WEST CARE
MEDICAL LTD

# LEGENDAIR

# SERVICE MANUAL


Tel: 604 540-8288

Fax: 604 540-8245

Web: www.westcaremedical.com

# Maintenance File
# *LEGENDAIR* ®
# Chapter 0 – Introduction to Maintenance (Rev. B)

# CONTENTS

# 1. INTRODUCTION

## 1.1 WARNINGS / SAFETY RULES

This maintenance file was produced within a limited context. Only persons trained and approved by AIROX are authorized to use it.

The person (operator) who needs to do any work on defective elements must refer to the electrical safety rules in force for this type of work. Similarly, knowledge about how this type of device is used is desirable *(Refer to the "**LEGENDAIR®** User's Manual" if necessary).*

BEFORE DOING ANY MAINTENANCE WORK, MAKE SURE THAT THE DEVICE IS SWITCHED OFF.

>> *AIROX cannot be held responsible for incidents caused by this device unless the installation, maintenance or modifications are made by an authorized person using original spare parts and respecting quality assurance and traceability rules approved by AIROX. Due to its CE marking, no modifications may be made without the written permission of AIROX.*

## 1.2 GUARANTEE / GUARANTEE SEAL

>> *No maintenance work for which the equipment needs to be opened is necessary within the first twelve months of operation.*

A tamper proof label under the equipment states that the equipment is under "Guarantee" for the first year.

The contractual guarantee provided by AIROX will be null and void if this label is damaged in any way by opening the equipment during the first twelve months (unless AIROX gave written permission before the equipment was opened).

## 1.3 METHOD / TRACEABILITY / INSPECTION

The operator should note all equipment configuration parameters before starting to do any work, if possible depending on the operating condition.

### 1.3.1 Traceability

It is recommended that approved After Sales services should keep the following elements for 10 years, for traceability purposes:

- work data,
- inspection sheet.

If there is an incident with a device, these documents will be requested to determine its history and to demonstrate that maintenance and the work operations have actually been done.

In general, the operator should record information about the work - Nature of the work, replacement of defective parts.

### 1.3.2 Inspection sheet *(appendix 1 – Chap IV).*

Adjustment-inspection instructions must be applied in all cases after each mechanical and/or electrical operation. Do not forget to reconfigure the device in accordance with the user's parameters *(Elements backed up before the work operation).*

## 2. DEFINITION OF CHAPTERS

This file is organized in the form of chapters to define all information necessary for the maintenance technician.

### 2.1 DOCUMENTATION PLAN:

>> *Cover page.*

>> *Chapter 0: Introduction to Maintenance.*

>> *Chapter 1: Technical and Functional Description.*

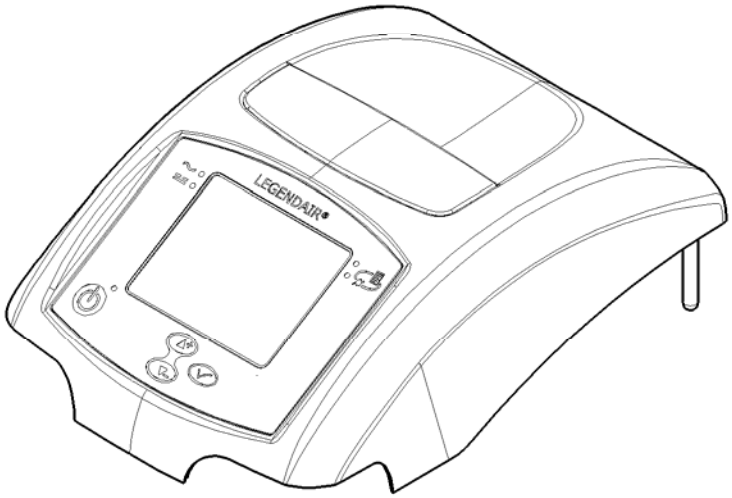
>> *Chapter 2: Preventive Maintenance.*

**Parc d’activités Pau-Pyrénées**
**ZI de l’échangeur**
**64008 PAU CEDEX (FRANCE)**

Tel. : 33.(0)5.59.14.02.02- Fax : (33.(0)5.59.14.02.00 - E-mail : contact@airox.fr

# Maintenance File
# *LEGENDAIR* ®
# Chapter 1 – Technical and Functional Description (Rev. B)

# CONTENTS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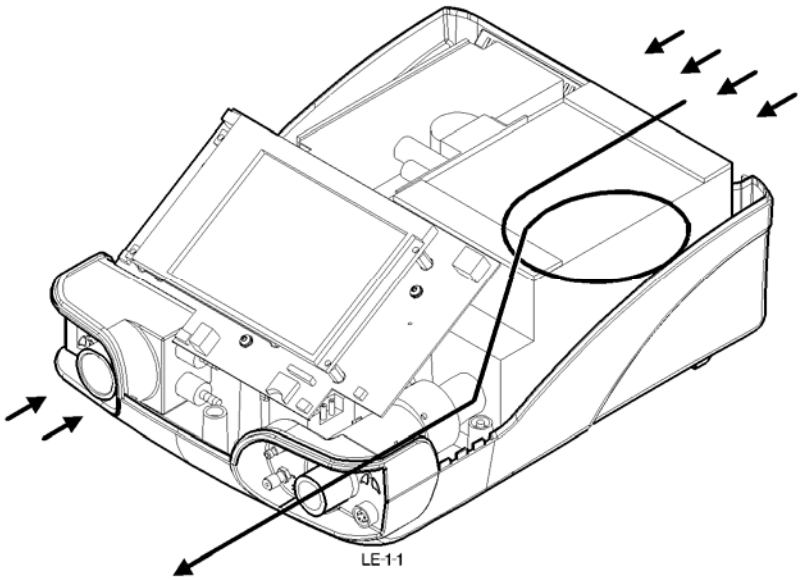
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# 1. INTRODUCTION

## 1.1 OVERVIEW

This chapter presents a brief reminder of the technical and functional characteristics of the ***LEGENDAIR®***.

# 2. TECHNICAL DESCRIPTION

The ***LEGENDAIR®*** is composed of elements located in two sub-assemblies forming the top casing and the bottom casing of the nose ventilator.

These two equipped sub-assemblies also incorporate wiring and an air circuit (see the air path – fig LE1.1).

## 2.1 GENERAL TECHNICAL DATA FOR THE DEVICE

**Insufflation Flow Rate:** from 0 to 200 l/min (or $dm^3$/min) in absolute.

>> *Maximum flow rate at 10 mbar = 190 l/min,*
>> *Maximum flow rate at 20 mbar = 160 l/min,*
>> *Precision of measurement: ± 10% above 15 L/min.*

**Insufflation Pressure:** from 4 to 55 mbar (or hPa) absolute(1) .

>> *Precision of measurement: ± (0.8 mbar + 4% of reading).*

Note : The maximum pressure limit threshold above which the device cannot supply a flow of air (intrinsic limitation of the turbine motor) is 70 mbar.

**Cycling rate:** from 4 to 40 bpm (or breaths/min) absolute.

>> *Precision of calculation: ± 1 bpm.*

**I/T cycling mode:** from 25% to 50% in absolute setting.

>> *Precision of calculation: ± 10%.*

**I/E cycling mode:** from 1/1 to 1/3 in absolute setting

>> *Precision of calculation: ± 10%.*

**FiO2 measurement:** from 18% to 100% with cell COMEPA MI COM 102-1 to 1013 hPa and 25°C

>> *Precision of measurement: ± 3%*
>> *Response time: < 13 s for 90% of the final value*
>> *Stability of the precision of measurement: ± 1% past 8 h*

(1) There are specific limitations for each mode.

Inspiratory resistance of the ventilator: - 3 mbar to 60 L/min.

Level of sound pressure in accordance with standard NF EN ISO 17510-1: 30 dBA

**A/C Electrical supply:**

- 115/230 V ± 10% - 50/60 Hz.
- Consumption: 80 VA nominal and 90 VA max.

**DC direct electrical power supply:**

- 24 V ± 2.5 V -3.3 A maxi
- Consumption: 80 VA nominal

Internal battery: 25.2 V -4.4 Ah of the Lithium Ion - rapid recharge type.

The autonomy offered by the internal battery depends on the level of adjustments made, the environmental conditions (primarily in terms of temperature) as well as the physiological characteristics of the patient.

On average autonomy with a temperature of 25°C is as follows:

| Ventilation parameters | Average autonomy based on maximum battery charge |
|---|---|
| VT ~ 200 ml<br>IPAP ~ 10 mbar<br>R ~ 20 bpm | 10 h |
| VT ~ 300 ml<br>IPAP ~ 20 mbar<br>R ~ 15 bpm | 8 h |
| VT ~ 500 ml<br>IPAP ~ 30 mbar<br>R ~ 15 bpm | 6 h |
| Max of ventilation parameters | 4 h |

The time taken to recharge the internal batteries is of the order of 8 hours to obtain a good level of autonomy (see § Battery maintenance).

**Insulation class:** Class II – Protection index IP 30.

**Medical device class:** Class II B – Type BF applied part.

**Dimensions (excluding accessories) :** H = 154 mm, L = 235 mm, D = 315 mm.

**Weight:** 4.5 kg in double branch option.

**The following environmental conditions shall be respected:**

In storage or transport:

- Temperature: -20 to 60 °C.
- Humidity: 10 to 80 % RH.
- Atmospheric pressure: 600 to 1060 hPa.

In use:

- Temperature: 5 to 35 °C.
- Humidity: 30 to 75 % RH.
- Atmospheric pressure: 700 to 1060 hPa.

**Note**: The measurements of the flow rates and therefore the estimations of volume of leakage that result (see § Measurement visualisation) are influenced by the variations in atmospheric pressure. A calibration of the flow rate sensor is recommended if atmospheric pressure is much different than 1000 hPa (see § Sensor calibration). For example, altimetric variation of 1000 m leads to a variation of flow rate measurement of the order of 10%.

In extreme conditions of use (such as humidity at 95% and power supply at -15%) the ventilator does not demonstrate particular malfunction.

# 3. FUNCTIONAL DESCRIPTION

## 3.1 ARCHITECTURE - PRINCIPLE

The ***LEGENDAIR®*** ventilator is composed of an airflow generator to manage the inspiration and expiration phases controlled by variable set values.

The overall system is controlled by a computer that receives information from pressure and flow sensors.

The flow generator is a micro-turbine driven by an electric motor.

The main function blocks are as follows:

- Generator block *(Turbine built into a box with sound insulation and air filter)*
- Supply block / Charger *(AC/DC power supply, wiring,* switching board*)*
- Battery block
- Pneumatic block (*flow laminator + solenoid valve+ O2 supply + Expiration block (Option) + couplings + silicon and polyurethane tubes)*

- CPU block *(piloting printed circuit board + turbine control board)*
- Structure and User-Machine Interfaces *(housings + display + keypad + communication ports)*

## 3.2 OPERATION OF THE DEVICE

The ***LEGENDAIR®*** ventilator is composed on one hand of an airflow generator capable of supplying a sufficient range of flow rates and pressures and on the other hand of a three-way valve enabling piloting of the expiration valve.

The flow generator is a low-inertia micro-turbine driven by a brushless electric motor: the valve is a proportional piezo valve.

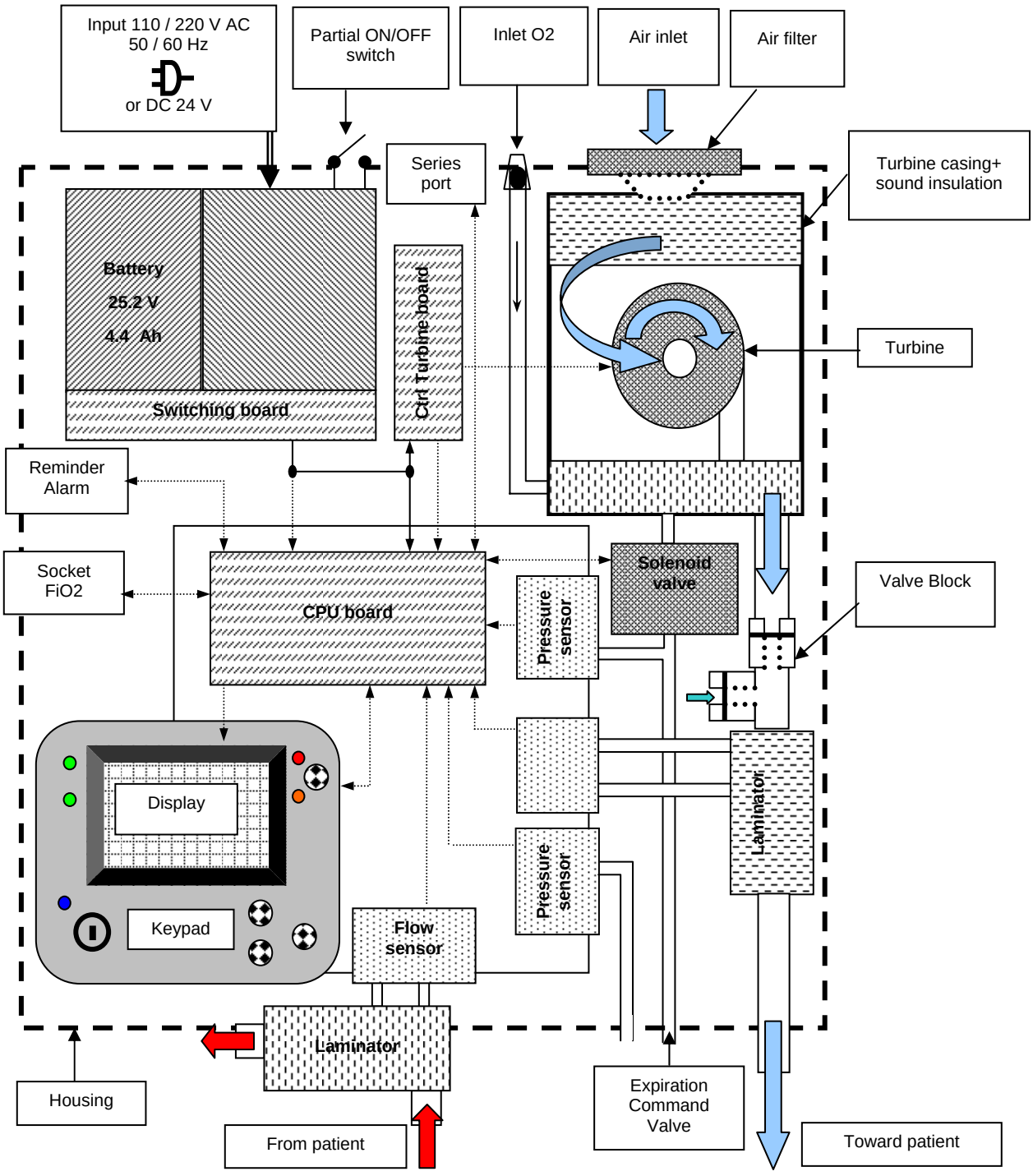
These two actuators are controlled according to specific piloting laws by a computer receiving information from the pressure and flow sensors built into the apparatus.

The operation of the device is based on a self-adapting drive system of the speed of the flow generator, in a closed loop.

The speed of the flow generator (turbine) is servo-controlled to the patient pressure signal or the inspired flow signal.

The laws for piloting turbine speed are based on equations and vary according to the ventilation modes, settings and the ventilatory cycle phases. Thus, fixing the pressure flow ramp or flow rise time has an influence on the level of turbine acceleration at the start of insufflation. The transition between the insufflation and expiration phase is itself controlled by a deceleration or braking proportional to the difference in pressure between the two phases.

The expiration valve is pressure-piloted during the inspiratory phase and as the main regulation part during the expiratory phase. The speed of the turbine is thus adapted to the expiratory pressure level during the entire expiratory phase in order to compensate for "parasite" leaks in the circuit beyond the leak regulated by the valve. This rinsing flow is as small as possible in order to limit the patient expiratory brake phenomenon without however cancelling it in order to prevent turbine overheating and expired gasses re-aspiration phenomena. A system of non-return valve and spontaneous ventilation are used to facilitate the threshold of balance.


Input 110 / 220 V AC
50 / 60 Hz
or DC 24 V
Partial ON/OFF switch
Inlet O2
Air inlet
Air filter
Series port
Turbine casing+ sound insulation
Battery
25.2 V
4.4 Ah
Switching board
Ctrl Turbine board
Turbine
Reminder Alarm
Socket FiO2
CPU board
Solenoid valve
Pressure sensor
Valve Block
Display
Keypad
Flow sensor
Pressure sensor
Laminator
Laminator
Housing
From patient
Expiration Command Valve
Toward patient

The measurement of the flow rate completes the system by enabling detection of patient inspiratory efforts and to trigger insufflation phases. The flow rate measurement can also be used to determine the end of the insufflation phase in certain ventilation modes. Finally, it serves to calculate the leak volumes and rates reached at each cycle, regardless of the ventilation mode in progress. This also enables the proposal of an automatic adjustment of the insufflation pressure between two determined limits in order to attain a desired volume.

The various measurement signals used in the piloting and detection are specifically filtered in order to limit risk of disturbance and malfunction.

**Parc d’activités Pau-Pyrénées**
**ZI de l’échangeur**
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# Maintenance File
# *LEGENDAIR* ®
# Chapter 2 – Preventive Maintenance (Rev. B)

# CONTENTS

# 1. INTRODUCTION

## 1.1 GENERAL

This chapter sets forth preventive maintenance conditions and procedures.

Preventive maintenance procedures relate to systematic maintenance operations. These activities are conducted according to maintenance intervals defined by the manufacturer.

Preventive maintenance conditions are contingent on certain predefined events resulting from measurements or observations made during operations.

Non-compliance to these maintenance recommendations can result in performance alterations, excessive overheating or even loss of certain functionalities, and compromise the long term durability of the device.

*>> It is generally recommended to clean and disinfect the device before performing any maintenance operations.*

>> ***According to maintenance quality procedures, the technician should complete an intervention report for each device.***

## 1.2 MAINTENANCE PROCEDURE DEFINTION

Overall operations to be performed are set forth in various maintenance procedures:

*>> equipment replacement procedures,*

*>> operational inspection and monitoring,*

*>> cleaning and disinfection,*

*>> general audit operations.*

There are 4 types of maintenance visits, based on operating time of the device which is either determined by hours of use or months of operation.

| | |
|---|---|
| Visit every year | V2 |
| Visit every 3 years | V3 |
| Visit every 6 years | V4 |

*Note: Only the cleaning and disinfecting procedure is not part of this structure, as it is defined as recommended and is only performed according to the usage of the device and the environment in which it is used.*

**1st level maintenance*: (V1)**
Maintenance performed at the patient, please refer to the current User Manual.

**2nd level maintenance: (V2, V3, V4)**
Maintenance performed in the workshop, please refer to the maintenance file.

| CAUTION |
|---|
| **BEFORE ANY MAINTENANCE OPRATION:**<br>**PLEASE MAKE SURE THE DEVICE USES THE MOST RECENT SOFTWARE VERSION**<br><br>**From serial # LEGENDAIR® 40957K166311 and 40959K207311, software version LE02XXX**<br><br>**Before serial # LEGENDAIR® 40957K166311 and 40959K207311, software version LE01XXXX**<br><br>**Check the distance between the CPU card and the INVERTER (IC5) card (the gap must be more than 1 mm).** |

### 1.2.1 Preventive Operations Summary Table

| OPERATION | V2 | V3 | V4 | CORRESPONDING PARAGRAPH |
|---|---|---|---|---|
| Cleaning and disinfection | * | * | * | CHAPTER II-2.1 |
| Cleaning of autoclavable expiratory block (double branch option) (3809999) | * | * | * | CHAPTER II-2.2 |
| Cleaning of single-patient expiratory block (double branch option) (3823099) | * | * | * | CHAPTER II-2.2 |
| Air inlet filter replacement (2963399) ** | * | * | * | CHAPTER II-3.1 |
| User interface control, adjustment and calibration | X | X | X | CHAPTER II-4.1 |
| Cleaning of flow laminator (3812099) | X | X | X | CHAPTER II-4.2 |
| Battery replacement (2963599) | | X | | CHAPTER II-5.1 |
| Piezo valve replacement (3811799) | | X | | CHAPTER II-6.1 |
| Turbine casing replacement (3806499) | | | X | CHAPTER II-7.1 |

>> *(**)* or with each patient change and *Specific procedure: Fine particle filter must be changed more often according to fouling levels or operation location.*

## 1.3 CORRESPONDENCE TABLES

### 1.3.1 Correspondence table in months of use

| Visit after … of use | Visits to perform | Visit after … of use | Visits to perform |
|---|---|---|---|
| 1 year | V2 | 4 years | V2 |
| 2 years | V2 | 5 years | V2 |
| 3 years | V2+V3 | 6 years | V2+V3+V4 |
| | | | |

### 1.3.2 Correspondence table in hours of use (intensive use)

| Visit after an intensive use of … | Visits to perform |
|---|---|
| | |
| 3 000 h | V2 |
| 4 500 h | V2+V3 |
| 15 000 h | V2+V3+V4 |

>> ***V2, V3, V4 : Must be performed in the workshop.***

**RECALL: FIRST LEVEL MAINTENANCE***

**Consumables replacement frequency**

In normal ventilator use, i.e. in a dust-free environment and notwithstanding any part damage (impacts, tears, major pollution), replacement frequency recommended for consumables is described in the User Manual.

Non-compliance to these recommendations can results in performance alterations, excessive overheating or even loss of certain functionalities, and compromise the long term durability of the device.

**Note**: For all other accessories not necessarily considered as consumables, please refer to the manufacturer's recommendations.

### *1.3.1 Correspondence table in months of use*

| Inspection after ... of use | Inspections to be made | Inspection after ... of use | Inspections to be made |
|---|---|---|---|
| 2 months (*) | V1 | 38 months | V1 |
| 4 months | V1 | 40 months | V1 |
| 6 months | V1+V2 | 42 months | V1+V2 |
| 8 months | V1 | 44 months | V1 |
| 10 months | V1 | 46 months | V1 |
| 1 year | V1+V2+V3 | 4 years | V1+V2+V3 |
| 14 months | V1 | 50 months | V1 |
| 16 months | V1 | 52 months | V1 |
| 18 months | V1+V2 | 54 months | V1+V2 |
| 20 months | V1 | 56 months | V1 |
| 22 months | V1 | 58 months | V1 |
| 2 years | V1+V2+V3 | 5 years | V1+V2+V3 |
| 26 months | V1 | 62 months | V1 |
| 28 months | V1 | 64 months | V1 |
| 30 months | V1+V2 | 66 months | V1+V2 |
| 32 months | V1 | 68 months | V1 |
| 34 months | V1 | 70 months | V1 |
| 3 years | V1+V2+V3+V4 | 6 years | V1+V2+V3+V4+V5 |

*(*) or every 3 months, according to the in-house procedure of the service provider.*

### *1.3.2 Correspondence table in hours of use (intensive use)*

| Inspection after intensive use of ... | Inspections to be made |
|---|---|
| 1,500 h | V1+V2 |
| 3,000 h | V1+V2+V3 |
| 4,500h | V1+V2+V3+V4 |
| 15,000 h | V1+V2+V3+V4+V5 |

## 1.4 SAFETY MEASURES

The person (operator) who needs to work on defective elements must refer to electrical safety rules in force for this type of work.

BEFORE DOING ANY MAINTENANCE WORK, MAKE SURE THAT THE DEVICE IS SWITCHED OFF.

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## 1.5 TIGHTENING TORQUE / TOOLS / FASTENERS

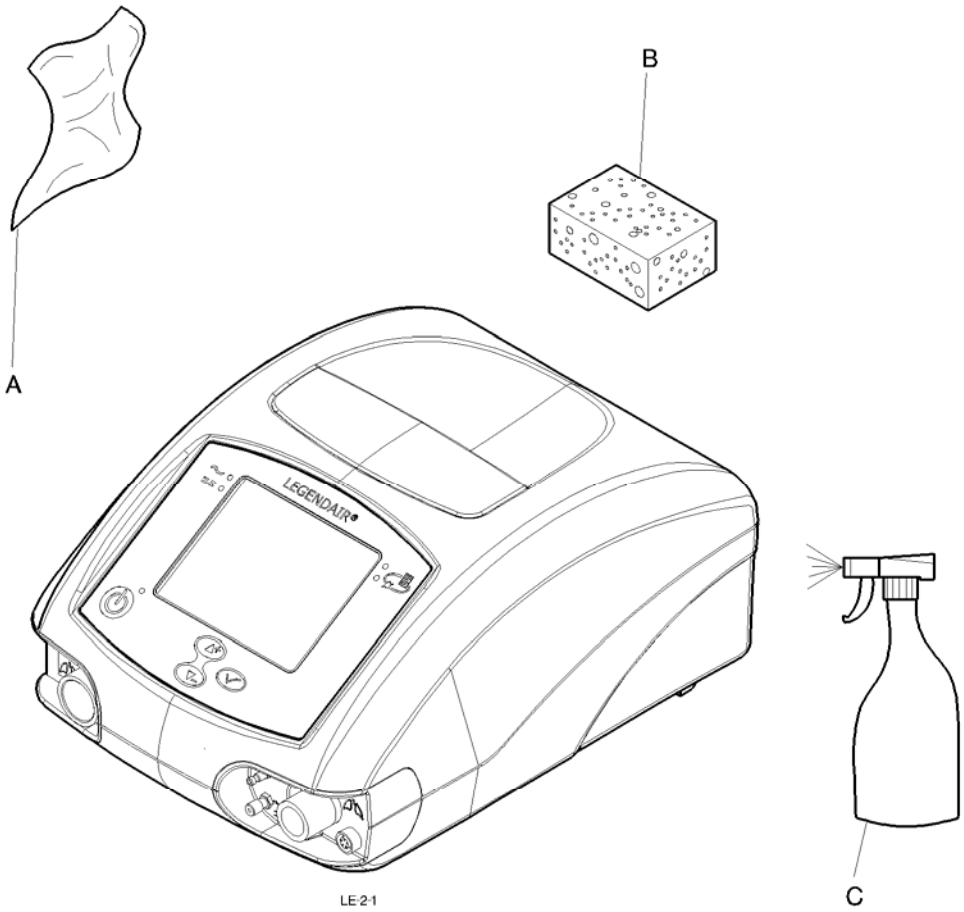
### *1.5.1 Tightening torque*

All tightening torques respect standards in force and depend on the diameter of the screw or nut to be tightened. All specific torques are summarized in maintenance procedures.

### *1.5.2 Removal – installation tools*

The tools necessary for carrying out all the maintenance procedures are: Screwdriver or T10 + T20 male Hexalobe adapter spanner, flat screwdriver.

***Figure CP 2.1 - Cleaning and disinfection of LEGENDAIR®***



# 2. MAINTENANCE INSPECTION V1 (OR 1500 H)

## 2.1 CLEANING AND DISINFECTION (FIG CP 2.1)

**Product reference:** ..... Bactericide and germicide solution: ANIOSPRAY 29 or 41, or AMPHOSPRAY 41.

**Number of operator:** ..... 1.

**Special or specific tools:** ..... Cloth, sponge, vaporizer.

**Preliminary operations:** ..... Make sure that the device is switched off. **Do not allow any liquid to enter inside the device (in particular through the cooling apertures).**

### *2.1.1 Cleaning the device*

- Clean the outside of the device using a cloth (A) or a sponge (B) slightly dampened with a bactericide or germicide solution. Spray (C) the device if necessary, taking account of the requirements discussed in the preliminary operations.

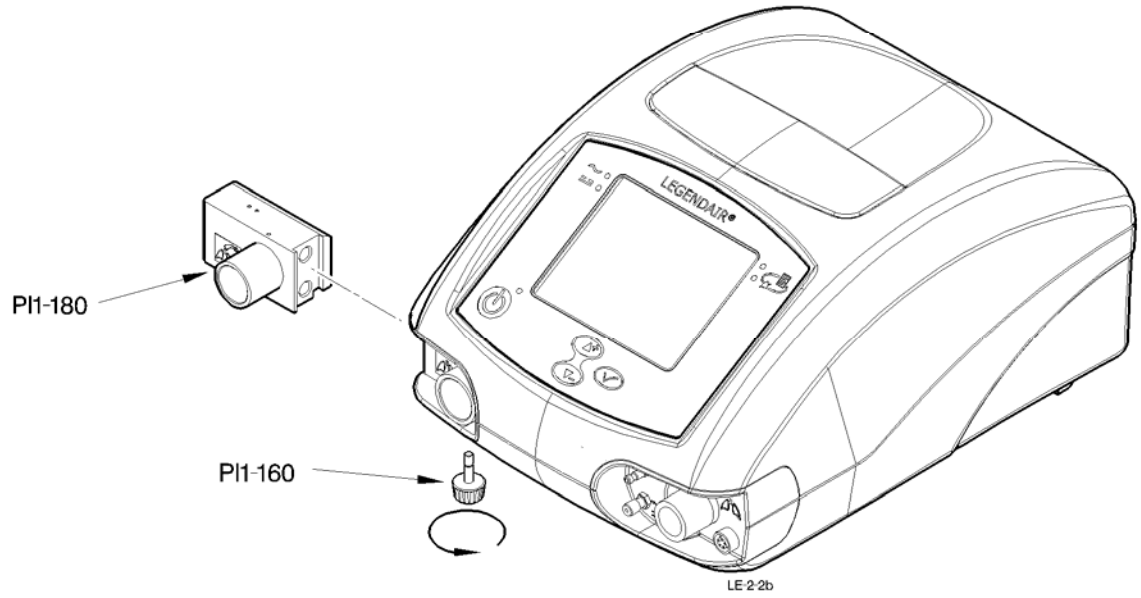
>> ***Do not dampen filters, or dry them before reuse if they are wet.***

### *2.1.2 Patient circuit*

Patient circuits distributed for this device are for single use only and therefore cannot be disinfected.

If a re-usable patient circuit is used, follow the recommendations of the manufacturer for cleaning and disinfecting.

***Figure CP 2.2 - Cleaning the expiration unit (double branch option)***



## 2.2 CLEANING THE EXPIRATION UNIT (DOUBLE BRANCH OPTION (FIG CP 2.2)

**Product reference:** ..... Bactericide and germicide solution: ANIOSPRAY 29 or 41, or AMPHOSPRAY 41.

**Number of operator:** ..... 1.

**Special or specific tools:** ..... None.

**Preliminary operations:** ..... Make sure that the device is switched off. Clean the device before starting the work (Chap II.2.1).

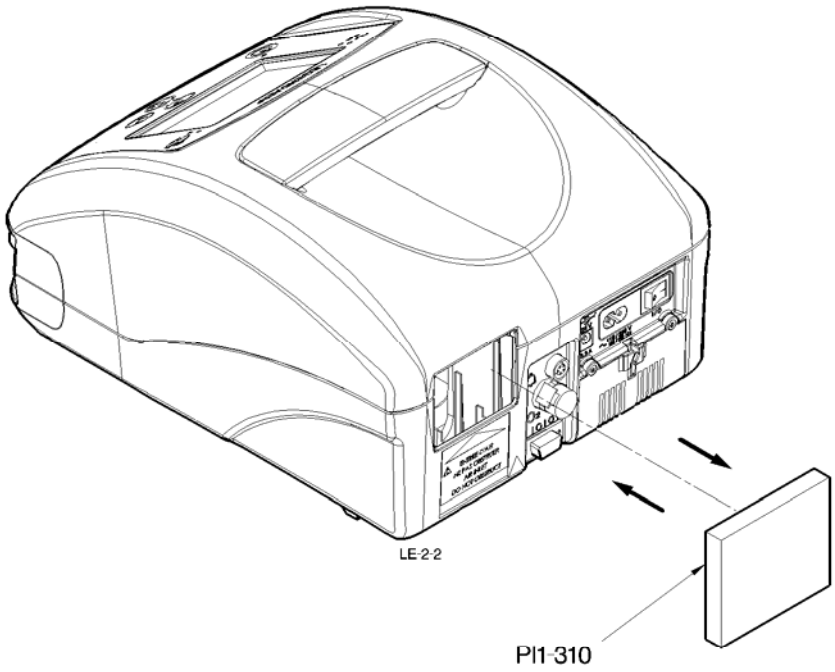
### *2.2.1 Removal / Cleaning / Installation*

- Put the device in a clean and open environment.
- Unscrew the knurled knob (Pl1-160) to release the Expiration Block (Pl1-180).
- Extract the Expiration Block laterally.
- Clean the block in soapy water and then rinse with clean water.
- Use products such as ANIOSPRAY 29 for external cleaning.

>> ***Use a light air blast to clear away any remaining water.***

- Replace the Expiration Block (Pl1-180) and screw the knurled knob (Pl1-160) in place.
- Calibrate the sensors (Chap V-3-1).
- Perform the final inspection procedures before putting back into service (Chap IV).

***Figure CP 2.3 – Air inlet filter***



# 3. MAINTENANCE INSPECTION V2 (OR 1500 H)

## 3.1 REMOVAL / INSTALLATION OF THE AIR INLET FILTER (FIG CP 2.3)

**Spare part reference:** ..... 3804800 : Air inlet filter.

**Number of operator:** ..... 1.

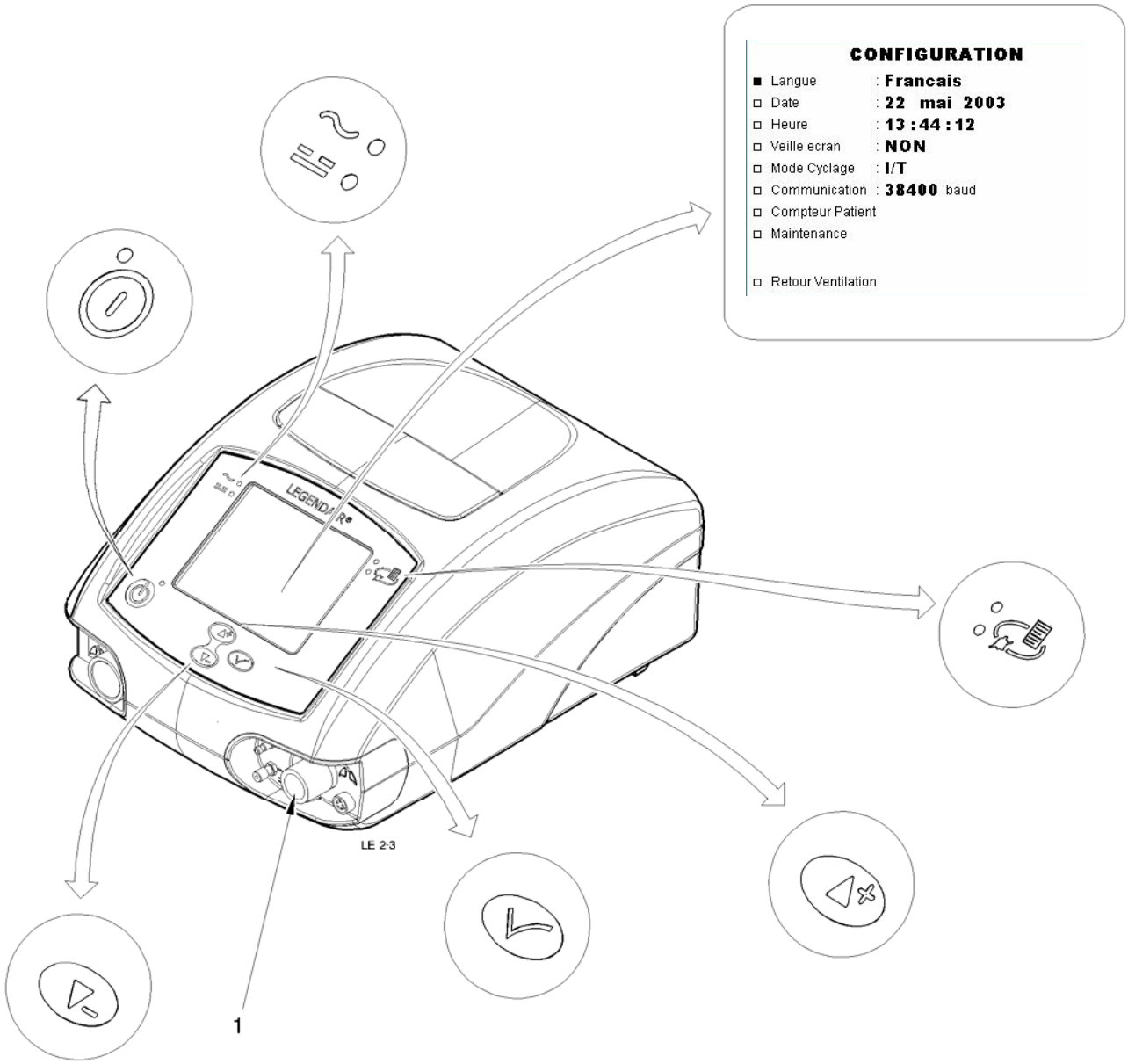
**Special or specific tools:** ..... None.

**Preliminary operations:** ..... Clean the device before starting the work (Chap II.2.1).

### *3.1.1 Removal / Installation*

- Put the device in a clean and open environment.
- Extract the old filter and replace it.

***Figure CP 2.4a – Checking User/Machine interfaces, voltages and sensors***



# 4. MAINTENANCE INSPECTION V3 (OR 3000 H)

## 4.1 CHECKING USER-MACHINE INTERFACES, VOLTAGES AND SENSORS (FIG CP 2.4A/ 2.4B/ 2.4C)

**Spare part reference:** ..... .

**Number of operator:** ..... 1.

**Special or specific tools:** ..... 0 to 200 L/min flow meter (measurement device), Ø22 patient tube without accessory, a T-union, a leak aperture (Ø 5mm), $O_2$ cell COMEPA mi com 102-1.

**Preliminary operations:** ..... Clean the device before starting the work (Chap II.2.1). Check that there are no appearance defects on the device. Check that the wiring is present and that the casing is properly fixed.

### *4.1.1 Checking user/machine interfaces*

4.1.1.1 Check the keypad, the display and the clock/date

- Switch the device on in Setup mode by simultaneously pressing the On/Off switch found at the rear of the machine (position "1" or ON") and keeping the key pressed until the menu appears on the screen.

- Check the device date.

>> *If necessary: Place the cursor on the DATE line (with ▲+ or ▼-) Validate your intention to modify the parameters by the ✓ key: the parameter flashes and the left cursor becomes ⁝. Modify its value using the ▲+ or ▼- keys. Validate the new value with the ✓ key.*

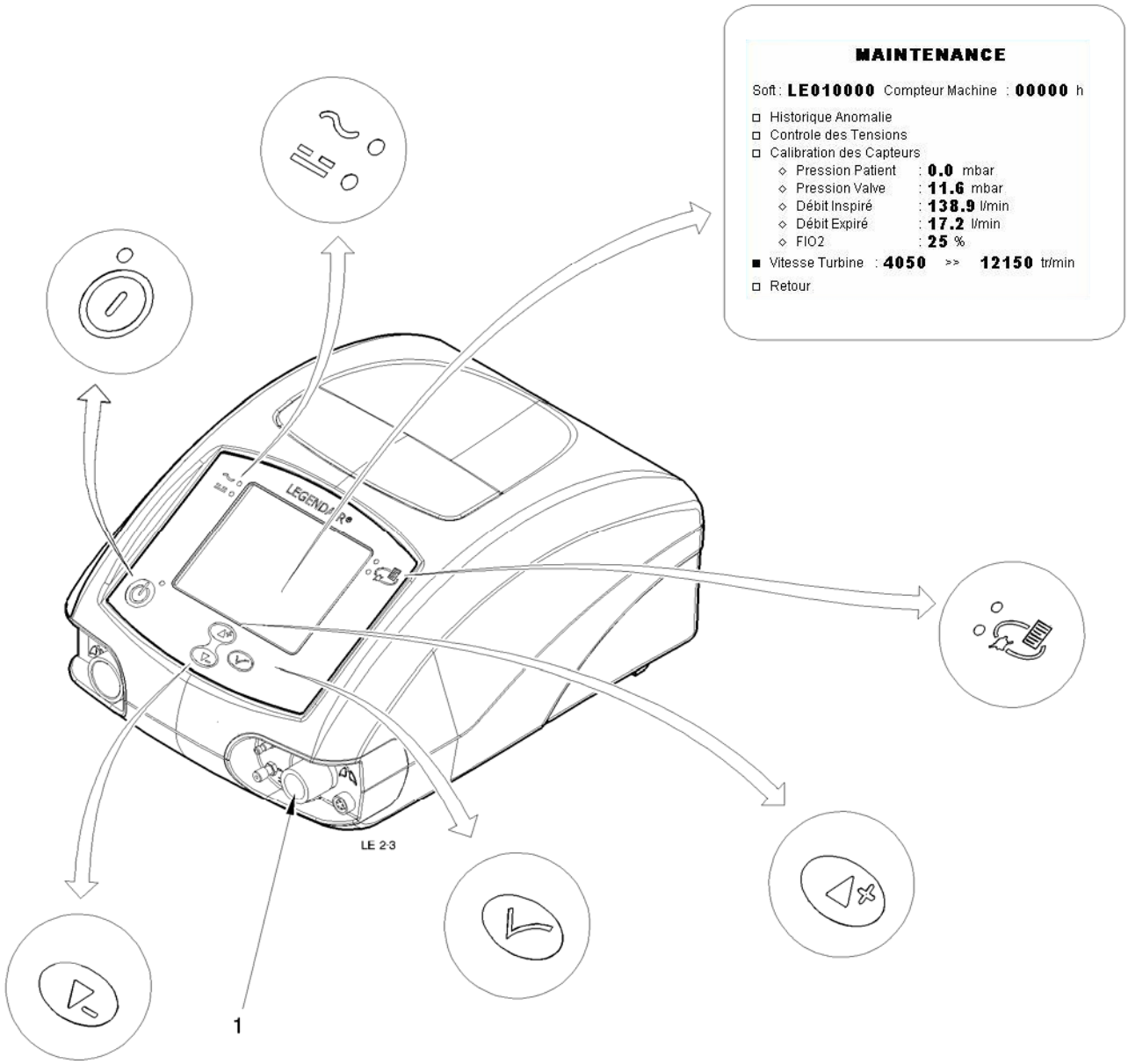
- Check the time on the device.

>> *If necessary: Place the cursor on the TIME line (with ▲+ or ▼-). Validate your intention to modify the parameters by the ✓ key: the parameter flashes and the left cursor becomes ⁝. Modify its value using the ▲+ or ▼- keys. Validate the new value with the ✓ key.*

**Note :** When a parameter comprises several adjustment fields (ex. Date, Time) go from field to field using the same key. If a parameter modification is not validated after 7 seconds, the ventilator restores the previous value. The parameters of the setup menu remain memorised until they are partially or completely modified anew.

>> ***Place the cursor on the Maintenance line to continue the checks.***

***Figure CP 2.4b – Checking User/Machine interfaces, voltages and sensors***



### *4.1.2 Checking the sensors*

4.1.2.1 Check calibration of the pressure sensor

- Check correct operation of the sensor by connecting the patient outlet (1) of the ***LEGENDAIR***® to the measurement devise.

>> ***Use two T- unions on the machine outlet, one for coupling the endcap of the pressure meter and the second where the measurement device and a leak aperture (Ø 5mm) have been placed.***

>> ***The device must be in MAINTENANCE mode (see above).***

- Place the cursor on line "Patient Pressure" press key : a 0 must appear opposite line "Patient Pressure".

- Again press key : a value of 40 should appear opposite line "Patient Pressure".

- Check the difference between values read on the measurement devise and on the device (Patient Pressure) is less than +/- 1 mbar.

>> *If it is not, do a calibration (Chap V.3.1).*

- Switch the device Off.

4.1.2.2 Check calibration of the valve pressure sensor

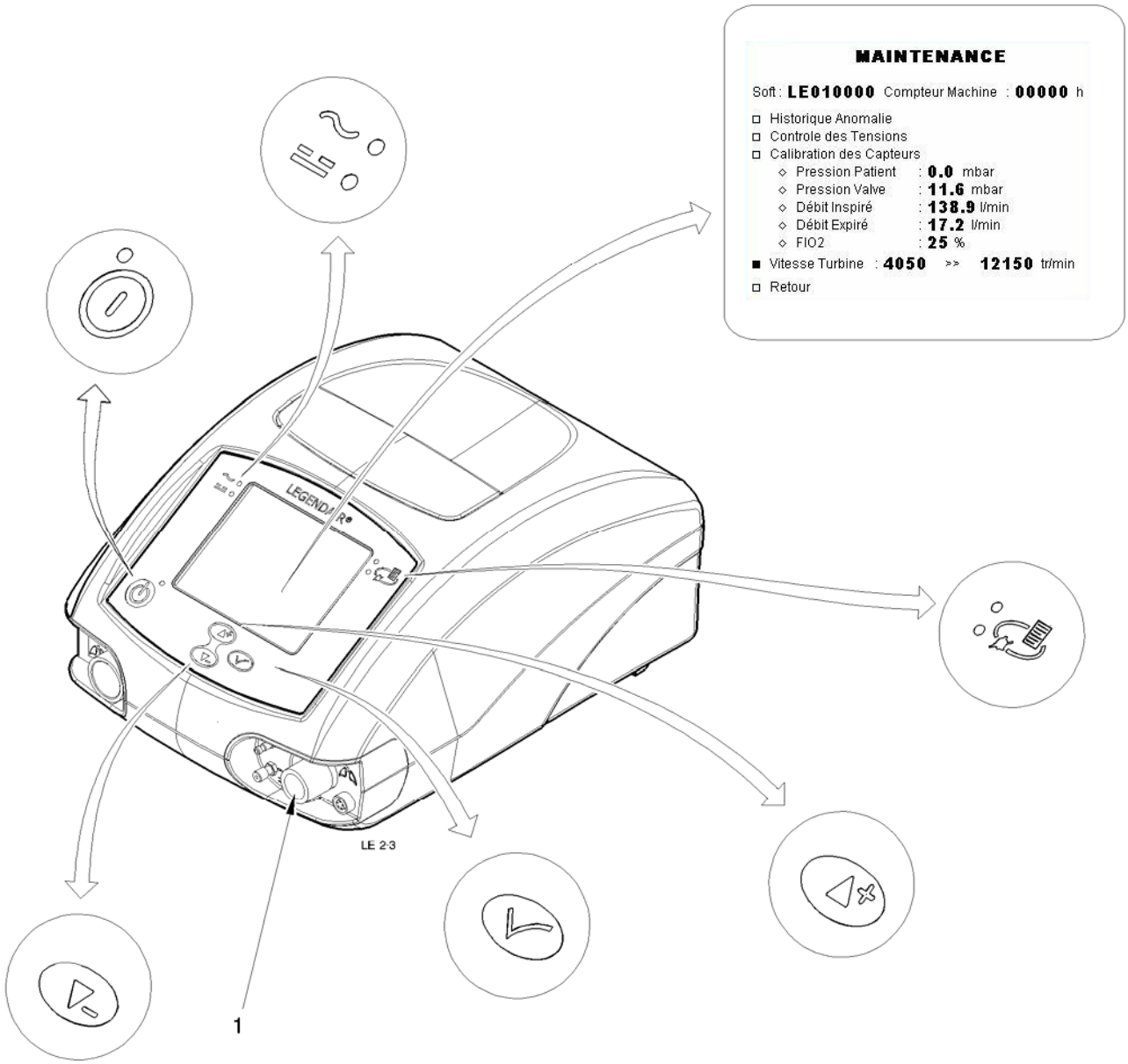
>> ***The device must be in MAINTENANCE mode (see above).***

- Place the cursor on the line "Valve Pressure" and check that the display indicates 0.0 to 0,2 mbar.

>> *If it is not, do a calibration (Chap V.3.1).*

- Switch the device Off.

***Figure CP 2.4b – Checking User/Machine interfaces, voltages and sensors***



4.1.2.3 Checking the inspired flow sensor

- Connect the ventilation patient outlet (1) to the measurement devise using a tube of sufficient length and section.

>> ***No part should be placed in series between the ventilator and the measurement devise during the operation so as not to introduce either leak or loss of supplementary charge.***

>> ***The device must be in MAINTENANCE mode (see above).***

- Place the cursor on the line "Inspired flow" and then press the key: a 0 must appear opposite the Inspired flow.

- Repeat the operation for calibration point : the flows indicated by the measurement devise must be 5±0,5l/min; 12±0,6l/min; 37±1,9l/min; 60±3l/min; 90±4,5l/min; 135±6,7l/min and 160±8l/min

>> *If it is not, do a calibration (Chap V.3.1).*

- Switch the device Off.

4.1.2.4 Checking the expired flow sensor

>> ***This is necessary if the device is equipped with an Expiration Block.***

- Connect the patient ventilator to the female cone of patient return with the help of a Ø 22 mm tube.

>> ***The device must be in MAINTENANCE mode (see above).***

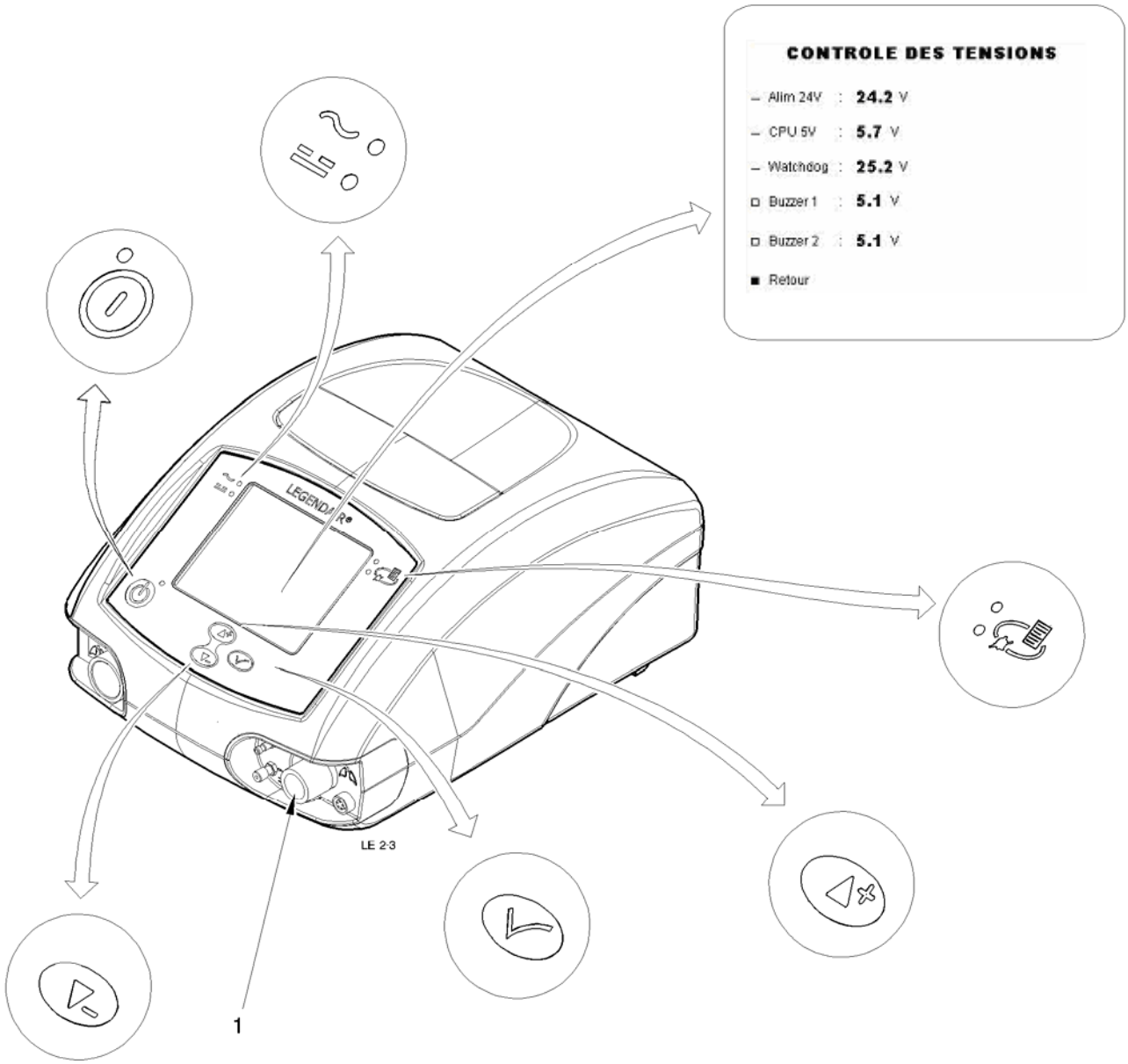
- Put the cursor on line "Inspired flow", then press key .

- The interval between the values appearing on the line "Expired flow" and the line "Inspired flow" must be less than +/- 0,5 l/min.

>> *If it is not, do a calibration (Chap V.3.1).*

- Switch the device Off.

*Figure CP 2.4c – Checking User/Machine interfaces, voltages and sensors*



4.1.2.5 Checking the $FiO_2$ sensor

- Connect a cell O2 COMEPA Mi Com 102-1 to the device.

>> ***The device must be in MAINTENANCE mode (see above).***

- Place the cursor on the line "FiO2" and check that the display reads 21% +/- 1 %.

>> *If it is not, do a calibration (Chap V.3.1).*

- Switch the device Off.

### *4.1.3 Check the internal voltages*

- Switch the device on in setup mode by simultaneously pressing the On/Off switch found at the rear of the machine (position "1" or ON") and keeping the key pressed until the menu appears on the screen. Place the cursor on " **MAINTENANCE"** and then validate, select the line "Voltage control" and verify:

- With the mains connected, display the general power supply voltage **"ALIM 24,5±1,5V".**

>> *If it is not, check the supply circuit (Chap V.3.1).*

- With the external source of DC connected up, display the general power supply voltage **"ALIM 24,5±1,5V".**

>> *If it is not, check the supply circuit (Chap V.3.1).*

- With internal battery branching, display the voltage of the battery **"28,5±1V"** (function of the charge status) and the appearance of the battery symbol.

>> *If it is not, check the supply circuit (Chap V.3.1).*

- Place the cursor on the line "return", then validate. On "turbine speed" press **,** let the device run for 5 min and replace the cursor in order to see the battery voltage and check that it equals 27,5V ± 0,5V.

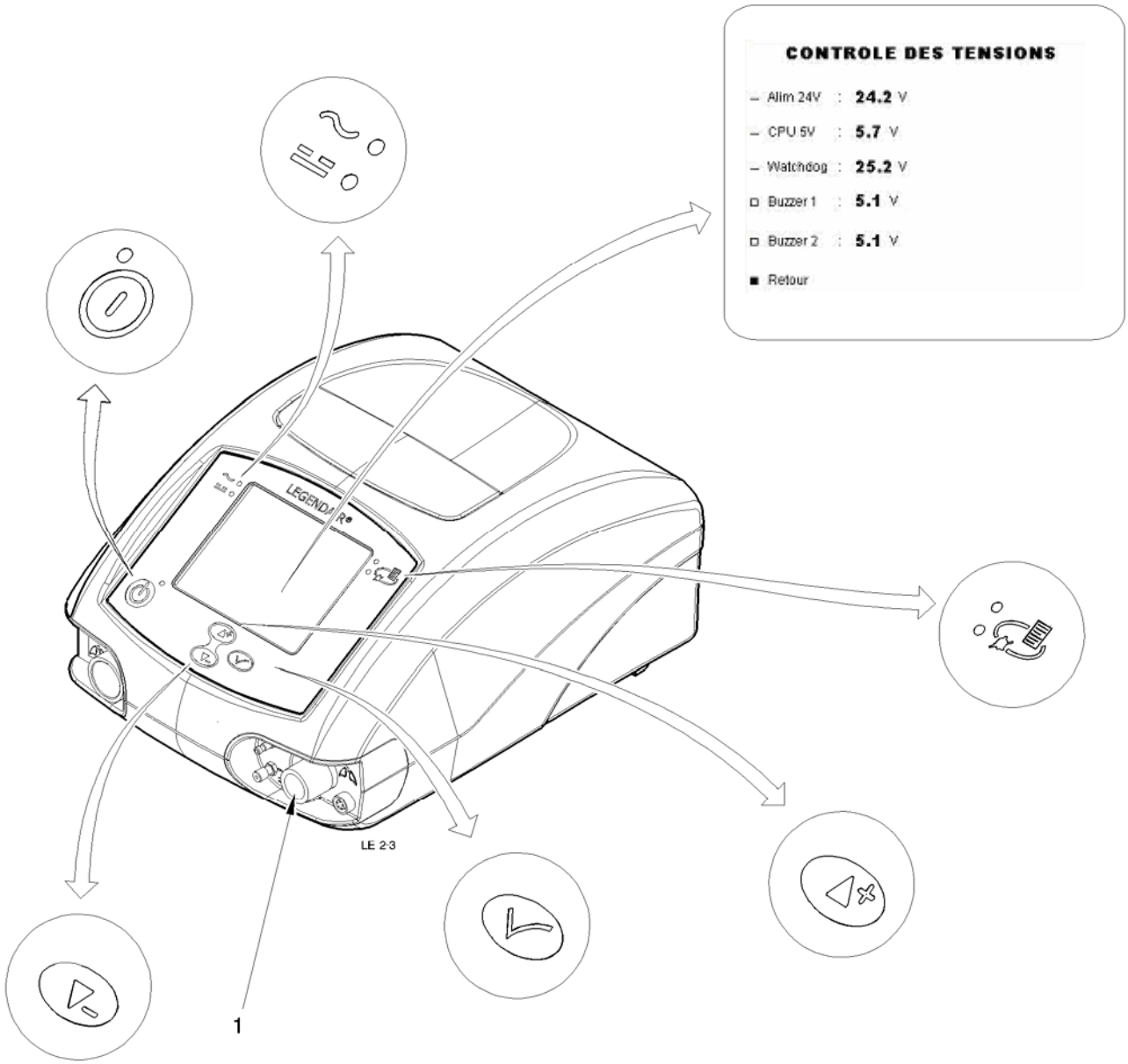
- Reconnect the mains power supply and check that after 5 min of charging the battery voltage level has returned to its initial value.

>> *If it is not, check the supply circuit (Chap V.3.1).*

- Reconnect the device to the mains power supply.

- Display the CPU logic circuit voltage **"CPU 5V±0,5V".**

*Figure CP 2.4c – Checking User/Machine interfaces, voltages and sensors*



>> *If it is not, check the supply circuit (Chap V.3.1).*

- Display the Watchdog voltage **"25±2V".**

>> *If it is not, check the supply circuit (Chap V.3.1).*

- Switch the device Off.

### *4.1.4 Check the buzzers*

- Switch the device on in setup mode by simultaneously pressing the On/Off switch found at the rear of the machine (position "1" or ON") and keeping the key pressed until the menu appears on the screen. Place the cursor on "**MAINTENANCE**" and validate.

- Place the cursor on the line of each one of the buzzers and press the Validation key .

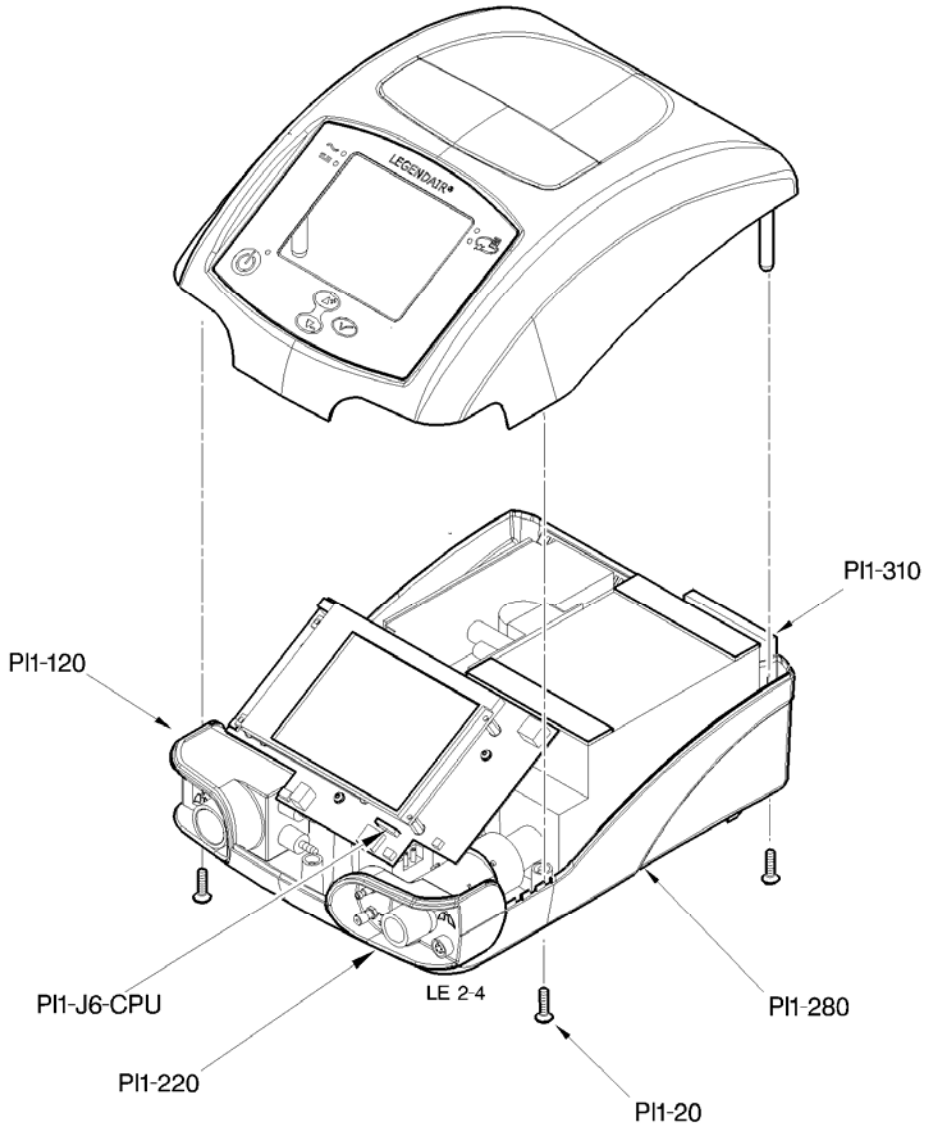
>> *you can activate the buzzers separately and ensure that they operate correctly and are correctly supplied.*

- The voltages must lie within the following range:

  - Tension BUZZER 1 5 V ± 1V
  - Tension BUZZER 2 5 V ± 1V

- Switch the device Off.

***Figure CP 2.5 – Opening and closing the device.***



## 4.2 OPENING AND CLOSING THE DEVICE – RELATED PROCEDURE (FIG CP 2.5)

**Spare part reference:** ..... None.

**Number of operator:** ..... 1.

**Special or specific tools:** ..... None.

**Preliminary operations:** ..... Make sure that the device is switched off. Clean the device before starting the work (Chap II.2.1).

### *4.2.1 Opening and closing*

| GUARANTEE SEAL |
|---|
| A tamper proof label under the equipment states that the equipment is under "Guarantee" for the first year.<br>The contractual guarantee provided by AIROX will be null and void if this label is damaged in any way by opening the equipment during the first twelve months (unless AIROX gave written permission before the equipment was opened). |

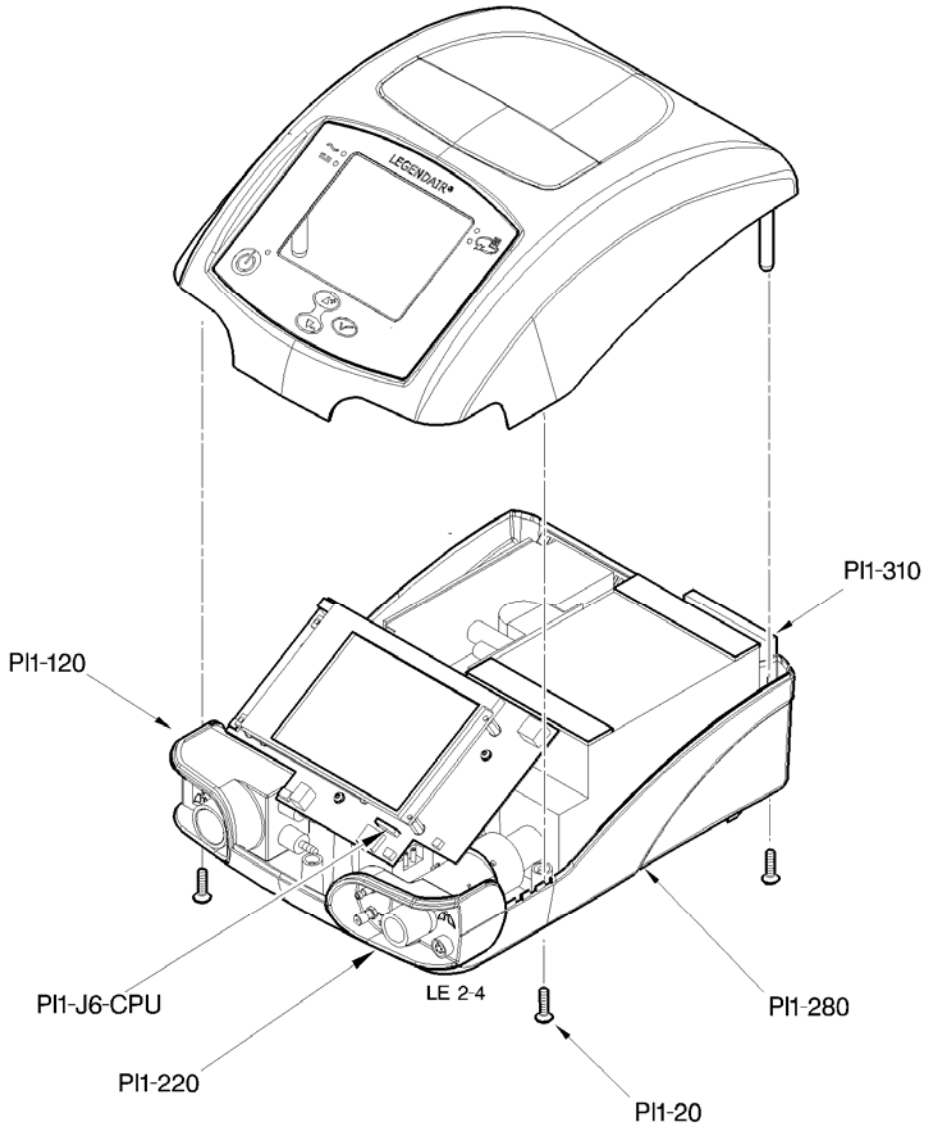
| IMPORTANT |
|---|
| Device sensitive to electrostatic phenomena<br>  **SDES Sensitive to electrostatic discharge**<br>No work necessary on parts of the device can be done until methods for protection against electrostatic discharges have been applied. |

- Put the device in a clean and open environment.

- Remove the five attachment screws (Pl1.20) on the bottom casing side (Pl1-280) and open the device.

>> ***Carefully separate the two casings to avoid tearing off the keypad connections.***

***Figure CP 2.5 – Opening and closing the device.***



- Disconnect the keypad from the CPU board (Pl1-120) (Connection Pl1.**J6**.CPU to be unbolted by traction on the upper part of the connection) in order to disassociate the two casings.

- Do the work that made it necessary to open the device. … …

>> ***Before closing the device, check the position of the wires and tubes. Also check that each element is attached.***

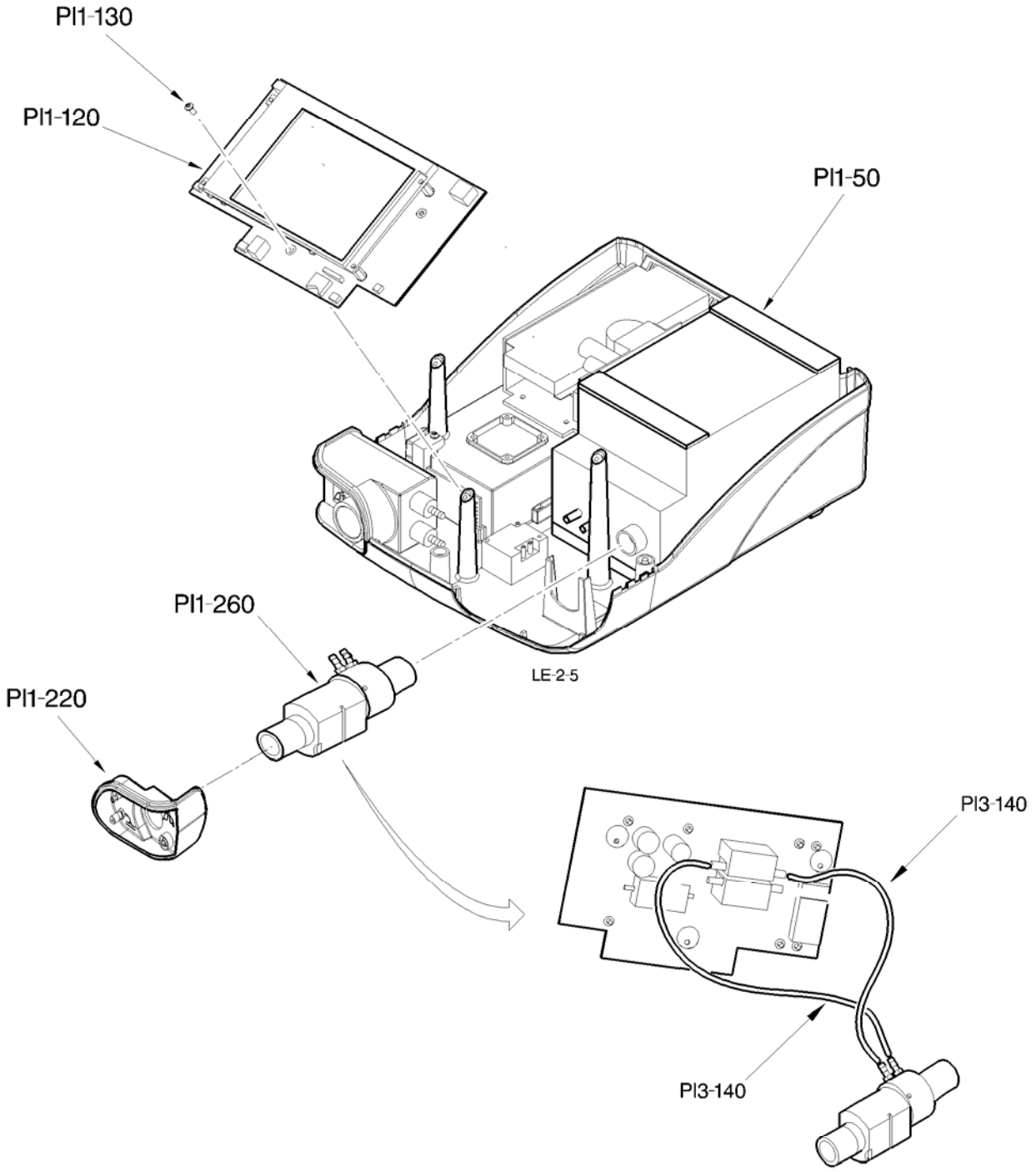
- Connect the keypad to the CPU board (Pl1-120) (Connection Pl1.**J6**.CPU to be bolted).

- Put the two casings of the device into place and fix them using the five screws (Pl1.20) on the bottom casing side (Torque 10 Nm max).

>> ***Pay attention to the positioning of the cone supports (Pl1-200 & Pl1-220) prior to final fixation. Do not forget to replace the air inlet filter (Pl1-310) following assembly of casings.***

- Perform the final inspection procedures before putting back into service (Chap IV).

***Figure CP 2.6 – Flow laminator cleaning***



## 4.3 FLOW LAMINATOR CLEANING PROCEDURE (FIG CP 2.6)

**Product reference:** ..... Bactericide and germicide solution: ANIOSPRAY 29 or 41, or AMPHOSPRAY 41.

**Number of operator:** ..... 1.

**Special or specific tools:** ..... None.

**Preliminary operations:** ..... Make sure that the device is switched off. Clean the device before starting the work (Chap II.2.1).

### *4.3.1 Removal / Cleaning / Installation*

- Put the device in a clean and open environment.

- Open the device (see procedure CHAP II.4.2).

- Unscrew the three attachment screws (Pl1-130) for the CPU board (Pl1-120).

>> *Do not disconnect the wiring of the CPU board.*

- Tilt the CPU board forward in order to disconnect its two tubes (Pl3-140).

>> ***Take care not to tear off the sensors during removal.***

- Raise the turbine casing (Pl1-50) slightly in order to extract the flow laminator assembly (Pl1-260).

- Clean these elements in soapy water and then rinse with clean water.

- Use products such as ANIOSPRAY 29 to clean these parts, except for the tubes that should be used once only.

>> ***Use a light air blast on the different connections to clear away any remaining water.***

- Reinstall all removed elements. It is essential to check the direction of assembly of the tubes (see detail fig. LE2-5).

- Position the support cone (Pl1-220) ad check that the flow laminator in firmly secured (Pl1-260).

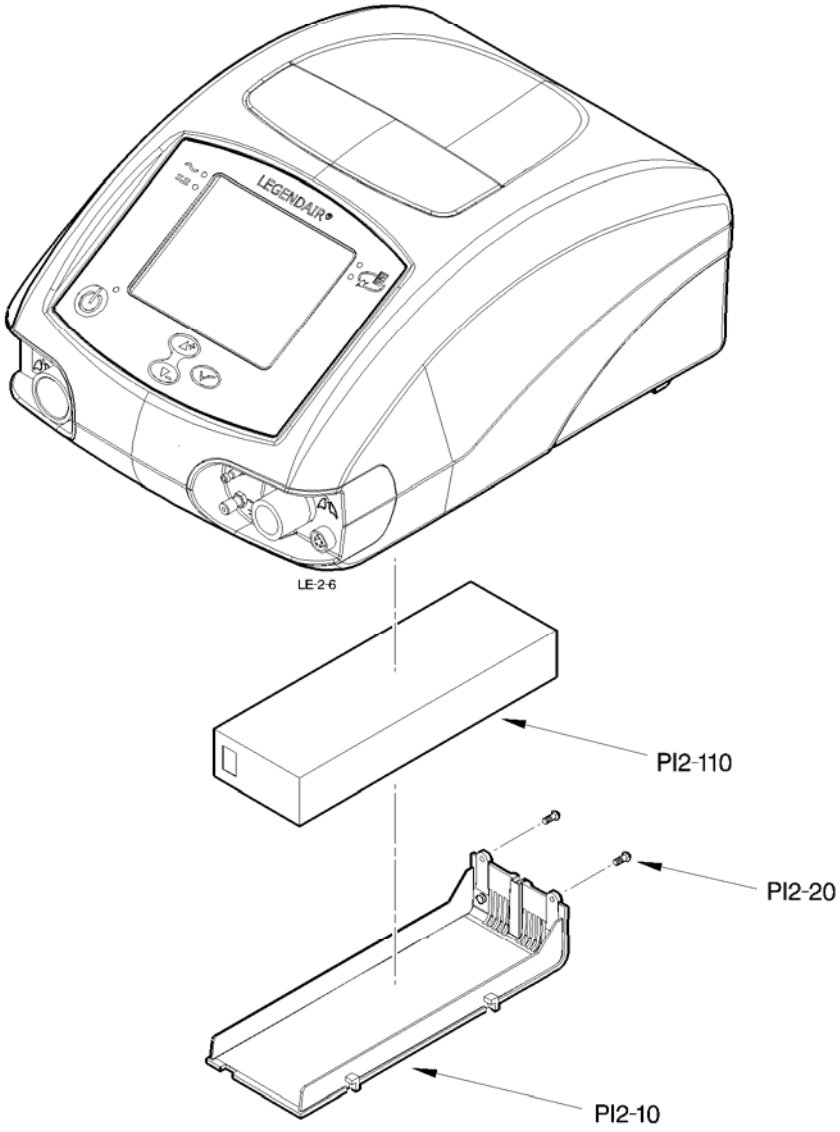
- Reinstall the CPU board (Pl1-120) with the three attachment screws (Pl1-130) (Torque 5 Nm max.)

- Close the device again, taking all necessary precautions (see procedure ).

- Calibrate the sensors (Chap V-3-1).

- Perform the final inspection procedures before putting back into service (Chap IV).

***Figure CP 2.7 – Batteries***



# 5. MAINTENANCE INSPECTION V4 (OR 4500 H)

## 5.1 REMOVAL / INSTALLATION OF THE BATTERY (FIG CP 2.7)

**Spare part reference:** ..... 2963500 : Battery.

**Number of operator:** ..... 1.

**Special or specific tools:** ..... None.

**Preliminary operations:** ..... Make sure that the device is switched off. Clean the device before starting the work (Chap II.2.1).

### *5.1.1 Removal / Installation*

- Put the device in a clean and open environment.

>> *Caution, the device must be switched off: electrostatic risk.*

- Remove the both attachment screws (Pl2.20) from the battery cover (Pl2-10).

- Clear the cover away from its holding rails by pulling it towards the rear of the device.

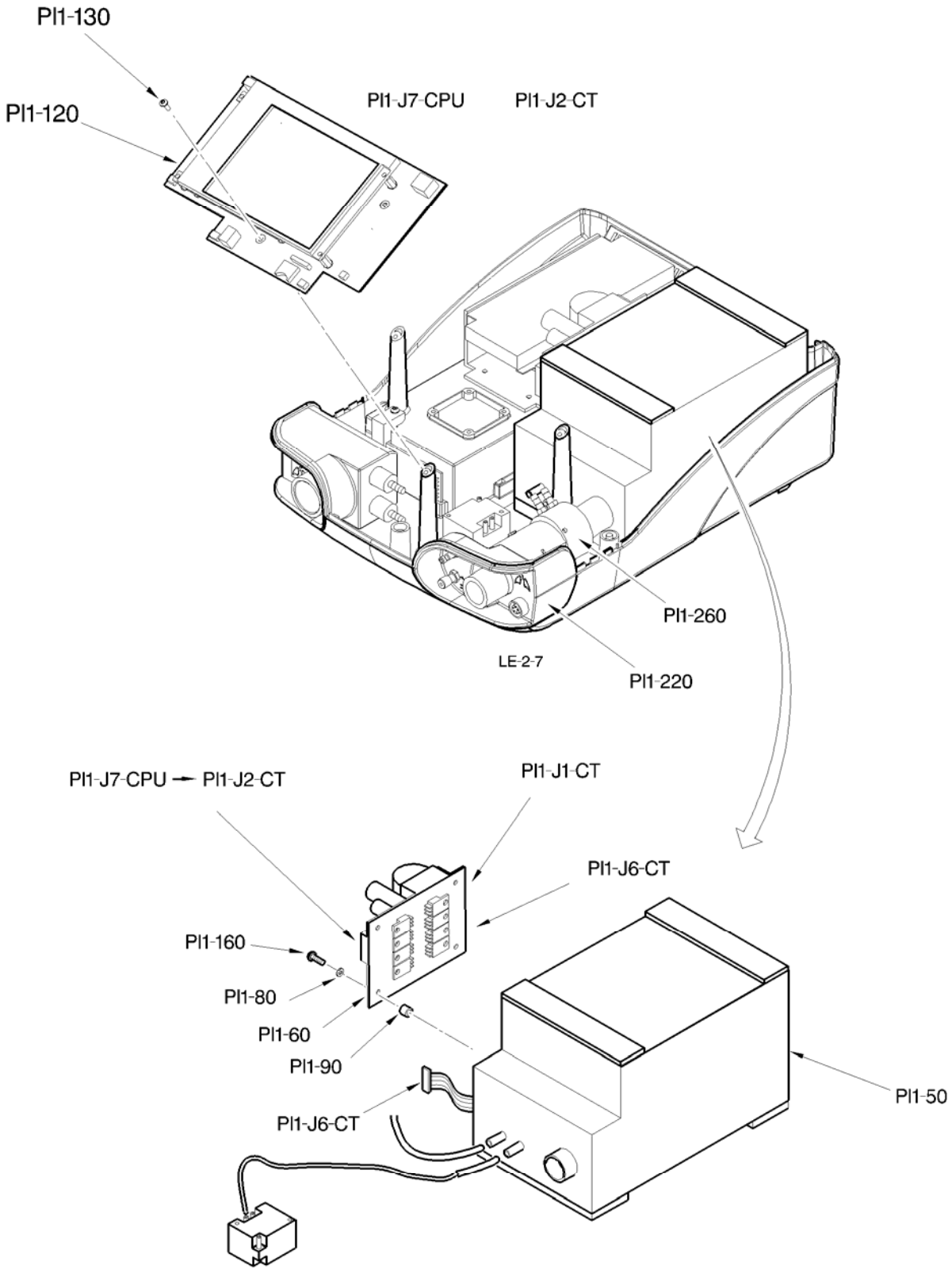
- Remove the battery (Pl2.110) and replace it **(be careful of the direction in which it is inserted)**.

>> ***Faulty batteries should be disposed of according to environmental legislation in your country.***

- Check the position of all the elements and secure the cover by means of screw Pl2.20 (Cp 10 Nm maxi).

- Perform the final inspection procedures before putting back into service (Chap IV).

***Figure CP 2 8 – Turbine box with wiring***



# 6. MAINTENANCE INSPECTION V5 (OR 15000 H)

## 6.1 REMOVAL / INSTALLATION OF THE TURBINE BOX WITH WIRING (FIG CP 2.8)

**Spare part reference:** ..... 3806499 *:* Turbine box with wiring (*Legendair*).

**Number of operator:** ..... 1.

**Special or specific tools:** ..... None.

**Preliminary operations:** ..... Make sure that the device is switched off. Clean the device before starting the work (Chap II.2.1).

### *6.1.1 Removal / Installation*

- Put the device in a clean and open environment.

- Open the device (see procedure CHAP II.4.2).

- Unscrew the three attachment screws (Pl1-130) for the CPU board (Pl1-120).

- Disconnect all connectors Pl1.**J1**.CT, Pl1.**J2**.CT of the turbine control board.

>> ***Caution, the device must be switched off: electrostatic risk.***

- Extract the turbine casing (Pl1.50) from its housing and uncouple the flow rate measurement block (Pl1-260), the $O_2$ supply pipes and the piezo solenoid valve.

- Place the turbine box (Pl1-50) in a clean and open environment, then remove the four screws, the washers and the spacers (Pl1.70, Pl1.80, Pl1.90) in order to extract the turbine control board (Pl1.60).

- Disconnect the box from the turbine control board (Pl1.**J6**.CT).

- Replace the turbine box (Pl1-50).

- Replace the turbine control board (Pl1.60) on the box with four screws, the washers and the spacers (Pl1.70, Pl1.80, Pl1.90) (Torque 5 Nm max.).

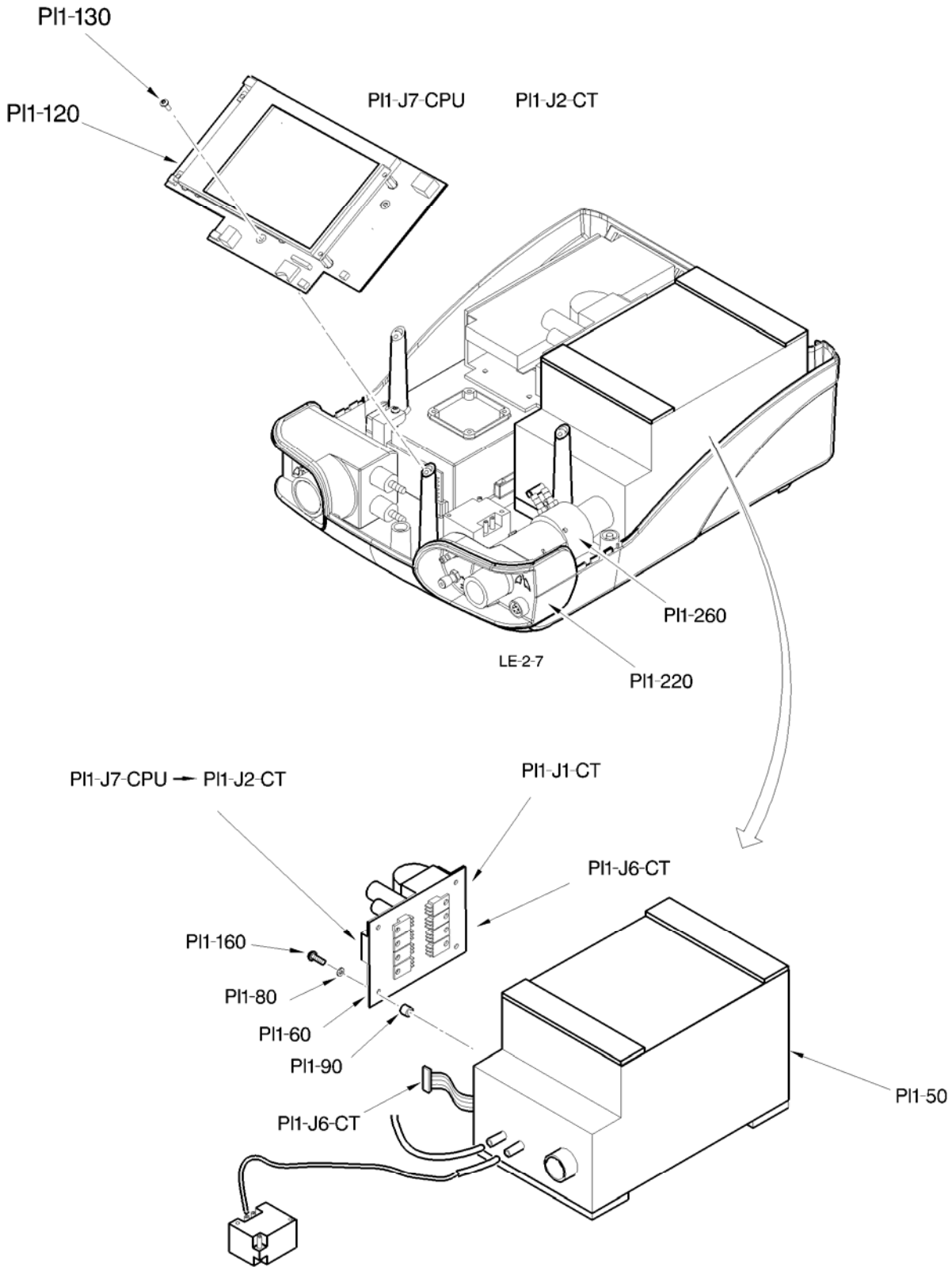
- Connect the box to the turbine control board (Pl1.**J6**.CT).

- Couple the flow rate measurement block (Pl1-260) to the casing and connect the two O2 supply pipes and the piezo solenoid valve, then reinsert the assembly into its housing. Put the cone support (Pl1-50) also into place. Put the cone support (Pl1-220) also into place.

- Reconnect all connectors Pl1.**J1**.CT, Pl1.**J2**.CT to the turbine control board.

>> ***Pl1.J1.CT with the power supply wiring, Pl1.J2.CT connected to Pl1.J7.CPU.***

***Figure CP 2.8 – Turbine box with wiring***



- Check the support of all the elements.

- Reinstall the CPU board (Pl1-120) with the three attachment screws (Pl1-130) (Torque 5 Nm max.)

- Close the device again, taking all necessary precautions (see procedure ).

- Perform the final inspection procedures before putting back into service (Chap IV).

**Parc d’activités Pau-Pyrénées**
**ZI de l’échangeur**
**64008 PAU CEDEX (FRANCE)**

Tel. 33.(0)5.59.14.02.02- Fax : (33.(0)5.59.14.02.00 - E-mail : contact@airox.fr

# Maintenance File
# *LEGENDAIR* ®

# Chapter 3 – Troubleshooting Assistance (Rev. B)

# CONTENTS

# 1. INTRODUCTION

## 1.1 OVERVIEW

This chapter describes all incident solving procedures used for alarms and anomalies (troubleshooting assistance).

**These procedures are applicable when simple corrective actions carried out when an alarm appears are unsuccessful (see User's Manual) and the user decides that the result is due to a hardware failure.**

## 1.2 DEFINITION OF PROCEDURES

Each alarm is described in the form of steps to be validated to define the cause of the recorded anomaly.

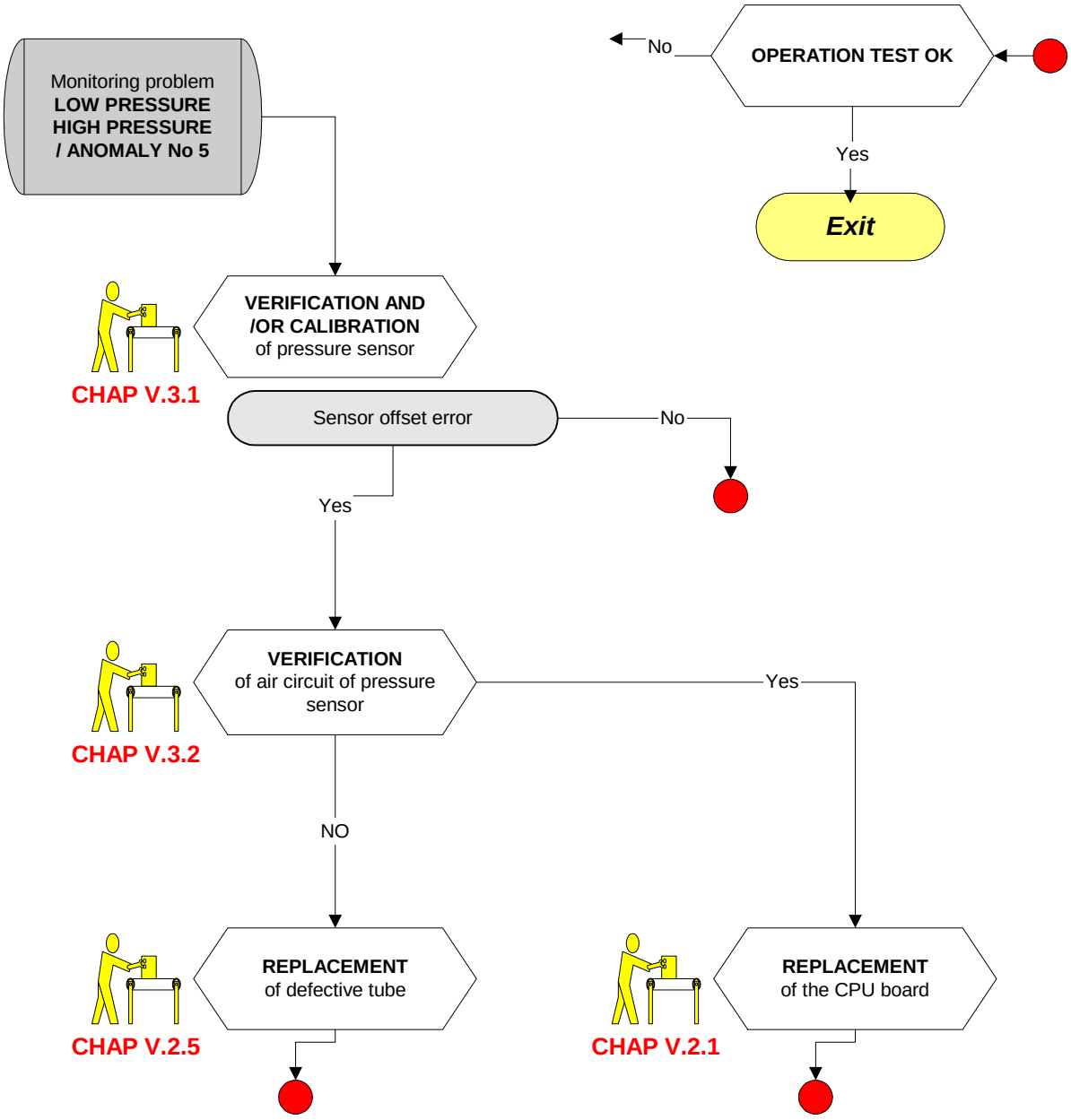
These steps are systematically sent to maintenance operations (maintenance symbol). These activities must be performed with methodology to achieve the best result of the investigation.

Note: "**NC**" means that the procedure has not been described (simple operation to be done).

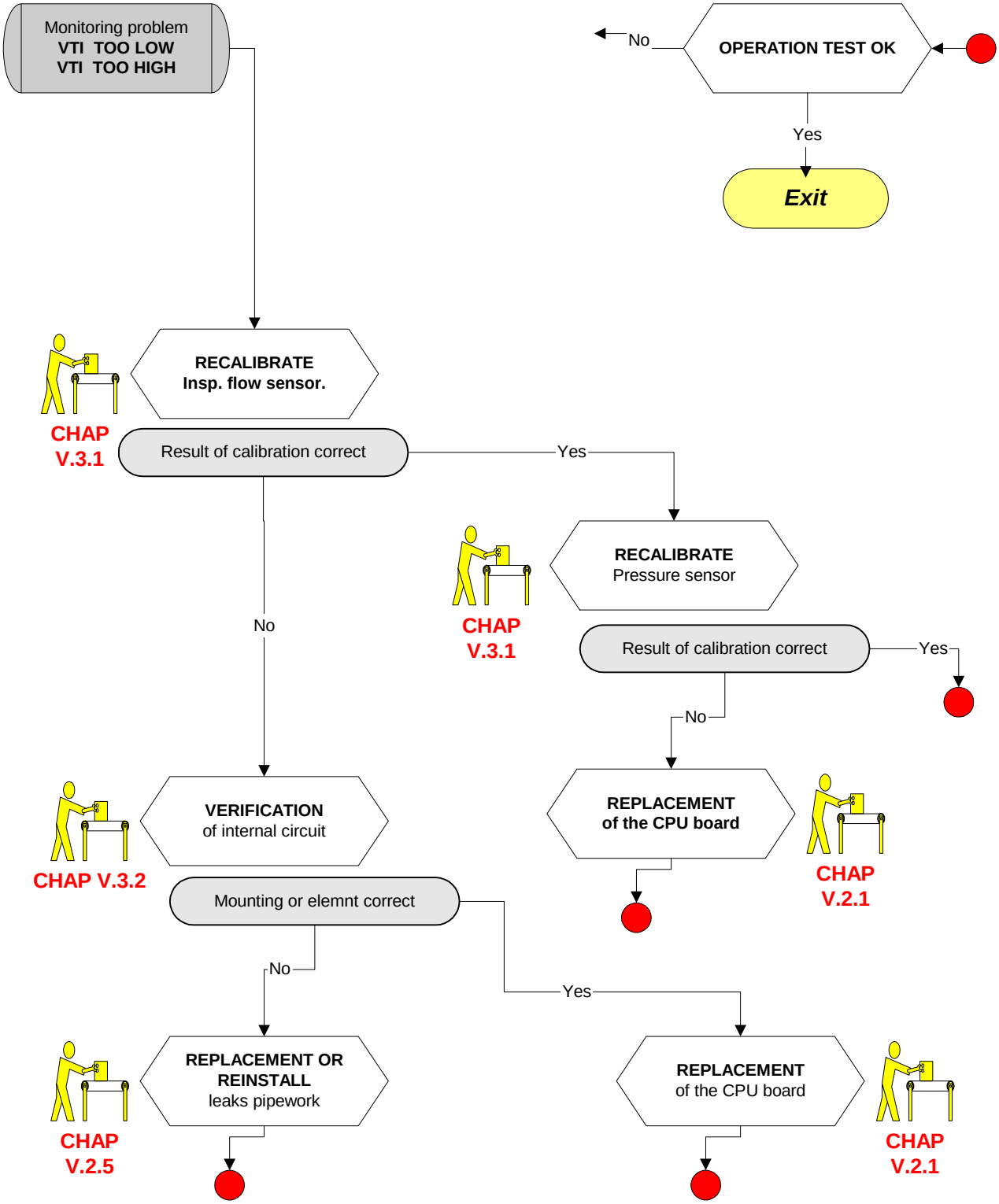
The only exit condition is that a general operating test step should be carried out (Chap IV).

# 2. INCIDENT SOLVING PROCEDURES

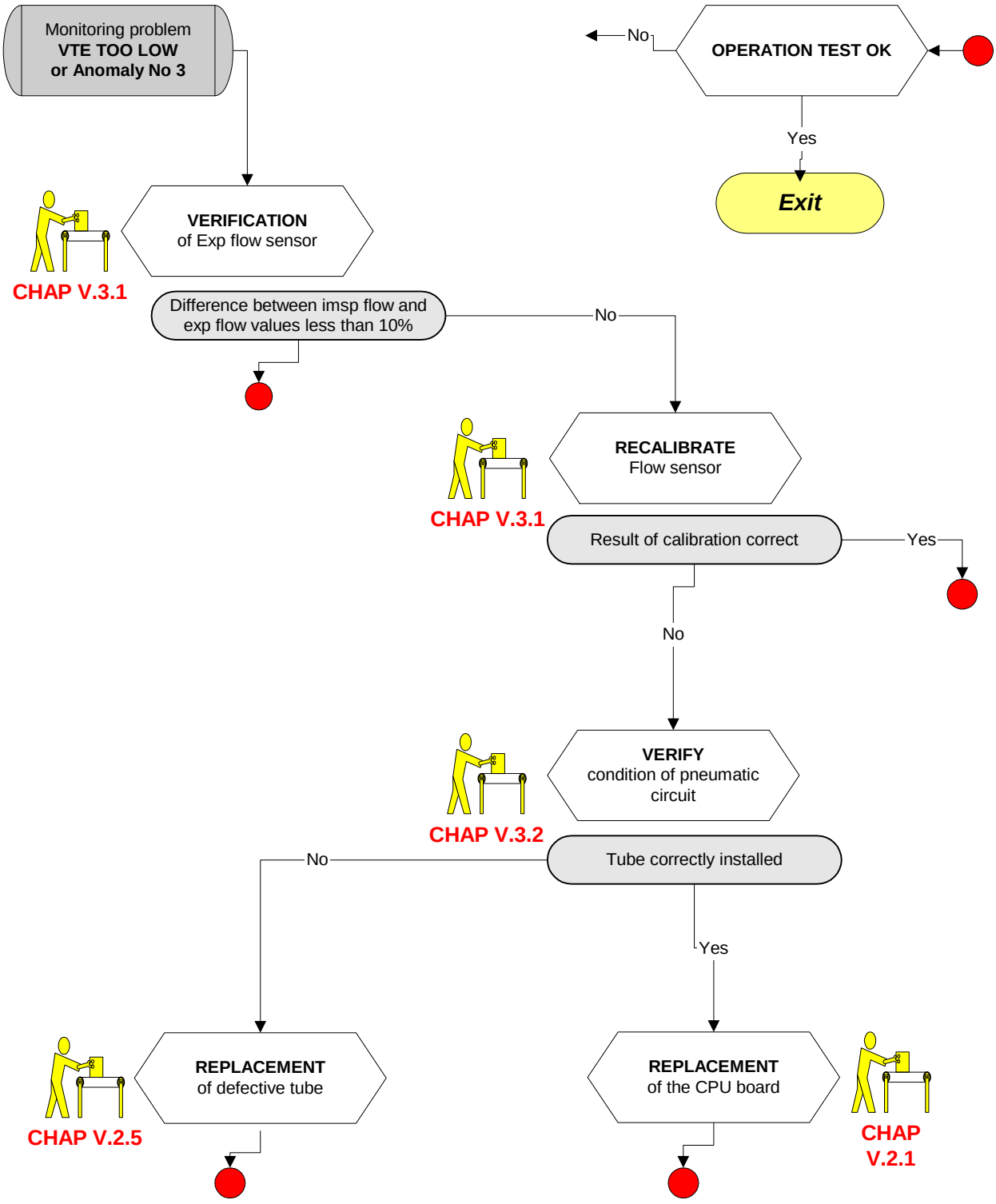
## 2.1 ALARM: HIGH PRESSURE / LOW PRESSURE / ANOMALY N°5



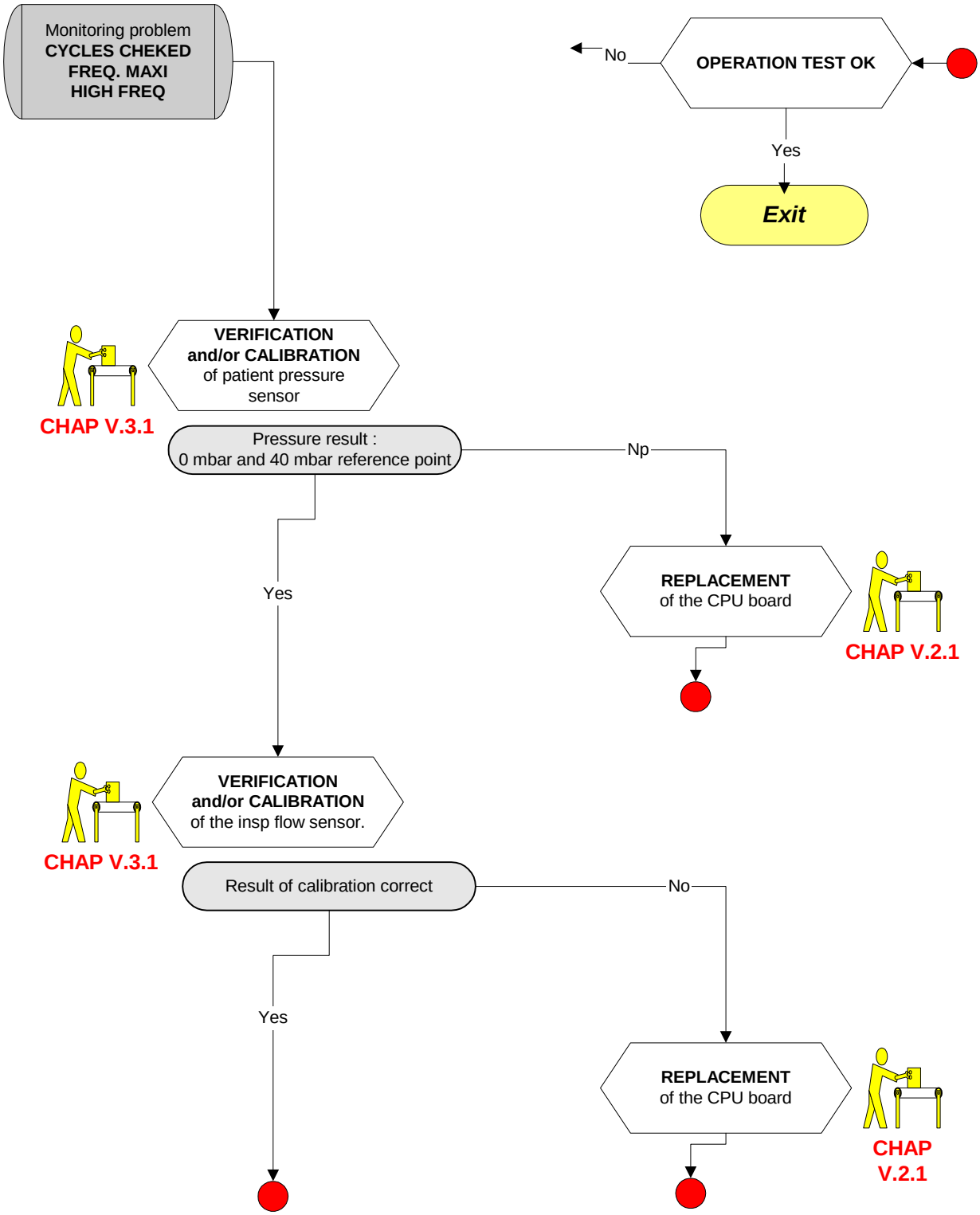
## 2.2 ALARM: VTI TOO LOW < VTI TOO HIGH



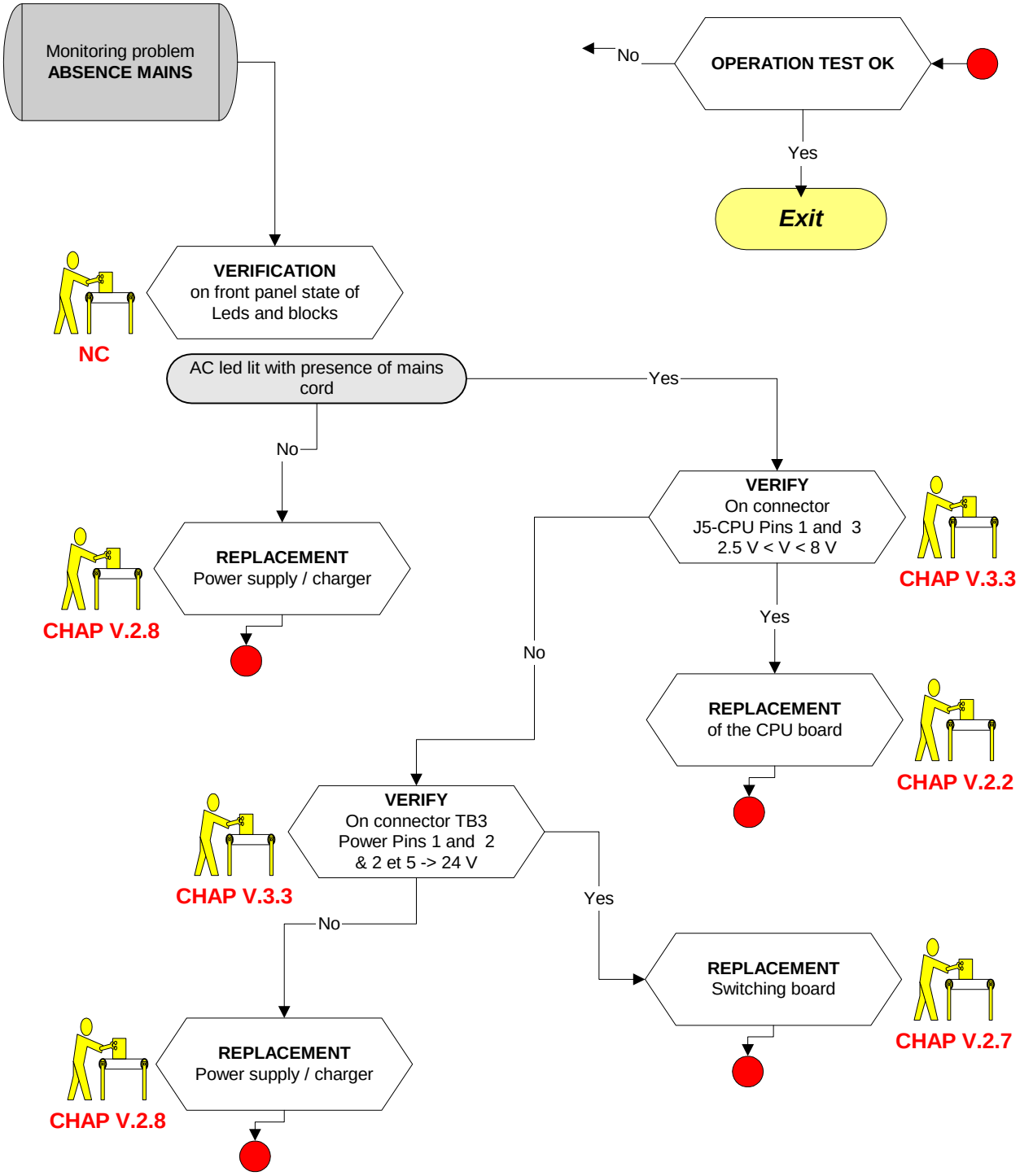
## 2.3 ALARM: VTE TOO LOW OR ANOMALY NO 3



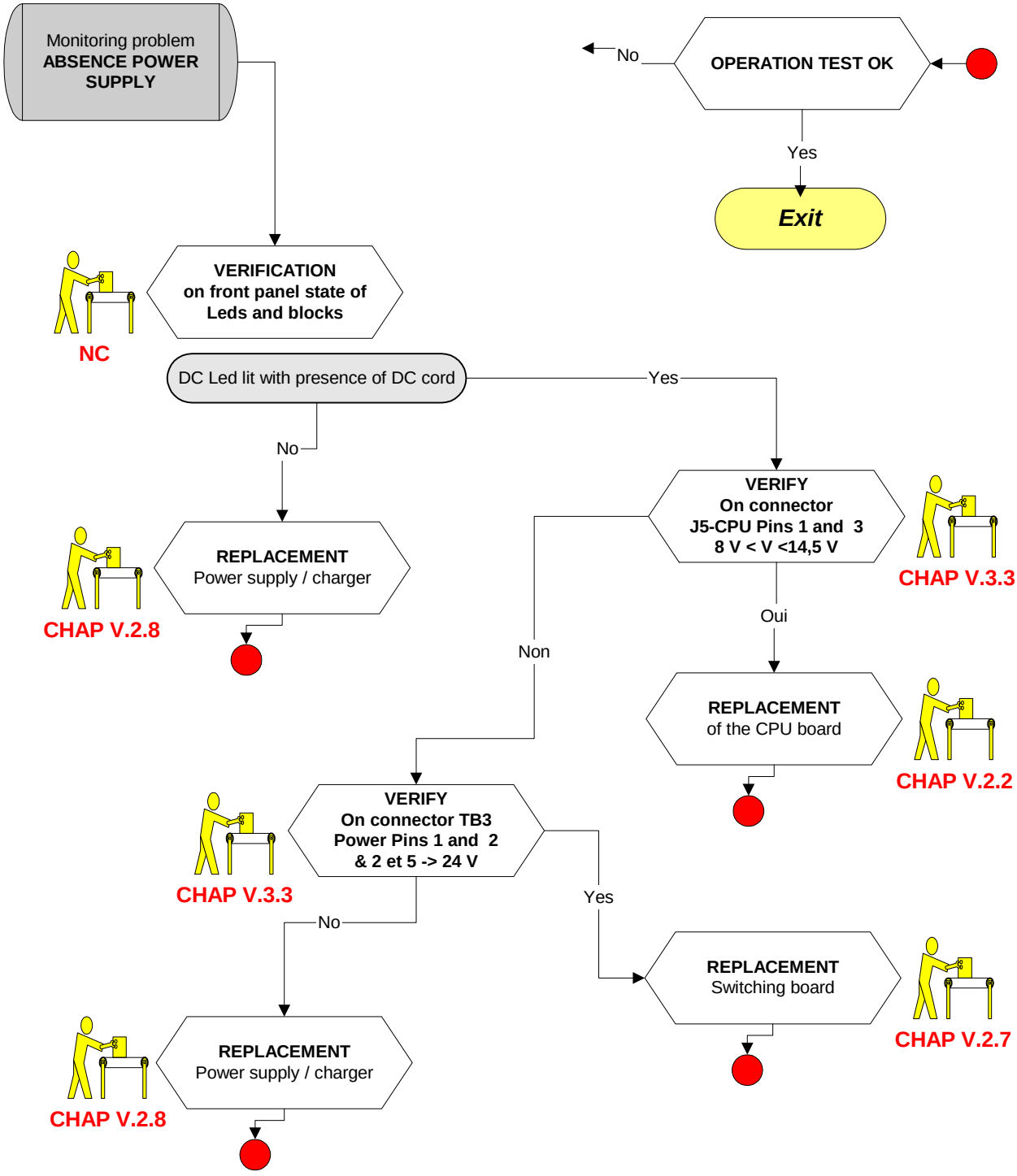
## 2.4 ALARM: CYCLES CHEKED / FREQ MAXI / HIGH FREQ



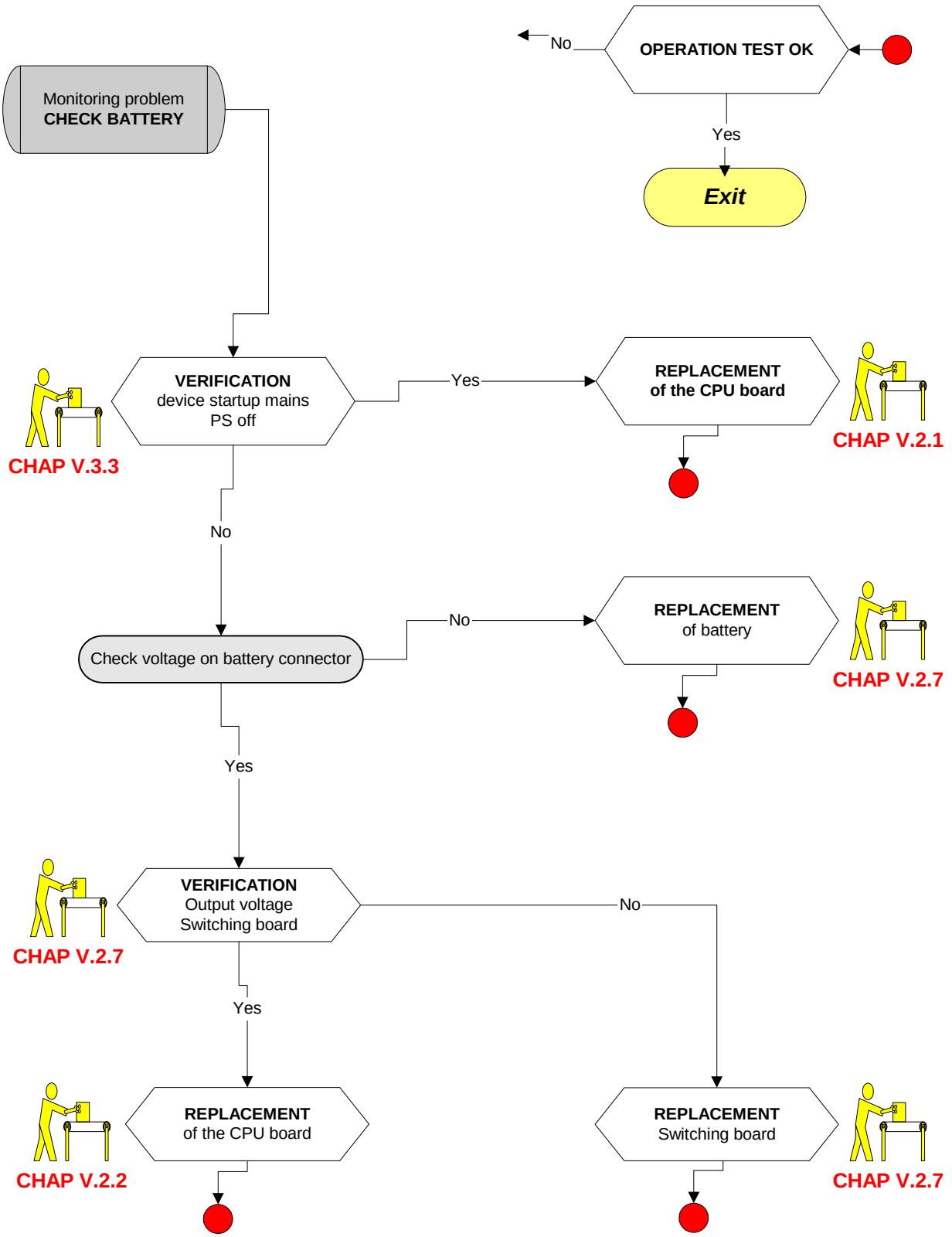
## 2.5 ALARM: ABSENCE MAINS



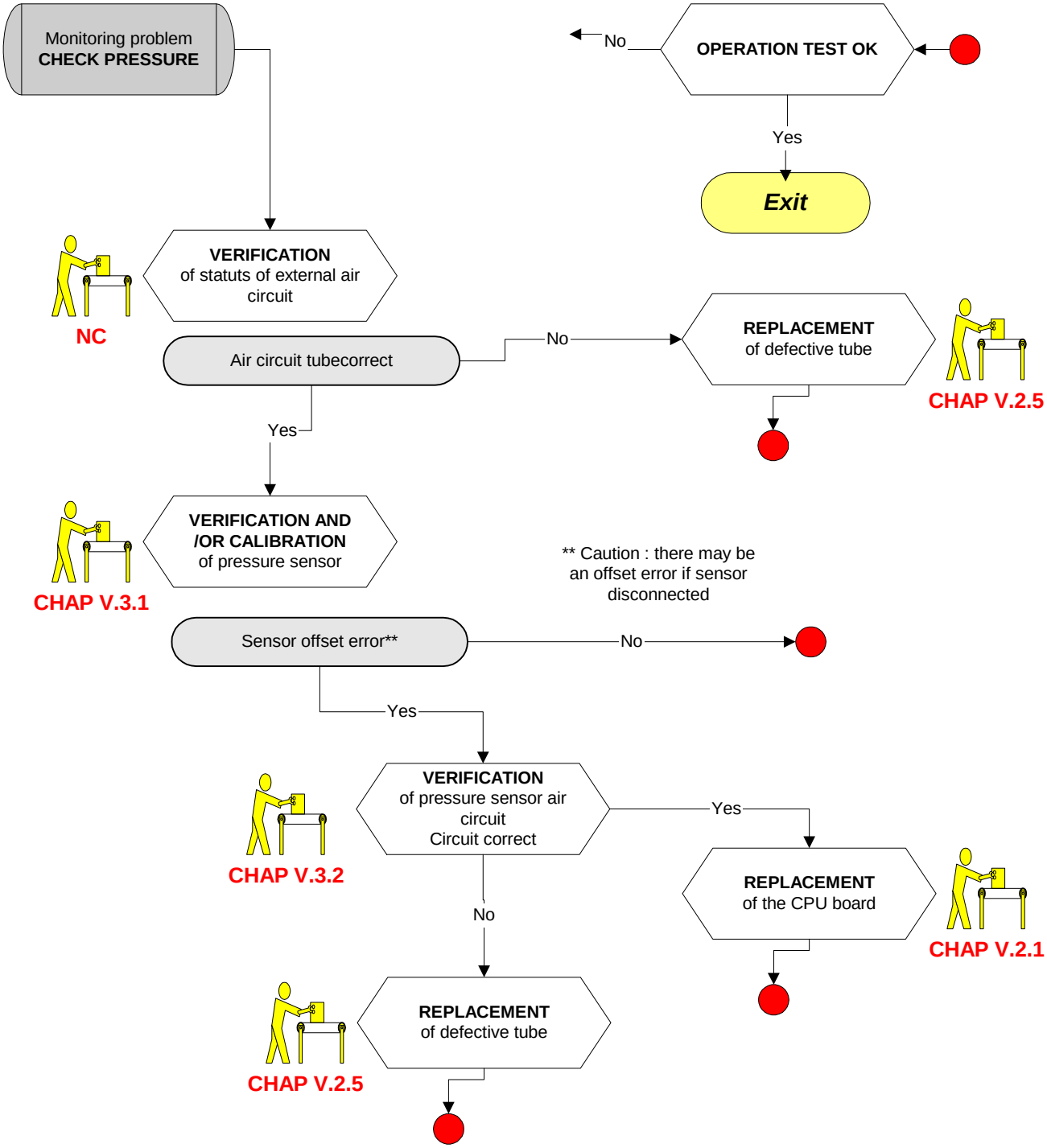
## 2.6 ALARM: ABSENCE POWER SUPPLY



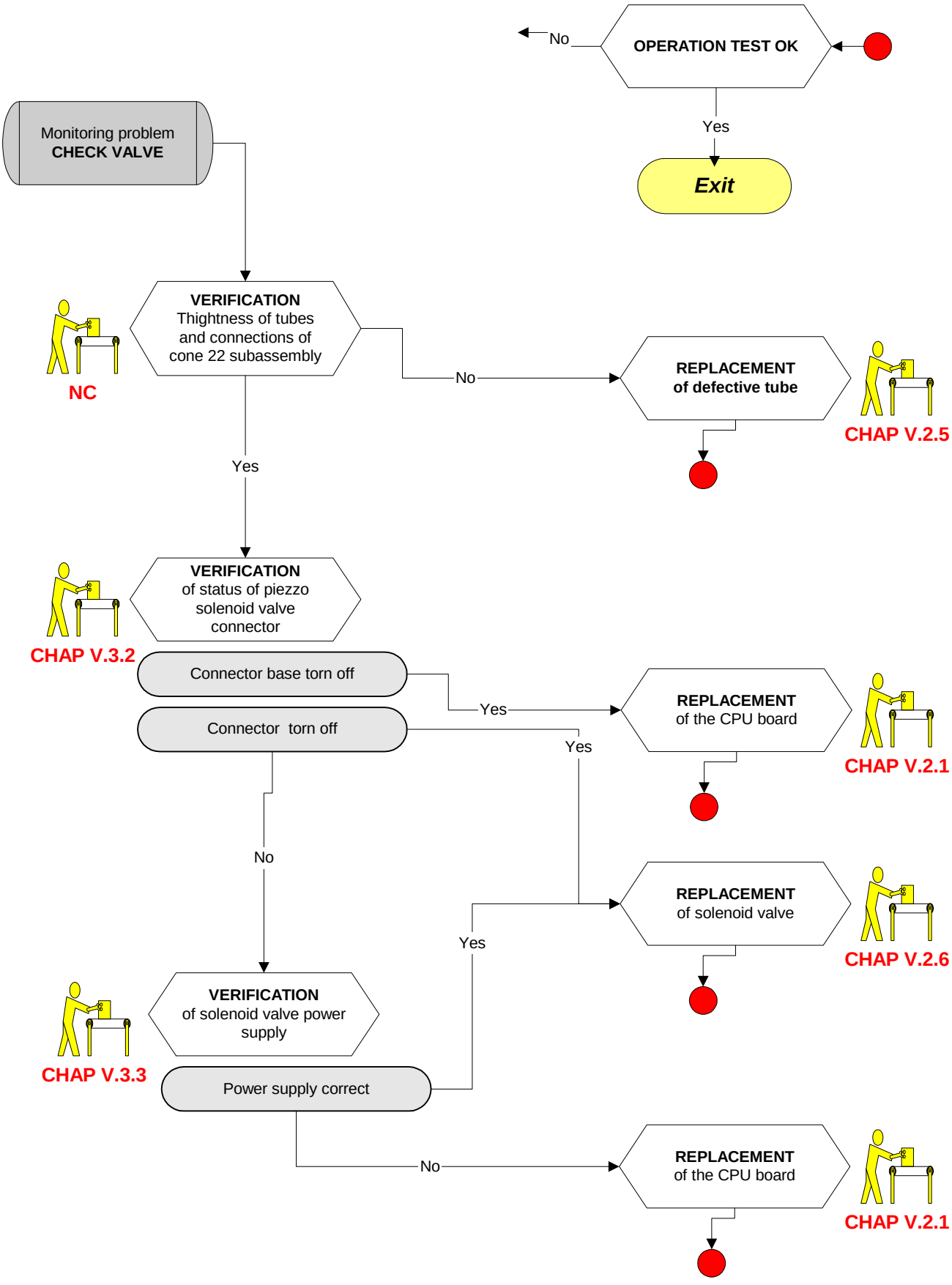
## 2.7 ALARM: CHECK BATTERY



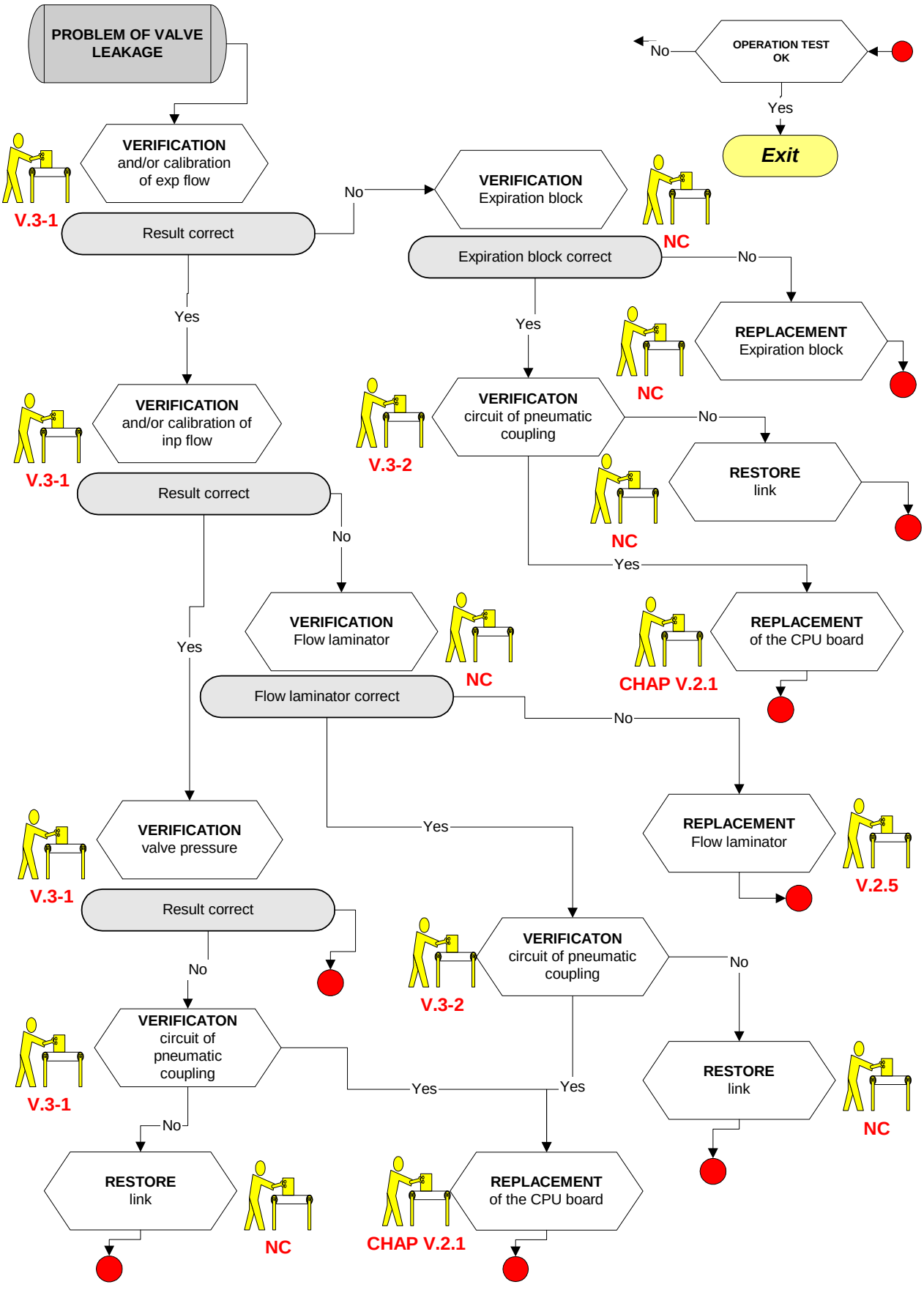
## 2.8 ALARM: CHECK PRESSURE



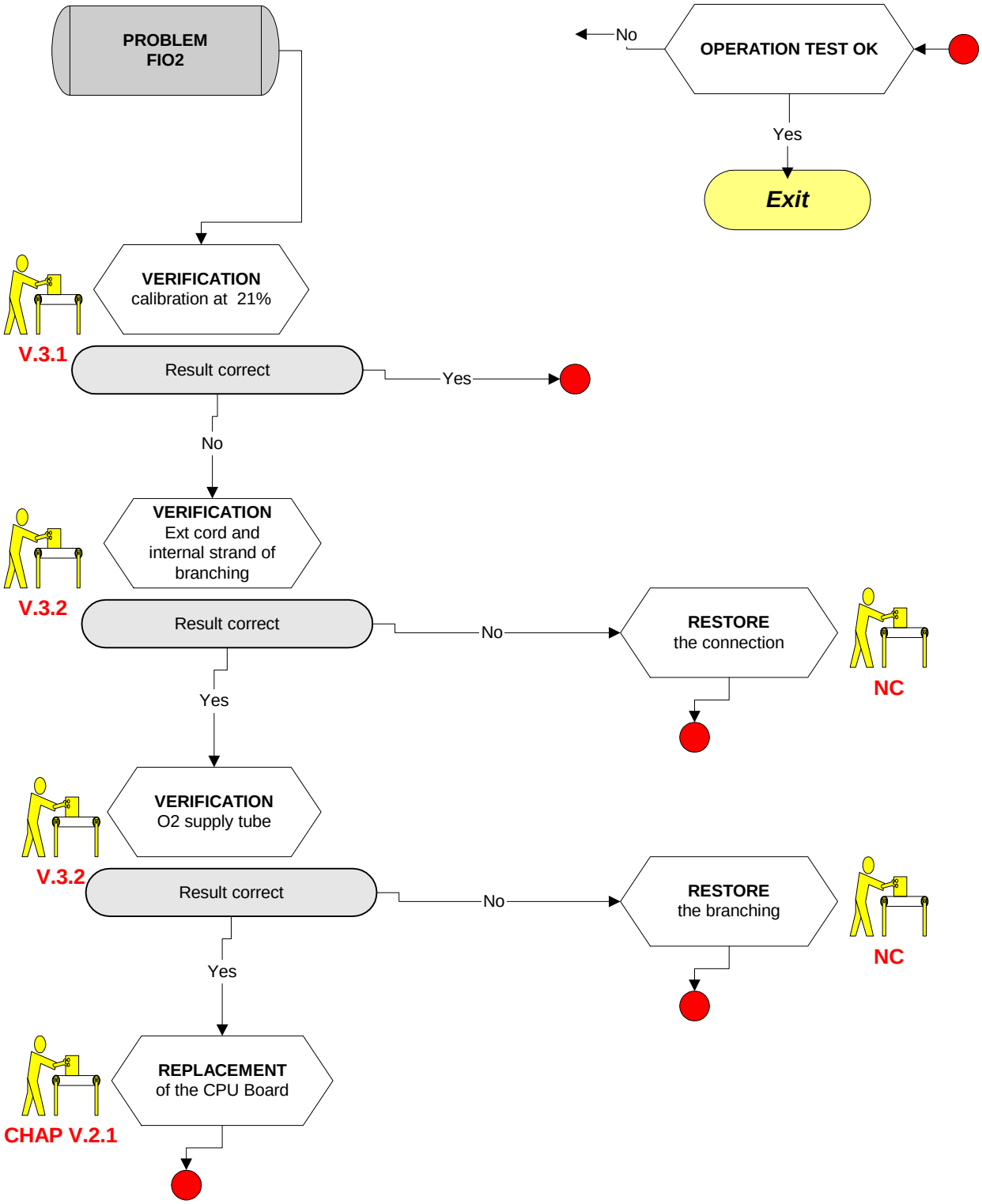
## 2.9 ALARM: CHECK VALVE



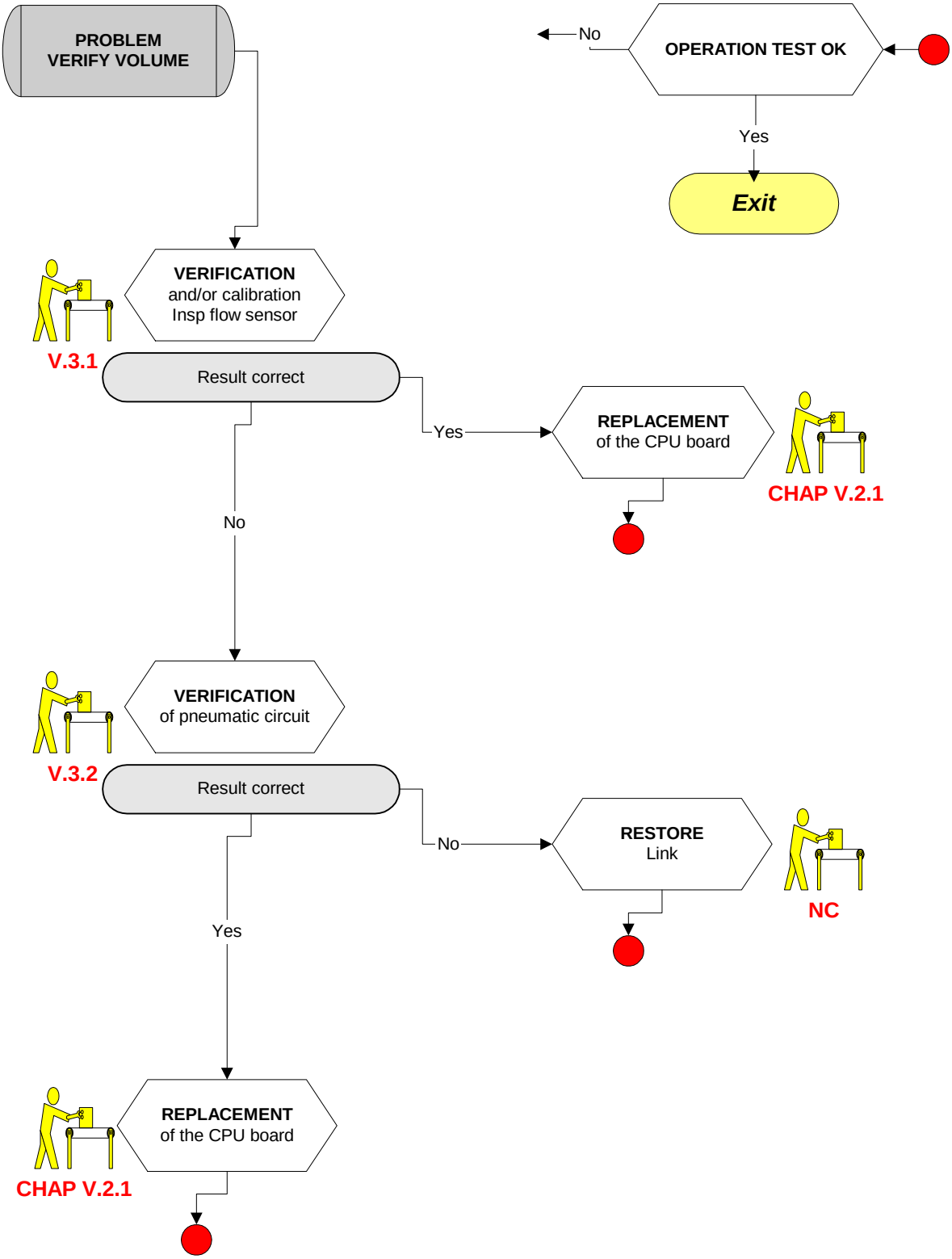
## 2.10 ALARM: VALVE LEAKAGE



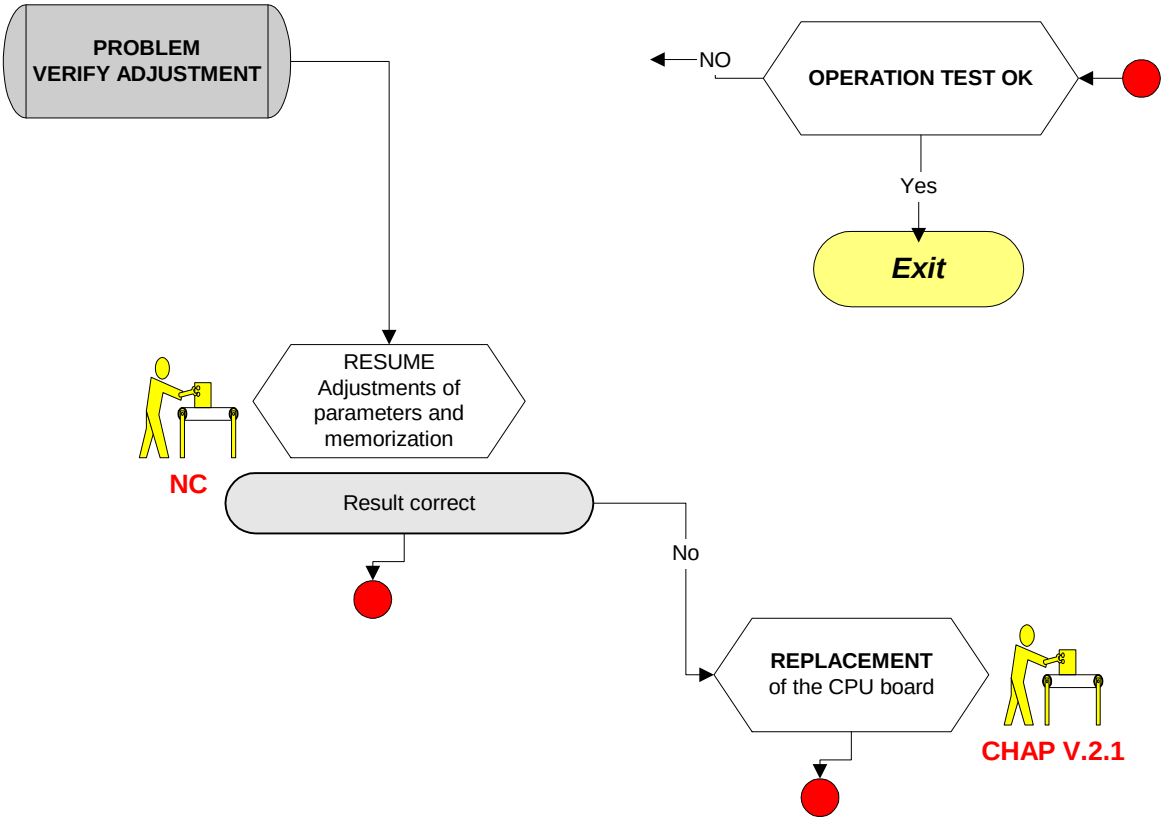
## 2.11 ALARM: FIO2 TOO LOW / FIO2 TOO HIGH / ABSENCE FIO2 / CALIBRATE FIO2 / CALIBRATION FAILURE



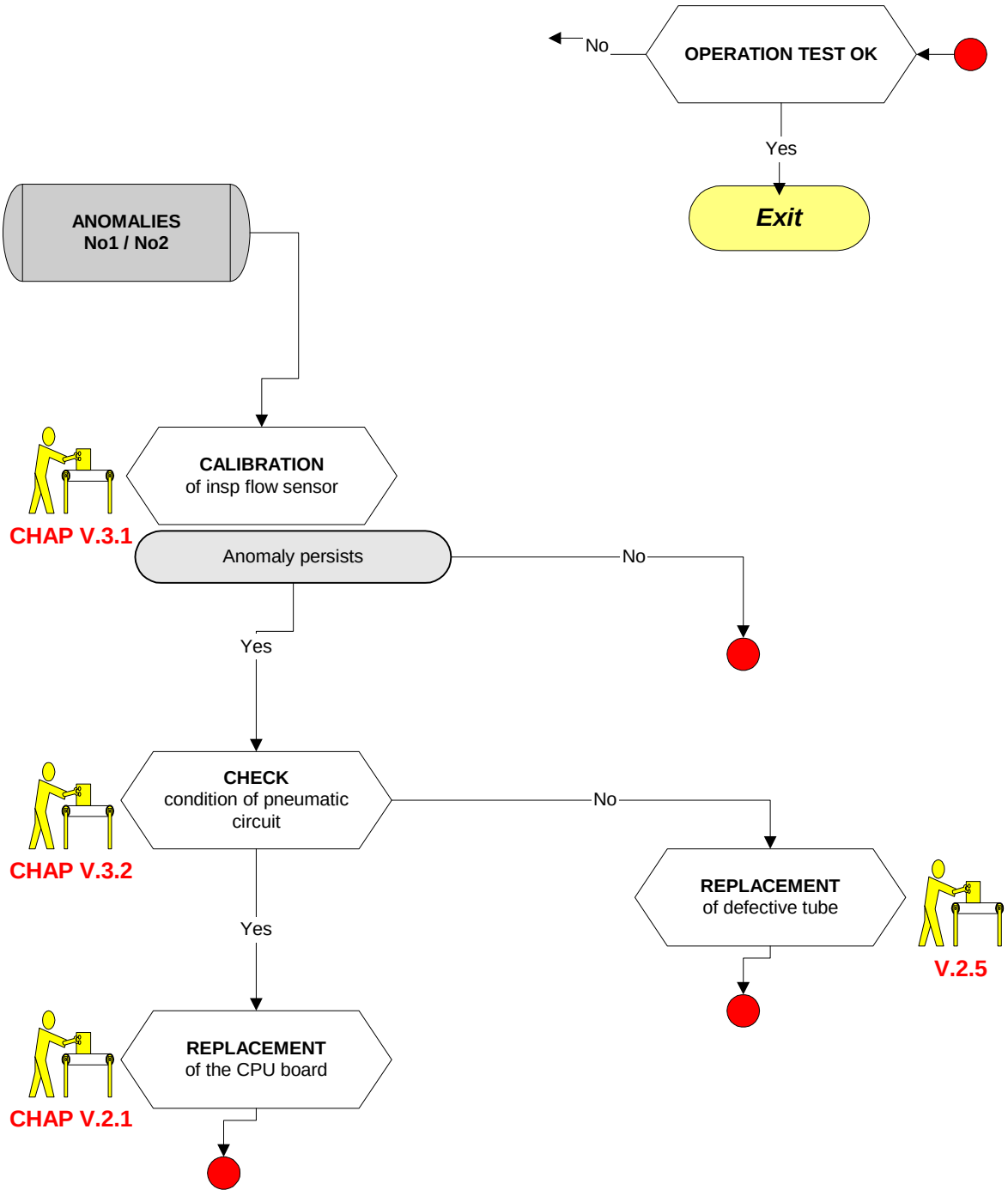
## 2.12 ALARM: VERIFY VOLUME



## 2.13 ALARM: VERIFY ADJUSTMENT

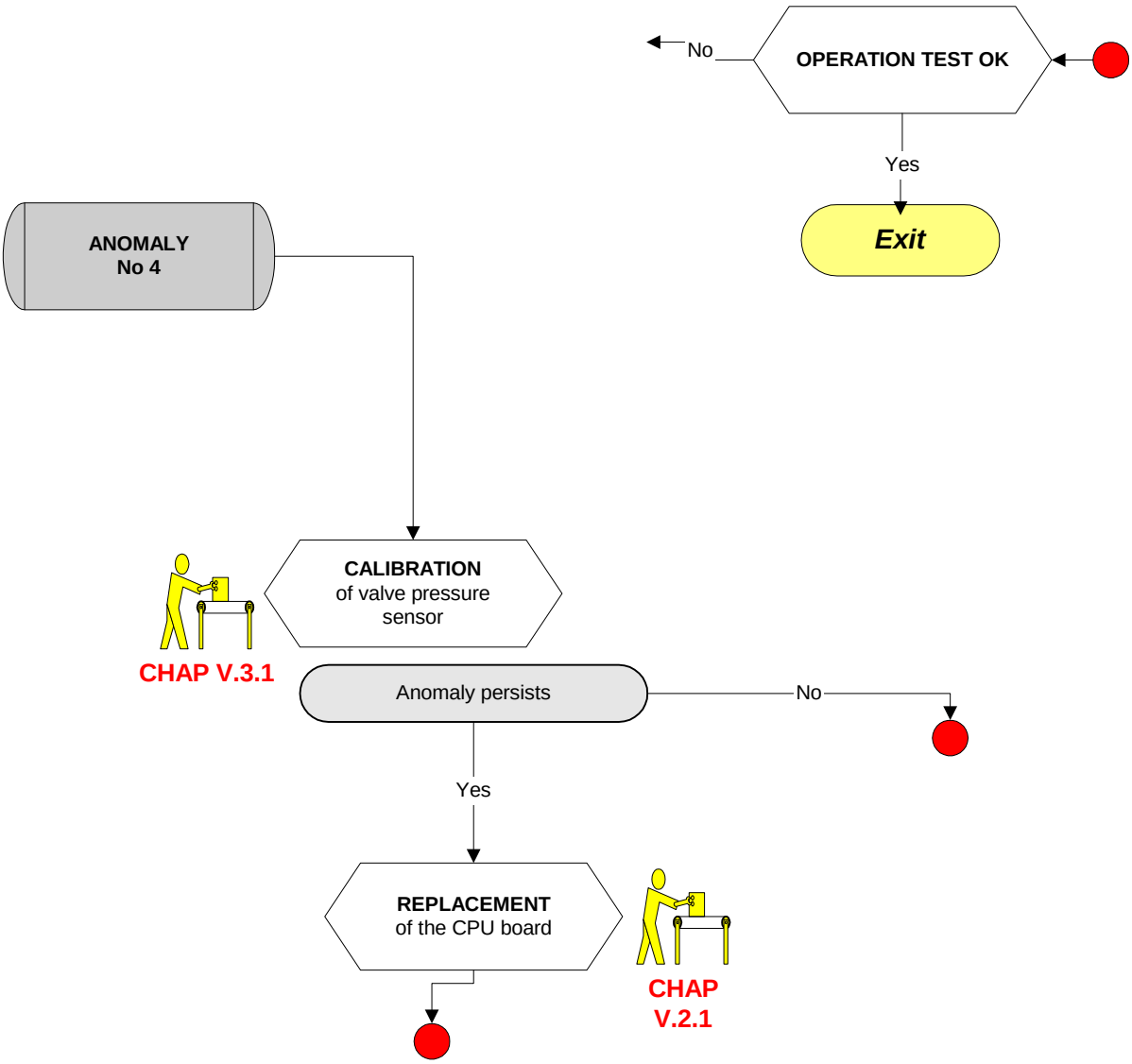


## 2.14 ANOMALIES NO 1 & NO 2

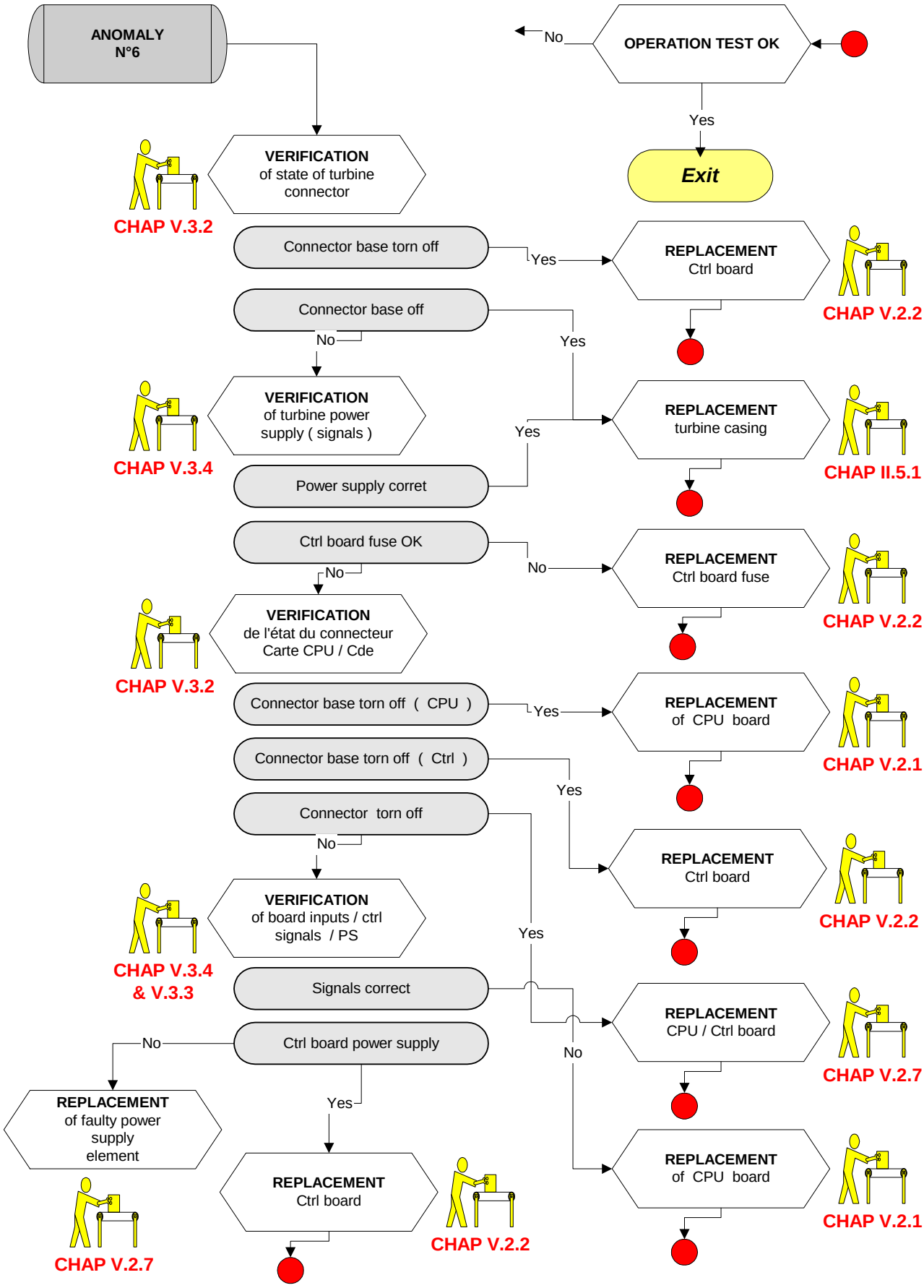



**Note:** Anomaly No 1 may occur during an endurance test on sublung, signaled by operating conditions!

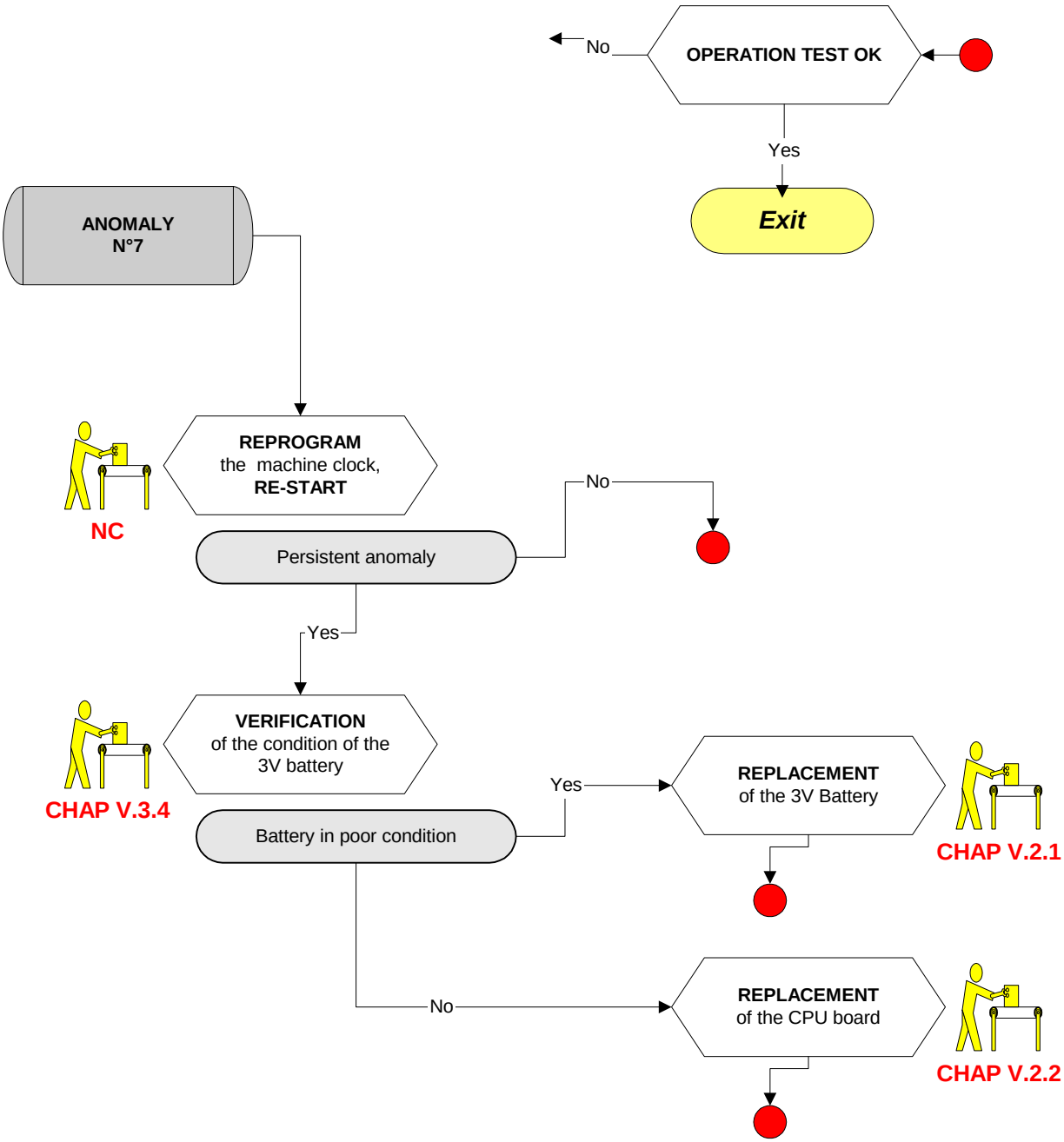
## 2.15 ANOMALY NO. 4



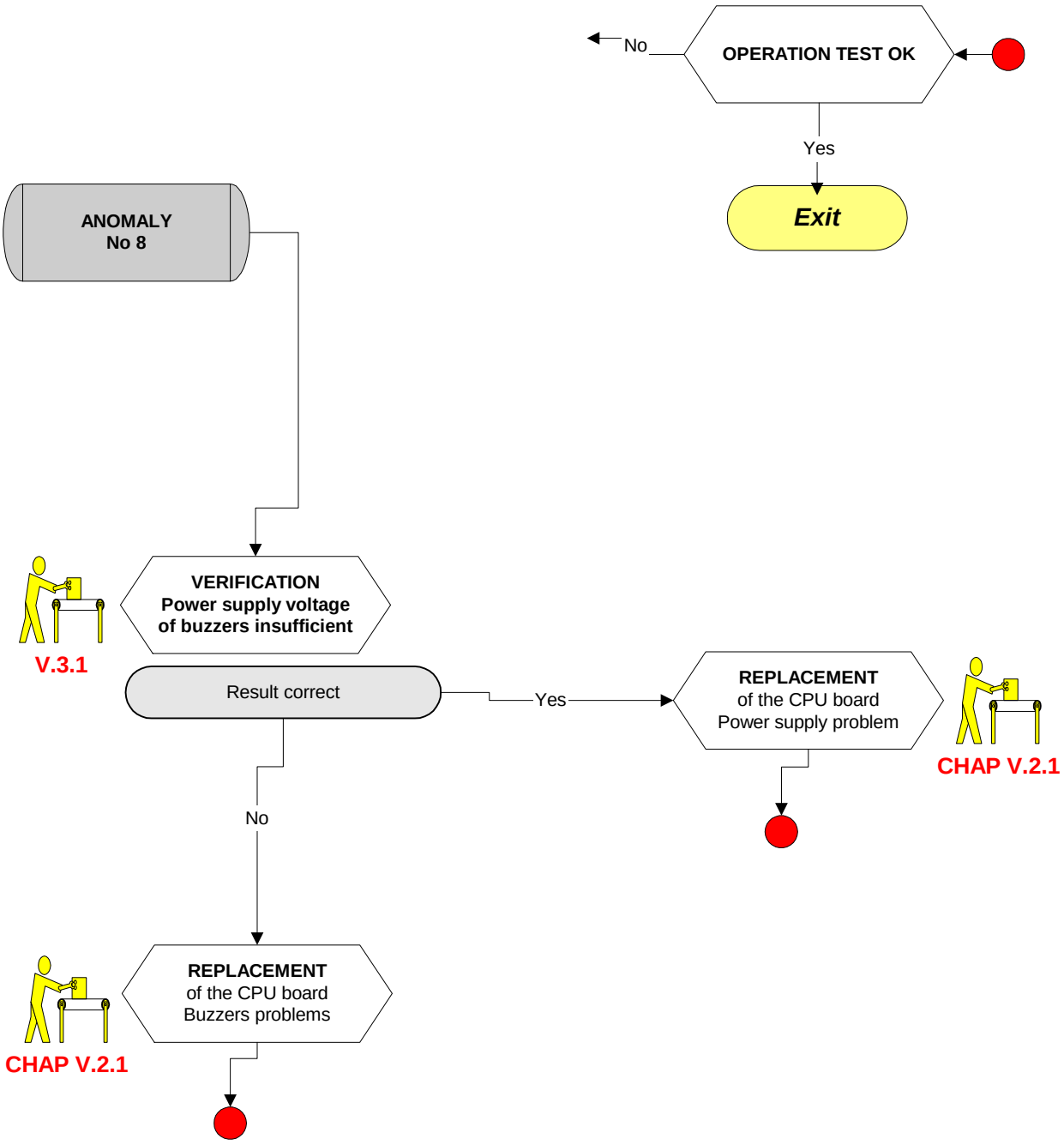
## 2.16 ANOMALY NO. 6



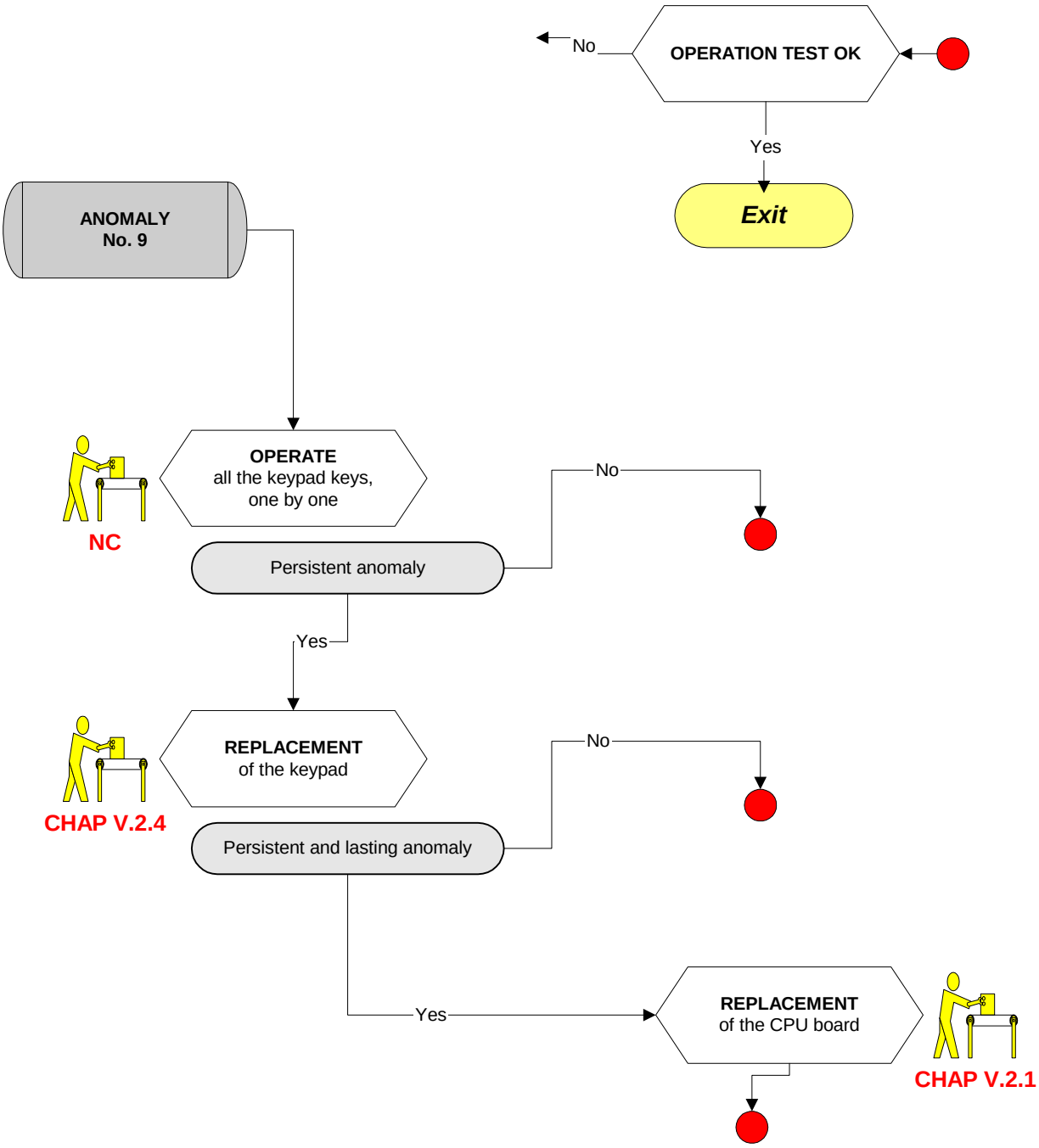
## 2.17 ANOMALY NO. 7



## 2.18 ANOMALY NO. 8



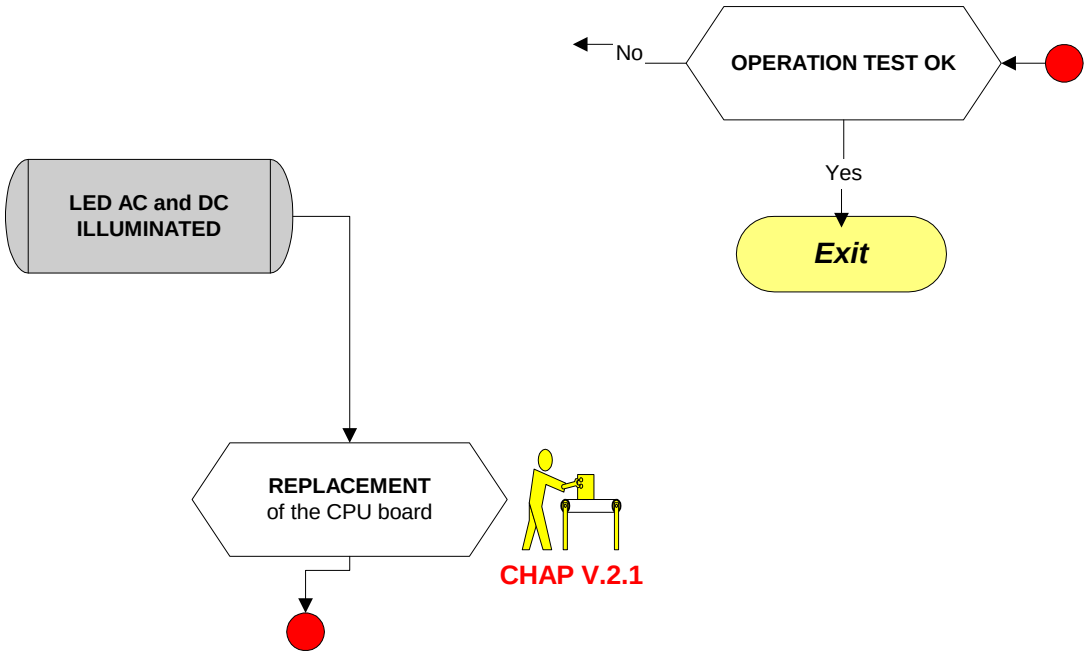
## 2.19 ANOMALY NO. 9



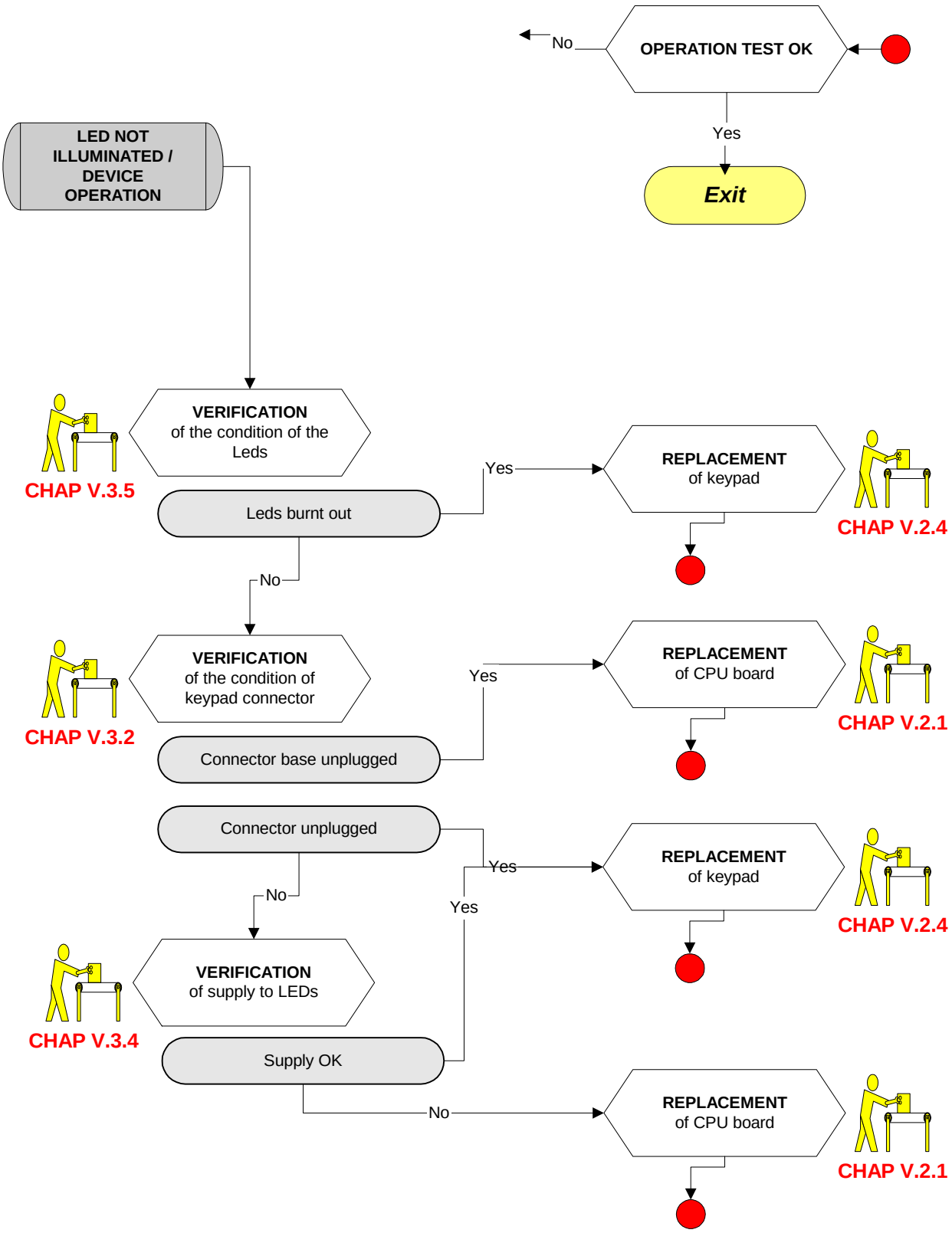
# 3. INCIDENT SOLVING PROCEDURES WITHOUT ALARM SIGNAL

## 3.1 LED AC AND DC ILLUMINATED

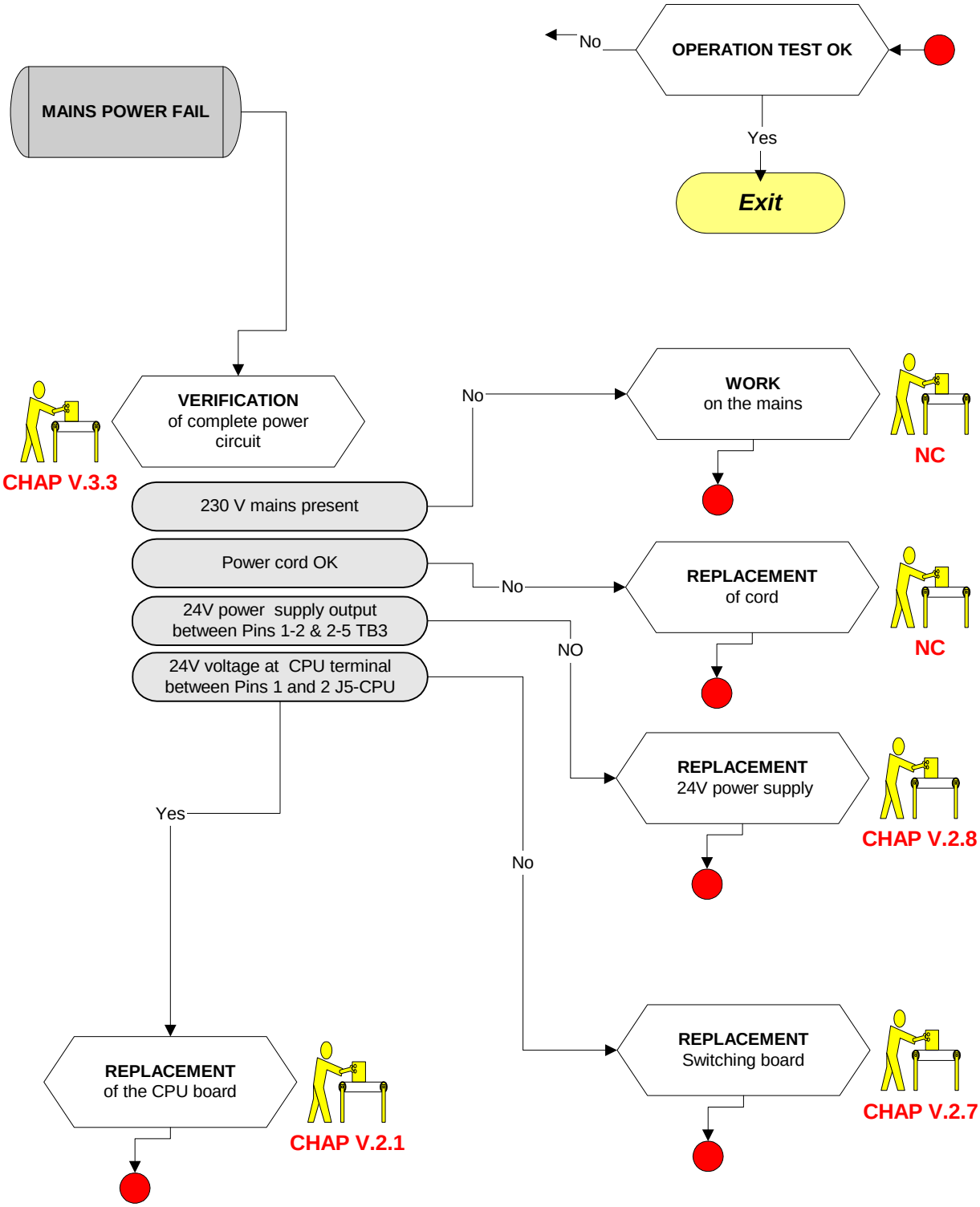
*In presence of a single power source AC or DC.*



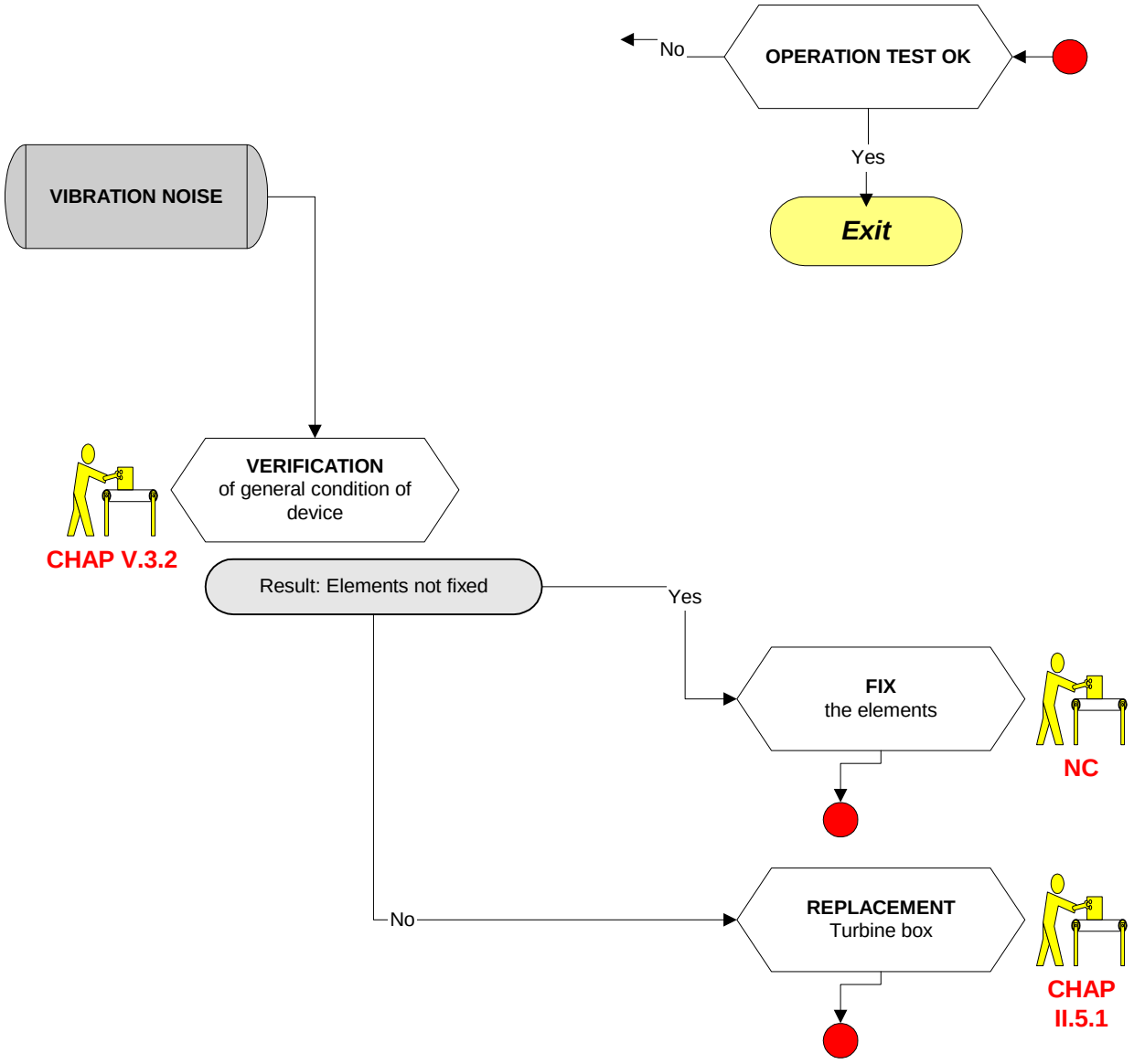
## 3.2 LED NOT ILLUMINATED / OPERATION OF THE DEVICE



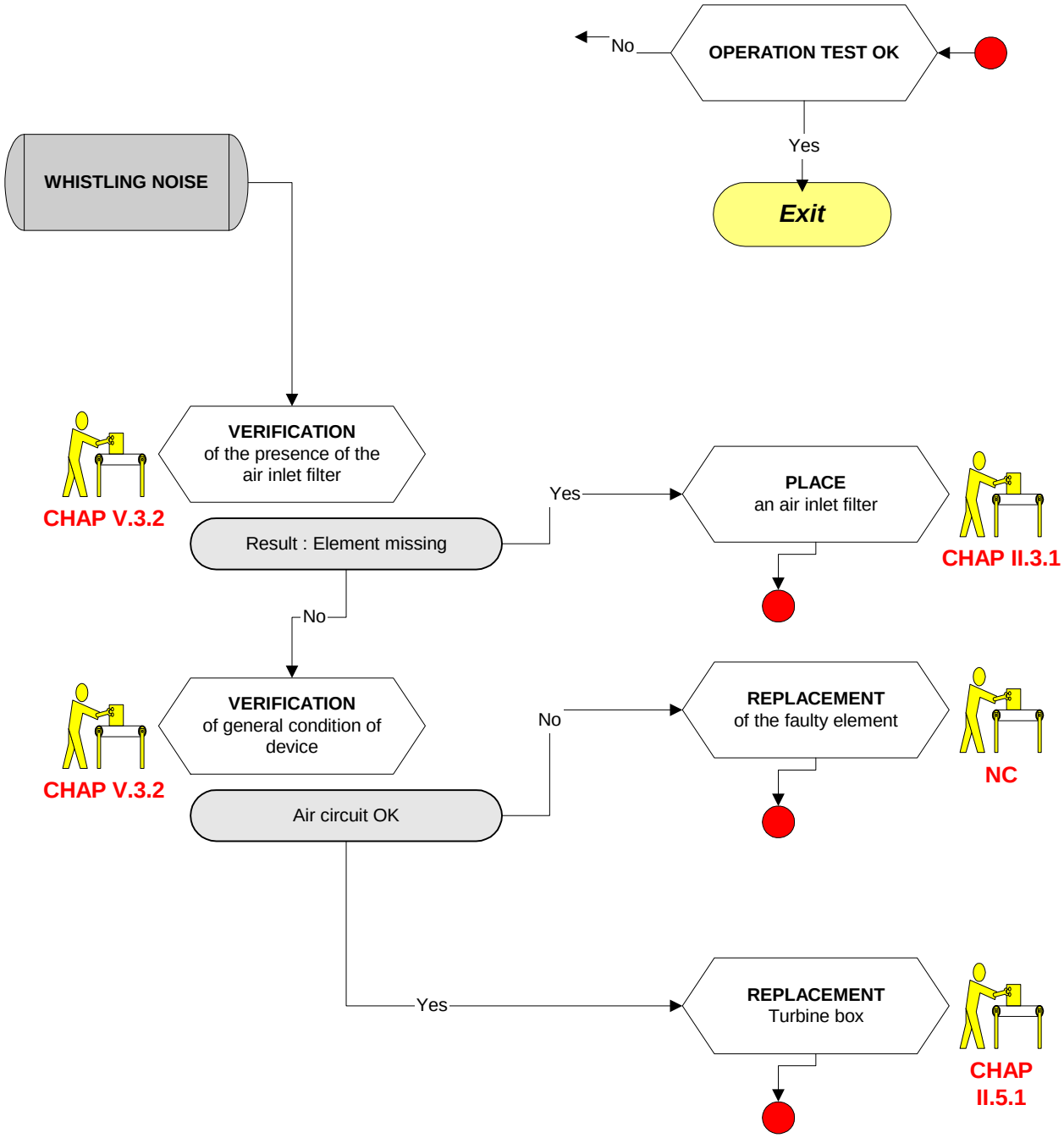
## 3.3 MAINS POWER FAIL / NO OPERATION OF THE DEVICE



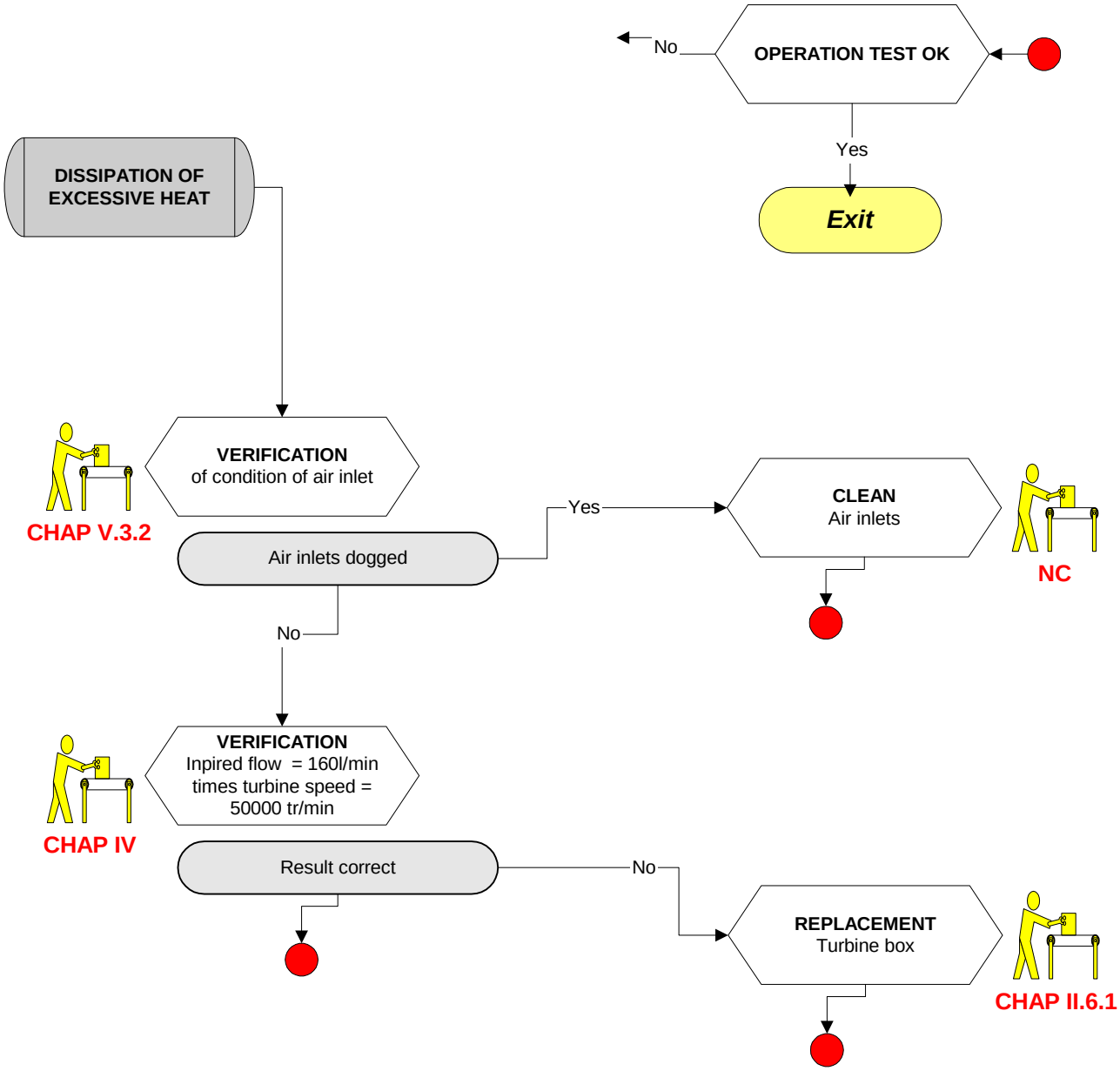
## 3.4 VIBRATION NOISE



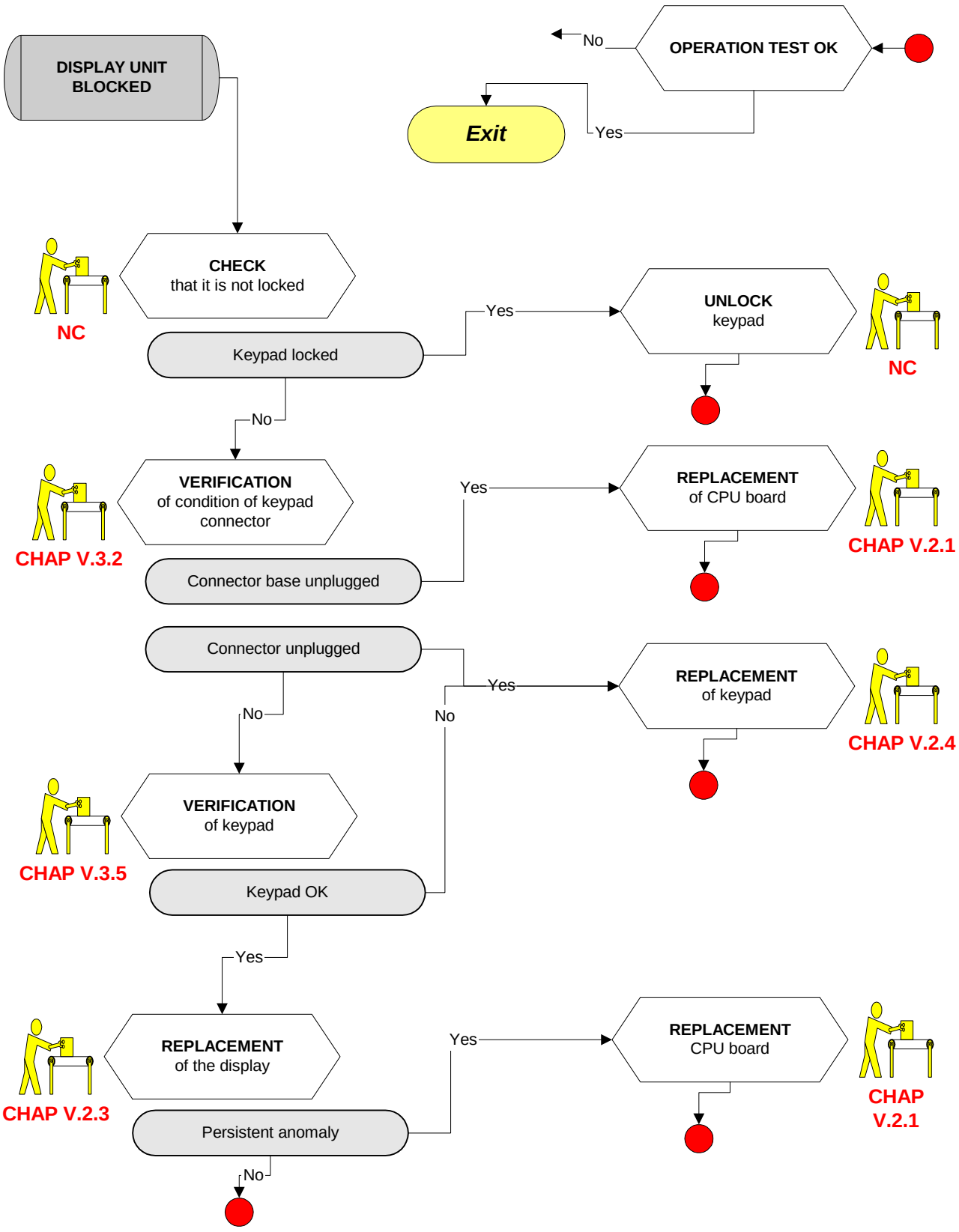
## 3.5 WHISTLING OR AIR NOISE



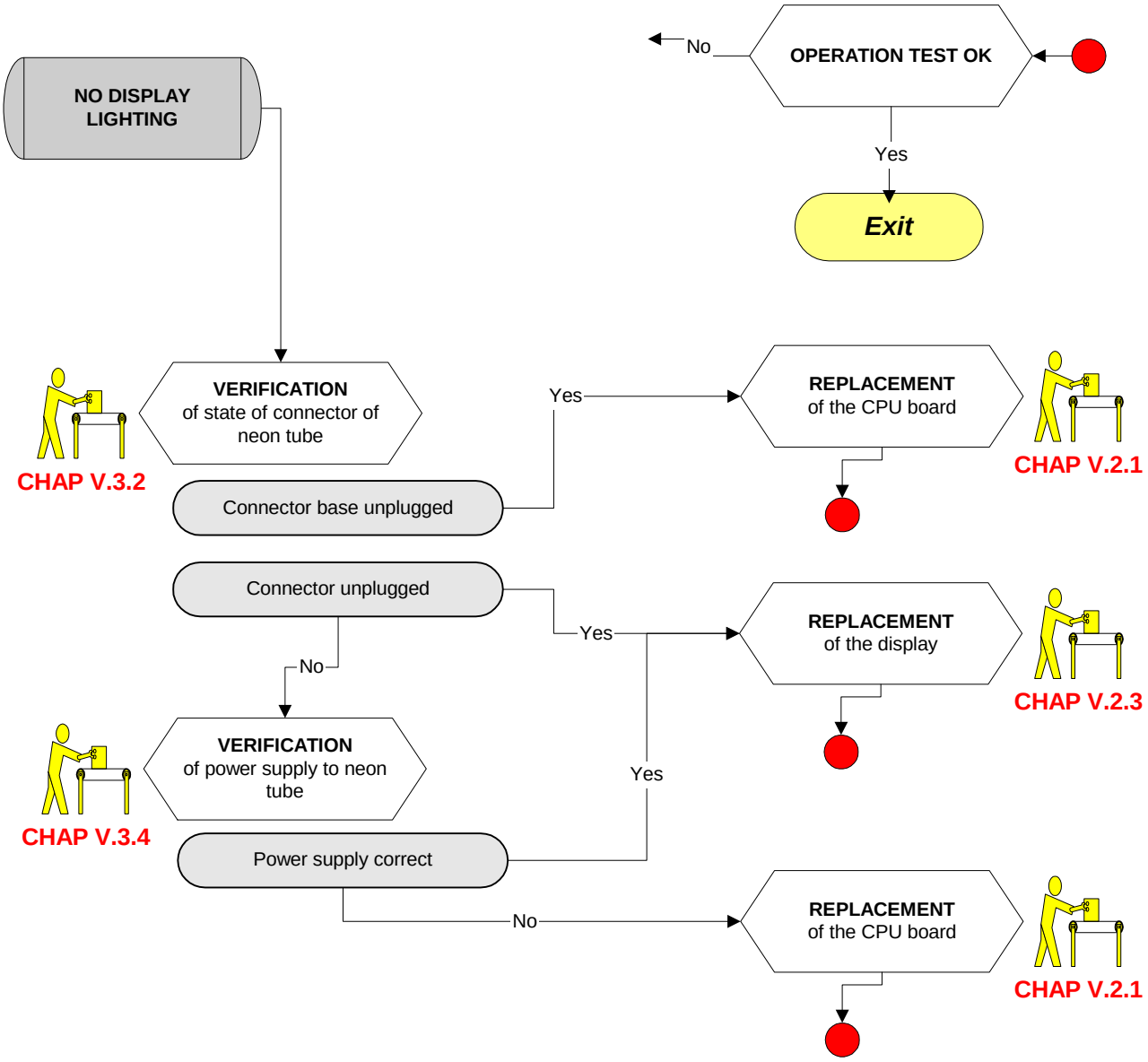
## 3.6 DISSIPATION OF EXCESSIVE HEAT



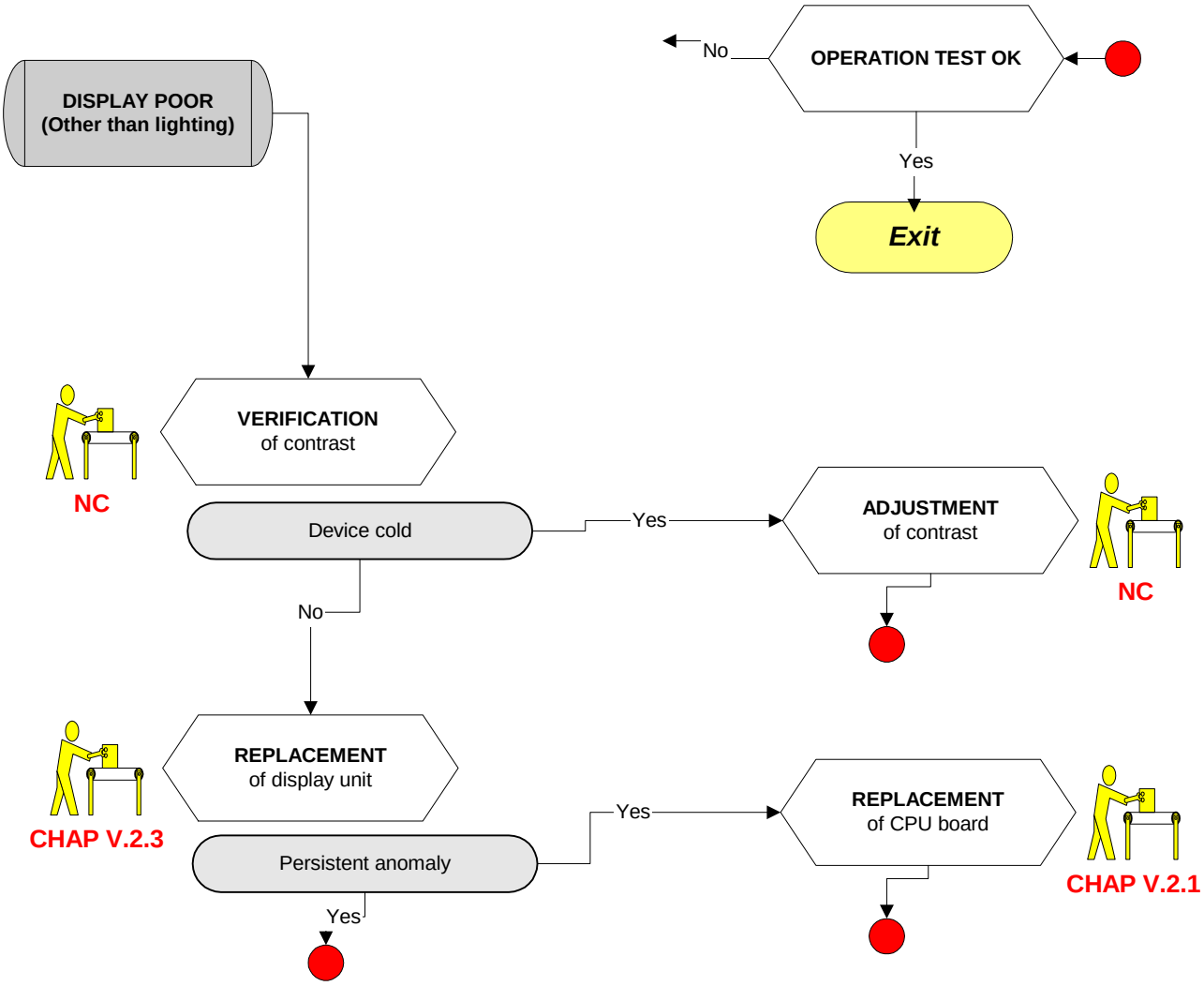
## 3.7 DISPLAY BLOCKED



## 3.8 DEGRADED DISPLAY / NO DISPLAY LIGHTING



## 3.9 DISPLAY POOR (OTHER THAN LIGHTING)



**Parc d’activités Pau-Pyrénées**
**ZI de l’échangeur**
**64008 PAU CEDEX (FRANCE)**

Tel. 33.(0)5.59.14.02.02- Fax : (33.(0)5.59.14.02.00 - E-mail : contact@airox.fr

# Maintenance File
# *LEGENDAIR* ®
# Chapter 4 – Inspection (Rev. B)

# CONTENTS

# 1. INTRODUCTION

## 1.1 OVERVIEW

This document describes conditions for the execution and final inspection phases to be done on the ventilators so that they can be put back into service.

The results for each device are noted and validated by the inspector on the sheet attached in Appendix 1:

- work sheet,
- final inspection sheet.

>> *<u>Note:</u> The format of the work sheet is optional and it can be replaced by any other document that can be used to trace the work.*

The devices are accepted at the end of the technical intervention (mechanical), fully assembled and with their work sheet filled in.

## 1.2 INSPECTION EQUIPMENT

Before each use, the inspector checks the validity of the following required equipment:

- Flow measurer from 0 to 200 l/min, resolution 0.1 l/min, precision 5% (measurement devise)
- A simple cone-branching circuit (22 mm to 2 m), with an INTERSURGICAL F5013005 reference valve and proximal pressure off take,
- a METRON QA-90 type electrical safety analyzer: measurement of the leakage current, earthing, insulation resistance,
- an autotransformer,
- a stop watch,
- a SIEMENS test lung (TEST LUNG190 réf.6006832 E037E),
- a flow generator (set to 60 l/min),
- a manometer ±50 mbar, precision 2%,
- DC power supply 24V- 3A,
- FiO2 kit (code 3810600).

# 2. INSPECTION PROCEDURE

## 2.1 GENERAL APPEARANCE INSPECTION

- Before any handling, check that the work sheet is completely filled in, signed and that the information in it is correct.

- Check that there are no general appearance defects on the device.

- Check that the strainer and air inlet filter are present and adjusted.

- Check that the stands are present and that the casing is properly fixed.

- Check that 3 labels are present (air inlet - identification - O2).

>> ***Fill in the corresponding box on the final inspection sheet.***

## 2.2 CHECKING ELECTRICAL SAFETY

### *2.2.1 Checking of electrical leaks with Metron QA-90*

>> *Check the configuration: class II, test 60601-1, type BF.*

- Switch the Metron QA-90 on at a voltage of 253 V, created by the autotransformer.

- Plug the device into the power supply connector on the front of the Metron QA-90.

- Connect the "envelope" cable to the RS232 port.

- Connect the applicable part cable to the patient outlet.

- Start the test and print the test sheet.

>> *The test result appears at the bottom of the test sheet, check that it shows:* ***TEST OK****.*

>> *Attach the results sheet to the final inspection sheet.*

>> ***Fill in the corresponding box on the final inspection sheet.***

## 2.3 CHECKING THE POWER SUPPLIES

- Switch the device on in setup mode by simultaneously pressing the On/Off switch found at the rear of the machine (position "1" or ON") and keeping the key pressed until the menu appears on the screen. Place the cursor on " **MAINTENANCE"** and then validate, select the line "Voltage control" and verify:

- With the mains connected, display the general power supply voltage **"ALIM 24,5±1,5V".**

- With the external source of DC connected up, display the general power supply voltage **"ALIM 24,5±1,5V".**

- With the built-in battery power supply connected up, display the battery symbol.

>> *With the battery fully charged, the supply voltage should display « 29 ± 1 V ».*

- Place the cursor on the line "return" and then validate. On "turbine speed" press , let the device run for 5 min and replace the cursor in order to see the battery voltage and check that it equals 27,5 ± 0,5V.

>> *This point will be repeated at the end of the inspection to check that the voltage has returned to 29 ± 1 V.*

- Reconnect the device to the mains power supply.

- Display the CPU logic circuit voltage **"CPU 5V±0,5V".**

- Display the Watchdog voltage **"25±2V".**

>> ***Fill in the corresponding boxes on the final inspection sheet.***

- Place the cursor on BUZZER 1, then press the key, the corresponding voltage displays along with a beep for two seconds.

>> *Repeat the operation on BUZZER 2 and note the values of the voltages on the test sheet.*

- The voltages must lie within the following range:

| | |
|---|---|
| Tension BUZZER 1 | 5 V ± 1V |
| Tension BUZZER 2 | 5 V ± 1V |

>> ***Fill in the corresponding boxes on the final inspection sheet.***

- Switch the device Off.

## 2.4 CHECKING THE SOFTWARE EDITION

>> Check on welcome menu software version***.***

## 2.5 CLOCK / DATE / CONTRAST SETTING

- Switch the device on in setup mode by simultaneously pressing the On/Off switch found at the rear of the machine (position "1" or ON") and keeping the key pressed until the menu appears on the screen.

- Check the device date.

>> *If necessary: Place the cursor on the DATE line (with or ) Validate your intention to modify the parameters by the key: the parameter flashes and the left cursor becomes . Modify its value using the or keys. Validate the new value with the key.*

- Check the time on the device.

>> *If necessary: Place the cursor on the TIME line (with or ). Validate your intention to modify the parameters by the key: the parameter flashes and the left cursor becomes . Modify its value using the or keys. Validate the new value with the key.*

- Test the display contrast by keeping the key pressed down and adjusting it by successively pressing the and the .

## CHECK/CALIBRATION/PERFORMANCE LEVELS

### *2.5.1* Checking operation of keys/LEDs

- Connect to the mains, the led ~ must be lit up.

- Flip the switch to ON; the and ~ LEDs must be activated.

- Run ventilation by pressing the key, the corresponding LED should go out.

- Wait for 15 seconds until the "low pressure" alarm is triggered; the LED must be lit up.

- Inhibit the low-pressure alarm, the sound alarm should disappear.

>> ***Fill in the corresponding boxes on the final inspection sheet.***

>> *Switch the device Off.*

## 2.5.2 Pressure and flow calibration check

- Switch the device on in SETUP mode by pressing the key on the keypad and putting the On/Off switch to ON.

- Put the cursor onto the MAINTENANCE line and press the key.

**CHECKING PATIENT PRESSURE**

- Insert a T union with a manometer and a leak aperture (Ø 5mm) on the patient outlet.

- Place the cursor on line "Patient Pressure" press key, a 0 must appear opposite line.

- Again press key, a value of 40 should appear opposite line "Patient Pressure".

- Note the values shown by the manometer on the inspection sheet.

- Press the key, the pressure should again be displayed.

**CHECKING VALVE PRESSURE**

- Place the cursor on line "Valve Pressure" press key, a 0 must appear opposite line.

- Press the key, the pressure should again be displayed.

- Note the value shown by the manometer on the inspection sheet.

**CHECKING INSPIRED FLOW**

- Connect the patient outlet of the ventilator to the measurement devise.

>> *Use a patient circuit with no valve or pressure reading to prevent any leaks.*

- Put the cursor on the “Inspired flow” line, then press the key to go from one calibration point to the next.

- Repeat the operation for each calibration point. The flow rates indicated by the measurement devise must be in the range of tolerance given (see inspection sheet in Appendix 1).

>> ***Note the values read on the device for each measuring point.***

**CHECKING EXPIRED FLOW (applicable to LEGENDAIR equipped with double branch option)**

- Connect the patient outlet of the ventilator to the expiration block.

- Maintain the cursor on the “Inspired flow” line, then press the key to go from one calibration point to the next.

- Repeat the operation for each calibration point. Note the flows indicated on the “Expired flow” line. They should be between the indicated tolerances (see the inspection sheet in Appendix 1).

**CHECKING FIO2**

- Connect the cell O2 to the connection made available for this purpose (see Pl1-250).

- Put the cursor onto line « FIO2 », then press key .

- Check that the display of FIO2 is at 21% and press the key again to validate.

**CHECKING FLOW MAXI / PRESSURE MAXI**

- Leave the patient outlet open,

- Place the cursor on the “Turbine speed” line and press the key to select maximum flow (pwm = 50 000).

- Read the value shown on the screen, line “Inspired Flow” (higher than 160 l/min).

- Connect a manometer with the O2 union on the O2 power outlet.

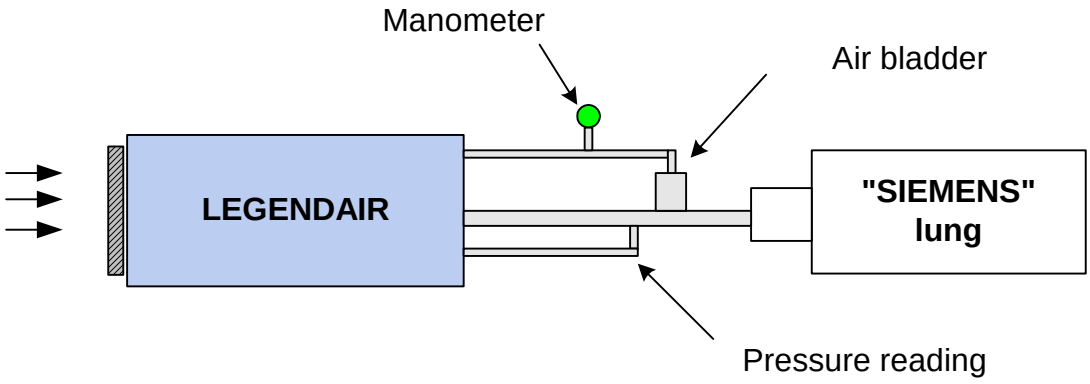
- Block the patient outlet and read the pressure value obtained on the screen, line “Patient Pressure” and on the manometer. It should the same as or greater than 70 mbar.

>> *Be careful not to let the device run with the outlet blocked:* ***RISK OF TURBINE DETERIORATION.***

>> ***Note the values indicated on the display in the corresponding boxes of the inspection sheet.***

- Switch the device Off.

### *2.5.3 Checking performance levels*




- Connect the ventilator furnished with a simple patient circuit branch to the SIEMENS lung, connect the piloting valve and the proximal pressure meter.

- Switch the device On by positioning the switch to ON.

- Start the ventilation in PACV mode with the ⏻ key.

- The main parameters must be set as follows: IPAP *40 mbar*, EPAP *5 mbar*, Flow Ramp 2 (*3 lit blocks),* frequency *10 bpm*, I/T *33%*.

- Press the 🔕 key to go to the monitoring page.

- Wait for several cycles to be completed so that the measurements are stable.

>> ***Note the Ipap and Epap values indicated. They should be 40 ± 2 mbar and 5 ± 1 mbar.***

- Check that the Vt indicated is 750 ml ± 10%.

- Note the Vt value on the final inspection sheet.

- Check the valve pressure on the manometer.

>> ***Fill in the corresponding boxes on the final inspection sheet.***

### *2.5.4 Checking low pressure alarm and mains disconnection*

**LOW PRESSURE**

- Disconnect the "Siemens" lung.

>> *A sound and a visual alarm (red Led lit up) with the message LOW PRESSURE should be triggered after 15 seconds.*

- Reconnect the lung to the patient outlet to inhibit the alarm.

>> ***Validate the triggering of the LOW PRESSURE ALARM on the inspection sheet.***

**ALARM POWER SUPPLIES**

- Connect the mains power supply and DC power supply adjusted to 24 V.

- **Mains power supply**, check that the LED AC is active.

>> ***Validate the box corresponding to the test sheet***

- Disconnect the mains power supply, an EXT POWER SUPPLY FAILURE alarm must be triggered.

- **External continuous power supply,** check that the LED DC is active.

- Inhibit the alarm by keeping the 🔕 key pressed down.

>> ***Validate the box corresponding to the test sheet.***

- Disconnect the 24 V power supply, an EXTERNAL POWER FAILURE alarm should be triggered.

- Check that the buzzers operate, then inhibit the alarm and check that the battery symbol is displayed.

- Switch off the device and turn it back on in configuration mode by pressing simultaneously on the M/A switch located at the back of the machine (position “1 or ON”) and holding down the key until the menu appears on the screen. Place the cursor on “**MAINTENANCE“,** then validate on ”Voltage Control” and validate again:

- the power voltage should have risen to 29V ± 1 V (confirmation of the proper functioning the battery charge).

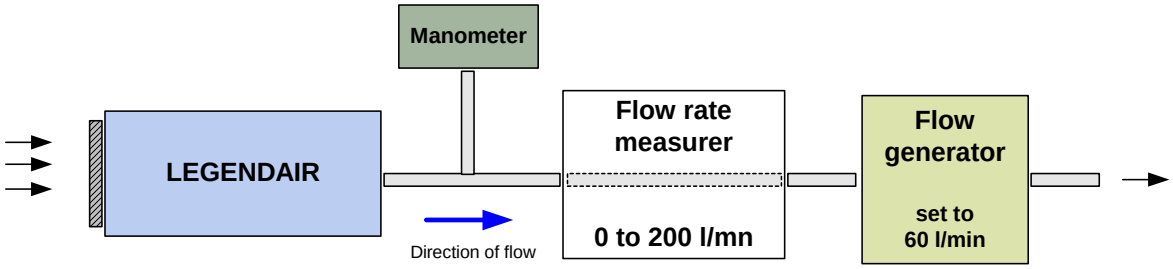
>> ***Validate the corresponding boxes on the final inspection sheet.***

### *2.5.5 Default parameters*

- Set the main parameters as follows: IPAP : *10 mbar*, Epap : *4 mbar*, Flow Ramp 2: *3 lit blocks, frequency: 10 c/min*, I/T : *33%*.

>> ***Fill in the corresponding box on the final inspection sheet.***

### *2.5.6 Checking the inspiratory resistance when stopped*




- Connect the patient outlet tube via the measurement devise, ventilator stopped, to the flow generator.

- Place a pressure check union at the patient connection in order to measure the inspiratory resistance.

- Apply a flow rate of 60 l/min to the TIMETER (calibrated to 36) and measure the depression at the patient connection (see inspection sheet in Appendix 1).

>> ***Fill in the corresponding box on the final inspection sheet.***

## 2.6 COMPLETE DEVICE INSPECTION

Check:

- O2 union,

- The presence of the instructions and the patient tube in its pocket.

# 3. APPENDIX 1

Appendix 1 below contains a model of the work sheet and a copy of the inspection sheet.

| *SAV* | **WORK SHEET**<br>**LEGENDAIR** | AIROX |
|---|---|---|

| **SERIAL NUMBER:** | **SOFTWARE:** | | | | **Customer No:** | | |
|---|---|---|---|---|---|---|---|
| **PREVENTIVE MAINTENANCE** | **YES** | **NO** | **V1** | **V2** | **V3** | **V4** | **V5** |
| **HOURS OF OPERATION** | | | | | | | |

| **DESIGNATION OF THE ELEMENT REPLACED** | **Serial number / Batch** | **COMMENTS** |
|---|---|---|
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| | | |

| **COMMENTS:** | **OPERATOR Name:** | |
|---|---|---|
| | **DATE :** | **INITIALS:** |

| *SAV* | **INSPECTION SHEET LEGENDAIR** | AIROX |
|---|---|---|

| **Serial number:** | **SOFTWARE:** | **Customer No:** | **Timer:** |
|---|---|---|---|

| **DOCUMENTS / APPEARANCE** | **Result** | **Comments** |
|---|---|---|
| Verification of work sheet | | |
| General appearance inspection: filter, fastenings, bases | | |
| Labels (air inlet + identification + O2). | | |

| **ELECTRICAL SAFETY** | **Result** | **Comments** |
|---|---|---|
| METRON check class II BF | | |

| **POWER SUPPLIES** | **Result** | **Comments** |
|---|---|---|
| Verification power voltage from mains 24,5 ± 1.5 V | | |
| Verification power voltage from external power 24 ± 1.5 V | | |
| Verification battery voltage 29 ± 1V and battery Symbol | | |
| Verification of 5 V ± 0.5 V CPU voltage | | |
| Verification of Watchdog 25 ± 2 V voltage | | |
| Buzzer 1 voltage: 5 ± 1 V | | |
| Buzzer 2 voltage: 5 ± 1 V | | |

| **CLOCK / DATE / CONTRAST** | **Result** | **Comments** |
|---|---|---|
| Setting of clock / date | | |
| Display contrast **+** / **-** | | |
| Keypad keys ▼ ▲ **+** **-** | | |
| Led / Led / Led ⏻ | | |

| **CALIBRATIONS / PERFORMANCE LEVELS** | **Result** | **Comments** |
|---|---|---|
| Check of pressure calibration 0 and 40 mbar | | |
| Check of valve pressure calibration at 0 mbar | | |
| Check of flow rate calibration | | |
| 5 ± 0.5 l/min | | |
| 12 ± 0.6 l/min | | |
| 37 ± 1.9 l/min | | |
| 60 ± 3 l/min | | |
| 90 ± 4.5 l/min | | |
| 135 ± 6.7 l/min | | |
| 160 ± 8 l/min | | |
| Check of calibration expired flow at ± 0,5 l/min | | |
| Verification FIO2 at 21% at +1 / -2% | | |
| Check of performances flow maxi: >160 l/min | | |
| Check of performances pressure maxi: >70 mb | | |
| Check of performances: Mode PCV Ipap *40 mbar*, Epap *5 mbar*, Flow Ramp 2 (*3 lit squares),* frequency *10 c/min*, I/T *33%* | | |
| Bar graph IPAP/EPAP: 40 ± 2 mbar / 5 ± 1 mbar | | |
| Check of Vt: 800 ml ±10% | | |
| Check of valve: 40 mbar ±10% | | |
| Low pressure alarm | | |
| Led + Alarm mains power supply | | |
| Led + Alarm external continuous power supply | | |
| Battery symbol and power voltage = 29 ± 1V | | |
| Default setting: Ipap 15 mbar, Epap 0mbar | | |
| Inspiratory resistance when stopped: -2 mbar ± 1 mbar | | |

| **EQUIPMENTS** | O2 union | | Instructions for use | | Pocket | | Patient Tube | |
|---|---|---|---|---|---|---|---|---|
| **COMMENTS** | | | | | | | | |
| **OPERATEUR** | | **Date** | | **Stamp** | | | | |

**Parc d’activités Pau-Pyrénées**
**ZI de l’échangeur**
**64008 PAU CEDEX (FRANCE)**

Tel. 33.(0)5.59.14.02.02- Fax : (33.(0)5.59.14.02.00 - E-mail : contact@airox.fr

# Maintenance File
# *LEGENDAIR* ®
# Chapter 5 – Corrective Maintenance (Rev. B)

# CONTENTS

# 1. INTRODUCTION

## 1.1 OVERVIEW

| ATTENTION |
| --- |
| BEFORE DOING MAINTENANCE CHECK SOFTWARE VERSION |

This chapter describes conditions and procedures for corrective maintenance.

Corrective maintenance procedures are applicable to all elements and sub elements detected as being defective.

Corrective maintenance procedures described in this chapter are derived from the list of removable elements (LRU) initially filled in by the manufacturer.

The reference of the element that have to be replaced, the Number of operator, special and specific tools, preliminary operations before removal, and removal and installation operations are described for each procedure. The figures illustrating these procedures are provided in a location corresponding to the text wherever possible.

>> *In general, it is recommended that the equipment should be cleaned and disinfected before carrying out any maintenance operation.*

>> ***The operator should fill in a work sheet for each equipment, according to a maintenance quality scheme (Appendix1 – Chapter IV).***

## 1.2 SAFETY MEASURES

The person (operator) who needs to work on defective elements must refer to electrical safety rules in force for this type of work.

BEFORE DOING ANY MAINTENANCE WORK, MAKE SURE THAT THE DEVICE IS SWITCHED OFF.

>> *AIROX cannot be held responsible for incidents caused by this device unless the installation, maintenance or modifications are made by an authorized person using original spare parts and respecting quality assurance and traceability rules approved by AIROX. Due to its CE marking, no modifications may be made without the written permission of AIROX.*

## 1.3 TIGHTENING TORQUE / REMOVAL - INSTALLATION TOOLS

### *1.3.1 Tightening torque*

All tightening torques respect standards in force and depend on the diameter of the screw or nut to be tightened. All specific torques are summarized in maintenance procedures.

### *1.3.2 Removal – installation tools*

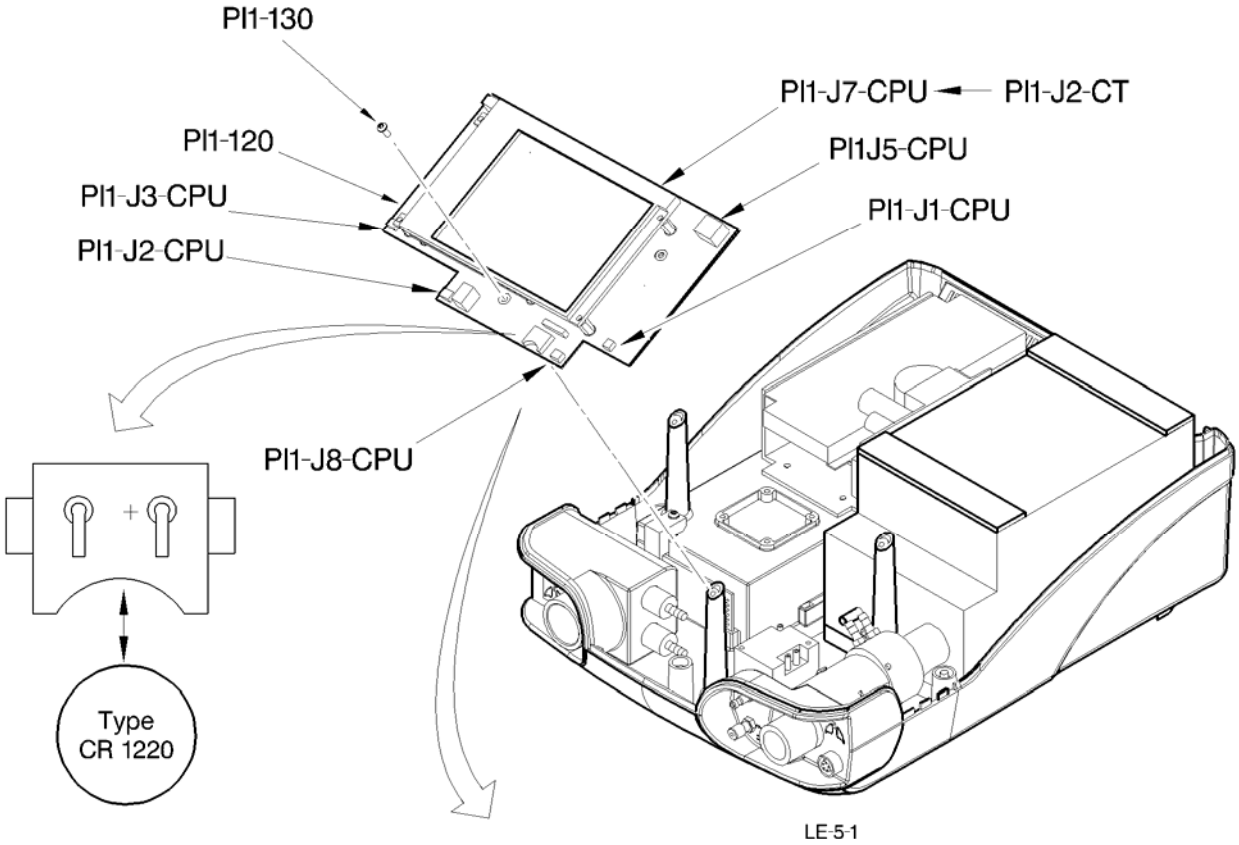
The tools necessary for carrying out all the maintenance procedures are: Screwdriver or male hexalobe endcap key T10 + T20, flat screwdriver and cross screwdriver.

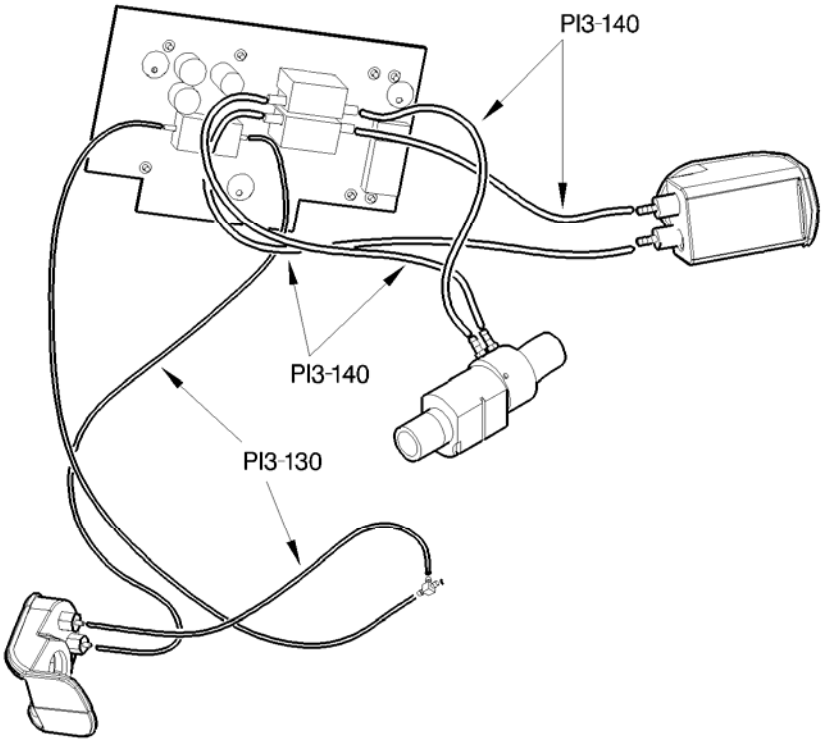
## 1.4 EQUIPMENT NECESSARY FOR THE CHECK AND VERIFICATION

Before each use, the inspector checks the validity of the following required equipment:

- Flow measurer from 0 to 200 l/min, resolution 0.1 l/min, precision 5%,
- a multimeter.

***Figure CP 5.1 – CPU board, 3V battery***



# 2. REMOVAL / INSTALLATION PROCEDURE

## 2.1 REMOVAL / INSTALLATION OF THE CPU BOARD, AND THE 3V BATTERY (FIG CP 5.1)

**Spare part reference:** ..... 3811600 : CPU board.
..... 3 V lithium battery type CR 1220.

**Number of operator:** ..... 1.

**Special or specific tools:** ..... None.

**Preliminary operations:** ..... Make sure that the device is switched off. Clean the device before doing the work (Chap II.2.1)

### *2.1.1 Removing / Installing the CPU board*

- Put the device in a clean and open environment.
- Open the device (see procedure Chap II.4.2).
- Disconnect all connectors Pl1.**J3**.CPU, Pl1.**J2**.CPU, Pl1.**J8**.CPU, Pl1.**J1**.CPU, Pl1.**J5**.CPU and Pl1.**J7**.CPU of the CPU board.

>> ***Caution, the device must be switched off: electrostatic risk.***

- Unscrew the three attachment screws (Pl1-130) for the CPU board (Pl1-120).
- Extract the board from its housing and uncouple the set of air tubes (Pl3-130 and Pl3-140).
- Replace the CPU board (Pl1-120) and put back the set of air tubes (Pl3-130 and Pl3-140).

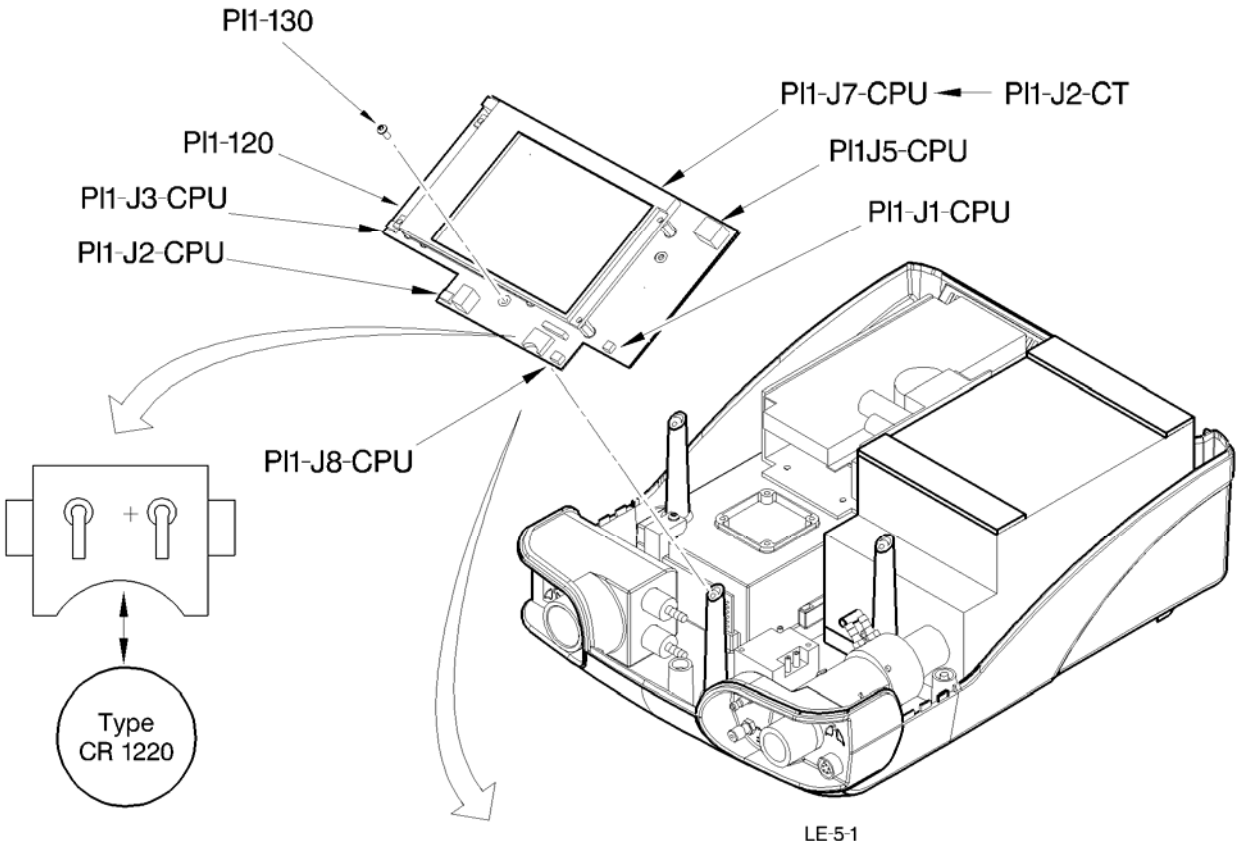
>> *It is recommended that these elements be replaced if justified, depending on their general condition (Chap V.2.5). Take care not to reverse the tubes during reassembly (see figure CP 5.1).*

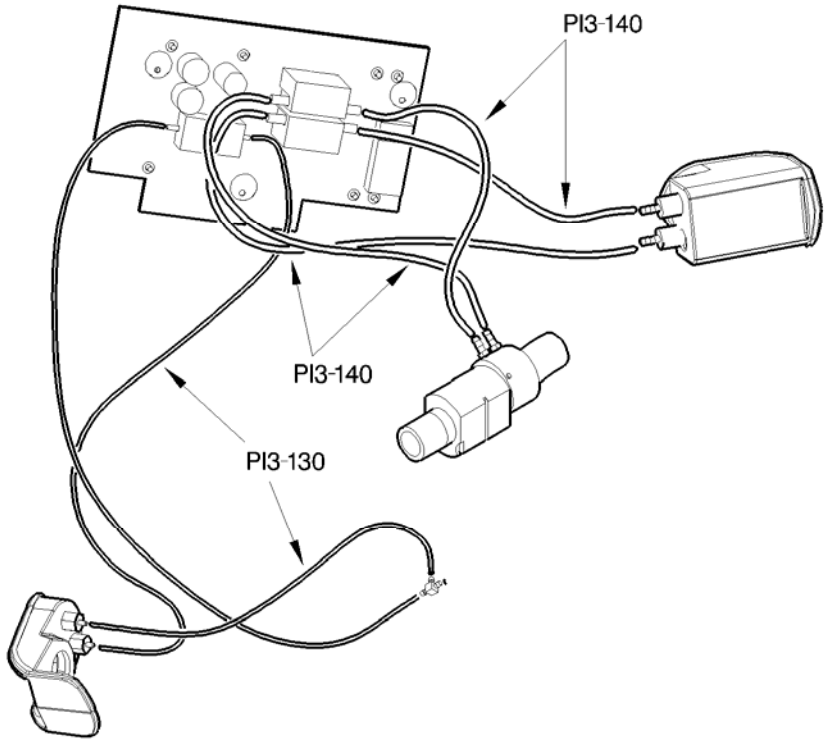
- Position the new board and pre-position the three attachment screws (Pl1-130). Validate the position of the board and finish tightening (Torque 5 Nm max).
- Reconnect all connectors of the CPU board.

>> *Pl1.J3.CPU with the Alarm Reminder strand , Pl1.J2.CPU with the RS232 strand, Pl1.J8.CPU with the FiO2 strand, Pl1.J5.CPU with the Power Supply strand, Pl1.J7.CPU connected to Pl1.J2.CT, Pl1.J1.CPU with the piezo solenoid valve strand.*

- Close the device again taking all necessary precautions (see procedure Chap II.4.2).
- Perform the final inspection procedures before putting back into service (Chap IV).

***Figure CP 5.1 – CPU board, 3V battery***



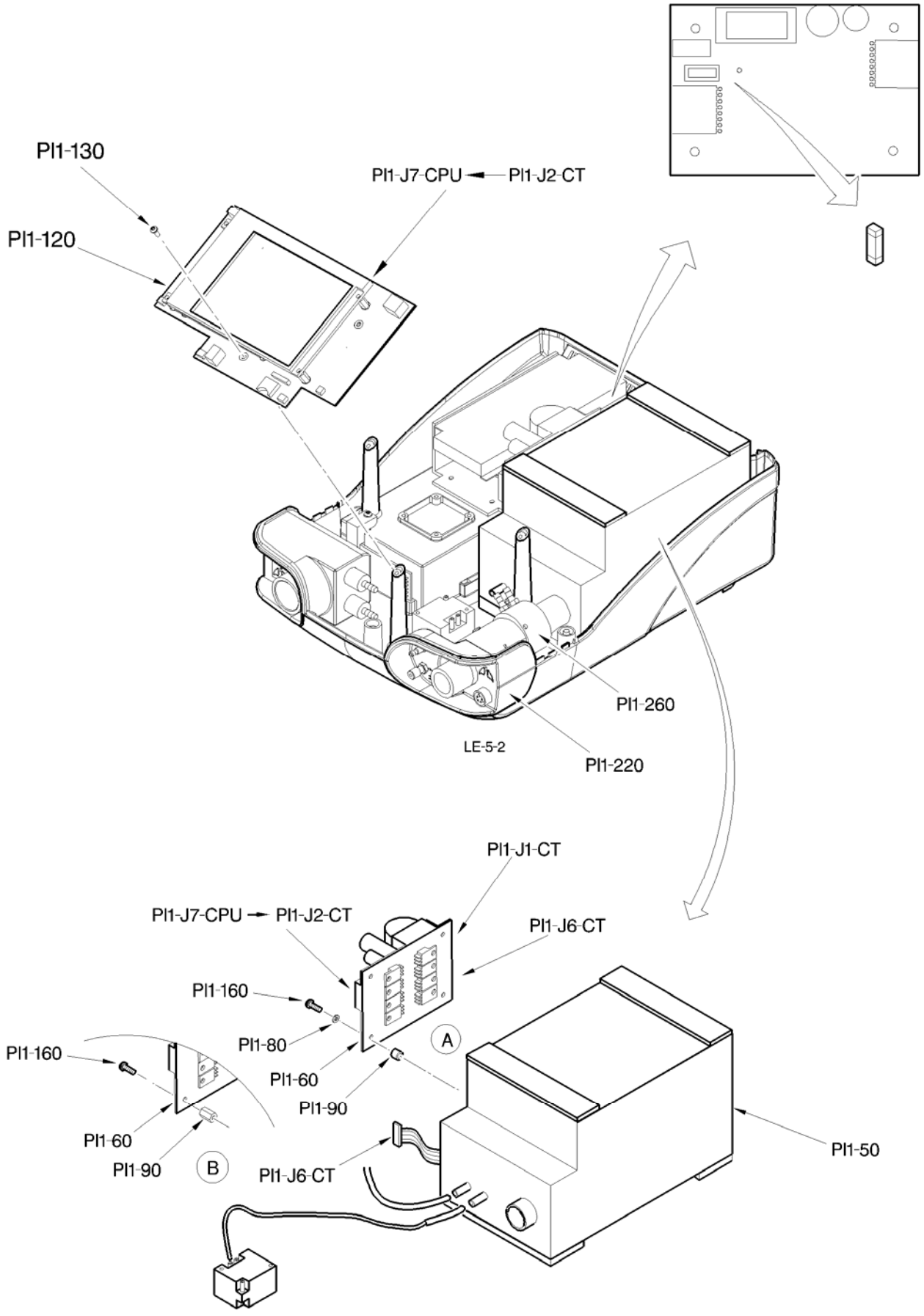
### *2.1.2 Replacing the 3V battery*

- Put the device in a clean and open environment.
- Open the device (see procedure Chap II.4.2).
- Locate the 3V battery.
- Carefully extract the 3V battery and replace it.

>> *Take care not to damage the support.*

- Close the device again taking all necessary precautions (see procedure Chap II.5.1).
- Perform the final inspection procedures before putting back into service (Chap IV).

***Figure CP 5.2 – Turbine control board, fuse***



## 2.2 REMOVAL / INSTALLATION OF THE TURBINE CONTROL BOARD (FIG CP 5.2)

**Spare part reference:** ..... 3812200 : Turbine control board.
..... CMS 5A fuse.

**Number of operator:** ..... 1.

**Special or specific tools:** ..... None.

**Preliminary operations:** ..... Make sure that the device is switched off. Clean the device before doing the work (Chap II.2.1).

### *2.2.1 Removing / Installing the turbine control board*

- Put the device in a clean and open environment.

- Open the device (see procedure Chap II.4.2).

- Unscrew the three attachment screws (Pl1-130) for the CPU board (Pl1-120).

- Disconnect all connectors Pl1.**J1**.CT, Pl1.**J2**.CT of the turbine control board.

>> ***Caution, the device must be switched off: electrostatic risk.***

- Extract the turbine casing (Pl1.50) from its housing and uncouple the flow rate measurement block (Pl1-260), the $0_2$ supply pipes and the piezo solenoid valve.

**WITH ROUND SPACERS (Zone A)**

- Place the turbine box (Pl1-50) in a clean and open environment, then remove the four screws, the washers and the spacers (Pl1.70, Pl1.80, Pl1.90) in order to extract the turbine control board (Pl1.60).

- Disconnect the box from the turbine control board (Pl1.**J6**.CT).

- Replace the turbine control board (Pl1-60).

- Replace the turbine control board (Pl1.60) on the box with four screws, the washers and the spacers (Pl1.70, Pl1.80, Pl1.90) (Torque 5 Nm max.).

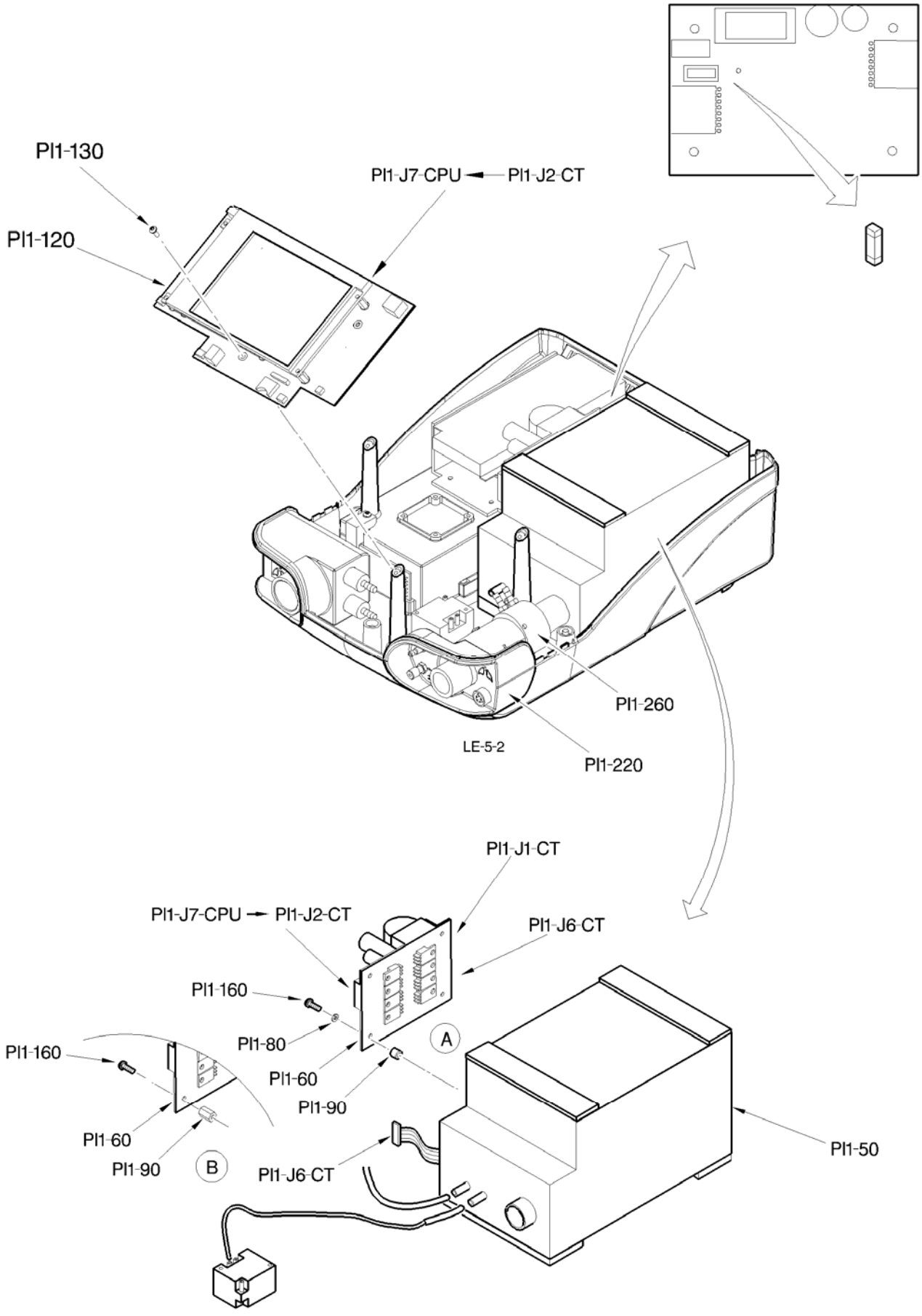
**WITH HEXAGONAL SPACERS (Zone B)**

- Place the turbine box (Pl1-50) in a clean and open environment, then remove the four screws and the spacers (Pl1.70, Pl1.90) in order to extract the turbine control board (Pl1.60).

- Disconnect the box from the turbine control board (Pl1.**J6**.CT).

- Replace the turbine control board (Pl1-60).

***Figure CP 5.2 – Carte Commande Turbine, fusible***



- Replace the turbine control board (Pl1.60) on the box with four screws and the spacers (Pl1.70, Pl1.90) (Torque 5 Nm max.).

**COMMON ASSEMBLING**

- Connect the box to the turbine control board (Pl1.**J6**.CT).

- Couple the flow rate measurement block (Pl1-260) to the casing and connect the two O2 supply pipes and the piezo solenoid valve, then reinsert the assembly into its housing. Put the cone support (Pl1-50) also into place. Put the cone support (Pl1-220) also into place.

- Reconnect all connectors Pl1.**J1**.CT, Pl1.**J2**.CT to the turbine control board.

>> *Pl1.J1.CT with the power supply wiring, Pl1.J2.CT connected to Pl1.J7.CPU.- Check the support of all the elements.*

- Reinstall the CPU board (Pl1-120) with the three attachment screws (Pl1-130) (Torque 5 Nm max.).

- Close the device again taking all necessary precautions (see procedure Chap II.5.1).

- Perform the final inspection procedures before putting back into service (Chap IV).

### *2.2.2 Removing / Installing the fuse*

- Put the device in a clean and open environment.

- Open the device (see procedure Chap II.5.1).

- Locate the CMS fuse.

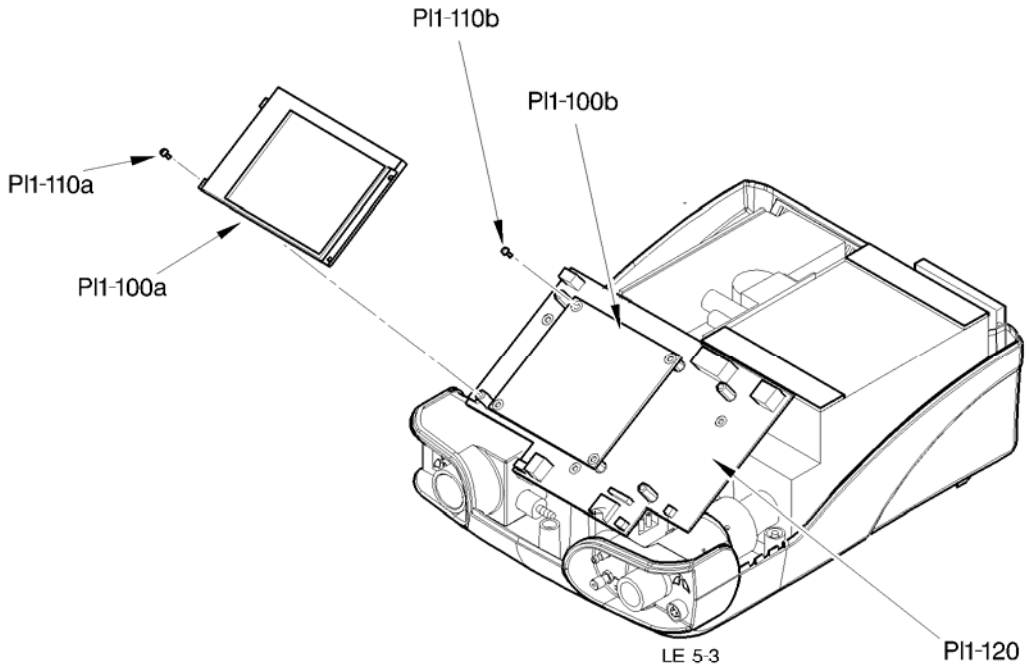
- Extract the fuse carefully and replace it.

>> *Take care not to damage the support.*

- Close the device again taking all necessary precautions (see procedure Chap II.5.1).

- Perform the final inspection procedures before putting back into service (Chap IV).

***Figure CP 5.3 – Removal of the display***



## 2.3 REMOVAL / INSTALLATION OF THE DISPLAY (FIG CP 5.3)

**Spare part reference:** ..... 3810900 : Legendair Display

**Number of operator:** ..... 1.

**Special or specific tools:** ..... None.

**Preliminary operations:** ..... Make sure that the device is switched off. Clean the device before doing the work (Chap II.2.1).

### *2.3.1 Removal / Installation*

- Put the device in a clean and open environment.

- Open the device (see procedure Chap II.4.2).

- Unscrew the four attachment screws CBL M3-6 (Pl1-110a) for the display (Pl1-100a).

- Tilt the display on its side.

- Unscrew the four countersunk attachment screws M3-6 (Pl1-110b) of the ‘’DRIVER‘’ board (Pl1-100b).

- Disconnect the connector Pl1.**J9**.CPU of the display.

- Extract the ‘’DRIVER’’ board from its housing by decoupling the CPU board (Pl1-120).

>> *Caution, do not damage the connector.*

- Replace the display (Pl1-100).

- Put the new ‘’DRIVER’’ board in position (Pl1-100b) on the CPU board (Pl1-120). Validate its position and finish its holding into place with four attachment countersunk head screw M3-6 (Pl1-110b) (Torque 5 Nm max).

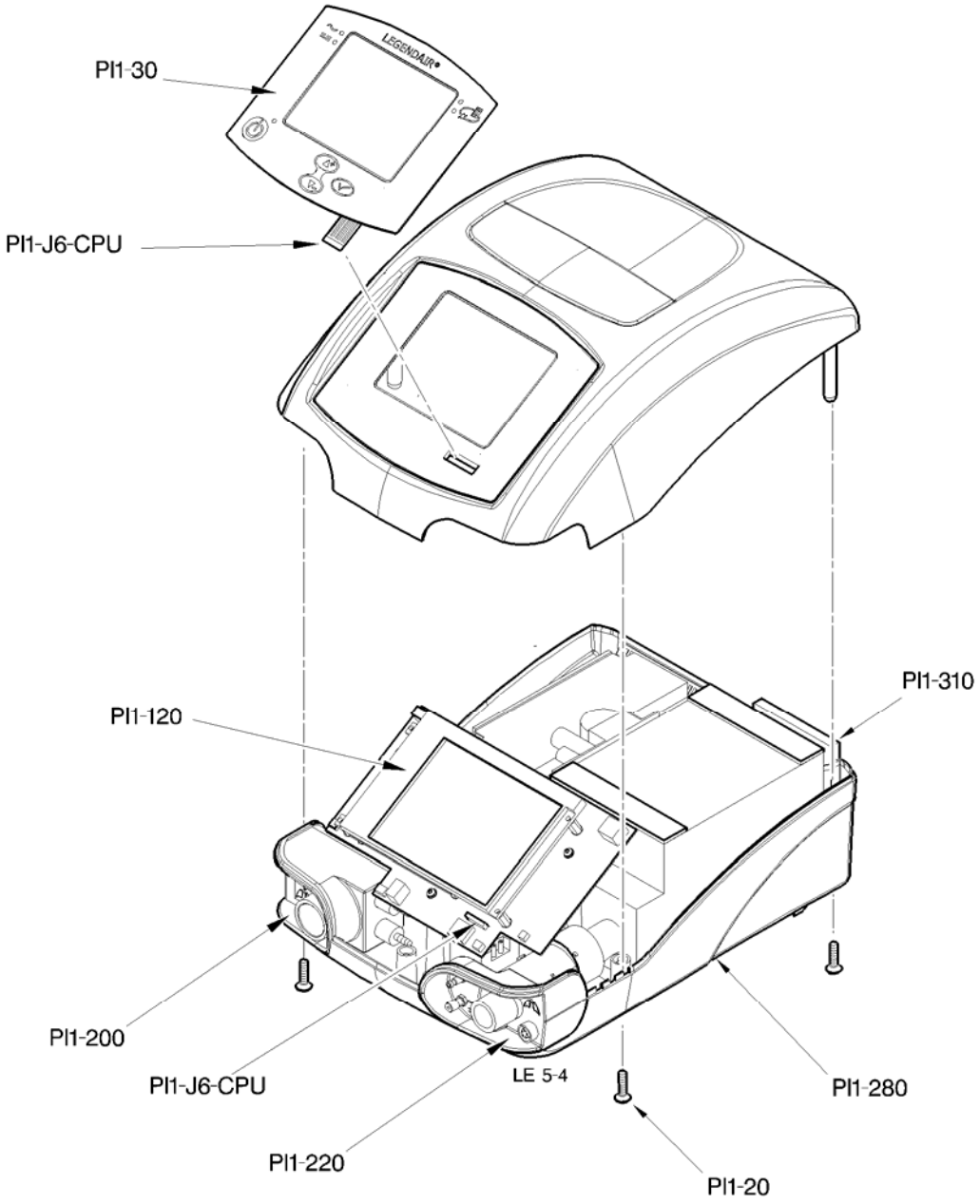
- Put the display in place (Pl1-100a). Validate its position and finish its holding into place with four attachment screws CBL M3-6 (Pl1-110a) (Torque 5 Nm max).

- Reconnect the connector Pl1.**J9**.CPU of the display (Neon Power Supply display).

- Close the device again taking all necessary precautions (see procedure Chap II.4.2).

- Perform the final inspection procedures before putting back into service (Chap IV).

***Figure CP 5.4 – Removal of the keypad***



## 2.4 REMOVAL / INSTALLATION OF THE KEYPAD (FIG CP 5.4)

**Spare part reference:** ..... 3808900 : LEGENDAIR keypad only

**Number of operator:** ..... 1.

**Special or specific tools:** ..... None.

**Preliminary operations:** ..... Make sure that the device is switched off. Clean the device before doing the work (Chap II.2.1).

### *2.4.1 Removal / Installation*

- Put the device in a clean and open environment.

- Remove the five attachment screws (Pl1.20) on the bottom casing side (Pl1-280) and open the device.

>> ***Carefully separate the two casings to avoid tearing off the keypad connections.***

- Disconnect the keypad from the CPU board (Pl1-120) (Connection Pl1.**J6**.CPU to be unbolted by traction on the upper part of the connection) in order to disassociate the two casings.

>> ***After removing the keypad, clean the glued surface to eliminate glue residue.***

>> ***Before closing the device, check the position of the wires and tubes. Also check that each element is attached.***

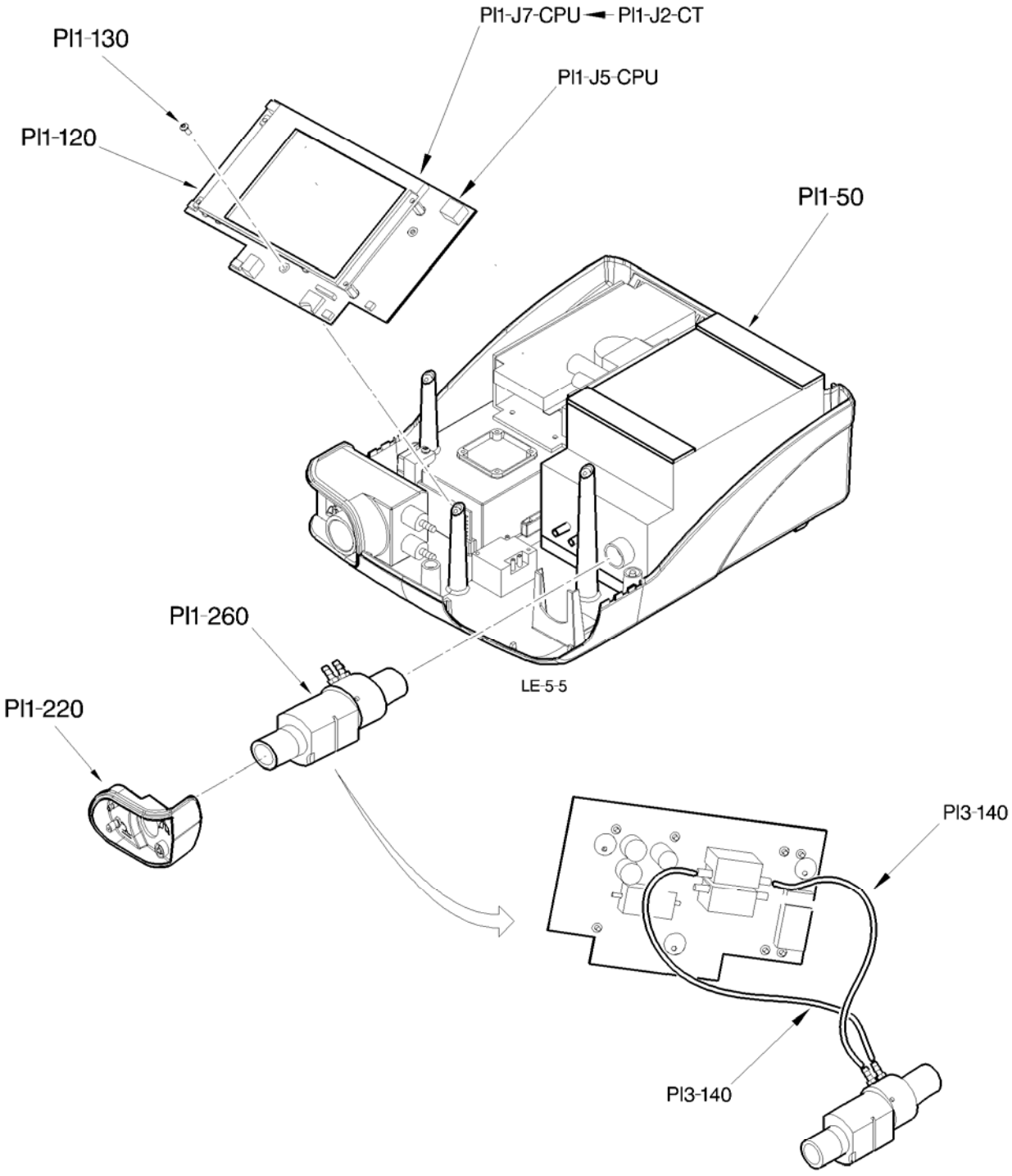
- Connect the keypad to the CPU board (Pl1-120) (Connection Pl1.**J6**.CPU to be bolted).

- Put the two casings of the device into place and fix them using the five screws (Pl1.20) on the bottom casing side (Torque 10 Nm max).

>> ***Pay attention to the positioning of the cone supports (Pl1-200 & Pl1-220) before final attachment. Do not forget to replace the air inlet filter (Pl1-310) following assembly of casings.***

- Perform the final inspection procedures before putting back into service (Chap IV).

***Figure CP 5.5 – Removal of the flow rate measurement block and the air tubes***



## 2.5 REMOVAL OF THE FLOW RATE MEASUREMENT BLOCK AND THE AIR TUBES (FIGURE CP 5.5)

**Spare part reference:** ..... 3812099 : Flow laminator with tubing.

**Number of operator:** ..... 1.

**Special or specific tools:** ..... None.

**Preliminary operations:** ..... Make sure that the device is switched off. Clean the device before doing the work (Chap II.2.1).

### *2.5.1 Removal / Installation*

- Put the device in a clean and open environment.

- Open the device (see procedure Chap II.4.2).

- Unscrew the three attachment screws (Pl1-130) for the CPU board (Pl1-120).

>> *Disconnect the wiring from the CPU board Pl1.**J5**.CPU, Pl1.**J7**.CPU.*

- Tilt the CPU board forward in order to disconnect its tube ensemble (Pl3-140).

>> ***Take care not to tear off the sensors during removal.***

- Raise the turbine casing (Pl1-50) slightly in order to extract the flow rate measurement block (Pl1-260).

- Replace the flow rate measurement block.

- Replace the defective tubes.

- Reinstall all elements. It is essential to check the direction of assembly of the tubes (see detail fig. SM5-5).

- Position the support cone (Pl1-220) ad check that the flow rate measurement block in firmly secured (Pl1-260).

- Reinstall the CPU board (Pl1-120) with the three attachment screws (Pl1-130) (Torque 5 Nm max.)

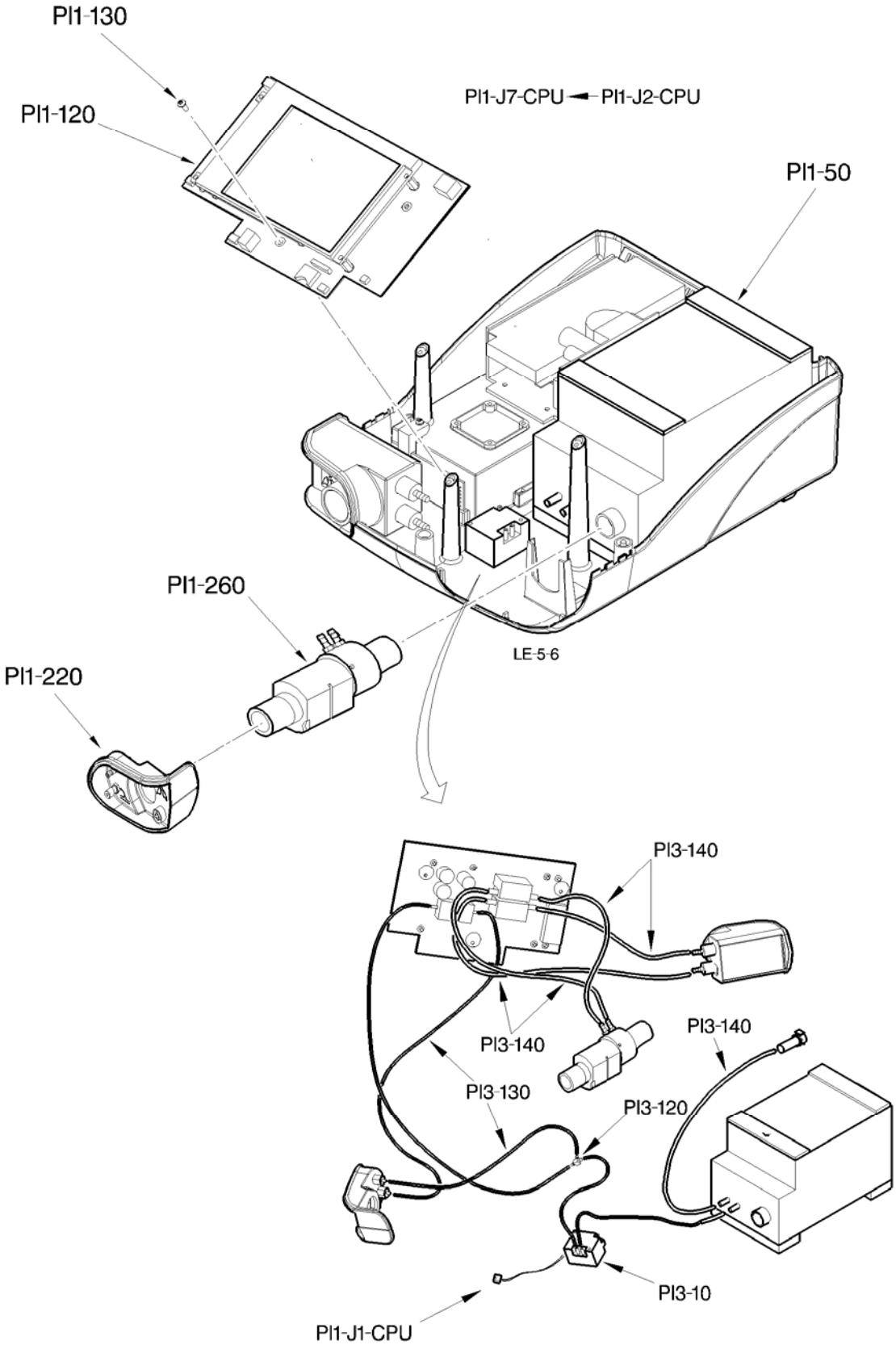
*- Reconnect the CPU board Pl1.**J5**.CPU with the power supply strand, Pl1.**J7**.CPU connected to Pl1.J2.CT.*

- Close the device again taking all necessary precautions (see procedure Chap II.4.2).

- Calibrate the sensors (Chap V-3-1).

- Perform the final inspection procedures before putting back into service (Chap IV).

***Figure CP 5.6 – Removal of the piezo solenoid valve and air tubes***



## 2.6 REMOVAL / INSTALLATION OF THE PIEZO SOLENOID VALVE AND OF TUBES (FIG CP 5.6)

**Spare part reference:** ..... 3811700 : fitted solenoid valve.

**Number of operator:** ..... 1.

**Special or specific tools:** ..... None.

**Preliminary operations:** ..... Make sure that the device is switched off. Clean the device before doing the work (Chap II.2.1).

### *2.6.1 Removal / Installation*

- Put the device in a clean and open environment.

- Open the device (see procedure Chap II.4.2).

- Unscrew the three attachment screws (Pl1-130) for the CPU board (Pl1-120).

>> *Disconnect the wiring of the CPU board Pl1.**J5**.CPU, Pl1.**J7**.CPU and Pl1.**J1**.CPU.*

- Tilt the CPU board forward in order to disconnect its tube ensemble (Pl3-130, Pl3-140).

>> ***Take care not to tear off the sensors during removal.***

- Remove the fitted solenoid valve (Pl3-150) from the lower casing.

- Replace the fitted solenoid valve (Pl3-150) with its tubes.

- Replace the defective tubes (Pl3-130, Pl3-140).

- Reinstall all elements. It is essential to check the direction of assembly of the tubes (see detail fig. SM5-6).

>> *Verify the airtightness of the air circuit ensemble, especially at the level of the T-shaped plastic (Pl3-120).*

- Position the support cone (Pl1-220) ad check that the flow rate measurement block in firmly secured (Pl1-260).

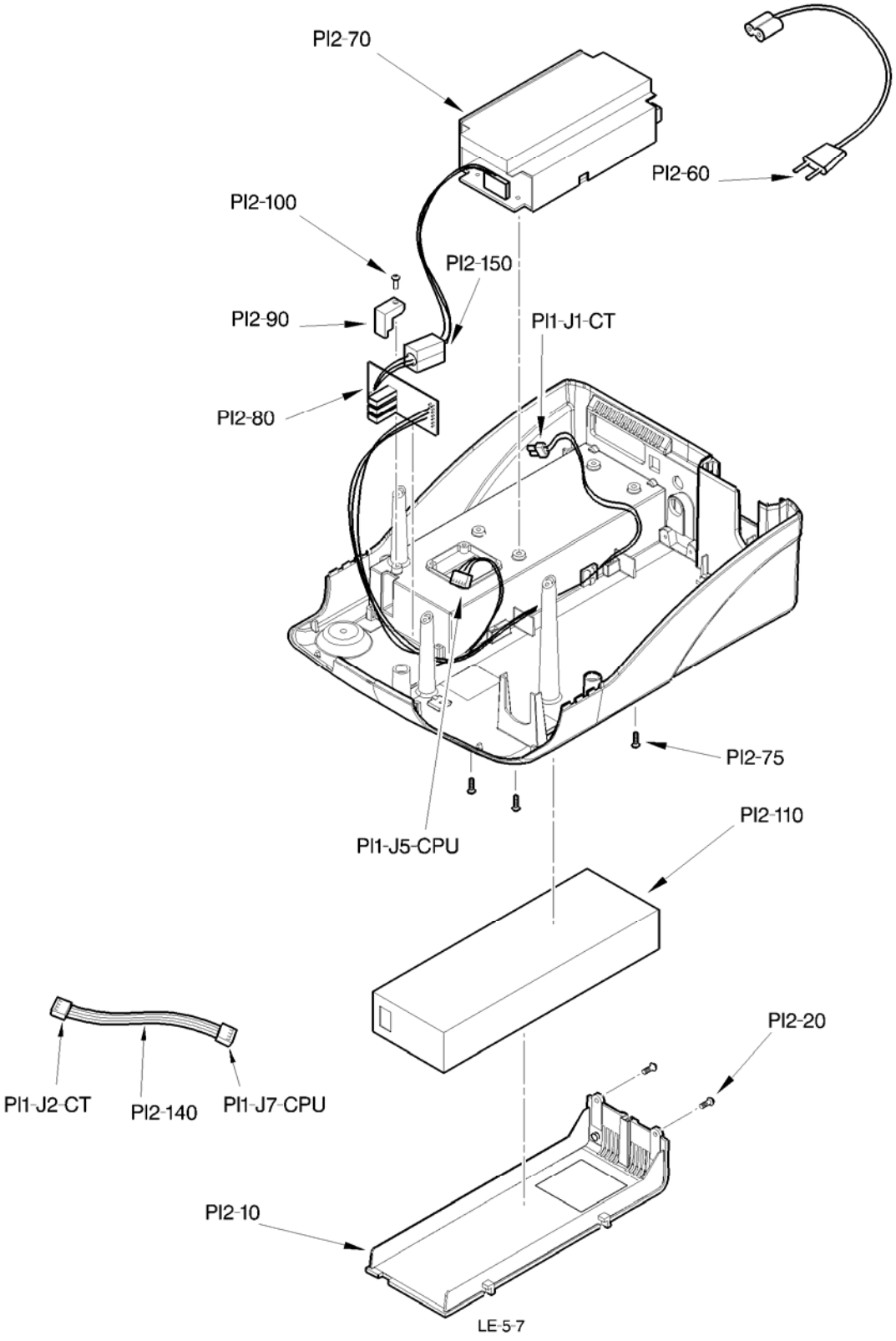
- Reinstall the CPU board (Pl1-120) with the three attachment screws (Pl1-130) (Torque 5 Nm max.)

>> *Reconnect the CPU board Pl1.**J5**.CPU to the power supply strand, Pl1.**J7**.CPU connected to Pl1.J2.CT and Pl1.**J1**.CPU connected to the fitted piezo solenoid valve.*

- Close the device again taking all necessary precautions (see procedure Chap II.4.2).

- Perform the final inspection procedures before putting back into service (Chap IV).

***Figure CP 5.7 – Power supply and other wiring circuit subassemblies***



## 2.7 REMOVAL / INSTALLATION OF POWER SUPPLY AND OTHER WIRING CIRCUIT SUBASSEMBLIES (FIG CP 5.7)

**Spare part reference:** ..... 3808600 : Battery cover and 2963500: Battery
……..3809100 : Switching board
…….3805600 : CPU/CT strand and 2961400: Mains cable

**Number of operator:** ..... 1.

**Special or specific tools:** ..... None.

**Preliminary operations:** ..... Make sure that the device is switched off. Clean the device before doing the work (Chap II.2.1).

- Remove the two attachment screws (Pl2.20) from the battery cover (Pl2-10), then extract it in order to access the battery (Pl2.110).

- Clear the cover away from its holding rails by pulling it towards the rear of the device.

- Remove the battery (Pl2.110).

- Replace the battery cover or the battery according to the element in question.

>> ***Faulty batteries should be disposed of according to environmental legislation in your country.***

- Check the position of all the elements and secure the cover by means of screw Pl2.20 (Cp 10 Nm maxi).

- Perform the final inspection procedures before putting back into service (Chap IV).

### *2.7.1 Removal / Installation of the switching board / power supply strand*

- Put the device in a clean and open environment.

- Open the device (see procedure Chap II.4.2).

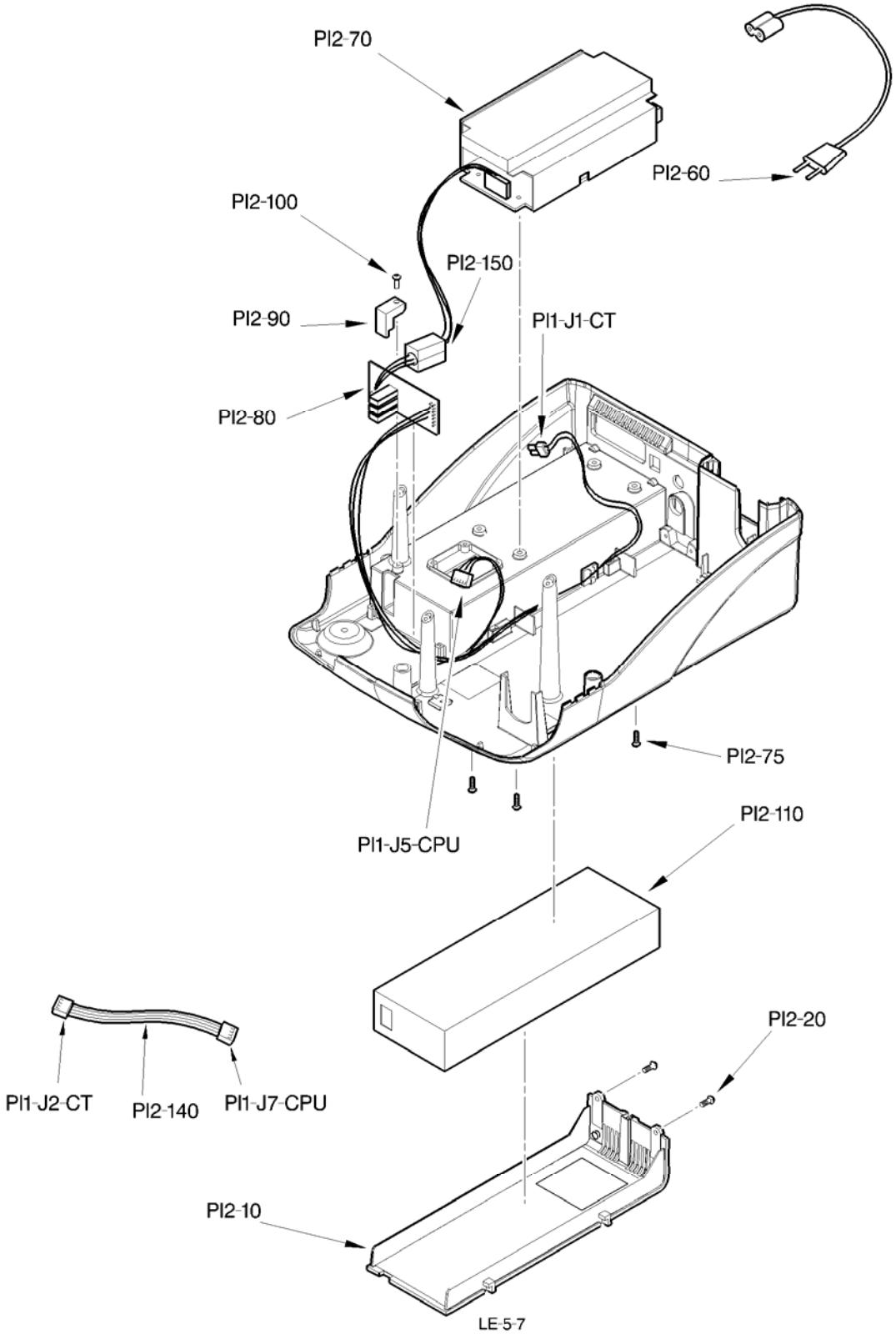
- For access reasons, extract the CPU board prior to any other intervention (Chap V.2.1).

- Remove the screw (Pl2.100) and the attachment stop (Pl2.90) to extract the switching board (Pl2.80).

- Disconnect the power supply cabling (Pl2-70), clear the strand from the ferrite and extract the switching board ensemble (Pl2.80).

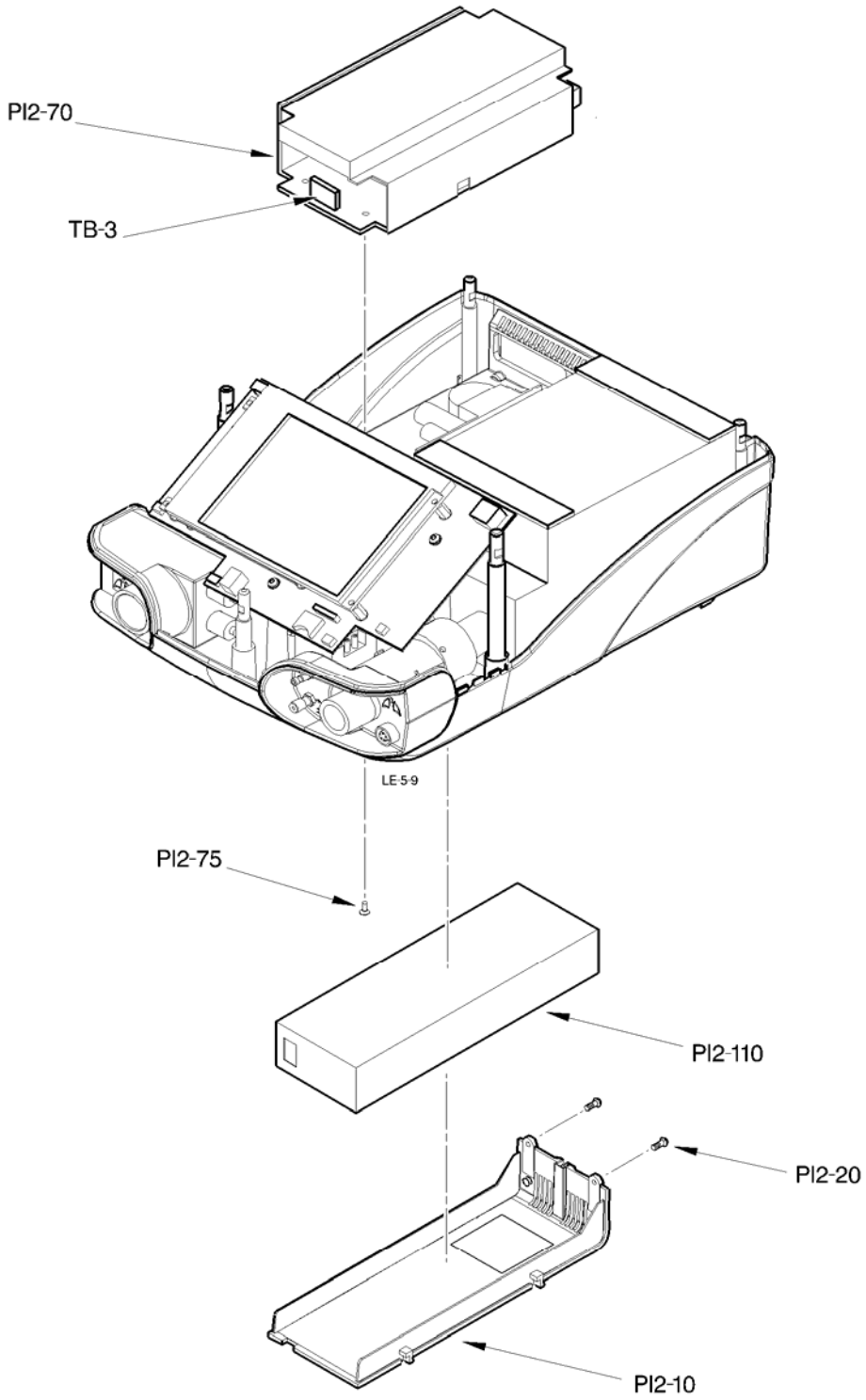
- Replace the switching board ensemble (Pl2.80) and position it in its housing.

***Figure CP 5.7 – Power supply and other wiring circuit subassemblies***



- Attach the attachment stop (Pl2.90) with the screw (Pl2.100).
- Replace the CPU board (Chap V.2.1).
- Close the device again taking all necessary precautions (see procedure Chap II.4.2).
- Perform the final inspection procedures before putting back into service (Chap IV).

***Figure CP 5.8 – Removal of the power supply***



## 2.8 REMOVAL / INSTALLATION OF THE POWER SUPPLY / 24V CHARGER (FIG CP 5.8)

**Spare part reference:** ..... 2964100 : Power supply / 24V Charger. from LEGENDAIR serial n° KXXXXXX)
..... 2967900 : Power supply 24V Push Pull (From LEGENDAIR serial N° KXXXXXX)

**Number of operator:** ..... 1.

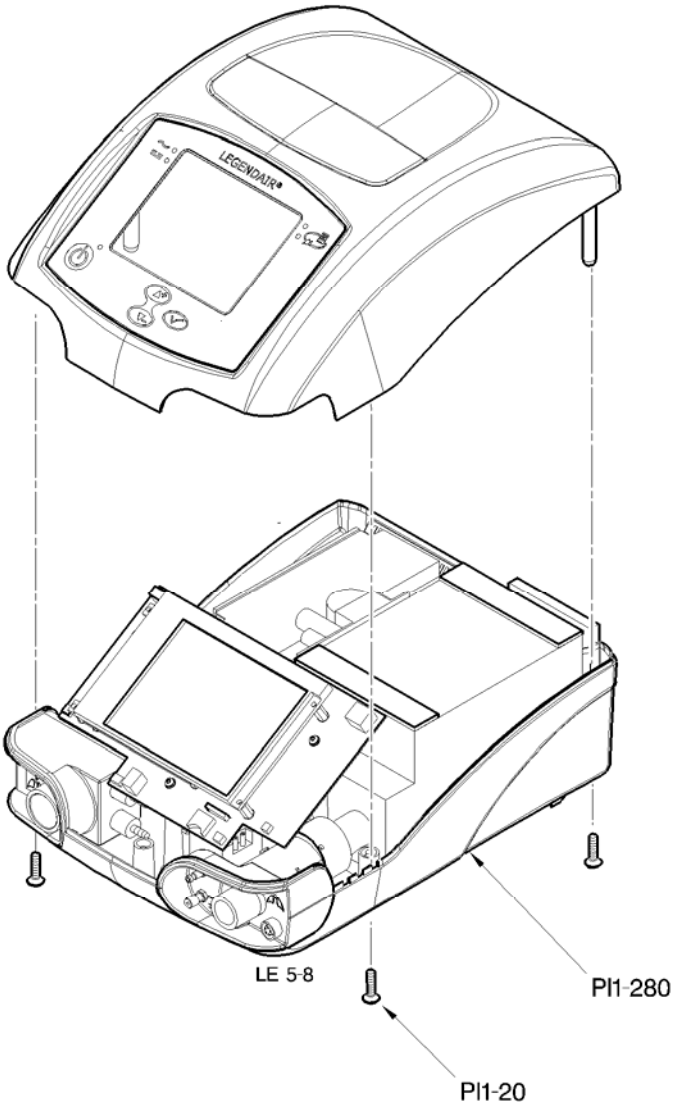
**Special or specific tools:** ..... None.

**Preliminary operations:** ..... Make sure that the device is switched off. Clean the device before doing the work (Chap II.2.1).

### *2.8.1 Removal / Installation*

- Put the device in a clean and open environment.
- Open the device (see procedure Chap II.4.2).
- Remove the both attachment screws (Pl2.20) from the battery cover (Pl2-10).
- Clear the cover away from its holding rails by pulling it towards the rear of the device.
- Extract the ensemble then remove the four attachment screws (Pl2-75) of the power supply (Pl2-70).
- Disconnect the cabling (Connector TB3).
- Replace the power supply (Pl2-70) and attach it with the four attachment screws (Pl2-75).
- Reconnect the cabling of the switching board (Connector TB3).
- Check the position of the battery and secure the cover by means of screw Pl2.20 (Cp 10 Nm maxi).
- Close the device again taking all necessary precautions (see procedure Chap II.4.2).
- Calibrate the sensors (Chap V-3-1).
- Perform the final inspection procedures before putting back into service (Chap IV).

***Figure CP 5.9 – Fitted LEGENDAIR casings***



## 2.9 REMOVAL / INSTALLATION OF THE CASINGS ENSEMBLE (FIG CP 5.9)

**Spare part reference:** ..... 3806399 : Fitted LEGENDAIR Casings

**Number of operator:** ..... 1.

**Special or specific tools:** ..... None.

**Preliminary operations:** ..... Make sure that the device is switched off. Clean the device before doing the work (Chap II.2.1).

### *2.9.1 Removal / Installation*

- Put the device in a clean and open environment.

- Carry out the ”Opening of the device” operation (CH II-4-2).

- Carry out the successive removal of different components (Chap V-2-1 to V-2-8).

- Reassemble the different elements following the instructions.

>> *The replacement of the identification label will be carried out by our after-sales service, upon request.*

- Close the device again taking all necessary precautions (see procedure Chap II.4.2).

- Calibrate the sensors (Chap V-3-1).

- Perform the final inspection procedures before putting back into service (Chap IV).

# 3. VERIFICATION, VALIDATION AND CALIBRATION PROCEDURE

## 3.1 CHECKING SENSORS AND CALIBRATION

### *3.1.1 Pressure sensor*

3.1.1.1 Operating check

- Switch the device on in Setup mode by simultaneously pressing the On/Off switch found at the rear of the machine (position "1" or ON") and keeping the key pressed until the menu appears on the screen.

- Place the cursor on the MAINTENANCE line.

- Validate by pressing the key. The MAINTENANCE menu should appear.

- Check correct operation of the sensor by connecting the patient outlet of the ***LEGENDAIR*** ® to the measurement device.

>> ***Use two T-unions in the machine outlet, one for the coupling of the endcap of the pressure reader and the second where the measurement device and a leak aperture (Ø 5mm) have been placed.***

- Place the cursor on line "Patient Pressure" press key : a 0 must appear opposite line "Patient Pressure".

- Again press key : a value of 40 should appear opposite line "Patient Pressure".

- Check the difference between values read on the measurement device and on the device (Patient Pressure) must be less than +/- 1 mbar.

>> *If not, do a calibration.*

- Switch the device Off.

3.1.1.2 Calibration of pressure sensor

- A calibration at zero and at 40 mbar is recommended for this sensor.

- Switch the device on in Setup mode by simultaneously pressing the On/Off switch found at the rear of the machine (position "1" or ON") and keeping the key pressed until the menu appears on the screen.

- Place the cursor on the MAINTENANCE line.

- Validate by pressing the key. The MAINTENANCE menu should appear.

- Use a T-union in the machine outlet or where the measurement device and a leak aperture (Ø 5mm) have been placed.

- Place the cursor on the line "Patient Pressure" then press the key, a validation beep should sound and a value of 0 should appear opposite the Patient Pressure line.

- Again press the key, a validation beep should sound and a value of 40 should appear opposite the Patient Pressure line. With the help of the and keys, adjust the value of pwm so that the pressure read on the manometer is equal to 40 mb +/- 0,2 mb.

- Keep the key pressed until you hear a beep.

- Switch the device Off.

### *3.1.2 Valve Pressure Sensor*

3.1.2.1 Operating check

- Switch the device on in Setup mode by simultaneously pressing the On/Off switch found at the rear of the machine (position "1" or ON") and keeping the key pressed until the menu appears on the screen.

>> The coupling of the piloting balloon must be in the open air.

- Place the cursor on the MAINTENANCE line.

- Validate by pressing the key. The MAINTENANCE menu should appear.

- Place the cursor on the line "Valve Pressure" and verify that the display indicates 0.0 to 0,2 mbar.

>> *If not, do a calibration.*

- Switch the device Off.

3.1.2.2 Calibration of valve pressure sensor

- A calibration at zero is recommended for this sensor.

- Switch the device on in Setup mode by simultaneously pressing the On/Off switch found at the rear of the machine (position "1" or ON") and keeping the key pressed until the menu appears on the screen.

- Place the cursor on the MAINTENANCE line.

- Validate by pressing the ✓ key. The MAINTENANCE menu should appear.

- Place the cursor on line "Valve Pressure" press key ✓: a 0 must appear opposite line "Valve Pressure".

- Press the ✓ key again until a sound is heard which validates the value.

- Switch the device Off.

### *3.1.3 Inspired Flow Sensor*

3.1.3.1 Operating check

- Switch the device on in Setup mode by simultaneously pressing the On/Off switch found at the rear of the machine (position "1" or ON") and keeping the key pressed until the menu appears on the screen.

- Place the cursor on the MAINTENANCE line.

- Connect the ventilation patient outlet to the measurement device using a tube of sufficient length and section.

>> ***No part should be placed in series between the ventilator and the measurement device during the operation so as not to introduce either leak or loss of supplementary charge.***

- Place the cursor on the line "Inspired flow" then press the key: a 0 will display opposite Inspired flow.

- Repeat the operation for calibration point : the flows indicated by the measurement device must be 5±0,5; 12±0,6; 37±1.9; 60±3; 90±4.5; 135±6.7 and 160±8l/min of the device reference flows.

>> *If not, do a calibration.*

- Switch the device Off.

3.1.3.2 Calibration of the inspired flow sensor

- Switch the device on in Setup mode by simultaneously pressing the On/Off switch found at the rear of the machine (position "1" or ON") and keeping the key pressed until the menu appears on the screen.

- Place the cursor on the MAINTENANCE line.

- Validate by pressing the ✓ key. The MAINTENANCE menu should appear.

- Connect the ventilation patient outlet to the measurement device using a tube of sufficient length and section.

>> No part should be placed in series between the ventilator and the measurement device during the operation so as not to introduce either leak or loss of supplementary charge.

- Put the cursor on the "Inspired flow" line and start a calibration sequence by pressing the ✓ key.

>> *The flow rate objectives to be calibrated are displayed in succession facing "Inspired Flow": 0 l/min, 5 l/min, 12 l/min, 37 l/min, 60 l/min, 90 l/min, 135 l/min and 160l/min.*

>> *On each calibration point the machine automatically adjusts the speed of the generator to reach the point to adjust.*

- Adjust the point of operation of the ventilator with the aid of the buttons ▲ or ▼ so that the flow rate value returned by the measurement device is as close as possible to the point to be calibrated, to within ± 0.2 l/min for each point.

- When the value measured is correct, validate the configuration of the ventilator by pressing the ✓ button until you hear a beep.

>> *Every calibration procedure undertaken must be carried out to its end, i.e. the validation of the 7 points of the flow rate curve.*

- Switch the device Off.

### *3.1.4 Expired flow sensor (double branch option)*

3.1.4.1 Operating check

- Couple the patient outlet of the ventilator to the female cone of the patient return, with the help of a Ø 22 mm tube.

- Switch the device on in Setup mode by simultaneously pressing the On/Off switch found at the rear of the machine (position "1" or ON") and keeping the ↺ key pressed until the menu appears on the screen.

- Place the cursor on the MAINTENANCE line.

- Validate by pressing the ✓ key. The MAINTENANCE menu should appear.

- Put the cursor onto line "Inspired flow", then press key .

- The interval between the values read on the line "Expired flow" and the line "Inspired flow" must be less than +/- 0,5 l/min.

>> *If not, do a calibration.*

- Switch the device Off.

3.1.4.2 Calibration of the expired flow sensor

- Couple the patient outlet of the ventilator to the female cone of the patient return, with the help of a Ø 22 mm tube.

- Switch the device on in Setup mode by simultaneously pressing the On/Off switch found at the rear of the machine (position "1" or ON") and keeping the key pressed until the menu appears on the screen.

- Place the cursor on the MAINTENANCE line.

- Validate by pressing the key. The MAINTENANCE menu should appear.

- Put the cursor onto line "Expired flow ", then press key .

>> *The sensor shall then be automatically calibrated with reference to the values measured by the previously calibrated inspired flow sensor.*

>> *In the event that the sensor is not calibrated or is badly calibrated, the unit sends several beeps. A technical default will be activated by the apparatus (See Chapter III).*

- Switch the device Off.

### *3.1.5 Sensor FiO2*

3.1.5.1 Operating check

- Couple a cell O2 COMEPA Mi Com 102-1 to the device.

- Switch the device on in Setup mode by simultaneously pressing the On/Off switch found at the rear of the machine (position "1" or ON") and keeping the key pressed until the menu appears on the screen.

- Place the cursor on the MAINTENANCE line.

- Validate by pressing the key. The MAINTENANCE menu should appear.

- Place the cursor on the line "FiO2" and verify that the display reads 21% +/- 1 %.

>> *If not, do a calibration.*

- Switch the device Off.

3.1.5.2 Calibrating the FiO2 sensor

- Switch the device on in Setup mode by simultaneously pressing the On/Off switch found at the rear of the machine (position "1" or ON") and keeping the key pressed until the menu appears on the screen.

- Place the cursor on the MAINTENANCE line.

- Validate by pressing the ✓ key. The MAINTENANCE menu should appear.

- Place the cursor on line « FIO2 », then press key ✓. The objective of the calibration "21%" blinks on the "FiO2" line.

After making sure that the sensor is indeed vented (not in an oxygen-enriched flow) for a period of 15 to 30 seconds, the point is validated by pressing the ✓ key; this validation will be confirmed by a beep.

>> *In the event that the sensor is not calibrated or is badly calibrated, the unit sends several beeps. A technical default will be activated by the apparatus (See Chapter III).*

- Switch the device Off.

## 3.2 CHECKING THE GENERAL CONDITIONS, THE AIR CIRCUIT AND ELECTRICAL CONNECTIONS

### *3.2.1 Checking the general mechanical conditions (attachment, ...)*

- Check that there are no general appearance defects on the device. Check that the support stands are present.

- Open the device (see procedure Chap II.4.2).

- Check that the elements assembly is properly fixed and that there are no bodies or parts of foreign elements moving in the device.

>> *If there is a vibration problem, also open the compartment to check the turbine box (condition of the foam...).*

- Replace damaged or broken elements.

- Close the device again taking all necessary precautions (see procedure Chap II.4.2).

### *3.2.2 Checking the air circuit*

- Open the device (see procedure Chap II.4.2).

- Verify the airtightness for each coupling situated on the flow laminator, the expiration support cone and the inspiration support cone.

>> *Do this by removing the tube (inside the Legendair) for the union to be checked, block the end piece and apply pressure at the union.*

>> *If the union leaks, replace it.*

- Similarly, check that the air is correctly routed in the flow rate measurement block to make sure that nothing is blocking it.

- Check that the tubes are in good condition (polyurethane, silicon) and properly attached.

>> *If one of the tubes is trapped, split or blocked, replace it.*

- Check the air routing from its exit from the turbine outlet.

>> *If the tube has come out of its position, put it back. If it is broken or split, replace it.*

- Close the device again taking all necessary precautions (see procedure Chap II.4.2).

### *3.2.3 Checking the attachment of electrical connections*

- Open the device (see procedure Chap II.4.2).

- For each connector on the CPU board and on the turbine control board, move the assembly to make sure that it is properly fixed and also check that there are no breaks (broken wire, socket torn off or unsoldered, ...).

>> *If it is, replace either the CPU / control board, or the element attached to the defective connector.*

- Close the device again taking all necessary precautions (see procedure Chap II.4.2).

## 3.3 CHECKING THE SUPPLY CIRCUIT / FUSES

- Before starting the investigation, check that mains power is present at the electrical connection. (Change outlets if necessary). Also check the condition of the circuit connections.

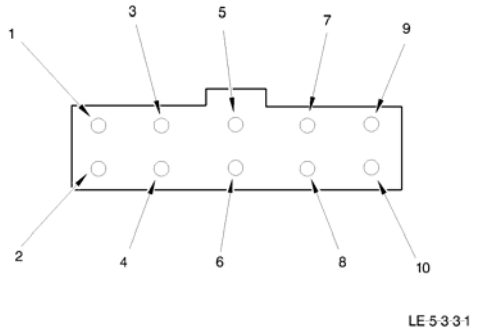
The check procedures described below contain simple instructions for failure investigations.

### *3.3.1 Checking the power supply*

- Verify the different outlet voltages on the power supply.

- Open the device (see procedure Chap II.4.2).

- Verify the outlet voltage + 24V on the Connector of the power supply/Charger with the help of a multimeter. Voltage + 24V between the pins 1 and 2 but also between 5 and 2.




>> *If it is not, replace the power supply.*

- Check that this same +24V voltage arrives at the CPU board connector Pl1.**J5**.CPU across pins 1 and 2. (See also the voltage of the CPU board), and the level of the turbine control board Pl1.**J1**.CT across pins 1 and 2. (See also the voltage at the CT board).

>> *If this is not the case, change the fitted switching board.*

### *3.3.2 Checking the Turbine control board fuse*

- Open the device.

- Use a multimeter to check the condition of the fuse on the Turbine control board.

>> *Also check their reference:* ***CMS 5A fuse.***

## 3.4 CHECKING THE INPUT/OUTPUT VOLTAGES: CPU BOARD, TURBINE CONTROL BOARD, AND 3V BATTERY

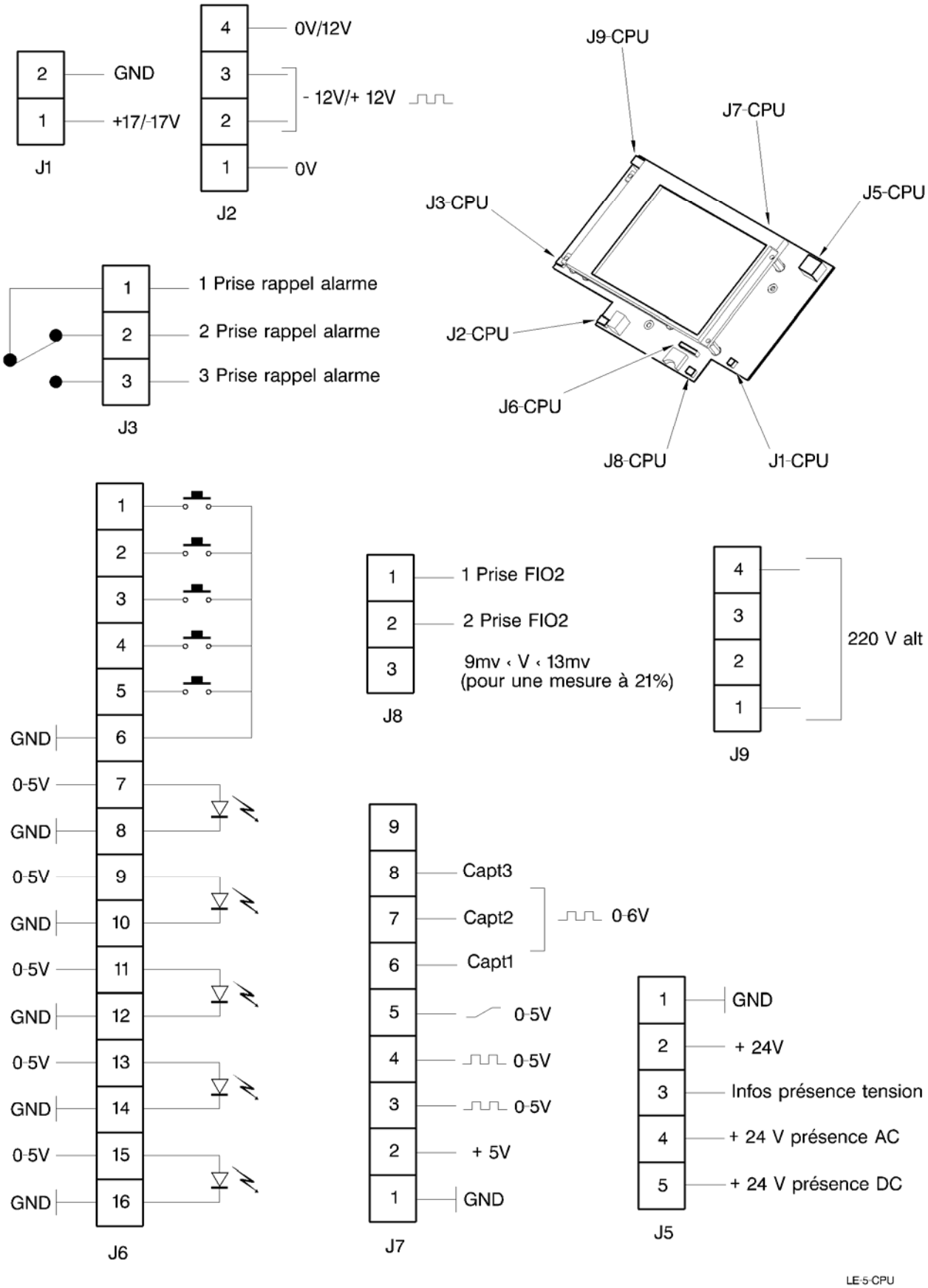
### *3.4.1 Checking the CPU board input/output voltages (levels)*

Each connector on the CPU board is connected to a peripheral element. The following table shows the correspondences between the connectors and the given elements:

| | | | |
|---|---|---|---|
| **J1** | Piezo solenoid valve | **J6** | Keypad |
| **J2** | RS232 | **J7** | Turbine control board |
| **J3** | Alarm signal | **J8** | FiO2 |
| **J5** | Power supply | **J9** | Neon Display |

Check that the available input/output voltages (levels) are correct for each connector (Measurement Instrument – multimeter).

These results will be helpful in investigating the defective element (CPU board / wiring or peripheral element).


2
1
GND
+17/-17V
J1
4
3
2
1
0V/12V
- 12V/+ 12V
0V
J2
1
2
3
1 Prise rappel alarme
2 Prise rappel alarme
3 Prise rappel alarme
J3
J9-CPU
J7-CPU
J5-CPU
J3-CPU
J2-CPU
J6-CPU
J8-CPU
J1-CPU
1
2
3
4
5
GND
6
0-5V
7
GND
8
0-5V
9
GND
10
0-5V
11
GND
12
0-5V
13
GND
14
0-5V
15
GND
16
J6
1
2
3
1 Prise FIO2
2 Prise FIO2
9mv ‹ V ‹ 13mv
(pour une mesure à 21%)
J8
4
3
2
1
220 V alt
J9
9
8
7
6
5
4
3
2
1
Capt3
Capt2
Capt1
0-6V
0-5V
0-5V
0-5V
+ 5V
GND
J7
1
2
3
4
5
GND
+ 24V
Infos présence tension
+ 24 V présence AC
+ 24 V présence DC
J5
LE-5-CPU

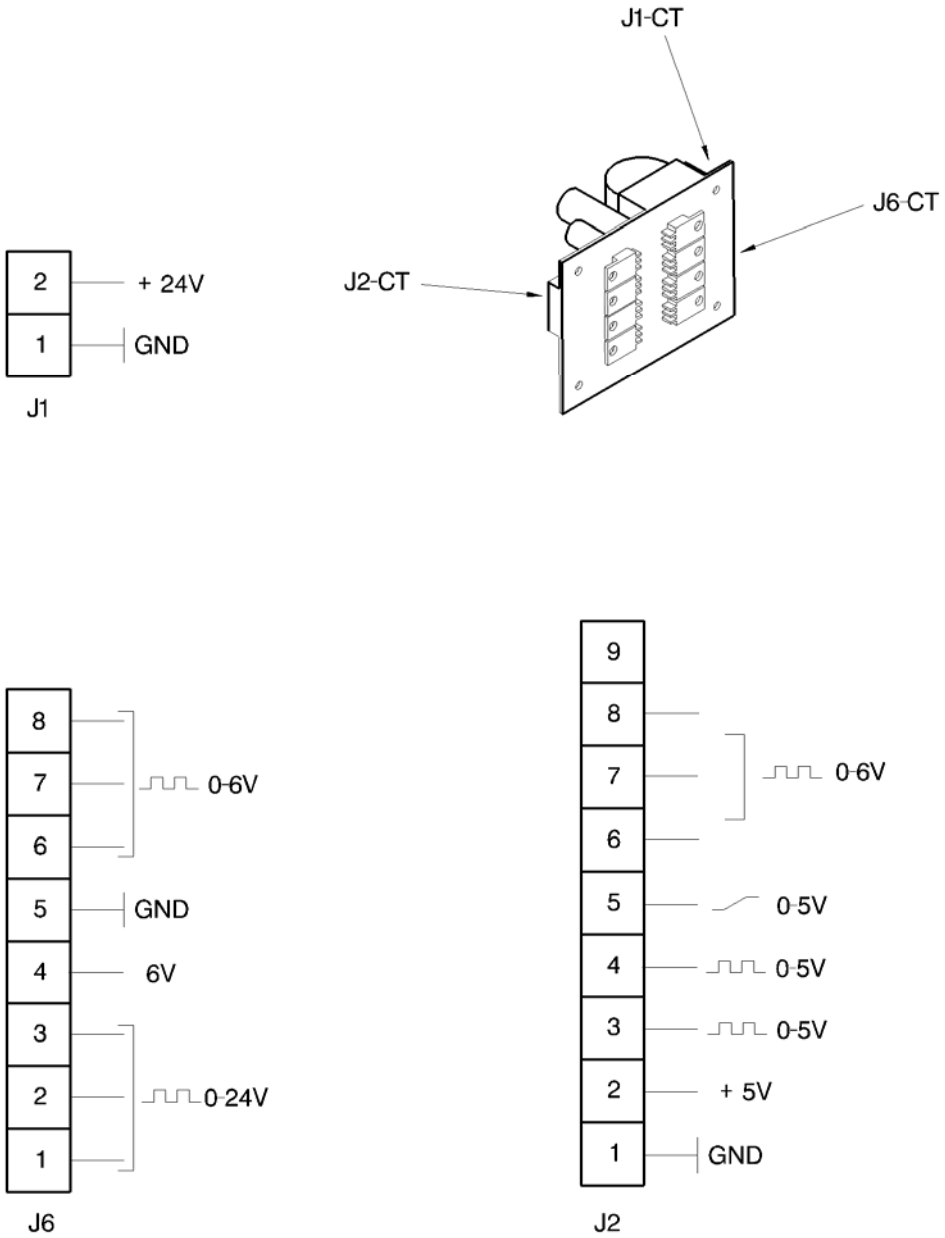
### *3.4.2 Checking the Turbine control board input/output voltages (levels)*

Each connector on the Turbine Control board (shown on the diagram as CT) is connected to a peripheral element. The following table shows the correspondences between the connectors and the given elements:

| | | | |
|---|---|---|---|
| **J1** | Power supply | **J6** | CPU board |
| **J2** | Turbine | | |

Check that the available input/output voltages (levels) are correct for each connector (Measurement Instrument – multimeter).

These results will be helpful in investigating the defective element (Turbine control board / wiring or peripheral element).


J1-CT
J6-CT
J2-CT
2
1
+ 24V
GND
J1
8
7
6
5
4
3
2
1
0-6V
GND
6V
0-24V
J6
9
8
7
6
5
4
3
2
1
0-6V
0-5V
0-5V
0-5V
+ 5V
GND
J2

LE-5-CT

### *3.4.3 Checking the 3V battery*

- Open the device.

- Remove the 3V battery and use a multimeter to check its condition (CPU board).

>> *Replace the 3V battery if its level is less than 2V.*

## 3.5 CHECKING THE KEYPAD / LEDS

### *3.5.1 Checking the keypad*

- Open the device.

- Disconnect the keypad (connector Pl1.**J6**.CPU) from the CPU board and check that it is operating correctly using a multimeter (continuity position).

- Do this by connecting the multimeter between pins 1 and 6, and press on the **ALARM INHIBITION** key on the keypad: the multimeter should validate the continuity of the circuit.

- Do this check for these keys: **+HAUT** = (pins 2-6), **-BAS** = (pins 3-6), **VALID V** (pins 4-6), and **I (M/A)** (pins 5-6.)

>> *Replace the keypad if the test is not correct.*

### *3.5.2 Checking the LEDs*

- Open the device.

- Disconnect the keypad (connector Pl1.**J6**.CPU) from the CPU board and use a multimeter (diode test position) to check the state of the LEDs.

- Do this by connecting the multimeter between pins 7 and 8: the multimeter should display a diode threshold.

- Also check this between pins 9 and 10, and 11 and 12, 13 and 14, 15 and 16.

>> *Replace the keypad if the test is not correct.*

**Parc d’activités Pau-Pyrénées**
**ZI de l’échangeur**
**64008 PAU CEDEX (FRANCE)**

Tel. 33.(0)5.59.14.02.02- Fax : (33.(0)5.59.14.02.00 - E-mail : contact@airox.fr

# Maintenance File
# *LEGENDAIR* ®

# Chapter 6 – Illustrated Catalog (Ed. B)

# CONTENTS



# LIST OF FIGURES

# 1. INTRODUCTION

## 1.1 GENERAL BREAKDOWN SYSTEM USED

The following principle is used for presentation of the descriptive articles list:

- *an assembly comprises all immediately lower components, the name of which is offset towards the right by one indent,*
- *a component forms part of an immediately higher assembly, the names of which are offset towards the left by one indent,*
- *attachment elements are shown immediately after the article that they are used to fix and before any of the components of the article, preceded by the term "Attachment parts" and followed by " * * * "*
- *the relation between the different elements is highlighted in the "NAME" column using the following system,*
- *this breakdown can continue as far as the 7$^{th}$ indent.*

Example:

1 2 3 4 5 6 7

Main assembly

* Attachment parts for the main assembly

* * *

* Components of the main assembly

* Assembly

* Attachment parts for the assembly

* * *

* * Components of the assembly

* * Sub-assembly

* * Attachment parts for the sub-assembly

* * *

* * * Components of the sub-assembly

* * * Subdivision of the sub-assembly

* * * Attachment parts for the subdivision

* * *

Mark 1 is not shown in any of the plates in the parts list.

The mark is preceded by a dash (-).

## 1.2 CREATING DIRECTORIES

### 1.2.1 Overview

Directories are used for logistics needs. They facilitate searches in the illustrated catalog, provide part identifications and fix distribution levels of "replenishment" articles that have to be procured, put into stock and distributed.

### 1.2.2 Alphanumeric list of manufacturer's references

The classification is made in increasing alphanumeric order of references from the left towards the right, each rank being taken separately.

The order of priority for each rank is as follows:

- *space,*
- *dash,*
- *letters from A to Z,*
- *numbers from 0 to 9.*

A manufacturer's reference can only begin with a letter or a number.

For repetitive articles:

- *the manufacturer reference and the designation of articles included in this parts list several times are only given once, however all other information is given,*
- *the reference and designation are repeated on the first line of each new page.*

## 1.3 HOW TO USE THE CATALOG

### 1.3.1 Part identification

Several cases can arise:

- *The part to be identified originates from a disassembly:*
  - find the corresponding plate, identify the part on the plate and note the mark assigned to the part,
  - then read the information on the text page adjacent to this mark.
- *Only the manufacturer's reference is known:*
  - find this reference in the alphanumeric list of manufacturer references,
  - then note the information for the reference, plate number and mark, adjacent to this reference.

### 1.3.2 Interchangeable parts

If two interchangeable articles may be used indifferently for the same purpose during manufacture, they are included in the illustrated catalog one after the other separated by the word "OR" on the line between them.

The interchangeable article is only shown on the plate if it includes a major difference.

### 1.3.3 Specification of article quantities

The " **QTY**" column is filled in for one immediately higher assembly.

Attachment elements are given for only one element.

### 1.3.4 Applicability

The applicability code is used to indicate if it is possible to install variants of the article on the immediately higher assembly.

When applicability is full, the "**APPL**." column is left blank.

This code consists of a variant letter associated with the mark of the assembly and article.

Example:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 01 | –1A | | | ASSEMBLY | 1 | | |
| | -1B | | | " | 2 | | |
| | –1C | | | " | 3 | | |
| | -10A | | | SUB–ASSEMBLY | 1 | | 1A |
| | -10B | | | " | 2 | | 1BC |

Article mark 10B is installed on assemblies 2 and 3, marks 1B and 1C. Article mark 10A can only be installed on assembly 1 mark 1A.

## 1.4 ABBREVIATIONS AND SPECIAL CODES

### 1.4.1 Abbreviations

- ***DET*** *Detail*
  *Cross reference to the breakdown plate or a document*
- ***EIS*** *Ensemble immédiatement supérieur (Immediately higher assembly)*
  *Cross-reference to the plate for the assembly*
- ***EI*** *Interchangeable*
- ***ND*** *Article not distributed in this quantity or article forming an After Sales kit (assembled)*
- ***NP*** *Non-procurable article*

- ***NI*** *Not illustrated*
- ***SB*** *Selon Besoin (As required)*
  *This abbreviation is made whenever it is impossible to define the quantity.*
- ***SR*** *Spécial Rechange (Special Spare Part)*
  *This abbreviation is used for an assembly of articles created specially to repair an assembly.*
- ***RF*** *Reference*
  *This abbreviation is used when the article was mentioned on a previous plate and it has to be repeated to facilitate understanding of how an assembly is composed.*

### 1.4.2 Coding system

- ***CBLXS*** *Wide pan head screw, TORX end*
- ***CL*** *Wide cylindrical head screw*
- ***CHC*** *Cylindrical hexagonal socket head screw*
- ***H*** *Hexagonal head screw*
- ***HM*** *Narrow hexagonal head screw*
- ***HU*** *Machined hexagonal head screw*
- ***STHC*** *Hexagonal grub screw*
- ***TCBL*** *Cylindrical head screw, TORX end*
- ***LU*** *Wide machined washer*
- ***MU*** *Average machined flat washer*
- ***ZU*** *Narrow machined flat washer*
- ***FX*** *Countersunk head screw, TORX end*

## 1.5 DIRECTORY OF MANUFACTURER'S DESIGNATIONS

| DESIGNATION | LOCATION | QTY. |
|---|---|---|
| ADHESIVE TRANSFER | 03 160A | 1 |
| DISPLAY LEGENDAIR | 01 100A | 1 |
| POWER SUPPLY / CHARGER 24V 3.3A or Power Supply PUSH PULL | 02 70A | 1 |
| TRUARC RING | 01 150A | 1 |
| FOAM STRIP (10-50) LEGENDAIR | 04 21A | 2 |
| FOAM STRIP (3-20) SMARTAIR | 04 20A | 2 |
| FOAM STRIP (5-30) | 04 30A | 2 |
| BATTERY LI-ION LEGENDAIR | 02 110A | 1 |
| EXPIRATION BLOCK DOUBLE BRANCH | 01 180A | 1 |
| CAPTIVE KNURLED KNOB | 01 160A | 1 |
| ADHESIVE STOP Dia 9.5 Ep 3.8 | 02 130A | 2 |
| SWITCHING BOARD STOP | 02 90A | 1 |
| MASKED HOUSING SIMPLE BRANCH | 01 185A | 1 |
| TURBINE BOX | 04 10A | 1 |
| FITTED TURBINE BOX | 01 50A | 1 |
| TURBINE BOARD CDE LEGENDAIR or Filtered control motor board | 01 60A | 1 |
| CABLED SWITCHING BOARD | 02 80A | 1 |
| CPU BOARD LEGENDAIR | 01 120A | 1 |
| SILICONE VALVE | 03 30A | 2 |
| KEYPAD LEGENDAIR | 01 30A | 1 |
| SELF-ADHESIVE PIPE COLLAR | 02 30A | 5 |
| CONE 22 PORTE VALVE | 03 10A | 1 |
| LOWER CASING LEGENDAIR | 01 280A | 1 |
| UPPER CASING LEGENDAIR | 01 10A | 1 |
| FITTED CASINGS LEGENDAIR | 01 350A | 1 |
| BATTERY COVER | 02 10A | 1 |
| FITTED PIEZO SOLENOID VALVE | 01 140A | 1 |
| FITTED PIEZO SOLENOID VALVE | 03 150A | 1 |
| ENDCAP O2 MALE | 01 340A | 1 |
| BALLOON PILOTING ENDCAP | 01 230A | 1 |
| NYLON SPACER LG 5 or HEXAGONAL Sapcer M/F M3 Lg 5 | 01 90A | 4 |
| AIR INLET LABEL | 01 290A | 1 |
| IDENTIFICATION LABEL | 01 270A | 1 |
| BATTERY ASSEMBLY LABEL LEGENDAIR | 02 120A | 1 |
| LABEL PSDE | 01 300A | 1 |
| ROUND FERRITE 34-23-19 CABLE | 02 150A | 1 |
| AIR INLET FILTER | 01 310A | 1 |
| AIR FLOW LEGENDAIR ® | 01 260A | 1 |
| PIN GO5 3-12 INOX | 03 60A | 2 |

| DESIGNATION | LOCATION | QTY. |
|---|---|---|
| O-RING 1.6-22.1 | 03 40A | 4 |
| FLOW LAMINATOR LEGENDAIR | 03 180A | 1 |
| BIPOLAR MAINS OUTLET CABLE | 02 60A | 2 |
| SELF-ADHESIVE BASE 12,7x12,7 EP. 5,8 | 01 170A | 4 |
| THERMAL CONDUCTION PLATE | 04 40A | 1 |
| HANDLE | 01 40A | 1 |
| THREADED JOINT 10-32 (dia. Int. 1/8) | 03 70A | 2 |
| FLOW MEASUREMENT JOINT | 03 90A | 1 |
| JOINT O2 FEMALE WITH VALVE | 01 330A | 1 |
| JOINT PRESSURE FEMALE | 01 210A | 2 |
| JOINT PRESSURE MALE | 01 240A | 1 |
| WASHER GROWER D3 | 01 80A | 4 |
| SUPPORT VALVE ANTI-RETURN | 03 50A | 1 |
| SUPPORT VALVE SPONTANEOUS RESPIRATION | 03 110A | 1 |
| SUPPORT CONE EXPIRATION | 01 200A | 1 |
| SUPPORT CONE INSPIRATION | 01 220A | 1 |
| VENTILATION SIEVE | 03 100A | 1 |
| T-SHAPED PLASTIC D1.5 | 03 120A | 1 |
| MAINTENANCE VALVE LUG | 03 20A | 1 |
| STRAND CPU/CDE TURBINE 9brs/9brs | 02 140A | 1 |
| STRAND PIEZO SOLENOID VALVE | 03 170A | 1 |
| STRAND OUTLET FIO2 | 01 250A | 1 |
| STRAND ALARM REMINDER | 01 320A | 1 |
| STRAND SUB D 9BRS | 02 40A | 1 |
| CROSSPIECE OF FLUTED PARTITION | 01 190A | 2 |
| POLYURETHANE TUBE | 03 130A | 1 |
| SILICONE TUBE (15-21) | 03 80A | 1 |
| SILICONE TUBE 3-6 | 03 140A | 1 |
| SCREW | 01 110A | 8 |
| SCREW CBL M6,5-8 | 02 50A | 2 |
| SCREW TCB D 3,5x8 HEXALOBES | 01 130A | 3 |
| SCREW TCB D 3,5x8 HEXALOBES | 02 100A | 1 |
| SCREW TCB M3x10 HEXALOBES | 01 70A | 4 |
| SCREW TF M3-8 HEXALOBES | 02 20A | 2 |
| SCREW TF M3-8 HEXALOBES | 02 75A | 4 |
| SCREW TF M4X10 HEXALOBES | 01 20A | 7 |

## 1.6 LIST OF AFTER SALES REFERENCES MARKETED IN KIT (/ASSEMBLED)

| DESIGNATION | LOCATION | AFTER SALES REF. |
|---|---|---|
| **Fitted casings LEGENDAIR** | 01 | **3808399** |
| * Upper casing LEGENDAIR | 01 10A | |
| * Screw TFM4-10 | 01 20A | |
| * Keypad LEGENDAIR | 01 30A | 3808900 |

| DESIGNATION | LOCATION | AFTER SALES REF. |
|---|---|---|
| * Handle | 01 40A | |
| * Truarc ring | 01 150A | |
| * Captive knurled knob | 01 160A | |
| * Self-adhesive bases 12,7x12,7 Ep.5,8 | 01 170A | |
| * Lower casing LEGENDAIR | 01 280A | |
| * Air inlet label | 01 290A | |
| * Label PSDE | 01 300A | |
| * Battery cover | 02 10A | |
| * Screw TFM3-8 | 02 20A | |
| * Battery assembly Label | 02 120A | |
| * Adhesive stop | 02 130A | |
| **Fitted upper casing LEGENDAIR** | 01 10A | **3808499** |
| **Flow Laminator LEGENDAIR** | | **3812099** |
| * Cone 22 valve portal | 03 10A | |
| * Maintenance valve lug | 03 20A | |
| * Silicone valve | 03 30A | |
| * O-ring D1.6 – 22.1 | 03 40A | |
| * Support valve anti-return | 03 50A | |
| * Pin G 05 3-12 | 03 60A | |
| * Threaded joint 10-32 | 03 70A | |
| * Silicone tube (15-21) | 03 80A | |
| * Flow measurement joint | 03 90A | |
| * Ventilation sieve | 03 100A | |
| * Support valve spontaneous respiration | 03 110A | |
| * Silicone tube 3-6 | 03 120A | |
| **Fitted turbine box LEGENDAIR** | | **3806499** |
| * Turbine box LEGENDAIR | 04 10A | |
| * Foam strip (3-20) SMARTAIR Plus | 04 20A | |
| * Foam strip (10-50) LEGENDAIR | 04 21A | |
| * Foam strip (5-30) | 04 30A | |
| * Thermal conduction plate | 04 40A | |
| **Fitted piezo solenoid valve** | 03 150A | **3811700** |
| * Piezo solenoid valve strand | 03 170A | |
| * Silicone tube 3-6 | 03 140A | |
| * Polyurethane tube | 03 130A | |
| * T-shaped plastic | 03 120A | |
| * Adhesive transfer | 03 160A | |

## 2. DETAILED PARTS LIST

*(see below.)*

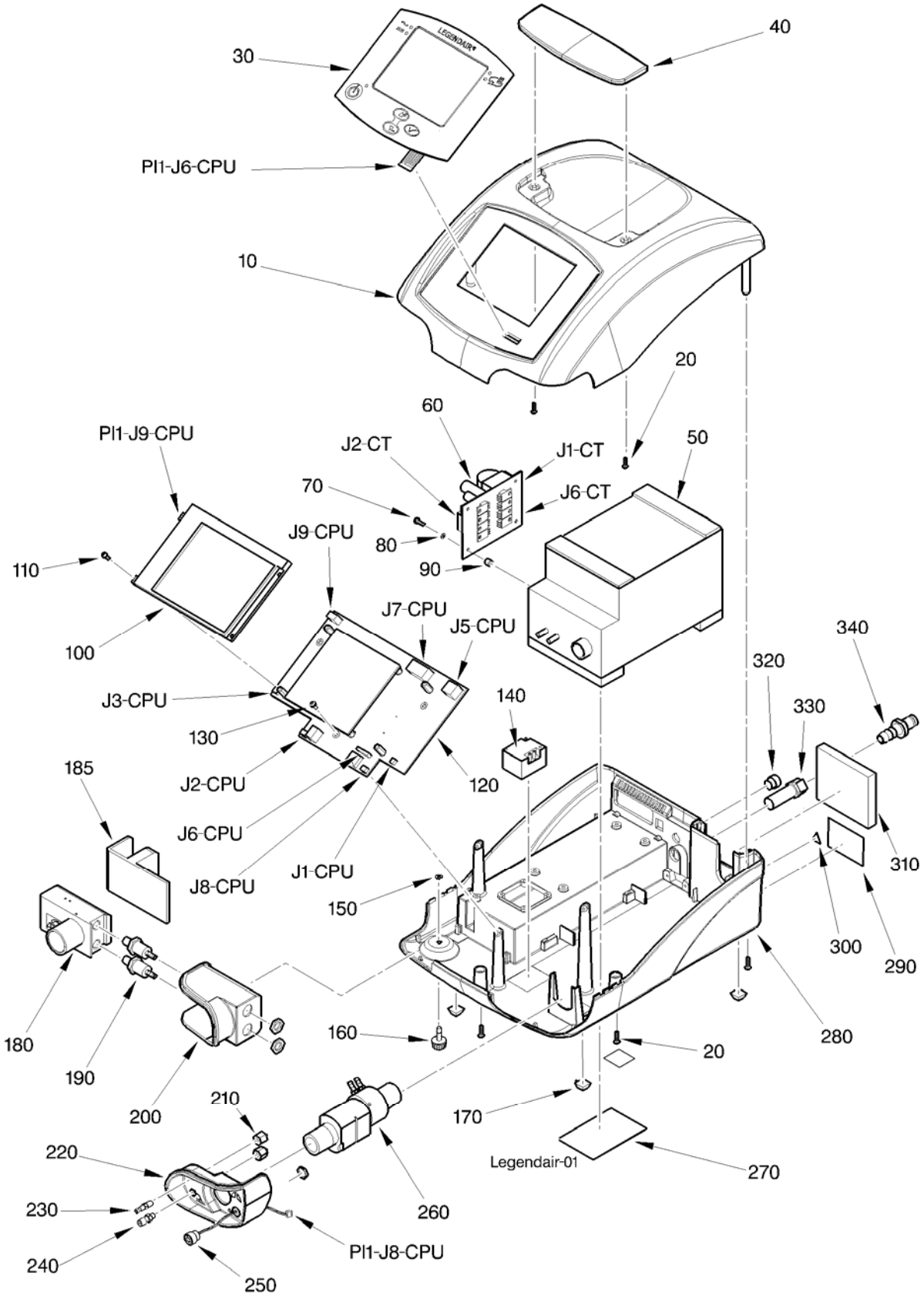



**PLATE 01 - LEGENDAIR ®**

| PL. MARK | MAN. CODE | REFERENCE | DESIGNATION<br>1234567 | QTY. | APPL. |
|---|---|---|---|---|---|
| 01 - 1A | | 4095700 | LEGENDAIR ® | RF | |
| 10A | | 3808499 | .FITTED UPPER CASING LEGENDAIR<br>*Attachment parts* | 1 | |
| 20A | | *ND* | .SCREW TF M4X10 HEXALOBES<br>* * * | 7 | |
| 30A | | 3808900 | .KEYPAD LEGENDAIR | 1 | |
| 40A | | *ND* | .HANDLE | 1 | |
| 50A | | 3806499 | .FITTED TURBINE BOX<br>SEE DETAIL 04-1A * * * | 1 | |
| 60A | | 3812700 | .FILTERED CONTROL LOTOR BOARD<br>*Attachment parts* | 1 | |
| 70A | | *ND* | .SCREW TCB M3x10 HEXALOBES | 4 | |
| 80A | | *ND* | .WASHER GROWER D3 | 4 | |
| 90A | | *ND* | .NYLON SPACER LG 5<br>* * * | 4 | |
| 100A | | 3810900 | .DISPLAY LEGENDAIR<br>*Attachment parts* | 1 | |
| 110A | | *NP* | .SCREW<br>* * * | 8 | |
| 120A | | 3811600 | .CPU BOARD LEGENDAIR<br>*Attachment parts* | 1 | |
| 130A | | *ND* | .SCREW TCB D 3,5x8 HEXALOBES<br>* * * | 3 | |
| 140A | | 3811700 | .FITTED PIEZO SOLENOID VALVE<br>SEE DETAIL 03-150A * * * | 1 | |
| 150A | | *ND* | .TRUARC RING | 1 | |
| 160A | | *ND* | .CAPTIVE KNURLED KNOB | 1 | |
| 170A | | *ND* | .SELF-ADHESIVE BASE 12,7x12,7 EP. 5,8 | 4 | |
| 180A | | 3809999 | .EXPIRATION BLOCK DOUBLE BRANCH | 1 | |
| 185A | | 3809800 | .MASKED HOUSING SIMPLE BRANCH | 1 | |
| 190A | | *ND* | .CROSSPIECE OF FLUTED PARTITION | 2 | |
| 200A | | *ND* | .SUPPORT CONE EXPIRATION | 1 | |
| 210A | | *ND* | .PRESSURE JOINT FEMALE | 2 | |
| 220A | | *ND* | .SUPPORT CONE INSPIRATION | 1 | |
| 230A | | *ND* | .BALLOON PILOTING ENDCAP | 1 | |
| 240A | | *ND* | .PRESSURE JOINT MALE | 1 | |
| 250A | | 3809500 | .STRAND OUTLET FIO2 | 1 | |
| 260A | | | .AIR FLOW AIR LEGENDAIR ®<br>SEE DETAIL 03-01A | 1 | |
| 270A | | *NP* | .IDENTIFICATION LABEL | 1 | |
| 280A | | *ND* | .LOWER CASING LEGENDAIR | 1 | |
| 290A | | *ND* | .AIR INLET LABEL | 1 | |
| 300A | | *ND* | .LABEL PSDE | 1 | |
| 310A | | 3804800 | .AIR INLET FILTER | 1 | |
| 320A | | 3809600 | .STRAND ALARM REMINDER | 1 | |
| 330A | | 2962600 | .JOINT O2 FEMALE WITH VALVE | 1 | |
| 340A | | 2962700 | .ENDCAP O2 MALE | 1 | |
| - 350A | | 3806399 | .FITTED CASINGS LEGENDAIR | | |
| | | 3818099 | ROUND UNDER CASING EQUIPED | 1 | |

(-) NOT ILLUSTRATED

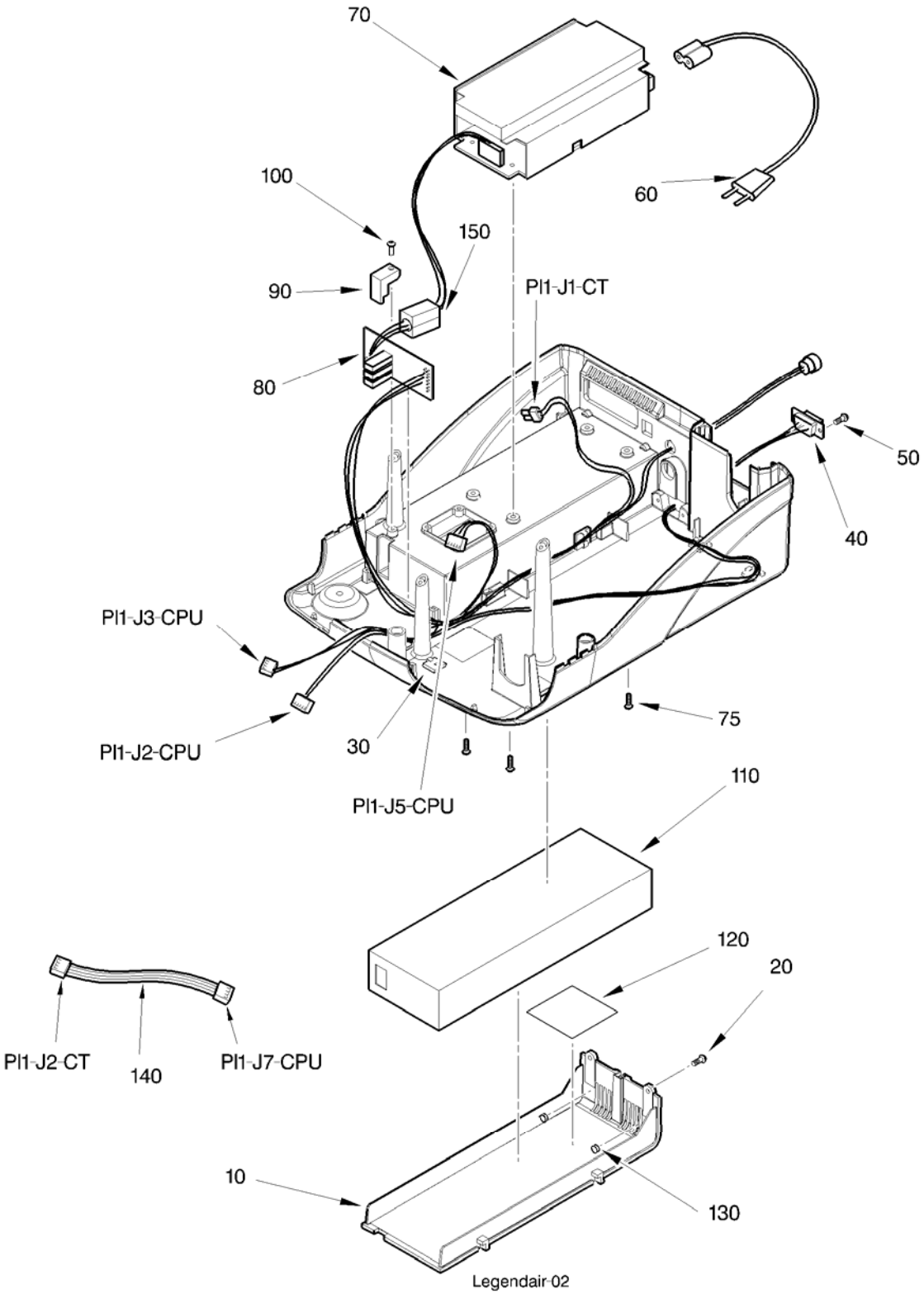



**PLATE 02 - LEGENDAIR ® (CON'T)**

| PL. MARK | MAN. CODE | REFERENCE | DESIGNATION<br>1234567 | QTY. | APPL. |
|---|---|---|---|---|---|
| 02 - 1A | | 4095700 | LEGENDAIR ®<br>(CON'T) | RF | |
| 10A | | 3808600 | .BATTERY COVER<br>*Attachment parts* | 1 | |
| 20A | | *ND* | .SCREW TF M3-8 HEXALOBES<br>* * * | 2 | |
| 30A | | *ND* | .SELF-ADHESIVE PIPE COLLAR | 5 | |
| 40A | | 3809200 | .STRAND SUB D 9BRS<br>*Attachment parts* | 1 | |
| 50A | | *ND* | .SCREW CBL M6,5-8<br>* * * | 2 | |
| 60A | | 2961400 | .BIPOLAR MAINS OUTLET CABLE | 1 | |
| 70A | | 2964100 | .POWER SUPPLY / CHARGER 24V 3.3A | 1 | |
| | | OR 2967900 | OR POWER SUPPLY 24V PUSH PULL<br>*Attachment parts* | | |
| 75A | | *ND* | .SCREW TF M3-8 HEXALOBES<br>* * * | 4 | |
| 80A | | 3809100 | .CABLED SWITCHING BOARD<br>*Attachment parts* | 1 | |
| 90A | | *ND* | .SWITCHING BOARD STOP | 1 | |
| 100A | | *ND* | .SCREW TCB D 3,5x8 HEXALOBES<br>* * * | 1 | |
| 110A | | 2963500 | .BATTERY LI-ION MOLTECH LEGENDAIR<br>OR BATTERY LI-ON SAFT | 1 | |
| 120A | | *ND* | .BATTERY ASSEMBLY LABEL<br>LEGENDAIR | 1 | |
| 130A | | *ND* | .ADHESIVE STOP Dia 9.5 Ep 3.8 | 2 | |
| 140A | | 3805600 | .STRAND CPU/CDE OF TURBINE<br>9brs/9brs | 1 | |
| 150A | | *ND* | .ROUND FERRITE 34-23-19 CABLE | 1 | |

(-) NOT ILLUSTRATED

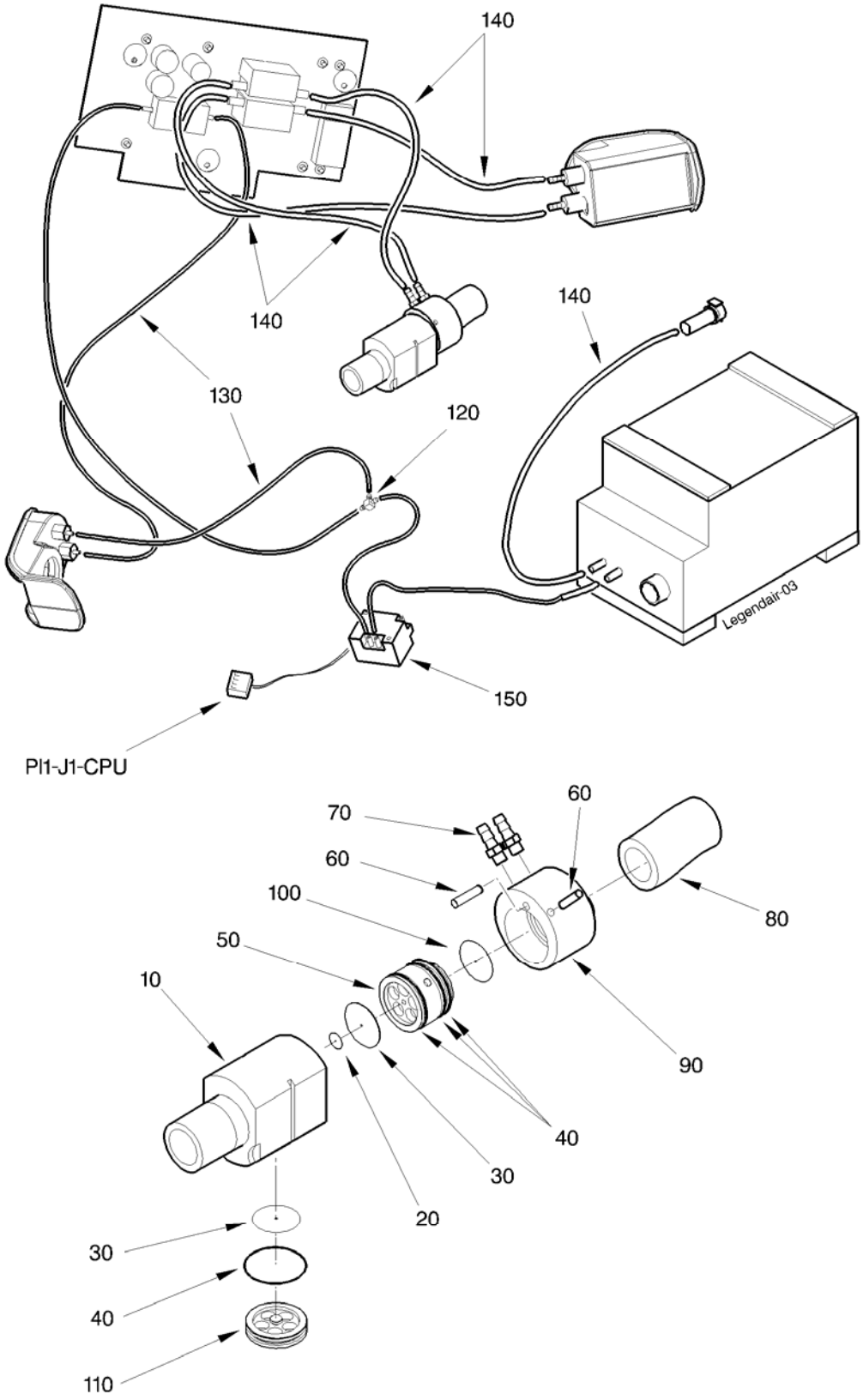



**PLATE 03 – AIR FLOW LEGENDAIR ®**

| PL. MARK | MAN. CODE | REFERENCE | DESIGNATION<br>1234567 | QTY. | APPL. |
|---|---|---|---|---|---|
| 03 - 1A | | | AIR FLOW LEGENDAIR ®<br>SEE EIS 01-260A | RF | |
| 10A | | *ND* | .CONE 22 VALVE PORTAL | 1 | |
| 20A | | *ND* | .MAINTENANCE VALVE LUG | 1 | |
| 30A | | *ND* | .SILICONE VALVE | 2 | |
| 40A | | *ND* | .O-RING 1.6-22.1 | 4 | |
| 50A | | *ND* | .SUPPORT VALVE ANTI-RETURN | 1 | |
| 60A | | *ND* | .PIN GO5 3-12 INOX | 2 | |
| 70A | | *ND* | .THREADED JOINT 10-32 (dia. Int. 1/8) | 2 | |
| 80A | | *ND* | .SILICONE TUBE (15-21) | 1 | |
| 90A | | *ND* | .FLOW MEASUREMENT JOINT | 1 | |
| 100A | | *ND* | .VENTILATION SIEVE | 1 | |
| 110A | | *ND* | .SUPPORT VALVE SPONTANEOUS RESPIRATION | 1 | |
| 120A | | *ND* | .T-SHAPED PLASTIC D1.5 | 1 | |
| 130A | | *ND* | .POLYURETHANE TUBE | 1 | |
| 140A | | *ND* | .SILICONE TUBE 3-6 | 1 | |
| 150A | | 3811700 | .FITTED PIEZO SOLENOID VALVE<br>Attachment parts | 1 | |
| - 160A | | *ND* | .ADHESIVE TRANSFER<br>* * * | 1 | |
| - 170A | | *ND* | .STRAND PIEZO SOLENOID VALVE | 1 | |
| - 180A | | 3812099 | .FLOW LAMINATOR LEGENDAIR | 1 | |
| - | | | | | |
| - | | | | | |

(-) NOT ILLUSTRATED

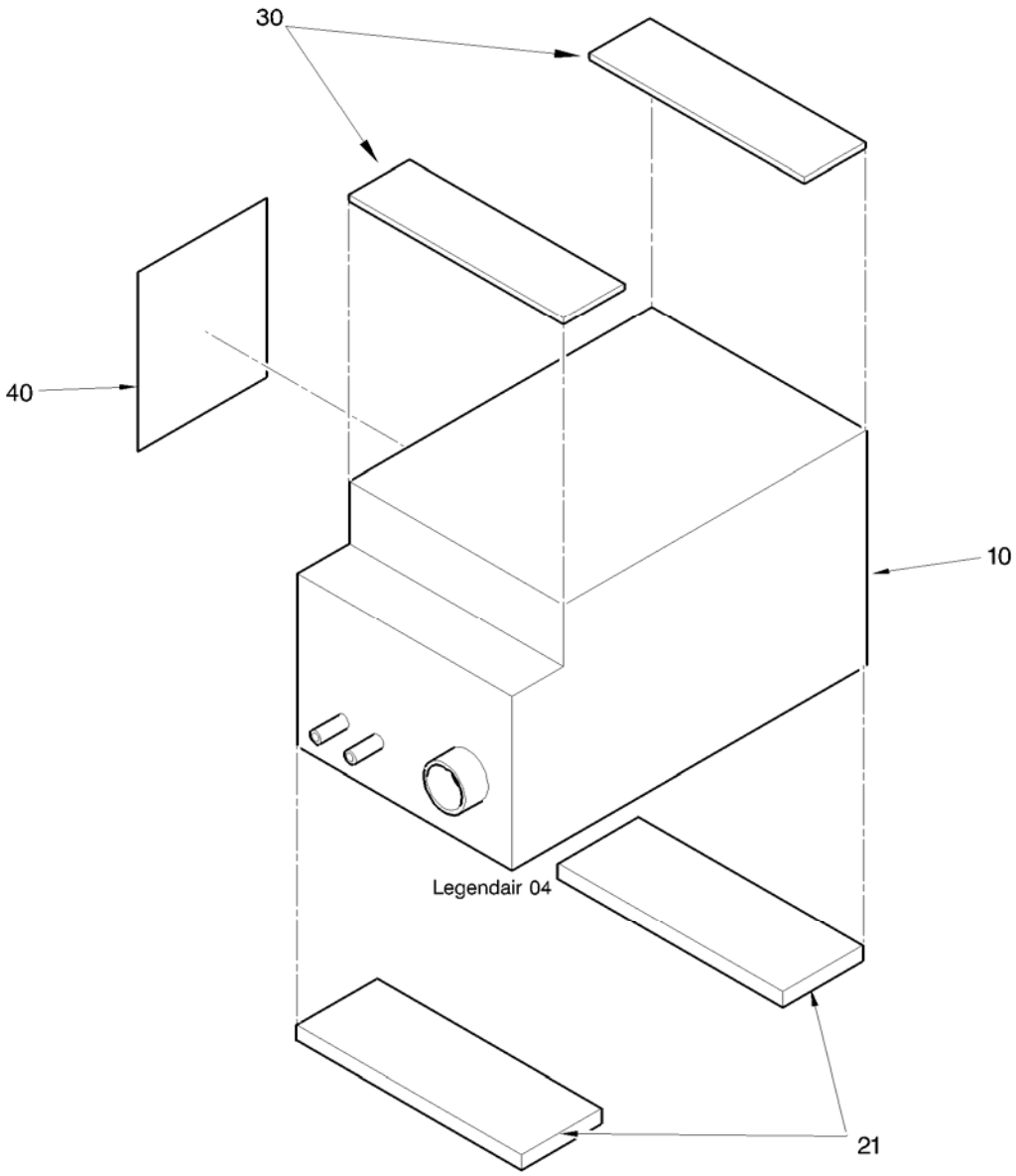


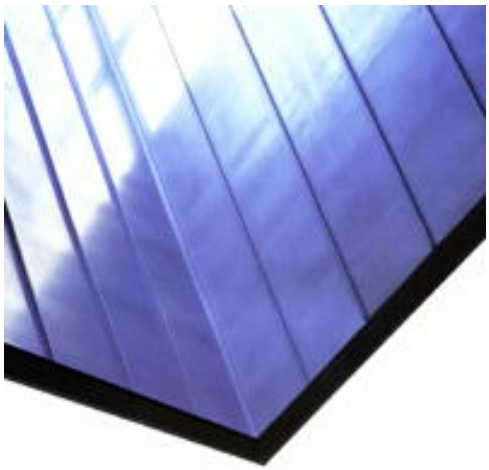

**PLATE 04 – FITTED TURBINE BOX LEGENDAIR**

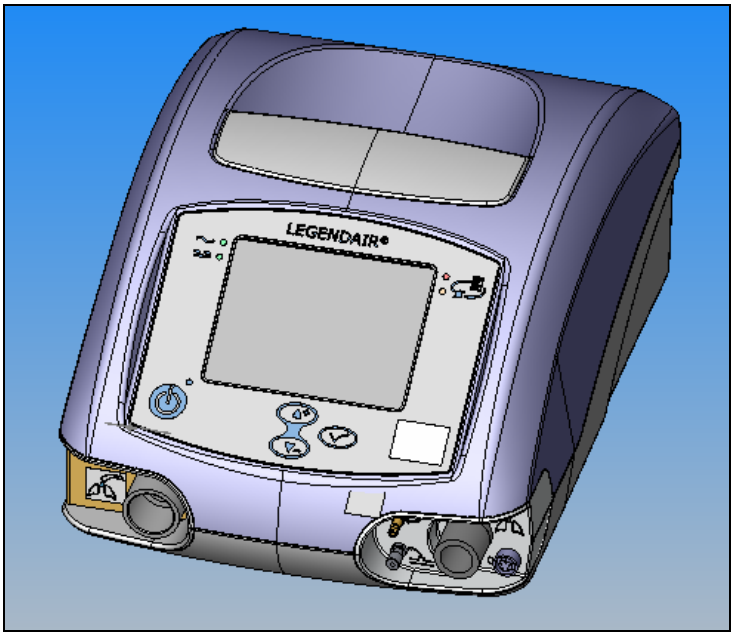
| PL. MARK | MAN. CODE | REFERENCE | DESIGNATION<br>1234567 | QTY. | APPL. |
|---|---|---|---|---|---|
| 04 - 1A | | 3806499 | FITTED TURBINE BOX LEGENDAIR<br>SEE EIS 01-140A | RF | |
| 10A | | *ND* | .TURBINE BOX | 1 | |
| - 20A | | *ND* | .FOAM STRIP(3-20) SMARTAIR PLUS | 2 | |
| 21A | | *ND* | .FOAM STRIP(10-50) LEGENDAIR | 2 | |
| 30A | | *ND* | .FOAM STRIP(5-30) | 2 | |
| 40A | | *ND* | .THERMAL CONDUCTION PLATE | 1 | |
| - 50A | | *ND* | BANDE MOUSSE (5-30) Lg 100 | 1 | |

(-) NOT ILLUSTRATED

Parc d’activités Pau-Pyrénées
ZI de l’échangeur
64008 PAU CEDEX (FRANCE)

Tel. : 33.(0)5.59.14.02.02- Fax : (33.(0)5.59.14.02.00 - E-mail : contact@airox.fr






# *MAINTENANCE FILE:*

# *LEGENDAIR ®*

# MODIFICATION MANAGEMENT

| Approval of revision of the ***LEGENDAIR*** ® Index B | | | |
|---|---|---|---|
| | **Name** | **Function** | **Signature** |
| **Made by**: | JM TOLDI | After Sales Manager | |
| **Verified or Approved by:** | ALAIN SOUBRA | General Manager | |

| Revision | Validity/application date | Nb of pages | Nb of appended pages | Subject and description of the modification |
|---|---|---|---|---|
| A | 03/2004 | | | Creation of the documentation |
| B | 02/2006 | | | Update from ADM n°05/12/54 include |
| | | | | |

# INSPECTION SHEET
# LEGENDAIR

| | |
|---|---|
| **Service Request Number :** | **Date :** |
| **Serial Number :** | **Ventilator Hours :** |
| **Software :** | **Customer Asset ID # :** |

| **DOCUMENTS / APPEARANCE** | **Result √** | **Comments** |
|---|---|---|
| Verification of work sheet | | |
| General appearance inspection: filter, fastenings, bases | | |
| Labels (air inlet + identification + O2). | | |

| **ELECTRICAL SAFETY** | **Result √** | **Comments** |
|---|---|---|
| METRON Check class II BF | | |

| **POWER SUPPLIES** | **Result** | **Comments** |
|---|---|---|
| Verification power voltage from mains 24.5 V ± 1.5 V | V | |
| Verification of 5 V ± 0.5 V CPU voltage | V | |
| Verification of Watchdog 25 V ± 2 V voltage | V | |
| Verification power voltage from external power 24 V ± 1.5 V | V | |
| Verification battery voltage 29 V ± 1V and battery symbol | V | |
| Buzzer 1 voltaxe: 5.1 V | V | |
| Buzzer 2 voltage: 5.1 V | V | |

| **CLOCK / DATE / CONTRAST** | **Result √** | **Comments** |
|---|---|---|
| Setting of clock / date | | |
| Display contrast + / - | | |
| Keypad keys | | |
| Led / led / Led | | |

| **CALIBRATIONS / PERFORMANCE LEVELS** | | **Result √** | **Comments** |
|---|---|---|---|
| Check pressure calibration 0 and 40 mbar or 1,181 inHg | | | |
| Check valve pressure calibration at 0 mbar | | | |
| Check flow rate calibration | 5 ± 0.5 l/min | l/min | |
| | 12 ± 0.6 l/min | l/min | |
| | 37 ± 1.9 l/min | l/min | |
| | 60 ± 3 l/min | l/min | |
| | 90 ± 4.5 l/min | l/min | |
| | 135 ± 6.7 l/min | l/min | |
| | 160 ± 8 l/min | l/min | |
| Check calibration expired flow at 0,5 l/min | | | |
| Verification FIO2 at 21% at +1 / -2% | | | |
| Check performance flow maxi: >160 l/min | | l/min | |
| Check performance pressure maxi: >70 mb or > 2,067 inHg | | | |

| **VENTILATION MODE** | **Result √** | **Comments** |
|---|---|---|
| **Performance Check : Mode PCV Ipap 40 mbar, Epap 5 mbar, Flow Ramp 2, Rate 10 c/min, I/T 33%** | | |
| Bar graph IPAP/EPAP: 40 ± 2 mbar / 5 ± 1 mbar | mbar | |
| Check of Vt: 800 ml ±10% | ml | |
| Check of valve: 40 mbar ±10% | mbar | |
| Low pressure alarm | | |
| Led + Alarm mains power supply | | |
| Led + Alarm external continuous power supply | | |
| Battery symbol | % | |
| Default setting: Ipap 15 mbar, Epap 0mbar | | |

| | |
|---|---|
| **TEST EQUIPMENT & SERIAL # :** | |
| **COMMENTS :** | |
| **BIOMEDICAL REPRESENTATIVE :** | |

# UPGRADES INSPECTION SHEET
# LEGENDAIR

| | | | |
|---|---|---|---|
| **Service Repport Number :** | | **Date :** | |
| **Serial Number :** | | **Ventilator Hours :** | |
| **Software :** | | **Customer Asset ID # :** | |

| **Upgrades Inpection** | **Part Number** | **Upgraded √** |
|---|---|---|
| Bottom case / Power supply | 3818099 / 2967900 | |
| CPU PCB Board (Should be marked SLC) | 381160 | |
| Ferrite Core / Cables RS232 & Nurse call | | |
| New Silicon Tubing | | |
| New Tubing Connectors (clear) | | |

| **Main Parts** | **Part Number** |
|---|---|
| Top Cover | 3808499 |
| Laminator | 3812099 |
| Cover Main Switch | 3814299 |
| Key Board | 3808900 |
| Filter | 3804800 |
| Communication Board | 3809100 |
| Turbine | 3806499 |
| Battery Charger Board | 3799200 |
| Battery | 2963500 |
| | |


Tel: 604 540-8288

Fax: 604 540-8245

Toll Free: 1 888-540-8288

Website: www.westcaremedical.com