

# PHOT-X II

MODEL 303

*DENTAL X-RAY*

## INSTALLATION INSTRUCTIONS

*·Ceiling Mount Type .....CK*

**⚠ WARNING**

This X-ray equipment may be dangerous to patients and operators unless safe exposure factors and operating instructions are observed.

 **Belmont**<sup>®</sup>

0608 (REV.0)

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## CAUTION

This manual provides information and instructions for the installation, assembly calibration and certification procedures for **BELMONT PHOT-X II MODEL 303** dental x-ray. The instructions contained in this book should be thoroughly read and understood by dealer service personal before attempting to install the X-ray unit. After installation is completed, owners should file this manual and refer back to it to schedule periodic maintenance.

## SECTION 1 : TECHNICAL DATA

### [ 1 ] ELECTRICAL AND RADIATION DATA

1. X-ray tube ----- Toshiba D-0711 (Stationary Anode)
  - a. Focal spot ----- 0.7 mm
  - b. Target Material ----- Tungsten
  - c. Target angle ----- 16°
  - d. Maximum anode heat content ----- 7kJ (10kHU)
2. Maximum x-ray tube assembly heat content ----- 120kJ (170kHU)
3. Rated peak tube potential ----- 60 kV / 70 kV selectable
4. Rated tube current ----- 4 mA / 7 mA selectable
5. Maximum rated peak tube potential ----- 70 kV

Rated Line Voltage	[Vac]	100	110	120	220	230	240
Minimum Line Voltage	[Vac]	90	99	108	198	207	216
Maximum Line Voltage	[Vac]	110	121	132	242	253	264
Rated Line Power	[kVA]	1.1	1.2	1.3	1.5	1.5	1.6
Rated Line Current at 70kV,7mA	[Aac]	10.8	10.8	10.8	6.6	6.6	6.6
Maximum Line Current at 70kV,7mA	[Aac]	12	12	12	7.3	7.3	7.3
(Internal Resistance	[Ω] )	(0.18 ~ 0.44)	(0.20 ~ 0.49)	(0.22 ~ 0.53)	(0.97 max.)	(1.02 max.)	(1.06 max.)
Range of Line Voltage Regulation	[%]	2 ~ 5	2 ~ 5	2 ~ 5	0 ~ 3	0 ~ 3	0 ~ 3

7. Power line frequency ----- 50/60Hz,Single Phase
8. Exposure time ----- 0.01 ~ 3.2 sec.
9. Inherent filtration ----- 1.7 mm Al Equivalent
10. Added filtration ----- 0.3 mm Al
11. Minimum filtration permanently in useful beam ----- 2.0 mm Al Equivalent at 70 kV
12. Nominal roentgen output
 

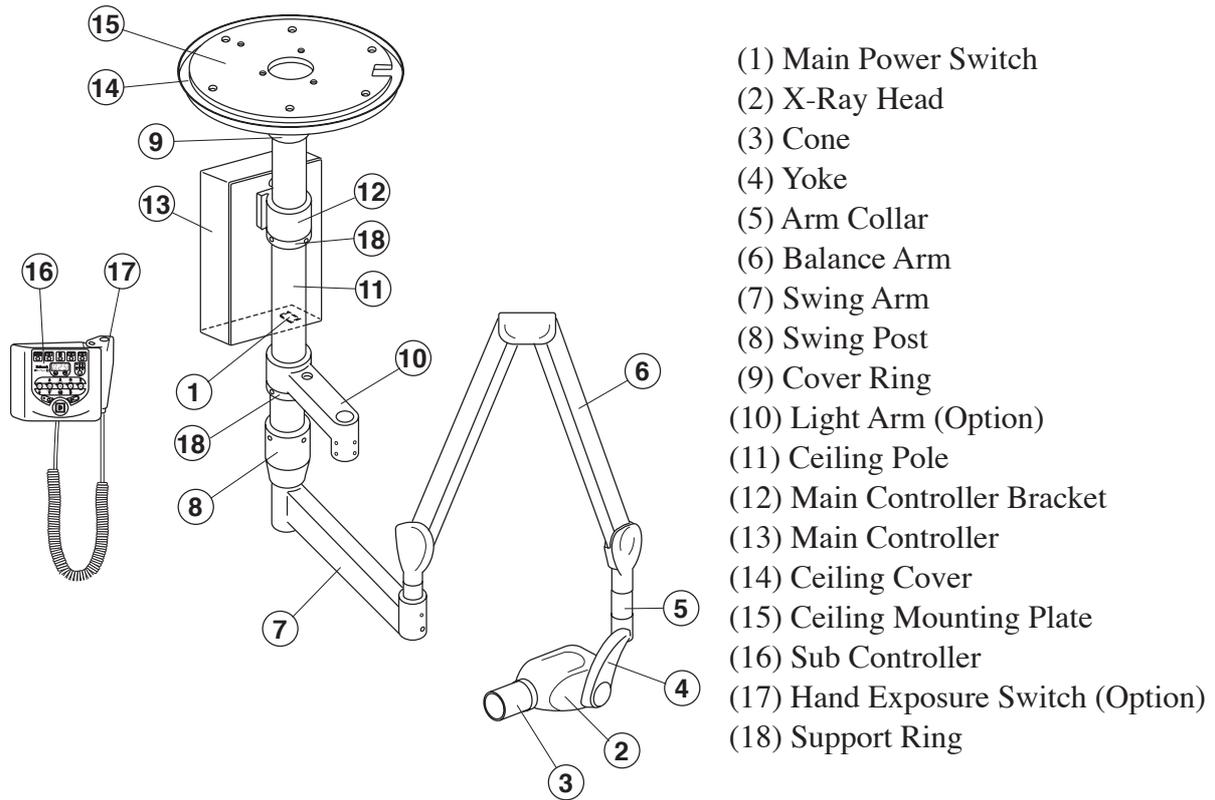
	60 kV	70 kV	
	4 mA	7 mA	4 mA 7mA
a. Distal end of regular cone -----	5.4	9.4	7.1 12.4 mGy/sec. ± 40%
b. Distal end of long cone -----	2.4	4.2	3.1 5.5 mGy/sec. ± 40%

(Data obtained by direct measurement in the useful beam)
13. Nominal electrical output of H.V. generator ----- 0.49 kW at 70 kV, 7 mA
14. Cone
 

	Source to skin distance	Field size
a. Regular cone -----	203 mm	58 mm dia., circular
b. Long cone (option) -----	305 mm	58 mm dia., circular
c. Rectangular cone (option) -----	203 mm	36 x 47 mm, rectangular
15. Maximum symmetrical radiation field ----- 60 mm dia. at distal end of cone
16. Leaking technique factor ----- 70 kV / 0.14 mA  
(0.14 mA is maximum rated continuous current for 7 mA with a duty cycle 1 : 50)
17. Duty cycle ----- 1 : 50 (0.5 sec. exposure with 25 sec. interval)
18. Maximum deviation of tube potential, tube current and exposure time
  - a. Below 0.1 sec. setting ----- ±10 kV, ±2 mA, ±5 msec.
  - b. 0.1 sec. setting & up ----- ±5 kV, ±1 mA, ±10 msec.
19. Measurement base of technique factors
  - a. peak tube potential ----- Average of peak tube potentials during one exposure
  - b. tube current ----- Average of tube current during one exposure
  - c. exposure time ----- Time period during x-ray is emitted
20. Half value layer ----- 1.5 mm Al over
21. Source to the base of cone distance ----- 94 mm
22. Environmental condition for storage ----- -20 ~ 70°C, 10 ~ 100%, 500 ~ 1060hPa
23. Environmental condition for operation ----- 10 ~ 40°C, 30 ~ 70%, 700 ~ 1060hPa

## [ 2 ] OVERALL VIEW AND MAJOR COPMPNENTS

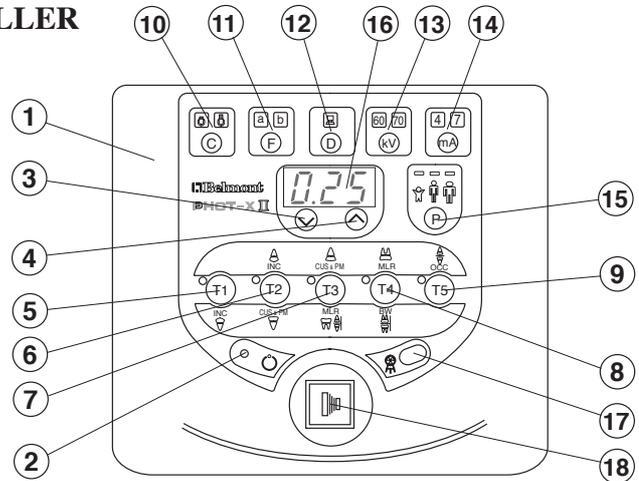
### 1. CEILING MOUNT TYPE (CK)



- (1) Main Power Switch
- (2) X-Ray Head
- (3) Cone
- (4) Yoke
- (5) Arm Collar
- (6) Balance Arm
- (7) Swing Arm
- (8) Swing Post
- (9) Cover Ring
- (10) Light Arm (Option)
- (11) Ceiling Pole
- (12) Main Controller Bracket
- (13) Main Controller
- (14) Ceiling Cover
- (15) Ceiling Mounting Plate
- (16) Sub Controller
- (17) Hand Exposure Switch (Option)
- (18) Support Ring

**Fig.1-1** Overall view and Major Components for CK

### 2. SUB CONTROLLER



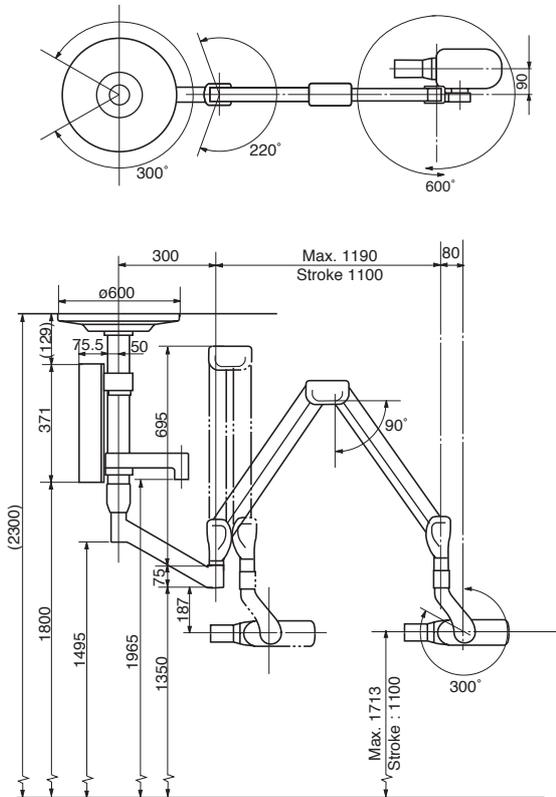
**Fig.1-2** Controller Switches

- (1) Sub Controller Frant Panel
- (2) Ready Light
- (3) Exposure Time Adjusting Switch (Down)
- (4) Exposure Time Adjusting Switch (Up)
- (5) Tooth Selection Switch (T1)
- (6) Tooth Selection Switch (T2)
- (7) Tooth Selection Switch (T3)
- (8) Tooth Selection Switch (T4)
- (9) Tooth Selection Switch (T5)
- (10) Cone Type Selection Switch
- (11) Film Speed Selection Switch
- (12) Digital Imaging Switch
- (13) kV Selection Switch
- (14) mA Selection Switch
- (15) Patient Size Selection Switch
- (16) Exposure Time Display Window
- (17) Exposure Warning Light
- (18) Exposure Switch

### [ 3 ] PHYSICAL DIMENSIONS

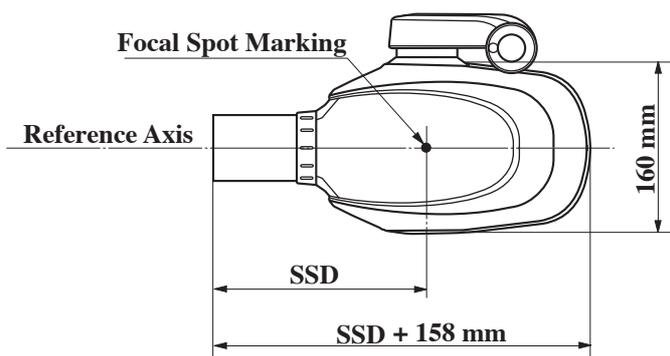
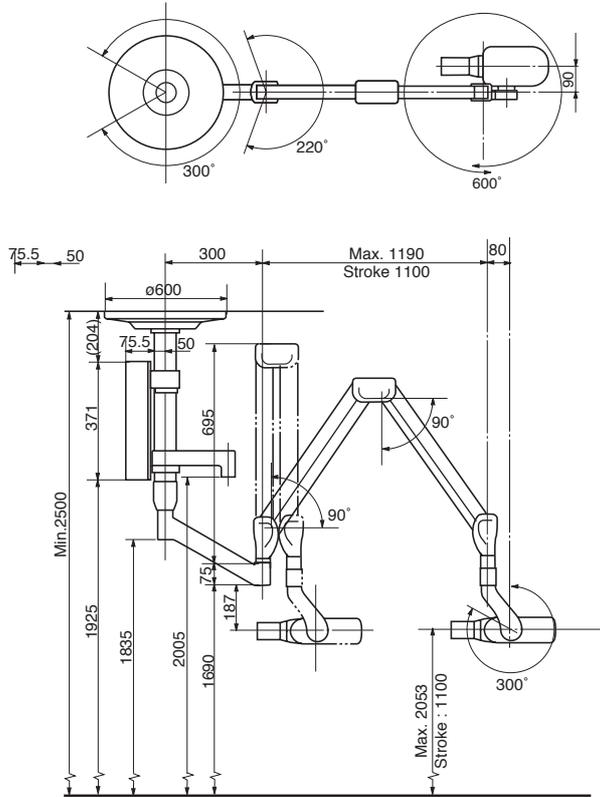
[UNIT : mm]

#### PHOT-XII CK Standard Type



[UNIT : mm]

#### PHOT-XII CK Germany Type



- SSD (Source to Skin Distance) :
- a. Regular cone-----203 mm
  - b. Long cone-----305mm
  - c. Rectangular cone-----203 mm

**Fig.1-3 Dimensions**

## [ 4 ] TUBE HEAD THERMAL CHARACTERISTICS

### A. Interval between each exposure

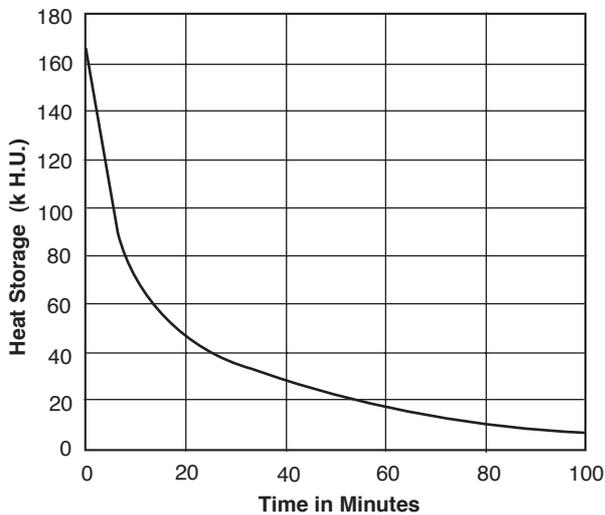
The temperature inside of the tube head rises when an exposure is made. The value of the heat generated is measured in Heat Units (HU), which is the product of tube potential, tube current and exposure time. Excessive heat will accumulate inside of the tube head if the x-ray is used without a proper cool down interval between each exposure. The excessive heat may damage the x-ray tube, high voltage generator or both.

### B. Duty cycle

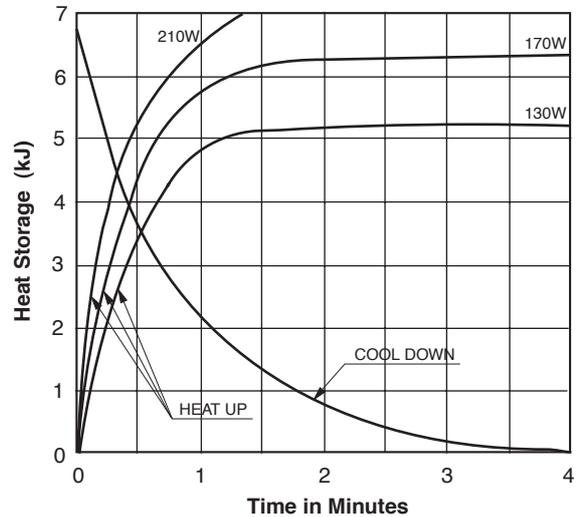
A cool down interval of 50 seconds or more must be allowed between each 1 second exposure. (a 25 second cool down must be allowed between each 0.5 second exposure.) This will avoid the accumulation of excess heat and prolong the tube head life.

### C. Tube head cooling curve

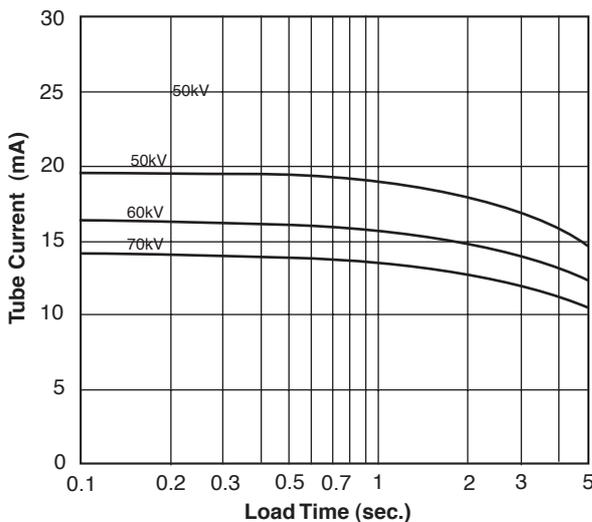
#### 1. Tube Housing cooling curve



#### 2. Anode thermal characteristics



#### 3. Maximum rating chart



## SECTION 2 : PRE-INSTALLATION INSTRUCTION

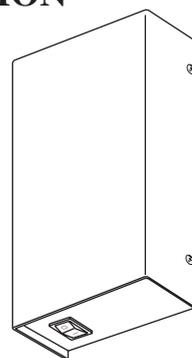
### [ 1 ] SUPPORT REQUIREMENTS

#### A. Arm and head

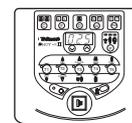
The ceiling and mounting hardware for ceiling mounting plate must be sufficient to withstand a **150 kg** withdrawal force.

#### B. Main Controller (Fig.2-1)

The main controller is installed on the pole.



**Main Controller**



**Sub Controller**

#### C. Sub Controller (Fig.2-1)

When mounting the sub controller, the wall and mounting hardware must be sufficient to withstand a 4.5kg shear load.

**Fig.2-1 Main Controller and Sub Controller**

### ⚠ CAUTION

**If the PHOT-X II Model 303 is to be mounted in a manner other than what is specified in this manual or if the hardware to be used is other than what is supplied, the support capability of the ceiling and the strength of the hardware must be checked and verified to be adequate.**

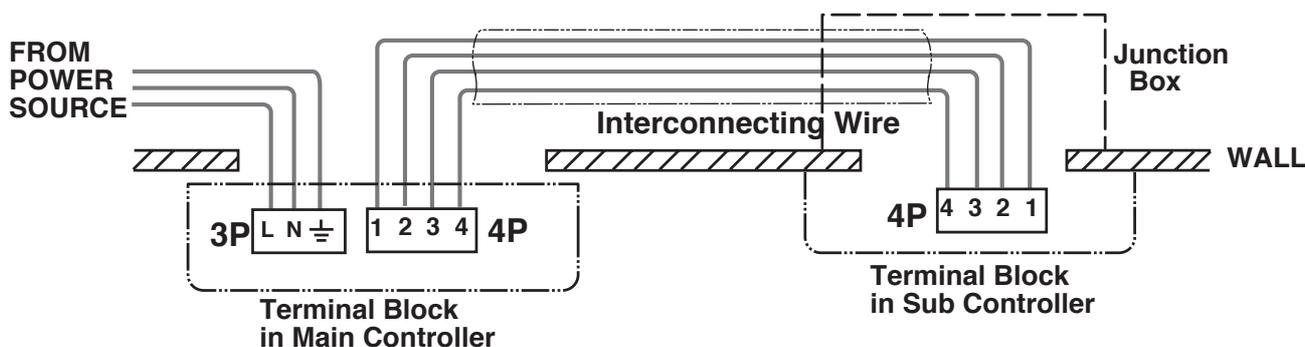
### [ 2 ] ELECTRICAL REQUIREMENTS

#### A. Power supply

The model 303 x-ray system is operated on a power supply of rated line voltage  $\pm 10\%$  with a three wire (hot, neutral, earth) circuit, separately connected to the central distribution panel with an over current protection device. Use a flexible cable approved by CEE (13) 52 or 53 consists of 0.75 mm<sup>2</sup> or 1 mm<sup>2</sup> conductors. Diameter of the sheath of cable should be 6 ~ 7.5 mm diameter. Line voltage regulation should be within the range of 2 ~ 5% (for 100V, 110V type) or 0 ~ 3% (for 220V, 230V, 240V type) at rated current.

#### B. Concealed wiring (Fig.2-2)

Concealed wiring is accomplished by bringing conduit and wires in a flush mounted junction box located behind the sub controller. Recommended height for the flush junction box is 1310 mm. Wiring done in this manner should extend 300mm beyond the wall surface to allow sufficient wire for connections. Interconnecting wires between main controller and sub controller should be 4 conductor, 0.5 mm<sup>2</sup>, 300V. Maximum wire run distance is 10 m.



**Fig.2-2 Concealed Wiring**

**Note :** All connections, workmanship and materials used must comply with the local codes.

## SECTION 3 : INSTALLATION INSTRUCTIONS

### ⚠ CAUTION

This section explains the installation instructions for PHOT-XII MODEL 303. After the installation is completed, PHOT-XII MODEL 303 requires the calibration and inspection. Refer to SECTION 5.

### [ 1 ] INSTALLATION REQUIREMENTS

#### Tools :

Standard tool kit including 1.5 mm, 2 mm, 3 mm and 5 mm allen keys.

#### Instruments :

- Digital multimeter with an accuracy of 1%, capable of measuring 300 V AC and 10 mA DC, and capable of indicating true RMS value within 1 sec.
- Standard calculator.

#### TEST 1 : POWER SUPPLY

Prior to starting the installation inspect the power supply and confirm that the power supply is within rated line voltage  $\pm 10\%$  and that the supply is a 3 wire earthed circuit, separately connected to the central distribution panel with an overcurrent protection device.

### [ 2 ] INSTALLATION

#### A. MOUNTING PLATE AND POLE INSTALLATION

1. Pass the power supply cable and inter connecting wire through the centre hole of ceiling mounting plate. (Fig.3-1)

2. Fix the ceiling mounting plate to the ceiling with lag bolts or anchor bolts. Make sure the mounting plate is firmly fixed and can withstand a 150kg withdrawal force. (Fig.3-1)

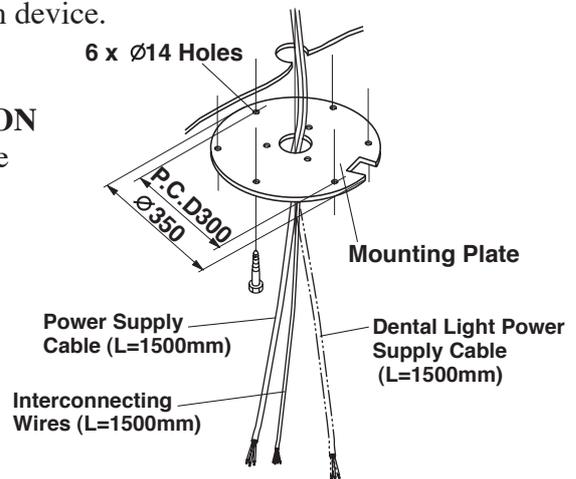


Fig.3-1 Fixing Ceiling Mounting Plate

3. After setting the cover and cover ring to the pole, pass the power supply cable and interconnecting wire through the hole for main controller on the pole. Pass power supply cable for light through the hole for light arm. (Option) Fix the pole to the ceiling mounting plate with 3 x mounting bolts (M8 x 20). Make the pole vertical by adjusting 3 x adjusting bolts and 3 x mounting bolts. (Fig.3-2) Set the cover and cover ring to the pole and tighten the set screws of cover ring as the cover stays at the upper end of the pole. (Fig.3-2)
4. Set the main controller bracket to the pole with 3x cap bolts (M5 x 8) on the support ring. (Fig.3-2)
3. Pass the power supply cable for light through the light arm and fix the light arm to the pole with 3x cap bolts on the support ring. (Option) (Fig.3-2)

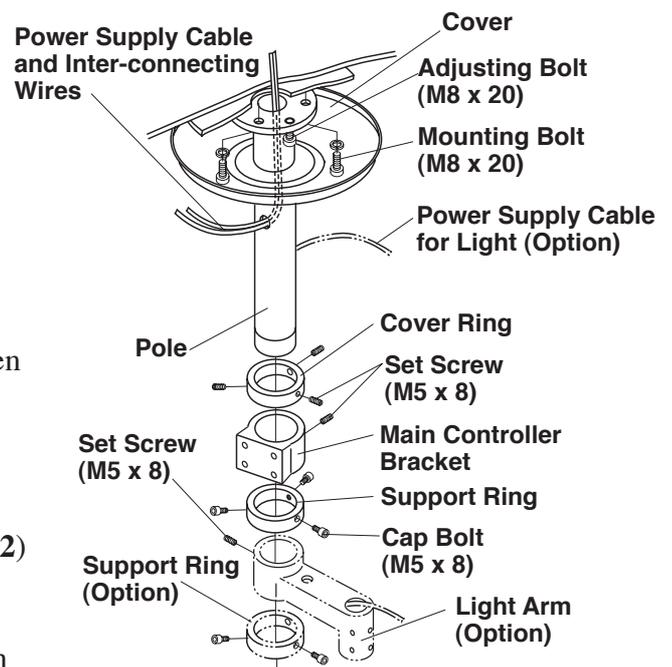
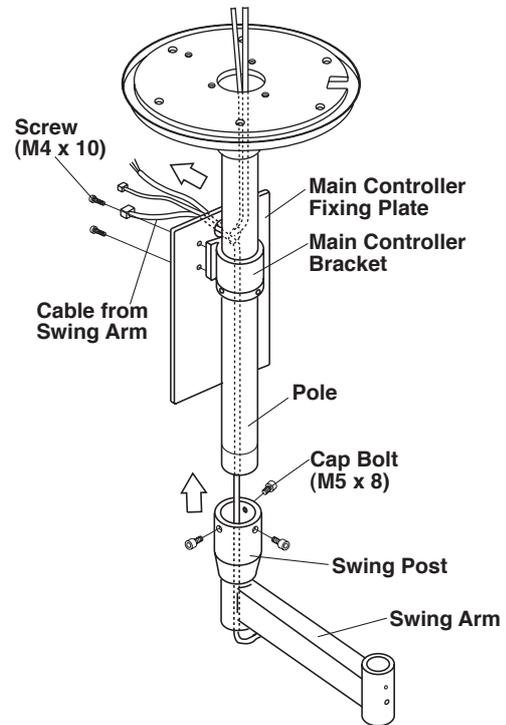


Fig.3-2 Fixing Pole & Cover

## B. SWING ARM INSTALLATION

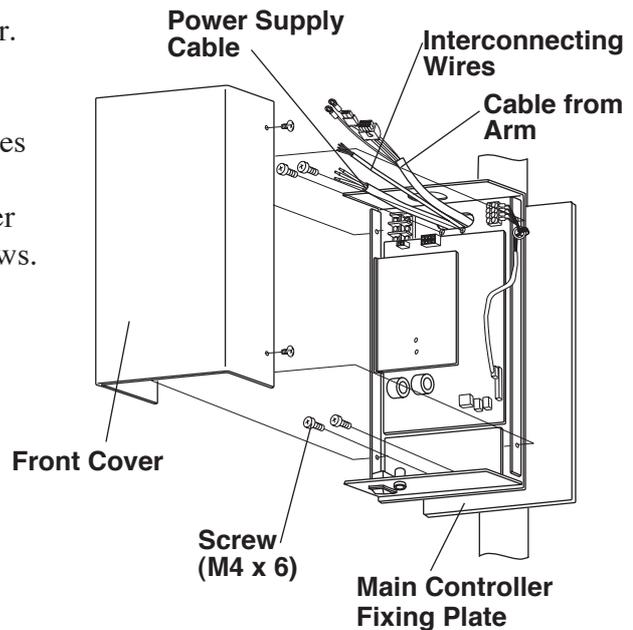
1. Pass the power supply cable and inter connecting wire through the main controller fixing plate hole and fix the main controller fixing plate to the main controller bracket with screws (M4 x 10). (**Fig.3-3**)
2. Pass the arm cable from the swing arm through the pole and pull out from the main controller fixing plate hole.  
Fix the swing post with swing arm to the end of pole with cap bolts (M5 x 8). (**Fig.3-3**)



**Fig.3-3** Swing Arm Installation

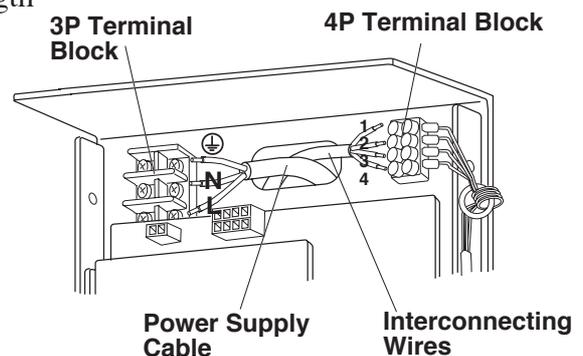
## C. MAIN CONTROLLER INSTALLATION

1. Remove 4 cover screws and open the front cover. (**Fig.3-4**)
2. After passing the arm cable, interconnecting wires and power supply cable through the hole on the chassis of main controller, fix the main controller on the main controller fixing plate with 4 x screws. (**Fig.3-4**)



**Fig.3-4** Main Controller Installation

3. Cut the wires of power supply cable to workable length and strip 10mm of insulation.  
Connect the wires of power supply cable to **3P** terminal block. (**Fig.3-5**)
4. Cut the interconnecting wires to workable length and strip 5mm insulation. Connect the wires to **4P** terminal block. (**Fig.3-5**)



**Fig.3-5** Power Supply Cable and Interconnecting Wires Connection

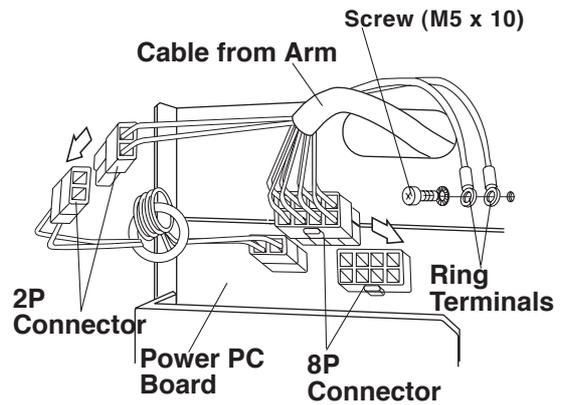
5. Connect **8P** connector of the arm cable to the **8P** connector on power PC board.  
Connect **2P** connector of the arm cable to the **2P** connector coming from PC board.

(Fig.3-6)

6. Connect 2 wires with ring terminals from the arm cable to the chassis with a M5 screw.

(Fig.3-6)

**Note :** The front cover for the main controller should not be closed until all installation and the post-installation inspections and confirmation are completed.



**Fig.3-6** Connecting 2P and 8P Connectors on Power PC Board

#### D. BALANCE ARM INSTALLATION

##### ⚠ CAUTION

**Do not release Arm holding band until the X-ray head has been installed.**  
**Balance arm assembly is spring loaded and can cause equipment damage and injury if not handled in the proper manner.**

1. During this procedure, do not remove Arm holding band.

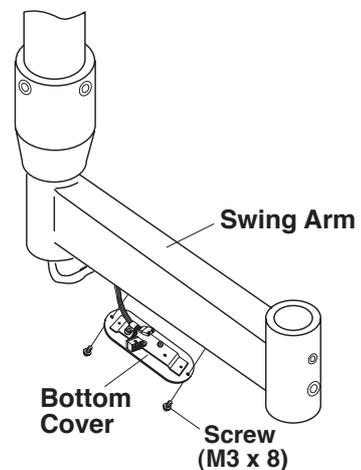
**Note :** Before installation of the balance arm, adjust swing arm stopper position and swing arm swing angle.  
Refer to SECTION 4, D and E.

2. Remove 2 x screws (M3 x8) from the underside of the swing arm to open the bottom cover.

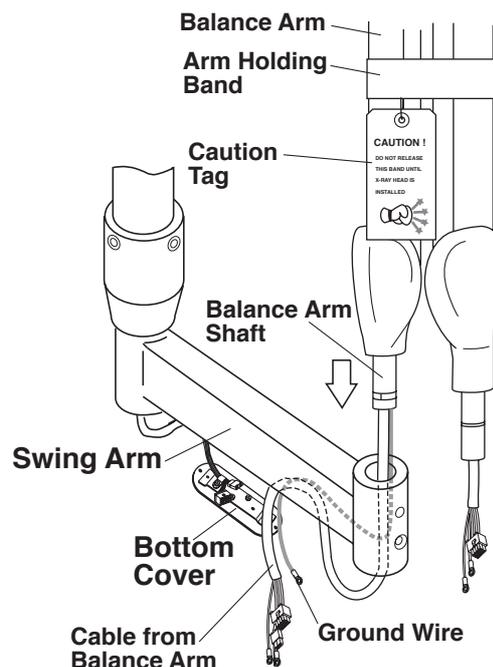
(Fig.3-7)

3. Route the cable with 2P and 8P connectors from the balance arm shaft through the swing arm. Insert the balance arm into the swing arm. The cable should be fed through the bottom cover opening on the bottom of the swing arm. Ground wire only goes through the swing arm.

(Fig.3-8)



**Fig.3-7** Swing Arm Bottom Cover



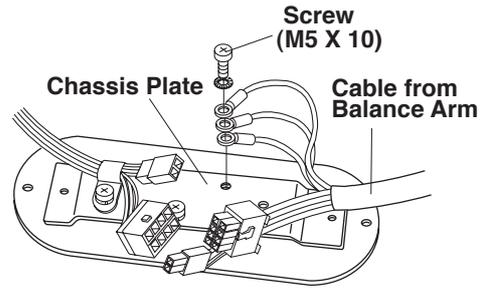
**Fig.3-8** Balance Arm Installation

- Secure the 3 wires (Grounded wires) with ring terminals together with the (M5 x 10mm) screw on the bottom cover. (Fig.3-9)

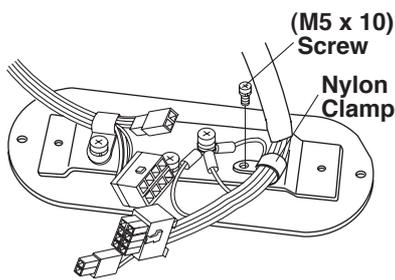
**Note :** Three ring terminals should not protrude from a chassis plate. (Fig.3-9)

- Secure the wires from the balance arm to the bottom cover with the nylon cable clamp to prevent damage from twisting. (Fig.3-10) Then connect the **2P** and **8P** connectors. (Fig.3-11)

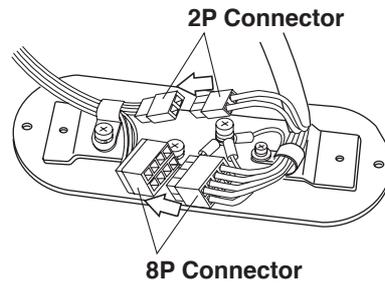
- Re-attach the bottom cover to the horizontal arm with two screws. (Fig.3-7)



**Fig.3-9** Attaching Grounded Wires on Bottom Cover



**Fig.3-10** Attaching Balance Arm Cable on Bottom Cover



**Fig.3-11** Connection of Connectors on Bottom Cover

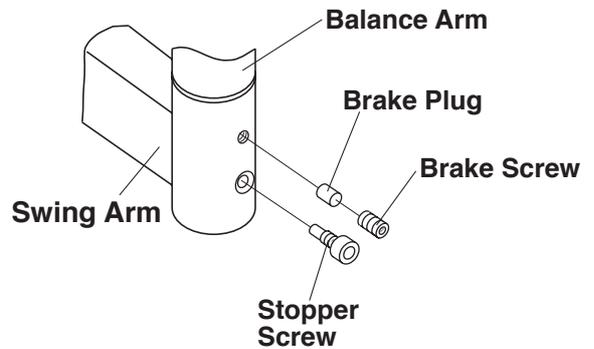
- Insert the brake plug and brake screw (M6 x 6mm) into upper threaded hole on the swing arm. (Fig.3-12)

**Do not fully tighten.**

- Insert the stopper screw into lower threaded hole on the swing arm and tighten securely. (Fig.3-8)

**⚠ CAUTION**

**If stopper screw is not tightened securely, the Balance Arm can lift out of the swing arm.**



**Fig.3-12** Attaching Balance Arm to Swing Arm

## E. HEAD ASSEMBLY INSTALLATION

### ⚠ WARNING

**Do not release Arm holding band until the X-ray head has been installed.**  
**Balance arm assembly is spring loaded and can cause equipment damage and injury if not handled in the proper manner.**  
**Refer to the Caution Tag on the band.**

1. Remove the arm collar screw (M4 x 8mm) from the arm collar. Slide the arm collar upward and temporarily hold it in position with adhesive tape. (Fig.3-13)

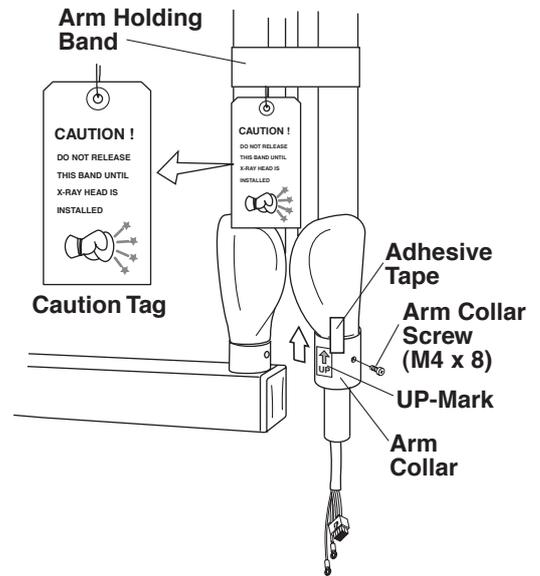
2. Open the yoke inside cover of x-ray head by removing (M3 x 8mm) countersunk screw. (Fig.3-14)

**Note :** When opening the yoke inside cover, use a short screw driver.

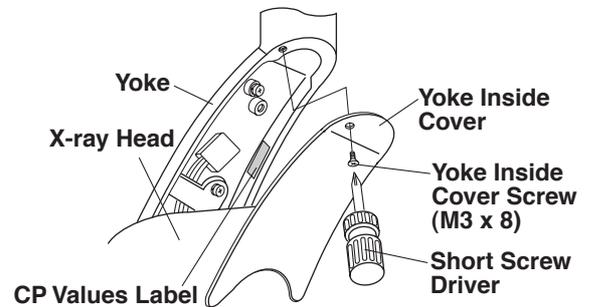
3. Making sure the stopper ring is placed on the yoke, insert the wiring from the balance arm assembly through the head shaft and into the yoke. (Fig.3-15)

4. Insert the shaft of the balance arm into the head yoke, and while holding the head in position, insert the head key securely into the retaining groove. (Fig.3-15)

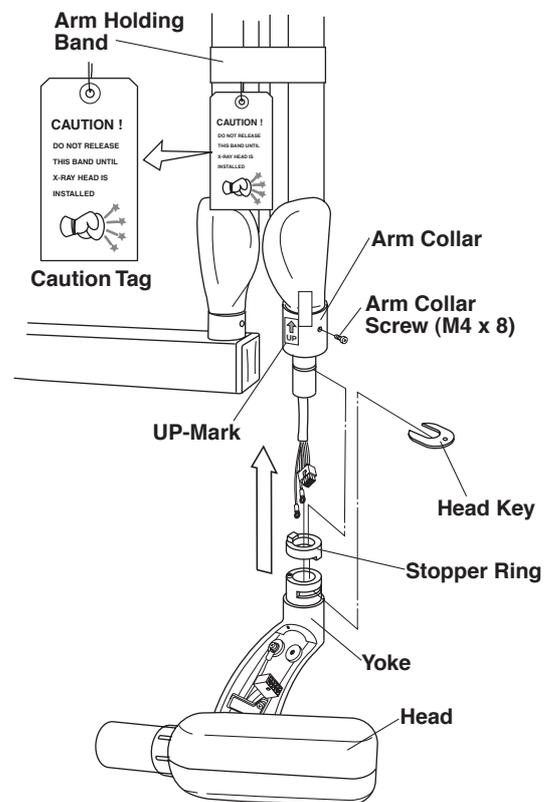
5. Remove adhesive tape and slide the arm collar downward. Fix it in place with the arm collar screw. Remove the UP-mark from the arm collar. (Fig.3-15)



**Fig.3-13** Setting Arm Collar on Balance Arm



**Fig.3-14** Removing Yoke Inside Cover



**Fig.3-15** X-ray Head Installation

6. Loosen the (M5 x 10mm) screw and remove the nylon cable clamp from the yoke housing. Place cable clamp on the balance arm cable. Connect the **10P** connectors, and then attach the balance arm cable to the yoke housing with the nylon cable clamp. (Fig.3-16)

7. Remove the (M5 x 10mm) screw from the ground terminal inside of the yoke housing. Secure the green ground wires from balance arm and head to the ground terminal with the (M5 x 10mm) screw. (Fig.3-16)

8. Reattach the yoke inside cover with the screw (M3 x8mm). Before closing the cover, note the CP values on the CP values label inside of the yoke. (Fig.3-16)

9. Remove arm holding band.

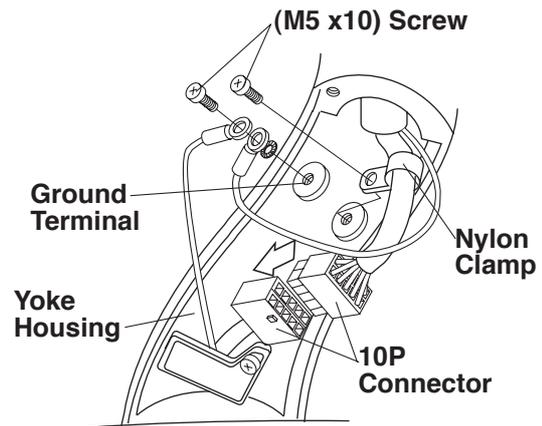


Fig.3-16 Connection 10P Connector in Yoke

#### F. SUB CONTROLLER INSTALLATION

The wall and strength of hardware used must be checked and verified as being adequate to withstand a 4.5 kg shear load. A flush mounted junction box with the necessary conduit and wiring should be pre-installed at 1310mm from the floor.

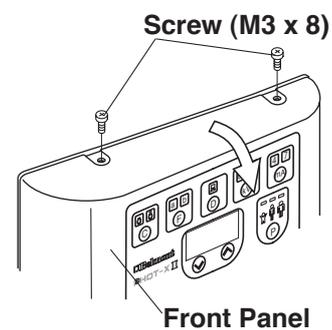


Fig.3-17 Opening Front Panel

1. Remove two (M3 x8mm) screws from top of the control box and open the front panel. (Fig.3-17)
2. Disconnect the **4P** connector from the timer PC Board. (Fig.3-18)
3. Route the interconnecting wires from the main controller through access hole of chassis and mount on the wall with three (ø4.1 x 20mm) wood screws. (Fig.3-18)

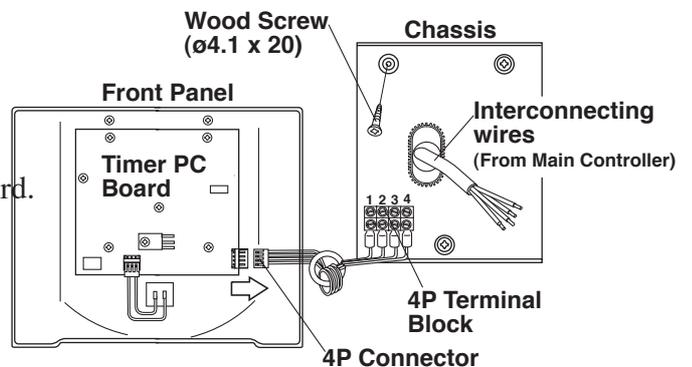


Fig.3-18 Attaching Sub Controller Chassis

4. Cut 4 interconnecting wires from main controller to a workable length. Strip 5mm insulation off the wires and connect them to the **4P** terminal block. Terminal number for each wire should be matched to the terminal number in the main controller. (Fig.3-19)

#### CAUTION

Miswiring causes permanent damage to both timer PC board and power PC board.

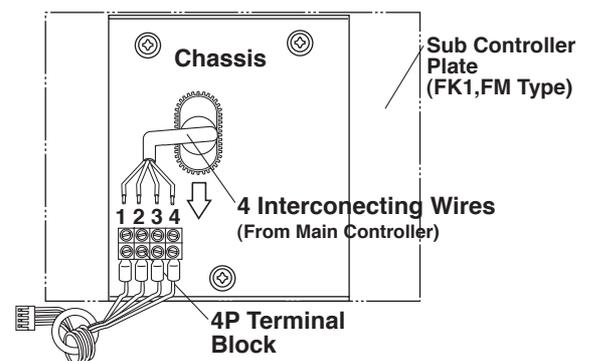
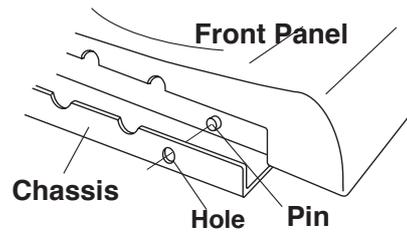


Fig.3-19 Interconnecting Wires Connection in Sub Controller

- If wire length is too long, push it back into the access hole of the wall. This will prevent mechanical damage to the timer PC Board when replacing the front cover.
- Reattach the **4P** connector to the timer PC Board (**Fig.3-18**)
- Set the pins located on the bottom of the front panel into holes on the bottom of chassis and attach the front cover to the chassis with two (M3 x 8mm) screws. (**Fig.3-17 & Fig.3-20**)

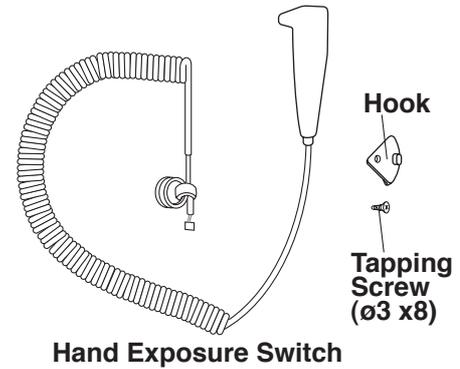


**Fig.3-20** Bottom of Sub Controller

### G. HAND EXPOSURE SWITCH (OPTION)

An optional hand exposure switch can be connected to the sub controller. Since this exposure switch has a coiled cord, operator can stand the most suitable position for operation.

The exposure switch on the front panel of sub controller and this hand exposure switch can be used. If local code prohibits use of both switches, disconnect the connector of either one of the switches.

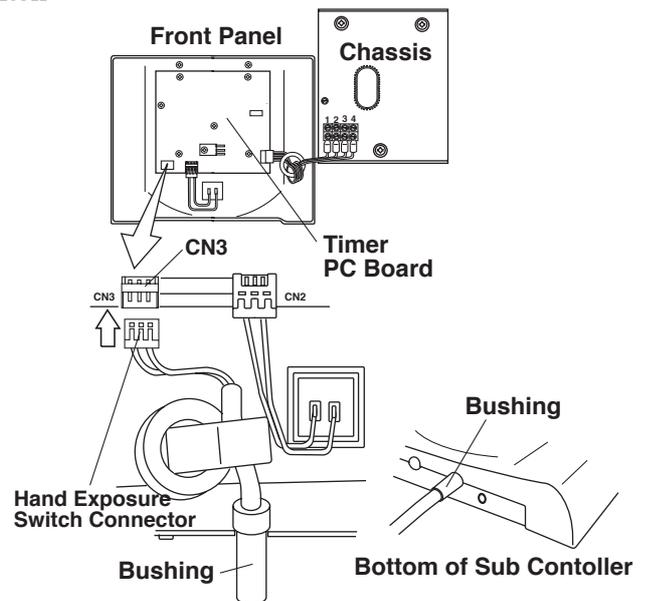


**Fig.3-21** Hand Exposure Switch Kit

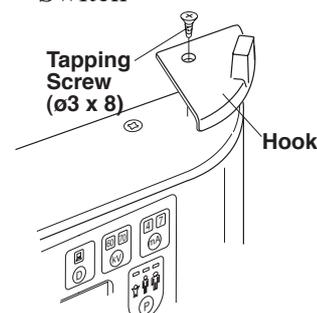
- Confirm the contents of optional hand exposure switch kit. (**Fig.3-21**)

Hand exposure switch -----	1
Hook -----	1
Screw for hook (ø3 x 8mm Tapping screw) -----	1

- Remove two (M3 x 8mm) screws from top of the sub controller and open front panel.
- Connect the connector at the end of hand exposure switch coil cord to CN3 connector on the timer PC board. (**Fig.3-22**)
- Insert the bushing of coil cord into the slot at the bottom of the chassis, reattach the front cover and secure two (M3 x 8mm) screws again. (**Fig.3-22**)
- Place the hook on the top corner (right or left) of controller and attach it with the tapping screw (ø3 x 8mm). (**Fig.3-23**)



**Fig.3-22** Connecting Hand Exposure Switch

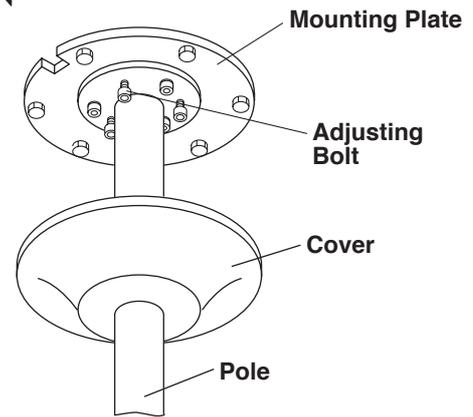


**Fig.3-23** Attaching Hand Exposure Switch Hook

## SECTION 4 : POST INSTALLATION INSPECTION

### A. LEVEL ADJUSTMENT FOR CEILING POLE

Level for ceiling pole can be adjusted by 3 level adjusting bolts (M8 x 20) located the flange of ceiling pole.



### B. SWING FRICTION ADJUSTMENT

#### ⚠ CAUTION

When adjusting arm swing friction, set the arm holding band on the balance arm for safety.

1. Swing Arm Swing Friction Adjustment (**Fig.4-2**)  
The swing arm swing friction can be adjusted by the brake screw located on the swing arm.
2. Balance Arm Swing Friction Adjustment (**Fig.4-2**)  
The balance arm swing friction can be adjusted by the brake screw located on the swing arm.

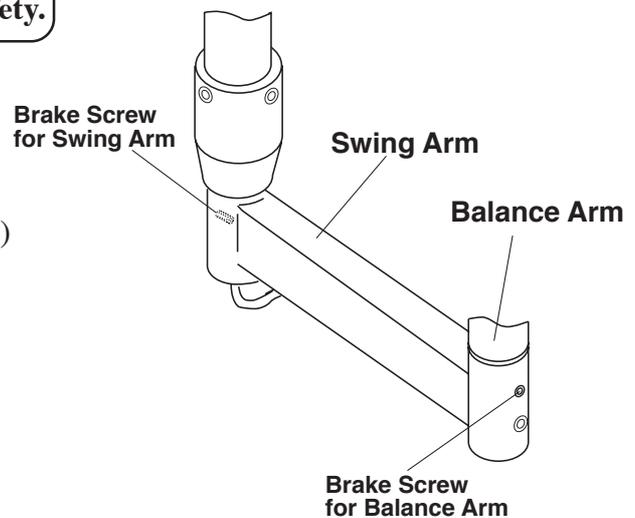


Fig.4-1 Level Adjustment for Ceiling Pole

Fig.4-2 Swing Friction Adjustment

### C. BALANCE ARM TENSION ADJUSTMENT (Fig.4-3)

1. Place the balance arm into position.
  2. If either balance arm drift higher or lower from the set position, remove the spring adjuster cover and adjust the balance arm spring tension with the balance arm wrench.
- The Balance arm swing friction can be adjusted by the brake screw located end of the horizontal arm.

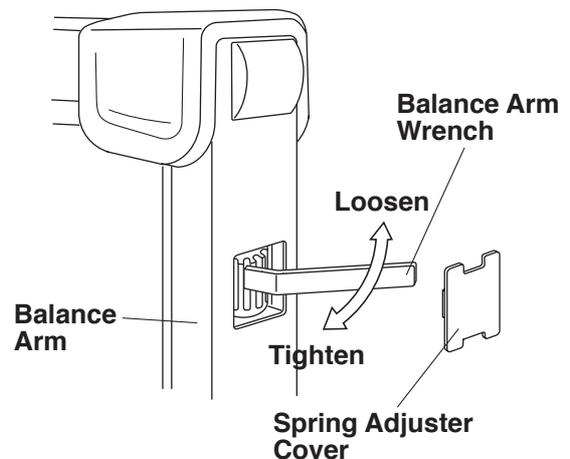
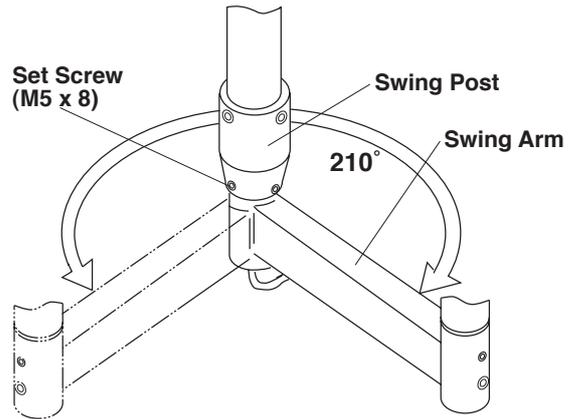


Fig.4-3 Balance Arm Tension Adjustment

## D. SWING ARM STOPPER POSITION ADJUSTMENT

### (Fig.4-4)

1. Swing arm swing angle is set at 210° in the factory.  
Swing arm stopper position can be adjusted.
2. Loosen 3 x set screws (M5 x 8) on the swing post. Turn the swing arm and adjust swing arm stopper position (Adjusting stopper ring angle). After setting swing arm stopper position, tighten 3 x set screws firmly and fix the stopper position.



**Fig.4-4** Swing Arm Stopper Position Adjustment

## E. SWING ARM SWING ANGLE ADJUSTMENT

### (Fig.4-5)

1. Swing arm swing angle is set at 210° in the factory.  
Swing arm swing angle can be adjusted.
2. Remove the head and balance arm.  
Refer SECTION 3, D.

### **⚠ WARNING**

**Balance arm should be closed and bind with the band. Balance arm assembly is spring loaded and can cause equipment damage and injury when the head is removed without band.**

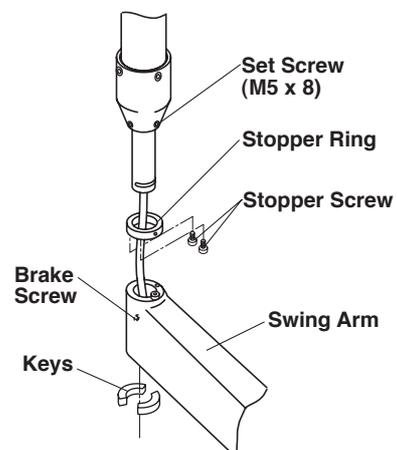
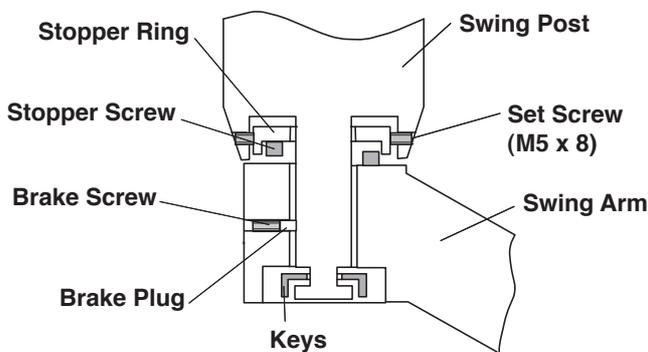
3. Loosen the brake screw and remove the keys from the bottom of the swing post to remove the swing arm.
4. Loosen 3 x set screw (M5 x 8) on the swing post and remove the stopper ring.
5. To change stopper screw position on the stopper ring can adjust swing arm angle.  
Stopper screw position on the stopper ring and swing arm angle is shown in **Table-1**.
6. After setting swing arm angle, adjust swing arm stopper position. Refer to SECTION 4, D.
7. Install the balance arm and head.

### Swing Angle

300°		Standard Setting
90°		
270°		
150°		
210°		
60°		
300°		
120°		
240°		

- With Stopper Screw
- Without Stopper Screw (Screw Hole)

**Table-1** Stopper Screw Position and Swing Arm swing Angle



**Fig.4-5** Swing Arm Angle Adjustment

## F. HEAD POSITIONING

If head drifts from the set position, adjust the brake screws according to the following procedures.

(Fig.4-6)

1. Loosen the yoke side cap screw ( $\phi 3 \times 8$ mm tapping screw) and remove the yoke side cap.
2. Adjust the six brake screws using a screw driver.
3. After adjustment, reattach the yoke side cap and screw.

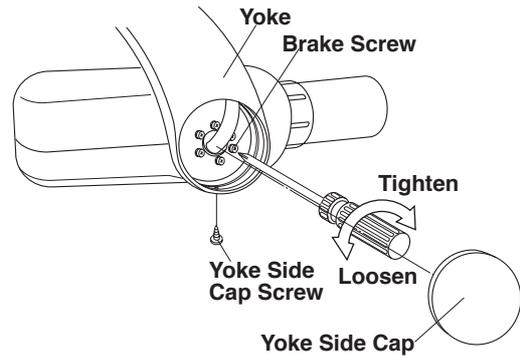


Fig.4-6 Head Positioning

## SECTION 5 : CONTROL IDENTIFICATION AND OPERATION

### [ 1 ] MAJOR COMPONENTS AND CONTROL IDENTIFICATION

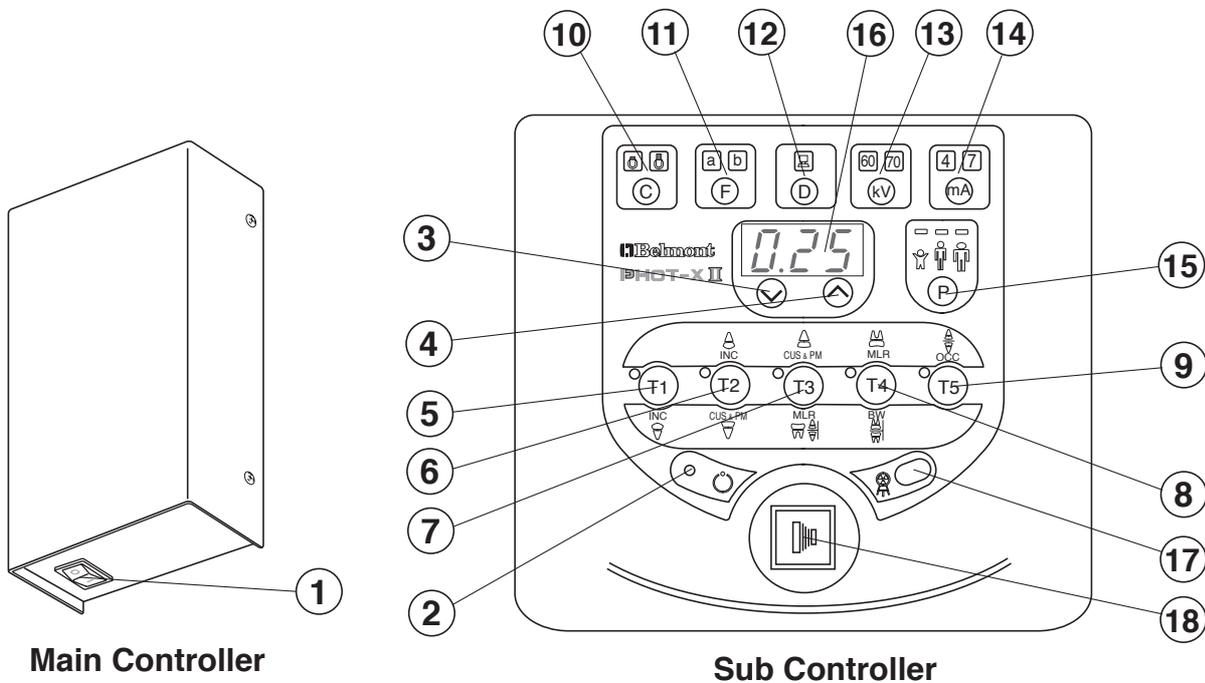


Fig.5-1 Major Components and Control Identification

- |   |                                    |
|---|------------------------------------|
| (1) Main Power Switch                     | (10) Cone Type Selection Switch    |
| (2) Ready Light                           | (11) Film Speed Selection Switch   |
| (3) Exposure Time Adjusting Switch (Down) | (12) Digital Imaging Switch        |
| (4) Exposure Time Adjusting Switch (Up)   | (13) kV Selection Switch           |
| (5) Tooth Selection Switch (T1)           | (14) mA Selection Switch           |
| (6) Tooth Selection Switch (T2)           | (15) Patient Size Selection Switch |
| (7) Tooth Selection Switch (T3)           | (16) Exposure Time Display Window  |
| (8) Tooth Selection Switch (T4)           | (17) Exposure Warning Light        |
| (9) Tooth Selection Switch (T5)           | (18) Exposure Switch               |

## [ 2 ] FUNCTION OF CONTROLS

### (1) Main Power Switch

Pushing the upper side of this switch to the ON position energizes the x-ray unit. (Ready light and pre-select light for cone type, film or digital, kV, mA, and patient size illuminate.) It is recommended to keep this switch OFF when the unit is not in use, in order to prevent an accidental exposure.

**IMPORTANT : To prevent the risk of an accidental exposure, push the lower side of this switch to the OFF position, when the unit is not in use.**

### (2) Ready Light

This light illuminates when the line voltage is within operable range (rated line voltage  $\pm 10\%$ ). When this light is not on, exposure can not be made.

### (3),(4) Exposure Time Adjusting Switches

By momentarily pushing the  $\text{\textcircled{\small \wedge}}$  (or  $\text{\textcircled{\small \vee}}$ ) switch, the exposure time displayed increases (or decreases) by one increment. By keeping the switch depressed more 2 sec., the exposure time displayed increases (or decreases) continuously until the switch is released.

Model 303 has the following 24 exposure time settings :

0.00, 0.01, 0.02, 0.03, 0.04, 0.05, 0.06, 0.08, 0.10, 0.13, 0.16, 0.20, 0.25, 0.32, 0.40  
0.50, 0.63, 0.80, 1.00, 1.25, 1.60, 2.00, 2.50, 3.20 (sec.)

### (5) ~ (9) Tooth Selection Switches (T1 ~ T5)

Pushing one of these switches sets the exposure time automatically for the following (10) ~ (15).

(5) T1 : Incisor of Mandible

(6) T2 : Incisor of Maxilla, Cuspid & Premolar of Mandible

(7) T3 : Cuspid & Premolar of Maxilla, Molars of Mandible, Bite Wing

(8) T4 : Molar of Maxilla, Bite Wing Molars

(9) T5 : Occlusal

If the T1 switch (5) is depressed more than 3 sec., unit goes into "Lock Mode".

In lock mode, the only functional switch is the power switch. To exit from the lock mode, depress the T1 switch more than 3 sec. again.

### (10) Cone Type Selection Switch

Depressing this switch for more than 2 sec. selects the cone type : 8" standard cone or 12" optional long cone. (If the optional rectangular cone is to be used, select the 8" standard cone setting.)

### (11) Film Speed Selection Switch

a. PHOT-X II has 16 film speed settings : (F.00 ~ F.15)

Two speed settings are pre-set at the factory (a & b) and can be selected with (11).

a = Film speed No. F.09 (equivalent to ISO speed group "D" or Kodak Ultra-Speed film)

b = Film speed No. F.05 (equivalent to ISO speed group "F/E" or Kodak InSight film)

b. Pushing this switch momentarily displays the selected film speed setting in the **Exposure Time Display Window** (16).

Depressing this switch for more than 2 sec. changes the film type being selected.

c. If the **Digital Imaging Switch** (12) is depressed, both of the film speed indicating light (a & b) are turned off.

### (12) Digital Imaging Switch

If a digital imaging system is used, shorter exposure time is often required. PHOT-X II has 16 speeds for digital imaging : (d.00 ~ d.15). Pushing this switch momentarily displays the speed being selected in the **Exposure Time Display Window** (16). With the factory speed setting d.06, the exposure time becomes half of F.06 setting.

**TABLE 1. Speed Setting and Exposure Time (Regular Cone)** [ unit : sec.]

Speed Setting	kV	mA	Child					Adult					Large Adult				
			T1	T2	T3	T4	T5	T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
F.09	60	4	0.16	0.16	0.20	0.25	0.32	0.25	0.32	0.32	0.40	0.63	0.32	0.40	0.40	0.50	0.80
		7	0.08	0.10	0.13	0.13	0.20	0.13	0.16	0.20	0.25	0.32	0.16	0.20	0.25	0.32	0.40
	70	4	0.10	0.13	0.16	0.16	0.25	0.16	0.20	0.25	0.32	0.40	0.20	0.25	0.32	0.40	0.50
		7	0.06	0.08	0.08	0.10	0.16	0.10	0.13	0.16	0.16	0.25	0.13	0.16	0.20	0.20	0.32
F.05	60	4	0.06	0.08	0.08	0.10	0.16	0.10	0.13	0.16	0.16	0.25	0.13	0.16	0.20	0.20	0.32
		7	0.03	0.04	0.05	0.06	0.08	0.06	0.06	0.08	0.10	0.13	0.08	0.08	0.10	0.13	0.16
	70	4	0.04	0.05	0.06	0.08	0.10	0.08	0.08	0.10	0.13	0.16	0.10	0.10	0.13	0.16	0.20
		7	0.02	0.03	0.04	0.04	0.06	0.04	0.05	0.06	0.10	0.05	0.06	0.08	0.08	0.08	0.13
d.06	60	4	0.04	0.05	0.05	0.06	0.10	0.06	0.08	0.10	0.10	0.16	0.08	0.10	0.10	0.13	0.20
		7	0.02	0.03	0.03	0.04	0.10	0.04	0.04	0.05	0.06	0.08	0.05	0.05	0.06	0.08	0.10
	70	4	0.03	0.03	0.04	0.04	0.06	0.05	0.05	0.06	0.08	0.10	0.06	0.06	0.08	0.10	0.13
		7	0.02	0.02	0.02	0.03	0.04	0.03	0.03	0.04	0.04	0.06	0.03	0.04	0.05	0.05	0.08

**TABLE 2. Speed Setting and Exposure Time (Long Cone)** [ unit : sec.]

Speed Setting	kV	mA	Child					Adult					Large Adult				
			T1	T2	T3	T4	T5	T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
F.09	60	4	0.40	0.50	0.63	0.63	1.00	0.63	0.80	1.00	1.00	1.60	0.80	1.00	1.25	1.25	2.00
		7	0.25	0.25	0.32	0.40	0.50	0.40	0.50	0.50	0.63	1.00	0.50	0.63	0.63	0.80	1.25
	70	4	0.32	0.32	0.40	0.50	0.63	0.50	0.63	0.63	0.80	1.25	0.63	0.80	0.80	1.00	1.60
		7	0.16	0.20	0.25	0.25	0.40	0.25	0.32	0.40	0.50	0.63	0.32	0.40	0.50	0.50	0.80
F.05	60	4	0.16	0.20	0.25	0.25	0.40	0.25	0.32	0.40	0.50	0.63	0.32	0.40	0.50	0.63	0.80
		7	0.10	0.10	0.13	0.16	0.25	0.16	0.20	0.25	0.25	0.40	0.20	0.25	0.25	0.32	0.50
	70	4	0.13	0.13	0.16	0.20	0.25	0.20	0.25	0.25	0.32	0.50	0.25	0.32	0.32	0.40	0.63
		7	0.06	0.08	0.10	0.10	0.16	0.10	0.13	0.16	0.20	0.25	0.13	0.16	0.20	0.25	0.32
d.06	60	4	0.10	0.13	0.16	0.16	0.25	0.16	0.20	0.25	0.25	0.40	0.20	0.25	0.32	0.32	0.50
		7	0.06	0.08	0.08	0.10	0.13	0.10	0.13	0.13	0.16	0.25	0.13	0.16	0.16	0.20	0.32
	70	4	0.08	0.08	0.10	0.13	0.16	0.13	0.16	0.16	0.20	0.32	0.16	0.20	0.20	0.25	0.40
		7	0.04	0.05	0.06	0.06	0.10	0.06	0.08	0.10	0.13	0.16	0.08	0.10	0.13	0.13	0.20

**(13) kV Selection Switch**

Momentarily depressing this switch will change the tube potential to 60 or 70 kV. Since the tube potential is constant DC, a 60 kV setting on the PHOT-X II is similar to a 70 kVp setting on a conventional x-ray. If either the **Film Speed Switch** (11) or **Digital Imaging Switch** (12) is depressed, 60kV is automatically selected.

**(14) mA Selection Switch**

Momentarily depressing this switch will change the tube current setting (4 or 7 mA). If the **Digital Imaging Switch** (12) is depressed, 4 mA is automatically selected and if the **Film Speed Switch** (11) is depressed, 7 mA is automatically selected.

**(15) Patient Size Selection Switch**

This switch alters the selection of patient type/size to be radiographed (child---adult---large---child) and sets the exposure time automatically.

**NOTE : Setting or adjusting the exposure time manually (with ⤴ or ⤵ switch) supersedes (5) ~ (15) functions.**

**(16) Exposure Time Display Window**

This window displays the selected exposure time. If an abnormal condition exists or a malfunction occurs, an Error Code is displayed. (See Section 5 : [ 5 ] **ERROR CODES**)

**(17) Exposure Warning Light**

Illumination of this light indicates the unit is producing x-radiation.

**(18) Exposure Switch**

This switch initiates radiographic exposure. When making an exposure, depress and hold this switch until the **Exposure Warning Light** (17) and the audible warning shut off. Failure to keep this switch depressed will result in the premature termination of the exposure and error code E.00 will be displayed in **Exposure Time Display Window** (16).

### [ 3 ] OPERATING PROCEDURES

1. Turn ON the Main Power Switch (1).
2. Confirm that Ready Light (2) is illuminated.

**NOTE : The ready light will not illuminate unless the incoming line voltage is correct and within the x-ray's operable range (rated line voltage  $\pm 10\%$ ).**

3. Select the appropriate tooth type ((5) ~ (9)), and confirm the pre-selected conditions (cone type, film or digital, kV, mA and patient size) are suitable for exposure.

**NOTE : To manually set the exposure time, depress either of the manual Exposure Time Adjust Switches (  $\wedge$  or  $\vee$  ) until the desired exposure time appears in the Exposure Time Display Window (16). While the unit is in manual mode, other selection switches ((5) ~ (15)) do not affect exposure time. (All of the tooth selection lights are off.) To return to the automatic exposure time selection mode, depress any one of Tooth Selection Switches ((5) ~ (9)).**

4. Depress the Exposure Switch (18). When the Exposure Switch is depressed, the Exposure Warning Light (17) illuminates and the audible warning sounds. Do not release the Exposure Switch until the Exposure Warning Light and audible warning automatically shut off. Failure to keep the switch depressed will result in exposure being terminated prematurely.
5. To continue to radiograph other teeth, just select appropriate Tooth Selection Switches ((5) ~ (9)).

**IMPORTANT : To protect x-ray tubehead from heat accumulation, wait for a time interval that is equal to 50 times the selected exposure time before making additional exposures. (Example : a 25 sec. wait is necessary between exposures that are 0.5 sec. in duration.)**

6. Turn OFF the Main Power Switch (1) in order to prevent accidental exposure when the unit is not in use.

**NOTE : If the unit is left over 8 min. without being operated and Main Power Switch (1) is kept on, figure "1" runs through the Exposure Time Display Window (16). This does not mean that malfunction of the unit has occurred ; this is an energy saving feature. The unit returns to ready condition by pressing any one of the switches, except the Exposure Switch (18).**

### [ 4 ] HAND EXPOSURE SWITCH

Hand exposure switch can be connected to the sub controller. Since this exposure switch has a coiled cord, operators can stand in the most suitable position for operation.

As controller has separate connector for this exposure switch, both exposure switch (18) on the front panel of sub controller and this hand exposure switch can be used.

If local code prohibits use of both, ask installer to disconnect the connector of either switch.

## [ 5 ] ERROR CODES

If an abnormal condition exists in the unit, or a malfunction occurs, an error code is displayed in the Exposure Time Display Window !6. Please refer to the Table below.

Error Code	Condition	Step to be Taken	Possible Solution
E.00	Exposure switch was released before exposure termination.	All the tooth selection lights blink. Depress one of the tooth switches.	Release the exposure switch after the exposure light turns off.
E.01	Exposure switch was depressed within 10 sec. of previous exposure.	A 10 sec. delay is built in between each exposure.  Release the exposure switch.	There should be a " wait" interval of 50 times the exposure time between successive exposures.
	Exposure time was set and exposure switch was depressed within 3 sec. of the power switch being turned on.		Wait a minimum 3 sec. after the main power switch is turned on before pressing the exposure switch.
E.02	Line voltage was less than 90% of rated voltage.		If line voltage is less than 90% of rated voltage, correct it by using a step-up transformer (*)
E.03	Line voltage was more than 110% of rated voltage.		If line voltage is less than 110% of rated voltage, correct it by using a step-down transformer (*)
E.05	Tube current at last portion of exposure was less than 3 mA at 4 mA setting or less than 5.25 mA at 7 mA setting.	Turn off the main power switch and wait for approximately 2 min. Turn on the main power switch again.	Conduct the confirmation of tube current described in section 6.
E.06	Tube current at last portion of exposure was more than 5 mA at 4 mA setting or more than 8.75 mA at 7 mA setting.		
E.07	During the exposure, tube current becomes less than 2 mA at 4mA setting or less than 3.5 mA at 7 mA setting.		
E.08	During the exposure, tube current becomes more than 15 mA.		
E.09	Setting for pre-heating time is out of range.		
E.10	Exposure switch or exposure circuit had been ON, when main power switch is turned on.		
E.11	Tube current is detected during pre-heating period.		
E.12	Tube current is detected when main power switch is turned on.	Refer to the service manual.	
E.14	Tube potential at last portion of exposure was less than 50 kV at 60 kV setting or less than 60 kV at 70 kV setting.		

Error Code	Condition	Step to be Taken	Possible Solution
E.15	Tube Potential at last portion of exposure was more than 70 kV at 60 kV setting.	Turn off the main power switch and wait for approximately 2 min. Turn on the main power switch again.	Refer to the service manual.
E.16	During the exposure, tube potential becomes less than 40 kV at 60 kV setting or less than 50 kV at 70 kV setting.		
E.17	During the exposure, tube potential becomes more than 80 kV.		
E.19	Excess current was detected in primary circuit of high voltage transformer.		
E.20	Exposure switch was depressed when tube head temperature was over 60°C.	Release the exposure switch.	Turn off the main power switch and wait until temperature goes down.
E.22	Failure of electrical communication between the power PCB and timer PCB.	Turn off the main power switch and wait for approximately 2 min.	Refer to the service manual.
E.23	Some switch had been on, when the main power switch is turned on. (Except the exposure switch.)	Turn on the main power switch again.	

(\*) Should a step up or down transformer be required to follow local and national electrical code for electrical ratings and installation.

## [ 6 ] MAINTENANCE

PHOT-X II MODEL 303 x-ray unit requires post installation confirmation and periodic maintenance checks to be performed by dealer service personnel. These procedures ensure that the x-ray unit is functioning within the manufacturer's specifications and remain in compliance with the Standard.

It is the responsibility of the owner of the unit to see that these maintenance checks are done **once every 6 months** and that they are performed by a trained, certified service technician.

The specific instructions to perform these checks are located within this Installation Manual.

A. Line voltage confirmation (page 22)

B. Tube potential and Tube current confirmation (page 22)

C. Inspection of arm and head movement (page 14 ~ 16)

D. Mechanical safety

1. The ceiling mounting plate should be checked to confirm that it is securely attached to the ceiling.
2. The pole should be checked to confirm that it is securely attached to the ceiling mounting plate. The pole must be level horizontally and vertically.

## **SECTION 6 : POST INSTALLATION CONFIRMATION**

### **[ 1 ] CONFIRMATION OF POWER SUPPLY VOLTAGE**

As specified in Electrical Requirements (page 7), power supply voltage must be within the operable range (rated line voltage  $\pm 10\%$ ). Confirm the power supply voltage again before turning on the unit.

1. Open the front panel of main controller by loosening four screws on side of the controller.
2. Set the range of digital multimeter at 300 VAC, connect probes of multimeter to L and N of the 3P terminal block.
3. Confirm that the reading is rated line voltage  $\pm 10\%$ .

**NOTE** : PHOT-X II MODEL 303 x-ray can not be operated unless the power supply voltage is within this range.

### **[ 2 ] CONFIRMATION OF TUBE POTENTIAL COMPENSATION VALUE**

Tube potential is kept to be the constant and specified value by the feed-back control system. High voltage is converted into low voltage feed back signal by the voltage divider. The precision of tube potential depends on the accuracy of this voltage divider, although each divider has little deviation. To compensate this deviation, we prepare the compensation value for each tube head. Before making an exposure, check this value to be same as the value stored in the subcontroller.

1. Confirm the tube potential compensation (CP) values for 60kV and for 70kV written on the label attached inside of the head yoke.
2. Turn on the main power switch. Keep depressing patient, cone and tube potential switches together until “CP. O” is displayed in exposure time window. This value is for 60kV and should be the same value on the label. If displayed value is different, press Exposure Time Adjusting Switches ( $\wedge$  or  $\vee$ ) and make the CP value to be same as the label and press patient switch to store it
3. Press kV switch, then CP value for 70kV will be displayed. This value should be same as the value for 70kV written on the label. If it is different, adjust displayed value by the Exposure Time Adjusting Switches ( $\wedge$  or  $\vee$ ) and press patient switch to store it.

### **[ 3 ] CONFIRMATION OF TUBE CURRENT**

PHOT-X II Model 303 x-ray incorporates self diagnose and adjusting system to check if the tube current are within specified ranges at the beginning of exposure.

1. Keep depressing tooth selection switches T1, T4 & T5 together until “h. OO” is appeared on the exposure time display window.
2. Wait until the display changes to be “0.01”.
3. Make exposure by depressing the exposure switch.

#### **CAUTION**

**X-radiation is generated for 0.01 second.**

4. Repeat step 2. and 3. until “Fin” is displayed. This self diagnose and adjustment is automatically done for all combination of 60kV/70kV and 4mA/7mA.

## [ 4 ] CONFIRMATION OF EXPOSURE WARNING LIGHT & BUZZER

### A. EXPOSURE WARNING BUZZER

1. Make an exposure and confirm that the exposure warning buzzer located within the sub controller is activated during the entire exposure.

### B. EXPOSURE WARNING LIGHT

Exposure warning light is located on the front panel of the sub controller,

1. Make an exposure and confirm that the warning light illuminates during the exposure.

## [ 5 ] CONFIRMATION OF LINE VOLTAGE REGULATION

1. Make sure that main power switch is "OFF".
2. Set the range of digital multimeter at 300 VAC, connect probes of multimeter to L and N of the 3P terminal block in the main controller.
3. Turn the main power switch on, and set the exposure time at 2.00 sec. with manual switch at 70kV, 7mA.
4. Record the no-load line voltage (VN) indicated by the multimeter before exposure.
5. Make an exposure and record the load voltage (VL) indicated by the multimeter during exposure.

### **▲ WARNING**

**X-Radiation is generated for 2 seconds.**

**NOTE :** Read the multimeter when the value is stabilized (about one second after exposure started).

6. Calculate line voltage regulation R(%) in the formula below :

$$R = \frac{VN - VL}{VL} \times 100$$

**NOTE :** Line voltage regulation must not exceed the range of 2 ~ 5 % for 100,110,120Vac and 0 ~ 3% for 220,230,240Vac. If it is greater than this range, the size of the power supply wires must be increased. Refer to the power supply requirements outlined on page 5 to determine the correct wire size necessary.

If line voltage regulation is within the range, apparent resistance of supply line can be considered to be less than in the range of value specified on page 2.

## SECTION 7 : INITIAL SETTING

### [ 1 ] SPEED SETTING FOR FILM AND DIGITAL IMAGING

#### A. FILM SPEED

Prior to shipment of the x-ray from the factory, the following two film speeds are programmed to be selected by the Film Speed Selection Switch.

a = Film speed F.09 (equivalent to ISO speed group "D", or Kodak Ultra-speed Film)

b = Film speed F.05 (equivalent to ISO speed group "F/E", or Kodak InSight Film)

In addition to these two speeds, PHOT-X II MODEL 303 x-ray can provide 16 different film speeds (F.00 ~ F.15) and any two of them can be programmed for easy selection. If the doctor uses a different film speed, or prefers darker (or lighter) radiographs, the new speed can be programmed as follows. Higher speed settings make films darker. If film speed is increased by 1, exposure time becomes 25 % longer.

1. Keep the kV selection switch and mA selection switch depressed simultaneously for more than 3 seconds. Release the switches if the ready light starts to flash.
2. Push F switch momentarily until the "a" light above the F switch illuminates. The exposure time display window shows the present film speed for "a" setting. (The factory default setting, F.09 should be displayed.) By depressing  or  switch, increase or decrease film speed number until desired number for "a" setting is displayed.
3. To change the "b" setting from the factory default, F.05, push F switch momentarily until the "b" light illuminates. By depressing  or  switch, increase or decrease film speed until the desired number for "b" setting is displayed.
4. Press **T1 switch** to store these settings, then turn the main power switch off.

#### B. SPEED FOR DIGITAL IMAGING

PHOT-X II MODEL 303 x-ray has 16 speeds for digital imaging (d.00 ~ d.15). The factory setting is d.06 and with this setting the exposure time becomes half of F.06 setting.

As the sensitivity is different according to each manufacturer of digital imaging sensors, this setting should be adjusted. To get a darker image, increase the speed setting and to get a lighter image, decrease the speed setting. If the speed setting is increased by 1, exposure time becomes 12 % longer.

1. Keep kV selection switch and mA selection switch depressed simultaneously for more than 3 seconds. Release the switches if the ready light starts to flash.
2. Push D switch momentarily until the light above the D switch illuminates and the exposure time display window shows the present speed setting. (The factory default setting d.06 should be displayed.)
3. By depressing  or  switch, increase or decrease speed until the desired number is displayed.
4. Press **T1 switch** to store these settings, then turn the main power switch off.

**TABLE 1. Speed Setting and Exposure Time (Regular Cone)** [ unit : sec.]

Speed Setting	kV	mA	Child					Adult					Large Adult				
			T1	T2	T3	T4	T5	T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
F.09	60	4	0.16	0.16	0.20	0.25	0.32	0.25	0.32	0.32	0.40	0.63	0.32	0.40	0.40	0.50	0.80
		7	0.08	0.10	0.13	0.13	0.20	0.13	0.16	0.20	0.25	0.32	0.16	0.20	0.25	0.32	0.40
	70	4	0.10	0.13	0.16	0.16	0.25	0.16	0.20	0.25	0.32	0.40	0.20	0.25	0.32	0.40	0.50
		7	0.06	0.08	0.08	0.10	0.16	0.10	0.13	0.16	0.16	0.25	0.13	0.16	0.20	0.20	0.32
F.05	60	4	0.06	0.08	0.08	0.10	0.16	0.10	0.13	0.16	0.16	0.25	0.13	0.16	0.20	0.20	0.32
		7	0.03	0.04	0.05	0.06	0.08	0.06	0.06	0.08	0.10	0.13	0.08	0.08	0.10	0.13	0.16
	70	4	0.04	0.05	0.06	0.08	0.10	0.08	0.08	0.10	0.13	0.16	0.10	0.10	0.13	0.16	0.20
		7	0.02	0.03	0.04	0.04	0.06	0.04	0.05	0.06	0.06	0.10	0.05	0.06	0.08	0.08	0.13
d.06	60	4	0.04	0.05	0.05	0.06	0.10	0.06	0.08	0.10	0.10	0.16	0.08	0.10	0.10	0.13	0.20
		7	0.02	0.03	0.03	0.04	0.10	0.04	0.04	0.05	0.06	0.08	0.05	0.05	0.06	0.08	0.10
	70	4	0.03	0.03	0.04	0.04	0.06	0.05	0.05	0.06	0.08	0.10	0.06	0.06	0.08	0.10	0.13
		7	0.02	0.02	0.02	0.03	0.04	0.03	0.03	0.04	0.04	0.06	0.03	0.04	0.05	0.05	0.08

**TABLE 2. Speed Setting and Exposure Time (Long Cone)** [ unit : sec.]

Speed Setting	kV	mA	Child					Adult					Large Adult				
			T1	T2	T3	T4	T5	T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
F.09	60	4	0.40	0.50	0.63	0.63	1.00	0.63	0.80	1.00	1.00	1.60	0.80	1.00	1.25	1.25	2.00
		7	0.25	0.25	0.32	0.40	0.50	0.40	0.50	0.50	0.63	1.00	0.50	0.63	0.63	0.80	1.25
	70	4	0.32	0.32	0.40	0.50	0.63	0.50	0.63	0.63	0.80	1.25	0.63	0.80	0.80	1.00	1.60
		7	0.16	0.20	0.25	0.25	0.40	0.25	0.32	0.40	0.50	0.63	0.32	0.40	0.50	0.50	0.80
F.05	60	4	0.16	0.20	0.25	0.25	0.40	0.25	0.32	0.40	0.50	0.63	0.32	0.40	0.50	0.63	0.80
		7	0.10	0.10	0.13	0.16	0.25	0.16	0.20	0.25	0.25	0.40	0.20	0.25	0.25	0.32	0.50
	70	4	0.13	0.13	0.16	0.20	0.25	0.20	0.25	0.25	0.32	0.50	0.25	0.32	0.32	0.40	0.63
		7	0.06	0.08	0.10	0.10	0.16	0.10	0.13	0.16	0.20	0.25	0.13	0.16	0.20	0.25	0.32
d.06	60	4	0.10	0.13	0.16	0.16	0.25	0.16	0.20	0.25	0.25	0.40	0.20	0.25	0.32	0.32	0.50
		7	0.06	0.08	0.08	0.10	0.13	0.10	0.13	0.13	0.16	0.25	0.13	0.16	0.16	0.20	0.32
	70	4	0.08	0.08	0.10	0.13	0.16	0.13	0.16	0.16	0.20	0.32	0.16	0.20	0.20	0.25	0.40
		7	0.04	0.05	0.06	0.06	0.10	0.06	0.08	0.10	0.13	0.16	0.08	0.10	0.13	0.13	0.20

## [ 2 ] PRIORITY OF SELECTIONS

Factory default setting :

Cone : Regular cone  
 Film Speed : "a"  
 Digital Imaging : off  
 kV selection : 60 kV  
 mA selection : 7 mA  
 Patient Type : Adult

If necessary, these settings can be changed. For example, if digital imaging is used for pedodontistry, digital imaging and "child" (patient type) should be selected.

1. Keep kV selection switch and mA selection switch depressed simultaneously for more than 3 seconds. Release the switches if the ready light starts to flash.
2. Press D switch momentarily. (Light above D switch illuminates and speed setting for digital imaging is displayed on exposure time display window.)
3. Select the patient type "child" by depressing P switch momentarily.
4. Press **T1 switch** to store these settings, then turn the main power switch off.
5. Cone type, kV and mA selection can be changed by same procedures.

**NOTE :** For digital imaging, 60 kV and 4 mA is recommended to get good contrast and precise exposure time control.

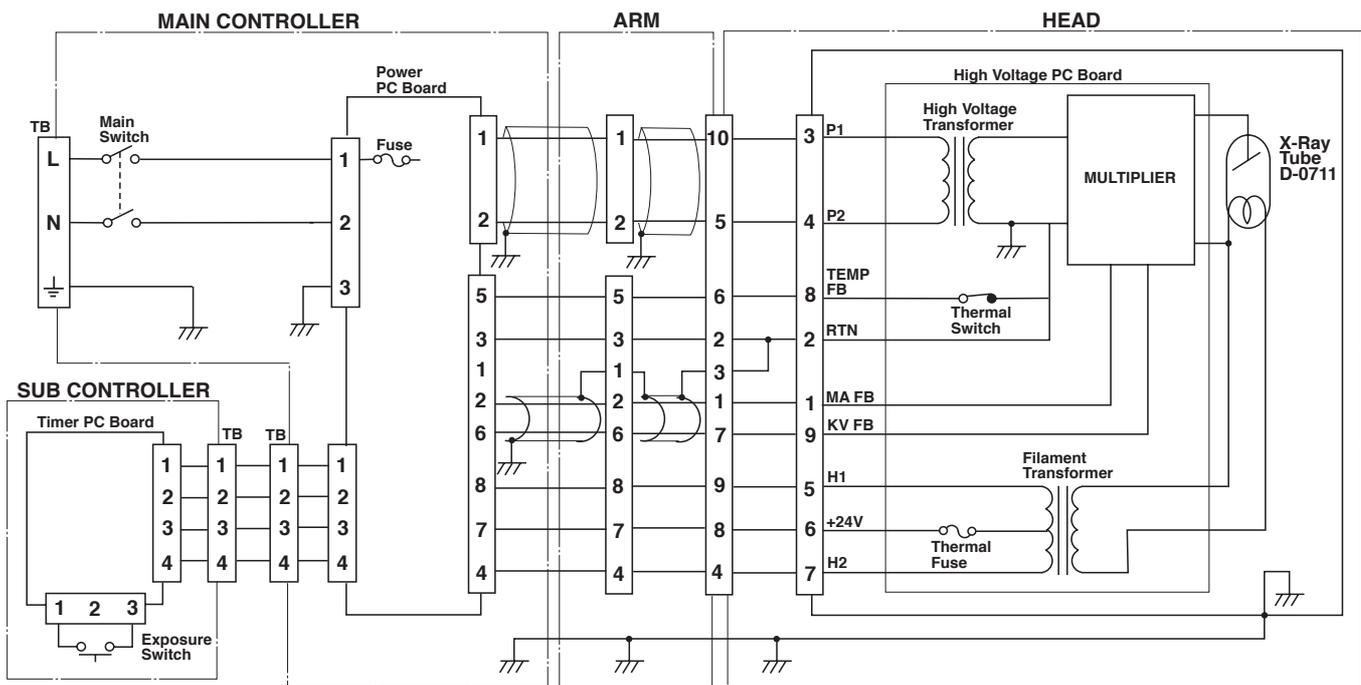
### [ 3 ] ELECTRONIC CHIME ON/OFF

An electronic chime sounds when switches are depressed. If preferred, this sound can be deactivated as follows :

1. Keep T1 and T2 switches depressed together for more than 3 seconds.  
Release the switches if the ready light starts to flash.
2. "bu. 2" will be displayed in exposure time display window.
3. By depressing either ☺ or ☹ switch, display changes to "bu.0".
4. Press **P switch** (Patient size Switch) to store this setting and turn off the main power switch.

**NOTE :** Exposure Warning Buzzer and alarm sound of error code can not be eliminated.

### APPENDIX 1 : CIRCUIT DIAGRAM



Note : Fuse Rating 100,110,120V Type : 10A  
220,230,240V Type : 6.3A

**NOTE**



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