Coramex S.A.

Corix® PRO 70 Digital

VETERINARY X – RAY EQUIPMENT

User's Manual

Release 1.0 March 2005

CONTENTS

1. INTRODUCTION

Corix PRO 70, manufactured by Coramex S.A. performs high quality intra-oral radiographs, ensured by the repeatability of examination combined with reduced exposure times and with the small focal spot.

Corix PRO 70 has a powerful and user-friendly hand held controller that fits into the palm of your hand.

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

2. SAFETY INFORMATION

Coramex S.A. designs and manufactures high quality equipment. This manual provides all the necessary information for the correct handling of the equipment as well as warnings related to risks associated to X-ray generators.

Coramex S.A. shall not be responsible for:

- Any use of the equipment different from what it has been designed for.
- Any damage to the equipment, the operator or the patient caused by incorrect installation and maintenance not compliant with the procedures contained in the relevant user's and installation manuals, or by incorrect operation techniques.
- Any mechanical and/or electrical changes caused during or after installation, different from those reported in the service manual.
- Any expenses related to the eventual disposal of the equipment or parts.

Only qualified service personnel, authorized by Coramex S.A. are allowed to perform technical interventions on the equipment.

Only qualified service personnel are 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 intended by it.

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

Corix PRO 70 is a dental imaging device and must be used only under the supervision of qualified staff with knowledge in the field of protection against radiation.

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

To protect the patient from X-ray, radiation protection accessories, such as standard leaded aprons must be used.

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 if required.

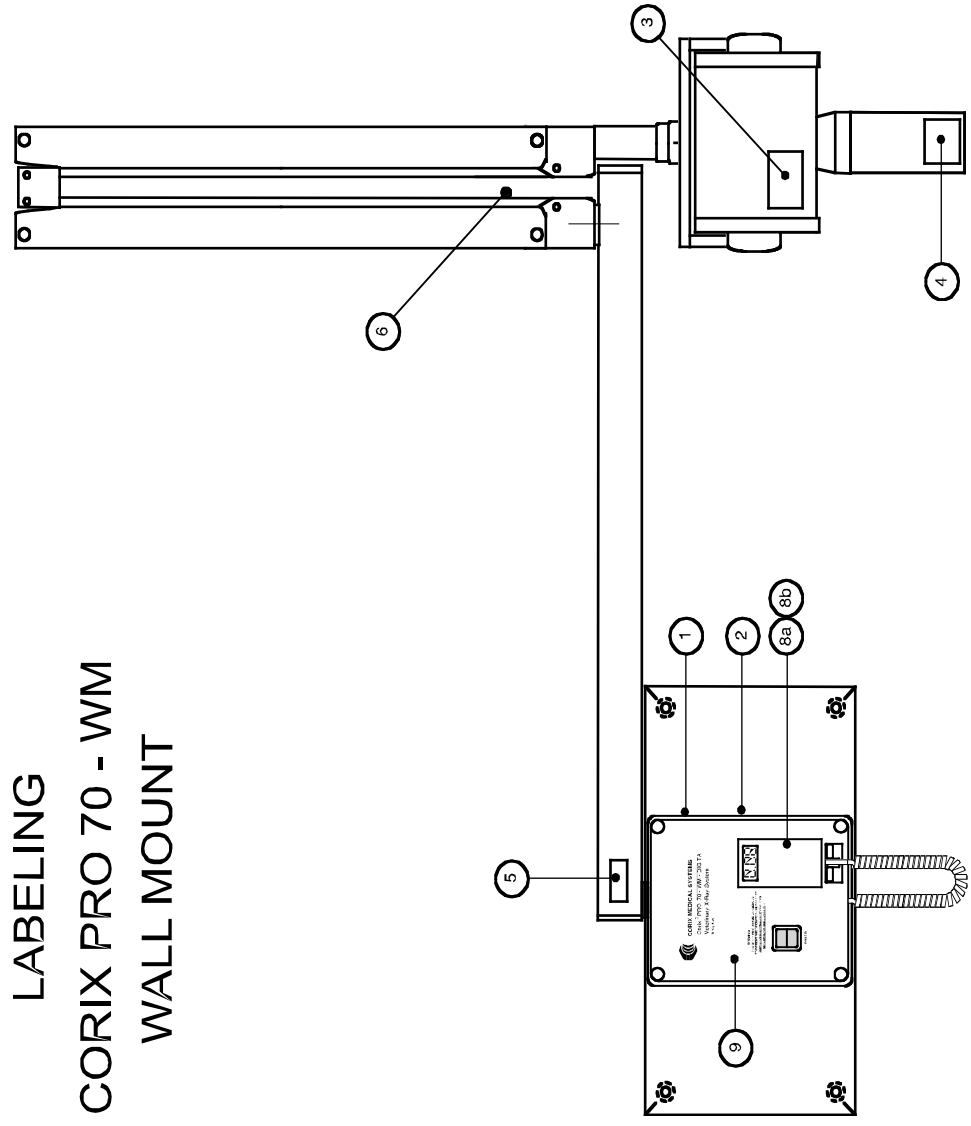
Parts of the apparatus that may be in contact with the patient must be regularly cleaned following the instructions provided in this manual.

The equipment is not designed to be use in the presence of flammable anesthetics, oxygen or nitrous oxide.

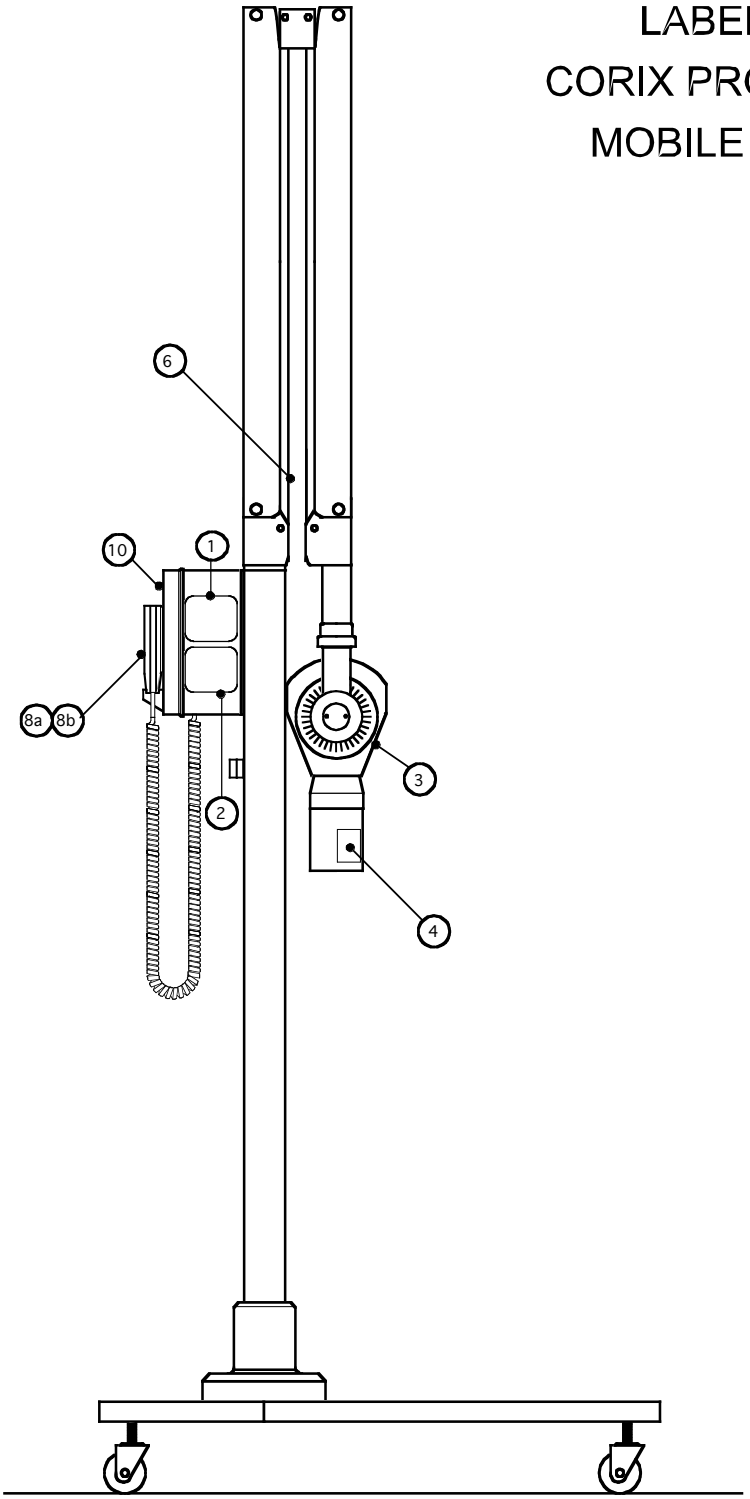
Before performing any maintenance intervention, the equipment must be disconnected from the input line voltage by means of the relevant magnetic-thermal switch.

3. DESCRIPTION

3.1 Identification labels



LABELING
CORIX PRO 70 - MM
MOBILE STAND



LABELING

CORIX PRO 70 - PS

PORTABLE STAND

LABEL # 1

WARNING

THIS X RAY UNIT MAY BE DANGEROUS TO THE PATIENTAND OPERATOR UNLESS SAFE EXPOSURE FACTORS AND OPERATING INSTRUCTIONS ARE OBSERVED.
ELECTRICAL SHOCK HAZARD - DO NOT REMOVE PANELS.
RISK OF EXPLOSION - DO NOT USE IN PRESENCE OF FLAMMABLE ANESTHETICS.
FOR CONTINUED PROTECTION AGAINST RISK OF FIRE, REPLACE ONLY WITH SAME TYPE AND RATING OF FUSE.

LABEL # 2

MANUFACTURER: CORAMEX S.A.
LAURO VILLAR No. 94-B.
02440 MEXICO, D.F. MEXICO

MOD: CORIX PRO 70

X-RAY CONTROL PART: P101USV

LINE VOLTAGE 120Vac±10% (109-132Vac)
CURRENT MAX. 12A (132Vac) 50/60Hz.
CLASS 1 TYPE B
SHORT TIME OPERATION SERIAL No.XXXXX
MANUFATURED: MMMMMMMM/YYYY. MEXICO
COMPLIES WITH DHHS PERFORMANCE STANDARD 21 CFR SUBCHAPTER J. COMPLIES WITH UL 2606-1

LABEL # 3

MANUFACTURER: CORAMEX S.A.
LAURO VILLAR No. 94-B.
02440 MEXICO, D.F. MEXICO

MOD: CORIX PRO 70 PART: P103USV

X-RAY TUBE HOUSING ASSEMBLY

RATED PEAK TUBE POTENTIAL: 70KVp±7%
RATED TUBE CURRENT: 8mA±15%
TOTAL FILTRATION 2mm. Al SERIAL No.XXXXX
FOCAL SPOT: 0.8mm.
MANUFATURED: MMMMMMMM/YYYY. MEXICO
X-RAY TUBE C.E.I srl ITALY MOD:OX/70-P.S/N.XXXXX
COMPLIES WITH DHHS PERFORMANCE STANDARD 21 CFR SUBCHAPTER J.

LABEL # 4

MANUFACTURER: CORAMEX S.A.
LAURO VILLAR No. 94-B.
02440 MEXICO, D.F. MEXICO

MOD: CORIX PRO 70

BEAM LIMITING DEVICE PART: P104USV

SOURCE TO SKIN DISTANCE (FFD): 20cm.
X-RAY FIELD Ø AT MINIMUM FFD: 6cm.
SERIAL No.XXXXXX
MANUFATURED: MMMMMMMM/YYYY. MEXICO
COMPLIES WITH DHHS PERFORMANCE STANDARD 21 CFR SUBCHAPTER J.

LABEL # 5

MANUFACTURER: CORAMEX, S.A.
LAURO VILLAR No. 94-B
02440 MEXICO, D.F. MEXICO
EXTENSION ARM. PART. P105USV
Serial: XXXXX MMMMMMMM/YYYY

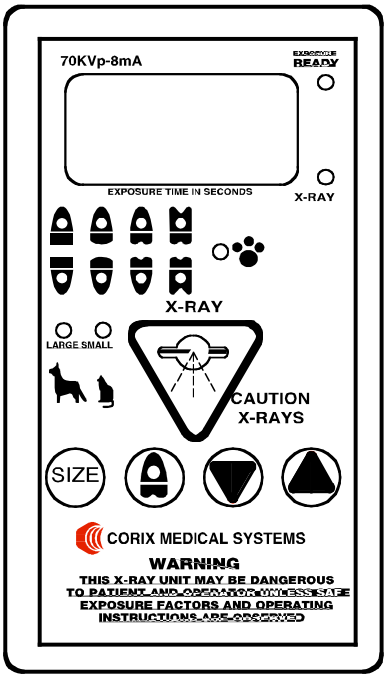
LABEL # 6

MANUFACTURER: CORAMEX, S.A.
LAURO VILLAR No. 94-B.
02440 MEXICO, D.F. MEXICO
SCISSORS ARM. PART. P106USV
Serial: XXXXX MMMMMMMM/YYYY

LABEL # 7

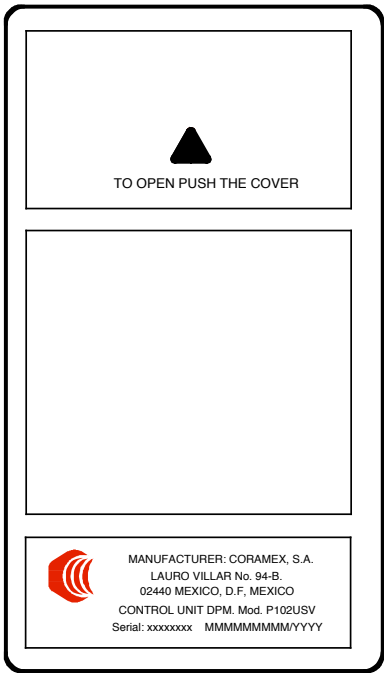
MANUFACTURER: CORAMEX, S.A.
LAURO VILLAR No. 94-B.
02440 MEXICO, D.F. MEXICO
MOBILE ARM. PART. P131USV
Serial: XXXXX MMMMMMMM/YYYY

LABEL # 8a



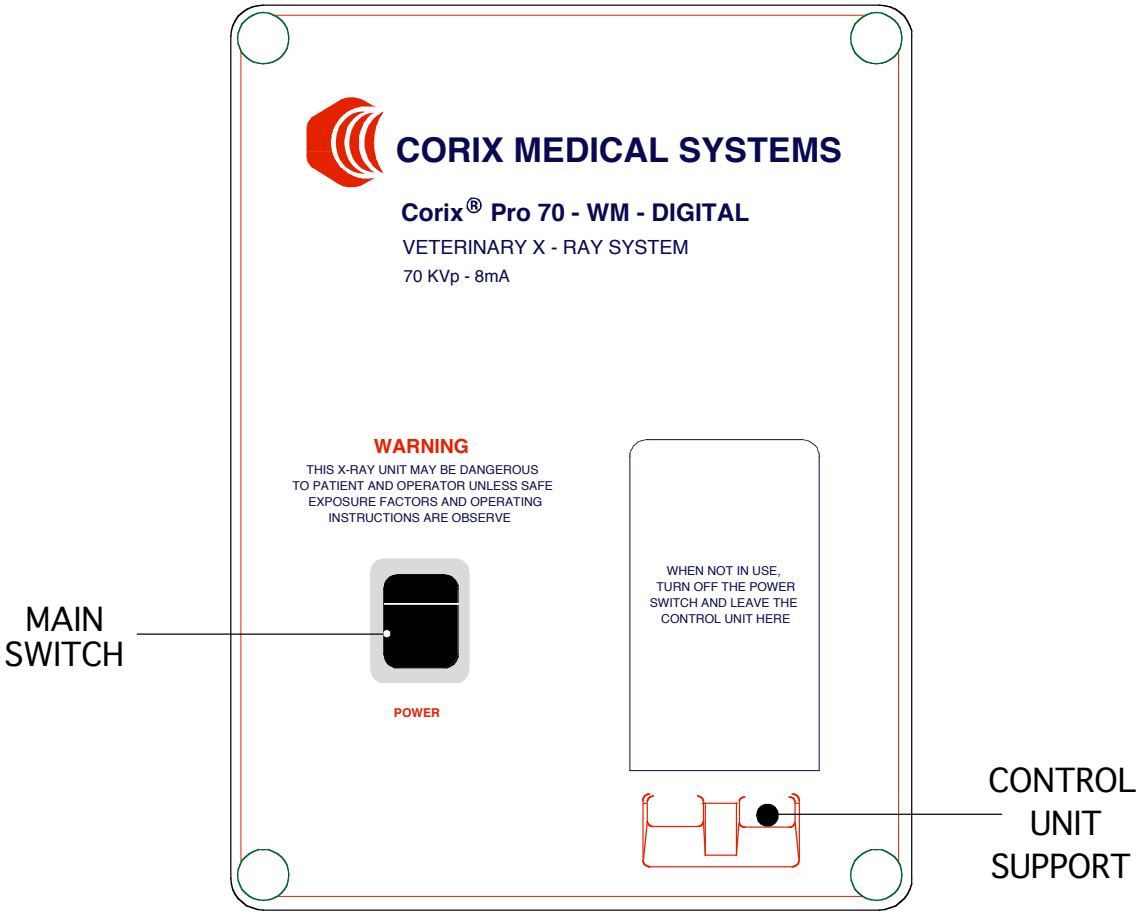
FRONT

LABEL # 8b



REAR

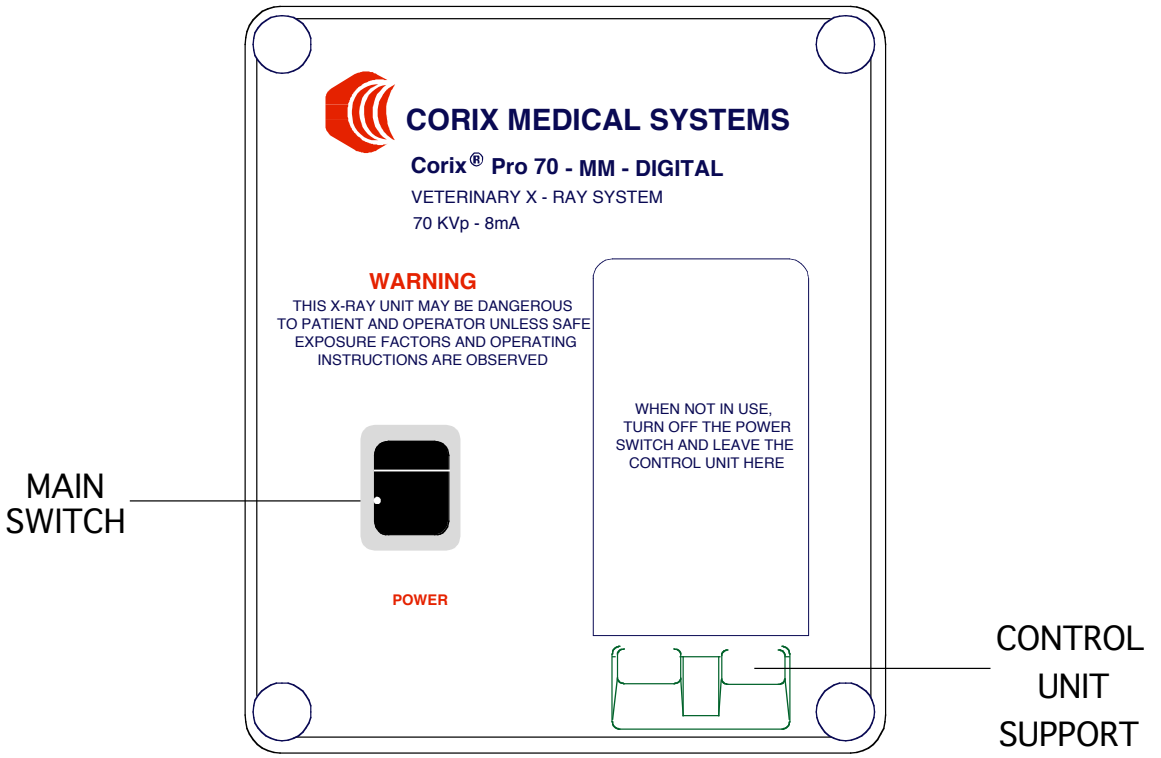
LABEL # 9



SCALE 1:2

FRONT PANEL LABEL
(FOR WALL MOUNT)

LABEL # 10



SCALE 1:2

FRONT PANEL LABEL

(FOR MOBILE STAND AND PORTABLE STAND)

3.2 Equipment Parts

A set of different models of the complete extraoral dental X-Ray device share the certified components listed

Model Corix PRO 70 Wall Mount

Common Part	X-Ray Tube Housing Assembly	Part: P103USV
	Beam Limiting Device	Part: P104USV
	X-Ray Control (External Panel),	Part: P101USV
	(Control Unit)	Part: P102USV
Particular Part	Extension Arm Standard (80cm)	Part: P105USV
	Extension Arm Large (90cm)	Part: P105LUSV
	Extension Arm Short (35cm)	Part: P105SUSV
	Bracket Remote Timer Kit (optional)	Part: P116USV
	Scissors Arm	Part: P106USV
	Wall Plate	Part: P115USV

Model Corix PRO 70 Mobile Stand

Common Part	X-Ray Tube Housing Assembly	Part: P103USV
	Beam Limiting Device	Part: P104USV
	X-Ray Control (External Panel),	Part: P101USV
	(Control Unit)	Part: P102USV
Particular Part	Scissors Arm	Part: P106USV
	Mobile Base	Part: P121USV

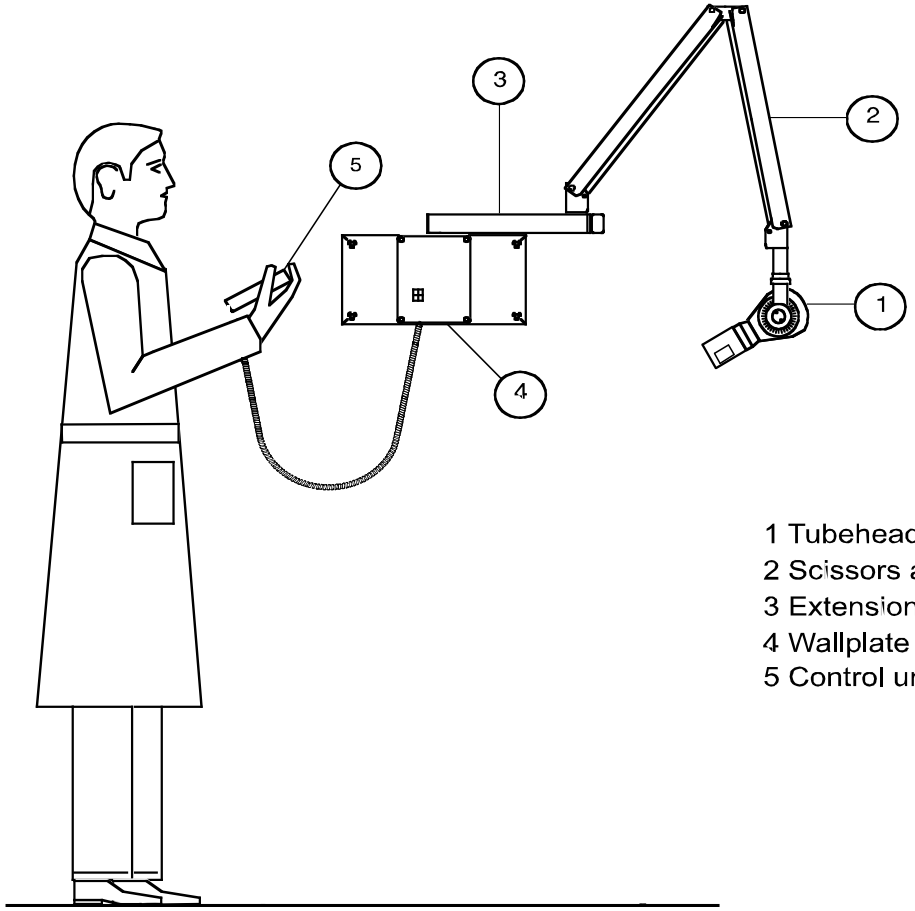
Model Corix PRO 70 Portable Stand

Common Part	X-Ray Tube Housing Assembly	Part: P103USV
	Beam Limiting Device	Part: P104USV
	X-Ray Control (External Panel),	Part: P101USV
	(Control Unit)	Part: P102USV
Particular Part	Mobile Arm	Part: P131USV
	Part: Portable Base	Part: P132USV

3.3 Configurations

a) Standard Configuration

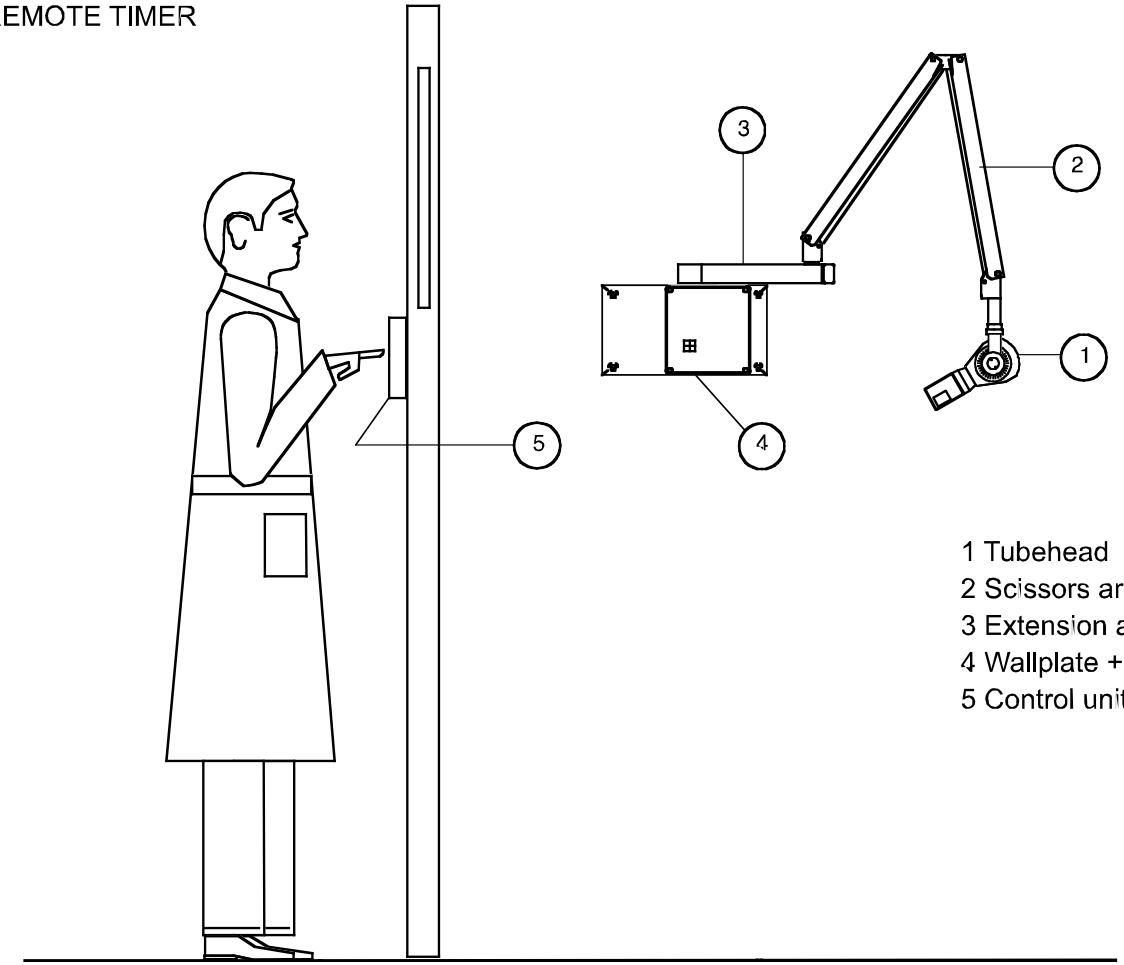
CORIX PRO 70 - WM
WALL MOUNT



1 Tubehead
2 Scissors arm
3 Extension arm
4 Wallplate + X- ray control
5 Control unit with X-Ray button

b) Remote Timer Configuration (optional)

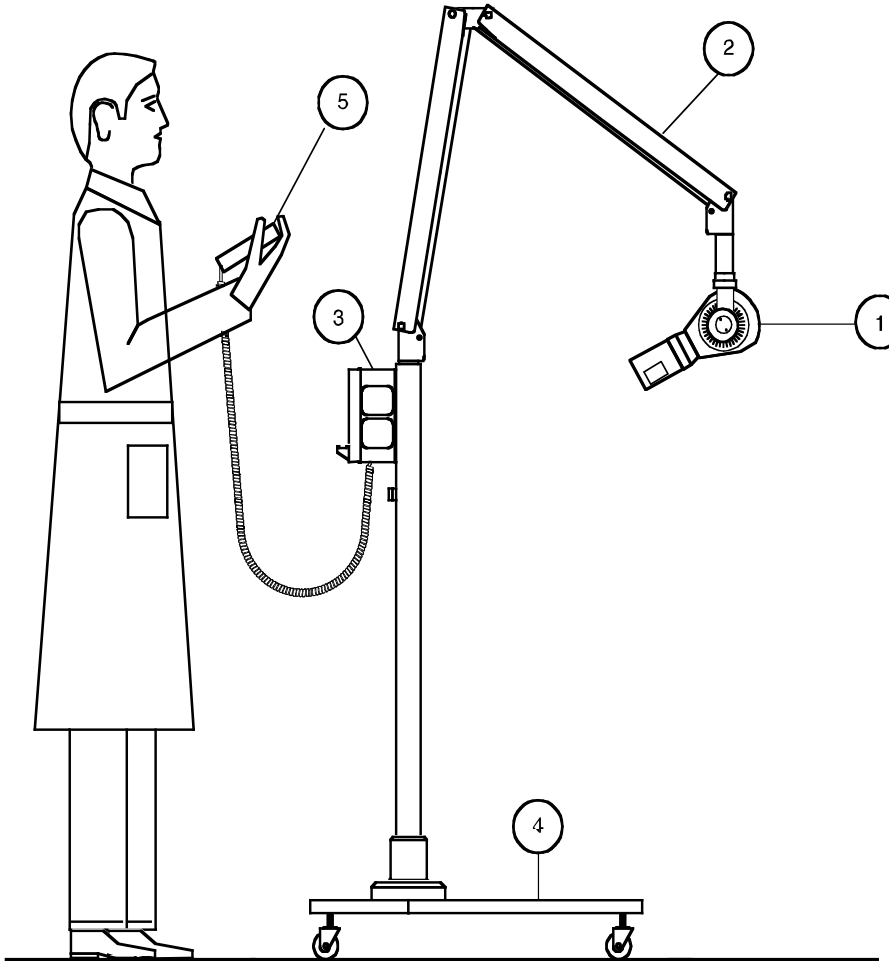
CORIX PRO 70 - WM
WALL MOUNT
REMOTE TIMER



1 Tubehead
2 Scissors arm
3 Extension arm
4 Wallplate + X- ray control
5 Control unit with X-Ray button

c) Mobile Stand Configuration

CORIX PRO 70 - MM
MOBILE STAND

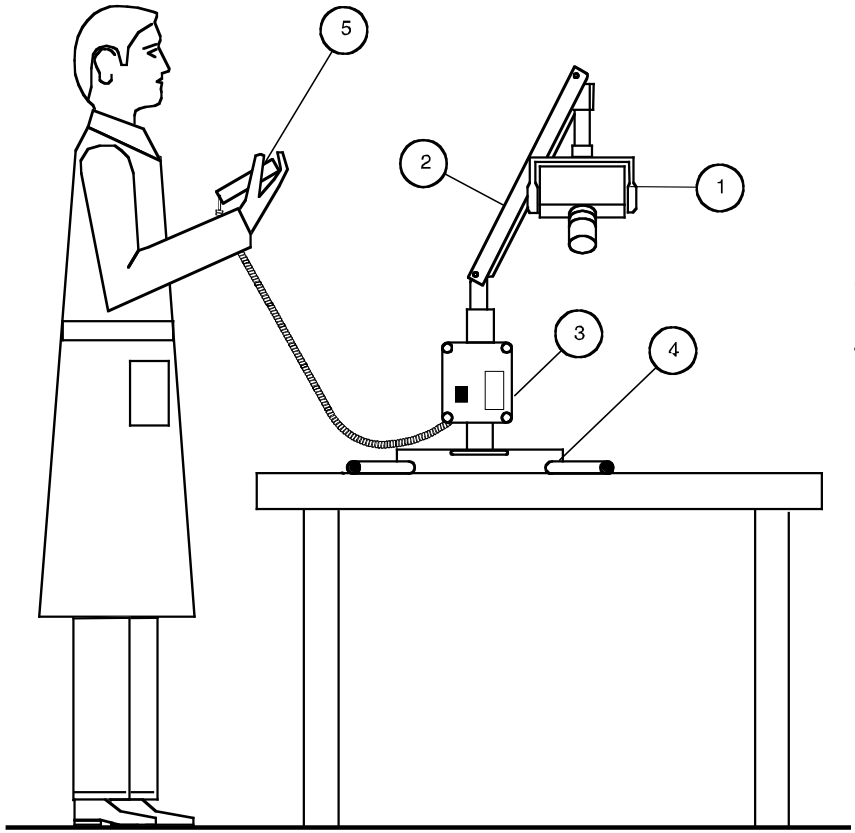


1 Tubehead
2 Scissors arm
3 X-ray Control
4 Mobile Stand
5 Control unit with X-Ray button

d) Mobie Stand Configuration

CORIX PRO 70 - PS

PORTABLE STAND



1 Tubehead
2 Mobile arm
3 X-ray Control
4 Portable Stand
5 Control unit with X-Ray button

4. TECHNICAL FEATURES

Technical features	
Equipment	Intra-oral Diagnostic X-Ray Imaging (General Purpose Dental)
Manufacturer	Coramex S.A. Lauro Villar 94-B Mexico, D.F. 02440 - Mexico
Model Designation	Corix PRO 70
Class	I type B
Rated Line voltage	120 V ± 10% (109-132 Vac)
Line frequency	50/60 Hz
Line current	10 A max (120 Vac)
Power consumption	1.050 KW max @ 132Vac
Apparent line resistance	0.2 Ohms max 120 V
Line Voltage regulation	≤ 3%
Main Fuse	10 A F
X-Ray Control	Microprocessor Controlled Digital Timer
Manufacturer	Coramex, S.A.
Part Designation	P101USV (panel with Main Terminals Device)
TIMER	DPM Timer (Control Unit)
Part Designation	P102USV (Hand Held Controller)
Exposure Times	Manual time selection, from 0.03 s to 3.00 s, in steps of 0.01 s Plus 9 pre-set exposure times, with automatic line voltage compensation. A pre-heating time of 0.15 s for loading the x-ray tube must be added to the time selection shown on the display. *
Timer Accuracy	± 10%

Tube Housing Assembly	Extra-oral Diagnostic X-ray generator and Beam Limiting Device
Manufacturer	Coramex S.A.
Part Designation	P103USV
Rated output voltage	70 kVp ± 7% (Single phase, self-rectifying)
Rated output current	8 mA ± 15% @ 120Vac
Maximum deviation of output current	4.5 mA (over the voltage range)
Total filtration	2 mm Al eq.
Transformer insulation	Oil Bath
Cooling	Thermal Convection Cooling
Radiation leakage at 1 m	< 50 mR/h (technical Factors 70Kvp, 8mA, 1s)

Exposure Interval (Duty Cycle)	01:30 The minimum Exposure Interval between exposures (30 time units of cooling time for every time unit of exposure) is a Preset value in the microprocessor controlled digital timer, Model DPM.
X-Ray Tube	(Part of the Tube Housing Assembly)
Manufacturer	C.E.I. S.R.L.
Model Designation	OX/70-P
Focal spot	0.8 mm (IEC 336)
Inherent Filtration	0.5 mm Al eq.

Beam Limiting Device	
Manufacturer	Coramex, S.A.
Part Designation	P104USV
Minimum Focal Spot to Skin Distance (FFD)	200 mm
X-Ray Field ⌀ at Minimum FFD	60mm

* Note : "Pre-heating time" is the time required by the tubehead to enable the correct radiation output.
When testing the timer the correct time is the displayed time, plus the "pre-heating time". For example : it display reads : 0.40s, the correct time is : 0.40s + 0.15s = 0.55s.

4.1. DPM Timer Preset Exposure Times

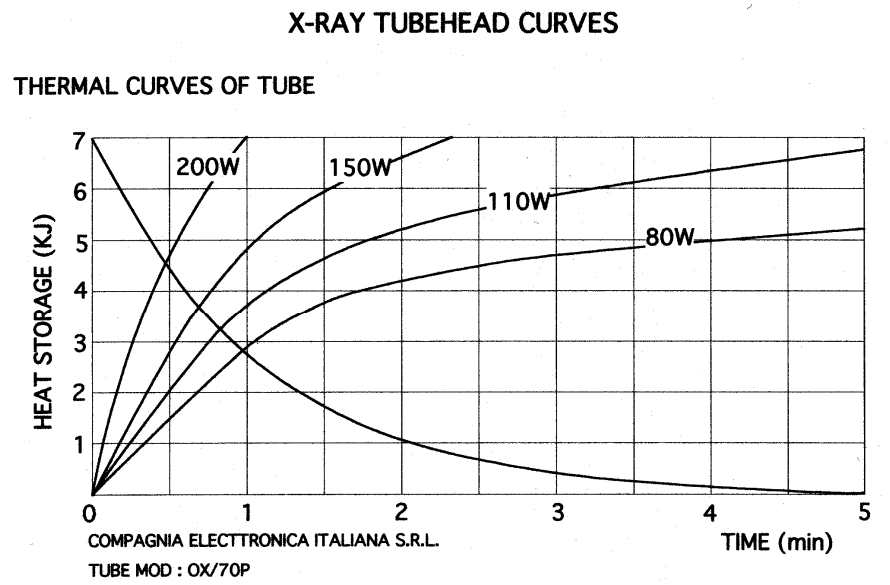
The following table of pre-set exposure times in Seconds is showing the rated exposure time for a nominal line voltage of 120V. and the final corrected exposure time, as a function of the line voltage correction factor and patient size, for the minimum (109v.) and maximum (132V) line voltage operating range.

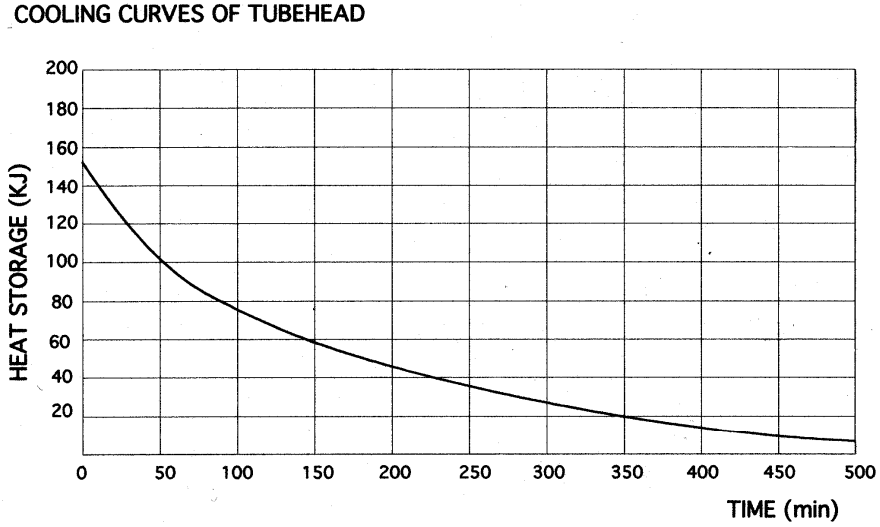
Notes:

- Suggested exposure times in Seconds, for E type films.
- Film speed: Factory pre-set for E type Films. If set for Digital x-ray, (C.C.D. Sensor), pre-set exposure times are reduced by 1/3.
- Corrected exposure times rounded to the nearest 1/100 of second.
- This table will not show the added 0.15 seconds of preheating time for the x-ray tube.

LINE VOLTAGE	**120V**		**109V**		**132V**	
LINE VOLTAGE CORRECTION FACTOR	1.0		1.9		0.55	
PATIENTS SIZE	**MEDIUM**	**SMALL**	**MEDIUM**	**SMALL**	**MEDIUM**	**SMALL**
UPPER JAW						
INCISOR	0.24	0.16	0.47	0.31	0.13	0.09
CUSPID	0.24	0.16	0.47	0.31	0.13	0.09
BICUSPID	0.30	0.20	0.57	0.38	0.16	0.11
MOLAR	0.33	0.22	0.63	0.42	0.18	0.12
LOWER JAW						
INCISOR	0.18	0.12	0.33	0.22	0.09	0.06
CUSPID	0.18	0.12	0.33	0.22	0.09	0.06
BICUSPID	0.21	0.14	0.41	0.21	0.12	0.08
MOLAR	0.24	0.16	0.47	0.31	0.13	0.09
PAW	0.24	0.16	0.47	0.31	0.13	0.09

4.2 Tubehead Characteristics



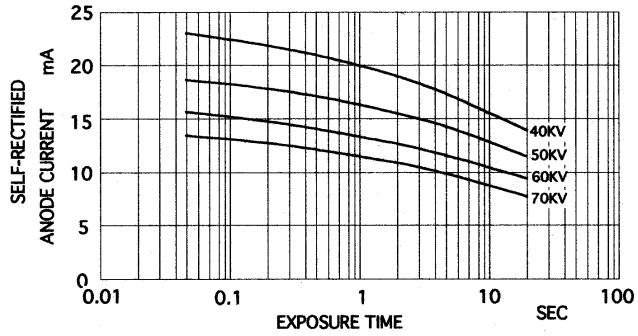


EMISSION AND FILAMENT FEATURES

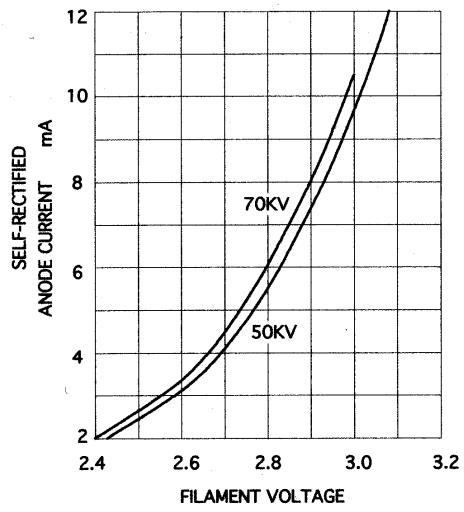
COMPAGNIA ELECTTRONICA ITALIANA S.R.L.

TUBE MOD : OX/70P

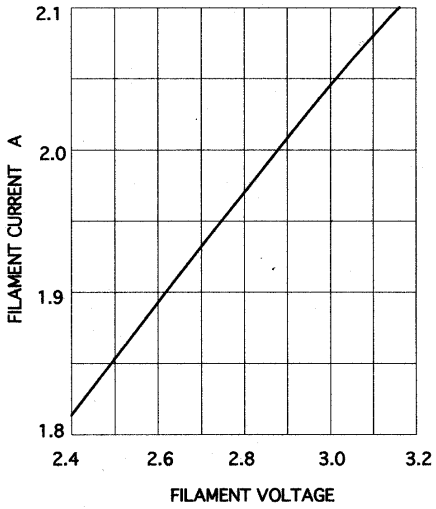
RATING CHARTS



EMISSION CHARACTERISTICS

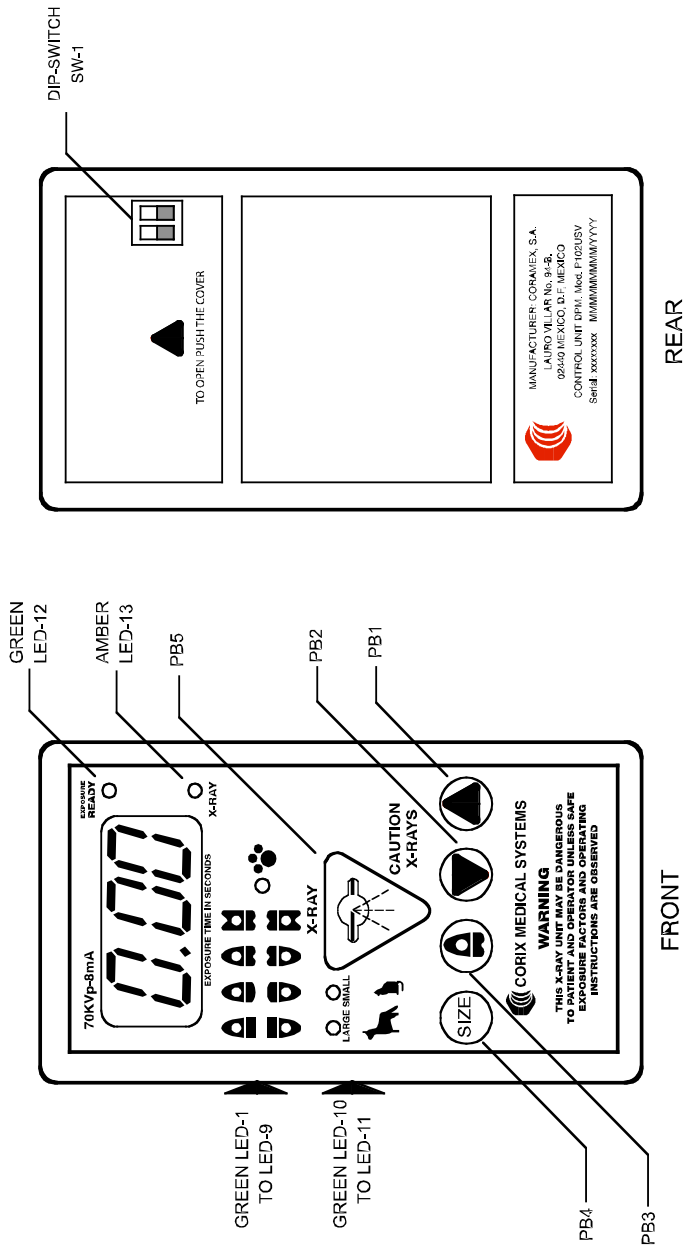


FILAMENT CARACTERISTICS



5. OPERATING INSTRUCTIONS

5.1 Timer



CORIX PRO 70 - USER MANUAL

DPM TIMER - HAND HELD CONTROLLER

a) Technical Description of the Digital Timer Model

The DPM digital timer is a hand held controller connected to the X-Ray equipment model CORIX PRO 70 through a flexible extension cable.

This timer is built around a programmable microprocessor and an EEPROM memory, which contains preset exposure times and voltage variation correction algorithms.

The three digit display will show seconds to two decimal places, with a range of 0.03 to 3.00 seconds.

Buttons PB-1 and PB-2 are used to select the event timing manually with increases and decreases of 0.01 seconds.

Button PB-3 is used to select 9 preset exposure times, which are shown in the front panel with green LED-1 to LED-9 contained within the tooth icons.

Button PB-4 is used to select two options of patient's size which are indicated in the front panel with green LED-10 and LED-11, also indicated by human icons.

A DIP switch SW-1, located in the rear of the timer, selects two film speeds.

A green LED-12 indicate READY to exposure.

Button PB-5 starts exposure (X-RAY) and is indicated by amber LED-13.

Buzzer DXZ-1 is used to give audible feedback of the pressing of buttons PB-1 to PB-4 and also to indicate the end of the exposure time.

b) DPM Timer Compensation Factor

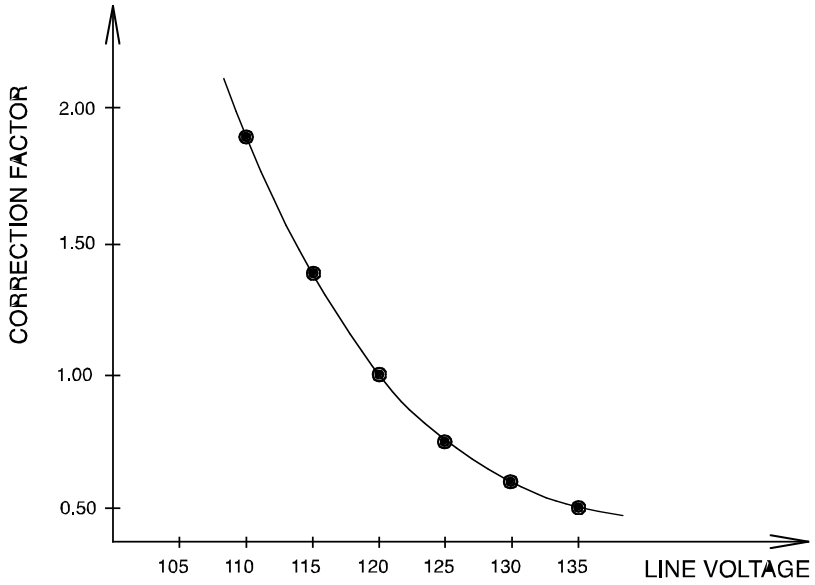
Corix PRO 70 - DPM Timer allows the user to select the exposure time either by pressing the "up" and "down" buttons or by selecting 9 pre-set times, by pressing the "tooth" button, on the front panel of the hand held control unit.

The DPM Timer has been designed to allow automatic correction of the selected pre- set exposure time in case the line voltage has drifted from 120 V. A change in the line voltage affects both the peak voltage and the anodic current ratings of the x-ray tube, which finally affects the image density on the film or on the image sensor.

Purpose of the time correction is to provide the same dose of radiation against variations of the line voltage within the standard accepted limits of 120 V. ± *10%. This feature allows the user to get basically the same image quality regardless of possible variations in the line voltage.*

The value of the correction factor has been determined empirically by measuring the radiation dose against the line voltage, keeping the exposure time constant, and then determining the correction factor in the exposure time required to keep the radiation dose constant against the line voltage.

The following graphic will show the relationship between the correction factor and the line voltage.



Once the user has selected the exposure time, either by pressing the "up" and "down" buttons or by selecting a pre-set time and the appropriate "tooth" button, the digital display will show the selected exposure time and the equipment is now READY to take an exposure.

WARNING:

X-Ray button must be kept depressed throughout the exposure. If the patient should move during the examination, the button must be released, thereby interrupting the emissions.

After an exposure the digital display will be flashing, allowing for the cooling cycle, and during this period the equipment is NOT enabled to take an exposure. After the cooling cycle the digital display will shows the last selected exposure time and the equipment will be again READY to take an exposure, either with the last selected exposure time or by selecting a new one.

6. SYSTEM OPERATION

Preparing the equipment

1) When the main switch S-1 located on the CORIX PRO 70 equipment is turned on; the operation sequence is started, and the digital display will show 0.00 seconds.

2) The exposure time can be set either manually or by preset times.

3) Manual selection is made with PB-1 to increase time and PB-2 to decrease it. When the buttons are held for more than two seconds the change rate of speed will increase.

4) Preset selection is made by progressively pushing PB-3 to change the preset times which will be shown by the corresponding icon on the front panel.
The default setting when selecting patient size by acting on PB-4 is the Adult setting.

The microprocessor will compute the corrected exposure time based on the preset time multiplied by a factor related to the size of the patient and another factor related to film speed. This pre-computed time will then be corrected using an algorithm dependent on the line voltage at that moment.
The display time will be the corrected time.

NOTE: When line voltage is out of the 109V - 132V operating range the digital display will show HI when over 132V and LO when under 109V. Under these error modalities, the X-RAY exposure button PB-5 will be disabled and green LED-12 READY will be OFF.

5) Once the above operations have been done the DPM timer is ready, indicated by green LED-12, to take an exposure and it is noted that PB-5 functions as a "Dead Man Switch": that is **if the switch is released before the end of the set time, the exposure will be instantly aborted.**

6) During the exposure the display will count down and at the end the display will show "---" for a period that is 30 times the exposure, to allow cooling of the X-RAY tube. Once the "---" Disappear the last preset time will be shown on the digital display and the DPM timer will be ready again.

Positioning the tubehead for exposures

a) Arrange the tubehead with an angle suitable for the required exposure and positioning.
b) Introduce the film into the patient's mouth according to the chosen technique (bisecting or parallel).
c) Move the beam limiting device near the animal and direct it exactly towards the tooth under examination by referring to Mulligan, Thomas W., Aller, Mary Suzanne, Williams, Charles A. (1998). Extraoral Imaging Techniques. In: Mary Suzanne Aller *Atlas of Canine & Feline Dental Radiography*. Yardley, Pennsylvania: Veterinary Learning Systems. p23-26

Exposure techniques

Please, refer to Mulligan, Thomas W., Aller, Mary Suzanne, Williams, Charles A. (1998). Intraoral Imaging Techniques. In: Mary Suzanne Aller *Atlas of Canine & Feline Dental Radiography*. Yardley, Pennsylvania: Veterinary Learning Systems. p27-44

Bisecting angle and Parallel techniques

Please, refer to Mulligan, Thomas W., Aller, Mary Suzanne, Williams, Charles A. (1998). Projection Geometry. In: Mary Suzanne Aller *Atlas of Canine & Feline Dental Radiography*. Yardley, Pennsylvania: Veterinary Learning Systems. p15-22

7. PROTECTION AGAINST RADIATION

Radiation protection is generally regulated by law.

Trained personnel only are allowed operation and use of the equipment.

- The film must be introduced into the patient's mouth manually or by means of the relevant holders; it must be held by the patient.
- During radiation exposure, the operator must not be in contact with the tubehead or the collimator.
- During radiation exposure, only the operator and patient must be allowed in the room.
- To reduce the unwanted effects of secondary radiation on the patient, we suggest using the relevant leaded aprons.

8. CHECKS AND CORRECTION OF POSSIBLE FAULTS IN DENTAL RADIOGRAPHS

Typical defects of intra-oral radiology	Possible causes:
Light radiographs:	Insufficient exposure to X-ray (short time) Insufficient development time Deteriorated developer Developer temperature below recommended value Incorrect developing fluid dilution
Dark radiographs:	Excessive exposure to X-ray (long time) Excessive development time Developer temperature above recommended value Incorrect developing fluid dilution
Blurred radiographs (details not visible):	The patient moved The tubehead moved
Partially exposed radiographs:	X-ray directed off the film's mid section Low developmental fluid level, with consequent partial film development Two or more films placed against each other during development
Clouded radiographs:	Excessive film shelf life (check expiration date) Film accidentally exposed to X-ray Film accidentally exposed to other natural or artificial light sources
Radiograph showing a black line:	This line appears when the film is excessively folded
Radiographs showing signs of electrostatic electricity:	When film is compressed too much and the air is dry, static electricity may be released discharging in the compensation points, which display black marks.
Radiographs with chemical spots:	Development and fixing fluid spattered on the film before development and fixing procedures produces spot on the radiograph; such spots are: Dark, when caused by development fluid Light when caused by fixing fluid
Radiographs with emulsion coming off:	If the film is kept in a hot water bath too long (e.g. throughout the whole night), the emulsion may become softer and partially come off the film base. After development, the film will show scratches.
Typical defects caused by incorrect positioning	
Radiographs with elongated or shortened image:	The main beam is not perpendicular to the bisecting of the angle formed by the tooth longitudinal axis and the film.
Radiographs with stretched out tip tooth	Probably caused by excessive film folding inside patient's mouth.

9. MAINTENANCE

This equipment requires proper operation, regular maintenance and servicing. The following precautions will ensure safe and effective functioning of the system.

Periodic maintenance consists of checks directly affected by the operator and/or by Technical Service.

Checks directly affected 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 scissors arm balancing
- Check centering of X-ray beam

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

Cleaning and disinfecting.
Gently wipe metal and plastic components with damp cloth. Use a liquid soap. After use on each patient, disinfect distal end of the beam limiting device with antiseptic solution.

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