MODEL S105

FLOOR TO WALL/FLOOR TO CEILING TUBESTAND

INSTALLATION MANUAL

L536-00 REV. U

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INSTALLATION AND SERVICE MANUAL
TEXT REVISION HISTORY

Revision	Description	ECR / Release Date
D	Create manual text ECR #2064	December, 2000
E	ADDED PAGES FOR UL	May, 2011
F	UPDATED FOR UL INSTALLATION AND TUBE ARM DESIGN CHANGE	March, 2012
G	REMOVE TEXT FROM SECTION 1.3 WARNING NOTE	December 2012
H	ADDED INSTRUCTIONS AND WARNING FOR ADJUSTING MECHANICAL BRAKE ASS'Y IN SECTION 4.5	May, 2014
J	ADDED INSTRUCTION FOR ADJUSTING ELECTRONIC BRAKE ASS'Y IN SECTION 4.5	June, 2014
K	UPDATES FOR RAIL CONSOLIDATION	September, 2014
L	ADD SECT 7 WIRING DIAGRAM	November, 2014
M	CHANGE TO C'WT SHIPPING SCREWS	January 2015
N	REMOVED 1.2; REPLACED ITEMS IN 1.1 WITH SYMBOL TABLE	November, 2016
Q	ADDED NILES, IL ADDRESS TO COVER SHEET; ADDED WARNING STATEMENT AND "INTENDED USE" STATEMENT TO SHEET 4	June, 2017
R	CORRECT SECTION NUMBER CALL-OUT IN SECTION 4.9.3.2	July, 2018
T	Added Cover Sheet; Removed Replacement Part Guide Section.	ECR 10436 / February, 2020
U	Update 4.6.1 Electric Lock Kit connections – vertical lock cable connectorized at Floor Car	ECR 11073 / October, 2022

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1.0 DEFINITIONS AND SPECIFICATIONS

1.1 Definition of Symbols Used on the Equipment

Symbol Legends	
Symbol	**Definition**
	Date of manufacture
	Manufacturer
	Serial Number
	Reference Number (Model/Part Number)
	Keep Dry
	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.
	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).
	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.
	DANGER 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.

1.2 General Precautions

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NOTE

The UL Classification does not include X-Ray Generator, Collimator, X-ray Tube, or Image Detector.

WARNING

All of the components used with the tubestand shall comply with UL 60601 standards.

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NOTE

The 24Vdc power shall be provided by a generator certified to UL 60601-1 standards or Summit accessory power supply part no. 05960.

WARNING

X-RAY EQUIPMENT MAYBE DANGEROUS TO BOTH PATIENT AND OPERATOR UNLESS PROPER SAFETY MEASURES ARE OBSERVED

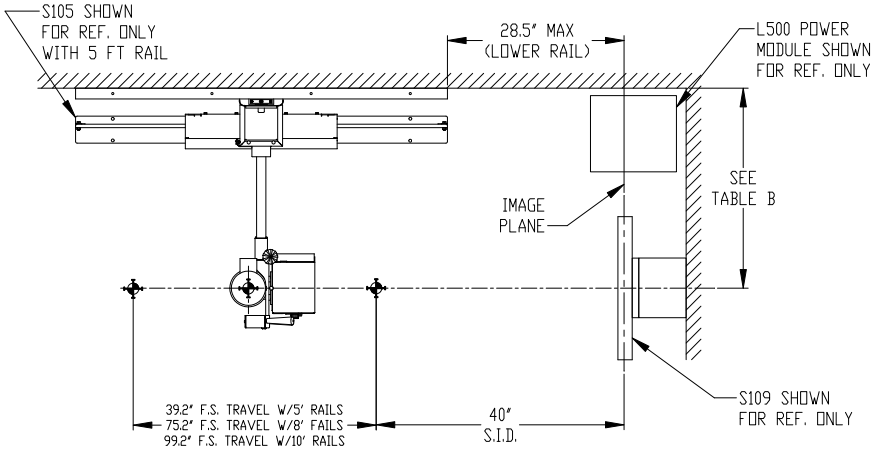
Intended Use

This is an x-ray Tubestand, a mechanical device intended to support and position an x-ray tube and collimator as required for radiographic procedures.

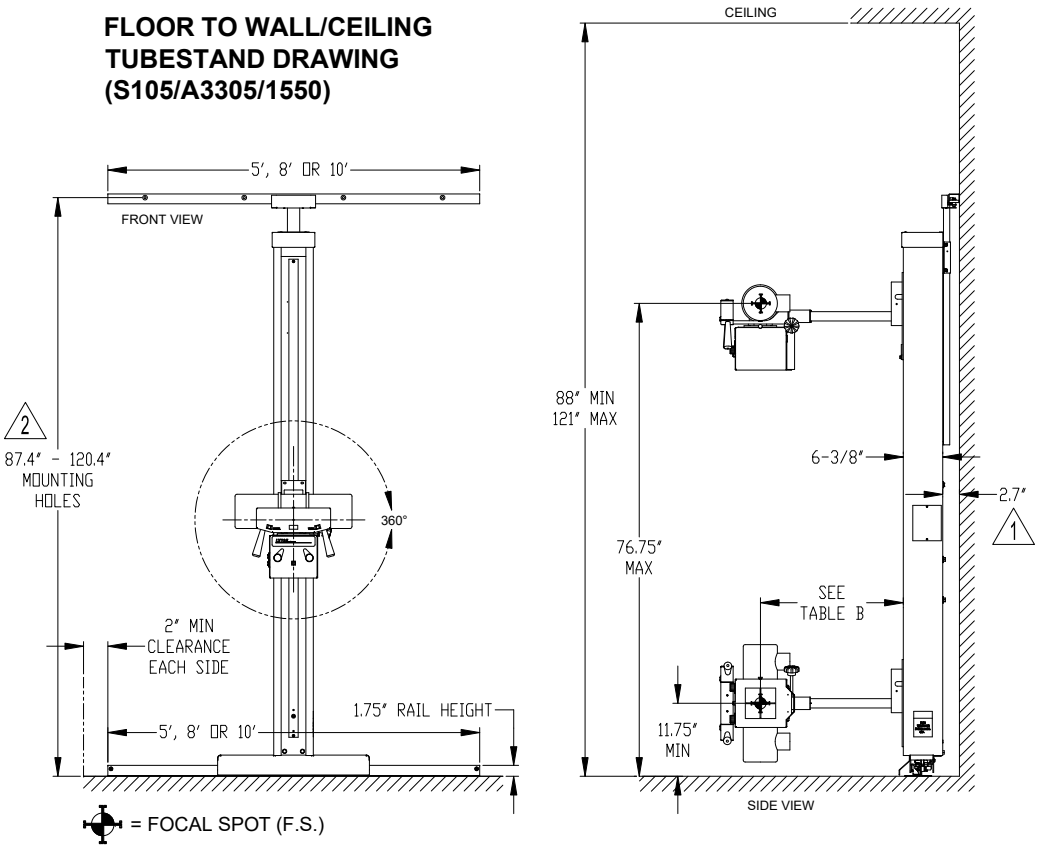
1.3 Specification Summary Table

SPECIFICATION SUMMARY TABLE	
Electrical Ratings	24VDC, 1A ⎓
Maximum Safe Working Load	75 lbs / 34 kilograms
Environmental Conditions	Temperature range for: Transport and Storage: -40° F to +158° F / -40° C to +70° C Use: +50° F to +104° F / +10° C to +40° C Relative Humidity Limits for: Transport and Storage: 10% to 100% Use: 30% to 75% Atmospheric pressure range for: Transport and Storage: 14.67 inHg to 31.30 inHg / 500 hPa to 1060 hPa Use: 20.67 inHg to 31.30 inHg / 700 hPa to 1060 hPa
Information regarding potential EMC interference and advice for avoidance	• Main power quality should be that of a typical commercial or hospital environment • Power frequency magnetic fields should be at levels characteristic of a typical location in a commercial or hospital environment
Degree of protection against harmful ingress of water	IPXO/Ordinary
Degree of protection against electric shock	Class I, Type B Applied Parts 
Applicable Standards	This X-ray Tubestand complies with the following regulatory and design standards: • UL 60601-1 • CAN/CSA C22.2 NO601.1 • IEC60601-2-32:1994 • CSA C22.2 No. 601.2.32-98
Safety Label	
Note: The UL Classification does not include the Image Receptor	
Equipment not suitable for use with flammable anesthetic mixture with air or with oxygen or nitrous oxide.	

2.0 MECHANICAL LAYOUT



FLOOR TO WALL/CEILING TUBESTAND DRAWING (S105/A3305/1550)



1. ASSUMES NO HEADER BOARD INSTALLED, DIMENSION TO BACK OF UPPER RAIL.
2. IF HEADER BOARD IS NEEDED FROM UPPER RAIL, MOUNT IT WITH ITS CENTER AT 87.4" - 120.4" ABOVE FLOOR.

TABLE B: DISTANCE FS TO FRONT OF COLUMN	DISTANCE FS TO WALL (NO HEADER)	PART NO. ASSY, TUBE ARM/MOUNT
10" for Chiro applications and some non- angulating tubemounts.	19.2"[487mm]	06237-008
14" for small tables (Vet, Mobile, and narrow stationary and some non-angulating tubemounts).	23.2"[589mm]	06237-012
17" for stationary integrated medical tables	26.2"[665mm]	06237-015
19" for other fixed medical tables	28.2"[716mm]	06237-017
23" for float top tables	32.2"[817mm]	06237-021

3.0 ASSEMBLY NOTES

1) Most required fasteners will be found attached to the part they are used on.

2) Unpack and inspect all parts prior to assembly.

WARNING

3) To avoid possible injury, do not insert fingers or hands into counter weight access openings on sides of column.

4.0 INSTALLATION GUIDE

Corrective action must be taken before proceeding if the floor, wall, or ceiling conditions are not suitable for level, secure rail installation.

4.1 Rail and Column Installation

4.1.1 Upper Rail Installation

WARNING

Vertically align the ends of the upper and lower rail. The horizontal travel stops are on the lower rail. Proper alignment ensures that the upper bearing assembly stays engaged to the rail at all times.

Place the floor rail close to its final location, but do not attach permanently yet. See *Figure 1* below.

Secure the upper rail to the wall or ceiling using appropriate fasteners (not included).

NOTE

For proper operation of the upper bearing assembly in the rail, do not use washers larger than 0.5 inch outside diameter. See assembly detail figure 5.

It is important that the front surface is vertical, the rail is not twisted, and that it is level and square in all directions. Shimming may be necessary.

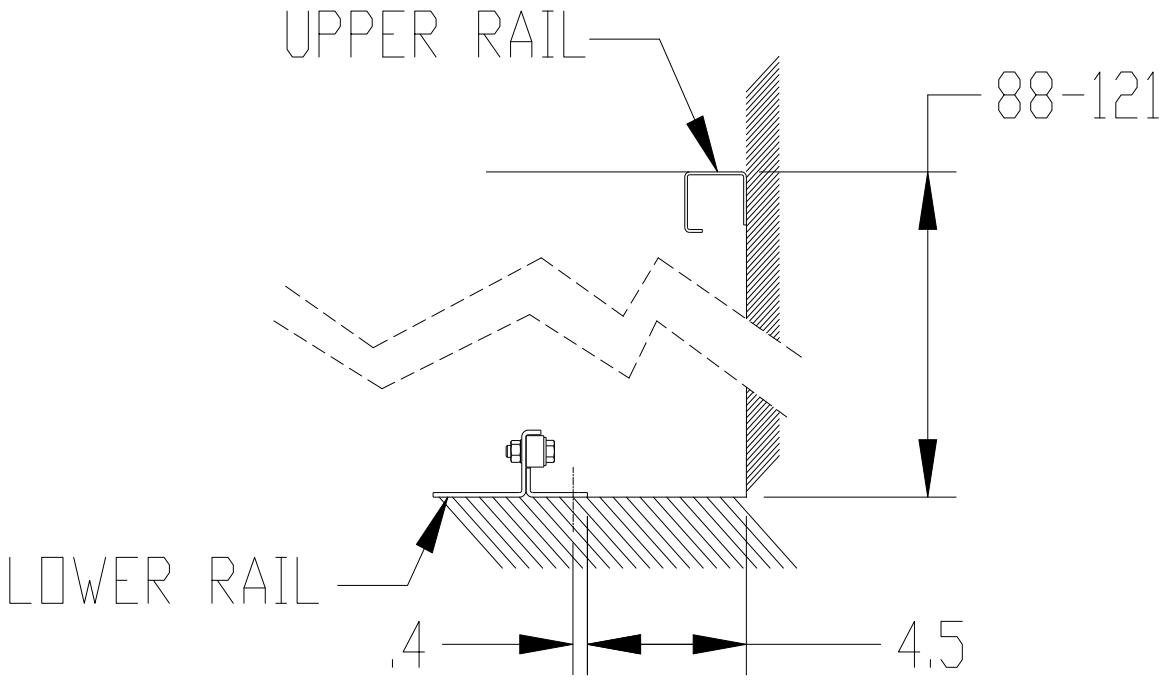


Figure 1: Rail Layout

NOTE

For best performance of the system do not install the lower rail on a compressible surface/material such as carpet with padding.

4.1.2 Column Preparation

Remove the column assembly from its carton and place it horizontally for access to the rear and bottom. Assembly will be facilitated by having two floor dollies or 2x4 boards available to place the column on.

Attach the upper clamp (shipped with the accessories) to the column assembly, leaving the screws loose enough to slide the upper bearing assembly under the clamp (note the spacer at the bottom on the surface facing the column) from the top and allow it to move all the way down. Tighten the clamp mounting screws to reduce the clearance but still allow the upper assembly to slide through the clamp. See *figure 2*.

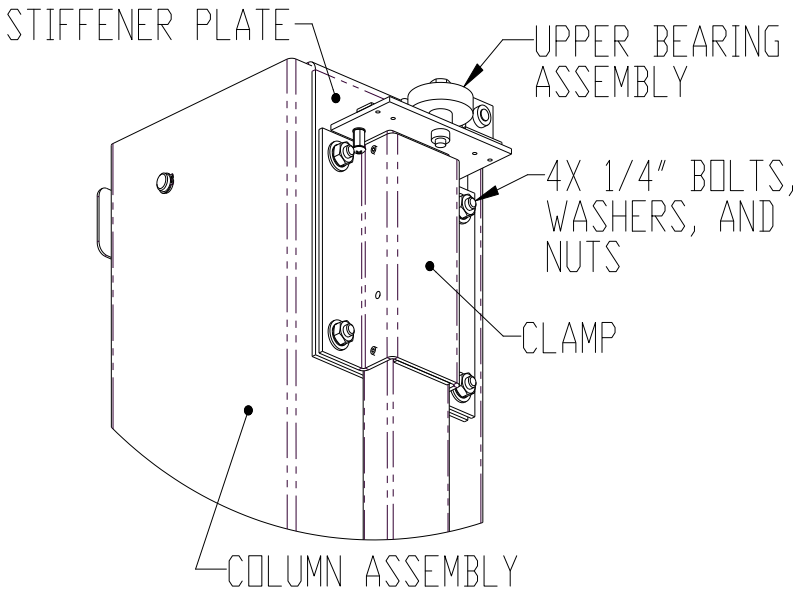


Figure 2: Clamp and Upper Bearing Assembly

Install the floor car. Locate the 2X 5/16-18x3.25 bolts and washers taped to the top of the floor car. Remove the 2X 3/8-16x0.75 bolts and washers from the back of the floor car. Place the floor car into the bottom of the column and secure as shown. See *Figure 3.* Plastic plugs are included with the floor car to insert into the unused tapped holes on the front of the column at the bottom.

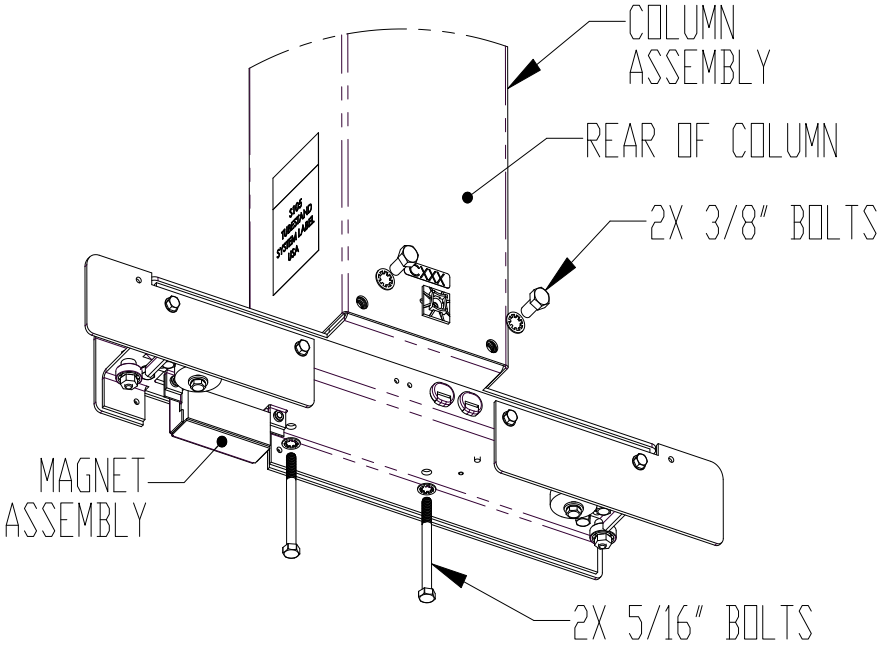


Figure 3: Installing the Floor Car

CAUTION

Torque the 5/16-18 bolts to 144-170 lb-in (12-14 lb-ft or 16.3-19.2 N-m). Do not over-torque.

Remove the front cover from the floor car and detach the magnet assembly from the floor car, leaving the cable connected. Use masking tape to temporarily hold the magnet to the top of the floor car. See *figure 4.*

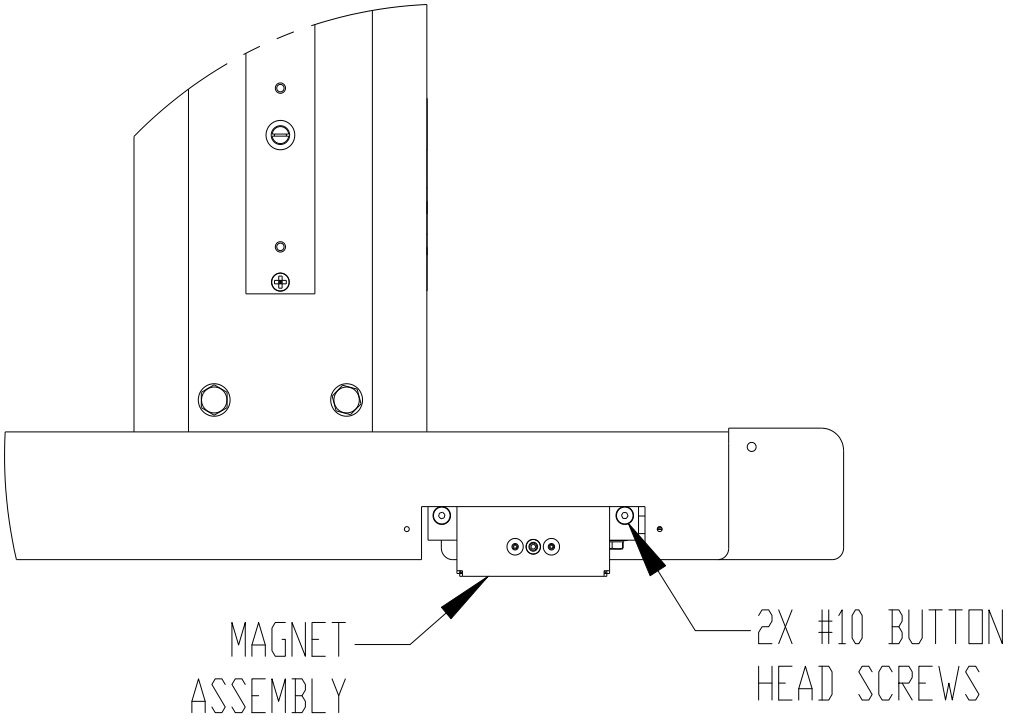


Figure 4: Detaching the Magnet

CAUTION

Failure to detach the magnet assembly could result in damage to the magnet assembly or floor when maneuvering the column to install on the floor rail.

4.1.3 Column Installation on the Rails

Remove the travel stop from the lower rail on the installation side.

Stand the column up and move into position as shown in *Figure 5*. Check that the upper bearing assembly is free to move up and down. Lift the column on the rail side and shift to engage the lower bearing assembly. Continue moving the column toward center until the upper bearing assembly is close to the end of the upper rail. At this time lift the upper assembly to the proper height and engage it to the upper rail. Lift again to engage the lower bearings on the outside and roll the column toward rail center.

If the slide shipping strap has been removed, check that the counterweight cables are in proper position in their pulleys at the top of the column.

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NOTE

A piece of plywood 21” x 6”x 5/8” thick will facilitate engaging the floor car to the lower rail. Place the column on the plywood in the figure 5 position and it will be very close to the proper height to minimize lifting.

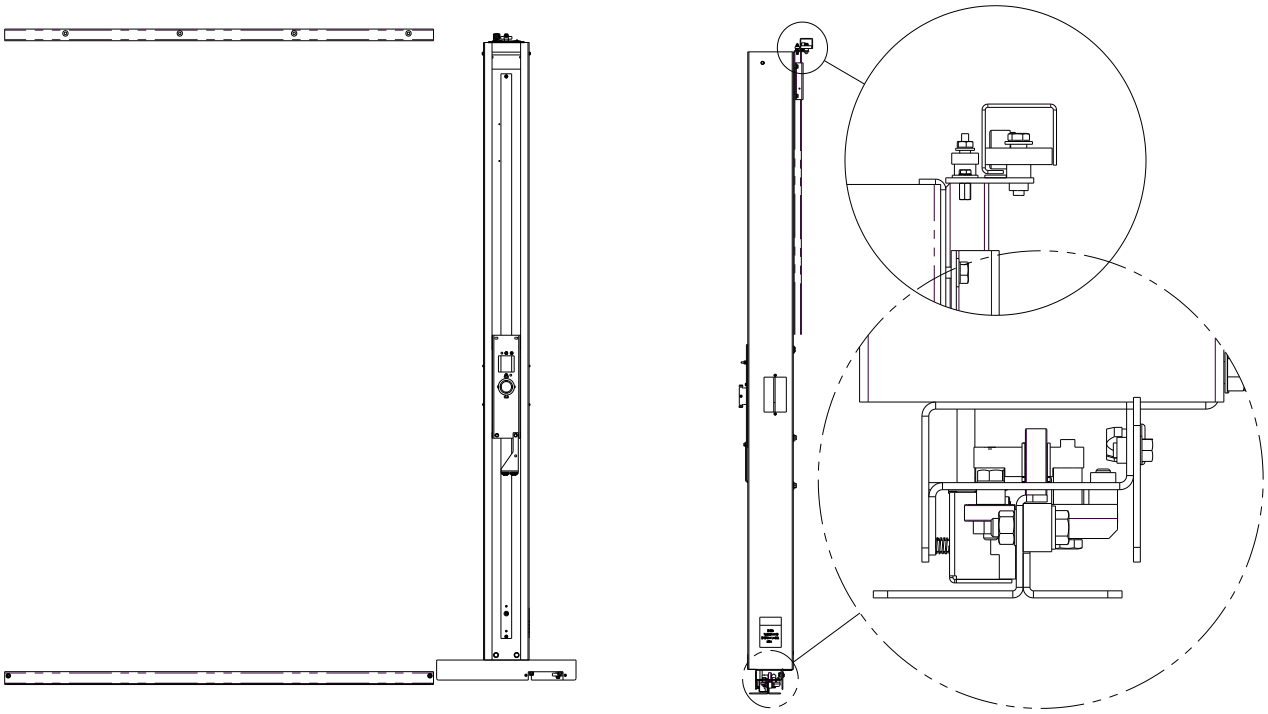

Figure 5: Bearing Assembly Engagement

Replace the travel stop on the lower rail.

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WARNING

Failure to reinstall the travel stop could result in the column disengaging from the rails and falling.

Set the height of the upper bearing assembly by inserting a 12” zip tie (~.050 thick) between the upper rail and both plastic strips on the upper bearing assembly (see *Figure 6*). Push the upper assembly up against the zip tie to set the spacing and tighten the clamp mounting bolts. Remove the 12” zip tie.

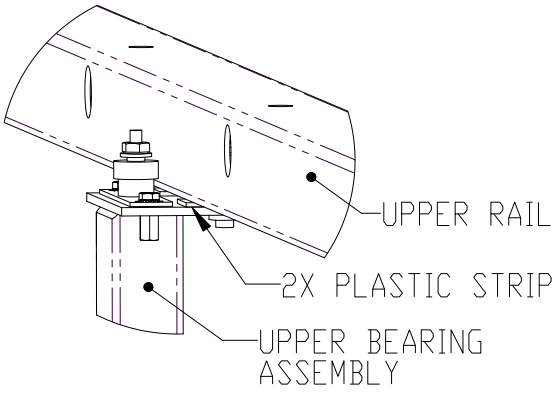

Figure 6: Upper Bearing Assembly

Reinstall the horizontal magnet assembly (see *figure 4*), making sure the cable & wires are pushed back up into the floor car and remain clear of the floor rail during operation.

4.1.4 Lower Rail Installation

The floor rail position is critical; adjust it to achieve the following:

a) The column must be vertical in both directions across its entire travel.
b) The top bearing surface of the rail must be level--shim under the rail if necessary.
c) Free-rolling travel across the entire column range of motion.
d) Upper bearing does not come within 3” of the end of the upper rail *on either side* when the column is at its end of horizontal travel.

When all of the above are met, secure the rail permanently to the floor using appropriate anchors and fasteners (not included). Check the clearance of the hardware used to the front flange of the floor car. Remove or substitute hardware if it is too close.

4.1.5 Upper Bearing Assembly Leveling

On each side of the upper bearing assembly clamp drive the leveling set screws against the tube, keeping it in the center (see *Figure 7).* Do not fully tighten. Place a level on the side of the upper bearing assembly bar. If it is not level, adjust one set of set screws (one side out, one side in) to shift the bar and make it vertical. After the bar is level fully tighten all four set screws to lock in place.

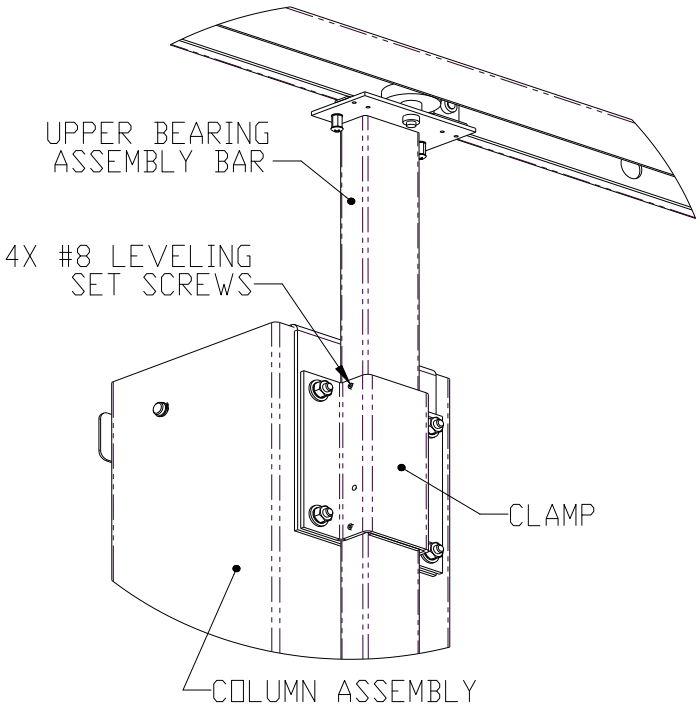

Figure 7: Leveling the Upper Bearing Assembly

4.1.6 Cable Drape Bracket

Move the cable drape bracket (mounted on the vertical slide assembly) from its shipping location to its operating location by removing the 2X 1/4”-20 mounting screws, rotating the bracket assembly, and reinstalling the mounting screws. See *Figure 8*.

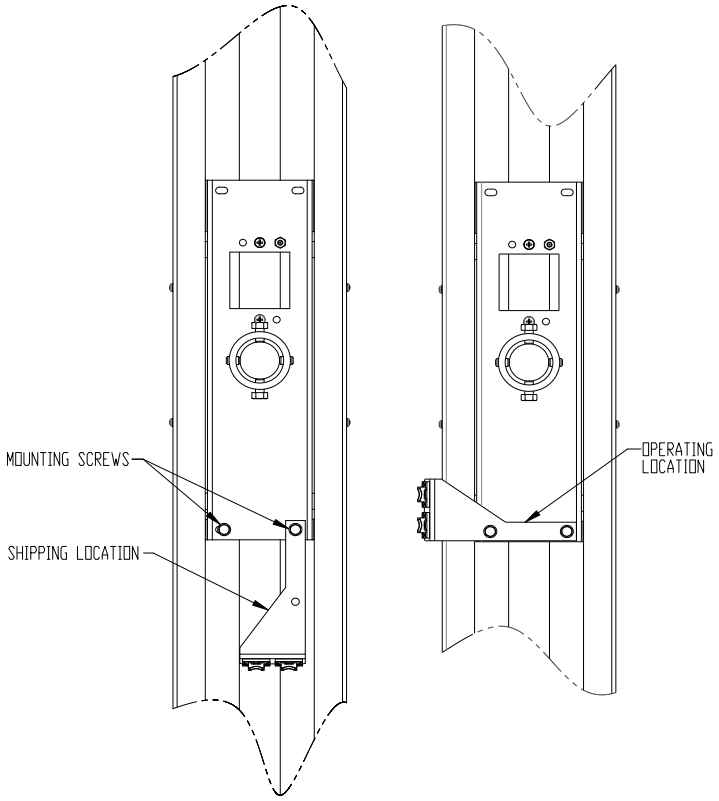

Figure 8: Rotating the Cable Drape Bracket

4.2 Tube Arm Assembly Installation

Prepare by removing the vertical lock cover, the angulation lock, and the quick-release pin from the tube arm assembly. See *Figure 9.*

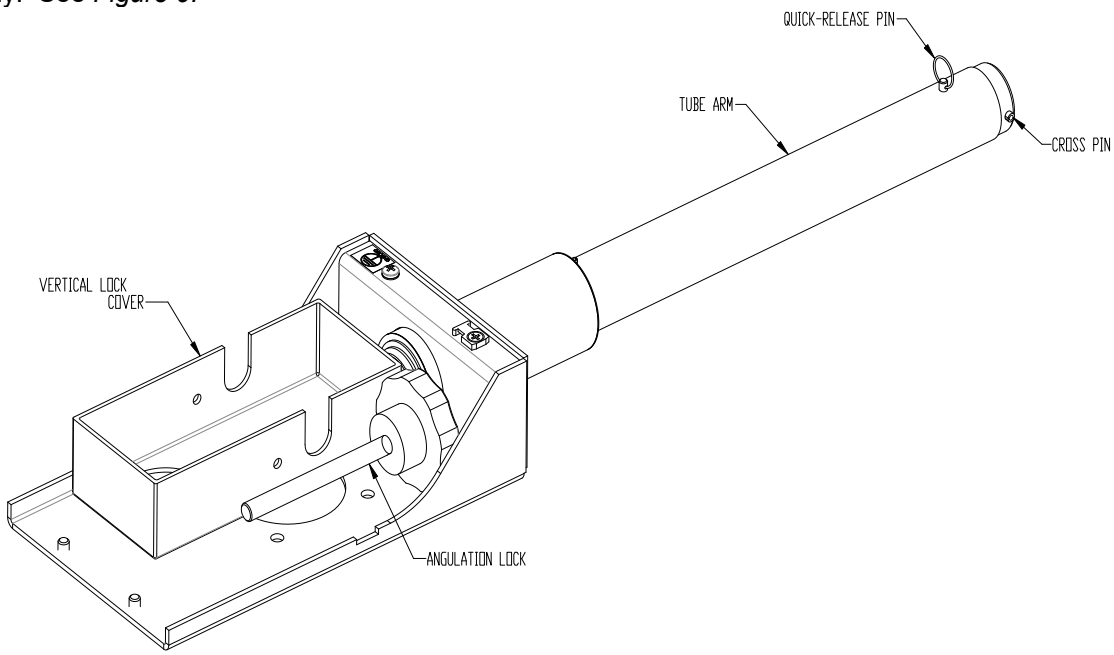

Figure 9: The Tube Arm Assembly

Check that the four adjusting screws are loose on the collar of the vertical side. Relocate the vertical lock cover onto the tube arm. To install, rotate the tube arm so that the cross pin is vertical. Insert the tube arm through

the vertical slide collar and through the back flange, with the cross pin passing through the matching slots in the back flange of the vertical slide. See *Figure 10*.

When the cross pin is all the way through, rotate the tube arm 90°, ensuring that the pin stays behind the rear flange of the vertical slide. Reinstall the quick release pin through the vertical slide collar AND through the hole in the tube arm. See *Figure 11*. Tighten all four adjusting screws, keeping the tube arm approximately level and perpendicular to the front of the column.

Install the angulation lock into the open tapped hole on the tube mount. See *Figure 11*.

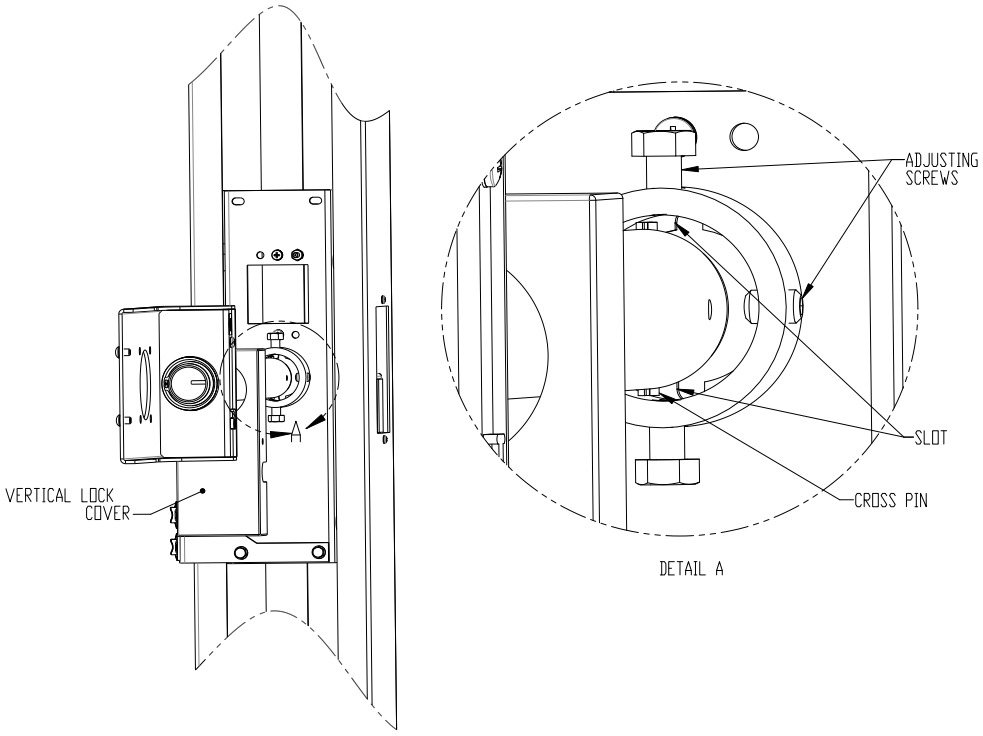

Figure 10

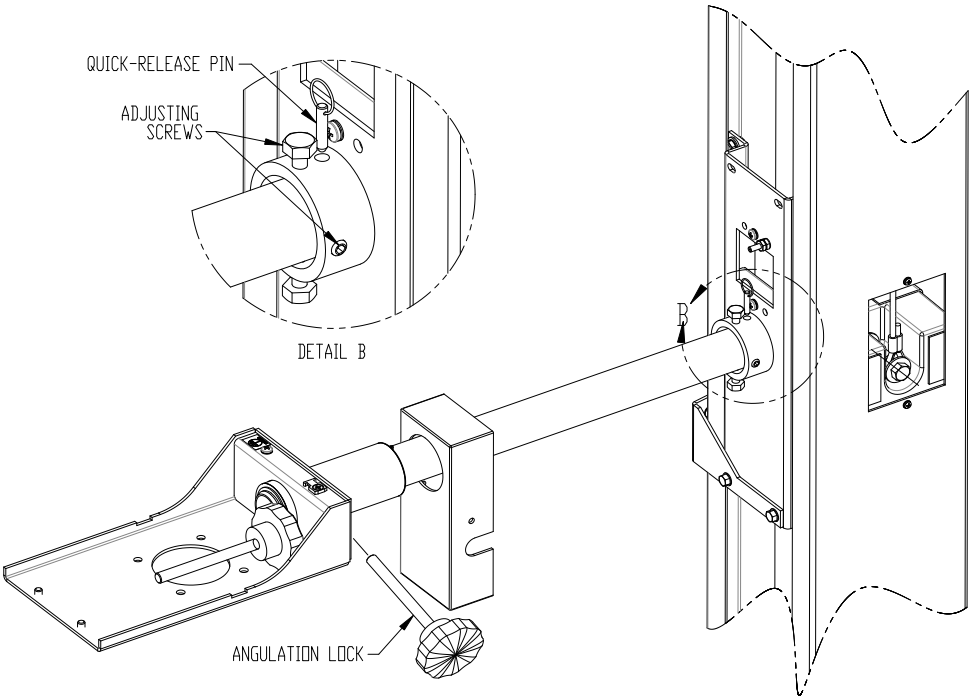

Figure 11

4.3 Vertical Lock Installation

4.3.1 Electric Lock Kit

Remove the lock mounting screws and ground nuts from the vertical slide along with associated lock washers. Reuse the screws to mount the vertical lock assembly to the slide. Note facing the slide, the cables going to the floor car should be on the right and the cables going to the angulation box and tube mount bracket should be on the left.

Secure the two ground cable ends inside the lock assembly to the ground stud (mounted to the slide body) in this order: lock washer, cable lug, nut, tighten, lock washer, cable lug, tighten. The order of the cables does not matter. Secure the left ground cable (gray with green/yellow end) from the vertical lock assembly to the tube mount. Place the lock washer between the tube mount and ground lug.

4.3.2 Mechanical Lock Kit

Install the vertical mechanical lock assembly to the vertical slide using the screws provided.

4.4 Tube and Collimator Installation

Install the X-ray tube, collimator, and high voltage cables per the manufacturer's recommendations.

4.5 Angulation Box Installation

Install the angulation box (see *Figure 12*).

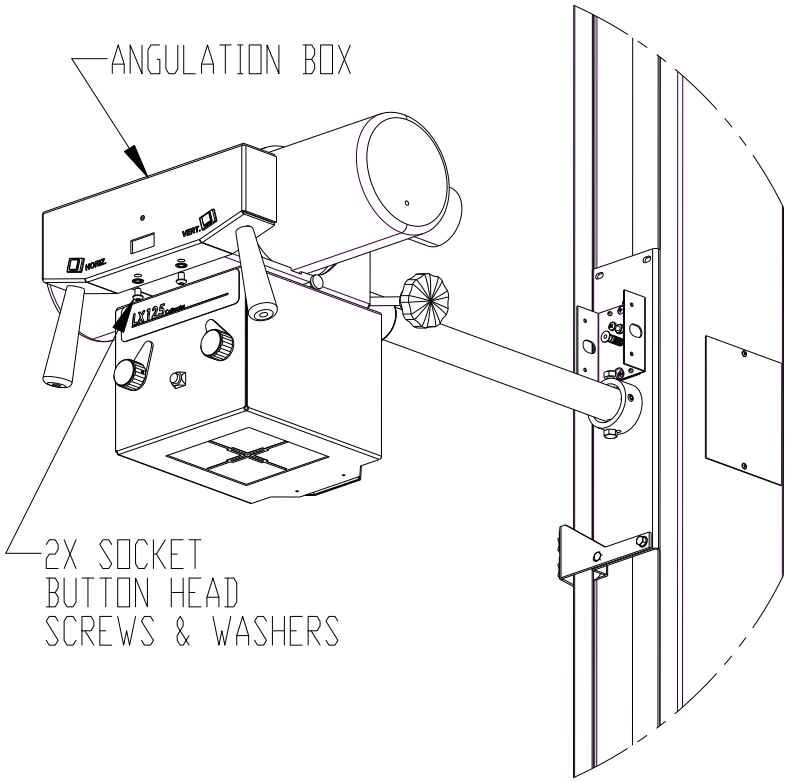

Figure 12: Angulation Box Installation

4.6 Column Cabling

4.6.1 Electric Lock Kit

The electrical junction box is integrated into the floor car of the tubestand (see *Figure 13*). The incoming 24 VDC power cable will occupy exit D. Locate the free cable end from the vertical lock assembly labeled "TO FLOOR CAR.", exiting from the right-hand side of the lock assembly. Connect this cable to the cable end at cable exit C.

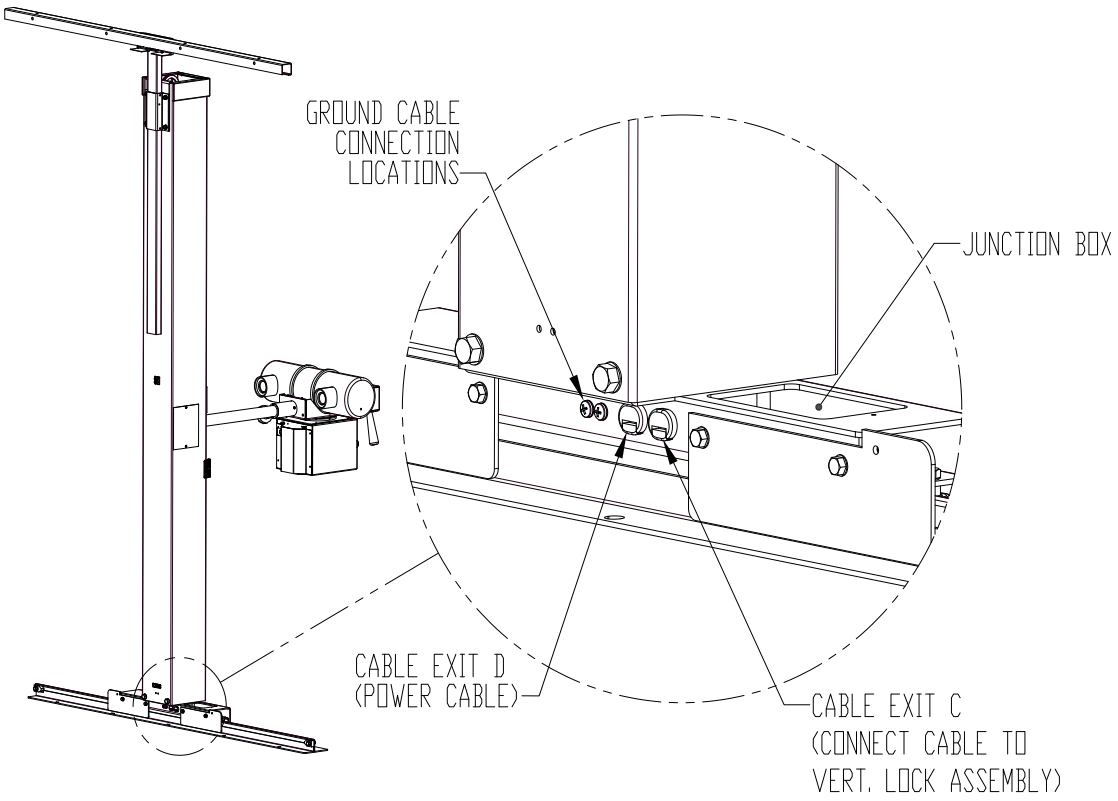

Figure 13: Back of the Floor Car

Connect the ground cable (gray with green/yellow end) from the right side of the vertical lock to an unoccupied ground cable connection location on the floor car (see *Figure 13*). Connect the ground cable (gray with green/yellow end) from the left side of the vertical lock to the tube mount platform (see *Figure 15*).

Connect the remaining cable from the left side of the lock assembly to the angulation box (see F*igure 12*).

Zip-tie the cable(s) from the floor car to the back of the column near the center (mount provided), leaving a service loop to account for the vertical motion of the slide.

Zip-tie the ground and angulation box cables to the tie mount on the tube mount platform (see *Figure 15),* leaving enough slack in the cable to allow for rotation of the head.

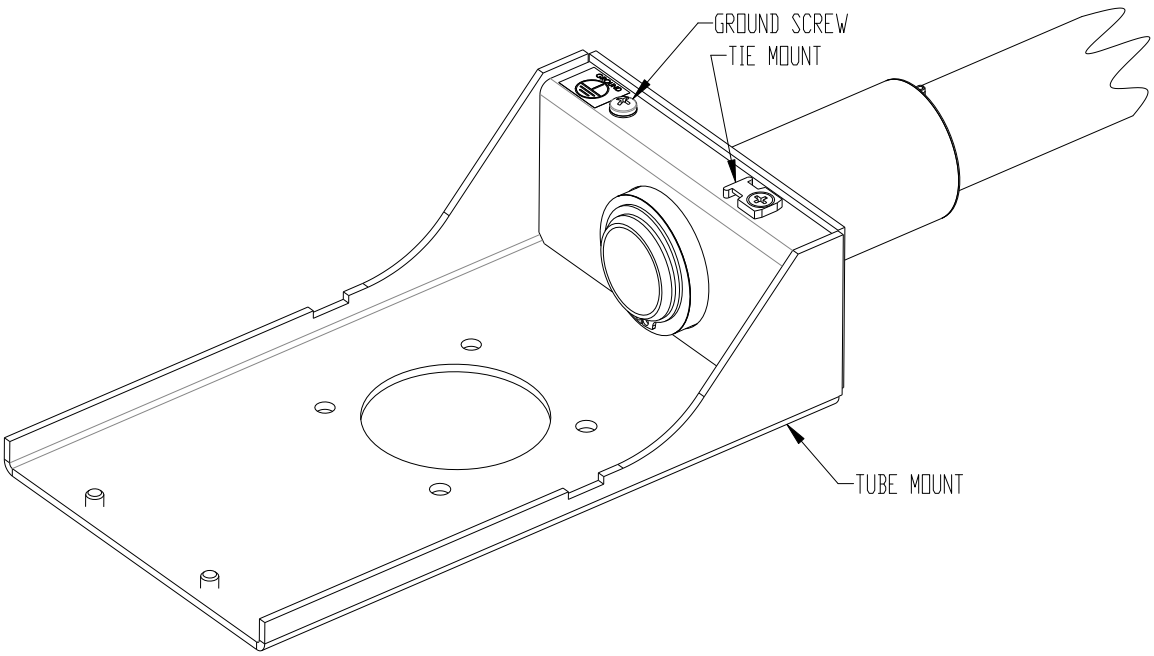

Figure 15 Tube Mount Platform

Connect the the 25-ft green/yellow wire to ground on the generator or power supply. Connect the cable marked "TO 24 VDC SUPPLY" to a 24V power supply (1A minimum) and test the locks.

4.6.2 Mechanical Lock Kit (ground cable only)

Ground cables come factory-installed to the floor car. Connect the the 25-ft green/yellow wire to ground on the generator. Route the gray ground cable up the column and secure it to the tube mount (see *Figure 15*). Pull the cable up from the floor car to remove the slack and zip-tie it to the back of the column near the center (mount provided), leaving a service loop to account for the vertical motion of the slide. Zip-tie the other end to the tie mount on the tube mount platform.

4.7 Trim Weights

Pre-trim the counterweight if necessary at this time by adding trim weights through one of the access holes in the side of the column. See *Figure 16*.

Leave the covers off at this time in case a final trim is required later.

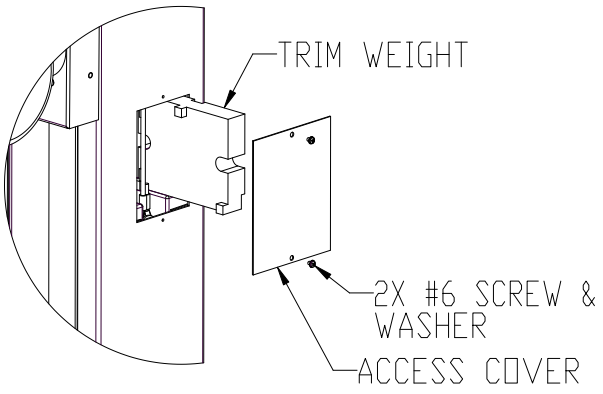

Figure 16: Addition of Trim Weights

4.8 Release the Main Counterweight

If it has not been done, remove the shipping strap from the vertical slide.

Remove the two hex shipping bolts at the rear of the column to allow the main counterweight to move vertically. Apply the label strip (held nearby with masking tape or included in the accessory kit) to cover the two holes in the column. See *Figure 17.*

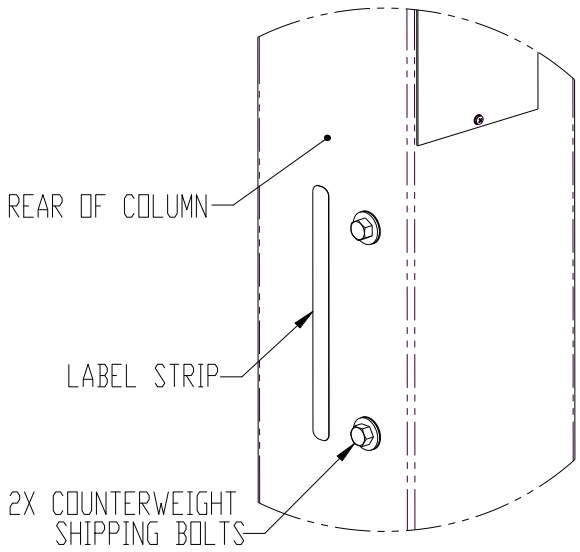

Figure 17 : Counterweight Shipping Bolts

4.9 Column Adjustments

4.9.1 Level the Arm

Level the tube arm using the adjusting screws (see *Figures 10 & 11*) to make it perpendicular to the column and its travel.

4.9.2 Vertical Lock Adjustment

4.9.2.1 Vertical Electric Lock

Loosen the nut shown in *Figure 18*. Turn the indicated screw clockwise to move the magnet closer to, or counter clockwise to move away from, brake strip of tubestand and tighten nut. Magnet should be adjusted so that it is as close as possible to brake strip without dragging (approximately 1/32” gap - about the thickness of a credit card).

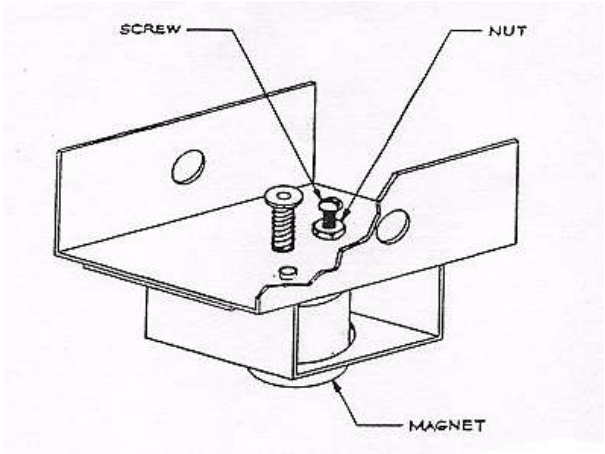

Figure 18: Vertical Electric Lock Adjustment

4.9.2.2 Vertical Mechanical Lock

The lock comes pre-adjusted from the factory to provide a lock force of between 10-25 pounds of lock force. After the manual vertical lock is installed, and if adjustments need to be made, turning the 7/16" hex head bolt counter-clockwise increases the vertical lock force and turning it clockwise decreases the lock force.

CAUTION

Do <u>NOT</u> over-tighten the 7/16" hex head bolt of the vertical lock. Doing so can cause premature failure of the retaining rings and bushings, which are critical to lock function. When properly adjusted, the lock should produce between 10-25 pounds of lock force and when unlocked, should not drag or chatter. The lock force should be measured and verified to be with the specified range prior to putting the unit into service.

4.9.3 Horizontal Lock Adjustment

4.9.3.1 Horizontal Electric Lock

Check operation of the horizontal lock magnet and adjust if necessary. With the horizontal lock magnet de-energized, tighten or loosen the lock adjustment screw (See *Figure 19*) to set the gap between the magnet face and the brake strip. Ideal adjustment is a minimum gap without any dragging across the entire range of motion with the lock de-energized.

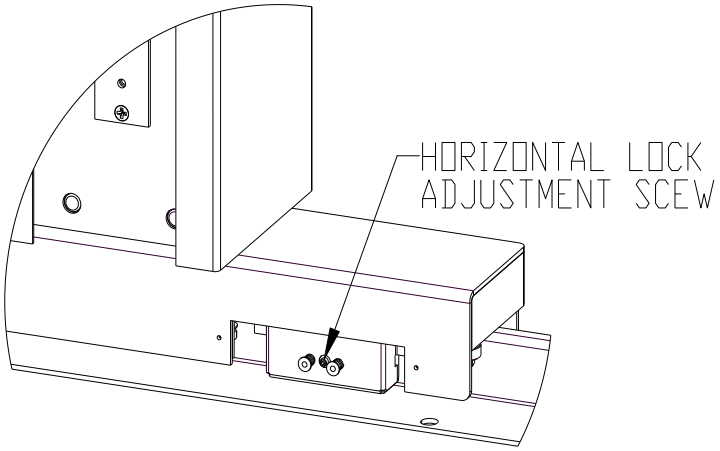

Figure 19: Horizontal Lock Adjustment

4.9.3.2 Horizontal Drag for Mechanical Lock Kit

For the mechanical lock kit, horizontal motion is controlled with drag by tightening the lower bearings on the floor rail**. See section 4.9.5 & *Figure 21* below**. Reduce the clearance until the two rear rollers and two front bearings contact the rail simultaneously. Check operation and re-adjust if necessary.

4.9.4 Upper Roller Adjustment

Adjustment is provided for the clearance between the main roller (inside the rail) and the pinch roller (outside the rail in the front. Check the clearance by holding the angulation box handles and pushing the column toward the wall. Rearward movement of the column should be minimal. Also there should be no drag from this roller across the longitudinal travel (drag indicates that it is too tight).

To adjust, loosen the 2X #6 hex head roller adjustment bracket screws (use a ¼" socket or box-end wrench). If they are hard to loosen, first loosen the 2X hex cover standoffs mounted on the screws below the plate. Push the bracket and roller toward the rail to decrease the clearance or away to increase. Retighten the screws to secure in place. Exercise care in tightening to avoid over-torquing and damage to the screws or base plate. Be sure to tighten the 2X hex cover standoffs after the pinch roller has been adjusted. See *Figure 20*.

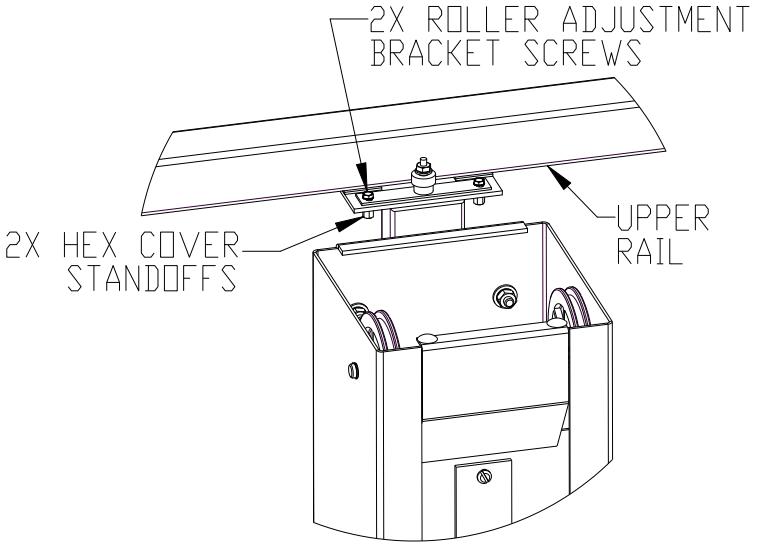

Figure 20: Upper Front Roller Adjustment

4.9.5 Lower Bearing Adjustment

Adjustment is provided on the floor car for the clearance between the main horizontal roller (one each side, back side of the rail) and the pinch bearings (one each side, front side of the rail). If adjustment is necessary, rotate the eccentric mount to change the clearance (see *Figure 21*). Tighten securely once appropriately set.

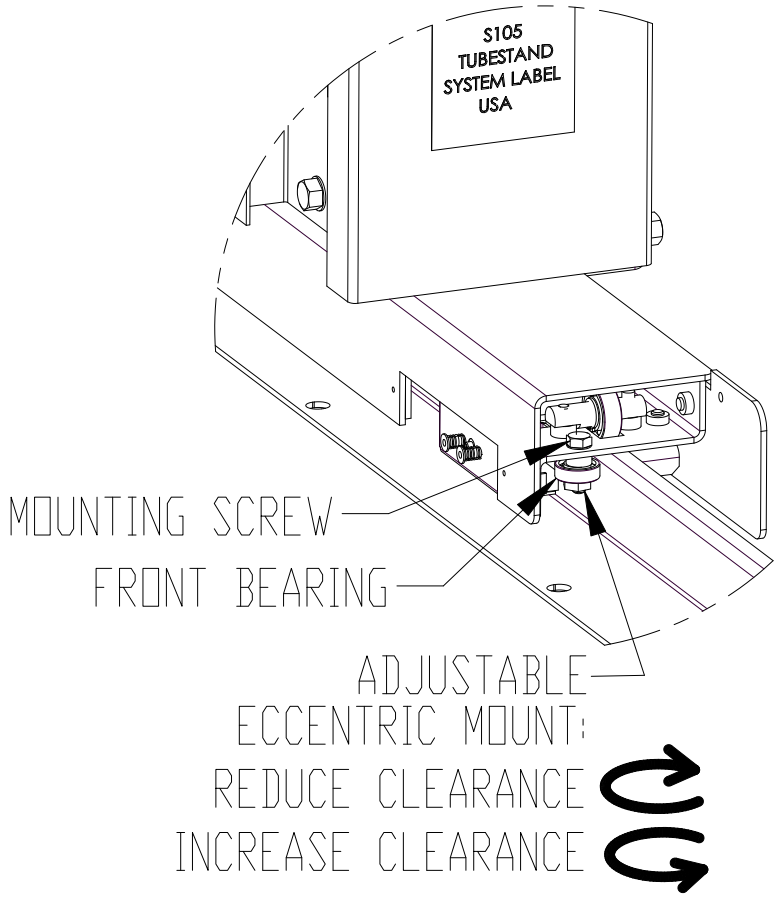

Figure 21: Lower Front Bearing Adjustment

4.9.6 Angulation Indicator

Check and zero the angulation indicator if necessary.

4.9.7 Final Level and Alignment Check

Perform a final check on the lower and upper rails to confirm that they are parallel and level. Perform a final check on the horizontal motions of the column. Make adjustments if necessary to positions and/or shimming. Perform a final check on the beam alignment and travel. Adjust the arm, floor car, and/or rails if necessary.

4.10 Cover Installation

4.10.1 Column Cap

Install the column cap by sliding it down from the top.

4.10.2 Upper Bearing Cover

If the dimension Z shown in *Figure 22* (the distance between the bottom of the upper bearing plate and the top of the clamp) is 2.06 or larger, attach the upper bearing cover using the 2X #6 button head screws included there (see *Figure 23*). If Z is between zero and 2.06, omit the upper cover.

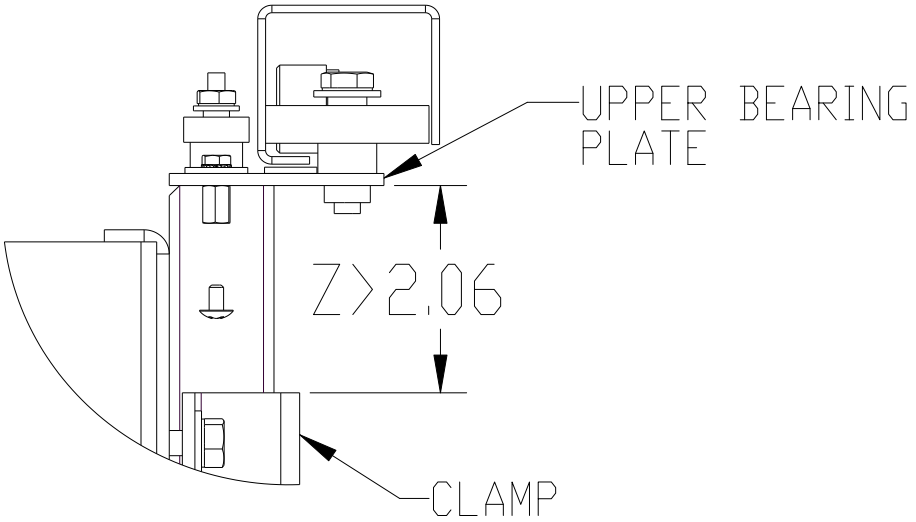

Figure 22: When to Attach the Upper Bearing Cover

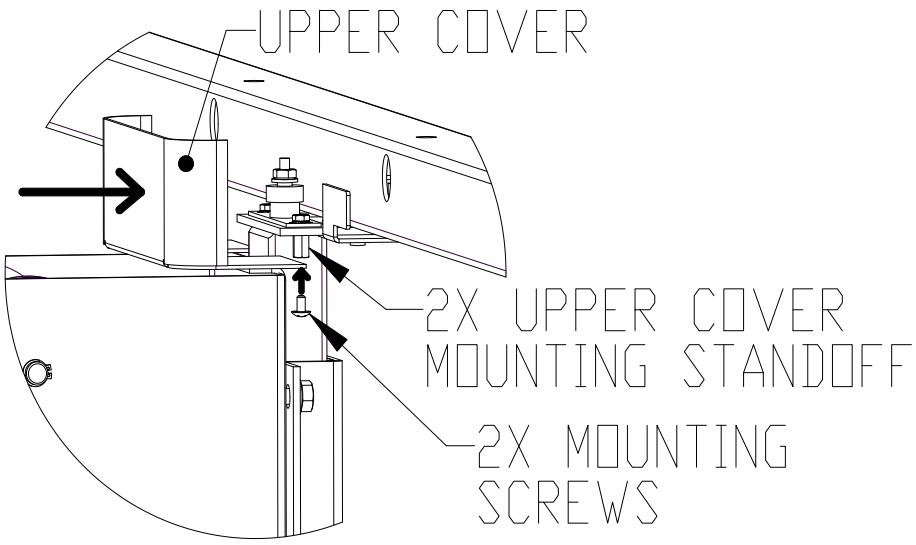

Figure 23: Upper Bearing Cover Installation

4.10.3 Floor Car Cover

Install the floor car cover. Tilt the cover down in the front slightly in order to get the front tab under the flanges of the column (see *Figure 24)*.

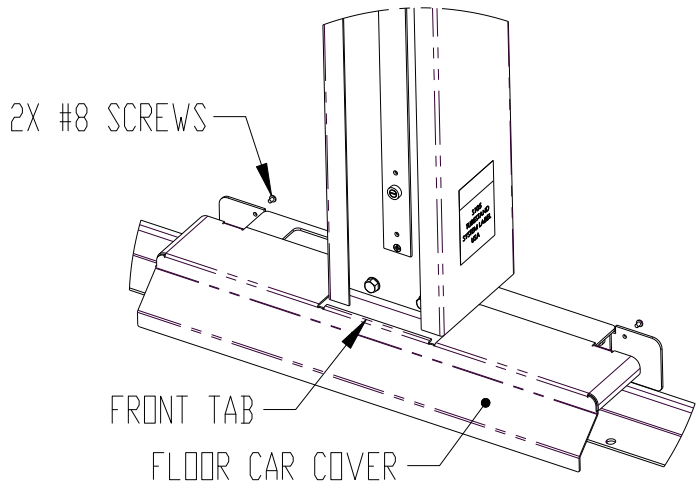

Figure 24: Floor Car Cover Installation

4.11 High Voltage Cables and Cable Management

Install the high voltage cables per the manufacturer's recommendations.

Arrange and secure the cables, leaving service loops to accommodate full vertical and horizontal travel as well as desired angulation.

4.12 Final Trim

At this point check the balance of the system and add or remove trim weight if necessary (see *Figure 16*). Install the two access covers to the sides of the column.

4.13 SID (Source to Image Distance) labeling

An SID labeling kit is provided, see instructions included there. Horizontal and vertical are provided however vertical SID labeling is only required when a table is present and horizontal SID labeling is only required when a wallstand is present.

5.0 BASIC MAINTENANCE

The following schedule of maintenance is required for safety of operation, continued ease of use, and continued long life of the product.

The maintenance program should be performed only by qualified and authorized service personnel. Frequency of the service should be 30 days after installation and annually thereafter unless indicated otherwise by local codes and regulations.

5.1 Tubestand

Check alignment (x-ray beam to film or receptor).

Inspect counterweight cables for fraying, damage, or wear.

Inspect all tubestand movements for binding or interference, check all bearings for proper operation.

Check all fasteners for tightness including the floor rail fasteners, wall/ceiling rail fasteners, and tubearm screws.

Verify the travel stops are in good functional condition.

Verify the locks are working properly.

Check the SID markers as required.

Inspect cabling for damage.

5.2 Collimator

Verify accuracy of field size.

Verify accuracy of light field to x-ray field alignment.

Check lamp on-off switch for proper operation.

Inspect collimator cable for fraying or damage.

5.3 X-Ray Tube

Inspect the housing for possible oil leakage.

Assure that the housing is tightly fastened to the tube mount and collimator.

Inspect stator cable for fraying or damage.

Inspect high voltage cable ends for carbon tracking. Clean and re-grease HV Cable ends annually.

6.0 WIRING DIAGRAM