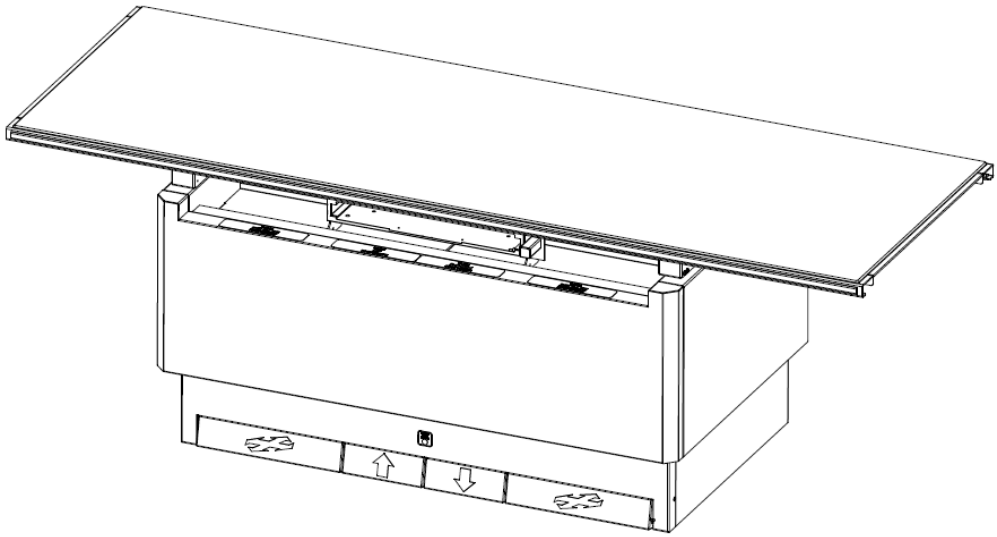
S211

Elevator/Four-way Radiographic Table

Installation and Operation Manual

08148 Rev D



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Revision History

Rev	Description	ECR	Released
A	Production Release	10017	8/2018
B	Updated: Power to 115/230 Selectable input; Parts List, and Component Legend; Removed section 6.2 Electrical Schematics.	10269	7/2019
C	Removed Replacement Part List table; Updated TOC	10306	9/2019
D	Updated section 3.3	10515	7/2020

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1. GENERAL INFORMATION

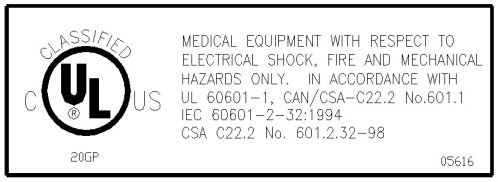
1.1 Introduction

The S211 radiographic table can be raised or lowered, has a lockable floating table top, and has a movable image receptor. Four image receptor options are available (PBL compatibility is optional):

1 Grid Cabinet
2 Reciprocating Bucky
3 Grid Cabinet w/AEC (Automatic Exposure Control)
4 Reciprocating Bucky w/AEC

The S211 is compatible with certified tube housing assemblies, X-ray controls, X-ray generators, cassette holders, and beam limiting devices. It will not affect regulatory compliance of these components when they are installed, connected, and adjusted in accordance with the applicable manufacturer's instructions.

1.2 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.
	Safety Label

1.3 Notices/Safety

1.3.1 Service and Operation

CAUTION

THIS MANUAL IS FOR USE BY PERSONNEL QUALIFIED TO INSTALL, MAINTAIN, AND OPERATE THIS EQUIPMENT.

Only qualified personnel should install, maintain, and operate this equipment. 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 PROPER SAFETY MEASURES ARE 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

Adequate precautions must be taken to prevent unauthorized or unqualified persons from operating this equipment or exposing themselves or others to its radiation.

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 Servicing the Table

WARNING

MOVING PARTS AND HIGH VOLTAGES ARE EXPOSED THAT CAN CAUSE SERIOUS INJURY WHEN THE FRONT PANELS ARE REMOVED. DISCONNECT POWER PRIOR TO SERVICING AND WEAR PROTECTIVE EYEWEAR.

Only properly trained and qualified personnel shall access any internal parts of the x-ray system. A red service switch is provided inside the table. Pressing the button will disconnect power and the power-on indicator will go off.

1.3.4 Intended Use

This is an x-ray table, a mechanical device intended to support a patient during a radiographic procedure.

1.3.5 Attenuation

All included components between the patient and image receptor have been certified to comply with 21 CFR Chapter 1 Subchapter J (§1020.30).

1.3.6 Cleaning

It is recommended that any surfaces in contact with a patient be disinfected between uses.

1.4 Specifications

SPECIFICATION SUMMARY TABLE	
Electrical Ratings 115 VAC 50/60 Hz, Single Phase	Maximum while raising or lowering: 6A Maximum at idle: 2A
Electrical Ratings 230 VAC 50/60 Hz, Single Phase	Maximum while raising or lowering: 3A Maximum at idle: 1A
Maximum Patient Load	400 lbs / 181.8 kg
Duty Cycle	Intended for intermittent use; 10% duty cycle for raising and lowering the table. Maximum 2 minutes of total raise/lower time per 20-minute period.
Environmental Conditions for transport, storage, and operation	Temperature: 40° F to 100° F (10° C to 40° C) Relative humidity: 5% to 95%, non-condensing Atmospheric pressure: sea level to 8000 feet (700 – 1100 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	IPX0 (No protection)
Degree of protection against electric shock	Class I, Type B Applied Parts 
Equipment not suitable for use with flammable anesthetic mixture with air or with oxygen or nitrous oxide.	
Table Physical Dimensions and Weights	
Height above finished floor, table top	23-35 in
Travel, Table top	31 in longitudinal (±15.5); 10 in transverse (±5)
Size/Weight,Table top and base assembled (standard)	84x40x35h in; 580 lb
Distance, image plane to table top	3.5 in (standard); 4.0 in (AEC)
Crated Size/Weight, table base	57x33x39h in; approximately 550 lbs
Crated Size/Weight, table top	88x35x4h in; approximately 80 lbs

1.5 Shipment and Handling

Exercise caution when moving and unpacking equipment.

Once delivered, inspect the table so that for evident and concealed damage. It is the responsibility of the dealer to make all shipping claims as all equipment is shipped FOB from the factory.

If it is necessary to store the table before delivery to the installation site select a dry location with moderate temperatures.

Open the crates and cartons carefully. Do not dispose of them until you have located all parts and the machine is fully assembled.

2. PRE-INSTALLATION INFORMATION

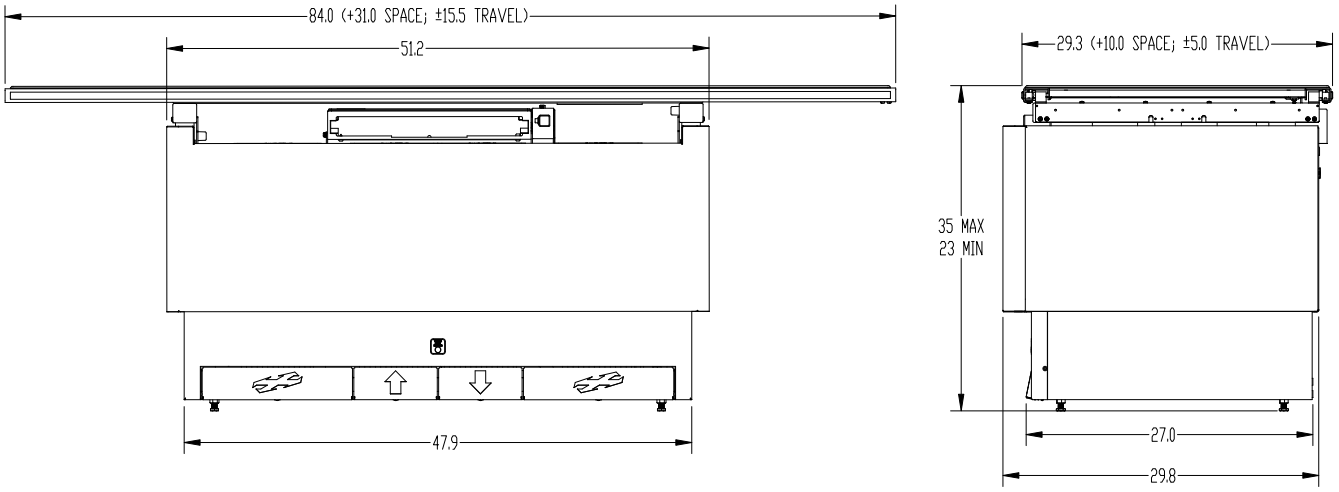
Ensure adequate space for the full range of table top motion.

Conventional radiographic room construction should be used. Consult the State Health Department and local building codes for specific radiation shielding requirements.

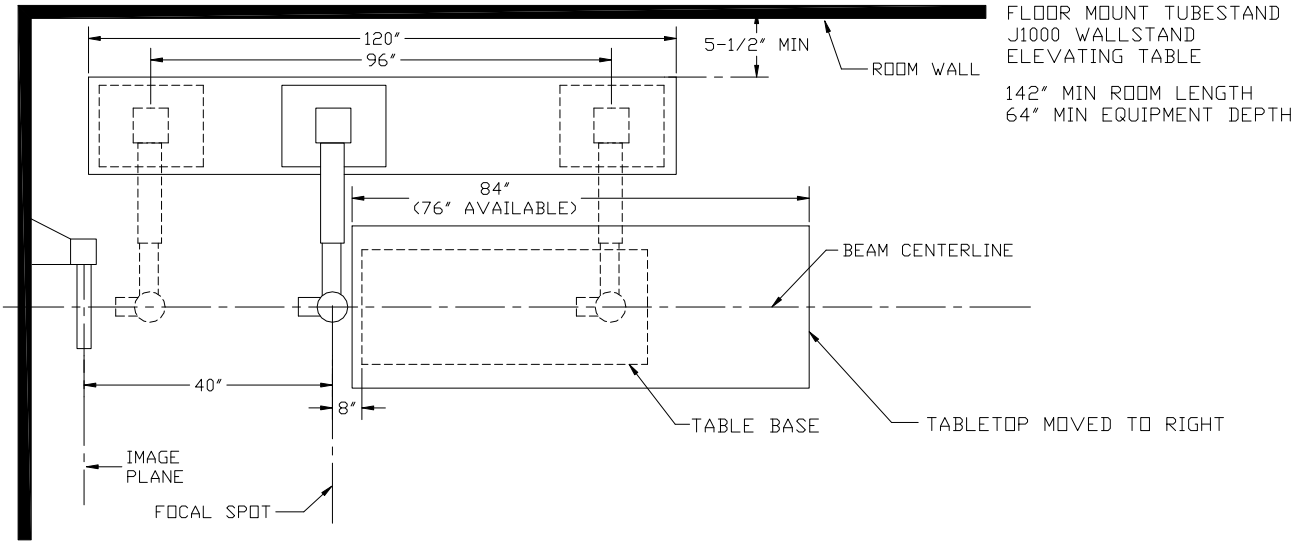
2.1 Installation Hardware

Three 3/8" anchors are required for mounting to the floor and are NOT provided. Select appropriate hardware for the materials present at the installation site.

2.2 Table Dimensions



2.3 Example Room Layout



3. INSTALLATION

Table installation should be performed after installation of the tubestand, collimator, and X-ray tube. Separate manuals are provided with these items.

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NOTE

The tabletop is packaged separately and must be installed from one side of the table. Ensure adequate clearance for this operation. It may be necessary to assemble the tabletop before fastening the table to the floor.

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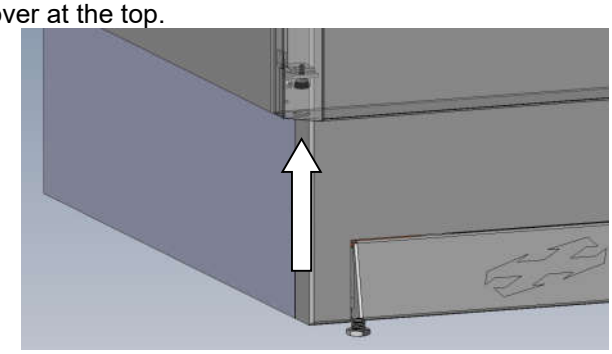
CAUTION

THE RED SHIPPING BRACKET MUST BE REMOVED BEFORE DRIVING THE TABLE UP OR DOWN. IT IS LOCATED BEHIND THE REMOVABLE FRONT PANELS. LEAVE THE BRACKET IN PLACE WHILE THE TABLE IS UNBOLTED FROM THE PALLET AND MOVED CLOSE TO ITS FINAL LOCATION.

3.1 Unpacking

1. Remove the crate lid and any packing material from the pallet.
2. Remove the table base from the pallet.
   a. Remove the upper front panel. Access the two captive mounting #2 Phillips screws through the holes at the lower corners (shown below). After loosening the screws completely, lift to unhook the cover at the top.



   b. To remove the lower front (foot pedal) panel, remove the two screws on each side and pull the panel outward away from the table base. Unplug the foot switch cable, ground cable, and working height indicator cable.
   c. Remove the bolts securing the base to the pallet. Facing the table, they are typically located in the table base frame at the right rear and left front corners.
3. Place the table base close to its final position in the room and remove the red shipping bracket. Replace the screws and store the shipping bracket for possible future use.

3.2 Mounting the Table Top

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NOTE

Check wall clearance prior to mounting the table top and anchoring the table as it can only be assembled from one of the sides of the table. The table top may also need to be moved partially off the base to verify centering of the beam to the image receptor.

1. Remove the longitudinal lock assembly, mounted on table top module (rear/right) of the table base by three screws.
2. Orient the table top so that the longitudinal brake strip is toward the rear of the table base.

3. Remove one travel stop from table top frame (front channel, the side opposite the installation side of the table).
4. Slide the top onto the base, inserting the bearing swivel brackets into the frame channels.
5. Slide the tabletop back and forth to ensure the top moves freely with a minimum of transverse and vertical movement.
6. If an excess of vertical or transverse motion occurs adjust the appropriate bearings (see Figure 1).
    a. Transverse Bearing Adjustment (View A-A)
    b. Vertical Bearing Adjustment (View B-B)

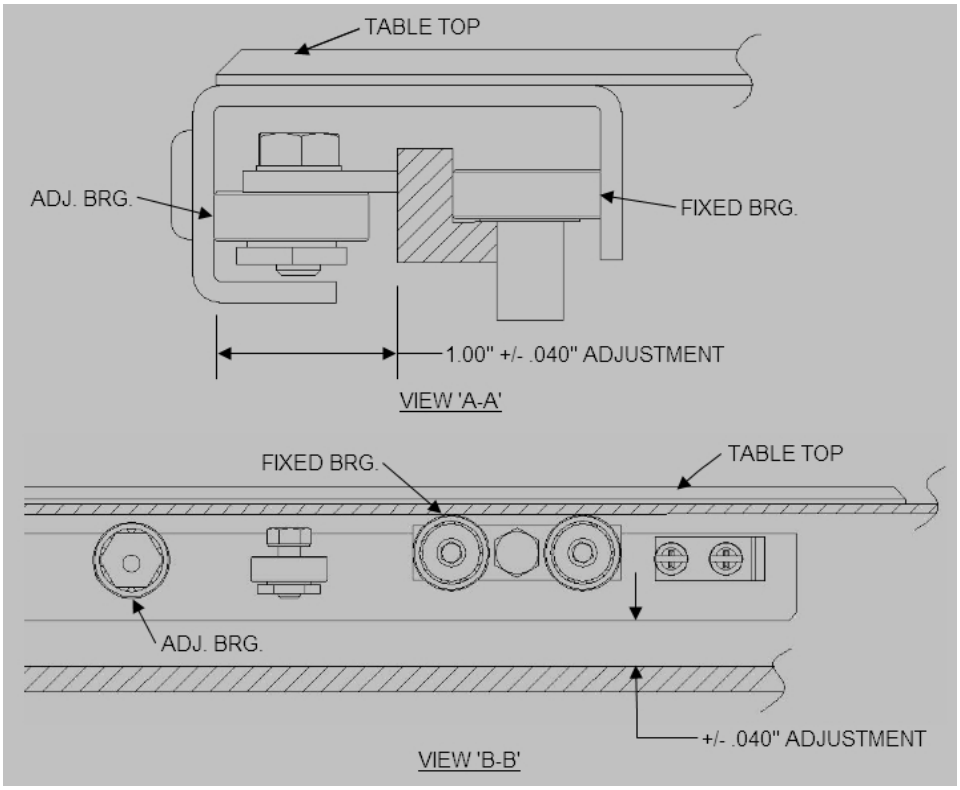

Figure 1: Tabletop bearing adjustment

7. Replace the table travel stop and reinstall the longitudinal lock assembly.

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NOTE

It is recommended to apply some non-permanent thread locking compound onto the threads of the longitudinal lock mounting screws.

3.2 Anchoring the Table

To ensure patient safety the table must be anchored to the floor using 3/8” anchors.

3.2.1 Prior to Anchoring

a. Finalize the table location and verify that the x-ray beam tracks the center of the image receptor throughout the travel range of table image receptor.

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NOTE

The image receptor center is approximately 13.5” forward of the rear of the lower section of the table base.

b. Adjust the leveling feet under the table base so that the table top is level in both longitudinal and transverse directions.

3.2.2 Anchoring

a. Locate and unpack the bag containing the three (3) floor brackets, two (2) bracket covers and hardware.

b. Attach one bracket to the rear of the front frame rail with two ¼"-20 bolts, lock washer and flat washer as shown in figure 2. With the base of the bracket flush with the floor, tighten the bolts.

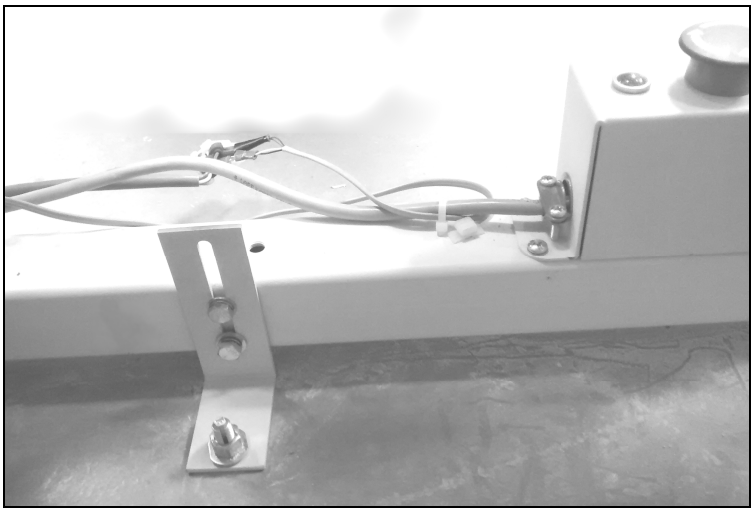


Figure 2: Front Floor Anchor Bracket (rear view)

c. Attach the remaining two brackets to the rear corners of the lower section of the table base as shown in figure 3. Place the bases of the brackets flush with the floor but do not tighten the bolts.

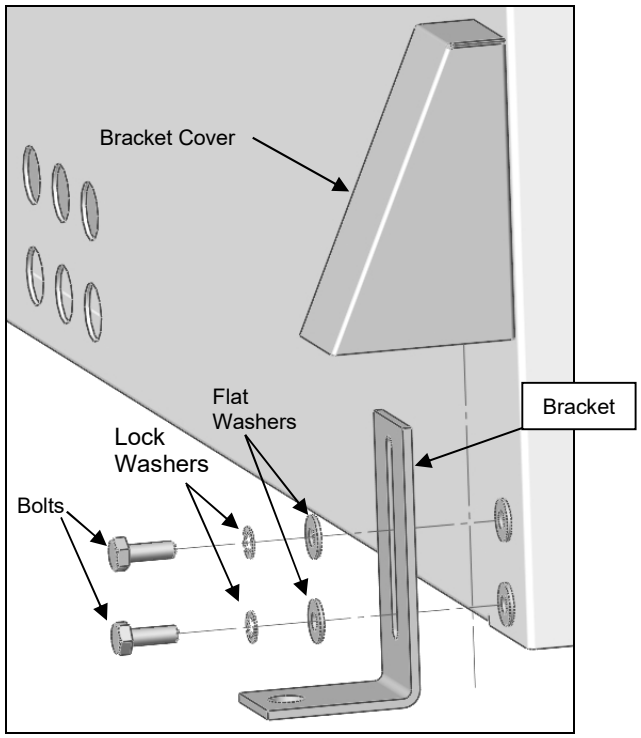


Figure 3: Rear Floor Anchor Brackets

d. Using the mounting holes in the base of the brackets as a guide, drill into the floor to the depth recommended by the anchor bolt manufacturer.

e. Install anchor bolts through the drilled holes and secure as recommended by the anchor bolt manufacturer.

f. After the brackets are secured to the floor tighten all of the mounting bolts (bracket to table).

3.3 Electrical Connections

Connect the incoming ground cable prior to connecting Bucky, AEC, accessories, etc.

WARNING

TO ENSURE PROPER GROUNDING AND REGULATORY COMPLIANCE THE SUPPLIED INCOMING GREEN/YELLOW WIRE MUST BE CONNECTED TO EARTH GROUND.

Use the line voltage selection switch at the rear of the table (above the IEC power inlet) to select the correct voltage (115V or 230V) for the supplied power. Remove the screws from the cord lock bracket, plug cord into IEC inlet, and then reattach cord lock. Connect the table to a standard wall outlet or fused disconnect. See section 1.4 Specifications for current draw.

NOTE

This table is supplied with a power cable for US 115V outlets (NEMA 5-15). Installer is responsible for sourcing appropriate power cords or terminal connections for other outlets.

Optional bucky cable connects directly to the x-ray generator (see generator manual).
Optional AEC connections will plug directly into the generator per the manual.

Connector J8 on the table power supply provides isolated contact closure at the installed working height (N.C. at working height). This can be wired to the generator interlock to prevent exposure when the table is not at the working height.

3.4 Adjustments and Verification

3.4.1 SID Switch (Working Height) Adjustment

The S211 table pauses when the table top reaches an adjustable “working height” (generally for 40” SID) and an indicator light illuminates on the pedal panel.

The SID switch is preset at the factory with the table top between 32 and 33 inches from the floor. It is located at the upper right corner of the scissor mechanism (see SW7 in Section 6.1).

To change height at which the table top pauses:

1. Move the table to the desired working height. NOTE: The distance from the table top to the film plane is given in section 1.4 Specifications.
2. Remove the upper front panel and turn the power off by pressing down on the service switch. The red indicator light will go off.
3. Loosen the #8-32 screws and move the adjustable bracket down away from the tabletop (See Figure 4 below).
4. Loosen the #4-40 screws and slide the roller switch so that the SID switch roller is centered under the actuator.
5. Tighten #4-40 screws.
6. With no load on the tabletop, insert a business card or 0.012” feeler gauge between the base of the switch and the SID switch roller. Move the adjustable bracket up (toward the tabletop) until the roller switch bottoms out against the business card or gauge.
7. Hold the bracket in position and tighten the #8-32 screws.

8. Remove the business card or gauge.
9. Turn the power back on by twisting the service switch in the direction shown on the switch. The red indicator power light should be lit.
10. Replace the front panel.
11. Test that the table stops and the working height indicator illuminates at the desired working height.

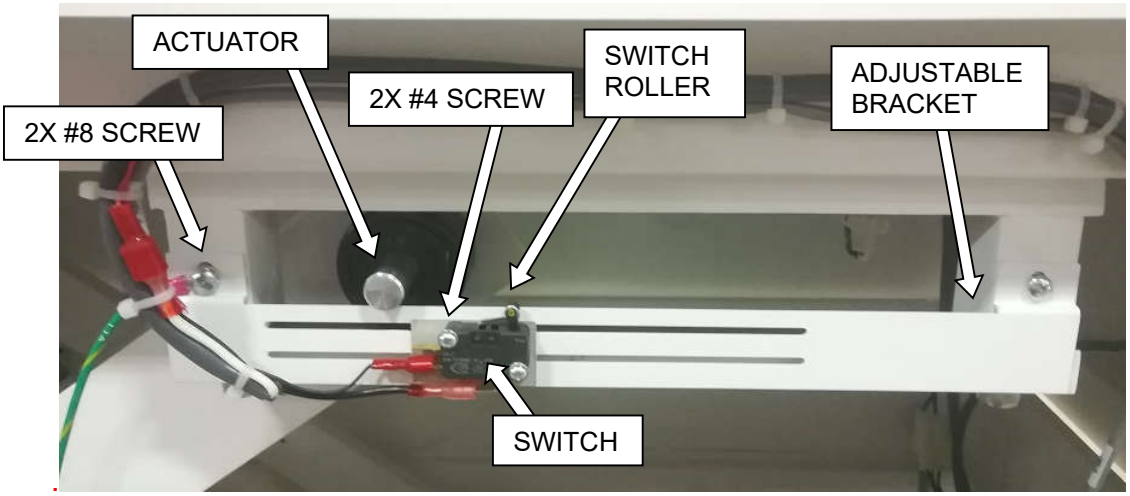


Figure 4: SID/Working Height Adjustment

To change the duration of the working height delay:

Both upper and lower front panels must be removed to access the power supply.

To change the working height pause duration adjust potentiometer P1 on the table power supply board (located in the front right corner of the table base). Rotate clockwise for longer or counterclockwise for shorter. The maximum setting is one second.

Replace the front panels.

3.4.2 Vertical Motion Verification

With power on, depress the appropriate footswitch pedal to raise the table top from minimum to maximum height. This should take less than 20 seconds.

The S211 has vertical travel limit switches that can be adjusted to change the minimum and maximum heights of the table, see section 6.1 SW5 and SW6.

3.4.3 Longitudinal and Transverse Motion Verification

Verify that when each table top lock pedal is depressed the table top can be moved in any direction.

3.4.4 Image Receptor Lock Adjustment

The image receptor lock is adjusted at the factory. If required the lock can be adjusted (see Figure 5):

1. Move the tabletop forward to expose the back of the receptor.
2. Remove the cover
3. Loosen the stop nuts
4. Turn the adjustment screws to raise or lower the magnet.
5. The magnet should be placed as close as possible to the braking surface without touching.
6. Retighten the stop nuts.
7. Move the image receptor through its entire range of motion to verify that it locks and there is no scraping
8. Repeat steps 2 through 6 if required.
9. Replace the cover.

Figure 5: Receptor Lock Adjustment

3.4.5 Transverse Locks

The transverse locks are set at the factory and do not require field adjustment.

To access a transverse lock for service:

1. Slide the image receptor to the end of its travel, exposing the table base cover and the transverse lock access panel.
2. Remove table top stops and slide table top half way off to expose lock access panel.
3. Remove the transverse access panel on that side to expose the lock assembly.

3.4.6 Longitudinal Lock

The longitudinal lock assembly is set at the factory and does not require field adjustment. To access it for service it is located at the rear right of the table top module.

4. RECOMMENDED MAINTENANCE

4.1 Maintenance Schedule and Inspection

Safe performance of the S211 table requires daily inspection by the user and scheduled service by qualified X-ray equipment service personnel. It is the operator's responsibility to select service personnel (consult the factory for recommendations if necessary).

4.2 Daily Maintenance and Inspection (Operator)

1. Clean up any spills.
2. Visually inspect for damage and general wear.
3. Gently push on the tabletop and cabinet to verify that the electric locks are working properly.
4. Check to see that the table top moves freely and does not bind with locks off.
5. Check to see that the image receptor moves freely with locks off.

4.3 Scheduled Maintenance (Service Personnel)

1. In order to comply with applicable federal and state regulations, the following maintenance schedule must be adhered to:
   a. First service 30-90 days after equipment installation.
   b. Subsequent service annually.
2. Scheduled maintenance should include, but not be limited to, the following checks:
   a. Verify proper operation of table top and grid cabinet.
   b. Inspect all electric locks for proper operation.
   c. Verify the table top lock foot switches operate properly.
   d. Verify the raising and lowering function; verify working height location/pause and illumination of the working height indicator light on the pedal panel.

e. Verify proper equipment grounding.

f. Verify proper anchoring of the table to the floor.

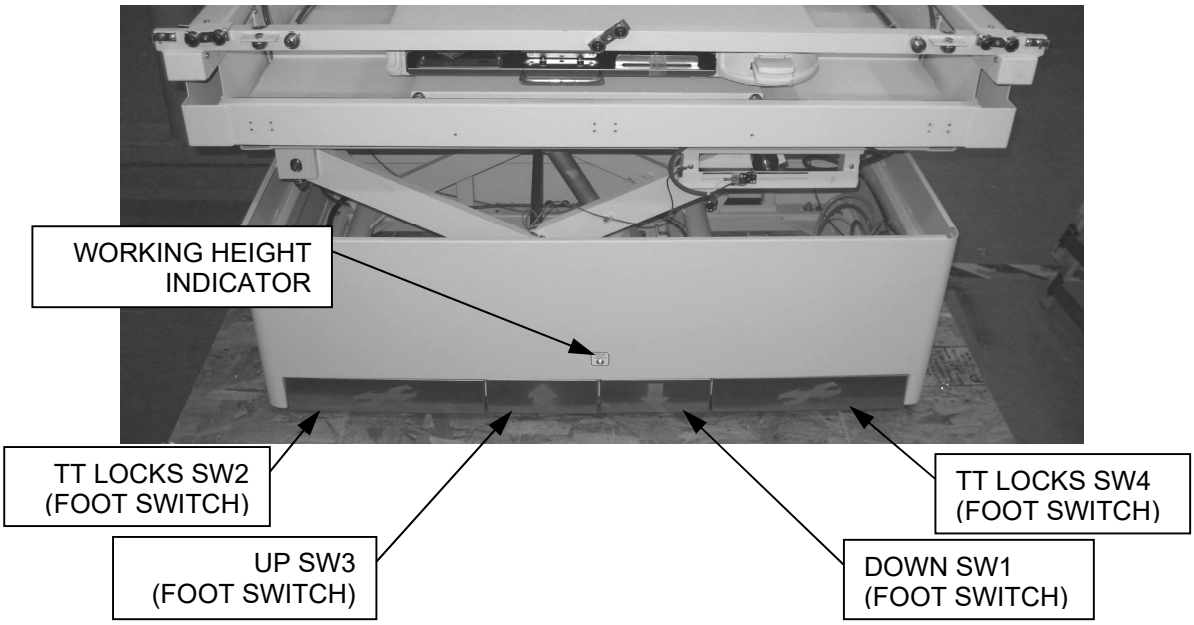
g. Inspect all electrical connections for integrity and absence of corrosion

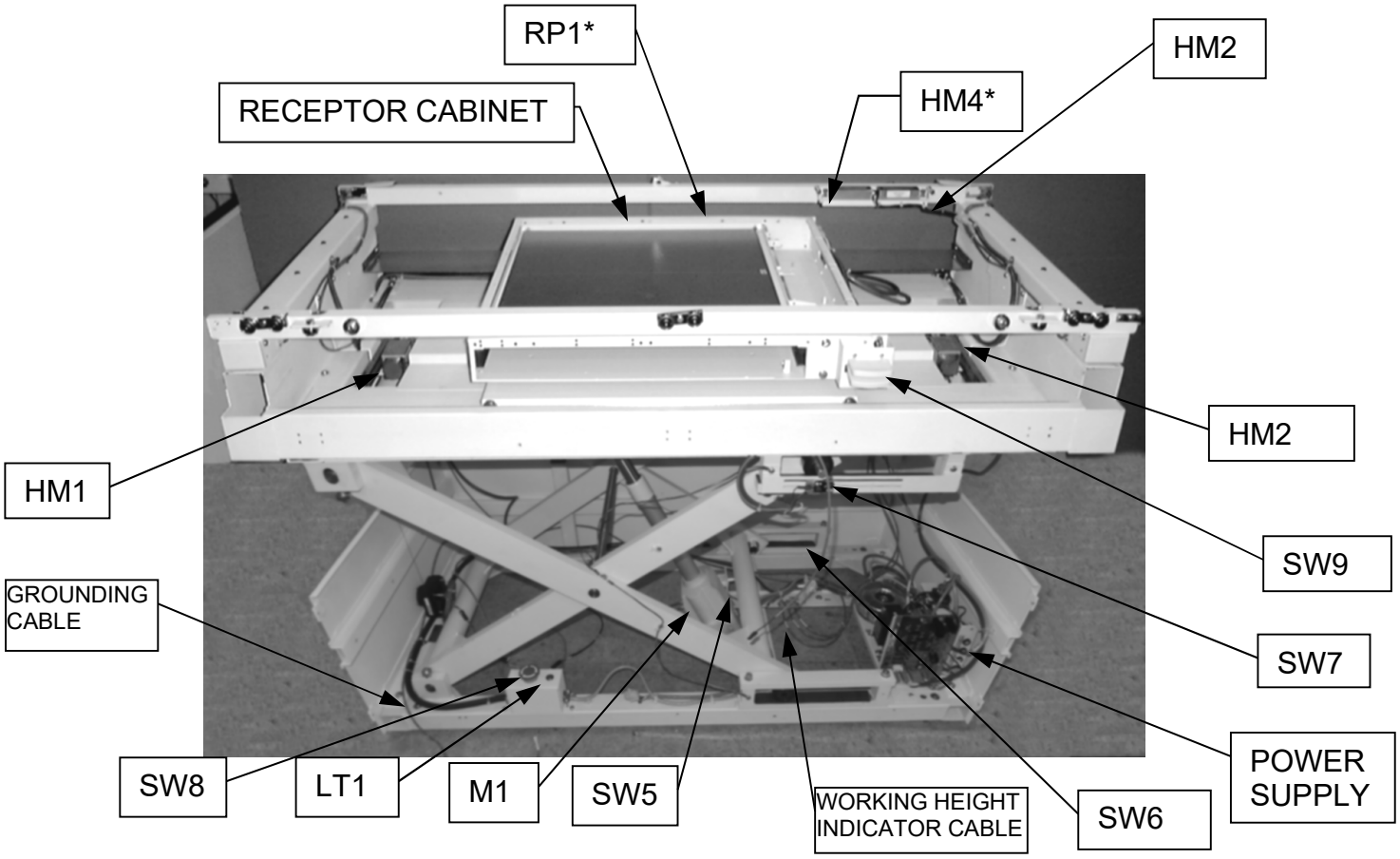
h. Verify all mechanical fasteners remain properly tightened.

5. ELECTRICAL REFERENCE COMPONENT LEGEND

See photos following for locations in table

I.D.	DESCRIPTION	FUNCTION	LOCATION
C1	Cap, 12000 uF, 63V	Filter Cap	On power supply
C2	Cap, 5800 uF, 40V	Power for locks	On power supply
F1-F2	Fuse, 4A, Slo-Blo	Line current limit	On power supply
F3-F6	Fuse, 600mA, Slo-Blo	Line current limit	On power supply
F7-F10	Fuse, 1.25A, Slo-Blo	Line current limit	On power supply
T1	Transformer, 117/30VAC	Step down 120V input	On power supply
T2	Transformer, 115/24VAC	Step down 120V input	On power supply
BR1	Bridge rectifier	Convert ac to dc	On power supply
BR2	Bridge rectifier	Convert ac to dc	On power supply
R1	Resistor, 0.3 ohm, 50W	Current limiting	On power supply
R2	Resistor, 7.5 ohm, 25W	Current limiting	On power supply
PCB	Logic control board	Control motion of table and locks	On power supply
HM1	Solenoid, 24Vdc	Table top lock (left transverse)	Table base, top left
HM2	Solenoid, 24Vdc	Table top lock (right transverse)	Table base, top right
HM3	Electro-magnets, 24Vdc	Table top lock (longitudinal)	Under table top, upper right rear
HM4	Electro-magnet, 24Vdc	Image receptor carriage magnet	Right rear of bucky-grid cabinet
LT1	Pilot light, red, 120Vac	Indicates “power ON”	Table base, bottom front center
M1	Motor	Raise & lower table top	Table base, bottom center
RP1	Receptacle (OPTIONAL)	Connects to size sensing tray	Rear of film cabinet
SW1	Switch, SPDT, micro sw	Operator’s foot switch, “DOWN”	Table base, bottom front right
SW2, SW4	Switch, SPDT, micro sw	Operator’s foot switches, “table top locks”	Table base, bottom front outside left and right
SW3	Switch, SPDT, micro sw	Operator’s foot switch, “UP”	Table base, bottom front left
SW5	Switch, DPDT, white push button	“UP” travel limit	Table base, bottom center
SW6	Switch, DPDT, white push button	“DOWN” travel limit	Table base, bottom right
SW7	Switch, SPDT, micro sw	Vertical Detent	Table base, upper front right
SW8	Switch, power interrupt	Interrupts power to table	Table base, bottom front center
SW9	Switch, SPDT, pushbutton	Image receptor carriage lock	bucky-grid cabinet, front right
VSW	Switch, DPDT, Snap-in	115/230 VAC Selection	Table base, back





*HM4 AND RP1 ARE LOCATED BEHIND THE RECEPTOR CABINET

See Section 5 Component Legend table for description and function

6. Table Operation

WARNING

CARE MUST BE TAKEN WHEN OPERATING THE TABLE TOP WITH A PATIENT ON THE TABLE.

IF TABLE IS EQUIPPED WITH TABLETOP-MOUNTED LOCK RELEASE HANDLE, KEEP PATIENT CLEAR OF SWITCH TO PREVENT ACCIDENTAL ACTUATION.

- Never raise or lower the table top while the patient is getting on or off the table
- Never release the table top locks while the patient is getting on or off the table
- Keep patient and operator hands/fingers clear of any moving parts during operation
- Always verify when driving the table down that there are no items such as a stool or chair that the tabletop will hit.
- Avoid sudden movements

6.1 Table Top Operation

Controls: four foot pedals on the lower front panel (from left to right when facing the table): *Table Top Lock Release, Raise table, Lower table, Table Top Lock Release.*

The table top is designed to lock transversely when there is no electric power to the table.

During vertical motion, the table top pauses at an exposure stop position (working height for proper SID) and an indicator lights on the lower front panel. The pause time and height are adjustable by qualified service personnel.

a. To raise or lower the table top, depress the foot switch marked with arrow up or arrow down.

b. To release the table top locks, depress either outside foot switch. To reactivate the table top locks, release the switch.

NOTE

When raising or lowering the table, the table top locks remain engaged until vertical motion is stopped.

6.2 Image Receptor Operation

Control: Image receptor lock release switch/handle located on the cabinet.

The image receptor can be repositioned horizontally and has an electric lock. To release, press the button on the receptor cabinet handle. To re-engage, release the button.