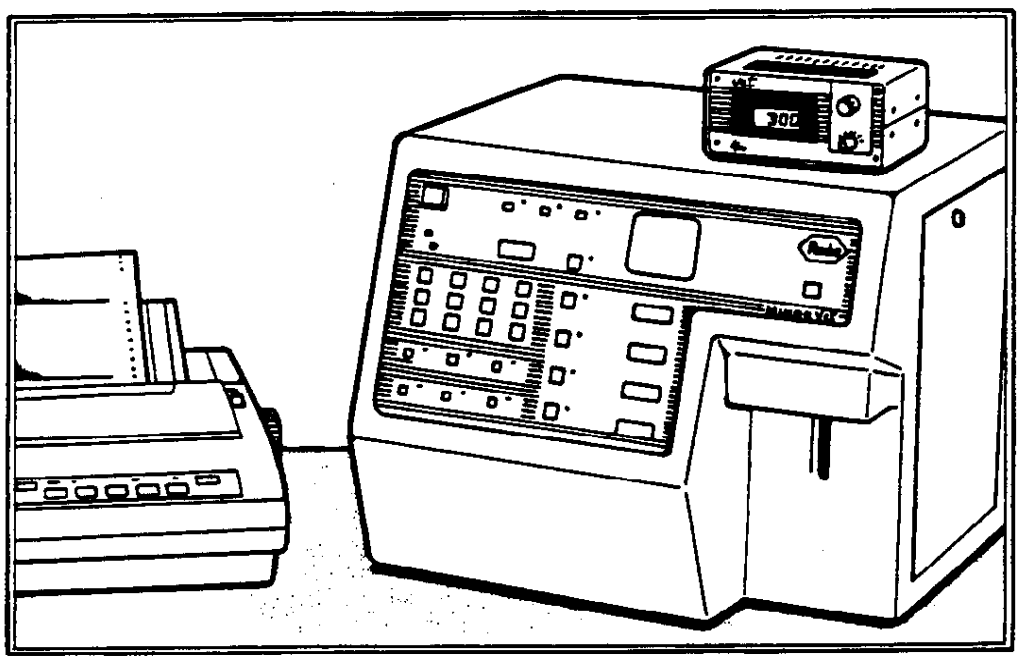
MINOS VET/ PAM
User's manual

Part number : RAB 012 A Ind.A



Roche

HEMATOLOGIE

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REVISIONS

Index	P/N revision	REVISION	Section	Date
A		Creation		12/02/93

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SECTION 1

1. INTRODUCTION

1.1. Presentation

The **MINOS VET** is a compact, bench-top hematology system that provides comprehensive hematologic results for animal and human blood. With one-step, push-button sampling and calibration, operation of the **MINOS VET** is reliable and trouble free. Only 25 µl of whole blood is required for measurement of 11 hematologic parameters, eliminating the need for predilution of samples. The automatic daily maintenance is fast and convenient. Animal or human blood can be selected by a single switch on the veterinary threshold selection device.

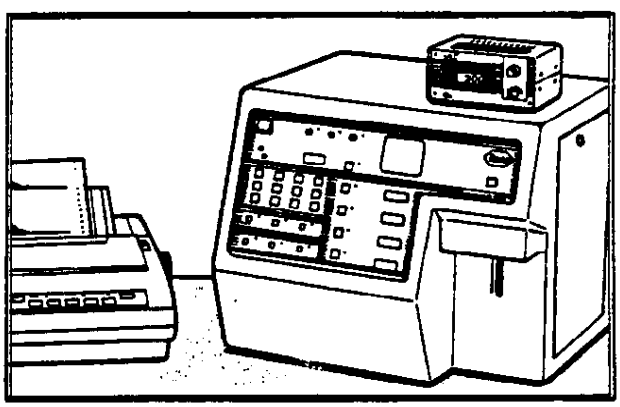
The following animal can be directly selected : Cat, dog, bovine, sheep, horse, rat.

The 11 parameters are as follow :

- WBC, RBC, HGB, HCT, MCV, MCH, MCHC,
- Plt, MPV, PCT, PDW and the platelet distribution curve.

from 25 µl of whole blood (taken from EDTA). The device, which is small in size, has 6 main parts :

1 - The pneumatic supply
2 - The electrical supply
3 - The electronic boards
4 - The dilution pneumatics
5 - A printer which prints out the results and the plotting of the distribution curves for Plt.
6 - The veterinary threshold selection unit.
All the controls are grouped together on one panel, at the front of the system (Diag 1.1).



Diag.1.1

1.2. Symboles

Signification of the symboles located at the rear side of the instrument, next to the main plug :

Earth connection

Warning : read enclosed documents

Switch off position

Switch on position

Alternative current

Instrument type "B".
Instrument giving full protection against electrical hazard related to :

- leakage current
- earth connection

1.3. General points

The **MINOS VET** is classified as a class 1, type B electro-medical device.
It responds to the 601.1 norm of the International Electronical Commission.

Work security, reliability and general characteristics are guaranted by **ABX** under the following conditions only :

- services and repairs are provided by an **ABX** authorized technician

- the electrical supply of the laboratory follows the national or international regulations

- the system is operated under the following instructions.

SECTION 2

2. SET UP PROCEDURE

2.1. Inspection

A thorough checkover is carried out on the **MINOS VET** before sending it.
We, nevertheless, recommend checking the apparatus as soon as it is received to report any anomalies to the carrier.
The start-up procedures must imperatively be followed closely in the order given below.

2.2. Unpacking

The apparatus is enveloped in a special, protective foam before being placed in a cardboard box. Cut the four angles of the box to unpack the machine.

2.3. Package contents

The **MINOS VET** boxes contain the following parts :

DESIGNATION	PART NUMBER	QTY
MINOS VET	ZAA XXX AE	1
MINOS printer (DATAPRODUCT 220V)	XAA 156 A	1
MINOS printer (DATAPRODUCT 110V)	XAA 253 A	1
Veterinary threshold selection unit	XAA 275 A	1
MINOS VET installation kit with :	XEA 175 A	1
- 0.125 A Fuse	DAR 002 A	2
- 0,4 A Fuse	DAR 004 A	2
- 0.63 A Fuse	DAR 005 A	4
- 1,6 A Fuse	DAR 011 A	2
- 6,3 A Fuse	DAR 015 A	2
- Ty-rap 2.4 x 92	DBH 001 A	6
- Plastic connector Dia.3 10/32	EAA 003 A	1
- Plastic connector Dia.1,5 10/32	EAA 004 B	2
- Plastic connector M5 3/19,5	EAA 006 A	2
- Plastic connector T javel Dia.1,6	EAB 005 B	1
- Plastic connector T javel Dia.2,3	EAB 006 B	1
- Plastic connector javel Dia.2,3	EAB 010 A	1
- Plastic connector Dia.3 L25	EAB 011 A	2
- Red restrictor	EAD 002 A	1
- Blue restrictor	EAD 007 A	1
- Cristal tube 3x6	EAE 011 A	6
- Versilic tube 1,5x3	EAE 024 A	1
- Silicon tube 1,5x3,5	EAE 025 A	3
- Silicon PACI tube	EAE 032 A	2
- O ring 14x1,78	FAA 007 A	1

- O ring 0,74x1,02	FAA 011 A	1
- O ring 1,4x1,25	FAA 012 A	1
- O ring 2,2x1,0	FAA 047 A	2
- Reagent filter	FAE 005 A	
- **MINOS** plastic cover	FBH 002 A	1
- 2-holed diluent stopper	FBL 001 A	4
- Sampling probe	GAA 123 A	1
- Cardboard box	JAA 011 A	1
- Repair kit plastic box	JAG 003 A	1
- CHC 3x5	KAA 001 A	2
- CHC 3x8	KAA 003 A	2
- CHC 3x10	KAA 004 A	2
- FHC 3x8	KAB 003 A	2
- FHC 3x10	KAB 004 A	2
- VMTC 3x5	KAC 002 A	2
- Nut HU Dia.3	KAH 001A	2
- Washer MU Dia.3	KAJ 001 A	2
- 2mm curved wrench	MAB 001 A	1
- 2,5mm curved wrench	MAB 002 A	1
- 5V Hgb Lamp Assy	XBA 145 A	1
- One way valve	XCA 051 A	1
- Pinch valve 3 ways	XCA 119 A	1
- Diluent straw	XEA 015 A	1
- Detergent straw	XEA 016 A	1
- Lyse straw	XEA 017 A	1
- Jar of grease KM1011	XEA 019A	1

Specific **MINOS VET 220v GB** :

DESIGNATION	**PART NUMBER**	**QTY**
Europ. power cable	DAC 011 A	1
Fuse 5x20 1,25A	DAR 010 A	6
DATAPRODUCT printer cover	FBH 004 A	1
English user's manual	RAB 012 A	1
Daily start up procedure **MINOS**	RAM 003 A	1

Specific **MINOS VET 110v US** installation kit :

DESIGNATION	PART NUMBER	QTY
US. power cable	DAC 012 A	1
Fuse 5x20 2,5A	DAR 013 A	6
DATAPRODUCT printer cover	FBH 005 A	1
English user's manual	RAB 012 A	1
Daily start up procedure **MINOS**	RAM 003 A	1

2.4. Working conditions

MINOS VET should be placed on a clean and level table or work station.
Please note that **MINOS VET** printer and reagents weigh approximately 60 kilogrammes.

Avoid exposure to sunlight.

Proper ventilation requires that a space of at least 20 cm must be left behind the apparatus.

2.5. Grounding

The grounding must be followed closely.

Check that the wall ground (earth) plug is correctly connected to the laboratory grounding electricity installation.

If there is no ground then use a ground stake. Current electricity norms must be applied.

2.6. Humidity and temperature conditions

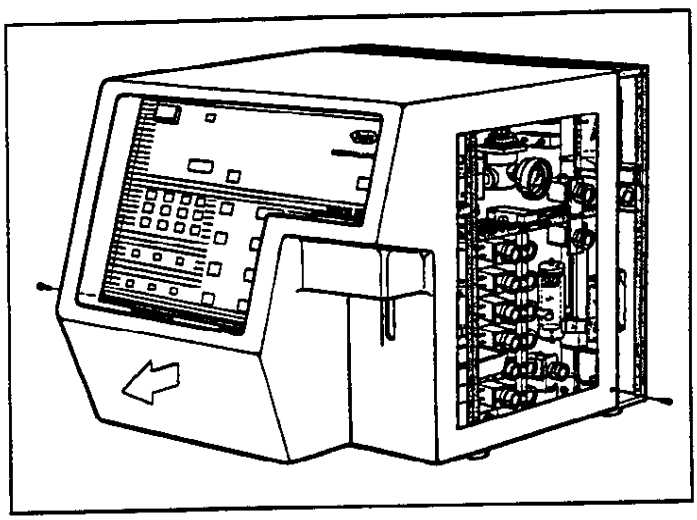
MINOS VET can function between 15 and 35°C, with relative humidity, meaning less than 85% with no condensation.

If it is kept at a temperature less than 10°C, the machines should be allowed to sit for an hour at correct room temperature before use.

2.7. Visual checks

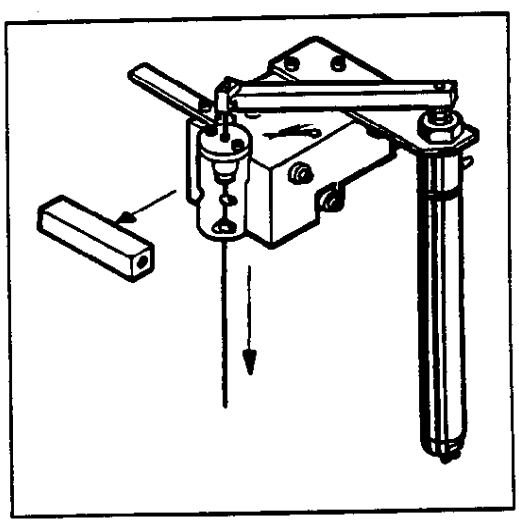
2.7.1. Mechanical check

Open the **MINOS VET** door on the right hand side of the instrument (The key will be found on the rear side of the instrument).
Unscrew the two cover fixation screws and remove the cover : pull it forward on the frontof the machine (Diag.2.1).



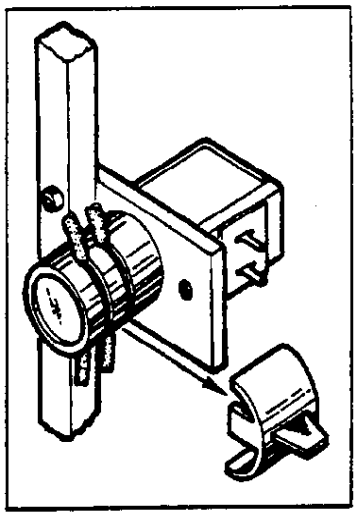
Diag.2.1

Place the carriage as far forward as possible, as shown in Diag 2.2., here below. Lower needle and check that it is not bent.



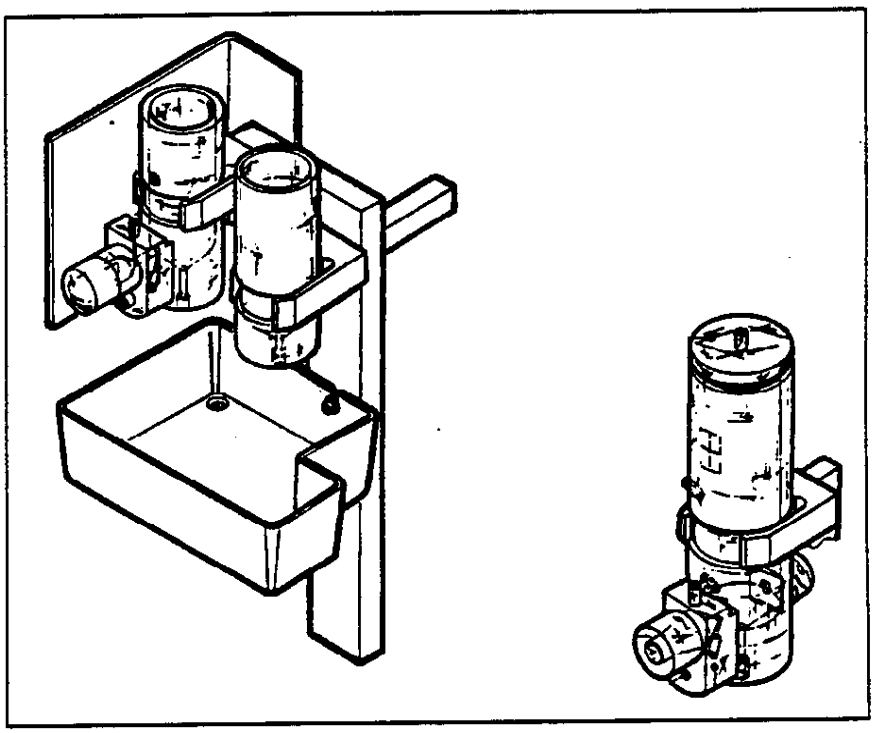
Diag.2.2

Remove the red clips from the pinch valves (Diag.2.3).



Diag 2.3.

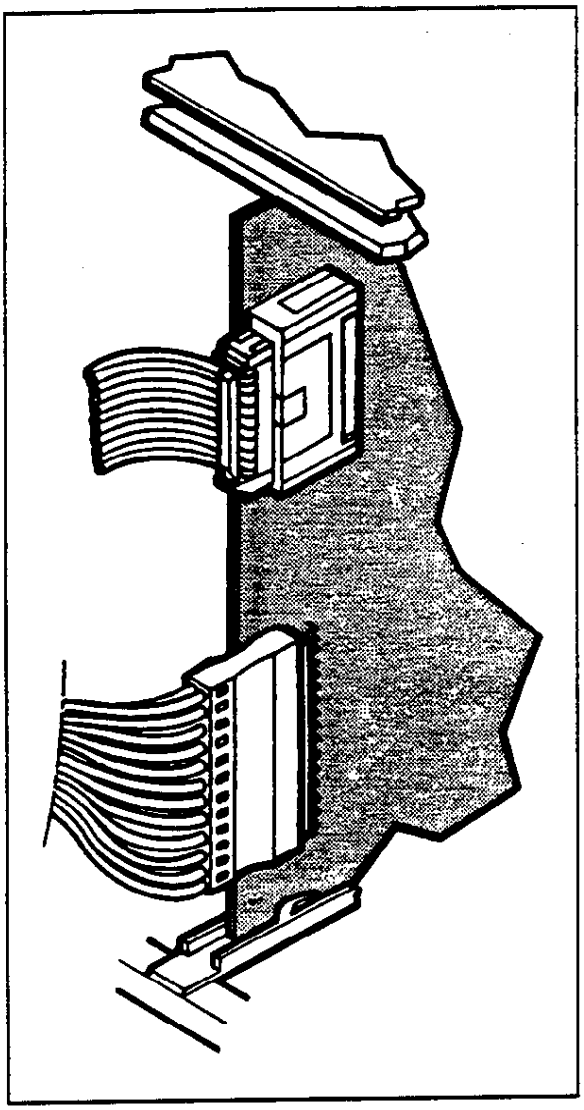
Check the position of the counting chambers as shown in Diag 2.4., below. Each chamber should be in its proper position with its clips, and the electrodes should be well positioned in their casings.



Diag 2.4.

2.7.2. Electronic check

Check that the connectors on each printed circuit board as well as the printed circuit boards themselves are perfectly positioned, and that the boards are locked into position as shown in Diag.2.5.



Diag.2.5

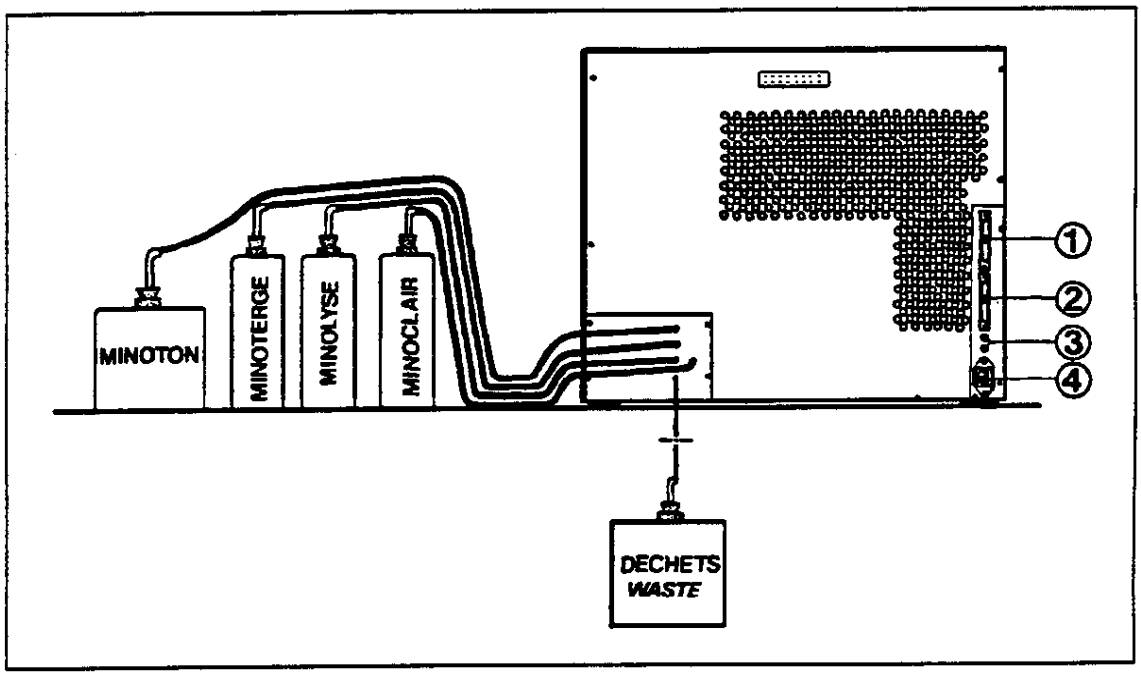
2.8. Reagent connections

2.8.1. Reagents

Reagent inputs and waste output are located at the right hand side of the **MINOS VET** rear panel (Diag.2.6).
The **MINOTON** diluent input is located at the top, the **MINOTERGE** input onsecond position and the **MINOLYSE** input on third. **MINOCLAIR** input is located on the right hand side of the **MINOLYSE** input (See section 3. for the reagents specifications and handling precautions).

NOTA :	The AIR output is used when the sampler (**PAM**) is connected.

WARNING :	**MINOTON, MINOTERGE,MINOLYSE and MINOCLAIR have to be located at the same level than the machine (on the bench).**



Diag.2.6.

1 Printer output
2 RS 232 output
3 Main fuses
4 Main power socket

2.8.2.Waste connection

The waste container has to be connected on the reagent block bottom output (Diag.2/6). This container has to be located under the level of the machine (under the bench).

WARNING : **Waste liquids have to be neutralized before being discharged.**

- Cyanids from lysing solution :for 20l of lysing solution, add 50ml of Sodium Hydroxide 200g/l, then 100ml of Ammonium Persulfate solution 500g/l daily prepared,
or
add 50ml of Sodium Hydroxide 200g/l, then add 500ml of Sodium Hypochloride solution 30%.

- Waste liquids at the output of MINOS STE have to be neutralized with the following procedure :
For 20l of waste liquids, add 50ml of Sodium Hydroxide solution 200g/l, then 250ml of bleach solution 12°Cl daily prepared from the commercialized solution (48°Cl).

2.9. Electrical connections

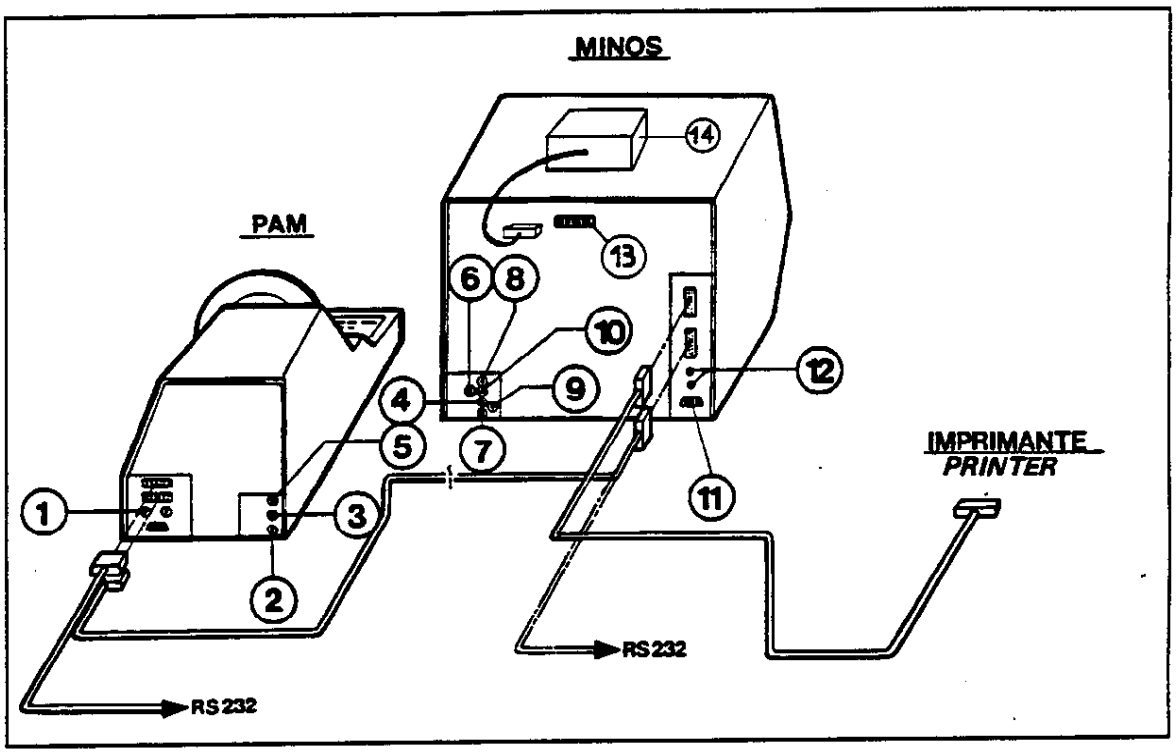
The **MINOS VET** in its standard version, is equipped with a power plug according to European standards (220 V and 50 hz), located on the rear left hand side of the device (Diag.2/7).
Two 1.25-amp fuses are located, above the power plug.

On request, the device can be adapted to any other voltage or frequency.

Connect the printer on the upper plug (Diag.2.7).

In the case of using a **PAM**, connect the cable from the **PAM** to the lower outlet of the **MINOS.**
When the **MINOS VET** is connected to a laboratory computer, connect the computer cable on the lower outlet.
When the **MINOS VET** is connected to a **PAM** and a computer connection, connect the **PAM** on the lower outlet and the computer on the upper outlet of the **PAM.**

WARNING : **RS 232 and printer outlet should not be connected in any case to a voltage above 5v, otherwise internal componants may be destroyed.**



Diag.2.7.

1 - **PAM** main fuses
2 - **PAM** waste connection
3 - **PAM** diluent connection
4 - **MINOS** lyse connection
5 - **PAM/MINOS** air connection
6 - **MINOS/PAM** air connection
7 - **MINOS** waste connection
8 - **MINOS** diluent connection
9 - Cleaner connection
10 - **MINOS** detergent connection
11 - Main power socket
12 - **MINOS** main fuses
13 - Vet. unit connection
14 - Veterinary unit

SECTION 3

3.SPECIFICATIONS

Informations contained in this section are subject to change without notice.

3.1. MINOS VET

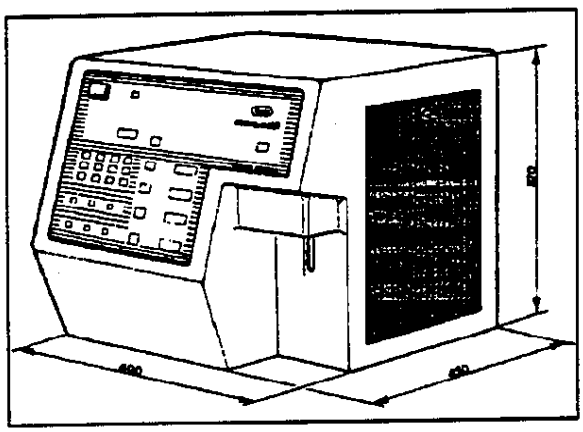
MINOS VET carries out blood counts, and requires no manual operations.
Indeed all the operations including drawing blood, dilution, measuring, calculations, print-out, and computer transfer with the following information :

- The parameters given :

MINOS VET : It analyses 11 parameters : WBC, RBC, Hgb, Hct, MCV, MCH, MCHC, PLT, MPV, Pct, PDW.
It gives also the platelet distribution curve.

- Capacity of internal memory : - Blood counts : 300

- Dimensions : Diag.3.1.
  - Height : approximately 370 mm
  - Width : approximately 400 mm
  - Depth : approximately 430 mm



Diag.3.1.

- Weight : approximatly 32Kgs.

- Power supply

* 220 VAC ± 10%	or	*110 VAC ± 10%
* 50 Hz ± 1 Hz		*60 Hz ± 1 Hz

- Power Consumption

  * Start up : 250 VA (-30%, +10%)
  * Working conditions : 150 VA (-30%, +10%)

- Conditions for use

  * 15 - 35°C (room temperature)
  * 85% maximum (relative humidity, no condensation)

- Hemoglobin

  * Hgb flowcell
  * 540 nm interferential filter

- Size of apertures

  * WBC = 100 µm
  * RBC/PLT = 50 µm

- Final dilutions

  * WBC = approximately 1/240
  * RBC / Plt = approximately 1/20 000

- Throughput

  * 60 samples / hour

- Volume of whole blood sample : 25µl

- Reagents consumption :

CYCLE	DILUENT	LYSE	DETERGENT	CLEANER
Manual Sampling	27ml	1ml	x	x
Diluent rinse	85ml	1ml	x	x
Detergent rinse	60ml	x	60ml	8ml
Lyse priming	8ml	7ml	x	x
Back flush	12ml	x	x	x
Drain chambers	x	x	x	x
Automatic cleaning	120ml	1ml	x	8ml

- Measuring principles

  * WBC.RBC.PLT = Impedance change
  * Hematocrit = Electronic integration
  * Hemoglobin = Cyanmethemoglobin method

- Reproducibility : (Drawn up after 30 analyses from fresh whole blood sample)

  - WBC $\leq$ 3% at 10.10^9 WBC /l
  - Hgb $\leq$ 2% at 15 g/dl
  - PLT $\leq$ 7% at 300.10^9 PLT /l
  - RBC $\leq$ 3% at 5.10^{12} RBC /l
  - Hct $\leq$ 3% at 45%

- Linearity

  - WBC : 0,1 to 50.10^9 WBC /L : 5%
  - RBC : 0,5 to 15.10^{12} RBC /l :5%
  - Hgb : 2,0 to 25.0 g/dl :4%
  - Hct : 10 to 70 % :5%
  - Plt : 10 to 2000.10^9 PLT /l :10% (on platelet concentrates)

- Carryover

  - RBC < 0,5%
  - Hct < 0,5%
  - WBC < 2%
  - Hgb < 2%
  - Plt < 2%

3.2. Veterinary threshold selection unit

- Size :

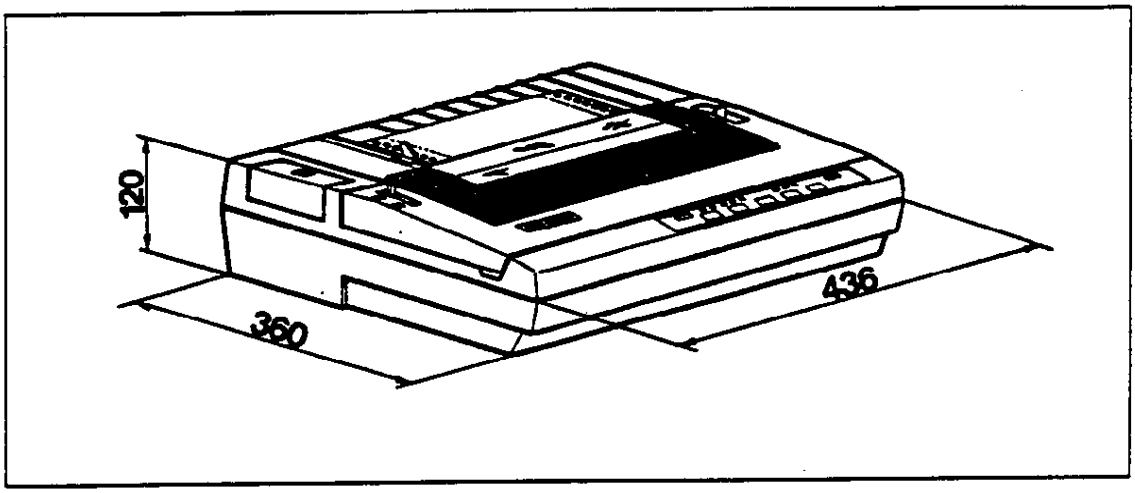
  - Height : approximately 75 mm
  - Width : approximately 150 mm
  - Depth : approximately 110 mm

- Weight : 0,7kg approximately.

3.3. Printer

- Size (see Diag.3.2.)

    * Height = approximately 120 mm
    * Width = approximately 436 mm
    * Length = approximately 360 mm



Diag.3.2

- Weight : approximately 10 kilos

- Power supply :

    * 220,240 VAC ± 10% or 110 VAC ± 10%
    * 50/60 hz ± 1Hz

- Power consumption : 120VA

- Paper :

    * Minimum width : 127 mm
    * Maximum paper roll diameter : 254 mm

- Ribbon : black/red nylon, 3.000.000 characters

3.4. Reagents

In order for the machine to operate correctly, high-quality reagents must be used.

ABX has the necessary reagents in stock.

Respect expiration date and temperature between 15 and 30°C.

3.4.1.MINOTON

Role :
This diluent is necessary for the process involved in counting the blood cells.
Can be dangerous.

Composition :
Stabilized saline solution which contains an organic buffer and fungicide.

Description :
Limpid and odorless aqueous solution.

Physico-chemical properties :
Boiling point : About 100°C.
PH : 7.4 ± 0.1.

Handling Precautions :
Avoid skin and eye contact.
Use laboratory gloves when handling the reagents.
If a large quantity of reagent is ingested a mucous irritation can result.

Emergency First aid :

If the eyes or skin come into contact with the reagent, flush / rinse abundantly with water.
If a large quantity is ingested, drink water immediately, and induce vomiting.

3.4.2. MINOLYSE

Role :

This reagent is used to lyse blood cells and determine hemoglobin concentration (may be dangerous).

Composition :

The reagent contains potassium cyanide, a concentration of approximately 0.03% and quarternine ammonium salts, concentration level of 2%.

Description :

Aqueous solution, limpid and odorless.

Physico-chemical properties :

Boiling point : approximately 100°C.
PH : 10.1 ± 0.3.

Handling Precautions :

Avoid contact with eyes, skin and clothing.
Wear laboratory gloves when handling the product.
The product may be harmful if ingested.
The product can be absorbed through an open wound, or inhalation.

Emergency First Aid :

If the eyes or skin come into contact with the reagent, flush with water.
If the reagent is inhaled, breathe fresh air immediately.
If a large quantity is ingested, drink water immediately, and induce vomiting. Call local anti-poison center, or contact doctor.

3.4.3. MINOTERGE

Function :

Washing agent.
(May be harmful).

Composition :

Phosphate buffer containing salines and tensioactive derivatives.

Description :

Aqueous solution which is green and odorless.

Physico-chemical properties :

Boiling point : around 100°C.
PH = 7.4 ± 1.0.

Handling Precautions :

Avoid contact with eyes.

Emergency First Aid :

In case the product comes into contact with the eyes, rinse with water.
If the product is ingested, induce vomiting.

3.4.4. MINOCLAIR

Function :

Cleaning agent

May be harmful

Composition :

Sodium Hypochlorite (9%)
Sodium Hydroxide (0,25% approximatly)

Description :

Aqueous solution, colorless and has a typical smell of chloride.

Physico-chemical properties :

Boiling point : 100°C

PH : 12,5 ± 0,5 at 25°C.

Handling precautions :

Avoid contact with eyes, skin, and clothing.
Rinse thoroughly with water after handling.
Keep the container closed when not in use.
Wear laboratory gloves when handling the product.
The product may be harmful if ingested or, inhalated.

Emergency First Aid :

In case the product comes into contact with skin, rinse thoroughly with water. If it comes into contact with eyes, rinse with water for 15 minutes and call for a medical check.
If ingested, do not induce vomiting, drink a lot of water and call immediately a doctor.

3.5. Limits

3.5.1. Cleaning

In section 9, specific start-up, shutdown, daily and weekly cleaning methods are listed. The cleaning procedures identified are mandatory for the proper use and operation of the **MINOS VET**.
FAILURE TO EXECUTE ANY OF THESE RECOMMENDED PROCEDURES MAY RESULT IN DECREASED RELIABILITY OF THE SYSTEM.

3.5.2. Blood specimens

Verification of any abnormal blood specimens should be performed using reference methods and other standard laboratory procedures for the conclusive verification of results.The sections below list known limitations of automated blood cell counters which use the principle of impedance.

3.5.3. Known interfering substances

WBC White Blood Cells (Leukocytes) :

Evaluated WBC results that exceed the linearity limits of the system will require dilution of the blood sample. Re-assaying the diluted sample may help to obtain the correct assay value.

Immature nucleated red blood cells (NRBC) will be counted in the WBC (White Blood Cell) parameter.

The formula utilized for correcting the WBC parameter, when nucleated red blood cells are present, is :

$$\text{CORRECT WBC} : \quad \frac{\text{Uncorrected WBC} \times 100}{100 + (\text{nb of NRBC}/100\ \text{WBC})}$$

In particular rare instances, the erythrocytes in the blood sample may not completely lyse. Non-lysed erythrocytes will cause a falsly elevated WBC count.

RBC Red Blood Cells (Erythrocytes) :

The red blood cell dilution contains all the formed elements in the blood : erythrocytes, leukocytes, and platelets.

During the counting of the erythrocytes (red blood cells), platelets are not counted, since their size falls below the minimum threshold.

Leukocytes (White blood cells), on the other hand, are included in the RBC count. However, since the normal ratio between red blood cells and white blood cells is so extreme, the influence of the WBC on the RBC is negligible. In rare cases where the WBC is extremely high, the RBC count may be corrected, especially if the RBC count is extremely low.

Agglutinated red blood cells may cause a falsely decreased RBC count. Blood samples containing the agglutinated red blood cells may be identified by observing abnormal MCH and MCHC values, as well as by examination of the stained blood film.

Hgb (Hemoglobin) :

Turbidity of the blood sample due to any number of physiologic and/or therapeutic factors may produce falsely elevated Hgb results. To obtain accurate hemoglobin results when increased turbidity of the blood sample occurs, determine the cause of the turbidity and follow the appropriate method below :

1. Elevated WBC : An extremely elevated WBC will cause excessive light scatter. In these cases use reference (manual) methods.The diluted sample should be centrifuged, and the supernatant fluid measured on a spectrophotometer.

2. Elevated lipids : Elevated lipids in the blood sample will give the plasma a "milky" appearance. Accurate hemoglobin determinations can be achieved by using reference (manual) methods and a plasma blank.

Increased turbidity may also be seen in case where the red blood cells are resistant to lysing. This condition will cause a falsely elevated Hgb result, but may be detected by observing the abnormal MCH, MCHC values.

Erroneous hemoglobin results will cause the results of the MCH and MCHC to be erroneous as well.

Hct (hematocrit)

Red blood cells agglutination may produce an erroneous Hct value. Red blood cells agglutination may be detected by observing the abnormal MCH and MCHC values, as well as by examination of the stained blood film In such cases, manual methods may be required to obtain an accurate Hct value.

MCV (Mean Corpuscular Volume)

Red blood cell agglutination may produce an erroneous MCV value. Red blood cell agglutination may be detected by observing the abnormal MCH and MCHC values, as well as by examination of the stained blood film. In such cases, manual methods may be required to obtain an accurate MCV value.

Excessive large platelets and/or the presence of an excessively high WBC count may interfere with the accurate determination of the MCV value. In such cases, careful examination of the stained blood film may reveal the error.

MCH (Mean Corpuscular Hemoglobin) :

The MCH is a function of th Hgb value and the RBC count. The limitations listed for the HGB and RBC will have an effect on the MCH and may cause erroneous values.

MCHC (Mean Corpuscular Hemoglobin Concentration)

The MCHC is a function of the Hgb and Hct values.the limitations listed for the Hgb and Hct will have an effect on the MCHC and may cause erroneous values.

PLT (Platelets)

Very small erythrocytes (microcytes) , erythrocytes fragments (schizocytes), and WBC fragments may interfere with the proper counting of platelets. Blood samples containing agglutinated erythrocytes may trap platelets, causing an erroneous low platelet count. The presence of agglutinated erythrocytes may be detected by observation of abnormal MCH and MCHC values and by careful examination of the stained blood film.

Giant platelets in excessive numbers may cause an erroneously low platelet count since these large platelets exceed the upper threshold for the platelet parameter and are not counted.

Reference (manual) methods may be necessary to obtain an accurate platelet count.

MPV (Mean Platelet Volume)

Giant platelets that exceed the upper threshold of the Platelet parameter may not be counted as platelets. Consequently, these larger platelets will not be included in the instrument's calculation of Mean Platelet Volume.

Very small erythrocytes (microcytes), erythrocytic fragments (Schizocytes), and white blood cell fragments may interfere with the proper counting and sizing of Platelets.

Blood samples containing agglutinated erythrocytes may trap Platelets, causing an erroneous MPV result. The presence of agglutinated erythrocytes may be detected by observation of the abnormal MCH and MCHC values and by careful examination of the stained blood film.

WARNING :	**Blood samples collected in EDTA will not maintain a stable Mean Platelet Volume. Platelets collect in EDTA swell with time and temperature.**

SECTION 4

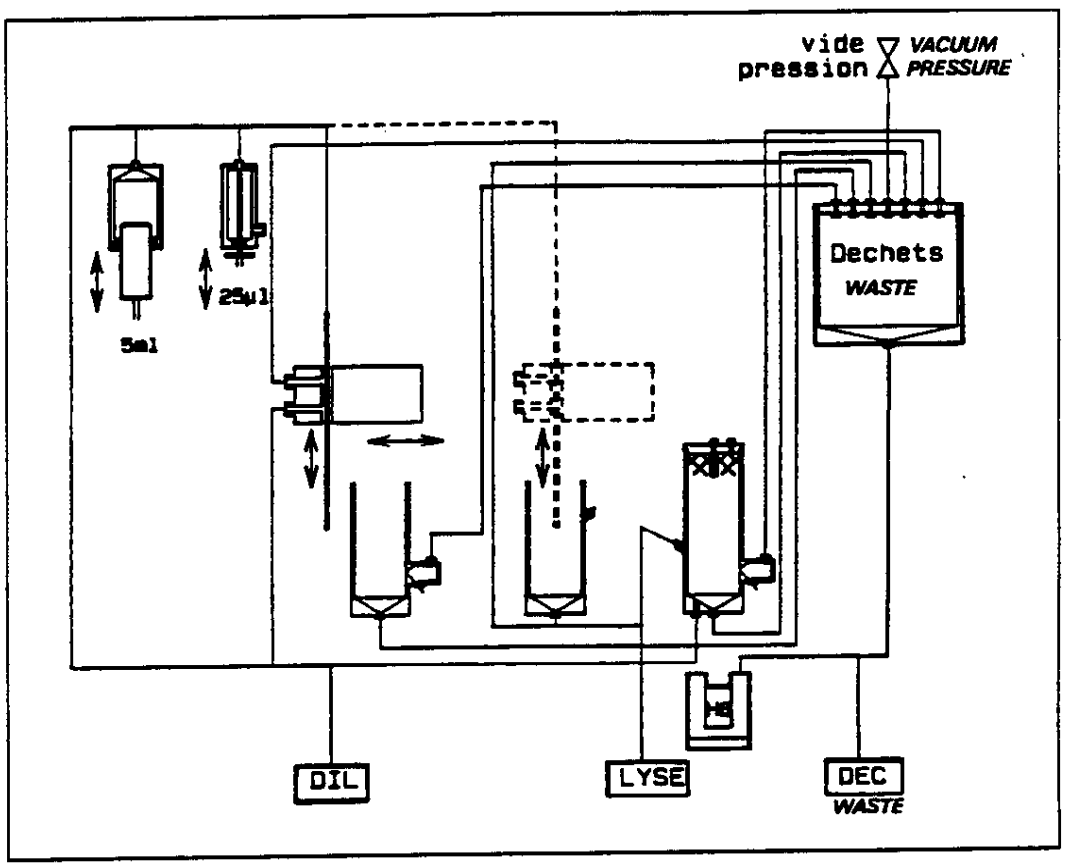
4. TECHNOLOGY

4.1. Hydraulic

The **MINOS VET** hydraulic system is completely commanded by the main computer through a printed circuit board interface.

4.1.1. Sampler Circuit

The diagram 4.1. shows the hydraulic system used for the sampling.

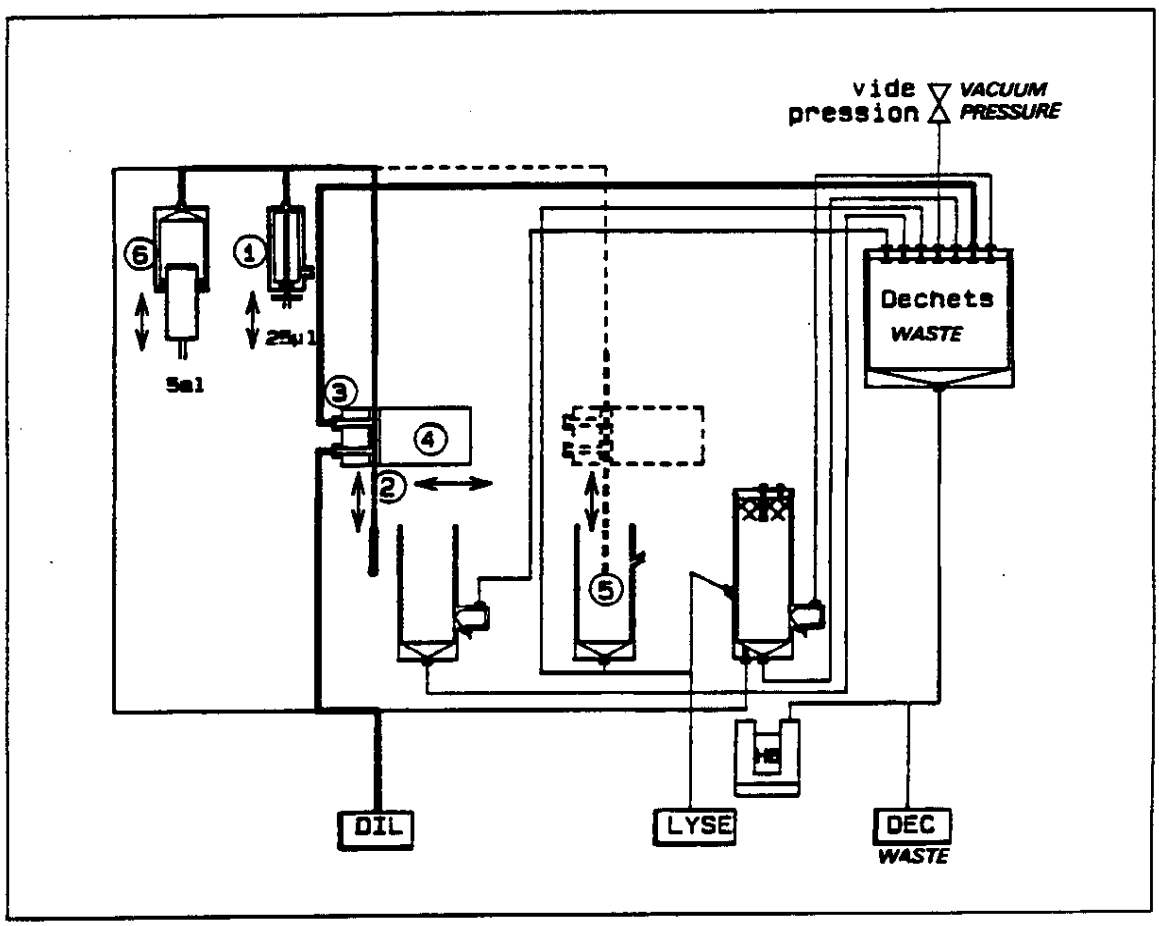


Diag.4.1.

4.1.2. Sample drawing / Dilution

The sample syringe ① draws 25µl of whole blood into the needle ② .
The needle ② rises and it is rinsed ③ while the carriage moves ④ .
The needle ② then descends into the mixing chamber ⑤ and 5 ml of diluent are sent by the dispenser ⑥ (Diag.4.2.).

The first dilution is 1/200.



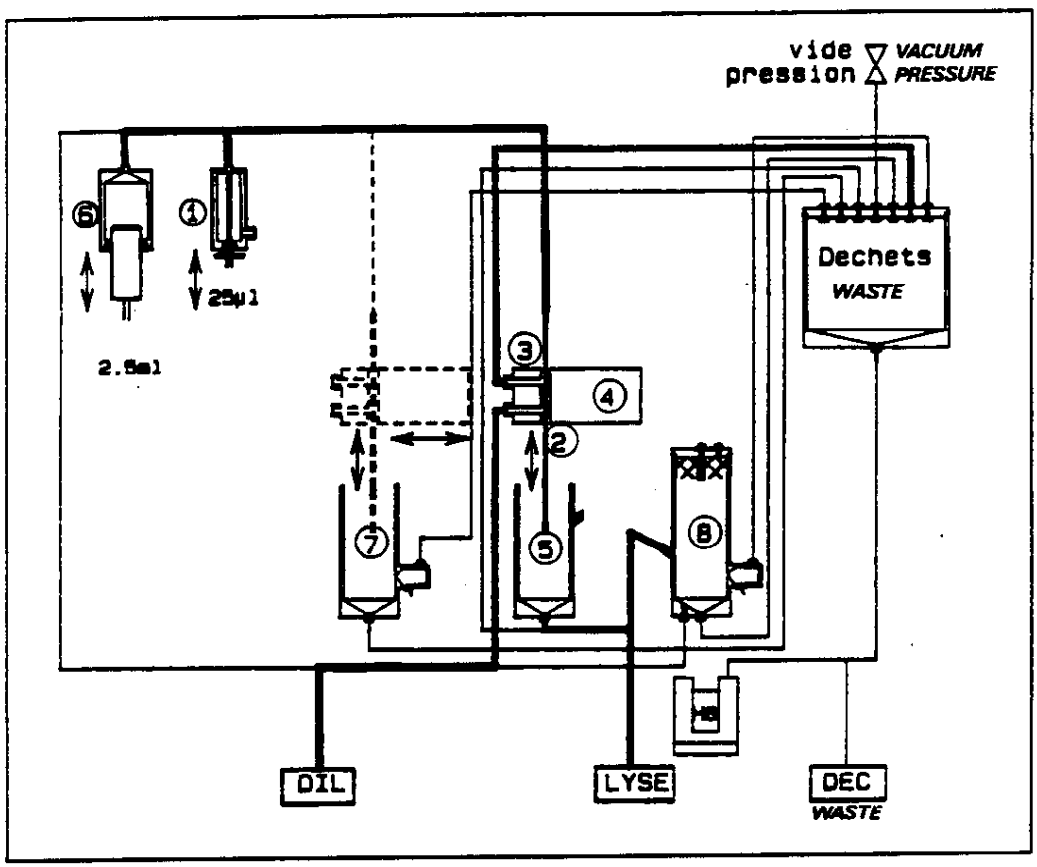
Diag.4.2.

4.1.3. RBC Dilution / transfer WBC chamber

25 µl of the first dilution are drawn into the needle ② by the syringe ① , the needle ② rises, it is rinsed ③ while the carriage moves ④ . The needle ② then descends into the RBC chamber ⑦ and 2.5 ml of diluent are sent by the dispenser ⑥ . RBC dilution is 1/20000.

At the same time, the WBC dilution is transfered from the mixing chamber ⑤ towards the WBC chamber ⑧ and 1ml of the lyse solution is sent to the WBC chamber (Diag.4.3.).

WBC dilution is 1/240.



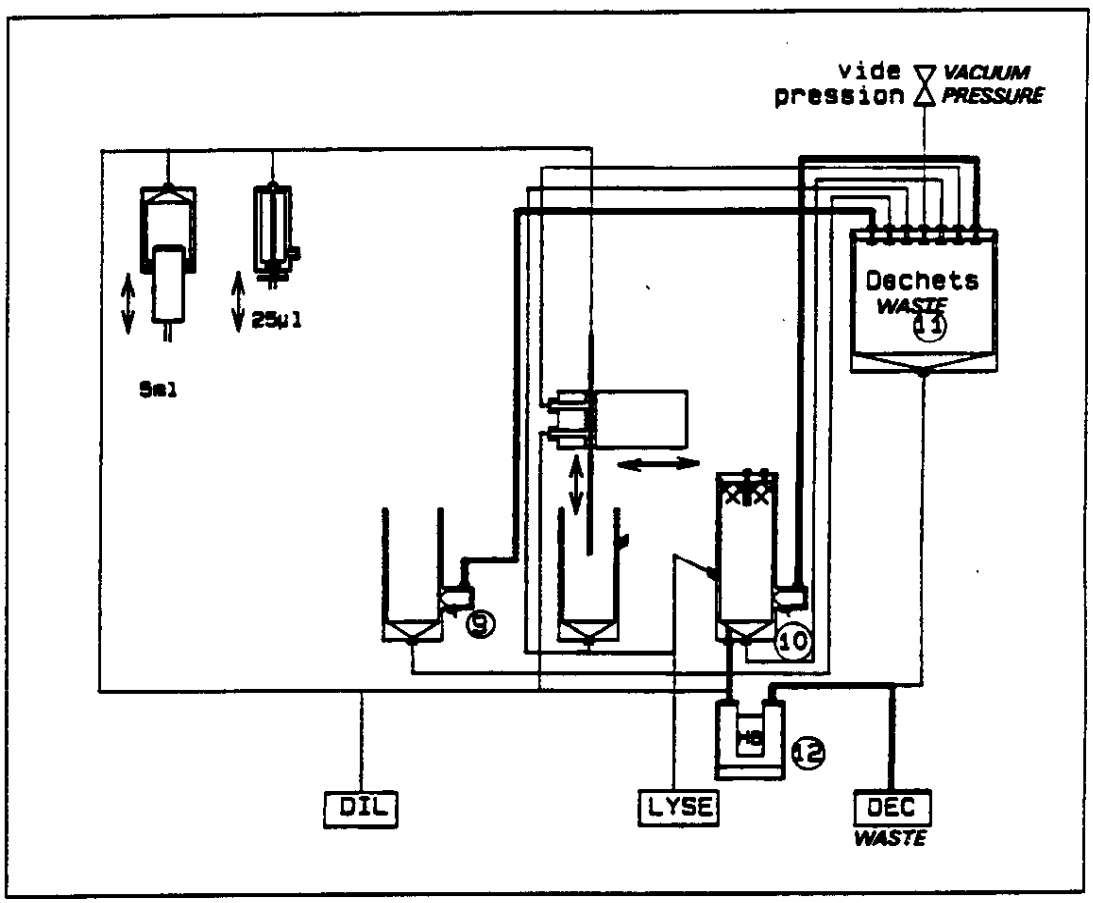
Diag.4.3.

4.1.4. Counts

The WBC and RBC dilutions are drawn at the same time through micro-apertures ⑨ and ⑩ with the regulated vacuum (from the regulated vacuum chamber ⑪).

During the first count, 1 ml of diluent is sent into the hemoglobine chamber ⑫ to measure the blank.

Before the start of the second count, 1 ml of the WBC dilution is sent into the hemoglobin chamber ⑫ for the hemoglobin measure (Diag.4.4.).



Diag.4.4.

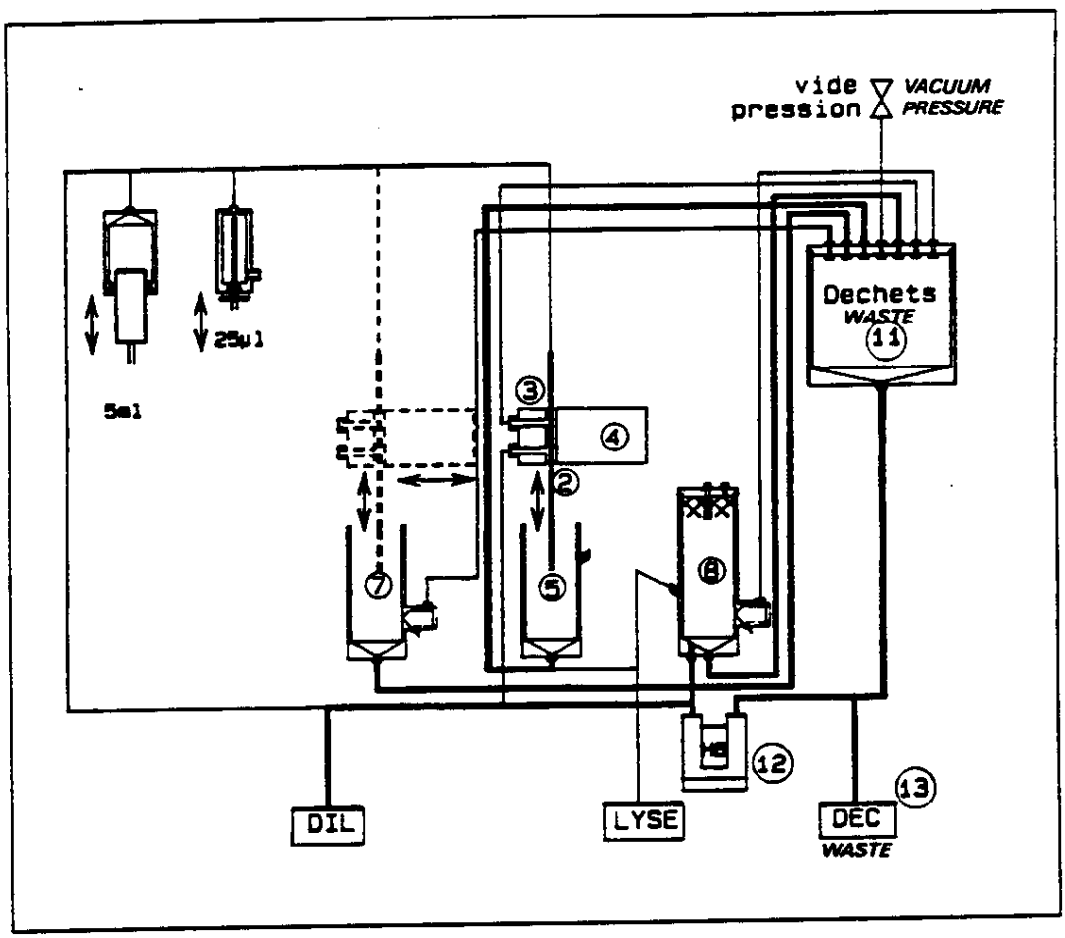
4.1.5. Chamber draining / Rinses

At the end of the counts, the chambers ⑤, ⑦, and ⑧ are drained into the waste chamber ⑪ and they are subsequently rinsed with diluent.

The sampling needle ② returns to its initial point.

The Hgb cuvette ⑫ is rinsed with diluent.

The liquids in the waste chamber ⑪ are drained into the waste container ⑬ (Diag.4.5.).



Diag.4.5.

4.2. Measurement principles

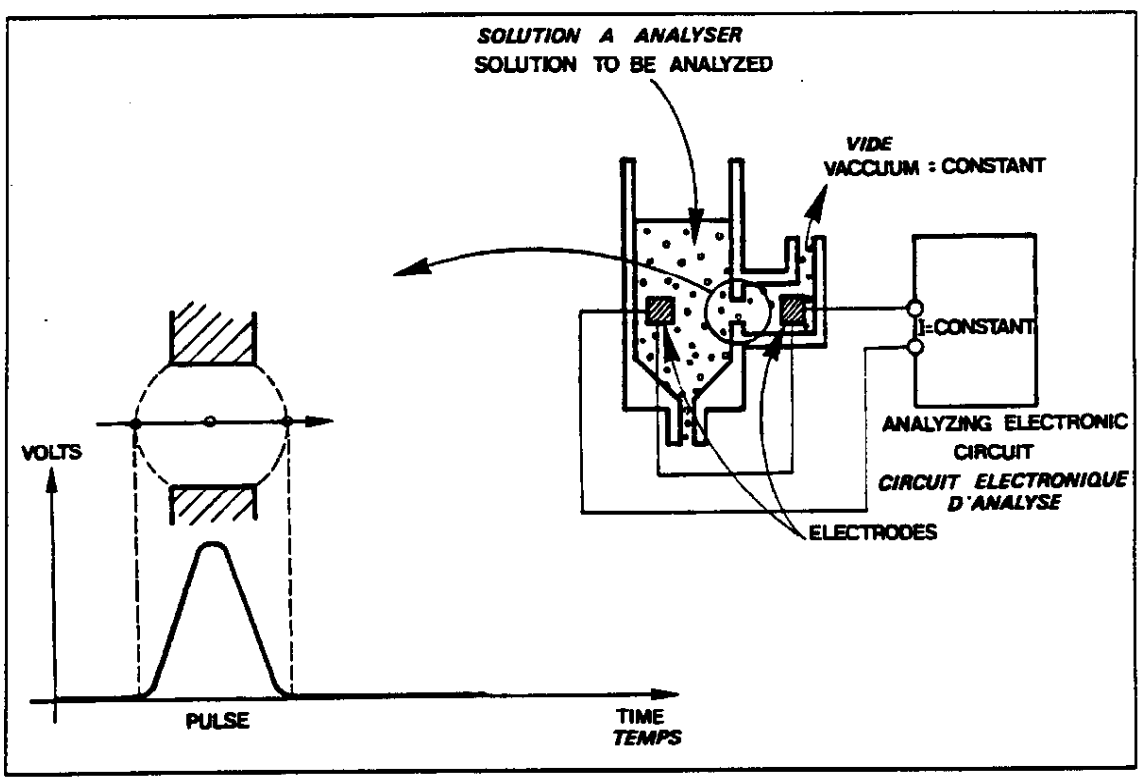
4.2.1. RBC / WBC / Plt detection principles

The counting principle is based on an impedance variation generated by the passage of cells through the calibrated micro-aperture.

1 - The sample is diluted in an electrolytic diluent (current conductor). The conductivity of the diluent differs considerably from the conductivity of the cells.

2 - The dilution is sucked through the calibrated micro-aperture. Two electrodes are placed on each side of the aperture. Electric current passes through the electrodes continuously.

3 - When the cell passes through the aperture, electric resistance (or impedance) between the two electrodes increases proportionately with the cell volume (Diag.4.6.).



Diag.4.6.

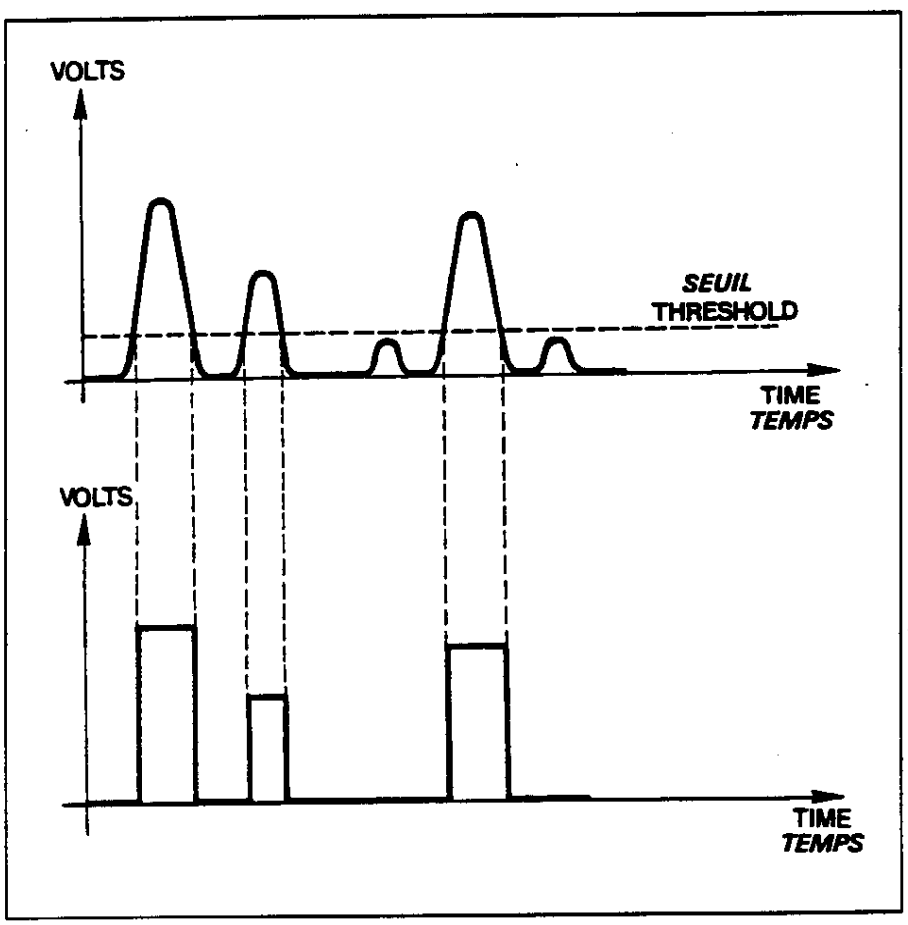
We can derive from Ohm's law :

$$U = RI$$

U = Voltage
I = Current
R = Resistance

Since I is constant, R increases with each cell passage (through the aperture), thus U increases proportionately to the cell volume.

4 - The generated impulsions have a very low voltage, which the amplification circuit increases, so that the electronic system can analyse them and eliminate the background noise (Diag.4.7.).



Diag.4.7.

5 - Two measuring chambers and detection circuits separately carry out the analysis of white blood cells, and that of platelets and red blood cells.
Pulses are sent also on the WBC/RBC distribution board wich will plot the distribution curves.

6 - The dilutions used for these different measures are the following:

* WBC = 25 µl of whole blood mixed with 5 ml of diluent, the final dilution stands at 1/200, then 1ml of lyse are added before the count, meaning that the final dilution stands at 1/240.

* RBC / Plt = 25 µl of the dilution at 1/200 are mixed with 2.5ml of the diluent, meaning that the dilution is 1/20000.

7 - Each type of cell (WBC, RBC, Plt) is analysed by an independent micro-processor.

8 - To count the platelets, the **MINOS VET** uses high performing electronics, which avoids the use of complex hydraulic systems for the elimination of faulty impulses generated at the rear side of the aperture.

When red blood cells re-enter the analysis zone, this creates impulses with a height comparable to platelet impulses, but with a different shape.
The machine uses a very sophisticated impulse sorting system. This system rejects any impulsion which does not have the typical platelet shape.

This sorting system maintains a very reliable aperture and a traditional hydraulic system.

9 - **MINOS VET** gives PLT distribution curve, by analysis on 256 counting channels .

4.2.2. Hemoglobin measurement principle

1 - 1ml of lyse agent is added to the 5ml of 1/200 dilution. This agent contains potassium ferricyanide [Fe(Cn)]K and potassium cyanide [KCN].

2 - The hemoglobin freed by the lyse of the red blood cells combines with the potassium cyanide to form the chromogenous cyanmethemoglobin compound.

3 - The compound is then measured by spectrophotometry, in a circulation cuvette, with a wave length of 540 nm.

4 - The circulation cuvette is rinsed two times following the count and once beforehand. The first rinse re-establishes the blank level, re-established for each count.

5 - The value of the blank Hgb and that of the voltage of the Hgb lamp are controlled after each cycle. If there is a mishap with either the lamp or the Hgb circuit, the user will be forewarned.

6 - The result is given in g/dl .

4.2.3. Hematocrit measurement principle

1 - The height of the impulse generated by the passage of a cell through the micro-aperture is directly proportional to the volume of the analysed cell.

2 - The hematocrit is measured by a special electronic circuit which adds up all the impulse heights.

3 - A mathematical process is applied to the sum obtained to compensate for simultaneous passages in the aperture.

4 - The result is rendered in %.

4.3. PLT distribution study

MINOS VET carries out volumetric distribution Plt on 256 analysis channels with the following measuring range :

* Plt = approximately 2 to 33 fl.

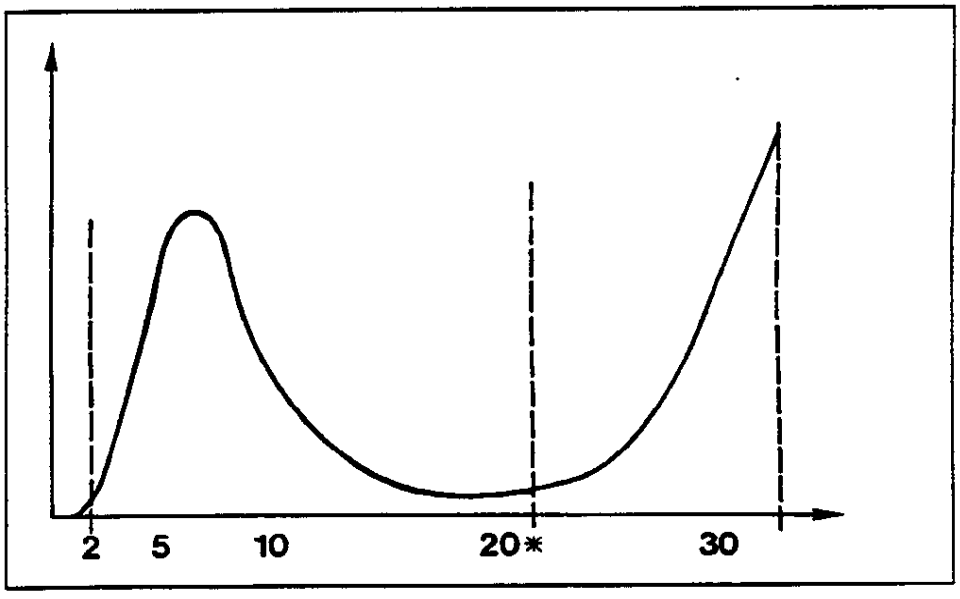
The platelet distribution study counts platelets, detects platelet anomalies and warns the lab technician in the event of a non-platelet cell population (shizocytes, microcytes, etc..., see section 4.4.).

1 - Platelets are counted, between a low threshold placed at 2 µm and a variable high threshold *(* x Plt).

$$Plt = * Plt \times Kplt$$

where Kplt is the calibration coefficient.

The variable high threshold varies according to the microcyte population, which is present in the platelet analysis zone (see Diag.4.8).



Diag.4.8

2 - Counting the mean platelet volume

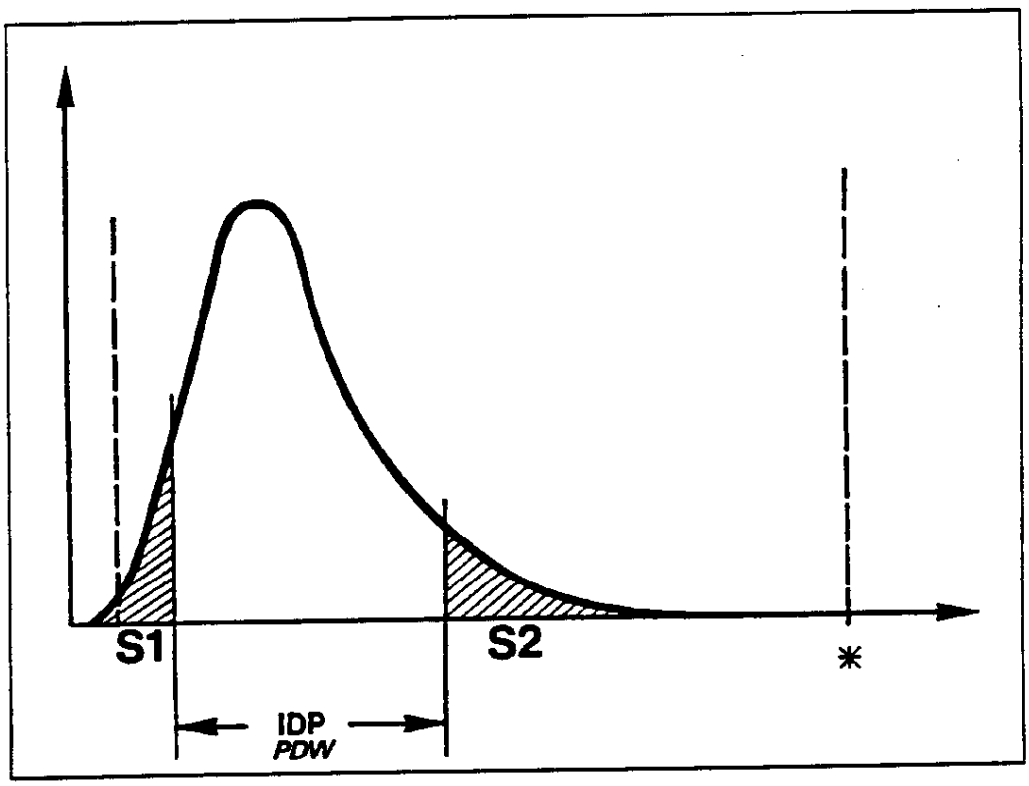
The MPV (Mean Platelet Volume) is directly derived from the analysis of the platelet distribution curve.
The MPV is expressed in µm .

3 - Calculating thrombocrit

$$THT\% = \frac{Pla\ (10\ /\mu l) \times MPV\ (\mu m)}{10000}$$

4 - Measuring the PDW (Platelet Distribution Width)

This count is derived from the platelet curve (Diag.4.9.).



Diag.4.9

PDW = Width of the curve between 15% of the number of platelets starting from 2 µm (S1) and 15% of the number of platelets beginning with the variable top threshold * (S2).

4.4. Study of warnings

With the print-out of results the following warnings may occur :

- * * * following either WBC, RBC, HCT or Plt indicates that the system counted three times but that all three counts differed and were outside the systems count limits. The result should be verified by repeating the sample.

- **$** , placed after the test number indicates that three counts were made, the $ flag also precedes the paramater concerned.

- **DIL*** printed for the WBC or HCT result indicates that the full scale for that parameter has been exceeded.
Repeat the sample using a 1/:2 dilution and repeat each time the flag reappears.

- **H** : following a result indicates that this result is above the laboratory limit set up in the SPECIAL FUNCTIONS (see section 7.).

- **L** : following a result indicates that this result is below the laboratory limit set up in the SPECIAL FUNCTIONS (see section 7.).

4.4.1. Platelet flags

- *** MIC following the Platelet result indicates the presence of microcytes in the Platelet measurement zone.

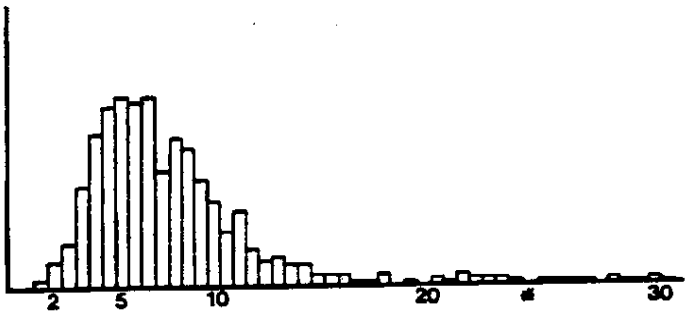
- SCH following the Platelet result indicates the presence of schizocytes or Platelet aggregates in the Platelet measurement zone.

-*** SCL following the Platelet result indicates the presence of small cells in the 2 and 3 µm zone. A second sample cycle should be carried out and the results verified. If this flag should persist, order an automatic cleaning cycle and resample. If the warning again persists verify using a Platelet Rich Plasma (PRP) of the sample and make a manual slide count for the Platelets.

- MIC without asterisk warns the operator the microcytes presence which will not affect the platelet result.

4.4.2. Platelet distributions and warnings

NAME		
SURNAME		
DATE	16/12/86	
TEST N°	036	
WBC	10,5	$10^3/mm^3$
RBC	4,47	$10^6/mm3$
HGB	13,4	g/dl
HCT	38,5	%
MCV	086	μ^3
MCH	29,9	pg
MCHC	34,8	g/dl
PLT	0224	$10^3/mm^3$
MPV	07,4	μ^3
PCT	0,165	%
PDW	14,8	
POLY N	LYMPHO	
POLY E	MONO	
POLY B		

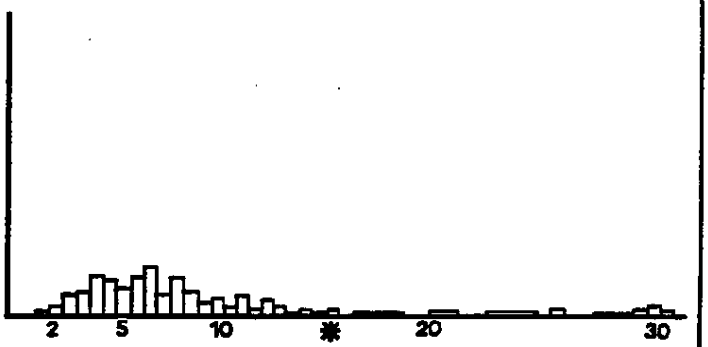


PLATELET DISTRIBUTION

Diag.4.10

Normal Platelets distribution

NAME		
SURNAME		
DATE	16/12/86	
TEST N°	033	
WBC	02,2	$10^3/mm^3$
RBC	2,12	$10^6/mm3$
HGB	06,0	g/dl
HCT	16,5	%
MCV	077	μ^3
MCH	28,3	pg
MCHC	36,3	g/dl
PLT	0052	$10^3/mm^3$
MPV	07,4	μ^3
PCT	0,038	%
PDW	18,9	
POLY N	LYMPHO	
POLY E	MONO	
POLY B		

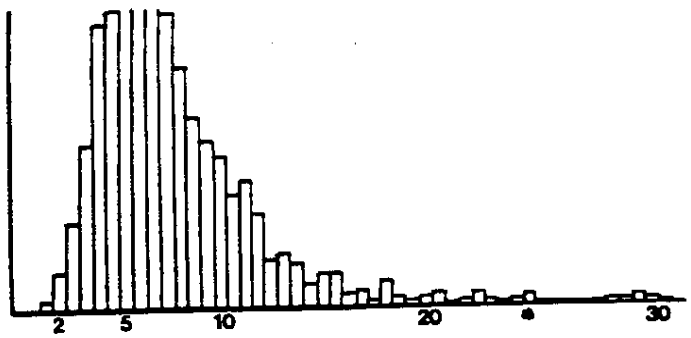


PLATELET DISTRIBUTION

Diag.4.11

- Thrombopenia
- Normal Platelets distribution.

NAME		
SURNAME		
DATE	16/12/86	
TEST N°	038	
WBC	20,4	$10^3/mm^3$
RBC	5,6	$10^6/mm3$
HGB	18,3	g/dl
HCT	54,0	%
MCV	095	μ^3
MCH	32,4	pg
MCHC	33,8	g/dl
PLT	0421	$10^3/mm^3$
MPV	07,6	μ^3
PCT	0,319	%
PDW	14,4	
POLY N	LYMPHO	
POLY E	MONO	
POLY B		

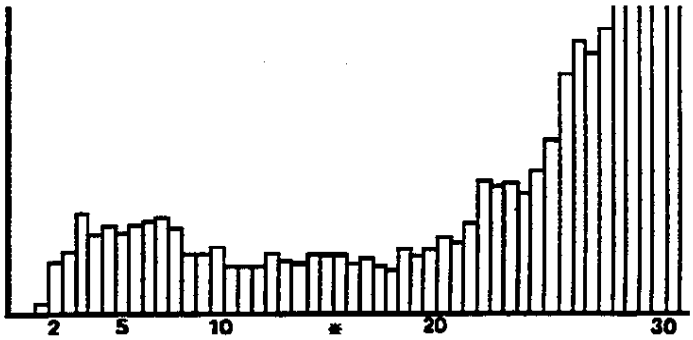


PLATELET DISTRIBUTION

Diag.4.12

- Thrombocytosis
- Normal Platelets distribution (the saturation of the peaks between 2 and 20 µm is due only to the plotting of the curve), the result however is correct.

NAME		
SURNAME		
DATE	19/12/86	
TEST N°	002	
WBC	03,0	$10^3/mm^3$
RBC	5,34	$10^6/mm3$
HGB	09,4	g/dl
HCT	34,9	%
MCV	065	μ^3
MCH	17,6	pg
MCHC	26,9	g/dl
PLT	0184***	$10^3/mm^3$
MPV	05,4***	MICROC
PCT	0,094	μ^3
PDW	00,0***	%
POLY N	LYMPHO	
POLY E	MONO	

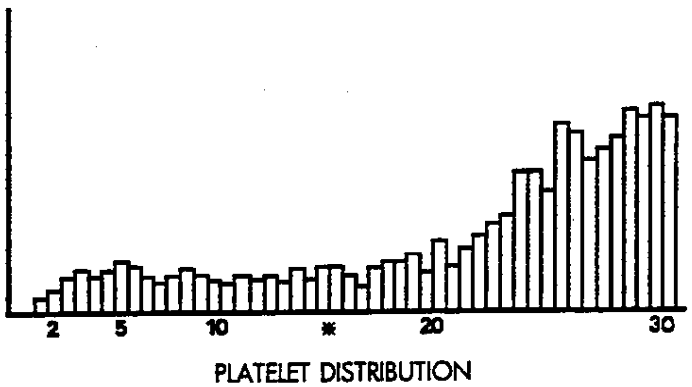


PLATELET DISTRIBUTION

Diag.4.13

- Microcyte warning (MIC).
- When the last PLT peaks are saturated, the result of the platelets is incorrect. A Platelets count must be made on P.R.P (Platelet Rich Plasma).

NAME		
SURNAME		
DATE	19/12/86	
TEST N°	001	
WBC	02,8	$10^3/mm^3$
RBC	5,31	$10^6/mm3$
HGB	09,2	g/dl
HCT	34,2	%
MCV	064	μ^3
MCH	17,3	pg
MCHC	26,9	g/dl
PLT	0175***	$10^3/mm^3$
MPV	05,4***	MICROC
PCT	0,094	μ^3
PDW	00,0***	%
POLY N	LYMPHO	
POLY E	MONO	

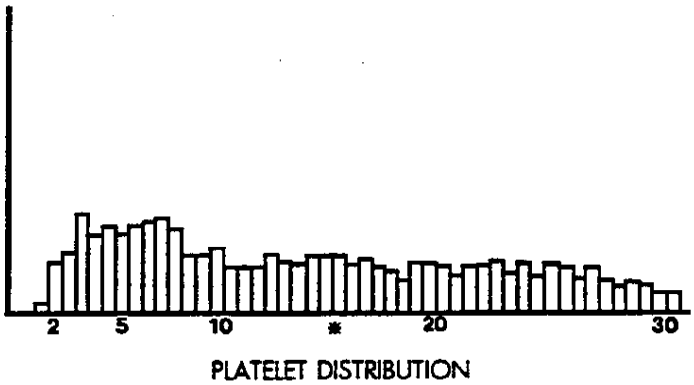


PLATELET DISTRIBUTION

Diag.4.14

- Microcyte warning (MIC).
- The last PLT peaks are not saturated, the result of the Platelets is correct. As a safety precaution, it is preferable to remake a Platelets count on P.R.P.

NAME		
SURNAME		
DATE	18/12/86	
TEST N°	001	
WBC	06,6	$10^3/mm^3$
RBC	4,55	$10^6/mm3$
HGB	13,1	g/dl
HCT	43,7	%
MCV	096	μ^3
MCH	28,7	pg
MCHC	29,9	g/dl
PLT	0137***	$10^3/mm^3$
MPV	11,0***	SCHIZ
PCT	0,150	μ^3
PDW	17,2	%
POLY N	LYMPHO	
POLY E	MONO	



PLATELET DISTRIBUTION

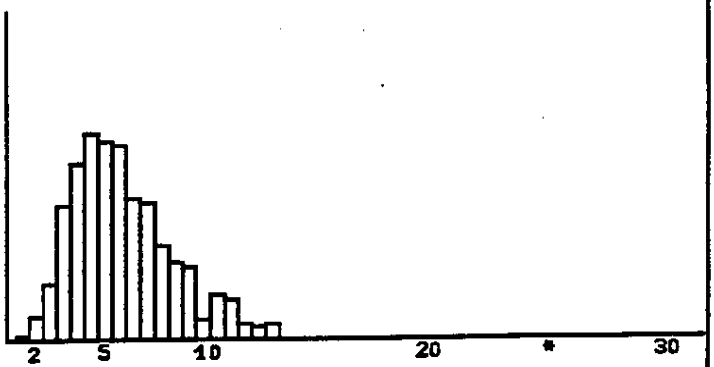
Diag.4.15

- Warning ***SCHIZ.
- The distribution reveals the presence of the peaks up to 50µm.

They are due to platelet aggregates or to macrothrombocytes or schistocytes.
Run a platelet count on PRP.
In the latter case, a check must be done on a blood film.

4.4.3. Example of platelet distribution on animal blood

NAME		
SURNAME		
DATE	09/02/89	
TEST N°	004	
WBC	08,8	$10^3/mm^3$
RBC	8,15	$10^6/mm3$
HGB	13,6	g/dl
HcT	40,6	%
MCV	050	μ^3
MCH	16,6	pg
MCHC	33,4	g/dl
PLT	0156	$10^3/mm^3$
MPV	05,5	μ^3
PCT	0,086	%
PDW	16,2	
POLY N	LYMPHO	
POLY E	MONO	

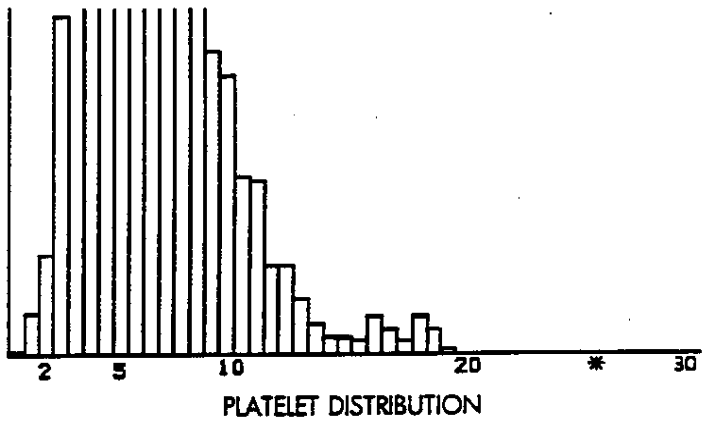


PLATELET DISTRIBUTION

Diag.4.16

Horse blood

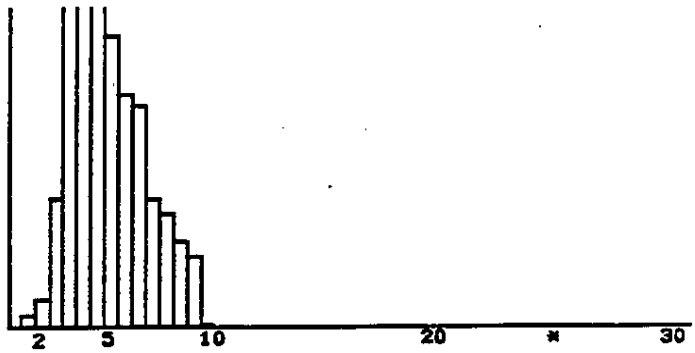
NAME		
SURNAME		
DATE	09/02/89	
TEST N°	004	
WBC	06,0	$10^3/mm^3$
RBC	7,94	$10^6/mm3$
HGB	14,7	g/dl
HcT	39,6	%
MCV	050	μ^3
MCH	18,5	pg
MCHC	37,1	g/dl
PLT	0681	$10^3/mm^3$
MPV	05,7	μ^3
PCT	0,386	%
PDW	15,8	
POLY N	LYMPHO	
POLY E	MONO	



Diag.4.17

Rat blood

NAME		
SURNAME		
DATE	09/02/89	
TEST N°	004	
WBC	06,2	$10^3/mm^3$
RBC	11,61	$10^6/mm3$
HGB	12,4	g/dl
HcT	38,4	%
MCV	033	μ^3
MCH	10,6	pg
MCHC	32,2	g/dl
PLT	0239	$10^3/mm^3$
MPV	04,6	μ^3
PCT	0,110	%
PDW	15,0	
POLY N	LYMPHO	
POLY E	MONO	

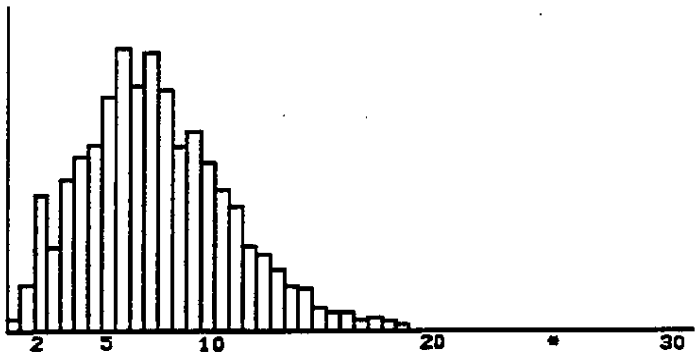


PLATELET DISTRIBUTION

Diag.4.18

Sheep blood

NAME		
SURNAME		
DATE	09/02/89	
TEST N°	004	
WBC	08,2	$10^3/mm^3$
RBC	3,25	$10^6/mm3$
HGB	07,4	g/dl
HcT	20,8	%
MCV	064	μ^3
MCH	22,7	pg
MCHC	35,5	g/dl
PLT	0317	$10^3/mm^3$
MPV	06,9	μ^3
PCT	0,218	%
PDW	18,8	
POLY N	LYMPHO	
POLY E	MONO	

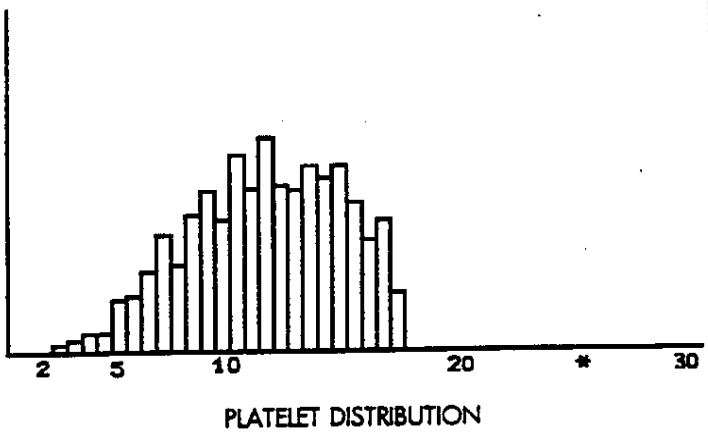


PLATELET DISTRIBUTION

Diag.4.19

Dog blood

NAME		
SURNAME		
DATE	09/02/89	
TEST N°	004	
WBC	18,6	$10^3/mm^3$
RBC	7,57	$10^6/mm3$
HGB	12,3	g/dl
HcT	36,4	%
MCV	048	μ^3
MCH	16,2	pg
MCHC	33,7	g/dl
PLT	0226	$10^3/mm^3$
MPV	11,4	μ^3
PCT	0,258	%
PDW	11,3	
POLY N	LYMPHO	
POLY E	MONO	

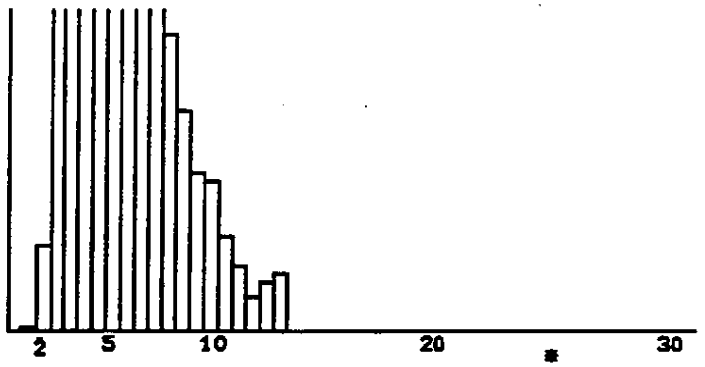


PLATELET DISTRIBUTION

Diag.4.20

Cat blood

NAME		
SURNAME		
DATE	09/02/89	
TEST N°	004	
WBC	02,3	$10^3/mm^3$
RBC	8,18	$10^6/mm3$
HGB	14,6	g/dl
HcT	43,7	%
MCV	053	μ^3
MCH	17,8	pg
MCHC	33,4	g/dl
PLT	0781	$10^3/mm^3$
MPV	04,8	μ^3
PCT	0,374	%
PDW	14,6	
POLY N	LYMPHO	
POLY E	MONO	

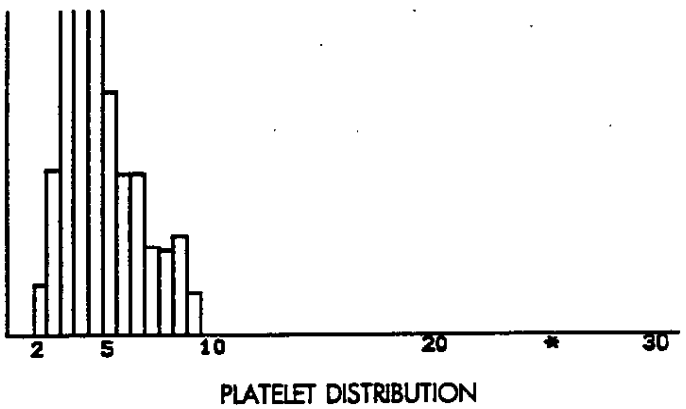


PLATELET DISTRIBUTION

Diag.4.21

Mouse blood

NAME		
SURNAME		
DATE	09/02/89	
TEST N°	004	
WBC	12,0	$10^3/mm^3$
RBC	9,97	$10^6/mm3$
HGB	12,6	g/dl
HcT	35,1	%
MCV	035	μ^3
MCH	12,6	pg
MCHC	35,8	g/dl
PLT	0213	$10^3/mm^3$
MPV	04,4	μ^3
PCT	0,093	%
PDW	13,6	
POLY N	LYMPHO	
POLY E	MONO	



PLATELET DISTRIBUTION

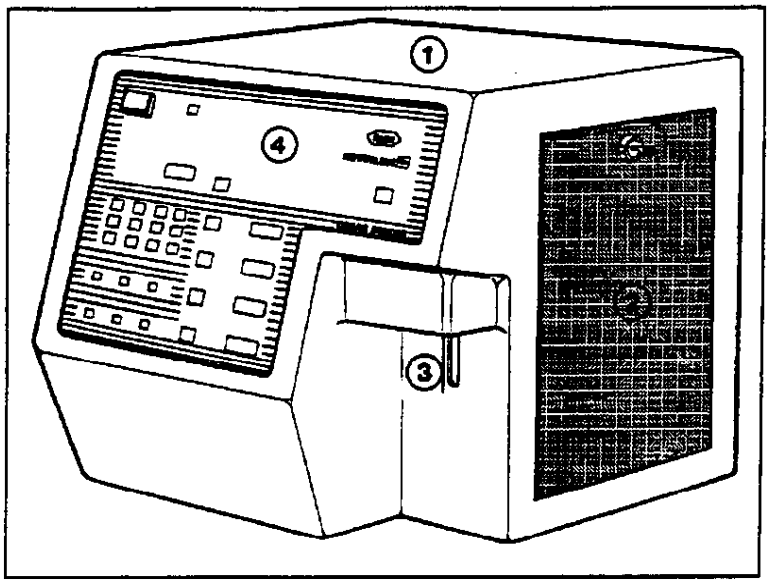
Diag.4.22

Bovine blood

SECTION 5

5. DESCRIPTION AND PART LIST

5.1. Analyseur



Diag.5.1

1 Cover
2 Door to pneumatical part
3 Sampling needle
4 Front panel

1 - **MINOS VET** Cover

The instrument cover is fixed by the mean of 2 screws located on the rear left and right hand sides.
Before any attemp to remove the cover, take off the pneumatical door on the right hand side of the system.

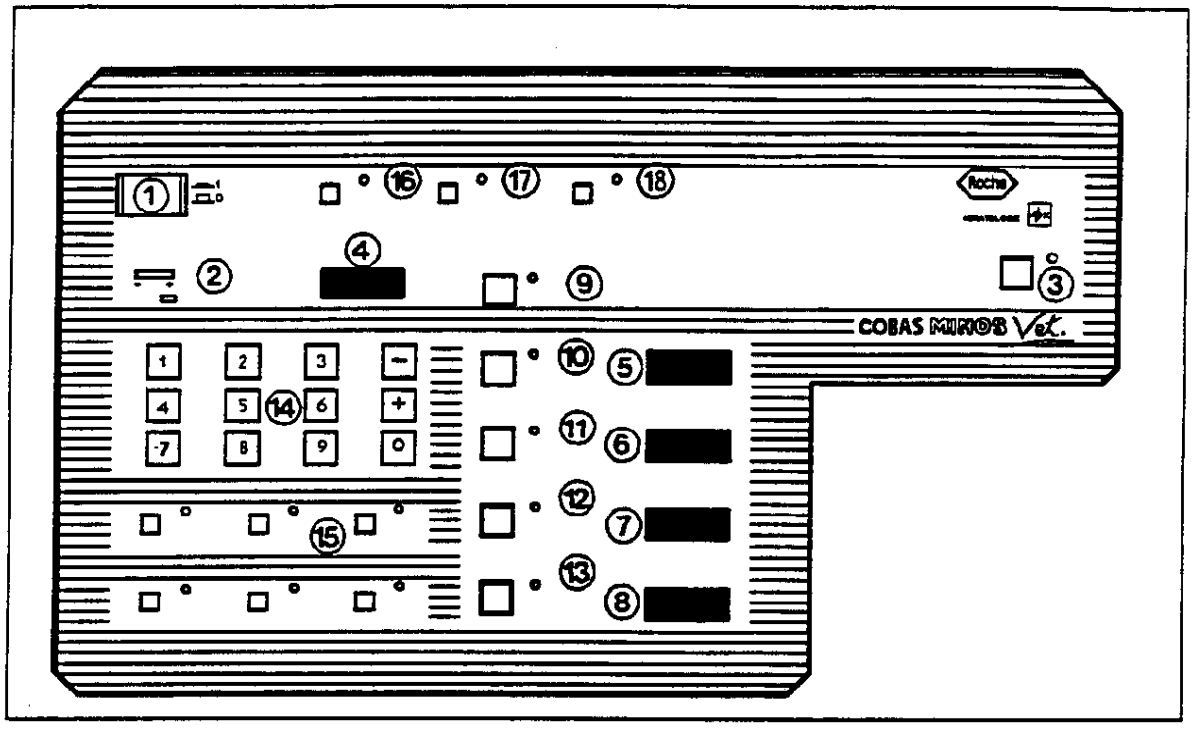
2 - Pneumatical access door

This door equipped with a locker gives an access to the pneumatical prts. It allows also the operator to check the hydraulic cycle operation.
It is recommended to keep the door locked during the measuring cycles as it is equipped with an electrical interference shield.

3 - Sampling needle

This needle allows the 25µl whole blood sampling. Its internal and external rinsing is an **ABX** patent and is fully automatic.
When the instrument has to be moved, it is recommended to lift up manually the needle in its upper position through the pneumatical door to avoid any damage.

5.1.1. Front panel and command keys



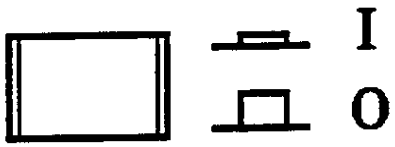
Diag.5.2

1 Power switch ON/OFF
2 Indicator lights VACUUM/PRESSURE
3 Analysis cycle command key
4 PATIENT N°/PLT result display
5 WBC result display
6 RBC result display
7 Hb result display
8 Ht result display
9 PLT Calibration key
10 WBC Calibration key
11 RBC Calibration key
12 Hb Calibration key
13 Ht Calibration key
14 Numérical keyboard
15 Cleaning and reagent priming keys
16 Special functions keys
17 Data out put key
18 Curve functions key

MINOS VET front panel is made of a soft and waterproof plastic material which allows an easy cleaning.

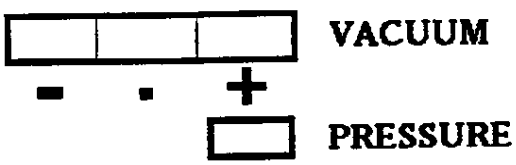
Each sensitive key is equipped with a control light wich remains on during all the associated cycle operation.

1 - ON/OFF Power switch



An inside indicator light is on during all the instrument operation.

2 - Light indicators VACUUM/PRESSURE



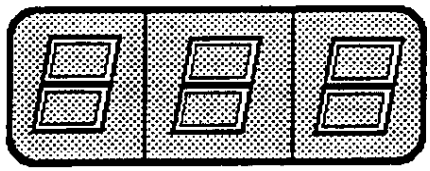
These two indicators are on the red position when the instrument is switched on.
The vacuum indicator turns to green after few seconds and the pressure indicator needs about ten seconds(when the working pressure 1,5 Bar is reached) .

NOTA :	For security reasons, when one or two of these indicators remain on the red position, it is not possible to activate any of the hydraulic cycle command key (see section 10. for troubleshooting procedure.).

3 - Analysis cycle command key 

This key allows the 25µl whole blood sampling for analysis. When it is activated, the indicator light flashes during the sampling time. When the indicator stops flashing, the operator is allowed to remove the tube from the sampling position.

4 - PATIENT N°/PLT result display



PATIENT N°

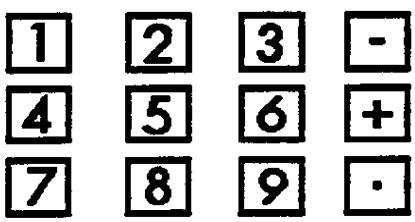
PLATELET

When the instrument is switched on, the display shows 001 for the first patient analysis number.
At the end of the analysing cycle, the display will show the PLT result for 5 seconds, then it turns to the next patient number 002.

5, 6, 7, 8 : WBC, RBC, Hgb, Hct result displays.

9, 10, 11, 12, 13 : WBC, RBC, PLT, Hgb, Hct Calibration keys.

14 - Numerical keyboard.



Keys from 0 to 9 allow the operator to enter the following figures :

- Date
- Calibration values
- Pathological limits
- Display and print out of a memorized result
- Patient number for analysis

[+] and - [-] keys allow the operator to enter the next or previous patient number.

15 - Cleaning and reagent priming keys.

Diluent rinse : 
This key allows the operator to run an automatic cleaning of the instrument with diluent **(MINOTON)**.
It is used also when replacing the diluent container to prime the reagent.

Detergent Rinse : 
This cycle will run inside the instrument a cleaning reagent **(MINOCLAIR)** then a detergent **(MINOTERGE)**.
The rinse detergent cycle has to be carried out every day at the end of the work. **MINOS VET** will be left in stand by position at the end of this cycle.

Lyse prime : 
This cycle, priming the lyse has to be carried out when replacing the lyse bottle to avoid any air bubbles inside the tubing.

Drain chamber : 
This key allows the drainage of the Mixing, RBC, WBC and Waste chambers.

Back flush : 
This key allows the operator to carry out a back flush pressure at the counting apertures (WBC and RBC/PLT).

Automatic cleaning : 
This cycle carries out, automatically, a whole cleaning procedure of the instrument involving **MINOCLAIR**. All hydraulical parts are cleaned, hemoglobin optical chamber included.
This cycle has a duration of 5 minutes.

16 - Data output function : 

This function allows the transmission by batch of memorized patient results to a main laboratory computer.

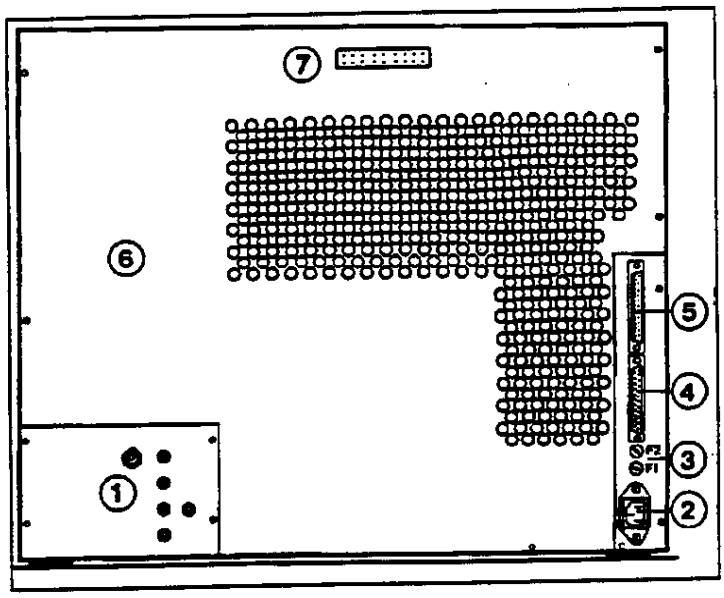
17 - Special functions : 

This commande key gives an access to different sub-functions (See section 7.1.).

18 - Paper advance : 

This function allows the printer paper advance on the printer.

5.1.2. Rear panel / Main fuses

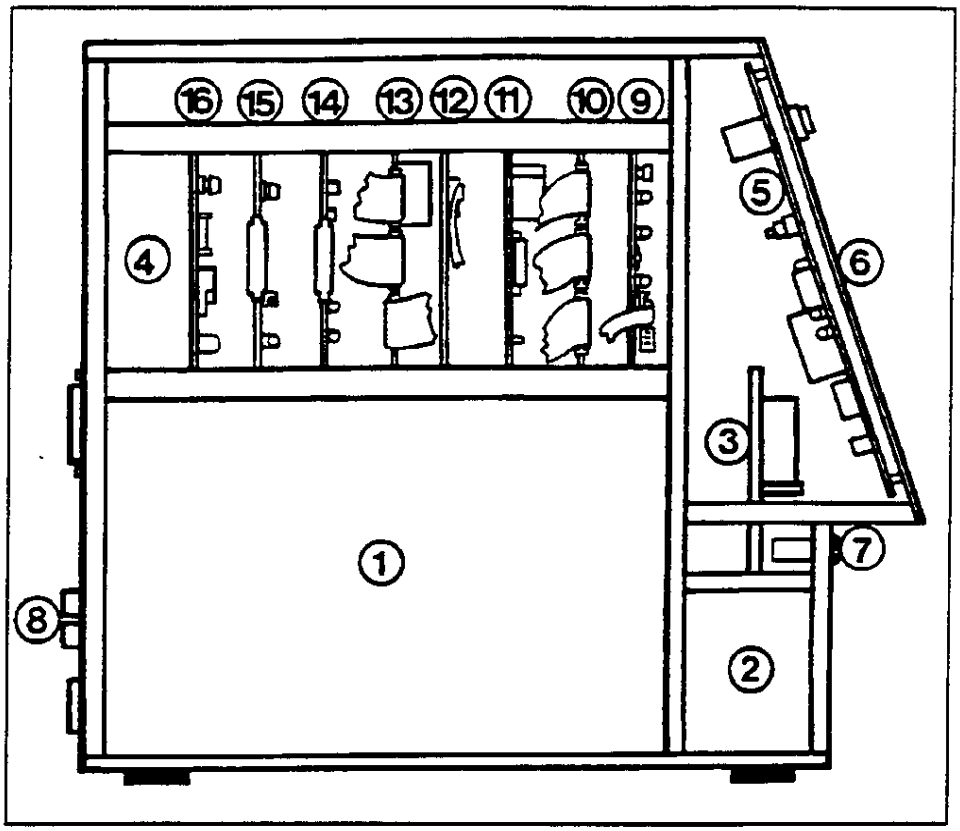


Diag.5.3

1 Reagent block
2 Power socket
3 F1,F2 Main fuses
4 RS : **PAM** or computer connection
5 printer out put
6 rear panel
7 Veterinary unit connection

Diag.5.3b

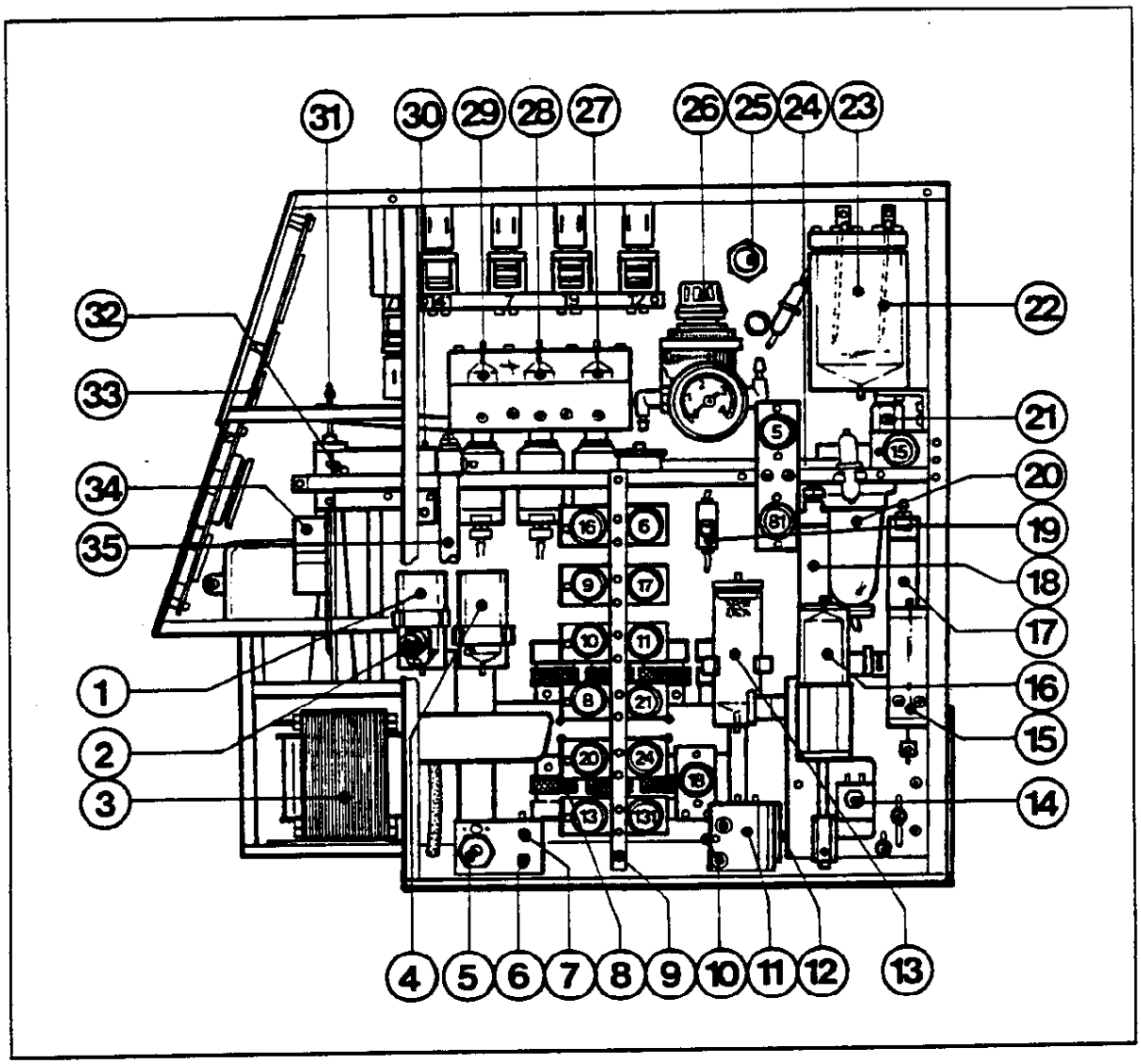
5.1.3. Left side internal view



Diag.5.4

1	Compressor	9	Plt board
2	Power supply	10	Microprocessor board
3	Power and regulation boards	11	Memory board
4	Card cage	12	ADC board
5	Front panel board	13	interface board
6	Front panel	14	Ht/Hb board
7	Power supply fuses	15	WBC board
8	Main supply fuses	16	RBC board

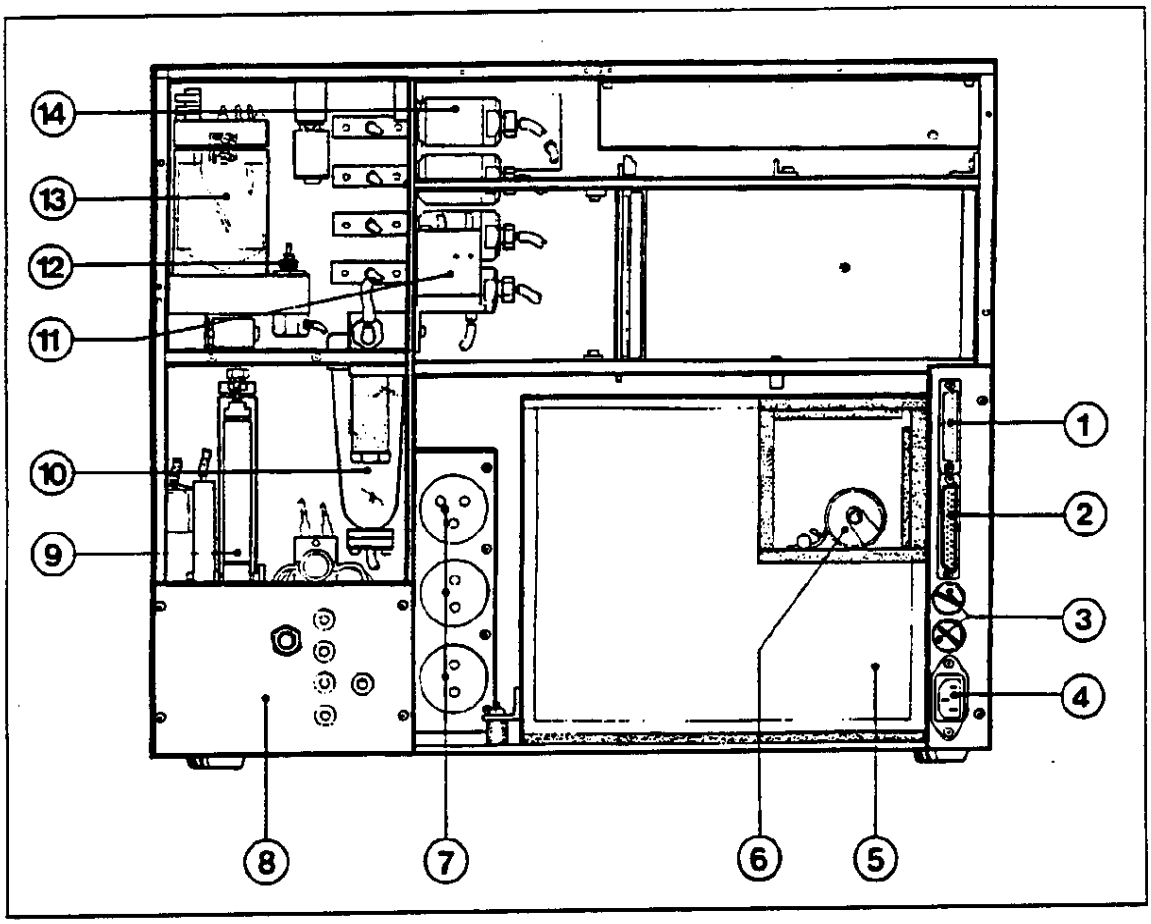
5.1.4. Right internal view



Diag.5.5

1 RBC chamber
2 RBC counting chamber
3 Main transformer
4 Mixing chamber
5 Main bubbling regulator
6 RBC bubbling regulator
7 Mixing bubbling regulator
8 Electrovalves ASSY
9 Pinch valves ASSY
10 Hb Lamp
11 Hb spectrophotometer
12 Hb photodetector
13 WBC chamber
14 PLT solenoid
15 25µl syringe
16 5 ml dispenser
17 25 µl syringe air cylinder
18 5 ml dispenser air cylinder
19 Adjustable retrictor
20 HP filter
21 Backflush regulator
22 Level detection electrodes
23 Waste chamber
24 Carriage air cylinder
25 Vacuum regulator
26 Pressure regulator
27 Lyse pump
28 Hb pump
29 Needle rinse pump
30 Carriage stopper solenoid
31 Sampling needle
32 Sample carriage
33 Front panel board
34 Power supply board
35 Sampling needle air cylinder

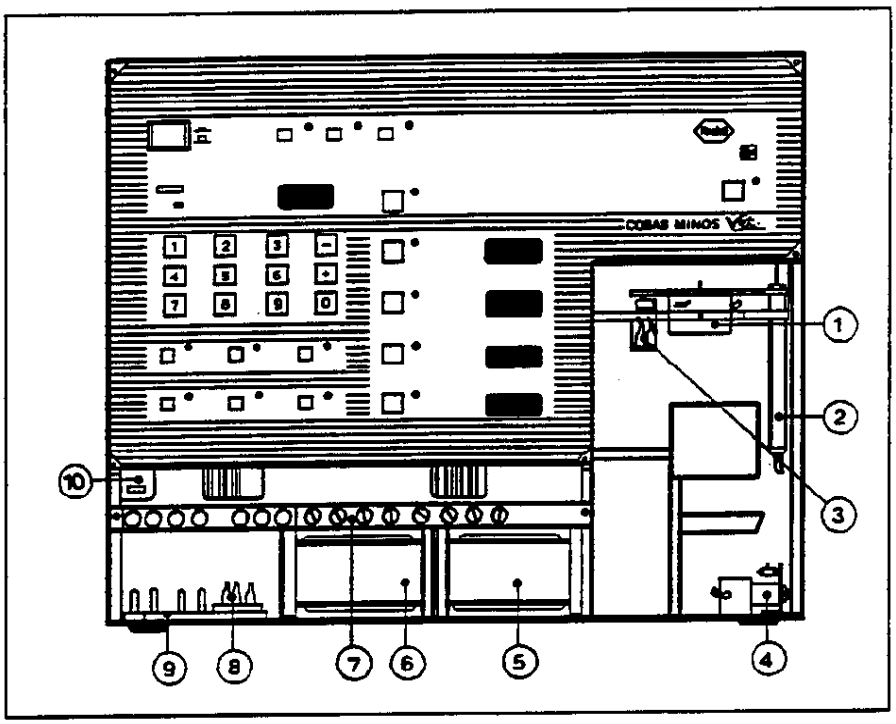
5.1.5. Rear inside view



Diag.5.6

1 Printer out put
2 RS/**PAM**-computer out put
3 Main fuses
4 Power suplly socket
5 compressor
6 Starting capacitor
7 Vacuum/pressure reservoirs
8 Reagent block
9 25µl seringe air cylinder
10 high pressure filter
11 Pressostat
12 Back flush regulator
13 Waste/vacuum chamber
14 pneumatical command pilot

5.1.6. Front inside view



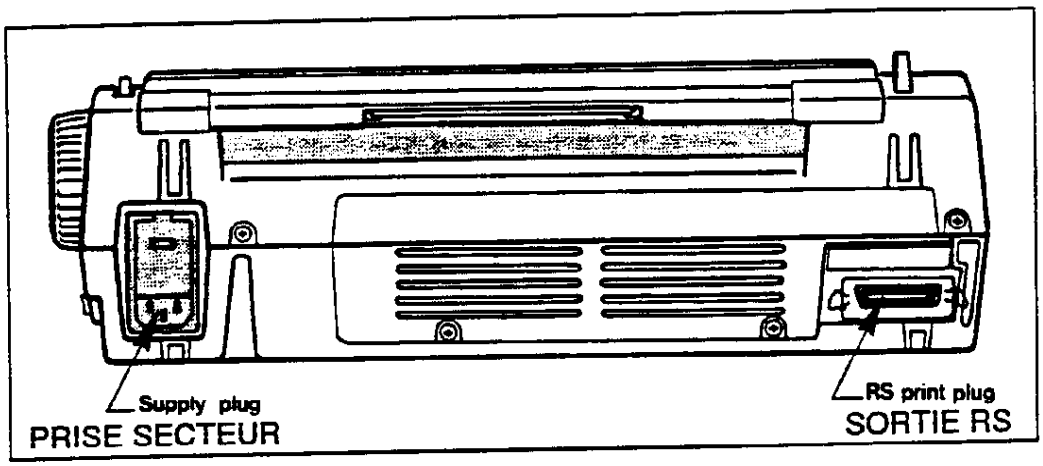
Diag.5.7

1 Sampling needle carriage
2 Sampling needle air cylinder assy
3 Carriage stopper
4 Bubbling regulators
5 Main transformer
6 17V transformer
7 Power supply fuses
8 Rectifier bridge
9 5V regulators
10 Shaffner filter

5.2. Printer

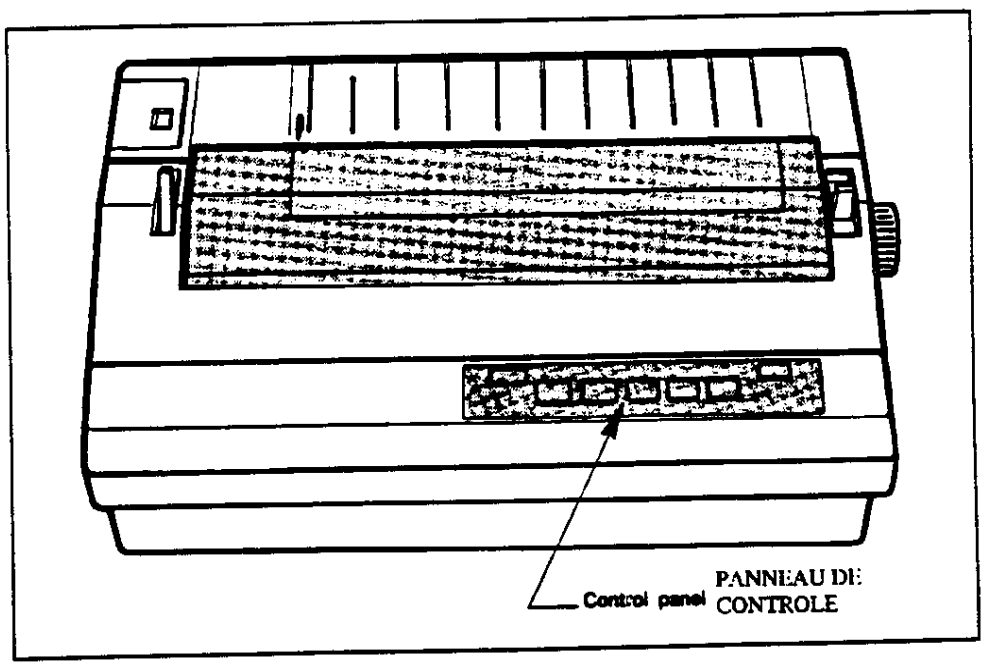
5.2.1. Connection

Printer is connected to **MINOS VET** with the cable delivered with the instrument.
Lock the connector by the mean of the 2 screws on the upper out put of the **MINOS VET**.
Lock the printer connector by the mean of the 2 clips located on the connector itself.



Diag.5.8

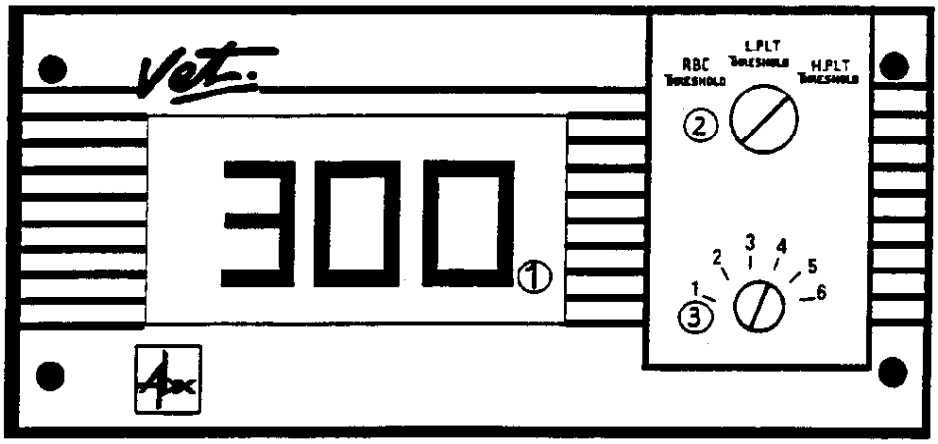
5.2.2. Front view



Diag.5.9

5.3. Veterinary threshold selection unit

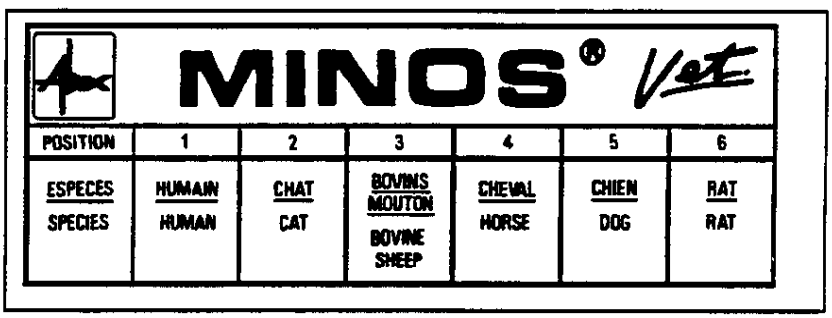
5.3.1. Front view



Diag.5.10

1 - Threshold value display
2 - Threshold value display selection knob
3 - Specimen selection

5.3.2. Top view (specimen selection)



Diag.5.11

SECTION 6

6. PREPARATION BEFORE ANALYSIS AND START UP

6.1. Reagents and products

Check the reagent levels for **MINOTON, MINOLYSE, MINOCLAIR, MINOTERGE.**
If the level is not high enough, or if the expiration date has passed, replace the bottle concerned.
Check that the printer has enough paper to print out the results.

6.2. Waste

Check the level of the liquid in the waste container.
If necessary, replace the container and carry out the waste neutralisation procedure as described in section 2.8.2.

6.3. Connections

Check that all reagent and waste tubes are properly fitted and not pinched.Check that the printer is connected to **MINOS VET**.

6.4. Start up

After making sure that the voltage shown on the rear side of the instruments correspond to the laboratory voltage (see section 2.9.), press on the ON/OFF switch on the right hand side of the printer.
Check that the POWER light indicator is ON.
Check that the READY indicator light is ON, if not press on the READY key.

Power ON instrument by pressing on the ON/OFF switch on the front panel.

When instrument turns on, the displays show :

- Patient N° display shows : 001
- RBC, WBC, Hb, Ht, show : 000
- Compressor starts
- Vacuum/pressure light indicators turn from red to green.

When initialisation is completed, go to further sections, if not, switch instrument OFF an ON again.
If the problem persists, please contact **ABX** authorized service department.

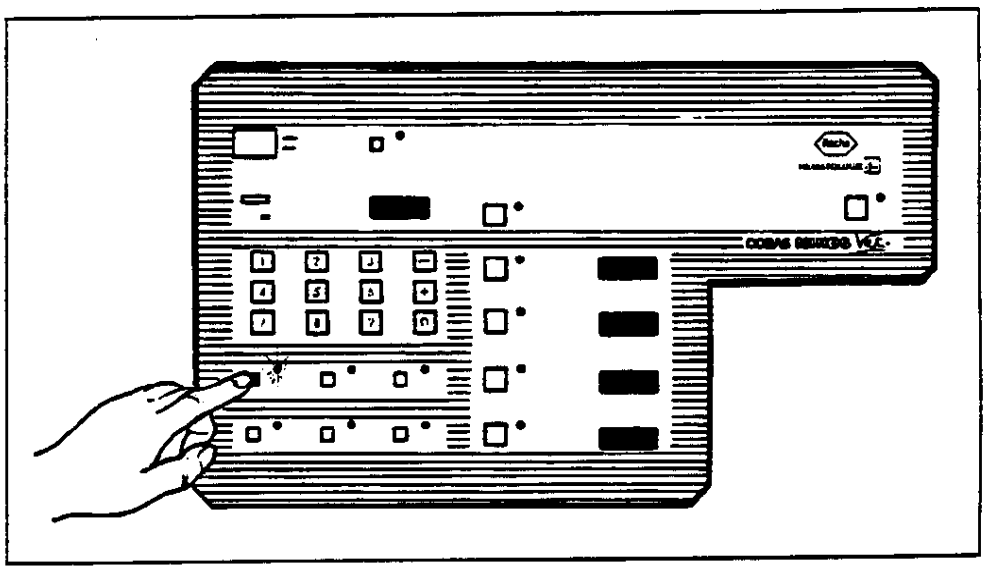
6.5. Reagents priming

When **MINOS VET** was first installed, it contained no reagent. All reagents have to be primed now.
Run a blank measuring cycle to check the proper operation of the dispenser,(see section 4.1.).
When the command cycle light indicator is off, carry out in the following sequence :

- a diluent rinse
- a detergent rinse
- a diluent rinse
- a prime lyse
- a blank measuring cycle.

6.5.1. diluent priming

Diluent rinse cycle : press on the DILUENT RINSE key, bottom left of the front panel (Diag.6.1.).

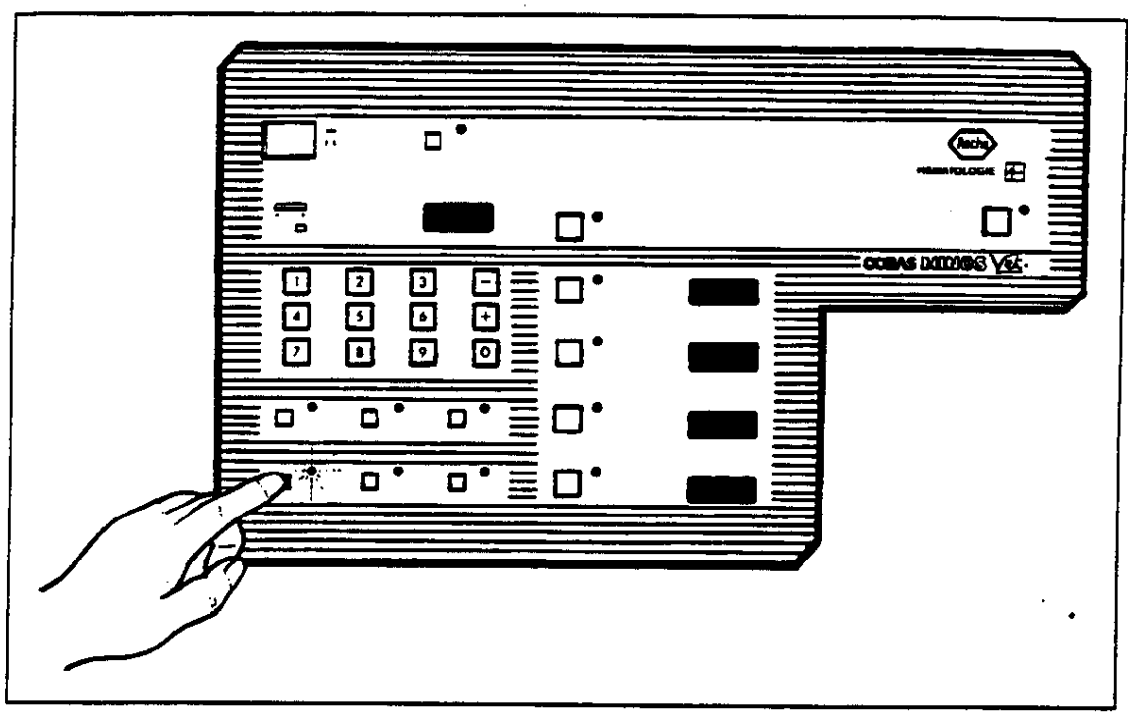


Diag.6.1.

The red indicator light switchs ON and the rinsing cycle will be crried out automatically.
the dispenser is activated 4 times which allows a complete priming and rinsing of the hydraulictubes with a clean diluent coming from the container.
a blank measuring cycle ends the rinse diluent cycle in order to prime all the reagents used in a measuring cycle.

6.5.2. Detergent priming

Press on the DETERGENT RINSE key on the bottom left of the front panel (Diag.6.2.).



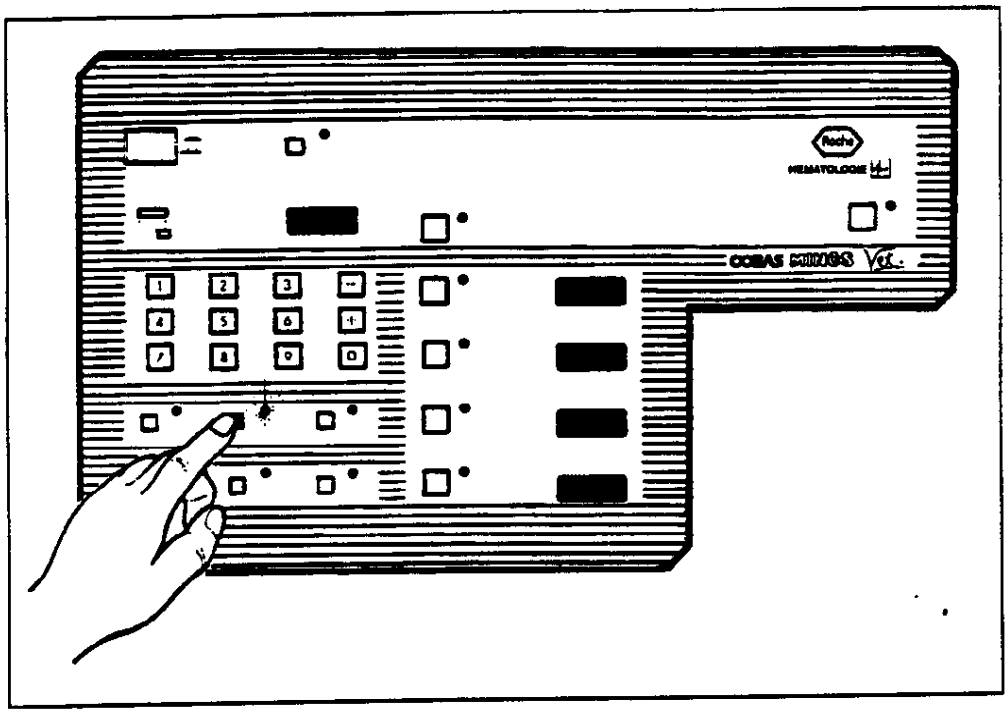
Diag.6.2.

The red indicator light switches ON and the rinse detergent cycle is carried out automatically.
The dispenser is activated 4 times wich allows all hydraulic tubes to be primed and rinsed with the detergent coming from the container.
When the cycle is finished, the instrument turns to stand by mode, the compressor stops and the instrument remains with detergent in all the tubings.
Switch the instrument off for a long stop or, when it is needed, carry out a rinse diluent before analysis.

WARNING :	**Never run a measuring cycle after a rinse detergent without rinsing the instrument with a** DILUENT RINSE **.**

6.5.3. Lyse priming

Press on the [LYSE PRIME] key at the bottom left of the front panel (Diag.6.3.).



Diag.6.3.

The instrument carries out a complete priming of the lyse tubes by the mean of 7 lyse aspirations (1 ml of lyse for each aspiration).
When the cycle is finished, the red light indicator switch off.

WARNING :	**Never run 2 lyse prime cycles consecutively to avoid overflowing of the lyse foam in the waste chamber.**

6.6. Sample collection and mixing

6.6.1. Sample collection

Sample collection has to be done on veneous blood by the means of vacuum or atmosferic sample collection tubes.
MINOS VET having high performances, it is possible to collect blood into microtainer with a minimum volume of 100µl (pediatric laboratory for exemple).
In all cases, the anticoagulant used has to be EDTA K_3.

WARNING :	**The sample collection tube has to be filled with the exact quantity of blood indicated on the tube itself. Any misadjustement of blood sample collected will show a possible variation in the results.**

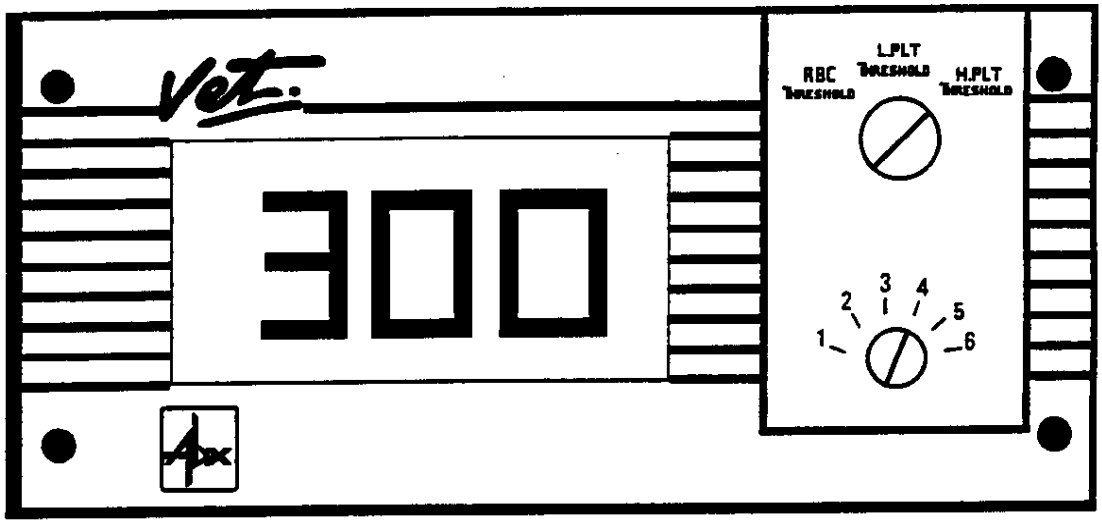
ABX REAGENT DEPARTMENT manufacture sample collection tubes which are highly recommanded for the use of **MINOS VET**.
ABX SERVICE DEPARTMENT has a list of recommanded sample collection tubes at your disposal.

6.6.2. Mixing

Blood samples have to be mixed at least 2 minutes (gentle upside down rotation), before any measure.

6.7. Threshold selection

Before analysis, it is mandatory to select the species to be analyzed, human or animal blood.
According to the chart table located on the top of the threshold selection unit, turn the species selector to the required position from 1 to 6. Threshold values for RBC, low platelet, high platelet are displayed on the screen (in millivolts or volts) according to the knob position (Diag.6.4).



Diag.6.4

RBC threshold is given in millivolts.
PLT low threshold is given in millivolts.
PLT high threshold is given in volts (The display will show 300 for a value of 3,00v for example).

SECTION 7

7. SYSTEM SET UP

7.1. Special functions

7.1.1. Changing the date

Changing the date is accessible with the special function 990.
Press SPECIAL FUNCTIONS key and then 990

the following will appear :

- 2 dashes on RBC (for entering the day)
- 2 dashes on HGB (for entering the month)
- 2 dashes on HCT (for entering the year)

on the keyboard, enter two figures for the day, two for the month and two for the year.

Press SPECIAL FUNCTIONS key once again to exit.

NOTA :	In case of error, re-enter all the figures, then exit from SPECIAL FUNCTIONS and start the operation over again.

WARNING :	**Changing the date erases the results in memory after the first blood count is carried out.**

7.1.2. Print out of calibration coefficients

Print out of calibration coefficients is accessible with the special function 991.
Press SPECIAL FUNCTIONS key and then 991.

The printer will then print-out the calibration coefficients.

7.1.3. Print out of the program version

The print-out of the program- version number used on the system is accessible with the special function 992.

Press on the SPECIAL FUNCTIONS key, then 992. The program version used is printed.

NOTA :	When using the special function 992, the **MINOS VET** carries out a check on its internal memories (RAM).

7.1.4. Print out of the worklist memorized on the PAM

When using the **PAM,** memorized worklists : names,identifications, validations are accessible with the special function 993.

Press on SPECIAL FUNCTIONS key, then 993, memorized worklists will be printed out.

7.1.5. Entering pathological limits.

Pathological limits can be entered with the special function 994.

Press on SPECIAL FUNCTIONS, then 994.
Select the required parameter to enter or to modify.

- WBC : Press WBC CALIBRATION key.Three dashes appear on the WBC display. Enter the lower value then when the three dashes re-appear enter the higher value.

- RBC : Press RBC CALIBRATION. Follow the same procedure as above.

- HGB : Press HB CALIBRATION. Follow the same procedure as above.

- MCV : Press HT CALIBRATION. Follow the same procedure as above but with the MCV values.

- Plt : Press PLT CALIBRATION. Follow the same procedure as above.

7.1.6. Printing pathological limits and means

The print out of the pathological limits and means is accessible with the special function 995.

Press SPECIAL FUNCTIONS, then 995 the pathological limits entered in section 7.1.5 will be printed. The means of all the memorized samples in between these limits will be printed as well.

NOTA :	Graphs plotted from these means allow the operator to follow the good quality of the **MINOS VET** results.

7.1.7. Printing a memorized result

The 300 results can be reprinted individually on request. Press on SPECIAL FUNCTIONS then enter the result number to be reprinted (3 digits). The result will be automatically reprinted with the flags.

WARNING :	**When changing the date, all results in memory will be erased after running the first sample.**

7.1.8. PLT Curve printing

The operator has the choice to print out or not PLT distribution curve with each result.

Press on SPECIAL FUNCTIONS then 996. Select the print out of the curve by pressing on the PLT calibration key.

Example : - result print out with the PLT distribution curve :

- press on SPECIAL FUNCTIONS then enter 996
- PLT display give the current set up :PLT : 0 (no curve print out)
- press on PLT CALIBRATION
- PLT display gives the new set up : PLT : 1 (print out of PLT distribution curve), press on SPECIAL FUNCTIONS to record the new set up

NOTA :	To cancel the print out of the PLT distribution curve, follow the same above procedure. When the PLT display shows 1, press on the PLT calibration key and the display turns to 0 (no curve print out). Press on SPECIAL FUNCTIONS to record the new set up.

7.1.9. Hematocrit correction factor

According to the selected species, the measured hematocrit value can be fine adjusted by mean of a correction coefficient called HEMATOCRIT CORRECTION FACTOR. This coefficient (between 0,5 and 1,5) can be introduced in the hematocrit calculation by mean of the special function 777.

Press on the SPECIAL FUNCTIONS key, then enter 777. The display shows the memorized value for few seconds, then clear off. Enter the required value between 0,5 1,5 and press SPECIAL FUNCTIONS key to record the new set up.

7.1.10. MINOS/PAM correlation coefficient

When using the **PAM** (Passeur Automatique pour **MINOS**, automated sampler) coefficients can be introduced in some parameter calculations for a better correlation with the results obtained directly on the **MINOS.** These coefficients are called correlation coefficients and are accessible through the special function 800.

Press the SPECIAL FUNCTIONS key and enter 800. The displays switched off, press on the CALIBRATION key of the parameter to be modify. Its display shows the recorded value and then clears off. Enter the new value (between 0,5 to 1,5) and press the parameter calibration key to record the new set up. Factory adjust values are as follow :

- WBC : 0,95 - RBC : 1,01 - Hgb : 1,01 - Hct : 1,00 - Plt : 1,00

7.1.11. Correlation coefficient print out

Correlation coefficient values as described above can be printed out with the special function 801. Press on the SPECIAL FUNCTIONS key and enter 801, values are automatically printed.

7.1.12. Result edition format

On veterinary use, it is possible to cancell the platelet flags (dedicated for human blood) with the special function 802. Press on the key, and enter 802. Press on the PLT calibration key, the display shows 0 for veterinary use or 1 for the human blood use (with the plt flags). Press on the plt calibration key to sweep from one mode to the other. Press SPECIAL FUNCTIONS to record the new set up.

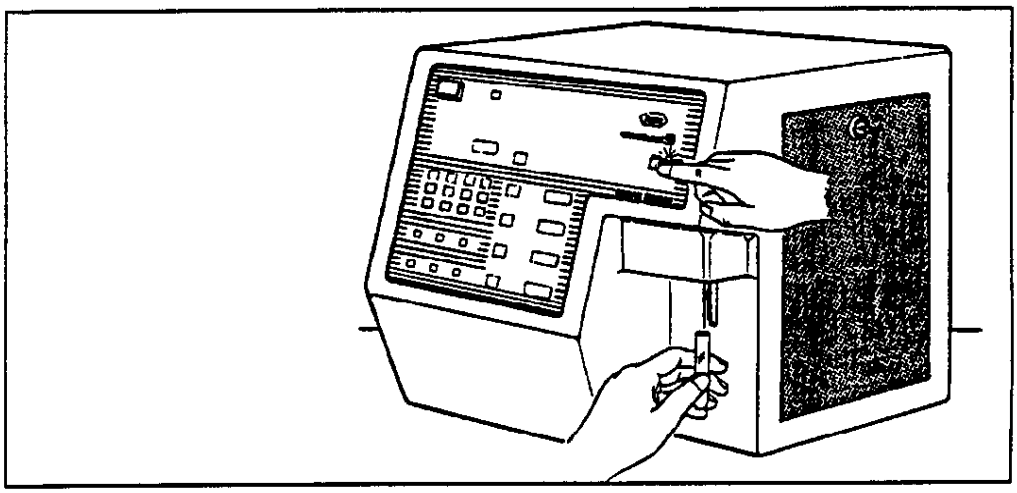
NOTA : When instrument is switched on, it is set up in veterinary mode.

7.2. Calibration

7.2.1. General points

NOTA :	**MINOS VET** is one of the only automatic systems which gives its coefficient of calibration at any time. This possibility allows the operator to follow the good operation of his system and to plan in advance the the maintenance visit schedule.

It is not necessary to calibrate instrument if the results obtained are within the acceptable limits (see blood control instructions).
The machine must always be clean for calibration (see section 8.2.blank control).
Prior to any calibration operation, the reproducibility of the machine must be checked.
For this, use non-pathological blood and run it through several times in succession. Present the blood sample as shown Diag.7.1. and wait for the end of the flashing (LED) before taking the tube away.



Diag.7.1.

Check, for the parameter or parameters to be calibrated, that the maximum difference between the lowest and the highest values does not exceed :

- 5% for WBC
- 3% for RBC
- 3% for Hct
- 2% for Hgb
- 10% for Platelets

Should this not be the case, refer to Section 10.

Results of a blood control are always given specifically for a range of different instruments. For **MINOS** range manufactured by **ABX**, results taken into account are given for instruments using resistivity measuring method for WBC, RBC, PLT, Hct and a method measuring Hgb at 540 nm.

Follow the blood control manufacturer indications and always check the expiration date.

Before any calibration, run the blood control at least 2 times.

Make sure the blood control has been taken out of the fridge 30 minutes before use and that the mixing instructions have been followed.

NOTA :	**ABX REAGENT DEPARTMENT** provides a whole range of control and calibration blood perfectly compatible with the use on **MINOS VET**. They might be used also on other manufacturer instruments.

7.2.2. Instrument calibration

When section 7.2.1. recommandations have been taken, run the blood control at least 2 times and check the results.
If one parameter or more is out the acceptable limits, carry out a calibration procedure.

NOTA :	**MINOS VET** is an instrument which retains its calibration coefficients in memory , which means that each parameter can be calibrated, independently of the others.

Run the control blood as shown diag. .7.1.

Press [ASPIRATE SAMPLE] key.

Wait for the end of the flashing light and remove the blood control vial. Check the printed results for calibration.

7.2.2.1. White blood cell calibration

Press [WBC CALIBRATION] key.

- All the display units go off, and three dashes appear in the WBC display.
- The LED of the WBC key lights up.
- Enter the value of the control blood on the numerical keyboard.

NOTA :	Always enter three figures. For instance ; if the control blood gives 7.8.10 /mm , enter 078 on the keyboard.

- Press [WBC CALIBRATION] key once again, to exit from WBC calibration.

The calibration coefficient is displayed instead of the WBC figure.

NOTA :	In case of error, the correct value can be entered by re-starting the operation from the beginning, but without rerunning the control blood.

After the calibration, all the calibration coefficients are shown on the displays.

7.2.2.2. RBC calibration

Use the same procedure as for the WBC calibration, but with [RBC CALIBRATION] key.

Always enter three figures.

7.2.2.3. Hematocrit calibration

Use again the same procedure as for calibration of the WBC, but with [HT CALIBRATION] key.

Enter always 3 figures.

7.2.2.4. Hb calibration

Use again the same procedure as for calibration of the WBC, but with [HB CALIBRATION] key.

7.2.2.5. PLT calibration

Use again the same procedure as for calibration of the WBC, but with [PLT CALIBRATION] key.

NOTA :	Never calibrate the device on blood from which the Platelets result is given with a warning (section 4.4.1.).

After having calibrated the required parameter or parameters, take a further measurement on the control blood in order to make sure that the adjustment has been correctly made.

7.2.3. Calibration coefficient table

WARNING :	**MINOS VET counts a certain number of cells regarding the vacuum value in the waste chamber (- 200 mB). This value might vary with time, this variation will be corrected with calibration. As a matter of fact, calibration coefficient cannot have fixed values but have to be in between tolerances below :**

PARAMETERS	**MINOS VET** COEFFICIENT	TOLERANCES	
WBC	7,6	+ 0,6	- 0,4
RBC	2,76	+ 0,2	- 0,2
Hct	33	+ 2	- 2
Hgb	10	+ 0,5	- 0,5
PLT	39	+ 7	- 8

SECTION 8

8. RUNNING SAMPLE SERIES

8.1. Daily start up

MINOS VET already under reagents : run a [DILUENT RINSE] and check the filling and the drainage of the mixing, RBC, and WBC chambers through the transparent door.

8.2. Blank diluent control

After completing the start up procedure, control the background noise by running a blank measuring cycle. This control has to be done after a rinse diluent.

Press on [ASPIRATE SAMPLE] key without presenting any tube to the sampling probe. The measuring cycle will be carried out on reagents only.

The result should not exceed :

- WBC : $0,3 . 10^3/mm^3$
- RBC : $0,02. 10^6/mm^3$
- Hb : 0,0 g/dl
- Ht : 0,1 %
- PLT : $0,08. 10^3/mm^3$

Should this not be the case, carry out a further [DILUENT RINSE] followed by a further measurement.

If the problem persits, refer to section 10.

8.3. Running samples

After completing the start up procedure, select the species to be analyzed on the veterinary threshold selection unit. Run a non pathological blood from the previous day, then a blood control. If necessary, perform a calibration (see section 7.2.).

When results are in the acceptable limits, enter the identification number of the first sample (always 3 digits) by the mean of the front panel keyboard .

Present the blood sample and press [ASPIRATE SAMPLE].

When the [ASPIRATE SAMPLE] light indicator stops flashing, remove the tube. At the end of the result print out, the sample identification number is increased by 1. If another identification number is needed, just enter it means of the keyboard. It is possible to use the [+] and [-] keys to increase or decrease the identification number.

NOTA :	If an error occurs, complete the 3 digits identification and start again the procedure.

At the end of the sample number 50, a printed message appears : "PLEASE WAIT, AUTOMATIC CLEANING".

Instrument carries out an automatic cleaning (duration : 5 minutes). When the [AUTOMATIC CLEANING] light indicator switch off, the instrument is ready for analysis.

NOTA :	If an automatic cleaning has been carried out manually, the **MINOS VET** internal counter turns to 0 and the next automatic cleaning will be carry out after 50 samples.

When the day workload is completed, refer to section 9 for the end of day maintenance procedures.

8.4. Veterinary normal values

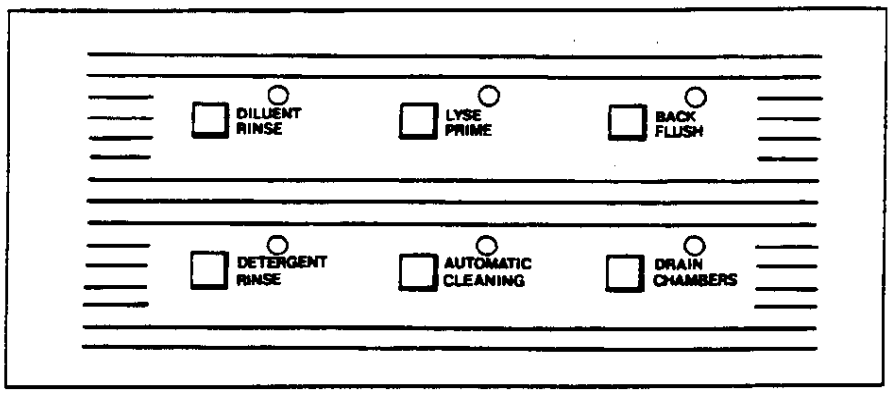
Values given in the table below are normal values as determined by the clinical hematology laboratory ENVA-INRA.

ANIMAL	WBC 103/mm3	RBC 106/mm3	Hgb g/dl	Hct %	MCV Fl	PLT 103/mm3
BOVINE	4 - 12	5 - 10	8 - 15	24 - 46	40 - 60	100 - 750
CAT	5,5 - 19,5	5 - 10	8 - 15	24 - 45	39 - 55	300 - 800
DOG	6 - 17	5,5 - 8,5	12 - 18	37 - 55	60 - 77	200 - 500
HORSE	5,4 - 14,3	6,8 - 12,9	11 - 19	32 - 53	37 - 59	100 - 350
RABBIT	4,3 - 11	7 - 8,5	14 - 18	43 - 50	55 - 65	270 - 650
FISCHER-RAT 6 months	6 - 23,9	5,97 - 7,65	12,3 - 16,2	40,9 - 49	68 - 75	570 - 1125
SHEEP	4 - 12	9 - 15	9 - 15	27 - 45	28 - 40	250 - 750

SECTION 9

9. MAINTENANCE AND ADJUSTMENTS

MINOS VET has computer control cleaning procedures. The whole operator cleaning procedure are done by the means of the cleaning keys on the front panel (Diag.9.1.).



Diag.9.1.

9.1. Daily maintenance

9.1.1. Start up

Every day, when the instrument is switched on, it is necessary to run a diluent rinse by pressing the DILUENT RINSE key, as the system was stopped the previous day on detergent.
This diluent rinse cycle has to be followed by a blank measuring cycle in order to check the cleanless of the instrument and the reagents.

9.1.2. During the day, on request

During the day, every 50 samples, the instrument performs automatically an automatic cleaning.
As soon as the 50th result is printed out, a message "PLEASE WAIT, AUTOMATIC CLEANING" is printed.

Reagent **MINOCLAIR** (Sodium hypochlorite solution) is involved in the automatic cleaning. The cycle last five minutes and send reagents in all the tubes :

- RBC chamber
- WBC chamber
- Hgb spectrophotometer
- transmission tubing

At the end of the automatic cleaning, the instrument is rinsed automatically by the means of 8 pneumatical cycles with **MINOTON** (equivalent to 2 rinse diluent).

NOTA :	The number of sample run between 2 automatic cleaning cycles are memorized even when instrument is switched off. If an automatic cleaning cycle is done on request, the counter is turned back to zero.

Automatic cleaning cycle has to be used every time a misfunctionning occurs :
- drif on one or several parameters, increase of the background noise, blockage of the apertures. (see section 10.).

If the instrument is not operating for more than one hour (switched off or in stand by mode), it is recommended to run a  and a blanck measure before running a sample batch.

When instrument has to be stopped for several hours, it is recommended to run a  (see section 9.1.3. end of the day maintenance).

9.1.3. End of the day maintenance

When the last sample has been printed, run an automatic cleaning by pressing the AUTOMATIC CLEANING key.

At the end of the cycle, run a **MINOTERGE** rinse ,by pressing the DETERGENT RINSE key.

MINOS VET carries out in the following sequence:

- a **MINOCLAIR** rinsing (cleaning solution)
- a diluent rinsing
- a detergent rinsing

At the end of the cycle, instrument goes automatically under stand by mode. It can be reuse any time starting with a DILUENT RINSE cycle followed by a blank measuring cycle or it can be switched off until the next sample is available.

WARNING :	**Every day, MINOS VET has to undergo a 4 hours period under detergent These 4 hours can be consecutive or not. If this recommendation is not taken into account, it may influence on the result quality and increase the maintenance visit frequency.**

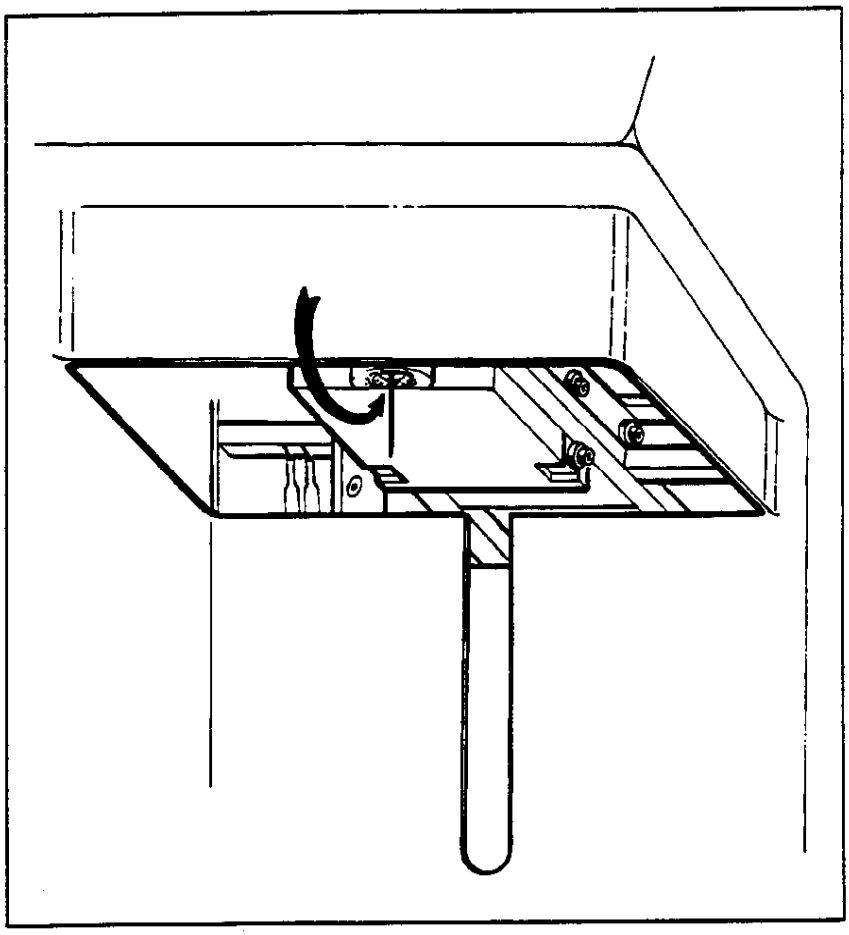
9.2. Weekly maintenance

If the every day recommandations are carried out, weekly maintenance will be reduce to a minimum level.

9.2.1. Sample carriage cleaning

When presenting samples for analysis, sample probe has to be introduce has deep aas possible inside the sample tube. This may results into a contact in between the sample tube edge and the bottom of the sample probe carriage. This contact will leave a blood deposit on the bottom of the sample probe carriage.

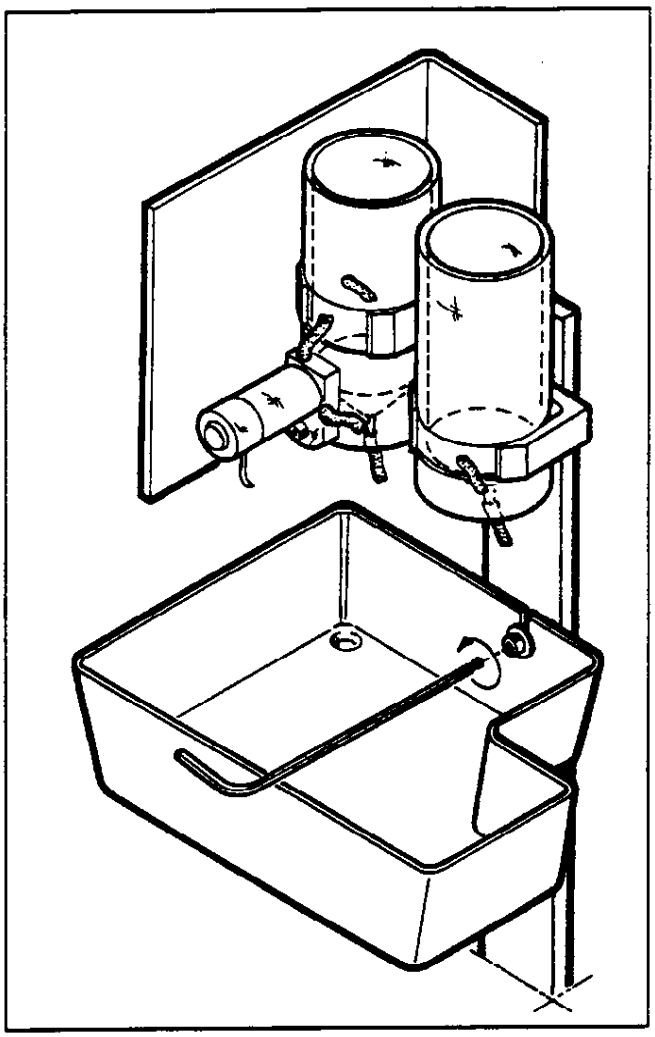
It is recommanded, once a week, to clean the bottom of the sample probe carriage with a wet cotton or piece of soft paper after having moved up the probe manually (instrument switched off) diag.9.2.



Diag.9.2.

9.2.2. Cleaning the overflow protection tray

- Take off the transparent door on the right hand side of the instrument.
- With the 2,5 hexagonal wrench from the accessory box, release the screw holding the tray and remove the tray (Diag.9.3.).



Diag.9.3.

- Clean the tray with soappy water, plunge it in water overnight if necessary.

NOTA :	Inspect carefully the bottom frame when opening the side door and check for liquid spillages. All liquids on the frame have to be dried to avoid corrosion of the metallical parts.

- Re install the tray after cleaning and drying.

9.2.3. Cleaning front panel and protection cover

It is recommanded to use only soft materials and soappy water. Remove any spillage of blood or reagents as soon as possible. Never use abrasive or solvent products, plastic covering may be damaged.

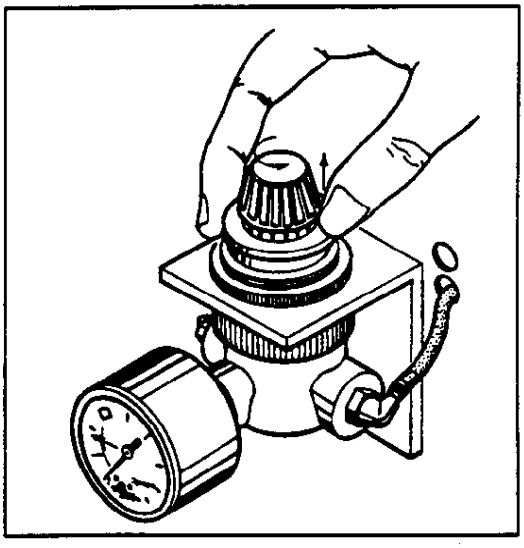
9.2.4. Checking sampling needle

Visually check that the sampling needle is not bent.
Run several blank cycles and check that the needle movement is regular.

9.3. Adjustments

9.3.1. Pressure adjustment

Working pressure is 1,5 bar. When starting the instrument, this pressure has to be reached in half a minute. The pressure light indicator has to turn from red to green when the pressure reach 1,2 bar. When the pressure is not correct, check for air leaks in the instrument : typical noise or air bubbles.
When the problem is solved, readjust the pressure. Lift up the locking red ring and turn the main regulator knob (Diag.9.4.).
When the correct setting is obtained, switch off and on instrument to check the above recommandations. When the adjustment is correct, lock the red ring by pushing it down.



Diag.9.4.

9.3.2. Vacuum adjustment

WARNING :	**From the MINOS technology, the quantity of cells counted is directly proportionnal to the vacuum value in the regulated/waste chamber. As a matter of fact, when the vacuum is readjusted, all parameters (except Hgb) have to be recalibrated.**

NOTA :	Vacuum adjustments have to be done on clean instrument, on perfect operating conditions.

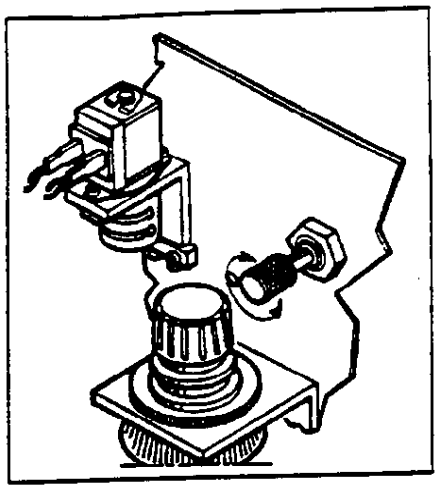
Instruments are adjusted in factory to a working vacuum of -200 mbar. This adjustment is carried out with a special equipement.

If the operator is advised that **coefficients for RBC, WBC, PLT** are out of the limits (above or below) **in the same way** he may readjust the vacuum and calibrate its instrument to return the coefficients inside the acceptable limits (section 7.2.3.).

When the vacuum is properly adjusted, an easy check can be carried out : run a non pathological blood having a RBC value between 4,00 and 4,5 $10^6/mm^3$; the raw counting on RBC, before the result is displayed should be between 1,30 and 1,50.

Vacuum adjustment is done with the chromed knob on the pneumatical side of the intrument (Diag.9.5.). Screw to increase, unscrew to decrease the vacuum.

NOTA :	A normal vacuum readjustment should be done by turning the knob within a maximum of one or two turns. Should this not be the case, contact **ABX** authorized service department.



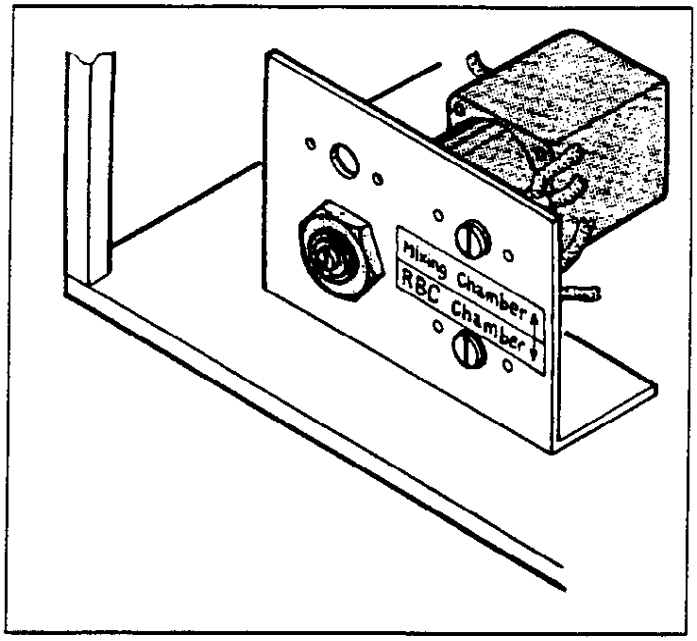
Diag.9.5.

9.3.3. Bubbling adjustment

Bubbling is applied on mixing and RBC chamber dilutions to homogeneize them.
Bubbling have to be adjusted properly for effecicient mixing but not too strong to avoid overflowing and introduction of microbubbles inside the dilutions.

Bubbling regulators are located on the pneumatical side, right hand side of the instrument (Diag.9.6.).

NOTA :	Main bubbling regulator is adjusted in factory at 60 mbar . This pressure allows the operator to readjust easely the air flows in the mixing and RBC chambers.



Diag.9.6.

9.3.3.1. Mixing chamber

Open the transparent door on the right hand side of the instrument. With a small screw driver, screw to increase the bubbling and unscrew to decrease it. A correct adjustment is obtained when the bubbled solution volume increase up to the second third of the chamber

9.3.3.2. RBC chamber

Adjust RBC chamber only when mixing chamber bubbling adjustment is finished. Turn the regulator adjustment screw until correct adjustment is obtained.
Air bubbles have to be seen coming one by one but with a speed which does not allow the counting.

SECTION 10

10. TROUBLESHOOTING

10.1. Pneumatical and mechanical problems

All problems should be solved with the help of the pneumatic layout drawing.
In all cases, if the problem is not solved with one of the solutions given hereunder, call **ABX** authorized technical services.

10.1.1. No blood suction

1) - Check the correct operation of the 25 µl sampling syringe
2) - Check the correct operation of valve (24) in cycle.
3) - Check that the sampling needle is not blocked.

10.1.2. Distribution of the 5 ml of DILUENT incorrect.

1) - Check the correct operation of the dispenser.
2) - Check that there is no air leak in the diluent system.
3) - Check the operation of valve (5) in cycle.
4) - Check the operation of valve (6) in cycle.

10.1.3. Incorrect Transfert mixing chamber/WBC chamber

1) - Drain the chambers.
2) - Make a transfer by pressing valves (8) and (81) simultaneously.
3) - If the dilution is not drained, check the restrictor (red plastic) located to the right of valve (81).
4) - Check that there is no clot in the transfer tubing.

10.1.4. No regulated vacuum

1) - If the regulated vacuum LED on the front panel is in the red zone on the left, drain the chambers ; If this operation occurs normally, the device can perform its cycles.
2) - If the chambers are incompletely drained, increase the vacuum by means of the vacuum regulator knob (by a maximum of one turn).

10.1.5 No RBC or WBC chamber draining

1) - Check the regulated vacuum LED on the front panel.
2) - Check the operation of valve [20] for RBC and valve [21] for WBC.
3) - Increase the vacuum if necessary, using the vacuum regulator knob by a maximum of one turn..

10.1.6 No draining of the waste chamber

1) - Drain manually by pressing valve [14] and then the valve [15].
2) - If draining does not occur :

Check the draining tube at the rear of the device.
Check the operation of valve [14] and [15].

10.2 Incorrect results on the measured parameters

The **MINOS VET** is a device which measures the WBC - RBC - HCT - HGB and Platelet parameters according to the principles set out in chapter VI.1.

Should technical problems arise, it is extremely important that the parameter or parameters giving problems are clearly distinguished.

10.2.1 Problem on WBC and HGB

1) - Check the correct operation of the sampling needle and the diluent dispenser.
2) - Check that the first dilution is correctly transferred from the mixing chamber to the WBC chamber (see pneumatic diagram).
3) - Check the lyse level in the container.
4) - Check that the lyse pump duly sends 1 ml of lyse during the parameter cycle (in accordance with the pneumatic diagram).
5) - Check that there are no bubbles in the lyse pump.

10.2.2 Problem on WBC only

1) - Apply a back flush and re-run one cycle.
2) - Check the presence of normal initial counting (approximately 100 for a result at 8,3).
3) - Check the calibration coefficient with SPECIAL FUNCTIONS.
4) - Perform an automatic cleaning.
5) - Check the opening of valve (17) (see pneumatic diagram) during count.
6) - Carry out autoconcentrated cleaning.

10.2.3 Problem on HGB only

1) - Perform an automatic cleaning.
2) - Check the calibration coefficient with SPECIAL FUNCTIONS.
3) - During the cycle, check that the value on the HGB display is correct (12.0 to 15.0 for a result of 13.0 to 14.0).
4) - Check the correct operation of the lyse pump, of pinch valves (12) and (18) (see pneumatic diagram).

10.2.4 Problem on RBC and HCT

1) - Check the bubbing in the mixing chamber ; It should be strong in action.
2) - Check the position of the sampling needle in the mixing chamber : It should be between the edge and the center of the chamber, and close to the bottom of it.
3) - Check the correct operation of the 25 µl sampling syringe and the diluent dispenser.
4) - Check that the first dilution is correctly transferred from the mixing chamber to the WBC chamber.
5) - Check the diluent level in the container.
6) - Perform an automatic cleaning.

10.2.5 Problem on RBC only

1) - During the count, check that the normal initial counts are correctly displayed (about 100 to 120 for a final result of 4.00 to 5.00 x 10 / mm).
2) - Check the calibration coefficient with SPECIAL FUNCTIONS.
3) - Apply a back flush and re-run a cycle.
4) - Check the opening of valve (16) during the count.
5) - Check the correct operation of the sampling needle and the pump of the needle rinse system. Apply an automatic cleaning.

10.2.6 Problem on HCT only

1) - Apply a back flush and re-run a cycle.
2) - Check the calibration coefficient with SPECIAL FUNCTIONS.
3) - During count, check the presence of a normal initial count (about 15.0 to 17.0 for a result between 45.0 and 52.0%).
4) - Perform an automatic cleaning.

10.2.7 Problem on Platelets

1) - Apply a back flush.
2) - Check the position of the sampling needle (it should be close to the bottom of the mixing chamber).
3) - Check the calibration coefficient with SPECIAL FUNCTIONS.

10.3 Hematocrit - related corrective factor for platelets counts

Using Platelet Rich Plasma (P.R.P)

Hematocrit= HCT %	Hematocrit Factor	Hematocrit= HCT %	Hematocrit Factor
10	0,90	41	0,44
11	0,89	42	0,42
12	0,87	43	0,41
13	0,86	44	0,40
14	0,85	45	0,39
15	0,84	46	0,38
16	0,83	47	0,37
17	0,82	48	0,36
18	0,80	49	0,35
19	0,79	50	0,34
20	0,78	51	0,33
21	0,77	52	0,32
22	0,75	53	0,31
23	0,74	54	0,30
24	0,73	55	0,29
25	0,71	56	0,28
26	0,70	57	0,27
27	0,68	58	0,26
28	0,66	59	0,25
29	0,65	60	0,24
30	0,63	61	0,23
31	0,61	62	0,22
32	0,60	63	0,21
33	0,58	64	0,20
34	0,56	65	0,19
35	0,54	66	0,18
36	0,52	67	0,17
37	0,50	68	0,16
38	0,48	69	0,15
39	0,47	70	0,14
40	0,45		

10.4 MINOS AUTO CONCENTRATED CLEANING

1	Drain chamber
2	Pour 5 ml of the **MINOCLAIR** bottle into RBC chamber and into the mixing chamber
3	Replace the bottle of **MINOCLAIR** with its pneumatic connection
4	Press simultaneously on 8 & 81 valves to get transfert from mixing chamber to WBC chamber
5	Press simultaneously on 16, 13 & 11 valves to allow **MINOCLAIR** transfert into RBC conting head (during 10 seconds)
6	Press simultaneously on 17, 131 & 11 valves to allow **MINOCLAIR** transfert into WBC counting head (during 10 seconds)
7	Let the machine in stand by during 5 minutes
8	Switch ON/OFF the machine to start again the compressor
9	Simulate a counting with a bottle of **MINOCLAIR** in pressing on 16 & 17 valves during 15 seconds
10	Provide a back flush into the RBC aperture in pressing simultaneously on 14 & 16 valves during 15 seconds
11	Provide a back flush into the WBC aperture in pressing simultaneously on 14 & 17 valves during 15 seconds
12	Repeat 8, 9, 10 if it is necessary
13	Carry out : * Diluent rinse * Back flush * Diluent rinse * Blank cycle to check cleanliness of the machine * Cycle with a control blood in order to check the calibration

10.5 PNEUMATIC SCHEMATIC

SECTION 11

11. PAM OPERATING MANUAL

11.1. Introduction

11.1.1. Presentation

PAM (Passeur automatic pour **MINOS** : **MINOS** automatic sampler) has been specially design for the best use of **MINOS** instruments. The **PAM** unit carries out automatically the mixing and sampling on closed sample tubes for routine and emergency workload.

11.1.2. Main characteristics

- **PAM** is sampling through closed tubes by piercing the rubber stopper. Its operation is fully automatic from sampling to printing results.
- **PAM** can be connected to all instrument in the **MINOS** range.
- Tube identification is done on an alphanumerical keyboard.
- Patient name and file number can be printed on result form.
- Internal and external rinsing of the sampling probe is done automatically between each sampling.
- Detection and rejection of short samples.
- automatic re-run when sample is out of laboratory limits.
- automatic re-run when sample is rejected.
- Sample programation up to 240 patients.
- Automatic cleaning of the instrument.

11.1.3. General points

PAM is an electro-medical device wich is classified as a class 1, B type and responds to norm 601.1 of the International Electronical Commission.
Work security, reliability and general characteristics are guaranted by **ABX** under the following conditions :

- services and repairs are provided by an **ABX** authorized technician,
- the electrical supply of the laboratory follows the national or international regulations,
- the system is operated under the following intructions.

11.2. Installation

11.2.1. Inspection

A thorough checkover is carried out on the **PAM** before sending it.
We, nevertheless, recommend checking the apparatus as soon as it is received to report any anomalies to the carrier.
The start-up procedures must imperatively be followed closely in the order given below.

11.2.2. Unpacking

The apparatus is enveloped in a special, protective foam before being placed in a cardboard box.
Cut the four angles of the box to unpack the machine.

11.2.3. Package contents

The **PAM** box contains the following parts :

DESIGNATION	PART NUMBER	QTY
PAM unit with :		1
Numbered trays		1
Sampling receptacle		1
MINOS PAM cable		1
Commun installation kit :	XEA 250 A	1
Fuse 1,25 A	DAR 010 A	4
Fuse 1,6 A	DAR 011 A	2
Fuse 3,15 A	DAR 014 A	2
Cristal tube 3x6	EAE 011 A	4
Silicon tube 0,78x2,58	EAE 019 A	1
Silicon tube 2x4	EAE 026 A	2
Male quick connector	EAH 002 A	1
O Ring 1,9x2,6	FAA 026 A	1
Plastic protection cover	FBH 006 A	1
3 holes stopper	FBL 002 A	1
E020 washer	GAE 005 A	1
E060 washer	GAE 009 A	1
Diluent straw for **PAM**	XEA 018 A	1
Jar of grease	XEA 019 A	1

DESIGNATION	PART NUMBER	QTY
- **PAM** installation kit Fr/GB containing :	XEA 251 A	1
Europ. power cable	DAC 011 A	1
Fuse 0,8 A	DAR 006 A	4
Multiposition plugs	JAM 001 A	1
Commun installation kit	XEA 250 A	1
or		
- **PAM** installation kit US containing :	XEA 252 A	1
Power cable US	DAC 012 A	1
Fuse 1,6A	DAR 011 A	4
Commun installation kit	XEA 250 A	1

11.2.4. Working conditions

PAM should be placed on a clean and level table or work station.
Please note that **PAM** printer and reagents weigh approximately 32 kilogrammes.

Avoid exposure to sunlight.

Proper ventilation requires that a space of at least 20 cm must be left behind the apparatus.

11.2.5. Grounding

The grounding must be followed closely.

Check that the wall ground (earth) plug is correctly connected to the laboratory grounding electricity installation.

If there is no ground then use a ground stake. Current electricity norms must be applied.

11.2.6. Humidity and temperature conditions

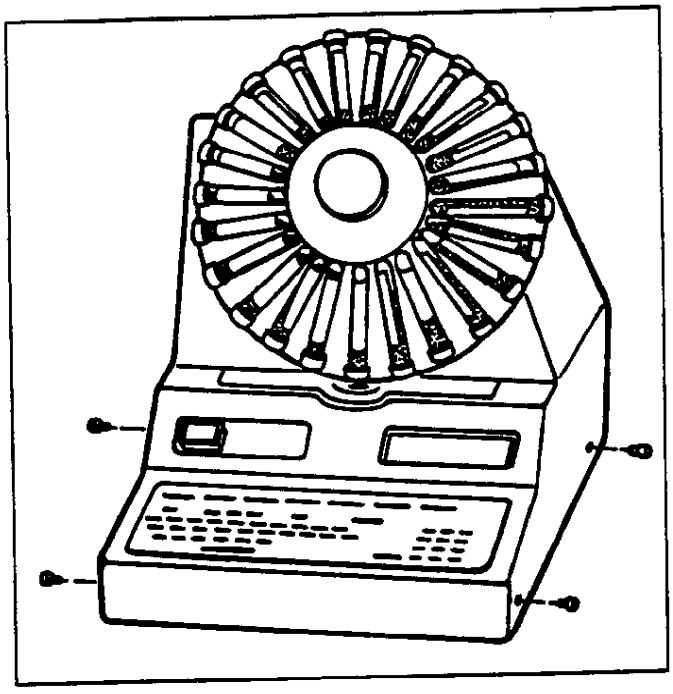
PAM can function between 15 and 35°C, with relative humidity, meaning less than 85% with no condensation.

If it is kept at a temperature less than 10°C, the machines should be allowed to sit for an hour at correct room temperature before use.

11.2.7. Visual check

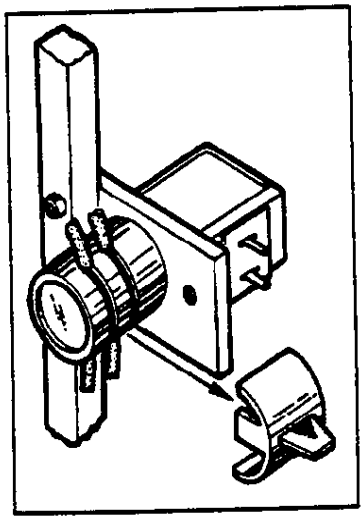
11.2.7.1. Mechanical check

Unscrew the 4 cover fixation screws with the help of the hexagonal wrench 2,5 delivered with the instrument (Diag.11.1).



Diag.11.1

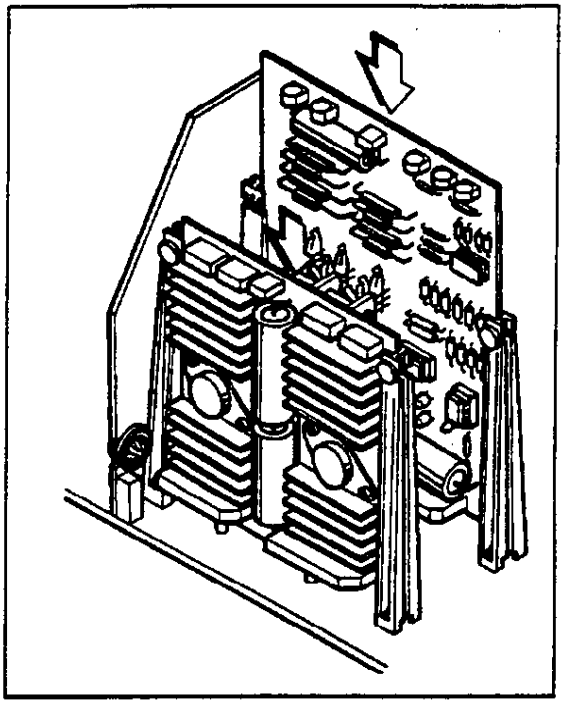
Remove the red clips from the pinch valves (Diag.11.2.).



Diag.11.2.

11.2.7.2. Electronical check

Check that the 2 electronical boards on the right hand side of the instrument are properly fitted (Diag.11.3.).

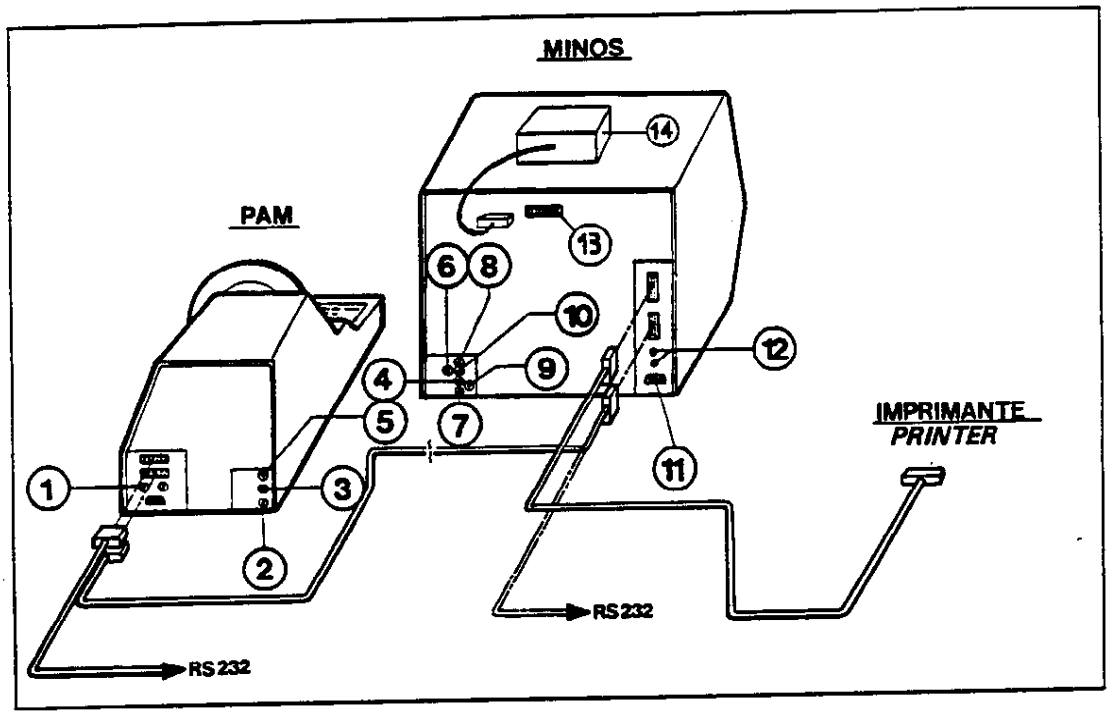


Diag.11.3.

11.3. Connections

11.3.1. Electrical connections

Plug the **PAM** to the 220V or 110V main power supply, using the **PAM**'s power cable. Plug in the signal cable between the **MINOS** and the **PAM**, using the outlet connectors situated just above the fuse holders on both **MINOS** and **PAM** (Diag.11.4.).



Diag.11.4.

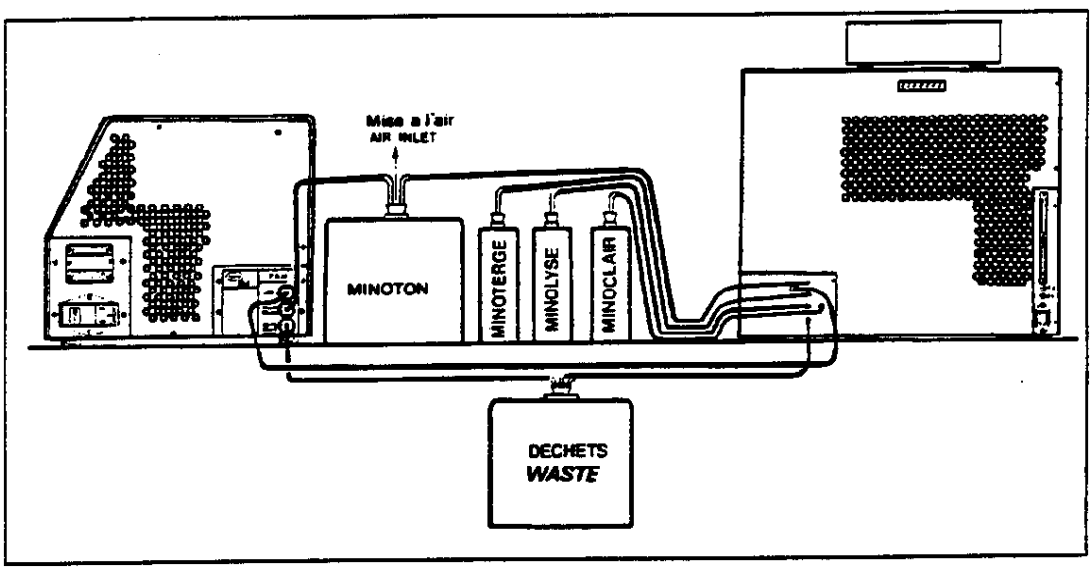
1 - **PAM** main fuses
2 - **PAM** waste connection
3 - **PAM** diluent connection
4 - **MINOS** lyse connection
5 - **PAM/MINOS** air connection
6 - **MINOS/PAM** air connection
7 - **MINOS** waste connection
8 - **MINOS** diluent connection
9 - Cleaner connection
10 - **MINOS** detergent connection
11 - Main power socket
12 - **MINOS** main fuses
13 - Veterinary unit connexion
14 - Veterinary unit

11.3.2. Tubing connection

Connect the air-pressure tubing from the "snap-in" air outlet behind the **MINOS** to the air inlet behind the **PAM** (Diag.11.5.).
Connect a 2.0 x 4.0 versilic silicon tubing from the **MINOTON** diluent container to the diluent inlet on the **PAM**.
Connect a waste tube (3.0 x 6.0 crystal) from the waste outlet on the **PAM** and feed to the waste container.

Make sure the waste container has an outlet to the atmosphere.

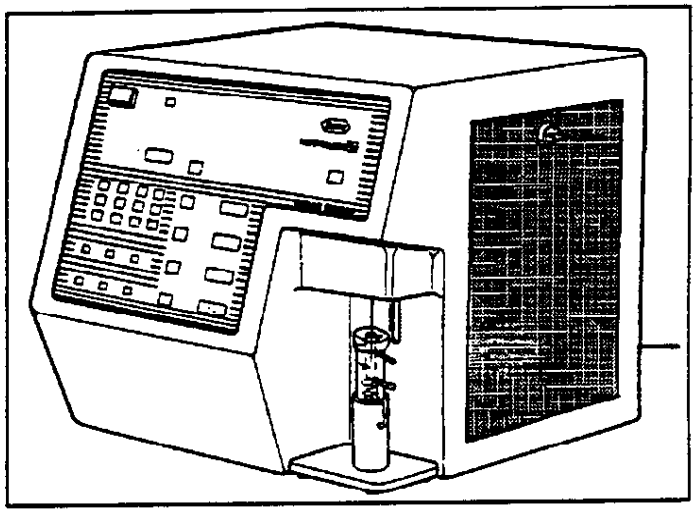
NOTA :	Important notices concerning reagents and waste locations as well as waste neutralisation described in section 2.8. of the **MINOS VET** operation manual are still available when using the **PAM**.



Diag.11.5.

11.3.3. Positioning of sampling receptacle

Place the **PAM** sampling receptacle underneath the sampling needle of the **MINOS**.
Unblock the receptacle by turning a quarter turn and lift gently by hand.
Center the needle correctly in the receptacle (it should not touch the inner wall of the chamber) Diag.11.6.



Diag.11.6.

11.4. Specifications

(May be modified according to technical improvements.)

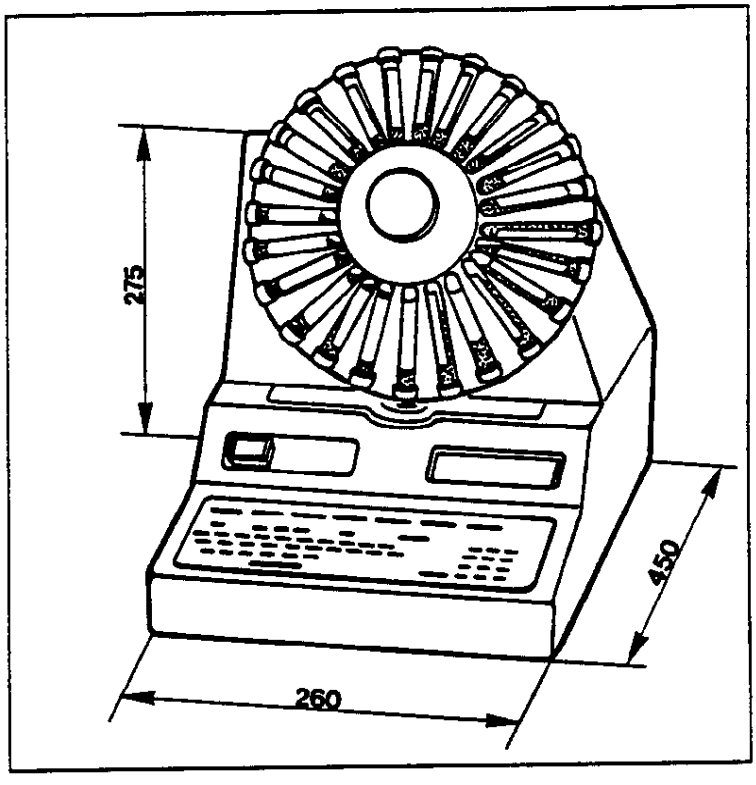
PAM unit carries out in a fully automatical way the blood sampling through the sample closed tube, the blood transfer from the unit to the sampling receptacle on the **MINOS**, the tube cleaning between samples and the re-run when a short sampling occurs, when a sample is out the laboratory limits, or when a sample is rejected.

Specifications are as follow :

- Internal memory capacity : 240 patient names with identifications and validations (10 trays of 24 tubes, 15 characters per tube.).

- Wheigt : 11 Kgs

- Dimensions : DIAG.11.7.
- Height : approximately 275 mm
- Width : approximately 260 mm
- Depth : approximately 450 mm
- Tray diameter : 240 mm



Diag.11.7.

- Power supply
  - * 220 VAC ± 10%
  - * 50 Hz ± 1 Hz

- Power Consumption
    * Start up : 175 VA (-30%, + 10%)
    * Working conditions : 100 VA (-30%, + 10%)

- Conditions for use
    * 15 - 35°C (room temperature)
    * 85% maximum (relative humidity, no condensation)

- Throughput
    * 56 samples / hour

- Volume of whole blood sample : 450 µl

- Reagents consumption :

The 3 **PAM** cycles need only **MINOTON**.

CYCLE	**MINOTON**
Sampling	7ml
Rinse	20ml
Cleaning	4ml

- Cycle durations : Rinsing :120 seconds
  Cleaning : 32 seconds
  Sampling : 52 seconds

- Display : LCD screen 2x20 characters
- Microprocessor 6809

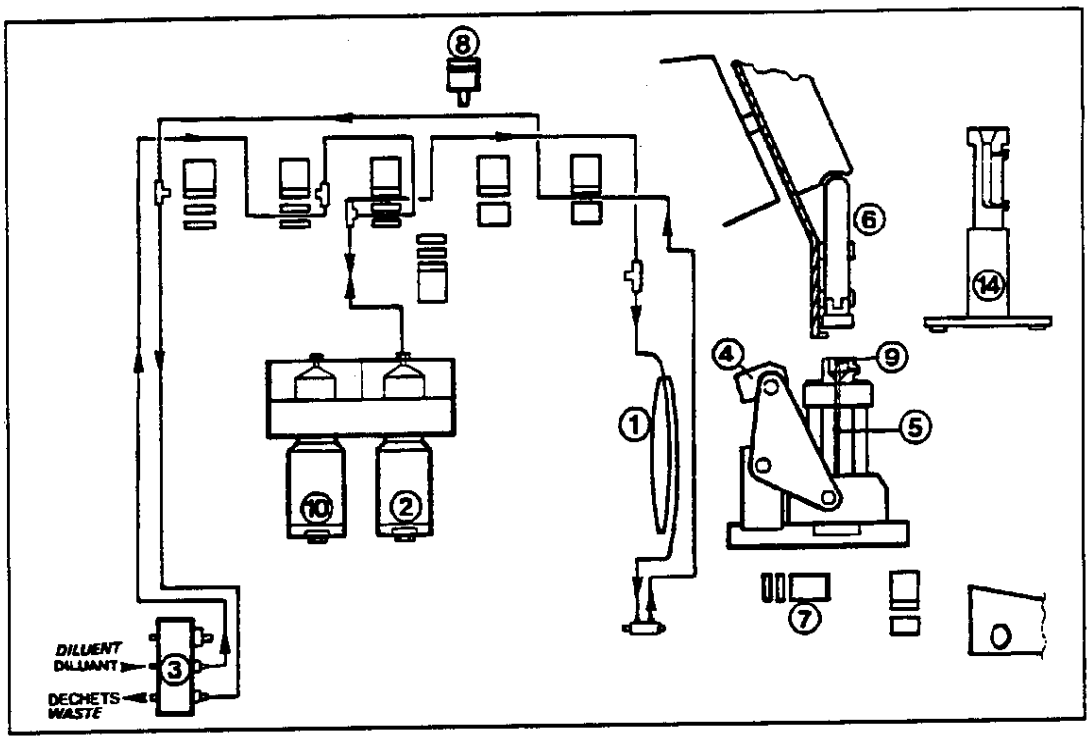
11.5. Limitations

Limitations given in section 3.4. of this manual are still available when using the **PAM.**
Follow carefully the maintenance and blood drawing, mixing and storing recommandations.

11.6. Hydraulic technology

11.6.1. Rinsing before sampling

When pressing the cycle key, the blood aspiration tube ① is rinsed several times.
The 500µl pump ② aspirates diluent from the reagent block ③ and pushes it through the sampling tube ① to the waste connector of the reagent block ③ (Diag.11.8.).

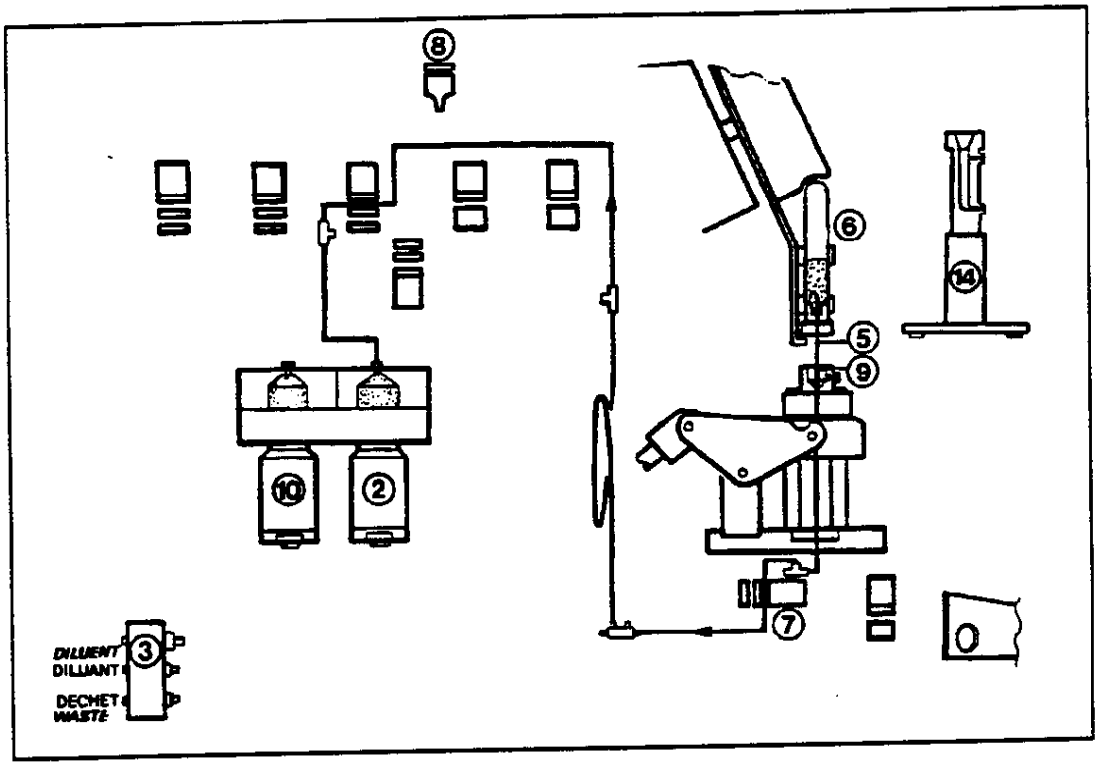


Diag.11.8.

11.6.2. First blood aspiration

The air cylinder ④ is activated and the piercing needle ⑤ moves up through the tube rubber stopper ⑥.

Blood is aspirated by means of the vacuum in the 500µl pump ② (Diag.11.9.).

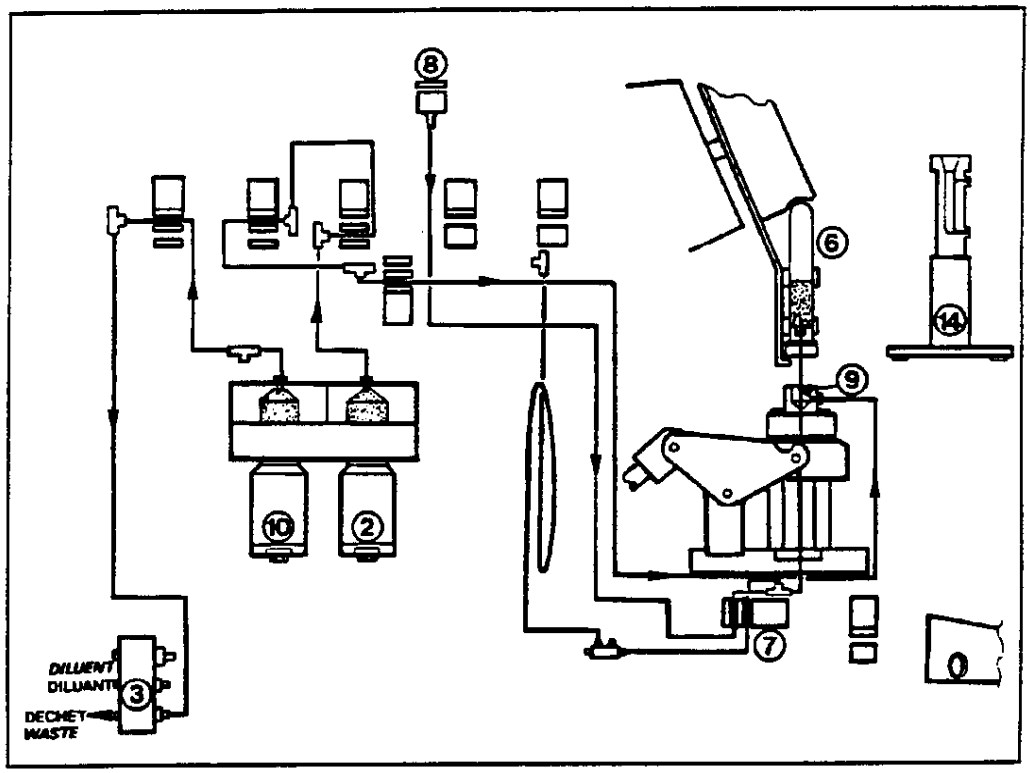


Diag.11.9.

11.6.3. Sample tube aeration

The valve ⑦ is activated and atmospheric air is aspirated through a one way valve ⑧ in the sample tube ⑥ to compensate the vacuum.

At the same time, the 500µl pump ② pushes some diluent into the needle rinsing cup ⑨. The 1ml waste pump ⑩ pushes the liquids to the waste connector of the reagent block ③ (Diag.11.10).



Diag.11.10

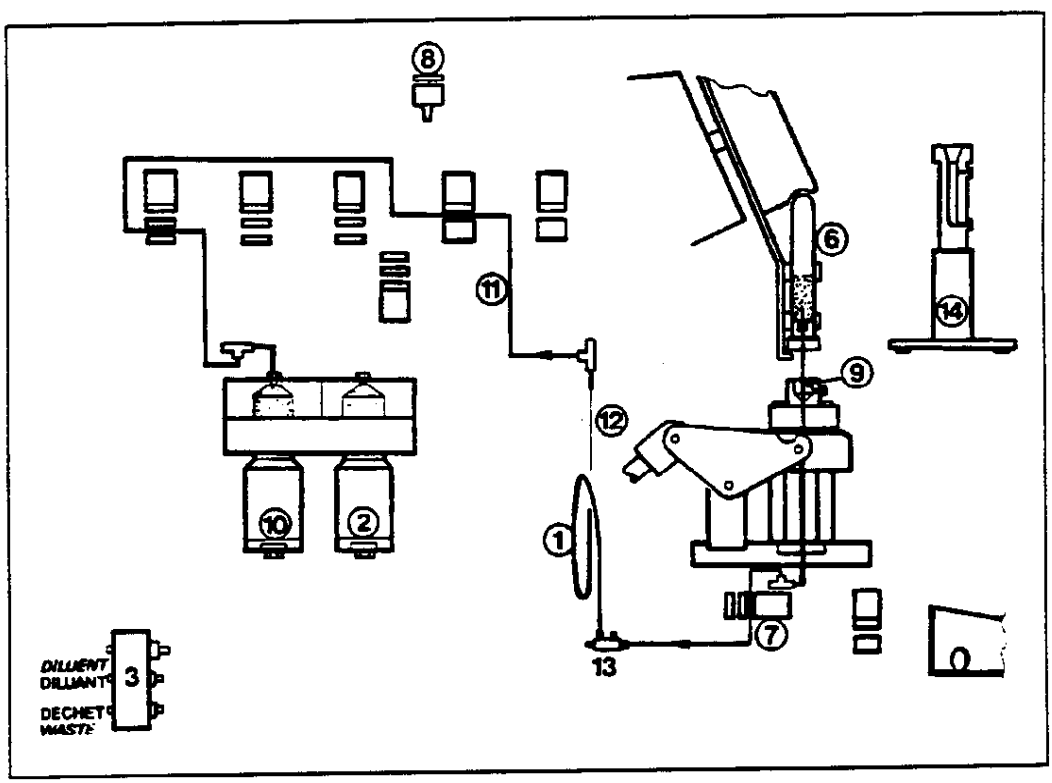
11.6.4. Second blood aspiration

A second blood aspiration is done by the mean of the vacuum inside the 1ml waste pump ⑩.

In the sampling tube ① can be found :

- the first aspiration ⑪ which is used to clean the tube to avoid contamination,
- an air bubble ⑫ coming from aeration between the 2 samplings,
- the second aspiration ⑬ which the end part will be send to the sampling receptacle ⑭.

A second aeration will be apply to the sample tube to compensate the vacuum at the end of the second aspiration (Diag.11.11.).



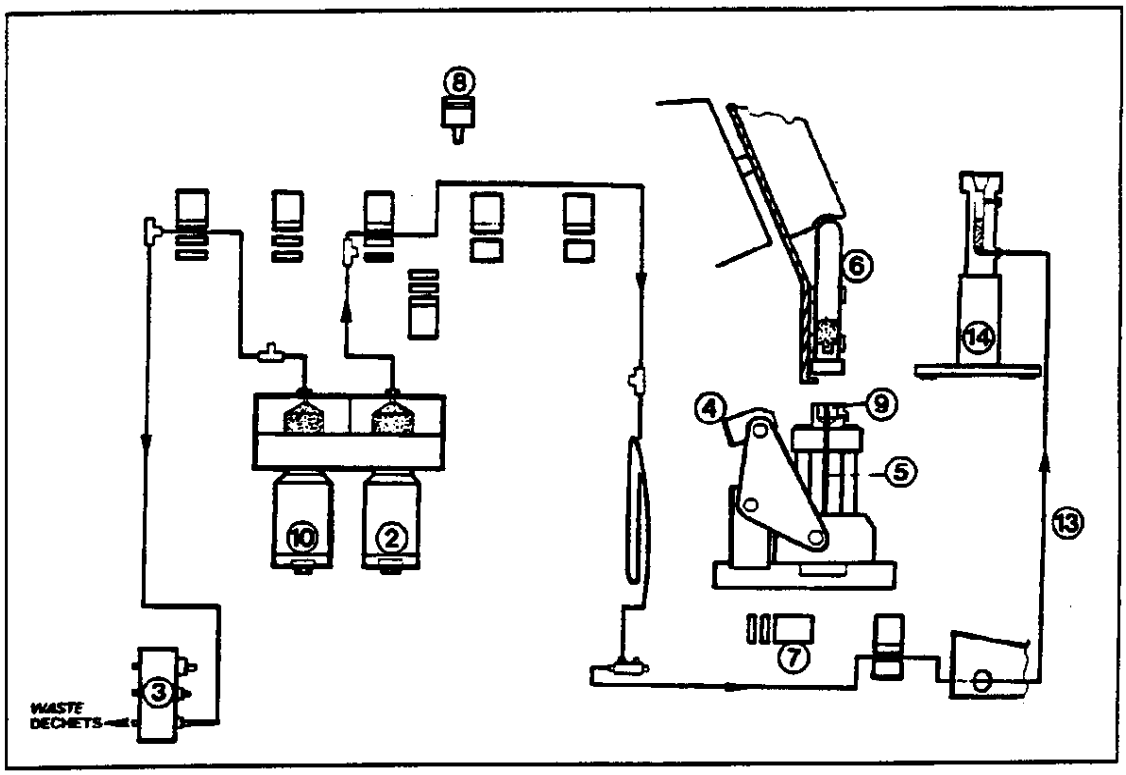
Diag.11.11.

11.6.5. Transfer to the sampling receptacle

When the piercing needle ⑤ goes down, it is cleaned externally with the diluent contained in the rinsing cup ⑨.

At the same time, the 500µl pump ② pushes the sampled blood from the second aspiration ⑬ to the sampling receptacle ⑭.

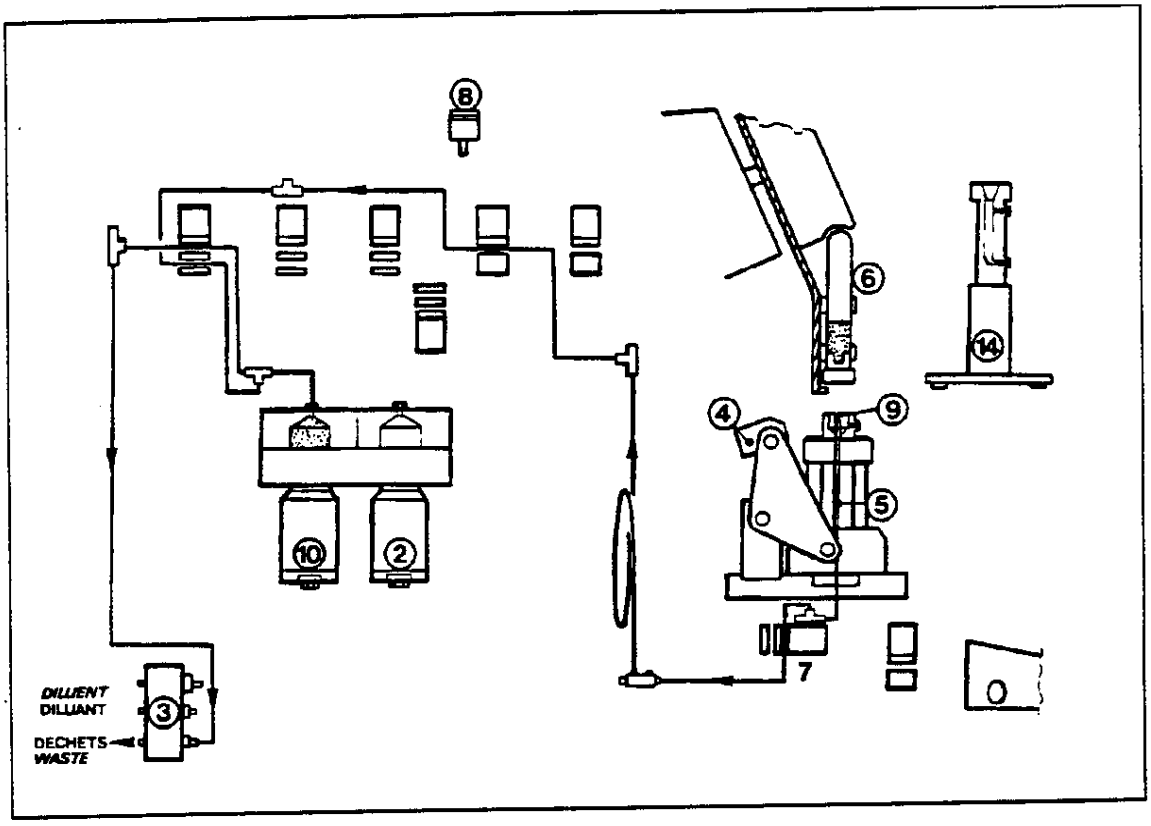
The waste pump ⑩ pushes the liquids to the waste connector of the reagent block ③ (Diag.11.12.).



Diag.11.12.

11.6.6. Piercing needle internal rinsing

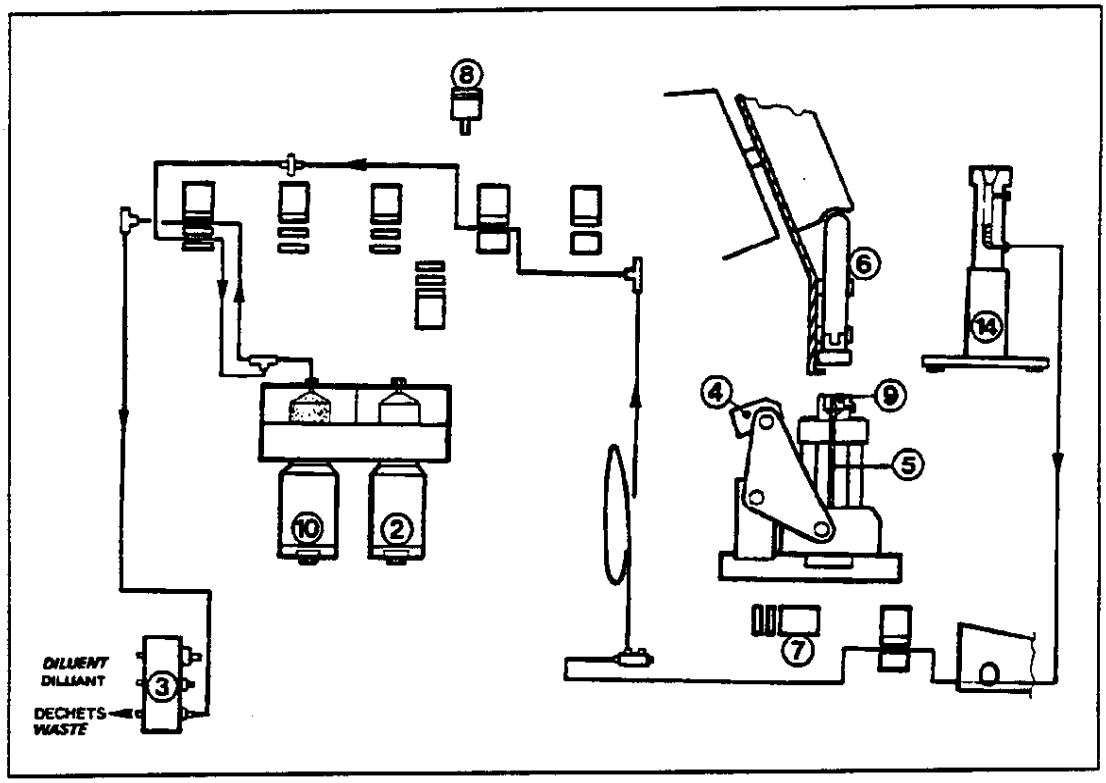
The **MINOS** samples 25µl of whole blood from the sampling receptacle ⑭ (see section 4.1.2.), the piercing neddle ⑤ is cleaned internally by the mean of the 1ml pump ⑩ which aspirate the diluent through the needle ⑤ and pushes it to the waste connector of the reagent block ③ (Diag.11.13.).



Diag.11.13.

11.6.7. Sampling receptacle drainage

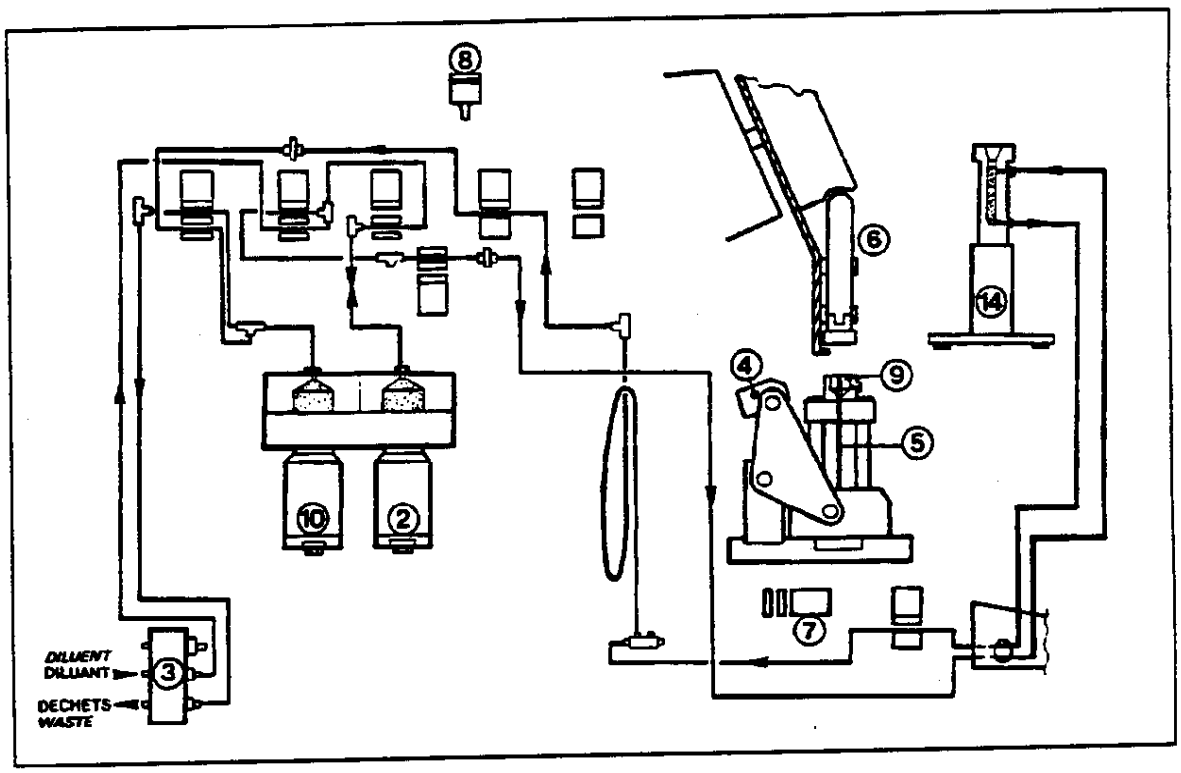
The 1ml waste pump ⑩ aspirates the blood from the sampling receptacle ⑭ to the waste connector of the reagent block ③ (Diag.11.14.).



Diag.11.14.

11.6.8. Sampling receptacle rinsing

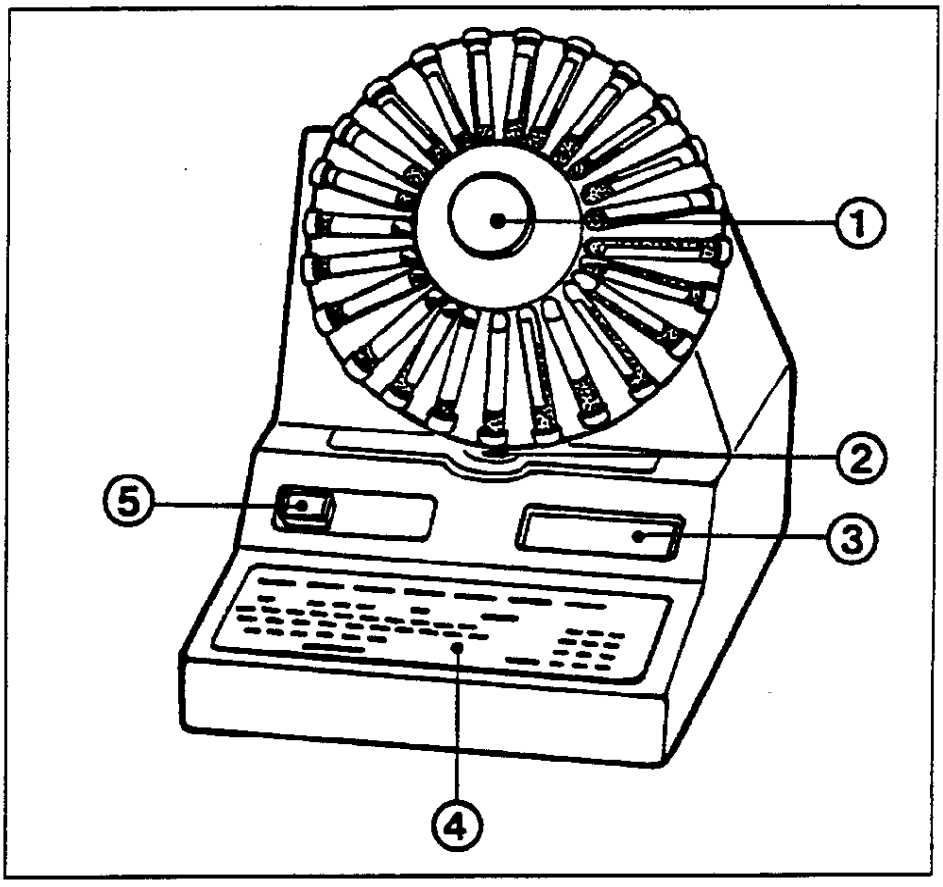
The 500µl pump ② sends diluent into the sampling receptacle ⑭ through the top connector and the 1ml waste pump ⑩ aspirates it thtough the bottom connector and pushes it to the waste connector of the reagent block ③ (Diag.11.15.).



Diag.11.15.

11.7. Description and part list

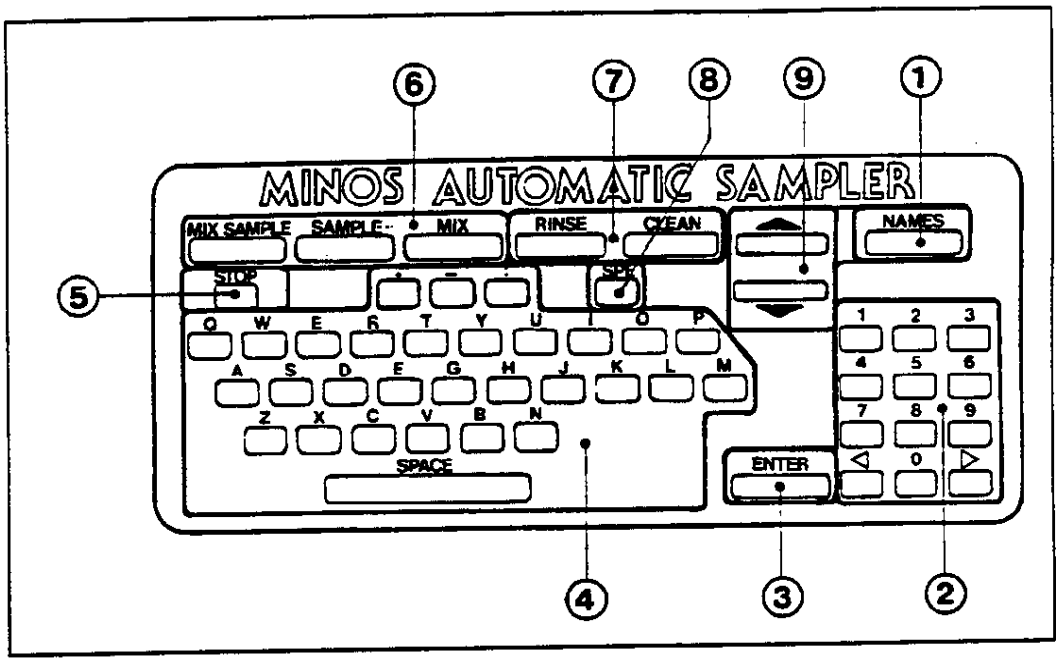
11.7.1. Front view



Diag.11.16.

1 Sample tray
2 Needle rinsing cup
3 LCD display
4 Command keyboard
5 ON/OFF light indicator

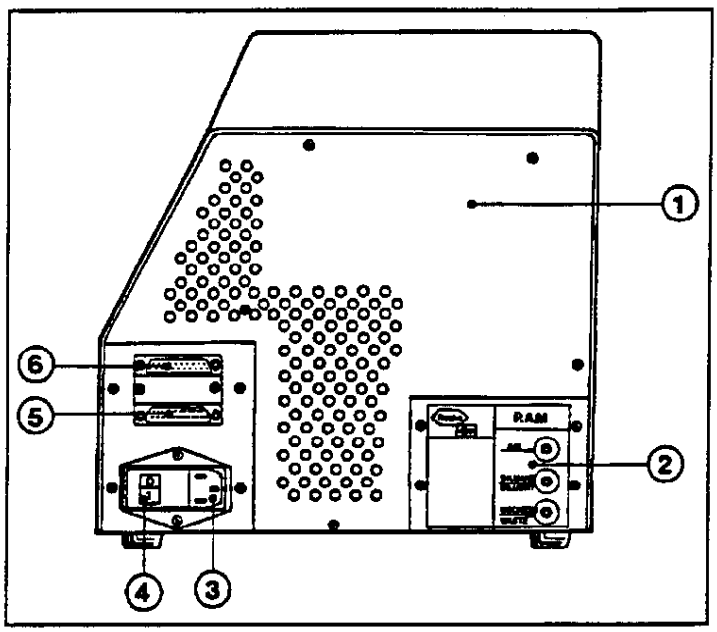
11.7.2. Command keyboard



Diag.11.17

1	Name and identification key	6	Commande cycle keys
2	Numerical keyboard	7	Maintenance keys
3	Validation key	8	Special functions key
4	Alphabetic keyboard	9	Display screening
5	Cycle stop		

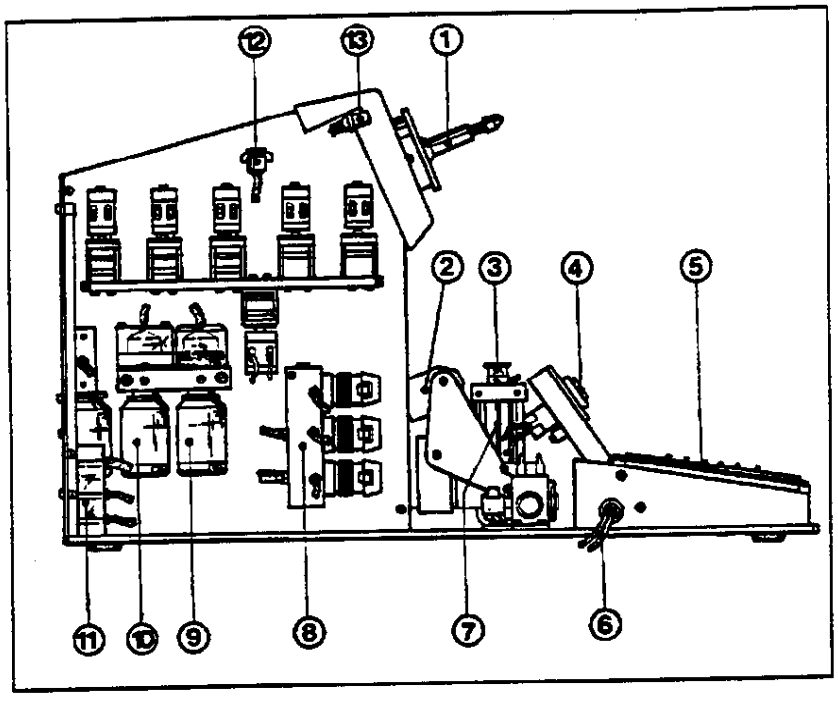
11.7.3. Rear view



Diag.11.18.

1 Protection rear panel
2 Reagent block
3 Main supply plug
4 ON/OFF switch
5 **MINOS** RS connector
6 RS computer connector

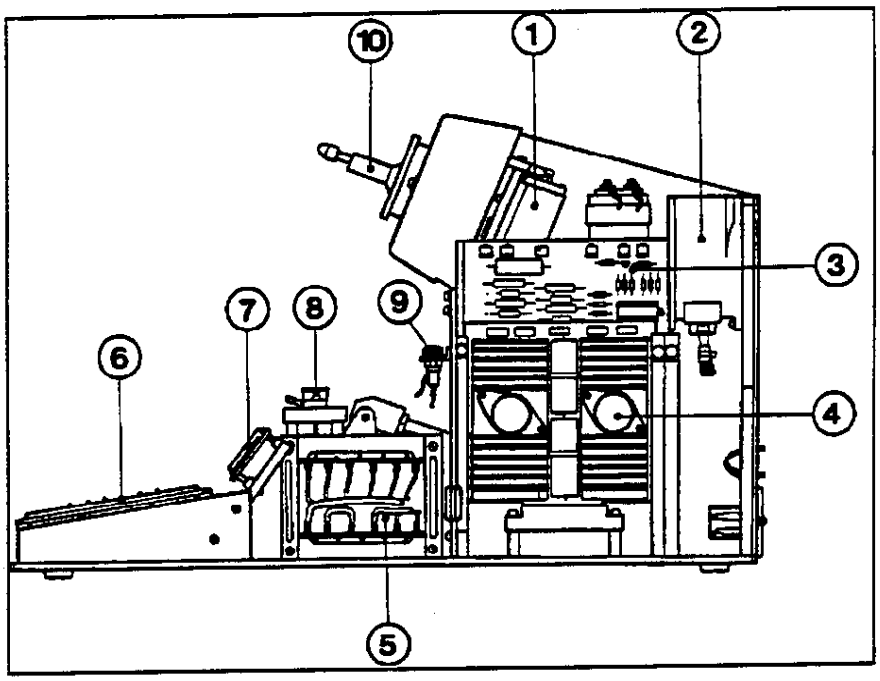
11.7.4. Left inside view



Diag.11.19.

1	Sample tray axis	8	Electropneumatical valves
2	Piercing needle air cylinder	9	500µl pump
3	Needle rinsing cup	10	1ml waste pump
4	ON/OFF light indicator	11	Reagent block
5	Command keyboard	12	One way valve
6	Hydraulic connections	13	Tray number detection
7	Piercing needle		

11.7.5. Right inside view



Diag.11.20

1	Sample tray motor	6	Command keyboard
2	Fan	7	LCD screen
3	Motor command board	8	Needle rinsing cup
4	Power supply board	9	Power supply fuses
5	Power supply transformer	10	Sample tray axis

11.8. Preparation before analysis and start up

11.8.1. Reagents and consummables

Check the level of the diluent **MINOTON.**
If the level is too low or the expiration date passed, replace the container
Check that the quantity of paper is sufficient for the programmed analysis.

11.8.2. Waste

Check the level of the liquid in the waste container. If necessary, replace the container and apply the neutralisation procedure as described in section 2.8.2.

11.8.3. Connections

Check that the hydraulic tubes are properly fitted and not pinched. Check the cable connections **MINOS - PAM** and **MINOS** - Printer.

11.8.4. Start up

After having followed the above intructions :

- Press the ON/OFF switch.
- It's green light turns on.
- **PAM** displays :

*** ABX--PAM ***

Should the display be different, switch off and start again.
(Call **ABX** technical services if the problem continues).

11.9. Command cycles

11.9.1 Mixing

After having loaded the tray with blood sample tubes and if necessary, having entered the identification (Section 11.9.5), position the tray on the **PAM**'s central axis, insert and turn gently until it "clicks" into position.

PRESS ON	DISPLAY	REMARKS
MIX	MIX ???	
then		
ENTER	MIX # TRAY NUMBER 01	- the tray is turning - the tray number is displayed - the sign # means the cycle is in process.
In order to stop press again on MIX	MIX # MOUNT TRAY	- There is no tray or the tray is not properly fitted.
ERROR MESSAGE :		

NOTA : The tray will turn until someone press on the key :

MIX

11.9.2. Rinsing

Rinsing allows cleaning or total priming of the pneumatic tubing system (see pneumatic diagram).

WARNING : The cycle must be used on start-up and shut-down of the PAM. In no case should the PAM be shut-down without a rinse cycle.

PRESS ON	DISPLAY	REMARKS
RINSE	RINSE ???	
then		
ENTER	RINSE #	- the sign # means the cycle is in process.
ERROR MESSAGE :	RINSE # AWAITING MINOS	- Check that the **MINOS** is ON and vacuum and pressure in green position. - **MINOS** was in stand by mode and restarts. - **MINOS** is running a cycle.
	*** ABX - PAM ***	- after 30 seconds **PAM** returns to stand by mode

The cycle lasts for 2 minutes.
Only an urgent stop can interrupt it before the end of the cycle.

ONLY IN THE CASE OF AN URGENT STOP :

Press :

STOP

Display shows :

URGENT STOP

11.9.3. Positioning the sample tubes

- Only use tubes with a silicone stopper.
- Place the sample tray flat on the bench.
- Make sure that the stopper is well fixed in the tube.
- The stopper end of the tube is placed towards the exterior of the tray.
- Press the tube in the clips.
- Check that the stopper is well in place.
- Repeat the operation for each tube.

WARNING : If a tube is placed upside down the needle may be damaged.

NOTA : For optimal operation of the **PAM**, it is necessary to use 5ml vacuated or non vacuated type tubes. **ABX** technical services can provide a list of suppliers for these type of tubes.

11.9.4 Validation of a complete tray

Validation of a complete tray without identification entry. This procedure allows the user to validate a complete tray quickly without entering individual patient identifications or demographics.

NOTA : Verify that the memory for this tray has been correctly cleared before starting the following procedure :

PRESS ON	DISPLAY	REMARKS
SPE	SPECIAL FUNCTION []	
then V A L	SPECIAL FUNCTION VAL	
then 01 to 10	SPECIAL FUNCTION VAL 01	- enter the tray number to be validated.
then ENTER	*** ABX - PAM ***	- **PAM** has validated the whole sample tray number 01.

11.9.5. Entering patient identification

The **PAM** is the only sampler on the market which allows alphanumeric identification of blood samples.
15 characters (letters or numbers) are available for identification.

11.9.5.1. Clearing the memory

The **PAM** retains 240 identifications in its memory (10 trays of 24 tubes)
To clear one or more trays from memory proceed as follows :

PRESS ON	DISPLAY	REMARKS
SPE	SPECIAL FUNCTION []	
then		
M	SPECIAL FUNCTION M01	
01		
to		
10		
then	*** ABX - PAM ***	- The **PAM** clears off validations and identifications of the sample tray N°1. - To clear off other trays, proceed the same way. - To clear off all the trays, follow the same procedure and enter MM.
ENTER		

11.9.5.2. Procedure for identification entry

WARNING :	**It is highly unadvisable to load sample tubes onto the tray when it is mounted in position on the PAM. Never interfere with the rotation of the tray as this could cause faulty positioning when sampling with possible damage to tray or needle.**

Load the sample tubes with the tray flat on the bench.
Load the individual sample tubes as their identifications are entered in chronological order from tube position :
- 01 to 24 for tray n°1, 25 to 48 for tray n°2, 49 to 72 for tray n°3 and so on...

PRESS ON	DISPLAY	REMARKS
NAME	TRAY NUMBER ???	
then		
tray number from :		
01	TRAY NUMBER 01	- Cursor flashes on 01.
to		
9		
for tray N°10 :		
<		
1		
0		
then	TRAY NUMBER 01 001	- 001 corresponds to the position N°1 on tray N°1. - 025 corresponds to the position N°1 on tray N°2.
ENTER		

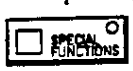
PRESS ON	DISPLAY	REMARKS
A to Z or 0 to 9	TRAY NUMBER 01 001 SMITH	- or keys : . - : - cursor control key : < >
ENTER	TRAY NUMBER 01 001 SMITH #	- Sign # shows that the tube 001 has been validated - If : ENTER
▽	TRAY NUMBER 01 002	is pressed again, the sign # disappears and the tube is not validated. - the keys : ▽ and △ allows the operator to screen all the memorised entries
New identification entry		
EXIT : NAMES	*** ABX - PAM ***	

NOTA :	Memory contents can be checked, using names key and scrolling memory with :

or

For every validated tube the # sign will appear.

11.9.5.3. Worklist print out

When it is required, the operator is able to print out the memorized worklist by pressing the **MINOS**  then 993.

The worklist will be printed out on the **MINOS** printer (Section 7.1.4.).

11.9.5.4. Invalidation of one or more sample tubes

PRESS ON	DISPLAY	REMARKS
NAME	TRAY NUMBER ???	
ENTER		
TRAY NUMBER		
1	TRAY NUMBER 01	
to		
<		
1	TRAY NUMBER 01	
0		
ENTER		
	TRAY NUMBER 01 001	

PRESS ON	DISPLAY	REMARKS
forward  backward 	TRAY NUMBER 01 012 SMITH #	- go to the required tube - sign # indicates that the tube is validated
ENTER	TRAY NUMBER 01 012 SMITH	- Identification stay in memory but validation is cancelled

11.10. Entry of limits on the MINOS

The **PAM** automatically resamples all sample tubes having a parameter or parameters falling outside the limits preprogrammed by the user.

11.10.1. Entry of limits on the MINOS

Press the SPECIAL FUNCTIONS key on the **MINOS**, then 994.
The limits for one or more parameters may be entered.
Press the calibration key for the parameter whose limits are to be entered.

Enter the low limit first and then the high limit using the numerical keyboard.

If an error is made begin the sequence again.

NOTA : To enter the MCV limits use the Hematocrit calibration key.

11.10.2. Verification of the limits in memory on the MINOS

Press the SPECIAL FUNCTIONS key, then 995.
The **MINOS** prints out it's preprogrammed limits for :

WBC - RBC - Hgb - MCV - Plt and its with-in limits MEANS.

11.11. Sampling cycle

11.11.1. Sampling

Before any operation, check that :

1) The reagent level for the **MINOS** is sufficient for a complete tray.

2) The **MINOS** is in ready or standby mode.

3).The pathological limits have been entered properly (Special Functions 995, Chapter VIII).

4).A **PAM** rinse cycle has been made before the operation.

Mount a tray, the tubes of which have been validated.

PRESS ON	DISPLAY	REMARKS
SAMPLE	SAMPLE ???	- The tray turns for tray number reading.
ENTER	SAMPLE ???	- sign # indicates that the sampling cycle is being run.
	TRAY NUMBER 01 001 SMITH #	- The **PAM** samples once again if the results are out of **MINOS** pathological limits, rejected or flagged.
	TRAY NUMBER 01 002 JONES #	
	END OF TRAY	- Until the last validated sample on the tray has been run.

11.11.2. Mix/sampling cycle

Press the

MIX - SAMPLE

The **PAM** will mix for three minutes, and run a normal sampling cycle.

11.12. Error messages

DISPLAYED ERROR FLAGS	COMMENTS
TRAY NUMBER 01 TUBE NOT VALIDATED	- No tube has been validated on tray N°1.
SAMPLE MOUNT TRAY	- The sampling cycle has been requested, without mounting a tray, or the tray has not been inserted correctly on the axis.
TRAY NUMBER 01 AWAITING MINOS	- Check : - the **MINOS** is not switched on. - the **MINOS** is already performing a cycle (rinse, cleaning...). - the **MINOS** was in stand by and the **PAM** has restarted it. - the vacuum or pressure LEDs are on red on the **MINOS.** -After 30 seconds, the **PAM** returns to ready.
TRAY NUMBER 01 # 001 NOT SAMPLED	- The sampled blood quantity is insufficient (due to low blood level or clot). - The flag " BLOOD LEVEL TOO LOW " is printed. - The **PAM** continues to the next sample cycle.

11.13. Maintenance

11.13.1. Daily

A rinse at the beginning and end of each series is sufficient for the proper running of the **PAM.**

11.13.2. Weekly

When the PAM is in ready mode :

install on the tray a cleaning solution tube for **PAM** (contact **ABX REAGENT DEPARTMENT**) then validate the tray and the tube position.

Run a sampling cycle, two sampling cycles will be carried out, an error message "BLOOD LEVEL TOO LOW " will be printed.

Run 2 rinsing cycles.

11.14. User special functions on the PAM

The following is a list of the standard program commands.

Press : [SPE] key, then :

1) [M], [M] then [ENTER]

- Clear off all memorized names (001 to 240) but keep the validations.

2) [M], [T] then [ENTER]

- Clear off all the validations (001 to 240) but keep the names in memory.

3) [M], [X][X] then [ENTER]

- M followed by the tray number, clear off all names and validations on this tray.

4) [V][A][L] [X][X] then [ENTER]

- VAL followed by a tray number validate the whole tray but clear off all the names.

11.15. Pneumatical schematic