

***MANUAL COLLIMATOR  
(NON-CERTIFIED)***

***MODEL NO. G800***

**USER AND ASSEMBLER MANUAL**

**G886**

**REV. L**

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**TABLE OF CONTENTS**

I. USER INFORMATION

A. FEATURES ..... 1  
B. OPERATION ..... 2  
C. GENERAL SPECIFICATIONS ..... 2  
D. MAINTENANCE ..... 3  
E. LAMP REPLACEMENT ..... 4

II. INSTALLATION/SERVICE INFORMATION

A. COMPATIBILITY ..... 6  
B. ELECTRICAL SPECIFICATIONS ..... 6  
C. LAMP TIMING DIP SWITCHES ..... 7  
D. INSTALLATION ..... 7  
E. SIZE AND ALIGNMENTS ..... 12  
F. LIGHT FIELD ADJUSTMENT ..... 12  
G. CROSSHAIR ADJUSTMENT ..... 14  
H. COLLIMATOR DISASSEMBLY/REASSEMBLY ..... 14  
I. LAMP TIMER BOARD REPLACEMENT ..... 16

**Installation and Service Manual Revisions History**

Revision	Pages Affected/Revision Description	Release Date	ECR #
D	REVISED	DEC 1997	1381
E	REVISED PG.1 & PG. 2. REMOVED SCHEMATIC J302.(TO BE PACKAGED SEPARATELY)	MAR 2000	1914
F	REVISED TABLE OF CONTENTS REMOVED PG. 14	JUNE 2000	1952
G	ADDED LOCKWASHERS FOR MOUNTING, UPDATED FIGURES		
H	ADDED DIP SWITCH CONFIGURATION, LAMP TIMER BOARD REPLACEMENT AND RELOCATED EXISTING INFORMATION	MAY 2002	2618
J	<b>ADDED SCREW LENGTH WARNING</b>	<b>AUG 2002</b>	<b>2713</b>
K	CLARIFIED TERMS "HIP SW" & "NO HANDS" ADDED "NOTE...RECYCLE POWER FOR DIP SW SETTINGS TO TAKE EFFECT."	NOV. 2002	2789
L	SHEET 10, CHANGED 16 mm SCREW REFERENCE TO 18 mm.	MAY 2010	6780

## I. USER INFORMATION

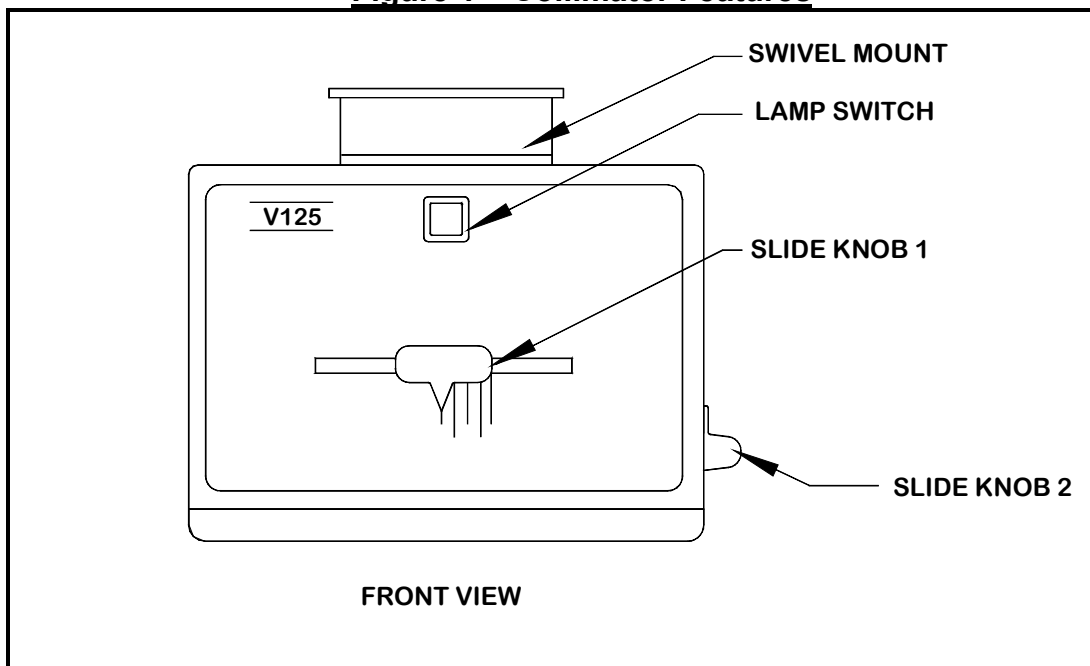
### A. COLLIMATOR FEATURES (See Figure 1, Below)

1. Collimator Slide Knob 1 - Controls the longitudinal shutters. Calibrated scale corresponds to 40" source to image distance (S.I.D.)
2. Collimator Slide Knob 2 - Controls the cross shutters. Calibrated scale corresponds to 40" source to image distance (S.I.D.)
3. "Lamp" Switch - Controls the light field. Depressing and releasing the push-button switch, while the light field is "off", causes the light field to turn "on" and stay "on" for the set lamp time duration. At the end of this "on" period, the light field will automatically switch "off". Depressing and releasing the switch while the light field is "on" interrupts the "on" period and instantly shuts the light field "off". This feature allows the operator to manually terminate the light field, thus extending lamp life.

Additional terminals are provided on the lamp timer PCB to allow for secondary hip activated lamp switches to be used in conjunction with the primary lamp switch. If the hip switch selection is enabled, at the end of the "on" period the light will dim gradually. Depressing the switch during gradual turn-off will restart the lamp and timer for another "on" period. However, activating the hip switch option disables the manual termination feature.

4. Swivel Mount - Allows rotation of the collimator with mechanical detents at 0°, -90° and +90°.

**Figure 1 – Collimator Features**



**B. OPERATION**

1. Position the collimator knobs to correspond to the film size.
2. Turn the light field "on" and center the light field to the film.
3. The light field can be manually terminated if operator desires.  
(Only when the hip switch feature is not part of system configuration)

NOTE: Radiographic quality is not affected by the light field being "on" or "off" during exposure.

**C. GENERAL SPECIFICATIONS**

Applications - Stationary radiographic systems.

Maximum rated KVp - 125 KVp

Outer dimensions (L. W. H.) - 9.00 X 7.50 X 6.25

Net weight - 13 lbs. (approx.)

Lamp - type FCS, 150W @ 24V - (pin base)

Lamp timer - solid state, adjustable to: 30, 60, 90, or 120 seconds.

Input power - 150W, 24VAC (nominal)

Projected field size - square or rectangular, continuously variable.  
(See Chart.)

SID	MAXIMUM LENGTH	MAXIMUM WIDTH
40"	17"	17"

Minimum Inherent Filtration - 2.0mm alum. equivalence at 125 KVp.

**D. MAINTENANCE**

Periodic inspection and preventative maintenance of this equipment is necessary to assure continued safe performance and compliance with applicable state and federal regulations. The following maintenance program must be closely followed.

Q: Who should perform the service?

A: Service personnel specifically trained, experienced and familiar with this type of medical x-ray equipment.

Q: When and how often?

A: Appropriate inspection and service should be performed 30 days after installation and every 12 months thereafter.

Q: Specifically, what must be inspected, tested and/or serviced?

A: Several things:

1. Verify that knobs are tightly mounted and properly positioned.
2. Shutter assemblies operate smoothly with minimal backlash and no binding.
3. Lamp timer works properly.
4. Electrical connections are clean and tight.
5. Verify collimator is tightly mounted to tube.
6. Verify "load-on" voltage is within specified range.
7. Verify sizes and alignment of x-ray field, light field and dial indication.
8. All external covers are properly and securely mounted.

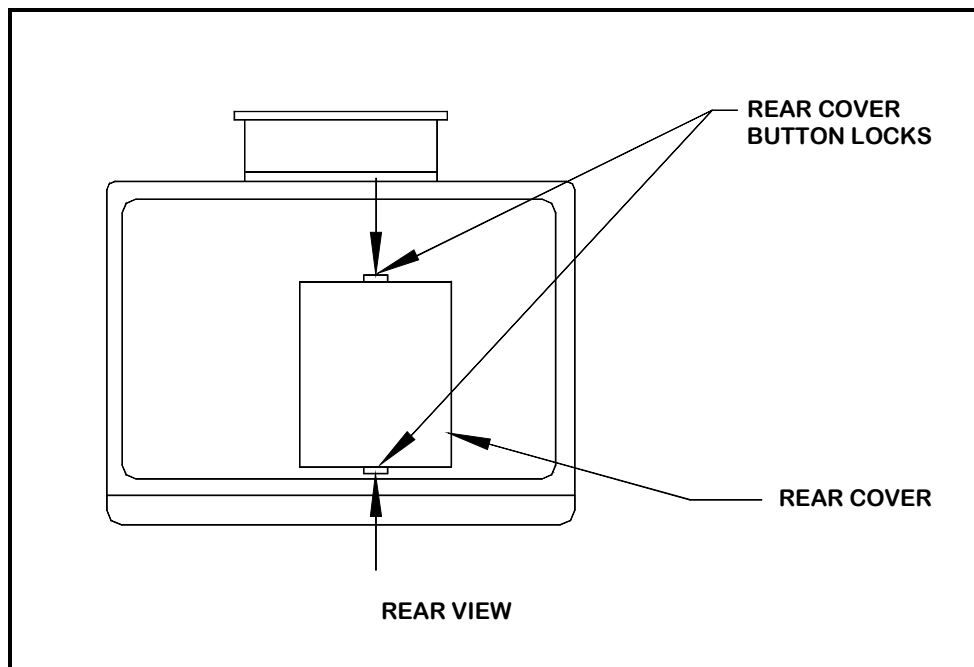
**WARNING**

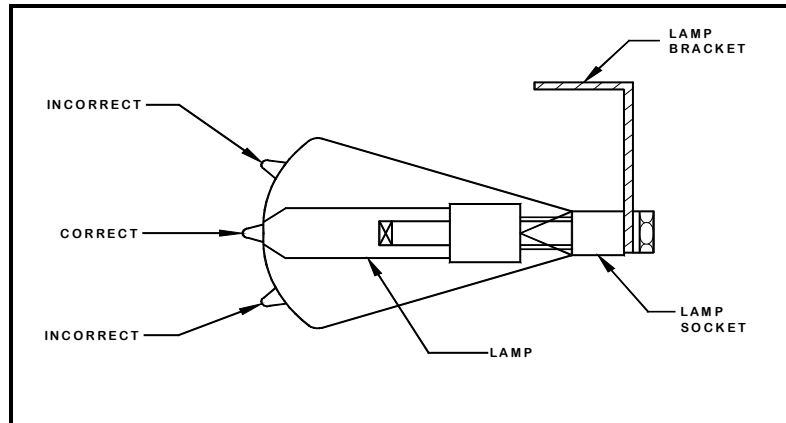
This product should not be altered or modified in any way as such action may adversely affect its performance, adversely affect operator and/or patient safety, and void the factory warranty.

**E. LAMP REPLACEMENT****WARNING**

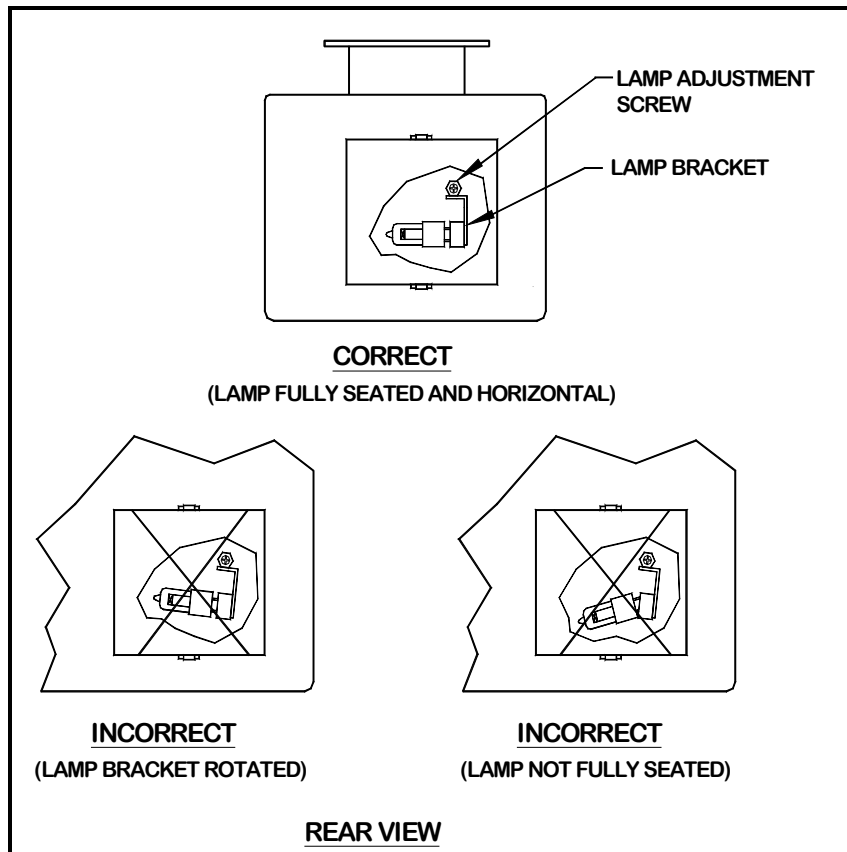
1. Turn off power prior to removing any covers.
2. Do not look directly at the lamp during operation.
3. Do not make exposures when the lamp cover is not in place.
4. Do not touch the lamp with bare fingers at any time, as skin oils on the lamp will reduce lamp life.
5. Be careful not to disturb the lamp bracket position when removing or inserting the bulb as this will affect light field alignment (as shown in [Figure 4](#)).

1. Press the two rear cover button locks in and remove the rear cover as shown in [Figure 2](#).
2. Remove the old lamp and replace it with the new one, making sure the lamp pins are pushed completely into the socket as shown in [Figure 3](#).
3. Replace the rear cover, making sure the button locks snap into the holes in the cover.

**Figure 2 - Rear cover removal**



**Figure 3 - Lamp replacement**



**Figure 4 - Lamp and Bracket Positioning**

## II. INSTALLATION INFORMATION

**A. COMPATIBILITY** - The V125 collimator is compatible with x-ray tube housing assemblies that meet all of the following specifications:

1. **FOCAL DISTANCES** - The distance from the tube's focal spot to the collimator mounting surface must be  $2.32 \pm .03$ ". A selection of spacers is provided to make up this distance if the combined dimension of the tube housing assembly and tube mount are less than this value.
2. **BEAM ANGLE** - To avoid x-ray field cut-off at large shutter openings, the total included angle of the x-ray beam emerging from the tube housing must be  $28^\circ$  (minimum) in each direction (length and width).
3. **MOUNTING** - This collimator is intended for use on x-ray tube housings and tube mounts provided with a four hole mounting pattern equally spaced on a 3.62 diameter bolt circle.

### B. ELECTRICAL SPECIFICATIONS

30 VAC maximum no-load  
21.0 to 23.0 VAC load-on  
Fused 8 to 10 Amps at source

#### ELECTRICAL WARNING

For safety, the power source must either be ground referenced or isolated from the power line.

#### CABLE CONNECTIONS:

C1 & C2 - 24VAC, fused at 8 Amps.  
CSW1 & CSW2 – for hip switch option only. Cut and isolate if not used.  
GND – Ground connection

### **WARNING:**

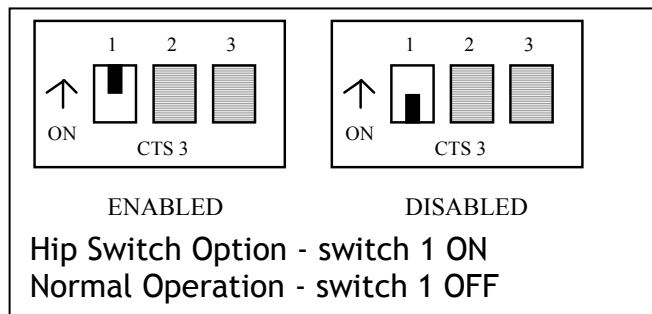
**Connecting the wires labeled C1 & C2 to a source other than 24 VAC, and connecting the wires labeled CSW1 & CSW2 to anything other than the proper hip-switch contacts as described in the generator manual will result in damage to collimator components not covered by warranty.**

**C. LAMP TIMING DIP SWITCHES**

NOTE: The Collimator’s microprocessor detects DIP switch settings only when the Collimator’s 24VAC power supply is switched from the OFF state to the ON state. Therefore, for any new DIP switch settings to take effect, the Collimator’s 24VAC power supply must be recycled after the DIP switches are changed.

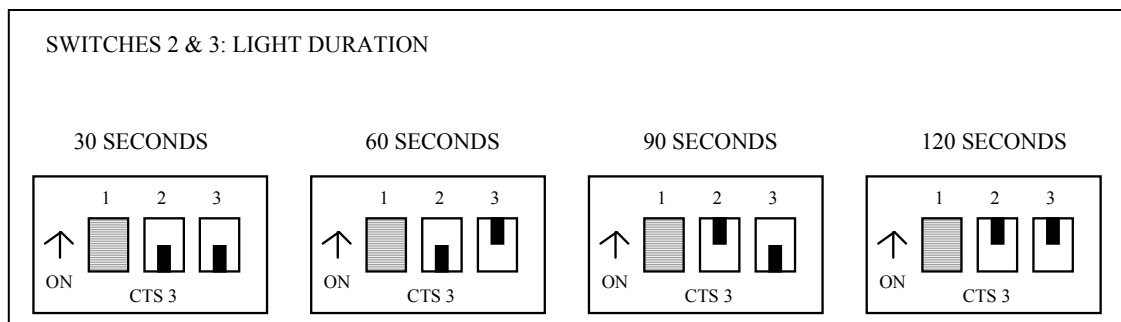
1. HIP SWITCH OPERATION (refer to Section II-G for lamp timer access)

The "hip switch" option (which disables the user's ability to manually extinguish the lamp) is used when external collimator hip switches are factory installed on the edges of the table top. To enable this special timing feature, set DIP SW 1 to ON. The normal position for DIP SW1 is OFF, which allows the operator to manually light and extinguish the collimator lamp.



2. LIGHT DURATION.

The lamp time is selectable in 30 second increments using DIP SW2 & DIP SW3 as shown below.



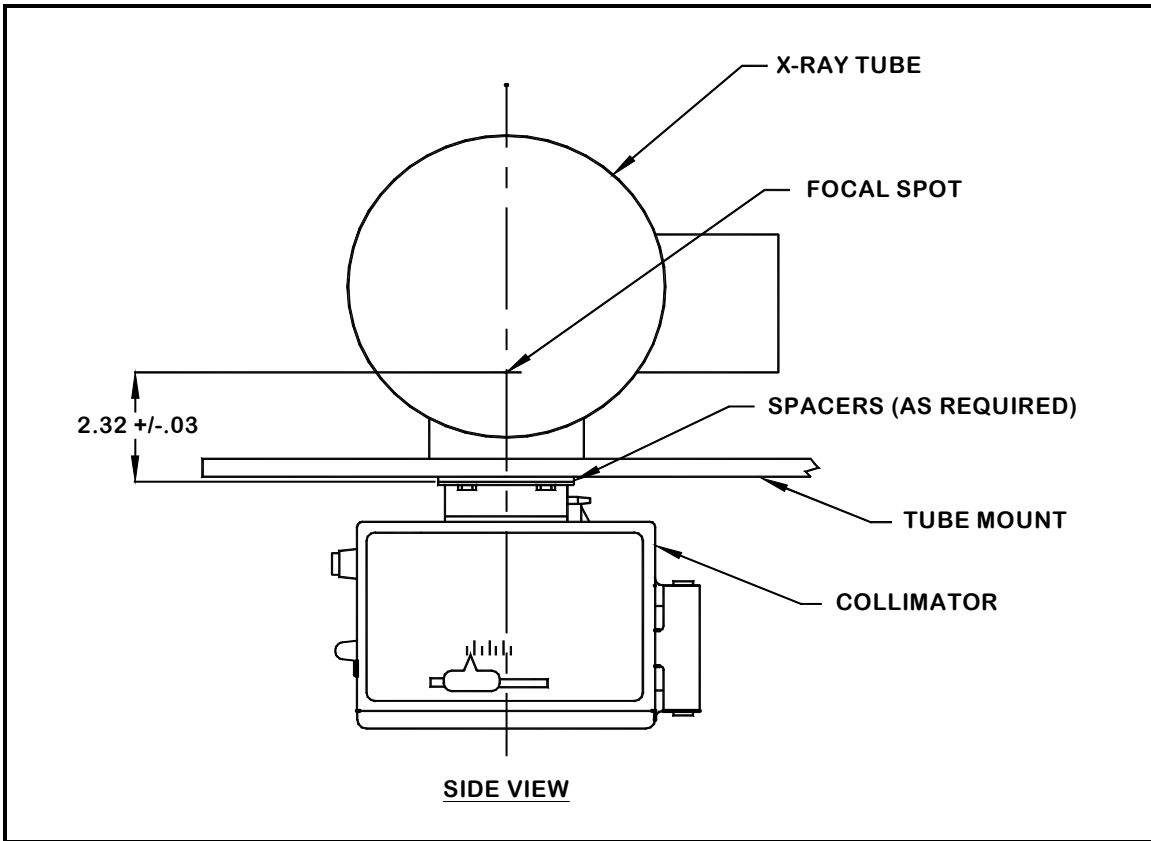
**D. INSTALLATION****1. SPACER SELECTION**

This collimator will perform properly only when the distance between the focal spot of the x-ray tube and the mounting surface of the collimator port is  $2.32 \pm 03$ " as shown in [Figure 5](#) below. A selection of spacers is provided which should accommodate all tubes and tubemounts commonly available.

**NOTE:**  
**Toshiba tubes sold by Summit (2.08" F.S. to port mount surface) used with Summit tubemounts (.12" thick) require two .06" thick spacers.**

To select the proper number of spacers for the particular components being installed, follow steps A through E below:

- A. Determine the distance from the focal spot to the port mounting surface of the x-ray tube (typically 1.88" to 2.25").
- B. Determine the thickness of the tubemount between the tube and collimator (typically .09" to .187").
- C. Add the distance of "A" to the thickness of "B".
- D. The calculated spacer thickness is determined by subtracting the sub-total of "C" from the specified distance of 2.32".
- E. Now considering the spacers provided (four .06" thick spacers) select the number of spacers that most closely matches the calculated spacer thickness from "D".
- F. Adding spacers decreases x-ray field size.



**Figure 5 - Focal Spot to Mounting Surface Distance**

## 2. SELECTION OF COLLIMATOR MOUNTING SCREWS

**WARNING**

Mounting flanges of typical x-ray tubes are threaded either 1/4-20 or M6 (metric). It is critical that screws of the correct thread size be used which match the threads of the x-ray tube. **Toshiba Tubes sold by Summit use M6 bolts.**

For proper safe mounting of the collimator to the tube, screws must be selected which provide at least 4 full threads of engagement with the tube's mounting flange, but are not so long as to bottom-out in the holes. To calculate the minimum screw length, total up the thickness of the tubemount, the total thickness of spacers, and .37". This total is the minimum screw length.

Two sets of hex head bolts are provided with the collimator:

- (4) 1/4-20 x 3/4" long
- (4) M6 x 18mm long

*WARNING: Failure to use screws which provide at least 4 full threads of screw engagement with the tube mounting flange may cause a safety hazard. The screws included with the collimator hardware kit will not accommodate all x-ray tube and spacer combinations.*

## 3. MOUNTING THE COLLIMATOR

- A. Mount the appropriate spacers along with two of the mounting bolts as shown in [Figure 6](#). Tighten the bolts until there is approximately 1/8" gap between the spacers and the tubemount.
- B. With the collimator swivel detent engaged in its slot, push the collimator against the spacers until the spacers are flush with the tubemount. Rotate the collimator so that the two open-ended slots on the mounting flange fully engage the two mounting bolts already in place, as shown in [Figure 7](#).

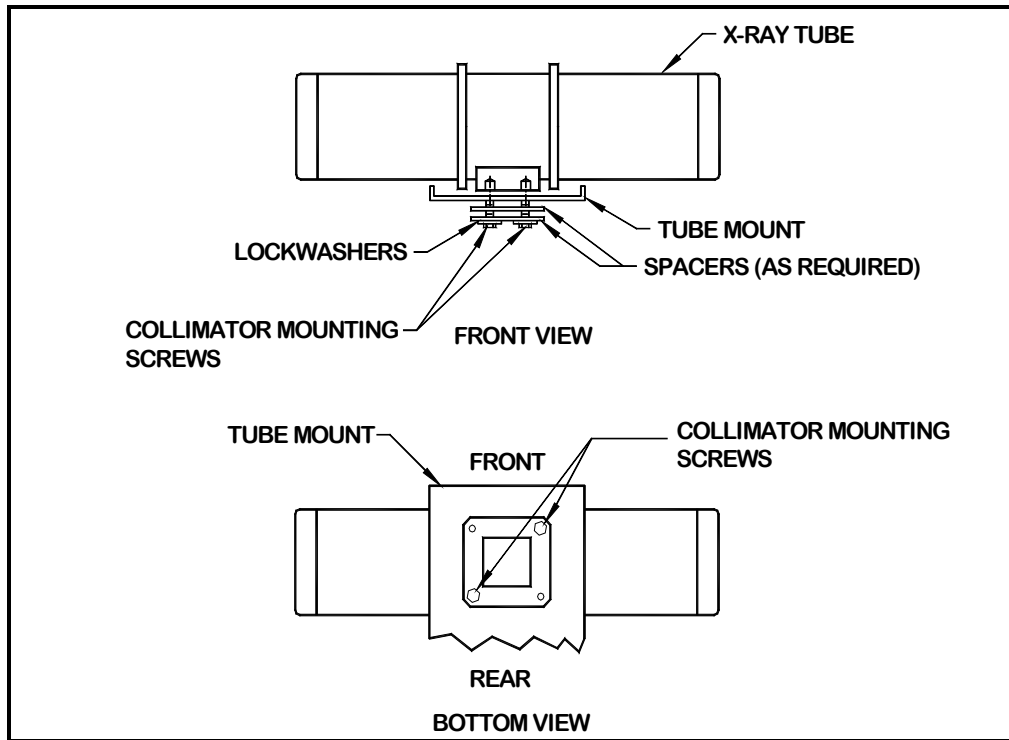
**NOTE:** Swivel detent should be towards tubestand when properly mounted.

- C. Fully tighten the two mounting bolts already in place, then install and fully tighten the two remaining mounting screws.

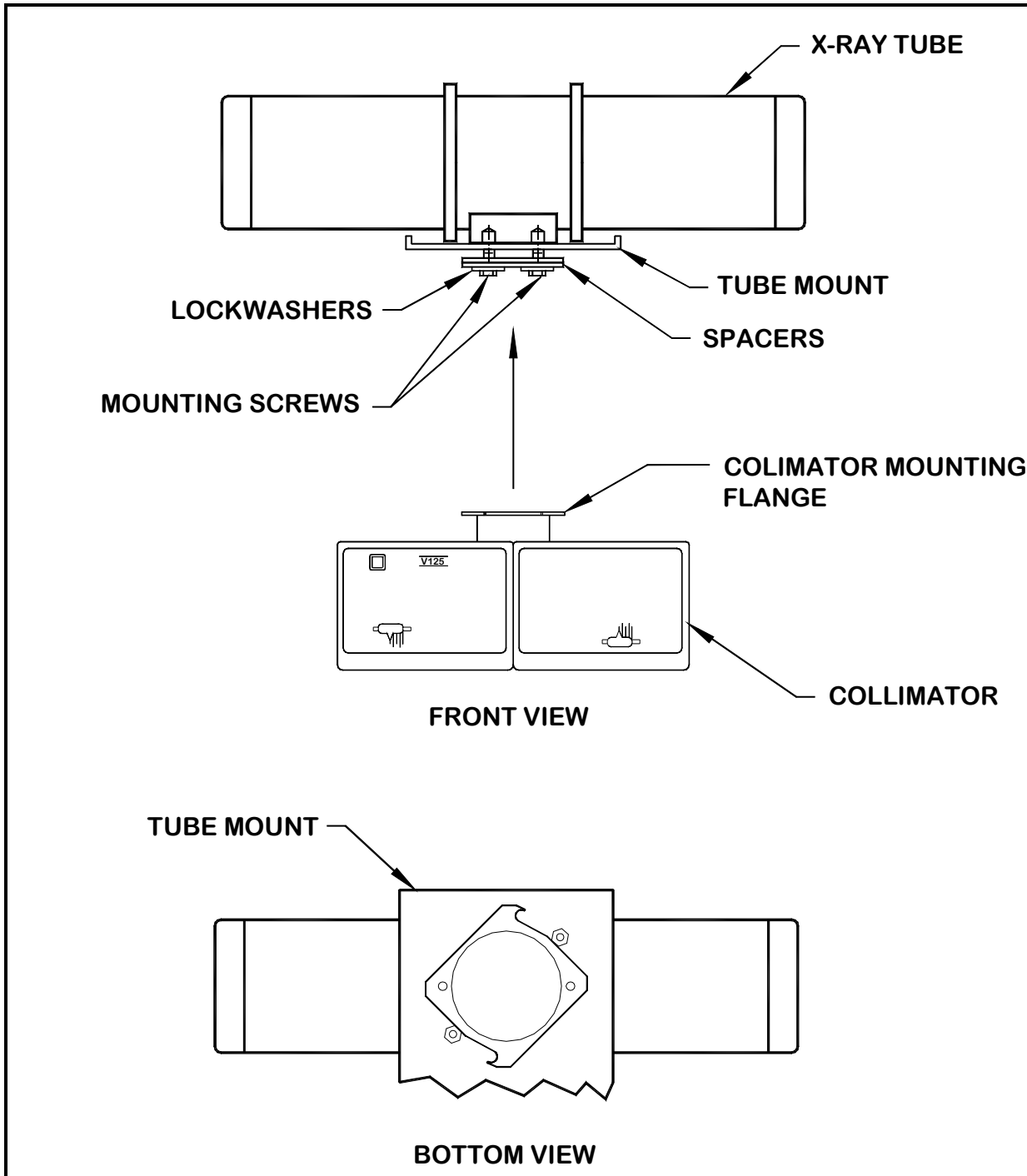
**WARNING**

Hold the collimator firmly in place until the mounting bolts are fully tightened.

- D. Thoroughly inspect port mounting area for gaps, loose joints or loose components.



**Figure 6 - Collimator Mounting**



**Figure 7 - Collimator Mounting**

**E. SIZE & ALIGNMENTS**

1. Place a loaded x-ray film cassette perpendicular to and centered with the collimator light field, at a distance of 40" from the focal spot of the x-ray tube.
2. Set the collimator's indicated field size to a standard size somewhat smaller than the film being used.
3. Place four radiographically opaque markers (coins work well) within the light field near the center of each edge so that the outer edges of the markers align with the visible edges of the light field. These markers will leave images on the processed radiograph which represent the light field. Place a fifth marker in the lower left quadrant so that the processed radiograph can be properly oriented.
4. Expose the film with enough radiation to produce an optical density of approximately 1.0.
5. Develop the film and examine the resultant image:
  - a. The length and width of the x-ray field (dark image area) should be equal to the length and width of the selected field size within  $\pm 0.5$ " (at 40" S.I.D.) in each direction. If not, it will be necessary to change the spacing between the collimator and tubemount (increasing the spacer thickness reduces the x-ray field size and vice versa). See Section II.C. - Installation, if necessary.
  - b. The distance between each edge of the x-ray field and the corresponding edge of the light field (as indicated by outer edge of the marked image) must not exceed  $\square 0.5$ ". If it does exceed this distance, refer to Section II.E. - Light Field Adjustment.
6. Repeat this test for at least two field size settings: small and large.

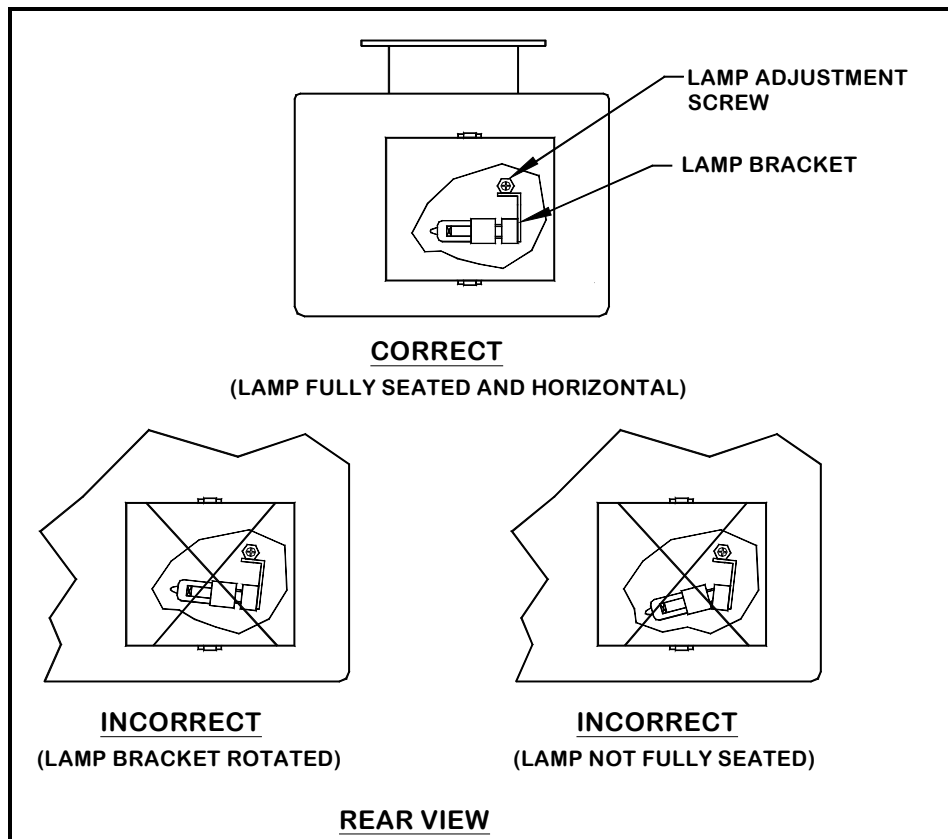
**F. LIGHT FIELD ADJUSTMENT**

1. This step is only required if the installation does not meet the light field/x-ray congruency test of Section II-D above.
2. Remove the rear cover as described in Section I.E - Lamp Replacement.

**NOTE:**

All directions of light field motion are controlled by the single lamp adjustment screw and bracket. Secure the bracket with pliers to prevent excessive movement during adjustment.

3. If light field adjustment is required, grab the lamp bracket with a needle-nose pliers and loosen the lamp adjustment screw just enough to move the lamp bracket as desired. Immediately re-tighten the screw to avoid a large change in light field position. Repeat x-ray to light field test, and re-adjust the lamp bracket as needed. Retighten the lamp adjustment screw, making sure the lamp is correctly orientated as shown in Figure 8 below.
4. Replace the rear cover, making sure the button locks snap into the holes in the cover.
5. Repeat Steps 1 through 5 until the light field and x-ray field comply with the specification in Step 5 of Section II-D.



**Figure 8 - Lamp and Bracket Positioning**

**G. CROSSHAIR ADJUSTMENT** (refer to Figure 9 for parts identification)

1. Loosen the four bezel mounting screws.
2. Push the blade of a screwdriver into one of the four slots on the window and use the screwdriver to move the window until the crosshairs indicate the center of the light field, making sure that the crosshairs are not rotated with respect to the light field edges.
3. Re-tighten the four bezel mounting screws.

**H. COLLIMATOR DISASSEMBLY/REASSEMBLY** (refer to Figure 9 as needed)

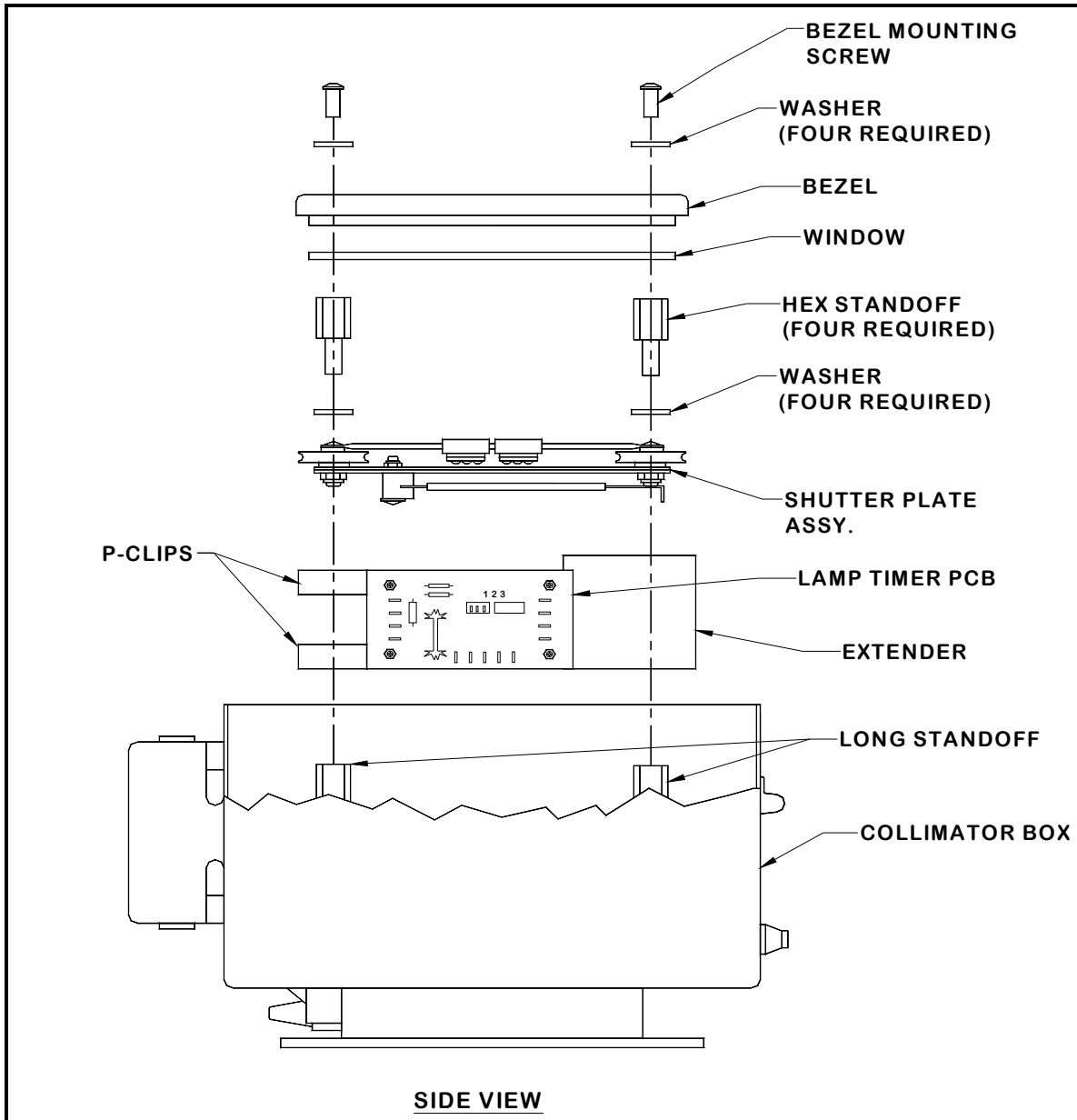
DISASSEMBLY - The following procedure should be followed if it is necessary to gain access to the internal components of the collimator.

1. Remove the four bezel mounting screws and washers. Remove the bezel and the exit window.
2. Unscrew the four hex standoffs and remove the four standoff washers.
3. Remove the shutter plate assembly.
4. Remove the lamp timer PCB by sliding it off the long standoff and disconnecting all of the wire leads attached to the PCB.

NOTE: The quick connect terminals are very fragile and should not be bent or stressed when connecting or disconnecting.

**REASSEMBLY**

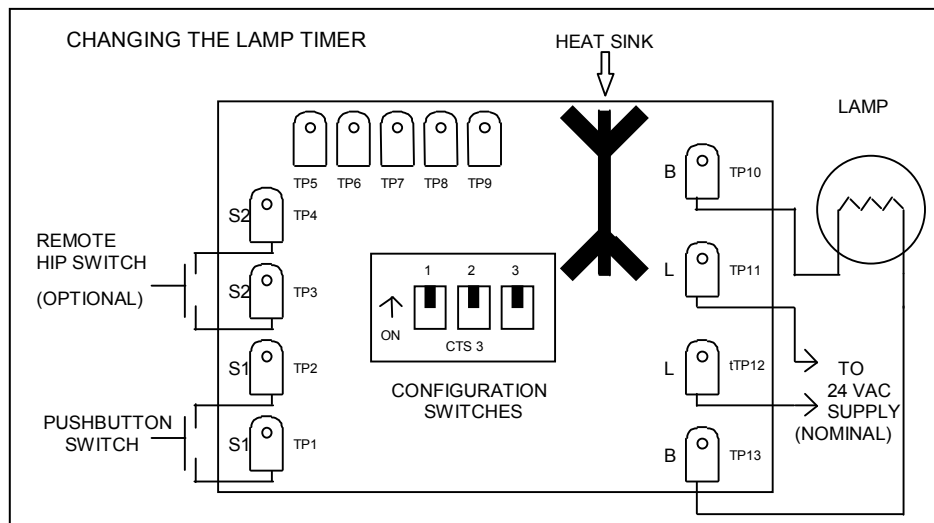
1. Replace the lamp timer PCB by carefully connecting all of the leads to the quick connect terminals as indicated in section II-H. Slide the PCB's plastic P-clips onto the rear long standoff, making sure that the PCB's plastic extender gets trapped between the front long standoff and the collimator body.
2. Replace the shutter plate assembly, making sure the shutter notches and knob hooks are lined up. Placing the slide knobs and shutters in the fully closed positions before inserting the shutter plate works best. The steel side of the shutter plate, stamped "INSIDE", should face the inside of the collimator and the lead side should face out. Check that the shutters move smoothly when the knobs are moved through their complete range.
3. Replace the four hex standoffs and their washers.
4. Replace the exit window and bezel and the four bezel mounting screws.



**Figure 9 - Parts identification**

## I. LAMP TIMER BOARD REPLACEMENT (part number J300)

1. Rotate tubemount assembly so that the window of the collimator is pointed towards the ceiling and secure in place with the tubearm lock knob. Turn off collimator power supply so that no voltage is present.
2. Follow the instructions from Section II-G and [Figure 9](#) above to remove the bezel, exit window and shutter assembly.
3. Remove the wires from the J300 lamp timer board and note the position of the wires that connect to the timer board. Remove the screws that secure the board to the collimator.
4. Install the new board in the same orientation as original board. Reconnect the wires to the appropriate terminals on the board. Refer to [Figure 10](#) below as needed.



**Figure 10 - Lamp Timer Terminal Layout**

5. Turn on power supply for the collimator and verify operation. Adjust lamp time and function as described in Section II-C above.
6. Replace the shutter assembly, window and bezel as described in Section II-G above.
7. Adjust the collimator window as required to re-center the crosshairs to the central ray as described in Section II-F above.