analogic

Innovative Solutions for Life

PEABODY, MA 01960

CTXX85 Whole-Body, Multi-Slice CT Scanner

Preventive Maintenance Manual

16-01649

Trademarks

License Section

The granting of any license, and the terms of any warranty is explicitly defined in the contract to purchase this product.

Technical Support

For technical assistance, contact Analogic at:

Tel: (888) 857-3585

Email: ctsupport@analogic.com

Revision History

Date	Rev	Description
1 OCTOBER 2019	00	Initial release

Contents

1. Purpose/Scope

This document deswcribes the installation of certain Field Replaceable Units (FRUs) for the CTXX85 Whole-body, Multi-Slice CT Scanner. FRU installation procedures are delivered electronically. They are listed in this document for reference, with a quantity of zero.

2. Related Documentation

Document Number	Description
16-01609	PRODUCT DATASHEET, CTXX85
16-01617	SITE PREPARATION GUIDE, CTXX85
16-01654	INSTALLATION MANUAL, CTXX85
16-01648	CHECKLIST, INSTALLATION, CTXX85
16-01652	CHECKLIST, SITE ACCEPTANCE TEST (SAT), CTXX85
16-01626	USER MANUAL, CTXX85
16-01650	SERVICE MANUAL, CTXX85

3. Required Tools and Supplies

Tools
• Metric and English Hex wrench sets, including 7/64 in. hex wrench • Torque drivers • Metric and English box wrench sets • Flat and Phillips screwdriver sets • Pliers • Wire cutters • Lockout/tagout kit • Level • Rule

Special Tools	Analogic Equipment/Software
• Ring Gap Set (0.10, 0.30, 0.40, 0.60 shims) • 0.090 shim • Chatillor Digital Force Gauge DFGXIII • Windows® Laptop with couch GUI and Script installed • USB/CAN Adapter • MF25 pin D-sub cable • MF9 pin D-sub cable • Shop vacuum with HEPA filter • Precision digital protractor • Digital calipers • Torque wrenches • (2) M10 Ring hoists • 12 in. lifting strap, rated for 400 lbs. • Power supply (consult Analogic for voltage requirements)	• 2-4 [21-05896-01] BOLTS, M8 X 35 • [77-63249] WRENCH, PIN SPANNER • [77-64256] TILT POWER BOX 120VAC IN 24VDC OUT • 2 [77-64258] ROTOR MOUNTING GUIDE RODS • [77-64301] MANUAL RELEASE PULL • [77-64277] FIXTURE, ROTATION MOTOR INSTALLATION and bolt • [77-64278] FIXTURE, MOTOR DRIVE PULLEY ALIGNMENT • [77-64284] LIFT, X-RAY TUBE INSTALLATION • [77-78302] FIXTURE, TABLE ESTOP/COM TEST INTERFACE, CTXX85 • [103-123958-01] ASSY, SERVICE CRANE CTXX85 • [919-91133Vxx] DESTINY COUCH TEST AND SCRIPT GUIs

Supplies
• [113857] Loctite® 243 • [15-600131] Loctite 414 • [53-910046] Loctite 425 • [15-890031] Thompson LinearLube® • Lysol cleaning wipes suitable for use on touchscreen monitors • WD-40® • Torque seal indicator • Small (12”) disposable plastic bags or HV plug caps • Disposable gloves • Clean wipes • Cable ties

4. General Safety Cautions

<table>
<tr><td>  </td><td>⚠ WARNING

ELECTRIC SHOCK HAZARD! HIGH VOLTAGE!

Hazardous voltages are present inside the cabinets and covers of this instrument. Turn off all system power and lockout/tagout power at the facility source before opening Cabinets or Covers for any reason. Planned maintenance shall be performed by final system manufacturer’s qualified personnel only and should follow the Planned Maintenance referenced in this manual.

Disconnect system from facility Mains power, follow site lock out tag out protocols and wait a minimum of five (5) minutes prior to performing maintenance inside the system. To avoid risk of electric shock, this equipment must only be connected to a supply Mains with protective earth ground. Terminal Block Covers must be replaced after connecting power wiring.

DO NOT LEAVE THE UNIT POWERED UP WHEN UNATTENDED.</td></tr>
<tr><td>  </td><td>CRUSH/PINCH HAZARD!

Certain components are extremely heavy and can slip and injure personnel if not properly handled.
Personnel trained in the use of a forklift truck and overhead crane are required to move certain components.

NEVER work underneath any component being lifted by an overhead crane or lifting device. Always keep your body at a safe distance from any part being lifted. Use extreme care when lifting components.
All instructions contained in this document are intended for personnel who have been properly trained and approved for safe use and handling of the described components: cranes, lifting straps, lifting rings, and related equipment. Only approved/authorized personnel should attempt to complete the described procedures.</td></tr>
<tr><td>  </td><td>ROTATING COMPONENTS HAZARD!

Ensure that all system covers are installed prior to rotating the system. Apply disk brakes prior to performing steps at or near the disk.</td></tr>
</table>

	**⚠ WARNING** **PISTONS UNDER PRESSURE!** DO NOT over-extend or release a piston under tension. Ensure area is clear to avoid collisions during tilt positioning. Pistons are under pressure follow all steps exactly to prevent injury.
	**CHEMICAL HAZARD!** Certain procedures may require the handling of lead or parts containing encapsulated lead. Always wear appropriate Personal Protective Equipment (PPE) such as gloves and other PPE as required by your facility and all local, national and industry codes. Always work in properly vented areas. Always wash hands thoroughly after handling lead.
	**RADIATION HAZARD!** This equipment produces ionizing radiation. Operator must follow safe operating instructions. Observe Maintenance Schedules to ensure safe operations of all systems, including alarms. Do not insert any part of the body into an energized system. Only authorized, properly trained personnel may operate this equipment.
	**HEAVY COMPONENTS** Two people may be required to safely lift and move covers, panels, and various components. Always ask for assistance in moving any object that is heavy, bulky, awkward, or unbalanced.
	Review all Safety instructions provided with your Analogic systems prior to any maintenance or repair operations. Ensure that the safety instructions originally provided with this equipment are read and understood by the individuals responsible for plant safety, design, installation, operation, and maintenance. Additional copies are available upon request. In addition, all equipment supplied by Analogic should undergo periodic safety inspections to verify that all safety-related items such as guards, safety markings and safety cables are installed properly and operating as intended.
	The CTXXX85-YY is Class I, ordinary equipment with continuous operation. This equipment is not suitable for use in the presence of a FLAMMABLE ANESTHETIC MIXTURE WITH AIR or OXYGEN or NITROUS OXIDE.

⚠ CAUTION

ESD HAZARD!

Certain electronic components can be damaged by electrostatic discharge. Wear a grounded conductive wrist strap when handling any PCB.

FRAGILE FIBER OPTIC CABLES!

Use extreme care when handling fiber optics cables. Do not put any stress on the cables as the inner fiber optics are easily damaged. Do not overtighten tie-wraps or damage to the fiber cables will occur.

At no time during handling or installation should the fibers be bent tighter than a ½ inch radius.

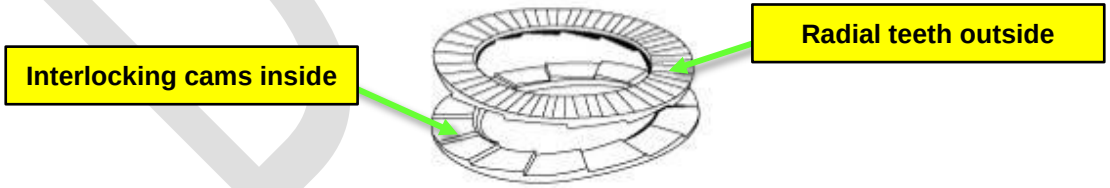
4.1. Nord-Locks

Nord-Lock washers provide a secure locking system for fasteners.

The washers are only effective when installed properly.

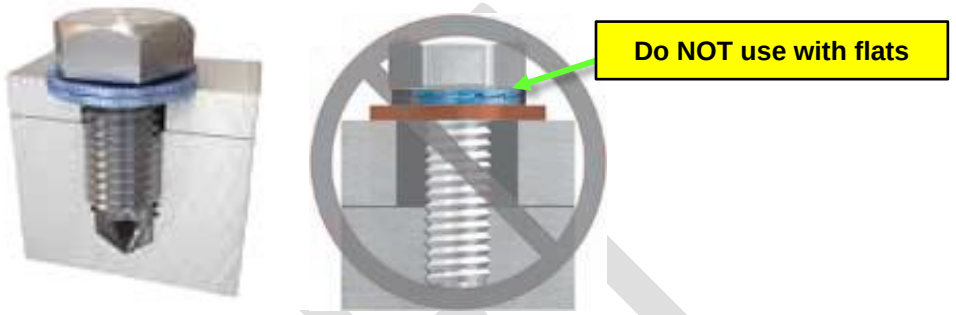
The washers are supplied in matched pairs. When new, the pairs are glued together in the correct orientation. If pairs are separated or reused, make sure the two halves are installed cam face to cam face, as below. Wherever possible, REPLACE Nor-Locks with new Nord-Locks.

CAUTION: Always install Nord-Lock washers **cam face** to **cam face**.



The teeth on the outside of the washer pairs bite into the bolt head and the join material.

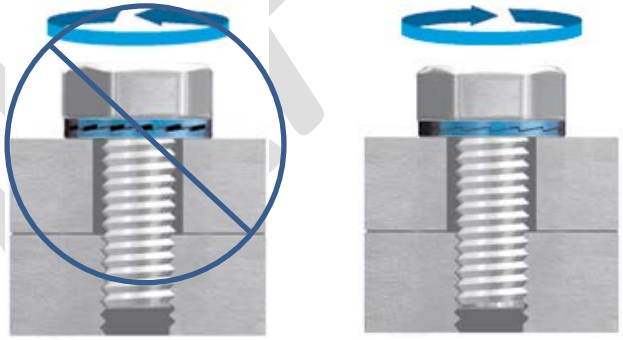
When used with a cap screw or bolt in a threaded hole, install one pair of washers, **cam face to cam face**, under the cap screw or bolt head. Do not use Nord-Lock washers with flats or any other type of washer that is not captured in place.



Correct use of Nord-Lock for Threaded Bolt

Unless bent, over-torqued, or otherwise damaged, Nord-Lock washers may be reused. Ensure that reused pairs are mated cam face to cam face. Use the correct torque for all fasteners. Nord-Locks may click once as cams mate. Do not confuse this sound with an expected click from the torque wrench. When removing fasteners secured with Nord-Lock washers, slight additional force is required initially to jump the cams up and over each other.

Verify Nord-Lock hardware is installed correctly by visually confirming the interlocking washers are fully mated and locked together. When fully tightened, no gap will be seen between the two washers, and the washers will not come loose under vibration.



NOT locked – INCORRECT **Fully Locked -- CORRECT**

4.2. Torque Seal / Inspection Lacquer

Torque Seal inspection lacquer provides a visual indicator of whether fasteners remain at the proper torque position. Torque Seal becomes brittle when dry. The line created at application will crack if a fastener moves.

CAUTION: Torque seal is a visual indicator only. It is **not** an adhesive. It does not in any way adhere or lock fasteners to threads or other surfaces.

Apply Torque Seal on the side of the bolt or nut, across the washer, and onto the mating surface.
Seal requires approximately two minutes to dry to touch; approximately 24 hours to fully cure.

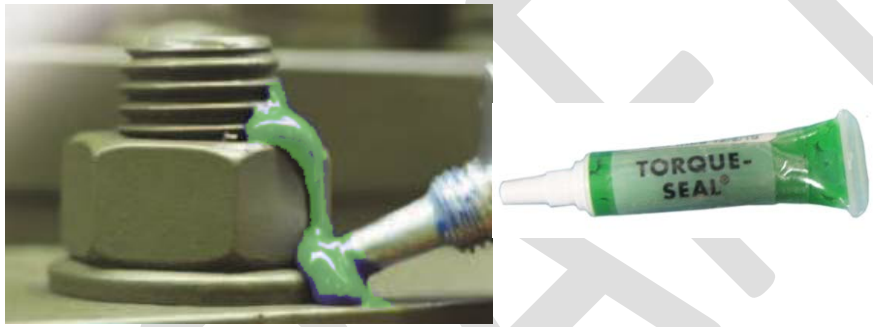


Figure 1 Torque Seal Across Bolt/Washer/Surface

5. System Components

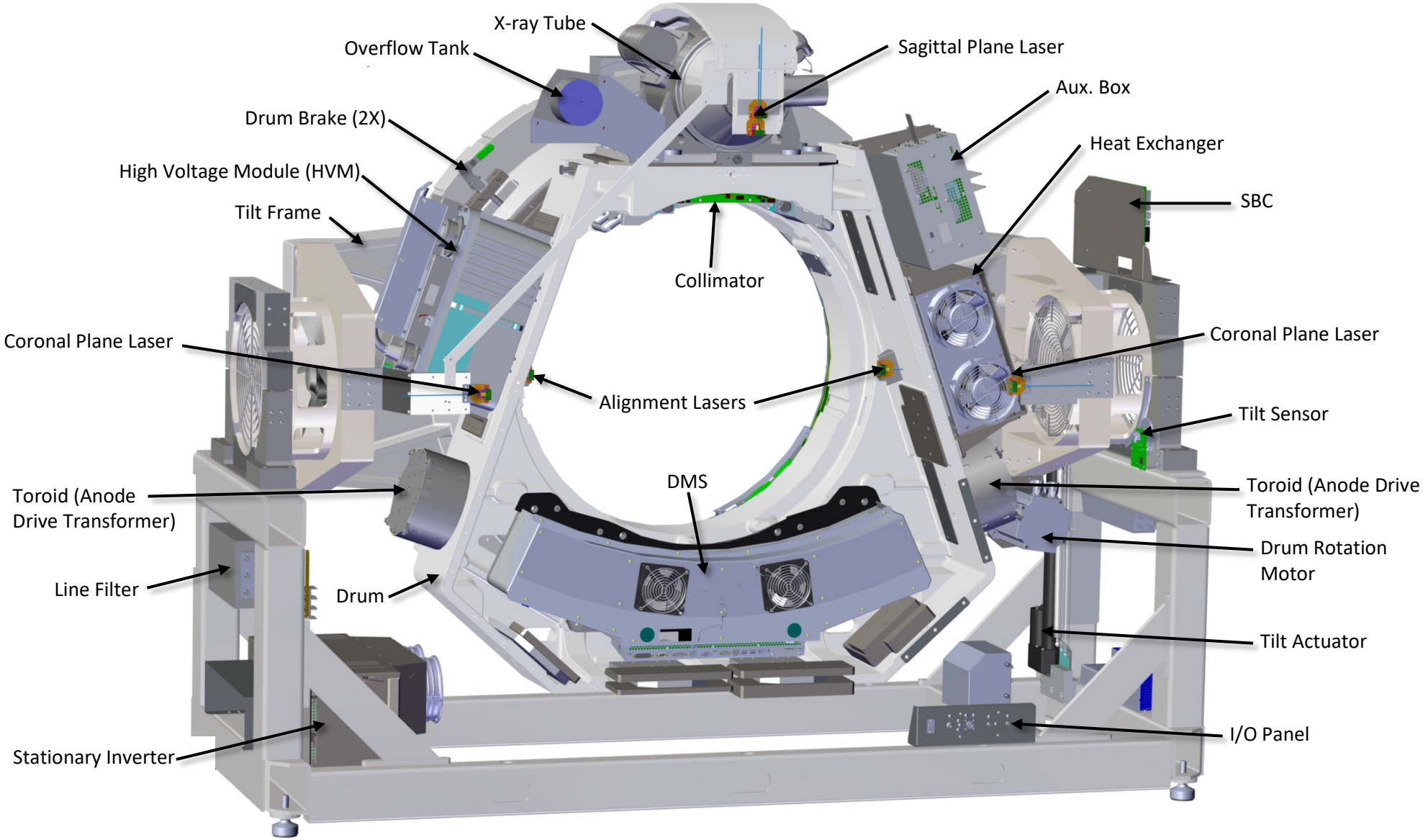


Figure 2 FRONT VIEW – Covers Removed (tilting system)

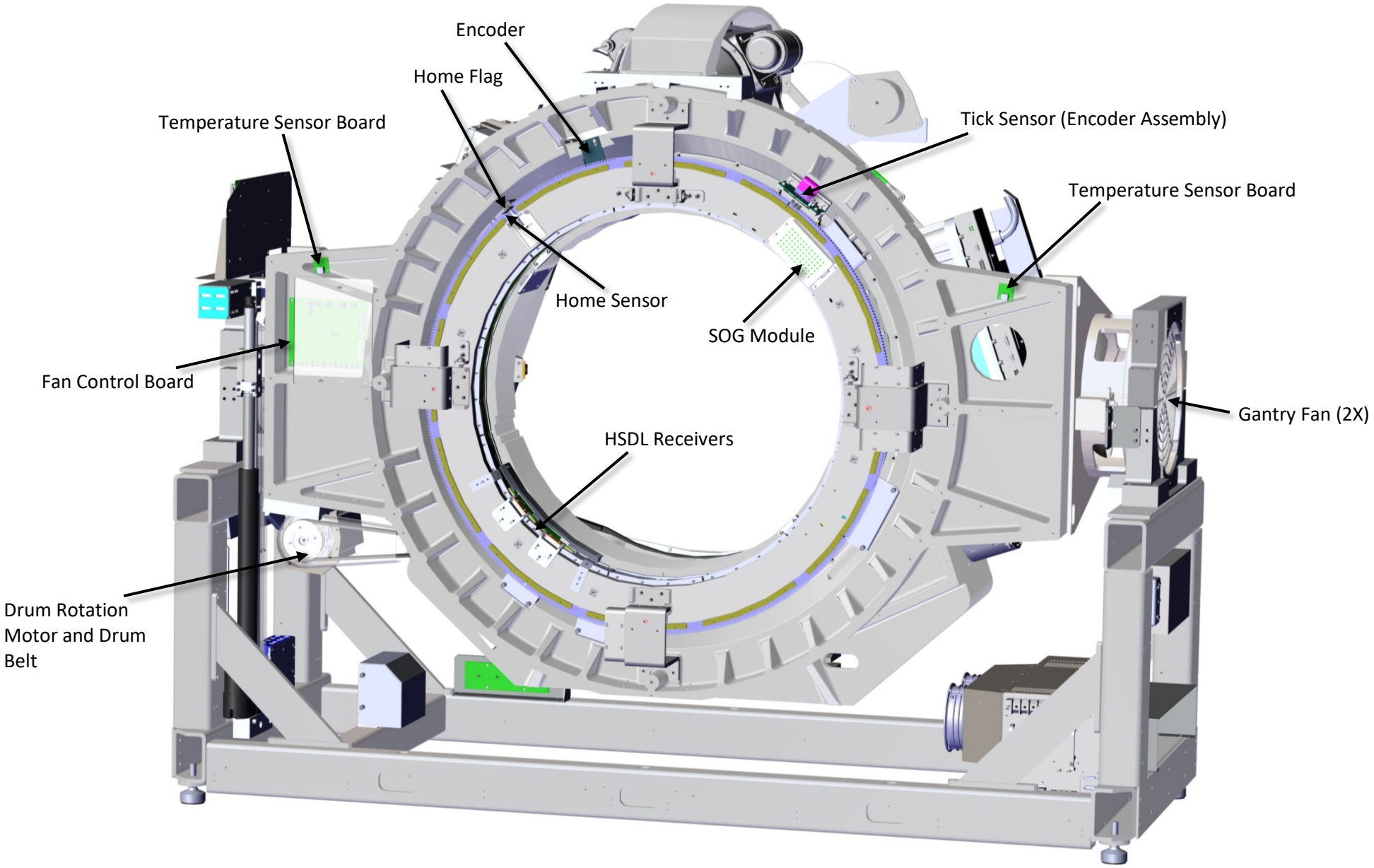


Figure 3 REAR VIEW - Covers Removed (tilting system)

6. Turning Off System Power

This procedure describes how to safely power down the system and prevent component damage.

1. Verify that HEAT STORAGE is BELOW 25%, then press and hold the PDU or GCB OFF button for several seconds.
2. The GCB/PDU will stop any gantry rotation and X-ray tube internal anode rotation.
3. WAIT FOR THE SYSTEM TO SHUT DOWN. The PDU WHITE light illuminates.
4. Shut down and lockout/tagout all facility power to the PDU.

<table>
<tr><td rowspan="2">  </td><td>⚠ WARNING</td></tr>
<tr><td>ELECTRIC SHOCK HAZARD! HIGH VOLTAGE!
Hazardous voltages are present inside the cabinets and covers of this instrument. Turn off all system power and lockout/tagout power at the facility source before opening Cabinets or Covers for any reason. Planned maintenance shall be performed by final system manufacturer’s qualified personnel only and should follow the Planned Maintenance referenced in this manual.
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<tr><td>  </td><td>⚠ CAUTION
POTENTIAL X-RAY TUBE DAMAGE!
DO NOT TURN OFF SYSTEM POWER UNTIL HEAT STORAGE IS BELOW 25%
Verify that heat storage is BELOW 25% before turning off system power. This is critical as system power is required to cool the X-ray tube. Turning off power on a hot tube will cause irreparable damage. Carefully follow power-down steps to prevent system damage.</td></tr>
</table>

7. PM SCHEDULES

7.1. Room/Console/Gantry/PDU Check

#	Area	ACTION	ITEM	Time to Complete (minutes)*	SEMI-ANNUAL PM	ANNUAL PM	Tech.	Initials
1	Room	TEST	Exam Room Door Interlocks	10	YES	YES		
2	Room	CHECK	X-ray ON Lights, Signals	5	YES	YES		
3	System	CHECK	Emergency STOP Buttons – Gantry, Console, PDU, Other	5	YES	YES		
4	System	CLEAN	Air Handling Filters, Fans, Grills	15	YES	YES		
5	Console	CHECK	System Clock	5	YES	YES		
6	Console	CHECK	Touchscreen Calibration Check	5	YES	YES		
7	Console	CHECK	Cables/Power Cable Terminals	5	YES	YES		
8	Console	CHECK/CLEAN	Fans	5	YES	YES		
9	Console	CLEAN	Filters	5	YES	YES		
10	Console	CLEAN	Display Monitor/Exterior	5	YES	YES		
11	PDU	CHECK	Safety Labels	5	YES	YES		
12	PDU	CHECK	Power Cable Terminals	5	YES	YES		
13	GANTRY	CHECK	Anchor Check/Seismic Anchor	5	YES	YES		
14	GANTRY	CHECK	Protective Earth Connection	5	YES	YES		
15	GANTRY	CHECK	CHECK: Encoder wheel	5	YES	YES		
16	GANTRY	CHECK	Static Discharge Brushes	5	YES	YES		
17	GANTRY	CHECK	X-ray Tube Connections	10	YES	YES		
18	GANTRY	CHECK	Cables and Hardware (secure/tight)	10	YES	YES		
19	GANTRY	CHECK	Tilt zero check	05	YES	YES		
20	GANTRY	CHECK/ADJUST	Belt, Belt Tension	30	YES	YES		
21	GANTRY	CHECK/CLEAN	Internal and External Components/Surfaces	15	YES	YES		
22	GANTRY	CHECK/CLEAN	Aux Box Fan	10	-	YES		
23	GANTRY	CHECK/CLEAN	Heat Exchanger Fans	20	-	YES		
24	GANTRY	CHECK/REPLACE	DMS Fan Filters	60	-	YES		
25	GANTRY	CHECK	Audio Functions	5	YES	YES		
26	GANTRY	CHECK	Safety Labels	5	YES	YES		

After cover removal for access.

7.2. Table Checks

ITEM	Area	TABLE CHECK	Time to Complete (minutes)	SEMI-ANNUAL PM	ANNUAL PM	Result
1	Table	Table position accuracy check	10	YES	YES	
2	Table	Verify Mechanics	5	YES	YES	
3	Table	Anchor check/Seismic anchor check*	15	YES	YES	
4	Table	Inspect protective earth connection and verify cables are seated properly	10	YES	YES	
5	Table	Check Service jack	10	YES	YES	
6	Table	Check/fill hydraulic assembly	30	YES	YES	
7	Table	Check ball screw/nut for visible wear	5	YES	YES	
8	Table	Check bearing rail cartridges	5	YES	YES	
9	Table	Check clutch for visible wear	5	YES	YES	
10	Table	Check motor for visible wear	5	YES	YES	
11	Table	Check gearbox for visible wear	5	YES	YES	
12	Table	Clean inside/outside of table	15	YES	YES	
13	Table	Grease lead screw	15	YES	YES	

8. CHECK SYSTEM CLOCK AND TOUCHSCREEN CALIBRATION

8.1. Check Console System Clock

1. Power on the system and login to the Operator Console.
2. Note the time in the bottom right-hand corner of the Operator Console program.
3. Verify the time matches the local time zone.

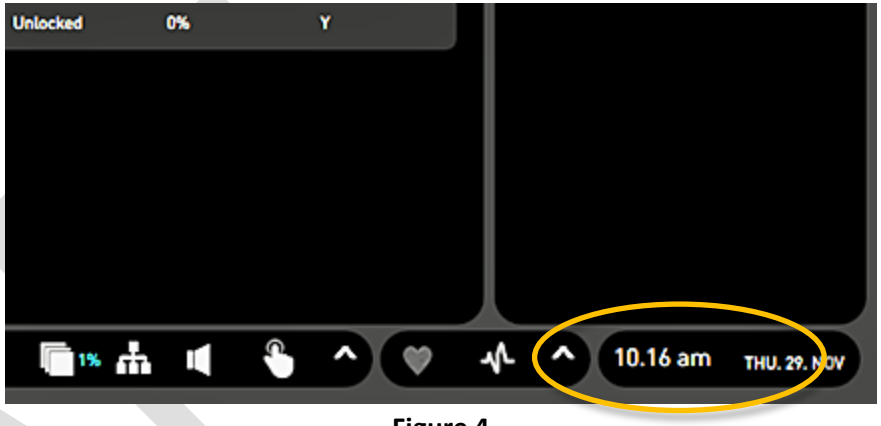

Figure 4

8.2. Check Console Touchscreen Calibration Check

1. Power on the system and login to the Operator Console.
2. Test touchscreen response in different screen locations.
3. Verify touch response aligns with finger location.
4. Calibrate if required. See the procedures on the next page.

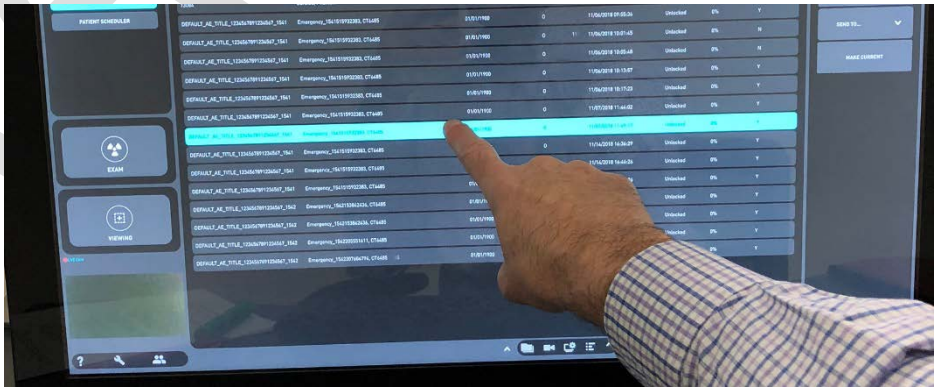

Figure 5

Calibration for ViewSonic Optical Touch Displays

1. Enter the **Control Panel** menu on your Windows system, then select **Hardware and Sound**.

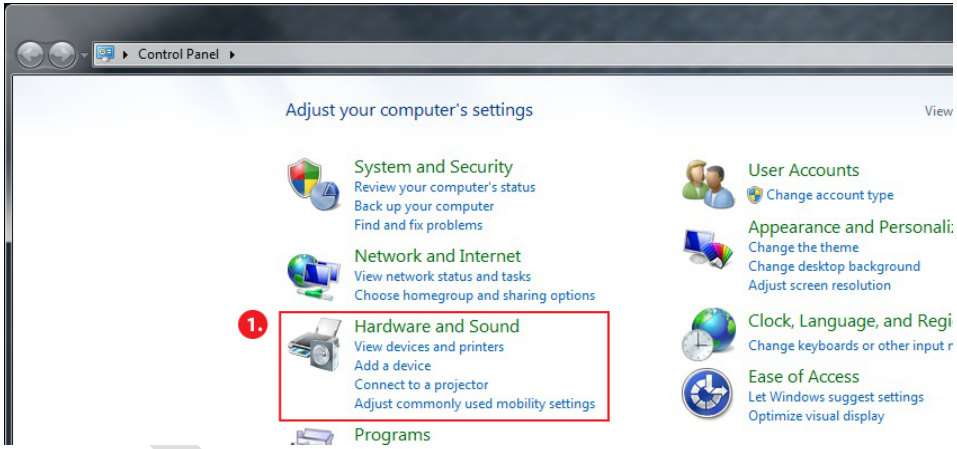

Figure 6

2. Within the **Tablet PC Settings**, select **Calibrate the screen for pen or touch input**.

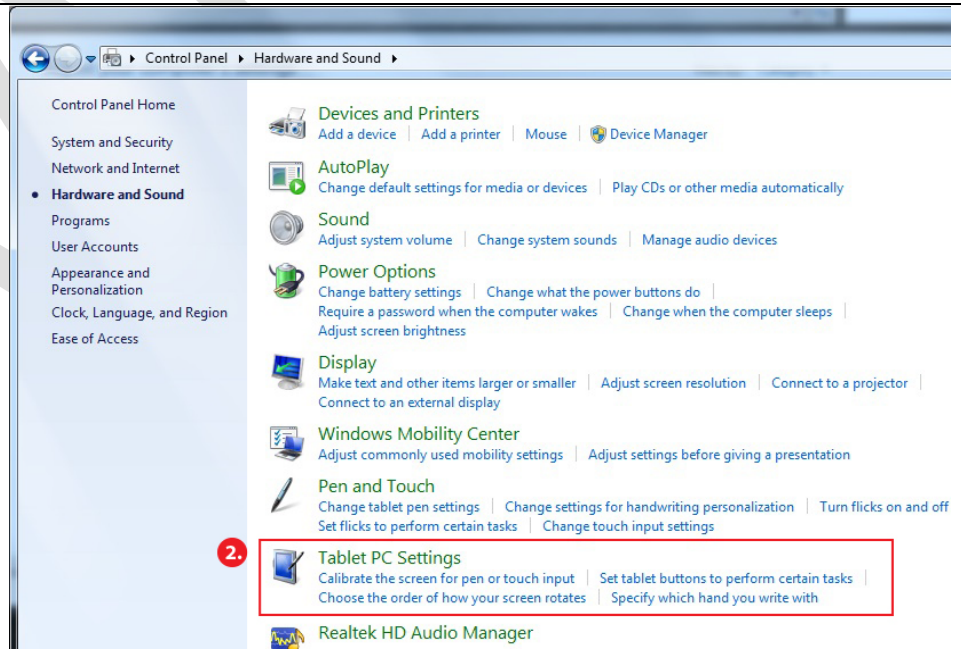

Figure 7

3. Select the desired ViewSonic touch display from the **Display Options** drop-down menu, then press **Calibrate**.

4. Follow the on-screen instructions to tap the crosshair targets that appear on the screen. After calibration is complete, the **Digitizer Calibration Tool** window displays.

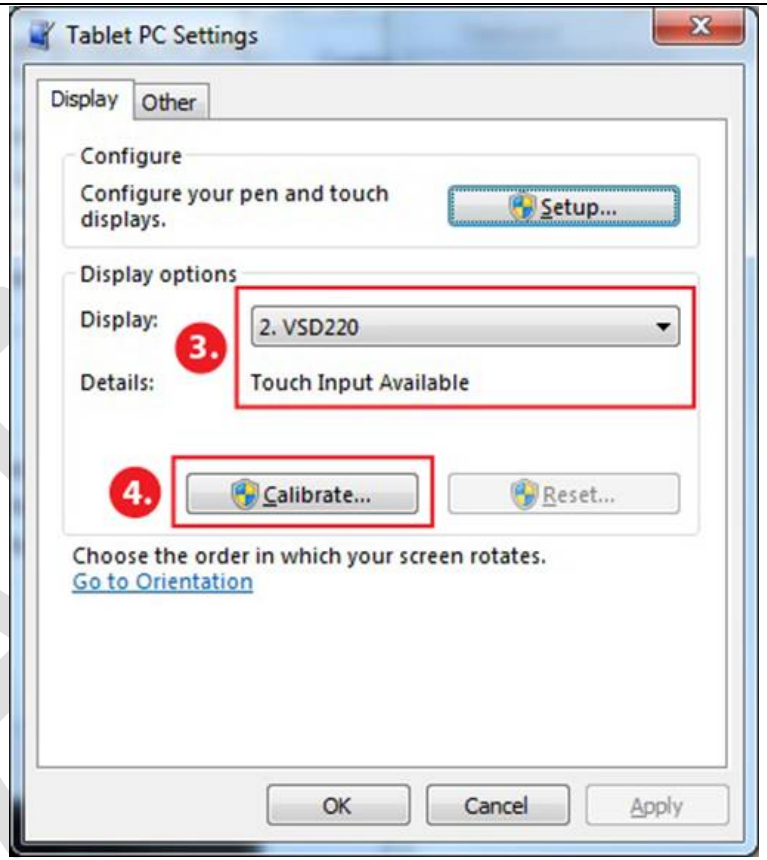

Figure 8

5. Select **Yes** to save the calibration settings.

The URL is:
www.viewsonic.com/us/viewsonic-optical-touch-display-calibration

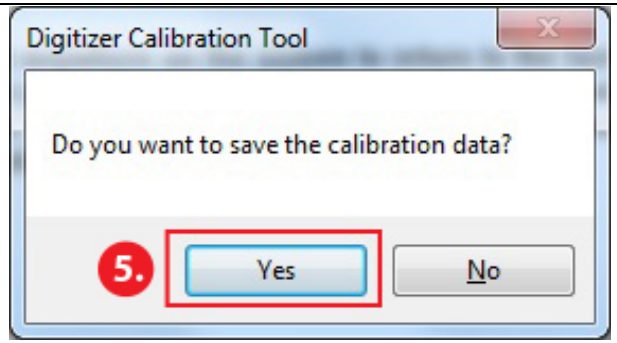

Figure 9

9. CHECK EXAM ROOM INTERLOCKS and INDICATORS

9.1. Check Exam Room Door Interlocks

1. Power on the system and login to the Operator terminal.
2. Prop open an exam room door.
3. Use the Operator Console setup to perform a Cold Warmup scan series.
4. Select **Daily Calibration**.
5. Check **Tube Warmup**.

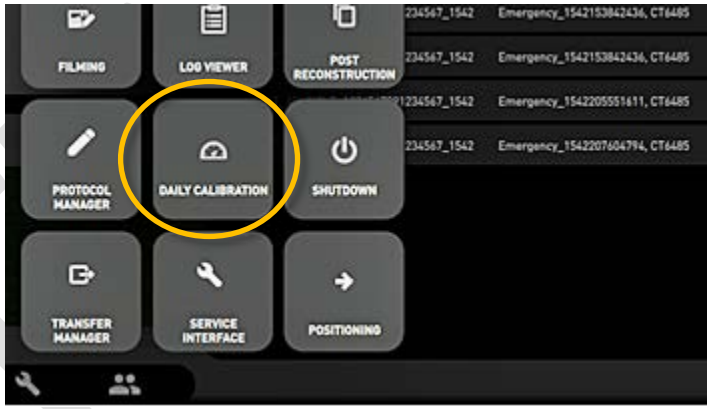

Figure 10

6. Select **Confirm**.
   An Error should display on Operator console indicating the exam room door is open.

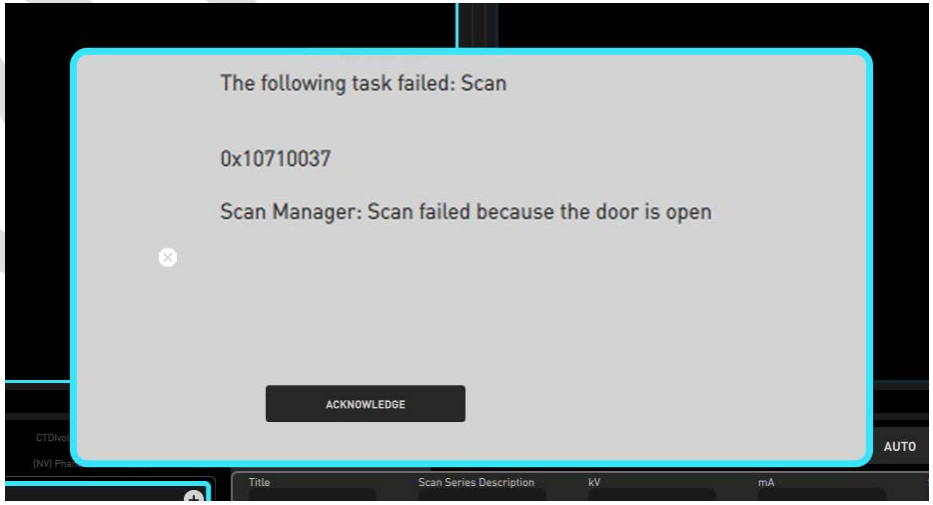

Figure 11

9.2. CHECK X-Ray ON Lights, Signals

1. Perform a Tube Warmup scan series from the Operator Console.
2. Verify X-ray on indicator lamp above exam room door illuminates during the scan.

Figure 12

3. Verify indicator lamps on the GCB and Gantry keypads activate during the scan.
4. Verify X-ray on icon appears on Gantry display during the scan.

Figure 13

10. CHECK E-STOPS

10.1. Test Emergency STOP Buttons (Gantry, Console, PDU, Other)

⚠ CAUTION

POTENTIAL X-RAY TUBE DAMAGE!
DO NOT TURN OFF SYSTEM POWER UNTIL HEAT STORAGE IS BELOW 25%.

Verify that heat storage is BELOW 25% before turning off system power. This is critical as system power is required to cool the X-ray tube.

1. Verify that HEAT STORAGE is BELOW 25%.
2. Activate e-stop on the GCB (Gantry Control Box).

Figure 14

3. Verify that the software will not allow X-ray or motion without clearing the e-stop.
4. Verify e-stop icon appears on Gantry display.
5. Verify table is in “free-float” for emergency patient removal.
6. Reset tripped e-stop button.
7. Repeat steps for all e-stop buttons.

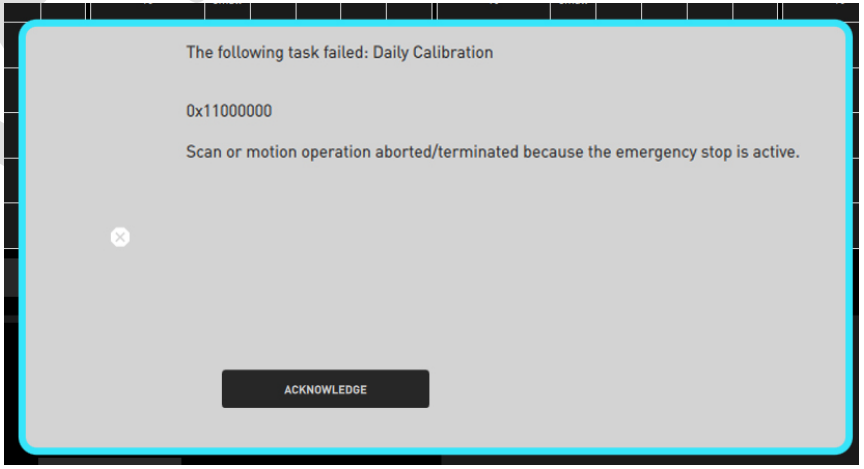

Figure 15

11. CLEAN SYSTEM AIR HANDLING FILTERS/FANS/GRILLS

11.1. CLEAN: Air Handling Filters, Fans, Grills

Tools/Supplies: shop vacuum with HEPA filter

⚠ CAUTION

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DO NOT TURN OFF SYSTEM POWER UNTIL HEAT STORAGE IS BELOW 25%.

Verify that heat storage is BELOW 25% before turning off system power. This is critical as system power is required to cool the X-ray tube.

1. Verify that HEAT STORAGE is BELOW 25%.
2. Press and hold the PDU or GCB OFF button for several seconds.
   The GCB/PDU will stop any gantry rotation and X-ray tube internal anode rotation.
3. WAIT FOR THE SYSTEM TO SHUT DOWN.
   The PDU WHITE light will turn ON.

Figure 16

4. Clean all external Gantry air-handling grills with the shop vacuum.
5. Open or remove covers as necessary to access grills, fans, and inlets. Vacuum then wipe with cleaning wipes all surfaces of the grills, fans, and inlets.

12. CHECK/CLEAN OPERATOR CONSOLE COMPUTER

12.1. Check Computer Cables, Clean Computer Fan Grill, Clean Monitor

Tools/Supplies: Shop vacuum with HEPA filter, Lysol® wipes appropriate for cleaning touchscreen monitor, lint-free microfiber cloth

⚠ CAUTION

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DO NOT TURN OFF SYSTEM POWER UNTIL HEAT STORAGE IS BELOW 25%.

Verify that heat storage is BELOW 25% before turning off system power. This is critical as system power is required to cool the X-ray tube.

1. Verify that HEAT STORAGE is BELOW 10%.
2. Press and hold the PDU or GCB OFF button for several seconds.
   The GCB/PDU will stop any gantry rotation and X-ray tube internal anode rotation.
3. WAIT FOR THE SYSTEM TO SHUT DOWN.
   The PDU WHITE light turns ON.
4. Use Shop Vacuum to clean excessive dust accumulation on the rear of the monitor.
5. Use Lysol® monitor wipes to wipe down rear of the monitor.
6. Make sure all cables are still properly connected after cleaning before returning machine to service.
7. Use Lysol® monitor wipes to clean the touchscreen display. Dry/buff with a lint free microfiber cloth.

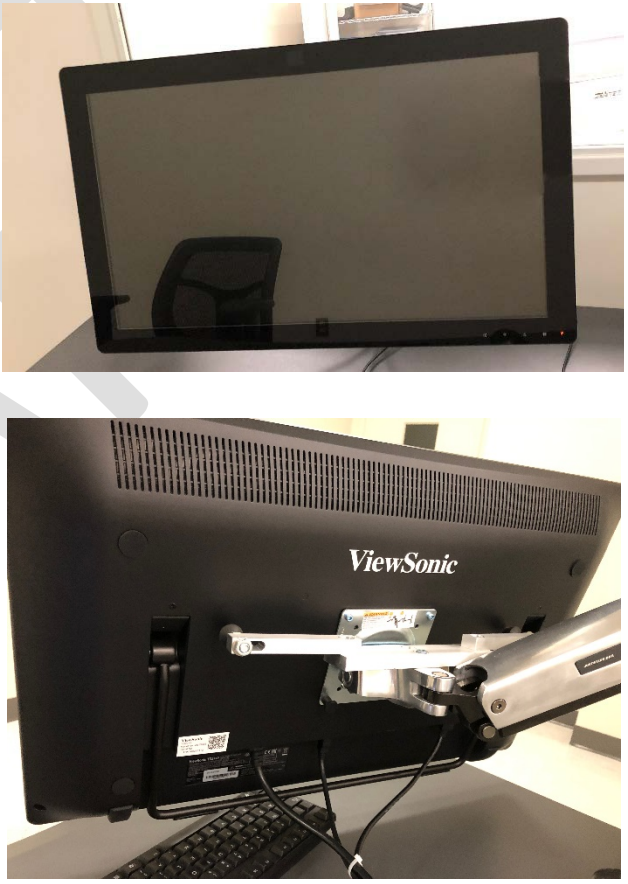

Figure 17

8. Clean the computer fan air intake with the shop vacuum.
9. Inspect/reseat as required, all the cable connections on the back of the operator console computer.

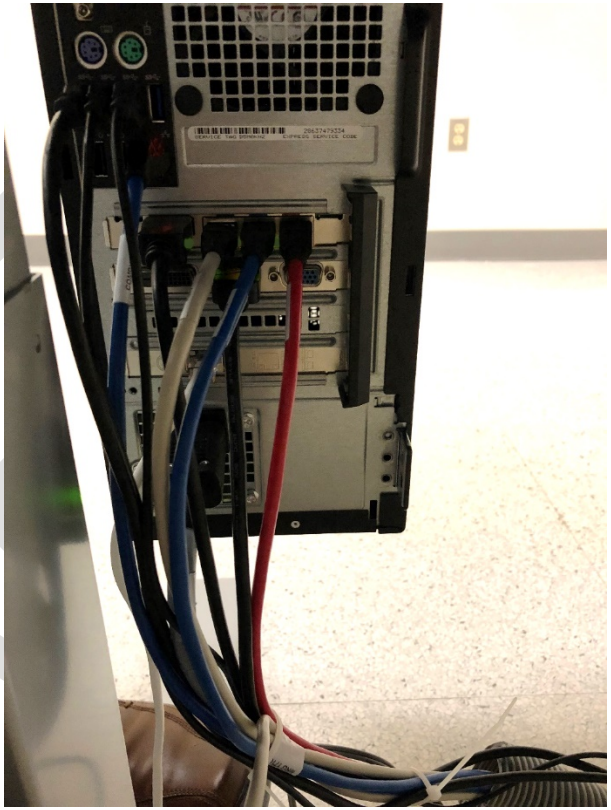

Figure 18

13. CLEAN AND CHECK THE PDU

13.1. Check PDU Safety Labels

Tools/Supplies: lockout/tagout kit

⚠ CAUTION

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Verify that heat storage is BELOW 25% before turning off system power. This is critical as system power is required to cool the X-ray tube.

1. Verify that HEAT STORAGE is BELOW 25%.
2. Press and hold the PDU or GCB OFF button for several seconds.
   The GCB/PDU will stop any gantry rotation and X-ray tube internal anode rotation.
3. WAIT FOR THE SYSTEM TO SHUT DOWN.
   The PDU WHITE light will turn ON.
4. Turn off main disconnect, lockout/tagout as required.

Figure 19

5. Inspect PDU and verify all safety labels are attached properly and in good condition. Replace as necessary. Refer to photos are right and on next page.

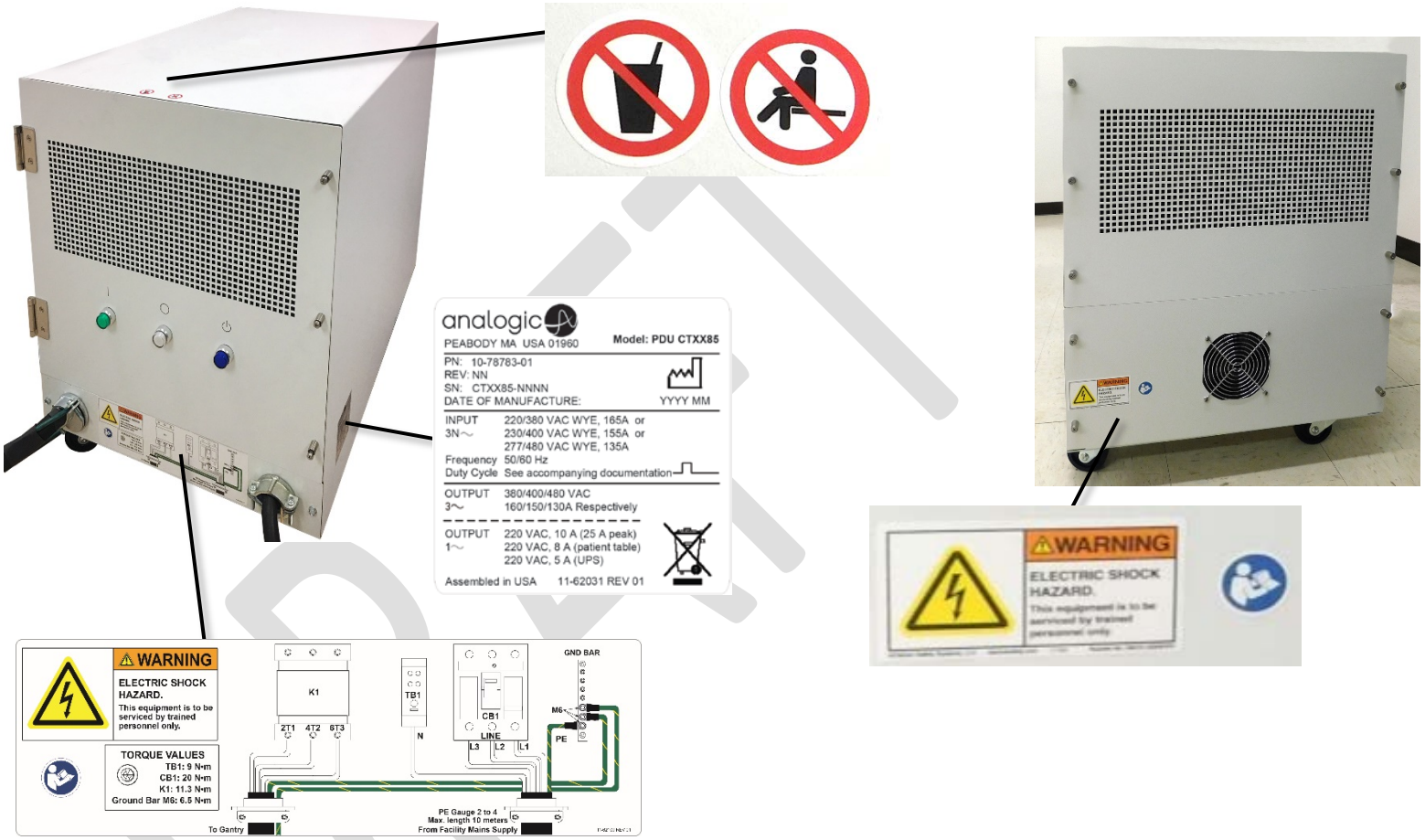

Figure 20

13.2. Check PDU Power Cable Terminals, Clean Computer Filters/Inlets

Tools/Supplies: lockout/tagout kit, vacuum cleaner, clean wipes, flatblade Phillips screwdriver sets

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   The GCB/PDU will stop any gantry rotation and X-ray tube internal anode rotation.
3. WAIT FOR THE SYSTEM TO SHUT DOWN. The PDU WHITE light turns ON.
4. Turn off main disconnect, lockout/tagout as required.

Figure 21

5. Open PDU door and inspect PDU power connections. Ensure the connections are tight and free from damage or discoloration.
6. Inspect/reseat as required, all the cable connections on the SCRC PC and PDU control board.

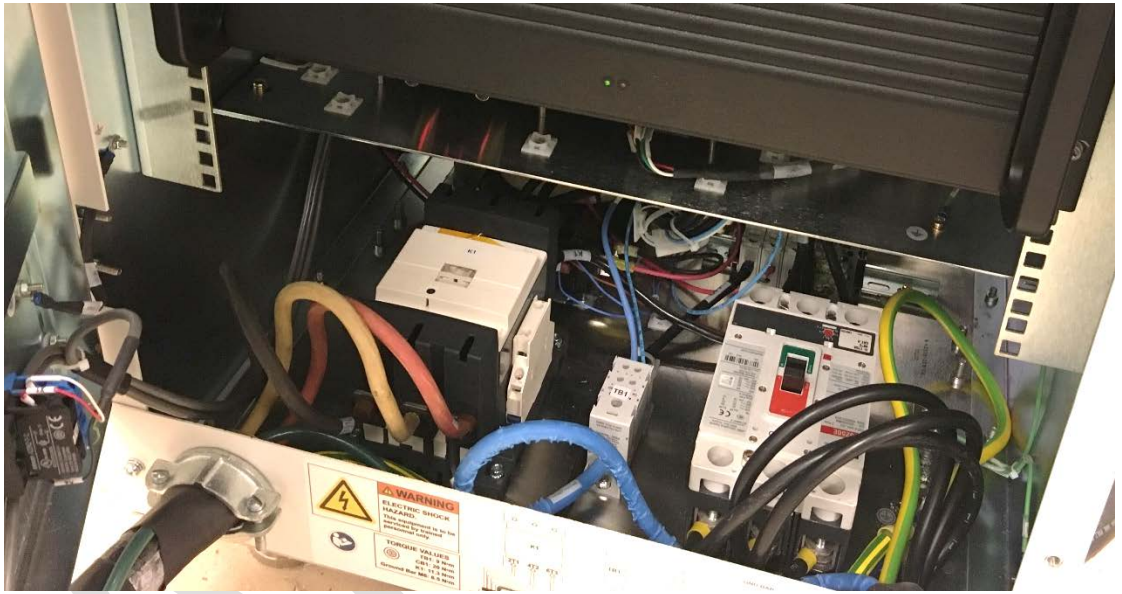


Figure 22

7. Open SCRC PC front.

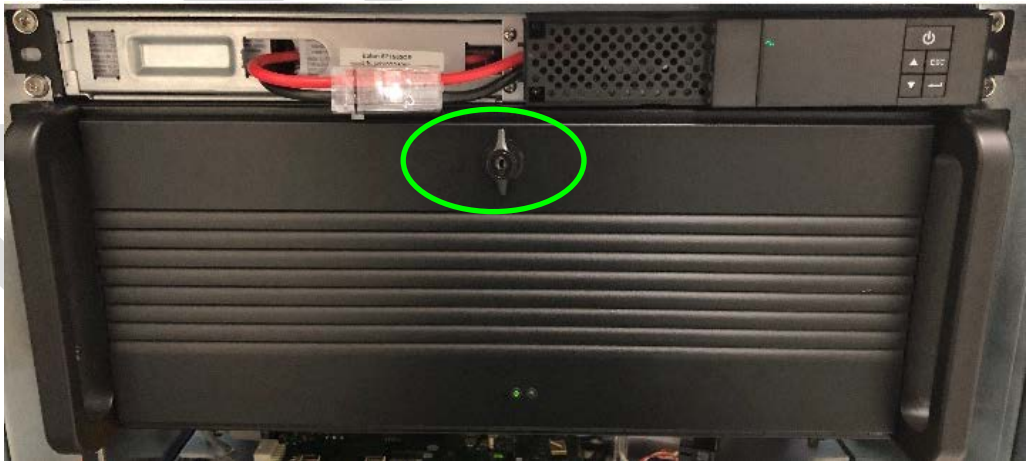
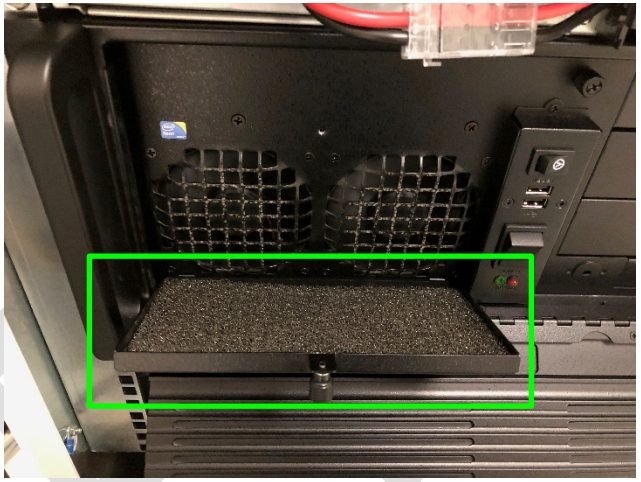


Figure 23

8. Open SCRC PC filter panel.
9. Remove and clean the air.
10. Use vacuum cleaner to clean fan inlets and surrounding area and wipe all areas clean with clean wipes.
11. Replace air filter, then close all panels/doors.



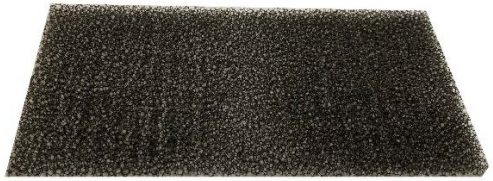


Figure 24

14. CHECK AND CLEAN GANTRY

Turn Off and Lockout/Tagout all Power to the System BEFORE Removing Covers

⚠ CAUTION

POTENTIAL X-RAY TUBE DAMAGE!
DO NOT TURN OFF SYSTEM POWER UNTIL HEAT STORAGE IS BELOW 25%.

Verify that heat storage is BELOW 25% before turning off system power. This is critical as system power is required to cool the X-ray tube.

1. Verify that HEAT STORAGE is BELOW 25%.
2. Press and hold the PDU or GCB OFF button for several seconds.
   The GCB/PDU will stop any gantry rotation and X-ray tube internal anode rotation.
3. WAIT FOR THE SYSTEM TO SHUT DOWN. The PDU WHITE light turns ON.
4. Turn off the main disconnect, lockout/tagout as required.

Figure 25

14.1. Check System Anchors

Tools/Supplies: standard field service tool kit to remove covers

1. Verify the main system power disconnect has been turned off and is locked/tagged out.
2. Remove covers as necessary.
3. Inspect Gantry anchor hardware.
   Ensure hardware is in place and tight.

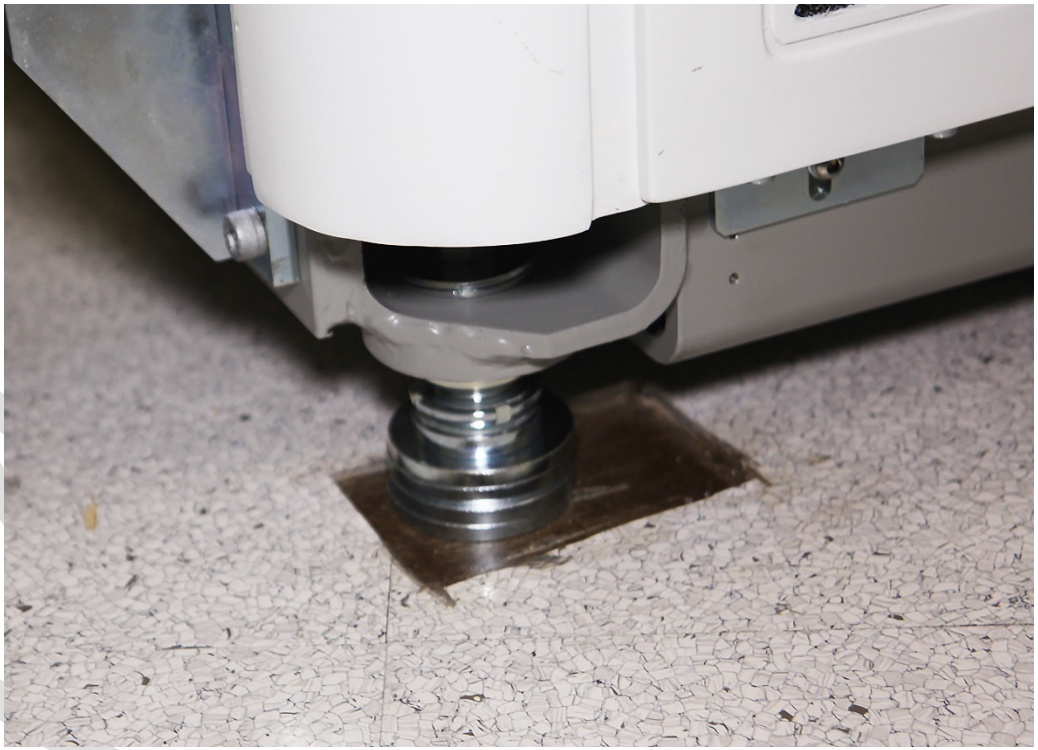


Figure 26

14.2. Check Protective Earth Connection

Tools/Supplies: : lockout/tagout kit, standard field service tool kit to remove covers

1. Verify the main system power disconnect has been turned off and is locked/tagged out.
2. Remove covers as necessary to access the protective earth connection. Verify the protective earth connection is properly seated and free from damage or discoloration.

Figure 27

14.3. Check Encoder Wheel and Static Control Brush (if installed)

Tools/Supplies: field service tool kit

1. Verify the main system power disconnect has been turned off and is locked/tagged out.
2. Remove covers as necessary to access the Encoder Wheel.

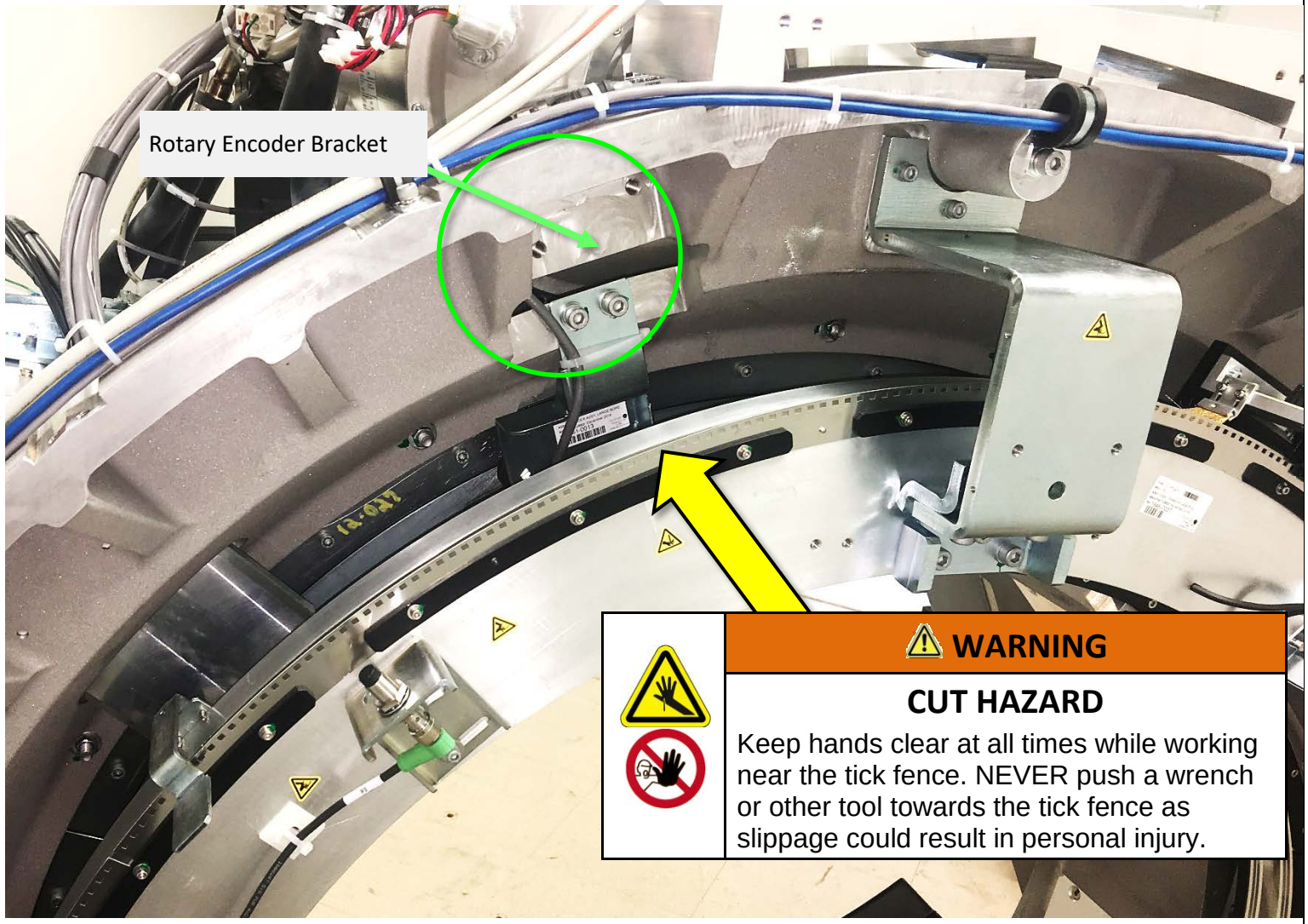


Figure 28

3. Engage both drum brakes.
4. Inspect rotary encoder wheel. The wheel surface should be clean and in spring-loaded contact with the drum. Check for signs of wear. Wheel should be secure with no loose wires. Ensure spring tension allows for proper contact with drum.
5. If the system has a static control brush:
    a. Verify static control brush is in contact with the drum and the brush is in good condition.
    b. Using a Philips screwdriver, remove the two screws that affix the brush to the encoder bracket. Save the screws for later installation.
    c. Check for debris on the drum that may have accumulated under the brush. Remove any debris.
    d. If a new replacement brush is available, install replacement brush and discard old brush.
    e. If a new brush is not available, fan the brush to dislodge any debris and reinstall.
    f. Verify there is some downward tension of the roller on the drum and that the brush is adjusted to press on the drum.
6. Dis-engage drum brakes.

Figure 29

14.4. Check X-ray Tube Connections

Tools/Supplies:

1. Verify the main system power disconnect has been turned off and is locked/tagged out.
2. Remove covers as necessary to access the X-ray tube connections to the HVM.

3. Remove covers as necessary.
4. Rotate drum to access X-ray tube candlestick connections.
5. Carefully remove Cathode Candlestick. Make sure not to scrape the edges.

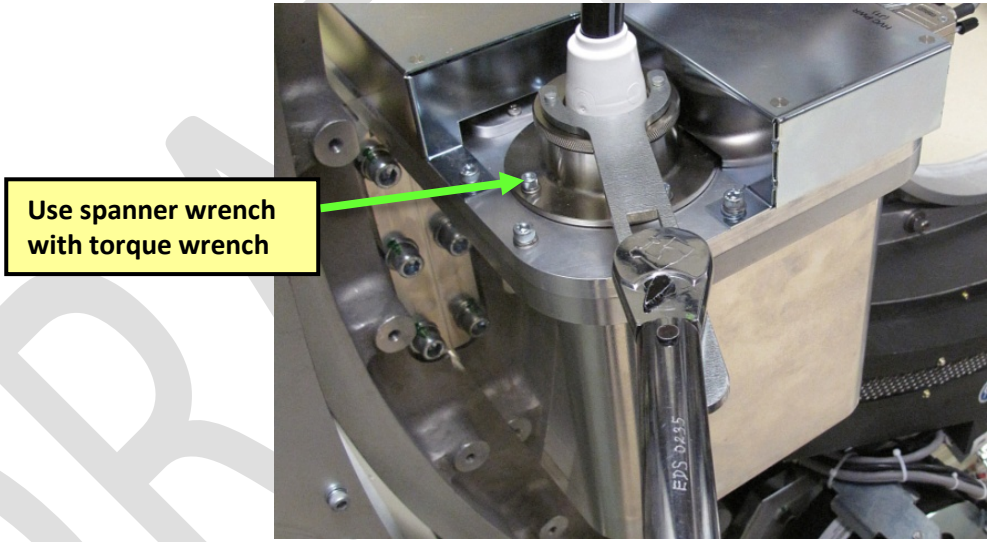


Figure 30 (device will vary from photo shown)

6. Apply one bead of insulating Compound to the candlestick as shown.

7. With gloved hands, spread the insulating compound to create a thin and even coat. Sides of candle stick should be completely covered.

   IMPORTANT: Do not get any Insulating Compound on the metal connectors at the end of the Candlestick.

Figure 31 [NOTE: Candlestick shape may vary from that shown]

8. Without scraping the sides of the candlestick, insert it back into the port.
9. Turn the screw cap by hand until finger tight, then use the spanner wrench with torque wrench to tighten.
10. **Torque to 360 lb-in. (40.7 N·m). Apply torque seal.**
11. Clear workspace of debris.
12. Return all removed covers.

Figure 32

14.5. Check Cables and Hardware (Torque)

Tools/Supplies: Torque wrenches, as required

1. Verify the main system power disconnect has been turned off and is locked/tagged out.
2. Remove covers as necessary to access the drum components, as listed below.

3. Thoroughly, Inspect all system cabling and hardware for damage.

4. Perform torque check on drum components.

   Refer to Table at right, and locator drawing on next page.

   a. Set calibrated torque wrench to 80% of production build torque value for component.
   b. Check the torque on a minimum of two mounting bolts for each component; bolts should not rotate.
   c. If mounting bolts rotate, re-torque all component mounting bolts to 100% production build specified torque.

	80% Check Torque			Production Torque			OK
-	N•m	lb-ft.	lb-in.	N•m	lb-ft.	lb-in.	
Aux Box	37.6	28	336	47	35	420	
Collimator	54.4	40	480	68	50	600	
DMS	34.4	25.6	307	43	32	384	
Heat Exchanger	37.6	28	336	47	35	420	
HVM – bolts holding Bracket to HVM	39.2	28.8	346	49	36	432	
HVM – bolts holding HVM to drum	37.6	28	336	47	35	420	
Toroids	24.8	18.4	221	31	23	276	
X-ray Tube: Brackets to Mounting Plate	75.92	56	672	94.9	70	840	
X-ray Tube: Mounting Plate to Drum	45.2	33.6	400	56.5	42	500	

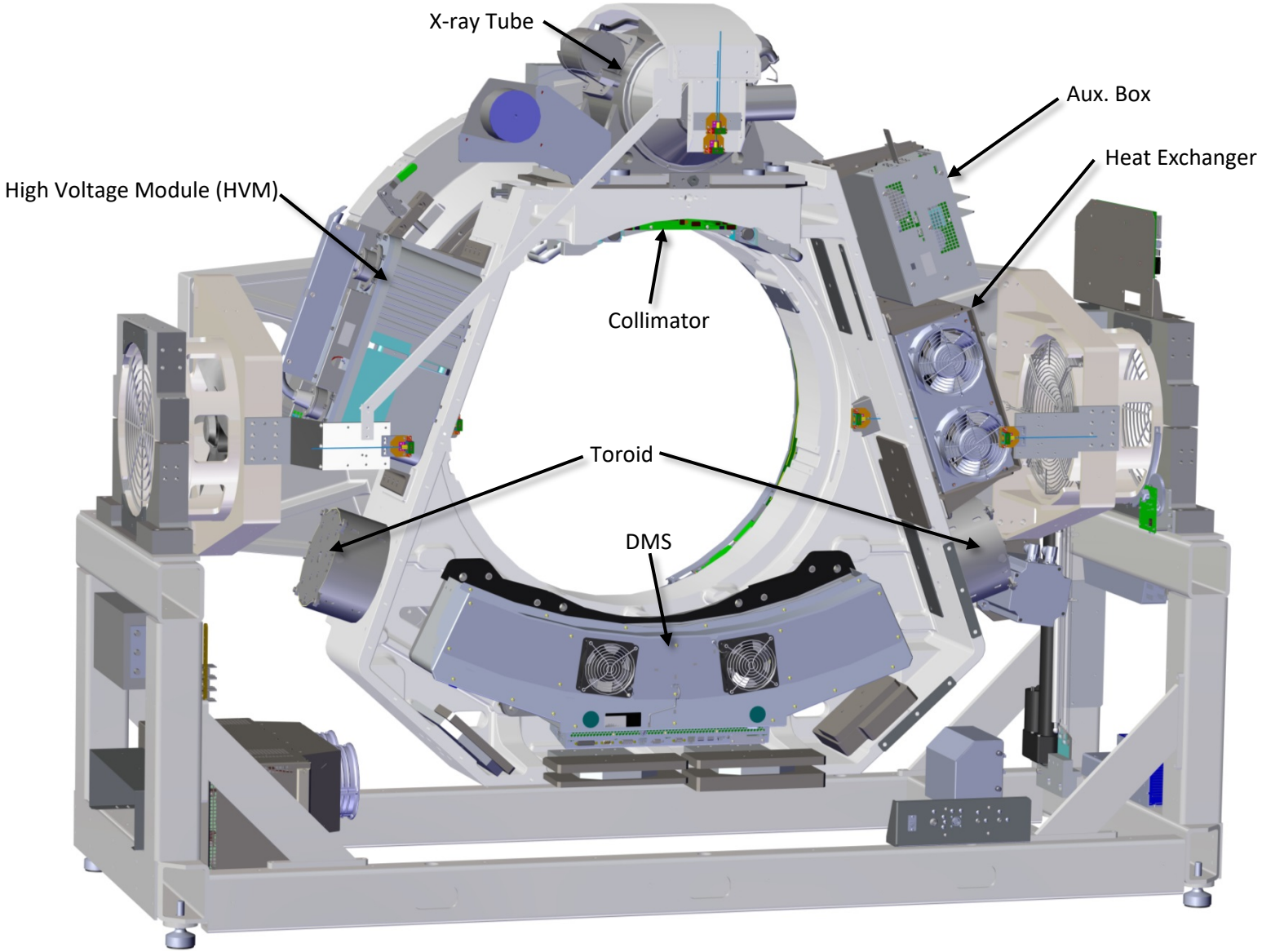


Figure 33 (some components may vary from those shown, per system)

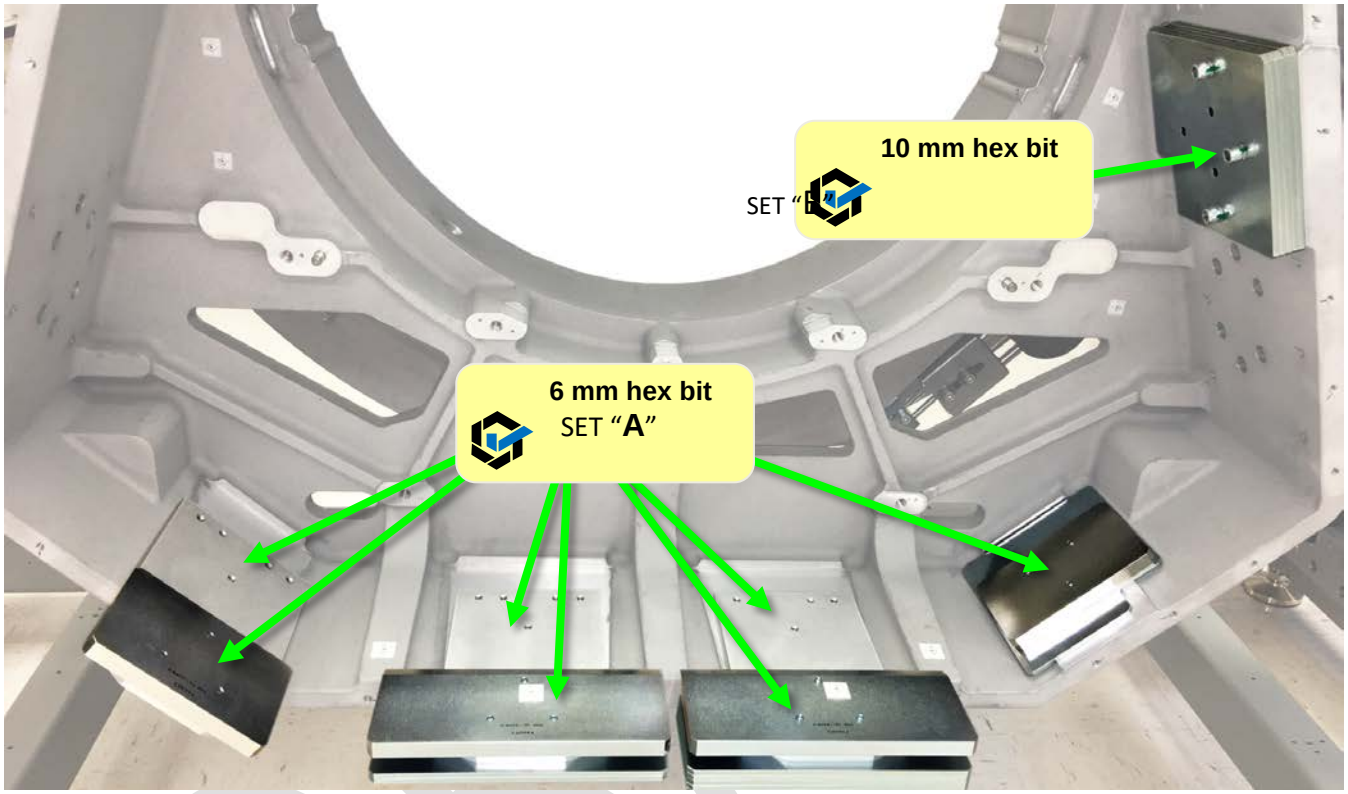


Figure 34 – Drum Weights (shown with components removed for clarity)

5. Verify Drum Weights:

   a. Set calibrated torque wrench to 80% of production build torque value for component.
   b. Check the torque on a minimum of two mounting bolts for each component; bolts should not rotate.
   c. If mounting bolts rotate, re-torque all component mounting bolts to 100% production build specified torque.

	80% Check Torque			Production Torque			OK
-	N•m	lb-ft.	lb-in.	N•m	lb-ft.	lb-in.	
Set "A"	24.8	18.4	221	31	23	276	
Set "B"	54.4	40	480	68	50	600	

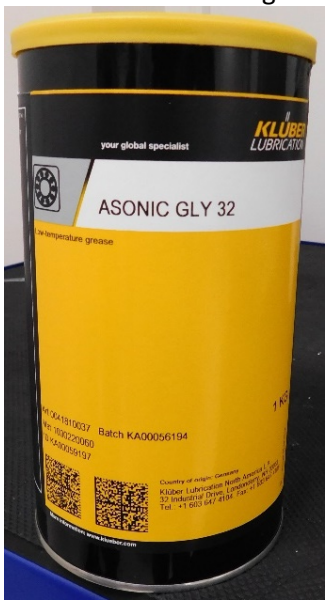
6.

7. Verify Drum Balance Weights:

   d. Set calibrated torque wrench to 80% of production build torque value for component.
   e. Check the torque on a minimum of two mounting bolts for each component; bolts should not rotate.
   f. If mounting bolts rotate, re-torque all component mounting bolts to 100% production build specified torque.

	80% Check Torque			Production Torque			OK
-	N•m	lb-ft.	lb-in.	N•m	lb-ft.	lb-in.	
Cap screws	21.7	16	192	27.1	20	240	
Threaded rod	10.8	8	96	13.5	10	120	

14.6. Grease the Gantry Bearing

Special Tools	Standard Tools	Supplies
Metered Grease gun – Milwaukee 2646-21CT M18 Cordless 2-Speed Grease Gun Kit or equivalent is recommended, **Set Counter Dial to 20, and Speed Control to "1"** **(flow rate of 3.5 oz./min. for the Asonic GLY 32 Grease)** 	• Field service toolkit to remove panels as necessary to access bearing grease fitting	• Clean wipes • Kluber Asonic GLY 32 grease 

1. Remove input power from system before proceeding. Lockout/tagout power at the facility source.
2. Remove panels as necessary to access the grease fitting on the inside of the gantry bore, as shown.
3. Fill the cartridge on a metered grease gun with Kluber Asonic GLY 32. DO NOT MIX GREASES. DO NOT SUBSTITUTE!
4. **Set meter to dispense 0.4 fluid oz. (setting "20" for listed grease gun)**
5. **Set flow rate to: 3.5 oz./min. (setting '1" – Slow - for listed grease gun)**

Figure 35

6. Manually rotate drum to the approximate starting position (left photo) shown above, then connect grease gun to grease fitting.
7. Begin rotating the drum then start the metered grease gun to begin greasing the bearing while the bearing is moving.

   Rotating the drum/bearing will ensure that too much grease is not placed in any one location.

8. Rotate drum by hand several times, to spread the grease.
9. Use a lint free towel to wipe any excess grease that may have spilled out the sides.

14.7. Check Belt and Check/Adjust Belt Tension

Tools/Supplies: BTM-400PLUS Check-Line® Belt Tension Meter and Wand, torque wrench as indicated and open-end wrench set

1. Verify that the hand brakes are in the OFF position.
2. Attach sensor wand to the belt tension meter.
   Color may vary from that shown.
   The system should be set to display units as follows:

   TENSION: tens. [N]
   MASS: Kg/m
   SPAN: length (m)

   Refer to the Check-Line User Manual for display language and other settings options.

Figure 36

3. Press the on/off button to turn the unit on. Verify display is as shown: "tens. [N].

If necessary, press ENTER and then use the arrow keys to select "tens. [N]", press the ENTER key again, and then turn the unit off then back on to verify display is as shown below.

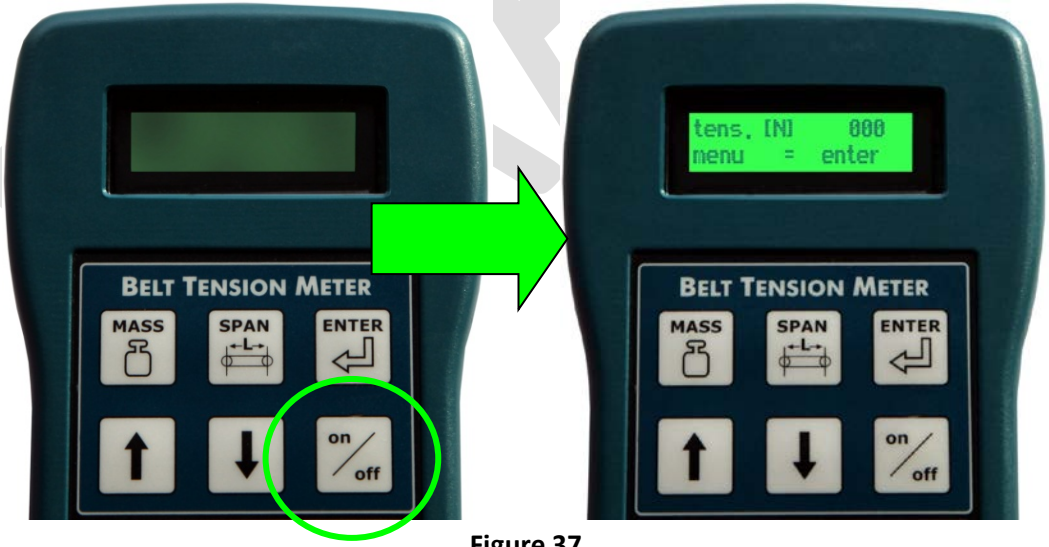


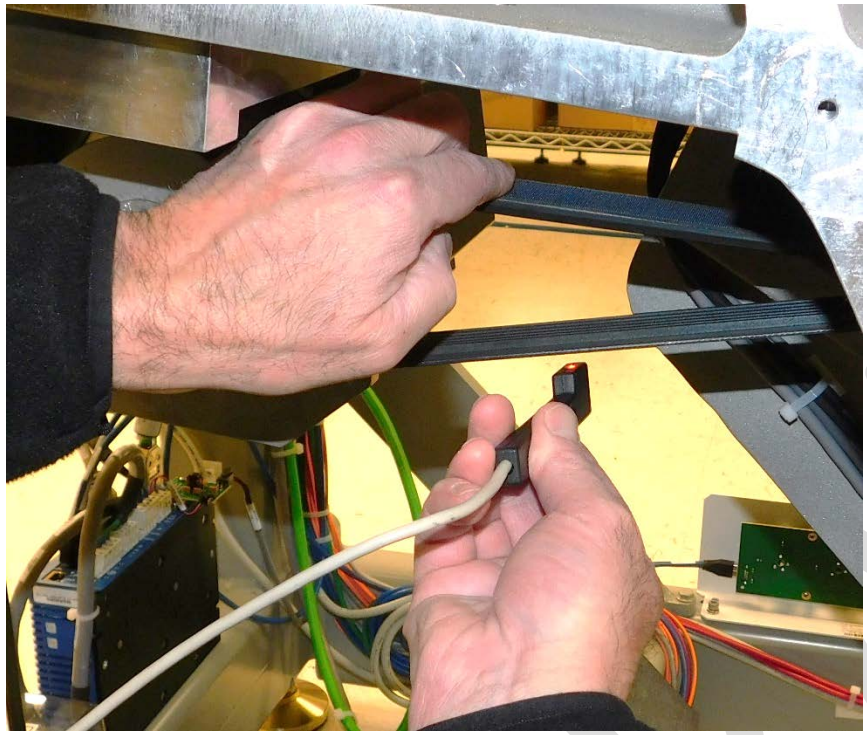
Figure 37

4. Press **MASS,** and then use the arrows to set a value of **0.268 Kg/m**. Press **ENTER**.

Figure 38

5. Press **SPAN,** and then use the arrows to set a value of **0.310 m**. Press **ENTER**.

Figure 39



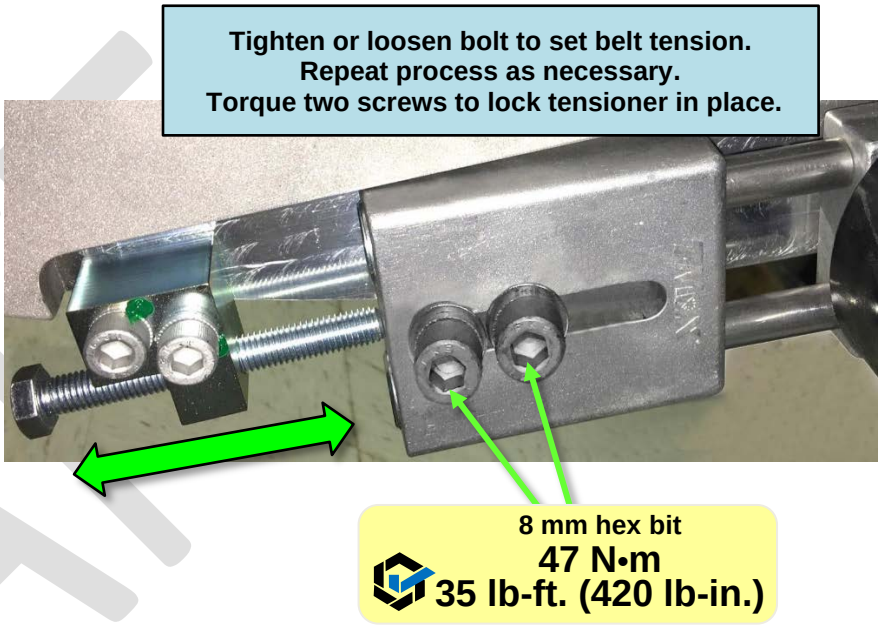


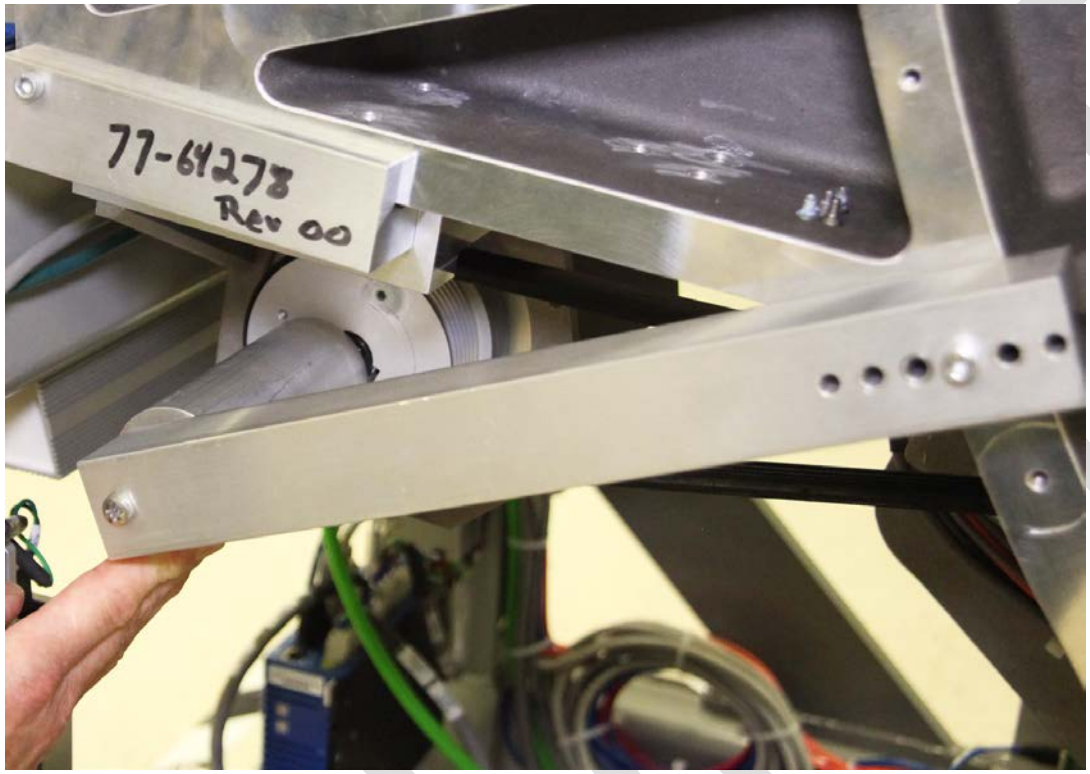
Figure 40

1. Tighten belt to “reasonable” tension. This is an initial estimate based on feel. It does not have to be accurate.
2. Hold sensor probe as shown, 3 to 20 mm from belt, with light pointed at center of belt.
3. Tap or pluck the belt near the middle of the free span, so that the belt vibrates.
4. Meter displays belt tension. **Target: 350 N. Acceptable range: 350 – 450 N.**
5. Repeat process four times to verify belt is properly tensioned. Torque tensioner screws to lock tension in place.

Note: If tension cannot be achieved, the motor mount may need to be moved away from the drum.

Belt Motor and Sheave Positioning

Refer to these instructions if it is necessary to move the Belt Motor mounting position to tighten the belt.



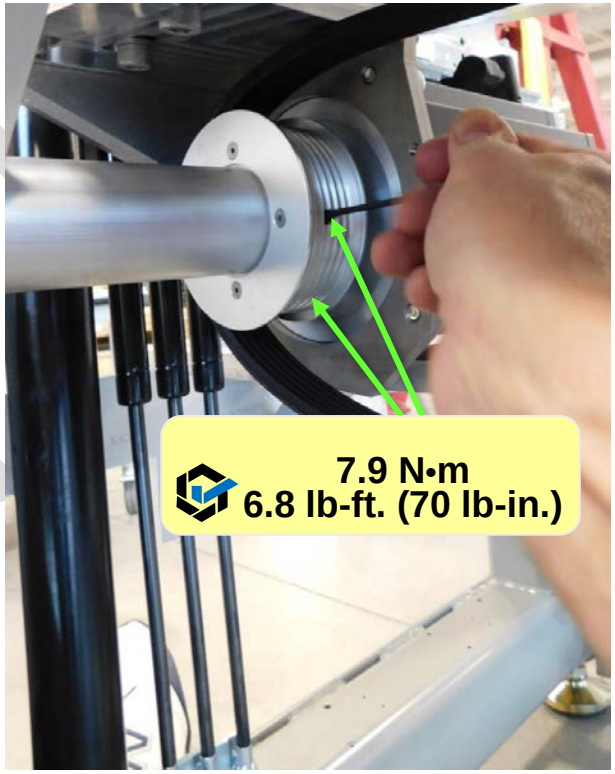


Figure 41 (shown with flange belt installed at next step)

1. Remove outer flange from belt sheave. Secure fixtures to frame as shown. Loosen motor mount bolts just enough to hold motor mount flush against fixture 77-64278.
2. VERIFY SHEAVE LOCATION ON MOTOR SHAFT:
   Hold long sheave placement fixture against sheave and tighten fixture to frame. Verify the sheave is firmly against the alignment fixture - parallel to the end of the fixture. If necessary, remove 2 setscrews from sheave, apply Loctite 243 to setscrews then re-install and push sheave against alignment fixture. Torque setscrews as indicated.
3. Remove and replace motor mount screws one-at-a-time, applying new coat of Loctite 243 to each bolt.
4. Fully release the belt tensioner.

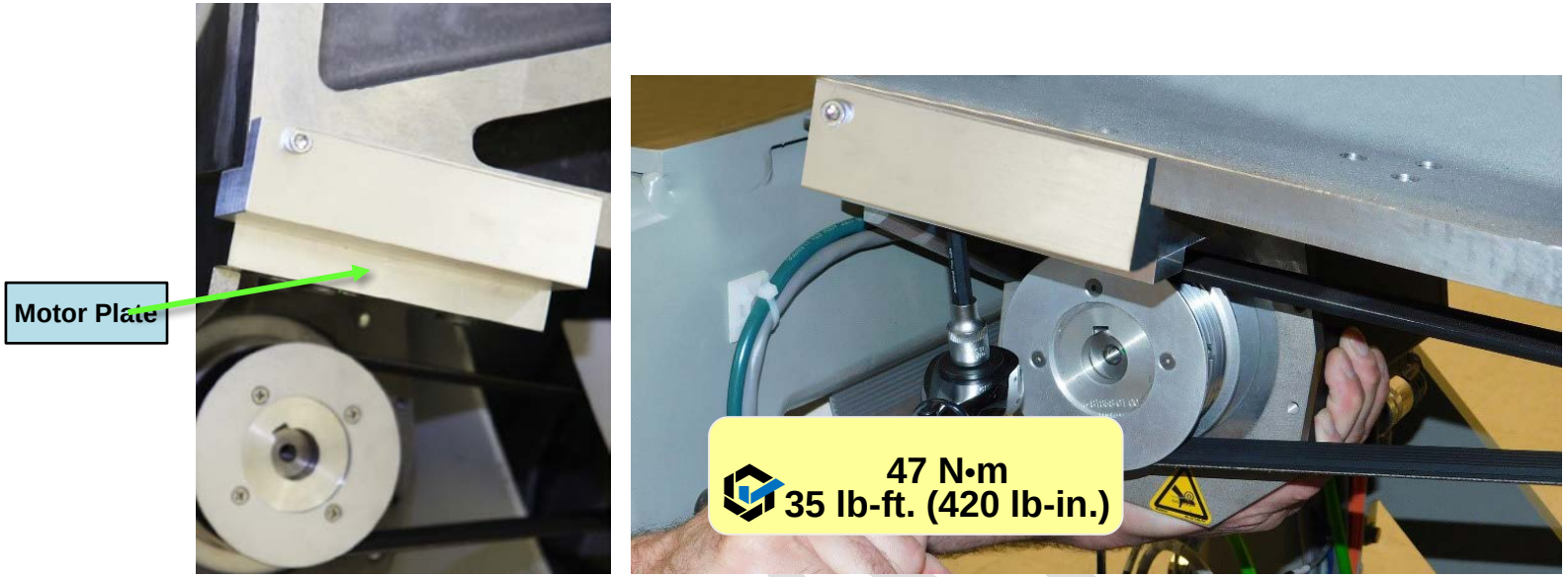


Figure 42

5. With motor mount firmly against fixture, pull the motor away from the drum. Verify the Motor Plate is flush with the fixture surfaces.
6. Torque mounting bolts.

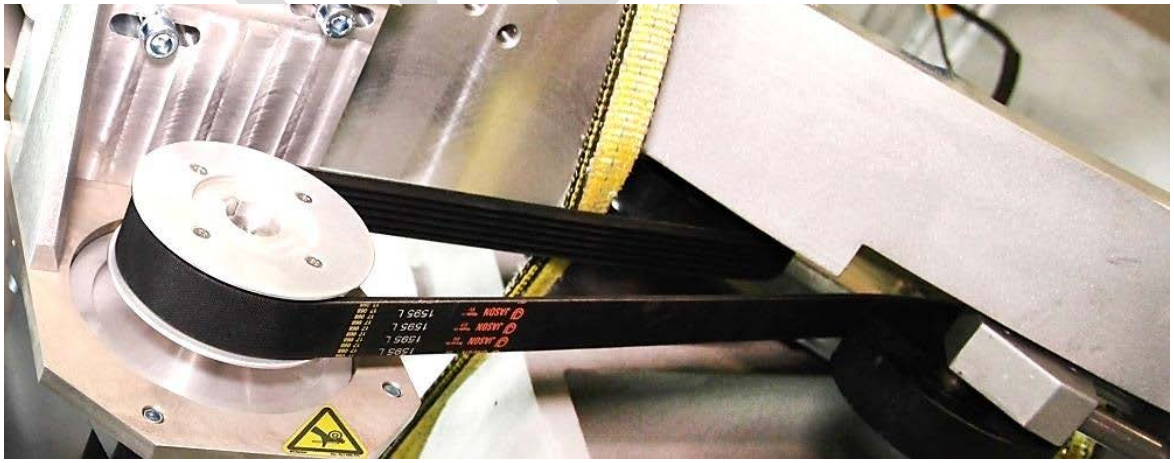


Figure 43

6. Re-install flange to end of sheave with M4x12 screws (4) and Loctite 243.

14.8. Clean Internal and External Components/Surfaces

Tools/Supplies: clean wipes, appropriate cleaning fluid for surfaces, vacuum cleaner with HEPA filter,

1. Clean interior and exterior of system, including panels, air inlets, fan inlets, etc. Refer to the photos at right and on the following pages.

Figure 44 – DMS Fans
(number of fans and locations may vary from that shown)

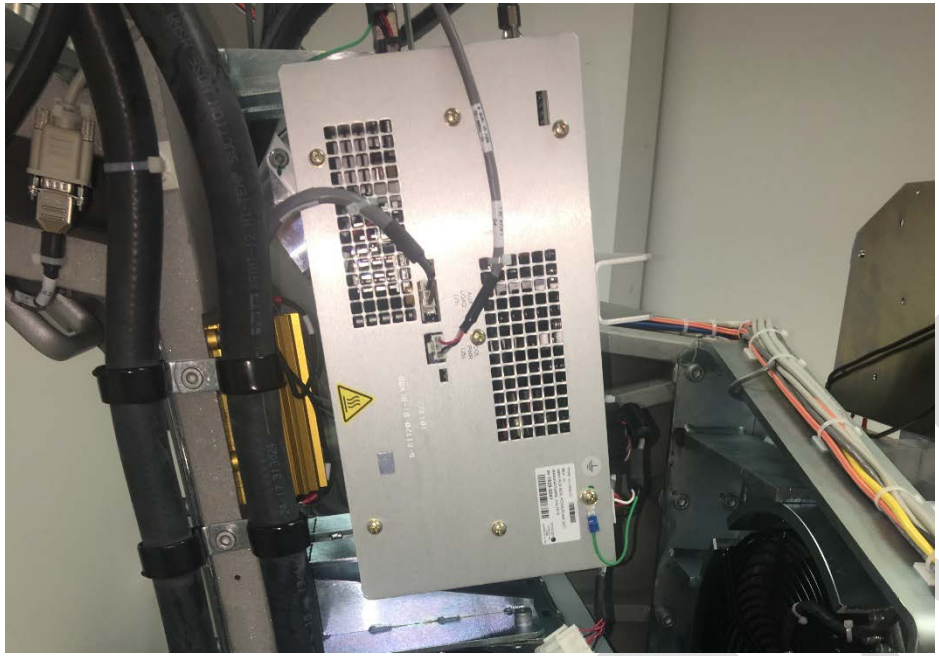


Figure 45 Air inlets on Aux Box

Figure 46 – Fan on rear of Aux box

Figure 47 Stationary Power Inverter Fan and Air inelts/outlets

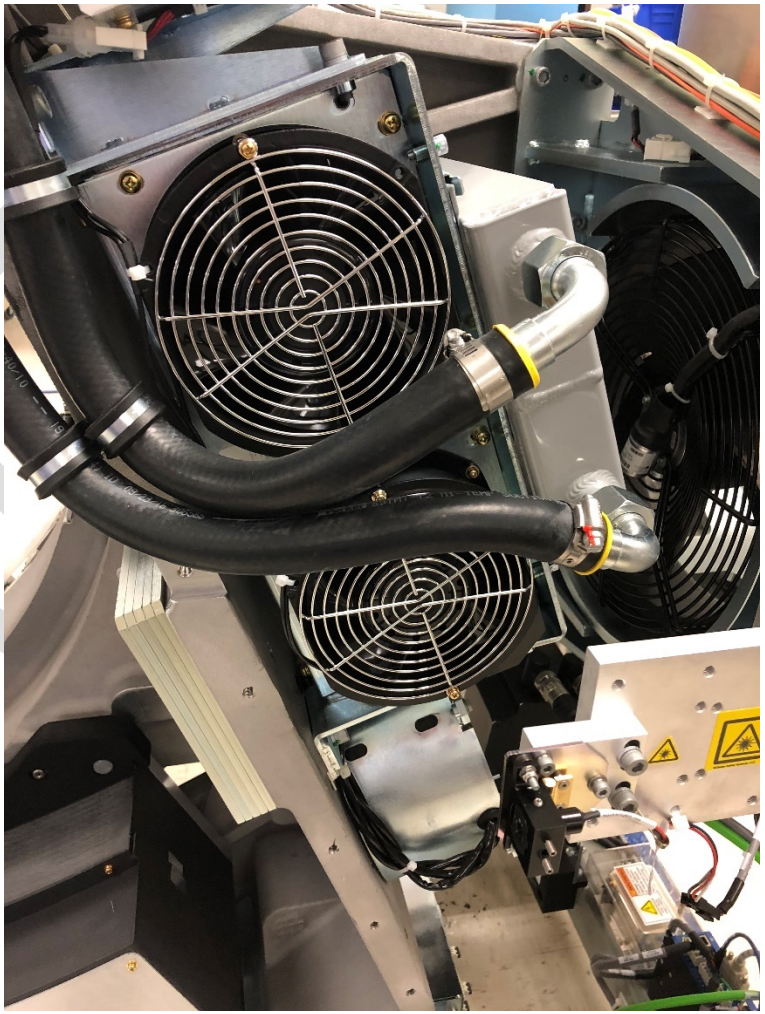


Figure 48 – Heat Exchanger Fans

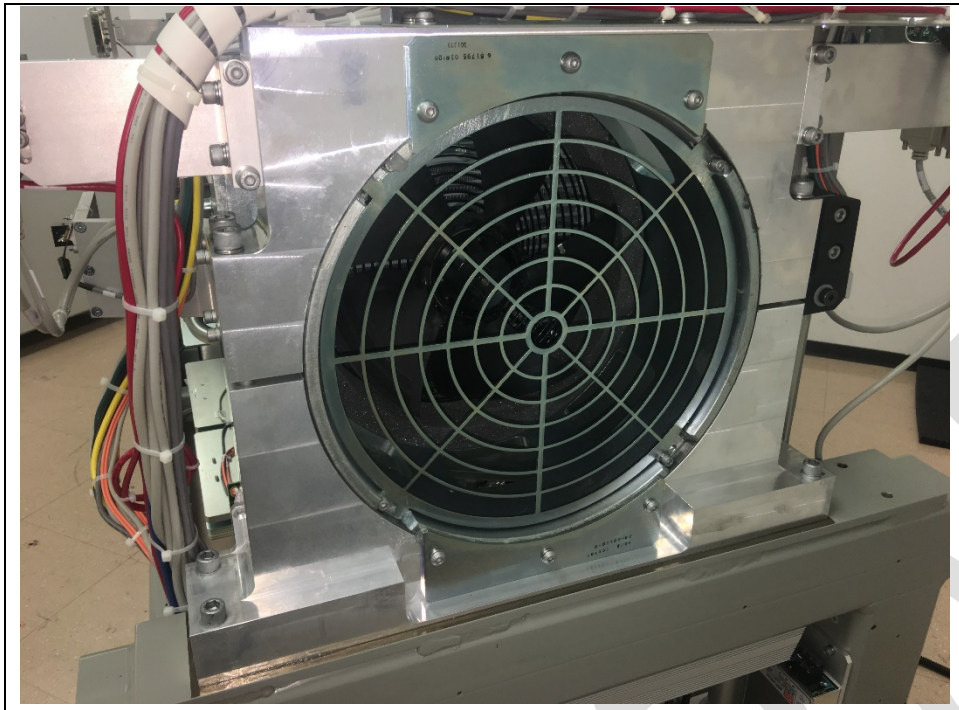
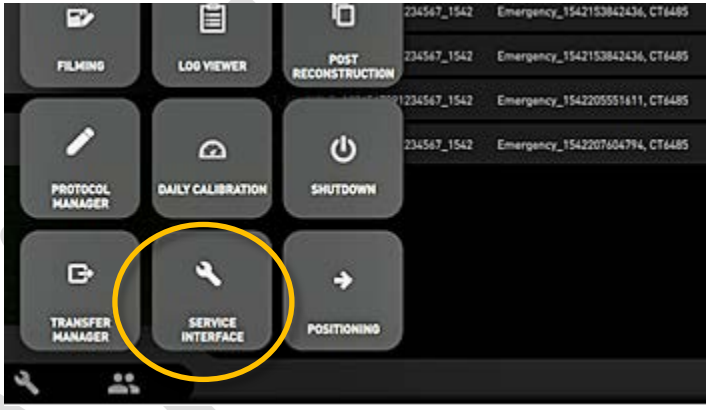


Figure 49 Tilt System Fans (2x)

14.9. Check Tilt Accuracy (on tilting systems)

Tools/Supplies: precision digital protractor

1. With system power on, exit to desktop from "wrench" menu icon in Operator console.
2. Open Service interface, select Utilities > Movable assemblies.



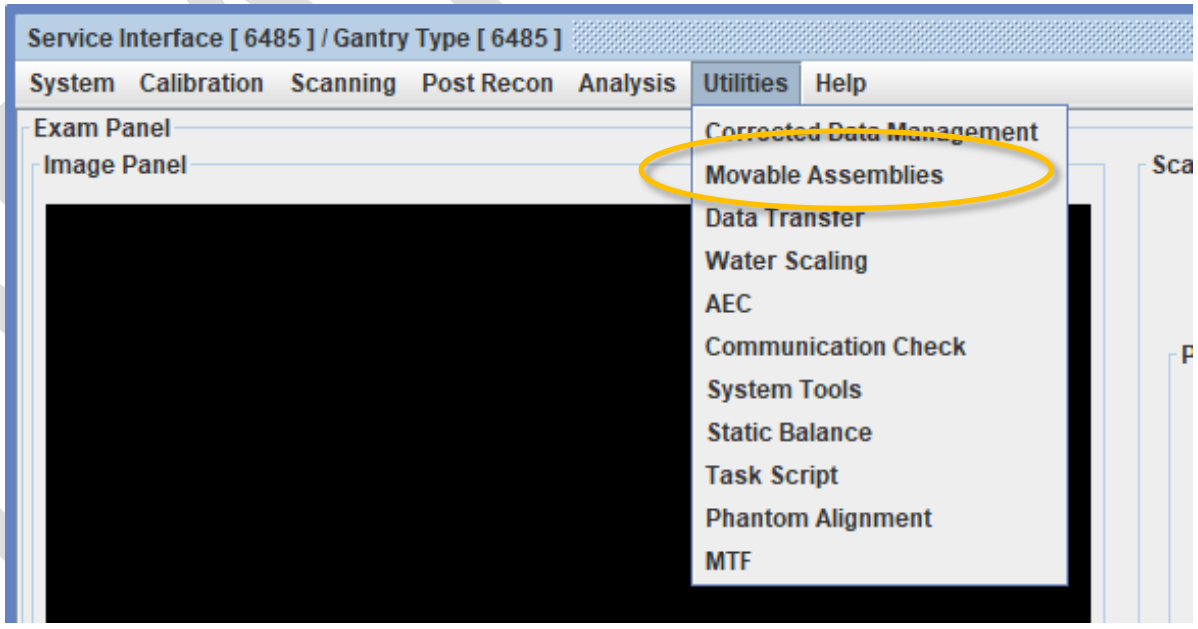


Figure 50

3. If gantry is rotating, press 'stop rotation'.
4. Enter a Gantry Tilt Positioning angle of +5 degrees. Hold move bottom down.
5. Enter a Gantry Tilt Positioning angle of 0 degrees. Hold move bottom down.

6. Place a digital protractor on the tube mounting plate as shown.

   The protractor should indicate 0 ± 0.5 degrees.

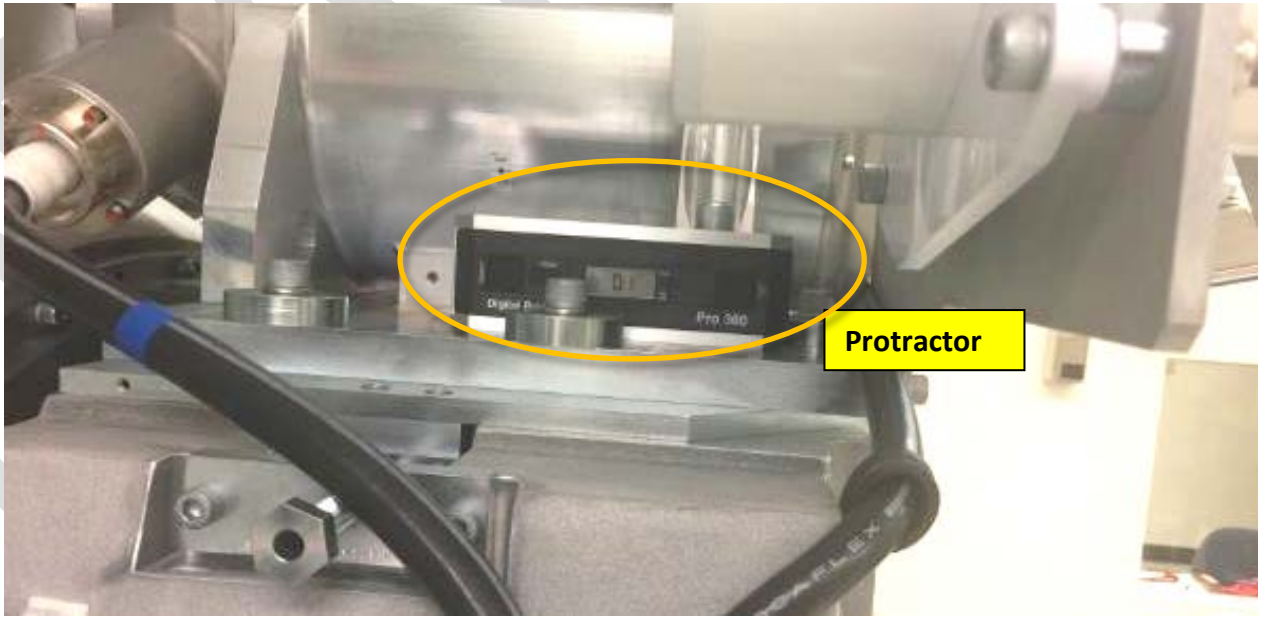


Figure 51

15. CHECK AUDIO FUNCTIONS

15.1. Check Audio Functions

1. Power on the system and login to the Operator Console.
2. Position a second person near the patient table inside the CT room.
3. Push the talk button and communicate with the person in the CT room.
4. Verify communication works properly in both directions.
5. Navigate to the wrench icon in the lower left-hand corner of the screen.
6. Select AutoVoice Manager.
7. Highlight any of the autovoice phrases.
8. Select play.
9. Verify the person in the CT can hear the communication.

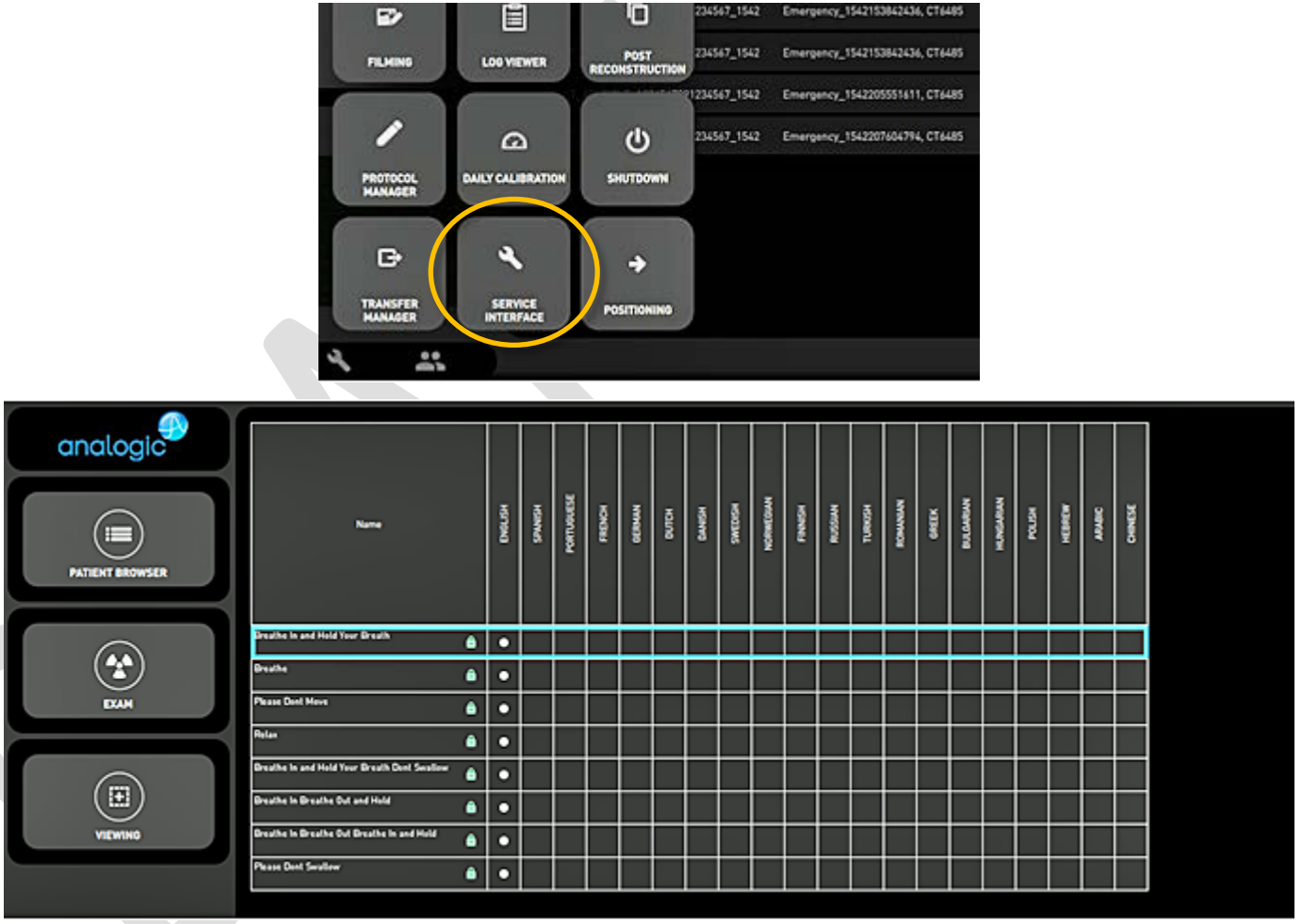


Figure 52