Veterinary Radiographic System

Table/Structure
Installation and Service Manual

07188

REV. F

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Installation and Service Manual Revisions History

Revision	Pages Affected/Revision Description	Release Date	ECR#
A	Initial Issue	May 2015	8684
B	Revised Sec. 2.3.2 and Sec. 3 instructions to include reference for 4-way Floating Tabletops	Dec. 2015	8918
C	Updated address to Niles, IL	July, 2017	9607
D	Updated: Section 3 (first paragraph) and 5.3 (item 8); Sections 2.4 (item 2), 2.5 (item 4), and 4.3	February, 2021	10705
E	Revised many manual sections and added grounding instructions	August, 2022	11038
F	Added receptor cabinet ground cable instructions in section 2.3	January, 2023	11152

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1. PRE-INSTALLATION

1.1 General

This manual contains installation, calibration, and service information for the Veterinary Radiographic System. It does not contain information on all equipment included with the system (for example the collimator and x-ray tube). Please refer to the documentation included with those components during installation.

1.2 Definition of Symbols

Symbol Legends	
Symbol	**Definition**
	NOTE This symbol represents Information that assists the user of the manual in the performance of a task. It may provide the user with better methods of conducting the task, or it may point out conditions that could cause the system to fail to operate properly.
 CAUTION	Points out special procedures or precautions that personnel must follow to avoid equipment damage.
 WARNING	Identifies situations or actions that may affect patient or user safety. Disregarding a warning could result in patient or user injury.
	This symbol indicates an Electro Sensitive Device is present which must be carefully handled to prevent damage to the device.
	ELECTRIC SHOCK HAZARD WARNING This symbol indicates an electric shock hazard.
	DANGEROUS VOLTAGE This symbol indicates hazards arising from dangerous voltages.
	DIRECT CURRENT This symbol indicates a direct current source.
	PROTECTIVE EARTH TERMINATIONS This symbol indicates protective earth terminations in device.
	Date of manufacture
	Manufacturer
	Serial Number
	Reference Number (Model/Part Number)
	Keep Dry
	TYPE B APPLIED PART This symbol indicates equipment providing a particular degree of protection against electric shock, particularly regarding allowable leakage currents and reliability of the protective earth connection (if present).
	Safety Label

1.3 Safety

1.3.1 Service and Operation

CAUTION

THIS MANUAL IS FOR USE BY PERSONNEL QUALIFIED TO INSTALL, CALIBRATE, MAINTAIN, AND SERVICE RADIOGRAPHIC EQUIPMENT

Only qualified personnel should install, set up, maintain, and operate this equipment. A user manual is included with the system. Familiarize all operators with how to use the system properly. Only qualified service personnel should remove electrical covers.
The manufacturer does not accept responsibility for any of the following:

- Equipment improperly installed, operated, maintained, or repaired
- Equipment which has been modified in any way
- Harm to patient or other personnel for any of the above causes

WARNING

X-RAY EQUIPMENT CAN BE DANGEROUS TO BOTH PATIENT AND OPERATOR UNLESS MEASURES OF PROTECTION ARE STRICTLY OBSERVED

All operators of this equipment should be familiar with regulations and recommendations of industry authorities.
These can include:

- State Department of Health
- Code of Federal Regulations (21 CFR subchapter J Radiological Health)
- National Council on Radiation Protection and Measurements (NCRP 33 or successor)
- International Commission on Radiological Protection (ICRP 26 or successor)

1.3.2 Radiation Protection

WARNING

X-RAYS ARE DANGEROUS TO OPERATOR, PATIENT, AND OTHERS IN THE AREA UNLESS ESTABLISHED SAFE EXPOSURE PROCEDURES ARE STRICTLY OBSERVED.

Useful and scattered x-ray beams can produce bodily harm. Adequate precautions must always be taken to avoid exposure to the primary beam, leakage radiation from the source housing, and scattered radiation (resulting from the passage of radiation through matter).

The operator assumes sole responsibility for radiation safety. Those working in the immediate area must protect themselves with lead shielding. These items include but are not limited to goggles, thyroid shield, apron, and gloves with a lead equivalency of not less than 0.5 mm.
The best safety rule for x-ray operators:

Avoid exposure to the primary beam at all times

All operators of this equipment are to comply with regulations and recommendations of industry authorities (see list, previous section).

The manufacturer, its agents, and representatives do not accept any responsibility for overexposure of patients or personnel to x-ray radiation, including that which is the result of poor operating techniques or procedures.

1.3.3 Monitoring of Personnel

Monitoring of personnel to determine the amount of radiation to which they have been exposed provides valuable feedback on the effectiveness of radiation safety measures.

A common monitoring method is the use of individual film dosimeters which are worn by personnel at all times in areas of potential radiation exposure. The badges are then collected at regular intervals and sent out for processing and reporting.

1.3.4 Electrical

WARNING

LETHAL VOLTAGES PRESENT INSIDE EQUIPMENT

Only properly trained and qualified personnel shall access any internal parts of the x-ray system. Live electrical terminals may be deadly. Make sure line disconnect switches are opened and other appropriate precautions are taken before opening access doors, removing enclosure panels, or attaching accessories.

Disconnect the main and auxiliary power supplies to the generator before removing the high voltage cables (from the x-ray tube or high voltage transformer) or cover(s) from the generator. If high voltage cables must be disconnected, ground immediately to dissipate residual electrical charge that may remain on the cables or tube.

1.3.5 Mechanical

WARNING

INTERNAL PINCH HAZARD

Exercise extreme caution when servicing the internal components of the column. The vertical slide and counterweight move in opposite directions, posing an extreme threat. Keep extremities away while moving the x-ray head up or down with the rear covers off.

1.4 Space Requirements

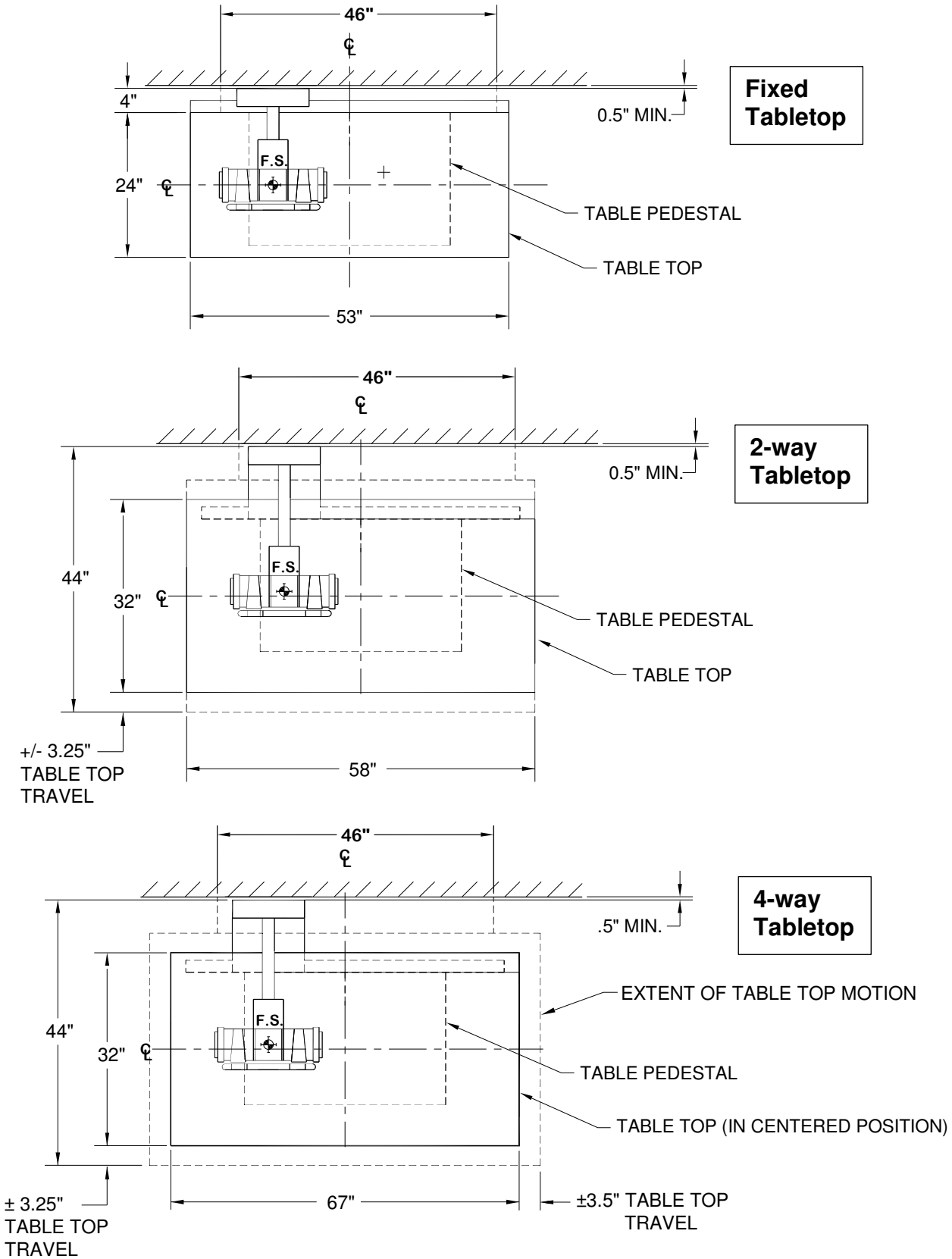

Figure 1: Space Requirements

1.5 Preliminary Room Inspection

Prior to beginning installation, inspect the x-ray room to verify compliance with specifications for the following:

- Incoming Line
- Service Disconnect
- Lead Shielding per local code
- Conduit
- Space Requirements

1.6 Unpacking

All freight is shipped FOB from the factory. It is the installer's responsibility to inspect all shipping containers for proper count and signs of damage. If carton damage is found, inspect for merchandise damage immediately. If found, notify the carrier or their agent immediately.

If there is hidden damage to the merchandise, it is the installer's responsibility to report that damage within a reasonable amount of time and contact the shipping company to make a claim. Order replacement parts if necessary.

The column ships packed in its own box, strapped to the top of the table. Find the upper/tube arm assembly, x-ray tube, and collimator packed inside the table.

Remove the screws indicated in the following figures to detach the table from the skid.

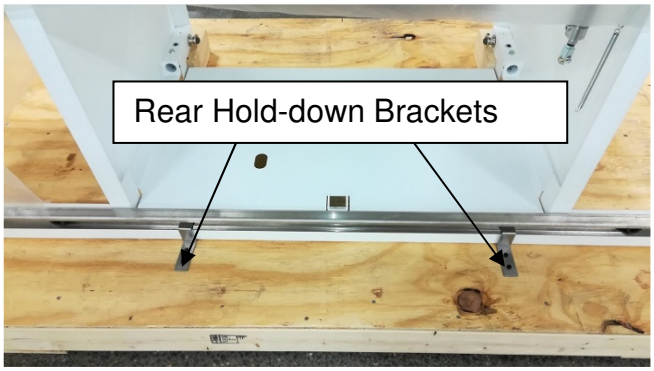

Figure 2: Table Rear Attachment to Skid

Figure 3: Table Front Attachment to Skid

2 MECHANICAL ASSEMBLY

2.1 Table Feet and Leveling

Locate and install the five table feet. The two 4" feet are for the front corners and the three 1" feet are for the rear rail. Red and blue U-shaped plastic spacers are included with the table kit. If leveling requires a gap between the foot and the table structure, insert a spacer and tighten the foot against the spacer to prevent table base motion.

Position the table close to its final location, using the leveling feet and spacers to bring the table close to level at this time. Final leveling can be done at end of assembly.

2.2 Column Installation

The assembly sequence is different for fixed and floating tabletops. For both types, the **column must be installed from the left side of the table**.
For float top tables skip to section 2.2.2.

2.2.1 Fixed-Top Table

1. Remove the column travel stop from the left side of lower rear rail. See photo below.

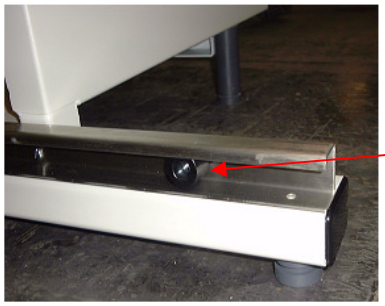

Figure 4: Lower Rail and Left End Stop

2. Position the column so that it is in line with the lower rail.
3. Carefully tilt the column away from the table and shift it until the closer tubestand bearing can be pushed into the lower rail. Now straighten the tubestand and engage the upper bearing. Continue to lift and push to completely engage all the bearings to the upper and lower tracks. See figure below.

Figure 5: Mounting Tubestand to Lower Rail

4. Reinstall the column travel stop to the lower rail.

WARNING

FAILURE TO REINSTALL THE TRAVEL STOP COULD RESULT IN DISENGAGEMENT OF THE COLUMN ASSEMBLY FROM THE TABLE, LEADING TO DAMAGE AND/OR INJURY.

2.2.2 Float Top Table

**Refer to photos in section 2.2.1 as necessary*

1. Remove front cover from the bearing carriage by removing the six Philips cover screws.
2. Mount the bearing carriage to the column using six ¼" hex screws.
3. Mount the caster assembly to the bottom of the column using two #10-32x3/8 screws.
4. Replace the cover that was removed in step one.

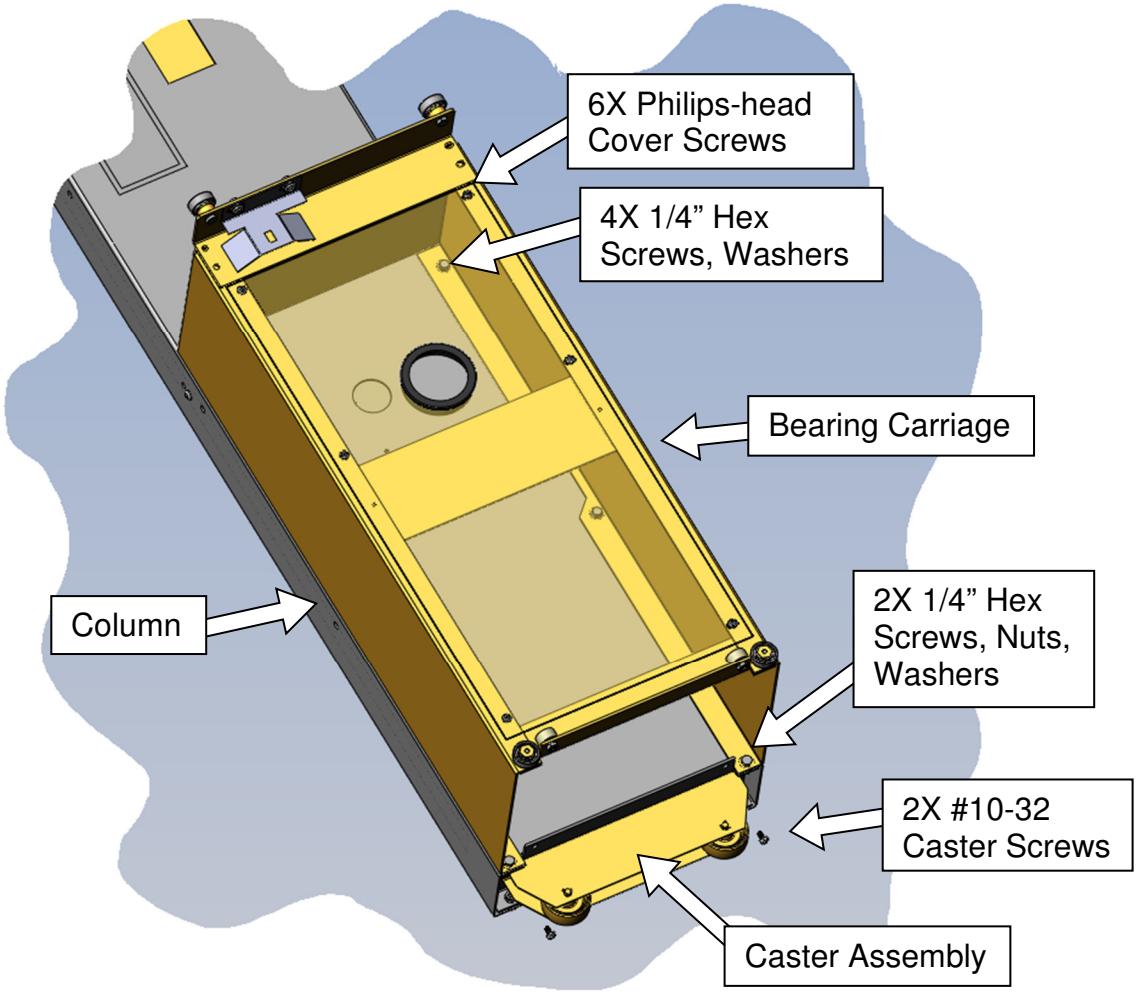

Figure 6: Bearing Carriage Assembly

5. If present, remove the front rail cover from the left side of the table as shown in Figure 7 below.

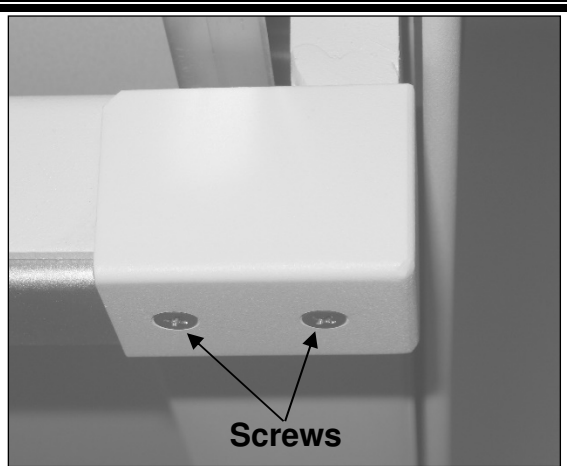

Figure 7: Front Rail Cover

6. Manually release the left and right transverse lock solenoid pins and slide the table top frame forward to expose the upper column bearing rail.

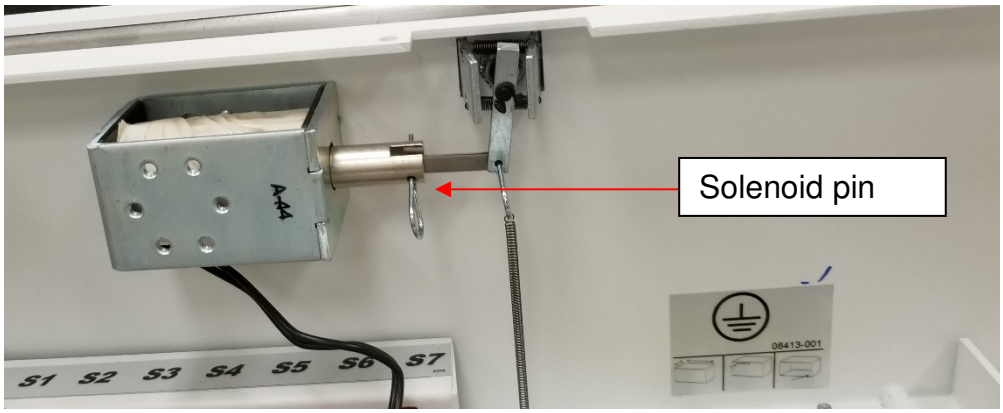

Figure 8: Transverse Lock Solenoid

7. Remove either the Philips or Allen head screws (depending on which your table is equipped with) from the front and rear corners of the tabletop frame.

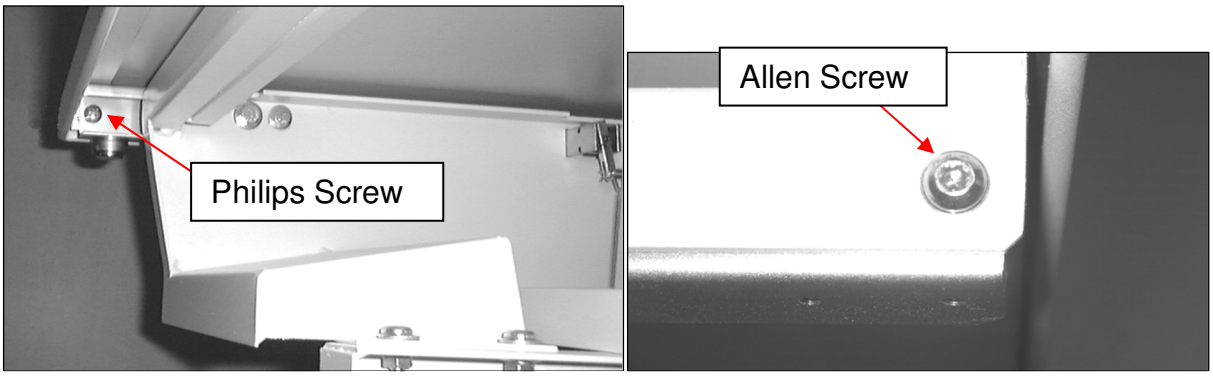

Figure 9: Left tabletop rail screws

8. Raise the upper tabletop frame to expose the transverse motion bearing track. Remove the four screws from the left bearing track as shown in Figure 10 below.

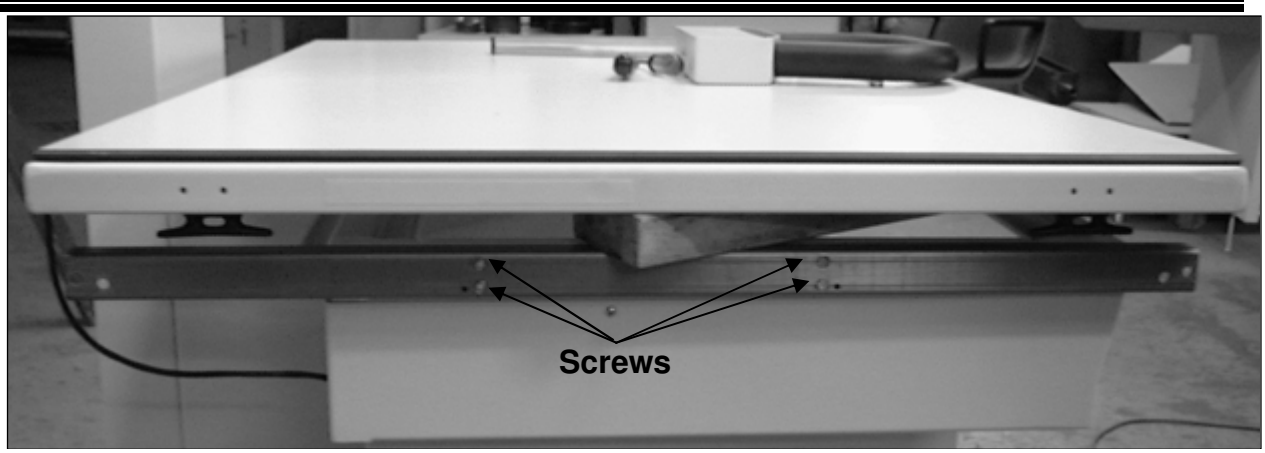

Figure 10: Left bearing track

9. Slide the bearing track forward as shown in Figure 11 below in order to expose the Tubestand bearing rail.

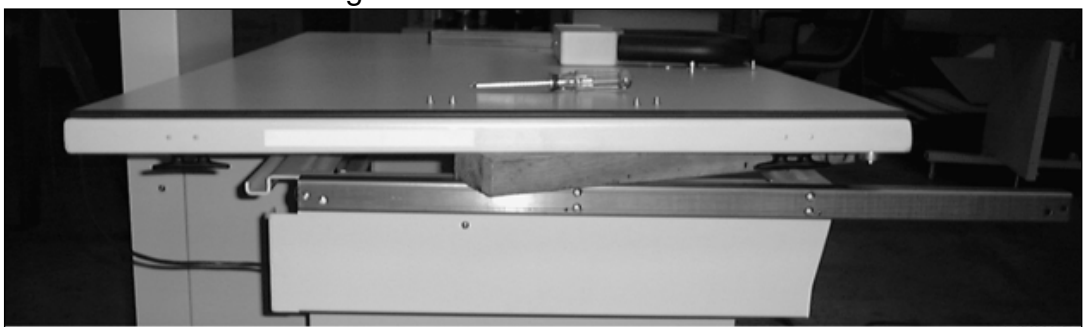

Figure 11: Shifted Bearing Track

10. Remove the column travel stop from the left side of the lower rear rail (Figure 4).
11. Position the column so that it is in line with the lower rail.
12. Carefully tilt the column away from the table and shift it until the closer tubestand bearing can be pushed into the lower rail. Now straighten the tubestand and engage the upper bearing. Continue to lift and push to completely engage all the bearings to the upper and lower tracks. See figure 5.
13. Replace the column travel stop on the lower rail.
14. Reverse steps 5 through 9 above to reassemble the tabletop frame.

WARNING

FAILURE TO REINSTALL THE TRAVEL STOP COULD RESULT IN DISENGAGEMENT OF THE COLUMN ASSEMBLY FROM THE TABLE, LEADING TO DAMAGE AND/OR INJURY.

2.3 Tube Arm, X-Ray Tube, and Collimator Installation

WARNING

DO NOT REMOVE THE TWO SHIPPING BOLTS (REAR OF THE COLUMN) UNTIL THE TUBE, COLLIMATOR AND HIGH VOLTAGE CABLES HAVE BEEN INSTALLED. THESE BOLTS LOCK THE COUNTERWEIGHT TO THE VERTICAL SLIDE.

2.3.1 2PT Systems

1. Insert the 1.5" diameter tube arm into the collar on Tubestand as shown in Figure 12 below. Be sure to fully insert the tube arm and secure it with the two retaining screws.

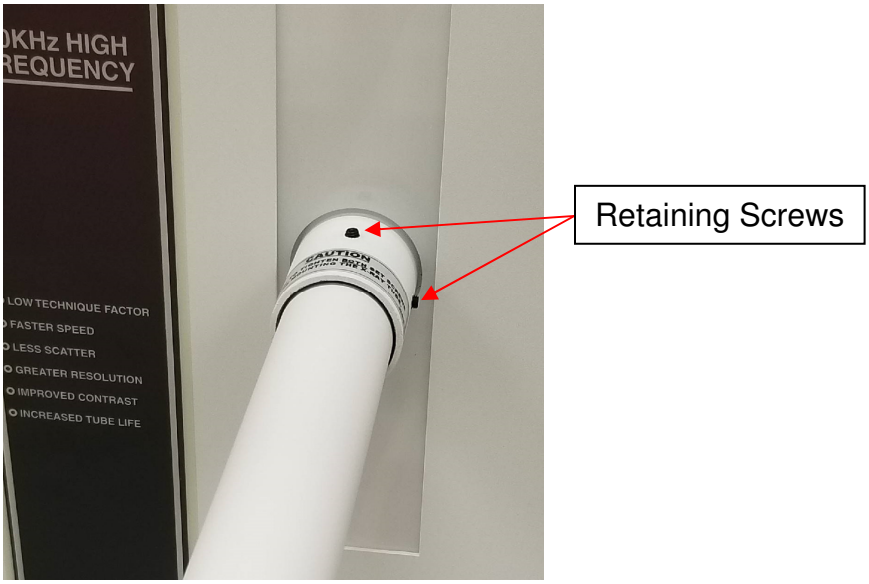

Figure 12: Tube arm Retaining Screws

2. Mount the X-Ray tube and collimator. Carefully read and follow the documentation for those components during installation.
3. Make sure ground cables are attached to tube arm, tubestand and film cabinet with hardware shown in figure 13. Figures 14, 15, and 16 show where the cables are attached on the system.

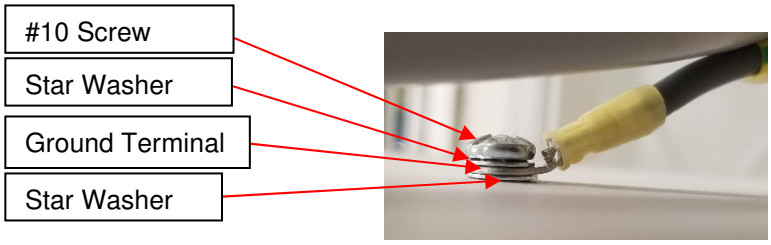

Figure 13: Hardware for mounting ground cables

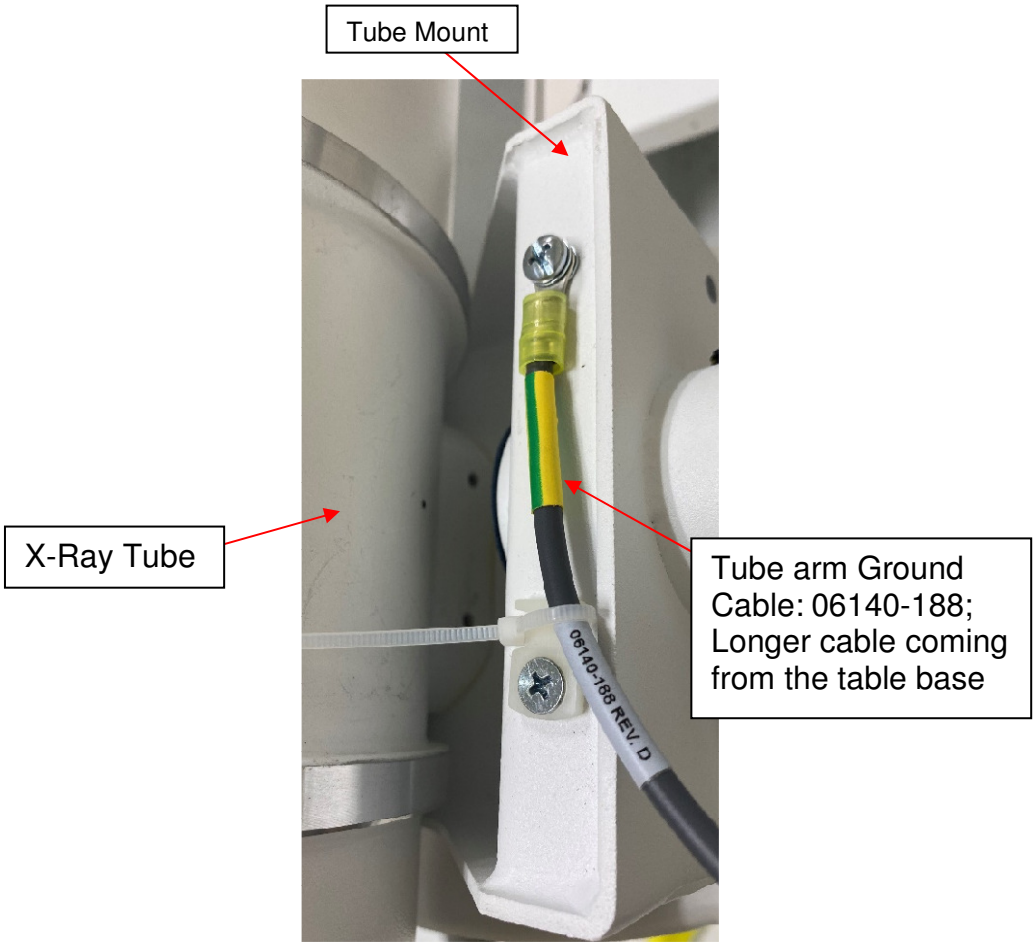

Figure 14: Tube arm ground cable

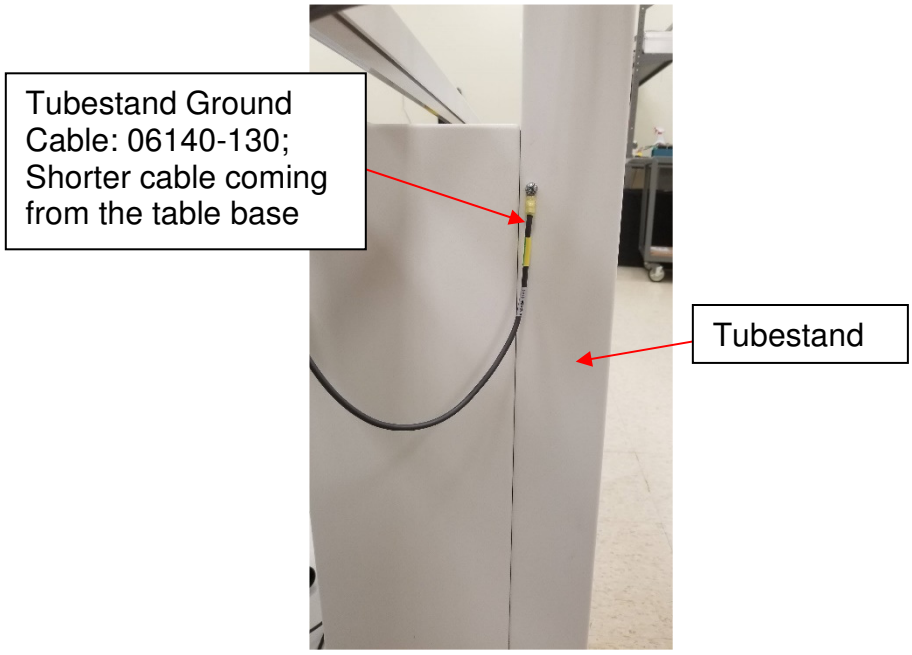

Figure 15: Tubestand ground cable

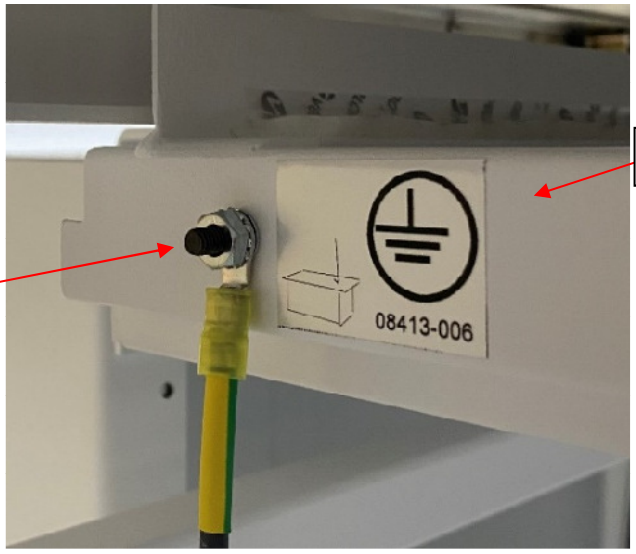

Figure 16: Receptor cabinet ground cable

4. Install the high voltage cables to the X-Ray tube. Route high voltage, collimator, stator, and tube arm ground cables as shown in Figure 16 below. Be sure to leave enough slack in the cables to allow the tube arm to move fully up and down.

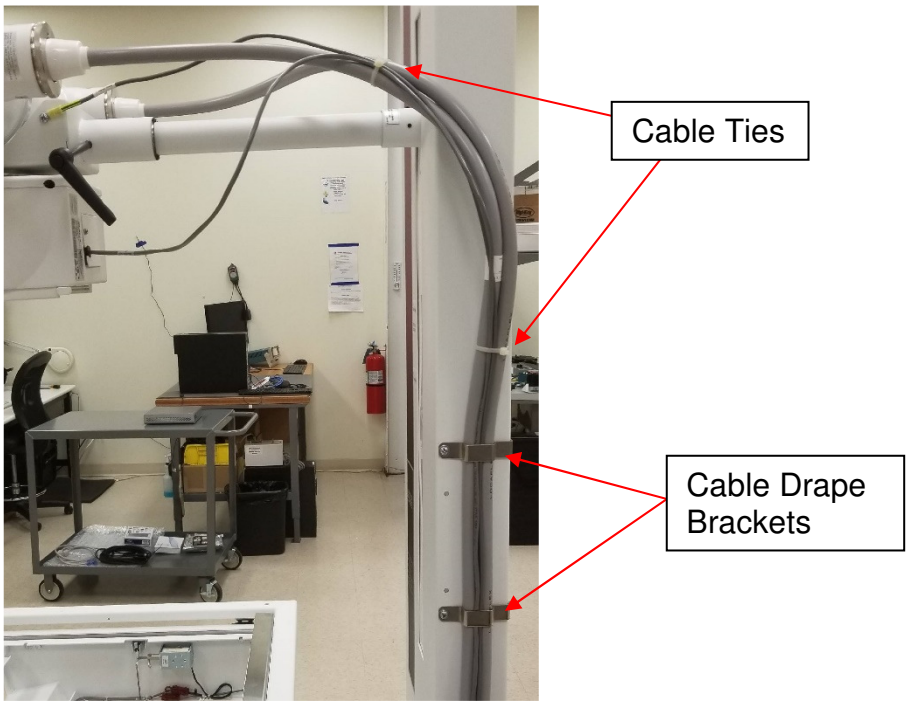

Figure 17: Tubestand Cable Routing

2.3.2 AP Systems

1. Place the tube arm on a surface that has been verified to be level. Remove the "roll" potentiometer assembly cover.
2. Verify that the belt is tight enough to prevent slack within the drive belt wheels. If adjustment is needed, loosen the two 10-32 screws and move the entire potentiometer assembly left or right to tighten or loosen the drive belt.

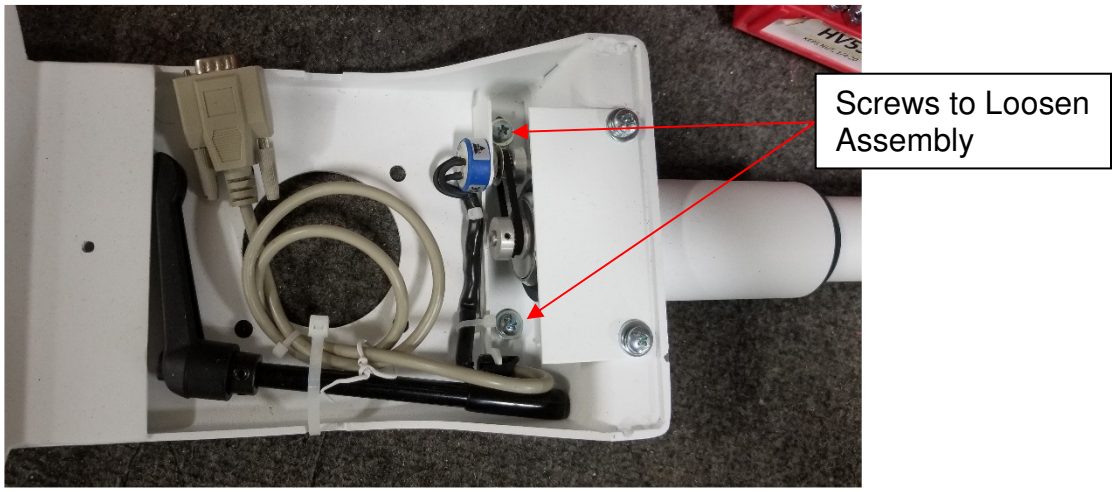

Figure 18: Roll Potentiometer

3. Remove the set bolt in the tube arm. Measure the resistance of the roll pot by measuring between pins 1 and 4 on the DB9 connector, or pins 1 and 2 of the potentiometer. The resistance should read 500±20 Ω at zero degrees. If this is not the case, rotate the tube arm until this resistance is achieved. Once proper adjustment is verified, install the arm-locking knob to secure the tube mount to the tube arm shaft.

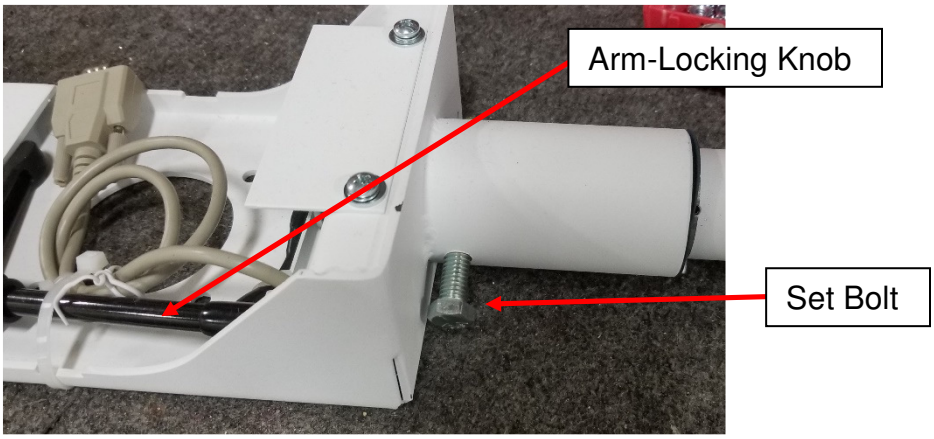

Figure 19: Roll Pot adjustment

4. Insert the 1.5" diameter tube arm into the collar on Tubestand as shown in Figure 12. Make sure the tube mount is in the beam-down position and that the tube arm is fully inserted into the tube arm. Secure the tube arm with the two retaining screws.
5. Follow steps 2 through 4 from section 2.3.1 to install X-Ray tube and collimator.

2.4 Mounting the Operator Console (AP Systems)

1. Remove the two ¼-20 mounting screws and washers shown in Figure 19 from the back of the console.

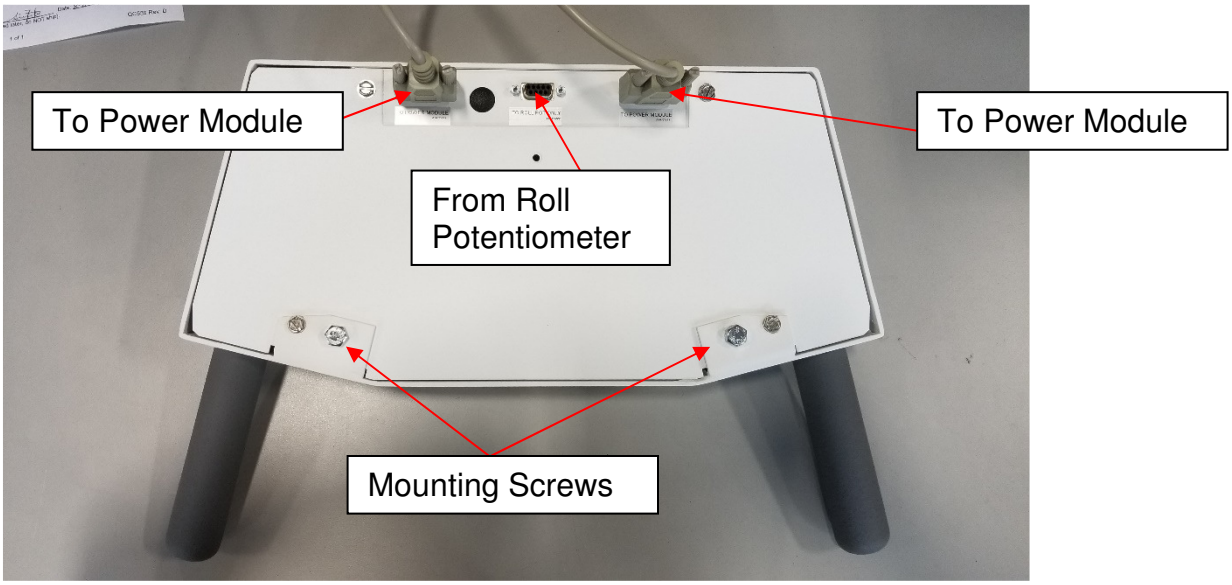

Figure 20: Back of Console

2. Install the console to the two mounting points on the tube arm using the hardware removed in the previous step.

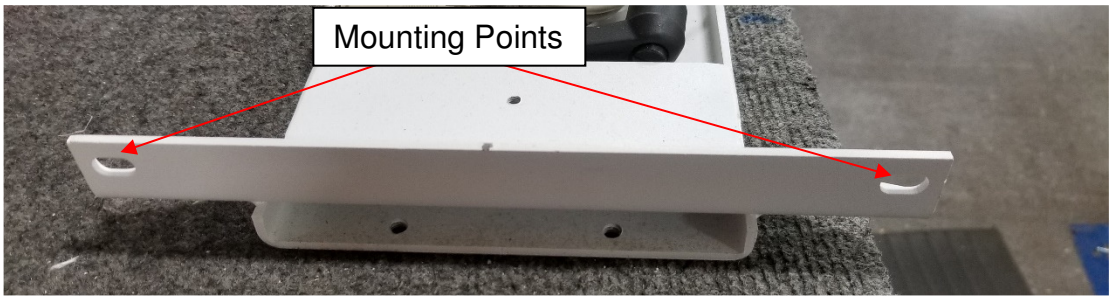

Figure 21: Console Mounting Points

3. Route the “roll” potentiometer cable under the x-ray rube and connect it to the middle DB9 connector on the console. See Figure 19.
4. Route the communication cables under the tube and so that they follow the high voltage, stator, collimator, and ground cables.

WARNING

Any excess amount of communication cables should be bundled outside of the power module enclosure. Fold and tie the cables together carefully in a fashion that avoids any "large-area" loop, as shown below.

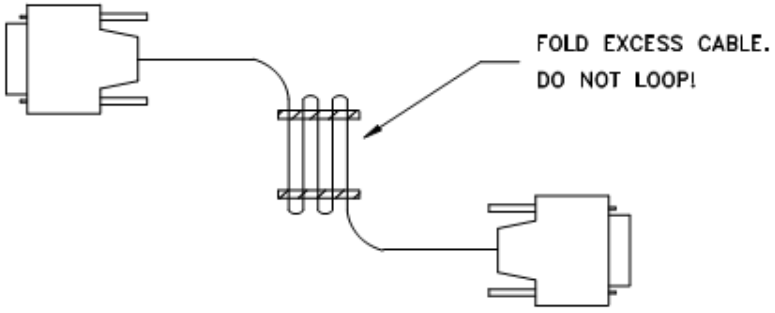

Figure 22: Excess cable bundle

2.5 Removing Shipping Screws & Initial Trim

Remove the shipping screws that lock the main counterweight and vertical carriage together, taking care to ensure that the counterbalance is adequate to avoid sudden, uncontrolled motion of the vertical slide. If necessary, place additional trim counterweights into the channels at the top of the main counterweight.

2.6 Grounding & Cable Routing

1. The other end of the earth cable connected to the table (08425-084; see figure 22) attaches to an open ground stud inside of the generator as shown in Figure 23 below.

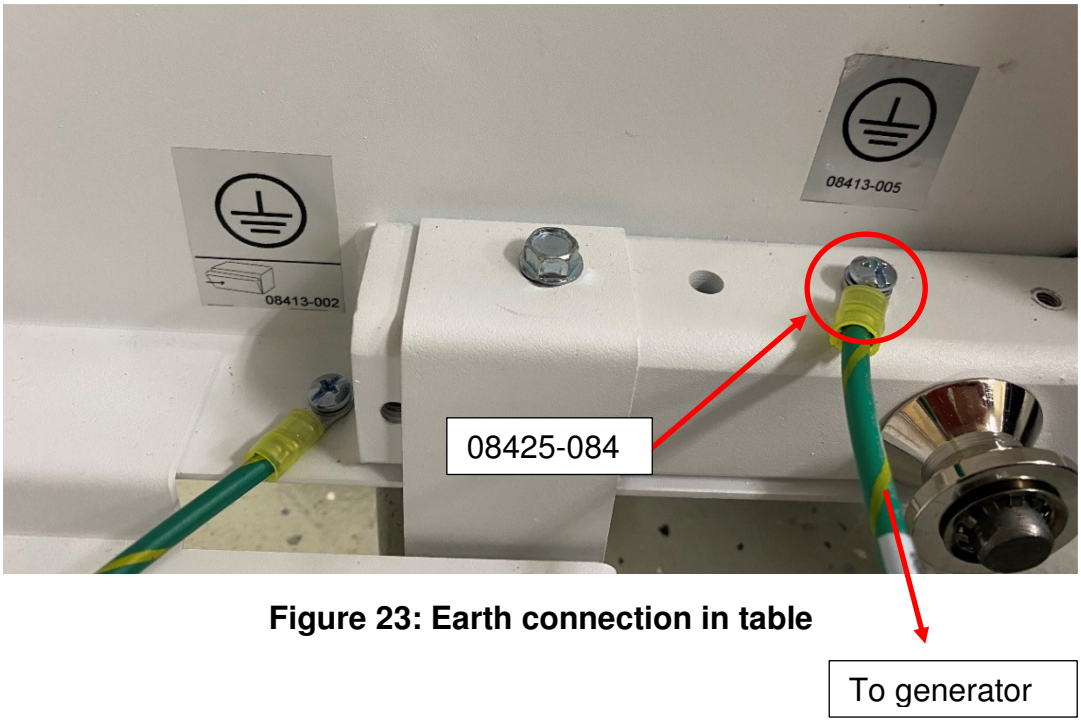

Figure 23: Earth connection in table

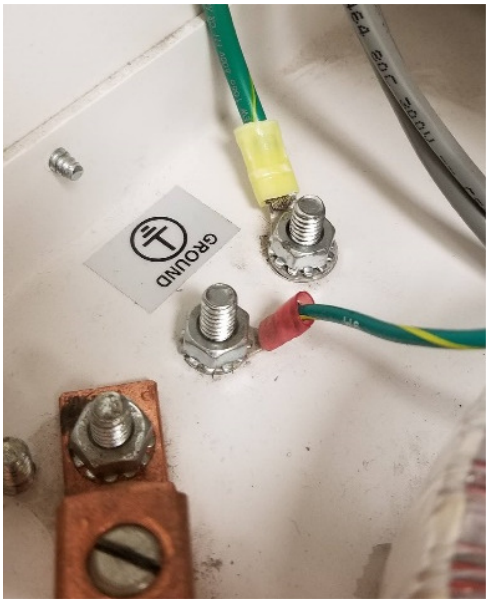

Figure 24: Earth connection in generator

2. Use cable ties and cable tie mounts to route the high voltage, ground, collimator, and stator cables as shown in Figure 24 below.

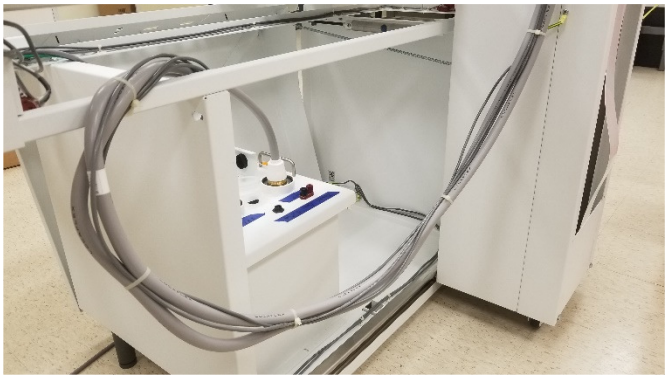

Figure 25: Cable Routing from Tubestand

3. Route the power cable through the bracket on the left or right rear corner of the table as shown in Figure 25.

Figure 26: Power Cable Routing

4. Route the DB9 cable for the PC through the bracket on the opposite side of the table as the power cable.

Figure 27: Earth and PC Cable Routing

5. If equipped, route the cable from the foot switch up through the middle bracket on the back of the table (See Section 3).

Figure 28: Foot Switch Cable Routing

6. Check all tubestand and table motions. Move and/or secure any cables that interfere.

3 GENERATOR INSTALLATION AND CALIBRATION

Please read and follow the High Frequency X-Ray Generator Installation and Service Manual for generator and HV tank installation and calibration.

In order to install the generator, it is recommended to remove the table front cover.

3.1 Table Front Cover Removal

There are two different table front covers depending on the table model.

3.1.1 Tilt Front Cover (2-Point Models)

1. Remove the air cylinder nut and bolt and detach the spring end shown in figure 28.

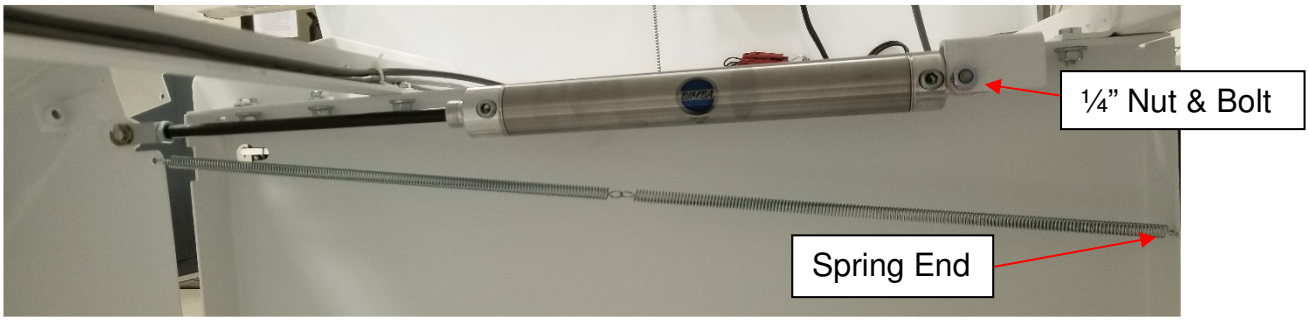

Figure 29: Front Cover Spring and Air Cylinder

2. Remove one of the ends of the retaining cable shown in Figure 29.

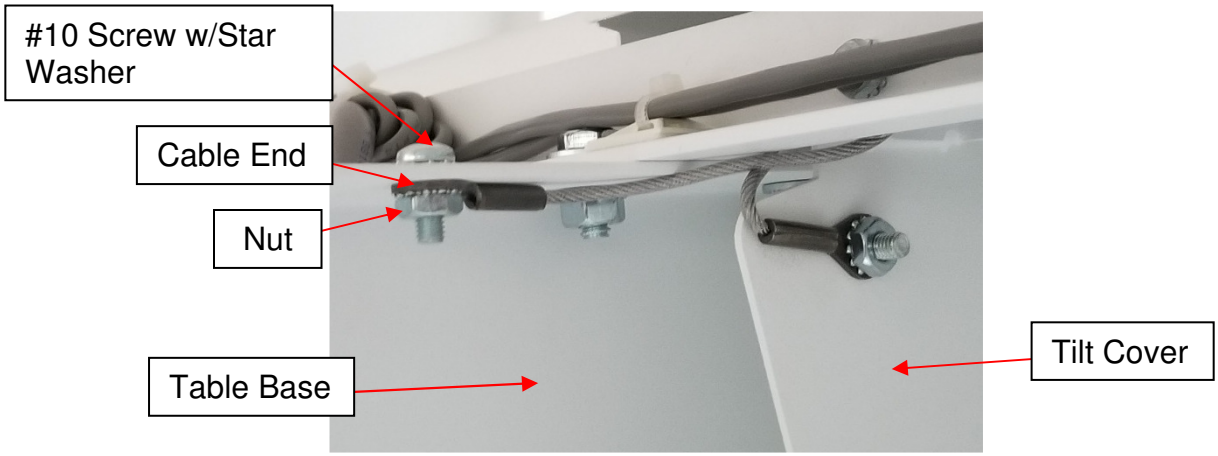

Figure 30: Tilt Door Retaining Cable

3.1.2 Fixed Front Cover (AP models)

Loosen the brackets shown in Figure 30 below. Bracket may appear different from photo due to table base construction.

Figure 31: Fixed Front Cover Brackets

3.1.3 Final step

Remove the front cover by sliding over the front rollers of the table as shown in figure 31.

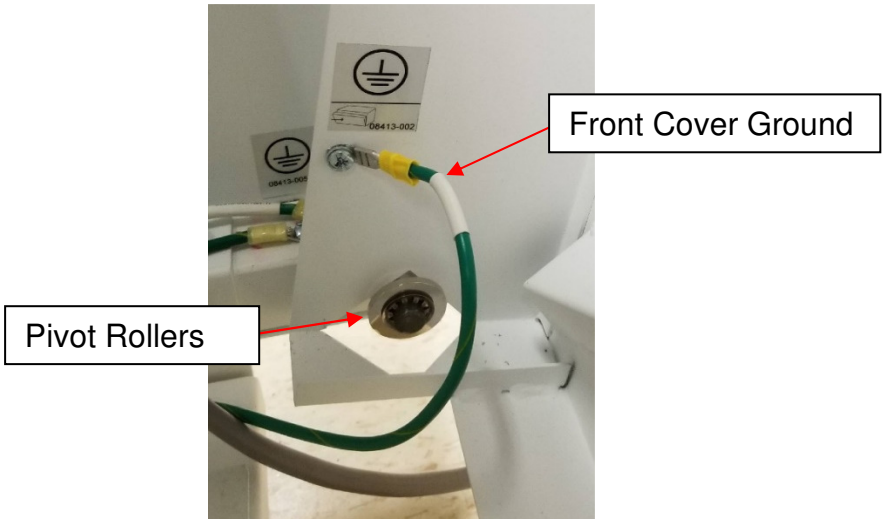

Figure 32: Front Cover Ground and Rollers

3.2 Generator installation

Install the front cover by placing the notches on the bottom of the cover over the pivot rollers located on the bottom left and right sides of the table base. Plug in the front cover ground at this point.

Table 1: Float Top Table Connections

TERMINAL	CONNECTION
H1	S0
H2	Tabletop Locks
S0	H1
S1	Left Side Solenoid
S2	Right Side Solenoid
S3	Optional Hip Switch
S4	Optional Treadle Switch
S5	Left Side Lock Switch
S6	Right Side Lock Switch
S7	TB5

The following are to be completed before calibration:

1. Place the high voltage transformer on the right side of the shelf inside the table base (See figure 24).
2. Place the Power Module on the left side of the shelf inside the table base.
3. Connect foot switch to TB5 on power module.
4. Connect console to the power module.
5. Connect collimator to TB3
6. Connect the X-Ray tube to the HV tank.
7. Re-install table front cover

3.3 Table Front Cover Installation

Install the front cover by placing the notches on the bottom of the cover over the pivot rollers located on the bottom left and right sides of the table base. Plug in the front cover ground at this point.

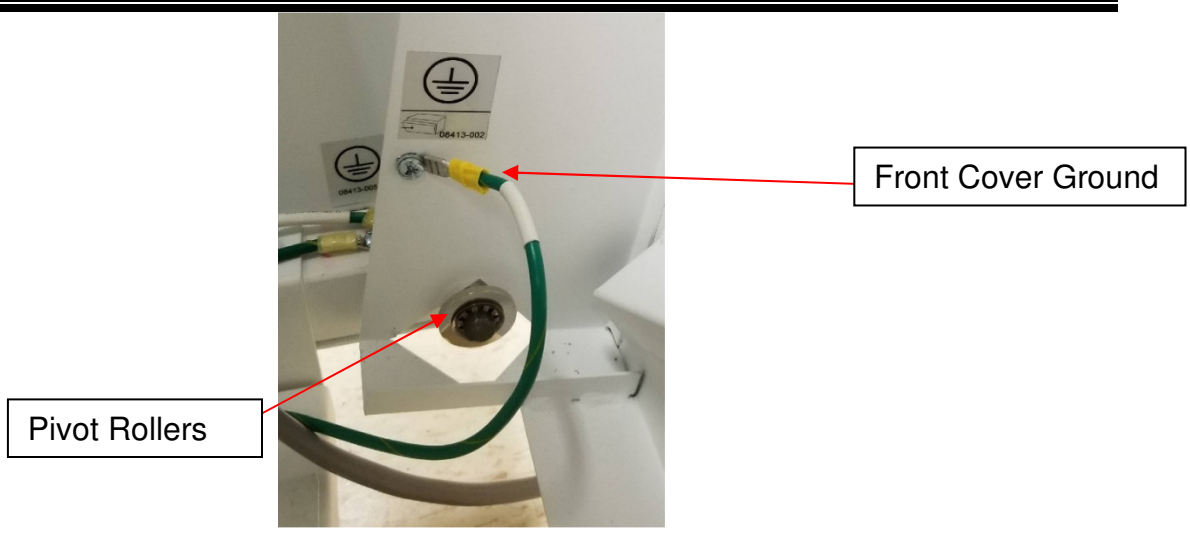

Figure 33: Front Cover Ground and Rollers

3.3.1 Tilt Front Cover

1. Install the spring and air shock on the left side of the table as pictured in Figure 33.

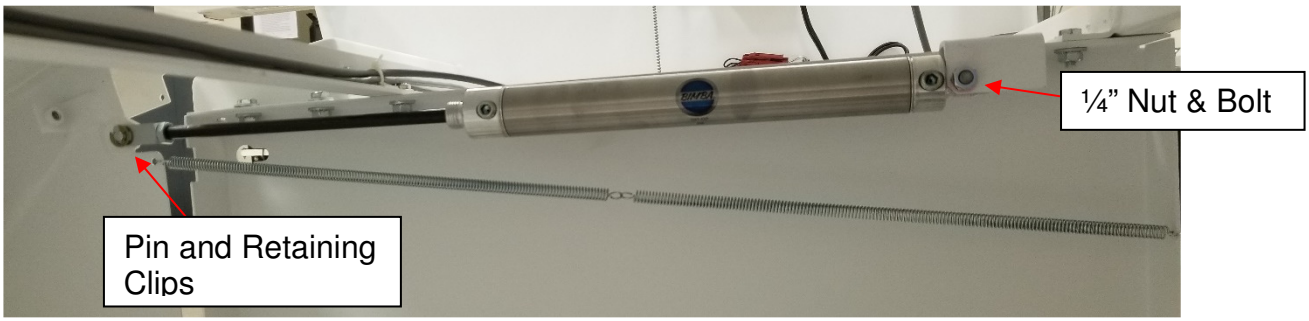

Figure 34: Front Cover Spring and Shock

2. Install the two ends of the retaining cable to the right side of the table as pictured in Figure 34.

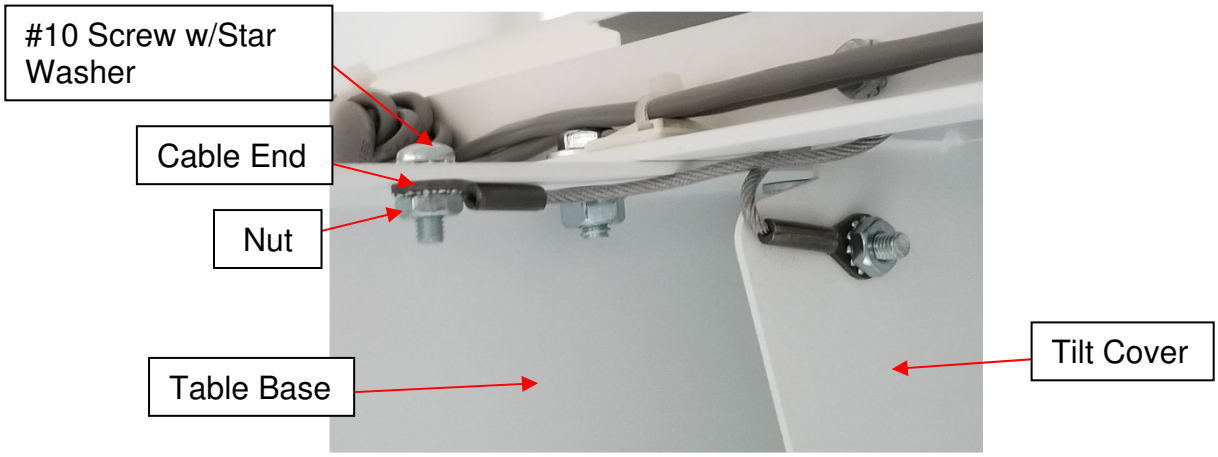

Figure 35: Tilt Door Retaining Cable

3.3.2 Fixed Front Cover

Attach brackets to table base using 10-32 hardware as shown in Figure 35 below. Bracket may appear different from photo due to table base construction.

Figure 36: Fixed Front Cover Brackets

4 FINAL ADJUSTMENTS AND ASSEMBLY

4.1 Table Leveling

Check that the table is level in all directions. The column should not drift from any position it is placed in. Adjust the leveling feet/shims if necessary.

4.2 Tube Arm Leveling

Use the Allen head adjustment screw located under the tube arm collar to level the tube arm. Turning the screw clockwise raises the tube arm while turning it counterclockwise lowers the tube arm.

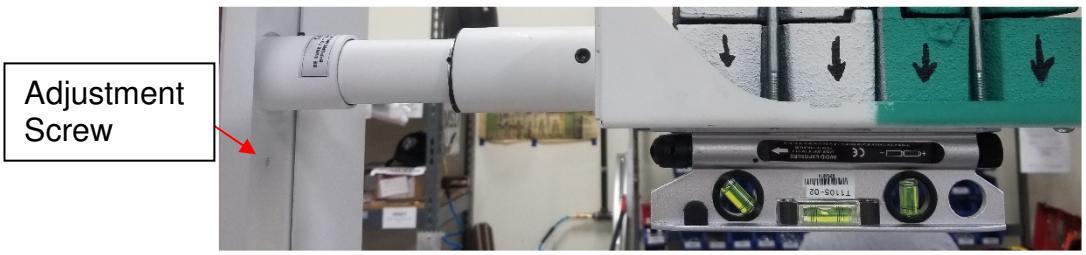

Figure 37: Tube Arm Leveling

4.3 40 Inch SID Detents

40-inch SID detents are provided for image and tabletop planes. These detents are factory-adjusted however (if necessary) the vertical location of the detent bearing can be adjusted. Remove the column rear cover to access this bearing.

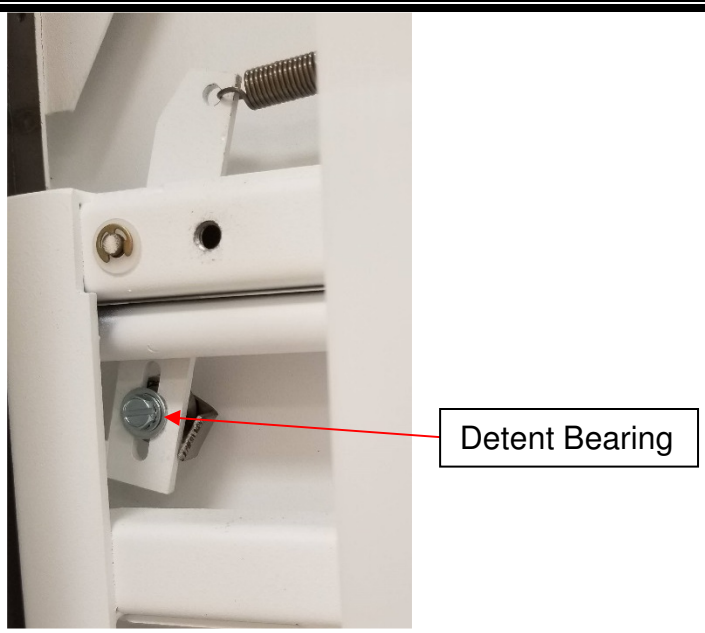

Figure 38: SID Detents

4.4 Light Field to X-Ray Field Alignment

The coincidence of the x-ray and light fields must be verified. Specific instructions can be found in the collimator manual.

4.5 X-Ray Field to Image Receptor Alignment

**Align the receptor to the x-ray field with the tabletop panel removed*

1. Adjust the location of the receptor left-to-right by moving the cabinet interlock bracket. It is located on the upper bearing bracket of the column.

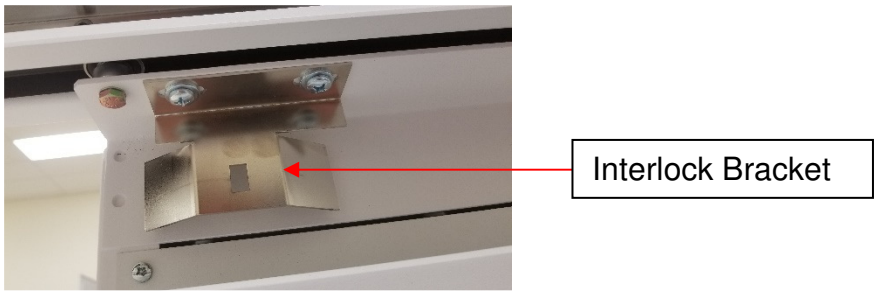

Figure 39: Interlock Bracket

2. Front to back adjustments can be made by loosening the screws in Figure 12 and sliding the tube arm in or out. Remember to retighten the screws after the adjustment has been made.

4.6 Final Counterweight Trim

Perform a final check of counterweight balance by moving the head up and down. Adjust the number of trim weights in the counterweight channels if necessary.

4.7 Foot Loop Installation

The foot loop and hardware are shipped loose with the accessories.

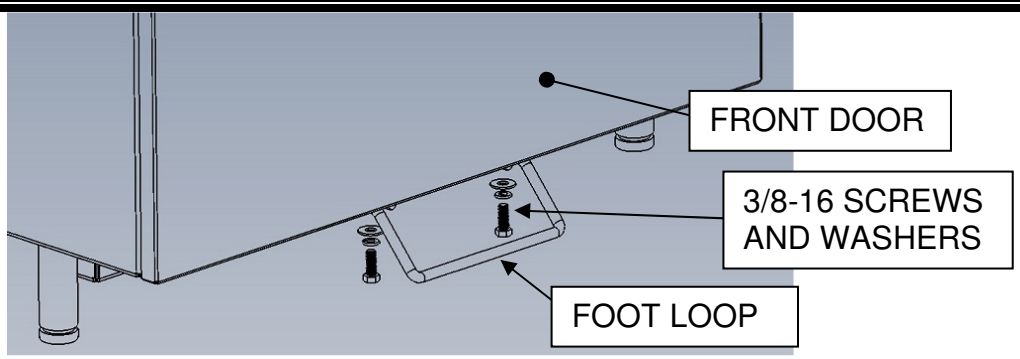

Figure 40: Attaching the Foot Loop

4.8 Table Anchoring

Secure the table to the floor using the four clamps provided with the feet. Slide the clamp into the notch at the base of each foot, turn at 45º to the table and secure using a screw or anchor appropriate for the floor material.

4.9 **OPTIONAL Tabletop Extension** (for Fixed-top Tables Only)

The tabletop extension adds 12" of length and can be mounted on either end of the table. To attach, align and slide the notches in the extension over the buttons mounted to the end of upper table structure.