with distilled water or wash solution. In the case of the latter, the analyzer asks the technician to place a bottle of wash solution in stead of the distilled water container or to fill the latter with wash solution. Once the wash has been performed, the analyzer asks for the distilled water container to be put back in position. Finally, the analyzer primes the system with distilled water.



4.3.4. Changing the lamp

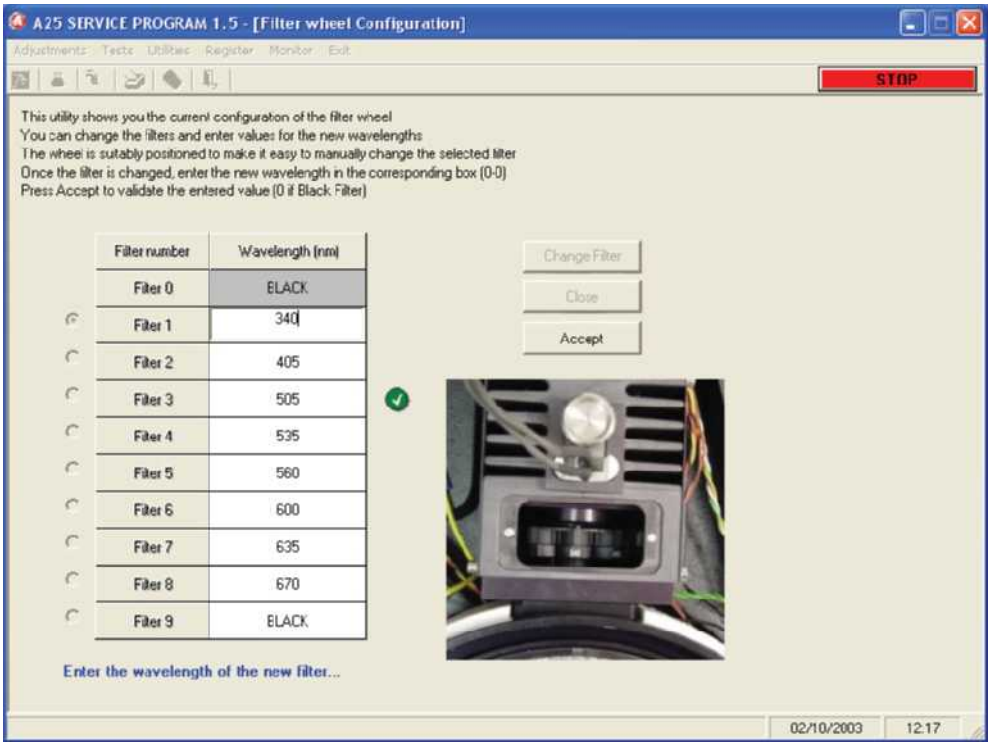
When entering the screen, it is possible to choose between: Changing or checking the lamp. When a new lamp is installed, this utility must be used to notify the analyzer that the lamp has been changed and optimize the



luminosity of the photometric system. The lamp must be changed with the analyzer in sleeping mode. If the analyzer is on standby mode, the program shuts it down automatically. The lamp must never be touched with fingers. Once the new lamp has been installed and the covers of the optic and rotor put back, access the change lamp utility and press the *Test* button. The program starts up the analyzer, checks the light intensity of the optical system, shuts down the analyzer and then requests the technician to remove the lamp holder again and replace it again turning it 180º on the axis of the lamp. If the temperature of the lamp holder is high, wait until it cools down or use pincers to hold it. The program starts up the analyzer again, measures the light intensity of the optical system again, compares the light intensity in both possible positions and chooses the greatest luminosity. If it is the current position, it tells the technician that the test is complete. If the best position were the previous one, the program shuts down the analyzer and asks the technician to remove the lamp holder and replace it, turning it 180º on the axis of the lamp, returning the lamp to its initial position. If the option selected at the beginning was to Check the Lamp, the process is the same but without shutting down the analyzer at the beginning.

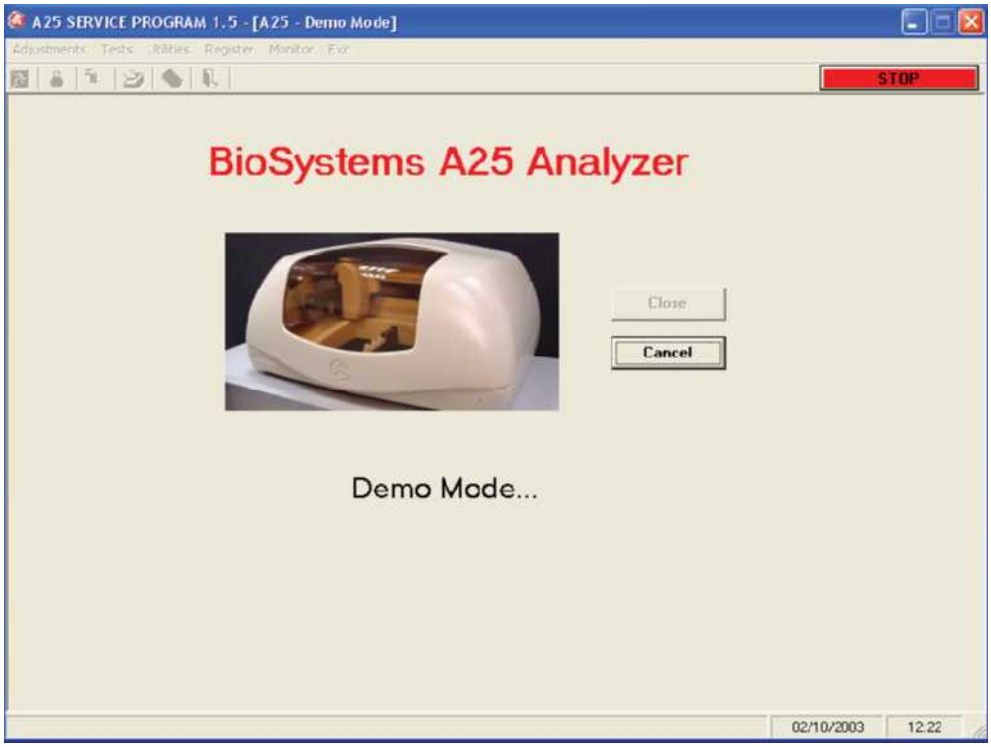
4.3.5. Configuration of the filter wheel

This screen enables the modification of the analyzer filter wheel. The wheel has 10 positions. Position 0 must always contain a covered filter so that the analyzer can perform the darkness adjustment. Positions 1 to 9 can be used for optical filters. All the positions of the wheel must be occupied for it to work correctly. The positions that do not contain an optical filter must be occupied by a covered filter. The analyzer includes as standard 8 optical filters in positions 1 to 8 and two covered filters in positions 0 to 9. If one of the filters is to be changed, select the desired position of the wheel and press the Change Filter button. The analyzer automatically positions the filter wheel appropriately so that the technician can change the filter through the window of the optical system. Next, if it is different, introduce the wavelength of the new filter that has been installed. If the filter is covered, introduce value 0. On closing the screen, the analyzer asks if the filters have actually been physically changed and a series of warnings are given to the technician telling him he must bear in mind whether or not he has changed a filter.



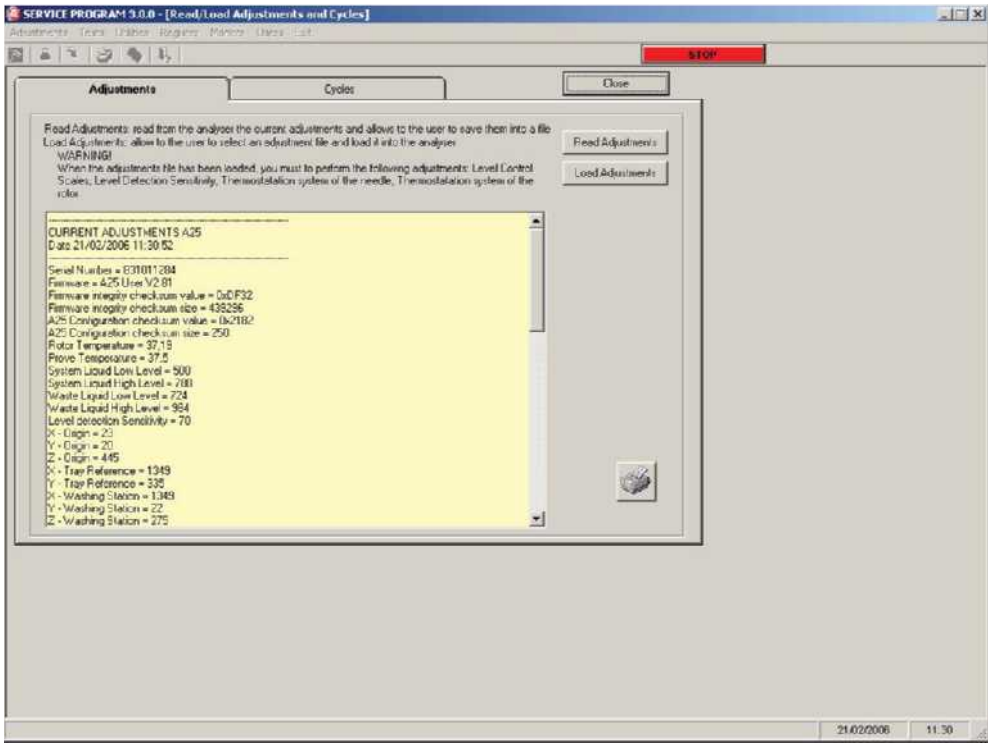
4.3.6. Demonstration mode

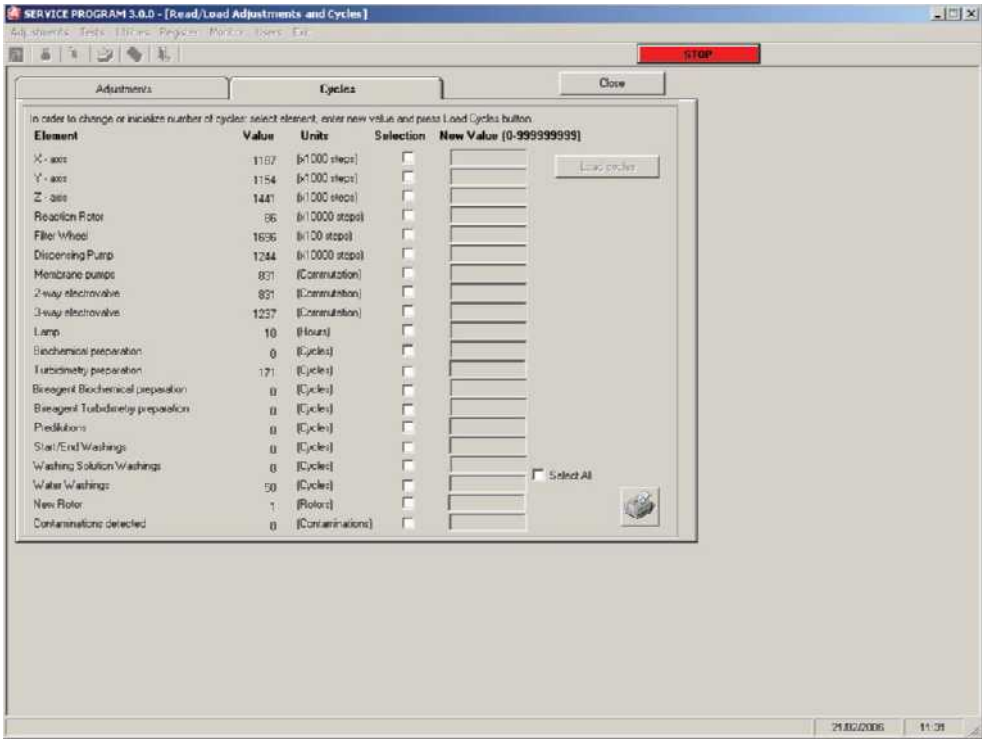
On pressing the *Start* button, the analyzer activates some of its mobile components, imitating functioning during a work routine. The activated mechanical components are the operating arm, the reactions rotor and the filter wheel. On pressing the *Cancel* button, the analyzer finishes the current cycle and returns to its rest position.



4.4.7 Read/load adjustments and cycles

From this screen, it is possible to read the current adjustments that the analyser is using by pressing the button Read Adjustments.
It is allowed to save these adjustments in a file. The technician selects the name and location of this file.
Also from this same screen and with the button Load Adjustments, the technician is allowed to select an adjustment file and to load it in the analyzer. Once the adjustment loading is made, the analyser turns off and the application is closed. When reinitiating the application, the new loaded adjustments will be already active.
From the firmware version 2.80, the programme counts the number of cycles of each element and the task of the analyser. From this menu, it is possible to read the cycles completed by the analyser. The screen displays the said cycles with the corresponding units.





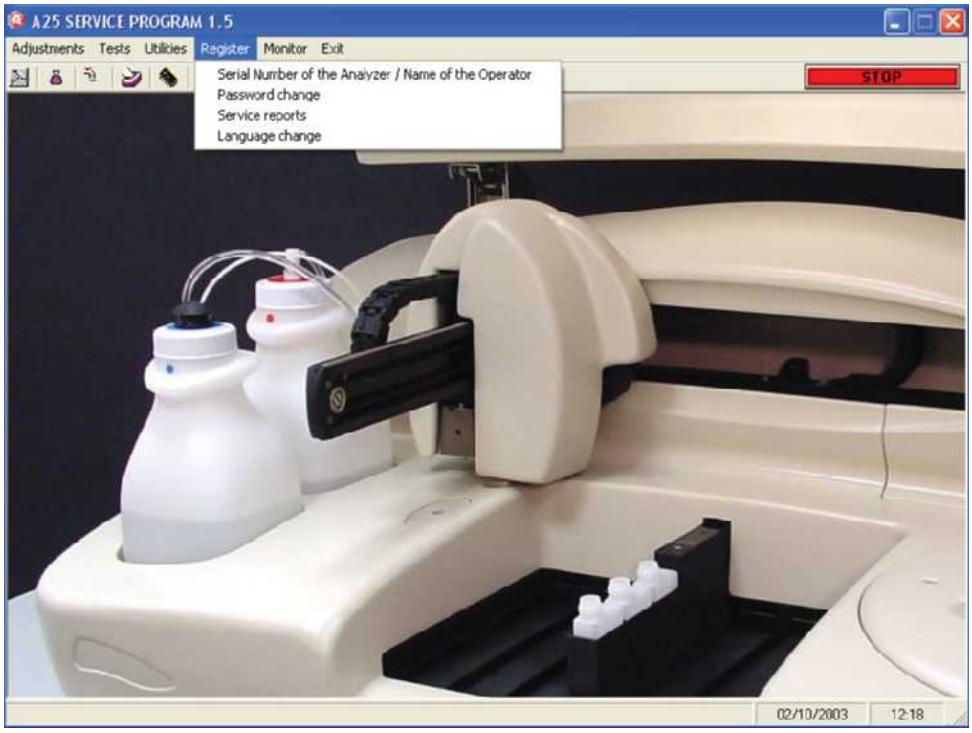
The programme automatically saves a copy of the adjustments and cycles read in a file. This file is located in the following folder:

c:\Program files\A25 Service\Adjustments\

When a physical element of the analyser has to be changed, e.g. the Z axis belt, the counter must be reset to zero for it to correspond to the number of cycles actually stored in the analyser. To perform this operation, select the box of the element that is to be initialised and enter the number of cycles in the enabled box. Then press the *Load cycles* button.
Using the *Load adjustments* button, this screen also enables the technician to select an adjustments file and load it in the analyser. When the adjustments are loaded, the cycles are also loaded. Perform this operation when a CPU board has to be changed. This avoids having to completely readjust the analyser; only the following sections will have to be readjusted:
Scales
Level detection sensitivity
Needle thermostatation
Rotor thermostatation

4.5. REGISTER

This enables the management of past adjustments, tests, incidences, repairs and maintenance of the instrument.

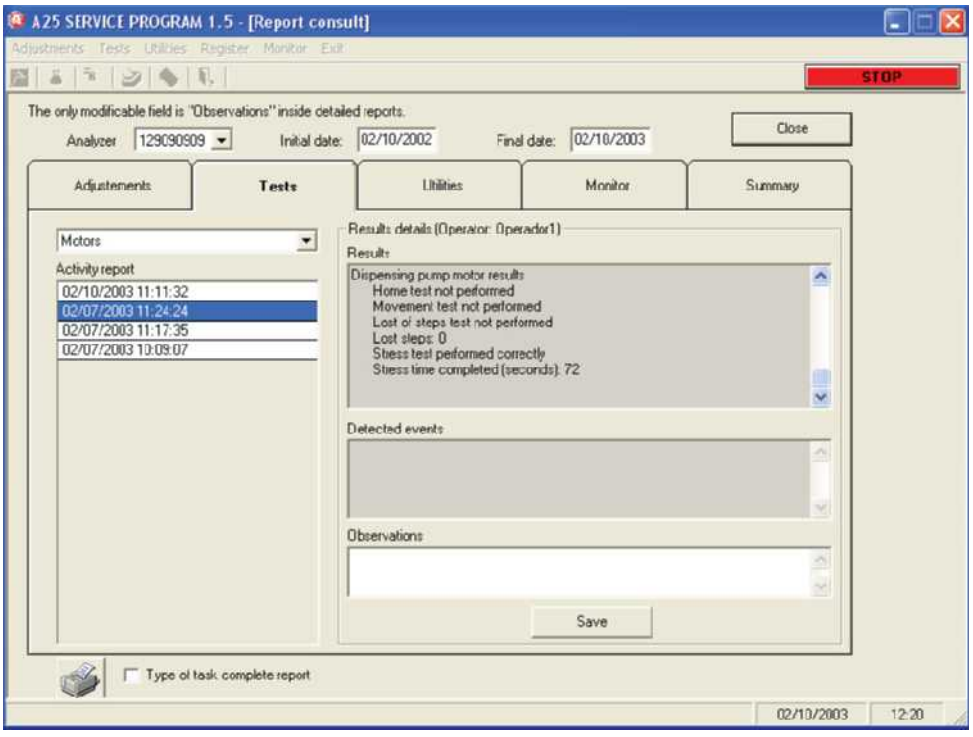


4.5.1. Introducing the analyzer serial number

The technician can enter the analyzer serial number so that it appears on printed service reports. If an entered serial number is changed, the service records are reinitiated. In this case, the technician can store all the previous data in a file.
The technician can enter his name so that it appears on the printed service reports.

4.5.2. Service Reports

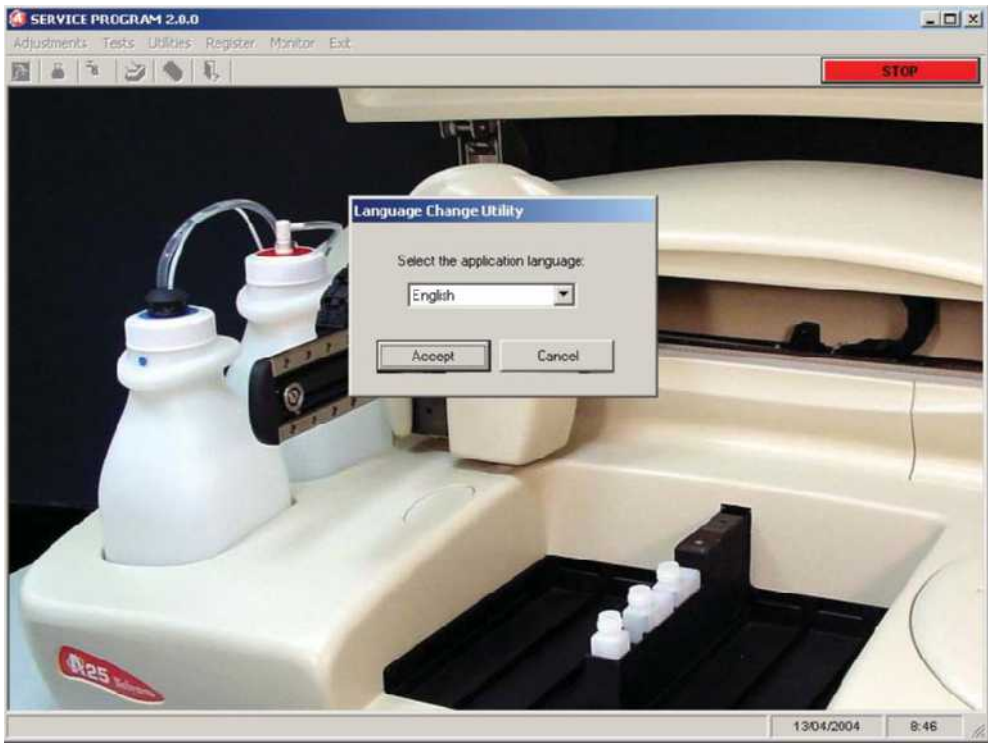
The program can display and print various service reports. The printed reports contain the analyzer serial number and the name of the current technician.
Reports are stored organised by: Adjustments, Tests, Utilities, Monitor and Summary of actions and tasks carried out.



In all cases, it is possible to select the actions carried out within a range of dates chosen by the technician. The technician can enter short descriptions of the incidences that may happen in the analyzer and the repairs and maintenance operations that may be performed to the instrument in the Observations box.

4.5.3. Language change

This makes it possible to choose the language used in the service program.



4.5.4. Users

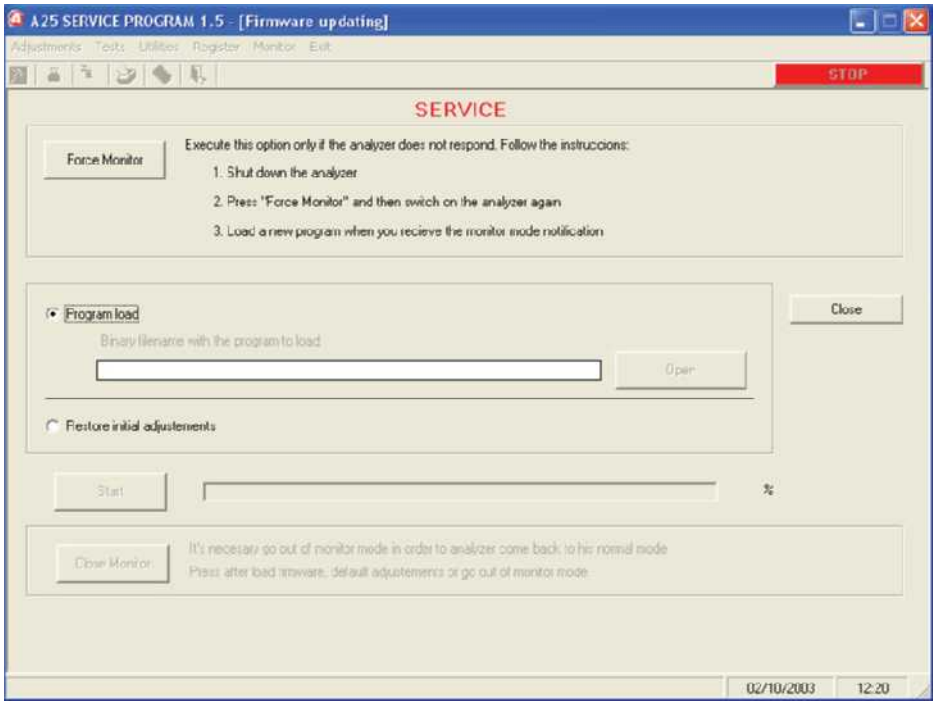
Two types of user can be created with different access levels:

· **SAT.** This user has full access to the programme. This user has permission to create and/or delete other users.
· **User.** This user has restricted access to the programme. This user can only perform the tests and run the utilities. He/she can not make any adjustments or load any previously saved adjustments files or change the firmware version of the analyser.

From the *Users* menu, it is possible to create, delete and change users. The *Change password* option is for each user to change his own password.

4.6. MONITOR

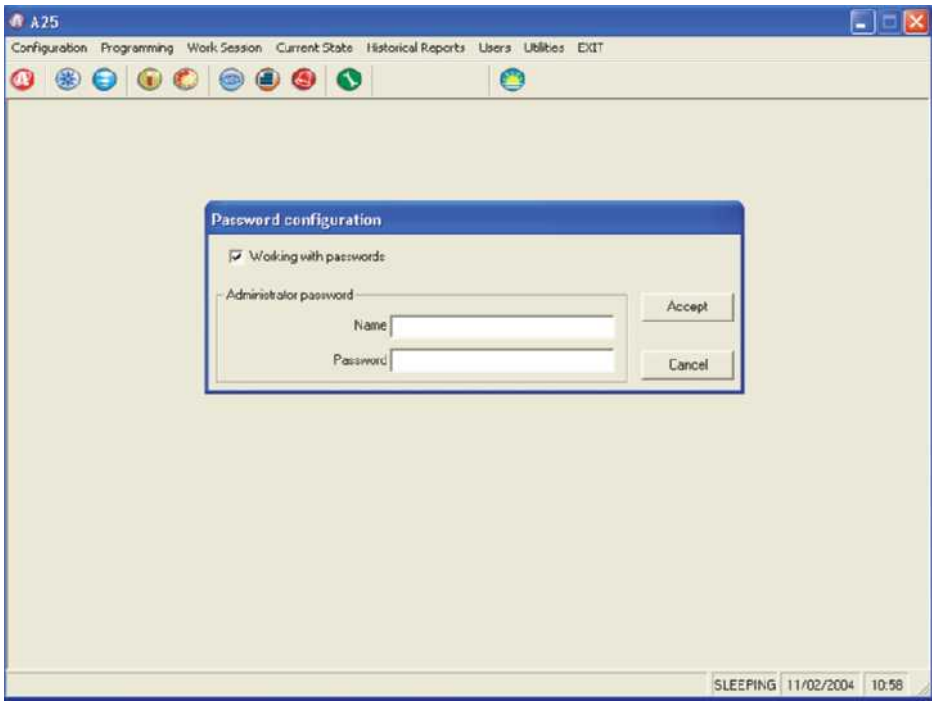
These enable the low level communication with the analyzer to load new versions of the program in the *flash* memory of the analyzer (*firmware*) or to restore the default adjustment parameters.
The firmware of the analyzer resides in a permanent flash memory. The change of this program can be made through the computer without the need for changing the memory chip.
To load the new version, press the *Start* button, previously indicating where the program is located using the *Open* button.
From version 3.0.2, before loading a new firmware, the program checks that the file is correct. If is so, the program sends it directly to the analyzer. If there is an error message, please contact the Technical Service to replace/ recover the corrupt file
First of all, the current content of the flash memory is deleted and then the new program is loaded. This operation may take several minutes.
Once the program has changed, the analyzer is restarted with the new version of the program. While the copy

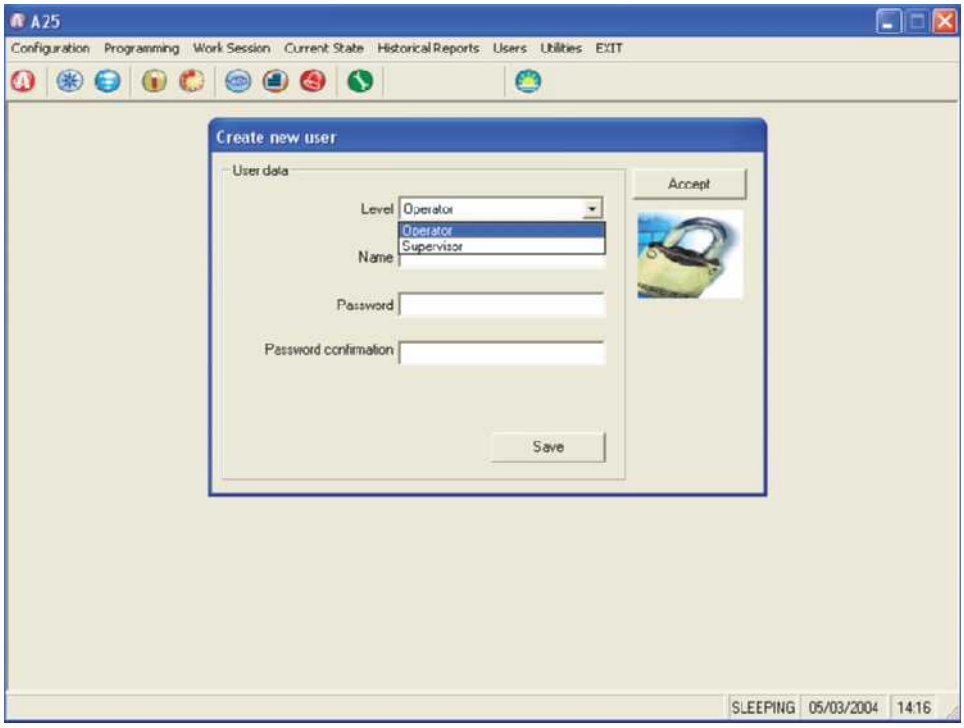


process is being performed, the screen indicates the percentage completed.
There is also the option to Restore Default Adjustments, selecting the option and pressing Start.
If the technician wants the analyzer to enter monitor mode (e.g. because the analyzer does not respond because the *firmware* was incorrectly loaded, he may do so by shutting down the analyzer, pressing the *Force Monitor* button and then rebooting.
Once the new programme has been loaded or the default adjustments have been restored, exit the monitor by pressing the *Close* button.

4.7 User's program

In this section, the service options in the user program will be described. These options are intended to configure the user's access level.
Each section explains how to manage and create different levels of access to the user program of the analyser.
When the program is installed for the first time, there is not a created user and access to the program is complete.



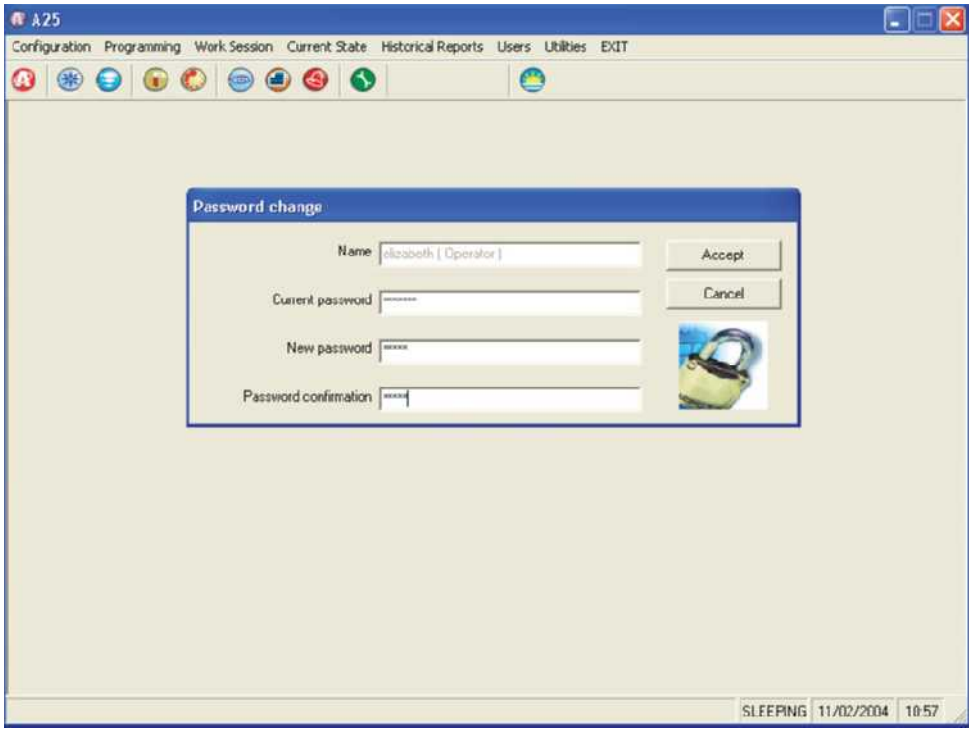


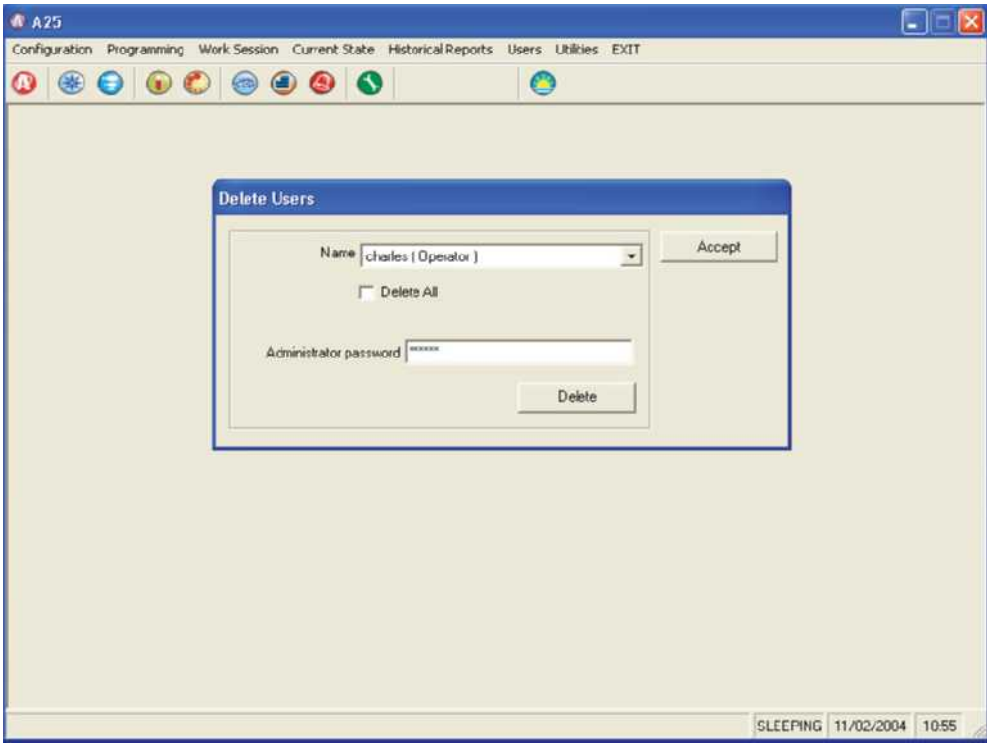
4.7.1 Configuration of the level of access to the analyser

To activate the option of level of access to the analyser, the first time you should enter as administrator, whose values are:

Name of user: **admin**
access key: **a25**

with this screen, the application with the operation by passwords is configured.
The first time that the program is activated, it forces the user to change the initial password.
It is possible to create three types of user with different access levels:





• **Operator**, is the user with a lower level of access to the application. He can only do working sessions, reports of current and historical results, and validate quality control results. In the screens of programming of techniques and contaminations, he can look up programming values, but he can not modify any parameter. He can not delete results or alarms. This user has total access to the rack and profile programming and to the analyser's configuration (except for changes of filters). He can change his own password.

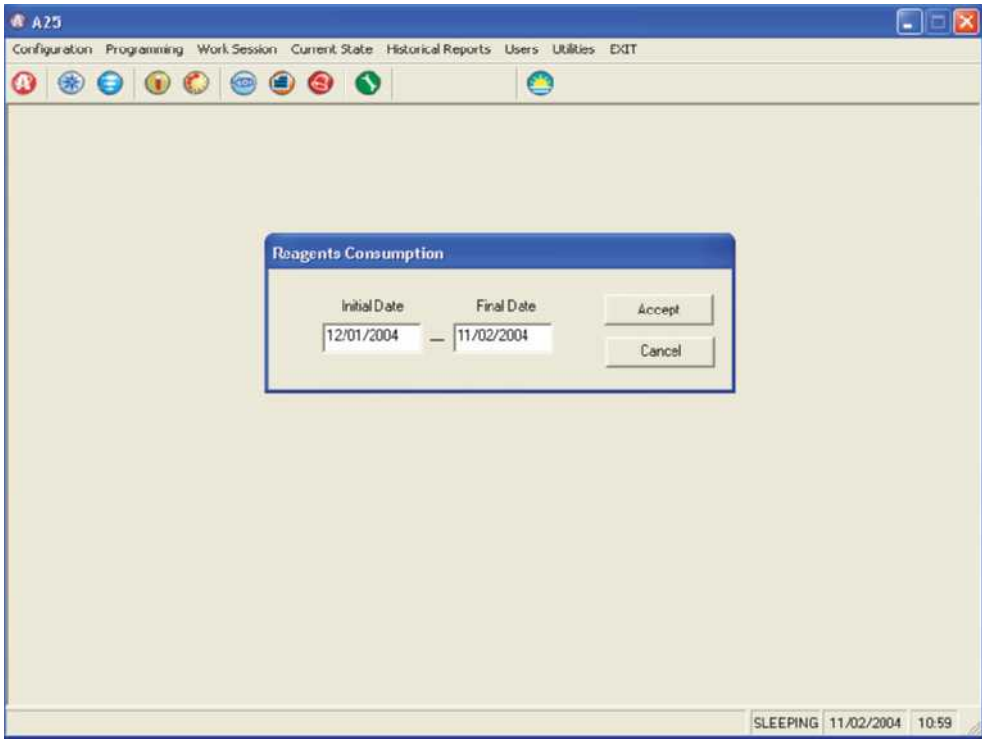
• **Supervisor**, is the user with a medium access level. This user has got the same privileges as the operator user's and, in addition, he has got permissions to modify the programming of techniques in the calibration parameters and the control values. He can create a restricted number of new techniques, that is defined at the moment of creating such user and that it is a default setting of 5. He can also modify the programming of contaminations and change the analyser's filters. He can change his own password.

• **Administrator**, is the user with total access to the analyser's functions. He can create new users -as much at supervisor as at operator level-, eliminate or modify users. When creating supervisor users, he has to indicate the maximum number of new techniques that can create. He can activate or deactivate *Work Without Passwords* (option within the Configuration menu). He can also activate/deactivate the working without cover detection (this option is useful for the technical service to make verifications without needing to let the cover down). This option activates solely when the passwords are active.

When users are created, the access is limited to different parts of the program. When starting the program, an identification of the user is requested, by the user name and a password, and then the program will automatically restrict the different parts of the program depending on the access level permitted.
Whenever you want, you can change the user by means of the option *Change of user* from the User menu.
It is also allowed to eliminate users already created. Each user is capable of changing his password. All these options can be reached from the user menu.

4.7.2 Reagent Consumption

In order to access the consumption of reagents, it is first necessary to configure the program with the option of working with passwords. The administrator user is the only one that can access this menu -this option is deactivated for any other user.
In order to generate a list of the consumption of reagents, the administrator has to introduce the dates between which he wants to know the consumption. For this, it appears a screen like this:
Such option creates two files of results, one in text format *.txt* and the another one in excel format *.xls*. These files



will be located at directory within the application directory, it will usually be:

c:\Archivos de programa\A25\Reagents

and the contents of the file shows similar this:

REAGENT CONTROL CONSUME REPORT

Initial Date: 02/11/2004 Final Date: 02/12/2004

Test	Blank Prep.	Calibrator Pre	Control Prep.	Patient Prep.	Total Prep.	Vol. R1 (uL)	Vol. R2 (uL)
glucose	1	0	0	5	6	1332	0
alt	1	0	0	3	4	888	0
bilirrubin	9	0	0	23	32	7104	

3552*Reagents*

5. MAINTENANCE AND CLEANING

First of all, this chapter gives a step-by-step description of the different operations required for both the preventive maintenance and repair of the analyzer. The following are basic recommendations for the preventive maintenance of the instrument. Finally, a series of instructions for care and cleaning are given.

5.1. MAINTENANCE OPERATIONS

5.1.1. Housings and covers

5.1.1.1. Removing the arm housing

a) Remove the side screws that hold the housing in position.
b) Remove the housing by lifting upwards.

5.1.1.2. Removing the front housing

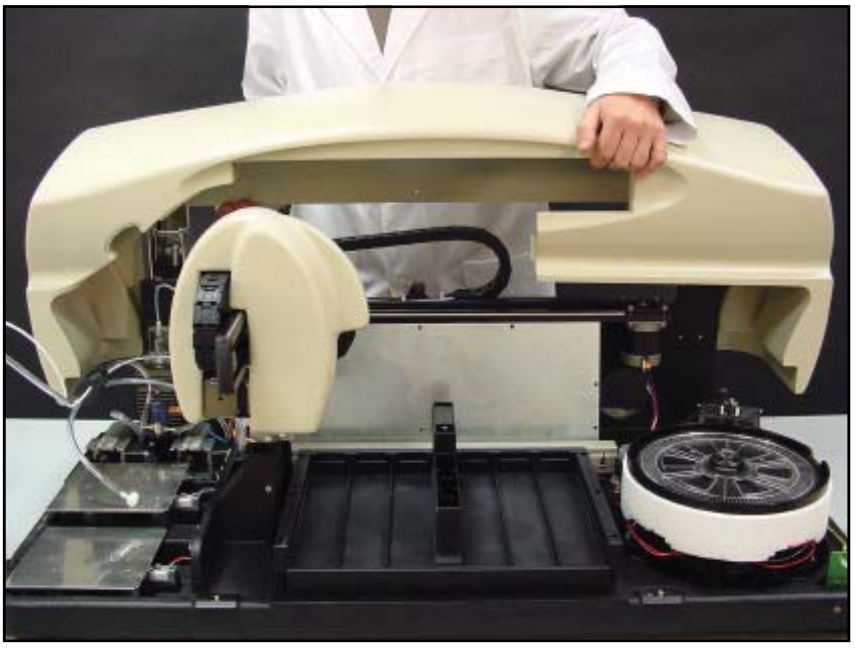
a) Remove the screws that hold the housing in position from the bottom of the base.
b) Disconnect the containers and remove them from the analyzer.
c) Remove the rotor cover and the racks on the tray.
d) Manually move the operating arm as far as possible to the right.
e) Remove the housing by pulling it to the front.

5.1.1.3. Removing the main cover

a) Open the analyzer cover.
b) Remove the two bottom screws that hold the cover to each hinge.
c) Close the analyzer cover.
d) Block the hinges in this position pushing a metal pin of around 3 mm diameter through their side holes. For this, use 2 screwdrivers or appropriate diameter Allen keys.
e) Hold the cover so that it does not fall and remove the 2 upper screws that hold the cover to each hinge.

5.1.1.4. Removing the back housing

a) Remove the front housing.
b) Remove the main cover.
c) Manually move the operating arm as far as possible to the left.
d) Remove the screws that hold the housing in position from the bottom of the base and the back screw.
e) Remove the rubber grommet that holds the container tubes.
f) Remove the housing by pulling it upwards and tilting it slightly forwards.



5.1.1.5. Removing the main cover hinges

a) Remove the main cover and the corresponding back metal covers.
b) Disconnect the electrical hose from the cover detector.
c) Remove the 4 screws that hold each hinge to the base. The 2 top screws of each hinge must be removed by introducing the Allen key in the back holes of the hinges.

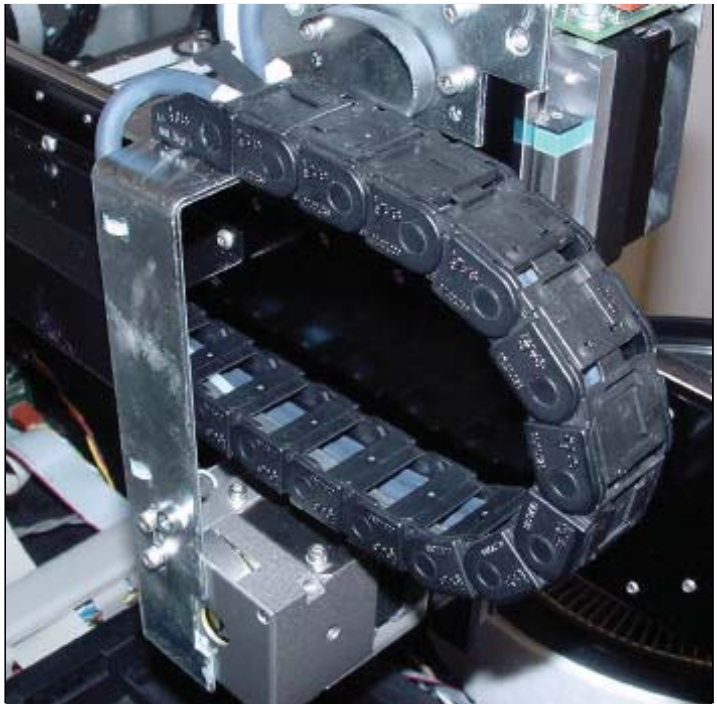
5.1.2. Operating arm

5.1.2.1. Fully removing the operating arm

a) Remove all the analyzer housing.
b) Remove the front cover over the electronics.
c) Disconnect all the electrical hoses from the arm.
d) Remove the support of the clamps together with the terminal of the X carriage chain.
e) Take the cables out.
f) Remove the nut on the electrovalve and cut the clamps that hold the tube to the base.
g) Remove the electronic microprocessor and power supply boards.
h) Remove the arm by removing the 12 screws on the X guide.

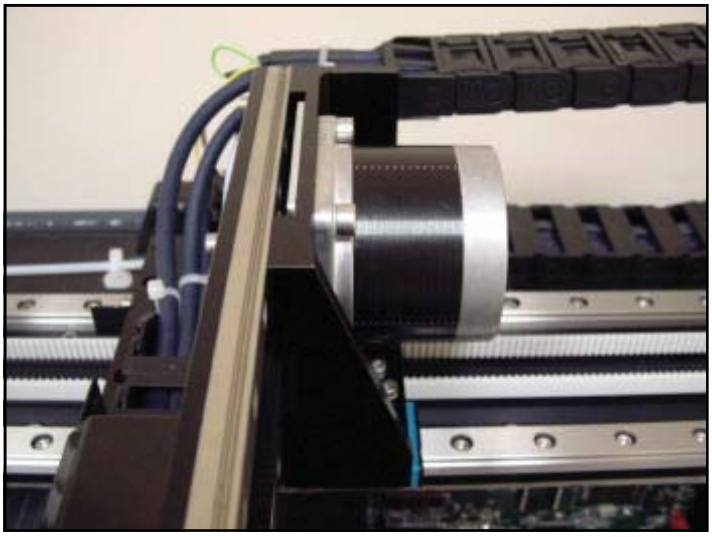
5.1.2.2. Changing the cable carrier chain with the electrical hoses and dispensing tube

a) Remove all the analyzer housing.
b) Disconnect all the connectors and bonding strips of the electrical hoses from the arm and cut all the necessary clamps.
c) Disconnect the Teflon dispensing tube at both ends (needle and electrovalve).
d) Remove the support cover from the Y carriage cable carrier chain.
e) Separate the cable carrier chains from their terminals using a small screwdriver as a lever and removing the pins from the holes that join the chain links together. It is not necessary to remove the terminals from their supports.
f) Remove the cable carrier chain.
g) Install the new chain, make all the connections and replace the cut clamps.



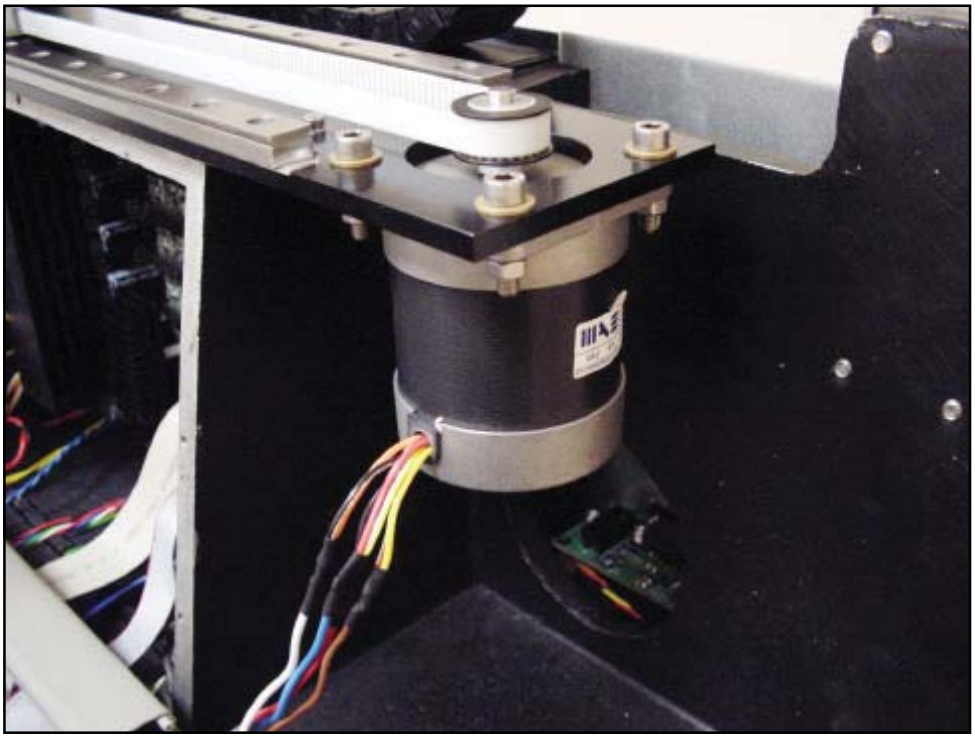
5.1.2.3. Changing an electrical hose or the dispensing tube

a) Remove all the analyzer housing.
b) Remove the support cover from the Y carriage cable carrier chain.
c) Remove the caps from all the links in the cable carrier chains.
d) Cut the clamps as necessary.
e) Replace the electrical hose or tube with a new one.
f) Place it in the chains in such a way that it it is set on the bottom of the chain or, if this is not possible, on the existing cables.
g) Replace the clamps and caps.



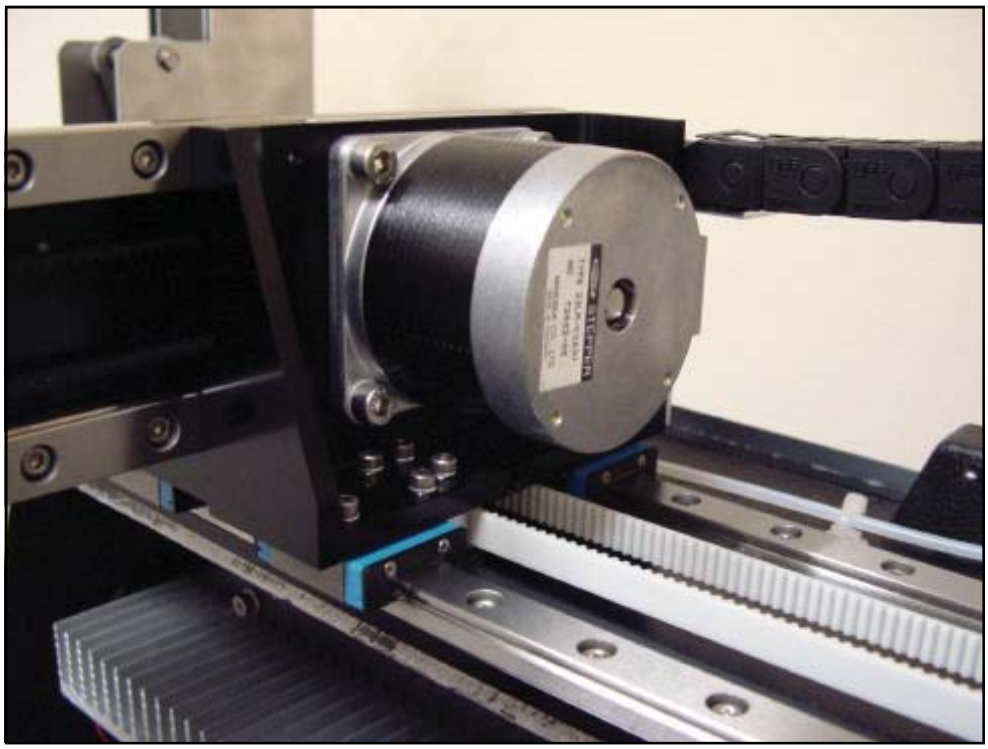
5.1.2.4. Changing the X motor

a) Remove all the analyzer housing.
b) Disconnect the motor cable from the microprocessor board.
c) Cut the clamps as necessary.
d) Remove the motor.
e) Change the motor (with pulley).
f) Mount the motor on the X guide without tightening the screws.
g) Connect the notched belt, tighten it manually displacing the motor and tighten the 4 screws that hold it in position.
h) Connect the motor cable and fasten it with clamps.
I) Do the adjuntments and test with the service program



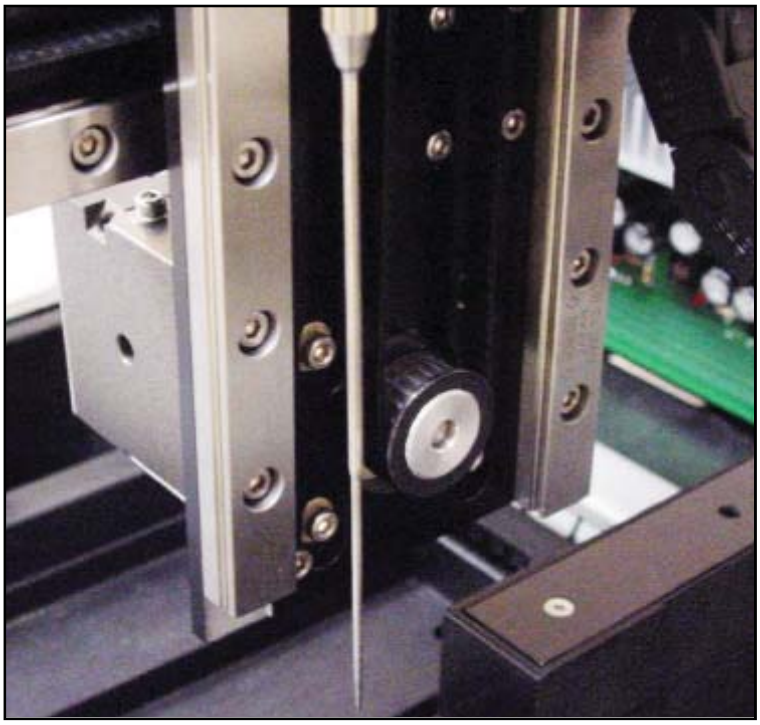
5.1.2.5. Changing the Y motor

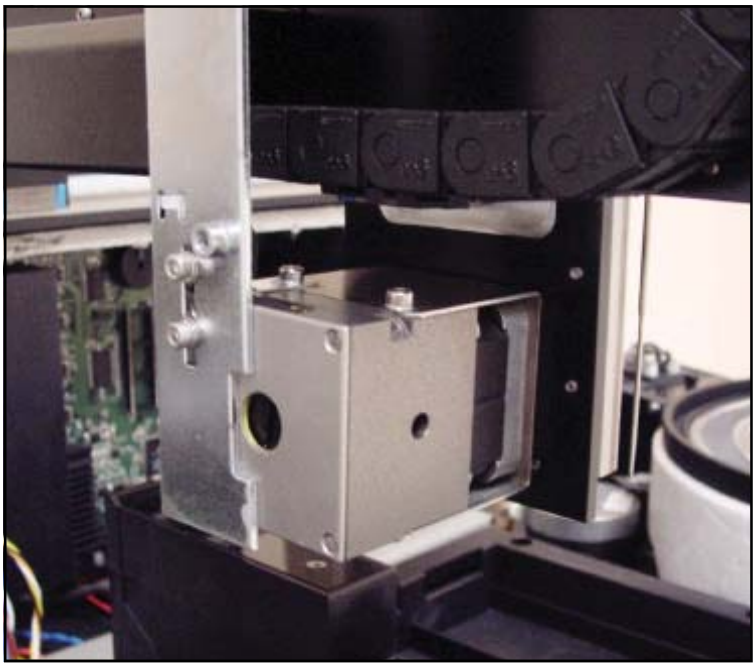
a) Remove all the analyzer housing.
b) Disconnect the motor cable from the microprocessor board.
c) Remove the motor.
d) Change the motor (with pulley).
e) Mount the motor on the Y guide without tightening the screws.
f) Connect the notched belt, tighten it manually displacing the motor and tighten the 4 screws that hold it in position.
g) Connect the motor cable.
h) Do the adjuntments and test with the service program



5.1.2.6. Changing the Z motor

a) Remove the arm housing.
b) Remove the 4 screws that hold the motor in position from the back of the spring-encoder unit.
c) Remove the protective plate from the motor connector and the encoder photodetector.
d) Remove the photodetector from the encoder and disconnect the cables.
e) Remove the unit made up of the Z motor and the spring-encoder unit.
f) Loosen the Allen bolt on the encoder, located in the unit support body. You may have to turn the encoder with a screwdriver at the back to direct the Allen bolt with an opening in the housing so that the key can enter.
g) Remove the fastening part that joins the motor with the support body.
h) Change the motor unit with pulley for a new one.
i) Introduce the back shaft of the motor into the encoder until it hits the back. Put screwfastener on the Allen bolt on the encoder and make sure that it is fixed to the flat part of the motor shaft.
j) Mount the fastening part that joins the motor with the support body.
k) Mount the unit made up by the motor and the spring-encoder on the Y carriage. Do not fully tighten the 6 screws that hold the Y carriage to the unit.
l) Mount the photodetector on the encoder and connect the cables.
m) Mount the protection sheeting on the photodetector of the encoder and the motor connector.
n) Turn the spring 1 and half turns (360 º + 180 º) clockwise using the slot at the back of the encoder. Use a M4x25 screw to block the spring in the desired position. This screw must be introduced in the threaded hole of the support body for this purpose as shown in the photograph.
o) Place the Z carriage in the top position of its run and fit the belt on the upper return pulley and on the motor pulley.
p) Loosen the screw that blocks the spring (if it has been used) and tighten the belt by displacing the motor downwards. Tighten the 4 screws on the front and the 2 on the back, which hold the unit together.
q) Do the motor test with the service program



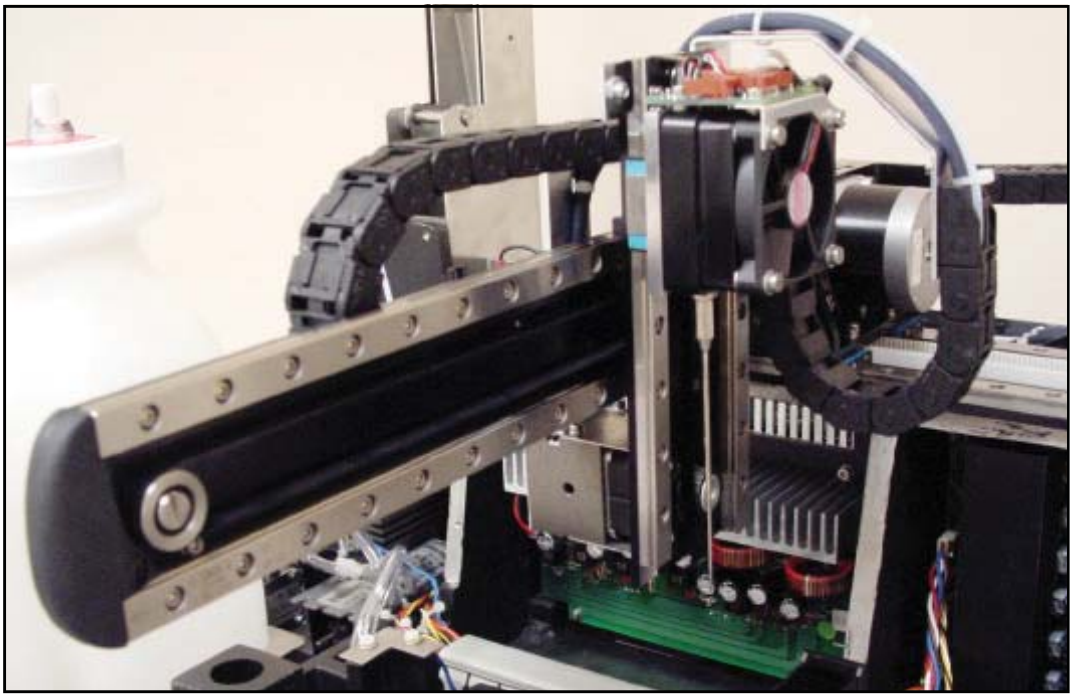


5.1.2.7. Changing the X motor belt

a) Remove all the analyzer housing.
b) Loosen the screws that hold the X motor in place and remove the belt from both pulleys.
c) Remove the belt fastening.
d) Remove the X belt fastening cap.
e) Change the belt for a new one.
f) Remount the belt fastening cap. Put screwfastener on the screw before tightening it.
g) Mount the belt fastening on the X carriage.
h) Put the belt on the pulleys, tighten it manually, displacing the motor and fasten it by tightening the 4 screws.
i) Do the motor test with the service program

5.1.2.8. Changing the Y motor belt

a) Remove the arm housing. To work more comfortably, you can also remove the back housing, but it is not necessary.
b) Loosen the motor and remove the belt from both pulleys.
c) Remove the fastening that joins the belt with the Y carriage.
d) Remove the Y belt fastening cap.
e) Change the belt for a new one.
f) Remount the belt fastening cap. Put screwfastener on the screw before tightening it.
g) Mount the belt fastening on the Y carriage.
h) Put the belt on the pulleys, tighten it manually, displacing the motor and fasten it by tightening the 4 screws.
i) Do the motor test with the service program

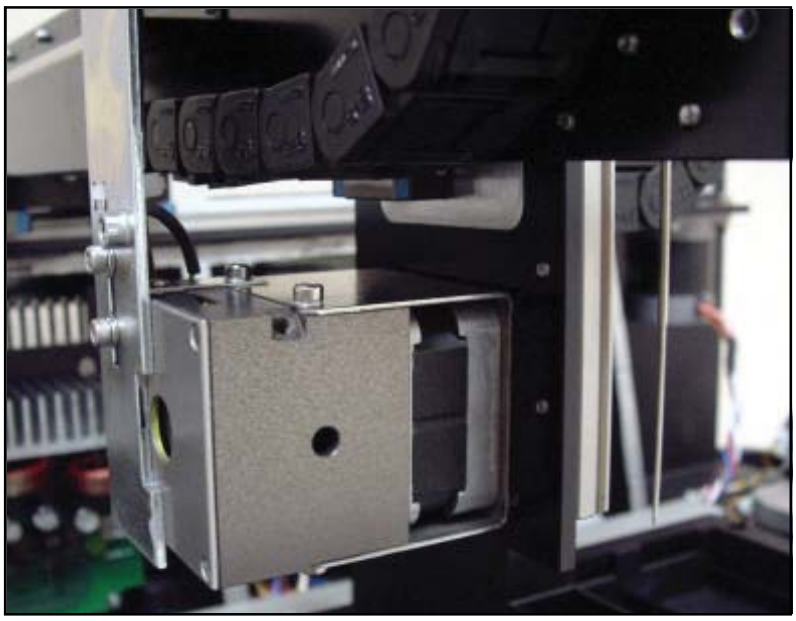


5.1.2.9 Changing the Z motor belt

a) Remove the arm housing.
b) Remove the thermostated needle. It is recommendable to remove the needle before handling the unit to prevent it from being damaged. It is not necessary to disconnect the tube or the connectors, all that is required is access to the screws that hold the belt fastening to the Z carriage.
c) Loosen the 4 screws that hold the Z motor in place and the 2 at the back of the spring-encoder unit in order to be able to move the motor and loosen the belt.
d) Remove the belt from both pulleys.
e) Remove the belt fastening on the Z carriage.
f) Remove the Z belt fastening cap.
g) Change the belt for a new one.
h) Remount the belt fastening cap. Put screwfastener on the screw before tightening it.
i) Mount the belt fastening on the Z carriage.
j) Mount the thermostated needle.
k) Turn the spring 1 and half turns (360 º + 180 º) clockwise using the slot at the back of the encoder. Use a M4x25 screw to block the spring in the desired position. This screw should be introduced in the threaded hole for this purpose on the support body.
l) Place the Z carriage in the top position of its run and fit the belt on the upper return pulley and on the motor pulley.
m) Loosen the screw that blocks the spring (if it has been used) and tighten the belt by displacing the motor downwards. Tighten the 4 screws on the front and the 2 on the back, which hold the unit together.
n) Do the motor test with the service program

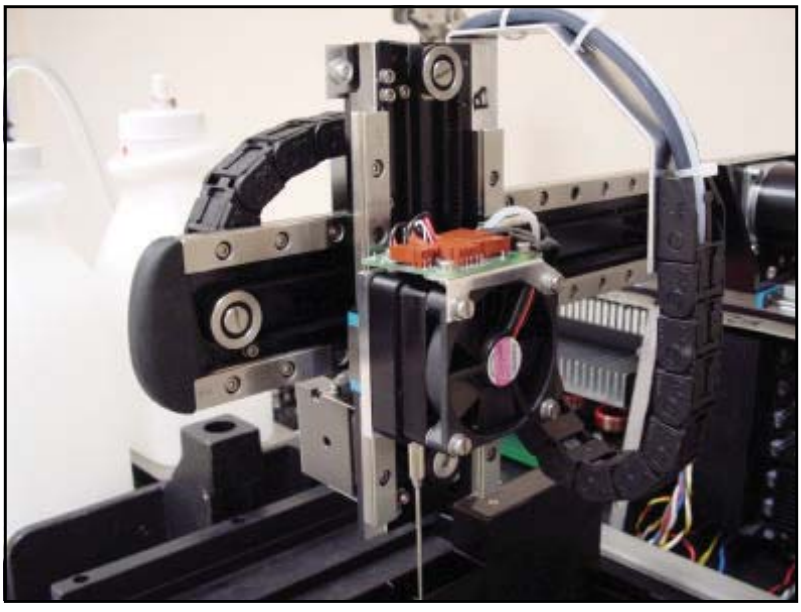
5.1.2.10. Changing the encoder-spring unit

Proceed as with changing the Z motor, but changing the spring-encoder unit instead of the motor. Do the motor test with the service program



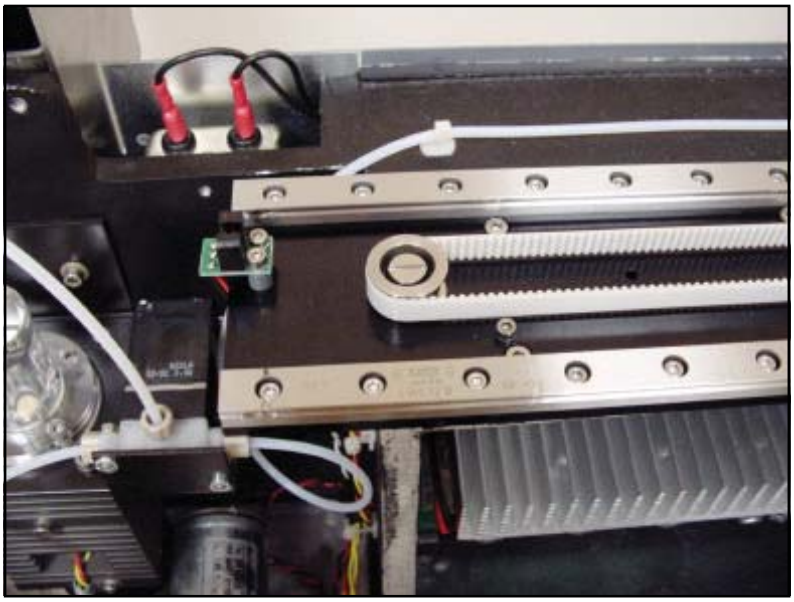
5.1.2.11. Changing the belt return pulleys

a) Remove the necessary housing according to the belt you wish to replace.
b) Loosen the belt by loosening the corresponding motor and moving it.
c) Remove the belt from the return pulley.
d) Remove the return pulley and replace it with a new one. Put screwfastener on the thread of the pulley bolt and tighten it.
e) Fit the belt.
f) Tighten the pulley by moving the corresponding motor and tightening the screws that hold it in place.
g)i) Do the motor test with the service program



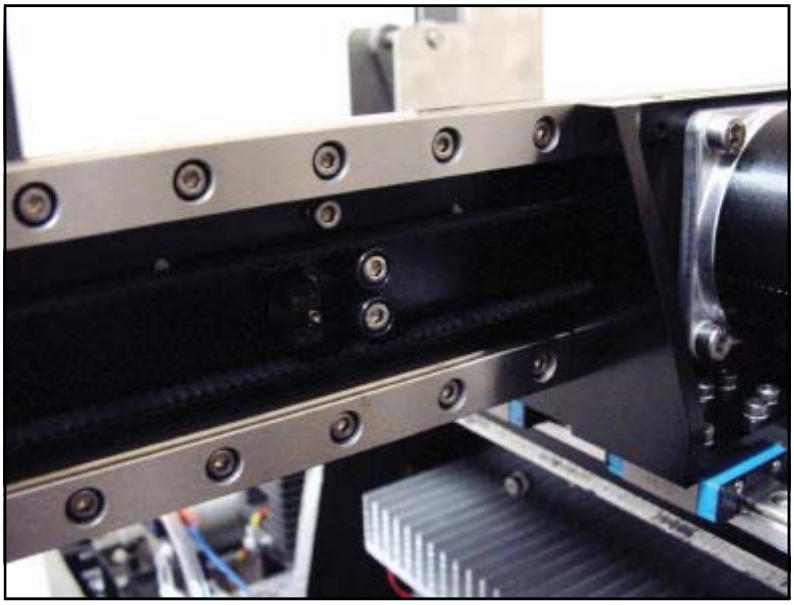
5.1.2.12. Changing the X start photodetector

a) Remove the front housing of the analyzer. To work more comfortably, you can also remove the back housing, but it is not necessary.
b) Disconnect the photodetector cable from the microprocessor board.
c) Install the new photodetector.



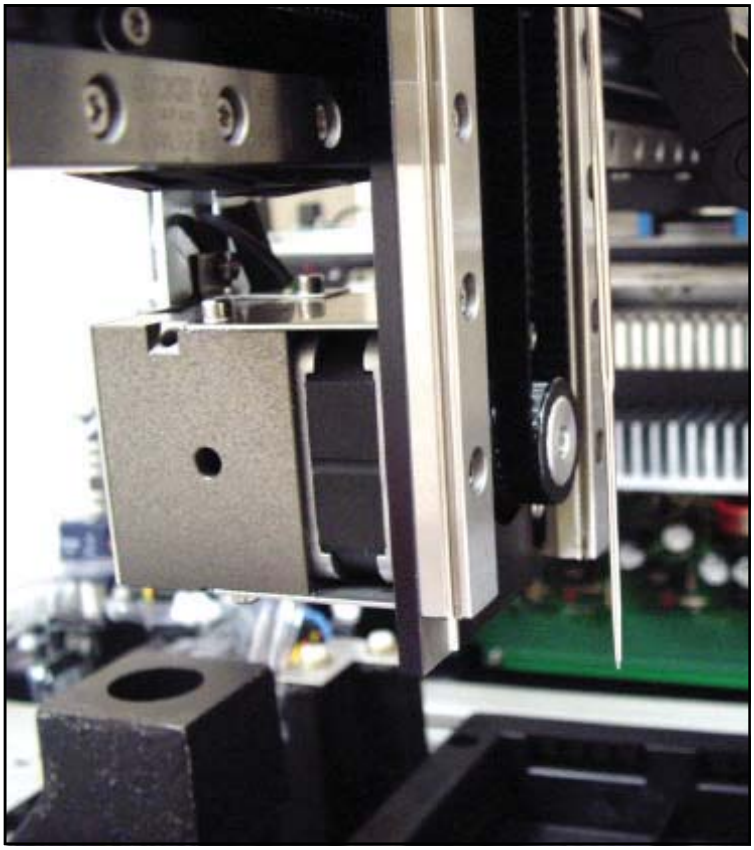
5.1.2.13. Changing the Y start photodetector

a) Remove the support cover from the Y carriage cable carrier chain.
b) Unplug the photodetector connector.
c) Install the new photodetector.
d) Remount the chain support cover.



5.1.2.14. Changing the Z encoder photodetector

a) Remove the arm housing.
b) Remove the protective sheeting of the encoder photodetector.
c) Remove and unsolder the photodetector cable.
d) Solder the cables on a new photodetector and fit it on the unit.
e) Remount the protective sheeting and the arm housing.



5.1.3. Dispensing system

5.1.1.1. Removing the thermostated needle set

a) Remove the arm housing.
b) It is recommendable to remove the needle before handling the unit to prevent it from being damaged.
c) Disconnect the electrical connectors and the Teflon tube.
d) Remove the entire thermostated needle unit by removing the 4 screws that hold it in place. The fan is separated from the rest of the unit.

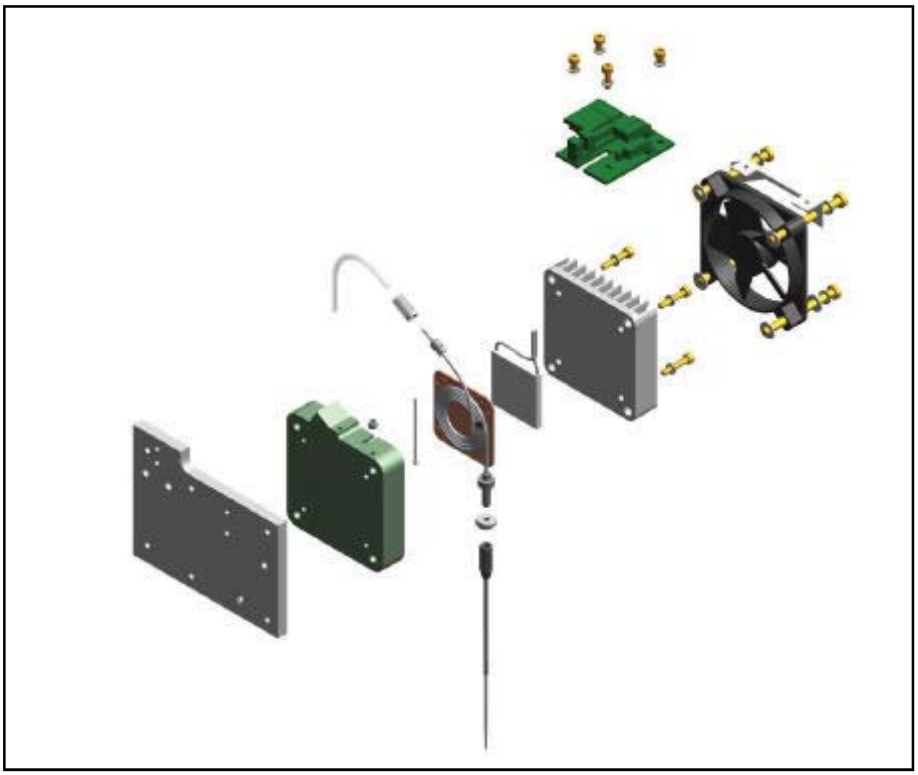
5.1.3.2. Changing the needle fan

a) Remove the thermostated needle.
b) On removing it, taking out the 4 screws that hold it in place, the fan is left separate from the unit.

5.1.3.3. Changing the needle Peltier cell

a) Remove the arm housing
b) It is recommended to remove the needle before continuing to handle the unit to prevent it from being damaged.
c) Disconnect connectors and the Teflon tube.
d) Remove the entire needle thermostatation system (body, fan and electronics), held in place by the 4 screws (1).
e) Remove the electronics board.
f) Remove the radiator.

g) Remove the broken Peltier.
h) Put heat-conductive silicone on the plate of the spiral and on both sides of the Peltier.
i) Fir the Peltier in the centre of the copper plate. Guide the cables through the upper slot of the needle body.
j) Put heat-conductive silicone on the radiator and fit it. Attention: the Peltier is a very fragile component and screws should be fastened gradually and alternately.
k) Fir the electronics and the fan.
l) Fit the unit on the Z carriage. Attention: tighten the screws gradually and alternately.
m) Plug in the electrical connectors and the Teflon tube.
n) Replace the needle.

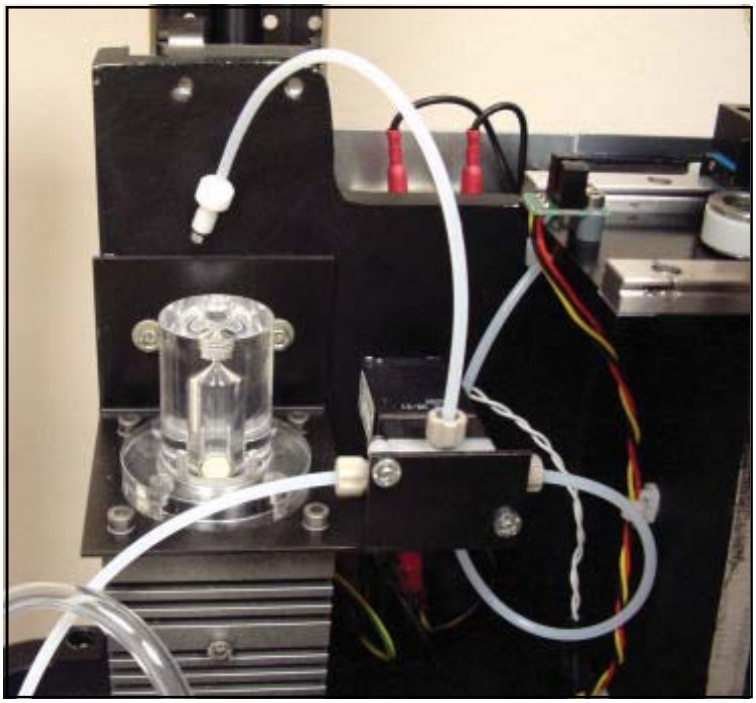


5.1.3.4. Changing the needle temperature sensor

a) Remove the arm housing
b) It is recommendable to remove the needle before continuing to handle the unit to prevent it from being damaged.
c) Disconnect connectors and the Teflon tube.
d) Remove the entire needle thermostatation system (body, fan and electronics), held in place by the 4 screws (1).
e) Remove the electronics board.
f) Remove the radiator and the Peltier.
g) Remove the upper nut and the lower nut of the spiral unit.
h) Remove the spiral unit.
i) Change the thermistor. Attention: the heat-conductive silicone must be replaced in the thermistor housing so that it is completely covered in it.
j) Guide the cables through the upper slot of the needle body.
k) Remount the spiral unit and the lower nut and upper nut.
l) If the heat-conductive silicone has degraded or spread, put heat-conductive silicone on the plate in the spiral and on both sides of the Peltier.
m) Put heat-conductive silicone on the radiator and fit it. Attention: the Peltier is a very fragile component and screws should be fastened gradually and alternately.
n) Fit the electronics and the fan.
o) Fit the unit on the Z carriage. Attention: tighten the screws gradually and alternately.
p) Plug in the electrical connectors and the Teflon tube.
q) Replace the needle.

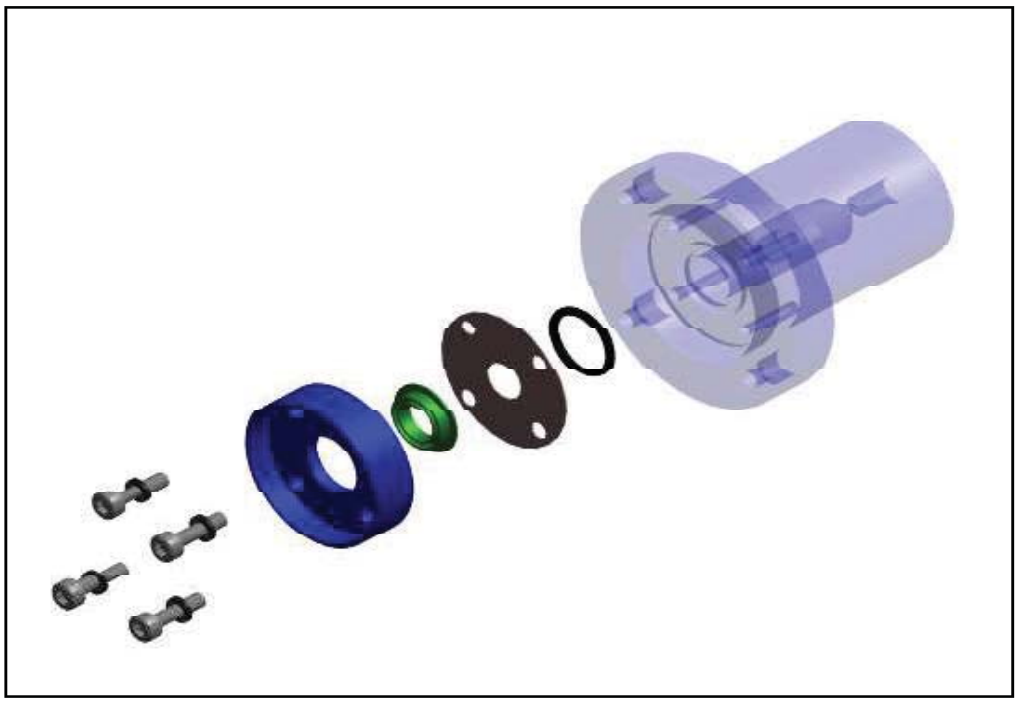
5.1.3.5 Changing the ceramic pump

r) Remove the front housing. To work easier, you may also remove the back housing.
s) Disconnect the fitting and the electrical hose from the pump.
t) Remove the 2 screws that hold the support to the base.



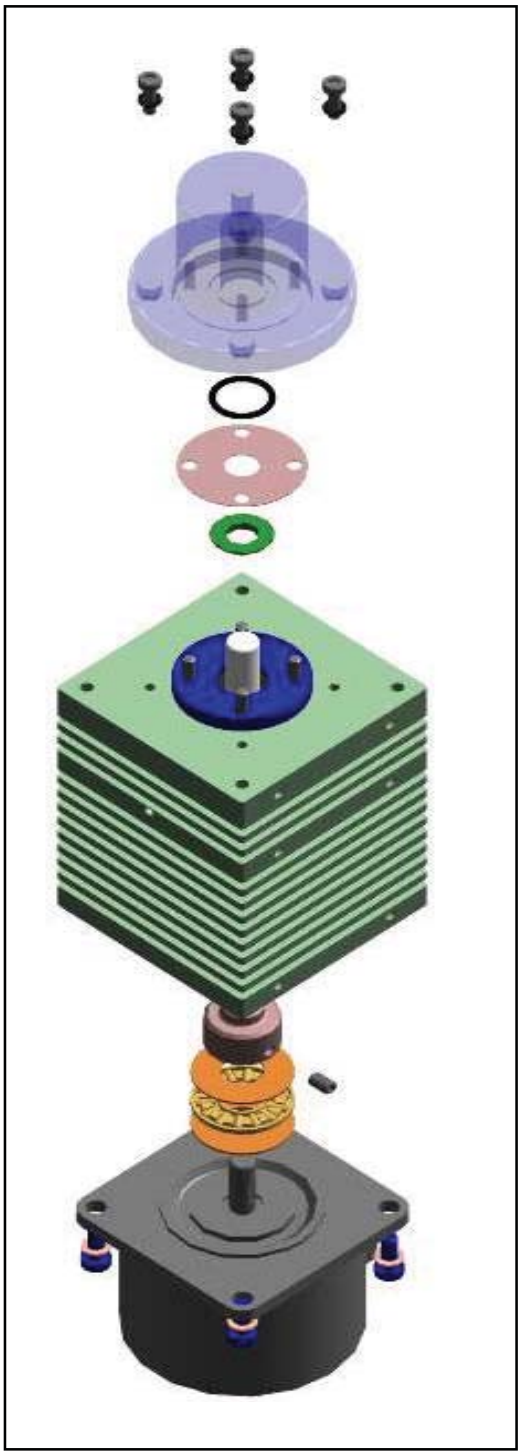
5.1.3.6. Changing the dispensing pump seal

a) Remove the dispensing pump.
b) Remove the fluidic chamber.
c) Remove the seal support.
d) Replace the seal.
e) Fit the seal support by tightening the 4 screws gradually.
f) Refit the fluidic chamber in the pump.



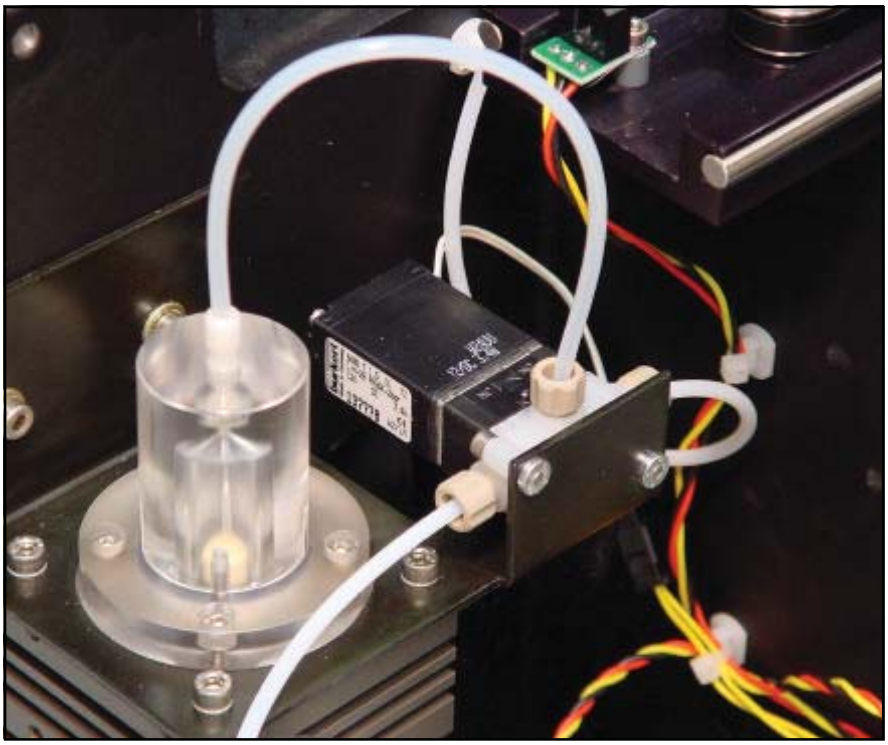
5.1.3.7. Changing the dispensing pump motor

a) Remove the dispensing pump.
b) Remove the motor by removing the corresponding screws.
c) Unscrew the ceramic piston support. Handle with great care.
d) Loosen the Allen bolt and remove the stud and the axial bearing.
e) Fit the axial bearing and the stud on the new motor. The Allen bolt must coincide with the machined surface of the motor shaft.
f) Remove the fluidic chamber to access the ring seal and the plastic disc.
g) Clean off the used grease. Put new grease on the stud and on the piston support.
h) Fit the motor with the stud and the piston support on the pump body.
i) Clean the piston if it has been stained with lubricant grease.
j) Fit the plastic disc and the ring seal on the ceramic piston as shown in the diagram. See the assembly position of the disc.
k) Refit the fluidic chamber in the pump.



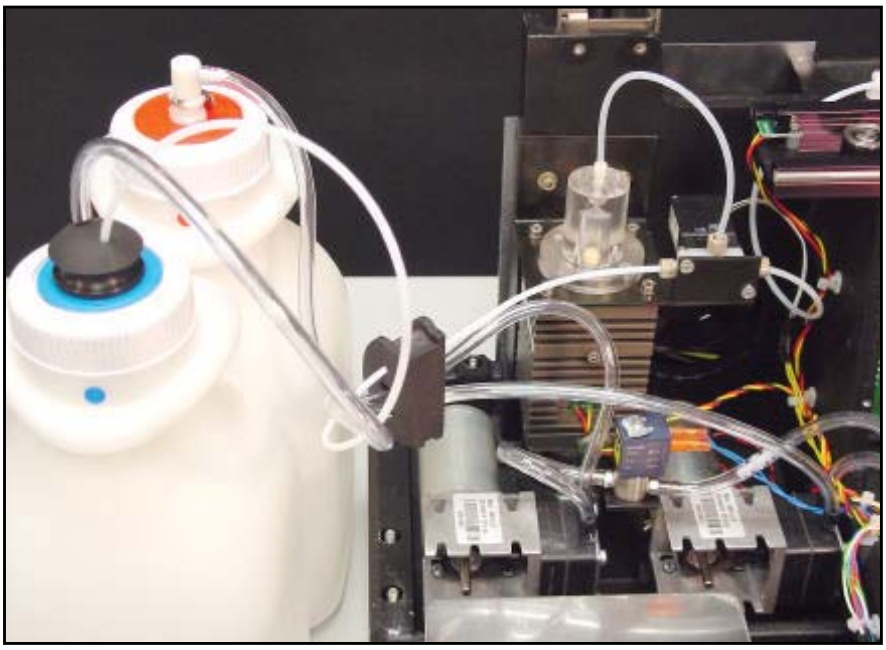
5.1.3.8. Changing the dispensing electrovalve

a) Remove the dispensing pump.
b) Disconnect the fittings and the electrical connector.
c) Remove the screws that hold the electrovalve in position. Access to these screws is easier if the dispensing pump is removed.
d) Fit the new electrovalve. Do not tighten the screws to excess so as not to deform the plastic body of the electrovalve and damage its leakproof quality.



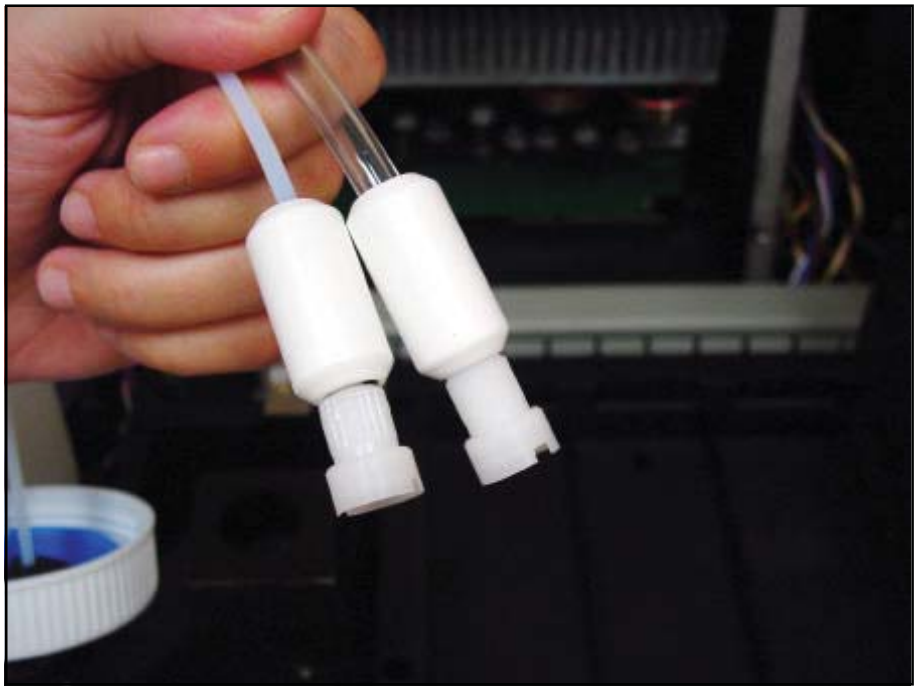
5.1.3.9. Changing the container tube unit

a) Remove the front housing.
b) Disconnect the fittings and the tubes. Remove the grommet from the back housing.
c) Fit the new unit.



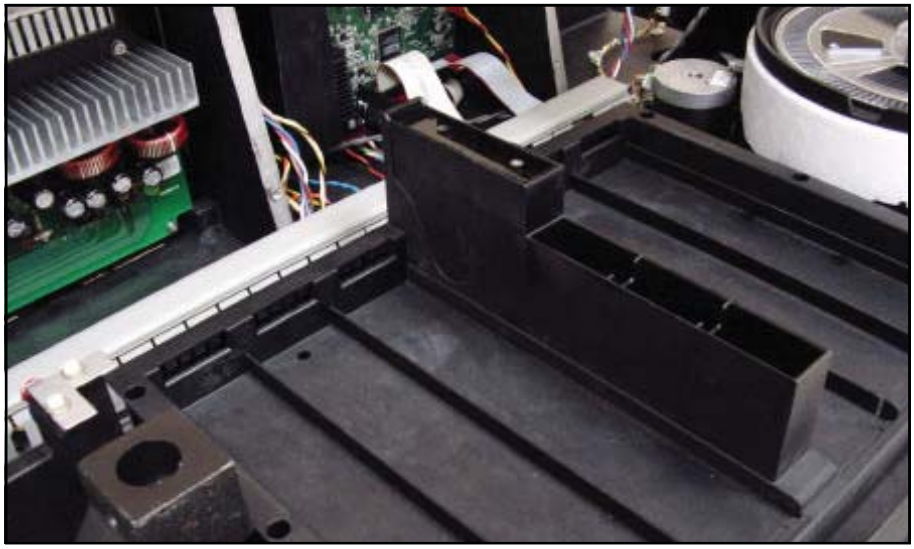
5.1.3.10. Changing the distilled water container filters

a) Unscrew the lid and remove the tubes from the distilled water container.
b) Remove the Teflon tube filter by unscrewing the fitting.
c) Remove the PVC tube filter by pulling on the filter.
d) Fit the new filters and replace the tubes in the container.



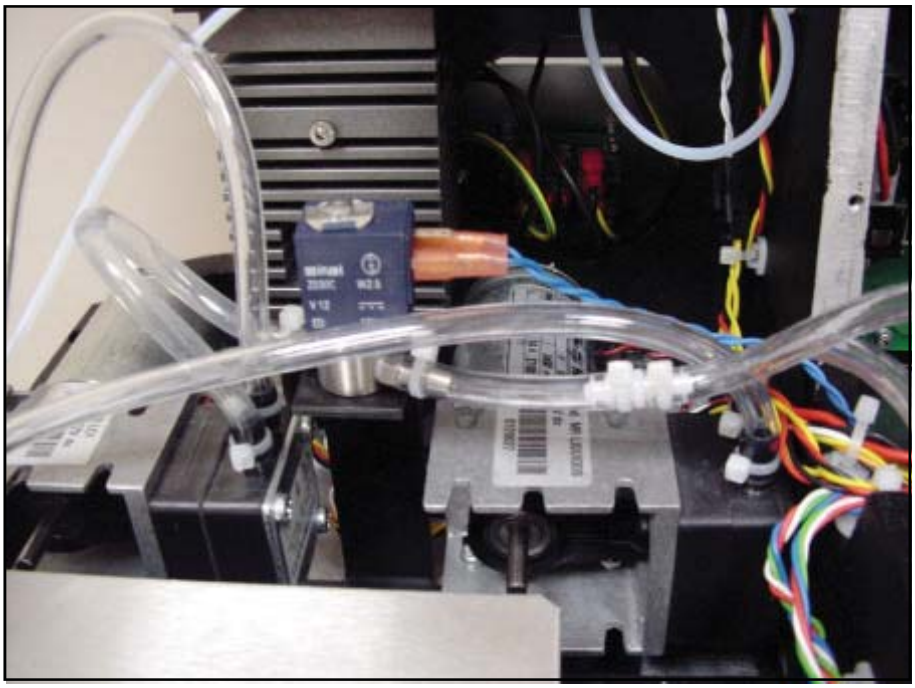
5.1.3.11. Removing the racks tray

a) Remove the front housing.
b) Remove the screws that hold the tray in position.
c) Disconnect the electrical hose from the detection board and the PVC tubes in the washing station.
d) When you refit the tray, check that the PVC tubes are correctly connected.



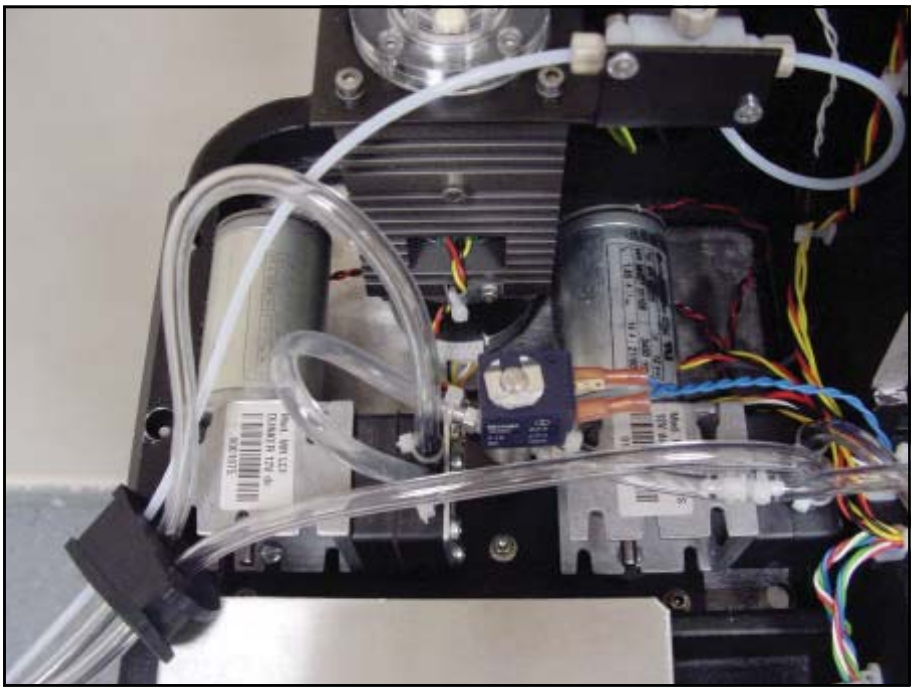
5.1.3.12. Changing the washing electrovalve

a) Remove the front housing.
b) Disconnect the PVC tubes and the electrical connector.
c) Remove the lower screws that hold the electrovalve in position.
d) Fit the new electrovalve.



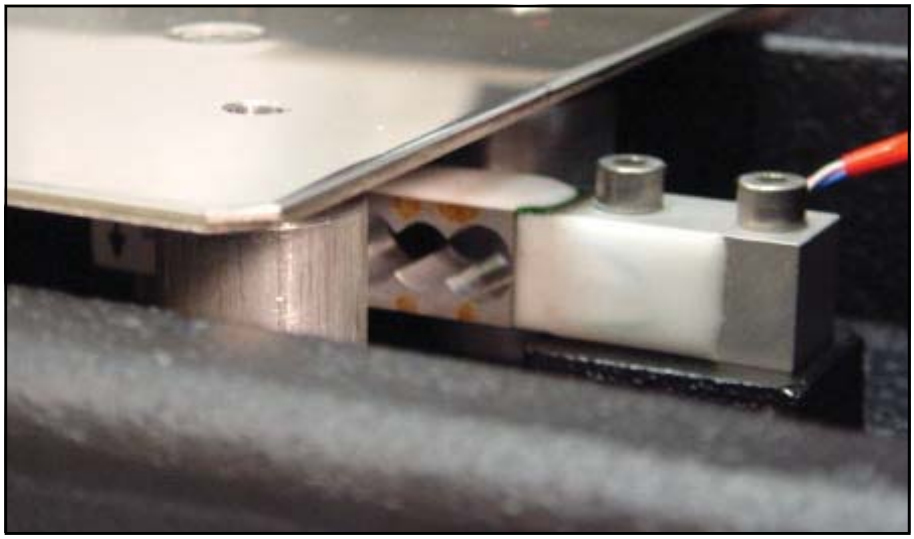
5.1.3.13. Changing the washing pumps

a) Remove the front housing.
b) Disconnect the PVC tubes from the pumps and from the wash electrovalve.
c) Remove the 3 screws that hold the pump support to the base.
d) Fit the new pump.



5.1.3.14. Changing the load cell of the level control scales

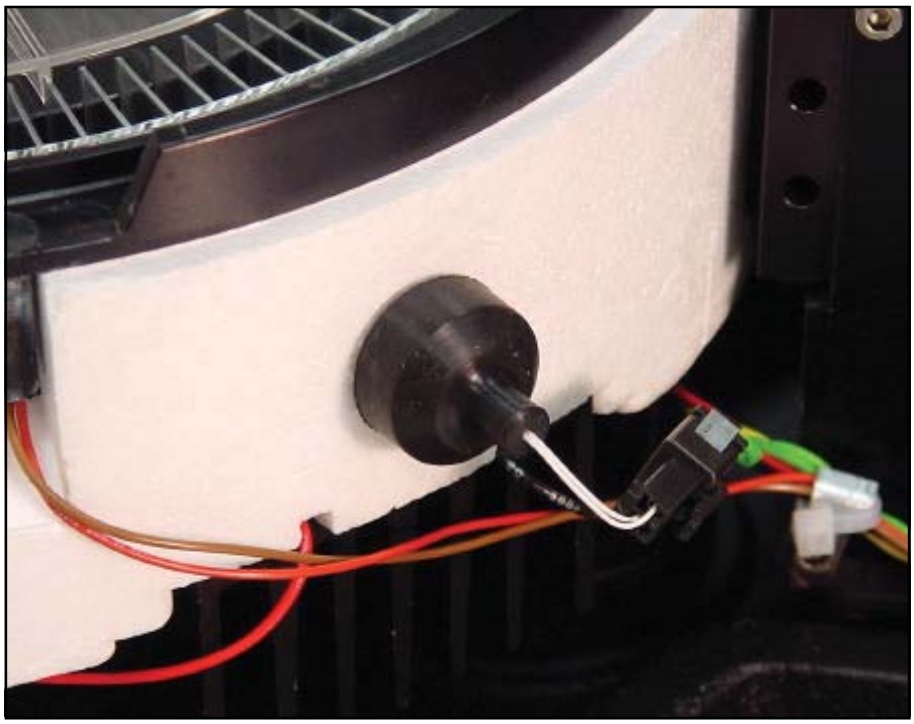
a) Remove the front housing.
b) Disconnect the electrical hose and remove the screws that hold the load cell to the base.
c) Remove the load cell to be changed.
d) Fit the new load cell. The load cell is very sensitive and must be handled with care. Any slight knock may deform it and render it useless.



5.1.4. Reactions rotor and reading

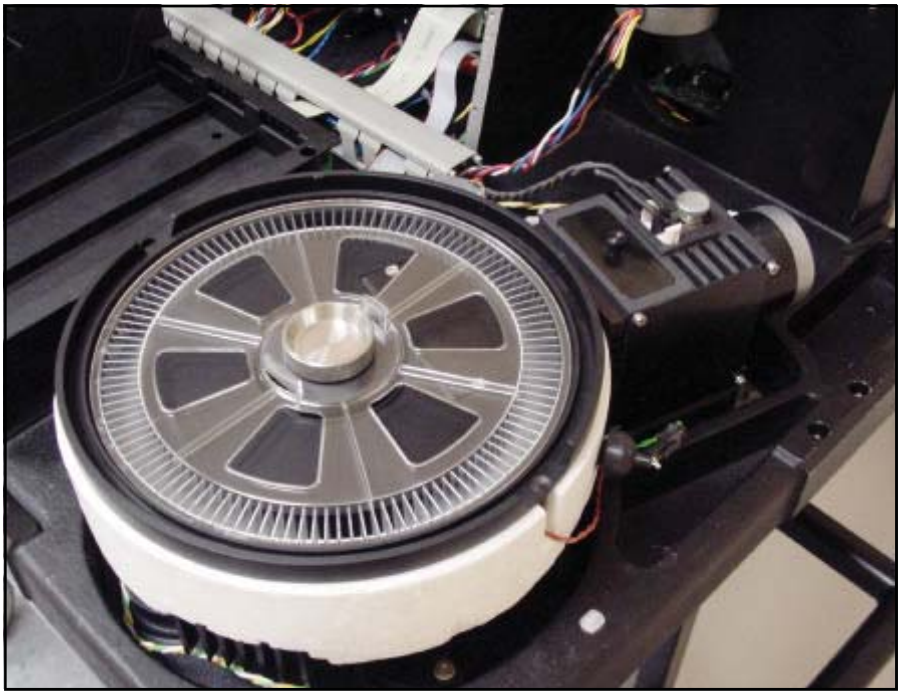
5.1.4.1. Changing the rotor temperature probe

a) Remove the front housing.
b) Disconnect the electrical hose
c) Remove the thermal insulation from the temperature probe.
d) Remove the probe.
e) Clean the thermal silicone form the housing and put new thermal silicone on the end of the new probe.
f) Fit the new probe.



5.1.4.2. Fully removing the rotor

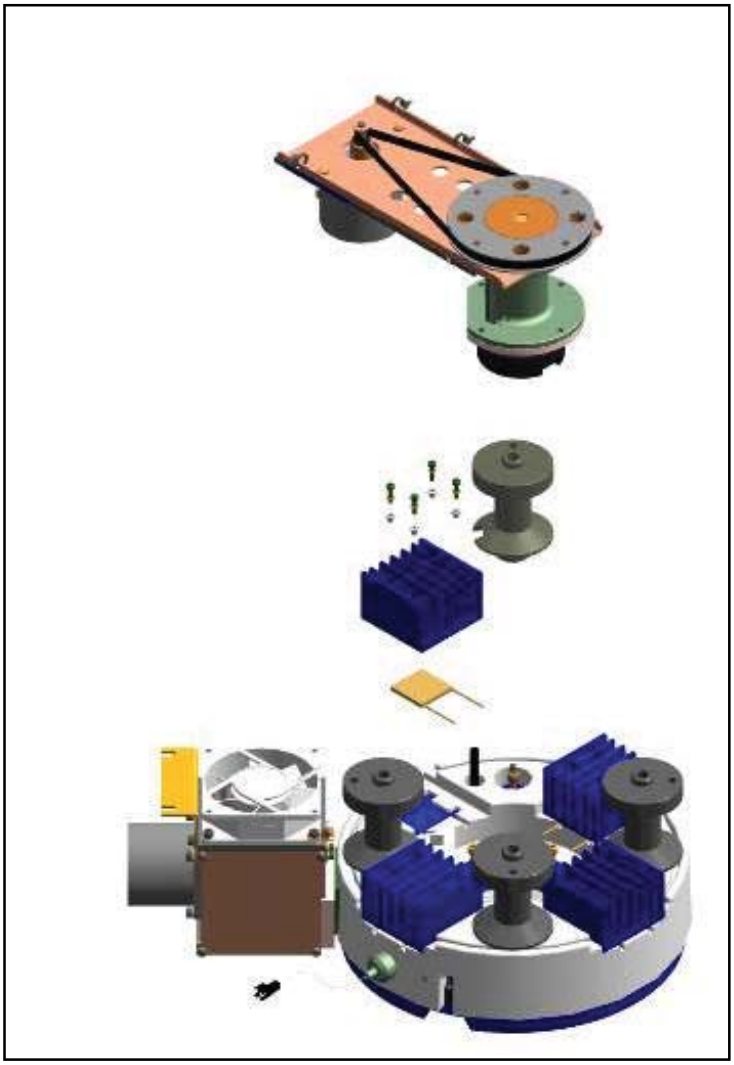
a) Remove the front housing.
b) Disconnect the electrical hoses.
c) Remove the rotor from the base by taking out the 3 leg screws and the 2 bracket screws.



5.1.4.3. Changing the rotor Peltier cells

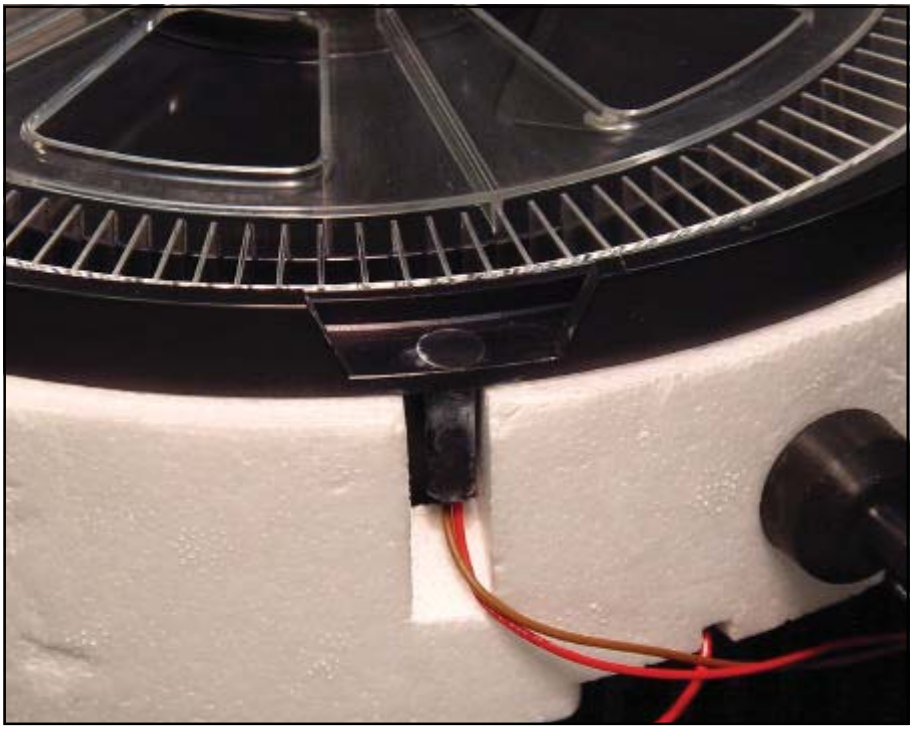
a) Remove the complete rotor.
b) Remove the corresponding radiator. If the cell is the one below the transmission system, said system must be first removed. For this, proceed as follows:
- Remove the rotor centerer (see instructions for changing the start photodetector of the rotor).
- Remove the transmission system by taking out the corresponding 4 screws. By appropriately positioning the rotor pulley, you can access the 4 screws through the 4 pulley holes. Also remove the column shown in the photograph.

c) Unsolder the Peltier to be replaced and solder the new one in its place. Exactly reproduce the original cabling.
d) Clean the thermal silicone from the heating channel and from the radiator with alcohol. Put new thermal silicone on both sides of the new Peltier.
e) Refit the system.



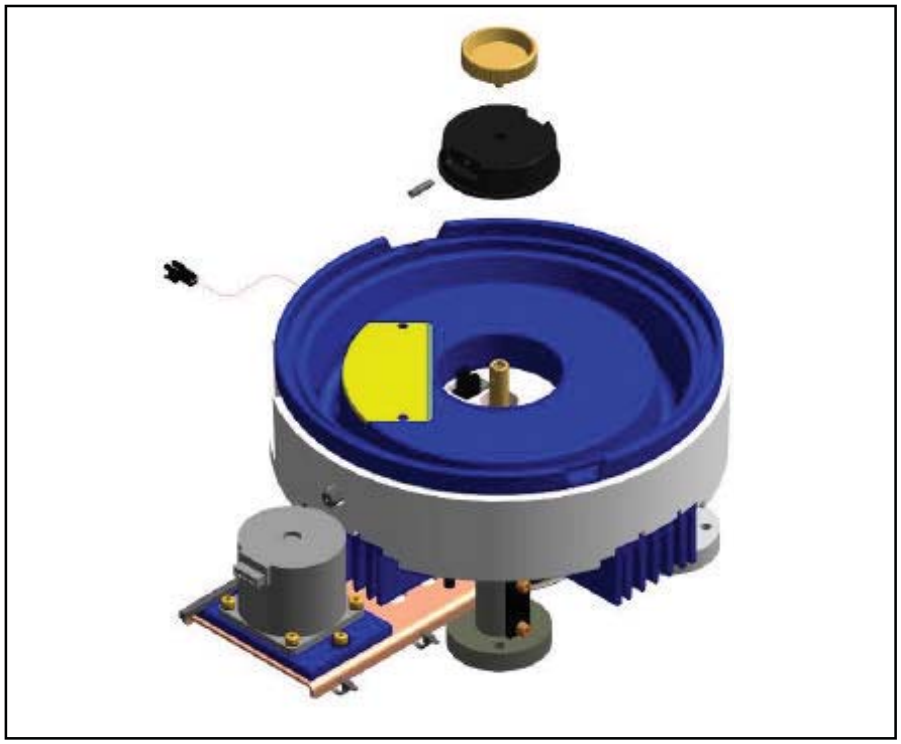
5.1.4.4. Changing the rotor cover detector

a) Remove the front housing.
b) Disconnect the detector to be replaced.
c) Remove it from its housing and take it out.
d) Clean the remnants of the original glue from the housing.
e) Place a little adhesive on the detector housing and then introduce the new detector.



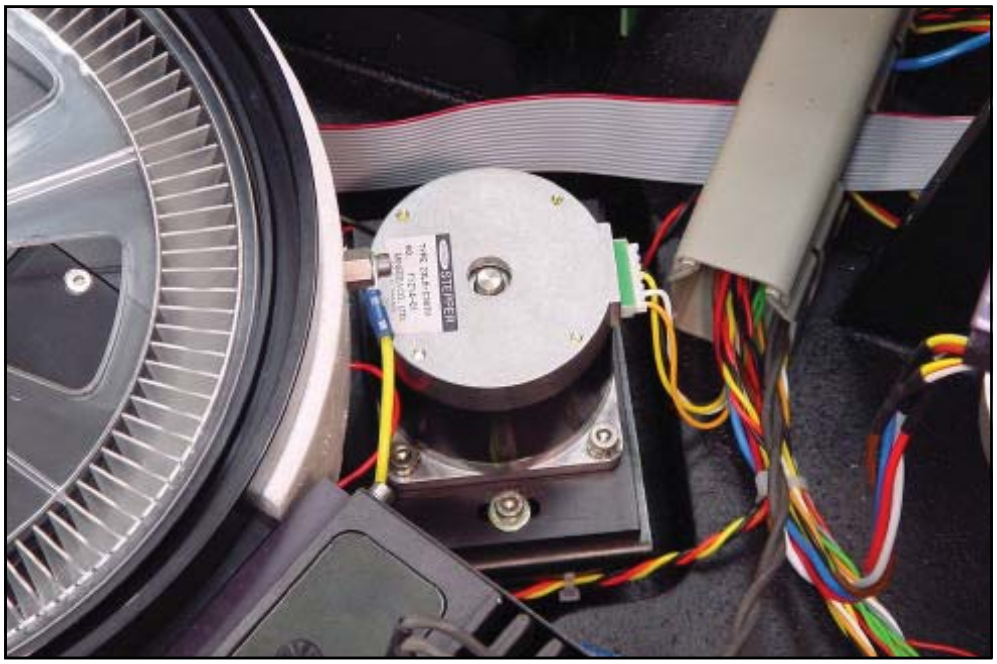
5.1.4.5. Changing the rotor start photodetector

a) Loosen the Allen bolt on the rotor centerer and take it out by pulling upwards.
b) Remove the start photodetector board. Unsolder this board from the electrical hose and solder the new one.
c) Refit the system and check that the centerer turns freely. Fix the allen stud with threadlock glue.



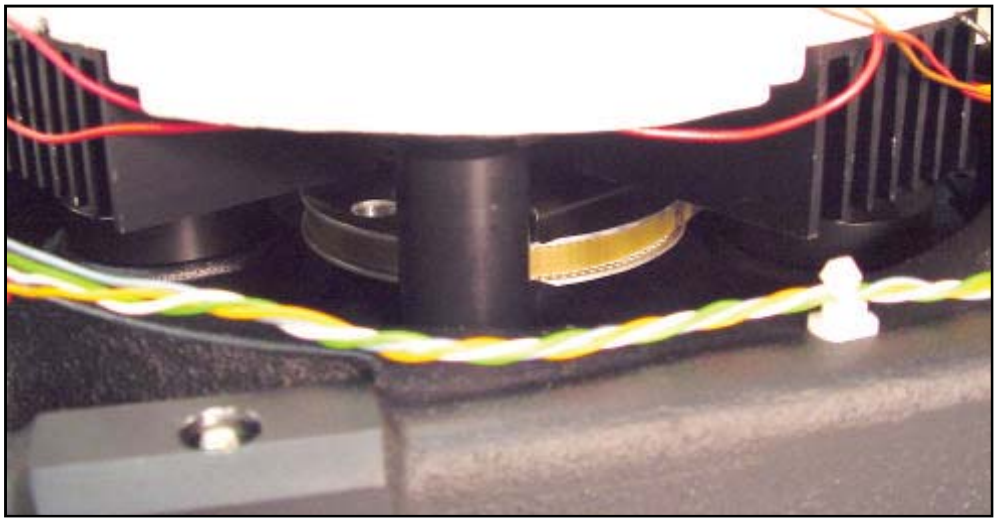
5.1.4.6. Changing the rotor motor

a) Remove the complete rotor.
b) Disconnect the motor to be replaced.
c) Remove the pulley from the motor by loosening the Allen bolt.
d) Fit the pulley on the new motor. The Allen bolt must coincide with the machined surface of the motor shaft. Put screwfastener on the bolt and tighten it.
e) Fit the new motor on the unit. The transmission belt must be tight.
f) Perform the miss test on the rotor motor and the rotor positioning test in the service program to check that the belt tension is correct and that the system functions correctly.



5.1.4.7. Changing the rotor belt

a) Remove the complete rotor.
b) Loosen the motor to free the belt to be replaced.
c) Fit the new belt, tighten it and then fasten the motor.
d) Perform the miss test on the rotor motor and the rotor positioning test in the service program to check that the belt tension is correct and that the system functions correctly.



5.1.4.8. Changing the lamp

The analyzer is fitted with a 12 V 20 W halogen lamp with an estimated average lifetime of 1,000 hours. It is recommended that you change the lamp every year even though its lifetime has not run out. When the lamp needs to be changed, access the *Change lamp* utility of the user program and follow the steps indicated by the program itself. To replace the lamp, proceed as follows:

a) Remove the rotor cover.
b) Remove the two screws that hold down the cover of the optics and remove the cover.
c) Loosen the Allen screw that holds the fastening tab of the lamp holder.
d) Push the tab back.
e) Remove the lamp holder, loosen the Allen screw and take out the lamp.
f) Insert the new lamp, pushing the terminals to the back. Tighten the Allen screw until the lamp is securely in place. Do not touch the lamp bulb with your fingers. To handle the lamp, use the wrapping, cutting it at the terminal end and squeezing it until they come out.
g) Put the lamp holder back in place. Put the tab in position and fasten the Allen screw.
h) Place the optics cover back in position and tighten the screws that hold it in place. Put the rotor cover back.
i) The lamp does not require any adjustment, but it can be placed in the analyzer in two possible positions by turning it 180º around its longitudinal axis. The program itself requires the user to place the lamp in the two possible positions and check in which of the two maximum light intensity is obtained in the optical system.
j) Recalculate and save the reference integration time in the photometry test.

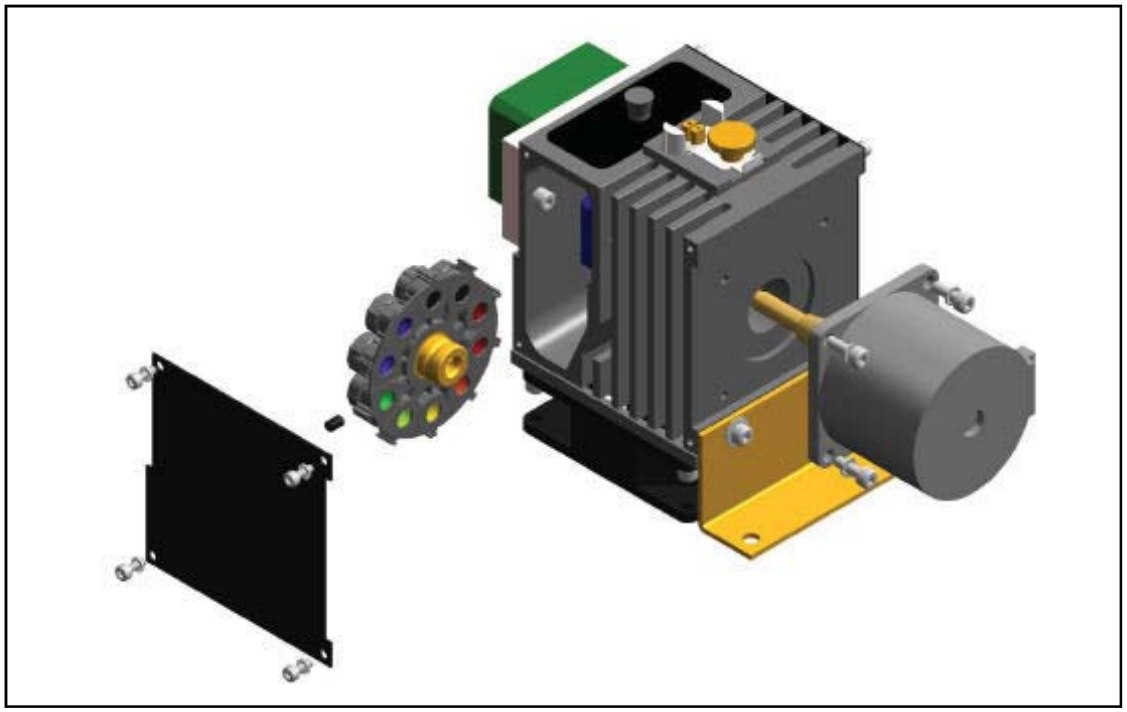
5.1.4.9. Changing an optical filter

a) Access the *Filter Wheel Configuration* screen of the user or service program. Indicate which filter is to be changed (position 1-9) and click on the *Change filter* button.
b) Remove the rotor cover.
c) Remove the two screws that hold down the cover of the optics and remove the cover.
d) Remove the filter wheel cover by simply pulling on it.
e) Remove the top filter using a pair of fine pliers.
f) Position the new filter by pressing down until it is correctly in place.
g) Do not leave the position free without putting a filter holder in place. If no filter is required in this position, put a covered filter holder in place.
h) Place the filter wheel cover and the optics cover back in position and tighten the screws that hold it in place. Put the rotor cover back.

i) If it is different, enter the wavelength of the new filter that has been installed.

5.1.4.10. Configuration of the filter wheel

To change the filter wheel, it is not necessary to remove the rotor from the base.
a) Remove the front housing.
b) Remove the side cover of the lighting system.
c) Loosen the Allen bolts that holds the filter wheel in place.
d) Remove the motor. On removing the motor, joined to the wheel shaft, the wheel comes free.
e) Place the new filter wheel in position and introduce the motor with the shaft in position. The Allen bolt must coincide with the machined area of the shaft. Put screwfastener on the bolt.
f) Fit the wheel to the shaft. Check that the rotor turns freely without mechanical interference.
g) Do the motor adjustments with the service program.

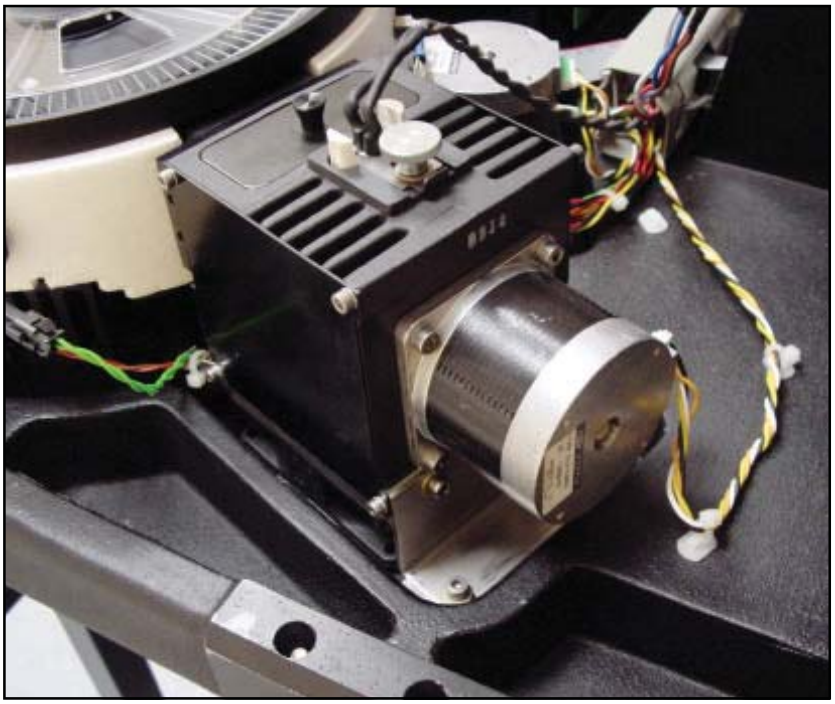


5.1.4.11. Changing the filter wheel start photodetector

a) Remove the complete rotor.
b) Remove the lighting system.
d) Remove the start photodetector board. Unsolder this board from the electrical hose and solder the new one.
e) Refit the system and check that the wheel turns freely.
f) Do the motor adjustments with the service program.

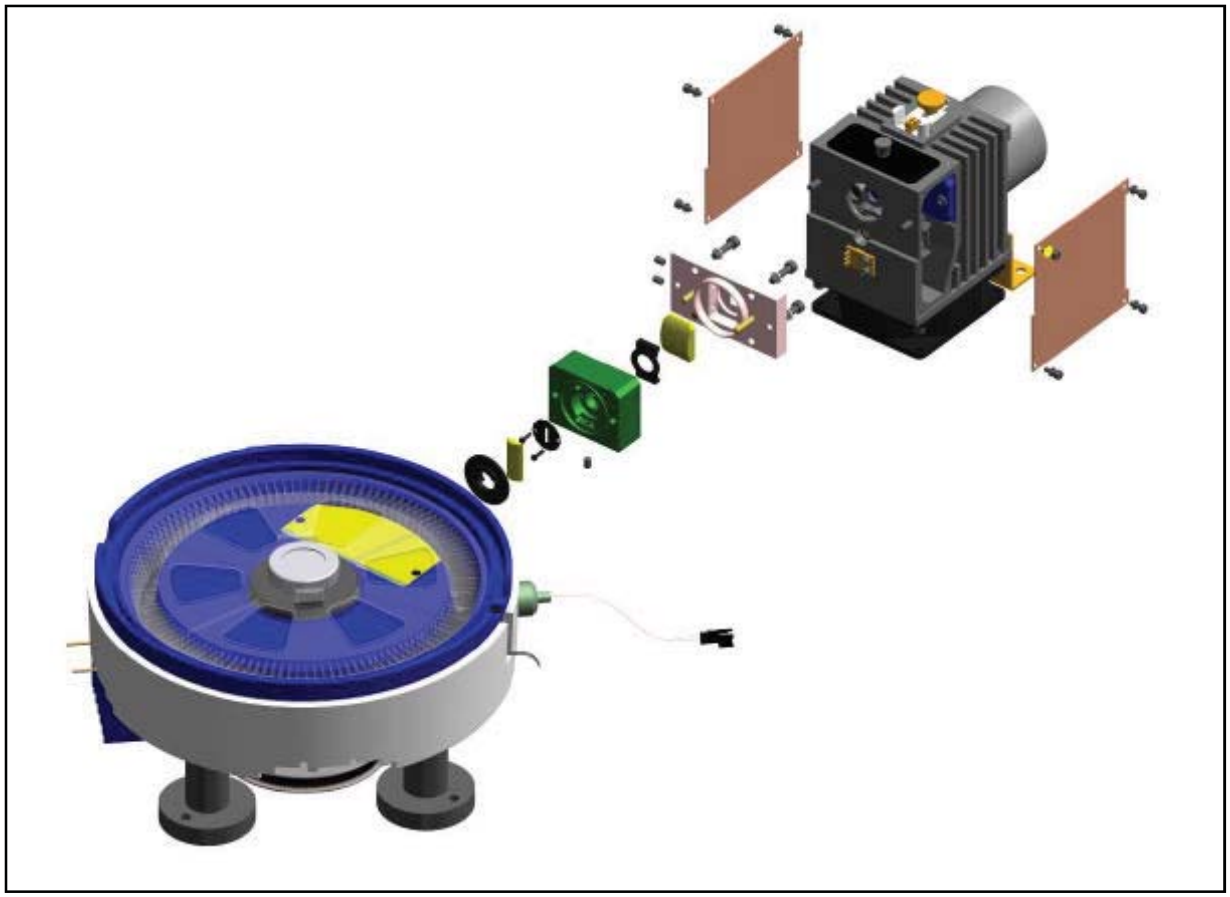
5.1.4.12. Changing the filter wheel motor

To change the filter wheel motor, it is not necessary to remove the rotor from the base.
a) Remove the front housing.
b) Remove the side covers of the lighting system.
c) Loosen the Allen bolt that holds the filter wheel in place.
d) Remove the motor. On removing the motor, joined to the wheel shaft, the wheel comes free.
e) Loosen the Allen bolt that holds the filter wheel shaft to the motor.
f) Fit the wheel shaft on the new motor. The Allen bolt must coincide with the machined surface of the motor shaft. Put screwfastener on the bolt and fit the wheel shaft to the motor.
g) Put the motor with the wheel shaft in position, introducing the shaft in the filter wheel. The Allen bolt must coincide with the machined area of the shaft. Put screwfastener on the bolt.
h) Fit the wheel to the shaft. Check that the rotor turns freely without mechanical interference.
i) g) Do the motor adjustments with the service program.



5.1.4.13. Changing the lenses

a) Remove the complete rotor.
b) Remove the side covers of the optic.
c) Remove the lighting system.
d) See the illustration and remove the desired lens as shown.



5.1.4.14. Changing the optical fan

a) Remove the complete rotor.
b) Turn the rotor over to access the bottom and remove the fan to be replaced.
c) Fit the new fan and put the rotor on the base again.

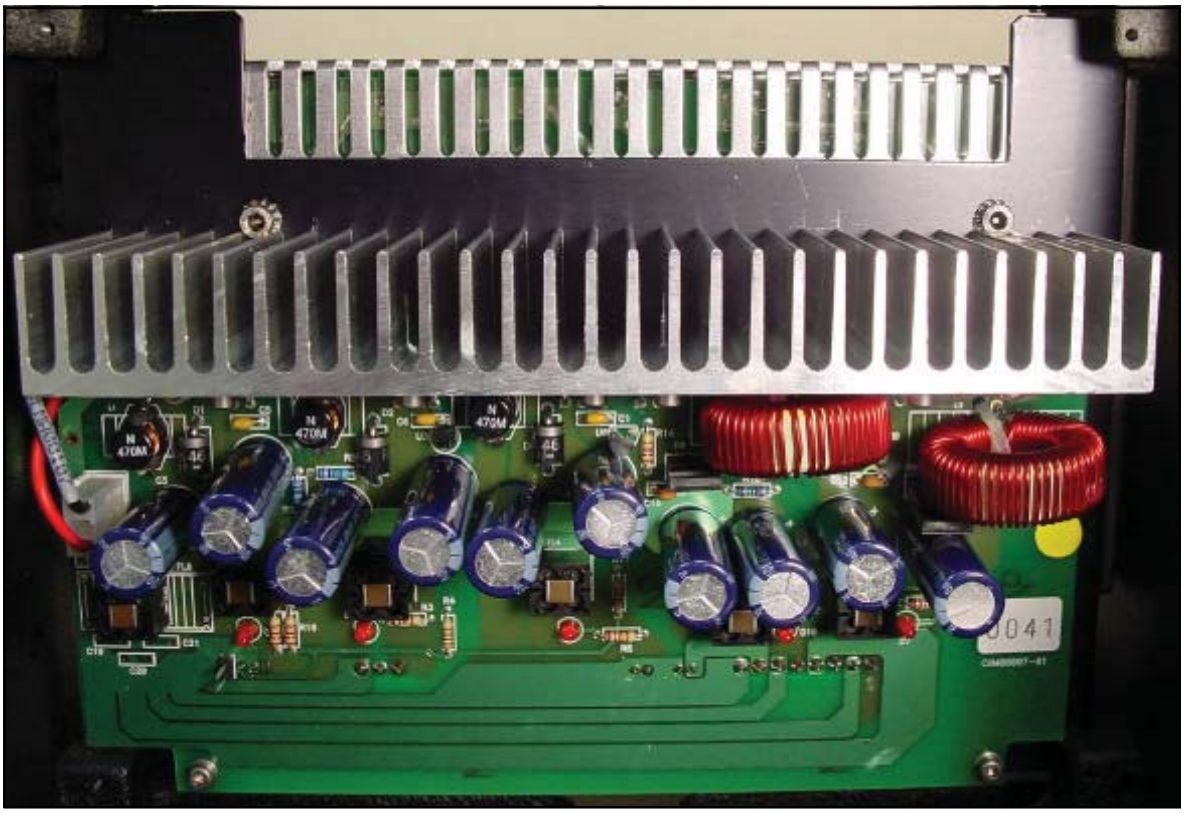
5.1.5. Electronic Systems

5.1.5.1. Changing the microprocessor board

a) Remove the back cover of the electronics. Unplug the connectors of the 2 fans from the cover.
b) Remove the front housing of the analyzer.
c) Remove the front cover of the electronics.
d) Disconnect all the connectors from the microprocessor board from the front of the analyzer.
a) From the back of the analyzer, remove the 4 screws that hold the board to the base. These screws also hold earth connections.
e) Remove the board from the back of the analyzer.
f) When installing the new board, reconnect all the connectors carefully. Remember to connect the earth connections on the board fastening screws.

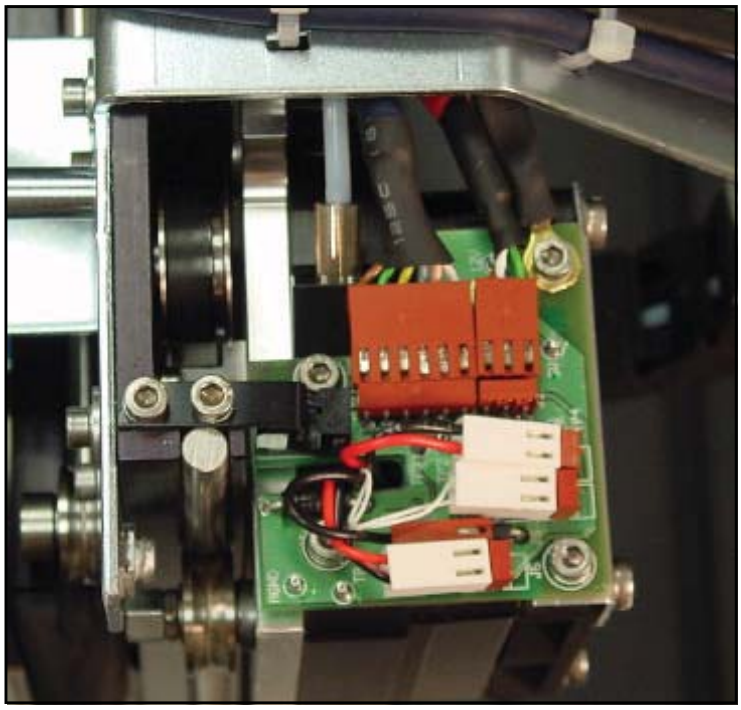
5.1.5.2. Changing the power supply board

a) Remove the back cover of the electronics. Unplug the connectors of the 2 fans from the cover.
b) Disconnect all the connectors from the power supply board.
c) Remove the 4 screws that hold the board to the base.
d) Remove the board.
e) When installing the new board, reconnect all the connectors carefully.



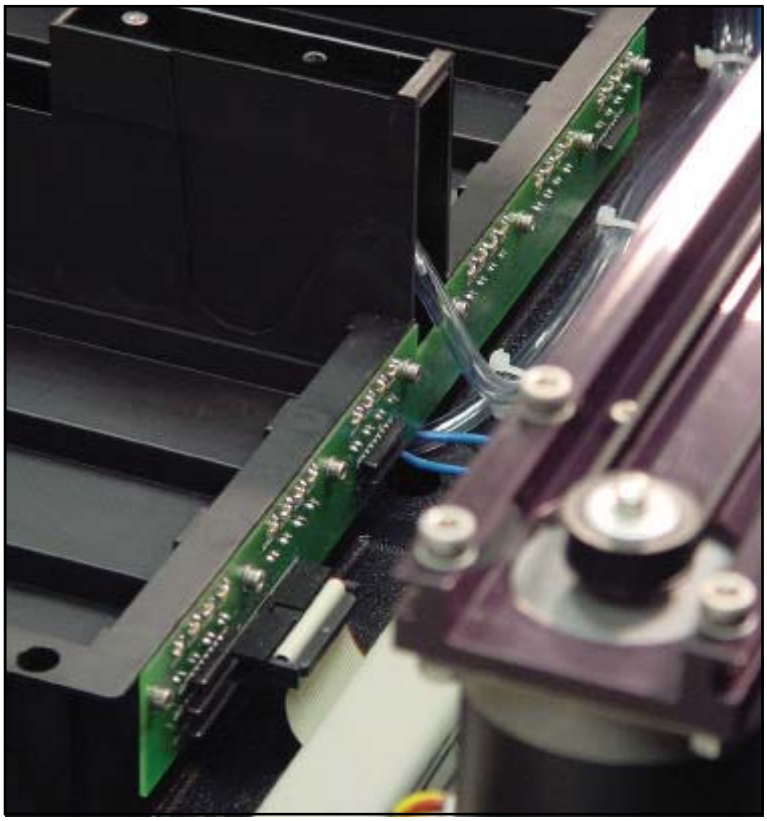
5.1.5.3. Changing the needle conditioning board

a) Remove the arm housing
b) Unplug the connectors carefully.
c) Change the board.
d) Plug in the connectors again and fit the arm housing.



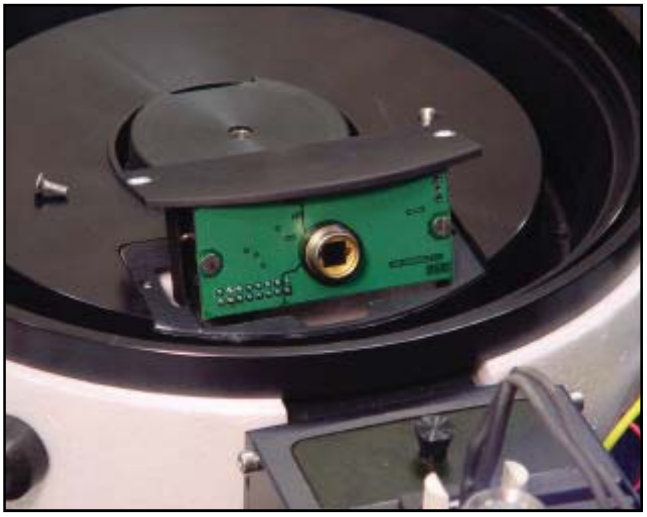
5.1.5.4. Changing the racks detection board

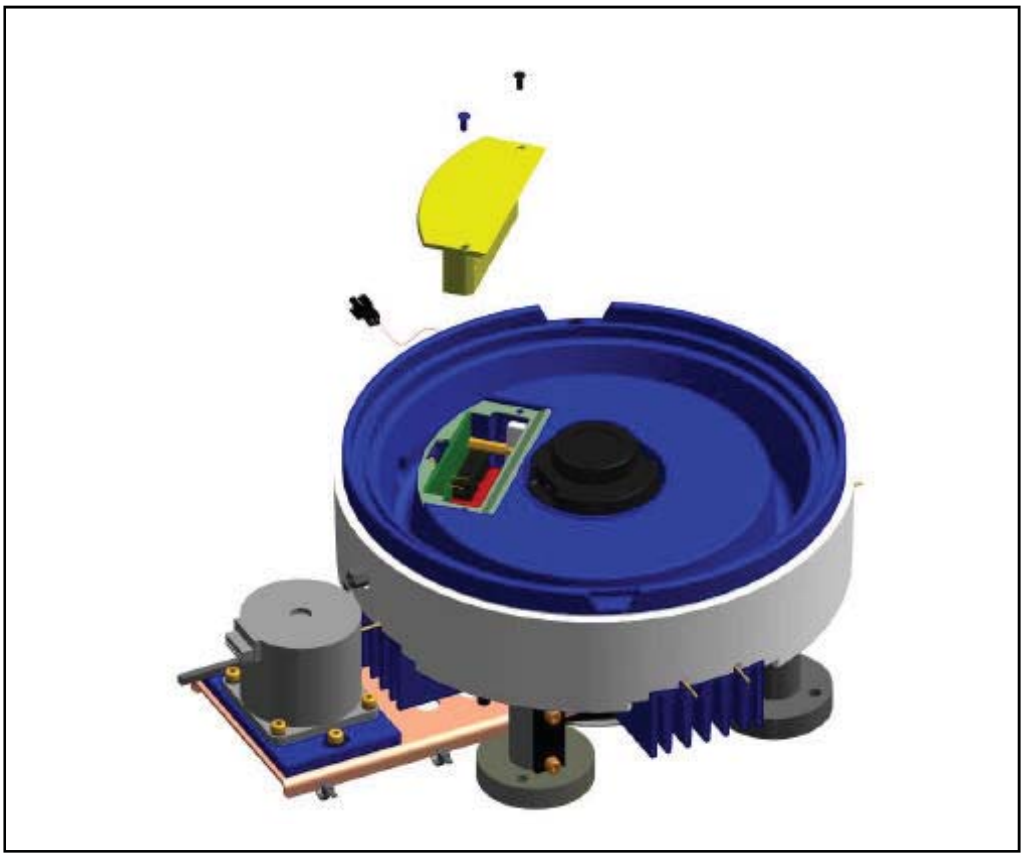
a) Remove the front housing.
b) Remove the racks tray.
c) Disconnect the electrical hose from the racks detection board.
d) Remove the board loosening the screws and moving it downwards.
e) Install the new board.



5.1.5.5. Changing the photometric system board

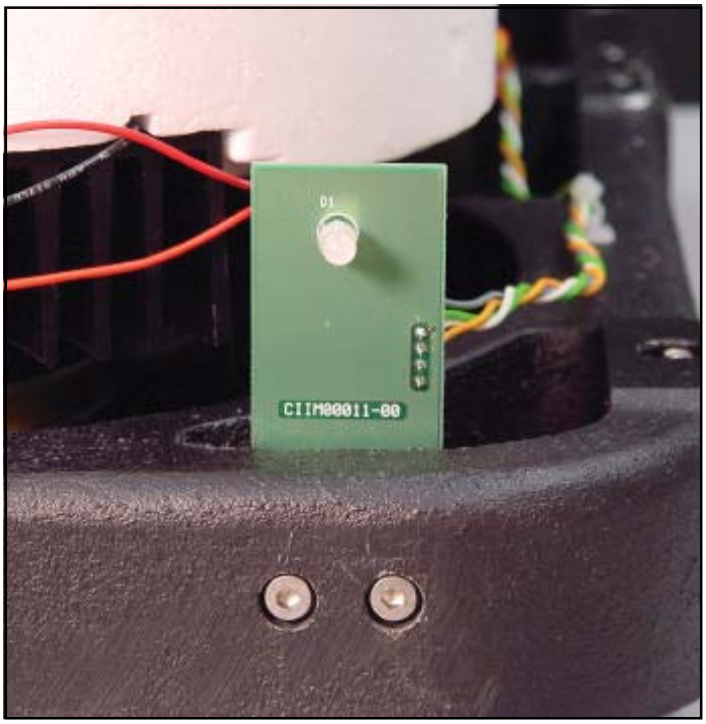
a) Remove the screws from the photometric system support cover.
b) Slightly move the support cover towards the centre of the rotor and remove it from its housing.
c) Disconnect the flat band from the photometric system board.
d) Change the board.
e) Refit the support cover in place ensuring that the flat band is not folded.





5.1.5.6. Changing the front indicator board

a) Remove the front housing.
b) Disconnect the hose from the board.
c) Remove the board from the front indicator.
d) Install the new board.



5.1.5.7. Change the communications board

a) Remove the left back cover of the electronics.
b) Disconnect the connector from the board.
c) Unscrew the board from the cover.
d) Install the new board.

5.1.5.8.Changing the firmware program

The firmware of the analyzer resides in a permanent flash memory. The change of this program can be made through the computer without the need for changing the memory chip. For this, follow the instructions in the section *Loading new firmware versions* of the Service Program. See section 4.6

5.2. RECOMMENDED PREVENTIVE MAINTENANCE

It is advisable to carry out at least the following actions for weekly maintenance:
Take the following steps in the user program:

• A cycle NSL (New System Liquid) with air. Remove the bottle with system liquid and make the NSL
• A cycle NSL with washing solution. Put the bottle with washing solution and make the NSL
• A cycle NSL with system liquid. Put the bottle with system liquid and make the NSL

Clean the outside of the end with 70º alcohol, use the utility of end change to access it.

It is recommended that the following maintenance actions are performed annually or every 1,000 working hours.

Operating arm
1. Check the state and tension of the belts.
2. Replace the components in an unsatisfactory state.
3. Make the adjustments and tests related to the service program.

Dispensing system.
1. Exhaustively wash all the dispensing circuit with washing solution and rinse it with distilled water.
2. Remove and clean the needle. Check its state.
3. Check the state of all the dispensing circuit tubes. Check the absence of obstructions or diameter changes.
4. Check the leakproof quality of the fittings and the 3-channel electrovalve body.
5. Check the leakproof quality of the dispensing pump fitting and seal. Check there is no loss and no bubbles.
6. Clean the distilled water container filters.
7. Clean the washing station.
8. Check the state of the washing system tubes.
9. Check the leakproof quality of the fittings and the 2-way electrovalve body.
10. Replace the components in an unsatisfactory state.
11. Make the adjustments and tests related to the service program.

Reactions rotor
1. Check the state of the heating channel.
2. Check the belt tension.
3. Replace the components in an unsatisfactory state.
4. Make the adjustments and tests related to the service program.

Optical system
1. Check the state of the lamp.
2. Clean the filters.
3. Clean the lenses.
4. Clean the photodiode.
5. Replace the components in an unsatisfactory state.
6. Make the adjustments and tests related to the service program.

5.3. CARE AND CLEANING

5.3.1. General care of the analyzer

a) Never use detergents or abrasive products for cleaning the surface of the analyzer. Use only a damp cloth with water and pH-neutral soap.
b) If a reagent or corrosive product spills or splashes onto the apparatus, clean it with a damp cloth and soap immediately. If necessary, protect your hands with appropriate laboratory gloves.
c) All the components of the analyzer have drainage conduits leading to the exterior to enable the elimination of any liquid spilled and to prevent the apparatus from flooding. If the spillage is significant, the liquid spilled onto the table through the drainage conduits and the analyzer must be adequately cleaned.
d) When not in use, close the main cover of the analyzer to protect it from dust.

5.3.2. Cleaning the optical system

The components of the optical system must be cleaned periodically in order to keep them free from dust and dirt. These components are the lamp, the lenses, the filters and the photodiode. The recommended necessary material is as follows:
- Special paper for cleaning optical components (non-abrasive paper which does not leave solid residue).
- Ether and alcohol solution at 50%
- Cotton wool buds.
- Small bellows.

All the optical components must be handled in an area of maximum cleanliness and with great care given that they are fragile and delicate. To remove them and refit them, the corresponding instructions given in the *Maintenance* chapter must be carefully followed. Avoid touching the useful area of these components with fingers. The lenses, filters and the photodiode must be held by the sides. Do not touch the lamp bulb. To handle the lamp, use the wrapping, cutting it at the terminal ends and squeezing them until they come out. To clean the optical components, bear in mind the following:

a) Remove the dust on the surface of the component with the bellows. This will avoid scratching by particles when cleaning with paper.
b) Carefully clean the surface of the component with the cleaning paper.
c) If the dirt is persistent or greasy, clean the component with the paper moistened with the alcohol and ether solution. Then dry with dry paper. To clean the filters or the window of the photodiode, use the cotton wool buds with the paper

in difficult and delicate areas.

d) Finally, it is recommended that you use the bellows once again, thus removing any remains of paper or cotton.

5.3.3. Cleaning the dispensing system

It is a good idea to recommend to the user that he configures the analyzer to automatically wash the dispensing system with washing solution at the start and end of each working day to ensure that it is completely free from air bubbles and is perfectly clean. With the initial wash, the system is ready for working in optimum conditions during the entire working day, offering maximum performance. With the final wash, the analyzer cleans the needle at the end of the working day,

keeping it in optimum condition for future working days. Additional washing of the dispensing system can be performed using the *Dispensing system wash* utility of the user program. The analyzer must be in standby mode.

The user himself should clean and check the state of the distilled water container filters at least once every 3 months. The service operations should also check the state of these filters.

If the needle is obstructed by solid residue, it must be removed and cleaned using the metal cleaning rod supplied with the analyzer. For this, the *Remove the dispensing needle* utility should be used. It is also recommendable to clean the outside surface of the needle with a piece of cotton or a soft cloth dampened with alcohol. The needle must be replaced if it is noticeably deteriorated.

5.3.4. General cleaning of the interior of the apparatus

It is important for the interior of the instrument to be free from dust at all times in order to preserve the correct functioning of the different components. For this, remove the front housing of the analyzer and carefully clean the dust inside the instrument.

A I. TECHNICAL SPECIFICATIONS

PLEASE NOTE
The manufacturer accepts no liability for damage caused by incorrect use of the apparatus.

GENERAL SPECIFICATIONS

Automatic random and continual access analyzer aimed at giving results per patient, with direct photometric reading over a reactions rotor.

Preparation cycle time	15 s (up to 240 prep/h)
Warm-up time	25 min
Reading time for each preparation	Every 15 s, up to 15 min
Dimensions	1080 x 695 x 510 mm (42.5"x27.4"x20.1") (length x depth x height)
Weight	73 kg (162 lb)

REAGENTS AND SAMPLES TRAY

Positions for racks	6
Detection of up to 15 different types of racks	
Capacity of the sample racks	24
Maximum number of samples	120
ø13 mm, ø15 mm sample tubes (max. height 100 mm),	ø13 mm paediatric well
Capacity of the reagent racks	10
Maximum number of reagents	50 (plus 3 auxiliary fixed positions)
20 ml and 50 ml reagent bottles	
Possible configurations	

Sample racks	Reagent racks	Number of samples	Number of reagents
1	5	24	50
2	4	48	40
3	3	72	30
4	2	96	20
5	1	120	10

DISPENSING SYSTEM

NEEDLE

Detachable tip	
Vertical length	110 mm
Capacity level detection	
Self-adjustment of position	

NEEDLE THERMOSTATATION SYSTEM

Actuator	1 Peltier cell
Control	Fuzzy Logic
Thermostatation time	$\leq$ 6 s
Dispensation temperature	37°C
Trueness	± 0.5°C
Repeatability	± 0.5°C

DISPENSING PUMP

Ceramic piston with PTFE-graphite seal	
Piston diameter	8 mm
Stroke	25 mm
Dispensing volume	3 µL - 1250 µL
Resolution	0.126 µL
Fuzziness	<1% up to 3 µL
Dispensing rate	max. 880 µL/s
Programmable reagent volume	10 µL -440 µL
Programmable sample volume	3 µL -40 µL

NEEDLE WASHING SYSTEM

System liquid consumption	approx. 7 ml per preparation
System liquid container volume	2700 ml
Waste container volume	2700 ml
Waste and water level control per weighing (load cells)	

REACTIONS ROTOR AND READING

WELL ROTOR

Semi-disposable extractable methacrylate rotor	
Number of wells	120
Accepted reaction volumes	200 µL -800 µL
Light path length	6 mm

ROTOR THERMOSTATION SYSTEM

Actuators	4 Peltier cells
Control	PID
Working temperature	37°C
Trueness	± 0.2°C
Stability	± 0.1°C

OPTICAL SYSTEM

Halogen lamp	12 V, 20 W
Wavelength selection with compensated interferential filters	
Detection system with silicon photodiode and 20-bit AD integrator-converter	
Measurement range	from -0.05 A to 2.5 A
Reading speed	5 readings
Maximum number of filters	9
Base configuration of the filter drum	340, 405, 505, 535, 560, 600, 635, 670 nm
Wavelength precision	± 2 nm
Bandwidth	10 ± 2 nm
Digital resolution	≤ 0.0001 A
Base line stability	max. 0.004 A in 30 min, at 505 nm
Repeatability of the reading system (1 SD, 505 nm, with filter movement)	± 0.0005 A to 0.1 A (CV = 0.5%) ± 0.0003 A to 1.0 A (CV = 0.3 %) ± 0.0005 A to 2.5 A (CV = 0.2 %)
Optical repeatability between wells	± 0.003 A at 340 nm ± 0.002 A to 505 nm, 670 nm
Precision	± 0.005 A to 0.1 A (± 5%) ± 0.015 A to 0.5 A (± 3%) ± 0.02 A to 1.0 A (± 2%) ± 0.04 A to 2.0 A (± 2%) ± 0.05 A to 2.5 A (± 5%) at 340 nm, 405 nm, 505 nm

MINIMUM COMPUTER REQUIREMENTS

Pentium IV processor or higher
Windows 98 or higher
512 Mb RAM
20 Gb free hard disk space
CD-ROM
VGA Monitor, minimum resolution of 640x480
Mouse
RS-232 serial channel or USB connector
The insulation level of the communications channel of the A25 analyzer is *reinforced* (the insulation of the communications channel of the computer must also be reinforced)(1)

POWER SUPPLY

Input voltage	125-230 Vac, 50/60 Hz
Power	300 VA
Electrical installation category (overvoltage category)	II
The power point must be officially approved, earthed and the cable must have a minimum cross-section of 1.5 $mm^{2.}$	

ATMOSPHERIC CONDITIONS

Interior use	
Height	< 2500 m
Temperature	10°C - 35°C
Relative humidity	< 75%
Contamination level	2

(1) Reinforced insulation is that which ensures protection equal to or higher than double that provided by the main insulation.
The main insulation is that whose failure could lead to a risk of electric shock *(EN 61010-1).*

COMPLIANCE WITH APPLIED DIRECTIVES AND STANDARDS

Directive 98/79/CEE regarding sanitary products for in vitro diagnostic use

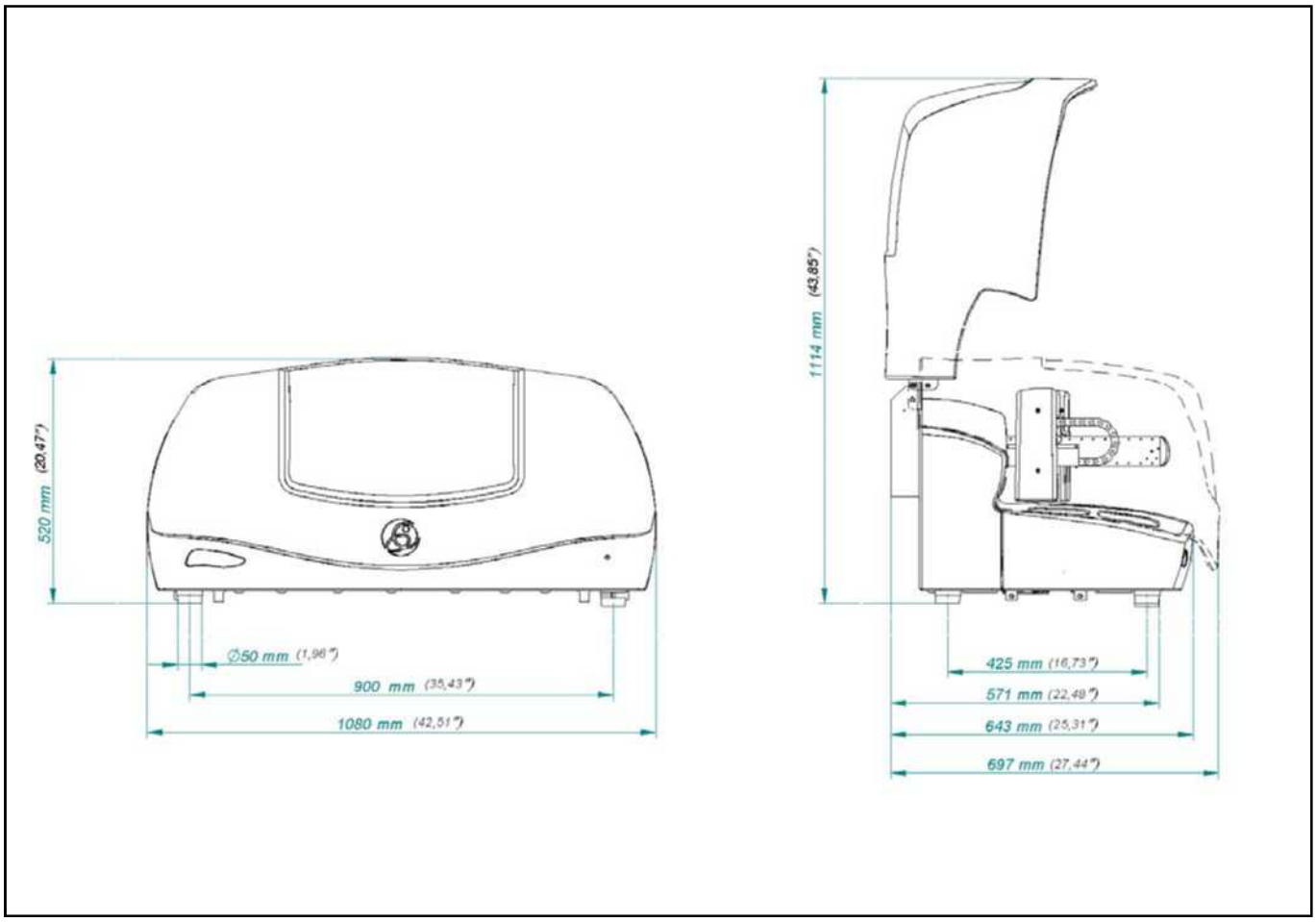
- UNE EN 61010-1:1996+ A2:1996+ERRATUM:1998 “Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1 - General requirements” + A2 (96)
- UNE EN 61326:1999//A1:2000 “Electromagnetic equipment for measurement, control and laboratory use –ECM requirements. Part 1: General requirements”.
- UNE EN 61000-3-2:2001 “Electromagnetic compatibility (EMC) – Part 3: Limits –Section 2: Limits for harmonic current emissions”.
- UNE EN 61000-3-3:1997//A1(02) “Electromagnetic compatibility (EMC) – Part 3: Limits –Section 3: Limitation of voltage fluctuations and flicker in low-voltage supply systems”.
- UNE EN 55022 (00)//A1:2002 “Information technology equipment – Radio disturbance characteristics - Limits and methods of measurement”.
  Continuous conducted: Class A
  Radiated: Class A
- UNE EN 61000-4-2 (97)//A1(99)//A2(01) “Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 2: Electrostatic discharge immunity test”.
- UNE EN 61000-4-3 (98)//A1(99)//A2(01) “Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 3: Radiated, radio-frequency, electromagnetic field immunity test”.
- UNE EN 61000-4-4 (97)//A1(01)//A2(02) “Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 4: Electrical fast transient/burst immunity test”.
- UNE EN 61000-4-5 (97)//A1(01) “Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 5: Surge immunity test”.
- UNE EN 61000-4-6 (98)//A1(01) “Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 6: Immunity to conducted disturbances, induced by radio-frequency fields”.
- UNE EN 61000-4-11 (97)//A1(01)“Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques

– Section 11: Voltage dips, short interruptions and voltage variations immunity tests".

- UNE EN 22233-1992 (ISO 2233-1986). Packaging — Complete, filled transport packages and unit loads — Conditioning for testing
- UNE EN 24180-2-1992 (ISO 4180-1980). Complete, filled transport packages — General rules for the compilation of performance test schedules.
- UNE EN 22247-1992 (ISO 2247-2000). Packaging — Complete, filled transport packages and unit loads — Vibration tests at fixed low frequency
- UNE EN 22248-1992 (ISO 2248-1985). Packaging — Complete, filled transport packages — Vertical impact test by dropping

The special "waste container crossed out" symbol indicates that the product in question is subject to the selective waste collection principle as established in European Union Directive WEEE (Waste Electrical and Electronic Equipment).
Once the instrument's lifetime is completed it becomes waste and, as established in the directive, the said waste must be separated from domestic waste for its proper recycling. To this end, the manufacturer facilitates its elimination.

MAXIMUM SIZE OF ANALYZER



The manufacturer reserves the right to modify any technical specification without prior notice.

A II. ADJUSTMENT MARGINS TABLES

Main voltage measurement points

CIIM00007 Power supply board

TP1- 5V	[4.9-5.1] V
TP2 - 12V	[11.7 -11.9] V
TP3 - 12V	[11.8-12.2] V
TP4 - 12V	[11.8-12.2] V
TP5 - 12V	[11.8-12.2] V
TP36	[32-40] V

CIIM0006 Microprocessor board

TP50 - Vref Z motor	[3-4] mV
TP51 - Vref Ymotor	[3-4] mV
TP52 - Vref Xmotor	[3-4] mV
TP53 - Vref pump motor	[3-4] mV
TP54 - Vref filter wheel motor	[3-4] mV
TP55 - Vref rotormotor	[3-4] mV

Main adjustment values of the analyzer

	Tolerances
Operating arm positioning	
X axis loss of steps	
Loss of steps	[-3,3]
Y axis loss of steps	
Loss of steps	[-3,3]
Z axis loss of steps	
Loss of steps	[-3,3]
Loss of steps rotor motor	
Loss of steps	[-3,3]
Loss of steps filter drum motor	
Loss of steps	[-3,3]
Loss of steps pump motor	
Loss of steps	[-4,4]
XY position adjustment	
X origin	[11,51]
Y origin	[2,48]
X racks tray	[1337,1379]
Y racks tray	[311,359]
X washing station	[1337,1379]
Y washing station	[-5,45]
X rotor	[2870,2910]
Y rotor	[660,701]
Self-centering of needle	
X Offset	[-3,3]
Y Offset	[-3,3]
Level control scales	
Water 0 L (0 D)	[-3%,3%]
Water 1.35 L (1 D)	[35%,65%]
Water 2.7 L (2 D)	[95%,105%]
Waste 0 L (0 D)	[-3%,3%]
Waste 1.35 L (1 D)	[35%,65%]
Waste 2.7 L (2 D)	[95%,105%]
Level detection sensitivity	
Rack 2	[45,100]
Rack 5	[45,100]
Calculated (Adjusted)	[45,100]
Positioning of the dispensing point	
Dispensing rotor	[-10,30]
Fine rotor X	[2870,2910]
Filter wheel positioning	
Positioning	[-6,0]
Positioning of rotor in optic	
Positioning	[-12,6]
Needle thermostatation	
Set point temperature	[35.5,38.5]
Rotor thermostatation	
Set point temperature	[36,38]
Integration times	
F1 340 nm	[45,70]
F2 405 nm	[8,26]
F3 505 nm	[8,26]
F4 535 nm	[8,26]
F5 560 nm	[8,26]
F6 600 nm	[8,26]
F7 635 nm	[8,26]
F8 670 nm	[11,29]
Number of counts	
F1 340 nm	[750000,970000]
F2 405 nm	[840000,970000]
F3 505 nm	[840000,970000]
F8 670 nm	[840000,970000]
Darkness counts	
F1 340 nm	[3700,4300]
F2 405 nm	[3700,4300]
F3 505 nm	[3700,4300]
F8 670 nm	[3700,4300]
SMF repeatability (Noise)	
Dev. Est. NC. F0 Covered	≤ 55
Dev. Est. Abs. F1 340 nm	≤ 0.0004
Dev. Est. Abs. F2 405 nm	≤ 0.0006
Dev. Est. Abs. F3 505 nm	≤ 0.0004
Dev. Est. Abs. F8 670 nm	≤ 0.0007
Stability at 505 nm	
Dev. Est. Abs. F3 505 nm	≤ 0.0008
Max. NC	[840000,970000]
Min. NC	[840000,970000]
Max NC / Min NC	≤ 1.006
Repeatability MF (Repeatability)	
Dev. Est. Abs. F1 340 nm	≤ 0.0008
Dev. Est. Abs. F2 405 nm	≤ 0.0006
Dev. Est. Abs. F3 505 nm	≤ 0.0005
Dev. Est. Abs. F4 535 nm	≤ 0.0005
Dev. Est. Abs. F5 560 nm	≤ 0.0005
Dev. Est. Abs. F6 600 nm	≤ 0.0005
Dev. Est. Abs. F7 635 nm	≤ 0.0005
Dev. Est. Abs. F8 670 nm	≤ 0.0005

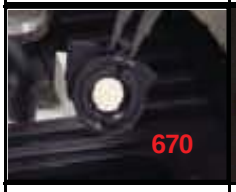
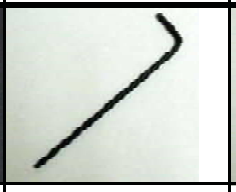
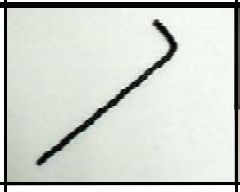
A III. LIST OF CONSUMABLES, ACCESSORIES AND SPARES

If any of the components of the analyzer deteriorate of if any of the perishable materials are required, always use original BioSystems material. The following table shows lists of components that may be required. To purchase said components, please contact your usual distributor and order each component using its corresponding code. This will simplify work and minimise errors.

List of user spares, perishable materials and accessories.

CODE	DESCRIPTION(Sort by code)
LA10418	12 V/20 W halogen lamp
CA10455	European mains cable
CA10456	American mains cable
FI10466	Serial channel cable for connection to PC
AC10770	Samples wells(1000)
AC11484	User program CD
AC11485	Reactions rotor (10 units)
AC11486	Reactions rotor fastening screw
BO11487	System liquid container with top
FI11488	System liquid container filters
BO11489	Waste container with lid and fitting
FI11490	535 nm filter unit
FI11491	560 nm filter unit
FU11492	Set of 4 A (F) fuses
BO11493	50 ml bottle with top (10 units)
BO11494	20 ml bottle with top (10 units)
AC11495	Access filter cover
AC11496	Optical system cover with screws
AC11497	Reactions rotor cover
FI11498	Covered filter unit
ZO11499	Lamp holder fastening system
AC11500	Detachable needle
AC11501	20 ml/50 ml reagents rack
AC11502	13 mm tube sample rack
AC11503	15 mm tube sample rack
AC11504	Paediatric well samples rack
AC11505	Operating arm fastening for transport
AC11506	Height-adjustable leg
BO11523	Washing solution container with top
BO11524	Bottle of concentrated system liquid (1l)
FI11563	340 nm filter unit
FI11564	405 nm filter unit
FI11565	505 nm filter unit
FI11566	600 nm filter unit
FI11567	635 nm filter unit
FI11568	670 nm filter unit
AC11575	Auxiliary housing cover
AC12223	Allen key 2mm
AC12224	Allen key 2.5mm
	User Manual/Installation and maintenance manual
BO13416	Bottle of concentrated washing solution (100mL)

CODE	DESCRIPTION (Sort by description)
LA10418	12 V/20 W halogen lamp
AC11502	13 mm tube sample rack
AC11503	15 mm tube sample rack
BO11494	20 ml bottle with top (10 units)
AC11501	20 ml/50 ml reagents rack
FI11563	340 nm filter unit
FI11564	405 nm filter unit
BO11493	50 ml bottle with top (10 units)
FI11565	505 nm filter unit
FI11490	535 nm filter unit
FI11491	560 nm filter unit
FI11566	600 nm filter unit
FI11567	635 nm filter unit
FI11568	670 nm filter unit
AC11495	Access filter cover
AC12224	Allen key 2.5mm
AC12223	Allen key 2mm
CA10456	American mains cable
AC11575	Auxiliary housing cover
BO11524	Bottle of concentrated system liquid (1l)
BO13416	Bottle of concentrated washing solution (100mL)
FI11498	Covered filter unit
AC11500	Detachable needle
CA10455	European mains cable
AC11506	Height-adjustable leg
ZO11499	Lamp holder fastening system
AC11505	Operating arm fastening for transport
AC11496	Optical system cover with screws
AC11504	Paediatric well samples rack
AC11485	Reactions rotor (10 units)
AC11497	Reactions rotor cover
AC11486	Reactions rotor fastening screw
AC10770	Samples wells(1000)
FI10466	Serial channel cable for connection to PC
FU11492	Set of 4 A (F) fuses
FI11488	System liquid container filters
BO11487	System liquid container with top
	User Manual/Installation and maintenance manual
AC11484	User program CD
BO11523	Washing solution container with top
BO11489	Waste container with lid and fitting

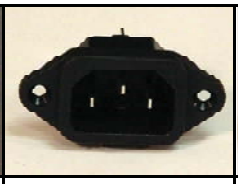
					
LA10418	CA10455	CA10456	FI10466	AC10770	
					
AC11484	AC11485	AC11486	BO11487	FI11488	BO11489
					
AC11501	AC11502	FU11492	BO11493	BO11494	AC11495
					
AC11496	AC11497	FI11498	ZO11499	AC11500	AC11501
					
AC11502	AC11503	AC11504	AC11505	AC11506	BO11523
					
BO11524	FI11563	FI11564	FI11565	FI11566	FI11567
					
FI11568	AC11575	AC12223	AC12224		BO13416

List of spares exclusive to the technical support service.

CODE	DESCRIPTION (Sort by code)
AC10116	Tool set slot key-1
AC10117	Tool set lens key-1
AC10118	knurled screw DIN653 M4x25
VA10355	CN-202 mains connector
ZO10407	Fuse holder
ME10490	Fan grill
PC10752	Varistor board
AC11511	Full operating arm
ME11512	X carriage belt
ME11513	Y carriage belt
ME11514	Z carriage belt
MO11516	Y motor
MO11518	X motor
AC11519	Encoder-spring unit, with motor
AC11520	Thermostated needle set
AC11521	Thermistor
MO11522	60 mm fan
AC11525	Thermostated probe upper fitting
ME11526	Full dispensing pump
AC11527	Dispensing pump seals
AC11528	Dispensing pump fluidic chamber
ME11530	3-way electrovalve
TU11531	Operating arm Teflon tube
TU11532	Dispensing pump Teflon tube
TU11533	Container tube unit
AC11534	Washing system diaphragm pump
ME11535	2-channel electrovalve with nuts
AC11536	Washing system restrictor
TU11537	Washing system PVC tubes
AC11538	Washing station cover
AC11539	Waste container nut and cap
CE11540	Load cell
AC11542	Rotor temperature probe, with thermal insulation
ME11543	Rotor belt
MO11544	Rotor motor
AC11545	Full reactions rotor
AC11545	Rotor cover detector
AC11546	Filter wheel body
MO11547	Filter wheel motor
AC11548	Leakproof joint of the photometric system
ME11549	Hydro-pneumatic cylinder of the cover hinge
AC11550	Arm housing
PC11551	Microprocessor board
PC11552	Photometric system board
PC11553	Needle conditioning board
PC11554	Racks detection board
PC11555	Front indicator board
PC11556	Power supply board
IN11557	Main switch
MO11558	80 mm fan
AC11559	Cover window
ZO11560	Lamp holder
CE11561	Peltier cell
FO11562	Start photodetector (without cable)(5)
TU11569	A25 tube set
FO11570	5 Photodetector set
AC11571	Racks support tray
CA11572	Base housing 1
CA11573	Base housing 2
AC11574	Full hinges
AC11575	Auxiliary cover
AC11579	Base
CA11580	Upper housing
VA11581	Upper housing transparent plastic
AC11582	Metal base of the needle detection base
AC11740	X track rail with two slide units
AC11741	Y track rail with slide unit
AC11742	Z track rail with slide unit
AC11743	Linear slide unit
AC11744	Service manual in Spanish
AC11745	Service manual in English
AC11749	Liquid system contained cap
AC11859	Fastening bolt YZ-1 axes
AC11860	Temperature adjustment tool
PC11862	Communication board
AC11892	CD service program
AC11930	Ceramic ‘piston set with motor

List of spares exclusive to the technical support service.

CODE	DESCRIPTION (Sort by description)
ME11535	2-channel electrovalve with nuts
ME11530	3-way electrovalve
FO11570	5 Photodetector set
MO11522	60 mm fan
MO11558	80 mm fan
TU11569	A25 tube set
AC11550	Arm housing
AC11575	Auxiliary cover
AC11579	Base
CA11572	Base housing 1
CA11573	Base housing 2
AC11892	CD service program
AC11930	Ceramic 'piston set with motor
VA10355	CN-202 mains connector
PC11862	Communication board
TU11533	Container tube unit
AC11559	Cover window
AC11528	Dispensing pump fluidic chamber
AC11527	Dispensing pump seals
TU11532	Dispensing pump Teflon tube
AC11519	Encoder-spring unit, with motor
ME10490	Fan grill
AC11859	Fastening bolt YZ-1 axes
AC11546	Filter wheel body
MO11547	Filter wheel motor
PC11555	Front indicator board
ME11526	Full dispensing pump
AC11574	Full hinges
AC11511	Full operating arm
AC11545	Full reactions rotor
ZO10407	Fuse holder
ME11549	Hydro-pneumatic cylinder of the cover hinge
AC10118	knurled screw DIN653 M4x25
ZO11560	Lamp holder
AC11548	Leakproof joint of the photometric system
AC11743	Linear slide unit
AC11749	Liquid system contained cap
CE11540	Load cell
IN11557	Main switch
AC11582	Metal base of the needle detection base
PC11551	Microprocessor board
PC11553	Needle conditioning board
TU11531	Operating arm Teflon tube
CE11561	Peltier cell
PC11552	Photometric system board
PC11556	Power supply board
PC11554	Racks detection board
AC11571	Racks support tray
ME11543	Rotor belt
AC11545	Rotor cover detector
MO11544	Rotor motor
AC11542	Rotor temperature probe, with thermal insulation
AC11745	Service manual in English
AC11744	Service manual in Spanish
FO11562	Start photodetector (without cable)(5)
AC11860	Temperature adjustment tool
AC11521	Thermistor
AC11520	Thermostated needle set
AC11525	Thermostated probe upper fitting
AC10117	Tool set lens key-1
AC10116	Tool set slot key-1
CA11580	Upper housing
VA11581	Upper housing transparent plastic
PC10752	Varistor board
AC11538	Washing station cover
AC11534	Washing system diaphragm pump
TU11537	Washing system PVC tubes
AC11536	Washing system restrictor
AC11539	Waste container nut and cap
ME11512	X carriage belt
MO11518	X motor
AC11740	X track rail with two slide units
ME11513	Y carriage belt
MO11516	Y motor
AC11741	Y track rail with slide unit
ME11514	Z carriage belt
AC11742	Z track rail with slide unit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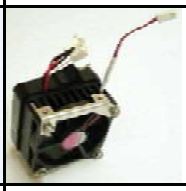
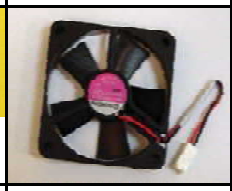
PC10752	AC11511	ME11512	ME11513	ME11514	MO11516
					
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	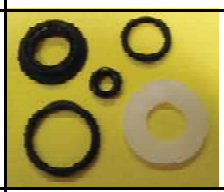		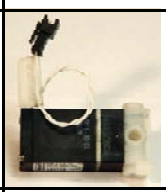		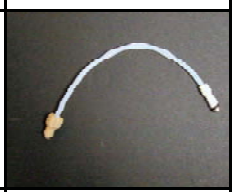
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	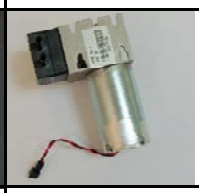				
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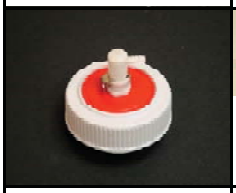					
AC115390	CE11540	AC11542	ME11543	MO11544	AC11545
					
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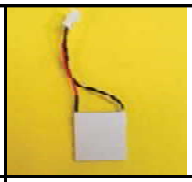
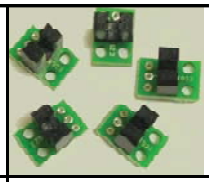
PC11551	PC11552	PC11553	PC11554	PC11555	PC11556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	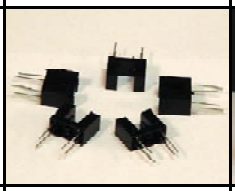				
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				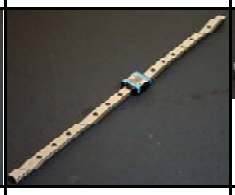	
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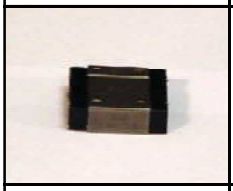					
AC11743	AC11744	AC11745	AC11749	AC11859	AC11860
					
PC11862	AC11892	AC11930			

A IV. LIST OF REQUIRED TOOLS

1. Set of metric Allen keys.
2. Loctite 243 screwfastener or similar
3. Mechanical grease ELESA NT1 (for ceramic pump only).
4. Heat silicone or similar
5. Soldering iron
6. Screwdrivers or two 3 mm Allen keys.
7. Loctite 245 or similar (for ceramic pump only).
8. Assembly tool: Tool set slot key-1 (MO0001)
9. Assembly tool: Tool set lens key-1 (MO0004)
10. Fastening: Knurled screw DIN653 M4x25 (To block spring Y carriage).
11. Fastening: Fastening bolt YZ-1 axes (To block Z carriage).
12. Temperature adjustment tool.

A V. SOFTWARE VERSIONS

Change in the versions of service program

Date	version	Change
3/06/03	1.3	First versions
14/04/03	1.3.2	Corrections
4/06/04	2.0.0	Improve the rotor verification test
		Improve some display screen
		Improve the test/change lamp
		New screen: save and load the file adjustments
		New initialitation screen. shows the state information of the analyser
09/07/04	2.5.0	Change the sensibility adjust
20/03/06	3.0.0	New adjustment: adjust the maximum sweep of the z axis
		New test of the maximum sweep of the z axis
		Improve the level detection test
		Improve the photometric test
		Improve the stress test
		New user's menu
		Improve the read/load adjustment and cycles
28/06/06	3.0.2	Correction of errors
		Improve the checking before load a new firmware

Change in the versions of user program

Date	version	Changes
24/07/03	1.4.0	First version
14/11/03	1.4.1	Corrections and new languages implemented, russian
27/11/03	1.4.2	Corrections
10/02/04	2.0.0	New funtionality: Sat report
		Importr/ exportr sesions
		PC-host (LIMS) module
		Possibility to create different users levels
		Add sound alarm
8/07/04	2.5.0	New contamination file
		Possibility to modify the factor by the user
		USB connection
		Use different type of rack with the racks deteccion activate
		Change in the rotor verification test
28/01/05	3.0.0	Automatic repetition
		Printed automatic final reports
		Cancel samples patient and test
		Delete blanks and standards
		Improve the downcounting time
		Possibility to save test in a file
		Improve turbidimetry test
		Start running automaticaly after doing a New rotor
		New Button in monitor screen shows the preparation/well
		Read patient code with barcode reader
		Corrections
13/09/05	3.1.1	Calculated test
		New programming test options:
		Decreasing calibrations curve
		Reactive blank with saline solution
		New type of sample: Whole blood

20/03/06	3.2.0	Correction of Run Time errors Improve the Base Line execution (repetion when it fails)
26/06/06	3.2.2	New button in the tools menu, reset the historical base line Fix the options of the initial and final wash. Delete the menu to choose the parameter of initial and final wash.

Change in the versions of firmware

Date	version	Change
21/05/03	1.0	First version
9/06/03	1.3	Correction of washing cycles. Correction of Base line. Correction of communications.
25/07/03	1.34	Improve of switch on/off of the analyser. Robust rotor manoeuvre.
1/12/03	1.40	Improve the communications of auxiliar channel. Improve the stress mode. Correction of integration time calculus.
13/02/04	1.60	Improve the information send by the auxiliar channel. Improve the switch off lamp. Correction of the temperature rotor and probe control.
9/07/04	2.00	Improve and robust the communications. New implementation of the turbidimetric system. New functional of the alarm acustic signal. Correction, unification of the criterions of service and user programs. Improve the stress mode. Add the sensibility map of the racks.
23/07/04	2.02	Corrections of the level deteccion map.
28/02/05	2.40	Improve the demo test. Improve the bireactive test with contaminations. Enlarge the integration time limits. Improve the encoder control.
4/03/05	2.42	
14/03/05	2.44	Corretion of the synthesis of FPGA
17/05/05	2.46	Add 2 new type of racks of 13 and 15mm. Correction of stress test.
31/05/05	2.48	Correction of encoder control
14/09/05	2.50	Impove, from user program load the analyser adjustments.
03/02/06	2.54	Correction of the encoder error during warming-up and shut-down
20/03/06	2.80	Improve the execution of base line new adjustment, the maximum sweep of the z axis New cycles meter Correct the bireactive, bichromatic with contamination test
26/05/06	2.94	Increase the acceptance range of base line check Increase the Z motor current to 1.6A

Compatibilities table

User A25 firmware	1.4.0	1.4.1	1.4.2	2.0.0	2.5.0	3.0.0	3.1.1	3.2.0	3.2.2
1.0	x	x	x	x	x				
1.3	x	x	x	x	x				
1.34	x	x	x	x	x				
1.40			x	x	x				
1.60					x				
2.00					x				
2.02					x				
2.40						x	x	x	x
2.42						x	x	x	x
2.44						x	x	x	x
2.46						x	x	x	x
2.48						x	x	x	x
2.50							x	x	x
2.54							x	x	x
2.80							x	x	x
2.94							x	x	x

It is advisable to always install the last existing version of firmware.

SHEET REPAIR

IDENTIFY DATA
Laboratory/hostipal name:
Person responsible of the analyser:
Address:
Phone:
Fax:
E-mail:
ANALYSER DATA
Analyser serial number:
Purchase date:

REPAIR DESCRIPTION	
Date	Description

BIOSYSTEMS, S.A. Costa Brava, 30, 08030 Barcelona - Spain Tel: 34-93 311 08 11 Fax: 34-93 346 77 99
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