Contents

This manual is the English translation of the Italian original manual version.

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1. INTRODUCTION

The intra-oral x-ray equipment Explor-X 70, manufactured by VILLA SISTEMI MEDICALI S.p.A., performs high-quality intra-oral radiographs, ensured by the repeatability of examination combined with reduced exposure times and with the small focal spot.

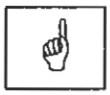
Explor-X 70 is conceived to perform only intra-oral x-ray.

The equipment displays the following features:

- High-quality radiographs
- Easy to use
- Ergonomic design.

The functioning of the system is microprocessor controlled, thus ensuring high repeatability of exposure times, and is composed of the following parts:

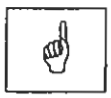
- Timer: AP TIME X or TIME X complete with wall plate
- Extension arm (60cm - 23 5/8" oval or 55cm - 21 5/8" square, 75cm - 29 1/2" or 90cm - 35 7/16" for wall version and 30cm - 11 3/4" for ceiling and dental chair version)
- Scissors arm
- 70kV 8mA tubehead.



NOTE:
The extension and scissors arms may be provided in both square and oval versions; a square extension arm can only be combined with a square scissors arm, and the same holds for the oval versions.

This manual is intended to assist the user in the safe and efficient operation of the equipment described.

1.1 Icons appearing in the manual



Indicates a "NOTE"; the utmost attention shall be devoted to the reading of paragraphs marked by this icon.

Indicates a "WARNING"; paragraphs marked with this icon cover patient and/or operator safety aspects

2. SAFETY INFORMATION

WARNING:
Read this chapter very carefully.

VILLA SISTEMI MEDICALI designs and manufactures equipment in compliance with safety requirements; moreover, it provides all the necessary information for correct utilization as well as warnings related to risks associated to x-ray generators.

Villa Sistemi Medicali shall not be responsible for:

- any use of the Explor-X 70 equipment different from that for with it has been designed,
- any damage to the equipment, the operator or the patient caused either by incorrect installation and maintenance not compliant with the procedures contained in the relevant user's and service manuals provided with the equipment, or by incorrect operation techniques,
- any mechanical and/or electrical changes effected during or after installation, different from those reported in the service manual.

Only qualified service personnel, authorized by VILLA SISTEMI MEDICALI is allowed to perform technical interventions on the equipment.

Only authorized personnel is allowed to remove the tubehead from its support and access the internal components.

2.1 Warnings

The equipment must be used in compliance with the procedures contained in the present manual and shall never be used for purposes different from those envisaged by it.

Before performing any maintenance intervention, the equipment must be disconnected from the input line voltage by means of the relevant magnetic-thermal switch.

The utmost attention must be paid during the installation and calibration phase with the equipment connected to the line, since components directly supplied by the input line are accessible.

Explor-X 70 is a medical imaging equipment and must therefore be used only under the supervision of qualified medical staff, having the necessary knowledge in the field of protection against radiation.

The user bears legal responsibility related to the possession, installation and use of the equipment.

Explor-X 70 is designed for continuous operation with intermittent load; compliance with the envisaged utilization cycles is therefore required.

Although the equipment has been designed to ensure a satisfactory degree of protection against electromagnetic interference, in compliance with IEC European regulations, the unit must be positioned at an adequate distance from electric power transformation plants, UPS, amateur and cellular telephone transmitters and receivers. The use of cellular telephone communication devices is allowed only at a distance higher than 1.5m (59") from any element of the equipment.

Any other instrument or equipment for professional use placed near the Explor-X 70 must comply with Electromagnetic Compatibility regulations. Non-complying instruments, known to have a low immunity to electromagnetic fields, must be installed at a distance of at least 3m (118") from the Explor-X 70 and must be supplied through a dedicated power line.

Explor-X 70 must be switched off during the use of High Frequency surgical device or similar instruments placed near the equipment.

The equipment has not been designed to be used in the presence of anaesthetic mixtures inflammable with air, oxygen or nitrous oxide.

Parts of the apparatus which may be in contact with the patient must be regularly cleaned following the instructions provided in this manual.

Although the x-ray doses provided by modern equipment are reduced on average, during exposure the operator must take all the necessary precautions and/or protection measures for the patient and for himself, in compliance with existing regulations.

The film must be introduced in the patient's mouth either manually or by means of the relevant holders; it must never be held by the operator, and only the patient may hold it during exposure if required.

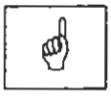
WARNING:
For safety purposes, it is forbidden to overload the extension arm and the scissors arm in an anomalous way, e.g. by hanging down from them.

2.2 Environmental risk and disposal

The equipment contains - in some of its parts - solid and liquid substances which must be disposed at the recycling centers appointed by local regulations at the end of the equipment's life cycle.

In particular, the equipment contains the following materials and/or components:

- **Tubehead:** non-biodegradable plastic materials, metal, glass, dielectric oil, lead, tungsten.
- **Other parts of the equipment:** non-biodegradable plastic materials, metal, printed circuits, iron and plastic materials



NOTE:
VILLA SISTEMI MEDICALI is not responsible for eventual disposal of the apparatus or parts thereof and for the related expenses.

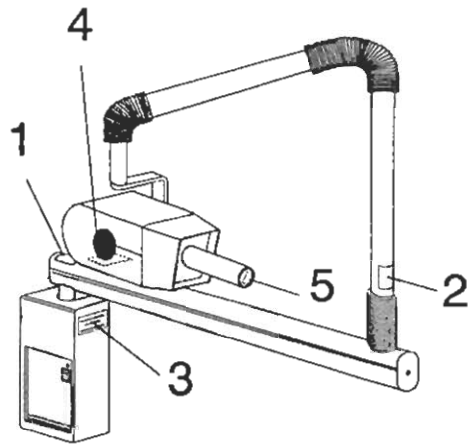
2.3 Symbols used

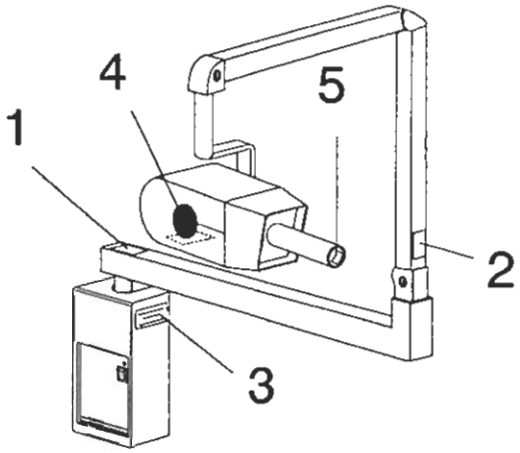
Besides the symbols present on the keyboard (see chapter 5 of User's Manual), in this manual and on the Explor-X 70 the following symbols are used:

Symbol	Description
	Equipment with Type B applied parts
~	AC
N	Connection to neutral conductor
L	Connection to line conductor
	Protection grounding
	Functional grounding
	OFF ; equipment not connected to power line
|	ON ; equipment connected to power line
	Exposure enabling; enabled exposure status is revealed by the glowing of the relevant green symbol.
	Focal spot in compliance with IEC 336
	X-ray emission

3. DESCRIPTION

3.1 Identification labels





Extension arm features label
1

Made in Italy
Model AAAAAAAA
Serial number
10XXYYYY
20090 BUCCINASCO
MILANO - ITALIA
Settled for
Explor-X 70

Scissors arm features label
2

Made in Italy
Model AAAAAAAA
Serial number
BBXXYYYY
20090 BUCCINASCO
MILANO - ITALIA
Settled for
Explor-X 70

System timer features label
3

Made in Italy
EXPLOR-X 70
Mains: 230 V~ 6 A 50 Hz
Duty Cycle : 1 / 60
Manufactured : Month Year
X RAY CONTROL Model : EM603776
S/N : 22XXYYYY
CE 0434

Tubehead features label
4

Made in Italy
DIAGNOSTIC SOURCE ASSEMBLY
Model : EXPLOR-X 70 Type : B4604591
S.N : 31XXYYYY Manufactured : Month Year
Output max : 70kVp - 8 mA - 3.2 s 230 V~
Total Filtration : 2 mmAl
X-ray beam: Ø 6 cm at SSD 70 cm
X-RAY TUBE D0818
Manufacturer Toshiba Japan
S/N :

Beam limiting device features label
5

Made in Italy
BEAM LIMITING DEVICE Model : 61604059
DIAMETER 6 cm AT SSD 20 cm
S/N: 60XXYYYY
Manufactured: Month Year

3.2 Functions, Models and Versions

The Explor-X 70 intra-oral x-ray equipment is composed of the following parts:

3.2.1 Extension arm and scissors arm (Square or Oval)

The scissors arm is an arm with double joint, enabling linear and upward extension. The tubehead remains balanced in all positions.

NOTE:
The scissors arm is intended to operate correctly with a minimum angle of 20°; hence, its use requires an opening angle larger than 20°.

A horizontal extension arm can also be added; it is available in different sizes to meet all possible requirements.
Both the extension arm and the scissors arm may be either square or oval.

NOTE:
A square extension arm can only be combined to a square scissors arm. The same holds true for oval arms configurations.

3.2.2 Tubehead

Its 70 kVp voltage and 8 mA current reduce exposure times and the amount of radiation absorbed by the patient. The tubehead is equipped with a collimator with a 20cm (7 7/8") focus to skin distance and a 6cm (2 3/8") beam diameter at the cone output. The tubehead is connected to the arm by means of a sliding contact, allowing 360° horizontal rotation and 290° vertical rotation.

3.2.3 Timer

The Explor-X 70 may be equipped with two different types of Timer:

- **AP TIME X**

  AP TIME X is a microprocessor-controlled digital timer allowing both manual and automatic selection of exposure times.
  Automatic selection allows to choose among 54 pre-set times according to the type of patient (adult or child), his/her size (small, medium, large) and to the type of tooth.
  Fixed times available for manual selection are 32 and may range from 0.04 seconds minimum to 3.20 seconds maximum.
  The key feature of this timer is automatic time compensation according to input line voltage variations within a range of ±10% of nominal value.

- **TIME X**

  TIME X displays the same features as the AP TIME X Timer, with the exception of automatic and digital anatomic selection. In other words, this timer allows only manual selection of exposure times.

NOTE:
A configuration with remote x-ray switch, outside the examination room, is also available.
The equipment provides two separate contacts for possible connection to external signalling devices. One contact reveals that the equipment is functioning and ready to use, whereas the second reveals x-ray emission. The connection modality and the requirement for signalling devices are provided in the Chapter 5.2.

3.3 Configurations

3.3.1 Standard configuration

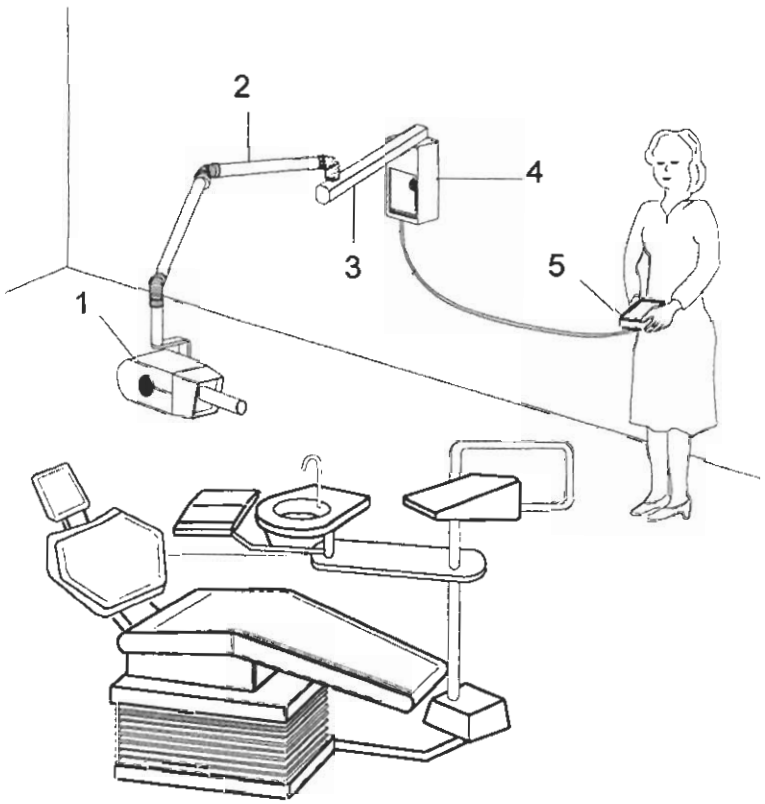


Figure 3-1

1 Tubehead
2 Scissors arm
3 Extension arm
4 Wall plate + Timer
5 X-ray button

3.3.2 Remote timer configuration

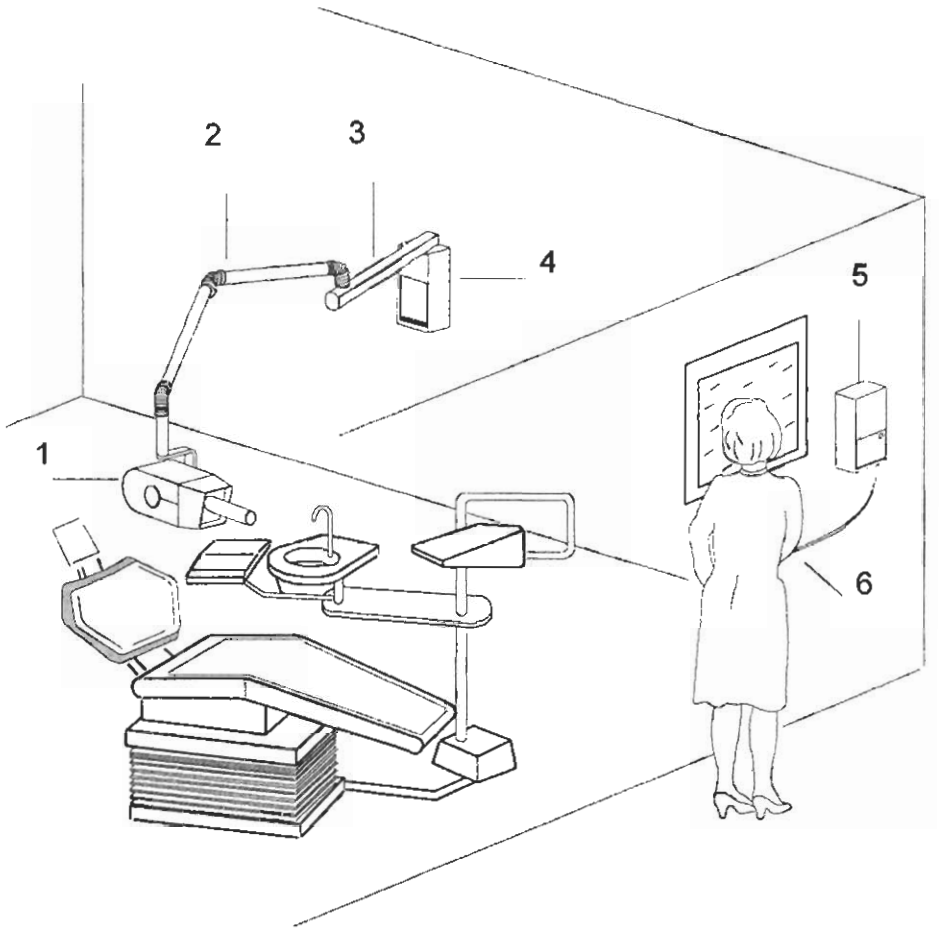


Figure 3-2

1 Tubehead
2 Scissors arm
3 Extension arm
4 Wall plate
5 Remote timer
6 X-ray button

3.3.3 Dental chair configuration

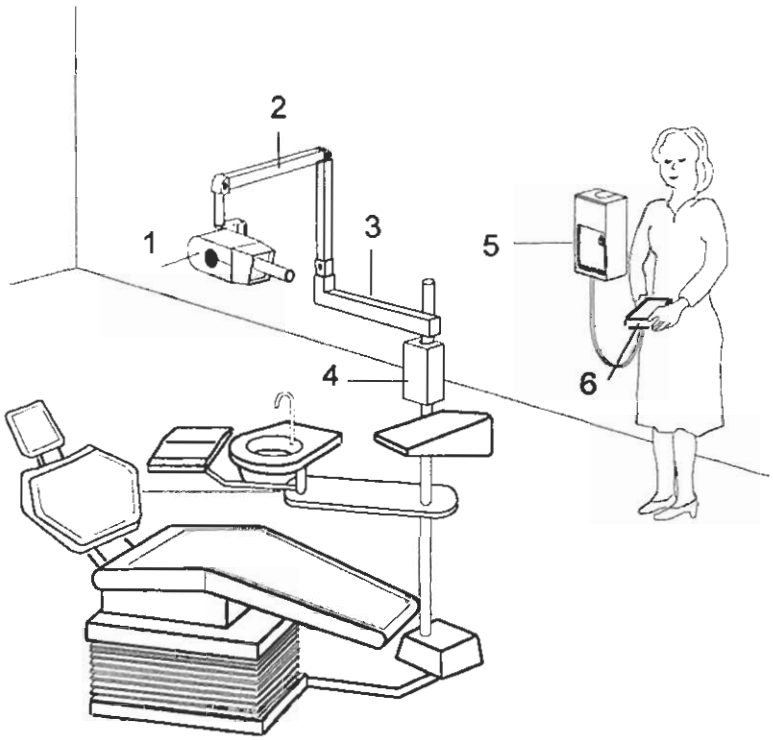


Figure 3-3

1 Tubehead
2 Scissors arm
3 Dental chair extension arm
4 Dental chair connection
5 Remote timer
6 X-ray button

3.3.4 Ceiling suspension configuration

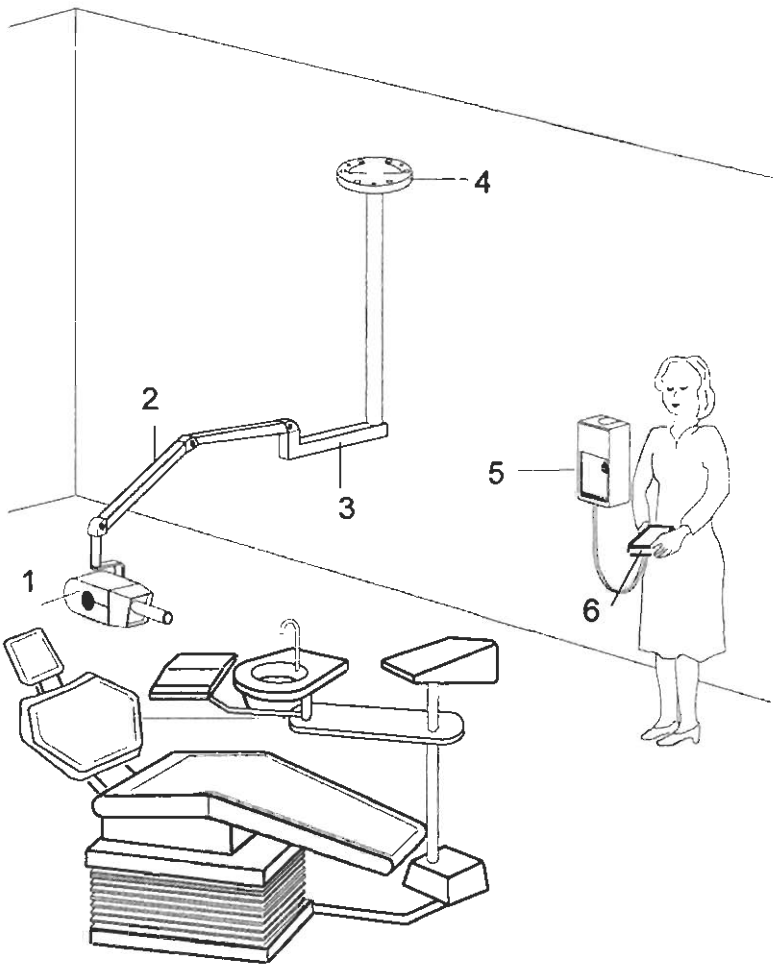


Figure 3-4

1 Tubehead
2 Scissors arm
3 Ceiling extension arm
4 Ceiling suspension plate
5 Remote timer
6 X-ray button

3.3.5 Mobile stand configuration

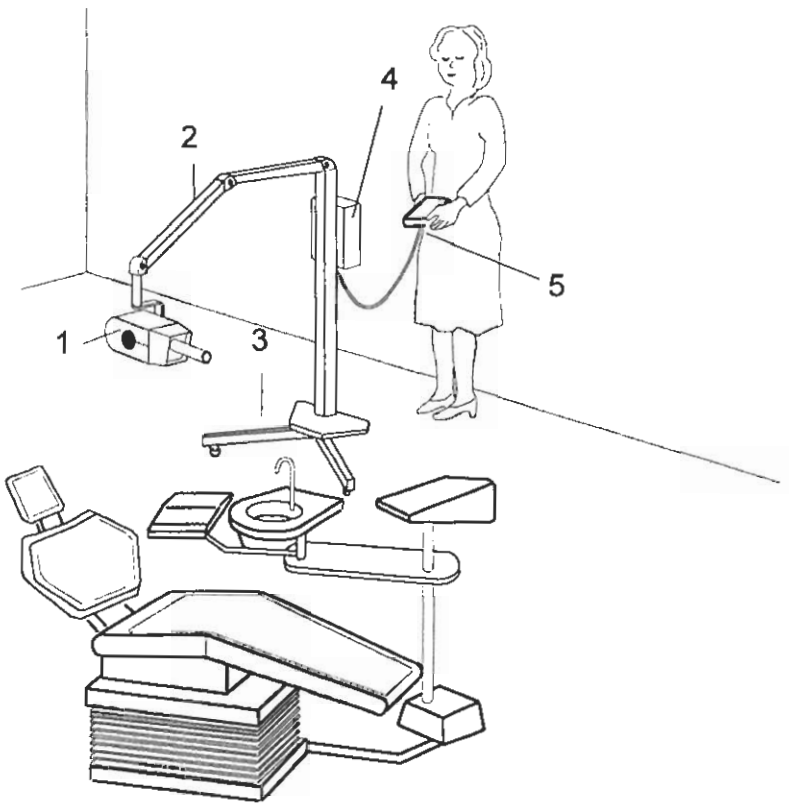


Figure 3-5

1 Tubehead
2 Mobile stand scissors arm
3 Mobile stand
4 Timer
5 X-ray button

3.3.6 Configuration with remote x-ray button

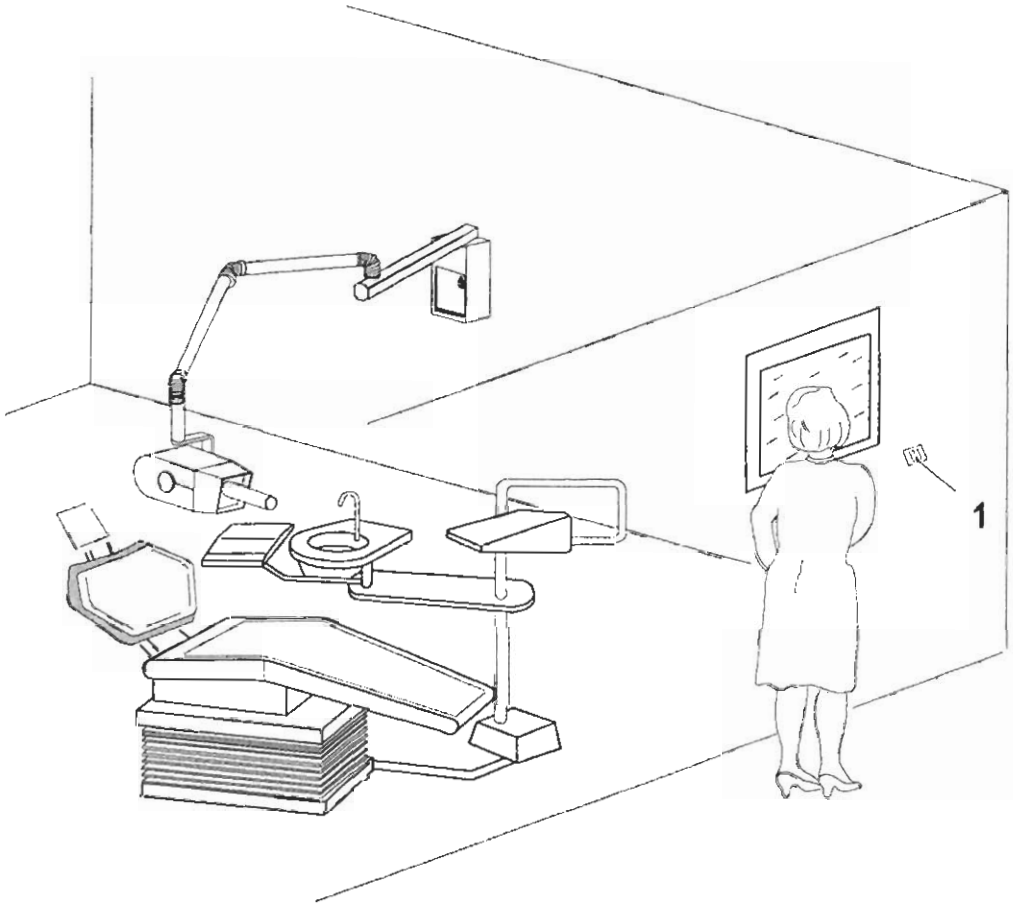


Figure 3-6

1 X-ray button

3.4 Identification of versions

The different versions of the system are identified by using the following configuration coding system.

3.4.1 Code generation

94 60 0 7X X X X

Line voltage
0=220V
2=240V
3=230V

Timer
4=AP TIME X
5=TIME X
6=AP TIME X remote
7=TIME X remote

Scissors arm
0=Square wall mounting 75cm (29 1/2")
1=Square mobile
2=Square ceiling
3=Oval wall mounting 75cm (29 1/2")
4=Oval mobile
5=Oval ceiling
6=Square wall mounting 55cm (21 5/8")
7=Square wall mounting 90cm (35 7/16")
8=Oval wall mounting 60cm (23 5/8")
9=Oval wall mounting 90em (35 7/16")

Model
70=Explor-X 70 kV Toshiba x-ray tube

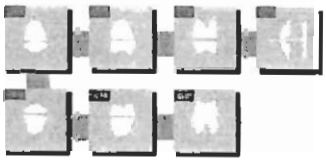
Fixed = 0

Product type
60=intra orali

ID number
94=Intra oral selling code

3.5 Description of the control panel function

"ANATOMIC TOOTH" selection button



NOTE:
By depressing this button it is possible to switch to "automatic x-ray emission time selection " and the relevant functions are enabled.

Every time this button is depressed the selection of the tooth type is rotationally changed. A different exposure time corresponds to each selection.

Depressing of the button is confirmed by a sound signal combined with the glowing of the relevant LED.

The automatic mode can be closed by depressing either the "Increase" or the "Decrease" button; this operation brings the system back to MANUAL mode. By selecting the OCCLUSAL function (see the description of the following button) it is possible to shift from a targeted choice to a specific examination mode.

"OCCLUSAL" selection button

NOTE:
By depressing this button it is possible to switch to "automatic x-ray emission time selection " and the relevant functions are enabled.

Every time this button is depressed the selection of upper or lower occlusal is rotationally changed. A different exposure time corresponds to each selection.

Depressing of the button is confirmed by a sound signal combined with the glowing of the relevant LED.

The automatic mode can be closed by depressing either the "Increase" or the "Decrease" button; this operation brings the system back to MANUAL mode. By selecting the ANATOMIC TOOTH function (see the description of the previous button) it is possible to go back to «Tooth type» anatomic selection mode.

"ADULT/CHILD" selection button 

NOTE:
By depressing this button it is possible to switch to "automatic x-ray emission time selection"; the Size and Anatomic-Occlusal functions are enabled (for the latter, the last used selection will be activated)

Every time this button is depressed the selection is changed, choosing between Adult and Child. A different exposure time corresponds to each selection.

Depressing of the button is confirmed by a sound signal combined with the glowing of the relevant LED.

The automatic mode can be closed by depressing either the "Increase" or the "Decrease" button; this operation brings the system back to MANUAL mode.

"PATIENT SIZE" selection button 

NOTE:
By depressing this button it is possible to switch to "automatic x-ray emission time selection"; the Adult/Child and Anatomic-Occlusal functions are enabled (for the latter, the last used selection will be activated).

Every time this button is depressed the selection is changed, choosing between the different sizes available (Small/Medium/Large). A different exposure time corresponds to each selection.

Depressing of the button is confirmed by a sound signal combined with the glowing of the relevant LED.

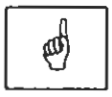
The automatic mode can be closed by depressing either the "Increase" or the "Decrease" button; this operation brings the system back to MANUAL mode.

"DIGITAL" selection button

NOTE:
By depressing this button it is possible to switch to "**automatic Digital x-ray emission time selection**"; the Adult-Child, Size and Anatomic-Occlusal functions are enabled (for the latter, the last used selection will be activated).

By depressing this button the system switches to «Digital Selection» of x-ray times. Lower exposure times, typical of the DIGITAL system, are automatically selected for every tooth type, size and Adult/Child patient.

Depressing of the button is confirmed by a sound signal combined with the glowing of the relevant LED.



NOTE:
This button and the relevant functions can be disabled by Technical Service during the programming phase.

"INCREASE" and "DECREASE" buttons

These buttons are generally used to select x-ray exposure times during «Manual Selection". Their simultaneous pressure also provides access to service functions (see chapter 8). By depressing one of these buttons the system goes back to «manual selection» of the x-ray exposure timer IN ANY CASE, and to the relevant recovery of displaying conditions.

"EXPOSURE ENABLING" button

Once the cycle to be performed has been chosen, this button enables the x-ray cycle; this means that further pressure on the x-ray button, carried out within the set time, causes x-ray emission.

NOTE:
Pressing the "Ready" key, the system will be ready for the exposure and also it will starting showing on the display the exposure time corrected according to the internal line voltage fluctuation algorithm (please see chapter 4.1).

The «Ready for x-ray» status is displayed by the glowing of the green LED , which remains on until the end of the emission cycle or until expiration of the "Enabled exposure time" (usually 15 seconds).

NOTE:
Pressure on the x-ray button without enabling causes the display of the last exposure time selected.

4. TECHNICAL FEATURES

Technical features	
Equipment	Explor-X 70
Manufacturer	VILLA SISTEMI MEDICALI Buccinasco (Ml) Italy
Class	Class I with type B applied parts (IEC 601-1 classification) 
Protection level	Standard apparatus IP20
Line voltage	220/230/240V~ (According to the installed tubehead)
Line frequency	50Hz
Rated current	4 Arms impulsive @ rated voltage
Power consumption	880 VA impulsive @ 220 V ~ 920 VA impulsive @ 230 V ~ 960 VA impulsive @ 240 V ~
Max apparent line resistance	0.8 Ω max @ rated voltage
Main fuse	6A F
Preset exposure times	from 0.04 to 3.2s in 32 steps
Anatomic selection (for AP TIME X only)	54 pre-set times
Exposure times accuracy	± 10% or ± 20ms (whichever is greater)
High voltage circuit type	Single phase, self-rectifying
kV selection	70 kVp
Tubehead current	8 mA
kV accuracy	± 8%
Tubehead (anode) current accuracy (at nominal voltage)	± 15%
Ref. current - exposure time product	0.8 mAs (8mA - 0.1s)
Max exposure time	3.2 s
Timer dimension	310x170x100 mm (12x7x4 inches)

Tubehead features	
Manufacturer	VILLA SISTEMI MEDICALI Buccinasco (MI) Italy
Rated voltage	70kV$_p$
Tubehead power	430 W
Pre-heating time	240 ms
Total filtration	2 mm Al eq. @ 70 kV
Transformer insulation	Oil bath
Interval between exposure / duty cycle	60 times x-ray time / 1:60
Minimum focus to skin distance	20cm (7 7/8")
X-ray beam diameter (@ 20 cm focus)	≤ 6cm (2 3/8")
Cooling	Convection
Radiation leakage at 1 m	<0.25 mGy/h, duty cycle 1:60
Technical factors for radiation leakage	70kV, 8mA, 1s
X-ray tube features	
Manufacturer	Toshiba (Japan)
Type	D-082B
Focal spot	0.8 (IEC 336)
Inherent filtration	min. 0.5 mm Al equivalent at 70 kV
Anode tilt	20°
Anode material	Tungsten
Rated voltage	70 kV
Maximum filament current	1.9 A
Maximum filament voltage	3 V
Anode thermal capacity	7 kJ
Environmental conditions	
Operating temperature range	+10°C ÷ +40°C
Operating relative humidity range	30% ÷ 75%
Temperature range for transport and storage	-20°C ÷ +70°C
Max. relative humidity for transport and storage	<95 % non condensing
Min. atmospheric pressure for storage and transport	630hPa

Apparatus and detachable parts weight	
Gross weight including packing	35 kg
Net apparatus weight in standard configuration	30 kg
75cm (29 1/2")extension arm (standard)	5 kg
90cm (35 7/16") extension arm	5.7 kg
Scissors arm	8.5 kg
Timer plus wall plate	8.3 kg
Tubehead	8.5 kg

NOTE:
The timer works in synchronism with the line voltage.
For exposure times lower than 0.08s the 25% limit between the value of the different selections (EN60601-2-7 regulation) cannot be respected because smaller variations would not have any appreciable effect on the generated x-ray dose (EN60601-2-7 regulation).

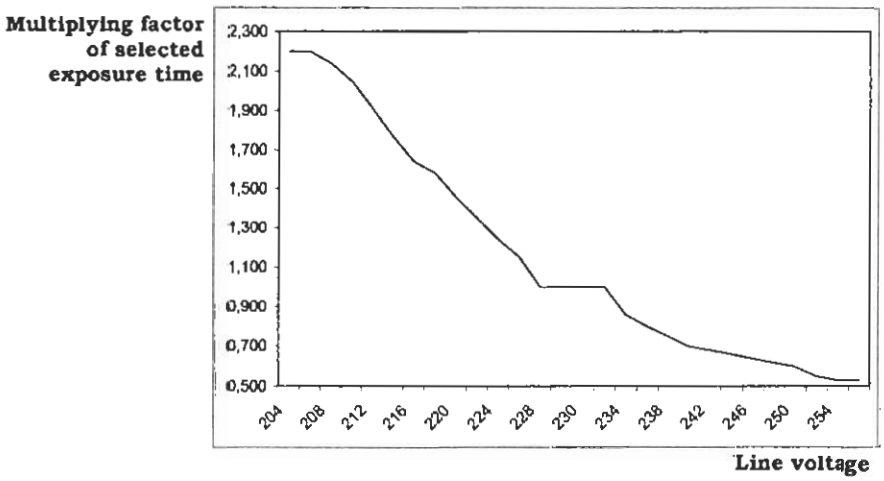
4.1 Exposure time correction method

The Villa Sistemi Medicali x-ray intraoral equipment is equipped with a special feature called "Computer Controlled Density" that allows to automatically correct the exposure time according to the fluctuation of the mains voltage from its nominal value.
A change in the line voltage affects the peak voltage applied to the x-ray tube and the value of high voltage affects significantly the spectrum of the radiation, which finally affects the optical density of the image on the film. Purpose of the timer correction is to provide basically the same optical density on the film in front of any variation of the line voltage, within the standard accepted limits of rated voltage (+/-10%). This feature allows the user to get basically the same quality of the image without caring about possible variations of the line voltage, which are quite common in many areas, and very difficult to monitor.

The automatic correction of the exposure time works with the following sequence: the internal voltmeter of the timer monitors continuously the line voltage, while the user selects the desired exposure times. Once the user has selected the exposure time that is thought adequate to obtain the proper quality of the image for that specific test, the user presses the button to enable the system and the timer displays the corrected actual exposure time that is calculated by the timer itself, on the basis of the line voltage measured every half a second by the internal voltmeter.

NOTA:
AP TIME X and TIME X timers works synchronously with the power line, so the calculated time is always rounded off to a multiple of pulses.

The corrected exposure time shown once the timer has been enabled by the "Ready" button and during the exposure is the time used by the equipment: it is calculated applying a correction factor to the selected exposure time, based on an empirical law that correlates the dose with the high voltage peak and consequently with the line voltage.
The qualitative trend of the multiplying factor and the line voltage is shown in the following picture (for a timer set to operate at 230V):



4.2 Technical factors measuring method

kV_p The value of kVp is defined as the stationary value of high voltage applied to the tube, that stabilises under load after the pre-heating time.
The value of kV_p is measured by means of a non-invasive instrument, having an accuracy over 2%, at the rated value of input line voltage.
Direct measurement of high voltage may be carried out only by disassembling the tubehead.

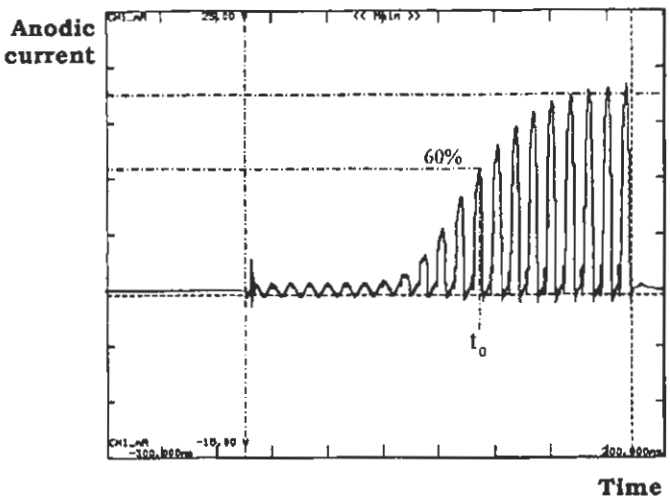
mA The value of anode current is defined as the average value of stationary current stabilising under load after the pre-heating time.
The value of anode current is measured by means of a digital voltmeter and by measuring voltage drops at the ends of 1 kΩ resistance, 1% mounted on the tubehead. To access this resistance, plastic tubehead protection covers must be removed. The digital voltmeter must be in the DC mode, and the transformation ratio is 1 mA = 1V.

t The value of exposure time is the time during which a significant amount of x-rays is generated; it is measured by counting the number of half-waves where the value of anode current peak is over 60% of the steady-state value. The time required to reach such condition is called "pre-heating time".
Measurement must be effected under rated input voltage conditions, by measuring the wave shape of anode current on the 1kΩ resistance and by means of a memory oscilloscope.
Measurement of exposure times by means of non-invasive instruments may lead to non-quantifiable systematic errors of measurement related to the instrument used (please see chapter 4.3).

4.3 Proper use of the dosimeters when assessing exposure times

The use of non-invasive instruments for the measurement of the exposure parameters of the intraoral equipment may lead to some problems when interpreting the result of the measurement of the exposure times.

The origin of this problem is related to the raising curve of the anodic current of the x-ray tube, as shown in the next graph:



According to the EN60601-2-7 standard, "the exposure time of 1 or 2 peak generators is measured by counting the number of cycles or half-cycles during which a significant quantity of radiation is emitted". In the case of the Villa Sistemi Medicali intraoral equipment, the measuring methods consists of the measurement of the peaks that exceed the 60% of the level reached at the steady-state. This method is defined as an invasive method as the current trend can be measured by reading current flowing the 1Ω resistor within the tubehead case.

The non-invasive methods, based on the use of instruments that measure the dose , are clearly much easier and quicker to use than the invasive method, but can introduce significant errors when measuring exposure times. This is due to the fact that some of these intruments start counting the exposure time as soon as a small quantity of radiation is detected by the sensor thus calculating exposure times longer than the ones declared by the manufacturer that instead tests and certifies the equipment by using the invasive method.

The determinations achieved with these non-invasive instruments can lead to the conclusion that the timer of the equipment under test is not accurate while the inaccuracy is clearly explained by a different definition of exposure time as shown in the following.

Examples

Next table shows the comparison of the times obtained by using the non-invasive method (measuring instrument Solidose 308 RTI PMX-1D) and the times obtained by using the invasive method according to the rule that the counting of the exposure time starts when the anodic current reaches the 60% of the steady-state value.

Time indicated by the timer during the exposure (obtained has described above)	Time measured with the non-invasive method
220 ms	305 ms
300 ms	425 ms
440 ms	545 ms
560 ms	665 ms
650 ms	745 ms
780 ms	885 ms
890 ms	984 ms

As clearly shown in the table, there is a constant discrepancy for all the exposure times; this difference is given by the raising time of the current as the non-invasive instrument starts measuring the time as soon as a small quantity of dose is detected. The result of this behaviour is that all exposure times are longer than the time declared by the definition of when current reaches the 60% of the steady-state.

Corrective actions

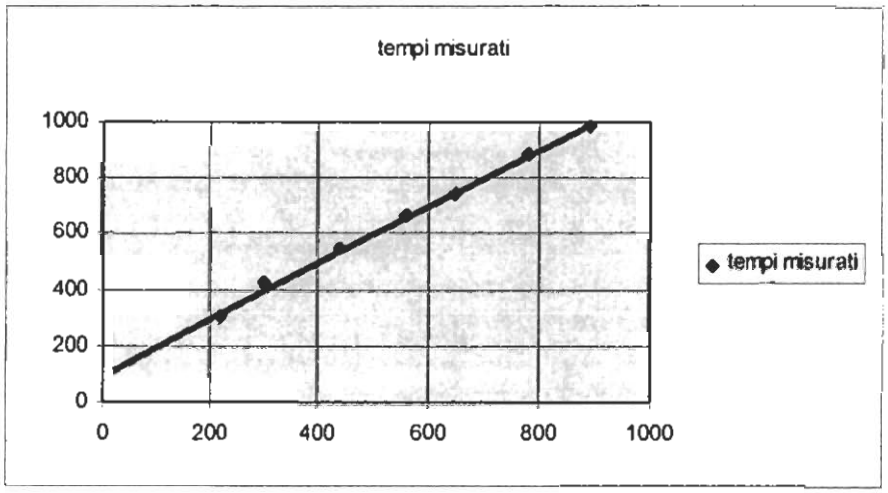
Among the different non-invasive instruments, some include a special feature that allows to perform a more accurate measurement of the exposure times. When this special function is activated, the measuring instrument requires the execution of 2 measurements: the first one determines the time required by the equipment to reach a given significant dose value, the second one counts the time interval between the time assessed during the first measurement and the end of the exposure. The result of this second measurement is the exposure time. The measurement of the exposure times carried out with instruments that include this special feature matches quite well with the times assessed by the invasive method (see next table).

Time indicated by the timer during the exposure (obtained has described above)	Time measured with the non-invasive method (measuring instrument RTI PMXII set in "lock mode")
100 ms	103 ms
250 ms	264 ms
400 ms	401 ms
500 ms	503 ms
700 ms	703 ms
1000 ms	1003 ms
2000 ms	1960 ms

When using non-invasive instruments not including this special feature, a practical method can be used to overcome this problem, as described here after:

- Set on a graph the times measured by the non-invasive instrument versus the corrected times displayed by the timer; interpolate the points on the graph by a straight line (if possible by means of the least square algorithm method, otherwise in graphical way)
- Determine the intercept of the straight line with respect to the Y axis: this intercept value can be considered the time that the non-invasive instrument adds to any measurement (offset value), due to the fact that it is triggered by the first dose that reaches its sensor instead of starting the count when reaching the 60% of the steady-state anodic current value
- Subtract this offset value from each measurement displayed by the instrument and compare the times so obtained with the times shown by the timer.

The use of this method with the data shown in the first example allows to confirm that the measurement become consistent well within the limits given by the rules. Infact, the offset value of the first example is approximately 100ms; once this offset is subtracted from the measured values the results become very similar to the preset times.

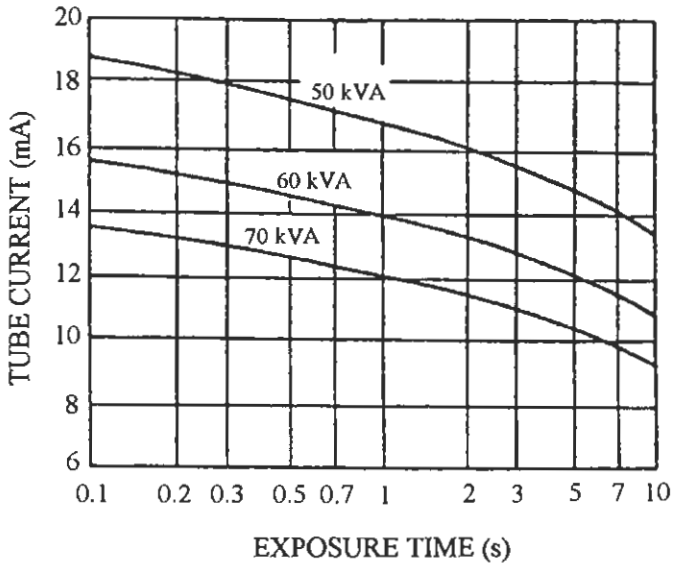


4.4 X-ray tubehead curves

TOSHIBA D-082 B

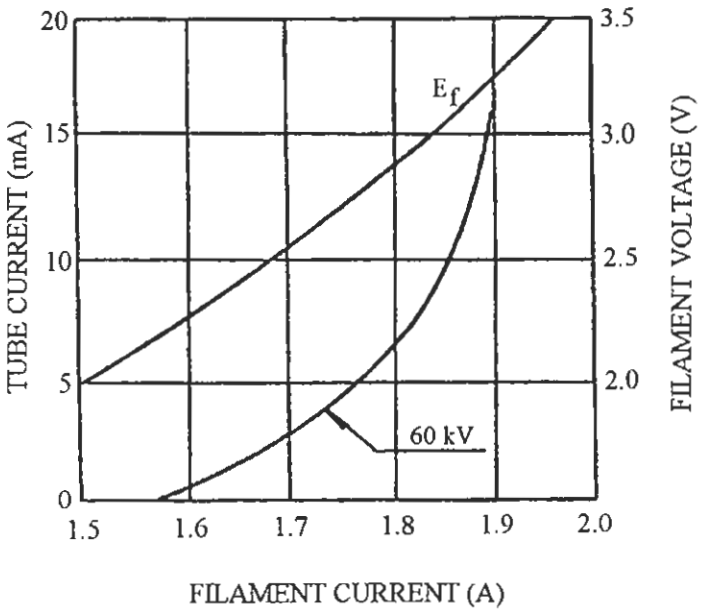
Emission and filament features

Self-Rectified
Focal Spot : 0.8 mm

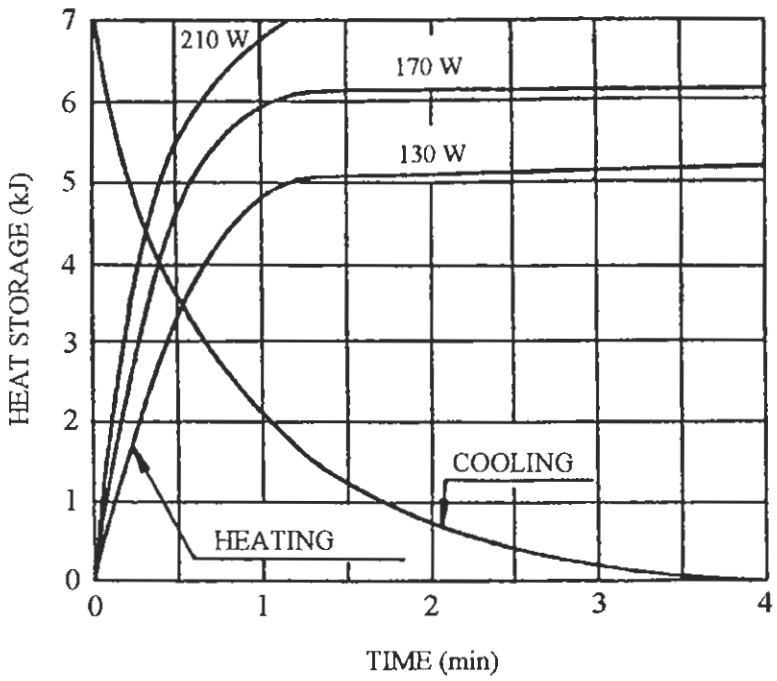


Load

Self-Rectifier



Cooling curve



4.5 Standards and regulation

Applicable regulations:

EEC 93/42: EN 60601-1
EN 60601-1-1
EN 60601-1-2
EN 60601-1-3
EN 60601-1-4
EN 60601-2-7
EN 60601-2-28

4.6 Dimensions

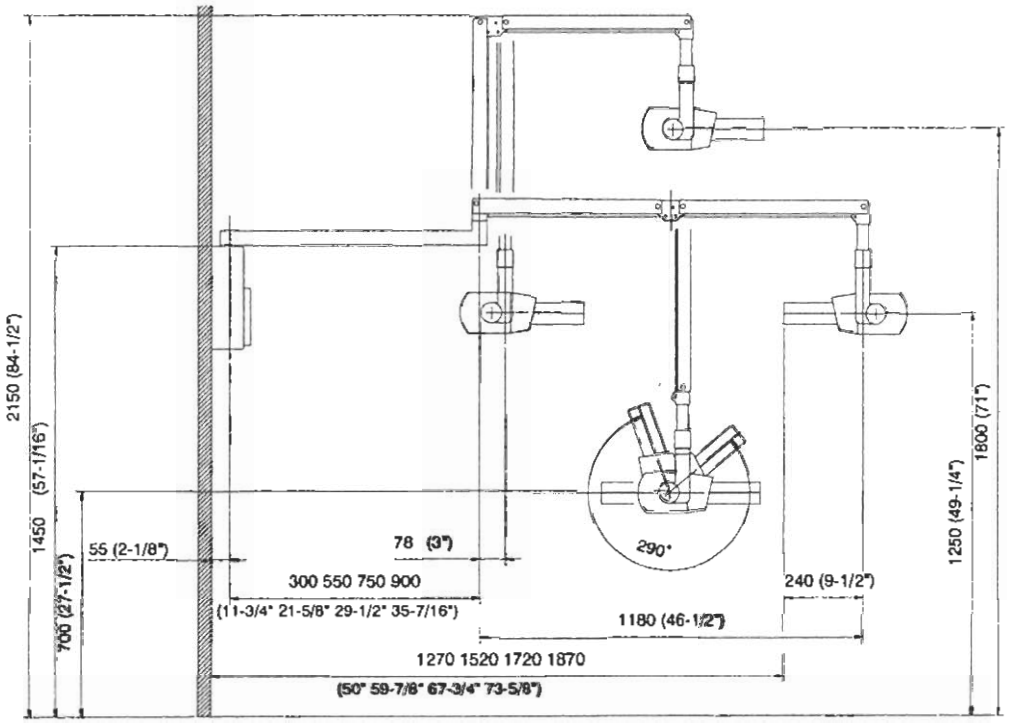


Figure 4-1 - Wall mounting configuration - Square arms

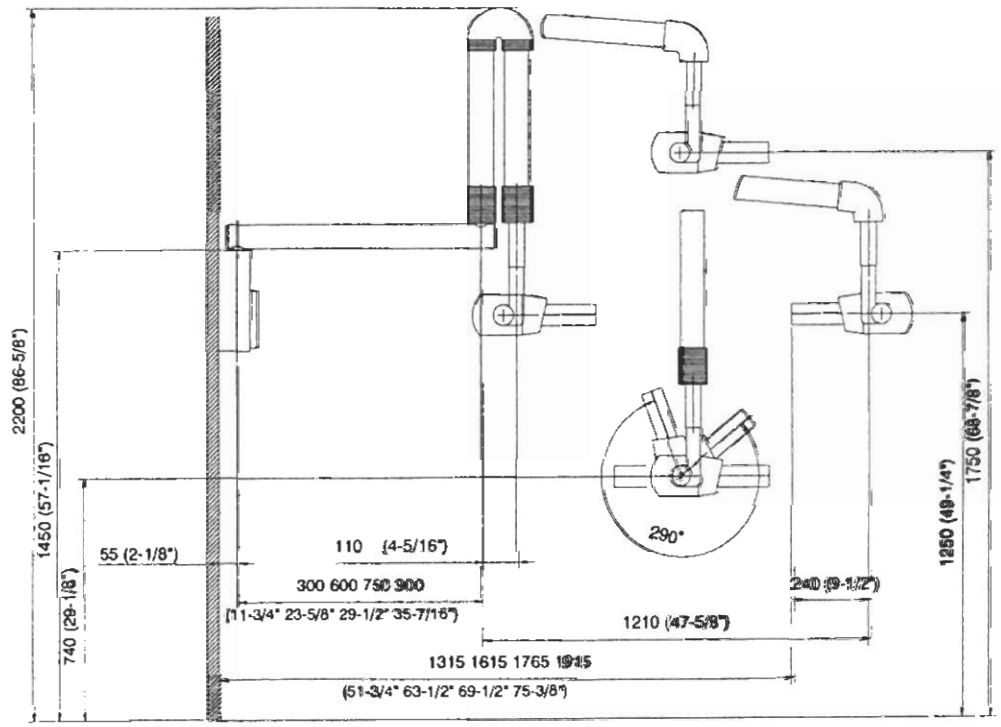


Figure 4-2 - Wall mounting configuration - Oval arms

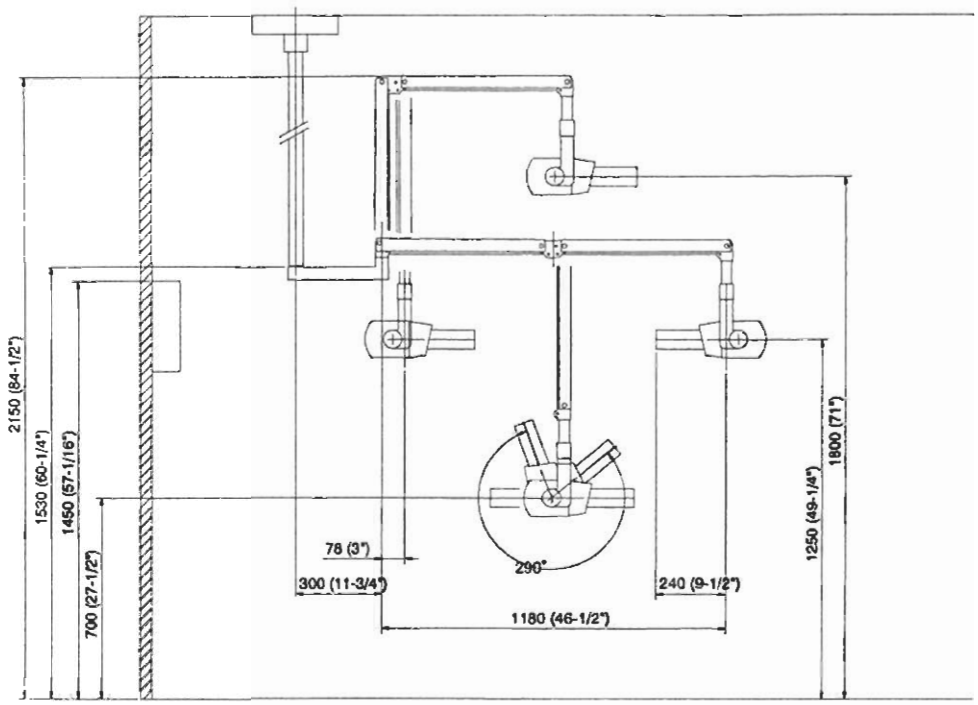


Figure 4-3 - Ceiling suspension configuration - Square arms

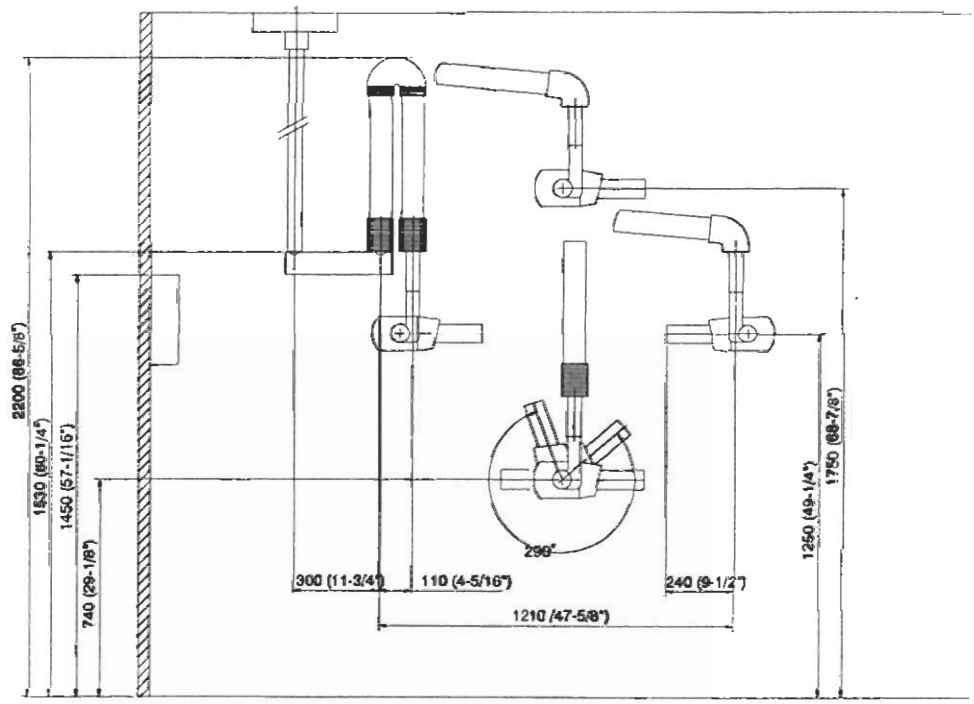


Figure 4-4 - Ceiling suspension configuration - Oval arms

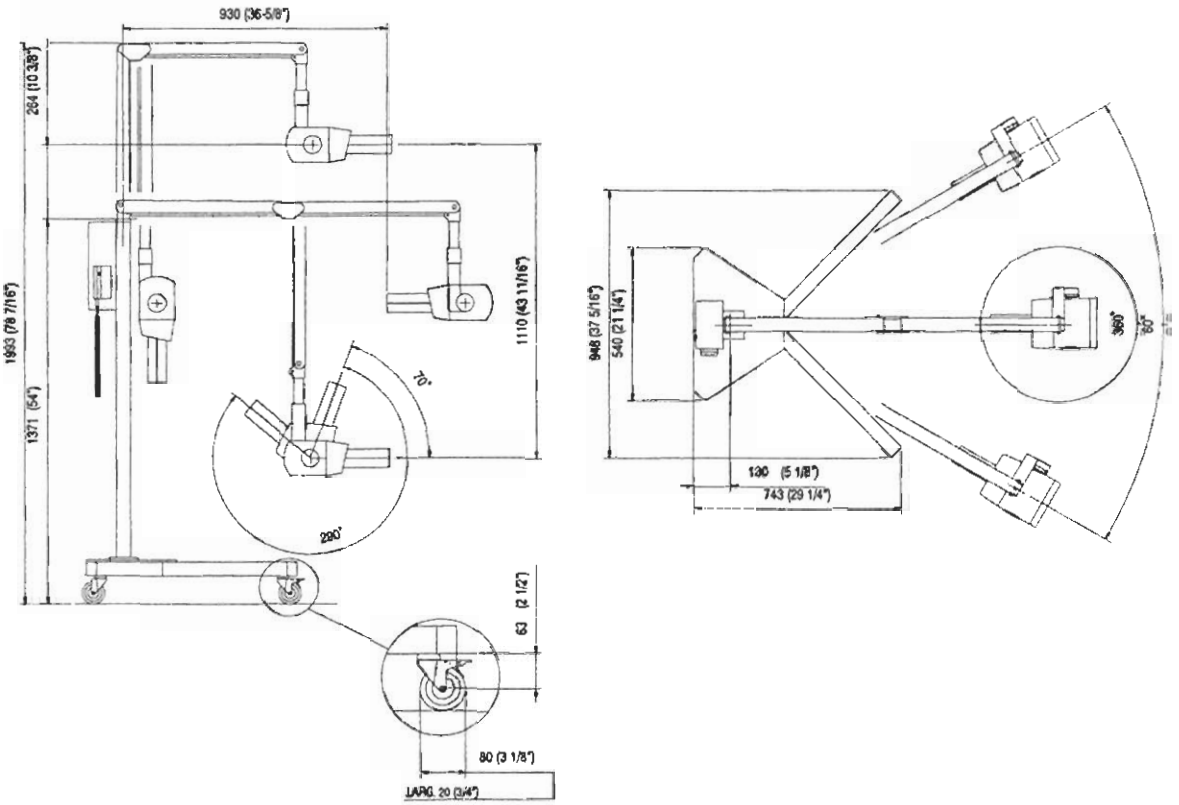


Figure 4-5 - Mobile stand configuration - Square arms

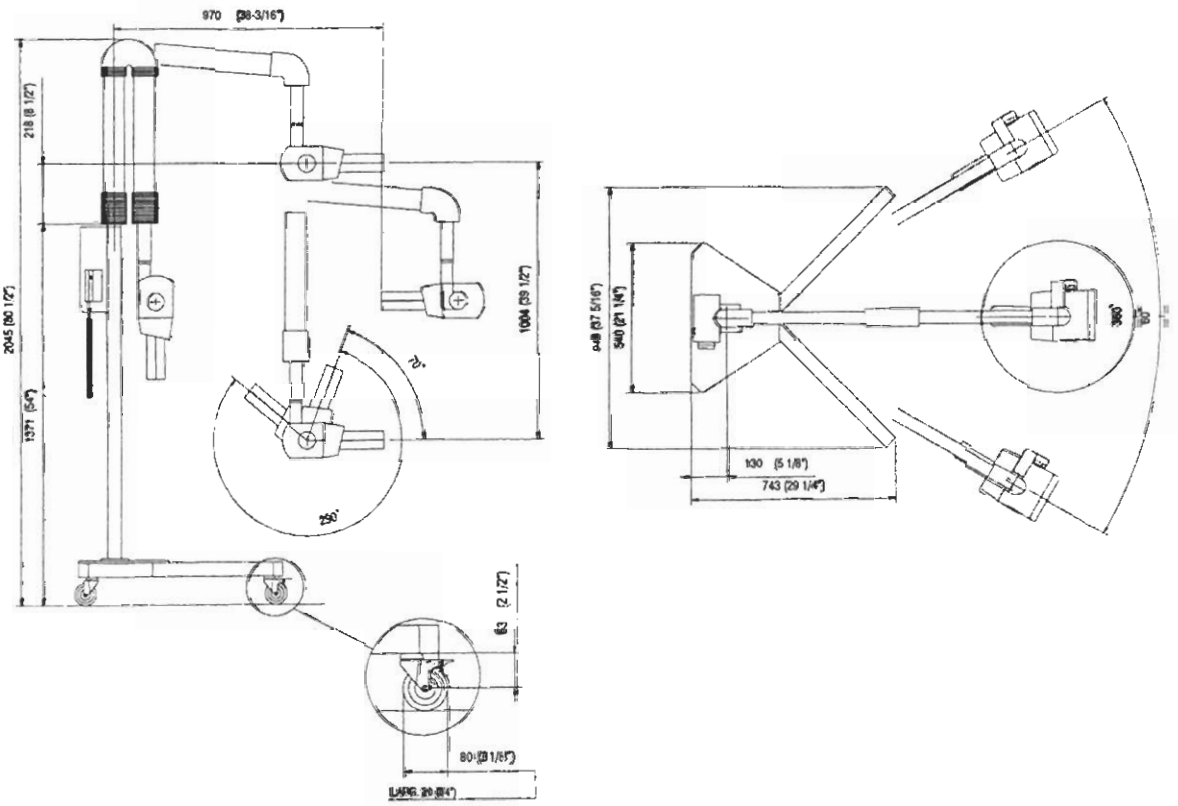


Figure 4-6 - Mobile stand configuration - Oval arms

5. PRE-INSTALLATION

Explor-X 70 does not require specific pre-installation procedures: compliance with the rules stated in Chapter 5.1 is the only requirement. Should you wish to effect sub-trace connections for the Explor-X 70, these must be carried out before the intra-oral x-ray equipment installation phase, considering dimensions and suggcstcd distance from floor as stated in Chapter 4.6.
The manufacturer is able to ensure the necessary technical assistance and advice since the pre-installation phase; wall building and pre-installation are at the customer's charge.

5.1 Fixing methods

NOTE:
This chapter applies to Wall, Remote Timer (only for the arm support plate) and Ceiling suspension versions. Dental chair and Mobile Stand versions do not require any assessment of wall solidity.

Assessment of wall solidity is left to the person in charge of installation. The extraction load on each boss is 240kg (528 lb) for the wall mounting version and 220kg (484 lb) for the ceiling suspension version.
For each type of wall, use the most suitable fixing method according to the following specifications:

- wood walls: 8x70 A 4.8 self-threading screws (provided in installation kit)
- concrete or R250 cement bricks: expansion iron bosses (provided in installation kit) in M8 or WURTH chemical bosses (not provided)
- hollow bricks: in-wall support (not provided) which must support different weight and momentum as shown in the following table.

	Remote/Wall version	**Ceiling version**
Weight	120 kg (264 lb)	120 kg (264 lb)
Momentum	140 kgm (1324 Nm)	84 kgm (836 Nm)

WARNING:
Villa Sistemi Medicali shall bear no responsibility for installations not complying with the above instructions and specifications.

5.2 Electrical features

The supply line must comply with the following values:

- Single-phase mains voltage + ground 220/230/240V ± 10%
- Line Frequency 50 Hz
- Absorbed current 4 Arms
- Apparent line resistance 0.8 Ω max

Connection of the equipment requires a magnetic-thermal switch having the following features:

- Nominal current 6 A
- Differential sensibility 30 mA

The equipment must be connected to a system provided with correct grounding, in compliance with IEC regulations.
Maximum distance between electrical panel and supply terminal block varies according to the section of supply wires as reported in Table 1 below.

	Distance		
Supply	0 - 15m	0 - 15m	22.5 - 37.5m
220/230/240V 50Hz	2.5mm² (14 AWG)	4mm² (12 AWG)	6mm² (10 AWG)

Table 1

NOTE:
We recommend to use wires whose section is not lower than 2.5mm² (14 AWG).
For standard configuration (Figure 3-1) and mobile stand configuration (Figure 3-5), the supply terminal block is the same as the timer's; for the other configurations, the Timer's supply terminal block is only a "link" between the electrical panel and the arms support terminal block.

In compliance with **IEC 601-2-7** (CEI 62-27) regulations, the EXPLOR-X 70 is equipped for connection to the following signalling devices at the entrance of the x-ray room:

- READY Light: Green light signalling that the equipment is ready to perform the examination. Connect to the Terminal block X2.1-2 of the Power Board (250Vac / 8A)
- X-RAY Light: Yellow light signalling that entrance into the examination room is not allowed since one exposure is being carried out. Connect to the Terminal block X2.3-4 of the Power Board (250Vac / 8A)

6. INSTALLATION

6.1 Wall mounting installation

The Explor-X 70 intra-oral x-ray unit is shipped in pre-assembled groups.
Mechanical mounting only consists of assembling these groups.
Registration of all mechanical elements is therefore effected prior to delivery; any intervention on these components is not required and may cause malfunction of the equipment; any operation must therefore be carried out by personnel authorised by the manufacturer.

6.1.1 Wall plate + Timer (standard configuration)

1. To ensure correct positioning of the equipment, the enclosed template (code 39609122) must be placed in the required position, thus identifying the desired fixing position on the wall. Taking into consideration equipment dimensions, place the upper part of the template at a distance of 1450 mm (57") from floor.

WARNING:
The plate must be placed so that the supply wires income hole coincides with their outcome from the wall.
Assessment of wall solidity is left with the person responsible for installation, taking into account the fact that to the extraction load on top bosses is 240 kg (528 lb) each.
The fixing bosses to be used for the different types of wall are the following:

- wood walls: self-threading screws provided in installation kit
- concrete walls: expansion bosses provided in installation kit
- hollow bricks: chemical bosses (not provided)

For less resistant walls a counterplate (See Paragraph 6.5.1) will have to be used.

2. Mark the points for wall plate mounting and make the relevant holes having a diameter corresponding to that of the selected bosses.
3. Remove wall plate/Timer external cover by loosening the two screws (**1**) located in the bottom part of the plate.
4. Loosen the internal screw (**2**) fixing the components plate and rotate the support by 90°.

5. Make holes in wall in the marked points and insert the expansion bosses provided in the installation kit.
6. Secure wall plate to wall by means of the screws (**3**), inserting the counterplate (**4**) between the two and check that top plane is levelled (use a level).

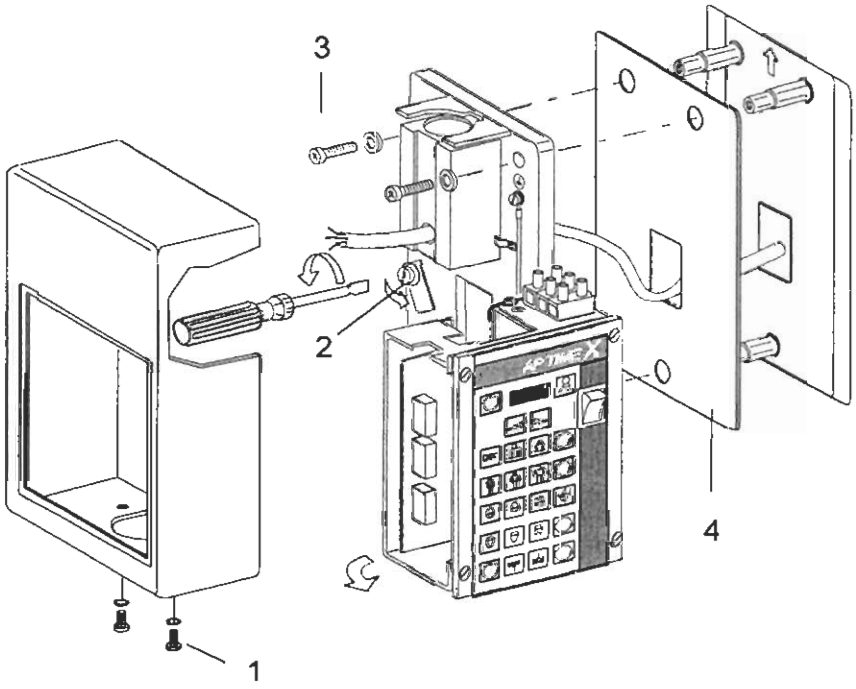


Figure 6-1

6.1.2 Wall plate (configuration with Remote Timer and Dental chair version)

Installation of the system with Remote Timer is marked by the presence of two seemingly similar elements. The first, having an arm support function, is made up of a wall plate complete with x-ray support block, (transit) terminal block and external cover. The second element, having a timer function, is made up of a support timer plate and external cover (with two boards and one control panel).

NOTE:
For the dental chair version the system is composed only by the second element.

WARNING:
The plate must be placed so that the supply wires income hole coincides with their outcome from the wall.
Assessment of wall solidity is left with the person responsible for installation, taking into account the fact that load on top bosses is 240 kg (528 lb) each.
The fixing bosses to be used for the different types of wall are the following:

- wood walls: self-threading screws provided in installation kit
- concrete walls: expansion bosses provided in installation kit
- hollow bricks: chemical bosses (not provided)

For less resistant walls a counterplate (See Paragraph 6.5.1) will have to be used.

- **Wall plate**

1. Mark the points for wall plate mounting by means of the enclosed template (code 39609124) and make the relevant holes having a diameter corresponding to that of the selected bosses.
2. Remove wall plate external cover by loosening the two screws (**1**) located in the bottom part of the plate.
3. Loosen the internal cover fixing screws (**2**).
4. Make holes in wall in the marked points and insert the expansion bosses provided in the installation kit.
5. Secure wall plate to wall by means of the screws (**3**), and check that top plane is levelled (use a level).

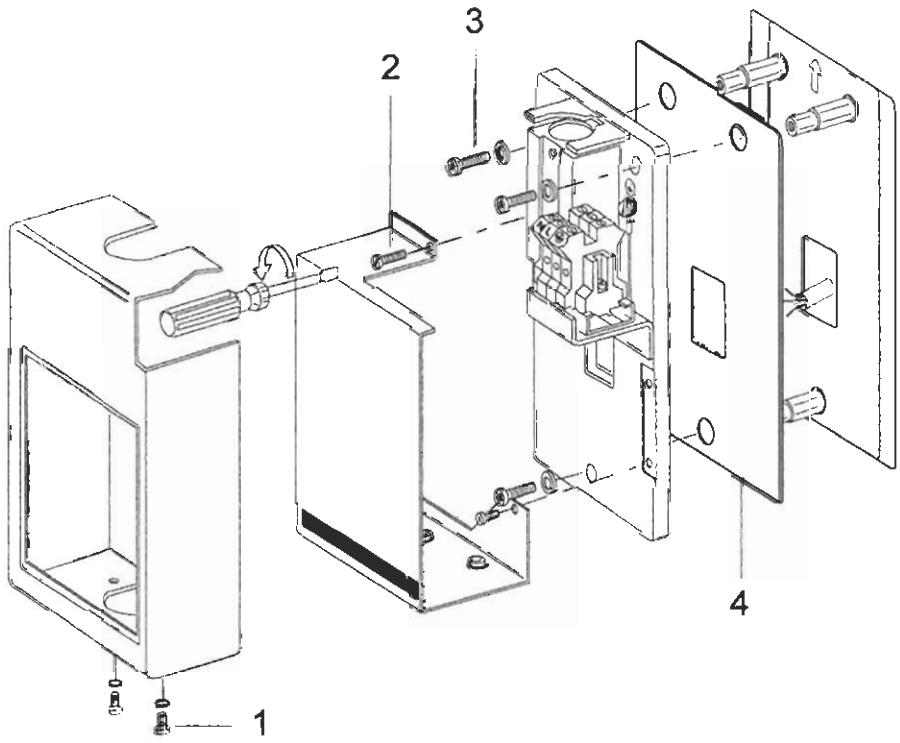


Figure 6-2

- **Timer plate**

1. Mark the points for wall plate mounting by means of the enclosed template (code 39609122) and make the relevant holes having a diameter corresponding to that of the selected bosses.
2. Remove timer external cover by loosening the two screws (**1**) located in the bottom part of the plate.
3. Loosen the internal screw (**2**) fixing the components plate and rotate the support by 90°.
4. Make holes in wall in the marked points and insert the expansion bosses provided in the installation kit.
5. Secure wall plate to wall by means of the screws (**3**), inserting the counter-plate (**4**) between the two and check that top plane is levelled (use a level).

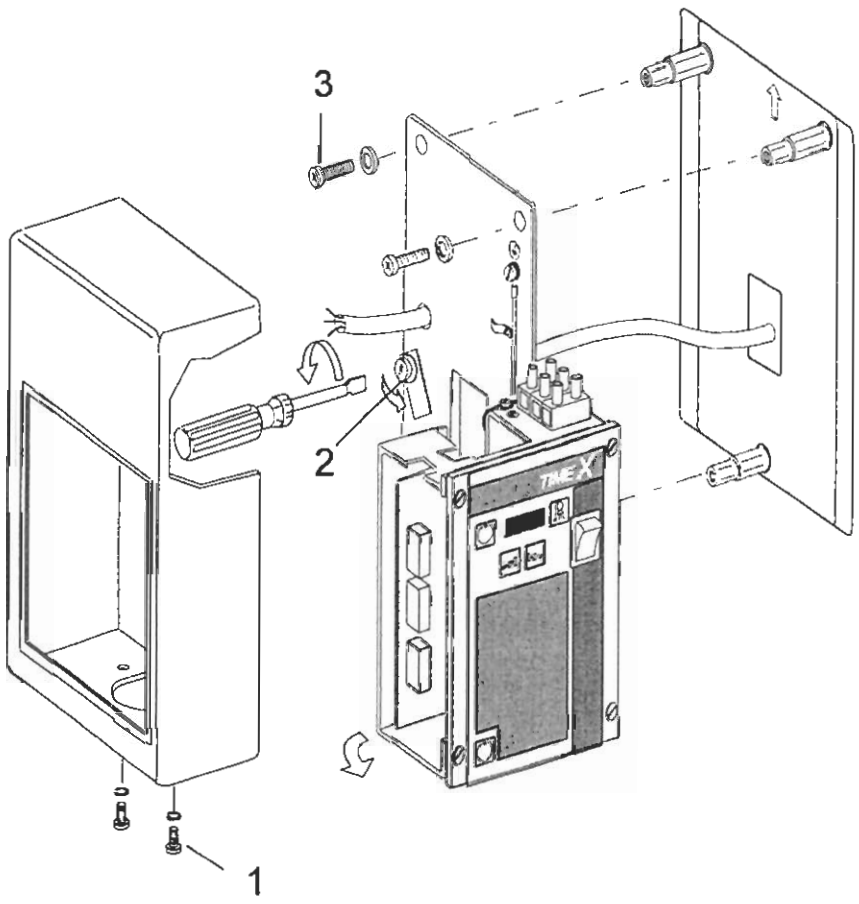


Figure 6-3

6.1.3 Ceiling suspension plate installation

NOTE:
Check ceiling solidity, taking into consideration the fact that maximum extraction load is 220kg (484 lb)

In the case of ceiling suspension versions, install the ceiling suspension plate and stand taking into account the fact that distance from the timer must not exceed 4m.
We recommend to install remote timer and connection wires (external in duct or sub) first.

1. Mark the 6 holes on ceiling using the template provided in installation kit (code 39609156).
2. Make holes in ceiling and insert the bosses provided in installation kit.
3. Screw ceiling suspension plate (**1**) to the ceiling by using the relevant screws (**2**).
4. Insert connection wires in the hole in the centre of the plate and drive them through the stand (**3**) (see Figure 6-5).
5. Screw stand (**3**) to ceiling suspension plate using the two screws (**4**) provided in installation kit (see Figure 6-6).
6. Check levelling of the assembly and, if necessary, adjust by means of the ceiling suspension plate fixing screws.
7. Install ceiling suspension plate cover (**5**) with the four screws (**6**).

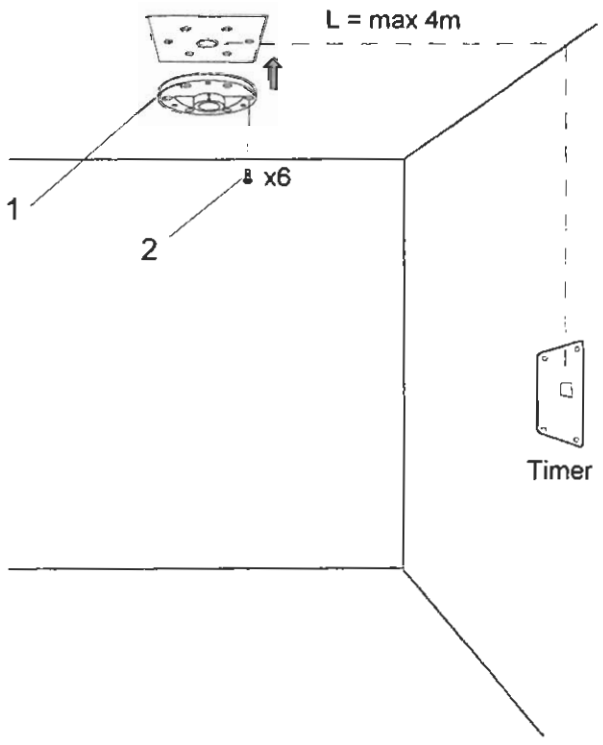


Figure 6-4

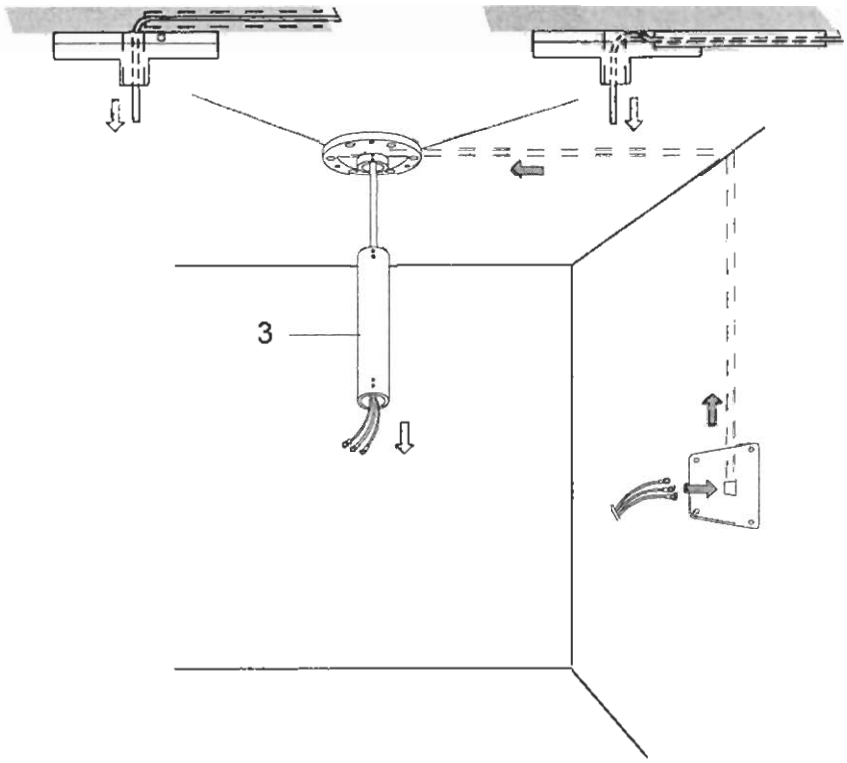


Figure 6-5

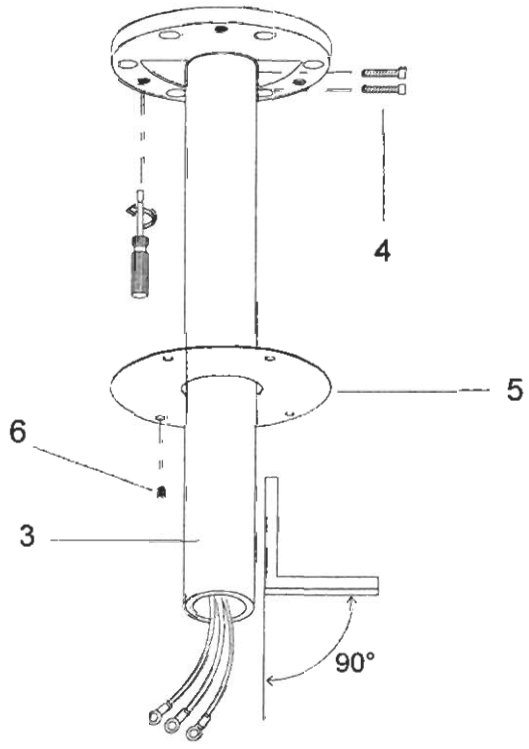


Figure 6-6

6.1.4 Mobile stand mounting and timer installation

1. Cross the two base tubes (**1**) in the relevant slot and fix them together by means of the relevant screw (**2**) and nut (**3**).
2. Position base plate (**4**) and secure it by means of the four relevant screws (**5**).
3. Mount column stand (**6**) on base plate (**4**) by means of the four relevant screws (**7**).
4. Remove timer's external cover by loosening the two screws located in the bottom part of the timer (**8**).
5. Loosen components plate internal fixing screw (**9**) and rotate the plate by 90°.
6. Fix timer (**10**) on the back side of column stand (**6**) by means of the two relevant screws (**11**) and check that top plane is levelled (using a level).

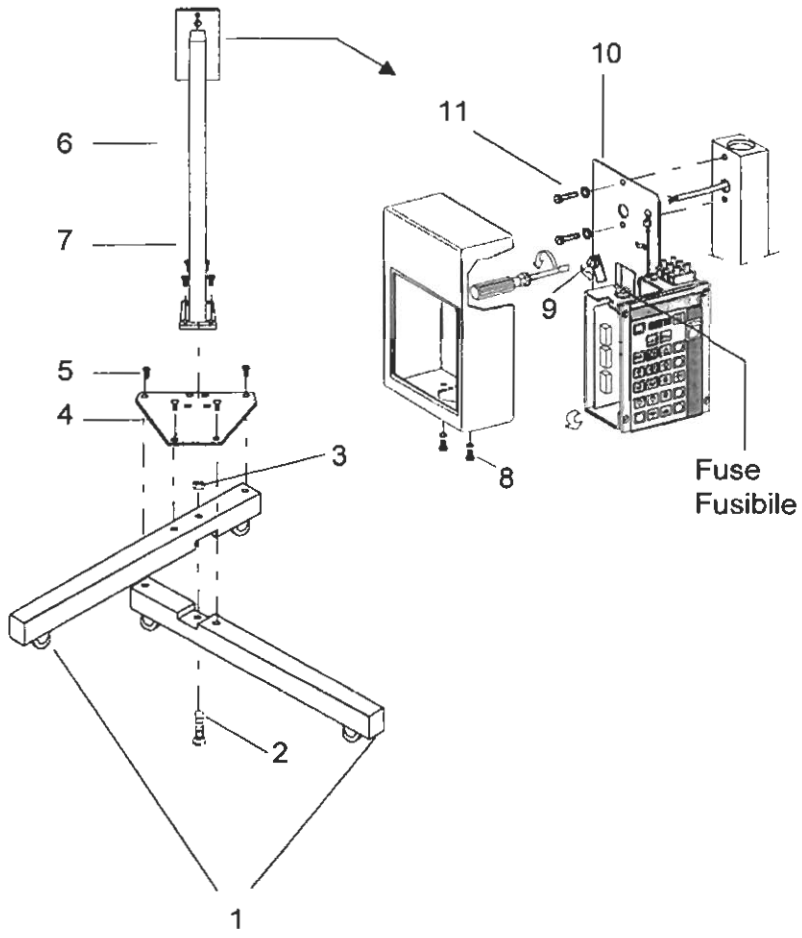


Figure 6-7

NOTE:
An additional 6A F (6.3x32) fuse is provided for the mobile stand version.

6.2 Scissors arms and extensions arms mounting

6.2.1 Preparation of square arms

WARNING:
To ease this operation (and avoid any inconvenience), we recommend not to remove the part of packing holding the two sections of the scissors arm closed and to perform the whole phase on bench. Non-compliance with this procedure may cause damage to the equipment and to people.

1. By means of tape, put the scissors arm cable and extension arm traction wire together (**1**). Pull the traction wire and at the same time push the cable into the extension arm from the other end; when the cable comes out from the extension arm, separate the cable from the traction wire (**2**).
2. Turn out the safety screw «A» (**4**) and introduce Scissors Arm pivot into Extension Arm (**2**).
3. Insert cable extremity in the relevant hole on extension arm and pull cable through rotation pivot (**3**).
4. Close hole on extension arm by means of the plastic plug provided in installation kit (**4**).

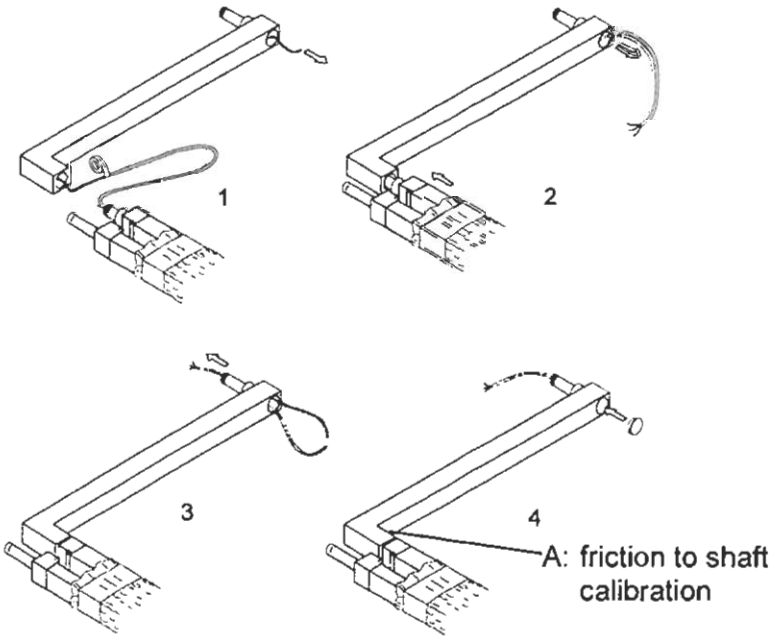


Figure 6-8

NOTE:
At the end of operation please proceed with friction adjustment as described in paragraph 7.2.2.

6.2.2 Preparation of oval arms

WARNING:
To ease this operation (and avoid any inconvenience), we recommend not to remove the part of packing holding the two sections of the scissors arm closed and to perform the whole phase on bench. Non-compliance with this procedure may cause damage to the equipment and to people.

1. To easily pull cable through extension arm, remove cover of the first arm by means of the relevant screw (**a**). Then remove the rotation pivot by loosening the two fixing screws (**b**) (**1**).
2. By means of tape, put scissors arm tubehead cable and extension arm traction wire together (**2**). Pull the traction wire and at the same time push the cable into the extension arm from the other end; when the cable comes out from the extension arm, separate the cable from the traction wire (**3**).
3. Insert scissors arm pivot in the relevant hole on extension arm (**3**).
4. Place rotation pivot and cover back on extension arm (**4**), performing the operations described at point 1 in reverse order.

WARNING:
Wrong pivot positioning can negatively affect the equipment's operational radius.

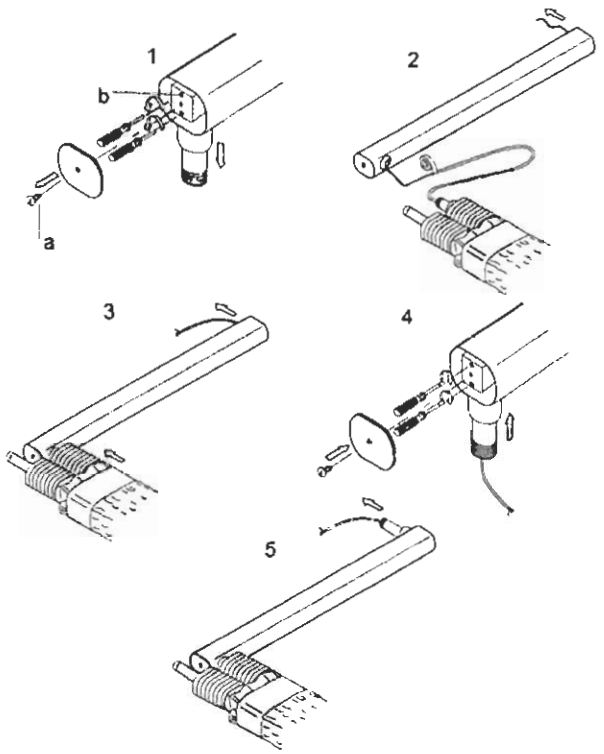


Figure 6-9

6.2.3 Preparation of square arms for ceiling mounting

WARNING:
To ease this operation (and avoid any inconvenience), we recommend not to remove the part of packing holding the two sections of the scissors arm closed and to perform the whole phase on bench. Non-compliance with this procedure may cause damage to the equipment and to people.

1. By means of tape, put scissors arm cable and extension arm traction wire together (**1**). Pull the traction wire and at the same time push the cable into the extension arm from the other end; when the cable comes out from the extension arm, separate the cable from the traction wire (**2**).
2. Insert scissors arm pivot in the relevant hole on extension arm (**2**).
3. Insert cable extremity in the relevant hole on extension arm and pull cable through rotation pivot (**3**).
4. Close hole on extension arm by means of the plastic plug provided in installation kit (**4**).

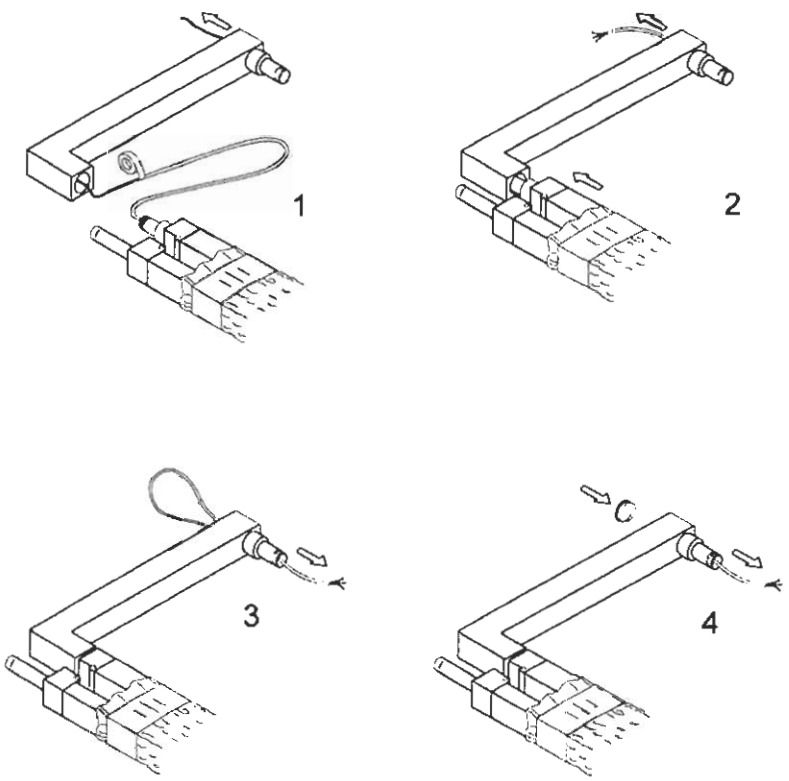


Figure 6-10

6.2.4 Preparation of oval arms for ceiling mounting

WARNING:
To ease this operation (and avoid any inconvenience), we recommend not to remove the part of packing holding the two sections of the scissors arm closed and to perform the whole phase on bench. Non-compliance with this procedure may cause damage to the equipment and to people.

1. By means of tape, put single pantograph arm tubehead cable and extension arm traction wire together (**1**). Pull the traction wire and at the same time push the cable into the extension arm from the other end; when the cable comes out from the extension arm, separate the cable from the traction wire (**2**)
2. Insert scissors arm pivot in the relevant hole on extension arm (**2**).
3. Insert sleeve on extension arm rotation pivot (pulling through it also tubehead supply cable) (**3**).
4. Secure sleeve by means of safety ring (**4**).

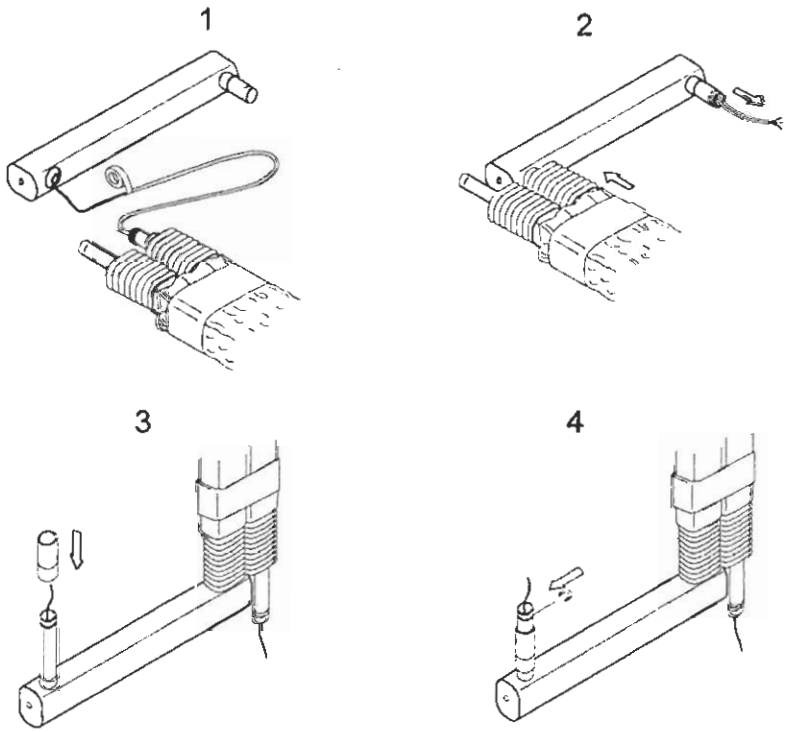


Figure 6-11

6.3 Arms mounting on support

6.3.1 Wall mounting of arms assembly

1. Mount complete extension arm on wall plate, by inserting rotation pivot in the relevant mounting sleeve.

NOTE:
To insert extension arm rotation pivot, keep arm in orthogonal position with respect to plate.
Do not free scissors arms from holding pack.

2. Check that extension arm is levelled, by means of a level; should this not be the case, adjust it by operating on adjustment screws, as described below:
   - extension arm with angle wider than 90°: operate on top screws (**B**)
   - extension arm with angle narrower than 90°: operate on bottom screws (**A**)

NOTE:
Since, in this phase, extension arm must not support tubehead weight, we recommend to keep the angle slightly wider than 90°, thus allowing a full-load flexion of about 4 mm with a 900 mm extension arm.

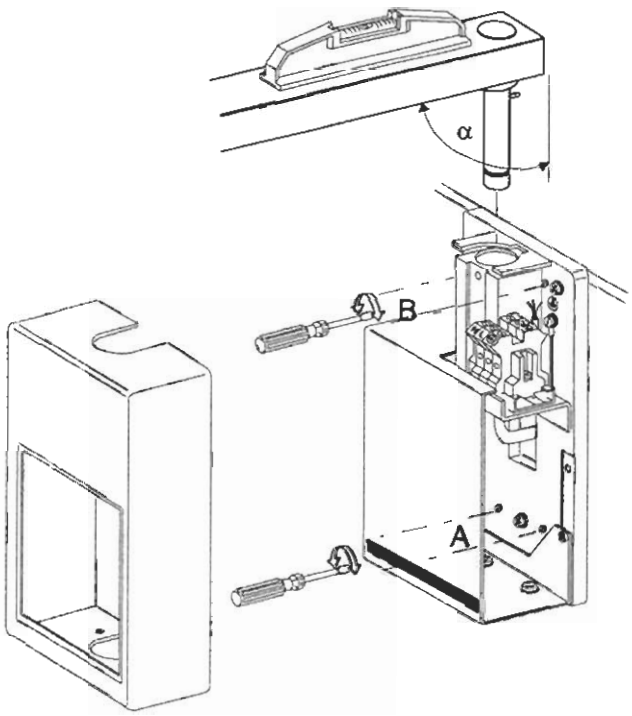


Figure 6-12

6.3.2 Mounting of arms assembly on dental chair's operation desk

1. Mount complete extension arm in dental chair stand, by inserting rotation pivot in the relevant thimble.

NOTE:
The stand on which the extension arm fixing plate must be fixed, is not supplied by Villa Sistemi Medicali.
To insert extension arm rotation pivot in thimble, keep arm in orthogonal position with respect to stand.
Do not free scissors arms from holding pack.

2. Check that the extension arm is levelled, by means of a level.

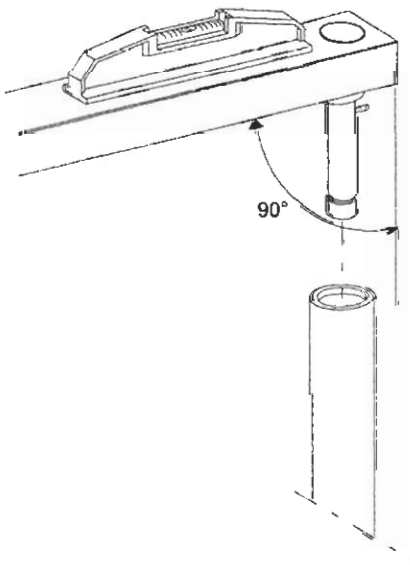


Figure 6-13

6.3.3 Ceiling mounting of arms assembly

1. Connect extension arm cables with stand cables, then insert extension arm pivot in the stand and secure it with two screws.

NOTE:
To insert extension arm rotation pivot, keep arm in orthogonal position with respect to plate.
Do not free scissors arms from holding pack.

2. Check that extension arm is levelled, by means of a level; should this not be the case, assess that ceiling suspension stand is perpendicular with respect to the floor and that extension arm pivot is correctly installed.

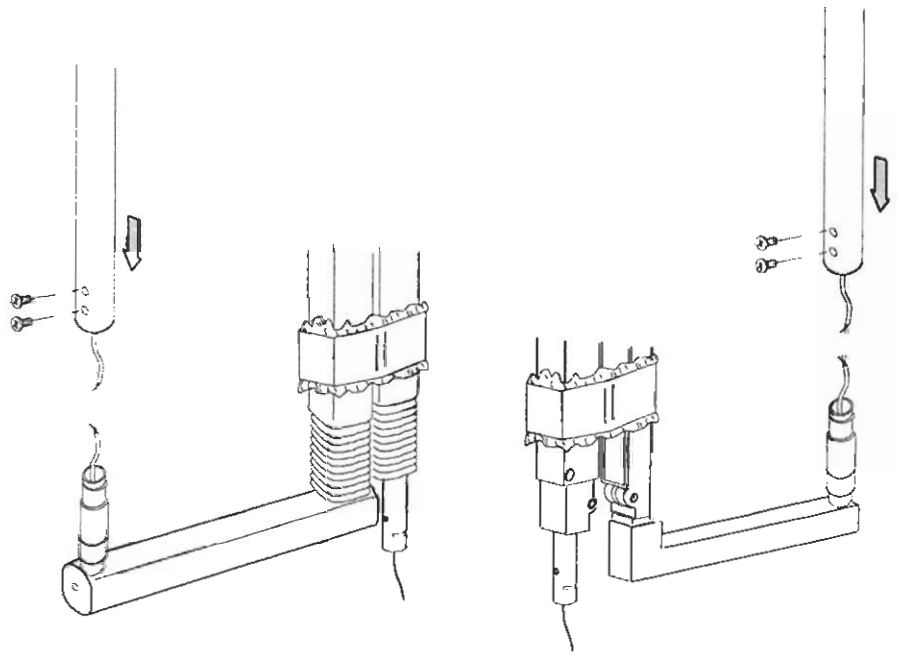


Figure 6-14

6.3.4 Stand mounting of arms assembly

Mount scissors arm (extension arm is absent in this configuration) on stand, by inserting rotation pivot in the relevant thimble.

NOTE:
To insert extension arm rotation pivot in thimble, keep arm in orthogonal position with respect to stand.
Do not free scissors arms from holding pack.

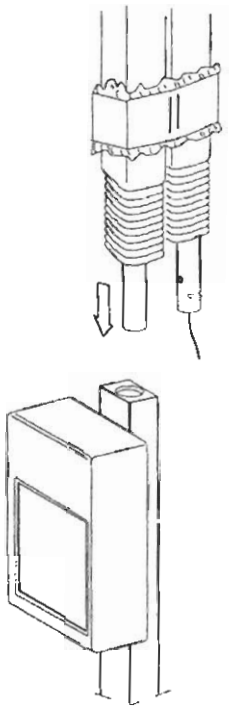


Figure 6-15

6.4 Tubehead mounting

6.4.1 On square arms

1. Remove safety screw (**1**) located on joint.
2. Keep arm articulation at maximum height and position safety cover (**2**) on joint.
3. Insert tubehead rotation pivot on joint for about half of its length and insert elastic ring (**3**) in the two relevant transversal slots.

NOTE:
The elastic ring must be inserted on the same side as the screw, in order to avoid excessive movement of safety cover.

4. Completely insert rotation pivot, so that safety ring fits the relevant slots on the pivot. Only after this has been carried out, the scissors arms holding pack can be removed.
5. Lower cover on elastic ring and screw back safety screw (**1**).

NOTE:
The function of the cover is to avoid that security ring leaves the relevant set. Therefore, cover (**2**) must be held in the right position by means of the relevant holding screw (**1**).
All operations for extension arm friction adjustment must be performed as described in paragraph 7.2.1.

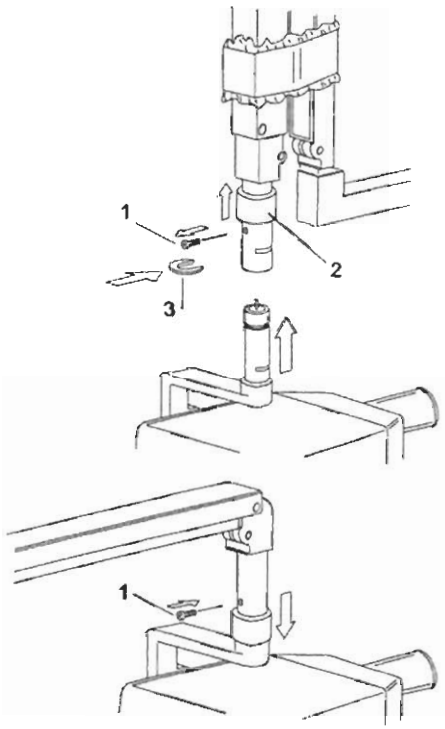


Figure 6-16

6.4.2 On oval arms

1. Remove safety screw (**1**) located on joint.
2. Lift joint protection cover (**2**) to see the safety elastic ring (**3**) insertion slot. Insert a pivot - whose diameter shall not exceed 3 mm (e.g., a screwdriver) - in the hole left empty by safety screw, in order to keep protection cover lifted and see safety ring slot.
3. Insert tubehead rotation pivot on joint for about half of its length and insert elastic ring (**3**) in the two relevant transversal slots.

NOTE:
The elastic ring must be inserted on the same side as the screw, in order to avoid excessive movement of safety cover.

4. Completely insert rotation pivot in the joint, secure it with safety ring (**3**) and lower protection cover (**2**). Only after this has been carried out, the scissors arms holding pack can be removed.
5. Lower cover on elastic ring and screw safety screw back (**1**).

NOTE:
The function of the cover is to avoid that security ring leaves the relevant seat. Therefore, cover (**2**) must be held in the right position by means of the relevant holding screw (**1**).
All operations for extension arm friction regulation must be performed as described in paragraph 7.2.2.

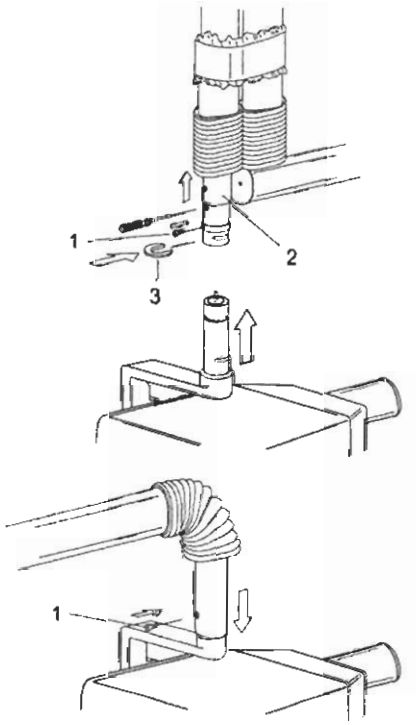


Figure 6-17

6.5 Installation of options

6.5.1 Counterplate

In case of utilisation on low-resistance walls, a counterplate must be used, on which the requested wall plate will be fixed (e.g., 16" , USA-type modular walls).

1. Mark the 4 holes for counterplate mounting on wall in the selected position, at a distance of 1450 mm (57") from floor, by using the template provided in the installation kit.
2. Make holes in wall in the selected points and insert the relevant bosses.
3. Secure counterplate (**1**) to the wall by means of the relevant screws (**2**), and assess that top plane is levelled (by means of a level).
4. Apply finishing panel (**3**) on counterplate.
5. Mount wall plate on counterplate by means of the relevant screws, provided in the installation kit (4).

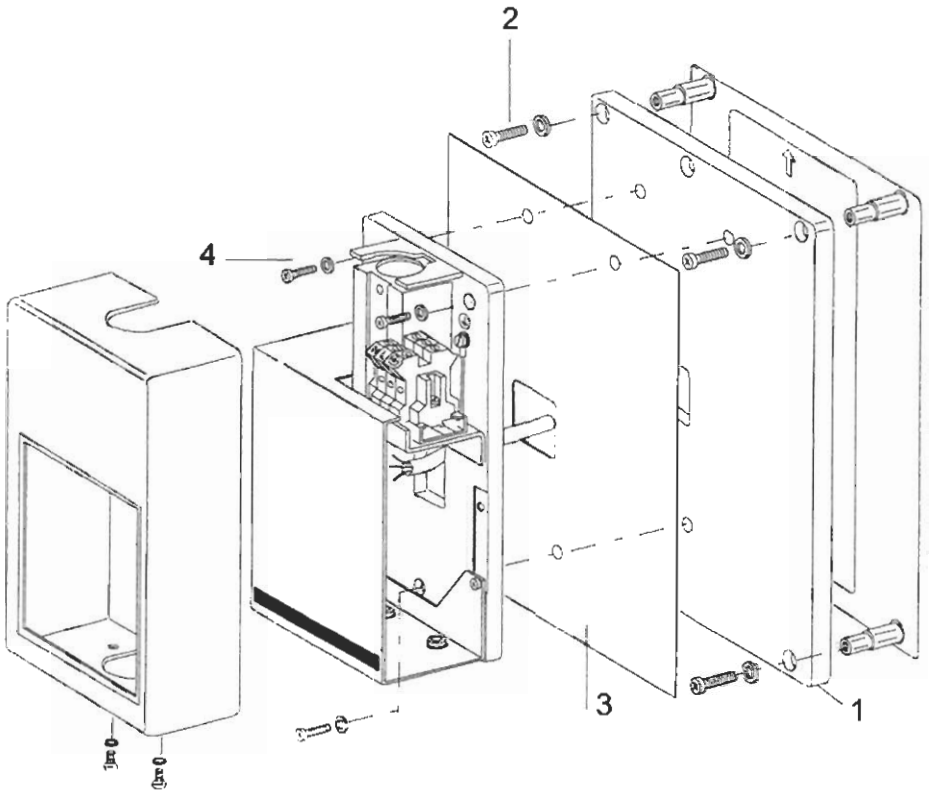


Figure 6-18

6.5.2 Hand remote control

NOTE:
The cable connecting Timer and hand remote control, either external or subtrace, must always be inserted into an iron cable run to avoid disturbances to signals inside the cable.
The cable may have a maximum length of 15 meters and, consequently, the distance between Timer and hand remote control must be smaller than this length.

The cable must have a minimum section of 1mm² and has to be connected to connectors X12 and X13 of the Logic Board (CPU board).
The hand remote control to be connected to the Timer is not supplied by Villa Sistemi Medicali.
Safety regulations require the use of a button enabled by the relevant safety key.

NOTE:
Both in the AP TIME X timer version and in the TIME X timer version, the Explor-X 70 is equipped with an exposure enabling button  .

Nevertheless, we recommend installation of the external hand control enabled by the relevant safety device (key).

6.5.3 Installation of chemical bosses

Installation with chemical bosses is recommended for hollow bricks.

To install chemical bosses, follow the instructions enclosed in the installation kit.

6.6 Electrical connection

After completions of the mechanical installation of the timer (available in different versions), proceed to electrical connection referring to the electrical schematics presented in chapter 9.
The timer must be connected to a system equipped with adequate grounding, in compliance with existing local safety regulations

6.6.1 Electrical connection for standard versions

1. Perform connection between main switch and timer terminal block by means of a bipolar cable + ground, whose minimum section must be of 2.5mm² (14 AWG); close cable on timer side with the relevant prod terminals provided in installation kit. Secure cable to terminal block, respecting indicated positions (L = line - brown cable, N = neutral - blue cable, Ground = yellow/green cable). The three wires must be bundled together near terminal block.
2. Connect tubehead cable to supply board, closing cables with the relevant terminals provided in installation kit, **respecting the positions indicated in the following table:**

Signal	Tubehead wire	Power board Position	Cable colour
Line	L2	X3	Brown
Neutral	N2	X4	Blue
Ground	Ground	Ground	Yellow/Green

X3 and X4 wires must be bundled together near the relevant faston; it is also necessary to prevent the wires from running between the boards, and consequently the excess wire must be fixed to the upper part of the timer by means of a bent.

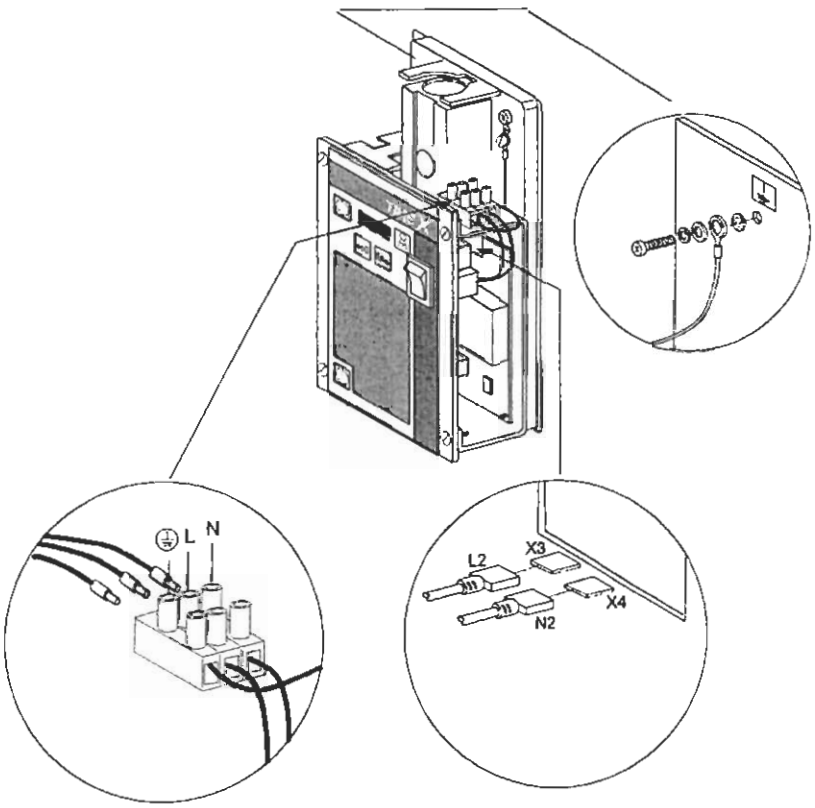


Figure 6-19

6.6.2 Electrical connection for versions equipped with remote timer

1. Perform connection between main switch and remote timer terminal block by means of a bipolar cable + ground, whose minimum section must be of 2.5mm² (14 AWG); close cable on timer side with the relevant prod terminals provided in installation kit. Secure cable to terminal block, respecting indicated positions (L = line - brown cable, N = neutral - blue cable, Ground = yellow/green cable).
2. Connect X3, X4 and Ground tiiner cables to terminal block L, N and Ground respectively on wall plate terminal block, using the terminals provided in the installation kit.
3. Connect tubehead cable to wall plate terminal block, closing cables with relevant prod terminals provided installation kit, respecting indicated positions (N2 = blue cable, L2 = brown cable, Ground = yellow/green cable on point of frame - see table page 56).

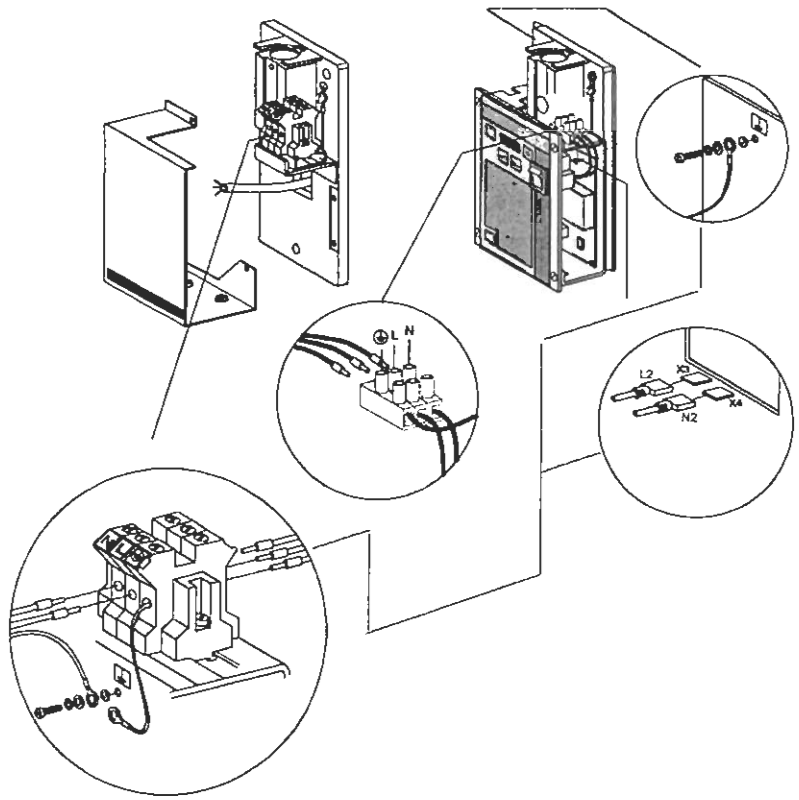


Figure 6-20

WARNING:
For all versions, tubehead connection to the supply board must be effected following the instructions provided, to ensure that the system functions at nominal values. Wrong connections may cause abnormal current absorption and consequent drop in tubehead performance and, in some cases, interruption of mains fuses.

6.7 Final functioning tests

6.7.1 AP TIME X timer

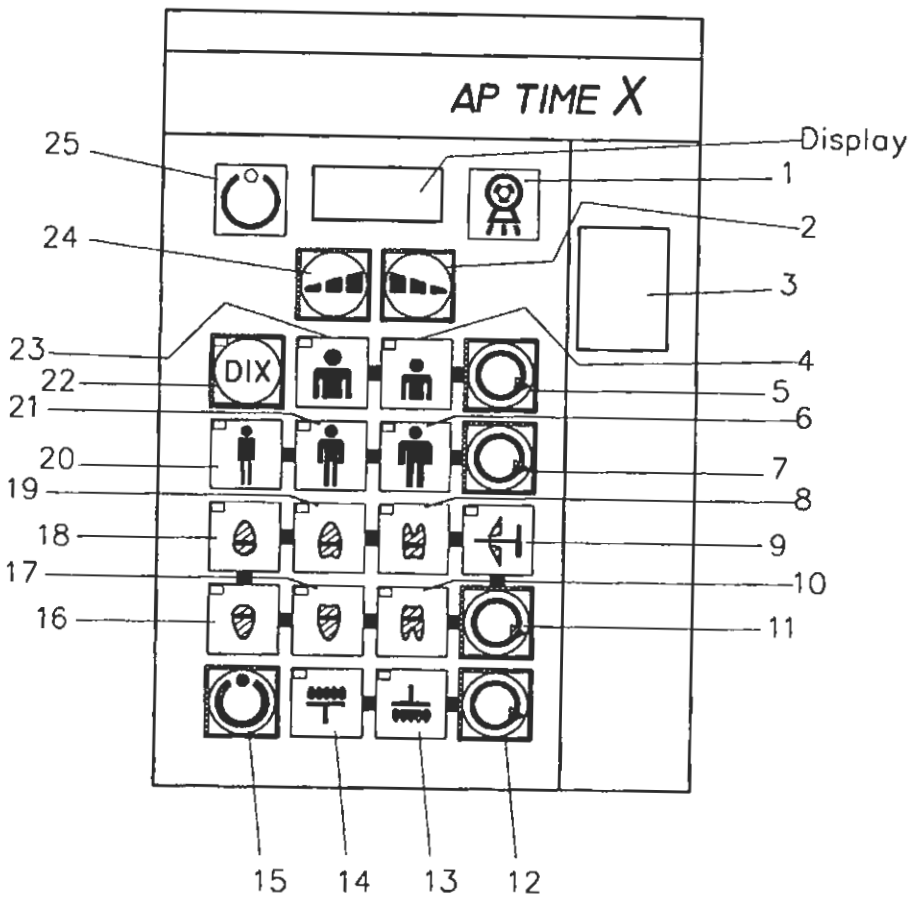


Figure 6-21

LEGEND:

1	X-ray emission LED	**10**	Lower Molar LED	**18**	Upper incisor LED
2	Decrease key	**11**	Tooth type selection key	**19**	Upper canine LED
3	Mains switch	**12**	Occlusal selection key	**20**	Small size LED
4	Child LED	**13**	Lower Occlusal LED	**21**	Medium size LED
5	Adult/Child selection key	**14**	Upper Occlusal LED	**22**	Digital radiography selection key
6	Large size LED	**15**	Exposure enabling key	**23**	Adult LED
7	Size selection key	**16**	Lower incisor LED	**24**	Increase key
8	Upper Molar LED	**17**	Lower canine LED	**25**	«Ready for x-ray» Green LED
9	Bite-wing LED				

All equipment functions are set at standard values and are tested in the factory during final tests. However, some of the functions may be regulated by Service engineers only after installation has been completed or according to specific requirements (see chapter 8).

After equipment has been connected to network mains voltage, perform the following functional tests:

1. Put mains switch (3) on **ON** position and check that light on the switch turns on and that hand remote control is set on automatic function selection mode for keys **23** (adult), **22** (medium size) and **19** (upper jaw premolar) (the relevant LEDs are on).

2. Check correct functioning in automatic mode by checking that the values displayed correspond to those reported in the table for all combinations of Patient, Size and Tooth type. Values reported in the table are calculated with multiplying factor «1» (see paragraph 7.5.2 of the User's Manual)

	0.25	0.32	0.50	0.12	0.16	0.23
	0.32	0.50	0.70	0.18	0.25	0.36
	0.36	0.63	0.80	0.23	0.32	0.45
	0.25	0.32	0.50	0.12	0.16	0.23
	0.36	0.50	0.70	0.18	0.25	0.36
	0.30	0.40	0.60	0.12	0.16	0.23
	0.23	0.30	0.45	0.12	0.16	0.23
	0.60	0.80	1.00	0.30	0.40	0.60
	0.45	0.60	0.90	0.23	0.30	0.45

Table 1

3. Select manual function by pressing button  **2** (increase) or  **24** (decrease) and check that display visualises the different manual exposure times by repeatedly pressing the relevant keys, as shown in the following table:

0.04 - 0.06 - 0.08 - 0.10 - 0.12 - 0.14 - 0.16 - 0.18 - 0.20 - 0.23 - 0.25 - 0.30 - 0.32 - 0.36 - 0.40 - 0.45 - 0.50- 0.54 - 0.60 - 0.63 - 0.70 - 0.80 - 0.90 - 1.00- 1.25 -1.30 - 1.40 - 1.60 - 2.00 - 2.50 - 3.00 - 3.20

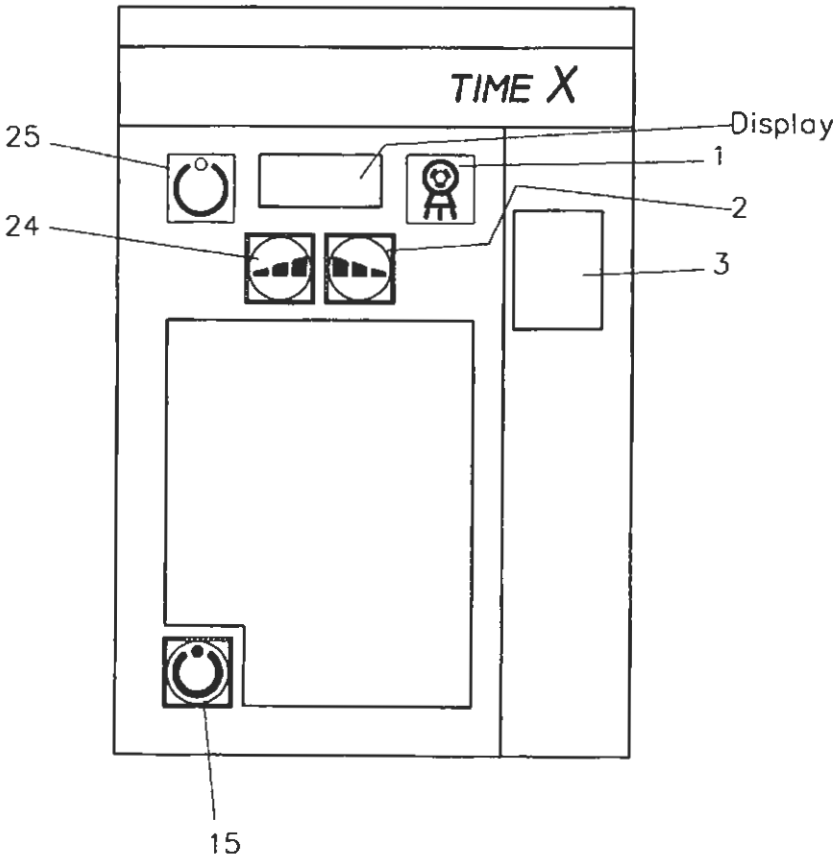
WARNING:
The following test implies x-ray emission; please follow all measures envisaged by local safety regulations.

4. Position fluorescent screen (not provided) for radiation visualisation at extreme end of collimator; press key  **15** and check simultaneous switching on of green LED  **25**, press x-ray button and check simultaneous switching on of the yellow LED  **1** and generation of acoustic signal accompanying x-ray emission.

NOTE:
Pressing the "Ready" key, the system will be ready for the exposure and also it will starting showing on the display the exposure time corrected according to the internal line voltage fluctuation algorithm (please see chapter 4.1).

Once these checks have been successfully completed, **EQUIPMENT IS READY FOR USE.**

6.7.2 TIME X Timer



LEGEND:

1 X-Ray emission LED

2 Decrease key

3 Mains switch

15 Exposure enabling key

24 Increase key

25 "Ready for x-ray" Green LED

Figure 6-22

All equipment functions are set at standard values and are tested in the factory during final tests. However, some of the functions may be regulated by Service engineers only after installation has been completed or according to specific requirements. (See Chapter 8).
After equipment has been connected to network mains voltage, perform the following functional tests:

1. Position main switch (**3**) on **ON** position and check that light on the switch turns on and hand remote control is activated.

2. By means of key **2** (increase) or **24** (decrease) check that display visualises all manual exposure times indicated in the following table:

0.04 - 0.06 - 0.08 - 0.10 - 0.12 - 0.14 - 0.16 - 0.18 - 0.20 - 0.23 - 0.25 - 0.30 - 0.32 - 0.36 - 0.40 - 0.45 - 0.50- 0.54 - 0.60 - 0.63 - 0.70 - 0.80 - 0.90 - 1.00- 1.25 -1.30 - 1.40 - 1.60 - 2.00 - 2.50 - 3.00 - 3.20

WARNING:
The following test implies x-ray emission; please follow all measures envisaged by local safety regulations.

3. Position fluorescent screen (not provided) for radiation visualisation at the extreme end of collimator; press key  **15** and check simultaneous switching on of green LED  **25**, press x-ray button and check simultaneous switching on of the yellow LED  **1** and generation of acoustic signal accompanying x-ray emission.

NOTE:
Pressing the "Ready" key, the system will be ready for the exposure and also it will starting showing on the display the exposure time corrected according to the internal line voltage fluctuation algorithm (please see chapter 4.1).

Once these checks have been successfully completed, **EQUIPMENT IS READY FOR USE.**

7. MAINTENANCE

7.1 General features

Like all electrical equipment, this unit requires not only correct use, but also regular maintenance and checks. Such measures will guarantee safe and effective equipment functioning and will prevent any risk for both patient and operator.
Preventive maintenance consists of checks performed directly by operator and of periodical maintenance interventions to be performed by Service engineers only.

Checks directly effected by the operator may be:

- check that labels are intact and properly secured
- check that tubehead is free from oil residues
- check that the hand control cable is not broken or worn out
- check for external damage on the apparatus, which may prejudice protection against radiation
- check centering of x-ray beam
- check scissors arm balancing
- on the square arm check that, when the 2 sections of the arm are fully open (e.g. first arm in vertical position, second arm in orizontal position) they are perpendicular each other.
  If instead the angle between the 2 sections of the arm is lower than 85°, check the position of the pivot holding the tube-head as follows:
  - if it is perpendicular to the floor (angle between the pivot and the second section of the arm >90°), perpendicularity between the 2 sections of the arm can be obtained by performing the Square arm balancing procedure (see paragraph 7.2.1)
  - if the pivot holding the tube-head is not perpendicular to the floor (angle between the pivot ad the second section of the arm =90°), then the arm needs refurbishing as, probably, the junction mechanism and the covers are worn out. This condition can be confirmed by the fact that the second arm has an evident mechanical play bringing it from rest position to horizontal position.

WARNING:
Checks must be performed before any operating session.
In case of irregularities or failures, the operator shall contact Technical Service.

In order to preserve the equipment's original features, preventive maintenance must be effected once a year by a authorised engineer.

WARNING:
Preventive and/or corrective interventions may be performed by authorised personnel by Villa Sistemi Medicali.

During this maintenance phase the equipment's functional performance is checked and repaired if required, following the instructions provided in paragraphs 7.2 and chapter 8.

WARNING:
In case of components replacement, use only original spare parts.

7.2 Arms adjustment

NOTE:
Arms adjustment does not require removal of tubehead. In case this operation is considered useful or necessary, before removing tubehead bring scissors arm in closed position and secure it with safety fixing device. This operation is necessary to avoid damage to people and to the arm.

7.2.1 Oval arms

Arms adjustment may be necessary in the following cases:

- the simultaneous movement of scissors and extension arms is not ergonomic; in this case, operate on extension arm friction adjustment.
- scissors arm is not perfectly balanced; in this case, operate on spring adjustment.

- **Extension arm friction adjustment**

1. Remove logo label located on extension arm cover.
2. Remove extension arm front cover by loosening the relevant screw.
3. Regulate friction by means of a 4mm hexagonal wrench and checking arm rotation.

NOTE:
The purpose of friction is also to avoid disconnection of scissors arm; hence it must not be loose.

4. Place cover and logo label back in the original position.

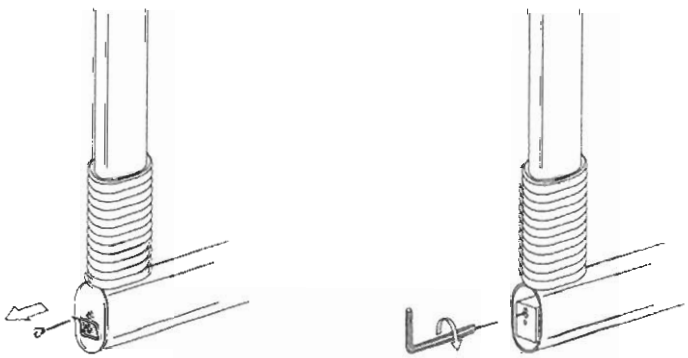


Figure 7-1

- **Scissors arm adjustment: second arm**

To proceed to scissors arm adjustment, proceed as follows:

- **Friction adjustment (Figure A)**
  1. Move bellows aside to uncover friction.
  2. Operate with one 10mm wrench and one 13mm wrench, regulate friction by rotating the 13 mm wrench ¼ of a turn at a time.
  3. Once adjustment has been completed, place bellows back in the original position.

- **Spring adjustment (figure B)**

  In case friction adjustment is not sufficient, operate on spring adjustment system:
  1. Move bellows aside and bring arm in horizontal position.
  2. By means of an 6 mm hexagonal wrench rotate clockwise in case arm tends to lower with respect to release position, or counter-clockwise if arm tends to rise.
  3. Once adjustment has been completed, place bellows back in the original position.

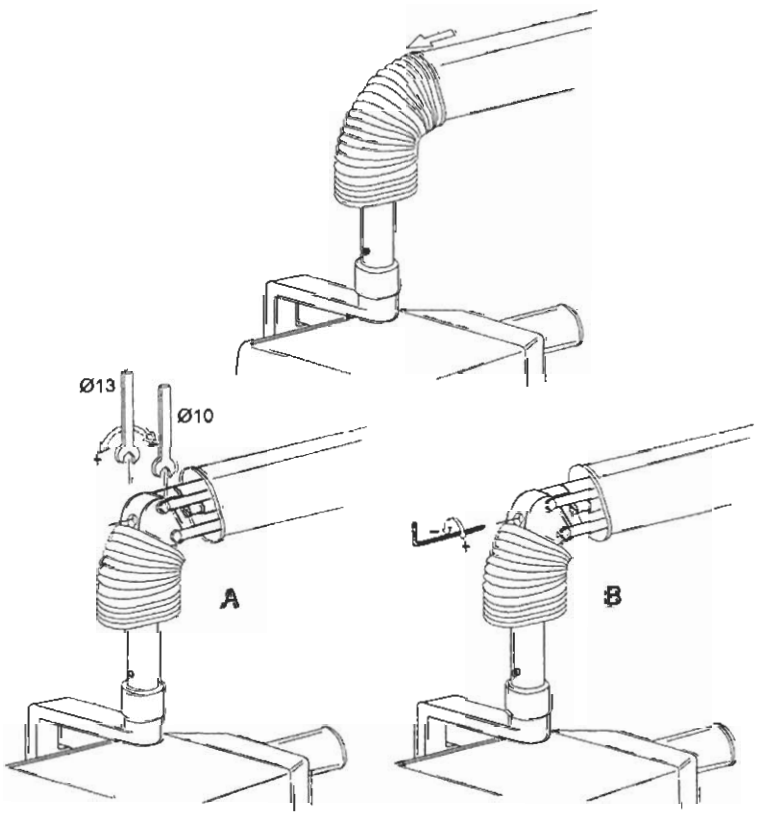


Figure 7-2

- **Single pantograph arm adjustment: first arm**

In case first arm adjustment is required:

Friction adjustment

1. Move bellows aside and bring second arm in vertical position.
2. Operate with one 10mm wrench and one 13mm wrench, regulate friction by rotating the 13mm wrench ¼ of a turn at a time.
3. Once adjustment has been completed, place bellows back in the original position.

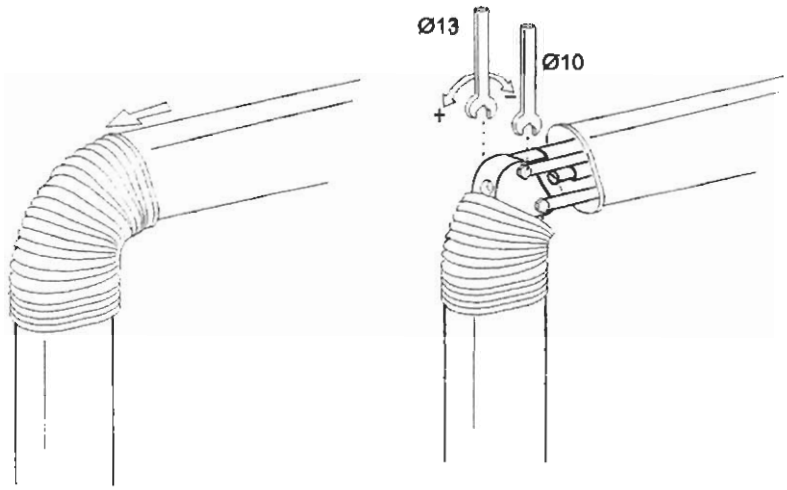


Figure 7-3

7.2.2 Square arms

After a certain time, arms balancing springs may sag.
Should this happen, tubehead will no longer be balanced in all positions and spring calibration will be required.

- **Balancing of second arm**

1. Keep first arm in vertical position.
2. Remove screw and pivot, then lift carter to allow adjustment operations.
3. Insert an hexagonal pivot - whose diameter must not be over 4mm - in the holes on spring adjustment thimble. Rotate pivot clockwise in case tubehead tends to lower, or counter-clockwise if tubehead tends to rise.
4. Once correct balancing has been found, place pivot back in the original position and secure it with the relevant screw.

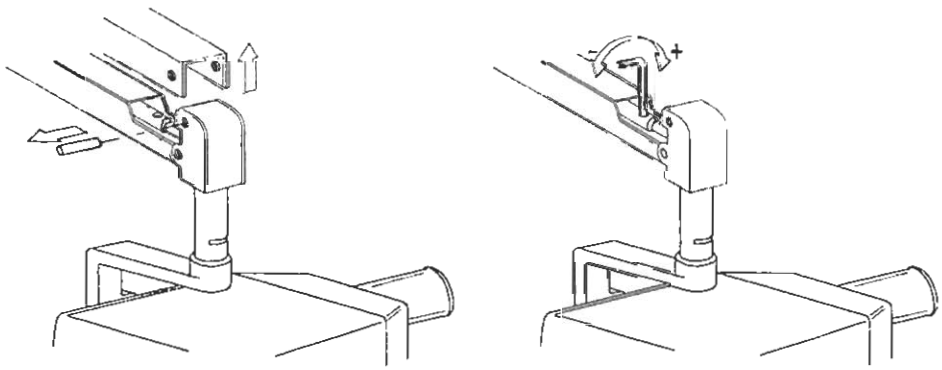


Figure 7-4

- **Balancing of first arm**

Should balancing of first arm be necessary:

1. Place arm in horizontal position.
2. Lift arms assembly so as to reduce load on pivot, then remove screw and pivot.

NOTE:
At this stage the arm is no longer balanced; therefore, be very careful when proceeding with the operation.

3. Lift carter to allow adjustment operations.
4. Insert an hexagonal pivot - whose diameter must not be over 4mm - in the holes on spring adjustment thimble. Rotate pivot clockwise in case tubehead tends to lower, or counter-clockwise if tubehead tends to rise.
5. Once correct balancing has been found, place pivot back in original position and secure it with the relevant screw.

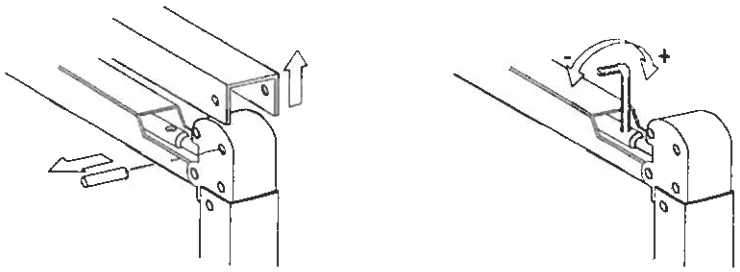


Figure 7-5

- **Extension arm friction adjustment**

  Adjust friction by means of a 4mm hexagonal wrench and check arm rotation.

NOTE:
The purpose of friction is also to avoid disconnection of scissors arm; hence it must not be totally loosened except in the case of arms replacement.

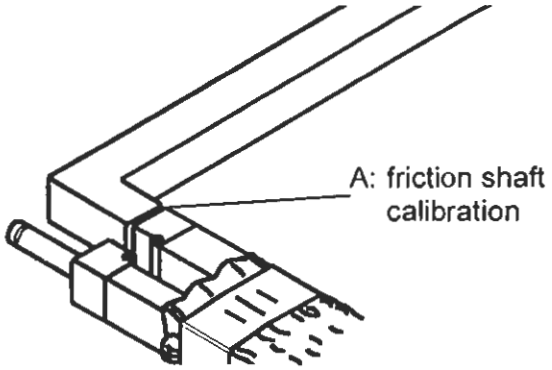


Figure 7-6

8. SET-UP AND ERROR MESSAGES

8.1 Set-up

In case of replacement of the electronic boards of the timer or of the whole tube-head, the system will require the re-adjustment of some parameters by means of the «PARAMETER SET-UP» procedure.

NOTE:
During the Set-up procedure the LED's of the keyboard will not be activated.

Starting from the condition of system switched off (system not connected to the mains), switch on the unit by acting on the green mains switch (I/O) located on the front panel of the timer. Wait for the end of the initial self check procedure and that Software revision appears on the display (e.g. 2.11). While the display shows the software revision, keep pressed contemporaneously the increase and decrease keys for five seconds.
The activation of the Set-up program is confirmed by the system through the message **"Pr0"** shown on the display for 2 seconds.

When the 2 seconds time is elapsed, the message **"Pr0"** disappears and the system shows the message **"P01"**, corresponding to the first parameter of the set-up procedure.

WARNING:
During any step of the Set-up procedure, the storing of the selections is achieved by pressing the "system enabled" key .

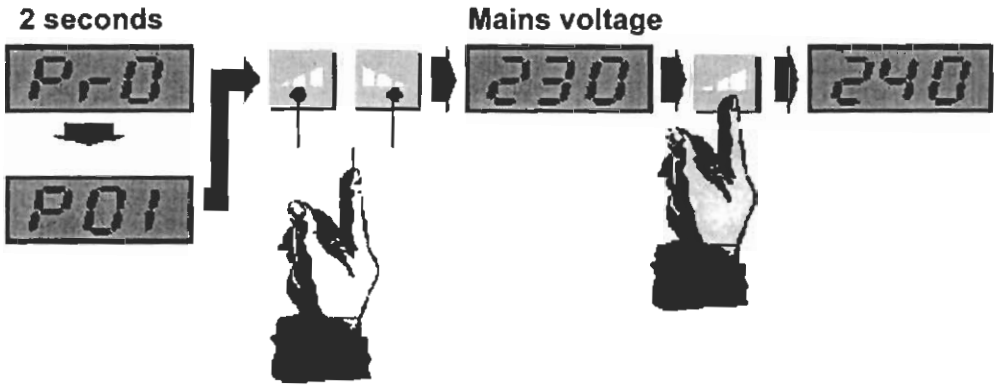
After pressing this key, the system stores the actual selection and moves to the next parameter to be set.

NOTE:
The modification of the parameter actually selected has to be carried out within 5 seconds from the selection of the parameters itself. If the 5 seconds time elapses before the confirmation key has been pressed, the system will show again on the display the number of the parameters «PXX» to be checked/modified.

Within the set-up program, the procedure to access and modify any of the parameter is the following:

1. when the display shows the message **"Pxx"** press the «increase» or «decrease» keys to activate the parameter to be modified.
2. to modify the parameter selected press the «increase» or «decrease» keys until the display shows the needed value.

Example: selection of the line voltage

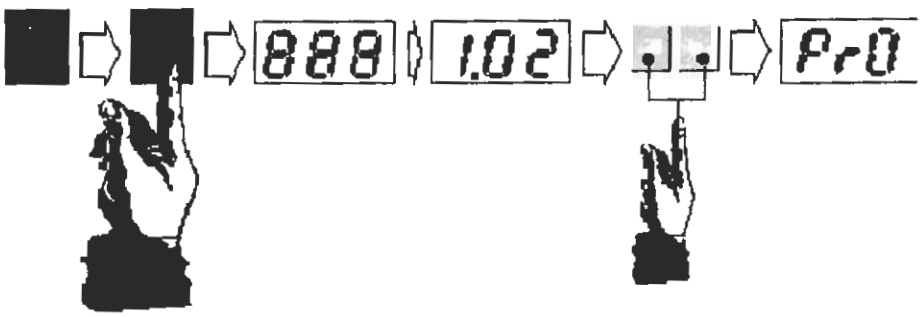


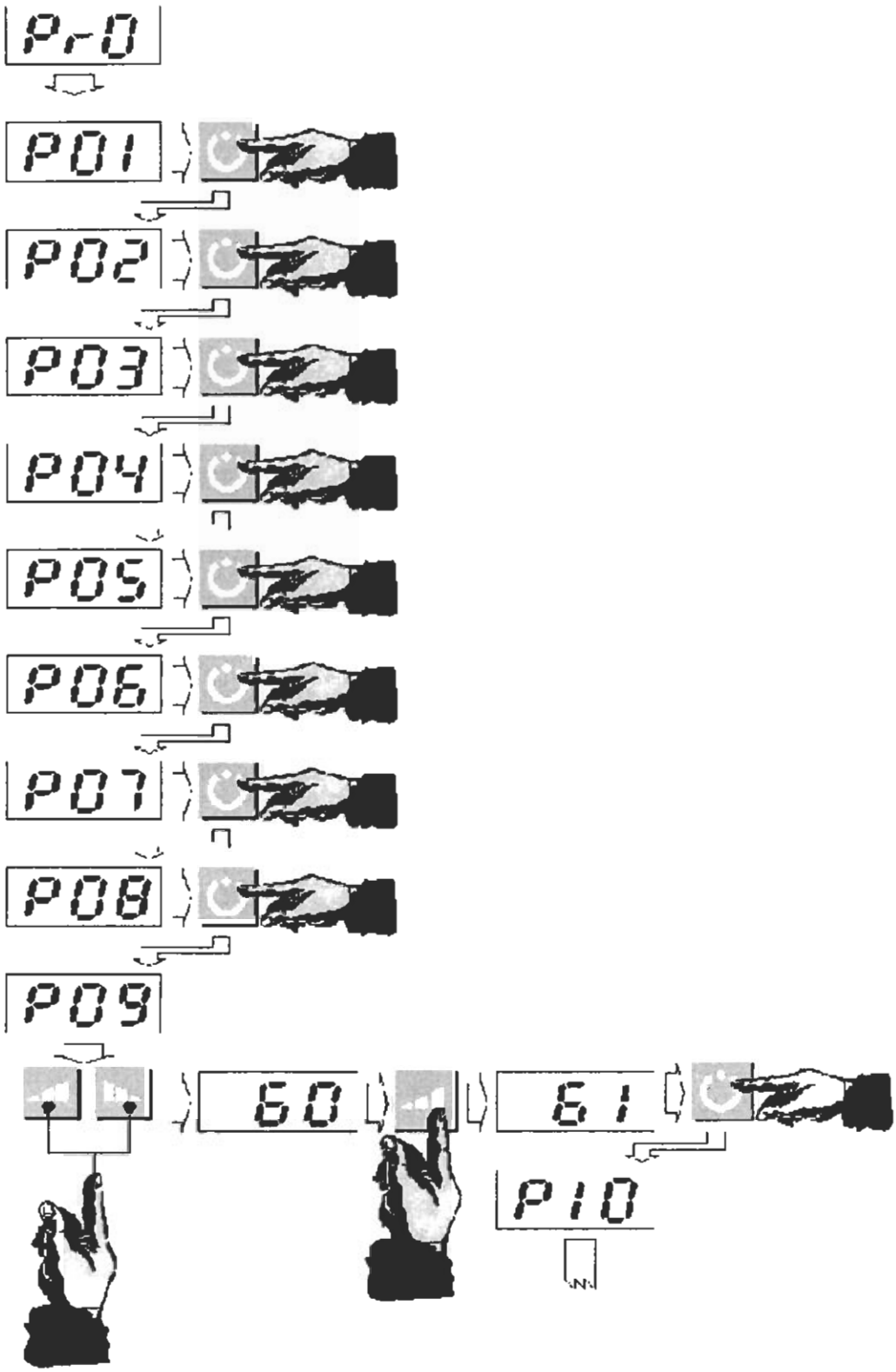
In addition, if only one or few of the parameters need to be modified, press several times the key until the parameter to be modify is reached, without entering into the adjustment of all the other parameters.

Example: ***1) Activation of Pause (P09)***

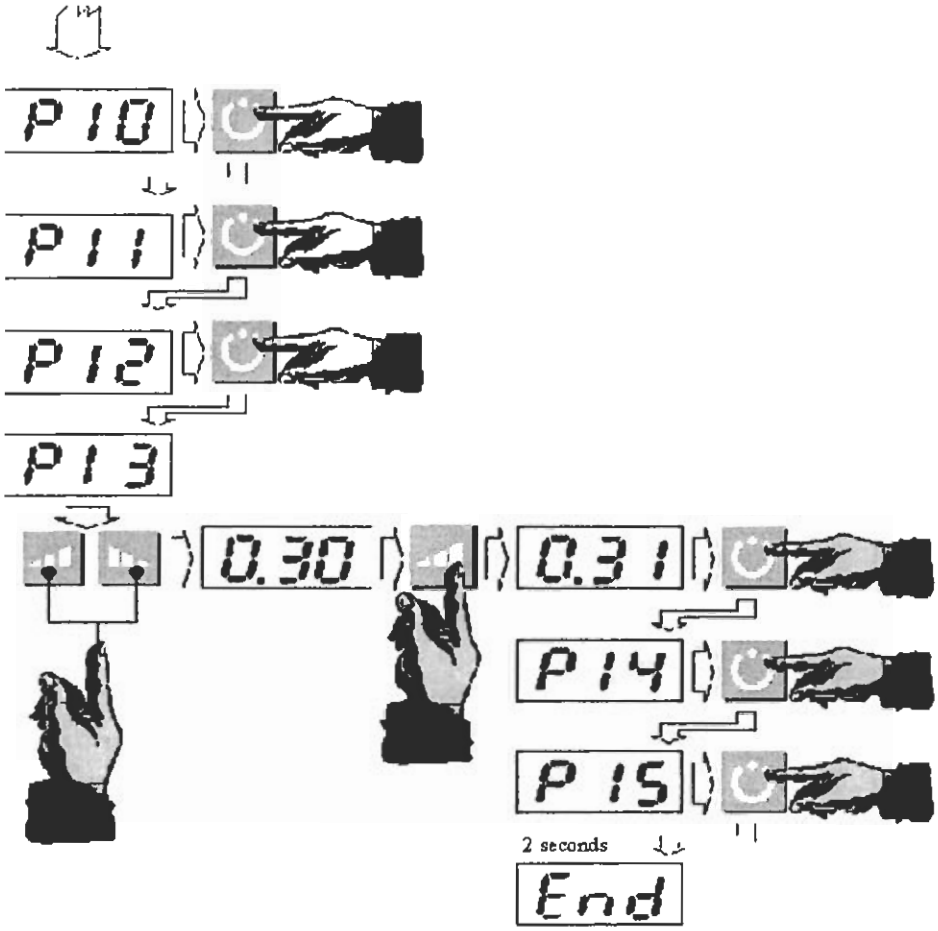
2) Selection of the manual exposure time (P13).

The following two pages show the sequence of actions to perform in order to carry out the programming of the two parameters P09 e P13, without entering all the other parameters (QUICK PROGRAMMING SEQUENCE).





Continues in the next page


P10
P11
P12
P13
0.30
0.31
P14
P15
2 seconds
End

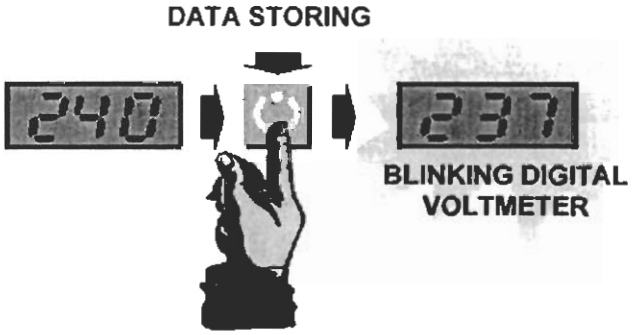
8.1.1 Accessing and setting parameters

P01 Selection of the line voltage:

the value chosen in this selection is used as internal reference to correct the exposures time depending on the actual mains voltage. Possible selections are 120Vac, 220Vac, 230Vac and 240Vac; make sure that the selected voltage corresponds to the mains voltage.

NOTE:
Whenever the value selected differs from the value indicated on the identification plate, the system will not comply with the 93/42/CE rules.

After making proper selection, press the ; in this case (**P01**), after pressing the key, the display will show (blinking mode) the actual mains voltage read by the internal voltmeter of the unit (± 1,5%); in this way, the system allows the operator to check for possible line voltage fluctuations.



Next steps allow to adjust the reading of the internal voltmeter of timer by using an external digital voltmeter (DVM):

1. Connect to the mains input terminal block of the timer a digital voltmeter (DVM) able to read the true RMS value, set to read alternate voltage (AC).
2. Press contemporaneously the keys and for at least two seconds. This action resets possible correction previously introduced.
3. Acting on keys and/or , match the reading of the internal voltmeter of the timer with the reading of the external DVM.
4. Once proper adjustment has been carried out, press the key to confirm. The display will then move to the second step of the set –up procedure showing the message **"P02"**.

P02 Selection of the driving mode of the tube-head:

parameter not to be modified

The value set must be **[P=1]**.

NOTE:
Selection of values different from the one shown above will affect the proper functioning of the unit and will affect the exposure parameters set by the operator. Therefore, modification of the setting of "**P02**" is forbidden.

Press the key to proceed with the next settings.

P03 Pre-heating time:

parameter not to be modified.

The value set must be **[0.24]** (seconds).

NOTE:
To guarantee proper functioning of the system and to comply with the 93/42/CE rules, modification of the parameter "**P03**" is forbidden.

Press the key to proceed with the next settings.

P04 Booster time:

parameter not to be modified

The value set must be **[0.04]**.

NOTE:
Selection of values different from the one shown above will affect the proper functioning of the unit and will affect the exposure parameters set by the operator. Therefore, modification of the setting of "**P04**" is forbidden.

Press the key to proceed with the next settings.

P05 Minimum exposure time:

this selection allows the setting of the minimum exposure time (in seconds). The minimum value can be chosen among the following times:

0.02 / 0.04 / 0.06 / 0.08 / 0.10 / 0.12 / 0.14 / 0.16 / 0.18 / 0.20

NOTE:
If the minimum exposure time selected is 0.02, the system will not comply with the 93/42/CE rules.

Proper minimum value to set is **[0.04]** (seconds).

Press the key to proceed with the next settings.

P06 Maximum exposure time:

this selection allows the limiting of the exposure times available to the user to the maximum value of 2 seconds.

- setting **[E=0]** all the exposure times shown in the next table will be available to the operator
- setting **[E=1]** the maximum exposure time is 2 seconds.

0.04 - 0.06 - 0.08 - 0.10 - 0.12 - 0.14 - 0.16 - 0.18 - 0.20 - 0.23 - 0.25 - 0.30 - 0.32 - 0.36 - 0.40 - 0.45 - 0.50- 0.54 - 0.60 - 0.63 -0.70 - 0.80 - 0.90 - 1.00- 1.25 -1.30 - 1.40 - 1.60 - 2.00 - **2.50 - 3.00 - 3.20**

Press the key to proceed with the next settings.

P07 Selection of the compensation factors of the exposure times:

This parameter changes depending on the nominal mains voltage of the equipment as shown in the following table:

Mains Voltage	P7
220V	008
230V	014
240V	020

NOTE:
To comply with the 93/42/CE rules, the selected value must be as shown in the above table.

Press the key to proceed with the next settings.

P08 Selection of the compensation factor of the pre-heating time:

This parameter changes depending on the nominal mains voltage of the equipment as shown in the following table:

Mains Voltage	P8
220V	004
230V	006
240V	008

NOTE:
To comply with the 93/42/CE rules, the selected value must be as shown in the above table.

Press the key to proceed with the next settings.

P09 Activation of the tube-head cooling time:

this parameter is a factor K (admitted values from 0 to 80) which, multiplied by the actual exposures time, gives the minimum pause between exposures.

PAUSE BETWEEN EXPOSURE = Exposure time * K

The default value is **[60]** (sixty times the exposure time).

NOTE:
To allow proper cooling of the tube-head between exposures, the minimum value to be set is 60. Values different from the indicated one may affect the reliability of the system, in addition, the system will not comply with the 93/42/CE rules.

Press the key to proceed with the next settings.

P10 Time between enabling of exposure and exposure:

is the maximum time (in seconds) available to the operator between the enabling of an exposure (obtained by pressing the key) and the execution of the exposure itself. This parameter ranges from 10 to 30 seconds (1 second step).
The default value is **[15]** seconds and can be modified by means of the keys "increase" and "decrease".

Press the key to proceed with the next settings.

P11 Selection of the tube-head version:

this parameter allows proper setting of the unit according to the tube-head to be connected.
The default value is **[70]** (Explor-X 70).

NOTE:
Whenever a value different from 70 is selected, the system will not comply with the 93/42/CE rules.

Press the key to proceed with the next settings.

P12 Enabling of digital radiography:

this selection allows the activation of the digital functioning mode, which is in turn linked to the use of the Digital selection key.

Setting **[d=0]** the digital functioning mode is disabled; therefore, pressing the Digital selection key  will not cause the activation of the relevant LED.

Setting **[d=1]** instead, activates the digital functioning mode. After this setting is done, the system allows the operator to automatically adapt the exposure times (shortening) to digital acquisition devices, upon pressure of the relevant activation key  ; this reduces the exposure time by the 80% of the set value for a D type film.

Press the  key to proceed with the next settings.

P13 Setting of the default exposure time:

this selection sets the default exposure time which will be proposed to the operator once he enters the manual functioning mode. The time ranges from 140 to 500 msec, with the following steps:

0.14 / 0.16 / 0.18 / 0.20 / 0.23 / 0.25 / 0.30 / 0.32 / 0.36 / 0.40 / 0.45 / 0.50

The default value is **[0.30]** (seconds).

Press the  key to proceed with the next settings.

P14 Resetting of the exposure counter:

this selection allows the resetting of the internal exposure counter.
First the system shows the digits relative to the «thousand», then it shows the digits relative to the values from 0 to 999.

To reset the counter act as follows:

1. press the x-ray push button and check that the number shown on the display starts blinking
2. within 5 seconds, press again the x-ray push button and check that the display stops blinking and shows "**000**": this indicates that the «thousand» digit has been reset
3. press the «decrease» key and act as above to reset the «hundred» digits.

Press the  key to proceed with the next settings.

P15 Enabling or disabling of the "Ready" button:

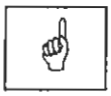
this selection enables/disables the use of the READY button.

***A=1** = use of READY button as programmed in P10.

***A=0** = disables READY button.

The default value is **[A=1]**.

Press «increase» button then select the desired value.



NOTE:
Whenever a value different from "A=1" is selected, the system will not comply with the 93/42/CE rules.

Press the  key to confirm and move to the next setting.

This will also display END as programming is now complete.

Next table shows the ranges of the programmable parameters

Display	Parameter	Default	WARNING
P01	Selection of the line voltage	220/230/240	(2)
P02	Selection of the driving mode of the tube-head	P=1	(1)
P03	Pre-heating time	0.24	(1)
P04	Booster time	0.04	
P05	Minimum exposure time	0.04	(1)
P06	Maximum exposure time	E=0	
P07	Selection of the compensation factors of the exposure times	008/014/020	(1) and (2)
P08	Selection of the compensation factors of the pre-heating time	004/006/008	(1) and (2)
P09	Activation of the pause	60	(1)
P10	Time between enabling of exposure and exposure	15	
P11	Selection of the tube-head version (65/70 kV)	70	(1)
P12	Enabling of digital radiography	d=0	
P13	Setting of the default exposure time	0.30	
P14	Resetting of the exposure counter	///////	
P15	Enabling of the «System enabled» key	A=1	(1)

WARNING:
The parameters marked with (**1**) in previous table must be left unchanged to preserve system's functionality and to comply with 93/42/CE rules.
The parameters marked with (**2**) must be set as shown in previous pages.

8.2 Error messages

AP TIME X and TIME X timers are equipped with a self-diagnosis function which continuously monitors the machine and the relevant safety circuits.
In case a problem is encountered, the machine shows an error message, to alert the operator. There are three different categories of error messages:

- errors occurred during the activation phase, which requires the intervention of the service
- resettable errors occurred during the activation phase (do not require service)
- errors occurred during the x-ray emission phase.

The first of the three typologies of errors occurs at switch on; in this case the system is stopped in order to prevent any further action. This status can only be reset by switching off and then back on the machine or by following the instructions provided in the next pages. The corresponding error codes are from **"E01"** to **"E09"**.

The error conditions that can be reset usually inhibit some of the functions of the machine, leaving the others operative. The corresponding error messages are from "**E11**" to "**E13**".

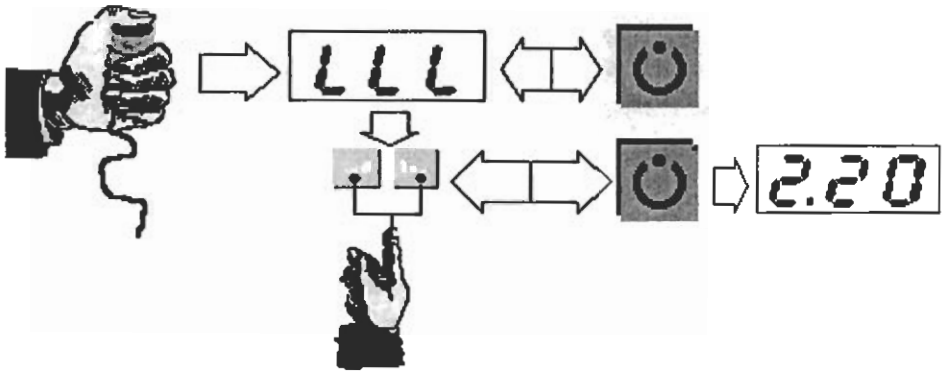
Errors found during the x-ray emission phase can bring the machine in a status where further exposures are not allowed. This typology of anomalies has error codes from **"E20"** to **"E25"**.

Refer to paragraph 8.4 for further details on any of the three categories of error messages mentioned above.

NOTE:
Erratic intervention of error messages (i.e. display signal error number different from one time to another) can be due to a bad connection between power and logic board. Check the correctness of the flat cable connecting X1 on the power board with X4 on the logic board; verify the complete insertion and eventually change the flat cable.

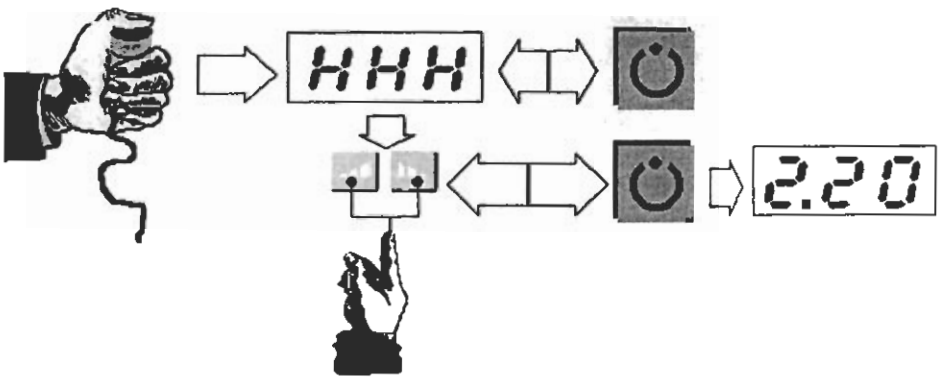
- **Input line voltage below rated voltage by 12.1%**

  Before performing the exposure a check of the input line voltage is performed. If voltage is below rated voltage by 12.1% , the display shall show the code "LLL" combined to glowing of the green operation LED. To reset this alarm, press the "INCREASE" or "DECREASE" button.



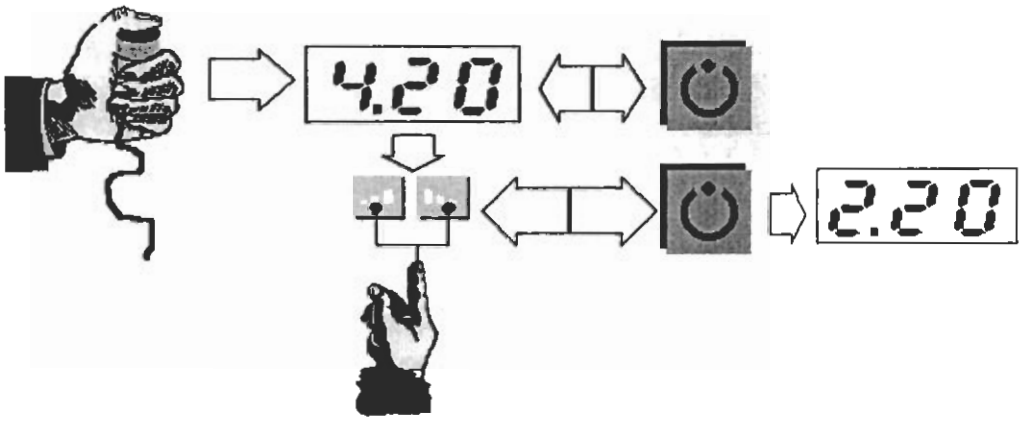
- **Input line voltage above rated voltage by 12.1%**

  Before performing the exposure a check of the input line voltage is performed. If voltage is above rated voltage by 12.1% , the display shall show the code "HHH" combined to glowing of the green operation LED. To reset this alarm, press the "INCREASE" or "DECREASE" button.



- **Calculated exposure time above 4 seconds**

  Before starting the exposure, the actual exposure time is calculated according to the fluctuation of the line voltage. If the time calculated is above 4 seconds, the display will show the value of calculated time (e.g. 4.20 seconds) and the green operation LED will simultaneously start blinking. In this condition, the exposure will not be carried out. To reset this alarm, press the "INCREASE" or "DECREASE" button.



NOTE:
In case of a serious system control failure, a dedicated safety hardware device will stop the x-ray emission after 5.5 seconds. This status is also indicated by the relevant error condition.

8.3 Replacing the tubehead

WARNING:
Before proceeding to tubehead replacement operations, close and tie the two scissors arm sections together.
Non-compliance with these instructions leads to serious assembly difficulties as well as to possible damages to the installation engineer and the arm itself.

1. Remove safety screw on the joint
2. Lift joint protection cover until the hole for insertion of the safety elastic ring is visible. Insert a pivot - whose diameter must not exceed 3mm - into the safety screw hole, inserting it in the hole on the joint. The protection cover is consequently kept lifted, thus showing the safety ring.
3. Holding the tubehead with one hand, remove the safety ring.
4. Gently remove the tubehead, rotating it if necessary.
5. Install the new tubehead proceeding to the operations already described for tubehead mounting (see paragraph 6.4).

NOTE:
Following tubehead replacement, it may be necessary to reset the exposures counting device (see chapter 8, "**P14**" parameter).

8.4 Troubleshooting

8.4.1 Timer does not function.

WARNING:
CPU BOARD AND POWER BOARD ARE FACTORY MATCHED.
NEVER ATTEMPT TO REPLACE AT SINGLE BOARD LEVEL, AS THIS ACTION WILL IMPAIR THE SYSTEM PERFORMANCE.

- **The main switch is not illuminated**

  The line voltage is not present; check input line voltage.

- **The main switch is ON, but the display does not light up**

  Look at the LED H1, located on the lower right side of the power board:

  1. If the LED H1 is lighted, check the fuse F4 (630 mA). If the fuse blew out, replace it. If not, check the flat cable connecting the power board with the logic board. Check the correct insertion of the cable or broken wires; eventually replace the cable.
  2. If the LED H1 is not lighted the main fuse F2 (6.3A - 250V) has blown out, replace it.

  If the fuse F4 continue to blow, change both boards.

- **The main fuse F2 continues to blow**

  This means that there is abnormal current absorption which possible cause can be a possible inversion of tubehead wires or a short circuit.

- **Check of correctness of wires connection**

  Look at X3 and X4 terminals and verify that labels on the wires correspond to the relevant terminal (see paragraph 6.6).

- **Check for short circuit on power board**

  1. Disconnect the tubehead cable from the power board removing the wires marked L2/X3 and N2/X4 from the X3 and X4 connector on the power board.
  2. If available, connect a test resistor (e.g. 680Ω 100W) on the X3 and X4 connector.(*also see next note)
  3. Select an exposure time of about 2 s on the timer and perform simulated exposures (3 or 4); in fact, there is no x-ray emission due to the fact that the tubehead is disconnected.
  4. If the fuse blows, the short circuit is on the power board, so change the boards.
  5. If the fuse does not blow, check for possible error of wires labeling; to perform this operation, **be sure to secure the arm in order to avoid possible injuries to people and/or damage to the arm.**

NOTE (*):
If the test resistor is not available, the test can be conducted on the same way, but at the end of the exposure time the error message "**E23**" will be displayed. Reset the error turning off the timer.

- **Correctness of wires labeling**

  1. Close and tie the two scissors arm sections together.
  2. Remove safety screw on the tubehead joint.
  3. Lift joint protection cover until the hole for insertion of the safety elastic ring is visible. Insert a pivot - whose diameter must not exceed 3 mm - into the safety screw hole, inserting it in the hole on the joint. The protection cover is consequently kept lifted, thus showing the safety ring.
  4. Holding the tubehead with one hand, remove the safety ring.
  5. Gently remove the tubehead, rotating it if necessary.
  6. Using a voltmeter set to measure ohm and a full scale value of about 1 kΩ (or low resistance), verify that the wire labeled L2/X3 is connected to the central pin of the sliding male connector at the arm end; this is assured when the meter reads a low value (near zero Ω); if the meter measures a high value, generally indicated as ɜ, this means a label inversion, so connect wire L2/X3 to X4 and vice versa, or exchange wire labels and connect as usual.

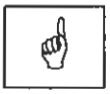
- **Check for damage on tubehead cable**

  This can be tested measuring the resistance between the two wires, using the same procedure as above; a low value means a short in the cable, so exchange the scissors arm.
  This can be tested also on the following mode:

  1. Reconnect tubehead wires to the appropriate connector, respecting the standard procedure; connect L2/X3 wire to connector X3 and wire N2/X4 to X4.
  2. Select an exposure time of about 2 s on the timer and perform simulated exposures (3 or 4); in fact, there is no x-ray emission due to the fact that the tubehead is disconnected.
  3. If the fuse blow, the short circuit is in the cable, so change the scissors arm.

- **Tubehead defective**

  If the previous checks give positive results (i.e. correct labelling and no short circuit on the arm), a possible cause is a short circuit on the tubehead. Change the tubehead, using the procedure described in the manual (see paragraph 8.3).



NOTE:
Following tubehead replacement, it may be necessary to reset the exposures counting device (see chapter 8, "**P14**" parameter).

8.4.2 Errors occurred at switch on

WARNING:
CPU BOARD AND POWER BOARD ARE FACTORY MATCHED.
NEVER ATTEMPT TO REPLACE AT SINGLE BOARD LEVEL, AS THIS ACTION WILL IMPAIR THE SYSTEM PERFORMANCE.

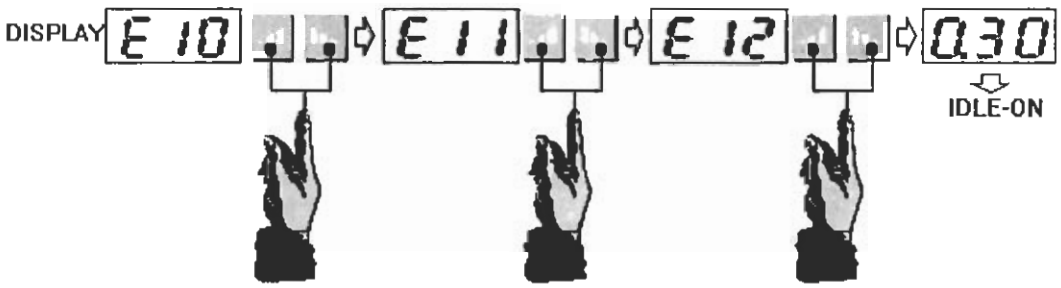
DISPLAY Signal	Meaning	Checks and actions to carry out
CHS	Checksum error of the memories (EEPROM + EPROM) and RAM test (1)	This means that a severe error occurred on the system memory, so data could be corrupted. • Switch off the timer and on again, pressing at the same time the Ready pushbutton and x-ray command. This will reset the system to default values • If the error still remains, replace the Power and Logic boards. **NOTE: After reset, a complete set up sequence has to be performed.**
E01	X-ray relay found activated (closed) at switch on	Severe error on the safety device. Check the flat cable between power and logic boards, to be sure it is connected properly. If the cable is broken, replace it; otherwise replace the Power and Logic boards.
E02	Tubehead powered at switch on	**Switch off immediately the timer because emission can occur.** Check for possible flat cable not well inserted. If the cable is broken, replace it; otherwise replace the Power and Logic boards.
E03	X-ray "primary" push button found closed at switch on	Check if the "primary" x-ray push button is pressed or shorted; in this case replace it. Otherwise replace the Power and Logic boards.
E04	X-ray "remote" push button found closed at switch on	Check if the "remote" x-ray push button is pressed or shorted; in this case replace it. Otherwise replace the Power and Logic boards.
E05	Both x-ray push buttons found closed at switch on	Check if the both x-ray push buttons are pressed or shorted; in this case replace them. Otherwise replace the Power and Logic boards.
E06	"System enabling" key found pressed at switch on	• Verify that keyboard connectors are well and correctly inserted on the X1 connectors on logic board. The flat cable having the longer connector has to be put on the connector nearest the logic board, while the shortest one to the other one, with the lower end terminating at pin 31. • Replace the keyboard. • Replace the Power and Logic boards, if necessary.
E07	"Digital mode" key found pressed at switch on (3)	Same as Error E06 above.
E08	"Increase" key found pressed at switch on	Same as Error E06 above.
E09	"Decrease" key found pressed at switch on	Same as Error E06 above.

8.4.3 Resettable errors at switch on

If during the self-test automatically performed by the machine after switch on, a resettable error condition is met, the relevant error message remains on the display until the "Increase" or "Decrease" keys are pressed. This action brings the system to the IDLE-ON status and the display shows the default exposure time.

NOTE:
If more than one error condition is met at the same time, the different error messages can be scrolled on the display by pressing contemporaneously the keys "Increase" and "Decrease". The system will enter the IDLE-ON status only after that the last error message has been shown on the display.

EXAMPLE:
ADULT/CHILD, SIZE and ANATOMIC TOOTH selection buttons already depressed upon Power-on (TEST) will lead to:



DISPLAY Signal	Meaning	Checks and actions to carry out
E10	ADULT/CHILD selection key found pressed at switch on	• Verify that keyboard connectors are well and correctly inserted on the X1 connectors on logic board. The flat cable having the longer connector has to be put on the connector nearest the logic board, while the shortest one to the other one, with the lower end terminating at pin 31. • Replace the keyboard. • Replace the Power and Logic boards if necessary.
E11	PATIENT SIZE selection key found pressed at switch on	Same as error E10
E12	ANATOMIC selection key found pressed at switch on	Same as error E10
E13	OCCLUSAL selection key found pressed at switch on	Same as error E10

8.4.4 Errors during exposure

DISPLAY Signal	Meaning	Checks and actions to carry out
E20	X-ray relay does not close within the given time	Check for possible flat cable between power and logic boards not well inserted (connected). If the cable is broken, replace it; otherwise replace the Power and Logic boards.
E21	The x-ray relays does not open within the given 50 msec time	**Severe error on the safety device. Switch off immediately the timer because emission can occur.** Check for possible flat cable between power and logic boards not well inserted (connected). If the cable is broken, replace it; otherwise replace the Power and Logic boards.
E22	The triac controlling the x-ray emission does not close within the given time (50 msec)	Check for possible flat cable between power and logic boards not well inserted (connected). If the cable is broken, replace it; otherwise replace the Power and Logic boards.
E23	The triac controlling the x-ray emission does not open within the given time (50 msec)	No load connected to the board; check the correct and complete insertion of tubehead wires. Check for possible flat cable between power and logic boards not well inserted (connected). If the cable is broken, replace it; otherwise replace the Power and Logic boards.
E24	The x-ray relay found closed when enabling the exposure cycle	The main relay K3 is found closed, so can be stuck. Check for possible flat cable between power and logic boards not well inserted (connected). If the cable is broken, replace it; otherwise replace the Power and Logic boards.
E25	Triggering of the hardware timer	**The emission was terminated by the safety backup timer.** **The emission can take place immediately at power on, so any action has to be carried out with the tubehead wires disconnected.** Check for possible flat cable between power and logic boards not well inserted and eventually replace it. Reset the system; if the cause of error is still present, E02 will be signalled; in this case, replace the Power and Logic boards.

9. SCHEMATICS AND DRAWINGS

1. Explor-X 70 AP TIME X general connection
2. Explor-X 70 AP TIME X general connection for mobile
3. Explor-X 70 TIME X general connection
4. Explor -X 70 TIME X general connection for mobile
5. Power board layout
6. Power board schematic
7. Logic board layout
8. Logic board schematic

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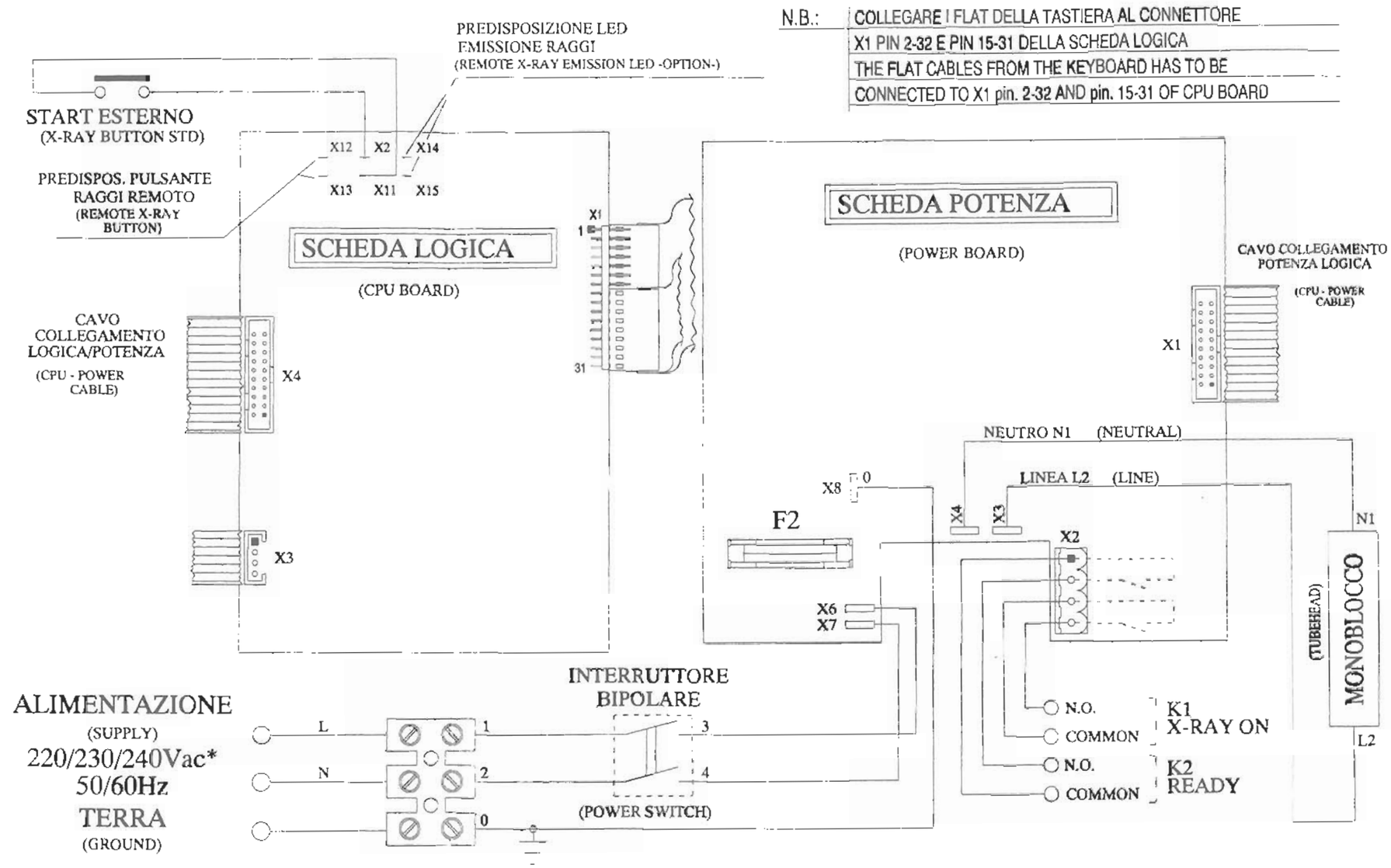

* IN ACCORDO CON IL MONOBLOCCO UTILIZZATO
ACCORDING TO THE INSTALLED TUBEHEAD

Explor-X 70 AP TIME X General connection	1
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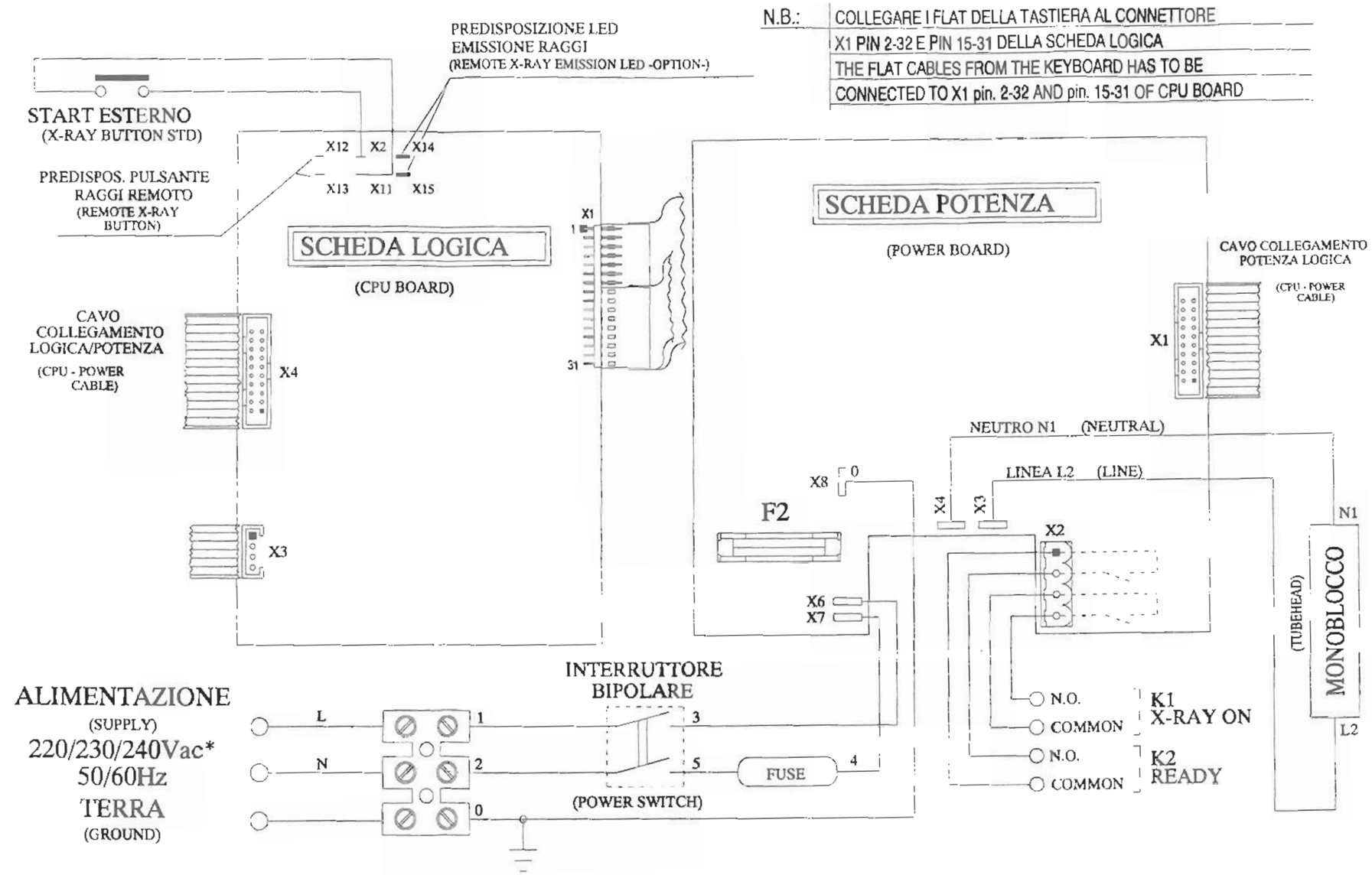

* IN ACCORDO CON IL MONOBLOCCO UTILIZZATO
ACCORDING TO THE INSTALLED TUBEHEAD

Explor-X 70 AP TIME X General connection for mobile	**2**
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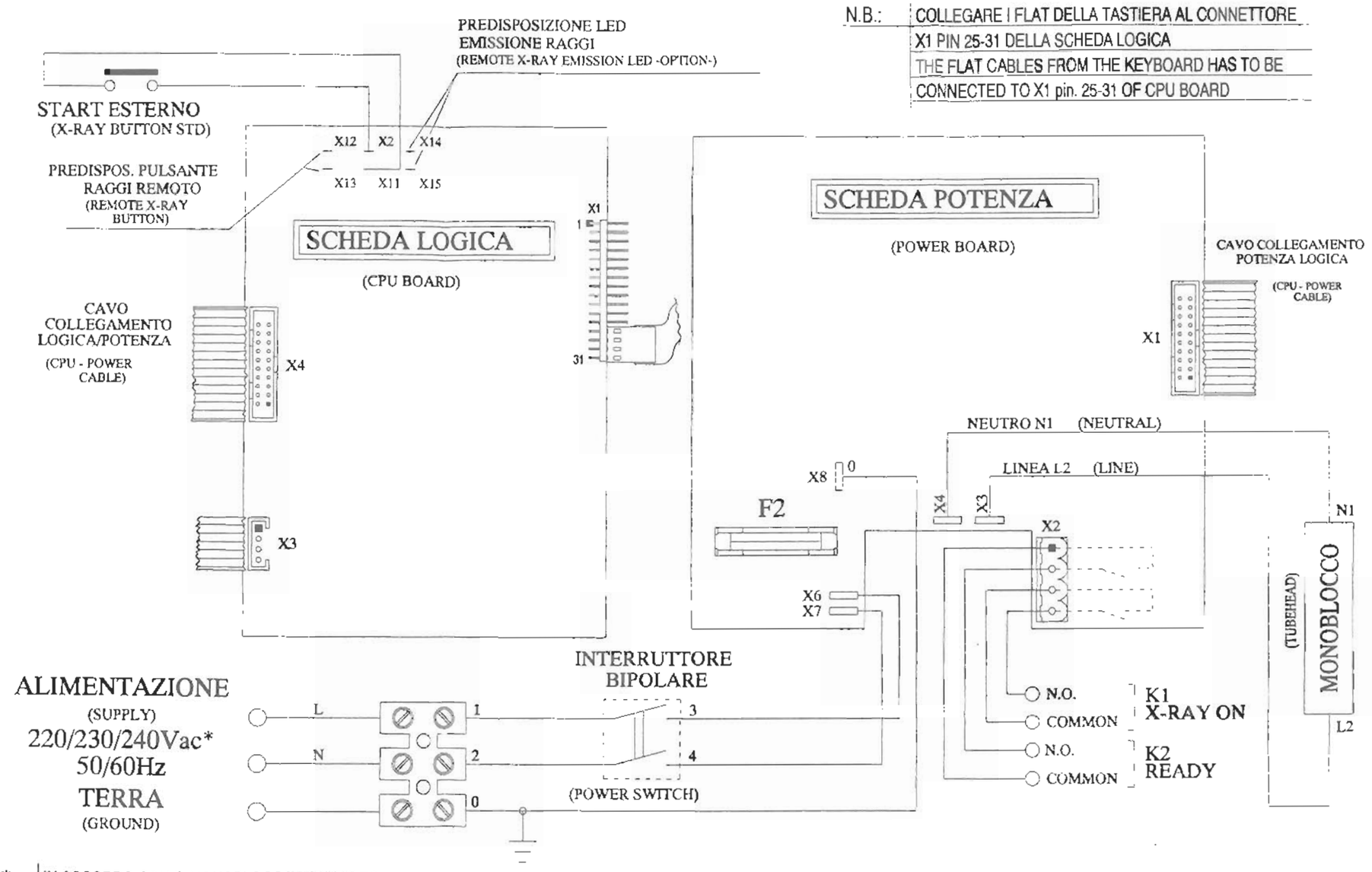

* IN ACCORDO CON IL MONOBLOCCO UTILIZZATO
ACCORDING TO THE INSTALLED TUBEHEAD

Explor-X 70 TIME X **General connection**	**3**
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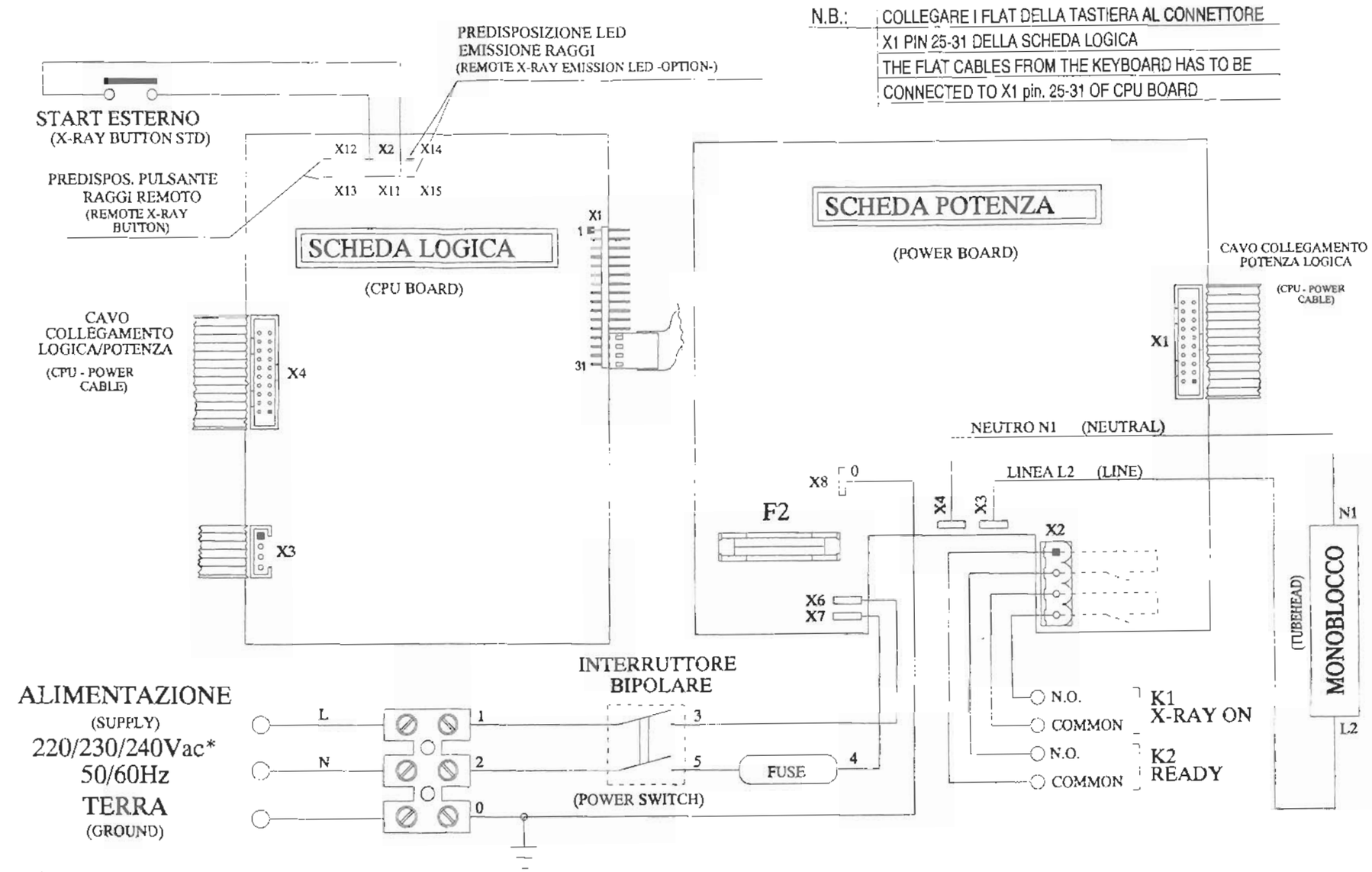

* IN ACCORDO CON IL MONOBLOCCO UTILIZZATO
ACCORDING TO THE INSTALLED TUBEHEAD

Explor-X 70 TIME X General connection for mobile	4
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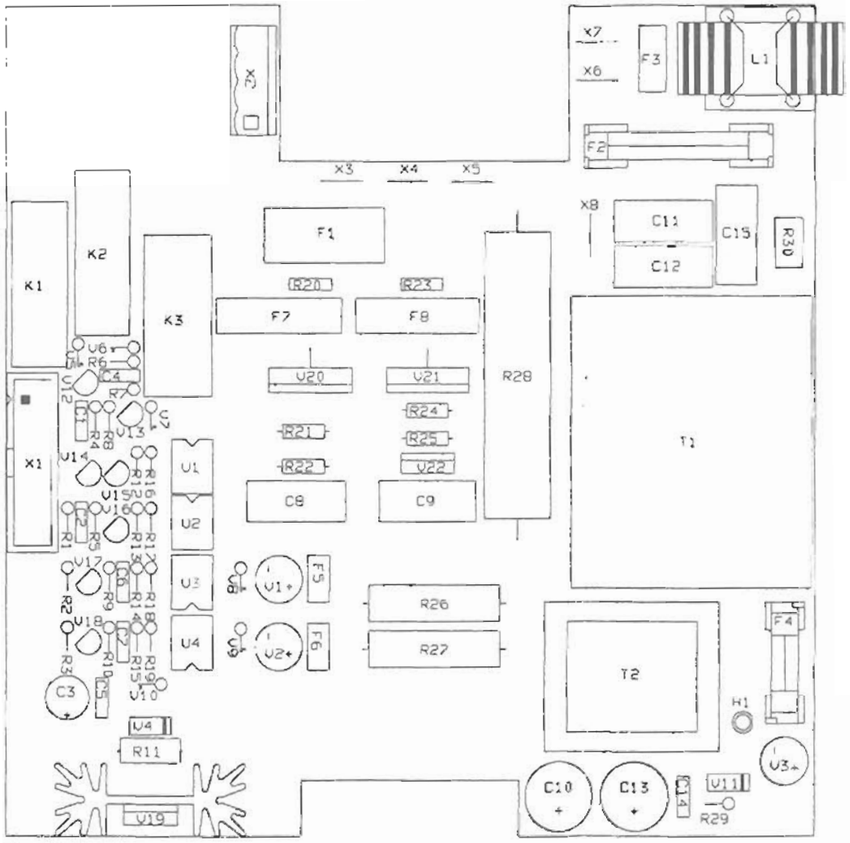
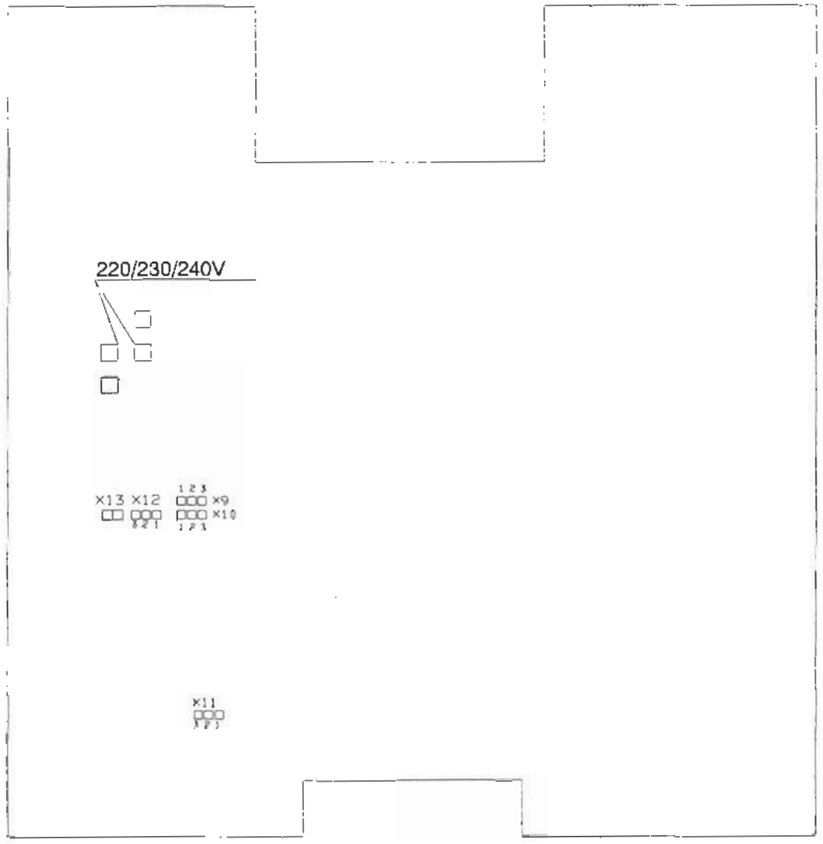
LATO COMPONENTI
(COMPONENTS SIDE)



LATO SALDATURE
(SOLDER SIDE)



Explor-X 70 **AP TIME X - TIME X** **Power board layout**	**5**
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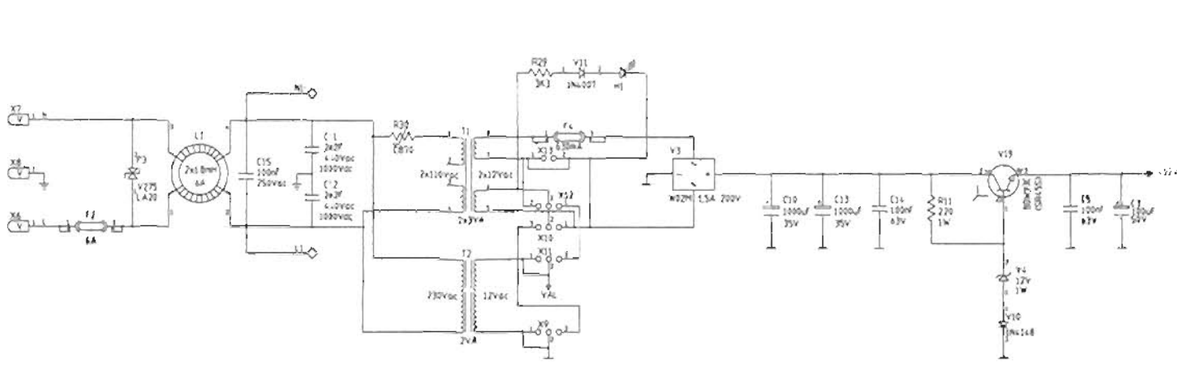
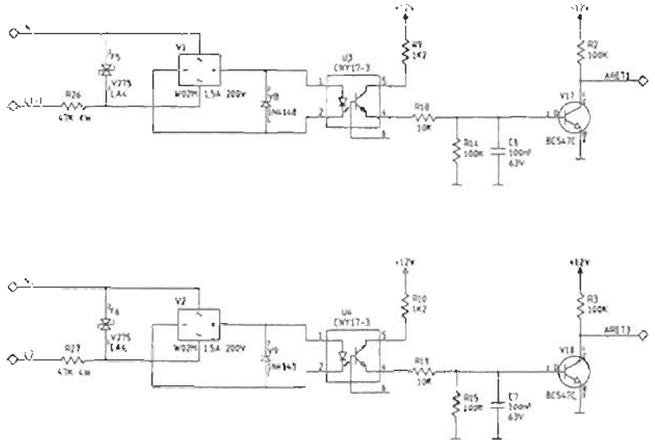
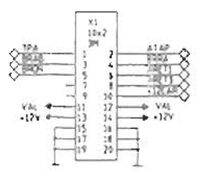
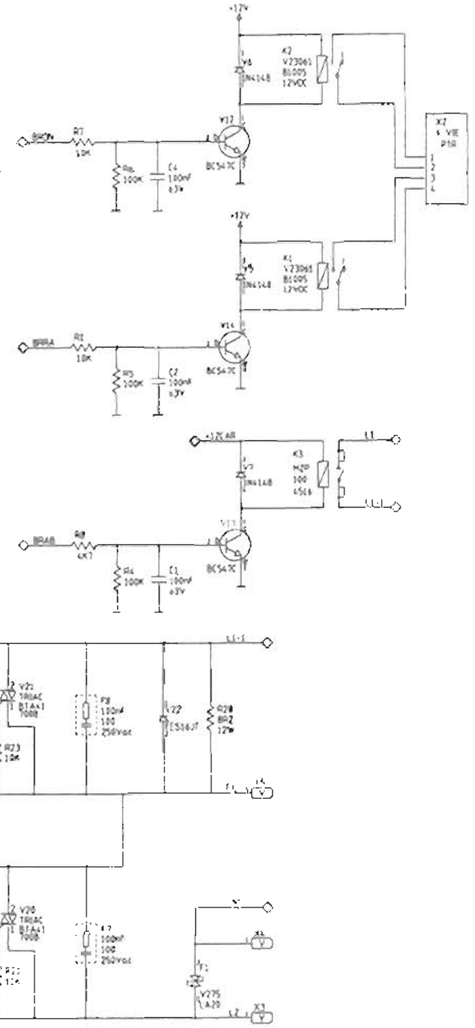




TRAFO	
NUM.GIEAR	NUM.HANN
1	1
2	3
3	6
4	8
5	10
6	12
7	13
8	15





Explor-X 70 **AP TIME X - TIME X** **Power board schematic**	**6**
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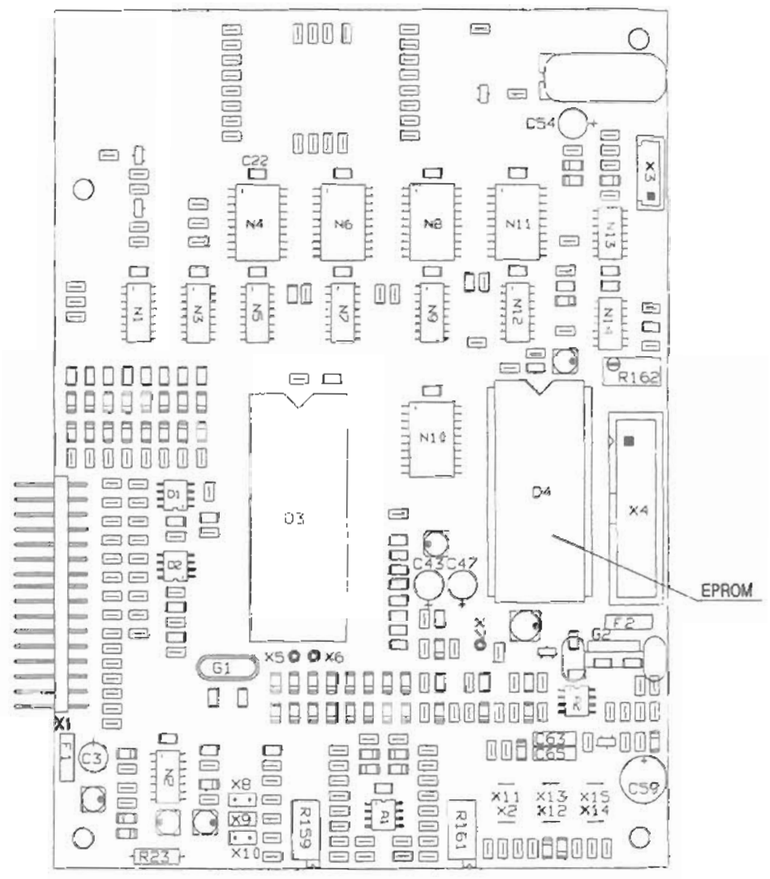
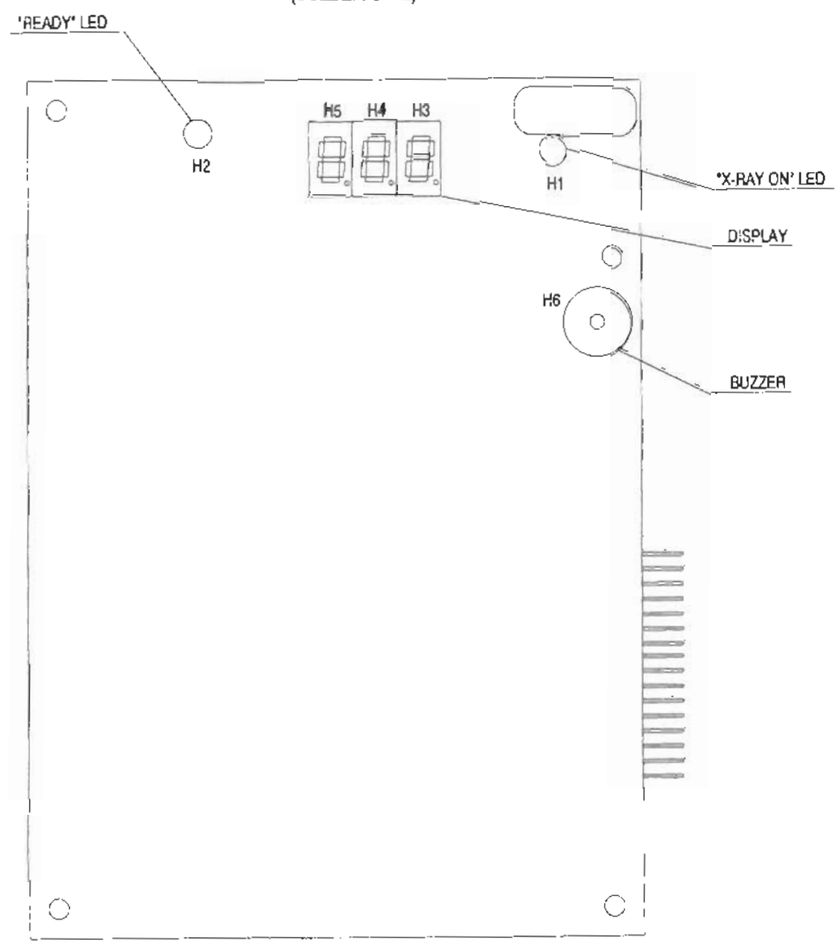
LATO COMPONENTI
(COMPONENTS SIDE)



LATO SALDATURE
(SOLDER SIDE)



Explor-X 70 AP TIME X - TIME X Logic board layout	7
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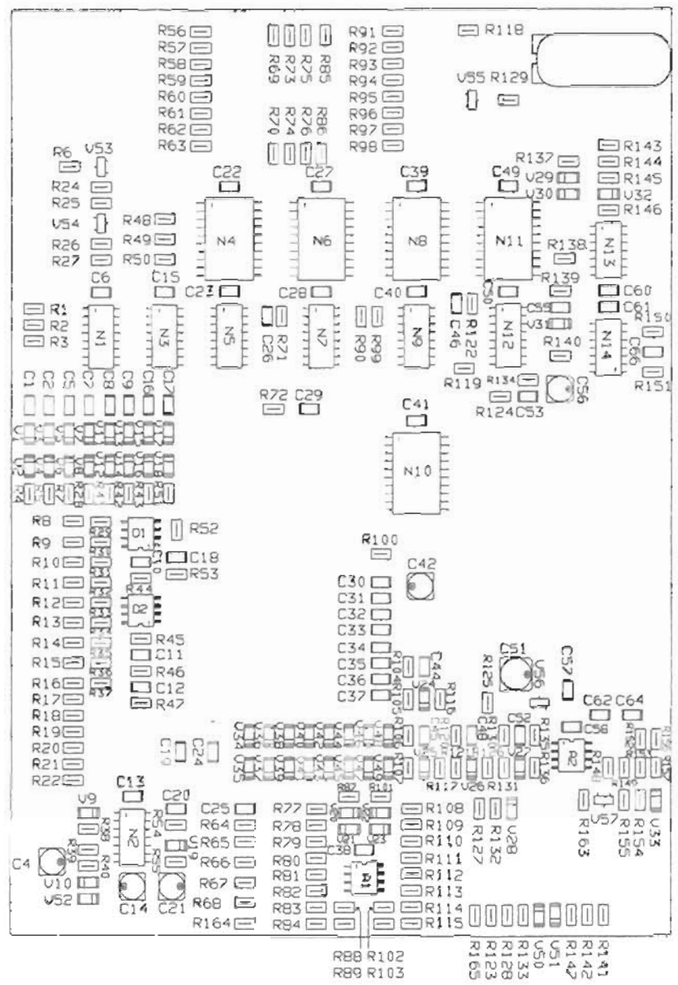
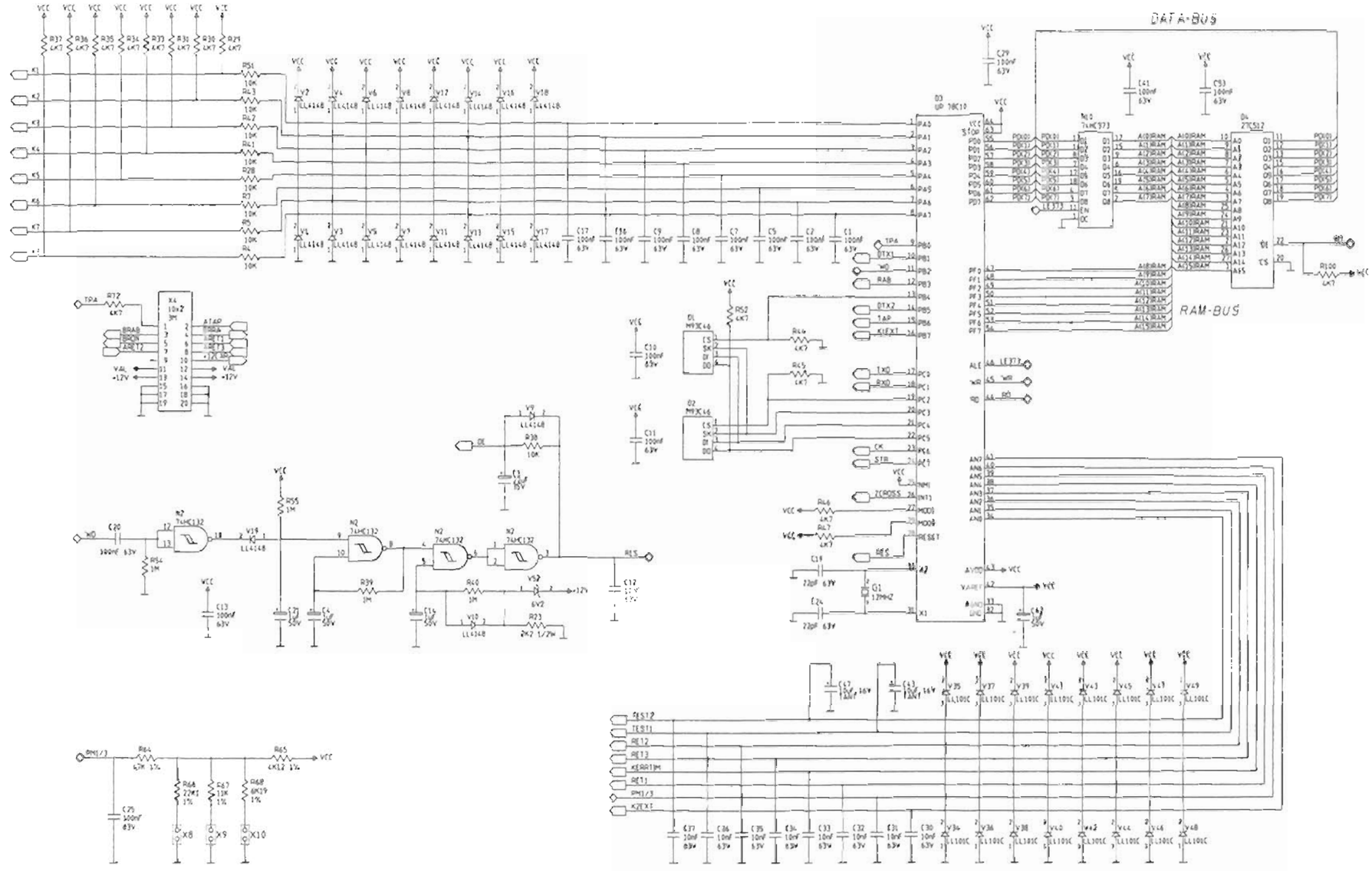
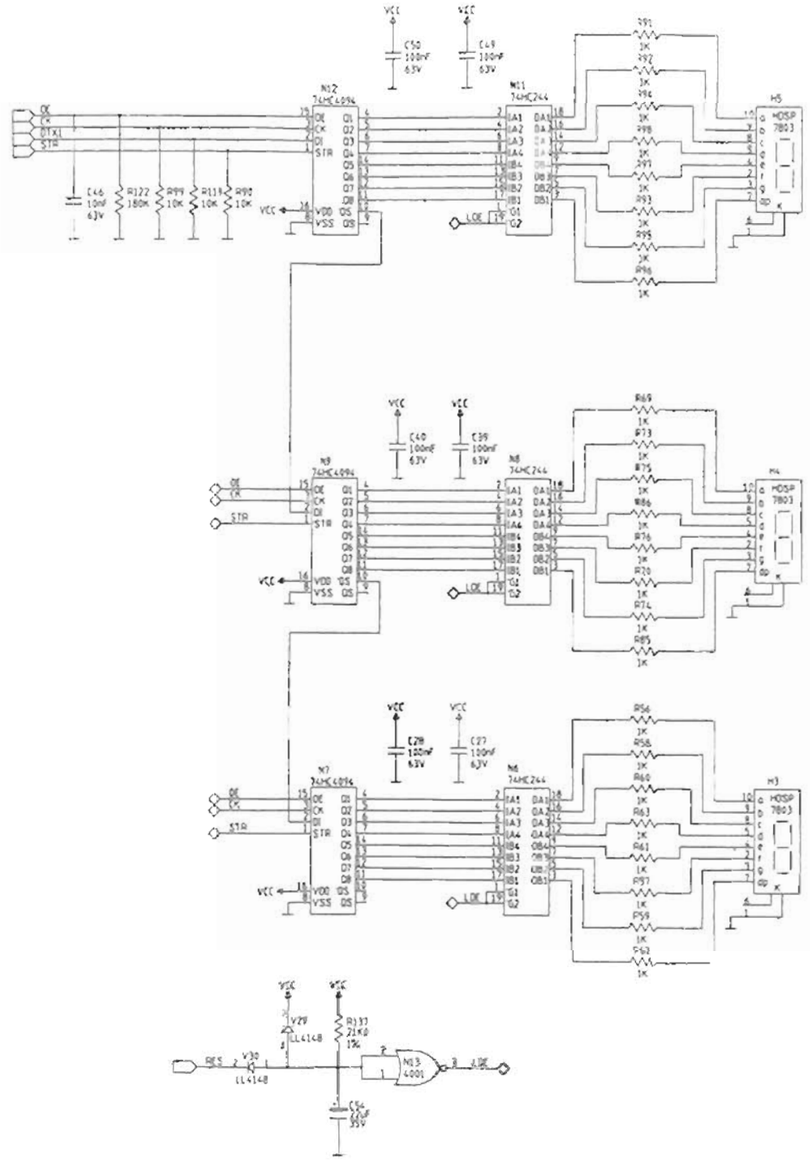
LATO COMPONENTI
(COMPONENTS SIDE)

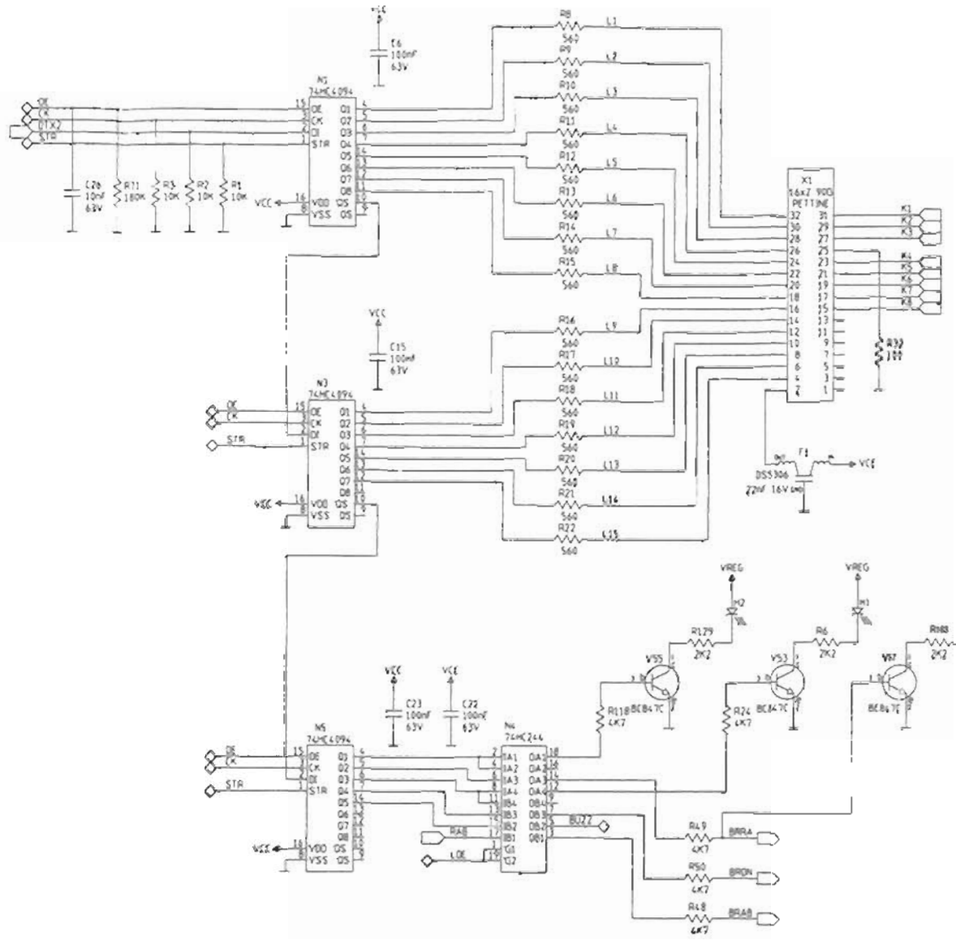


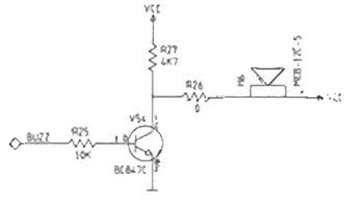
Explor-X 70 **AP TIME X - TIME X** Logic board layout	7
Code 39609063 - Rev.03	Page 2 of 2



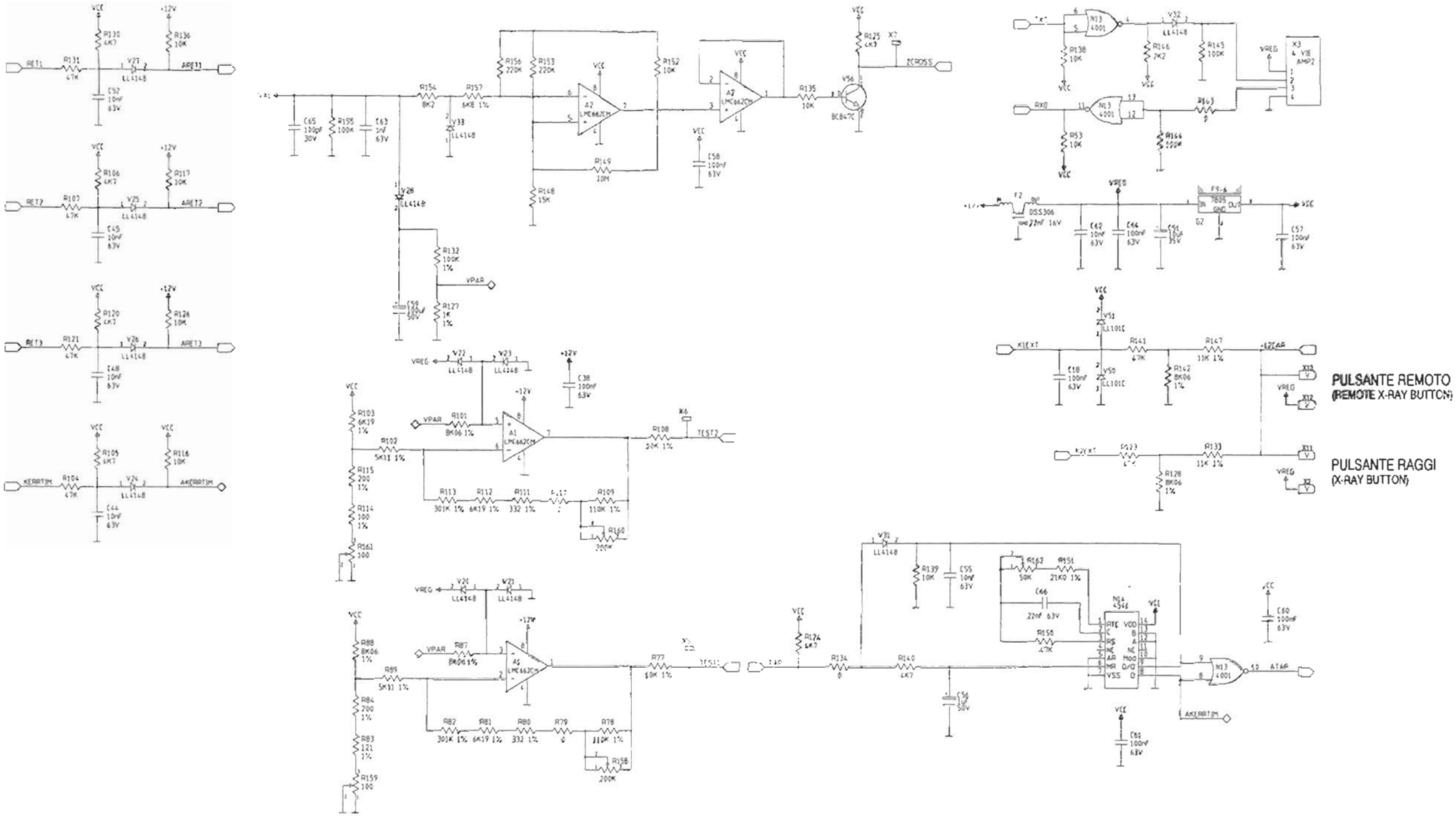
Explor-X 70 AP TIME X - TIME X Logic board schematic	8
Code 39609057 - Rev.03	Page 1 of 3







Explor-X 70 **AP TIME X - TIME X** **Logic board schematic**	**8**
Code 39609057 - Rev.03	**Page 2 of 3**



Explor-X 70 **AP TIME X - TIME X** **Logic board schematic**	**8**
Code 39609057 - Rev.03	**Page 3 of 3**

10. SPARE PARTS

1 - TIMER: AP Time X - Time X

2 - EXTENSION ARM

3 - SCISSORS ARM

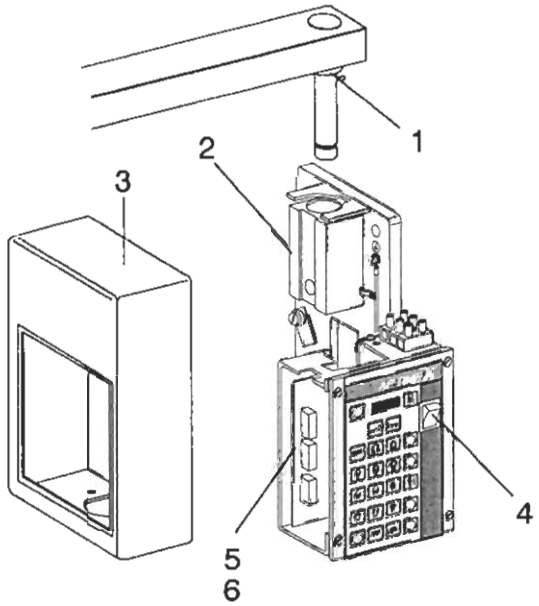
4 - CEILING SUPPORT

5 - TUBEHEAD

6 - OPTION

1 - TIMER: AP Time X - Time X

Ref.	Order code	Specification	Note
1	5160227400	Rotating pivot spacer	For extension arm
2	6160111500	Support arm	
3	5460130400	Timer cover	
4	4291415900	ON / OFF switch	
5	6660379800	Kit PCB AP TIME X	
6	6660379600	Kit PCB TIME X	
7	4560311800 4560311900	Fuse holder Cap for fuse holder	For mobile version
8	6260372500	X-ray push button	
9	6660374300	Keyboard assy for AP TIME X	
10	6660374200	Keyboard assy for TIME X	
F2	2300974100	Fuse 6.3x32 6A F	Mounted on Power PCB
F4	2300938000	Fuse 5x20 630mA T	Mounted on Power PCB
FUSE	2300974100	Fuse 6.3x32 6A F	For mobile version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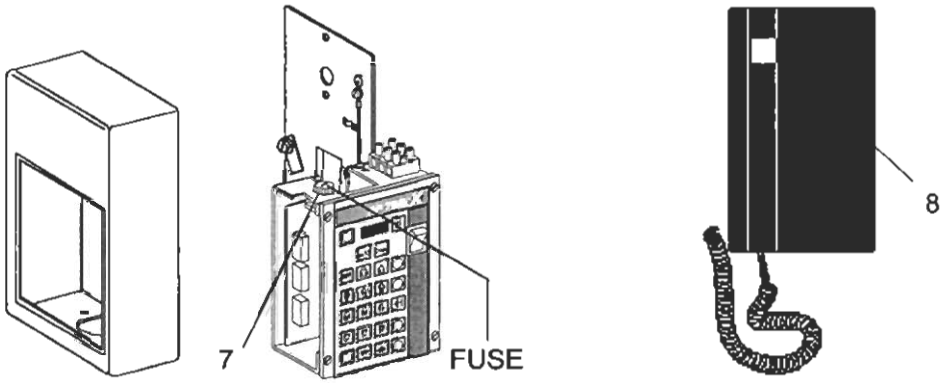
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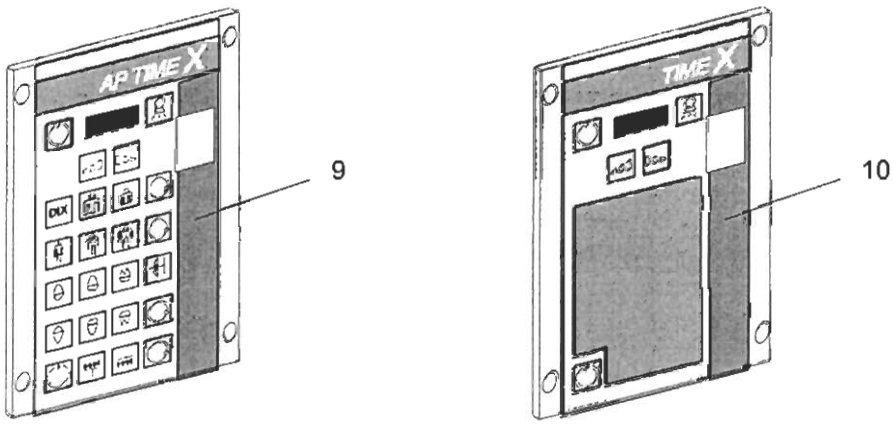
AP TIME X
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TIME X
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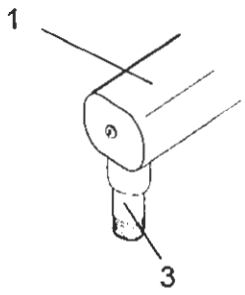
2 - EXTENSION ARM

Oval

Ref.	Order code	Specification	Note
1	5160244200	Cover 75 cm	
	5160244700	Cover 90 cm	
	5160249300	Cover 60 cm	
	5160256100	Cover 30 cm	
2	5160249800	Rotating pivot locking	
3	5260249400	Pivot	
4	6160256000	Busher Ø 25 assy	
5	8160100100	Dental unit support	
7	8260250300	Extension arm 60 cm cpl	
	8260250400	Extension arm 75 cm cpl	
	8260250500	Extension arm 90 cm cpl	
	8260256500	Extension arm 30 cm cpl	
	8260254500	Extension arm 30 cm for ceiling support	
9	5260119100	Ceiling support - rotating bushing for 1° arm	

Square

Ref.	Order code	Specification	Note
3	5260201000	Pivot (arm 75, 55, 30 cm)	
	5260205900	Pivot (arm 90 cm)	
5	8160100100	Dental unit support	
6	8160213900	Extension arm 55 cm cpl	
	8160213500	Extension arm 75 cm cpl	
	8160213600	Extension arm 90 cm cpl	
	8160214500	Extension arm 30 cm cpl	
	8160215000	Extension arm 30 cm for ceiling support	
9	5260119100	Ceiling support - rotating bushing for 1° arm	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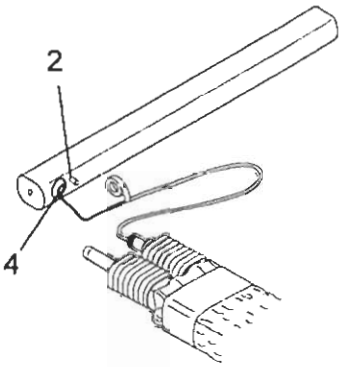
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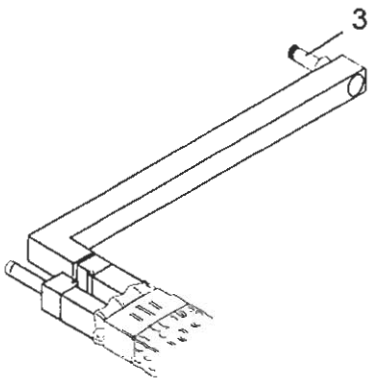
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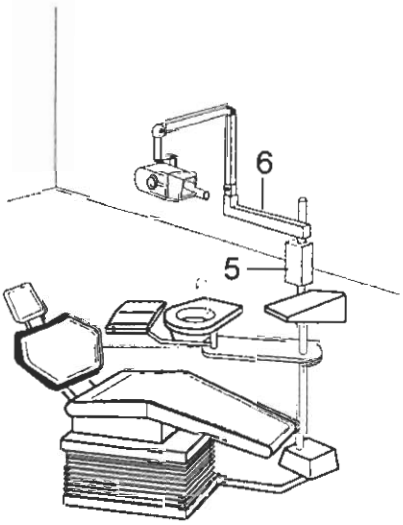
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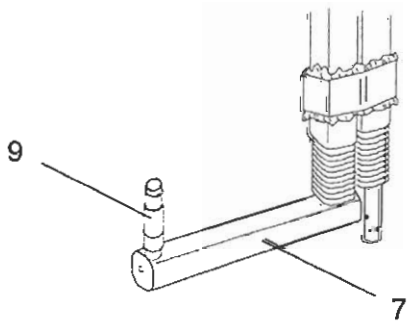
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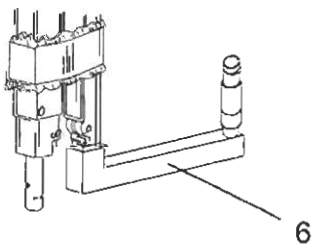
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3 - SCISSORS ARM

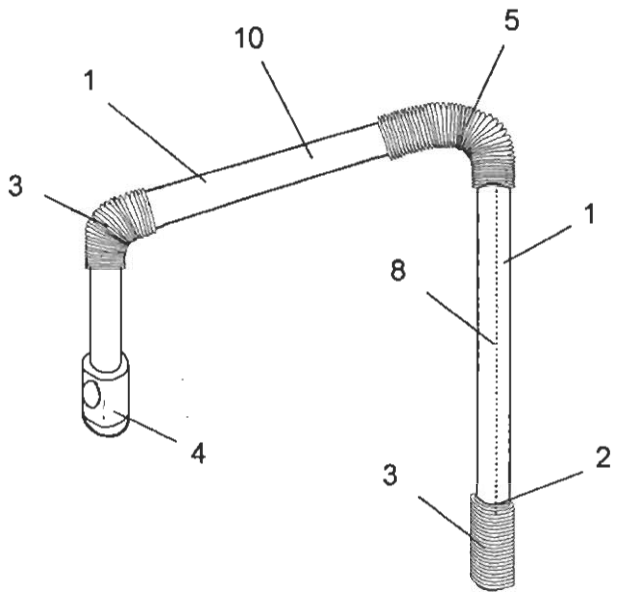
Oval

Ref.	Order code	Specification	Note
1	5160248100	Scissors arm cover	
2	5460258100	Plastic cap for bellow	
3	5460248300	Bellow (short)	
4	5660248700	Tubehead support cover (metal part)	
5	6160248800	Bellow (central part)	
8	7260207100	Scissor arm cable complete with sliding connector (female)	
10	8160250200	Scissors arm complete	(1)

Square

Ref.	Order code	Specification	Note
6	6660210200	1° scissor arm cover	
7	6660210300	2° scissor arm cover	
8	7260207100	Scissor arm cable complete with sliding connector (female)	
9	5460218800	Central joint plastic cover	
10	8160214000	Scissors arm complete (goffered)	(1)

Note (1):
Please specify where the arm is installed (Mobile, Wall mounted, Ceiling suspension or Dental chair) when ordering.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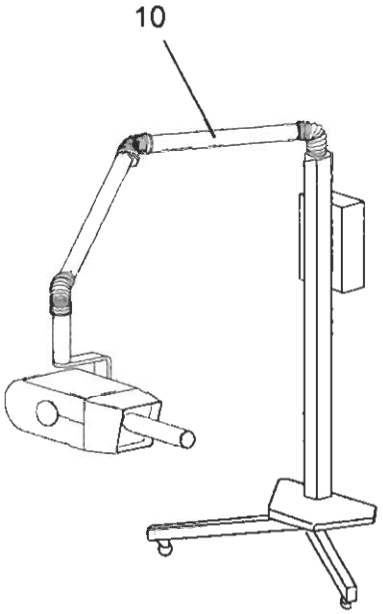
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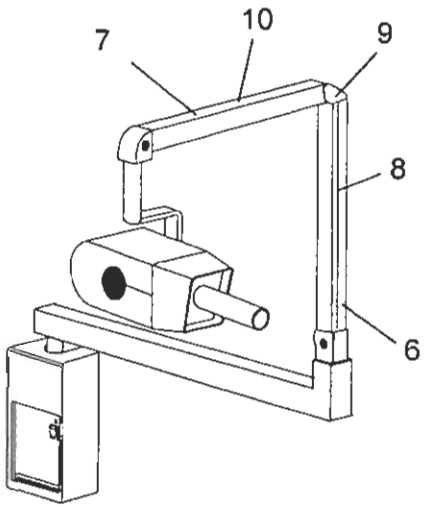
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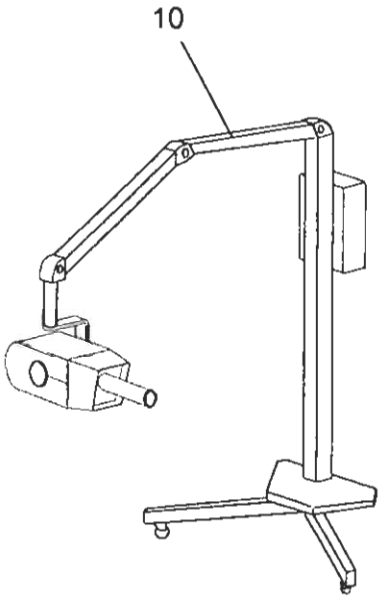
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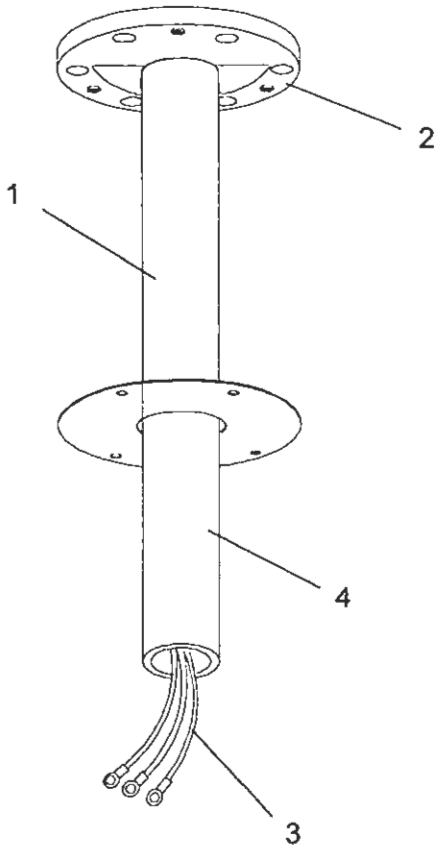
4 - CEILING SUPPORT

Ref.	Order code	Specification	Note
1	5160117700	Ceiling support arm	
2	8160118500	Ceiling support	
3	6260118600	Cable for ceiling support	
4	8260118700	Ceiling support complete of support arm	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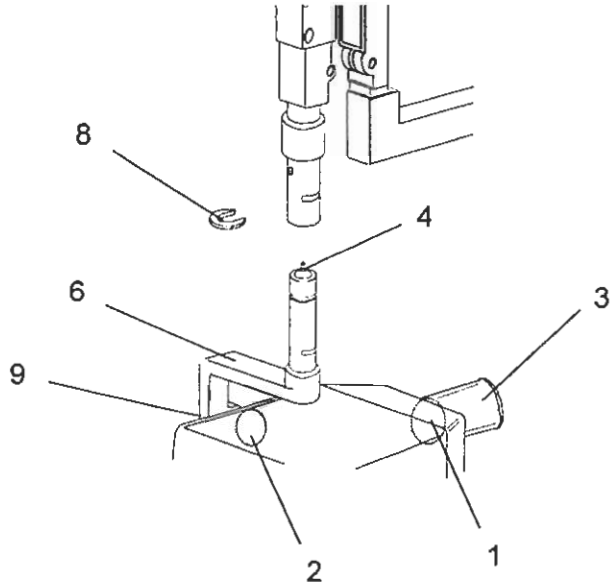
5 - TUBEHEAD

Ref.	Order code	Specification	Note
1	5160401800	Aluminium filter	
2	5160423800	Angle indicator	
3	6160405900	Tubehead collimator	
4	6260439600	Sliding connector (male)	
5	6660422300	Explor-X tubehead cover (without label)	
6	7260439500	Tubehead support	
7	8460457000	Tubehead complete assembly 220V	
	8460459100	Tubehead complete assembly 230V	
	8460457100	Tubehead complete assembly 240V	
8	5160402800	Seeger	
9	5460420800	Lateral cover	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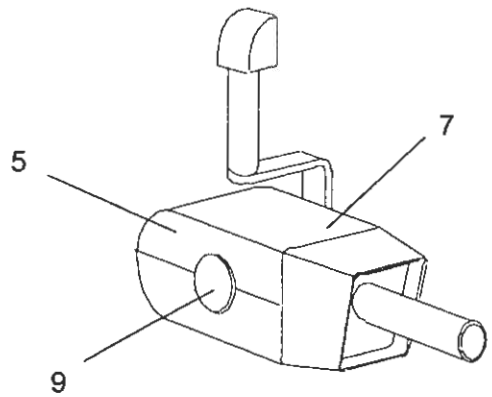
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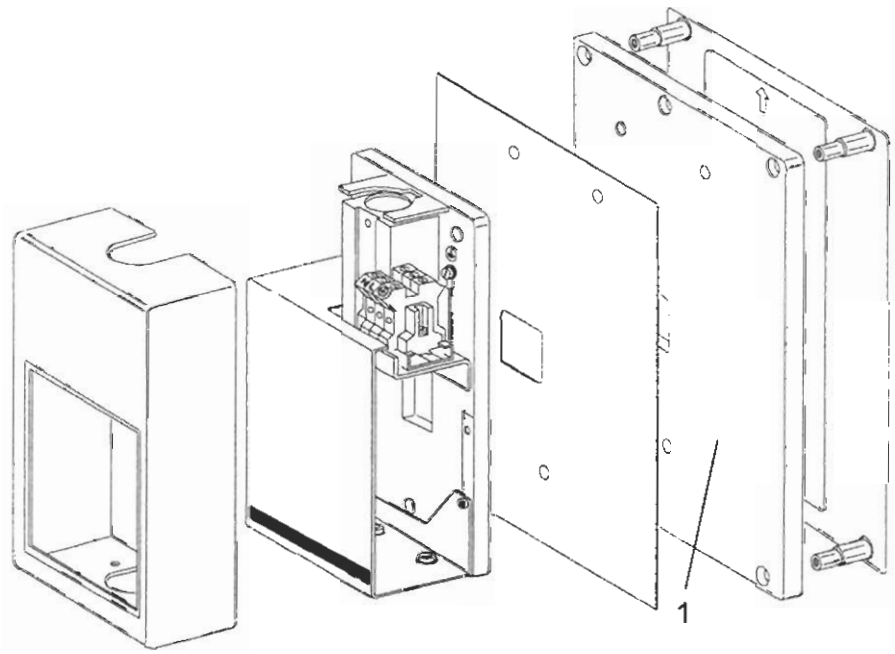
5 - OPTION

Ref.	Order code	Specification	Note
1	8160113500	Counterplate	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11. FIXING TEMPLATES

The system is equipped with a set of templates, composed of the following elements:

Code	Description
39609122	Template for standard version timer
39609124	Template for remote version
39609125	Template for counterplate
39609156	Template for ceiling suspension version