
TUBESTAND

S-82

OPERATOR'S MANUAL



HCMI, Inc.
2146 East Pythian
Springfield, MO 65802
Phone (417) 864-6511
Fax (417) 864-7394



TABLE OF CONTENTS S-82 Tubestand

Installation Notice	Page 3
List of Revisions	Page 4
HCMI, Inc. Disclaimer	Page 5
Radiation and Mechanical/Electrical Warning	Page 6
Preface	Page 7-10
Introduction	Page 7
Safety Notice	Page 7
Safety Recommendations	Page 7
Shipping Information	Page 8
Compatibility Statement	Page 8
Compatible Beam Limiting Systems	Page 9
Alignment of the System	Page 9
Limited Warranty	Page 10
General Information	Page 11-17
Tubestand Specifications	Page 11-12
Electric Lock Base Magnet	Page 13
SY Tube Mount	Page 13
Optional Transverse Arm	Page 13
Tube Handle Assembly	Page 14
Tubestand Gauges	Page 14
Cable Clamps	Page 14
Ceiling Rail Stops	Page 15
Hardware Bag	Page 15
Trim Counterweights	Page 16
Plastic Wiremold	Page 16
SID Switch	Page 16
Optional Floor Mount Plate	Page 17
Optional Wall Mount Plate	Page 17
Pre-Installation	Page 18
Description	Page 18
Environmental Conditions	Page 18
Room Construction	Page 18
Installation	Page 19-29
Overview	Page 19
Shipping Bolt Removal	Page 19
Tubestand Assembly	Page 19
Wall Rail Installation	Page 20
Ceiling Rail Installation	Page 21
Positioning the Tubestand	Page 22
Tube Handle Assembly Installation	Page 23
Vertical SID Switch Installation	Page 23
Horizontal SID	Page 23
X-Ray Tube/Collimator Installation	Page 24
Tubestand Wiring	Page 24



TABLE OF CONTENTS (continued)

Cabling	Page 25
Leveling Procedures	Page 26
Adjusting the Load Bearings	Page 26
Adjusting the Guide Bearings	Page 27
Adjusting the Side Bearings	Page 27
Adjusting the Collar Magnet	Page 28
Adding Trim Counterweights	Page 28
Leveling the Collimator to Table Top	Page 29
Collimator at 90° Position	Page 29
Alignment	Page 30-31
Overview	Page 30
Aligning the Collimator	Page 30
Light Field to X-Ray Field	Page 30
Vertical Frame Alignment	Page 30-31
Table Bucky Alignment	Page 31
Optional Components	Page 32-33
Overview	Page 32
Fixed Base Assembly	Page 32
Transverse Arm Assembly	Page 33
Schematics	Page 34



INSTALLATION NOTICE

**THIS INSTALLATION AND
OPERATION MANUAL MUST BE
DELIVERED TO THE PURCHASER
UPON COMPLETION OF THE
INSTALLATION PRIOR TO
RELEASE OF THE EQUIPMENT.**



MANUAL INSTALLATION OPERATORS

- Notice This manual is copyrighted and all rights are reserved. No portion of this document may be copied, photocopied, reproduced, translated or reduced to any electronic medium or machine readable form without prior consent in writing from HCMI, Inc.
- Disclaimer HCMI, Inc. reserves the right to make changes to this manual and the equipment described herein without notice. HCMI, Inc. shall not be liable for any technical or editorial errors or omissions made herein or for incidental, special or consequential damage of whatsoever nature resulting from the furnishing of this manual or operation and performance of equipment in connection with this manual. The original draft of this document is written in English. The revision level of this document is shown on the front cover.

© Copyright 2000 HCMI, Inc.
2146 East Pythian, Springfield, MO 65802 USA

All product names or brand names are trademarks of their respective holders.

Radiation and Mechanical/Electrical Warning (from NEMA Standards Publication/No. XR8-1979)

Radiation



Warning for Diagnostic X-Ray Systems

X-rays are dangerous to both operator and others in the vicinity unless established safe exposure procedures are strictly observed.

The useful and scattered beams can produce serious, genetic or potentially fatal bodily injuries to any persons in the surrounding area if used by an unskilled operator. Adequate precautions must always be taken to avoid exposure to the useful beam, as well as to leakage radiation from within the source housing or to scattered radiation resulting from the passage of radiation through matter.

Those authorized to operate, test, participate in or supervise the operation of the equipment must be thoroughly familiar and comply completely with the currently established safe exposure factors and procedures described in publications such as Sub-Chapter J of Title 21 of the Code of Federal Regulations, "Diagnostic X-Ray Systems and their Major Components", and the National Council on Radiation Protection (NCRP) No. 33, Medical S-Ray and Gamma-Ray Protection for Energies up to 10 MeV-Equipment Design and Use, as revised or replaced in the future.

Failure to observe these warnings may cause serious, genetic or potentially fatal bodily injuries to the operator or those in the area.

Mechanical/Electrical



Warning for Diagnostic X-Ray Systems

All of the moveable assemblies and parts of X-ray equipment should be operated with care. Only properly trained and qualified personnel should be permitted access to any internal parts. Live electrical terminals are deadly; be sure line disconnect switches are opened and other appropriate precautions are taken before opening access doors, removing enclosure panels or attaching accessories.

Do not remove the flexible high tension cables from the X-ray tube housing or high tension generator or the access covers from the generator until the main and auxiliary power supplies have been disconnected.

When disconnecting high voltage cables, they must be grounded immediately in order to dissipate any electrical charge that may remain on the cables or the tube.

Failure to comply with the foregoing may result in serious or potentially fatal bodily injuries to the operator or those in the area.



PREFACE

INTRODUCTION

This manual is intended to assist the operator in the assembly and installation of the S-82 Tubestand designed and manufactured by HCMI, Inc. of Springfield, MO.

This equipment must be used in accordance with all safety procedures described in this manual and must not be used for purposes other than those described herein. This equipment should only be used by personnel with recognized qualifications and adequate training, especially in radiation protection.

All Safety procedures described in this manual are strictly observed in order to ensure the safety of both patient and user.

SAFETY NOTICE

The equipment manufactured by HCMI, Inc. covered in this manual functions reliably when operated and maintained according to the instructions provided in this manual.

HCMI, Inc. cannot assume responsibility for any malfunctioning of this equipment resulting from improper operation, maintenance, or repair, or from damage or modification of its components.

This equipment may be dangerous to both patient and operator unless safe exposure factors and operating instructions are observed.

This equipment is sold to be used exclusively by or under the prescribed direction of a person who is licensed by law to operate equipment of this nature. HCMI, Inc. claims all responsibility from any injury resulting from improper application of this equipment.

SAFETY RECOMMENDATIONS

All movable assemblies and parts of this equipment must be operated with reasonable care. Manufacturer's equipment recommendations must be observed as outlined in this manual.

Routine inspection of these assemblies should be performed by qualified service personnel on a semi-annual basis. Only properly trained service personnel should service or maintain the HCMI, Inc. equipment. Failure to follow manufacturer's or service personnel's recommendations may result in serious injury.

PREFACE (continued)

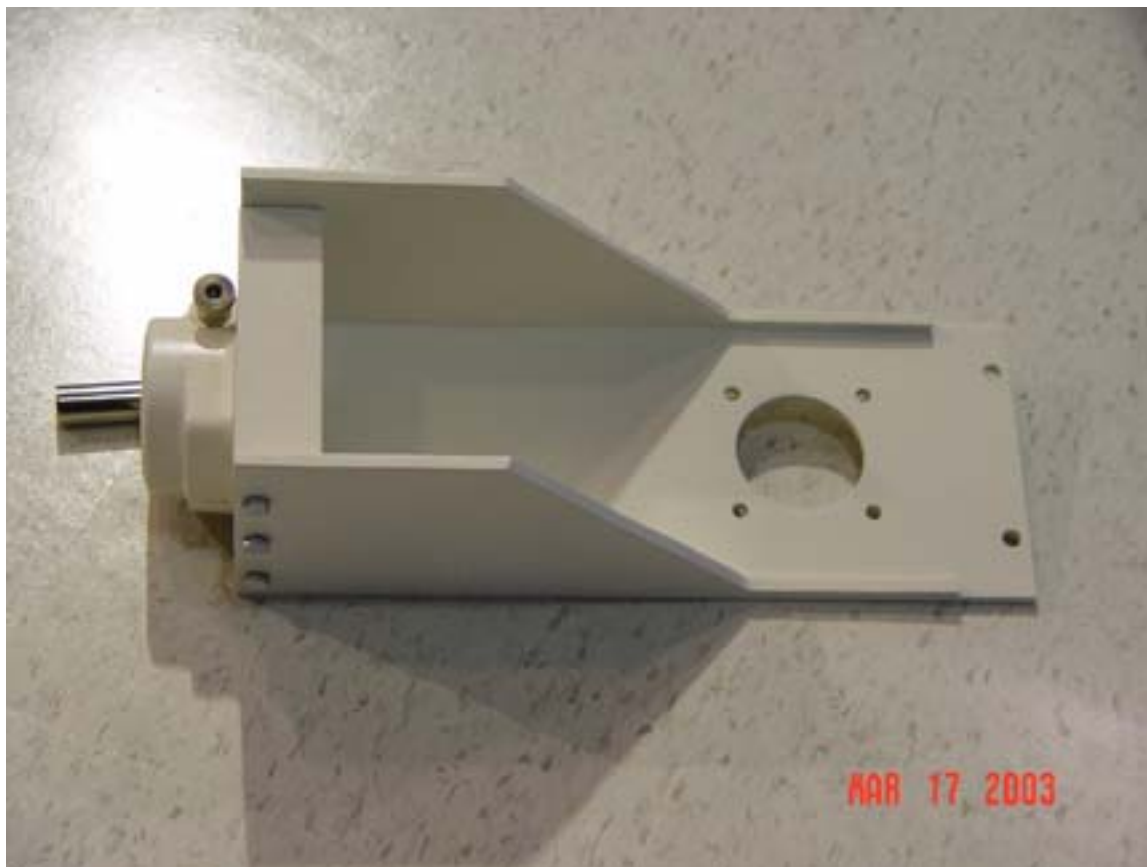
SHIPPING INFORMATION

The manufacturer is relieved of any responsibility for damage during shipment after unit is picked up by the carrier.

Examine all cartons and crates carefully at time of delivery. If damage is apparent, have delivery driver write a "Damaged Shipment Note" on copies of freight bill, sign it, and file appropriate carrier claim. Should you discover concealed damage, immediately notify the transporting agent and ask for an "Inspection of Damage".

COMPATIBILITY STATEMENT

Tube Housing Assembly compatibility is assured provided that the tube and collimator mounting is compatible with generic tube support mount as shown below:





PREFACE (continued)

COMPATIBLE BEAM LIMITING SYSTEMS:

Manufacturer and Model

Catalog No.

Progeny MC-150C Eureka

Med – MC150C
Pinnacle – MC150PN

ALIGNMENT OF THE SYSTEM

When assembled, a diagnostic X-Ray system must be capable of maintaining the alignment of the center of the X-Ray field to the center of the image receptor to within 2% of the SID. This will be achieved by calibration of the Beam Limiting System and the alignment of the Tubestand. The assembler is to follow the detailed instructions provided by this manual. When the S-82 Tubestand is also used with a wall cassette stand or Bucky Stand, care should be taken during room planning and preinstallation to allow for the accurate alignment of the components. This accuracy is to be within 2% of the SID used. After the Tubestand tracks are aligned to the table Bucky they cannot be adjusted transversely. Therefore, transverse alignment of the radiation field to the film in the Bucky stand must be made by adjustment of the extension arm centering detent or the position of the Bucky on the stand or the relocation of the entire stand.



PREFACE (continued)

LIMITED WARRANTY

Subject to the exceptions and upon the conditions stated below, **HCMI, Inc.** Warrants that the **Tubestand S-82RM** and its options, will be free from defects in material and construction for five (5) years, used or not used, to the original purchaser, after the date of sale. **HCMI, Inc.** agrees that if any such product should prove to be defective within said warranty period, will replace any defective part for a said warranty period. This warranty applies only if determination is made that the defect developed under normal and proper use.

The purchaser agrees to pay for all labor and/or parts determined to be not warranted and to pay all expenses accrued in doing said repairs.

It is expressly agreed that the above warranty will be in lieu of all warranties of fitness and of the warranty of merchantability and that **HCMI, Inc.** will have no liability for special or consequential damages of any kind or from any cause at all arising out of manufacture, use, sale, handling, repair, maintenance, or replacement of any of the products sold under this warranty.

Representation and warranties formed by any person, including dealers and representatives of **HCMI, Inc.**, which are inconsistent or in conflict with the terms of this warranty, will not be binding upon **HCMI, Inc.** unless reduced to writing and approved by the Board of Directors of **HCMI, Inc.**

Buyers will notify **HCMI, Inc.** in writing by registered mail also certified mail or return receipt requested, **within thirty (30) days of a breach of guarantee after discovery thereof; otherwise, such claims will be deemed to be waived.**

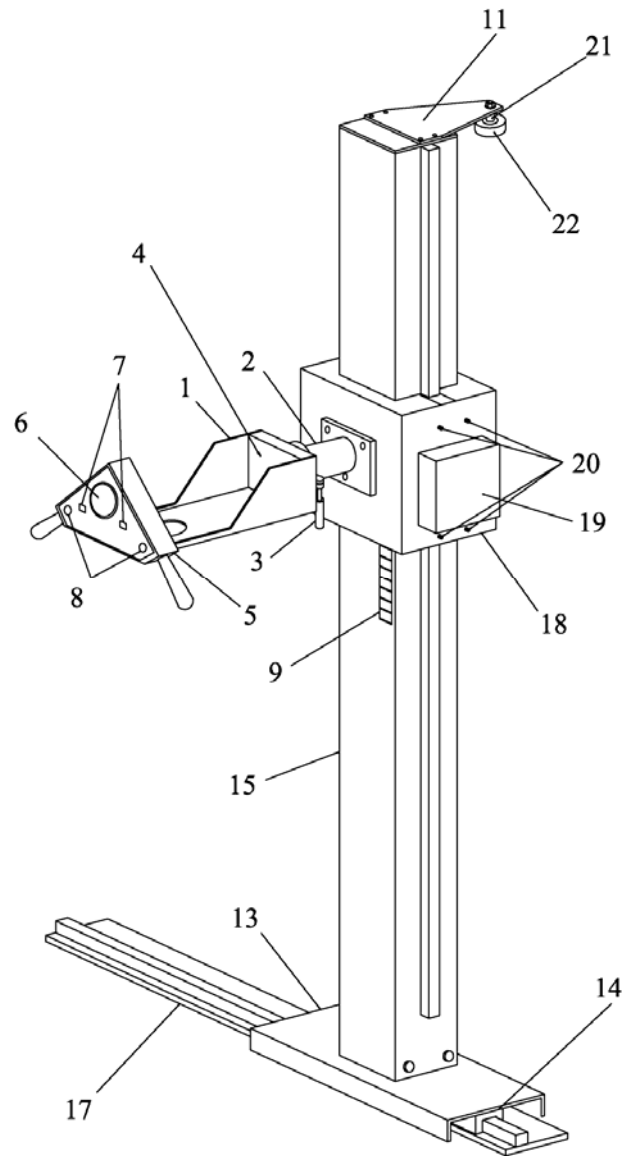
No product or device can be defective in whole or in part because of biological differences among individuals. Therefore, **HCMI, Inc.** does not represent or warrant under any circumstances that a particular result can or will be achieved by using its product or products. The choice of use of the product, the method or methods of use, the diagnosis of the patient's condition and the application for the patient is solely the responsibility of the practitioner and not of **HCMI, Inc.**

GENERAL INFORMATION

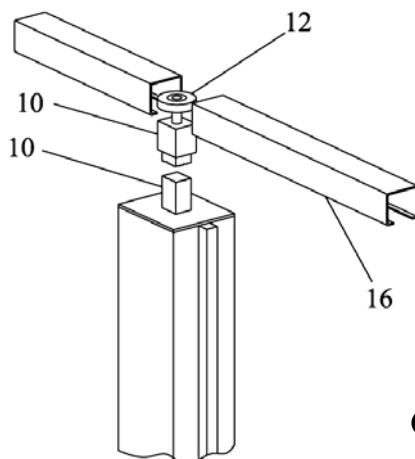
TUBESTAND SPECIFICATIONS

This section provides parts information for the tubestand.

PART	PART NUMBER
1 Tube Mounting Platform	MW-3315
2 SY Yoke	MW-3090-1 ½" MW-3091-5 ½" MW-3080-11 ½"
3 Rotational Lock Handle	HW-3060
4 SY Lock Housing	MW-3060
5 Tube Handle Assembly Chiro.	A-E4
6 Tube Angle Gauge- Inclinator	A-INCLIN
7 40" and 72" SID Indicators	
8 HOR and VERT Lock Switches	SW-0015
9 Vertical SID Gauge	LB-0235
10 Ceiling Travel Guide Plate	MW-3920
11 Wall Travel Guide Plate	MW-3225
12 Horizontal Travel Bearing Housing	HW-3230
13 Tubestand CAR	MW-3295
14 Horizontal Lock Assembly	A-HLOCK
15 Tubestand Column	MW-3910
16 Ceiling Rail/Wall Rail	MW-3005
17 Base Rail 6Ft. 8Ft. 10Ft.	MW-3300 MW-3301 MW-3303
18 Collar	MW-3285
19 Terminal Cover	MW-3230
20 Collar Adjust Allen Screws	HW-3430
21 Wall Travel Guide Plate Stem	HW-3240
22 Bearing and Housing	HW-3190



Wall Rail



Ceiling Rail



GENERAL INFORMATION (continued)

TUBESTAND SPECIFICATIONS

S-82 RM

Tubestand for
X-ray installations.

MINIMUM CEILING HEIGHT

88" Min

VERTICAL TRAVEL

Floor to Focal Spot

Min. 18"
Max. 72"

LONGITUDINAL TRAVEL

S-82 RM 6

52"

S-82 RM 8

76"

S-82 RM 10

100"

TRANSVERSE TRAVEL (T-4)

9.75"

TUBE, COLLIMATOR AND CABLE SUPPORT CAPACITY

150lbs.

POWER REQUIREMENTS

120VAC (50/60 Hz), 2 Amps

TUBESTAND WEIGHT

Net 360 lbs.
Gross 450 lbs.

COLOR

Off-white

COLUMN CENTERLINE TO WALL

9 ¼"

**BACK EDGE OF FLOOR RAIL ASSEMBLY
TO WALL**

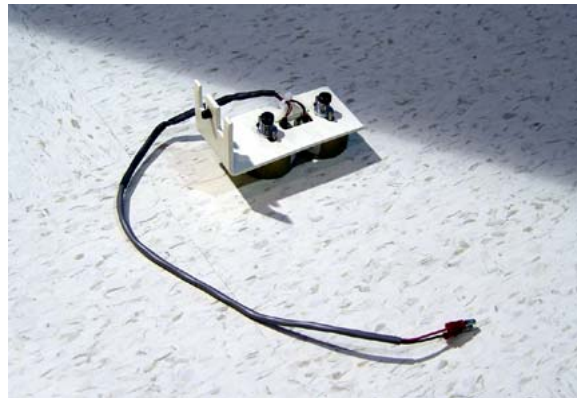
5"

GENERAL INFORMATION (continued)

ELECTRIC LOCK BASE MAGNET (P/N A-HLOCK)

WHERE USED: Magnet/Bracket Assembly mounts to bottom of Base

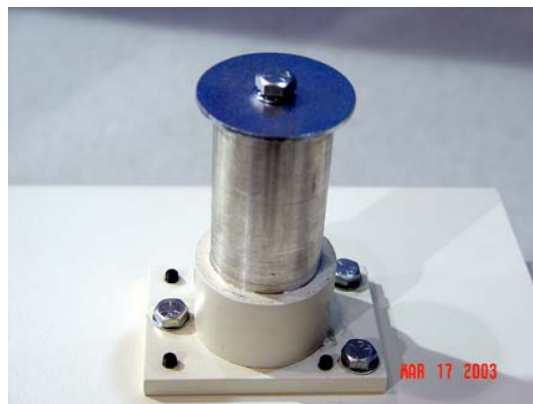
FUNCTION: Electrically energized 24 VDC magnet allows horizontal movement of Tubestand Assembly when LONG button on tube handle assembly is pressed.



SY TUBE MOUNT (P/N MW-3315)

WHERE USED: 'Tube Mount Plate' mounts to front of Collar on SY yoke.

FUNCTION: Heavy gauge aluminum mount supports x-ray tube, Tube Handle Assembly and collimator. SY Lock Lever locks tube mount in any degree position desired. (Lever is shown in "LOCKED" position.)



OPTIONAL TRANSVERSE ARM (P/N A-T4)

WHERE USED: Mounting Plate mounts to left of tubestand Collar.

FUNCTION: Yoke Plate supports mount. Boom extends and retracts via heavy duty ball bearing assembly under cover.



GENERAL INFORMATION (continued)

TUBE HANDLE ASSEMBLY (P/N A-E4)

WHERE USED: Tube Handle Assembly mount to tube mounting platform.

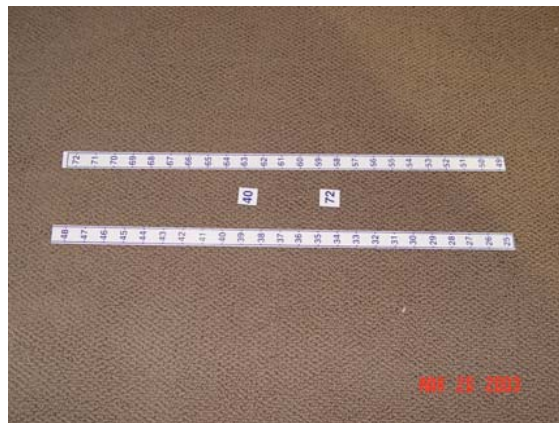
FUNCTION: Control center for precise positioning of tube/collimator before x-ray. Electrical vertical and longitudinal positioning switches are conveniently placed. Tube angle is displayed on inclinometer. SID lights indicate when 40" or 72" position is achieved.



TUBESTAND GAUGES (SELF-STICK LABELS) (P/N LB-0235, 25"-48": P/N LB-0236, 49"-72")

WHERE USED: Applied to tubestand at time of assembly.

FUNCTION: Serves as reference markers for positioning collar for tubestand SID.



CABLE CLAMPS (P/N HW-3065)

WHERE USED: One clamp mounts to lower side of Collar. Second clamp is usually mounted to nearby wall.

FUNCTION: Used to dress and support high-tension x-ray tube cables, etc.



GENERAL INFORMATION (continued)

CEILING RAIL STOPS (P/N M1266)

WHERE USED: Rubber stops are secured with bolt to inside of Ceiling Rail.

FUNCTION: To block movement of tubestand on Ceiling Rail.



HARDWARE BAG (P/N M1405)

WHERE USED: Assorted hardware for tubestand.

FUNCTION: Contains loose hardware required for tubestand assembly (contents shown in table below).

DESCRIPTION	PART NO.	QTY
SID CAMS	HW-3075	2
MALE RED BULLET CONNECTORS	CN-0490	2
FEMALE RED BULLET CONNECTORS	CN-0485	2
RUBBER STOPPERS	9-699	2
1/4" x 4" LAG BOLTS	9-504	2
1/4" x 2" LAG BOLTS	9-501	4
5/16" x 1" HEX HEAD BOLTS	9-447	2
#10 x 2" PHILLIP HEAD SCREWS	9-492	2
1/4" FLAT WASHER	9-541	6
1/4" LOCK WASHER	9-568	6

GENERAL INFORMATION (continued)

TRIM COUNTERWEIGHTS (P/N MW-4265)

WHERE USED: Pieces are placed on top of counterweight.

FUNCTION: To increase weight of Counterweight in small increments to achieve balance between weight of Collar and Counterweight. Note that Trim Counterweights may vary in size, weight, and shape.



PLASTIC WIREMOLD (P/N MS-3055)

WHERE USED: Self-stick adhesive bottom mounts to left side of tubestand.

FUNCTION: Routes smaller wiring and cables from Collar and Tubestand Base along tubestand.



SID SWITCH (P/N A-SID)

WHERE USED: Switch Assembly consists of two switches with mounting bracket. Assembly mounts to bottom flange of Tubestand Base.

FUNCTION: Roller on Switch Arms come into contact with SID switch cams mounted to Base Rail at 40" and 72". Switch is actuated, their respective lamps are lighted on tube handle assembly.



Note: 40" and 72" indicator lights are in tubestand handle. These lights are not visible until energized by SID cams.

GENERAL INFORMATION (continued)

OPTIONAL FLOOR MOUNT PLATE (P/N MW-3160)

WHERE USED: Mounts to bottom of tubestand.

FUNCTION: Used when stationary tubestand is desired.



OPTIONAL WALL MOUNT PLATE (P/N MW-3150)

WHERE USED: Mounts on top of tubestand.

FUNCTION: Used when stationary tubestand is desired. Used in conjunction with Floor Mount Plate.





PRE-INSTALLATION

DESCRIPTION

The S-82 Tubestand consists of three basic assemblies: Top and bottom rails, and base assembly.

ENVIRONMENTAL CONDITIONS

There are no special environmental conditions required for the safe operation of the Tubestand. However, it is not designed for use in the presence of explosive or flammable gases as might be found in operating rooms. Operation or prolonged storage temperatures below 32°F should be avoided as it will cause the lubricants to become more resistive to manually operated motions.

ROOM CONSTRUCTION

Conventional radiographic room construction should be used for areas where the tubestand is to be installed. Consult the State Health Department or local building codes for specific radiation shielding requirements. **NOTE: For seismic areas, all components must be secured with anchors specified by local standards.**



INSTALLATION

OVERVIEW

This section contains installation and assembly instructions for the S-82 Tubestand. The S-82 Tubestand Assembly is shipped factory pre-assembled. Assembly instructions for optional system components such as the Fixed Base Assembly option, are provided in the Optional Components section.

SHIPPING BOLT REMOVAL

The S-82 Tubestand is shipped with a shipping bolt installed in the tubestand car. In addition, to prevent Collar movement during shipping, the Stop Bracket is positioned above the Collar. The shipping bolt must be removed as follows:

1. Rest the tubestand flat (horizontal) on soft support material.
2. Remove the shipping bolt located in the tubestand car.
3. Do not reposition the Stop Bracket.

TUBESTAND ASSEMBLY

Assembling the S-82 Tubestand consists of the following:

- Installing the Floor and Wall Rails
- Positioning the tubestand/verifying tubestand assembly and travel
- Installing the x-ray tube/collimator mounting platform
- Mounting the x-ray tube and collimator
- Installing the tube handle assembly
- Leveling and aligning system components

INSTALLATION (continued)

WALL RAIL INSTALLATION

The procedure that follows describes how to install the wall rail with Floor-to-Wall mounted systems.

1. Lay the tubestand, front down, on the floor.
2. Remove the shipping bolt and attach the horizontal travel bearing plate to the top of the tubestand.
3. Place the floor rail about 10" from wall to industrial rail.
4. Place the tubestand on the floor rail and lean it back to the wall.
5. Slide the wall rail onto the horizontal travel bearing housing and flush the ends of the wall rail with the ends of the existing board.
6. Move one end of the rail about a quarter of a bubble above level and attach with supplied $\frac{1}{4}$ " x 4" lag bolt.
7. Level the rail and attach other end of wall rail to the wall with supplied $\frac{1}{4}$ " x 4" lag bolt.
8. Slide the floor rail toward the wall until tubestand is level from end to end of horizontal travel.



INSTALLATION (continued)

CEILING RAIL INSTALLATION

The procedure that follows describes how to install the ceiling rail with Floor-to-Ceiling mounted systems.

1. Install the Ceiling Rail square to the wall.



Do not support the Ceiling Rail from a suspended or drop ceiling without additional support of sufficient structural strength.

2. Place the base rail under the ceiling rail but do not fasten to the floor at this time.
3. Carefully raise the Tubestand to an upright position with the counter weight pulley wheel facing rear. The collar will rise up the tubestand because of the pull of the counterweight. Position the Base.
4. Mount all hardware on top of tubestand, securely tightening all necessary bolts.





INSTALLATION (continued)

POSITIONING THE TUBESTAND FLOOR TO CEILING

1. Measure the distance from the top of the Tubestand to the inside channel of the Ceiling Rail. Cut the Extension Rail to 2 5/8" less than the distance measured. Mount the Top Trolley Assembly to the Extension Piece and tighten the four (4) 1/4" – 20 allen screws located in back of the Top Trolley Assembly. Hang the top Trolley/Extension Piece Assembly in the Ceiling Rail.
2. Install one (1) rubber wall rail stop at each end of the wall rail as follows:
 - a. Set the tubestand at the location where motion is to be restricted.
 - b. Insert 5/16-18 x 3" bolt through hole in front of rail, through rubber stop, through rear of rail and fasten with 5/16"-18 lock nut.
 - c. Repeat above steps for opposite end of wall rail.
 - d. After stops have been installed, roll the Tubestand the full length of the base rail several times to assure that it does not bind or shimmy. Check the top trolley assembly to assure it is securely mounted on extension rail.
3. Using an 18-inch (min) double-bubble level, check that tubestand is plumb. If not, level and perform the following steps:
 - a. Move tubestand away from area where not level.
 - b. Shim up base rail using phenolic shims wedged between the base and floor.
 - c. Return the tubestand to original position and recheck with level.
 - d. Continue this procedure for entire length of base rail until tubestand is plumb with floor.
4. Route the cable marked "Base Magnet" through the 1/2" diameter grommet hole in the back lip of the base. Pull the cable through to approximately 10-12 inches.
5. Mount base magnet to magnet mounting block. Note that the hardware is already in the magnet mounting block located on the right side of the base as you face the front. The magnet bracket has two (2) 5/16" slots for vertical adjustment.
6. Mount the magnet bracket to the mounting block using the 1/4-20 hardware provided. Hand-tighten the two (2) 1/4-20 bolts with the magnet bracket in its full "up" position.
7. Adjust the base magnet as follows:
 - a. Loosen bolts to allow movement of bracket.
 - b. Slide a 3" x 5" index card between the magnet and electric lock base track.
 - c. Tighten bolts and remove index card
8. Anchor the base rail securely to the floor. Be sure to use adequate length screws for secure mounting.



INSTALLATION (continued)

TUBE HANDLE ASSEMBLY INSTALLATION

1. Mount the tube handle assembly to the tube mount platform using four (4) 5/16-20 x 1/2" hex head bolts and four (4) external star lock washers.
2. To check calibration of the angle gauge, place a level on the Tube mount. The angle gauge should read 0° with the tube mount level. If not, adjust the face of the angle gauge by loosening the .050 allen screws located near the bottom of the Tube Handle Assembly. Turn the angle gauge until the pointer aligns with the 0° marking, and then re-tighten the .050 allen screws.
3. Peel off the protective backing from the foam adhesive and mount the 3/4" plastic wire mold to the left side of the tubestand facing front so that it passes underneath the collar alongside the rear collar bearings.

VERTICAL SID SWITCH (COLLAR-MOUNTED) INSTALLATION

1. Mount the Vertical SID switch (P/N A-SID) to the collar using the two (2) pre-drilled holes located in the lower right side of the collar back. Do not tighten the screws.
2. Position the Tripper so that its protrusion depresses the actuator of the SID switch and mark location on tubestand. Clean marked area with alcohol. Peel off backing strip from tripper and affix to tubestand in marked location.
3. The SID switch has two (2) detent positions (two distinct "clicks" are audible when the actuator is slowly depressed). Adjust the SID switch bracket in its slot so that when the Tripper and switch make contact, both detent positions are made. Tighten all hardware.

HORIZONTAL SID (BASE-MOUNTED)

1. Mount the Horizontal SID Switch Assembly to the Base using pre-drilled holes located on the left side of the Base (as you face front of tubestand). Hardware is already assembled in holes. The switch assembly is mounted in back of the Base opposite magnet.
2. Position the tubestand at 40" SID or 72" SID from film in the wall bucky or cassette holder.
3. Note that the cam on track should be staggered. Move the tubestand to the alternate SID location to determine if both Cams are fully actuating the appropriate switches. Note that switches have two (2) detent positions (two distinct "clicks" are audible when each actuator is slowly depressed). Both detent positions must be "made" when the switch is "tripped". Adjust SID bracket if necessary.



INSTALLATION (continued)

X-RAY TUBE/COLLIMATOR INSTALLATION

Mount the x-ray tube and collimator to the tube mount according to collimator and x-ray tube installation and operation manuals.

TUBESTAND WIRING

1. Remove the Terminal Cover from the right side of the collar. This will reveal the Magnet and Collar Terminal Block.
2. Attach the SID switch cable (marked "SID Lights") to the Collar Terminal Block as shown in the interconnection diagrams.
3. Connect numbered Handgrip wires to the Collar Terminal Block according to the Interconnection Diagram.



WARNING:

MAKE SURE POWER TO THE GENERATOR IS OFF BEFORE PROCEEDING

4. Connect 20 ft. power line from the tubestand terminal block to the 24 VDC power supply. Black wire to black, red and white wires to red. Remove green wire. 24 VDC power supply plugs into 120 VAC outlets.



WARNING:

DO NOT TOUCH THE TERMINAL BLOCK; 24 – 30 VDC PRESENT.

5. Check for current with a voltmeter ("volts-DC" setting) on terminals 1 (-COM) and 2 (+24 VDC). Reading should be between +24 and +30 VDC. If not, check all terminal block connections and generator operation. Turn off generator.



INSTALLATION (continued)

CABLING

NOTE: **Optional Expand Zip Cable Covering with necessary Zippering Tool is highly recommended for dressing cables. If this option is ordered, apply covering before proceeding with the following steps and omit tie-wrapping of cables.**

All cables from the x-ray tube, collimator, etc., should be neatly bundled together and dressed as follows:

1. Drape cables between the Tube and the Collar to provide enough slack for tube mount rotation in both directions. Tie-wrap cables at 5" intervals.
2. Route cables to the Collar Cable Clamp (previously mounted).
3. From the Collar, route cables to the nearest wall (usually behind the Tubestand), leaving plenty of drape between the Collar and the wall to provide slack for vertical and horizontal movement of the Collar and the Tubestand. Mount cable clamp half to the wall at the point after sufficient slack has been provided and secure the cables in the clamp.
4. Route the cables to the generator along the floor baseboard. Tie-wrap cables at 5" intervals.



INSTALLATION (continued)

LEVELING PROCEDURES

The Collar must be level in relation to the Tubestand to assure a smooth and even travel along Tubestand rails. Leveling the Collar requires adjustment of the eight (8) Ball Bearing Assemblies inside the Collar. The bearings are adjusted by turning the eccentric bushings which are sandwiched between the bearing and the bearing mounting block. Turning the eccentric bushings changes the position of the bearing, thereby shifting the collar's position. Two pairs of bearings are considered Load Bearings since these bearings support the full weight of the tube mount assembly. The remaining two pairs of bearings guide the Collar and protect it from improper handling. The following are procedures for adjusting the bearings, adding trim counterweights (if necessary) and for leveling the collimator:

ADJUSTING THE LOAD BEARINGS

Note: For access to collar eccentric bushings, it will be necessary to grind down an ordinary $\frac{3}{4}$ " open-end wrench to a thickness of $\frac{1}{8}$ " maximum.

1. Place a level on the Collar top or side.
2. Locate the two (2) top Load Bearings at top-rear of Collar.
3. Check that the bearing on the opposite side of the rail (or top Guide Bearing) is in the retracted position before adjusting the top Load Bearings.

Note: Since there are a total of four (4) bearing assemblies to be adjusted, adjusting one bearing will only slightly move the Collar toward perpendicularity. It will be necessary to alternately adjust each Load Bearing repeatedly until perpendicularity with the Tubestand is achieved.

4. Starting with either the right or the left Top Load Bearing, hold the Bearing Bolt stationary with a $\frac{1}{2}$ " open-end wrench while turning the Eccentric Bushing with a $\frac{3}{4}$ " ground-down wrench. Turn bushing until the level shows the Collar to be nearing perpendicularity.
5. Adjust the other Top Load Bearing in the same manner.
6. Locate the two (2) Bottom Load Bearings at the bottom front of the collar.
7. Before adjusting the Bottom Load Bearings, verify that the bearing on the opposite side of the rail (or Bottom Guide Bearing) is in the retracted position.
8. Adjust both Bottom Load Bearings in the same manner.
9. After some minor re-adjustment of all ball-bearing assemblies, the Collar should be perpendicular to the Tubestand.



INSTALLATION (continued)

ADJUSTING THE GUIDE BEARINGS

1. Locate the two (2) Top Guide Bearings at the top-front of the Collar.
2. Starting with either the right or left bearing, hold the Bearing Bolt stationary with ½” open-end wrench while turning the Eccentric Bushing with ¾” ground-down wrench. Turn the bushing until the bearing *just touches* the rail. **DO NOT FORCE GUIDE BEARING AGAINST RAIL!**
3. Test for the right amount of guide bearing pressure against rail as follows:

With thumb or finger on bearing surface, attempt to turn the bearing.

- a. If bearing turns when a reasonable amount of pressure is applied, bearing is properly adjusted.
 - b. If bearing cannot be turned at all, bearing pressure against rail is too great.
 - c. If bearing spins freely on its own, bearing must be adjusted to touch rail.
4. Locate the two (2) Bottom Guide Bearings in the same manner as outlined in Step 3.
 5. Adjust both Bottom Guide Bearings.
 6. Test for correct pressure of Guide Bearing against rail.

ADJUSTING THE SIDE GUIDE BEARINGS

Leveling the Collar across its front plane requires the adjustment of the four (4) smaller Side Guide Bearings which are perpendicular to and mounted between each pair of Load and Guide Bearings. These bearings are adjusted by the four (4) ¼-20 hex set-screws on the left and right sides of the Collar. Each pair of set-screws adjusts one bearing assembly by moving the bearing “axle” in or out, thereby altering the position of the Collar. Proceed as follows:

1. Place the level across the top front of the Collar.
2. Using 1/8” allen key, turn set-screws as shown until the Collar is level.
3. Check collar travel by moving it up and down the entire length of the Tubestand. The Collar should move freely and easily.

NOTE: The Collar may travel downward without assistance due to improper counterweight balance. Additional Trim Counterweights should be added.

4. If the Collar appears to be dragging, Guide Bearing pressure may be too great. Repeat Step 4 from the *Adjusting Guide Bearings* procedure.



INSTALLATION (continued)

ADJUSTING THE COLLAR MAGNET

The collar Magnet has been factory-adjusted. However, the Leveling Procedures performed in the preceding paragraphs usually necessitate re-adjustment.

To determine if the Collar Magnet is properly adjusted, press \leftrightarrow button on the Tube Handle Assembly and look down into the collar at the magnet while moving the Collar up and down slightly. The magnet is properly adjusted when light is just barely visible passing between rail and magnet face. Releasing the \leftrightarrow button should lock the collar securely. The magnet will probably be positioned either too close to or too far from the tubestand rail. Determine which case is applicable as follows:

1. Press \leftrightarrow switch on the Tube Handle Assembly and gently move the collar up and down the tubestand. The Collar should travel freely and with very little effort. Travel should be smooth and quiet. (A soft rubbing sound will emanate from inside the tubestand: this is normal.) If the collar drags, look down into the collar through the right front and observe the magnet while pressing the \leftrightarrow switch on the Tube Handle Assembly. If the magnet appears to be touching the rail, the magnet is *too close to the rail*. Adjust the magnet by adding an equal number of shim washers to each Magnet Mounting Tab.
2. Press \leftrightarrow switch repeatedly while moving the collar up and down the tubestand. If slapping occurs (magnet banging against rail each time \leftrightarrow switch is released), magnet is *too far from rail*. Adjust the magnet by removing an equal number of shim washers from under each Magnet Mounting Tab.
3. If the collar is easily moved when the \leftrightarrow switch is not depressed, magnet is *too far from rail*. Adjust the magnet by removing an equal number of shim washers from under each Magnet Mounting Tab.

ADDING TRIM COUNTERWEIGHTS

Check for proper balance between the Collar and the counterweight. The Collar should remain stationary when the collar lock is released. If the Collar moves downward, additional trim counterweights may be added as follows:

1. Remove eight (8) pan head screws and back panel from back of Tubestand.
2. Lower collar to raise main counterweight.
3. Add trim counterweights by placing them into the container until proper balance between counterweight and collar is achieved.
4. Replace back panel and raise collar.



INSTALLATION (continued)

The procedures that follow describe how to level the collimator with respect to the radiographic table top. The first procedure, *Leveling the Collimator to Table Top (at 0° Position)*, is to be performed on all systems. If the collimator is to be used in its 90° position, such as on systems equipped with an optional rotating tube mount, the collimator must be level to the wall where the cassette holder or frame is mounted. For these systems, perform *Leveling the Collimator to Table Top (at 90° Position)* procedure.

LEVELING THE COLLIMATOR TO TABLE TOP (AT 0° POSITION)

1. With the collimator at 0° (parallel to the table top), place a level (8" minimum length) on the top surface of the collimator.
2. If the collimator is not level, adjustment of the allen set-screws in the Yoke Mounting Plate is necessary. Location of the Yoke Mounting Plate and the yoke adjusting set-screws.
 - a. If the collimator is tilting forward, slightly loosen the bottom bolt on the Yoke Mounting Plate and, using a 1/8" allen key, turn both bottom set-screws clockwise until they are snug. Re-tighten the bolt and check level. Repeat for fine adjustment if necessary.
 - b. If the collimator is tilting backward, slightly loosen the two top bolts on the Yoke Mounting Plate and turn both top set-screws clockwise until they are snug. Re-tighten both bolts and check level. Repeat for fine adjustment if necessary.

COLLIMATOR AT 90° POSITION

1. If the collimator is to be used in 90° position, level as follows:
 - a. Rotate the collimator 90° so that it faces the wall where the cassette holder or frame will be mounted.
 - b. Place a level on the top horizontal surface.
 - c. If the collimator is tilting forward, slightly loosen the bottom bolt on the Yoke Mounting Plate and, using a 1/8" allen key, turn both bottom set-screws clockwise until they are snug. Re-tighten the bolt and check level. Repeat for fine adjustment if necessary.
 - d. If the collimator is tilting backward, slightly loosen the two top bolts on the Yoke Mounting Plate and turn both top set-screws clockwise until they are snug. Re-tighten both bolts and check level. Repeat for fine adjustment if necessary.



ALIGNMENT

OVERVIEW

This section contains alignment instructions for the S-82 Tubestand.

ALIGNING THE COLLIMATOR

LIGHT FIELD TO X-RAY FIELD

Align the collimator's light field to the x-ray field as described in the Installation and Operation manual provided with the collimator.

VERTICAL FRAME ALIGNMENT

Before installing a wall-mounted cassette holder, the collimator must be adjusted to compensate for any light field alignment deviations. If the yoke is even slightly misaligned, the projected cross-hair error will increase as the Tubestand is moved for different SID techniques. The following procedure describes how to properly align the collimator by adjusting the set-screws along the sides of the Yoke Mounting Plate.

1. Move the Tubestand to 40" SID position.
2. Face the collimator 90° to the wall where the cassette holder will be mounted.

NOTE: If the Tubestand has a transverse arm (T4 option), select the center detent position.

3. Adjust the height of the collimator to approximately 56" from the center of the collimator to the floor.
4. Turn on the generator.
5. Press the collimator light button to project the cross-hairs on the wall.
6. With a pencil, make a small cross in the exact center of the cross-hairs.
7. Move the Tubestand to 72" SID position.
8. Turn on the Collimator light again and compare the projected cross-hair position in relation to the penciled cross made in Step 6. If the position of the cross-hairs at 72"SID is different than at 40" SID, make another cross mark (+) in the exact center of the new cross-hair position. Movement of the cross-hairs (called "walking") indicates that the Tubestand Yoke (tubular support extending from the collar) requires adjustment, which is corrected by adjusting the appropriate set screws on the Yoke Mounting Plate. To adjust the set-screws, proceed as follow:
 - a. Locate the set-screws on the Yoke Mounting Plate which is bolted to the collar face. (With the Transverse Arm option (T4), the Yoke Mounting Plate is bolted to the extension arm.

NOTE: Be sure to loosen the corresponding bolts before turning set-screws.

Carefully observe the cross-hair movement as you turn the appropriate set-screws. Compensate for half the total error by moving the cross-hairs directly between the two penciled cross.



ALIGNMENT (continued)

- b. Re-tighten the yoke bolts and repeat from step 5 as often as necessary until cross-hair walking is eliminated.

Movement of the cross-hairs (called “walking”) indicates that the Tubestand Yoke (tubular support extending from the collar) requires adjustment, which is corrected by adjusting the appropriate set screws on the Yoke Mounting Plate. To adjust the set-screws, proceed as follows:

- a. Locate the set-screws on the Yoke Mounting Plate which is bolted to the collar face. (With the Transverse Arm option (T4), the Yoke Mounting Plate is bolted to the extension arm.
- b. Figure 4-7 shows which pair of set-screws is to be turned clockwise according to the direction of the cross-hair walk.

NOTE: Be sure to loosen the corresponding bolts before turning set-screws.

- c. Carefully observe the cross-hair movement as you turn the appropriate set-screws. Compensate for half the total error by moving the cross-hairs directly between the two penciled crosses.
- d. Re-tighten the yoke bolts and repeat from Step 5 as often as necessary until cross-hair walking is eliminated.

TABLE BUCKY ALIGNMENT

Position the collimator to the table and verify alignment to the table bucky. Adjust the table so that it is in alignment with the projected collimator cross-hairs. Refer to the Table Installation and Operation Manual for procedures.



OPTIONAL COMPONENTS

OVERVIEW

This section provides assembly procedures for the tubestand's optional components, which include the following:

- Base Assembly
- SY, SY Tube Mount

NOTE: Read the procedures in each section carefully to provide an overview of the required tasks before beginning the actual assembly. In many cases, you will be required to return to specific procedures in the Pre-Installation section to complete a portion of the installation. Be sure to follow the exact sequence of instructions.

FIXED BASE ASSEMBLY

To install tubestands provided with a Fixed Base Option, proceed as follows:

1. Remove the Shipping Bolt located in the Tubestand Base.
2. Stand up and level the tubestand vertically at the location desired.
3. Attach top bracket to the top of the tubestand.
4. Attach the base to the floor using suitable hardware for the type of flooring. Four (4) clearance holes are provided, one in each corner.
5. Refer to the Pre-Installation section and complete installation procedures beginning with X-Ray Tube Mount Installation procedure.



OPTIONAL COMPONENTS (continued)

TRANSVERSE ARM ASSEMBLY (T4 OPTION)

To install the Transverse Arm Assembly, proceed as follows:

1. Refer to complete installation procedures up to X-Ray Tube Mount Installation procedure.
2. Remove the Transverse Cover as follows:
 - a. Remove the six (6) 8-32 x 1/4" pan head screws located on the top and bottom of the transverse cover.
 - b. Pull the cover away from the assembly.
3. Mount the Transverse Plate to the Collar using three (3) 3/8-16 x 3/4" hex head bolts, 3/8" flat washers and 3/8" split lock washers in round holes. Hand tighten only. Use one 3/8"-16 x 1" socket head cap screw with 3/8" internal tooth star washer and eccentric bushing, in rectangular hold.
4. Check if the Transverse Assembly is level to the floor:
 - a. Place a level on the boom in its extended position.
 - b. Turn the "Boom Adjusting Eccentric Bushing" (5/8" hex) under the cap screw head until the level shows the Transverse is plumb to floor.
 - c. Tighten all bolts and cap screw.
5. Refer to complete installation procedures beginning with X-Ray Tube Mount Installation procedure.
6. Check for required "Detenting Action". If adjustment is required, turn Detent Adjustment Screw clockwise for increased detent action and counter-clockwise for decreased detent action.
7. Replace the covers. Secure it with six (6) 8/32 x 1/4" pan head screws.

SCHEMATICS

