

# PHOT-XIIs

**Model 505**

***DENTAL X-RAY***

## **INSTALLATION INSTRUCTIONS (for USA)**

*Wall Mount Type.....WK*

### **⚠ WARNING**

This x-ray equipment may be dangerous to patient and operator unless safe exposure factors, operating instructions and maintenance schedules are observed.

### **⚠ CAUTION**

This manual provides information and instructions for the installation, assembly, calibration and certification procedures for **BELMONT PHOT-XIIs Model 505** 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.

If this manual is lost or cannot be read by a damage, order the manual by the book number written on the last page.





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## SECTION 1: TECHNICAL DATA

### [ 1 ] ELECTRICAL AND RADIATION DATA

1. X-ray tube ----- Toshiba D-046 (Stationary Anode)
  - a. Nominal focal spot value ----- 0.4 (IEC60336)
  - b. Target Material ----- Tungsten
  - c. Target angle ----- 12.5 deg
  - d. Maximum anode heat content ----- 4.3 kJ (6.1 kHU)
2. Maximum x-ray tube assembly heat content ----- 293 kJ (413 kHU)
3. Rated peak tube potential ----- 60 kV / 70 kV selectable
4. Rated tube current ----- 3 mA / 6 mA selectable
5. Maximum rated peak tube potential ----- 70 kV
6. Rated line voltage ----- 120 VAC, 60 Hz, Single phase, 1.2 kVA
7. Line voltage range ----- 108 VAC ~ 132 VAC
8. Range of line voltage regulation ----- 0 ~ 5 % (Apparent resistance 0.52 ohm)
9. Rated line current ----- 10 A at 70 kV, 6 mA
10. Maximum line current ----- 11 A at 70 kV, 6 mA
11. Exposure time ----- 0.01 ~ 2.0 sec.
12. Inherent filtration ----- 1.7 mm Al Equivalent
13. Added filtration ----- 0.3 mm Al
14. Minimum filtration permanently in useful beam ----- 2.0 mm Al Equivalent at 70 kV
15. Nominal radiation output
 

	60 kV		70 kV	
	3 mA	6 mA	3 mA	6 mA
a. Distal end of regular cone -----	4.6	9.1	5.9	11.8 mGy/sec. ± 40%
b. Distal end of long cone -----	2.0	4.1	2.6	5.2 mGy/sec. ± 40%

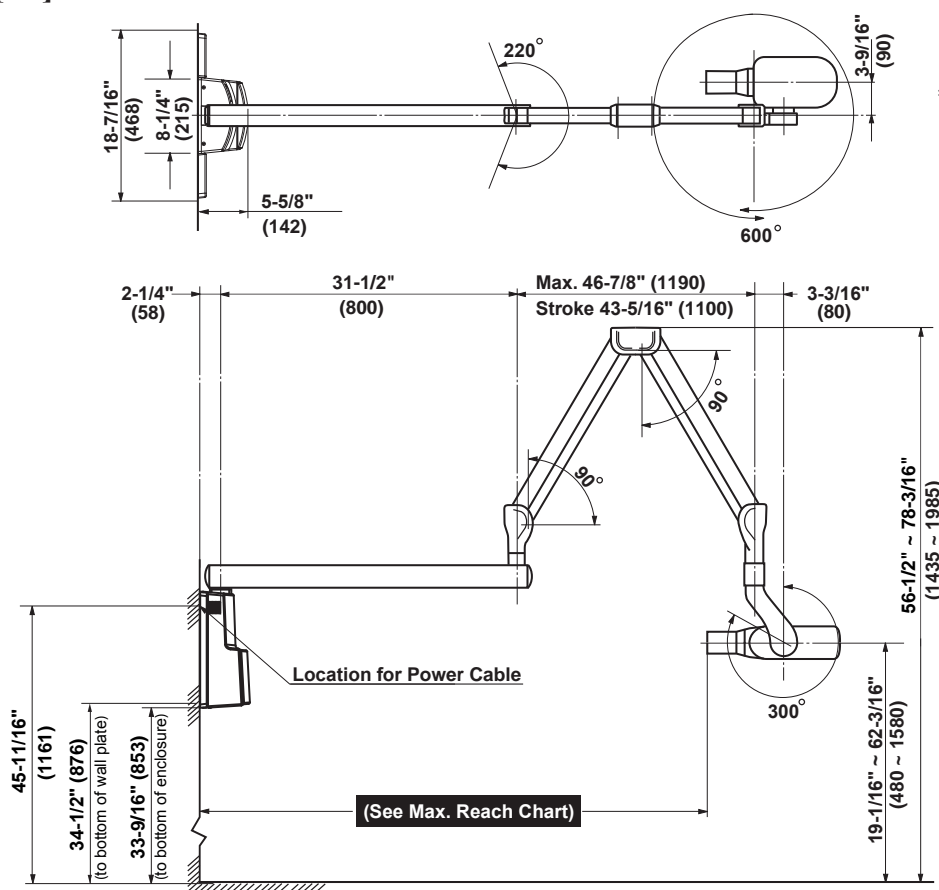
(Data obtained by direct measurement in the useful beam)
16. Nominal electrical output of H.V. generator ----- 0.42 kW at 70 kV, 6 mA
17. Cone
 

	Source to skin distance	Field size
a. Regular cone -----	8 inches (203 mm)	58 mm dia., circular
b. Long cone (option) -----	12 inches (305 mm)	58 mm dia., circular
c. Rectangular collimator (option) -----	SSD of cone + 40mm	32 x 40 mm, rectangular
18. Maximum symmetrical radiation field ----- 60 mm dia. at distal end of cone
19. Leaking technique factor ----- 70 kV / 0.19 mA (697mAs at 1 hour)  
(0.19 mA is maximum rated continuous current for 6mA with a duty cycle 1:30)
20. Duty cycle ----- 1 : 30 (0.5 sec. exposure with 15 sec. interval)
21. 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.
22. 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
23. Half value layer ----- 1.5 mm Al over
24. Source to the base of cone distance ----- 94 mm
25. Environmental condition for storage ----- -20 ~ 70 °C, 10 ~ 100 %, 500 ~ 1060 hPa
26. Environmental condition for operation ----- 10 ~ 40 °C, 30 ~ 70 %, 700 ~ 1060 hPa
27. Dose area product ----- Estimated air kerma displayed [mGy]  
x 26.4 [cm<sup>2</sup>] (for regular and long cone)  
Estimated air kerma displayed [mGy]  
x 12.8 [cm<sup>2</sup>] (for rectangular collimator)

## [ 2 ] PHYSICAL DIMENSIONS

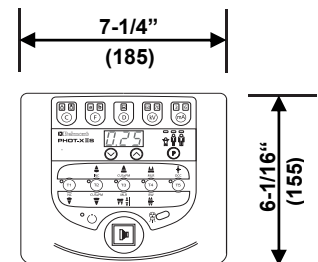
( ) = mm

\* 8-1/4" is the Pass-Thru Plate Width, if Optional 097PTP is ordered and Housing Side Panels are Removed.



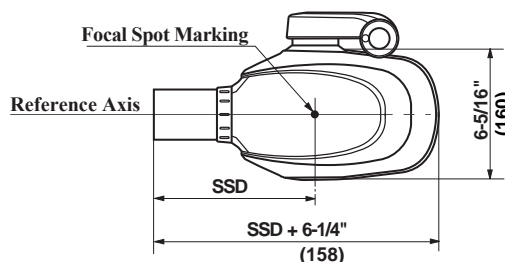
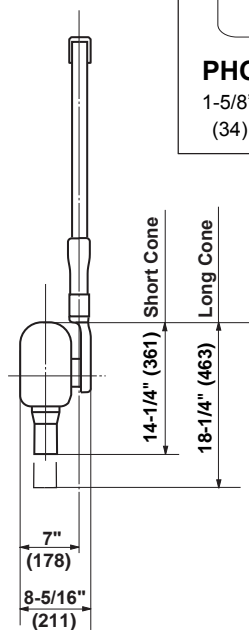
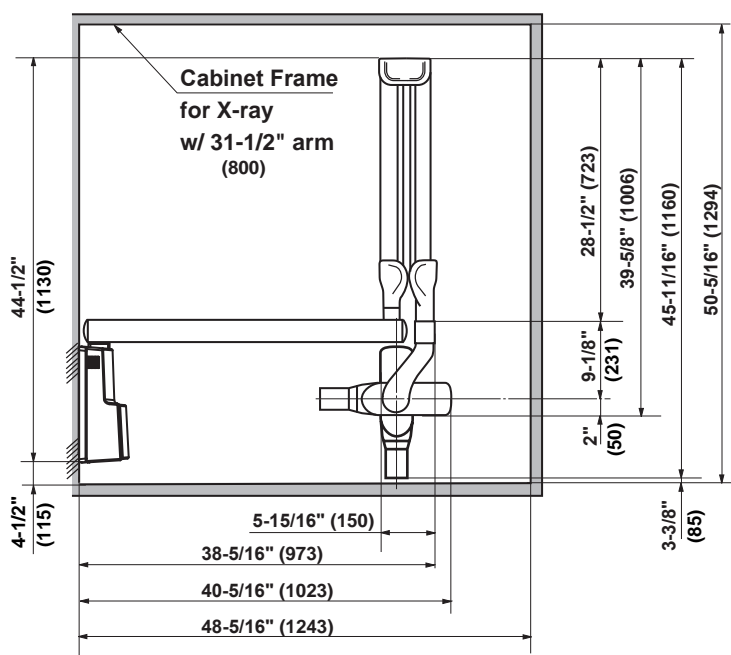
### Maximum Reach

84-1/8" (2122)	with	40.0" arm (1000)
75-5/8" (1922)	with	31.5" arm (800)
64-1/8" (1622)	with	20.0" arm (500)
56-1/8" (1422)	with	12.0" arm (300)



### PHOT-X IIs Sub Controller

1-5/8" Front-to-Back Box Thickness (34)



SSD (Source to Skin Distance) :

a. Regular cone ----- 8 inches (203mm)

b. Long cone ----- 12 inches (305mm)

Note : Installation of rectangular collimator (p/# 1S01WEA0) increases SSD by 40 mm from above value.

Fig. 1-1 Dimensions

### [ 3 ] TUBE HEAD THERMAL CHARACTERISTICS

#### A. Interval between each exposure

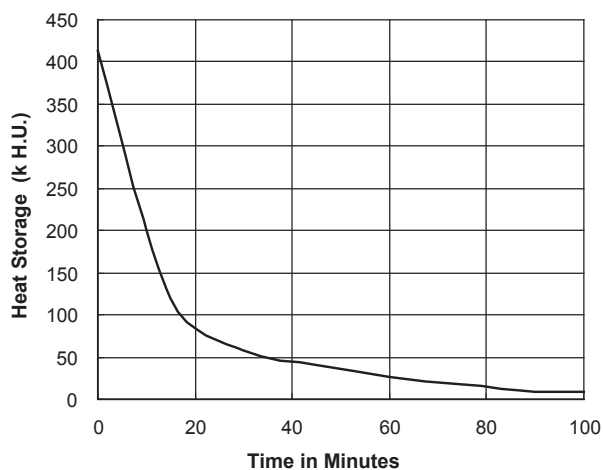
The temperature inside of the tube head rises when an exposure is made. The value of the heat generated is measured in Heat Units (HU), which is the product of tube potential, tube current and exposure time. Excessive heat will accumulate inside of the tube head if the x-ray is used without a proper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

#### B. Duty cycle

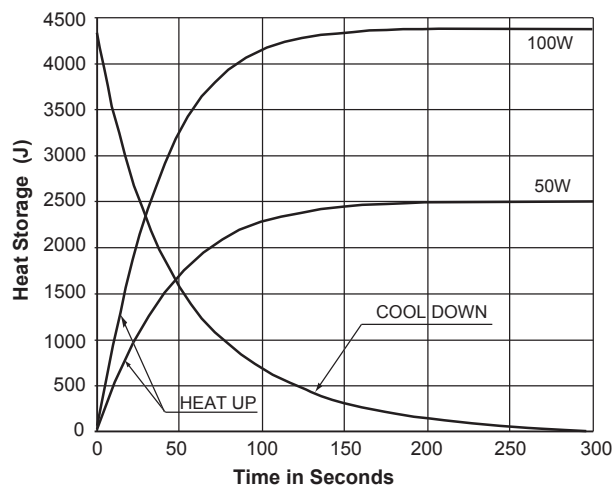
A cool down interval of 30 seconds or more must be allowed between each 1 second exposure. (a 15 second cool down must be allowed between each 0.5 second exposure.) This will avoid the accumulation of excess heat and prolong the tube head life.

#### C. Tube head cooling curve

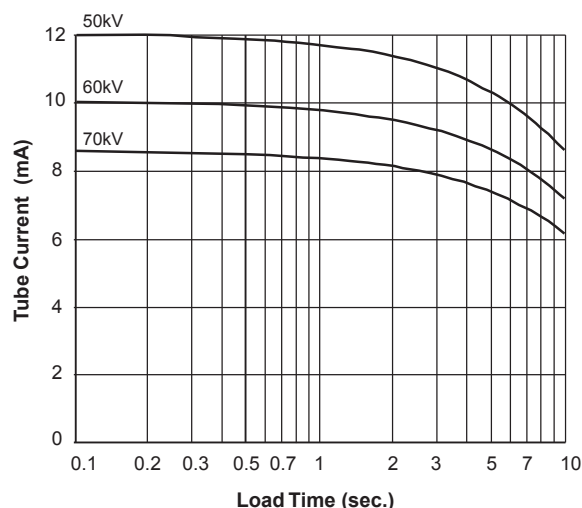
##### 1. Tube Hosung cooling curve



##### 2. Anode thermal characteristics



##### 3. Maximum rating chart



## SECTION 2 : PRE-INSTALLATION INSTRUCTIONS

### [ 1 ] SUPPORT REQUIREMENTS

#### Main Controller :

The main controller of Model 505 has a wall plate designed for mounting on two 2 x 4 wood studs with 16 inches (406mm) centers. The wall and mounting hardware must be sufficient to withstand a **100 pound (45kg) shear load and a 450 pound (205kg) with drawal force** at each of the four (ø 9 x 75mm) lag screws.

#### Sub Controller :

When mounting the Model 505 sub controller, the wall and mounting hardware must be sufficient to withstand a **10 pound (4.5kg) shear load**.

#### ⚠ CAUTION

**If the PHOT-XII Model 505 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 wall and the strength of the hardware must be checked and verified to be adequate.**

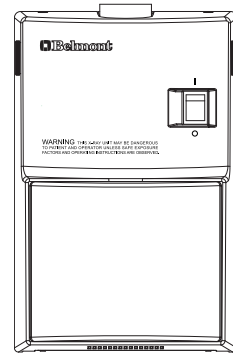


Fig.2-1 Main Controller

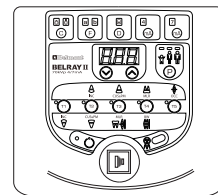


Fig.2-2 Sub Controller

### [ 2 ] ELECTRICAL REQUIREMENTS

#### Power supply :

The Model 505 x-ray system will operate on a power supply of 120VAC  $\pm 10\%$  (108 ~ 132V AC) with a 3 wire GROUNDED circuit, separately connected to the central distribution panel with an over current protection device rated for 15 amperes. Recommended wire size is 14 AWG; but if the wire run distance is to exceed 50 feet (15m), 12 AWG is required. For wire run distances in excess of 75 feet (23m) 10 AWG is required. Line voltage regulation must be within 0 ~ 5 % at 11 amps.

#### Interconnecting wiring between main controller and sub controller :

4 conductors, 20 AWG, 300V, 33 feet (10m) cable is included.

#### Concealed wiring :

Route conduit and wires through wall and into (2) flush mounted junction boxes located (1) behind the main controller and (1) behind the sub controller. Recommended heights above the finished floor for the flush junction boxes are : 44-7/8" (1140mm) for the main controller and 51-5/8" (1310mm) for the sub controller. Wiring done in this manner should extend 12 inches (300mm) beyond the wall surface to allow sufficient wire for connections.

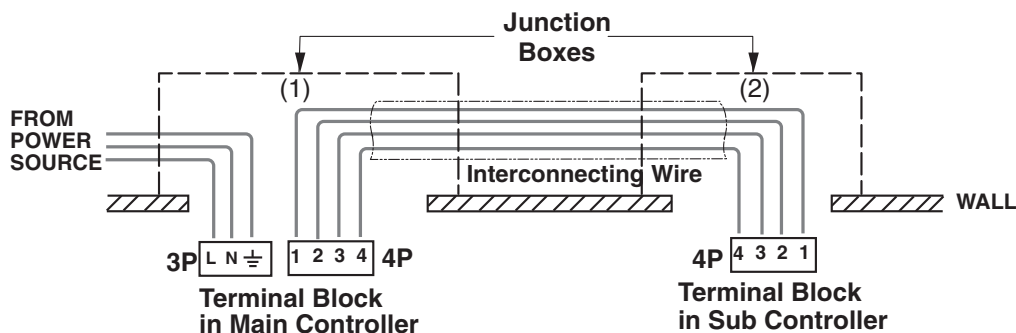


Fig.2-3 Concealed Wiring

**Note :** Follow local and national electrical code (NFPA 70) requirements during installation.

### [ 3 ] LOCATION OF COMPONENTS

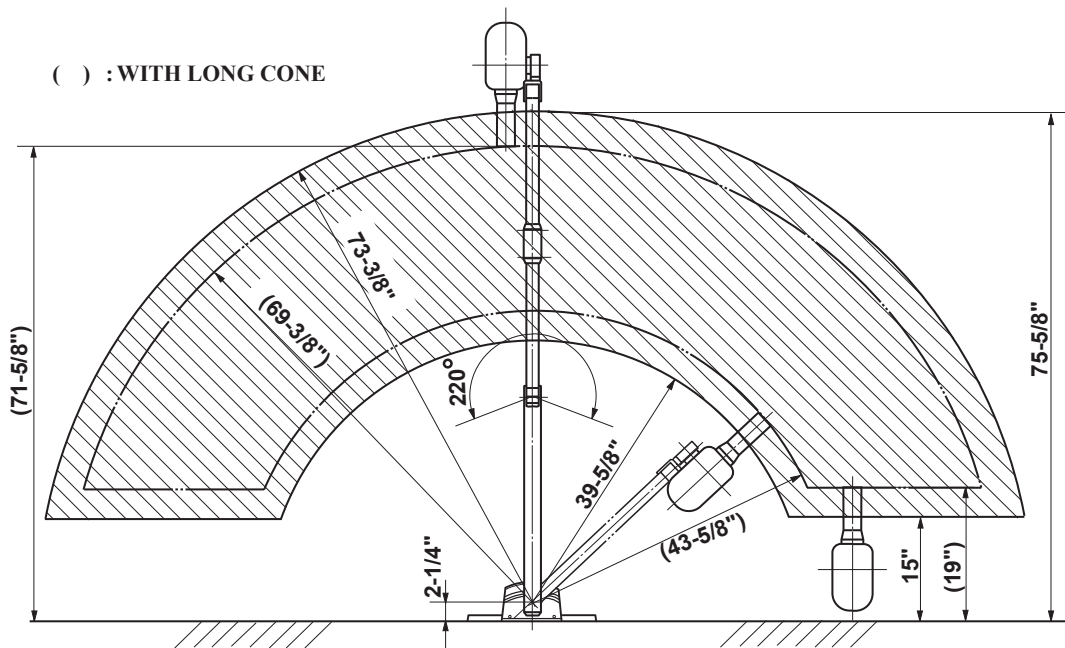
#### A. Main Controller, Arm and Head Assemblies :

Using the information Provided in Fig.2-4, determine the correct location for the main controller.

#### **⚠ CAUTION**

**PHOTX-IIs Model 505 x-ray unit should be installed on the wall that prevents the horizontal arm rotate 360°.**

**NOTE :** State and local requirements supersede guide lines indicated below.



**Fig.2-4** Radius of Activity for X-ray Head

#### B. Sub controller

When determining the location for the sub controller, the following radiation requirements concerning the operator's positioning must be considered.

The operator must :

1. have full view of the patient.
2. have means for audio and visual communication with the patient.
3. have full view of kV, mA, timer selections and exposure warning light.
4. be at least 2 m away from the x-ray head and patient and out of the path of the x-ray beam or be positioned behind a protective device.



## SECTION 3 : INSTALLATION INSTRUCTIONS

Within the installation and confirmation procedures are inspection/test steps which the installer must perform to insure that the installation meets the manufacturer's specifications. These steps require the installer to record the necessary information onto the "ASSEMBLER'S INSTALLATION REPORT " section of the limited warranty report from supplied, which **MUST** be returned to BELMONT along with the warranty card.

### [ 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 150 V AC and 10 mA DC, and capable of indicating true RMS value within 1 sec.
- Standard calculator.

#### **Power Supply :**

Prior to starting the installation, inspect the power supply and confirm that it is 120VAC  $\pm 10\%$ , and a 3 wire GROUNDED circuit, separately connected to the circuit breaker panel with an over current protection device rated for 15 A (Refer to Page 5, [2] ELECTRICAL REQUIREMENTS).

**Record the voltage reading of power supply on "Assembler's Installation Report".**

### [ 2 ] UNPACKING

Unpack the entire contents of the shipping carton. Included within the shipping carton are :

<b><u>Hardware</u></b>	<b><u>Quantity</u></b>
Head with Regular Cone -----	1
Main Controller -----	1
Screw for chassis (M4 x 10 mm) -----	4
Screw for chassis (M4 x 20 mm) -----	1
Stopper Ring -----	1
Front cover seal -----	4
Wall Plate -----	1
Lag Screws for wall plate ( $\varnothing 9 \times 75$ mm) -----	4
Arm Mounting Bracket -----	1
Machine Bolt (M8 x 20 mm) -----	3
Washer (M8) -----	3
Sub Controller -----	1
Sub Controller Mounting wood screw ( $\varnothing 4.1 \times 20$ mm) -----	3
Head key -----	1
Arm collar -----	1
Balance Arm -----	1
Balance Arm Wrench -----	1
Horizontal Arm W/2 x End Caps -----	1
Brake Screw (M6 x 6 mm) -----	2
Brake Plug (Brass Plug $\varnothing 5 \times 4$ mm) -----	2
Retaining Bolt (M6 x 35 mm) -----	2
Stopper Screw (M6 x 15 mm) -----	1
Brake Spring (o 5 x 11mm) -----	1
Hook for side cover -----	4
Screw for hook (M4 x 6mm) -----	8
Interconnecting wires (10m) -----	1
<b><u>Documentation</u></b>	<b><u>Quantity</u></b>
Installation manual -----	1
Operators manual -----	1
Limited Warranty / Report Form -----	1
Wall mounting Template -----	1
FDA Form 2579 -----	1

**Inspect contents of shipping carton for damage or missing components.**

### [ 3 ] MAIN CONTROLLER AND ARM INSTALLATION

The instructions given below are for mounting the main controller assembly on two 2 x 4 wood studs with 16 inch (406mm) centers. Should the PHOT-XII's Modle 505 be mounted in a manner other than what is specified here, the wall and the strength of the hardware used must be checked and verified as being adequate to withstand a 100 pound (45kg) shear load and a 450 pound (205kg) withdrawal force at each of the four (ø9 x 75mm) lag screws. When using concealed wiring, a flush mounted junction box with the necessary conduit and wiring must be pre-installed at 44-7/8 inches (1140mm) from the floor and between the two studs (refer to wall mounting template).

#### A. WALL PLATE OF MAIN CONTROLLER

##### **⚠ WARNING**

**Make sure the power supply is turned OFF at the circuit breaker panel.**

1. Tape the wall mounting template to the wall, positioning it so that the holes for mounting plate lag screws are aligned with the vertical 2 x 4" studs.

**NOTE :** Confirm that the location of concealed wiring matches to the access hole of wall plate template.

2. Mark the hole locations for the mounting plate lag screws.
3. Use a 3/16" (5mm) dia. drill to make a pilot hole approximately 2" (50mm) deep for each mounting plate lag screws.

##### **⚠ CAUTION**

**Do not use a drill larger than 3/16" (5mm) dia. for these holes.**

4. Place the wire through the hole into the stud mount wall plate and mount the plate to the stud with the four (ø9 x 75mm) lag screws.

**DO NOT FULLY TIGHTEN.**

##### **⚠ CAUTION**

**Be careful not to mount the wall plate backward**

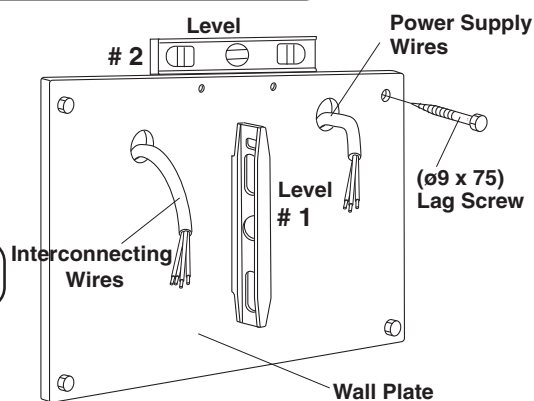
5. Hold the plate firmly against the wall, place a level across the front face. (#1 position in **Fig.3-1**)  
If the wall is not plumb, use shims behind the plate to level.

6. Place a level across top edge of wall plate, level and tighten lag screws securely. (#2 position in **Fig.3-1**)

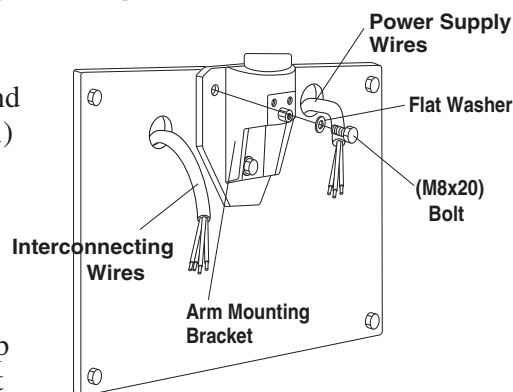
**NOTE :** Final leveling of wall plate is described on page 16.

#### B. ARM MOUNTING BRACKET

1. Using three (M8 x 20mm) bolts with washers in top mounting holes and in lower mounting hole, mount arm mounting bracket to wall plate. (**Fig.3-2**)



**Fig.3-1 Wall Plate Installation**



**Fig.3-2 Arm Mounting Bracket Installation**

### C. CHASSIS OF MAIN CONTROLLER

1. Remove the restriction plate over the terminal blocks by taking out two (M 4 x 8mm) screws. (Fig.3-3)
2. Route electrical interconnecting wires and power supply wires through the access holes on chassis and mount the chassis on the arm bracket with three of four (M4 x 8mm) screws. (A screw at lower right corner should be secured with a green wire from arm at setp D 6. on page 10.) Secure the bottom corner of chassis with two (M4 x 8mm) screws to the wall plate. (Fig.3-3)

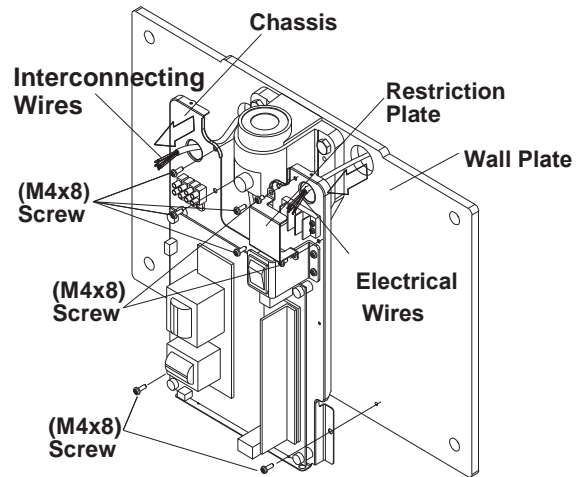


Fig.3-3 Attaching Chassis to Wall Plate

3. Cut the wires to workable length and strip 3/8" of insulation for power supply wires and 3/16" for interconnecting wires for Sub Controller. Connect power supply wires to 3P terminal block and interconnecting wires to 4P terminal block. (Fig.3-4)
4. Reattach the restriction plate. (Fig.3-3)

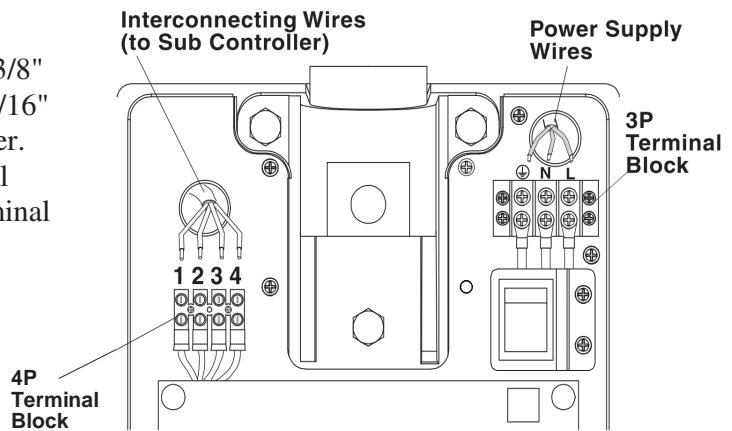


Fig.3-4 Wires Connection in Main Controller

### D. HORIZONTAL ARM

1. Place a thrust washer over the hole on top of the arm mounting bracket. (Fig.3-5) Insert the cable of horizontal arm into the hole, and mount to the arm mounting bracket, as shown in Fig.3-5.
2. Insert two retaining bolts into the upper threaded holes of the arm mounting bracket and tighten securely with a Allen wrench. (Fig.3-6)

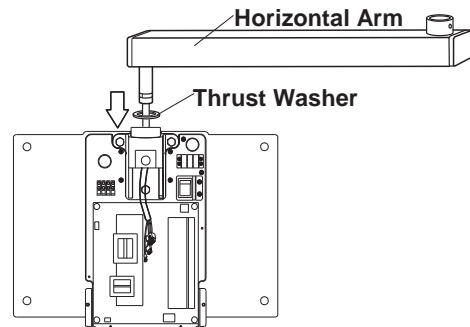


Fig.3-5 Horizontal Arm Installation-1

#### IMPORTANT :

The retaining bolts must be installed to ensure that the horizontal arm can not lift out of the arm mounting bracket.

3. Insert brake plug, brake spring and brake screw (M6 x 6 mm) into the threaded hole of the hex fitting located on the arm mounting bracket. **DO NOT FULLY TIGHTEN.** (Fig.3-6)

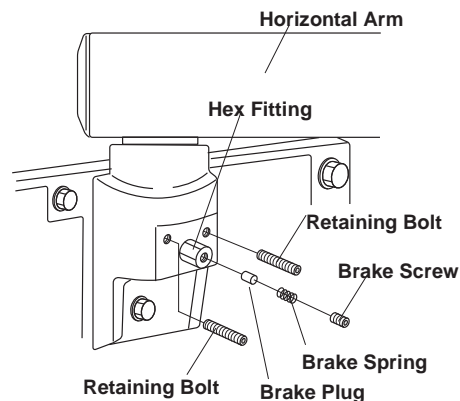
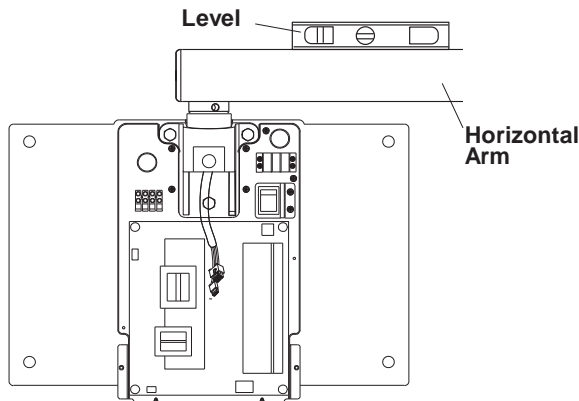


Fig.3-6 Horizontal Arm

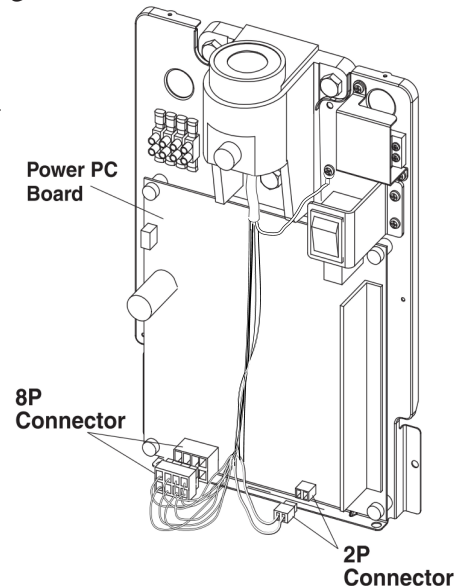
- Place a level on the horizontal arm and confirm that the arm is level throughout its left and right swing positions. **(Fig.3-7)**

**NOTE :** Final leveling of horizontal arm is described on Page 16.

- Connect 2P and 8P connectors of horizontal arm cable to the respective connectors on power PC Board. **(Fig.3-8)**
- Secure the green wire of arm cable by a lower right corner screw of four screws securing chassis to the arm bracket.



**Fig.3-7** Level confirmation

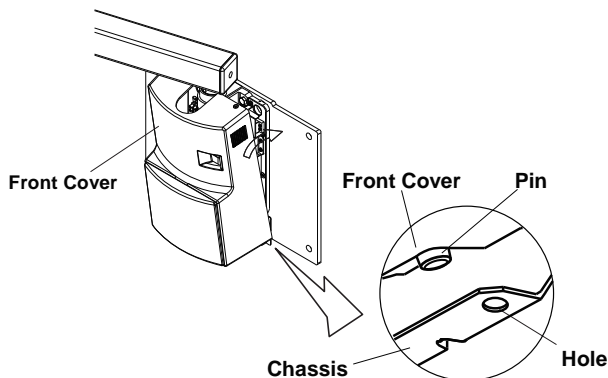


**Fig.3-8** Connecting 2P and 8P Connectors on Power PC Board

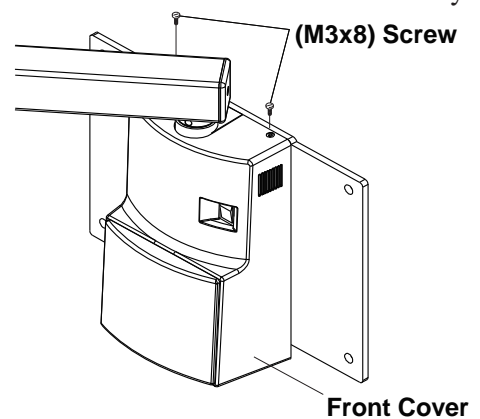
## E. FRONT COVER

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

- Set the pins located on the bottom of the front cover into holes on the bottom of metal chassis, and then push the top side toward the wall to close. **(Fig.3-9A)**
- Install two (M3 x 8mm) screws into the top of the cover and confirm that the cover is securely attached. **(Fig.3-9B)**



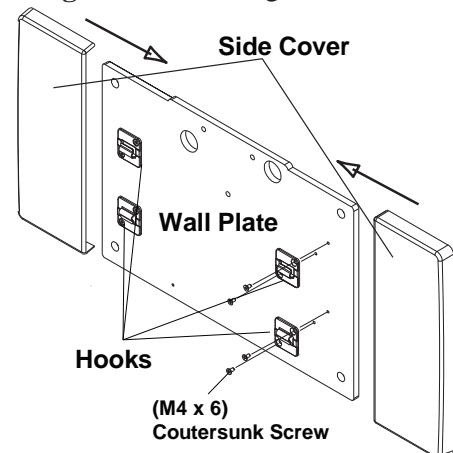
**Fig.3-9A** Attaching Front Cover-1



**Fig.3-9B** Attaching Front Cover-2

## F. SIDE COVER

- After the front cover of the main controller is installed, attach four hooks to the wall plate with (M4 x 6mm) screws supplied.
- Slide in the side cover from right and left side of the wall plate as the hooks catch the side covers. **(Fig.3-10)**



**Fig.3-10** Side Cover Installation

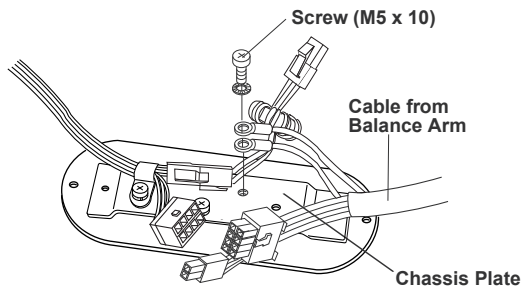
## G. BALANCE ARM ASSEMBLY

### ⚠ 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.**

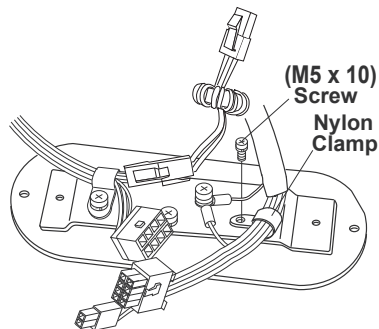
1. During this procedure, do not remove Arm holding band.
2. Remove two (M3 x 8mm) screws from the underside of the horizontal arm to open the bottom cover. (Fig.3-11)
3. Route the cable with 2P and 8P connectors from the balance arm shaft through the horizontal arm. Insert the balance arm into the horizontal arm. The cable should be fed through the bottom cover opening on the bottom of the horizontal arm. (Fig.3-12)
4. Secure 2 wires (Grounded wires) together with the (M5 x 10mm) screw on the bottom cover. (Fig.3-13A)

Note : Two ring terminals should not protrude from a chassis plate. (Fig.3-13A)

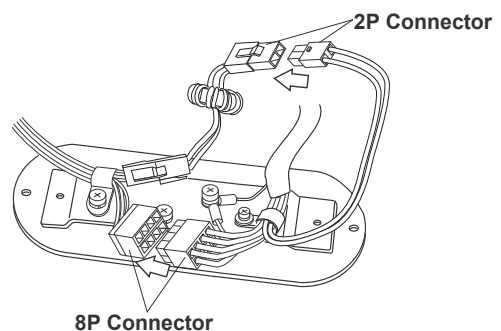


**Fig.3-13A** Attaching Grounded Wires on Bottom Cover

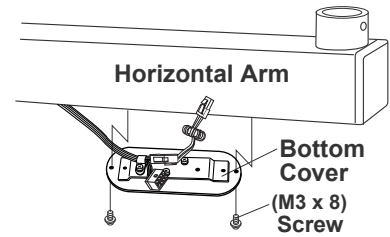
5. Secure the wires from the balance arm to the bottom cover with the nylon cable clamp to prevent damage from twisting. (Fig.3-13B) Then connect the 2P and 8P connectors. (Fig.3-13C)
6. Re-attach the bottom cover to the horizontal arm with two screws. (Fig.3-12)



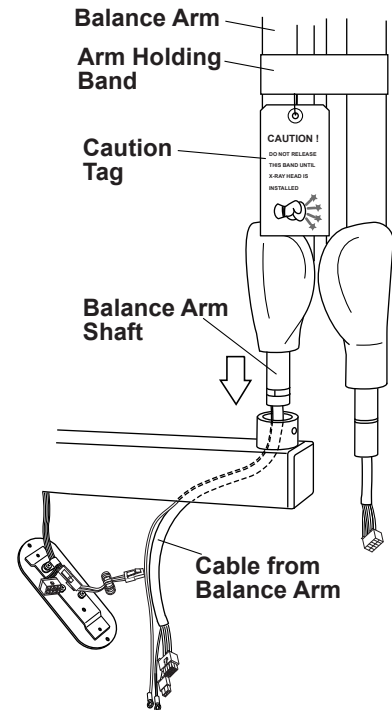
**Fig.3-13B** Attaching Balance Arm Cable on Bottom Cover



**Fig.3-13C** Connection of Connectors on Bottom Cover



**Fig.3-11** Horizontal Arm Bottom Cover



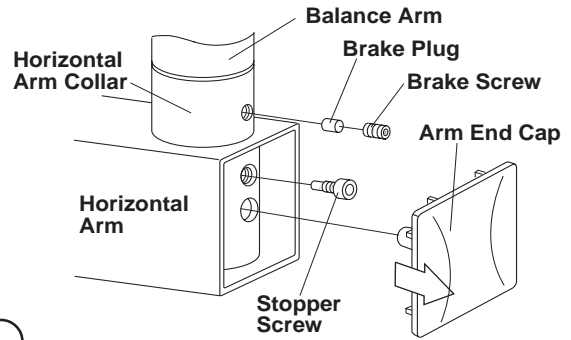
**Fig.3-12** Balance Arm Installation

7. Insert the brake plug and brake screw (M6 x 6mm) into the horizontal arm collar. (Fig.3-14)  
Do not fully tighten.

8. Remove the end cap from horizontal arm.  
Insert the stopper screw into upper threaded hole inside horizontal arm and tighten securely.  
Replace the end cap. (Fig.3-14)

**⚠ CAUTION**

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



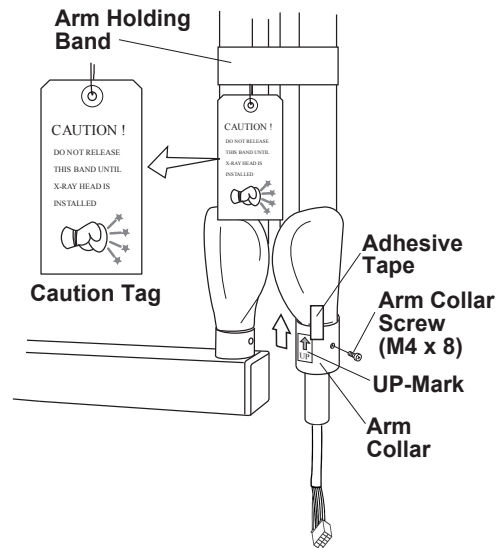
**Fig.3-14** Attaching Balance Arm to Horizontal Arm

## [ 4 ] HEAD ASSEMBLY INSTALLATION

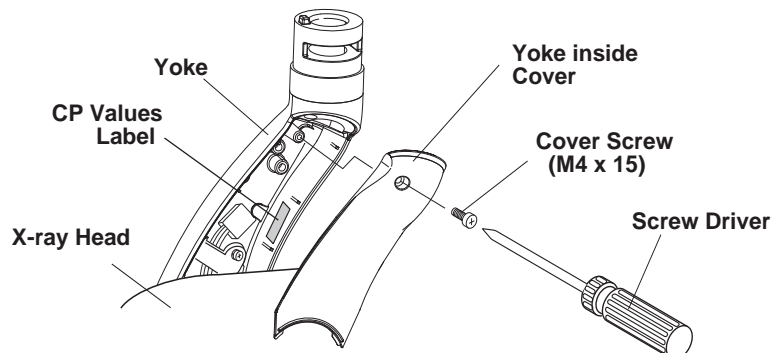
**⚠ WARNING**

**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.3-15)
2. Open the yoke inside cover of x-ray head by removing (M4 x 15mm) cover screw. (Fig.3-16)



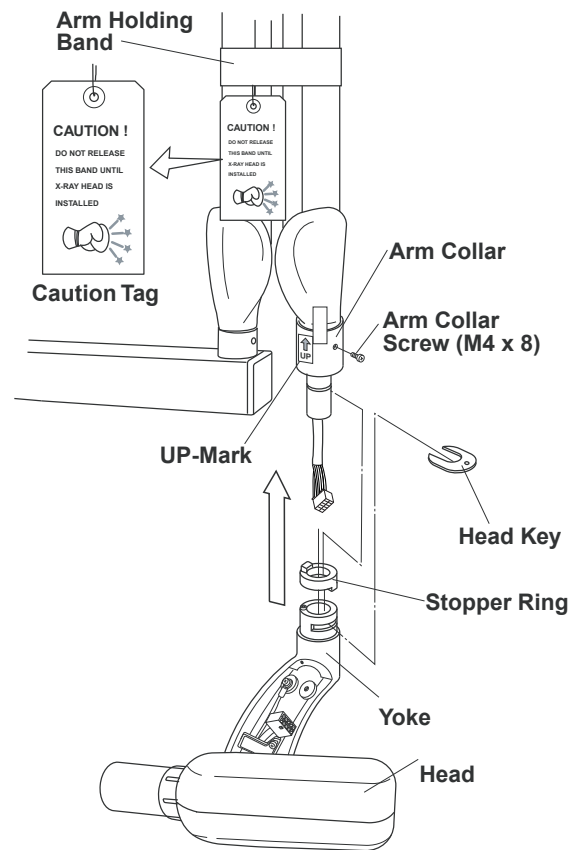
**Fig.3-15** Setting Arm Collar on Balance Arm



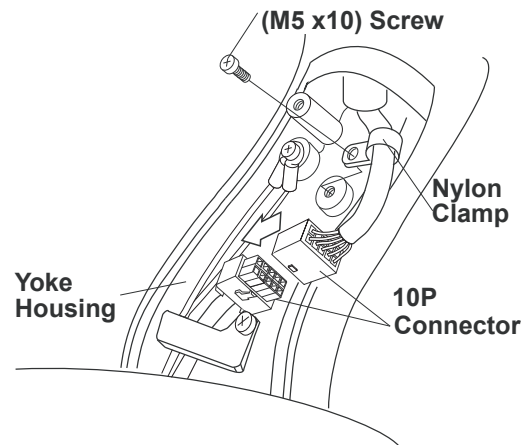
**Fig.3-16** Removing Yoke Inside Cover



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.3-17**)
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.3-17**)
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.3-17**)
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.3-18**)
7. Reattach the yoke inside cover with the screw (M4 x 15mm). Before closing the cover, note the CP values on the CP values label inside of the yoke. (**Fig.3-16**)
8. Remove arm holding band.



**Fig.3-17** X-ray Head Installation



**Fig.3-18** Connection 10P Connector in Yoke

## [ 5 ] SUB CONTROLLER INSTALLATION

The wall and the strength of the hardware used must be checked and verified as being adequate to withstand a 10 pound (4.5kg) shear load. A flush mounted junction box with the necessary conduit and wiring should be pre-installed at 51-5/8" (1310mm) from the floor.

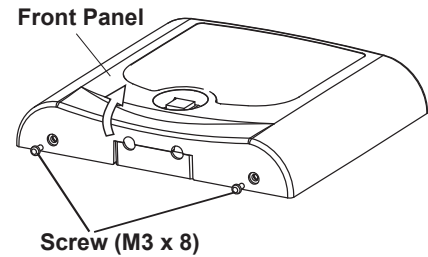
1. Remove two (M3 x8mm) screws from the under side of the controller and open the front panel. **(Fig.3-19)**
2. Disconnect the 4P connector from the timer PC Board. **(Fig.3-20)**
3. Route the interconnecting wires from the main controller through access hole of chassis and mount on the wall with four (ø4.1 x 20mm) wood screws. **(Fig.3-20)**
4. Cut 4 interconnecting wires from main controller to a workable length. Strip 3/16" 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.3-21)**

### CAUTION

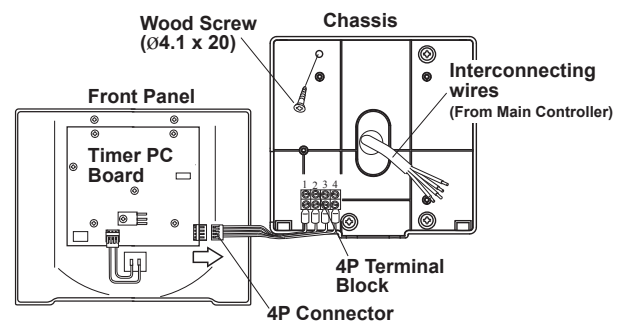
**Miswiring causes permanent damage to both timer PC board and power PC board.**

5. 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.
6. Reattach the 4P connector to the timer PC Board. **(Fig.3-20)**

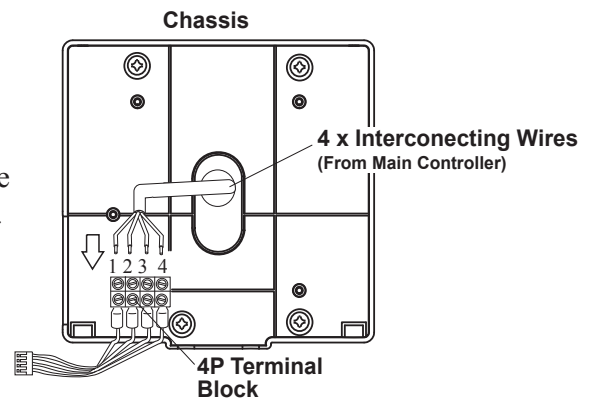
7. Set the pins located on the upper side of the front panel into holes on the top of chassis and attach the front cover to the chassis with two (M3 x 8mm) screws. **(Fig.3-19 & Fig.3-22)**



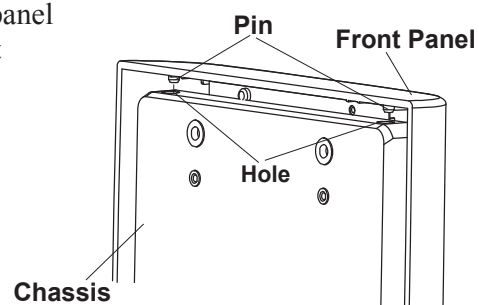
**Fig.3-19** Opening Front Panel



**Fig.3-20** Attaching Sub Controller Chassis



**Fig.3-21** Interconnecting Wires Connection in Sub Controller



**Fig.3-22** Upper side of Sub Controller



## [ 6 ] 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.

1. Confirm the contents of optional hand exposure switch kit. (Fig.3-23)

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

2. Remove two (M3 x8mm) screws from the under side of the controller and open the front panel.
3. Connect the connector at the end of hand exposure switch coil cord to CN3 connector on the timer PC board. (Fig.3-24)
4. 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.3-24)
5. Place the hook on the top corner (right or left) of controller and attach it with the tapping screw (ø3 x 8mm). (Fig.3-25)

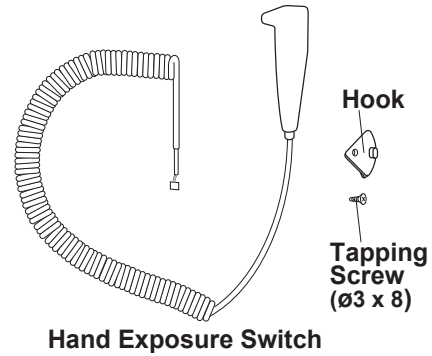


Fig.3-23 Hand Exposure Switch Kit

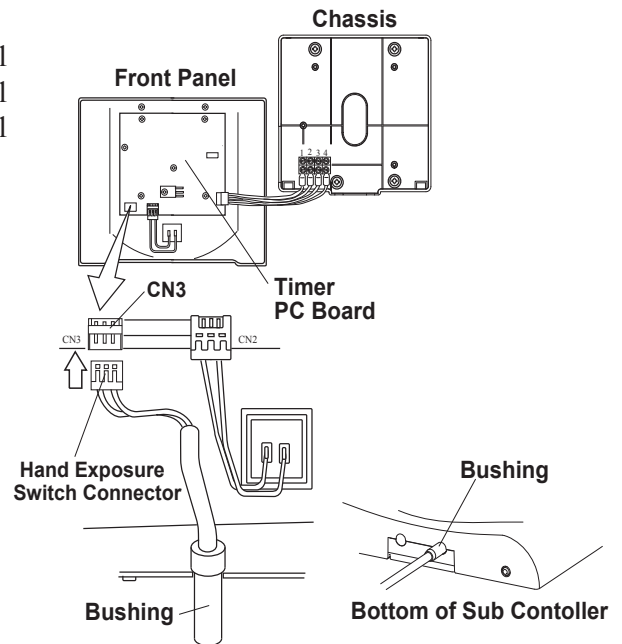


Fig.3-24 Connecting Hand Exposure Switch

## [ 7 ] EXTERNAL INTERLOCKS (NOT SUPPLIED)

If the external interlock for preventing from starting to emit x-radiation or to stop emitting x-radiation is used, the interlock switch should be inserted in #3 terminal of 4P terminal block either in the main controller or in the sub controller. If this interlock switch is opened, emission will be stopped. It is recommended to indicate the state of this interlock switch. (Fig.3-26)

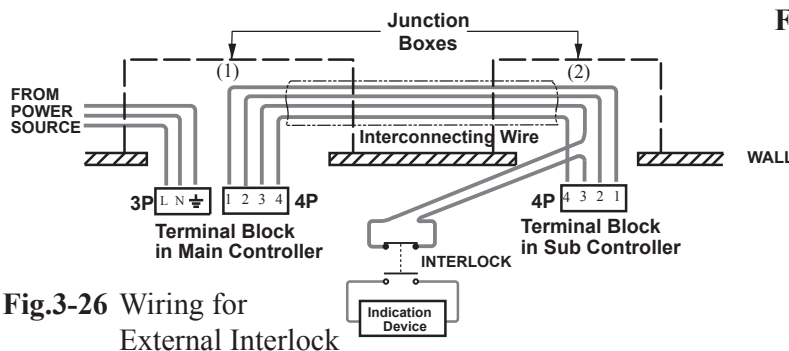


Fig.3-26 Wiring for External Interlock

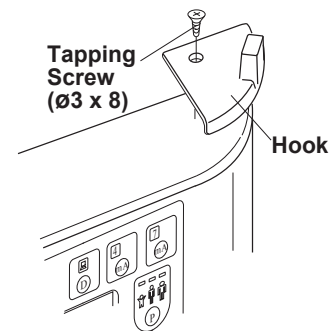


Fig.3-25 Attaching Hand Exposure Switch Hook

## SECTION 4 : POST INSTALLATION INSPECTION

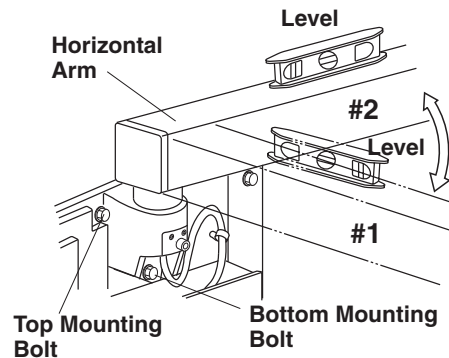
### [ 1 ] ARM ASSEMBLY

1. Incorrect leveling of the wall plate and wall bracket can cause arm drift. First, check leveling with horizontal arm in position **#1**. (**Fig.4-1**) If not correct, bracket must be adjusted by placing shims behind the wall plate.

#### IMPORTANT :

If the end of the horizontal arm shown in position **#1** is pitched below level, then the tube head will drift away from the wall. If the end of the horizontal arm in position **#1** is pitched above level, then the arm will require only minimum adjustment of the brake screw. (**Fig.3-13**)

2. Check leveling in position **#2**. If not correct, adjust Horizontal Arm as follows : (**Fig.4-1**)
  - a. Slightly loosen two top mounting bolts for arm mounting bracket.
  - b. Shift the bracket left or right until the arms are accurately leveled.
  - c. Move the horizontal arm to position **#1**.
  - d. Fully tighten two top mounting bolts.
  - e. Fully tighten bottom mounting bolt.

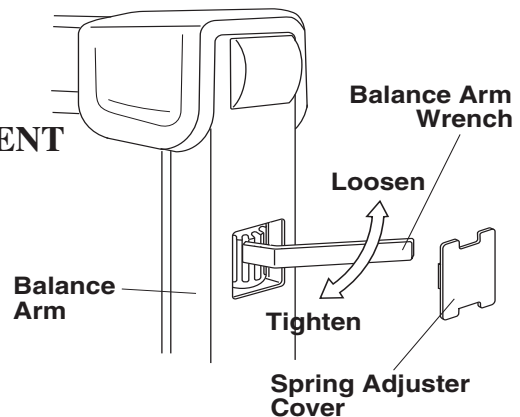


**Fig.4-1** Horizontal Arm Adjustment

**NOTE :** Slight tendencies to drift can be corrected by tightening brake screw in horizontal arm. Do not tighten beyond what is required to prevent drift.

### [ 2 ] BALANCE ARM TENSION ADJUSTMENT

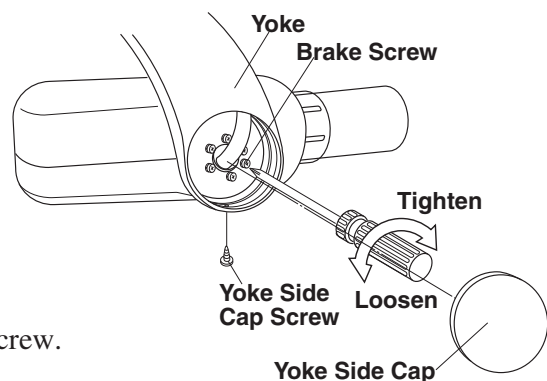
1. Place the balance arm assembly into position.
2. If either balance arm drifts higher or lower from the set position, remove the spring adjuster cover and adjust the balance arm spring tension with the balance arm wrench supplied. (**Fig.4-2**)



**Fig.4-2** Balance Arm Tension Adjustment

### [ 3 ] HEAD POSITIONING

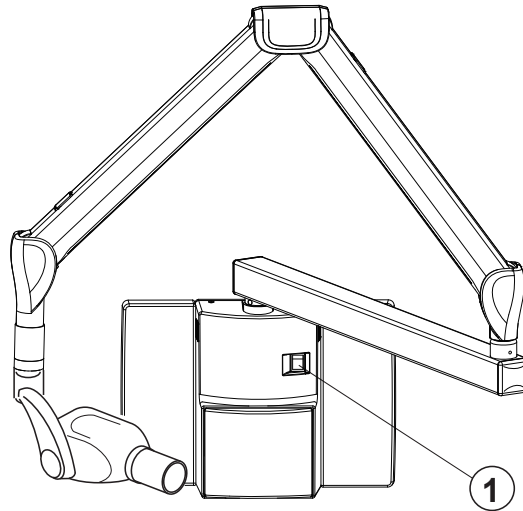
- A. Place head into position.
- B. If head drifts from the set position, adjust the brake screws according to the following procedures. (**Fig.4-3**)
  1. Loosen the yoke side cap screw (ø3 x 8mm tapping screw) and remove the yoke side cap.
  2. Adjust the six brake screws using a screw driver.
  3. After adjustment, reattach the yoke side cap and screw.



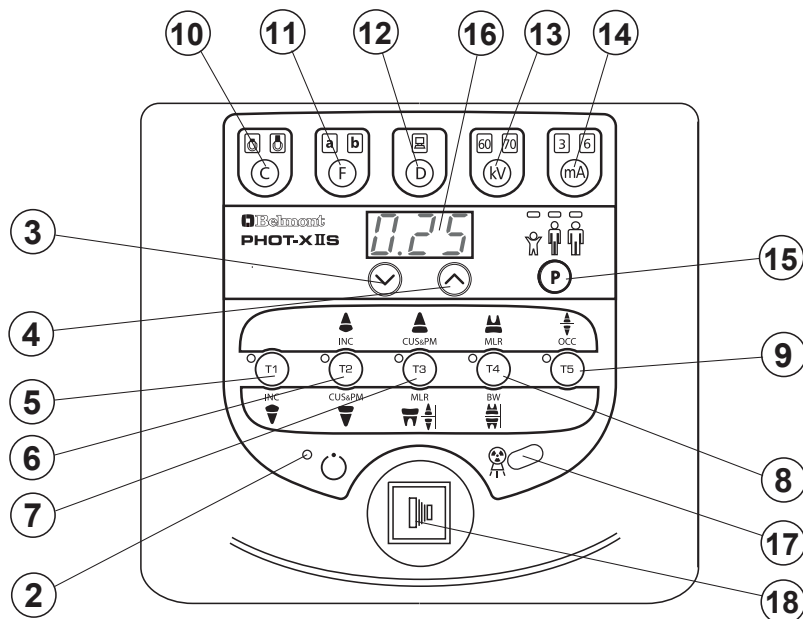
**Fig.4-3** Head Positioning

## SECTION 5 : CONTROL IDENTIFICATION AND OPERATION

### [ 1 ] MAJOR COMPONENTS AND CONTROL IDENTIFICATION



**Fig.5-1** Major Components for WK Type



**Fig.5-2** Control Identification

- |  |                                 |
|--|---------------------------------|
| ① Main Power Switch                    | ⑩ Cone Type Selection Switch    |
| ② Ready Light                          | ⑪ Film Speed Selection Switch   |
| ③ ExposureTime Adjusting Switch (Down) | ⑫ Digital Imaging Switch        |
| ④ ExposureTime 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 ExposureTime Display Window   |
| ⑧ Tooth Selection Switch (T4)          | ⑰ ExposureWarning 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 lights 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 (108 ~ 132Vac).

When this light is not on, exposure can not be made.

### ③④ Exposure Time Adjusting Switches

By momentarily pushing the  (or ) 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 505 has the following 37 exposure time settings :

0.00, 0.01, 0.02, 0.03, 0.04, 0.05, 0.06, 0.07, 0.08, 0.09, 0.10, 0.11, 0.13, 0.14, 0.16, 0.18, 0.20, 0.22, 0.25, 0.28, 0.32, 0.36, 0.40, 0.45, 0.50, 0.56, 0.63, 0.71, 0.80, 0.90, 1.00, 1.12, 1.25, 1.40, 1.60, 1.80, 2.00(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, Bitewing

⑧ T4 : Molar of Maxilla, Bitewing Molars

⑨ T5 : Occlusal

If the T1 switch⑤ 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

By depressing this switch for less than 2 sec., selected cone type can be confirmed. If round cone is selected, "rnd" is displayed. If the cone with rectangular collimator is selected, "rEC" is displayed. Depressing this switch more than 2 sec. changes the cone type by the following order.

Short cone (Round) --> Short cone with rectangular collimator --> Long cone (Round) -->

Long cone with rectangular collimator --> Short cone (Round) --> continued

### ⑪ Film Speed Selection Switch

a. PHOT-X IIs 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 switch 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)

Including these two speeds, PHOT-X IIs Model 505 x-ray can provide 16 different film speeds (F.00 ~ F.15) and any two of them can be programmed for easy selection. If 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. Pushing **Film Speed Selection Switch** ⑪ momentarily displays the selected film speed setting in the **Exposure Time Display Window** ⑩  
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 lights (a & b) are turned off.

### ⑫ Digital Imaging Switch

If a digital imaging system is used, shorter exposure time is often required. PHOT-X IIs 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** ⑩. With the factory speed setting d.10, the exposure time becomes half of F.10 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.
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.10 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.

### ⑬ kV Selection Switch

Momentarily depressing this switch will change the tube potential to 60 or 70 kV. 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 (3 or 6 mA). If the Digital Imaging Switch ⑫ is depressed, 3 mA is automatically selected and if the Film Speed Switch ⑪ is depressed, 6 mA is automatically selected.

**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	3	0.20	0.25	0.28	0.32	0.50	0.32	0.40	0.50	0.56	0.80	0.40	0.50	0.63	0.71	1.00
		6	0.10	0.11	0.14	0.16	0.25	0.16	0.20	0.25	0.28	0.40	0.20	0.25	0.28	0.36	0.50
	70	3	0.14	0.16	0.20	0.22	0.36	0.25	0.28	0.36	0.40	0.56	0.28	0.36	0.45	0.50	0.71
		6	0.07	0.08	0.10	0.11	0.18	0.11	0.14	0.18	0.20	0.28	0.14	0.18	0.22	0.25	0.36
F. 05	60	3	0.08	0.10	0.11	0.14	0.20	0.14	0.16	0.20	0.22	0.32	0.18	0.20	0.25	0.28	0.40
		6	0.04	0.05	0.06	0.07	0.10	0.07	0.08	0.10	0.11	0.16	0.09	0.10	0.13	0.14	0.20
	70	3	0.06	0.07	0.08	0.10	0.14	0.10	0.11	0.14	0.16	0.25	0.13	0.14	0.18	0.20	0.28
		6	0.03	0.04	0.04	0.05	0.07	0.05	0.06	0.07	0.08	0.11	0.06	0.07	0.09	0.10	0.14
d.10	60	3	0.13	0.14	0.18	0.20	0.28	0.20	0.25	0.28	0.36	0.50	0.25	0.32	0.36	0.40	0.63
		6	0.06	0.07	0.09	0.10	0.14	0.10	0.13	0.14	0.16	0.25	0.13	0.16	0.18	0.22	0.32
	70	3	0.09	0.11	0.13	0.14	0.22	0.14	0.18	0.22	0.25	0.36	0.18	0.22	0.25	0.32	0.45
		6	0.04	0.05	0.06	0.07	0.11	0.07	0.09	0.11	0.13	0.18	0.09	0.11	0.13	0.16	0.22

**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	3	0.40	0.50	0.63	0.71	1.00	0.71	0.80	1.00	1.12	1.60	0.90	1.00	1.25	1.40	2.00
		6	0.20	0.25	0.28	0.36	0.50	0.36	0.40	0.50	0.56	0.80	0.45	0.50	0.63	0.71	1.00
	70	3	0.28	0.36	0.45	0.50	0.71	0.50	0.56	0.71	0.80	1.25	0.63	0.71	0.90	1.00	1.40
		6	0.14	0.18	0.22	0.25	0.36	0.25	0.28	0.36	0.40	0.56	0.32	0.36	0.45	0.50	0.71
F. 05	60	3	0.18	0.20	0.25	0.28	0.40	0.28	0.36	0.40	0.45	0.71	0.36	0.45	0.50	0.56	0.90
		6	0.09	0.10	0.13	0.14	0.20	0.14	0.18	0.20	0.25	0.36	0.18	0.22	0.25	0.28	0.45
	70	3	0.13	0.14	0.18	0.20	0.28	0.20	0.25	0.28	0.32	0.50	0.25	0.32	0.36	0.40	0.63
		6	0.06	0.07	0.09	0.10	0.14	0.10	0.13	0.14	0.16	0.25	0.13	0.16	0.18	0.22	0.32
d.10	60	3	0.25	0.32	0.36	0.45	0.63	0.45	0.50	0.63	0.71	1.00	0.56	0.63	0.80	0.90	1.25
		6	0.13	0.16	0.18	0.22	0.32	0.22	0.25	0.32	0.36	0.50	0.28	0.32	0.40	0.45	0.63
	70	3	0.18	0.22	0.28	0.32	0.45	0.32	0.36	0.45	0.50	0.71	0.40	0.45	0.56	0.63	0.90
		6	0.09	0.11	0.13	0.16	0.22	0.16	0.18	0.22	0.25	0.36	0.20	0.22	0.28	0.32	0.45

**⑮ Patient Size Selection Switch**

This switch alters the selection of patient type/size to be radiographed (child→adult→large adult → child) and sets the exposure time automatically. If the weight of child is less than 20kg, press ☑ switch once after setting to child. If the weight of child is over 30kg and less than 50kg, press ☒ switch once after setting to child. If the weight of child is over 50kg and less than 70kg, press ☒ switch twice after setting to child. If the weight of child is over 70kg, set to adult.

**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. Estimated air kerma (radiation output) at distal end of cone can be displayed in this window by manual operation or automatically after the exposure. If an abnormal condition exists or a malfunction occurs, an Error Code is also displayed in this window. (See Section :[9] **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 an 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 (108 ~ 132V AC).

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 Adjusting Switches (⤴ or ⤵) until the desired exposure time appears in the Exposure Time Display Window ⑩. While the unit is in manual mode, other selection switches (⑤ ~ ⑨) 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 Exp. 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 30 times the selected exposure time before making additional exposures. (Example : a 15 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 exposures when the unit is not in use.

**NOTE :** If the unit left over 8 min. without being operated and the Main Power Switch ① is kept on, figure "1" runs through the Exposure Time Display Window ⑩. 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 ] ESTIMATED AIR KERMA

Estimated air kerma (radiation output) at distal of cone can be displayed in the exposure time window by depressing the patient switch for more than 1 second. Unit for this value is mGy and this value is calculated by kV, mA, Exposure time and Cone type selected at that time.

Patient type display lamps and displayed value in the window are flashing in this mode and if either of the manual exposure time adjusting switch is depressed during this mode, accumulated air kerma will be displayed. Accumulated value will be reset when the power switch is turned off or leave the x-ray unit more than 8 minutes without depressing any switch. To return to normal mode, press the patient switch for more than 1 second again or leave the controller untouched for more than 10 seconds.

### [ 5 ] OPTIONAL HAND EXPOSURE SWITCH

An optional 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.

## [ 6 ] 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 ⑯. 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 2 mA at 3 mA setting or less than 4.5 mA at 6 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 4 mA at 3 mA setting or more than 7.5 mA at 6 mA setting.		
E.07	During the exposure, tube current becomes less than 1.5 mA at 3mA setting or less than 3 mA at 6 mA setting.		
E.08	During the exposure, tube current becomes more than 4.5 mA at 3mA setting or more than 9 mA at 6 mA setting.		
E.09	Setting for pre-heating time is out of range.		Refer to the service manual.
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.		
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.18	Excess current was detected in primary circuit of filament transformer.		
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. Turn on the main power switch again.	Refer to the service manual.
E.23	Some switch had been on, when the main power switch is turned on. (Except the exposure switch.)		

(\*) Should a step up or down transformer be required to follow local and national electrical code for electrical ratings (120VAC, 60Hz, Single Phase, 1.2kVA) and installation.

## [ 7 ] MAINTENANCE

PHOT-X IIs Model 505 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 manufacture's specifications and remains in compliance with the Standard.

It is responsibility of the owner of the unit to see that these maintenance checks are correctly performed. The specific instructions to perform these checks are located within the PHOT-X IIs Model 505 Installation manual.

- Maintenance personnel : Qualified dealer service personnel who has the experience with Belmont's x-ray or has been trained by Belmont. But item 7 - 10 of the maintenace check list on page 29 should be verified routinely by treatment room personnel.
- Specification of the parameters to be monitored and monitoring frequency : Refer to the maintenance check list on page 29.
- Acceptance limit : Refer to the Maintenance check list on page 29.
- Required action when failed : Refer to the Maintenace check list on page 29.
- Tools to maintain quality control logs : Use the check list on page 29.
- Training material : Operator's instructions, Installation manual and Service manual

## [ 8 ] DISPOSAL

### 1. Disposal of x-ray unit or components

The tube head of this x-ray unit contains the lead for x-ray shield and oil for insulation. When disposing the x-ray unit or components, appropriately dispose complying with all current applicable regulations and local codes.

### 2. Disposal of used film and CCD cover

Dispose the used film covers and CCD sensor covers appropriately, according to precedures indicatated by each manufacturer and all current applicabel regurations and local codes.

## SECTION 6 : POST INSTALLATION CONFIRMATION

### [ 1 ] CONFIRMATION OF POWER SUPPLY VOLTAGE

As specified in Electrical Requirements (page 5), power supply voltage must be within the operable range of 108 ~ 132 VAC. Confirm the power supply voltage again before turning on the unit.

1. Open the front panel of main controller by loosening two screws on top of the controller.
2. Set the range of digital multimeter at 200 VAC, connect probes of multimeter to L and N of the 3P terminal block.

#### WARNING





**Do not touch the restriction plate (refer to Fig.3-3) with the probes of multimeter during measurement, or a short circuit occurs.**

3. Confirm that the reading is  $120V \pm 10\%$  (108 ~ 132 VAC).

NOTE : PHOT-XIIs Model 505 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 P(patient), C(cone) and kV selection switches together until “CP. ○” 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 ( or ) 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 ( or ) and press patient switch to store it.

### [ 3 ] MA (TUBE CURRENT) ADJUSTMENT

PHOT-XIIs Model 505 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.○○” is appeared on the exposure time display window
2. Wait until the display changes to be “0.50”.
3. Make exposure by depressing the exposure switch.

#### WARNING

**X-radiation is generated for 0.5 second.**

4. Repeat step 2. and 3. until “Fin” is displayed. This self diagnose and adjustment is automatically done for 3mA and 6mA.

#### [ 4 ] CONFIRMATION OF KV and MA

1. Turn the main switch on and set the exposure time at 1 sec. and 60 kV, 3 mA.
2. Make an exposure and keep the exposure switch depressed continuously after the exposure is over.
3. Keeping the exposure switch depressed, press kV selection switch twice. KV measured value will be displayed on the LED window. This value should be  $60 \pm 5$  kV.
4. Keeping the exposure switch depressed, press mA selection switch twice. MA measured value will be displayed on the LED window. This value should be  $3 \pm 1$  mA.
5. Release the exposure switch and change the setting to 70 kV, 6 mA.
6. Make an exposure and keep the exposure switch depressed continuously after the exposure is over.
7. Keeping the exposure switch depressed, press kV selection switch twice. KV measured value will be displayed on the LED window. This value should be  $70 \pm 5$  kV.
8. Keeping the exposure switch depressed, press mA selection switch twice. MA measured value will be displayed on the LED window. This value should be  $6 \pm 1$  mA.

#### [ 5 ] 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.

#### [ 6 ] CONFIRMATION OF LINE VOLTAGE REGULATION

1. Make sure that main power switch is "OFF".
2. Set the range of digital multimeter at 200 VAC, connect probes of multimeter to L and N of the 3P terminal block in the main controller.



**WARNING**

**Do not touch the restriction plate (refer to Fig.3-3) with the probes of multimeter during measurement, or a short circuit occurs.**

3. Turn the main power switch on, and set the exposure time at 2.00 sec. with manual switch at 70kV, 6mA.
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 0 ~ 5 %. If it is greater than 5%, 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 0.5 OHM.

## 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 IIs Model 505 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-XIIs Model 505 x-ray has 16 speeds for digital imaging (d.00 ~ d.15). The factory setting is d.10 and with this setting the exposure time becomes half of F.10 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.10 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.

## [ 2 ] PRIORITY OF SELECTIONS

Factory default setting :

Cone	: Short cone
Film Speed	: off
Digital Imaging	: "d.10"
kV selection	: 60 kV
mA selection	: 6 mA
Patient Type	: Adult

If necessary, these settings can be changed. For example, if "D-speed" film and long cone with rectangular collimator is used for pedodontistry, default settings for "Film", "Cone" and "Patient" should be changed as follows.

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 F switch momentarily. (Light for "Film a" illuminates and speed setting for "Film a" is displayed on exposure time display window.)
3. Select the patient type "child" by depressing P switch momentarily.
4. Press C switch several times until the light for long cone flashing. (Flashing means rectangular collimator is attached to the cone.)
5. Press **T1 switch** until buzzer beeps twice to store these settings, then turn the main power switch off.
6. Cone type, kV and mA selection can be changed by same procedures.

## [ 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 type Switch) until the buzzer beeps twice 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.

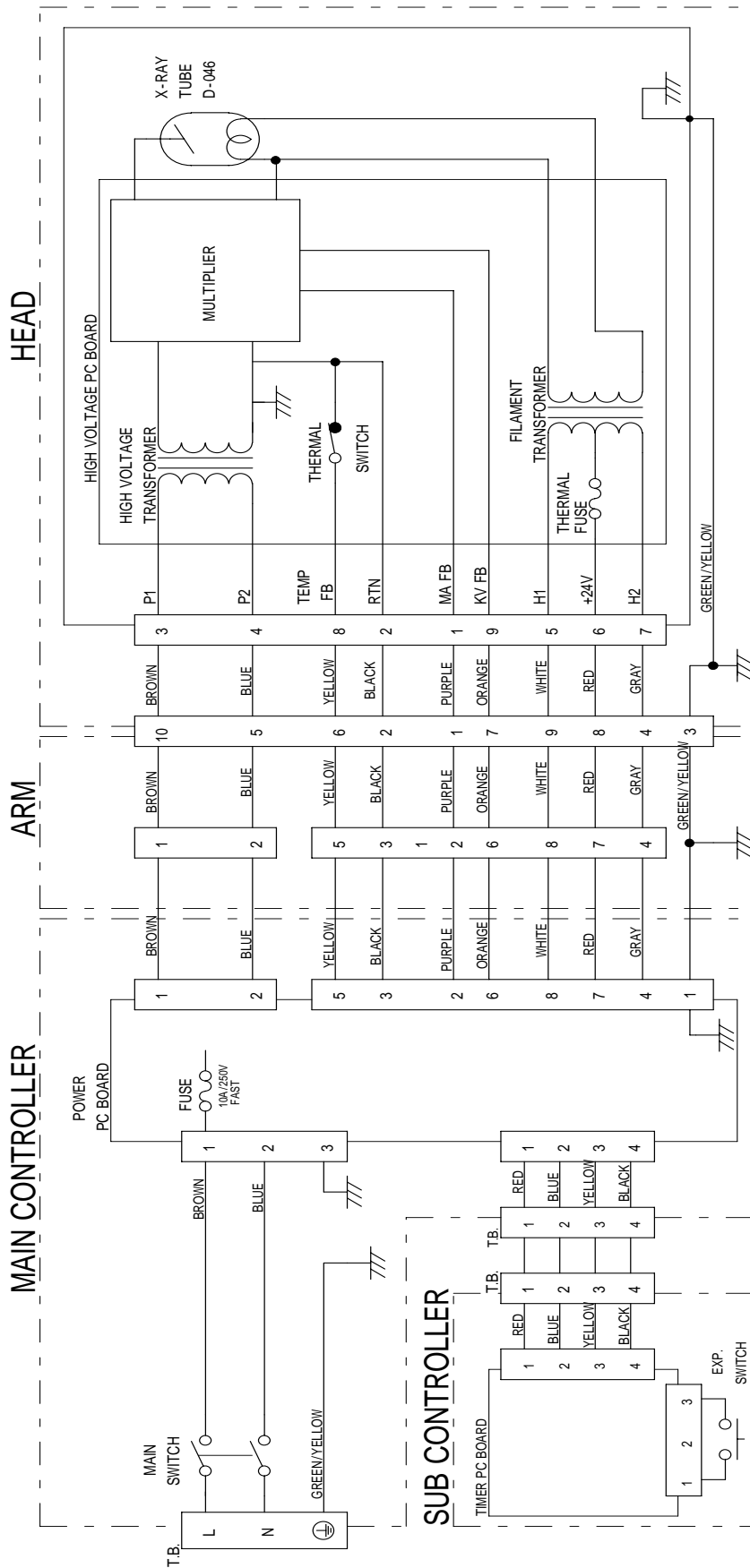
## [ 4 ] ESTIMATED AIR KERMA DISPLAY SETTING

With factory setting the estimated air kerma can be displayed only when the patient type selection switch is depressed more than 1 second. If automatic display after each exposure is preferred, change the display setting as follows.

1. Keep T2 and T5 switches depressed together for more than 3 seconds.  
Release the switches if the ready light starts to flash.
2. "rd.1" will be displayed in exposure time display window.
3. By depressing either ☸ or ☹ switch, change display to "rd.2".
4. Press P switch (Patient type Switch) until the buzzer beeps twice to store this setting and turn off the main power switch.

**NOTE** : If "rd.0" is stored, estimated air kerma can not be displayed automatically nor manually.

# APPENDIX 1 : CIRCUIT DIAGRAM

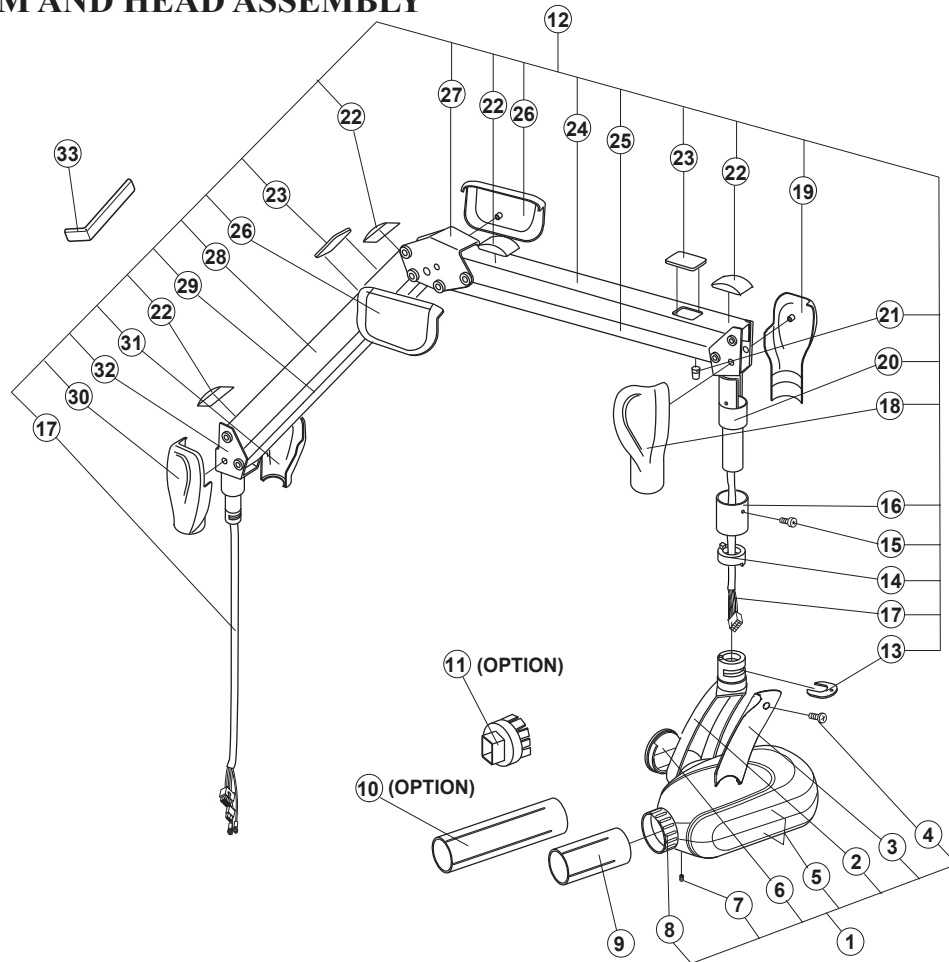


## APPENDIX 2 : MAINTENANCE CHECK LIST

Parameter	Acceptance limit	Frequency	Procedures when failed	OK/NG
1. Line voltage	Confirm the line voltage is within 120V±10%. Also confirm the voltage drop during exposure is within 5%.	Yearly	Connect to the power supply within 120V±10%. Check disconnection of wire or connection failure. Repair cable connection as needed.	
2. Tube current	Confirm the measured mA value indicated on the LED window is within the rated value ± 1 mA.	Yearly	Perform MA adjustment. (Refer to page 24 of Installation manual.)	
3. Tube potential	Confirm the measured kV value indicated on the LED window is within the rated value ±10%.	Yearly	Check the tube potential compensation (CP) values are same as the values on the label in the head yoke.	
4. Timer	Confirm the error of the measured value by noninvasive exposure time meter is within ±5% or 20mS at 0.01 and 2.0 seconds exposure. *The non invasive time meter should be calibrated to measure the radiation from dental x-ray.	Yearly	Exchange the power PC board to new one and check the result.	
5. Wall mounting plate	Confirm the wall plate is firmly fixed to the wall.	Yearly	If bolts are loose, find the reason why bolts became loose, take counter measure that prevents bolts become loose.	
6. Arm mounting bracket	Make sure that the arm bracket is firmly attached to the wall plate.	Yearly	If bolts that fix the arm bracket to the wall plate are loose, find the reason why bolts became loose, take counter measure that prevent bolts become loose.	
7. Dosimetry	Save the image that was taken under appropriate conditions as a reference image. Compare a newly taken image with a reference image to assure the image quality.	Weekly	If the image quality is found poor comparing to a reference image, check the condition of image receptor (film, sensor or imaging plate), image developer (developing fluid, dental film developer, PC or scanner). If they are OK, then set appropriate film / sensor speed by referring to page 18 of installation manual.	
8. Horizontal arm	Confirm that horizontal arm is firmly inserted to the arm bracket. Make sure the retaining bolt is firmly inserted to the arm bracket.	Daily (before use)	If the retaining bolt is loose, find the reason why bolt became loose, take counter measure that prevent the retaining bolt become loose.	
9. Head	Confirm the head can be smoothly positioned.	Daily (before use)	Adjust the brake screws by referring to page 16 of installation manual.	
10. Balance arm	Confirm the balance arm moves smoothly without making noise.	Daily (before use)	Adjust the tension of the balance arm by referring to page 16 of installation manual. If the balance arm makes noise, apply grease.	

## APPENDIX 3 : PARTS IDENTIFICATION

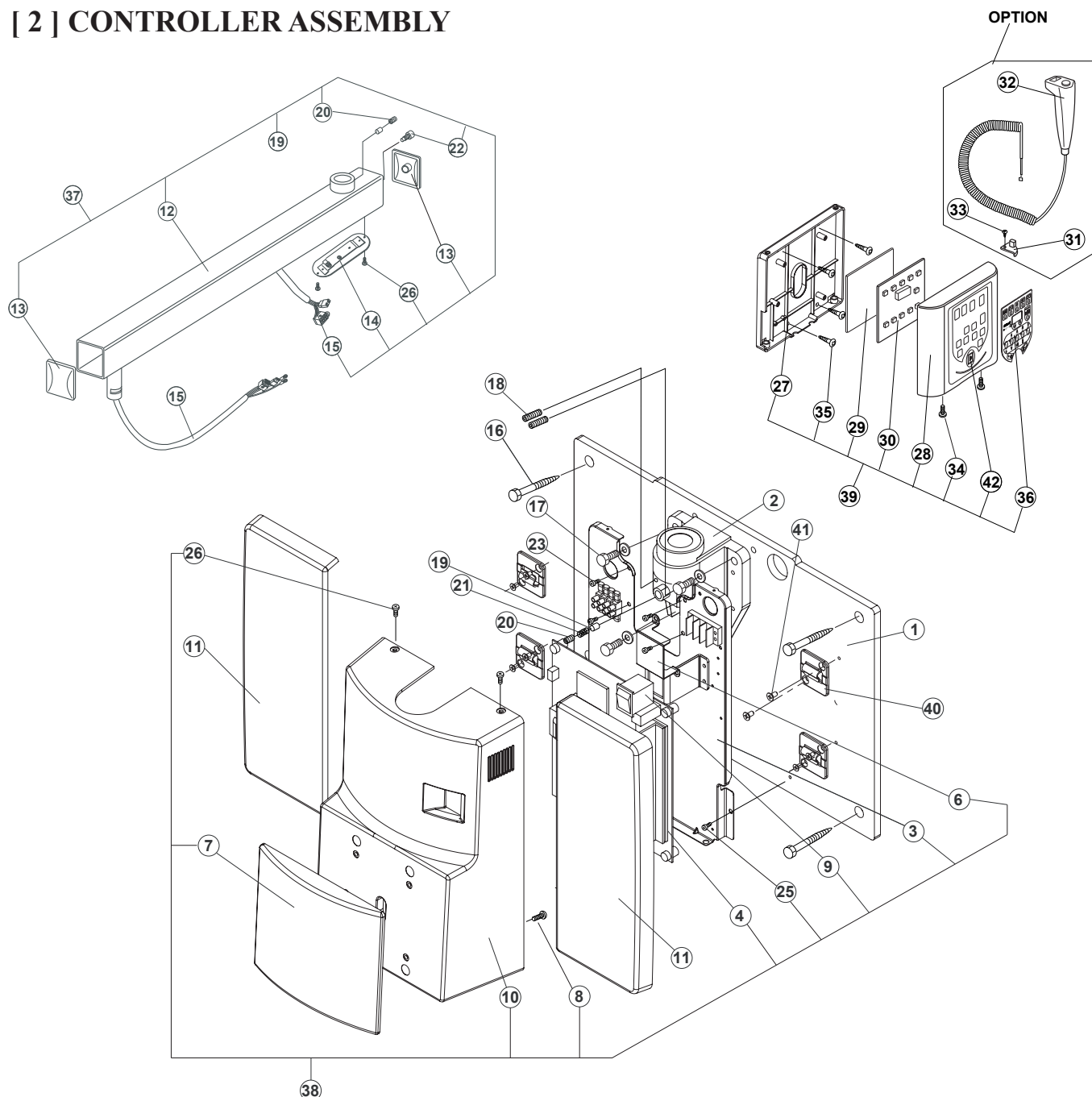
### [ 1 ] ARM AND HEAD ASSEMBLY



ID.No.	Parts No.	Description	QTY
1	1S01WAA0	X-Ray Head Assembly	1
2	1A0FU4A0	Yoke	1
3	1A0FU6A0	Yoke Inside Cover	1
4	-----	Yoke Inside Cover Screw (M4 x 15)	1
5	1P03JRA0	Head Housing Cover Set	1set
6	ECQR60A0	Yoke Side Cap	1
7	-----	Yoke Side Cap Screw (ø 3 x 8)	1
8	ECPJ65A0	Lock Ring	1
9	1A0FU5A0	Regular Cone	1
10	1G04Q1A0	Long Cone (Option)	(1)
11	1S01WEA0	Rectangular Collimator (Option)	(1)
12	1S01WBA0	Balance Arm Assembly	1
13	ECQR62A0	Head Key	1
14	ECQR24A0	Stopper Ring	1
15	-----	Arm Collar Screw (M4 x 8)	1
16	ECQR31A0	Arm Collar	1
17	1P03JSA0	Wire Harness in Balance Arm	1
18	1A0FU7A0	Left Cover for Joint No.3	1
19	1A0FU8A0	Right Cover for Joint No.3	1
20	ECPE16E0	Joint No.3	1
21	ECQR33A0	Cushion Absorber	1
22	1A0FUCA0	Crevice Cover	4
23	1A0FUDA0	Spring Adjuster Cover	2
24	1A0FULA0	Arm Cover No.2	1
25	ECPE30B0	Balance Arm No.2	1
26	1A0FUBA0	Cover for Joint No.2	2
27	ECPJ58B0	Joint No.2	1
28	1A0FUKA0	Arm Cover No.1	1
29	ECPE31B0	Balance Arm No.1	1
30	1A0FU9A0	Left Cover for Joint No.1	1
31	1A0FUAA0	Right Cover for Joint No.1	1
32	ECPE15B0	Joint No.1	1
33	ECLJ82A0	Balance Arm Wrench	1



## [ 2 ] CONTROLLER ASSEMBLY



ID.No.	Parts No.	Description	QTY
1	1A0FUJA0	Wall Plate	1
2	ECPE34B0	Arm Mounting Bracket	1
3	1A0389B0	Chassis	1
4	1A0ERXA0	Power PC Board	1
6	1A0387A0	Restriction Plate	1
7	1A0FTZA0	Front Panel	1
8	-----	Screw for Front Panel	1
9	1E01J8A0	Main Power Switch	1
10	1A0FTYA0	Front Cover	1
11	1A0FUEA0	Side Cover	1
12	1A0FUMA0	Horizontal Arm Frame (800mm)	1
13	ECQR61A0	Arm End Cap	2
14	ECQR70C0	Arm Bottom Cover	2
15	1P03JWA0	Wire Harness in Horizontal Arm (800mm)	1
	1P03JXA0	Wire Harness in Horizontal Arm (1000mm)	
	1P03JTA0	Wire Harness in Horizontal Arm (300mm)	
	1P03JUA0	Wire Harness in Horizontal Arm (500mm)	
	1P03JVA0	Wire Harness in Horizontal Arm (650mm)	
16	-----	Lag Screw	4
17	-----	Machine Bolt	3
18	ECPR44B0	Retaining Bolt	2
19	ECLS06B0	Brake Plug	1
20	-----	Brake Screw	1
21	ECLS11B0	Brake Spring	1

ID.No.	Parts No.	Description	QTY
22	ECLS09B0	Stopper Screw	1
23	-----	Screw for Chassis	4
25	-----	Screw for Chassis	2
26	-----	Screw for Cover	2
27	1A0FU1A0	Chassis for Sub Controller	1
28	1A0FU0A0	Front Panel for Sub Controller	1
29	ECQR58A0	Protector for Timer PC Board	1
30	1A0HHVA0	Timer PC Board	1
31	1A0FZCA0	Hook for Hand Exposure Switch (Option)	1
32	EHL53A0	Hand Exposure Switch Assembly (Option)	1
33	-----	Tapping Screw (Option)	1
34	-----	Front Cover screw for Sub Controller	2
35	-----	Wood Screw	2
36	1A0ERWA0	Switch sheet	1
37	1P03MMA0	Horizontal Arm Assmbly (800mm)	1
	1P03NBA0	Horizontal Arm Assmbly (1000mm)	
	1P03N8A0	Horizontal Arm Assmbly (300mm)	
	1P03N9A0	Horizontal Arm Assmbly (500mm)	
	1P03NAA0	Horizontal Arm Assmbly (650mm)	
38	1S01W9A0	Main Controller Assembly	1
39	1S01W8A0	Sub Controller Assembly	1
40	1A0FUFA0	Hook for Side Cover	1
41	-----	Screw for Hook	1
42	EHLN17A0	Exposure Switch with Wires	1

## APPENDIX 4 : CERTIFICATION

FORM FDA 2579 FROM THE DEPARTMENT OF HEALTH AND HUMAN SERVICES MUST BE COMPLETED AND MAILED TO THE RESPECTIVE AGENCIES FOR THIS INSTALLATION TO BE CONSIDERED COMPLETE. ALSO COMPLETE THE WARRANTY CARD AND THE ASSEMBLERS INSTALLATION REPORT AND RETURN TO BELMONT EQUIPMENT CORP.

### REFER TO THE SAMPLE FORM :

<b>FOR FDA USE ONLY</b>	<b>DEPARTMENT OF HEALTH AND HUMAN SERVICES</b> PUBLIC HEALTH SERVICE FOOD AND DRUG ADMINISTRATION <b>REPORT OF ASSEMBLY OF A DIAGNOSTIC X-RAY SYSTEM</b>	From Approved: OMB No. 0910-0213 Expiration Date: December 31, 1992 See reverse for OMB statement.
		<b>D</b> <b>XXXXXXX</b>

<b>1. EQUIPMENT LOCATION</b> a. NAME OF HOSPITAL, DOCTOR OR OFFICE WHERE INSTALLED ✓ b. STREET ADDRESS ✓ c. CITY ✓      d. STATE ✓ e. ZIP CODE ✓      f. TELEPHONE NUMBER ✓	<b>2. ASSEMBLER INFORMATION</b> a. COMPANY NAME ✓ b. STREET ADDRESS ✓ c. CITY ✓      d. STATE ✓ e. ZIP CODE ✓      f. TELEPHONE NUMBER ✓
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<b>3. GENERAL INFORMATION</b>			
a. THIS REPORT IS FOR ASSEMBLY OF CERTIFIED COMPONENTS WHICH ARE (Check appropriate box(es)) <input checked="" type="checkbox"/> NEW ASSEMBLY - FULLY CERTIFIED SYSTEM <input type="checkbox"/> REASSEMBLY - FULLY CERTIFIED SYSTEM <input type="checkbox"/> REASSEMBLY - MIXED SYSTEM (Both certified and uncertified components) <input type="checkbox"/> REPLACEMENT COMPONENTS IN AN EXISTING SYSTEM <input type="checkbox"/> AN ADDITION TO AN EXISTING SYSTEM			
b. INTENDED USE(S) (Check applicable box(es)) <input type="checkbox"/> GENERAL PURPOSE RADIOGRAPHY <input type="checkbox"/> GENERAL PURPOSE FLUOROSCOPY <input type="checkbox"/> TOMOGRAPHY (Other than CT) <input type="checkbox"/> ANGIOGRAPHY		<input type="checkbox"/> PODIATRY <input type="checkbox"/> UROLOGY <input type="checkbox"/> MAMMOGRAPHY <input type="checkbox"/> CHEST <input type="checkbox"/> CHIROPRATIC <input type="checkbox"/> CT HEAD SCANNER <input type="checkbox"/> CT WHOLE BODY SCANNER <input type="checkbox"/> HEAD - NECK (Medical) <input checked="" type="checkbox"/> DENTAL - INTRAORAL <input type="checkbox"/> DENTAL - CEPHALOMETRIC <input type="checkbox"/> DENTAL PANAMIC <input type="checkbox"/> RADIATION THERAPY SIMULATOR <input type="checkbox"/> C - ARM FLUOROSCOPIC <input type="checkbox"/> DIGITAL <input type="checkbox"/> OTHER (Specify in comments)	
c. THE X-RAY SYSTEM IS (Check one) <input checked="" type="checkbox"/> STATIONARY <input type="checkbox"/> MOBILE		d. THE MASTER CONTROL IS IN ROOM Location of Control Box	
		e. DATE OF ASSEMBLY ✓    ✓    ✓ (mo.)    (day)    (yr.)	

**4. COMPONENT INFORMATION** (If additional space is needed for this section use another form, replacing the preprinted number with form Number and complete items 1, 4, and 5 only)

a. THE MASTER CONTROL IS <input checked="" type="checkbox"/> A NEW INSTALLATION <input type="checkbox"/> EXISTING (Certified) <input type="checkbox"/> EXISTING (Non-certified)	b. CONTROL MANUFACTURER Takara Belmont, USA Inc. c. CONTROL MODEL NUMBER 505-CM, 505-CS	b. CONTROL SERIAL NUMBER ✓ c. SYSTEM MODEL NAME (CT Systems Only)
--	--	---

Complete the following information for the certified components listed below which you installed. For beam limited device, tables and CT gantries the manufacturer and Model number in the indicated spaces. For other certified components, enter in the appropriate block how many of each you installed in this system.

f.	SELECTED COMPONENTS	OTHER CERTIFIED COMPONENTS (Enter number of each installed in appropriate blocks)		
BEAM LIMITING DEVICE	MANUFACTURER	MODEL NUMBER	DATE MANUFACTURED	<div style="display: flex; justify-content: space-between;"><div><input checked="" type="checkbox"/> 1 X-RAY CONTROL <input type="checkbox"/> HIGH VOLTAGE GENERATOR <input type="checkbox"/> VERTICAL CASSETTE HOLDER <input type="checkbox"/> TUBE HOUSING ASSEMBLY (Medical) <input checked="" type="checkbox"/> 1 DENTAL TUBE HEAD</div><div><input type="checkbox"/> CRADLE <input type="checkbox"/> FILM CHANGER <input type="checkbox"/> IMAGE INTENSIFIER <input type="checkbox"/> SPOT FILM DEVICE <input type="checkbox"/> OTHER (Specify)</div></div>
	MANUFACTURER	MODEL NUMBER	DATE MANUFACTURED	
	MANUFACTURER	MODEL NUMBER	DATE MANUFACTURED	
TABLES	MANUFACTURER	MODEL NUMBER	DATE MANUFACTURED	
	MANUFACTURER	MODEL NUMBER	DATE MANUFACTURED	
CT GANTRY	MANUFACTURER	MODEL NUMBER	DATE MANUFACTURED	

<b>5. ASSEMBLER CERTIFICATION</b>		
I affirm that all certified components assembled or installed by me for which this report is being made, were adjusted and tested by me according to the instructions provided by the manufacturer(s), were of the type required by the diagnostic x-ray performance standard (21 CFR Part 1020), were not modified to adversely affect performance, and were installed in accordance with provisions of 21 CFR Part 1020. I also affirm that all instruction manuals and other information required by 21 CFR Part 1020 for this assembly have been furnished to the purchaser and within 15 days from the date of assembly, each copy of this report will be distributed as indicated at the bottom of each copy.		
a. PRINTED NAME ✓	b. SIGNATURE ✓	c. DATE ✓
d. COMMENTS		

**NOTE**

## NOTE



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