



MEDICATECH USA®

MasteRad MX30 Installation and Operating Manual (Version 2)



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2 SAFETY INFORMATION

2.1 Introduction

The policy of MedicatechUSA is to manufacture X-Ray equipment that meets high standards of performance and reliability. We enforce strict quality control techniques to eliminate the potential for defects and hazards in our products.

The intended use of this equipment is to provide a sub-system for positioning an X-Ray source and X-Ray bucky for the purpose of acquiring X-Ray images of the desired parts of a patient's anatomy. Use of this equipment in any other fashions may lead to serious personal injury.

The safety guidelines provided in this section of the manual are intended to educate the operator on all safety issues in order to operate and maintain the stand in a safe manner.

2.2 Manual Conventions

This manual uses three types of messages to emphasize information or potential risks to personnel or equipment.

To ensure safety, read all Safety Information provided herein and observe all:

- **WARNINGS**
- **CAUTIONS** and
- **NOTES**

	WARNING An instruction that draws attention to the risk of injury or death.
	CAUTION An instruction that draws attention to the risk of damage to the product or proper use of the product.
	NOTE Provides additional information such as expanded explanations, hints or reminders.

2.3 General Safety

Numerous design features, operational safeguards and mechanical and electrical interlocks have been incorporated into this product's design for the safety of both the operator and patient and to protect the equipment from damage.

	NOTE Personnel operating and maintaining this product should receive training and be familiar with all aspects of operation and maintenance. To ensure safety, read this SAFETY section thoroughly before using the equipment and observe all WARNINGS, CAUTION statements and NOTE located throughout the manual. NOTE Only a qualified, authorized Service Provider should service/repair electrical or mechanical components.
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The following are general safety precautions:

- Do not remove any covers for any purpose.
- Do not defeat or bypass built-in equipment safety features.
- Do not attempt any repairs if the equipment fails to operate correctly. Immediately call a qualified person authorized to repair the equipment.
- Do not attempt to relocate the equipment, or connect or disconnect any communication cables. Call a qualified person authorized to alter the equipment before attempting to relocate the equipment.
- Observe all warnings and cautions, stated or implied in procedures.
- Carefully read the product manual before operating the equipment.

	NOTE Follow all local, state and Federal guidelines and regulations on the disposal of hazardous material(s).
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2.4 Electrical and Mechanical Safety

Only a qualified, authorized Service Provider should replace electrical or mechanical components.

A. Electrical Safety

Sources of potentially lethal voltages/currents are physically and electrically isolated from both

the operator and patient by insulated cables and mechanically secured covers and access panels.

- Do not remove any panels, for any reason.
- Do not expose, in any way, cables or their mating sockets.

B. Mechanical Safety

The following are mechanical safety precautions:

- Keep fingers, hands and tools clear of moving parts.
- Always maintain observance of the patient position while positioning the equipment.
- Always maintain observance of other equipment in the area while positioning the equipment to prevent collision and potential damage.
- Unless specifically instructed, do not operate equipment with any covers removed.

2.5 Procedural Safety

The procedures in this manual are designed for the safety of the patient, operator and the equipment as well as ensuring the acquisition of diagnostic quality images. Failure to follow the procedures in this manual (or warnings, cautions and notes) can result in potential health and safety hazards and/or damage to the equipment.

- Observe and follow all cautions and warnings, stated or implied, in this manual.

2.6 User Maintenance/Serviceing

Unless specifically instructed herein, all maintenance and servicing of the equipment should be performed by qualified, authorized Service Providers. None of the electronic assemblies, cables or mechanical assemblies is user serviceable.

A. Cleaning and Disinfecting

Some cleaning solutions, disinfectants and other chemicals can be destructive to the equipment or pose a risk of fire. The manufacturer is not responsible for damages or injuries that may result from the use of non-authorized chemicals on or near the equipment.

	WARNING Do not operate the equipment when cleaning the equipment. Power switch should be in the “OFF” position before cleaning equipment.
	CAUTION Do not spray cleaning solution directly onto the equipment. Moisten a cloth with a 70% isopropyl alcohol solution for use on plastics and enameled metal. Apply to patient contact areas after each contact.
	CAUTION Do not immerse the equipment in liquid, do not autoclave equipment.

2.7 Hardware/Software Modifications

The equipment is complete as installed. The addition or subtraction of hardware or software not authorized by the manufacturer can lead to:

- Potential health risk to operator and/or patient.
- X-Ray imaging artifacts that can interface with proper image interpretation.
- Equipment malfunction and/or damage.

	WARNING Do not try to defeat or bypass built-in safety features.
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	WARNING Do not try to move equipment or disconnect any communication or power cables. Refer such actions to qualify authorized personnel only.
	WARNING Follow all safety labels placed on the equipment.

2.8 Environmental Safety and Operating Environment

The equipment is designed to operate in ambient air, free of corrosive compounds. The manufacturer is not responsible for injury or damages resulting from any equipment exposed to flammable or flame promoting gases (ether, alcohol or an oxygen enriched environment).

The following environmental conditions are appropriate for the equipment. Operation under conditions outside of these ranges could damage the equipment.

	WARNING Operate the equipment outside of its operating environment limits may lead to malfunction of or damage to the equipment.
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PARAMETER	LIMITS
Acceptable Temperature Range	5°C to 30°C or 41°F to 86°F
Acceptable Relative Humidity	10% to 75% (non-condensing)

2.9 Radiation and X-Ray General Safety Information

Everyone associated with X-Ray work must be familiar with the recommendations of the:

- Center for Devices and Radiological Health (CDRH)
- National Institute of Standards and Technology (NIST)
- National Council on Radiation Protection (NCRP), and
- International Committee on Radiation Protection (ICRP)

Be sure that all personnel authorized to operate the equipment are familiar with the established regulations of the authorities named above. All personnel should be monitored to ensure compliance with the above.

Although X-Ray radiation is hazardous, X-Ray equipment does not pose any danger when properly used. Be certain all operating personnel are properly educated concerning the hazards of X-Ray radiation. Persons responsible for the equipment must understand the safety requirements and special warnings for X-Ray operation.

2.10 Manufacturer's Responsibility

Allow only authorized, properly trained personnel to operate the equipment.

This equipment is sold with the understanding that the manufacturer, its agents, and representatives do not accept any responsibility for overexposure of patients or personnel to X-Ray radiation. No responsibility is assumed for any unit that has not been serviced by qualified authorized service personnel.

3 INTRODUCTION

3.1 Introduction

This manual provides installation and service information for MX-45 FM system.

3.2 Description

The MasteRad MX30 is an X-Ray tube, collimator and bucky support subsystem integrated into a radiographic system. This MX30 FM system has been designed and developed for various X-Ray examination techniques with both Flat panel detector in proper examination circumstances.

3.3 Specifications

- **Compatibility**

The system is compatible with a wide variety of generators, image receptor, and tubes. It is intended to be used in a stationary diagnostic X-Ray configuration.

- **Voltage** 220 VAC, 1 Phase, 50/60Hz $\pm 10\%$

- **Power Consumption** 40kW

- **Earth** 3 Conductor Type with protective earth

3.4 Product Label

4 INSTALLATION

4.1 Unpacking

MX30 system is packed with wood when it is delivered. To unpack and remove the wood box, please use required tools.

● Required Tools

Standard Service engineer tool kit

Electric drill motor and assorted bits

4.2 Room Layout (unit: mm)

Before installation, please measure recommended dimensions of exam room.

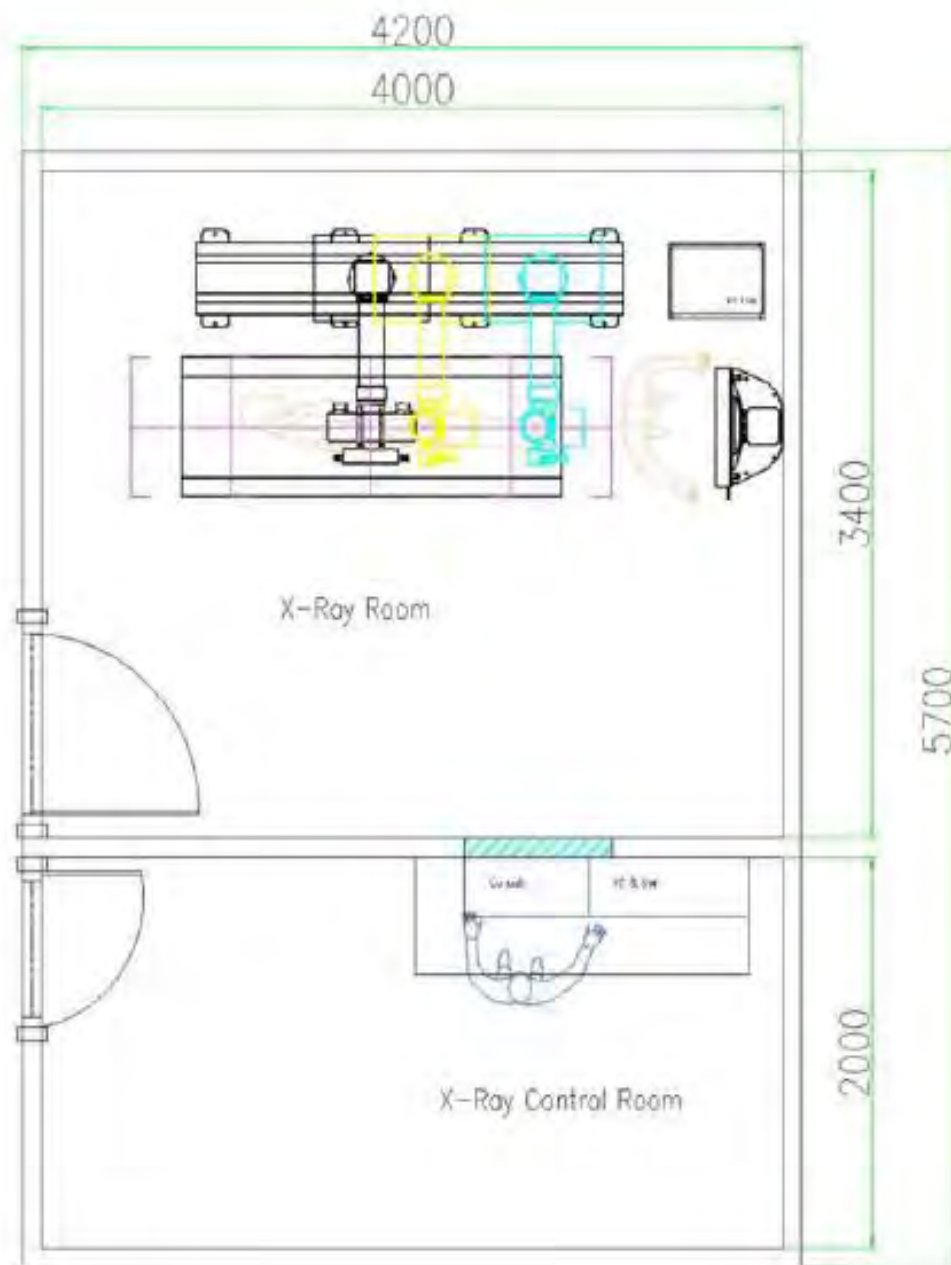
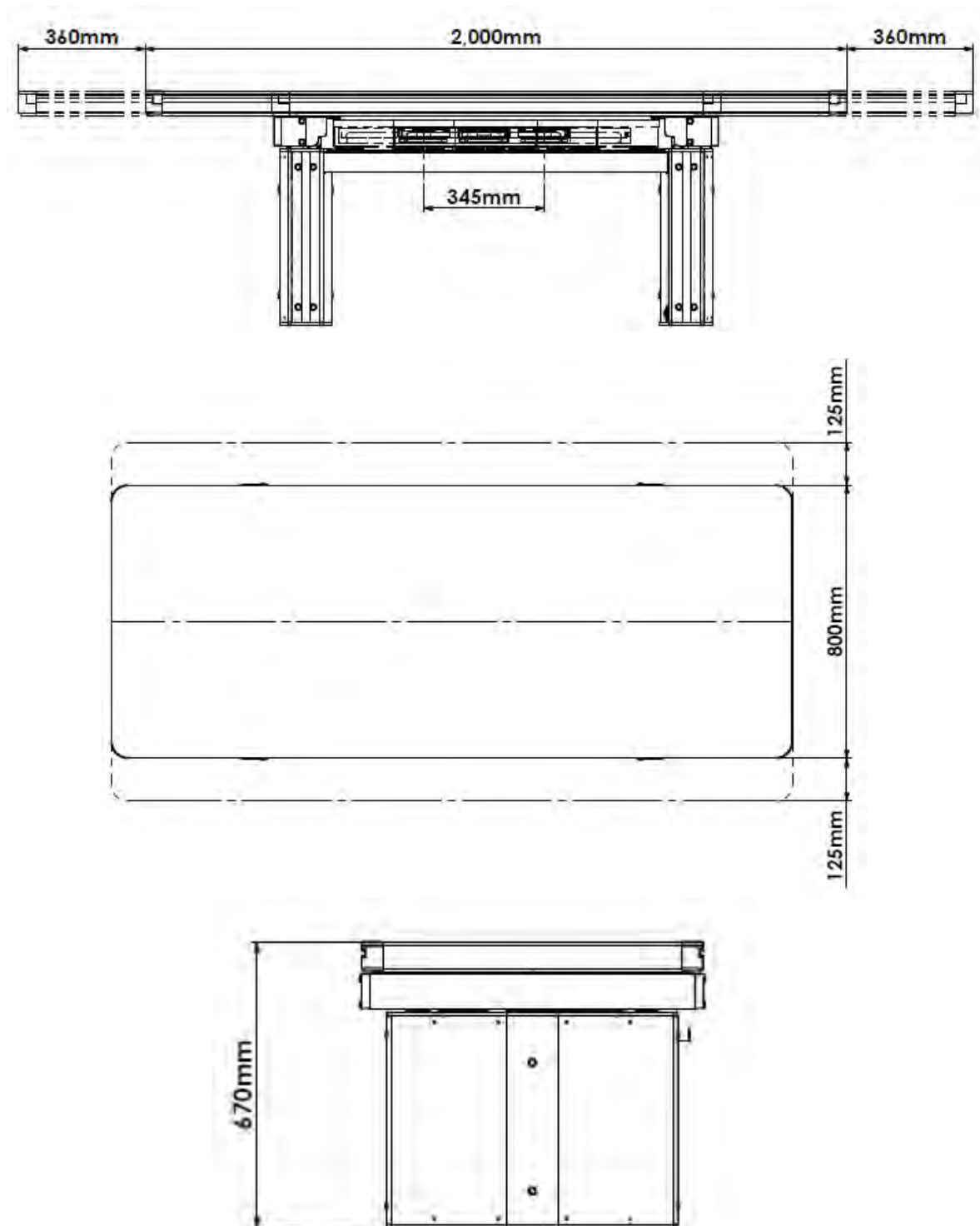


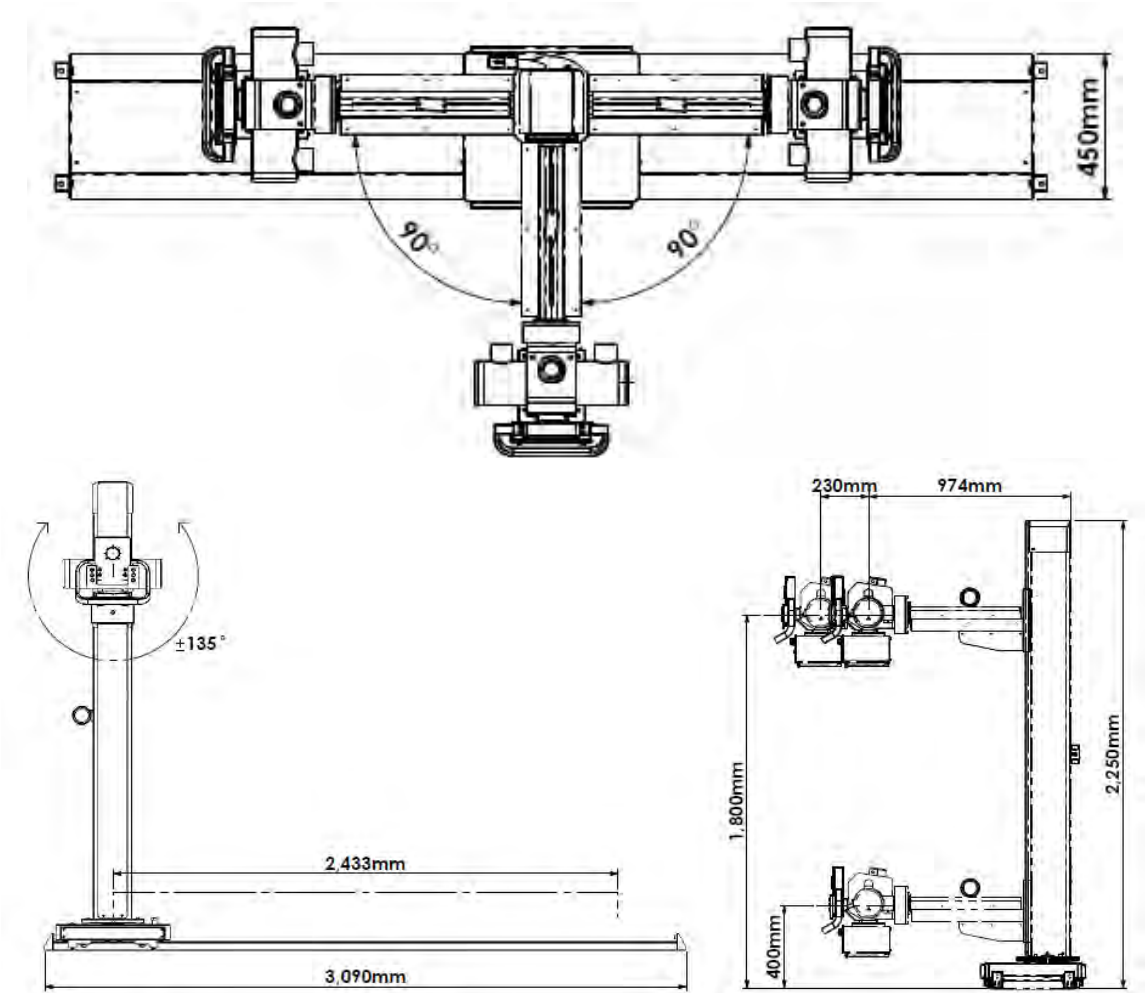
Figure 2-1, Room Layout

4.3 Dimension

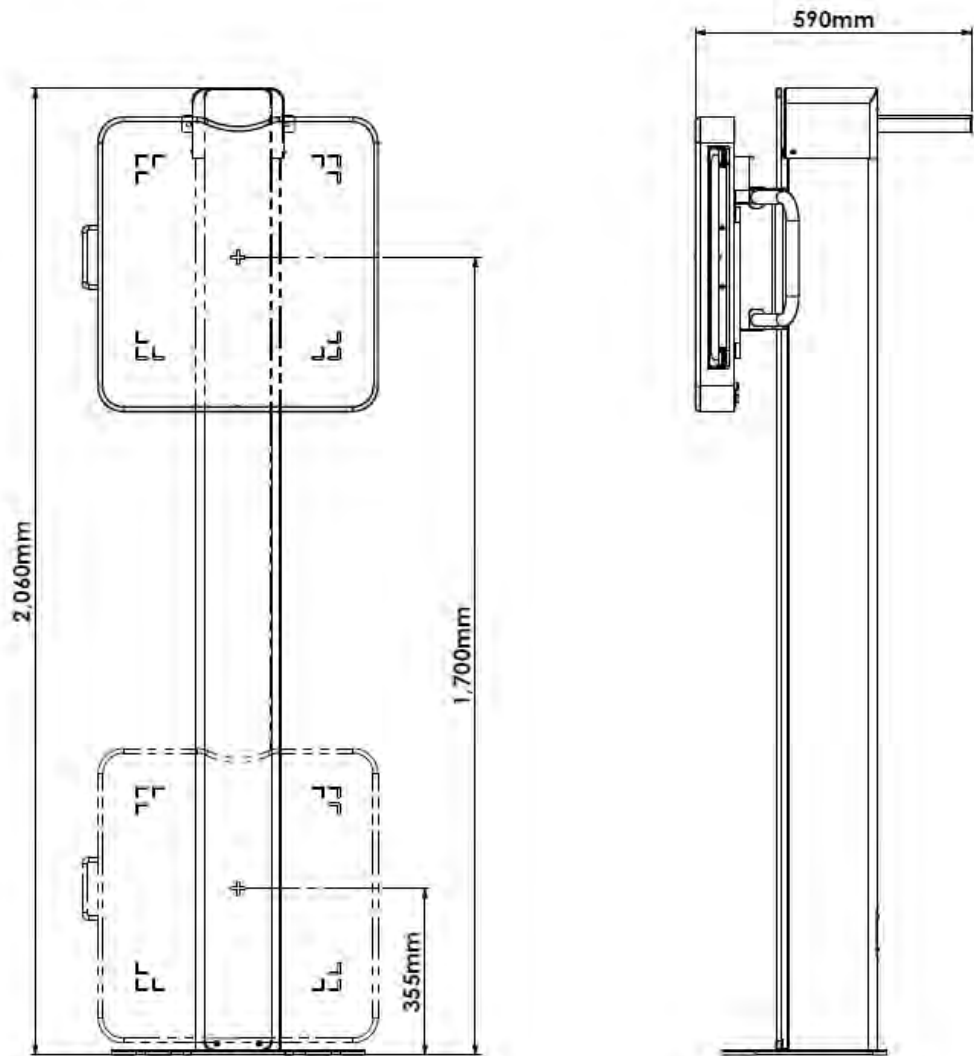
- BUCKY TABLE – 4WAY



● X-RAY TUBE STAND – Floor ceiling mounted

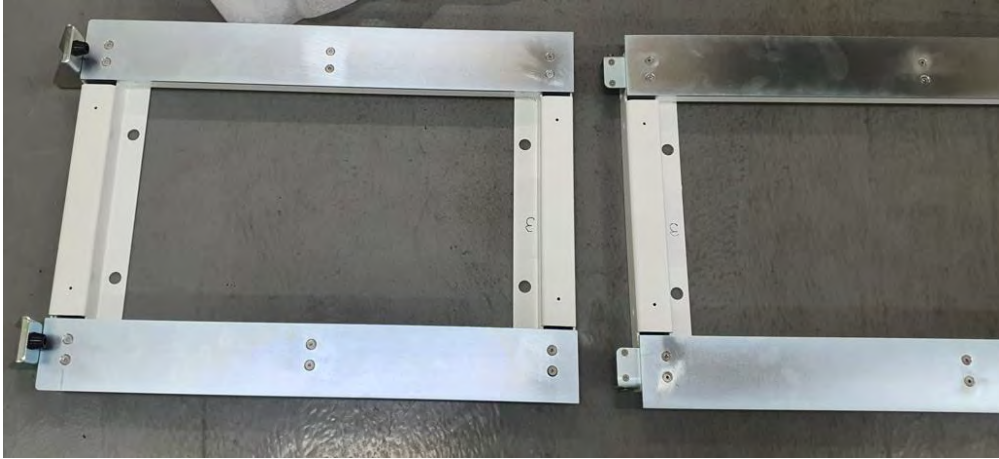


● Wall Bucky Stand

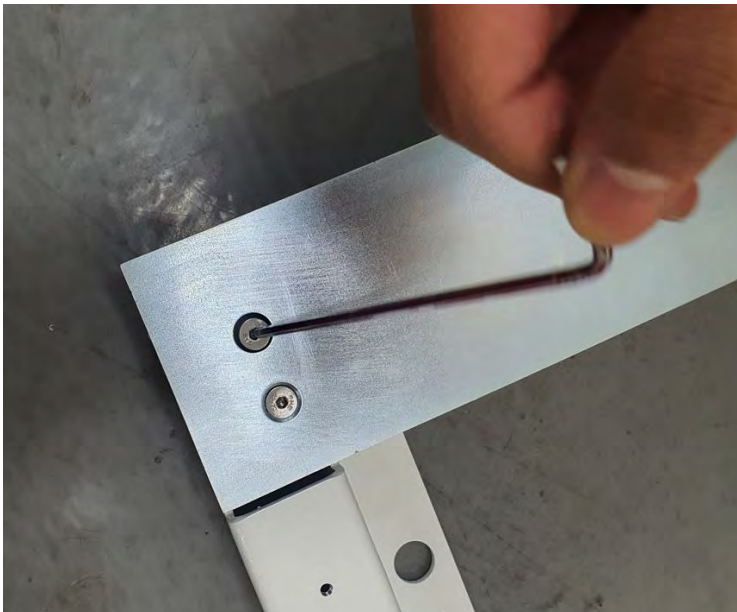


4.4 Floor Rail installation

Connect the extension rail



Loosen the extension rail bolts



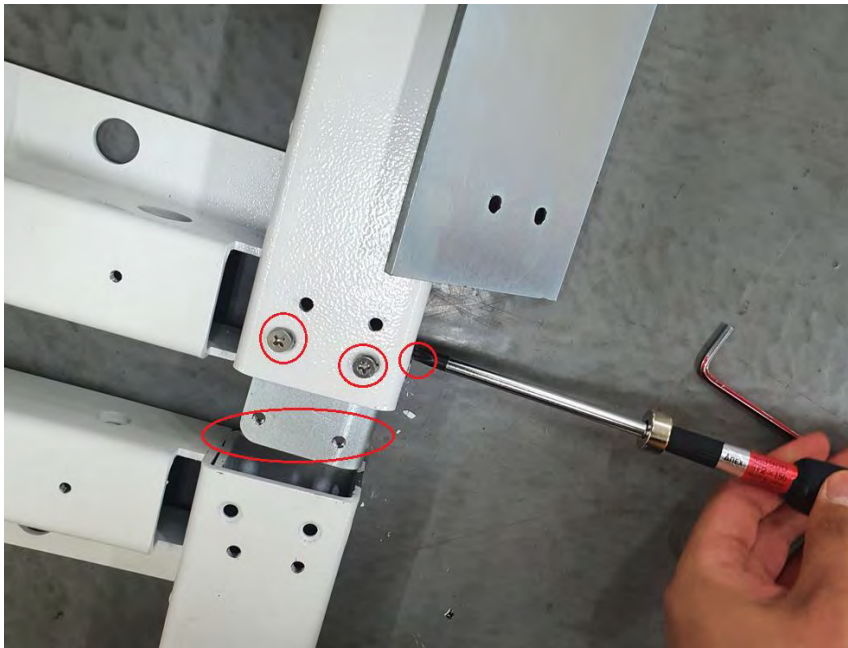
Loosen all bolts as shown below



Also loosen the bolts on the other rails



Loosen the bolts to allow the bracket to move



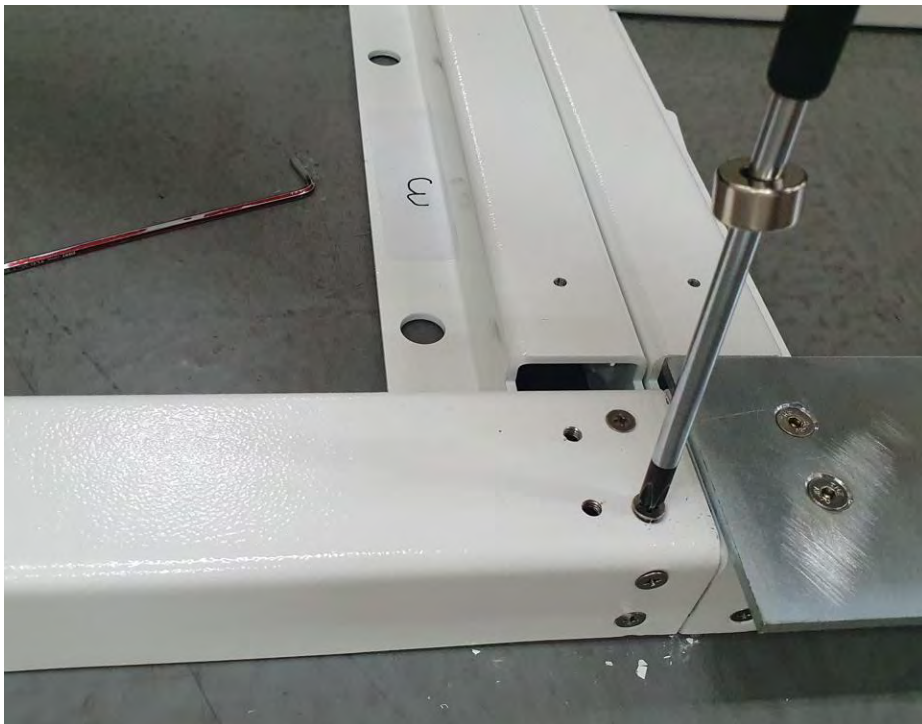
Connect with the extension rail.



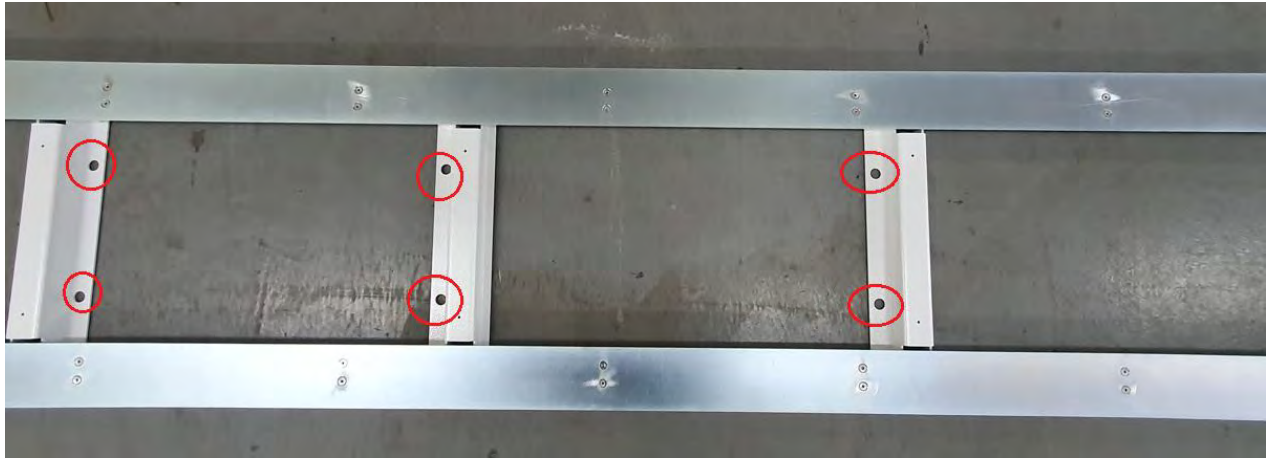
Reassemble the bolts



Secure with bolts



4.5 Fixing the floor rail



Place the rail in the position to be fixed

Fix it with anchor bolts using the fixing holes on the floor rail

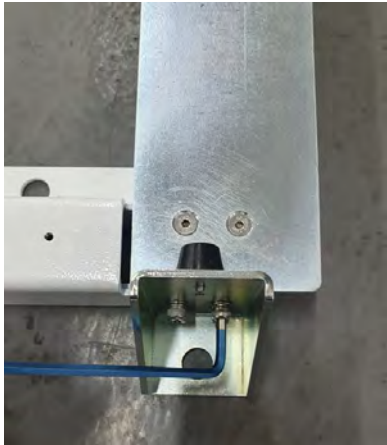
Caution

It is very important to maintain level horizontally, so if the base floor is not guarantee a perfect horizontal level, then achieve it using some piece of sheet metal or set screws.

The base plate should be locked up with a floor using anchor bolts. Otherwise, the complete system may be fallen down to the floor due to a weight balance problem.

4.6 Tube stand installation

Remove the rail stopper first

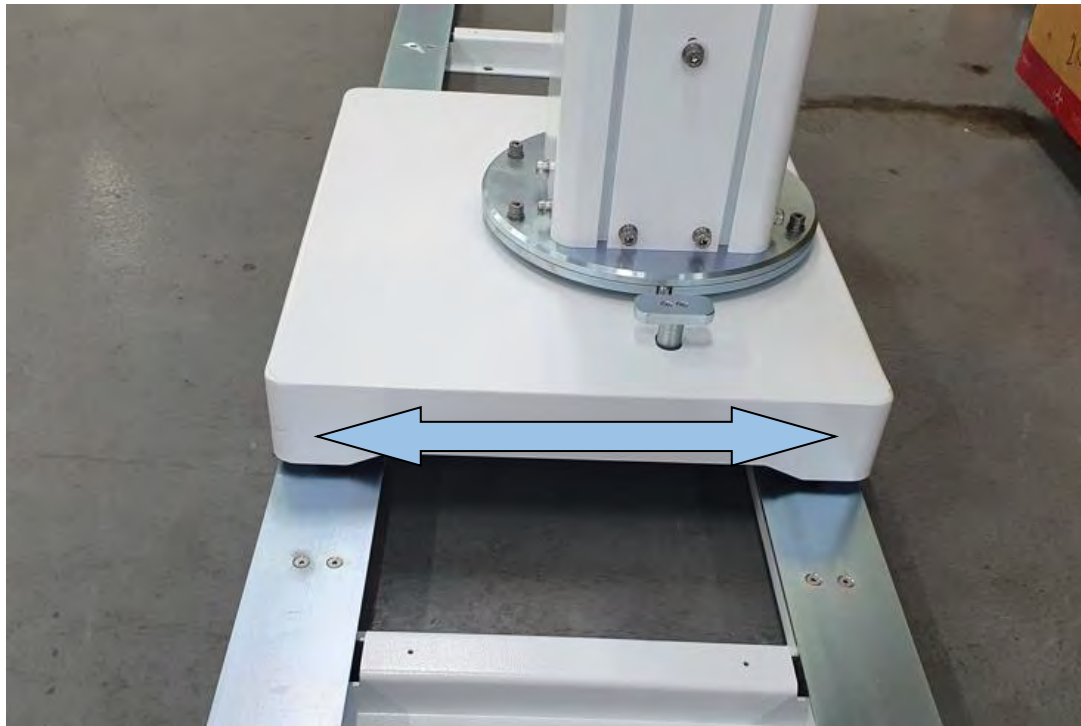


Slowly the stand and carefully place it on the rail. To prevent damage to the floor, lay a paper box on the floor before working.

Two or more workers must work together.



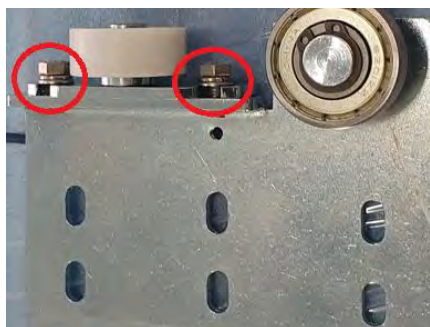
Adjust the stand base to be located in the center of the floor rail.



Reassemble the stopper.



Lightly loosen the fixing bolts on the rail guide bearings.

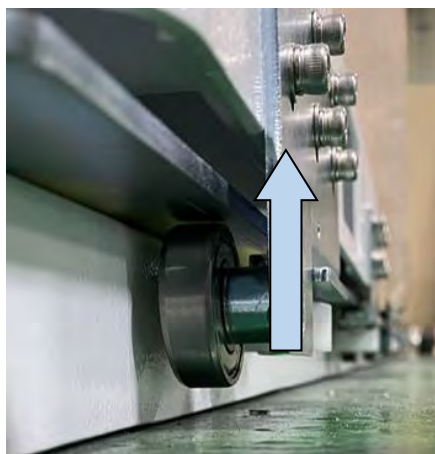


Engage the floor rail guide bearing to the side of the stand floor base.

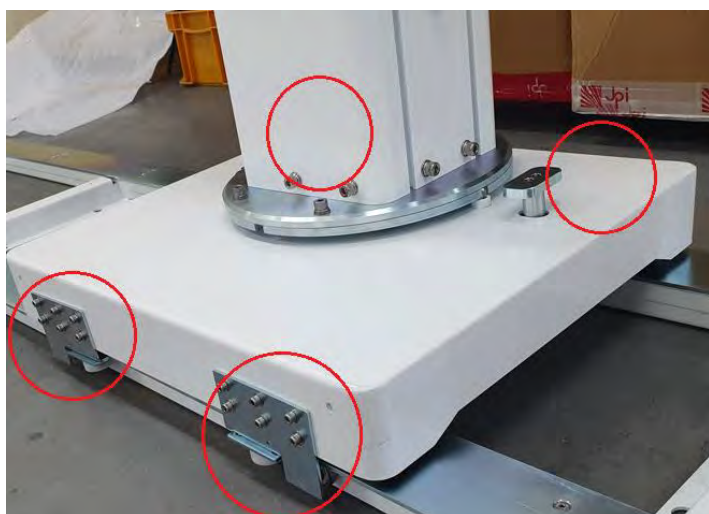


Fix the bottom rail guide bearing close to the bottom rail using fixing bolts.

If it is too tight, the bearing will not move well, so fix it so that it moves easily.



The bottom rail guide bearings must be installed in 4 positions.



Assemble the guide bearing cover to the stand bottom base.



Tube Arm Installation



Remove the fixed cover bolts.



Attach the tube arm to the stand.

Because the tube arm is heavy, it requires two operators to lift and work.

To prevent the tube arms from sagging downward, put spacers between the bolts to assemble them together.



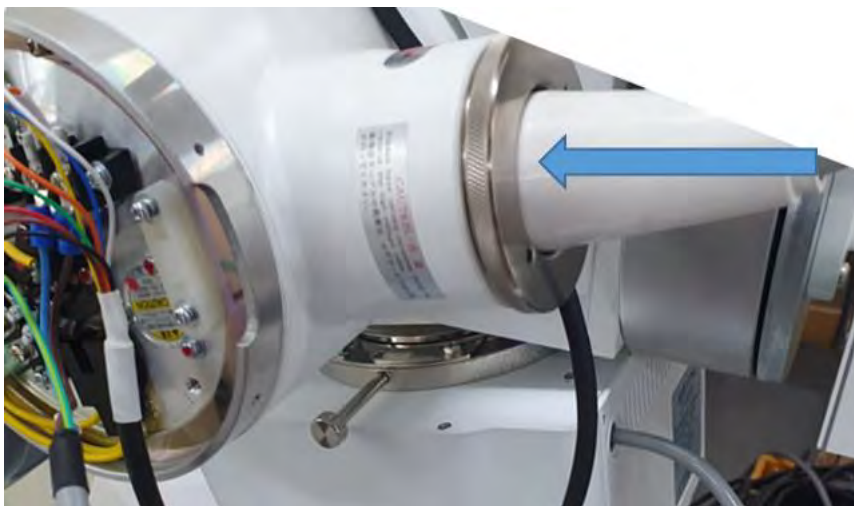
Connect the collimator. Secure using a spanner(8mm).



High voltage cable connection.

When you are connecting high voltage cable, be careful of its polarity.

*CAUTION: Cable must be connected deep into the hole.





This section of the MX30 v.4.2 Assembly Guide focuses on assembling the Tube Cover for the Tube Arm.

TOOLS NEEDED for this section: *Metric Allan Wrench Set and a Phillips head Screw Driver*

Tube Assembly: When you unpack your Tube Cover Assembly, it will already be put together. Keep track of screws and where they go as you dismantle and put back together again on the MX30 Tube Arm.



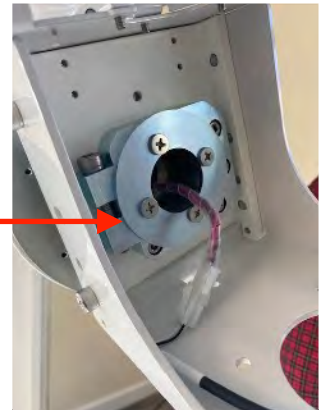


Example of Final Assembly: The following pages will walk you through the installation of each of the Tube Cover components.

After you have installed the Tube Arm (See Tube Arm Assembly Section), you will start by attaching the tube cradle and securing it to the arm with the M8x16 screws.

Step One: Locate the tube cradle and screws. The tube cradle slides over the outer sides of the Tube Arm rotation mechanism.

Note: The MX30 v.4 tube rotation has detents that click at $\pm 45^\circ$ and 90° detents. Before moving forward with Tube Cover Assembly, be sure to have completed or reviewed the Adjusting Tube Rotation Section.

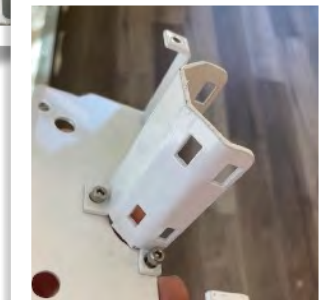


Locate the two threaded openings on top of the Tube Arm Rotational plate.

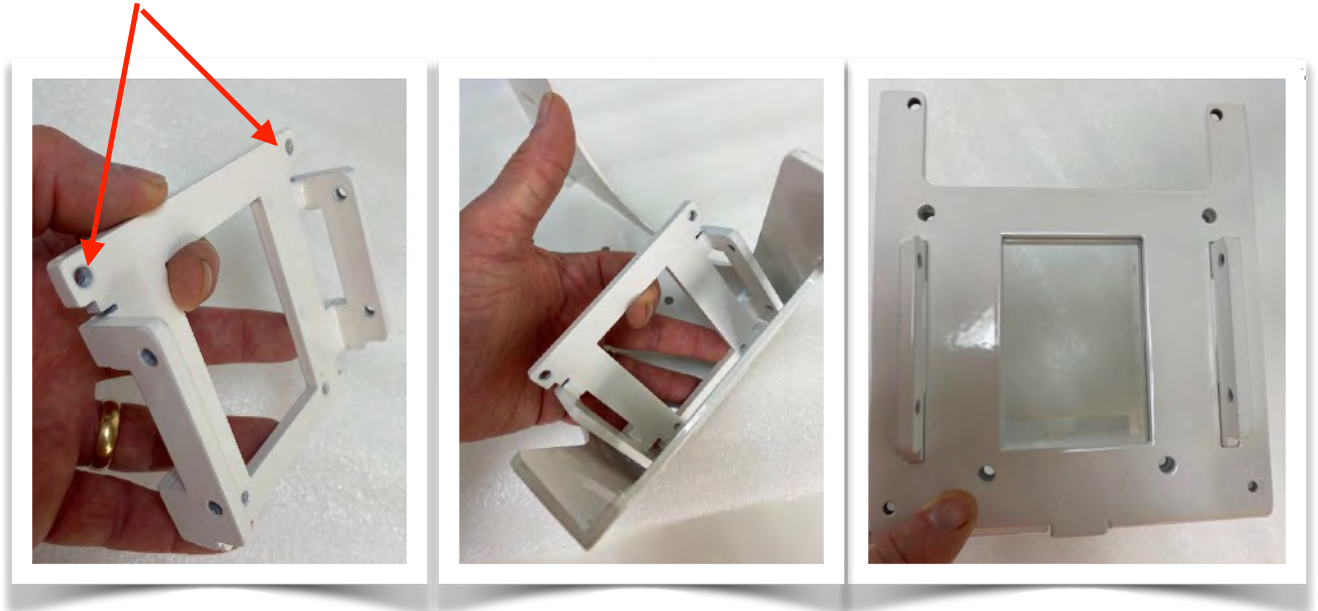


Step Two: Locate the tube cover bracket.

Step Three: Locate the hose support bracket and secure it to the top of the tube cover bracket using two screws.



Step Four: Locate the control panel support arm. Note how the holes should be confirmed when inserting this part through the tube cradle. This will already be attached unless you dismantled it.



Step Five: Before moving forward with the Tube Cover Assembly, add the tube and collimator.

Step Six: With the tube and collimator in place, attach the Tube Cover Bracket with the Hose Support Bracket attached using their screws.



Step Seven: Locate the Tube Cover Face Plate and install using two smaller screws at the top and two larger screws at the bottom.



Step Eight: Locate and add the Tube Cover Back Plate with the Face Plate using two screws.

You can now attach the HV Cables to the tube and feed them through to the top opening of the back and face plates. You will eventually be using the provided cable hose and Hose Holder to secure at the top.



This is the Hose and Hose Holder that contains the HV Cables.

Step Nine: Feed the control panel connector cable through the top face plate opening and through the face plate itself.



Step Ten: The control mounting bracket uses four button head 1.25 x 20 screws. Secure bracket to the back of the control panel. Not the open "hook" is on top.



Step Eleven: Feed the four black connector cables through the face plate and over the tube. Attach to their corresponding connections. Each connector is labeled.

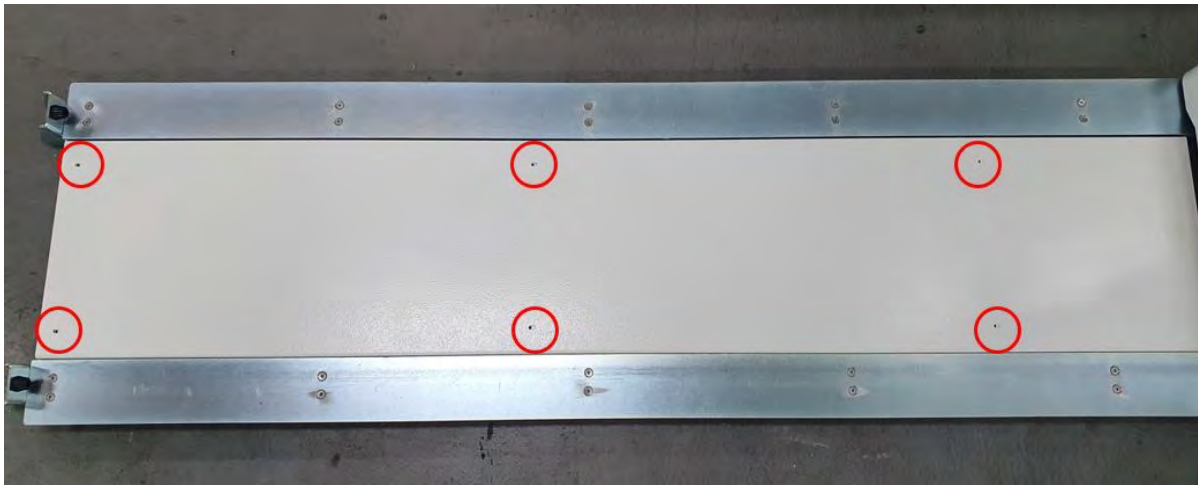


Step Twelve: Locate the two Neck Collar Plates. These are not marked and are universal so they can attach to either side of the Control Panel Mounting Bracket.



Rail Cover Installation

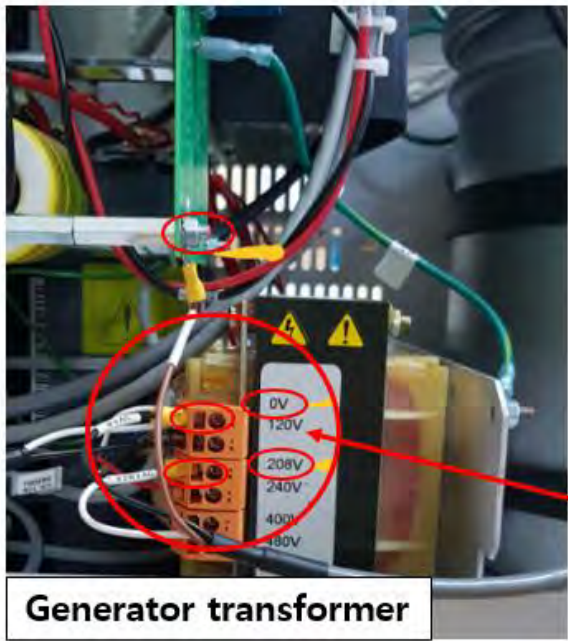
Please install rail cover like below picture.



4.7 Cable Components

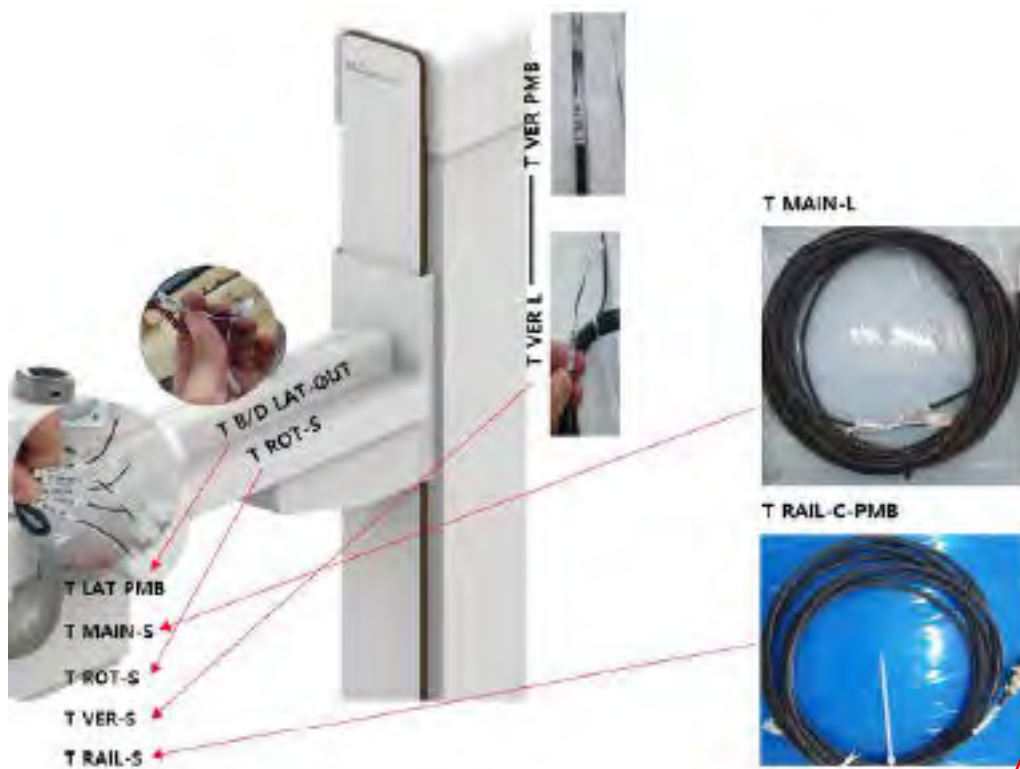
TBL MAIN (4way Table)	B MAIN (Wall Bucky stand)
	
T RAIL-C-PMB (Floor mounted Tube stand)	Tube Rotor&collimator power cable
	
T MAIN-L (OP Handle bar Power cable)	SMPS power cable
	

SMPS connection



SMPS Power cable	SMPS	Generator transformer
AC-L	L	208VAC
AC-N	N	0VAC
GND		GND

Tube stand cable connection



Connect the T MAIN-L cable to the SMPS.

24VDC / GND



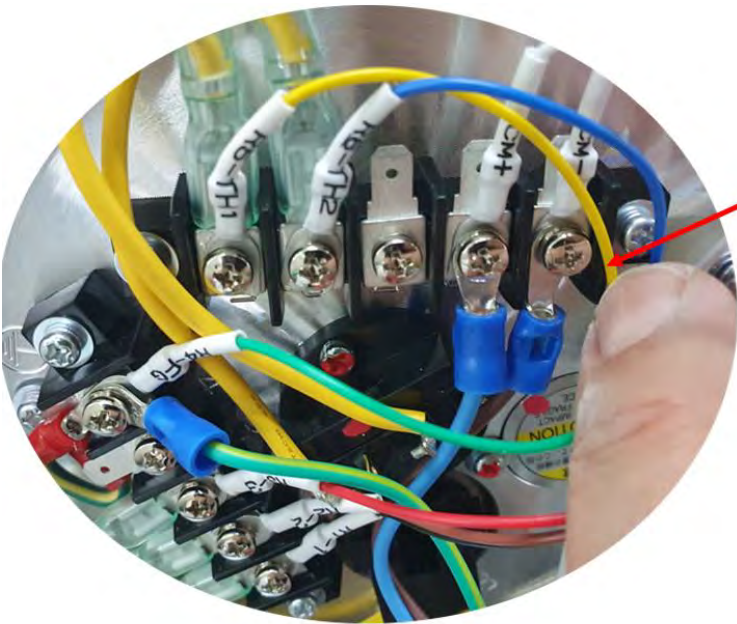
Tube rotor cable connection (CANNON E7239X Tube)



Tube	Tube Rotor cable
1	R1-1
2	R2-2
3	R3-3
E	R4-FG
5	R5-TH1
6	R6-TH2

Collimator power cable connection

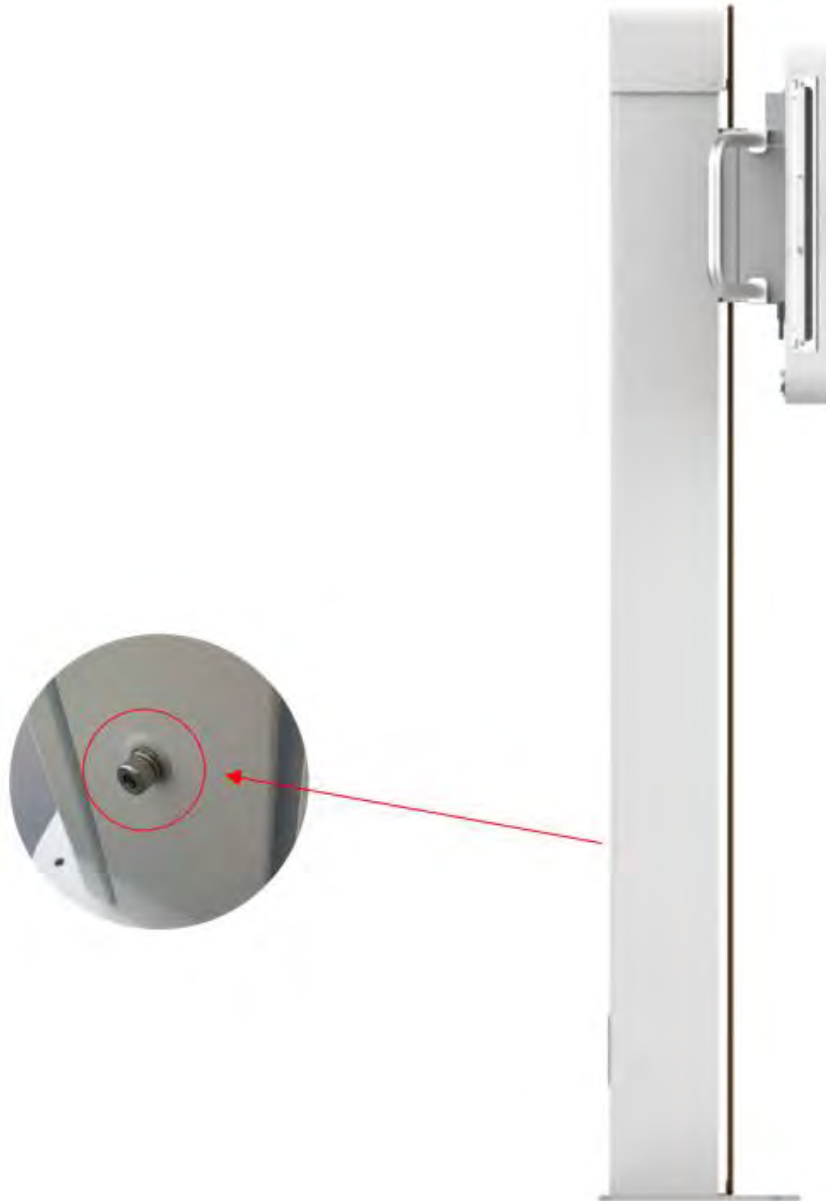
Connect the collimator power line as shown below.



Tube	Tube Rotor cable	Collimator
8	CM+	Blue
9	CM-	Brown
E	GND	GND

4.8 Wall Bucky stand installation

Remove the weight bolts.



Remove the weight bolt after moving the WALL STAND to the location where it will be installed.

Grid installation

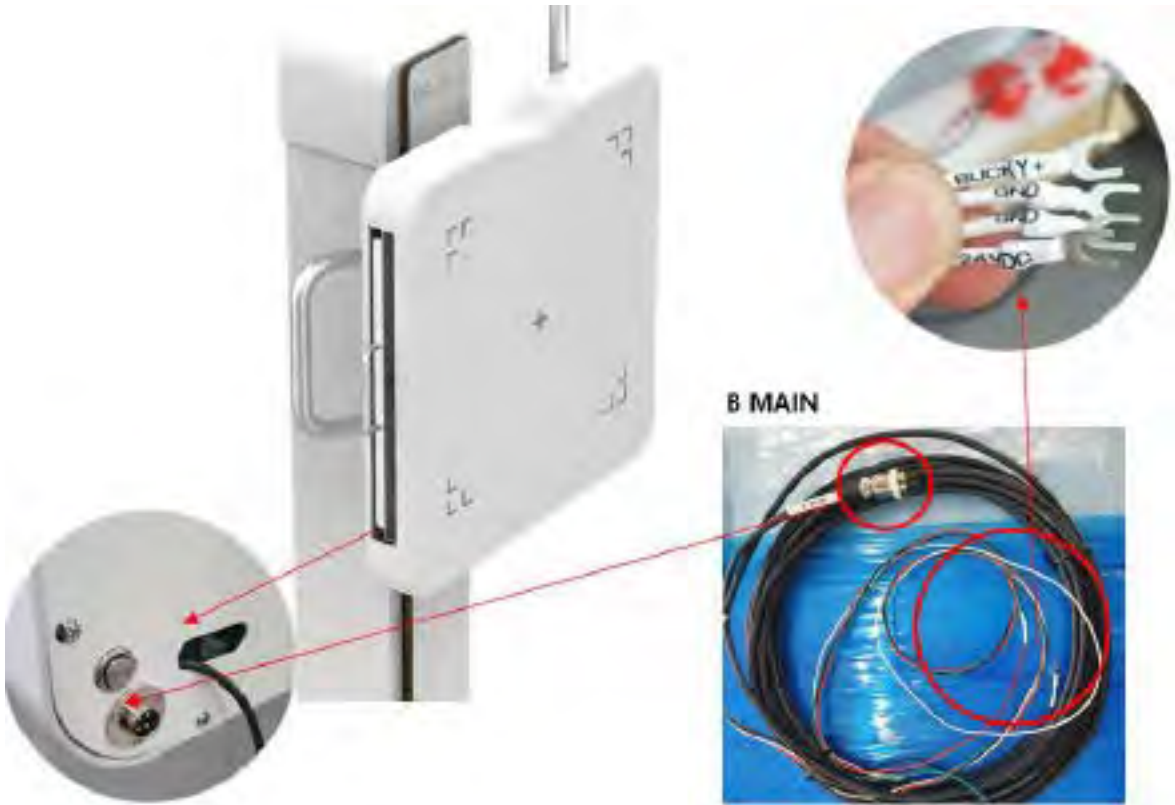
Remove the cover bolt.



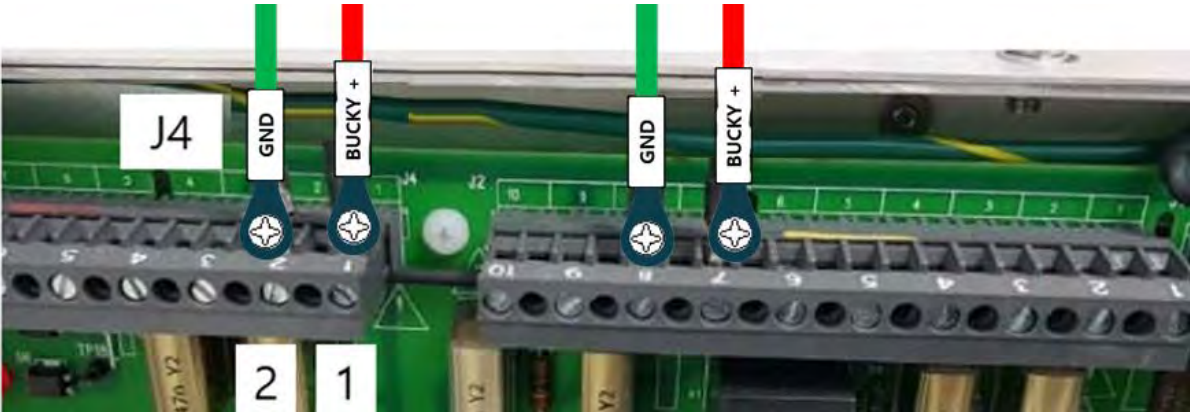
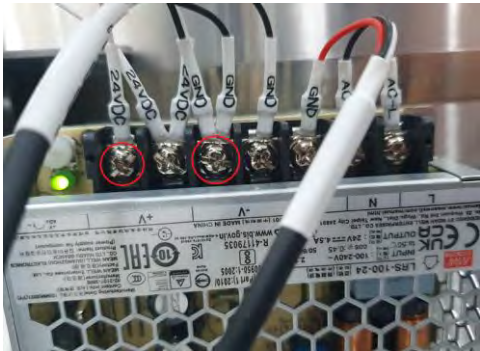
Assemble the grid by loosening the bolts.



Wall bucky stand cable connection



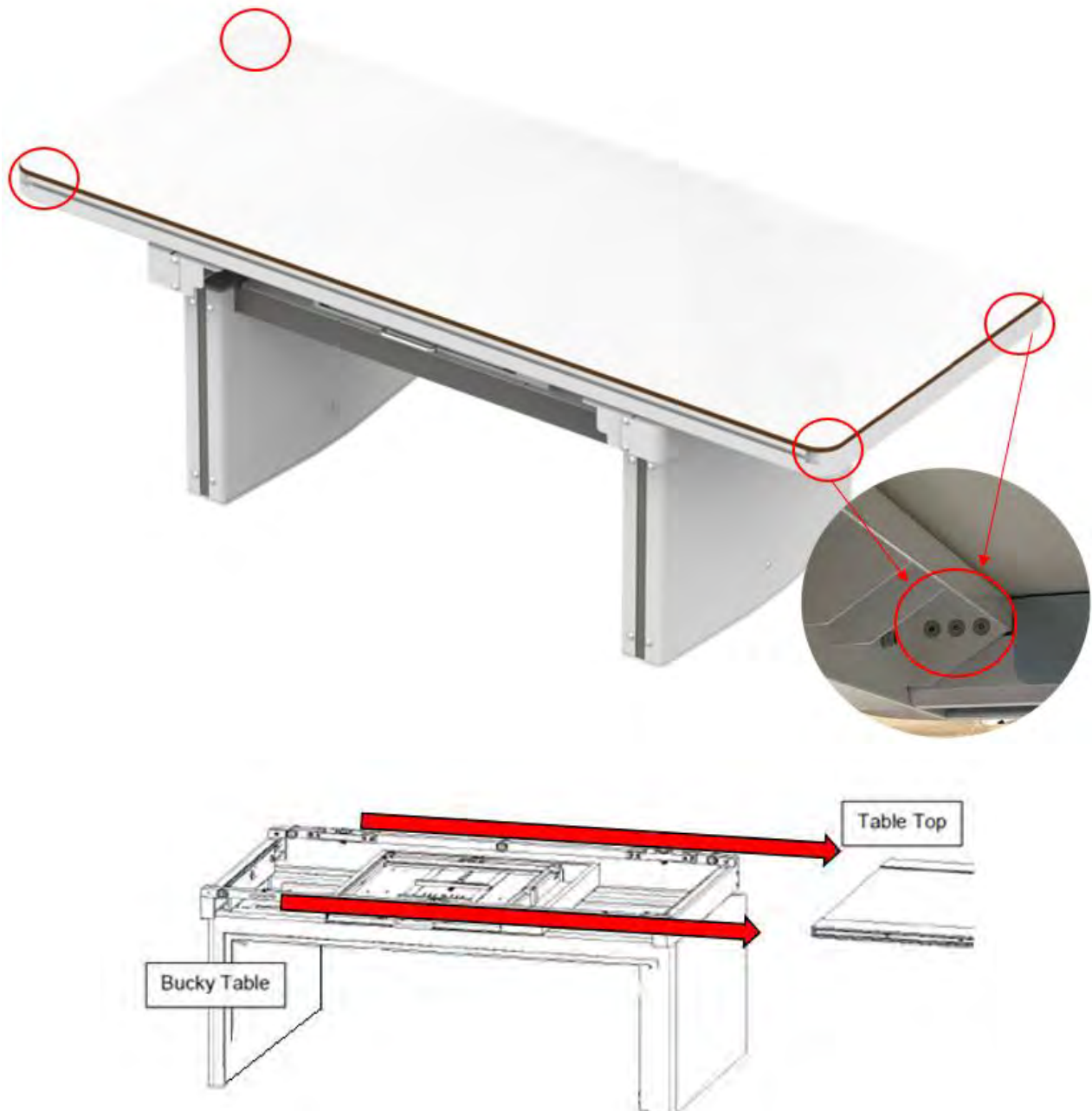
B MAIN Cable	Connect to
BUCKY+	Generator J4_1
GND	Generator J4_2
GND	SMPS
24VDC	SPMS



4.9 4 way table installation

Grid installation

Remove the stopper by loosening the bolt. Then slide the table top and remove it.



Assemble the grid by loosening the bolts.

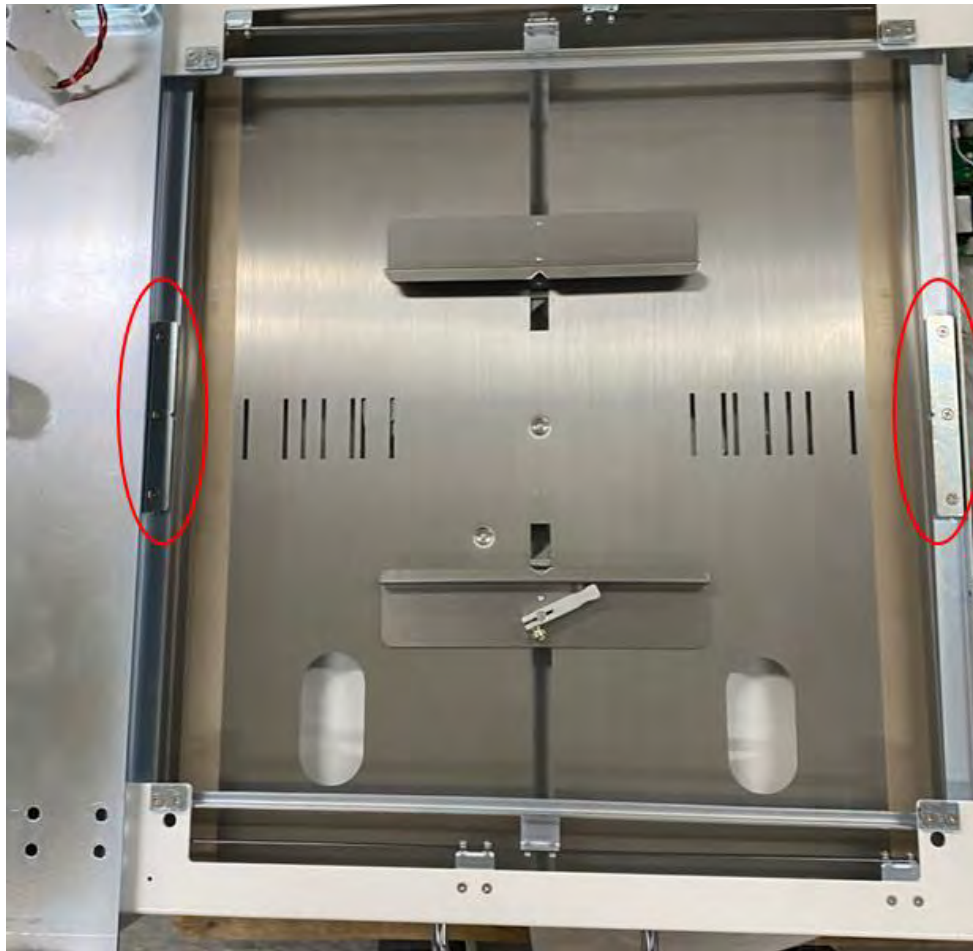
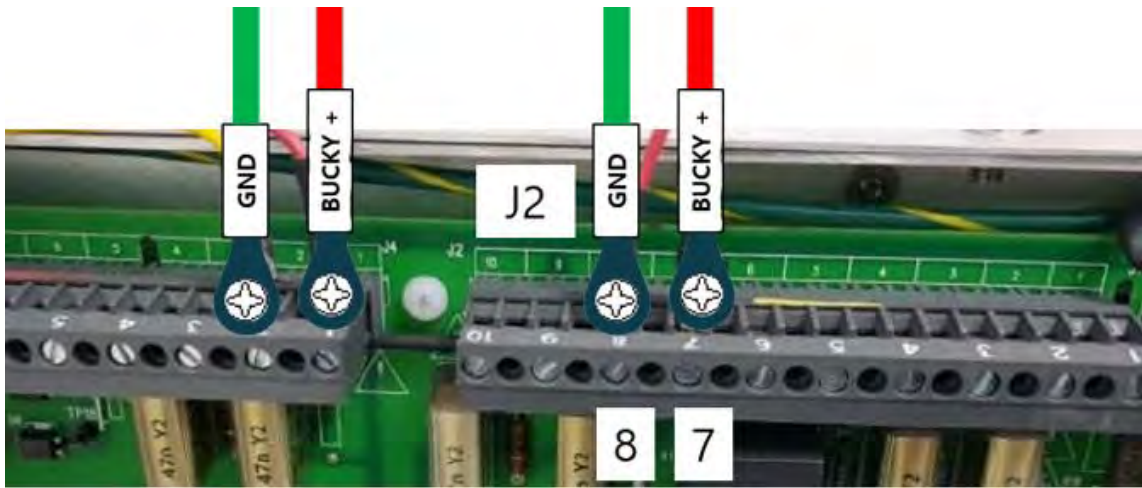
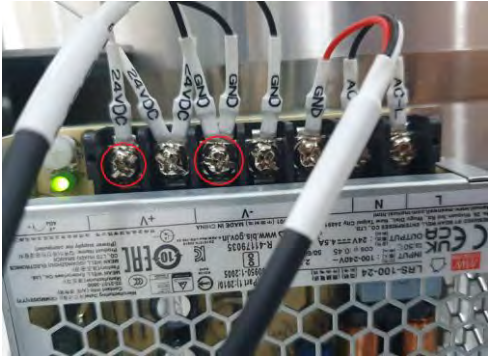


Table cable connection



TBL MAIN Cable	Connect to
BUCKY+	Generator J2_7
GND	Generator J2_8
GND	SMPS
24VDC	SPMS



5 INSTALLATION GENERATOR

5.1 Locating and Mounting the Generator

The generator cabinet is self-standing and does not need to be supported. The installation should meet with the following requirements:

- The application place must be flat and level;
- The region of installation must be clean and free of dirt or debris;
- Air circulation environment: cooling is primarily by conduction; therefore, room-temperature air must be free to circulate around the cabinet;
- Generator should close proximity to power distribution box. Cables should not be on the floor where they could be stepped on;
- Easy front and side access for service and installation, and sufficient clearance at the rear for room interface cables for generator. Figure 1-1 shows recommended clearances for generator;
- For the patient environment of the X-ray room, the generator should be located in a position that can't be touched by the patient.

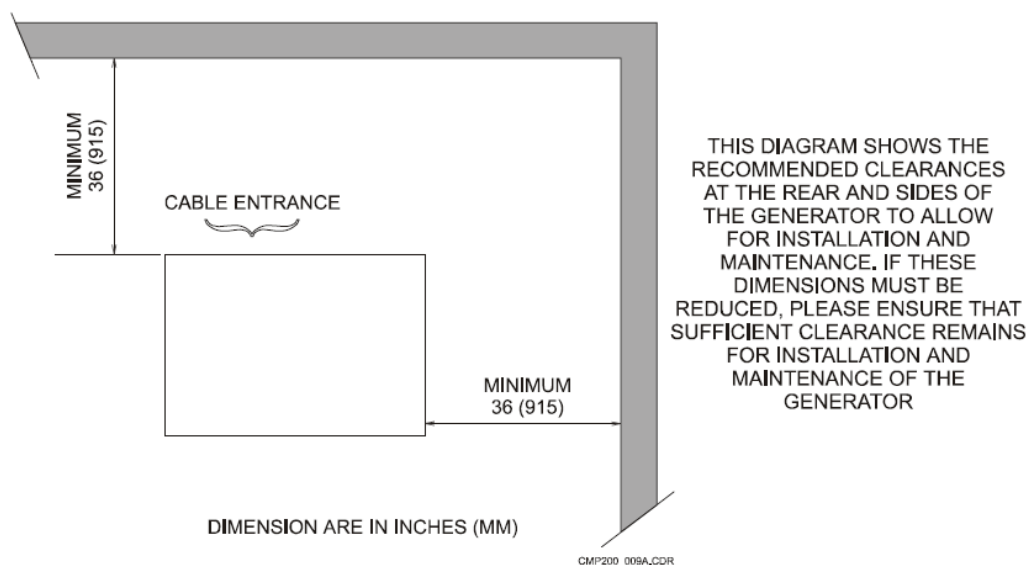


Figure 1-1 Generator Recommended Clearance

5.2 WIRING TO THE GENERATOR

Main AC Power Supply Connection

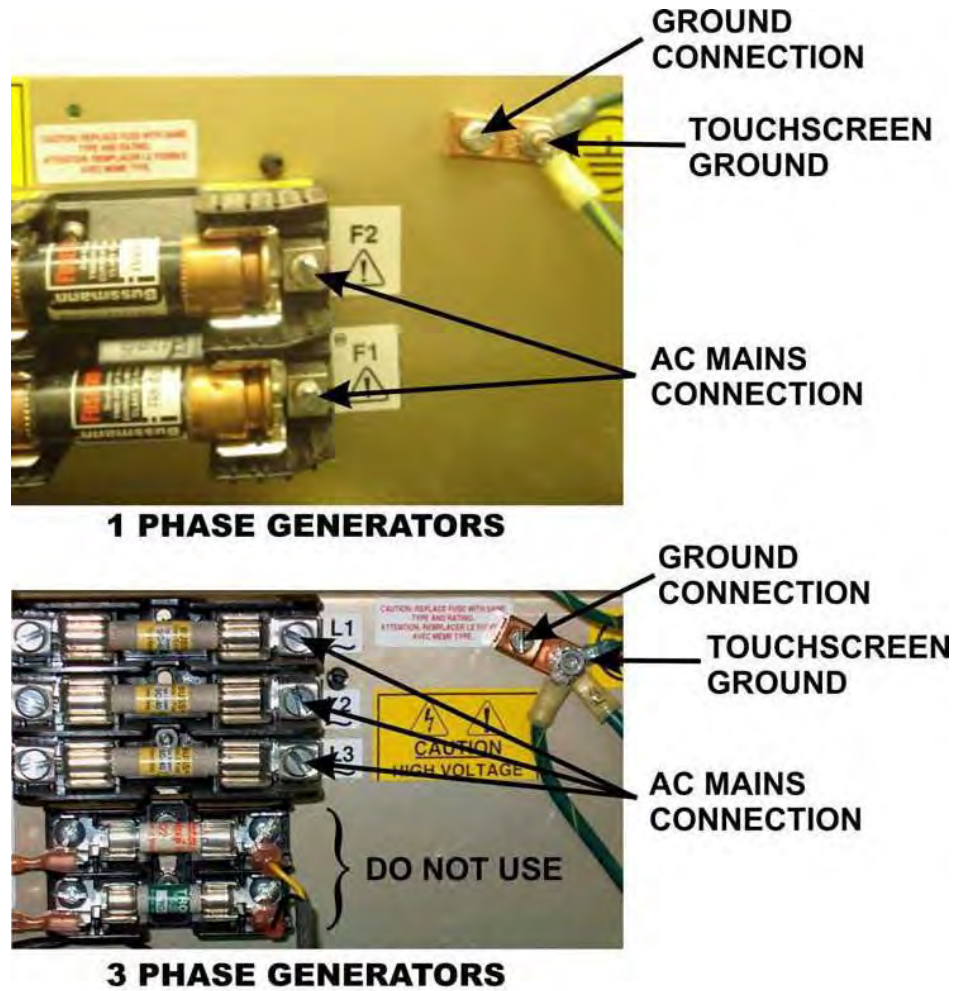


Figure 1-2 Generator mains connection

High Voltage Cables

1. Verify that the HT cable terminations are clean, in good condition, and coated with vapor proof compound.
2. Remove the dust caps that cover the high voltage terminals on the HT tank.
3. Connect the anode and cathode cables to the HT tank. Ensure that the cables are plugged into the proper connectors on the HT tank. Refer to figure 1-3.
4. Be sure that the HT cable connectors are tight and there is no play between the connector insulator and the screw-down ring.

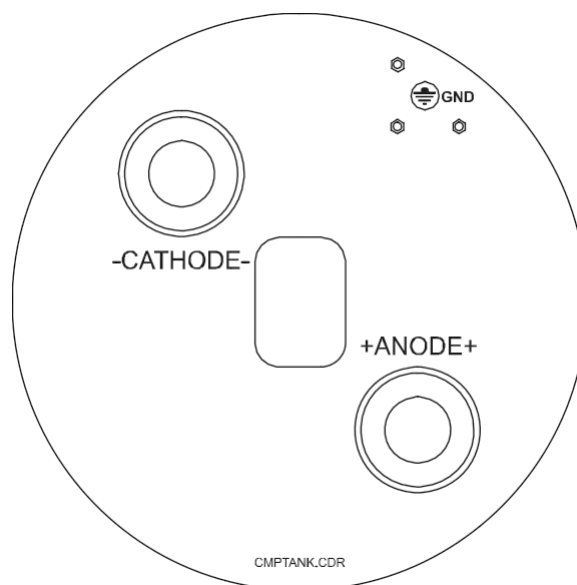


Figure 1-3 HV connector identification

Communication Cable Connection

Membrane Console

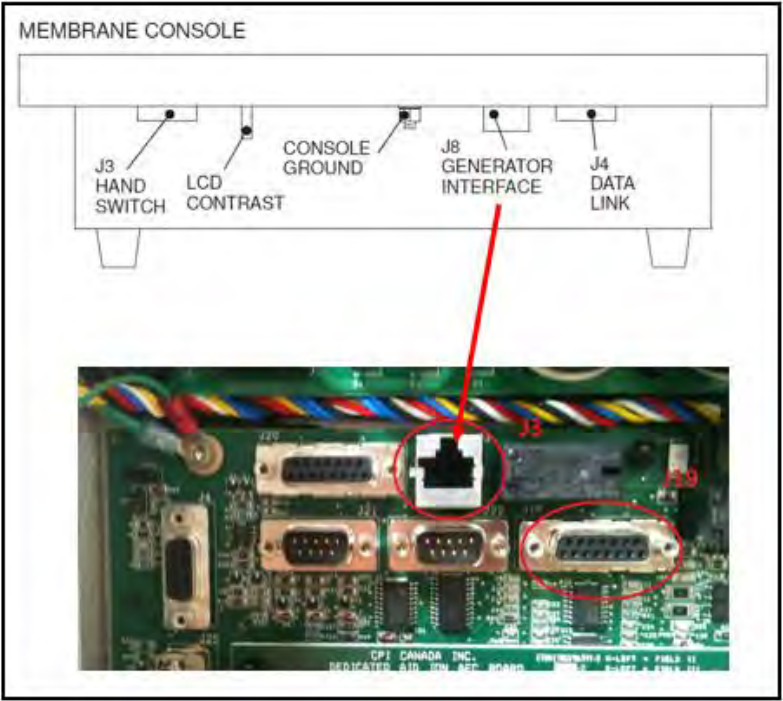


Figure 1-4 Membrane Console Connection

Mini Console

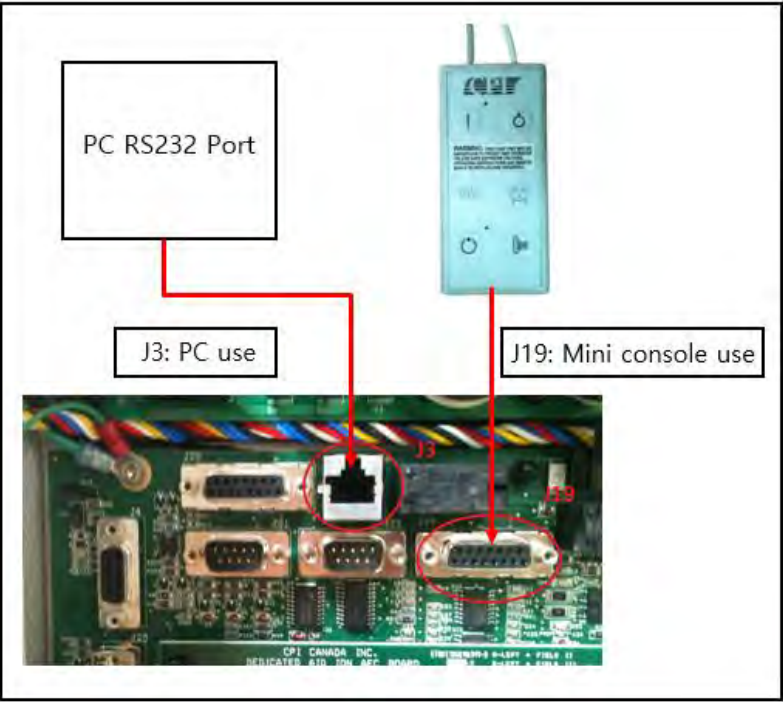


Figure 1-5 Mini Console Connection

Tube Rotor cable connection

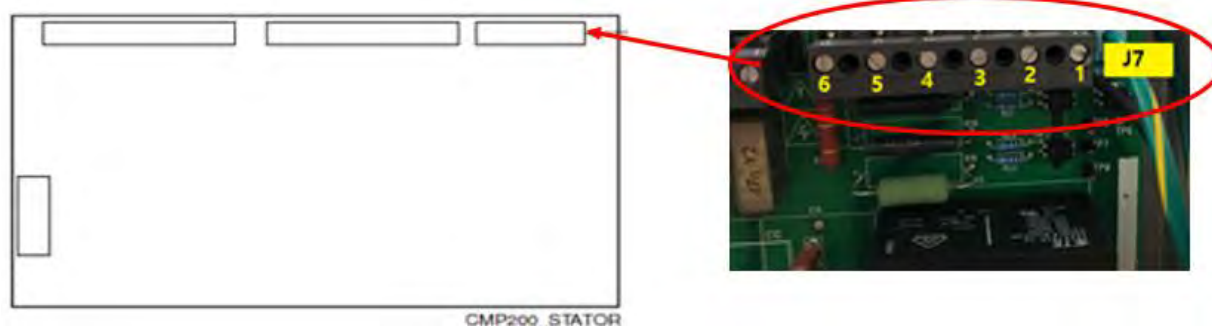
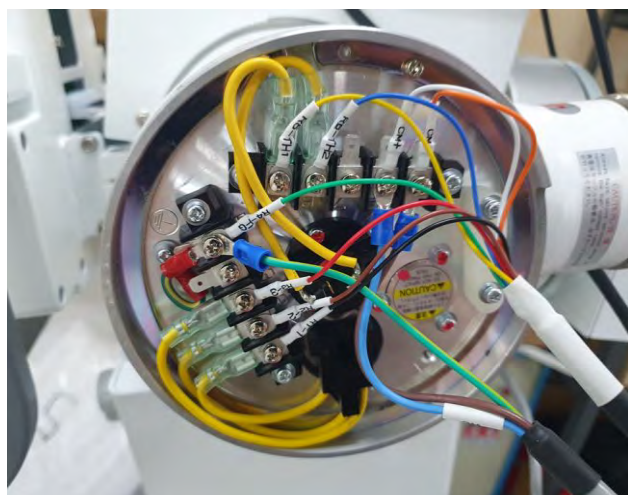


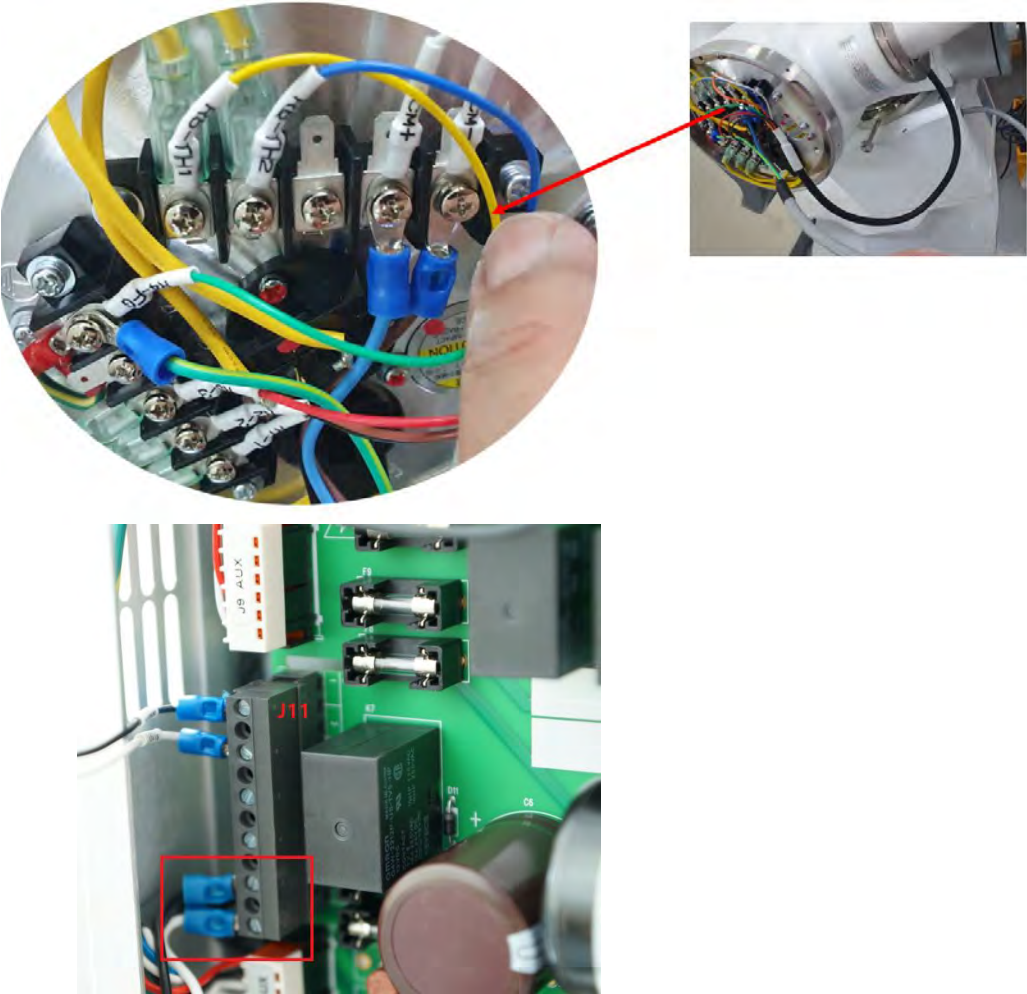
Figure 1-6 Tube / thermal switch connections on H.V. auxiliary board (low speed starter)

CANON E7239X Tube



FUNCTION	TUBE	Rotor cable	GENERATOR CONNECT TO
COMMON	1	R1-1	J7-4
MAIN	2	R2-2	J7-5
SHIFT	3	R3-3	J7-6
GROUND	E	R4-FG	J7-3
THERMAL SWITCH	5	R5-TH1	J7-1
THERMAL SWITCH	6	R6-TH2	J7-2

Collimator Cable Connection



FUNCTION	GENERATOR CONNECT TO
24VAC	J11-5&6

H.V. AUXILIARY BOARD JUMPERS

Remove the connected jumper cable.
If the jumper cables listed below are connected to the board, remove them. Bucky power is not used.

BUCKY OUTPUT	H.V. AUXILIARY BOARD JUMPERS
24VDC	E11-E5
110VAC	E9-E5

Warning
Be sure to remove the connected jumper cable.

5.3 Control Console set

Membrane Console

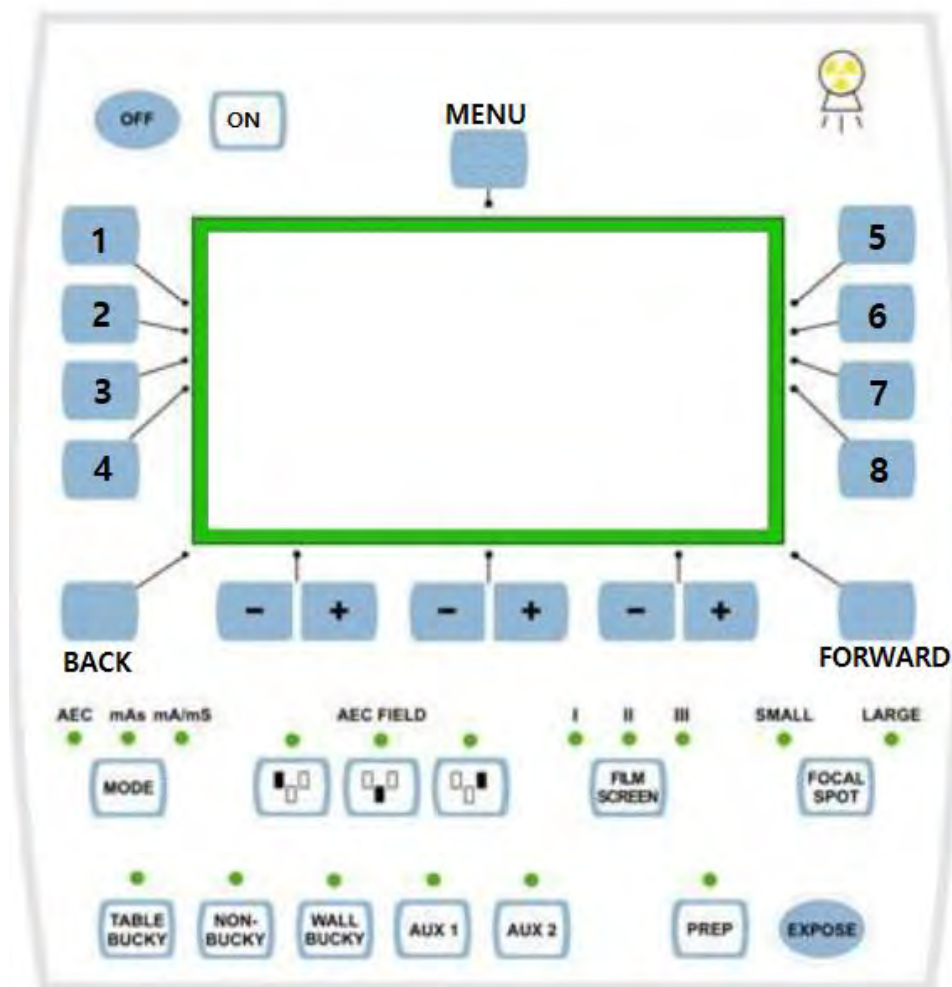


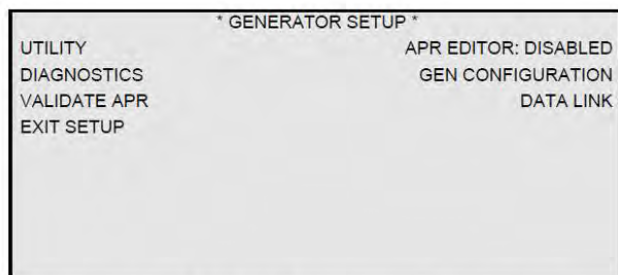
Figure 1-6 Programming / calibration mode reference

Use these step to access the GENERATOR SETUP menu (membrane console)

Step	Action(membrane console)
1	Start with the generator switched OFF
2	While pressing and holding the MENU button, press the power ON button on the console.
3	Enter the password by pressing the button sequence: [1]-[8]-[4]-[5] .
4	The GENERATOR SETUP menu will be displayed next.

To enter the SETUP mode

1. Select the GEN CONFIGURATION.

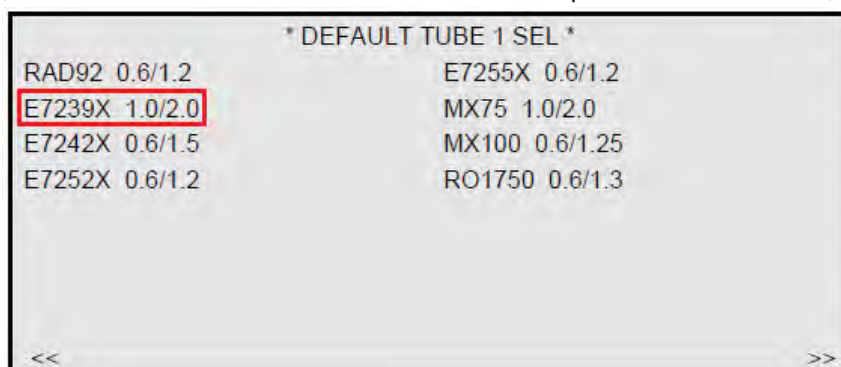


GEN CONFIGURATION

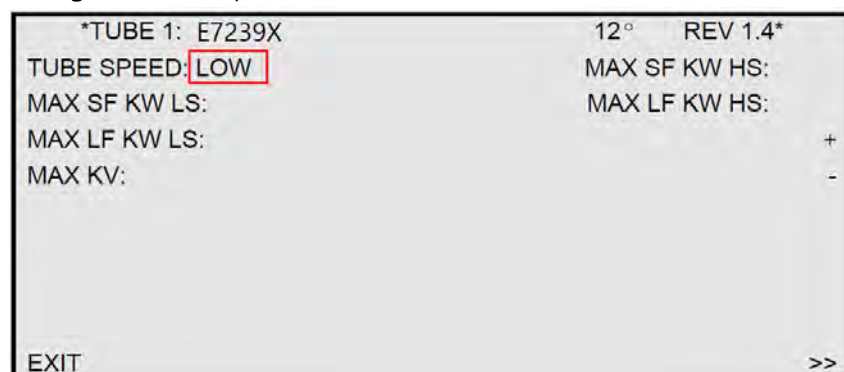
- | | |
|----------------------------|--------------------------------------|
| • TUBE SELECTION | • Tube Setup utility. |
| • GENERATOR LIMITS | • Generator Limits Setup utility. |
| • RECEPTOR SETUP | • Receptor Setup utility. |
| • I/O CONFIGURATION | • Receptor Setup utility. |
| • AEC SETUP | • AEC Setup and Calibration utility. |
| • AEC CALIBRATION | • AEC Setup and Calibration utility. |

2. TUBE SELECTION

(Please check the model name of the installed product and select it.)

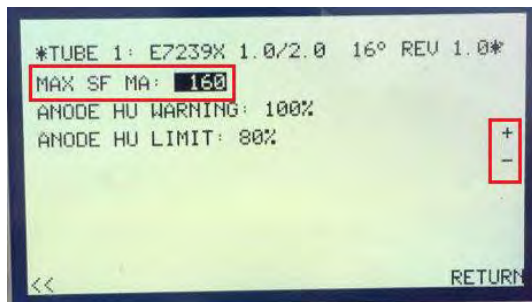


Change the tube speed to LOW.

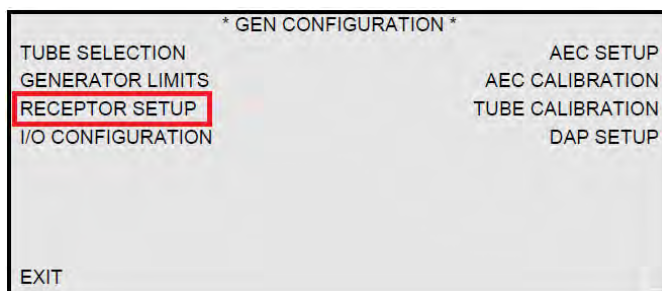


MAX SF MA

Sets the maximum mA in small focus. This should be set as low as possible to prevent focal spot track wear and focal spot blooming.

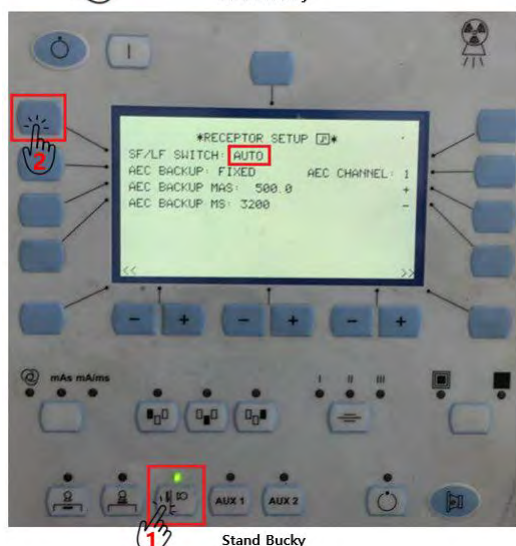
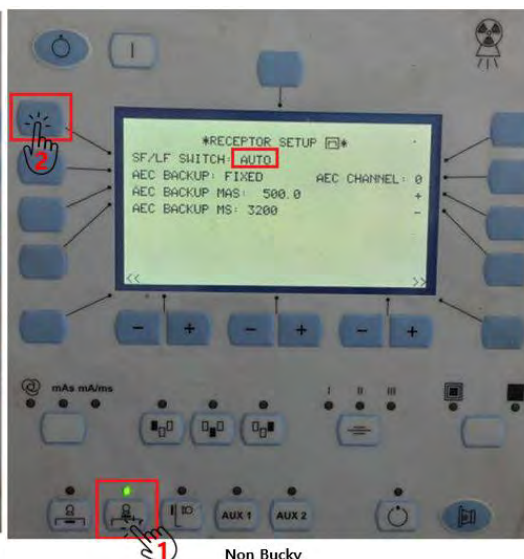
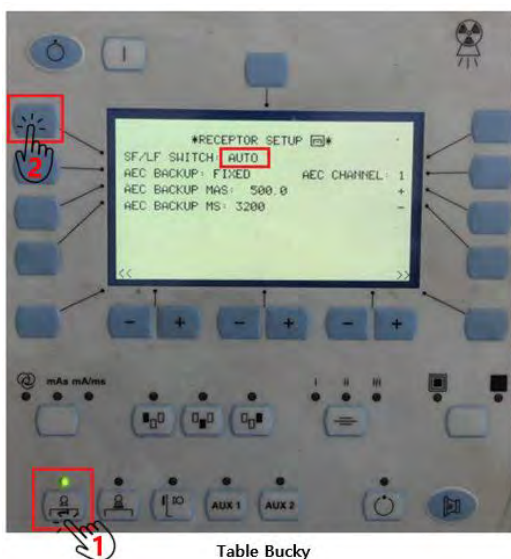


3. RECEPTOR SETUP

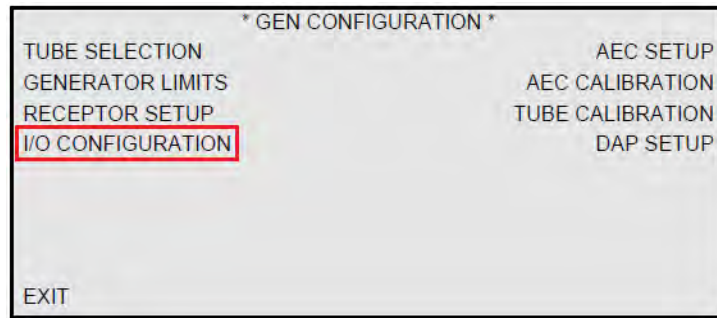


SF/LF SWITCH : AUTO

Small or large focus will automatically be selected by the generator.



Select the I/O CONFIGURATION



Select the Table Bucky

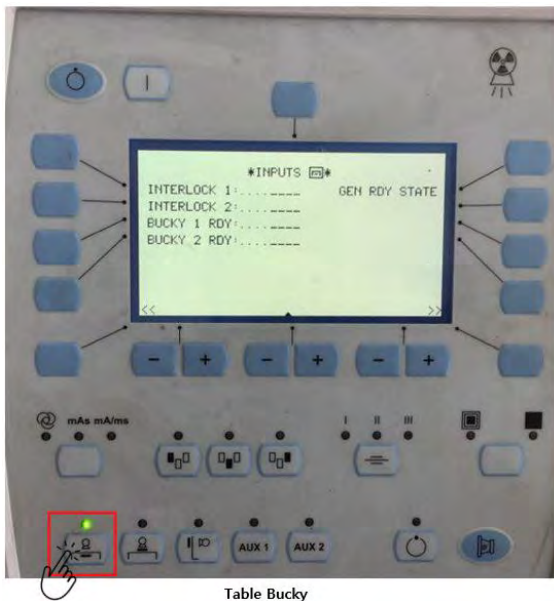


Table Bucky (Bucky 1) Setup the INPUTS

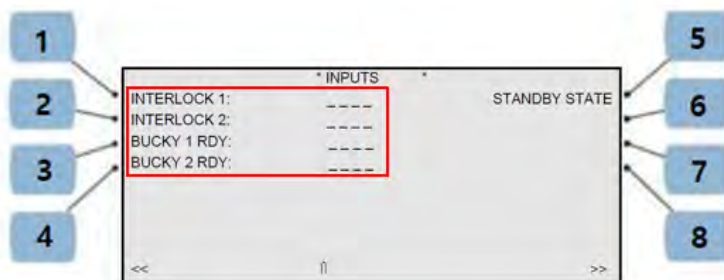
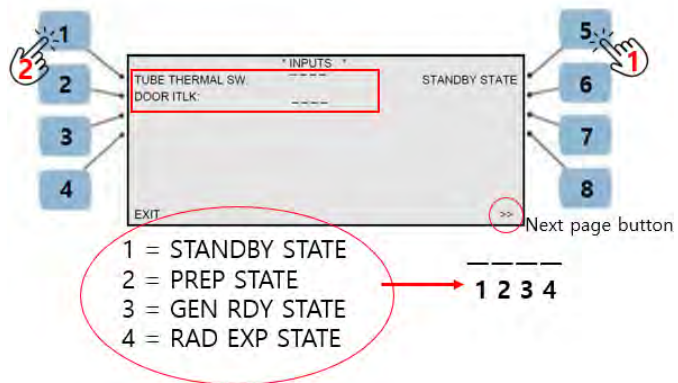
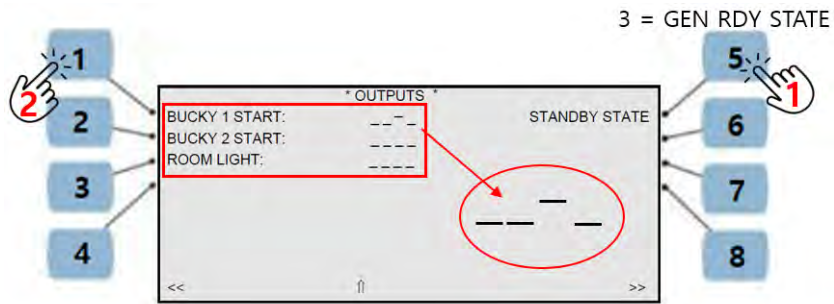
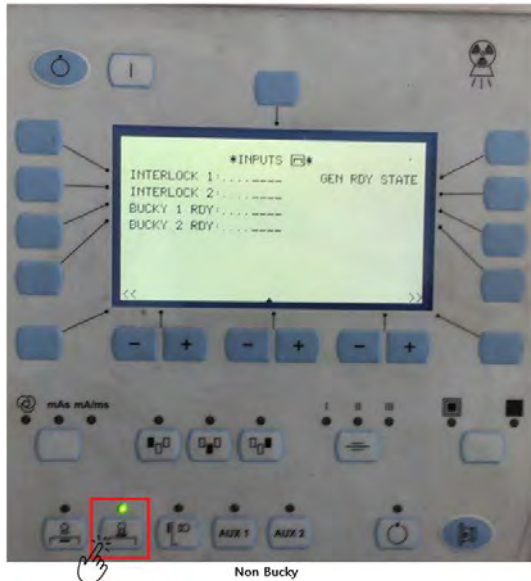


Table Bucky (Bucky 1) Setup the OUTPUTS



Select the Non Bucky



Non Bucky Setup the INPUTS

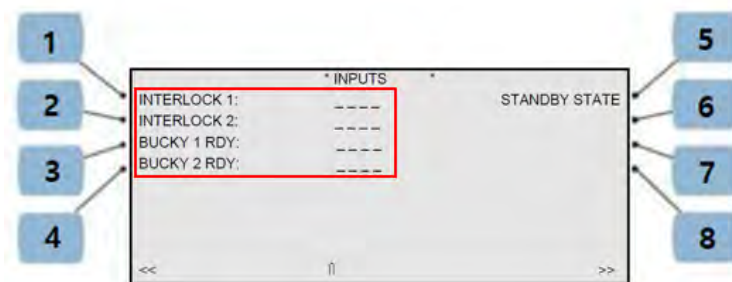
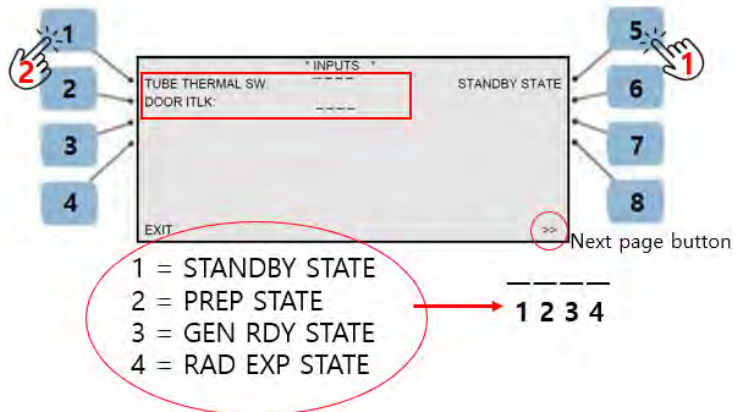
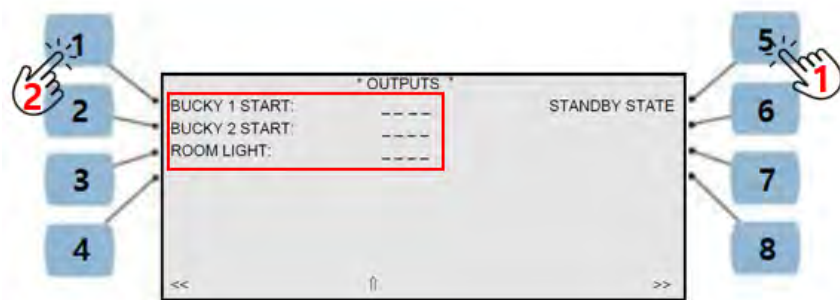
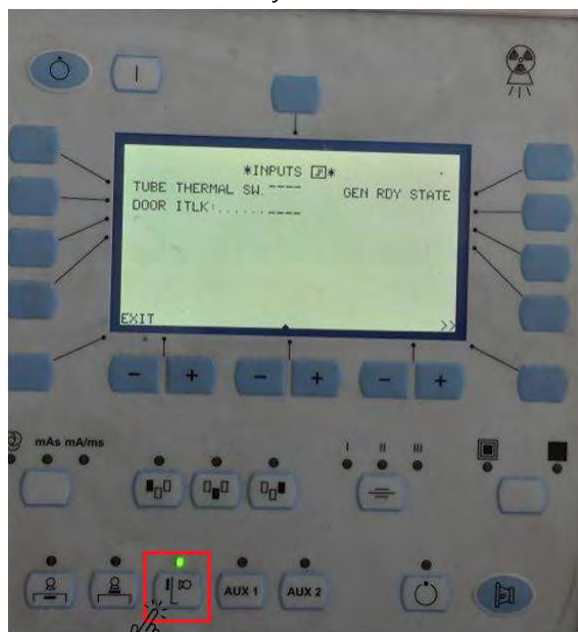


Table Bucky (Non Bucky) Setup the OUTPUTS

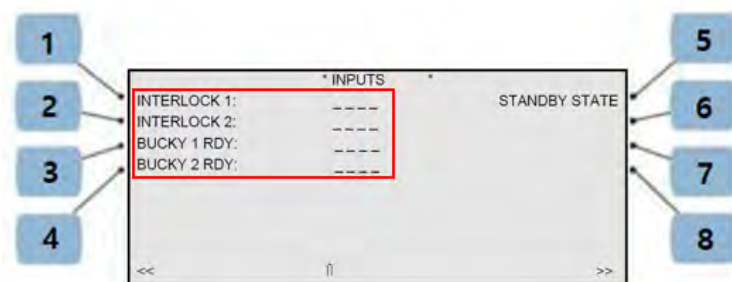
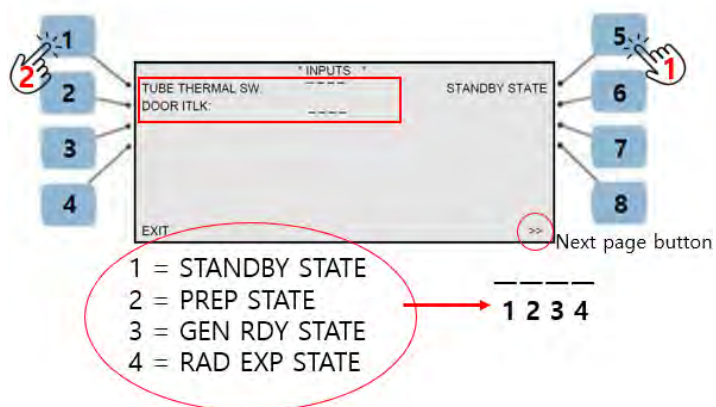


Select the Stand Bucky

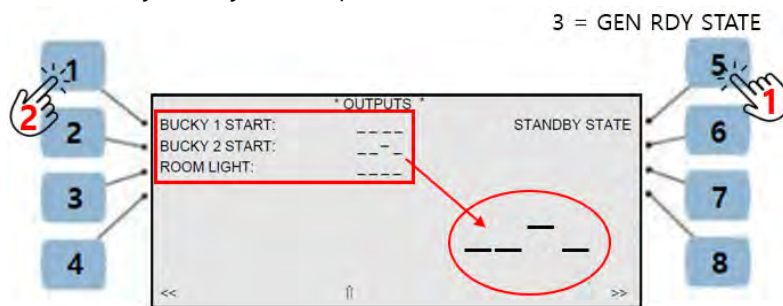


Stand Bucky

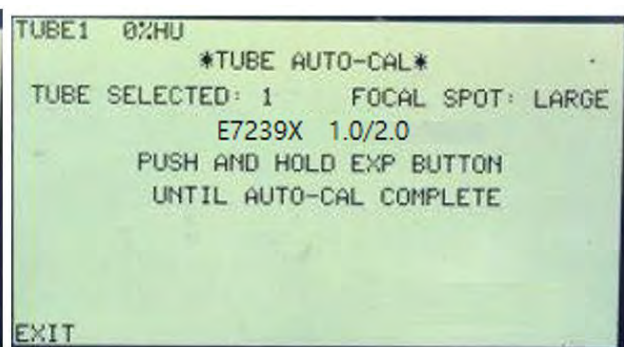
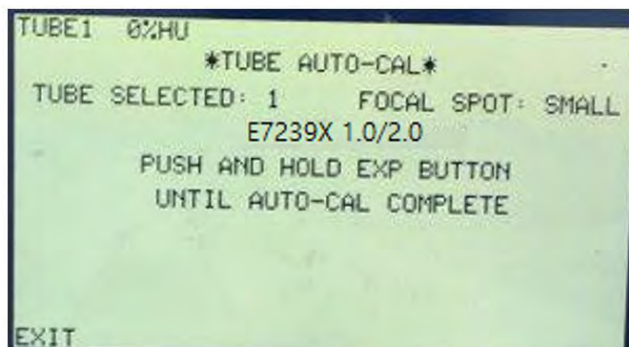
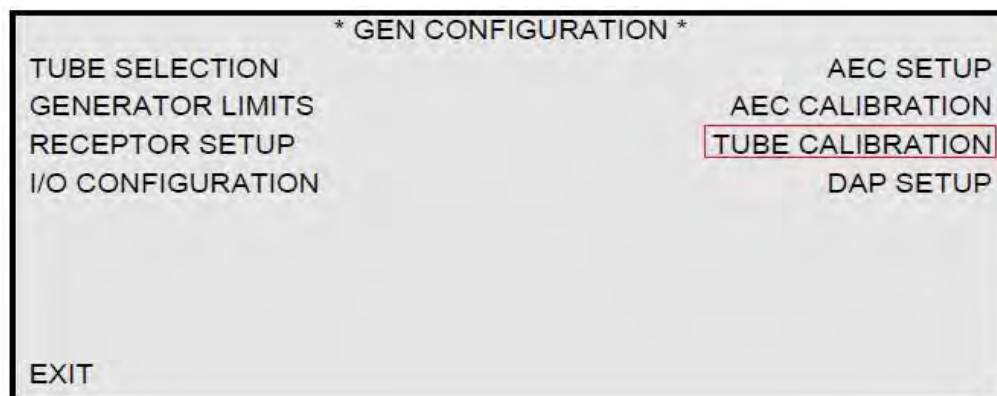
Stand Bucky (Bucky 2) Setup the INPUTS



Stand Bucky (Bucky 2) Setup the OUTPUTS



5.4 Tube calibration



- Make sure the tube model name is correct and start the calibration.
- After selecting the focus is small calibration.
- Calibration is complete you see the message, Push the hand switch.
- Calibrated the same way is a large focus.



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