SURGICAL C-ARM TABLES

SERVICE MANUAL

058-800 058-805 058-810 058-815



058-800 and 058-805



058-810 and 058-815



Surgical C-Arm Tables







058-810 and 058-815

This manual covers installation and operation procedures for the following products:

058-800 Urology C-Arm Table, 120 VAC

058-805 Urology C-Arm Table, 230 VAC

058-810 Brachytherapy C-Arm Table, 115 VAC

058-815 Brachytherapy C-Arm Table, 230 VAC



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Biodex Medical Imaging Table Warranty

1. Product Warranty

- A. This equipment and its accessories (excluding cushions), are warranted by BIODEX MEDICAL SYSTEMS, INC. against defects in materials and workmanship for a period of two years from the date of shipment from BIODEX MEDICAL SYSTEMS, INC. During the warranty period, BIODEX MEDICAL SYSTEMS, INC. will in its sole discretion, repair (on-site), send replacement parts or replace the equipment found to have such defects, at no charge to the customer. EXCEPT AS STATED ABOVE, THERE ARE NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION WARRANTIES OR MERCHANTABILITY OR FITNESS FOR USE. BIODEX DOES NOT ASSUME LIABILITY FOR INCIDENTAL, CONSEQUENTIAL OR INDIRECT DAMAGES INCLUDING LOSS OF USE, SALES, PROFITS OR BUSINESS INTERRUPTION.
- B. This warranty does not apply if the product, as determined by BIODEX MEDICAL SYSTEMS, INC., is defective due to abuse, misuse, modification or service performed by other than a BIODEX MEDICAL SYSTEMS, INC. authorized repair representative. Misuse and abuse include, but are not limited to, subjecting limits and allowing the equipment to become contaminated by fluid materials.
- C. In order to obtain warranty repair service and to expedite repair process, please contact BIODEX MEDICAL SYSTEMS, INC. Support Services Dept. at 800-224-6339, and select product support as prompted.

2. Warranty Is Non-Transferable.

3. Non-Warranty Service

- A. Repairs and/or replacements not covered by this warranty may be performed by BIODEX MEDICAL SYSTEMS, INC. authorized service representatives.
- B. The cost of transportation to and from the service location will be the responsibility of the customer.

Service Procedure

If you think you have a service problem, take the following action:

- 1. Check to see that the problem occurs more than once.
- 2. Refer to the instruction manual and operations procedure.

If you still think you have a service problem, call BIODEX MEDICAL SYSTEMS, INC., Service Department at (800) 224-6339 and select product service as prompted.

Keep yourself and the phone next to the equipment.

- 1. Service will ask you for a brief description of the problem. We will ask specific questions about the malfunction that occurred. This diagnostic process may take a few minutes, so call us when you can set aside an uninterrupted block of time.
- 2. After taking the information, we will advise on the action we will take.
- 3. Sometimes service personnel must consult with engineering and it may take time to get back to you. Be sure to let the service representative know your schedule so that we can call at a convenient time.
- 4. The return call may be from a person other than whom you first reported the problem to.
- 5. After analyzing the problem, we will decide if the unit can be repaired on site, or replacement parts will be sent.
- 6. If the unit must be returned, Biodex will provide a return materials authorization number (R.M.A. #.) Pack the table in the carton that it was originally shipped in. It is the customer's responsibility for any damage that occurs during shipping.
- 7. Non-warranty/non-service contract charges for repair are as follows:
 - a. Materials
 - +
 - b. Time
 - +
 - c. Travel Zone



Contact Information

Biodex Medical Systems, Inc.

1. CONTROL MODULE REPLACEMENT

Tools Required:

Phillips screwdriver

The control module is located on the lower back panel.

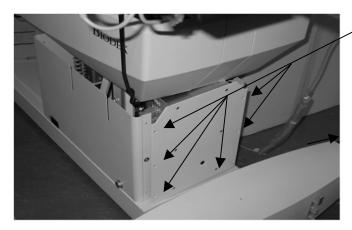
- 1. To access the control module, remove the four larger Phillips screws securing the lower portion of the bellows to the clamshell covers. Each side has two screws located near the center of the clamshell.
- 2. The bellows is still secured to the top of the clamshell covers, but now it can be lifted and secured with bungee cords (see Figure 1.1). The table must be raised to its highest position to allow clearance to access and remove the controller.

NOTE: If the table cannot be raised to the up position the covers must be removed. First remove the remaining 12 Phillips screws securing the lower portion of the bellows to the covers. Next, separate the covers by removing the four securing screws located at each end, and then slide the covers out.

- 3. Remove the six screws that secure the lower back panel (see Figure 1.2). Remove the lower back panel. Slide the control module out carefully. Make sure that the connecting cables are not being damaged as you slide the box out.
- 4. Disconnect all cables (see Figure 1.3).
- 5. Remove the six nuts that secure the module to the back panel.

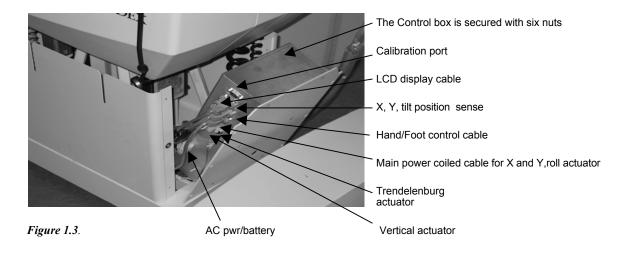


Figure 1.1.



Six Phillips screws securing side cover/control box

Figure 1.2.



2. X MOVEMENT ACTUATOR REPLACEMENT, (HEAD-TO-TOE)

Tools Required:

- Allen keys
- Wire cutters
- · Socket set, standard
- Phillips screwdriver

REMOVAL

- 1. Make sure the table is level before you remove the actuator assembly. The table may abruptly move when the actuator is disconnected.
- 2. Remove the tabletop, which is secured with eight bolts (see Chapter 9, Tabletop Replacement).
- 3. Remove the tie wrap that holds the excess power cable of the actuator to the bed frame, and disconnect the actuator connector.
- 4. Remove the 7/16 bolts that secure the worm gear collar bracket to the frame.
- 5. Remove the two Allen screws holding the actuator-mounting clevis bracket to the frame.
- 6. Remove the clevis bracket from the actuator.
- 7. Cut the tie wraps holding the sound insulation on the actuator and carefully remove the insulation. The insulation will be re-used on the new motor.

INSTALLATION

Note: A calibration is needed for this actuator.

- 1. Install the clevis bracket on the new actuator.
- 2. Install the existing insulation on to the new actuator using tie wraps.
- 3. Install the motor and clevis bracket back on the frame.

NOTE: The frame is slotted, so install bracket as close to the bottom as possible. This will insure the end of the worm gear does not hit the table when it is turning.

- 4. Plug the actuator connector in and run the collar about 3/4 of the way up the worm gear.
- 5. Install the collar bracket with two 7/16 bolts into weldment. Keep the flat side of the collar facing up when installing the collar.
- 6. Calibrate the table as instructed in Chapter 11, Calibration Procedure.

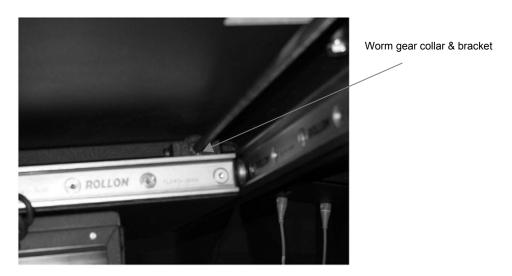


Figure 2.1. The X actuator worm gear collar and bracket. To access the bolts the top must be removed. This view is from underneath.

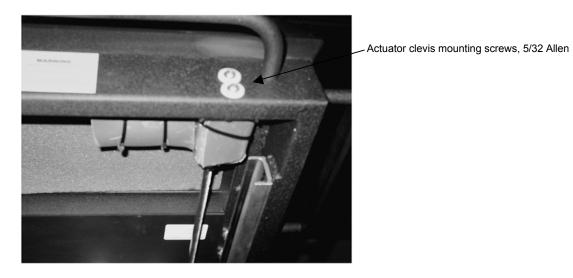


Figure 2.2. Actuator clevis mounting screws.

3. Y MOVEMENT ACTUATOR REPLACEMENT, (LATERAL)

Tools Required:

- Phillips screwdriver, Allen keys
- Socket set, standard Wire cutters

REMOVAL

- 1. Activate the X motor and move the tabletop all the way towards the back.
- 2. Remove the four 9/16th bolts, which are now accessible from the underside of the tabletop (see Figure 3.1).
- 3. Activate X motor and move the tabletop all the way forward.
- 4. Support the tabletop, before removing the final four 9/16th bolts, which are accessible from the forward underside of table.
- 5. Remove the four remaining bolts and lift to remove the tabletop. Once the tabletop is removed you will have access to the X actuator as shown in Figure 3.1.
- 6. Remove the two Phillip screws holding the resistor strip wiper bracket (see Figure 3.2).
- 7. Remove the four hex head bolts located in the side of the Y-motor nut mounting bracket.

NOTE: Do not remove the Allen screws holding the rollers.

- 8. Remove the two 3/16 Allen bolts holding the actuator collar to the Y-motor nut-mounting bracket (see Figure 3.3).
- 9. Remove the C-clip and pin holding the actuator to the clevis bracket.
- 10. Disconnect the power connector and remove the actuator.

INSTALLATION

NOTE: The actuator needs to be calibrated after installation.

- 1. Install the new actuator to the clevis bracket.
- 2. Install the actuator collar to the Y-motor nut mounting bracket with the flat side of the collar facing away from the bracket.
- 3. Install the Y-motor nut mounting bracket to the frame using the four hex bolts. Refer to assembly drawing, Surgical C-Arm, for reference.
- 4. The collar on the worm gear should now be facing down towards the base weldment. Run the actuator through its min and max range to make sure is moves without restriction and runs quietly.
- 5. Install tabletop.
- 6. Calibrate table as instructed in Chapter 11, Calibration Procedure.



Figure 3.1.

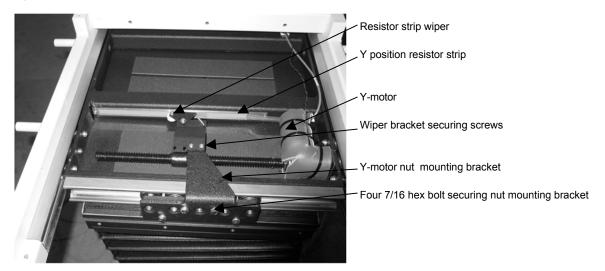


Figure 3.2.

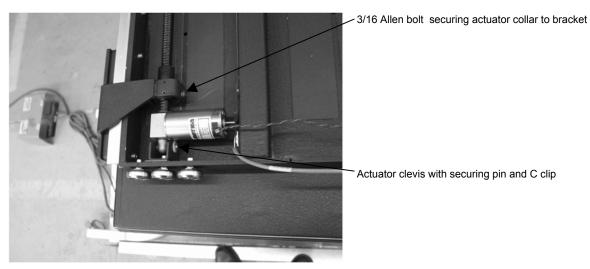


Figure 3.3.

4. LIFT ACTUATOR REPLACEMENT

Tools Required:

- Phillips screwdriver
- 5 mm Allen key
- 8 mm wrench

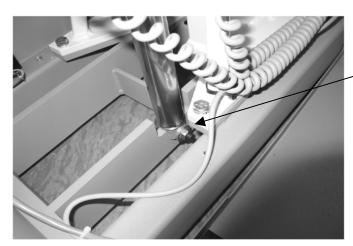
PROCEDURE

- 1. If the lift actuator is operational, the table should be brought down to its lowest position. If the actuator is not operational, the tabletop must be supported to prevent it from falling once the actuator is removed.
- 2. Lower the tabletop to its lowest position and remove the 18 Phillips screws that secure the lower portion of the bellows.
- 3. Remove the eight Phillips screws securing the top covers, and remove one cover at a time.
- 4. Remove the lower right cover secured with nine Phillips screws.
- 5. Remove the lower back panel (see Chapter 1, Control Module Replacement). Only three panels now remain on the right side since you should have already removed the lower left panel.

NOTE: Be sure to support the tabletop on both ends to prevent it from dropping once the lift actuator is removed.

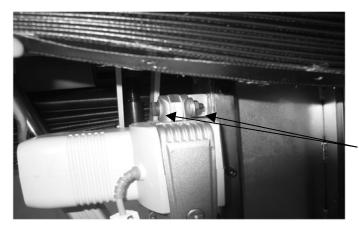
- 6. The actuator is secured at both ends with a 5-mm Allen head shoulder bolt and an 8-mm nut. (Figure 4.1 shows the lift actuator bottom-securing bolt. Figure 4.2 shows the lift actuator upper securing bolt.)
- 7. Remove the actuator and unplug the actuator power cable at the RCA jack on the controller box. (Figure 4.3 shows the control box and vertical lift actuator RCA plug location. Also, refer to the parts section drawing labeled I-Base Assy. for assembly components and part numbers.)

NOTE: For reinstallation of the actuator, reverse the process and test for proper operation before installing the enclosures.



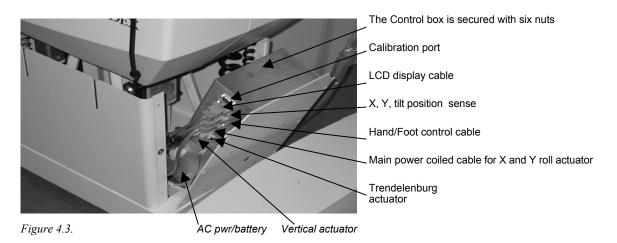
Lift actuator lower bolt and nut

Figure 4.1.



Lift actuator upper bolt and nut

Figure 4.2.



5. LATERAL TILT ACTUATOR REPLACEMENT

Tools Required:

- Phillips screwdriver
- 3/16" Allen key
- 1/2" wrench

PROCEDURE

- 1. If the lateral tilt actuator is operational, tilt it down on the patient right side. The table should be brought head down to its lowest position. If the actuator is not operational, the tabletop must be supported to prevent the tabletop from suddenly tilting once the actuator is removed.
- 2. The actuator is located inside the bellow on the patient right side. Remove the 18 Phillips screws that secure the lower portion of the bellows.
- 3. Remove the eight Phillips screws that secure the top covers, and then remove the covers one at a time.
- 4. Remove the lower right cover that is secured with nine Phillips screws.
- 5. Remove the lower back panel. (Six screws secure the lower back panel, but only three remain on the right side since you should have already removed the lower left panel.)

NOTE: Be sure to support the tabletop to prevent it from dropping once the lateral tilt actuator is removed.

- 6. The actuator is secured to the table with a 3/16-inch Allen head shoulder bolt and 1/2-inch nut. (Figure 5.1 shows the securing bolt assembly). In addition, the acme nut is secured with two 3/16-inch bolts. (Figure 5.2 shows the acme nut assembly.)
- 7. Remove the actuator and unplug the actuator power cable at connector #3 on the controller box. (Figure 5.3 shows the control box and actuator plug location #3. Also refer to the parts section drawing, labeled Base Top Assembly for assembly components and part numbers.)

NOTE: For reinstallation of the actuator, reverse the process and test for proper operation before installing the enclosures.

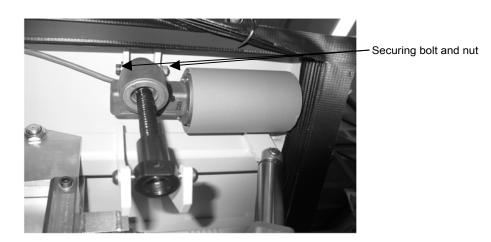
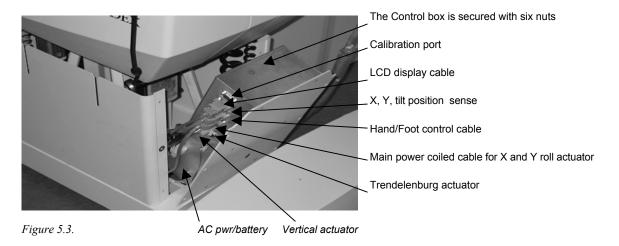


Figure 5.1.



Figure 5.2.



6. HEAD-TO-TOE TILT ACTUATOR REPLACEMENT

Tools Required:

• Phillips screwdriver

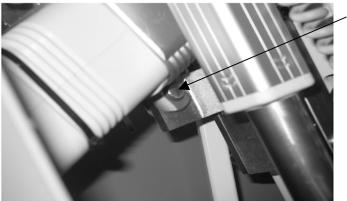
PROCEDURE

- 1. If the tilt actuator is operational, the table should be brought head down to its lowest position. If the actuator is not operational, the tabletop must be supported to prevent the top from suddenly tilting once the actuator is removed.
- 2. Tilt the top head down to its lowest position, and remove the eighteen Phillips screws that secure the lower portion of the bellows.
- 3. Remove the eight Phillips screws securing the top covers, and then remove the covers one at a time.
- 4. Remove the lower right cover secured with nine Phillips screws.
- 5. Remove the lower back panel. (Six screws secure the lower back cover, but only three remain on the right side since you should have already removed the lower left panel.)

NOTE: Support the tabletop to prevent it from dropping once the tilt actuator is removed.

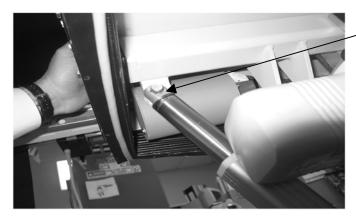
- 6. The actuator is secured at both ends with a pin and C-clip. Remove the clip and pull the pins out. (Figure 6.1 shows the lift actuator bottom-securing bolt. Figure 6.2 shows the lift actuator upper securing bolt. Refer to the illustrated parts section with the page entitled I Base Assy, see item #51.)
- 7. Remove the actuator and unplug the actuator power cable at the RCA connector on the controller box. Figure 6.3 shows the control box and actuator plug location.

NOTE: To reinstall the actuator, reverse the process and test for proper operation before installing the enclosures.



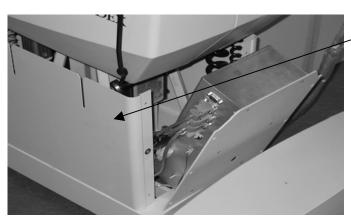
Actuator lower securing pin and clip

Figure 6.1.



Actuator upper securing pin and clip

Figure 6.2.



- Trendelenburg actuator

Figure 6.3.

7. TABLETOP REPLACEMENT

Tools Required:

• 9/16" wrench

PROCEDURE

- 1. Activate the X motor and move the tabletop all the way towards the back.
- 2. Remove the four 9/16-inch bolts, which are now accessible from the underside of the tabletop (see Figure 7.1).
- 3. Activate the X motor and move the tabletop all the way forward.
- 4. Support the tabletop before removing the final four 9/16-inch bolts that are accessible from the forward underside of table.
- 5. Remove the four remaining bolts and lift to remove the tabletop.



Figure 7.1.

8. CONTROLLER BOX REPLACEABLE COMPONENT

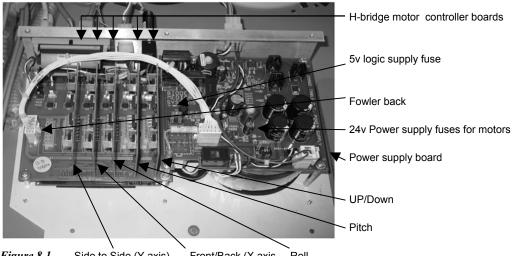


Figure 8.1. Side to Side (Y axis) Front/Back (X axis.....Roll

Tools Required:

• Phillips screwdriver

PROCEDURE

Figure 8.1 shows the control board layout. There are six board slots, which are labeled to designate their function. Each board activates a specific actuator or solenoid. The control board is configured to the table type it is used in. The control box is configured for a 058-830 table that is why the last slot J8 (Fowler Back) is not used.

Slot Designations	<u>Function</u>
J3	Up/Down
J4	Pitch (head to toe tilt)
J5	Roll (side to side tilt)
J6	Front to Back (x axis)
J7	Side to Side (y axis)
Ј8	Fowler back

Replaceable Components

- Fuses are located on the power supply board as identified above. The motor fuses (2) are 15amp and the display/logic is 2-amp. To replace, simply pull straight out from the socket.
- To replace the H-bridge motor controller board, pull straight up. To easily identify if board is defective replace with board from a known operating motor. When installing boards, line up pins on board with connector and press down evenly.
- To replace the Power Supply board, remove the four Phillips screws located at each corner. Next, disconnect the three connectors, J3, J5 &J6.

The above component replacement does not require that the table be recalibrated; however verification of proper operation is required.

9. TILT SENSOR BOARD REMOVAL AND REPLACEMENT



Figure 9.1.

Tools Required:

• Phillips screwdriver

PROCEDURE

The tilt sensor is under the tabletop, on the patient left side next to lateral tilt actuator.

- 1. Raise table to maximum height, for better accessibility.
- 2. Remove the eighteen Phillips screw securing the lower portion of the bellow.
- 3. Lift the bellows and secure in the up position. This provides you with access to the sensor.
- 4. Disconnect the signal cable connector.
- 5. Remove the three Phillips screws securing the sensor board.
- 6. To reinstall the Tilt Sensor board, reverse the procedure above. For a detailed illustration refer to Chapter 16, Part and Assembly Illustrations.

NOTE: The table must be recalibrated when a new sensor is installed. Refer to Chapter 11, Calibration Procedure for instructions.

10. POSITION SENSING STRIP REPLACEMENT

Tools Required:

• Phillips screwdriver

PROCEDURE

The table utilizes three precision resistor strips to sense the table's height and X, Y tabletop position. Figure 10-1 shows the resistor strip installed on the table. The wiper/roller move along the resistor strip as the position of the table changes. The resistance change is in direct correlation to the wiper position. Any changes in resistance are converted to position counts, which are shown on the display.

NOTE: Refer to Chapter 4, Lift Acutator Replacement, steps one through four, to access the position strip for ion strip for replacement.

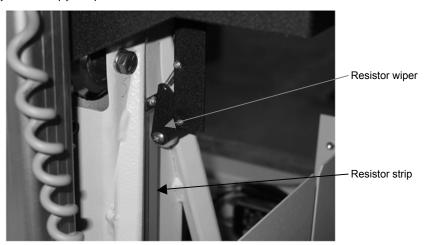


Figure 10.1. Height position sensing resistor strip.

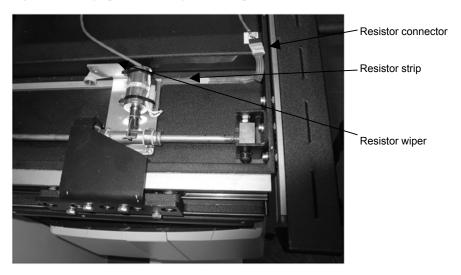


Figure 10.2. Y position sensing resistor strip (solenoid assembly, tabletop removed.)

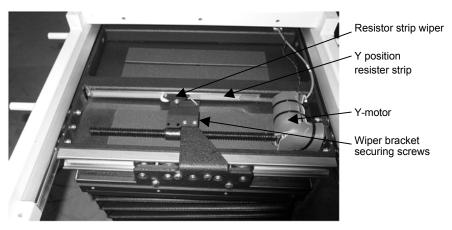


Figure 10.3. Y position sensing resistor strip (actuator assembly, tabletop removed.)

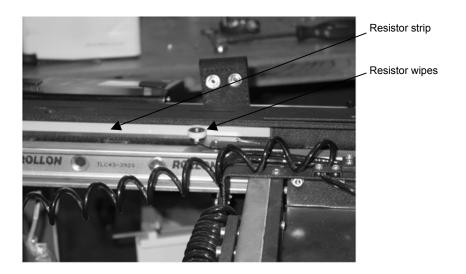


Figure 10.4. X position sensing resistor strip (tabletop removed for viewing.)



Figure 10.5. Resistor strip not installed. Note that the strip is secured with adhesive to a thin metal mounting plate. The mounting plate is attached to the designated location with two Phillips screws at each end.

REPLACING THE RESISTOR STRIP

To replace the resistor strip, remove the two securing screws. Next, lift wiper/roller and remove the strip (strip may also be secured with adhesive). When any sensor is replaced a table calibration is required. Refer to Chapter 11, Calibration Procedure, for instructions.

11. TABLE CALIBRATION PROCEDURE

Tools Required:

• PC with latest table calibration software installed

PROCEDURE

- 1. Connect COMM PORT 1 of the PC to the 9 pin male "D" connector of the table's control box, using a 9 pin female to 9 pin female RS-232 cable.
- 2. Turn the computer and monitor on.
- 3. When Windows is finished booting, double-click the left mouse button on the Image Table icon on the PC's desktop, to start the utility software.
- 4. Enter the table serial number in the appropriate box in the utility software.
- 5. Turn the table ON. "Welcome", "Press C to Calibrate" and other information or characters may be displayed in the software's receive window.
- 6. Click the left mouse button on "CALIBRATE." "++++ IMAGE TABLE CALIBRATION ++++" will be displayed in the software's receive window.
- 7. Follow the on-screen prompts in the utility's receive window.
- 8. The current selection for the type of table is displayed. This can be changed by pressing "Y" on the keyboard.
- 9. The table type choices are: 1) 830/870/C-ARM, 2) 840 Float Top, 3) Lithotripsy, 4) 800/810 URO/BRACH. Select the correct table type by pressing number 1-4 on the keyboard.
- 10. The current selection for the type of motor installed is displayed. The motor type choice is either High Speed or Low Speed. If this is incorrect, the motor type can be changed by pressing "Y" on the keyboard, otherwise press "N".
- 11. You will be given the option to calibrate each of the following:

UP/DOWN

FORWARD/BACK

SIDE TO SIDE

JOYSTICK

PITCH Axis

ROLL Axis

- 12. Select "Y" for each and follow the on-screen prompts.
- 13. To Calibrate UP/DOWN:
 - a. Press the appropriate UP or DOWN hand switch button so that "+ +" is displayed in the utility's receive window.
 - b. When the MAX Position is reached, reverse direction momentarily to back away from the MAX Position slightly, then press any key to set position.
 - c. Press the appropriate UP or DOWN hand switch button so that "- -" is displayed in the utility's receive window.
 - d. When the MAX Position is reached, reverse direction momentarily to back away from the MAX Position slightly, then press any key to set position.

14. Calibrate FORWARD/BACK:

- a. Press the appropriate FORWARD or BACK hand switch button so that "+ +" is displayed in the utility's receive window.
- b. When the MAX Position is reached, reverse direction momentarily to back away from the MAX Position slightly, then press any key to set position.
- c. Press the appropriate FORWARD or BACK hand switch button so that "--" is displayed in the utility's receive window.
- d. When the MAX Position is reached, reverse direction momentarily to back away from the MAX Position slightly, then press any key to set position.

15. Calibrate SIDE TO SIDE:

- a. Press the appropriate LEFT or RIGHT hand switch button so that "+ +" is displayed in the utility's receive window.
- b. When the MAX Position is reached, reverse direction momentarily to back away from the MAX Position slightly, then press any key to set position.
- c. Press the appropriate LEFT or RIGHT hand switch button so that "--" is displayed in the utility's receive window.
- d. When the MAX Position is reached, reverse direction momentarily to back away from the MAX Position slightly, then press any key to set position.

16. Calibrate PITCH Axis:

- a. Press the appropriate PITCH hand switch button so that "+ +" is displayed in the utility's receive window.
- b. When you reach 20 degrees position, reverse direction momentarily to back away slightly, then press any key to set position.
- c. Press the appropriate PITCH hand switch button so that "- -" is displayed in the utility's receive window.
- d. When you reach 20 degrees position, reverse direction momentarily to back away slighly, then press any key to set position.

17. Calibrate ROLL Axis:

- a. Press the appropriate ROLL hand switch button so that "+ +" is displayed in the utility's receive window.
- b. Press any key when 18 DEGREES TILT is reached.
- c. Press the appropriate ROLL hand switch button so that "- -" is displayed in the utility's receive window.
- d. Press any key when 18 DEGREES TILT is reached.

18. You will be asked if you need to change the HOME Position. Move the table to the NEW HOME Position, then press any key.

NOTE: The table must have the HOME position set to Full Down, Full Back, and Left/Right Centered.

- 19. When "****** EXIT Calibration MODE ******" is displayed you can choose to discard the previous calibration by pressing "C" to recalibrate, or save the calibration by pressing "S," or load a saved calibration by pressing "L".
- 20. When you are satisfied with the calibration, press "S" to save the calibration. Various numbers and letters will scroll by in the software's receive window.
- 21. The Imaging Table Calibration Utility may be exited by clicking File --> Exit on the menu bar or by clicking the X in the upper right corner.

12. CASTER REPLACEMENT

Tools Required:

- 9/16" Allen key
- 1/2" wrench
- ¾" wrench (thin)

HEAD END CASTER REPLACEMENT

The two head casters lock simultaneously by depressing either the left or right pedal. They are connected via a hex shaft. (see Figure 12.1).

- 1. Lift head end of table so that casters are six inches off the floor.
- 2. Remove each pedal weldment (left and right), which are secured with two 9/64 allen head screw and slide hex shaft out.
- 3. Remove the two 1/2-inch hex bolts from each of the caster mount and slide casters out. (see Figure 12.1)

FOOT END CASTER REPLACEMENT

- 1. Lift head and foot end of table so that casters are six inches off the floor.
- 2. Each caster is secured with a ¾-inch hex stud. To remove caster a special thin ¾-inch wrench is required. When replacing caster use Loctite blue on treads.

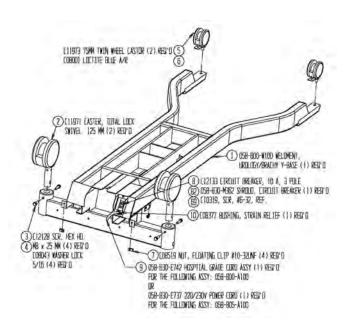


Figure 12.1. Caster replacement.

13. TABLE FIRMWARE UPDATE

- 1. Connect the PC to the 9 pin female "D" connector of the control box, using the special 9 pin female to 9 pin male DSP programming cable.
- 2. Turn the computer and monitor on.
- 3. Turn the table on.
- 4. When Windows is finished booting, double-click the left mouse button on the Image table icon on the PC's desktop to start the utility software.
- 5. Enter the table serial number in the appropriate box in the utility software.
- 6. Click on the PROGRAM LCB to begin the firmware update.
- 7. When the update is complete, close any newly opened windows by clicking the X in the upper right corner of each window.
- 8. The Imaging Table Calibration Utility may be exited by clicking File --> Exit on the menu bar or by clicking the X in the upper right corner.

14. Part And Assembly Illustrations

